

PHILIPS

Wideband transistors and hybrids

S10

1987

PHILIPS

Data handbook



Electronic
components
and materials

Semiconductors

Book S10

1987

Wideband transistors and

Wideband hybrid IC modules

DATA HANDBOOK SYSTEM

DATA HANDBOOK SYSTEM

Our Data Handbook System comprises more than 60 books with specifications on electronic components, subassemblies and materials. It is made up of four series of handbooks:

ELECTRON TUBES	BLUE
SEMICONDUCTORS	RED
INTEGRATED CIRCUITS	PURPLE
COMPONENTS AND MATERIALS	GREEN

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- T4** **Magnetrons for microwave heating**
- T5** **Cathode-ray tubes**
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- T6** **Geiger-Müller tubes**
- T8** **Colour display systems**
Colour TV picture tubes, colour data graphic display tube assemblies, deflection units
- T9** **Photo and electron multipliers**
- T10** **Plumbicon camera tubes and accessories**
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- S4a Low-frequency power transistors and hybrid modules**
- S4b High-voltage and switching power transistors**
- S5 Field-effect transistors**
- S6 R.F. power transistors and modules**
- S7 Surface mounted semiconductors**
- S8a Light-emitting diodes**
- S8b Devices for optoelectronics**
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- S9 Power MOS transistors**
- S10 Wideband transistors and wideband hybrid IC modules**
- S11 Microwave transistors**
- S12 Surface acoustic wave devices**
- S13 Semiconductor sensors**
- S14 Liquid Crystal Displays**

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IC02a/b	Video and associated systems Bipolar, MOS	published 1986
IC03	Integrated circuits for telephony Bipolar, MOS	published 1986
IC04	HE4000B logic family CMOS	published 1986
IC05N	HE4000B logic family – uncased ICs CMOS	published 1984
IC06N	High-speed CMOS; PC74HC/HCT/HCU Logic family	published 1986
IC08	ECL 10K and 100K logic families	published 1986
IC09N	TTL logic series	published 1986
IC10	Memories MOS, TTL, ECL	new issue 1987
IC11N	Linear LSI	published 1985
Supplement to IC11N	Linear LSI	published 1986
IC12	I²C-bus compatible ICs	not yet issued
IC13	Semi-custom Programmable Logic Devices (PLD)	new issue 1987
IC14	Microcontrollers and peripherals Bipolar, MOS	new issue 1987
IC15	FAST TTL logic series	published 1986
IC16	CMOS integrated circuits for clocks and watches	published 1986
IC17	Integrated Services Digital Networks (ISDN)	not yet issued
IC18	Microprocessors and peripherals	new issue 1987

COMPONENTS AND MATERIALS (GREEN SERIES)

The green series of data handbooks comprises:

- C2** Television tuners, coaxial aerial input assemblies
- C3** Loudspeakers
- C4** Ferroxcube potcores, square cores and cross cores
- C5** Ferroxcube for power, audio/video and accelerators
- C6** Synchronous motors and gearboxes
- C7** Variable capacitors
- C8** Variable mains transformers
- C9** Piezoelectric quartz devices
- C11** Varistors, thermistors and sensors
- C12** Potentiometers, encoders and switches
- C13** Fixed resistors
- C14** Electrolytic and solid capacitors
- C15** Ceramic capacitors
- C16** Permanent magnet materials
- C17** Stepping motors and associated electronics
- C18** Direct current motors
- C19** Piezoelectric ceramics
- C20** Wire-wound components for TVs and monitors
- C22** Film capacitors

WIDEBAND TRANSISTORS AND WIDEBAND HYBRID IC MODULES

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SELECTION GUIDE

This table shows the most preferred types of n-p-n transistors and their complements for wideband applications. It shows the types *in sequence of linear output voltage* capability in each type of envelope. The values of V_o , ITO and PL1 are only given as a typical reference.

For detailed information see relevant data sheet.

Wideband transistors ($f_T = 5$ GHz)

envelope	polarity		I_C (mA)	14	30	70	80	90	120	240	600
			V_{CE} (V)	10	8	10	10	10	15	15	18
			V_o^* (mV)	150	425	700		1000	1200	1600	2500
			ITO (dBm)	27	36	40		43	45	47	52
		PL1 (dBm)	8	17	21		24	26	28	33	
SOT-37	•		BFT24	BFR90A	BFR91A	BFR96S		BFQ34T			
		•		BFQ51	BFQ23	BFQ32S					
SOT-23	•		BFT25	BFR92A	BFR93A						
		•		BFT92	BFT93						
SOT-89	•					BFQ19	BFQ18A				
SOT-122	•								BFQ34	BFQ68	BFQ136
SOT-103	•			BFG90A	BFG91A	BFG96		BFG34			
		•		BFG51	BFG23	BFG32					
SOT-143	•			BFG92A	BFG93A						
SOT-173	•			BFP90A	BFP91A	BFP96					
		•		BFQ51C	BFQ23C	BFQ32C					
TO-72	•			BFQ53	BFQ22S	BFQ63					
		•		BFQ52	BFQ24	BFQ32M					

* Typical output voltage at $d_{im} = -60$ dB (DIN45004B, par. 6.3: 3-tone).

Wideband transistors ($f_T = 7,5$ GHz)

			I_C (mA)		15	50			
			V_{CE} (V)		8	8			
SOT-37	•				BFQ65				
SOT-23	•				BFQ67				
SOT-103	•				BFG65	BFG195			
SOT-143	•				BFG67				
SOT-173	•				BFQ66				

type number	frequency range MHz	power gain (dB) at f = 50 MHz	application	page
BGY61 BGY65 BGY67 BGY67A	5 - 200	13,0 ± 0,5 18,5 ± 0,5 22,0 ± 0,5 24,0 ± 0,5	reverse amplifiers	631 635 639 643
BGY50 BGY51	40 - 300	12,5 ± 0,4	preamplifier post amplifier	599 599
BGY52 BGY53	40 - 300	16,4 ± 0,4	preamplifier post amplifier	603 603
BGY54 BGY55	40 - 300	17,0 ± 0,4	preamplifier post amplifier	607 607
BGY56 BGY57	40 - 300	22,0 ± 0,6	preamplifier post amplifier	611 611
BGY58	40 - 300	33,0 ± 1,0	line extender	615
BGY58A	40 - 330	34,0 ± 1,0	line extender	619
BGY59	40 - 300	38,5 ± 1,0	line extender	623
BGY60	40 - 300	33,5 ± 1,0	interstage amplifier (2 x 17 dB)	627
BGD102 BGD104	40 - 450	18,5 ± 0,5 20,0 ± 0,5	power doubler amplifiers	583 583
BGD102E BGD104E	40 - 450	18,5 ± 0,5 20,0 ± 0,5	power doubler amplifiers	587 587
BGY70 BGY71	40 - 450	12,5 ± 0,4	preamplifier post amplifier	647 647
BGY74 BGY75	40 - 450	17,0 ± 0,4	preamplifier post amplifier	651 651
BGY78	40 - 450	34,0 ± 1,0	line extender	655
BGY84 BGY85	40 - 450	17,0 ± 0,5	preamplifier post amplifier	659 659
BGY84A BGY85A	40 - 450	18,4 ± 0,4	preamplifier post amplifier	663 663
BGY86 BGY87	40 - 450	22,0 ± 0,5	preamplifier post amplifier	667 667
BGY88	40 - 450	34,5 ± 1,0	line extender	671
BGY584A BGY585A	40 - 550	18,2 ± 0,5	preamplifier post amplifier	675 675
BGY586 BGY587	40 - 550	22,0 ± 0,5	preamplifier post amplifier	679 679
BGD502 BGD504	40 - 550	18,5 ± 0,5 20,0 ± 0,5	power doubler power doubler	591 591
BGX885	40 - 860	17,0 ± 0,5	40 - 860 MHz amplifier	595

All modules normally operate at $V_B = 24$ V, but are able to withstand supply transients up to 30 V.

12 V supply voltage

	type	stages	gain (dB)	$V_{O(rms)}$ (dB μ V) -60 dB IMD (note 1) min. values	noise figure (dB)	max. VSWR typ. values (note 2)		supply current (mA)	page
						input	output		
low	OM345	1	12	97	5,5	2,0	1,4	11,5	733
medium	OM350	2	18	98	6,0	1,5	1,9	18	739
medium	OM360	3	23	105	7,0	1,3	1,5	55	745
output	OM361	3	28	105	6,0	1,5	1,7	50	751
high	OM370	3	28	111	7,0	2,3	1,9	105	757
output									

24 V supply voltage

	type	stages	gain (dB)	$V_{O(rms)}$ (dB μ V) -60 dB IMD (note 1) min. values	noise figure (dB)	max. VSWR typ. values (note 2)		supply current (mA)	page
						input	output		
low output	OM320	2	15,5	92	5,5	2,2	2,5	33	687
	OM321	2	15,5	98	6,0	2,5	2,0	33	693
	OM335	3	27	98	5,5	1,9	3,2	35	711
medium output	OM322	2	15	103	7,0	1,7	1,7	60	699
	OM336	3	22	105	7,0	1,4	1,6	65	717
	OM339	3	28	105	6,0	1,5	1,5	66	729
high	OM323*	2	15	112	9,0	1,9	2,3	100	705
output	OM337*	3	26	113	9,8	2,3	1,8	115	721

* Also available in A-version for external coil and output capacitor.

Notes

1. Measured at -60 dB intermodulation distortion to DIN45004, par. 6.3: 3-tone, $f = 470$ MHz.
2. The typical maximum VSWR occurring in the frequency range 40-860 MHz, for a sample connected to a 75 Ω line.

TYPE NUMBER SURVEY
(alphanumeric)

RATINGS

CHARACTERISTICS (typical values unless otherwise specified)

type number	n-p-n or p-n-p	envelope	V _{CEO} V	I _C mA	P _{tot} mW	f _T GHz	F at dB	f MHz	GUM at dB	f MHz	V _o * mV	PL1** dBm	IT0** dBm	I _C mA	V _{CE} V	page
BF689K	n	TO-92	15	25	360	1,8	3,0	200	16	200	—	—	—	—	—	59
BF763	n	TO-92	15	25	500	1,8	5,0	800	—	—	—	—	—	—	—	61
BFG23	p	SOT-103	12	35	180	5,0	3,7	800	14,5	800	400	16	35	30	8	63
BFG32	p	SOT-103	15	75	700	4,5	4,3	800	13,5	800	500	18	37	70	10	69
BFG34	n	SOT-103	18	150	1000	3,7	2,3	800	14,5	800	750	22	41	90	10	75
BFG51	p	SOT-103	15	25	180	5,0	3,4	800	16,5	800	150	7	26	14	10	81
BFG65	n	SOT-103	10	50	300	7,5	3,0	2000	10,5	2000	—	—	—	—	—	89
BFG67	n	SOT-143	10	50	300	7,5	3,0	2000	10	2000	—	—	—	—	—	97
BFG90A	n	SOT-103	15	25	180	5,0	2,4	800	19	800	150	8	27	14	10	101
BFG91A	n	SOT-103	12	35	300	6,0	2,3	800	17,5	800	425	17	36	30	8	111
BFG92A	n	SOT-143	15	25	300	5,0	1,8	800	9,5	2000	—	—	—	—	—	121
BFG93A	n	SOT-143	12	35	300	6,0	1,6	800	9	2000	—	—	—	—	—	125
BFG96	n	SOT-103	15	150	700	5,0	3,7	800	15	800	700	21	40	70	10	129
BFG195	n	SOT-103	10	100	500	7,5	1,9	800	11	2000	—	—	—	—	—	139
BFP90A	n	SOT-173	15	30	250	5,0	2,4	800	19,5	800	150	8	27	14	10	141
BFP91A	n	SOT-173	12	50	350	6,0	2,3	800	18,5	800	425	17	36	30	8	151
BFP96	n	SOT-173	15	100	500	5,0	2,5	800	15	800	700	21	40	70	10	157
BFQ17	n	SOT-89	25	150	1000	1,2	—	—	6,5	800	—	—	—	—	—	163
BFQ18A	n	SOT-89	15	150	1000	3,6	—	—	—	—	700	21	40	80	10	167
BFQ19	n	SOT-89	15	75	500	5,0	—	—	7,5	800	500	18	37	50	10	171

* Typical reference value at d_{im} = -60 dB.

** Typical reference values.

RATINGS

CHARACTERISTICS (typical values unless otherwise specified)

type number	n-p-n or p-n-p	envelope	V _{CEO} V	I _C mA	P _{tot} mW	f _T GHz	F dB	at f MHz	G _{UM} dB	at f MHz	V _o * mV	PL1** dBm	IT0** dBm	I _C mA	V _{CE} V	page
BFQ22S	n	TO-72	12	35	150	5,0	1,9	500	16	500	300	14	33	30	5	175
BFQ23	p	SOT-37	12	35	180	5,0	2,4	500	16,5	500	300	14	33	30	5	179
BFQ23C	p	SOT-173	12	50	350	5,0	3,7	800	15	800	400	16	35	30	8	187
BFQ24	p	TO-72	12	35	150	5,0	2,4	500	15	500	300	14	33	30	5	195
BFQ32	p	SOT-37	15	75	500	4,2	3,8	500	14	500	500	18	37	50	10	199
BFQ32C	p	SOT-173	15	100	500	4,5	4,3	800	13	800	500	19	38	70	10	203
BFQ32M	p	TO-72	15	75	250	4,5	2,3	500	11	500	—	—	—	—	—	211
BFQ32S	p	SOT-37	15	100	700	4,5	4,3	800	10	800	600	20	39	70	10	213
BFQ33	n	SOT-100	7	20	140	12,0	2,5	2000	13	2000	—	—	—	14	5	221
BFQ33C	n	SOT-173	7	20	140	12,0	3,0	2000	13,3	2000	—	—	—	—	—	227
BFQ34	n	SOT-122	18	150	2250	3,9	8,0	500	16,3	500	1200	26	45	120	15	233
BFQ34T	n	SOT-37	18	150	1000	3,7	—	—	19,5	300	1000	24	43	100	10	243
BFQ51	p	SOT-37	15	25	180	5,0	2,4	800	18	500	150	7	26	14	10	253
BFQ51C	p	SOT-173	15	30	250	5,0	2,5	800	16,5	800	150	8	27	14	10	261
BFQ52	p	TO-72	15	25	150	5,0	2,7	500	17	500	150	7	26	14	10	269
BFQ53	n	TO-72	15	25	150	5,0	2,4	500	18	500	150	7	26	14	10	273
BFQ63	n	TO-72	15	75	250	4,5	2,3	500	11,5	500	500	18	37	50	10	277
BFQ65	n	SOT-37	10	50	300	7,5	3,0	2000	8	2000	—	—	—	—	—	281
BFQ66	n	SOT-173	10	50	350	7,5	3,0	2000	11,5	2000	—	—	—	—	—	285
BFQ67	n	SOT-23	10	50	180	7,5	3,0	2000	8	2000	—	—	—	—	—	291

* Typical reference value at d_{im} = -60 dB.

** Typical reference values.

RATINGS

CHARACTERISTICS (typical values unless otherwise specified)

type number	n-p-n or p-n-p	envelope	V _{CEO} V	I _C mA	P _{tot} mW	f _T GHz	F dB	at	f MHz	GUM dB	at	f MHz	V _o * mV	PL1** dBm	IT0** dBm	I _C mA	V _{CE} V	page
BFO68	n	SOT-122	18	300	4500	4,0	—	—	—	13	800	1600	28	47	240	15	295	
BFO136	n	SOT-122	18	600	9000	4,0	—	—	—	12,5	800	2500	33	52	500	15	305	
BFR49	n	SOT-100	15	25	180	5,0	2,5	1000	—	17	1000	—	—	—	—	—	313	
BFR53	n	SOT-23	10	50	250	2,0	5,0	500	—	10,5	800	100	5	24	30	5	319	
BFR64	n	SOT-48	25	200	3500	1,0	6,0	200	—	—	—	—	—	—	—	—	329	
BFR65	n	SOT-48	25	400	5000	>1,0	—	—	—	—	—	—	—	—	—	—	337	
BFR90	n	SOT-37	15	25	180	5,0	2,4	500	—	19,5	500	150	7	26	14	10	345	
BFR90A	n	SOT-37	15	25	180	5,0	2,4	800	—	15	800	150	8	27	14	10	353	
BFR91	n	SOT-37	12	35	180	5,0	1,9	500	—	18	500	300	14	33	30	5	367	
BFR91A	n	SOT-37	12	35	300	6,0	2,3	800	—	14	800	425	17	36	30	8	375	
BFR92	n	SOT-23	15	25	200	5,0	2,4	500	—	18	500	150	7	26	14	10	387	
BFR92A	n	SOT-23	15	25	200	5,0	2,4	800	—	15	800	150	8	27	14	10	397	
BFR93	n	SOT-23	12	35	200	5,0	1,9	500	—	16,5	500	300	14	33	30	5	409	
BFR93A	n	SOT-23	12	35	250	5,0	2,3	800	—	14	800	425	16	35	30	8	419	
BFR94	n	SOT-48	25	150	3500	3,5	5,0	500	—	13,5	500	700	21	40	90	20	431	
BFR95	n	TO-39	25	150	1500	3,5	9,0	200	—	—	—	1000	24	43	80	18	441	
BFR96	n	SOT-37	15	75	500	5,0	3,3	500	—	15,2	500	500	18	37	50	10	445	
BFR96S	n	SOT-37	15	100	700	5,0	4,0	800	—	11,5	800	700	21	40	70	10	453	
BFS17	n	SOT-23	15	25	250	1,3	4,5	500	—	—	—	—	—	—	—	—	465	
BFS17A	n	SOT-23	15	25	300	2,8	2,5	800	—	13,5	800	150	7	26	14	10	471	

* Typical reference value at $d_{im} = -60$ dB.

** Typical reference values.

RATINGS

CHARACTERISTICS (typical values unless otherwise specified)

type number	n-p-n or p-n-p	envelope	V _{CEO} V	I _C mA	P _{tot} mW	f _T GHz	F dB	at f MHz	GUM dB	at f MHz	V _o * mV	PL1** dBm	IT0** dBm	I _C mA	V _{CE} V	page
BFT24	n	SOT-37	5	2,5	30	2,3	3,8	500	17	500	—	—	—	—	—	477
BFT25	n	SOT-23	5	6,5	50	2,3	3,8	500	18	500	—	—	—	—	—	485
BFT92	p	SOT-23	15	25	200	5,0	2,7	500	18	500	150	7	26	14	10	493
BFT93	p	SOT-23	12	35	200	5,0	2,4	500	16,5	500	300	14	33	30	5	499
BFW16A	n	TO-39	25	150	1500	1,2	<6,0	200	—	—	—	—	—	—	—	505
BFW17A	n	TO-39	25	150	1500	1,1	—	—	—	—	—	—	—	—	—	515
BFW30	n	TO-72	10	50	250	1,6	<5,0	500	—	—	100	5	24	30	6	523
BFW92	n	SOT-37	15	25	190	1,6	4,0	500	—	—	—	—	—	—	—	529
BFW92A	n	SOT-37	15	25	200	2,8	2,5	800	13	800	150	7	26	14	10	537
BFW93	n	SOT-37	10	50	190	1,7	<5,0	500	10,5	800	100	5	24	30	5	541
BFX89	n	TO-72	15	25	200	1,2	3,3	200	—	—	—	—	—	—	—	549
BFY90	n	TO-72	15	25	200	1,4	2,5	200	—	—	—	—	—	—	—	561
2N918	n	TO-72	15	50	200	<0,9	<6,0	60	36	200	—	—	—	—	—	577

* Typical reference value at d_{im} = -60 dB.

** Typical reference values.

type	frequency range	power gain at f = 50 MHz dB	slope cable equivalent dB	application	page
	MHz				
BGD102	40 - 450	18,5 ± 0,5	0,5 to 2,5	power doubler	583
BGD102E	40 - 450	18,5 ± 0,5	0,5 to 2,0	power doubler	587
BGD104	40 - 450	20,0 ± 0,5	0,5 to 2,5	power doubler	583
BGD104E	40 - 450	20,0 ± 0,5	0,5 to 2,0	power doubler	587
BGD502	40 - 550	18,5 ± 0,5	0,2 to 2,2	power doubler	591
BGD504	40 - 550	20,0 ± 0,5	0 to 2,0	power doubler	591
BGX885	40 - 860	17,0 ± 0,5	0,2 to 1,2	40 - 860 MHz amplifier	595
BGY50	40 - 300	12,5 ± 0,4	0,2 to 0,8	preamplifier	599
BGY51	40 - 300	12,5 ± 0,4	0,2 to 0,8	post amplifier	599
BGY52	40 - 300	16,4 ± 0,4	0 to 1,0	preamplifier	603
BGY53	40 - 300	16,4 ± 0,4	0 to 1,0	post amplifier	603
BGY54	40 - 300	17,0 ± 0,4	0 to 1,0	preamplifier	607
BGY55	40 - 300	17,0 ± 0,4	0 to 1,0	post amplifier	607
BGY56	40 - 300	22,0 ± 0,6	0 to 1,0	preamplifier	611
BGY57	40 - 300	22,0 ± 0,6	0 to 1,0	post amplifier	611
BGY58	40 - 300	33,0 ± 1,0	0,5 to 1,5	line extender	615
BGY58A	40 - 330	34,0 ± 1,0	0,5 to 1,5	line extender	619
BGY59	40 - 300	38,5 ± 1,0	0 to 1,5	line extender	623
BGY60	40 - 300	33,5 ± 1,0	0,5 to 1,5	interstage amplifier (2 x 17 dB)	627
BGY61	5 - 200	13,0 ± 0,5	-0,2 to 0,5	reverse amplifier	631
BGY65	5 - 200	18,5 ± 0,5	-0,2 to 0,5	reverse amplifier	635
BGY67	5 - 200	22,0 ± 0,5	-0,2 to 0,5	reverse amplifier	639
BGY67A	5 - 200	24,0 ± 0,5	-0,2 to 0,5	reverse amplifier	643
BGY70	40 - 450	12,5 ± 0,4	0,5 to 2,0	preamplifier	647
BGY71	40 - 450	12,5 ± 0,4	0,5 to 2,0	post amplifier	647
BGY74	40 - 450	17,0 ± 0,4	0,5 to 1,5	preamplifier	651
BGY75	40 - 450	17,0 ± 0,4	0,5 to 1,5	post amplifier	651
BGY78	40 - 450	34,0 ± 1,0	0,5 to 2,5	line extender	655
BGY84	40 - 450	17,0 ± 0,5	0,5 to 1,5	preamplifier	659
BGY84A	40 - 450	18,4 ± 0,4	0,3 to 1,5	preamplifier	663
BGY85	40 - 450	17,0 ± 0,5	0,5 to 1,5	post amplifier	659
BGY85A	40 - 450	18,4 ± 0,4	0,3 to 1,5	post amplifier	663
BGY86	40 - 450	22,0 ± 0,5	0,2 to 1,5	preamplifier	667
BGY87	40 - 450	22,0 ± 0,5	0,2 to 1,5	post amplifier	667
BGY88	40 - 450	34,5 ± 1,0	0,5 to 2,5	line extender	671
BGY584A	40 - 550	18,2 ± 0,5	0,5 to 2,0	preamplifier	675
BGY585A	40 - 550	18,2 ± 0,5	0,5 to 2,0	post amplifier	675
BGY586	40 - 550	22,0 ± 0,5	0,5 to 2,0	preamplifier	679
BGY587	40 - 550	22,0 ± 0,5	0,5 to 2,0	post amplifier	679

type	frequency range MHz	transducer gain dB	output voltage at $d_{im} = -60$ dB $\text{dB}\mu\text{V}$	supply voltage V	page
OM320	40 - 860	15,5	≥ 92	24	687
OM321	40 - 860	15,5	≥ 98	24	693
OM322	40 - 860	15	≥ 103	24	699
OM323	40 - 860	15	≥ 112	24	705
OM323A	40 - 860	15	≥ 112	24	705
OM335	40 - 860	27	≥ 98	24	711
OM336	40 - 860	22	≥ 105	24	717
OM337	40 - 860	26	≥ 113	24	721
OM337A	40 - 860	26	≥ 113	24	721
OM339	40 - 860	28	≥ 105	24	729
OM345	40 - 860	12	≥ 97	12	733
OM350	40 - 860	18	≥ 98	12	739
OM360	40 - 860	23	≥ 105	12	745
OM361	40 - 860	28	≥ 105	12	751
OM370	40 - 860	28	≥ 111	12	757

MARKING LIST

Types in SOT-23, SOT-89 and SOT-143 envelopes are marked with a code as listed below.
The actual type number and data code are on the packing.

The envelope number is mentioned in those cases where the same marking code appears twice.

mark	type no.	mark	type no.	mark	type no.	mark	type no.
A1	BAW56	AH	BCX70H	BA	BCX54	BR2	BSR31
A2	BAT18	(SOT-23)		(SOT-89)		BR3	BSR32
A3	BAT17	AH	BCX53	BB	BCW61B	BR4	BSR33
A4	BAV70	(SOT-89)		(SOT-23)		BS1	BST60
A5	BRY61	AJ	BCX70J	BB	BCX54-6	BS2	BST61
		(SOT-23)		(SOT-89)			
A51	BRY62					BS3	BST62
A6	BAS16	AJ	BCX53-6	BC	BCW61C	BT1	BST15
A61	BAS28	(SOT-89)		(SOT-23)		BT2	BST16
A7	BAV99	AK	BCX70K	BC	BCX54-10	C1	BCW29
A8	BAS19	(SOT-23)		(SOT-89)		C2	BCW30
		AK	BCX53-10	BD	BCW61D		
A81	BAS20	(SOT-89)		(SOT-23)		C3	
A82	BAS21					C4	BCW29R
A9		AL	BCX53-16	BD	BCX54-16	C5	BCW30R
A91	BAS17	AM	BCX52-16	(SOT-89)		C6	
AA	BCW60A	AR1	BSR40	BE	BCX55	C7	BCF29
(SOT-23)		AR2	BSR41	BF	BCX55-6		
		AR3	BSR42	BG	BCX71G	C77	BCF29R
AA	BCX51			(SOT-23)		C8	BCF30
(SOT-89)		AR4	BSR43			C9	BCF30R
AB	BCW60B	AS1	BST50	BG	BCX55-10	C91	BCV62
(SOT-23)		AS2	BST51	(SOT-89)		CA	BCX68
AB	BCX51-6	AS3	BST52	BH	BCX71H		
(SOT-89)		AT1	BST39	(SOT-23)		CAC	BC868
				BH	BCX56	CE	BCX69
AC	BCW60C	AT2	BST40	(SOT-89)		CEC	BC869
(SOT-23)		B1				D1	BCW31
AC	BCX51-10	B2	BSV52	BJ	BCX71J	D2	BCW32
(SOT-89)		B3		(SOT-23)			
AD	BCW60D	B4	BSV52R	BJ	BCX56-6	D3	BCW33
(SOT-23)				(SOT-89)		D4	BCW31R
		B5	BSR12	BK	BCX71K	D5	BCW32R
AD	BCX51-16	B6		(SOT-23)		D6	BCW33R
(SOT-89)		B7				D7	BCF32
AE	BCX52	B8	BSR12R	BK	BCX56-10		
AF	BCX52-6	BA	BCW61A	(SOT-89)			
AG	BCX70G	(SOT-23)		BL	BCX56-16		
				BM	BCX55-16		
				BR1	BSR30		

MARKING

mark	type no.	mark	type no.	mark	type no.	mark	type no.
D77	BCF32R	H31	BCW89R	M61		S4	
D8	BCF33	H4	BCW69R	M62	PBMF4391	S5	
D81	BCF33R	H5	BCW70R	M63	PBMF4392	S6	BF510
D91	BCV61	H6		M64	PBMF4393	S7	BF511
DA	BF622	H7	BCF70	M74	BSS83	S8	BF512
DB	BF623	H71	BCF70R	M8		S9	BF513
DC	BF620	H8		M89	BF989	T1	BCX17
DF	BF621	H9		M9		T2	BCX18
E1	BFS17	H91		M90	BF990	T3	BSS63
E2		K1	BCW71	M91	BF991	T4	BCX17R
E3		K2	BCW72	M92	BF992	T5	BCX18R
E4	BFS17R	K3	BCW81	M94	BF994	T6	BSS63R
E5		K31	BCW81R	M96	BF996	T7	BSR15
E6		K4	BCW71R	M97	BFR101A	T71	BSR15R
E7		K5	BCW72R	M98	BFR101B	T8	BSR16
E8		K6		N1	BFR53	T81	BSR16R
F1	BFS18	K7	BCV71	N2		T9	BSR18
F2	BFS19	K71	BCV71R	N3		T91	BSR18R
F3	BF840	K8	BCV72	N4	BFR53R	T92	BSR18A
F31	BF841	K81	BCV72R	N5		T93	BSR18AR
F4	BFS18R	K9	BCF81	O1		U1	BCX19
F5	BFS19R	K91	BCF81R	O2	BST82	U2	BCX20
F6		KM	BST80	O3		U3	BSS64
F7		KN	BST84	O4		U4	BCX19R
F8	BF824	KO	BST86	P1	BFR92	U5	BCX20R
FA	BFQ17	L2		P2	BFR92A	U6	BSS64R
FB	BFQ19	L20	BAS29	P3		U7	BSR13
FD	BCV26	L21	BAS31	P4	BFR92R	U8	BSR14
FF	BCV27	L22	BAS35	P5	BFR92AR	U81	BSR14R
(SOT-23)		L3		P6		U9	BSR17
FF	BFQ18A	L30	BAV23	P7		U91	BSR17R
(SOT-89)		L4	BAT54	P8		U92	BSR17A
G1	BFS20	L41	BAT74	P9		U93	BSR17AR
G2	BF550	L5		R1	BFR93	V1	
G3	BF536	L51	BAS56	R2	BFR93A	V2	BFQ67
G4	BFS20R	LM	BST120	R3		V3	BFG67
G5	BF550R	LN	BST122	R4	BFR93R	V4	BFT25R
G6	BF569	M1	BFR30	R5	BFR93AR	V5	
G7	BF579	M2	BFR32	R6		V6	
G8	BF660	M3	BFT46	R7		V7	
G81	BF660R	M31	BSD20	R8		V8	
G9	BF767	M32	BSD22	R9		V9	
H1	BCW69	M4	BSR56	S1	BBY31	W1	BFT92
H2	BCW70	M5	BSR57	S2	BBY40	W2	
H3	BCW89	M6	BSR58	S3		W3	

MARKING

mark	type no.	mark	type no.	mark	type no.	mark	type no.
W4	BFT92R	Z11	BZX84-C2V4	3G	BC857C	6ER	BC818-16R
W5		Z12	-C2V7	3GR	BC857CR	6F	BC818-25
W6		Z13	-C3V0	3K	BC858B	6FR	BC818-25R
W7		Z14	-C3V3	3KR	BC858BR	6G	BC818-40
W8		Z15	-C3V6	3L	BC858C	6GR	BC818-40R
W9		Z16	BZX84-C3V9	3LR	BC858CR	6Y2	BZV49-C6V2
X1	BFT93	Z17	-C4V3	3Y0	BZV49-C3V0	6Y8	-C6V8
X2		1A	BC846A	3Y3	BZV49-C3V3	7Y5	-C7V5
X3		1BR	BC846AR	3Y6	BZV49-C3V6	8Y2	-C8V2
X4	BFT93R	1E	BC847A	3Y9	BZV49-C3V9	9Y1	-C9V1
X5		1ER	BC847AR	4A	BC859A	10Y	BZV49-C10
X6		1F	BC847B	4AR	BC859AR	11Y	-C11
X7		1FR	BC847BR	4B	BC859B	12Y	-C12
X8		1G	BC847C	4BR	BC859BR	13Y	-C13
X9		1GR	BC847CR	4C	BC859C	15Y	-C15
Y1	BZX84-C11	1J	BC848A	4CR	BC859CR	16Y	BZV49-C16
Y2	-C12	1JR	BC848AR	4E	BC860A	18Y	-C18
Y3	-C13	1K	BC848B	4ER	BC860AR	20Y	-C20
Y4	-C15	1KR	BC848BR	4F	BC860B	22Y	-C22
Y5	-C16	1L	BC848C	4FR	BC860BR	24Y	-C24
Y6	BZX84-C18	1LR	BC848CR	4G	BC860C	27Y	BZV49-C27
Y7	-C20	1V	BF820	4GR	BC860CR	30Y	-C30
Y8	-C22	1W	BF821	4Y3	BZV49-C4V3	33Y	-C33
Y9	-C24	1X	BF822	4Y7	BZV49-C4V7	36Y	-C36
Y10	-C27	1Y	BF823	5A	BC807-16	39Y	-C39
Y11	BZX84-C30	2B	BC849B	5AR	BC807-16R	43Y	BZV49-C43
Y12	-C33	2BR	BC849BR	5B	BC807-25	47Y	-C47
Y13	-C36	2C	BC849C	5BR	BC807-25R	51Y	-C51
Y14	-C39	2CR	BC849CR	5C	BC807-40	56Y	-C56
Y15	-C43	2F	BC850B	5CR	BC807-40R	62Y	-C62
Y16	BZX84-C47	2FR	BC850BR	5E	BC808-16	68Y	BZV49-C68
Y17	-C51	2G	BC850C	5ER	BC808-16R	75Y	-C75
Y18	-C56	2GR	BC850CR	5F	BC808-25		
Y19	-C62	2Y4	BZV49-C2V4	5FR	BC808-25R		
Y20	-C68	2Y7	BZV49-C2V7	5G	BC808-40		
Y21	BZX84-C75	3A	BC856A	5GR	BC808-40R		
Z1	-C4V7	3AR	BC856AR	5Y1	BZV49-C5V1		
Z2	-C5V1	3B	BC856B	5Y6	BZV49-C5V6		
Z3	-C5V6	3BR	BC856BR	6A	BC917-16		
Z4	-C6V2	3E	BC857A	6AR	BC817-16R		
Z5	BZX84-C6V8	3ER	BC857AR	6B	BC817-25		
Z6	-C7V5	3F	BC857B	6BR	BC817-25R		
Z7	-C8V2	3FR	BC857BR	6C	BC817-40		
Z8	-C9V1	3J	BC858A	6CR	BC817-40R		
Z9	-C10	3JR	BC858AR	6E	BC818-16		

GENERAL

Type designation

Rating systems

Letter symbols

s-parameters

Tape and Reel Specifications

**TO-92 variant
transistors on tape**

**Soldering recommendations
for SOT-23, SOT-143 and SOT-89**

**Soldering recommendations
for SOT-37 and SOT-103**

**Soldering recommendations
for SOT-48 and SOT-122**

**Mounting and soldering
recommendations for CATV hybrids**

**Thermal Characteristics of
SOT-23 and SOT-143 envelopes**

PRO ELECTRON TYPE DESIGNATION CODE FOR SEMICONDUCTOR DEVICES

This type designation code applies to discrete semiconductor devices — as opposed to integrated circuits —, multiples of such devices and semiconductor chips.

“Although not all type numbers accord with the Pro Electron system, the following explanation is given for the ones that do.”

A basic type number consists of:

TWO LETTERS FOLLOWED BY A SERIAL NUMBER

FIRST LETTER

The first letter gives information about the material used for the active part of the devices.

- A. GERMANIUM or other material with band gap of 0,6 to 1,0 eV.
- B. SILICON or other material with band gap of 1,0 to 1,3 eV.
- C. GALLIUM-ARSENIDE or other material with band gap of 1,3 eV or more.
- R. COMPOUND MATERIALS (e.g. Cadmium-Sulphide).

SECOND LETTER

The second letter indicates the function for which the device is primarily designed.

- A. DIODE; signal, low power
- B. DIODE; variable capacitance
- C. TRANSISTOR; low power, audio frequency ($R_{th\ j-mb} > 15\ K/W$)
- D. TRANSISTOR; power, audio frequency ($R_{th\ j-mb} \leq 15\ K/W$)
- E. DIODE; tunnel
- F. TRANSISTOR; low power, high frequency ($R_{th\ j-mb} > 15\ K/W$)
- G. MULTIPLE OF DISSIMILAR DEVICES — MISCELLANEOUS; e.g. oscillator
- H. DIODE; magnetic sensitive
- L. TRANSISTOR; power, high frequency ($R_{th\ j-mb} \leq 15\ K/W$)
- N. PHOTO-COUPLER
- P. RADIATION DETECTOR; e.g. high sensitivity phototransistor
- Q. RADIATION GENERATOR; e.g. light-emitting diode (LED)
- R. CONTROL AND SWITCHING DEVICE; e.g. thyristor, low power ($R_{th\ j-mb} > 15\ K/W$)
- S. TRANSISTOR; low power, switching ($R_{th\ j-mb} > 15\ K/W$)
- T. CONTROL AND SWITCHING DEVICE; e.g. thyristor, power ($R_{th\ j-mb} \leq 15\ K/W$)
- U. TRANSISTOR; power, switching ($R_{th\ j-mb} \leq 15\ K/W$)
- X. DIODE: multiplier, e.g. varactor, step recovery
- Y. DIODE; rectifying, booster
- Z. DIODE; voltage reference or regulator (transient suppressor diode, with third letter W)

TYPE DESIGNATION

SERIAL NUMBER

Three figures, running from 100 to 999, for devices primarily intended for consumer equipment.*
One letter (Z, Y, X, etc.) and two figures, running from 10 to 99, for devices primarily intended for industrial/professional equipment.*

This letter has no fixed meaning except W, which is used for transient suppressor diodes.

VERSION LETTER

It indicates a minor variant of the basic type either electrically or mechanically. The letter never has a fixed meaning, except letter R, indicating reverse voltage, e.g. collector to case or anode to stud.

SUFFIX

Sub-classification can be used for devices supplied in a wide range of variants called associated types. Following sub-coding suffixes are in use:

1. VOLTAGE REFERENCE and VOLTAGE REGULATOR DIODES: *ONE LETTER and ONE NUMBER*

The LETTER indicates the nominal tolerance of the Zener (regulation, working or reference) voltage

- A. 1% (according to IEC 63: series E96)
- B. 2% (according to IEC 63: series E48)
- C. 5% (according to IEC 63: series E24)
- D. 10% (according to IEC 63: series E12)
- E. 20% (according to IEC 63: series E6)

The number denotes the typical operating (Zener) voltage related to the nominal current rating for the whole range.

The letter 'V' is used instead of the decimal point.

2. TRANSIENT SUPPRESSOR DIODES: *ONE NUMBER*

The NUMBER indicates the maximum recommended continuous reversed (stand-off) voltage V_R . The letter 'V' is used as above.

3. CONVENTIONAL and CONTROLLED AVALANCHE RECTIFIER DIODES and THYRISTORS: *ONE NUMBER*

The NUMBER indicates the rated maximum repetitive peak reverse voltage (V_{RRM}) or the rated repetitive peak off-state voltage (V_{DRM}), whichever is the lower. Reversed polarity is indicated by letter R, immediately after the number.

4. RADIATION DETECTORS: *ONE NUMBER*, preceded by a hyphen (-)

The NUMBER indicates the depletion layer in μm . The resolution is indicated by a version LETTER.

5. ARRAY OF RADIATION DETECTORS and GENERATORS: *ONE NUMBER*, preceded by a stroke (/).

The NUMBER indicates how many basic devices are assembled into the array.

* When these serial numbers are exhausted the serial number for consumer types may be extended to four figures, and that for industrial types to three figures.

RATING SYSTEMS

The rating systems described are those recommended by the International Electrotechnical Commission (IEC) in its Publication 134.

DEFINITIONS OF TERMS USED

Electronic device. An electronic tube or valve, transistor or other semiconductor device.

Note

This definition excludes inductors, capacitors, resistors and similar components.

Characteristic. A characteristic is an inherent and measurable property of a device. Such a property may be electrical, mechanical, thermal, hydraulic, electro-magnetic, or nuclear, and can be expressed as a value for stated or recognized conditions. A characteristic may also be a set of related values, usually shown in graphical form.

Bogey electronic device. An electronic device whose characteristics have the published nominal values for the type. A bogey electronic device for any particular application can be obtained by considering only those characteristics which are directly related to the application.

Rating. A value which establishes either a limiting capability or a limiting condition for an electronic device. It is determined for specified values of environment and operation, and may be stated in any suitable terms.

Note

Limiting conditions may be either maxima or minima.

Rating system. The set of principles upon which ratings are established and which determine their interpretation.

Note

The rating system indicates the division of responsibility between the device manufacturer and the circuit designer, with the object of ensuring that the working conditions do not exceed the ratings.

ABSOLUTE MAXIMUM RATING SYSTEM

Absolute maximum ratings are limiting values of operating and environmental conditions applicable to any electronic device of a specified type as defined by its published data, which should not be exceeded under the worst probable conditions.

These values are chosen by the device manufacturer to provide acceptable serviceability of the device, taking no responsibility for equipment variations, environmental variations, and the effects of changes in operating conditions due to variations in the characteristics of the device under consideration and of all other electronic devices in the equipment.

The equipment manufacturer should design so that, initially and throughout life, no absolute maximum value for the intended service is exceeded with any device under the worst probable operating conditions with respect to supply voltage variation, equipment component variation, equipment control adjustment, load variations, signal variation, environmental conditions, and variations in characteristics of the device under consideration and of all other electronic devices in the equipment.

DESIGN MAXIMUM RATING SYSTEM

Design maximum ratings are limiting values of operating and environmental conditions applicable to a bogey electronic device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.

These values are chosen by the device manufacturer to provide acceptable serviceability of the device, taking responsibility for the effects of changes in operating conditions due to variations in the characteristics of the electronic device under consideration.

The equipment manufacturer should design so that, initially and throughout life, no design maximum value for the intended service is exceeded with a bogey device under the worst probable operating conditions with respect to supply voltage variation, equipment component variation, variation in characteristics of all other devices in the equipment, equipment control adjustment, load variation, signal variation and environmental conditions.

DESIGN CENTRE RATING SYSTEM

Design centre ratings are limiting values of operating and environmental conditions applicable to a bogey electronic device of a specified type as defined by its published data, and should not be exceeded under normal conditions.

These values are chosen by the device manufacturer to provide acceptable serviceability of the device in average applications, taking responsibility for normal changes in operating conditions due to rated supply voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, environmental conditions, and variations in the characteristics of all electronic devices.

The equipment manufacturer should design so that, initially, no design centre value for the intended service is exceeded with a bogey electronic device in equipment operating at the stated normal supply voltage.

LETTER SYMBOLS FOR TRANSISTORS AND SIGNAL DIODES

based on IEC Publication 148

LETTER SYMBOLS FOR CURRENTS, VOLTAGES AND POWERS

Basic letters

The basic letters to be used are:

I, i = current
 V, v = voltage
 P, p = power.

Lower-case basic letters shall be used for the representation of instantaneous values which vary with time.

In all other instances upper-case basic letters shall be used.

Subscripts

A, a	Anode terminal
(AV), (av)	Average value
B, b	Base terminal, for MOS devices; Substrate
(BR)	Breakdown
C, c	Collector terminal
D, d	Drain terminal
E, e	Emitter terminal
F, f	Forward
G, g	Gate terminal
K, k	Cathode terminal
M, m	Peak value
O, o	As third subscript: The terminal not mentioned is open circuited
R, r	As first subscript: Reverse. As second subscript: Repetitive. As third subscript: With a specified resistance between the terminal not mentioned and the reference terminal.
(RMS), (rms)	R. M. S. value
S, s	As first or second subscript: Source terminal (for FETS only)
	As second subscript: Non-repetitive (not for FETS)
	As third subscript: Short circuit between the terminal not mentioned and the reference terminal
X, x	Specified circuit
Z, z	Replaces R to indicate the actual working voltage, current or power of voltage reference and voltage regulator diodes.

Note: No additional subscript is used for d. c. values.

LETTER SYMBOLS

Upper-case subscripts shall be used for the indication of:

- a) continuous (d. c.) values (without signal)
Example I_B
- b) instantaneous total values
Example i_B
- c) average total values
Example $I_{B(AV)}$
- d) peak total values
Example I_{BM}
- e) root-mean-square total values
Example $I_{B(RMS)}$

Lower-case subscripts shall be used for the indication of values applying to the varying component alone:

- a) instantaneous values
Example i_b
- b) root-mean-square values
Example $I_{b(rms)}$
- c) peak values
Example I_{bm}
- d) average values
Example $I_{b(av)}$

Note: If more than one subscript is used, subscript for which both styles exist shall either be all upper-case or all lower-case.

Additional rules for subscripts

Subscripts for currents

Transistors: If it is necessary to indicate the terminal carrying the current, this should be done by the first subscript (conventional current flow from the external circuit into the terminal is positive).

Examples: I_B , i_B , i_b , I_{bm}

Diodes: To indicate a forward current (conventional current flow into the anode terminal) the subscript F or f should be used; for a reverse current (conventional current flow out of the anode terminal) the subscript R or r should be used.

Examples: I_F , I_R , i_F , $I_{f(rms)}$

Subscripts for voltages

Transistors: If it is necessary to indicate the points between which a voltage is measured, this should be done by the first two subscripts. The first subscript indicates the terminal at which the voltage is measured and the second the reference terminal or the circuit node. Where there is no possibility of confusion, the second subscript may be omitted.

Examples: V_{BE} , v_{BE} , v_{be} , V_{bem}

Diodes: To indicate a forward voltage (anode positive with respect to cathode), the subscript F or f should be used; for a reverse voltage (anode negative with respect to cathode) the subscript R or r should be used.

Examples: V_F , V_R , v_F , V_{rm}

Subscripts for supply voltages or supply currents

Supply voltages or supply currents shall be indicated by repeating the appropriate terminal subscript.

Examples: V_{CC} , I_{EE}

Note: If it is necessary to indicate a reference terminal, this should be done by a third subscript

Example: V_{CCE}

Subscripts for devices having more than one terminal of the same kind

If a device has more than one terminal of the same kind, the subscript is formed by the appropriate letter for the terminal followed by a number; in the case of multiple subscripts, hyphens may be necessary to avoid misunderstanding.

Examples: I_{B2} = continuous (d.c.) current flowing into the second base terminal

V_{B2-E} = continuous (d.c.) voltage between the terminals of second base and emitter

Subscripts for multiple devices

For multiple unit devices, the subscripts are modified by a number preceding the letter subscript; in the case of multiple subscripts, hyphens may be necessary to avoid misunderstanding.

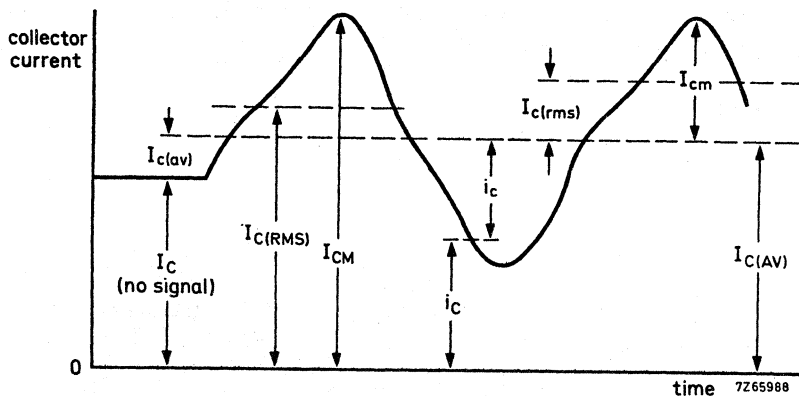
Examples: I_{2C} = continuous (d.c.) current flowing into the collector terminal of the second unit

V_{1C-2C} = continuous (d.c.) voltage between the collector terminals of the first and the second unit.

LETTER SYMBOLS

Application of the rules

The figure below represents a transistor collector current as a function of time. It consists of a continuous (d. c.) current and a varying component.



LETTER SYMBOLS FOR ELECTRICAL PARAMETER METERS

Definition

For the purpose of this Publication, the term "electrical parameter" applies to four-pole matrix parameters, elements of electrical equivalent circuits, electrical impedances and admittances, inductances and capacitances.

Basic letters

The following is a list of the most important basic letters used for electrical parameters of semiconductor devices.

- B, b = susceptance; imaginary part of an admittance
- C = capacitance
- G, g = conductance; real part of an admittance
- H, h = hybrid parameter
- L = inductance
- R, r = resistance; real part of an impedance
- X, x = reactance; imaginary part of an impedance
- Y, y = admittance;
- Z, z = impedance;

Upper-case letters shall be used for the representation of:

- a) electrical parameters of external circuits and of circuits in which the device forms only a part;
- b) all inductances and capacitances.

Lower-case letters shall be used for the representation of electrical parameters inherent in the device (with the exception of inductances and capacitances).

Subscripts

General subscripts

The following is a list of the most important general subscripts used for electrical parameters of semiconductor devices:

F, f	= forward; forward transfer
I, i (or 1)	= input
L, l	= load
O, o (or 2)	= output
R, r	= reverse; reverse transfer
S, s	= source

Examples: Z_S , h_I , h_F

The upper-case variant of a subscript shall be used for the designation of static (d.c.) values.

Examples: h_{FE} = static value of forward current transfer ratio in common-emitter configuration (d.c. current gain)

R_E = d.c. value of the external emitter resistance.

Note: The static value is the slope of the line from the origin to the operating point on the appropriate characteristic curve, i.e. the quotient of the appropriate electrical quantities at the operating point.

The lower-case variant of a subscript shall be used for the designation of small-signal values.

Examples: h_{fe} = small-signal value of the short-circuit forward current transfer ratio in common-emitter configuration

$Z_e = R_e + jX_e$ = small-signal value of the external impedance

Note: If more than one subscript is used, subscripts for which both styles exist shall either be all upper-case or all lower-case

Examples: h_{FE} , y_{RE} , h_{fe}

Subscripts for four-pole matrix parameters

The first letter subscript (or double numeric subscript) indicates input, output, forward transfer or reverse transfer

Examples: h_i (or h_{11})
 h_o (or h_{22})
 h_f (or h_{21})
 h_r (or h_{12})

A further subscript is used for the identification of the circuit configuration. When no confusion is possible, this further subscript may be omitted.

Examples: h_{fe} (or h_{21e}), h_{FE} (or h_{21E})

Distinction between real and imaginary parts

If it is necessary to distinguish between real and imaginary parts of electrical parameters, no additional subscripts should be used. If basic symbols for the real and imaginary parts exist, these may be used.

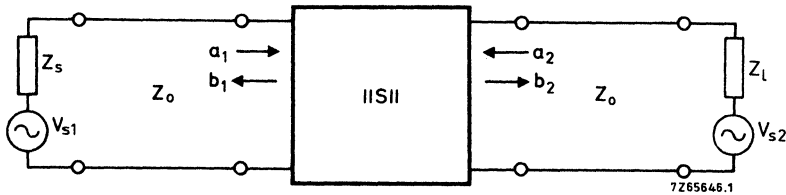
Examples: $Z_i = R_i + jX_i$
 $y_{fe} = g_{fe} + jb_{fe}$

If such symbols do not exist or if they are not suitable, the following notation shall be used:

Examples: $\text{Re}(h_{ib})$ etc. for the real part of h_{ib}
 $\text{Im}(h_{ib})$ etc. for the imaginary part of h_{ib}

SCATTERING PARAMETERS

In distinction to the conventional h, y and z-parameters, s-parameters relate to travelling wave conditions. The figure below shows a two-port network with the incident and reflected waves a_1 , b_1 , a_2 and b_2 .



$$a_1 = \frac{V_{i1}}{\sqrt{Z_0}}$$

$$a_2 = \frac{V_{i2}}{\sqrt{Z_0}}$$

1)

$$b_1 = \frac{V_{r1}}{\sqrt{Z_0}}$$

$$b_2 = \frac{V_{r2}}{\sqrt{Z_0}}$$

Z_0 = characteristic impedance of the transmission line in which the two-port is connected.

V_i = incident voltage

V_r = reflected (generated) voltage

The four-pole equations for s-parameters are:

$$b_1 = s_{11}a_1 + s_{12}a_2$$

$$b_2 = s_{21}a_1 + s_{22}a_2$$

Using the subscripts i for 11, r for 12, f for 21 and o for 22, it follows that:

$$s_i = s_{11} = \left. \frac{b_1}{a_1} \right|_{a_2 = 0}$$

$$s_r = s_{12} = \left. \frac{b_1}{a_2} \right|_{a_1 = 0}$$

$$s_f = s_{21} = \left. \frac{b_2}{a_1} \right|_{a_2 = 0}$$

$$s_o = s_{22} = \left. \frac{b_2}{a_2} \right|_{a_1 = 0}$$

1) The squares of these quantities have the dimension of power.

S-PARAMETERS

The s-parameters can be named and expressed as follows:

$s_i = s_{11}$ = Input reflection coefficient.

The complex ratio of the reflected wave and the incident wave at the input, under the conditions $Z_1 = Z_0 = 50 \Omega$ and $V_{s2} = 0$.

$s_r = s_{12}$ = Reverse transmission coefficient.

The complex ratio of the generated wave at the input and the incident wave at the output, under the conditions $Z_s = Z_0 = 50 \Omega$ and $V_{s1} = 0$.

$s_f = s_{21}$ = Forward transmission coefficient.

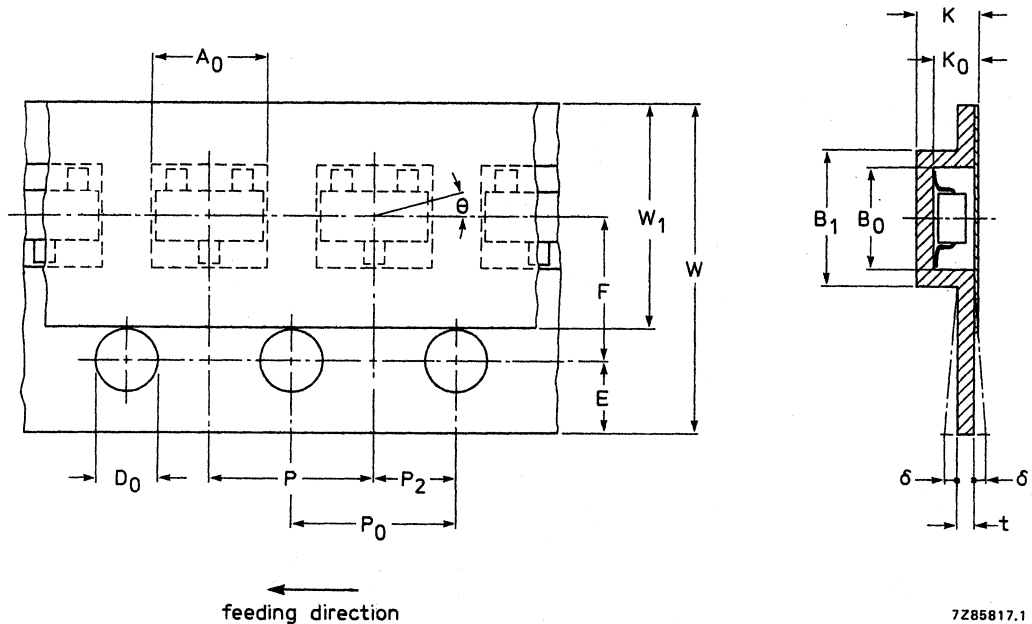
The complex ratio of the generated wave at the output and the incident wave at the input, under the conditions $Z_1 = Z_0 = 50 \Omega$ and $V_{s2} = 0$.

$s_o = s_{22}$ = Output reflection coefficient.

The complex ratio of the reflected wave and the incident wave at the output, under the conditions $Z_s = Z_0 = 50 \Omega$ and $V_{s1} = 0$.

TAPE AND REEL SPECIFICATION

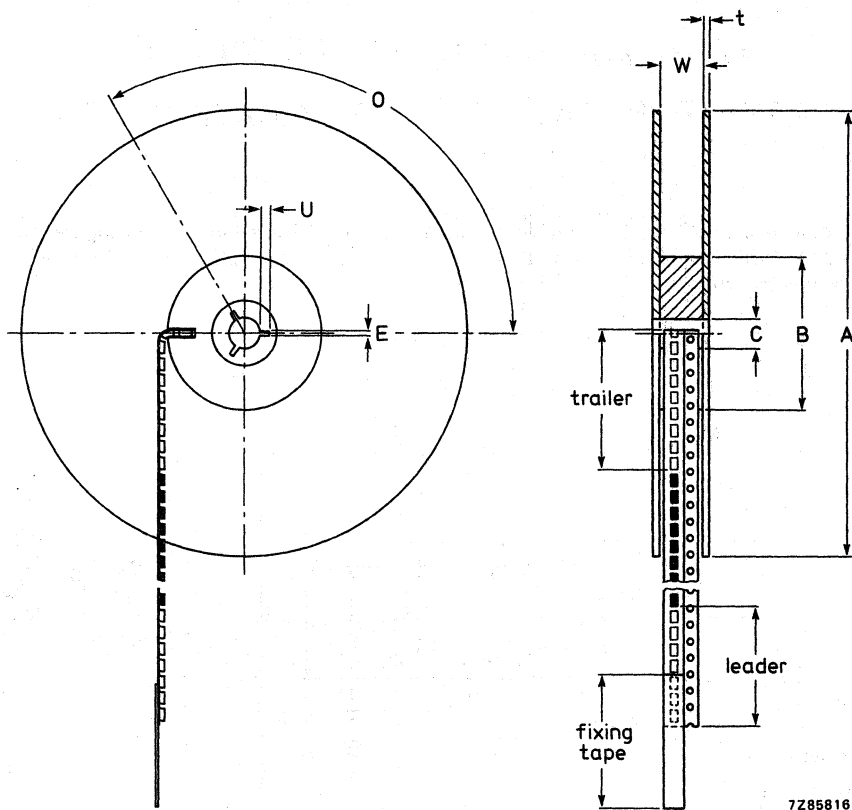
Semiconductors in SOT-23 and SOT-143 encapsulations can be delivered in reel packing for automatic placement on hybrid circuits and printed circuit boards. The devices are placed with the mounting side downwards in compartments.



7Z85817.1

Fig. 1 Configuration of bandolier. Dimensions in mm.

Compartment		tol.		Centre line dimensions		tol.		
length	A ₀ component length		+0,2	length direction	P ₂	2,0	±0,05	
width	B ₀ component width		+0,2	width direction	F	3,5	±0,05	
depth	K ₀	0,95	+0,2	Fixing tape	width	W ₁	5,5	±0,25
width outside	B ₁	3,3	max.					
pitch	P	4,0	±0,1	Carrier tape	width	W	8,0	±0,2
deviation	θ	15°	max.					
Sprocket hole	diameter	D ₀	1,5	+0,1	thickness	t	0,4	max.
	pitch	P ₀	4,0	±0,1	Overall thickness	K	1,5	max.
	distance	E	1,75	±0,1				
	cumulative (10)							
	pitch error		±0,1					



7285816

Fig. 2 Configuration of reel and flange (dimensions in mm).

Flange			tol.	Hub			tol.
diameter	A	180	+0 -2	diameter	B	62	± 1,5
thickness	t	1,5	+0,5 -0,1	spindle hole	C	12,75	+0,15 -0
space between flanges	W	9,5	± 0,5	key slit			
				width	E	2	± 0,5
				depth	U	4	± 0,5
				location	O	120	degrees

Amount of devices per reel

The bandolier of a 180 mm reel contains at least 2500 devices with no more than 15 empty compartments (0,5%). Three consecutive empty places might be found provided this gap is followed by 6 consecutive devices.

The carrier tape (leader) starts with at least 75 empty positions (equivalent to 300 mm); the covering foil is at least 300 mm. In order to fix the carrier tape a self-adhesive tape of 20 to 50 mm is applied.

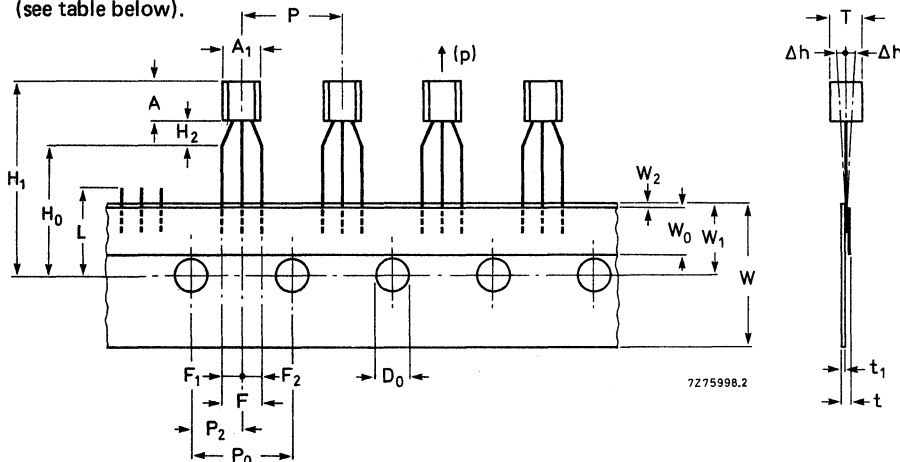
At the end of the bandolier (trailer) at least 75 empty positions (equivalent to a length of 300 mm) and 300 mm foil. For fixing onto the reel a self-adhesive tape of 20 to 50 mm is applied.

TO-92 VARIANT TRANSISTORS ON TAPE

MECHANICAL DATA

Fig. 1 (see table below).

Dimensions in mm



Item	Symbol	Specifications				Remarks
		min.	nom.	max.	tol.	
Body width	A ₁	4,0		4,8		
Body height	A	4,8		5,2		
Body thickness	T	3,9		4,2		
Pitch of component	P		12,7		± 1	
Feed hole pitch	P ₀		12,7		± 0,3	Cumulative pitch error 1,0 mm/20 pitch
Feed hole centre to component centre	P ₂		6,35		± 0,4	To be measured at bottom of clinch
Distance between outer leads	F		5,08		+ 0,6 - 0,2	
Component alignment	Δh		0	1		At top of body
Tape width	W		18		± 0,5	
Hold-down tape width	W ₀		6		± 0,2	
Hole position	W ₁		9		+ 0,7 - 0,5	
Hold-down tape position	W ₂		0,5		± 0,2	
Lead wire clinch height	H ₀		16		± 0,5	
Component height	H ₁			32,25		
Length of snapped leads	L			11,0		
Feed hole diameter	D ₀		4		± 0,2	
Total tape thickness	t			1,2		t ₁ 0,3-0,6
Lead-to-lead distance	F ₁ , F ₂		2,54		+ 0,4 - 0,1	
Clinch height	H ₂			3		
Pull-out force	(p)	6N				

TAPE

PACKING

The transistors are supplied on tape in boxes (ammopack) or on reels. The number per reel is 1600 and per ammobox 2000*.

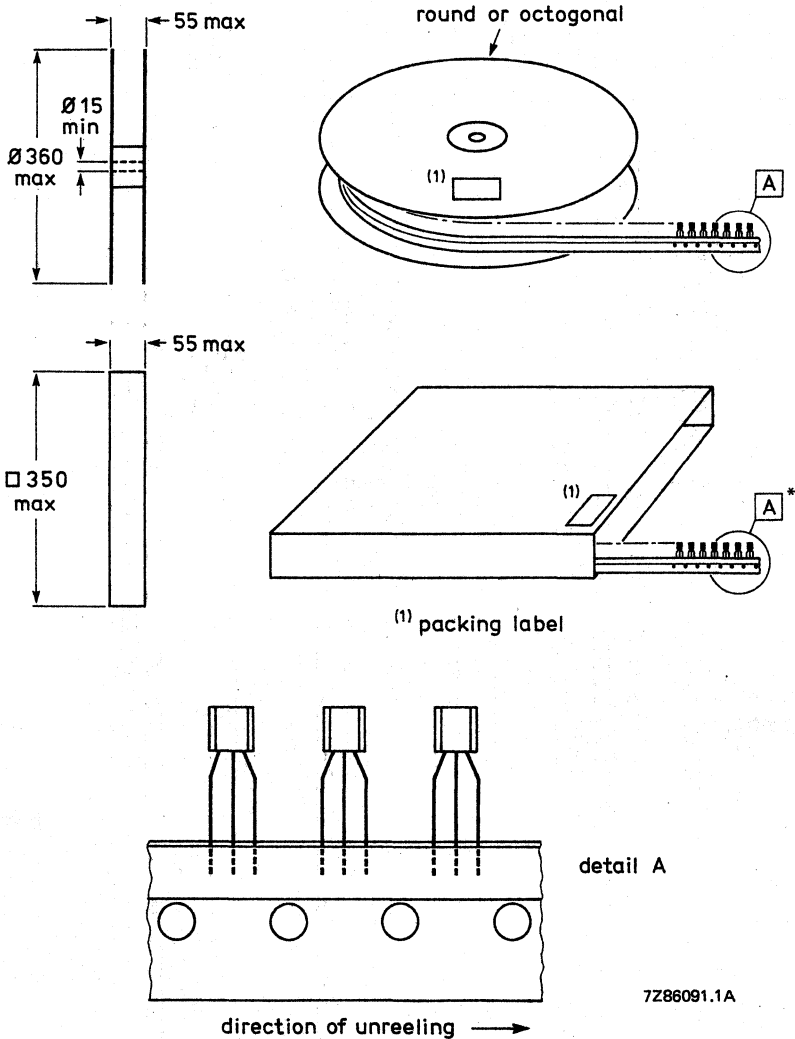


Fig. 2 Dimensions (in mm) of reel and box.

DROPOUTS

A maximum of 0,5% of the specified number of transistors in each packing may be missing. Up to 3 consecutive components may be missing provided the gap is followed by 6 consecutive components.

TAPE SPLICING

Slice the carrier tape on the back and/or front so that the feed hole pitch (P_0) is maintained (see Fig. 3).

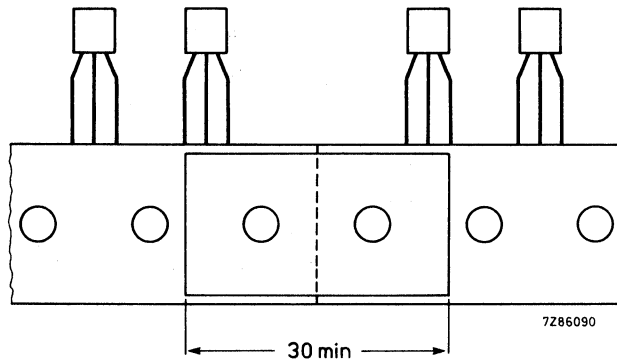


Fig. 3 Jointing tape with splicing patch.

- * The ammobox has 80 layers of 25 transistors each. Each layer contains 25 transistors plus one empty position in order to fold the layer correctly. The ammobox is accessible from both sides enabling the user to choose between "normal" (see Fig. 2) and "reverse" tape.

SOLDERING RECOMMENDATIONS

SOT-23, SOT-143 AND SOT-89 ENVELOPES

SOT-23, SOT-143 and SOT-89 devices are ideally suited for placement onto thick and thin film substrates and printed circuit boards.

To assure reliable and consistent connections particular attention should be paid to:

1. Flux

A non-active flux is recommended. Where active fluxes are employed, great care in subsequent substrate cleaning must be exercised.

2. Metal-alloy solder or solder paste

Correct choice of solder alloy or solder paste to be employed e.g. 62% Sn, 36% Pb, 2% Ag or 60% Sn/40% Pb. Any paste used should contain at least 85% metal dry weight.

3. Soldering temperature

This will vary according to the actual method employed.

REFLOW SOLDERING

The preferred technique for mounting microminiature components on hybrid thick and thin-film is the method of reflow soldering.

The tags of SOT-23, SOT-143 and SOT-89 envelopes are pre-tinned and the best results are obtained if a similar solder is applied to the corresponding soldering areas on the substrate. This can be done by either dipping the substrate in a solder bath or by screen printing a solder paste.

The maximum temperature of the leads or tab during the soldering cycle should not exceed 285 °C. The most economic method of soldering is a process in which all different components are soldered simultaneously for example SOT-23, SOT-143 or SOT-89 devices, capacitors and resistors.

Having first been fluxed, all components are positioned on the substrate. The slight adhesive force of the flux is sufficient to keep the components in place. Solder paste contains a flux and has therefore good inherent adhesive properties which eases positioning of the components.

With the components in position the substrate is heated to a point where the solder begins to flow. This can be done on a heating plate or on a conveyor belt running through an infrared tunnel. The maximum allowed temperature of the plastic body of a device must be kept below 280 °C during the soldering cycle. For further temperature behaviour during the soldering process see Figs 2 and 3.

The surface tension of the liquid solder tends to draw the tags of the device towards the centre of the soldering area and has thus a correcting effect on slight mispositionings. However, if the layout leaves something to be desired the same effect can result in undesirable shifts; particularly if the soldering areas on the substrate and the components are not concentrically arranged. This problem can be solved using a standard contact pattern, which leaves sufficient scope for the self-positioning effect (see Figs 4 and 5).

After cooling the connections may be visually inspected and, where necessary, repaired with a light soldering iron. Finally any remaining flux must be removed carefully.

IMMERSION SOLDERING

Where a complete substrate or printed circuit board is immersed in solder:

- a. The temperature of the soldering bath should not exceed 280 °C.
- b. The duration of the soldering cycle should not exceed 10 seconds.
- c. Forced cooling may be applied (see Fig. 1).

HAND SOLDERING

It is possible to solder microminiature devices with a light hand-held soldering iron, but this method has obvious drawbacks and should therefore be restricted to laboratory use and/or incidental repairs on production circuits.

- 1. It is time-consuming and expensive.
- 2. The device cannot be positioned accurately and therefore the connecting tags may come into contact with the substrate and damage it.
- 3. There is a great risk of breaking either substrate or even internal connections inside the encapsulation.
- 4. The envelope may be damaged by the iron.

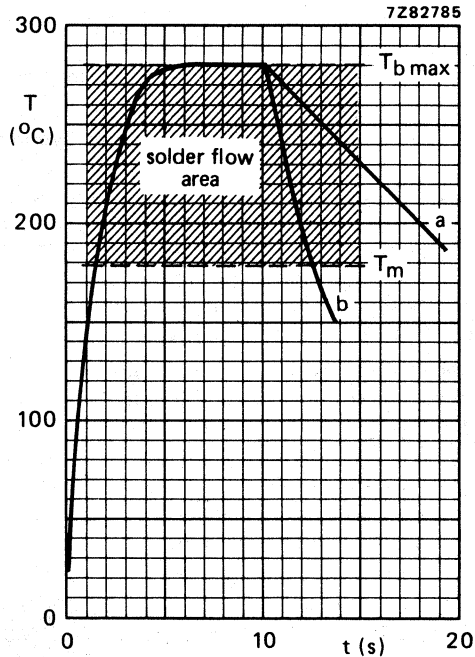


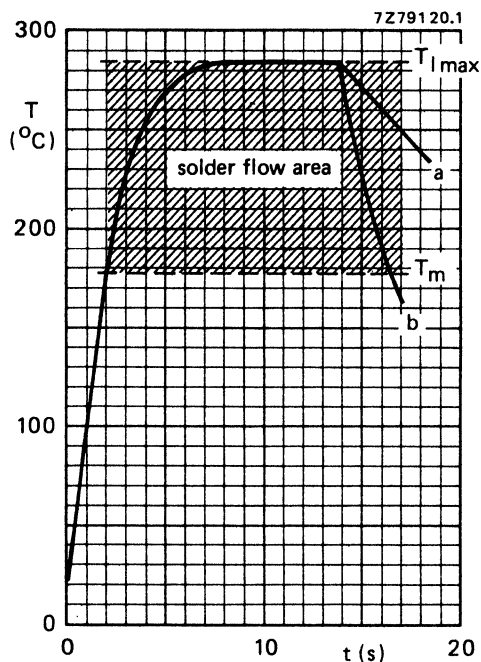
Fig. 1 Device temperature during immersion soldering.

Maximum time of immersion in soldering bath is 10 seconds at an ambient temperature of 25 °C.

a = free convection cooling; b = forced cooling.

$T_{b \text{ max}}$ = maximum bath temperature (280 °C).

T_m = melting temperature of solder (179 °C).



- a = free convection cooling.
- b = permissible forced cooling.
- $T_{l\ max}$ = Maximum lead or tab temperature = 285 °C.
- T_m = Melting point of the solder is 179 °C.
- T_{amb} = 25 °C.

Time of heat supply:
without preheating max. 14 s
with preheating max. 10 s
Maximum time of preheating 45 s

Fig. 2 Reflow soldering without preheating.

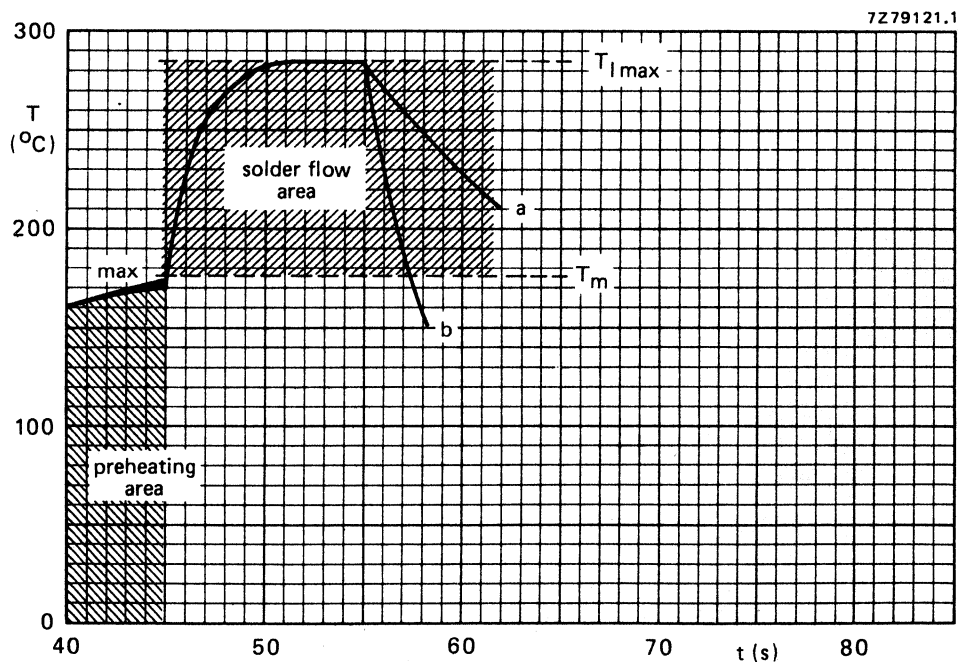


Fig. 3 Reflow soldering with preheating.

**SOLDERING
RECOMMENDATIONS**

Minimum required dimensions of metal connection pads on hybrid thick and thin-film substrates.

Dimensions in mm

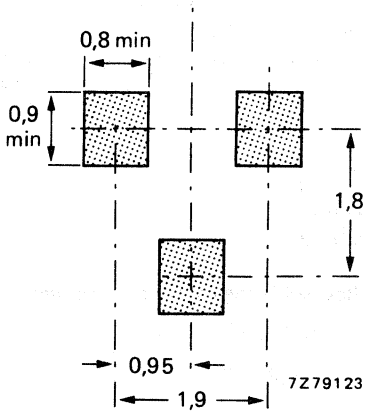


Fig. 4 SOT-23 pattern.

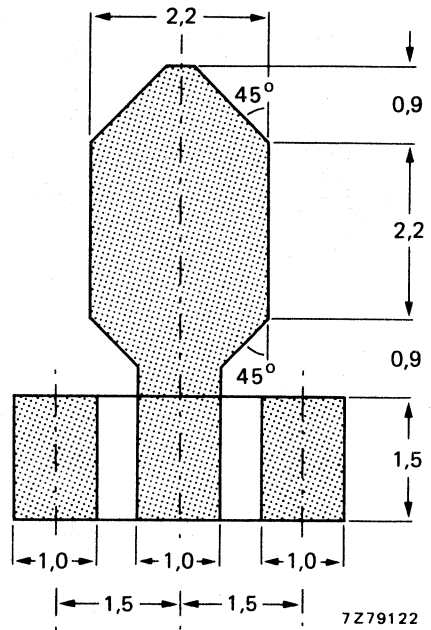


Fig. 5 SOT-89 pattern.

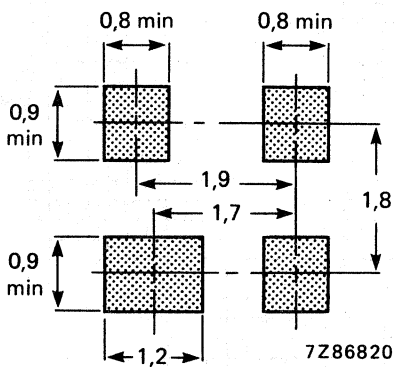


Fig. 6 SOT-143 pattern.

SOLDERING RECOMMENDATIONS SOT-37 AND SOT-103

Transistors in SOT-37 and SOT-103 envelopes may be mounted with leads flat (Fig. 1) or bent (Figs 2 and 3). Different soldering procedures apply for the different styles of mounting.

FLAT-LEAD MOUNTING

Soldering by hand

Avoid putting any force on the leads during or just after soldering.

Solder the three leads one at a time, *not* simultaneously.

Proceed from one lead to the adjacent lead, *not* to the opposite one.

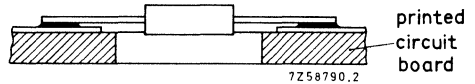


Fig. 1

Solder temperature	max.	300 °C
Soldering time	max.	5 s
Solder-to-case distance	min.	2 mm

BENT-LEAD MOUNTING

If leads are bent, all three may be soldered simultaneously if desired.

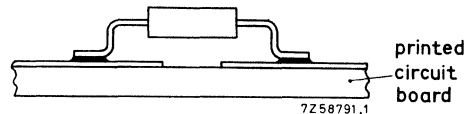


Fig. 2

Solder temperature	max.	300 °C
Soldering time	max.	10 s

DIP OR WAVE SOLDERING

When dip or wave soldering, the maximum allowable temperature of the solder is 260 °C. This temperature must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds. The device may be mounted up to the lead projections, but the temperature of the body must not exceed the specified storage maximum.

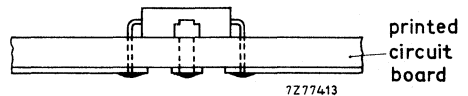


Fig. 3

Solder temperature	max.	260 °C
Soldering time	max.	5 s

SOLDER RECOMMENDATIONS FOR SOT-48 AND SOT-122

A brass nut is supplied with each transistor for securing it to a heatsink.

Screw thread, diameter and nuts:

stud diameter	thread	maximum diameter of threaded stud	nut thickness
¼"	8-32UNC-2A(B)	4,14 mm	3,5 mm SOT-48 5,0 mm SOT-122

To ensure optimum heat transfer and to avoid damage to the threaded stud of the transistor the following recommendations should be observed:

1. Diameter of the mounting hole in the heatsink $4,15 + 0,05; -0$ mm (max. 4,2 mm).
2. Heatsink surfaces at the mounting hole to be flat, parallel, and free of burrs or oxydation.
3. Torque on nut: minimum 0,75 Nm (7,5 kgcm), maximum 0,85 Nm (8,5 kgcm).
4. Recommended distance from the top surface of the heatsink to surface of printed-circuit board: $2,9 + 0; -0,2$ mm.

Tension in the transistor leads sets the limit on spacing between heatsink and printed-circuit board; in general, the leads can withstand more pull in the downward direction than in the upward direction.

Solder the leads to the connection pads with resin-cored tin-lead solder, using an iron of normal temperature. Soldering iron temperatures as high as 350 °C are safely tolerable; the transistor can withstand an interior temperature of 250 °C for about ten minutes.

The leads may be tinned, if required, by dipping them into a solder bath at about 230 °C; each lead may be dipped up to its full length. A flux of the quality of Super-Safe is recommended; after tinning, surplus flux should be rinsed away with tap water.

MOUNTING AND SOLDERING RECOMMENDATIONS FOR CATV HYBRIDS

Mounting

1. The heatsink surface must be flat, free of burrs, oxidization and parallel to the mounting surface.
2. The heatsink, mounting base and ground leads should be properly r.f. grounded.
3. Heatsink compound should be applied sparingly and evenly on the mounting base.

Suitable heatsink compounds:

Dow Corning 340,
Eccotherm TC-5 (E&C),
Wakefield 120.

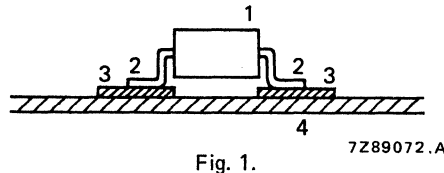
4. When mounting CATV hybrid components, the UNC screws must first be turned finger-tight. The screws should then be tightened to within the tolerance of minimum 0,5 Nm to maximum 0,7 Nm.

Soldering

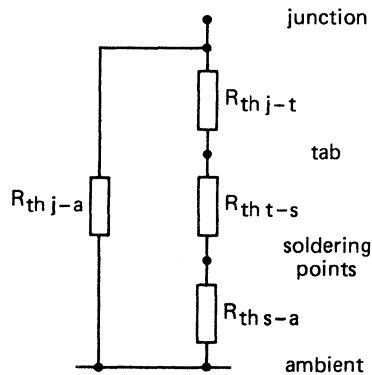
Devices may be soldered directly into a circuit using a soldering iron with a maximum temperature of 260 °C for not more than 3 s when the soldered joints are a minimum of 3 mm from the module.

THERMAL CHARACTERISTICS FOR SOT-23 AND SOT-143 ENVELOPES

The heat generated in a semiconductor chip normally flows by various paths to the surroundings (ambient).



1. Heat radiation from the envelope to ambient (1).
This heat transfer can be neglected when the envelope is mounted on a substrate or printed circuit board.
2. Heat transmission via leads (2) soldering points (3) and substrate (4).



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Fig. 2 Thermal behaviour of heat flow when the device is mounted on a substrate or printed circuit board.

- $R_{th\ j-t}$ = Thermal resistance from junction to tab.
 $R_{th\ t-s}$ = Thermal resistance from tab to soldering points.
 $R_{th\ s-a}$ = Thermal resistance from soldering points to ambient.
 $R_{th\ j-a}$ = Thermal resistance from junction to ambient.

Heat transfer directly from envelope to ambient

This depends on the difference between the temperatures of envelope and the surroundings. When the device is mounted on a substrate or printed circuit board direct heat flow can usually be neglected in relation to the heat flow via leads and substrate.

Thus the thermal model can be as in Fig. 3.

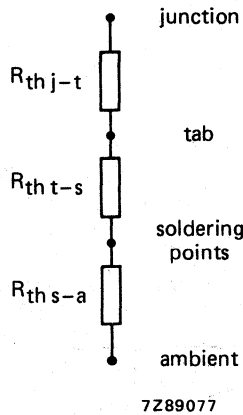


Fig. 3 Basic thermal model.

Heat transfer from junction to tab

This is an internal heat transfer and has been measured. In general it is:

- for high-frequency transistors, low-power diodes and (MOS) FETs 60 K/W
- for low-frequency and switching transistors 50 K/W
- for low-frequency medium-power transistors 30 K/W

Heat transfer from tab to soldering points

- This value has also been measured for SOT-23 with $P_{tot} < 350$ mW 280 K/W
- for types of semiconductors in this envelope with $P_{tot} < 425$ mW 260 K/W
- for types of semiconductors in a SOT-143 envelope this value is 310 K/W

Heat transfer from soldering points to ambient

This depends on the shape and material of tracks and substrate. In figures 4 and 5 standard mounting conditions are given to set up the maximum power ratings for SOT-23 and SOT-143 encapsulations.

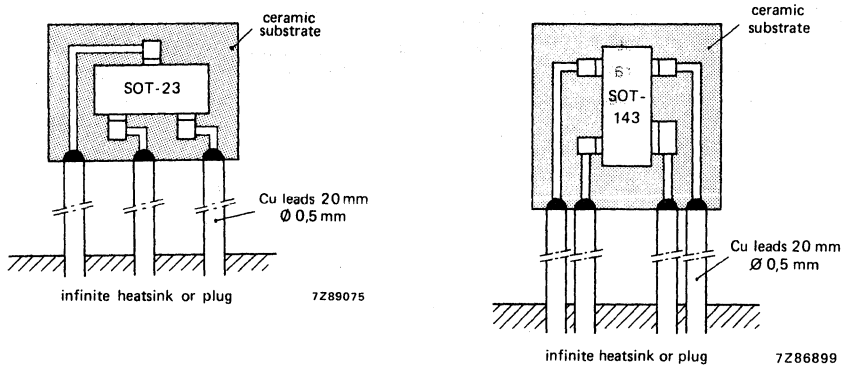


Fig. 4 Test circuits SOT-23 and SOT-143 mounting conditions on a ceramic substrate.

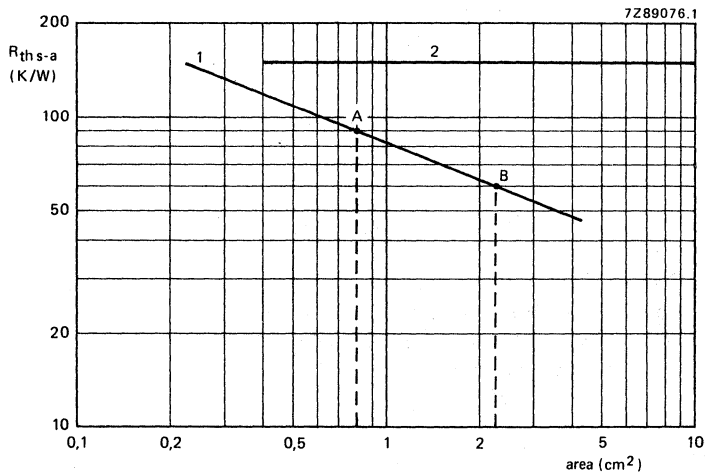


Fig. 5 Heat transfer from soldering points to ambient.

1. Ceramic substrate

Point A on the curve in Fig. 5 is for an area of the ceramic substrate of 8 mm x 10 mm x 0,7 mm for the maximum rating of all high-frequency, low-frequency and switching transistors and also for all diodes.

Point B on the curve in Fig. 5 is for an area of the ceramic substrate of 15 mm x 15 mm x 0,7 mm for the maximum rating of low-frequency medium-power semiconductors.

2. Printed circuit board

$R_{th s-a} = 150 \text{ K/W}$ for SOT-23 and SOT-143 envelopes mounted on a printed circuit board.

THERMAL CHARACTERISTICS

The values for the thermal resistance from junction to tab, and tab to soldering points, are given earlier and in Fig. 5.

The formula for devices in SOT-23 with one crystal can be generalized:

$$T_j = P (R_{th\ j-t} + R_{th\ t-s} + R_{th\ s-a}) + T_{amb}$$

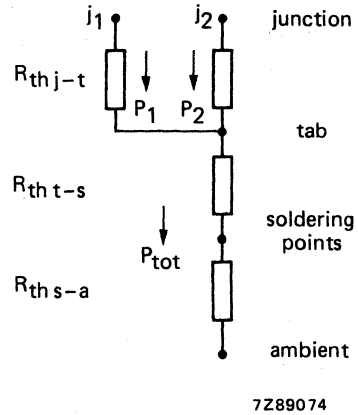
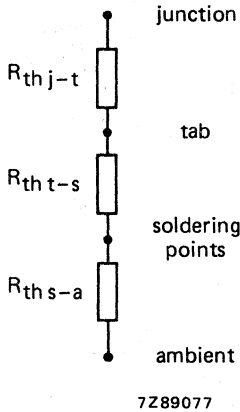


Fig. 6 Thermal model of SOT-23 envelopes with one crystal.

Fig. 7 Thermal model of SOT-23 envelopes with two crystals (double diode).

The formulae for devices with two crystals (double diodes) are:

$$T_{tab} = P_{tot} \cdot (R_{th\ t-s} + R_{th\ s-a}) + T_{amb} = P_{tot} (280 + 90) + T_{amb}$$

$$T_{j1} = (P_1 \times R_{th\ j-t}) + T_{tab} = P_1 \cdot 60 + T_{tab}$$

$$T_{j2} = (P_2 \times R_{th\ j-t}) + T_{tab} = P_2 \cdot 60 + T_{tab}$$

As mentioned with Fig. 3:

$R_{th\ j-t}$ for diodes is 60 K/W.

$R_{th\ s-a}$ (area 8 mm x 10 mm x 0,7 mm) = 90 K/W.

$R_{th\ t-s}$ for all semiconductors in SOT-23 = 280 K/W.

Thus:

$$T_{j1} = 60 P_1 + 370 P_{tot} + T_{amb}$$

$$T_{j2} = 60 P_2 + 370 P_{tot} + T_{amb}$$

DEVICE DATA

Wideband transistors

N-P-N H.F. WIDEBAND TRANSISTOR

N-P-N transistor in a TO-92 envelope intended for application as an amplifier or oscillator in the v.h.f. and u.h.f. range.

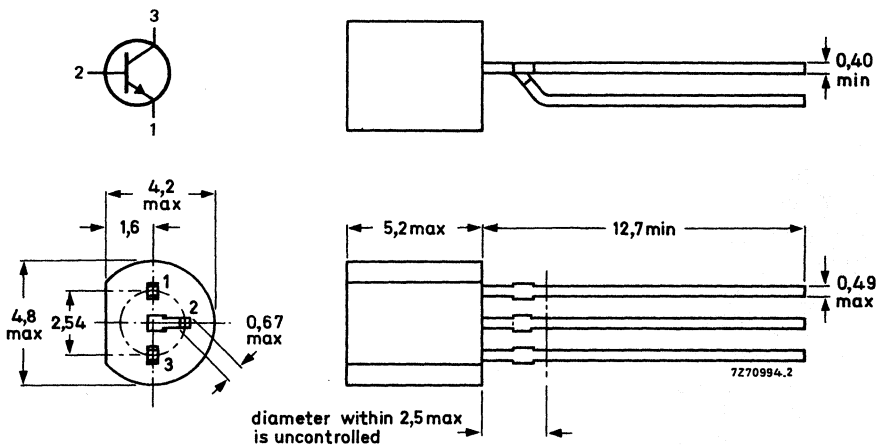
QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	25 V
Collector-emitter voltage (open base)	V_{CEO}	max.	15 V
Collector current (d.c.)	I_C	max.	25 mA
Total power dissipation up to $T_{amb} = 60\text{ }^\circ\text{C}$	P_{tot}	max.	360 mW
D.C. current gain			
$I_C = 2\text{ mA}; V_{CE} = 5\text{ V}$	h_{FE}	min.	20
$I_C = 20\text{ mA}; V_{CE} = 5\text{ V}$		35 to	70
Transition frequency at $f = 500\text{ MHz}$			
$I_C = 15\text{ mA}; V_{CE} = 5\text{ V}$	f_T	typ.	1,8 GHz

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-92 variant.



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

→ Collector-base voltage (open emitter)	V_{CBO}	max.	25 V
→ Collector-emitter voltage open base $R_{BE} \leq 50 \Omega$	V_{CEO}	max.	15 V
	V_{CER}	max.	25 V
→ Emitter-base voltage (open collector)	V_{EBO}	max.	3,5 V
→ Collector current d.c.	I_C	max.	25 mA
peak value; $t_p < 1 \mu s$	I_{CM}	max.	50 mA
Total power dissipation up to $T_{amb} = 60 \text{ }^\circ\text{C}$	P_{tot}	max.	360 mW
Junction temperature	T_j	max.	150 $^\circ\text{C}$
Storage temperature	T_{stg}		-55 to +150 $^\circ\text{C}$

THERMAL RESISTANCE

→ From junction to ambient in free air	$R_{th\ j-a}$	=	250 K/W
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CHARACTERISTICS

$T_j = 25 \text{ }^\circ\text{C}$ unless otherwise specified

Collector cut-off current $V_{CB} = 15 \text{ V}; I_E = 0$	I_{CBO}	max.	50 nA
Emitter cut-off current $V_{EB} = 2 \text{ V}; I_C = 0$	I_{EBO}	max.	1,0 μA
Saturation voltages $I_C = 25 \text{ mA}; I_B = 1,25 \text{ mA}$	V_{CEsat}	max.	1,0 V
	V_{BEsat}	max.	1,0 V
D.C. current gain $I_C = 2 \text{ mA}; V_{CE} = 5 \text{ V}$ $I_C = 20 \text{ mA}; V_{CE} = 5 \text{ V}$	h_{FE}	min.	20 35 to 70
Transition frequency at $f = 500 \text{ MHz}$ $I_C = 15 \text{ mA}; V_{CE} = 5 \text{ V}$	f_T	typ.	1,8 GHz
→ Feedback capacitance $I_C = 2 \text{ mA}; V_{CE} = 5 \text{ V}; T_{amb} = 25 \text{ }^\circ\text{C}$	C_{re}	typ.	1,1 pF
→ Noise figure at $f = 100 \text{ MHz}$ $I_C = 2 \text{ mA}; V_{CE} = 5 \text{ V}; Z_S = 60 \Omega; T_{amb} = 25 \text{ }^\circ\text{C}$	F	typ.	4,0 dB
→ Noise figure at $f = 200 \text{ MHz}$ $I_C = 2 \text{ mA}; V_{CE} = 5 \text{ V}; Z_S = 60 \Omega; T_{amb} = 25 \text{ }^\circ\text{C}$	F	typ.	3,0 dB
→ Power gain at $f = 100 \text{ MHz}$ $I_C = 2 \text{ mA}; V_{CE} = 5 \text{ V}; Z_S = 60 \Omega; R_L = 2 \text{ k}\Omega; T_{amb} = 25 \text{ }^\circ\text{C}$	G_p	typ.	16 dB
→ Power gain at $f = 200 \text{ MHz}$ $I_C = 2 \text{ mA}; V_{CE} = 5 \text{ V}; Z_S = 60 \Omega; R_L = 920 \Omega; T_{amb} = 25 \text{ }^\circ\text{C}$	G_p	typ.	16 dB

N-P-N H.F. WIDEBAND TRANSISTOR

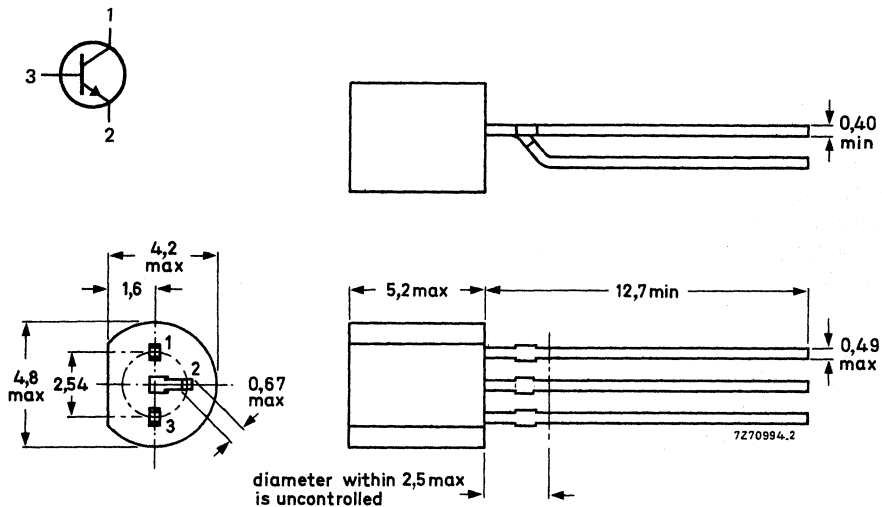
N-P-N transistor in a TO-92 envelope. It is primarily intended for use in H.F. amplifiers and u.h.f. oscillators.

QUICK REFERENCE DATA

Collector-emitter breakdown voltage	$V_{(BR)CEO}$	max.	15 V
Collector-base breakdown voltage	$V_{(BR)CBO}$	max.	25 V
Collector current (d.c.)	I_C	max.	25 mA
Total power dissipation up to $T_{amb} = 25\text{ }^\circ\text{C}$	P_{tot}	max.	500 mW
Junction temperature	T_j	max.	150 $^\circ\text{C}$
D.C. current gain $I_C = 5\text{ mA}; V_{CE} = 10\text{ V}$	h_{FE}	min.	25
		max.	250
Transition frequency at $f = 100\text{ MHz}$ $I_C = 5\text{ mA}; V_{CE} = 10\text{ V}$	f_T	typ.	1,8 GHz
Noise figure at $Z_S = 60\ \Omega$ $I_C = 5\text{ mA}; V_{CE} = 10\text{ V}; f = 800\text{ MHz}$	F	typ.	5,0 dB

Fig. 1 TO-92var.

Dimensions in mm



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage	V_{CEO}	max.	15 V
Collector-base voltage	V_{CBO}	max.	25 V
Collector current (d.c.)	I_C	max.	25 mA
Total power dissipation up to $T_{amb} = 25\text{ }^\circ\text{C}$	P_{tot}	max.	500 mW
Junction temperature	T_j	max.	150 $^\circ\text{C}$
Storage temperature	T_s		-65 to +150 $^\circ\text{C}$

THERMAL RESISTANCE

→ From junction to ambient in free air	$R_{th\ j-a}$	=	250 K/W
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CHARACTERISTICS

→ $T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified			
Collector-emitter breakdown voltage $I_C = 1\text{ mA}; I_B = 0$	$V_{(BR)CEO}$	max.	15 V
Collector-base breakdown voltage → $I_C = 10\text{ }\mu\text{A}; I_E = 0$	$V_{(BR)CBO}$	max.	25 V
Collector cut-off current $I_E = 0; V_{CB} = 10\text{ V}$	I_{CBO}	max.	50 nA
D.C. current gain $I_C = 5\text{ mA}; V_{CE} = 10\text{ V}$	h_{FE}	min. max.	25 250
Collector-emitter saturation voltage $I_C = 10\text{ mA}, I_B = 1\text{ mA}$	V_{CEsat}	max.	0,5 V
Transition frequency at $f = 100\text{ MHz}$ $I_C = 5\text{ mA}; V_{CE} = 10\text{ V}$	f_T	typ.	1,8 GHz
→ Noise figure at $Z_S = 60\text{ }\Omega$ $I_C = 5\text{ mA}; V_{CE} = 10\text{ V}; f = 800\text{ MHz}; T_{amb} = 25\text{ }^\circ\text{C}$	F	typ.	5,0 dB

P-N-P 2 GHz WIDEBAND TRANSISTOR

P-N-P transistor in a four-lead dual emitter plastic envelope (SOT-103). This device is designed for application in wideband amplifiers, such as MATV and CATV systems, up to 2 GHz.

N-P-N complement is BFG91A.

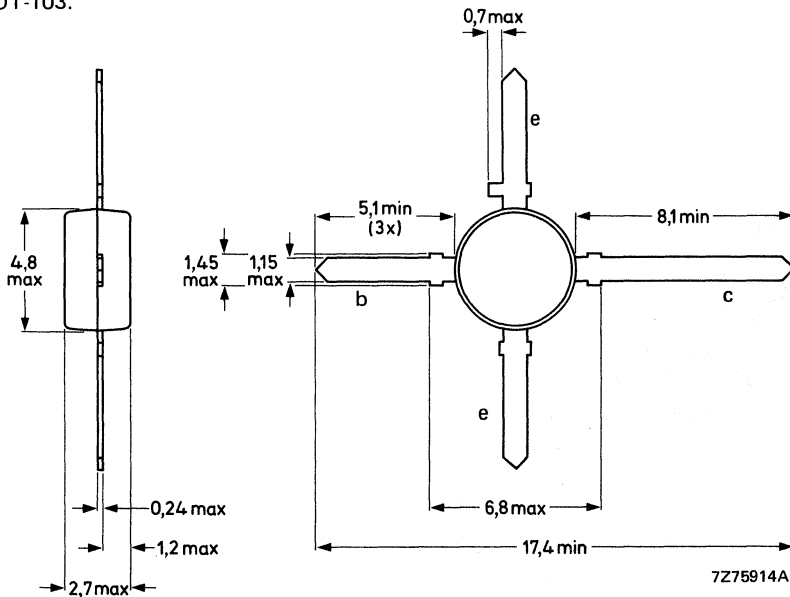
QUICK REFERENCE DATA

Collector-base voltage (open emitter)	$-V_{CBO}$	max.	15 V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	12 V
Collector current (d.c.)	$-I_C$	max.	35 mA
Total power dissipation up to $T_{amb} = 60\text{ }^\circ\text{C}$	P_{tot}	max.	180 mW
Junction temperature	T_j	max.	150 $^\circ\text{C}$
D.C. current gain $-I_C = 30\text{ mA}$; $-V_{CE} = 5\text{ V}$	h_{FE}	min.	20
Transition frequency at $f = 500\text{ MHz}$ $-I_C = 30\text{ mA}$; $-V_{CE} = 5\text{ V}$	f_T	typ.	5,0 GHz
Feedback capacitance at $f = 1\text{ MHz}$ $I_C = 0$; $-V_{CE} = 10\text{ V}$	C_{re}	typ.	0,8 pF
Noise figure at optimum source impedance $-I_C = 30\text{ mA}$; $-V_{CE} = 8\text{ V}$; $f = 800\text{ MHz}$	F	typ.	3,7 dB

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-103.



7275914A

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	$-V_{CB0}$	max.	15 V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	12 V
Emitter-base voltage (open collector)	$-V_{EBO}$	max.	2 V
Collector current			
d.c.	$-I_C$	max.	35 mA
peak value; $f > 1$ MHz	$-I_{CM}$	max.	50 mA
Total power dissipation up to $T_{amb} = 60$ °C	P_{tot}	max.	180 mW
Storage temperature	T_{stg}		-65 to +150 °C
Junction temperature	T_j	max.	150 °C

THERMAL RESISTANCE

From junction to ambient (free air) mounted on a fibre-glass print (see Fig. 2)

$R_{th\ j-a}$	500 K/W
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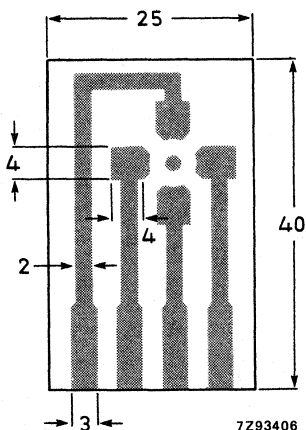


Fig. 2 Requirements for fibre-glass print (dimensions in mm). Single-sided 35 μ m Cu-clad epoxy fibre-glass print, thickness 1,5 mm. Tracks are fully tin-lead plated. Shaded area is Cu.

CHARACTERISTICS

$T_j = 25$ °C unless otherwise specified

Collector cut-off current

$I_E = 0; -V_{CB} = 5$ V

$-I_{CBO}$	max.	50 nA
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D.C. current gain

$-I_C = 30$ mA; $-V_{CE} = 5$ V

h_{FE}	min.	20
----------	------	----

Transition frequency at $f = 500$ MHz

$-I_C = 30$ mA; $-V_{CE} = 5$ V

f_T	typ.	5,0 GHz
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Noise figure at optimum source impedance and

$-V_{CE} = 8$ V; $f = 800$ MHz; $T_{amb} = 25$ °C

at $-I_C = 4$ mA

at $-I_C = 30$ mA

F	typ.	2,3 dB
	typ.	3,7 dB

Collector capacitance at $f = 1 \text{ MHz}$

$$I_E = i_e = 0; -V_{CB} = 10 \text{ V}$$

C_c typ. 1,2 pF ←

Emitter capacitance at $f = 1 \text{ MHz}$

$$I_C = i_c = 0; -V_{EB} = 0,5 \text{ V}$$

C_e typ. 1,8 pF

Feedback capacitance at $f = 1 \text{ MHz}$

$$I_C = 0; -V_{CE} = 10 \text{ V}$$

C_{re} typ. 0,8 pF

Maximum unilateral power gain (s_{re} assumed to be zero)

$$G_{UM} = 10 \log \frac{|s_{fe}|^2}{[1 - |s_{ie}|^2][1 - |s_{oe}|^2]}$$

$$\begin{aligned} -I_C = 30 \text{ mA}; -V_{CE} = 5 \text{ V}; f = 800 \text{ MHz}; T_{amb} = 25 \text{ }^\circ\text{C} \\ -I_C = 30 \text{ mA}; -V_{CE} = 5 \text{ V}; f = 2 \text{ GHz}; T_{amb} = 25 \text{ }^\circ\text{C} \end{aligned}$$

G_{UM} typ. 14,5 dB
typ. 7,0 dB ←

Output voltage at $d_{im} = -60 \text{ dB}$

$$\begin{aligned} I_C = -30 \text{ mA}; -V_{CE} = 8 \text{ V}; \\ R_L = 75 \text{ } \Omega; T_{amb} = 25 \text{ }^\circ\text{C} \end{aligned}$$

$$\begin{aligned} V_p = V_o \text{ at } d_{im} = -60 \text{ dB}; f_p = 795,25 \text{ MHz} \\ V_q = V_o -6 \text{ dB}; f_q = 803,25 \text{ MHz} \\ V_r = V_o -6 \text{ dB}; f_r = 805,25 \text{ MHz} \end{aligned}$$

measured at $f_{(p+q-r)} = 793,25 \text{ MHz}$

V_o typ. 400 mV ←

Second harmonic distortion (see Fig. 3)

$$\begin{aligned} -I_C = 30 \text{ mA}; -V_{CE} = 8 \text{ V}; R_L = 75 \text{ } \Omega; \\ VSWR < 2; T_{amb} = 25 \text{ }^\circ\text{C} \end{aligned}$$

$$\begin{aligned} V_p = V_o = 60 \text{ mV at } f_p = 250 \text{ MHz} \\ V_q = V_o = 60 \text{ mV at } f_q = 560 \text{ MHz} \end{aligned}$$

measured at $f_{(p+q)} = 810 \text{ MHz}$

d_2 typ. -50 dB ←

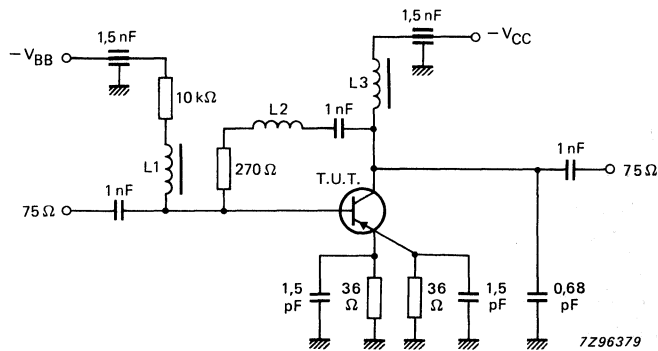


Fig. 3 Intermodulation distortion and second harmonic distortion MATV test circuit.

$L1 = L3 = 5 \text{ } \mu\text{H}$ micro-choke

$L2 = 3$ turns Cu wire (0,4 mm), internal diameter 3 mm, winding pitch 1 mm

→ s-parameters (common emitter) at $-V_{CE} = 5\text{ V}$; typical values

$-I_C$ mA	f MHz	S_{ie}	S_{fe}	S_{re}	S_{oe}	GUM dB
5	40	0,54/ -29,5°	12,3/168,4°	0,02/ 78,6°	0,97/ -11,8°	36,1
	100	0,56/ -64,9°	11,1/149,9°	0,04/ 65,3°	0,89/ -27,2°	29,3
	200	0,61/ -103,7°	8,9/130,0°	0,07/ 50,0°	0,73/ -44,8°	24,3
	500	0,65/ -154,8°	4,5/ 97,4°	0,09/ 34,6°	0,42/ -69,9°	16,4
	800	0,66/ -171,6°	3,1/ 82,9°	0,10/ 34,4°	0,41/ -80,1°	13,0
	1000	0,68/ -179,6°	2,5/ 73,4°	0,11/ 34,2°	0,42/ -89,7°	11,6
	2000	0,67/ +144,3°	1,3/ 49,7°	0,15/ 49,5°	0,29/ -115,8°	5,1
10	40	0,31/ -53,6°	18,0/165,0°	0,01/ 76,2°	0,95/ -16,1°	35,6
	100	0,43/ -98,5°	15,4/144,0°	0,03/ 61,9°	0,82/ -36,2°	29,5
	200	0,56/ -131,6°	11,3/123,0°	0,05/ 49,0°	0,63/ -57,4°	24,9
	500	0,65/ -169,0°	5,3/ 94,1°	0,07/ 43,5°	0,33/ -86,7°	17,3
	800	0,66/ +178,8°	3,5/ 81,7°	0,08/ 46,8°	0,33/ -95,0°	13,8
	1000	0,67/ +172,7°	2,8/ 72,7°	0,09/ 47,6°	0,35/ -104,4°	12,1
	2000	0,67/ +140,0°	1,5/ 51,5°	0,15/ 58,5°	0,22/ -133,4°	6,2
20	40	0,21/ -116,7°	22,6/162,0°	0,01/ 73,9°	0,91/ -20,1°	35,1
	100	0,42/ -134,0°	18,5/138,9°	0,02/ 61,2°	0,75/ -44,0°	29,8
	200	0,57/ -154,2°	12,7/118,0°	0,03/ 52,4°	0,55/ -67,8°	25,3
	500	0,66/ -178,3°	5,8/ 92,1°	0,05/ 54,5°	0,29/ -101,8°	18,0
	800	0,66/ +173,0°	3,8/ 79,9°	0,07/ 57,8°	0,29/ -108,3°	14,4
	1000	0,66/ +168,7°	3,0/ 72,0°	0,09/ 57,6°	0,31/ -116,7°	12,5
	2000	0,68/ +137,5°	1,6/ 52,1°	0,16/ 63,8°	0,20/ -150,2°	6,8
30	40	0,29/ -147,1°	24,0/161,0°	0,01/ 72,2°	0,88/ -21,8°	34,6
	100	0,47/ -151,7°	19,3/137,4°	0,02/ 62,0°	0,72/ -47,2°	29,9
	200	0,59/ -162,6°	13,0/116,4°	0,03/ 56,1°	0,51/ -72,0°	25,4
	500	0,68/ +177,7°	5,7/ 91,3°	0,05/ 60,1°	0,27/ -107,9°	18,2
	800	0,66/ +170,0°	3,8/ 79,3°	0,07/ 62,5°	0,27/ -113,2°	14,5
	1000	0,67/ +166,6°	3,0/ 71,6°	0,08/ 61,8°	0,30/ -121,1°	12,5
	2000	0,70/ +136,5°	1,6/ 52,0°	0,16/ 65,9°	0,20/ -156,2°	7,0

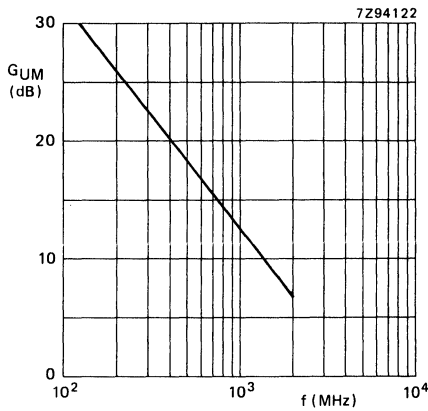


Fig. 4 $-V_{CE} = 5 \text{ V}$; $-I_C = 30 \text{ mA}$;
 $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

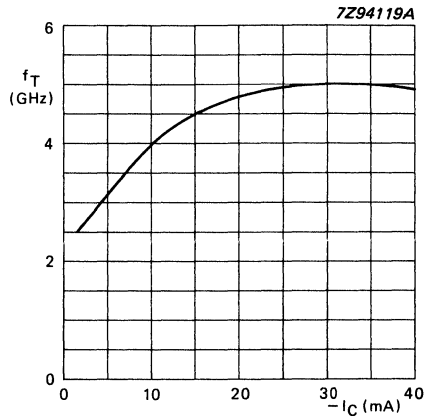


Fig. 5 $-V_{CE} = 5 \text{ V}$; $f = 500 \text{ MHz}$;
 $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

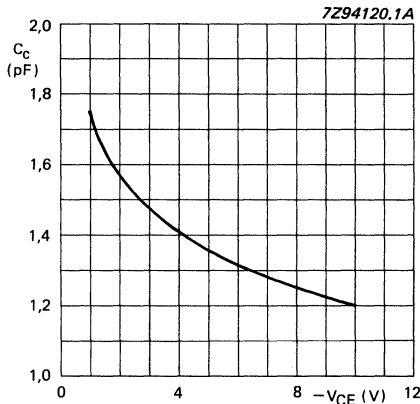


Fig. 6 $I_E = i_e = 0$; $f = 1 \text{ MHz}$; $T_j = 25 \text{ }^\circ\text{C}$;
 typical values.

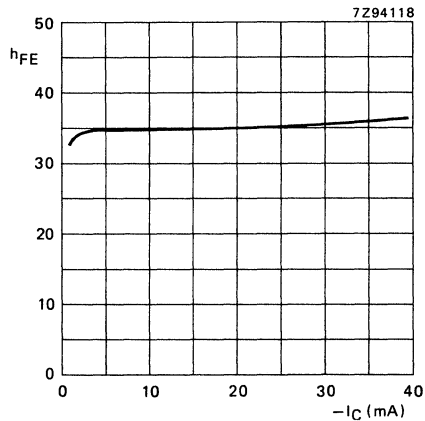


Fig. 7 $-V_{CE} = 5 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$;
 typical values.

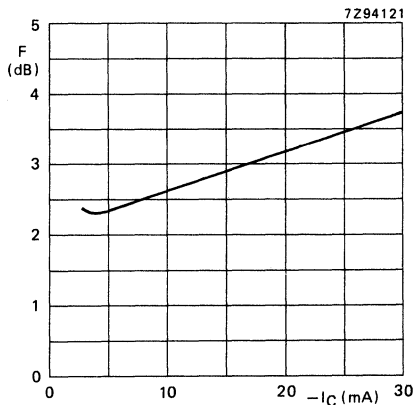
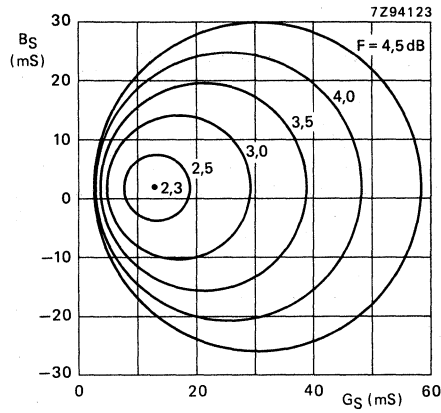
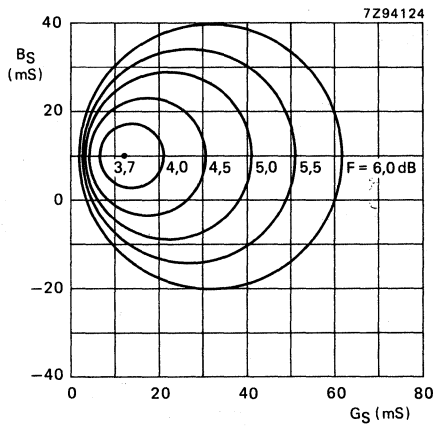


Fig. 8 $-V_{CE} = 8 \text{ V}$; $f = 800 \text{ MHz}$; $Z_S = \text{opt.}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.



→ Fig. 9 Circles of constant noise figure; $-V_{CE} = 8 \text{ V}$ $-I_C = 4 \text{ mA}$; $f = 800 \text{ MHz}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.



→ Fig. 10 Circles of constant noise figure; $-V_{CE} = 8 \text{ V}$; $-I_C = 30 \text{ mA}$; $f = 800 \text{ MHz}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

P-N-P 2 GHz WIDEBAND TRANSISTOR

P-N-P transistor in a four-lead dual emitter plastic envelope (SOT-103). The device is designed for application in wideband amplifiers, such as MATV and CATV systems, up to 2 GHz.

N-P-N complement is BFG96.

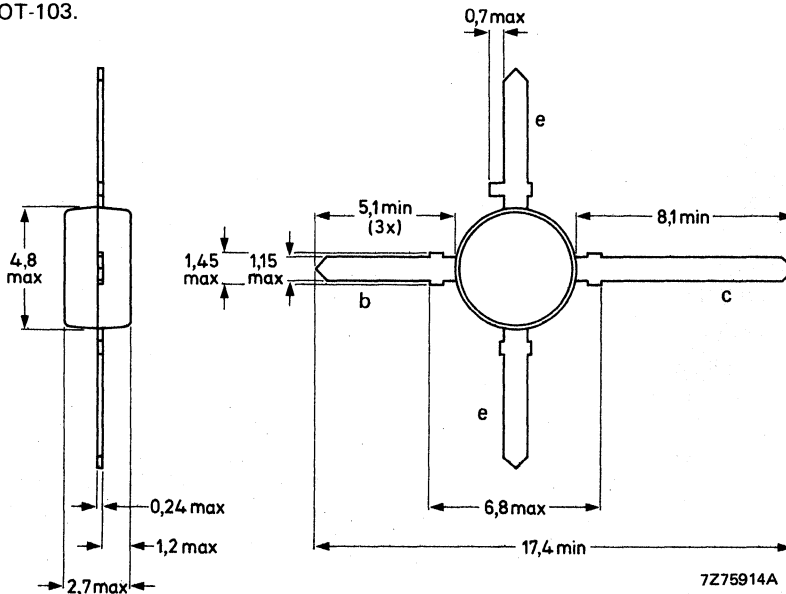
QUICK REFERENCE DATA

Collector-base voltage (open emitter)	$-V_{CBO}$	max.	20 V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	15 V
Collector current (d.c.)	$-I_C$	max.	75 mA
Total power dissipation up to $T_{amb} = 70\text{ }^\circ\text{C}$	P_{tot}	max.	700 mW
Junction temperature	T_j	max.	175 $^\circ\text{C}$
D.C. current gain			
$-I_C = 50\text{ mA}; -V_{CE} = 10\text{ V}$	h_{FE}	min.	20
Transition frequency at $f = 500\text{ MHz}$			
$-I_C = 50\text{ mA}; -V_{CE} = 10\text{ V}$	f_T	typ.	4,5 GHz
Feedback capacitance at $f = 1\text{ MHz}$			
$I_C = 0; -V_{CE} = 10\text{ V}$	C_{re}	typ.	1,4 pF
Noise figure at optimum source impedance			
$-I_C = 50\text{ mA}; -V_{CE} = 10\text{ V}; f = 800\text{ MHz}$	F	typ.	4,3 dB

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-103.



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	$-V_{CBO}$	max.	20 V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	15 V
Emitter-base voltage (open collector)	$-V_{EBO}$	max.	3 V
Collector current			
d.c.	$-I_C$	max.	75 mA
peak value; > 1 MHz	$-I_{CM}$	max.	150 mA
Total power dissipation up to $T_{amb} = 70\text{ }^\circ\text{C}$ mounted on print (see Fig. 2)	P_{tot}	max.	700 mW
Storage temperature	T_{stg}		-65 to +175 $^\circ\text{C}$
Junction temperature	T_j	max.	175 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to ambient (free air) mounted on a fibre-glass print (see Fig. 2)

$R_{th\ j-a}$	150 K/W
$R_{th\ j-c}$	75 K/W

From junction to case

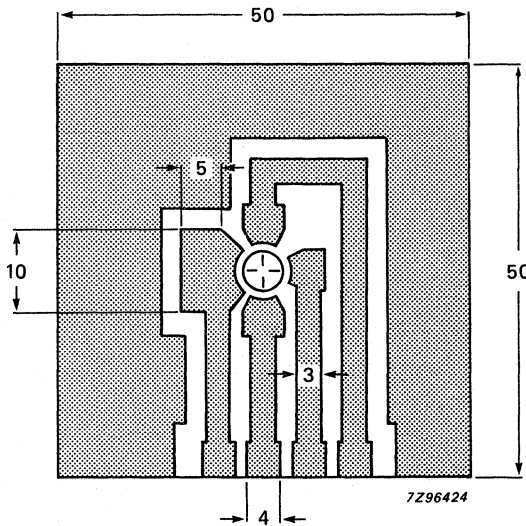


Fig. 2 Requirements for fibre-glass print (dimensions in mm). Single-sided 35 μm Cu-clad epoxy fibre-glass print, thickness 1,5 mm. Tracks are fully tin-lead plated. Shaded area is Cu.

CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Collector cut-off current

$I_E = 0; -V_{CB} = 10\text{ V}$	$-I_{CBO}$	max.	100 nA
----------------------------------	------------	------	--------

D.C. current gain

$-I_C = 50\text{ mA}; -V_{CE} = 10\text{ V}$	h_{FE}	min.	20
--	----------	------	----

Transition frequency at $f = 500\text{ MHz}$

$-I_C = 50\text{ mA}; -V_{CE} = 10\text{ V}$	f_T	typ.	4,5 GHz
--	-------	------	---------

Noise figure at optimum source impedance and

$-I_C = 50\text{ mA}; -V_{CE} = 10\text{ V}; f = 800\text{ MHz}; T_{amb} = 25\text{ }^\circ\text{C}$	F	typ.	4,3 dB
--	---	------	--------

Collector capacitance at $f = 1$ MHz

$$I_E = i_e = 0; -V_{CB} = 10 \text{ V}$$

C_C typ. 2,0 pF

Emitter capacitance at $f = 1$ MHz

$$I_C = i_c = 0; -V_{EB} = 0,5 \text{ V}$$

C_e typ. 5,0 pF

Feedback capacitance at $f = 1$ MHz

$$I_C = 0; -V_{CE} = 10 \text{ V}$$

C_{re} typ. 1,4 pF

Maximum unilateral power gain (s_{re} assumed to be zero)

$$GUM = 10 \log \frac{|s_{fe}|^2}{[1 - |s_{ie}|^2][1 - |s_{oe}|^2]}$$

$$-I_C = 50 \text{ mA}; -V_{CE} = 10 \text{ V}; f = 800 \text{ MHz}; T_{amb} = 25 \text{ }^\circ\text{C}$$

GUM typ. 13,5 dB

$$-I_C = 50 \text{ mA}; -V_{CE} = 10 \text{ V}; f = 2 \text{ GHz}; T_{amb} = 25 \text{ }^\circ\text{C}$$

GUM typ. 6,0 dB

Output voltage at $d_{im} = -60$ dB

$$-I_C = 70 \text{ mA}; -V_{CE} = 10 \text{ V};$$

$$R_L = 75 \text{ } \Omega; T_{amb} = 25 \text{ }^\circ\text{C}$$

$$V_p = V_o \text{ at } d_{im} = -60 \text{ dB}; f_p = 795,25 \text{ MHz}$$

$$V_q = V_o -6 \text{ dB}; f_q = 803,25 \text{ MHz}$$

$$V_r = V_o -6 \text{ dB}; f_r = 805,25 \text{ MHz}$$

measured at $f_{(p+q-r)} = 793,25 \text{ MHz}$

V_o typ. 500 mV

Second harmonic distortion (see Fig. 3)

$$-I_C = 70 \text{ mA}; -V_{CE} = 10 \text{ V}; R_L = 75 \text{ } \Omega;$$

$$VSWR < 2; T_{amb} = 25 \text{ }^\circ\text{C}$$

$$V_p = V_o = 150 \text{ mV at } f_p = 250 \text{ MHz}$$

$$V_q = V_o = 150 \text{ mV at } f_q = 560 \text{ MHz}$$

measured at $f_{(p+q)} = 810 \text{ MHz}$

d_2 typ. -50 dB

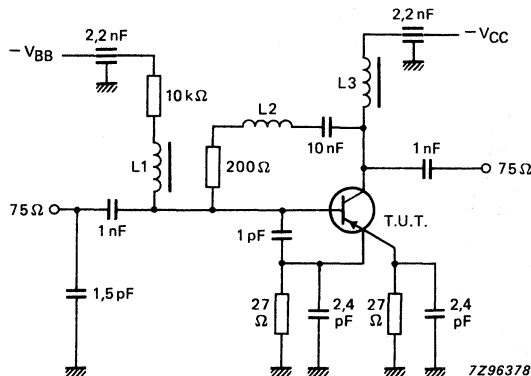


Fig. 3 Intermodulation distortion and second harmonic distortion test circuit.

$L1 = L3 = 5 \text{ } \mu\text{H}$ micro-choke

$L2 = 1,5$ turns Cu wire (0,4 mm), internal diameter 3 mm, winding pitch 1 mm

→ s-parameters (common emitter) at $-V_{CE} = 10 \text{ V}$, $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

I_C mA	f MHz	s_{ie}	s_{fe}	s_{re}	s_{oe}	GUM dB
5	40	0,75/ -42,7°	13,8/159,7°	0,03/ 70,9°	0,93/ -20,1°	35,4
	100	0,74/ -90,7°	10,8/133,3°	0,06/ 49,2°	0,74/ -41,9°	27,5
	200	0,75/-128,8°	7,0/112,1°	0,08/ 33,6°	0,52/ -59,2°	21,8
	500	0,74/-167,7°	3,0/ 83,6°	0,09/ 25,1°	0,32/ -79,5°	13,4
	800	0,74/-178,7°	2,0/ 69,0°	0,10/ 26,8°	0,37/ -89,3°	10,1
	1000	0,74/-172,2°	1,6/ 59,3°	0,11/ 27,7°	0,41/ -99,6°	8,4
	2000	0,76/+139,8°	0,8/ 33,3°	0,14/ 47,5°	0,40/-139,1°	2,6
10	40	0,61/ -63,4°	22,1/153,0°	0,03/ 65,7°	0,88/ -30,7°	35,3
	100	0,67/-115,6°	15,2/124,9°	0,05/ 44,3°	0,62/ -61,2°	28,4
	200	0,73/-146,7°	9,0/106,0°	0,06/ 34,0°	0,41/ -85,1°	23,1
	500	0,74/-176,1°	3,8/ 83,3°	0,07/ 36,2°	0,25/-117,2°	15,3
	800	0,73/+173,2°	2,5/ 70,5°	0,09/ 40,5°	0,28/-119,4°	11,5
	1000	0,73/+168,5°	2,0/ 62,1°	0,10/ 41,8°	0,33/-126,0°	9,6
	2000	0,75/+137,4°	1,0/ 38,2°	0,16/ 53,3°	0,31/-159,4°	4,1
20	40	0,50/ -93,5°	30,5/146,0°	0,02/ 60,6°	0,81/ -43,2°	35,5
	100	0,66/-138,4°	18,7/118,4°	0,03/ 42,7°	0,53/ -82,0°	29,4
	200	0,72/-160,8°	10,5/101,8°	0,04/ 38,9°	0,38/-111,9°	24,3
	500	0,74/+178,5°	4,3/ 83,3°	0,06/ 48,9°	0,28/-148,3°	16,5
	800	0,73/+168,9°	2,8/ 71,6°	0,08/ 52,5°	0,30/-147,7°	12,6
	1000	0,73/+165,2°	2,2/ 63,3°	0,09/ 52,3°	0,54/-150,6°	10,7
	2000	0,75/+135,5°	1,2/ 42,2°	0,17/ 57,5°	0,30/ 176,9°	5,3
30	40	0,48/-111,8°	34,6/142,5°	0,02/ 58,6°	0,76/ -50,3°	35,7
	100	0,67/-148,2°	20,1/115,3°	0,03/ 43,8°	0,50/ -93,2°	29,9
	200	0,73/-166,2°	11,0/ 99,9°	0,03/ 43,7°	0,38/-124,1°	24,8
	500	0,74/+175,8°	4,5/ 83,2°	0,05/ 55,4°	0,32/-158,2°	17,0
	800	0,73/+168,4°	2,1/ 72,1°	0,08/ 57,7°	0,32/-157,9°	13,0
	1000	0,73/+164,3°	2,3/ 64,2°	0,09/ 56,6°	0,35/-159,8°	11,2
	2000	0,75/+134,8°	1,2/ 44,0°	0,17/ 59,2°	0,32/ 167,5°	5,8
50	40	0,49/-131,2°	38,8/139,8°	0,01/ 57,1°	0,70/ -58,7°	35,9
	100	0,69/-157,6°	21,1/112,6°	0,02/ 46,5°	0,48/-104,7°	30,3
	200	0,73/-171,3°	11,5/ 98,3°	0,03/ 49,5°	0,39/-134,9°	25,2
	500	0,75/+174,1°	4,6/ 82,4°	0,05/ 61,6°	0,35/-165,6°	17,4
	800	0,73/+166,8°	3,0/ 71,5°	0,08/ 62,0°	0,34/-165,3°	13,5
	1000	0,73/+162,7°	2,4/ 64,1°	0,09/ 59,9°	0,37/-166,8°	11,4
	2000	0,76/+134,0°	1,2/ 45,3°	0,18/ 60,9°	0,34/ 160,9°	6,0

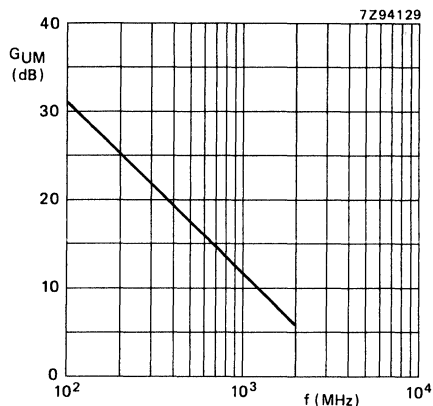


Fig. 4 $-V_{CE} = 10 \text{ V}$; $-I_C = 50 \text{ mA}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

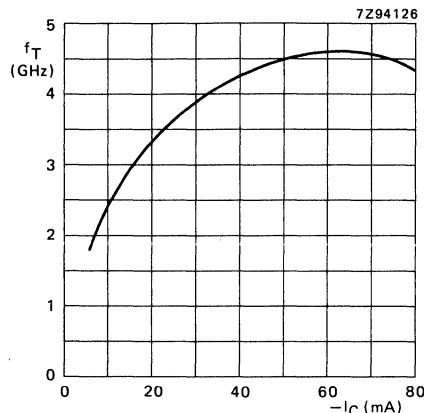


Fig. 5 $-V_{CE} = 10 \text{ V}$; $f = 500 \text{ MHz}$; $T_j = 25 \text{ }^\circ\text{C}$; typical values.

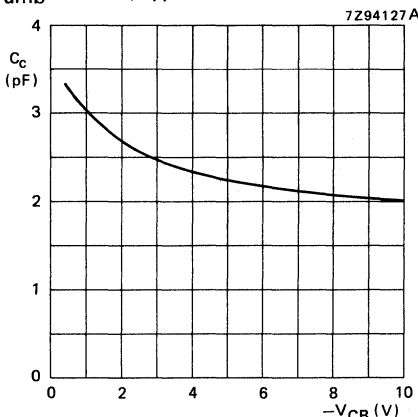


Fig. 6 $I_E = I_{e_0} = 0$; $f = 1 \text{ MHz}$; $T_j = 25 \text{ }^\circ\text{C}$; typical values.

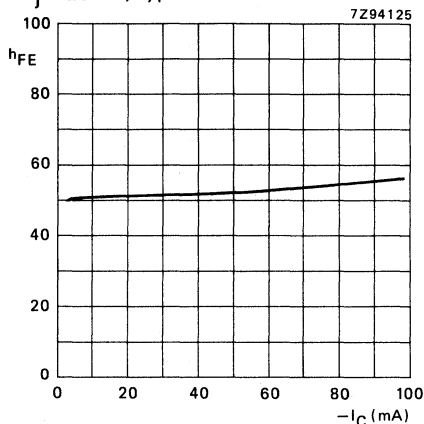


Fig. 7 $-V_{CE} = 10 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$; typical values.

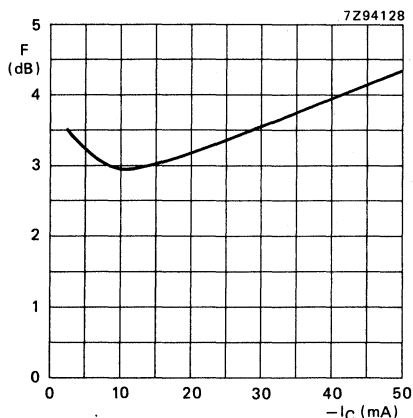


Fig. 8 $-V_{CE} = 10 \text{ V}$; $f = 800 \text{ MHz}$; $Z_S = \text{opt.}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

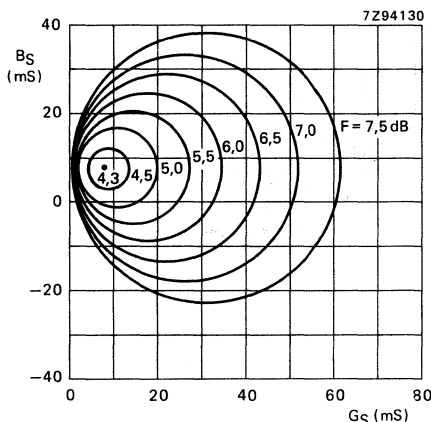


Fig. 9 Circles of constant noise figure; $-V_{CE} = 10 \text{ V}$; $-I_C = 50 \text{ mA}$; $f = 800 \text{ MHz}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

N-P-N 1 GHz WIDEBAND TRANSISTOR

N-P-N transistor in a four-lead dual-emitter plastic envelope (SOT-103). This device is designed for wide-band application in CATV and MATV amplifier systems and features high output voltage capabilities.

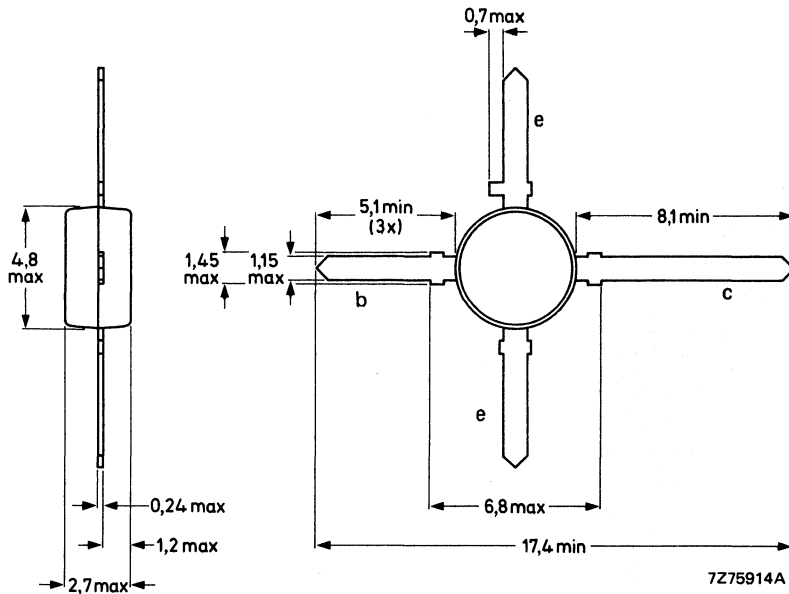
QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	25 V
Collector-emitter voltage (open base)	V_{CEO}	max.	18 V
Collector current (d.c.)	I_C	max.	150 mA
Total power dissipation up to $T_{amb} = 45\text{ }^\circ\text{C}$	P_{tot}	max.	1 W
Junction temperature	T_j	max.	175 $^\circ\text{C}$
D.C. current gain $I_C = 100\text{ mA}; V_{CE} = 10\text{ V}$	h_{FE}	min.	25
Transition frequency at $f = 500\text{ MHz}$ $I_C = 100\text{ mA}; V_{CE} = 10\text{ V}$	f_T	typ.	3,7 GHz
Noise figure at optimum source impedance $I_C = 20\text{ mA}; V_{CE} = 10\text{ V}; f = 800\text{ MHz}$	F	typ.	2,3 dB
Output power at 1 dB gain compression $V_{CE} = 10\text{ V}; I_C = 90\text{ mA}; f = 800\text{ MHz}$	PL1	typ.	+22 dBm
Third order intercept point $V_{CE} = 10\text{ V}; I_C = 90\text{ mA}; f = 800\text{ MHz}$	ITO	typ.	+41 dBm

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-103.



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	25 V
Collector-emitter voltage (open base)	V_{CEO}	max.	18 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2 V
Collector current (d.c.)	I_C	max.	150 mA
Total power dissipation up to $T_{amb} = 45\text{ }^\circ\text{C}$ mounted on a fibre-glass p.c.b. (see Fig. 2)	P_{tot}	max.	1 W
Storage temperature	T_{stg}		-65 to +175 $^\circ\text{C}$
Junction temperature	T_j	max.	175 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to ambient mounted on a glass-fibre p.c.b. (see Fig. 2)

$R_{th\ j-a}$	=	130 K/W
$R_{th\ j-c}$	=	50 K/W

From junction to case

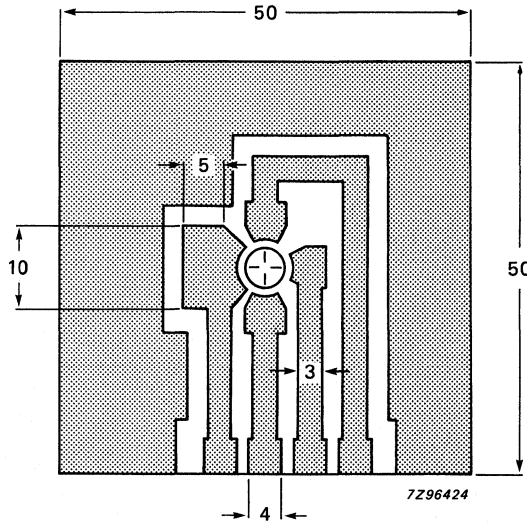


Fig. 2 Requirements for fibre-glass print (dimensions in mm). Single-sided 35 μm Cu-clad epoxy fibre-glass print, thickness 1,5 mm. Tracks are fully tin-lead plated. Shaded area is Cu.

CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Collector cut-off current

$I_E = 0; V_{CB} = 15\text{ V}$

I_{CBO}	max.	100 μA
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D.C. current gain

$I_C = 100\text{ mA}; V_{CE} = 10\text{ V}$

h_{FE}	min.	25
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Transition frequency at $f = 500\text{ MHz}$

$I_C = 100\text{ mA}; V_{CE} = 10\text{ V}$

f_T	typ.	3,7 GHz
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Collector output capacitance at $f = 1\text{ MHz}$

$I_E = i_e = 0; V_{CB} = 10\text{ V}$

C_c	typ.	2,3 pF
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Emitter capacitance at $f = 1\text{ MHz}$

$I_C = i_e = 0; V_{EB} = 0,5\text{ V}$

C_e	typ.	10 pF
-------	------	-------

Feedback capacitance at $f = 1\text{ MHz}$

$I_E = 0; V_{CE} = 10\text{ V}$

C_{re}	typ.	1,2 pF
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Maximum unilateral power gain (s_{re} assumed to be zero)

$$G_{UM} = 10 \log \frac{|s_{fe}|^2}{[1-|s_{ie}|^2][1-|s_{oe}|^2]}$$

$I_C = 100 \text{ mA}; V_{CE} = 10 \text{ V}; f = 800 \text{ MHz}; T_{amb} = 25 \text{ }^\circ\text{C}$
 $I_C = 100 \text{ mA}; V_{CE} = 10 \text{ V}; f = 2 \text{ GHz}; T_{amb} = 25 \text{ }^\circ\text{C}$

GUM typ. 14,5 dB
 typ. 7,0 dB

Noise figure at optimum source impedance

$I_C = 20 \text{ mA}; V_{CE} = 10 \text{ V}; f = 800 \text{ MHz}; T_{amb} = 25 \text{ }^\circ\text{C}$

F typ. 2,3 dB

Output power at 1 dB gain compression

$V_{CE} = 10 \text{ V}; I_C = 90 \text{ mA}; f = 800 \text{ MHz}; T_{amb} = 25 \text{ }^\circ\text{C}$
 $V_{CE} = 10 \text{ V}; I_C = 100 \text{ mA}; f = 300 \text{ MHz}; T_{amb} = 25 \text{ }^\circ\text{C}$

PL1 typ. +22 dBm
 typ. +24 dBm

Third order intercept point

$V_{CE} = 10 \text{ V}; I_C = 90 \text{ mA}; f = 800 \text{ MHz}; T_{amb} = 25 \text{ }^\circ\text{C}$
 $V_{CE} = 10 \text{ V}; I_C = 100 \text{ mA}; f = 300 \text{ MHz}; T_{amb} = 25 \text{ }^\circ\text{C}$

ITO typ. +41 dBm
 typ. +43 dBm

Output voltage at $d_{im} = -60 \text{ dB}$

$I_C = 500 \text{ mA}; V_{CE} = 15 \text{ V};$
 $R_L = 75 \text{ } \Omega; T_{amb} = 25 \text{ }^\circ\text{C}$

$V_p = V_o$ at $d_{im} = -60 \text{ dB}, f_p = 795,25 \text{ MHz}$
 $V_q = V_o - 6 \text{ dB}$ at $f_q = 803,25 \text{ MHz}$
 $V_r = V_o - 6 \text{ dB}$ at $f_r = 805,25 \text{ MHz}$

measured at $f_{(p+q-r)} = 793,25 \text{ MHz}$

V_o typ. 750 mV

Second harmonic distortion (see Fig. 3)

$I_C = 100 \text{ mA}; V_{CE} = 10 \text{ V}; R_L = 75 \text{ } \Omega;$
 $VSWR < 2; T_{amb} = 25 \text{ }^\circ\text{C}$

$V_p = V_o = 316 \text{ mV}$ at $f_p = 250 \text{ MHz}$
 $V_q = V_o = 316 \text{ mV}$ at $f_q = 560 \text{ MHz}$

measured at $f_{(p+q)} = 810 \text{ MHz}$

d_2 typ. -55 dB

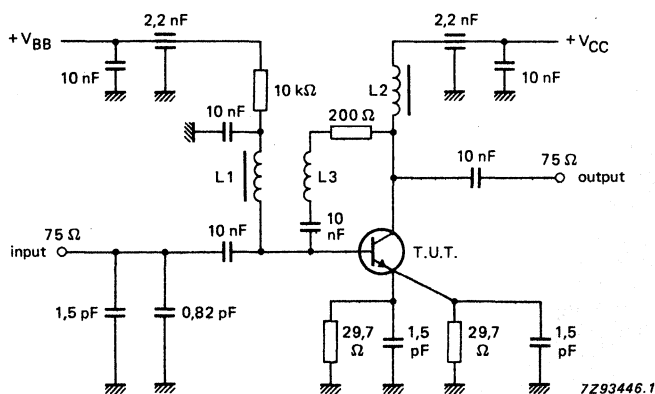


Fig. 3 Intermodulation distortion and second harmonic distortion test circuit.

L1 = L2 = 5 μH Ferroxcube choke
 L3 = 2 turns Cu wire (0,5 mm), internal diameter 4 mm, winding pitch 2 mm

s-parameters (common emitter) at $V_{CE} = 10\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$; typical values.

I_C mA	f MHz	s_{ie}	s_{fe}	s_{re}	s_{oe}	GUM dB
5	40	0,91/ -40,7°	13,5/156,6°	0,03/ 69,3°	0,95/ -16,4°	40,1
	100	0,95/ -87,6°	10,3/131,2°	0,05/ 46,6°	0,77/ -32,1°	29,6
	200	0,85/ -126,7°	6,6/109,7°	0,07/ 30,2°	0,59/ -42,3°	22,9
	500	0,78/ -167,3°	2,8/ 79,9°	0,07/ 20,9°	0,45/ -58,1°	14,1
	800	0,78/ +177,2°	1,8/ 64,7°	0,07/ 27,3°	0,51/ -73,6°	10,7
	1000	0,78/ +169,7°	1,5/ 54,6°	0,07/ 33,5°	0,56/ -86,6°	9,1
	1200	0,82/ +162,2°	1,1/ 48,7°	0,07/ 45,7°	0,52/ -101,5°	7,4
	2000	0,82/ +140,5°	0,7/ 27,6°	0,12/ 71,3°	0,42/ -138,0°	2,2
10	40	0,85/ -48,2°	20,9/154,7°	0,03/ 66,3°	0,92/ -23,3°	40,2
	100	0,80/ -98,7°	14,8/126,7°	0,05/ 43,6°	0,68/ -45,0°	30,6
	200	0,78/ -135,7°	4,0/106,9°	0,06/ 30,4°	0,47/ -58,5°	24,1
	500	0,76/ -171,8°	3,8/ 81,8°	0,06/ 28,6°	0,30/ -74,9°	15,7
	800	0,76/ +175,0°	2,5/ 68,5°	0,07/ 36,9°	0,36/ -85,8°	12,2
	1000	0,76/ +168,4°	2,0/ 58,8°	0,07/ 41,3°	0,41/ -97,4°	10,4
	1200	0,79/ +161,2°	1,6/ 53,9°	0,08/ 51,0°	0,38/ -111,8°	8,8
	2000	0,80/ +140,6°	1,0/ 30,6°	0,14/ 66,8°	0,36/ -142,8°	4,6
20	40	0,81/ -56,5°	28,5/151,5°	0,02/ 63,0°	0,89/ -31,3°	40,6
	100	0,76/ -108,9°	19,0/122,8°	0,04/ 41,7°	0,60/ -59,9°	31,4
	200	0,75/ -143,2°	11,2/104,7°	0,05/ 31,7°	0,39/ -80,3°	25,3
	500	0,74/ -175,9°	4,7/ 82,7°	0,06/ 36,2°	0,23/ -107,6°	17,0
	800	0,73/ +172,5°	3,0/ 70,7°	0,07/ 44,3°	0,27/ -110,2°	13,2
	1000	0,74/ +166,8°	2,4/ 62,2°	0,08/ 47,6°	0,31/ -118,3°	11,5
	1200	0,78/ +159,0°	1,9/ 58,9°	0,09/ 55,1°	0,29/ -133,5°	10,2
	2000	0,77/ +140,3°	1,2/ 35,4°	0,14/ 63,7°	0,28/ -155,5°	6,1
30	40	0,79/ -61,1°	32,7/149,4°	0,02/ 61,8°	0,87/ -35,7°	40,7
	100	0,75/ -113,4°	21,1/121,0°	0,04/ 40,7°	0,58/ -68,2°	31,8
	200	0,74/ -146,2°	12,1/104,0°	0,05/ 32,5°	0,38/ -92,8°	25,8
	500	0,73/ -177,0°	5,0/ 83,7°	0,06/ 39,5°	0,23/ -127,4°	17,6
	800	0,73/ +172,0°	3,3/ 72,0°	0,07/ 47,2°	0,25/ -126,8°	13,9
	1000	0,73/ +166,9°	2,6/ 63,9°	0,08/ 49,8°	0,29/ -132,4°	12,1
	1200	0,77/ +158,6°	2,1/ 61,1°	0,09/ 56,7°	0,28/ -147,9°	10,8
	2000	0,76/ +140,0°	1,4/ 38,3°	0,15/ 62,3°	0,24/ -165,7°	6,6
50	40	0,78/ -64,6°	36,7/147,3°	0,02/ 60,0°	0,86/ -40,3°	41,0
	100	0,73/ -118,1°	22,9/119,4°	0,04/ 39,7°	0,56/ -76,5°	32,2
	200	0,73/ -148,9°	13,0/102,6°	0,04/ 33,2°	0,37/ -104,5°	26,3
	500	0,73/ -178,1°	5,3/ 94,3°	0,06/ 42,6°	0,25/ -142,7°	18,1
	800	0,72/ +170,5°	3,5/ 73,1°	0,07/ 49,4°	0,25/ -142,0°	14,3
	1000	0,72/ +165,2°	2,7/ 64,8°	0,08/ 51,5°	0,30/ -145,6°	12,3
	1200	0,76/ +157,5°	2,3/ 63,0°	0,09/ 58,0°	0,29/ -161,1°	11,2
	2000	0,75/ +139,9°	1,4/ 40,5°	0,15/ 60,8°	0,24/ -177,2°	7,0

s-parameters (common emitter) at $V_{CE} = 10\text{ V}$; $T_{amb} = 25\text{ }^\circ\text{C}$; typical values.

I_C mA	f MHz	s_{ie}	s_{fe}	s_{re}	s_{oe}	G_{UM} dB
75	40	0,78/ $-67,3^\circ$	38,4/146,4 $^\circ$	0,02/ $59,1^\circ$	0,84/ $-42,8^\circ$	41,1
	100	0,74/ $-112,0^\circ$	23,5/118,2 $^\circ$	0,04/ $39,3^\circ$	0,55/ $-81,1^\circ$	32,4
	200	0,73/ $-151,1^\circ$	13,3/102,3 $^\circ$	0,04/ $33,9^\circ$	0,37/ $-110,4^\circ$	26,4
	500	0,72/ $-178,4^\circ$	5,5/ $84,4^\circ$	0,06/ $43,8^\circ$	0,27/ $-149,1^\circ$	18,3
	800	0,72/ $+170,2^\circ$	3,5/ $73,1^\circ$	0,07/ $50,3^\circ$	0,27/ $-148,8^\circ$	14,4
	1000	0,72/ $+164,6^\circ$	2,8/ $65,6^\circ$	0,09/ $52,1^\circ$	0,30/ $-151,7^\circ$	12,4
	1200	0,76/ $+157,8^\circ$	2,3/ $63,8^\circ$	0,09/ $58,3^\circ$	0,30/ $-166,8^\circ$	11,3
100	2000	0,75/ $+139,5^\circ$	1,5/ $41,7^\circ$	0,16/ $59,7^\circ$	0,24/ $+175,2^\circ$	7,2
	40	0,78/ $-68,3^\circ$	38,9/145,2 $^\circ$	0,02/ $58,2^\circ$	0,83/ $-44,4^\circ$	41,0
	100	0,74/ $-121,6^\circ$	23,5/117,2 $^\circ$	0,04/ $38,8^\circ$	0,54/ $-83,1^\circ$	23,3
	200	0,73/ $-151,6^\circ$	13,1/101,3 $^\circ$	0,04/ $33,7^\circ$	0,37/ $-112,7^\circ$	26,4
	500	0,73/ $-179,4^\circ$	5,4/ $83,8^\circ$	0,06/ $44,3^\circ$	0,27/ $-151,3^\circ$	18,2
	800	0,73/ $+170,6^\circ$	3,5/ $73,4^\circ$	0,07/ $50,6^\circ$	0,27/ $-150,9^\circ$	14,5
	1000	0,72/ $+165,3^\circ$	2,8/ $65,4^\circ$	0,09/ $52,2^\circ$	0,30/ $-153,4^\circ$	12,4
1200	0,77/ $+157,3^\circ$	2,3/ $64,1^\circ$	0,09/ $58,3^\circ$	0,30/ $-168,6^\circ$	11,3	
2000	0,75/ $+139,4^\circ$	1,5/ $41,9^\circ$	0,15/ $59,7^\circ$	0,24/ $+175,2^\circ$	7,0	

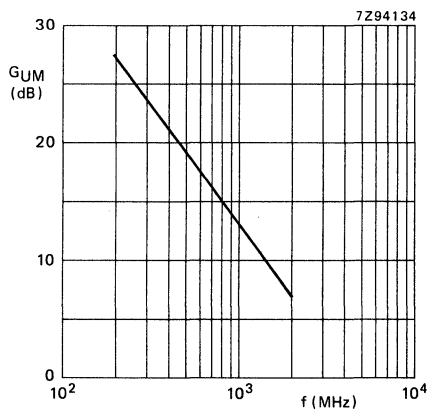


Fig. 4 $V_{CE} = 10\text{ V}$; $I_C = 100\text{ mA}$; $T_{amb} = 25\text{ }^\circ\text{C}$; typical values.

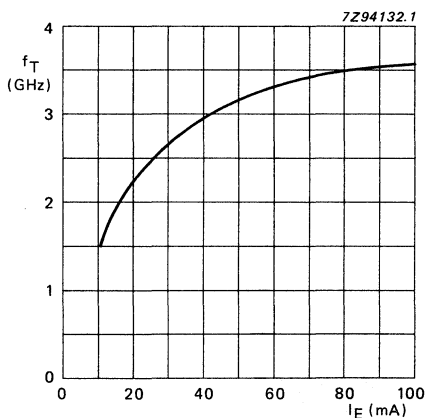


Fig. 5 $V_{CE} = 10\text{ V}$; $f = 500\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$; typical values.

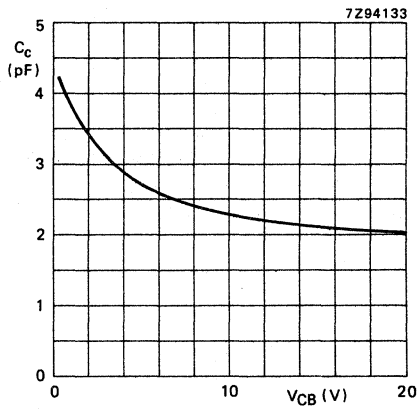


Fig. 6 $I_E = I_E = 0$; $f = 1 \text{ MHz}$; $T_j = 25 \text{ }^\circ\text{C}$; typical values.

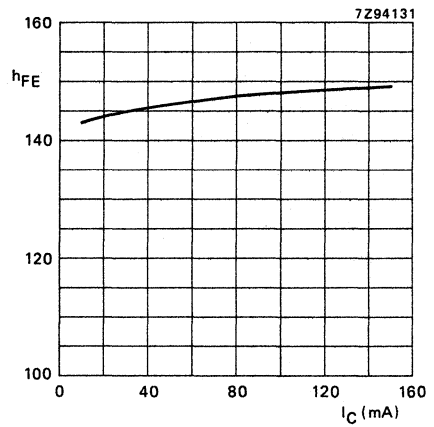


Fig. 7 $V_{CE} = 10 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$; typical values.

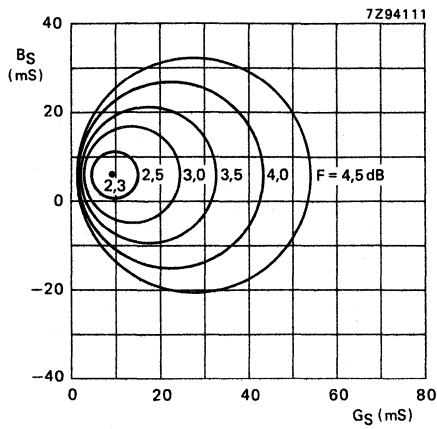


Fig. 8 Circles of constant noise figure; $V_{CE} = 10 \text{ V}$; $I_C = 20 \text{ mA}$; $f = 800 \text{ MHz}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$; typical values.

P-N-P 2 GHz WIDEBAND TRANSISTOR

P-N-P transistor in a four-lead dual emitter plastic envelope (SOT-103). This device is designed for application in wideband amplifiers, such as in CATV and MATV systems, up to 2 GHz.

N-P-N complement is BFG90A.

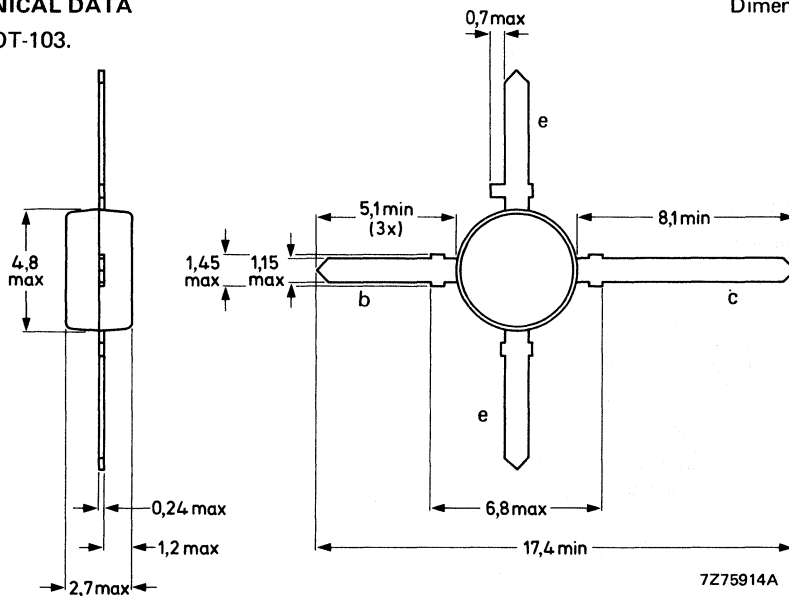
QUICK REFERENCE DATA

Collector-base voltage (open emitter)	$-V_{CBO}$	max.	20 V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	15 V
Collector current (d.c.)	$-I_C$	max.	25 mA
Total power dissipation up to $T_{amb} = 60\text{ }^\circ\text{C}$	P_{tot}	max.	180 mW
Junction temperature	T_j	max.	150 $^\circ\text{C}$
D.C. current gain			
$-I_C = 14\text{ mA}; -V_{CE} = 10\text{ V}$	h_{FE}	min.	20
Transition frequency at $f = 500\text{ MHz}$			
$-I_C = 14\text{ mA}; -V_{CE} = 10\text{ V}$	f_T	typ.	5 GHz
Feedback capacitance at $f = 1\text{ MHz}$			
$I_C = 0; -V_{CE} = 10\text{ V}$	C_{re}	typ.	0,45 pF
Noise figure at optimum source impedance			
$-I_C = 14\text{ mA}; -V_{CE} = 10\text{ V}; f = 800\text{ MHz}$	F	typ.	3,4 dB

MECHANICAL DATA

Fig. 1 SOT-103.

Dimensions in mm



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	$-V_{CBO}$	max.	20 V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	15 V
Emitter-base voltage (open collector)	$-V_{EBO}$	max.	2 V
Collector current			
d.c.	$-I_C$	max.	25 mA
peak value; $f > 1$ MHz	$-I_{CM}$	max.	35 mA
Total power dissipation up to $T_{amb} = 60$ °C	P_{tot}	max.	180 mW
Storage temperature	T_{stg}		-65 to +150 °C
Junction temperature	T_j	max.	150 °C

THERMAL RESISTANCE

From junction to ambient (free air) mounted on a fibre-glass print (see Fig. 2)

$R_{th\ j-a}$ 500 K/W

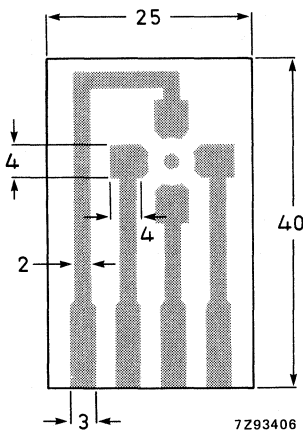


Fig. 2 Requirements for fibre-glass print (dimensions in mm). Single-sided 35 μ m Cu-clad epoxy fibre-glass print, thickness 1,5 mm. Tracks are fully tin-lead plated. Shaded area is Cu.

→ CHARACTERISTICS

$T_j = 25$ °C unless otherwise specified

Collector cut-off current

$I_E = 0; -V_{CB} = 10$ V

$-I_{CBO}$ max. 50 nA

D.C. current gain

$-I_C = 14$ mA; $-V_{CE} = 10$ V

h_{FE} min. 20

Transition frequency at $f = 500$ MHz

$-I_C = 14$ mA; $-V_{CE} = 10$ V

f_T typ. 5,0 GHz

Noise figure at optimum source impedance and

$-V_{CE} = 10$ V; $f = 800$ MHz; $T_{amb} = 25$ °C

at $-I_C = 4$ mA

F typ. 2,4 dB

at $-I_C = 14$ mA

typ. 3,4 dB

Collector capacitance at $f = 1$ MHz

$I_E = i_e = 0; -V_{CB} = 10$ V

C_C typ. 0,9 pF

Emitter capacitance at $f = 1$ MHz

$I_C = i_c = 0; -V_{EB} = 0,5$ V

C_e typ. 1,1 pF

Feedback capacitance at $f = 1$ MHz

$I_C = 0; -V_{CE} = 10$ V

C_{re} typ. 0,45 pF

Maximum unilateral power gain (s_{re} assumed to be zero)

$$G_{UM} = 10 \log \frac{|s_{fe}|^2}{[1 - |s_{ie}|^2][1 - |s_{oe}|^2]}$$

$-I_C = 14$ mA; $-V_{CE} = 10$ V; $f = 800$ MHz; $T_{amb} = 25$ °C

G_{UM} typ. 16,5 dB

$-I_C = 14$ mA; $-V_{CE} = 10$ V; $f = 2$ GHz; $T_{amb} = 25$ °C

typ. 8,5 dB

Output voltage at $d_{im} = -60$ dB

$-I_C = 14$ mA; $-V_{CE} = 10$ V;

$R_L = 75 \Omega$; $T_{amb} = 25$ °C

$V_p = V_o$ at $d_{im} = -60$ dB; $f_p = 795,25$ MHz

$V_q = V_o - 6$ dB; $f_q = 803,25$ MHz

$V_r = V_o - 6$ dB; $f_r = 805,25$ MHz

measured at $f_{(p+q+r)} = 793,25$ MHz

V_o typ. 150 mV

Seconds harmonic distortion (see Fig. 3)

$-I_C = 14$ mA; $-V_{CE} = 10$ V; $R_L = 75 \Omega$;

$VSWR < 2$; $T_{amb} = 25$ °C

$V_p = V_o = 150$ mV at $f_p = 250$ MHz

$V_q = V_o = 150$ mV at $f_q = 560$ MHz

measured at $f_{(p+q)} = 810$ MHz

d_2 typ. -50 dB

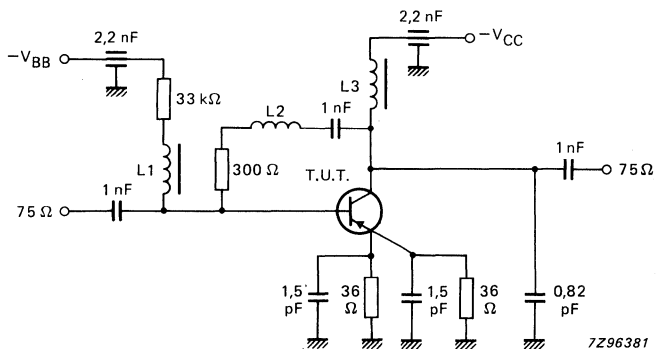


Fig. 3 Intermodulation distortion and second harmonic distortion MATV test circuit.

$L1 = L3 = 5 \mu$ H micro-choke

$L2 = 3$ turns Cu wire (0,4 mm), internal diameter 3 mm, winding pitch 1 mm

s-parameters (common emitter) at $-V_{CE} = 10\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$; typical values.

$-I_C$ mA	f MHz	S_{ie}	S_{fe}	S_{re}	S_{oe}	GUM dB
5	40	0,66/ 67,4°	13,1/132,5°	0,04/ 48,9°	0,98/+81,6°	38,4
	100	0,65/ 41,0°	12,3/131,7°	0,04/ 63,7°	0,96/+49,7°	35,6
	200	0,63/ -25,4°	10,4/136,5°	0,05/ 64,1°	0,82/+ 2,7°	27,5
	500	0,50/ -61,8°	6,5/105,8°	0,08/ 44,8°	0,58/-19,6°	19,3
	800	0,48/-173,2°	4,7/ 87,7°	0,10/ 46,9°	0,49/-29,3°	15,9
	1000	0,46/-170,1°	3,7/ 81,1°	0,10/ 44,7°	0,43/-33,1°	13,4
	1200	0,47/+178,4°	3,0/ 77,4°	0,11/ 44,8°	0,38/-46,5°	11,3
	1500	0,54/+169,8°	2,8/ 57,0°	0,13/ 51,1°	0,34/-48,1°	11,1
	2000	0,46/+144,6°	2,0/ 22,4°	0,15/ 4,0°	0,31/-89,8°	7,4
10	40	0,44/+ 60,2°	19,4/137,8°	0,04/ 34,2°	0,96/+79,6°	37,9
	100	0,45/+ 24,4°	17,8/129,8°	0,04/ 58,6°	0,91/+43,5°	33,6
	200	0,47/ -49,4°	14,3/127,2°	0,05/ 57,9°	0,73/ -4,7°	27,5
	500	0,46/ 92,9°	7,7/ 97,6°	0,07/ 48,4°	0,46/-25,9°	19,7
	800	0,47/-176,4°	5,4/ 82,6°	0,09/ 53,8°	0,38/-30,9°	16,4
	1000	0,48/-179,6°	4,2/ 77,1°	0,09/ 52,5°	0,33/-35,6°	14,0
	1200	0,48/+167,7°	3,3/ 75,6°	0,10/ 53,5°	0,29/-45,9°	11,9
	1500	0,53/+159,7°	3,3/ 57,5°	0,12/ 58,7°	0,27/-48,7°	12,0
	2000	0,48/+137,2°	2,2/ -3,9°	0,15/ 11,3°	0,24/-91,2°	8,1
14	40	0,34/+ 53,8°	22,3/136,9°	0,04/ 34,1°	0,95/+78,2°	37,4
	100	0,37/+ 11,9°	19,9/131,0°	0,03/ 54,7°	0,88/+41,3°	33,1
	200	0,42/ -64,7°	15,9/123,1°	0,04/ 57,3°	0,69/ -8,5°	27,6
	500	0,46/-160,6°	7,9/ 96,8°	0,06/ 54,0°	0,40/-26,8°	19,7
	800	0,47/-174,4°	5,5/ 81,7°	0,08/ 56,7°	0,34/-32,1°	16,5
	1000	0,48/+175,9°	4,2/ 75,7°	0,08/ 54,9°	0,30/-37,0°	14,1
	1200	0,50/+164,4°	3,4/ 74,5°	0,09/ 56,4°	0,27/-44,1°	12,3
	1500	0,55/+158,1°	3,2/ 54,6°	0,11/ 62,4°	0,24/-45,1°	12,0
	2000	0,49/+134,9°	2,2/ -5,4°	0,14/ 13,4°	0,22/-90,9°	8,5

s-parameters (common emitter) at $-V_{CE} = 5 \text{ V}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

$-I_C$ mA	f MHz	S_{ie}	S_{fe}	S_{re}	S_{oe}	GUM dB
20	40	0,15/ +3,5°	21,7/136,8°	0,04/ 28,1°	0,91/ +75,5°	34,6
	100	0,31/ -46,9°	18,4/142,5°	0,04/ 64,9°	0,80/ +35,6°	30,2
	200	0,45/ -83,8°	14,2/120,9°	0,04/ 56,5°	0,59/ -15,5°	25,8
	500	0,55/ -175,0°	6,6/ 94,1°	0,06/ 52,3°	0,32/ -34,4°	18,4
	800	0,58/ +177,2°	4,6/ 79,2°	0,08/ 58,4°	0,27/ -36,0°	15,4
	1000	0,57/ +170,3°	3,5/ 73,8°	0,08/ 58,1°	0,24/ -41,3°	12,9
	1200	0,59/ +159,5°	2,8/ 72,9°	0,09/ 59,3°	0,21/ -47,7°	11,1
	2000	0,54/ +150,9°	2,2/ 56,0°	0,11/ 67,6°	0,18/ -36,0°	8,3
25	40	0,15/ -27,1°	22,0/138,1°	0,04/ 34,0°	0,90/ +75,4°	34,0
	100	0,32/ -61,0°	18,7/131,1°	0,03/ 64,9°	0,78/ +34,3°	30,1
	200	0,45/ -80,4°	14,1/119,5°	0,04/ 54,0°	0,56/ -15,9°	25,6
	500	0,57/ -179,4°	6,4/ 92,4°	0,06/ 53,9°	0,31/ -34,4°	18,3
	800	0,57/ +174,6°	4,5/ 78,9°	0,08/ 59,2°	0,26/ -35,4°	15,1
	1000	0,59/ +167,5°	3,4/ 73,1°	0,08/ 58,3°	0,23/ -40,1°	12,8
	1200	0,61/ +157,3°	2,8/ 71,8°	0,08/ 61,8°	0,21/ -48,5°	11,1
	2000	0,56/ +151,1°	2,2/ 75,3°	0,10/ 68,9°	0,18/ -24,3°	8,4
30	40	0,19/ -46,2°	21,9/138,3°	0,04/ 28,3°	0,88/ +74,7°	33,3
	100	0,34/ -73,1°	18,2/129,2°	0,03/ 63,7°	0,77/ +30,6°	29,6
	200	0,47/ -67,1°	13,9/118,9°	0,04/ 56,8°	0,55/ -16,8°	25,5
	500	0,58/ -176,6°	6,2/ 92,5°	0,05/ 56,9°	0,29/ -30,8°	18,1
	800	0,59/ +167,6°	4,3/ 77,7°	0,08/ 60,3°	0,26/ -35,6°	14,9
	1000	0,60/ +167,4°	3,3/ 72,7°	0,08/ 59,9°	0,23/ -37,6°	12,6
	1200	0,63/ +157,3°	2,7/ 70,8°	0,09/ 63,1°	0,21/ -45,9°	10,9
	2000	0,57/ +156,7°	2,2/ 49,2°	0,11/ 70,6°	0,19/ -45,4°	8,6
	2000	0,63/ +130,5°	1,8/ -8,2°	0,14/ 19,2°	0,20/ -95,7°	7,5

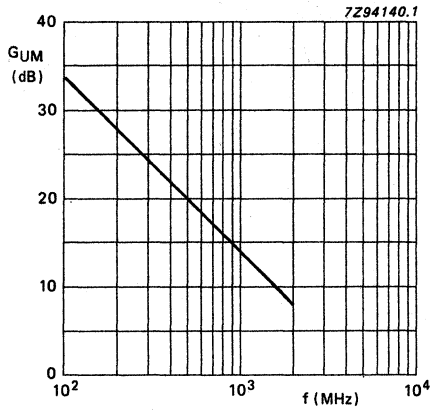


Fig. 4 $-V_{CE} = 10 \text{ V}$; $-I_C = 14 \text{ mA}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

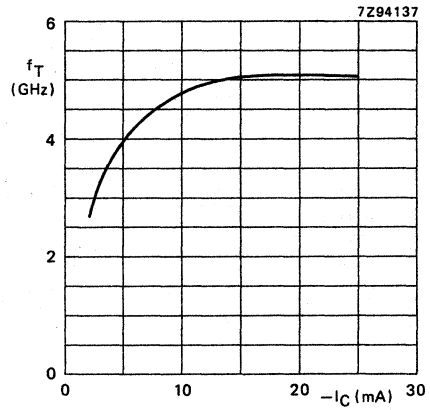


Fig. 5 $-V_{CE} = 10 \text{ V}$; $f = 500 \text{ MHz}$; $T_j = 25 \text{ }^\circ\text{C}$; typical values.

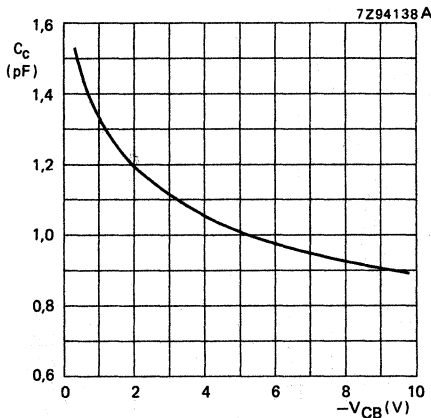


Fig. 6 $I_E = i_e = 0$; $f = 1 \text{ MHz}$; $T_j = 25 \text{ }^\circ\text{C}$; typical values.

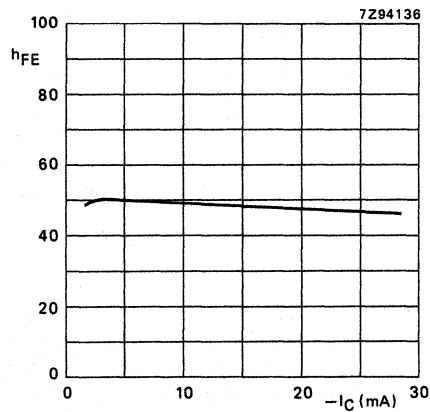


Fig. 7 $-V_{CE} = 10 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$; typical values.

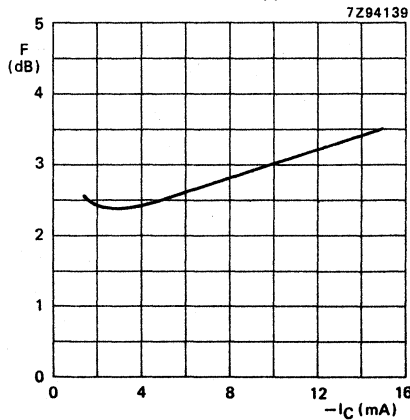


Fig. 8 $-V_{CE} = 10 \text{ V}$; $f = 800 \text{ MHz}$; $Z_S = \text{opt.}$; $T_{amb} = 25 \text{ }^\circ\text{C}$.

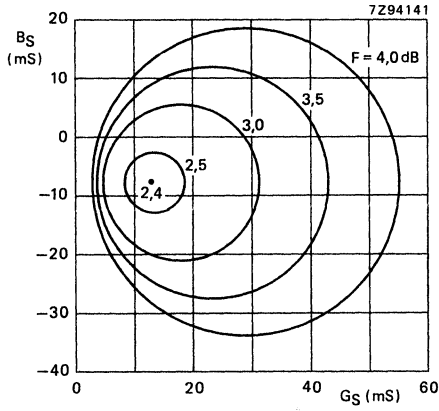


Fig. 9 Circles of constant noise figure; $-V_{CE} = 10 \text{ V}$; $-I_C = 4 \text{ mA}$; $f = 800 \text{ MHz}$; typical values.

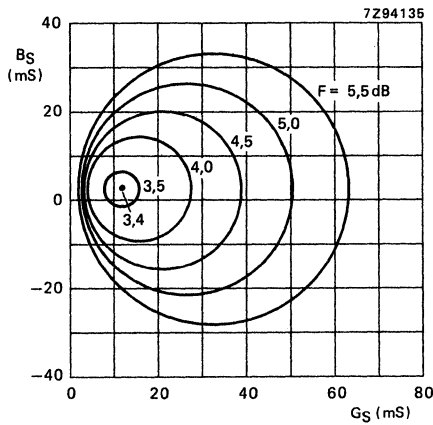


Fig. 10 Circles of constant noise figure; $-V_{CE} = 10 \text{ V}$; $-I_C = 14 \text{ mA}$; $f = 800 \text{ MHz}$; typical values.

N-P-N 2 GHz WIDEBAND TRANSISTOR

N-P-N transistor in a four-lead dual-emitter plastic envelope (SOT-103). It is designed for wideband application in the GHz range, such as satellite TV systems (SATV) and repeater amplifiers in fibre-optical systems. The device features a very high transition frequency, high gain and a very low noise figure up to high frequencies.

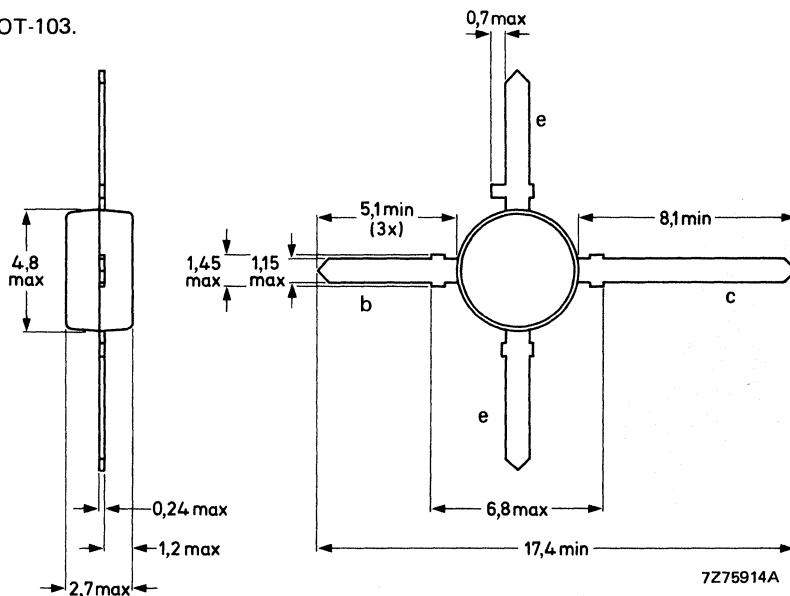
QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	20 V
Collector-emitter voltage (open base)	V_{CEO}	max.	10 V
Collector current (d.c.)	I_C	max.	50 mA
Total power dissipation up to $T_{amb} = 60\text{ }^\circ\text{C}$	P_{tot}	max.	300 mW
Junction temperature	T_j	max.	150 $^\circ\text{C}$
D.C. current gain	h_{FE}	min.	60
$I_C = 15\text{ mA}; V_{CE} = 5\text{ V}$			
Transition frequency at $f = 500\text{ MHz}$	f_T	typ.	7,5 GHz
$I_C = 15\text{ mA}; V_{CE} = 8\text{ V}$			
Noise figure at $Z_S = 60\ \Omega$;	F	typ.	3,0 dB
$I_C = 15\text{ mA}; V_{CE} = 8\text{ V}; f = 2\text{ GHz}$			
Maximum unilateral power gain at $f = 2\text{ GHz}$	G_{UM}	typ.	10,5 dB
$I_C = 15\text{ mA}; V_{CE} = 8\text{ V}$			

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-103.



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	20 V
Collector-emitter voltage (open base)	V_{CEO}	max.	10 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2,5 V
Collector current (d.c.)	I_C	max.	50 mA
Total power dissipation up to $T_{amb} = 60\text{ }^\circ\text{C}$ mounted on a fibre-glass p.c.b. (see Fig. 2)	P_{tot}	max.	300 mW
Storage temperature	T_{stg}		-65 to +150 $^\circ\text{C}$
Junction temperature	T_j	max.	150 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to ambient (free air) mounted on a glass-fibre p.c.b. (see Fig. 2)

$R_{th\ j-a}$	=	300 K/W
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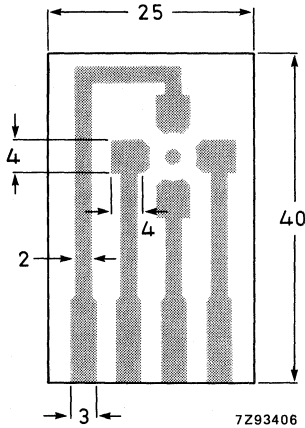


Fig. 2 Requirements for fibre-glass print (dimensions in mm). Single-sided 35 μm Cu-clad epoxy fibre-glass print, thickness 1,5 mm. Tracks are fully tin-lead plated. Shaded area is Cu.

→ **CHARACTERISTICS**

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Collector cut-off current

$I_E = 0; V_{CB} = 5\text{ V}$

I_{CBO}	max.	50 nA
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D.C. current gain

$I_C = 15\text{ mA}; V_{CE} = 5\text{ V}$

h_{FE}	min.	60
	typ.	100

Transition frequency at $f = 500\text{ MHz}$

$I_C = 15\text{ mA}; V_{CE} = 8\text{ V}$

f_T	typ.	7,5 GHz
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Collector capacitance at $f = 1\text{ MHz}$

$I_E = i_e = 0; V_{CB} = 8\text{ V}$

C_c	typ.	1,1 pF
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Emitter capacitance at $f = 1\text{ MHz}$

$I_C = i_c = 0; V_{EB} = 0,5\text{ V}$

C_e	typ.	1,3 pF
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Feedback capacitance at $f = 1\text{ MHz}$

$I_E = 0; V_{CE} = 8\text{ V}$

C_{re}	typ.	0,5 pF
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Maximum unilateral power gain (s_{re} assumed to be zero)

$$G_{UM} = 10 \log \frac{|s_{fe}|^2}{[1 - |s_{ie}|^2] [s_{oe}|^2]}$$

$I_C = 15 \text{ mA}; V_{CE} = 8 \text{ V}; f = 800 \text{ MHz}; T_{amb} = 25 \text{ }^\circ\text{C}$

$I_C = 15 \text{ mA}; V_{CE} = 8 \text{ V}; f = 2 \text{ GHz}; T_{amb} = 25 \text{ }^\circ\text{C}$

Noise figure at optimum source impedance and

$V_{CE} = 8 \text{ V}; f = 800 \text{ MHz}; T_{amb} = 25 \text{ }^\circ\text{C};$

$I_C = 5 \text{ mA}$

$I_C = 15 \text{ mA}$

Noise figure at $Z_S = 60 \text{ } \Omega$ and

$V_{CE} = 8 \text{ V}; f = 2 \text{ GHz}; T_{amb} = 25 \text{ }^\circ\text{C};$

$I_C = 5 \text{ mA}$

$I_C = 15 \text{ mA}$

GUM	typ.	18,5 dB
	typ.	10,5 dB

F	typ.	0,8 dB
	typ.	1,5 dB

F	typ.	2,5 dB
	typ.	3,0 dB

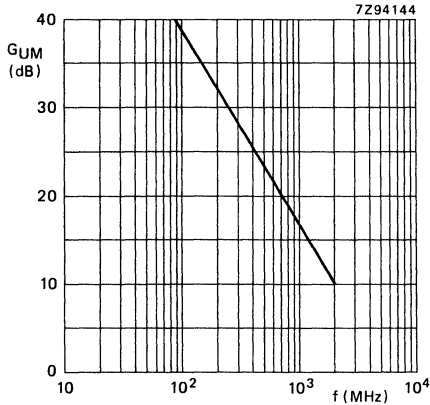


Fig. 3 $V_{CE} = 8 \text{ V}; I_C = 15 \text{ mA}; T_{amb} = 25 \text{ }^\circ\text{C};$ typical values.

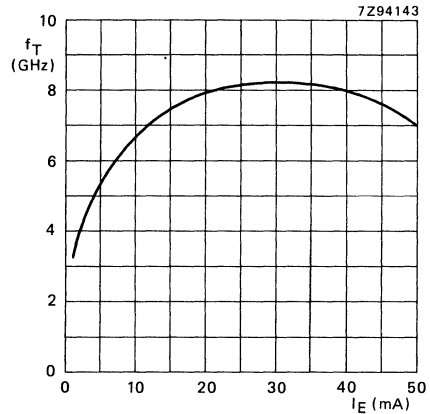


Fig. 4 $V_{CE} = 8 \text{ V}; f = 500 \text{ MHz};$ typical values.

s-parameters (common emitter) at $V_{CE} = 8\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$; typical values

I_C mA	f MHz	s_{ie}	s_{fe}	s_{re}	s_{oe}	GUM dB
5	40	0,86/ -11,0°	15,0/173,8°	0,01/ 85,5°	0,98/ -5,7°	42,8
	100	0,85/ -31,0°	14,6/159,5°	0,02/ 72,7°	0,96/ -16,8°	40,4
	200	0,74/ -58,3°	12,4/143,0°	0,04/ 62,0°	0,81/ -29,4°	30,0
	500	0,62/ -114,9°	8,0/109,7°	0,07/ 44,1°	0,57/ -51,2°	21,8
	800	0,54/ -141,0°	5,5/ 94,8°	0,08/ 43,7°	0,46/ -59,3°	17,3
	1000	0,52/ -155,9°	4,5/ 85,5°	0,08/ 42,9°	0,43/ -61,7°	15,3
	1200	0,50/ -170,7°	3,7/ 78,8°	0,09/ 44,8°	0,39/ -64,9°	13,3
	1500	0,51/ +179,4°	3,1/ 72,3°	0,10/ 49,7°	0,34/ -72,3°	11,7
2000	0,50/ +159,2°	2,3/ 60,6°	0,11/ 54,7°	0,33/ -85,7°	9,1	
10	40	0,75/ -17,4°	26,0/169,9°	0,01/ 78,7°	0,95/ -9,4°	42,4
	100	0,72/ -46,3°	24,0/151,2°	0,02/ 67,2°	0,89/ -24,9°	37,6
	200	0,60/ -81,7°	18,0/131,8°	0,03/ 57,3°	0,68/ -39,7°	30,0
	500	0,52/ -138,7°	9,8/101,3°	0,05/ 48,9°	0,41/ -59,2°	22,0
	800	0,48/ -159,5°	6,5/ 89,3°	0,06/ 53,7°	0,34/ -64,8°	17,9
	1000	0,48/ -171,7°	5,2/ 81,5°	0,07/ 55,0°	0,31/ -66,2°	16,0
	1200	0,48/ +175,6°	4,2/ 76,4°	0,08/ 57,6°	0,27/ -68,1°	14,1
	1500	0,48/ +169,3°	4,0/ 70,5°	0,10/ 61,4°	0,25/ -76,4°	12,5
2000	0,48/ +150,8°	2,7/ 60,2°	0,12/ 63,0°	0,25/ -89,4°	10,0	
15	40	0,66/ -22,8°	33,9/167,0°	0,01/ 77,8°	0,94/ -12,0°	42,7
	100	0,62/ -58,5°	29,9/145,5°	0,02/ 64,3°	0,83/ -30,2°	36,8
	200	0,53/ -97,7°	21,1/125,5°	0,03/ 56,4°	0,60/ -45,0°	29,8
	500	0,50/ -149,2°	10,4/ 97,8°	0,04/ 53,9°	0,34/ -62,4°	22,2
	800	0,47/ -167,8°	6,8/ 86,8°	0,06/ 59,6°	0,29/ -66,8°	18,5
	1000	0,47/ -178,4°	5,5/ 79,9°	0,07/ 60,8°	0,26/ -68,1°	16,2
	1200	0,48/ +169,9°	4,5/ 75,3°	0,08/ 62,7°	0,23/ -69,5°	14,4
	1500	0,48/ +165,1°	3,8/ 69,5°	0,10/ 65,7°	0,21/ -78,5°	12,8
2000	0,48/ +147,3°	2,8/ 60,0°	0,12/ 66,1°	0,21/ -91,5°	10,5	
20	40	0,60/ -27,3°	39,4/164,9°	0,01/ 72,7°	0,92/ -13,9°	42,1
	100	0,56/ -67,7°	33,1/141,8°	0,02/ 62,9°	0,79/ -33,4°	36,2
	200	0,49/ -108,4°	22,6/121,8°	0,03/ 56,3°	0,54/ -47,9°	29,8
	500	0,49/ -155,6°	10,7/ 95,9°	0,04/ 57,2°	0,31/ -63,7°	22,2
	800	0,47/ -172,1°	6,0/ 85,5°	0,06/ 63,0°	0,26/ -67,5°	18,2
	1000	0,47/ +178,1°	5,6/ 79,0°	0,07/ 63,6°	0,24/ -68,6°	16,3
	1200	0,49/ +167,1°	4,6/ 74,8°	0,08/ 65,8°	0,20/ -69,9°	14,6
	1500	0,48/ +162,9°	3,8/ 69,0°	0,10/ 68,0°	0,20/ -79,3°	12,9
2000	0,48/ +145,5°	2,9/ 59,7°	0,13/ 67,7°	0,20/ -92,6°	10,4	
30	40	0,50/ -35,8°	46,8/161,7°	0,01/ 73,5°	0,90/ -16,5°	41,7
	100	0,48/ -83,7°	37,2/136,5°	0,02/ 60,8°	0,72/ -37,5°	35,7
	200	0,46/ -124,2°	23,9/117,0°	0,02/ 57,6°	0,47/ -50,6°	29,7
	500	0,49/ -163,7°	10,7/ 93,5°	0,04/ 62,0°	0,27/ -63,3°	22,1
	800	0,47/ -177,5°	6,0/ 84,0°	0,06/ 67,1°	0,23/ -66,4°	18,2
	1000	0,48/ +173,9°	5,6/ 77,7°	0,07/ 67,4°	0,22/ -67,3°	16,3
	1200	0,50/ +163,8°	4,6/ 73,8°	0,08/ 69,1°	0,19/ -68,4°	14,6
	1500	0,48/ +160,3°	3,8/ 68,1°	0,10/ 70,6°	0,18/ -79,1°	12,9
2000	0,49/ +143,4°	2,9/ 59,1°	0,13/ 69,5°	0,18/ -92,6°	10,5	

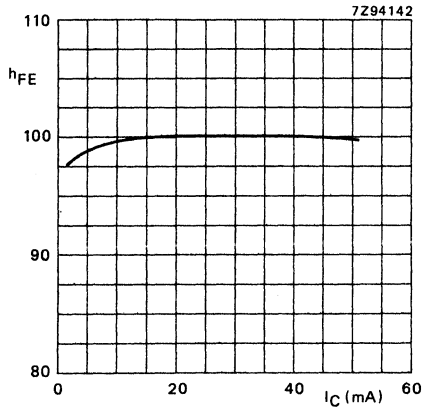


Fig. 5 $V_{CE} = 5 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$; typical values.

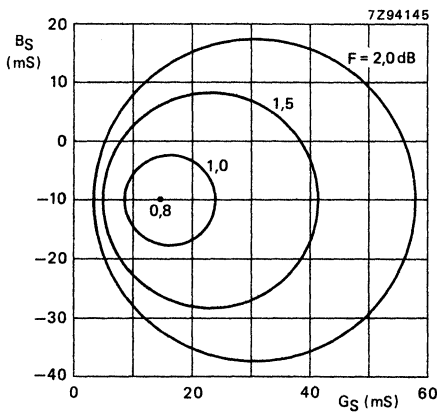


Fig. 6 Circles of constant noise figure; $V_{CE} = 8 \text{ V}$; $I_C = 5 \text{ mA}$; $f = 800 \text{ MHz}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

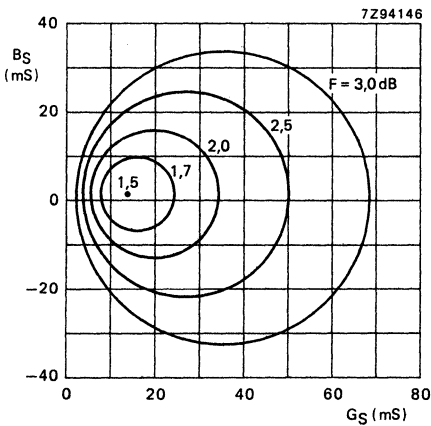


Fig. 7 Circles of constant noise figure; $V_{CE} = 8 \text{ V}$; $I_C = 15 \text{ mA}$; $f = 800 \text{ MHz}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

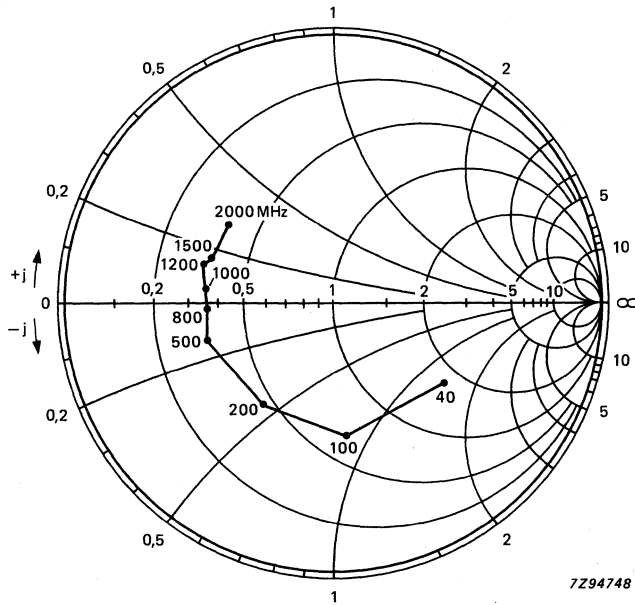


Fig. 8 Input impedance, derived from input reflection coefficient s_{ie} coordinates, in ohm x 50.

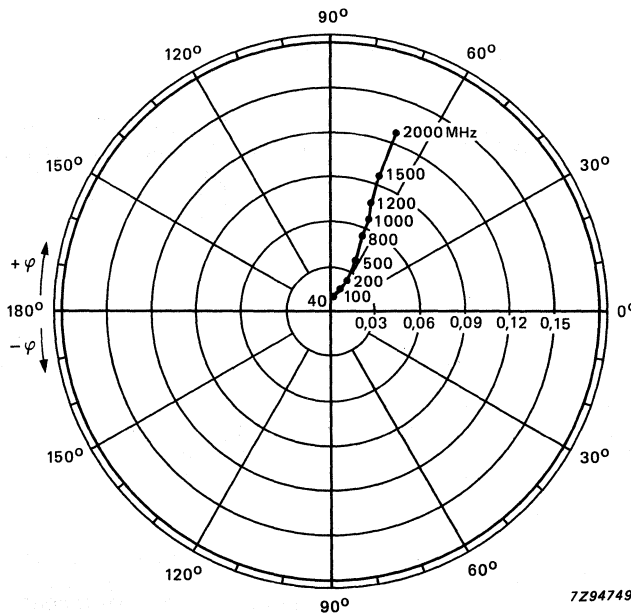


Fig. 9 Reverse transmission coefficient s_{re} .

Conditions for Figs 8, 9, 10 and 11: $V_{CE} = 8 \text{ V}$; $I_C = 30 \text{ mA}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

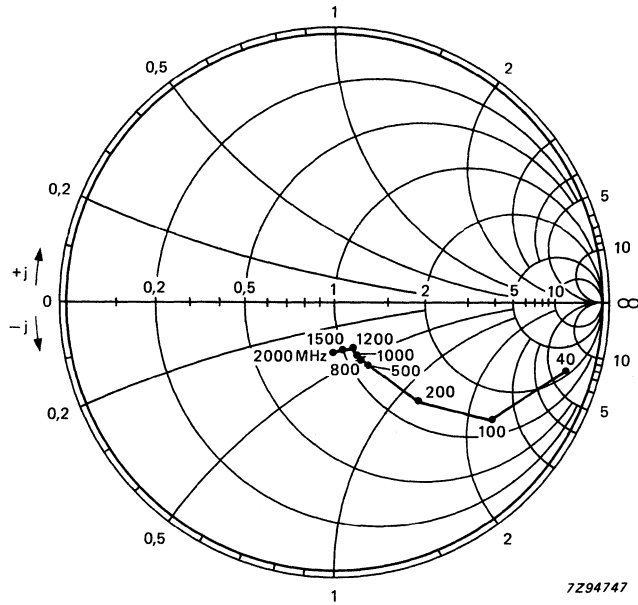


Fig. 10 Output impedance, derives from output reflection coefficient s_{oe} coordinates, in ohm \times 50.

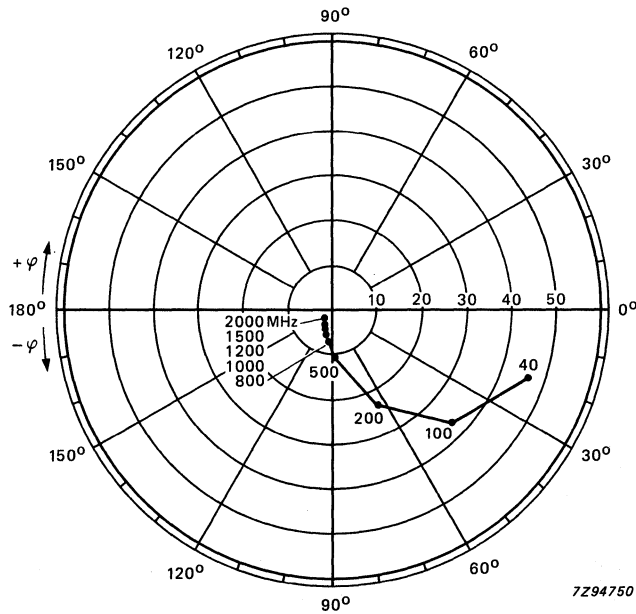


Fig. 11 Forward transmission coefficient s_{fe} .

N-P-N 2 GHz WIDEBAND TRANSISTOR ←

N-P-N transistor in a four-lead dual-emitter plastic envelope (SOT-143). It is designed for wideband application in the GHz range, such as satellite TV systems (SATV) and repeater amplifiers in fibre-optical systems. The device features a very high transition frequency, high gain and a very low noise figure up to high frequencies. ←

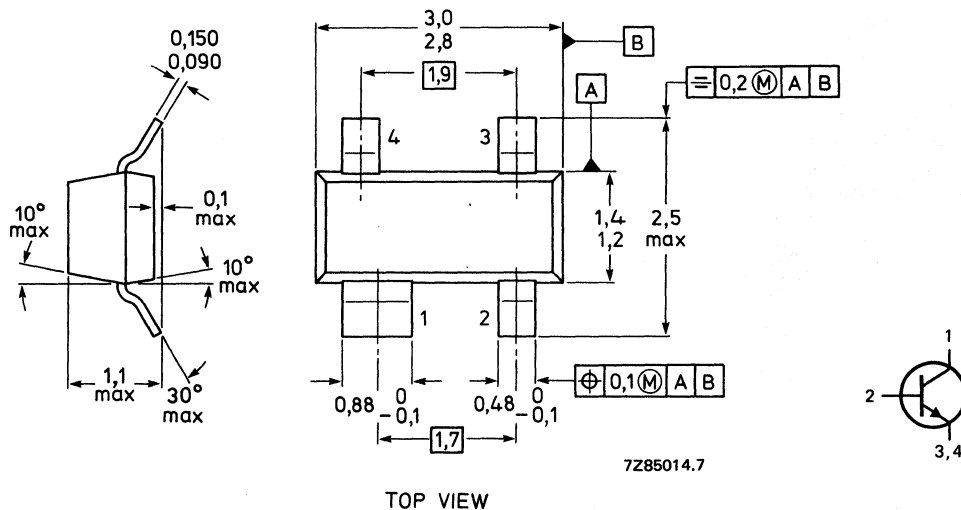
QUICK REFERENCE DATA

Collector-base voltage	V_{CBO}	max.	20 V
Collector-emitter voltage	V_{CEO}	max.	10 V
Collector current (d.c.)	I_C	max.	50 mA
Total power dissipation up to $T_{amb} = 25\text{ °C}$	P_{tot}	max.	300 mW
Junction temperature	T_j	max.	150 °C
D.C. current gain $I_C = 15\text{ mA}; V_{CE} = 5\text{ V}$	h_{FE}	min. typ.	60 100
Transition frequency at $f = 500\text{ MHz}$ $I_C = 15\text{ mA}; V_{CE} = 8\text{ V}$	f_T	typ.	7,5 GHz
Maximum unilateral power gain at $f = 2\text{ GHz}$ $I_C = 15\text{ mA}; V_{CE} = 8\text{ V}; T_{amb} = 25\text{ °C}$	G_{UM}	typ.	10,0 dB
Noise figure at $f = 2\text{ GHz}$ $Z_S = 60\text{ }\Omega; T_{amb} = 25\text{ °C}$ $I_C = 5\text{ mA}; V_{CE} = 8\text{ V}$ $I_C = 15\text{ mA}; V_{CE} = 8\text{ V}$	F F	typ.	2,5 dB 3,0 dB

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-143.



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CB0}	max.	20 V
Collector-emitter voltage (open base)	V_{CE0}	max.	10 V
Emitter-base voltage (open collector)	V_{EB0}	max.	2,5 V
Collector current (d.c.)	I_C	max.	50 mA
Total power dissipation up to $T_{amb} = 25\text{ }^\circ\text{C}$ mounted on a ceramic substrate of 8 mm x 10 mm x 0,7 mm	P_{tot}	max.	300 mW
Storage temperature	T_{stg}		-65 to + 150 $^\circ\text{C}$
Junction temperature	T_j	max.	150 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to ambient
mounted on a ceramic substrate of
8 mm x 10 mm x 0,7 mm

$R_{th\ j-a}$	=	430 K/W
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CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Collector cut-off current

$I_E = 0; V_{CB} = 10\text{ V}$

I_{CBO}	max.	50 nA
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D.C. current gain

$I_C = 15\text{ mA}; V_{CE} = 5\text{ V}$

h_{FE}	min.	60
	typ.	100

Transition frequency at $f = 500\text{ MHz}$

$I_C = 15\text{ mA}; V_{CE} = 8\text{ V}$

f_T	typ.	7,5 GHz
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Collector capacitance at $f = 1\text{ MHz}$

$I_E = I_e = 0; V_{CB} = 8\text{ V}$

C_c	typ.	0,7 pF
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Emitter capacitance at $f = 1\text{ MHz}$

$I_C = I_c = 0; V_{EB} = 0,5\text{ V}$

C_e	typ.	1,3 pF
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Feedback capacitance at $f = 1\text{ MHz}$

$I_C = 0; V_{CE} = 8\text{ V}$

C_{re}	typ.	0,5 pF
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Maximum unilateral power gain (s_{re} assumed to be zero)

$$G_{UM} = 10 \log \frac{|s_{fe}|^2}{[1 - |s_{ie}|^2][1 - |s_{oe}|^2]}$$

at $I_C = 15\text{ mA}; V_{CE} = 8\text{ V};$
 $f = 2\text{ GHz}; T_{amb} = 25\text{ }^\circ\text{C}$

G_{UM}	typ.	10,0 dB
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Noise figures at $f = 800\text{ MHz}; Z_S = \text{opt.};$

$T_{amb} = 25\text{ }^\circ\text{C}; V_{CE} = 8\text{ V}$

$I_C = 5\text{ mA}$

$I_C = 15\text{ mA}$

F	typ.	0,8 dB
F	typ.	1,5 dB

Noise figures at $f = 2\text{ GHz}; Z_S = 60\text{ }^\circ\Omega$

$T_{amb} = 25\text{ }^\circ\text{C}; V_{CE} = 8\text{ V}$

$I_C = 5\text{ mA}$

$I_C = 15\text{ mA}$

F	typ.	2,5 dB
F	typ.	3,0 dB

s-parameters (common emitter) at $V_{CE} = 8 \text{ V}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

I_C mA	f MHz	S_{ie}	S_{fe}	S_{re}	S_{oe}	GUM dB
2	40	0,96/ -6,8°	5,8/177,8°	0,01/ 84,5°	0,99/ -3,2°	44,1
	100	0,98/ -20,8°	5,6/165,8°	0,03/ 77,5°	1,01/ -10,0°	46,5
	200	0,89/ -40,1°	5,1/153,2°	0,05/ 66,8°	0,91/ -19,0°	28,7
	500	0,81/ -89,3°	4,3/121,5°	0,09/ 43,4°	0,79/ -38,5°	21,5
	800	0,68/-123,0°	3,3/102,0°	0,11/ 33,8°	0,67/ -50,0°	15,7
	1000	0,64/-139,9°	2,8/ 89,8°	0,11/ 28,0°	0,65/ -54,5°	13,7
	1200	0,60/-157,3°	2,3/ 81,1°	0,11/ 25,8°	0,62/ -61,7°	11,5
	1500	0,59/-173,3°	2,0/ 71,8°	0,11/ 27,4°	0,55/ -69,3°	9,5
2000	0,57/+161,7°	1,5/ 56,3°	0,10/ 32,2°	0,54/ -85,8°	6,7	
5	40	0,91/ -10,9°	13,5/174,8°	0,01/ 83,3°	0,98/ -5,9°	44,2
	100	0,91/ -30,3°	12,6/159,5°	0,03/ 72,2°	0,96/ -17,0°	40,9
	200	0,79/ -56,3°	10,6/143,5°	0,04/ 60,3°	0,81/ -29,5°	29,3
	500	0,64/-115,9°	7,4/109,8°	0,07/ 41,4°	0,58/ -50,8°	21,5
	800	0,55/-145,5°	5,2/ 93,5°	0,08/ 39,9°	0,48/ -59,5°	17,1
	1000	0,53/-161,4°	4,2/ 84,0°	0,08/ 39,1°	0,44/ -62,2°	15,0
	1200	0,52/-176,5°	3,5/ 77,8°	0,08/ 41,2°	0,42/ -67,1°	13,1
	1500	0,51/+172,2°	2,9/ 69,1°	0,09/ 44,6°	0,38/ -75,7°	11,3
2000	0,50/+149,8°	2,2/ 56,7°	0,11/ 49,8°	0,38/ -89,5°	8,7	
10	40	0,85/ -16,1°	23,5/170,6°	0,01/ 80,1°	0,96/ -9,7°	43,8
	100	0,81/ -42,6°	21,3/151,8°	0,02/ 67,2°	0,89/ -25,2°	38,0
	200	0,67/ -76,3°	16,6/133,0°	0,04/ 55,5°	0,68/ -40,0°	29,6
	500	0,54/-137,5°	9,5/101,5°	0,05/ 45,7°	0,42/ -60,2°	21,9
	800	0,49/-161,8°	6,3/ 88,5°	0,07/ 49,2°	0,35/ -67,0°	17,7
	1000	0,49/-175,2°	5,1/ 80,5°	0,07/ 50,6°	0,32/ -68,9°	15,8
	1200	0,49/+171,5°	4,2/ 75,8°	0,08/ 53,4°	0,29/ -72,5°	13,9
	1500	0,47/+163,5°	3,5/ 67,5°	0,09/ 55,3°	0,28/ -82,1°	12,3
2000	0,47/+142,5°	2,6/ 56,8°	0,12/ 57,7°	0,29/ -94,5°	9,6	
15	40	0,80/ -20,1°	31,0/167,8°	0,01/ 76,4°	0,94/ -12,2°	43,5
	100	0,74/ -51,8°	26,9/146,8°	0,02/ 64,1°	0,83/ -30,3°	37,2
	200	0,60/ -89,4°	19,9/126,7°	0,03/ 54,0°	0,60/ -45,5°	29,8
	500	0,51/-147,5°	10,3/ 98,0°	0,05/ 49,7°	0,35/ -64,9°	22,1
	800	0,47/-168,5°	6,7/ 86,5°	0,06/ 54,6°	0,29/ -70,8°	18,1
	1000	0,47/+179,2°	5,4/ 79,3°	0,07/ 55,9°	0,27/ -72,8°	16,1
	1200	0,48/+166,5°	4,4/ 75,0°	0,08/ 58,4°	0,24/ -75,8°	14,3
	1500	0,46/+160,0°	3,7/ 67,0°	0,10/ 59,2°	0,24/ -86,0°	12,5
2000	0,45/+139,5°	2,7/ 56,8°	0,12/ 60,2°	0,25/ -97,8°	10,0	
20	40	0,76/ -23,8°	37,2/165,4°	0,01/ 75,6°	0,92/ -14,3°	43,3
	100	0,69/ -60,0°	31,2/142,6°	0,02/ 61,7°	0,78/ -34,3°	36,8
	200	0,55/ -99,6°	21,8/122,5°	0,03/ 53,6°	0,54/ -49,5°	29,8
	500	0,49/-152,5°	10,6/ 96,0°	0,04/ 53,0°	0,31/ -68,0°	22,2
	800	0,46/-172,9°	7,0/ 85,0°	0,06/ 58,1°	0,26/ -73,3°	18,2
	1000	0,46/+175,9°	5,5/ 78,3°	0,07/ 59,3°	0,24/ -75,3°	16,1
	1200	0,47/+163,5°	4,6/ 74,3°	0,08/ 61,5°	0,21/ -78,3°	14,5
	1500	0,45/+157,9°	3,8/ 66,4°	0,10/ 61,4°	0,22/ -88,9°	12,8
2000	0,45/+137,8°	2,8/ 56,7°	0,12/ 61,7°	0,22/-100,2°	10,2	

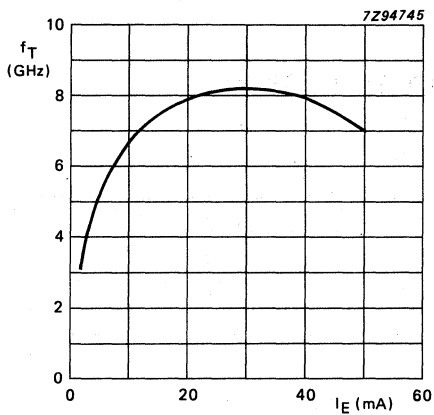


Fig. 2 $V_{CE} = 8 \text{ V}$; $f = 500 \text{ MHz}$;
 $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

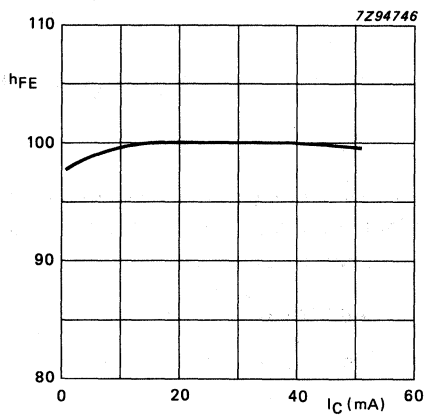


Fig. 3 $V_{CE} = 5 \text{ V}$; $T_{amb} = 25 \text{ }^\circ\text{C}$;
 typical values.

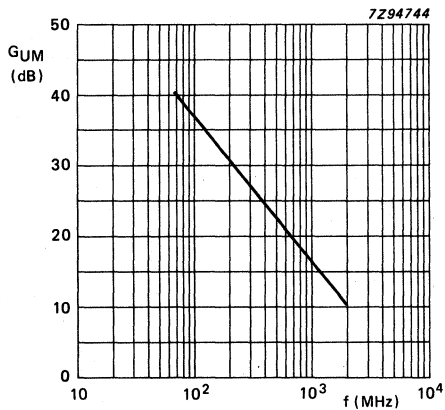


Fig. 4 $V_{CE} = 8 \text{ V}$; $I_C = 15 \text{ mA}$;
 $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

N-P-N 2 GHz WIDEBAND TRANSISTOR

N-P-N transistor in a four-lead dual-emitter plastic envelope (SOT-103). This device is designed for application in wideband amplifiers, such as in CATV and MATV systems, up to 2 GHz.

P-N-P complement is BFG51.

QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	20 V
Collector-emitter voltage (open base)	V_{CEO}	max.	15 V
Collector current (d.c.)	I_C	max.	25 mA
Total power dissipation up to $T_{amb} = 60\text{ }^\circ\text{C}$	P_{tot}	max.	180 mW
Junction temperature	T_j	max.	150 $^\circ\text{C}$
D.C. current gain $I_C = 14\text{ mA}; V_{CE} = 10\text{ V}$	h_{FE}	min.	40
Transition frequency at $f = 500\text{ MHz}$ $I_C = 14\text{ mA}; V_{CE} = 10\text{ V}$	f_T	typ.	5,0 GHz
Feedback capacitance at $f = 1\text{ MHz}$ $I_C = 0; V_{CE} = 10\text{ V}$	C_{re}	typ.	0,35 pF
Noise figure at $Z_S = \text{opt.}; T_{amb} = 25\text{ }^\circ\text{C};$ $I_C = 14\text{ mA}; V_{CE} = 10\text{ V}; f = 800\text{ MHz}$	F	typ.	2,4 dB
Maximum unilateral power gain at $f = 800\text{ MHz}$ $I_C = 14\text{ mA}; V_{CE} = 10\text{ V}$	G_{UM}	typ.	19 dB
Output power at 1 dB gain compression $V_{CE} = 10\text{ V}; I_C = 14\text{ mA}; f = 800\text{ MHz}$	PL_1	typ.	+8 dBm
Third order intercept point $V_{CE} = 10\text{ V}; I_C = 14\text{ mA}; f = 800\text{ MHz}$	ITO	typ.	+27 dBm

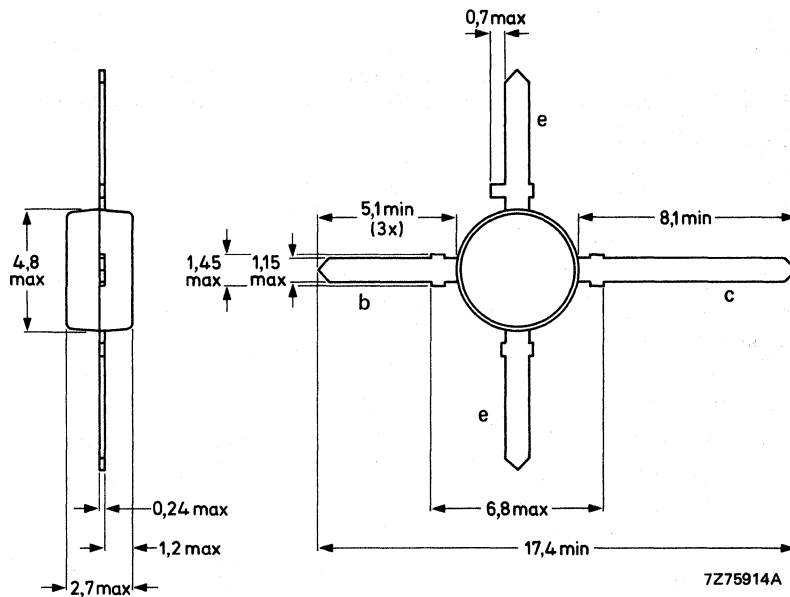
MECHANICAL DATA

SOT-103 (see Fig. 1).

MECHANICAL DATA

Fig. 1 SOT-103.

Dimensions in mm



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CB0}	max.	20 V
Collector-emitter voltage (open base)	V_{CE0}	max.	15 V
Emitter-base voltage (open collector)	V_{EB0}	max.	2 V
Collector current (d.c.)	I_C	max.	25 mA
Total power dissipation up to $T_{amb} = 60\text{ }^{\circ}\text{C}$	P_{tot}	max.	180 mW
Storage temperature	T_{stg}		-65 to +150 $^{\circ}\text{C}$
Junction temperature	T_j	max.	150 $^{\circ}\text{C}$

THERMAL RESISTANCE

From junction to ambient in free air and mounted on glass-fibre p.c.b. (see Fig. 2)

$$R_{th\ j-a} = 500\ K/W$$

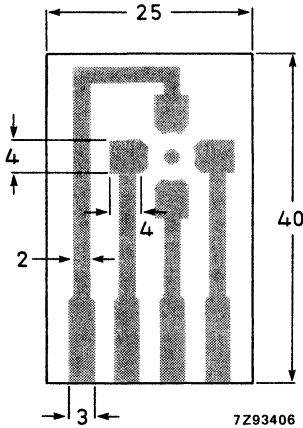


Fig. 2 Requirements for fibre-glass print (dimensions in mm). Single-sided 35 μ m Cu-clad epoxy fibre-glass print, thickness 1,5 mm. Tracks are fully tin-lead plated. Shaded area is Cu.

CHARACTERISTICS

$T_j = 25\ ^\circ C$ unless otherwise specified

Collector cut-off current

$$I_E = 0; V_{CB} = 10\ V$$

I_{CBO}	max.	50 nA
-----------	------	-------

D.C. current gain

$$I_C = 14\ mA; V_{CE} = 10\ V$$

h_{FE}	min.	40
	typ.	90

Transition frequency at $f = 500\ MHz$

$$I_C = 14\ mA; V_{CE} = 10\ V$$

f_T	typ.	5,0 GHz
-------	------	---------

Collector capacitance at $f = 1\ MHz$

$$I_E = i_e = 0; V_{CB} = 10\ V$$

C_c	typ.	0,7 pF
-------	------	--------

Emitter capacitance at $f = 1\ MHz$

$$I_C = i_c = 0; V_{EB} = 0,5\ V$$

C_e	typ.	1,2 pF
-------	------	--------

Feedback capacitance at $f = 1\ MHz$

$$I_C = 0; V_{CE} = 10\ V$$

C_{re}	typ.	0,35 pF
----------	------	---------

Maximum unilateral power gain (s_{re} assumed to be zero)

$$G_{UM} = 10\ log\ \frac{|s_{fe}|^2}{[1 - |s_{ie}|^2][1 - |s_{oe}|^2]}$$

$$I_C = 14\ mA; V_{CE} = 10\ V; f = 800\ MHz; T_{amb} = 25\ ^\circ C$$

$$I_C = 14\ mA; V_{CE} = 10\ V; f = 2\ GHz; T_{amb} = 25\ ^\circ C$$

G_{UM}	typ.	19,0 dB
	typ.	10,5 dB

Noise figure at $T_{amb} = 25\ ^\circ C$

$$I_C = 4\ mA; V_{CE} = 10\ V; f = 800\ MHz; Z_S = opt.$$

$$I_C = 14\ mA; V_{CE} = 10\ V; f = 800\ MHz; Z_S = opt.$$

$$I_C = 4\ mA; V_{CE} = 10\ V; f = 2\ GHz; Z_S = 60\ \Omega$$

F	typ.	1,7 dB
F	typ.	2,4 dB
F	typ.	3,6 dB

Output power at 1 dB gain compression

$I_C = 14 \text{ mA}$; $V_{CE} = 10 \text{ V}$; $T_{amb} = 25 \text{ }^\circ\text{C}$;
 $R_L = 75 \text{ } \Omega$; measured at $f = 800 \text{ MHz}$

PL1 typ. +8 dBm

Third order intercept point (see Fig. 3)

$I_C = 14 \text{ mA}$; $V_{CE} = 10 \text{ V}$;
 $R_L = 75 \text{ } \Omega$; $T_{amb} = 25 \text{ }^\circ\text{C}$;
 $P_p = \text{ITO} - 6 \text{ dB}$; $f_p = 800 \text{ MHz}$;
 $P_q = \text{ITO} - 6 \text{ dB}$; $f_q = 801 \text{ MHz}$;

measured at $f(2q-p) = 802 \text{ MHz}$ and
 at $f(2p-q) = 799 \text{ MHz}$

ITO typ. +27 dBm

Output voltage at $d_{im} = -60 \text{ dB}$

$I_C = 14 \text{ mA}$; $V_{CE} = 10 \text{ V}$;
 $R_L = 75 \text{ } \Omega$; $T_{amb} = 25 \text{ }^\circ\text{C}$

$V_p = V_o$ at $d_{im} = -60 \text{ dB}$; $f_p = 795,25 \text{ MHz}$
 $V_q = V_o - 6 \text{ dB}$; $f_q = 803,25 \text{ MHz}$
 $V_r = V_o - 6 \text{ dB}$; $f_r = 805,25 \text{ MHz}$

measured at $f(p+q-r) = 793,25 \text{ MHz}$

V_o typ. 150 mV

Second harmonic distortion (see Fig. 3)

$I_C = 14 \text{ mA}$; $V_{CE} = 10 \text{ V}$; $R_L = 75 \text{ } \Omega$;
 $V_{SWR} < 2$; $T_{amb} = 25 \text{ }^\circ\text{C}$

$V_p = V_o = 60 \text{ mV}$ at $f_p = 250 \text{ MHz}$
 $V_q = V_o = 60 \text{ mV}$ at $f_q = 560 \text{ MHz}$

measured at $f(p+q) = 810 \text{ MHz}$

d_2 typ. -50 dB

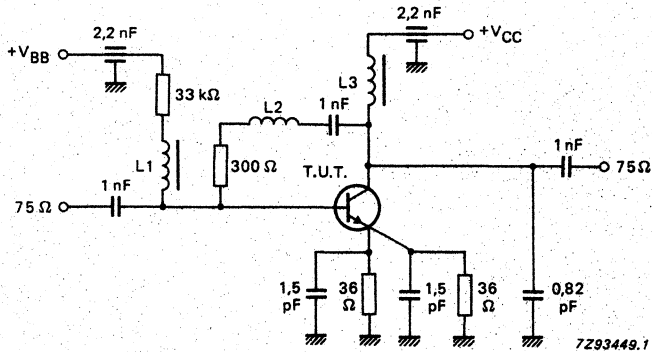


Fig. 3 Intermodulation distortion and second harmonic distortion MATV test circuit.

$L1 = L3 = 5 \text{ } \mu\text{H}$ Ferroxcube choke

$L2 = 3$ turns Cu wire (0,4 mm), internal diameter 3 mm, winding pitch 1 mm

s-parameters (common emitter) at $V_{CE} = 10\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$; typical values

I_C mA	f MHz	S_{ie}	S_{fe}	S_{re}	S_{oe}	GUM dB
5	40	0,85/ -10,3°	15,9/173,9°	0,01/ 79,5°	0,99/ -4,1°	45,9
	100	0,84/ -29,2°	15,5/160,1°	0,02/ 74,0°	0,98/ -12,5°	42,6
	200	0,73/ -55,3°	13,2/143,8°	0,03/ 64,3°	0,85/ -21,6°	31,3
	500	0,58/ -109,4°	8,6/111,5°	0,05/ 48,9°	0,66/ -34,9°	23,0
	800	0,49/ -135,3°	5,9/ 97,2°	0,06/ 50,2°	0,58/ -40,0°	18,4
	1000	0,47/ -150,0°	4,9/ 88,2°	0,07/ 50,1°	0,56/ -41,2°	16,5
	1200	0,45/ -165,4°	4,0/ 81,3°	0,07/ 51,3°	0,54/ -44,5°	14,5
	1500	0,44/ -175,5°	3,3/ 76,0°	0,08/ 56,1°	0,47/ -48,7°	12,5
2000	0,43/ +164,4°	2,5/ 64,4°	0,09/ 59,5°	0,46/ -61,0°	9,7	
10	40	0,75/ -15,6°	26,0/170,7°	0,01/ 76,9°	0,98/ -6,5°	45,4
	100	0,72/ -41,8°	24,3/152,8°	0,02/ 70,4°	0,98/ -17,5°	39,7
	200	0,60/ -74,8°	18,8/133,8°	0,02/ 60,2°	0,76/ -27,1°	31,1
	500	0,48/ -130,9°	10,4/103,6°	0,04/ 53,2°	0,55/ -36,3°	23,0
	800	0,43/ -152,5°	6,9/ 91,8°	0,05/ 57,9°	0,48/ -39,6°	18,8
	1000	0,43/ -164,9°	5,6/ 84,2°	0,06/ 59,0°	0,48/ -40,3°	16,9
	1200	0,43/ -178,7°	4,6/ 78,5°	0,06/ 60,5°	0,46/ -42,7°	15,1
	1500	0,42/ +174,8°	3,8/ 73,8°	0,08/ 64,6°	0,41/ -47,3°	13,1
2000	0,41/ +156,4°	2,8/ 63,5°	0,10/ 65,6°	0,40/ -59,5°	10,5	
14	40	0,69/ -19,1°	32,0/168,7°	0,01/ 75,0°	0,97/ -7,8°	45,6
	100	0,65/ -49,8°	28,8/148,5°	0,02/ 68,6°	0,90/ -20,0°	38,8
	200	0,53/ -86,1°	21,1/128,8°	0,02/ 58,9°	0,70/ -29,0°	30,8
	500	0,46/ -136,5°	10,8/100,5°	0,04/ 56,5°	0,50/ -35,7°	23,0
	800	0,42/ -159,5°	7,1/ 89,5°	0,05/ 61,8°	0,45/ -38,6°	19,0
	1000	0,42/ -170,8°	5,8/ 82,7°	0,06/ 62,6°	0,45/ -39,2°	17,1
	1200	0,42/ +176,6°	4,7/ 77,5°	0,06/ 64,0°	0,44/ -41,4°	15,3
	1500	0,42/ +171,2°	3,9/ 72,8°	0,07/ 67,4°	0,39/ -46,4°	13,3
2000	0,41/ +153,5°	2,9/ 62,9°	0,10/ 68,0°	0,38/ -58,5°	10,5	

s-parameters (common emitter) at $V_{CE} = 5\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$; typical values

I_C mA	f MHz	S_{ie}	S_{fe}	S_{re}	S_{oe}	GUM dB
20	40	0,58/ -26,9°	38,9/165,5°	0,01/ 72,8°	0,95/ -10,2°	44,1
	100	0,54/ -66,6°	33,1/142,5°	0,01/ 64,2°	0,84/ -24,2°	37,2
	200	0,47/ -107,4°	22,6/122,3°	0,02/ 57,4°	0,62/ -32,2°	30,3
	500	0,46/ -153,9°	10,7/ 96,8°	0,03/ 59,9°	0,44/ -36,2°	22,6
	800	0,44/ -170,2°	7,0/ 86,8°	0,05/ 65,3°	0,41/ -39,1°	18,6
	1000	0,45/ -179,6°	5,6/ 80,4°	0,06/ 66,0°	0,41/ -39,7°	16,7
	1200	0,46/ +169,6°	4,6/ 75,8°	0,06/ 67,4°	0,39/ -41,9°	15,0
	1500	0,45/ +165,3°	3,8/ 71,0°	0,08/ 70,3°	0,35/ -47,6°	13,1
2000	0,45/ +148,8°	2,8/ 61,7°	0,10/ 70,2°	0,34/ -60,2°	10,5	
30	40	0,47/ -42,2°	43,2/159,9°	0,01/ 69,0°	0,92/ -12,1°	42,0
	100	0,46/ -93,3°	33,0/133,8°	0,01/ 58,1°	0,76/ -24,7°	35,1
	200	0,45/ -132,2°	20,4/114,8°	0,02/ 58,3°	0,57/ -27,8°	28,9
	500	0,49/ -166,2°	9,2/ 93,5°	0,03/ 64,4°	0,46/ -29,5°	21,4
	800	0,47/ -178,6°	6,0/ 84,8°	0,04/ 69,7°	0,44/ -34,8°	17,5
	1000	0,48/ +173,9°	4,8/ 79,0°	0,05/ 70,0°	0,45/ -36,7°	15,7
	1200	0,50/ +165,0°	3,9/ 74,5°	0,06/ 71,4°	0,43/ -40,6°	14,1
	1500	0,49/ +160,8°	3,3/ 70,0°	0,07/ 74,4°	0,39/ -46,8°	12,1
2000	0,50/ +145,2°	2,4/ 60,8°	0,10/ 74,0°	0,38/ -61,1°	9,7	

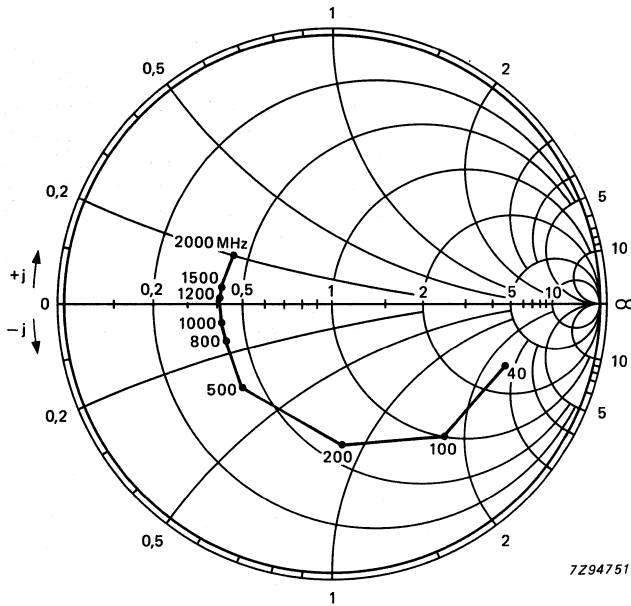


Fig. 4 Input impedance, derived from input reflection coefficient s_{ie} coordinates, in ohm x 50.

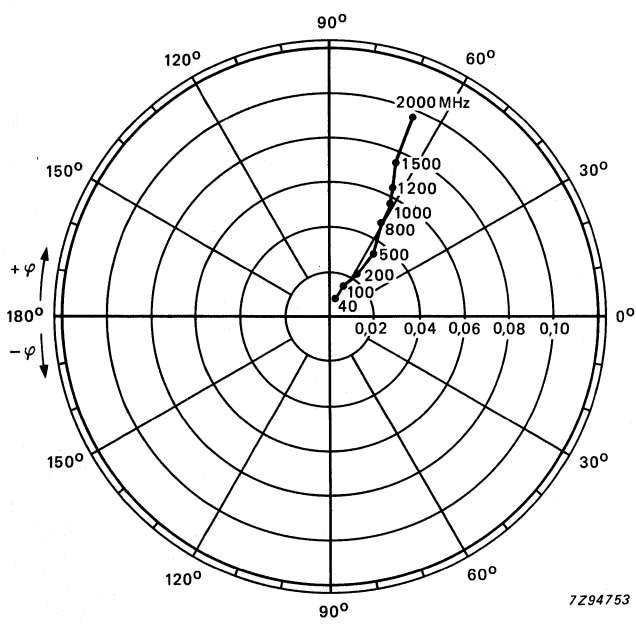


Fig. 5 Reverse transmission coefficient s_{re} .

Conditions for Figs 4 to 7: $V_{CE} = 10 \text{ V}$; $I_C = 14 \text{ mA}$; $T_{amb} = 25 \text{ }^\circ\text{C}$.

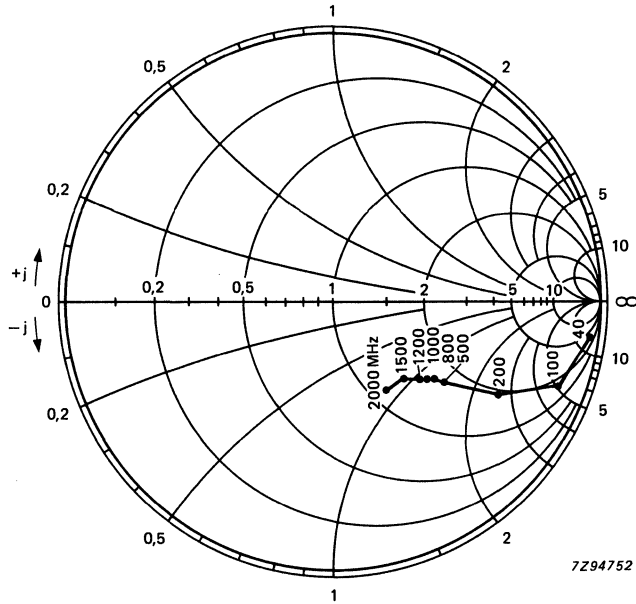


Fig. 6 Output impedance, derived from output reflection coefficient s_{oe} coordinates, in ohm x 50.

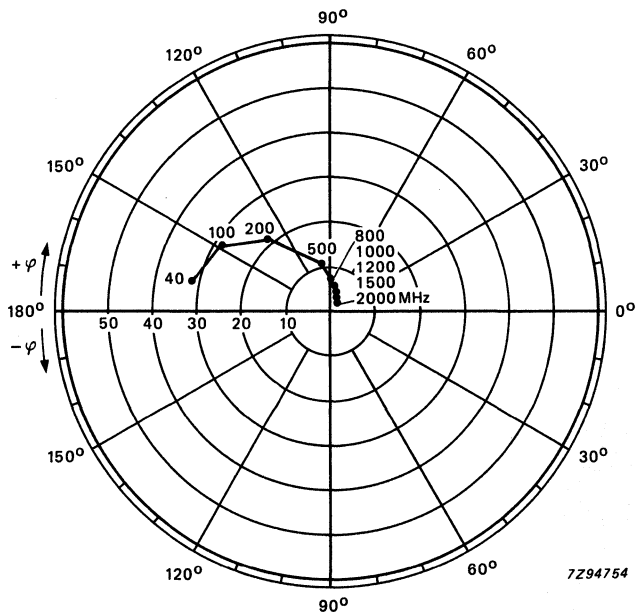


Fig. 7 Forward transmission coefficient s_{fe} .

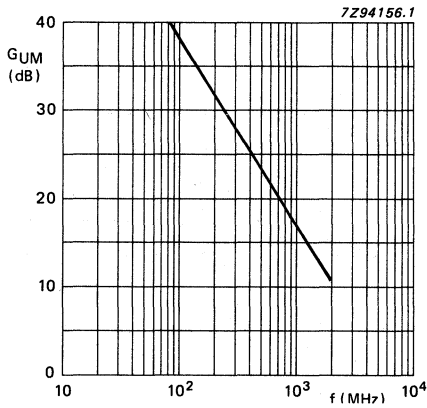


Fig. 8 $V_{CE} = 10 \text{ V}$; $I_C = 14 \text{ mA}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

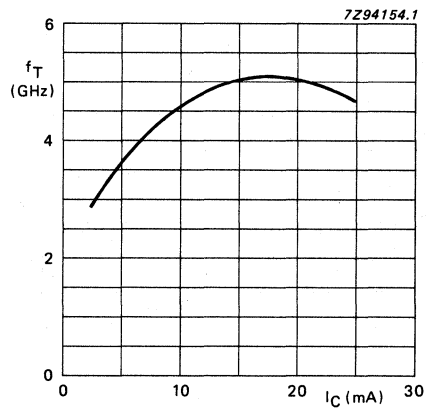


Fig. 9 $V_{CE} = 10 \text{ V}$; $f = 500 \text{ MHz}$; $T_j = 25 \text{ }^\circ\text{C}$; typical values.

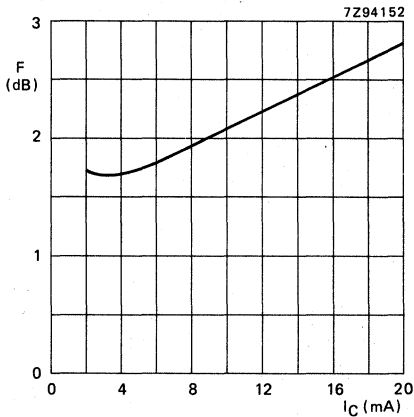


Fig. 10 $V_{CE} = 10 \text{ V}$; $f = 800 \text{ MHz}$; $Z_S = \text{opt.}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

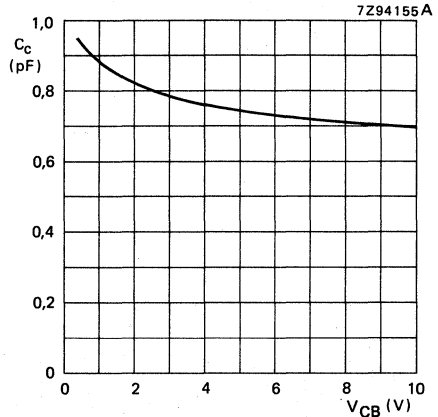


Fig. 11 $I_E = I_e = 0$; $f = 1 \text{ MHz}$; $T_j = 25 \text{ }^\circ\text{C}$; typical values.

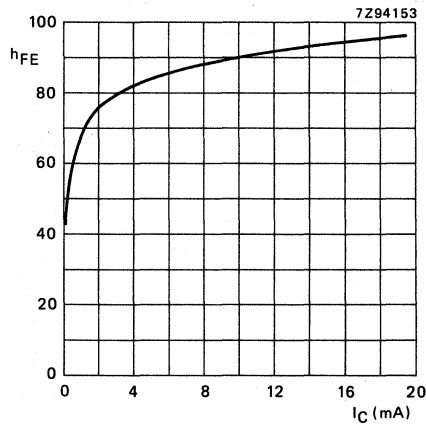


Fig. 12 $V_{CE} = 10 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$; typical values.

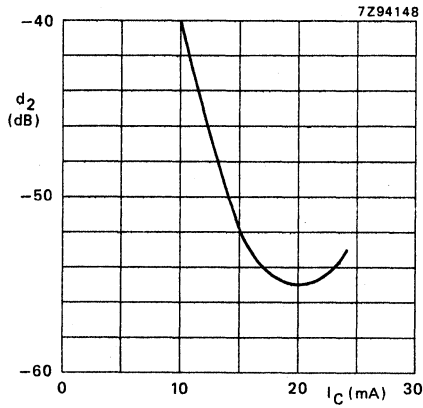


Fig. 13 $V_{CE} = 10 \text{ V}$; $V_O = 60 \text{ mV}$;
 $f_{(p+q)} = 810 \text{ MHz}$; $T_{amb} = 25 \text{ }^\circ\text{C}$;
 typical values.

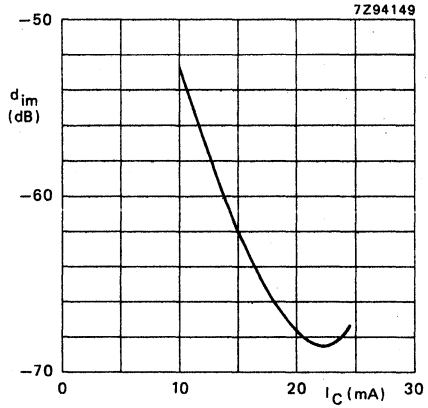


Fig. 14 $V_{CE} = 10 \text{ V}$; $V_O = 150 \text{ mV}$;
 $f_{(p+q)} = 793,25 \text{ MHz}$; $T_{amb} = 25 \text{ }^\circ\text{C}$;
 typical values.

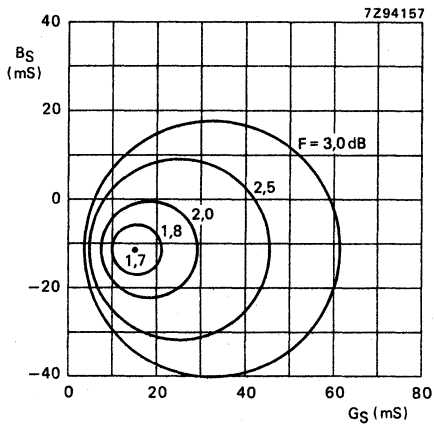


Fig. 15 Circles of constant noise figure;
 $I_C = 4 \text{ mA}$; $V_{CE} = 10 \text{ V}$; $f = 800 \text{ MHz}$;
 typical values.

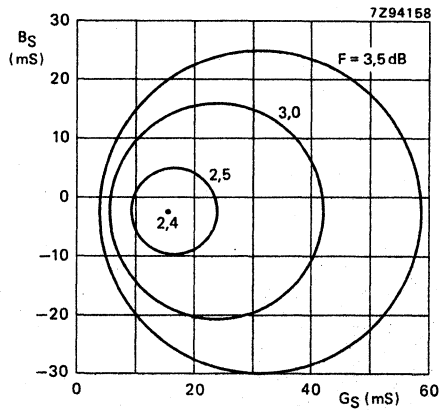


Fig. 16 Circles of constant noise figure;
 $I_C = 14 \text{ mA}$; $V_{CE} = 10 \text{ V}$; $f = 800 \text{ MHz}$;
 typical values.

CLASS-B OPERATION

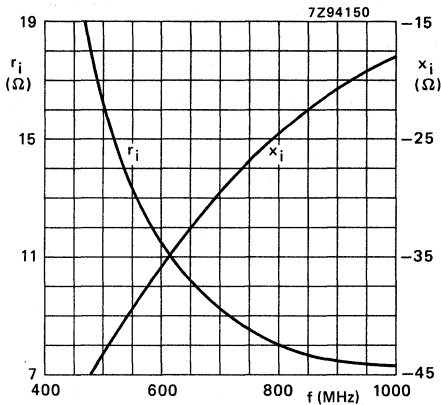


Fig. 17 Input impedance (series components).

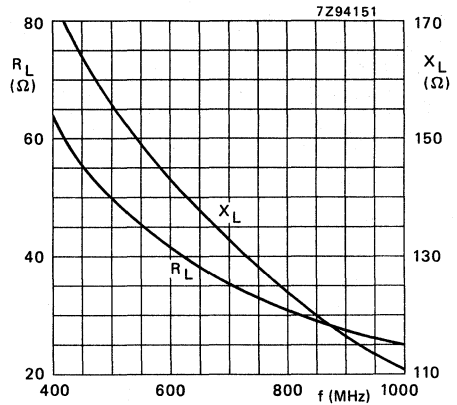


Fig. 18 Load impedance (series components).

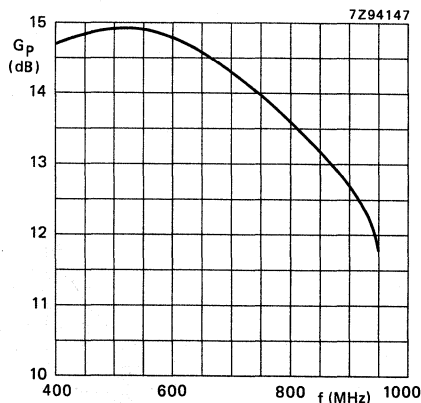


Fig. 19 Power gain versus frequency.

Conditions for Figs 17 to 19:

$V_{CE} = 10 \text{ V}$; $P_L = 100 \text{ mW}$; $T_{amb} = 25 \text{ }^\circ\text{C}$;
typical values.

OPERATING NOTE for Figs 17 to 19:

A base-emitter resistor of $82 \text{ } \Omega$ is recommended to avoid oscillation. This resistor must be effective for r.f. only.

N-P-N 2 GHz WIDEBAND TRANSISTOR

N-P-N transistor in a four-lead dual-emitter plastic envelope (SOT-103). This device is designed for application in wideband amplifiers, such as in CATV and MATV systems, up to 2 GHz.

P-N-P complement is BFG23.

QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	15 V
Collector-emitter voltage (open base)	V_{CEO}	max.	12 V
Collector current (d.c.)	I_C	max.	35 mA
Total power dissipation up to $T_{amb} = 60\text{ }^\circ\text{C}$	P_{tot}	max.	300 mW
Junction temperature	T_j	max.	150 $^\circ\text{C}$
D.C. current gain $I_C = 30\text{ mA}; V_{CE} = 5\text{ V}$	h_{FE}	min.	40
Transition frequency at $f = 500\text{ MHz}$ $I_C = 30\text{ mA}; V_{CE} = 5\text{ V}$	f_T	typ.	6,0 GHz
Feedback capacitance at $f = 1\text{ MHz}$ $I_C = 0; V_{CE} = 5\text{ V}$	C_{re}	typ.	0,5 pF
Noise figure at optimum source impedance $I_C = 30\text{ mA}; V_{CE} = 8\text{ V}; f = 800\text{ MHz}$	F	typ.	2,3 dB
Maximum unilateral power gain at $f = 800\text{ MHz}$ $I_C = 30\text{ mA}; V_{CE} = 8\text{ V}$	G_{UM}	typ.	17,5 dB
Output power at 1 dB gain compression $V_{CE} = 8\text{ V}; I_C = 30\text{ mA}; f = 800\text{ MHz}$	PL_1	typ.	+17 dBm
Third order intercept point $V_{CE} = 8\text{ V}; I_C = 30\text{ mA}; f = 800\text{ MHz}$	ITO	typ.	+36 dBm

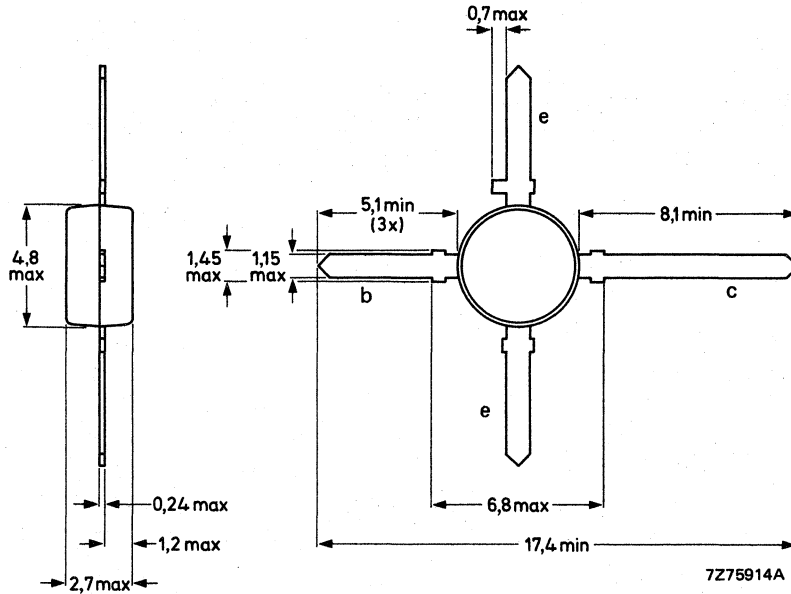
MECHANICAL DATA

SOT-103 (see Fig. 1).

MECHANICAL DATA

Fig. 1 SOT-103.

Dimensions in mm



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	15 V
Collector-emitter voltage (open base)	V_{CEO}	max.	12 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2 V
Collector current			
d.c.	I_C	max.	35 mA
peak value; $f > 1$ MHz	I_{CM}	max.	50 mA
Total power dissipation up to $T_{amb} = 60$ °C	P_{tot}	max.	300 mW
Storage temperature	T_{stg}		-65 to +150 °C
Junction temperature	T_j	max.	150 °C

THERMAL RESISTANCE

From junction to ambient in free air
mounted on glass-fibre p.c.b. (see Fig. 2)

$$R_{th\ j-a} = 300\ K/W$$

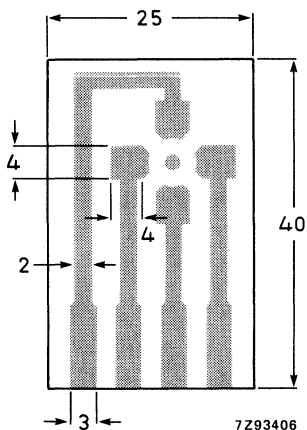


Fig. 2 Requirements for fibre-glass print (dimensions in mm). Single-sided 35 μ m Cu-clad epoxy fibre-glass print, thickness 1,5 mm. Tracks are fully tin-lead plated. Shaded area is Cu.

CHARACTERISTICS

$T_j = 25\ ^\circ C$ unless otherwise specified

Collector cut-off current

$$I_E = 0; V_{CB} = 5\ V$$

I_{CBO}	max.	50 nA
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D.C. current gain

$$I_C = 30\ mA; V_{CE} = 5\ V$$

h_{FE}	min.	40
	typ.	90

Transition frequency at $f = 500\ MHz$

$$I_C = 30\ mA; V_{CE} = 5\ V$$

f_T	typ.	6,0 GHz
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Collector output capacitance at $f = 1\ MHz$

$$I_E = I_C = 0; V_{CB} = 10\ V$$

C_C	typ.	0,9 pF	←
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Emitter capacitance at $f = 1\ MHz$

$$I_C = I_E = 0; V_{EB} = 0,5\ V$$

C_e	typ.	2,5 pF
-------	------	--------

Feedback capacitance at $f = 1\ MHz$

$$I_E = 0; V_{CE} = 10\ V$$

C_{re}	typ.	0,6 pF	←
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Maximum unilateral power gain (s_{re} assumed to be zero)

$$G_{UM} = 10 \log \frac{|s_{fe}|^2}{[1 - |s_{ie}|^2][1 - |s_{oe}|^2]}$$

$$I_C = 30\ mA; V_{CE} = 8\ V; f = 800\ MHz; T_{amb} = 25\ ^\circ C$$

$$I_C = 30\ mA; V_{CE} = 8\ V; f = 2\ GHz; T_{amb} = 25\ ^\circ C$$

G_{UM}	typ.	17,5 dB	←
	typ.	9,5 dB	←

Noise figure at optimum source impedance

$$V_{CE} = 8\ V; f = 800\ MHz; T_{amb} = 25\ ^\circ C$$

$$I_C = 4\ mA$$

$$I_C = 30\ mA$$

F	typ.	1,6 dB
	typ.	2,3 dB

Output power at 1 dB gain compression

$V_{CE} = 8 \text{ V}$; $I_C = 30 \text{ mA}$; $T_{amb} = 25 \text{ }^\circ\text{C}$;
 $R_L = 75 \text{ } \Omega$; measured at $f = 800 \text{ MHz}$

P_{L1} typ. +17 dBm

Third order intercept point (see Fig. 3)

$I_C = 30 \text{ mA}$; $V_{CE} = 8 \text{ V}$;
 $R_L = 75 \text{ } \Omega$; $T_{amb} = 25 \text{ }^\circ\text{C}$;
 $P_p = ITO - 6 \text{ dB}$; $f_p = 800 \text{ MHz}$;
 $P_q = ITO - 6 \text{ dB}$; $f_q = 801 \text{ MHz}$;
 measured at $f_{(2q-p)} = 802 \text{ MHz}$ and
 at $f_{(2p-q)} = 799 \text{ MHz}$

ITO typ. +36 dBm

→ Output voltage at $d_{im} = -60 \text{ dB}$

$I_C = 30 \text{ mA}$; $V_{CE} = 8 \text{ V}$;
 $R_L = 75 \text{ } \Omega$; $T_{amb} = 25 \text{ }^\circ\text{C}$
 $V_p = V_o$ at $d_{im} = -60 \text{ dB}$; $f_p = 795,25 \text{ MHz}$
 $V_q = V_o - 6 \text{ dB}$; $f_q = 803,25 \text{ MHz}$
 $V_r = V_o - 6 \text{ dB}$; $f_r = 805,25 \text{ MHz}$
 measured at $f_{(p+q-r)} = 793,25 \text{ MHz}$

V_o typ. 425 mV

Second harmonic distortion (see Fig. 3)

$V_{CE} = 8 \text{ V}$; $I_C = 30 \text{ mA}$; $R_L = 75 \text{ } \Omega$;
 $VSWR < 2$; $T_{amb} = 25 \text{ }^\circ\text{C}$

$V_p = V_o = 200 \text{ mV}$ at $f_p = 250 \text{ MHz}$
 $V_q = V_o = 200 \text{ mV}$ at $f_q = 560 \text{ MHz}$
 measured at $f_{(p+q)} = 810 \text{ MHz}$

d_2 typ. -50 dB

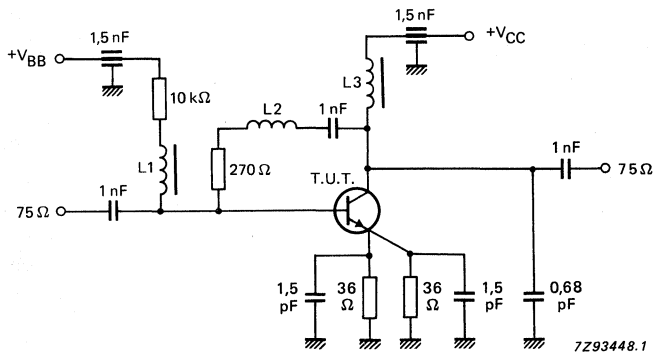


Fig. 3 Intermodulation distortion and second harmonic distortion MATV test circuit.

$L1 = L3 = 5 \text{ } \mu\text{H}$ Ferroxcube choke

$L2 = 3$ turns Cu wire (0,4 mm), internal diameter 3 mm, winding pitch 1 mm

s-parameters (common emitter) at $V_{CE} = 8 \text{ V}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values

I_C mA	f MHz	S_{ie}	S_{fe}	S_{re}	S_{oe}	GUM dB
2	40	0,87/ -12,7°	1,0/173,4°	0,01/ 82,7°	0,99/ -3,3°	41,7
	100	0,88/ -35,0°	6,9/159,0°	0,03/ 71,2°	0,97/ -10,1°	35,8
	200	0,80/ -66,1°	5,8/142,0°	0,05/ 57,7°	0,88/ -18,5°	26,3
	500	0,77/ -125,7°	3,9/106,8°	0,08/ 33,0°	0,75/ -30,8°	19,2
	800	0,72/ -154,0°	2,7/ 90,0°	0,08/ 27,5°	0,68/ -38,5°	14,4
	1000	0,71/ -168,4°	2,2/ 79,2°	0,08/ 25,1°	0,68/ -41,8°	12,7
	1200	0,72/ +178,8°	1,8/ 71,3°	0,07/ 27,2°	0,68/ -48,7°	10,8
	1500	0,71/ +166,3°	1,5/ 63,8°	0,06/ 36,2°	0,60/ -54,7°	8,5
2000	0,73/ +145,3°	1,1/ 50,1°	0,07/ 57,0°	0,58/ -73,0°	6,0	
5	40	0,73/ -19,4°	15,3/170,4°	0,01/ 79,1°	0,99/ -6,5°	43,5
	100	0,73/ -50,8°	14,3/152,0°	0,02/ 65,9°	0,94/ -17,7°	35,6
	200	0,67/ -89,5°	11,2/132,3°	0,04/ 52,7°	0,77/ -27,5°	27,4
	500	0,66/ -145,6°	6,1/ 99,5°	0,05/ 37,4°	0,56/ -37,8°	19,9
	800	0,64/ -168,6°	4,1/ 85,8°	0,06/ 40,9°	0,50/ -43,8°	15,8
	1000	0,64/ +179,7°	3,3/ 77,0°	0,06/ 43,6°	0,50/ -44,8°	13,9
	1200	0,65/ +168,8°	2,7/ 71,0°	0,06/ 48,5°	0,48/ -49,8°	12,2
	1500	0,65/ +159,3°	2,3/ 64,0°	0,07/ 56,8°	0,43/ -56,3°	10,3
2000	0,67/ +140,5°	1,7/ 51,9°	0,09/ 66,5°	0,42/ -73,0°	7,9	
10	40	0,57/ -29,4°	25,4/166,5°	0,01/ 76,3°	0,97/ -10,2°	41,5
	100	0,58/ -71,8°	22,1/144,3°	0,02/ 61,5°	0,86/ -25,2°	34,5
	200	0,57/ -114,0°	15,6/123,8°	0,03/ 51,0°	0,64/ -35,5°	27,9
	500	0,61/ -160,7°	7,6/ 95,0°	0,04/ 47,4°	0,43/ -43,0°	20,5
	800	0,60/ -178,5°	5,0/ 83,3°	0,05/ 54,5°	0,38/ -46,8°	16,6
	1000	0,60/ +171,9°	4,0/ 75,7°	0,06/ 57,4°	0,38/ -47,5°	14,7
	1200	0,62/ +162,1°	3,3/ 70,8°	0,07/ 61,1°	0,36/ -50,9°	13,0
	1500	0,61/ +154,8°	2,7/ 64,0°	0,08/ 66,2°	0,32/ -58,4°	11,2
2000	0,63/ +137,2°	2,0/ 53,2°	0,11/ 70,0°	0,32/ -73,9°	8,9	
20	40	0,39/ -47,1°	37,2/161,5°	0,01/ 71,7°	0,94/ -14,7°	41,8
	100	0,47/ -99,9°	29,9/136,3°	0,02/ 59,8°	0,77/ -32,6°	34,4
	200	0,52/ -137,7°	19,2/116,3°	0,02/ 53,2°	0,52/ -41,9°	28,4
	500	0,59/ -171,6°	8,6/ 91,8°	0,04/ 58,7°	0,33/ -46,5°	21,0
	800	0,57/ +174,5°	5,6/ 81,8°	0,05/ 64,6°	0,30/ -49,5°	17,1
	1000	0,59/ +166,5°	4,5/ 74,5°	0,06/ 66,4°	0,30/ -49,6°	15,2
	1200	0,61/ +157,6°	3,7/ 70,3°	0,07/ 68,9°	0,28/ -51,7°	13,6
	1500	0,59/ +151,8°	3,0/ 63,8°	0,09/ 71,4°	0,25/ -60,3°	11,8
2000	0,61/ +134,9°	2,3/ 53,7°	0,12/ 71,6°	0,25/ -75,4°	9,4	
30	40	0,31/ -65,9°	44,7/158,2°	0,01/ 71,3°	0,92/ -17,6°	41,7
	100	0,45/ -118,8°	33,5/131,5°	0,01/ 59,5°	0,71/ -36,6°	34,5
	200	0,51/ -149,7°	20,6/112,5°	0,02/ 56,8°	0,46/ -44,3°	29,7
	500	0,58/ -176,5°	8,9/ 90,0°	0,03/ 64,1°	0,29/ -47,4°	21,2
	800	0,57/ +171,5°	5,8/ 80,3°	0,05/ 69,6°	0,27/ -49,9°	17,5
	1000	0,58/ +164,2°	4,6/ 73,7°	0,06/ 69,9°	0,26/ -50,0°	15,4
	1200	0,61/ +155,8°	3,8/ 69,8°	0,07/ 71,7°	0,24/ -51,4°	13,8
	1500	0,58/ +150,6°	3,1/ 63,3°	0,09/ 73,3°	0,22/ -60,9°	11,9
2000	0,61/ +133,9°	2,4/ 53,4°	0,12/ 72,5°	0,22/ -75,9°	9,5	

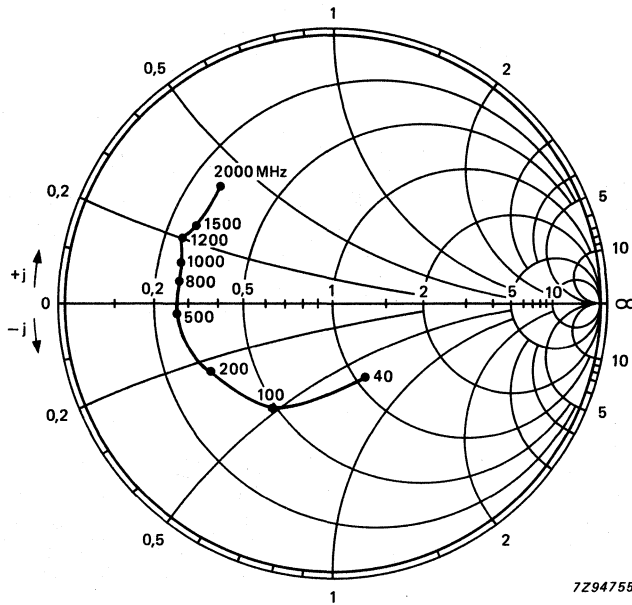


Fig. 4 Input impedance, derived from input reflection coefficient s_{ie} coordinates, in ohm x 50.

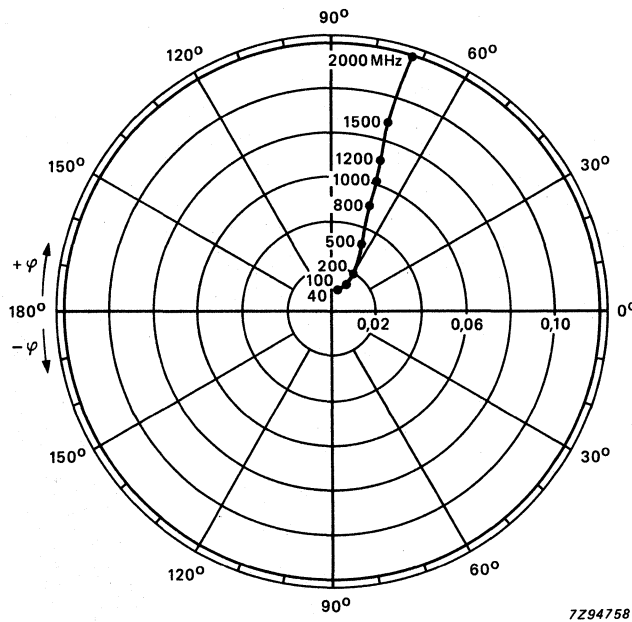


Fig. 5 Reverse transmission coefficient s_{re} .

Conditions for Figs 4 to 7: $V_{CE} = 8 \text{ V}$; $I_C = 30 \text{ mA}$; $T_{amb} = 25 \text{ }^\circ\text{C}$.

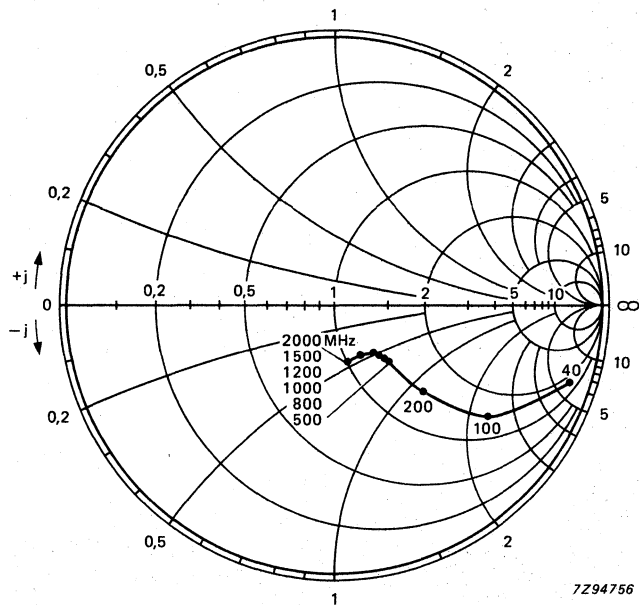


Fig. 6 Output impedance, derived from output reflection coefficient s_{oe} coordinates, in ohm \times 50.

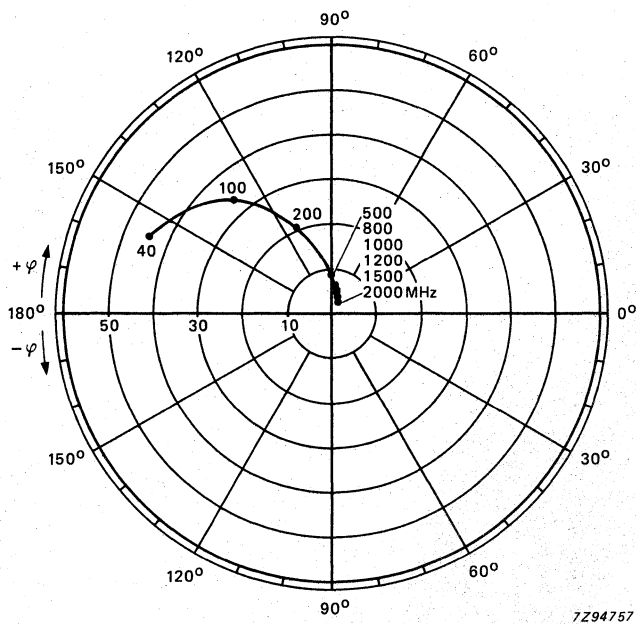
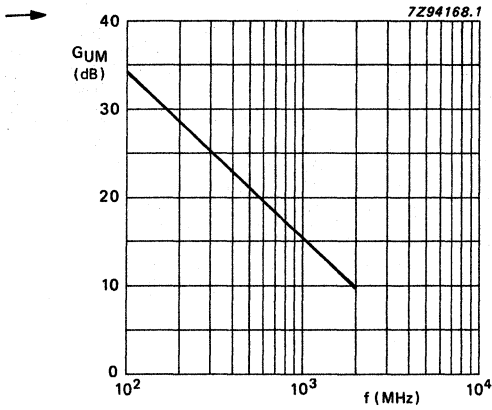


Fig. 7 Forward transmission coefficient s_{fe} .



→ Fig. 8 $V_{CE} = 8 \text{ V}$; $I_C = 30 \text{ mA}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

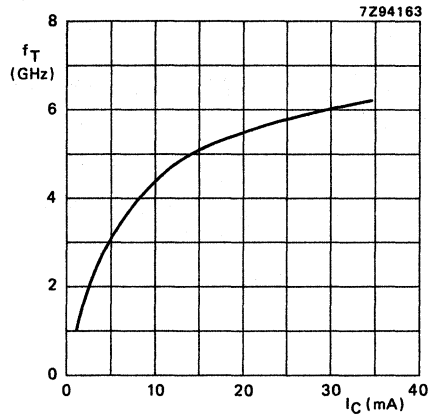
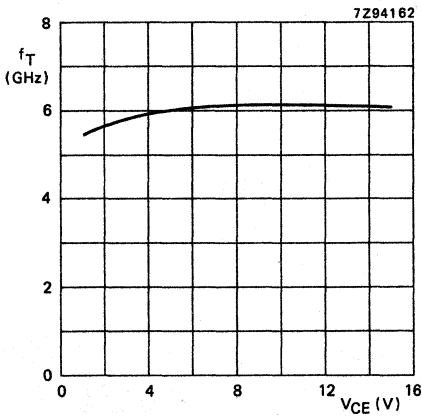


Fig. 9 $V_{CE} = 8 \text{ V}$; $f = 500 \text{ MHz}$; $T_j = 25 \text{ }^\circ\text{C}$; typical values.



→ Fig. 10 $I_C = 30 \text{ mA}$; $f = 500 \text{ MHz}$; $T_j = 25 \text{ }^\circ\text{C}$; typical values.

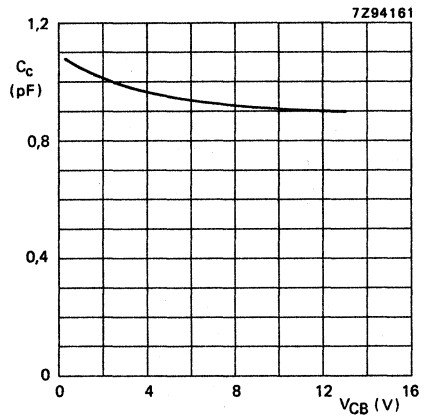
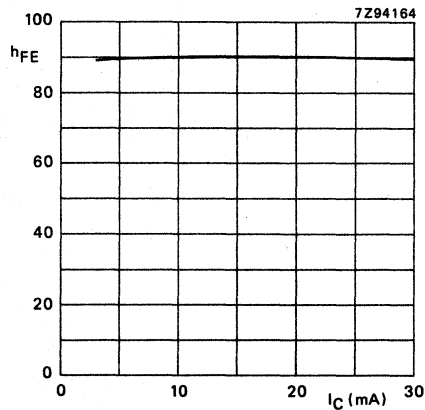


Fig. 11 $I_E = i_e = 0$; $f = 1 \text{ MHz}$; $T_j = 25 \text{ }^\circ\text{C}$; typical values.



→ Fig. 12 $V_{CE} = 5 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$; typical values.

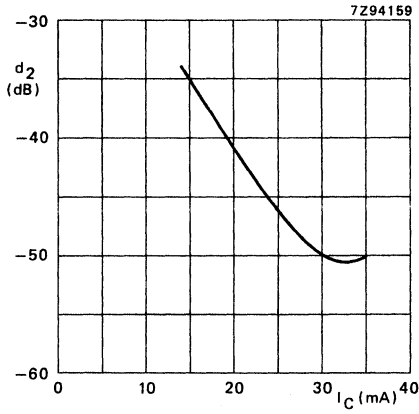


Fig. 13 $V_{CE} = 8 \text{ V}$; $V_O = 200 \text{ mV}$;
 $f_{(p+q)} = 810 \text{ MHz}$; $T_{amb} = 25 \text{ }^\circ\text{C}$;
 typical values.

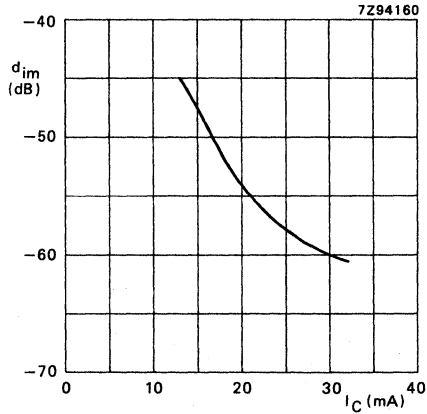


Fig. 14 $V_{CE} = 8 \text{ V}$; $V_O = 425 \text{ mV}$;
 $f_{(p+q-r)} = 793,25 \text{ MHz}$; $T_{amb} = 25 \text{ }^\circ\text{C}$;
 typical values.

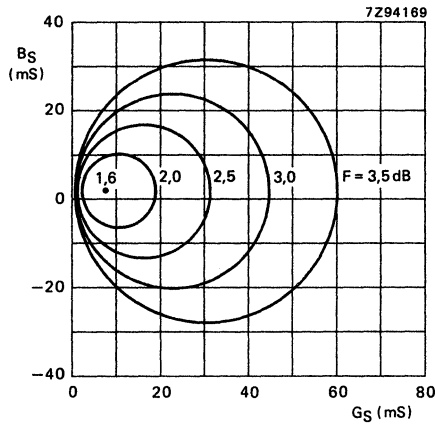


Fig. 15 Circles of constant noise figure;
 $I_C = 4 \text{ mA}$; $V_{CE} = 8 \text{ V}$; $f = 800 \text{ MHz}$;
 $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

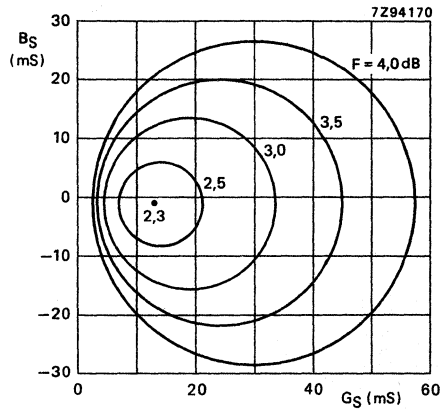
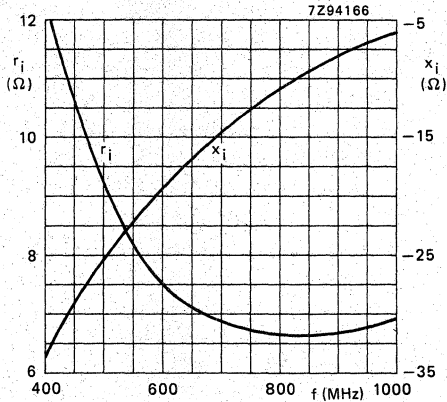


Fig. 16 Circles of constant noise figure;
 $I_C = 30 \text{ mA}$; $V_{CE} = 8 \text{ V}$; $f = 800 \text{ MHz}$;
 $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

CLASS-B OPERATION



→ Fig. 17 Input impedance (series components).

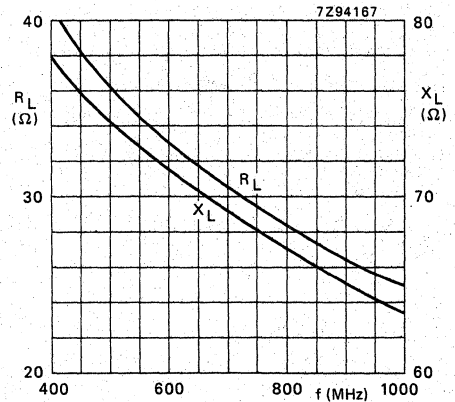
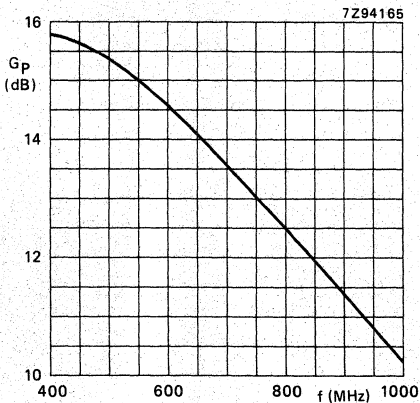


Fig. 18 Load impedance (series components).



→ Fig. 19 Power gain versus frequency.

Conditions for Figs 17 to 19:

$V_{CE} = 7,5 \text{ V}$; $P_L = 160 \text{ mW}$; $T_{amb} = 25 \text{ }^\circ\text{C}$;
typical values.

OPERATING NOTE for Figs 17 to 19:

A base-emitter resistor of $82 \text{ } \Omega$ is recommended to avoid oscillation. This resistor must be effective for r.f. only.

N-P-N 2 GHz WIDEBAND TRANSISTOR

N-P-N transistor in a four-lead dual-emitter SOT-143 envelope. The device is primarily intended for use in v.h.f. and u.h.f. wideband amplifiers and features low noise and high power gain.

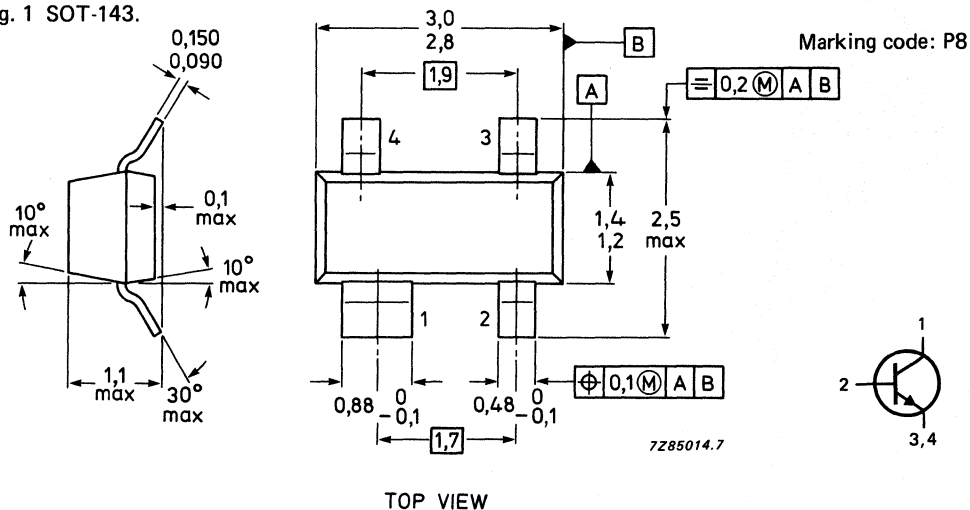
QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	20 V
Collector-emitter voltage (open base)	V_{CEO}	max.	15 V
Collector current (d.c.)	I_C	max.	25 mA
Total power dissipation up to $T_{amb} = 25\text{ }^\circ\text{C}$	P_{tot}	max.	300 mW
Junction temperature	T_j	max.	150 $^\circ\text{C}$
D.C. current gain $I_C = 14\text{ mA}; V_{CE} = 10\text{ V}$	h_{FE}	min. typ.	40 90
Transition frequency at $f = 500\text{ MHz}$ $I_C = 14\text{ mA}; V_{CE} = 10\text{ V}$	f_T	typ.	5,0 GHz
Feedback capacitance at $f = 1\text{ MHz}$ $I_C = 0; V_{CE} = 10\text{ V}$	C_{re}	typ.	0,35 pF
Noise figure at $f = 800\text{ MHz}$ $I_C = 4\text{ mA}; V_{CE} = 10\text{ V}; Z_S = \text{opt.}$	F	typ.	1,8 dB
Maximum unilateral power gain $I_C = 14\text{ mA}; V_{CE} = 10\text{ V}$ $f = 800\text{ MHz}$ $f = 2\text{ GHz}$	GUM	typ.	17,5 dB 9,5 dB

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-143.



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	20 V
Collector-emitter voltage (open base)	V_{CEO}	max.	15 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2 V
Collector current (d.c.)	I_C	max.	25 mA
Total power dissipation up to $T_{amb} = 25\text{ }^\circ\text{C}$ and mounted on a ceramic substrate of 8 mm x 10 mm x 0,7 mm	P_{tot}	max.	300 mW
Storage temperature	T_{stg}		-65 to +150 $^\circ\text{C}$
Junction temperature	T_j	max.	150 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to ambient
and mounted on a ceramic substrate
of 8 mm x 10 mm x 0,7 mm

$R_{th\ j-a}$	430 K/W
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CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Collector cut-off current $I_E = 0; V_{CB} = 10\text{ V}$	I_{CBO}	max.	50 nA
D.C. current gain $I_C = 14\text{ mA}; V_{CE} = 10\text{ V}$	h_{FE}	min. typ.	40 90
Transition frequency at $f = 500\text{ MHz}$ $I_C = 14\text{ mA}; V_{CE} = 10\text{ V}$	f_T	typ.	5,0 GHz
Collector capacitance at $f = 1\text{ MHz}$ $I_E = I_e = 0; V_{CB} = 10\text{ V}$	C_c	typ.	0,6 pF
Emitter capacitance at $f = 1\text{ MHz}$ $I_C = I_c = 0; V_{EB} = 0,5\text{ V}$	C_e	typ.	1,2 pF
Feedback capacitance at $f = 1\text{ MHz}$ $I_C = 0; V_{CE} = 10\text{ V}$	C_{re}	typ.	0,35 pF
Maximum unilateral power gain (s_{re} assumed to be zero)			
$G_{UM} = 10 \log \frac{ s_{fe} ^2}{[1 - s_{ie} ^2][1 - s_{oe} ^2]}$			
$I_C = 14\text{ mA}; V_{CE} = 10\text{ V}; T_{amb} = 25\text{ }^\circ\text{C};$ $f = 800\text{ MHz}$ $f = 2\text{ GHz}$	G_{UM}	typ. typ.	17,5 dB 9,5 dB
Noise figure at $f = 800\text{ MHz}$ and $T_{amb} = 25\text{ }^\circ\text{C}$ $I_C = 4\text{ mA}; V_{CE} = 10\text{ V}; Z_S = \text{opt.}$	F	typ.	1,8 dB

s-parameters (common emitter) at $V_{CE} = 5\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$; typical values

I_C mA	f MHz	S_{ie}	S_{fe}	S_{re}	S_{oe}	GUM dB
2	40	0,87/ -9,1°	7,0/174,7°	0,01/ 82,1°	1,00/ -2,8°	50,0
	100	0,88/ -26,2°	6,9/162,5°	0,02/ 75,2°	1,01/ -9,0°	39,6
	200	0,79/ -49,8°	6,1/148,0°	0,04/ 65,0°	0,92/ -16,6°	28,2
	500	0,68/ -102,5°	4,6/115,2°	0,07/ 44,4°	0,81/ -30,0°	20,6
	800	0,59/ -153,5°	3,2/ 97,7°	0,07/ 39,3°	0,73/ -39,7°	15,3
	1000	0,56/ -149,0°	2,7/ 86,8°	0,08/ 36,6°	0,73/ -44,0°	13,6
	1200	0,54/ -164,7°	2,2/ 78,4°	0,08/ 36,1°	0,72/ -50,8°	11,5
	1500	0,53/ -178,6°	1,9/ 70,8°	0,08/ 40,6°	0,63/ -57,9°	9,0
2000	0,51/ 158,1°	1,4/ 55,7°	0,08/ 46,3°	0,63/ -76,2°	6,3	
5	40	0,74/ -14,0°	14,4/172,1°	0,01/ 80,4°	0,99/ -4,8°	45,2
	100	0,73/ -37,7°	13,8/156,7°	0,02/ 71,0°	0,98/ -13,8°	39,6
	200	0,64/ -68,7°	11,4/138,8°	0,03/ 60,1°	0,84/ -22,8°	28,7
	500	0,55/ -126,5°	7,0/106,5°	0,05/ 46,3°	0,66/ -35,0°	21,0
	800	0,50/ -152,7°	4,7/ 91,5°	0,06/ 47,4°	0,59/ -42,8°	16,6
	1000	0,49/ -166,7°	3,9/ 82,7°	0,06/ 47,8°	0,59/ -45,9°	14,8
	1200	0,48/ 179,7°	3,2/ 76,1°	0,07/ 49,8°	0,58/ -51,3°	12,9
	1500	0,48/ 169,9°	2,6/ 69,0°	0,08/ 54,2°	0,51/ -58,7°	10,8
2000	0,48/ 148,9°	1,9/ 56,0°	0,09/ 57,5°	0,51/ -75,9°	8,2	
10	40	0,59/ -21,1°	23,6/168,8°	0,01/ 73,4°	0,98/ -7,3°	44,3
	100	0,57/ -53,7°	21,6/149,8°	0,02/ 67,1°	0,92/ -19,0°	36,7
	200	0,50/ -92,0°	16,2/129,8°	0,02/ 56,9°	0,74/ -28,5°	28,9
	500	0,48/ -146,3°	8,7/100,2°	0,04/ 52,2°	0,54/ -37,6°	21,4
	800	0,46/ -167,6°	5,7/ 87,5°	0,05/ 56,9°	0,49/ -44,1°	17,3
	1000	0,46/ -179,1°	4,6/ 80,0°	0,06/ 57,9°	0,50/ -46,6°	15,5
	1200	0,47/ 169,1°	3,8/ 74,6°	0,06/ 60,0°	0,48/ -51,1°	13,7
	1500	0,46/ 162,3°	3,1/ 67,9°	0,08/ 62,4°	0,44/ -59,1°	11,7
2000	0,46/ 142,8°	2,3/ 56,3°	0,09/ 63,8°	0,44/ -75,9°	9,2	
14	40	0,50/ -26,3°	28,8/166,7°	0,01/ 74,4°	0,98/ -8,8°	43,9
	100	0,49/ -64,6°	25,4/145,8°	0,02/ 66,4°	0,89/ -21,5°	36,2
	200	0,46/ -105,3°	18,2/125,5°	0,02/ 57,5°	0,68/ -30,6°	29,0
	500	0,47/ -154,3°	9,2/ 97,9°	0,03/ 56,7°	0,50/ -37,8°	21,6
	800	0,45/ -173,4°	6,0/ 86,0°	0,05/ 61,1°	0,46/ -44,0°	17,5
	1000	0,46/ 176,3°	4,8/ 78,8°	0,05/ 52,2°	0,46/ -46,4°	15,7
	1200	0,47/ 165,3°	3,9/ 73,9°	0,06/ 63,8°	0,45/ -50,7°	13,9
	1500	0,46/ 159,5°	3,2/ 67,3°	0,08/ 65,4°	0,41/ -59,1°	12,0
2000	0,46/ 140,6°	2,4/ 56,1°	0,10/ 65,9°	0,41/ -75,8°	9,5	
20	40	0,42/ -33,9°	34,3/164,1°	0,01/ 73,6°	0,97/ -10,4°	43,3
	100	0,43/ -79,0°	28,8/141,3°	0,01/ 63,1°	0,84/ -24,0°	35,4
	200	0,42/ -120,1°	19,7/121,0°	0,02/ 58,1°	0,63/ -31,3°	29,0
	500	0,46/ -162,0°	9,4/ 95,5°	0,03/ 60,6°	0,46/ -37,1°	21,6
	800	0,45/ -178,4°	6,1/ 84,5°	0,05/ 65,0°	0,43/ -43,5°	17,6
	1000	0,46/ 172,4°	4,9/ 77,8°	0,05/ 65,6°	0,44/ -45,9°	15,7
	1200	0,48/ 162,3°	4,0/ 73,1°	0,06/ 66,9°	0,43/ -50,1°	14,0
	1500	0,46/ 157,2°	3,3/ 66,7°	0,08/ 67,3°	0,39/ -58,9°	12,1
2000	0,47/ 138,9°	2,5/ 55,8°	0,10/ 67,6°	0,39/ -75,9°	9,5	

s-parameters (common-emitter) at $V_{CE} = 10\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$; typical values.

I_C mA	f MHz	S_{ie}	S_{fe}	S_{re}	S_{oe}	GUM dB
2	40	0,87/ -8,9 ^o	6,8/174,8 ^o	0,01/ 80,8 ^o	1,00/ -2,5 ^o	49,9
	100	0,88/ -25,8 ^o	6,8/162,8 ^o	0,02/ 76,3 ^o	1,01/ -8,8 ^o	39,5
	200	0,79/ -49,3 ^o	6,0/148,3 ^o	0,04/ 64,8 ^o	0,92/-16,3 ^o	28,2
	500	0,69/-101,8 ^o	4,5/115,5 ^o	0,07/ 44,9 ^o	0,82/-29,8 ^o	20,6
	800	0,59/-131,9 ^o	3,2/ 98,0 ^o	0,08/ 39,1 ^o	0,73/-39,6 ^o	15,2
	1000	0,56/-148,5 ^o	2,7/ 87,0 ^o	0,08/ 36,3 ^o	0,73/-43,8 ^o	13,5
	1200	0,54/-164,1 ^o	2,2/ 78,6 ^o	0,08/ 36,3 ^o	0,72/-50,7 ^o	11,5
	1500	0,53/-178,2 ^o	1,8/ 71,0 ^o	0,08/ 40,5 ^o	0,64/-57,8 ^o	9,0
2000	0,52/ 158,5 ^o	1,4/ 55,8 ^o	0,08/ 46,3 ^o	0,63/-76,2 ^o	6,3	
5	40	0,73/ -14,1 ^o	14,6/172,2 ^o	0,01/ 77,9 ^o	0,99/ -4,8 ^o	44,6
	100	0,72/ -37,9 ^o	14,1/156,6 ^o	0,02/ 71,0 ^o	0,98/-13,8 ^o	39,7
	200	0,63/ -69,2 ^o	11,6/138,7 ^o	0,03/ 60,3 ^o	0,83/-22,9 ^o	28,6
	500	0,55/-127,0 ^o	7,1/106,4 ^o	0,05/ 46,4 ^o	0,66/-35,0 ^o	21,1
	800	0,50/-153,1 ^o	4,8/ 91,5 ^o	0,06/ 48,0 ^o	0,58/-42,7 ^o	16,6
	1000	0,49/-167,1 ^o	3,9/ 82,8 ^o	0,06/ 48,6 ^o	0,59/-45,8 ^o	14,8
	1200	0,48/ 179,5 ^o	3,2/ 76,2 ^o	0,07/ 50,2 ^o	0,58/-51,1 ^o	12,9
	1500	0,48/ 169,8 ^o	2,6/ 69,2 ^o	0,08/ 54,7 ^o	0,51/-58,6 ^o	10,8
2000	0,47/ 148,7 ^o	2,0/ 56,3 ^o	0,09/ 58,0 ^o	0,51/-75,8 ^o	8,2	
10	40	0,59/ -20,9 ^o	23,7/168,9 ^o	0,01/ 76,7 ^o	0,98/ -7,2 ^o	43,5
	100	0,57/ -53,5 ^o	21,6/149,9 ^o	0,02/ 67,5 ^o	0,92/-18,8 ^o	36,7
	200	0,50/ -91,7 ^o	16,2/130,0 ^o	0,02/ 58,0 ^o	0,74/-28,3 ^o	28,9
	500	0,48/-146,0 ^o	8,7/100,5 ^o	0,04/ 52,4 ^o	0,55/-37,3 ^o	21,5
	800	0,46/-167,3 ^o	5,7/ 87,7 ^o	0,05/ 57,2 ^o	0,49/-43,7 ^o	17,3
	1000	0,46/-178,8 ^o	4,6/ 80,3 ^o	0,06/ 58,3 ^o	0,50/-46,3 ^o	15,5
	1200	0,47/ 169,4 ^o	3,8/ 74,8 ^o	0,06/ 60,2 ^o	0,48/-50,9 ^o	13,7
	1500	0,46/ 162,5 ^o	3,1/ 68,0 ^o	0,08/ 62,7 ^o	0,44/-58,9 ^o	11,7
2000	0,46/ 143,1 ^o	2,3/ 56,5 ^o	0,09/ 64,0 ^o	0,44/-75,6 ^o	9,2	
14	40	0,51/ -25,9 ^o	28,5/166,9 ^o	0,01/ 72,3 ^o	0,98/ -8,5 ^o	43,9
	100	0,50/ -63,8 ^o	25,4/146,1 ^o	0,02/ 65,3 ^o	0,89/-21,3 ^o	36,2
	200	0,46/-104,5 ^o	18,2/125,8 ^o	0,02/ 57,6 ^o	0,69/-30,3 ^o	29,0
	500	0,47/-153,6 ^o	9,2/ 98,2 ^o	0,03/ 55,7 ^o	0,50/-37,5 ^o	21,6
	800	0,45/-172,9 ^o	6,0/ 86,2 ^o	0,05/ 61,3 ^o	0,46/-43,7 ^o	17,5
	1000	0,46/ 176,8 ^o	4,8/ 79,0 ^o	0,05/ 62,6 ^o	0,46/-46,2 ^o	15,7
	1200	0,47/ 165,8 ^o	3,9/ 74,1 ^o	0,06/ 63,7 ^o	0,45/-50,4 ^o	14,0
	1500	0,46/ 159,9 ^o	3,2/ 67,5 ^o	0,08/ 65,3 ^o	0,41/-58,9 ^o	12,0
2000	0,46/ 140,9 ^o	2,4/ 56,4 ^o	0,09/ 65,9 ^o	0,41/-75,6 ^o	9,5	
20	40	0,42/ -32,2 ^o	34,3/165,3 ^o	0,01/ 72,8 ^o	0,97/ -9,3 ^o	43,3
	100	0,43/ -77,0 ^o	28,8/142,5 ^o	0,01/ 65,2 ^o	0,85/-22,9 ^o	35,7
	200	0,43/-118,2 ^o	19,7/122,1 ^o	0,02/ 58,3 ^o	0,64/-30,8 ^o	29,0
	500	0,46/-160,6 ^o	9,5/ 96,5 ^o	0,03/ 61,6 ^o	0,47/-36,0 ^o	21,7
	800	0,45/-177,2 ^o	6,1/ 85,5 ^o	0,05/ 65,4 ^o	0,43/-42,3 ^o	17,6
	1000	0,46/ 173,6 ^o	4,9/ 78,8 ^o	0,05/ 66,7 ^o	0,44/-44,8 ^o	15,8
	1200	0,48/ 163,5 ^o	4,0/ 74,1 ^o	0,06/ 68,0 ^o	0,43/-49,1 ^o	14,1
	1500	0,46/ 158,3 ^o	3,3/ 67,5 ^o	0,08/ 68,9 ^o	0,39/-57,7 ^o	12,1
2000	0,47/ 139,9 ^o	2,5/ 56,7 ^o	0,10/ 68,4 ^o	0,40/-74,7 ^o	9,6	

N-P-N 2 GHz WIDEBAND TRANSISTOR

N-P-N transistor in a four-lead dual-emitter SOT-143 envelope. The device is primarily intended for use in u.h.f. and microwave amplifiers and features low noise and high power gain.

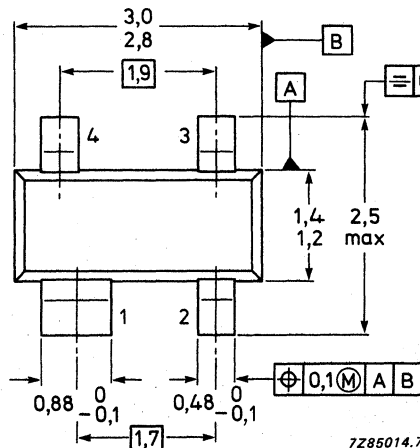
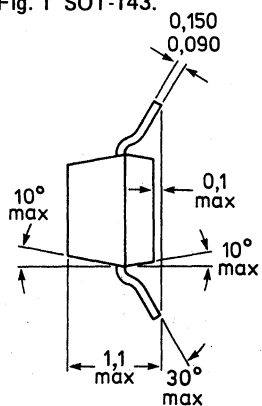
QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	15 V
Collector-emitter voltage (open base)	V_{CEO}	max.	12 V
Collector current (d.c.)	I_C	max.	35 mA
Total power dissipation up to $T_{amb} = 25\text{ }^\circ\text{C}$	P_{tot}	max.	300 mW
Junction temperature	T_j	max.	150 $^\circ\text{C}$
D.C. current gain $I_C = 30\text{ mA}; V_{CE} = 5\text{ V}$	h_{FE}	min. typ.	40 90
Transition frequency at $f = 500\text{ MHz}$ $I_C = 30\text{ mA}; V_{CE} = 5\text{ V}$	f_T	typ.	6,0 GHz
Feedback capacitance at $f = 1\text{ MHz}$ $I_C = 0; V_{CE} = 5\text{ V}$	C_{re}	typ.	0,6 pF
Noise figure at $f = 800\text{ MHz}$ $I_C = 4\text{ mA}; V_{CE} = 8\text{ V}; Z_S = \text{opt.}$	F	typ.	1,6 dB
Maximum unilateral power gain $I_C = 30\text{ mA}; V_{CE} = 8\text{ V}$ $f = 800\text{ MHz}$ $f = 2\text{ GHz}$	GUM	typ.	17,0 dB 9,0 dB

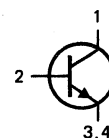
MECHANICAL DATA

Fig. 1 SOT-143.

Dimensions in mm



Marking code: R8



TOP VIEW

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V _{CB0}	max.	15 V
Collector-emitter voltage (open base)	V _{CEO}	max.	12 V
Emitter-base voltage (open collector)	V _{EB0}	max.	2 V
Collector current (d.c.)	I _C	max.	35 mA
Total power dissipation up to T _{amb} = 25 °C and mounted on a ceramic substrate of 8 mm x 10 mm x 0,7 mm	P _{tot}	max.	300 mW
Storage temperature	T _{stg}		-65 to +150 °C
Junction temperature	T _j	max.	150 °C

THERMAL RESISTANCE

From junction to ambient
and mounted on a ceramic substrate
of 8 mm x 10 mm x 0,7 mm

R _{th j-a}	430 K/W
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CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current

I_E = 0; V_{CB} = 5 V

I _{CB0}	max.	50 nA
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D.C. current gain

I_C = 30 mA; V_{CE} = 5 V

h _{FE}	min.	40
	typ.	90

Transition frequency at f = 500 MHz

I_C = 30 mA; V_{CE} = 5 V

f _T	typ.	6,0 GHz
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Collector capacitance at f = 1 MHz

I_E = I_e = 0; V_{CB} = 5 V

C _c	typ.	0,9 pF
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Emitter capacitance at f = 1 MHz

I_C = I_c = 0; V_{EB} = 0,5 V

C _e	typ.	2,5 pF
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Feedback capacitance

I_C = 0; V_{CE} = 5 V

C _{re}	typ.	0,6 pF
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Maximum unilateral power gain (s_{re} assumed to be zero)

$$G_{UM} = 10 \log \frac{|s_{fe}|^2}{[1 - |s_{ie}|^2][1 - |s_{oe}|^2]}$$

I_C = 30 mA; V_{CE} = 8 V; T_{amb} = 25 °C:

f = 800 MHz

f = 2 GHz

G _{UM}	typ.	17,0 dB
	typ.	9,0 dB

Noise figure at f = 800 MHz and T_{amb} = 25 °C

I_C = 4 mA; V_{CE} = 8 V; Z_S = opt.

F	typ.	1,6 dB
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s-parameters (common emitter) at $V_{CE} = 5\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$; typical values

I_C mA	f MHz	S_{ie}	S_{fe}	S_{re}	S_{oe}	GUM dB
2	40	0,93/ -10,4 ^o	7,1/174,6 ^o	0,02/ 84,9 ^o	1,00/ -3,3 ^o	52,9
	100	0,93/ -30,9 ^o	7,0/160,6 ^o	0,03/ 73,5 ^o	1,00/ -11,9 ^o	52,8
	200	0,83/ -58,3 ^o	6,0/144,6 ^o	0,06/ 60,4 ^o	0,88/ -22,1 ^o	27,2
	500	0,74/-115,5 ^o	4,2/110,2 ^o	0,10/ 36,5 ^o	0,71/ -40,3 ^o	18,9
	800	0,67/-144,9 ^o	2,9/ 92,5 ^o	0,11/ 29,0 ^o	0,61/ -51,6 ^o	13,9
	1000	0,65/-161,0 ^o	2,4/ 81,5 ^o	0,11/ 25,2 ^o	0,60/ -55,8 ^o	12,0
	1200	0,64/-175,0 ^o	2,0/ 73,9 ^o	0,10/ 25,2 ^o	0,58/ -62,7 ^o	9,9
	1500	0,64/+171,3 ^o	1,7/ 64,5 ^o	0,11/ 28,1 ^o	0,52/ -72,1 ^o	8,1
2000	0,63/+148,8 ^o	1,2/ 49,6 ^o	0,10/ 35,4 ^o	0,52/ -90,7 ^o	5,5	
5	40	0,86/ -17,1 ^o	16,2/171,0 ^o	0,01/ 81,2 ^o	0,99/ -7,5 ^o	46,5
	100	0,83/ -46,6 ^o	15,2/152,3 ^o	0,03/ 66,6 ^o	0,92/ -21,4 ^o	36,9
	200	0,72/ -82,0 ^o	11,6/133,0 ^o	0,05/ 53,3 ^o	0,73/ -34,7 ^o	27,8
	500	0,63/-140,5 ^o	6,5/101,0 ^o	0,07/ 38,0 ^o	0,48/ -52,8 ^o	19,6
	800	0,60/-164,4 ^o	4,3/ 87,0 ^o	0,08/ 39,2 ^o	0,41/ -61,7 ^o	15,4
	1000	0,59/-177,4 ^o	3,5/ 78,3 ^o	0,08/ 39,9 ^o	0,39/ -64,2 ^o	13,4
	1200	0,59/+170,7 ^o	2,9/ 72,9 ^o	0,09/ 43,3 ^o	0,37/ -69,0 ^o	11,6
	1500	0,58/+160,8 ^o	2,4/ 64,2 ^o	0,10/ 46,6 ^o	0,34/ -79,5 ^o	9,9
2000	0,58/+140,3 ^o	1,8/ 51,8 ^o	0,11/ 51,4 ^o	0,35/ -95,8 ^o	7,4	
10	40	0,78/ -25,7 ^o	27,2/166,2 ^o	0,01/ 78,4 ^o	0,97/ -12,5 ^o	44,5
	100	0,72/ -64,9 ^o	23,2/143,3 ^o	0,03/ 61,1 ^o	0,83/ -31,4 ^o	35,5
	200	0,62/-105,0 ^o	16,2/123,2 ^o	0,04/ 50,0 ^o	0,59/ -45,9 ^o	28,1
	500	0,59/-155,7 ^o	7,9/ 95,5 ^o	0,05/ 44,9 ^o	0,34/ -63,2 ^o	20,3
	800	0,56/-175,9 ^o	5,1/ 83,5 ^o	0,07/ 50,4 ^o	0,29/ -70,7 ^o	16,2
	1000	0,57/+173,2 ^o	4,1/ 76,3 ^o	0,07/ 52,3 ^o	0,27/ -72,7 ^o	14,3
	1200	0,58/+162,5 ^o	3,4/ 72,1 ^o	0,08/ 55,6 ^o	0,25/ -76,2 ^o	12,5
	1500	0,56/+154,8 ^o	2,8/ 63,8 ^o	0,10/ 56,6 ^o	0,25/ -88,2 ^o	10,8
2000	0,56/+135,3 ^o	2,1/ 52,8 ^o	0,13/ 58,5 ^o	0,26/-102,7 ^o	8,4	
20	40	0,65/ -39,4 ^o	42,2/159,3 ^o	0,01/ 72,3 ^o	0,91/ -19,7 ^o	42,7
	100	0,60/ -89,5 ^o	31,6/132,8 ^o	0,02/ 55,5 ^o	0,69/ -42,9 ^o	34,8
	200	0,55/-129,0 ^o	19,7/114,0 ^o	0,02/ 50,4 ^o	0,44/ -57,0 ^o	28,4
	500	0,57/-168,3 ^o	8,8/ 91,5 ^o	0,04/ 54,8 ^o	0,24/ -74,1 ^o	20,8
	800	0,55/+175,7 ^o	5,6/ 81,0 ^o	0,06/ 60,5 ^o	0,21/ -80,3 ^o	16,8
	1000	0,55/+166,5 ^o	4,5/ 74,8 ^o	0,07/ 61,7 ^o	0,19/ -82,5 ^o	14,8
	1200	0,57/+156,9 ^o	3,7/ 71,1 ^o	0,08/ 64,0 ^o	0,17/ -85,5 ^o	13,2
	1500	0,54/+150,5 ^o	3,1/ 63,0 ^o	0,10/ 63,0 ^o	0,18/-130,7 ^o	11,4
2000	0,55/+131,8 ^o	2,3/ 53,3 ^o	0,13/ 62,3 ^o	0,20/-111,3 ^o	9,0	
30	40	0,58/ -50,3 ^o	50,7/154,7 ^o	0,01/ 69,7 ^o	0,87/ -24,2 ^o	42,2
	100	0,56/-104,9 ^o	35,1/127,1 ^o	0,02/ 53,8 ^o	0,61/ -48,7 ^o	34,5
	200	0,54/-141,0 ^o	20,7/109,8 ^o	0,02/ 52,4 ^o	0,37/ -61,2 ^o	28,4
	500	0,56/-173,6 ^o	8,9/ 89,5 ^o	0,04/ 60,0 ^o	0,20/ -77,6 ^o	20,8
	800	0,55/+172,3 ^o	5,7/ 79,7 ^o	0,06/ 64,8 ^o	0,18/ -83,1 ^o	16,9
	1000	0,56/+164,0 ^o	4,5/ 73,8 ^o	0,07/ 65,3 ^o	0,17/ -85,3 ^o	14,9
	1200	0,58/+154,8 ^o	3,7/ 70,6 ^o	0,08/ 67,1 ^o	0,15/ -88,3 ^o	13,3
	1500	0,55/+148,9 ^o	3,1/ 62,5 ^o	0,10/ 65,2 ^o	0,16/-100,8 ^o	11,5
2000	0,55/+130,5 ^o	2,3/ 53,0 ^o	0,13/ 63,7 ^o	0,18/-114,1 ^o	9,1	

s-parameters (common-emitter) at $V_{CE} = 8\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$; typical values

I_C mA	f MHz	S_{ie}	S_{fe}	S_{re}	S_{oe}	GUM dB
2	40	0,94/ -9,9°	7,1/174,8°	0,01/ 84,5°	1,00/ -2,8°	53,5
	100	0,94/ -30,0°	7,0/161,3°	0,03/ 73,7°	1,00/ -11,0°	53,4
	200	0,83/ -56,5°	6,1/145,5°	0,05/ 61,5°	0,89/ -20,5°	27,7
	500	0,74/ -113,2°	4,3/111,4°	0,09/ 37,8°	0,73/ -37,8°	19,4
	800	0,66/ -142,9°	3,0/ 93,7°	0,10/ 30,8°	0,63/ -48,7°	14,3
	1000	0,64/ -159,0°	2,5/ 82,5°	0,10/ 27,0°	0,62/ -52,8°	12,4
	1200	0,63/ -173,3°	2,0/ 74,6°	0,10/ 26,9°	0,61/ -59,6°	10,3
	1500	0,62/ +172,7°	1,7/ 65,5°	0,10/ 29,8°	0,54/ -68,5°	8,3
2000	0,63/ +149,9°	1,3/ 50,5°	0,10/ 37,8°	0,54/ -87,0°	5,7	
5	40	0,87/ -15,9°	15,9/171,6°	0,01/ 81,6°	0,99/ -6,5°	46,7
	100	0,84/ -43,8°	14,8/153,5°	0,03/ 68,2°	0,93/ -19,3°	37,7
	200	0,72/ -78,0°	11,6/134,5°	0,05/ 54,8°	0,76/ -31,6°	28,3
	500	0,63/ -136,7°	6,7/102,2°	0,07/ 38,8°	0,52/ -48,3°	20,0
	800	0,59/ -161,4°	4,4/ 87,9°	0,08/ 40,0°	0,44/ -56,7°	15,7
	1000	0,58/ -174,8°	3,6/ 79,0°	0,08/ 40,8°	0,43/ -59,3°	13,7
	1200	0,58/ +172,8°	2,9/ 73,4°	0,08/ 44,0°	0,41/ -63,9°	11,9
	1500	0,57/ +162,6°	2,5/ 64,9°	0,09/ 47,2°	0,37/ -73,9°	10,1
2000	0,57/ +141,9°	1,8/ 52,3°	0,11/ 52,4°	0,38/ -90,2°	7,6	
10	40	0,80/ -23,3°	26,3/167,2°	0,01/ 78,3°	0,97/ -11,0°	44,6
	100	0,74/ -60,0°	22,9/145,1°	0,03/ 62,7°	0,85/ -28,1°	36,3
	200	0,62/ -99,1°	16,2/125,0°	0,04/ 50,9°	0,62/ -41,6°	28,4
	500	0,58/ -151,7°	8,1/ 96,7°	0,05/ 45,4°	0,38/ -56,3°	20,6
	800	0,55/ -172,9°	5,3/ 84,4°	0,06/ 50,5°	0,32/ -63,4°	16,5
	1000	0,55/ +175,8°	4,2/ 77,0°	0,07/ 52,3°	0,31/ -64,9°	14,5
	1200	0,56/ +164,5°	3,5/ 72,4°	0,08/ 55,1°	0,29/ -68,2°	12,8
	1500	0,54/ +156,7°	2,9/ 64,3°	0,10/ 56,6°	0,28/ -79,7°	11,1
2000	0,54/ +136,8°	2,1/ 53,1°	0,12/ 58,5°	0,28/ -94,3°	8,6	
20	40	0,70/ -35,0°	41,2/160,7°	0,01/ 75,1°	0,92/ -17,3°	43,5
	100	0,63/ -82,0°	31,7/134,8°	0,02/ 57,6°	0,72/ -38,6°	35,4
	200	0,55/ -122,2°	20,2/115,6°	0,03/ 50,9°	0,47/ -51,0°	28,7
	500	0,55/ -164,6°	9,1/ 92,2°	0,04/ 54,4°	0,27/ -63,8°	21,0
	800	0,53/ +178,4°	5,8/ 81,6°	0,06/ 60,2°	0,24/ -69,5°	17,0
	1000	0,54/ +168,8°	4,6/ 75,3°	0,07/ 61,3°	0,22/ -70,7°	15,0
	1200	0,55/ +158,7°	3,8/ 71,4°	0,08/ 63,4°	0,20/ -72,9°	13,4
	1500	0,52/ +152,5°	3,2/ 63,5°	0,10/ 63,0°	0,21/ -85,9°	11,6
2000	0,53/ +133,3°	2,4/ 53,4°	0,13/ 62,3°	0,22/ -99,5°	9,2	
30	40	0,65/ -42,9°	49,0/156,7°	0,01/ 72,7°	0,89/ -20,9°	43,0
	100	0,58/ -94,4°	35,1/129,5°	0,02/ 54,7°	0,65/ -43,2°	35,0
	200	0,53/ -132,8°	21,1/111,5°	0,03/ 51,8°	0,40/ -53,7°	28,7
	500	0,54/ -169,5°	9,2/ 90,5°	0,04/ 58,8°	0,23/ -64,8°	21,1
	800	0,52/ +175,3°	5,9/ 80,5°	0,06/ 63,6°	0,21/ -70,2°	17,0
	1000	0,53/ +166,4°	4,7/ 74,3°	0,07/ 64,6°	0,20/ -71,4°	15,1
	1200	0,55/ +156,8°	3,9/ 70,8°	0,08/ 66,1°	0,18/ -73,2°	13,4
	1500	0,52/ +150,9°	3,2/ 63,0°	0,10/ 64,8°	0,19/ -87,3°	11,7
2000	0,53/ +132,2°	2,4/ 53,0°	0,13/ 63,5°	0,20/ -100,8°	9,0	

N-P-N 2 GHz WIDEBAND TRANSISTOR

N-P-N transistor in a four-lead dual-emitter plastic envelope (SOT-103). This device is designed for application in wideband amplifiers, such as CATV and MATV systems, up to 2 GHz.

P-N-P complement is BFG32.

QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	20 V
Collector-emitter voltage (open base)	V_{CEO}	max.	15 V
Collector current (d.c.)	I_C	max.	75 mA ←
Total power dissipation up to $T_{amb} = 70\text{ }^\circ\text{C}$	P_{tot}	max.	700 mW
Junction temperature	T_j	max.	175 $^\circ\text{C}$
D.C. current gain $I_C = 50\text{ mA}; V_{CE} = 10\text{ V}$	h_{FE}	min.	25
Transition frequency at $f = 500\text{ MHz}$ $I_C = 50\text{ mA}; V_{CE} = 10\text{ V}$	f_T	typ.	5,0 GHz
Feedback capacitance at $f = 1\text{ MHz}$ $I_C = 0; V_{CE} = 10\text{ V}$	C_{re}	typ.	1,0 pF
Maximum unilateral power gain at $f = 800\text{ MHz}$ $I_C = 50\text{ mA}; V_{CE} = 10\text{ V}$	G_{UM}	typ.	15,0 dB
Output power at 1 dB gain compression $V_{CE} = 10\text{ V}; I_C = 70\text{ mA}; f = 800\text{ MHz}$	PL_1	typ.	+21 dBm
Third order intercept point $V_{CE} = 10\text{ V}; I_C = 70\text{ mA}; f = 800\text{ MHz}$	ITO	typ.	+40 dBm

MECHANICAL DATA

SOT-103 (see Fig. 1).

THERMAL RESISTANCE

From junction to ambient in free air
mounted on glass-fibre p.c.b. (see Fig. 2)

$$R_{th\ j-a} = 150\ K/W$$

From junction to case

$$R_{th\ j-c} = 75\ K/W$$

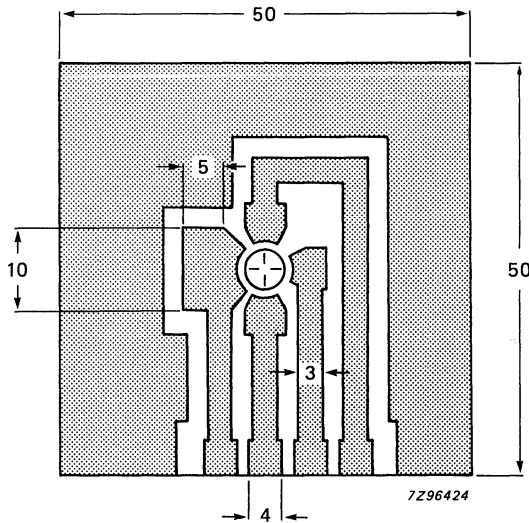


Fig. 2 Requirements for fibre-glass print (dimensions in mm). Single-sided 35 μm Cu-clad epoxy fibre-glass print, thickness 1,5 mm. Tracks are fully tin-lead plated. Shaded area is Cu.

CHARACTERISTICS

$T_j = 25\ ^\circ C$ unless otherwise specified

Collector cut-off current

$$I_E = 0; V_{CB} = 10\ V$$

$$I_{CBO} \text{ max. } 100\ nA$$

D.C. current gain

$$I_C = 50\ mA; V_{CE} = 10\ V$$

$$h_{FE} \text{ min. } 25$$

$$\text{typ. } 50$$

Transition frequency at $f = 500\ MHz$

$$I_C = 50\ mA; V_{CE} = 10\ V$$

$$f_T \text{ typ. } 5,0\ GHz$$

Collector capacitance at $f = 1\ MHz$

$$I_E = i_e = 0; V_{CB} = 10\ V$$

$$C_c \text{ typ. } 1,5\ pF$$

Emitter capacitance at $f = 1\ MHz$

$$I_C = i_c = 0; V_{EB} = 0,5\ V$$

$$C_e \text{ typ. } 6,5\ pF$$

Feedback capacitance at $f = 1\ MHz$

$$I_C = 0; V_{CE} = 10\ V$$

$$C_{re} \text{ typ. } 1,0\ pF$$

Noise figure at $Z_S = \text{opt.}$ and $T_{amb} = 25\ ^\circ C$

$$I_C = 70\ mA; V_{CE} = 10\ V; f = 800\ MHz$$

$$F \text{ typ. } 4,0\ dB$$

Maximum unilateral power gain (s_{re} assumed to be zero)

$$G_{UM} = 10 \log \frac{|s_{fe}|^2}{[1 - |s_{ie}|^2][1 - |s_{oe}|^2]}$$

$$I_C = 50\ mA; V_{CE} = 10\ V; f = 800\ MHz; T_{amb} = 25\ ^\circ C$$

$$G_{UM} \text{ typ. } 15,0\ dB$$

$$I_C = 50\ mA; V_{CE} = 10\ V; f = 2\ GHz; T_{amb} = 25\ ^\circ C$$

$$\text{typ. } 8,0\ dB$$

Output power at 1 dB gain compression
 $I_C = 70 \text{ mA}; V_{CE} = 10 \text{ V}; T_{amb} = 25 \text{ }^\circ\text{C};$
 $R_L = 75 \text{ } \Omega;$ measured at $f = 800 \text{ MHz}$

P_{L1} typ. +21 dBm

Third order intercept point (see Fig. 3)

$I_C = 70 \text{ mA}; V_{CE} = 10 \text{ V};$
 $R_L = 75 \text{ } \Omega; T_{amb} = 25 \text{ }^\circ\text{C};$
 $P_p = \text{ITO} - 6 \text{ dB}; f_p = 800 \text{ MHz};$
 $P_q = \text{ITO} - 6 \text{ dB}; f_q = 801 \text{ MHz};$
 measured at $f(2q-p) = 802 \text{ MHz}$ and
 at $f(2p-q) = 799 \text{ MHz}$

ITO typ. +40 dBm

→ Output voltage at $d_{im} = -60 \text{ dB}$

$I_C = 70 \text{ mA}; V_{CE} = 10 \text{ V};$
 $R_L = 75 \text{ } \Omega; T_{amb} = 25 \text{ }^\circ\text{C}$
 $V_p = V_o$ at $d_{im} = -60 \text{ dB}; f_p = 795,25 \text{ MHz}$
 $V_q = V_o - 6 \text{ dB}; f_q = 803,25 \text{ MHz}$
 $V_r = V_o - 6 \text{ dB}; f_r = 805,25 \text{ MHz}$

V_o typ. 700 mV

Second harmonic distortion (see Fig. 3)

→ $I_C = 70 \text{ mA}; V_{CE} = 10 \text{ V}; R_L = 75 \text{ } \Omega;$
 $V_{SWR} < 2; T_{amb} = 25 \text{ }^\circ\text{C}$

→ $V_p = V_o = 320 \text{ mV}$ at $f_p = 250 \text{ MHz}$
 $V_q = V_o = 320 \text{ mV}$ at $f_q = 560 \text{ MHz}$
 measured at $f_{(p+q)} = 810 \text{ MHz}$

d_2 typ. -52 dB

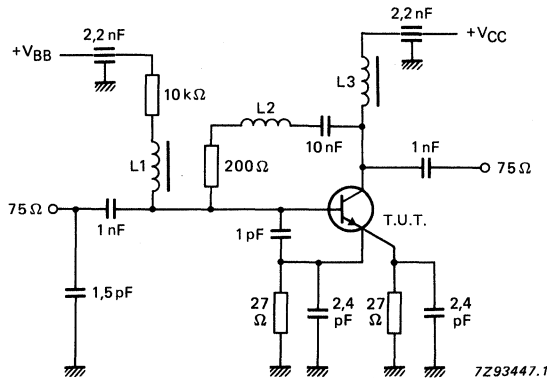


Fig. 3 Intermodulation distortion and second harmonic distortion MATV test circuit.

$L1 = L3 = 5 \text{ } \mu\text{H}$ micro-choke
 $L2 = 1,5$ turns Cu wire (0,4 mm), internal diameter 3 mm, winding pitch 1 mm.

s-parameters (common emitter) at $V_{CE} = 10\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$; typical values

I_C mA	f MHz	S_{ie}	S_{fe}	S_{re}	S_{oe}	GUM dB
10	40	0,68/ -50,8°	26,0/155,5°	0,02/ 67,1°	0,90/ -22,7°	38,2
	100	0,68/ -106,4°	18,2/126,5°	0,03/ 46,0°	0,65/ -45,7°	30,3
	200	0,68/ -142,5°	10,8/107,9°	0,04/ 38,0°	0,41/ -56,9°	24,1
	500	0,71/ -173,4°	4,6/ 84,5°	0,05/ 41,2°	0,25/ -69,3°	16,6
	800	0,69/ +173,9°	3,0/ 73,3°	0,07/ 49,3°	0,25/ -78,7°	12,7
	1000	0,70/ +166,7°	2,4/ 65,8°	0,08/ 52,5°	0,25/ -82,7°	10,8
	1200	0,72/ +159,6°	1,9/ 61,5°	0,09/ 56,9°	0,24/ -91,4°	9,3
	1500	0,71/ +153,2°	1,7/ 53,2°	0,11/ 60,2°	0,25/ -103,8°	7,7
2000	0,73/ +138,2°	1,2/ 42,7°	0,14/ 63,2°	0,29/ -126,1°	5,5	
15	40	0,60/ -64,1°	33,5/150,8°	0,02/ 64,6°	0,86/ -29,5°	28,4
	100	0,65/ -121,2°	21,8/121,5°	0,03/ 45,0°	0,56/ -56,5°	30,8
	200	0,66/ -152,0°	12,4/104,8°	0,03/ 40,9°	0,33/ -70,6°	24,9
	500	0,70/ -177,4°	5,1/ 83,8°	0,05/ 49,3°	0,19/ -90,4°	17,3
	800	0,68/ +171,4°	3,3/ 73,5°	0,07/ 56,4°	0,19/ -98,2°	13,4
	1000	0,69/ +164,8°	2,6/ 66,7°	0,08/ 58,4°	0,18/ -102,4°	11,5
	1200	0,72/ +157,8°	2,2/ 62,8°	0,09/ 61,7°	0,17/ -110,5°	10,0
	1500	0,70/ +152,1°	1,8/ 54,6°	0,12/ 63,1°	0,20/ -121,3°	8,4
2000	0,72/ +137,2°	1,4/ 44,7°	0,15/ 64,1°	0,23/ -139,8°	6,3	
20	40	0,55/ -75,5°	39,4/147,3°	0,02/ 60,6°	0,83/ -34,8°	38,6
	100	0,63/ -130,6°	24,0/118,3°	0,02/ 43,9°	0,51/ -64,8°	31,1
	200	0,66/ -156,7°	13,3/102,8°	0,03/ 44,2°	0,29/ -82,0°	25,3
	500	0,70/ -179,7°	5,4/ 83,5°	0,05/ 54,3°	0,17/ -108,8°	17,7
	800	0,68/ +170,0°	3,5/ 73,7°	0,07/ 60,3°	0,17/ -115,6°	13,9
	1000	0,69/ +163,7°	2,8/ 67,0°	0,08/ 61,3°	0,16/ -119,4°	11,9
	1200	0,72/ +156,9°	2,3/ 63,5°	0,09/ 64,0°	0,15/ -129,7°	10,5
	1500	0,69/ +151,5°	2,0/ 55,5°	0,12/ 64,3°	0,18/ -136,5°	8,8
2000	0,71/ +136,7°	1,5/ 45,9°	0,16/ 63,9°	0,21/ -152,0°	6,7	
30	40	0,51/ -92,9°	47,3/142,3°	0,02/ 58,4°	0,79/ -42,7°	38,8
	100	0,62/ -142,5°	26,5/114,3°	0,02/ 44,5°	0,44/ -76,6°	31,5
	200	0,65/ -162,4°	14,4/100,6°	0,03/ 49,2°	0,25/ -98,8°	25,9
	500	0,69/ +177,9°	5,8/ 83,0°	0,05/ 60,3°	0,17/ -132,5°	18,2
	800	0,68/ +168,5°	3,8/ 73,8°	0,07/ 64,7°	0,17/ -136,9°	14,3
	1000	0,69/ +162,5°	3,0/ 67,5°	0,08/ 64,7°	0,16/ -143,7°	12,4
	1200	0,71/ +155,8°	2,4/ 64,4°	0,10/ 66,4°	0,15/ -155,4°	10,9
	1500	0,68/ +150,8°	2,1/ 56,3°	0,12/ 65,7°	0,18/ -156,5°	9,3
2000	0,71/ +136,2°	1,6/ 47,2°	0,16/ 64,4°	0,21/ -168,4°	7,3	
50	40	0,49/ -113,0°	55,6/136,3°	0,01/ 57,1°	0,71/ -52,4°	39,1
	100	0,63/ -153,5°	28,5/110,2°	0,02/ 48,7°	0,39/ -90,8°	32,0
	200	0,65/ -168,7°	15,3/ 98,3°	0,02/ 56,7°	0,24/ -117,4°	26,3
	500	0,69/ +175,9°	6,0/ 82,4°	0,05/ 65,8°	0,20/ -149,7°	18,6
	800	0,67/ +167,2°	3,9/ 73,6°	0,07/ 68,1°	0,19/ -154,7°	15,0
	1000	0,69/ +161,5°	3,1/ 67,7°	0,09/ 67,2°	0,18/ -162,2°	12,8
	1200	0,71/ +155,1°	2,6/ 65,0°	0,10/ 68,7°	0,18/ -173,8°	11,3
	1500	0,68/ +150,3°	2,2/ 56,9°	0,13/ 66,7°	0,19/ -172,1°	9,7
2000	0,70/ +135,7°	1,7/ 48,3°	0,17/ 64,9°	0,21/ -177,2°	8,0	

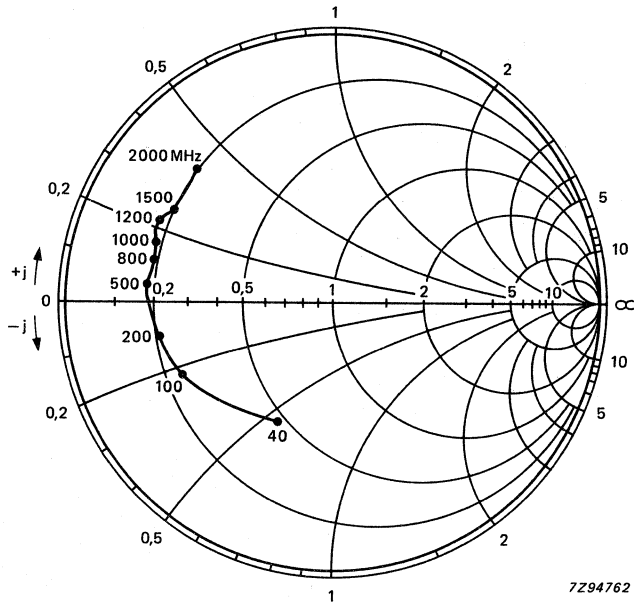


Fig. 4 Input impedance, derived from input reflection coefficient s_{ie} coordinates, in ohm x 50.

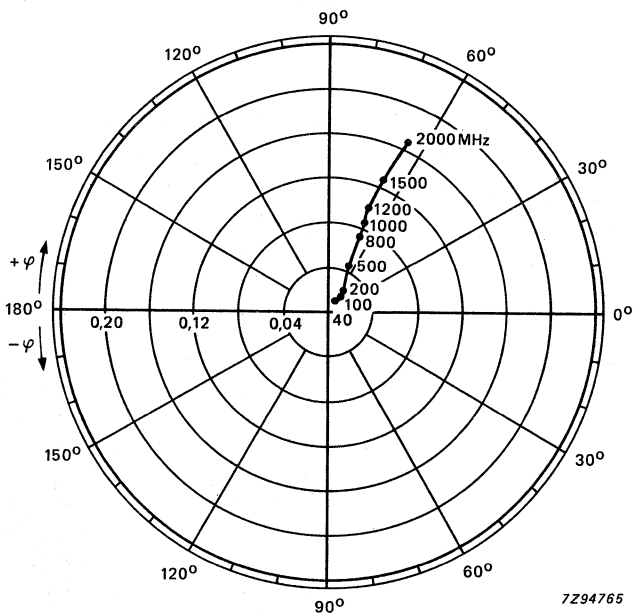


Fig. 5 Reverse transmission coefficient s_{re} .

Conditions for Figs 4 to 7: $V_{CE} = 10 \text{ V}$; $I_C = 50 \text{ mA}$; $T_{amb} = 25 \text{ }^\circ\text{C}$.

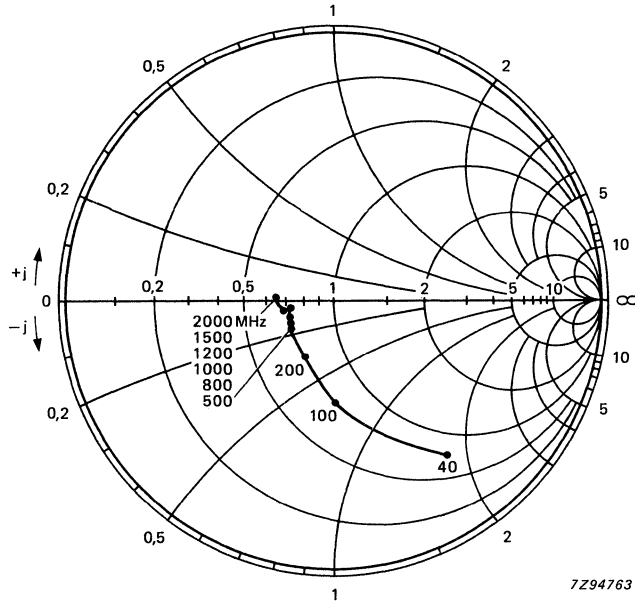


Fig. 6 Output impedance, derived from output reflection coefficient s_{oe} coordinates, in ohm x 50.

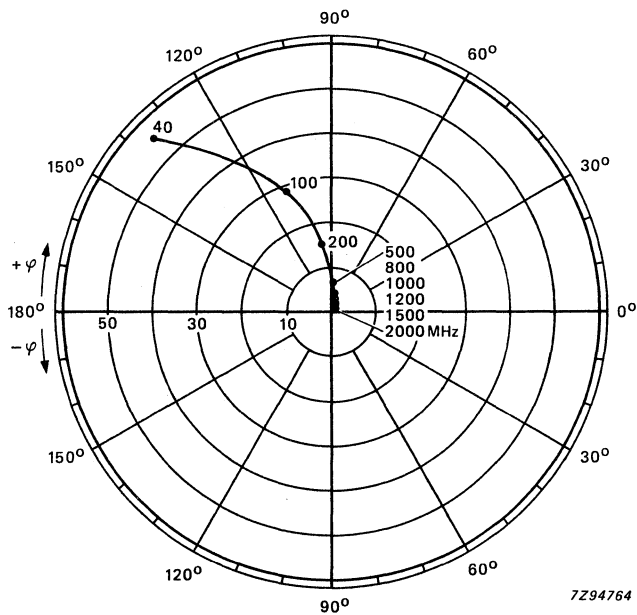
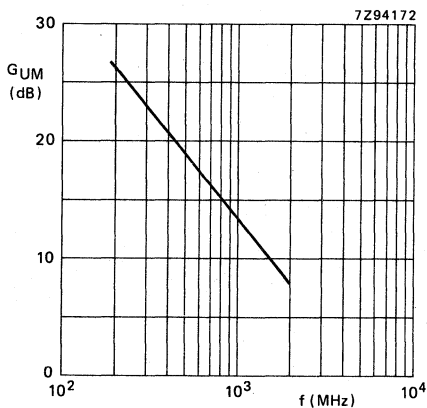


Fig. 7 Forward transmission coefficient s_{fe} .



→ Fig. 8 $V_{CE} = 10 \text{ V}$; $I_C = 50 \text{ mA}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

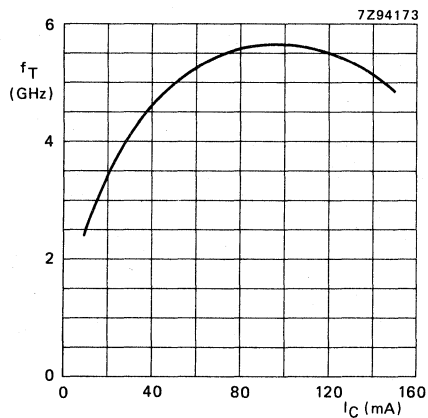
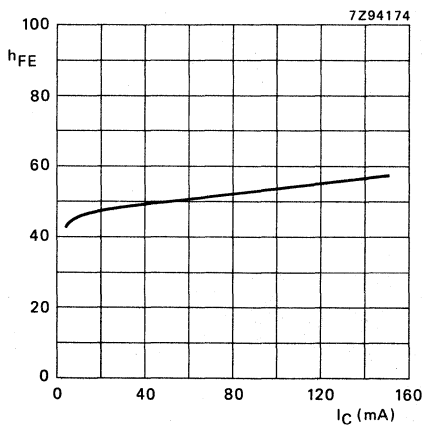


Fig. 9 $V_{CE} = 10 \text{ V}$; $f = 500 \text{ MHz}$; $T_j = 25 \text{ }^\circ\text{C}$; typical values.



→ Fig. 10 $V_{CE} = 10 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$; typical values.

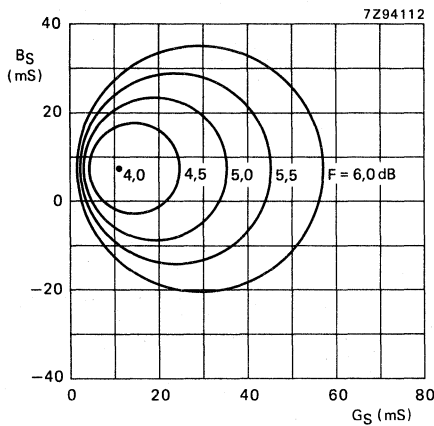


Fig. 11 Circles of constant noise figure $I_C = 70 \text{ mA}$; $V_{CE} = 10 \text{ V}$; $f = 800 \text{ MHz}$; typical values.

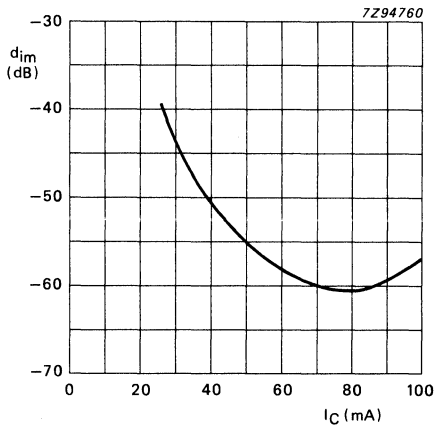


Fig. 12 $V_{CE} = 10$ V; $V_O = 700$ mV;
 $f_{(p+q-r)} = 793,25$ MHz; $T_{amb} = 25$ °C;
 typical values.

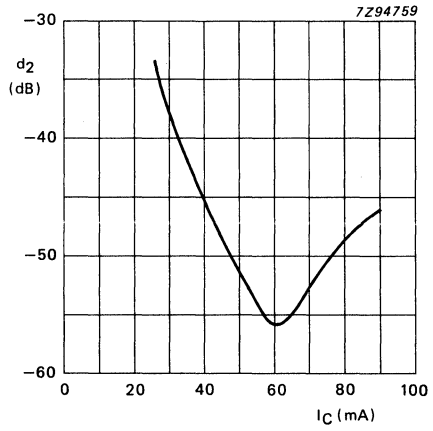


Fig. 13 $V_{CE} = 10$ V; $V_O = 320$ mV;
 $f_{(p+q)} = 810$ MHz; $T_{amb} = 25$ °C;
 typical values.

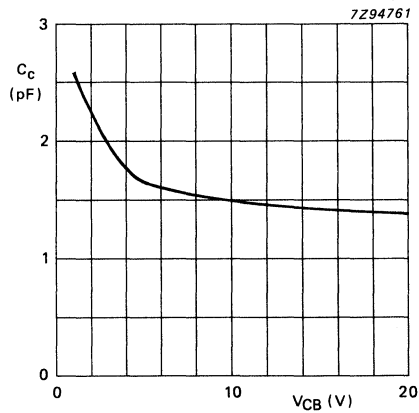


Fig. 14 $I_E = i_e = 0$; $f = 1$ MHz; $T_j = 25$ °C; typical values.

CLASS-B OPERATION

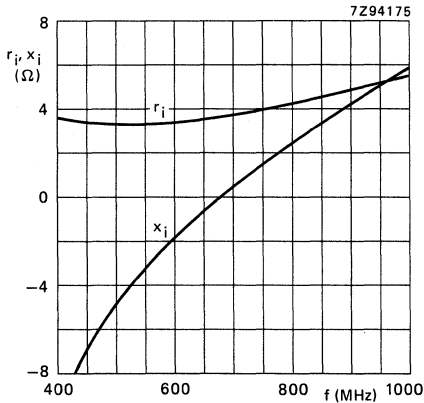


Fig. 15 Input impedance (series components).

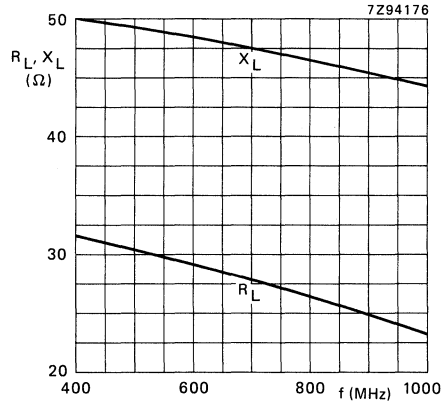


Fig. 16 Load impedance (series components).

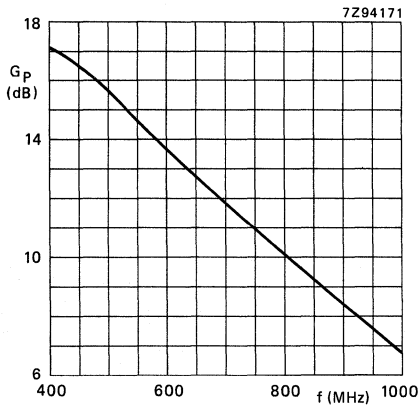


Fig. 17 Power gain versus frequency.

Conditions for Figs 15 to 17:

$V_{CE} = 10 \text{ V}$; $P_L = 500 \text{ mW}$; $T_{amb} = 25 \text{ }^\circ\text{C}$;
typical values.

OPERATING NOTE for Figs 15 to 17:

A resistance of $39 \text{ } \Omega$ between base and emitter is recommended to avoid oscillation. This resistance must be effective for r.f. only.

N-P-N 2 GHz WIDEBAND TRANSISTOR

N-P-N transistor in a four-lead dual-emitter plastic envelope (SOT-103). It is designed for wideband application in the GHz range, such as satellite TV systems (SATV) and repeater amplifiers in fibre-optical systems. The device features a very high transition frequency, high gain and a very low noise figure up to high frequencies.

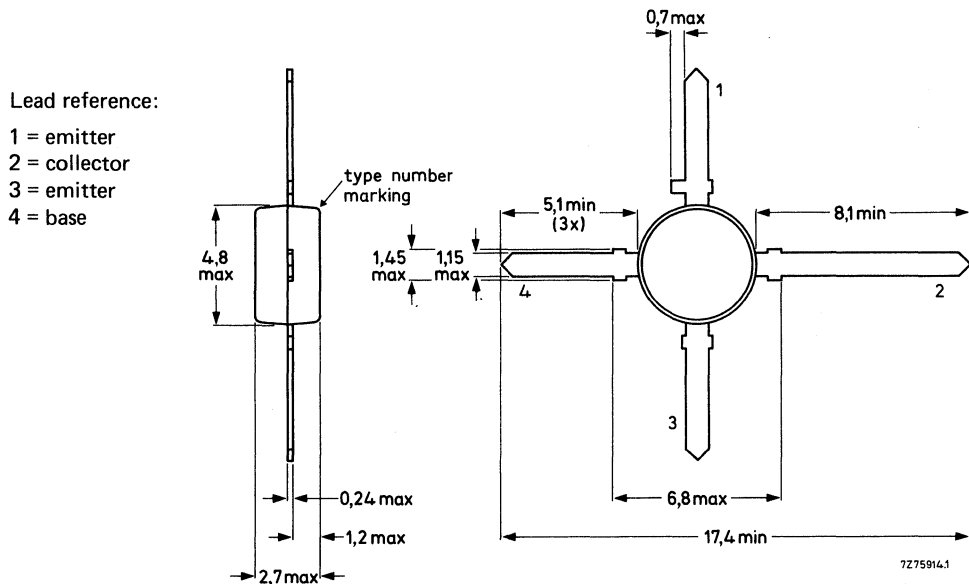
QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	20 V
Collector-emitter voltage (open base)	V_{CEO}	max.	10 V
Collector current (d.c.)	I_C	max.	100 mA
Total power dissipation up to $T_{amb} = 50\text{ }^\circ\text{C}$	P_{tot}	max.	500 mW
Junction temperature	T_j	max.	150 $^\circ\text{C}$
D.C. current gain			
$I_C = 50\text{ mA}$; $V_{CE} = 5\text{ V}$	h_{FE}	min.	40
Transition frequency at $f = 2\text{ GHz}$			
$I_C = 50\text{ mA}$; $V_{CE} = 8\text{ V}$	f_T	typ.	7,5 GHz
Maximum unilateral power gain at $f = 2\text{ GHz}$			
$I_C = 50\text{ mA}$; $V_{CE} = 8\text{ V}$	GUM	typ.	11,0 dB

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-103.



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V _{CBO}	max.	20 V
Collector-emitter voltage (open base)	V _{CEO}	max.	10 V
Emitter-base voltage (open collector)	V _{EB0}	max.	2,5 V
Collector current (d.c.)	I _C	max.	100 mA
Total power dissipation up to T _{amb} = 50 °C*	P _{tot}	max.	500 mW
Storage temperature	T _{stg}		-65 to +150 °C
Junction temperature	T _j	max.	150 °C

THERMAL RESISTANCE

From junction to ambient*	R _{th j-a}	=	200 K/W
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CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current

I _E = 0; V _{CB} = 5 V	I _{CBO}	max.	100 nA
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D.C. current gain

I _C = 50 mA; V _{CE} = 5 V	h _{FE}	min.	40
---	-----------------	------	----

Transition frequency at f = 2 GHz

I _C = 50 mA; V _{CE} = 8 V	f _T	typ.	7,5 GHz
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Collector capacitance at f = 1 MHz

I _E = i _e = 0; V _{CB} = 8 V	C _c	typ.	1,5 pF
--	----------------	------	--------

Emitter capacitance at f = 1 MHz

I _C = i _c = 0; V _{EB} = 0,5 V	C _e	typ.	3,3 pF
--	----------------	------	--------

Feedback capacitance at f = 1 MHz

I _C = 0; V _{CE} = 8 V	C _{re}	typ.	0,85 pF
---	-----------------	------	---------

Maximum unilateral power gain (s_{re} assumed to be zero)

$$G_{UM} \text{ (in dB)} = 10 \log \frac{|s_{fe}|^2}{[1 - |s_{ie}|^2][1 - |s_{oe}|^2]}$$

I _C = 50 mA; V _{CE} = 8 V; f = 2 GHz; T _{amb} = 25 °C	G _{UM}	typ.	11,0 dB
--	-----------------	------	---------

Noise figure at optimum source impedance and

V_{CE} = 8V; f = 800 MHz; T_{amb} = 25 °C

I _C = 15 mA	F	typ.	1,4 dB
I _C = 50 mA	F	typ.	1,9 dB

* Mounted on a printed-circuit board of 40 mm x 25 mm x 1,5 mm.

N-P-N 2 GHz WIDEBAND TRANSISTOR

N-P-N transistor in a sub-miniature HERMETICALLY SEALED micro-stripline envelope. The BFP90A features low noise, high gain and low distortion figures.

This device is designed for v.h.f. and u.h.f. wideband amplifiers and applications in the GHz range.

P-N-P complement is BFQ51C.

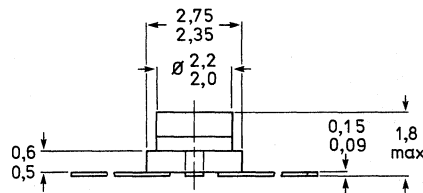
QUICK REFERENCE DATA

Collector-base voltage	V_{CBO}	max.	20 V
Collector-emitter voltage	V_{CEO}	max.	15 V
Collector current (d.c.)	I_C	max.	30 mA
Total power dissipation up to $T_{amb} = 125\text{ }^\circ\text{C}$	P_{tot}	max.	250 mW
Junction temperature	T_j	max.	175 $^\circ\text{C}$
D.C. current gain	h_{FE}	min.	40
$I_C = 14\text{ mA}; V_{CE} = 10\text{ V}$		typ.	90
Transition frequency at $f = 500\text{ MHz}$	f_T	typ.	5,0 GHz
$I_C = 14\text{ mA}; V_{CE} = 10\text{ V}$			
Maximum unilateral power gain	G_{UM}	typ.	23,5 dB
$I_C = 14\text{ mA}; V_{CE} = 10\text{ V}$		typ.	19,5 dB
at $f = 500\text{ MHz}$			
at $f = 800\text{ MHz}$			

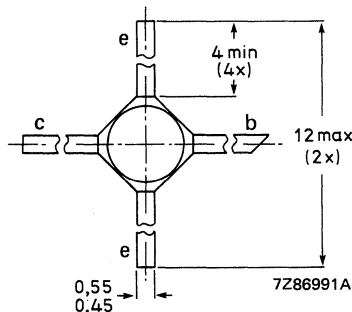
MECHANICAL DATA

Fig. 1 SOT-173.

Dimensions in mm



Marking code: P0



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	20 V
Collector-emitter voltage (open base)	V_{CEO}	max.	15 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2 V
Collector current (d.c.)	I_C	max.	30 mA
Total power dissipation up to $T_{amb} = 125\text{ }^\circ\text{C}$ mounted on a ceramic substrate of $0,7\text{ mm} \times 10\text{ cm}^2$	P_{tot}	max.	250 mW
Storage temperature	T_{stg}		-65 to +150 $^\circ\text{C}$
Junction temperature	T_j	max.	175 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to ambient in free air mounted on a ceramic substrate of $0,7\text{ mm} \times 10\text{ cm}^2$

$R_{th\ j-a}$	=	200 K/W
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CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Collector cut-off current

$I_E = 0; V_{CB} = 10\text{ V}$

I_{CBO}	max.	50 nA
-----------	------	-------

D.C. current gain

$I_C = 14\text{ mA}; V_{CE} = 10\text{ V}$

h_{FE}	min.	40
	typ.	90

Transition frequency at $f = 500\text{ MHz}$

$I_C = 14\text{ mA}; V_{CE} = 10\text{ V}$

f_T	typ.	5,0 GHz
-------	------	---------

Collector capacitance at $f = 1\text{ MHz}$

$I_E = i_e = 0; V_{CB} = 10\text{ V}$

C_c	typ.	0,5 pF
-------	------	--------

Emitter capacitance at $f = 1\text{ MHz}$

$I_C = i_c = 0; V_{EB} = 0,5\text{ V}$

C_e	typ.	1,2 pF
-------	------	--------

Feedback capacitance at $f = 1\text{ MHz}$

$I_C = 0; V_{CE} = 10\text{ V}$

C_{re}	typ.	0,3 pF
----------	------	--------

Maximum unilateral power gain (s_{re} assumed to be zero)

$$GUM = 10 \log \frac{|s_{fe}|^2}{[1 - |s_{ie}|^2] [1 - |s_{oe}|^2]}$$

at $I_C = 14\text{ mA}; V_{CE} = 10\text{ V}; T_{amb} = 25\text{ }^\circ\text{C}$

$f = 500\text{ MHz}$

$f = 800\text{ MHz}$

GUM	typ.	23,5 dB
	typ.	19,5 dB

Noise figure at $f = 800\text{ MHz}; Z_S = \text{opt.}; T_{amb} = 25\text{ }^\circ\text{C}$

$I_C = 4\text{ mA}; V_{CE} = 10\text{ V}$

$I_C = 14\text{ mA}; V_{CE} = 10\text{ V}$

F	typ.	1,7 dB
	typ.	2,4 dB

s-parameters (common emitter) at $V_{CE} = 10\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$; typical values

I_C mA	f MHz	S_{ie}	S_{fe}	S_{re}	S_{oe}	GUM dB
2	40	0,89/ $-8,4^{\circ}$	7,0/174,9 $^{\circ}$	0,006/83,5 $^{\circ}$	0,99/ $-2,3^{\circ}$	40,7
	100	0,88/ $-20,8^{\circ}$	6,9/167,0 $^{\circ}$	0,015/79,6 $^{\circ}$	0,98/ $-5,4^{\circ}$	37,3
	200	0,84/ $-40,7^{\circ}$	6,6/154,0 $^{\circ}$	0,028/70,2 $^{\circ}$	0,95/ $-10,2^{\circ}$	31,8
	500	0,72/ $-87,4^{\circ}$	5,0/126,0 $^{\circ}$	0,053/51,7 $^{\circ}$	0,86/ $-19,6^{\circ}$	23,0
	800	0,64/ $-116,6^{\circ}$	3,7/107,3 $^{\circ}$	0,063/43,9 $^{\circ}$	0,81/ $-24,9^{\circ}$	18,3
	1000	0,59/ $-132,4^{\circ}$	3,1/ 98,1 $^{\circ}$	0,066/42,4 $^{\circ}$	0,79/ $-27,8^{\circ}$	15,9
	1200	0,56/ $-145,7^{\circ}$	2,7/ 90,6 $^{\circ}$	0,068/41,1 $^{\circ}$	0,77/ $-30,4^{\circ}$	14,2
	1500	0,55/ $-162,1^{\circ}$	2,0/ 77,6 $^{\circ}$	0,073/36,9 $^{\circ}$	0,82/ $-34,0^{\circ}$	12,5
5	2000	0,54/ $+175,6^{\circ}$	1,6/ 64,3 $^{\circ}$	0,076/41,3 $^{\circ}$	0,80/ $-39,6^{\circ}$	10,2
	40	0,78/ $-12,7^{\circ}$	14,8/172,3 $^{\circ}$	0,006/81,4 $^{\circ}$	0,98/ $-3,7^{\circ}$	41,5
	100	0,76/ $-30,9^{\circ}$	14,0/160,8 $^{\circ}$	0,014/75,3 $^{\circ}$	0,96/ $-8,8^{\circ}$	37,7
	200	0,70/ $-58,3^{\circ}$	12,4/144,1 $^{\circ}$	0,024/64,9 $^{\circ}$	0,89/ $-15,1^{\circ}$	31,6
	500	0,58/ $-112,1^{\circ}$	7,8/114,7 $^{\circ}$	0,040/50,6 $^{\circ}$	0,74/ $-23,5^{\circ}$	23,1
	800	0,52/ $-138,8^{\circ}$	5,5/ 98,5 $^{\circ}$	0,048/50,1 $^{\circ}$	0,69/ $-26,4^{\circ}$	19,0
	1000	0,49/ $-153,6^{\circ}$	4,4/ 91,2 $^{\circ}$	0,052/51,7 $^{\circ}$	0,67/ $-28,5^{\circ}$	16,6
	1200	0,48/ $-163,4^{\circ}$	3,8/ 84,5 $^{\circ}$	0,056/53,2 $^{\circ}$	0,66/ $-30,5^{\circ}$	15,2
10	1500	0,49/ $-178,1^{\circ}$	3,0/ 73,8 $^{\circ}$	0,064/50,8 $^{\circ}$	0,70/ $-33,9^{\circ}$	13,7
	2000	0,48/ $+162,9^{\circ}$	2,3/ 62,7 $^{\circ}$	0,075/56,0 $^{\circ}$	0,70/ $-38,8^{\circ}$	11,3
	40	0,65/ $-18,3^{\circ}$	23,5/169,2 $^{\circ}$	0,005/79,9 $^{\circ}$	0,98/ $-5,4^{\circ}$	43,8
	100	0,63/ $-43,4^{\circ}$	21,5/154,2 $^{\circ}$	0,012/71,9 $^{\circ}$	0,93/ $-12,3^{\circ}$	37,5
	200	0,56/ $-78,1^{\circ}$	17,4/134,5 $^{\circ}$	0,020/61,1 $^{\circ}$	0,82/ $-19,0^{\circ}$	31,3
	500	0,49/ $-132,4^{\circ}$	9,5/107,0 $^{\circ}$	0,032/54,4 $^{\circ}$	0,65/ $-24,0^{\circ}$	23,1
	800	0,46/ $-154,9^{\circ}$	0,4/ 93,3 $^{\circ}$	0,041/58,0 $^{\circ}$	0,62/ $-26,1^{\circ}$	19,3
	1000	0,44/ $-167,1^{\circ}$	5,1/ 87,4 $^{\circ}$	0,047/60,6 $^{\circ}$	0,61/ $-27,6^{\circ}$	17,1
14	1200	0,44/ $-174,8^{\circ}$	4,3/ 81,7 $^{\circ}$	0,052/62,5 $^{\circ}$	0,60/ $-29,7^{\circ}$	15,5
	1500	0,46/ $+171,1^{\circ}$	3,5/ 71,3 $^{\circ}$	0,060/60,4 $^{\circ}$	0,64/ $-32,7^{\circ}$	14,3
	2000	0,45/ $+154,8^{\circ}$	2,7/ 61,4 $^{\circ}$	0,075/63,5 $^{\circ}$	0,64/ $-37,6^{\circ}$	11,8
	40	0,56/ $-22,6^{\circ}$	28,1/167,9 $^{\circ}$	0,005/78,8 $^{\circ}$	0,98/ $-6,3^{\circ}$	44,4
	100	0,54/ $-53,4^{\circ}$	25,2/150,4 $^{\circ}$	0,011/69,5 $^{\circ}$	0,92/ $-14,0^{\circ}$	37,4
	200	0,51/ $-91,1^{\circ}$	19,6/130,4 $^{\circ}$	0,018/59,7 $^{\circ}$	0,79/ $-20,8^{\circ}$	31,5
	500	0,47/ $-143,6^{\circ}$	10,1/103,3 $^{\circ}$	0,028/56,0 $^{\circ}$	0,63/ $-24,5^{\circ}$	23,5
	800	0,47/ $-164,4^{\circ}$	6,6/ 70,0 $^{\circ}$	0,037/59,9 $^{\circ}$	0,60/ $-26,0^{\circ}$	19,5
14	1000	0,44/ $-174,9^{\circ}$	5,4/ 84,7 $^{\circ}$	0,043/62,4 $^{\circ}$	0,59/ $-27,5^{\circ}$	17,5
	1200	0,45/ $+177,0^{\circ}$	4,5/ 79,3 $^{\circ}$	0,049/64,0 $^{\circ}$	0,59/ $-29,4^{\circ}$	15,9
	1500	0,47/ $+167,8^{\circ}$	3,7/ 70,4 $^{\circ}$	0,059/62,5 $^{\circ}$	0,62/ $-32,4^{\circ}$	14,5
	2000	0,46/ $+152,2^{\circ}$	2,9/ 61,0 $^{\circ}$	0,075/64,7 $^{\circ}$	0,62/ $-37,5^{\circ}$	12,3

S-parameters (common emitter) at $V_{CE} = 10\text{ V}$; $T_{amb} = 25\text{ }^\circ\text{C}$; typical values (continued)

I_C mA	f MHz	S_{ie}	S_{fe}	S_{re}	S_{oe}	G_{UM} dB
20	40	0,52/ -28,1 ^o	33,9/164,9 ^o	0,005/77,6 ^o	0,96/ -7,5 ^o	43,0
	100	0,50/ -64,1 ^o	29,3/145,4 ^o	0,011/67,4 ^o	0,88/-15,5 ^o	37,1
	200	0,46/-104,5 ^o	21,0/124,4 ^o	0,016/59,7 ^o	0,73/-20,8 ^o	30,8
	500	0,46/-150,2 ^o	10,3/101,0 ^o	0,026/61,4 ^o	0,60/-22,1 ^o	23,2
	800	0,44/-165,7 ^o	6,7/ 89,7 ^o	0,037/66,1 ^o	0,58/-23,9 ^o	19,2
	1000	0,44/-175,7 ^o	5,4/ 84,2 ^o	0,044/68,6 ^o	0,58/-25,7 ^o	17,4
	1200	0,44/+178,5 ^o	4,5/ 79,6 ^o	0,050/69,8 ^o	0,57/-27,9 ^o	15,7
	1500	0,46/+164,3 ^o	3,7/ 69,2 ^o	0,058/65,8 ^o	0,62/-31,4 ^o	14,4
25	2000	0,46/+149,9 ^o	2,3/ 60,3 ^o	0,075/67,5 ^o	0,62/-36,6 ^o	12,2
	40	0,48/ -33,4 ^o	36,8/162,7 ^o	0,005/75,8 ^o	0,95/ -8,2 ^o	42,6
	100	0,47/ -72,9 ^o	30,3/141,7 ^o	0,010/65,2 ^o	0,85/-16,2 ^o	36,3
	200	0,45/-113,4 ^o	21,0/121,1 ^o	0,015/59,1 ^o	0,71/-20,2 ^o	30,5
	500	0,45/-156,0 ^o	9,9/ 99,1 ^o	0,025/62,9 ^o	0,60/-20,8 ^o	22,8
	800	0,45/-170,1 ^o	6,5/ 88,1 ^o	0,036/67,9 ^o	0,58/-23,1 ^o	19,0
	1000	0,44/-179,1 ^o	5,2/ 83,2 ^o	0,043/69,9 ^o	0,58/-25,0 ^o	17,0
	1200	0,44/+175,4 ^o	4,3/ 78,9 ^o	0,050/71,2 ^o	0,58/-27,4 ^o	15,4
1500	0,47/+162,2 ^o	3,5/ 68,5 ^o	0,058/67,3 ^o	0,62/-31,2 ^o	14,2	
2000	0,48/+148,5 ^o	2,7/ 59,4 ^o	0,074/68,8 ^o	0,62/-36,6 ^o	11,8	

s-parameters (common emitter) at $V_{CE} = 5\text{ V}$; $T_{amb} = 25\text{ }^\circ\text{C}$; typical values

I_C mA	f MHz	S_{ie}	S_{fe}	S_{re}	S_{oe}	G_{UM} dB
2	40	0,87/ -8,2 ^o	6,7/175,5 ^o	0,007/84,2 ^o	1,00/ -2,4 ^o	43,1
	100	0,86/ -20,9 ^o	6,6/166,5 ^o	0,016/78,8 ^o	0,99/ -6,0 ^o	38,7
	200	0,83/ -40,3 ^o	6,2/154,3 ^o	0,031/69,8 ^o	0,96/-11,0 ^o	32,3
	500	0,71/ -87,9 ^o	4,6/125,4 ^o	0,058/49,9 ^o	0,86/-21,3 ^o	22,3
	800	0,65/-119,8 ^o	3,5/105,6 ^o	0,069/40,3 ^o	0,80/-26,6 ^o	17,7
	1000	0,59/-134,3 ^o	2,9/ 97,1 ^o	0,071/37,9 ^o	0,78/-29,6 ^o	15,2
	1200	0,58/-148,1 ^o	2,5/ 88,8 ^o	0,074/36,0 ^o	0,76/-32,2 ^o	13,6
	1500	0,55/-163,0 ^o	2,0/ 76,3 ^o	0,077/35,9 ^o	0,78/-35,0 ^o	11,6
5	2000	0,52/+174,5 ^o	1,6/ 62,9 ^o	0,030/40,2 ^o	0,76/-40,5 ^o	9,2
	40	0,74/ -13,1 ^o	14,5/172,7 ^o	0,006/81,9 ^o	0,99/ -4,1 ^o	44,2
	100	0,72/ -32,6 ^o	13,9/160,4 ^o	0,015/74,7 ^o	0,97/ -9,7 ^o	38,0
	200	0,68/ -60,3 ^o	12,2/143,9 ^o	0,026/63,7 ^o	0,90/-16,7 ^o	31,6
	500	0,57/-115,7 ^o	7,6/113,6 ^o	0,043/48,2 ^o	0,73/-25,9 ^o	22,8
	800	0,54/-144,5 ^o	5,3/ 96,6 ^o	0,050/45,9 ^o	0,67/-28,9 ^o	18,6
	1000	0,50/-157,0 ^o	4,3/ 90,0 ^o	0,054/47,4 ^o	0,65/-30,7 ^o	16,4
	1200	0,50/-168,3 ^o	3,7/ 83,4 ^o	0,058/48,6 ^o	0,64/-32,8 ^o	14,9
1500	0,50/+178,9 ^o	2,9/ 72,7 ^o	0,067/49,5 ^o	0,67/-34,9 ^o	13,2	
2000	0,49/+160,3 ^o	2,2/ 61,3 ^o	0,078/54,2 ^o	0,66/-39,7 ^o	10,7	

s-parameters (common emitter) at $V_{CE} = 5\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$; typical values (continued)

I_C mA	f MHz	S_{ie}	S_{fe}	S_{re}	S_{oe}	G_{UM} dB
10	40	0,59/ -20,3 ^o	23,3/169,2 ^o	0,006/79,7 ^o	0,98/ -5,8 ^o	43,8
	100	0,57/ -48,4 ^o	21,4/152,9 ^o	0,013/70,4 ^o	0,93/ -13,3 ^o	37,0
	200	0,54/ -84,5 ^o	17,1/133,6 ^o	0,021/59,5 ^o	0,81/ -20,4 ^o	30,9
	500	0,49/ -139,3 ^o	9,2/105,3 ^o	0,032/52,2 ^o	0,64/ -25,4 ^o	22,8
	800	0,49/ -162,1 ^o	6,1/ 91,0 ^o	0,040/55,4 ^o	0,60/ -26,9 ^o	18,8
	1000	0,47/ -173,0 ^o	4,9/ 85,1 ^o	0,046/58,1 ^o	0,59/ -27,9 ^o	16,8
	1200	0,47/ +178,0 ^o	4,1/ 79,4 ^o	0,051/59,8 ^o	0,59/ -30,0 ^o	15,3
	1500	0,48/ +169,1 ^o	3,4/ 70,7 ^o	0,064/59,8 ^o	0,61/ -34,3 ^o	13,8
14	2000	0,48/ +153,0 ^o	2,6/ 60,5 ^o	0,080/62,6 ^o	0,60/ -39,4 ^o	11,4
	40	0,51/ -25,7 ^o	28,1/167,4 ^o	0,005/78,8 ^o	0,98/ -6,9 ^o	43,5
	100	0,50/ -59,3 ^o	25,0/149,1 ^o	0,012/68,4 ^o	0,91/ -15,3 ^o	36,6
	200	0,49/ -98,5 ^o	19,1/128,7 ^o	0,019/58,4 ^o	0,77/ -22,3 ^o	30,8
	500	0,48/ -149,2 ^o	9,7/102,2 ^o	0,029/55,2 ^o	0,61/ -25,8 ^o	22,9
	800	0,48/ -168,9 ^o	6,3/ 89,1 ^o	0,038/59,3 ^o	0,57/ -27,2 ^o	18,9
	1000	0,47/ -178,5 ^o	5,1/ 83,6 ^o	0,044/61,8 ^o	0,57/ -28,6 ^o	16,9
	1200	0,48/ +173,6 ^o	4,3/ 78,2 ^o	0,050/63,1 ^o	0,56/ -30,6 ^o	15,5
20	1500	0,48/ +164,7 ^o	3,5/ 69,5 ^o	0,062/63,3 ^o	0,60/ -33,6 ^o	13,9
	2000	0,48/ +149,7 ^o	2,7/ 59,5 ^o	0,079/65,2 ^o	0,59/ -38,8 ^o	11,5
	40	0,42/ -34,0 ^o	33,1/165,0 ^o	0,005/77,1 ^o	0,97/ -8,0 ^o	43,1
	100	0,44/ -74,8 ^o	28,2/144,4 ^o	0,011/66,3 ^o	0,87/ -17,0 ^o	36,2
	200	0,46/ -115,0 ^o	20,3/123,6 ^o	0,016/57,7 ^o	0,73/ -22,8 ^o	30,5
	500	0,48/ -159,0 ^o	9,8/ 99,1 ^o	0,026/58,9 ^o	0,58/ -24,3 ^o	22,8
	800	0,49/ -174,7 ^o	6,3/ 87,0 ^o	0,036/63,8 ^o	0,56/ -26,0 ^o	18,9
	1000	0,48/ +176,5 ^o	5,1/ 82,0 ^o	0,042/65,9 ^o	0,56/ -27,7 ^o	16,9
30	1200	0,49/ +169,6 ^o	4,3/ 76,8 ^o	0,049/66,9 ^o	0,56/ -30,0 ^o	15,4
	1500	0,49/ +160,6 ^o	3,4/ 68,0 ^o	0,061/66,8 ^o	0,60/ -32,6 ^o	13,8
	2000	0,49/ +146,6 ^o	2,6/ 58,7 ^o	0,079/68,4 ^o	0,60/ -38,0 ^o	11,4
	40	0,35/ -67,3 ^o	33,6/155,3 ^o	0,005/69,1 ^o	0,91/ -10,0 ^o	38,9
	100	0,45/ -116,5 ^o	24,2/130,1 ^o	0,010/56,5 ^o	0,78/ -16,4 ^o	32,7
	200	0,50/ -147,5 ^o	14,8/112,3 ^o	0,013/54,2 ^o	0,67/ -17,0 ^o	27,3
	500	0,53/ -174,4 ^o	6,6/ 95,1 ^o	0,022/63,7 ^o	0,62/ -18,9 ^o	19,9
	800	0,54/ +175,0 ^o	4,3/ 85,5 ^o	0,032/69,0 ^o	0,61/ -23,0 ^o	16,2
30	1000	0,53/ +168,1 ^o	3,5/ 81,2 ^o	0,039/70,9 ^o	0,61/ -25,9 ^o	14,4
	1200	0,55/ +162,6 ^o	3,0/ 76,1 ^o	0,045/71,9 ^o	0,61/ -29,1 ^o	13,0
	1500	0,57/ +154,5 ^o	2,4/ 67,8 ^o	0,057/71,4 ^o	0,64/ -33,2 ^o	11,5
	2000	0,57/ +141,1 ^o	1,8/ 58,7 ^o	0,075/73,4 ^o	0,64/ -39,8 ^o	9,2

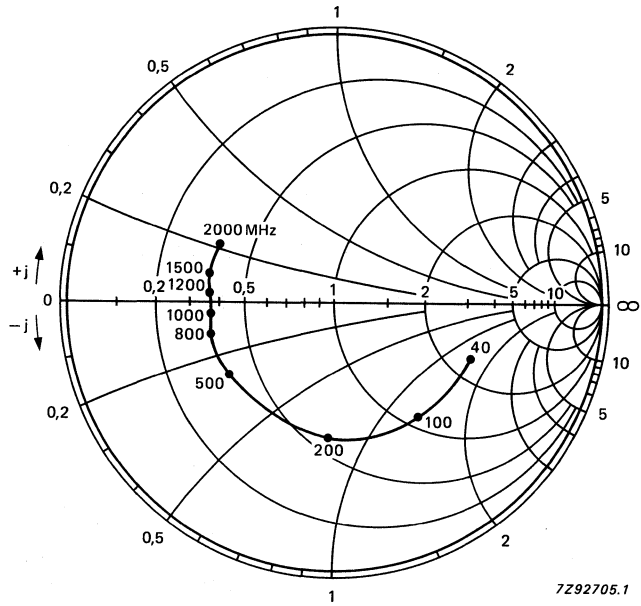


Fig. 2 Input impedance, derived from input reflection coefficient s_{ie} coordinates, in ohm x 50.

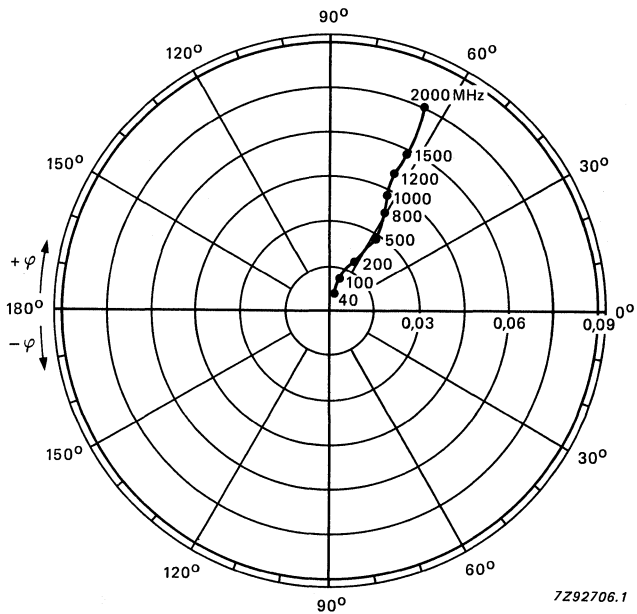


Fig. 3 Reverse transmission coefficient s_{re} .

Conditions for Figs 2 to 5: $V_{CE} = 10 \text{ V}$; $I_C = 14 \text{ mA}$; $T_{amb} = 25 \text{ }^\circ\text{C}$.

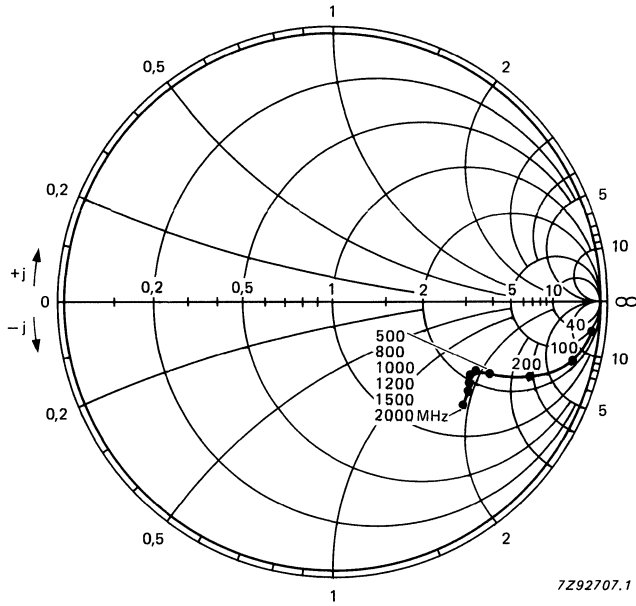


Fig. 4 Output impedance, derived from output reflection coefficient s_{oe} coordinates, in ohm x 50.

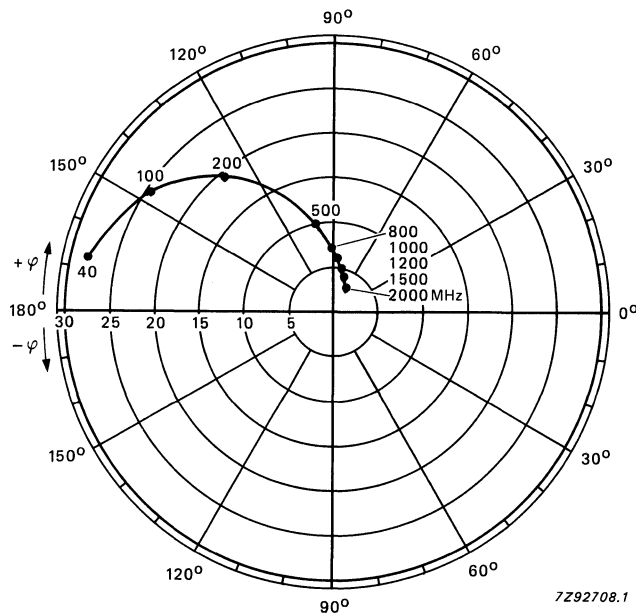


Fig. 5 Forward transmission coefficient s_{fe} .

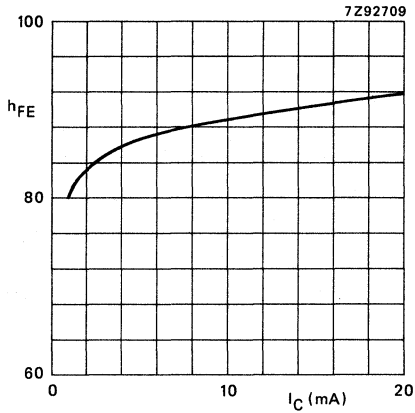


Fig. 6 $V_{CE} = 10\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$; typical values.

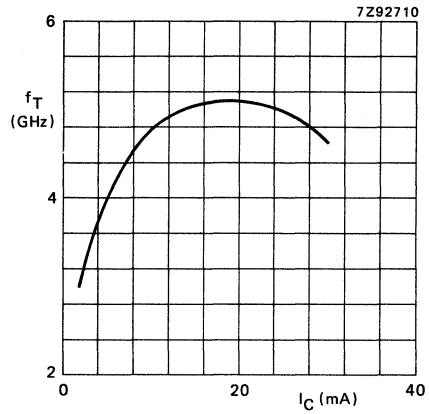


Fig. 7 $V_{CE} = 10\text{ V}$; $f = 500\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$; typical values.

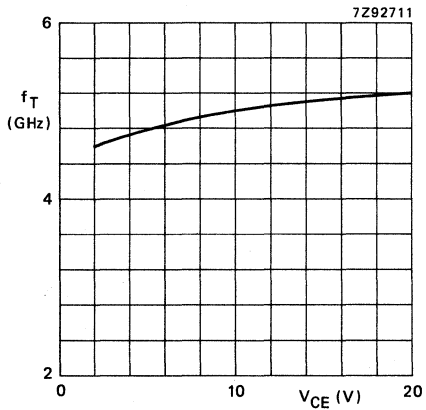


Fig. 8 $I_C = 14\text{ mA}$; $f = 500\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$; typical values.

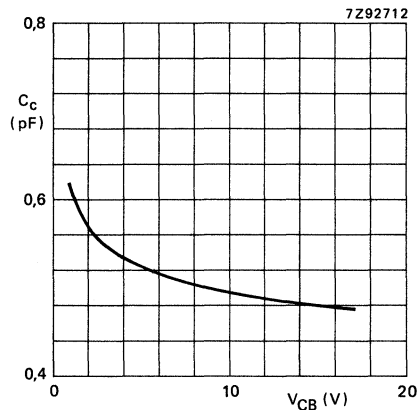


Fig. 9 $I_E = i_e = 0$; $f = 1\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$; typical values.

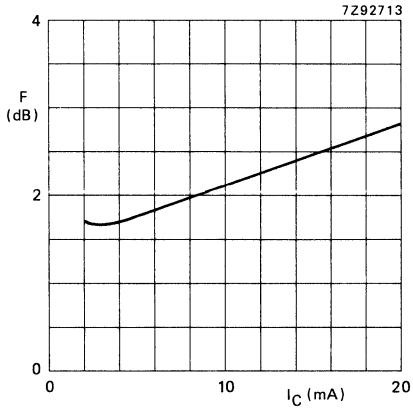


Fig. 10 $V_{CE} = 10$ V; $f = 800$ MHz; $Z_S = \text{opt.}$;
 $T_{\text{amb}} = 25$ °C; typical values.

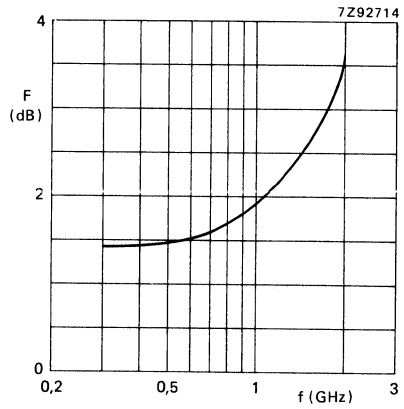


Fig. 11 $V_{CE} = 10$ V; $I_C = 4$ mA; $Z_S = \text{opt.}$;
 $T_{\text{amb}} = 25$ °C; typical values.

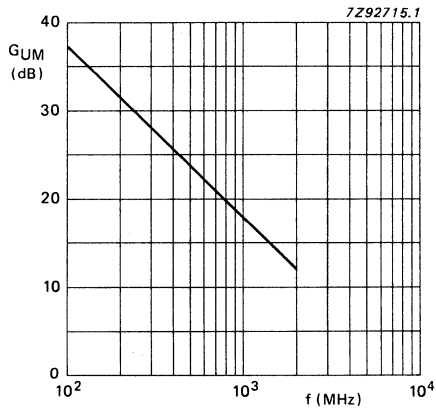


Fig. 12 $V_{CE} = 10$ V; $I_C = 14$ mA;
 $T_{\text{amb}} = 25$ °C. typical values.

N-P-N 2 GHz WIDEBAND TRANSISTOR

Gold-metallized n-p-n transistor in a sub-miniature HERMETICALLY SEALED micro-stripline envelope. The BFP91A features low noise, high gain and low distortion figures.

This device is designed for v.h.f. and u.h.f. wideband amplifiers and applications in the GHz range.

P-N-P complement is BFO23C.

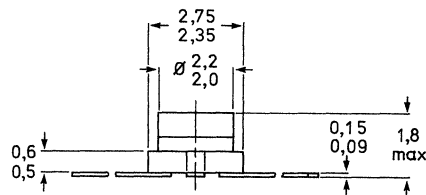
QUICK REFERENCE DATA

Collector-base voltage	V_{CBO}	max.	15 V
Collector-emitter voltage	V_{CEO}	max.	12 V
Collector current (d.c.)	I_C	max.	50 mA
Total power dissipation up to $T_{amb} = 105\text{ }^\circ\text{C}$	P_{tot}	max.	350 mW
Junction temperature	T_j	max.	175 $^\circ\text{C}$
D.C. current gain $I_C = 30\text{ mA}; V_{CE} = 5\text{ V}$	h_{FE}	min.	40
Transition frequency at $f = 500\text{ MHz}$ $I_C = 30\text{ mA}; V_{CE} = 5\text{ V}$	f_T	typ.	6,0 GHz
Maximum unilateral power gain $I_C = 30\text{ mA}; V_{CE} = 8\text{ V}$ at $f = 500\text{ MHz}$ at $f = 800\text{ MHz}$	G_{UM}	typ.	22,5 dB 18,5 dB

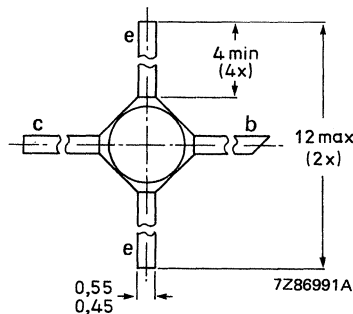
MECHANICAL DATA

Fig. 1 SOT-173.

Dimensions in mm



Marking code: P1



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	15 V
Collector-emitter voltage (open base)	V_{CEO}	max.	12 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2 V
Collector current (d.c.)	I_C	max.	50 mA
Total power dissipation up to $T_{amb} = 105\text{ }^\circ\text{C}$ mounted on a ceramic substrate of $0,7\text{ mm} \times 10\text{ cm}^2$	P_{tot}	max.	350 mW
Storage temperature	T_{stg}		$-65\text{ to } +150\text{ }^\circ\text{C}$
Junction temperature	T_j	max.	175 $^\circ\text{C}$

THERMAL RESISTANCE

→ From junction to ambient in free air mounted on a ceramic substrate of $0,7\text{ mm} \times 10\text{ cm}^2$	$R_{th\ j-a}$	=	200 K/W
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CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Collector cut-off current

$$I_E = 0; V_{CB} = 10\text{ V}$$

I_{CBO}	max.	50 nA
-----------	------	-------

D.C. current gain

$$I_C = 30\text{ mA}; V_{CE} = 5\text{ V}$$

h_{FE}	min.	40
	typ.	90

Transition frequency at $f = 500\text{ MHz}$

$$I_C = 30\text{ mA}; V_{CE} = 5\text{ V}$$

f_T	typ.	6,0 GHz
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Collector capacitance at $f = 1\text{ MHz}$

$$I_E = i_e = 0; V_{CB} = 10\text{ V}$$

C_c	typ.	0,7 pF
-------	------	--------

Emitter capacitance at $f = 1\text{ MHz}$

$$I_C = i_c = 0; V_{EB} = 0,5\text{ V}$$

C_e	typ.	2,5 pF
-------	------	--------

Feedback capacitance at $f = 1\text{ MHz}$

$$I_C = 0; V_{CE} = 10\text{ V}$$

C_{re}	typ.	0,5 pF
----------	------	--------

Maximum unilateral power gain (s_{re} assumed to be zero)

$$G_{UM} = 10 \log \frac{|s_{fe}|^2}{[1 - |s_{ie}|^2] [1 - |s_{oe}|^2]}$$

at $I_C = 30\text{ mA}; V_{CE} = 8\text{ V}; T_{amb} = 25\text{ }^\circ\text{C}$

$f = 500\text{ MHz}$

$f = 800\text{ MHz}$

G_{UM}	typ.	22,5 dB
	typ.	18,5 dB

→ Noise figure at $f = 800\text{ MHz}; Z_S = \text{opt.}; T_{amb} = 25\text{ }^\circ\text{C}$

$$I_C = 4\text{ mA}; V_{CE} = 8\text{ V}$$

$$I_C = 30\text{ mA}; V_{CE} = 8\text{ V}$$

F	typ.	1,6 dB
	typ.	2,3 dB

s-parameters (common emitter) at $V_{CE} = 8 \text{ V}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

I_C mA	f MHz	s_{ie}	s_{fe}	s_{re}	s_{oe}	GUM dB
2	40	0,92/ -13,6°	6,8/172,5°	0,011/81,7°	0,99/ -3,9°	41,8
	100	0,90/ -33,2°	6,8/160,7°	0,027/72,9°	0,97/ -9,0°	36,2
	200	0,86/ -62,0°	6,0/143,6°	0,048/59,0°	0,92/ -15,6°	29,5
	500	0,79/ -117,3°	3,8/111,1°	0,075/35,5°	0,78/ -26,8°	19,9
	800	0,73/ -144,5°	2,6/ 93,6°	0,080/27,4°	0,73/ -32,5°	14,9
	1000	0,71/ -157,6°	2,1/ 85,2°	0,081/25,5°	0,72/ -36,6°	12,7
	1200	0,71/ -167,6°	1,8/ 77,8°	0,081/24,7°	0,72/ -40,5°	11,3
	1500	0,68/ -178,8°	1,5/ 68,1°	0,090/24,5°	0,69/ -46,5°	8,8
2000	0,68/ +163,8°	1,2/ 54,6°	0,088/30,2°	0,68/ -55,2°	6,7	
5	40	0,81/ -19,5°	16,0/169,4°	0,011/79,3°	0,98/ -6,9°	42,7
	100	0,79/ -46,6°	14,5/153,7°	0,024/67,7°	0,93/ -15,8°	36,2
	200	0,74/ -82,4°	11,8/133,9°	0,040/52,9°	0,80/ -25,4°	29,3
	500	0,69/ -136,4°	6,5/103,9°	0,056/36,1°	0,60/ -35,3°	21,0
	800	0,66/ -158,8°	4,3/ 89,5°	0,061/35,2°	0,55/ -38,5°	16,7
	1000	0,65/ -169,4°	3,5/ 82,7°	0,064/36,8°	0,54/ -41,3°	14,8
	1200	0,65/ -177,2°	2,9/ 76,7°	0,066/38,6°	0,53/ -44,3°	13,1
	1500	0,60/ +172,1°	2,3/ 68,5°	0,083/42,5°	0,49/ -49,2°	10,5
2000	0,60/ +158,0°	1,8/ 56,9°	0,095/48,3°	0,49/ -56,1°	8,2	
10	40	0,70/ -27,3°	26,2/165,5°	0,010/76,7°	0,97/ -10,5°	43,6
	100	0,68/ -63,2°	22,8/146,5°	0,021/62,8°	0,86/ -23,2°	35,7
	200	0,66/ -102,8°	16,9/125,5°	0,032/49,2°	0,68/ -34,3°	29,7
	500	0,64/ -150,7°	8,3/ 98,9°	0,043/40,6°	0,46/ -41,9°	21,7
	800	0,63/ -167,1°	5,5/ 86,1°	0,048/45,8°	0,43/ -43,1°	17,9
	1000	0,62/ -176,9°	4,4/ 81,2°	0,056/47,4°	0,41/ -45,2°	15,8
	1200	0,62/ -176,9°	3,6/ 76,1°	0,061/49,9°	0,40/ -47,6°	14,0
	1500	0,57/ +165,6°	3,0/ 68,6°	0,084/53,2°	0,36/ -52,3°	11,8
2000	0,58/ +153,5°	2,3/ 58,0°	0,103/55,7°	0,35/ -58,1°	9,4	
20	40	0,55/ -40,8°	40,6/160,3°	0,009/73,3°	0,93/ -15,8°	12,4
	100	0,57/ -86,4°	32,5/137,6°	0,017/58,1°	0,77/ -32,6°	35,9
	200	0,59/ -125,5°	21,6/117,0°	0,024/48,7°	0,54/ -43,9°	30,0
	500	0,62/ -163,2°	9,9/ 94,4°	0,035/49,6°	0,34/ -49,0°	22,6
	800	0,60/ -176,3°	6,3/ 84,5°	0,046/55,5°	0,30/ -49,2°	18,3
	1000	0,59/ +175,8°	5,1/ 79,3°	0,053/58,1°	0,30/ -49,9°	16,4
	1200	0,59/ +171,1°	4,3/ 74,8°	0,061/59,7°	0,30/ -52,0°	14,9
	1500	0,55/ +161,8°	3,4/ 68,6°	0,088/61,0°	0,25/ -57,7°	12,5
2000	0,56/ +150,8°	2,6/ 58,8°	0,111/61,2°	0,25/ -61,8°	10,1	
30	40	0,48/ -50,4°	48,6/157,4°	0,008/71,2°	0,91/ -18,7°	42,5
	100	0,53/ -99,7°	36,9/133,2°	0,015/56,5°	0,71/ -37,4°	35,8
	200	0,57/ -135,7°	23,2/113,3°	0,021/49,7°	0,48/ -48,0°	30,2
	500	0,60/ -167,9°	10,4/ 93,1°	0,032/54,2°	0,29/ -52,2°	22,5
	800	0,59/ -180,0°	6,6/ 83,6°	0,044/54,9°	0,27/ -52,0°	18,5
	1000	0,59/ +173,4°	5,3/ 78,6°	0,053/61,8°	0,27/ -52,2°	16,7
	1200	0,59/ +169,2°	4,4/ 74,3°	0,060/62,8°	0,26/ -54,3°	45,0
	1500	0,56/ +160,2°	3,5/ 68,2°	0,089/63,3°	0,21/ -59,7°	12,8
2000	0,55/ +149,4°	2,7/ 59,0°	0,113/62,3°	0,21/ -64,5°	10,5	

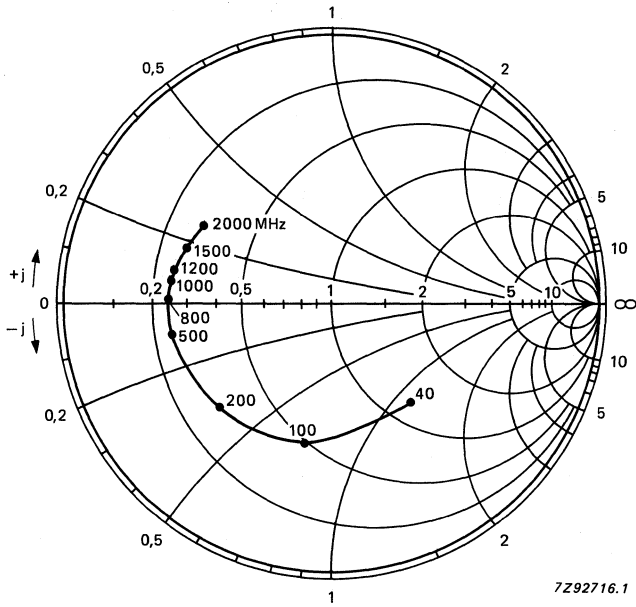


Fig. 2 Input impedance, derived from input reflection coefficient s_{ie} coordinates, in ohm x 50.

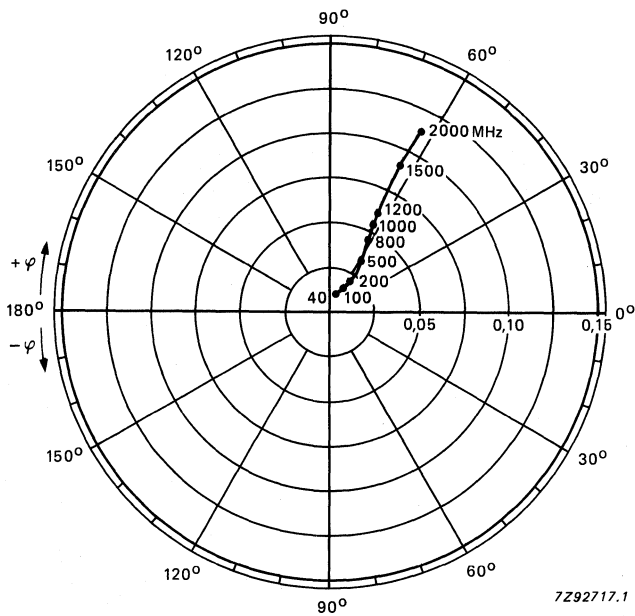


Fig. 3 Reverse transmission coefficient s_{re} .

Conditions for Figs 2 to 5: $V_{CE} = 8 \text{ V}$; $I_C = 30 \text{ mA}$; $T_{amb} = 25 \text{ }^\circ\text{C}$.

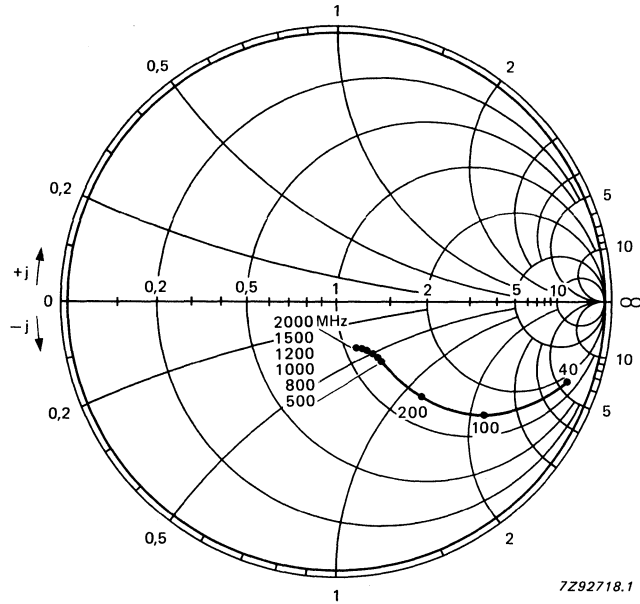


Fig. 4 Output impedance, derived from output reflection coefficient s_{0e} coordinates, in ohm x 50.

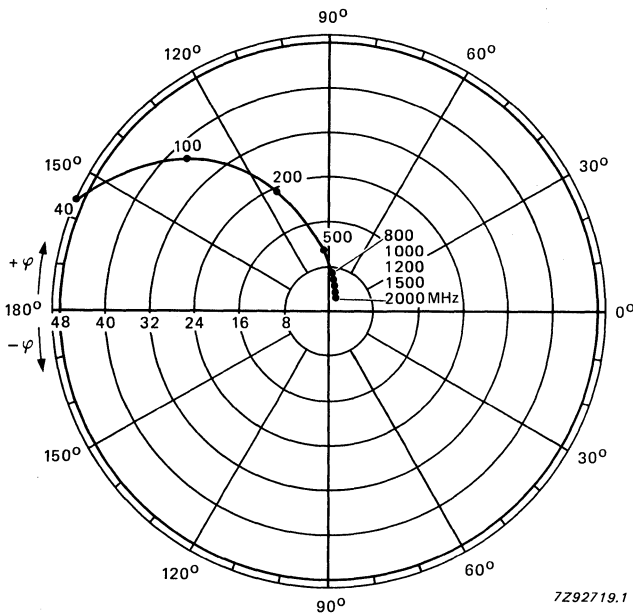


Fig. 5 Forward transmission coefficient s_{fe} .

BFP91A

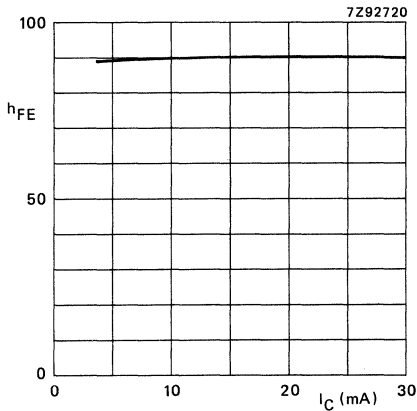


Fig. 6 $V_{CE} = 5\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$; typical values.

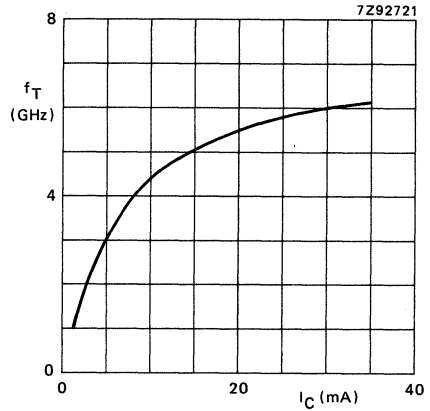


Fig. 7 $V_{CE} = 5\text{ V}$; $f = 500\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$; typical values.

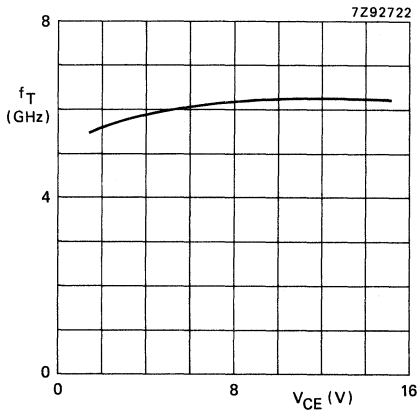


Fig. 8 $I_C = 30\text{ mA}$; $f = 500\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$; typical values.

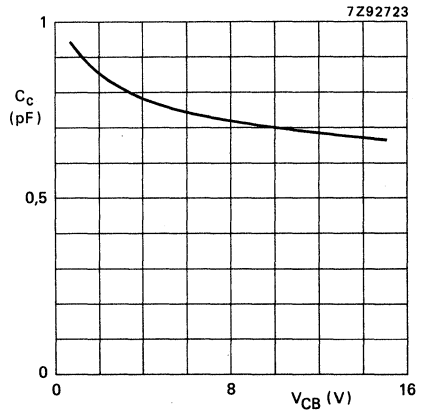


Fig. 9 $I_E = i_e = 0$; $f = 1\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$; typical values.

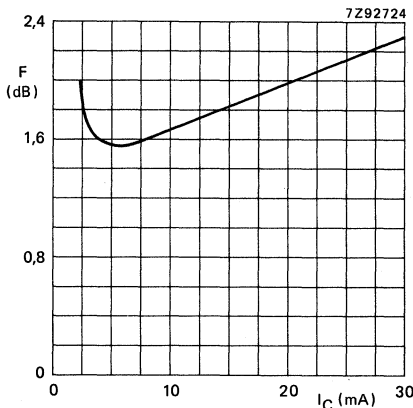


Fig. 10 $V_{CE} = 8\text{ V}$; $f = 800\text{ MHz}$; $Z_S = \text{opt.}$; $T_{\text{amb}} = 25\text{ }^\circ\text{C}$; typical values.

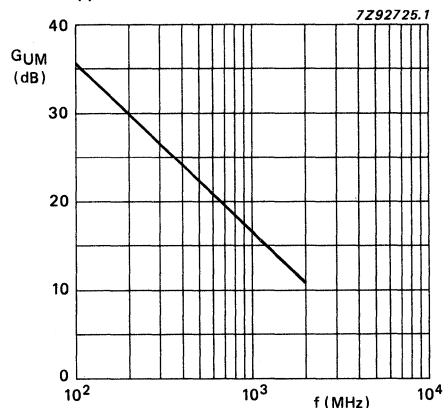


Fig. 11 $V_{CE} = 8\text{ V}$; $I_C = 30\text{ mA}$; $T_{\text{amb}} = 25\text{ }^\circ\text{C}$; typical values.

N-P-N 2 GHz WIDEBAND TRANSISTOR

N-P-N transistor in a sub-miniature HERMETICALLY SEALED micro-stripline envelope. The BFP96 features low noise, high gain and low distortion figures.

This device is designed for v.h.f. and u.h.f. wideband amplifiers and applications in the GHz range.

P-N-P complement is BFQ32C.

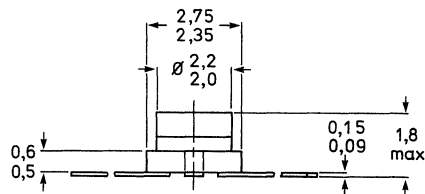
QUICK REFERENCE DATA

Collector-base voltage	V_{CBO}	max.	20 V
Collector-emitter voltage	V_{CEO}	max.	15 V
Collector current (d.c.)	I_C	max.	100 mA
Total power dissipation up to $T_{amb} = 75\text{ }^\circ\text{C}$	P_{tot}	max.	500 mW
Junction temperature	T_j	max.	175 $^\circ\text{C}$
D.C. current gain $I_C = 50\text{ mA}; V_{CE} = 10\text{ V}$	h_{FE}	min.	25
Transition frequency at $f = 500\text{ MHz}$ $I_C = 50\text{ mA}; V_{CE} = 10\text{ V}$	f_T	typ.	5,0 GHz
Maximum unilateral power gain $I_C = 50\text{ mA}; V_{CE} = 10\text{ V}$ at $f = 500\text{ MHz}$ at $f = 800\text{ MHz}$	G _{UM}	typ.	19,0 dB 15,0 dB

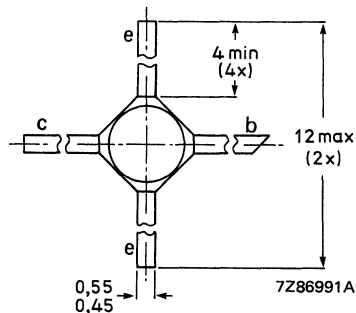
MECHANICAL DATA

Fig. 1 SOT-173.

Dimensions in mm



Marking code: P6



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	20 V
Collector-emitter voltage (open base)	V_{CEO}	max.	15 V
Emitter-base voltage (open collector)	V_{EB0}	max.	3 V
Collector current (d.c.)	I_C	max.	100 mA
Total power dissipation up to $T_{amb} = 75\text{ }^\circ\text{C}$ mounted on a ceramic substrate of 0,7 mm x 10 cm ²	P_{tot}	max.	500 mW
Storage temperature	T_{stg}	-65 to +150	$^\circ\text{C}$
Junction temperature	T_j	max.	175 $^\circ\text{C}$

THERMAL RESISTANCE

→ From junction to ambient in free air mounted on a ceramic substrate of 0,7 mm x 10 cm ²	$R_{th\ j-a}$	=	200 K/W
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CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Collector cut-off current

$$I_E = 0; V_{CB} = 10\text{ V}$$

I_{CBO}	max.	100 nA
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D.C. current gain

$$I_C = 50\text{ mA}; V_{CE} = 10\text{ V}$$

h_{FE}	min.	25
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Transition frequency at $f = 500\text{ MHz}$

$$I_C = 50\text{ mA}; V_{CE} = 10\text{ V}$$

f_T	typ.	5,0 GHz
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Collector capacitance at $f = 1\text{ MHz}$

$$I_E = i_e = 0; V_{CB} = 10\text{ V}$$

C_c	typ.	1,3 pF
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Emitter capacitance at $f = 1\text{ MHz}$

$$I_C = i_c = 0; V_{EB} = 0,5\text{ V}$$

C_e	typ.	5,5 pF
-------	------	--------

Feedback capacitance at $f = 1\text{ MHz}$

$$I_C = 0; V_{CE} = 10\text{ V}$$

C_{re}	typ.	1,0 pF
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Maximum unilateral power gain (s_{re} assumed to be zero)

$$G_{UM} = 10 \log \frac{|s_{fe}|^2}{[1 - |s_{ie}|^2] [1 - |s_{oe}|^2]}$$

at $I_C = 50\text{ mA}; V_{CE} = 10\text{ V}; T_{amb} = 25\text{ }^\circ\text{C}$

$f = 500\text{ MHz}$

$f = 800\text{ MHz}$

G_{UM}	typ.	19,0 dB
	typ.	15,0 dB

→ Noise figure at $f = 800\text{ MHz}; Z_S = \text{opt.}; T_{amb} = 25\text{ }^\circ\text{C}$

$$I_C = 50\text{ mA}; V_{CE} = 10\text{ V}$$

F	typ.	3,7 dB
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→

s-parameters (common emitter) at $V_{CE} = 10 \text{ V}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

I_C mA	f MHz	S_{ie}	S_{fe}	S_{re}	S_{oe}	G_{UM} dB
10	40	0,73/ -50,1 ^o	26,3/153,9 ^o	0,020/67,3 ^o	0,90/ -22,1 ^o	38,9
	100	0,72/ -99,3 ^o	18,7/128,4 ^o	0,036/47,4 ^o	0,67/ -41,7 ^o	31,2
	200	0,71/-136,2 ^o	11,2/108,6 ^o	0,045/37,3 ^o	0,44/ -51,9 ^o	25,0
	500	0,71/-167,7 ^o	4,8/ 88,2 ^o	0,057/38,8 ^o	0,29/ -58,8 ^o	17,1
	800	0,71/-179,3 ^o	3,1/ 75,9 ^o	0,070/45,0 ^o	0,29/ -63,8 ^o	13,3
	1000	0,70/+174,9 ^o	2,5/ 71,1 ^o	0,078/48,9 ^o	0,29/ -66,8 ^o	11,3
	1200	0,70/+170,2 ^o	2,1/ 65,5 ^o	0,087/51,1 ^o	0,30/ -71,5 ^o	9,8
	1500	0,71/+161,3 ^o	1,7/ 55,4 ^o	0,098/50,5 ^o	0,34/ -74,2 ^o	8,1
2000	0,72/+152,0 ^o	1,3/ 42,8 ^o	0,119/52,1 ^o	0,35/ -87,0 ^o	5,9	
15	40	0,67/ -60,5 ^o	32,9/150,2 ^o	0,018/64,0 ^o	0,87/ -27,4 ^o	39,1
	100	0,69/-111,5 ^o	22,0/123,6 ^o	0,031/44,8 ^o	0,60/ -50,0 ^o	31,5
	200	0,70/-144,2 ^o	12,9/105,5 ^o	0,038/37,5 ^o	0,38/ -62,3 ^o	25,8
	500	0,71/-171,5 ^o	5,5/ 86,8 ^o	0,051/43,0 ^o	0,23/ -69,8 ^o	18,0
	800	0,71/+178,5 ^o	3,5/ 75,4 ^o	0,064/49,2 ^o	0,22/ -73,2 ^o	14,1
	1000	0,69/+173,1 ^o	2,8/ 70,4 ^o	0,075/52,1 ^o	0,22/ -75,1 ^o	12,1
	1200	0,70/+169,0 ^o	2,4/ 65,1 ^o	0,085/53,7 ^o	0,23/ -80,0 ^o	10,6
	1500	0,70/+159,7 ^o	1,9/ 57,0 ^o	0,100/54,0 ^o	0,26/ -82,8 ^o	8,8
2000	0,71/+151,3 ^o	1,5/ 45,0 ^o	0,121/54,1 ^o	0,26/ -93,0 ^o	6,6	
20	40	0,64/ -69,4 ^o	38,8/146,7 ^o	0,017/61,9 ^o	0,84/ -32,3 ^o	39,3
	100	0,67/-120,4 ^o	24,3/120,1 ^o	0,027/43,8 ^o	0,54/ -57,4 ^o	31,8
	200	0,69/-149,7 ^o	13,9/103,5 ^o	0,034/39,4 ^o	0,33/ -71,9 ^o	26,2
	500	0,71/-173,4 ^o	5,8/ 86,5 ^o	0,048/47,3 ^o	0,20/ -83,3 ^o	18,5
	800	0,71/+177,4 ^o	3,7/ 75,6 ^o	0,063/52,6 ^o	0,18/ -86,7 ^o	14,5
	1000	0,70/+172,2 ^o	3,0/ 71,0 ^o	0,075/55,0 ^o	0,18/ -87,5 ^o	12,6
	1200	0,70/+168,5 ^o	2,5/ 65,7 ^o	0,085/56,0 ^o	0,19/ -91,8 ^o	11,1
	1500	0,69/+159,0 ^o	2,1/ 58,1 ^o	0,102/56,6 ^o	0,21/ -91,4 ^o	9,3
2000	0,70/+151,0 ^o	1,5/ 46,4 ^o	0,124/55,7 ^o	0,22/-100,8 ^o	7,0	
30	40	0,61/ -79,4 ^o	45,6/142,2 ^o	0,016/59,2 ^o	0,79/ -39,3 ^o	39,4
	100	0,66/-128,6 ^o	26,8/116,6 ^o	0,025/43,9 ^o	0,48/ -68,1 ^o	32,2
	200	0,68/-155,2 ^o	14,8/101,3 ^o	0,031/43,0 ^o	0,28/ -87,0 ^o	26,5
	500	0,70/-176,0 ^o	6,1/ 86,1 ^o	0,047/53,4 ^o	0,17/-107,7 ^o	18,8
	800	0,69/+175,6 ^o	3,9/ 76,3 ^o	0,066/58,7 ^o	0,16/-110,7 ^o	14,7
	1000	0,68/+170,5 ^o	3,1/ 72,2 ^o	0,079/60,9 ^o	0,16/-109,9 ^o	12,6
	1200	0,69/+167,1 ^o	2,6/ 67,2 ^o	0,090/61,3 ^o	0,16/-111,5 ^o	11,2
	1500	0,69/+158,4 ^o	2,2/ 59,2 ^o	0,107/59,5 ^o	0,17/-104,7 ^o	9,9
2000	0,70/+150,5 ^o	1,6/ 47,9 ^o	0,132/57,5 ^o	0,17/-112,6 ^o	7,4	
50	40	0,58/ -91,5 ^o	52,3/136,8 ^o	0,015/56,4 ^o	0,71/ -47,1 ^o	39,3
	100	0,64/-137,0 ^o	28,4/112,4 ^o	0,022/44,8 ^o	0,41/ -78,0 ^o	32,2
	200	0,66/-159,6 ^o	15,5/ 99,2 ^o	0,028/17,9 ^o	0,25/-100,3 ^o	26,6
	500	0,68/-176,9 ^o	6,6/ 85,6 ^o	0,048/57,9 ^o	0,17/-124,8 ^o	19,0
	800	0,68/-175,5 ^o	4,2/ 76,1 ^o	0,069/61,0 ^o	0,16/-128,5 ^o	15,0
	1000	0,68/+170,4 ^o	3,3/ 72,8 ^o	0,082/62,4 ^o	0,15/-128,1 ^o	13,2
	1200	0,68/+166,8 ^o	2,8/ 66,8 ^o	0,094/62,1 ^o	0,16/-129,4 ^o	11,8
	1500	0,69/+157,6 ^o	2,3/ 59,7 ^o	0,106/60,7 ^o	0,14/-122,7 ^o	10,3
2000	0,70/+149,6 ^o	1,7/ 48,7 ^o	0,130/58,0 ^o	0,19/-129,8 ^o	7,8	

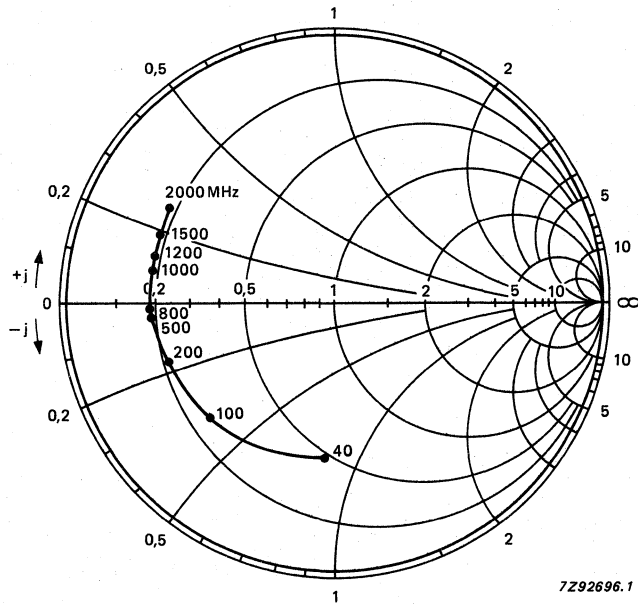


Fig. 2 Input impedance, derived from input reflection coefficient s_{ie} coordinates, in ohm x 50.

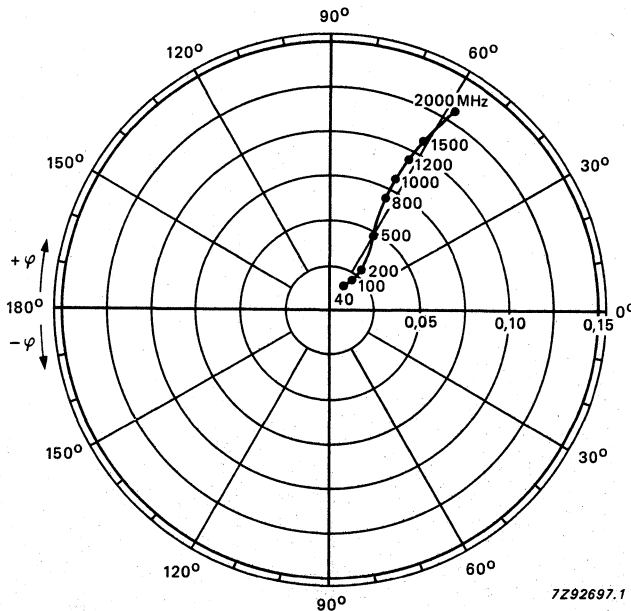


Fig. 3 Reverse transmission coefficient s_{re} .

Conditions for Figs 2 to 5: $V_{CE} = 10 \text{ V}$; $I_C = 50 \text{ mA}$; $T_{amb} = 25 \text{ }^\circ\text{C}$.

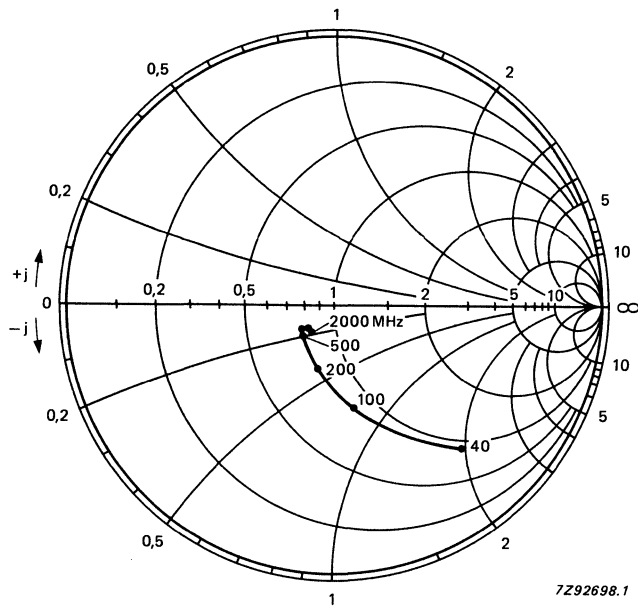


Fig. 4 Output impedance, derived from output reflection coefficient s_{oE} coordinates, in ohm x 50.

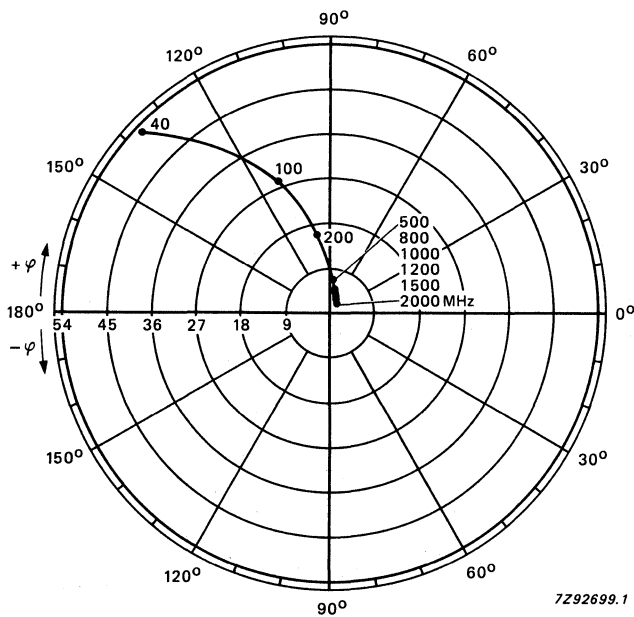


Fig. 5 Forward transmission coefficient s_{fE} .

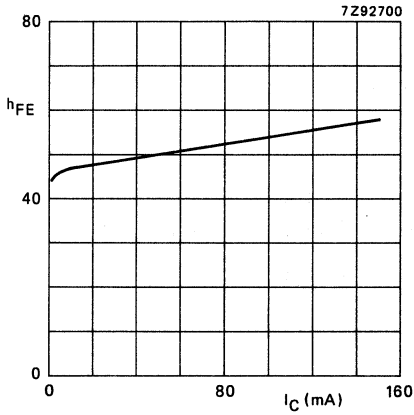


Fig. 6 $V_{CE} = 10\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$; typical values.

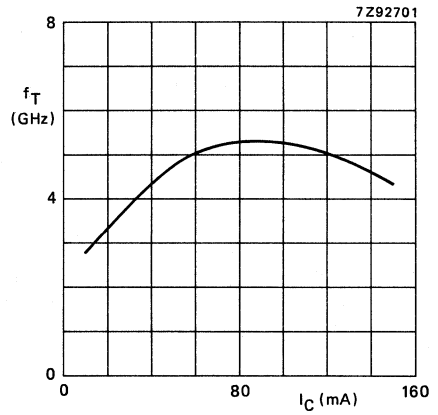


Fig. 7 $V_{CE} = 10\text{ V}$; $f = 500\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$; typical values.

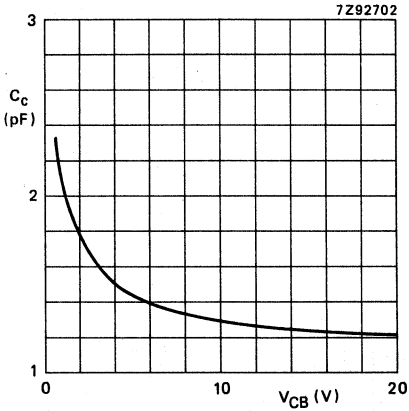


Fig. 8 $I_E = I_C$; $f = 1\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$; typical values.

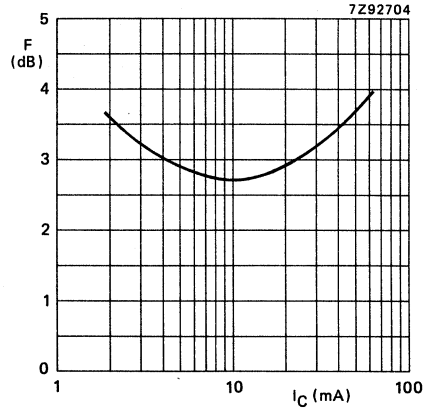


Fig. 9 $V_{CE} = 10\text{ V}$; $f = 800\text{ MHz}$; $Z_S = \text{opt.}$; $T_{\text{amb}} = 25\text{ }^\circ\text{C}$; typical values.

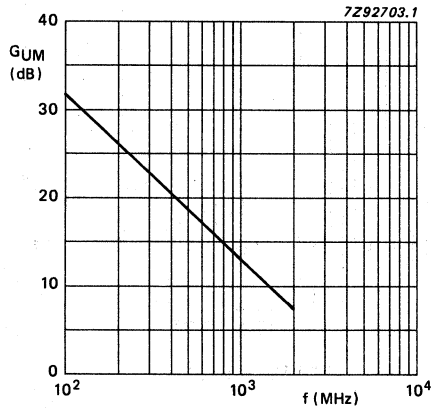


Fig. 10 $V_{CE} = 10\text{ V}$; $I_C = 50\text{ mA}$; $T_{\text{amb}} = 25\text{ }^\circ\text{C}$; typical values.

N-P-N H.F. WIDEBAND TRANSISTOR



N-P-N multi-emitter transistor in a SOT-89 plastic envelope intended for application in thick and thin-film circuits. The transistor has extremely good intermodulation properties and a high power gain. It is primarily intended for:

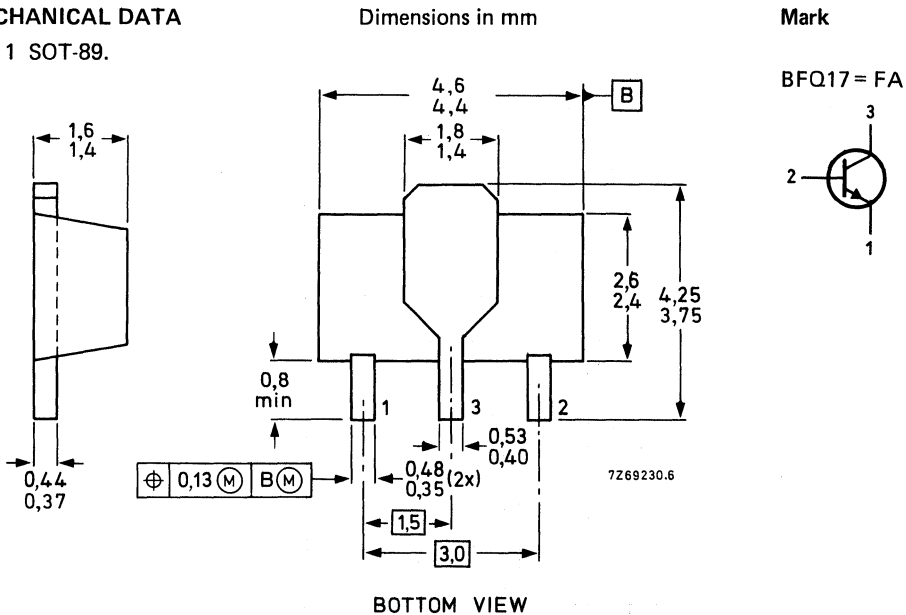
- Output and driver stages of channel and band serial amplifiers with high output power for bands I, II, III and IV/V (40–860 MHz).
- Output and driver stages of wideband amplifiers.

QUICK REFERENCE DATA

Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	40 V
Collector-emitter voltage (open base)	V_{CEO}	max.	25 V
Collector current (peak value; $f > 1$ MHz)	I_{CM}	max.	300 mA
Total power dissipation up to $T_{amb} = 25$ °C	P_{tot}	max.	1 W
Junction temperature	T_j	max.	150 °C
Transition frequency at $f = 500$ MHz $I_C = 150$ mA; $V_{CE} = 15$ V	f_T	typ.	1,2 GHz
Feedback capacitance at $f = 1$ MHz $I_C = 10$ mA; $V_{CE} = 15$ V;	C_{re}	typ.	1,9 pF

MECHANICAL DATA

Fig. 1 SOT-89.



See also *Soldering recommendations*.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	40	V
Collector-emitter voltage ($R_{BE} \leq 50 \Omega$; peak value)	V_{CERM}	max.	40	V 1)
Collector-emitter voltage (open base)	V_{CEO}	max.	25	V 1)
Emitter-base voltage (open collector)	V_{EBO}	max.	2	V
Collector current (d. c.)	I_C	max.	150	mA
Collector current (peak value; $f > 1$ MHz)	I_{CM}	max.	300	mA
Total power dissipation up to $T_{amb} = 25 \text{ }^\circ\text{C}$ mounted on a ceramic substrate area = 2,5 cm ² ; thickness = 0,7 mm	P_{tot}	max.	1	W
Storage temperature	T_{stg}		-65 to +150	$^\circ\text{C}$
Junction temperature	T_j	max.	150	$^\circ\text{C}$
THERMAL RESISTANCE				
From junction to collector tab	$R_{thj-tab}$	=	30	K/W
From junction to ambient in free air mounted on a ceramic substrate area = 2,5 cm ² ; thickness = 0,7 mm	R_{thj-a}	=	125	K/W

1) $I_C = 10$ mA.

CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Collector cut-off current

$I_E = 0; V_{CB} = 20\text{ V}; T_j = 150\text{ }^\circ\text{C}$ I_{CBO} max. 20 μA

Saturation voltage

$I_C = 100\text{ mA}; I_B = 10\text{ mA}$ V_{CEsat} max. 0,5 V

D. C. current gain

$I_C = 50\text{ mA}; V_{CE} = 5\text{ V}$ h_{FE} min. 25

$I_C = 150\text{ mA}; V_{CE} = 5\text{ V}$ h_{FE} min. 25

Transition frequency at $f = 500\text{ MHz}$ 1)

$I_C = 150\text{ mA}; V_{CE} = 15\text{ V}$ f_T typ. 1,2 GHz

Collector capacitance at $f = 1\text{ MHz}$

$I_E = I_e = 0; V_{CB} = 15\text{ V}$ C_c max. 4 pF

Feedback capacitance at $f = 1\text{ MHz}$

$I_C = 10\text{ mA}; V_{CE} = 15\text{ V}; T_{amb} = 25\text{ }^\circ\text{C}$ C_{re} typ. 1,9 pF

Max. unilateral power gain (s_{re} assumed to be zero)

$$G_{UM} = 10 \log \frac{|s_{fe}|^2}{(1 - |s_{ie}|^2)(1 - |s_{oe}|^2)}$$

$I_C = 60\text{ mA}; V_{CE} = 15\text{ V}; T_{amb} = 25\text{ }^\circ\text{C};$

$f = 200\text{ MHz}$

$f = 800\text{ MHz}$

G_{UM} typ. 16 dB

G_{UM} typ. 6,5 dB

1) Measured under pulse conditions.

7Z72947

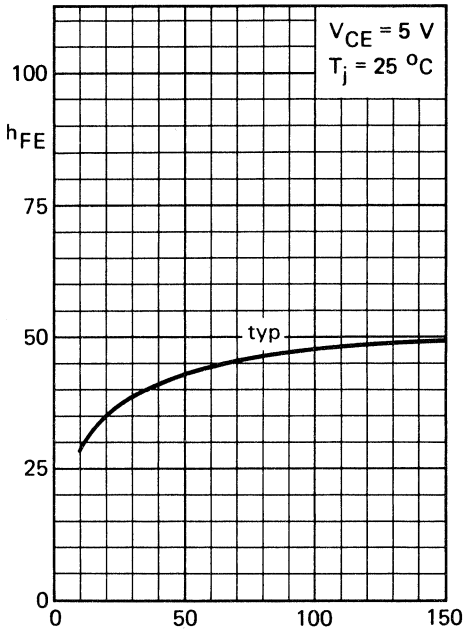


Fig. 2. $V_{CE} = 5\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$; I_C (mA) typical values

7Z72950

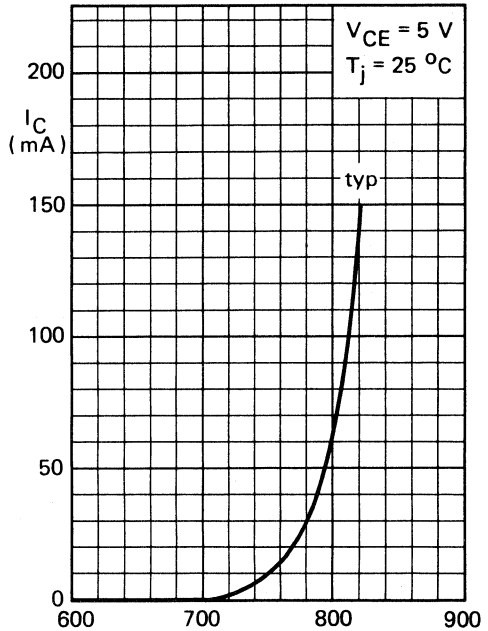


Fig. 3. $V_{CE} = 5\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$; V_{BE} (mV) typical values

7Z72948

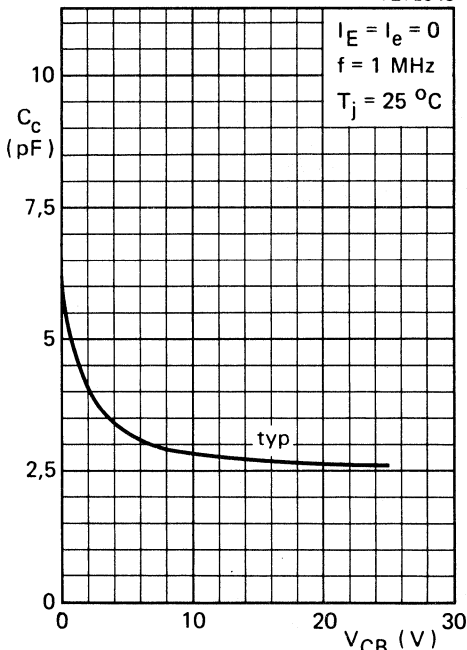


Fig. 4. $I_E = I_e = 0$; $f = 1\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$; typical values

7Z73167

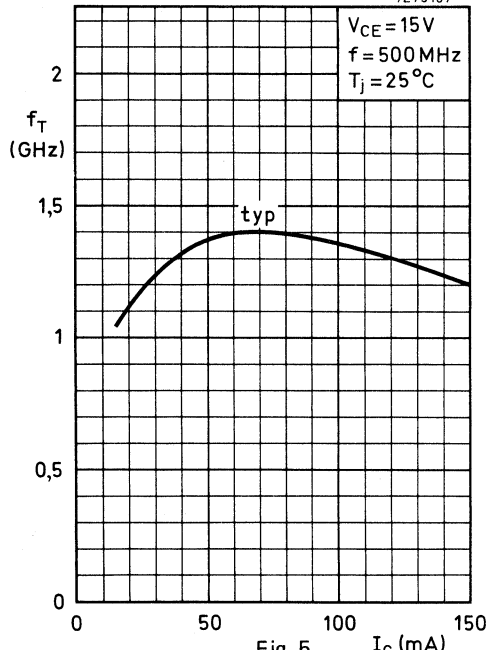


Fig. 5. $V_{CE} = 15\text{ V}$; $f = 500\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$; typical values

N-P-N H.F. WIDEBAND TRANSISTOR

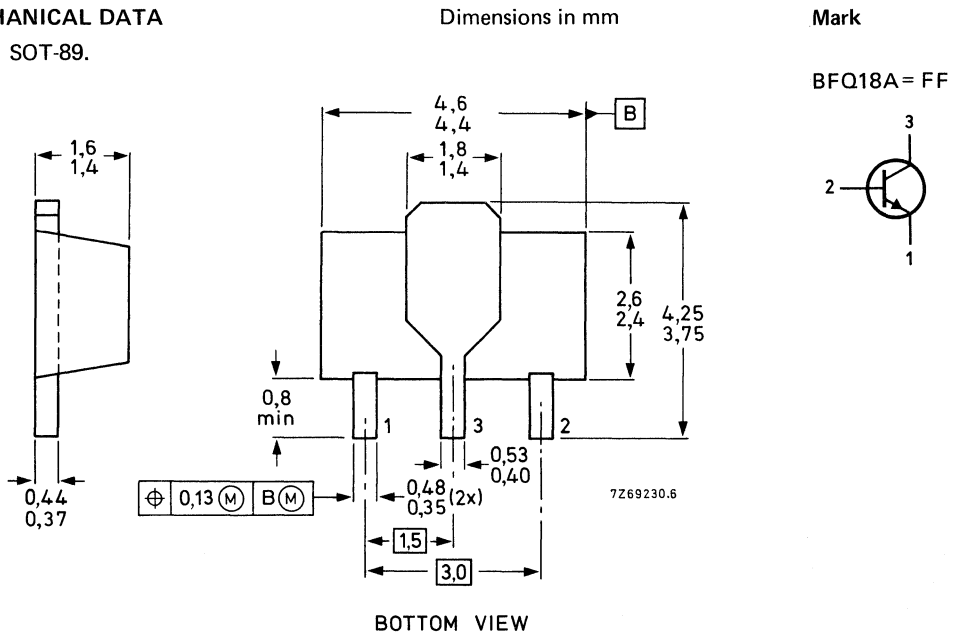
N-P-N transistor in a plastic SOT-89 envelope intended for application in thick and thin-film circuits. It is primarily intended for MATV purposes.

QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	25 V
Collector-emitter voltage (open base)	V_{CEO}	max.	15 V
Collector current (d.c.)	I_C	max.	150 mA
Total power dissipation up to $T_{amb} = 25\text{ }^\circ\text{C}$	P_{tot}	max.	1 W
Junction temperature	T_j	max.	150 $^\circ\text{C}$
Transition frequency at $f = 500\text{ MHz}$ $I_C = 100\text{ mA}; V_{CE} = 10\text{ V}$	f_T	typ.	3,6 GHz
Feedback capacitance at $f = 10,7\text{ MHz}$ $I_C = 0; V_{CE} = 10\text{ V}$	C_{re}	typ.	1,2 pF
Intermodulation distortion $I_C = 80\text{ mA}; V_{CE} = 10\text{ V}; R_L = 75\text{ }\Omega$ measured at $f_{(p+q-r)} = 793,25\text{ MHz}$	d_{im}	max.	-60 dB

MECHANICAL DATA

Fig. 1 SOT-89.



See also soldering recommendations

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	25 V
Collector-emitter voltage (open base)	V_{CEO}	max.	15 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2 V
Collector current (d.c.)	I_C	max.	150 mA
Total power dissipation up to $T_{amb} = 25\text{ }^\circ\text{C}$ *	P_{tot}	max.	1 W
Storage temperature	T_{stg}		-65 to + 150 $^\circ\text{C}$
Junction temperature	T_j	max.	150 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to collector tab	$R_{th\ j-tab}$	=	25 K/W
From junction to ambient in free air *	$R_{th\ j-a}$	=	125 K/W

CHARACTERISTICS

$T_{amb} = 25\text{ }^\circ\text{C}$ unless otherwise specified

D.C. current gain **

$I_C = 50\text{ mA}; V_{CE} = 10\text{ V}$	h_{FE}	min.	25
$I_C = 100\text{ mA}; V_{CE} = 10\text{ V}$	h_{FE}	min.	25

Transition frequency at $f = 500\text{ MHz}$ **

$I_C = 50\text{ mA}; V_{CE} = 10\text{ V}$	f_T	typ.	3,2 GHz
$I_C = 100\text{ mA}; V_{CE} = 10\text{ V}$	f_T	typ.	3,6 GHz

Collector capacitance at $f = 1\text{ MHz}$

$I_E = I_e = 0; V_{CB} = 10\text{ V}$	C_C	typ.	2,0 pF
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Emitter capacitance at $f = 1\text{ MHz}$

$I_C = I_c = 0; V_{EB} = 0,5\text{ V}$	C_e	typ.	11 pF
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Feedback capacitance at $f = 10,7\text{ MHz}$

$I_C = 0; V_{CE} = 10\text{ V}$	C_{re}	typ.	1,2 pF
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* The device mounted on a ceramic substrate area = 2,5 cm²; thickness = 0,7 mm.

** Measured under pulse conditions.

Intermodulation distortion (see Fig. 2)

$I_C = 80 \text{ mA}; V_{CE} = 10 \text{ V}; R_L = 75 \Omega$

$V_p = V_o = 700 \text{ mV}$ at $f_p = 795,25 \text{ MHz}$

$V_q = V_o - 6 \text{ dB}$ at $f_q = 803,25 \text{ MHz}$

$V_r = V_o - 6 \text{ dB}$ at $f_r = 805,25 \text{ MHz}$

Measured at $f_{(p+q-r)} = 793,25 \text{ MHz}$

d_{im} max. -60 dB

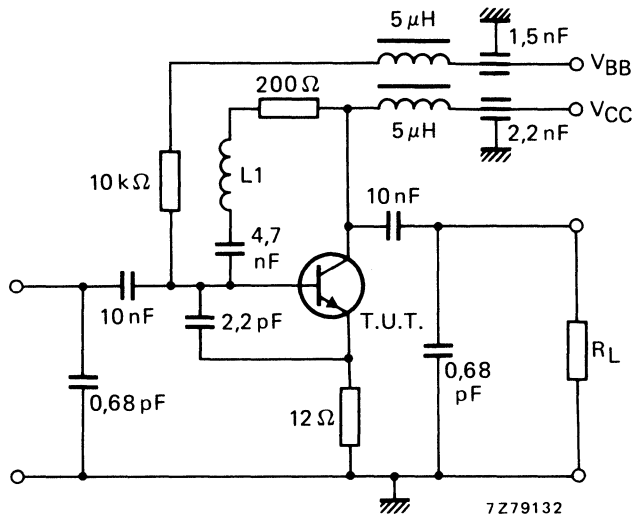


Fig. 2 MATV-test circuit (40–860 MHz).

N-P-N 1 GHz WIDEBAND TRANSISTOR

N-P-N transistor in a SOT-89 plastic envelope intended for application in thick- and thin-film circuits.

It is primarily intended for use in u.h.f. and microwave amplifiers such as in aerial amplifiers, radar systems, oscilloscopes, spectrum analysers etc.

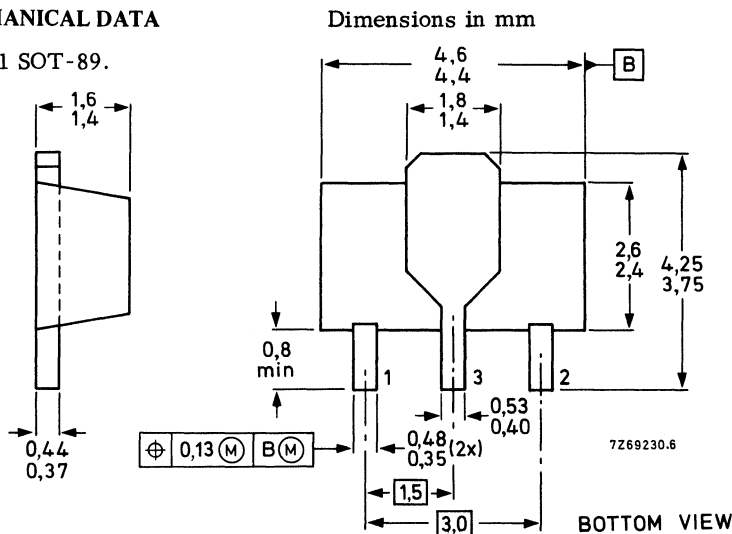
The transistor features very low intermodulation distortion and high power gain. Thanks to its very high transition frequency, it also has excellent wideband properties and low noise up to high frequencies.

QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	20	V
Collector-emitter voltage (open base)	V_{CEO}	max.	15	V
Collector current (d.c.)	I_C	max.	75	mA
Total power dissipation up to $T_{amb} = 87,5 \text{ }^\circ\text{C}$	P_{tot}	max.	500	mW
Junction temperature	T_j	max.	150	$^\circ\text{C}$
Transition frequency at $f = 500 \text{ MHz}$ $I_C = 50 \text{ mA}; V_{CE} = 10 \text{ V}$	f_T	typ.	5	GHz
Feedback capacitance at $f = 1 \text{ MHz}$ $I_C = 10 \text{ mA}; V_{CE} = 10 \text{ V};$	C_{re}	typ.	1,3	pF
Noise figure at optimum source impedance $I_C = 50 \text{ mA}; V_{CE} = 10 \text{ V}; f = 500 \text{ MHz};$	F	typ.	3,3	dB

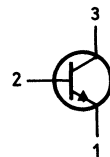
MECHANICAL DATA

Fig. 1 SOT-89.



Mark

BFQ19 = FB



See also soldering recommendations

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC134)

Collector-base voltage (open emitter)	V_{CBO}	max.	20	V
Collector-emitter voltage (open base)	V_{CEO}	max.	15	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,3	V

Collector current (d. c.)	I_C	max.	75	mA
Collector current (peak value); $f > 1$ MHz	I_{CM}	max.	150	mA

Total power dissipation up to $T_{amb} = 87,5$ °C mounted on a ceramic substrate area = $2,5$ cm ² ; thickness = $0,7$ mm	P_{tot}	max.	500	mW
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Storage temperature	T_{stg}	-65 to +150	°C
Junction temperature	T_j	max.	150 °C

THERMAL RESISTANCE

From junction to collector tab	$R_{th j-tab}$	=	40	K/W
From junction to ambient in free air mounted on a ceramic substrate area = $2,5$ cm ² ; thickness = $0,7$ mm	$R_{th j-a}$	=	125	K/W

CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Collector cut-off current

$I_E = 0; V_{CB} = 10\text{ V}$ I_{CBO} max. 100 nA

D.C. current gain 1)

$I_C = 50\text{ mA}; V_{CE} = 10\text{ V}$ h_{FE} min. 25
typ. 50

$I_C = 75\text{ mA}; V_{CE} = 10\text{ V}$ h_{FE} min. 25
typ. 52

Transition frequency at $f = 500\text{ MHz}$ 1)

$I_C = 50\text{ mA}; V_{CE} = 10\text{ V}$ f_T min. 4,0 GHz
typ. 5,0 GHz

$I_C = 75\text{ mA}; V_{CE} = 10\text{ V}$ f_T min. 4,4 GHz
typ. 5,5 GHz

Collector capacitance at $f = 1\text{ MHz}$

$I_E = I_e = 0; V_{CB} = 10\text{ V}$ C_c typ. 1,6 pF

Emitter capacitance at $f = 1\text{ MHz}$

$I_C = I_c = 0; V_{EB} = 0,5\text{ V}$ C_e typ. 5,0 pF

Feedback capacitance at $f = 1\text{ MHz}$

$I_C = 10\text{ mA}; V_{CE} = 10\text{ V}; T_{amb} = 25\text{ }^\circ\text{C}$ C_{re} typ. 1,3 pF

Noise figure at optimum source impedance

$I_C = 50\text{ mA}; V_{CE} = 10\text{ V}; f = 500\text{ MHz}; T_{amb} = 25\text{ }^\circ\text{C}$ F typ. 3,3 dB

Max. unilateral power gain (s_{re} assumed to be zero)

$$G_{UM} = 10 \log \frac{|s_{fe}|^2}{(1 - |s_{ie}|^2)(1 - |s_{oe}|^2)}$$

$I_C = 50\text{ mA}; V_{CE} = 10\text{ V}; T_{amb} = 25\text{ }^\circ\text{C};$

$f = 200\text{ MHz}$ G_{UM} typ. 18,5 dB

$f = 500\text{ MHz}$ G_{UM} typ. 11,5 dB

$f = 800\text{ MHz}$ G_{UM} typ. 7,5 dB

1) Measured under pulse conditions.

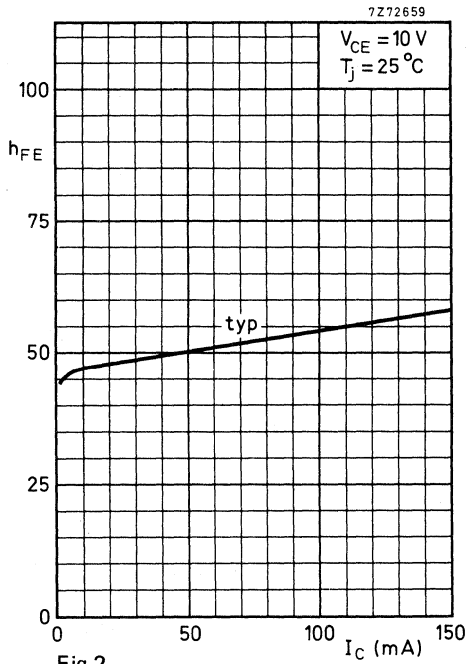


Fig.2.
VCE=10V;Tj=25°C; Typical values

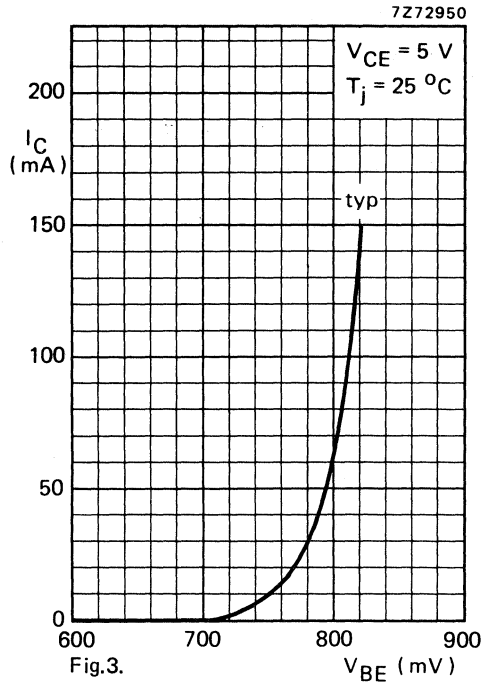


Fig.3.
VCE=5V;Tj=25°C; Typical values

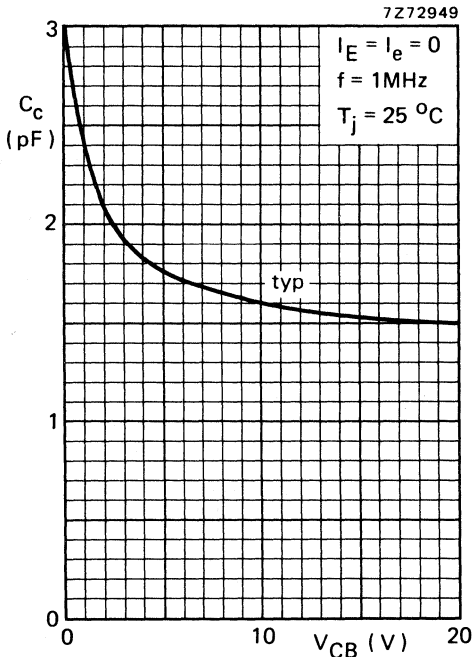


Fig.4.
IE=Ie=0;f=1MHz;Tj=25°C; Typical values

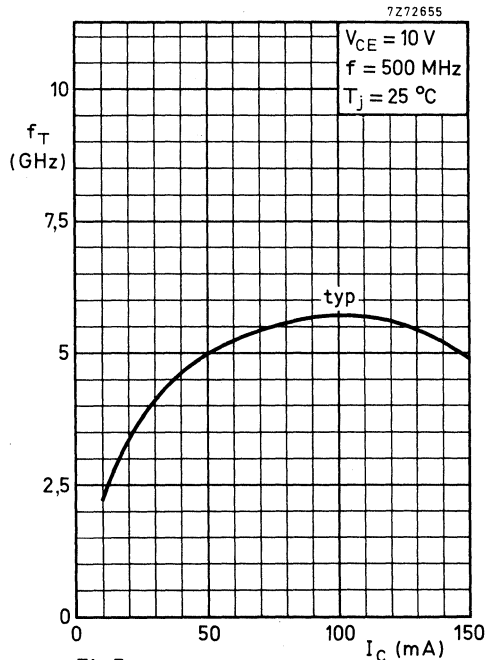


Fig.5.
VCE=10V;f=500MHz;Tj=25°C; Typical values

N-P-N H.F. WIDEBAND TRANSISTOR

N-P-N transistor in a TO-72 metal envelope with insulated electrodes and a shield lead connected to the case. It is primarily intended for use in u.h.f. and microwave aerial amplifiers, radar systems, oscilloscopes, spectrum analysers etc.

The transistor has extremely high power gain and good low noise performance.

P-N-P complement is BFQ24.

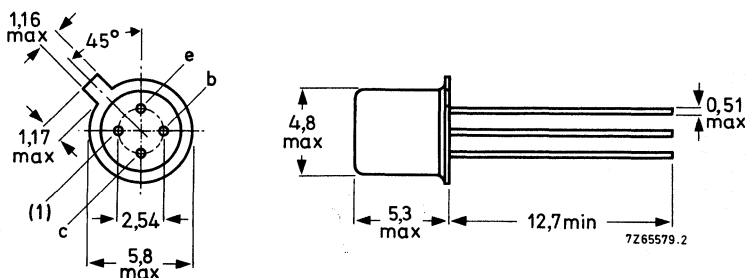
QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	15 V
Collector-emitter voltage (open base)	V_{CEO}	max.	12 V
Collector current (d.c.)	I_C	max.	35 mA
Total power dissipation up to $T_{amb} = 65\text{ }^\circ\text{C}$	P_{tot}	max.	150 mW
Junction temperature	T_j	max.	200 $^\circ\text{C}$
Transition frequency at $f = 500\text{ MHz}$ $I_C = 30\text{ mA}$; $V_{CE} = 5\text{ V}$	f_T	typ.	5,0 GHz
Feedback capacitance at $f = 1\text{ MHz}$ $I_C = 0$; $V_{CE} = 5\text{ V}$	C_{re}	typ.	0,65 pF
Noise figure at optimum source impedance $I_C = 2\text{ mA}$; $V_{CE} = 5\text{ V}$; $f = 500\text{ MHz}$	F	typ.	1,9 dB
Maximum unilateral power gain $I_C = 30\text{ mA}$; $V_{CE} = 5\text{ V}$; $f = 500\text{ MHz}$	G_{UM}	typ.	16,0 dB

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-72 with insulated electrodes.



(1) Shield lead connected to case.

Accessories: 56246 (distance disc).

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CB0}	max.	15 V
Collector-emitter voltage (open base)	V_{CE0}	max.	12 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2 V
Collector current (d.c.)	I_C	max.	35 mA
Collector current (peak value) at $f > 1$ MHz	I_{CM}	max.	50 mA
Total power dissipation up to $T_{amb} = 65$ °C	P_{tot}	max.	150 mW
Storage temperature	T_{stg}		-65 to + 200 °C
Junction temperature	T_j	max.	200 °C

→ THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j-a}$	=	900 K/W
From junction to case	$R_{th\ j-c}$	=	600 K/W

CHARACTERISTICS

$T_j = 25$ °C unless otherwise specified

Collector cut-off current

$$I_E = 0; V_{CB} = 5 \text{ V}$$

I_{CBO}	max.	50 nA
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→ D.C. current gain

$$I_C = 10 \text{ mA}; V_{CE} = 5 \text{ V}$$

h_{FE}	50 to 150
----------	-----------

→ Transition frequency (note)

$$I_C = 30 \text{ mA}; V_{CE} = 5 \text{ V}; f = 500 \text{ MHz}$$

f_T	typ.	5,0 GHz
-------	------	---------

→ Feedback capacitance (note)

$$I_C = 0; V_{CE} = 5 \text{ V}; f = 1 \text{ MHz}; T_{amb} = 25$$
 °C

C_{re}	typ.	0,65 pF
----------	------	---------

→ Noise figure at optimum source impedance (note)

$$I_C = 2 \text{ mA}; V_{CE} = 5 \text{ V}; f = 500 \text{ MHz}; T_{amb} = 25$$
 °C

$$I_C = 10 \text{ mA}; V_{CE} = 5 \text{ V}; f = 200 \text{ MHz}; T_{amb} = 25$$
 °C

F	typ.	1,9 dB
---	------	--------

F	max.	2,5 dB
---	------	--------

→ Maximum unilateral power gain (note)

s_{re} assumed to be zero

$$G_{UM} = 10 \log \frac{|s_{fe}|^2}{(1 - |s_{ie}|^2)(1 - |s_{oe}|^2)}$$

$$I_C = 10 \text{ mA}; V_{CE} = 5 \text{ V}; f = 200 \text{ MHz}; T_{amb} = 25$$
 °C

$$I_C = 30 \text{ mA}; V_{CE} = 5 \text{ V}; f = 500 \text{ MHz}; T_{amb} = 25$$
 °C

GUM	min.	21,0 dB
-----	------	---------

GUM	typ.	16,0 dB
-----	------	---------

→ Note

Shield lead grounded.

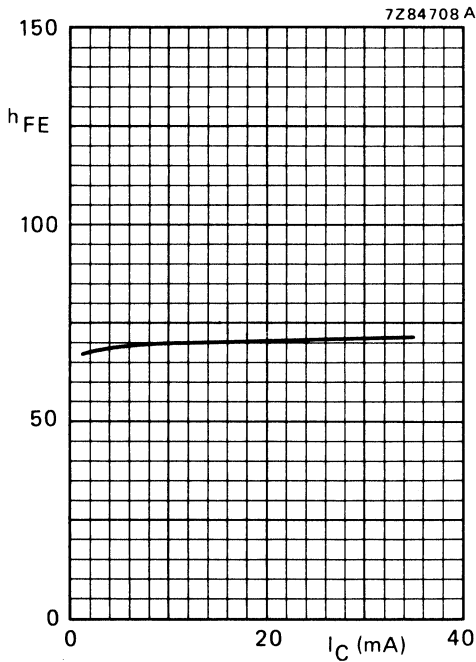


Fig. 2.

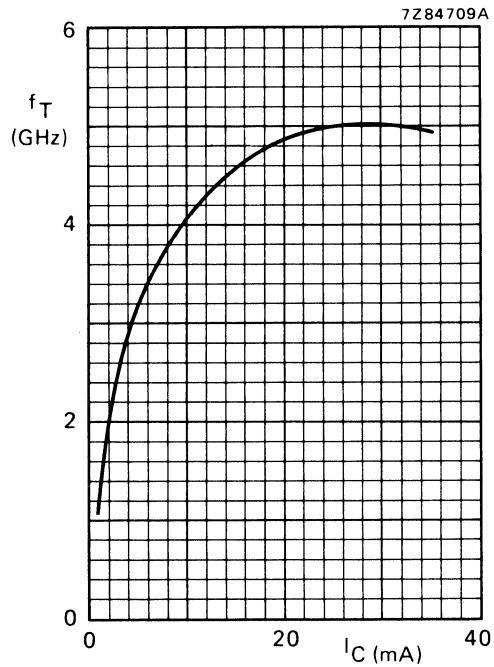


Fig. 3.

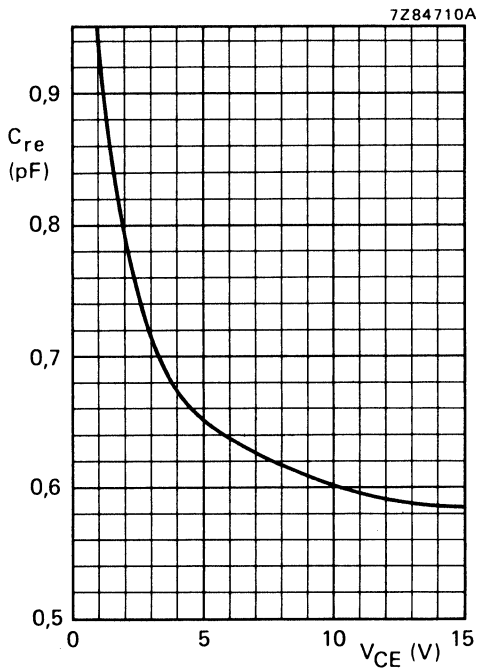


Fig. 4.

Conditions for Figs 2, 3 and 4:

Fig. 2 $V_{CE} = 5$ V; $T_j = 25$ °C; typical values.

Fig. 3 $V_{CE} = 5$ V; $f = 500$ MHz; $T_j = 25$ °C; shield lead grounded; typical values.

Fig. 4 $I_C = 0$; $f = 1$ MHz; $T_{amb} = 25$ °C; shield lead grounded; typical values.

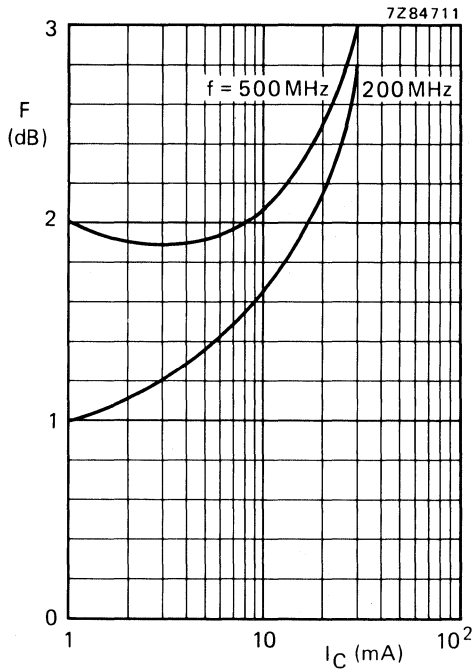


Fig. 5 $V_{CE} = 5\text{ V}$; $Z_S = \text{optimum}$; $T_{\text{amb}} = 25\text{ }^\circ\text{C}$; typical values; shield lead grounded; typ. values.

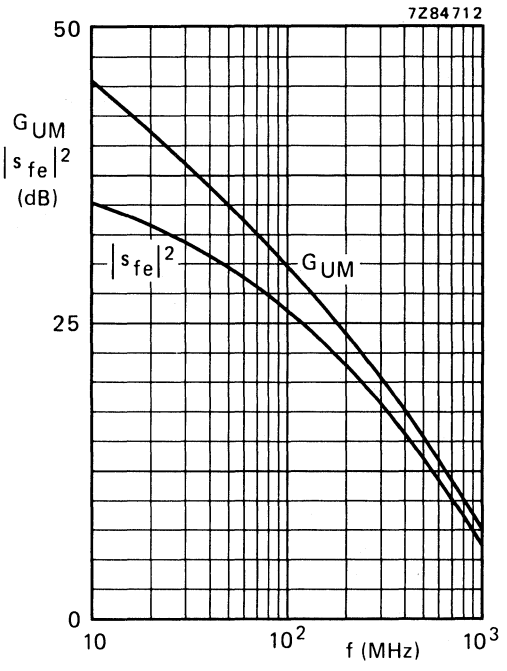


Fig. 6 $V_{CE} = 5\text{ V}$; $I_C = 30\text{ mA}$; $T_{\text{amb}} = 25\text{ }^\circ\text{C}$; typical values; shield lead grounded; typ. values.

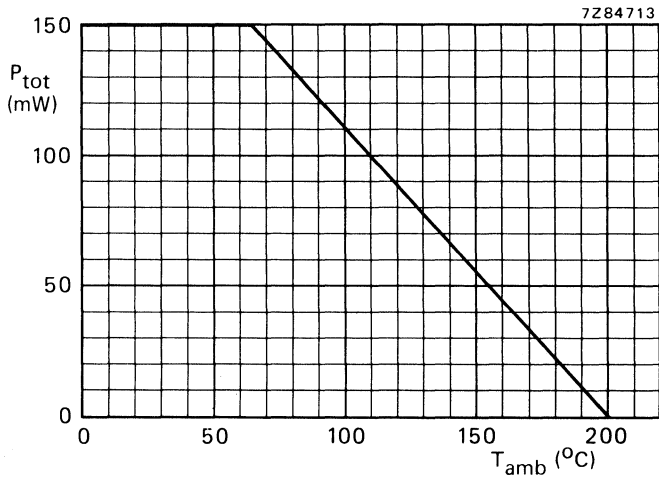


Fig. 7 Power derating curve versus ambient temperature.

P-N-P 1 GHz WIDEBAND TRANSISTOR

P-N-P transistor in a plastic SOT-37 envelope. It is primarily intended for use in u.h.f. and microwave amplifiers such as in aerial amplifiers, radar systems, oscilloscopes, spectrum analysers etc.

The transistor features low intermodulation distortion and high power gain; thanks to its very high transition frequency, it also has excellent wideband properties and low noise up to high frequencies.

N-P-N complements are BFR91 and BFR91A.

QUICK REFERENCE DATA

Collector-base voltage (open emitter)	$-V_{CB0}$	max.	15 V
Collector-emitter voltage (open base)	$-V_{CE0}$	max.	12 V
Collector current (d.c.)	$-I_C$	max.	35 mA
Total power dissipation up to $T_{amb} = 60\text{ }^{\circ}\text{C}$	P_{tot}	max.	180 mW
Junction temperature	T_j	max.	150 $^{\circ}\text{C}$
Transition frequency at $f = 500\text{ MHz}$ $-I_C = 30\text{ mA}; -V_{CE} = 5\text{ V}$	f_T	typ.	5,0 GHz
Feedback capacitance at $f = 1\text{ MHz}$ $-I_C = 2\text{ mA}; -V_{CE} = 5\text{ V}$	C_{re}	typ.	0,8 pF
Noise figure at optimum source impedance $-I_C = 2\text{ mA}; -V_{CE} = 5\text{ V}; f = 500\text{ MHz}$	F	typ.	2,4 dB

MECHANICAL DATA (see Fig. 1)

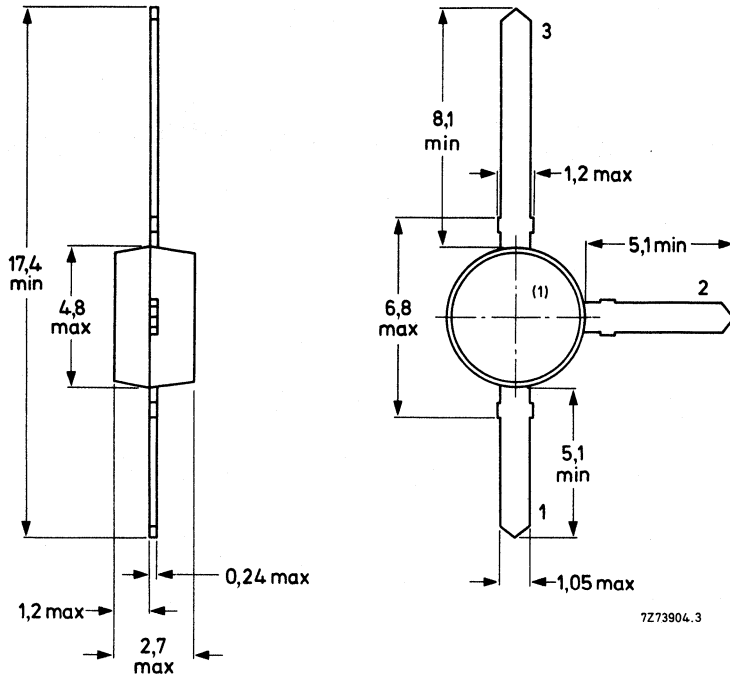
MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-37.

Connections

- 1. Base
- 2. Emitter
- 3. Collector



7273904.3

(1) = type number marking.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	$-V_{CBO}$	max.	15 V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	12 V
Emitter-base voltage (open collector)	$-V_{EBO}$	max.	2 V
Collector current (d.c.)	$-I_C$	max.	35 mA
Collector current (peak value) at $f > 1$ MHz	$-I_{CM}$	max.	50 mA
Total power dissipation up to $T_{amb} = 60$ °C	P_{tot}	max.	180 mW
Storage temperature	T_{stg}		-65 to + 150 °C
Junction temperature	T_j	max.	150 °C

THERMAL RESISTANCE

From junction to ambient in free air mounted on a fibre-glass print of 40 mm x 25 mm x 1 mm

$R_{th\ j-a} = 500\ K/W$

CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Collector cut-off current

$I_E = 0; -V_{CB} = 5\text{ V}$

$-I_{CBO}$ max. 50 nA

D.C. current gain

$-I_C = 30\text{ mA}; -V_{CE} = 5\text{ V}$

h_{FE} min. 20 ←

Transition frequency

$f = 500\text{ MHz}; -I_C = 30\text{ mA}; -V_{CE} = 5\text{ V}$

f_T typ. 5,0 GHz ←

Collector capacitance

$f = 1\text{ MHz}; I_E = I_e = 0; -V_{CB} = 10\text{ V}$

C_c typ. 1,2 pF ←

Emitter capacitance

$f = 1\text{ MHz}; I_C = I_c = 0; -V_{EB} = 0,5\text{ V}$

C_e typ. 1,8 pF

Feedback capacitance

$f = 1\text{ MHz}; I_C = 0; -V_{CE} = 10\text{ V}$

C_{re} typ. 0,8 pF ←

Noise figure at optimum source impedance

$-I_C = 2\text{ mA}; -V_{CE} = 5\text{ V}; f = 500\text{ MHz}; T_{amb} = 25\text{ }^\circ\text{C}$

F typ. 2,4 dB

Maximum unilateral power gain (s_{re} assumed to be zero)

$-I_C = 30\text{ mA}; -V_{CE} = 5\text{ V}; f = 500\text{ MHz}; T_{amb} = 25\text{ }^\circ\text{C}$

$$G_{UM} = 10 \log \frac{|s_{fe}|^2}{[1 - |s_{ie}|^2][1 - |s_{oe}|^2]}$$

G_{UM} typ. 15,0 dB

Output voltage at $d_{im} = -60\text{ dB}$

$I_C = 30\text{ mA}; V_{CE} = 5\text{ V};$

$R_L = 75\text{ }\Omega; T_{amb} = 25\text{ }^\circ\text{C}$

$V_p = V_o$ at $d_{im} = -60\text{ dB}; f_p = 495,25\text{ MHz}$

$V_q = V_o -6\text{ dB}; f_q = 503,25\text{ MHz}$

$V_r = V_o -6\text{ dB}; f_r = 505,25\text{ MHz}$

measured at $f_{(p+q-r)} = 495,25\text{ MHz}$

V_o typ. 300 mV ←

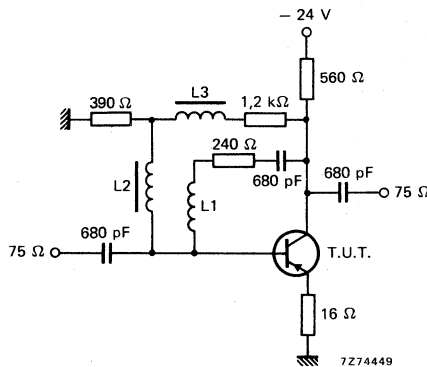


Fig. 2 Intermodulation distortion test circuit.

L1: 4 turns Cu wire (0,35); winding pitch 1 mm; internal diameter 4 mm.

L2 and L3: 5 μH (code number 3122 108 20150)

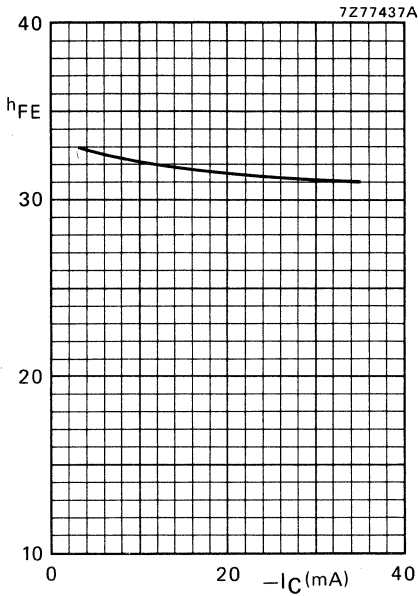


Fig. 3 $-V_{CE} = 5$ V; $T_j = 25$ °C; typical values.

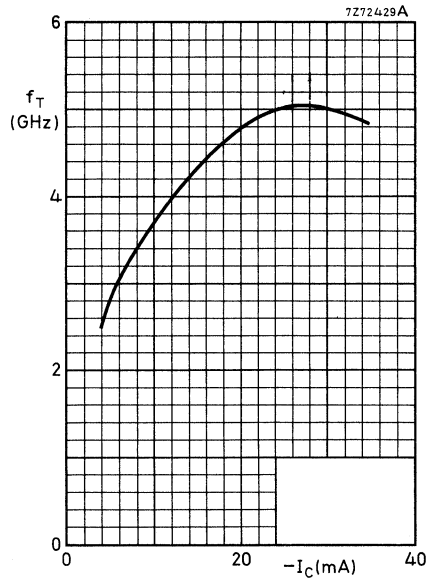


Fig. 4 $-V_{CE} = 5$ V; $f = 500$ MHz; $T_j = 25$ °C; typical values.

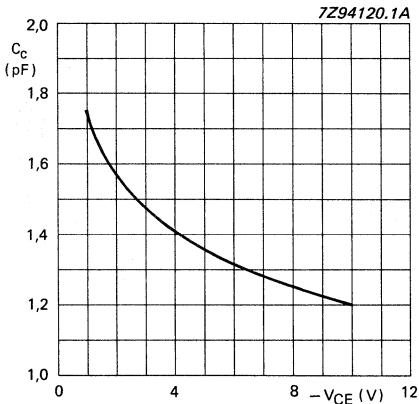


Fig. 5 $I_E = I_e = 0$; $f = 1$ MHz; $T_j = 25$ °C; typical values.

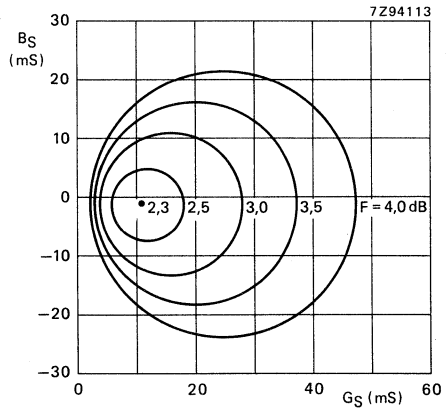
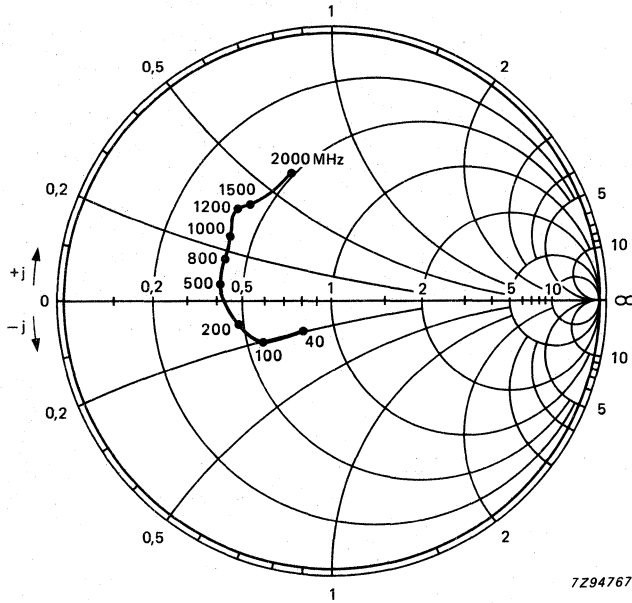


Fig. 6 Circles of constant noise figure; $-V_{CE} = 8$ V; $-I_C = 4$ mA; $f = 800$ MHz; $T_{amb} = 25$ °C; typical values.

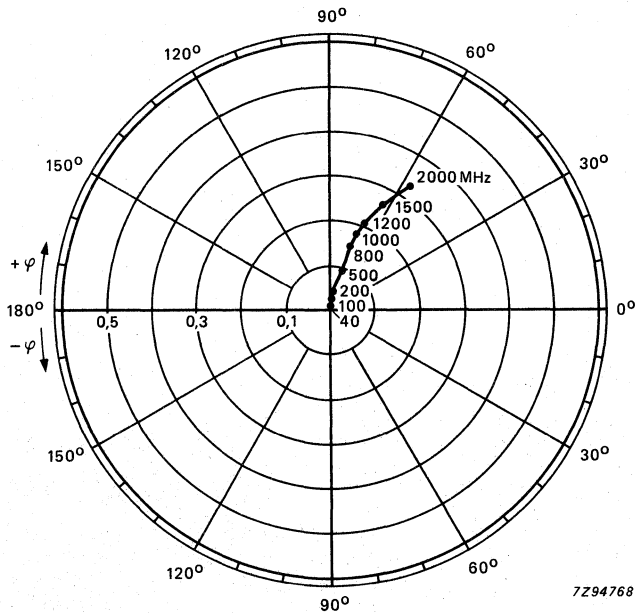
s-parameters (common-emitter) at $-V_{CE} = 5 \text{ V}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

I_C mA	f MHz	S_{ie}	S_{fe}	S_{re}	S_{oe}	GUM dB
5	40	0,62/ -21,2°	13,5/167,5°	0,02/ 81,6°	0,96/ -10,3°	36,0
	100	0,58/ -55,1°	11,8/145,8°	0,04/ 67,7°	0,86/ -27,5°	29,0
	200	0,48/ -97,1°	8,4/124,0°	0,07/ 58,2°	0,63/ -41,8°	21,9
	500	0,44/ -156,7°	4,3/ 92,0°	0,11/ 53,5°	0,38/ -58,5°	14,2
	800	0,43/ +177,0°	2,9/ 76,9°	0,14/ 56,9°	0,31/ -66,6°	10,4
	1000	0,44/ +161,3°	2,3/ 67,5°	0,16/ 57,0°	0,28/ -70,4°	8,5
	1200	0,47/ +146,3°	1,9/ 61,5°	0,19/ 58,2°	0,24/ -73,8°	7,0
	1500	0,47/ +137,8°	1,7/ 52,3°	0,23/ 57,8°	0,22/ -89,5°	5,7
2000	0,50/ +111,7°	1,3/ 40,1°	0,30/ 55,8°	0,20/ -115,8°	3,7	
10	40	0,38/ -36,0°	20,4/162,3°	0,02/ 79,1°	0,92/ -15,6°	35,0
	100	0,38/ -83,8°	16,0/137,0°	0,03/ 67,2°	0,75/ -37,0°	28,4
	200	0,37/ -128,4°	10,4/115,7°	0,05/ 62,9°	0,49/ -51,5°	22,2
	500	0,41/ -173,8°	4,8/ 88,3°	0,10/ 64,6°	0,27/ -68,3°	14,7
	800	0,40/ +166,0°	3,2/ 75,0°	0,14/ 65,7°	0,22/ -76,5°	11,0
	1000	0,42/ +152,8°	2,6/ 66,8°	0,17/ 64,1°	0,19/ -82,2°	9,1
	1200	0,46/ +139,3°	2,1/ 61,5°	0,20/ 63,7°	0,15/ -85,2°	7,7
	1500	0,45/ +133,5°	1,8/ 52,5°	0,25/ 60,6°	0,16/ -104,0°	6,3
2000	0,48/ +108,5°	1,4/ 41,0°	0,32/ 56,2°	0,15/ -135,1°	4,3	
15	40	0,25/ -52,3°	23,7/159,6°	0,02/ 77,2°	0,09/ -18,4°	34,5
	100	0,31/ -106,0°	17,8/133,2°	0,03/ 68,9°	0,69/ -41,6°	28,2
	200	0,34/ -145,3°	11,1/112,6°	0,05/ 67,7°	0,43/ -55,8°	22,3
	500	0,41/ +179,3°	4,9/ 87,0°	0,09/ 69,1°	0,23/ -73,6°	14,9
	800	0,40/ +161,7°	3,3/ 74,2°	0,15/ 68,6°	0,19/ -82,3°	11,1
	1000	0,42/ +149,7°	2,6/ 66,4°	0,18/ 66,4°	0,16/ -89,4°	9,3
	1200	0,46/ +136,9°	2,2/ 61,3°	0,20/ 65,4°	0,12/ -93,6°	7,9
	1500	0,45/ +131,8°	1,9/ 52,3°	0,26/ 61,7°	0,14/ -113,6°	6,5
2000	0,48/ +107,4°	1,5/ 41,1°	0,33/ 56,3°	0,13/ -146,5°	4,5	
20	40	0,17/ -74,7°	25,4/157,7°	0,01/ 77,9°	0,87/ -20,2°	34,3
	100	0,29/ -123,5°	18,6/131,1°	0,03/ 71,0°	0,65/ -44,3°	28,2
	200	0,34/ -155,1°	11,4/110,8°	0,04/ 70,9°	0,40/ -58,6°	22,4
	500	0,41/ +175,5°	5,0/ 86,3°	0,09/ 71,7°	0,21/ -77,4°	15,0
	800	0,40/ +159,3°	3,3/ 73,6°	0,15/ 70,4°	0,18/ -86,2°	11,2
	1000	0,43/ +148,0°	2,6/ 66,0°	0,18/ 67,5°	0,15/ -94,7°	9,4
	1200	0,47/ +135,6°	2,2/ 61,0°	0,21/ 66,3°	0,11/ -91,0°	8,0
	1500	0,45/ +131,0°	1,9/ 52,0°	0,26/ 62,1°	0,13/ -120,5°	6,6
2000	0,48/ +107,0°	1,5/ 40,8°	0,33/ 56,4°	0,13/ -154,2°	4,6	
30	40	0,15/ -129,3°	27,2/155,9°	0,01/ 76,8°	0,82/ -22,2°	33,7
	100	0,29/ -146,9°	19,3/128,8°	0,02/ 74,2°	0,60/ -47,2°	28,0
	200	0,35/ -166,7°	11,5/109,0°	0,04/ 75,3°	0,36/ -61,4°	22,4
	500	0,41/ +171,2°	5,0/ 85,3°	0,09/ 74,7°	0,19/ -81,8°	15,0
	800	0,41/ +156,7°	3,3/ 72,9°	0,15/ 71,8°	0,16/ -91,0°	11,2
	1000	0,44/ +146,2°	2,6/ 65,5°	0,18/ 68,8°	0,19/ -101,0°	9,4
	1200	0,48/ +134,5°	2,2/ 60,5°	0,21/ 67,3°	0,10/ -107,6°	8,0
	1500	0,46/ +130,1°	1,9/ 51,5°	0,26/ 62,5°	0,12/ -128,1°	6,6
2000	0,49/ +106,4°	1,5/ 40,3°	0,33/ 56,6°	0,12/ -162,1°	4,7	



7Z94767

Fig. 7 Input impedance, derived from input reflection coefficient s_{ie} coordinates, in ohm x 50.



7Z94768

Fig. 8 Reverse transmission coefficient s_{re} .

Conditions for figs 7 to 10: $-V_{CE} = 5 \text{ V}$; $-I_C = 30 \text{ mA}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

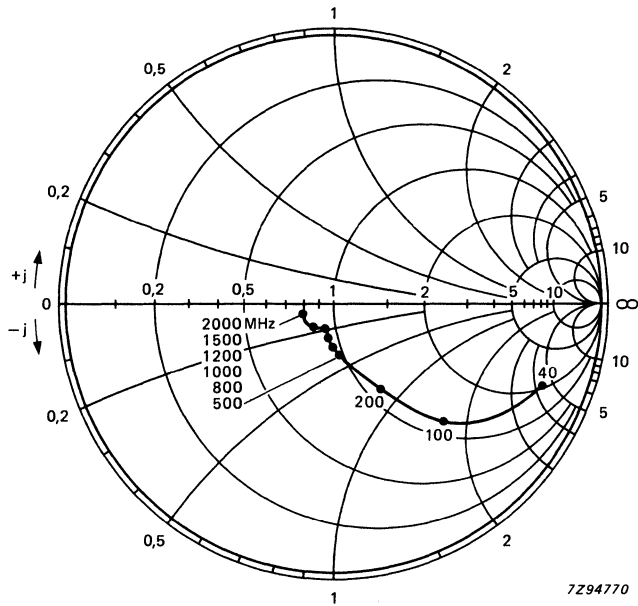


Fig. 9 Output impedance, derived from output reflection coefficient s_{oe} coordinates, in ohm \times 50.

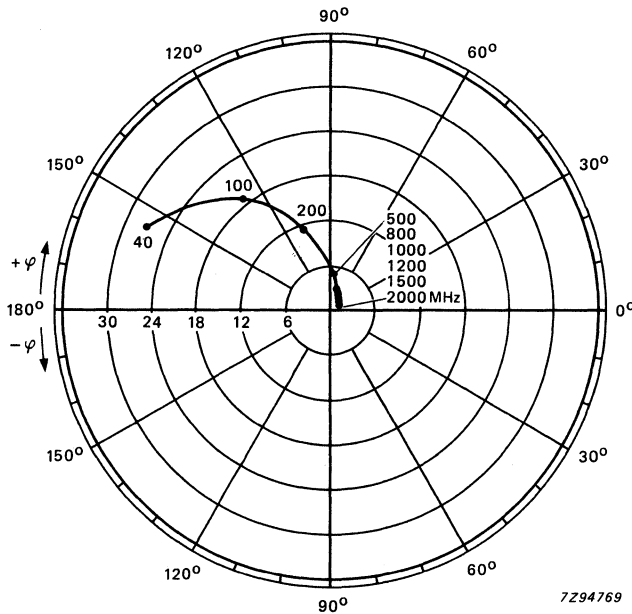


Fig. 10 Forward transmission coefficient s_{fe} .

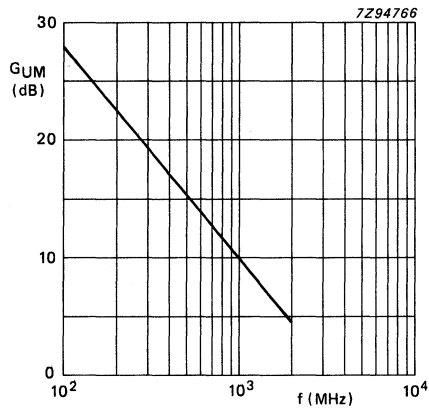


Fig. 11 $-V_{CE} = 5 \text{ V}$; $-I_C = 30 \text{ mA}$;
 $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

P-N-P 2 GHz WIDEBAND TRANSISTOR

P-N-P transistor in a sub-miniature HERMETICALLY SEALED micro-stripline envelope. It is primarily intended for use in u.h.f. and microwave amplifiers such as aerial amplifiers, radar systems, oscilloscopes, spectrum analysers etc. ←

The transistor features low intermodulation distortion and high power gain due to its very high transition frequency, excellent wideband properties and low noise up to high frequencies.

N-P-N complement is BFP91A.

QUICK REFERENCE DATA

Collector-base voltage	$-V_{CBO}$	max.	15 V	←
Collector-emitter voltage	$-V_{CEO}$	max.	12 V	
Collector current (d.c.)	$-I_C$	max.	50 mA	
Total power dissipation up to $T_{amb} = 105\text{ }^{\circ}\text{C}$	P_{tot}	max.	350 mW	
Junction temperature	T_j	max.	175 $^{\circ}\text{C}$	
D.C. current gain				
$-I_C = 30\text{ mA}; -V_{CE} = 5\text{ V}$	h_{FE}	min.	20	
Transition frequency at $f = 500\text{ MHz}$				
$-I_C = 30\text{ mA}; -V_{CE} = 5\text{ V}$	f_T	typ.	5,0 GHz	
Maximum unilateral power gain				
$-I_C = 30\text{ mA}; -V_{CE} = 8\text{ V}$				
at $f = 500\text{ MHz}$		typ.	20,0 dB	←
at $f = 800\text{ MHz}$	GUM	typ.	16,0 dB	

MECHANICAL DATA

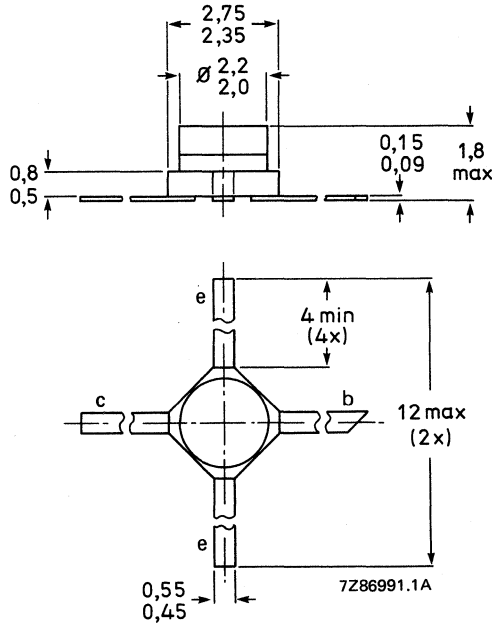
SOT-173 (see Fig. 1).

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-173.

Marking code: C3



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	$-V_{CBO}$	max.	15 V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	12 V
Emitter-base voltage (open collector)	$-V_{EBO}$	max.	2 V
Collector current (d.c.)	$-I_C$	max.	50 mA
Total power dissipation up to $T_{amb} = 105\text{ }^\circ\text{C}$ mounted on a ceramic substrate of 0,7 mm x 10 cm ²	P_{tot}	max.	350 mW
Storage temperature	T_{stg}		-65 to +150 °C
Junction temperature	T_j	max.	175 °C

THERMAL RESISTANCE

→ From junction to ambient in free air mounted on a ceramic substrate of 0,7 mm x 10 cm ²	$R_{th\ j-a}$		200 K/W
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CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current

I_E = 0; -V_{CB} = 5 V

-I_{CBO} max. 50 nA

D.C. current gain

-I_C = 30 mA; -V_{CE} = 5 V

h_{FE} min. 20

Transition frequency at f = 500 MHz

-I_C = 30 mA; -V_{CE} = 5 V

f_T typ. 5,0 GHz

Collector capacitance at f = 1 MHz

I_E = I_e = 0; -V_{CB} = 10 V

C_c typ. 1,0 pF

Emitter capacitance at f = 1 MHz

I_C = I_c = 0; -V_{EB} = 0,5 V

C_e typ. 1,8 pF

Feedback capacitance at f = 1 MHz

I_C = 0; -V_{CE} = 10 V;

C_{re} typ. 0,8 pF

Maximum unilateral power gain (s_{re} assumed to be zero)

$$G_{UM} = 10 \log \frac{|s_{fe}|^2}{[1 - |s_{ie}|^2][1 - |s_{oe}|^2]}$$

at -I_C = 30 mA; -V_{CE} = 8 V; T_{amb} = 25 °C;

f = 500 MHz

f = 800 MHz

G_{UM} typ. 20,0 dB
typ. 16,0 dB

Noise figures at f = 800 MHz; Z_S = opt.; T_{amb} = 25 °C

-I_C = 4 mA; -V_{CE} = 8 V

-I_C = 30 mA; -V_{CE} = 8 V

F typ. 2,3 dB
typ. 3,7 dB



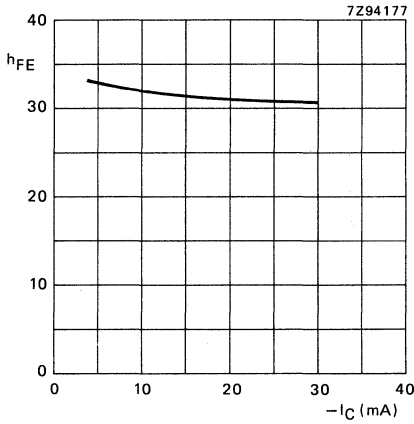


Fig. 2 $-V_{CE} = 5$ V; $T_j = 25$ °C; typical values.

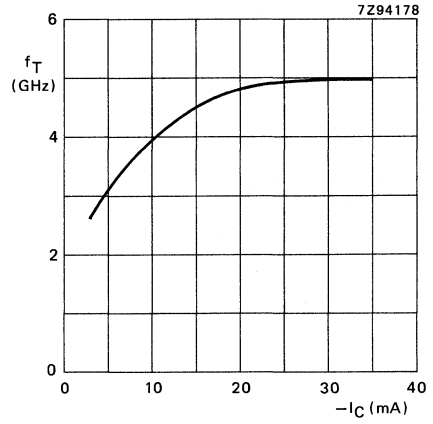


Fig. 3 $-V_{CE} = 5$ V; $f = 500$ MHz; $T_j = 25$ °C; typical values.

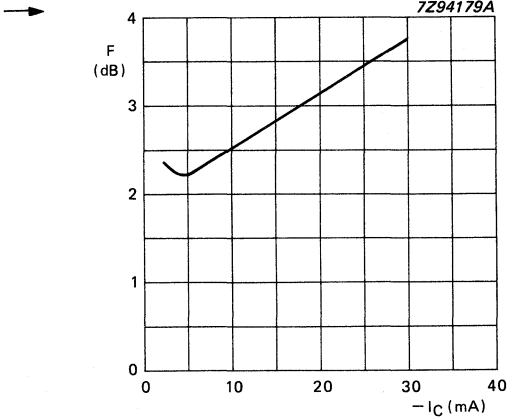


Fig. 4 $-V_{CE} = 8$ V; $f = 800$ MHz; $T_{amb} = 25$ °C; $Z_s = \text{optimum}$; typical values.

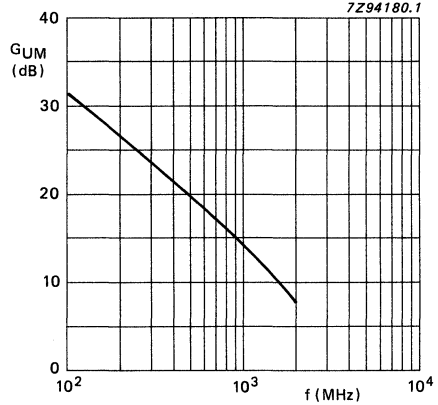


Fig. 5 $-V_{CE} = 8$ V; $-I_C = 30$ mA; $T_{amb} = 25$ °C; typical values.

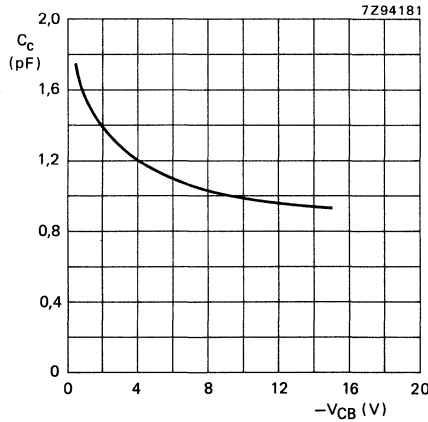


Fig. 6 $I_E = I_e = 0$; $f = 1$ MHz; $T_j = 25$ °C; typical values.

s-parameters (common emitter) at $-V_{CE} = 8 \text{ V}$; $T_{amb} = 25 \text{ }^\circ\text{C}$

I_C mA	f MHz	S_{ie}	S_{fe}	S_{re}	S_{oe}	GUM dB
2	40	0,84/ -13,4 ^o	6,6/172,9 ^o	0,019/ 82,8 ^o	0,99/ -5,7 ^o	38,7
	100	0,83/ -32,3 ^o	6,4/161,1 ^o	0,047/ 73,3 ^o	0,95/ -14,1 ^o	31,3
	200	0,80/ -60,8 ^o	5,7/143,8 ^o	0,083/ 59,4 ^o	0,87/ -25,7 ^o	25,7
	500	0,74/-114,6 ^o	3,7/112,1 ^o	0,136/ 35,8 ^o	0,66/ -45,8 ^o	17,3
	800	0,71/-142,7 ^o	2,6/ 92,5 ^o	0,149/ 25,7 ^o	0,55/ -54,2 ^o	12,9
	1000	0,68/-154,3 ^o	2,1/ 83,3 ^o	0,153/ 23,1 ^o	0,52/ -58,0 ^o	10,5
	1200	0,67/-164,3 ^o	1,7/ 75,5 ^o	0,153/ 20,8 ^o	0,50/ -62,2 ^o	8,4
	1500	0,65/-178,0 ^o	1,4/ 63,9 ^o	0,156/ 17,3 ^o	0,53/ -65,3 ^o	6,9
2000	0,66/+165,5 ^o	1,1/ 48,9 ^o	0,154/ 16,4 ^o	0,50/ -75,3 ^o	4,8	
5	40	0,66/ -22,5 ^o	13,5/169,4 ^o	0,017/ 79,7 ^o	0,97/ -10,2 ^o	37,4
	100	0,66/ -52,0 ^o	12,4/153,7 ^o	0,039/ 67,5 ^o	0,90/ -24,2 ^o	31,6
	200	0,66/ -89,6 ^o	10,1/132,9 ^o	0,064/ 52,4 ^o	0,74/ -41,3 ^o	26,0
	500	0,68/-141,5 ^o	5,5/103,0 ^o	0,091/ 34,5 ^o	0,46/ -64,5 ^o	18,5
	800	0,67/-162,7 ^o	3,7/ 87,8 ^o	0,100/ 31,9 ^o	0,36/ -72,6 ^o	14,6
	1000	0,66/-172,1 ^o	3,0/ 80,6 ^o	0,106/ 32,6 ^o	0,34/ -75,4 ^o	12,6
	1200	0,67/-179,7 ^o	2,5/ 73,8 ^o	0,111/ 33,0 ^o	0,32/ -79,4 ^o	11,0
	1500	0,63/+168,5 ^o	2,0/ 64,9 ^o	0,122/ 34,1 ^o	0,33/ -76,7 ^o	8,7
2000	0,64/+155,6 ^o	1,5/ 51,9 ^o	0,136/ 35,6 ^o	0,30/ -84,8 ^o	6,5	
10	40	0,47/ -35,4 ^o	20,4/165,5 ^o	0,014/ 76,9 ^o	0,93/ -14,9 ^o	36,0
	100	0,52/ -76,4 ^o	17,7/146,4 ^o	0,032/ 62,8 ^o	0,82/ -33,9 ^o	31,2
	200	0,59/-115,9 ^o	13,1/124,3 ^o	0,048/ 49,2 ^o	0,62/ -54,7 ^o	26,3
	500	0,65/-157,4 ^o	6,4/ 97,9 ^o	0,066/ 40,4 ^o	0,35/ -80,0 ^o	19,1
	800	0,65/-173,4 ^o	4,2/ 84,7 ^o	0,078/ 43,3 ^o	0,27/ -89,0 ^o	15,2
	1000	0,65/+178,9 ^o	3,4/ 78,8 ^o	0,087/ 45,7 ^o	0,24/ -91,3 ^o	13,3
	1200	0,65/+172,9 ^o	2,9/ 72,9 ^o	0,096/ 47,0 ^o	0,23/ -94,9 ^o	11,9
	1500	0,63/+161,2 ^o	2,4/ 65,1 ^o	0,111/ 46,5 ^o	0,23/ -91,9 ^o	10,0
2000	0,65/+150,1 ^o	1,8/ 53,0 ^o	0,133/ 46,8 ^o	0,20/ -99,0 ^o	7,5	
20	40	0,29/ -63,8 ^o	26,8/162,1 ^o	0,012/ 74,1 ^o	0,89/ -19,5 ^o	35,8
	100	0,45/-108,1 ^o	22,0/140,1 ^o	0,025/ 59,7 ^o	0,74/ -43,0 ^o	31,3
	200	0,58/-139,5 ^o	15,1/118,3 ^o	0,036/ 49,0 ^o	0,52/ -66,6 ^o	26,7
	500	0,65/-168,7 ^o	7,0/ 94,6 ^o	0,051/ 47,8 ^o	0,29/ -95,4 ^o	19,7
	800	0,66/-179,3 ^o	4,5/ 82,9 ^o	0,066/ 52,3 ^o	0,22/-106,4 ^o	15,8
	1000	0,66/+173,0 ^o	3,7/ 77,4 ^o	0,077/ 54,7 ^o	0,20/-109,3 ^o	14,0
	1200	0,66/+168,2 ^o	3,1/ 72,0 ^o	0,088/ 55,3 ^o	0,19/-112,9 ^o	12,5
	1500	0,65/+156,7 ^o	2,5/ 64,7 ^o	0,108/ 55,0 ^o	0,18/-107,3 ^o	10,6
2000	0,66/+146,8 ^o	1,9/ 53,1 ^o	0,132/ 53,4 ^o	0,16/-114,3 ^o	8,1	
30	40	0,23/ -93,3 ^o	29,3/160,2 ^o	0,010/ 72,3 ^o	0,86/ -21,6 ^o	35,4
	100	0,45/-125,5 ^o	23,5/137,3 ^o	0,021/ 59,0 ^o	0,70/ -47,1 ^o	31,3
	200	0,58/-149,5 ^o	15,5/115,7 ^o	0,030/ 50,6 ^o	0,48/ -71,6 ^o	26,7
	500	0,66/-173,2 ^o	7,1/ 93,2 ^o	0,046/ 52,8 ^o	0,26/-101,2 ^o	20,0
	800	0,66/+176,4 ^o	4,6/ 81,9 ^o	0,062/ 57,4 ^o	0,21/-112,3 ^o	16,0
	1000	0,66/+170,5 ^o	3,7/ 76,5 ^o	0,074/ 59,1 ^o	0,19/-115,4 ^o	14,0
	1200	0,66/+165,8 ^o	3,1/ 71,1 ^o	0,085/ 59,5 ^o	0,18/-118,5 ^o	12,5
	1500	0,65/+154,9 ^o	2,5/ 63,7 ^o	0,106/ 58,4 ^o	0,16/-113,0 ^o	10,7
2000	0,66/+145,5 ^o	1,9/ 52,4 ^o	0,132/ 56,3 ^o	0,14/-120,0 ^o	8,1	

$-V_{CE} = 8 \text{ V}$
 $-I_C = 30 \text{ mA}$
 $T_{amb} = 25 \text{ }^\circ\text{C}$

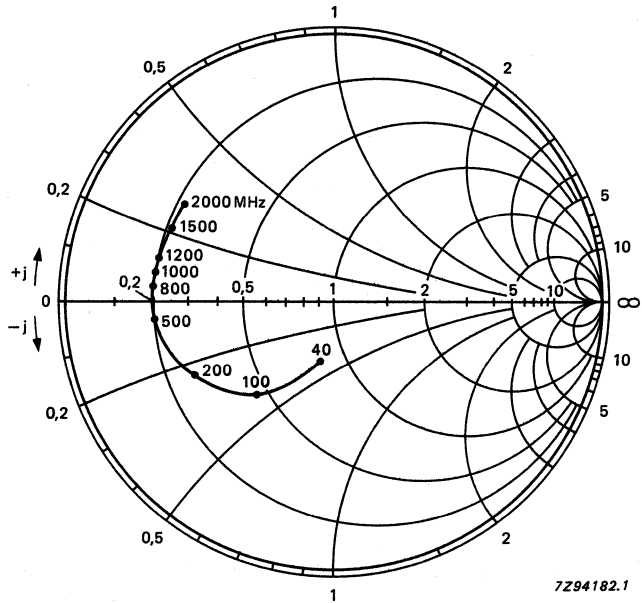


Fig. 7.

Input impedance derived from input reflection coefficient s_{ie} co-ordinates in ohm $\times 50$.

$-V_{CE} = 8 \text{ V}$
 $-I_C = 30 \text{ mA}$
 $T_{amb} = 25 \text{ }^\circ\text{C}$

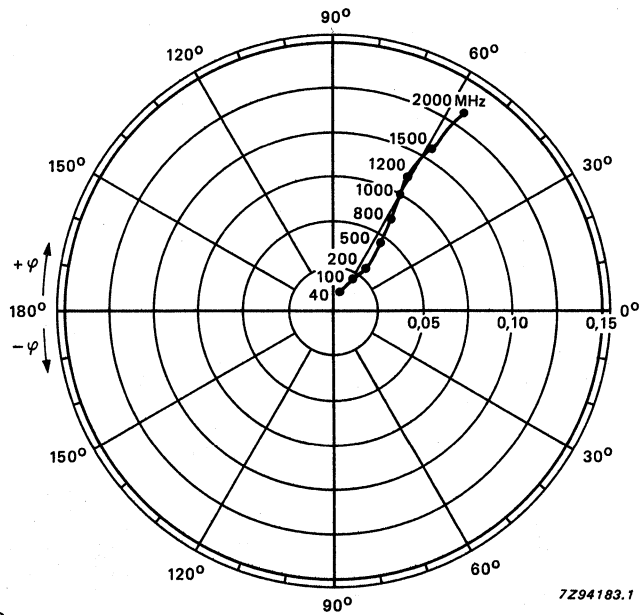


Fig. 8.

Reverse transmission coefficient s_{re} .

$-V_{CE} = 8 \text{ V}$
 $-I_C = 30 \text{ mA}$
 $T_{amb} = 25 \text{ }^\circ\text{C}$

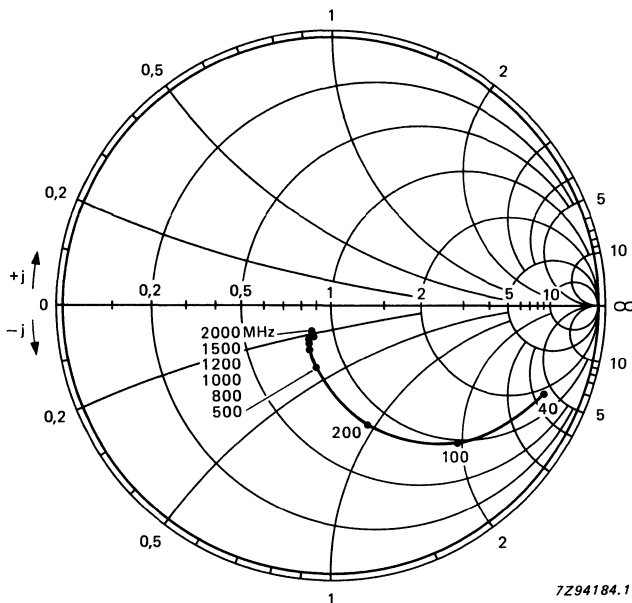


Fig. 9.

Output impedance derived from output reflection coefficient s_{oe} co-ordinates on ohm x 50.

$-V_{CE} = 8 \text{ V}$
 $-I_C = 30 \text{ mA}$
 $T_{amb} = 25 \text{ }^\circ\text{C}$

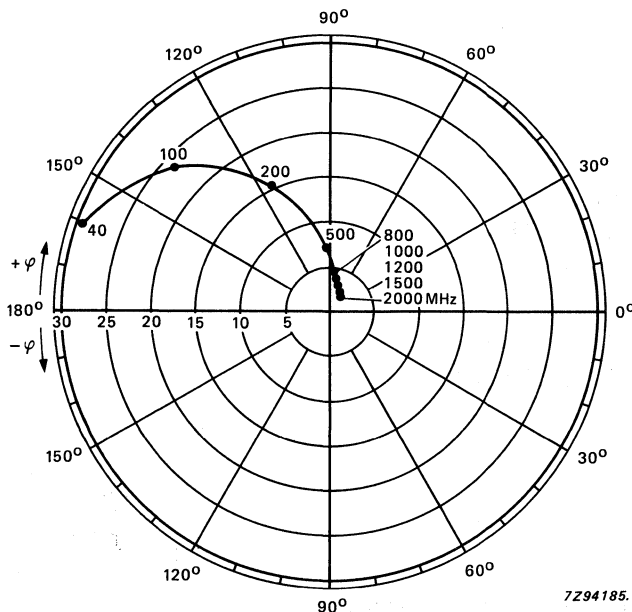


Fig. 10.

Forward transmission coefficient s_{fe} .

P-N-P H.F. WIDEBAND TRANSISTOR

P-N-P transistor in a TO-72 metal envelope with insulated electrodes and a shield lead connected to the case. It is primarily intended for use in u.h.f. and microwave amplifiers such as in aerial amplifiers, radar systems, oscilloscopes, spectrum analysers etc.

The transistor features extremely high power gain coupled with good low noise performance.

N-P-N complement is BFQ22S.

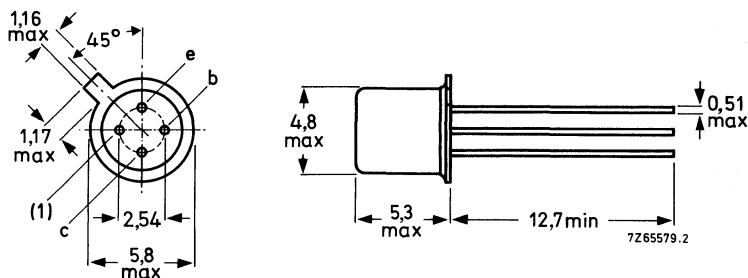
QUICK REFERENCE DATA

Collector-base voltage (open emitter)	$-V_{CBO}$	max.	15 V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	12 V
Collector current (d.c.)	$-I_C$	max.	35 mA
Total power dissipation up to $T_{amb} = 65\text{ }^\circ\text{C}$	P_{tot}	max.	150 mW
Junction temperature	T_j	max.	200 $^\circ\text{C}$
Transition frequency at $f = 500\text{ MHz}$ $-I_C = 30\text{ mA}; -V_{CE} = 5\text{ V}$	f_T	typ.	5,0 GHz
Feedback capacitance at $f = 1\text{ MHz}$ $I_C = 0; -V_{CE} = 5\text{ V}; T_{amb} = 25\text{ }^\circ\text{C}$	C_{re}	typ.	0,8 pF
Noise figure at optimum source impedance $-I_C = 2\text{ mA}; -V_{CE} = 5\text{ V}; f = 500\text{ MHz}$	F	typ.	2,4 dB
Maximum unilateral power gain $-I_C = 30\text{ mA}; -V_{CE} = 5\text{ V}; f = 500\text{ MHz}$	GUM	typ.	15,0 dB

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-72 with insulated electrodes.



(1) shield lead connected to case.

Accessories: 56246 (distance disc).

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	$-V_{CBO}$	max.	15 V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	12 V
Emitter-base voltage (open collector)	$-V_{EBO}$	max.	2 V
Collector current (d.c.)	$-I_C$	max.	35 mA
Collector current (peak value) at $f > 1$ MHz	$-I_{CM}$	max.	50 mA
Total power dissipation up to $T_{amb} = 65$ °C	P_{tot}	max.	150 mW
Storage temperature	T_{stg}		-65 to +200 °C
Junction temperature	T_j	max.	200 °C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j-a}$	=	900 K/W
From junction to case	$R_{th\ j-c}$	=	600 K/W

CHARACTERISTICS

$T_j = 25$ °C unless otherwise specified

Collector cut-off current

$I_E = 0; -V_{CB} = 5$ V	$-I_{CBO}$	max.	50 nA
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→ D.C. current gain

$-I_C = 30$ mA; $-V_{CE} = 5$ V	h_{FE}	min. typ.	20 50
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→ Transition frequency (note 1)

$-I_C = 30$ mA; $-V_{CE} = 5$ V; $f = 500$ MHz	f_T	typ.	5,0 GHz
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→ Collector capacitance (note 2)

$I_E = I_e = 0; -V_{CB} = 5$ V; $f = 1$ MHz	C_c	typ.	1,2 pF
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Emitter capacitance

$I_C = I_c = 0; -V_{EB} = 0,5$ V; $f = 1$ MHz	C_e	typ.	2,5 pF
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→ Feedback capacitance (note 1)

$I_C = 0; -V_{CE} = 5$ V; $f = 1$ MHz	C_{re}	typ.	0,8 pF
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→ Noise figure at optimum source impedance (note 1)

$-I_C = 2$ mA; $-V_{CE} = 5$ V; $f = 500$ MHz; $T_{amb} = 25$ °C	F	typ.	2,4 dB
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→ Maximum unilateral power gain (note 1)

s_{re} assumed to be zero

$$G_{UM} = 10 \log \frac{|s_{fe}|^2}{[1 - |s_{ie}|^2][1 - |s_{oe}|^2]}$$

$-I_C = 30$ mA; $-V_{CE} = 5$ V; $f = 500$ MHz; $T_{amb} = 25$ °C	G_{UM}	typ.	15,0 dB
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Notes

- 1. Shield lead grounded.
- 2. Shield lead not connected.

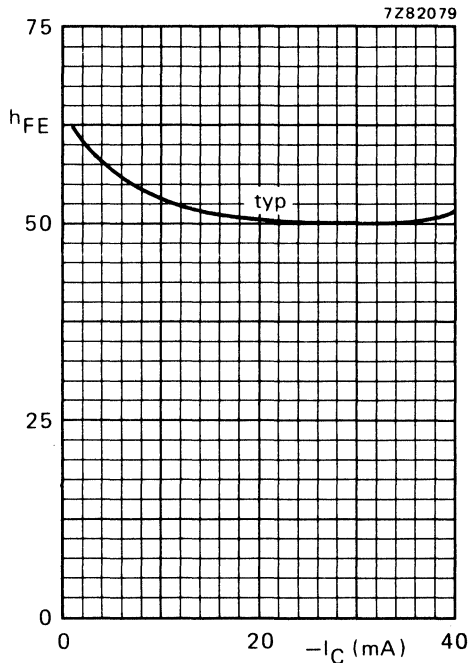


Fig. 2 $-V_{CE} = 5$ V; $T_j = 25$ °C; typical values.

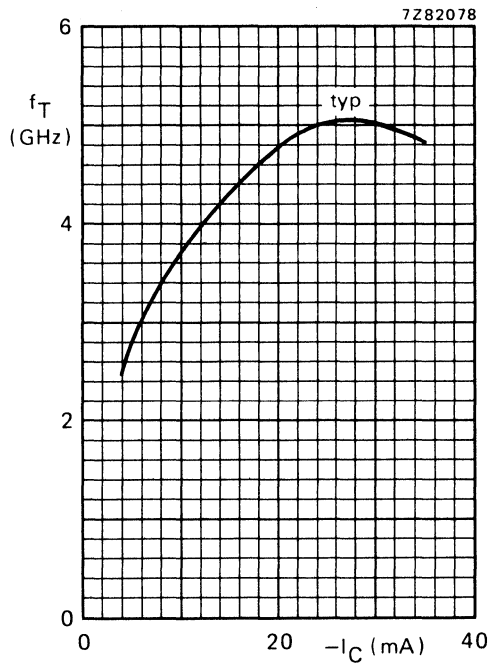


Fig. 3 $-V_{CE} = 5$ V; $f = 500$ MHz; $T_j = 25$ °C; typical values.

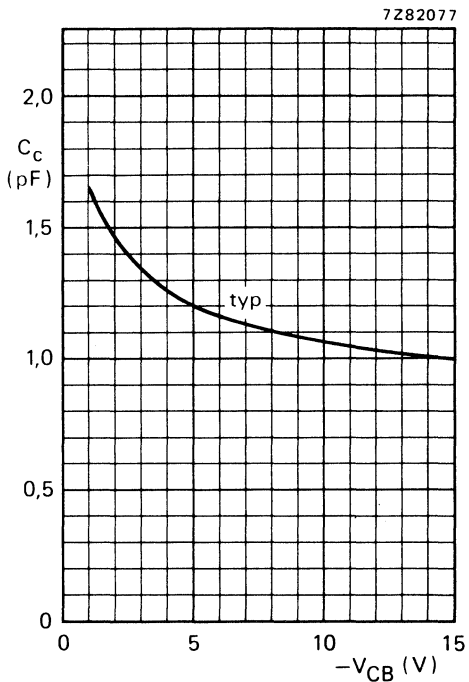


Fig. 4 $I_E = I_e = 0$; $f = 1$ MHz; $T_j = 25$ °C; typical values.

P-N-P 1 GHz WIDEBAND TRANSISTOR

P-N-P transistor in a plastic SOT-37 envelope.

It is intended for use in u.h.f. applications such as broadband aerial amplifiers (30 MHz to 860 MHz) and in microwave amplifiers such as radar systems, spectrum analysers etc.

The BFQ32 offers a high transition frequency and a low intermodulation distortion figure over a wide current range.

N-P-N complement is BFR96.

QUICK REFERENCE DATA

Collector-base voltage (open emitter)	$-V_{CBO}$	max.	20 V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	15 V
Collector current (d.c.)	$-I_C$	max.	75 mA
Total power dissipation up to $T_{amb} = 60\text{ }^\circ\text{C}$	P_{tot}	max.	500 mW
Junction temperature	T_j	max.	175 $^\circ\text{C}$
Transition frequency at $f = 500\text{ MHz}$ $-I_C = 50\text{ mA}; -V_{CE} = 10\text{ V}$	f_T	min.	3,6 GHz
Feedback capacitance at $f = 1\text{ MHz}$ $-I_C = 10\text{ mA}; -V_{CE} = 10\text{ V}$	C_{re}	max.	1,4 pF
Noise figure at optimum source impedance $-I_C = 50\text{ mA}; -V_{CE} = 10\text{ V}; f = 500\text{ MHz}$	F	typ.	3,75 dB
Output voltage at $d_{im} = -60\text{ dB}$ $-I_C = 50\text{ mA}; -V_{CE} = 10\text{ V}; R_L = 75\text{ }\Omega$ $f_{(p+q-r)} = 493,25\text{ MHz}$	V_o	typ.	500 mV

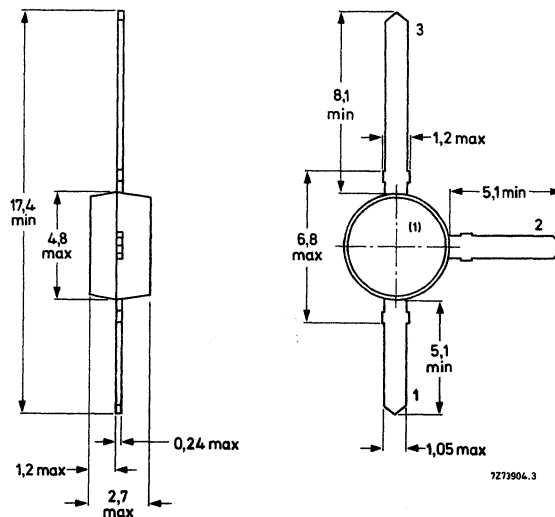
MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-37.

Connections

1. Base
2. Emitter
3. Collector



(1) = type number marking.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	$-V_{CBO}$	max.	20 V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	15 V
Emitter-base voltage (open collector)	$-V_{EBO}$	max.	3 V
Collector current (d.c.)	$-I_C$	max.	75 mA
Collector current (peak value); $f > 1$ MHz	$-I_{CM}$	max.	150 mA
Total power dissipation up to $T_{amb} = 60$ °C mounted on a fibre-glass print of 40 mm x 25 mm x 1 mm	P_{tot}		500 mW
Storage temperature	T_{stg}		-65 to + 175 °C
Junction temperature	T_j	max.	175 °C

THERMAL RESISTANCE

From junction to ambient in free air
mounted on a fibre-glass print
of 40 mm x 25 mm x 1 mm

$R_{th\ j-a}$	=	230 K/W
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CHARACTERISTICS

→ $T_j = 25$ °C unless otherwise specified

Collector cut-off current

$I_E = 0; -V_{CB} = 10$ V

$-I_{CBO}$	max.	100 nA
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→ D.C. current gain

$-I_C = 50$ mA; $-V_{CE} = 10$ V

h_{FE}	min.	20
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$-I_C = 75$ mA; $-V_{CE} = 10$ V

h_{FE}	min.	20
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→ Transition frequency at $f = 500$ MHz

$-I_C = 50$ mA; $-V_{CE} = 10$ V

f_T	min.	3,6 GHz
	typ	4,2 GHz

$-I_C = 75$ mA; $-V_{CE} = 10$ V

f_T	min.	4,0 GHz
	typ	4,6 GHz

Collector capacitance at $f = 1$ MHz

$I_E = I_e = 0; -V_{CB} = 10$ V

C_c	typ	1,3 pF
-------	-----	--------

Emitter capacitance at $f = 1$ MHz

$I_C = I_c = 0; -V_{EB} = 0,5$ V

C_e	typ	6 pF
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Feedback capacitance at $f = 1$ MHz

$-I_C = 10$ mA; $-V_{CE} = 10$ V

C_{re}	max.	1,4 pF
	typ	1,25 pF

Noise figure at optimum source impedance

$-I_C = 50 \text{ mA}; -V_{CE} = 10 \text{ V}; f = 500 \text{ MHz}; T_{amb} = 25 \text{ }^\circ\text{C}$

F typ. 3,75 dB ←

Maximum unilateral power gain (s_{re} assumed to be zero)

$$G_{UM} = 10 \log \frac{|s_{fe}|^2}{[1 - |s_{ie}|^2][1 - |s_{oe}|^2]}$$

$-I_C = 50 \text{ mA}; -V_{CE} = 10 \text{ V}; f = 500 \text{ MHz}; T_{amb} = 25 \text{ }^\circ\text{C}$

G_{UM} typ. 14,0 dB ←

Output voltage at $d_{im} = -60 \text{ dB}$

$-I_C = 50 \text{ mA}; -V_{CE} = 10 \text{ V};$

$R_L = 75 \text{ } \Omega; T_{amb} = 25 \text{ }^\circ\text{C}$

$V_p = V_o$ at $d_{im} = -60 \text{ dB}; f_p = 495,25 \text{ MHz}$

$V_q = V_o - 6 \text{ dB}; f_q = 503,25 \text{ MHz}$

$V_r = V_o - 6 \text{ dB}; f_r = 505,25 \text{ MHz}$

measured at $f_{(p+q-r)} = 495,25 \text{ MHz}$

V_o typ. 500 mV ←

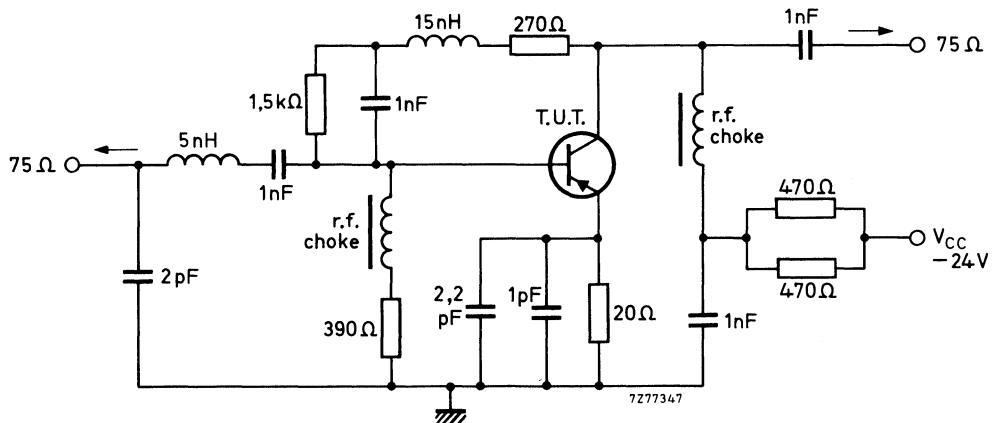


Fig. 2 Intermodulation test circuit.

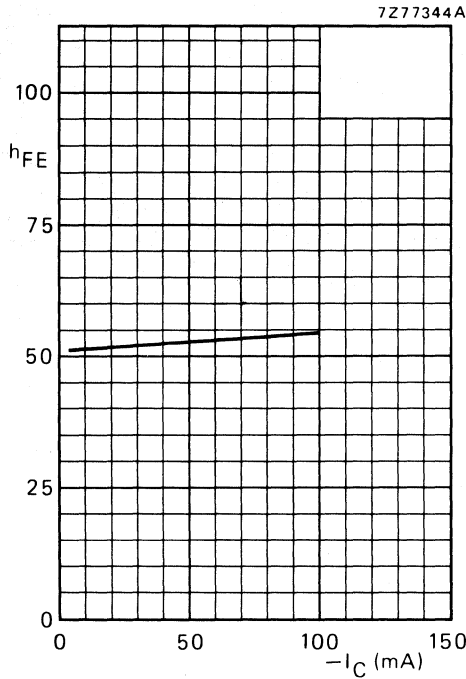


Fig. 3 $-V_{CE} = 10$ V; $T_j = 25$ °C; typical values.

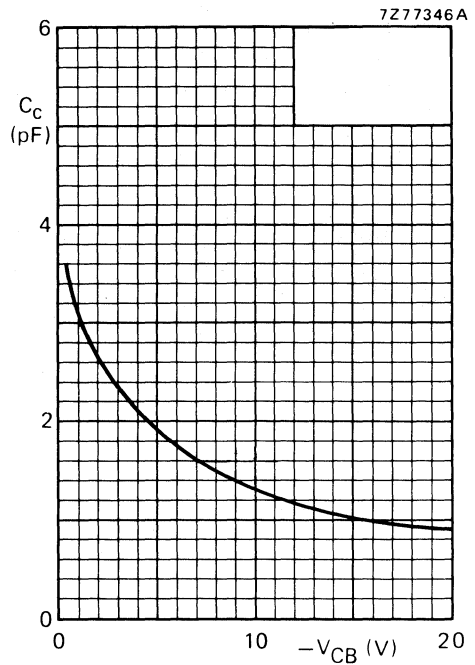


Fig. 4 $I_E = i_e = 0$; $f = 1$ MHz; $T_j = 25$ °C; typical values.

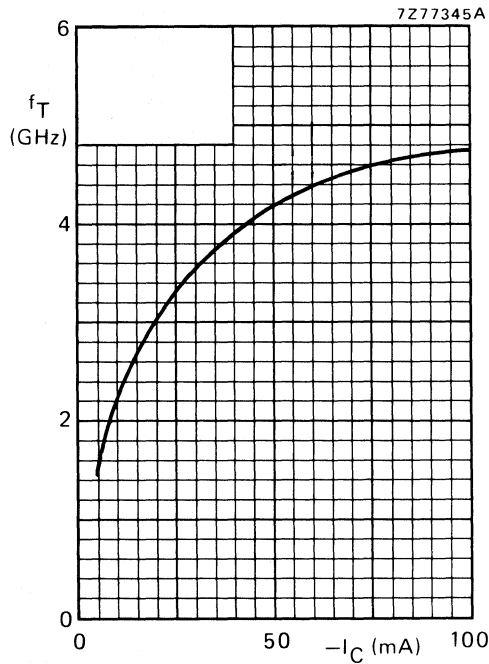


Fig. 5 $-V_{CE} = 10$ V; $f = 500$ MHz; $T_j = 25$ °C; typical values.

P-N-P 2 GHz WIDEBAND TRANSISTOR

P-N-P transistor in a sub-miniature HERMETICALLY SEALED micro-stripline envelope. It is intended for use in u.h.f. applications such as broadband aerial amplifiers. Microwave applications include radar systems, spectrum analysers etc.

The BFQ32C features a high transition frequency and a low intermodulation distortion figure over a wide current range.

N-P-N complement is BFP96.

QUICK REFERENCE DATA

Collector-base voltage	$-V_{CBO}$	max.	20 V
Collector-emitter voltage	$-V_{CEO}$	max.	15 V
Collector current (d.c.)	$-I_C$	max.	100 mA
Total power dissipation up to $T_{amb} = 75\text{ }^\circ\text{C}$	P_{tot}	max.	500 mW
Junction temperature	T_j	max.	175 $^\circ\text{C}$
D.C. current gain			
$-I_C = 50\text{ mA}; -V_{CE} = 10\text{ V}$	h_{FE}	min.	20
Transition frequency at $f = 500\text{ MHz}$			
$-I_C = 50\text{ mA}; -V_{CE} = 10\text{ V}$	f_T	typ.	4,5 GHz
Maximum unilateral power gain			
$-I_C = 50\text{ mA}; -V_{CE} = 10\text{ V}$			
at $f = 500\text{ MHz}$	GUM	typ.	18,0 dB
at $f = 800\text{ MHz}$		typ.	14,0 dB

MECHANICAL DATA

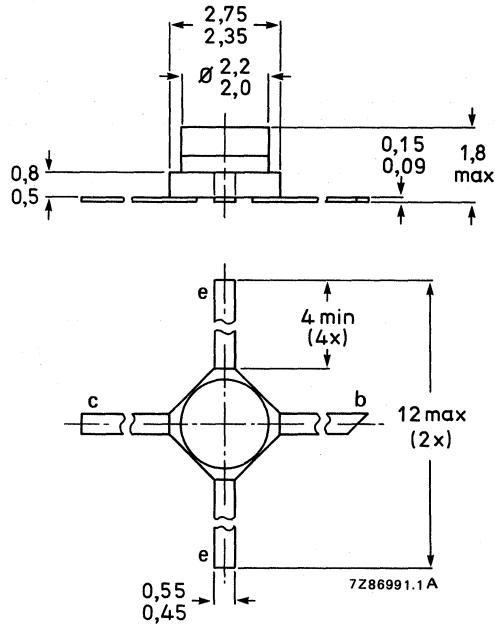
SOT-173 (see Fig. 1).

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-173.

Marking code: C2



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	$-V_{CB0}$	max.	20 V
Collector-emitter voltage (open base)	$-V_{CE0}$	max.	15 V
Emitter-base voltage (open collector)	$-V_{EB0}$	max.	3 V
Collector current (d.c.)	$-I_C$	max.	100 mA
Total power dissipation up to $T_{amb} = 75\text{ }^\circ\text{C}$ mounted on a ceramic substrate of $0,7\text{ mm} \times 10\text{ cm}^2$	P_{tot}	max.	500 mW
Storage temperature	T_{stg}		$-65\text{ to }+150\text{ }^\circ\text{C}$
Junction temperature	T_j	max.	175 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to ambient in free air, mounted on a ceramic substrate of $0,7\text{ mm} \times 10\text{ cm}^2$

$R_{th\ j-a}$	200 K/W
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CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Collector cut-off current

$I_E = 0; -V_{CB} = 10\text{ V}$

$-I_{CBO}$ max. 100 nA

D.C. current gain

$-I_C = 50\text{ mA}; -V_{CE} = 10\text{ V}$

h_{FE} min. 20

Transition frequency at $f = 500\text{ MHz}$

$-I_C = 50\text{ mA}; -V_{CE} = 10\text{ V}$

f_T typ. 4,5 GHz

Collector capacitance at $f = 1\text{ MHz}$

$I_E = I_e = 0; -V_{CB} = 10\text{ V}$

C_c typ. 1,9 pF

Emitter capacitance at $f = 1\text{ MHz}$

$I_C = I_c = 0; -V_{EB} = 0,5\text{ V}$

C_e typ. 5,0 pF

Feedback capacitance at $f = 1\text{ MHz}$

$I_C = 0; -V_{CE} = 10\text{ V}$

C_{re} typ. 1,4 pF

Maximum unilateral power gain (s_{re} assumed to be zero)

$$G_{UM} = 10 \log \frac{|s_{fe}|^2}{[1 - |s_{ie}|^2][1 - |s_{oe}|^2]}$$

at $-I_C = 50\text{ mA}; -V_{CE} = 10\text{ V}; T_{amb} = 25\text{ }^\circ\text{C}$

$f = 500\text{ MHz}$

$f = 800\text{ MHz}$

G_{UM} typ. 18,0 dB

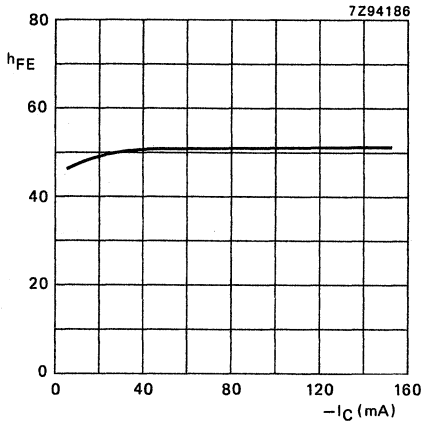
typ. 14,0 dB

Noise figures at $f = 800\text{ MHz}; Z_S = \text{opt.}; T_{amb} = 25\text{ }^\circ\text{C};$

$-I_C = 50\text{ mA}; -V_{CE} = 10\text{ V}$

F typ. 4,3 dB





→ Fig. 2 $-V_{CE} = 10$ V; $T_j = 25$ °C; typical values.

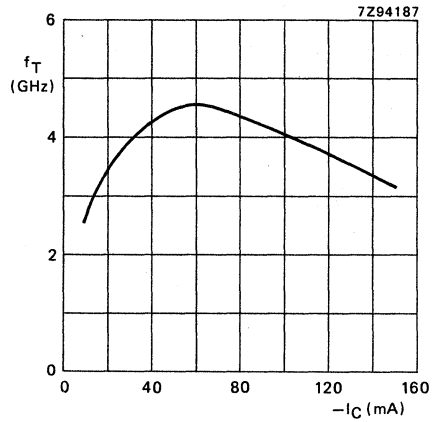
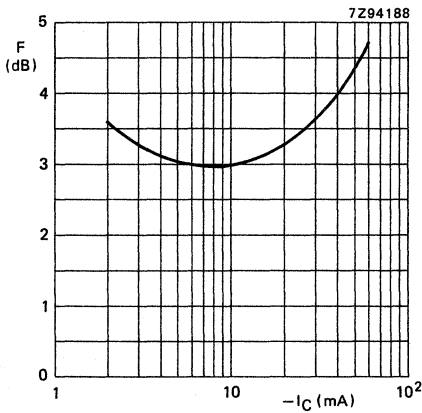


Fig. 3 $-V_{CE} = 10$ V; $f = 500$ MHz; $T_j = 25$ °C; typical values.



→ Fig. 4 $-V_{CE} = 10$ V; $f = 800$ MHz; $T_{amb} = 25$ °C; $Z_s = \text{optimum}$; typical values.

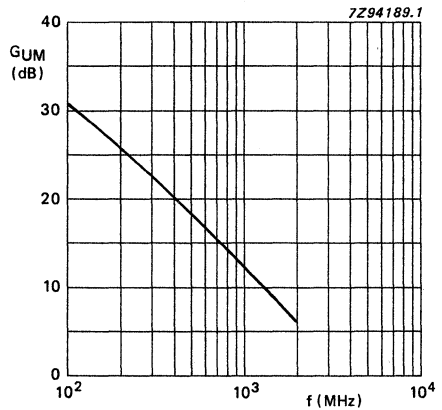
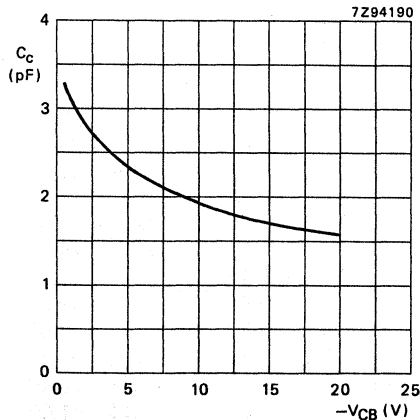


Fig. 5 $-V_{CE} = 10$ V; $-I_C = 50$ mA; $T_{amb} = 25$ °C; typical values.



→ Fig. 6 $I_E = I_e = 0$; $f = 1$ MHz; $T_j = 25$ °C; typical values.

s-parameters (common emitter) at $-V_{CE} = 10 \text{ V}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

I_C mA	f MHz	s_{ie}	s_{fe}	s_{re}	s_{oe}	GUM dB
10	40	0,49/ -69,3 ^o	20,4/153,8 ^o	0,023/ 66,3 ^o	0,88/ -26,1 ^o	33,9
	100	0,64/ -117,9 ^o	14,7/127,8 ^o	0,042/ 45,4 ^o	0,65/ -51,6 ^o	28,0
	200	0,72/ -148,5 ^o	8,8/107,1 ^o	0,051/ 33,3 ^o	0,41/ -70,4 ^o	22,9
	500	0,76/ -173,5 ^o	3,8/ 85,3 ^o	0,061/ 32,9 ^o	0,26/ -88,9 ^o	15,6
	800	0,76/ +176,5 ^o	2,4/ 73,4 ^o	0,071/ 38,7 ^o	0,25/ -96,4 ^o	11,6
	1000	0,76/ +171,4 ^o	2,0/ 66,9 ^o	0,079/ 42,5 ^o	0,26/ -100,5 ^o	10,1
	1200	0,76/ +167,0 ^o	1,7/ 60,7 ^o	0,087/ 45,0 ^o	0,27/ -105,9 ^o	8,7
	1500	0,73/ +157,7 ^o	1,3/ 51,6 ^o	0,111/ 50,7 ^o	0,29/ -102,5 ^o	6,0
	2000	0,75/ +147,2 ^o	1,0/ 39,5 ^o	0,136/ 53,3 ^o	0,31/ -115,7 ^o	3,9
15	40	0,45/ -81,6 ^o	24,5/151,2 ^o	0,021/ 64,7 ^o	0,85/ -31,0 ^o	34,5
	100	0,62/ -127,4 ^o	16,6/124,3 ^o	0,036/ 44,9 ^o	0,60/ -60,6 ^o	28,4
	200	0,71/ -154,0 ^o	9,8/105,7 ^o	0,044/ 36,4 ^o	0,38/ -83,1 ^o	23,5
	500	0,75/ -176,8 ^o	4,2/ 85,4 ^o	0,057/ 40,7 ^o	0,24/ -106,2 ^o	16,1
	800	0,75/ +174,1 ^o	2,6/ 72,9 ^o	0,071/ 46,8 ^o	0,22/ -113,4 ^o	12,2
	1000	0,74/ +168,5 ^o	2,2/ 67,6 ^o	0,083/ 50,1 ^o	0,22/ -115,9 ^o	10,3
	1200	0,74/ +164,4 ^o	1,8/ 61,9 ^o	0,093/ 51,9 ^o	0,23/ -120,1 ^o	8,9
	1500	0,73/ +156,9 ^o	1,5/ 54,1 ^o	0,114/ 54,3 ^o	0,26/ -122,0 ^o	7,0
	2000	0,76/ +147,5 ^o	1,1/ 42,1 ^o	0,138/ 54,7 ^o	0,28/ -131,5 ^o	5,0
20	40	0,42/ -95,3 ^o	27,9/148,7 ^o	0,019/ 63,2 ^o	0,83/ -35,6 ^o	34,8
	100	0,63/ -136,0 ^o	18,1/121,9 ^o	0,032/ 44,6 ^o	0,56/ -68,5 ^o	29,0
	200	0,71/ -158,8 ^o	10,5/104,2 ^o	0,039/ 38,7 ^o	0,36/ -94,6 ^o	24,1
	500	0,74/ -178,8 ^o	4,4/ 85,3 ^o	0,053/ 45,7 ^o	0,20/ -117,4 ^o	16,6
	800	0,74/ +173,0 ^o	2,8/ 73,5 ^o	0,070/ 51,6 ^o	0,23/ -129,4 ^o	12,7
	1000	0,74/ +167,6 ^o	2,3/ 68,5 ^o	0,083/ 54,4 ^o	0,22/ -131,6 ^o	10,8
	1200	0,74/ +163,5 ^o	1,9/ 63,0 ^o	0,094/ 55,6 ^o	0,23/ -134,6 ^o	9,4
	1500	0,73/ +156,7 ^o	1,6/ 55,2 ^o	0,116/ 56,7 ^o	0,23/ -137,0 ^o	7,5
	2000	0,75/ +147,3 ^o	1,2/ 43,4 ^o	0,142/ 55,8 ^o	0,25/ -145,7 ^o	5,4
30	40	0,42/ -120,4 ^o	32,2/145,8 ^o	0,016/ 61,2 ^o	0,79/ -42,2 ^o	35,2
	100	0,65/ -148,4 ^o	20,1/119,5 ^o	0,025/ 44,4 ^o	0,53/ -80,2 ^o	29,9
	200	0,73/ -165,5 ^o	11,3/102,0 ^o	0,031/ 41,5 ^o	0,36/ -111,0 ^o	25,0
	500	0,76/ +179,3 ^o	4,7/ 84,6 ^o	0,046/ 51,1 ^o	0,27/ -141,8 ^o	17,5
	800	0,76/ +172,1 ^o	3,0/ 74,7 ^o	0,064/ 56,4 ^o	0,26/ -150,4 ^o	13,6
	1000	0,76/ +167,5 ^o	2,4/ 69,5 ^o	0,077/ 58,5 ^o	0,25/ -153,6 ^o	11,6
	1200	0,76/ +163,8 ^o	2,0/ 64,5 ^o	0,088/ 59,0 ^o	0,25/ -156,1 ^o	10,0
	1500	0,74/ +155,7 ^o	1,7/ 56,8 ^o	0,119/ 59,7 ^o	0,24/ -150,9 ^o	8,1
	2000	0,76/ +146,1 ^o	1,3/ 45,3 ^o	0,146/ 57,8 ^o	0,25/ -157,6 ^o	6,0
50	40	0,46/ -137,3 ^o	36,6/141,9 ^o	0,013/ 58,9 ^o	0,73/ -50,0 ^o	35,6
	100	0,68/ -157,1 ^o	21,5/116,3 ^o	0,020/ 45,6 ^o	0,49/ -92,1 ^o	30,5
	200	0,74/ -170,4 ^o	11,8/100,1 ^o	0,026/ 46,9 ^o	0,36/ -124,6 ^o	25,5
	500	0,76/ -177,5 ^o	4,9/ 84,0 ^o	0,043/ 57,7 ^o	0,30/ -153,4 ^o	18,0
	800	0,76/ +171,0 ^o	3,1/ 74,9 ^o	0,063/ 61,4 ^o	0,28/ -161,8 ^o	14,0
	1000	0,76/ +166,6 ^o	2,5/ 69,8 ^o	0,076/ 62,5 ^o	0,27/ -165,5 ^o	12,0
	1200	0,76/ +162,9 ^o	2,1/ 64,9 ^o	0,089/ 62,4 ^o	0,27/ -168,1 ^o	10,5
	1500	0,74/ +155,2 ^o	1,7/ 57,6 ^o	0,123/ 61,0 ^o	0,23/ -165,0 ^o	8,2
	2000	0,76/ +146,1 ^o	1,3/ 46,7 ^o	0,151/ 58,4 ^o	0,23/ -172,4 ^o	6,2

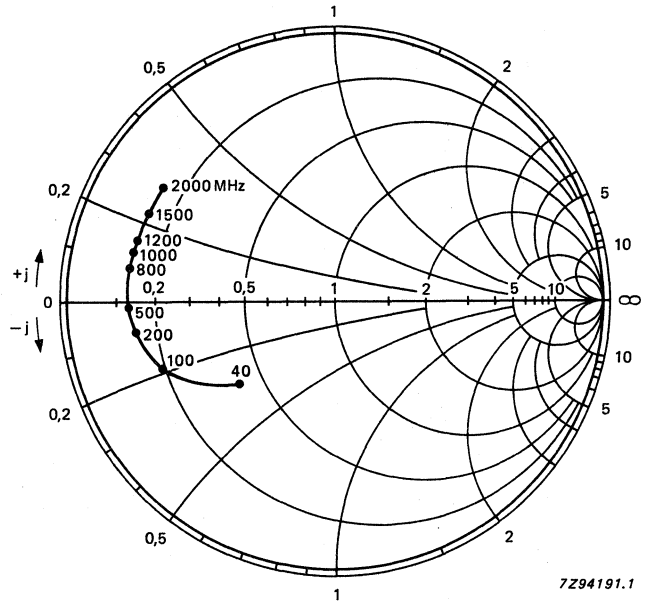


Fig. 7 $-V_{CE} = 10 \text{ V}$; $-I_C = 50 \text{ mA}$;
 $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

Input impedance derived from
 input reflection coefficient s_{ie}
 co-ordinates in ohm x 50.

7Z94191.1

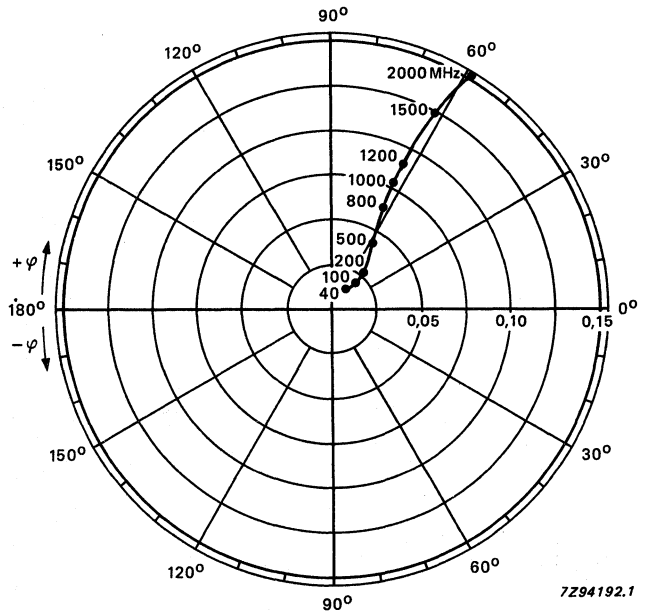


Fig. 8 $-V_{CE} = 10 \text{ V}$; $-I_C = 50 \text{ mA}$;
 $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

→ Reverse transmission coefficient s_{re} .

7Z94192.1

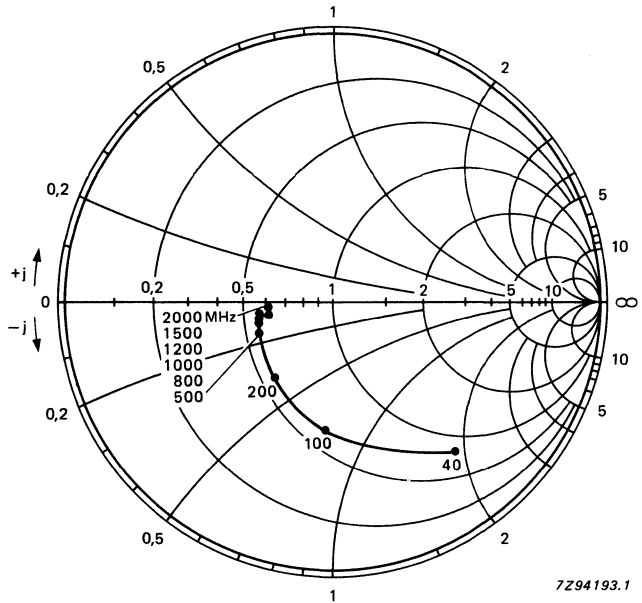


Fig. 9 $-V_{CE} = 10\text{ V}$; $-I_C = 50\text{ mA}$;
 $T_{amb} = 25\text{ }^\circ\text{C}$; typical values.

Output impedance derived from
 output reflection coefficient s_{OE}
 co-ordinates in ohm $\times 50$.

7294193.1

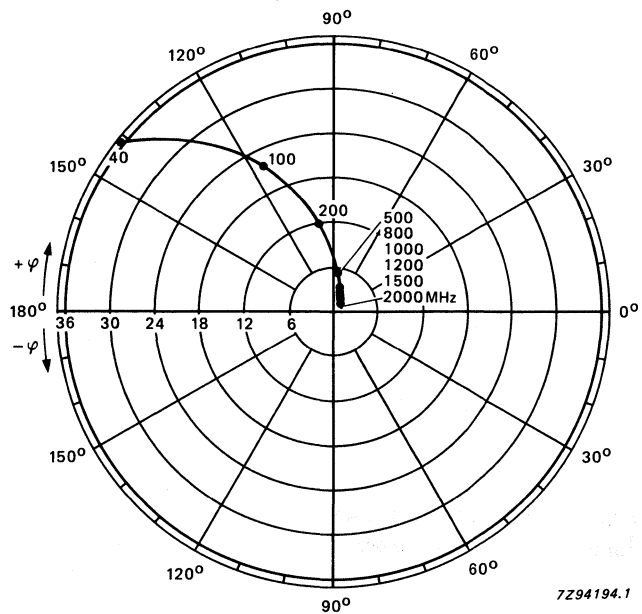


Fig. 10 $-V_{CE} = 10\text{ V}$; $-I_C = 50\text{ mA}$;
 $T_{amb} = 25\text{ }^\circ\text{C}$; typical values.

Forward transmission coefficient s_{fe} .

7294194.1

P-N-P H.F. WIDEBAND TRANSISTOR

P-N-P transistor in a TO-72 metal envelope with insulated electrodes and a shield lead connected to the case. It is primarily intended for use in u.h.f. and microwave amplifiers such as aerial amplifiers, radar systems, oscilloscopes, spectrum analysers etc.

The transistor features high power gain, high transition frequency and low noise up to high frequencies. N-P-N complement is BFQ63.

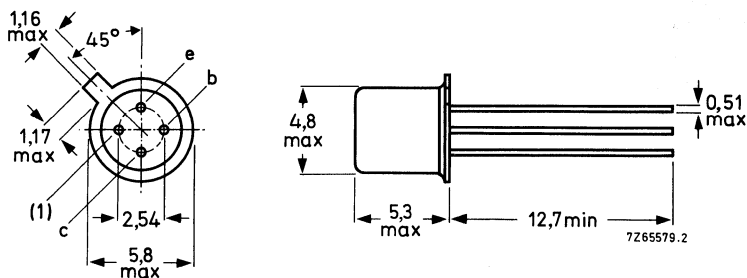
QUICK REFERENCE DATA

Collector-base voltage (open emitter)	$-V_{CBO}$ max.	20 V
Collector-emitter voltage (open base)	$-V_{CEO}$ max.	15 V
Collector current (d.c.)	$-I_C$ max.	75 mA
Total power dissipation up to $T_{amb} = 50\text{ }^{\circ}\text{C}$	P_{tot} max.	250 mW
Junction temperature	T_j max.	200 $^{\circ}\text{C}$
Transition frequency at $f = 500\text{ MHz}$ $-I_C = 50\text{ mA}; -V_{CE} = 5\text{ V}$	f_T typ.	4,5 GHz
Feedback capacitance at $f = 1\text{ MHz}$ $-I_C = 10\text{ mA}; -V_{CE} = 10\text{ V}$	C_{re} typ.	1,4 pF
Noise figure at optimum source impedance $-I_C = 10\text{ mA}; -V_{CE} = 5\text{ V}; f = 200\text{ MHz}$	F typ.	1,9 dB
Maximum unilateral power gain $-I_C = 20\text{ mA}; -V_{CE} = 5\text{ V}; f = 200\text{ MHz}$	G_{UM} typ.	18,0 dB

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-72 with insulated electrodes.



(1) Shield lead connected to case.

Accessories: 56246 (distance disc).

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	$-V_{CBO}$	max.	20 V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	15 V
Emitter-base voltage (open collector)	$-V_{EBO}$	max.	3 V
Collector current (d.c.)	$-I_C$	max.	75 mA
Collector current (peak value) at $f > 1$ MHz	$-I_{CM}$	max.	150 mA
Total power dissipation up to $T_{amb} = 50$ °C	P_{tot}	max.	250 mW
Storage temperature	T_{stg}		-65 to +200 °C
Junction temperature	T_j	max.	200 °C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j-a}$	=	600 K/W
From junction to case	$R_{th\ j-c}$	=	350 K/W

→ CHARACTERISTICS

$T_j = 25$ °C unless otherwise specified

Collector cut-off current

$$-I_E = 0; -V_{CB} = 10\text{ V}$$

$-I_{CBO}$	max.	100 nA
------------	------	--------

D.C. current gain

$$-I_C = 20\text{ mA}; -V_{CE} = 5\text{ V}$$

h_{FE}	min.	20
----------	------	----

$$-I_C = 50\text{ mA}; -V_{CE} = 5\text{ V}$$

h_{FE}	min.	20
----------	------	----

Transition frequency (note 1)

$$-I_C = 50\text{ mA}; -V_{CE} = 5\text{ V}; f = 500\text{ MHz}$$

f_T	typ.	4,5 GHz
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Collector capacitance (note 2)

$$I_E = i_e = 0; -V_{CB} = 10\text{ V}; f = 1\text{ MHz}$$

C_c	typ.	1,8 pF
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Emitter capacitance

$$I_C = i_c = 0; -V_{EB} = 0,5\text{ V}; f = 1\text{ MHz}$$

C_e	typ.	0,4 pF
-------	------	--------

Feedback capacitance (note 1)

$$-I_C = 10\text{ mA}; -V_{CE} = 10\text{ V}; f = 1\text{ MHz}; T_{amb} = 25\text{ °C}$$

C_{re}	typ.	1,4 pF
----------	------	--------

Noise figure at optimum source impedance (note 1)

$$-I_C = 10\text{ mA}; -V_{CE} = 5\text{ V}; f = 200\text{ MHz}; T_{amb} = 25\text{ °C}$$

F	typ.	1,9 dB
---	------	--------

$$-I_C = 10\text{ mA}; -V_{CE} = 5\text{ V}; f = 500\text{ MHz}; T_{amb} = 25\text{ °C}$$

F	typ.	2,3 dB
---	------	--------

Maximum unilateral power gain (note 1)

s_{re} assumed to be zero

$$G_{UM} = 10 \log \frac{|s_{fe}|^2}{(1 - |s_{ie}|^2)(1 - |s_{oe}|^2)}$$

$$-I_C = 20\text{ mA}; -V_{CE} = 5\text{ V}; f = 200\text{ MHz}; T_{amb} = 25\text{ °C}$$

G_{UM}	typ.	18,0 dB
----------	------	---------

$$-I_C = 50\text{ mA}; -V_{CE} = 5\text{ V}; f = 500\text{ MHz}; T_{amb} = 25\text{ °C}$$

G_{UM}	typ.	11,0 dB
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Notes

1. Shield lead grounded.
2. Shield lead and emitter lead connected to bridge earth.

P-N-P 1 GHz WIDEBAND TRANSISTOR

P-N-P transistor in a plastic SOT-37 envelope.

It is intended for use in u.h.f. applications such as broadcast aerial amplifiers and in microwave amplifiers such as radar systems, spectrum analysers etc.

The BFQ32S offers a high transition frequency and a low modulation distortion figure over a wide current range.

N-P-N complement is BFR96S.

QUICK REFERENCE DATA

Collector-base voltage (open emitter)	$-V_{CBO}$	max.	20 V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	15 V
Collector current (d.c.)	$-I_C$	max.	100 mA
Total power dissipation up to $T_{amb} = 70\text{ }^\circ\text{C}$	P_{tot}	max.	700 mW
Junction temperature	T_j	max.	175 $^\circ\text{C}$
Transition frequency at $f = 500\text{ MHz}$ $-I_C = 70\text{ mA}; -V_{CE} = 10\text{ V}$	f_T	typ.	4,5 GHz
Output voltage at $d_{im} = -60\text{ dB}$ $-I_C = 70\text{ mA}; -V_{CE} = 10\text{ V}$ $f_{(p+q-r)} = 793,25\text{ MHz}$	V_o	typ.	600 mV
Noise figure at optimum source impedance $-I_C = 50\text{ mA}; -V_{CE} = 10\text{ V}; f = 800\text{ MHz}$	F	typ.	4,3 dB
Maximum unilateral power gain $-I_C = 70\text{ mA}; -V_{CE} = 10\text{ V}; f = 800\text{ MHz}$	GUM	typ.	10,0 dB

MECHANICAL DATA (see Fig. 1)

Dimensions in mm

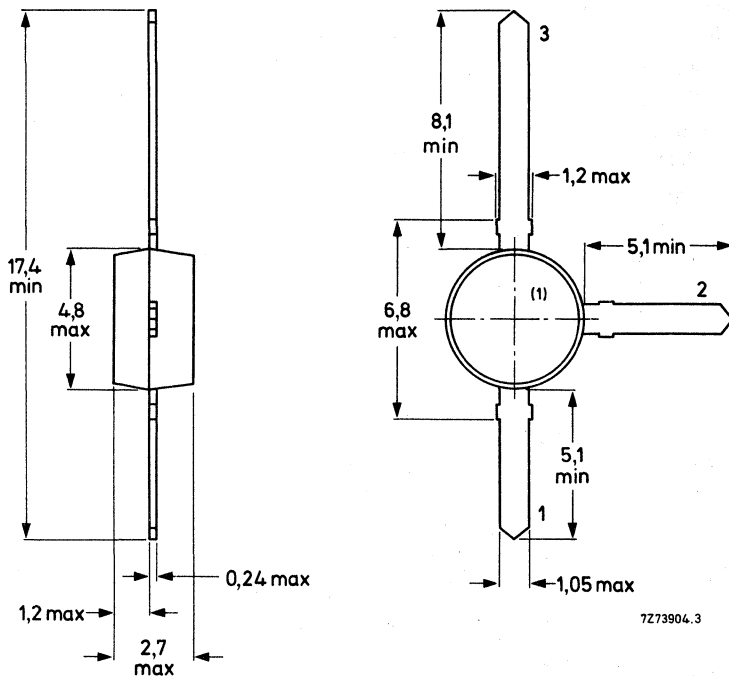
MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-37

Connections

- 1. Base
- 2. Emitter
- 3. Collector



(1) = type number marking.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	$-V_{CBO}$	max.	20 V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	15 V
Emitter-base voltage (open collector)	$-V_{EBO}$	max.	3 V
Collector current (d.c.)	$-I_C$	max.	100 mA

Total power dissipation up to $T_{amb} = 70\text{ }^\circ\text{C}$
 mounted on a fibre-glass print of
 50 mm x 50 mm x 1,5 mm (see Fig. 3)

P_{tot}	max.	700 mW
T_{stg}		-65 to + 175 $^\circ\text{C}$
T_j	max.	175 $^\circ\text{C}$

Storage temperature

Junction temperature

THERMAL RESISTANCE

From junction to ambient in free air
 mounted on a fibre-glass print of
 50 mm x 50 mm x 1,5 mm (see Fig. 3)

$R_{th\ j-a}$	=	150 K/W
$R_{th\ j-c}$	=	50 K/W

From junction to case

CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Collector cut-off current

$I_E = 0; -V_{CB} = 10\text{ V}$

$-I_{CBO}$ max. 100 nA

D.C. current gain

$-I_C = 70\text{ mA}; -V_{CE} = 10\text{ V}$

h_{FE} min. 20

Transition frequency at $f = 500\text{ MHz}$

$-I_C = 70\text{ mA}; -V_{CE} = 10\text{ V}$

f_T typ. 4,5 GHz

Collector capacitance at $f = 1\text{ MHz}$

$I_E = 0; -V_{CB} = 10\text{ V}$

C_c typ. 1,8 pF

Emitter capacitance at $f = 1\text{ MHz}$

$I_C = 0; -V_{EB} = 0,5\text{ V}$

C_e typ. 6,0 pF

Feedback capacitance at $f = 1\text{ MHz}$

$I_C = 0; -V_{CE} = 10\text{ V}$

C_{re} typ. 1,3 pF

Output voltage at $d_{im} = -60\text{ dB}$ (see Fig. 2)

$-I_C = 70\text{ mA}; -V_{CE} = 10\text{ V}; R_L = 75\text{ }\Omega; T_{amb} = 25\text{ }^\circ\text{C}$

$V_p = V_o$ at $d_{im} = -60\text{ dB}; f_p = 795,25\text{ MHz}$

$V_q = V_o - 6\text{ dB}; f_q = 803,25\text{ MHz}$

$V_r = V_o - 6\text{ dB}; f_r = 805,25\text{ MHz}$

measured at $f_{(p+q-r)} = 793,25\text{ MHz}$

V_o typ. 600 mV

Noise figure at optimum source impedance

$-I_C = 50\text{ mA}; -V_{CE} = 10\text{ V}; f = 800\text{ MHz}; T_{amb} = 25\text{ }^\circ\text{C}$

F typ. 4,3 dB

Maximum unilateral power gain (s_{re} assumed to be zero)

$$G_{UM} = 10 \log \frac{|s_{fe}|}{[1 - |s_{ie}|^2][1 - |s_{oe}|^2]}$$

$-I_C = 70\text{ mA}; -V_{CE} = 10\text{ V}; f = 800\text{ MHz}; T_{amb} = 25\text{ }^\circ\text{C}$

G_{UM} typ. 10,0 dB

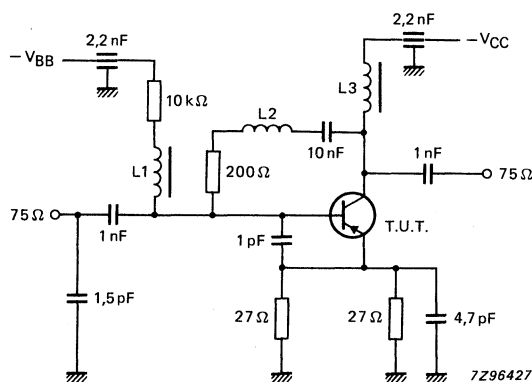


Fig. 2 Intermodulation distortion and second harmonic distortion test circuit.

L1 = L3 = 5 μH micro choke.

L2 = 1½ turns Cu wire (0,4 mm); internal diameter 3,0 mm; winding pitch 1 mm.

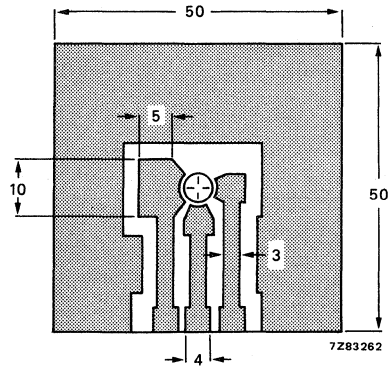


Fig. 3 Requirements for fibre-glass print (Dimensions in mm).
Single-sided 35 μm Cu-clad epoxy fibre-glass print, thickness 1,5 mm.
Tracks are fully tin-plated. Shaded area is Cu.

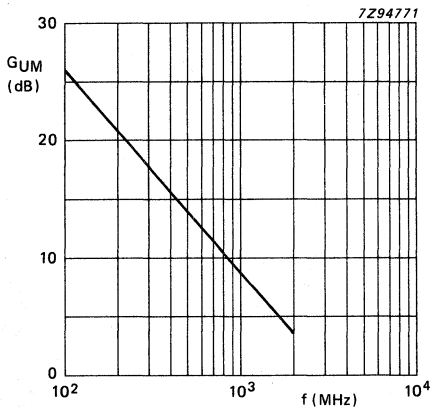


Fig. 4 $-V_{CE} = 10 \text{ V}$; $-I_C = 70 \text{ mA}$;
 $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

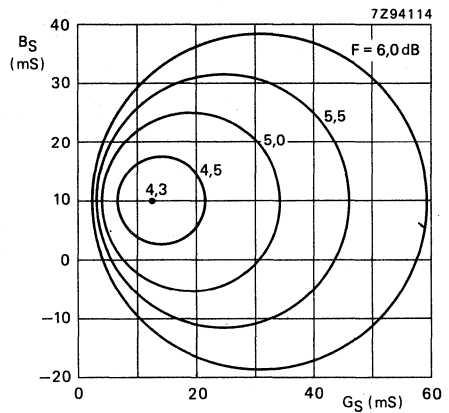


Fig. 5 Circles of constant noise figure;
 $-V_{CE} = 10 \text{ V}$; $-I_C = 50 \text{ mA}$; $f = 800 \text{ MHz}$;
 $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

s-parameters (common emitter) at $-V_{CE} = 10\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$; typical values.

I_C mA	f MHz	s_{ie}	s_{fe}	s_{re}	s_{oe}	GUM dB
10	40	0,57/ -58,5°	21,9/149,1°	0,03/ 67,4°	0,83/ -31,3°	33,5
	100	0,54/-115,0°	14,0/119,9°	0,05/ 52,1°	0,55/ -59,6°	25,9
	200	0,51/-150,4°	8,0/101,3°	0,06/ 52,2°	0,32/ -76,0°	19,8
	500	0,54/+174,6°	3,4/ 76,8°	0,11/ 58,3°	0,21/-102,6°	12,3
	800	0,53/+156,0°	2,2/ 62,8°	0,16/ 60,2°	0,22/-111,4°	8,6
	1000	0,54/+144,8°	1,8/ 54,3°	0,19/ 59,1°	0,22/-117,8°	6,8
	1200	0,58/+133,4°	1,5/ 48,9°	0,22/ 59,3°	0,21/-127,1°	5,6
	1500	0,56/+124,8°	1,3/ 38,8°	0,28/ 56,2°	0,26/-136,9°	4,3
2000	0,59/ +99,9°	1,0/ 28,0°	0,36/ 52,5°	0,30/-155,2°	2,6	
20	40	0,41/ -87,0°	29,7/140,9°	0,02/ 64,6°	0,72/ -44,1°	33,5
	100	0,47/-140,2°	16,8/113,0°	0,04/ 58,2°	0,42/ -78,8°	26,5
	200	0,48/-168,6°	9,1/ 97,5°	0,06/ 62,9°	0,25/-101,7°	20,6
	500	0,52/+168,4°	3,8/ 76,7°	0,11/ 66,3°	0,20/-135,8°	13,1
	800	0,51/+151,9°	2,5/ 63,8°	0,18/ 64,6°	0,21/-139,1°	9,4
	1000	0,53/+141,5°	2,0/ 56,0°	0,21/ 61,8°	0,21/-148,3°	7,6
	1200	0,57/+130,1°	1,7/ 51,3°	0,24/ 61,0°	0,20/-159,0°	6,4
	1500	0,54/+123,0°	1,5/ 41,2°	0,30/ 55,8°	0,24/-160,3°	5,0
2000	0,56/ +98,4°	1,2/ 30,4°	0,38/ 50,3°	0,27/-174,2°	3,4	
30	40	0,37/-105,8°	33,1/136,9°	0,02/ 66,1°	0,66/ -50,9°	33,5
	100	0,46/-151,1°	17,6/110,5°	0,03/ 62,8°	0,38/ -88,7°	26,6
	200	0,47/-170,5°	9,5/ 96,1°	0,05/ 68,0°	0,24/-114,6°	20,9
	500	0,52/+166,1°	3,9/ 76,5°	0,11/ 69,2°	0,22/-146,2°	13,4
	800	0,51/+150,5°	2,6/ 64,1°	0,18/ 66,0°	0,22/-149,9°	9,7
	1000	0,52/+140,3°	2,1/ 56,7°	0,21/ 62,8°	0,22/-159,1°	7,9
	1200	0,57/+129,1°	1,7/ 52,3°	0,25/ 61,5°	0,22/-169,9°	6,7
	1500	0,53/+122,2°	1,5/ 42,0°	0,31/ 55,7°	0,25/-169,0°	5,3
2000	0,56/ +97,6°	1,2/ 31,5°	0,39/ 49,6°	0,28/+178,0°	3,6	
50	40	0,35/-127,2°	35,9/133,0°	0,02/ 67,2°	0,59/ -58,3°	33,5
	100	0,46/-160,9°	16,2/108,0°	0,03/ 67,6°	0,34/ -99,7°	26,8
	200	0,47/-175,8°	9,7/ 94,8°	0,05/ 72,6°	0,23/-127,1°	21,1
	500	0,52/+164,3°	4,0/ 76,3°	0,12/ 71,5°	0,23/-155,0°	13,6
	800	0,51/+149,3°	2,6/ 64,2°	0,18/ 67,0°	0,23/-158,1°	9,8
	1000	0,52/+139,4°	2,1/ 57,0°	0,22/ 63,4°	0,24/-166,9°	8,0
	1200	0,57/+128,3°	1,8/ 52,8°	0,25/ 62,0°	0,24/-177,8°	6,9
	1500	0,53/+121,5°	1,5/ 42,8°	0,31/ 55,8°	0,27/-175,6°	5,4
2000	0,56/ +96,8°	1,2/ 32,3°	0,40/ 49,3°	0,29/+171,5°	3,8	
70	40	0,35/-137,4°	36,1/131,1°	0,02/ 67,0°	0,54/ -62,3°	33,4
	100	0,46/-165,0°	18,2/107,0°	0,03/ 70,5°	0,32/-105,3°	26,7
	200	0,48/-177,8°	9,7/ 94,3°	0,05/ 74,3°	0,23/-133,1°	21,1
	500	0,52/+163,7°	3,9/ 76,0°	0,12/ 72,2°	0,24/-158,5°	13,6
	800	0,51/+149,0°	2,6/ 63,9°	0,19/ 67,4°	0,24/-161,1°	10,0
	1000	0,53/+139,1°	2,1/ 56,8°	0,22/ 63,7°	0,25/-169,7°	8,0
	1200	0,58/+128,1°	1,8/ 52,7°	0,26/ 62,2°	0,24/-179,7°	6,9
	1500	0,54/+121,2°	1,5/ 42,6°	0,32/ 55,7°	0,27/-178,0°	5,4
2000	0,56/ +96,5°	1,2/ 32,3°	0,40/ 49,1°	0,29/+169,2°	3,9	

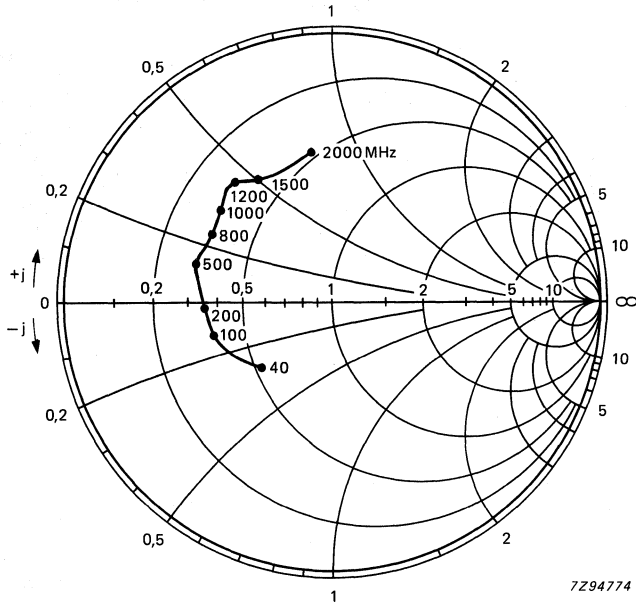


Fig. 6 Input impedance, derived from input reflection coefficient s_{ie} coordinates, in ohm x 50.

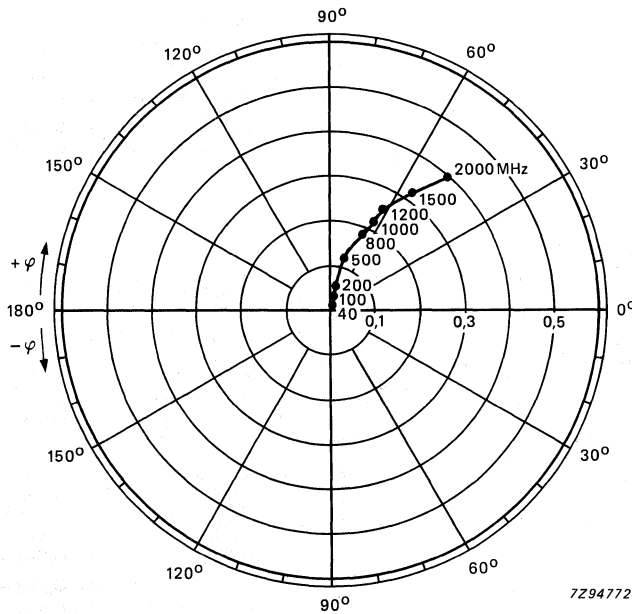


Fig. 7 Reverse transmission coefficient s_{re} .

Conditions for Figs 6 to 9: $-V_{CE} = 10 \text{ V}$; $-I_C = 70 \text{ mA}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

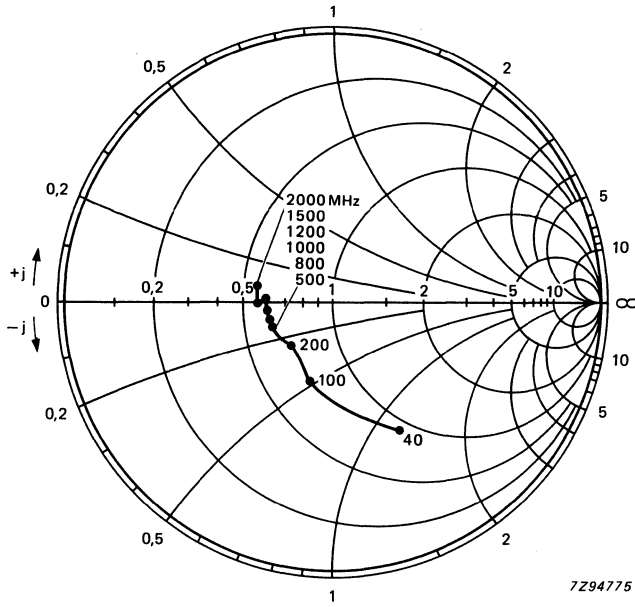


Fig. 8 Output impedance, derived from output reflection coefficient s_{0E} coordinates, in ohm x 50.

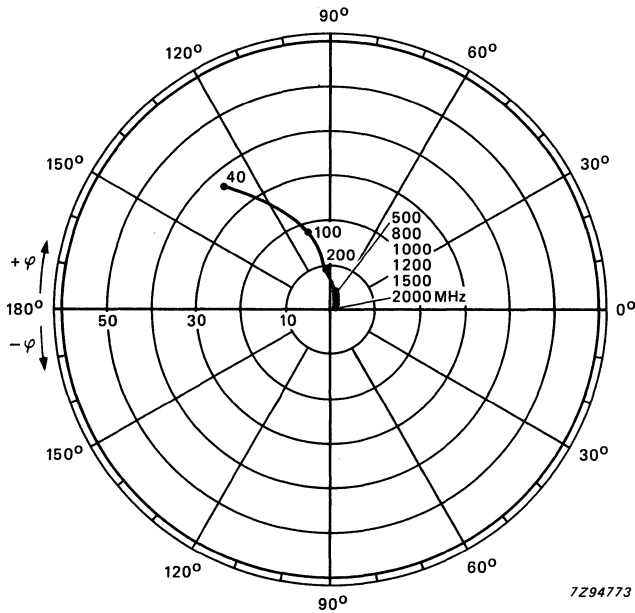


Fig. 9 Forward transmission coefficient s_{fE} .

N-P-N MICROWAVE TRANSISTOR

The BFQ is an N-P-N transistor in a miniature hermetically sealed microstripline encapsulation, featuring an extremely high transition frequency of 12 GHz and very low noise. ←

It is primarily intended for use in microwave amplifier applications.

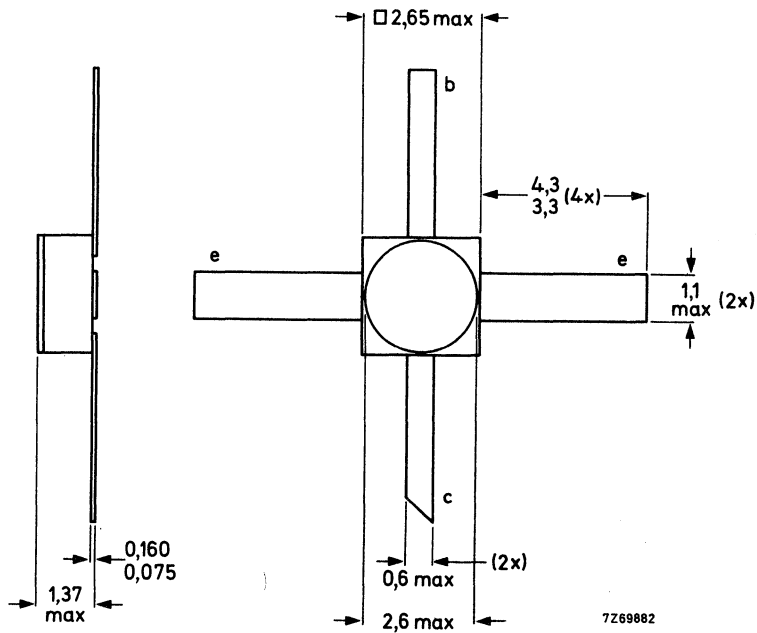
QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	9 V
Collector-emitter voltage (open base)	V_{CEO}	max.	7 V
Collector current (d.c.)	I_C	max.	20 mA
Total power dissipation up to $T_{amb} = 80\text{ }^\circ\text{C}$	P_{tot}	max.	140 mW
Transition frequency at $f = 1,5\text{ GHz}$ $I_C = 14\text{ mA}; V_{CE} = 5\text{ V}$	f_T	typ.	12 GHz
Noise figure at optimum source impedance $I_C = 5\text{ mA}; V_{CE} = 5\text{ V}; f = 2\text{ GHz}$	F	typ.	2,5 dB
Maximum unilateral power gain $I_C = 14\text{ mA}; V_{CE} = 5\text{ V}; f = 2\text{ GHz}; T_{amb} = 25\text{ }^\circ\text{C}$	G_{UM}	typ.	13,7 dB

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-100.



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	9 V
Collector-emitter voltage (open base)	V_{CEO}	max.	7 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2 V
Collector current (d.c.)	I_C	max.	20 mA
Total power dissipation up to $T_{amb} = 80\text{ }^\circ\text{C}$	P_{tot}	max.	140 mW
Storage temperature	T_{stg}		-65 to +150 $^\circ\text{C}$
Junction temperature	T_j	max.	150 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to ambient in free air
 mounted on a fibre-glass print
 of 40 mm x 25 mm x 1 mm

$$R_{th\ j-a} = 500\text{ K/W}$$

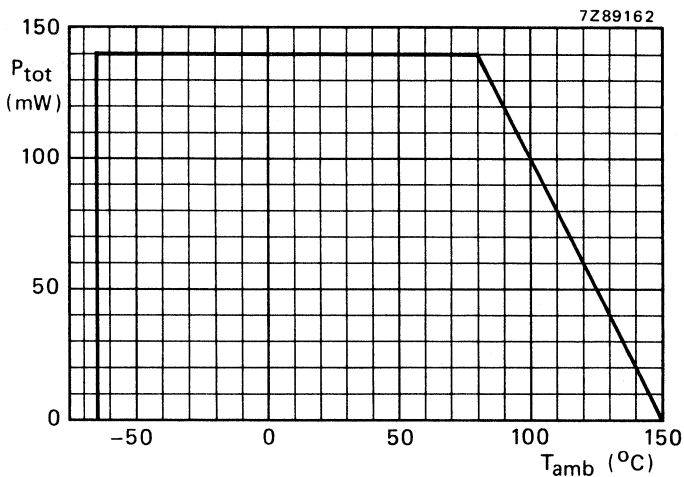


Fig. 2 Power derating curve versus ambient temperature.

CHARACTERISTICS

T_{amb} = 25 °C unless otherwise specified

Collector cut-off current

I_E = 0; V_{CB} = 5 V

I_{CBO} < 50 nA

D.C. current gain *

I_C = 14 mA; V_{CE} = 5 V

h_{FE} > 25

Collector capacitance at f = 1 MHz

I_E = I_e = 0; V_{CB} = 5 V

C_c typ. 0,45 pF

Feedback capacitance at f = 1 MHz

I_C = 0; V_{CE} = 5 V

C_{re} typ. 0,2 pF

Transition frequency at f = 1,5 GHz*

I_C = 14 mA; V_{CE} = 5 V

f_T typ. 12 GHz

Noise figure at optimum source impedance

I_C = 5 mA; V_{CE} = 5 V; f = 2 GHz

F typ. 2,5 dB

I_C = 5 mA; V_{CE} = 5 V; f = 4 GHz

F typ. 3,8 dB

Maximum unilateral power gain (s_{re} assumed to be zero)

$$G_{UM} = 10 \log \frac{|s_{fe}|^2}{(1 - |s_{ie}|^2)(1 - |s_{oe}|^2)}$$

I_C = 14 mA; V_{CE} = 5 V; f = 2 GHz

G_{UM} typ. 13,7 dB

I_C = 14 mA; V_{CE} = 5 V; f = 4 GHz

G_{UM} typ. 7,4 dB

s-parameters (common emitter)

I_C = 14 mA; V_{CE} = 5 V; R_S = R_L = 50 Ω; f = 2 GHz

Input reflection coefficient

s_{ie} typ. 0,18/ -155°

Reverse transmission coefficient

s_{re} typ. 0,10/ +49°

Forward transmission coefficient

s_{fe} typ. 4,3 / +75°

Output reflection coefficient

s_{oe} typ. 0,43/ -56°

I_C = 14 mA; V_{CE} = 5 V; R_S = R_L = 50 Ω; f = 4 GHz

Input reflection coefficient

s_{ie} typ. 0,19/ +171°

Reverse transmission coefficient

s_{re} typ. 0,14/ +34°

Forward transmission coefficient

s_{fe} typ. 2,0 / +48°

Output reflection coefficient

s_{oe} typ. 0,50/ -89°

* Measured under pulse conditions.

Conditions for Figs 3 and 4:
 $V_{CE} = 5 \text{ V}$; $I_C = 14 \text{ mA}$;
 $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

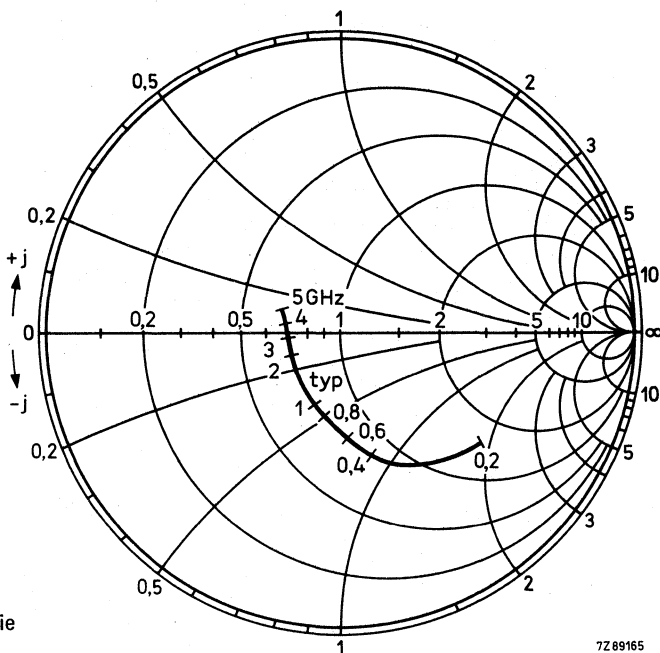


Fig. 3 Input impedance derived from input reflection coefficient s_{ie} co-ordinates in ohm x 50.

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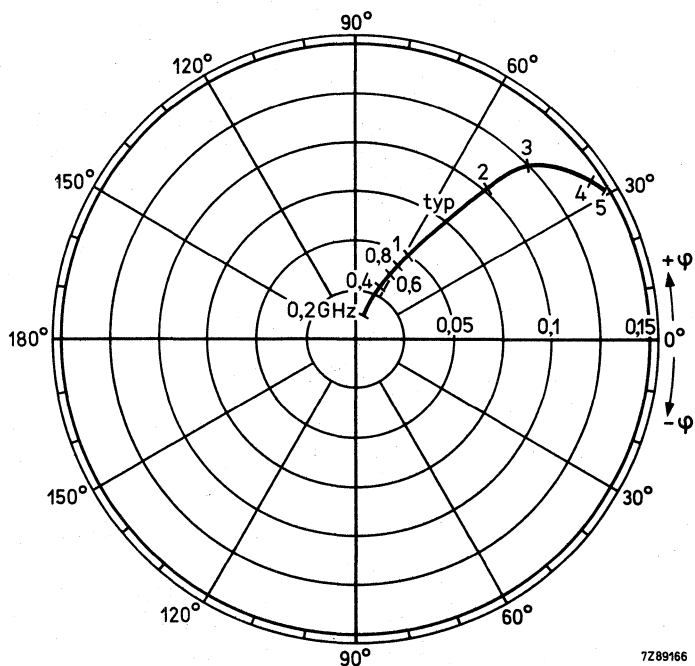


Fig. 4 Reverse transmission coefficient s_{re} .

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Conditions for Figs 5 and 6:
 $V_{CE} = 5 \text{ V}$; $I_C = 14 \text{ mA}$;
 $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

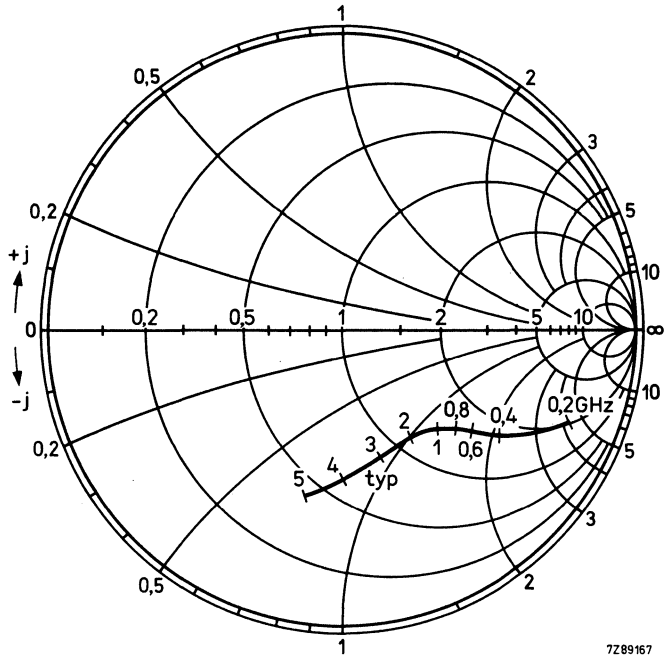


Fig. 5 Output impedance derived from output reflection coefficient s_{oe} co-ordinates in ohm $\times 50$.

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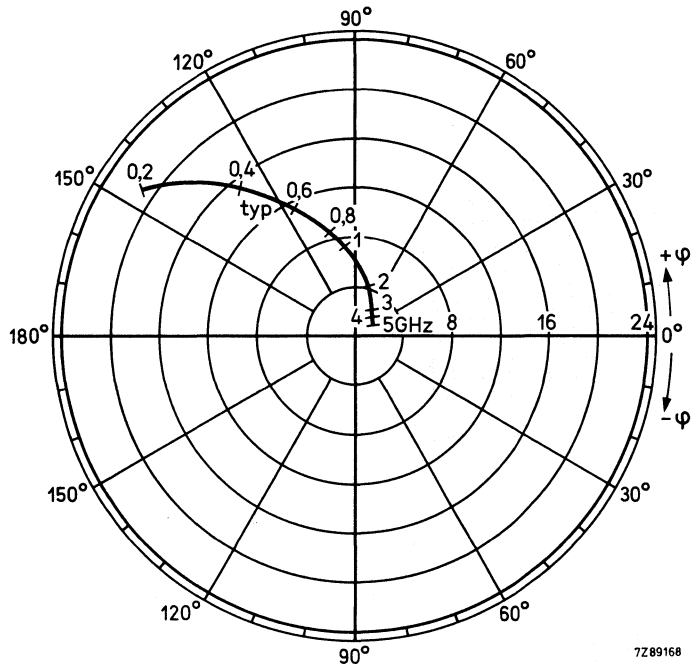


Fig. 6 Forward transmission coefficient s_{fe} .

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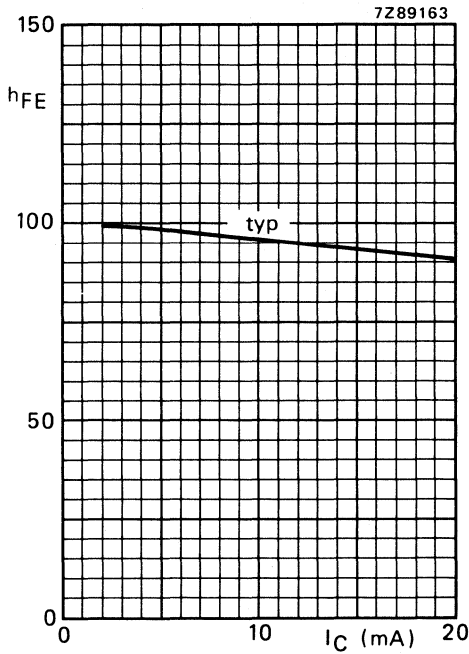


Fig. 7 $V_{CE} = 5\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$.

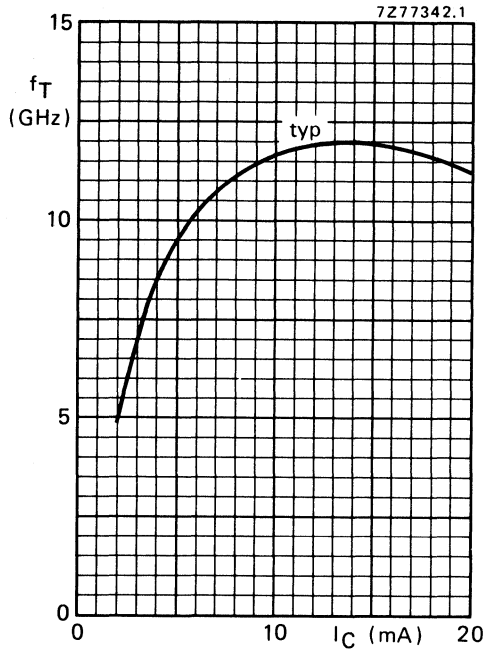


Fig. 8 $V_{CE} = 5\text{ V}$; $f = 1,5\text{ GHz}$; $T_j = 25\text{ }^\circ\text{C}$.

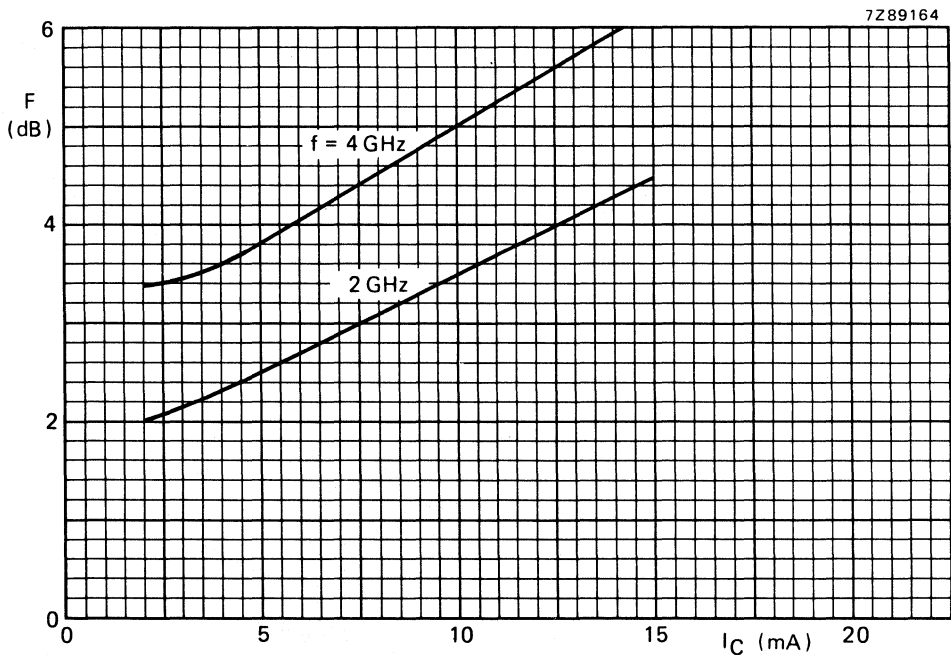


Fig. 9 $V_{CE} = 5\text{ V}$; $Z_S = \text{optimum}$; $T_{\text{amb}} = 25\text{ }^\circ\text{C}$; typical values.

N-P-N MICROWAVE TRANSISTOR

N-P-N transistor in a sub-miniature HERMETICALLY sealed microstripline encapsulation. This device features extremely high transition frequency of 12 GHz and very low noise. The BFQ33C is primarily intended for microwave amplifier applications.

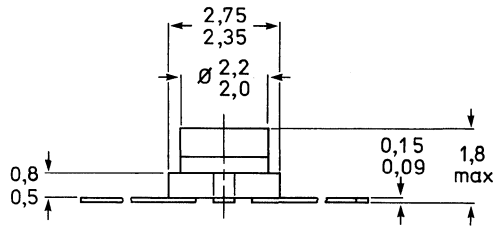
QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	9 V
Collector-emitter voltage (open base)	V_{CEO}	max.	7 V
Collector current (d.c.)	I_C	max.	20 mA
Total power dissipation up to $T_{amb} = 120\text{ }^\circ\text{C}$	P_{tot}	max.	140 mW
Transition frequency at $f = 1,5\text{ GHz}$ $I_C = 14\text{ mA}$; $V_{CE} = 5\text{ V}$	f_T	typ.	12 GHz
Noise figure at optimum source impedance $I_C = 5\text{ mA}$; $V_{CE} = 5\text{ V}$; $f = 2\text{ GHz}$	F	typ.	3,0 dB
Maximum unilateral power gain at $f = 2\text{ GHz}$; $I_C = 14\text{ mA}$; $V_{CE} = 5\text{ V}$	GUM	typ.	12,5 dB

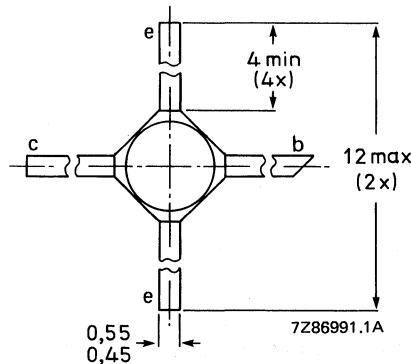
MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-173.



Marking code: Q3



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V _{CB0}	max.	9 V
Collector-emitter voltage (open base)	V _{CEO}	max.	7 V
Emitter-base voltage (open collector)	V _{EBO}	max.	2 V
Collector current (d.c.)	I _C	max.	20 mA
Total power dissipation up to T _{amb} = 120 °C	P _{tot}	max.	140 mW
Storage temperature	T _{stg}		-65 to +150 °C
Junction temperature	T _j	max.	150 °C

THERMAL RESISTANCE

From junction to ambient in free air mounted
on a ceramic substrate of 0,7 mm x 10 cm²

R _{th j-a}	200 K/W
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CHARACTERISTICS

→ T_j = 25 °C unless otherwise specified

Collector cut-off current

I_E = 0; V_{CB} = 5 V

I _{CBO}	max.	50 nA
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→ D.C. current gain

I_C = 14 mA; V_{CE} = 5 V

h _{FE}	min.	50
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Transition frequency at f = 1,5 GHz

I_C = 14 mA; V_{CE} = 5 V; T_{amb} = 25 °C

f _T	typ.	12 GHz
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Collector capacitance at f = 1 MHz

I_E = I_e = 0; V_{CB} = 5 V

C _c	typ.	0,35 pF
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Feedback capacitance at f = 1 MHz

I_C = 0; V_{CE} = 5 V

C _{re}	typ.	0,2 pF
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Noise figure at optimum source impedance

→ I_C = 5 mA; V_{CE} = 5 V; f = 2 GHz; T_{amb} = 25 °C

F	typ.	3,0 dB
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→ Maximum unilateral power gain (s_{re} assumed to be zero)

$$G_{UM} = 10 \log \frac{|s_{fe}|^2}{[1 - |s_{ie}|^2][1 - |s_{oe}|^2]}$$

at I_C = 14 mA; V_{CE} = 5 V; T_{amb} = 25 °C

f = 2 GHz

f = 4 GHz

G _{UM}	typ.	12,5 dB
G _{UM}	typ.	7,5 dB

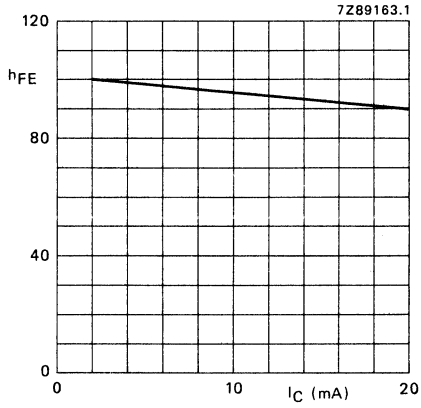


Fig. 2 $V_{CE} = 5 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$; typical values.

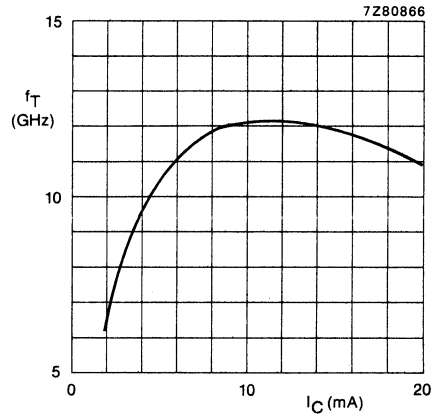


Fig. 3 $V_{CE} = 5 \text{ V}$; $f = 1,5 \text{ GHz}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

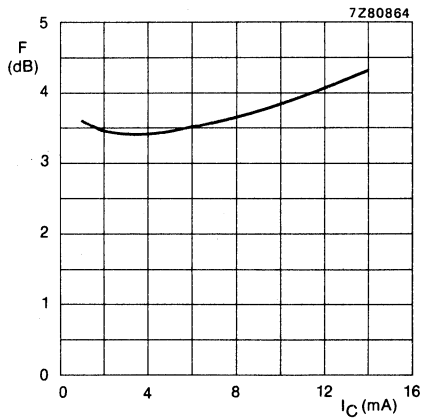


Fig. 4 $V_{CE} = 5 \text{ V}$; $Z_S = 60 \text{ } \Omega$; $T_{amb} = 25 \text{ }^\circ\text{C}$; $f = 2 \text{ GHz}$; typical values.

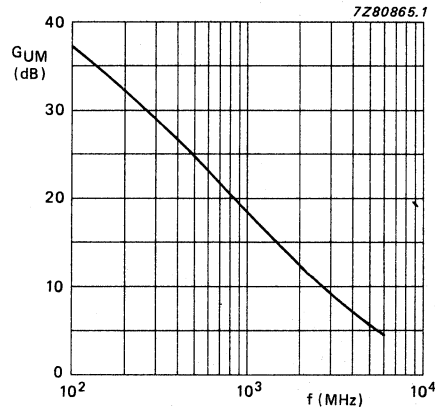


Fig. 5 $V_{CE} = 5 \text{ V}$; $I_C = 14 \text{ mA}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; $Z_S = 60 \text{ } \Omega$; typical values.

s-parameters (common-emitter) at $V_{CE} = 5\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$; typical values.

I_C mA	f MHz	S_{ie}	S_{fe}	S_{re}	S_{oe}	GUM dB
5	100	0,82/ -12,3°	12,6/168,1°	0,013/ 82,1°	0,97/ -7,6°	39,1
	200	0,78/ -24,2°	12,0/156,1°	0,024/ 77,0°	0,93/ -14,6°	34,5
	300	0,72/ -33,9°	11,0/146,1°	0,034/ 72,3°	0,89/ -20,3°	30,8
	400	0,67/ -42,9°	10,1/138,3°	0,043/ 69,4°	0,85/ -25,3°	28,1
	500	0,62/ -50,0°	9,2/131,3°	0,050/ 67,4°	0,81/ -28,6°	25,9
	600	0,57/ -56,3°	8,3/124,8°	0,056/ 65,6°	0,77/ -31,4°	24,0
	700	0,53/ -61,5°	7,6/119,8°	0,062/ 64,4°	0,74/ -33,8°	22,5
	800	0,49/ -66,6°	6,9/115,2°	0,068/ 63,7°	0,71/ -35,7°	21,0
	900	0,45/ -67,3°	6,3/111,4°	0,073/ 63,6°	0,69/ -36,1°	19,8
	1000	0,41/ -71,8°	5,8/107,4°	0,078/ 62,6°	0,66/ -37,4°	18,6
	1200	0,35/ -78,7°	5,1/100,5°	0,088/ 61,8°	0,63/ -39,7°	16,8
	1500	0,29/ -80,0°	3,9/ 89,6°	0,098/ 57,6°	0,63/ -40,0°	14,4
	2000	0,23/ -88,5°	3,2/ 79,8°	0,125/ 56,7°	0,59/ -44,2°	12,3
	2500	0,19/ -100,7°	2,7/ 70,8°	0,147/ 55,1°	0,56/ -49,5°	10,3
	3000	0,16/ -101,6°	2,3/ 64,1°	0,169/ 53,0°	0,57/ -53,7°	9,1
	3500	0,15/ -112,5°	2,1/ 60,4°	0,211/ 53,4°	0,55/ -58,2°	8,3
	4000	0,10/ -124,8°	1,9/ 52,7°	0,219/ 49,5°	0,52/ -68,6°	7,1
5000	0,02/ +127,0°	1,6/ 38,9°	0,267/ 43,5°	0,45/ -92,3°	5,3	
6000	0,14/ +56,1°	1,4/ 24,3°	0,298/ 32,4°	0,44/ -122,2°	4,1	
14	100	0,61/ -20,1°	21,2/161,3°	0,011/ 78,8°	0,93/ -11,4°	37,3
	200	0,55/ -37,8°	18,7/144,7°	0,020/ 73,3°	0,85/ -20,6°	32,5
	300	0,47/ -50,7°	15,9/132,7°	0,027/ 69,6°	0,77/ -26,2°	29,0
	400	0,42/ -61,6°	13,8/124,5°	0,034/ 68,2°	0,71/ -30,3°	26,6
	500	0,37/ -68,8°	11,9/118,0°	0,040/ 68,0°	0,66/ -32,5°	24,7
	600	0,34/ -75,4°	10,3/112,2°	0,045/ 67,7°	0,63/ -33,9°	23,0
	700	0,29/ -81,0°	9,2/108,0°	0,050/ 67,6°	0,60/ -35,4°	21,6
	800	0,29/ -86,0°	8,2/104,4°	0,055/ 67,9°	0,58/ -36,4°	20,5
	900	0,26/ -85,1°	7,4/101,4°	0,060/ 68,2°	0,57/ -36,0°	19,4
	1000	0,23/ -91,1°	6,7/ 78,3°	0,065/ 68,0°	0,55/ -36,6°	18,4
	1200	0,20/ -99,8°	5,7/ 92,9°	0,076/ 67,7°	0,53/ -38,4°	16,8
	1500	0,15/ -101,4°	4,4/ 83,0°	0,088/ 63,9°	0,55/ -37,7°	14,6
	2000	0,12/ -110,6°	3,6/ 75,4°	0,114/ 63,2°	0,53/ -41,8°	12,5
	2500	0,10/ -132,5°	2,9/ 67,8°	0,137/ 61,3°	0,51/ -46,9°	10,7
	3000	0,07/ -137,0°	2,6/ 61,8°	0,160/ 59,1°	0,52/ -51,3°	9,6
	3500	0,07/ -163,9°	2,3/ 60,0°	0,191/ 61,8°	0,55/ -54,0°	8,4
	4000	0,05/ +163,7°	2,1/ 52,0°	0,208/ 56,2°	0,47/ -65,6°	7,5
5000	0,11/ +81,7°	1,8/ 37,9°	0,261/ 49,2°	0,41/ -91,1°	5,8	
6000	0,23/ +56,0°	1,5/ 24,0°	0,291/ 38,3°	0,41/ -122,9°	4,6	

Conditions for Figs 6 and 7 :
 $V_{CE} = 5 \text{ V}$; $I_C = 14 \text{ mA}$;
 $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

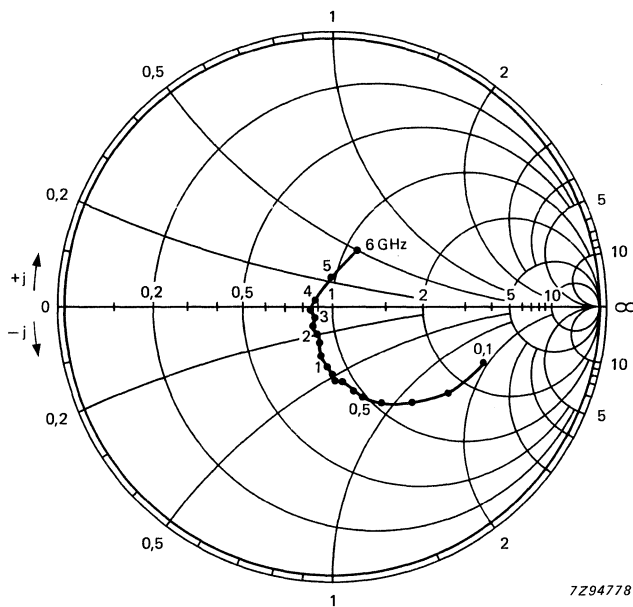


Fig. 6 Input impedance derived from input reflection coefficient s_{1e} co-ordinates in ohms $\times 50$.

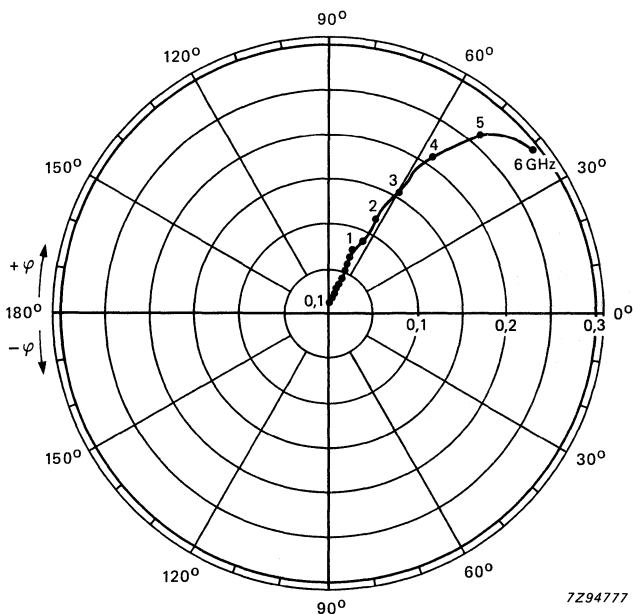


Fig. 7 Reverse transmission coefficient s_{re} .

Conditions for Figs 8 and 9:
 $V_{CE} = 5\text{ V}$; $I_C = 14\text{ mA}$;
 $T_{amb} = 25\text{ }^\circ\text{C}$; typical values.

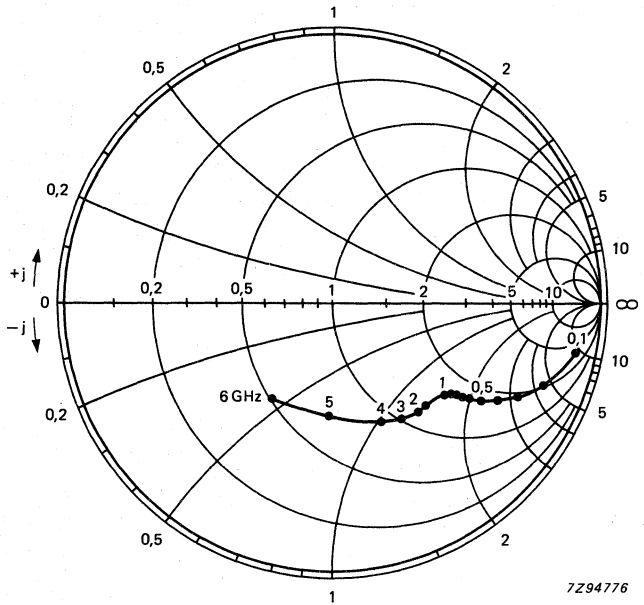


Fig. 8 Output impedance derived from output reflection coefficient s_{oe} co-ordinates in ohms x 50.

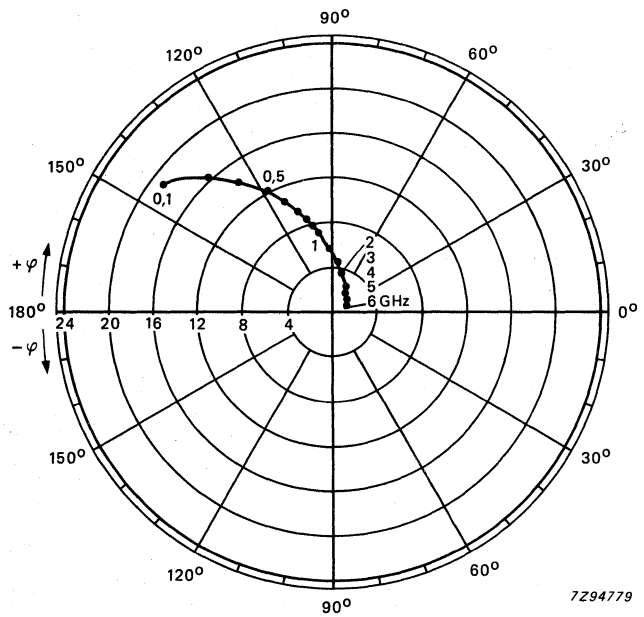


Fig. 9 Forward transmission coefficient s_{fe} .

N-P-N 1 GHz WIDEBAND TRANSISTOR

N-P-N transistor primarily intended for driver and final stages in MATV system amplifiers. This device is also suitable for use in low power band IV and V equipment. Diffused emitter ballasting resistors and the application of gold sandwich metallization ensure an optimum temperature profile and excellent reliability properties. This device features high output voltage capabilities.

The transistor has a ¼" capstan envelope with ceramic cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	25 V
Collector-emitter voltage (open base)	V_{CEO}	max.	18 V
Collector current (d.c.)	I_C	max.	150 mA
Total power dissipation (d.c.) up to $T_{mb} = 125\text{ }^\circ\text{C}$	P_{tot}	max.	2,25 W
Operating junction temperature	T_j	max.	200 $^\circ\text{C}$
Transition frequency at $f = 500\text{ MHz}$ $I_C = 150\text{ mA}$; $V_{CE} = 15\text{ V}$	f_T	min.	3,5 GHz
Output voltage at $d_{im} = -60\text{ dB}$ $I_C = 120\text{ mA}$; $V_{CE} = 15\text{ V}$; $R_L = 75\ \Omega$ $f_{(p+q-r)} = 793,25\text{ MHz}$	V_o	typ.	1,2 V
Output power at 1 dB gain compression	P_{L1}	typ.	+26 dBm
Third order intercept point	ITO	typ.	+45 dBm

MECHANICAL DATA

SOT-122 (see Fig. 1).

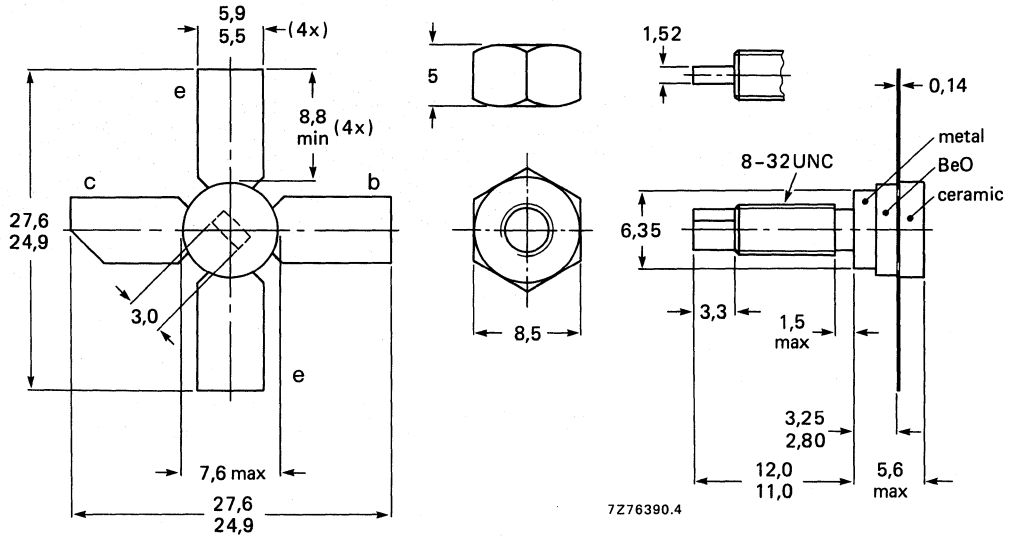
PRODUCT SAFETY

This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Fig. 1 SOT-122.

Dimensions in mm



Torque on nut: min. 0,75 Nm
(7,5 kg cm)
max. 0,85 Nm
(8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

When locking is required an adhesive is preferred instead of a lock washer.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V _{CBO}	max.	25 V
Collector-emitter voltage (open base) (see Fig. 3)	V _{CEO}	max.	18 V
Emitter-base voltage (open collector)	V _{EBO}	max.	2 V
Collector current (d.c.)	I _C	max.	150 mA
Total power dissipation (d.c.) up to T _{mb} = 125 °C (see Fig. 3)	P _{tot}	max.	2,25 W
Storage temperature	T _{stg}		-65 to +150 °C
Operating junction temperature	T _j	max.	200 °C

THERMAL RESISTANCE

From junction to mounting base	R _{th j-mb}	=	15,0 K/W
From mounting base to heatsink	R _{th mb-h}	=	0,6 K/W

CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Collector cut-off current

$I_E = 0; V_{CB} = 15\text{ V}$

I_{CBO} max. 100 μA

D.C. current gain

$I_C = 75\text{ mA}; V_{CE} = 15\text{ V}$

h_{FE} min. 25

$I_C = 150\text{ mA}; V_{CE} = 15\text{ V}$

h_{FE} min. 25

Transition frequency at $f = 500\text{ MHz}$

$I_C = 75\text{ mA}; V_{CE} = 15\text{ V}$

f_T min. 3,0 GHz
typ. 3,5 GHz

$I_C = 150\text{ mA}; V_{CE} = 15\text{ V}$

f_T min. 3,5 GHz
typ. 4,0 GHz

Collector capacitance at $f = 1\text{ MHz}$

$I_E = I_e = 0; V_{CB} = 15\text{ V}$

C_c typ. 2,0 pF
max. 2,75 pF

Emitter capacitance at $f = 1\text{ MHz}$

$I_C = I_c = 0; V_{EB} = 0,5\text{ V}$

C_e typ. 11 pF

Feedback capacitance at $f = 1\text{ MHz}$

$I_C = 10\text{ mA}; V_{CE} = 15\text{ V}; T_{amb} = 25\text{ }^\circ\text{C}$

C_{re} typ. 1,0 pF
max. 1,35 pF

Collector-stud capacitance *

C_{cs} typ. 0,8 pF

Noise figure measured in MATV test circuit (see Fig. 2)

$I_C = 120\text{ mA}; V_{CE} = 15\text{ V}; f = 500\text{ MHz}; T_{amb} = 25\text{ }^\circ\text{C}$

F typ. 8 dB

Maximum unilateral power gain (s_{re} assumed to be zero)

$$G_{UM} = 10 \log \frac{|s_{fe}|^2}{(1 - |s_{ie}|^2)(1 - |s_{oe}|^2)}$$

$I_C = 120\text{ mA}; V_{CE} = 15\text{ V}; f = 500\text{ MHz}; T_{amb} = 25\text{ }^\circ\text{C}$

G_{UM} typ. 16,3 dB

Output voltage at $d_{im} = -60\text{ dB}$ (see Figs 2 and 4)

(DIN 45004B, par. 6.3.: 3-tone)

$I_C = 120\text{ mA}; V_{CE} = 15\text{ V}; R_L = 75\text{ }\Omega; T_{amb} = 25\text{ }^\circ\text{C}$

$V_p = V_o$ at $d_{im} = -60\text{ dB}; f_p = 795,25\text{ MHz}$

$V_q = V_o -6\text{ dB}; f_q = 803,25\text{ MHz}$

$R_r = V_o -6\text{ dB}; f_r = 805,25\text{ MHz}$

measured at $f_{(p+q-r)} = 793,25\text{ MHz}$

V_o typ. 1,2 V

* Measured with grounded emitter and base.

Output power at 1 dB gain compression (see Fig. 2)

$I_C = 120 \text{ mA}; V_{CE} = 15 \text{ V}$

→ $R_L = 75 \Omega; T_{amb} = 25 \text{ }^\circ\text{C}$

measured at $f = 800 \text{ MHz}$

P_{L1} typ. +26 dBm

Third order intercept point (see Fig. 2)

$I_C = 120 \text{ mA}; V_{CE} = 15 \text{ V}$

→ $R_L = 75 \Omega; T_{amb} = 25 \text{ }^\circ\text{C}$

$P_p = \text{ITO} - 6 \text{ dB}; f_p = 800 \text{ MHz}$

$P_q = \text{ITO} - 6 \text{ dB}; f_q = 801 \text{ MHz}$

measured at $f(2q-p) = 802 \text{ MHz}$ and

at $f(2p-q) = 799 \text{ MHz}$

ITO typ. +45 dBm

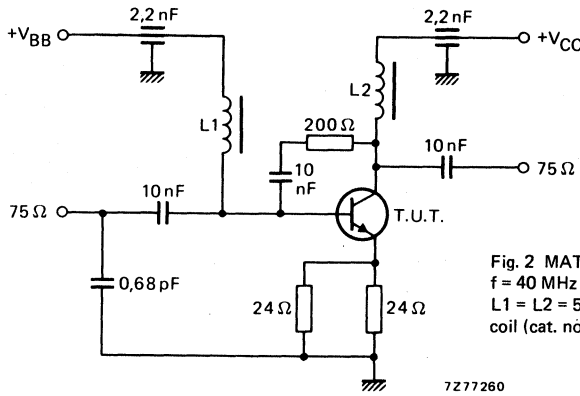


Fig. 2 MATV test circuit
 $f = 40 \text{ MHz to } 860 \text{ MHz}.$
 $L1 = L2 = 5 \mu\text{H}$ Ferroxcube
 coil (cat. no. 3122 108 20153).

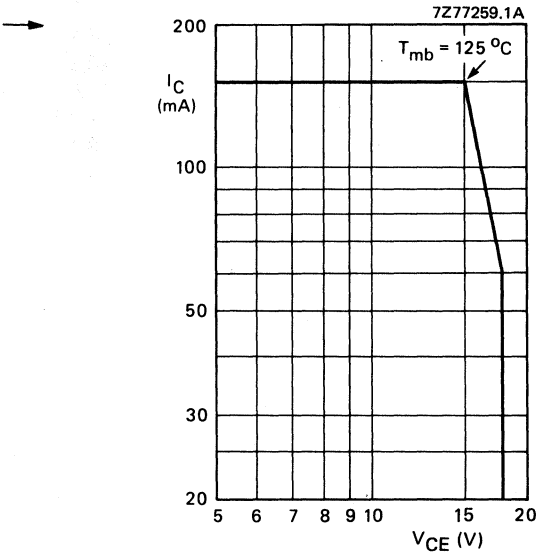


Fig. 3 D.C. SOAR.

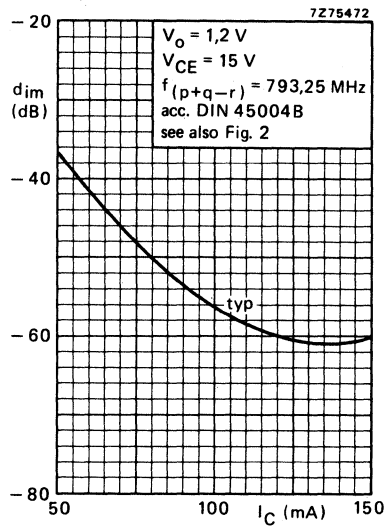


Fig. 4.

s-parameters (common emitter) at $V_{CE} = 7,5 \text{ V}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

I_C mA	f MHz	S_{ie}	S_{re}	S_{fe}	S_{oe}	G_{UM} dB
50	40	0,47/ -72°	0,02/64 $^\circ$	30,5/147 $^\circ$	0,85/ -34°	36,3
	200	0,55/ -154°	0,06/52 $^\circ$	11,3/101 $^\circ$	0,36/ -84°	23,2
	500	0,54/+ 177 $^\circ$	0,08/58 $^\circ$	4,9/ 78 $^\circ$	0,25/ -104°	15,6
	800	0,52/+ 160 $^\circ$	0,12/58 $^\circ$	3,2/ 63 $^\circ$	0,25/ -113°	11,8
	1000	0,50/+ 150 $^\circ$	0,15/57 $^\circ$	2,6/ 54 $^\circ$	0,26/ -118°	9,9
	1200	0,48/+ 142 $^\circ$	0,18/54 $^\circ$	2,2/ 46 $^\circ$	0,28/ -122°	8,3
75	40	0,45/ -76°	0,02/64 $^\circ$	32,1/144 $^\circ$	0,83/ -36°	36,2
	200	0,54/ -156°	0,05/53 $^\circ$	11,6/100 $^\circ$	0,35/ -90°	23,4
	500	0,54/+ 176 $^\circ$	0,08/59 $^\circ$	5,0/ 78 $^\circ$	0,24/ -112°	15,7
	800	0,51/+ 160 $^\circ$	0,13/59 $^\circ$	3,3/ 63 $^\circ$	0,24/ -121°	11,9
	1000	0,49/+ 150 $^\circ$	0,16/57 $^\circ$	2,7/ 55 $^\circ$	0,24/ -124°	10,1
	1200	0,46/+ 142 $^\circ$	0,18/54 $^\circ$	2,3/ 47 $^\circ$	0,26/ -128°	8,6
100	40	0,44/ -79°	0,02/63 $^\circ$	33,0/145 $^\circ$	0,82/ -37°	36,2
	200	0,54/ -157°	0,06/54 $^\circ$	11,8/100 $^\circ$	0,35/ -93°	23,5
	500	0,53/+ 175 $^\circ$	0,09/60 $^\circ$	5,1/ 78 $^\circ$	0,23/ -117°	15,8
	800	0,51/+ 159 $^\circ$	0,13/59 $^\circ$	3,3/ 64 $^\circ$	0,23/ -126°	11,9
	1000	0,49/+ 150 $^\circ$	0,16/57 $^\circ$	2,7/ 55 $^\circ$	0,24/ -129°	10,1
	1200	0,46/+ 142 $^\circ$	0,19/54 $^\circ$	2,3/ 47 $^\circ$	0,26/ -131°	8,6
120	40	0,43/ -81°	0,02/63 $^\circ$	33,5/145 $^\circ$	0,82/ -38°	36,2
	200	0,54/ -157°	0,05/55 $^\circ$	11,9/ 99 $^\circ$	0,35/ -95°	23,6
	500	0,53/+ 175 $^\circ$	0,09/60 $^\circ$	5,1/ 77 $^\circ$	0,23/ -119°	15,8
	800	0,51/+ 159 $^\circ$	0,13/59 $^\circ$	3,3/ 63 $^\circ$	0,23/ -128°	11,9
	1000	0,48/+ 149 $^\circ$	0,16/56 $^\circ$	2,7/ 55 $^\circ$	0,24/ -131°	10,0
	1200	0,46/+ 141 $^\circ$	0,19/53 $^\circ$	2,3/ 47 $^\circ$	0,25/ -132°	8,5
150	40	0,43/ -82°	0,02/63 $^\circ$	33,6/145 $^\circ$	0,81/ -39°	36,1
	200	0,54/ -158°	0,05/55 $^\circ$	11,8/ 99 $^\circ$	0,34/ -96°	23,5
	500	0,53/+ 175 $^\circ$	0,09/60 $^\circ$	5,1/ 77 $^\circ$	0,23/ -121°	15,8
	800	0,51/+ 159 $^\circ$	0,13/59 $^\circ$	3,3/ 63 $^\circ$	0,23/ -129°	11,9
	1000	0,49/+ 149 $^\circ$	0,16/56 $^\circ$	2,7/ 55 $^\circ$	0,24/ -132°	10,1
	1200	0,47/+ 141 $^\circ$	0,19/53 $^\circ$	2,3/ 47 $^\circ$	0,25/ -134°	8,6

BFQ34

→ s-parameters (common emitter) at $V_{CE} = 15\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$; typical values.

I_C mA	f MHz	S_{ie}	S_{re}	S_{fe}	S_{oe}	GUM dB
50	40	0,48/ -65°	0,02/62°	31,0/148°	0,83/ -30°	36,0
	200	0,53/-149°	0,04/52°	12,0/102°	0,37/ -73°	23,7
	500	0,52/+ 179°	0,08/58°	5,2/ 78°	0,25/ -89°	16,0
	800	0,50/+ 162°	0,12/59°	3,4/ 64°	0,26/ -99°	12,2
	1000	0,47/+ 152°	0,14/57°	2,8/ 55°	0,28/-104°	10,4
	1200	0,45/+ 144°	0,17/55°	2,3/ 47°	0,31/-109°	8,7
75	40	0,46/ -68°	0,02/62°	32,9/148°	0,82/ -32°	36,2
	200	0,52/-151°	0,04/53°	12,5/101°	0,36/ -79°	23,9
	500	0,51/+ 178°	0,08/59°	5,4/ 78°	0,24/ -97°	16,2
	800	0,48/+ 161°	0,12/59°	3,5/ 64°	0,24/-106°	12,3
	1000	0,46/+ 152°	0,15/57°	2,8/ 56°	0,26/-110°	10,3
	1200	0,44/+ 144°	0,17/55°	2,4/ 48°	0,28/-114°	8,9
100	40	0,47/ -69°	0,02/62°	33,9/147°	0,81/ -34°	36,3
	200	0,51/-151°	0,04/54°	12,6/101°	0,35/ -82°	23,9
	500	0,50/+ 178°	0,08/59°	5,5/ 78°	0,23/-101°	16,3
	800	0,48/+ 161°	0,12/59°	3,5/ 64°	0,23/-109°	12,3
	1000	0,45/+ 152°	0,15/57°	2,9/ 56°	0,25/-113°	10,5
	1200	0,43/+ 144°	0,18/54°	2,4/ 48°	0,27/-117°	8,8
120	40	0,47/ -69°	0,02/62°	34,6/146°	0,81/ -34°	36,5
	200	0,51/-151°	0,04/54°	12,7/101°	0,35/ -83°	24,0
	500	0,50/+ 178°	0,08/60°	5,5/ 78°	0,23/-103°	16,3
	800	0,48/+ 161°	0,12/59°	3,5/ 64°	0,23/-112°	12,3
	1000	0,45/+ 152°	0,15/57°	2,9/ 56°	0,24/-115°	10,5
	1200	0,43/+ 144°	0,18/54°	2,4/ 48°	0,26/-118°	8,8
150	40	0,49/ -70°	0,02/61°	34,8/146°	0,80/ -35°	36,5
	200	0,52/-152°	0,04/54°	12,6/100°	0,34/ -84°	23,9
	500	0,50/+ 178°	0,08/60°	5,4/ 78°	0,23/-103°	16,1
	800	0,48/+ 162°	0,12/59°	3,5/ 64°	0,23/-111°	12,3
	1000	0,46/+ 152°	0,15/57°	2,8/ 55°	0,24/-114°	9,6
	1200	0,44/+ 144°	0,18/54°	2,4/ 48°	0,27/-117°	8,9

Conditions for Figs 5 and 6:

$V_{CE} = 15 \text{ V}$; $I_C = 120 \text{ mA}$;
 $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

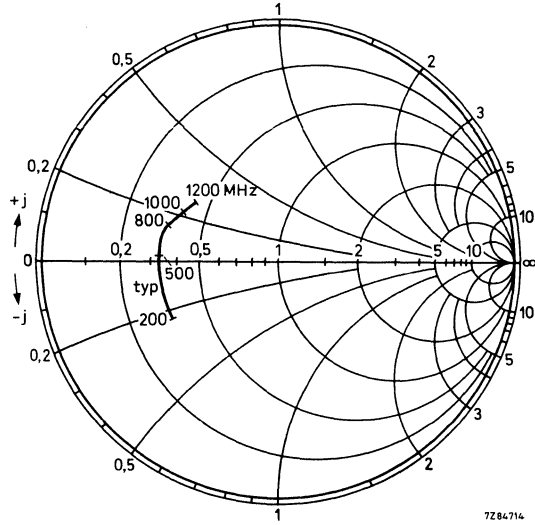


Fig. 5 Input impedance derived from input reflection coefficient s_{ie} co-ordinates in ohm $\times 50$.

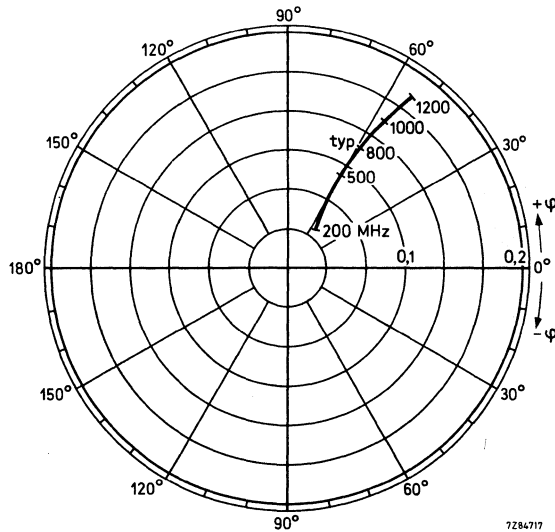


Fig. 6 Reverse transmission coefficient s_{re} .

Conditions for Figs 7 and 8:
 $V_{CE} = 15\text{ V}$; $I_C = 120\text{ mA}$;
 $T_{amb} = 25\text{ }^\circ\text{C}$; typical values.

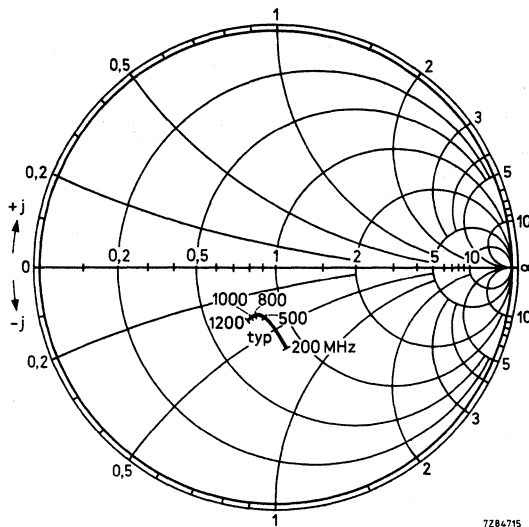


Fig. 7 Output impedance derived from output reflection coefficient s_{OE} co-ordinates in ohm $\times 50$.

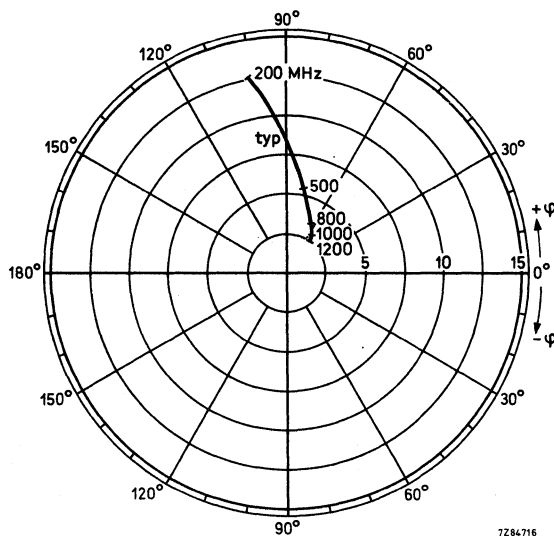


Fig. 8 Forward transmission coefficient s_{fe} .

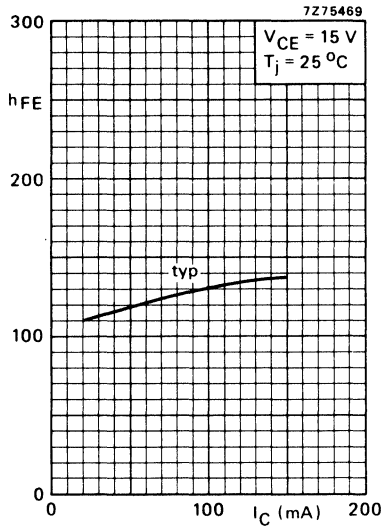


Fig. 9 $V_{CE} = 15\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$; typical values.

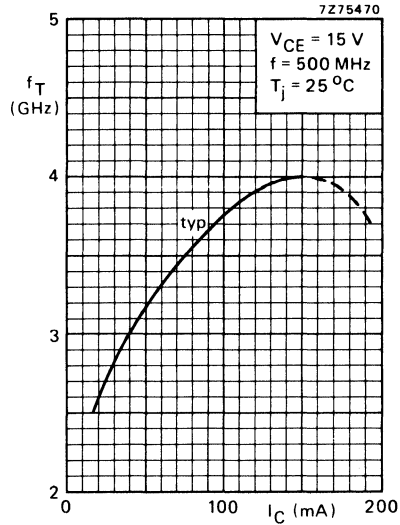


Fig. 10 $V_{CE} = 15\text{ V}$; $f = 500\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$; typical values.

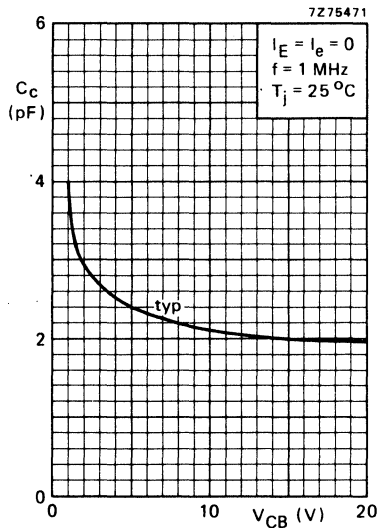


Fig. 11 $I_E = I_e = 0$; $f = 1\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$; typical values.

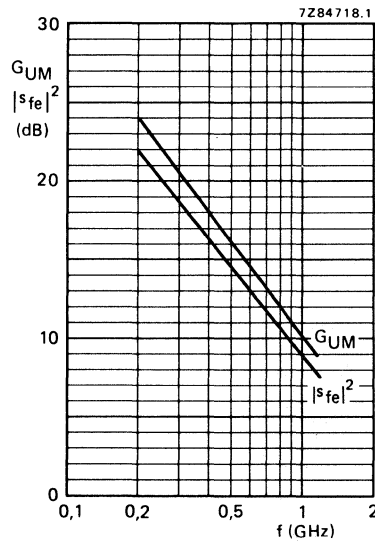


Fig. 12 $V_{CE} = 15\text{ V}$; $I_C = 120\text{ mA}$; $T_{amb} = 25\text{ }^\circ\text{C}$; typical values

N-P-N 1 GHz WIDEBAND TRANSISTOR

N-P-N transistor in a plastic SOT-37 envelope, intended for wideband amplification applications. The device features high output voltage capabilities.

QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	25 V	
Collector-emitter voltage (open base)	V_{CEO}	max.	18 V	
Collector current (d.c.)	I_C	max.	150 mA	
Total power dissipation up to $T_{amb} = 45\text{ }^{\circ}\text{C}$	P_{tot}	max.	1 W	
Junction temperature	T_j	max.	175 $^{\circ}\text{C}$	
D.C. current gain				
$I_C = 100\text{ mA}; V_{CE} = 10\text{ V}$	h_{FE}	min.	25	
Transition frequency at $f = 500\text{ MHz}$				
$I_C = 100\text{ mA}; V_{CE} = 10\text{ V}$	f_T	typ.	3,7 GHz	
Maximum power gain at $f = 300\text{ MHz}$				
$I_C = 100\text{ mA}; V_{CE} = 10\text{ V}$	G_{UM}	typ.	19,5 dB	←
Output voltage at $d_{jm} = -60\text{ dB}$				
$I_C = 100\text{ mA}; V_{CE} = 10\text{ V}; R_L = 75\text{ }\Omega;$ $f_{(p+q-r)} = 285,25\text{ MHz}$	V_o	typ.	1,0 V	
Output power at 1 dB gain compression				
$V_{CE} = 10\text{ V}; I_C = 100\text{ mA}; f = 300\text{ MHz}$	PL_1	typ.	+ 24 dBm	
Third order intercept point				
$V_{CE} = 10\text{ V}; I_C = 100\text{ mA}; f = 300\text{ MHz}$	IT_0	typ.	+ 43 dBm	

MECHANICAL DATA

SOT-37 (see Fig. 1).

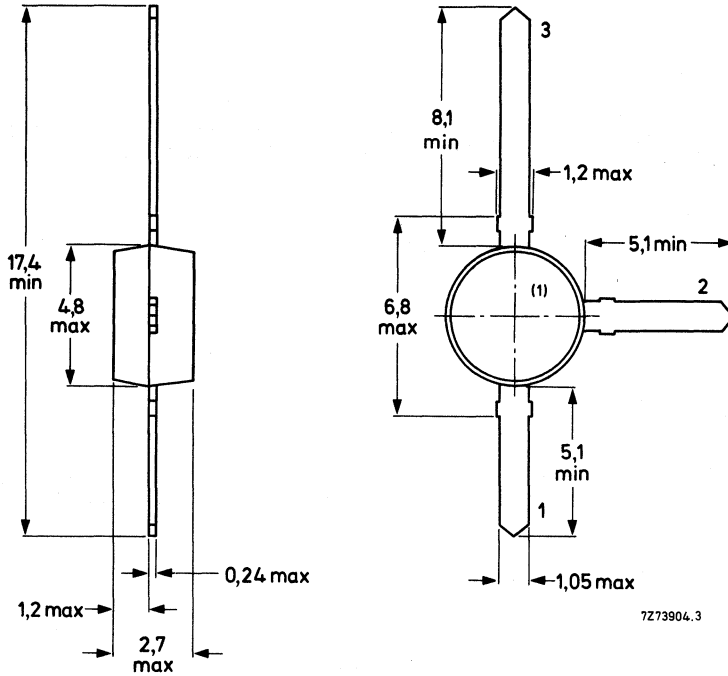
MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-37.

Connections:

- 1. Base
- 2. Emitter
- 3. Collector



7Z73904.3

(1) = type number marking.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CB0}	max.	25 V
Collector-emitter voltage (open base)	V_{CEO}	max.	18 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2 V
Collector current (d.c.)	I_C	max.	150 mA
Total power dissipation up to $T_{amb} = 45\text{ }^\circ\text{C}$ (see Fig. 2)	P_{tot}	max.	1 W
Storage temperature	T_{stg}		-65 to + 175 $^\circ\text{C}$
Junction temperature	T_j	max.	175 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to case

$$R_{th\ j-c} = 50\ K/W$$

From junction to ambient (free air) mounted on a fibre-glass print (see Fig. 2)

$$R_{th\ j-a} = 130\ K/W$$

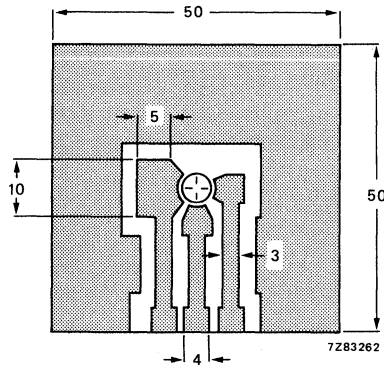


Fig. 2 Requirements for fibre-glass print (Dimensions in mm). Single-sided 35 μ m Cu-clad epoxy fibre-glass print, thickness 1,5 mm. Tracks are fully tin-plated. Shaded area is Cu.

CHARACTERISTICS

$T_j = 25\ ^\circ C$ unless otherwise specified

Collector cut-off current

$$I_E = 0; V_{CB} = 15\ V$$

$$I_{CBO} \text{ max. } 100\ \mu A$$

D.C. current gain

$$I_C = 100\ mA; V_{CE} = 10\ V$$

$$h_{FE} \text{ min. } 25$$

Transition frequency at $f = 500\ MHz$

$$I_C = 100\ mA; V_{CE} = 10\ V$$

$$f_T \text{ typ. } 3,7\ GHz$$

Collector capacitance at $f = 1\ MHz$

$$I_E = i_e = 0; V_{CB} = 10\ V$$

$$C_c \text{ typ. } 2,0\ pF$$

Emitter capacitance at $f = 1\ MHz$

$$I_C = i_c = 0; V_{EB} = 0,5\ V$$

$$C_e \text{ typ. } 10\ pF$$

Feedback capacitance at $f = 1\ MHz$

$$I_C = 0; V_{CE} = 10\ V$$

$$C_{re} \text{ typ. } 1,2\ pF$$

Maximum power gain at $f = 300\ MHz; T_{amb} = 25\ ^\circ C$

$$I_C = 100\ mA; V_{CE} = 10\ V$$

$$G_{UM} \text{ typ. } 19,5\ dB$$

Second harmonic distortion (see Fig. 3)

$$I_C = 100\ mA; V_{CE} = 10\ V; R_L = 75\ \Omega; T_{amb} = 25\ ^\circ C$$

$$V_p = V_o = 316\ mV = 50\ dMmV; f_p = 66\ MHz$$

$$V_q = V_o = 316\ mV = 50\ dBmV; f_q = 144\ MHz$$

Measured at $f_{(p+q)} = 210\ MHz$

$$d_2 \text{ typ. } -55\ dB$$

CHARACTERISTICS (continued)

Output voltage at $d_{im} = -60$ dB (see Fig. 3)
 (DIN 45004B); $T_{amb} = 25$ °C; $I_C = 100$ mA;
 $V_{CE} = 10$ V; $R_L = 75$ Ω

$V_p = V_o$ at $d_{im} = -60$ dB; $f_p = 287,25$ MHz
 $V_q = V_o - 6$ dB; $f_q = 294,25$ MHz
 $V_r = V_o - 6$ dB; $f_r = 295,25$ MHz

Measured at $f_{(p+q-r)} = 285,25$ MHz

V_o typ. 1,0 V

Output voltage at $d_{im} = -60$ dB (see Fig. 3)
 (DIN 45004B); $T_{amb} = 25$ °C; $I_C = 90$ mA;
 $V_{CE} = 10$ V; $R_L = 75$ Ω

$V_p = V_o$ at $d_{im} = -60$ dB; $f_p = 797,25$ MHz
 $V_q = V_o - 6$ dB; $f_q = 803,25$ MHz
 $V_r = V_o - 6$ dB; $f_r = 805,25$ MHz

Measured at $f_{(p+q-r)} = 793,25$ MHz

V_o typ. 750 mV

Output power at 1 dB gain compression

$V_{CE} = 10$ V; $I_C = 100$ mA; $f = 300$ MHz; $T_{amb} = 25$ °C
 $V_{CE} = 10$ V; $I_C = 90$ mA; $f = 800$ MHz; $T_{amb} = 25$ °C

P_{L1} typ. +24 dBm
 typ. +22 dBm

Third order intercept point

$V_{CE} = 10$ V; $I_C = 100$ mA; $f = 300$ MHz; $T_{amb} = 25$ °C
 $V_{CE} = 10$ V; $I_C = 90$ mA; $f = 800$ MHz; $T_{amb} = 25$ °C

ITO typ. +43 dBm
 typ. +41 dBm

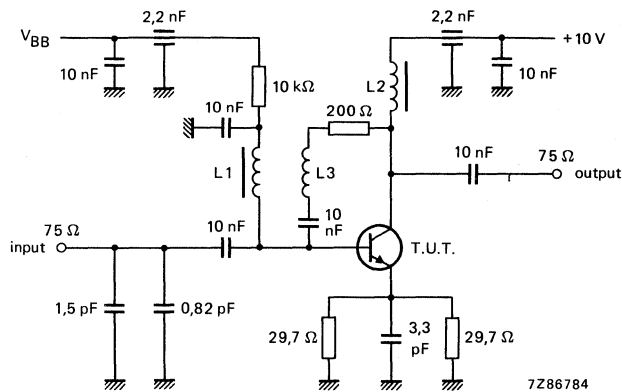


Fig. 3 Intermodulation distortion and second harmonic distortion MATV test circuit.

L1 = L2 = 5 μ H Ferroxcube choke

L3 = 2 turns Cu wire (0,5 mm), internal diameter 4 mm, winding pitch 2 mm.

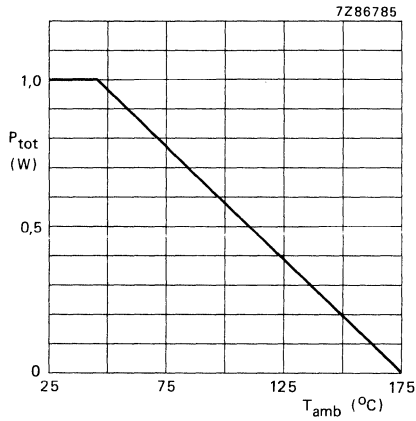


Fig. 4 Power derating curve.

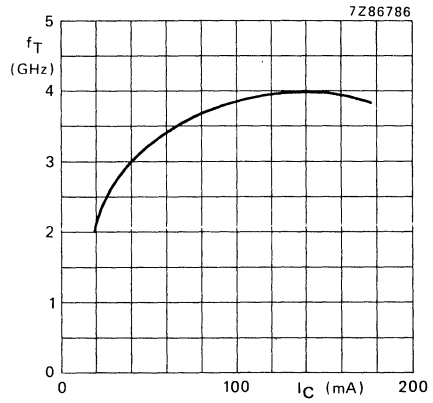


Fig. 5 $V_{CE} = 10$ V; $f = 500$ MHz; $T_j = 25$ °C; typical values.

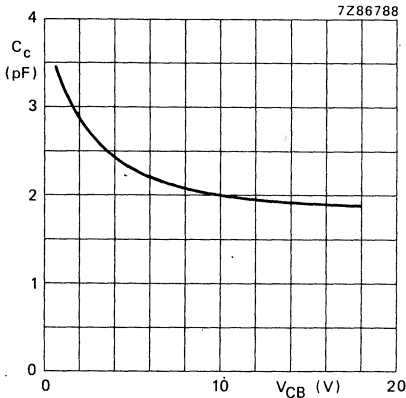


Fig. 6 $I_E = 0$; $f = 1$ MHz; $T_j = 25$ °C; typical values.

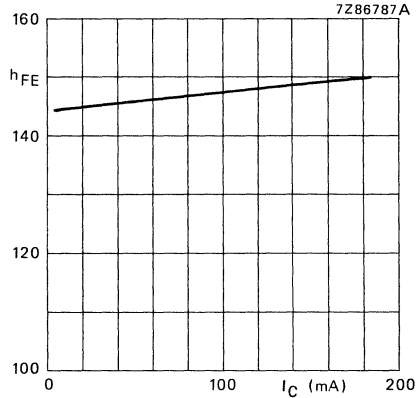


Fig. 7 $V_{CE} = 10$ V; $T_j = 25$ °C; typical values.

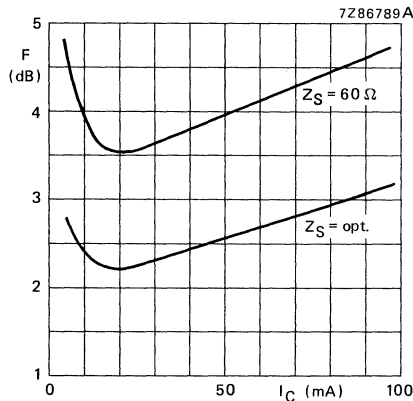


Fig. 8 $V_{CE} = 10$ V; $f = 800$ MHz; $T_{amb} = 25$ °C; typical values.

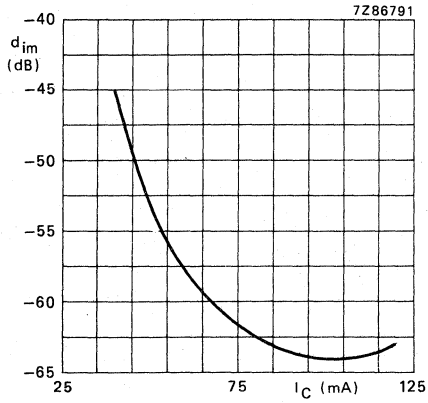


Fig. 9 $V_{CE} = 10 \text{ V}$; $V_O = 58 \text{ dBmV}$;
 $f_{(p+q-r)} = 285,25 \text{ MHz}$; $T_{amb} = 25 \text{ }^\circ\text{C}$;
 typical values.

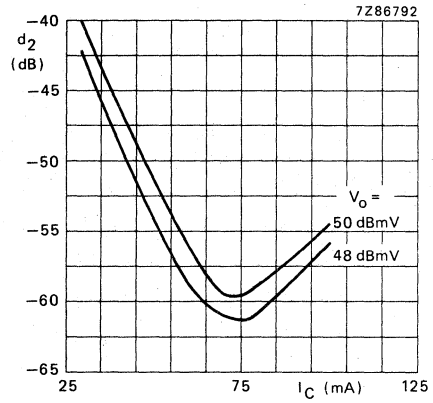


Fig. 10 $V_{CE} = 10 \text{ V}$; $f_p = 66 \text{ MHz}$;
 $f_p = 144 \text{ MHz}$; $f_{(p+q)} = 210 \text{ MHz}$;
 $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

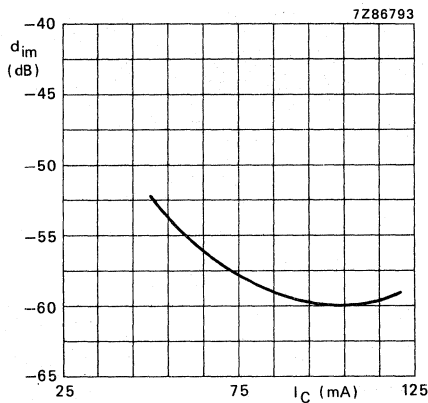


Fig. 11 $V_{CE} = 19 \text{ V}$; $V_O = 750 \text{ mV}$;
 $f_{(p+q-r)} = 793,25 \text{ MHz}$; $T_{amb} = 25 \text{ }^\circ\text{C}$;
 typical values.

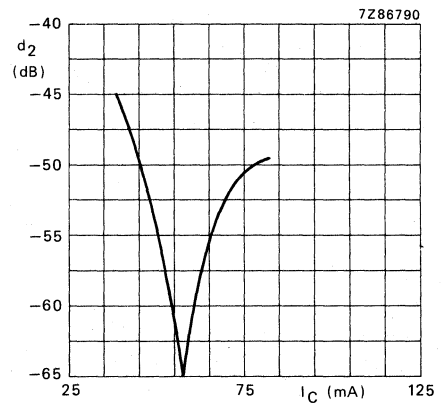


Fig. 12 $V_{CE} = 10 \text{ V}$; $V_O = 48 \text{ dBmV}$;
 $f_p = 560 \text{ MHz}$; $f_q = 250 \text{ MHz}$;
 $f_{(p+q-r)} = 810 \text{ MHz}$; $T_{amb} = 25 \text{ }^\circ\text{C}$;
 typical values.

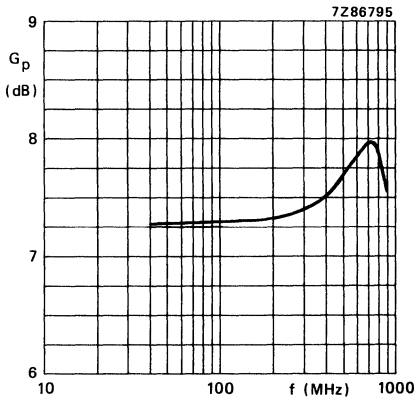


Fig. 13 Gain measured in test circuit (see Fig. 3); $T_{amb} = 25\text{ }^{\circ}\text{C}$; typical values.

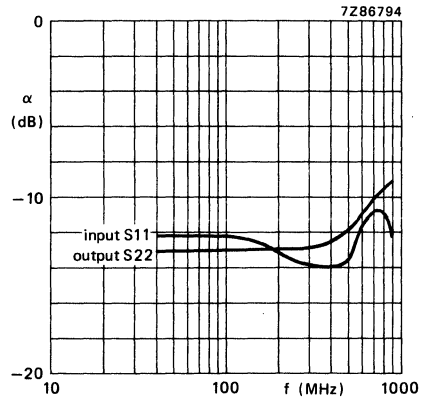


Fig. 14 Return losses measured in test circuit (see Fig. 3); $T_{amb} = 25\text{ }^{\circ}\text{C}$; typical values.

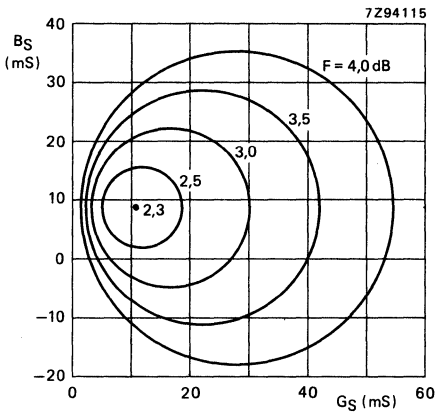


Fig. 15 Circles of constant noise figure; $V_{CE} = 10\text{ V}$; $I_C = 20\text{ mA}$; $f = 800\text{ MHz}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$; typical values.

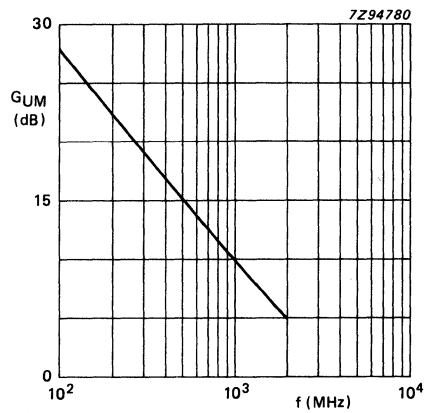


Fig. 16 $V_{CE} = 10\text{ V}$; $I_C = 100\text{ mA}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$; typical values.

s-parameters (common emitter) at $V_{CE} = 10\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$; typical values.

I_C mA	f MHz	S_{ie}	S_{fe}	S_{re}	S_{oe}	GUM dB
10	40	0,79/ -45,4°	20,9/153,0°	0,03/ 68,1°	0,89/ -21,2°	37,6
	100	0,66/ -98,3°	14,2/122,8°	0,04/ 49,5°	0,64/ -41,2°	27,8
	200	0,57/ -137,7°	8,3/103,0°	0,06/ 46,5°	0,43/ -49,9°	20,9
	500	0,58/ -178,3°	3,6/ 76,2°	0,08/ 57,1°	0,33/ -64,5°	13,3
	800	0,57/ +162,0°	2,3/ 61,2°	0,12/ 67,7°	0,36/ -80,5°	9,6
	1000	0,59/ +150,0°	1,9/ 51,5°	0,15/ 70,1°	0,38/ -90,4°	7,9
	1200	0,63/ +138,5°	1,5/ 45,4°	0,18/ 72,9°	0,38/ -100,6°	6,6
	1500	0,61/ +127,8°	1,3/ 35,7°	0,25/ 72,3°	0,43/ -115,6°	5,2
2000	0,66/ +101,8°	1,0/ 25,8°	0,36/ 68,1°	0,48/ -143,1°	3,4	
20	40	0,71/ -54,4°	29,0/147,8°	0,02/ 66,3°	0,84/ -29,5°	37,5
	100	0,58/ -109,5°	18,0/118,0°	0,04/ 51,3°	0,53/ -53,8°	28,3
	200	0,51/ -145,8°	10,0/100,8°	0,05/ 53,3°	0,33/ -64,9°	21,8
	500	0,52/ +178,2°	4,2/ 77,3°	0,09/ 62,9°	0,23/ -84,0°	14,1
	800	0,51/ +160,0°	2,8/ 63,8°	0,14/ 67,7°	0,26/ -96,2°	10,5
	1000	0,53/ +148,4°	2,2/ 55,0°	0,17/ 67,4°	0,27/ -105,0°	8,7
	1200	0,58/ +136,8°	1,8/ 49,4°	0,20/ 68,5°	0,27/ -113,0°	7,3
	1500	0,55/ +128,4°	1,6/ 39,4°	0,26/ 66,5°	0,33/ -125,2°	6,0
2000	0,59/ +103,2°	1,2/ 28,0°	0,35/ 63,0°	0,33/ -148,3°	4,2	
50	40	0,64/ -63,0°	36,6/142,7°	0,02/ 63,8°	0,78/ -38,2°	37,6
	100	0,51/ -118,9°	20,7/114,0°	0,03/ 54,2°	0,45/ -67,5°	28,6
	200	0,46/ -151,9°	11,2/ 98,9°	0,05/ 59,5°	0,27/ -83,6°	22,3
	500	0,48/ +175,1°	4,7/ 78,1°	0,10/ 66,3°	0,19/ -112,1°	14,7
	800	0,47/ +158,1°	3,1/ 65,7°	0,15/ 67,6°	0,22/ -119,0°	11,1
	1000	0,49/ +146,5°	2,5/ 57,8°	0,18/ 66,0°	0,22/ -126,4°	9,3
	1200	0,53/ +134,6°	2,1/ 52,6°	0,22/ 66,0°	0,21/ -135,5°	7,9
	1500	0,51/ +127,9°	1,8/ 42,9°	0,27/ 62,6°	0,27/ -141,4°	6,6
2000	0,54/ +103,0°	1,4/ 31,4°	0,36/ 58,5°	0,32/ -159,4°	4,8	
70	40	0,63/ -65,1°	38,0/141,4°	0,02/ 64,5°	0,76/ -40,3°	37,6
	100	0,51/ -121,0°	21,1/113,2°	0,03/ 54,8°	0,44/ -70,7°	28,7
	200	0,45/ -153,5°	11,5/ 98,5°	0,05/ 60,0°	0,26/ -88,2°	22,5
	500	0,48/ +174,7°	4,8/ 78,1°	0,10/ 66,9°	0,19/ -118,4°	14,8
	800	0,47/ +157,8°	3,1/ 65,9°	0,15/ 67,6°	0,21/ +12,9°	11,1
	1000	0,48/ +146,2°	2,5/ 58,2°	0,19/ 65,8°	0,22/ -131,8°	9,3
	1200	0,53/ +134,3°	2,1/ 53,1°	0,22/ 65,6°	0,21/ -141,0°	8,0
	1500	0,50/ +127,7°	1,8/ 43,4°	0,28/ 61,9°	0,26/ -145,3°	6,6
2000	0,53/ +103,0°	1,4/ 31,9°	0,36/ 57,6°	0,31/ -162,4°	4,9	
100	40	0,63/ -66,9°	38,9/140,1°	0,02/ 63,1°	0,75/ -42,0°	37,6
	100	0,50/ -122,8°	21,1/112,4°	0,03/ 54,8°	0,43/ -73,1°	28,6
	200	0,45/ -153,6°	11,4/ 98,0°	0,05/ 60,7°	0,25/ -91,3°	22,4
	500	0,48/ +174,2°	4,7/ 77,8°	0,10/ 66,9°	0,19/ -122,4°	14,8
	800	0,47/ +157,5°	3,1/ 65,8°	0,16/ 67,5°	0,21/ -126,3°	11,1
	1000	0,49/ +146,0°	2,5/ 58,0°	0,19/ 65,5°	0,22/ -135,1°	9,3
	1200	0,53/ +134,0°	2,1/ 53,1°	0,22/ 55,2°	0,21/ -144,5°	8,0
	1500	0,50/ +127,5°	1,8/ 43,4°	0,28/ 61,3°	0,26/ -147,9°	6,6
2000	0,53/ +102,9°	1,4/ 32,0°	0,38/ 57,1°	0,30/ -164,4°	4,8	

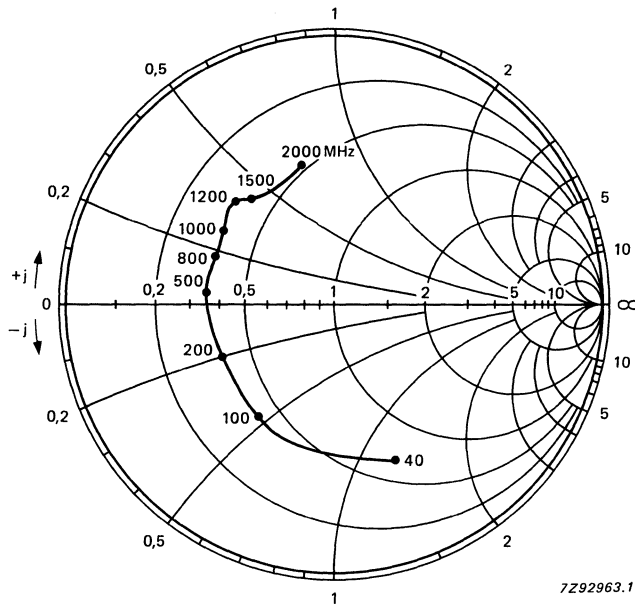


Fig. 17 Input reflection coefficient s_{1e} .

Conditions for Figs 17 and 18:
 $V_{CE} = 10 \text{ V}$; $I_C = 100 \text{ mA}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

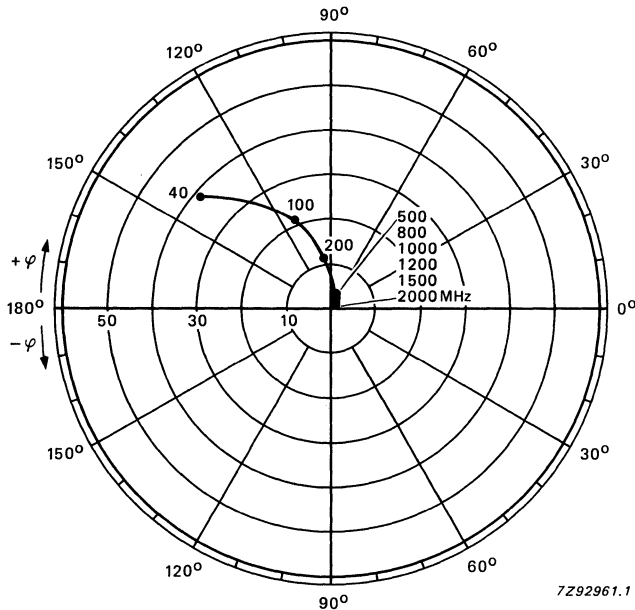


Fig. 18 Forward transmission coefficient s_{2e} .

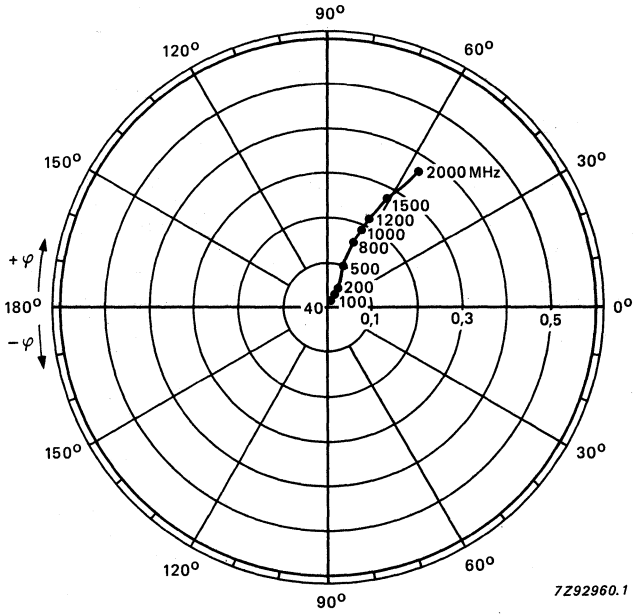


Fig. 19 Reverse transmission coefficient s_{re} .

Conditions for Figs 19 and 20:
 $V_{CE} = 10 \text{ V}$; $I_C = 100 \text{ mA}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

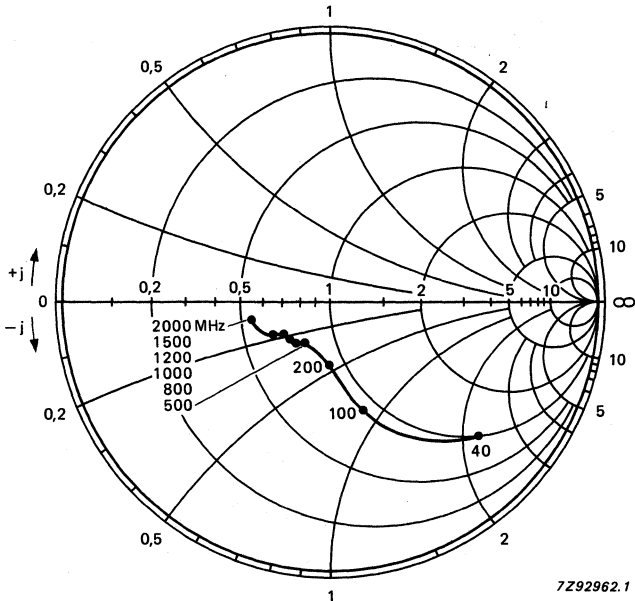


Fig. 20 Output reflection coefficient s_{oe} .

P-N-P 1 GHz WIDEBAND TRANSISTOR

P-N-P transistor in a plastic SOT-37 envelope. It is primarily intended for use in u.h.f. and microwave amplifiers such as in aerial amplifiers, radar systems, oscilloscopes, spectrum analysers etc.

The transistor features extremely high power gain coupled with good low noise performance.

N-P-N complements are BFR90 and BFR90A.

QUICK REFERENCE DATA

Collector-base voltage (open emitter)	$-V_{CBO}$	max.	20 V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	15 V
Collector current (d.c.)	$-I_C$	max.	25 mA
Total power dissipation up to $T_{amb} = 60\text{ }^\circ\text{C}$	P_{tot}	max.	180 mW
Junction temperature	T_j	max.	150 $^\circ\text{C}$
Transition frequency at $f = 500\text{ MHz}$ $-I_C = 14\text{ mA}; -V_{CE} = 10\text{ V}$	f_T	typ.	5,0 GHz
Feedback capacitance at $f = 1\text{ MHz}$ $I_C = 0; -V_{CE} = 10\text{ V}$	C_{re}	typ.	0,45 pF
Noise figure at optimum source impedance $-I_C = 4\text{ mA}; -V_{CE} = 10\text{ V}; f = 800\text{ MHz}; T_{amb} = 25\text{ }^\circ\text{C}$	F	typ.	2,4 dB

MECHANICAL DATA (see Fig. 1)

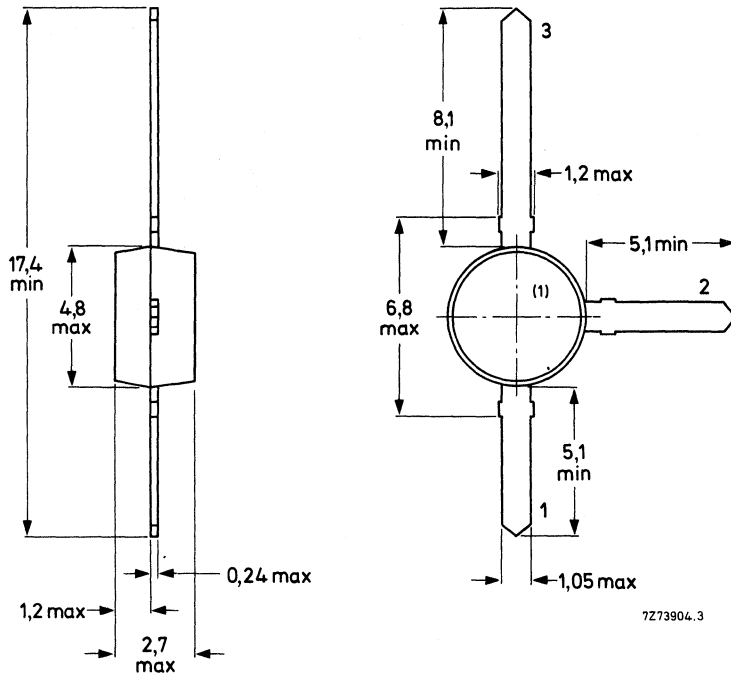
MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-37.

Connections

- 1. Base
- 2. Emitter
- 3. Collector



7273904.3

(1) = type number marking.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	$-V_{CBO}$ max.	20 V
Collector-emitter voltage (open base)	$-V_{CEO}$ max.	15 V
Emitter-base voltage (open collector)	$-V_{EBO}$ max.	2 V
Collector current (d.c.)	$-I_C$ max.	25 mA
Collector current (peak value) at $f > 1$ MHz	$-I_{CM}$ max.	35 mA
Total power dissipation up to $T_{amb} = 60$ °C	P_{tot} max.	180 mW
Storage temperature	T_{stg}	-65 to +150 °C
Junction temperature	T_j max.	150 °C

THERMAL RESISTANCE

From junction to ambient in free air
 mounted on a fibre-glass print
 of 40 mm x 25 mm x 1 mm

$R_{thj-a} = 500$ K/W

CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Collector cut-off current

$I_E = 0; -V_{CB} = 10\text{ V}$

$-I_{CBO}$ max. 50 nA

D.C. current gain

$-I_C = 14\text{ mA}; -V_{CE} = 10\text{ V}$

h_{FE} min. 20 ←

Transition frequency at $f = 500\text{ MHz}$

$-I_C = 14\text{ mA}; -V_{CE} = 10\text{ V}$

f_T typ. 5,0 GHz ←

Collector capacitance at $f = 1\text{ MHz}$

$I_E = I_e = 0; -V_{CB} = 10\text{ V}$

C_c typ. 0,65 pF

Emitter capacitance at $f = 1\text{ MHz}$

$I_C = I_c = 0; -V_{EB} = 0,5\text{ V}$

C_e typ. 1,2 pF

Feedback capacitance at $f = 1\text{ MHz}$

$I_C = 0; -V_{CE} = 10\text{ V}$

C_{re} typ. 0,45 pF

Noise figure at optimum source impedance

$-I_C = 4\text{ mA}; -V_{CE} = 10\text{ V}; f = 800\text{ MHz}; T_{amb} = 25\text{ }^\circ\text{C}$

F typ. 2,4 dB ←

Maximum unilateral power gain (s_{re} assumed to be zero)

$$G_{UM} = 10 \log \frac{|s_{fe}|^2}{[1 - |s_{ie}|^2][1 - |s_{oe}|^2]}$$

$-I_C = 14\text{ mA}; -V_{CE} = 10\text{ V}; T_{amb} = 25\text{ }^\circ\text{C}$

$f = 500\text{ MHz}$

$f = 800\text{ MHz}$

G_{UM} typ. 18,0 dB ←

G_{UM} typ. 14,0 dB

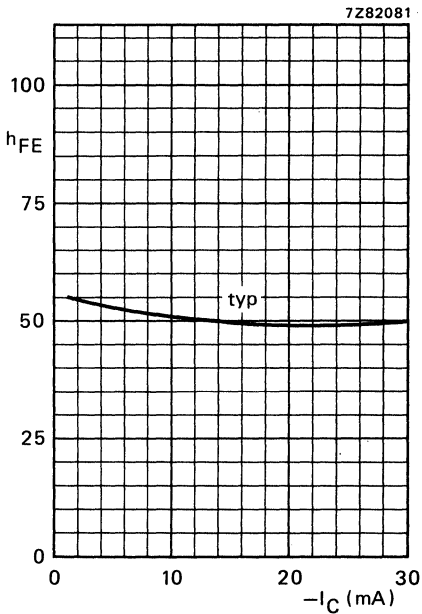


Fig. 2 $-V_{CE} = 10\text{ V}; T_j = 25\text{ }^\circ\text{C};$ typical values.

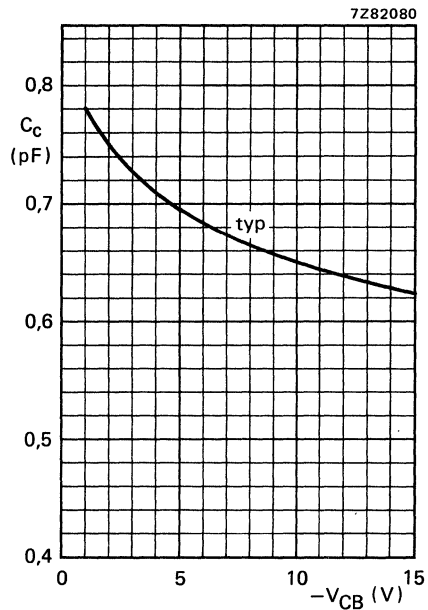


Fig. 3 $I_E = I_e = 0; f = 1\text{ MHz}; T_j = 25\text{ }^\circ\text{C};$ typical values.

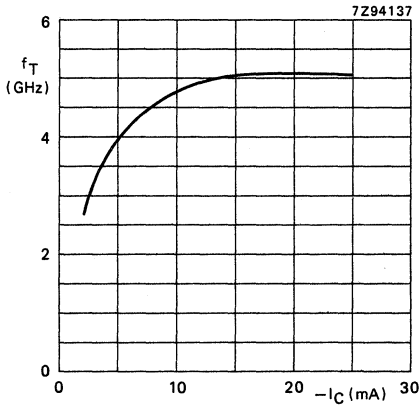


Fig. 4 $-V_{CE} = 10 \text{ V}$; $f = 500 \text{ MHz}$;
 $T_j = 25 \text{ }^\circ\text{C}$; typical values.

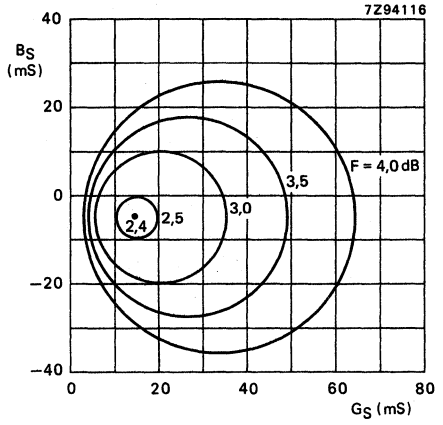


Fig. 5 Circles of constant noise figure.
 $-V_{CE} = 10 \text{ V}$; $-I_C = 4 \text{ mA}$; $f = 800 \text{ MHz}$;
 $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

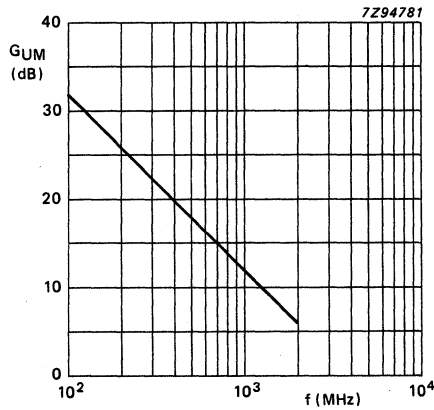


Fig. 6 $-V_{CE} = 10 \text{ V}$; $-I_C = 14 \text{ mA}$;
 $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

s-parameters (common emitter) at $-V_{CE} = 10\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$; typical values.

I_C mA	f MHz	s_{je}	s_{fe}	s_{re}	s_{oe}	GUM dB
2	40	0,89/ -4,7°	6,6/175,9°	0,01/ 86,5°	1,00/ -1,9°	44,8
	100	0,89/ -15,1°	6,5/164,8°	0,03/ 80,9°	1,01/ -8,5°	42,5
	200	0,79/ -33,5°	5,7/150,1°	0,05/ 73,4°	0,90/ -16,3°	26,7
	500	0,58/ -73,1°	4,4/118,5°	0,10/ 59,2°	0,78/ -31,2°	18,6
	800	0,40/ -100,3°	3,3/100,1°	0,13/ 56,7°	0,65/ -39,3°	13,4
	1000	0,31/ -116,4°	2,8/ 88,5°	0,14/ 54,3°	0,62/ -42,4°	11,4
	1200	0,24/ -142,0°	2,3/ 79,0°	0,15/ 53,4°	0,58/ -45,6°	9,3
	1500	0,23/ -166,8°	2,0/ 71,5°	0,18/ 56,1°	0,50/ -50,3°	7,6
2000	0,21/ +146,0°	1,6/ 56,1°	0,21/ 56,3°	0,44/ -64,2°	5,0	
5	40	0,73/ -8,3°	13,0/172,7°	0,01/ 85,8°	0,97/ -4,1°	38,5
	100	0,70/ -23,9°	12,4/157,1°	0,02/ 78,3°	0,95/ -13,7°	35,4
	200	0,56/ -47,2°	10,0/138,3°	0,04/ 71,4°	0,80/ -23,0°	26,0
	500	0,33/ -91,9°	6,1/106,3°	0,08/ 64,6°	0,61/ -34,5°	18,2
	800	0,21/ -118,3°	4,1/ 91,1°	0,11/ 66,3°	0,52/ -39,5°	13,9
	1000	0,16/ -140,0°	3,4/ 82,0°	0,13/ 65,0°	0,49/ -41,8°	12,0
	1200	0,14/ -179,1°	2,9/ 74,8°	0,15/ 63,9°	0,46/ -43,3°	10,2
	1500	0,16/ +168,5°	2,4/ 68,3°	0,18/ 65,1°	0,41/ -49,2°	8,6
2000	0,18/ +121,9°	1,9/ 55,1°	0,23/ 62,0°	0,36/ -62,4°	6,1	
10	40	0,54/ -12,2°	19,2/168,8°	0,01/ 80,9°	0,95/ -6,3°	37,5
	100	0,50/ -32,7°	17,4/149,7°	0,02/ 76,7°	0,89/ -17,8°	32,9
	200	0,36/ -59,7°	12,9/129,0°	0,03/ 72,8°	0,70/ -26,5°	25,8
	500	0,20/ -110,8°	6,8/ 99,3°	0,07/ 71,2°	0,51/ -33,8°	18,2
	800	0,13/ -138,7°	4,5/ 86,7°	0,11/ 72,5°	0,46/ -37,9°	14,1
	1000	0,11/ -170,2°	3,7/ 78,8°	0,13/ 70,5°	0,43/ -40,0°	12,3
	1200	0,13/ +150,8°	3,1/ 72,4°	0,15/ 68,9°	0,41/ -40,9°	10,6
	1500	0,16/ +151,1°	2,6/ 66,3°	0,18/ 68,8°	0,37/ -47,6°	8,9
2000	0,19/ +110,7°	2,0/ 54,2°	0,23/ 64,4°	0,32/ -61,0°	6,5	
14	40	0,44/ -14,2°	21,8/167,5°	0,01/ 82,2°	0,93/ -7,1°	36,5
	100	0,39/ -37,5°	19,1/146,9°	0,02/ 78,0°	0,86/ -19,3°	32,2
	200	0,27/ -66,9°	13,7/125,8°	0,03/ 74,2°	0,66/ -27,3°	25,6
	500	0,16/ -124,1°	6,9/ 97,8°	0,07/ 73,6°	0,49/ -32,9°	18,0
	800	0,12/ -153,3°	4,5/ 85,2°	0,11/ 74,3°	0,44/ -36,9°	14,0
	1000	0,12/ +175,7°	3,7/ 77,7°	0,13/ 72,3°	0,42/ -39,0°	12,3
	1200	0,15/ +143,0°	3,1/ 71,5°	0,15/ 70,6°	0,40/ -39,7°	10,6
	1500	0,17/ +145,1°	2,6/ 65,5°	0,19/ 69,9°	0,36/ -46,9°	9,0
2000	0,20/ +108,3°	2,0/ 53,4°	0,23/ 65,3°	0,31/ -60,3°	6,5	

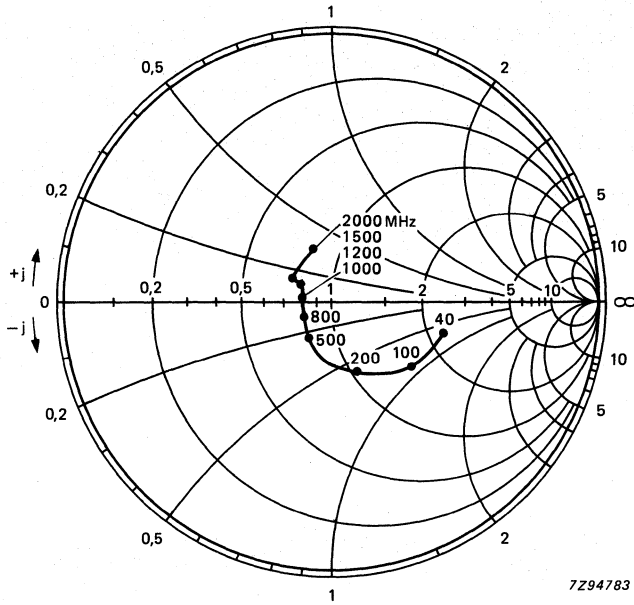


Fig. 7 Input impedance, derived from input reflection coefficient s_{ie} coordinates, in ohm x 50.

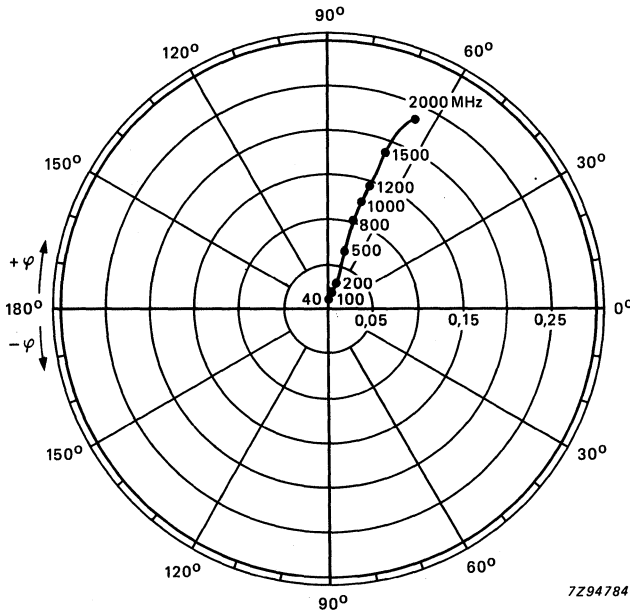


Fig. 8 Reverse transmission coefficient s_{re} .

Conditions for Figs 7 to 10: $-V_{CE} = 10 \text{ V}$; $-I_C = 14 \text{ mA}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

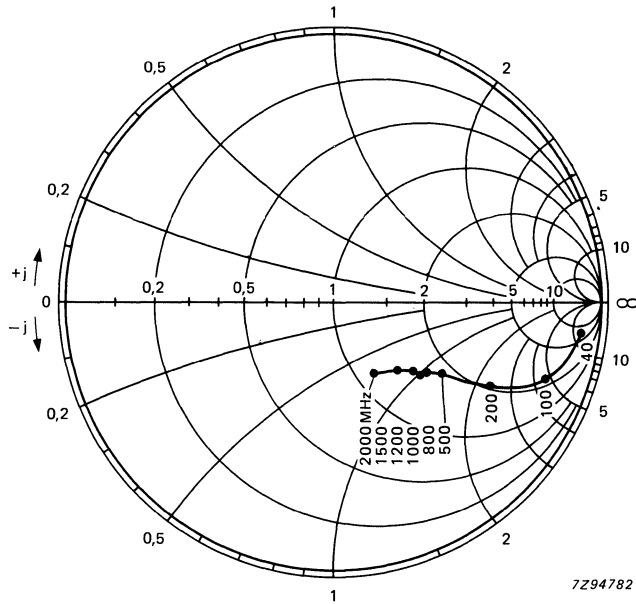


Fig. 9 Output impedance, derived from output reflection coefficient s_{oE} coordinates, in ohm \times 50.

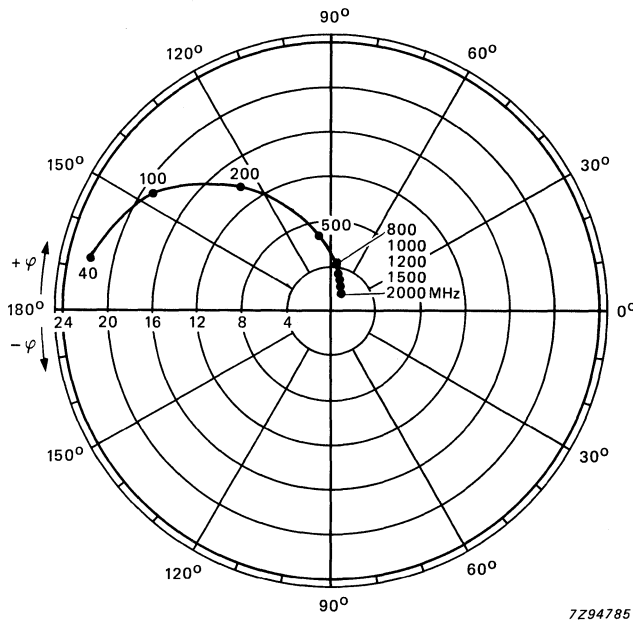


Fig. 10 Forward transmission coefficient s_{fE} .

P-N-P 2 GHz WIDEBAND TRANSISTOR

P-N-P transistor in a sub-miniature HERMETICALLY SEALED micro-stripline envelope. It is primarily intended for use in u.h.f. and microwave amplifiers such as aerial amplifiers, radar systems, oscilloscopes, spectrum analysers etc.

The transistor features extremely high power gain coupled with good low noise performance.

N-P-N complement is BFP90A.

QUICK REFERENCE DATA

Collector-base voltage	$-V_{CB0}$	max.	20 V	
Collector-emitter voltage	$-V_{CEO}$	max.	15 V	
Collector current (d.c.)	$-I_C$	max.	30 mA	
Total power dissipation up to $T_{amb} = 125\text{ }^\circ\text{C}$	P_{tot}	max.	250 mW	
Junction temperature	T_j	max.	175 $^\circ\text{C}$	
D.C. current gain				
$-I_C = 14\text{ mA}; -V_{CE} = 10\text{ V}$	h_{FE}	min.	20	←
Transition frequency at $f = 500\text{ MHz}$				
$-I_C = 14\text{ mA}; -V_{CE} = 10\text{ V}$	f_T	typ.	5,0 GHz	
Maximum unilateral power gain				
$-I_C = 14\text{ mA}; -V_{CE} = 10\text{ V}$				
at $f = 500\text{ MHz}$		typ.	20,5 dB	←
at $f = 800\text{ MHz}$	GUM	typ.	16,5 dB	

MECHANICAL DATA

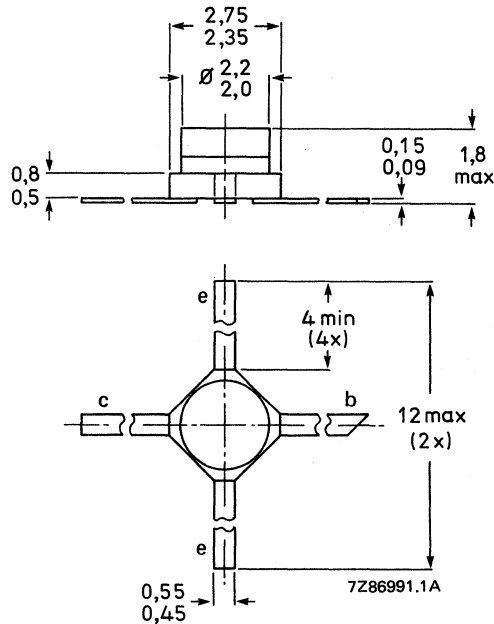
SOT-173 (see Fig. 1).

MECHANICAL DATA

Fig. 1 SOT-173.

Dimensions in mm

Marking code: C1



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	$-V_{CBO}$	max.	20 V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	15 V
Emitter-base voltage (open collector)	$-V_{EBO}$	max.	2 V
Collector current (d.c.)	$-I_C$	max.	30 mA
Total power dissipation up to $T_{amb} = 125\text{ }^\circ\text{C}$ mounted on a ceramic substrate of 0,7 mm x 10 cm ²			
	P_{tot}	max.	250 mW
Storage temperature	T_{stg}		-65 to +150 °C
Junction temperature	T_j	max.	175 °C

THERMAL RESISTANCE

→	From junction to ambient in free air mounted on a ceramic substrate of 0,7 mm x 10 cm ²	$R_{th\ j-a}$	200 K/W
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CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Collector cut-off current

$I_E = 0; -V_{CB} = 10\text{ V}$

$-I_{CBO}$ max. 50 nA

D.C. current gain

$-I_C = 14\text{ mA}; -V_{CE} = 10\text{ V}$

h_{FE} min. 20
typ. 50

Transition frequency at $f = 500\text{ MHz}$

$-I_C = 14\text{ mA}; -V_{CE} = 10\text{ V}$

f_T typ. 5,0 GHz

Collector capacitance at $f = 1\text{ MHz}$

$I_E = I_e = 0; -V_{CB} = 10\text{ V}$

C_C typ. 0,65 pF

Emitter capacitance at $f = 1\text{ MHz}$

$I_C = I_c = 0; -V_{EB} = 0,5\text{ V}$

C_e typ. 1,1 pF

Feedback capacitance at $f = 1\text{ MHz}$

$I_C = 0; -V_{CE} = 10\text{ V}$

C_{re} typ. 0,45 pF

Maximum unilateral power gain (s_{re} assumed to be zero)

$$G_{UM} = 10 \log \frac{|s_{fe}|^2}{[1 - |s_{ie}|^2][1 - |s_{oe}|^2]}$$

at $-I_C = 14\text{ mA}; -V_{CE} = 10\text{ V}; T_{amb} = 25\text{ }^\circ\text{C}$

$f = 500\text{ MHz}$

$f = 800\text{ MHz}$

G_{UM} typ. 20,5 dB
typ. 16,5 dB

Noise figures at $f = 800\text{ MHz}; Z_S = \text{opt.}; T_{amb} = 25\text{ }^\circ\text{C}$

$-I_C = 4\text{ mA}; -V_{CE} = 10\text{ V}$

$-I_C = 14\text{ mA}; -V_{CE} = 10\text{ V}$

F typ. 2,5 dB
typ. 3,5 dB



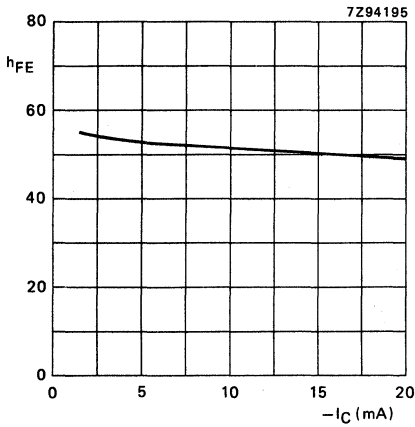


Fig. 2 $-V_{CE} = 10$ V; $T_j = 25$ °C; typical values.

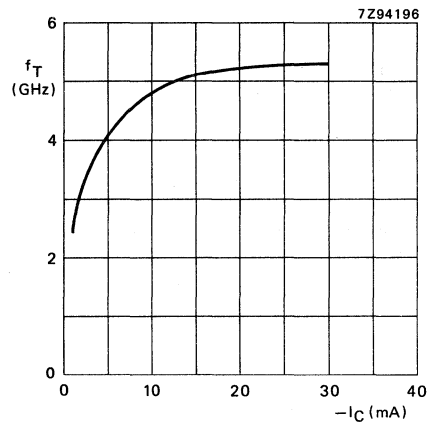


Fig. 3 $-V_{CE} = 10$ V; $f = 500$ MHz; $T_j = 25$ °C; typical values.

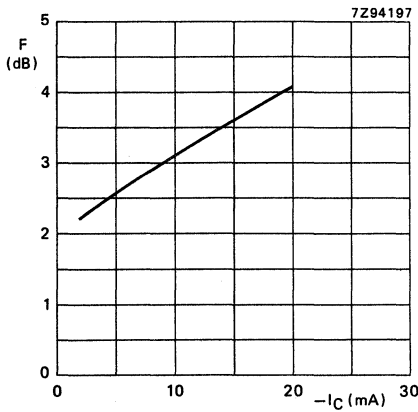


Fig. 4 $-V_{CE} = 10$ V; $f = 800$ MHz; $T_{amb} = 25$ °C; $Z_s = \text{optimum}$; typical values.

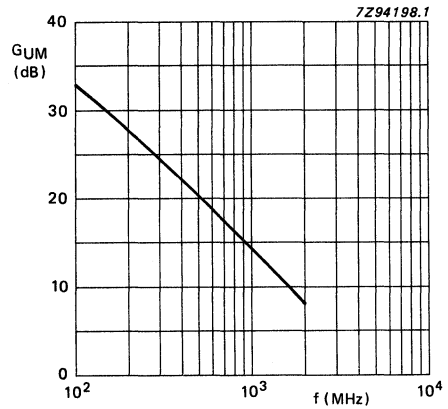


Fig. 5 $-V_{CE} = 10$ V; $-I_C = 14$ mA; $T_{amb} = 25$ °C; typical values.

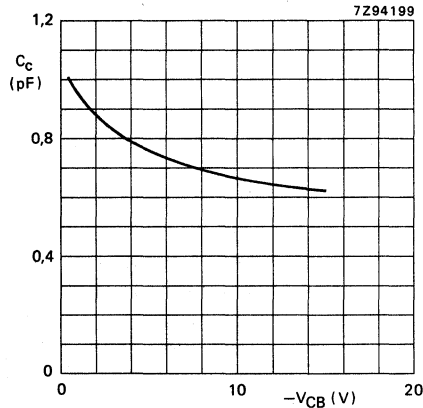


Fig. 6 $I_E = I_e = 0$; $f = 1$ MHz; $T_j = 25$ °C; typical values.

s-parameters (common-emitter) at $-V_{CE} = 10\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$; typical values.

I_C mA	f MHz	s_{ie}	s_{fe}	s_{re}	s_{oe}	GUM dB
2	40	0,87/ +8,2°	6,4/174,8°	0,011/ 84,6°	0,99/ -3,5°	39,3
	100	0,85/ -20,5°	6,3/165,9°	0,026/ 79,1°	0,98/ -8,7°	35,6
	200	0,81/ -39,7°	5,9/151,5°	0,050/ 70,1°	0,93/ -16,4°	28,7
	500	0,68/ -84,3°	4,4/122,4°	0,094/ 51,5°	0,79/ -31,4°	19,8
	800	0,59/ -112,1°	3,2/103,5°	0,116/ 43,6°	0,70/ -38,8°	14,9
	1000	0,54/ -125,2°	2,7/ 94,6°	0,124/ 41,0°	0,66/ -42,3°	12,6
	1200	0,52/ -137,2°	2,3/ 86,3°	0,133/ 20,0°	0,65/ -45,7°	10,9
	1500	0,47/ -149,4°	1,7/ 73,8°	0,140/ 34,3°	0,64/ -46,7°	8,2
	2000	0,44/ -169,4°	1,4/ 59,6°	0,157/ 31,7°	0,61/ -54,1°	6,0
5	40	0,72/ -13,1°	12,9/172,0°	0,010/ 82,6°	0,98/ -5,8°	39,4
	100	0,69/ -32,2°	12,3/159,6°	0,023/ 74,9°	0,94/ -14,1°	33,9
	200	0,64/ -60,2°	10,8/141,4°	0,041/ 64,1°	0,84/ -24,9°	28,3
	500	0,54/ -112,2°	6,7/111,8°	0,070/ 19,5°	0,62/ -39,7°	20,1
	800	0,50/ -137,3°	4,6/ 95,5°	0,085/ 47,2°	0,53/ -44,5°	15,9
	1000	0,47/ -148,5°	3,7/ 88,1°	0,094/ 46,8°	0,50/ -46,2°	13,7
	1200	0,46/ -158,2°	3,1/ 81,5°	0,103/ 46,6°	0,49/ -48,6°	12,1
	1500	0,44/ -169,7°	2,5/ 71,1°	0,117/ 44,5°	0,49/ -47,9°	10,0
	2000	0,44/ +173,2°	1,9/ 58,5°	0,139/ 42,8°	0,47/ -54,0°	7,7
10	40	0,55/ -19,4°	19,1/169,1°	0,009/ 80,3°	0,96/ -8,3°	38,2
	100	0,53/ -46,6°	17,7/153,6°	0,020/ 71,4°	0,89/ -19,4°	33,2
	200	0,50/ -82,2°	14,4/133,1°	0,033/ 60,6°	0,74/ -31,9°	27,9
	500	0,47/ -133,7°	7,8/105,0°	0,054/ 51,9°	0,50/ -44,1°	20,2
	800	0,46/ -153,7°	5,2/ 90,9°	0,069/ 52,8°	0,42/ -46,7°	16,2
	1000	0,45/ -162,5°	4,2/ 84,6°	0,079/ 53,3°	0,41/ -47,4°	14,2
	1200	0,46/ -170,3°	3,5/ 78,7°	0,088/ 53,2°	0,40/ -49,5°	12,6
	1500	0,45/ -178,8°	2,8/ 69,6°	0,106/ 51,6°	0,40/ -47,4°	10,8
	2000	0,46/ +166,7°	2,2/ 58,2°	0,128/ 49,9°	0,39/ -52,9°	8,5

s-parameters (common emitter) at $-V_{CE} = 10\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$; typical values.

I_C mA	f MHz	s_{ie}	s_{fe}	s_{re}	s_{oe}	GUM dB
14	40	0,46/ -24,2°	22,3/168,0°	0,008/ 79,0°	0,94/ -9,2°	37,3
	100	0,45/ -56,1°	20,1/151,0°	0,019/ 69,9°	0,86/-21,2°	32,9
	200	0,45/ -94,5°	15,6/130,6°	0,030/ 59,9°	0,70/-34,0°	27,8
	500	0,47/-142,0°	8,3/102,9°	0,049/ 54,1°	0,46/-44,4°	20,5
	800	0,48/-159,2°	5,4/ 89,6°	0,064/ 54,9°	0,39/-46,5°	16,5
	1000	0,47/-169,9°	4,4/ 83,9°	0,075/ 55,8°	0,38/-46,2°	14,6
	1200	0,47/-174,6°	3,7/ 78,8°	0,084/ 55,8°	0,37/-47,5°	13,1
	1500	0,46/+174,6°	2,8/ 68,3°	0,099/ 54,1°	0,37/-46,9°	10,6
	2000	0,47/+160,6°	2,2/ 57,0°	0,121/ 52,1°	0,35/-52,5°	8,3
20	40	0,35/ -31,2°	25,1/166,3°	0,007/ 77,6°	0,93/-10,4°	37,3
	100	0,38/ -70,2°	22,3/148,0°	0,017/ 68,7°	0,83/-23,7°	32,7
	200	0,42/-110,1°	16,8/126,4°	0,027/ 59,8°	0,65/-36,5°	27,7
	500	0,47/-151,9°	8,5/100,4°	0,044/ 56,7°	0,42/-45,4°	20,5
	800	0,48/-166,0°	5,5/ 87,3°	0,060/ 58,4°	0,37/-46,6°	16,6
	1000	0,48/-173,2°	4,4/ 81,9°	0,070/ 58,8°	0,36/-46,8°	14,6
	1200	0,49/-179,4°	3,7/ 76,4°	0,079/ 58,4°	0,35/-48,8°	13,1
	1500	0,48/+172,6°	2,9/ 67,9°	0,095/ 57,0°	0,35/-45,6°	10,8
	2000	0,49/+159,6°	2,2/ 56,8°	0,117/ 55,4°	0,34/-51,4°	8,5
25	40	0,29/ -38,0°	26,4/165,4°	0,007/ 76,2°	0,91/-10,9°	36,5
	100	0,35/ -80,7°	23,2/146,6°	0,016/ 67,8°	0,81/-24,7°	32,5
	200	0,41/-119,2°	17,1/124,4°	0,025/ 60,1°	0,63/-37,1°	27,7
	500	0,48/-156,2°	8,5/ 99,0°	0,042/ 58,2°	0,41/-44,6°	20,5
	800	0,50/-168,8°	5,5/ 86,4°	0,057/ 60,0°	0,36/-45,4°	16,7
	1000	0,50/-175,2°	4,4/ 80,9°	0,067/ 60,2°	0,35/-45,5°	14,7
	1200	0,51/+178,6°	3,7/ 75,5°	0,077/ 59,7°	0,34/-47,6°	13,2
	1500	0,49/+170,8°	2,8/ 67,0°	0,093/ 58,2°	0,35/-44,9°	10,8
	2000	0,50/+158,2°	2,2/ 56,2°	0,114/ 56,8°	0,34/-50,8°	8,5

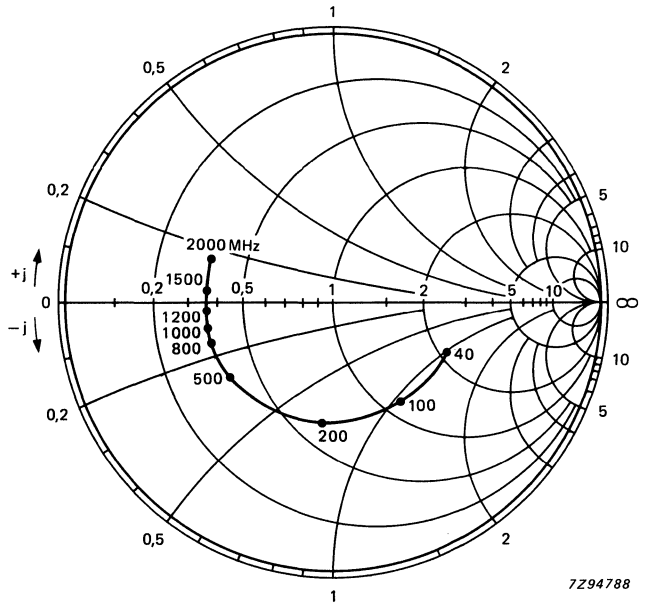


Fig. 7 $-V_{CE} = 10 \text{ V}$; $-I_C = 14 \text{ mA}$;
 $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

Input impedance derived from
 input reflection coefficient s_{ie}
 co-ordinates in ohm x 50.

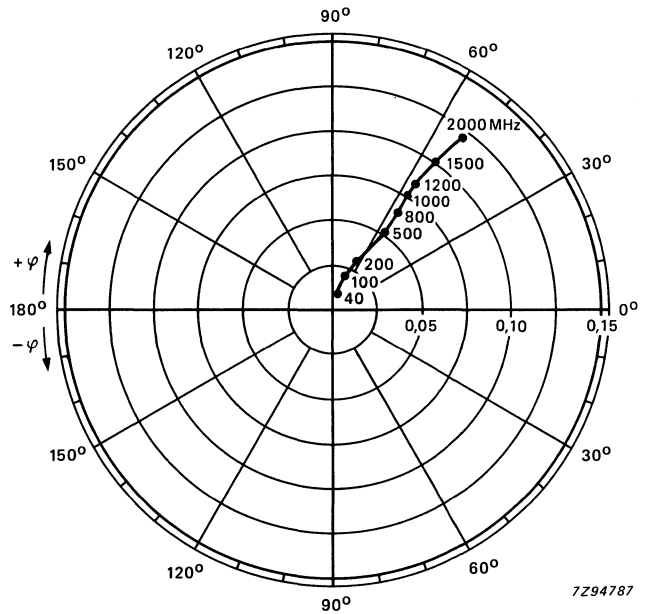


Fig. 8 $-V_{CE} = 10 \text{ V}$; $-I_C = 14 \text{ mA}$;
 $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

Reverse transmission coefficient s_{re} .

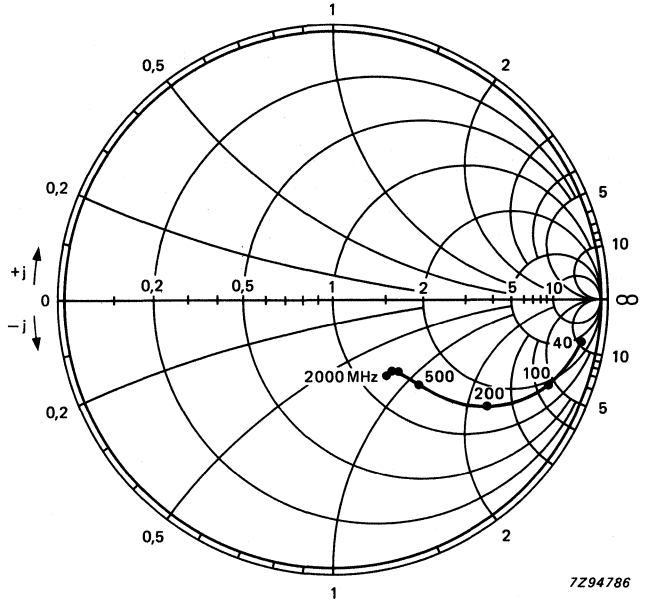


Fig. 9 $-V_{CE} = 10 \text{ V}$; $-I_C = 14 \text{ mA}$;
 $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

Output impedance derived from
 output reflection coefficient s_{oe}
 co-ordinates in ohm x 50.

7Z94786

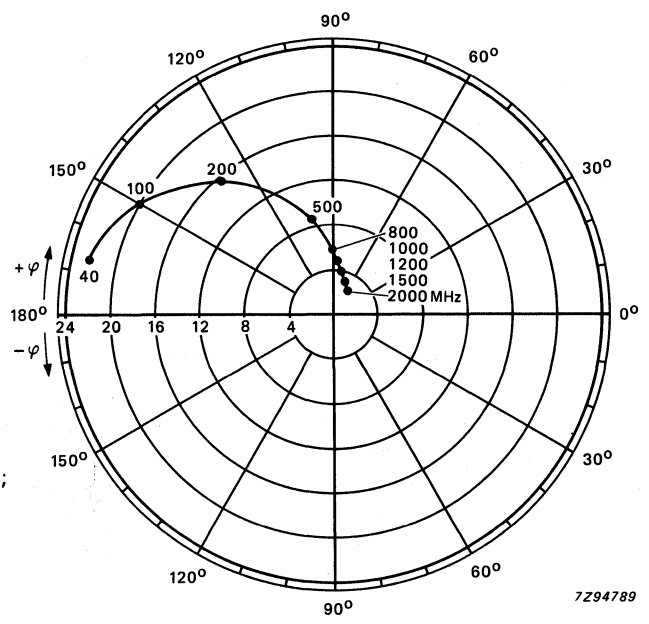


Fig. 10 $-V_{CE} = 10 \text{ V}$; $-I_C = 14 \text{ mA}$;
 $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

Forward transmission coefficient s_{fe} .

7Z94789

P-N-P H.F. WIDEBAND TRANSISTOR

P-N-P transistor in a TO-72 metal envelope with insulated electrodes and a shield lead connected to the case. It is primarily intended for use in u.h.f. and microwave amplifiers such as in aerial amplifiers, radar systems, oscilloscopes, spectrum analysers etc.

The transistor features extremely high power gain coupled with good low noise performance.

N-P-N complement is BFQ53.

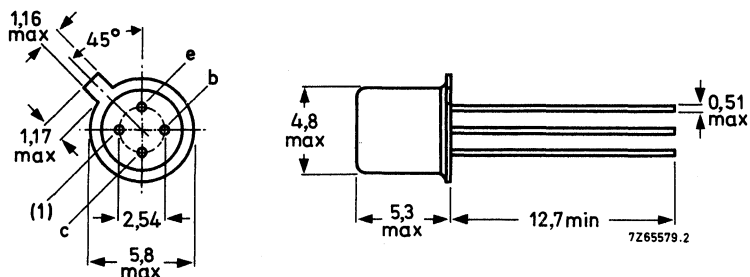
QUICK REFERENCE DATA

Collector-base voltage (open emitter)	$-V_{CBO}$	max.	20 V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	15 V
Collector current (d.c.)	$-I_C$	max.	25 mA
Total power dissipation up to $T_{amb} = 65^\circ\text{C}$	P_{tot}	max.	150 mW
Junction temperature	T_j	max.	200 $^\circ\text{C}$
Transition frequency at $f = 500$ MHz $-I_C = 14$ mA; $-V_{CE} = 10$ V	f_T	typ.	5,0 GHz
Feedback capacitance at $f = 1$ MHz $I_C = 0$; $-V_{CE} = 10$ V	C_{re}	typ.	0,5 pF
Noise figure at optimum source impedance $-I_C = 2$ mA; $-V_{CE} = 10$ V; $f = 500$ MHz	F	typ.	2,7 dB
Maximum unilateral power gain $-I_C = 14$ mA; $-V_{CE} = 10$ V; $f = 500$ MHz	GUM	typ.	17,0 dB

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-72 with insulated electrodes.



(1) shield lead connected to case.

Accessories: 56246 (distance disc).

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	$-V_{CBO}$	max.	20 V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	15 V
Emitter-base voltage (open collector)	$-V_{EBO}$	max.	2 V
Collector current (d.c.)	$-I_C$	max.	25 mA
Collector current (peak value) at $f > 1$ MHz	$-I_{CM}$	max.	35 mA
Total power dissipation up to $T_{amb} = 65^\circ\text{C}$	P_{tot}	max.	150 mW
Storage temperature	T_{stg}		-65 to +200 °C
Junction temperature	T_j	max.	200 °C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j-a}$	=	900 K/W
From junction to case	$R_{th\ j-c}$	=	600 K/W

CHARACTERISTICS

$T_j = 25^\circ\text{C}$ unless otherwise specified

Collector cut-off current

$I_E = 0; -V_{CB} = 10\text{ V}$	$-I_{CBO}$	max.	50 nA
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→ D.C. current gain

$-I_C = 14\text{ mA}; -V_{CE} = 10\text{ V}$	h_{FE}	min.	20
		typ.	50

→ Transition frequency (note 1)

$-I_C = 14\text{ mA}; -V_{CE} = 10\text{ V}; f = 500\text{ MHz}$	f_T	typ.	5,0 GHz
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→ Collector capacitance (note 2)

$I_E = I_e = 0; -V_{CB} = 10\text{ V}; f = 1\text{ MHz}$	C_c	typ.	0,85 pF
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Emitter capacitance

$I_C = I_c = 0; -V_{EB} = 0,5\text{ V}; f = 1\text{ MHz}$	C_e	typ.	1,2 pF
---	-------	------	--------

→ Feedback capacitance (note 1)

$I_C = 0; -V_{CE} = 10\text{ V}; f = 1\text{ MHz}$	C_{re}	typ.	0,5 pF
--	----------	------	--------

Noise figure at optimum source impedance (note 1)

$-I_C = 2\text{ mA}; -V_{CE} = 10\text{ V}; f = 500\text{ MHz}; T_{amb} = 25^\circ\text{C}$	F	typ.	2,7 dB
---	-----	------	--------

Maximum unilateral power gain (note 1)

(s_{re} assumed to be zero)

$$GUM = 10 \log \frac{|s_{fe}|^2}{(1 - |s_{ie}|^2)(1 - |s_{oe}|^2)}$$

$-I_C = 14\text{ mA}; -V_{CE} = 10\text{ V}; f = 500\text{ MHz}; T_{amb} = 25^\circ\text{C}$	GUM	typ.	17,0 dB
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→ Notes

1. Shield lead grounded.
2. Shield lead not connected.

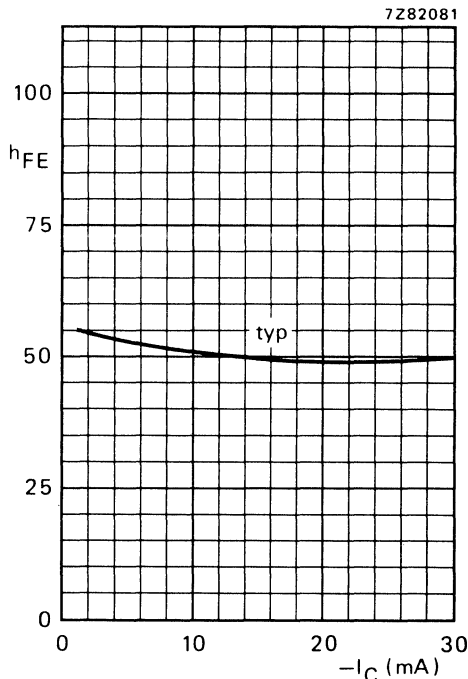


Fig. 2 $-V_{CE} = 10$ V; $T_j = 25$ °C; typ. values.

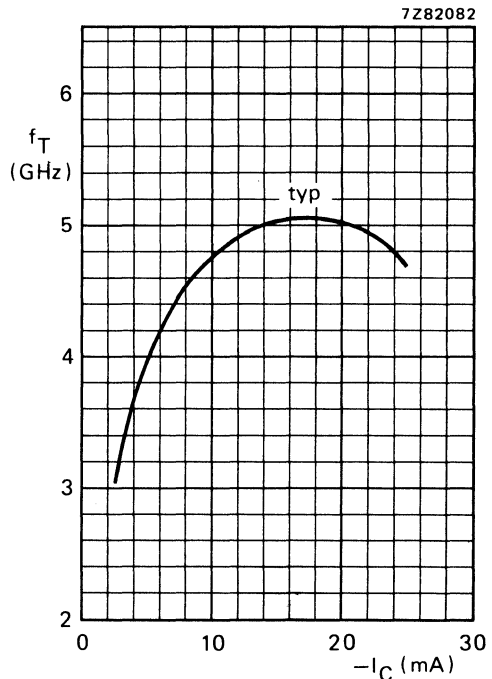


Fig. 3 $-V_{CE} = 10$ V; $f = 500$ MHz; $T_j = 25$ °C; typical values. ←

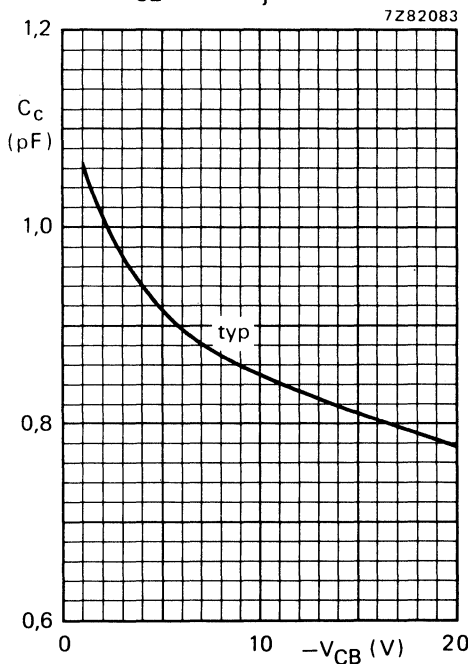


Fig. 4 $I_E = I_e = 0$; $f = 1$ MHz; $T_j = 25$ °C; typical values.

N-P-N H.F. WIDEBAND TRANSISTOR

N-P-N transistor in a TO-72 metal envelope with insulated electrodes and a shield lead connected to the case. It is primarily intended for use in u.h.f. and microwave amplifiers such as in aerial amplifiers, radar systems, oscilloscopes, spectrum analysers etc.

The transistor features extremely high power gain coupled with good low noise performance.

P-N-P complement is BFQ52.

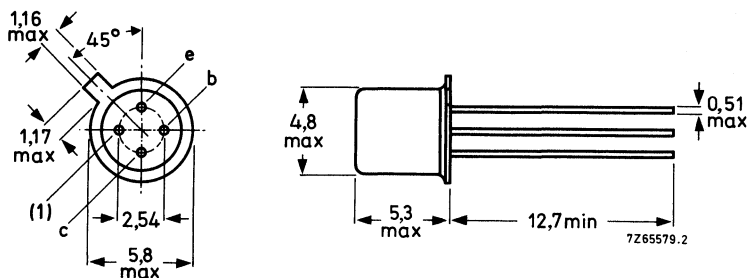
QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	20 V
Collector-emitter voltage (open base)	V_{CEO}	max.	15 V
Collector current (d.c.)	I_C	max.	25 mA
Total power dissipation up to $T_{amb} = 65^\circ\text{C}$	P_{tot}	max.	150 mW
Junction temperature	T_j	max.	200 $^\circ\text{C}$
Transition frequency at $f = 500\text{ MHz}$ $I_C = 14\text{ mA}; V_{CE} = 10\text{ V}$	f_T	typ.	5,0 GHz
Feedback capacitance at $f = 1\text{ MHz}$ $I_C = 0; V_{CE} = 10\text{ V}$	C_{re}	typ.	0,45 pF
Noise figure at optimum source impedance $I_C = 2\text{ mA}; V_{CE} = 10\text{ V}; f = 500\text{ MHz}$	F	typ.	2,4 dB
Maximum unilateral power gain $I_C = 14\text{ mA}; V_{CE} = 10\text{ V}; f = 500\text{ MHz}$	G_{UM}	typ.	18,0 dB

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-72 with insulated electrodes.



(1) shield lead connected to case.

Accessories: 56246 (distance disc).

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CB0}	max.	20 V
Collector-emitter voltage (open base)	V_{CEO}	max.	15 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2 V
Collector current (d.c.)	I_C	max.	25 mA
Collector current (peak value) at $f > 1$ MHz	I_{CM}	max.	35 mA
Total power dissipation up to $T_{amb} = 65$ °C	P_{tot}	max.	150 mW
Storage temperature	T_{stg}		-65 to +200 °C
Junction temperature	T_j	max.	200 °C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j-a}$	=	900 K/W
From junction to case	$R_{th\ j-c}$	=	600 K/W

CHARACTERISTICS

$T_j = 25$ °C unless otherwise specified

Collector cut-off current

$$I_E = 0; V_{CB} = 10\text{ V} \quad I_{CBO} \quad \text{max.} \quad 50\text{ nA}$$

→ D.C. current gain

$$I_C = 14\text{ mA}; V_{CE} = 10\text{ V} \quad h_{FE} \quad \begin{array}{l} \text{min.} \\ \text{typ.} \end{array} \quad \begin{array}{l} 25 \\ 50 \end{array}$$

→ Transition frequency (note 1)

$$I_C = 14\text{ mA}; V_{CE} = 10\text{ V}; f = 500\text{ MHz} \quad f_T \quad \text{typ.} \quad 5,0\text{ GHz}$$

Collector capacitance (note 2)

$$I_E = I_e = 0; V_{CB} = 10\text{ V}; f = 1\text{ MHz} \quad C_c \quad \text{typ.} \quad 0,75\text{ pF}$$

Emitter capacitance

$$I_C = I_c = 0; V_{EB} = 0,5\text{ V}; f = 1\text{ MHz} \quad C_e \quad \text{typ.} \quad 1,2\text{ pF}$$

Feedback capacitance (note 1)

$$I_C = 0; V_{CE} = 10\text{ V}; f = 1\text{ MHz} \quad C_{re} \quad \text{typ.} \quad 0,45\text{ pF}$$

Noise figure at optimum source impedance (note 1)

$$I_C = 2\text{ mA}; V_{CE} = 10\text{ V}; f = 500\text{ MHz}; T_{amb} = 25\text{ °C} \quad F \quad \text{typ.} \quad 2,4\text{ dB}$$

Maximum unilateral power gain (note 1)

s_{re} assumed to be zero

$$G_{UM} = \frac{|s_{fe}|^2}{(1 - |s_{ie}|^2)(1 - |s_{oe}|^2)}$$

$$I_C = 14\text{ mA}; V_{CE} = 10\text{ V}; f = 500\text{ MHz}; T_{amb} = 25\text{ °C} \quad G_{UM} \quad \text{typ.} \quad 18,0\text{ dB}$$

→ Notes

1. Shield lead connected
2. Shield lead not connected.

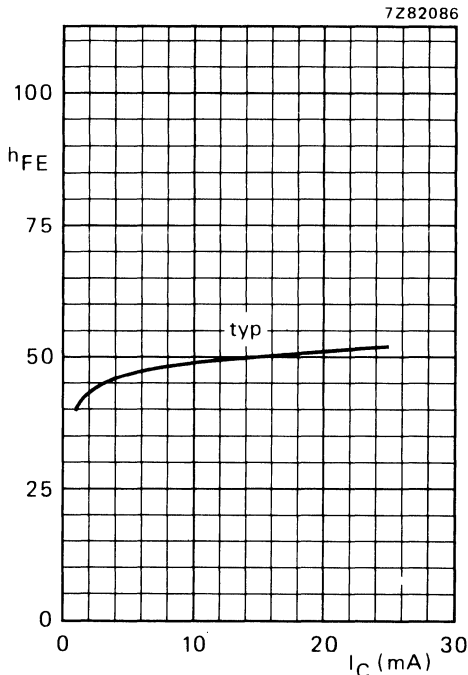


Fig. 2 $V_{CE} = 10 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$; typ. values.

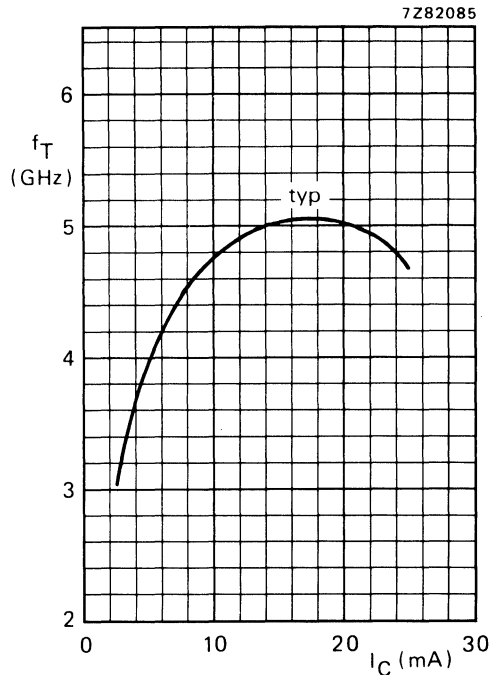


Fig. 3 $V_{CE} = 10 \text{ V}$; $f = 500 \text{ MHz}$; $T_j = 25 \text{ }^\circ\text{C}$; typical values.

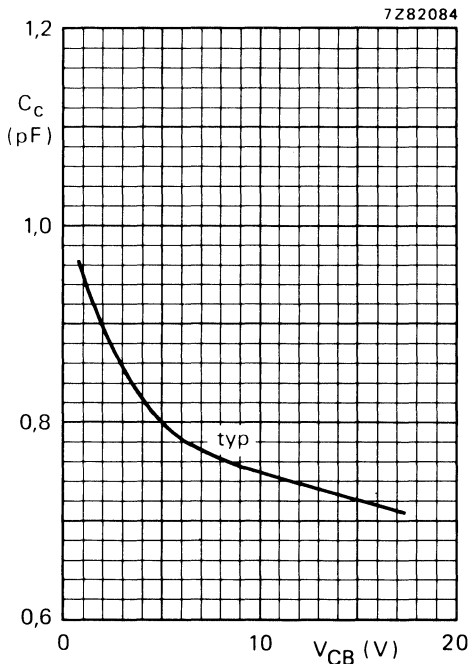


Fig. 4 $I_E = I_e = 0$; $f = 1 \text{ MHz}$; $T_j = 25 \text{ }^\circ\text{C}$; typical values.

N-P-N H.F. WIDEBAND TRANSISTOR

N-P-N transistor in a TO-72 metal envelope with insulated electrodes and a shield lead connected to the case. It is primarily intended for use in u.h.f. and microwave amplifiers such as in aerial amplifiers, radar systems, oscilloscopes, spectrum analysers etc.

The transistor features the combination of high power gain, high transition frequency and low noise up to high frequencies.

P-N-P complement is BFQ32M.

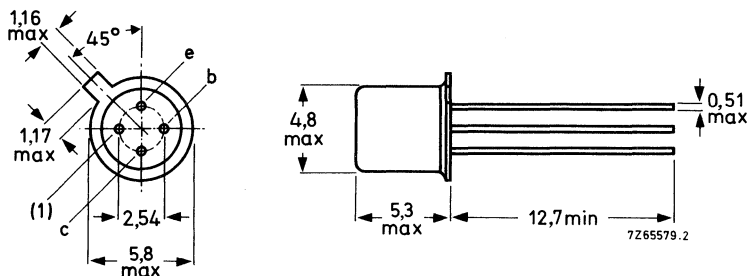
QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	20 V
Collector-emitter voltage (open base)	V_{CEO}	max.	15 V
Collector current (d.c.)	I_C	max.	75 mA
Total power dissipation up to $T_{amb} = 50\text{ }^\circ\text{C}$	P_{tot}	max.	250 mW
Junction temperature	T_j	max.	200 $^\circ\text{C}$
Transition frequency at $f = 500\text{ MHz}$ $I_C = 50\text{ mA}$; $V_{CE} = 5\text{ V}$	f_T	typ.	4,5 GHz
Feedback capacitance at $f = 1\text{ MHz}$ $I_C = 0$; $V_{CE} = 10\text{ V}$	C_{re}	typ.	1,0 pF
Noise figure at optimum source impedance $I_C = 10\text{ mA}$; $V_{CE} = 5\text{ V}$; $f = 200\text{ MHz}$	F	max.	3,0 dB
Maximum unilateral power gain $I_C = 20\text{ mA}$; $V_{CE} = 5\text{ V}$; $f = 200\text{ MHz}$	G_{UM}	min.	17,5 dB

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-72 with insulated electrodes.



(1) shield lead connected to case.

Accessories: 56246 (distance disc).

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CB0}	max.	20 V
Collector-emitter voltage (open base)	V_{CE0}	max.	15 V
Emitter-base voltage (open collector)	V_{EB0}	max.	3 V
Collector current (d.c.)	I_C	max.	75 mA
Collector current (peak value) at $f > 1$ MHz	I_{CM}	max.	150 mA
Total power dissipation up to $T_{amb} = 50$ °C	P_{tot}	max.	250 mW
Storage temperature	T_{stg}		-65 to +200 °C
Junction temperature	T_j	max.	200 °C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j-a}$	=	600 K/W
From junction to case	$R_{th\ j-c}$	=	350 K/W

CHARACTERISTICS

$T_j = 25$ °C unless otherwise specified

Collector cut-off current

$$I_E = 0; V_{CB} = 10\text{ V}$$

I_{CBO}	max.	100 nA
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→ D.C. current gain

$$I_C = 20\text{ mA}; V_{CE} = 5\text{ V}$$

h_{FE}	min.	50
	max.	150

→ Transition frequency (note 1)

$$I_C = 50\text{ mA}; V_{CE} = 5\text{ V}; f = 500\text{ MHz}$$

f_T	typ.	4,5 GHz
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Collector capacitance (note 2)

→ $I_C = i_c = 0; V_{CB} = 5\text{ V}; f = 1\text{ MHz}$

C_c	typ.	1,3 pF
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Feedback capacitance (note 2)

→ $I_C = 0; V_{CE} = 10\text{ V}; f = 1\text{ MHz}$

C_{re}	typ.	1,0 pF
	max.	1,4 pF

Noise figure at optimum source impedance (note 1)

$$I_C = 10\text{ mA}; V_{CE} = 5\text{ V}; f = 200\text{ MHz}; T_{amb} = 25\text{ °C}$$

$$I_C = 10\text{ mA}; V_{CE} = 5\text{ V}; f = 500\text{ MHz}; T_{amb} = 25\text{ °C}$$

F	max.	3,0 dB
F	typ.	2,3 dB

Maximum unilateral power gain (note 1)

s_{re} assumed to be zero

$$G_{UM} = 10 \log \frac{|s_{fe}|^2}{[1 - |s_{ie}|^2][1 - |s_{oe}|^2]}$$

$$I_C = 20\text{ mA}; V_{CE} = 5\text{ V}; f = 200\text{ MHz}; T_{amb} = 25\text{ °C}$$

$$I_C = 50\text{ mA}; V_{CE} = 5\text{ V}; f = 500\text{ MHz}; T_{amb} = 25\text{ °C}$$

G_{UM}	min.	17,5 dB
G_{UM}	typ.	11,5 dB

→ Notes

1. Shield lead grounded.
2. Shield lead and emitter lead connected to bridge earth.

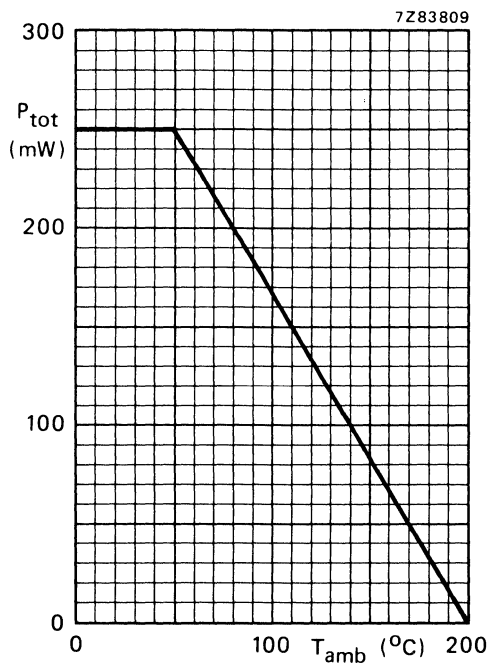


Fig. 2 Maximum permissible power dissipation in free air as a function of ambient temperature.

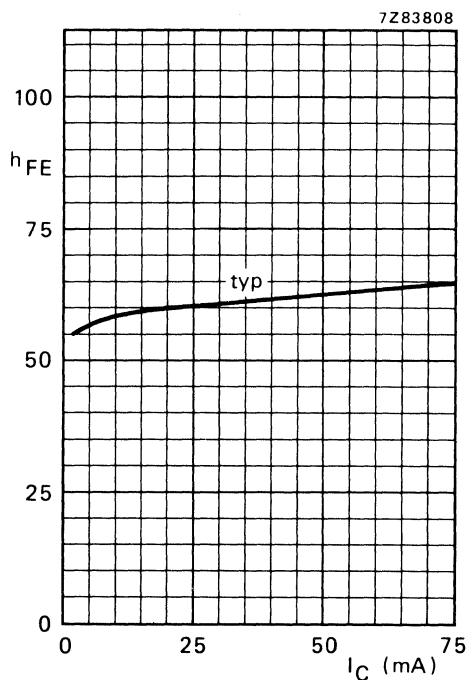


Fig. 3 $V_{CE} = 5\text{ V}$; $T_j = 25\text{ °C}$; typical values.

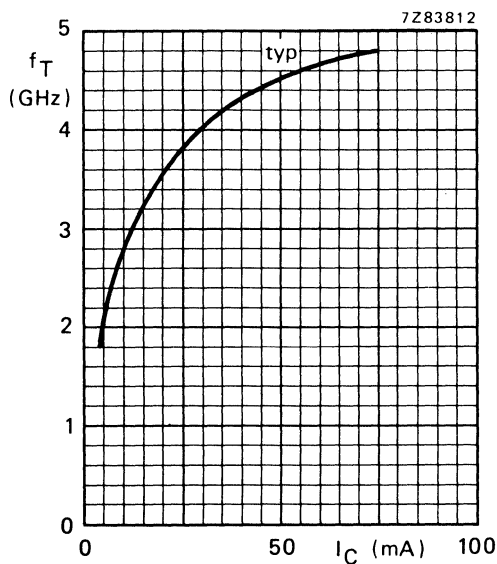


Fig. 4 $V_{CE} = 5\text{ V}$; $f = 500\text{ MHz}$; $T_j = 25\text{ °C}$; typical values.

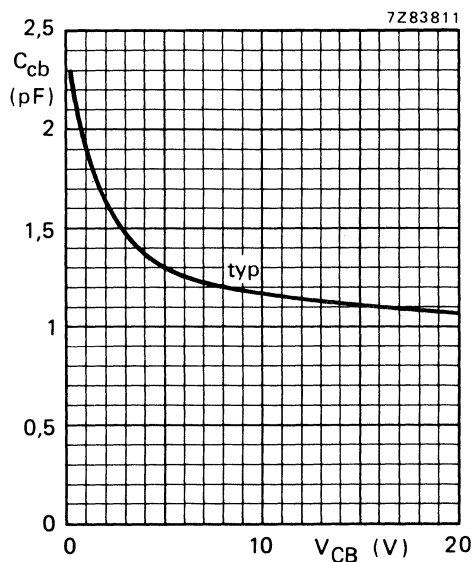


Fig. 5 $I_C = i_c = 0$; $f = 1\text{ MHz}$; $T_j = 25\text{ °C}$; typical values.

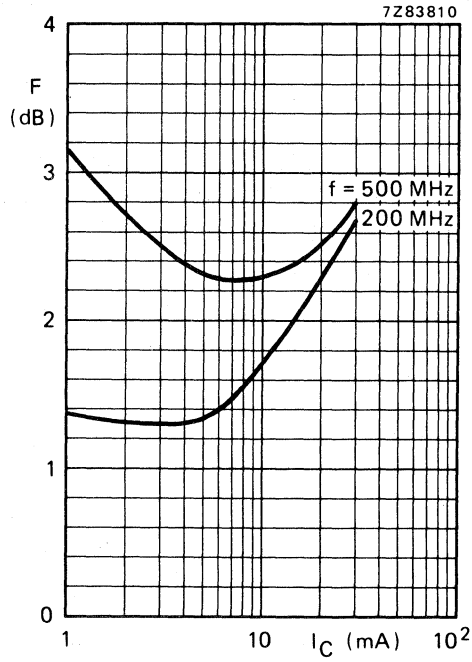


Fig. 6 $V_{CE} = 5$ V; $Z_S = \text{optimum}$; $T_{\text{amb}} = 25$ °C; typical values.

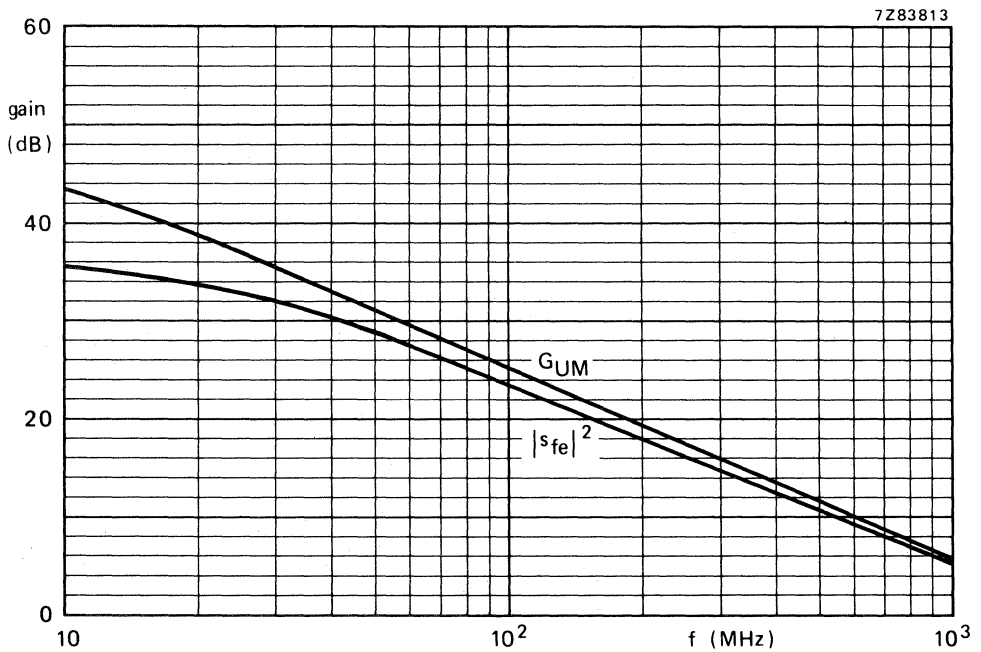


Fig. 7 $V_{CE} = 5$ V; $I_C = 50$ mA; $T_{\text{amb}} = 25$ °C; typical values.

N-P-N 2 GHz WIDEBAND TRANSISTOR

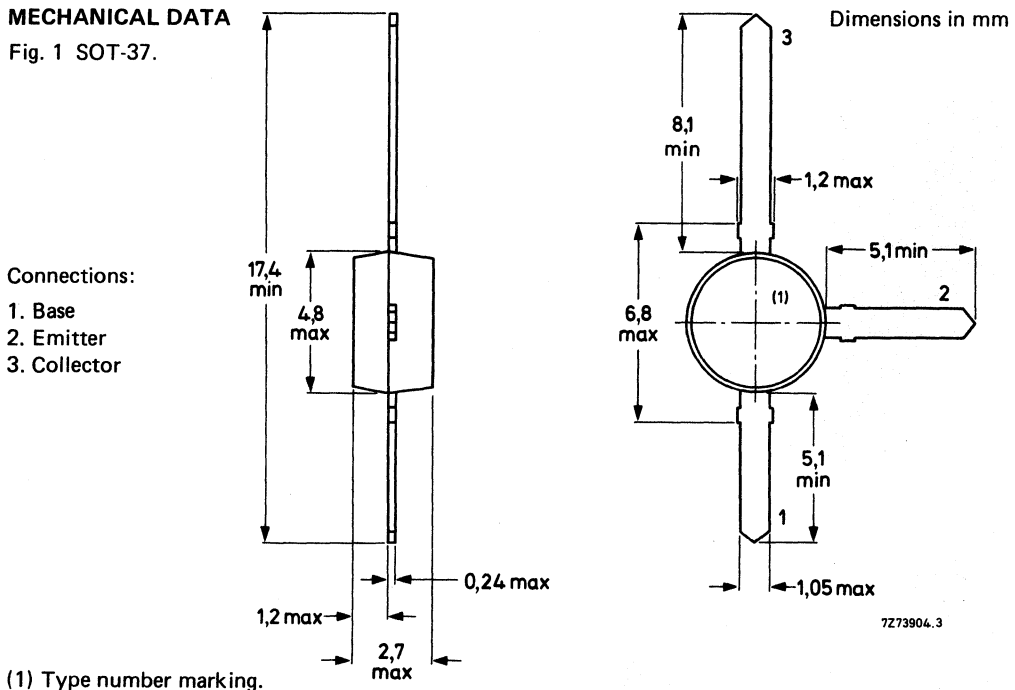
N-P-N transistor in a four-lead dual-emitter plastic envelope (SOT-103). It is designed for wideband application in the GHz range, such as satellite TV systems (SATV) and repeater amplifiers in fibre-optical systems. The device features a very high transition frequency and a very low noise figure up to high frequencies.

QUICK REFERENCE DATA

Collector-base voltage	V_{CBO}	max.	20 V
Collector-emitter voltage	V_{CEO}	max.	10 V
Collector current (d.c.)	I_C	max.	50 mA
Total power dissipation up to $T_{amb} = 60\text{ }^\circ\text{C}$	P_{tot}	max.	300 mW
Junction temperature	T_j	max.	150 $^\circ\text{C}$
D.C. current gain	h_{FE}	min.	60
$I_C = 15\text{ mA}; V_{CE} = 5\text{ V}$		typ.	100
Transition frequency at $f = 500\text{ MHz}$	f_T	typ.	7,5 GHz
$I_C = 15\text{ mA}; V_{CE} = 8\text{ V}$			
Maximum unilateral power gain at $f = 2\text{ GHz}$	GUM	typ.	8,0 dB
$I_C = 15\text{ mA}; V_{CE} = 8\text{ V}$			
Noise figure at $f = 2\text{ GHz}$	F	typ.	3,0 dB
$I_C = 15\text{ mA}; V_{CE} = 8\text{ V}; Z_s = 60\ \Omega$			

MECHANICAL DATA

Fig. 1 SOT-37.



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V _{CB0}	max.	20 V
Collector-emitter voltage (open base)	V _{CEO}	max.	10 V
Emitter-base voltage (open collector)	V _{EB0}	max.	2,5 V
Collector current (d.c.)	I _C	max.	50 mA
Total power dissipation up to T _{amb} = 60 °C mounted on a fibre-glass print of 40 mm x 25 mm x 1 mm	P _{tot}	max.	300 mW
Storage temperature	T _{stg}		-65 to +150 °C
Junction temperature	T _j	max.	150 °C

THERMAL RESISTANCE

From junction to ambient in free air mounted
on a fibre-glass print of 40 mm x 25 mm x 1 mm

R _{th j-a}	300 K/W
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CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current

I_E = 0; V_{CB} = 10 V

I _{CBO}	max.	50 nA
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D.C. current gain

I_C = 15 mA; V_{CE} = 5 V

h _{FE}	min.	60
	typ.	100

Transition frequency at f = 500 MHz

I_C = 15 mA; V_{CE} = 8 V

f _T	typ.	7,5 GHz
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Collector capacitance at f = 1 MHz

I_E = i_e = 0; V_{CB} = 8 V

C _c	typ.	0,8 pF
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Emitter capacitance at f = 1 MHz

I_C = i_c = 0; V_{EB} = 0,5 V

C _e	typ.	1,3 pF
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Feedback capacitance

I_C = 0; V_{CE} = 8 V

C _{re}	typ.	0,5 pF
-----------------	------	--------

→ Maximum unilateral power gain (s_{re} assumed to be zero)

$$G_{UM} = 10 \log \frac{|s_{fe}|^2}{[1 - |s_{ie}|^2][1 - |s_{oe}|^2]}$$

I_C = 15 mA; V_{CE} = 8 V; f = 800 MHz; T_{amb} = 25 °C

G _{UM}	typ.	16,0 dB
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I_C = 15 mA; V_{CE} = 8 V; f = 2 GHz; T_{amb} = 25 °C

G _{UM}	typ.	8,0 dB
-----------------	------	--------

→ Noise figure at f = 800 MHz; Z_S = opt.; T_{amb} = 25 °C

I_C = 5 mA; V_{CE} = 8 V

F	typ.	0,8 dB
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I_C = 15 mA; V_{CE} = 8 V

F	typ.	1,5 dB
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→ Noise figure at f = 2 GHz; Z_S = 60 Ω; T_{amb} = 25 °C

I_C = 5 mA; V_{CE} = 8 V

F	typ.	2,5 dB
---	------	--------

I_C = 15 mA; V_{CE} = 8 V

F	typ.	3,0 dB
---	------	--------

s-parameters (common emitter) at $V_{CE} = 8\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$; typical values

I_C mA	f MHz	S_{ie}	S_{fe}	S_{re}	S_{oe}	GUM dB
5	40	0,87/ -12,9°	15,83/171,2°	0,01/82,0°	0,98/ -6,5°	45,3
	100	0,81/ -31,0°	14,92/155,8°	0,02/74,8°	0,93/-15,7°	37,1
	200	0,69/ -54,6°	12,40/138,3°	0,04/67,0°	0,83/-25,9°	29,8
	500	0,42/-105,7°	7,12/104,9°	0,07/59,1°	0,59/-40,4°	19,7
	800	0,34/-128,7°	4,89/ 91,3°	0,10/63,0°	0,58/-49,1°	16,1
	1000	0,35/-142,8°	4,13/ 83,2°	0,12/63,7°	0,58/-58,0°	14,6
	2000	0,25/+128,0°	2,08/ 56,8°	0,20/67,8°	0,38/-63,3°	7,3
10	40	0,75/ -19,1°	26,88/165,6°	0,01/80,0°	0,96/-10,2°	43,8
	100	0,65/ -43,3°	23,08/144,9°	0,02/71,7°	0,86/-22,1°	35,5
	200	0,49/ -70,7°	16,71/125,2°	0,03/66,4°	0,70/-31,6°	28,6
	500	0,28/-126,5°	8,21/ 96,9°	0,06/66,4°	0,48/-40,0°	19,8
	800	0,24/-136,7°	5,39/ 86,8°	0,10/70,8°	0,50/-48,9°	16,1
	1000	0,26/-147,8°	4,49/ 79,9°	0,12/70,5°	0,51/-58,9°	14,6
	2000	0,22/+114,8°	2,28/ 56,5°	0,21/68,8°	0,32/-61,8°	7,8
15	40	0,67/ -23,8°	34,23/161,4°	0,01/78,3°	0,94/-12,6°	42,9
	100	0,54/ -51,8°	27,41/138,1°	0,02/71,0°	0,80/-25,5°	34,7
	200	0,39/ -80,0°	18,52/118,7°	0,03/68,4°	0,63/-33,2°	28,2
	500	0,22/-130,3°	8,47/ 93,5°	0,06/70,2°	0,44/-38,8°	19,7
	800	0,20/-140,8°	5,57/ 84,9°	0,10/73,6°	0,47/-48,4°	16,0
	1000	0,22/+147,5°	4,64/ 78,4°	0,12/72,9°	0,48/-59,0°	14,7
	2000	0,21/+109,8°	2,34/ 56,2°	0,22/68,7°	0,31/-61,0°	8,0
20	40	0,61/ -27,4°	39,76/158,4°	0,01/76,8°	0,92/-14,2°	42,4
	100	0,47/ -58,0°	30,05/133,7°	0,02/70,4°	0,75/-27,5°	34,2
	200	0,32/ -86,2°	19,38/114,7°	0,03/70,4°	0,58/-33,5°	28,0
	500	0,19/-136,8°	8,65/ 92,0°	0,06/72,4°	0,41/-37,5°	19,7
	800	0,18/-145,1°	5,62/ 83,5°	0,10/75,3°	0,46/-47,9°	16,1
	1000	0,20/-151,9°	4,63/ 77,7°	0,12/74,1°	0,47/-58,8°	14,6
	2000	0,21/-107,3°	2,37/ 55,7°	0,22/69,0°	0,30/-60,6°	8,1
30	40	0,51/ -33,2°	46,18/154,6°	0,01/75,6°	0,89/-16,4°	41,4
	100	0,37/ -67,3°	32,56/128,1°	0,02/70,6°	0,69/-29,1°	33,7
	200	0,26/ -97,3°	20,04/110,7°	0,03/72,3°	0,53/-32,7°	27,8
	500	0,17/-151,6°	8,64/ 89,7°	0,06/74,6°	0,39/-35,6°	19,6
	800	0,16/-152,2°	5,61/ 82,1°	0,10/76,7°	0,44/-46,9°	16,0
	1000	0,19/-157,7°	4,62/ 76,4°	0,12/75,1°	0,46/-58,3°	14,5
	2000	0,22/+106,4°	2,37/ 55,0°	0,23/69,3°	0,29/-60,0°	8,1

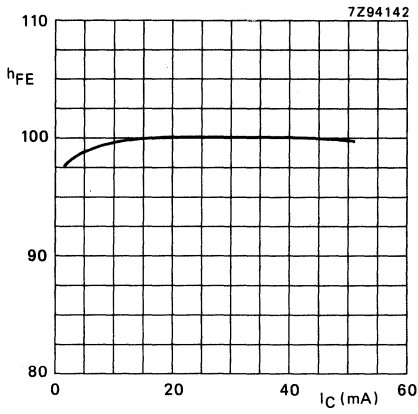


Fig. 2 $V_{CE} = 8 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$; typical values.

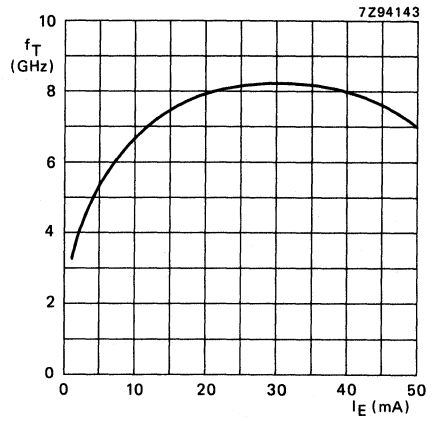


Fig. 3 $V_{CE} = 8 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$; typical values.

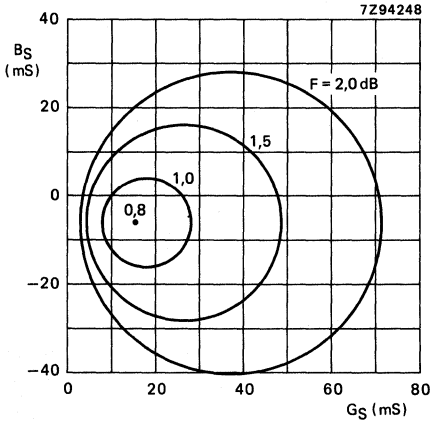


Fig. 4 Circles of constant noise figure;
 $V_{CE} = 8 \text{ V}$; $I_C = 5 \text{ mA}$; $f = 800 \text{ MHz}$; typical values.

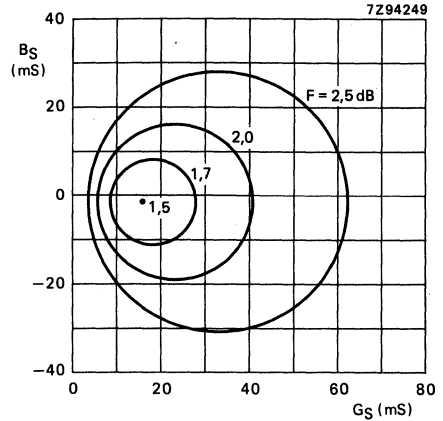


Fig. 5 Circles of constant noise figure;
 $V_{CE} = 8 \text{ V}$; $I_C = 15 \text{ mA}$; $f = 800 \text{ MHz}$; typ. values.

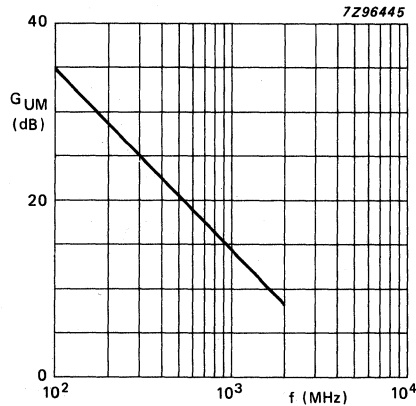


Fig. 6 $V_{CE} = 8 \text{ V}$; $I_C = 15 \text{ mA}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

N-P-N 2 GHz WIDEBAND TRANSISTOR

Small-signal planar epitaxial n-p-n transistor in HERMETICALLY SEALED microstripline envelope. It is designed for wideband application in the GHz range, such as satellite TV systems (SATV) and repeater amplifiers in fibre-optical systems. The device features a very high transition frequency and a very low noise figure up to high frequencies

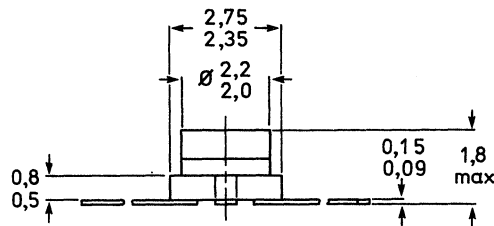
QUICK REFERENCE DATA

Collector-base voltage	V_{CBO}	max.	20 V
Collector-emitter voltage	V_{CEO}	max.	10 V
Collector current (d.c.)	I_C	max.	50 mA
Total power dissipation up to $T_{amb} = 105\text{ }^\circ\text{C}$	P_{tot}	max.	350 mW
Junction temperature	T_j	max.	175 $^\circ\text{C}$
D.C. current gain $I_C = 15\text{ mA}; V_{CE} = 5\text{ V}$	h_{FE}	min. typ.	60 100
Transition frequency at $f = 500\text{ MHz}$ $I_C = 15\text{ mA}; V_{CE} = 8\text{ V}$	f_T	typ.	7,5 GHz
Maximum unilateral power gain at $f = 2\text{ GHz}$ $I_C = 15\text{ mA}; V_{CE} = 8\text{ V}$	GUM	typ.	11,5 dB

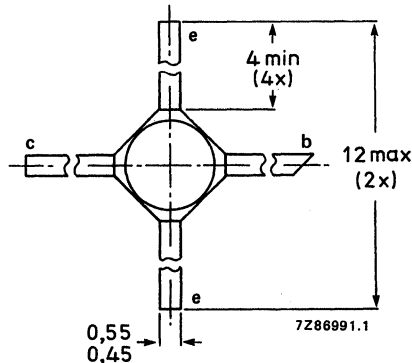
MECHANICAL DATA

Fig. 1 SOT-173.

Dimensions in mm



Marking code: Q6



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	20 V
Collector-emitter voltage (open base)	V_{CEO}	max.	10 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2,5 V
Collector current (d.c.)	I_C	max.	50 mA
Total power dissipation up to $T_{amb} = 105\text{ }^\circ\text{C}$ mounted on a ceramic substrate of 0,7 mm x 10 cm ²	P_{tot}	max.	350 mW
Storage temperature	T_{stg}		-65 to + 150 °C
Junction temperature	T_j	max.	175 °C

THERMAL RESISTANCE

From junction to ambient in free air mounted
on a ceramic substrate of 0,7 mm x 10 cm²

$R_{th\ j-a}$	200 K/W
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CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Collector cut-off current

$I_E = 0; V_{CB} = 5\text{ V}$

I_{CBO}	max.	50 nA
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→ D.C. current gain

$I_C = 15\text{ mA}; V_{CE} = 5\text{ V}$

h_{FE}	min.	60
	typ.	100

→ Transition frequency at $f = 500\text{ MHz}$

$I_C = 15\text{ mA}; V_{CE} = 8\text{ V}$

f_T	typ.	7,5 GHz
-------	------	---------

Collector capacitance at $f = 1\text{ MHz}$

$I_E = i_e = 0; V_{CB} = 8\text{ V}$

C_c	typ.	0,7 pF
-------	------	--------

Emitter capacitance at $f = 1\text{ MHz}$

$I_C = i_c = 0; V_{EB} = 0,5\text{ V}$

C_e	typ.	1,3 pF
-------	------	--------

Feedback capacitance

$I_C = 0; V_{CE} = 8\text{ V}$

C_{re}	typ.	0,4 pF
----------	------	--------

Maximum unilateral power gain (s_{re} assumed to be zero)

$$G_{UM} = 10 \log \frac{|s_{fe}|^2}{(1 - |s_{ie}|^2)(1 - |s_{oe}|^2)}$$

$I_C = 15\text{ mA}; V_{CE} = 8\text{ V}; f = 2\text{ GHz}; T_{amb} = 25\text{ }^\circ\text{C}$

G_{UM}	typ.	11,5 dB
----------	------	---------

→ Noise figure at $f = 2\text{ GHz}; Z_S = 60\text{ }^\circ\Omega; T_{amb} = 25\text{ }^\circ\text{C}$

$I_C = 5\text{ mA}; V_{CE} = 8\text{ V}$

F	typ.	2,5 dB
-----	------	--------

$I_C = 15\text{ mA}; V_{CE} = 8\text{ V}$

F	typ.	3,0 dB
	max.	4,0 dB

s-parameters (common emitter) at $V_{CE} = 8\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$; typical values. ←

I_C mA	f MHz	s_{ie}	s_{fe}	s_{re}	s_{oe}	G_{UM} dB
5	100	0,86/ -30,0°	15,8/160,5°	0,024/74,1°	0,97/ -16,1°	42,1
	200	0,79/ -56,5°	14,0/143,8°	0,043/62,5°	0,87/ -28,2°	33,3
	300	0,73/ -77,9°	11,8/130,6°	0,056/53,6°	0,76/ -37,0°	28,5
	400	0,68/ -95,3°	10,1/121,2°	0,064/48,0°	0,67/ -43,6°	25,4
	500	0,66/ -108,1°	8,7/114,1°	0,070/44,8°	0,62/ -48,0°	23,4
	600	0,63/ -119,0°	7,7/107,9°	0,074/42,7°	0,57/ -50,6°	21,6
	700	0,62/ -127,8°	6,7/103,2°	0,079/41,6°	0,53/ -52,6°	20,1
	800	0,59/ -135,8°	6,1/ 99,2°	0,081/40,8°	0,50/ -54,8°	18,8
	900	0,58/ -141,0°	5,5/ 95,5°	0,084/40,8°	0,49/ -55,5°	17,8
	1000	0,57/ -147,4°	5,0/ 92,0°	0,087/40,7°	0,46/ -56,5°	16,7
	1200	0,56/ -157,0°	4,2/ 85,9°	0,092/41,2°	0,44/ -59,5°	15,0
	1500	0,53/ -168,7°	3,4/ 77,5°	0,092/37,7°	0,44/ -60,6°	13,0
	2000	0,54/+ 171,9°	2,6/ 65,8°	0,103/40,6°	0,41/ -66,5°	10,6
	2500	0,54/+ 158,8°	2,2/ 57,8°	0,114/44,6°	0,39/ -75,2°	9,1
	3000	0,53/+ 144,8°	1,8/ 49,2°	0,129/48,1°	0,39/ -83,1°	7,3
	3500	0,55/+ 134,0°	1,6/ 41,9°	0,148/50,4°	0,37/ -96,2°	6,3
4000	0,54/+ 120,2°	1,5/ 32,1°	0,170/49,9°	0,37/ -109,0°	5,7	

I_C mA	f MHz	s_{ie}	s_{fe}	s_{re}	s_{oe}	G_{UM} dB
15	100	0,68/ -54,8°	31,3/147,5°	0,020/65,8°	0,86/ -28,0°	38,4
	200	0,61/ -92,4°	23,3/126,6°	0,031/54,6°	0,67/ -43,8°	32,0
	300	0,57/ -115,8°	17,5/114,4°	0,038/49,8°	0,52/ -51,5°	27,9
	400	0,55/ -131,0°	13,9/106,8°	0,042/48,7°	0,44/ -56,5°	25,4
	500	0,55/ -141,0°	11,5/101,6°	0,046/49,3°	0,40/ -59,3°	23,5
	600	0,53/ -149,3°	9,8/ 96,7°	0,051/50,4°	0,36/ -60,2°	21,9
	700	0,54/ -155,5°	8,5/ 93,3°	0,055/51,6°	0,34/ -61,2°	20,6
	800	0,54/ -160,6°	7,5/ 90,4°	0,058/52,9°	0,32/ -62,4°	19,5
	900	0,52/ -164,6°	6,7/ 87,8°	0,063/54,1°	0,31/ -62,3°	18,3
	1000	0,52/ -169,1°	6,1/ 85,4°	0,067/55,1°	0,30/ -62,6°	17,5
	1200	0,51/ -176,1°	5,1/ 80,3°	0,075/56,5°	0,28/ -64,7°	15,8
	1500	0,50/+ 171,5°	4,2/ 73,5°	0,081/55,8°	0,28/ -66,6°	14,1
	2000	0,52/+ 157,8°	3,2/ 63,8°	0,100/57,3°	0,26/ -68,2°	11,5
	2500	0,52/+ 148,1°	2,6/ 57,2°	0,120/58,6°	0,25/ -75,5°	9,9
	3000	0,51/+ 135,6°	2,2/ 49,1°	0,143/58,2°	0,25/ -81,8°	8,4
	3500	0,54/+ 127,6°	2,0/ 42,1°	0,167/57,5°	0,24/ -96,0°	7,8
4000	0,52/+ 114,6°	1,8/ 33,4°	0,191/54,3°	0,24/ -110,9°	6,7	

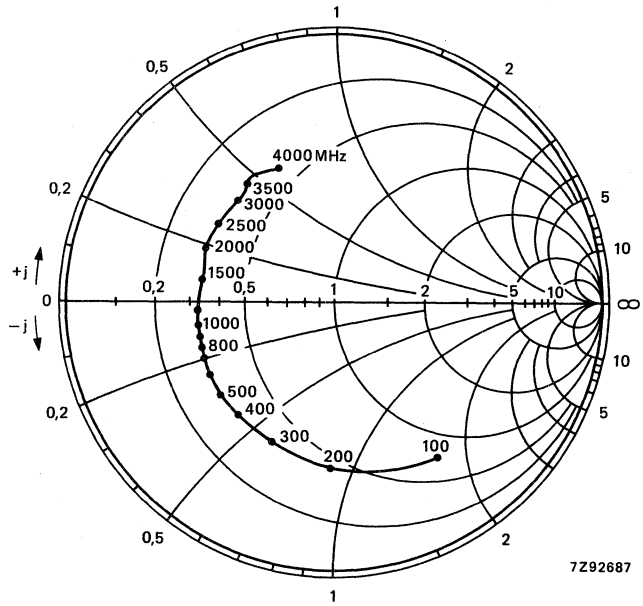


Fig. 2 Input impedance, derived from input reflection coefficient s_{ie} coordinates, in ohm x 50.

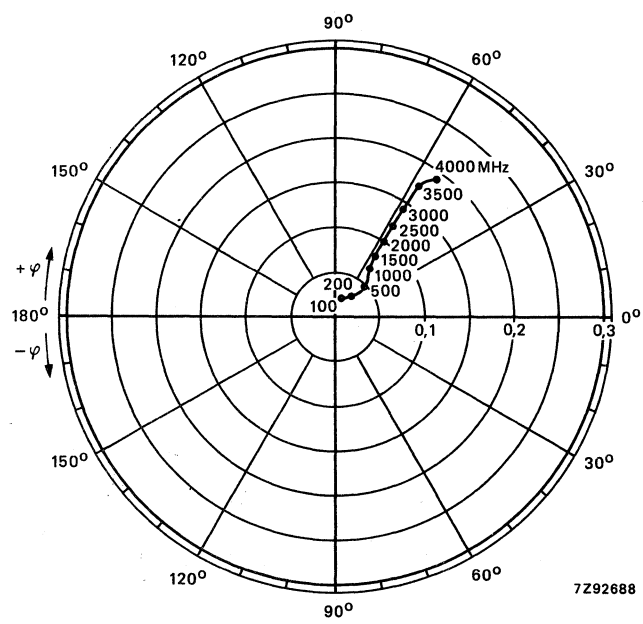
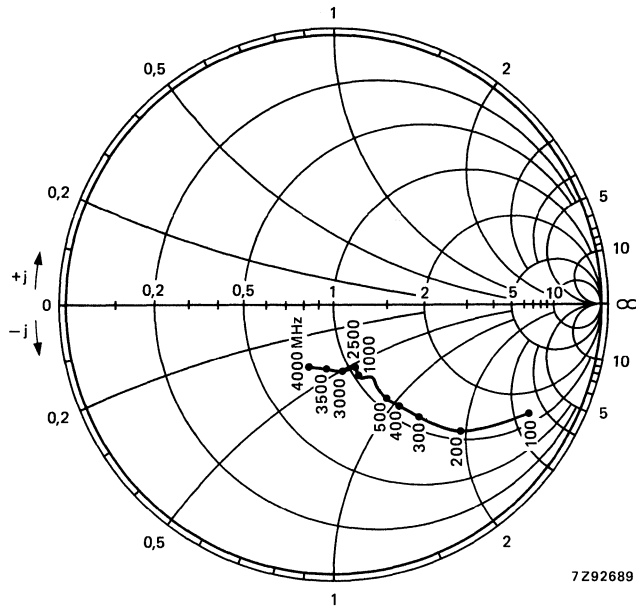


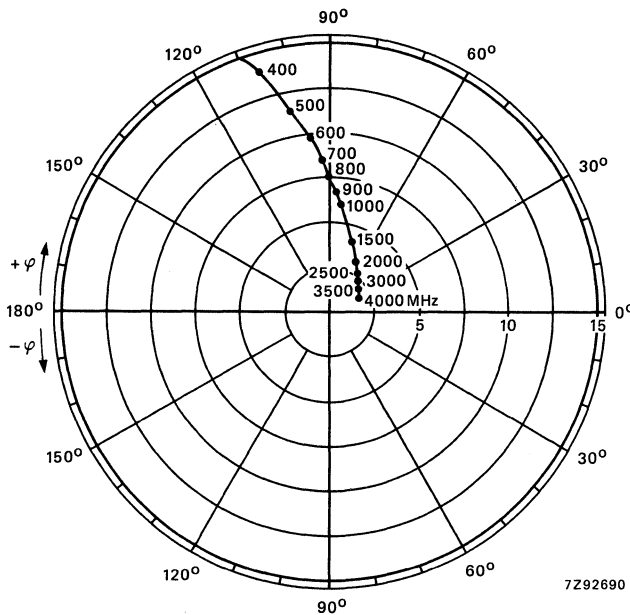
Fig. 3 Reverse transmission coefficient s_{re} .

→ Conditions for Figs 2 to 5: $V_{CE} = 8 \text{ V}$; $I_C = 15 \text{ mA}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.



7Z92689

Fig. 4 Output impedance, derived from output reflection coefficient s_{Oe} coordinates, in ohm x 50.



7Z92690

Fig. 5 Forward transmission coefficient s_{fe} .

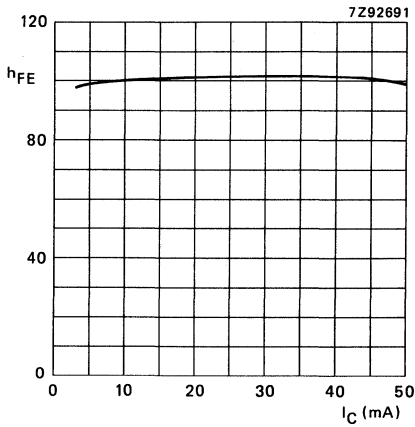


Fig. 6 $V_{CE} = 5$ V; $T_j = 25$ °C; typ. values.

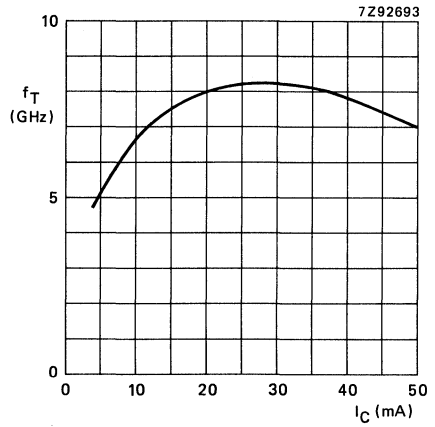


Fig. 7 $V_{CE} = 8$ V; $f = 500$ MHz; $T_j = 25$ °C; typ. values.

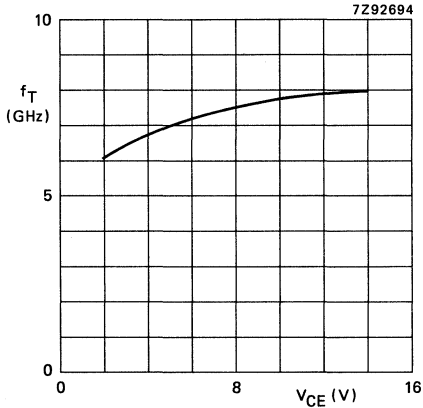


Fig. 8 $I_C = 15$ mA; $f = 500$ MHz; $T_j = 25$ °C; typ. values.

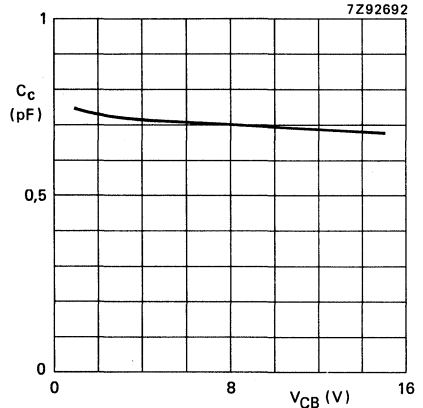


Fig. 9 $I_E = I_E = 0$; $f = 1$ MHz; $T_j = 25$ °C; typ. values.

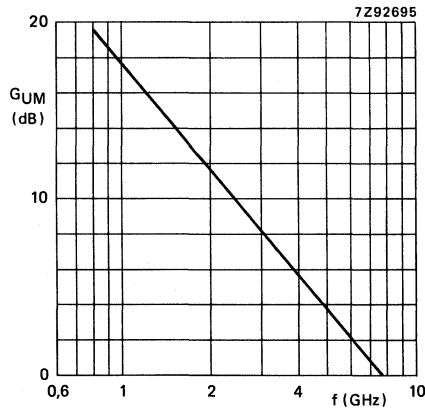


Fig. 10 $V_{CE} = 8$ V; $I_C = 15$ mA; $T_{amb} = 25$ °C; typ. values.

N-P-N 2 GHz WIDEBAND TRANSISTOR

N-P-N transistor in a plastic SOT-23 envelope. It is designed for wideband application in the GHz range, such as satellite TV systems (SATV) and repeater amplifiers in fibre-optical systems. The device features a very high transition frequency and a very low noise figure up to high frequencies.

QUICK REFERENCE DATA

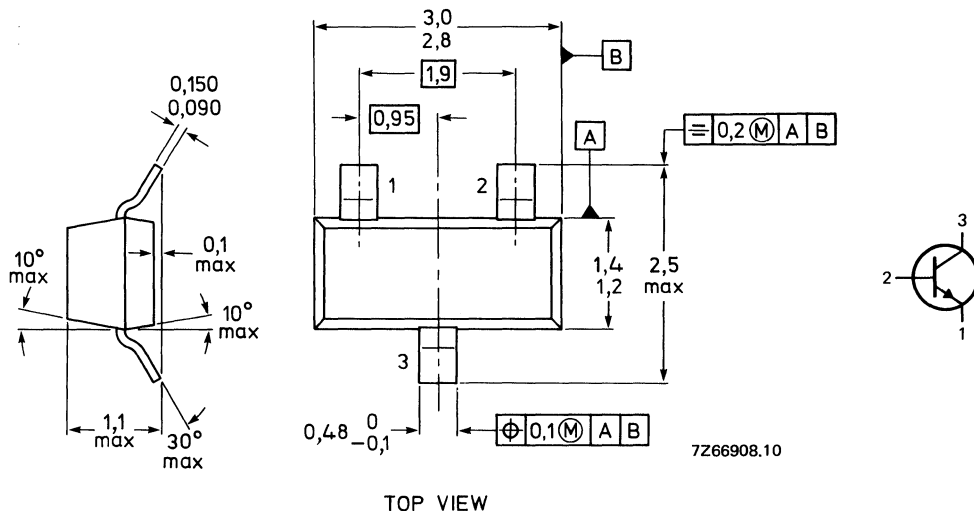
Collector-base voltage, open emitter	V_{CBO}	max.	20 V
Collector-emitter voltage, open base	V_{CEO}	max.	10 V
Collector current (d.c.)	I_C	max.	50 mA
Total power dissipation up to $T_{amb} = 70\text{ }^\circ\text{C}$	P_{tot}	max.	180 mW
Junction temperature	T_j	max.	150 $^\circ\text{C}$
D.C. current gain	h_{FE}	typ.	100
$I_C = 15\text{ mA}; V_{CB} = 5\text{ V}$			
Transition frequency at $f = 500\text{ MHz}$	f_T	typ.	7,5 GHz
$I_C = 15\text{ mA}; V_{CE} = 8\text{ V}$			
Maximum unilateral power gain at $f = 2\text{ GHz}$	G_{UM}	typ.	8,0 dB
$I_C = 15\text{ mA}; V_{CE} = 8\text{ V}$			

MECHANICAL DATA

Fig. 1 SOT-23.

Dimensions in mm

Mark : V2



If required, the R-version (reverse pinning) is available on request.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V _{CBO}	max.	20 V
Collector-emitter voltage (open base)	V _{CEO}	max.	10 V
Emitter-base voltage (open collector)	V _{EBO}	max.	2,5 V
Collector current (d.c.)	I _C	max.	50 mA
Total power dissipation up to T _{amb} = 70 °C*	P _{tot}	max.	180 mW
Storage temperature	T _{stg}		-65 to + 150 °C
Junction temperature	T _j	max.	150 °C

THERMAL RESISTANCE

From junction to ambient in free air*	R _{th j-a}	=	430 K/W
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CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current

I _E = 0; V _{CB} = 5 V	I _{CBO}	max.	50 nA
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D.C. current gain

I _C = 15 mA; V _{CB} = 5 V	h _{FE}	typ.	100
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Transition frequency at f = 500 mHz

I _C = 15 mA; V _{CE} = 8 V	f _T	typ.	7,5 GHz
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Collector capacitance at f = 1 MHz

I _E = i _e = 0; V _{CB} = 8 V	C _c	typ.	0,7 pF
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Emitter capacitance at f = 1 MHz

I _C = i _c = 0; V _{EB} = 0,5 V	C _e	typ.	1,3 pF
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→ Feedback capacitance at f = 1 MHz

I _C = 0; V _{CE} = 8 V	C _{re}	typ.	0,5 pF
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Maximum unilateral power gain (s_{re} assumed to be zero)

$$G_{UM} = 10 \log \frac{|s_{fe}|^2}{[1 - |s_{ie}|^2][1 - |s_{oe}|^2]}$$

I _C = 15 mA; V _{CE} = 8 V; f = 2 GHz; T _{amb} = 25 °C	G _{UM}	typ.	8,0 dB
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Noise figure at f = 2 GHz; R_S = 60 Ω; T_{amb} = 25 °C

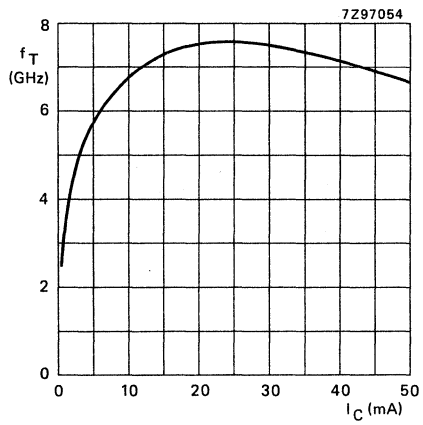
I _C = 5 mA; V _{CE} = 8 V	F	typ.	2,5 dB
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I _C = 15 mA; V _{CE} = 8 V	F	typ.	3,0 dB
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* Mounted on a ceramic substrate of 8 mm x 10 mm x 0,7 mm.

s-parameters (common emitter) at $V_{CE} = 8 \text{ V}$; typical values.

I_C mA	f MHz	S_{ie}	S_{fe}	S_{re}	S_{oe}	G _{UM} dB
2	40	0,93/ -9,5°	7,07/174,6°	0,01/83,2°	1,00/ -4,5°	46,7
	100	0,90/ -22,8°	6,96/163,5°	0,03/76,3°	0,97/-10,4°	36,4
	200	0,84/ -42,1°	6,35/150,4°	0,06/66,4°	0,91/-17,9°	29,2
	500	0,61/ -90,7°	4,40/117,2°	0,10/45,7°	0,67/-32,6°	17,5
	800	0,55/-118,0°	3,24/102,6°	0,12/42,2°	0,60/-38,2°	13,7
	1000	0,54/-135,5°	2,76/ 93,5°	0,12/41,2°	0,55/-43,6°	11,9
	2000	0,47/ 177,3°	1,57/ 64,5°	0,15/60,0°	0,47/-65,3°	6,1
5	40	0,84/ -14,9°	15,47/170,5°	0,01/80,7°	0,99/ -7,9°	44,5
	100	0,78/ -36,1°	14,35/154,8°	0,03/71,1°	0,92/-18,0°	35,4
	200	0,68/ -63,3°	11,97/137,7°	0,05/60,6°	0,79/-29,0°	28,5
	500	0,45/-119,8°	6,74/106,1°	0,08/49,7°	0,47/-40,1°	18,6
	800	0,42/-143,5°	4,55/ 94,7°	0,09/53,8°	0,41/-41,5°	14,8
	1000	0,43/-155,4°	3,80/ 87,4°	0,10/56,1°	0,37/-46,7°	13,1
	2000	0,35/ 169,2°	2,04/ 63,5°	0,18/69,4°	0,34/-63,3°	7,3
10	40	0,74/ -22,8°	25,66/165,6°	0,01/77,5°	0,96/-12,1°	43,0
	100	0,65/ -51,2°	22,19/145,5°	0,03/66,8°	0,84/-26,3°	34,6
	200	0,53/ -85,2°	16,35/126,4°	0,04/58,1°	0,64/-38,4°	28,0
	500	0,38/-144,4°	8,01/ 99,5°	0,06/58,0°	0,33/-42,8°	19,2
	800	0,36/-161,9°	5,29/ 90,0°	0,09/64,0°	0,30/-41,2°	15,5
	1000	0,38/ 169,9°	4,27/ 84,0°	0,10/66,0°	0,27/-47,0°	13,6
	2000	0,30/ 160,0°	2,29/ 62,8°	0,20/72,6°	0,27/-61,2°	7,9
15	40	0,67/ -28,3°	32,67/162,1°	0,01/75,8°	0,94/-14,9°	42,5
	100	0,57/ -62,8°	26,66/139,6°	0,02/64,6°	0,78/-31,4°	34,2
	200	0,46/ -99,5°	18,35/120,6°	0,04/58,7°	0,56/-42,8°	27,9
	500	0,36/-154,8°	8,49/ 96,8°	0,06/62,9°	0,27/-42,8°	19,5
	800	0,34/ 169,3°	5,55/ 88,4°	0,09/68,4°	0,26/-39,7°	15,7
	1000	0,36/ 176,8°	4,47/ 82,5°	0,10/69,7°	0,23/-46,3°	13,9
	2000	0,29/ 155,7°	2,37/ 62,3°	0,21/73,4°	0,25/-59,8°	8,2
20	40	0,63/ -32,5°	37,50/159,4°	0,01/74,2°	0,93/-17,2°	42,0
	100	0,52/ -70,8°	29,23/135,5°	0,02/63,4°	0,73/-34,7°	34,0
	200	0,42/-108,8°	19,22/117,4°	0,03/59,7°	0,50/-45,0°	27,8
	500	0,35/-162,0°	8,69/ 95,0°	0,06/64,9°	0,23/-41,6°	19,6
	800	0,33/-175,1°	5,62/ 86,9°	0,09/70,7°	0,24/-38,1°	15,7
	1000	0,36/-178,7°	4,57/ 81,7°	0,10/71,6°	0,21/-45,0°	14,0
	2000	0,28/-153,5°	2,40/ 62,0°	0,21/73,8°	0,24/-58,9°	8,2



→ Fig. 2 $V_{CE} = 8\text{ V}$; $f = 500\text{ MHz}$; typical values.

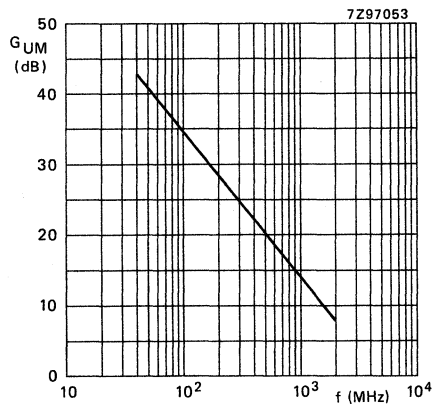


Fig. 3 $V_{CE} = 8\text{ V}$; $I_C = 15\text{ mA}$; $T_{amb} = 25\text{ }^\circ\text{C}$; typical values.

N-P-N 1 GHz WIDEBAND TRANSISTOR

N-P-N transistor primarily intended for final stages in MATV system amplifiers. This device is also suitable for use in low power band IV and V equipment. Diffused emitter ballasting resistors and the application of gold sandwich metallization ensure an optimum temperature profile and excellent reliability properties. The device features very high output voltage capabilities.

The transistor has a ¼" capstan envelope with ceramic cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	25 V
Collector-emitter voltage (open base)	V_{CEO}	max.	18 V
Collector current (d.c.)	I_C	max.	300 mA
Total power dissipation up to $T_{mb} = 110\text{ }^\circ\text{C}$	P_{tot}	max.	4,5 W
Operating junction temperature	T_j	max.	200 $^\circ\text{C}$
Transition frequency at $f = 500\text{ MHz}$ $I_C = 240\text{ mA}$; $V_{CE} = 15\text{ V}$	f_T	typ.	4,0 GHz
Output voltage at $d_{jm} = -60\text{ dB}$ $I_C = 240\text{ mA}$; $V_{CE} = 15\text{ V}$; $R_L = 75\text{ }\Omega$ $f_{(p+q-r)} = 793,25\text{ MHz}$	V_o	typ.	1,6 V
Output power at 1 dB gain compression	P_{L1}	typ.	+28 dBm
Third order intercept point	ITO	typ.	+47 dBm

MECHANICAL DATA

SOT-122 (see Fig. 1).

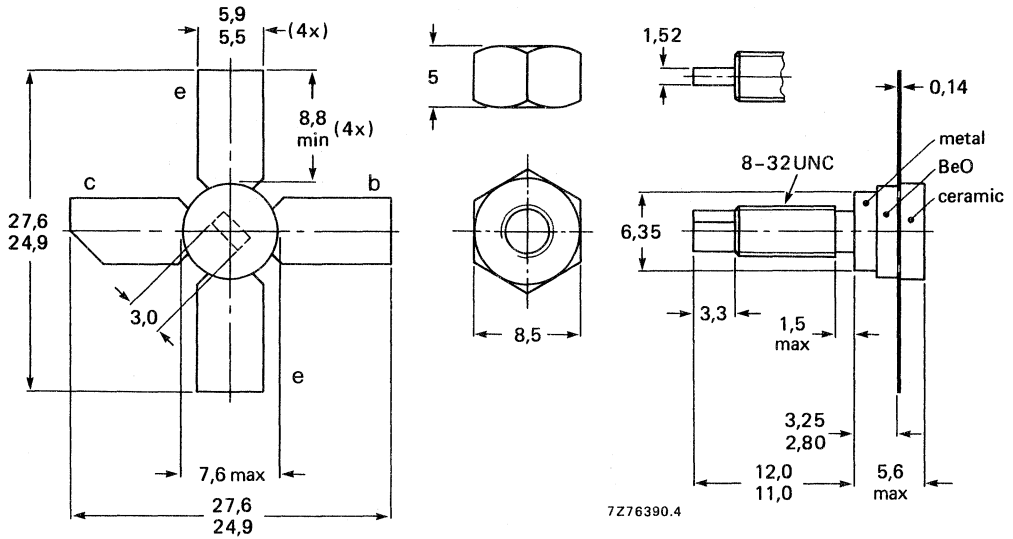
PRODUCT SAFETY

This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Fig. 1 SOT-122.

Dimensions in mm



Torque on nut: min. 0,75 Nm
(7,5 kg cm)
max. 0,85 Nm
(8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or
countersink either end of hole.

When locking is required an adhesive is preferred instead of a lock washer.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V _{CBO}	max.	25 V
Collector-emitter voltage (open base)	V _{CEO}	max.	18 V
Emitter-base voltage (open collector)	V _{EBO}	max.	2 V
Collector current (d.c.)	I _C	max.	300 mA
Total power dissipation up to T _{mb} = 110 °C (see Fig. 7)	P _{tot}	max.	4,5 W
Storage temperature	T _{stg}		-65 to +150 °C
Operating junction temperature	T _j	max.	200 °C

THERMAL RESISTANCE

From junction to mounting base	R _{th j-mb}	=	20,0 K/W
From mounting base to heatsink	R _{th mb-h}	=	0,6 K/W

CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Collector cut-off current

$I_E = 0; V_{CB} = 15\text{ V}$

I_{CBO} max. 50 μA ←

D.C. current gain

$I_C = 240\text{ mA}; V_{CE} = 15\text{ V}$

h_{FE} min. 25 ←

Transition frequency at $f = 500\text{ MHz}$

$I_C = 240\text{ mA}; V_{CE} = 15\text{ V}$

f_T typ. 4 GHz ←

Collector capacitance at $f = 1\text{ MHz}$

$I_E = I_e = 0; V_{CB} = 15\text{ V}$

C_c typ. 3,8 pF

Emitter capacitance at $f = 1\text{ MHz}$

$I_C = I_c = 0; V_{EB} = 0,5\text{ V}$

C_e typ. 20 pF

Feedback capacitance at $f = 1\text{ MHz}$

$I_C = 0; V_{CE} = 15\text{ V}$

C_{re} typ. 2,3 pF

Collector-stud capacitance*

C_{cs} typ. 0,8 pF ←

Maximum unilateral power gain (s_{re} assumed to be zero)

$$G_{UM} = 10 \log \frac{|s_{fe}|^2}{(1 - |s_{ie}|^2)(1 - |s_{oe}|^2)}$$

$I_C = 240\text{ mA}; V_{CE} = 15\text{ V}; f = 800\text{ MHz}; T_{amb} = 25\text{ }^\circ\text{C}$

G_{UM} typ. 13 dB

Output voltage at $d_{im} = -60\text{ dB}$ (see Figs 2 and 12)

(DIN 45004B, par. 6.3: 3-tone)

$I_C = 240\text{ mA}; V_{CE} = 15\text{ V}; R_L = 75\ \Omega; T_{amb} = 25\text{ }^\circ\text{C}$

$V_p = V_o$ at $d_{im} = -60\text{ dB}; f_p = 795,25\text{ MHz}$

$V_q = V_o - 6\text{ dB}; f_q = 803,25\text{ MHz}$

$V_r = V_o - 6\text{ dB}; f_r = 805,25\text{ MHz}$

measured at $f_{(p+q-r)} = 793,25\text{ MHz}$

V_o typ. 1,6 V

* Measured with emitter and base grounded. ←

Output power at 1 dB gain compression (see Fig. 2)

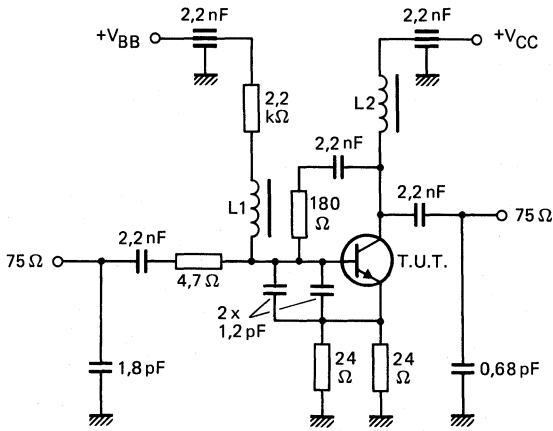
$I_C = 240 \text{ mA}$; $V_{CE} = 15 \text{ V}$
 $R_L = 75 \Omega$; $T_{amb} = 25 \text{ }^\circ\text{C}$
 measured at $f = 800 \text{ MHz}$

P_{L1} typ. +28 dBm

Third order intercept point (see Fig. 2)

$I_C = 240 \text{ mA}$; $V_{CE} = 15 \text{ V}$
 $R_L = 75 \Omega$; $T_{amb} = 25 \text{ }^\circ\text{C}$
 $P_p = \text{ITO} - 6 \text{ dB}$; $f_p = 800 \text{ MHz}$
 $P_q = \text{ITO} - 6 \text{ dB}$; $f_q = 801 \text{ MHz}$
 measured at $f(2q-p) = 802 \text{ MHz}$ and
 at $f(2p-q) = 799 \text{ MHz}$

ITO typ. +47 dBm



7Z82760

Fig. 2 Intermodulation distortion MATV test circuit. Power gain at $f = 40 \text{ MHz}$ to 860 MHz is typical 7 dB.

$L1 = L2 = 5 \mu\text{H}$ micro choke.

s-parameters (common emitter) at $V_{CE} = 7,5 \text{ V}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values. ←

I_C mA	f MHz	S_{ie}	S_{re}	S_{fe}	S_{oe}	G_{UM} dB
50	40	0,66/-135,7°	0,02/41,1°	30,4/124,0°	0,64/ -79,0°	34,4
	100	0,77/-164,0°	0,03/33,6°	14,8/101,2°	0,45/-125,3°	28,3
	200	0,80/-176,3°	0,03/44,1°	7,7/ 89,1°	0,39/-147,9°	22,9
	500	0,80/+170,2°	0,06/55,3°	3,1/ 70,3°	0,38/-159,5°	14,9
	800	0,78/+157,0°	0,09/60,5°	2,0/ 57,2°	0,42/-165,6°	10,9
	1000	0,78/+152,4°	0,11/61,8°	1,6/ 48,1°	0,43/-167,6°	9,0
	1200	0,75/+142,7°	0,13/59,9°	1,4/ 41,1°	0,46/-171,2°	7,5
100	40	0,67/-146,1°	0,02/40,9°	33,5/121,5°	0,64/ -90,4°	35,4
	100	0,78/-167,5°	0,02/37,2°	15,6/100,4°	0,49/-134,4°	29,1
	200	0,80/-178,3°	0,03/47,0°	8,1/ 89,2°	0,45/-155,5°	23,6
	500	0,79/+168,9°	0,06/60,4°	3,4/ 72,0°	0,43/-170,5°	15,8
	800	0,77/+156,1°	0,09/62,0°	2,2/ 59,5°	0,44/-174,5°	11,7
	1000	0,77/+151,5°	0,11/61,9°	1,8/ 51,5°	0,44/-178,5°	9,9
	1200	0,74/+141,8°	0,14/59,4°	1,5/ 44,0°	0,46/-178,5°	8,0
150	40	0,68/-149,0°	0,02/40,8°	34,3/120,6°	0,64/ -94,6°	35,7
	100	0,78/-168,8°	0,02/38,8°	15,9/100,0°	0,50/-138,0°	29,3
	200	0,80/-179,0°	0,03/49,0°	8,2/ 89,2°	0,47/-158,2°	23,8
	500	0,79/+168,5°	0,06/61,6°	3,4/ 72,5°	0,45/-173,2°	15,9
	800	0,77/+155,8°	0,09/62,5°	2,2/ 60,3°	0,46/-177,1°	11,8
	1000	0,76/+151,2°	0,12/62,1°	1,8/ 52,5°	0,46/+177,1°	9,9
	1200	0,73/+141,6°	0,14/59,1°	1,5/ 45,1°	0,47/+177,1°	7,9
200	40	0,68/-150,7°	0,02/40,5°	34,7/120,0°	0,64/ -97,3°	37,2
	100	0,78/-169,7°	0,02/39,6°	15,9/ 99,7°	0,51/-140,4°	29,4
	200	0,80/-179,8°	0,03/50,1°	8,2/ 89,0°	0,49/-159,8°	23,9
	500	0,79/+168,2°	0,06/62,1°	3,4/ 72,6°	0,47/-174,8°	16,0
	800	0,77/+155,6°	0,09/62,6°	2,2/ 60,5°	0,47/-178,6°	11,8
	1000	0,76/+150,9°	0,12/62,1°	1,8/ 52,9°	0,46/+175,5°	9,9
	1200	0,73/+141,4°	0,14/59,0°	1,5/ 45,3°	0,47/+174,6°	7,9
250	40	0,69/-151,9°	0,02/40,1°	34,6/119,4°	0,63/ -99,4°	35,9
	100	0,79/-170,3°	0,02/39,9°	15,8/ 99,5°	0,52/-141,8°	29,6
	200	0,80/+180,0°	0,03/51,0°	8,1/ 88,9°	0,49/-160,9°	23,8
	500	0,80/+168,0°	0,06/62,5°	3,4/ 72,6°	0,47/-175,6°	16,2
	800	0,78/+155,4°	0,09/62,8°	2,2/ 60,6°	0,48/-179,5°	12,1
	1000	0,77/+150,8°	0,12/62,1°	1,8/ 53,0°	0,47/+174,5°	10,1
	1200	0,73/+141,3°	0,14/58,9°	1,5/ 45,6°	0,47/+173,9°	7,9
300	40	0,69/-152,9°	0,02/39,7°	34,4/118,9°	0,62/-101,2°	35,6
	100	0,79/-170,8°	0,02/40,1°	15,5/ 99,2°	0,52/-143,2°	29,4
	200	0,80/+179,6°	0,03/51,5°	8,0/ 88,8°	0,50/-161,7°	23,7
	500	0,80/+167,9°	0,06/62,8°	3,4/ 72,5°	0,48/-176,2°	16,2
	800	0,78/+155,3°	0,09/62,9°	2,2/ 60,5°	0,48/+179,8°	12,1
	1000	0,77/+150,6°	0,12/62,1°	1,8/ 53,0°	0,47/+173,9°	10,1
	1200	0,74/+141,1°	0,14/59,1°	1,5/ 45,5°	0,48/+173,4°	8,1

→ s-parameters (common emitter) at $V_{CE} = 15 \text{ V}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

I_C mA	f MHz	S_{ie}	S_{re}	S_{fe}	S_{oe}	GUM dB
50	40	0,63/-132,3°	0,02/41,8°	33,5/126,6°	0,62/ -72,9°	34,8
	100	0,75/-161,1°	0,02/34,0°	16,4/103,0°	0,41/-115,2°	28,7
	200	0,78/-174,8°	0,03/40,7°	8,6/ 90,1°	0,34/-139,4°	23,3
	500	0,78/+ 169,9°	0,06/56,8°	3,6/ 71,4°	0,34/-153,8°	15,7
	800	0,77/+ 157,5°	0,08/60,9°	2,3/ 57,6°	0,37/-157,4°	11,8
	1000	0,74/+ 150,3°	0,10/61,8°	1,9/ 48,8°	0,40/-160,3°	9,8
	1200	0,73/+ 143,2°	0,12/61,0°	1,5/ 41,2°	0,42/-162,9°	7,7
100	40	0,63/-140,5°	0,02/41,6°	36,4/125,0°	0,61/ -82,0°	35,4
	100	0,76/-164,8°	0,02/37,3°	17,5/102,3°	0,44/-126,8°	29,5
	200	0,78/-176,8°	0,03/46,7°	9,1/ 90,3°	0,39/-149,8°	24,0
	500	0,77/+ 168,8°	0,06/60,3°	3,6/ 72,6°	0,38/-164,2°	16,2
	800	0,76/+ 156,7°	0,09/62,1°	2,4/ 60,0°	0,39/-168,6°	12,1
	1000	0,73/+ 149,6°	0,11/61,7°	2,0/ 51,2°	0,40/-170,8°	10,1
	1200	0,72/+ 142,6°	0,13/60,2°	1,7/ 44,6°	0,42/-172,6°	8,6
150	40	0,64/-143,2°	0,02/41,1°	37,6/123,9°	0,60/ -86,5°	35,7
	100	0,76/-166,0°	0,02/38,3°	17,9/101,8°	0,45/-131,0°	29,8
	200	0,78/-177,5°	0,03/48,1°	9,3/ 90,2°	0,41/-153,1°	24,2
	500	0,77/+ 168,2°	0,06/61,2°	3,9/ 73,1°	0,40/-167,7°	16,5
	800	0,76/+ 156,3°	0,09/62,2°	2,5/ 60,6°	0,40/-172,0°	12,5
	1000	0,72/+ 149,2°	0,11/61,5°	2,0/ 52,2°	0,41/-174,6°	10,0
	1200	0,72/+ 142,2°	0,13/59,5°	1,7/ 45,3°	0,42/-176,1°	8,6
200	40	0,65/-144,0°	0,02/40,6°	38,5/122,8°	0,60/ -90,2°	36,0
	100	0,76/-166,7°	0,02/39,0°	18,0/101,2°	0,46/-133,7°	29,9
	200	0,78/-177,9°	0,03/49,1°	9,3/ 89,9°	0,42/-155,2°	24,3
	500	0,77/+ 168,0°	0,06/61,6°	3,9/ 73,3°	0,41/-169,7°	16,5
	800	0,76/+ 156,1°	0,09/62,3°	2,5/ 60,9°	0,41/-174,0°	12,7
	1000	0,72/+ 149,1°	0,11/61,5°	2,1/ 52,8°	0,42/-175,7°	10,5
	1200	0,71/+ 142,1°	0,13/59,2°	1,7/ 45,8°	0,42/-177,3°	8,5
250	40	0,66/-144,9°	0,02/40,7°	38,6/122,1°	0,60/ -91,6°	36,2
	100	0,76/-167,0°	0,02/39,2°	18,0/100,8°	0,46/-135,4°	29,9
	200	0,78/-178,1°	0,03/49,5°	9,3/ 89,7°	0,43/-156,2°	24,3
	500	0,77/+ 167,8°	0,06/62,0°	3,9/ 73,2°	0,42/-170,3°	16,6
	800	0,76/+ 156,1°	0,09/62,4°	2,5/ 61,0°	0,41/-174,8°	12,8
	1000	0,72/+ 148,9°	0,11/61,5°	2,0/ 52,6°	0,41/-177,2°	10,0
	1200	0,72/+ 141,8°	0,14/58,8°	1,7/ 45,7°	0,41/-178,3°	8,6
300	40	0,67/-145,2°	0,02/40,1°	38,7/121,3°	0,59/ -93,3°	37,2
	100	0,77/-167,3°	0,02/39,0°	17,9/100,3°	0,46/-136,5°	30,0
	200	0,79/-178,2°	0,03/49,6°	9,2/ 89,4°	0,43/-156,8°	24,4
	500	0,78/+ 167,7°	0,06/62,0°	3,9/ 72,9°	0,42/-170,6°	16,7
	800	0,76/+ 156,1°	0,09/62,4°	2,5/ 60,8°	0,41/-174,7°	12,8
	1000	0,73/+ 148,8°	0,11/61,4°	2,0/ 52,5°	0,41/-177,4°	10,1
	1200	0,72/+ 142,0°	0,14/59,2°	1,7/ 45,7°	0,42/+ 177,4°	8,6

Conditions for Figs 3 and 4:

$V_{CE} = 15 \text{ V}$; $I_C = 240 \text{ mA}$;
 $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

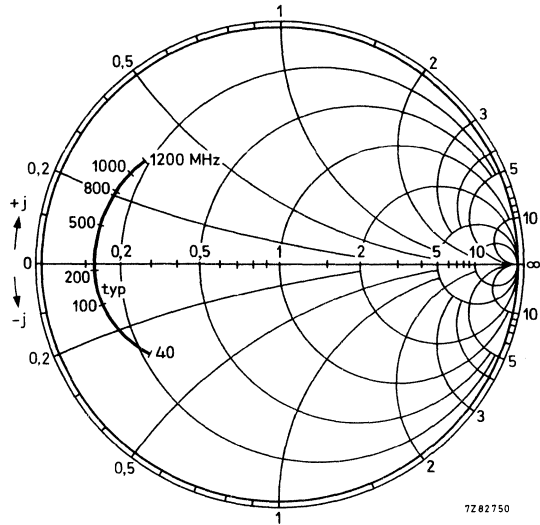


Fig. 3 Input impedance derived from input reflection coefficient s_{ie} co-ordinates in ohm $\times 50$.

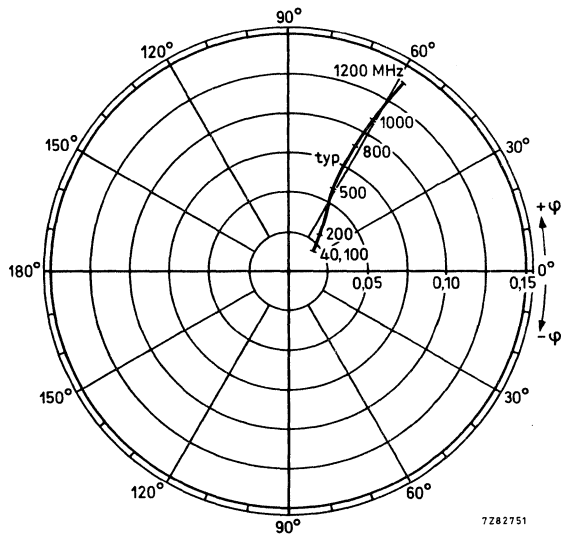


Fig. 4 Reverse transmission coefficient s_{re} .

Conditions for Figs 5 and 6:
 $V_{CE} = 15\text{ V}$; $I_C = 240\text{ mA}$;
 $T_{amb} = 25\text{ }^\circ\text{C}$; typical values.

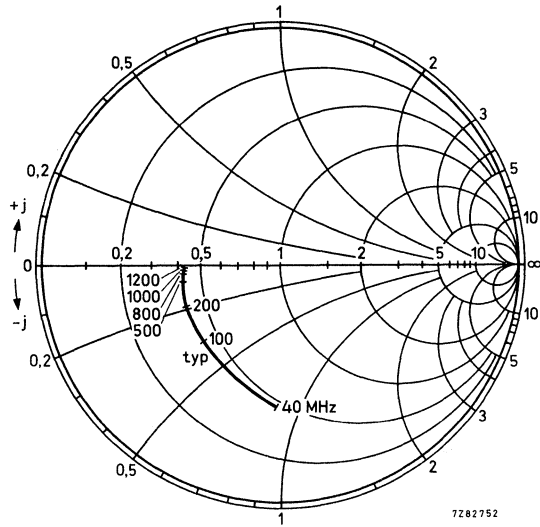


Fig. 5 output impedance derived from output reflection coefficient s_{OE} co-ordinates in ohm x 50.

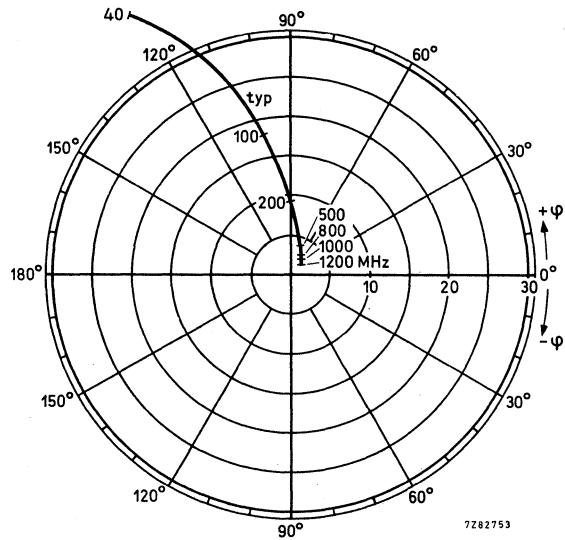


Fig. 6 Forward transmission coefficient s_{fe} .

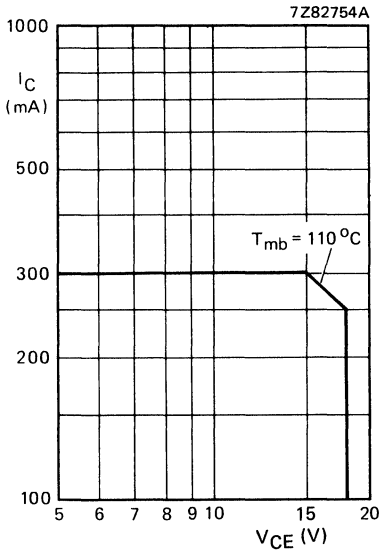


Fig. 7 D.C. SOAR.

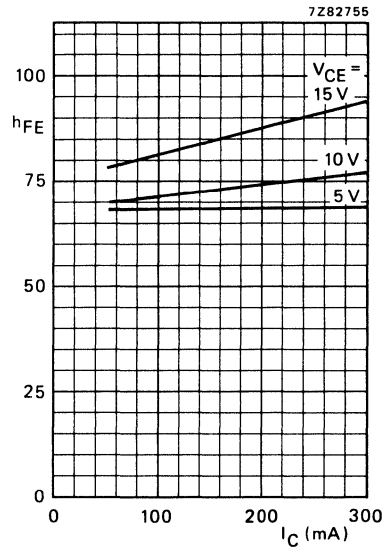


Fig. 8 $T_j = 25\text{ }^{\circ}\text{C}$; typical values.

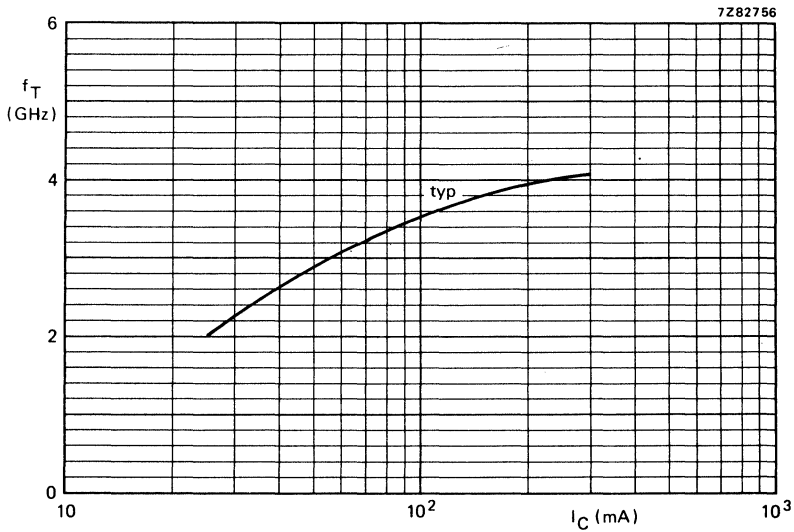


Fig. 9 $V_{CE} = 15\text{ V}$; $f = 500\text{ MHz}$; $T_j = 25\text{ }^{\circ}\text{C}$; typical values.

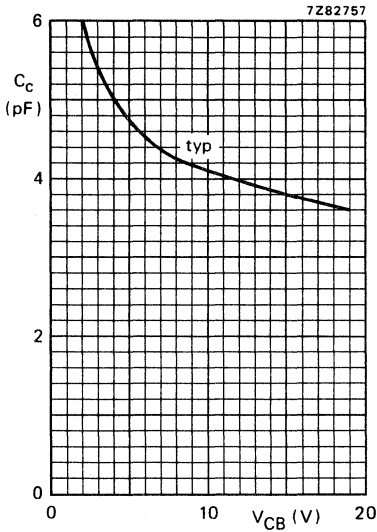


Fig. 10.

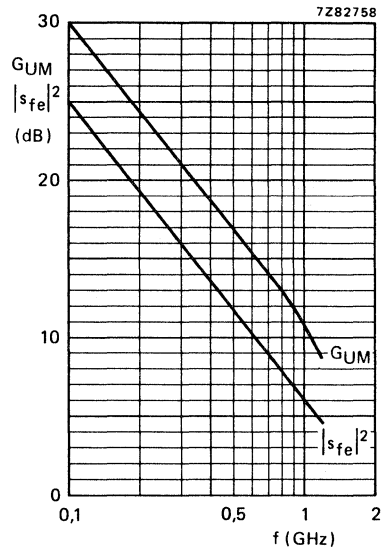


Fig. 11.

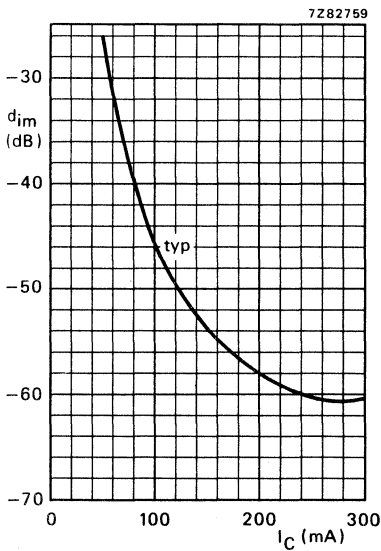


Fig. 12.

Conditions for Figs 10, 11 and 12:

Fig. 10 $I_E = I_e = 0$; $T_{amb} = 25\text{ }^\circ\text{C}$; typ. values.

Fig. 11 $V_{CE} = 15\text{ V}$; $I_C = 240\text{ mA}$;
 $T_{amb} = 25\text{ }^\circ\text{C}$; typical values.

Fig. 12 $V_{CE} = 15\text{ V}$; $V_o = 1,6\text{ V}$;
 $f_{(p+q-r)} = 793,25\text{ MHz}$; $T_{amb} = 25\text{ }^\circ\text{C}$;
 measured in MATV test circuit (see Fig. 2);
 typical values.

N-P-N 1 GHz WIDEBAND TRANSISTOR

N-P-N transistor primarily intended for final stages in u.h.f. amplifiers. The integrated diffused emitter ballasting resistors and application of gold sandwich metallization ensure an optimum temperature profile and excellent reliability properties. This device features extremely high output voltage capabilities. The transistor has a ¼" capstan envelope with ceramic cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

Collector-base voltage, open emitter	V_{CBO}	max.	25 V	
Collector-emitter voltage, open base	V_{CEO}	max.	18 V	
Collector current (d.c.)	I_C	max.	600 mA	
Total power dissipation up to $T_{mb} = 75^\circ\text{C}$	P_{tot}	max.	9 W	←
Junction temperature	T_j	max.	200 °C	
Transition frequency at $f = 500\text{ MHz}$ $I_C = 500\text{ mA}; V_{CE} = 15\text{ V}$	f_T	typ.	4,0 GHz	
Maximum unilateral power gain at $f = 800\text{ MHz}$ $I_C = 500\text{ mA}; V_{CE} = 15\text{ V}$	G_{UM}	typ.	12,5 dB	
Output voltage at $d_{im} = -60\text{ dB}$ $I_C = 500\text{ mA}; V_{CE} = 15\text{ V}; R_L = 75\ \Omega;$ $f_{(p+q-r)} = 793,25\text{ MHz}$	V_o	typ.	2,5 V	

MECHANICAL DATA

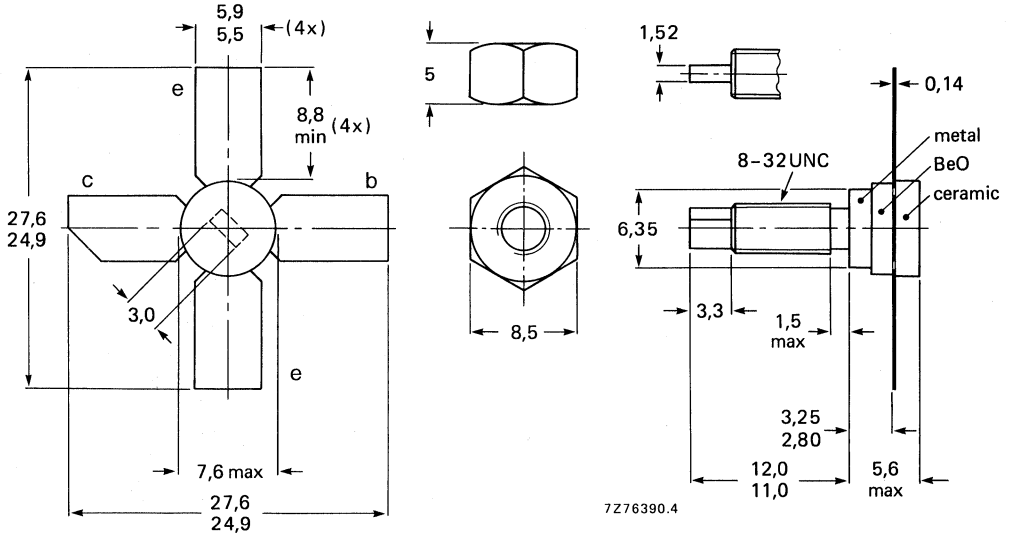
SOT-122 (see Fig. 1).

PRODUCT SAFETY. This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Fig. 1 SOT-122.

Dimensions in mm



Torque on nut: min. 0,75 Nm
(7,5 kg.cm)
max. 0,85 Nm
(8,5 kg.cm)

Diameter of clearance hole: max. 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer
or countersink either end of hole.

When locking is required an adhesive is preferred instead of a lock washer.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage, open emitter	V_{CBO}	max.	25 V
Collector-emitter voltage, open base	V_{CEO}	max.	18 V
Emitter-base voltage, open collector	V_{EBO}	max.	2 V
Collector current (d.c.)	I_C	max.	600 mA
→ Total power dissipation up to $T_{mb} = 75^\circ C$	P_{tot}	max.	9 W
Storage temperature	T_{stg}		-65 to + 150 °C
Junction temperature	T_j	max.	200 °C

THERMAL RESISTANCE

→ From junction to mounting base	$R_{th\ j-mb}$	=	14 K/W
From mounting base to heatsink	$R_{th\ mb-h}$	=	0,6 K/W

CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Collector cut-off current

$I_E = 0; V_{CB} = 15\text{ V}$

I_{CBO}	max.	75 μA
-----------	------	------------------

D.C. current gain

$I_C = 500\text{ mA}; V_{CE} = 15\text{ V}$

h_{FE}	min.	25
----------	------	----

Transition frequency at $f = 500\text{ MHz}$

$I_C = 500\text{ mA}; V_{CE} = 15\text{ V}$

f_T	typ.	4,0 GHz
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Collector capacitance at $f = 1\text{ MHz}$

$I_E = i_e = 0; V_{CB} = 15\text{ V}$

C_c	typ.	7,0 pF
-------	------	--------

Emitter capacitance at $f = 1\text{ MHz}$

$I_C = i_c = 0; V_{EB} = 0,5\text{ V}$

C_e	typ.	40 pF ←
-------	------	---------

Feedback capacitance

$I_C = 0; V_{CE} = 15\text{ V}$

C_{re}	typ.	4,0 pF
----------	------	--------

Collector-stud capacitance*

C_{cs}	typ.	0,8 pF
----------	------	--------

Maximum unilateral power gain (s_{re} assumed to be zero)

$$G_{UM} = 10 \log \frac{|s_{fe}|^2}{[1 - |s_{ie}|^2][1 - |s_{oe}|^2]}$$

$I_C = 500\text{ mA}; V_{CE} = 15\text{ V}; f = 800\text{ MHz}; T_{amb} = 25\text{ }^\circ\text{C}$

G_{UM}	typ.	12,5 dB
----------	------	---------

Output voltage at $d_{im} = -60\text{ dB}$ (see Fig. 2)

$I_C = 500\text{ mA}; V_{CE} = 15\text{ V};$

$R_L = 75\text{ }\Omega; T_{amb} = 25\text{ }^\circ\text{C}$

$V_p = V_o$ at $d_{im} = -60\text{ dB}; f_p = 795,25\text{ MHz}$

$V_q = V_o - 6\text{ dB}; f_q = 803,25\text{ MHz}$

$V_r = V_o - 6\text{ dB}; f_r = 805,25\text{ MHz}$

measured at $f_{(p+q-r)} = 793,25\text{ MHz}$

V_o	typ.	2,5 V
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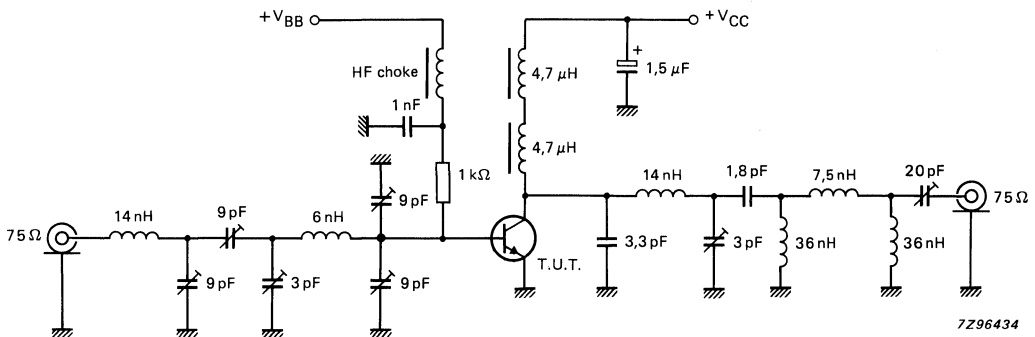


Fig. 2 High gain test circuit.

* Measured with emitter and base grounded.

→ s-parameters (common emitter) at $V_{CE} = 15\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$; typical values

I_C mA	f MHz	S_{ie}	S_{fe}	S_{re}	S_{oe}	G_{UM} dB
100	40	0,87/-161,9 ^o	27,9/104,8 ^o	0,017/24,5 ^o	0,60/-140,2 ^o	37,0
	100	0,89/-174,2 ^o	11,7/ 92,6 ^o	0,019/29,3 ^o	0,58/-163,7 ^o	30,0
	200	0,90/+180,0 ^o	5,8/ 85,8 ^o	0,024/43,0 ^o	0,58/-172,5 ^o	24,3
	500	0,89/+171,6 ^o	2,4/ 70,3 ^o	0,044/59,9 ^o	0,59/-178,3 ^o	16,3
	800	0,82/+164,3 ^o	1,6/ 58,1 ^o	0,068/64,2 ^o	0,60/+179,0 ^o	12,3
	1000	0,86/+159,9 ^o	1,2/ 51,7 ^o	0,086/66,1 ^o	0,60/+176,4 ^o	9,4
	1200	0,86/+155,6 ^o	1,1/ 42,4 ^o	0,105/63,7 ^o	0,60/+173,8 ^o	8,6
200	40	0,87/-165,2 ^o	29,3/103,8 ^o	0,014/26,2 ^o	0,65/-146,8 ^o	37,9
	100	0,90/-175,8 ^o	12,1/ 92,7 ^o	0,017/34,9 ^o	0,65/-167,3 ^o	31,3
	200	0,90/+179,1 ^o	6,1/ 86,9 ^o	0,023/49,7 ^o	0,65/-175,5 ^o	25,3
	500	0,89/+170,7 ^o	2,5/ 72,7 ^o	0,046/63,5 ^o	0,65/+177,7 ^o	17,2
	800	0,88/+163,5 ^o	1,6/ 61,4 ^o	0,072/65,8 ^o	0,64/+173,6 ^o	12,6
	1000	0,86/+159,2 ^o	1,3/ 55,3 ^o	0,090/66,5 ^o	0,63/+170,6 ^o	10,5
	1200	0,84/+155,1 ^o	1,2/ 48,9 ^o	0,109/63,3 ^o	0,62/+167,8 ^o	9,0
300	40	0,88/-166,4 ^o	29,6/103,2 ^o	0,013/26,8 ^o	0,67/-149,3 ^o	38,5
	100	0,90/-176,1 ^o	12,3/ 92,7 ^o	0,016/36,2 ^o	0,67/-168,5 ^o	31,6
	200	0,90/+178,6 ^o	6,2/ 86,9 ^o	0,023/51,8 ^o	0,67/-176,2 ^o	25,6
	500	0,89/+171,0 ^o	2,5/ 73,5 ^o	0,046/69,6 ^o	0,67/+176,6 ^o	17,4
	800	0,88/+163,8 ^o	1,6/ 63,2 ^o	0,072/66,2 ^o	0,66/+172,0 ^o	12,6
	1000	0,86/+159,5 ^o	1,4/ 56,9 ^o	0,091/66,7 ^o	0,64/+168,7 ^o	11,1
	1200	0,85/+154,5 ^o	1,2/ 49,5 ^o	0,110/63,3 ^o	0,63/+165,8 ^o	9,3
400	40	0,88/-166,8 ^o	29,6/102,7 ^o	0,013/26,8 ^o	0,69/-150,8 ^o	38,7
	100	0,90/-176,4 ^o	12,1/ 92,4 ^o	0,016/36,9 ^o	0,68/+169,2 ^o	31,6
	200	0,90/+178,5 ^o	6,1/ 87,1 ^o	0,023/52,4 ^o	0,68/-176,7 ^o	25,6
	500	0,89/+170,7 ^o	2,5/ 74,1 ^o	0,047/65,2 ^o	0,68/+176,0 ^o	17,5
	800	0,88/+163,4 ^o	1,6/ 64,1 ^o	0,073/66,3 ^o	0,66/+171,4 ^o	12,5
	1000	0,86/+159,0 ^o	1,3/ 56,4 ^o	0,092/66,7 ^o	0,65/+168,0 ^o	10,5
	1200	0,85/+154,6 ^o	1,2/ 50,7 ^o	0,111/63,1 ^o	0,64/+164,9 ^o	9,4
500	40	0,88/-167,0 ^o	29,3/102,2 ^o	0,013/27,0 ^o	0,69/-151,8 ^o	38,6
	100	0,90/-176,6 ^o	12,1/ 92,2 ^o	0,016/37,0 ^o	0,69/-169,5 ^o	31,7
	200	0,90/+178,6 ^o	6,1/ 86,8 ^o	0,023/52,8 ^o	0,68/-176,8 ^o	25,6
	500	0,89/+170,5 ^o	2,5/ 73,5 ^o	0,047/65,2 ^o	0,68/+175,8 ^o	17,5
	800	0,88/+164,0 ^o	1,6/ 62,5 ^o	0,073/66,5 ^o	0,67/+171,0 ^o	12,5
	1000	0,86/+159,2 ^o	1,3/ 56,6 ^o	0,092/66,7 ^o	0,65/+167,7 ^o	10,5
	1200	0,84/+154,8 ^o	1,2/ 50,6 ^o	0,112/63,1 ^o	0,64/+164,7 ^o	9,2

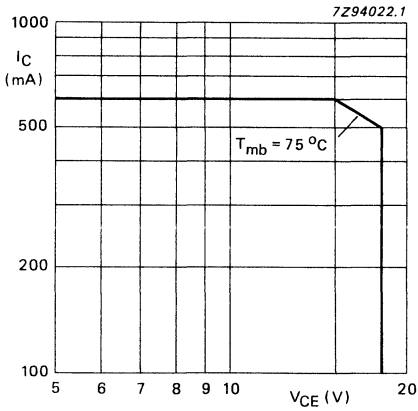


Fig. 3 D.C. SOAR.

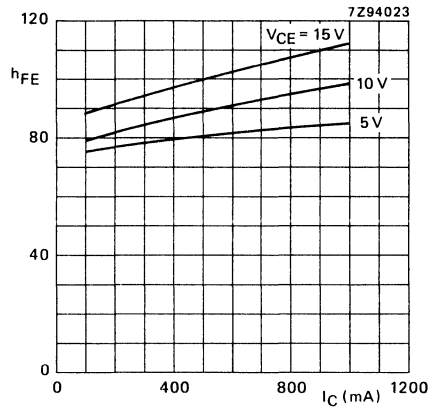


Fig. 4 $T_j = 25\text{ }^\circ\text{C}$; typ. values.

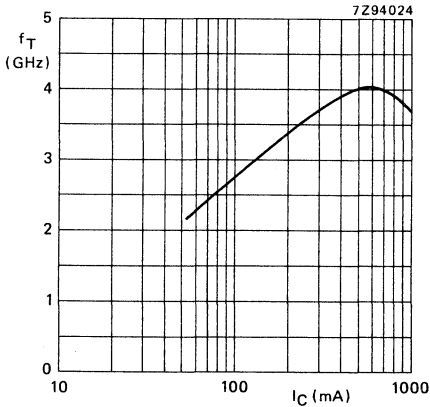


Fig. 5 $V_{CE} = 15\text{ V}$; $f = 500\text{ MHz}$;
 $T_j = 25\text{ }^\circ\text{C}$; typical values.

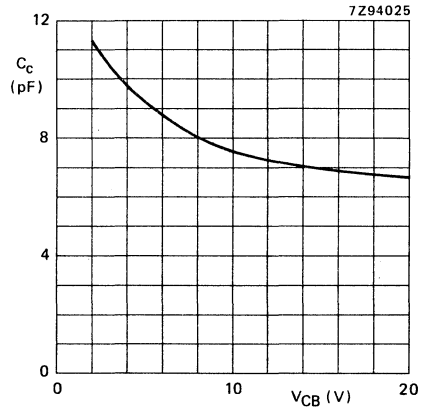


Fig. 6 $I_E = i_e = 0$; $f = 1\text{ MHz}$;
 $T_j = 25\text{ }^\circ\text{C}$; typical values.

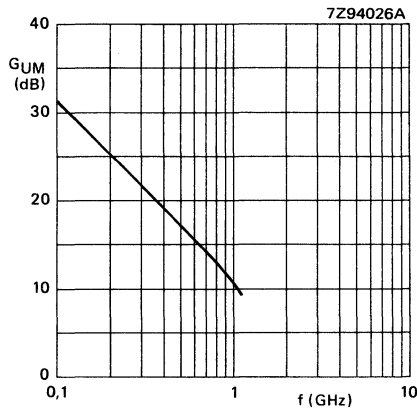
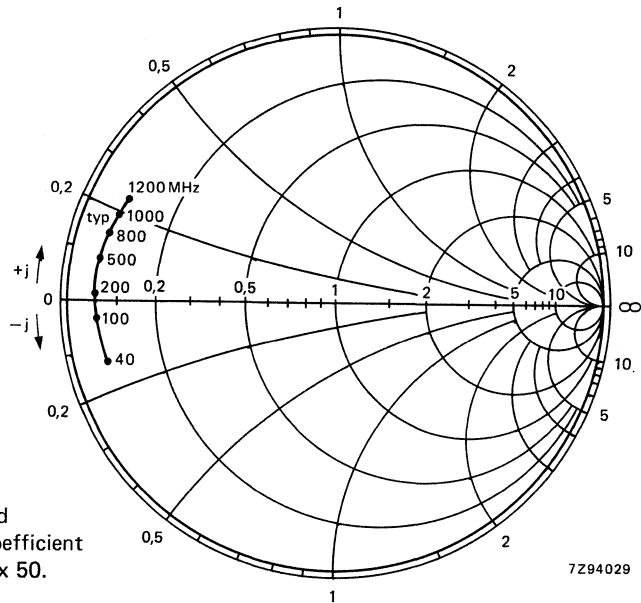


Fig. 7 $V_{CE} = 15\text{ V}$; $I_C = 500\text{ mA}$;
 $T_{amb} = 25\text{ }^\circ\text{C}$; typical values.

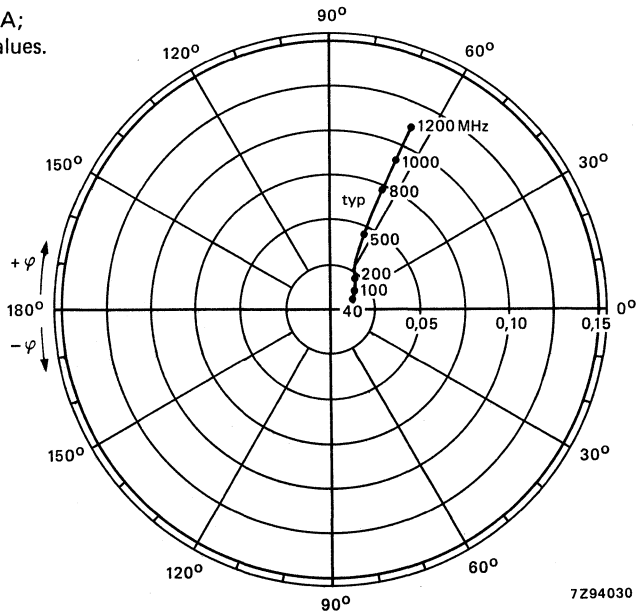


Input impedance derived from input reflection coefficient s_{ie} co-ordinates in ohm x 50.

7294029

Fig. 8.

Conditions for Figs 8 and 9:
 $V_{CE} = 15 \text{ V}$; $I_C = 500 \text{ mA}$;
 $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.



Reverse transmission coefficient s_{re} .

7294030

Fig. 9.

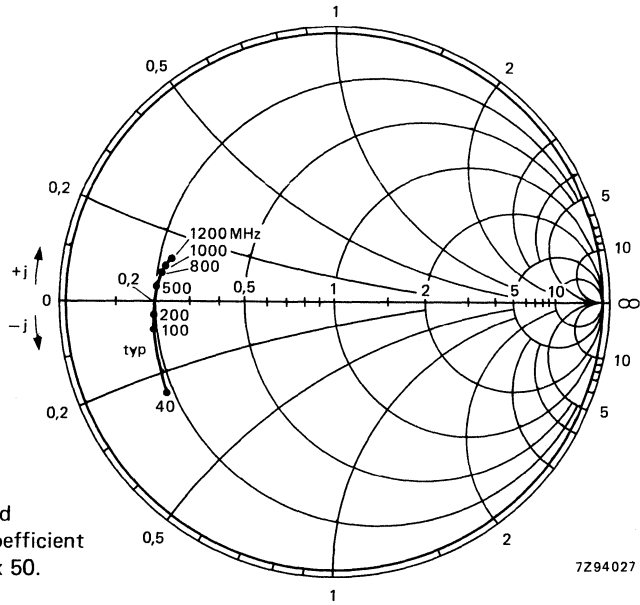


Fig. 10.

Conditions for Figs 9 and 10:
 $V_{CE} = 15 \text{ V}$; $I_C = 500 \text{ mA}$;
 $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

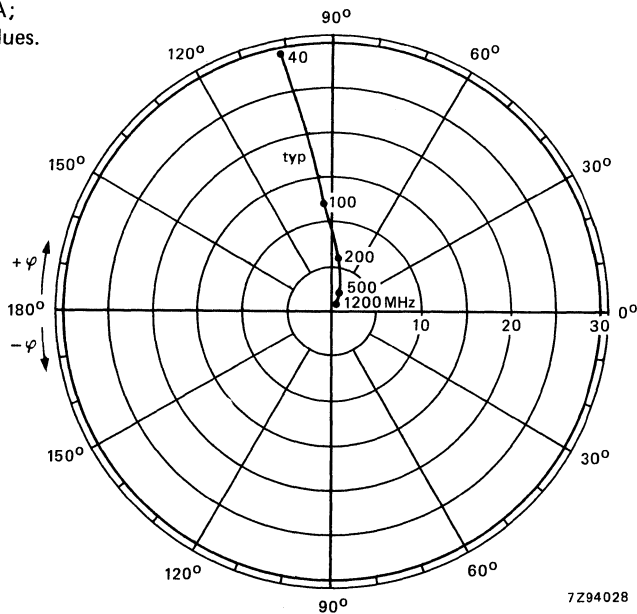


Fig. 11.

N-P-N 2 GHz WIDEBAND TRANSISTOR



N-P-N transistor in a miniature hermetically sealed micro stripline encapsulation featuring a high transition frequency and low noise. It is suitable for amplifiers up to S-band frequencies in instrumentation and microwave systems.

QUICK REFERENCE DATA

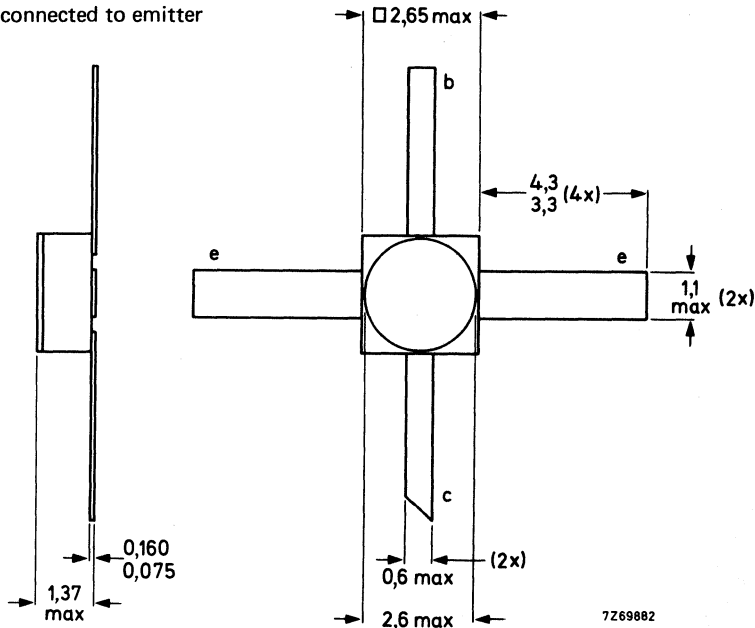
Collector-base voltage (open emitter)	V_{CBO}	max	20 V
Collector-emitter voltage (open base)	V_{CEO}	max	15 V
Collector current (d.c.)	I_C	max	25 mA
Total power dissipation up to $T_{amb} = 110\text{ }^\circ\text{C}$	P_{tot}	max	180 mW
Transition frequency $I_C = 14\text{ mA}; V_{CE} = 10\text{ V}$	f_T	typ	5,0 GHz
Noise figure at optimum source impedance $I_C = 2\text{ mA}; V_{CE} = 10\text{ V}; f = 1\text{ GHz}$	F	typ	2,5 dB
Transducer power gain $I_C = 14\text{ mA}; V_{CE} = 10\text{ V}; f = 1\text{ GHz}$	$ s_{fe} ^2$	typ	15,5 dB

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-100.

Metallized lid connected to emitter



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter; $I_C = 10 \mu\text{A}$)	V_{CB0}	max	20 V
Collector-emitter voltage (open base; $I_C = 10 \text{ mA}$)	V_{CEO}	max	15 V
Emitter-base voltage (open collector; $I_E = 10 \mu\text{A}$)	V_{EBO}	max	2 V
Collector current (d.c.)	I_C	max	25 mA
Total power dissipation up to $T_{amb} = 110 \text{ }^\circ\text{C}$	P_{tot}	max	180 mW
Storage temperature	T_{stg}		-65 to $+200 \text{ }^\circ\text{C}$
Junction temperature	T_j	max	$200 \text{ }^\circ\text{C}$

THERMAL RESISTANCE

From junction to ambient in free air
mounted on a fibre-glass print
of 40 mm x 25 mm x 1 mm

$$R_{th\ j-a} = 500 \text{ K/W}$$

CHARACTERISTICS

$T_{amb} = 25 \text{ }^\circ\text{C}$ unless otherwise specified

Collector cut-off current

$$I_E = 0; V_{CB} = 10 \text{ V}$$

$$I_{CBO} \text{ max. } 50 \text{ nA}$$

→ D.C. current gain

$$I_C = 14 \text{ mA}; V_{CE} = 10 \text{ V}$$

$$h_{FE} \text{ min. } 25$$

→ Transition frequency

$$I_C = 14 \text{ mA}; V_{CE} = 10 \text{ V}; f = 500 \text{ MHz}$$

$$f_T \text{ typ } 5,0 \text{ GHz}$$

Collector capacitance at $f = 1 \text{ MHz}$

$$I_E = I_e = 0; V_{CB} = 10 \text{ V}$$

$$C_c \text{ typ } 0,35 \text{ pF}$$

Emitter capacitance at $f = 1 \text{ MHz}$

$$I_C = I_c = 0; V_{EB} = 0,5 \text{ V}$$

$$C_e \text{ typ } 1,1 \text{ pF}$$

Feedback capacitance at $f = 1 \text{ MHz}$

$$I_C = 2 \text{ mA}; V_{CE} = 10 \text{ V}$$

$$C_{re} \text{ typ } 0,3 \text{ pF}$$

Noise figure at optimum source impedance

$$I_C = 2 \text{ mA}; V_{CE} = 10 \text{ V}; f = 1 \text{ GHz}$$

$$F \text{ typ } 2,5 \text{ dB}$$

$$I_C = 2 \text{ mA}; V_{CE} = 10 \text{ V}; f = 4 \text{ GHz}$$

$$F \text{ typ } 6,5 \text{ dB}$$

Maximum unilateral power gain (s_{re} assumed to be zero)

$$G_{UM} = 10 \log \frac{|s_{fe}|^2}{[1 - |s_{ie}|^2][1 - |s_{oe}|^2]}$$

$$I_C = 14 \text{ mA}; V_{CE} = 10 \text{ V}; f = 1 \text{ GHz}$$

$$G_{UM} \text{ typ } 17,0 \text{ dB}$$

$$I_C = 14 \text{ mA}; V_{CE} = 10 \text{ V}; f = 4 \text{ GHz}$$

$$G_{UM} \text{ typ } 6,5 \text{ dB}$$

Transducer power gain

$$I_C = 14 \text{ mA}; V_{CE} = 10 \text{ V}; f = 1 \text{ GHz}$$

$$|s_{fe}|^2 \text{ typ } 15,5 \text{ dB}$$

$$I_C = 14 \text{ mA}; V_{CE} = 10 \text{ V}; f = 4 \text{ GHz}$$

$$|s_{fe}|^2 \text{ typ } 3,5 \text{ dB}$$

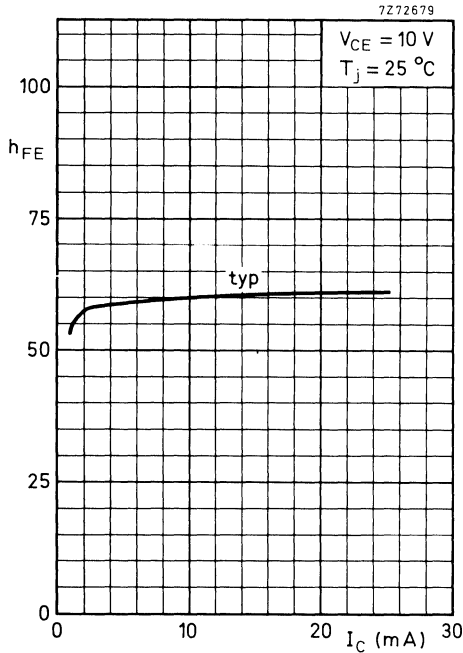


Fig. 2 $V_{CE} = 10\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$; typical values.

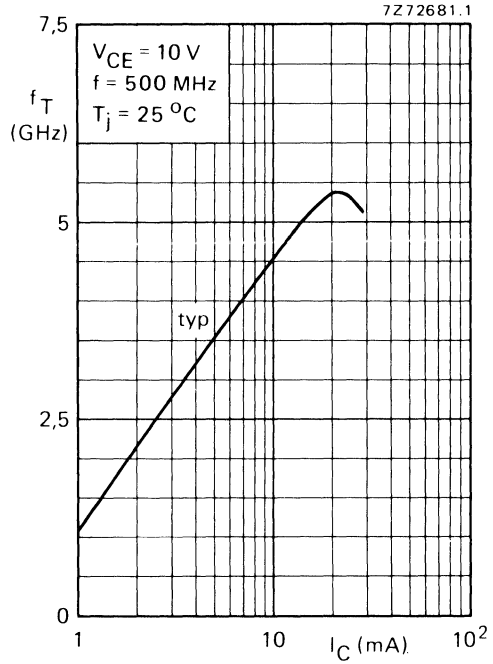


Fig. 3 $V_{CE} = 10\text{ V}$; $f = 500\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$; typical values.

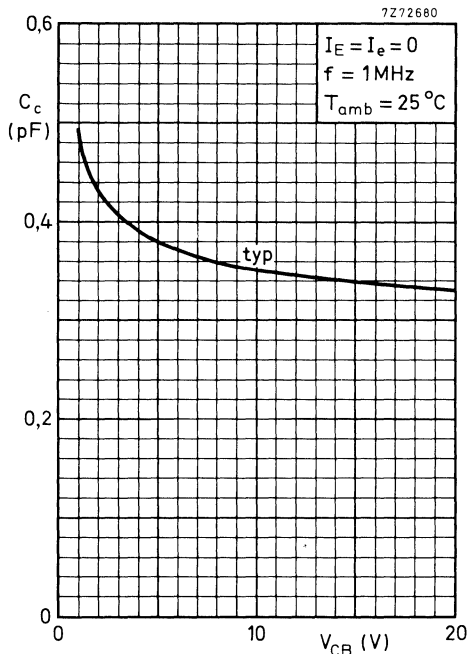


Fig. 4 $I_E = I_e = 0$; $f = 1\text{ MHz}$; $T_{amb} = 25\text{ }^\circ\text{C}$; typical values.

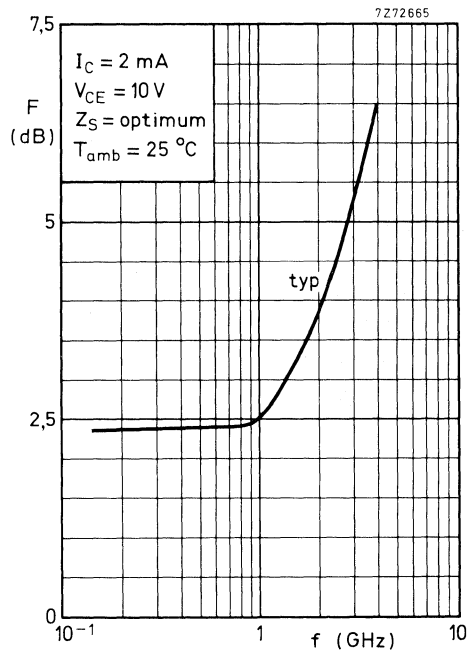


Fig. 5 $V_{CE} = 10\text{ V}$; $I_C = 2\text{ mA}$; $Z_S = \text{opt.}$; $T_{amb} = 25\text{ }^\circ\text{C}$; typical values.

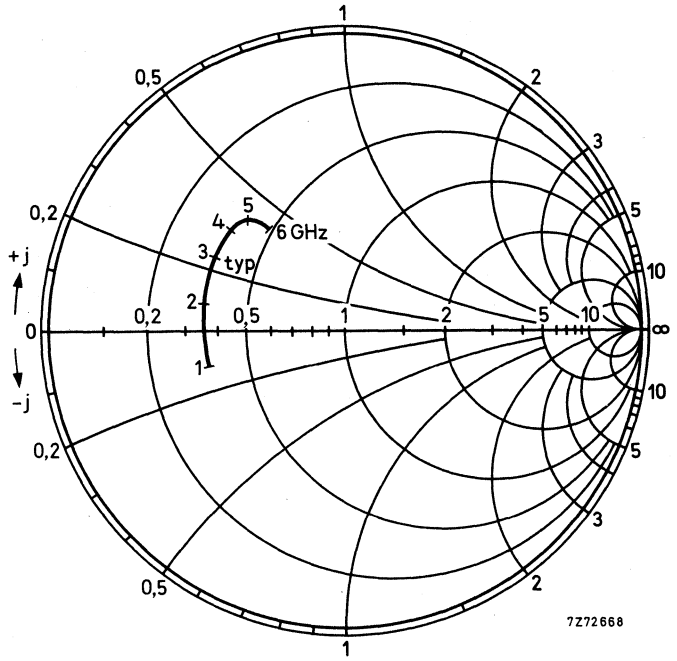


Fig. 6 $V_{CE} = 10\text{ V}$; $I_C = 14\text{ mA}$; $T_{amb} = 25\text{ }^\circ\text{C}$; typical values.

Input impedance derived from input reflection coefficient s_{ie} co-ordinates in ohm $\times 50$.

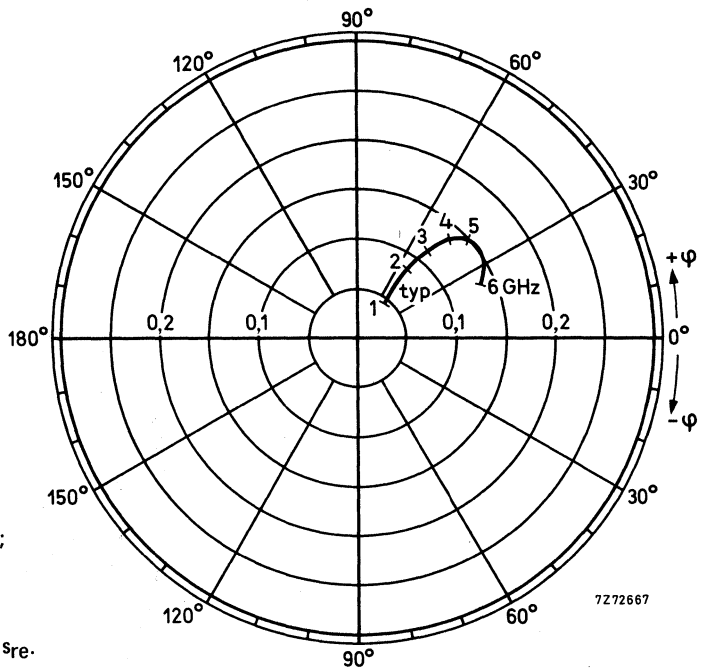


Fig. 7 $V_{CE} = 10\text{ V}$; $I_C = 14\text{ mA}$; $T_{amb} = 25\text{ }^\circ\text{C}$; typical values.

Reverse transmission coefficient s_{re} .

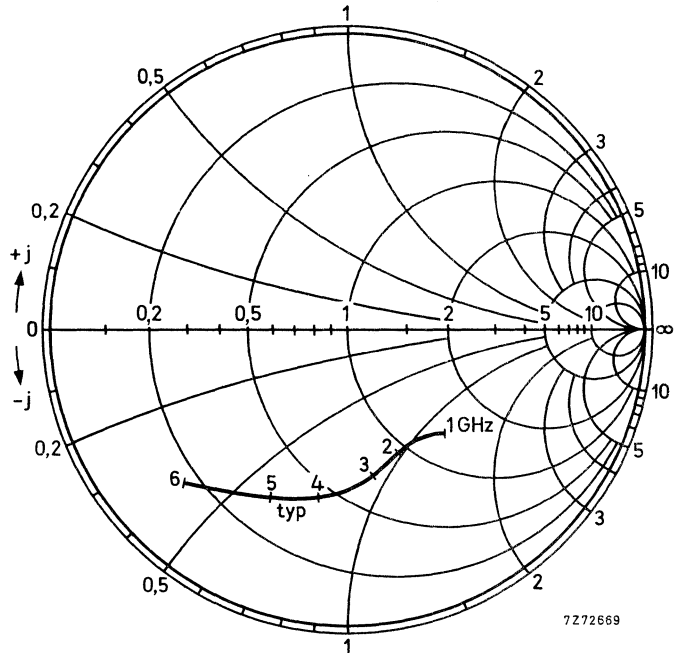


Fig. 8 $V_{CE} = 10\text{ V}$; $I_C = 14\text{ mA}$;
 $T_{amb} = 25\text{ }^\circ\text{C}$; typical values.

Output impedance derived from
 output reflection coefficient s_{oe}
 co-ordinates in ohm x 50.

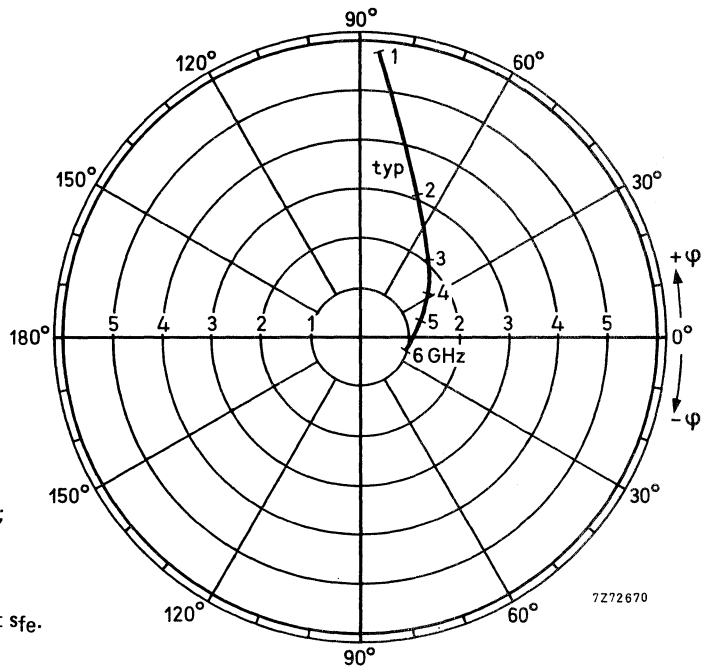


Fig. 9 $V_{CE} = 10\text{ V}$; $I_C = 14\text{ mA}$;
 $T_{amb} = 25\text{ }^\circ\text{C}$; typical values.

Forward transmission coefficient s_{fe} .

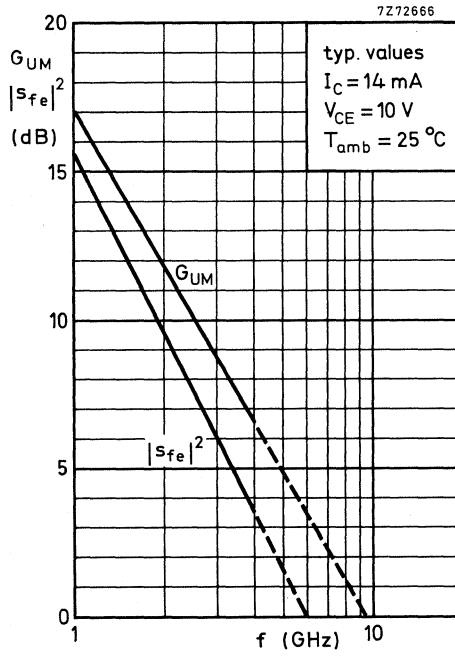


Fig. 10 $V_{CE} = 10 \text{ V}$; $I_C = 14 \text{ mA}$;
 $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

N-P-N H.F. WIDEBAND TRANSISTOR

N-P-N multi-emitter transistor in a plastic SOT-23 envelope intended for application in thick and thin-film circuits. The transistor has very low intermodulation distortion and very high power gain. It is primarily intended for:

- Wideband vertical amplifiers in high speed oscilloscopes.
- Television distribution amplifiers.

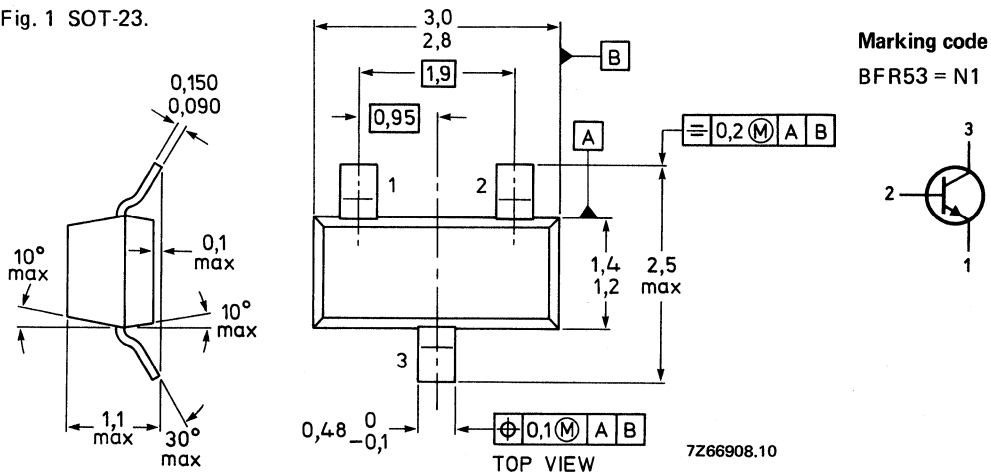
QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	18 V
Collector-emitter voltage (open base)	V_{CEO}	max.	10 V
Collector current (peak value; $f > 1$ MHz)	I_{CM}	max.	100 mA
Total power dissipation up to $T_{amb} = 65$ °C	P_{tot}	max.	250 mW
Junction temperature	T_j	max.	175 °C
Feedback capacitance at $f = 1$ MHz $I_C = 2$ mA; $V_{CE} = 5$ V	C_{re}	typ.	0,9 pF
Transition frequency at $f = 500$ MHz $I_C = 25$ mA; $V_{CE} = 5$ V	f_T	typ.	2,0 GHz
Max. unilateral power gain $I_C = 30$ mA; $V_{CE} = 5$ V; $f = 200$ MHz $I_C = 30$ mA; $V_{CE} = 5$ V; $f = 800$ MHz	GUM	typ.	22 dB
	GUM	typ.	10,5 dB
Intermodulation distortion at $T_{amb} = 25$ °C $I_C = 30$ mA; $V_{CE} = 5$ V; $R_L = 37,5$ Ω $V_o = 100$ mV at $f_p = 183$ MHz $V_o = 100$ mV at $f_q = 200$ MHz measured at $f(2q-p) = 217$ MHz	dim	typ.	-60 dB

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-23.



If required, the R-version (reverse pinning) is available on request.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter) see Fig. 3	V_{CB0}	max.	18 V
Collector-emitter voltage (open base) see Fig. 3	V_{CEO}	max.	10 V
Emitter-base voltage (open collector) see Fig. 3	V_{EBO}	max.	2,5 V
Collector current (d.c.)	I_C	max.	50 mA
Collector current (peak value: $f > 1$ MHz)	I_{CM}	max.	100 mA
Total power dissipation up to $T_{amb} = 65$ °C**	P_{tot}	max.	250 mW
Storage temperature	T_{stg}		-65 to +175 °C
Junction temperature	T_j	max.	175 °C

→ THERMAL RESISTANCE *

From junction to ambient**	$R_{th\ j-a}$	=	430 K/W
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CHARACTERISTICS

$T_j = 25$ °C unless otherwise specified

Collector cut-off current

$I_E = 0; V_{CB} = 10$ V

I_{CBO}	max.	50 nA
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→ D.C. current gain

$I_C = 25$ mA; $V_{CE} = 5$ V

h_{FE}	min.	25
----------	------	----

$I_C = 50$ mA; $V_{CE} = 5$ V

h_{FE}	min.	25
----------	------	----

→ Transition frequency at $f = 500$ MHz

$I_C = 25$ mA; $V_{CE} = 5$ V

f_T	typ.	2,0 GHz
-------	------	---------

Collector capacitance at $f = 1$ MHz

$I_E = I_e = 0; V_{CB} = 5$ V

C_c	typ.	0,9 pF
-------	------	--------

Emitter capacitance at $f = 1$ MHz

$I_C = I_c = 0; V_{EB} = 0,5$ V

C_e	typ.	1,5 pF
-------	------	--------

Feedback capacitance at $f = 1$ MHz

$I_C = 2$ mA; $V_{CE} = 5$ V; $T_{amb} = 25$ °C

C_{re}	typ.	0,9 pF
----------	------	--------

→ * See *Thermal characteristics*.

** Mounted on a ceramic substrate of 8 mm x 10 mm x 0,7 mm.

Noise figure at f = 500 MHz ▲

$I_C = 2 \text{ mA}; V_{CE} = 5 \text{ V}; T_{amb} = 25 \text{ }^\circ\text{C}$
 $G_S = 20 \text{ mS}; B_S \text{ is tuned}$

F max. 5,0 dB

Max. unilateral power gain (s_{re} assumed to be zero)

$$G_{UM} = 10 \log \frac{|s_{fe}|^2}{[1 - |s_{ie}|^2][1 - |s_{oe}|^2]}$$

$I_C = 30 \text{ mA}; V_{CE} = 5 \text{ V}; f = 200 \text{ MHz}; T_{amb} = 25 \text{ }^\circ\text{C}$
 $I_C = 30 \text{ mA}; V_{CE} = 5 \text{ V}; f = 800 \text{ MHz}; T_{amb} = 25 \text{ }^\circ\text{C}$

G_{UM} typ. 22 dB
 G_{UM} typ. 10,5 dB

Intermodulation distortion ▲

$I_C = 30 \text{ mA}; V_{CE} = 5 \text{ V}; R_L = 37,5 \text{ } \Omega$

$V_o = 100 \text{ mV}$ at $f_p = 183 \text{ MHz}$

$V_o = 100 \text{ mV}$ at $f_q = 200 \text{ MHz}$

measured at $f(2q-p) = 217 \text{ MHz}$

d_{im} typ. -60 dB

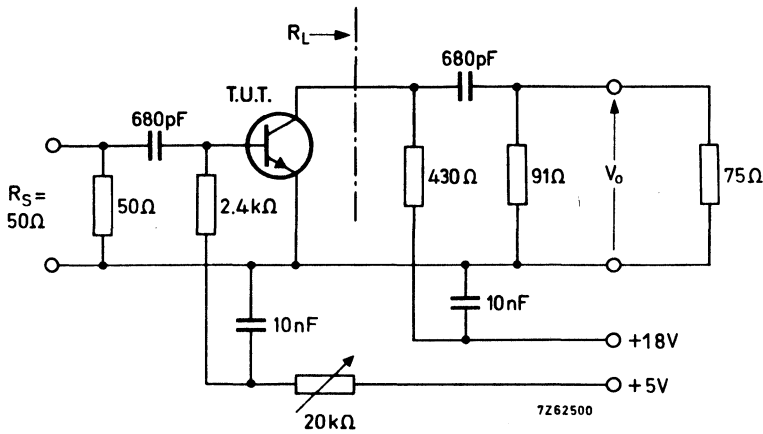


Fig. 2 Test circuit.

▲ Crystal mounted in a BFW30 envelope.

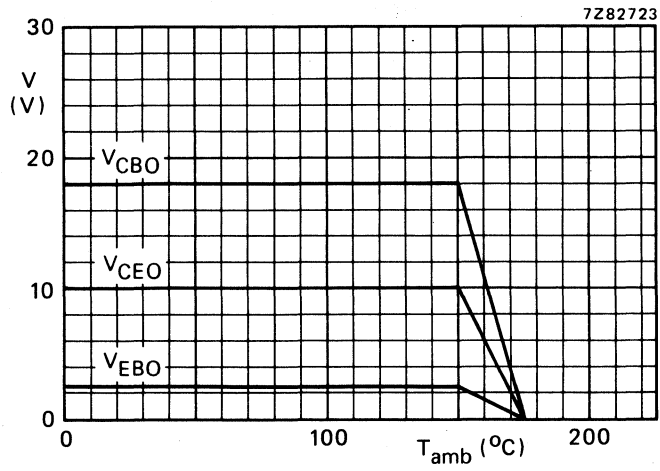


Fig. 3 Voltage derating curves.

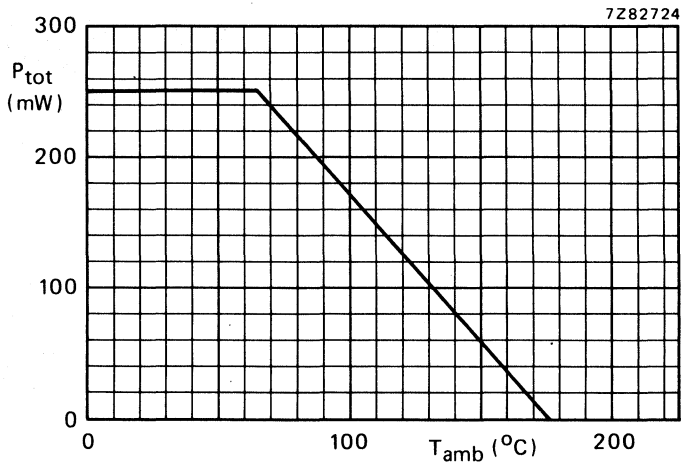


Fig. 4 Power derating curve.

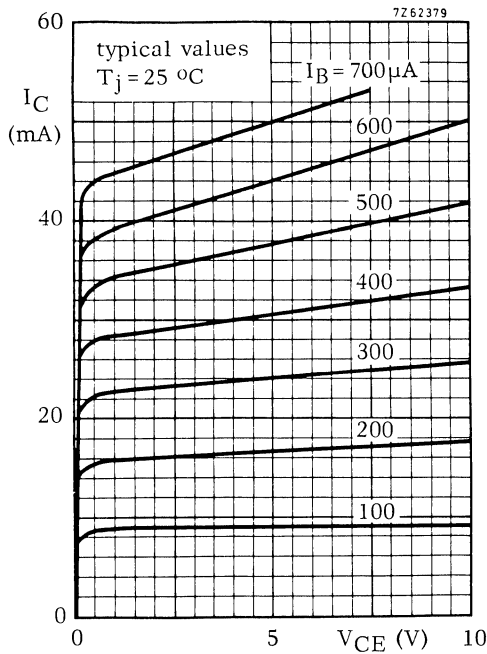


Fig. 5 $T_j = 25\text{ }^\circ\text{C}$; typical values.

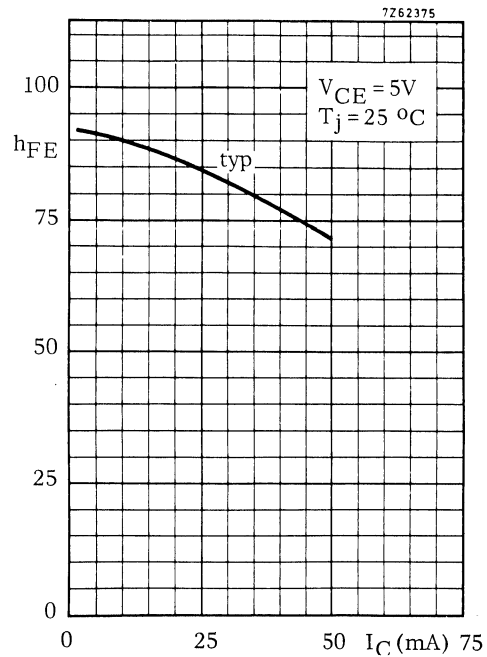


Fig. 6 $V_{CE} = 5\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$; typical values.

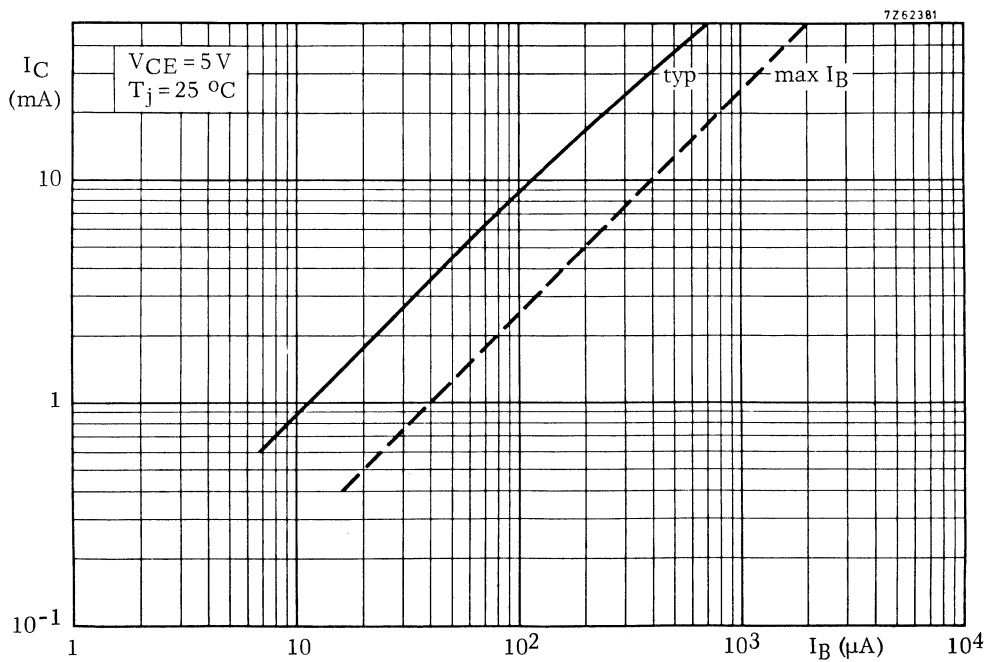


Fig. 7 $V_{CE} = 5\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$.

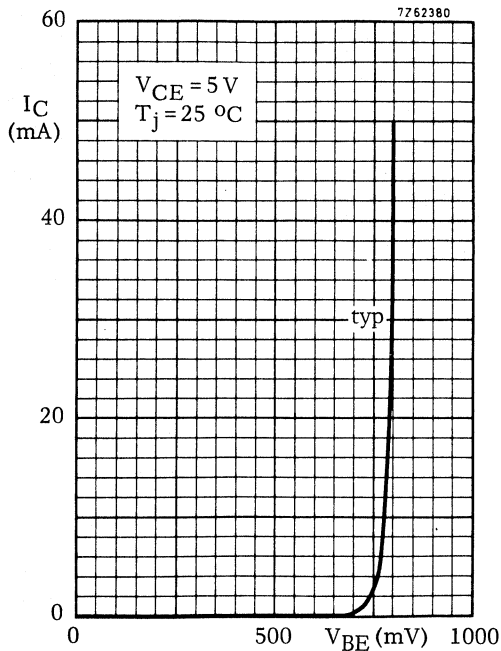


Fig. 8 $V_{CE} = 5\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$; typical values.

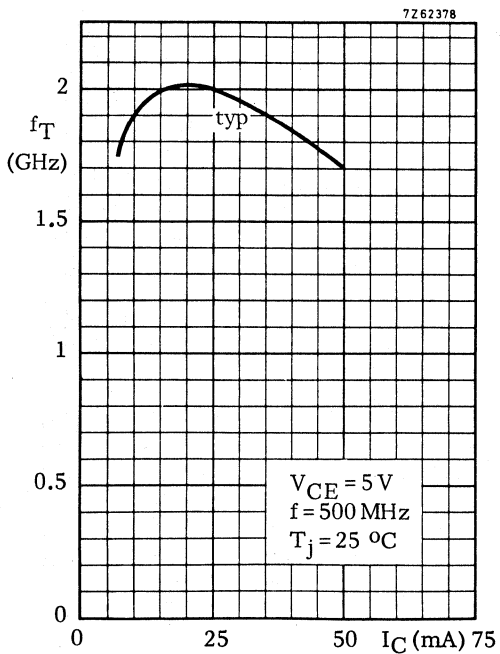


Fig. 9 $V_{CE} = 5\text{ V}$; $f = 500\text{ MHz}$;
 $T_j = 25\text{ }^\circ\text{C}$; typical values.

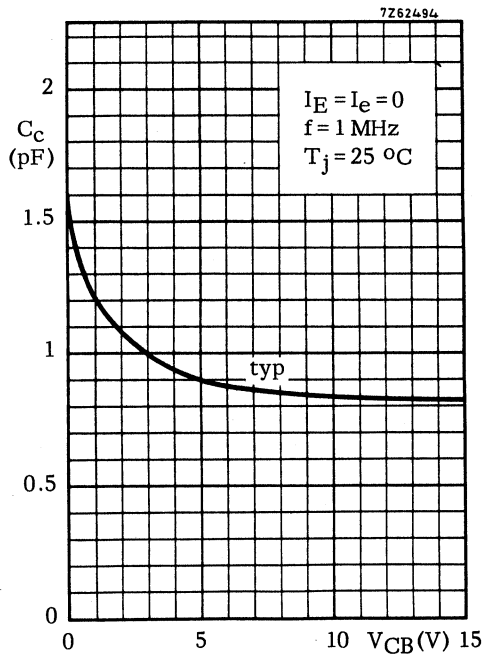


Fig. 10 $I_E = I_e = 0$; $f = 1\text{ MHz}$;
 $T_j = 25\text{ }^\circ\text{C}$; typical values.

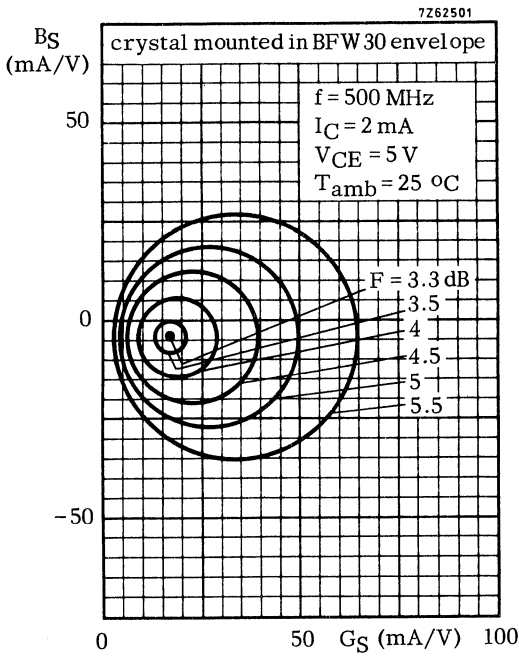


Fig. 11 Circles of constant noise figure; $V_{CE} = 5 \text{ V}$; $I_C = 2 \text{ mA}$; $f = 500 \text{ MHz}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; typ. values.

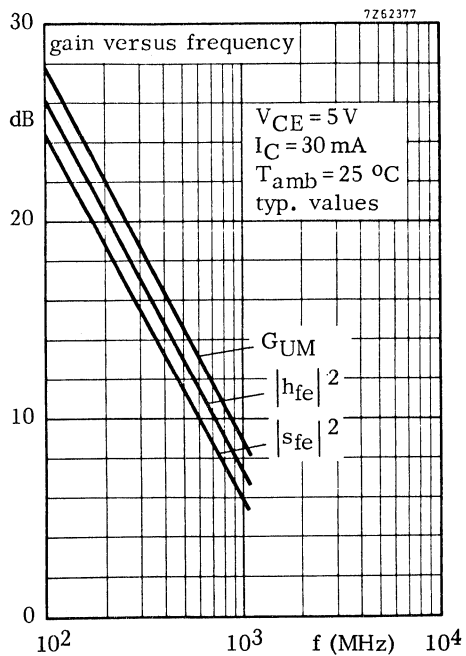


Fig. 12 $V_{CE} = 5 \text{ V}$; $I_C = 30 \text{ mA}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

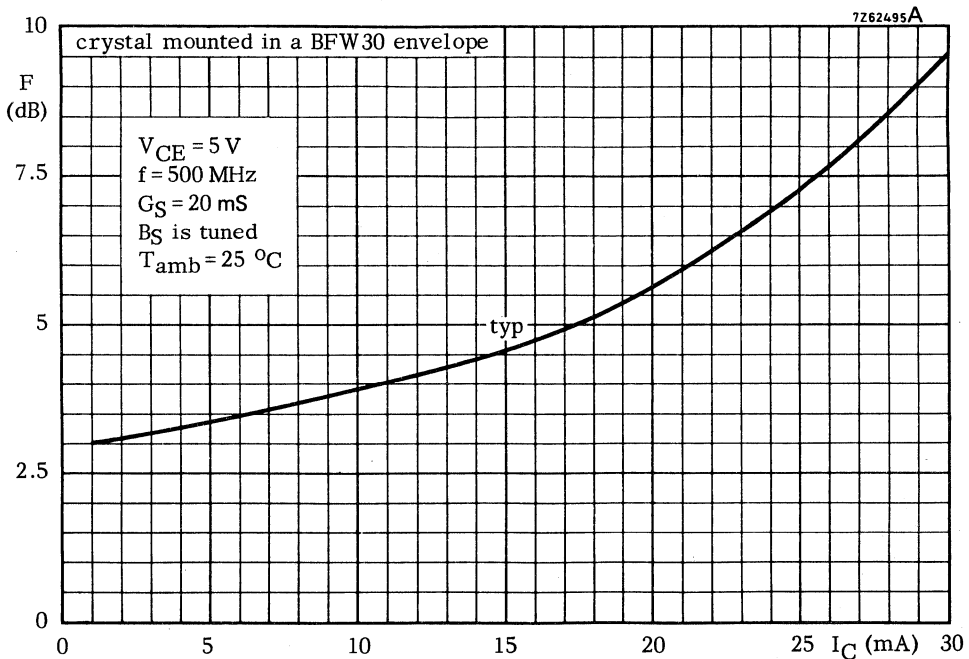


Fig. 13 $V_{CE} = 5 \text{ V}$; $f = 500 \text{ MHz}$; $G_S = 20 \text{ mS}$; B_S is tuned; $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

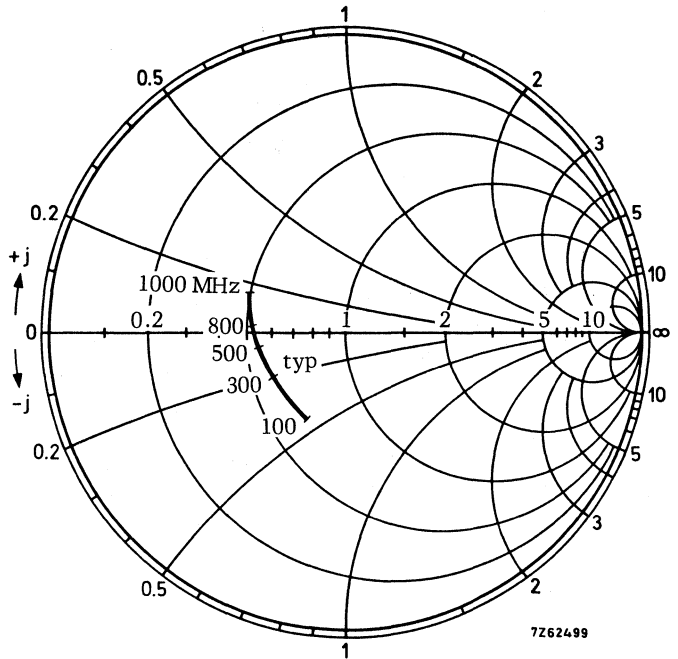


Fig. 14 $V_{CE} = 5\text{ V}$; $I_C = 30\text{ mA}$;
 $T_{amb} = 25\text{ }^\circ\text{C}$; typical values.

Input impedance derived from
 input reflection coefficient s_{ie}
 coordinates in ohm $\times 50$.

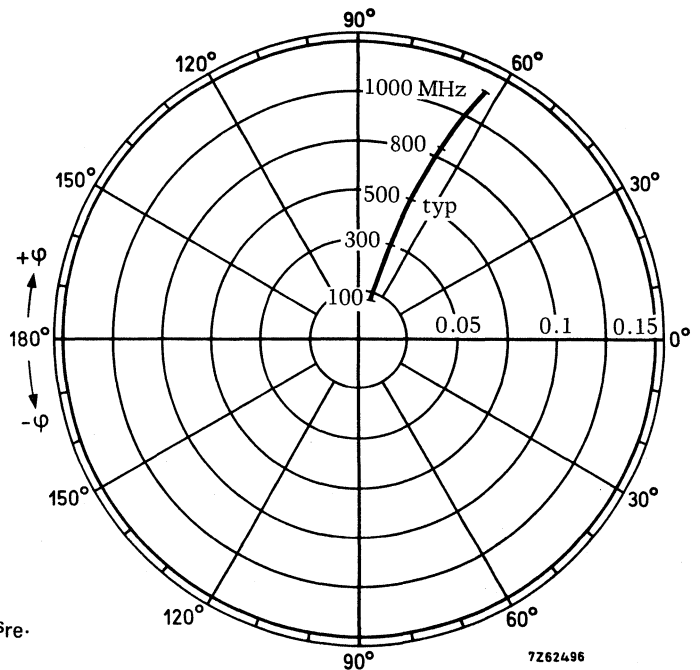


Fig. 15 $V_{CE} = 5\text{ V}$; $I_C = 30\text{ mA}$;
 $T_{amb} = 25\text{ }^\circ\text{C}$; typical values.

Reverse transmission coefficient s_{re} .

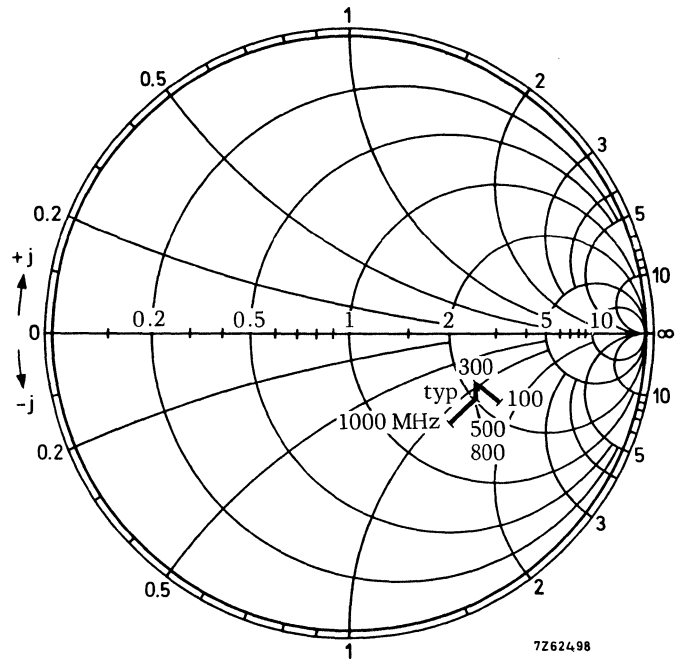


Fig. 16 $V_{CE} = 5 \text{ V}$; $I_C = 30 \text{ mA}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

Output impedance derived from output reflection coefficient s_{oe} coordinates in ohm $\times 50$.

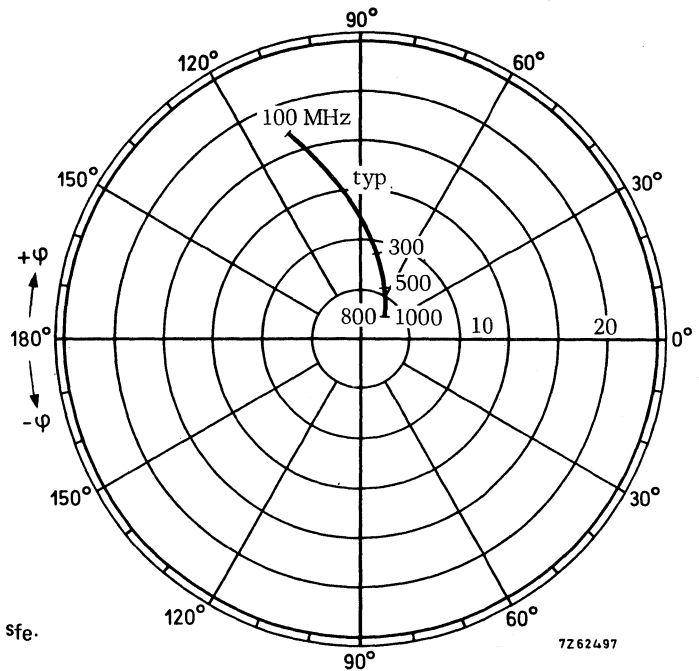


Fig. 17 $V_{CE} = 5 \text{ V}$; $I_C = 30 \text{ mA}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

Forward transmission coefficient s_{fe} .

N-P-N H.F. WIDEBAND TRANSISTOR



N-P-N multi-emitter transistor in a capstan envelope. The transistor has extremely good intermodulation properties and high power gain.

The device is primarily intended for:

- Final and driver stages of channel and band aerial amplifiers with high output power for band I, II, III and IV/V (40-860 MHz).
- Final and driver stages of wideband amplifiers (40-230 MHz).
- Final stages of the wideband vertical amplifier in high-speed oscilloscopes.
- Frequency multiplier and oscillator circuits.

QUICK REFERENCE DATA

Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	40 V
Collector-emitter voltage (open base)	V_{CEO}	max.	25 V
Collector current (peak value)	I_{CM}	max.	500 mA
Total power dissipation up to $T_{mb} = 60\text{ }^{\circ}\text{C}$; $f \geq 1\text{ MHz}$	P_{tot}	max.	3,5 W
Junction temperature	T_j	max.	150 $^{\circ}\text{C}$
Transition frequency at $f = 500\text{ MHz}$ $I_C = 75\text{ mA}$; $V_{CE} = 20\text{ V}$	f_T	min.	1200 MHz
Output power at $f = 200\text{ MHz}$ $I_C = 70\text{ mA}$; $V_{CE} = 20\text{ V}$; $d_{im} = -30\text{ dB}$	P_o	typ.	150 mW
Power gain at $f = 200\text{ MHz}$ $I_C = 70\text{ mA}$; $V_{CE} = 20\text{ V}$	G_p	typ.	16 dB

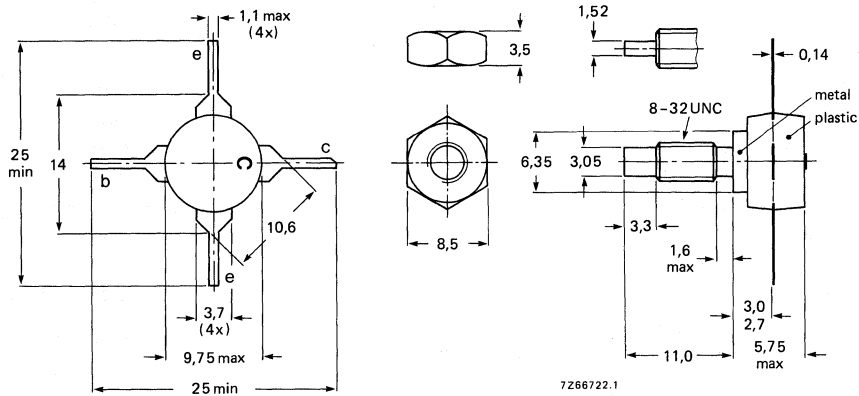
MECHANICAL DATA (see next page)

PRODUCT SAFETY. This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-48.



When locking is required an adhesive instead of a lock washer is preferred.

Torque on nut: min. 0,75 Nm
(7,5 kg cm)
max. 0,85 Nm
(8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,17 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	40 V	1)
Collector-emitter voltage ($R_{BE} = 10 \Omega$; peak value)	V_{CERM}	max.	40 V	2)
Collector-emitter voltage (open base)	V_{CEO}	max.	25 V	2)
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5 V	3)
Collector current (d.c.)	I_C	max.	200 mA	
Collector current (peak value) $f > 1$ MHz	I_{CM}	max.	500 mA	
Power dissipation ($f > 1$ MHz; see SOAR)	P_{tot}	max.	3,5 W	
Total power dissipation up to $T_{mb} = 60 \text{ }^\circ\text{C}$	T_{stg}		-40 to +150 $^\circ\text{C}$	
Storage temperature	T_j	max.	150 $^\circ\text{C}$	
Junction temperature				

THERMAL RESISTANCE

From junction to mounting base	$R_{th j-mb}$	=	25 K/W
From mounting base to heatsink	$R_{th mb-h}$	=	0,5 K/W

- 1) at $I_C = 100 \mu\text{A}$.
- 2) at $I_C = 10 \text{ mA}$.
- 3) at $I_E = 100 \mu\text{A}$.

CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Collector cut-off current

$I_E = 0; V_{CB} = 20\text{ V}$

I_{CBO} max. 10 μA

Saturation voltage

$I_C = 100\text{ mA}; I_B = 10\text{ mA}$

V_{CEsat} max. 0,75 V

D.C. current gain

$I_C = 50\text{ mA}; V_{CE} = 5\text{ V}$

h_{FE} min. 25

$I_C = 150\text{ mA}; V_{CE} = 5\text{ V}$

h_{FE} min. 25

Collector capacitance at $f = 1\text{ MHz}$

$I_E = I_e = 0; V_{CB} = 20\text{ V}$

C_c max. 4,5 pF

Feedback capacitance at $f = 1\text{ MHz}$

$I_C = 10\text{ mA}; V_{CE} = 20\text{ V}; T_{mb} = 25\text{ }^\circ\text{C}$

C_{re} typ. 1,7 pF

Noise figure at $f = 200\text{ MHz}$

$I_C = 40\text{ mA}; V_{CE} = 20\text{ V}; R_S = 75\text{ }\Omega; T_{mb} = 25\text{ }^\circ\text{C}$

F typ. 6 dB

Transition frequency at $f = 500\text{ MHz}$

$I_C = 15\text{ mA}; V_{CE} = 20\text{ V}$

f_T typ. 1000 MHz

$I_C = 75\text{ mA}; V_{CE} = 20\text{ V}$

f_T min. 1200 MHz

$I_C = 150\text{ mA}; V_{CE} = 20\text{ V}$

f_T typ. 1200 MHz

Output power at $f = 200\text{ MHz}; T_{mb} = 25\text{ }^\circ\text{C}$

$I_C = 70\text{ mA}; V_{CE} = 20\text{ V}; V_{SWR}$ at output < 2

$f_p = 202\text{ MHz}; f_q = 205\text{ MHz}; d_{im} = -30\text{ dB}$

measured at $f(2q-p) = 208\text{ MHz}$ (channel 9)

P_o min. 130 mW
typ. 150 mW

Output power at $f = 800\text{ MHz}; T_{mb} = 25\text{ }^\circ\text{C}$

$I_C = 70\text{ mA}; V_{CE} = 20\text{ V}; V_{SWR}$ at output < 2

$f_p = 798\text{ MHz}; f_q = 802\text{ MHz}; d_{im} = -30\text{ dB}$

measured at $f(2q-p) = 806\text{ MHz}$ (channel 62)

P_o min. 70 mW
typ. 90 mW

Power gain (not neutralized) $T_{mb} = 25\text{ }^\circ\text{C}$

$I_C = 70\text{ mA}; V_{CE} = 20\text{ V}; f = 200\text{ MHz}$

G_p min. 15 dB
typ. 16 dB

$I_C = 70\text{ mA}; V_{CE} = 20\text{ V}; f = 800\text{ MHz}$

G_p typ. 6,5 dB

CHARACTERISTICS (continued)

Intermodulation characteristics

1. Output power at $f = 200$ MHz; $T_{mb} = 25$ °C
 $I_C = 70$ mA; $V_{CE} = 20$ V; VSWR at output < 2
 $f_p = 202$ MHz; $f_q = 205$ MHz; $d_{im} = -30$ dB
 measured at $f(2q-p) = 208$ MHz (channel 9)

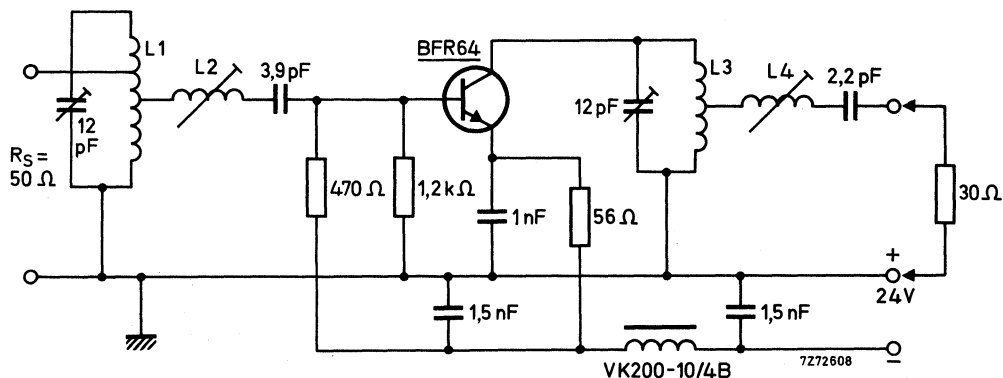


Fig. 2.

Coil data:

- L1 = 3 turns silver-plated Cu wire (1,4 mm); winding pitch 2,7 mm; int. dia. 8 mm; taps at 0,5 turn and 1,5 turns from earth.
 L2 = 5,5 turns silver-plated Cu wire (1,4 mm); winding pitch 2,2 mm; int. dia. 8 mm
 L3 = 3 turns silver-plated Cu wire (1,4 mm); winding pitch 3,3 mm; int. dia. 8 mm
 L4 = 5,5 turns silver-plated Cu wire (1,4 mm); winding pitch 2,2 mm; int. dia. 11 mm

Basis of adjustment

The intermodulation at an intermodulation distortion of -30 dB is caused by h.f. output current-voltage clipping.

The maximum undistorted output power is realized, if

- a. Current and voltage clipping take place concurrently.
 This occurs if

$$R_L = \frac{V_{CE} - V_{CEK}}{I_C},$$

in which V_{CEK} is the high-frequency knee voltage.

- b. The h.f. collector current is as small as possible.

This is so if $-C_L = +C_{Oe}$,

in which C_{Oe} is the output capacitance of the transistor at short-circuited input.

For maximum output power at an intermodulation distortion of -30 dB, the (experimentally found) values of R_L and C_L are:

$$R_L = 220 \Omega; C_L = -4 \text{ pF}.$$

Adjustment procedure

1. Remove the transistor and connect a dummy consisting of a $220\ \Omega$ resistor in parallel with a $4\ \text{pF}$ capacitor between the collector and emitter connections of the output circuit.
2. Tune and match the output circuit for zero reflection at $205\ \text{MHz}$ ($\text{VSWR} = 1$).
After this adjustment, no further change may be made in the output circuit.
3. Replace the dummy by the transistor. Tune and match the input circuit for maximum power gain and good band-pass curve.
The VSWR of the output will then, in most cases, be ≤ 2 over the whole channel. Corrections can be made by tuning $L2$; this will not disturb the band-pass curve.

Intermodulation characteristics

2. Output power at $f = 800\ \text{MHz}$; $T_{\text{mb}} = 25\ \text{°C}$
 $I_C = 70\ \text{mA}$; $V_{CE} = 20\ \text{V}$; VSWR at output < 2
 $f_p = 798\ \text{MHz}$; $f_q = 802\ \text{MHz}$; $d_{\text{im}} = -30\ \text{dB}$
 measured at $f(2q-p) = 806\ \text{MHz}$ (channel 62)

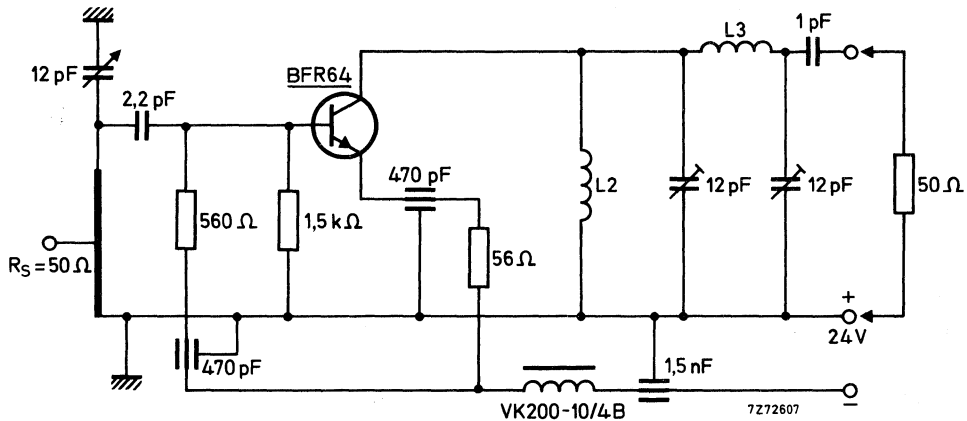


Fig. 3 Test circuit.

Coil data:

- $L1 = 25\ \text{mm} \times 7\ \text{mm} \times 0,85\ \text{mm}$ silver-plated Cu strip
 Tap of the input at $5\ \text{mm}$ from earth.
- $L2 = 13$ turns enamelled Cu wire ($0,6\ \text{mm}$); int. dia. $8\ \text{mm}$
- $L3 = 1,5$ turns Cu wire ($1,3\ \text{mm}$); int. dia. $8\ \text{mm}$

CHARACTERISTICS (continued)**Basis of adjustment**

At 800 MHz no dummy can be used to adjust for optimum collector load because at these frequencies the impedance transformations of a dummy are too high. A small signal at the mid-channel frequency of 802 MHz is fed to the input and increased until clipping occurs; that is, until the output power no longer increases linearly with the input signal. This clipping can be eliminated by tuning the output circuit, thereby making the output power equal to

$$P_O = \frac{I_C(V_{CE} - V_{CEK})}{2} = 480 \text{ mW.}$$

The output circuit is adjusted for minimum intermodulation if the input signal is as small as possible at $P_O = 480 \text{ mW}$. With this adjusting method, care must be taken that the transistor is not damaged by second breakdown (the voltage swing may not exceed the rated V_{CER} value). Therefore as soon as clipping occurs, the increase of the input signal should be stopped until the clipping has been eliminated. After this adjustment has been made no further change may be made in the output circuit. Adjust the input circuit for maximum power gain and good band-pass curve. The VSWR of the output is then ≤ 2 over the whole channel.

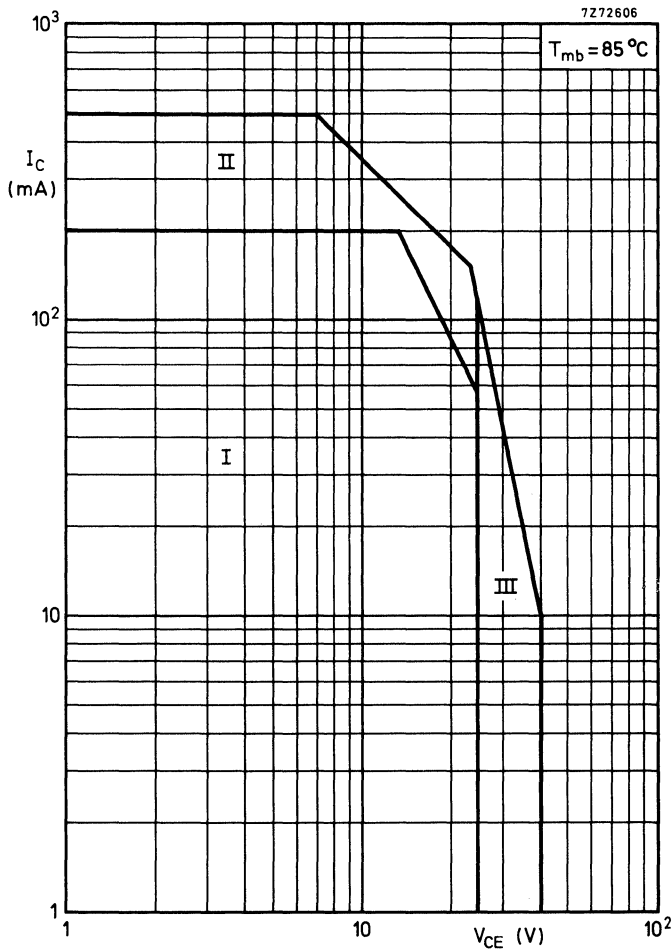


Fig. 4 Safe Operating ARea with the transistor forward biased.

- I Region of permissible d.c. operation
- II Permissible extension for repetitive pulsed operation; $f > 1\text{ MHz}$
- III Repetitive pulse operation in this region is allowable; provided $R_{BE} < 10\ \Omega$ and $f > 1\text{ MHz}$

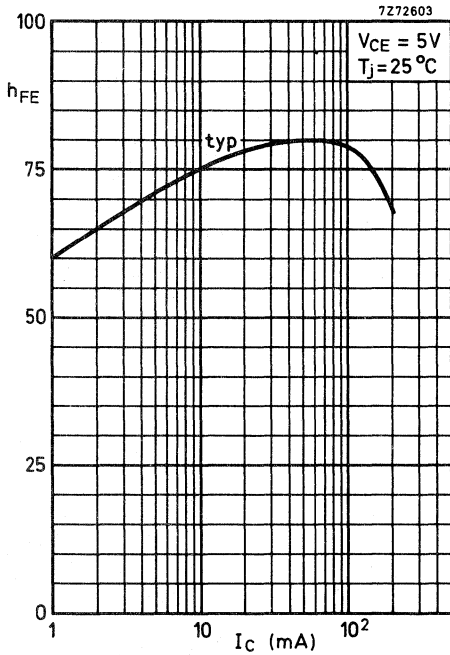


Fig. 5 $V_{CE} = 5V$; $T_j = 25^\circ C$; typical values.

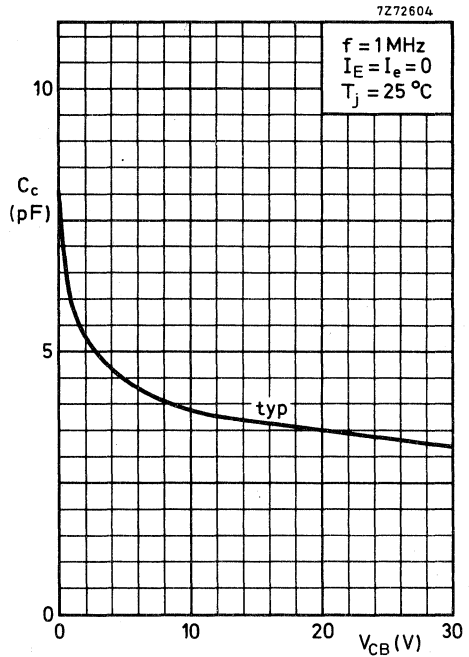


Fig. 6 $I_E = I_e = 0$; $T_j = 25^\circ C$; typical values.

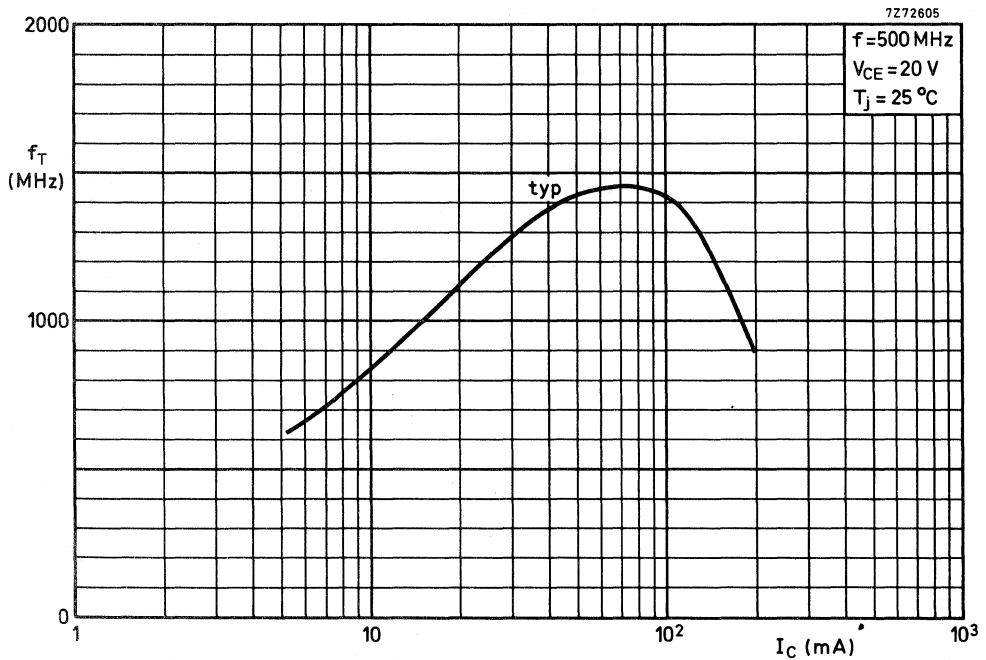


Fig. 7 $V_{CE} = 20V$; $f = 500MHz$; $T_j = 25^\circ C$; typical values.

N-P-N H.F. WIDEBAND TRANSISTOR

N-P-N multi-emitter silicon transistor in a capstan envelope. The transistor has extremely good inter-modulation properties and high power gain.

The device is primarily intended for channel amplifiers in aerial amplifier systems as well as other applications where an excellent f_T linearity and higher signal handling capabilities than available in existing devices are required.

QUICK REFERENCE DATA

Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	40 V
Collector-emitter voltage (open base)	V_{CEO}	max.	25 V
Collector current (peak value)	I_{CM}	max.	1000 mA
Junction temperature	T_j	max.	200 °C
Transition frequency at $f = 500$ MHz $I_C = 200$ mA; $V_{CE} = 20$ V	f_T	min.	1200 MHz
Output power at $f = 200$ MHz $I_C = 200$ mA; $V_{CE} = 20$ V; $d_{im} = -30$ dB	P_o	typ.	450 mW
Power gain at $f = 200$ MHz $I_C = 200$ mA; $V_{CE} = 20$ V	G_p	typ.	19 dB

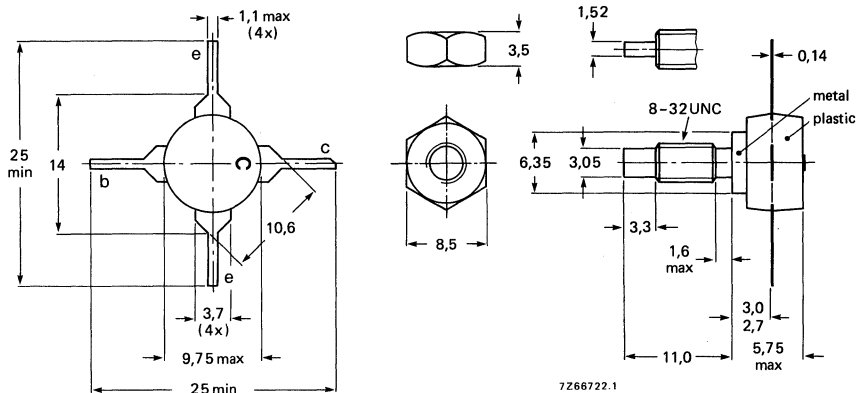
MECHANICAL DATA (see next page)

PRODUCT SAFETY. This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-48.



When locking is required an adhesive instead of a lock washer is preferred.

Torque on nut: min. 0,75 Nm
(7,5 kg cm)
0,85 Nm
(8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,17 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or
countersink either end of hole.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	40 V
Collector-emitter voltage ($R_{BE} = 10 \Omega$; peak value)	V_{CERM}	max.	40 V
Collector-emitter voltage (open base)	V_{CEO}	max.	25 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5 V
Collector current (d.c.)	I_C	max.	400 mA
Collector current (peak value) $f > 1$ MHz	I_{CM}	max.	1000 mA
Total power dissipation up to $T_{mb} = 125 \text{ }^\circ\text{C}$	P_{tot}	max.	5 W
Storage temperature	T_{stg}		-65 to +200 $^\circ\text{C}$
Junction temperature	T_j	max.	200 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j-mb}$	=	15 K/W
From mounting base to heatsink	$R_{th\ mb-h}$	=	0,5 K/W

CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Collector-base breakdown voltage

open emitter, $I_C = 1\text{ mA}$

$V_{(BR)CBO}$ min. 40 V

Collector-emitter breakdown voltage

$R_{BE} = 10\ \Omega$, $I_C = 5\text{ mA}$

open base, $I_C = 5\text{ mA}$

$V_{(BR)CER}$ min. 40 V

$V_{(BR)CEO}$ min. 25 V

Emitter-base breakdown voltage

open collector; $I_E = 1\text{ mA}$

$V_{(BR)EBO}$ min. 3,5 V

Collector cut-off current

$I_E = 0$; $V_{CB} = 20\text{ V}$

I_{CBO} max. $100\ \mu\text{A}$

Saturation voltage

$I_C = 200\text{ mA}$; $I_B = 20\text{ mA}$

V_{CEsat} max. 0,75 V

D.C. current gain

$I_C = 200\text{ mA}$; $V_{CE} = 20\text{ V}$

$I_C = 400\text{ mA}$; $V_{CE} = 20\text{ V}$

h_{FE} min. 30

h_{FE} min. 20

Collector capacitance at $f = 1\text{ MHz}$

$I_E = I_e = 0$; $V_{CB} = 20\text{ V}$

C_c max. 10 pF

Feedback capacitance at $f = 1\text{ MHz}$

$I_C = 10\text{ mA}$; $V_{CE} = 20\text{ V}$; $T_{mb} = 25\text{ }^\circ\text{C}$

C_{re} typ. 3,5 pF

Collector-stud capacitance

C_{cs} typ. 2 pF

Transition frequency at $f = 500\text{ MHz}$

$I_C = 200\text{ mA}$; $V_{CE} = 20\text{ V}$

$I_C = 400\text{ mA}$; $V_{CE} = 20\text{ V}$

f_T min. 1200 MHz

f_T min. 1000 MHz

Output power at $f = 200\text{ MHz}$; $T_{mb} = 25\text{ }^\circ\text{C}$

$I_C = 200\text{ mA}$; $V_{CE} = 20\text{ V}$; VSWR at output < 2

$f_p = 202\text{ MHz}$; $f_q = 205\text{ MHz}$; $d_{im} = -30\text{ dB}$

measured at $f(2q-p) = 208\text{ MHz}$ (channel 9)

P_o typ. 450 mW

Power gain (not neutralized) $T_{mb} = 25\text{ }^\circ\text{C}$

$I_C = 200\text{ mA}$; $V_{CE} = 20\text{ V}$; $f = 200\text{ MHz}$

G_p min. 15 dB

typ. 19 dB

$I_C = 200\text{ mA}$; $V_{CE} = 20\text{ V}$; $f = 800\text{ MHz}$

G_p typ. 4,5 dB

CHARACTERISTICS (continued)

Intermodulation characteristics

1. Output power at $f = 200$ MHz; $T_{mb} = 25$ °C
 $I_C = 200$ mA; $V_{CE} = 20$ V; VSWR at output < 2
 $f_p = 202$ MHz; $f_q = 205$ MHz; $d_{im} = -30$ dB
 measured at $f(2q-p) = 208$ MHz (channel 9)

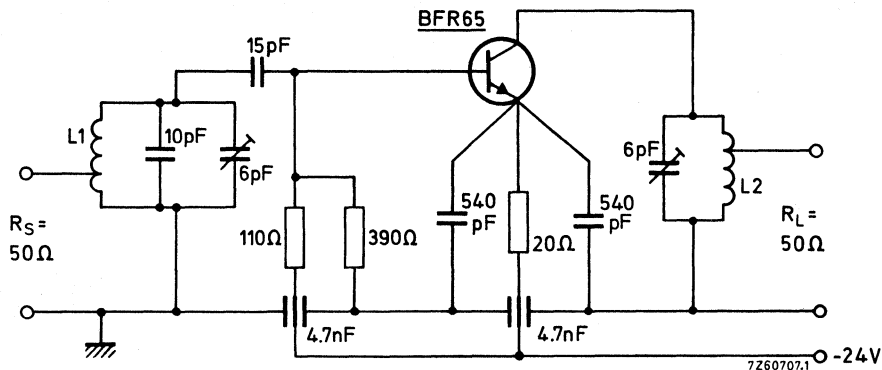


Fig. 2.

Coil data:

- L1 = 1 turn silver plated Cu wire (1,4 mm); int. diam. 8 mm; tap at 0,75 turn from earth.
 L2 = 3 turns silver plated Cu wire (1,4 mm); int. diam. 8 mm; winding pitch 2,7 mm; tap at 2,5 turns from earth.

Basis of adjustment

The intermodulation at an intermodulation distortion of -30 dB is caused by h.f. output current – voltage clipping.

The maximum undistorted output power is realised, if

- a. Current and voltage clipping take place concurrently.
 This occurs if

$$R_L = \frac{V_{CE} - V_{CEK}}{I_C},$$

in which V_{CEK} is the high frequency knee voltage.

- b. The h.f. collector current is as small as possible.

This is so if $-C_L = +C_{Oe}$,

in which C_{Oe} is the output capacitance of the transistor at short-circuited input.

For maximum output power at an intermodulation distortion of -30 dB, the (experimentally found) values of R_L and C_L are:

$R_L = 91 \Omega$; $C_L = -6,8$ pF.

Adjustment procedure

1. Remove the transistor and connect a dummy consisting of a $91\ \Omega$ resistor in parallel with a $6,8\ \text{pF}$ capacitor between the collector and emitter connections of the output circuit.
2. Tune and match the output circuit for zero reflection at $205\ \text{MHz}$ ($\text{VSWR} = 1$). After this adjustment, no further change may be made in the output circuit.
3. Replace the dummy by the transistor. Tune and match the input circuit for maximum power gain and good band pass curve.

The VSWR of the output will then, in most cases, be ≤ 2 over the whole channel.

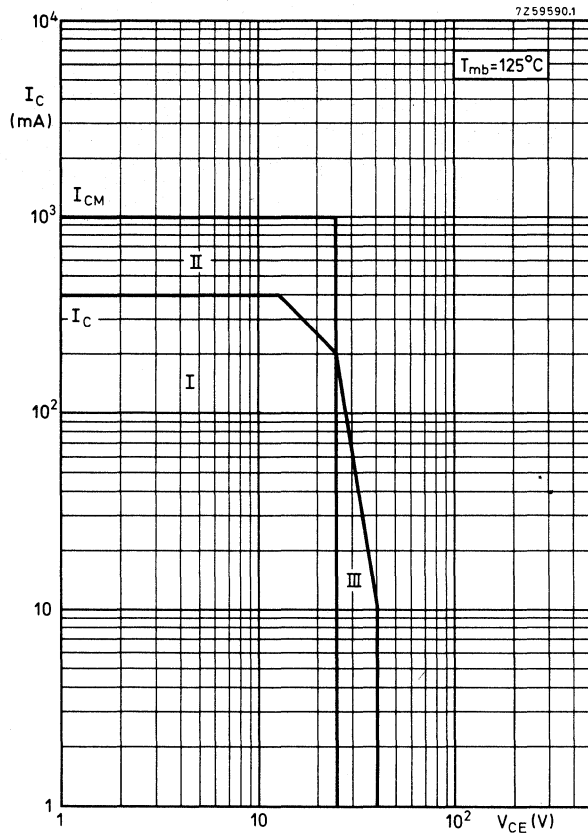


Fig. 3 Safe Operating Area with the transistor forward biased; $T_{mb} = 125\text{ }^{\circ}\text{C}$.

- I Region of permissible d.c. operation
- II Permissible extension for repetitive pulsed operation; $f > 1\text{ MHz}$
- III Repetitive pulsed operation in this region is allowable, provided $f > 1\text{ MHz}$;
 $R_{BE} < 10\ \Omega$

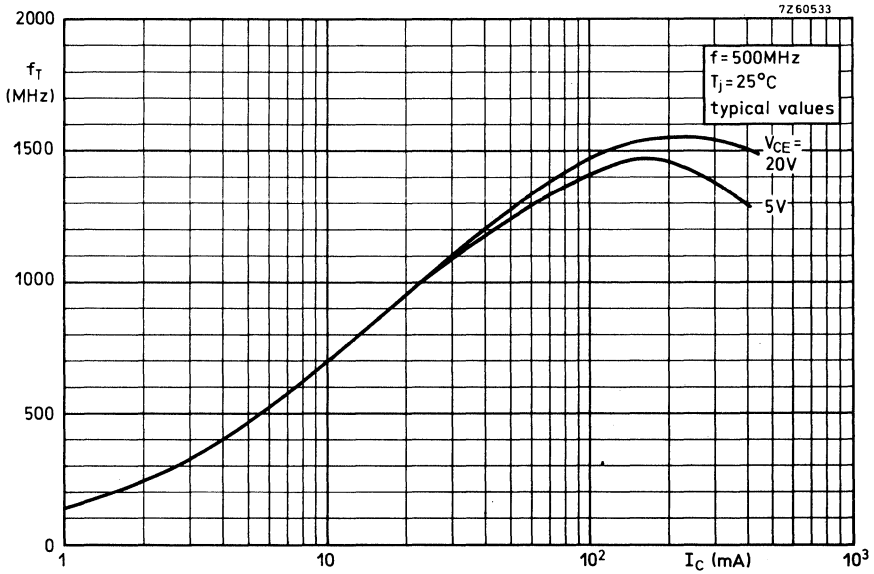


Fig. 4 $f = 500\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$; typical values.

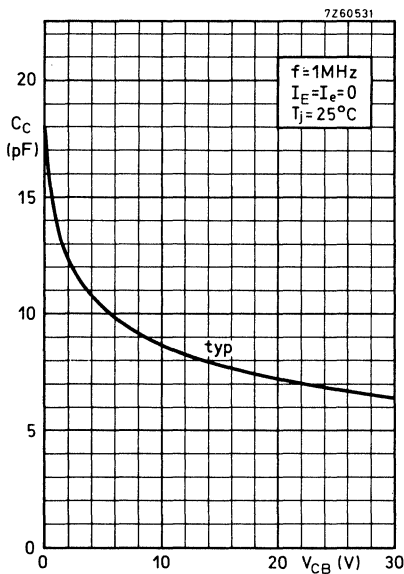


Fig. 5 $I_E = I_e = 0$; $f = 1\text{ MHz}$;
 $T_j = 25\text{ }^\circ\text{C}$; typical values.

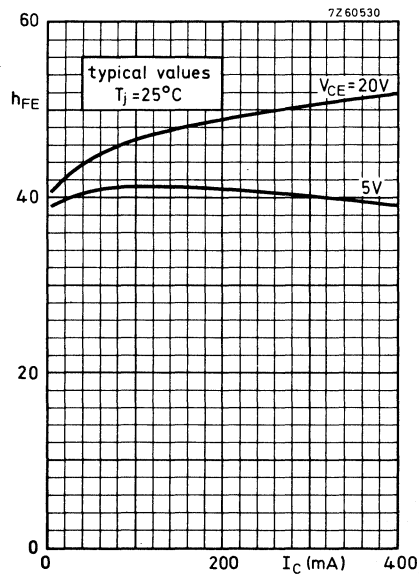


Fig. 6 $T_j = 25\text{ }^\circ\text{C}$; typical values.

N-P-N 1 GHz WIDEBAND TRANSISTOR

N-P-N transistor in a plastic SOT-37 envelope. It is primarily intended for use in u.h.f. and microwave amplifiers such as in aerial amplifiers, radar systems, oscilloscopes, spectrum analysers etc.

The transistor features low intermodulation distortion and high power gain; thanks to its very high transition frequency, it also has excellent wideband properties and low noise up to high frequencies.

P-N-P complement is BFQ51.

QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	20 V
Collector-emitter voltage (open base)	V_{CEO}	max.	15 V
Collector current (d.c.)	I_C	max.	25 mA
Total power dissipation up to $T_{amb} = 60\text{ }^\circ\text{C}$	P_{tot}	max.	180 mW
Junction temperature	T_j	max.	150 $^\circ\text{C}$
Transition frequency at $f = 500\text{ MHz}$ $I_C = 14\text{ mA}$; $V_{CE} = 10\text{ V}$	f_T	typ.	5,0 GHz
Feedback capacitance at $f = 1\text{ MHz}$ $I_C = 0$; $V_{CE} = 10\text{ V}$	C_{re}	typ.	0,4 pF
Noise figure at optimum source impedance $I_C = 2\text{ mA}$; $V_{CE} = 10\text{ V}$; $f = 500\text{ MHz}$	F	typ.	2,4 dB
Max. unilateral power gain $I_C = 14\text{ mA}$; $V_{CE} = 10\text{ V}$; $f = 500\text{ MHz}$	G_{UM}	typ.	19,5 dB
Output voltage at $d_{im} = -60\text{ dB}$ $I_C = 14\text{ mA}$; $V_{CE} = 10\text{ V}$; $R_L = 75\text{ }\Omega$; $f_{(p+q-r)} = 493,25\text{ MHz}$	V_o	typ.	150 mV

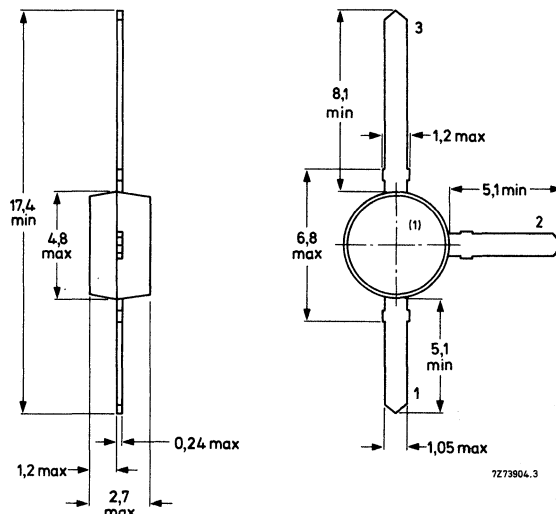
MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-37.

Connections

1. Base
2. Emitter
3. Collector



(1) = type number marking.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	20 V
Collector-emitter voltage (open base)	V_{CEO}	max.	15 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2 V
Collector current (d.c.)	I_C	max.	25 mA
Total power dissipation up to $T_{amb} = 60\text{ }^{\circ}\text{C}$	P_{tot}	max.	180 mW
Storage temperature	T_{stg}		-65 to +150 $^{\circ}\text{C}$
Junction temperature	T_j	max.	150 $^{\circ}\text{C}$

THERMAL RESISTANCE

From junction to ambient in free air and mounted on a glass-fibre print of 40 mm x 25 mm x 1 mm (Fig. 2)

$$R_{th\ j-a} = 500\text{ K/W}$$

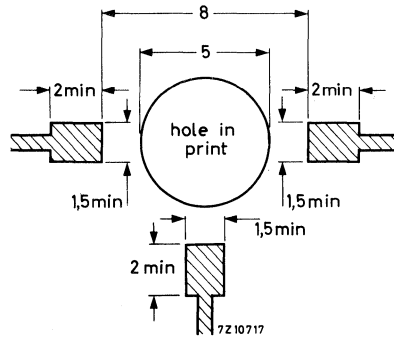


Fig. 2 Requirements for fibre-glass print. (Dimensions in mm)

CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Collector cut-off current

$I_E = 0; V_{CB} = 10\text{ V}$

I_{CBO} max. 50 nA

D.C. current gain

$I_C = 14\text{ mA}; V_{CE} = 10\text{ V}$

h_{FE} min. 40
typ. 90

Transition frequency at $f = 500\text{ MHz}$

$I_C = 14\text{ mA}; V_{CE} = 10\text{ V}$

f_T typ. 5,0 GHz

Collector capacitance at $f = 1\text{ MHz}$

$I_E = I_e = 0; V_{CB} = 10\text{ V}$

C_C typ. 0,5 pF

Emitter capacitance at $f = 1\text{ MHz}$

$I_C = I_C = 0; V_{EB} = 0,5\text{ V}$

C_e typ. 1,2 pF

Feedback capacitance at $f = 1\text{ MHz}$

$I_C = 0; V_{CE} = 10\text{ V}$

C_{re} typ. 0,4 pF

Noise figure at optimum source impedance

$I_C = 2\text{ mA}; V_{CE} = 10\text{ V}; f = 500\text{ MHz}; T_{amb} = 25\text{ }^\circ\text{C}$

F typ. 2,4 dB

Max. unilateral power gain (s_{re} assumed to be zero)

$$G_{UM} = 10 \log \frac{|s_{fe}|^2}{[1 - |s_{ie}|^2][1 - |s_{oe}|^2]}$$

$I_C = 14\text{ mA}; V_{CE} = 10\text{ V}; f = 500\text{ MHz}; T_{amb} = 25\text{ }^\circ\text{C}$

G_{UM} typ. 19,5 dB

Output voltage at $d_{im} = -60\text{ dB}$

$I_C = 14\text{ mA}; V_{CE} = 10\text{ V};$

$R_L = 75\text{ }\Omega; T_{amb} = 25\text{ }^\circ\text{C}$

$V_p = V_o$ at $d_{im} = -60\text{ dB}; f_p = 495,25\text{ MHz}$

$V_q = V_o - 6\text{ dB}; f_q = 503,25\text{ MHz}$

$V_r = V_o - 6\text{ dB}; f_r = 505,25\text{ MHz}$

measured at $f_{(p+q-r)} = 495,25\text{ MHz}$

V_o typ. 150 mV

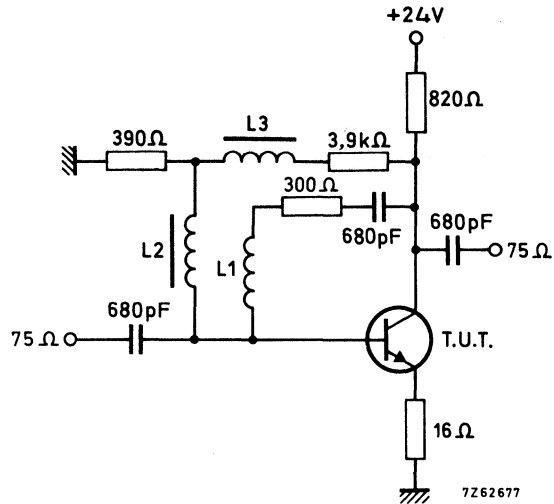


Fig. 3 Intermodulation test circuit.

L1 = 4 turns Cu wire (0,35 mm); winding pitch 1 mm; int. diam. 4 mm
 L2 and L3 5 μ H (code number: 3122 108 20150)

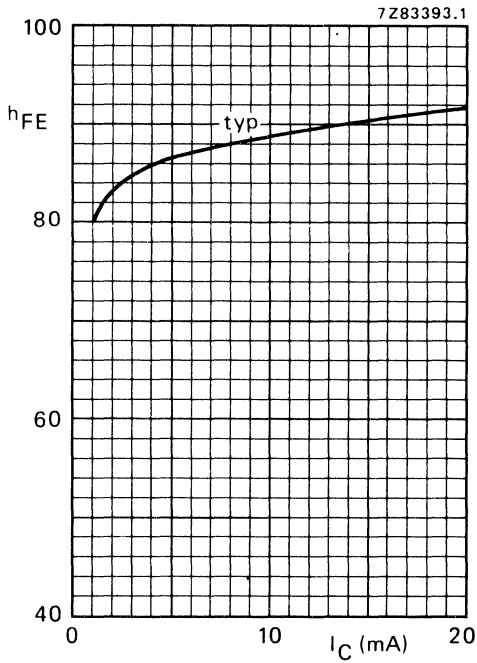


Fig. 4 $V_{CE} = 10 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$; typical values.

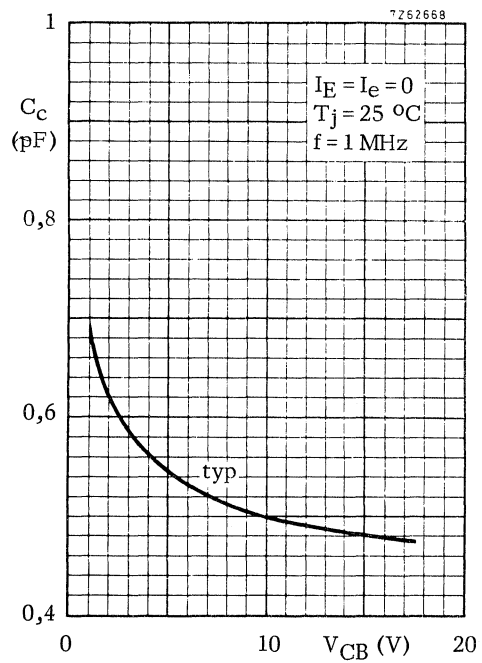


Fig. 5 $I_E = I_e = 0$; $T_j = 25 \text{ }^\circ\text{C}$; typical values.

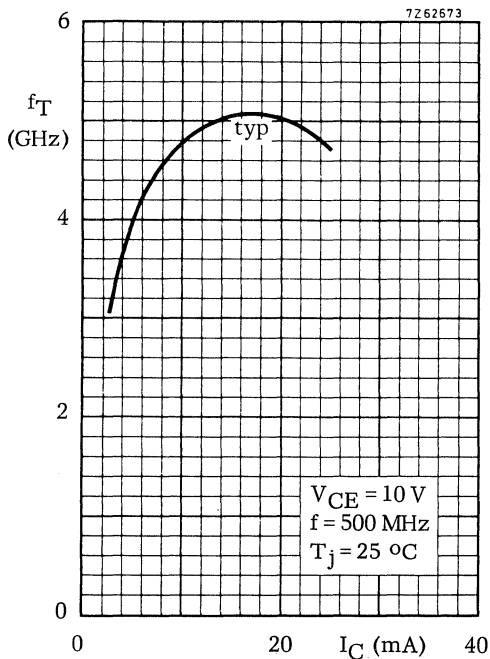


Fig. 6 $V_{CE} = 10 \text{ V}$; $f = 500 \text{ MHz}$; $T_j = 25 \text{ }^\circ\text{C}$; typical values.

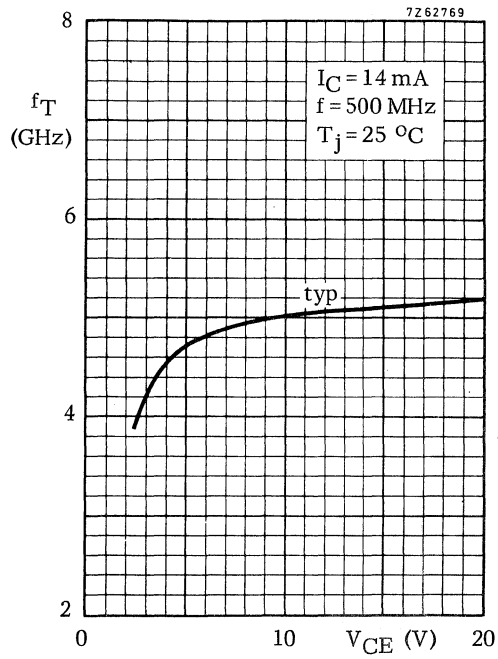


Fig. 7 $I_C = 14 \text{ mA}$; $f = 500 \text{ MHz}$; $T_j = 25 \text{ }^\circ\text{C}$; typical values.

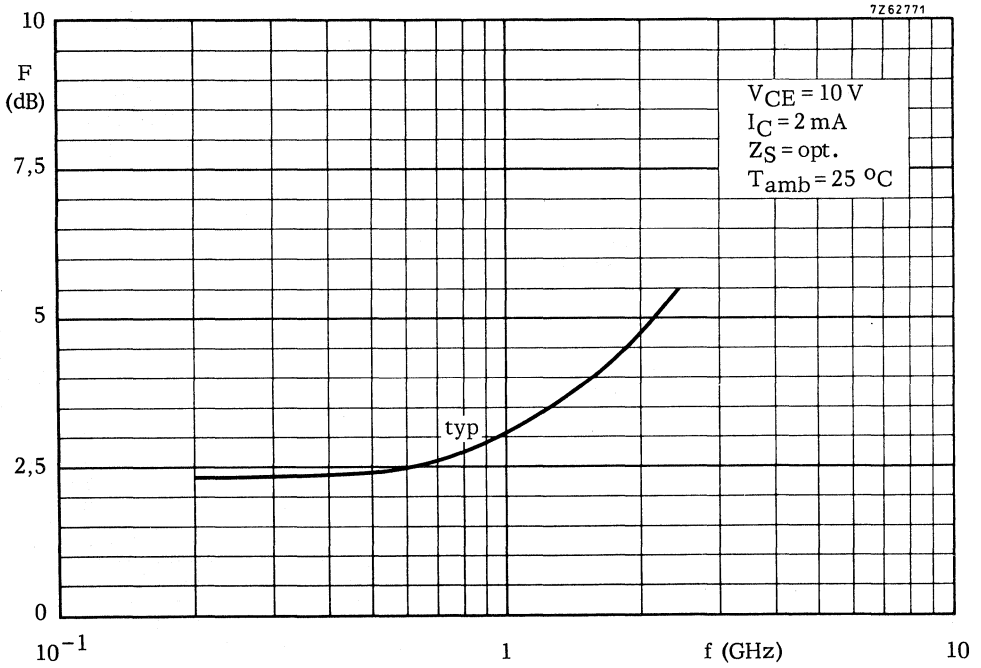


Fig. 8 $V_{CE} = 10 \text{ V}$; $I_C = 2 \text{ mA}$; $Z_S = \text{opt.}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$; typical values.

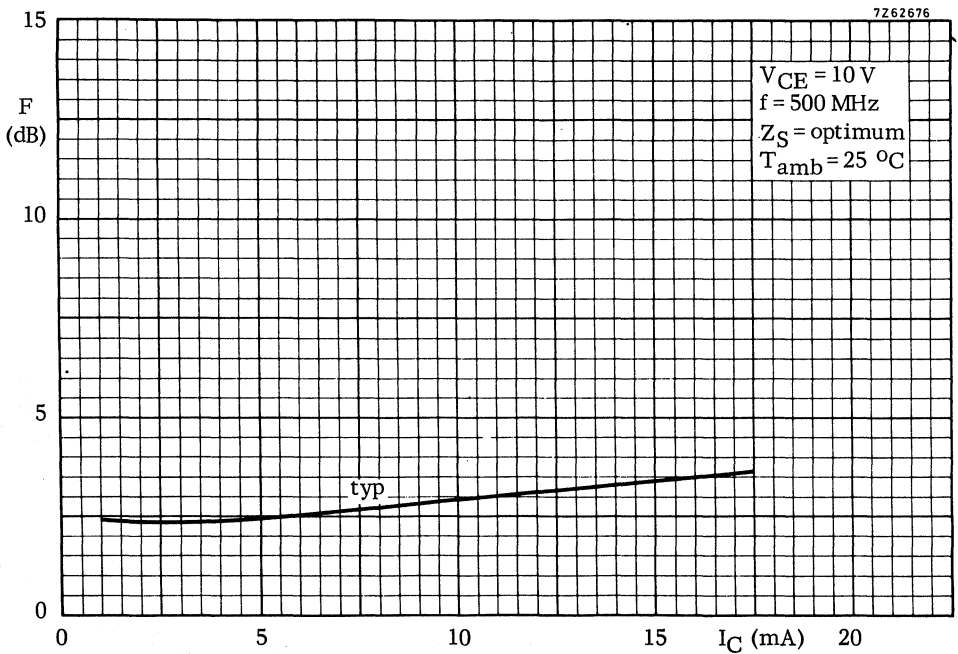


Fig. 9 $V_{CE} = 10 \text{ V}$; $f = 500 \text{ MHz}$; $Z_S = \text{opt.}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$; typical values.

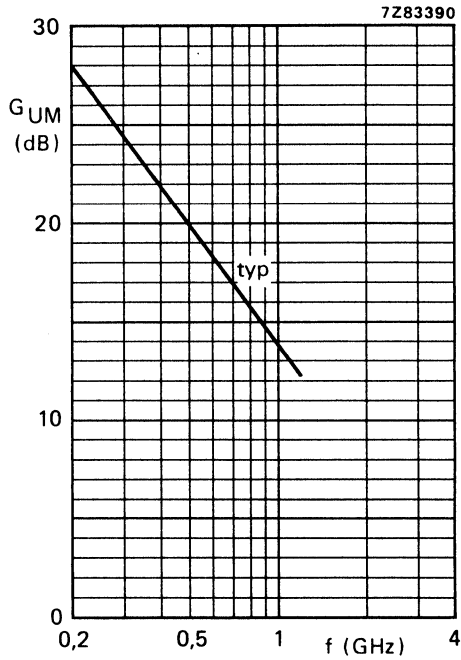


Fig. 10 $V_{CE} = 10 \text{ V}$; $I_C = 14 \text{ mA}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

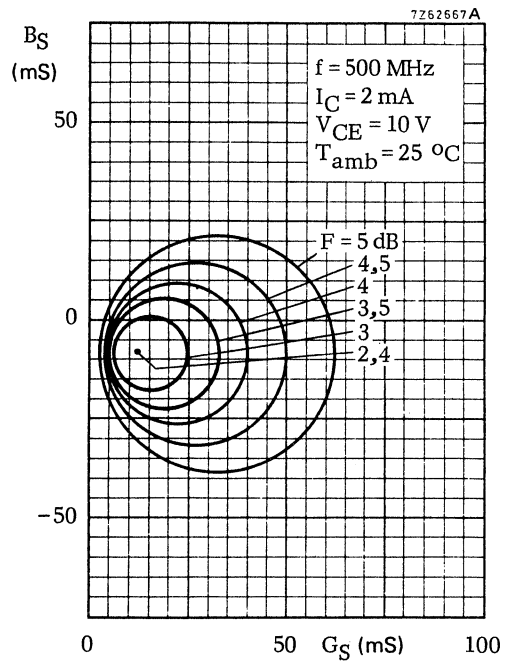


Fig. 11 Circles of constant noise figure; $V_{CE} = 10 \text{ V}$; $I_C = 2 \text{ mA}$; $f = 500 \text{ MHz}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

N-P-N 1 GHz WIDEBAND TRANSISTOR

N-P-N transistor in a plastic SOT-37 envelope primarily intended for use in v.h.f. and u.h.f. wideband amplifiers. P-N-P complement is BFQ51.

Features of this device:

- low noise
- low intermodulation distortion
- high power gain
- gold metallization

QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	20 V
Collector-emitter voltage (open base)	V_{CEO}	max.	15 V
Collector current (d.c.)	I_C	max.	25 mA
Total power dissipation up to $T_{amb} = 60^\circ\text{C}$	P_{tot}	max.	180 mW
Junction temperature	T_j	max.	150 $^\circ\text{C}$
Transition frequency at $f = 500$ MHz $I_C = 14$ mA; $V_{CE} = 10$ V	f_T	typ.	5,0 GHz
Feedback capacitance at $f = 1$ MHz $I_C = 0$; $V_{CE} = 10$ V	C_{re}	typ.	0,35 pF
Maximum unilateral power gain at $f = 800$ MHz $I_C = 14$ mA; $V_{CE} = 10$ V	G_{UM}	typ.	15,5 dB
Noise figure at $Z_S = 60 \Omega$ $I_C = 4$ mA; $V_{CE} = 10$ V; $f = 800$ MHz	F	typ.	1,8 dB
Output voltage at $d_{im} = -60$ dB $I_C = 14$ mA; $V_{CE} = 10$ V; $R_L = 75 \Omega$ $f_{(p+q-r)} = 793,25$ MHz	V_o	typ.	150 mV
Output power at 1 dB gain compression	P_{L1}	typ.	+ 8 dBm
Third order intercept point	ITO	typ.	+ 27 dBm

MECHANICAL DATA

SOT-37 (see Fig. 1).

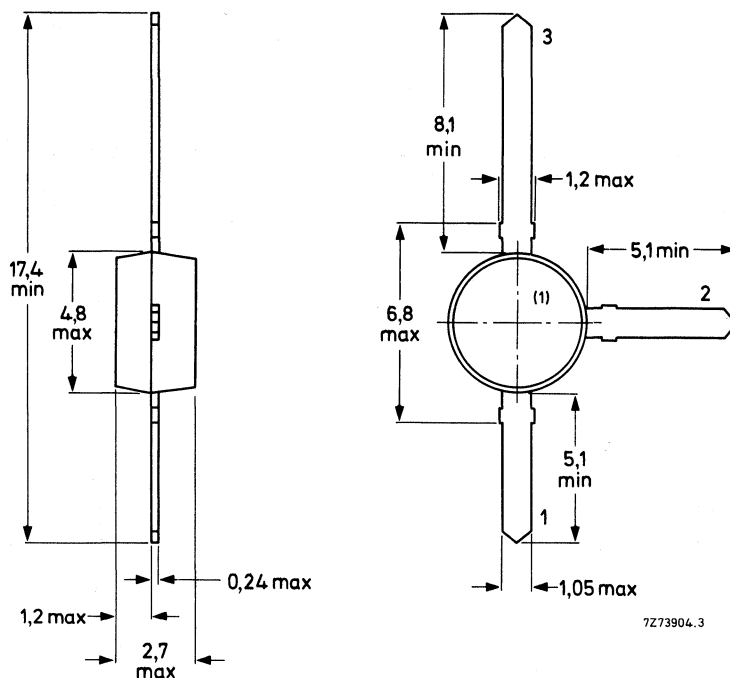
MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-37.

Connections

- 1. Base
- 2. Emitter
- 3. Collector



7Z73904.3

(1) = type number marking.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	20 V
Collector-emitter voltage (open base)	V_{CEO}	max.	15 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2 V
Collector current (d.c.)	I_C	max.	25 mA
Total power dissipation up to $T_{amb} = 60\text{ }^\circ\text{C}$	P_{tot}	max.	180 mW
Storage temperature	T_{stg}		-65 to +150 $^\circ\text{C}$
Junction temperature	T_j	max.	150 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to ambient in free air
 mounted on a fibre-glass print (see Fig. 2)
 of 40 mm x 25 mm x 1 mm

$R_{thj-a} = 500\text{ K/W}$

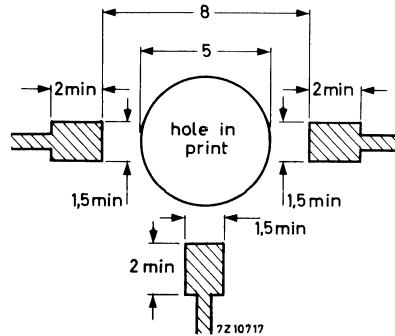


Fig. 2 Requirements for fibre-glass print. (Dimensions in mm.)

CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Collector cut-off current

$I_E = 0; V_{CB} = 10\text{ V}$

I_{CBO} max. 50 nA

D.C. current gain

$I_C = 14\text{ mA}; V_{CE} = 10\text{ V}$

h_{FE} min. 40
typ. 90 ←

Transition frequency at $f = 500\text{ MHz}$

$I_C = 14\text{ mA}; V_{CE} = 10\text{ V}$

f_T typ. 5,0 GHz ←

Collector capacitance at $f = 1\text{ MHz}$

$I_E = I_e = 0; V_{CB} = 10\text{ V}$

C_C typ. 0,6 pF

Emitter capacitance at $f = 1\text{ MHz}$

$I_C = I_c = 0; V_{EB} = 0,5\text{ V}$

C_e typ. 1,2 pF

Feedback capacitance at $f = 1\text{ MHz}$

$I_C = 0; V_{CE} = 10\text{ V}$

C_{re} typ. 0,35 pF

Noise figure at $T_{amb} = 25\text{ }^\circ\text{C}$

$I_C = 4\text{ mA}; V_{CE} = 10\text{ V}; Z_S = 60\text{ }\Omega; f = 800\text{ MHz}$

F typ. 1,7 dB ←

$I_C = 4\text{ mA}; V_{CE} = 10\text{ V}; Z_S = Z_{opt}; f = 2\text{ GHz}$

F typ. 3,6 dB

Maximum unilateral power gain (s_{re} assumed to be zero)

$$G_{UM} = 10 \log \frac{|s_{fe}|^2}{(1 - |s_{ie}|^2)(1 - |s_{oe}|^2)}$$

←

$I_C = 14\text{ mA}; V_{CE} = 10\text{ V}; f = 800\text{ MHz}; T_{amb} = 25\text{ }^\circ\text{C}$

G_{UM} typ. 15,5 dB

←

Output voltage at $d_{im} = -60$ dB (see Figs 3 and 15)

(DIN 45004B, par. 6.3: 3-tone)

$I_C = 14$ mA; $V_{CE} = 10$ V; $R_L = 75 \Omega$; $VSWR < 2$; $T_{amb} = 25$ °C

$V_p = V_o$ at $d_{im} = -60$ dB; $f_p = 795,25$ MHz

$V_q = V_o - 6$ dB ; $f_q = 803,25$ MHz

$V_r = V_o - 6$ dB ; $f_r = 805,25$ MHz

Measured at $f_{(p+q-r)} = 793,25$ MHz

V_o typ. 150 mV

Second harmonic distortion (see Figs 3 and 16)

$I_C = 14$ mA; $V_{CE} = 10$ V; $R_L = 75 \Omega$; $VSWR < 2$; $T_{amb} = 25$ °C

$V_p = 60$ mV at $f_p = 250$ MHz

$V_q = 60$ mV at $f_q = 560$ MHz

measured at $f_{(p+q)} = 810$ MHz

d_2 typ. -50 dB

Output power at 1 dB gain compression (see Fig. 3)

$I_C = 14$ mA; $V_{CE} = 10$ V

$R_L = 75 \Omega$; $T_{amb} = 25$ °C

measured at $f = 800$ MHz

P_{L1} typ. 8 dBm

Third order intercept point (see Fig. 3)

$I_C = 14$ mA; $V_{CE} = 10$ V

$R_L = 75 \Omega$; $T_{amb} = 25$ °C

$P_p = ITO - 6$ dB; $f_p = 800$ MHz

$P_q = ITO - 6$ dB; $f_q = 801$ MHz

measured at $f_{(2q-p)} = 802$ MHz and
at $f_{(2p-q)} = 799$ MHz

ITO typ. 27 dBm

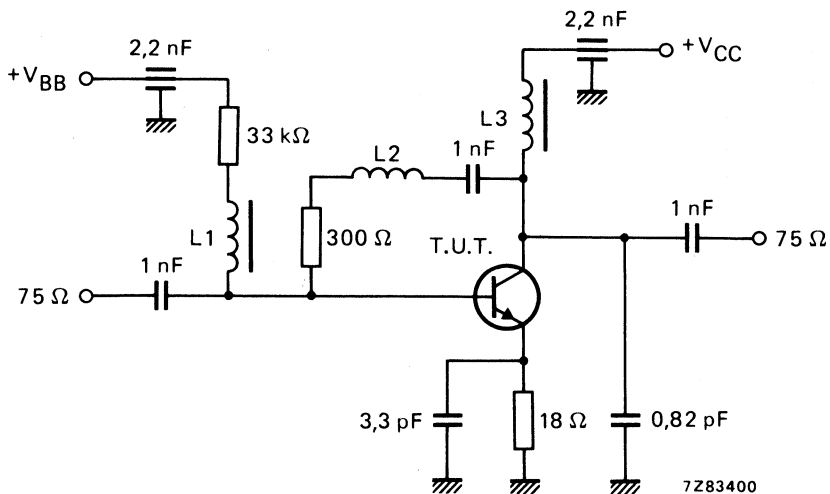


Fig. 3 Intermodulation distortion and second harmonic distortion test circuit.

$L1 = L3 = 5 \mu$ H micro choke

$L2 = 3$ turns Cu wire (0,4 mm); internal diameter 3 mm; winding pitch 1 mm

s-parameters (common emitter) at $V_{CE} = 5\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$; typical values.

I_C mA	f MHz	s_{ie}	s_{re}	s_{fe}	s_{oe}	G_{UM} dB
2	40	0,91/ $-7,7^{\circ}$	0,01/84 $^{\circ}$	6,8/173 $^{\circ}$	0,99/ $-2,7^{\circ}$	46,0
	200	0,79/ $-37,3^{\circ}$	0,03/71 $^{\circ}$	6,5/143 $^{\circ}$	0,93/ $-12,5^{\circ}$	29,2
	500	0,52/ $-81,0^{\circ}$	0,06/59 $^{\circ}$	4,6/116 $^{\circ}$	0,80/ $-22,5^{\circ}$	19,1
	800	0,34/ $-114,5^{\circ}$	0,08/58 $^{\circ}$	3,3/ 97 $^{\circ}$	0,73/ $-27,0^{\circ}$	14,2
	1000	0,26/ $-137,6^{\circ}$	0,09/59 $^{\circ}$	2,8/ 87 $^{\circ}$	0,70/ $-30,0^{\circ}$	12,2
	1200	0,22/ $-165,0^{\circ}$	0,10/61 $^{\circ}$	2,4/ 79 $^{\circ}$	0,67/ $-33,0^{\circ}$	10,4
5	40	0,80/ $-11,7^{\circ}$	0,01/81 $^{\circ}$	14,4/169 $^{\circ}$	0,99/ $-4,5^{\circ}$	44,6
	200	0,59/ $-51,0^{\circ}$	0,03/68 $^{\circ}$	11,2/134 $^{\circ}$	0,85/ $-17,0^{\circ}$	28,4
	500	0,29/ $-95,0^{\circ}$	0,05/66 $^{\circ}$	6,3/103 $^{\circ}$	0,70/ $-22,0^{\circ}$	19,3
	800	0,16/ $-130,0^{\circ}$	0,07/69 $^{\circ}$	4,2/ 88 $^{\circ}$	0,64/ $-26,0^{\circ}$	14,9
	1000	0,12/ $-162,0^{\circ}$	0,09/70 $^{\circ}$	3,4/ 81 $^{\circ}$	0,63/ $-28,0^{\circ}$	12,9
	1200	0,12/+ 158,0 $^{\circ}$	0,10/71 $^{\circ}$	2,9/ 74 $^{\circ}$	0,61/ $-31,0^{\circ}$	11,3
10	40	0,67/ $-16,7^{\circ}$	0,01/80 $^{\circ}$	23,3/164 $^{\circ}$	0,97/ $-6,6^{\circ}$	42,2
	200	0,39/ $-63,0^{\circ}$	0,02/70 $^{\circ}$	14,5/122 $^{\circ}$	0,76/ $-18,0^{\circ}$	27,7
	500	0,15/ $-109,0^{\circ}$	0,05/73 $^{\circ}$	7,0/ 96 $^{\circ}$	0,64/ $-20,0^{\circ}$	19,3
	800	0,09/ $-152,0^{\circ}$	0,07/75 $^{\circ}$	4,6/ 84 $^{\circ}$	0,60/ $-24,0^{\circ}$	15,2
	1000	0,07/+ 155,0 $^{\circ}$	0,09/75 $^{\circ}$	3,7/ 77 $^{\circ}$	0,59/ $-26,0^{\circ}$	13,2
	1200	0,10/+ 124,0 $^{\circ}$	0,11/74 $^{\circ}$	3,1/ 72 $^{\circ}$	0,58/ $-29,0^{\circ}$	11,7
14	40	0,58/ $-20,0^{\circ}$	0,01/79 $^{\circ}$	28,3/160 $^{\circ}$	0,96/ $-7,8^{\circ}$	41,9
	200	0,30/ $-71,0^{\circ}$	0,02/72 $^{\circ}$	15,5/117 $^{\circ}$	0,72/ $-18,0^{\circ}$	27,9
	500	0,11/ $-119,0^{\circ}$	0,05/75 $^{\circ}$	7,2/ 93 $^{\circ}$	0,62/ $-19,0^{\circ}$	19,3
	800	0,07/ $-177,0^{\circ}$	0,07/77 $^{\circ}$	4,6/ 82 $^{\circ}$	0,59/ $-23,0^{\circ}$	15,1
	1000	0,08/+ 138,0 $^{\circ}$	0,09/76 $^{\circ}$	3,8/ 76 $^{\circ}$	0,58/ $-25,0^{\circ}$	13,4
	1200	0,12/+ 118,0 $^{\circ}$	0,11/76 $^{\circ}$	3,2/ 71 $^{\circ}$	0,57/ $-28,0^{\circ}$	11,9
20	40	0,49/ $-25,0^{\circ}$	0,01/78 $^{\circ}$	32,9/157 $^{\circ}$	0,94/ $-9,0^{\circ}$	40,9
	200	0,22/ $-82,0^{\circ}$	0,02/74 $^{\circ}$	15,9/112 $^{\circ}$	0,69/ $-17,0^{\circ}$	27,1
	500	0,09/ $-143,0^{\circ}$	0,05/78 $^{\circ}$	7,1/ 91 $^{\circ}$	0,61/ $-18,0^{\circ}$	19,1
	800	0,08/+ 160,0 $^{\circ}$	0,07/78 $^{\circ}$	4,5/ 80 $^{\circ}$	0,59/ $-22,0^{\circ}$	15,0
	1000	0,10/+ 130,0 $^{\circ}$	0,09/78 $^{\circ}$	3,7/ 75 $^{\circ}$	0,58/ $-24,0^{\circ}$	13,2
	1200	0,14/+ 115,0 $^{\circ}$	0,11/77 $^{\circ}$	3,1/ 69 $^{\circ}$	0,57/ $-28,0^{\circ}$	11,6
30	40	0,36/ $-38,9^{\circ}$	0,01/76 $^{\circ}$	31,2/151 $^{\circ}$	0,90/ $-10,3^{\circ}$	37,7
	200	0,18/ $-122,0^{\circ}$	0,02/75 $^{\circ}$	14,0/106 $^{\circ}$	0,66/ $-14,0^{\circ}$	25,5
	500	0,15/ $-175,0^{\circ}$	0,05/80 $^{\circ}$	6,1/ 88 $^{\circ}$	0,61/ $-16,0^{\circ}$	17,8
	800	0,17/+ 148,0 $^{\circ}$	0,07/80 $^{\circ}$	3,9/ 78 $^{\circ}$	0,59/ $-21,0^{\circ}$	13,8
	1000	0,19/+ 131,0 $^{\circ}$	0,09/79 $^{\circ}$	3,1/ 72 $^{\circ}$	0,59/ $-24,0^{\circ}$	11,8
	1200	0,23/+ 119,0 $^{\circ}$	0,11/79 $^{\circ}$	2,7/ 67 $^{\circ}$	0,57/ $-28,0^{\circ}$	10,6

→ s-parameters (common emitter) at $V_{CE} = 10\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$; typical values.

I_C mA	f MHz	s_{ie}	s_{re}	s_{fe}	s_{oe}	GUM dB
2	40	0,91/ $-7,5^{\circ}$	0,01/84 $^{\circ}$	7,0/173 $^{\circ}$	0,99/ $-2,6^{\circ}$	46,0
	200	0,81/ $-36,0^{\circ}$	0,03/72 $^{\circ}$	6,3/149 $^{\circ}$	0,94/ $-12,0^{\circ}$	30,0
	500	0,54/ $-78,0^{\circ}$	0,06/59 $^{\circ}$	4,6/118 $^{\circ}$	0,82/ $-21,0^{\circ}$	19,6
	800	0,35/ $-110,0^{\circ}$	0,08/58 $^{\circ}$	3,4/ 98 $^{\circ}$	0,74/ $-26,0^{\circ}$	14,6
	1000	0,27/ $-132,0^{\circ}$	0,08/59 $^{\circ}$	2,8/ 89 $^{\circ}$	0,72/ $-29,0^{\circ}$	12,4
	1200	0,22/ $-159,0^{\circ}$	0,09/61 $^{\circ}$	2,5/ 80 $^{\circ}$	0,69/ $-0,32^{\circ}$	11,0
5	40	0,81/ $-11,1^{\circ}$	0,01/82 $^{\circ}$	14,4/169 $^{\circ}$	0,99/ $-4,3^{\circ}$	44,8
	200	0,61/ $-48,0^{\circ}$	0,03/69 $^{\circ}$	11,1/135 $^{\circ}$	0,86/ $-16,0^{\circ}$	28,8
	500	0,31/ $-90,0^{\circ}$	0,05/66 $^{\circ}$	6,4/105 $^{\circ}$	0,71/ $-22,0^{\circ}$	21,2
	800	0,17/ $-120,0^{\circ}$	0,07/69 $^{\circ}$	4,3/ 90 $^{\circ}$	0,66/ $-25,0^{\circ}$	15,3
	1000	0,11/ $-148,0^{\circ}$	0,08/70 $^{\circ}$	3,5/ 82 $^{\circ}$	0,64/ $-27,0^{\circ}$	13,2
	1200	0,10/ $+167,0^{\circ}$	0,10/71 $^{\circ}$	3,0/ 76 $^{\circ}$	0,63/ $-30,0^{\circ}$	11,8
10	40	0,70/ $-15,2^{\circ}$	0,01/80 $^{\circ}$	23,0/164 $^{\circ}$	0,97/ $-6,1^{\circ}$	42,4
	200	0,42/ $-58,0^{\circ}$	0,02/70 $^{\circ}$	14,8/124 $^{\circ}$	0,78/ $-17,0^{\circ}$	28,3
	500	0,17/ $-95,0^{\circ}$	0,05/73 $^{\circ}$	7,3/ 97 $^{\circ}$	0,65/ $-20,0^{\circ}$	19,8
	800	0,07/ $-104,0^{\circ}$	0,07/75 $^{\circ}$	4,7/ 85 $^{\circ}$	0,62/ $-23,0^{\circ}$	15,6
	1000	0,04/ $-174,0^{\circ}$	0,09/75 $^{\circ}$	3,9/ 79 $^{\circ}$	0,61/ $-25,0^{\circ}$	13,8
	1200	0,07/ $+120,0^{\circ}$	0,10/75 $^{\circ}$	3,3/ 73 $^{\circ}$	0,59/ $-28,0^{\circ}$	12,2
14	40	0,63/ $-18,0^{\circ}$	0,01/79 $^{\circ}$	28,2/161 $^{\circ}$	0,96/ $-7,2^{\circ}$	42,3
	200	0,34/ $-63,0^{\circ}$	0,02/72 $^{\circ}$	15,9/119 $^{\circ}$	0,74/ $-17,0^{\circ}$	28,0
	500	0,13/ $-98,0^{\circ}$	0,05/75 $^{\circ}$	7,5/ 95 $^{\circ}$	0,63/ $-19,0^{\circ}$	19,8
	800	0,05/ $-136,0^{\circ}$	0,07/77 $^{\circ}$	4,8/ 83 $^{\circ}$	0,61/ $-22,0^{\circ}$	15,5
	1000	0,04/ $+133,0^{\circ}$	0,09/76 $^{\circ}$	3,9/ 77 $^{\circ}$	0,60/ $-25,0^{\circ}$	13,8
	1200	0,08/ $+108,0^{\circ}$	0,10/76 $^{\circ}$	3,3/ 72 $^{\circ}$	0,58/ $-28,0^{\circ}$	12,2

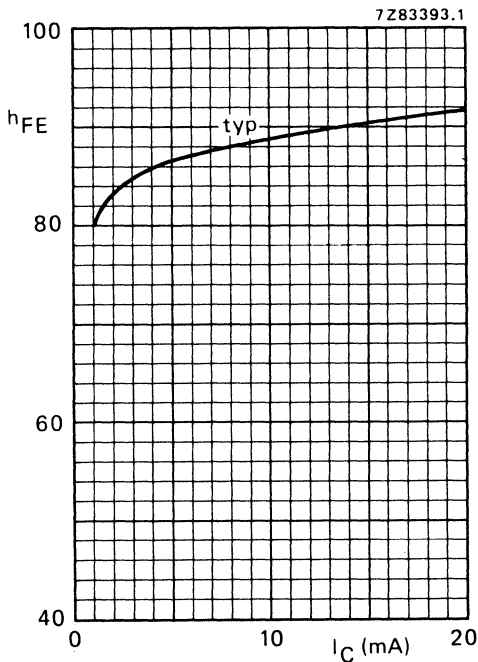


Fig. 4 $V_{CE} = 10$ V; $T_j = 25$ °C; typ. values.

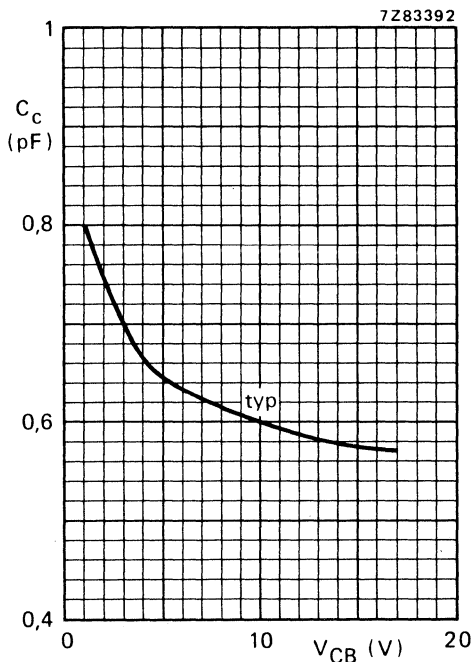


Fig. 5 $I_E = I_e = 0$; $f = 1$ MHz; $T_j = 25$ °C; typ. values.

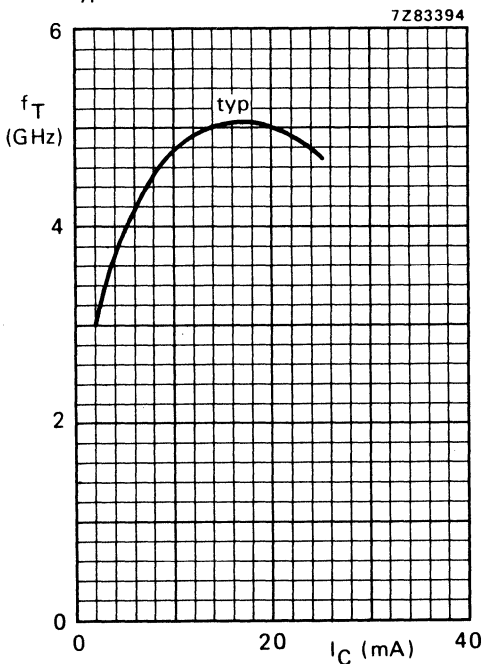


Fig. 6 $V_{CE} = 10$ V; $f = 500$ MHz; $T_j = 25$ °C; typical values.

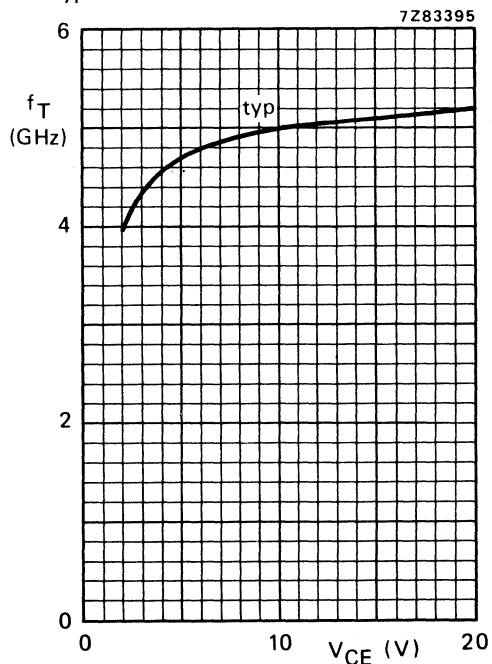


Fig. 7 $I_C = 14$ mA; $f = 500$ MHz; $T_j = 25$ °C; typical values.

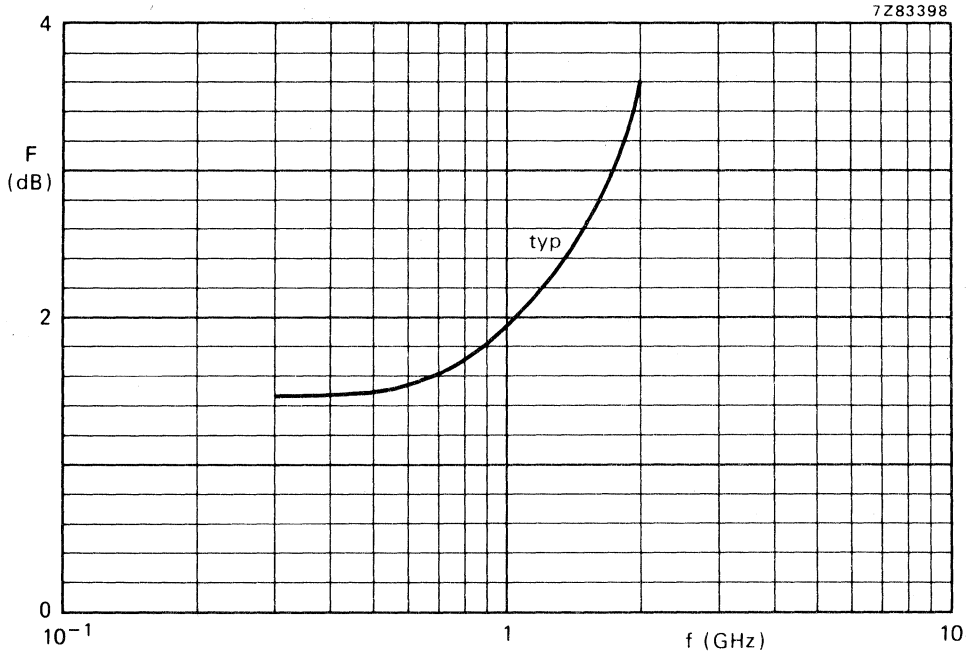


Fig. 8 $V_{CE} = 10\text{ V}$; $I_C = 4\text{ mA}$; $Z_S = \text{optimum}$; $T_{amb} = 25\text{ }^\circ\text{C}$; typical values.

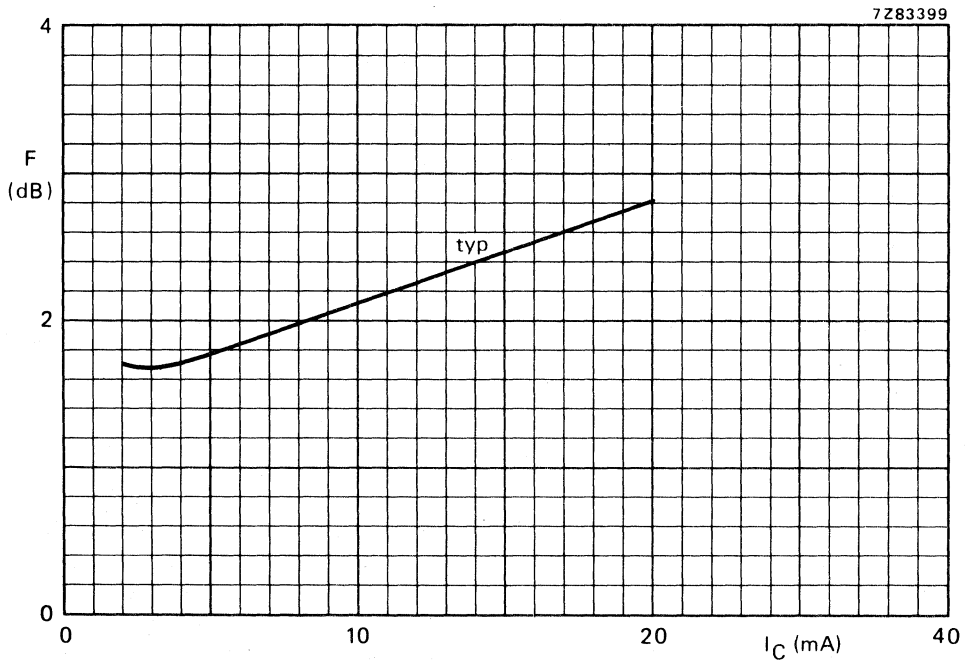


Fig. 9 $V_{CE} = 10\text{ V}$; $f = 800\text{ MHz}$; $Z_S = \text{optimum}$; $T_{amb} = 25\text{ }^\circ\text{C}$; typical values.

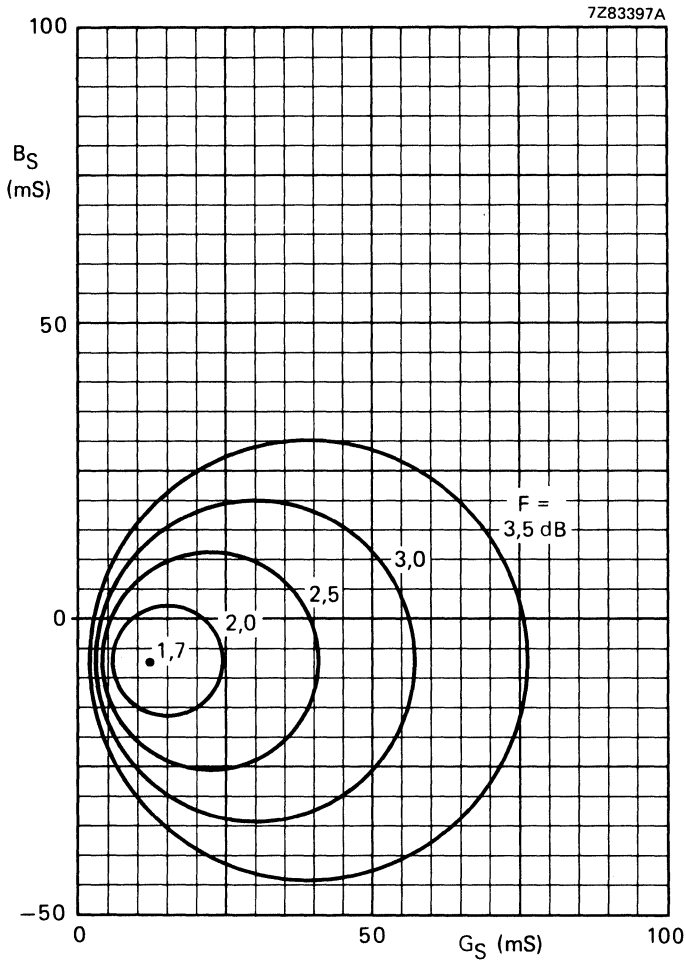


Fig. 10 Circles of constant noise figure.
 $V_{CE} = 10 \text{ V}$; $I_C = 4 \text{ mA}$; $f = 800 \text{ MHz}$; $T_{amb} = 25 \text{ }^\circ\text{C}$;
typical values.

Conditions for Figs 11 and 12:

$V_{CE} = 10 \text{ V}$; $I_C = 14 \text{ mA}$;
 $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

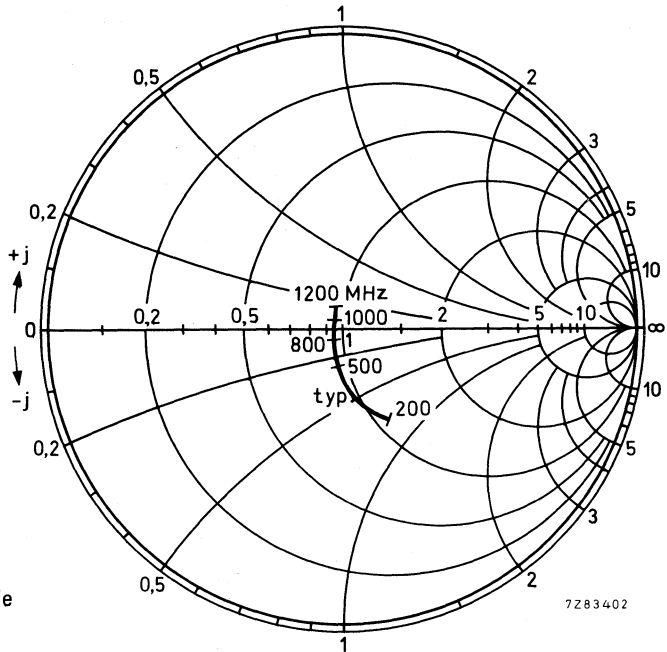


Fig. 11 Input impedance derived from input reflection coefficient s_{ie} co-ordinates in ohm x 50.

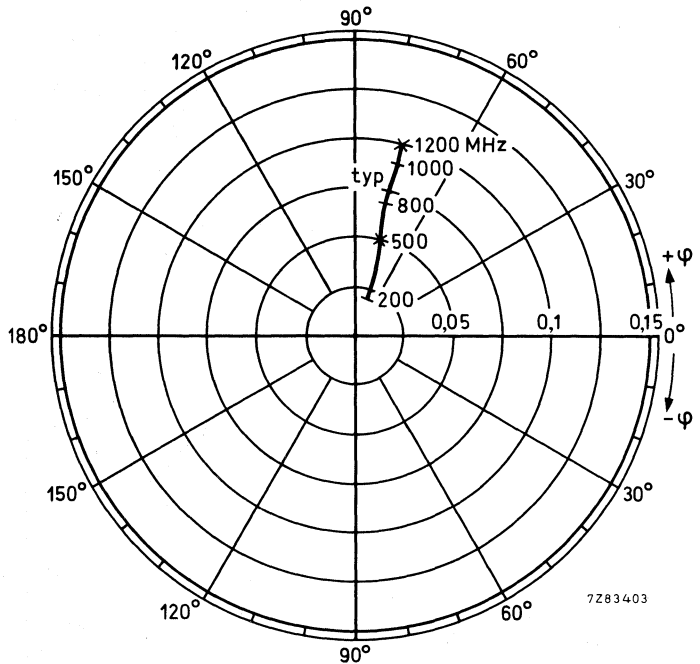


Fig. 12 Reverse transmission coefficient s_{re} .

Conditions for Figs 13 and 14:
 $V_{CE} = 10\text{ V}$; $I_C = 14\text{ mA}$;
 $T_{amb} = 25\text{ }^\circ\text{C}$; typical values.

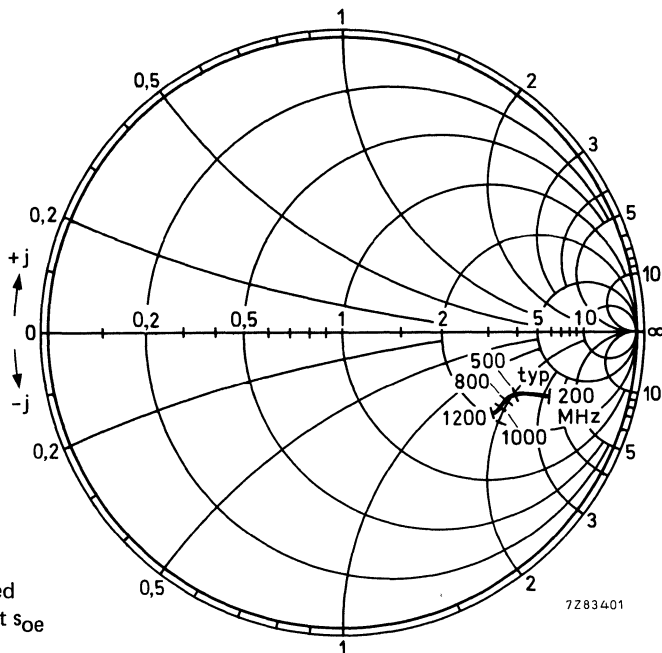


Fig. 13 Output impedance derived from output reflection coefficient s_{oe} co-ordinates in ohm $\times 50$.

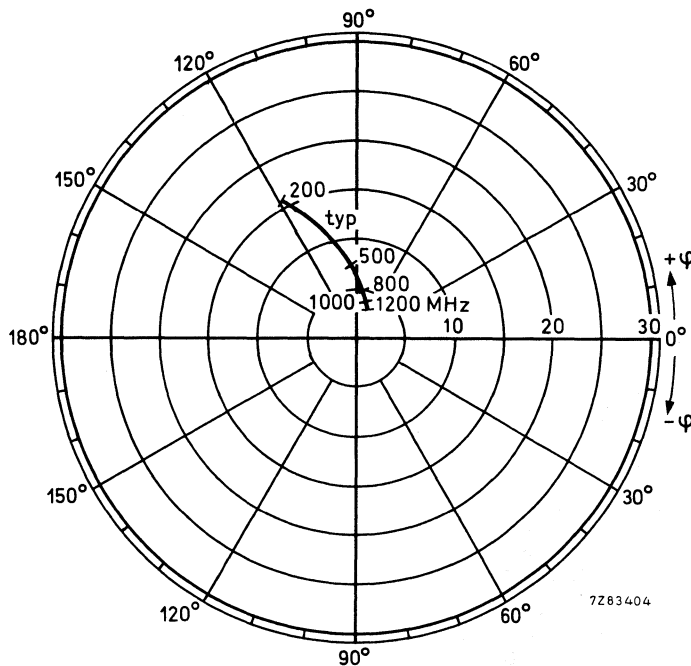


Fig. 14 Forward transmission coefficient s_{fe} .

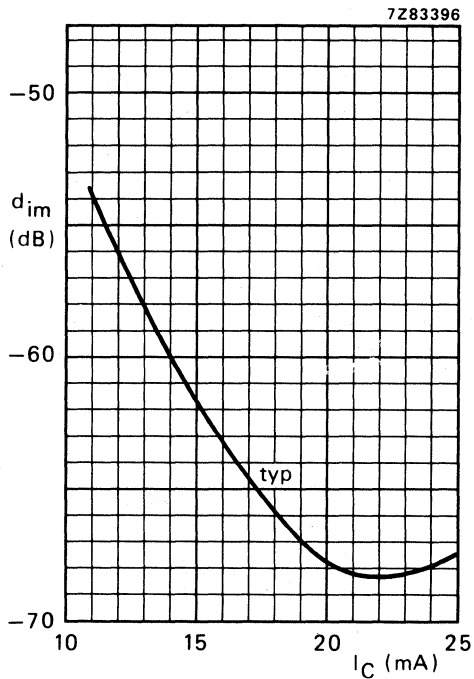


Fig. 15.

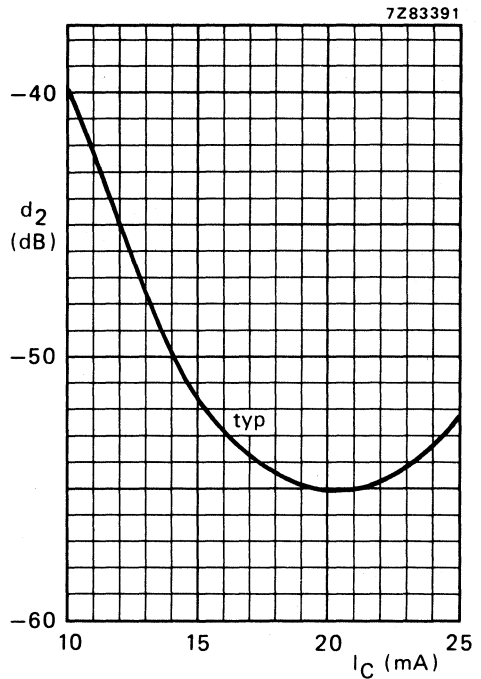


Fig. 16.

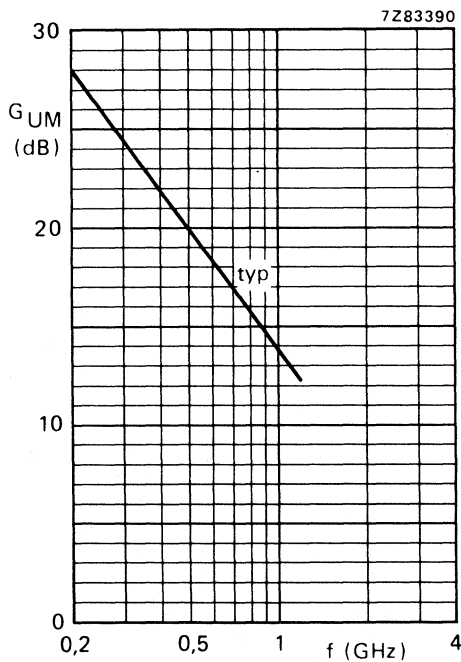


Fig. 17 $V_{CE} = 10$ V; $I_C = 14$ mA; $T_{amb} = 25$ °C; typical values.

Fig. 15 $V_{CE} = 10$ V; $V_O = 43,5$ dBmV = 150 mV; $f_{(p+q-r)} = 793,25$ MHz; $T_{amb} = 25$ °C; typ. values, measured in test circuit (see Fig. 3).

Fig. 16 $V_{CE} = 10$ V; $V_O = 60$ mV; $f_{(p+q)} = 810$ MHz; $T_{amb} = 25$ °C; measured in test circuit (see Fig. 3); typical values.

CLASS-B OPERATION

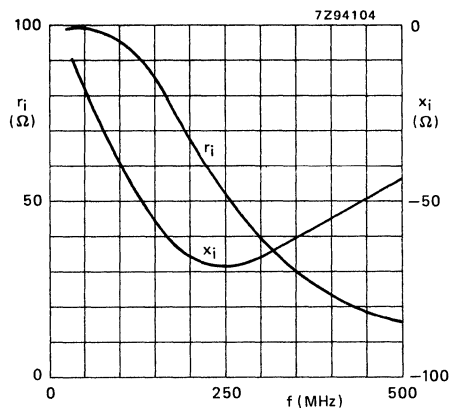


Fig. 18 Input impedance (series components).

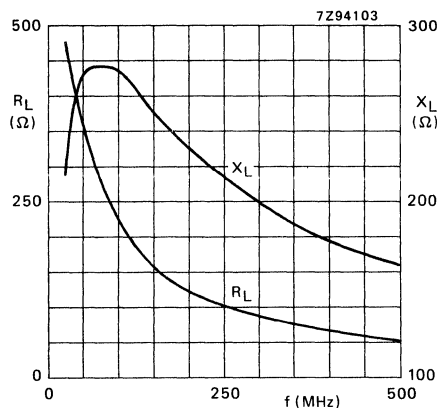


Fig. 19 Load impedance (series components).

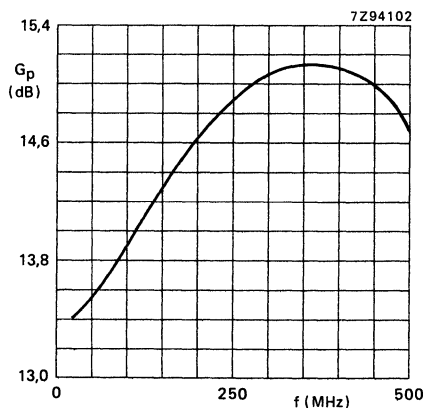


Fig. 20 Power gain versus frequency.

Conditions for Figs 18 to 20:

$V_{CE} = 10 \text{ V}$; $P_L = 100 \text{ mW}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

OPERATING NOTE for Figs 18 to 20:

A base-emitter resistor of $100 \text{ } \Omega$ is recommended to avoid oscillation. This resistor must be effective for r.f. only.

N-P-N 1 GHz WIDEBAND TRANSISTOR

N-P-N transistor in a plastic SOT-37 envelope. It is primarily intended for use in u.h.f. and microwave amplifiers such as in aerial amplifiers, radar systems, oscilloscopes, spectrum analysers etc.

The transistor features very low intermodulation distortion and high power gain; thanks to its very high transition frequency, it also has excellent wideband properties and low noise up to high frequencies.

P-N-P complement is BFQ23.

QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	15 V
Collector-emitter voltage (open base)	V_{CEO}	max.	12 V
Collector current (d.c.)	I_C	max.	35 mA
Total power dissipation up to $T_{amb} = 60\text{ }^\circ\text{C}$	P_{tot}	max.	180 mW
Junction temperature	T_j	max.	150 $^\circ\text{C}$
Transition frequency at $f = 500\text{ MHz}$ $I_C = 30\text{ mA}; V_{CE} = 5\text{ V}$	f_T	typ.	5,0 GHz
Feedback capacitance at $f = 1\text{ MHz}$ $I_C = 0; V_{CE} = 5\text{ V}$	C_{re}	typ.	0,8 pF
Noise figure at optimum source impedance $I_C = 2\text{ mA}; V_{CE} = 5\text{ V}; f = 500\text{ MHz}$	F	typ.	1,9 dB
Max. unilateral power gain $I_C = 30\text{ mA}; V_{CE} = 5\text{ V}; f = 500\text{ MHz}$	GUM	typ.	18,0 dB
Output voltage at $d_{im} = -60\text{ dB}$ $I_C = 30\text{ mA}; V_{CE} = 5\text{ V}; R_L = 75\text{ }\Omega;$ $f_{(p+q-r)} = 493,25\text{ MHz}$	V_o	typ.	300 mV

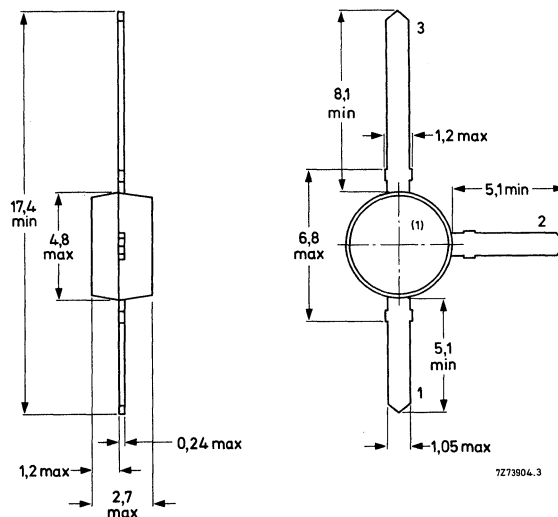
MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-37.

Connections

1. Base
2. Emitter
3. Collector



(1) = type number marking.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	15 V
Collector-emitter voltage (open base)	V_{CEO}	max.	12 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2 V
Collector current (d.c.)	I_C	max.	35 mA
Total power dissipation up to $T_{amb} = 60\text{ }^\circ\text{C}$	P_{tot}	max.	180 mW
Storage temperature	T_{stg}		-65 to +150 $^\circ\text{C}$
Junction temperature	T_j	max.	150 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to ambient in free air and mounted on a glass-fibre print of 40 mm x 25 mm x 1 mm

$$R_{th\ j-a} = 500\text{ K/W}$$

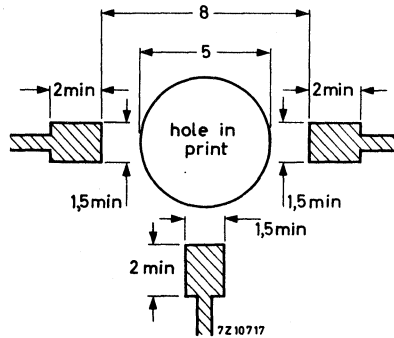


Fig. 2 Requirements for fibre-glass print. (Dimensions in mm)

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current

I_E = 0; V_{CB} = 5 V

I_{CBO} max. 50 nA

D.C. current gain

I_C = 30 mA; V_{CE} = 5 V

h_{FE} min. 40
typ. 90 ←

Transition frequency at f = 500 MHz

I_C = 30 mA; V_{CE} = 5 V

f_T typ. 5,0 GHz ←

Collector capacitance at f = 1 MHz

I_E = I_e = 0; V_{CB} = 10 V

C_c typ. 0,7 pF

Emitter capacitance at f = 1 MHz

I_C = I_c = 0; V_{EB} = 0,5 V

C_e typ. 2,5 pF

Feedback capacitance at f = 1 MHz

I_C = 0; V_{CE} = 5 V

C_{re} typ. 0,8 pF

Noise figure at optimum source impedance

I_C = 2 mA; V_{CE} = 5 V; f = 500 MHz; T_{amb} = 25 °C

F typ. 1,9 dB

Max. unilateral power gain (s_{re} assumed to be zero)

$$G_{UM} = 10 \log \frac{|s_{fe}|^2}{[1 - |s_{ie}|^2][1 - |s_{oe}|^2]}$$

I_C = 30 mA; V_{CE} = 5 V; f = 500 MHz; T_{amb} = 25 °C

G_{UM} typ. 18,0 dB ←

Output voltage at d_{im} = -60 dB

I_C = 30 mA; V_{CE} = 5 V;

R_L = 75 Ω; T_{amb} = 25 °C

V_p = V_o at d_{im} = -60 dB; f_p = 495,25 MHz

V_q = V_o -6 dB; f_q = 503,25 MHz

V_r = V_o -6 dB; f_r = 505,25 MHz

measured at f_(p+q-r) = 493,25 MHz

V_o typ. 300 mV

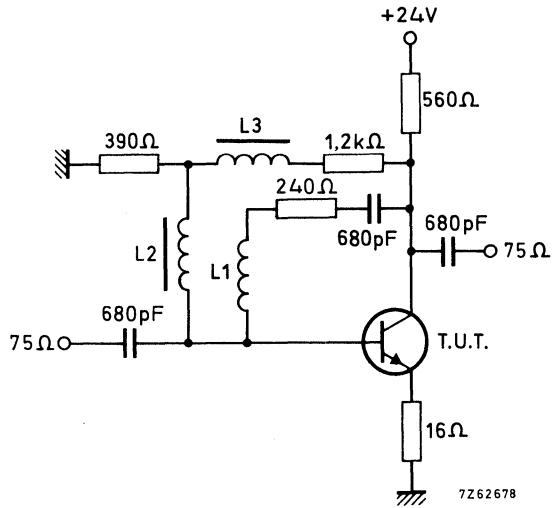


Fig. 3 Intermodulation test circuit.

L1 = 4 turns Cu wire (0,35 mm); winding pitch 1 mm; int. diam. 4 mm
 L2 and L3 5 μ H (code number: 3122 108 20150)

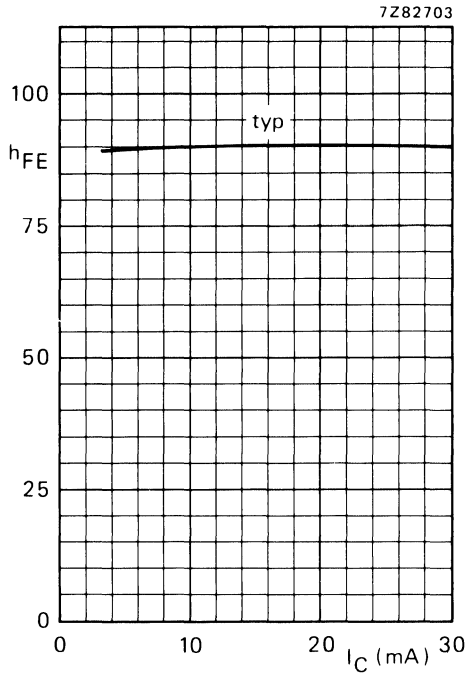


Fig. 4 $V_{CE} = 5\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$; typical values.

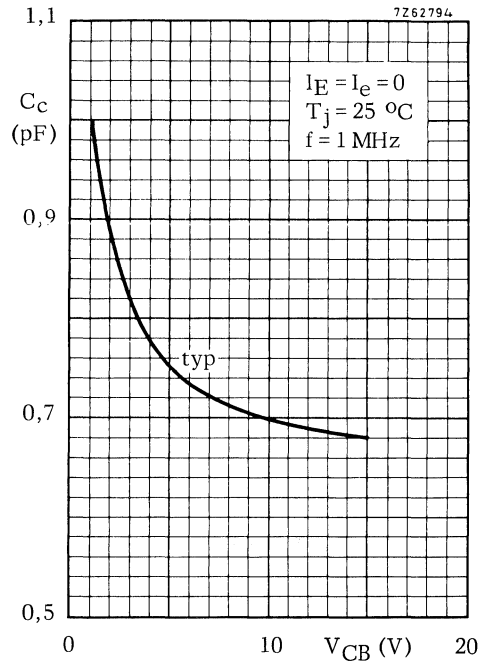


Fig. 5 $I_E = i_e = 0$; $T_j = 25\text{ }^\circ\text{C}$; $f = 1\text{ MHz}$; typical values.

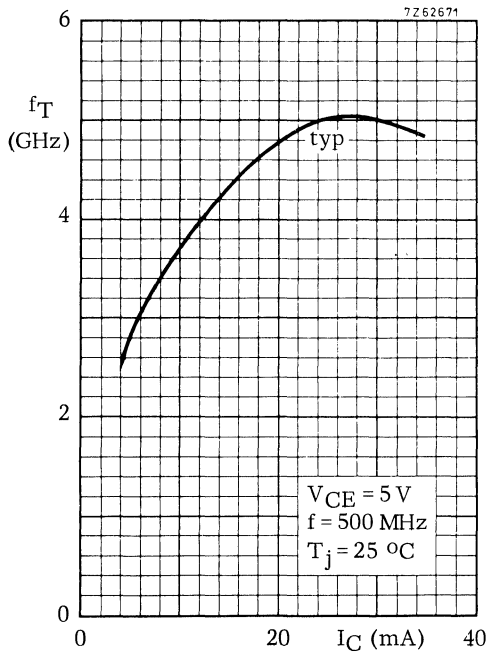


Fig. 6 $V_{CE} = 5\text{ V}$; $f = 500\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

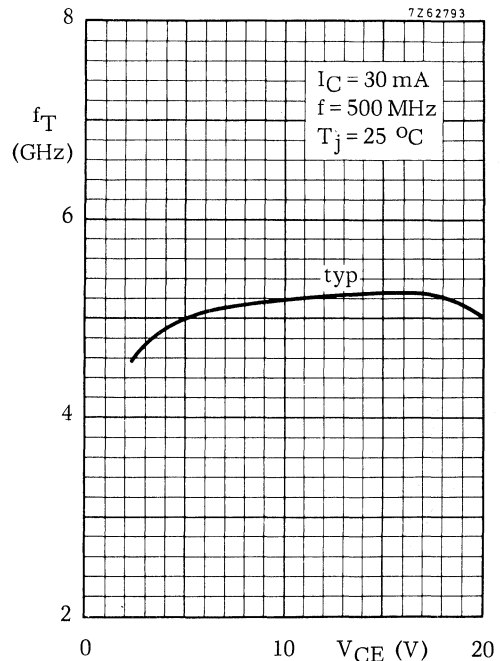


Fig. 7 $I_C = 30\text{ mA}$; $f = 300\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

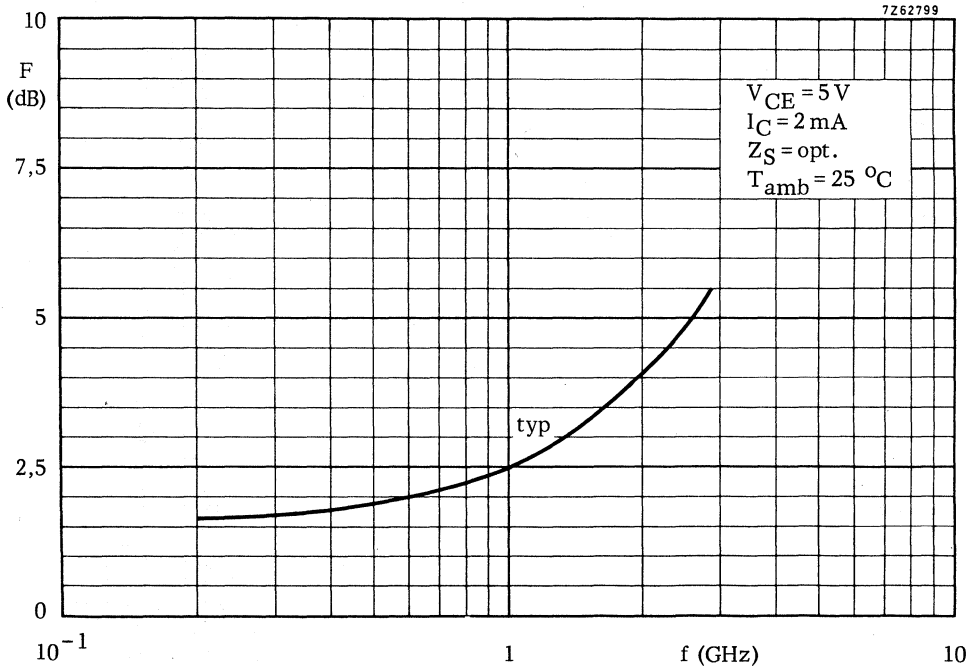


Fig. 8 $V_{CE} = 5\text{ V}$; $I_C = 2\text{ mA}$; $Z_S = \text{opt.}$; $T_{\text{amb}} = 25\text{ }^\circ\text{C}$; typical values.

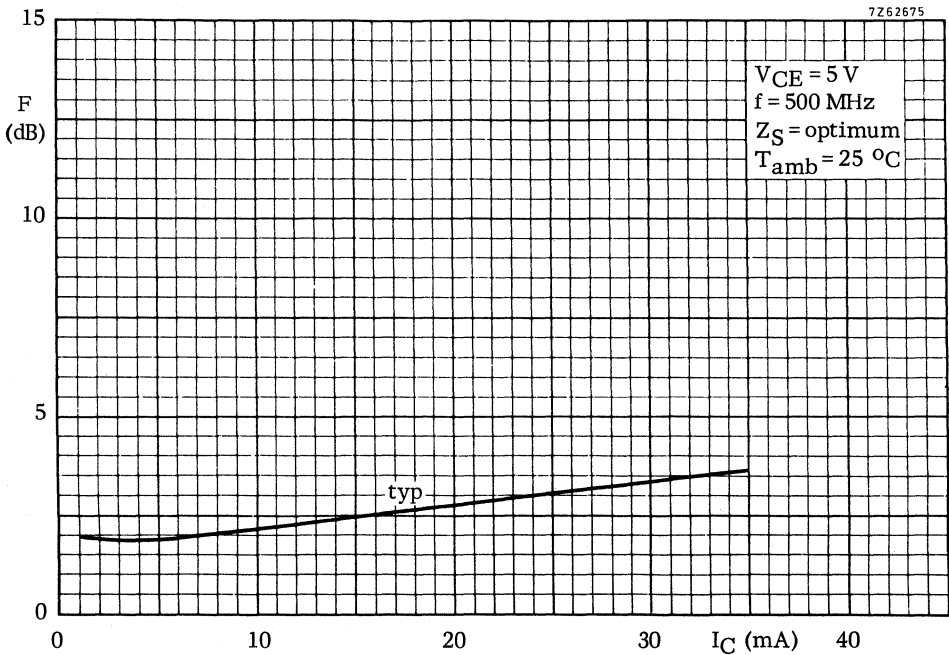


Fig. 9 $V_{CE} = 5\text{ V}$; $f = 500\text{ MHz}$; $Z_S = \text{opt.}$; $T_{\text{amb}} = 25\text{ }^\circ\text{C}$; typical values.

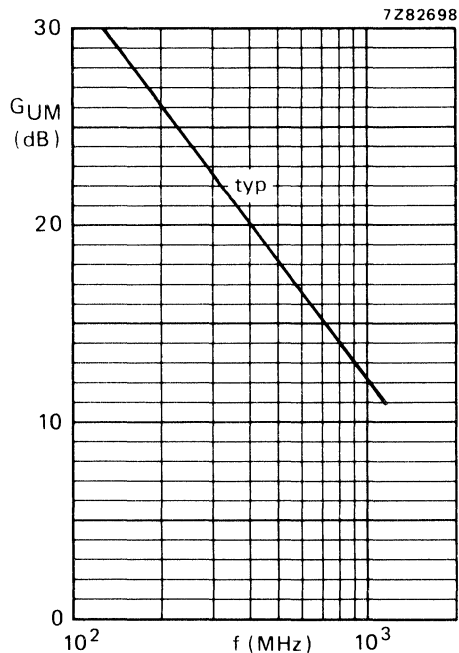


Fig. 10 $V_{CE} = 5\text{ V}$; $I_C = 30\text{ mA}$; $T_{amb} = 25\text{ }^\circ\text{C}$; typical values.

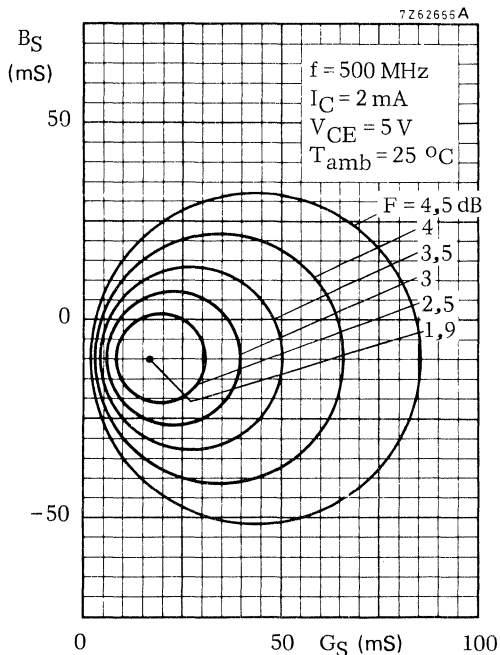


Fig. 11 Circles of constant noise figure; $V_{CE} = 5\text{ V}$; $I_C = 2\text{ mA}$; $f = 500\text{ MHz}$; $T_{amb} = 25\text{ }^\circ\text{C}$; typical values.

N-P-N 1 GHz WIDEBAND TRANSISTOR

N-P-N transistor in a plastic SOT-37 envelope primarily intended for use in u.h.f. and microwave amplifiers. P-N-P complement is BFQ23. ←

Features of this device:

- low noise;
- very low intermodulation distortion;
- high power gain;
- gold metallization.

QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CB0}	max.	15 V	
Collector-emitter voltage (open base)	V_{CEO}	max.	12 V	
Collector current (d.c.)	I_C	max.	35 mA	
Total power dissipation up to $T_{amb} = 60\text{ }^{\circ}\text{C}$	P_{tot}	max.	300 mW	
Junction temperature	T_j	max.	150 $^{\circ}\text{C}$	
Transition frequency at $f = 500\text{ MHz}$ $I_C = 30\text{ mA}; V_{CE} = 5\text{ V}$	f_T	typ.	6,0 GHz	
Feedback capacitance at $f = 1\text{ MHz}$ $I_C = 0; V_{CE} = 10\text{ V}$	C_{re}	typ.	0,6 pF	←
Noise figure at optimum source impedance $I_C = 4\text{ mA}; V_{CE} = 8\text{ V}; f = 800\text{ MHz}$	F	typ.	1,6 dB	
Maximum unilateral power gain $I_C = 30\text{ mA}; V_{CE} = 8\text{ V}; f = 800\text{ MHz}$	G_{UM}	typ.	14,0 dB	
Output voltage at $d_{im} = -60\text{ dB}$ (see Fig. 3) $I_C = 30\text{ mA}; V_{CE} = 8\text{ V}; R_L = 75\text{ }\Omega$ $f_{(p+q-r)} = 793,25\text{ MHz}$	V_o	typ.	425 mV	
Output power at 1 dB gain compression	P_{L1}	typ.	+ 17 dBm	
Third order intercept point	ITO	typ.	+ 36 dBm	

MECHANICAL DATA

SOT-37 (see Fig. 1).

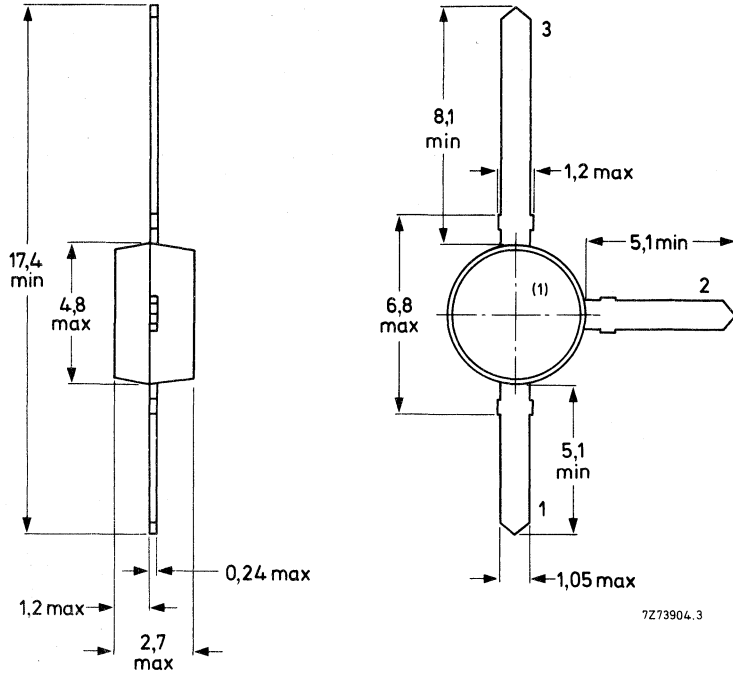
MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-37.

Connections

- 1. Base
- 2. Emitter
- 3. Collector



(1) = type number marking.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	15 V
Collector-emitter voltage (open base)	V_{CEO}	max.	12 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2 V
Collector current (d.c.)	I_C	max.	35 mA
Total power dissipation up to $T_{amb} = 60\text{ }^\circ\text{C}$	P_{tot}	max.	300 mW
Storage temperature	T_{stg}		-65 to + 150 $^\circ\text{C}$
Junction temperature	T_j	max.	150 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to ambient in free air
 mounted on a fibre-glass print (see Fig. 2)
 of 40 mm x 25 mm x 1 mm

$R_{thj-a} = 300\text{ K/W}$

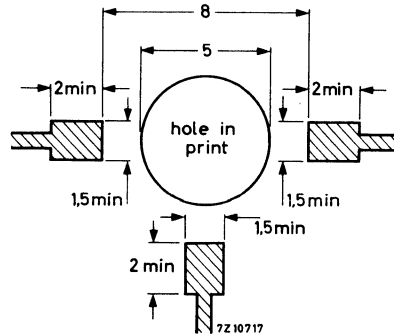


Fig. 2 Requirements for fibre-glass print. (Dimensions in mm.)

CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Collector cut-off current

$I_E = 0; V_{CB} = 5\text{ V}$

I_{CBO} max. 50 nA

D.C. current gain

$I_C = 30\text{ mA}; V_{CE} = 5\text{ V}$

h_{FE} min. 40
typ. 90 ←

Transition frequency at $f = 500\text{ MHz}$

$I_C = 30\text{ mA}; V_{CE} = 5\text{ V}$

f_T typ. 6,0 GHz ←

Collector capacitance at $f = 1\text{ MHz}$

$I_E = I_e = 0; V_{CB} = 10\text{ V}$

C_C typ. 0,9 pF ←

Emitter capacitance at $f = 1\text{ MHz}$

$I_C = I_c = 0; V_{EB} = 0,5\text{ V}$

C_e typ. 2,5 pF

Feedback capacitance at $f = 1\text{ MHz}$

$I_C = 0; V_{CE} = 10\text{ V}; T_{amb} = 25\text{ }^\circ\text{C}$

C_{re} typ. 0,6 pF ←

Noise figure at optimum source impedance

$I_C = 4\text{ mA}; V_{CE} = 8\text{ V}; f = 800\text{ MHz}; T_{amb} = 25\text{ }^\circ\text{C}$

$I_C = 30\text{ mA}; V_{CE} = 8\text{ V}; f = 800\text{ MHz}; T_{amb} = 25\text{ }^\circ\text{C}$

F typ. 1,6 dB ←

F typ. 2,3 dB ←

Maximum unilateral power gain (s_{re} assumed to be zero)

$$G_{UM} = 10 \log \frac{|s_{fe}|^2}{(1 - |s_{ie}|^2)(1 - |s_{oe}|^2)}$$

$I_C = 30\text{ mA}; V_{CE} = 8\text{ V}; f = 800\text{ MHz}; T_{amb} = 25\text{ }^\circ\text{C}$

G_{UM} typ. 14,0 dB

Output voltage at $d_{im} = -60$ dB (see Figs 3 and 14)

(DIN 45004B, par. 6.3: 3-tone)

$I_C = 30$ mA; $V_{CE} = 8$ V; $R_L = 75 \Omega$; $T_{amb} = 25$ °C

$V_p = V_o$ at $d_{im} = -60$ dB; $f_p = 795,25$ MHz

$V_q = V_o - 6$ dB ; $f_q = 803,25$ MHz

$V_r = V_o - 6$ dB ; $f_r = 805,25$ MHz

Measured at $f_{(p+q-r)} = 793,25$ MHz

V_o typ. 425 mV

Output voltage at $d_2 = -50$ dB (see Figs 3 and 15)

$I_C = 30$ mA; $V_{CE} = 8$ V; $R_L = 75 \Omega$; $T_{amb} = 25$ °C

$V_p = V_o$ at $d_2 = -50$ dB; $f_p = 250$ MHz

$V_q = V_o$ at $d_2 = -50$ dB; $f_q = 560$ MHz

measured at $f_{(p+q)} = 810$ MHz

V_o typ. 200 mV

Output power at 1 dB gain compression (see Fig. 3)

$I_C = 30$ mA; $V_{CE} = 8$ V

$R_L = 75 \Omega$; $T_{amb} = 25$ °C

measured at $f = 800$ MHz

PL_1 typ. +17 dBm

Third order intercept point (see Fig. 3)

$I_C = 30$ mA; $V_{CE} = 8$ V

$R_L = 75 \Omega$; $T_{amb} = 25$ °C

$P_p = ITO - 6$ dB; $f_p = 800$ MHz

$P_q = ITO - 6$ dB; $f_q = 801$ MHz

measured at $f_{(2q-p)} = 802$ MHz and

at $f_{(2p-q)} = 799$ MHz

ITO typ. +36 dBm

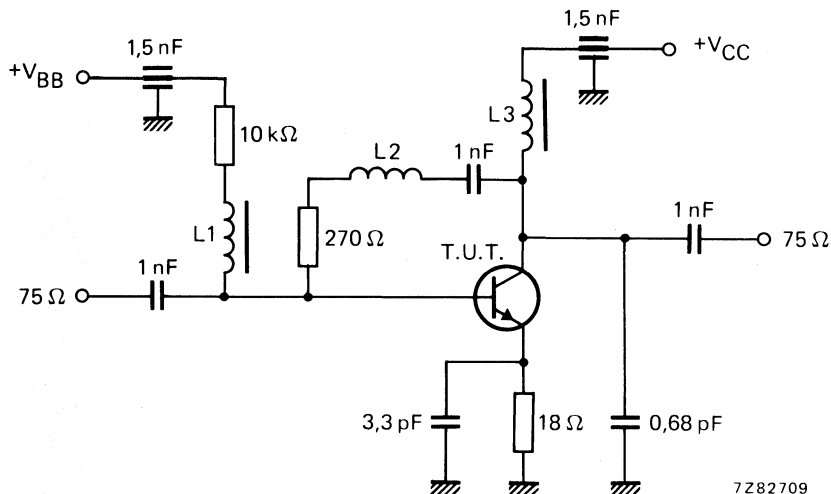


Fig. 3 Intermodulation distortion and second harmonic distortion test circuit.

$L1 = L3 = 5 \mu$ H micro choke

$L2 = 3$ turns Cu wire (0,4 mm); internal diameter 3 mm; winding pitch 1 mm

s-parameters (common emitter) at $V_{CE} = 8\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$; typical values.

The figures given in the tables below can also be used for operation at $V_{CE} = 5\text{ V}$. Only slight differences for the s-parameters may occur.

I_C mA	f MHz	S_{ie}	S_{re}	S_{fe}	S_{oe}	G_{UM} dB
2	40	0,89/ -12,9 ^o	0,01/75 ^o	9,5/166 ^o	0,97/ -6,1 ^o	38,7
	100	0,85/ -30,7 ^o	0,03/70,6 ^o	8,7/155 ^o	0,94/-13,5 ^o	33,7
	200	0,75/ -57,1 ^o	0,05/61,5 ^o	7,4/138 ^o	0,87/-22,5 ^o	27,1
	500	0,48/-113 ^o	0,08/50,9 ^o	4,4/106 ^o	0,72/-34,2 ^o	17,2
	800	0,37/-153 ^o	0,09/51,9 ^o	3,0/ 86,3 ^o	0,64/-40,0 ^o	12,5
	1000	0,34/-178 ^o	0,10/55,0 ^o	2,6/ 77,0 ^o	0,61/-47,8 ^o	10,9
	1200	0,34/+ 159 ^o	0,11/58,5 ^o	2,2/ 68,0 ^o	0,58/-53,9 ^o	9,2
5	40	0,79/ -18,4 ^o	0,01/74 ^o	17,8/162 ^o	0,94/ -9,1 ^o	38,6
	100	0,71/ -42,1 ^o	0,03/67,1 ^o	15,2/146 ^o	0,87/-19,5 ^o	32,8
	200	0,57/ -72,8 ^o	0,04/60,0 ^o	11,5/126 ^o	0,75/-28,7 ^o	26,5
	500	0,31/-127 ^o	0,07/60,1 ^o	5,8/ 98,2 ^o	0,59/-36,1 ^o	17,6
	800	0,25/-168 ^o	0,09/63,6 ^o	3,8/ 82,0 ^o	0,54/-41,0 ^o	13,4
	1000	0,25/+ 165 ^o	0,11/65,2 ^o	3,2/ 74,4 ^o	0,51/-46,7 ^o	11,7
	1200	0,26/+ 141 ^o	0,13/66,1 ^o	2,7/ 66,7 ^o	0,49/-52,2 ^o	10,1
10	40	0,67/ -25,3 ^o	0,01/71 ^o	27,9/156 ^o	0,90/-12,8 ^o	38,7
	100	0,55/ -55,1 ^o	0,02/65,1 ^o	21,8/136 ^o	0,78/-25,6 ^o	32,4
	200	0,40/ -88,2 ^o	0,04/62,4 ^o	14,7/116 ^o	0,62/-33,4 ^o	26,2
	500	0,20/-141 ^o	0,06/68,3 ^o	6,7/ 93,0 ^o	0,51/-35,9 ^o	18,0
	800	0,16/+ 177 ^o	0,09/70,0 ^o	4,3/ 79,3 ^o	0,48/-40,3 ^o	13,9
	1000	0,18/+ 151 ^o	0,12/69,7 ^o	3,5/ 72,5 ^o	0,46/-44,2 ^o	12,1
	1200	0,21/+ 130 ^o	0,14/68,9 ^o	3,0/ 65,1 ^o	0,43/-50,7 ^o	10,6
20	40	0,51/ -34,7 ^o	0,01/69 ^o	39,7/149 ^o	0,84/-17,4 ^o	38,6
	100	0,38/ -70,5 ^o	0,02/65,8 ^o	27,7/126 ^o	0,66/-29,5 ^o	32,0
	200	0,26/-104 ^o	0,03/68,0 ^o	16,8/109 ^o	0,51/-32,5 ^o	26,1
	500	0,16/-158 ^o	0,06/74,0 ^o	7,3/ 89,3 ^o	0,45/-33,4 ^o	18,4
	800	0,14/+ 155 ^o	0,10/73,6 ^o	4,6/ 77,5 ^o	0,42/-39,1 ^o	14,2
	1000	0,17/+ 133 ^o	0,12/72,3 ^o	3,8/ 71,2 ^o	0,41/-43,6 ^o	12,5
	1200	0,21/+ 115 ^o	0,14/70,5 ^o	3,2/ 64,4 ^o	0,39/-51,0 ^o	11,0
30	40	0,46/ -36,5 ^o	0,01/73 ^o	43,3/150 ^o	0,87/-16,9 ^o	39,9
	100	0,32/ -73,7 ^o	0,02/69,2 ^o	29,1/124 ^o	0,66/-27,2 ^o	32,2
	200	0,20/-109 ^o	0,03/72,0 ^o	17,1/106 ^o	0,50/-28,1 ^o	26,1
	500	0,14/-174 ^o	0,06/75,6 ^o	7,4/ 87,2 ^o	0,41/-31,7 ^o	18,3
	800	0,15/+ 143 ^o	0,10/74,7 ^o	4,8/ 74,9 ^o	0,39/-41,0 ^o	14,0
	1000	0,16/+ 124 ^o	0,12/72,9 ^o	3,9/ 70,5 ^o	0,38/-42,8 ^o	12,6
	1200	0,21/+ 111 ^o	0,15/71,0 ^o	3,3/ 63,8 ^o	0,37/-51,0 ^o	11,2

Conditions for Figs 4 and 5:
 $V_{CE} = 8 \text{ V}$; $I_C = 30 \text{ mA}$;
 $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

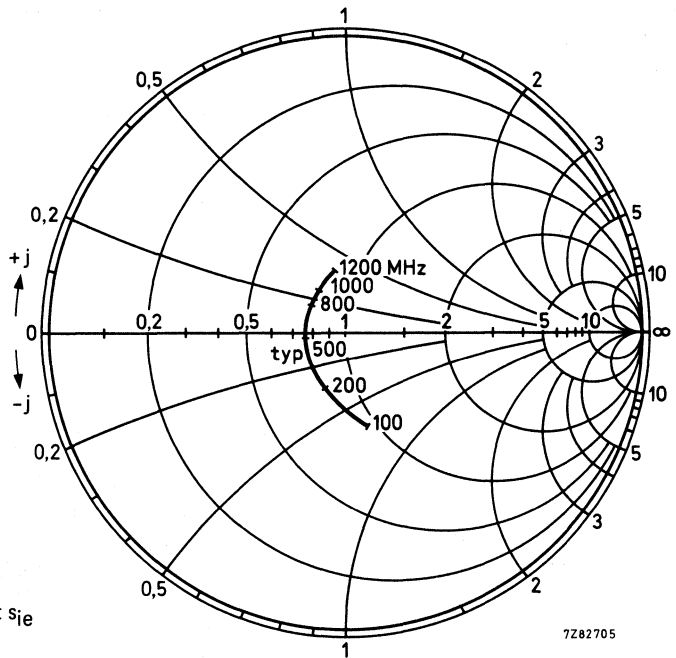


Fig. 4 Input impedance derived from input reflection coefficient s_{ie} co-ordinates in ohm x 50.

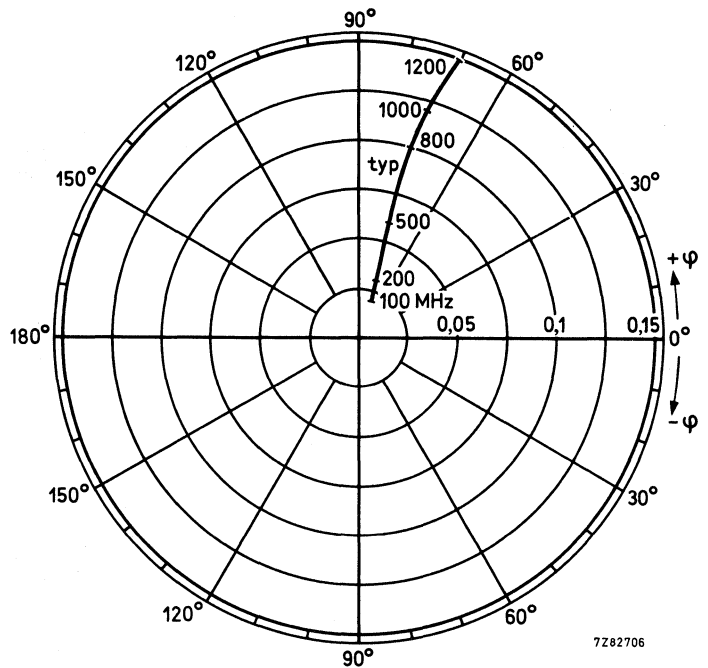


Fig. 5 Reverse transmission coefficient s_{re} .

Conditions for Figs 6 and 7:
 $V_{CE} = 8 \text{ V}$; $I_C = 30 \text{ mA}$;
 $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

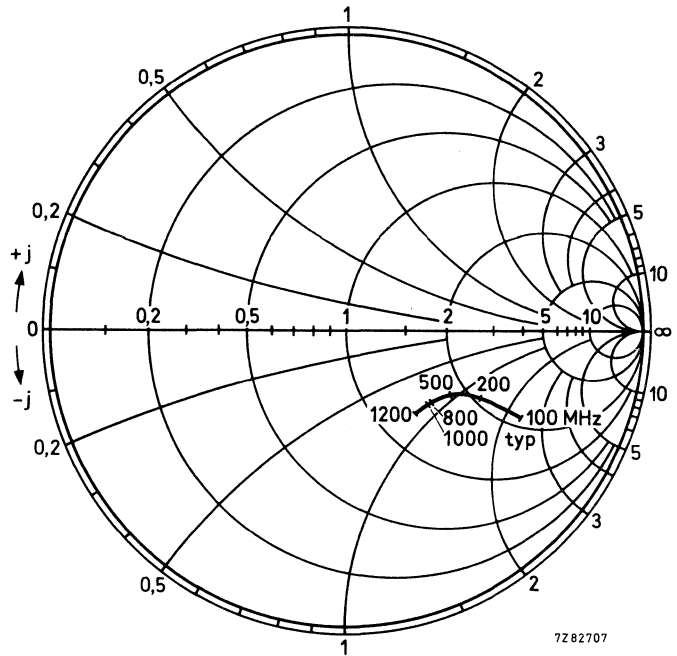


Fig. 6 Output impedance derived from output reflection coefficient s_{oe} co-ordinates in ohm x 50.

7282707

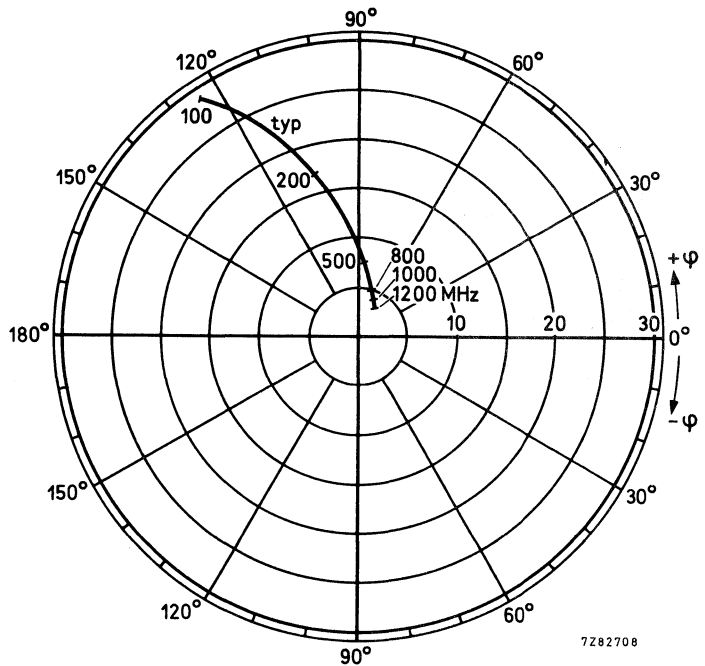


Fig. 7 Forward transmission coefficient s_{fe} .

7282708

7Z82703

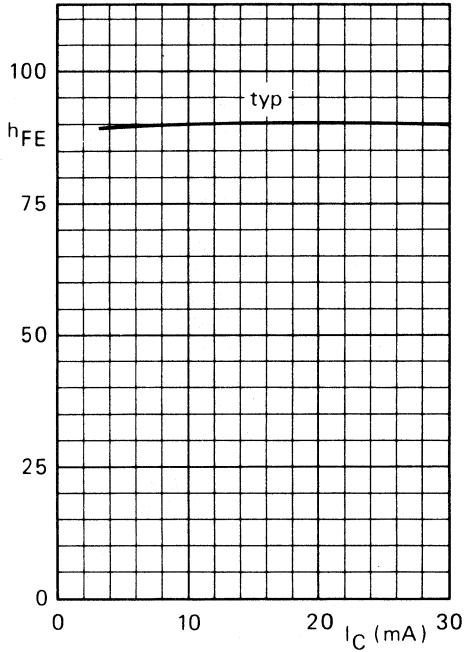


Fig. 8 $V_{CE} = 5\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$; typ. values.

7Z82702

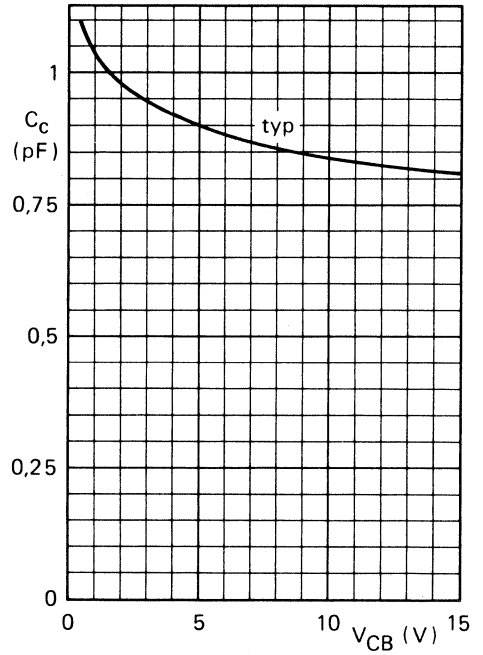


Fig. 9 $I_E = I_e = 0$; $f = 1\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$; typical values.

7Z82701

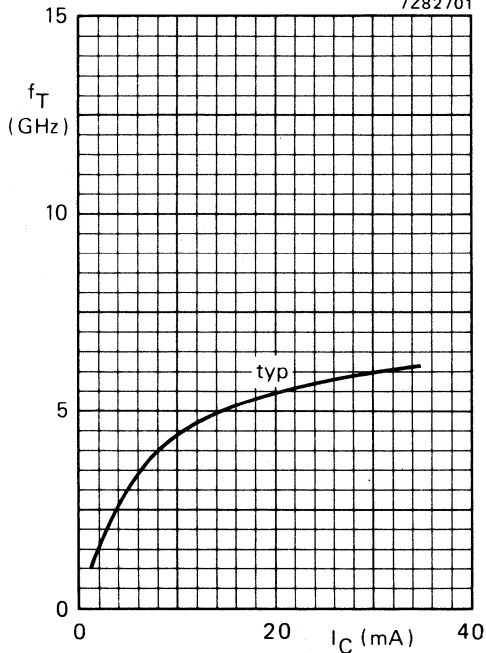


Fig. 10 $V_{CE} = 5\text{ V}$; $f = 500\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$; typical values.

7Z82700

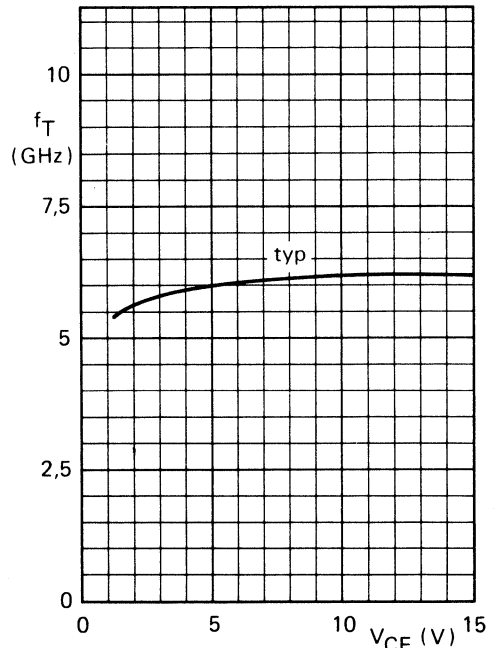


Fig. 11 $I_C = 30\text{ mA}$; $f = 500\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$; typical values.

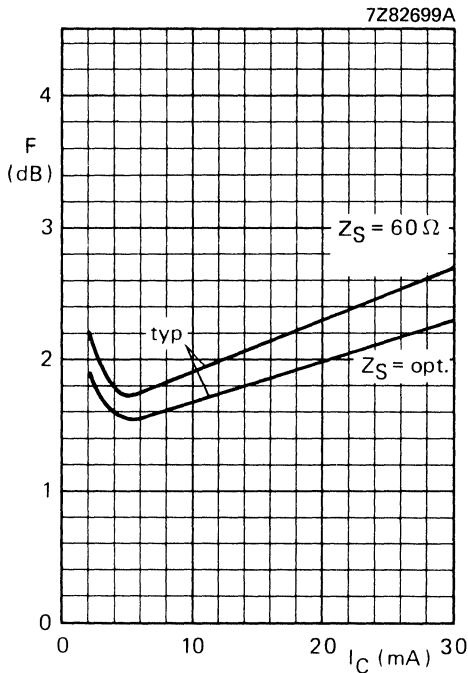


Fig. 12 $V_{CE} = 8 \text{ V}$; $f = 800 \text{ MHz}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; typ. values.

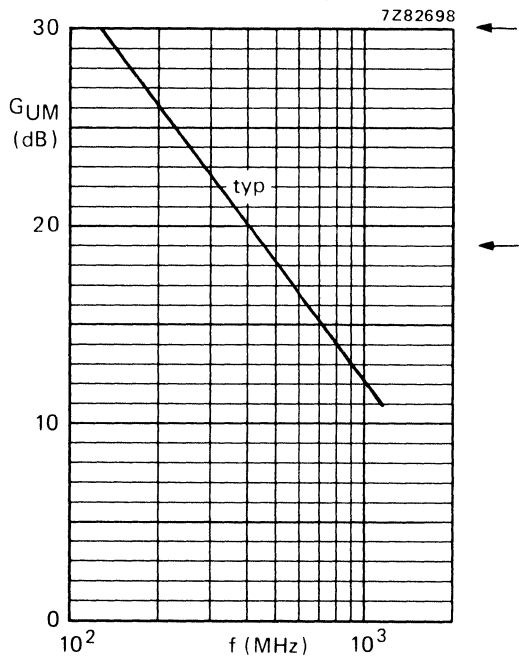


Fig. 13 $V_{CE} = 8 \text{ V}$; $I_C = 30 \text{ mA}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; typ. values.

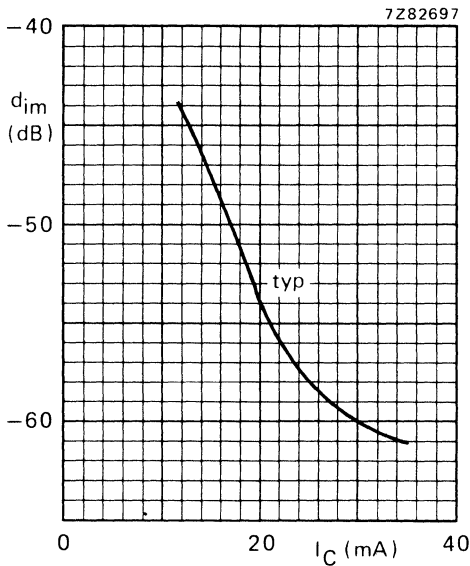


Fig. 14 $V_{CE} = 8 \text{ V}$; $V_o = 425 \text{ mV} = 52,6 \text{ dBmV}$; $f_{(p+q-r)} = 793,25 \text{ MHz}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; measured in test circuit (see Fig. 3); typical values.

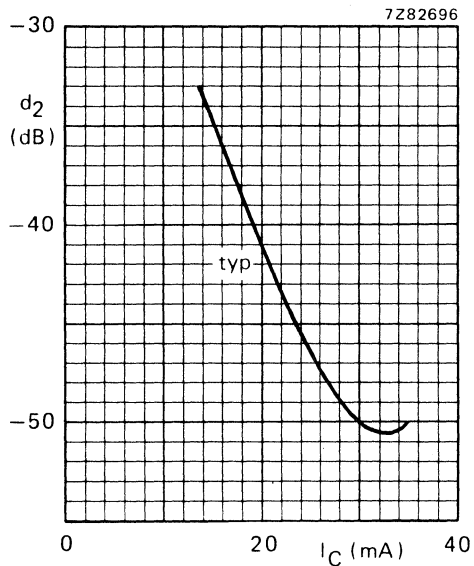


Fig. 15 $V_{CE} = 8 \text{ V}$; $V_o = 200 \text{ mV} = 46 \text{ dBmV}$; $f_{(p+q)} = 810 \text{ MHz}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; measured in test circuit (see Fig. 3); typical values.

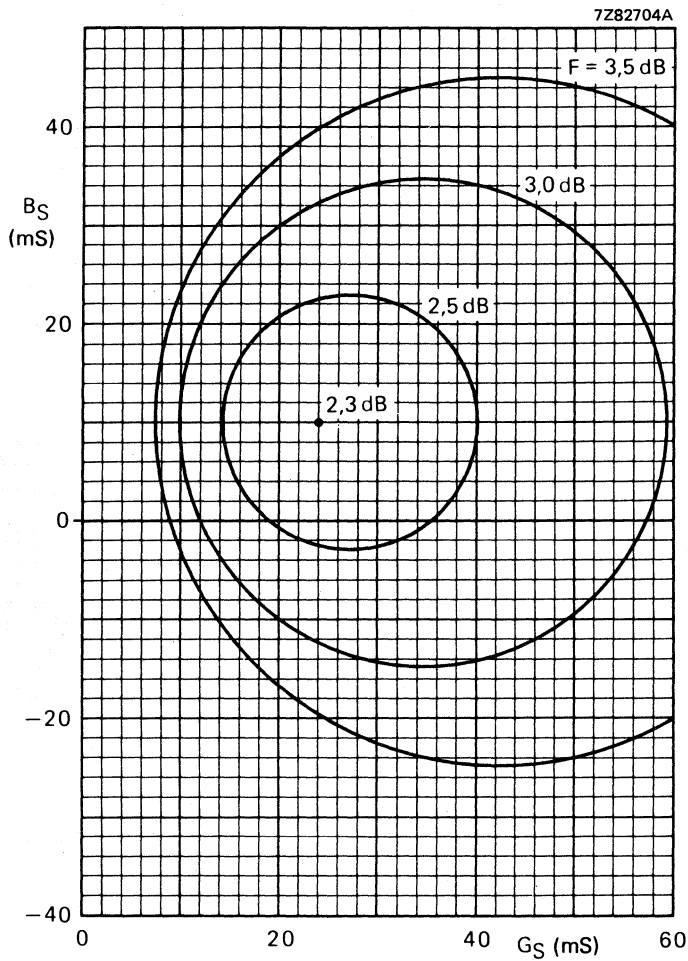


Fig. 16 Circles of constant noise figure.
 $V_{CE} = 8 \text{ V}$; $I_C = 30 \text{ mA}$; $f = 800 \text{ MHz}$;
 $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

CLASS-B OPERATION

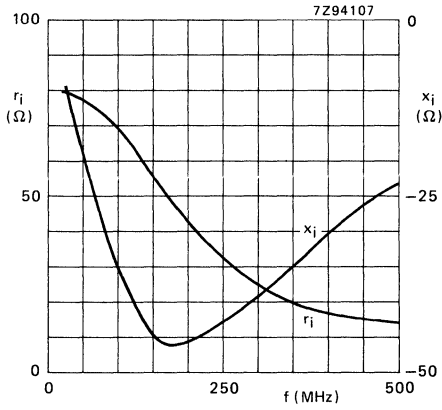


Fig. 17 Input impedance (series components).

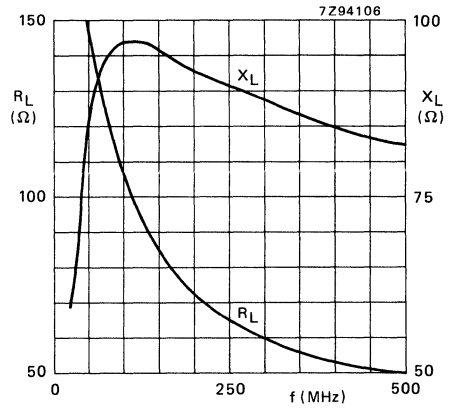


Fig. 18 Load impedance (series components).

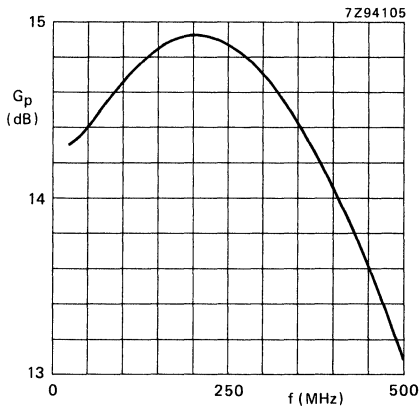


Fig. 19 Power gain versus frequency.

Conditions for Figs 17 to 19:

$V_{CE} = 7,5 \text{ V}$; $P_L = 160 \text{ mW}$; $T_{amb} = 25 \text{ }^\circ\text{C}$;
typical values.

OPERATING NOTE for Figs 17 to 19:

A base-emitter resistor of $82 \text{ } \Omega$ is recommended to avoid oscillation. This resistor must be effective for r.f. only.

N-P-N 1 GHz WIDEBAND TRANSISTOR

N-P-N transistor in a plastic SOT-23 envelope. It is primarily intended for use in u.h.f. and microwave amplifiers in thick and thin-film circuits, such as in aerial amplifiers, radar systems, oscilloscopes, spectrum analysers etc. The transistor features low intermodulation distortion and high power gain; thanks to its very high transition frequency, it also has excellent wideband properties and low noise up to high frequencies.

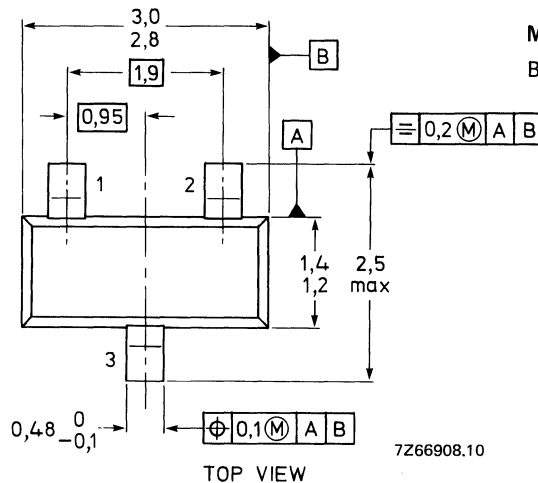
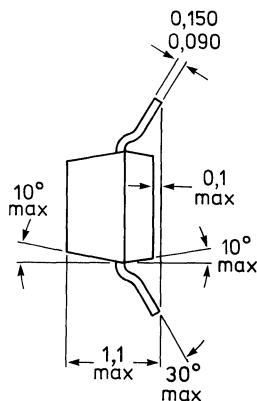
P-N-P complement is BFT92.

QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	20 V
Collector-emitter voltage (open base)	V_{CEO}	max.	15 V
Collector current (d.c.)	I_C	max.	25 mA
Total power dissipation up to $T_{amb} = 60\text{ }^\circ\text{C}$	P_{tot}	max.	200 mW
Junction temperature	T_j	max.	150 $^\circ\text{C}$
Transition frequency at $f = 500\text{ MHz}$ $I_C = 14\text{ mA}$; $V_{CE} = 10\text{ V}$	f_T	typ.	5,0 GHz
Feedback capacitance at $f = 1\text{ MHz}$ $I_C = 2\text{ mA}$; $V_{CE} = 10\text{ V}$	C_{re}	typ.	0,4 pF
Noise figure at optimum source impedance $I_C = 2\text{ mA}$; $V_{CE} = 10\text{ V}$; $f = 500\text{ MHz}$	F	typ.	2,4 dB
Max. unilateral power gain $I_C = 14\text{ mA}$; $V_{CE} = 10\text{ V}$; $f = 500\text{ MHz}$	GUM	typ.	18,0 dB
Output voltage at $d_{im} = -60\text{ dB}$ (see Fig. 2) $I_C = 14\text{ mA}$; $V_{CE} = 10\text{ V}$; $R_L = 75\text{ }\Omega$; $T_{amb} = 25\text{ }^\circ\text{C}$ $f_{(p+q-r)} = 493,25\text{ MHz}$	V_o	typ.	150 mV

MECHANICAL DATA

Fig. 1 SOT-23.



If required, the R-version (reverse pinning) is available on request.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	20 V
Collector-emitter voltage (open base)	V_{CEO}	max.	15 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2 V
Collector current (d.c.)	I_C	max.	25 mA
Total power dissipation up to $T_{amb} = 60\text{ }^\circ\text{C}^{**}$	P_{tot}	max.	200 mW
Storage temperature	T_{stg}		-65 to +150 $^\circ\text{C}$
Junction temperature	T_j	max.	150 $^\circ\text{C}$

THERMAL RESISTANCE*

From junction to ambient**	$R_{th\ j-a}$	=	430 K/W
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CHARACTERISTICS $T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Collector cut-off current $I_E = 0; V_{CB} = 10\text{ V}$	I_{CBO}	max.	50 nA
→ D.C. current gain $I_C = 14\text{ mA}; V_{CE} = 10\text{ V}$	h_{FE}	min. typ.	25 50
→ Transition frequency at $f = 500\text{ MHz}$ $I_C = 14\text{ mA}; V_{CE} = 10\text{ V}$	f_T	typ.	5,0 GHz
Collector capacitance at $f = 1\text{ MHz}$ $I_E = I_e = 0; V_{CB} = 10\text{ V}$	C_c	typ.	0,75 pF
Emitter capacitance at $f = 1\text{ MHz}$ $I_C = I_c = 0; V_{EB} = 0,5\text{ V}$	C_e	typ.	0,8 pF
→ Feedback capacitance at $f = 1\text{ MHz}$ $I_C = 2\text{ mA}; V_{CE} = 10\text{ V}; T_{amb} = 25\text{ }^\circ\text{C}$	C_{re}	typ.	0,4 pF

* See *Thermal characteristics*.

** Mounted on a ceramic substrate of 8 mm x 10 mm x 0,7 mm.

Noise figure at optimum source impedance*

$I_C = 2 \text{ mA}; V_{CE} = 10 \text{ V}; f = 500 \text{ MHz}; T_{amb} = 25 \text{ }^\circ\text{C}$

F typ. 2,4 dB

Max. unilateral power gain (s_{re} assumed to be zero)

$$G_{UM} = 10 \log \frac{|s_{fe}|^2}{[1-|s_{ie}|^2][1-|s_{oe}|^2]}$$

$I_C = 14 \text{ mA}; V_{CE} = 10 \text{ V}; f = 500 \text{ MHz}; T_{amb} = 25 \text{ }^\circ\text{C}$

G_{UM} typ. 18,0 dB

Output voltage at $d_{im} = -60 \text{ dB}$ (see Fig. 2)

(DIN 45004B; par. 6.3.: 3-tone)

$I_C = 14 \text{ mA}; V_{CE} = 10 \text{ V}; R_L = 75 \text{ } \Omega$

$V_p = V_o$ at $d_{im} = -60 \text{ dB}; f_p = 495,25 \text{ MHz}$

$V_q = V_o -6 \text{ dB}; f_q = 503,25 \text{ MHz}$

$V_r = V_o -6 \text{ dB}; f_r = 505,25 \text{ MHz}$

measured at $f_{(p+q-r)} = 493,25 \text{ MHz}$

V_o typ. 150 mV

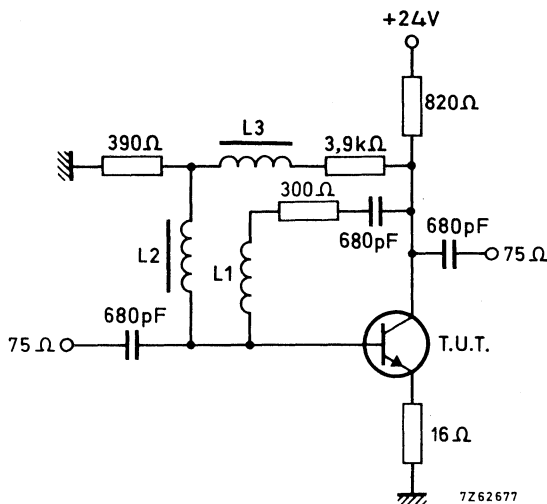


Fig. 2 Intermodulation test circuit.

L1 = 4 turns Cu wire (0,35 mm); winding pitch 1 mm; int. dia. 4 mm

L2 = L3 = 5 μH (code number: 3122 108 20150)

* Crystal mounted in a BFR90 envelope.

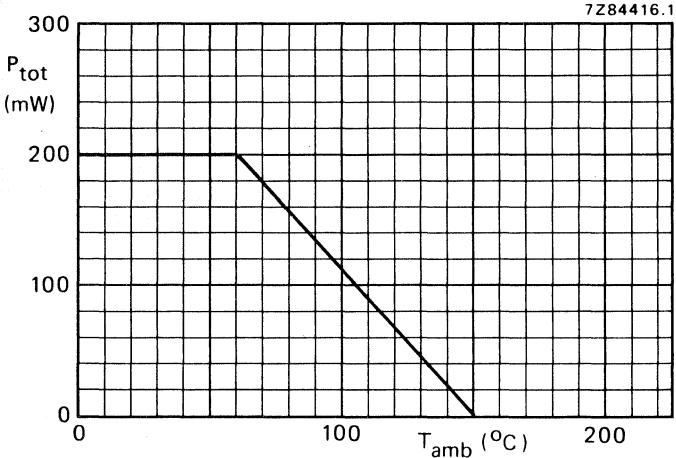


Fig. 3 Power derating curve.

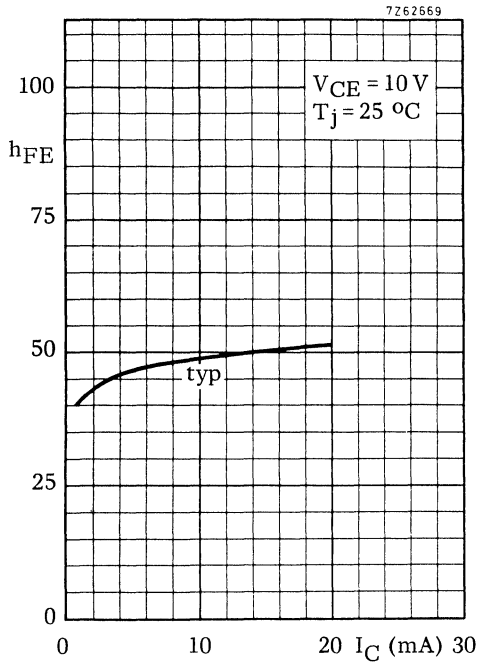


Fig. 4 $V_{CE} = 10\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$; typical values.

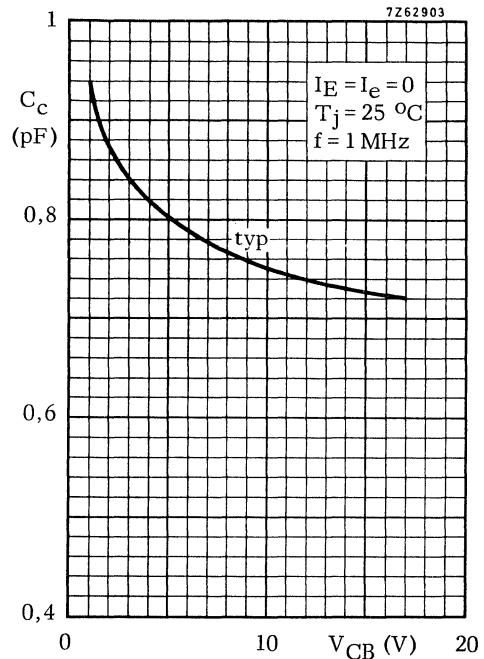


Fig. 5 $I_E = I_e = 0$; $f = 1\text{ MHz}$;
 $T_j = 25\text{ }^\circ\text{C}$; typical values.

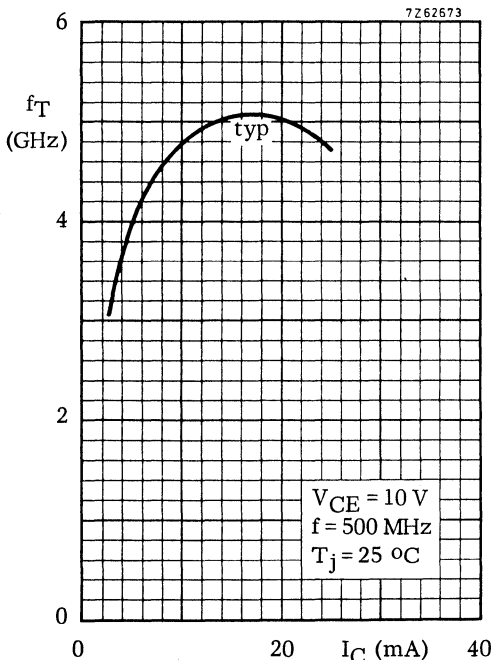


Fig. 6 $V_{CE} = 10\text{ V}$; $f = 500\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$;
typical values.

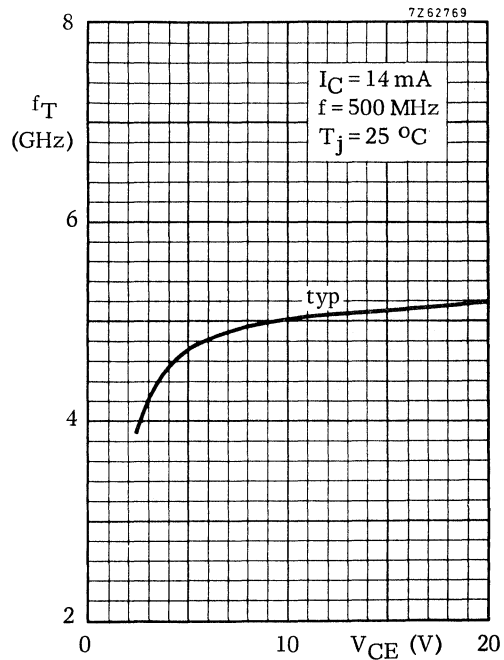


Fig. 7 $I_C = 14\text{ mA}$; $f = 500\text{ MHz}$;
 $T_j = 25\text{ }^\circ\text{C}$; typical values.

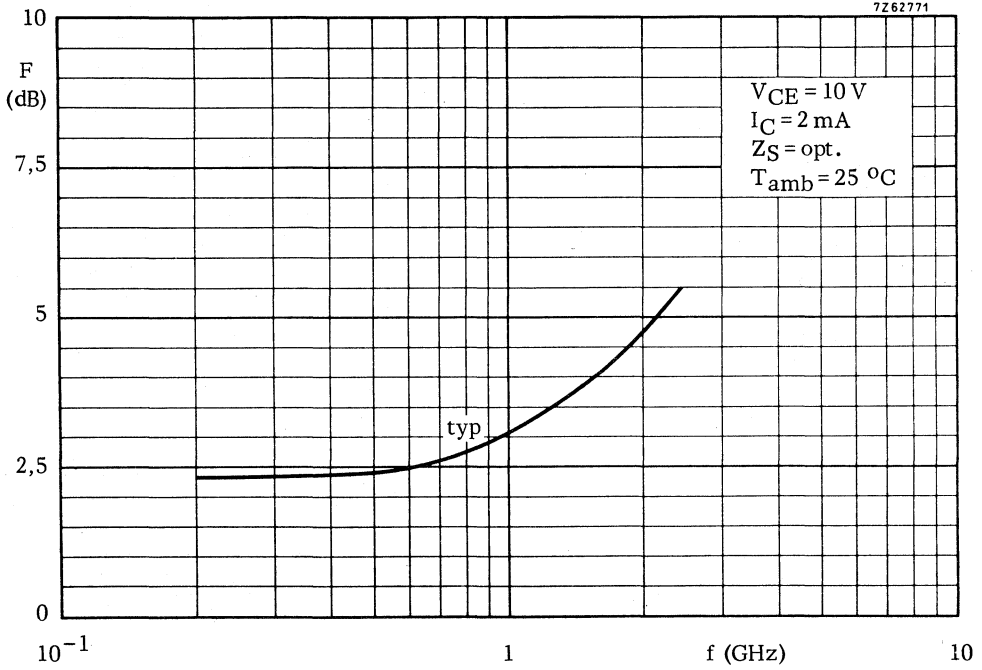


Fig. 8 $V_{CE} = 10 \text{ V}$; $I_C = 2 \text{ mA}$; $Z_S = \text{opt.}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$; typical values.

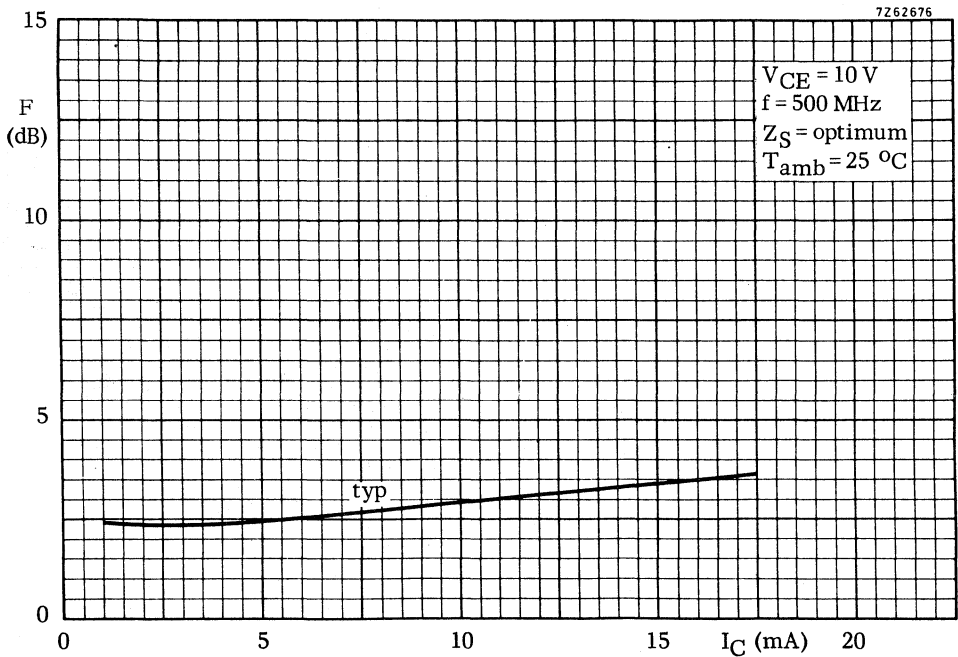


Fig. 9 $V_{CE} = 10 \text{ V}$; $f = 500 \text{ MHz}$; $Z_S = \text{opt.}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$; typical values.

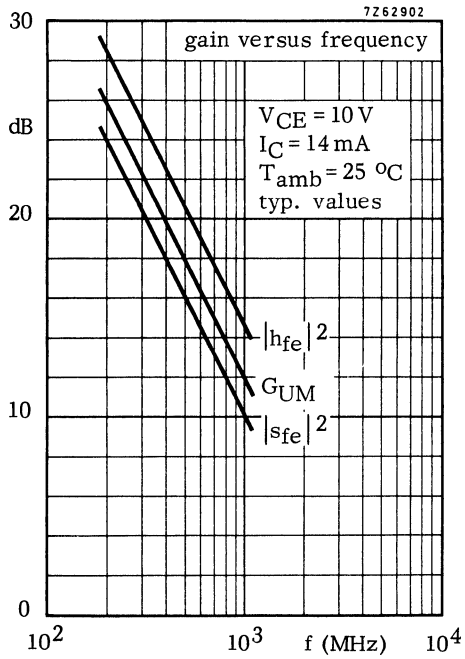


Fig. 10 $V_{CE} = 10\text{ V}$; $I_C = 14\text{ mA}$; $T_{amb} = 25\text{ }^\circ\text{C}$; typical values.

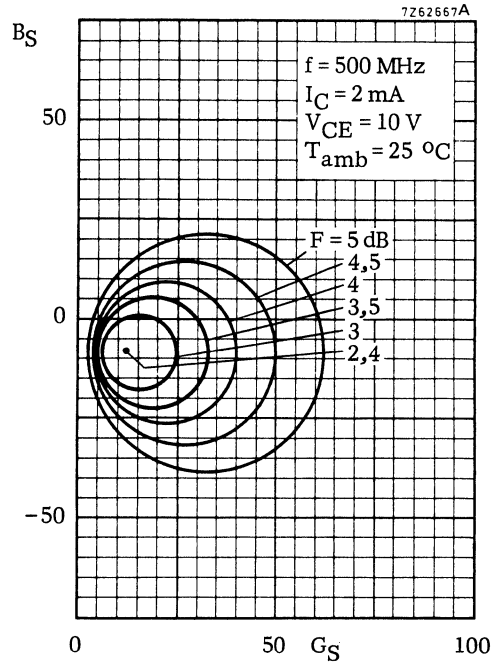


Fig. 11 Circles of constant noise figure; $V_{CE} = 10\text{ V}$; $I_C = 2\text{ mA}$; $f = 500\text{ MHz}$; $T_{amb} = 25\text{ }^\circ\text{C}$; typical values.

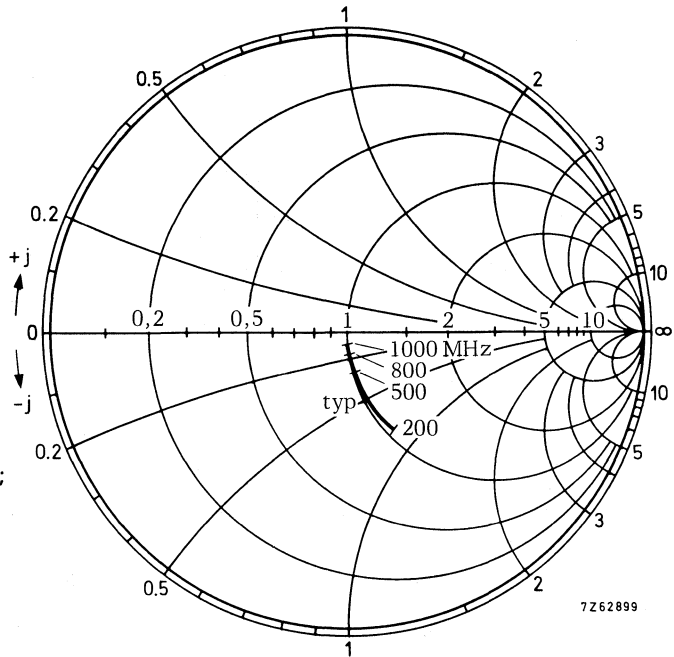


Fig. 12 $V_{CE} = 10\text{ V}$; $I_C = 14\text{ mA}$;
 $T_{amb} = 25\text{ }^\circ\text{C}$; typical values.

Input impedance derived from
 input reflection coefficient s_{ie}
 coordinates in ohm $\times 50$

7262899

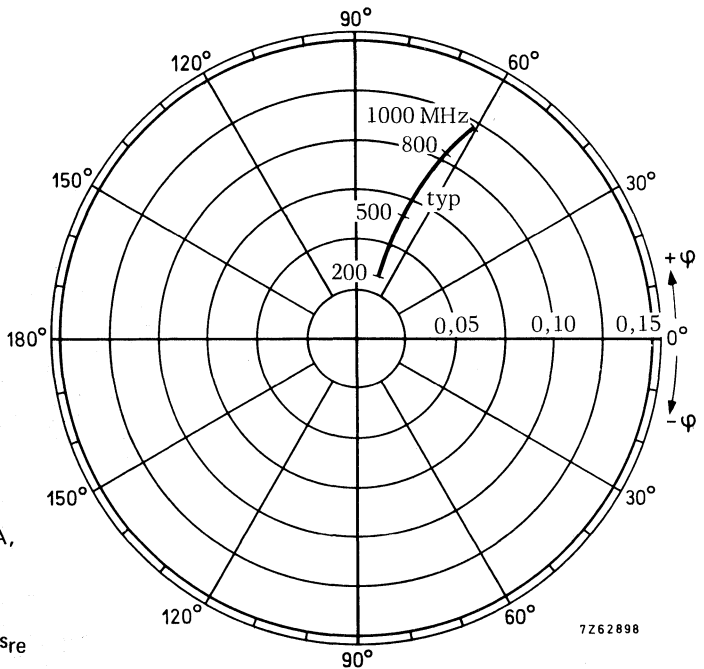


Fig. 13 $V_{CE} = 10\text{ V}$; $I_C = 14\text{ mA}$;
 $T_{amb} = 25\text{ }^\circ\text{C}$; typical values.

Reverse transmission coefficient s_{re}

7262898

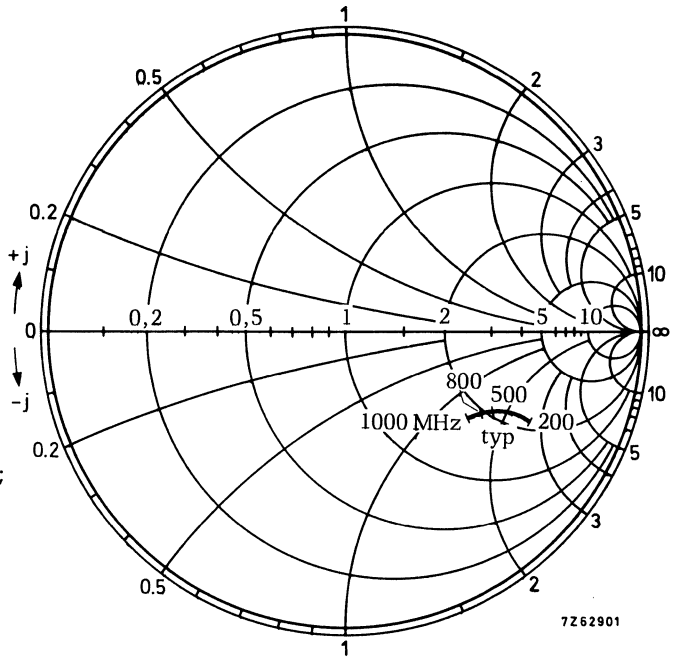


Fig. 14 $V_{CE} = 10 \text{ V}$; $I_C = 14 \text{ mA}$;
 $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

Output impedance derived from
 output reflection coefficient s_{OE}
 coordinates in $\text{ohm} \times 50$

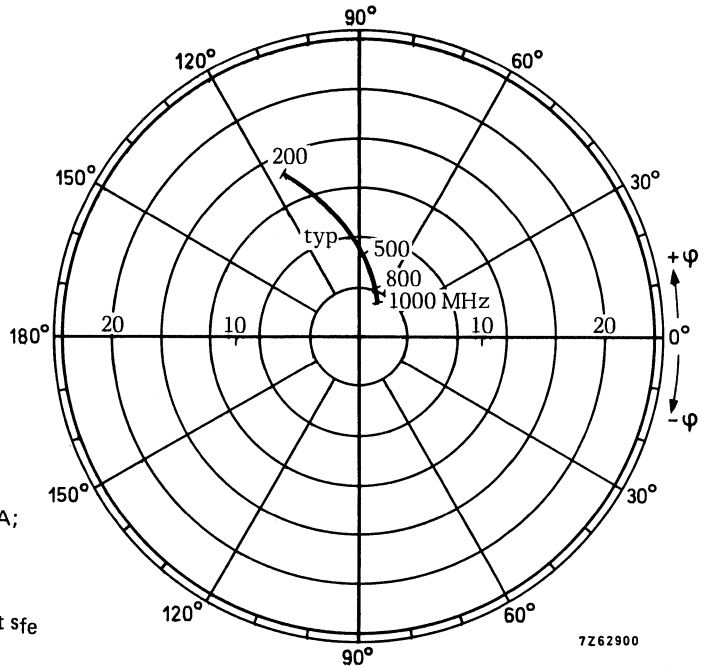


Fig. 15 $V_{CE} = 10 \text{ V}$; $I_C = 14 \text{ mA}$;
 $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

Forward transmission coefficient s_{fe}

N-P-N 1 GHz WIDEBAND TRANSISTOR

N-P-N transistor in a plastic SOT-23 envelope. It is primarily intended for use in v.h.f./u.h.f. broadband amplifiers. The transistor features:

- low noise;
- low intermodulation distortion;
- high power gain.

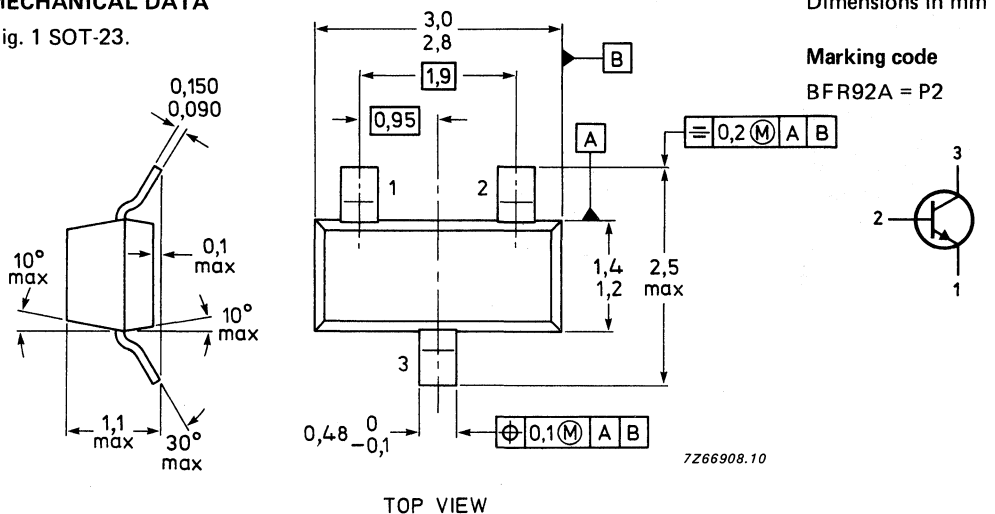
P-N-P complement is BFT92

QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	20 V
Collector-emitter voltage (open-base)	V_{CE0}	max.	15 V
Collector current (d.c.)	I_C	max.	25 mA
Total power dissipation up to $T_{amb} = 60\text{ }^\circ\text{C}$	P_{tot}	max.	200 mW
Junction temperature	T_j	max.	150 $^\circ\text{C}$
Transition frequency at $f = 500\text{ MHz}$ $I_C = 14\text{ mA}; V_{CE} = 10\text{ V}$	f_T	typ.	5,0 GHz
Feedback capacitance at $f = 1\text{ MHz}$ $I_C = 0; V_{CE} = 10\text{ V}$	C_{re}	typ.	0,35 pF
Noise figure at $R_S = 60\ \Omega$ $I_C = 4\text{ mA}; V_{CE} = 10\text{ V}; f = 800\text{ MHz}$	F	typ.	1,8 dB
Output voltage at $d_{im} = -60\text{ dB}$ $I_C = 14\text{ mA}; V_{CE} = 10\text{ V}; R_L = 75\ \Omega$ $f_{(p+q-r)} = 793,25\text{ MHz}$	V_o	typ.	150 mV

MECHANICAL DATA

Fig. 1 SOT-23.



If required, the R-version (reverse pinning) is available on request.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V _{CBO}	max.	20 V
Collector-emitter voltage (open base)	V _{CEO}	max.	15 V
Emitter-base voltage (open collector)	V _{EBO}	max.	2,0 V
Collector current (d.c.)	I _C	max.	25 mA
Total power dissipation up to T _{amb} = 60 °C**	P _{tot}	max.	200 mW
Storage temperature	T _{stg}		-65 to +150 °C
Junction temperature	T _j	max.	150 °C

THERMAL RESISTANCE*

From junction to ambient** R_{th j-a} = 430 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current

I_E = 0; V_{CB} = 10 V

I_{CBO} max. 60 nA

→ D.C. current gain

I_C = 14 mA; V_{CE} = 10 V

h_{FE} min. 40
typ. 90

→ Transition frequency at f = 500 MHz

I_C = 14 mA; V_{CE} = 10 V

f_T typ. 5,0 GHz

Collector capacitance at f = 1 MHz

I_E = I_e = 0; V_{CB} = 10 V

C_c typ. 0,6 pF

Emitter capacitance at f = 1 MHz

I_C = I_c = 0; V_{EB} = 0,5 V

C_e typ. 1,2 pF

Feedback capacitance at f = 1 MHz

I_C = 0; V_{CE} = 10 V; T_{amb} = 25 °C

C_{re} typ. 0,35 pF

Noise figure at T_{amb} = 25 °C

I_C = 4 mA; V_{CE} = 10 V; R_S = 60 Ω; f = 800 MHz

F typ. 1,8 dB

Maximum unilateral power gain (s_{re} assumed to be zero)

$$G_{UM} = 10 \log \frac{|s_{fe}|^2}{[1 - |s_{ie}|^2][1 - |s_{oe}|^2]}$$

I_C = 14 mA; V_{CE} = 10 V; f = 800 MHz; T_{amb} = 25 °C

G_{UM} typ. 15,5 dB

* See *Thermal characteristics*.

** Mounted on a ceramic substrate of 8 mm x 10 mm x 0,7 mm.

Output voltage at $d_{im} = -60$ dB (see Figs 2 and 17)*

(DIN 45004B, par. 6.3: 3-tone)

$I_C = 14$ mA; $V_{CE} = 10$ V; $R_L = 75 \Omega$; $V_{SWR} < 2$; $T_{amb} = 25$ °C

$V_p = V_o$ at $d_{im} = -60$ dB; $f_p = 795,25$ MHz

$V_q = V_o - 6$ dB ; $f_q = 803,25$ MHz

$V_r = V_o - 6$ dB ; $f_r = 805,25$ MHz

Measured at $f_{(p+q-r)} = 793,25$ MHz

V_o typ. 150 mV

Second harmonic distortion (see Figs 2 and 18)*

$I_C = 14$ mA; $V_{CE} = 10$ V; $R_L = 75 \Omega$; $V_{SWR} < 2$; $T_{amb} = 25$ °C

$V_p = 60$ mV at $f_p = 250$ MHz

$V_q = 60$ mV at $f_q = 560$ MHz

measured at $f_{(p+q)} = 810$ MHz

d_2 typ. -50 dB

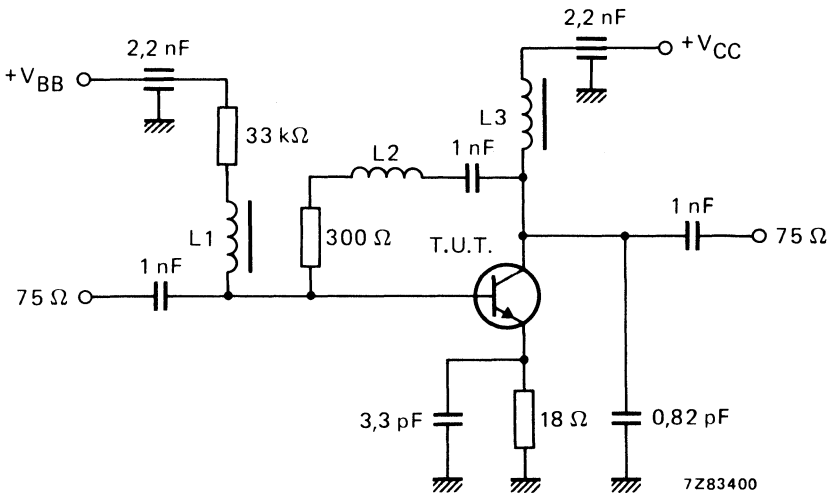


Fig. 2 Intermodulation distortion and second harmonic distortion MATV test circuit.

$L1 = L3 = 5 \mu\text{H}$ micro choke

$L2 = 3$ turns Cu wire (0,4 mm); internal diameter 3 mm; winding pitch 1 mm

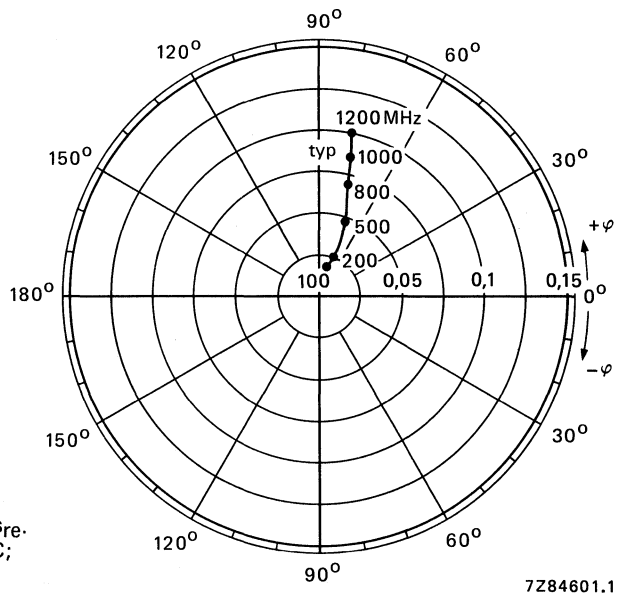
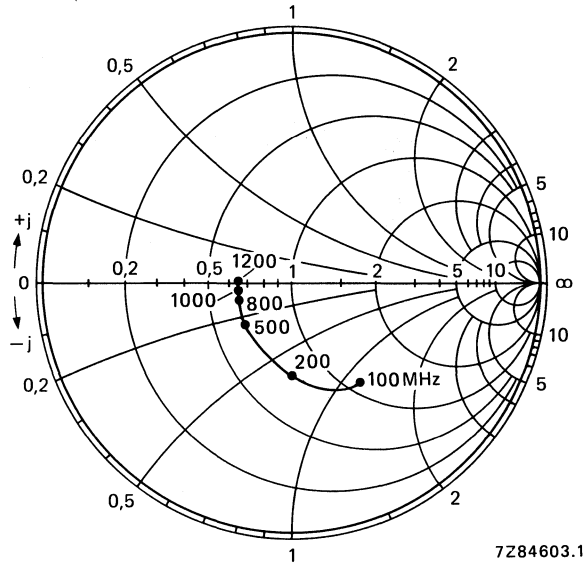
* Measured on same crystal in a SOT-37 envelope (BFR90A).

→ s-parameters (common emitter) at $V_{CE} = 5\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$; typical values.

I_C mA	f MHz	S_{ie}	S_{re}	S_{fe}	S_{oe}
2	40	0,88/ -8,9°	0,009/83,6°	6,7/174,2°	1,00/ -2,7°
	100	0,86/ -21,9°	0,022/78,3°	6,5/164,2°	0,98/ -6,6°
	200	0,80/ -42,2°	0,041/69,0°	6,0/149,2°	0,94/ -12,2°
	500	0,61/ -87,2°	0,073/54,9°	4,2/119,1°	0,81/ -20,2°
	800	0,48/ -117,4°	0,086/52,7°	3,1/100,5°	0,74/ -22,9°
	1000	0,44/ -133,8°	0,092/54,2°	2,6/ 91,4°	0,71/ -24,2°
5	1200	0,41/ -147,6°	0,099/57,5°	2,2/ 84,3°	0,70/ -25,7°
	40	0,75/ -14,4°	0,008/81,8°	14,4/170,2°	0,99/ -4,9°
	100	0,70/ -34,0°	0,020/74,2°	13,3/155,3°	0,94/ -11,2°
	200	0,60/ -61,7°	0,034/65,0°	10,9/135,8°	0,84/ -17,9°
	500	0,40/ -111,1°	0,057/61,1°	6,2/106,9°	0,67/ -21,9°
	800	0,32/ -139,7°	0,074/65,5°	4,2/ 92,4°	0,62/ -22,2°
10	1000	0,30/ -153,2°	0,086/68,2°	3,4/ 85,3°	0,61/ -22,8°
	1200	0,29/ -166,2°	0,100/70,9°	2,9/ 79,6°	0,60/ -24,0°
	40	0,61/ -21,1°	0,008/79,7°	22,9/165,2°	0,97/ -7,3°
	100	0,54/ -48,5°	0,017/71,4°	19,8/145,8°	0,88/ -15,5°
	200	0,42/ -82,1°	0,028/65,2°	14,4/124,7°	0,74/ -20,8°
	500	0,30/ -132,3°	0,050/69,0°	7,1/ 99,6°	0,59/ -20,5°
14	800	0,26/ -158,0°	0,072/73,7°	4,7/ 87,8°	0,56/ -20,3°
	1000	0,25/ -168,3°	0,088/75,2°	3,8/ 82,2°	0,56/ -20,9°
	1200	0,25/ -179,3°	0,104/76,6°	3,2/ 77,5°	0,55/ -22,1°
	40	0,53/ -26,0°	0,007/78,6°	27,7/162,4°	0,96/ -8,7°
	100	0,45/ -58,1°	0,016/70,5°	22,6/140,7°	0,85/ -17,2°
	200	0,36/ -94,4°	0,025/66,6°	15,6/119,7°	0,70/ -21,0°
20	500	0,27/ -142,8°	0,049/72,5°	7,3/ 96,9°	0,57/ -19,1°
	800	0,25/ -166,0°	0,072/76,5°	4,7/ 86,1°	0,55/ -19,1°
	1000	0,24/ -174,8°	0,088/77,4°	3,8/ 80,5°	0,55/ -19,9°
	1200	0,24/ 174,8°	0,105/78,4°	3,2/ 76,2°	0,54/ -21,3°
	40	0,45/ -33,1°	0,007/77,0°	32,3/158,8°	0,94/ -10,1°
	100	0,38/ -71,8°	0,015/69,5°	24,7/135,0°	0,80/ -18,4°
20	200	0,31/ -110,6°	0,023/68,3°	16,0/114,6°	0,66/ -20,1°
	500	0,26/ -154,5°	0,047/75,5°	7,2/ 94,3°	0,56/ -17,3°
	800	0,25/ -174,2°	0,071/78,7°	4,7/ 84,3°	0,55/ -17,8°
	1000	0,25/ 178,5°	0,088/79,3°	3,7/ 79,1°	0,54/ -18,9°
	1200	0,26/ 169,9°	0,104/80,0°	3,2/ 74,9°	0,54/ -20,5°

s-parameters (common emitter) at $V_{CE} = 10\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$; typical values.

I_C mA	f MHz	s_{ie}	s_{re}	s_{fe}	s_{oe}
2	40	0,89/ $-8,7^{\circ}$	0,008/83,6 $^{\circ}$	6,8/174,4 $^{\circ}$	1,00/ $-2,5^{\circ}$
	100	0,86/ $-21,2^{\circ}$	0,021/78,5 $^{\circ}$	6,5/164,6 $^{\circ}$	0,98/ $-6,1^{\circ}$
	200	0,80/ $-40,9^{\circ}$	0,038/69,5 $^{\circ}$	6,0/149,6 $^{\circ}$	0,94/ $-11,3^{\circ}$
	500	0,61/ $-85,3^{\circ}$	0,069/55,8 $^{\circ}$	4,3/119,8 $^{\circ}$	0,82/ $-18,7^{\circ}$
	800	0,48/ $-115,4^{\circ}$	0,081/53,8 $^{\circ}$	3,1/101,2 $^{\circ}$	0,75/ $-21,3^{\circ}$
	1000	0,44/ $-131,4^{\circ}$	0,086/55,5 $^{\circ}$	2,6/ 92,1 $^{\circ}$	0,73/ $-22,5^{\circ}$
	1200	0,40/ $-145,6^{\circ}$	0,093/58,9 $^{\circ}$	2,2/ 85,0 $^{\circ}$	0,72/ $-23,9^{\circ}$
5	40	0,77/ $-13,6^{\circ}$	0,008/81,8 $^{\circ}$	14,2/170,5 $^{\circ}$	0,99/ $-4,5^{\circ}$
	100	0,73/ $-32,3^{\circ}$	0,019/74,7 $^{\circ}$	13,2/155,8 $^{\circ}$	0,95/ $-10,3^{\circ}$
	200	0,62/ $-58,8^{\circ}$	0,032/65,6 $^{\circ}$	11,0/136,8 $^{\circ}$	0,85/ $-16,6^{\circ}$
	500	0,41/ $-107,2^{\circ}$	0,054/61,4 $^{\circ}$	6,3/107,7 $^{\circ}$	0,69/ $-20,4^{\circ}$
	800	0,32/ $-135,9^{\circ}$	0,071/65,9 $^{\circ}$	4,2/ 92,9 $^{\circ}$	0,64/ $-20,8^{\circ}$
	1000	0,30/ $-150,0^{\circ}$	0,082/68,6 $^{\circ}$	3,5/ 86,1 $^{\circ}$	0,63/ $-21,3^{\circ}$
	1200	0,28/ $-162,9^{\circ}$	0,095/71,5 $^{\circ}$	2,9/ 80,5 $^{\circ}$	0,62/ $-22,4^{\circ}$
10	40	0,66/ $-19,4^{\circ}$	0,007/80,1 $^{\circ}$	22,5/165,9 $^{\circ}$	0,97/ $-6,6^{\circ}$
	100	0,58/ $-44,7^{\circ}$	0,017/71,8 $^{\circ}$	19,5/147,0 $^{\circ}$	0,90/ $-14,1^{\circ}$
	200	0,45/ $-76,2^{\circ}$	0,027/65,4 $^{\circ}$	14,5/126,0 $^{\circ}$	0,76/ $-19,3^{\circ}$
	500	0,29/ $-125,1^{\circ}$	0,049/68,7 $^{\circ}$	7,2/100,6 $^{\circ}$	0,62/ $-19,2^{\circ}$
	800	0,24/ $-151,8^{\circ}$	0,070/73,5 $^{\circ}$	4,7/ 88,8 $^{\circ}$	0,59/ $-19,0^{\circ}$
	1000	0,24/ $-162,9^{\circ}$	0,084/75,2 $^{\circ}$	3,8/ 82,6 $^{\circ}$	0,58/ $-19,7^{\circ}$
	1200	0,23/ $-174,8^{\circ}$	0,099/76,8 $^{\circ}$	3,2/ 78,3 $^{\circ}$	0,58/ $-20,9^{\circ}$
14	40	0,60/ $-23,2^{\circ}$	0,007/78,6 $^{\circ}$	27,2/163,0 $^{\circ}$	0,96/ $-7,9^{\circ}$
	100	0,51/ $-52,5^{\circ}$	0,016/70,6 $^{\circ}$	22,6/141,8 $^{\circ}$	0,86/ $-15,8^{\circ}$
	200	0,38/ $-86,2^{\circ}$	0,025/66,4 $^{\circ}$	15,7/120,7 $^{\circ}$	0,72/ $-19,6^{\circ}$
	500	0,26/ $-134,3^{\circ}$	0,047/72,0 $^{\circ}$	7,5/ 97,8 $^{\circ}$	0,60/ $-18,0^{\circ}$
	800	0,22/ $-159,3^{\circ}$	0,069/76,2 $^{\circ}$	4,8/ 86,8 $^{\circ}$	0,57/ $-18,0^{\circ}$
	1000	0,22/ $-169,0^{\circ}$	0,085/77,3 $^{\circ}$	3,9/ 81,3 $^{\circ}$	0,57/ $-18,7^{\circ}$
	1200	0,22/ 179,8 $^{\circ}$	0,100/78,5 $^{\circ}$	3,3/ 76,8 $^{\circ}$	0,57/ $-20,1^{\circ}$
20	40	0,54/ $-28,2^{\circ}$	0,007/77,4 $^{\circ}$	31,7/159,9 $^{\circ}$	0,95/ $-9,1^{\circ}$
	100	0,45/ $-61,7^{\circ}$	0,015/69,5 $^{\circ}$	24,7/136,8 $^{\circ}$	0,82/ $-16,8^{\circ}$
	200	0,33/ $-97,5^{\circ}$	0,023/67,5 $^{\circ}$	16,3/116,2 $^{\circ}$	0,68/ $-18,8^{\circ}$
	500	0,24/ $-143,7^{\circ}$	0,046/74,4 $^{\circ}$	7,4/ 95,3 $^{\circ}$	0,59/ $-16,4^{\circ}$
	800	0,22/ $-166,4^{\circ}$	0,069/78,0 $^{\circ}$	4,8/ 85,2 $^{\circ}$	0,57/ $-16,9^{\circ}$
	1000	0,22/ $-174,7^{\circ}$	0,084/78,7 $^{\circ}$	3,8/ 80,1 $^{\circ}$	0,57/ $-17,8^{\circ}$
	1200	0,22/ 176,3 $^{\circ}$	0,100/79,7 $^{\circ}$	3,3/ 76,0 $^{\circ}$	0,57/ $-19,4^{\circ}$



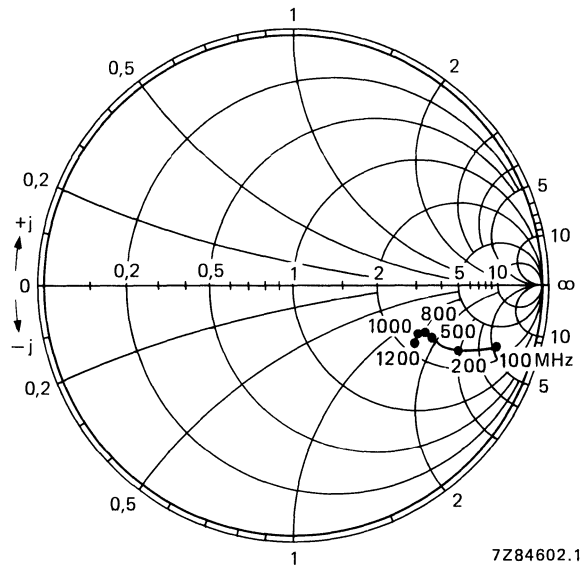


Fig. 5 Output impedance derived from output reflection coefficient s_{oe} co-ordinates in ohm $\times 50$. $V_{CE} = 10 \text{ V}$; $I_C = 14 \text{ mA}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

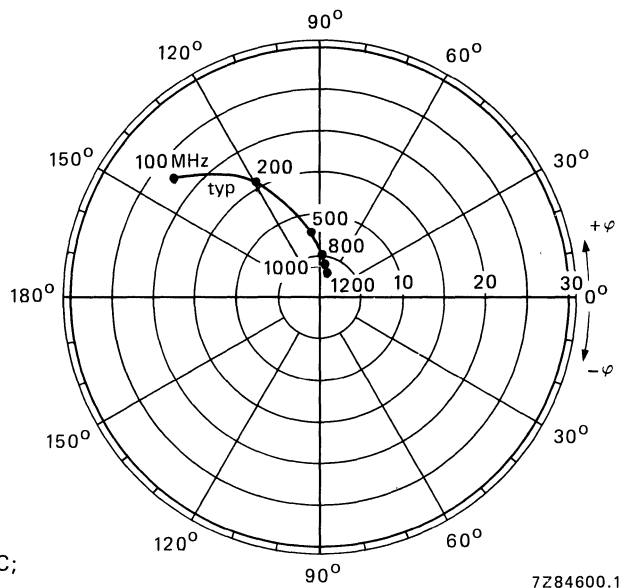


Fig. 6 Forward transmission coefficient s_{fe} . $V_{CE} = 10 \text{ V}$; $I_C = 14 \text{ mA}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

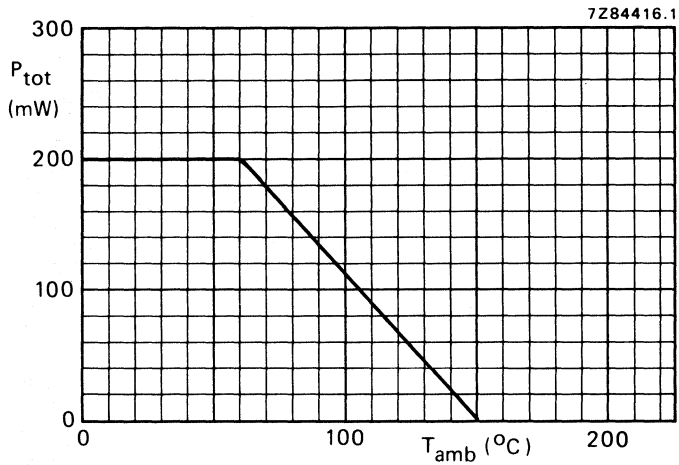


Fig. 7 Power derating curve.

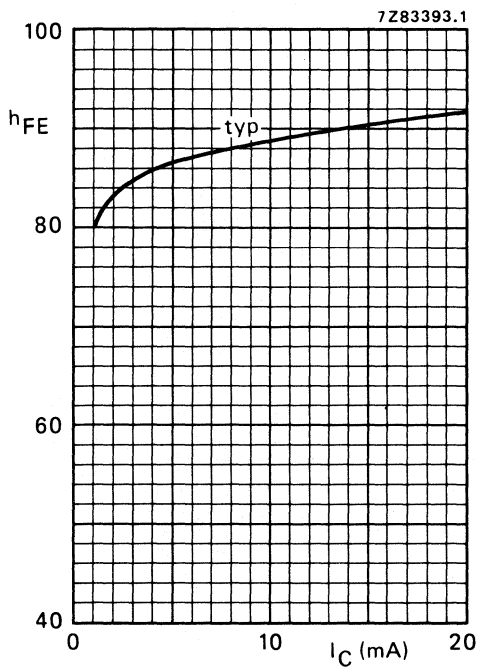


Fig. 8 $V_{CE} = 10$ V; $T_j = 25$ °C; typical values.

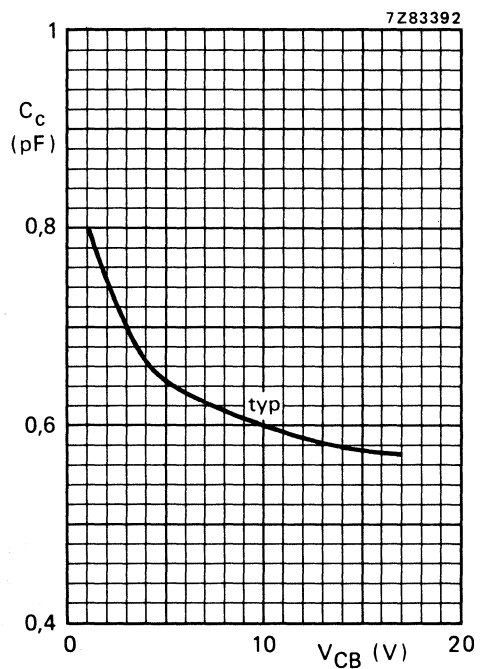


Fig. 9 $I_E = I_e = 0$; $f = 1$ MHz; $T_j = 25$ °C; typical values.

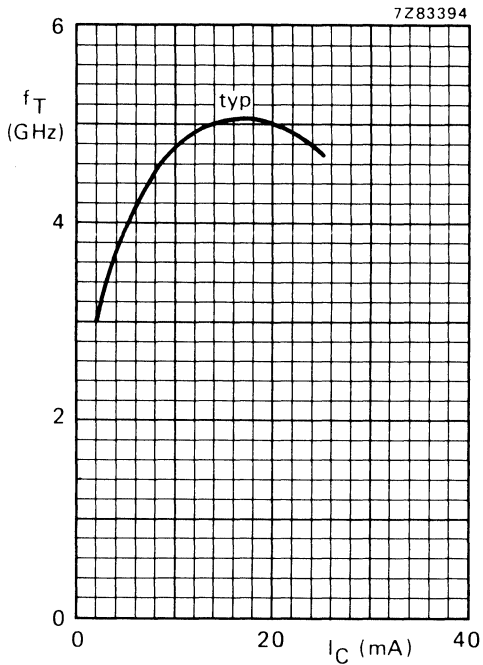


Fig. 10 $V_{CE} = 10$ V; $f = 500$ MHz; $T_j = 25$ °C; typical values.

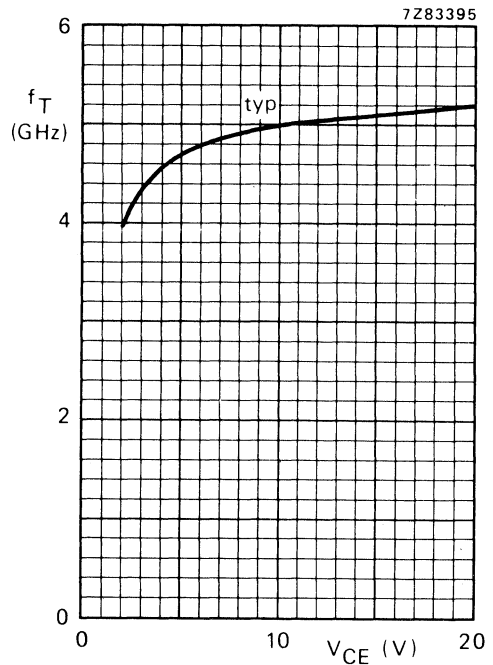


Fig. 11 $I_C = 14$ mA; $f = 500$ MHz; $T_j = 25$ °C; typical values.

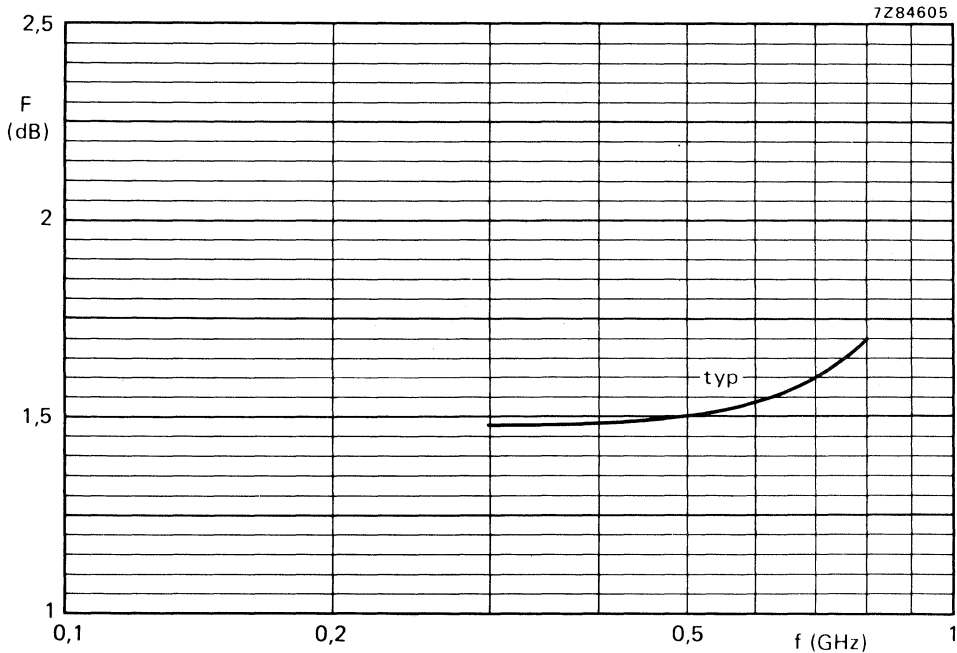


Fig. 12 $V_{CE} = 10$ V; $I_C = 4$ mA; $Z_S = \text{optimum}$; $T_{amb} = 25$ °C; typical values.

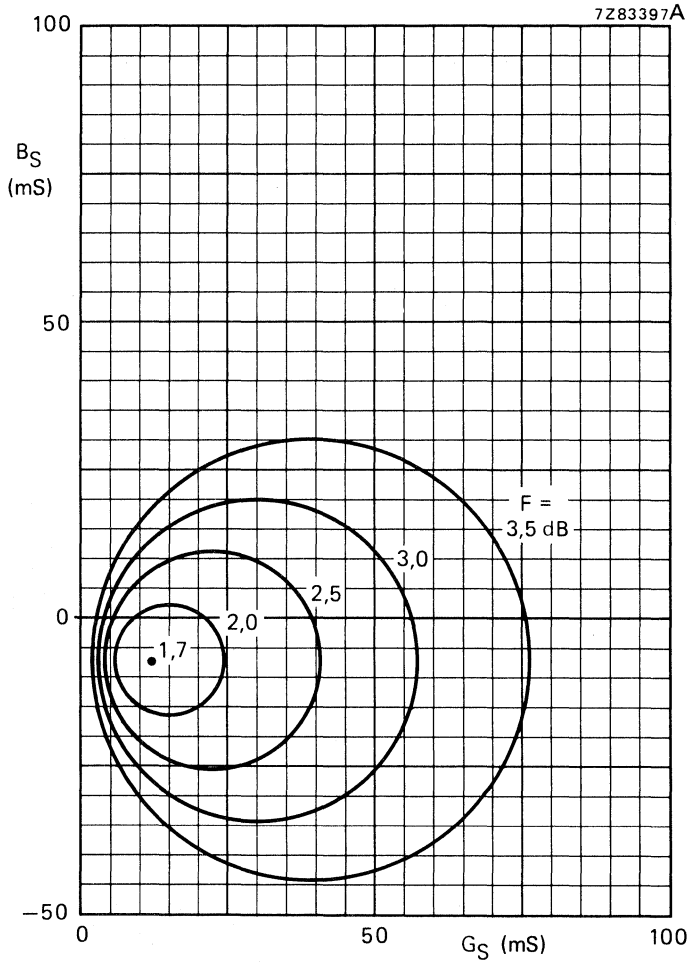


Fig. 13 Circles of constant noise figure.
 $V_{CE} = 10$ V; $I_C = 4$ mA; $f = 800$ MHz; $T_{amb} = 25$ °C;
typical values.

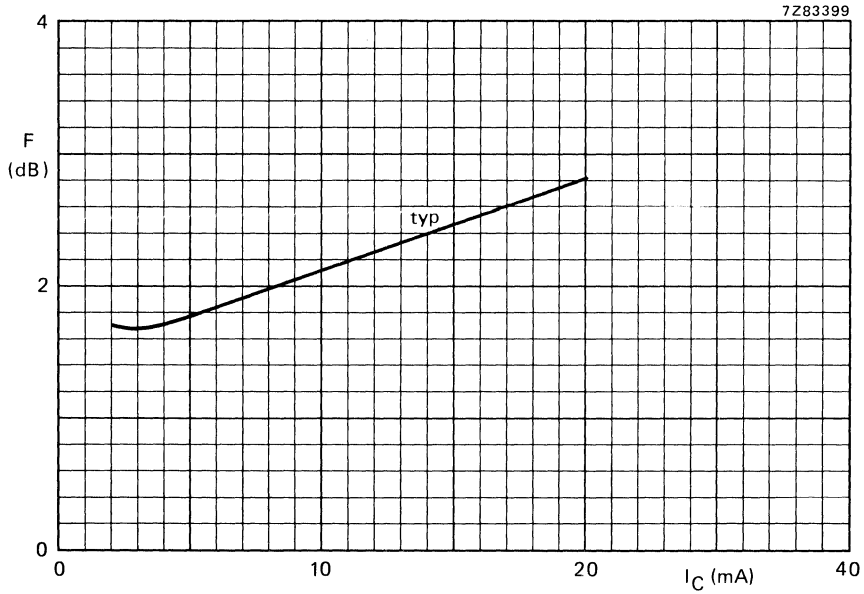


Fig. 14 $V_{CE} = 10$ V; $f = 800$ MHz; $Z_S = \text{optimum}$; $T_{amb} = 25$ °C; typical values.

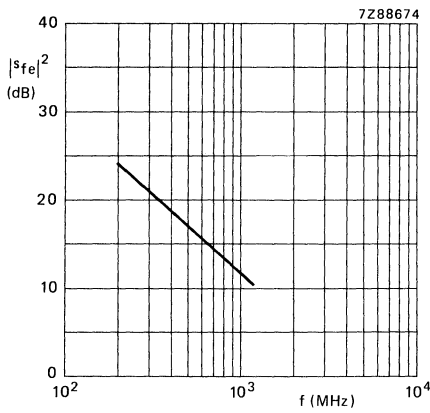


Fig. 15 $V_{CE} = 10$ V; $I_C = 14$ mA; $T_{amb} = 25$ °C; typical values.

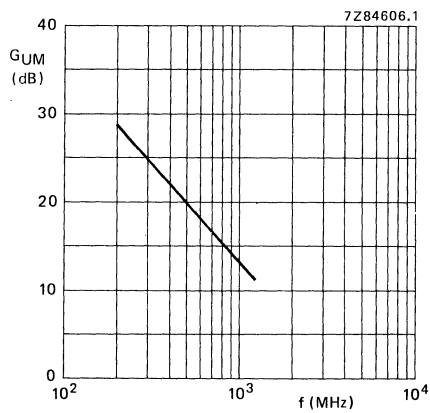


Fig. 16 $V_{CE} = 10$ V; $I_C = 14$ mA; $T_{amb} = 25$ °C; typical values.

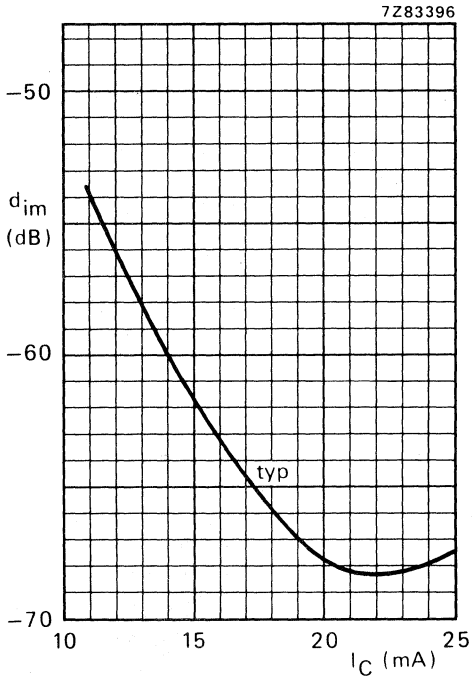


Fig. 17 $V_{CE} = 10$ V; $V_o = 43,5$ dBmV = 150 mV; $f_{(p+q-r)} = 793,25$ MHz; $T_{amb} = 25$ °C; measured in MATV test circuit (see Fig. 2); typical values.

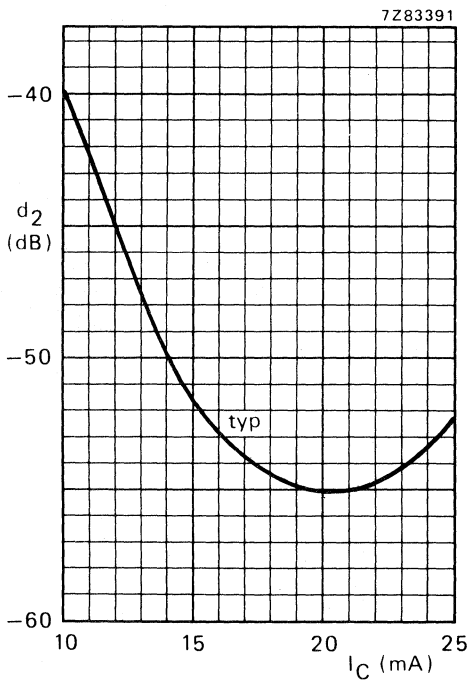


Fig. 18 $V_{CE} = 10$ V; $V_o = 60$ mV; $f_{(p+q)} = 810$ MHz; $T_{amb} = 25$ °C; measured in MATV test circuit (see Fig. 2); typical values.

N-P-N 1 GHz WIDEBAND TRANSISTOR

N-P-N transistor in a SOT-23 plastic envelope. It is primarily intended for use in u.h.f. and microwave amplifiers in thick and thin-film circuits, such as in aerial amplifiers, radar systems, oscilloscopes, spectrum analysers etc. The transistor features very low intermodulation distortion and high power gain; thanks to its very high transition frequency, it also has excellent wideband properties and low noise up to high frequencies.

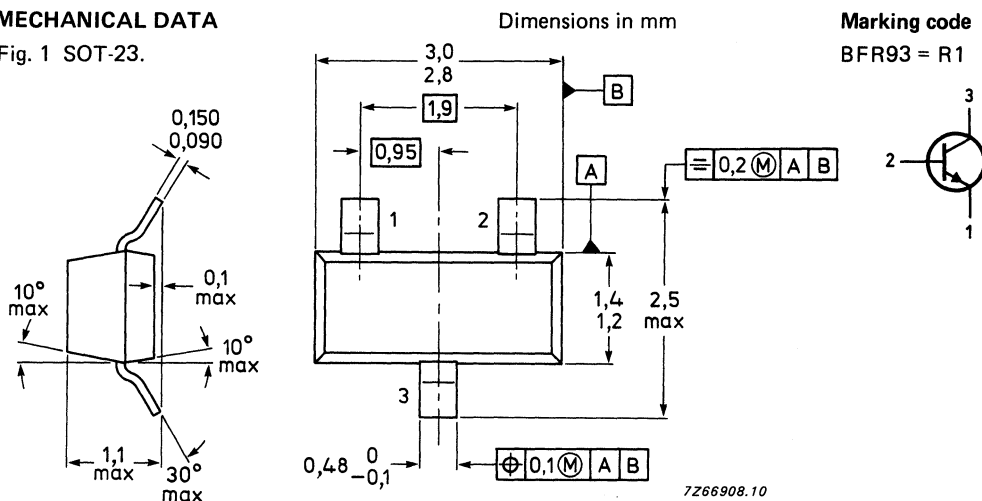
P-N-P complement is the BFT93.

QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CB0}	max.	15 V
Collector-emitter voltage (open base)	V_{CEO}	max.	12 V
Collector current (d.c.)	I_C	max.	35 mA
Total power dissipation up to $T_{amb} = 60\text{ }^\circ\text{C}$	P_{tot}	max.	200 mW
Junction temperature	T_j	max.	150 $^\circ\text{C}$
Transition frequency at $f = 500\text{ MHz}$ $I_C = 30\text{ mA}$; $V_{CE} = 5\text{ V}$	f_T	typ.	5 GHz
Feedback capacitance at $f = 1\text{ MHz}$ $I_C = 2\text{ mA}$; $V_{CE} = 5\text{ V}$	C_{re}	typ.	0,8 pF
Noise figure at optimum source impedance $I_C = 2\text{ mA}$; $V_{CE} = 5\text{ V}$; $f = 500\text{ MHz}$;	F	typ.	1,9 dB
Max. unilateral power gain $I_C = 30\text{ mA}$; $V_{CE} = 5\text{ V}$; $f = 500\text{ MHz}$;	G _{UM}	typ.	16,5 dB
Intermodulation distortion at $T_{amb} = 25\text{ }^\circ\text{C}$ $I_C = 30\text{ mA}$; $V_{CE} = 5\text{ V}$; $R_L = 75\text{ }\Omega$; $V_o = 300\text{ mV}$ $f_{(p+q-r)} = 493,25\text{ MHz}$	d_{im}	typ.	-60 dB

MECHANICAL DATA

Fig. 1 SOT-23.



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CB0}	max.	15 V
Collector-emitter voltage (open base)	V_{CE0}	max.	12 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2,0 V
Collector current (d.c.)	I_C	max.	35 mA
Total power dissipation up to $T_{amb} = 60\text{ }^\circ\text{C}^{**}$	P_{tot}	max.	200 mW
Storage temperature	T_{stg}		-65 to +150 $^\circ\text{C}$
Junction temperature	T_j	max.	150 $^\circ\text{C}$

THERMAL CHARACTERISTICS *

$$T_j = P \times (R_{th\ j-t} + R_{th\ t-s} + R_{th\ s-a}) + T_{amb}$$

Thermal resistance

From junction to tab	$R_{th\ j-t}$	=	60 K/W
From tab to soldering points	$R_{th\ t-s}$	=	280 K/W
From soldering points to ambient **	$R_{th\ s-a}$	=	90 K/W

CHARACTERISTICS $T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Collector cut-off current

$I_E = 0; V_{CB} = 10\text{ V}$

I_{CBO}	max.	50 nA
-----------	------	-------

D.C. current gain Δ

$I_C = 30\text{ mA}; V_{CE} = 5\text{ V}$

h_{FE}	min.	25
	typ.	50

Transition frequency at $f = 500\text{ MHz}$ Δ

$I_C = 30\text{ mA}; V_{CE} = 5\text{ V}$

f_T	typ.	5 GHz
-------	------	-------

Collector capacitance at $f = 1\text{ MHz}$

$I_E = I_e = 0; V_{CB} = 10\text{ V}$

C_c	typ.	0,7 pF
-------	------	--------

Emitter capacitance at $f = 1\text{ MHz}$

$I_C = I_c = 0; V_{EB} = 0,5\text{ V}$

C_e	typ.	1,8 pF
-------	------	--------

Feedback capacitance at $f = 1\text{ MHz}$

$I_C = 2\text{ mA}; V_{CE} = 5\text{ V}; T_{amb} = 25\text{ }^\circ\text{C}$

C_{re}	typ.	0,8 pF
----------	------	--------

 Δ Measured under pulse conditions.* See *Thermal characteristics*.

** Mounted on a ceramic substrate of 8 mm x 10 mm x 0,7 mm.

Noise figure at optimum source impedance *

$I_C = 2 \text{ mA}; V_{CE} = 5 \text{ V}; f = 500 \text{ MHz}; T_{amb} = 25 \text{ }^\circ\text{C}$

F typ. 1,9 dB

Max. unilateral power gain (s_{re} assumed to be zero)

$$G_{UM} = 10 \log \frac{|s_{fe}|^2}{(1 - |s_{ie}|^2)(1 - |s_{oe}|^2)}$$

$I_C = 30 \text{ mA}; V_{CE} = 5 \text{ V}; f = 500 \text{ MHz}; T_{amb} = 25 \text{ }^\circ\text{C}$

G_{UM} typ. 16,5 dB

Intermodulation distortion at $T_{amb} = 25 \text{ }^\circ\text{C}$ *

$I_C = 30 \text{ mA}; V_{CE} = 5 \text{ V}; R_L = 75 \text{ } \Omega; \text{V.S.W.R.} < 2$

$V_p = V_o = 300 \text{ mV}$ at $f_p = 495,25 \text{ MHz}$

$V_q = V_o - 6 \text{ dB}$ at $f_q = 503,25 \text{ MHz}$

$V_r = V_o - 6 \text{ dB}$ at $f_r = 505,25 \text{ MHz}$

Measured at $f_{(p+q-r)} = 493,25 \text{ MHz}$

d_{im} typ. -60 dB

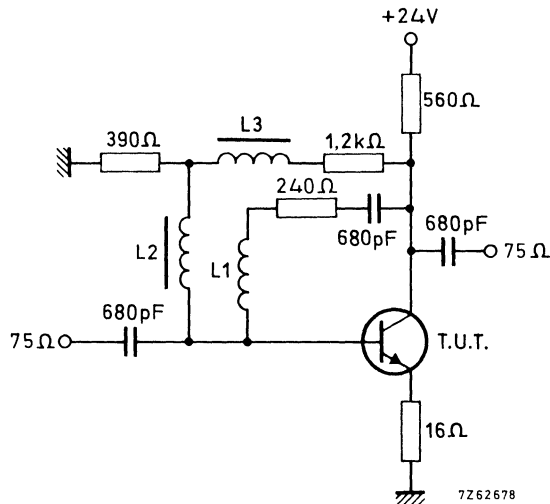


Fig. 2 Intermodulation test circuit.

L1 = 4 turns Cu wire (0,35); winding pitch 1 mm; int. dia. 4 mm

L2 and L3 5 μH (code number: 3122 108 20150)

* Crystal mounted in a BFR91 envelope.

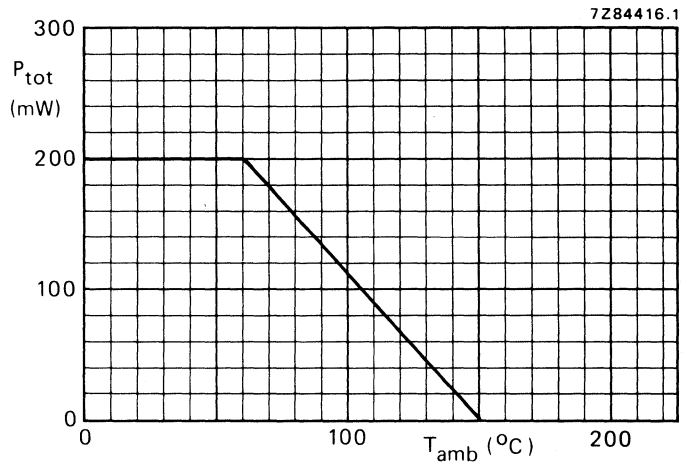


Fig. 3 Power derating curve.

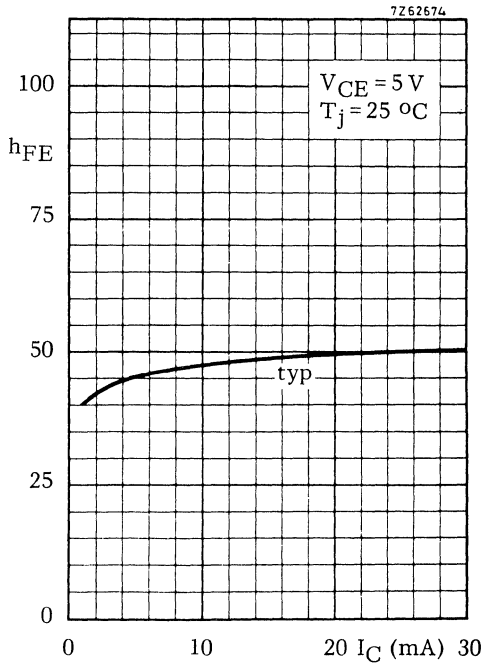


Fig. 4.

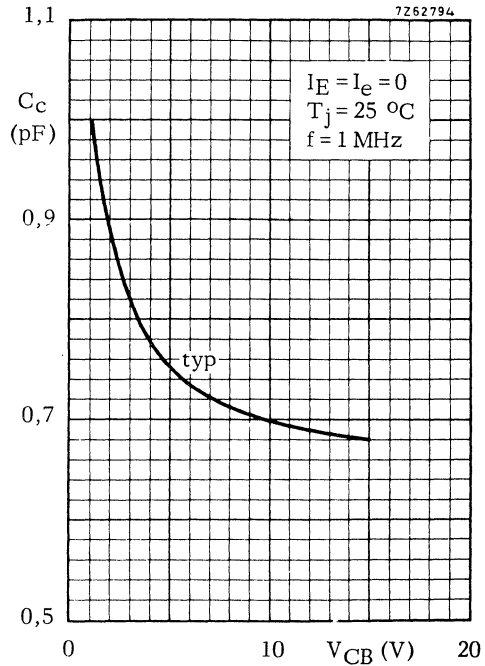


Fig. 5.

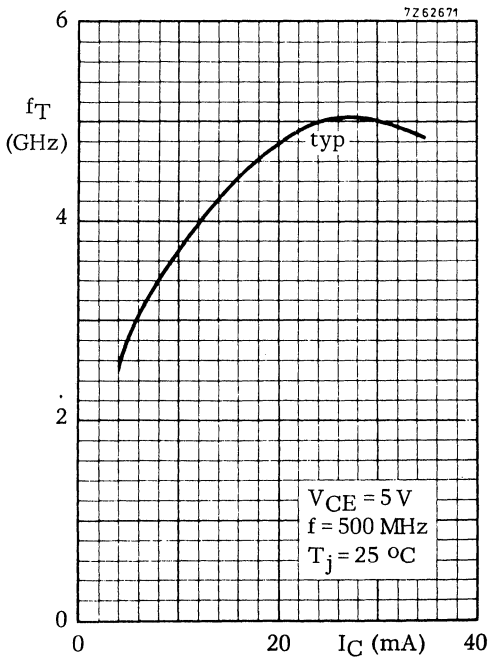


Fig. 6.

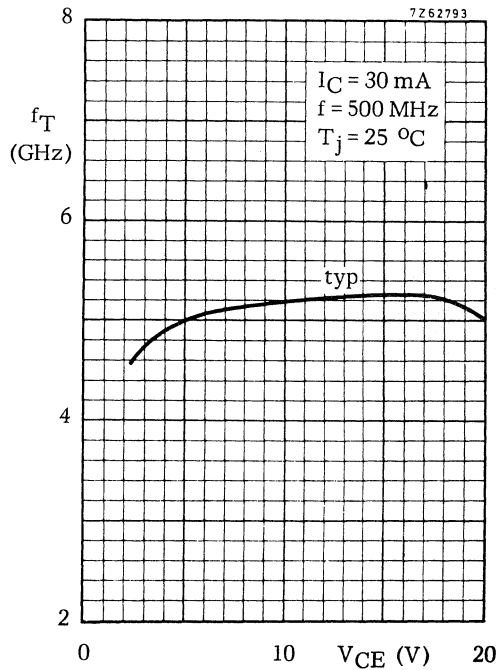


Fig. 7.

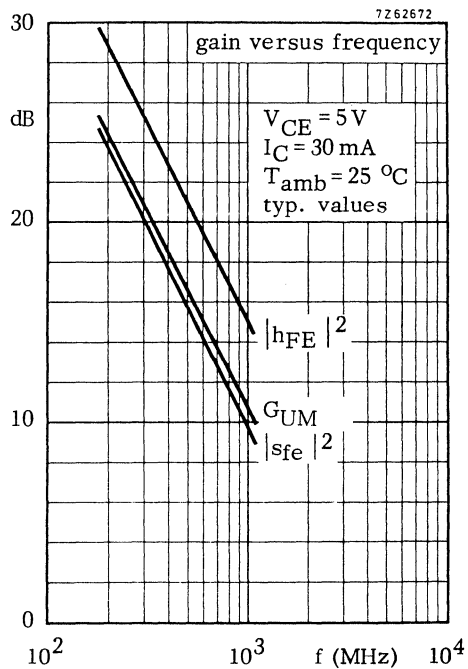


Fig. 10.

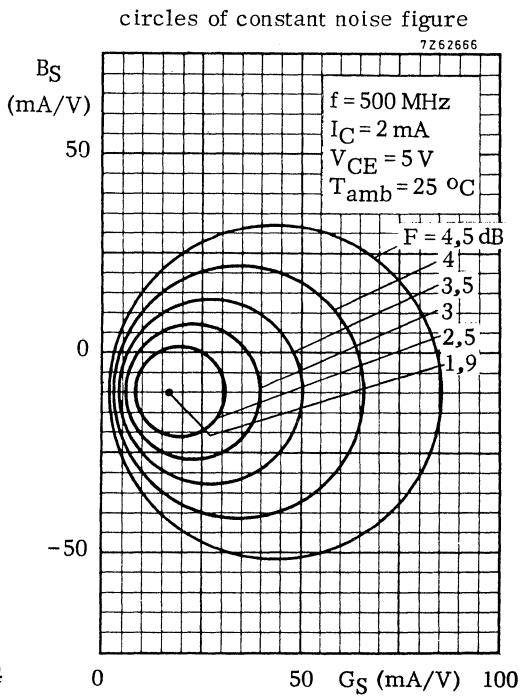


Fig. 11.

$V_{CE} = 5\text{ V}$
 $I_C = 30\text{ mA}$
 $T_{amb} = 25\text{ }^\circ\text{C}$

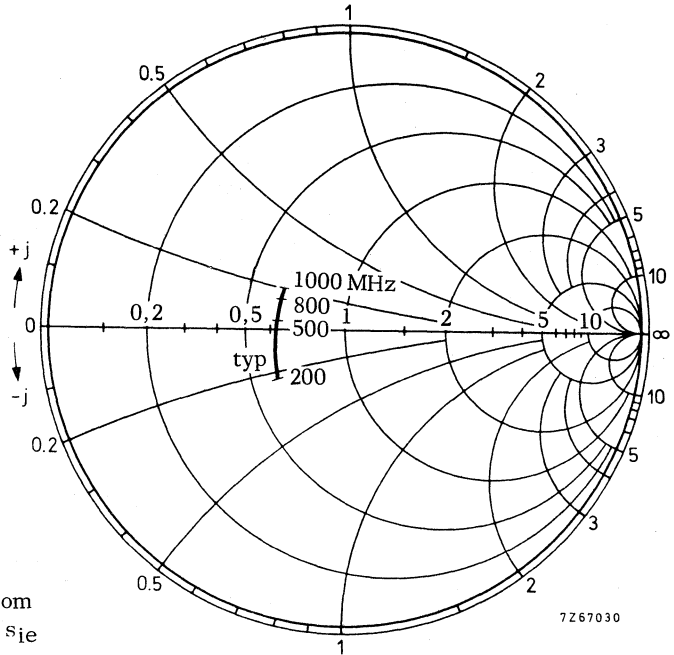


Fig. 12.

Input impedance derived from
input reflection coefficient s_{ie}
coordinates in ohm x 50

$V_{CE} = 5\text{ V}$
 $I_C = 30\text{ mA}$
 $T_{amb} = 25\text{ }^\circ\text{C}$

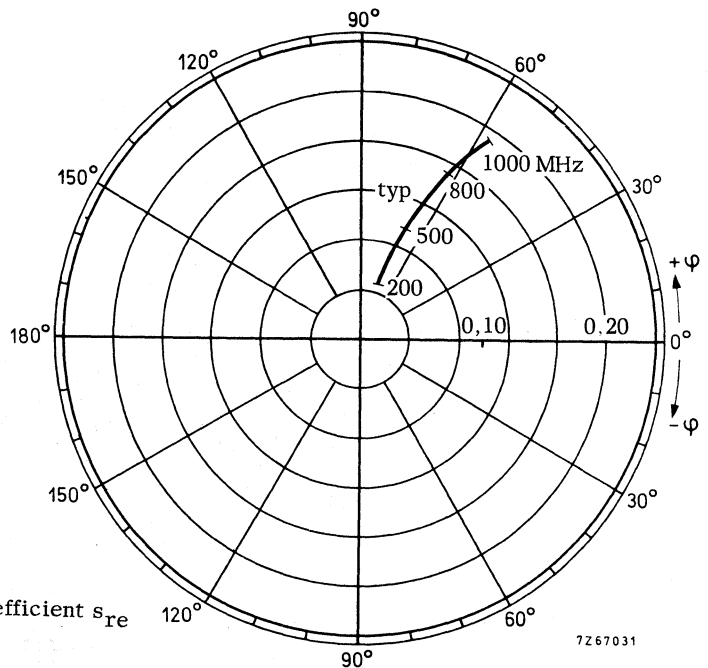


Fig. 13.

Reverse transmission coefficient s_{re}

$V_{CE} = 5\text{ V}$
 $I_C = 30\text{ mA}$
 $T_{amb} = 25\text{ }^\circ\text{C}$

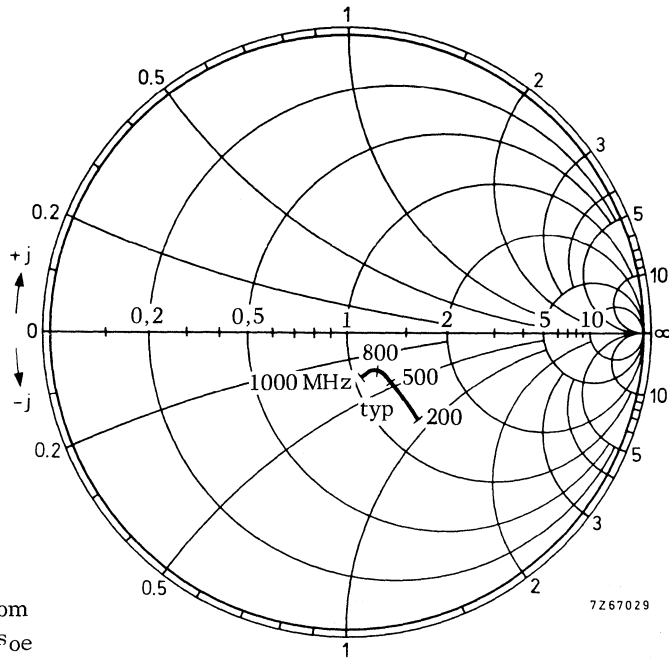


Fig. 14.

Output impedance derived from output reflection coefficient s_{oe} coordinates in ohm x 50

$V_{CE} = 5\text{ V}$
 $I_C = 30\text{ mA}$
 $T_{amb} = 25\text{ }^\circ\text{C}$

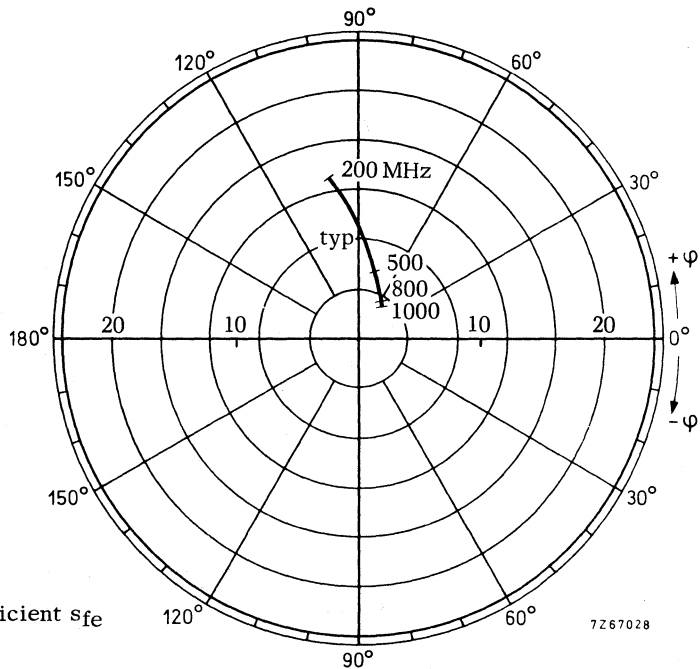


Fig. 15.

Forward transmission coefficient s_{fe}

N-P-N 1 GHz WIDEBAND TRANSISTOR

N-P-N transistors in a SOT-23 plastic envelope. They are primarily intended for use in v.h.f./u.h.f. broadband amplifiers. The transistors feature:

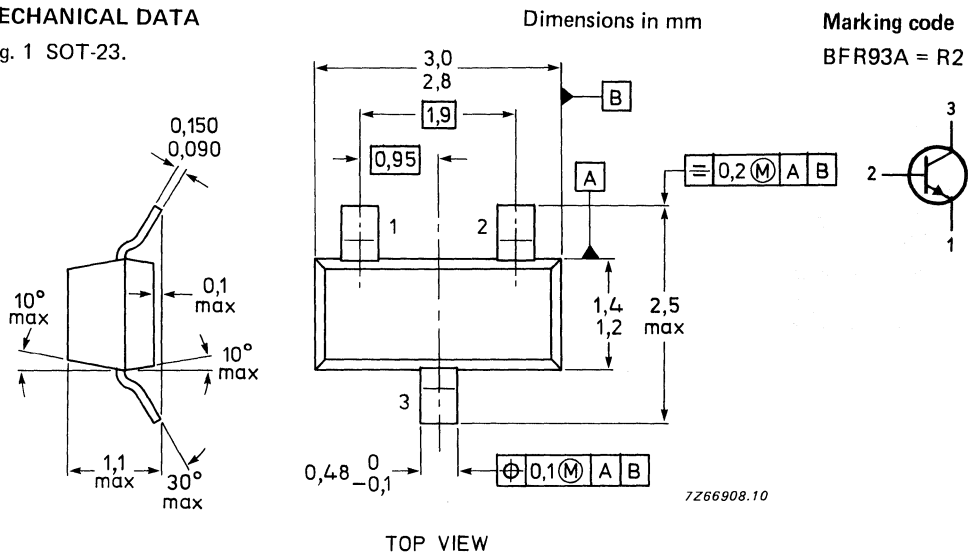
- low noise;
- very low intermodulation distortion;
- high power gain;
- P-N-P complement to the BFR93

QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CB0}	max.	15 V
Collector-emitter voltage (open base)	V_{CEO}	max.	12 V
Collector current (d.c.)	I_C	max.	35 mA
Total power dissipation up to $T_{amb} = 45\text{ °C}$	P_{tot}	max.	250 mW
Junction temperature	T_j	max.	150 °C
Transition frequency at $f = 500\text{ MHz}$ $I_C = 30\text{ mA}; V_{CE} = 5\text{ V}$	f_T	typ.	5 GHz
Feedback capacitance at $f = 1\text{ MHz}$ $I_C = 0; V_{CE} = 5\text{ V}; T_{amb} = 25\text{ °C}$	C_{re}	typ.	0,6 pF
Noise figure at optimum source impedance $I_C = 4\text{ mA}; V_{CE} = 8\text{ V}; f = 800\text{ MHz}$	F	typ.	1,6 dB
Output voltage at $d_{im} = -60\text{ dB}$ $I_C = 30\text{ mA}; V_{CE} = 8\text{ V}; R_L = 75\text{ }\Omega; T_{amb} = 25\text{ °C}$ $f_{(p+q-r)} = 793,25\text{ MHz}$	V_o	typ.	425 mV

MECHANICAL DATA

Fig. 1 SOT-23.



If required, the R-version (reverse pinning) is available on request
See also *Soldering recommendations*.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V _{CBO}	max.	15 V
Collector-emitter voltage (open base)	V _{CEO}	max.	12 V
Emitter-base voltage (open collector)	V _{EBO}	max.	2,0 V
Collector current (d.c.)	I _C	max.	35 mA
Total power dissipation up to T _{amb} = 45 °C**	P _{tot}	max.	250 mW
Storage temperature	T _{stg}		-65 to + 150 °C
Junction temperature	T _j	max.	150 °C

THERMAL CHARACTERISTICS*

$$T_j = P \times (R_{th\ j-t} + R_{th\ t-s} + R_{th\ s-a}) + T_{amb}$$

Thermal resistance

From junction to tab	R _{th j-t}	=	60 K/W
From tab to soldering points	R _{th t-s}	=	280 K/W
From soldering points to ambient**	R _{th s-a}	=	90 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current

I _E = 0; V _{CB} = 5 V	I _{CBO}	max.	50 nA
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D.C. current gain▲

I _C = 30 mA; V _{CE} = 5 V	h _{FE}	min.	40
		typ.	90

Transition frequency at f = 500 MHz▲

I _C = 30 mA; V _{CE} = 5 V	f _T	typ.	5 GHz
---	----------------	------	-------

Collector capacitance at f = 1 MHz

I _E = I _e = 0; V _{CB} = 5 V	C _c	typ.	0,7 pF
--	----------------	------	--------

Emitter capacitance at f = 1 MHz

I _C = I _c = 0; V _{EB} = 0,5 V	C _e	typ.	1,9 pF
--	----------------	------	--------

Feedback capacitance at f = 1 MHz

I _C = 0; V _{CE} = 5 V; T _{amb} = 25 °C	C _{re}	typ.	0,6 pF
---	-----------------	------	--------

Noise figure at optimum source impedance▲

I _C = 4 mA; V _{CE} = 8 V; f = 800 MHz	F	typ.	1,6 dB
I _C = 30 mA; V _{CE} = 8 V; f = 800 MHz	F	typ.	2,3 dB

Maximum unilateral power gain (s_{re} assumed to be zero)

See Figs 10 to 15

$$G_{UM} \text{ (in dB)} = 10 \log \frac{|s_{fe}|^2}{(1 - |s_{ie}|^2)(1 - |s_{oe}|^2)}$$

I _C = 30 mA; V _{CE} = 8 V; f = 800 MHz; T _{amb} = 25 °C	G _{UM}	typ.	14 dB
--	-----------------	------	-------

▲ Measured under pulse conditions.

* See *Thermal characteristics*.

** Mounted on a ceramic substrate of 8 mm x 10 mm x 0,7 mm.

Output voltage at $d_{im} = -60$ dB (see Figs 2 and 16)*

(DIN 45004B, par. 6.3: 3-tone)

$I_C = 30$ mA; $V_{CE} = 8$ V; $R_L = 75 \Omega$; $T_{amb} = 25$ °C

$V_p = V_o$ at $d_{im} = -60$ dB; $f_p = 795,25$ MHz

$V_q = V_o - 6$ dB ; $f_q = 803,25$ MHz

$V_r = V_o - 6$ dB ; $f_r = 805,25$ MHz

Measured at $f_{(p+q-r)} = 793,25$ MHz

V_o typ. 425 mV

Second harmonic distortion (see Figs 2 and 17)*

$I_C = 30$ mA; $V_{CE} = 8$ V; $R_L = 75 \Omega$; $T_{amb} = 25$ °C

$V_p = 200$ mV at $f_p = 250$ MHz

$V_q = 200$ mV at $f_q = 560$ MHz

measured at $f_{(p+q)} = 810$ MHz

d_2 typ. -50 dB

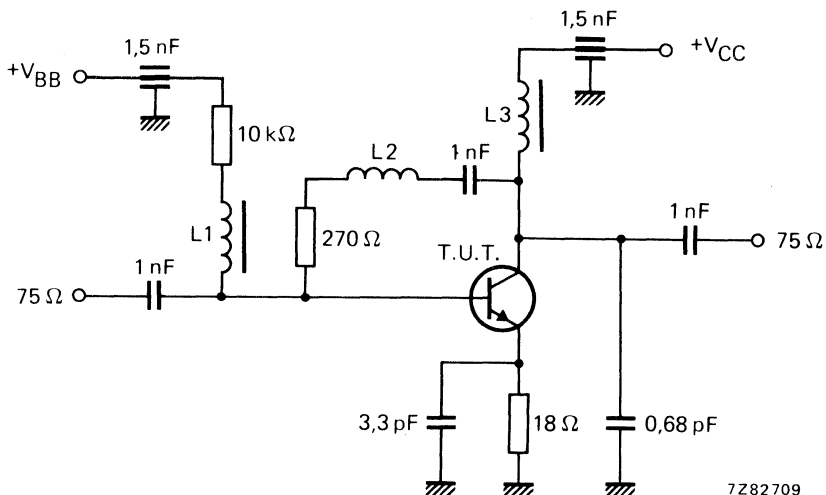


Fig. 2 Intermodulation distortion and second harmonic distortion MATV test circuit.

$L1 = L3 = 5 \mu\text{H}$ micro choke

$L2 = 3$ turns Cu wire (0,4 mm); internal diameter 3 mm; winding pitch 1 mm.

* Measured on same crystal in a SOT-37 envelope (BFR91A).

s-parameters (common emitter)

V_{CE} V	I_C mA	f MHz	S_{ie}	S_{re}	S_{fe}	S_{oe}
5	2	40	0,89/ -12,4°	0,016/82,3°	7,0/171,8°	0,88/ -4,8°
		100	0,87/ -30,1°	0,038/74,2°	6,7/160,1°	0,96/-11,3°
		200	0,80/ -56,3°	0,067/61,8°	6,0/142,3°	0,88/-20,1°
		500	0,64/-109,5°	0,106/44,3°	3,8/110,6°	0,69/-31,9°
		800	0,57/-140,3°	0,116/41,8°	2,7/ 91,5°	0,60/-35,5°
		1000	0,54/-154,5°	0,119/43,9°	2,2/ 82,8°	0,58/-38,0°
		1200	0,53/-166,6°	0,124/48,2°	1,9/ 75,1°	0,56/-40,2°
5	5	40	0,77/ -19,9°	0,015/79,4°	15,1/166,8°	0,97/ -8,8°
		100	0,72/ -46,9°	0,033/68,6°	13,5/149,7°	0,89/-19,6°
		200	0,62/ -81,4°	0,053/57,0°	10,5/128,5°	0,73/-30,3°
		500	0,48/-134,4°	0,079/52,6°	5,5/100,5°	0,51/-37,3°
		800	0,45/-159,8°	0,099/57,8°	3,6/ 85,6°	0,44/-37,9°
		1000	0,44/-170,8°	0,114/61,0°	3,0/ 78,8°	0,42/-39,3°
		1200	0,43/ 179,8°	0,131/64,2°	2,5/ 72,9°	0,41/-40,9°
5	10	40	0,63/ -29,7°	0,013/76,5°	24,4/161,0°	0,95/-13,5°
		100	0,56/ -66,2°	0,028/64,8°	20,0/139,4°	0,80/-17,8°
		200	0,47/-105,4°	0,042/57,8°	13,6/118,0°	0,59/-37,3°
		500	0,41/-152,0°	0,070/62,6°	6,4/ 94,8°	0,39/-39,0°
		800	0,39/-171,7°	0,099/67,6°	4,1/ 82,7°	0,35/-38,2°
		1000	0,39/ 179,6°	0,119/69,1°	3,4/ 76,7°	0,34/-39,1°
		1200	0,39/ 171,6°	0,140/70,5°	2,8/ 71,5°	0,33/-40,7°
5	20	40	0,47/ -44,2°	0,012/73,8°	35,2/154,0°	0,90/-19,2°
		100	0,42/ -90,7°	0,023/63,9°	25,4/129,3°	0,68/-35,0°
		200	0,39/-129,4°	0,034/62,9°	15,6/109,7°	0,47/-41,0°
		500	0,37/-165,1°	0,067/70,5°	6,8/ 90,9°	0,32/-38,4°
		800	0,37/ 179,5°	0,101/73,2°	4,4/ 80,3°	0,29/-37,4°
		1000	0,36/ 173,0°	0,124/73,4°	3,6/ 75,4°	0,29/-38,3°
		1200	0,37/ 166,2°	0,148/73,6°	3,0/ 70,3°	0,28/-40,0°
5	30	40	0,39/ -56,3°	0,011/72,3°	40,8/149,5°	0,86/-22,5°
		100	0,38/-106,8°	0,021/64,5°	27,4/124,0°	0,61/-37,9°
		200	0,37/-141,6°	0,032/66,4°	16,0/105,8°	0,41/-41,1°
		500	0,37/-171,0°	0,067/73,5°	6,9/ 88,9°	0,29/-36,6°
		800	0,37/ 175,9°	0,102/75,2°	4,4/ 79,1°	0,27/-36,0°
		1000	0,36/ 170,0°	0,126/74,8°	3,6/ 74,2°	0,27/-37,1°
		1200	0,37/ 163,9°	0,150/74,6°	3,0/ 69,5°	0,27/-39,0°

s-parameters (common emitter)

V_{CE} V	I_C mA	f MHz	s_{ie}	s_{re}	s_{fe}	s_{oe}
8	2	40	0,90/ -12,2°	0,015/82,1°	6,9/171,7°	0,99/ -4,8°
		100	0,88/ -29,2°	0,036/74,5°	6,6/160,4°	0,96/ -10,8°
		200	0,81/ -54,7°	0,064/62,4°	5,9/143,1°	0,89/ -19,2°
		500	0,64/ -107,0°	0,103/44,9°	3,8/111,5°	0,71/ -30,6°
		800	0,56/ -138,1°	0,112/42,1°	2,7/ 92,2°	0,62/ -34,1°
		1000	0,54/ -152,6°	0,116/44,1°	2,3/ 83,6°	0,60/ -36,4°
		1200	0,52/ -165,2°	0,120/48,5°	1,9/ 75,9°	0,58/ -38,6°
8	5	40	0,78/ -19,2°	0,014/79,4°	14,8/166,9°	0,98/ -8,6°
		100	0,73/ -44,6°	0,032/69,0°	13,5/150,4°	0,90/ -18,7°
		200	0,63/ -78,1°	0,051/57,5°	10,5/129,4°	0,75/ -28,9°
		500	0,48/ -131,2°	0,077/52,5°	5,6/101,3°	0,53/ -35,7°
		800	0,44/ -157,3°	0,096/57,7°	3,7/ 86,3°	0,46/ -36,2°
		1000	0,42/ -168,3°	0,110/61,0°	3,0/ 79,5°	0,44/ -37,5°
		1200	0,42/ -178,3°	0,126/64,3°	2,6/ 73,6°	0,43/ -39,0°
6	10	40	0,66/ -27,7°	0,013/76,7°	24,0/161,5°	0,95/ -12,9°
		100	0,58/ -62,0°	0,027/65,4°	19,9/140,4°	0,81/ -26,3°
		200	0,48/ -100,1°	0,041/58,0°	13,8/119,0°	0,61/ -35,5°
		500	0,40/ -148,2°	0,068/62,2°	6,5/ 95,4°	0,42/ -37,0°
		800	0,38/ -169,1°	0,096/67,4°	4,2/ 83,0°	0,37/ -36,2°
		1000	0,37/ -178,3°	0,116/69,0°	3,4/ 77,4°	0,36/ -37,0°
		1200	0,37/ 173,6°	0,136/70,5°	2,9/ 72,5°	0,35/ -38,5°
8	20	40	0,53/ -39,6°	0,012/73,8°	34,7/154,8°	0,91/ -18,1°
		100	0,45/ -83,0°	0,023/63,9°	25,6/130,5°	0,70/ -33,2°
		200	0,39/ -122,0°	0,034/62,2°	15,9/110,6°	0,49/ -39,0°
		500	0,35/ -161,3°	0,066/69,7°	7,0/ 91,4°	0,34/ -36,2°
		800	0,35/ -177,9°	0,098/72,7°	4,5/ 80,7°	0,31/ -35,1°
		1000	0,34/ 175,2°	0,121/73,1°	3,7/ 75,8°	0,31/ -36,0°
		1200	0,34/ 168,3°	0,143/73,4°	3,1/ 71,2°	0,30/ -37,5°
8	30	40	0,47/ -48,0°	0,011/72,2°	40,3/150,8°	0,87/ -20,9°
		100	0,41/ -95,5°	0,021/63,8°	27,5/125,4°	0,63/ -35,7°
		200	0,36/ -132,8°	0,032/64,9°	16,4/106,8°	0,44/ -38,9°
		500	0,35/ -166,6°	0,065/72,3°	7,1/ 89,6°	0,32/ -34,4°
		800	0,34/ 178,8°	0,100/74,4°	4,5/ 79,7°	0,30/ -33,6°
		1000	0,34/ 172,7°	0,122/74,4°	3,7/ 74,7°	0,30/ -34,7°
		1200	0,34/ 166,0°	0,145/74,3°	3,1/ 70,3°	0,29/ -36,5°

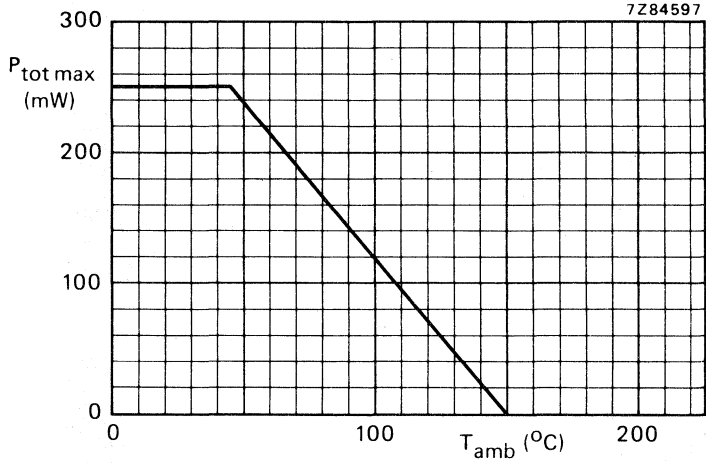


Fig. 3 Power derating curve.

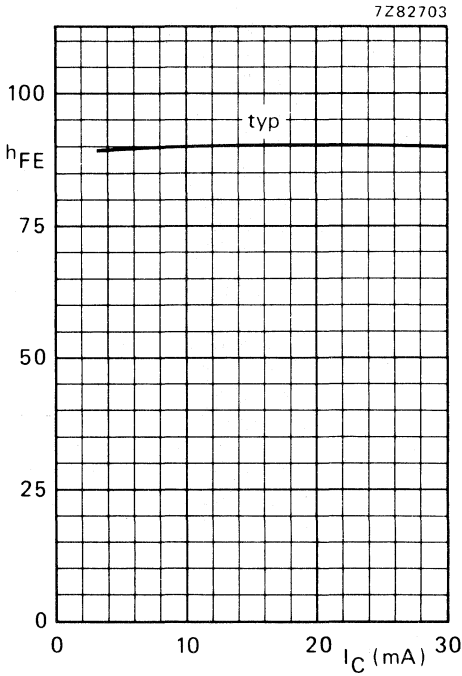


Fig. 4 $V_{CE} = 5\ V$; $T_j = 25\ ^\circ C$.

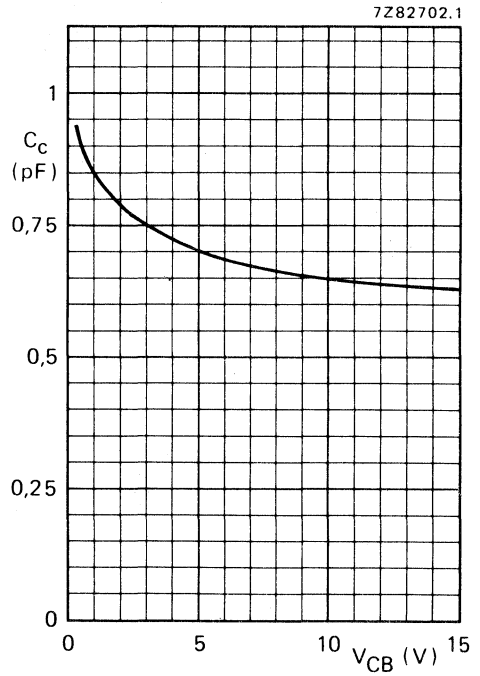


Fig. 5 Typical values collector capacitance
 $I_E = I_e = 0$; $f = 1\ MHz$; $T_j = 25\ ^\circ C$.

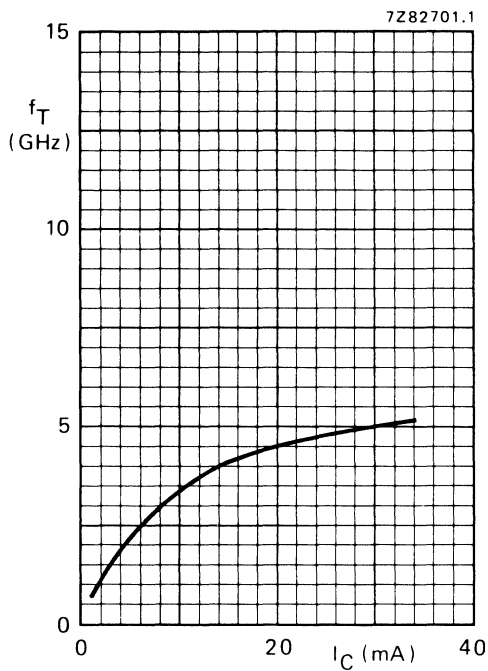


Fig. 6 Typical values transition frequency at $V_{CE} = 5\text{ V}$; $f = 500\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

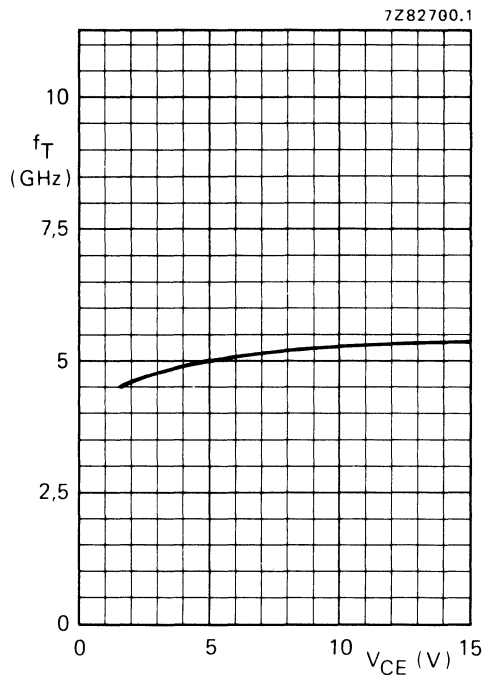


Fig. 7 Typical values transition frequency at $I_C = 30\text{ mA}$; $f = 500\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$.

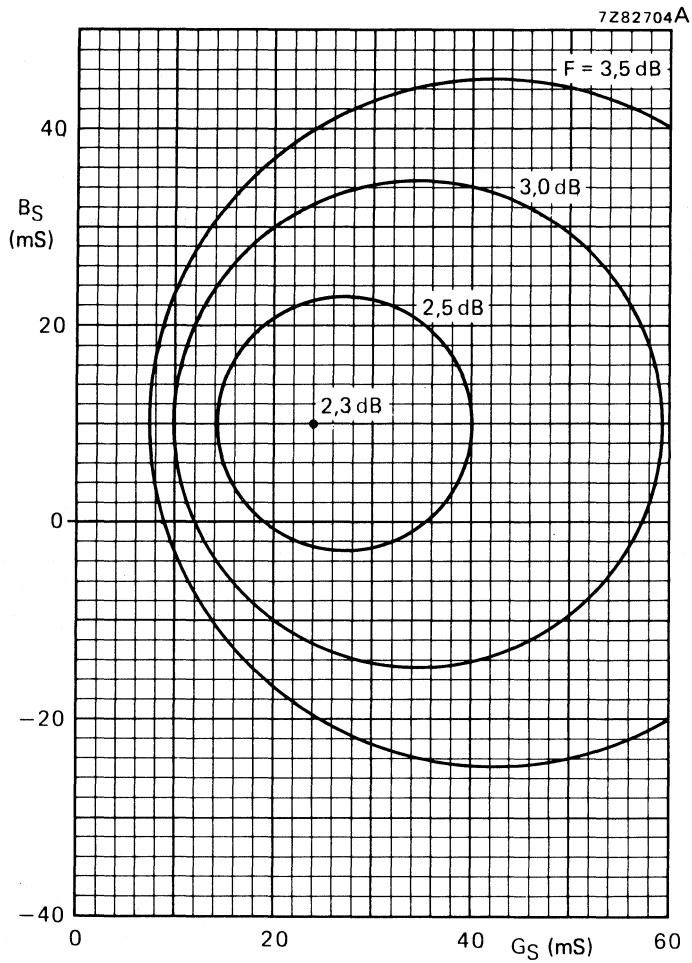


Fig. 8 Circles of constant noise figure.
 $V_{CE} = 8$ V; $I_C = 30$ mA; $f = 800$ MHz;
 $T_{amb} = 25$ °C; typical values.

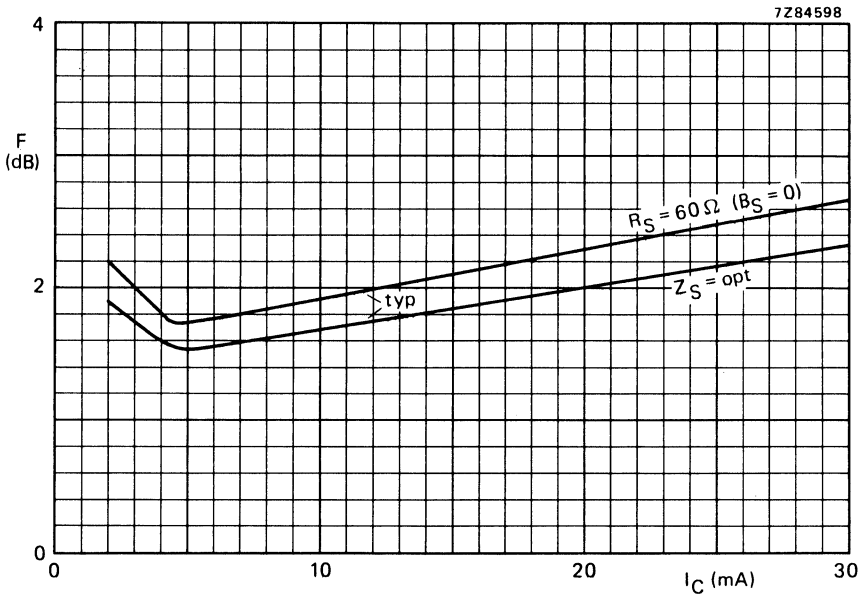


Fig. 9 $V_{CE} = 8 \text{ V}$; $f = 800 \text{ MHz}$; $T_{amb} = 25 \text{ }^\circ\text{C}$.

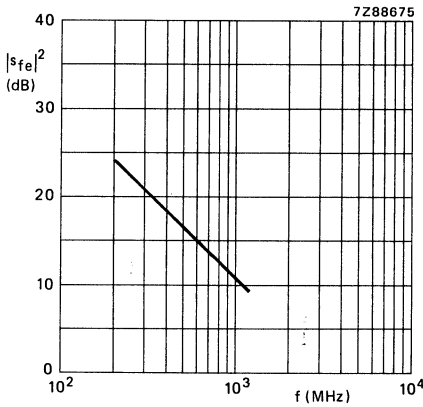


Fig. 10 Typical values forward transmission coefficient as a function of frequency. $V_{CE} = 8 \text{ V}$; $I_C = 30 \text{ mA}$; $T_{amb} = 25 \text{ }^\circ\text{C}$.

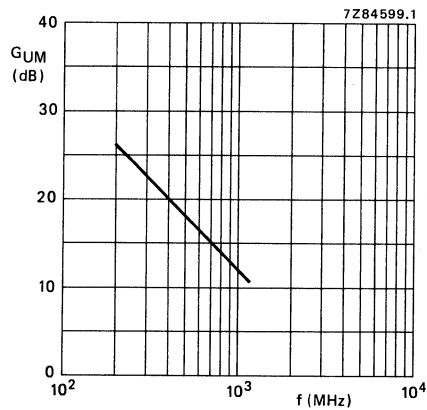


Fig. 11 Typical values unilateral power gain as a function of frequency. $V_{CE} = 8 \text{ V}$; $I_C = 30 \text{ mA}$; $T_{amb} = 25 \text{ }^\circ\text{C}$.

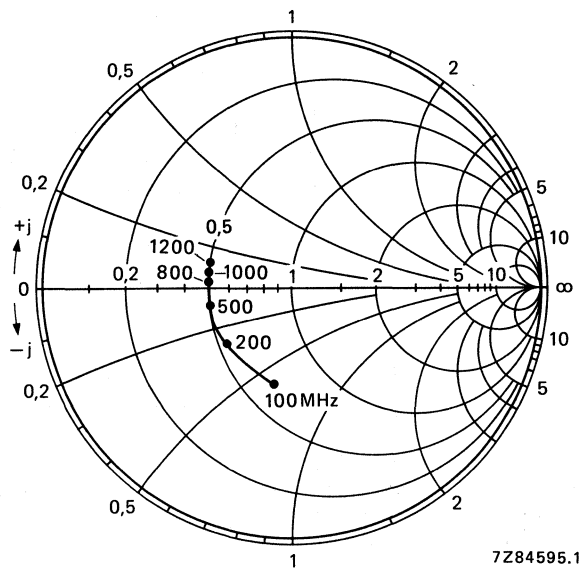


Fig. 12 Input impedance derived from input reflection coefficient s_{ie} co-ordinates in ohm x 50. $V_{CE} = 8 \text{ V}$; $I_C = 30 \text{ mA}$; $T_{amb} = 25 \text{ }^\circ\text{C}$.

7Z84595.1

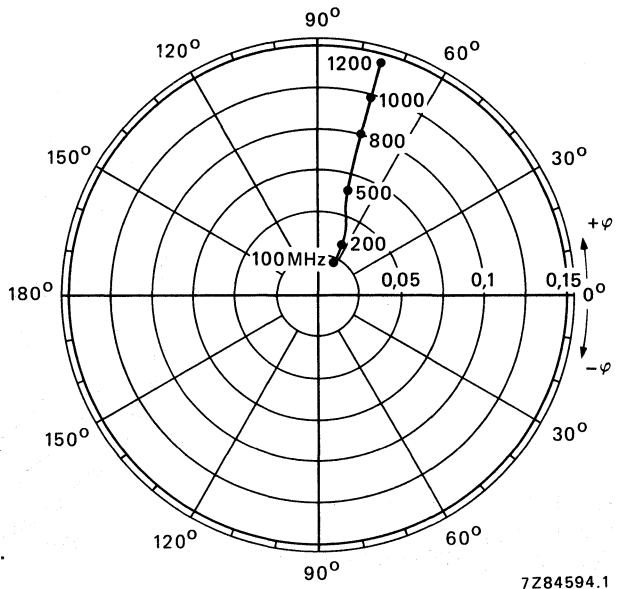


Fig. 13 Reverse transmission coefficient s_{re} . $V_{CE} = 8 \text{ V}$; $I_C = 30 \text{ mA}$; $T_{amb} = 25 \text{ }^\circ\text{C}$.

7Z84594.1

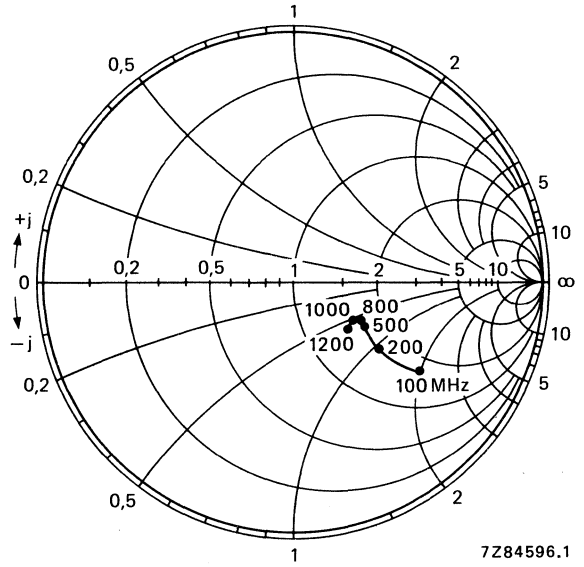


Fig. 14 Output impedance derived from output reflection coefficient s_{oe} co-ordinates in ohm $\times 50$.
 $V_{CE} = 8 \text{ V}$; $I_C = 30 \text{ mA}$; $T_{amb} = 25 \text{ }^\circ\text{C}$.

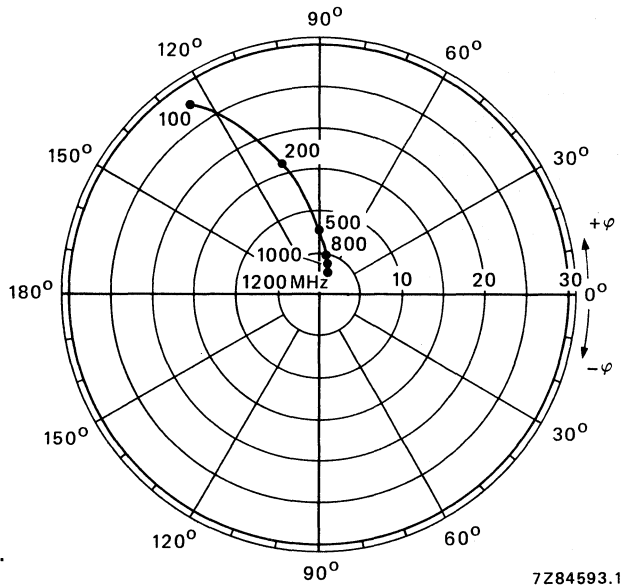


Fig. 15 Forward transmission coefficient s_{fe} .
 $V_{CE} = 8 \text{ V}$; $I_C = 30 \text{ mA}$; $T_{amb} = 25 \text{ }^\circ\text{C}$.

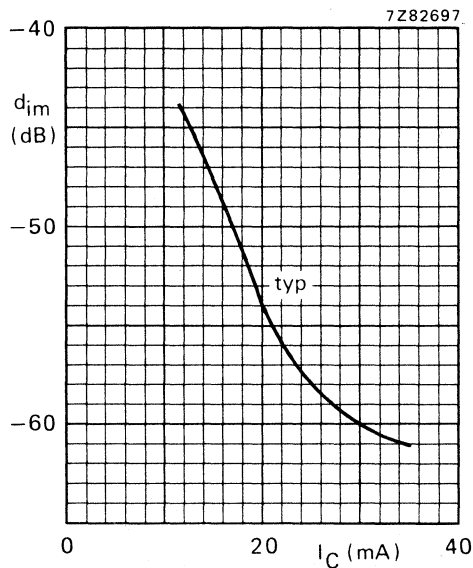


Fig. 16 $V_{CE} = 8 \text{ V}$; $V_o = 425 \text{ mV} = 52,6 \text{ dBmV}$;
 $f_{(p+q-r)} = 793,25 \text{ MHz}$; $T_{amb} = 25 \text{ }^\circ\text{C}$;
 measured in MATV test circuit (see Fig. 2).

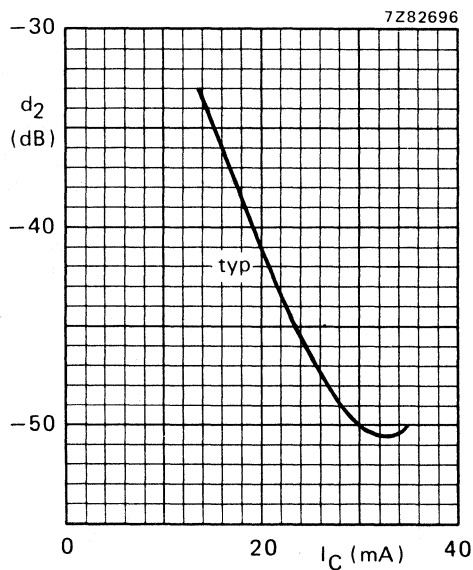


Fig. 17 $V_{CE} = 8 \text{ V}$; $V_o = 200 \text{ mV} = 46 \text{ dBmV}$;
 $f_{(p+q)} = 810 \text{ MHz}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; measured in
 MATV test circuit (see Fig. 2).

N-P-N H.F. WIDEBAND TRANSISTOR

N-P-N resistance-stabilized transistor in a SOT-48 capstan envelope featuring extremely low cross modulation, intermodulation and second harmonic distortion. Thanks to its high transition frequency it has a high power gain in conjunction with good wideband properties and low noise up to high frequencies.

It is primarily intended for CATV and MATV applications.

QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	30 V
Collector-emitter voltage (open base)	V_{CEO}	max.	25 V
Collector current (d.c.)	I_C	max.	150 mA
Total power dissipation up to $T_h = 145\text{ }^\circ\text{C}$; $f > 1\text{ MHz}$	P_{tot}	max.	3,5 W
Junction temperature	T_j	max.	200 $^\circ\text{C}$
Transition frequency at $f = 500\text{ MHz}$ $I_C = 90\text{ mA}$; $V_{CE} = 20\text{ V}$	f_T	typ.	3,5 GHz
Cross modulation distortion (channel 13) $I_C = 90\text{ mA}$; $V_{CE} = 20\text{ V}$; $V_o = 48\text{ dBmV}$	d_{cm}	typ. max.	-61 dB -57 dB
$I_C = 90\text{ mA}$; $V_{CE} = 20\text{ V}$; $V_o = 32\text{ dBmV}$	d_{cm}	typ. max.	-93 dB -89 dB
Intermodulation distortion at $f_{(p+q-r)} = 194,25\text{ MHz}$ $I_C = 90\text{ mA}$; $V_{CE} = 20\text{ V}$; $V_o = 60\text{ dBmV}$	d_{im}	typ.	-63 dB
Broadband power gain $I_C = 90\text{ mA}$; $V_{CE} = 20\text{ V}$	G_p	min. typ.	10 dB 11 dB
Noise figure at $f = 200\text{ MHz}$ $I_C = 90\text{ mA}$; $V_{CE} = 20\text{ V}$	F	typ. max.	8 dB 10 dB
2nd harmonic distortion at $f_p + f_q = 210\text{ MHz}$ $I_C = 90\text{ mA}$; $V_{CE} = 20\text{ V}$; $V_o = 48\text{ dBmV}$	d_2	max.	-56 dB

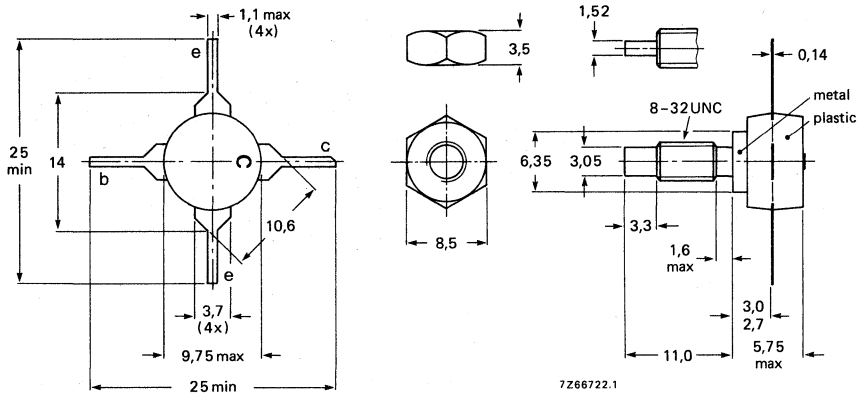
MECHANICAL DATA (see next page)

PRODUCT SAFETY. These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-48.



When locking is required an adhesive instead of a lock washer is preferred.

Torque on nut: min. 0,75 Nm
(7,5 kg cm)
max. 0,85 Nm
(8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,17 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not
chamfer or countersink either end of hole.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CB0}	max.	30 V
Collector-emitter voltage ($R_{BE} = 10 \Omega$)	V_{CER}	max.	35 V
Collector-emitter voltage (open base)	V_{CEO}	max.	25 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3 V
Collector current (d.c.)	I_C	max.	150 mA
Collector current (peak value); $f > 1$ MHz	I_{CM}	max.	300 mA
Total power dissipation (d.c.) up to $T_h = 160 \text{ }^\circ\text{C}$	P_{tot}	max.	2,5 W
Total power dissipation up to $T_h = 145 \text{ }^\circ\text{C}$; $f > 1$ MHz	P_{tot}	max.	3,5 W
Storage temperature	T_{stg}		-65 to + 200 $^\circ\text{C}$
Junction temperature	T_j	max.	200 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to mounting base	$R_{th j-mb}$	=	15 K/W
From mounting base to heatsink	$R_{th mb-h}$	=	0,6 K/W

CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Collector cut-off current

$I_E = 0; V_{CB} = 20\text{ V}$

I_{CBO} max. 50 μA

D.C. current gain

$I_C = 50\text{ mA}; V_{CE} = 20\text{ V}$

h_{FE} min. 30 ←

$I_C = 150\text{ mA}; V_{CE} = 20\text{ V}$

h_{FE} min. 30 ←

Transition frequency at $f = 500\text{ MHz}$

$I_C = 90\text{ mA}; V_{CE} = 20\text{ V}$

f_T typ. 3,5 GHz

$I_C = 150\text{ mA}; V_{CE} = 20\text{ V}$

f_T typ. 3,5 GHz

Collector capacitance at $f = 1\text{ MHz}$

$I_E = I_e = 0; V_{CB} = 20\text{ V}$

C_C typ. 3,5 pF

Emitter capacitance at $f = 1\text{ MHz}$

$I_C = I_c = 0; V_{EB} = 0,5\text{ V}$

C_e typ. 12 pF

Feedback capacitance at $f = 1\text{ MHz}$

$I_C = 10\text{ mA}; V_{CE} = 20\text{ V}$

C_{re} typ. 1,3 pF

Collector-stud capacitance at $f = 1\text{ MHz}$

C_{cs} typ. 2 pF

Noise figure at optimum source impedance

$I_C = 90\text{ mA}; V_{CE} = 20\text{ V}; f = 500\text{ MHz}; T_{amb} = 25\text{ }^\circ\text{C}$

F typ. 5 dB ←

Maximum unilateral power gain (s_{re} assumed to be zero)

$$G_{UM} = 10 \log \frac{|s_{fe}|^2}{(1 - |s_{ie}|^2)(1 - |s_{oe}|^2)}$$

$I_C = 90\text{ mA}; V_{CE} = 20\text{ V}; f = 500\text{ MHz}; T_{amb} = 25\text{ }^\circ\text{C}$

G_{UM} typ. 13,5 dB

CHARACTERISTICS (continued)

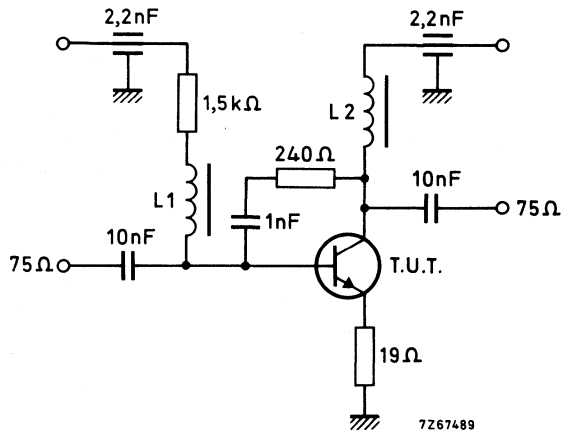
Output voltage at $d_{im} = -60$ dB (see Fig. 2)(DIN 45004B, par. 6.3: 3-tone); $T_{amb} = 25$ °C $I_C = 90$ mA; $V_{CE} = 20$ V; $R_L = 75$ Ω $V_p = V_o$ at $d_{im} = -60$ dB; $f_p = 495,25$ MHz $V_q = V_o - 6$ dB ; $f_q = 503,25$ MHz $R_r = V_o - 6$ dB ; $f_r = 505,25$ MHzmeasured at $f_{(p+q-r)} = 493,25$ MHz V_o typ. 700 mV

Fig. 2 MATV test circuit.

 $L1 = L2 = 5$ μH Ferroxcube coil (code number: 3122 108 20153)

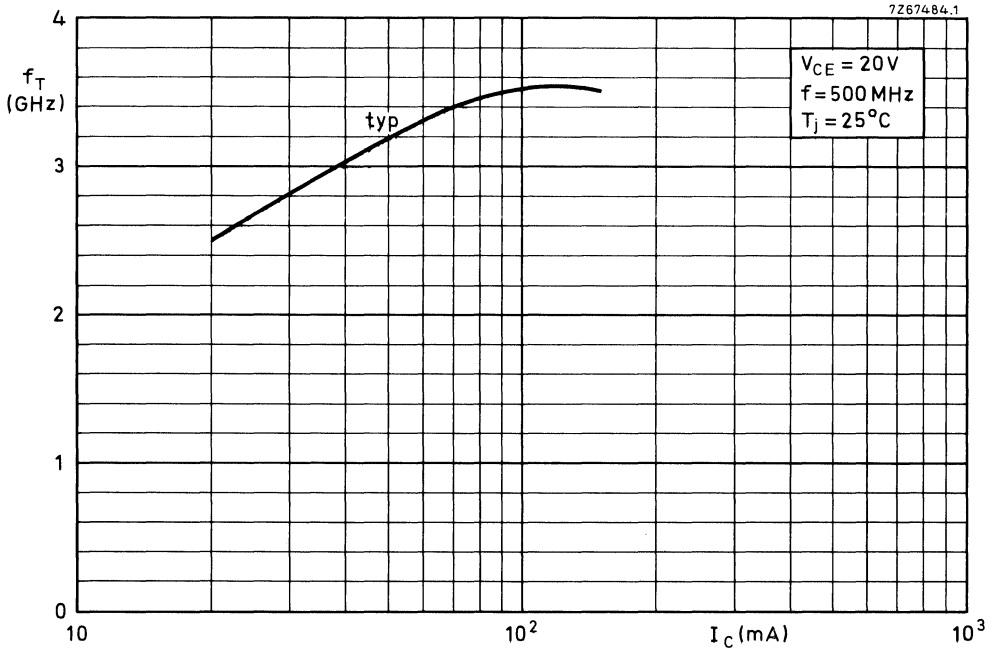


Fig. 3 $V_{CE} = 20\text{ V}$; $f = 500\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$; typical values.

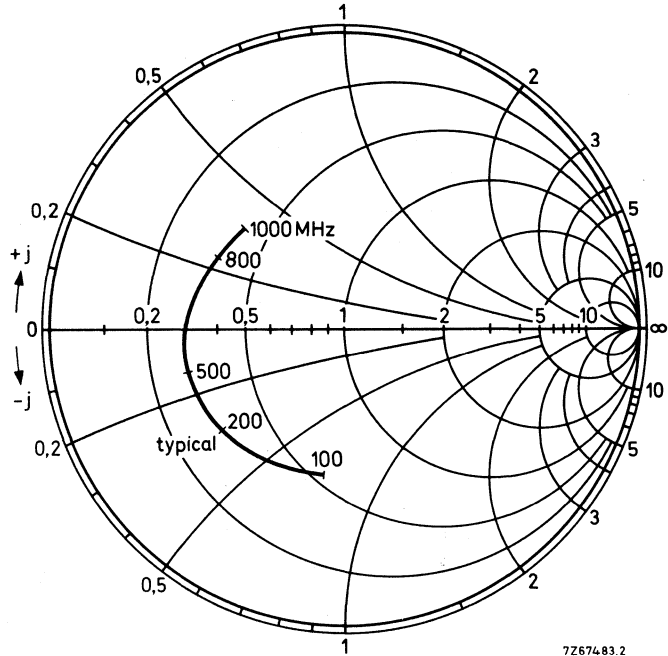


Fig. 4 $V_{CE} = 20 \text{ V}$; $I_C = 90 \text{ mA}$;
 $T_{amb} = 25^\circ\text{C}$; typical values.

Input reflection coefficient s_{ie}

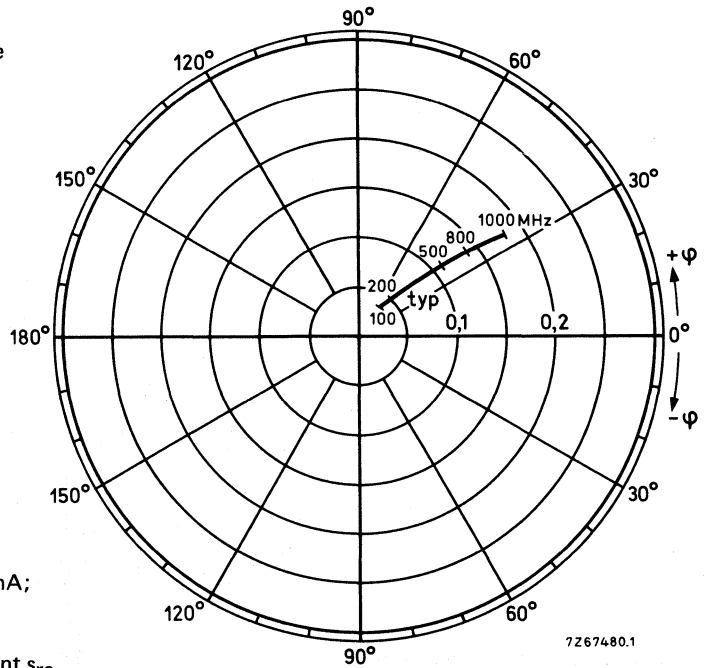
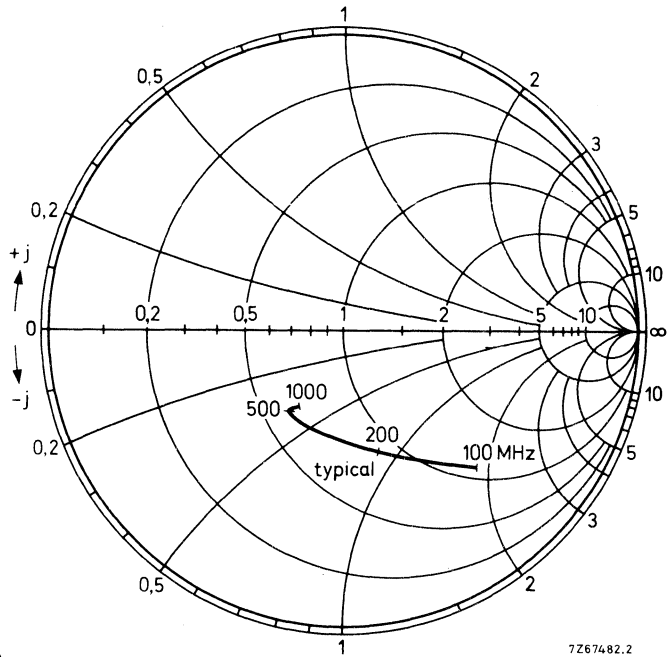


Fig. 5 $V_{CE} = 20 \text{ V}$; $I_C = 90 \text{ mA}$;
 $T_{amb} = 25^\circ\text{C}$; typical values.

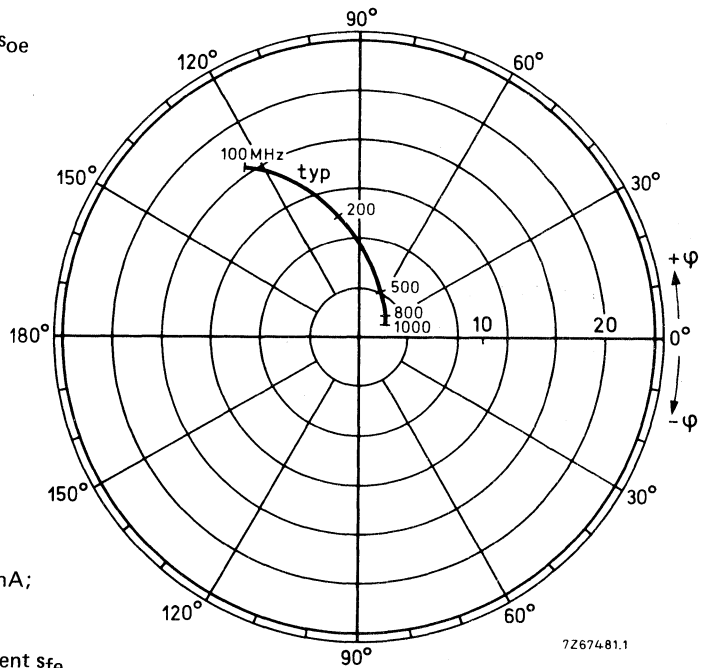
Reverse transmission coefficient s_{re}



7Z67482.2

Fig. 6 $V_{CE} = 20 \text{ V}$; $I_C = 90 \text{ mA}$;
 $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

Output reflection coefficient s_{oe}



7Z67481.1

Fig. 7 $V_{CE} = 20 \text{ V}$; $I_C = 90 \text{ mA}$;
 $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

Forward transmission coefficient s_{fe}

APPLICATION INFORMATION

$T_{amb} = 25\text{ }^{\circ}\text{C}$ unless otherwise specified

Cross modulation distortion (channel 13)*

$I_C = 90\text{ mA}; V_{CE} = 20\text{ V}; V_O = 48\text{ dBmV}$ d_{cm} typ. -61 dB

max. -57 dB

$I_C = 90\text{ mA}; V_{CE} = 20\text{ V}; V_O = 32\text{ dBmV}$ d_{cm} typ. -93 dB

max. -89 dB

Intermodulation distortion

$I_C = 90\text{ mA}; V_{CE} = 20\text{ V}; R_L = 75\text{ }\Omega$

$V_p = V_O = 60\text{ dBmV}$ at $f_p = 196,25\text{ MHz}$

$V_q = V_O - 6\text{ dB}$ at $f_q = 203,25\text{ MHz}$

$V_r = V_O - 6\text{ dB}$ at $f_r = 205,25\text{ MHz}$

Measured at $f_{(p+q-r)} = 194,25\text{ MHz}$

d_{im} typ. -63 dB

Power gain

$I_C = 90\text{ mA}; V_{CE} = 20\text{ V}$

G_p min. 10 dB

typ. 11 dB

Noise figure

$I_C = 90\text{ mA}; V_{CE} = 20\text{ V}; f = 200\text{ MHz}$

F typ. 8 dB

max. 10 dB

2nd harmonic distortion

$I_C = 90\text{ mA}; V_{CE} = 20\text{ V}$

$f_p = 66\text{ MHz}; f_q = 144\text{ MHz}; f_p + f_q = 210\text{ MHz}; V_O = 48\text{ dBmV}$

d_2 max. -56 dB

* In 12-channel measuring equipment; channel 13 unmodulated.

V_O = output level/signal, according to NCTA measuring standard.

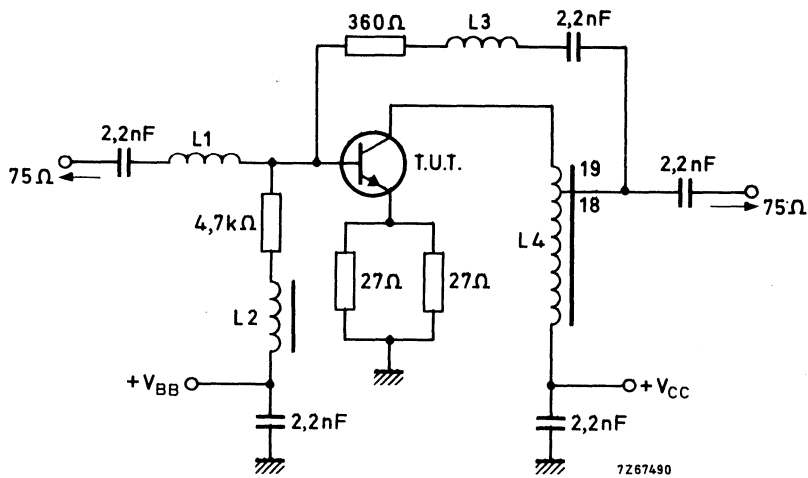


Fig. 8 CATV test circuit.

Frequency range 40 to 300 MHz (flatness gain $\pm 0,2$ dB)
 Return losses input and output < -16 dB
 Power gain G_p typ. 11 dB

L1 = 2 turns closely wound enamelled Cu wire (0,7 mm); int. diam. 3 mm

L2 = 5 μ H Ferroxcube coil (code number 3122 108 20153)

L3 = 5 turns closely wound enamelled Cu wire (0,7 mm); int. diam. 4,7 mm

L4 = 19 turns enamelled Cu wire (0,3 mm) on Ferroxcube core (code no. 4322 020 91001)

7267487

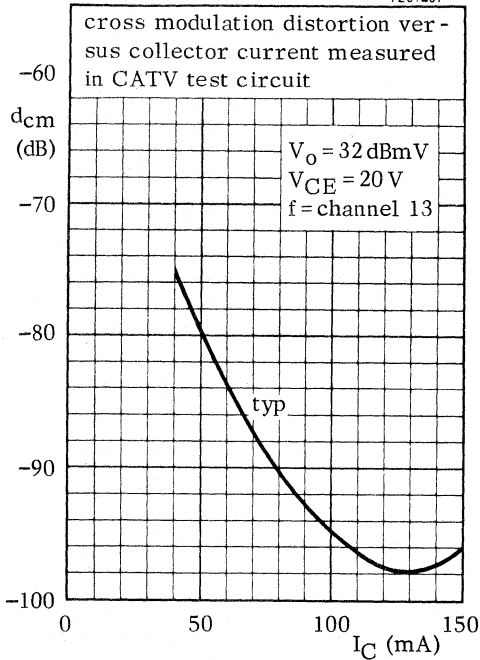


Fig. 9 $V_O = 32 \text{ dBmV}$; $V_{CE} = 20 \text{ V}$; $f = \text{ch. 13}$; typical values.

7267486

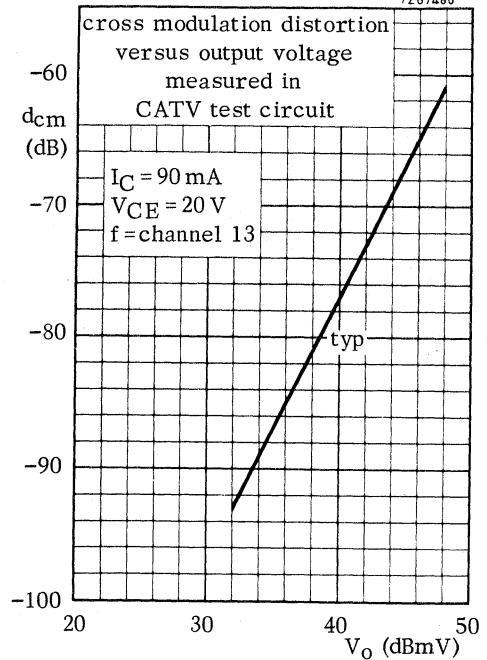


Fig. 10 $V_{CE} = 20 \text{ V}$; $I_C = 90 \text{ mA}$; $f = \text{ch. 13}$; typical values.

7267485

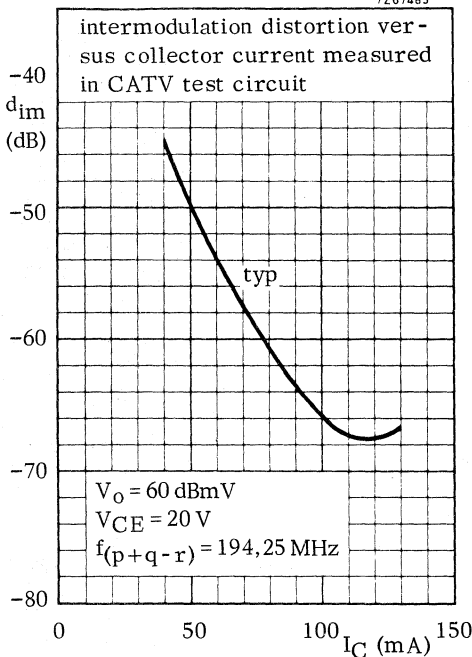


Fig. 11 $V_{CE} = 20 \text{ V}$; $V_O = 60 \text{ dBmV}$; $f_{(p+q-r)} = 194,25 \text{ MHz}$; typical values.

7267488

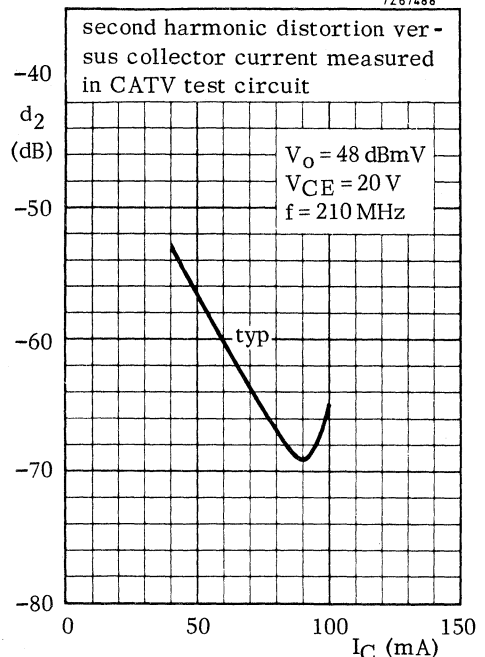


Fig. 12 $V_{CE} = 20 \text{ V}$; $V_O = 48 \text{ dBmV}$; $f = 210 \text{ MHz}$; typical values.

N-P-N H.F. WIDEBAND TRANSISTOR

N-P-N resistance stabilized transistor in a TO-39 metal envelope, with collector connected to the case.

Due to very linear characteristics the transistor features low cross modulation, intermodulation and second harmonic distortion. Thanks to its high transition frequency it has a high power gain combined with excellent wideband properties and low noise up to high frequencies.

The BFR95 is primarily intended for CATV and MATV applications.

QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	30 V
Collector-emitter voltage (open base)	V_{CEO}	max.	25 V
Collector current (d.c.)	I_C	max.	150 mA
Total power dissipation up to $T_{mb} = 125^\circ\text{C}$	P_{tot}	max.	1,5 W
Junction temperature	T_j	max.	200 $^\circ\text{C}$
Transition frequency at $f = 500$ MHz $I_C = 80$ mA; $V_{CE} = 20$ V	f_T	typ.	3,5 GHz
Cross modulation distortion (channel 13) $I_C = 80$ mA; $V_{CE} = 18$ V; $V_o = 48$ dBmV	d_{cm}	typ. max.	-61 dB -57 dB
$I_C = 80$ mA; $V_{CE} = 18$ V; $V_o = 32$ dBmV	d_{cm}	typ. max.	-93 dB -89 dB
Intermodulation distortion at $f_{(p+q-r)} = 194,25$ MHz $I_C = 80$ mA; $V_{CE} = 18$ V; $V_o = 60$ dBmV	d_{im}	typ.	-64 dB
Power gain $I_C = 80$ mA; $V_{CE} = 18$ V	G_p	min. typ.	8 dB 9 dB
Noise figure at $f = 200$ MHz $I_C = 80$ mA; $V_{CE} = 18$ V	F	typ. max.	9 dB 10 dB
Second harmonic distortion at $f_{(p+q)} = 210$ MHz $I_C = 80$ mA; $V_{CE} = 18$ V; $V_o = 48$ dBmV	d_2	typ.	-62 dB

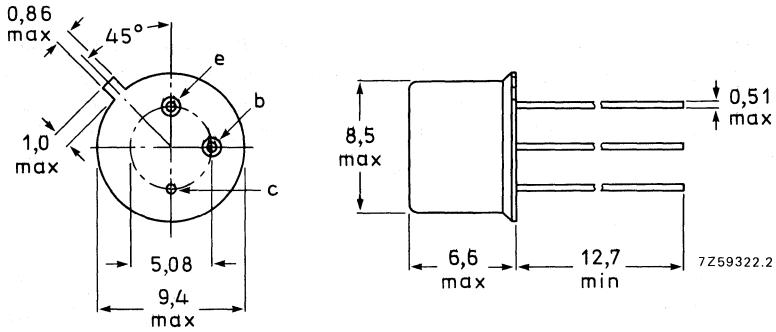
MECHANICAL DATA (see next page)

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-39

Collector connected to case



Maximum lead diameter guaranteed only for 12,7 mm.

Accessories: 56245 (distance disc).

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter) note 1	V_{CBO}	max.	30 V
Collector-emitter voltage ($R_{BE} = 10 \Omega$) note 2	V_{CER}	max.	35 V
Collector-emitter voltage (open base) note 2	V_{CEO}	max.	25 V
Emitter-base voltage (open collector) note 3	V_{EBO}	max.	3 V
Collector current (d.c.)	I_C	max.	150 mA
Collector current (peak value); $f > 1$ MHz	I_{CM}	max.	300 mA
Total power dissipation			
up to $T_{amb} = 25^\circ C$	P_{tot}	max.	0,7 W
up to $T_{mb} = 125^\circ C$	P_{tot}	max.	1,5 W
Storage temperature	T_{stg}		-65 to $+200^\circ C$
Junction temperature	T_j	max.	$200^\circ C$

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j-a}$	=	250 K/W
From junction to mounting base	$R_{th\ j-mb}$	=	50 K/W

Notes

1. At $I_C = 100 \mu A$.
2. At $I_C = 10 mA$.
3. At $I_E = 100 \mu A$.

CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Collector cut-off current

$I_E = 0; V_{CB} = 20\text{ V}$

I_{CBO}	max.	50 μA	←
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D.C. current gain

$I_C = 50\text{ mA}; V_{CE} = 20\text{ V}$

h_{FE}	min.	30	
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$I_C = 150\text{ mA}; V_{CE} = 20\text{ V}$

h_{FE}	min.	30	
----------	------	----	--

Transition frequency at $f = 500\text{ MHz}$

$I_C = 80\text{ mA}; V_{CE} = 20\text{ V}$

f_T	typ.	3,5 GHz	←
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$I_C = 150\text{ mA}; V_{CE} = 20\text{ V}$

f_T	typ.	3,5 GHz	
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Collector capacitance at $f = 1\text{ MHz}$

$I_E = I_e = 0; V_{CB} = 20\text{ V}$

C_c	typ.	3,5 pF	
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Feedback capacitance at $f = 1\text{ MHz}$

$I_C = 10\text{ mA}; V_{CE} = 20\text{ V}$

C_{re}	typ.	1,6 pF	
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APPLICATION INFORMATION

Measuring conditions: $I_C = 80\text{ mA}; V_{CE} = 18\text{ V}; T_{amb} = 25\text{ }^\circ\text{C}$

Cross modulation (channel 13) (note)

$V_o = 48\text{ dBmV}$

d_{cm}	typ.	-61 dB	
	max.	-57 dB	

$V_o = 32\text{ dBmV}$

d_{cm}	typ.	-93 dB	
	max.	-89 dB	

Intermodulation distortion

$V_p = V_o = 60\text{ dBmV}$ at $f_p = 196,25\text{ MHz}$

$V_q = V_o - 6\text{ dB}$ at $f_q = 203,25\text{ MHz}$

$V_r = V_o - 6\text{ dB}$ at $f_r = 205,25\text{ MHz}$

Measured at $f_{(p+q-r)} = 194,25\text{ MHz}$

d_{im}	typ.	-64 dB	
	min.	8 dB	←

Power gain

G_p	typ.	9 dB	
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Noise figure at $f = 200\text{ MHz}$

F	typ.	9 dB	
	max.	10 dB	

2nd harmonic distortion at $f_{(p+q)} = 210\text{ MHz}$

$f_p = 66\text{ MHz}; f_q = 144\text{ MHz}; V_o = 48\text{ dBmV}$

d_2	typ.	-62 dB	
	max.	-56 dB	

Note

In 12-channel measuring equipment; channel 13 unmodulated.

$V_o =$ output level/signal, in accordance with NCTA measuring standard.

APPLICATION INFORMATION

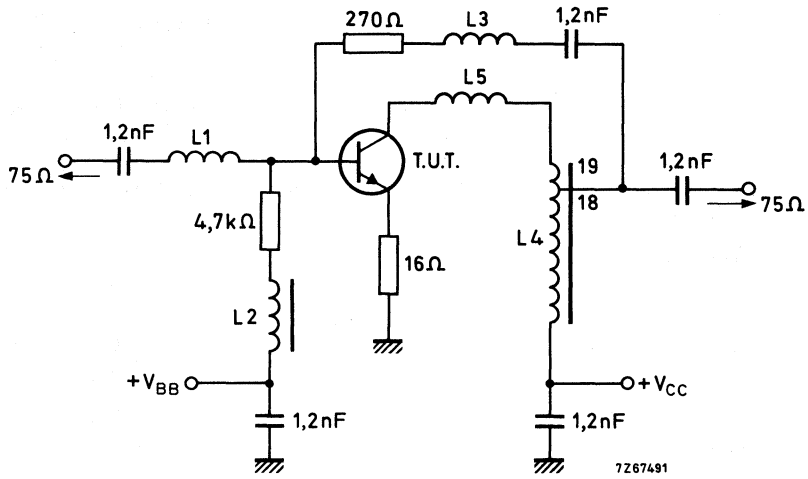


Fig. 2 CATV test circuit.
 Frequency range 40 to 300 MHz
 Power gain G_p typ. 9 dB

- L1 = 2 turns closely wound enamelled Cu wire (0,7 mm); int. dia. 3 mm
- L2 = 5 μ H Ferroxcube coil (cat. no. 3122 108 20153)
- L3 = 3 turns closely wound enamelled Cu wire (0,7 mm); int. dia. 4,7 mm
- L4 = 19 turns enamelled Cu wire (0,3 mm) on Ferroxcube core (cat. no. 4322 020 91001)
- L5 = 2 turns closely wound enamelled Cu wire (0,7 mm); int. dia. 3 mm.

N-P-N 1 GHz WIDEBAND TRANSISTOR

N-P-N transistor in a plastic SOT-37 envelope. It is primarily intended for use in u.h.f. and microwave amplifiers such as in aerial amplifiers, radar systems, oscilloscopes, spectrum analysers, etc. The transistor features very low intermodulation distortion and high power gain; thanks to its very high transition frequency, it also has excellent wideband properties and low noise up to high frequencies. P-N-P complement is BFQ32.

QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	20 V
Collector-emitter voltage (open base)	V_{CEO}	max.	15 V
Collector current (d.c.)	I_C	max.	75 mA
Total power dissipation up to $T_{amb} = 60\text{ }^\circ\text{C}$	P_{tot}	max.	500 mW
Junction temperature	T_j	max.	175 $^\circ\text{C}$
Transition frequency at $f = 500\text{ MHz}$ $I_C = 50\text{ mA}; V_{CE} = 10\text{ V}$	f_T	typ.	5,0 GHz
Feedback capacitance at $f = 1\text{ MHz}$ $I_C = 10\text{ mA}; V_{CE} = 10\text{ V}$	C_{re}	max.	1,4 pF
Noise figure at optimum source impedance $I_C = 50\text{ mA}; V_{CE} = 10\text{ V}; f = 500\text{ MHz}$	F	typ.	3,3 dB
Maximum unilateral power gain $I_C = 50\text{ mA}; V_{CE} = 10\text{ V}; f = 500\text{ MHz}$	G_{UM}	typ.	15,2 dB
Output voltage at $d_{im} = -60\text{ dB}$ $I_C = 50\text{ mA}; V_{CE} = 10\text{ V}; R_L = 75\text{ }\Omega$ $f_{(p+q-r)} = 493,25\text{ MHz}$	V_o	typ.	500 mV

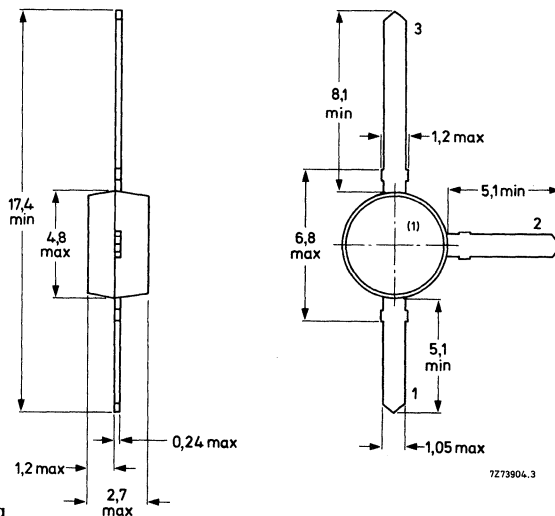
MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-37.

Connections

1. Base
2. Emitter
3. Collector



(1) = type number marking.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	20 V
Collector-emitter voltage (open base)	V_{CEO}	max.	15 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3 V
Collector current (d.c.)	I_C	max.	75 mA
Collector current (peak value); $f > 1$ MHz	I_{CM}	max.	150 mA
Total power dissipation up to $T_{amb} = 60$ °C mounted on a fibre-glass print of 40 mm x 35 mm x 1,5 mm	P_{tot}	max.	500 mW
Storage temperature	T_{stg}		-65 to + 175 °C
Junction temperature	T_j	max.	175 °C

THERMAL RESISTANCE

From junction to ambient in free air
mounted on a fibre-glass print
of 40 mm x 35 mm x 1,5 mm

R_{thj-a}	=	230 K/W
R_{thj-c}	=	70 K/W

→ From junction to case

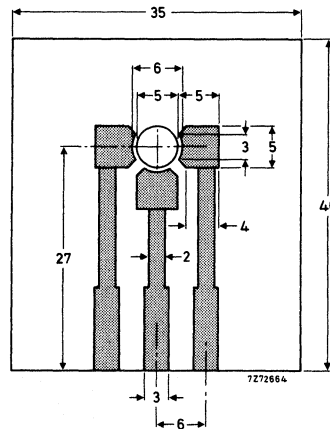


Fig. 2 Requirements for fibre-glass print.

Single-sided 35 μ m Cu-clad epoxy fibre-glass print, thickness 1,5 mm.
Tracks are fully tin-lead plated. Dimensions in mm.

CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Collector cut-off current

$I_E = 0; V_{CB} = 10\text{ V}$

I_{CBO} max. 100 nA

D.C. current gain

$I_C = 50\text{ mA}; V_{CE} = 10\text{ V}$

h_{FE} min. 25
typ. 50 ←

$I_C = 75\text{ mA}; V_{CE} = 10\text{ V}$

h_{FE} min. 25
typ. 52

Transition frequency at $f = 500\text{ MHz}$

$I_C = 50\text{ mA}; V_{CE} = 10\text{ V}$

f_T min. 4,0 GHz
typ. 5,0 GHz ←

$I_C = 75\text{ mA}; V_{CE} = 10\text{ V}$

f_T min. 4,4 GHz
typ. 5,5 GHz

Collector capacitance at $f = 1\text{ MHz}$

$I_E = I_e = 0; V_{CB} = 10\text{ V}$

C_c typ. 1,3 pF

Emitter capacitance at $f = 1\text{ MHz}$

$I_C = I_c = 0; V_{EB} = 0,5\text{ V}$

C_e typ. 6,5 pF

Feedback capacitance at $f = 1\text{ MHz}$

$I_C = 10\text{ mA}; V_{CE} = 10\text{ V}; T_{amb} = 25\text{ }^\circ\text{C}$

C_{re} typ. 1,0 pF
max. 1,4 pF

Noise figure at optimum source impedance

$I_C = 50\text{ mA}; V_{CE} = 10\text{ V}; f = 500\text{ MHz}; T_{amb} = 25\text{ }^\circ\text{C}$

$I_C = 50\text{ mA}; V_{CE} = 10\text{ V}; f = 800\text{ MHz}; T_{amb} = 25\text{ }^\circ\text{C}$

F typ. 3,3 dB
 F typ. 3,8 dB

Maximum unilateral power gain (s_{re} assumed to be zero)

$$G_{UM} = 10 \log \frac{|s_{fe}|^2}{(1 - |s_{ie}|^2)(1 - |s_{oe}|^2)}$$

$I_C = 50\text{ mA}; V_{CE} = 10\text{ V}; f = 500\text{ MHz}; T_{amb} = 25\text{ }^\circ\text{C}$

$I_C = 50\text{ mA}; V_{CE} = 10\text{ V}; f = 800\text{ MHz}; T_{amb} = 25\text{ }^\circ\text{C}$

G_{UM} typ. 15,2 dB
 G_{UM} typ. 11,5 dB ←

CHARACTERISTICS (continued)

→ Output voltage at $d_{im} = -60$ dB (see Fig. 3)
 (DIN 45004B, par. 6.3: 3-tone); $T_{amb} = 25$ °C
 $I_C = 50$ mA; $V_{CE} = 10$ V; $R_L = 75$ Ω
 $V_p = V_o$ at $d_{im} = -60$ dB; $f_p = 495,25$ MHz
 $V_q = V_o - 6$ dB ; $f_q = 503,25$ MHz
 $R_r = V_o - 6$ dB ; $f_r = 505,25$ MHz
 measured at $f_{(p+q-r)} = 493,25$ MHz

V_o typ. 500 mV

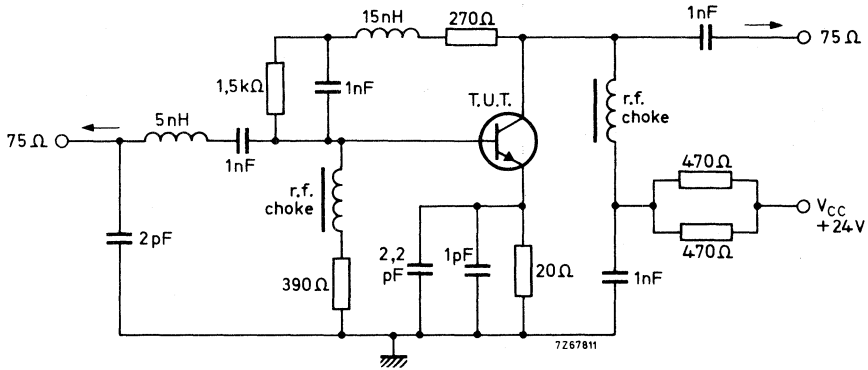


Fig. 3 Intermodulation test circuit.

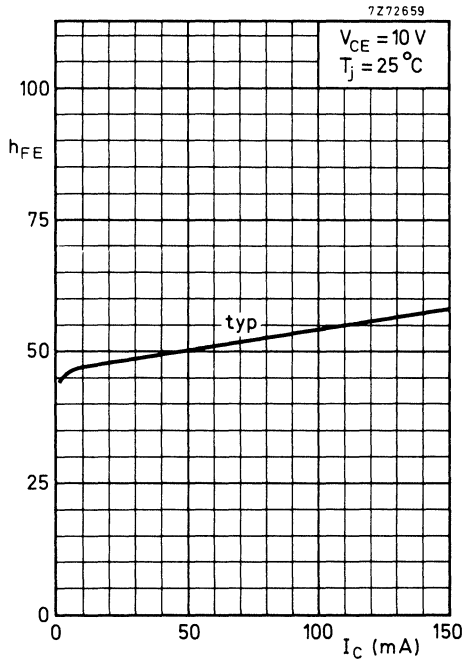


Fig. 4 $V_{CE} = 10\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$; typ. values.

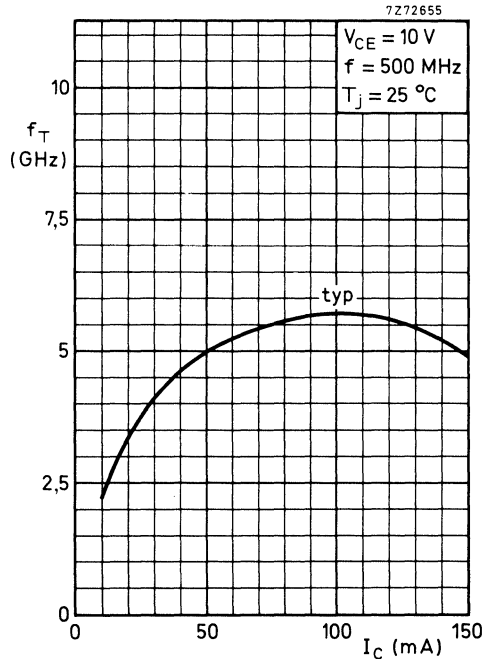


Fig. 5 $V_{CE} = 10\text{ V}$; $f = 500\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$; typical values.

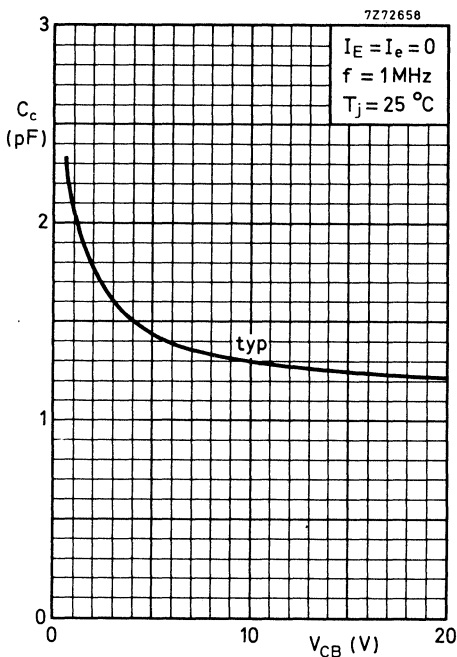


Fig. 6 $I_E = I_e = 0$; $f = 1\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$; typical values.

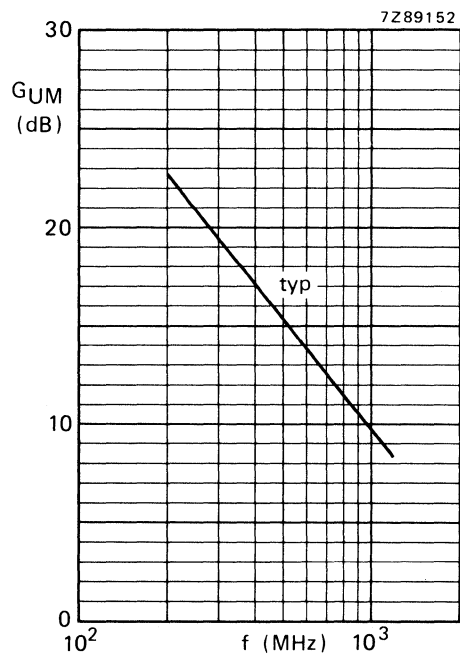


Fig. 7 $V_{CE} = 10\text{ V}$; $I_C = 50\text{ mA}$; $T_{amb} = 25\text{ }^\circ\text{C}$; typical values.

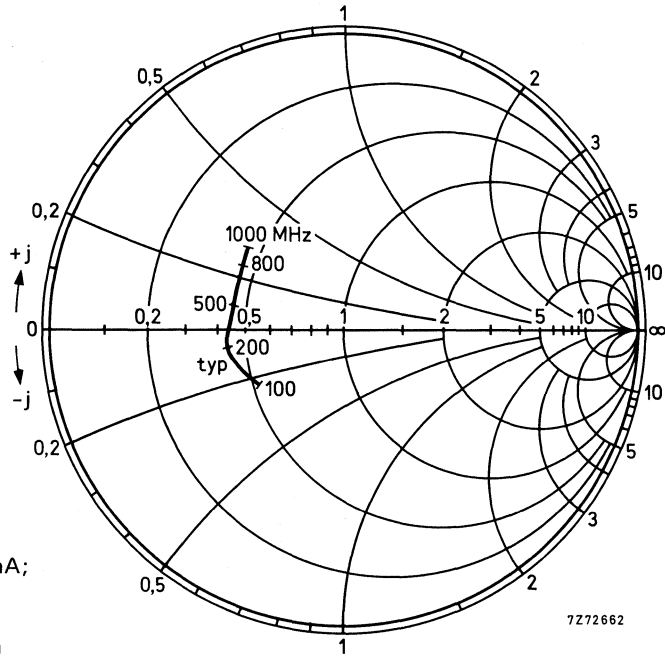


Fig. 8 $V_{CE} = 10\text{ V}$; $I_C = 50\text{ mA}$;
 $T_{amb} = 25\text{ }^\circ\text{C}$; typical values.

Input impedance derived from
 input reflection coefficient s_{ie}
 co-ordinates in ohm x 50

7272662

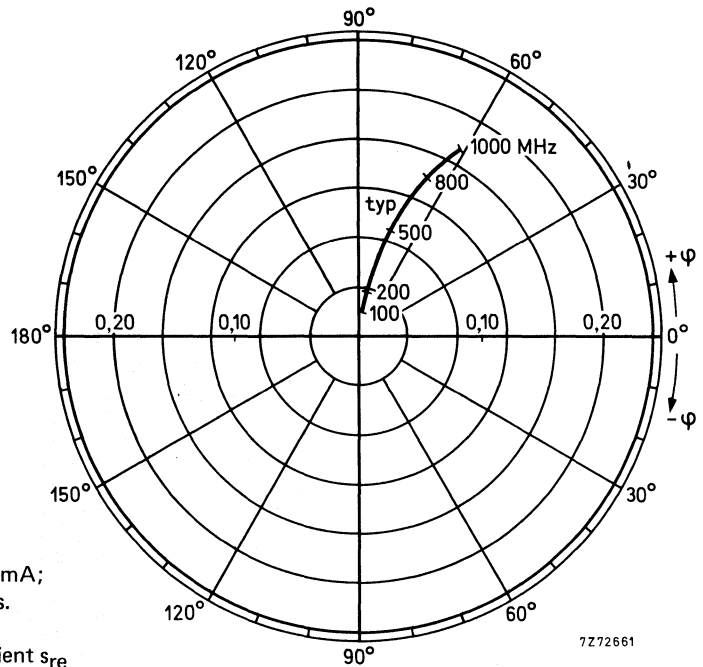


Fig. 9 $V_{CE} = 10\text{ V}$; $I_C = 50\text{ mA}$;
 $T_{amb} = 25\text{ }^\circ\text{C}$; typical values.

Reverse transmission coefficient s_{re}

7272661

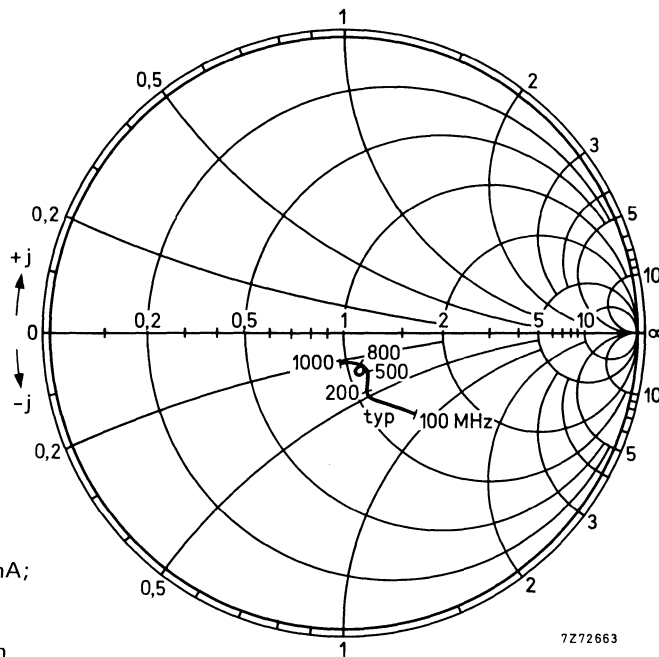


Fig. 10 $V_{CE} = 10\text{ V}$; $I_C = 50\text{ mA}$;
 $T_{amb} = 25\text{ }^\circ\text{C}$; typical values.

Output impedance derived from
 output reflection coefficient s_{oe}
 co-ordinates in ohm x 50

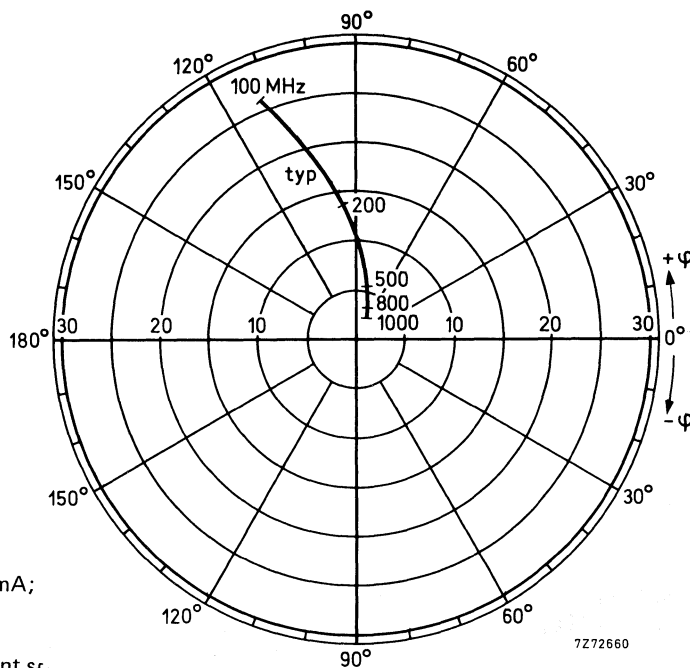


Fig. 11 $V_{CE} = 10\text{ V}$; $I_C = 50\text{ mA}$;
 $T_{amb} = 25\text{ }^\circ\text{C}$; typical values.

Forward transmission coefficient s_{fe}

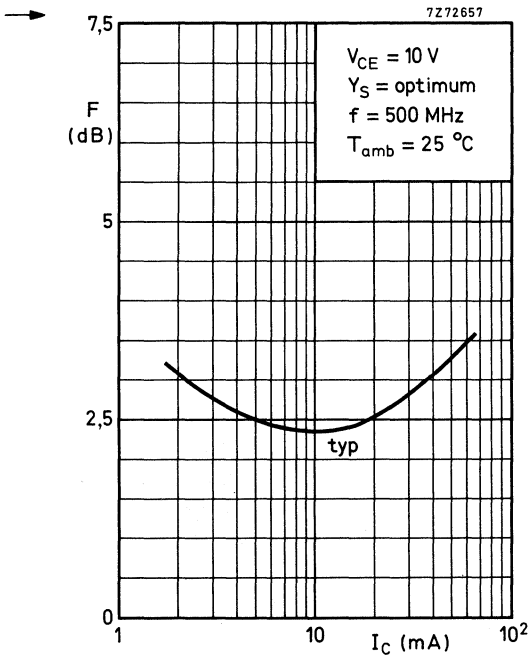


Fig. 12 $V_{CE} = 10 \text{ V}$; $f = 500 \text{ MHz}$;
 $Y_S = \text{optimum}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

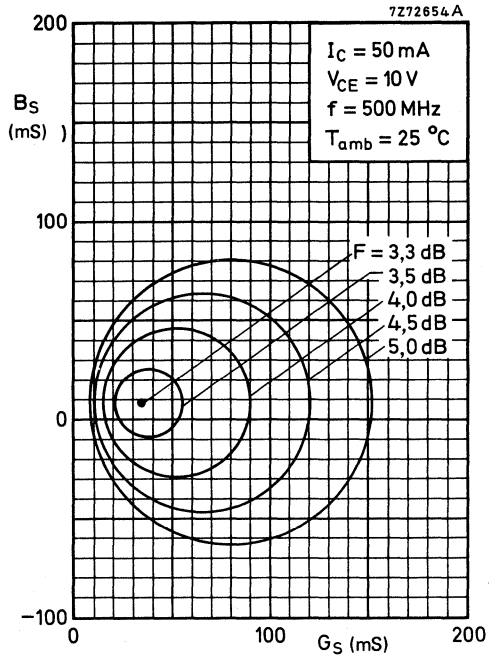


Fig. 13 Circles of constant noise figure.
 $I_C = 50 \text{ mA}$; $V_{CE} = 10 \text{ V}$; $f = 500 \text{ MHz}$;
 $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

N-P-N 1 GHz WIDEBAND TRANSISTOR

N-P-N transistor in a plastic SOT-37 envelope, primarily intended for MATV applications. The device features excellent output voltage capabilities. P-N-P complement is BFQ32S.

QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	20 V
Collector-emitter voltage (open base)	V_{CEO}	max.	15 V
Collector current (d.c.)	I_C	max.	100 mA
Total power dissipation up to $T_{amb} = 70\text{ }^\circ\text{C}$	P_{tot}	max.	700 mW
Junction temperature	T_j	max.	175 $^\circ\text{C}$
Transition frequency at $f = 500\text{ MHz}$ $I_C = 70\text{ mA}$; $V_{CE} = 10\text{ V}$	f_T	typ.	5,0 GHz
Feedback capacitance at $f = 1\text{ MHz}$ $I_C = 0$; $V_{CE} = 10\text{ V}$	C_{re}	typ.	1,0 pF
Noise figure at optimum source impedance $I_C = 70\text{ mA}$; $V_{CE} = 10\text{ V}$; $f = 800\text{ MHz}$	F	typ.	4,0 dB
Maximum unilateral power gain $I_C = 70\text{ mA}$; $V_{CE} = 10\text{ V}$; $f = 800\text{ MHz}$	G_{UM}	typ.	11,5 dB
Output voltage at $d_{im} = -60\text{ dB}$ (see Fig. 3) $I_C = 70\text{ mA}$; $V_{CE} = 10\text{ V}$; $R_L = 75\text{ }\Omega$ $f_{(p+q-r)} = 793,25\text{ MHz}$	V_o	typ.	700 mV
Output power at 1 dB gain compression	P_{L1}	typ.	+ 21 dBm
Third order intercept point	ITO	typ.	+ 40 dBm

MECHANICAL DATA

SOT-37 (see Fig. 1).

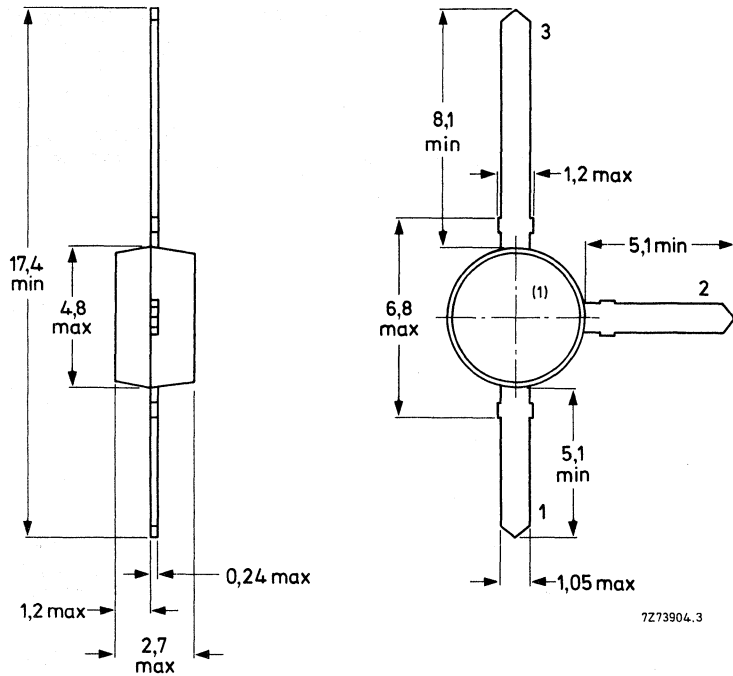
MECHANICAL DATA

Fig. 1 SOT-37.

Dimensions in mm

Connections

- 1. Base
- 2. Emitter
- 3. Collector



(1) = type number marking.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	20 V
Collector-emitter voltage (open base)	V_{CEO}	max.	15 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3 V
Collector current (d.c.)	I_C	max.	100 mA
Total power dissipation up to $T_{amb} = 70\text{ }^\circ\text{C}$ mounted on a fibre-glass print (see Fig. 2) of 50 mm x 50 mm x 1,5 mm			
	P_{tot}	max.	700 mW
Storage temperature	T_{stg}		-65 to + 175 $^\circ\text{C}$
Junction temperature	T_j	max.	175 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to ambient in free air
mounted on a fibre-glass print (see Fig. 2)
of 50 mm x 50 mm x 1,5 mm

$R_{th\ j-a}$	=	150 K/W
$R_{th\ j-c}$	=	50 K/W

→ From junction to case

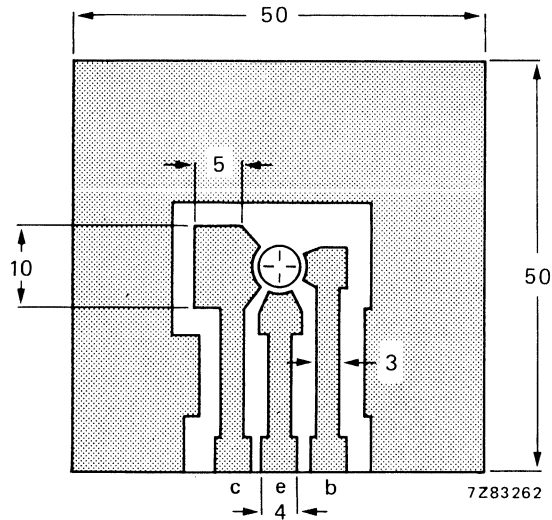


Fig. 2 Requirements for fibre-glass print. (Dimensions in mm.)
Single-sided 35 μm Cu-clad epoxy fibre-glass print, thickness
1,5 mm. Tracks are fully tin-lead plated. Shaded area is Cu.

CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Collector cut-off current

$I_E = 0; V_{CB} = 10\text{ V}$

I_{CBO} max. 100 nA

D.C. current gain

$I_C = 70\text{ mA}; V_{CE} = 10\text{ V}$

h_{FE} min. 25

Transition frequency at $f = 500\text{ MHz}$

$I_C = 70\text{ mA}; V_{CE} = 10\text{ V}$

f_T typ. 5,0 GHz

Collector capacitance at $f = 1\text{ MHz}$

$I_E = I_e = 0; V_{CB} = 10\text{ V}$

C_c typ. 1,5 pF

Emitter capacitance at $f = 1\text{ MHz}$

$I_C = I_c = 0; V_{EB} = 0,5\text{ V}$

C_e typ. 6,5 pF

Feedback capacitance at $f = 1\text{ MHz}$

$I_C = 0; V_{CE} = 10\text{ V}$

C_{re} typ. 1,0 pF

Noise figure at optimum source impedance

$I_C = 70\text{ mA}; V_{CE} = 10\text{ V}; f = 800\text{ MHz}; T_{amb} = 25\text{ }^\circ\text{C}$

F typ. 4,0 dB

Maximum unilateral power gain (s_{re} assumed to be zero)

$$G_{UM} = 10 \log \frac{|s_{fe}|^2}{(1 - |s_{ie}|^2)(1 - |s_{oe}|^2)}$$

$I_C = 70\text{ mA}; V_{CE} = 10\text{ V}; f = 800\text{ MHz}; T_{amb} = 25\text{ }^\circ\text{C}$

G_{UM} typ. 11,5 dB

Output voltage at $d_{im} = -60$ dB (see Figs 3 and 5)

(DIN45004B, par. 6.3: 3-tone)

$I_C = 70$ mA; $V_{CE} = 10$ V; $R_L = 75 \Omega$; $T_{amb} = 25$ °C

$V_p = V_o$ at $d_{im} = -60$ dB; $f_p = 795,25$ MHz

$V_q = V_o - 6$ dB; $f_q = 803,25$ MHz

$V_r = V_o - 6$ dB; $f_r = 805,25$ MHz

Measured at $f_{(p+q-r)} = 793,25$ MHz

V_o typ. 700 mV

Second harmonic distortion (see Figs 3 and 6)

$I_C = 70$ mA; $V_{CE} = 10$ V; $R_L = 75 \Omega$; $T_{amb} = 25$ °C

$V_p = V_o = 316$ mV = 50 dBmV; $f_p = 250$ MHz

$V_q = V_o = 316$ mV = 50 dBmV; $f_q = 560$ MHz

measured at $f_{(p+q)} = 810$ MHz

d_2 typ. -52 dB

Output power at 1 dB gain compression (see Fig. 3)

$I_C = 70$ mA; $V_{CE} = 10$ V

$R_L = 75 \Omega$; $T_{amb} = 25$ °C

measured at $f = 800$ MHz

P_{L1} typ. +21 dBm

Third order intercept point (see Fig. 3)

$I_C = 70$ mA; $V_{CE} = 10$ V

$R_L = 75 \Omega$; $T_{amb} = 25$ °C

$P_p = ITO - 6$ dB; $f_p = 800$ MHz

$P_q = ITO - 6$ dB; $f_q = 801$ MHz

and at $f_{(2p-q)} = 799$ MHz

ITO typ. +40 dBm

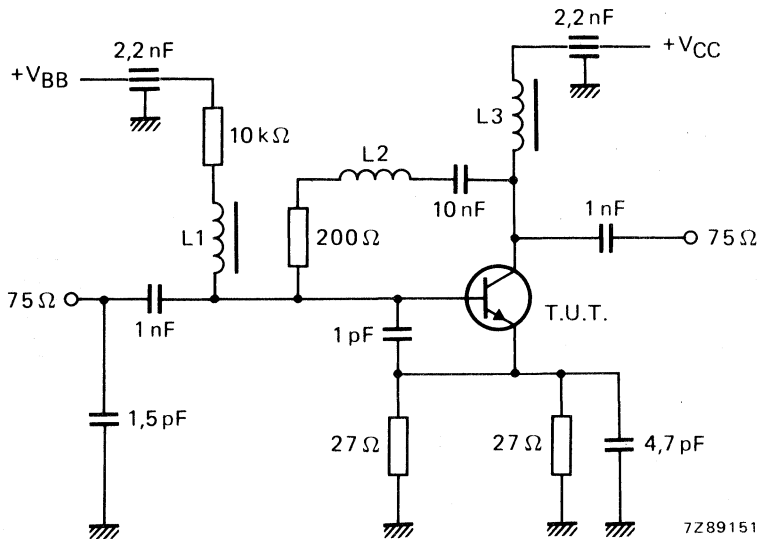


Fig. 3 Intermodulation distortion and second harmonic distortion test circuit.

$L1 = L3 = 5 \mu$ H micro choke

$L2 = 1\frac{1}{2}$ turns Cu wire (0,4 mm); internal diameter 3,0 mm; winding pitch 1 mm

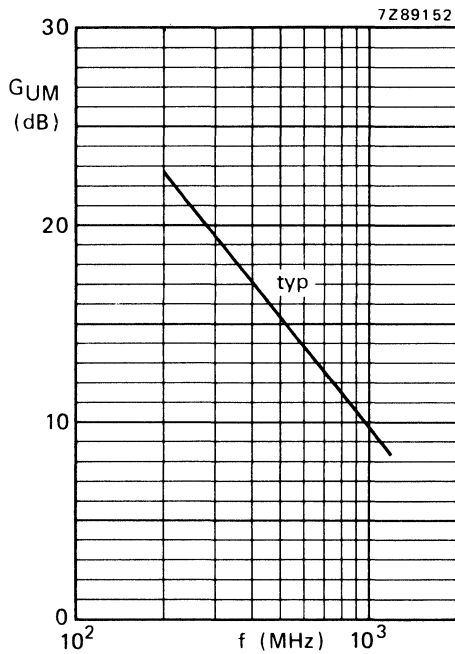


Fig. 4 $V_{CE} = 10 \text{ V}$; $I_C = 70 \text{ mA}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

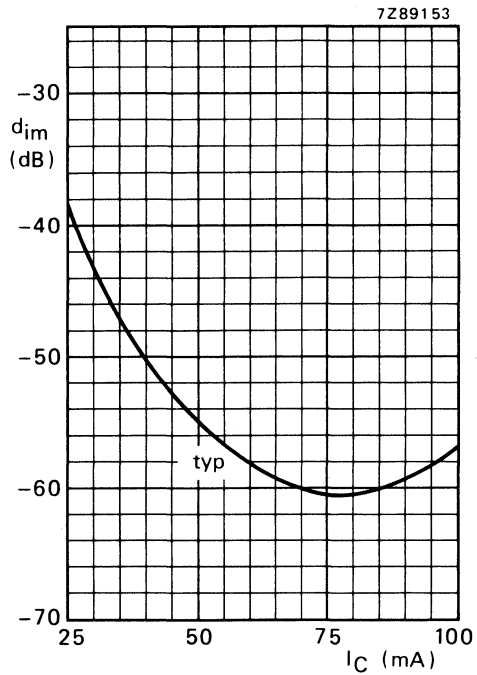


Fig. 5.

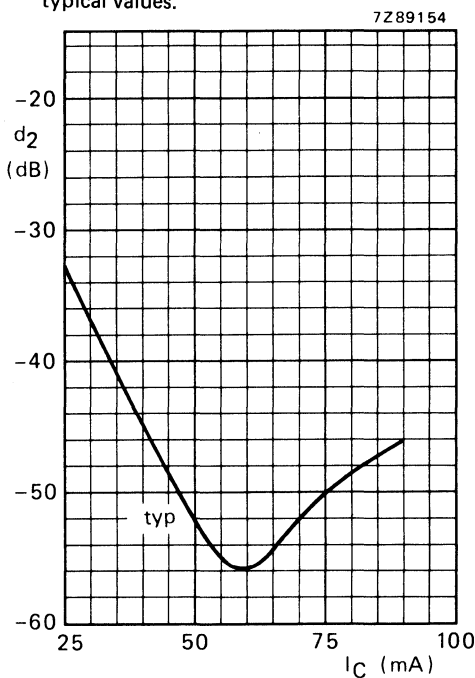


Fig. 6.

Intermodulation distortion (Fig. 5) and second harmonic distortion (Fig. 6) are measured in circuit (see Fig. 3).

Fig. 5 $V_{CE} = 10 \text{ V}$; $V_O = 700 \text{ mV} = 56,9 \text{ dBmV}$; $f_{(p+q-r)} = 793,25 \text{ MHz}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; typ. values.

Fig. 6 $V_{CE} = 10 \text{ V}$; $V_O = 316 \text{ mV} = 50 \text{ dBmV}$; $f_{(p+q)} = 810 \text{ MHz}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; typ. values.

→ s-parameters (common emitter) at $V_{CE} = 5\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$; typical values.

I_C mA	f MHz	s_{ie}	s_{re}	s_{fe}	s_{oe}	GUM dB
5	40	0,75/ -41,5 ^o	0,026/+69,1 ^o	15,1/+155,2 ^o	0,93/ -17,4 ^o	35,9
	200	0,62/-128,1 ^o	0,064/+41,9 ^o	7,1/+106,9 ^o	0,53/ -43,3 ^o	20,6
	500	0,55/-174,6 ^o	0,087/+47,0 ^o	3,2/ +79,8 ^o	0,40/ -53,2 ^o	12,4
	800	0,56/+158,7 ^o	0,115/+56,5 ^o	2,1/ +65,0 ^o	0,39/ -63,2 ^o	8,8
	1000	0,58/+146,7 ^o	0,135/+59,2 ^o	1,7/ +56,6 ^o	0,39/ -72,5 ^o	7,1
	1200	0,61/+135,5 ^o	0,159/+61,7 ^o	1,4/ +48,9 ^o	0,39/ -83,0 ^o	5,7
10	40	0,60/ -59,1 ^o	0,022/+64,1 ^o	24,3/+147,2 ^o	0,86/ -26,6 ^o	35,5
	200	0,54/-146,1 ^o	0,050/+49,4 ^o	9,1/+100,7 ^o	0,38/ -54,7 ^o	21,4
	500	0,50/+175,8 ^o	0,087/+59,3 ^o	3,9/ +78,6 ^o	0,27/ -62,8 ^o	13,4
	800	0,52/+152,4 ^o	0,129/+63,7 ^o	2,5/ +65,8 ^o	0,27/ -72,2 ^o	9,7
	1000	0,53/+141,0 ^o	0,157/+63,9 ^o	2,1/ +58,0 ^o	0,27/ -80,7 ^o	8,2
	1200	0,56/+130,7 ^o	0,186/+63,3 ^o	1,7/ +51,2 ^o	0,27/ -90,9 ^o	6,6
30	40	0,39/-105,6 ^o	0,015/+60,7 ^o	39,6/+133,3 ^o	0,69/ -44,1 ^o	35,5
	200	0,44/-168,4 ^o	0,041/+65,9 ^o	11,1/ +94,3 ^o	0,23/ -78,2 ^o	22,1
	500	0,46/+165,1 ^o	0,094/+70,3 ^o	4,7/ +77,3 ^o	0,16/ -88,4 ^o	14,6
	800	0,48/+145,4 ^o	0,146/+69,2 ^o	3,0/ +66,5 ^o	0,16/ -98,3 ^o	10,8
	1000	0,51/+135,6 ^o	0,175/+66,6 ^o	2,5/ +60,1 ^o	0,16/ -109,3 ^o	9,4
	1200	0,53/+126,2 ^o	0,206/+64,2 ^o	2,1/ +54,0 ^o	0,17/ -119,7 ^o	8,0
50	40	0,37/-129,3 ^o	0,013/+63,4 ^o	44,6/+127,8 ^o	0,62/ -51,4 ^o	35,7
	200	0,43/-174,7 ^o	0,040/+71,5 ^o	11,5/ +92,5 ^o	0,19/ -89,2 ^o	22,7
	500	0,45/+162,4 ^o	0,095/+72,7 ^o	4,8/ +76,8 ^o	0,14/ -101,5 ^o	14,7
	800	0,48/+143,4 ^o	0,151/+70,1 ^o	3,1/ +66,5 ^o	0,14/ -111,5 ^o	11,1
	1000	0,50/+134,3 ^o	0,182/+67,4 ^o	2,5/ +60,4 ^o	0,14/ -121,5 ^o	9,3
	1200	0,52/+124,9 ^o	0,215/+64,8 ^o	2,1/ +54,6 ^o	0,15/ -130,7 ^o	7,9
70	40	0,38/-141,7 ^o	0,011/+65,1 ^o	46,9/+124,9 ^o	0,57/ -55,8 ^o	35,8
	200	0,43/-177,6 ^o	0,040/+73,7 ^o	11,6/ +91,6 ^o	0,18/ -96,3 ^o	22,3
	500	0,46/+161,2 ^o	0,095/+73,9 ^o	4,9/ +76,5 ^o	0,13/ -109,5 ^o	14,9
	800	0,49/+143,1 ^o	0,150/+70,6 ^o	3,1/ +66,4 ^o	0,13/ -120,7 ^o	11,1
	1000	0,49/+133,5 ^o	0,186/+67,7 ^o	2,5/ +60,2 ^o	0,14/ -126,2 ^o	9,2
	1200	0,52/+124,1 ^o	0,218/+65,0 ^o	2,1/ +54,6 ^o	0,15/ -135,3 ^o	7,9

s-parameters (common emitter) at $V_{CE} = 10\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$; typical values.

I_C mA	f MHz	S_{ie}	S_{re}	S_{fe}	S_{oe}	G_{UM} dB
5	40	0,77/ -38,9°	0,023/+ 69,1°	15,2/+ 156,2°	0,93/ -15,4°	36,2
	200	0,62/-124,0°	0,059/+ 43,1°	7,4/+ 108,3°	0,57/ -38,0°	21,2
	500	0,54/-172,5°	0,081/+ 48,0°	3,4/ + 80,8°	0,45/ -46,8°	13,1
	800	0,55/+ 159,9°	0,106/+ 57,8°	2,2/ + 65,9°	0,43/ -57,1°	9,3
	1000	0,56/+ 147,2°	0,126/+ 61,5°	1,8/ + 57,5°	0,43/ -64,9°	7,6
	1200	0,58/+ 135,9°	0,150/+ 64,4°	1,5/ + 50,1°	0,42/ -74,7°	6,1
10	40	0,62/ -54,5°	0,020/+ 64,9°	24,5/+ 148,7°	0,87/ -23,5°	36,0
	200	0,53/-142,3°	0,046/+ 49,6°	9,6/+ 102,0°	0,42/ -47,8°	21,9
	500	0,48/+ 177,6°	0,080/+ 59,4°	4,2/ + 79,4°	0,31/ -54,2°	14,0
	800	0,50/+ 153,2°	0,118/+ 64,0°	2,7/ + 66,4°	0,31/ -63,5°	10,3
	1000	0,52/+ 142,3°	0,143/+ 64,1°	2,2/ + 59,1°	0,31/ -70,0°	8,7
	1200	0,54/+ 131,8°	0,168/+ 64,3°	1,8/ + 52,4°	0,30/ -79,5°	7,1
30	40	0,41/ -94,4°	0,014/+ 62,2°	40,9/+ 135,0°	0,72/ -39,2°	36,2
	200	0,42/-164,6°	0,039/+ 65,5°	11,8/ + 95,1°	0,25/ -64,5°	22,6
	500	0,42/+ 167,0°	0,087/+ 70,4°	4,9/ + 77,9°	0,19/ -71,1°	14,8
	800	0,45/+ 146,6°	0,136/+ 69,3°	3,2/ + 67,1°	0,18/ -79,1°	11,2
	1000	0,47/+ 136,6°	0,166/+ 67,2°	2,6/ + 60,6°	0,18/ -83,8°	9,5
	1200	0,49/+ 126,3°	0,196/+ 65,0°	2,2/ + 54,6°	0,17/ -95,1°	8,2
50	40	0,36/-114,4°	0,012/+ 62,7°	46,5/+ 129,6°	0,63/ -45,7°	36,1
	200	0,40/-171,0°	0,038/+ 70,4°	12,3/ + 93,1°	0,20/ -71,4°	22,7
	500	0,41/+ 163,9°	0,090/+ 72,4°	5,1/ + 77,1°	0,16/ -79,7°	15,1
	800	0,44/+ 144,7°	0,140/+ 70,1°	3,3/ + 66,7°	0,15/ -86,0°	11,4
	1000	0,47/+ 135,3°	0,168/+ 67,3°	2,7/ + 60,8°	0,14/ -95,3°	9,8
	1200	0,49/+ 125,2°	0,197/+ 65,0°	2,3/ + 55,2°	0,14/ -106,6°	8,5
70	40	0,35/-125,4°	0,012/+ 63,6°	49,1/+ 125,7°	0,58/ -49,5°	36,2
	200	0,40/-173,7°	0,038/+ 72,7°	12,4/ + 92,0°	0,18/ -74,8°	22,8
	500	0,41/+ 162,6°	0,091/+ 73,2°	5,2/ + 76,7°	0,15/ -82,0°	15,2
	800	0,44/+ 144,1°	0,143/+ 70,2°	3,3/ + 66,4°	0,14/ -87,4°	11,5
	1000	0,46/+ 134,6°	0,175/+ 67,3°	2,7/ + 60,2°	0,13/ -95,3°	9,7
	1200	0,48/+ 124,1°	0,200/+ 64,8°	2,3/ + 54,6°	0,13/ -109,5°	8,4

Conditions for Figs 7 and 8:
 $V_{CE} = 10 \text{ V}$; $I_C = 70 \text{ mA}$;
 $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

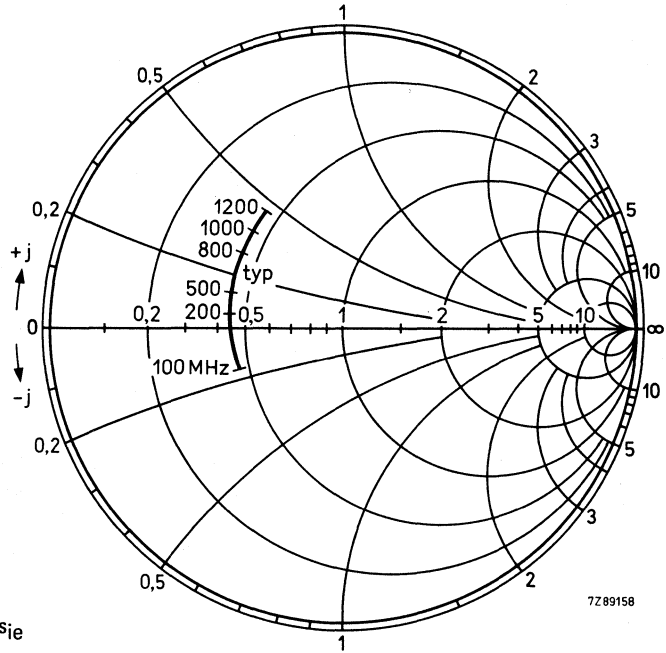


Fig. 7 Input impedance derived from input reflection coefficient s_{ie} co-ordinates in ohm $\times 50$.

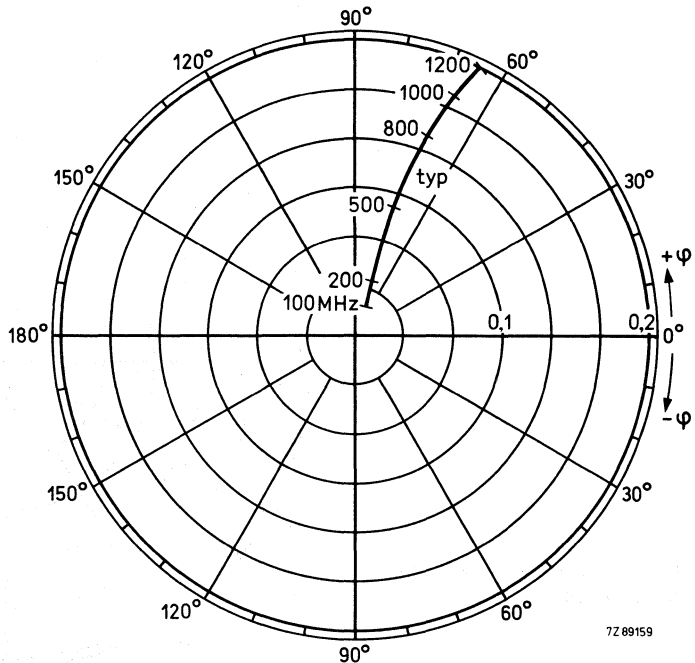


Fig. 8 Reverse transmission coefficient s_{re} .

Conditions for Figs 9 and 10:

$V_{CE} = 10 \text{ V}$; $I_C = 70 \text{ mA}$;

$T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

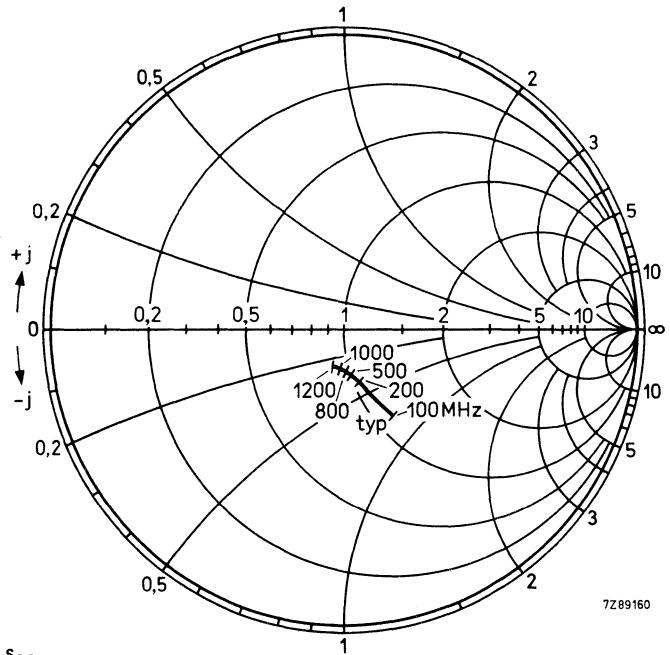


Fig. 9 Output impedance derived from output reflection coefficient s_{oe} co-ordinates in ohm $\times 50$.

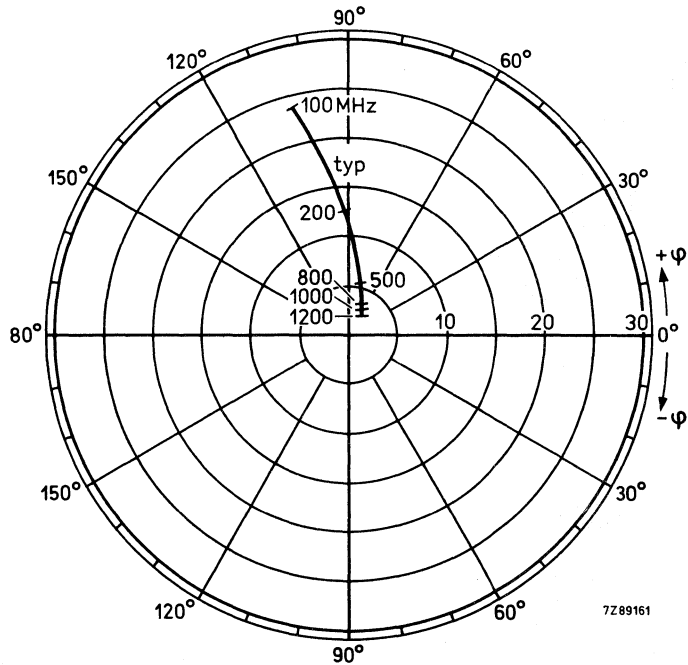


Fig. 10 Forward transmission coefficient s_{fe} .

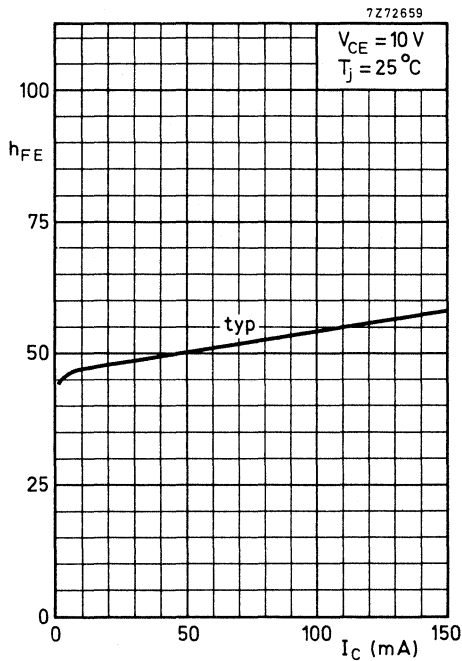


Fig. 11 $V_{CE} = 10\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$;
typical values.

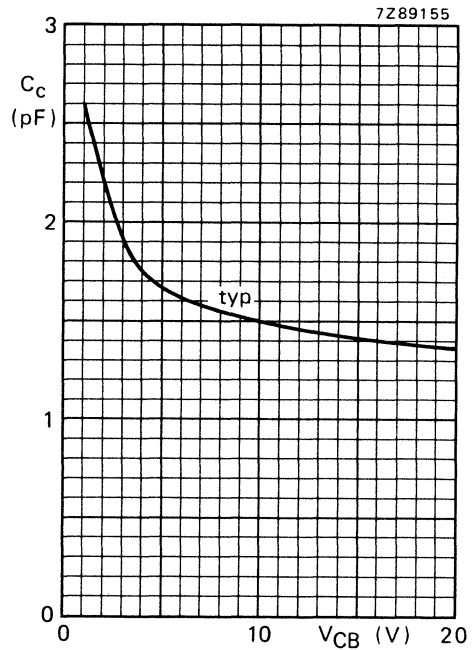


Fig. 12 $I_E = I_e = 0$; $f = 1\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$;
typical values.

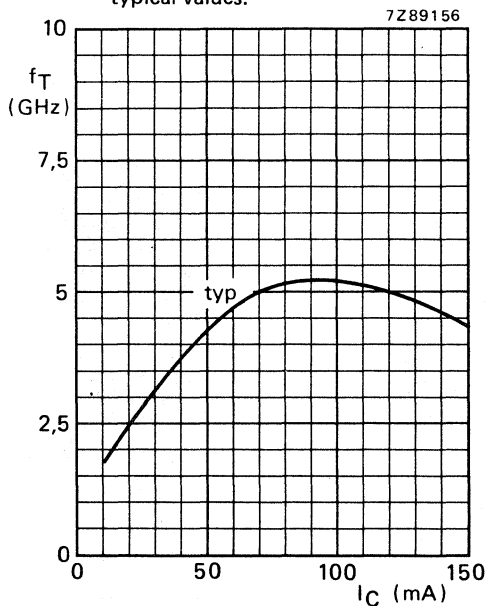


Fig. 13 $V_{CE} = 10\text{ V}$; $f = 500\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$;
typical values.

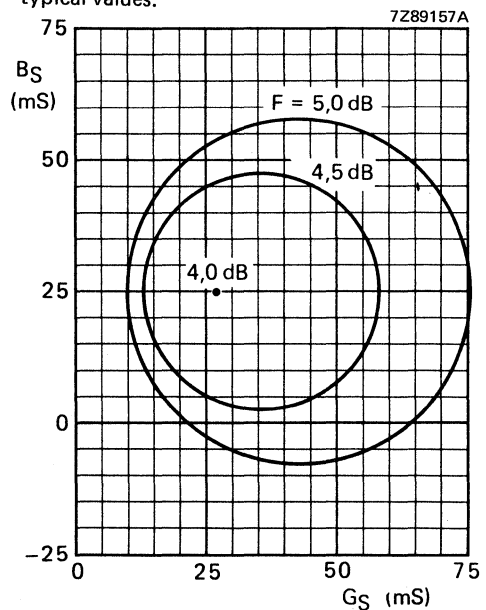


Fig. 14 Circles of constant noise figure.
 $V_{CE} = 10\text{ V}$; $I_C = 70\text{ mA}$; $f = 800\text{ MHz}$;
 $T_{amb} = 25\text{ }^\circ\text{C}$; typical values.

CLASS-B OPERATION

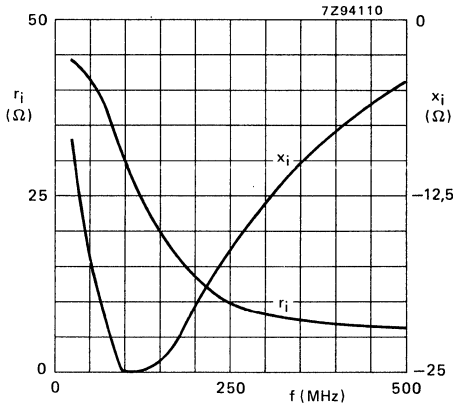


Fig. 15 Input impedance (series components).

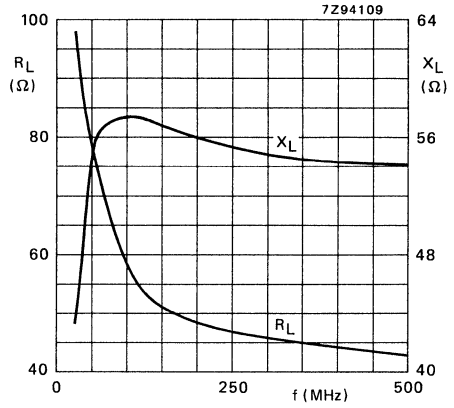


Fig. 16 Load impedance (series components).

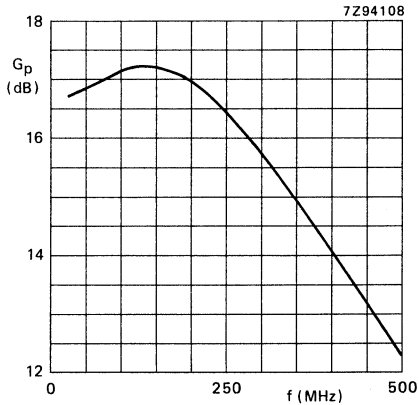


Fig. 17 Power gain versus frequency.

Conditions for Figs 15 to 17:

$V_{CE} = 10 \text{ V}$; $P_L = 500 \text{ mW}$; $T_{amb} = 25 \text{ }^\circ\text{C}$;
typical values.

OPERATING NOTE for Figs 15 to 17:

A base-emitter resistor of $47 \text{ } \Omega$ is recommended to avoid oscillation. This resistor must be effective for r.f. only.

N-P-N H.F. WIDEBAND TRANSISTOR

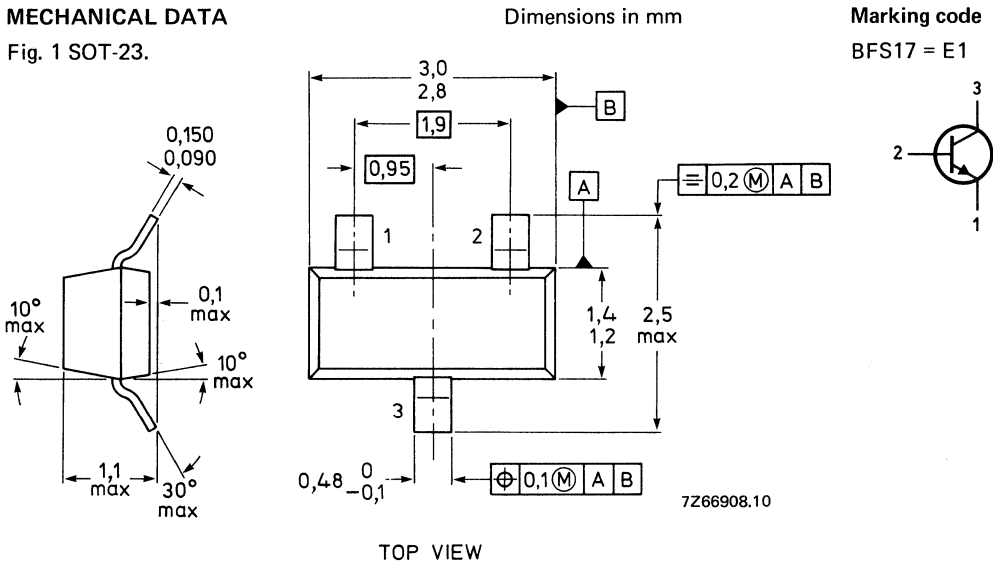
N-P-N transistor in a plastic SOT-23 envelope. It is intended for a wide range of v.h.f. and u.h.f. applications in thick and thin-film circuits.

QUICK REFERENCE DATA

Collector-base voltage (open emitter; peak value)	V_{CBOM} max.	25 V
Collector-emitter voltage (open base)	V_{CEO} max.	15 V
Collector current (peak value)	I_{CM} max.	50 mA
Total power dissipation up to $T_{amb} = 65\text{ }^{\circ}\text{C}$	P_{tot} max.	250 mW
Junction temperature	T_j max.	175 $^{\circ}\text{C}$
D.C. current gain $I_C = 2\text{ mA}; V_{CE} = 1\text{ V}$	h_{FE}	20 to 150
Transition frequency $I_C = 25\text{ mA}; V_{CE} = 5\text{ V}; f = 500\text{ MHz}$	f_T typ.	1,3 GHz
Noise figure $I_C = 2\text{ mA}; V_{CE} = 5\text{ V}; R_S = 50\text{ }\Omega; f = 500\text{ MHz}$	F typ.	4,5 dB

MECHANICAL DATA

Fig. 1 SOT-23.



If required, the R-version (reverse pinning) is available on request.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	25 V
Collector-emitter voltage (open base) $I_C = 10 \text{ mA}$	V_{CEO}	max.	15 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2,5 V
Collector current (d.c.)	I_C	max.	25 mA
Collector current (peak value)	I_{CM}	max.	50 mA
Total power dissipation up to $T_{amb} = 65 \text{ }^\circ\text{C}^{**}$	P_{tot}	max.	250 mW
Storage temperature	T_{stg}		-65 to + 175 $^\circ\text{C}$
Junction temperature	T_j	max.	175 $^\circ\text{C}$

THERMAL CHARACTERISTICS*

$$T_j = P (R_{th\ j-t} + R_{th\ t-s} + R_{th\ s-a}) + T_{amb}$$

Thermal resistance

From junction to tab	$R_{th\ j-t}$	=	60 K/W
From tab to soldering points	$R_{th\ t-s}$	=	280 K/W
From soldering points to ambient**	$R_{th\ s-a}$	=	90 K/W

CHARACTERISTICS $T_j = 25 \text{ }^\circ\text{C}$ unless otherwise specified

Collector cut-off current

$I_E = 0; V_{CB} = 10 \text{ V}$

I_{CBO} max. 10 nA

$I_E = 0; V_{CB} = 10 \text{ V}; T_j = 100 \text{ }^\circ\text{C}$

I_{CBO} max. 10 μA

D.C. current gain

$I_C = 2 \text{ mA}; V_{CE} = 1 \text{ V}$

h_{FE} 20 to 150

$I_C = 25 \text{ mA}; V_{CE} = 1 \text{ V}$

h_{FE} min. 20

Transition frequency

$I_C = 2 \text{ mA}; V_{CE} = 5 \text{ V}; f = 500 \text{ MHz}$

f_T typ. 1,0 GHz

$I_C = 25 \text{ mA}; V_{CE} = 5 \text{ V}; f = 500 \text{ MHz}$

f_T typ. 1,3 GHz

Collector capacitance at $f = 1 \text{ MHz}$

$I_E = I_e = 0; V_{CB} = 10 \text{ V}$

C_c max. 1,5 pF

* See *Thermal characteristics*.

** Mounted on a ceramic substrate of 8 mm x 10 mm x 0,7 mm.

Emitter capacitance at $f = 1 \text{ MHz}$

$I_C = I_C = 0; V_{EB} = 0,5 \text{ V}$

C_e max. 2,0 pF

Feedback capacitance at $f = 1 \text{ MHz}$

$I_C = 1 \text{ mA}; V_{CE} = 5 \text{ V}$

C_{re} typ. 0,65 pF

Noise figure*

$I_C = 2 \text{ mA}; V_{CE} = 5 \text{ V};$
 $f = 500 \text{ MHz}; R_S = 50 \Omega$

F typ. 4,5 dB

Intermodulation distortion

$I_C = 10 \text{ mA}; V_{CE} = 6 \text{ V}; R_L = 37,5 \Omega; T_{amb} = 25 \text{ }^\circ\text{C}$

$V_o = 100 \text{ mV}$ at $f_p = 183 \text{ MHz}$

$V_o = 100 \text{ mV}$ at $f_q = 200 \text{ MHz}$

measured at $f_{(2q-p)} = 217 \text{ MHz}$

d_{im} typ. -45 dB

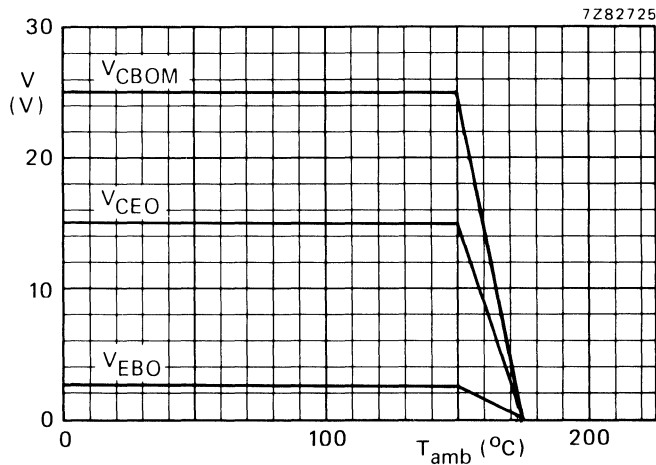


Fig. 2 Voltage derating curve.

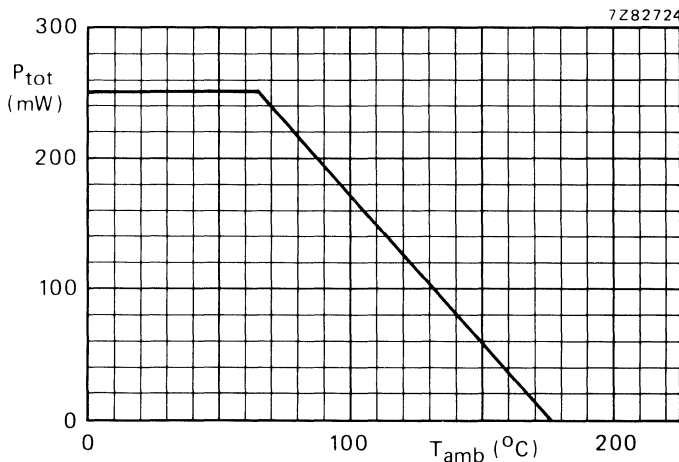


Fig. 3 Power derating curve.

* Crystal mounted in a BFY90 envelope.

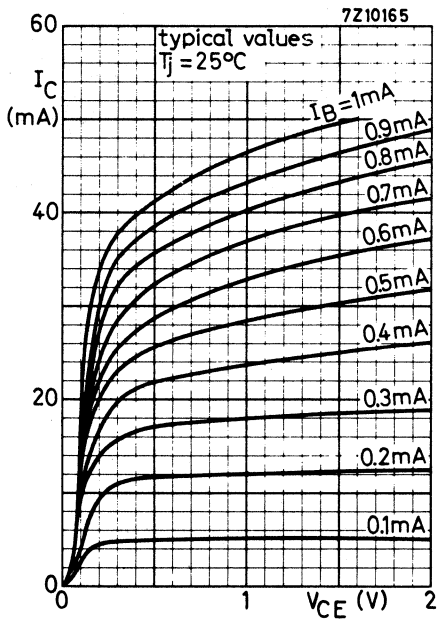


Fig. 4 $T_j = 25^\circ\text{C}$; typical values.

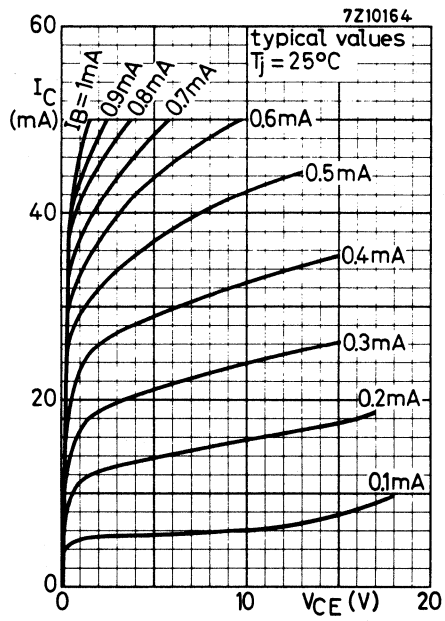


Fig. 5 $T_j = 25^\circ\text{C}$; typical values.

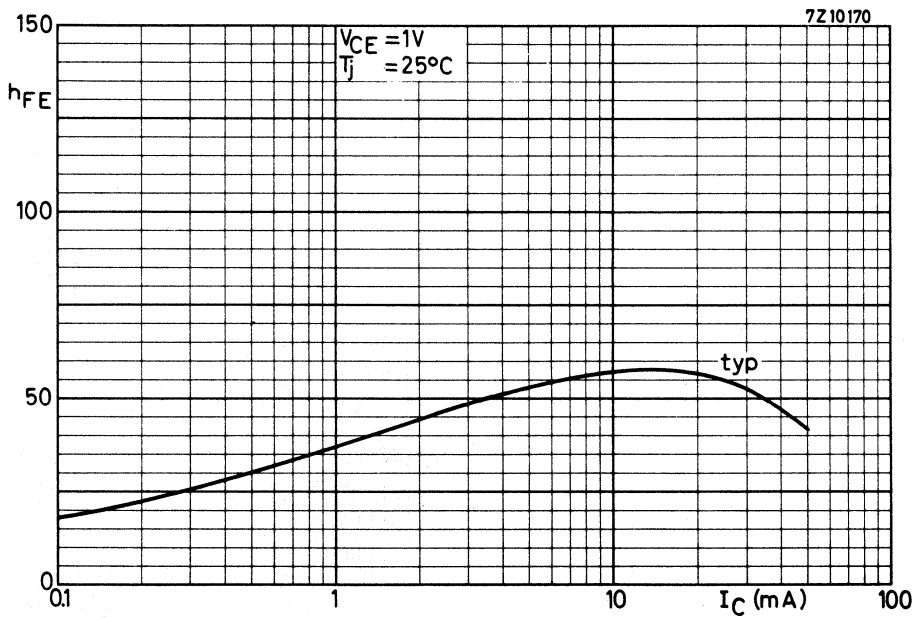


Fig. 6 $V_{CE} = 1\text{V}$; $T_j = 25^\circ\text{C}$; typical values.

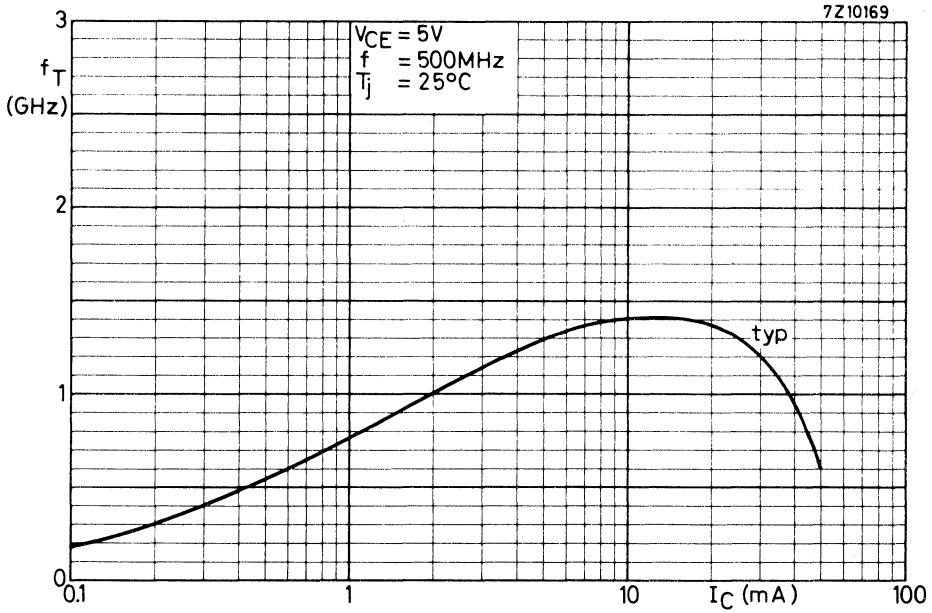


Fig. 7 $V_{CE} = 5V$; $f = 500MHz$; $T_j = 25^{\circ}C$; typical values.

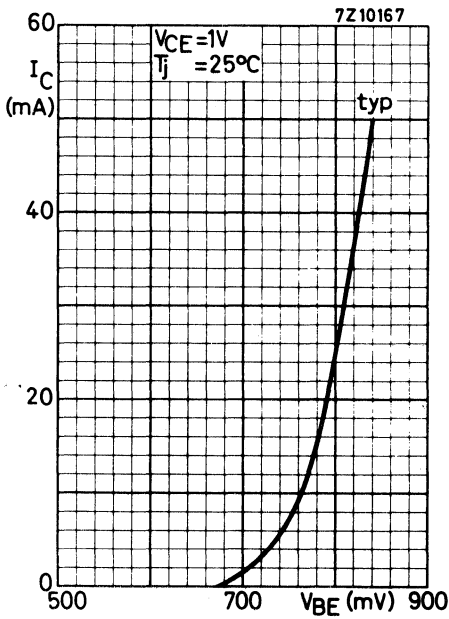


Fig. 8 $V_{CE} = 1V$; $T_j = 25^{\circ}C$; typical values.

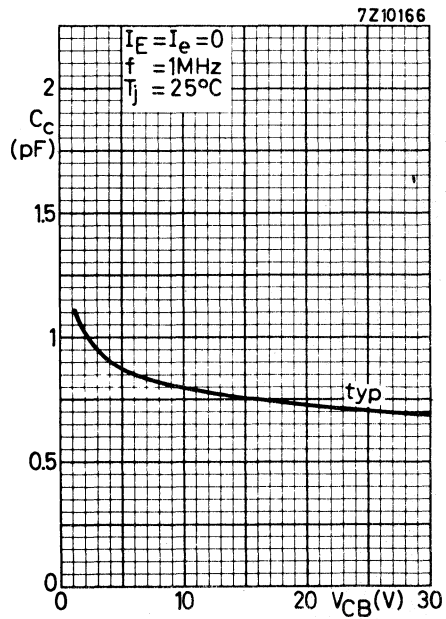


Fig. 9 $I_E = I_e = 0$; $f = 1MHz$; $T_j = 25^{\circ}C$; typical values.

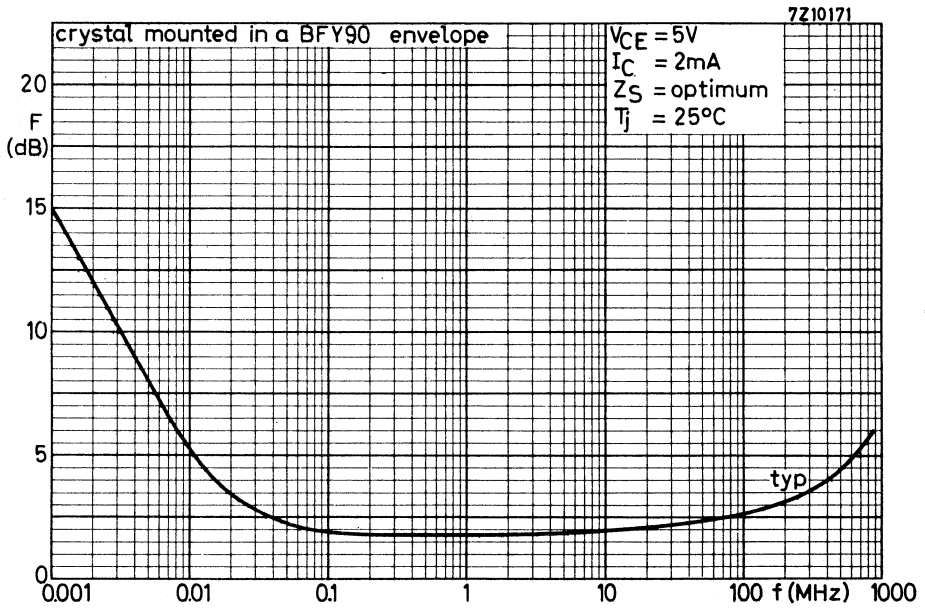


Fig. 10 $V_{CE} = 5 V$; $I_C = 2 mA$; $Z_S = \text{optimum}$; $T_j = 25^\circ C$; typical values.

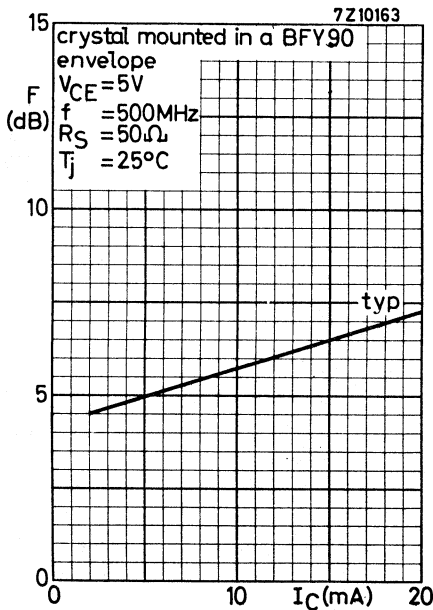


Fig. 11 $V_{CE} = 5 V$; $f = 500 MHz$; $R_S = 50 \Omega$; $T_j = 25^\circ C$; typical values.

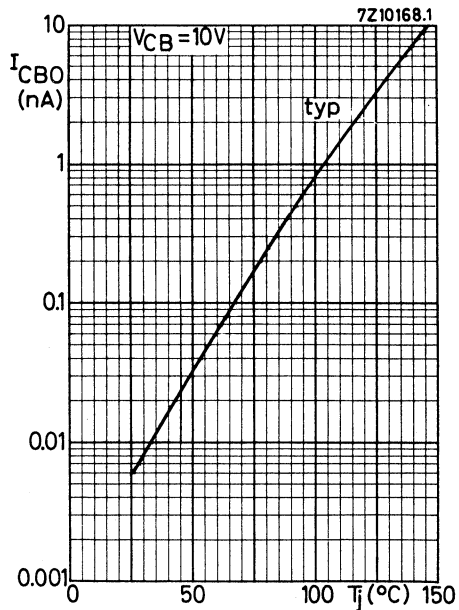


Fig. 12 $V_{CB} = 10 V$; typical values.

N-P-N 1 GHz WIDEBAND TRANSISTOR

N-P-N transistor in a plastic SOT-23 envelope. It is intended for a wide range of v.h.f. and u.h.f. applications in thick and thin-film circuits.

The BFS17A is the successor to the BFS17 and offers a higher power gain and an improved noise behaviour.

QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	25 V
Collector-emitter voltage (open base)	V_{CEO}	max.	15 V
Collector current (d.c.)	I_C	max.	25 mA
Total power dissipation up to $T_{amb} = 25\text{ }^\circ\text{C}$	P_{tot}	max.	300 mW
Junction temperature	T_j	max.	150 $^\circ\text{C}$
D.C. current gain $I_C = 2\text{ mA}; V_{CE} = 1\text{ V}$	h_{FE}		20 to 150
Transition frequency at $f = 500\text{ MHz}$ $I_C = 25\text{ mA}; V_{CE} = 5\text{ V}$	f_T	typ.	2,8 GHz
Noise figure $I_C = 2\text{ mA}; V_{CE} = 5\text{ V}; f = 800\text{ MHz}$	F	typ.	2,5 dB
Output voltage at $d_{im} = -60\text{ dB}$ $V_{CE} = 10\text{ V}; I_C = 14\text{ mA}; Z_L = 75\text{ }\Omega$ $f_{(p+q-r)} = 793,25\text{ MHz}$	V_o	typ.	150 mV
Maximum unilateral power gain at $f = 800\text{ MHz}$ $V_{CE} = 10\text{ V}; I_C = 14\text{ mA}$	G_{UM}	typ.	13,5 dB

MECHANICAL DATA (see Fig. 1).

If required, the R-version (reverse pinning) is available on request.

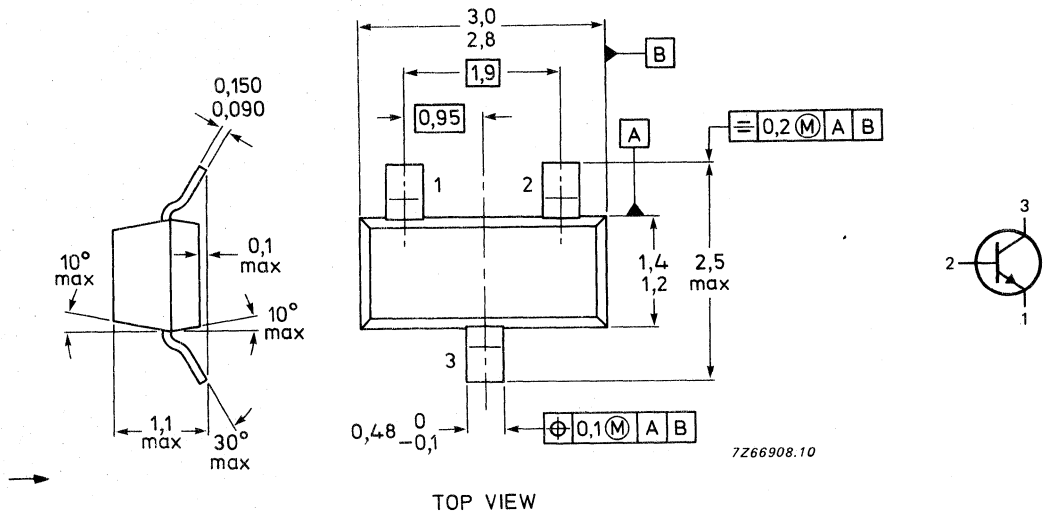
MECHANICAL DATA

Fig. 1 SOT-23.

Dimensions in mm

Marking code

BFS17A = E2



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	25 V
Collector-emitter voltage (open base)	V_{CEO}	max.	15 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2,5 V
Collector current (d.c.)	I_C	max.	25 mA
Collector current (peak value)	I_{CM}	max.	50 mA
Total power dissipation up to $T_{amb} = 25\text{ °C}^*$	P_{tot}	max.	300 mW
Storage temperature	T_{stg}		-65 to + 150 °C
Junction temperature	T_j	max.	150 °C

THERMAL RESISTANCE

From junction to ambient*	$R_{th\ j-a}$	=	430 K/W
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* Mounted on a ceramic substrate of 8 mm x 10 mm x 0,7 mm.

CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Collector cut-off current

$I_E = 0; V_{CB} = 10\text{ V}$

I_{CBO} max. 50 nA

D.C. current gain

$I_C = 2\text{ mA}; V_{CE} = 1\text{ V}$

$I_C = 25\text{ mA}; V_{CE} = 1\text{ V}$

h_{FE} 20 to 150
min. 20

Transition frequency at $f = 500\text{ MHz}$

$I_C = 25\text{ mA}; V_{CE} = 5\text{ V}$

f_T typ. 2,8 GHz

Collector capacitance at $f = 1\text{ MHz}$

$I_E = 0; V_{CB} = 10\text{ V}$

C_c typ. 0,7 pF

Emitter capacitance at $f = 1\text{ MHz}$

$I_C = 0; V_{EB} = 0,5\text{ V}$

C_e typ. 1,25 pF

Feedback capacitance at $f = 1\text{ MHz}$

$I_C = 0; V_{CE} = 5\text{ V}$

C_{re} typ. 0,6 pF

Maximum unilateral power gain

(s_{re} assumed to be zero)

$$G_{UM} = 10 \log \frac{|s_{fe}|^2}{[1 - |s_{ie}|^2][1 - |s_{oe}|^2]}$$

$I_C = 14\text{ mA}; V_{CE} = 10\text{ V}; f = 800\text{ MHz}$

G_{UM} typ. 13,5 dB

Noise figure at $f = 800\text{ MHz}$

$I_C = 2\text{ mA}; V_{CE} = 5\text{ V};$

$Z_S = 60\text{ }\Omega; T_{amb} = 25\text{ }^\circ\text{C}$

F typ. 2,5 dB

Output voltage at $d_{im} = -60\text{ dB}$

(DIN 45004B, par. 6,3: 3-tone)

$I_C = 14\text{ mA}; V_{CE} = 10\text{ V}; Z_L = 75\text{ }\Omega$

$V_p = V_o$; $f_p = 795,25\text{ MHz}$

$V_q = V_o -6\text{ dB}; f_q = 803,25\text{ MHz}$

$V_r = V_o -6\text{ dB}; f_r = 805,25\text{ MHz}$

Measured at $f(p + q - r) = 793,25\text{ MHz}$

V_o typ. 150 mV

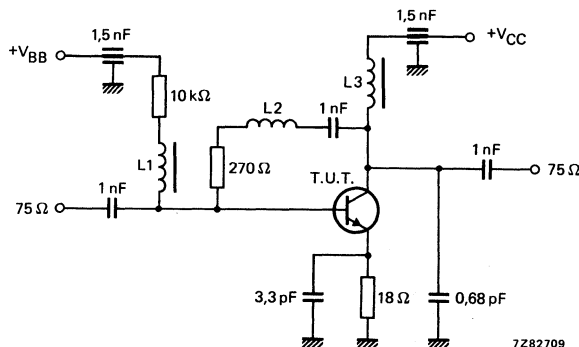


Fig. 2 Intermodulation distortion and second harmonic distortion MATV test circuit.

$L1 = L3 = 5\text{ }\mu\text{H}$ Ferroxcube choke.

$L2 = 3$ turns Cu wire (0,4 mm), internal diameter 3 mm, winding pitch 1 mm.

s-parameters (common emitter) at $V_{CE} = 5\text{ V}$; typical values.

I_C mA	f MHz	S_{ie}	S_{fe}	S_{ie}	S_{oe}	GUM dB
2	40	0,94/ -11,1°	6,50/173,0°	0,01/83,1°	1,00/ -4,1°	45,7
	100	0,89/ -27,6°	6,22/158,7°	0,03/74,1°	0,96/ -9,8°	34,0
	200	0,79/ -50,3°	5,38/143,2°	0,06/63,8°	0,89/ -16,0°	25,7
	500	0,50/ -103,1°	3,37/107,0°	0,09/47,1°	0,68/ -24,3°	14,5
	800	0,43/ -130,7°	2,43/ 93,1°	0,11/47,9°	0,64/ -28,0°	10,9
	1000	0,43/ -148,2°	2,08/ 84,5°	0,12/50,1°	0,62/ -32,6°	9,3
	1200	0,41/ -172,5°	1,73/ 75,8°	0,13/51,6°	0,54/ -31,6°	7,1
5	40	0,84/ -19,0°	14,43/167,4°	0,01/80,2°	0,98/ -7,6°	42,5
	100	0,74/ -45,0°	12,92/147,3°	0,03/67,8°	0,89/ -16,9°	32,5
	200	0,60/ -75,6°	9,60/128,6°	0,05/58,6°	0,75/ -23,1°	25,3
	500	0,38/ -133,5°	4,94/ 98,3°	0,07/54,6°	0,52/ -23,7°	15,9
	800	0,35/ -158,6°	3,25/ 86,5°	0,09/60,3°	0,52/ -25,6°	12,2
	1000	0,37/ -171,2°	2,71/ 79,9°	0,11/62,7°	0,50/ -30,1°	10,5
	1200	0,41/ +166,1°	2,31/ 73,4°	0,12/64,3°	0,43/ -24,8°	8,9
10	40	0,73/ -28,7°	23,50/160,9°	0,01/76,3°	0,95/ -11,7°	41,0
	100	0,59/ -64,1°	18,60/136,3°	0,02/63,7°	0,79/ -22,4°	31,6
	200	0,46/ -99,8°	12,38/117,6°	0,04/58,6°	0,62/ -26,1°	25,0
	500	0,35/ -156,4°	5,64/ 92,5°	0,06/62,4°	0,44/ -20,2°	16,5
	800	0,34/ -175,1°	3,67/ 82,7°	0,09/67,9°	0,46/ -22,2°	12,8
	1000	0,36/ +175,8°	3,00/ 76,7°	0,11/69,3°	0,44/ -26,6°	11,1
	1200	0,43/ +158,2°	2,56/ 71,6°	0,13/70,6°	0,38/ -19,1°	9,7
14	40	0,65/ -35,6°	28,67/156,8°	0,01/74,8°	0,93/ -13,7°	40,5
	100	0,52/ -75,9°	20,73/131,2°	0,02/62,5°	0,74/ -24,3°	31,2
	200	0,41/ -113,1°	13,17/113,0°	0,03/60,3°	0,57/ -25,8°	24,9
	500	0,35/ -164,2°	5,85/ 90,3°	0,06/65,2°	0,42/ -17,6°	16,8
	800	0,34/ -179,4°	3,76/ 81,3°	0,09/70,6°	0,44/ -20,1°	13,0
	1000	0,37/ +173,9°	3,04/ 75,8°	0,11/71,7°	0,43/ -24,8°	11,2
	1200	0,44/ +154,6°	2,63/ 69,7°	0,13/72,4°	0,38/ -17,0°	10,0
20	40	0,58/ -44,3°	33,42/152,4°	0,01/72,4°	0,90/ -15,8°	39,6
	100	0,45/ -89,5°	22,57/125,6°	0,02/61,8°	0,69/ -25,0°	30,9
	200	0,38/ -125,9°	13,53/108,7°	0,03/62,5°	0,53/ -24,2°	24,8
	500	0,35/ -171,5°	5,80/ 87,8°	0,06/68,0°	0,42/ -15,0°	16,7
	800	0,35/ +176,2°	3,68/ 79,4°	0,09/72,5°	0,44/ -18,4°	12,8
	1000	0,38/ +170,1°	3,01/ 74,2°	0,11/73,5°	0,43/ -23,1°	11,1
	1200	0,46/ +153,2°	2,63/ 69,3°	0,12/74,1°	0,38/ -15,8°	10,1

s-parameters (common emitter) at $V_{CE} = 10$ V; typical values.

I_C mA	f MHz	s_{ie}	s_{fe}	s_{ie}	s_{oe}	GUM dB
2	40	0,94/ -10,5°	6,35/173,2°	0,01/83,2°	1,00/ -3,5°	45,5
	100	0,89/ -26,1°	6,15/159,7°	0,03/74,7°	0,97/ -8,7°	34,6
	200	0,80/ -47,7°	5,37/144,2°	0,05/64,9°	0,91/ -13,8°	26,5
	500	0,51/ -98,2°	3,40/108,9°	0,08/48,8°	0,72/ -21,3°	15,1
	800	0,42/ -126,1°	2,45/ 94,6°	0,10/50,0°	0,69/ -25,0°	11,4
	1000	0,41/ -144,2°	2,09/ 85,6°	0,11/52,1°	0,66/ -29,0°	9,7
	1200	0,39/ -170,5°	1,76/ 77,1°	0,12/53,1°	0,59/ -28,1°	7,5
5	40	0,85/ -18,0°	14,09/168,2°	0,01/81,0°	0,99/ -6,3°	44,0
	100	0,76/ -41,4°	12,61/149,1°	0,03/69,2°	0,91/ -14,4°	33,3
	200	0,61/ -70,9°	9,69/130,0°	0,04/60,1°	0,79/ -19,9°	26,0
	500	0,38/ -126,8°	5,04/ 99,2°	0,07/54,9°	0,57/ -20,6°	16,5
	800	0,33/ -152,2°	3,35/ 87,9°	0,08/61,2°	0,57/ -22,7°	12,7
	1000	0,35/ -165,9°	2,75/ 81,0°	0,10/64,0°	0,55/ -26,4°	10,9
	1200	0,39/ +168,5°	2,35/ 74,1°	0,11/65,4°	0,49/ -22,3°	9,3
10	40	0,76/ -25,9°	22,67/161,9°	0,01/76,6°	0,96/ -9,8°	42,1
	100	0,63/ -57,9°	18,55/138,5°	0,02/65,1°	0,83/ -19,2°	32,5
	200	0,47/ -91,5°	12,47/119,0°	0,03/59,8°	0,67/ -22,4°	25,6
	500	0,33/ -151,1°	5,82/ 93,0°	0,06/62,2°	0,50/ -17,7°	17,1
	800	0,31/ -169,4°	3,78/ 83,6°	0,08/68,4°	0,51/ -19,6°	13,3
	1000	0,33/ -178,6°	3,10/ 77,9°	0,10/70,0°	0,50/ -23,5°	11,6
	1200	0,39/ +158,8°	2,65/ 71,9°	0,12/70,8°	0,45/ -17,8°	10,1
14	40	0,70/ -30,8°	27,63/158,1°	0,01/74,7°	0,95/ -11,6°	41,5
	100	0,55/ -67,6°	20,66/133,4°	0,02/63,8°	0,78/ -20,9°	32,0
	200	0,42/ -102,5°	13,42/115,4°	0,03/60,9°	0,62/ -22,4°	25,5
	500	0,32/ -158,3°	5,97/ 91,4°	0,06/65,1°	0,48/ -15,7°	17,1
	800	0,31/ -174,4°	3,88/ 81,8°	0,08/70,5°	0,50/ -18,3°	13,5
	1000	0,34/ +177,7°	3,14/ 76,7°	0,10/71,9°	0,49/ -22,2°	11,6
	1200	0,40/ +156,0°	2,71/ 70,2°	0,12/72,3°	0,44/ -15,9°	10,3
20	40	0,65/ -37,4°	32,19/154,4°	0,01/73,2°	0,92/ -13,4°	40,8
	100	0,49/ -76,7°	22,74/127,9°	0,02/62,7°	0,73/ -21,8°	31,7
	200	0,38/ -112,6°	13,78/110,5°	0,03/62,3°	0,59/ -21,1°	25,3
	500	0,32/ -164,7°	6,05/ 88,6°	0,06/67,4°	0,47/ -13,6°	17,2
	800	0,31/ -179,0°	3,84/ 80,1°	0,08/72,4°	0,50/ -16,8°	13,4
	1000	0,34/ +173,5°	3,14/ 75,1°	0,10/73,1°	0,49/ -21,0°	11,6
	1200	0,40/ +155,0°	2,69/ 69,8°	0,12/73,6°	0,44/ -14,7°	10,3

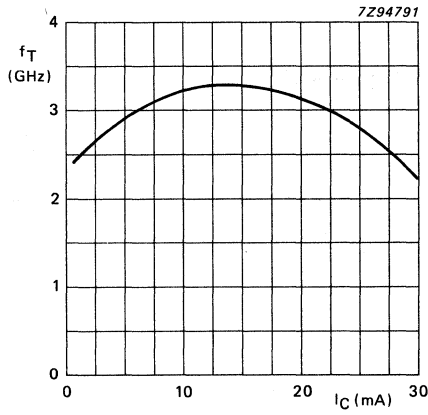


Fig. 3 $V_{CE} = 5$ V; $f = 500$ MHz;
 $T_{amb} = 25$ °C; typical values.

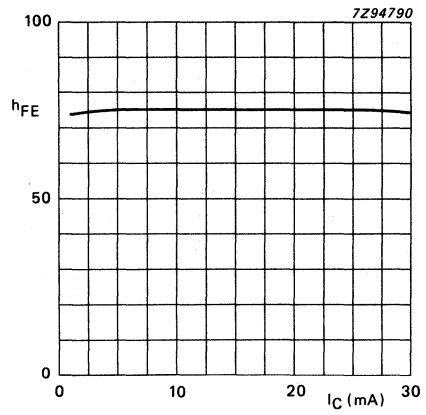


Fig. 4 $V_{CE} = 1$ V; $T_{amb} = 25$ °C;
typical values.

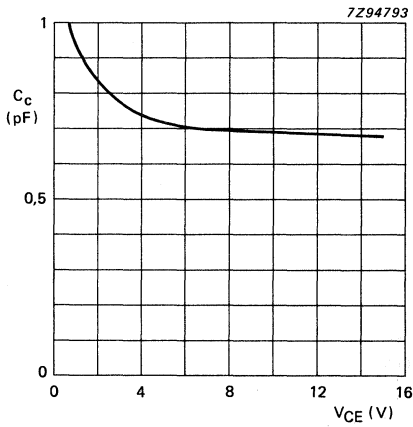


Fig. 5 $I_E = 0$; $f = 1$ MHz;
 $T_{amb} = 25$ °C; typical values.

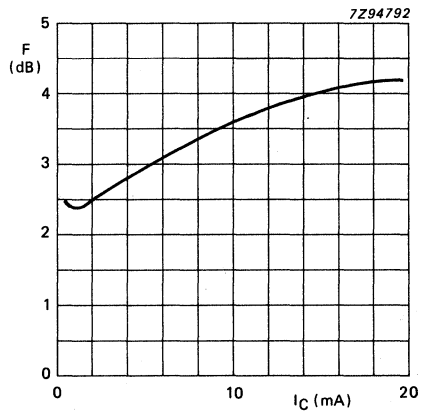


Fig. 6 $V_{CE} = 5$ V; $T_{amb} = 25$ °C;
 $f = 800$ MHz; $Z_S = 60$ Ω; typical values.

N-P-N H.F. WIDEBAND TRANSISTOR

N-P-N transistor in a plastic SOT-37 envelope. It is primarily intended for use in u.h.f. low power amplifiers such as in pocket phones, paging systems, etc. The transistor features low current consumption ($100 \mu\text{A} - 1 \text{ mA}$); thanks to its high transition frequency, it also has excellent wideband properties and low noise up to high frequencies.

QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	8 V
Collector-emitter voltage (open base)	V_{CEO}	max.	5 V
Collector current (d.c.)	I_C	max.	2,5 mA
Total power dissipation up to $T_{amb} = 135 \text{ }^\circ\text{C}$	P_{tot}	max.	30 mW
Junction temperature	T_j	max.	150 $^\circ\text{C}$
Transition frequency at $f = 500 \text{ MHz}$ $I_C = 1 \text{ mA}; V_{CE} = 1 \text{ V}$	f_T	typ.	2,3 GHz
Feedback capacitance at $f = 1 \text{ MHz}$ $I_C = 1 \text{ mA}; V_{CE} = 1 \text{ V}$	C_{re}	max.	0,4 pF
Noise figure at optimum source impedance $I_C = 1 \text{ mA}; V_{CE} = 1 \text{ V}; f = 500 \text{ MHz}$	F	typ.	3,8 dB
Max. unilateral power gain $I_C = 1 \text{ mA}; V_{CE} = 1 \text{ V}; f = 500 \text{ MHz}$	GUM	typ.	17 dB

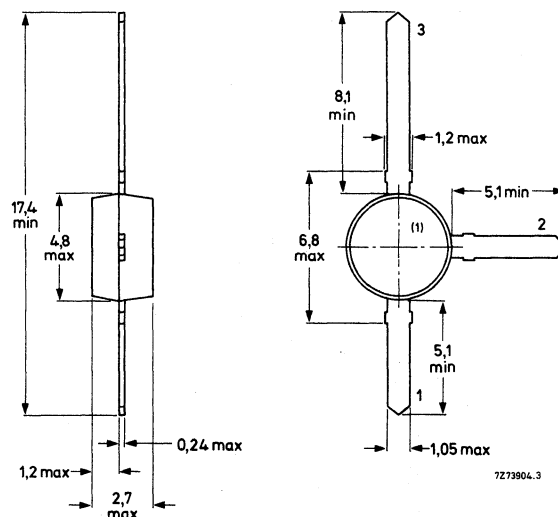
MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-37.

Connections

1. Base
2. Emitter
3. Collector



(1) = type number marking.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	8 V
Collector-emitter voltage (open base)	V_{CEO}	max.	5 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2 V
Collector current (d.c.)	I_C	max.	2,5 mA
Collector current (peak value; $f > 1$ MHz)	I_{CM}	max.	5,0 mA
Total power dissipation up to $T_{amb} = 135$ °C	P_{tot}	max.	30 mW
Storage temperature	T_{stg}	-65 to + 150	°C
Junction temperature	T_j	max.	150 °C

THERMAL RESISTANCE

From junction to ambient in free air
 mounted on a glass-fibre print
 of 40 mm x 25 mm x 1 mm (see Fig. 2)

$$R_{th\ j-a} = 500\ K/W$$

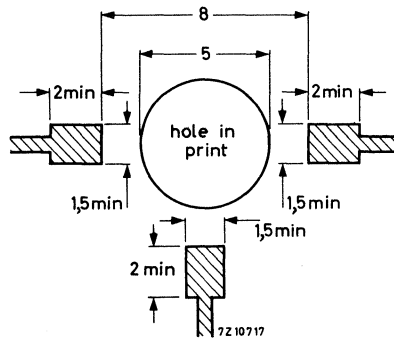


Fig. 2 Requirements for glass-fibre print. Dimensions in mm.

CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Collector cut-off current

$$I_E = 0; V_{CB} = 5\text{ V}$$

I_{CBO} max. 50 nA

D.C. current gain

$$I_C = 10\text{ }\mu\text{A}; V_{CE} = 1\text{ V}$$

h_{FE} min. 20
typ. 30

$$I_C = 1\text{ mA}; V_{CE} = 1\text{ V}$$

h_{FE} min. 20
typ. 40

Saturation voltages

$$I_C = 10\text{ }\mu\text{A}; I_B = 1\text{ }\mu\text{A}$$

V_{CEsat} max. 200 mV

V_{BEsat} max. 750 mV

$$I_C = 1\text{ mA}; I_B = 0,1\text{ mA}$$

V_{CEsat} max. 175 mV

V_{BEsat} max. 900 mV

Transition frequency at $f = 500\text{ MHz}$

$$I_C = 1\text{ mA}; V_{CE} = 1\text{ V}$$

f_T min. 1,2 GHz
typ. 2,3 GHz

Collector capacitance at $f = 1\text{ MHz}$

$$I_E = I_e = 0; V_{CB} = 0,5\text{ V}$$

C_C max. 0,55 pF

Emitter capacitance at $f = 1\text{ MHz}$

$$I_C = I_c = 0; V_{EB} = 0$$

C_e max. 0,45 pF

Feedback capacitance at $f = 1\text{ MHz}$

$$I_C = 1\text{ mA}; V_{CE} = 1\text{ V}; T_{amb} = 25\text{ }^\circ\text{C}$$

C_{re} max. 0,4 pF

Noise figure at optimum source impedance

$$I_C = 0,1\text{ mA}; V_{CE} = 1\text{ V}; f = 500\text{ MHz}; T_{amb} = 25\text{ }^\circ\text{C}$$

F typ. 5,5 dB

$$I_C = 1\text{ mA}; V_{CE} = 1\text{ V}; f = 500\text{ MHz}; T_{amb} = 25\text{ }^\circ\text{C}$$

F typ. 3,8 dB

Max. unilateral power gain (s_{re} assumed to be zero)

$$GUM = 10 \log \frac{|s_{fe}|^2}{(1 - |s_{ie}|^2)(1 - |s_{oe}|^2)}$$

$$I_C = 1\text{ mA}; V_{CE} = 1\text{ V}; f = 200\text{ MHz}; T_{amb} = 25\text{ }^\circ\text{C}$$

GUM typ. 24 dB

$$I_C = 1\text{ mA}; V_{CE} = 1\text{ V}; f = 500\text{ MHz}; T_{amb} = 25\text{ }^\circ\text{C}$$

GUM typ. 17 dB

$$I_C = 1\text{ mA}; V_{CE} = 1\text{ V}; f = 800\text{ MHz}; T_{amb} = 25\text{ }^\circ\text{C}$$

GUM typ. 11 dB

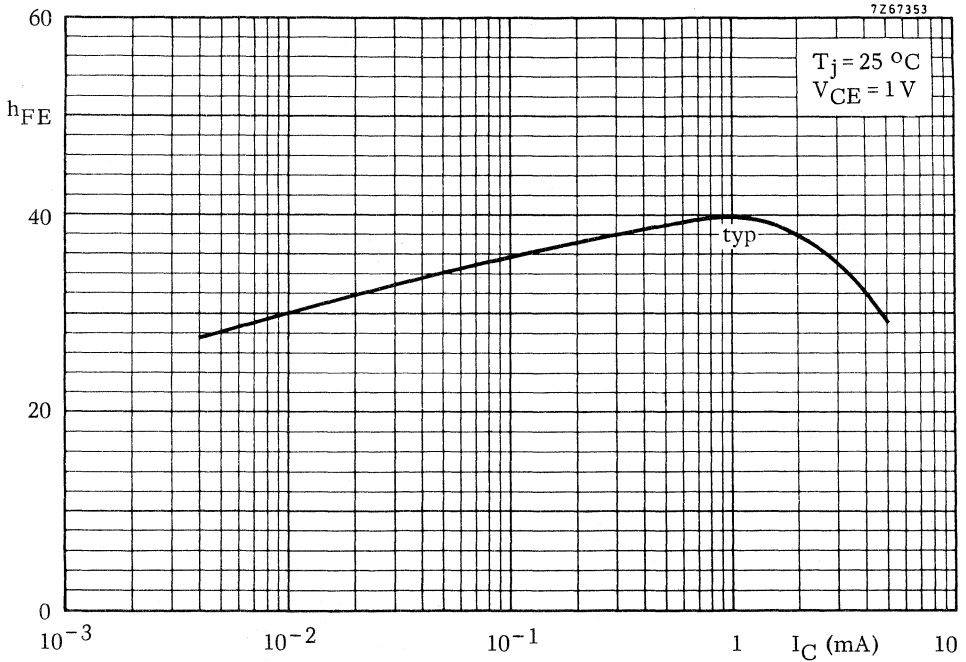


Fig. 3 $V_{CE} = 1\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$; typical values.

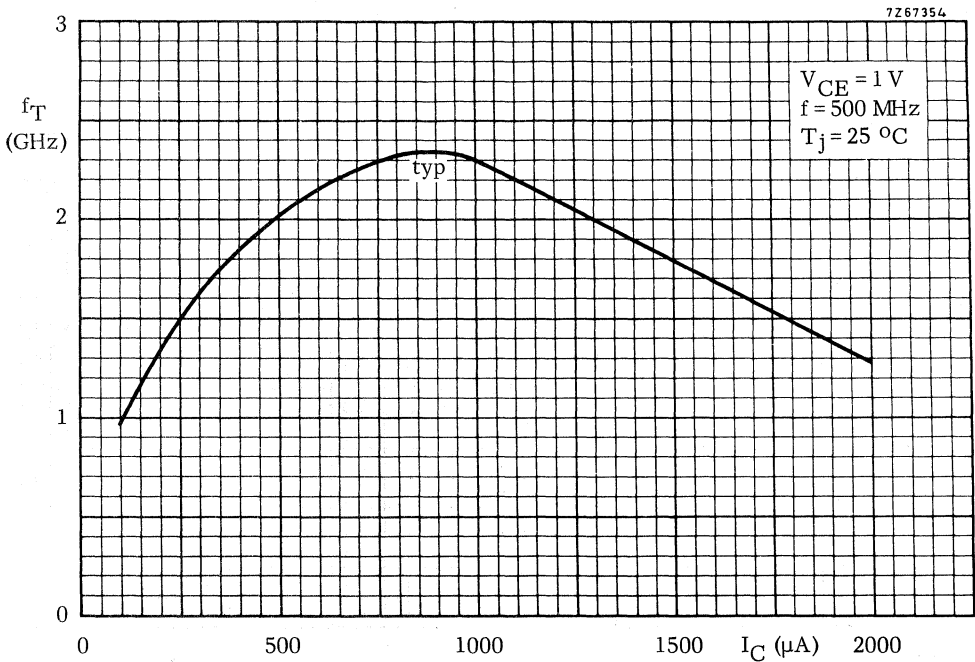


Fig. 4 $V_{CE} = 1\text{ V}$; $f = 500\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$; typical values.

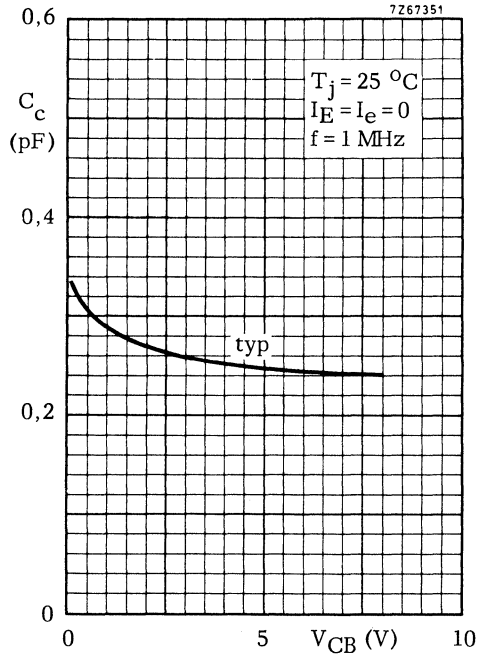


Fig. 5 $I_E = I_e = 0$; $f = 1\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$; typical values.

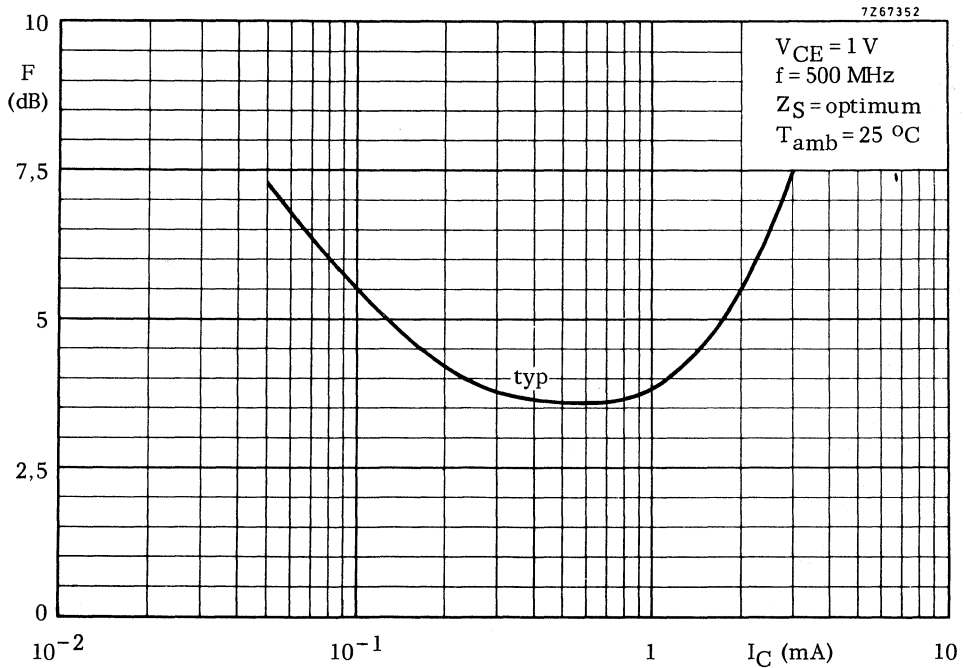


Fig. 6 $V_{CE} = 1\text{ V}$; $f = 500\text{ MHz}$; $Z_S = \text{opt.}$; $T_{\text{amb}} = 25\text{ }^\circ\text{C}$; typical values.

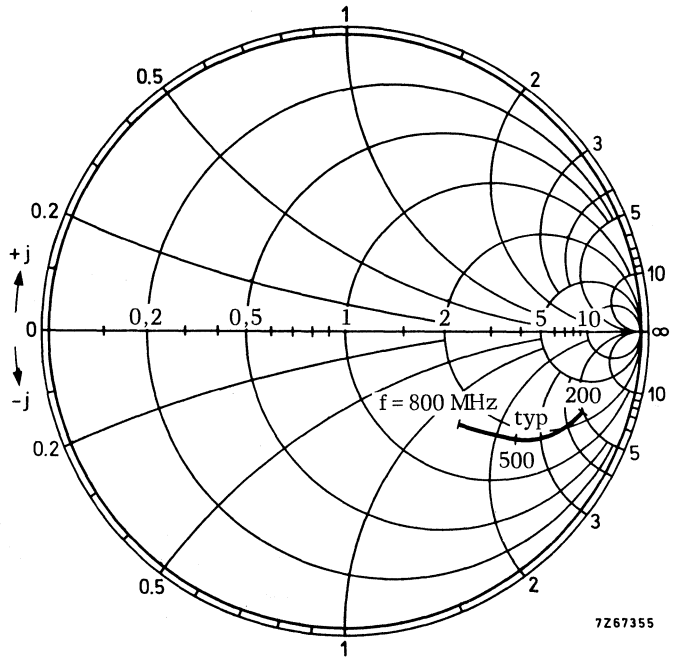


Fig. 7 $V_{CE} = 1\text{ V}$; $I_C = 1\text{ mA}$;
 $T_{amb} = 25\text{ }^\circ\text{C}$; typical values.

Input impedance derived from
 input reflection coefficient s_{ie}
 coordinates in ohm x 50

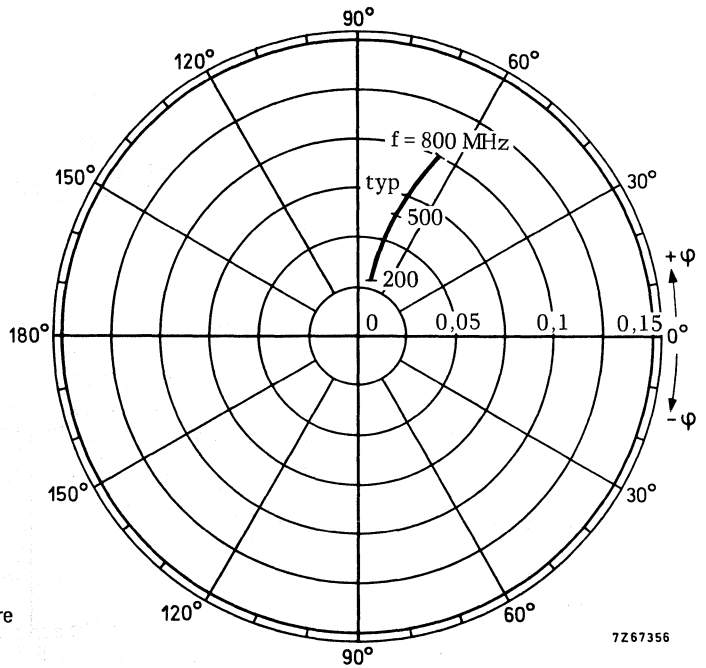


Fig. 8 $V_{CE} = 1\text{ V}$; $I_C = 1\text{ mA}$;
 $T_{amb} = 25\text{ }^\circ\text{C}$; typical values.

Reverse transmission coefficient s_{re}

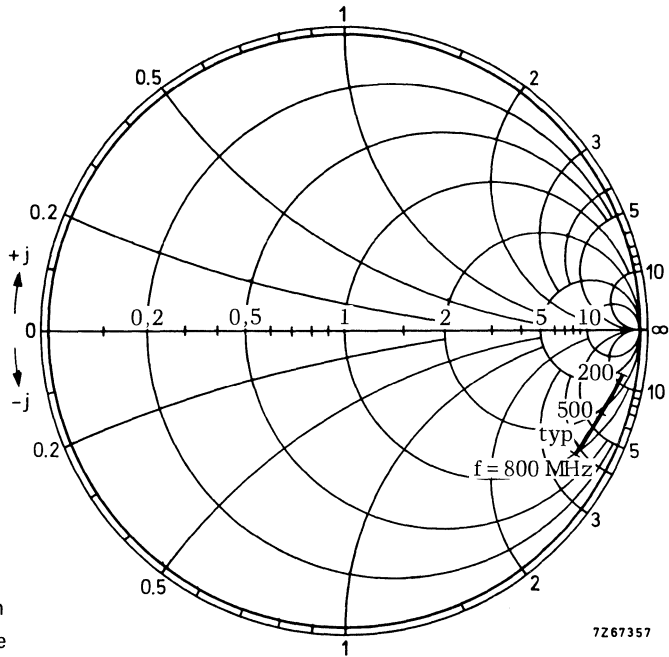


Fig. 9 $V_{CE} = 1\text{ V}$; $I_C = 1\text{ mA}$;
 $T_{amb} = 25\text{ }^\circ\text{C}$; typical values.

Output impedance derived from
 output reflection coefficient s_{oe}
 coordinates in ohm x 50

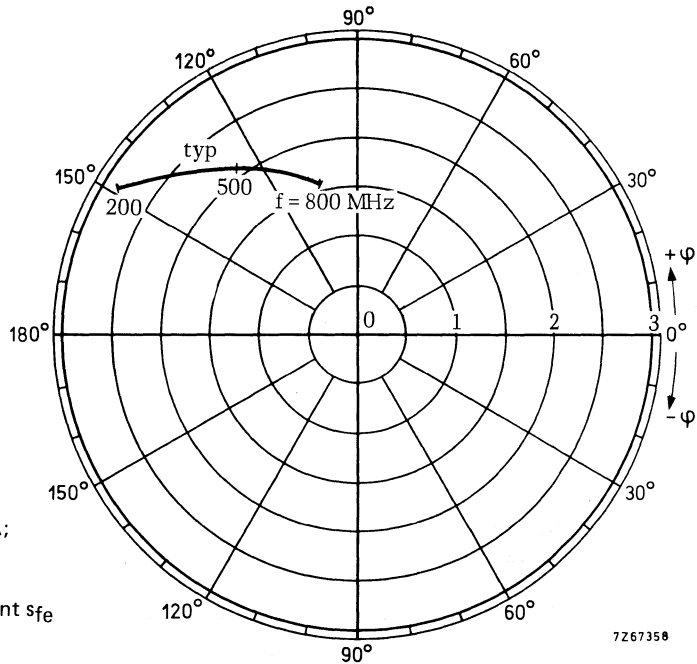


Fig. 10 $V_{CE} = 1\text{ V}$; $I_C = 1\text{ mA}$;
 $T_{amb} = 25\text{ }^\circ\text{C}$; typical values.

Forward transmission coefficient s_{fe}

N-P-N H.F. WIDEBAND TRANSISTOR

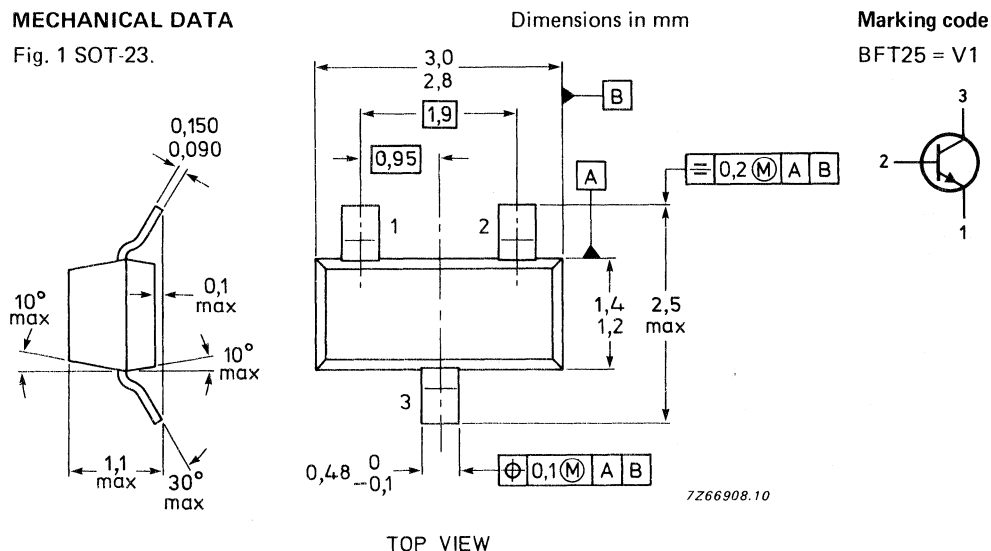
N-P-N transistor in a plastic SOT-23 envelope, primarily intended for use in u.h.f. low power amplifiers in thick and thin-film circuits, such as in pocket phones, paging systems, etc. The transistor features low current consumption (100 μ A – 1 mA); thanks to its high transition frequency, it also has excellent wideband properties and low noise up to high frequencies.

QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	8 V
Collector-emitter voltage (open base)	V_{CEO}	max.	5 V
Collector current (d.c.)	I_C	max.	6,5 mA
Total power dissipation up to $T_{amb} = 125\text{ }^\circ\text{C}$	P_{tot}	max.	50 mW
Junction temperature	T_j	max.	150 $^\circ\text{C}$
Transition frequency at $f = 500\text{ MHz}$ $I_C = 1\text{ mA}; V_{CE} = 1\text{ V}$	f_T	typ.	2,3 GHz
Feedback capacitance at $f = 1\text{ MHz}$ $I_C = 1\text{ mA}; V_{CE} = 1\text{ V}$	C_{re}	max.	0,45 pF
Noise figure at optimum source impedance $I_C = 1\text{ mA}; V_{CE} = 1\text{ V}; f = 500\text{ MHz}$	F	typ.	3,8 dB
Max. unilateral power gain $I_C = 1\text{ mA}; V_{CE} = 1\text{ V}; f = 500\text{ MHz}$	G_{UM}	typ.	18 dB

MECHANICAL DATA

Fig. 1 SOT-23.



If required, the R-version (reverse pinning) is available on request.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CB0}	max.	8 V
Collector-emitter voltage (open base)	V_{CEO}	max.	5 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2 V
Collector current (d.c.)	I_C	max.	6,5 mA
Collector current (peak value; $f > 1$ MHz)	I_{CM}	max.	10 mA
Total power dissipation up to $T_{amb} = 125$ °C**	P_{tot}	max.	50 mW
Storage temperature	T_{stg}		-65 to + 150 °C
Junction temperature	T_j	max.	150 °C

THERMAL CHARACTERISTICS*

$$T_j = P_x (R_{th j-t} + R_{th t-s} + R_{th s-a}) + T_{amb}$$

Thermal resistance

From junction to tab	$R_{th j-t}$	=	60 K/W
From tab to soldering points	$R_{th t-s}$	=	280 K/W
From soldering points to ambient**	$R_{th s-a}$	=	90 K/W

CHARACTERISTICS $T_j = 25$ °C unless otherwise specified

Collector cut-off current

$$I_E = 0; V_{CB} = 5 V$$

I_{CBO}	max.	50 nA
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D.C. current gain

$$I_C = 10 \mu A; V_{CE} = 1 V$$

h_{FE}	min.	20
	typ.	30

$$I_C = 1 mA; V_{CE} = 1 V$$

h_{FE}	min.	20
	typ.	40

Saturation voltages

$$I_C = 10 \mu A; I_B = 1 \mu A$$

V_{CEsat}	max.	200 mV
V_{BEsat}	max.	750 mV

$$I_C = 1 mA; I_B = 0,1 mA$$

V_{CEsat}	max.	175 mV
V_{BEsat}	max.	900 mV

Transition frequency at $f = 500$ MHz

$$I_C = 1 mA; V_{CE} = 1 V$$

f_T	min.	1,2 GHz
	typ.	2,3 GHz

* See *Thermal characteristics*.

** Mounted on a ceramic substrate of 8 mm x 10 mm x 0,7 mm.

Collector capacitance at $f = 1$ MHz

$$I_E = I_e = 0; V_{CB} = 0,5 \text{ V}$$

C_C max. 0,6 pF

Emitter capacitance at $f = 1$ MHz

$$I_C = I_c = 0; V_{EB} = 0$$

C_e max. 0,5 pF

Feedback capacitance at $f = 1$ MHz

$$I_C = 1 \text{ mA}; V_{CE} = 1 \text{ V}; T_{amb} = 25 \text{ }^\circ\text{C}$$

C_{re} max. 0,45 pF

Noise figure at optimum source impedance

$$I_C = 0,1 \text{ mA}; V_{CE} = 1 \text{ V}; f = 500 \text{ MHz}; T_{amb} = 25 \text{ }^\circ\text{C}$$

F typ. 5,5 dB

$$I_C = 1 \text{ mA}; V_{CE} = 1 \text{ V}; f = 500 \text{ MHz}; T_{amb} = 25 \text{ }^\circ\text{C}$$

F typ. 3,8 dB

Maximum unilateral power gain (s_{re} assumed to be zero)

$$G_{UM} \text{ (in dB)} = 10 \log \frac{|s_{fe}|^2}{(1 - |s_{ie}|^2)(1 - |s_{oe}|^2)}$$

$$I_C = 1 \text{ mA}; V_{CE} = 1 \text{ V}; f = 200 \text{ MHz}; T_{amb} = 25 \text{ }^\circ\text{C}$$

G_{UM} typ. 25,0 dB

$$I_C = 1 \text{ mA}; V_{CE} = 1 \text{ V}; f = 500 \text{ MHz}; T_{amb} = 25 \text{ }^\circ\text{C}$$

G_{UM} typ. 18,0 dB

$$I_C = 1 \text{ mA}; V_{CE} = 1 \text{ V}; f = 800 \text{ MHz}; T_{amb} = 25 \text{ }^\circ\text{C}$$

G_{UM} typ. 12,0 dB

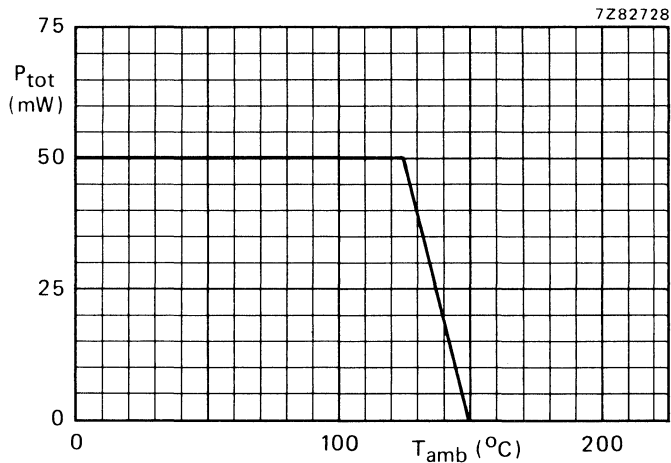


Fig. 2 Power derating curve.

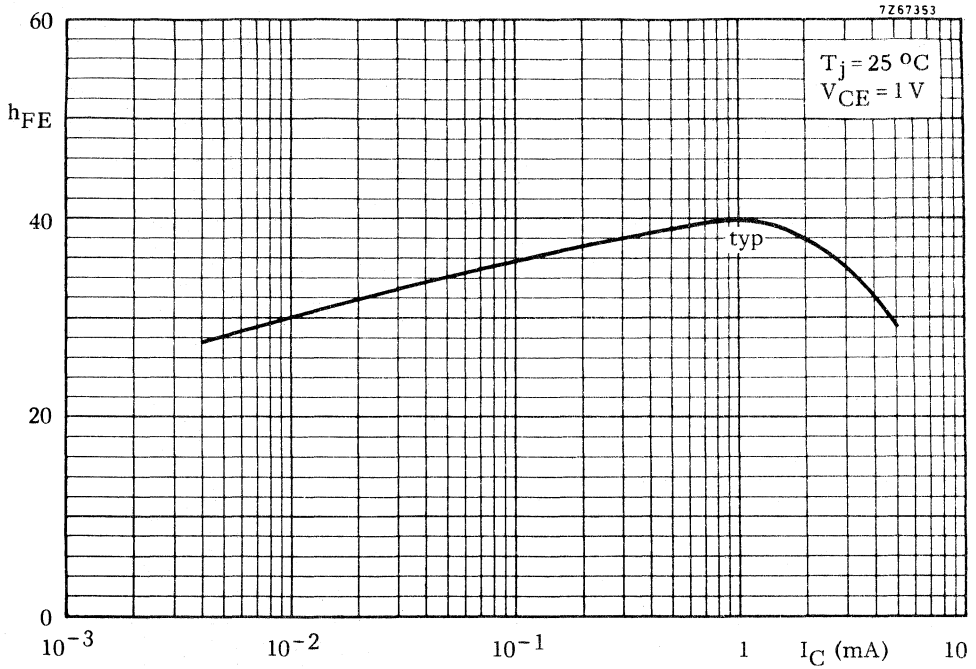


Fig. 3 $V_{CE} = 1\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$; typical values.

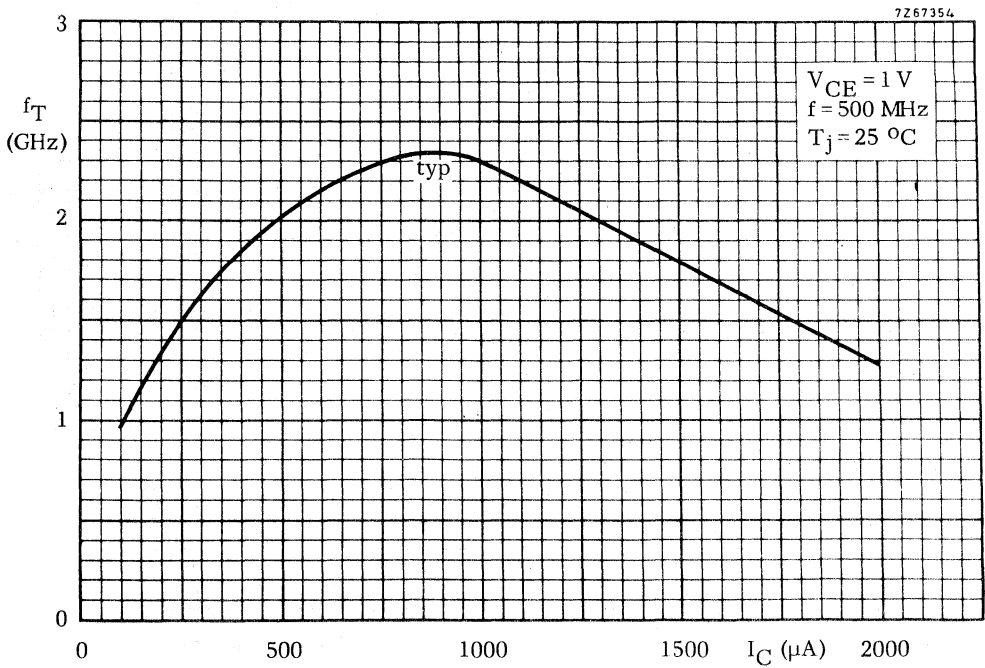


Fig. 4 $V_{CE} = 1\text{ V}$; $f = 500\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$; typical values.

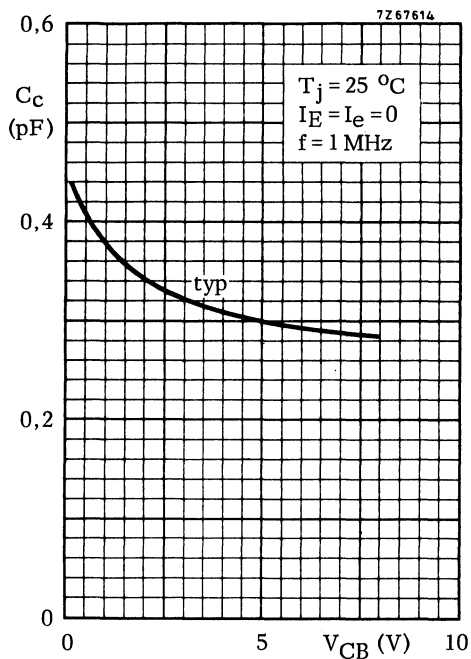


Fig. 5 $I_E = I_e = 0$; $f = 1\text{ MHz}$; $T_j = 25\text{ }^\circ\text{C}$; typical values.

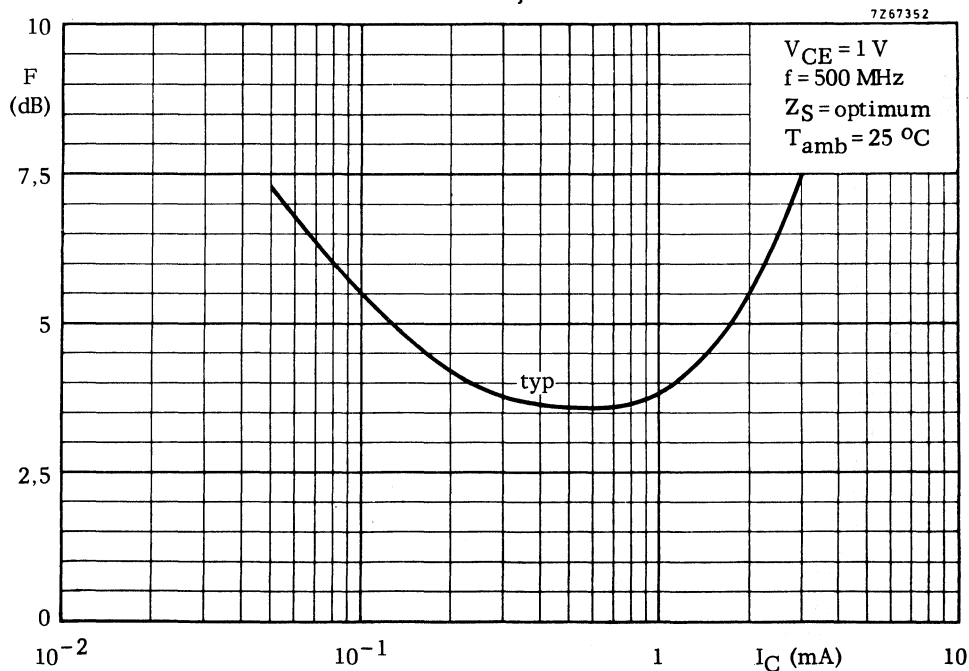


Fig. 6 $V_{CE} = 1\text{ V}$; $f = 500\text{ MHz}$; $Z_S = \text{opt.}$; $T_{amb} = 25\text{ }^\circ\text{C}$; typical values.

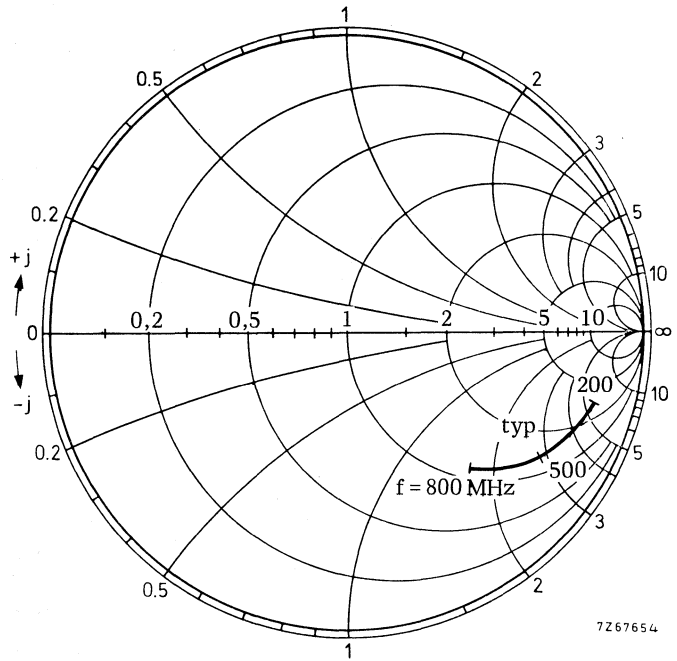


Fig. 7 $V_{CE} = 1\text{ V}$; $I_C = 1\text{ mA}$;
 $T_{amb} = 25\text{ }^\circ\text{C}$; typical values.

Input impedance derived from
 input reflection coefficient s_{ie}
 coordinates in ohm $\times 50$

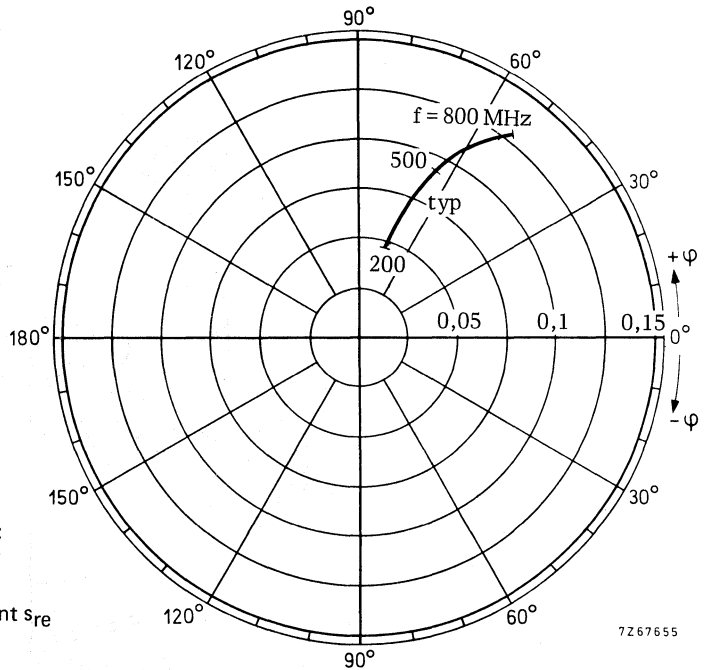


Fig. 8 $V_{CE} = 1\text{ V}$; $I_C = 1\text{ mA}$;
 $T_{amb} = 25\text{ }^\circ\text{C}$; typical values.

Reverse transmission coefficient s_{re}

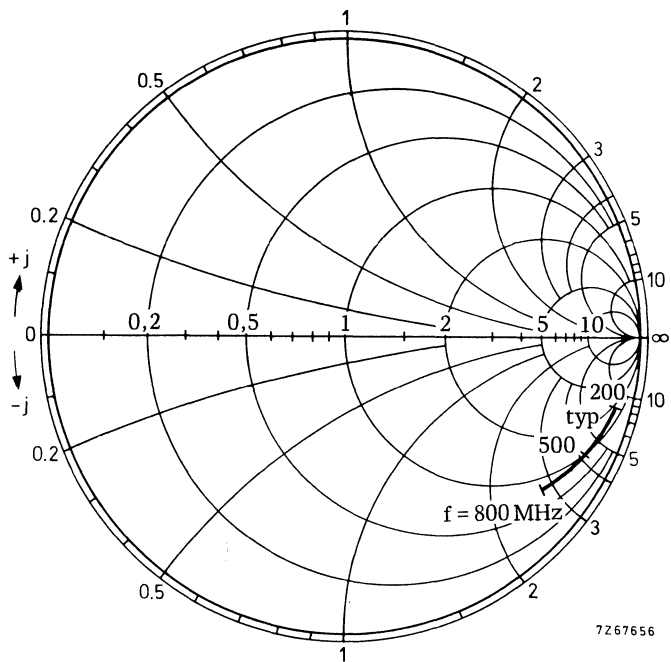


Fig. 9 $V_{CE} = 1\text{ V}$; $I_C = 1\text{ mA}$;
 $T_{amb} = 25\text{ }^\circ\text{C}$; typical values.

Output impedance derived from
 output reflection coefficient s_{oe}
 coordinates in ohm $\times 50$

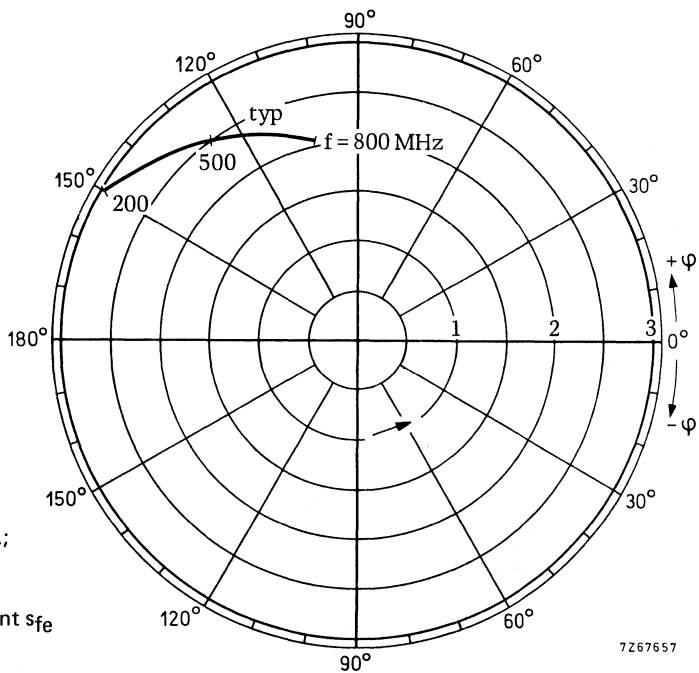


Fig. 10 $V_{CE} = 1\text{ V}$; $I_C = 1\text{ mA}$;
 $T_{amb} = 25\text{ }^\circ\text{C}$; typical values.

Forward transmission coefficient s_{fe}

P-N-P 1 GHz WIDEBAND TRANSISTOR

P-N-P transistor in a plastic SOT-23 envelope. It is primarily intended for use in u.h.f. and microwave amplifiers in thick and thin-film circuits, such as in aerial amplifiers, radar systems, oscilloscopes, spectrum analyses, etc.

The transistor features low intermodulation distortion and high power gain; thanks to its very high transition frequency, it also has excellent wideband properties and low noise up to high frequencies.

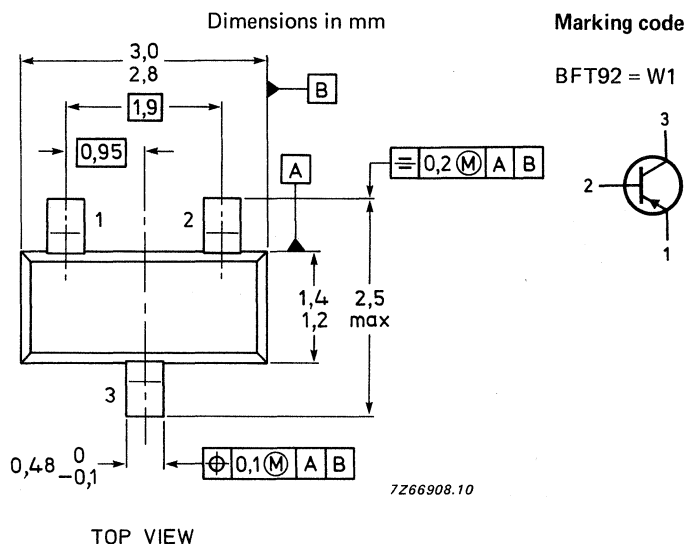
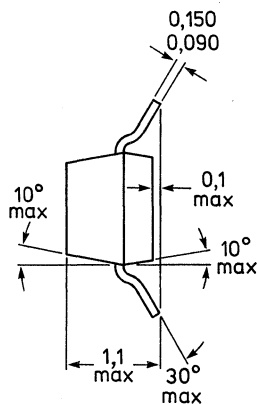
N-P-N complements are BFR92 and BFR92A.

QUICK REFERENCE DATA

Collector-base voltage (open emitter)	$-V_{CBO}$	max.	20 V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	15 V
Collector current (d.c.)	$-I_C$	max.	25 mA
Total power dissipation up to $T_{amb} = 60\text{ }^{\circ}\text{C}$	P_{tot}	max.	200 mW
Junction temperature	T_j	max.	150 $^{\circ}\text{C}$
Transition frequency at $f = 500\text{ MHz}$ $-I_C = 14\text{ mA}; -V_{CE} = 10\text{ V}$	f_T	typ.	5,0 GHz
Feedback capacitance at $f = 1\text{ MHz}$ $-I_C = 2\text{ mA}; -V_{CE} = 10\text{ V}$	C_{re}	typ.	0,7 pF
Noise figure at optimum source impedance $-I_C = 2\text{ mA}; -V_{CE} = 10\text{ V}; f = 500\text{ MHz}$	F	typ.	2,7 dB
Max. unilateral power gain $-I_C = 14\text{ mA}; -V_{CE} = 10\text{ V}; f = 500\text{ MHz}$	G_{UM}	typ.	18,0 dB
Output voltage at $d_{im} = -60\text{ dB}$ $-I_C = 14\text{ mA}; -V_{CE} = 10\text{ V}; R_L = 75\text{ }\Omega$ $f(p + q - r) = 493,25\text{ MHz}$	V_o	typ.	150 mV

MECHANICAL DATA

Fig. 1 SOT-23.



If required, the R-version (reverse pinning) is available on request.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	$-V_{CB0}$ max.	20 V
Collector-emitter voltage (open base)	$-V_{CEO}$ max.	15 V
Emitter-base voltage (open collector)	$-V_{EBO}$ max.	2 V
Collector current (d.c.)	$-I_C$ max.	25 mA
Collector current (peak value; $f > 1$ MHz)	$-I_{CM}$ max.	35 mA
Total power dissipation up to $T_{amb} = 60$ °C **	P_{tot} max.	200 mW
Storage temperature	T_{stg}	-65 to + 150 °C
Junction temperature	T_j max.	150 °C

THERMAL CHARACTERISTICS *

$$T_j = P (R_{th j-t} + R_{th t-s} + R_{th s-a}) + T_{amb}$$

Thermal resistance

From junction to tab	$R_{th j-t} =$	60 K/W
From tab to soldering points	$R_{th t-s} =$	280 K/W
From soldering points to ambient **	$R_{th s-a} =$	90 K/W

* See *Thermal characteristics*.

** Mounted on a ceramic substrate of 8 mm x 10 mm x 0,7 mm.

CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Collector cut-off current

$$I_E = 0; -V_{CB} = 10\text{ V}$$

$-I_{CBO}$ max. 50 nA

D.C. current gain

$$-I_C = 14\text{ mA}; -V_{CE} = 10\text{ V}$$

h_{FE} min. 20
typ. 50

Transition frequency at $f = 500\text{ MHz}$

$$-I_C = 14\text{ mA}; -V_{CE} = 10\text{ V}$$

f_T typ. 5,0 GHz

Collector capacitance at $f = 1\text{ MHz}$

$$I_E = I_e = 0; -V_{CB} = 10\text{ V}$$

C_C typ. 0,75 pF

Emitter capacitance at $f = 1\text{ MHz}$

$$I_C = I_c = 0; -V_{EB} = 0,5\text{ V}$$

C_e typ. 0,8 pF

$T_{amb} = 25\text{ }^\circ\text{C}$

Feedback capacitance at $f = 1\text{ MHz}$

$$-I_C = 2\text{ mA}; -V_{CE} = 10\text{ V}$$

C_{re} typ. 0,7 pF

Noise figure at optimum source impedance *

$$-I_C = 2\text{ mA}; -V_{CE} = 10\text{ V}; f = 500\text{ MHz}$$

F typ. 2,7 dB

Max. unilateral power gain (s_{re} assumed to be zero)

$$G_{UM} = 10 \log \frac{|s_{fe}|^2}{(1 - |s_{ie}|^2)(1 - |s_{oe}|^2)}$$

$$-I_C = 14\text{ mA}; -V_{CE} = 10\text{ V}; f = 500\text{ MHz}$$

G_{UM} typ. 18,0 dB

Output voltage at $d_{im} = -60\text{ dB}$ (see Fig. 2)

(DIN 45004B, par. 6.3.: 3-tone)

$$-I_C = 14\text{ mA}; -V_{CE} = 10\text{ V}; R_L = 75\ \Omega$$

$$V_p = V_o \text{ at } d_{im} = -60\text{ dB}; f_p = 495,25\text{ MHz}$$

$$V_q = V_o -6\text{ dB}; f_q = 503,25\text{ MHz}$$

$$R_r = V_o -6\text{ dB}; f_r = 505,25\text{ MHz}$$

$$\text{measured at } f_{(p+q-r)} = 493,25\text{ MHz}$$

V_o typ. 150 mV

* Crystal mounted in SOT-37 envelope.

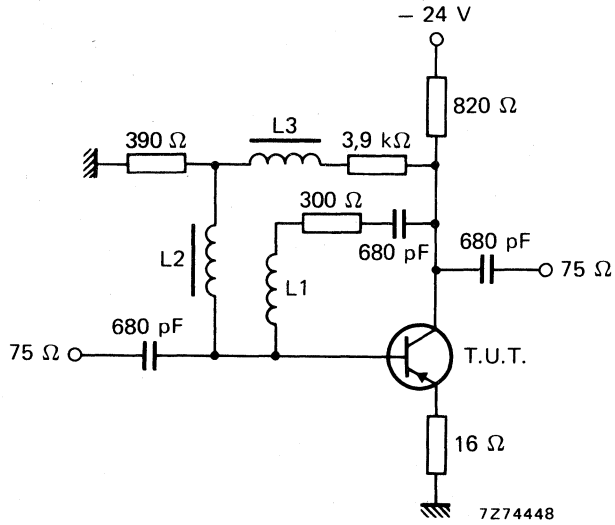


Fig. 2 Intermodulation test circuit.

L1 = 4 turns Cu wire (0,35 mm); winding pitch 1 mm; int. dia. 4 mm.
 L2 = L3 = 5 μH (catalogue number: 3122 108 20150).

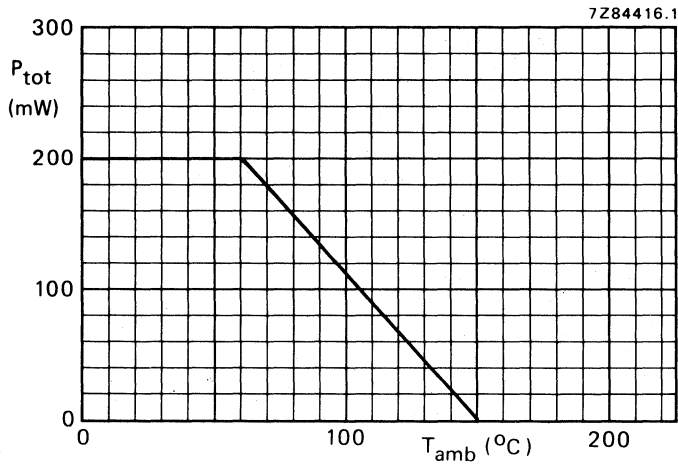


Fig. 3 Power derating curve.

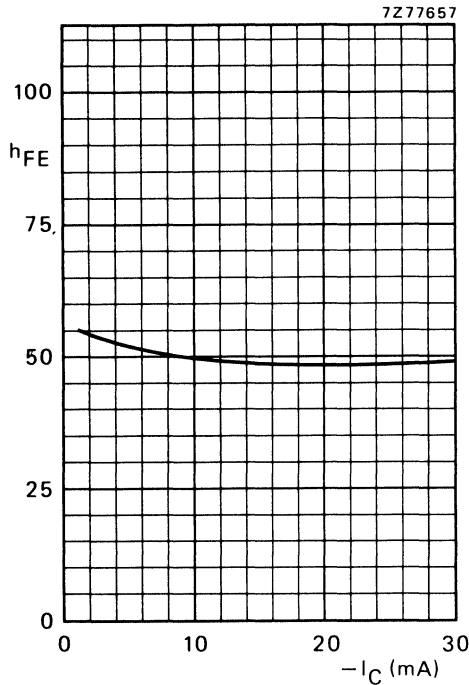


Fig. 4 $-V_{CE} = 10$ V; $T_j = 25$ °C; typical values.

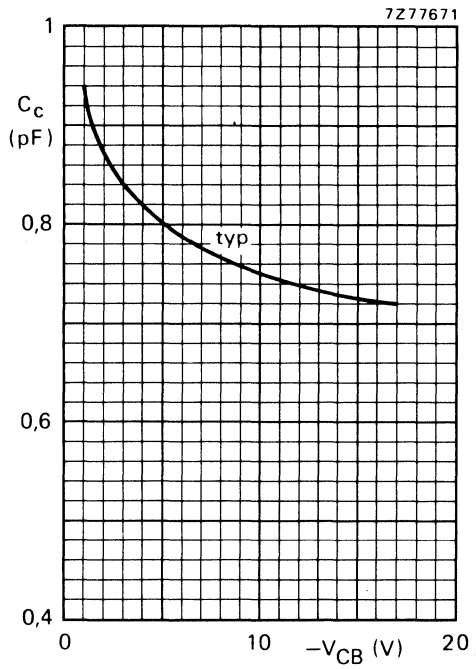


Fig. 5 $I_E = I_e = 0$; $T_j = 25$ °C; $f = 1$ MHz; typical values.

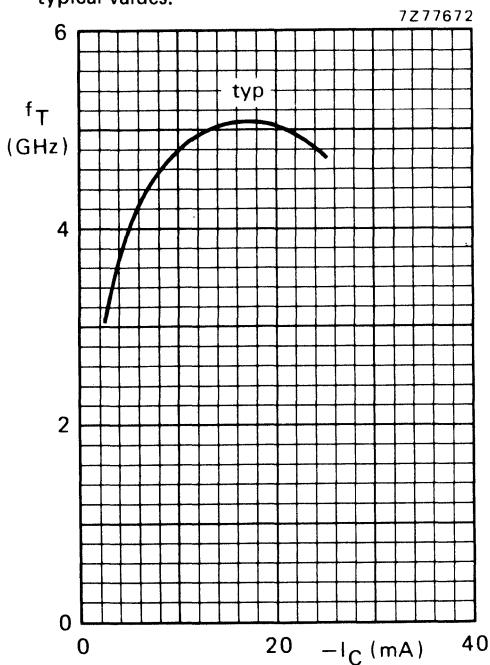


Fig. 6 $-V_{CE} = 10$ V; $f = 500$ MHz; $T_j = 25$ °C; typical values.

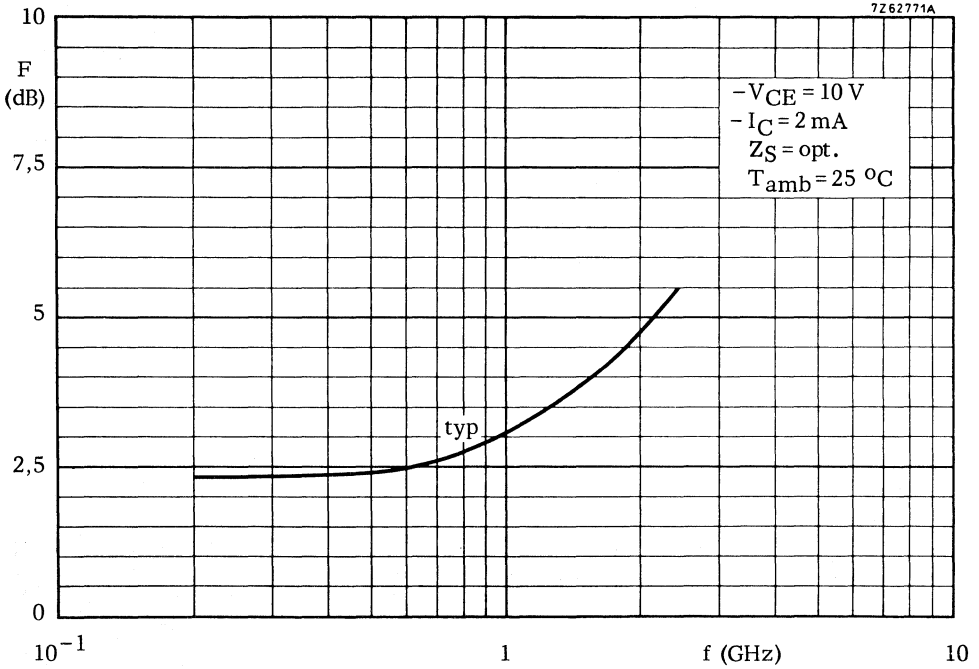


Fig. 7 $-V_{CE} = 10\text{ V}$; $-I_C = 2\text{ mA}$; $Z_S = \text{opt.}$; $T_{\text{amb}} = 25\text{ }^\circ\text{C}$; typical values.

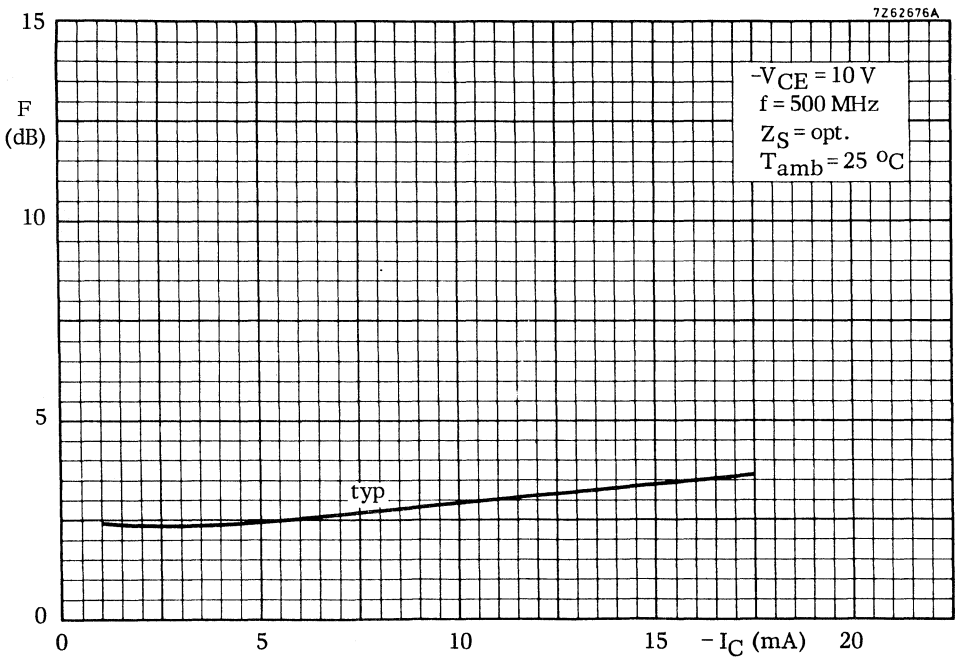


Fig. 8 $-V_{CE} = 10\text{ V}$; $f = 500\text{ MHz}$; $Z_S = \text{opt.}$; $T_{\text{amb}} = 25\text{ }^\circ\text{C}$; typical values.

P-N-P 1 GHz WIDEBAND TRANSISTOR

P-N-P transistor in a plastic SOT-23 envelope. It is primarily intended for use in u.h.f. and microwave amplifiers in thick and thin-film circuits, such as in aerial amplifiers, radar systems, oscilloscopes, spectrum analyses, etc.

The transistor features low intermodulation distortion and high power gain; thanks to its very high transition frequency, it also has excellent wideband properties and low noise up to high frequencies.

N-P-N complements are BFR93 and BFR93A.

QUICK REFERENCE DATA

Collector-base voltage (open emitter)	$-V_{CBO}$	max.	15 V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	12 V
Collector current (d.c.)	$-I_C$	max.	35 mA
Total power dissipation up to $T_{amb} = 60\text{ }^\circ\text{C}$	P_{tot}	max.	200 mW
Junction temperature	T_j	max.	150 $^\circ\text{C}$
Transition frequency at $f = 500\text{ MHz}$ $-I_C = 30\text{ mA}$; $-V_{CE} = 5\text{ V}$	f_T	typ.	5,0 GHz
Feedback capacitance at $f = 1\text{ MHz}$ $-I_C = 2\text{ mA}$; $-V_{CE} = 5\text{ V}$	C_{re}	typ.	1,0 pF
Noise figure at optimum source impedance $-I_C = 2\text{ mA}$; $-V_{CE} = 5\text{ V}$; $f = 500\text{ MHz}$	F	typ.	2,4 dB
Max. unilateral power gain $-I_C = 30\text{ mA}$; $-V_{CE} = 5\text{ V}$; $f = 500\text{ MHz}$	G_{UM}	typ.	16,5 dB
Output voltage at $d_{im} = -60\text{ dB}$ $-I_C = 30\text{ mA}$; $-V_{CE} = 5\text{ V}$; $R_L = 75\text{ }\Omega$ $f(p + q - r) = 493,25\text{ MHz}$	V_o	typ.	300 mV

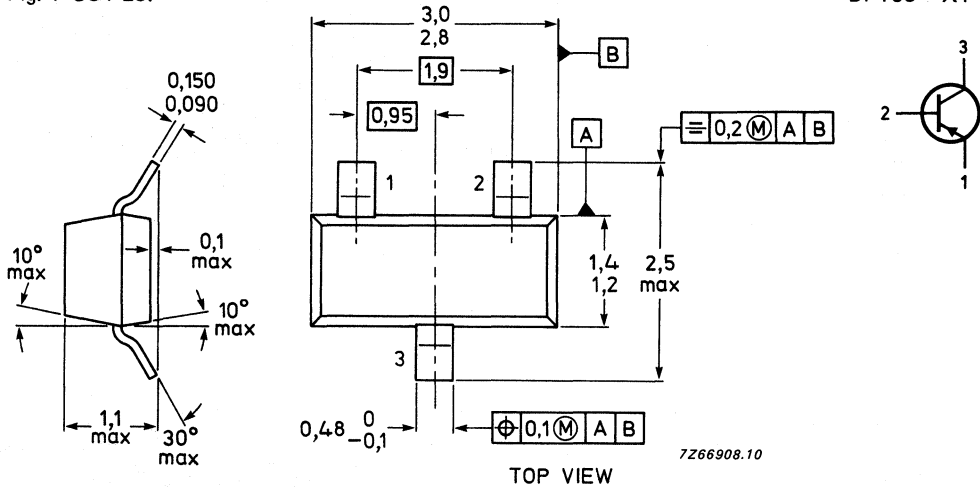
MECHANICAL DATA

Dimensions in mm

Marking code

Fig. 1 SOT-23.

BFT93 = X1



If required, the R-version (reverse pinning) is available on request.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	$-V_{CB0}$ max.	15 V
Collector-emitter voltage (open base)	$-V_{CEO}$ max.	12 V
Emitter-base voltage (open collector)	$-V_{EBO}$ max.	2 V
Collector current (d.c.)	$-I_C$ max.	35 mA
Collector current (peak value; $f > 1$ MHz)	$-I_{CM}$ max.	50 mA
Total power dissipation up to $T_{amb} = 60$ °C **	P_{tot} max.	200 mW
Storage temperature	T_{stg}	-65 to +150 °C
Junction temperature	T_j max.	150 °C

THERMAL CHARACTERISTICS *

$$T_j = P \times (R_{th\ j-t} + R_{th\ t-s} + R_{th\ s-a}) + T_{amb}$$

Thermal resistance

From junction to tab	$R_{th\ j-t}$ =	60 K/W
From tab to soldering points	$R_{th\ t-s}$ =	280 K/W
From soldering points to ambient **	$R_{th\ s-a}$ =	90 K/W

* See *Thermal characteristics*.

** Mounted on a ceramic substrate of 8 mm x 10 mm x 0,7 mm.

CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Collector cut-off current

$I_E = 0; -V_{CB} = 5\text{ V}$

$-I_{CBO}$ max. 50 nA

D.C. current gain

$-I_C = 30\text{ mA}; -V_{CE} = 5\text{ V}$

h_{FE} min. 20
typ. 50

Transition frequency at $f = 500\text{ MHz}$

$-I_C = 30\text{ mA}; -V_{CE} = 5\text{ V}$

f_T typ. 5,0 GHz

Collector capacitance at $f = 1\text{ MHz}$

$I_E = I_e = 0; -V_{CB} = 10\text{ V}$

C_C typ. 0,95 pF

Emitter capacitance at $f = 1\text{ MHz}$

$I_C = I_c = 0; -V_{EB} = 0,5\text{ V}$

C_e typ. 1,8 pF

$T_{amb} = 25\text{ }^\circ\text{C}$

Feedback capacitance at $f = 1\text{ MHz}$

$-I_C = 2\text{ mA}; -V_{CE} = 5\text{ V}$

C_{re} typ. 1,0 pF

Noise figure at optimum source impedance *

$-I_C = 2\text{ mA}; -V_{CE} = 5\text{ V}; f = 500\text{ MHz}$

F typ. 2,4 dB

Max. unilateral power gain (s_{re} assumed to be zero)

$$G_{UM} = 10 \log \frac{|s_{fe}|^2}{(1 - |s_{ie}|^2)(1 - |s_{oe}|^2)}$$

$-I_C = 30\text{ mA}; -V_{CE} = 5\text{ V}; f = 500\text{ MHz}$

G_{UM} typ. 16,5 dB

Output voltage at $d_{im} = -60\text{ dB}$ (see Fig. 2)

$-I_C = 30\text{ mA}; -V_{CE} = 5\text{ V}; R_L = 75\text{ }\Omega$

$V_p = V_o$ at $d_{im} = -60\text{ dB}; f_p = 495,25\text{ MHz}$

$V_q = V_o - 6\text{ dB}; f_q = 503,25\text{ MHz}$

$V_r = V_o - 6\text{ dB}; f_r = 505,25\text{ MHz}$

measured at $f(p + q - r) = 443,25\text{ MHz}$

V_o typ. 300 mV

* Crystal mounted in SOT-37 envelope.

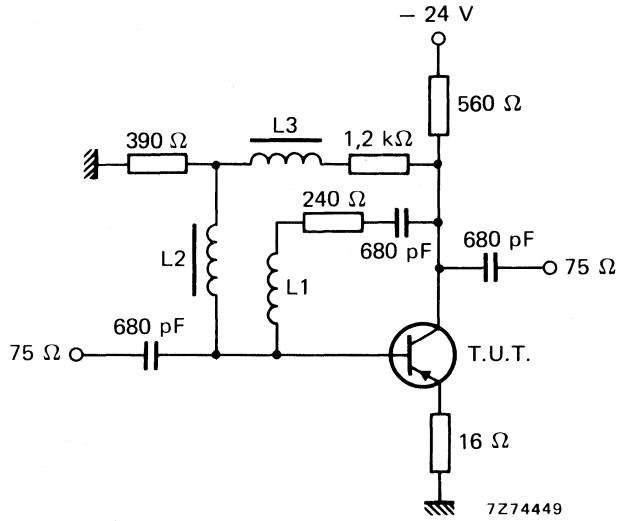


Fig. 2 Intermodulation test circuit.

L1 = 4 turns Cu wire (0,35); winding pitch 1 mm; int. dia. 4 mm.
 L2 and L3 = 5 μH (catalogue number: 3122 108 20150).

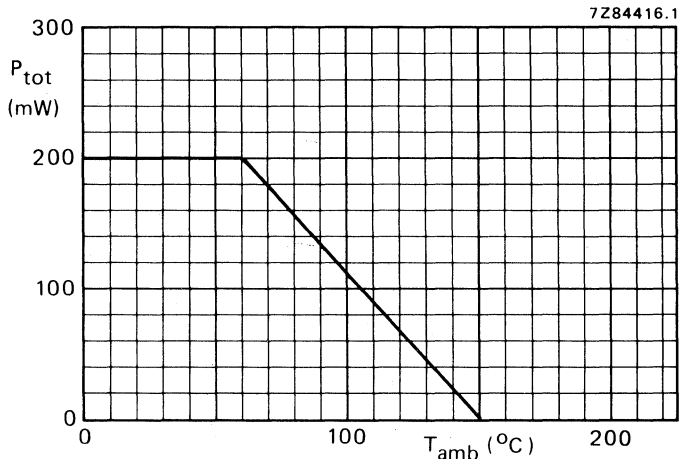


Fig. 3 Power derating curve.

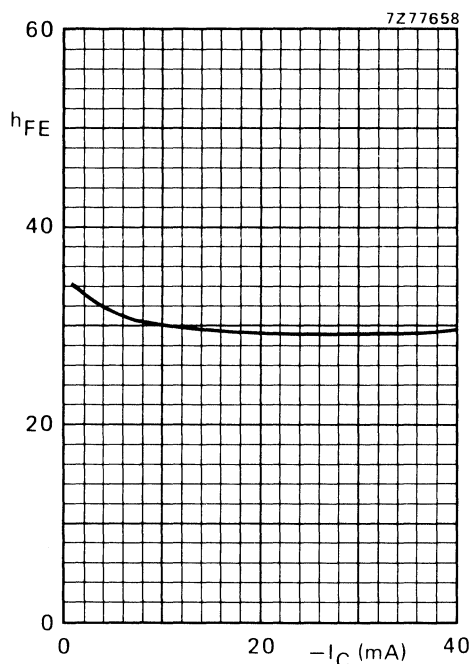


Fig. 4 $-V_{CE} = 5$ V; $T_j = 25$ °C; typical values.

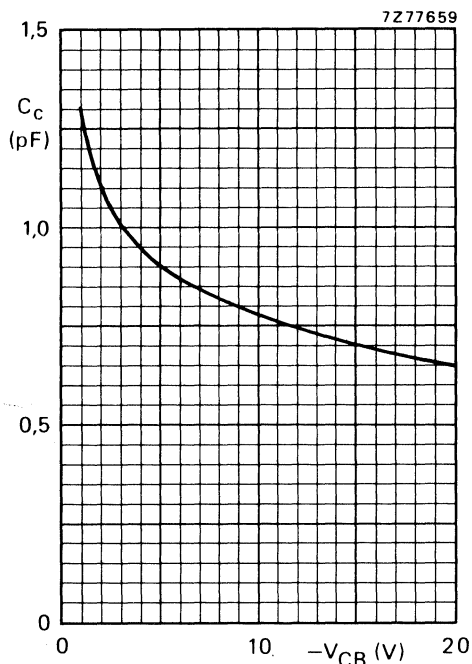


Fig. 5 $I_E = I_e = 0$; $T_j = 25$ °C; $f = 1$ MHz; typical values.

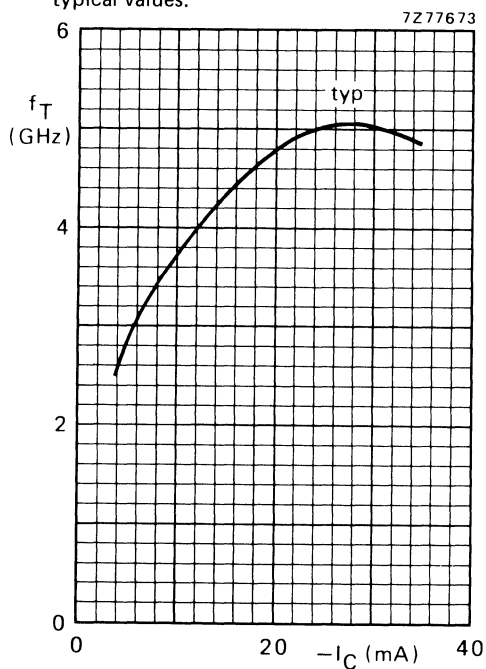


Fig. 6 $-V_{CE} = 5$ V; $T_j = 25$ °C; $f = 500$ MHz; typical values.

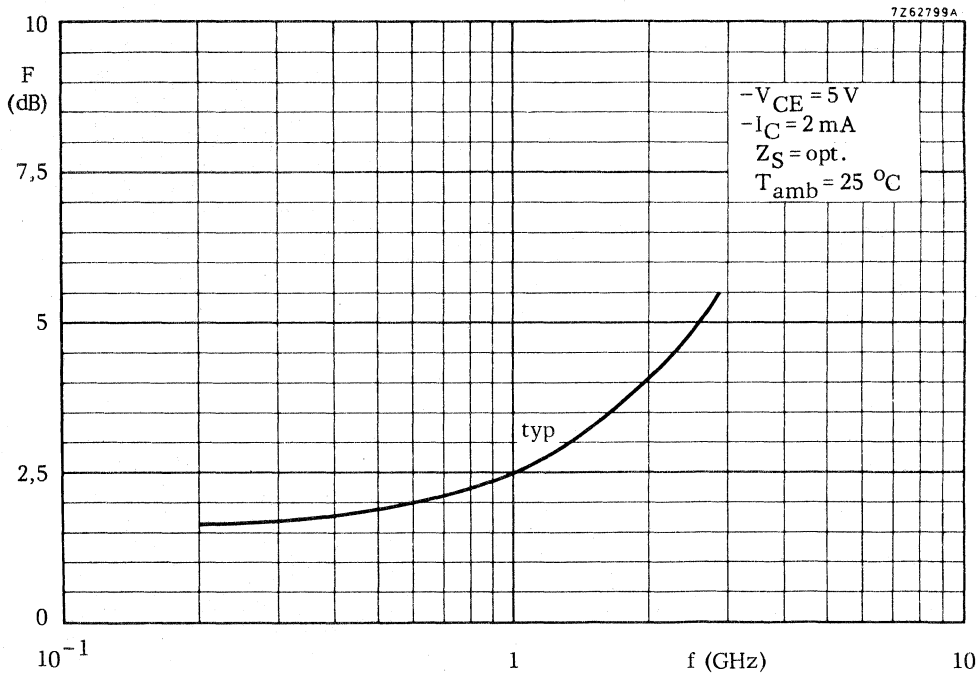


Fig. 7 $-V_{CE} = 5 \text{ V}$; $-I_C = 2 \text{ mA}$; $Z_S = \text{opt.}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$; typical values.

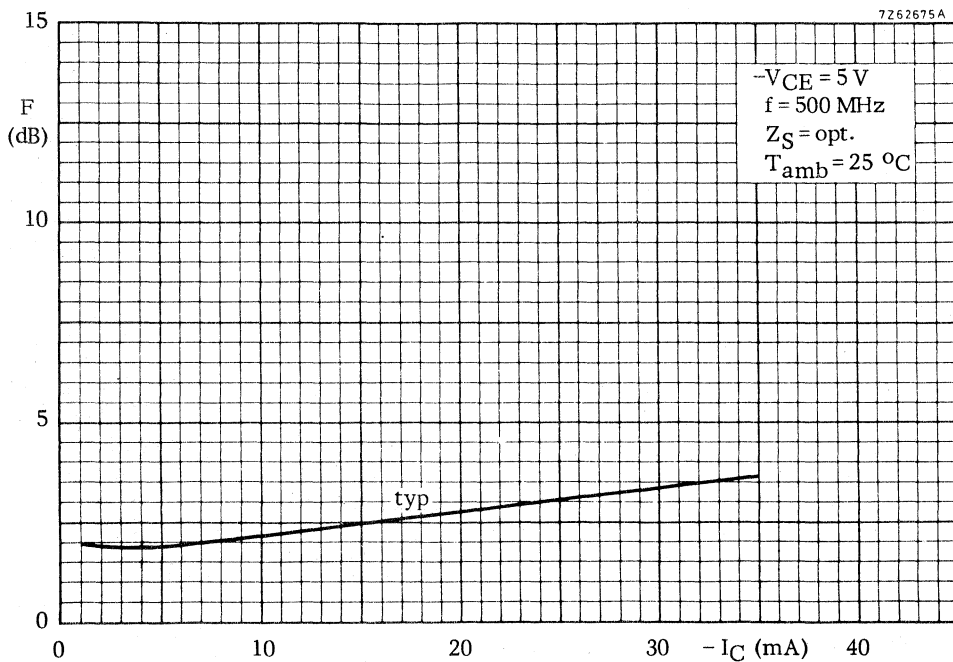


Fig. 8 $-V_{CE} = 5 \text{ V}$; $f = 500 \text{ MHz}$; $Z_S = \text{opt.}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$; typical values.

N-P-N H.F. WIDEBAND TRANSISTOR

N-P-N multi-emitter transistor in a TO-39 metal envelope, with the collector connected to the case. The transistor has extremely good intermodulation properties and a high power gain. It is a ruggedized version of the BFW16, which it succeeds. It is primarily intended for:

- Final and driver stages of channel and band aerial amplifiers with high output power for bands I, II, III and IV/V (40–860 MHz).
- Final stage of the wideband vertical amplifier in high speed oscilloscopes.

QUICK REFERENCE DATA

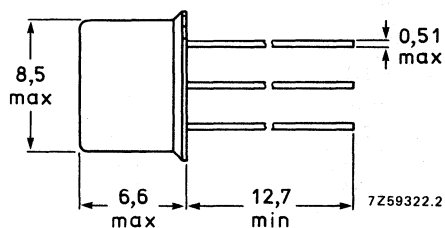
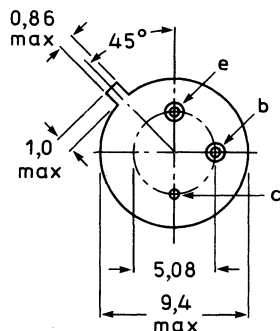
Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	40 V
Collector-emitter voltage (open base)	V_{CEO}	max.	25 V
Collector current (peak value; $f > 1$ MHz)	I_{CM}	max.	300 mA
Total power dissipation up to $T_{amb} = 125$ °C	P_{tot}	max.	1,5 W
Junction temperature	T_j	max.	200 °C
Feedback capacitance at $f = 1$ MHz $I_C = 10$ mA; $V_{CE} = 15$ V	C_{re}	typ.	1,7 pF
Transition frequency $I_C = 150$ mA; $V_{CE} = 15$ V; $f = 500$ MHz	f_T	typ.	1,2 GHz
Power gain (not neutralized); $I_C = 70$ mA; $V_{CE} = 18$ V $f = 200$ MHz $f = 800$ MHz	G_p	typ.	16 dB 6,5 dB
Output power $d_{im} = -30$ dB; VSWR at output < 2 ; $I_C = 70$ mA; $V_{CE} = 18$ V $f = 200$ MHz $f = 800$ MHz	P_o	typ.	150 mW 90 mW

MECHANICAL DATA

Dimensions in mm

Collector connected to case

Fig. 1 TO-39.



Maximum lead diameter is guaranteed only for 12,7 mm.

Accessories: 56245 (distance disc).

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	40 V
Collector-emitter voltage ($R_{BE} \leq 50 \Omega$) peak value	V_{CERM}	max.	40 V
Collector-emitter voltage (open base)	V_{CEO}	max.	25 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2 V
Collector current (d.c.)	I_C	max.	150 mA
Collector current (peak value; $f > 1$ MHz)	I_{CM}	max.	300 mA
Total power dissipation up to $T_{amb} = 125$ °C	P_{tot}	max.	1,5 W
Storage temperature	T_{stg}		-65 to + 200 °C
Junction temperature	T_j	max.	200 °C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th j-a}$	=	250 K/W
From junction to mounting base	$R_{th j-mb}$	=	50 K/W
From mounting base to heatsink mounted with top clamping washer of 56218 and a boron nitride washer for electrical insulation	$R_{th mb-h}$	=	1,2 K/W

CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Collector cut-off current

$I_E = 0; V_{CB} = 20\text{ V}; T_j = 150\text{ }^\circ\text{C}$

I_{CBO} max. 20 μA

Knee voltage

$I_C = 100\text{ mA}; I_B = \text{value for which}$

$I_C = 110\text{ mA at } V_{CE} = 1\text{ V}$

V_{CEK} max. 0,75 V

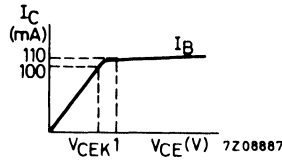


Fig. 2

D.C. current gain

$I_C = 50\text{ mA}; V_{CE} = 5\text{ V}$

$I_C = 150\text{ mA}; V_{CE} = 5\text{ V}$

h_{FE} min. 25

h_{FE} min. 25

Transition frequency

$I_C = 150\text{ mA}; V_{CE} = 15\text{ V}; f = 500\text{ MHz}$

f_T typ. 1,2 GHz

Collector capacitance at $f = 1\text{ MHz}$

$I_E = I_e = 0; V_{CB} = 15\text{ V}$

C_c max. 4 pF

Feedback capacitance at $f = 1\text{ MHz}$

$I_C = 10\text{ mA}; V_{CE} = 15\text{ V}; T_{amb} = 25\text{ }^\circ\text{C}$

C_{re} typ. 1,7 pF

Noise figure at $f = 200\text{ MHz}$

$I_C = 30\text{ mA}; V_{CE} = 15\text{ V}; Z_S = 75\text{ }\Omega; T_{amb} = 25\text{ }^\circ\text{C}$

F max. 6 dB

Power gain (not neutralized)

$I_C = 70\text{ mA}; V_{CE} = 18\text{ V}; T_{amb} = 25\text{ }^\circ\text{C}$

$f = 200\text{ MHz}$

$f = 800\text{ MHz}$

G_p typ. 16 dB

G_p typ. 6,5 dB

CHARACTERISTICS (continued)

Intermodulation characteristics

1. Output power at $f = 200 \text{ MHz}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$

$I_C = 70 \text{ mA}$; $V_{CE} = 18 \text{ V}$; V.S.W.R. at output < 2

$f_p = 202 \text{ MHz}$; $f_q = 205 \text{ MHz}$; $d_{\text{im}} = -30 \text{ dB}$

measured at $f(2q-p) = 208 \text{ MHz}$ (Channel 9)

P_o	min.	130 mW
	typ.	150 mW

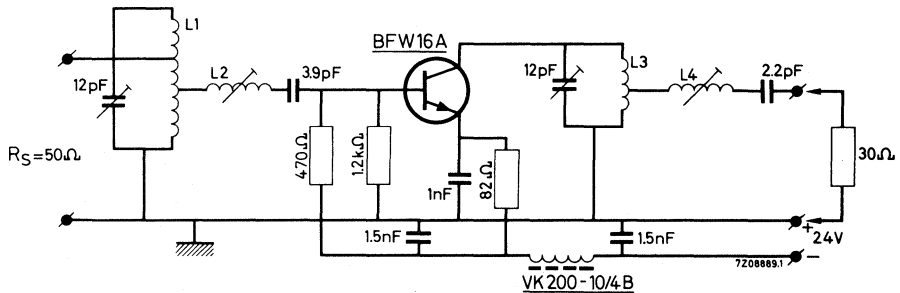


Fig. 3 Test circuit.

Coil data:

L1 = 3 turns silver plated Cu wire (1,4 mm); winding pitch 2,7 mm; int. diam. 8 mm;
taps at 0,5 turn and 1,5 turns from earth.

L2 = 5,5 turns silver plated Cu wire (1,4 mm); winding pitch 2,2 mm; int. diam. 8 mm.

L3 = 3 turns silver plated Cu wire (1,4 mm); winding pitch 3,3 mm; int. diam. 8 mm.

L4 = 5,5 turns silver plated Cu wire (1,4 mm); winding pitch 2,2 mm; int. diam. 11 mm.

CHARACTERISTICS (continued)

Basis of adjustment

The intermodulation at an intermodulation distortion of -30 dB is caused by h.f. output current – voltage clipping.

The maximum undistorted output power is realised, if

- a. Current and voltage clipping take place concurrently.
This occurs if

$$R_L = \frac{V_{CE} - V_{CEK}}{I_C},$$

in which V_{CEK} is the high frequency knee voltage.

- b. The h.f. collector current is as small as possible.

This is so if $-C_L = +C_{Oe}$,

in which C_{Oe} is the output capacitance of the transistor at short circuited input.

For maximum output power at an intermodulation distortion of -30 dB, the (experimentally found) value of R_L and C_L are:

$$R_L = 220 \Omega; C_L = -5,6 \text{ pF}.$$

C_{Oe} is found by 4 pF of the transistor and 1,6 pF by the mounting system concerning of a borium nitride washer between the envelope of the transistor and the chassis.

Adjustment procedure

1. Remove the transistor and connect a dummy consisting of a 220Ω resistor in parallel with a 5,6 pF capacitor between the collector and emitter connections of the output circuit.
2. Tune and match the output circuit for zero reflection at 205 MHz (V.S.W.R. = 1).
After this adjustment, no further change may be made in the output circuit.
3. Replace the dummy by the transistor. Tune and match the input circuit for maximum power gain and good band pass curve.
The V.S.W.R. of the output will then, in most cases, be ≤ 2 over the whole channel.
Corrections can be made by tuning L2; this will not disturb the band pass curve.

CHARACTERISTICS (continued)

Intermodulation characteristics

2. Output power at $f = 800 \text{ MHz}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$
 $I_C = 70 \text{ mA}$; $V_{CE} = 18 \text{ V}$; V.S.W.R. at output < 2
 $f_p = 798 \text{ MHz}$; $f_q = 802 \text{ MHz}$; $d_{\text{im}} = -30 \text{ dB}$
 measured at $f(2q-p) = 806 \text{ MHz}$ (Channel 62)

P_o	min.	70 mW
	typ.	90 mW

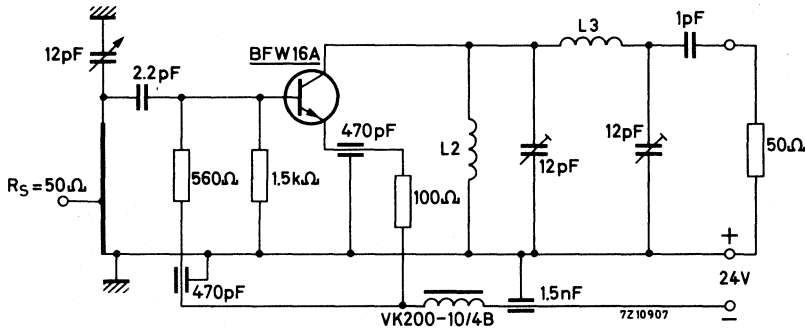


Fig. 4 Test circuit.

Coil data:

- L1 = 25 mm x 7 mm x 0,85 mm silver plated Cu strip
Tap of the input at 5 mm from earth.
- L2 = 13 turns enamelled Cu wire (0,6 mm); int. diam 8 mm.
- L3 = 1,5 turns Cu wire (1,3 mm); int. diam. 8 mm.

Basis of adjustment

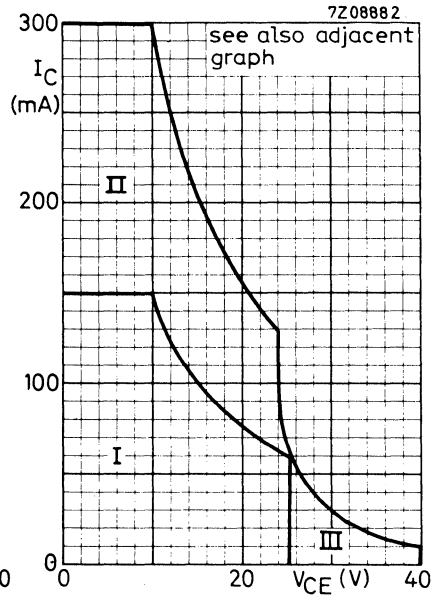
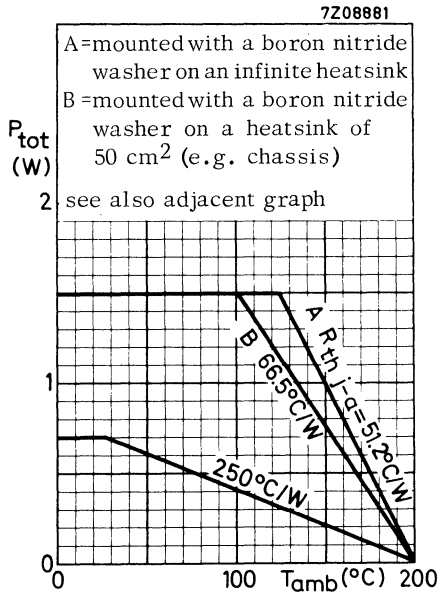
At 800 MHz no dummy can be used to adjust for optimum collector load because at these frequencies the impedance transformations of a dummy are too high. A small signal at the mid-channel frequency of 802 MHz is fed to the input and increased until clipping occurs; that is, until the output power no longer increases linearly with the input signal. This clipping can be eliminated by tuning the output circuit, thereby making the output power equal to

$$P_o = \frac{I_C(V_{CE} - V_{CEK})}{2} = 480 \text{ mW.}$$

The output circuit is adjusted for minimum intermodulation if the input signal is as small as possible at $P_o = 480 \text{ mW}$.

With this adjusting method care must be taken, that the transistor is not destructed by second breakdown (the voltage swing may not exceed the rated V_{CER} value). Therefore as soon as clipping occurs, the increase of the input signal should be stopped until the clipping has been eliminated. After this adjustment has been made no further change may be made in the output circuit.

Adjust the input circuit for maximum power gain and good band pass curve. The V.S.W.R. of the output is then ≤ 2 over the whole channel.



- I = Region of permissible operation under all base-emitter conditions and at all frequencies, including d.c.
- II = Additional region of operation at $f \geq 1$ MHz.
- III = Operating under pulsed conditions is allowed, provided the transistor is cut-off with $R_{BE} \leq 50 \Omega$ and $f \geq 1$ MHz.

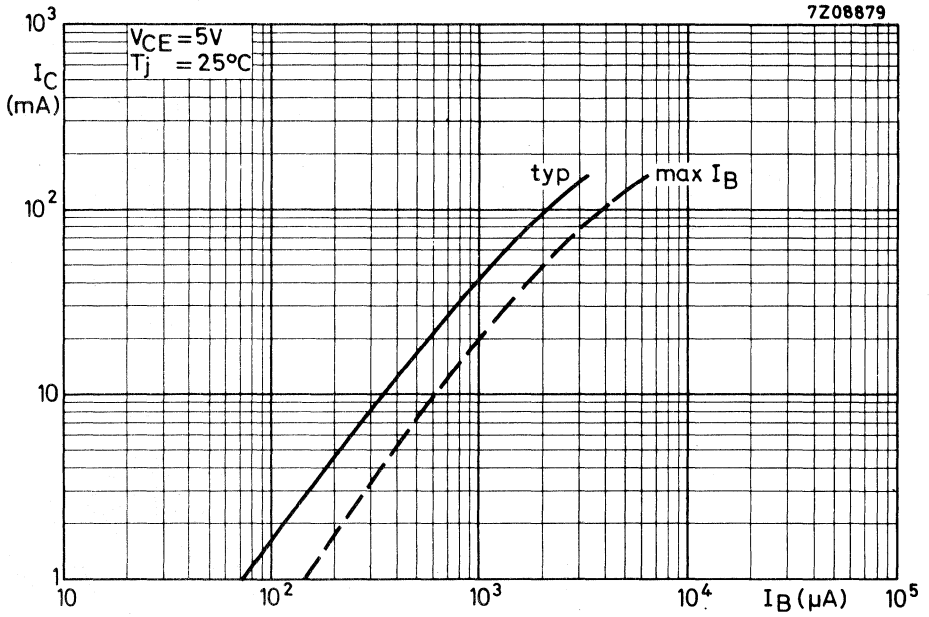


Fig. 7 $V_{CE} = 5V$; $T_j = 25^\circ C$

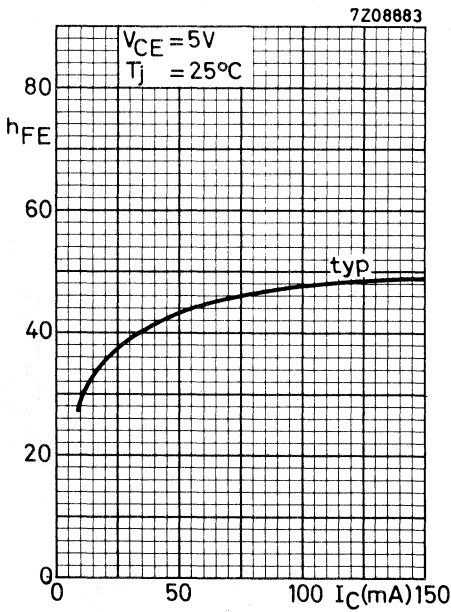


Fig. 8 $V_{CE} = 5V$; $T_j = 25^\circ C$;
typical values.

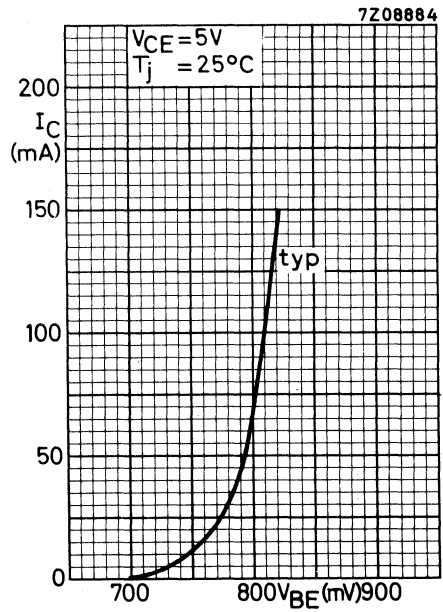


Fig. 9 $V_{CE} = 5V$; $T_j = 25^\circ C$;
typical values.

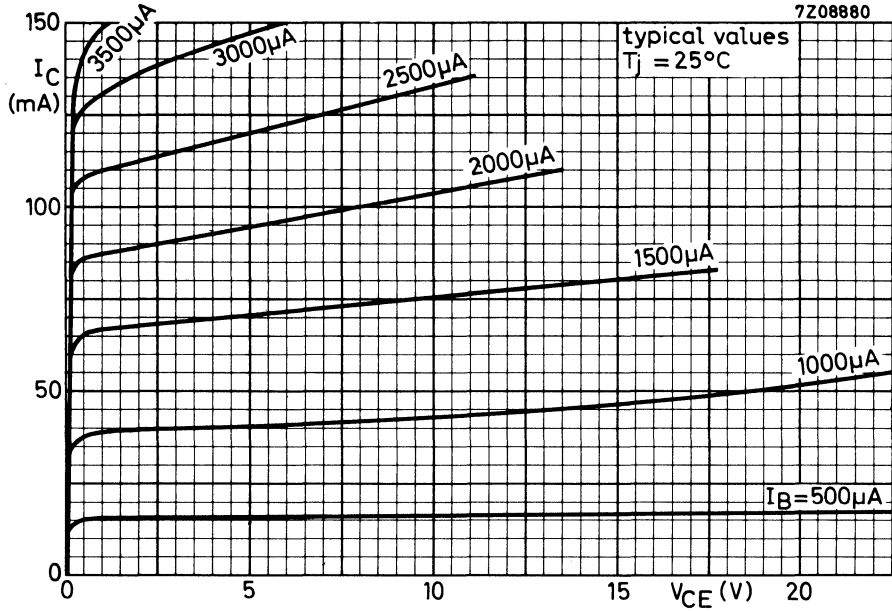


Fig. 10 $T_j = 25^\circ\text{C}$; typical values.

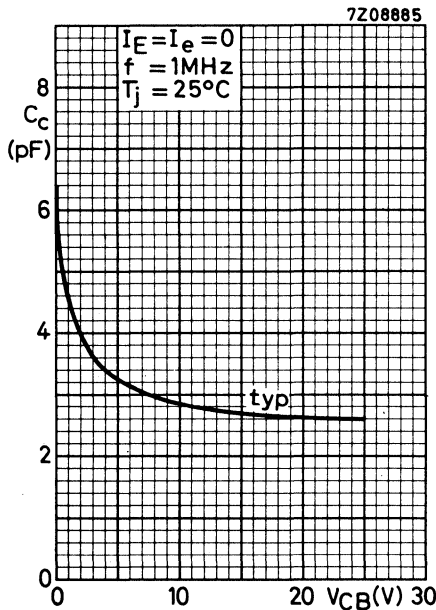


Fig. 11 $I_E = I_e = 0$; $f = 1\text{ MHz}$; $T_j = 25^\circ\text{C}$; typical values.

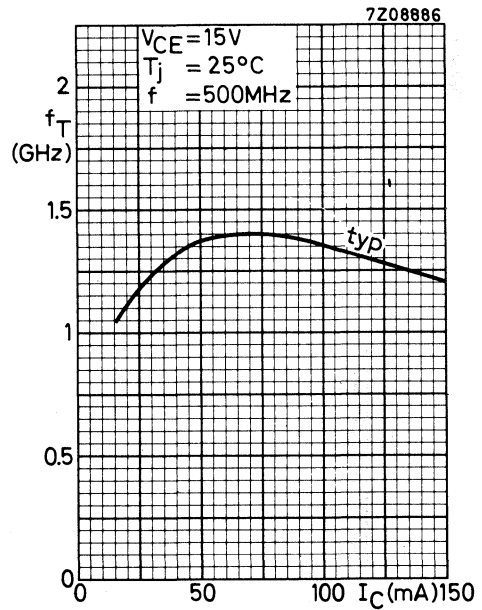


Fig. 12 $V_{CE} = 15\text{ V}$; $f = 500\text{ MHz}$; $T_j = 25^\circ\text{C}$; typical values.

APPLICATION INFORMATION

Performance of channel- and band amplifiers*

Frequency range	channel 4 61-68	channel 9 202-209	channel 55 742-750	band I 47-68	band II 87,5-108	band III 174-230	MHz
Transistor used in final stage	BFW16A	BFW16A	BFW16A	BFW16A	BFW16A	BFW16A	
driver stage		BFW16A	BFW16A			BFW16A	
second stage			BFW16A			BFW16A	
first stage	BFY90	BFY90	BFY90	BFY90	BFY90	BFY90	
Output power at $d_{im} = -30$ dB	150**	150**	100		30		mW
$d_{im} = -50$ dB				10		10	mW
$d_{im} = -60$ dB							mW
Power gain	50	44	26,5	51	43	39	dB
Noise figure	7	6	8	6,0-6,5	6,5	6,5	dB
V.S.W.R. over the whole channel or band							
for the input	< 2	< 2	< 2	< 2	< 2	< 2	
for the output	< 2	< 2	< 2	< 2	< 2	< 2	
Load impedance	30	30	50	30	30	30	Ω
Source impedance	60	60	50	60	60	60	Ω

* Application information bulletins of all these amplifiers and a study of intermodulation are available on request.

** $V_O = 2,2$ V over $R_L = 30 \Omega$ or
 $V_O = 3$ V over $R_L = 60 \Omega$.

N-P-N H.F. WIDEBAND TRANSISTOR

N-P-N multi-emitter transistor in a TO-39 metal envelope, with the collector connected to the case. The transistor has extremely good intermodulation properties and a high power gain. It is a ruggedized version of the BFW17, which it succeeds. It is primarily intended for final and driver stages of channel and band aerial amplifiers with high output power for bands I, II and III (40–230 MHz).

QUICK REFERENCE DATA

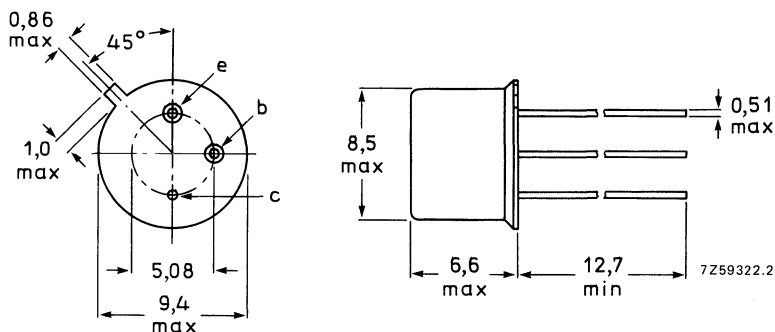
Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	40 V
Collector-emitter voltage (open base)	V_{CEO}	max.	25 V
Collector current (peak value; $f > 1$ MHz)	I_{CM}	max.	300 mA
Total power dissipation up to $T_{mb} = 125$ °C	P_{tot}	max.	1,5 W
Junction temperature	T_j	max.	200 °C
Feedback capacitance at $f = 1$ MHz $I_C = 10$ mA; $V_{CE} = 15$ V	C_{re}	typ.	1,7 pF
Transition frequency $I_C = 150$ mA; $V_{CE} = 15$ V; $f = 500$ MHz	f_T	typ.	1,1 GHz
Power gain (not neutralized) $I_C = 70$ mA; $V_{CE} = 18$ V; $f = 200$ MHz	G_p	typ.	16 dB
Output power $d_{im} = -30$ dB; VSWR at output < 2 ; $I_C = 70$ mA; $V_{CE} = 18$ V	P_o	typ.	150 mW

MECHANICAL DATA

Dimensions in mm

Collector connected to case

Fig. 1 TO-39.



Maximum lead diameter is guaranteed only for 12,7 mm.

Accessories: 56245 (distance disc).

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

→ Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	40 V
→ Collector-emitter voltage ($R_{BE} \leq 50 \Omega$) peak value	V_{CERM}	max.	40 V
→ Collector-emitter voltage (open base)	V_{CEO}	max.	25 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2 V
Collector current (d.c.)	I_C	max.	150 mA
Collector current (peak value; $f > 1$ MHz)	I_{CM}	max.	300 mA
Total power dissipation up to $T_{mb} = 125 \text{ }^\circ\text{C}$	P_{tot}	max.	1,5 W
Storage temperature	T_{stg}		-65 to +200 $^\circ\text{C}$
Junction temperature	T_j	max.	200 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j-a}$	=	250 K/W
From junction to mounting base	$R_{th\ j-mb}$	=	50 K/W
From mounting base to heatsink mounted with top clamping washer of 56218 and a boron nitride washer for electrical insulation	$R_{th\ mb-h}$	=	1,2 K/W

CHARACTERISTICS

$T_j = 25 \text{ }^\circ\text{C}$ unless otherwise specified

Collector cut-off current

$I_E = 0; V_{CB} = 20 \text{ V}; T_j = 150 \text{ }^\circ\text{C}$	I_{CBO}	max.	20 μA
--	-----------	------	------------------

Knee voltage

$I_C = 100 \text{ mA}; I_B = \text{value for which}$	V_{CEK}	max.	0,75 V
$I_C = 110 \text{ mA at } V_{CE} = 1 \text{ V}$			

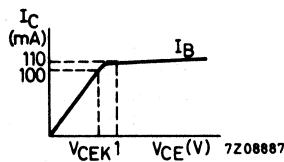


Fig. 2.

D.C. current gain

$I_C = 50 \text{ mA}; V_{CE} = 5 \text{ V}$

 h_{FE} min. 25

$I_C = 150 \text{ mA}; V_{CE} = 5 \text{ V}$

 h_{FE} min. 25

Transition frequency

$I_C = 150 \text{ mA}; V_{CE} = 15 \text{ V}; f = 500 \text{ MHz}$

 f_T typ. 1,1 GHzCollector capacitance at $f = 1 \text{ MHz}$

$I_E = I_e = 0; V_{CB} = 15 \text{ V}$

 C_C max. 4,0 pFFeedback capacitance at $f = 1 \text{ MHz}$

$I_C = 10 \text{ mA}; V_{CE} = 15 \text{ V}; T_{amb} = 25 \text{ }^\circ\text{C}$

 C_{re} typ. 1,7 pF

Power gain (not neutralized)

$I_C = 70 \text{ mA}; V_{CE} = 18 \text{ V}$

$f = 200 \text{ MHz}; T_{amb} = 25 \text{ }^\circ\text{C}$

 G_p typ. 16 dB

Intermodulation characteristics

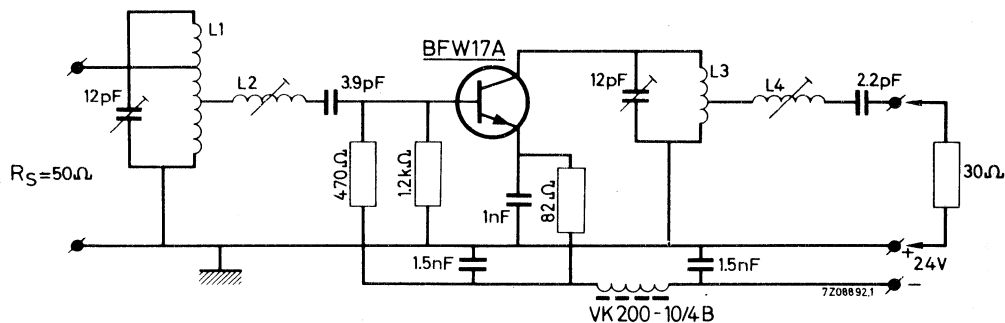
Output power at $f = 200 \text{ MHz}; T_{amb} = 25 \text{ }^\circ\text{C}$ $I_C = 70 \text{ mA}; V_{CE} = 18 \text{ V}; \text{V.S.W.R. at output} < 2$ $f_p = 202 \text{ MHz}; f_q = 205 \text{ MHz}; d_{im} = -30 \text{ dB}$ measured at $f(2q-p) = 208 \text{ MHz}$ (Channel 9) P_o typ. 150 mW

Fig. 3 Test circuit.

Coil data:

- L1 = 3 turns silver plated Cu wire (1,4 mm); winding pitch 2,7 mm;
int. diam. 8 mm; taps at 0,5 turn and 1,5 turns from earth.
- L2 = 5,5 turns silver plated Cu wire (1,4 mm); winding pitch 2,2 mm;
int. diam. 8 mm.
- L3 = 3 turns silver plated Cu wire (1,4 mm); winding pitch 3,3 mm;
int. diam. 8 mm.
- L4 = 5,5 turns silver plated Cu wire (1,4 mm); winding pitch 2,2 mm;
int. diam. 11 mm.

CHARACTERISTICS (continued)

Basis of adjustment

The intermodulation at an intermodulation distortion of -30 dB is caused by h.f. output current - voltage clipping.

The maximum undistorted output power is realised, if

- a. Current and voltage clipping take place concurrently.

This occurs if

$$R_L = \frac{V_{CE} - V_{CEK}}{I_C}$$

in which V_{CEK} is the high frequency knee voltage.

- b. The h.f. collector current is as small as possible.

This is so if $-C_L = +C_{Oe}$,

in which C_{Oe} is the output capacitance of the transistor at short circuited input.

For maximum output power at an intermodulation distortion of -30 dB, the (experimentally found) values of R_L and C_L are:

$$R_L = 220 \Omega; C_L = -5,6 \text{ pF.}$$

C_{Oe} is found by 4 pF of the transistor and 1,6 pF by the mounting system concerning of a borium nitride washer between the envelope of the transistor and the chassis.

Adjustment procedure

1. Remove the transistor and connect a dummy consisting of a 220Ω resistor in parallel with a 5,6 pF capacitor between the collector and emitter connections of the output circuit.
2. Tune and match the output circuit for zero reflection at 205 MHz (V.S.W.R. = 1). After this adjustment, no further change may be made in the output circuit.
3. Replace the dummy by the transistor. Tune and match the input circuit for maximum power gain and good band pass curve.
The V.S.W.R. of the output will then, in most cases, be ≤ 2 over the whole channel.
Corrections can be made by tuning L2; this will not disturb the band pass curve.

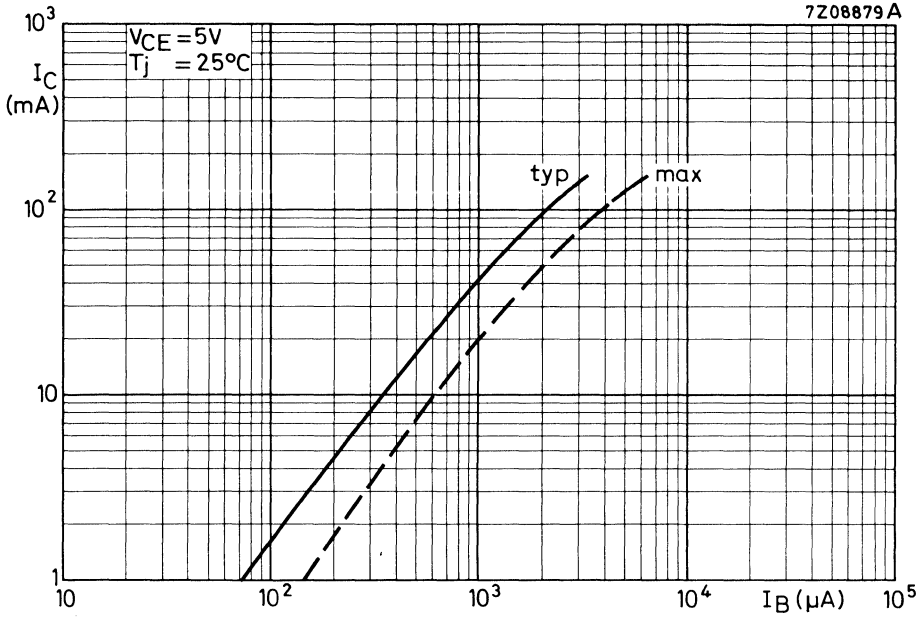


Fig. 4 $V_{CE} = 5 V$; $T_j = 25^\circ C$.

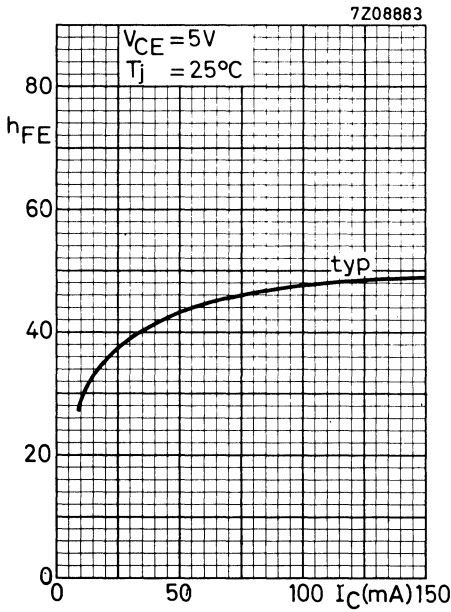


Fig. 5 $V_{CE} = 5 V$; $T_j = 25^\circ C$;
typical values.

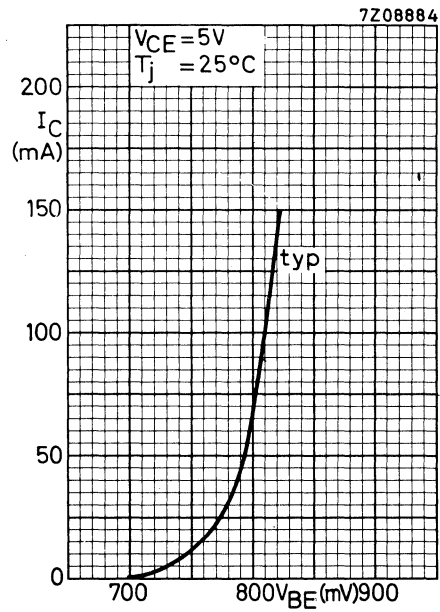


Fig. 6 $V_{CE} = 5 V$; $T_j = 25^\circ C$;
typical values.

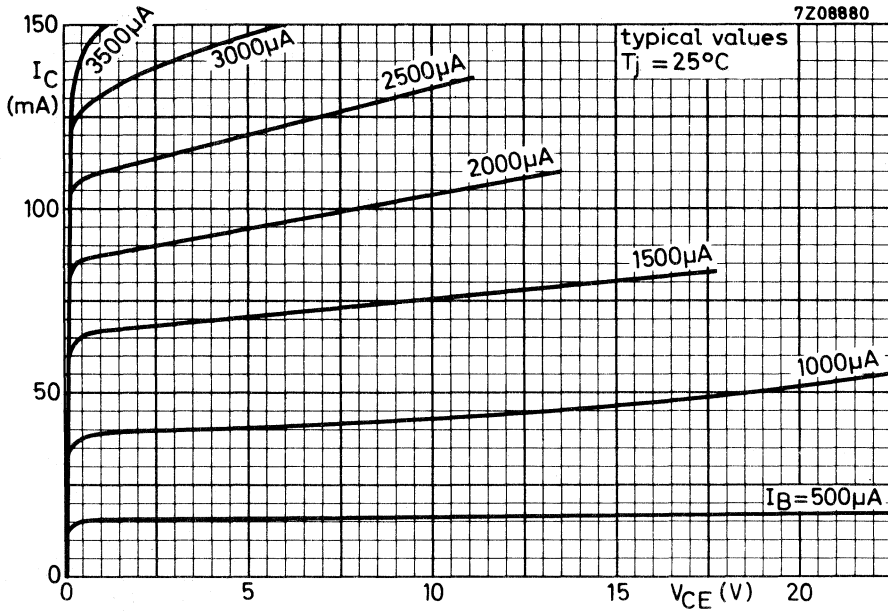


Fig. 7 $T_j = 25^\circ\text{C}$; typical values.

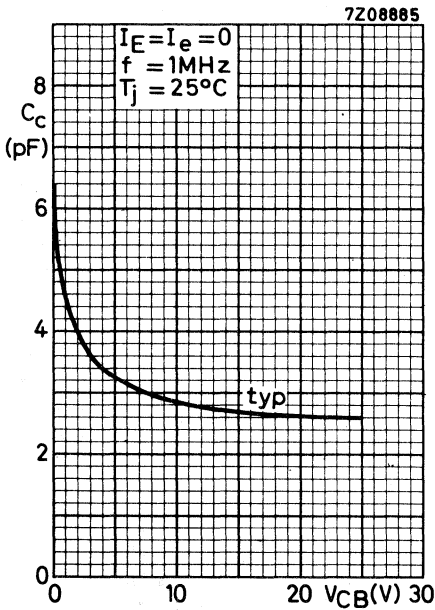


Fig. 8 $I_E = I_e = 0$; $f = 1\text{MHz}$;
 $T_j = 25^\circ\text{C}$; typical values.

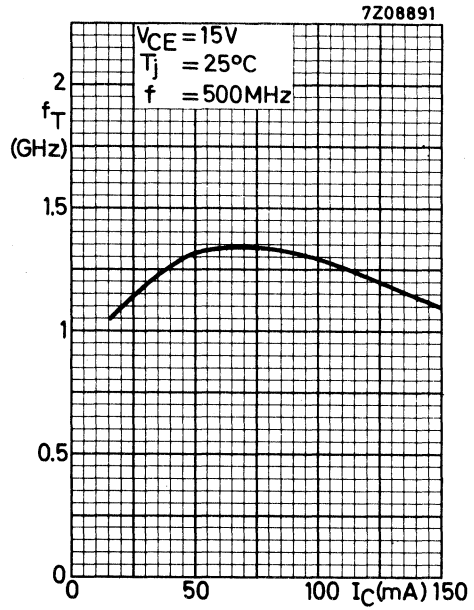
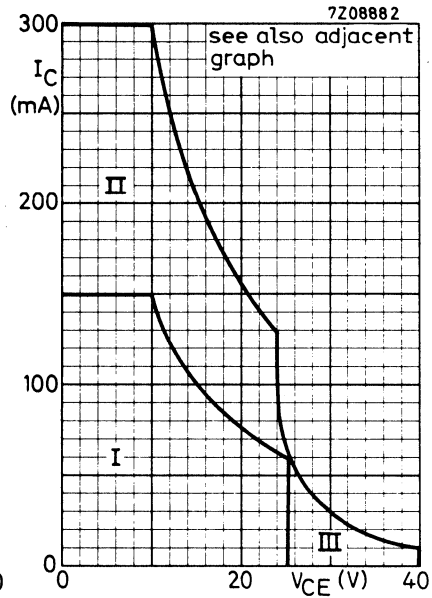
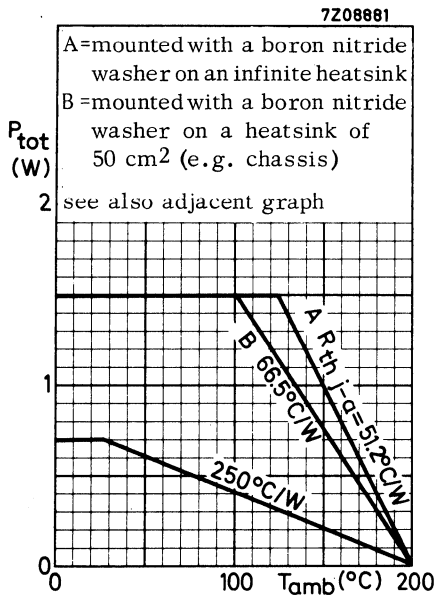


Fig. 9 $V_{CE} = 15\text{V}$; $f = 500\text{MHz}$;
 $T_j = 25^\circ\text{C}$; typical values.



- I = Region of permissible operation under all base-emitter conditions and at all frequencies, including d.c.
- II = Additional region of operation at $f \geq 1$ MHz
- III = Operating under pulsed conditions is allowed, provided the transistor is cut-off with $R_{BE} \leq 50 \Omega$ and $f \geq 1$ MHz.

N-P-N H.F. WIDEBAND TRANSISTOR

N-P-N multi-emitter transistor in a TO-72 metal envelope, with insulated electrodes and a shield lead connected to the case. The transistor has very low intermodulation distortion and very high power gain. It is primarily intended for:

- Wideband vertical amplifiers in high speed oscilloscopes.
- Wideband aerial amplifiers (40–860 MHz).
- Television distribution amplifiers.

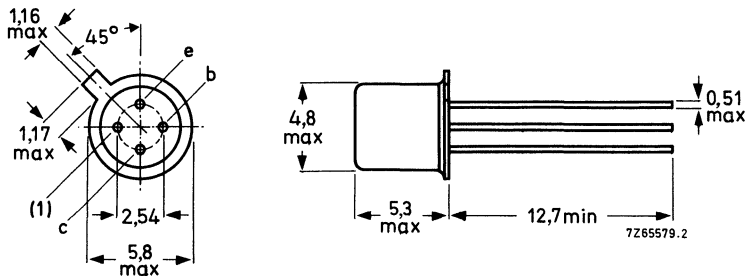
QUICK REFERENCE DATA

Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	20 V
Collector-emitter voltage (open base)	V_{CEO}	max.	10 V
Collector current (peak value; $f > 1$ MHz)	I_{CM}	max.	100 mA
Total power dissipation up to $T_{amb} = 25$ °C	P_{tot}	max.	250 mW
Junction temperature	T_j	max.	200 °C
Feedback capacitance at $f = 1$ MHz $I_C = 2$ mA; $V_{CE} = 5$ V	C_{re}	typ.	0,8 pF
Transition frequency $I_C = 50$ mA; $V_{CE} = 5$ V; $f = 500$ MHz	f_T	typ.	1,6 GHz
Power gain (not neutralized) $I_C = 30$ mA; $V_{CE} = 5$ V; $f = 200$ MHz $f = 800$ MHz	G_p	typ.	2,1 dB 7,5 dB
Intermodulation distortion $I_C = 30$ mA; $V_{CE} = 6$ V; $R_L = 37,5$ Ω; $V_o = 100$ mV at $f_p = 183$ MHz; $V_o = 100$ mV at $f_q = 200$ MHz; measured at $f(2q-p) = 217$ MHz	d_{im}	typ.	–60 dB

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-72.



(1) = shield lead (connected to case).

Accessories: 56246 (distance disc).

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

→ Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	20 V
Collector-emitter voltage (open base)	V_{CEO}	max.	10 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2,5 V
Collector current (d.c.)	I_C	max.	50 mA
Collector current (peak value; $f > 1$ MHz)	I_{CM}	max.	100 mA
Total power dissipation up to $T_{amb} = 25$ °C	P_{tot}	max.	250 mW
Storage temperature	T_{stg}		-65 to +200 °C
Junction temperature	T_j	max.	200 °C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j-a}$	=	700 K/W
From junction to case	$R_{th\ j-c}$	=	500 K/W

CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Collector cut-off current

$I_E = 0; V_{CB} = 10\text{ V}$

I_{CBO} max. 50 nA

D.C. current gain

$I_C = 25\text{ mA}; V_{CE} = 5\text{ V}$

h_{FE} min. 25

$I_C = 50\text{ mA}; V_{CE} = 5\text{ V}$

h_{FE} min. 25

Transition frequency*

$I_C = 50\text{ mA}; V_{CE} = 5\text{ V}; f = 500\text{ MHz}$

f_T typ. 1,6 GHz

Collector capacitance at $f = 1\text{ MHz}^{**}$

$I_E = I_e = 0; V_{CB} = 5\text{ V}$

C_c max. 1,5 pF

Feedback capacitance at $f = 1\text{ MHz}^*$

$I_C = 2\text{ mA}; V_{CE} = 5\text{ V}$

$-C_{re}$ typ. 0,8 pF

Noise figure*

$I_C = 2\text{ mA}; V_{CE} = 5\text{ V}$

$f = 500\text{ MHz}; Z_s = 50\text{ }\Omega$

F max. 5,0 dB ←

Power gain (not neutralized)*

$I_C = 30\text{ mA}; V_{CE} = 5\text{ V}; T_{amb} = 25\text{ }^\circ\text{C}$

	$f = 200$	800 MHz
G_p	> 19	dB
	typ. 21	7,5 dB

Intermodulation distortion*

$I_C = 30\text{ mA}; V_{CE} = 6\text{ V}; R_L = 37,5\text{ }\Omega; T_{amb} = 25\text{ }^\circ\text{C}$

$V_o = 100\text{ mV}$ at $f_p = 183\text{ MHz}$

$V_o = 100\text{ mV}$ at $f_q = 200\text{ MHz}$

measured at $f(2q-p) = 217\text{ MHz}$

dim typ. -60 dB

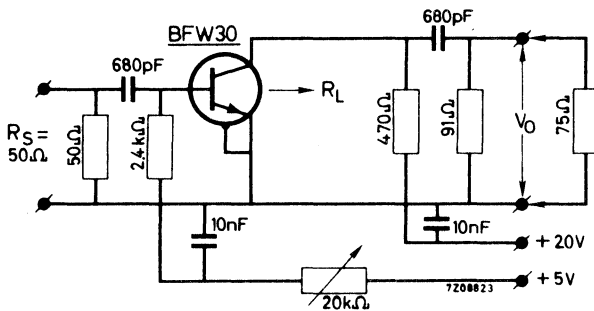


Fig. 2 Test circuit.

* Shield lead grounded.

** Shield lead not connected.

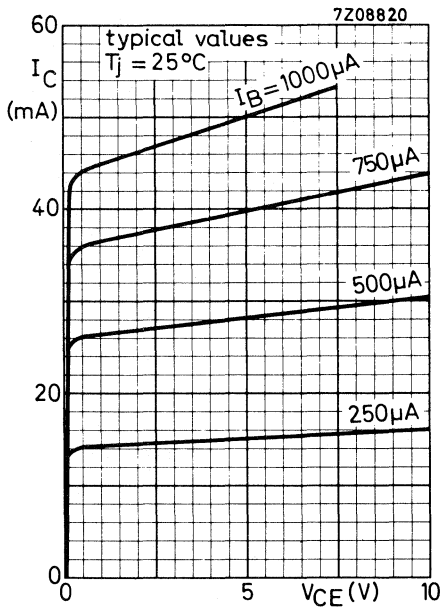


Fig. 3 $T_j = 25^\circ\text{C}$; typical values.

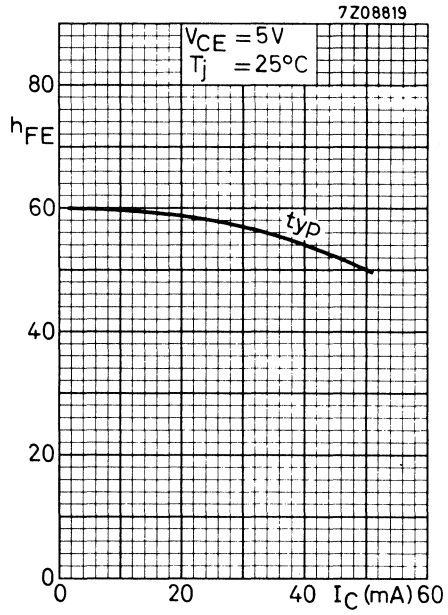


Fig. 4 $V_{CE} = 5\text{V}$; $T_j = 25^\circ\text{C}$; typical values.

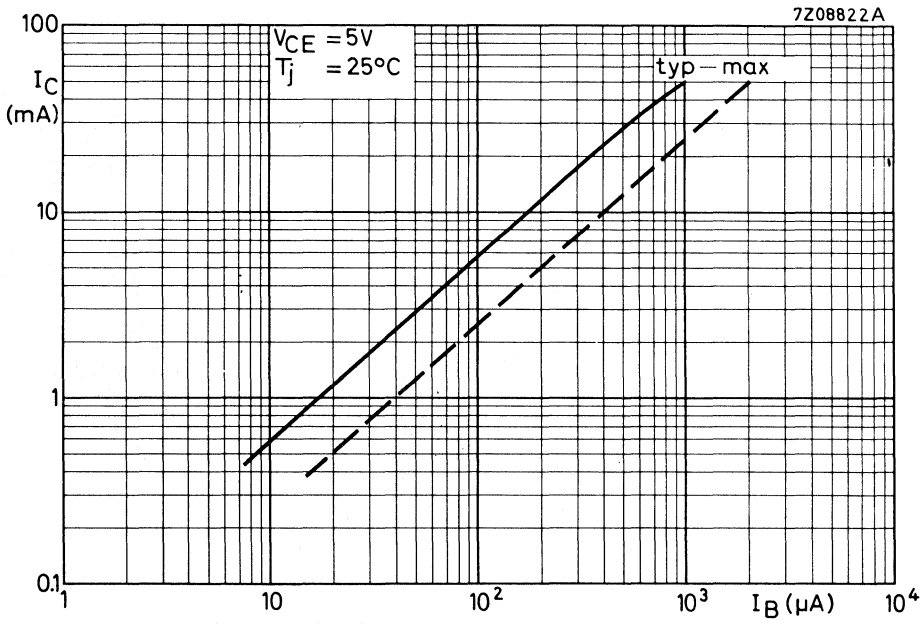


Fig. 5 $V_{CE} = 5\text{V}$; $T_j = 25^\circ\text{C}$.

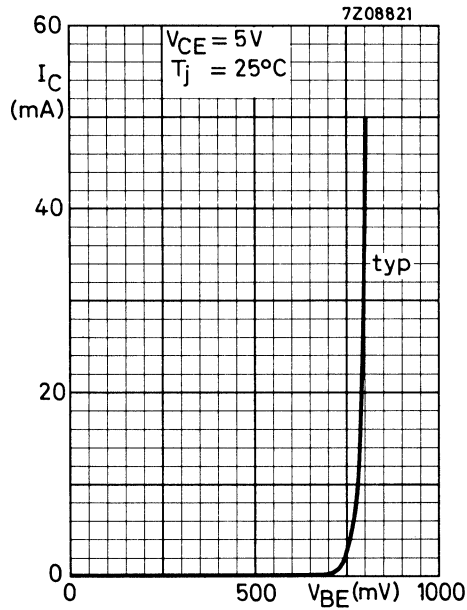


Fig. 6 $V_{CE} = 5V$; $T_j = 25^\circ C$; typical values.

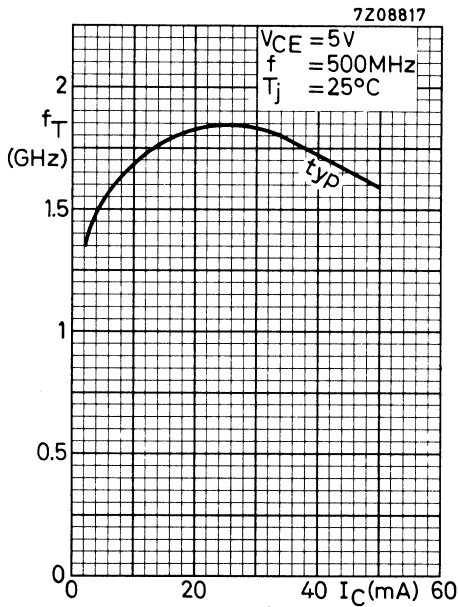


Fig. 7 $V_{CE} = 5V$; $f = 500MHz$; $T_j = 25^\circ C$; typical values.

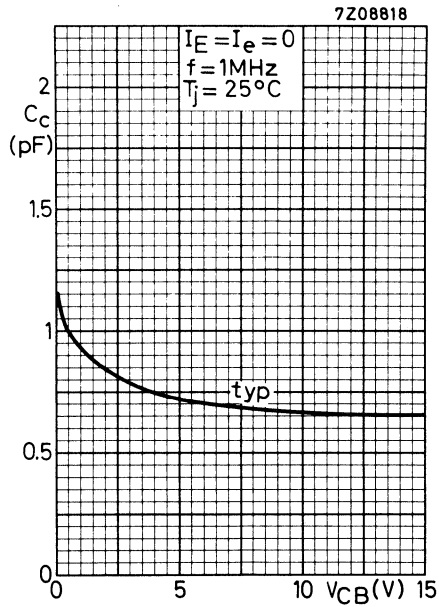


Fig. 8 $I_E = I_e = 0$; $f = 1MHz$; $T_j = 25^\circ C$; typical values.

N-P-N H.F. WIDEBAND TRANSISTOR



N-P-N transistor in a plastic SOT-37 envelope. It has a low noise over a wide current range, a very high power gain and good intermodulation properties.

It is primarily intended for:

- Wideband aerial amplifiers (40 - 860 MHz)
- Channel and band aerial amplifiers for band I, II, III and IV/V (40 - 860 MHz)
- Television distribution amplifiers
- Low noise wideband vertical amplifier in high speed oscilloscopes

QUICK REFERENCE DATA

Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	25	V
Collector-emitter voltage (open base)	V_{CEO}	max.	15	V
Collector current (peak value; $f > 1$ MHz)	I_{CM}	max.	50	mA
Total power dissipation up to $T_{amb} = 70$ °C	P_{tot}	max.	200	mW
Junction temperature	T_j	max.	150	°C
Transition frequency at $f = 500$ MHz $I_C = 25$ mA; $V_{CE} = 5$ V	f_T	typ.	1,6	GHz
Feedback capacitance at $f = 1$ MHz $I_C = 2$ mA; $V_{CE} = 5$ V	C_{re}	typ.	0,6	pF
Noise figure at $f = 500$ MHz $I_C = 2$ mA; $V_{CE} = 5$ V	F	typ.	4	dB
Power gain (not neutralized) $I_C = 10$ mA; $V_{CE} = 10$ V	G_p	typ.	23	800 MHz
Output power at $d_{im} = -30$ dB VSWR at output < 2 ; $I_C = 10$ mA; $V_{CE} = 10$ V	P_o	typ.	8	8 mW



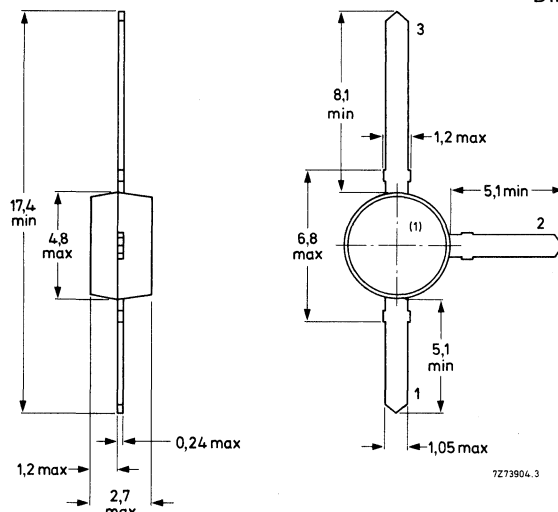
MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-37.

Connections

1. Base
2. Emitter
3. Collector



7273904, 3

(1) = type number marking.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

→ Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	25 V
→ Collector-emitter voltage (open base)	V_{CEO}	max.	15 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2,5 V
Collector current (d.c.)	I_C	max.	25 mA
Collector current (peak value; $f > 1$ MHz)	I_{CM}	max.	50 mA
→ Total power dissipation up to $T_{amb} = 70$ °C	P_{tot}	max.	200 mW
Storage temperature	T_{stg}		-65 to +150 °C
Junction temperature	T_j	max.	150 °C

THERMAL RESISTANCE

From junction to ambient in free air
 mounted on a glass-fibre print
 of 40 mm x 25 mm x 1 mm (Fig. 2)

$R_{th\ j-a} = 400$ K/W

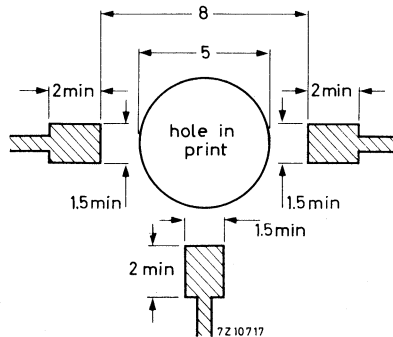


Fig. 2 Requirements for fibre-glass print (dimensions in mm).

CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Collector cut-off current

$I_E = 0; V_{CB} = 10\text{ V}$

I_{CBO} max. 50 nA

Knee voltage

$I_C = 20\text{ mA}; I_B = \text{value for which}$

$I_C = 22\text{ mA at } V_{CE} = 1\text{ V}$

V_{CEK} max. 0,75 V

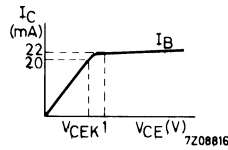


Fig. 3.

D.C. current gain

$I_C = 2\text{ mA}; V_{CE} = 1\text{ V}$

h_{FE} min. 20
max. 150

$I_C = 25\text{ mA}; V_{CE} = 1\text{ V}$

h_{FE} min. 20

Transition frequency at $f = 500\text{ MHz}$

$I_C = 2\text{ mA}; V_{CE} = 5\text{ V}$

f_T typ. 1,0 GHz

$I_C = 25\text{ mA}; V_{CE} = 5\text{ V}$

f_T typ. 1,6 GHz

Collector capacitance at $f = 1\text{ MHz}$

$I_E = I_e = 0; V_{CB} = 10\text{ V}$

C_c typ. 0,7 pF

Emitter capacitance at $f = 1\text{ MHz}$

$I_C = I_c = 0; V_{EB} = 0,5\text{ V}$

C_e typ. 1,5 pF

Feedback capacitance at $f = 1\text{ MHz}$

$I_C = 2\text{ mA}; V_{CE} = 5\text{ V}; T_{amb} = 25\text{ }^\circ\text{C}$

C_{re} typ. 0,6 pF

Noise figure at $f = 500\text{ MHz}$

$I_C = 2\text{ mA}; V_{CE} = 5\text{ V}; R_S = 50\text{ }\Omega; T_{amb} = 25\text{ }^\circ\text{C}$

F typ. 4,0 dB

Power gain (not neutralized)

$I_C = 10\text{ mA}; V_{CE} = 10\text{ V}; T_{amb} = 25\text{ }^\circ\text{C};$

$f = 200\text{ MHz}$

G_p typ. 23 dB

$f = 800\text{ MHz}$

typ. 11 dB

CHARACTERISTICS (continued)

Intermodulation characteristics

1. Output power at $f = 200$ MHz; $T_{amb} = 25$ °C
 $I_C = 10$ mA; $V_{CE} = 10$ V; VSWR at output < 2
 $f_p = 202$ MHz; $f_q = 205$ MHz; $d_{im} = -30$ dB
 measured at $f(2q-p) = 208$ MHz (Channel 9)

P_o typ. 8 mW

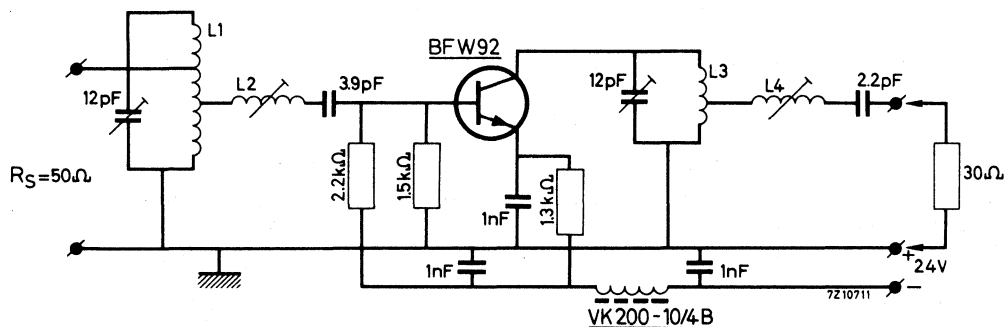


Fig. 4 Test circuit.

Coil data:

- L1 = 3 turns silver plated Cu wire (1,4 mm); winding pitch 2,7 mm;
 int. diam. 8 mm; taps at 0,5 turn and 1,5 turns from earth.
 L2 = 5,5 turns silver plated Cu wire (1,4 mm); winding pitch 2,2 mm;
 int. diam. 8 mm.
 L3 = 3 turns silver plated Cu wire (1,4 mm); winding pitch 3,3 mm;
 int. diam. 8 mm.
 L4 = 5,5 turns silver plated Cu wire (1,4 mm); winding pitch 2,2 mm;
 int. diam. 11 mm.

Basis of adjustment

The intermodulation at an intermodulation distortion of -30 dB is caused by h.f. output current - voltage clipping.

The maximum undistorted output power is realised, if

- a. Current and voltage clipping take place concurrently.

This occurs if

$$R_L = \frac{V_{CE} - V_{CEK}}{I_C},$$

in which V_{CEK} is the high frequency knee voltage.

- b. The h.f. collector current is as small as possible.

This is so if $-C_L = +C_{Oe}$,

in which C_{Oe} is the output capacitance of the transistor at short circuited input.

For maximum output power at an intermodulation distortion of -30 dB, the (experimentally found) values of R_L and C_L are:

$R_L = 820 \Omega$; $C_L = -1,0$ pF.

Adjustment procedure

1. Remove the transistor and connect a dummy consisting of a 820Ω resistor in parallel with a $1,0$ pF capacitor between the collector and emitter connections of the output circuit.
2. Tune and match the output circuit for zero reflection at 205 MHz ($V_{SWR} = 1$). After this adjustment, no further change may be made in the output circuit.
3. Replace the dummy by the transistor. Tune and match the input circuit for maximum power gain and good band pass curve.

The V_{SWR} of the output will then, in most cases, be ≤ 2 over the whole channel.

Corrections can be made by tuning L_2 ; this will not disturb the band pass curve.

CHARACTERISTICS (continued)

Intermodulation characteristics

2. Output power at $f = 800 \text{ MHz}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$
 $I_C = 10 \text{ mA}$; $V_{CE} = 10 \text{ V}$; VSWR at output < 2
 $f_p = 798 \text{ MHz}$; $f_q = 802 \text{ MHz}$; $d_{\text{im}} = -30 \text{ dB}$
 measured at $f(2q-p) = 806 \text{ MHz}$ (Channel 62)

P_O typ. 8 mW

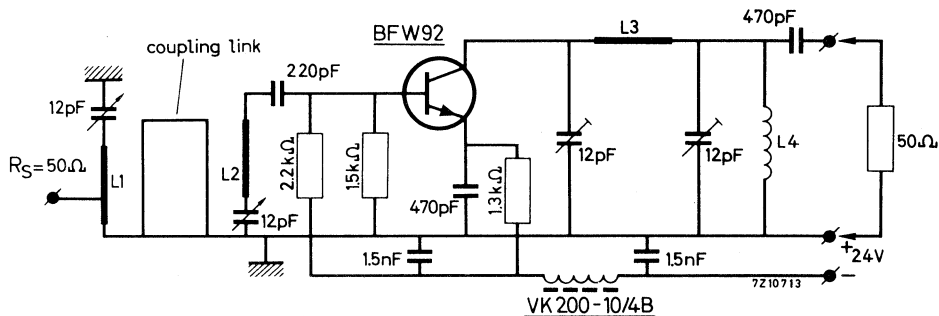


Fig. 5 Test circuit.

Coil data:

- L1 = 24 mm x 6 mm x 0,5 mm silver plated Cu strip.
Tap of the input at 5 mm from earth.
- L2 = 15 mm x 6 mm x 0,5 mm silver plated Cu strip.
- L3 = 20 mm x 8 mm x 0,5 mm silver plated Cu strip.
- L4 = 4 turns enamelled Cu wire (0,5 mm); winding pitch 1,5 mm; int. diam. 4 mm
- Coupling link: 42 mm silver plated Cu wire (1 mm).

Basis of adjustment

At 800 MHz no dummy can be used to adjust for optimum collector load because at these frequencies the impedance transformations of a dummy are too high. A small signal at the mid-channel frequency of 802 MHz is fed to the input and increased until clipping occurs; that is, until the output power no longer increases linearly with the input signal. This clipping can be eliminated by tuning the output circuit, thereby making the output power equal to

$$P_O = \frac{I_C (V_{CE} - V_{CEK})}{2} = 40 \text{ mW}$$

The output circuit is adjusted for minimum intermodulation if the input signal is as small as possible at $P_O = 40 \text{ mW}$.

After this adjustment has been made no further change may be made in the output circuit.

Adjust the input circuit for maximum power gain and good band pass curve.

The VSWR of the output is then ≤ 2 over the whole channel.

Intermodulation characteristics

3. Intermodulation distortion

$I_C = 10 \text{ mA}$; $V_{CE} = 6 \text{ V}$; $R_L = 37,5 \Omega$; $T_{amb} = 25 \text{ }^\circ\text{C}$

$V_O = 100 \text{ mV}$ at $f_p = 183 \text{ MHz}$

$V_O = 100 \text{ mV}$ at $f_q = 200 \text{ MHz}$

measured at $f(2q-p) = 217 \text{ MHz}$

d_{im} typ. -45 dB

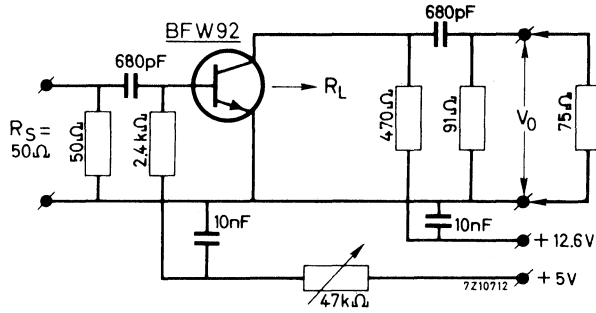


Fig. 6 Test circuit.

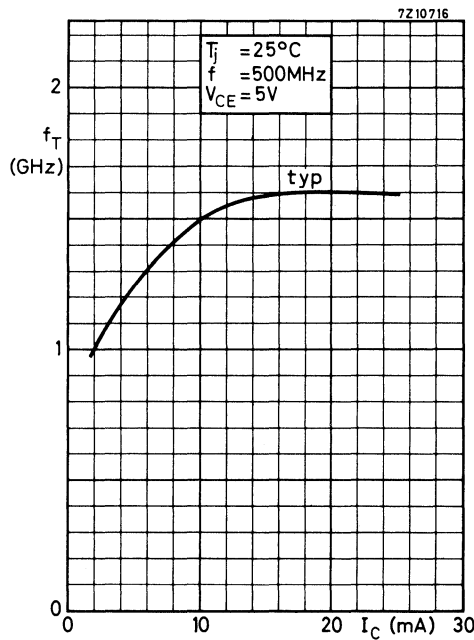


Fig. 7 $V_{CE} = 5 \text{ V}$; $f = 500 \text{ MHz}$; $T_j = 25 \text{ }^\circ\text{C}$; typical values.

N-P-N 1 GHz WIDEBAND TRANSISTOR

N-P-N transistor in a plastic SOT-37 envelope primarily intended for use in amplifiers in the 40-860 MHz range. The BFW92A is the successor to the BFW92 and offers higher power gain and improved noise behaviour.

QUICK REFERENCE DATA

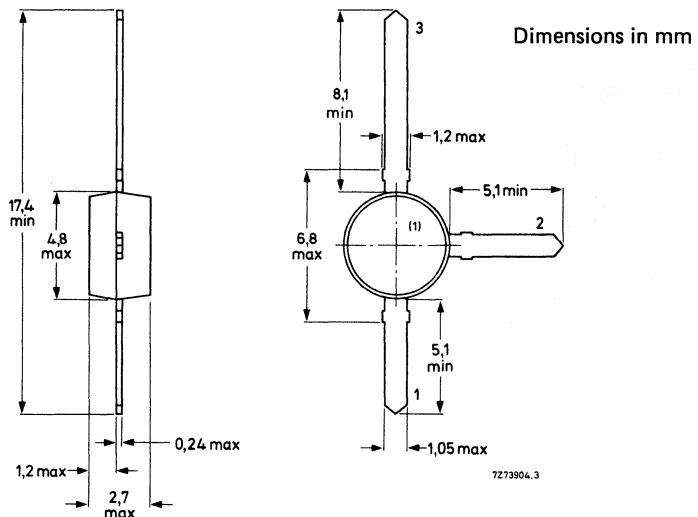
Collector-base voltage (open emitter)	V_{CBO}	max.	25 V
Collector-emitter voltage (open base)	V_{CE0}	max.	15 V
Collector current (d.c.)	I_C	max.	25 mA
Total power dissipation up to $T_{amb} = 70\text{ }^\circ\text{C}$	P_{tot}	max.	200 mW
Junction temperature	T_j	max.	150 $^\circ\text{C}$
Transition frequency at $f = 500\text{ MHz}$ $I_C = 25\text{ mA}; V_{CE} = 5\text{ V}$	f_T	typ.	2,8 GHz
Feedback capacitance at $f = 1\text{ MHz}$ $I_C = 0; V_{CE} = 5\text{ V}$	C_{re}	typ.	0,45 pF
Noise figure at $f = 800\text{ MHz}$ $I_C = 2\text{ mA}; V_{CE} = 5\text{ V}; Z_S = 60\ \Omega$	F	typ.	2,5 dB
Maximum unilateral power gain at $f = 800\text{ MHz}$ $I_C = 14\text{ mA}; V_{CE} = 10\text{ V}$	G _{UM}	typ.	13 dB
Output voltage at $d_{im} = -60\text{ dB}$ $I_C = 14\text{ mA}; V_{CE} = 10\text{ V}; R_L = 75\ \Omega$ $f_{(p+q-r)} = 793,25\text{ MHz}$	V_o	typ.	150 mV

MECHANICAL DATA

Fig. 1 SOT-37.

Connections

- 1. Base
- 2. Emitter
- 3. Collector



(1) Type number marking.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	25 V
Collector-emitter voltage (open base)	V_{CEO}	max.	15 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2,5 V
Collector current (d.c.)	I_C	max.	25 mA
Collector current (peak)	I_{CM}	max.	50 mA
Total power dissipation up to $T_{amb} = 70\text{ }^\circ\text{C}$	P_{tot}	max.	200 mW
Storage temperature	T_{stg}		-65 to + 150 $^\circ\text{C}$
Junction temperature	T_j	max.	150 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to ambient in free air mounted on a fibre-glass print (see Fig. 2) of 40 mm x 25 mm x 1 mm

$R_{th\ j-a} = 400\text{ K/W}$

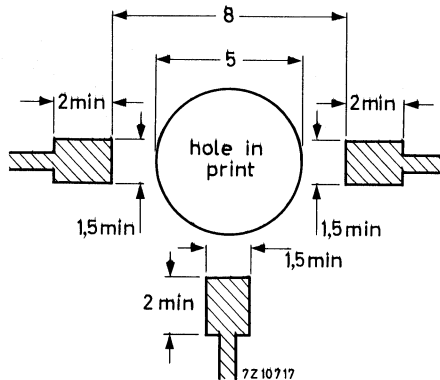


Fig. 2 Requirements for fibre-glass print (dimensions in mm).

CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Collector cut-off current

$I_E = 0; V_{CB} = 10\text{ V}$

I_{CBO}	max.	50 nA
-----------	------	-------

D.C. current gain

$I_C = 2\text{ mA}; V_{CE} = 1\text{ V}$

h_{FE}	min.	20
	max.	150

$I_C = 25\text{ mA}; V_{CE} = 1\text{ V}$

h_{FE}	min.	20
----------	------	----

Transition frequency at $f = 500$ MHz

$I_C = 25$ mA; $V_{CE} = 5$ V

f_T typ. 2,8 GHz

Collector capacitance at $f = 1$ MHz

$I_E = 0$; $V_{CB} = 10$ V

C_C typ. 0,8 pF

Emitter capacitance at $f = 1$ MHz

$I_C = 0$; $V_{EB} = 0,5$ V

C_e typ. 1,4 pF

Feedback capacitance at $f = 1$ MHz

$I_C = 0$; $V_{CE} = 5$ V

C_{re} typ. 0,45 pF

Noise figure at $f = 800$ MHz and $T_{amb} = 25$ °C

$I_C = 2$ mA; $V_{CE} = 5$ V; $Z_S = 60$ Ω

F typ. 2,5 dB ←

Output voltage at $d_{im} = -60$ dB (see Fig. 3)

$I_C = 14$ mA; $V_{CE} = 10$ V; $R_L = 75$ Ω; $T_{amb} = 25$ °C

$V_p = V_o$ at $d_{im} = -60$ dB; $f_p = 795,25$ MHz

$V_q = V_o - 6$ dB; $f_q = 803,25$ MHz

$V_r = V_o - 6$ dB; $f_r = 805,25$ MHz

Measured at $f_{(p+q-r)} = 793,25$ MHz

V_o typ. 150 mV

Maximum unilateral power gain at $f = 800$ MHz

$I_C = 14$ mA; $V_{CE} = 10$ V; $T_{amb} = 25$ °C

G_{UM} typ. 13 dB ←

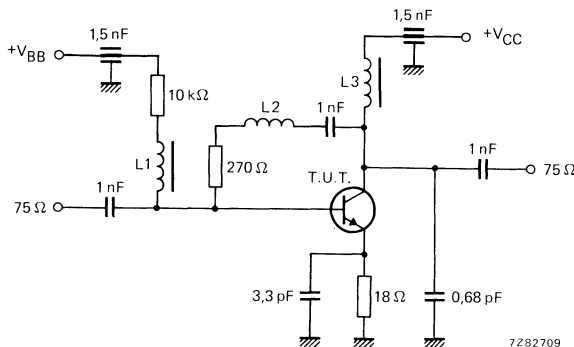


Fig. 3 Intermodulation distortion and second harmonic distortion MATV test circuit.

$L1 = L3 = 5$ μH microchoke

$L2 = 3$ turns Cu wire (0,4 mm); internal diameter 3 mm; winding pitch 1 mm

S-parameters (common emitter) at $I_C = 14$ mA; $V_{CE} = 10$ V; $T_{amb} = 25$ °C; typical values. ←

f MHz	s_{ie}	s_{re}	s_{fe}	s_{oe}
40	0,56/ -30°	0,01/76°	27,5/156°	0,94/ 10°
100	0,42/ -64°	0,02/69°	20,4/131°	0,81/-17°
200	0,28/-100°	0,03/68°	12,7/109°	0,70/-19°
500	0,18/-161°	0,05/74°	5,7/ 87°	0,63/-23°
800	0,18/+163°	0,08/75°	3,6/ 74°	0,63/-31°
1000	0,19/+145°	0,10/75°	2,9/ 66°	0,62/-36°

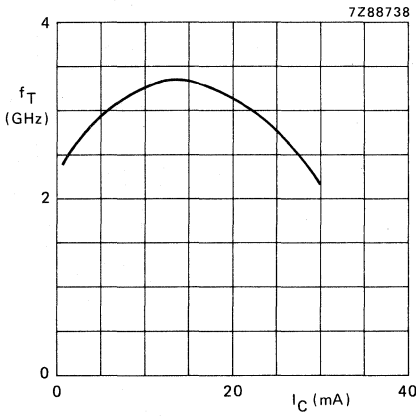


Fig. 4 $V_{CE} = 5$ V; $f = 500$ MHz; $T_j = 25$ °C; typical values.

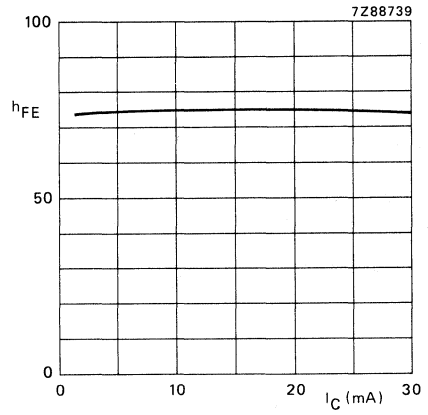


Fig. 5 $V_{CE} = 5$ V; $T_j = 25$ °C; typical values.

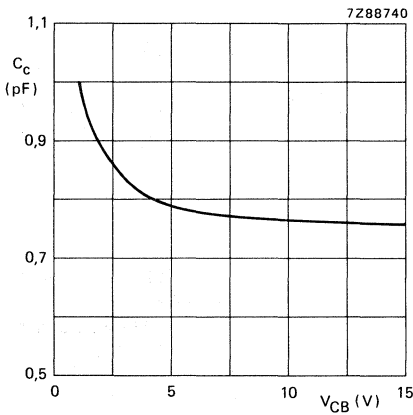


Fig. 6 $I_E = i_e = 0$; $T_j = 25$ °C; typical values.

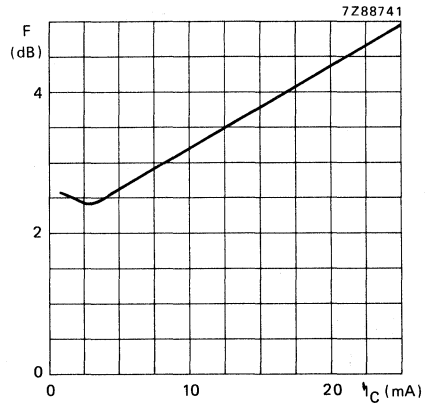


Fig. 7 $V_{CE} = 5$ V; $T_{amb} = 25$ °C; $f = 800$ MHz; $Z_S = 60$ Ω; typical values.



N-P-N H.F. WIDEBAND TRANSISTOR

N-P-N transistor in a plastic SOT-37 envelope.

The device is intended for use in v.h.f. - u.h.f. applications, primarily wideband aerial amplifiers 40 - 860 MHz.

It is intended for mounting on miniature printed-circuit boards.

QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	18 V
Collector-emitter voltage (open base)	V_{CEO}	max.	10 V
Collector current (peak value; $f > 1$ MHz)	I_{CM}	max.	100 mA
Total power dissipation up to $T_{amb} = 70$ °C	P_{tot}	max.	200 mW
Junction temperature	T_j	max.	150 °C
Feedback capacitance at $f = 1$ MHz $I_C = 2$ mA; $V_{CE} = 5$ V	C_{re}	typ.	0,6 pF
Transition frequency at $f = 500$ MHz $I_C = 50$ mA; $V_{CE} = 5$ V	f_T	typ.	1,7 GHz
Max. unilateral power gain $I_C = 30$ mA; $V_{CE} = 5$ V; $f = 200$ MHz	GUM	typ.	22 dB
$I_C = 30$ mA; $V_{CE} = 5$ V; $f = 800$ MHz	GUM	typ.	10,5 dB
Intermodulation distortion at $T_{amb} = 25$ °C $I_C = 30$ mA; $V_{CE} = 5$ V; $R_L = 37,5$ Ω $V_O = 100$ mV at $f_p = 183$ MHz $V_O = 100$ mV at $f_q = 200$ MHz measured at $f(2q-p) = 217$ MHz	dim	typ.	-60 dB

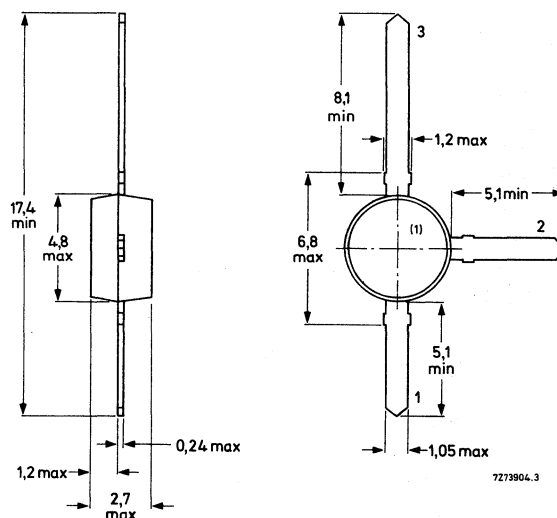
MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-37.

Connections

1. Base
2. Emitter
3. Collector



(1) = type number marking.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	18 V
Collector-emitter voltage (open base)	V_{CEO}	max.	10 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2,5 V
Collector current (d.c.)	I_C	max.	50 mA
Collector current (peak value; $f > 1$ MHz)	I_{CM}	max.	100 mA
Total power dissipation up to $T_{amb} = 70$ °C	P_{tot}	max.	190 mW
Storage temperature	T_{stg}		-65 to +150 °C
Junction temperature	T_j	max.	150 °C

THERMAL RESISTANCE

From junction to ambient in free air
 mounted on a glass-fibre print
 of 40 mm x 25 mm x 1 mm (Fig. 2)

$R_{th\ j-a} = 400$ K/W

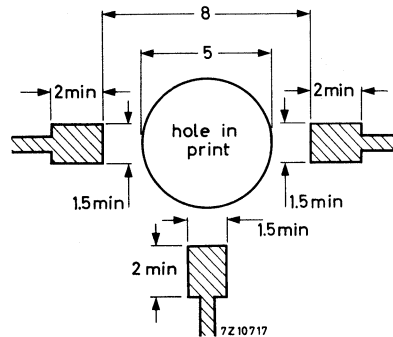


Fig. 2 Requirements for fibre-glass print (dimensions in mm).

CHARACTERISTICS

$T_j = 25$ °C unless otherwise specified

Collector cut-off current

$I_E = 0; V_{CB} = 10$ V

I_{CBO}	max.	50 nA
-----------	------	-------

→ D.C. current gain

$I_C = 25$ mA; $V_{CE} = 5$ V

h_{FE}	min.	25
----------	------	----

$I_C = 50$ mA; $V_{CE} = 5$ V

h_{FE}	min.	25
----------	------	----

→ Transition frequency at $f = 500$ MHz

$I_C = 50$ mA; $V_{CE} = 5$ V

f_T	typ.	1,7 GHz
-------	------	---------

Collector capacitance at $f = 1$ MHz

$I_E = I_e = 0; V_{CB} = 5$ V

C_c	typ.	0,7 pF
-------	------	--------

Emitter capacitance at $f = 1$ MHz

$I_C = I_c = 0; V_{EB} = 0,5$ V

C_e	typ.	1,5 pF
-------	------	--------

Feedback capacitance at $f = 1 \text{ MHz}$

$I_C = 2 \text{ mA}$; $V_{CE} = 5 \text{ V}$; $T_{amb} = 25 \text{ }^\circ\text{C}$

C_{re} typ. 0,6 pF

Noise figure at $f = 500 \text{ MHz}$

$I_C = 2 \text{ mA}$; $V_{CE} = 5 \text{ V}$; $G_S = 20 \text{ mS}$

B_S is tuned; $T_{amb} = 25 \text{ }^\circ\text{C}$

F max. 5,0 dB

Max. unilateral power gain (s_{re} assumed to be zero)

$$G_{UM} = 10 \log \frac{|s_{fe}|^2}{[1 - |s_{ie}|^2][1 - |s_{oe}|^2]}$$

$I_C = 30 \text{ mA}$; $V_{CE} = 5 \text{ V}$; $f = 200 \text{ MHz}$; $T_{amb} = 25 \text{ }^\circ\text{C}$

G_{UM} typ. 22 dB

$I_C = 30 \text{ mA}$; $V_{CE} = 5 \text{ V}$; $f = 800 \text{ MHz}$; $T_{amb} = 25 \text{ }^\circ\text{C}$

G_{UM} typ. 10,5 dB

Intermodulation distortion at $T_{amb} = 25 \text{ }^\circ\text{C}$

$I_C = 30 \text{ mA}$; $V_{CE} = 5 \text{ V}$; $R_L = 37,5 \text{ } \Omega$

$V_o = 100 \text{ mV}$ at $f_p = 183 \text{ MHz}$

$V_o = 100 \text{ mV}$ at $f_q = 200 \text{ MHz}$

measured at $f(2q-p) = 217 \text{ MHz}$

d_{im} typ. -60 dB

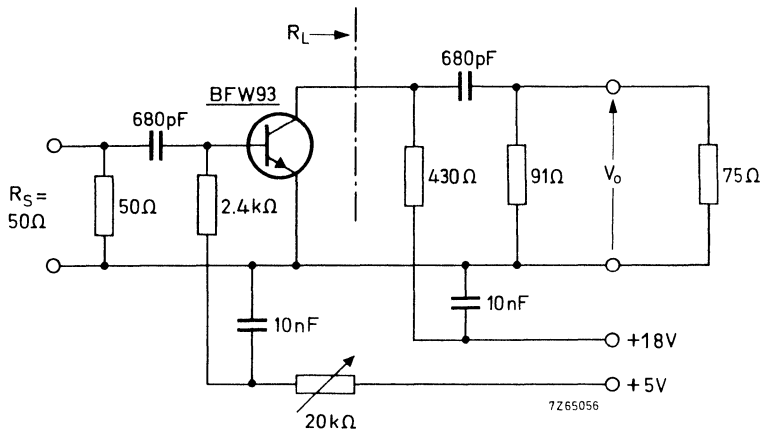


Fig. 3 Test circuit.

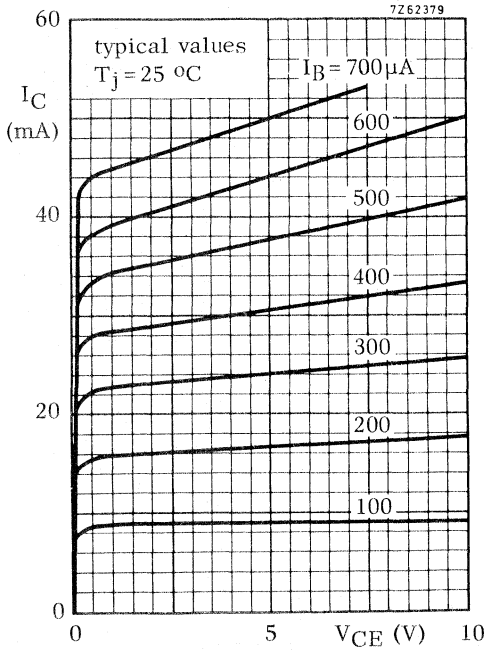


Fig. 4 $T_j = 25\text{ }^\circ\text{C}$; typical values.

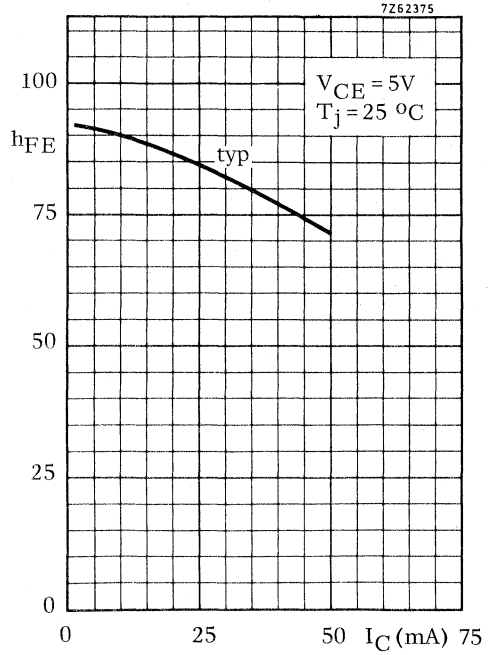


Fig. 5 $V_{CE} = 5\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$; typical values.

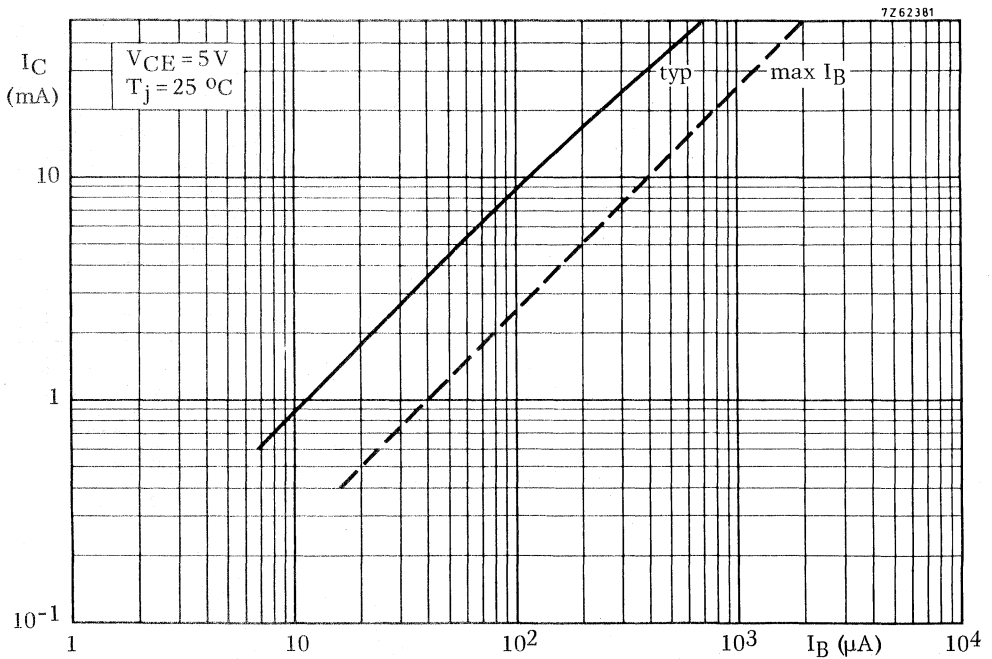


Fig. 6 $V_{CE} = 5\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$.

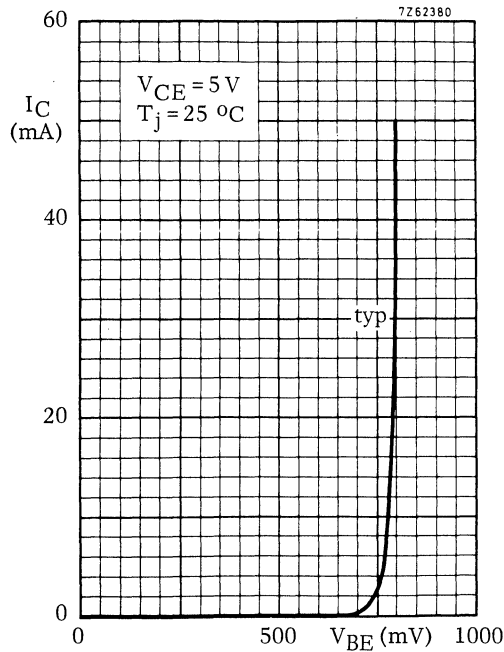


Fig. 7 $V_{CE} = 5\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$; typical values.

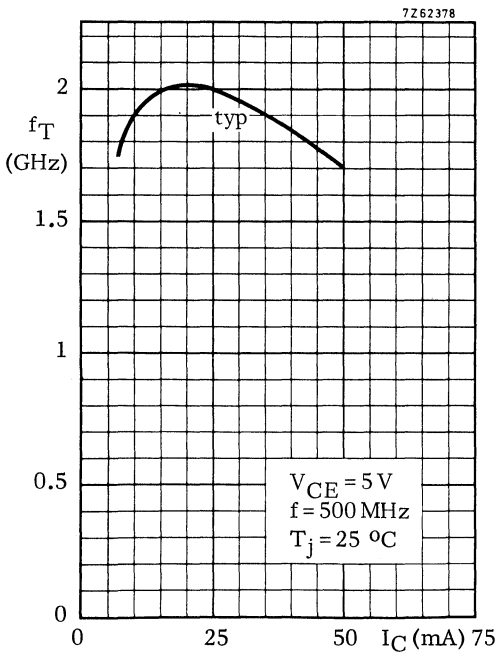


Fig. 8 $V_{CE} = 5\text{ V}$; $f = 500\text{ MHz}$;
 $T_j = 25\text{ }^\circ\text{C}$; typical values.

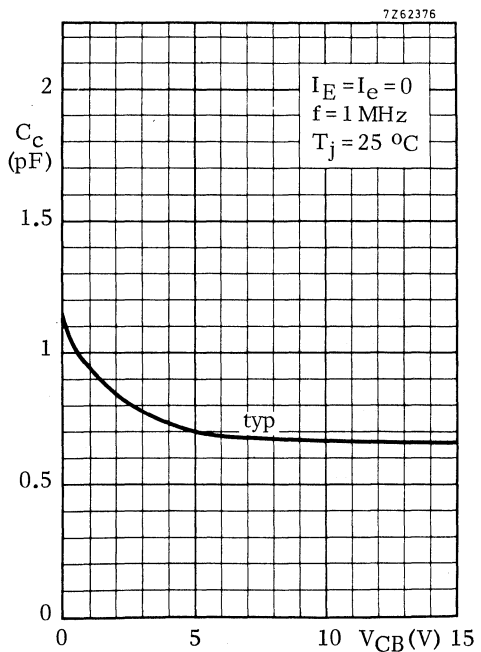


Fig. 9 $I_E = I_e = 0$; $f = 1\text{ MHz}$;
 $T_j = 25\text{ }^\circ\text{C}$; typical values.

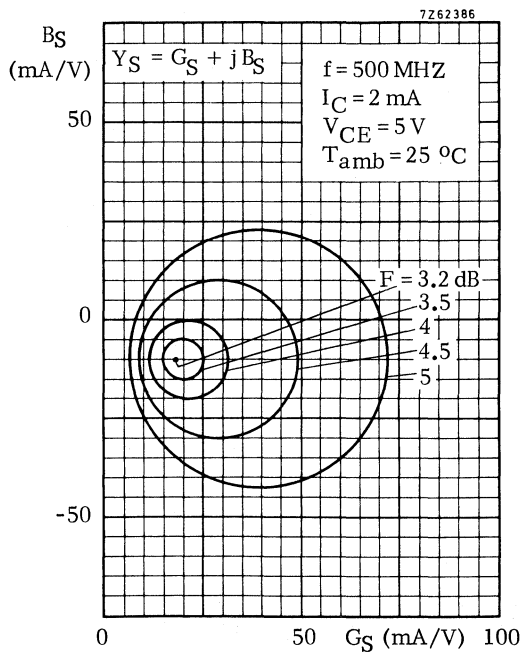


Fig. 10 $V_{CE} = 5\text{ V}$; $I_C = 2\text{ mA}$; $f = 500\text{ MHz}$; $T_{amb} = 25\text{ }^\circ\text{C}$; typical values.

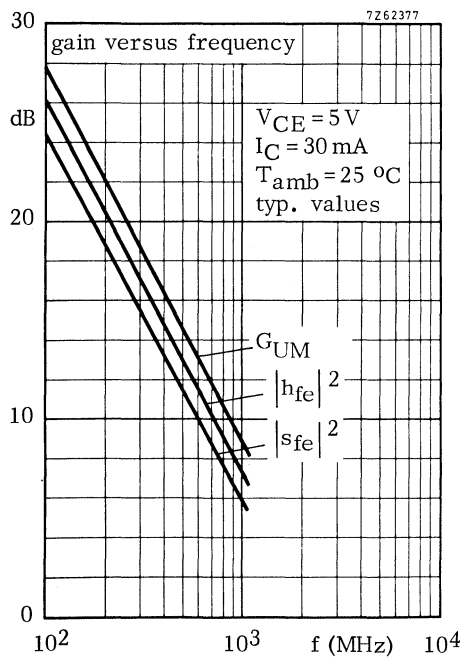


Fig. 11 $V_{CE} = 5\text{ V}$; $I_C = 30\text{ mA}$; $T_{amb} = 25\text{ }^\circ\text{C}$; typical values.

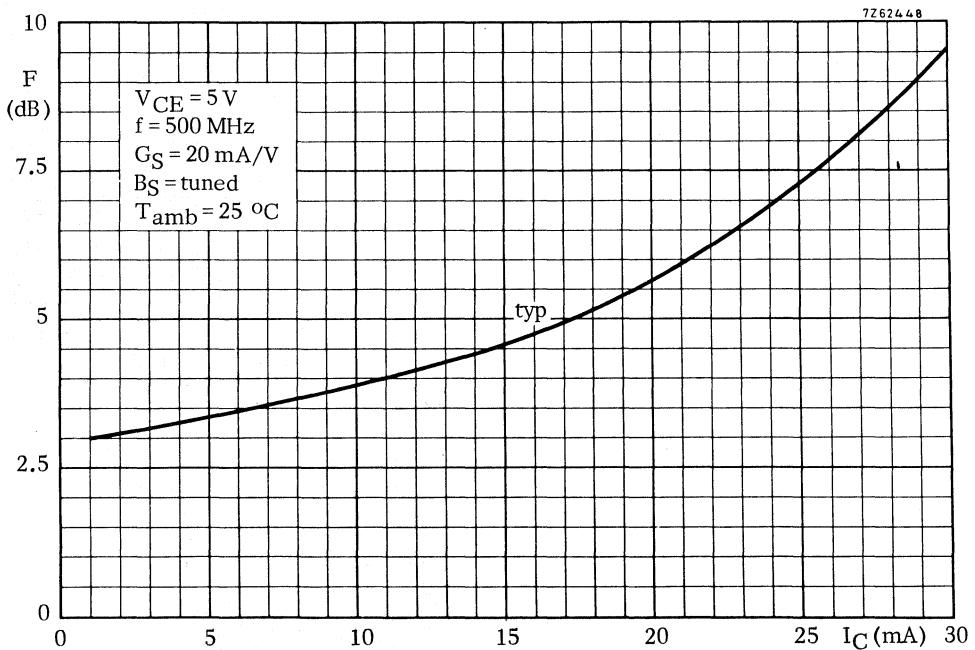


Fig. 12 $V_{CE} = 5\text{ V}$; $f = 500\text{ MHz}$; $G_S = 20\text{ mS}$; $B_S = \text{tuned}$; $T_{amb} = 25\text{ }^\circ\text{C}$; typical values.

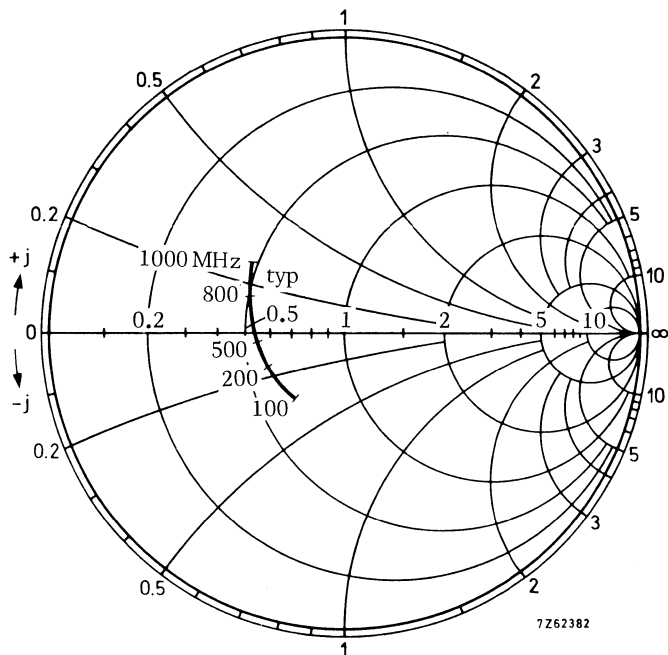


Fig. 13 $V_{CE} = 5 \text{ V}$; $I_C = 30 \text{ mA}$;
 $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

Input impedance derived from
 input reflection coefficient s_{ie}
 coordinates in ohm $\times 50$

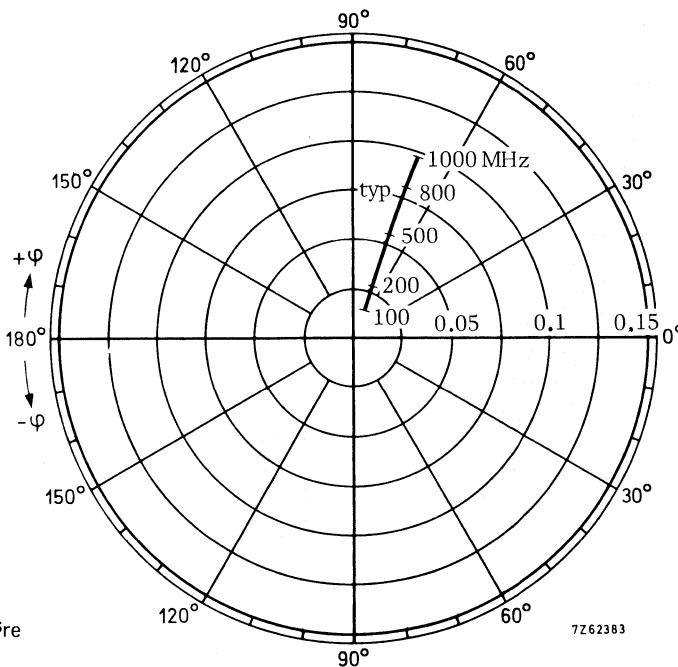


Fig. 14 $V_{CE} = 5 \text{ V}$; $I_C = 30 \text{ mA}$;
 $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

Reverse transmission coefficient s_{re}

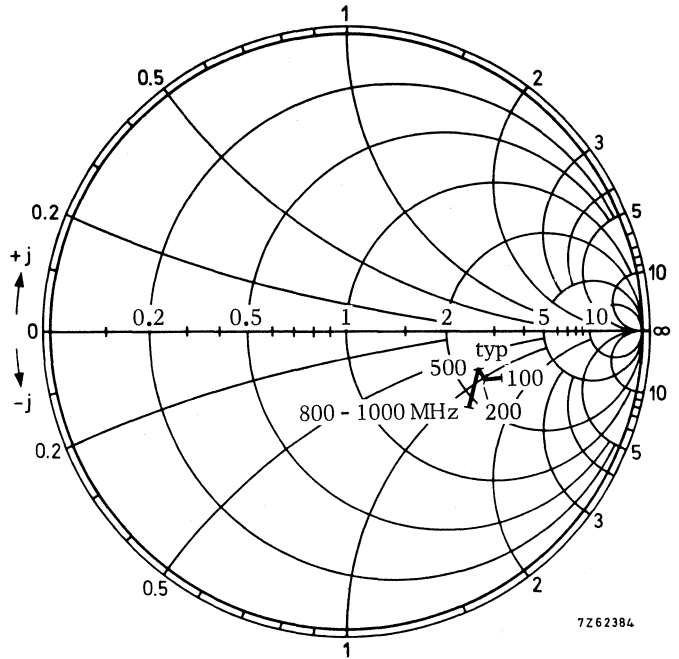


Fig. 15 $V_{CE} = 5\text{ V}$; $I_C = 30\text{ mA}$;
 $T_{amb} = 25\text{ }^\circ\text{C}$; typical values.

Output impedance derived from
 output reflection coefficient s_{oe}
 coordinates in ohm $\times 50$

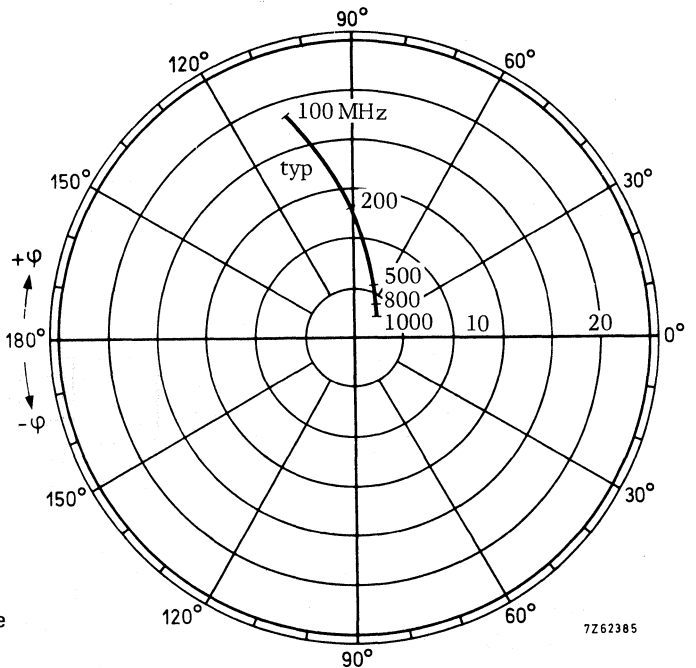


Fig. 16 $V_{CE} = 5\text{ V}$; $I_C = 30\text{ mA}$;
 $T_{amb} = 25\text{ }^\circ\text{C}$; typical values.

Forward transmission coefficient s_{fe}

N-P-N H.F. WIDEBAND TRANSISTOR



N-P-N transistor in a TO-72 metal envelope, with insulated electrodes and a shield lead connected to the case. The transistor has a low noise, a very high power gain and good intermodulation properties.

It is primarily intended for:

- Channel aerial amplifiers for bands I, II, III and IV/V (40-860 MHz).
- Wideband aerial amplifiers (40-860 MHz).

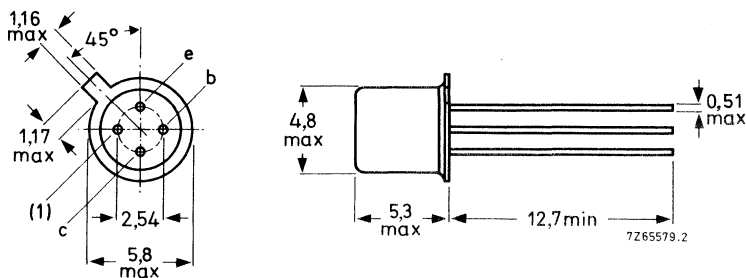
QUICK REFERENCE DATA

Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	30	V
Collector-emitter voltage (open base)	V_{CEO}	max.	15	V
Collector current (peak value; $f > 1$ MHz)	I_{CM}	max.	50	mA
Total power dissipation up to $T_{amb} = 25$ °C	P_{tot}	max.	200	mW
Junction temperature	T_j	max.	200	°C
Transition frequency $I_C = 25$ mA; $V_{CE} = 5$ V; $f = 500$ MHz	f_T	typ.	1,2	GHz
Feedback capacitance $I_C = 2$ mA; $V_{CE} = 5$ V; $f = 1$ MHz	C_{re}	typ.	0,6	pF
Noise figure at optimum source impedance $I_C = 2$ mA; $V_{CE} = 5$ V	F	typ.	f = 200	800
			3,3	7
Power gain (not neutralized) $I_C = 8$ mA; $V_{CE} = 10$ V	G_p	typ.	22	7
Output power $d_{im} = -30$ dB; VSWR at output < 2 ; $I_C = 8$ mA; $V_{CE} = 10$ V	P_o	typ.	6	6
				mW

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-72.



(1) = shield lead (connected to case).

Accessories: 56246 (distance disc).

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	30 V
→ Collector-emitter voltage (peak value) $R_{BE} \leq 50 \Omega$	V_{CERM}	max.	30 V
→ Collector-emitter voltage (open base)	V_{CEO}	max.	15 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2,5 V
Collector current (d.c.)	I_C	max.	25 mA
Collector current (peak value; $f > 1$ MHz)	I_{CM}	max.	50 mA
Total power dissipation up to $T_{amb} = 25^\circ C$	P_{tot}	max.	200 mW
Storage temperature	T_{stg}		-65 to + 200 °C
Junction temperature	T_j	max.	200 °C

THERMAL RESISTANCE

From junction to ambient in free air	R_{thj-a}	=	880 K/W
From junction to case	R_{thj-c}	=	580 K/W

CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Collector cut-off current

$I_E = 0; V_{CB} = 15\text{ V}$

I_{CBO} max. 10 nA

Knee voltage

$I_C = 20\text{ mA}; I_B = \text{value for which}$

$I_C = 22\text{ mA at } V_{CE} = 1\text{ V}$

V_{CEK} max. 0,75 V

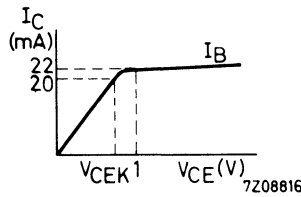


Fig. 2.

D.C. current gain

$I_C = 2\text{ mA}; V_{CE} = 1\text{ V}$

h_{FE} 20 to 150

$I_C = 25\text{ mA}; V_{CE} = 1\text{ V}$

h_{FE} 20 to 125

Transition frequency*

$I_C = 2\text{ mA}; V_{CE} = 5\text{ V}; f = 500\text{ MHz}$

f_T typ. 1,0 GHz

$I_C = 25\text{ mA}; V_{CE} = 5\text{ V}; f = 500\text{ MHz}$

f_T typ. 1,2 GHz

Collector capacitance at $f = 1\text{ MHz}^{**}$

$I_E = I_e = 0; V_{CB} = 10\text{ V}$

C_C max. 1,7 pF

Feedback capacitance at $f = 1\text{ MHz}^*$

$I_C = 2\text{ mA}; V_{CE} = 5\text{ V}; T_{amb} = 25\text{ }^\circ\text{C}$

C_{re} typ. 0,6 pF ←

Noise figure*

$I_C = 2\text{ mA}; V_{CE} = 5\text{ V}; T_{amb} = 25\text{ }^\circ\text{C}$

$f = 200\text{ MHz}; \text{optimum source impedance}$

F max. 4,0 dB ←

$f = 500\text{ MHz}; Z_S = 50\text{ }\Omega$

F max. 6,5 dB ←

$f = 800\text{ MHz}; \text{optimum source impedance}$

F typ. 7,0 dB

Power gain (not neutralized)*

$I_C = 8\text{ mA}; V_{CE} = 10\text{ V}; T_{amb} = 25\text{ }^\circ\text{C}$

		$f = 200$	800 MHz
G_p	min.	19	— dB
	typ.	22	7,0 dB

* Shield lead grounded.

** Shield lead not connected.

CHARACTERISTICS (continued)

Intermodulation characteristics*

- Output power at $f = 200$ MHz; $T_{amb} = 25$ °C
 $I_C = 8$ mA; $V_{CE} = 10$ V; V.S.W.R. at output < 2
 $f_p = 202$ MHz; $f_q = 205$ MHz; $d_{im} = -30$ dB
 measured at $f(2q-p) = 208$ MHz (Channel 9)

P_o typ. 6 mW

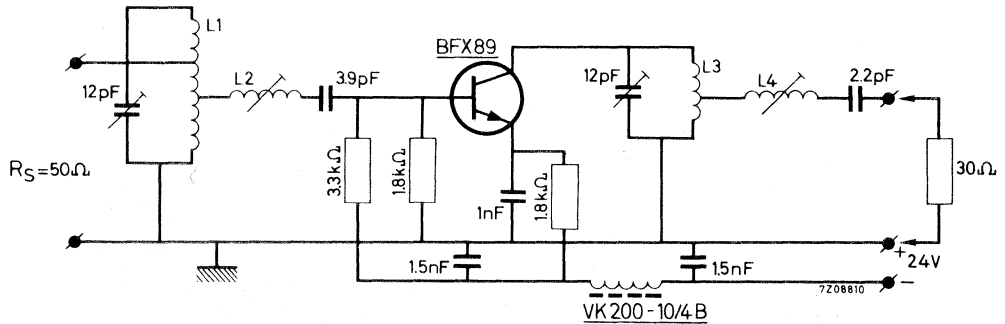


Fig. 3 Test circuit.

Coil data:

- L1 = 3 turns silver plated Cu wire (1,4 mm); winding pitch 2,7 mm; int. diam. 8 mm; taps at 0,5 turn and 1,5 turns from earth.
- L2 = 5,5 turns silver plated Cu wire (1,4 mm); winding pitch 2,2 mm; int. diam. 8 mm.
- L3 = 3 turns silver plated Cu wire (1,4 mm); winding pitch 3,3 mm; int. diam. 8 mm.
- L4 = 5,5 turns silver plated Cu wire (1,4 mm); winding pitch 2,2 mm; int. diam. 11 mm.

* Shield lead grounded.

CHARACTERISTICS

Basis of adjustment

The intermodulation at an intermodulation distortion of -30 dB is caused by h.f. output current – voltage clipping.

The maximum undistorted output power is realised, if

- a. Current and voltage clipping take place concurrently.

This occurs if

$$R_L = \frac{V_{CE} - V_{CEK}}{I_C},$$

in which V_{CEK} is the high frequency knee voltage.

- b. The h.f. collector current is as small as possible.

This is so if $-C_L = +C_{oe}$,

in which C_{oe} is the output capacitance of the transistor at short circuited input.

For maximum output power at an intermodulation distortion of -30 dB, the (experimentally found) values of R_L and C_L are:

$$R_L = 1 \text{ k}\Omega; C_L = -1,8 \text{ pF}$$

Adjustment procedure

1. Remove the transistor and connect a dummy consisting of a $1 \text{ k}\Omega$ resistor in parallel with a $1,8 \text{ pF}$ capacitor between the collector and emitter connections of the output circuit.
2. Tune and match the output circuit for zero reflection at 205 MHz ($V.S.W.R. = 1$). After this adjustment, no further change may be made in the output circuit.
3. Replace the dummy by the transistor. Tune and match the input circuit for maximum power gain and good band pass curve.

The $V.S.W.R.$ of the output will then, in most cases, be ≤ 2 over the whole channel.

Corrections can be made by tuning L_2 ; this will not disturb the band pass curve.

CHARACTERISTICS (continued)

Intermodulation characteristics*

2. Output power at $f = 800$ MHz; $T_{amb} = 25$ °C

$I_C = 8$ mA; $V_{CE} = 10$ V; V.S.W.R. at output < 2

$f_p = 798$ MHz; $f_q = 802$ MHz; $d_{im} = -30$ dB

measured at $f(2q-p) = 806$ MHz (Channel 62)

P_o typ. 6 mW

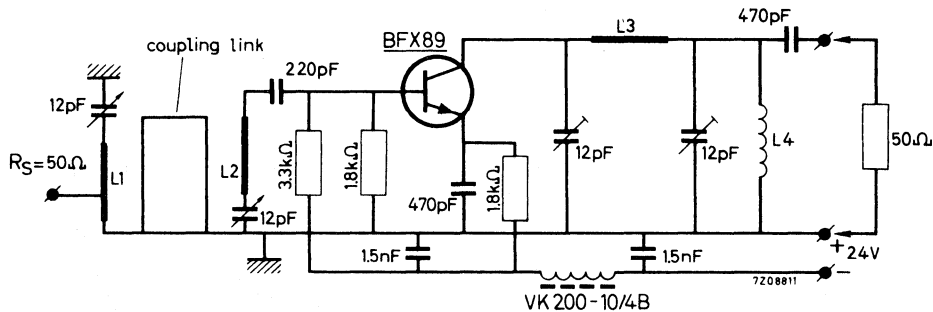


Fig. 4 Test circuit.

Coil data:

L1 = 24 mm x 6 mm x 0,5 mm silver plated Cu strip.

Tap of the input at 5 mm from earth.

L2 = 15 mm x 6 mm x 0,5 mm silver plated Cu strip.

L3 = 20 mm x 8 mm x 0,5 mm silver plated Cu strip.

L4 = 4 turns enamelled Cu wire (0,5 mm); winding pitch 1,5 mm; int. diam. 4 mm.

Coupling link: 42 mm silver plated Cu wire (1 mm).

Basis of adjustment

At 800 MHz no dummy can be used to adjust for optimum collector load because at these frequencies the impedance transformations of a dummy are too high. A small signal at the mid-channel frequency of 802 MHz is fed to the input and increased until clipping occurs; that is, until the output power no longer increases linearly with the input signal. This clipping can be eliminated by tuning the output circuit, thereby making the output power equal to

$$P_o = \frac{I_C (V_{CE} - V_{CEK})}{2} = 35 \text{ mW}$$

The output circuit is adjusted for minimum intermodulation if the input signal is as small as possible at $P_o = 35$ mW.

After this adjustment has been made no further change may be made in the output circuit.

Adjust the input circuit for maximum power gain and good band pass curve.

The V.S.W.R. of the output is then ≤ 2 over the whole channel.

* Shield lead grounded.

CHARACTERISTICS

Intermodulation characteristics*

3. Intermodulation distortion

$I_C = 8 \text{ mA}$; $V_{CE} = 6 \text{ V}$; $R_L = 37,5 \Omega$; $T_{amb} = 25 \text{ }^\circ\text{C}$

$V_o = 100 \text{ mV}$ at $f_p = 183 \text{ MHz}$

$V_o = 100 \text{ mV}$ at $f_q = 200 \text{ MHz}$

measured at $f_{(2q-p)} = 217 \text{ MHz}$

d_{im} typ. -40 dB

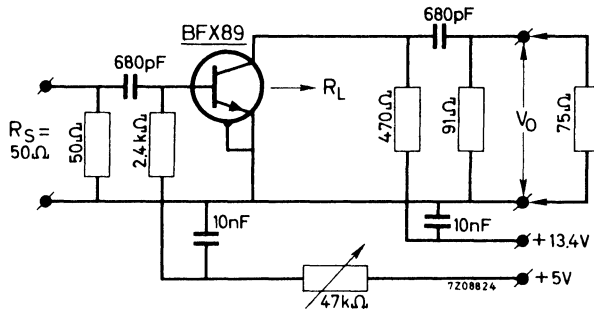


Fig. 5 Test circuit.

* Shield lead grounded.

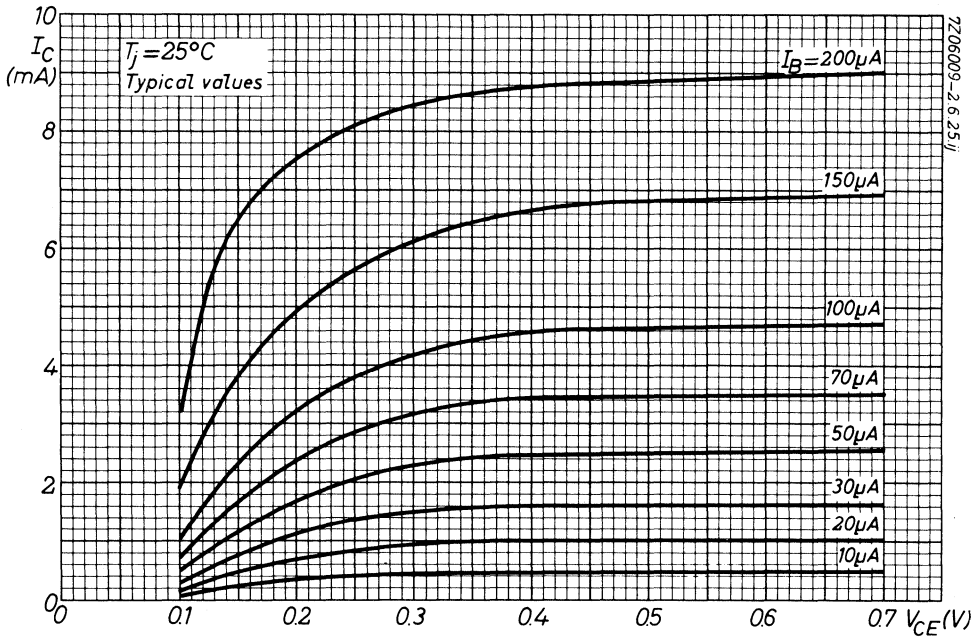


Fig. 6 $T_j = 25^\circ\text{C}$; typical values.

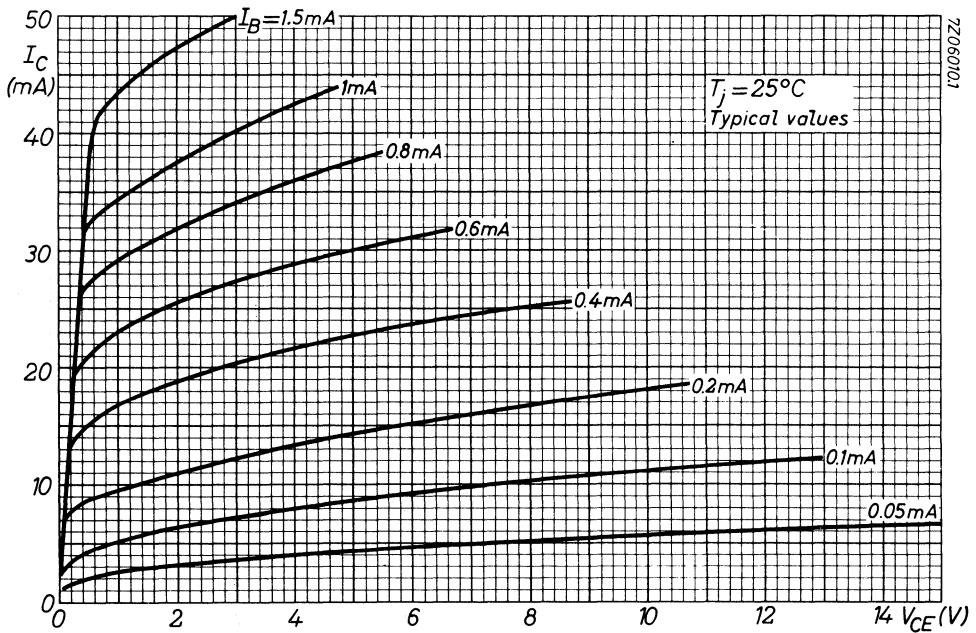


Fig. 7 $T_j = 25^\circ\text{C}$; typical values.

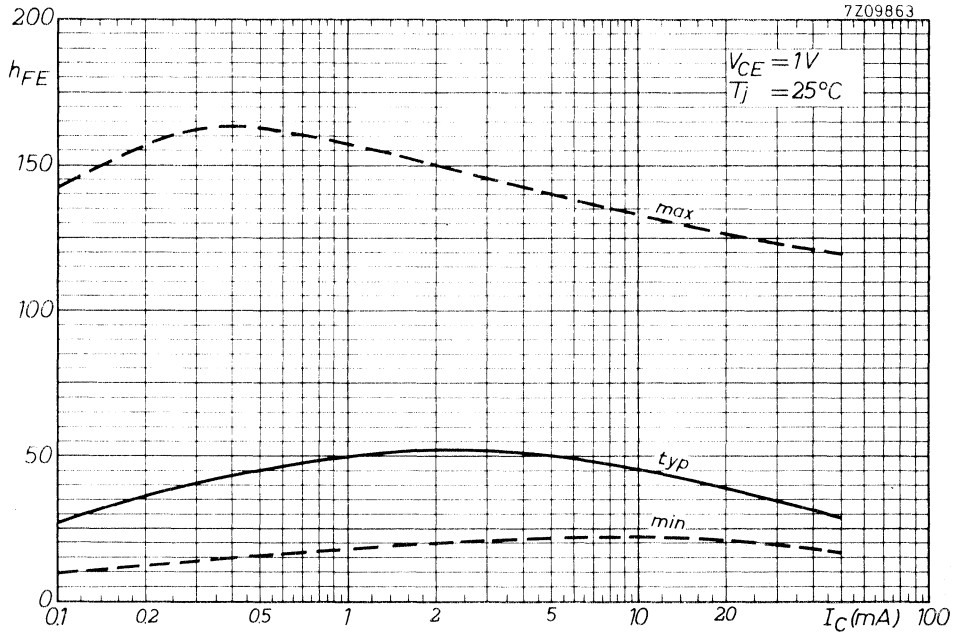


Fig. 8 $V_{CE} = 1V$; $T_j = 25^\circ C$.

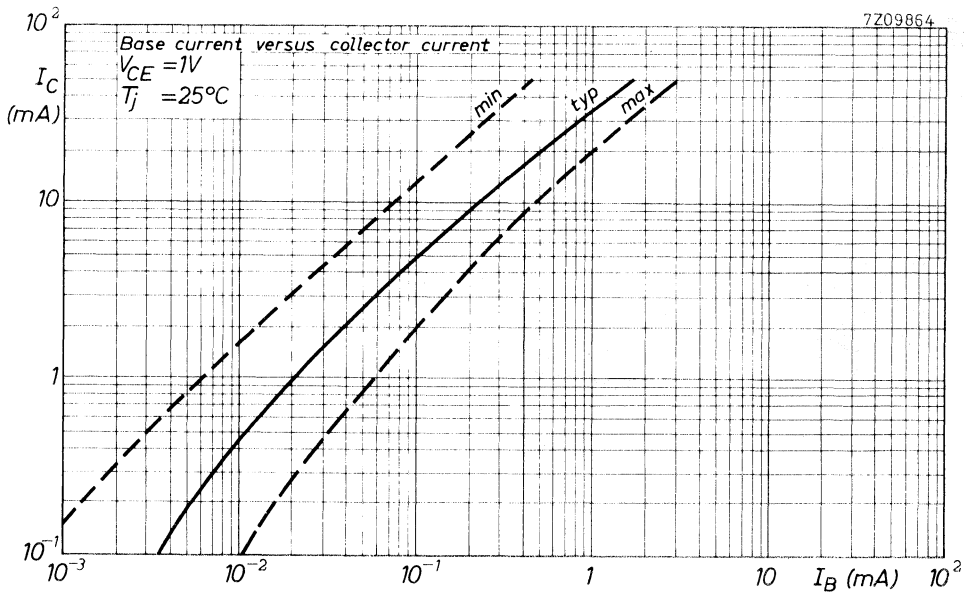


Fig. 9 $V_{CE} = 1V$; $T_j = 25^\circ C$.

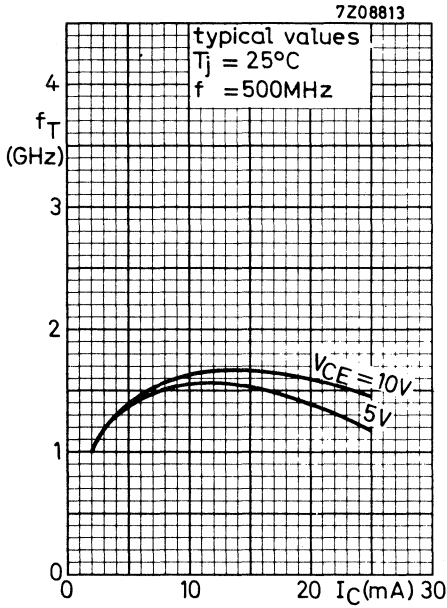


Fig. 10 $f = 500\text{ MHz}$; $T_j = 25^\circ\text{C}$; typical values.

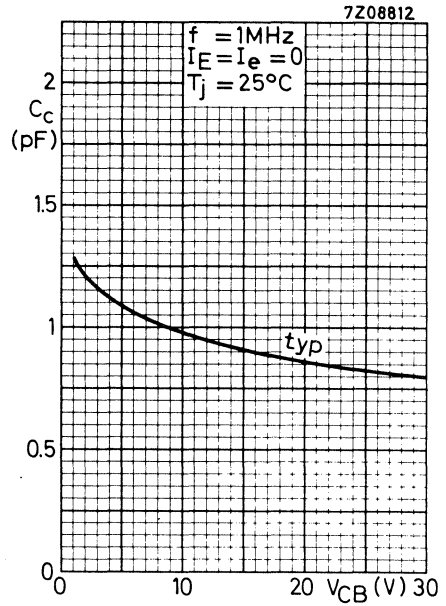


Fig. 11 $I_E = I_e = 0$; $f = 1\text{ MHz}$; $T_j = 25^\circ\text{C}$; typical values.

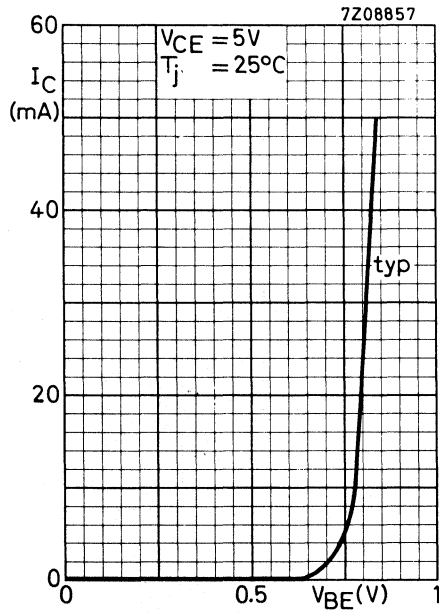


Fig. 12 $V_{CE} = 5\text{ V}$; $T_j = 25^\circ\text{C}$; typical values.

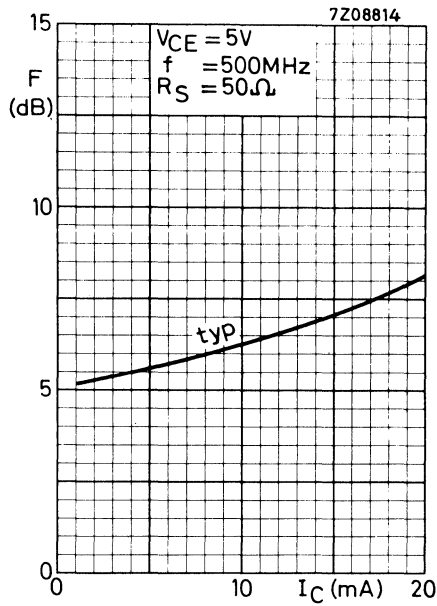


Fig. 13 $V_{CE} = 5 V$; $f = 500 MHz$; $Z_S = 50 \Omega$; $T_{amb} = 25 ^\circ C$; typical values.

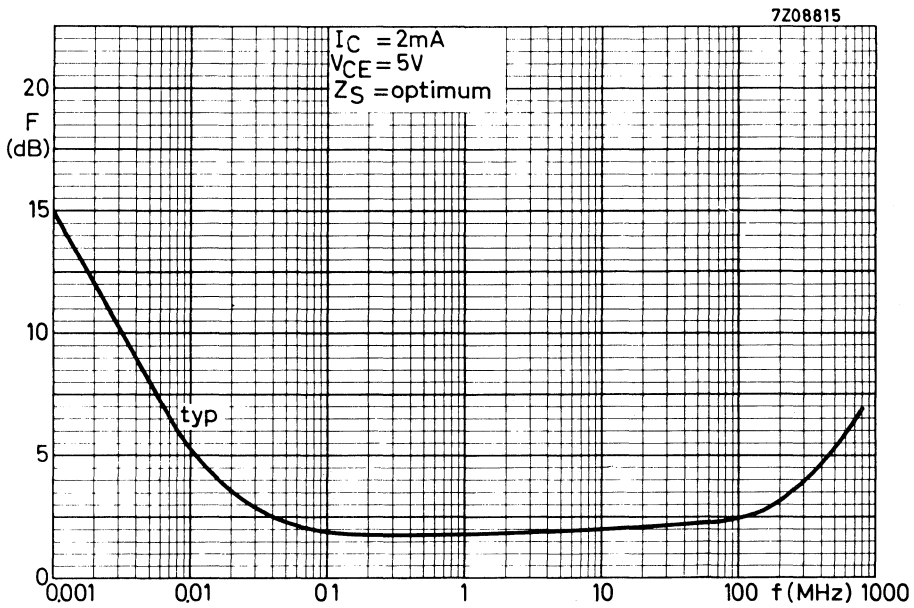


Fig. 14 $V_{CE} = 5 V$; $I_C = 2 mA$; $Z_S = opt.$; $T_{amb} = 25 ^\circ C$; typical values.

N-P-N H.F. WIDEBAND TRANSISTOR

N-P-N transistor in a TO-72 metal envelope with insulated electrodes and a shield lead connected to the case.

The transistor has very low noise over a wide current range, a very high power gain and excellent intermodulation properties.

It is primarily intended for:

- Channel- and band aerial amplifiers for band I, II, III and IV/V (40-860 MHz)
- Wide band aerial amplifiers (40-860 MHz)
- Television distribution amplifiers
- Low noise wide band vertical amplifier in high speed oscilloscopes

It is also suitable for military- and industrial applications, such as:

- R.F. amplifiers and mixers for communication equipment
- Microwave telephony link systems, wide band i.f. amplifiers
- Large bandwidth radar i.f. amplifiers

QUICK REFERENCE DATA

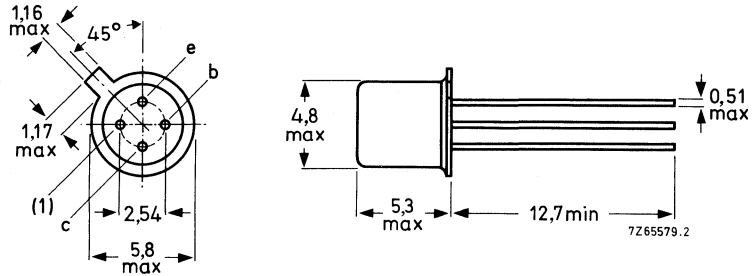
Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	30 V
Collector-emitter voltage (open base)	V_{CEO}	max.	15 V
Collector current (peak value; $f > 1$ MHz)	I_{CM}	max.	50 mA
Total power dissipation up to $T_{amb} = 25$ °C	P_{tot}	max.	200 mW
Junction temperature	T_j	max.	200 °C
Transition frequency $I_C = 25$ mA; $V_{CE} = 5$ V; $f = 500$ MHz	f_T	typ.	1,4 GHz
Feedback capacitance at $f = 1$ MHz $I_C = 2$ mA; $V_{CE} = 5$ V	C_{re}	typ.	0,6 pF
Noise figure at optimum source impedance $I_C = 2$ mA; $V_{CE} = 5$ V $f = 200$ MHz $f = 800$ MHz	F	typ.	2,5 dB 5,5 dB
Power gain (not neutralized) $I_C = 14$ mA; $V_{CE} = 10$ V $f = 200$ MHz $f = 800$ MHz	G_p	typ.	23 dB 8 dB
Output power $d_{im} = -30$ dB; V.S.W.R. at output < 2 $I_C = 14$ mA; $V_{CE} = 10$ V $f = 200$ MHz $f = 800$ MHz	P_o	typ.	12 mW 12 mW

MECHANICAL DATA (see next page)

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-72.



(1) = shield lead (connected to case).

Accessories: 56246 (distance disc).

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	30 V
Collector-emitter voltage (peak value) $R_{BE} \leq 50 \Omega$; $I_C = 10 \text{ mA}$	V_{CERM}	max.	30 V
Collector-emitter voltage (open base); $I_C = 10 \text{ mA}$	V_{CEO}	max.	15 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2,5 V
Collector current (d.c.)	I_C	max.	25 mA
Collector current (peak value; $f > 1 \text{ MHz}$)	I_{CM}	max.	50 mA
Total power dissipation up to $T_{amb} = 25 \text{ }^\circ\text{C}$	P_{tot}	max.	200 mW
Storage temperature	T_{stg}		-65 to + 200 $^\circ\text{C}$
Junction temperature	T_j	max.	200 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th j-a}$	=	880 K/W
From junction to case	$R_{th j-c}$	=	580 K/W

CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Collector cut-off current

$I_E = 0; V_{CB} = 15\text{ V}$

I_{CBO}	min.	10 nA
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Knee voltage

$I_C = 20\text{ mA}; I_B = \text{value for which}$

$I_C = 22\text{ mA at } V_{CE} = 1\text{ V}$

V_{CEK}	min.	0,75 V
-----------	------	--------

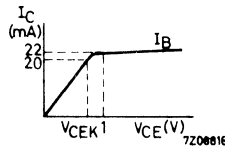


Fig. 2.

D.C. current gain

$I_C = 2\text{ mA}; V_{CE} = 1\text{ V}$

$I_C = 25\text{ mA}; V_{CE} = 1\text{ V}$

h_{FE}		25 to 150
h_{FE}		20 to 125

Transition frequency*

$I_C = 2\text{ mA}; V_{CE} = 5\text{ V}; f = 500\text{ MHz}$

f_T	min.	1,0 GHz
	typ.	1,1 GHz

$I_C = 25\text{ mA}; V_{CE} = 5\text{ V}; f = 500\text{ MHz}$

f_T	min.	1,3 GHz
	typ.	1,4 GHz

Collector capacitance at $f = 1\text{ MHz}^{**}$

$I_E = I_e = 0; V_{CB} = 10\text{ V}$

C_c	max.	1,5 pF
-------	------	--------

Feedback capacitance at $f = 1\text{ MHz}^*$

$I_C = 2\text{ mA}; V_{CE} = 5\text{ V}; T_{amb} = 25\text{ }^\circ\text{C}$

C_{re}	typ.	0,6 pF
	max.	0,8 pF

Noise figure*

$I_C = 2\text{ mA}; V_{CE} = 5\text{ V}; T_{amb} = 25\text{ }^\circ\text{C}$

$f = 100\text{ kHz}$; optimum source resistance

$f = 200\text{ MHz}$; optimum source impedance

$f = 500\text{ MHz}$; $Z_S = 50\text{ }\Omega$

$f = 800\text{ MHz}$; optimum source impedance

F	max.	4 dB
F	max.	3,5 dB
F	max.	5 dB
F	typ.	5,5 dB

Power gain (not neutralized)*

$I_C = 14\text{ mA}; V_{CE} = 10\text{ V}; T_{amb} = 25\text{ }^\circ\text{C}$

$f = 200\text{ MHz}$

$f = 800\text{ MHz}$

G_p	min.	21 dB
	typ.	23 dB
G_p	typ.	8 dB

* Shield lead grounded.

** Shield lead not connected.

CHARACTERISTICS (continued)

Intermodulation characteristics*

1. Output power at $f = 200$ MHz; $T_{amb} = 25$ °C

$I_C = 14$ mA; $V_{CE} = 10$ V; V.S.W.R. at output < 2

$f_p = 202$ MHz; $f_q = 205$ MHz; $d_{im} = -30$ dB

measured at $f_{(2q-p)} = 208$ MHz (Channel 9)

P_o	min.	10 mW
	typ.	12 mW

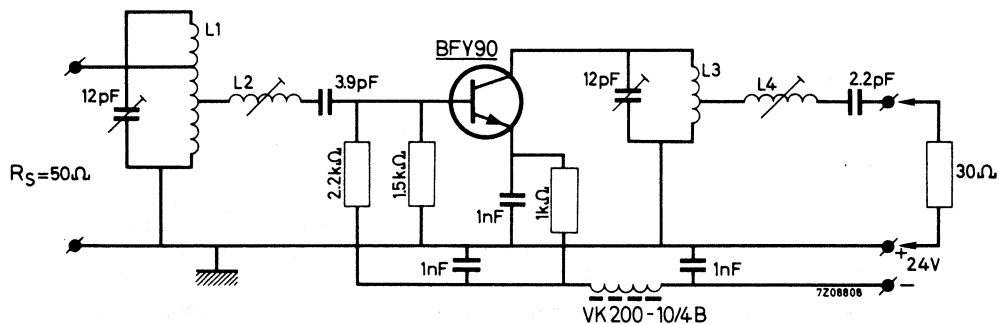


Fig. 3 Test circuit.

Coil data:

L1 = 3 turns silver plated Cu wire (1,4 mm); winding pitch 2,7 mm; int. diam. 8 mm; taps at 0,5 turn and 1,5 turns from earth.

L2 = 5,5 turns silver plated Cu wire (1,4 mm); winding pitch 2,2 mm; int. diam. 8 mm.

L3 = 3 turns silver plated Cu wire (1,4 mm); winding pitch 3,3 mm; int. diam. 8 mm.

L4 = 5,5 turns silver plated Cu wire (1,4 mm); winding pitch 2,2 mm; int. diam. 11 mm.

* Shield lead grounded.

CHARACTERISTICS

Basis of adjustment

The intermodulation at an intermodulation distortion of -30 dB is caused by h.f. output current – voltage clipping.

The maximum undistorted output power is realised, if

- a. Current and voltage clipping take place concurrently.

This occurs if

$$R_L = \frac{V_{CE} - V_{CEK}}{I_C},$$

in which V_{CEK} is the high frequency knee voltage.

- b. The h.f. collector current is as small as possible.

This is so if $-C_L = +C_{Oe}$,

in which C_{Oe} is the output capacitance of the transistor at short circuited input.

For maximum output power at an intermodulation distortion of -30 dB, the (experimentally found) values of R_L and C_L are:

$$R_L = 560 \Omega; C_L = -1,8 \text{ pF}$$

Adjustment procedure

1. Remove the transistor and connect a dummy consisting of a 560Ω resistor in parallel with a $1,8 \text{ pF}$ capacitor between the collector and emitter connections of the output circuit.
2. Tune and match the output circuit for zero reflection at 205 MHz ($V.S.W.R. = 1$). After this adjustment, no further change may be made in the output circuit.
3. Replace the dummy by the transistor. Tune and match the input circuit for maximum power gain and good band pass curve.

The V.S.W.R. of the output will then, in most cases, be ≤ 2 over the whole channel.

Corrections can be made by tuning L_2 ; this will not disturb the band pass curve.

CHARACTERISTICS (continued)

Intermodulation characteristics*

2. Output power at $f = 800 \text{ MHz}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$

$I_C = 14 \text{ mA}$; $V_{CE} = 10 \text{ V}$; V.S.W.R. at output < 2

$f_p = 798 \text{ MHz}$; $f_q = 802 \text{ MHz}$; $d_{\text{im}} = -30 \text{ dB}$

measured at $f(2q-p) = 806 \text{ MHz}$ (Channel 62)

P_O typ. 12 mW

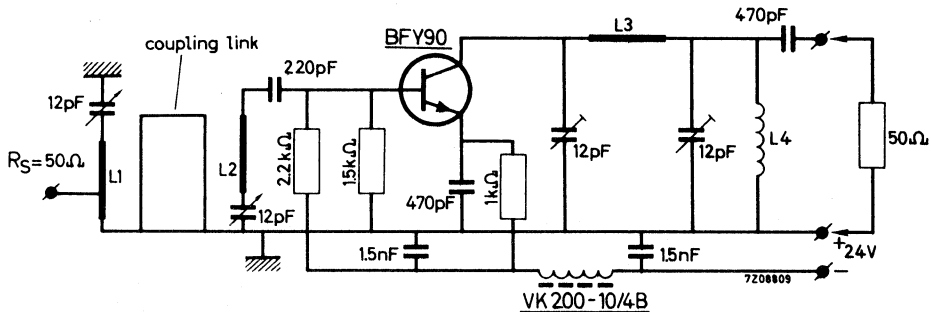


Fig. 4 Test circuit.

Coil data:

L1 = 24 mm x 6 mm x 0,5 mm silver plated Cu strip.

Tap of the input at 5 mm from earth.

L2 = 15 mm x 6 mm x 0,5 mm silver plated Cu strip.

L3 = 20 mm x 8 mm x 0,5 mm silver plated Cu strip.

L4 = 4 turns enamelled Cu wire (0,5 mm); winding pitch 1,5 mm; int. diam. 4 mm.

Coupling link: 42 mm silver plated Cu wire (1 mm).

Basis of adjustment

At 800 MHz no dummy can be used for optimum collector load because at these frequencies the impedance transformations of a dummy are too high. A small signal at the mid-channel frequency of 802 MHz is fed to the input and increased until clipping occurs; that is, until the output power no longer increases linearly with the input signal. This clipping can be eliminated by tuning the output circuit, thereby making the output power equal to

$$P_O = \frac{I_C (V_{CE} - V_{CEK})}{2} = 60 \text{ mW}$$

The output circuit is adjusted for minimum intermodulation if the input signal is as small as possible at $P_O = 60 \text{ mW}$.

After this adjustment has been made no further change may be made in the output circuit.

Adjust the input circuit for maximum power gain and good band pass curve.

The V.S.W.R. of the output is then ≤ 2 over the whole channel.

* Shield lead grounded.

CHARACTERISTICS

Intermodulation characteristics*

3. Intermodulation distortion

$I_C = 14 \text{ mA}$; $V_{CE} = 6 \text{ V}$; $R_L = 37,5 \Omega$; $T_{amb} = 25 \text{ }^\circ\text{C}$

$V_o = 100 \text{ mV}$ at $f_p = 183 \text{ MHz}$

$V_o = 100 \text{ mV}$ at $f_q = 200 \text{ MHz}$

measured at $f(2q-p) = 217 \text{ MHz}$

d_{im} typ. -50 dB

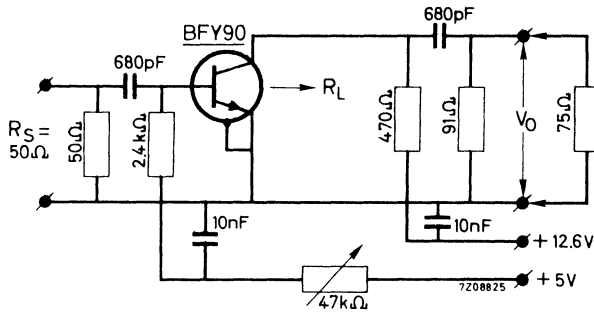


Fig. 5 Test circuit.

y parameters at $f = 500 \text{ MHz}$ (common emitter)*

$I_C = 2 \text{ mA}$; $V_{CE} = 5 \text{ V}$; $T_{amb} = 25 \text{ }^\circ\text{C}$

Input conductance

g_{ie} typ. 16 mS

Input capacitance

C_{ie} typ. 3,75 pF

Feedback admittance

$|y_{re}|$ typ. 1,55 mS

Phase angle of feedback admittance

φ_{re} typ. 258°

Transfer admittance

$|y_{fe}|$ typ. 45 mS

Phase angle of transfer admittance

φ_{fe} typ. 285°

Output conductance

g_{oe} typ. 0,19 mS

Output capacitance

C_{oe} typ. 1,9 pF

Maximum unilateralised power gain

$$G_{UM} = \frac{|y_{fe}|^2}{4g_{ie}g_{oe}}$$

$I_C = 2 \text{ mA}$; $V_{CE} = 5 \text{ V}$; $f = 500 \text{ MHz}$; $T_{amb} = 25 \text{ }^\circ\text{C}$

G_{UM} typ. 22 dB

* Shield lead grounded.

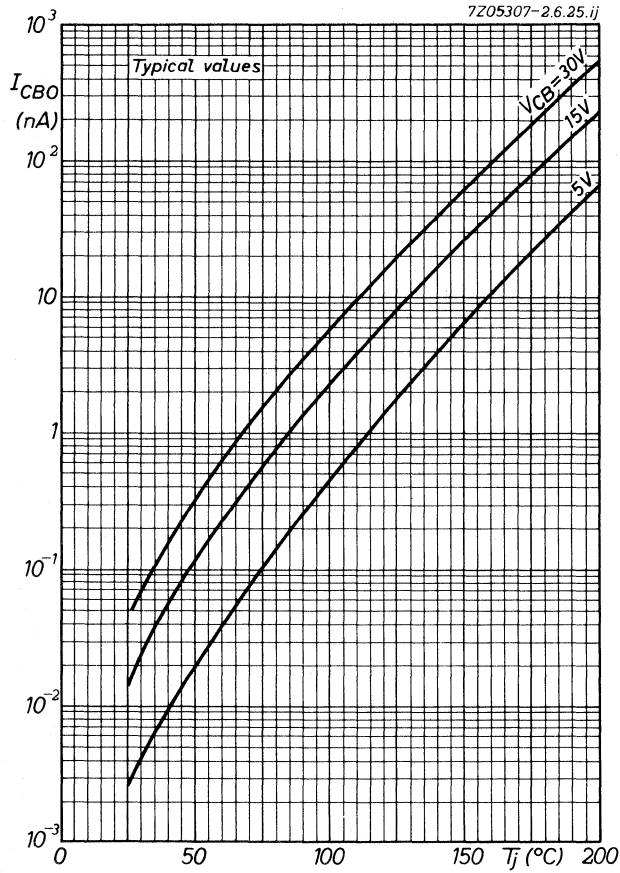


Fig. 6 Typical values.

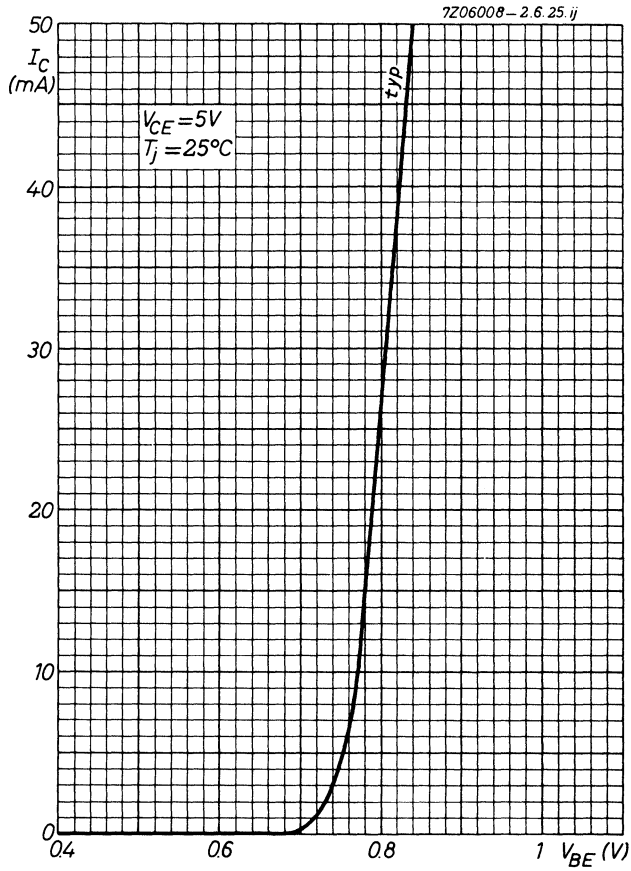


Fig. 7 $V_{CE} = 5 V$; $T_j = 25^\circ C$; typical values.

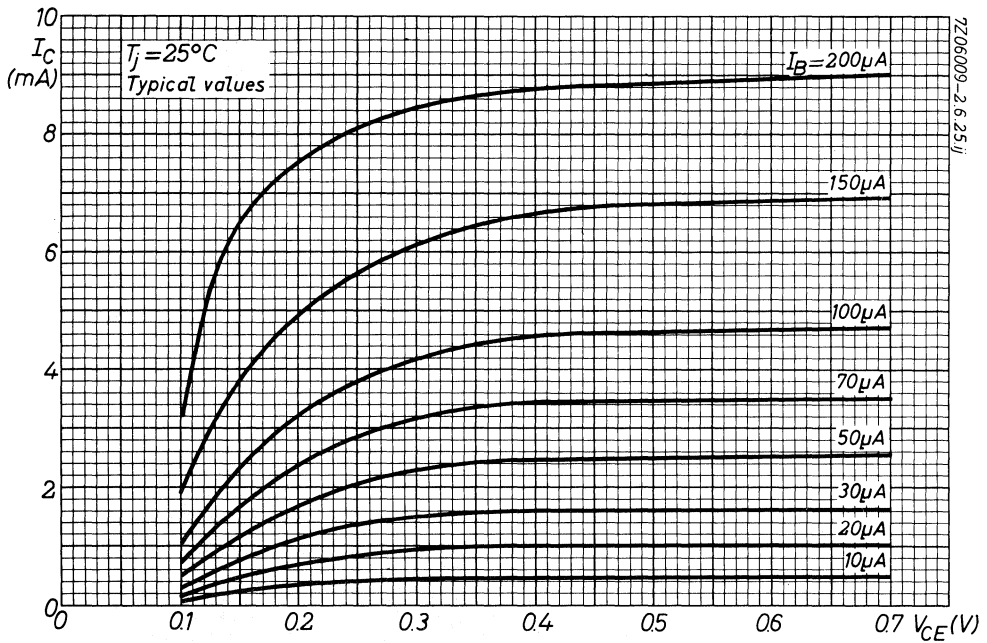


Fig. 8 $T_j = 25^\circ\text{C}$; typical values.

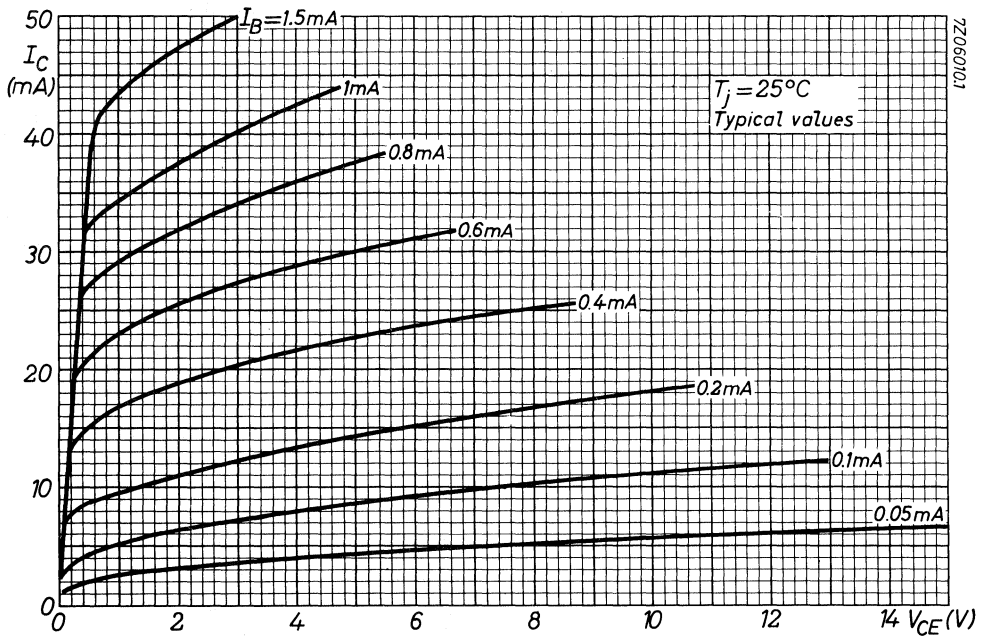


Fig. 9 $T_j = 25^\circ\text{C}$; typical values.

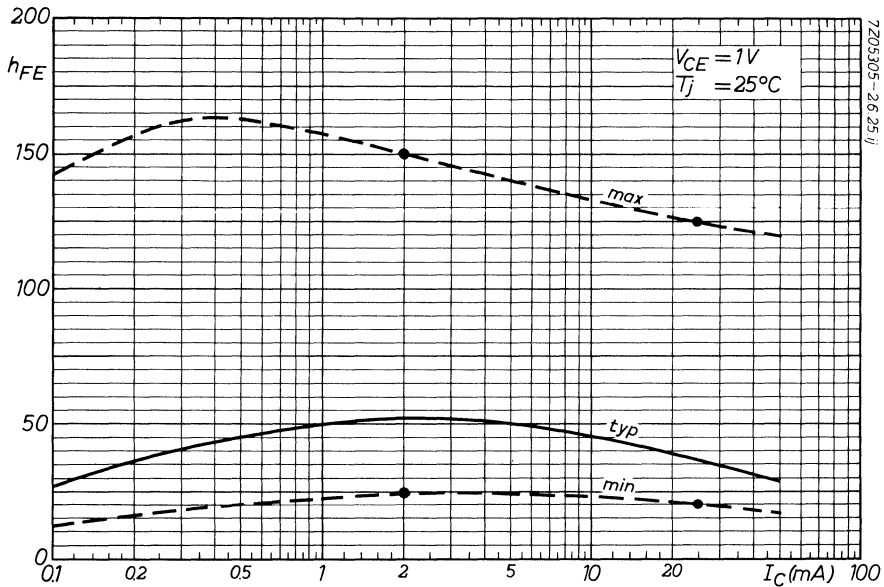


Fig. 10 $V_{CE} = 1V$; $T_j = 25^\circ C$.

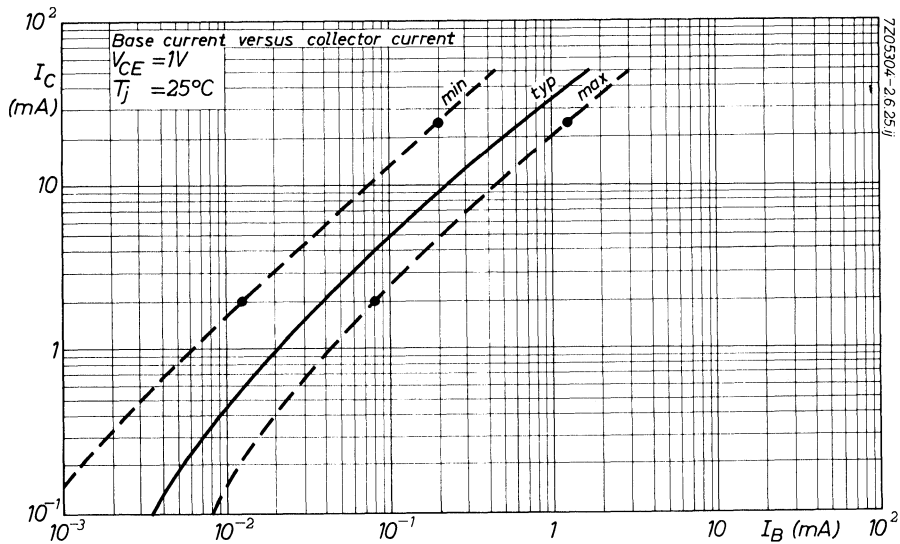


Fig. 11 $V_{CE} = 1V$; $T_j = 25^\circ C$.

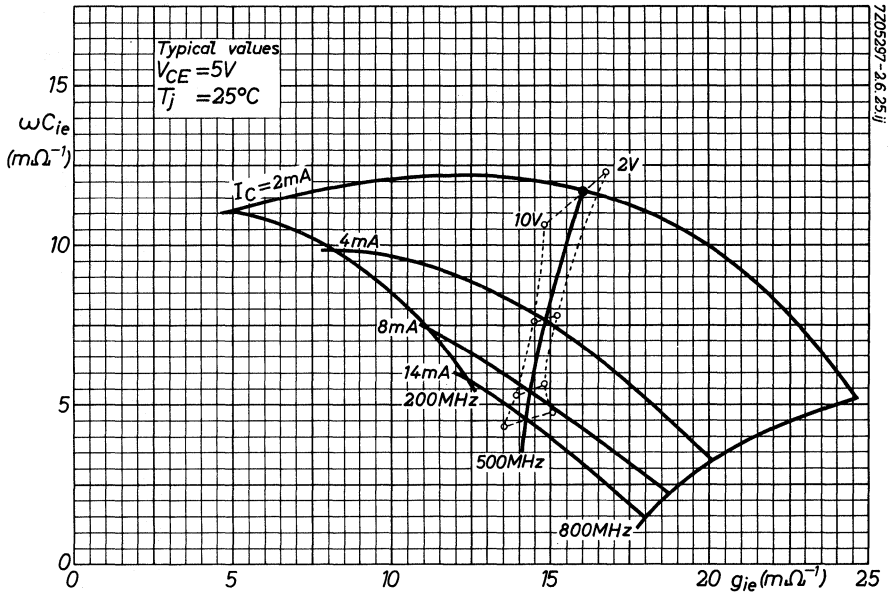


Fig. 12 $V_{CE} = 5 V$; $T_{amb} = 25^\circ C$; typical values.

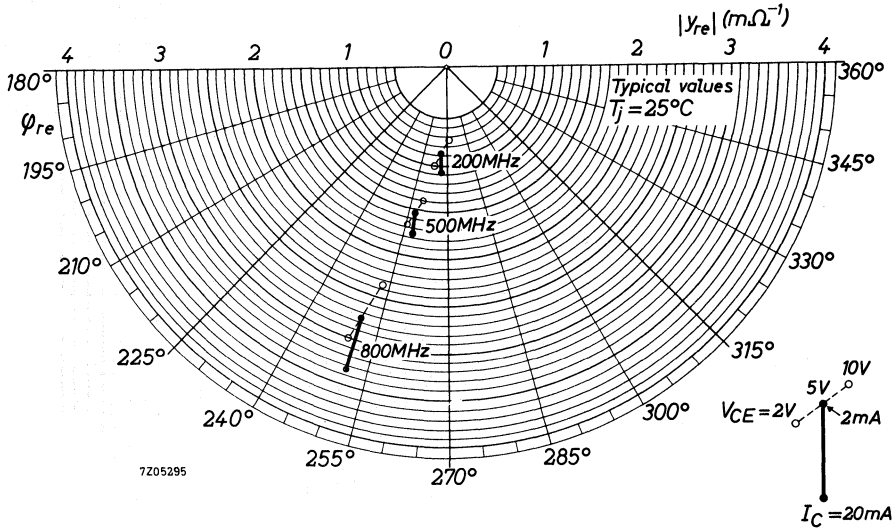


Fig. 13 $T_{amb} = 25^\circ C$; typical values.

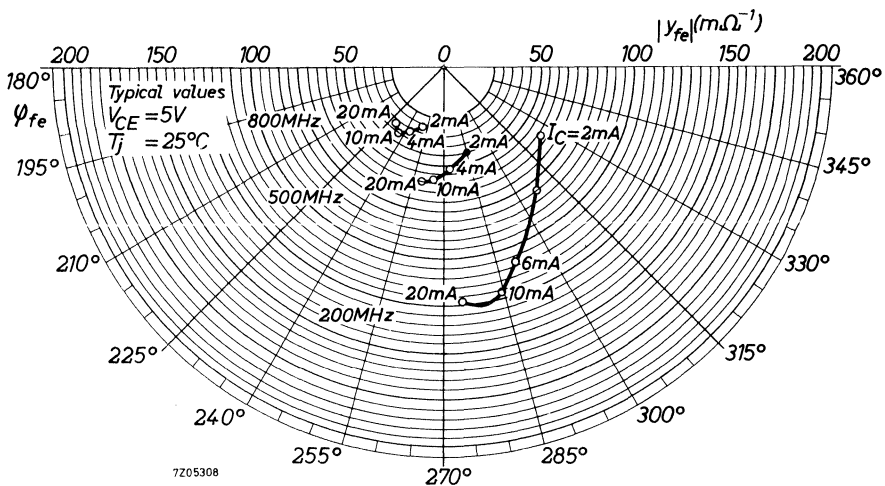


Fig. 14 $V_{CE} = 5V$; $T_{amb} = 25^\circ C$; typical values.

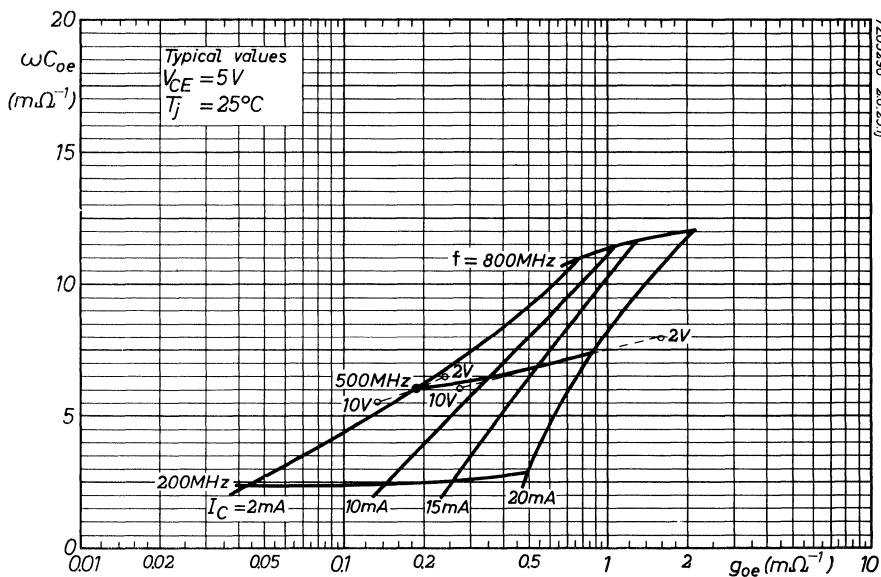


Fig. 15 $V_{CE} = 5V$; $T_{amb} = 25^\circ C$; typical values.

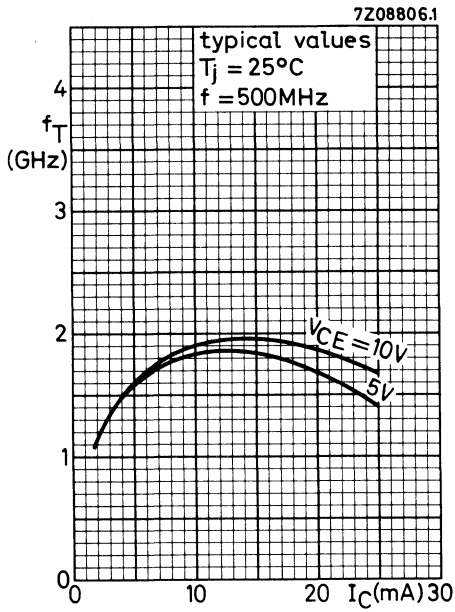


Fig. 16 $f = 500\text{ MHz}$; $T_j = 25^\circ\text{C}$;
 typical values.

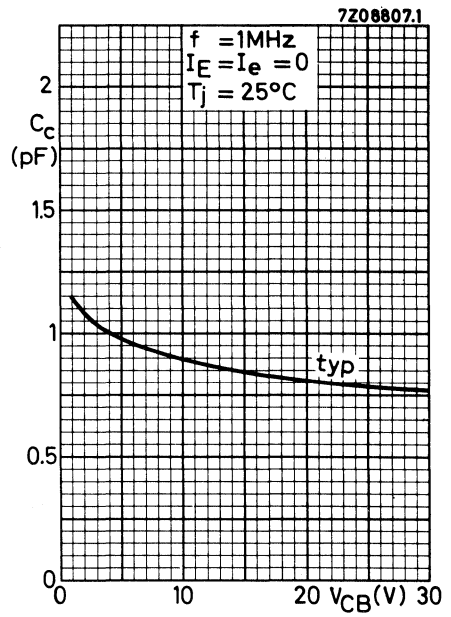


Fig. 17 $I_E = I_e = 0$; $f = 1\text{ MHz}$;
 $T_j = 25^\circ\text{C}$; typical values.

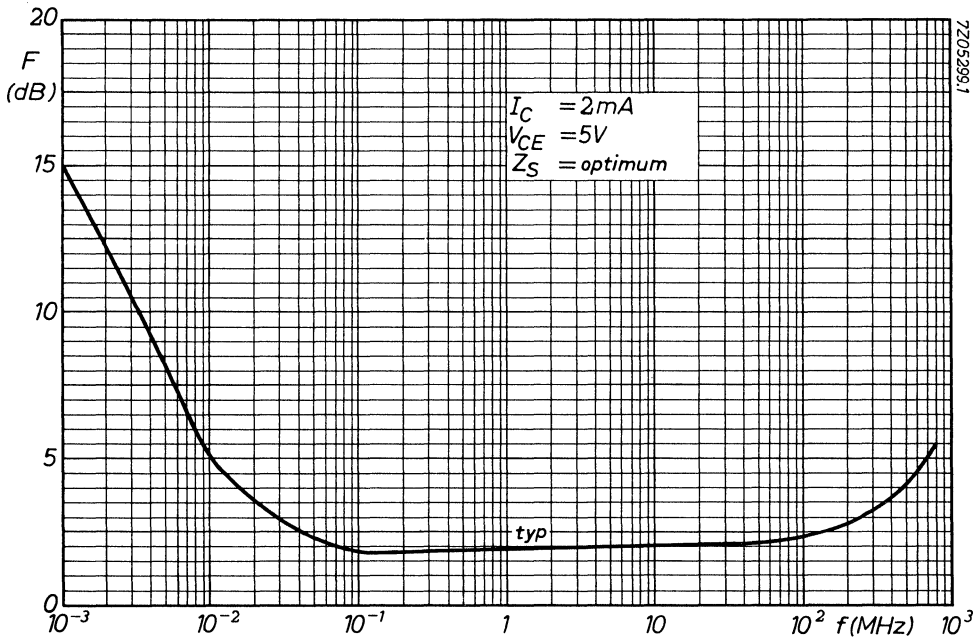


Fig. 18 $V_{CE} = 5\text{ V}$; $I_C = 2\text{ mA}$; $Z_S = \text{opt.}$; $T_{\text{amb}} = 25\text{ }^\circ\text{C}$; typical values.

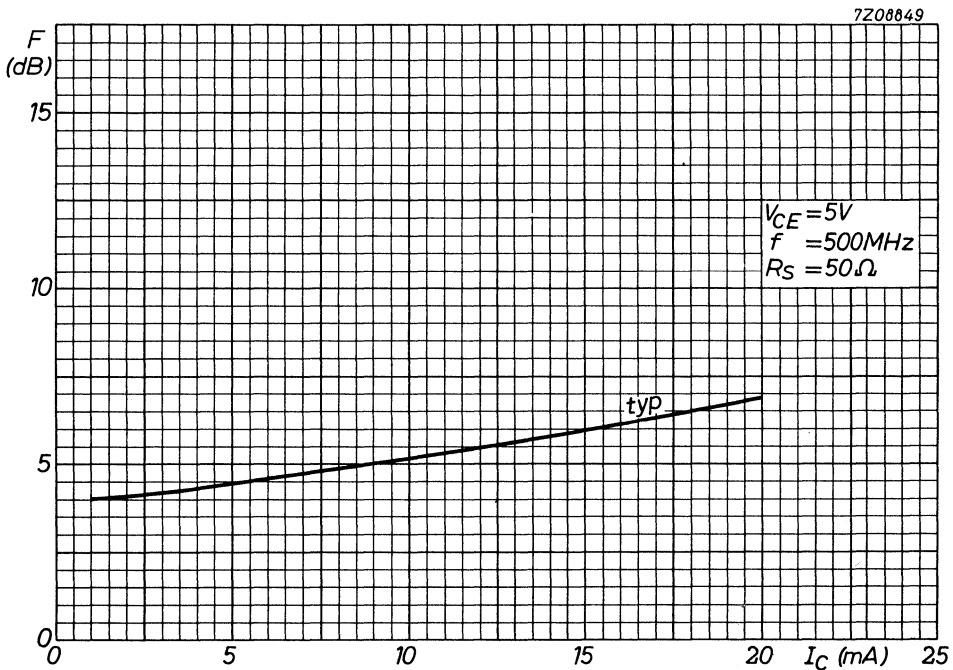


Fig. 19 $V_{CE} = 5\text{ V}$; $f = 500\text{ MHz}$; $Z_S = 50\ \Omega$; $T_{\text{amb}} = 25\text{ }^\circ\text{C}$; typical values.

N-P-N H.F. WIDEBAND TRANSISTOR

N-P-N transistor in TO-72 metal envelope with insulated electrodes and a shield lead connected to the case. The 2N918 is primarily intended for low power amplifiers and oscillators in the v.h.f. and u.h.f. ranges for industrial service.

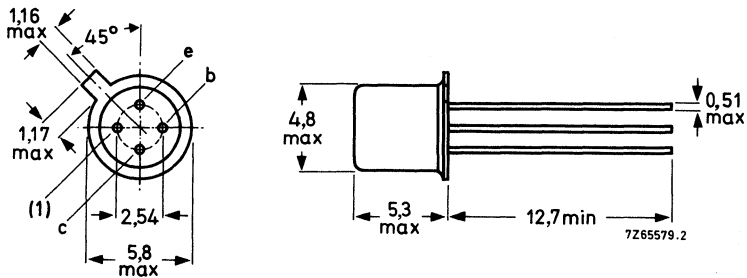
QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	30 V
Collector-emitter voltage (open base)	V_{CEO}	max.	15 V
Collector current (d.c.)	I_C	max.	50 mA
Total power dissipation up to $T_{amb} = 25^\circ\text{C}$	P_{tot}	max.	200 mW
Junction temperature	T_j	max.	200 $^\circ\text{C}$
Transition frequency $I_C = 6\text{ mA}; V_{CE} = 10\text{ V}$	f_T	min.	900 MHz
Maximum unilateralized power gain $I_C = 6\text{ mA}; V_{CE} = 12\text{ V}; f = 200\text{ MHz}$	G_{UM}	typ.	36 dB
Noise figure at $f = 60\text{ MHz}$ $I_C = 1\text{ mA}; V_{CE} = 6\text{ V}; Z_S = 400\ \Omega$	F	max.	6,0 dB

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-72.



(1) = shield lead (connected to case).

Accessories: 56246 (distance disc).

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CB0}	max.	30 V
→ Collector-emitter voltage (open base)	V_{CE0}	max.	15 V
Emitter-base voltage (open collector)	V_{EB0}	max.	3 V
Collector current (d.c.)	I_C	max.	50 mA
Total power dissipation up to $T_{amb} = 25\text{ }^{\circ}\text{C}$	P_{tot}	max.	200 mW
Storage temperature	T_{stg}		-65 to +200 $^{\circ}\text{C}$
Junction temperature	T_j	max.	200 $^{\circ}\text{C}$

THERMAL RESISTANCE

From junction to ambient in free air	R_{thj-a}	=	880 K/W
From junction to case	R_{thj-c}	=	580 K/W

CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified. All measurements taken with ungrounded shield lead.

Collector cut-off current

$$I_E = 0; V_{CB} = 15\text{ V}$$

$$I_{CBO} \quad \text{max.} \quad 10\text{ nA}$$

$$I_E = 0; V_{CB} = 15\text{ V}; T_j = 150\text{ }^\circ\text{C}$$

$$I_{CBO} \quad \text{max.} \quad 1\text{ }\mu\text{A}$$

Saturation voltages

$$I_C = 10\text{ mA}; I_B = 1\text{ mA}$$

$$V_{CEsat} \quad \text{max.} \quad 0,4\text{ V}$$

$$V_{BEsat} \quad \text{max.} \quad 1\text{ V}$$

D.C. current gain

$$I_C = 3\text{ mA}; V_{CE} = 1\text{ V}$$

$$h_{FE} \quad \text{min.} \quad 20$$

Collector capacitance at $f = 140\text{ kHz}$

$$I_E = I_e = 0; V_{CB} = 10\text{ V}$$

$$C_c \quad \text{max.} \quad 1,7\text{ pF}$$

$$I_E = I_e = 0; V_{CB} = 0$$

$$C_c \quad \text{max.} \quad 3,0\text{ pF}$$

Emitter capacitance at $f = 140\text{ kHz}$

$$I_C = I_c = 0; V_{EB} = 0,5\text{ V}$$

$$C_e \quad \text{max.} \quad 2,0\text{ pF}$$

Transition frequency

$$I_C = 6\text{ mA}; V_{CE} = 10\text{ V}^*$$

$$f_T \quad \text{min.} \quad 900\text{ MHz}$$

Noise figure at $f = 60\text{ MHz}$

$$I_C = 1\text{ mA}; V_{CE} = 6\text{ V}; Z_S = 400\text{ }\Omega; T_{amb} = 25\text{ }^\circ\text{C}$$

$$F \quad \text{max.} \quad 6,0\text{ dB} \quad \leftarrow$$

Oscillator power output at $f = 500\text{ MHz}$

$$-I_E = 8\text{ mA}; V_{CB} = 15\text{ V}; T_{amb} = 25\text{ }^\circ\text{C}$$

$$P_o \quad \text{min.} \quad 30\text{ mW} \quad \leftarrow$$

Maximum unilateralised power gain

$$G_{UM} = \frac{|y_{fe}|^2}{4g_{ie}g_{oe}}$$

$$I_C = 6\text{ mA}; V_{CE} = 12\text{ V}; f = 200\text{ MHz}; T_{amb} = 25\text{ }^\circ\text{C}$$

$$G_{UM} \quad \text{typ.} \quad 36\text{ dB} \quad \leftarrow$$

* JEDEC registration: $I_C = 4\text{ mA}; V_{CE} = 10\text{ V}, f_T > 600\text{ MHz}$.

→ **CHARACTERISTICS** (continued)

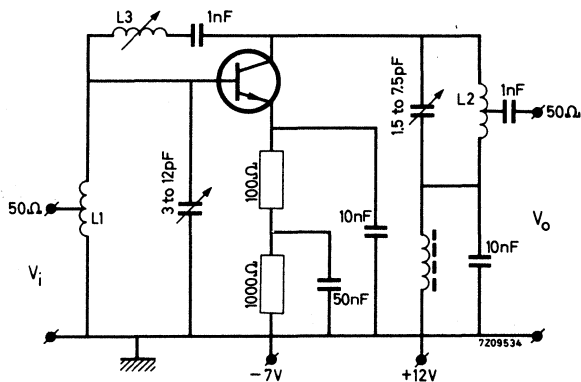
Available power gain at $f = 200 \text{ MHz}$

→ $I_C = 6 \text{ mA}$; $V_{CE} = 12 \text{ V}$; $T_{amb} = 25 \text{ }^\circ\text{C}$

G_p min. 15 dB

Basic circuit for measuring the available neutralised power gain (Fig. 2)

Grounded shield lead



L1 = 3,5 turns tinned Cu wire, 1,3 mm
d = 8 mm; length = 11 mm

Tap at ≈ 2 turns from earth side

L2 = 8 turns tinned Cu wire, 1,3 mm
d = 3 mm; length = 22 mm

Tap at 1 turn from earth side

L3 = 0,4 to 0,65 μH

DEVICE DATA

CATV amplifier modules

SELECTION GUIDE

type number	frequency range MHz	power gain (dB) at $f = 50$ MHz	application	page
BGY61	5 - 200	$13,0 \pm 0,5$	reverse amplifiers	631
BGY65		$18,5 \pm 0,5$		635
BGY67		$22,0 \pm 0,5$		639
BGY67A		$24,0 \pm 0,5$		643
BGY50	40 - 300	$12,5 \pm 0,4$	preamplifier	599
BGY51			post amplifier	599
BGY52	40 - 300	$16,4 \pm 0,4$	preamplifier	603
BGY53			post amplifier	603
BGY54	40 - 300	$17,0 \pm 0,4$	preamplifier	607
BGY55			post amplifier	607
BGY56	40 - 300	$22,0 \pm 0,6$	preamplifier	611
BGY57			post amplifier	611
BGY58	40 - 300	$33,0 \pm 1,0$	line extender	615
BGY58A	40 - 330	$34,0 \pm 1,0$	line extender	619
BGY59	40 - 300	$38,5 \pm 1,0$	line extender	623
BGY60	40 - 300	$33,5 \pm 1,0$	interstage amplifier (2 x 17 dB)	627
BGD102	40 - 450	$18,5 \pm 0,5$	power doubler	583
BGD104		$20,0 \pm 0,5$	amplifiers	583
BGD102E	40 - 450	$18,5 \pm 0,5$	power doubler	587
BGD104E		$20,0 \pm 0,5$	amplifiers	587
BGY70	40 - 450	$12,5 \pm 0,4$	preamplifier	647
BGY71			post amplifier	647
BGY74	40 - 450	$17,0 \pm 0,4$	preamplifier	651
BGY75			post amplifier	651
BGY78	40 - 450	$34,0 \pm 1,0$	line extender	655
BGY84	40 - 450	$17,0 \pm 0,5$	preamplifier	659
BGY85			post amplifier	659
BGY84A	40 - 450	$18,4 \pm 0,4$	preamplifier	663
BGY85A			post amplifier	663
BGY86	40 - 450	$22,0 \pm 0,5$	preamplifier	667
BGY87			post amplifier	667
BGY88	40 - 450	$34,5 \pm 1,0$	line extender	671
BGY584A	40 - 550	$18,2 \pm 0,5$	preamplifier	675
BGY585A			post amplifier	675
BGY586	40 - 550	$22,0 \pm 0,5$	preamplifier	679
BGY587			post amplifier	679
BGD502	40 - 550	$18,5 \pm 0,5$	power doubler	591
BGD504		$20,0 \pm 0,5$	power doubler	591
BGX885	40 - 860	$17,0 \pm 0,5$	40 - 860 MHz amplifier	595

All modules normally operate at $V_B = 24$ V, but are able to withstand supply transients up to 30 V.

CATV POWER-DOUBLER AMPLIFIER MODULES

Power-doubler amplifier modules for CATV systems operating at frequencies up to 450 MHz.

BGD102: 18,5 dB gain;

BGD104: 20,0 dB gain.

Features:

- excellent linearity;
- high output level;
- optimal reliability ensured by TiPtAu metallized crystals, silicon nitride passivation and rugged construction.

QUICK REFERENCE DATA

		BGD102	BGD104
Frequency range	f	40 to 450	40 to 450 MHz
Source impedance and load impedance	$Z_S=Z_L$	= 75	75 Ω
Power gain at f = 50 MHz	G _p	18,5 ±0,5	20,0 ±0,5 dB
Slope cable equivalent f = 40 MHz to 450 MHz	SL	0,5 to 2,5	0,5 to 2,5 dB
Flatness of frequency response f = 40 MHz to 450 MHz	FL	max. ±0,3	±0,3 dB
Return losses at input and output f = 40 MHz to 450 MHz	S ₁₁₋₂₂	min. 18	18 dB
2nd order distortion V _o = 46 dBmV	d ₂	max. -73	-73 dB
Composite triple beat; 60 channels V _o = 46 dBmV	CTB	max. -65	-64 dB
Cross modulation V _o = 46 dBmV at 60 channels	X _{mod}	max. -67	-66 dB
Noise figure f = 40 MHz to 450 MHz	F	max. 7	7 dB
D.C. supply voltage	+V _B	= 24	24 V*
Total d.c. current consumption at V _B = +24 V	I _{tot}	max. 435	435 mA

MECHANICAL DATA

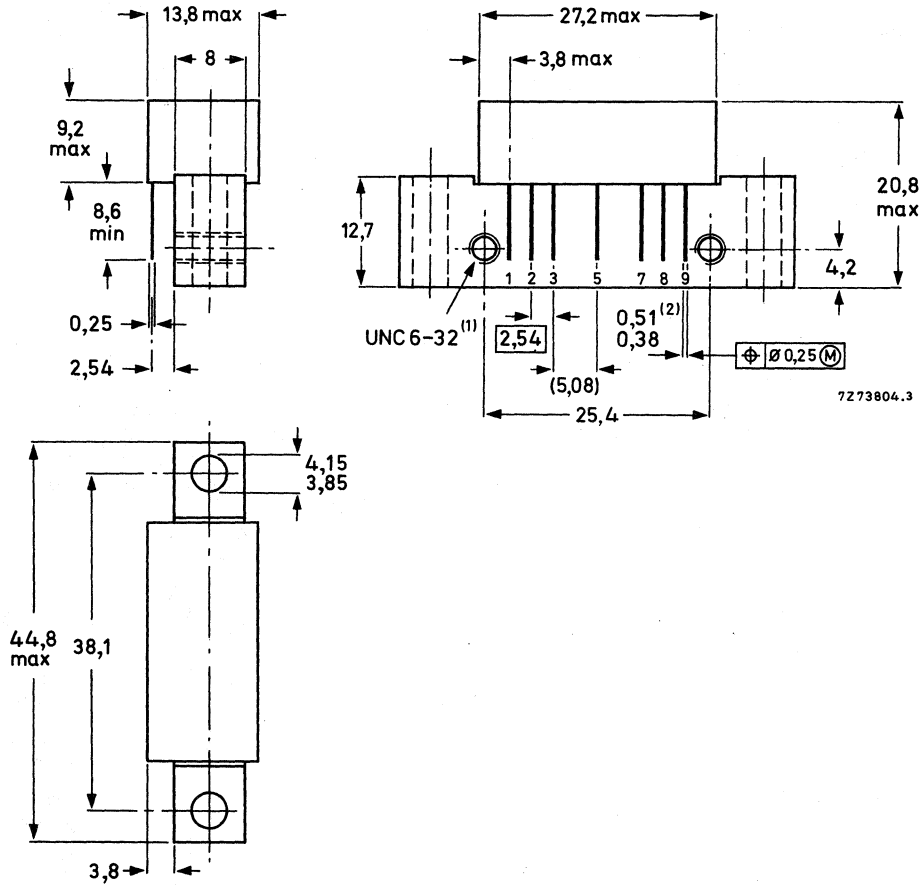
SOT-115 (see Fig. 1).

* The modules normally operate at V_B = 24 V, but are able to withstand supply transients up to 30 V.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-115.



(1) Screw 6-32UNC-2A available upon request (see "Accessories")

(2) Gold-plated leads.

→ See "Mounting and Soldering Recommendations".

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

R. F. input voltage	V_i	max. 65 dBmV
Storage temperature	T_{stg}	-40 to +100 °C
Operating mounting base temperature	T_{mb}	-20 to +100 °C

CHARACTERISTICSSupply voltage $V_B = +24$ V; $T_{mb} = 35$ °C

		BGD102	BGD104
Power gain at $f = 50$ MHz	G_p	18,5 ±0,5	20,0 ±0,5 dB
Power gain at $f = 450$ MHz	G_p	19,2–21,2	20,5–22,5 dB
Slope cable equivalent $f = 40$ MHz to 450 MHz	SL	0,5 to 2,5	0,5 to 2,5 dB
Flatness of frequency response $f = 40$ MHz to 450 MHz	FL	max. ±0,3	±0,3 dB
Return losses at input and output $Z_S = Z_L = 75 \Omega$; $f = 40$ MHz to 450 MHz	S_{11-22}	min. 18	18 dB
2nd order distortion $V_O = 46$ dBmV; channel 2 $V_O = 46$ dBmV; channel H5 Measured at channel H14	d_2	max. -73	-73 dB
Composite triple beat at 60 channels $V_O = 46$ dBmV; tested in channel H22	CTB	max. -65	-64 dB
Cross modulation at 60 channels $V_O = 46$ dBmV; tested in channel 2	X_{mod}	max. -67	-66 dB
Noise figure $f = 40$ MHz to 450 MHz	F	max. 7	7 dB
Total d.c. current consumption	I_{tot}	max. 435	435 mA

CATV POWER-DOUBLER AMPLIFIER MODULES

Power-doubler amplifier modules for CATV systems operating at frequencies up to 450 MHz.

BGD102E: 18,5 dB gain;

BGD104E: 20,0 dB gain.

Features:

- excellent linearity;
- high output level;
- optimal reliability ensured by TiPtAu metallized crystals, silicon nitride passivation and rugged construction.

QUICK REFERENCE DATA

		BGD102E	BGD104E
Frequency range	f	40 to 450	40 to 450 MHz
Source impedance and load impedance	$Z_S=Z_L$	= 75	75 Ω
Power gain at f = 50 MHz	G _p	18,5 ±0,5	20,0 ±0,5 dB
Slope cable equivalent f = 40 MHz to 450 MHz	SL	0,5 to 2,0	0,5 to 2,0 dB ←
Flatness of frequency response f = 40 MHz to 450 MHz	FL	max. ±0,3	±0,3 dB
Return losses at input and output at f = 40 MHz	S ₁₁₋₂₂	min. 20	20 dB
at f = 450 MHz		max. 18	18 dB
Output voltage at d _{im} = -60 dB f(p+q-r) = 438,25 MHz (DIN 45004B, par.6.3: 3-tone)	V _o	min. 65,0	64,5 dBmV
2nd order distortion V _o = 46 dBmV	d ₂	max. -73	-73 dB
Noise figure f = 40 MHz to 450 MHz	F	max. 7	7 dB
D.C. supply voltage	+V _B	= 24	24 V*
Total d.c. current consumption at V _B = +24 V	I _{tot}	max. 435	435 mA

MECHANICAL DATA

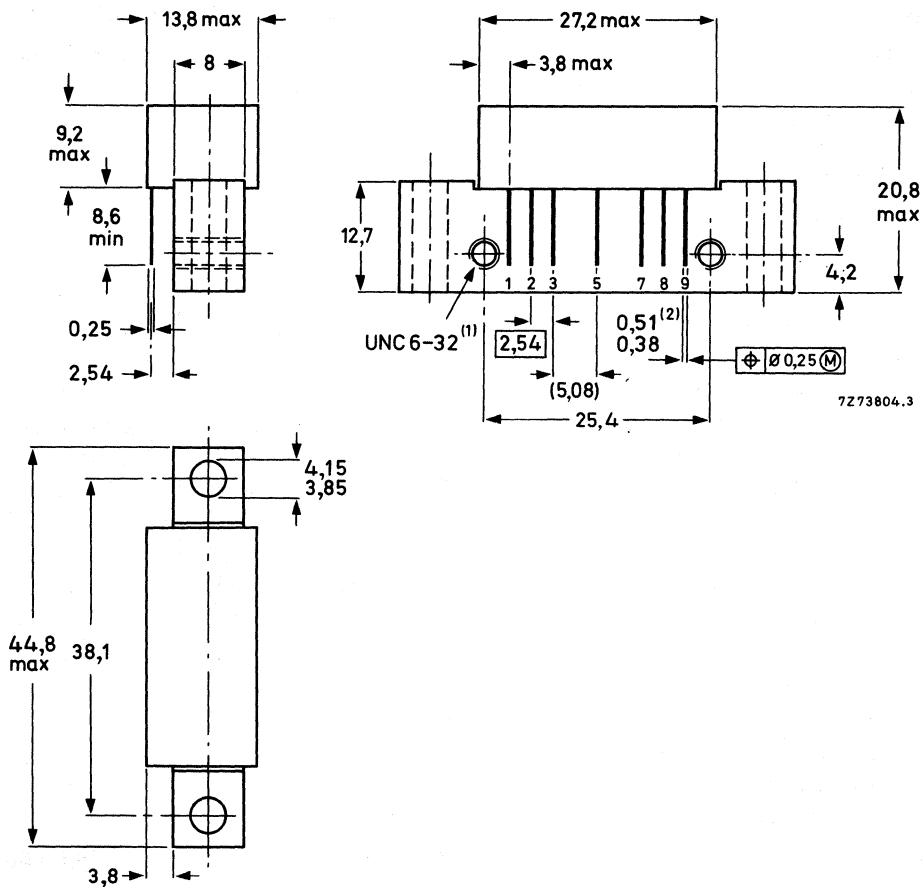
SOT-115 (see Fig. 1).

* The modules normally operate at V_B = 24 V, but are able to withstand supply transients up to 30 V.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-115.



- (1) Screw 6-32UNC-2A available upon request (see "Accessories").
(2) Gold-plated leads.

→ See "Mounting and Soldering Recommendations"

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

R.F. input voltage	V_i	max.	65 dBmV
Storage temperature	T_{stg}		-40 to +100 °C
Operating mounting base temperature	T_{mb}		-20 to +100 °C

CHARACTERISTICS

Supply voltage $V_B = +24\text{ V}$; $T_{mb} = 35\text{ °C}$

		BGD102E	BGD104E
Power gain at $f = 50\text{ MHz}$	G_p	18,5 ±0,5	20,0 ±0,5 dB
Power gain at $f = 450\text{ MHz}$	G_p	19,2–21,2	20,5–22,5 dB
Slope cable equivalent $f = 40\text{ MHz to } 450\text{ MHz}$	SL	0,5 to 2,0	0,5 to 2,0 dB ←
Flatness of frequency response $f = 40\text{ MHz to } 450\text{ MHz}$	FL	max. ±0,3	±0,3 dB
Return losses at input and output at $Z_S = Z_L = 75\ \Omega$;			
$f = 40\text{ MHz to } 80\text{ MHz}$	S_{11-22} min.	20	20 dB
$f = 80\text{ MHz to } 160\text{ MHz}$	S_{11-22} min.	19	19 dB
$f = 160\text{ MHz to } 450\text{ MHz}$	S_{11-22} min.	18	18 dB
Output voltage at $d_{im} = -60\text{ dB}$ (DIN 45004B,6.3: 3-tone)			
$V_p = V_o$; $f_p = 440,25\text{ MHz}$			
$V_q = V_o - 6\text{ dB}$; $f_q = 447,25\text{ MHz}$			
$V_r = V_o - 6\text{ dB}$; $f_r = 449,25\text{ MHz}$			
Measured at $f_{(p+q+r)} = 438,25\text{ MHz}$	V_o min.	65,0	64,5 dBmV
2nd order distortion $V_o = 46\text{ dBmV}$; channel 2 $V_o = 46\text{ dBmV}$; channel H5 Measured at channel H14	d_2 max.	-73	-73 dB
Composite triple beat at 60 channels $V_o = 46\text{ dBmV}$; tested in channel H22	CTB max.	-65	-64 dB ←
Cross modulation at 60 channels $V_o = 46\text{ dBmV}$; tested in channel 2	X_{mod} max.	-67	-66 dB
Noise figure $f = 40\text{ MHz to } 450\text{ MHz}$	F max.	7	7 dB
Total d.c. current consumption	I_{tot} max.	435	435 mA

DEVELOPMENT DATA

This data sheet contains advance information and specifications are subject to change without notice.

BGD502
BGD504

CATV POWER-DOUBLER AMPLIFIER MODULES

Hybrid amplifier modules for use in CATV systems and operating at frequencies up to 550 MHz.

BGD502: 18,5 dB gain

BGD504: 20,0 dB gain

Features

- excellent linearity
- extremely low noise
- optimal reliability ensured by TiPtAu metallized crystals, silicon nitride glass barrier and rugged construction

QUICK REFERENCE DATA

			BGD502	BGD504	
Frequency range	f		40 to 550	40 to 550 MHz	
Source impedance and load impedance	$Z_S = Z_L$	=	75	75 Ω	
Power gain at f = 50 MHz	G_p		18,5 \pm 0,5	20,0 \pm 0,5 dB	
Slope cable equivalent f = 40 MHz to 550 MHz	SL		0,2 to 2,2	0,0 to 2,0 dB	←
Flatness of frequency response f = 40 MHz to 550 MHz	FL	max.	\pm 0,3	\pm 0,3 dB	
Return losses at input and output f = 40 MHz to 550 MHz	S_{11-22}	min.	18	18 dB	
Output voltage at $d_{im} = -60$ dB (DIN 45004B, par. 6.3: 3-tone)	V_o	min.	64	63,5 dBmV	
2nd-order distortion $V_o = 44$ dBmV	d_2	max.	-72	-70 dB	
Composite triple beat; 77 channels $V_o = 44$ dBmV	CTB	max.	-65	-64 dB	←
Cross modulation $V_o = 44$ dBmV	X_{mod}	max.	-68	-67 dB	
Noise figure f = 550 MHz	F	max.	8,0	8,0 dB	
D.C. supply voltage*	$+V_B$	=	24	24 V*	
Total d.c. current consumption at $V_B = +24$ V	I_{tot}	max.	435	435 mA	
Operating mounting base temperature	T_{mb}		-20 to + 100	$^{\circ}C$	

MECHANICAL DATA

SOT-115 (see Fig. 1).

* The modules normally operate at $V_B = 24$ V, but are able to withstand supply transients up to 30 V.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

R.F. input voltage	V_i	max.	60 dBmV
Storage temperature	T_{stg}		-40 to + 100 °C
Operating mounting base temperature	T_{mb}		-20 to + 100 °C

CHARACTERISTICS

Supply voltage $V_B = + 24 V$; $Z_S = Z_L = 75 \Omega$; $T_{mb} = 35 \text{ }^\circ\text{C}$

DEVELOPMENT DATA

		BGD502	BGD504
Power gain at $f = 50 \text{ MHz}$	G_p	$18,5 \pm 0,5$	$20,0 \pm 0,5 \text{ dB}$
Power gain at $f = 550 \text{ MHz}$	G_p	18,8-20,8	20,2-22,2 dB
Slope cable equivalent $f = 40 \text{ MHz to } 550 \text{ MHz}$	SL	0,2 to 2,2	0,0 to 2,0 dB ←
Flatness of frequency response $f = 40 \text{ MHz to } 550 \text{ MHz}$	FL	max. $\pm 0,3$	$\pm 0,3 \text{ dB}$
Return losses at input and output $Z_S = Z_L = 75 \Omega$			
$f = 40 \text{ to } 80 \text{ MHz}$	S_{11-22}	min. 20	20 dB
$f = 80 \text{ to } 160 \text{ MHz}$		min. 19	19 dB
$f = 160 \text{ MHz to } 550 \text{ MHz}$		min. 18	18 dB
Output voltage at $d_{im} = -60 \text{ dB}$ (DIN 45004B; par. 6.3: 3-tone) $V_p = V_o$; $f_p = 540,25 \text{ MHz}$ $V_q = V_o - 6 \text{ dB}$; $f_q = 547,25 \text{ MHz}$ $V_r = V_o - 6 \text{ dB}$; $f_r = 549,25 \text{ MHz}$ Tested at $f_{(p+q-r)} = 538,25 \text{ MHz}$	V_o	min. 64	63,5 dBmV
2nd-order distortion $V_p = 44 \text{ dBmV}$; $f_p = 55,25 \text{ MHz (ch. 2)}$ $V_q = 44 \text{ dBmV}$; $f_q = 493,25 \text{ MHz (ch. 18)}$ Measured at $f_{(p+q)} = 548,5 \text{ MHz (ch. 27)}$	d_2	max. -72	-70 dB
Composite triple beat at 77 channels $V_o = 44 \text{ dBmV}$; tested at channel 27	CTB	max. -65	-64 dB
Cross modulation at 77 channels $V_o = 44 \text{ dBmV}$; tested in channel 2	X_{mod}	max. -68	-67 dB
Noise figure $f = 550 \text{ MHz}$	F	max. 8,0	8,0 dB
Total d.c. current consumption	I_{tot}	typ. 415 max. 435	415 mA 435 mA

DEVELOPMENT DATA

This data sheet contains advance information and specifications are subject to change without notice.

BGX885

CATV AMPLIFIER MODULE

Hybrid amplifier module for application in CATV/MATV amplifier systems operating at frequencies from 40 MHz up to 860 MHz.

Features:

- excellent linearity
- extremely low noise
- optimum reliability ensured by TiPtAu metallized crystals, silicon nitride glass barrier and rugged construction

QUICK REFERENCE DATA

Frequency range	f	40 to 860 MHz
Source impedance and load impedance	$Z_S = Z_L$	75 Ω
Power gain at f = 50 MHz	G_p	$17 \pm 0,5$ dB
Slope cable equivalent f = 40 MHz to 860 MHz	SL	0,2 to 1,2 dB ←
Flatness of frequency response f = 40 MHz to 860 MHz	FL	max. $\pm 0,3$ dB
Return losses at input and output f = 40 MHz (decrease 1,5 dB/octave)	S_{11-22}	min. 20 dB
Output voltage at $d_{im} = 60$ dB (DIN 45004, par. 6.3: 3-tone) $f_{(p+q-r)} = 339,25$ MHz $f_{(p+q-r)} = 849,25$ MHz	V_o	min. 61 dBmV min. 59 dBmV
2nd order distortion $f_{(p+q)} = 750$ MHz	d_2	max. -51 dB
Noise figures f = 350 MHz f = 860 MHz	F	max. 7,5 dB max. 8,0 dB
D.C. supply voltage	+ V_B	= 24 V*
Total d.c. current consumption $V_B = + 24$ V	I_{tot}	typ. 240 mA
Operating case temperature	T_c	-20 to 100 $^{\circ}C$

MECHANICAL DATA

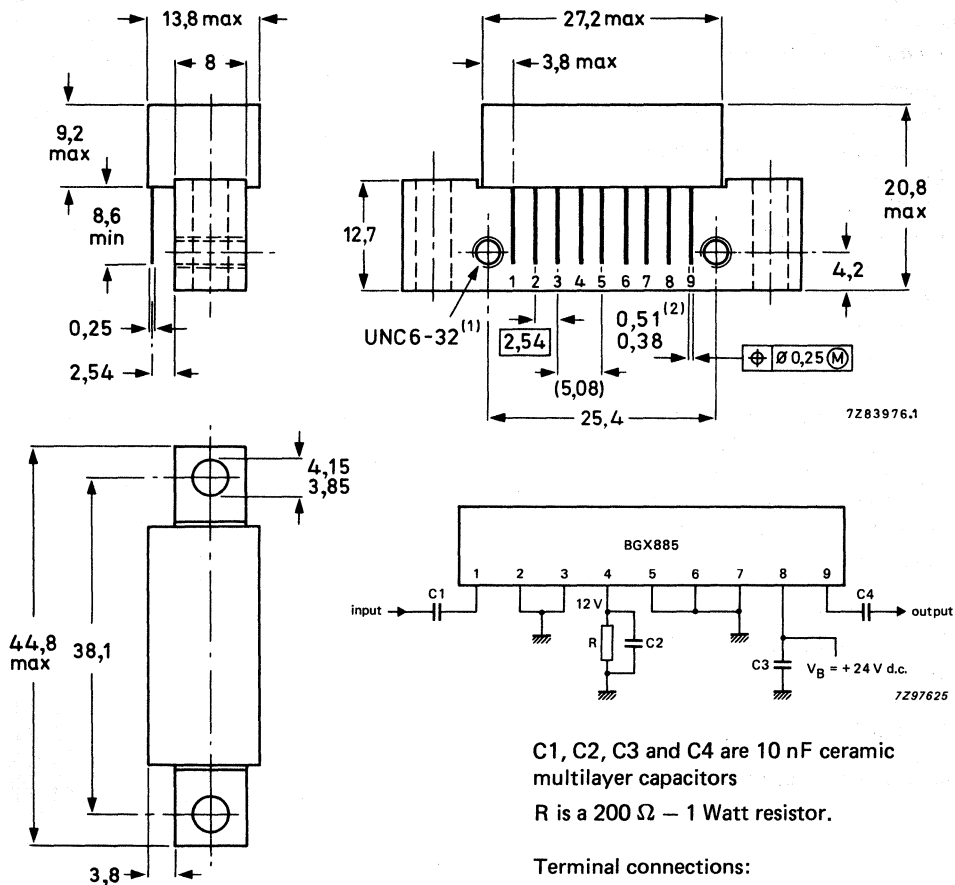
SOT-115 (see Fig. 1).

* The module normally operates at $V_B = 24$ V, but is able to withstand incidental supply transients up to 30 V.

MECHANICAL DATA

Fig. 1 SOT-115.

Dimensions in mm



(1) Screw 6-32UNC-2A available upon request.

See "Mounting and Soldering Recommendations".

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

R.F. input voltage	V_i	max.	60 dBmV
Storage temperature	T_{stg}	-40 to + 100 °C	
Operating case temperature	T_c	-20 to + 100 °C	

CHARACTERISTICS

Supply voltage $V_B = +24\text{ V}$; $Z_S = Z_L = 75\ \Omega$; $T_c = 30\ ^\circ\text{C}$

Power gain at $f = 50\text{ MHz}$

G_p $17 \pm 0,5\text{ dB}$

Slope cable equivalent

$f = 40\text{ MHz to }860\text{ MHz}$

SL $0,2\text{ to }1,2\text{ dB}$ ←

Flatness of frequency response

$f = 40\text{ MHz to }860\text{ MHz}$

FL $\text{max. } \pm 0,3\text{ dB}$

Return losses at input and output

$Z_S = Z_L = 75\ \Omega$

$f = 40\text{ MHz}$

Decrease per octave *

S_{11-22} $\text{min. } 20\text{ dB}$
 $1,5\text{ dB}$

Voltage output at $d_{im} = -60\text{ dB}$

(DIN 45004B, par. 6.3: 3-tone)

$V_p = V_o$; $f_p = 341,25\text{ MHz}$

$V_q = V_p - 6\text{ dB}$; $f_q = 348,25\text{ MHz}$

$V_r = V_p - 6\text{ dB}$; $f_r = 350,25\text{ MHz}$

Measured at $f_{(p+q-r)} = 339,25\text{ MHz}$

V_o $\text{min. } -61\text{ dBmV}$

$V_p = V_o$; $f_p = 851,25\text{ MHz}$

$V_q = V_p - 6\text{ dB}$; $f_q = 858,25\text{ MHz}$

$V_r = V_p - 6\text{ dB}$; $f_r = 860,25\text{ MHz}$

Measured at $f_{(p+q-r)} = 849,25\text{ MHz}$

V_o $\text{min. } 59\text{ dBmV}$

Second harmonic distortion

$V_p = 59\text{ dBmV}$ at $f_p = 350\text{ MHz}$

$V_q = 59\text{ dBmV}$ at $f_q = 400\text{ MHz}$

Measured at $f_{(p+q)} = 750\text{ MHz}$

d_2 $\text{max. } -51\text{ dB}$

Noise figures

$f = 350\text{ MHz}$

$f = 860\text{ MHz}$

F $\text{max. } 7,5\text{ dB}$
 $\text{max. } 8,0\text{ dB}$

Total d.c. current consumption

I_{tot} $\text{typ. } 220\text{ mA}$
 $\text{max. } 240\text{ mA}$

DEVELOPMENT DATA

* S_{11-22} has a minimum of 10 dB at f between 800 MHz and 860 MHz.

HYBRID V.H.F. PUSH-PULL AMPLIFIER MODULES

Hybrid amplifier modules intended for CATV systems.

QUICK REFERENCE DATA

		BGY50	BGY51	
Frequency range	f	40 to 300	40 to 300	MHz
Source impedance and load impedance	$Z_S = Z_L =$	75	75	Ω
Power gain at f = 50 MHz	G_p	$12,5 \pm 0,4$	$12,5 \pm 0,4$	dB
Slope cable equivalent f = 40 MHz to 300 MHz	SL	+0,2 to +0,8	+0,2 to +0,8	dB
Flatness of frequency response f = 40 MHz to 300 MHz	FL	max. $\pm 0,2$	$\pm 0,2$	dB
Return losses at input and output f = 40 MHz to 300 MHz	S_{11-22}	min. 20	20	dB ←
Output voltage at $d_{im} = -60$ dB (DIN 45004, par. 6.3: 3-tone)	V_o	min. 61	63,5	dBmV
2nd harmonic distortion at $V_o = 50$ dBmV	d_2	max. -71	-73	dB ←
Noise figure f = 40 MHz to 300 MHz	F	max. 7	8	dB
D.C. supply voltage	$+V_B =$	24	24	V *
Total d.c. current consumption at $V_B = +24$ V	I_{tot}	typ. 160	200	mA
Operating mounting base temperature	T_{mb}	-20 to +90	-20 to +90	$^{\circ}C$

MECHANICAL DATA

SOT-115 (see Fig. 1).

* The modules are able to withstand incidental short peaks in the supply voltage up to a maximum of 30 V.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

R.F. input voltage	V_i	max.	67 dBmV
Storage temperature	T_{stg}	-40 to +100 °C	
Operating mounting base temperature	T_{mb}	-20 to +90 °C	

CHARACTERISTICS

Supply voltage $V_B = +24\text{ V}$; $T_{amb} = 25\text{ °C}$

		BGY50	BGY51	
Power gain at $f = 50\text{ MHz}$	G_p	$12,5 \pm 0,4$	$12,5 \pm 0,4$	dB
Slope cable equivalent $f = 40\text{ MHz to }300\text{ MHz}$	SL	$+0,2\text{ to }+0,8$	$+0,2\text{ to }+0,8$	dB
Flatness of frequency response $f = 40\text{ MHz to }300\text{ MHz}$	FL	max. $\pm 0,2$	$\pm 0,2$	dB
Return losses at input and output $Z_S = Z_L = 75\ \Omega$; $f = 40\text{ MHz to }300\text{ MHz}$	S_{11-22}	min. 20	20	dB ←
Output voltage at $d_{im} = -60\text{ dB}$ (DIN 45004, par. 6.3: 3-tone)				
$V_p = V_o$; $f_p = 287,25\text{ MHz}$				
$V_q = V_o - 6\text{ dB}$; $f_q = 294,25\text{ MHz}$				
$V_r = V_o - 6\text{ dB}$; $f_r = 296,25\text{ MHz}$				
Measured at $f_{(p+q-r)} = 285,25\text{ MHz}$	V_o	min. 61	63,5	dBmV
2nd harmonic distortion				
$V_p = V_o = 50\text{ dBmV}$; $f_p = 55,25\text{ MHz}$				
$V_q = V_o = 50\text{ dBmV}$; $f_q = 211,25\text{ MHz}$				
Measured at $f_{(p+q)} = 266,5\text{ MHz}$	d_2	max. -71	-73	dB ←
Noise figure $f = 40\text{ MHz to }300\text{ MHz}$	F	max. 7	8	dB
Total d.c. current consumption	I_{tot}	typ. 160 max. 180	200 220	mA

HYBRID V.H.F. PUSH-PULL AMPLIFIER MODULES

Hybrid amplifier modules intended for CATV systems.

QUICK REFERENCE DATA

		BGY52	BGY53	
Frequency range	f	40 to 300	40 to 300	MHz
Source impedance and load impedance	$Z_S = Z_L =$	75	75	Ω
Power gain at f = 50 MHz	G_p	$16,4 \pm 0,4$	$16,4 \pm 0,4$	dB
Slope cable equivalent f = 40 MHz to 300 MHz	SL	0 to + 1,0	0 to + 1,0	dB
Flatness of frequency response f = 40 MHz to 300 MHz	FL	max. $\pm 0,1$	$\pm 0,1$	dB ←
Return losses at input and output f = 40 MHz to 300 MHz	S_{11-22}	min. 20	20	dB ←
Output voltage at $d_{im} = -60$ dB (DIN 45004, par. 6.3: 3-tone)	V_o	min. 61	63,5	dBmV
2nd harmonic distortion at $V_o = 50$ dBmV	d_2	max. -71	-73	dB ←
Noise figure f = 40 MHz to 300 MHz	F	max. 6	7	dB
D.C. supply voltage	$+V_B =$	24	24	V *
Total d.c. current consumption at $V_B = + 24$ V	I_{tot}	typ. 160	200	mA
Operating mounting base temperature	T_{mb}	-20 to + 90	-20 to + 90	$^{\circ}C$

MECHANICAL DATA

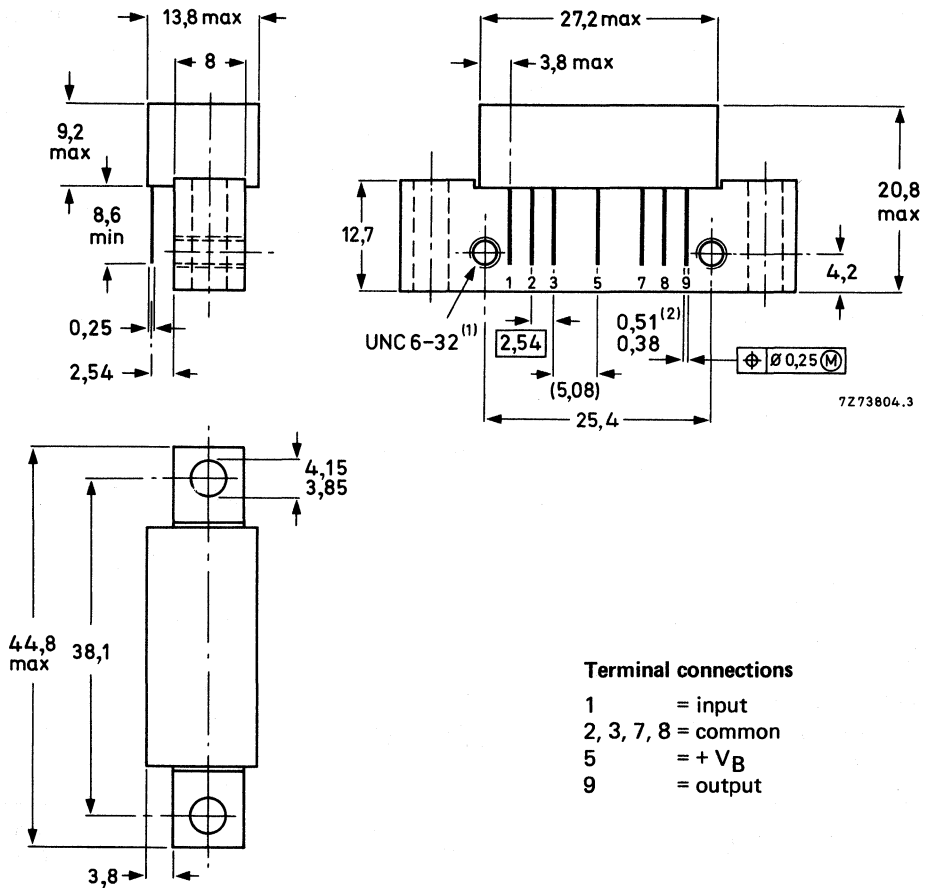
SOT-115 (see Fig. 1).

* The modules are able to withstand incidental short peaks in the supply voltage up to a maximum of 30 V.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-115.



Terminal connections

- 1 = input
- 2, 3, 7, 8 = common
- 5 = + V_B
- 9 = output

(1) Screw 6-32UNC-2A available upon request (see "Accessories").

(2) Tin-plated leads. Gold-plated leads available upon request.

→ See 'Mounting and Soldering Recommendations'.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

R.F. input voltage	V_i	max.	65 dBmV
Storage temperature	T_{stg}	-40 to +100 °C	
Operating mounting base temperature	T_{mb}	-20 to +90 °C	

CHARACTERISTICS

Supply voltage $V_B = +24\text{ V}$; $T_{amb} = 25\text{ °C}$

		BGY52	BGY53	
Power gain at $f = 50\text{ MHz}$	G_p	$16,4 \pm 0,4$	$16,4 \pm 0,4$	dB
Slope cable equivalent $f = 40\text{ MHz to }300\text{ MHz}$	SL	0 to +1,0	0 to +1,0	dB
Flatness of frequency response $f = 40\text{ MHz to }300\text{ MHz}$	FL max.	$\pm 0,1$	$\pm 0,1$	dB
Return losses at input and output $Z_S = Z_L = 75\ \Omega$; $f = 40\text{ MHz to }300\text{ MHz}$	S_{11-22} min.	20	20	dB ←
Output voltage at $d_{im} = -60\text{ dB}$ (DIN 45004, par. 6.3: 3-tone $V_p = V_o$; $f_p = 287,25\text{ MHz}$ $V_q = V_o - 6\text{ dB}$; $f_q = 294,25\text{ MHz}$ $V_r = V_o - 6\text{ dB}$; $f_r = 296,25\text{ MHz}$ Measured at $f(p+q-r) = 285,25\text{ MHz}$	V_o min.	61	63,5	dBmV
2nd harmonic distortion $V_p = V_o = 50\text{ dBmV}$; $f_p = 55,25\text{ MHz}$ $V_q = V_o = 50\text{ dBmV}$; $f_q = 211,25\text{ MHz}$ Measured at $f(p+q) = 266,5\text{ MHz}$	d_2 max.	-71	-73	dB ←
Noise figure $f = 40\text{ MHz to }300\text{ MHz}$	F max.	6	7	dB
Total d.c. current consumption	I_{tot} typ. max.	160 180	200 220	mA

CATV AMPLIFIER MODULES

Hybrid amplifier modules for CATV systems operating at frequencies up to 300 MHz.

BGY54: 17 dB input amplifier module;

BGY55: 17 dB output amplifier module.

Features:

- excellent linearity;
- extremely low noise;
- optimal reliability ensured by TiPtAu metallized crystals, silicon nitride passivation and rugged construction.

QUICK REFERENCE DATA

		BGY54	BGY55
Frequency range	f	40 to 300	40 to 300 MHz
Source impedance and load impedance	$Z_S = Z_L$	= 75	75 Ω
Power gain at f = 50 MHz	G_p	17,0 \pm 0,4	17,0 \pm 0,4 dB
Slope cable equivalent f = 40 MHz to 300 MHz	SL	0 to 1,0	0 to 1,0 dB
Flatness of frequency response f = 40 MHz to 300 MHz	FL	max. \pm 0,1	\pm 0,1 dB
Return losses at input and output f = 40 MHz to 300 MHz	S ₁₁₋₂₂	min. 20	20 dB
Output voltage at $d_{im} = -60$ dB (DIN 45004, par. 6.3: 3-tone)	V_o	min. 61	63,5 dBmV
2nd order distortion $V_o = 50$ dBmV	d_2	max. -71	-73 dB ←
Composite triple beat 32 channels $V_o = 46$ dBmV	CTB	max. -65	-67 dB
Output capability $X_{mod} = -57$ dB; 32 channels flat	V_o	min. 47,5	50 dBmV
Noise figure f = 40 MHz to 300 MHz	F	max. 6	6,5 dB
D.C. supply voltage	+ V_B	= 24	24 V*
Total d.c. current consumption at $V_B = +24$ V	I_{tot}	typ. 160	200 mA
Operating mounting base temperature	T_{mb}	-20 to +90	-20 to +90 °C

MECHANICAL DATA

SOT-115 (see Fig. 1).

* The modules normally operate at $V_B = 24$ V, but are able to withstand supply transients up to 30 V.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

R.F. input voltage	V_i	max.	65 dBmV
Storage temperature	T_{stg}		-40 to + 100 °C
Operating mounting base temperature	T_{mb}		-20 to + 90 °C

CHARACTERISTICS

Supply voltage $V_B = + 24 \text{ V}$; $T_{amb} = 25 \text{ °C}$

		BGY54	BGY55
Power gain at $f = 50 \text{ MHz}$	G_p	$17,0 \pm 0,4$	$17,0 \pm 0,4 \text{ dB}$
Slope cable equivalent $f = 40 \text{ MHz to } 300 \text{ MHz}$	SL	0 to 1,0	0 to 1,0 dB
Flatness of frequency response $f = 40 \text{ MHz to } 300 \text{ MHz}$	FL	max. $\pm 0,1$	$\pm 0,1 \text{ dB}$
Return losses at input and output $Z_S = Z_L = 75 \text{ } \Omega$; $f = 40 \text{ MHz to } 300 \text{ MHz}$	S_{11-22}	min. 20	20 dB
Output voltage at $d_{im} = -60 \text{ dB}$ (DIN 45004, 6.3: 3-tone) $V_p = V_o$; $f_p = 287,25 \text{ MHz}$ $V_q = V_o - 6 \text{ dB}$; $f_q = 294,25 \text{ MHz}$ $V_r = V_o - 6 \text{ dB}$; $f_r = 296,25 \text{ MHz}$ Measured at $f_{(p+q-r)} = 285,25 \text{ MHz}$	V_o	min. 61	63,5 dBmV
2nd order distortion $V_o = 50 \text{ dBmV}$; $f_p = 55,25 \text{ MHz}$ $V_o = 50 \text{ dBmV}$; $f_q = 211,25 \text{ MHz}$ Measured at $f_{(p+q)} = 266,5 \text{ MHz}$	d_2	max. -71	-73 dB ←
Composite triple beat 32 channels $V_o = 46 \text{ dBmV}$; channel W	CTB	max. -65	-67 dB
Output capability on channel W $X_{mod} = -57 \text{ dB}$; 32 channels flat	V_o	min. 47,5	50 dBmV
Noise figure $f = 40 \text{ MHz to } 300 \text{ MHz}$	F	max. 6	6,5 dB
Total d.c. current consumption	I_{tot}	typ. 160 max. 180	200 mA 220 mA

HYBRID V.H.F. PUSH-PULL AMPLIFIER MODULES

Hybrid amplifier modules intended for CATV systems.

QUICK REFERENCE DATA

		BGY56	BGY57	
Frequency range	f	40 to 300	40 to 300	MHz
Source impedance and load impedance	$Z_S = Z_L =$	75	75	Ω
Power gain at f = 50 MHz	G_p	22,0 ± 0,6	22,0 ± 0,6	dB
Slope cable equivalent f = 40 MHz to 300 MHz	SL	0 to + 1,0	0 to + 1,0	dB
Flatness of frequency response f = 40 MHz to 300 MHz	FL	max. ± 0,2	± 0,2	dB
Return losses at input and output f = 40 MHz to 300 MHz	S_{11-22}	min. 20	20	dB
Output voltage at $d_{im} = -60$ dB (DIN 45004, par. 6.3: 3-tone)	V_o	min. 61,5	64	dBmV
2nd harmonic distortion at $V_o = 50$ dBmV	d_2	max. -64	-66	dB ←
Noise figure f = 40 MHz to 300 MHz	F	max. 6	7	dB
D.C. supply voltage	+ $V_B =$	24	24	V *
Total d.c. current consumption at $V_B = + 24$ V	I_{tot}	typ. 160	200	mA
Operating mounting base temperature	T_{mb}	-20 to + 90	-20 to + 90	$^{\circ}C$

MECHANICAL DATA

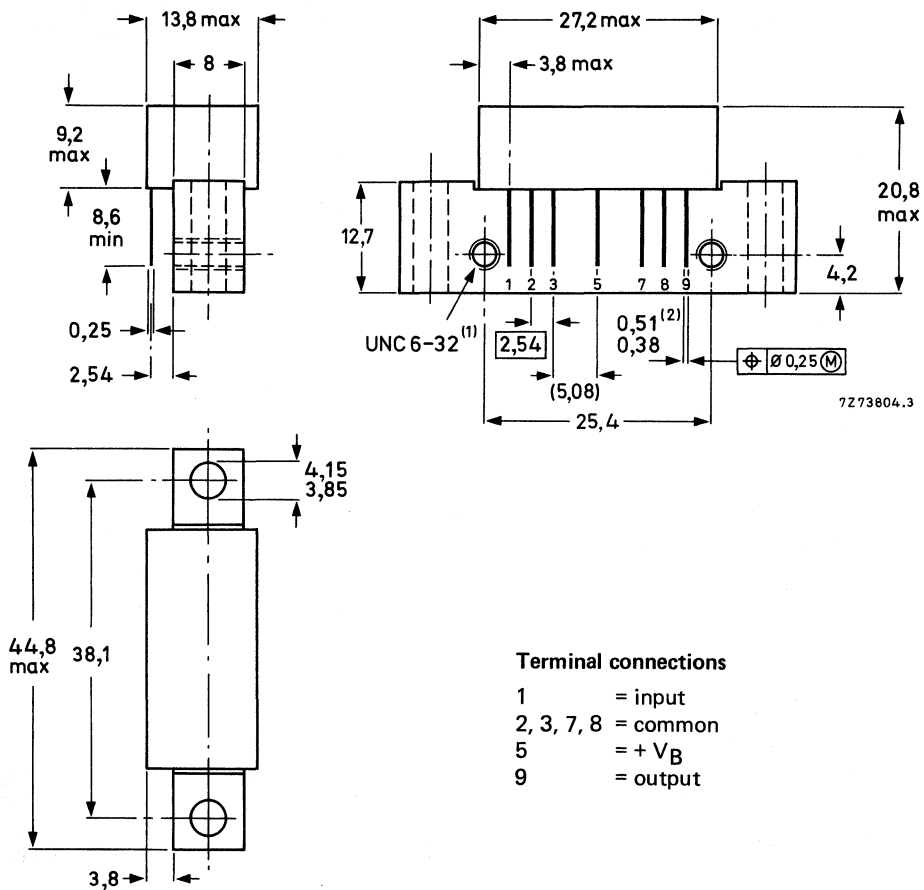
SOT-115 (see Fig. 1).

* The modules are able to withstand incidental short peaks in the supply voltage up to a maximum of 30 V.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-115.



Terminal connections

- 1 = input
- 2, 3, 7, 8 = common
- 5 = + V_B
- 9 = output

(1) Screw 6-32UNC-2A available upon request (see "Accessories").

(2) Leads tin-plated. Gold-plated leads available upon request.

→ See 'Mounting and Soldering Recommendations'.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

R.F. input voltage	V_i	max.	63 dBmV
Storage temperature	T_{stg}	-40 to +100 °C	
Operating mounting base temperature	T_{mb}	-20 to +90 °C	

CHARACTERISTICS

Supply voltage $V_B = +24$ V; $T_{amb} = 25$ °C

		BGY56	BGY57	
Power gain at $f = 50$ MHz	G_p	$22,0 \pm 0,6$	$22,0 \pm 0,6$	dB
Slope cable equivalent $f = 40$ MHz to 300 MHz	SL	0 to +1,0	0 to +1,0	dB
Flatness of frequency response $f = 40$ MHz to 300 MHz	FL max.	$\pm 0,2$	$\pm 0,2$	dB
Return losses at input and output $Z_S = Z_L = 75 \Omega$; $f = 40$ MHz to 300 MHz	S_{11-22} min.	20	20	dB
Output voltage at $d_{im} = -60$ dB (DIN 45004 par. 6.3: 3-tone) $V_p = V_o$; $f_p = 287,25$ MHz $V_q = V_o - 6$ dB; $f_q = 294,25$ MHz $V_r = V_o - 6$ dB; $f_r = 296,25$ MHz Measured at $f_{(p+q-r)} = 285,25$ MHz	V_o min.	61,5	64	dBmV
2nd harmonic distortion $V_p = V_o = 50$ dBmV; $f_p = 55,25$ MHz $V_q = V_o = 50$ dBmV; $f_q = 211,25$ MHz Measured at $f_{(p+q)} = 266,5$ MHz	d_2 max.	-64	-66	dB
Noise figure $f = 40$ MHz to 300 MHz	F max.	6	7	dB
Total d.c. current consumption	I_{tot} typ. max.	160 180	200 220	mA

HYBRID V.H.F. PUSH-PULL AMPLIFIER MODULE

Hybrid amplifier module intended for CATV systems.

QUICK REFERENCE DATA

Frequency range	f		40 to 300 MHz
Source impedance and load impedance	$Z_S = Z_L =$		75 Ω
Power gain at f = 50 MHz	G_p		33,0 \pm 1,0 dB
Slope cable equivalent f = 40 MHz to 300 MHz	SL		+ 0,5 to + 1,5 dB
Flatness of frequency response f = 40 MHz to 300 MHz	FL	max.	\pm 0,3 dB
Return losses at input and output f = 40 MHz to 300 MHz	S_{11-22}	min.	20 dB
Output voltage at $d_{im} = -60$ dB (DIN 45004, par. 6.3: 3-tone)	V_o	min.	64 dBmV
2nd harmonic distortion at $V_o = 50$ dBmV	d_2	max.	-70 dB ←
Noise figure f = 40 MHz to 300 MHz	F	max.	6 dB
D.C. supply voltage	+ V_B	=	24 V*
Total d.c. current consumption at $V_B = + 24$ V	I_{tot}	typ.	320 mA
Operating mounting base temperature	T_{mb}		-20 to + 90 $^{\circ}$ C

MECHANICAL DATA

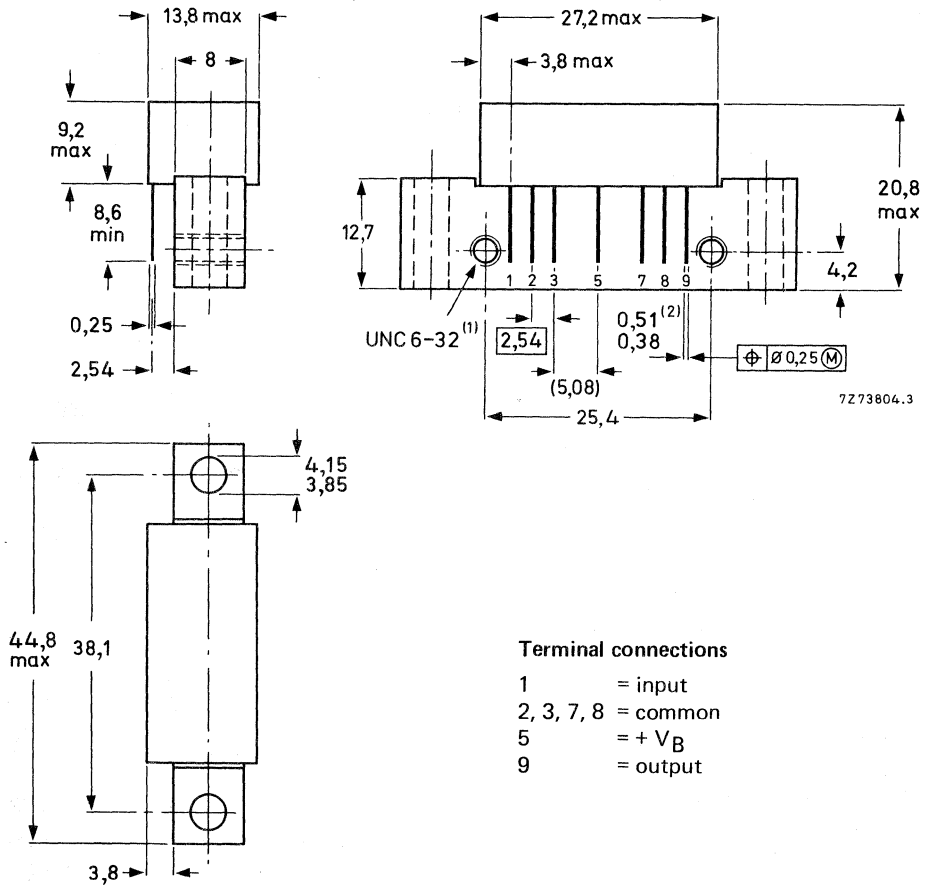
SOT-115 (see Fig. 1).

* The module is able to withstand incidental short peaks in the supply voltage up to a maximum of 30 V.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-115.



Terminal connections

- 1 = input
- 2, 3, 7, 8 = common
- 5 = + V_B
- 9 = output

(1) Screw 6-32UNC-2A available upon request (see "Accessories").

→ (2) Leads tin-plated. Gold-plated leads available upon request.

→ See 'Mounting and Soldering Recommendations'.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

R.F. input voltage	V_i	max.	55 dBmV
Storage temperature	T_{stg}		-40 to +100 °C
Operating mounting base temperature	T_{mb}		-20 to +90 °C

CHARACTERISTICSSupply voltage $V_B = +24$ V; $T_{amb} = 25$ °C

Power gain at $f = 50$ MHz	G_p		$33,0 \pm 1,0$ dB
Slope cable equivalent $f = 40$ MHz to 300 MHz	SL		+0,5 to +1,5 dB
Flatness of frequency response $f = 40$ MHz to 300 MHz	FL	max.	$\pm 0,3$ dB
Return losses at input and output $Z_S = Z_L = 75 \Omega$; $f = 40$ MHz to 300 MHz	S11-22	min.	20 dB
Output voltage at $d_{im} = -60$ dB (DIN 45004, par. 6.3: 3-tone) $V_p = V_o$; $f_p = 287,25$ MHz $V_q = V_o - 6$ dB; $f_q = 294,25$ MHz $V_r = V_o - 6$ dB; $f_r = 296,25$ MHz Measured at $f_{(p+q-r)} = 285,25$ MHz	V_o	min.	64 dBmV
2nd harmonic distortion $V_p = V_o = 50$ dBmV; $f_p = 55,25$ MHz $V_q = V_o = 50$ dBmV; $f_q = 211,25$ MHz Measured at $f_{(p+q)} = 266,5$ MHz	d_2	max.	-70 dB ←
Noise figure $f = 40$ MHz to 300 MHz	F	max.	6 dB
Total d.c. current consumption	I_{tot}	typ. max.	320 mA 340 mA

CATV AMPLIFIER MODULE

Hybrid amplifier module for use as 34 dB line extender in CATV systems operating at frequencies up to 330 MHz.

Features:

- excellent linearity;
- extremely low noise;
- optimal reliability ensured by TiPtAu metallized crystals, silicon nitride passivation and rugged construction.

QUICK REFERENCE DATA

Frequency range	f	40 to 330 MHz
Source impedance and load impedance	$Z_S = Z_L$	75 Ω
Power gain at f = 50 MHz	G_p	34,0 \pm 1,0 dB
Slope cable equivalent f = 40 MHz to 330 MHz	SL	0,5 to 1,5 dB
Flatness of frequency response f = 40 MHz to 330 MHz	FL	max. \pm 0,3 dB
Return losses at input and output f = 40 MHz to 330 MHz	S11-22	min. 20 dB
Output voltage at $d_{im} = -60$ dB (DIN 45004B, par. 6.3: 3-tone)	V_o	min. 64 dBmV
2nd order distortion at channel R $V_o = 50$ dBmV on channel 2 and 13	d_2	max. -70 dB
Composite triple beat 32 channels $V_o = 46$ dBmV	CTB	\leq -67 dB
Output capability $X_{mod} = -57$ dB; 32 channels flat	V_o	min. 50 dBmV
Noise figure f = 40 MHz to 330 MHz	F	max. 6 dB
D.C. supply voltage	+ V_B	= 24 V*
Total d.c. current consumption at $V_B = +24$ V	I_{tot}	typ. 320 mA
Operating mounting base temperature	T_{mb}	-20 to +90 $^{\circ}$ C

MECHANICAL DATA

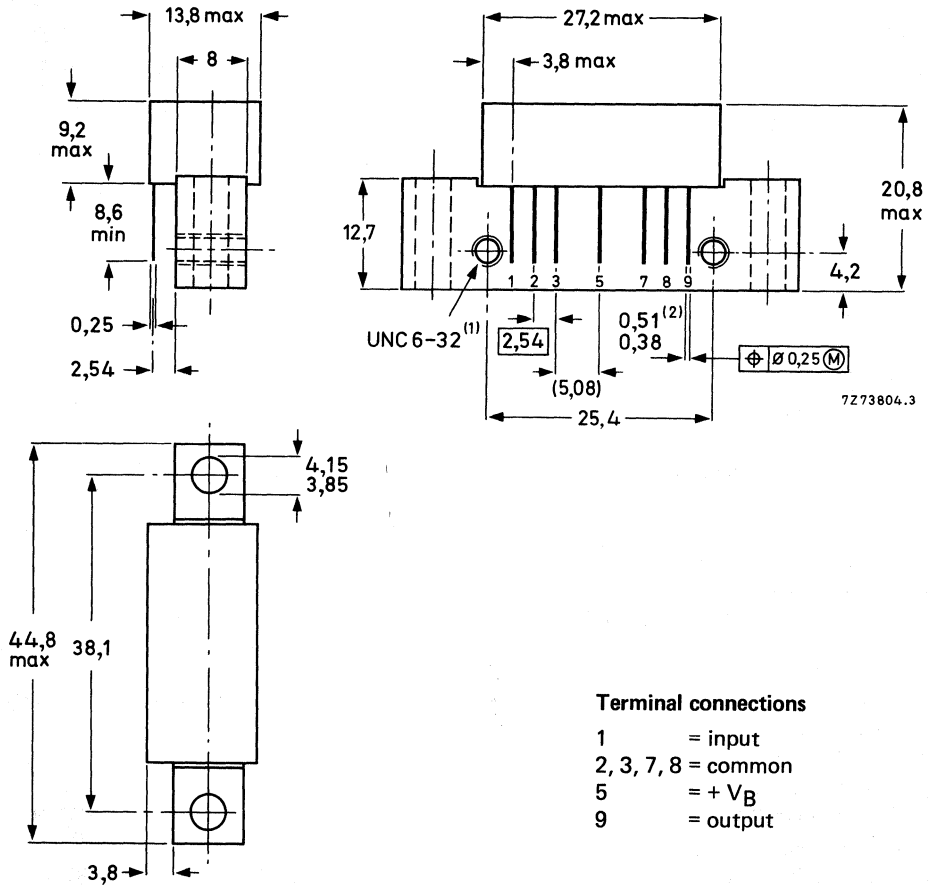
SOT-115 (see Fig. 1).

* The module normally operates at $V_B = 24$ V, but is able to withstand supply transients up to 30 V.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-115.



- (1) Screw 6-32UNC-2A available upon request (see "Accessories").
- (2) Leads gold-plated.

→ See 'Mounting and Soldering Recommendations'.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

R.F. input voltage	V_i	max.	55 dBmV
Storage temperature	T_{stg}	–40 to + 100 °C	
Operating mounting base temperature	T_{mb}	–20 to + 90 °C	

CHARACTERISTICS

Supply voltage $V_B = + 24 \text{ V}$; $T_{amb} = 25 \text{ °C}$

Power gain at $f = 50 \text{ MHz}$	G_p		$34,0 \pm 1,0 \text{ dB}$
Slope cable equivalent $f = 40 \text{ MHz to } 330 \text{ MHz}$	SL		0,5 to 1,5 dB
Flatness of frequency response $f = 40 \text{ MHz to } 330 \text{ MHz}$	FL	max.	$\pm 0,3 \text{ dB}$
Return losses at input and output $Z_S = Z_L = 75 \Omega$; $f = 40 \text{ MHz to } 330 \text{ MHz}$	S11-22 min.		20 dB
Output voltage at $d_{im} = -60 \text{ dB}$ (DIN 45004, 6.3: 3-tone) $V_p = V_o$; $f_p = 287,25 \text{ MHz}$ $V_q = V_o - 6 \text{ dB}$; $f_q = 294,25 \text{ MHz}$ $V_r = V_o - 6 \text{ dB}$; $f_r = 296,25 \text{ MHz}$ Measured at $f(p + q - r) = 285,25 \text{ MHz}$	V_o	min.	64 dBmV
2nd order distortion $V_o = 50 \text{ dBmV}$; channel 2 $V_o = 50 \text{ dBmV}$; channel 13 Measured at channel R	d_2	max.	–70 dB
Composite triple beat 32 channels $V_o = 46 \text{ dBmV}$; channel W	CTB	max.	–67 dB
Composite triple beat 40 channels $V_o = 46 \text{ dBmV}$; channel W	CTB	max.	–63 dB
Output capability on channel W $X_{mod} = -57 \text{ dB}$; 32 channels flat	V_o	min.	50 dBmV
$X_{mod} = -57 \text{ dB}$; 40 channels flat	V_o	min.	49,5 dBmV
Noise figure $f = 40 \text{ MHz to } 330 \text{ MHz}$	F	max.	6 dB
Total d.c. current consumption	I_{tot}	typ. max.	320 mA 340 mA

HYBRID V.H.F. PUSH-PULL AMPLIFIER MODULE

Hybrid amplifier module intended for CATV systems up to 300 MHz.

QUICK REFERENCE DATA

Frequency range	f	40 to 300 MHz
Source impedance and load impedance	$Z_S = Z_L$	= 75 Ω
Power gain at f = 50 MHz	G_p	38,5 \pm 1,0 dB
Slope cable equivalent f = 40 MHz to 300 MHz	SL	0 to + 1,5 dB
Flatness of frequency response f = 40 MHz to 300 MHz	FL	max. \pm 0,3 dB
Return losses at input and output f = 40 MHz to 300 MHz	S_{11-22}	min. 18 dB
Output voltage at $d_{im} = -60$ dB (DIN45004B, par. 6,3: 3-tone)	V_o	min. 64 dBmV
2nd harmonic distortion at $V_o = 50$ dBmV	d_2	max. -68 dB
Noise figure f = 40 MHz to 300 MHz	F	max. 6 dB
D.C. supply voltage	$+V_B$	= 24 V*
Total d.c. current consumption at $V_B = +24$ V	I_{tot}	typ. 320 mA
Operating mounting base temperature	T_{mb}	-20 to +90 $^{\circ}$ C

MECHANICAL DATA

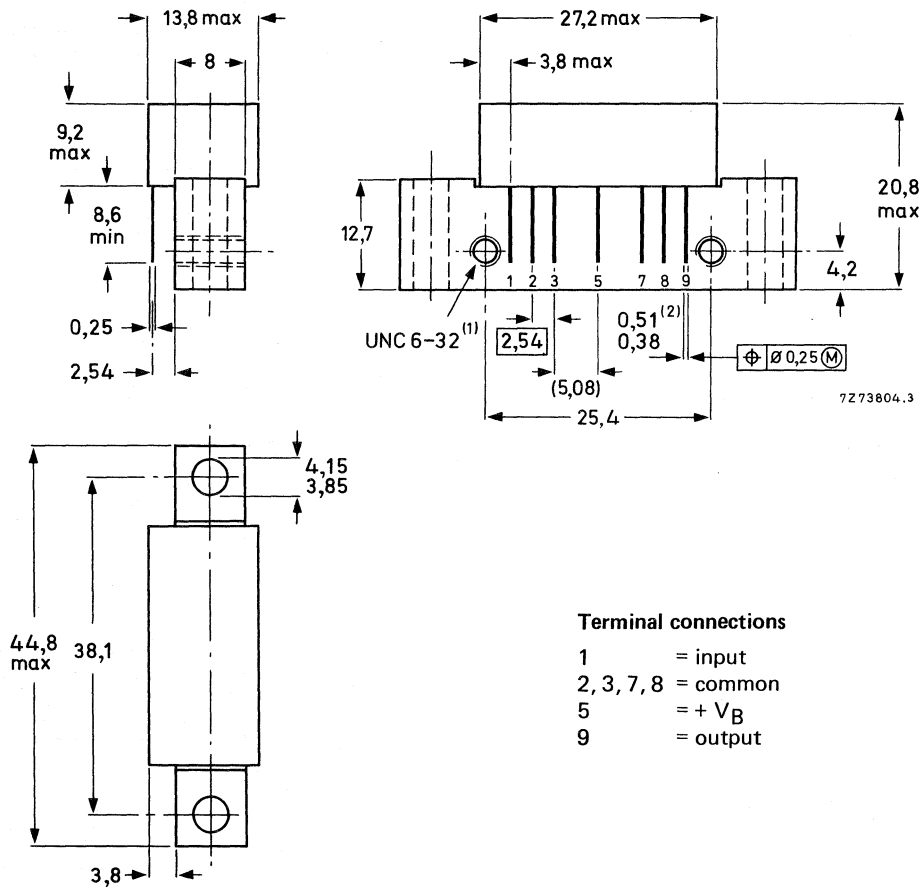
SOT-115 (see Fig. 1).

* The module normally operates at $V_B = 24$ V, but is able to withstand supply transients up to 30 V.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-115.



Terminal connections

- 1 = input
- 2, 3, 7, 8 = common
- 5 = + V_B
- 9 = output

(1) Screw 6-32UNC-2A available upon request (see "Accessories").

→ (2) Leads tin-plated. Gold-plated leads available upon request.

→ See "Mounting and Soldering Recommendations".

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

R.F. input voltage	V_i	max. 53 dBmV
Storage temperature	T_{stg}	-40 to +100 °C
Operating mounting base temperature	T_{mb}	-20 to +90 °C

CHARACTERISTICS

Supply voltage $V_B = +24$ V; $T_{amb} = 25$ °C

Power gain at $f = 50$ MHz	G_p	$38,5 \pm 1,0$ dB
Slope cable equivalent $f = 40$ MHz to 300 MHz	SL	0 to +1,5 dB
Flatness of frequency response $f = 40$ MHz to 300 MHz	FL	max. $\pm 0,3$ dB
Return losses at input and output $Z_S = Z_L = 75 \Omega$; $f = 40$ MHz to 300 MHz	S_{11-22}	min. 18 dB
Output voltage at $d_{im} = -60$ dB (DIN45004B, par. 6.3: 3-tone) $V_p = V_o$; $f_p = 287,25$ MHz $V_q = V_o - 6$ dB; $f_q = 294,25$ MHz $V_r = V_o - 6$ dB; $f_r = 296,25$ MHz Measured at $f_{(p+q-r)} = 285,25$ MHz	V_o	min. 64 dBmV
2nd harmonic distortion $V_p = V_o = 50$ dBmV; $f_p = 55,25$ MHz $V_q = V_o = 50$ dBmV; $f_q = 211,25$ MHz Measured at $f_{(p+q)} = 266,5$ MHz	d_2	max. -68 dB
Noise figure $f = 40$ MHz to 300 MHz	F	max. 6 dB
Total d.c. current consumption	I_{tot}	typ. 320 mA max. 340 mA

HYBRID V.H.F. PUSH-PULL AMPLIFIER MODULE

Interstage hybrid amplifier module intended for CATV systems up to 300 MHz. The inputs and outputs of the stages have been terminated separately.

QUICK REFERENCE DATA for total amplifier unless otherwise specified

Frequency range	f	40 to 300	MHz	
Source impedance and load impedance	$Z_S = Z_L$	= 75	Ω	
Power gain at f = 50 MHz	G_p	$33,5 \pm 1,0$	dB	
Slope cable equivalent f = 40 MHz to 300 MHz	SL	+ 0,5 to + 1,5	dB	
Flatness of frequency response f = 40 MHz to 300 MHz	FL	max. $\pm 0,3$	dB	
Return losses at input and output f = 40 MHz to 300 MHz	s_{11} s_{22}	pre-stage final stage		
		min. 20	18	dB
Output voltage at $d_{im} = -60$ dB (DIN45004B, par. 6.3: 3-tone)	V_o	min. 64		dBmV
		max. -66		dB
2nd harmonic distortion at $V_o = 50$ dBmV	d_2			dB
Noise figure f = 40 MHz to 300 MHz	F	max. 6	dB	
D.C. supply voltage	$+V_B$	= 24	V*	
Total d.c. current consumption at $V_B = +24$ V	I_{tot}	typ. 320	mA	
Operating mounting base temperature	T_{mb}	-20 to +90	$^{\circ}\text{C}$	

MECHANICAL DATA

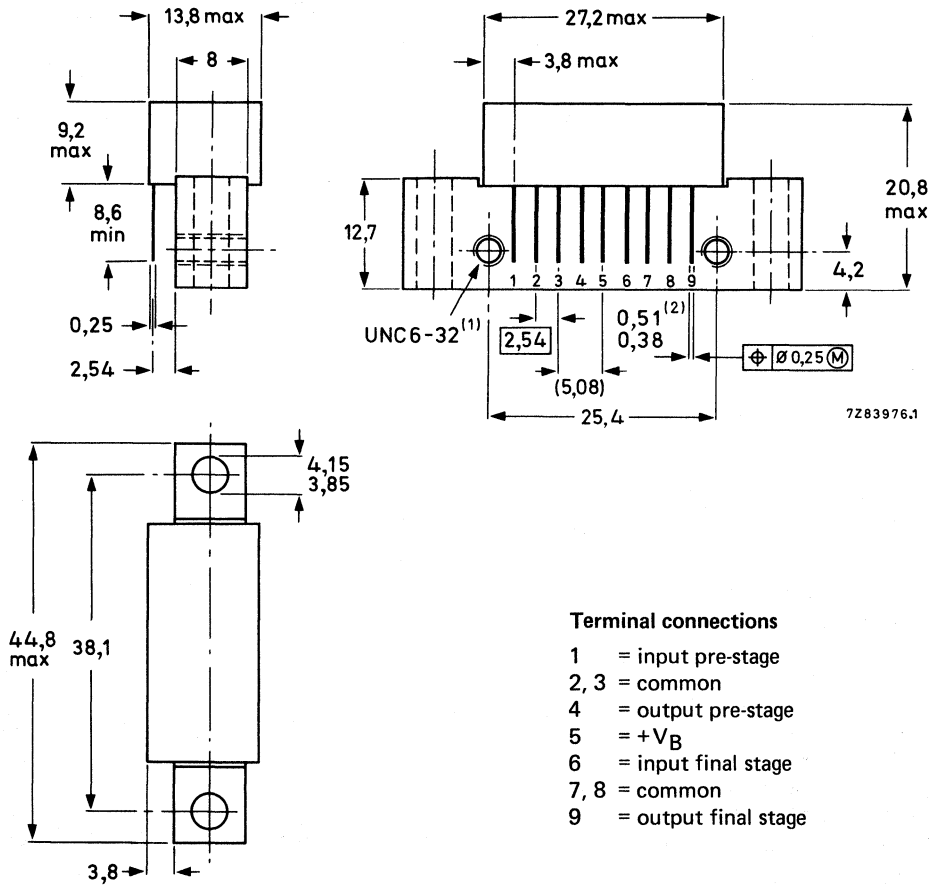
SOT-115 (see Fig. 1).

* The module normally operates at $V_B = 24$ V, but is able to withstand supply transients up to 30 V.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-115.



(1) Screw 6-32UNC-2A available upon request (see "Accessories").

→ (2) Leads tin-plated. Gold-plated leads available on request.

→ See "Mounting and Soldering Recommendations".

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

R.F. input voltage total amplifier	V_i	max.	55 dBmV	←
Storage temperature	T_{stg}		-40 to +100 °C	
Operating mounting base temperature	T_{mb}		-20 to +90 °C	

CHARACTERISTICS for total amplifier unless otherwise specified.

Supply voltage $V_B = +24\text{ V}$; $T_{amb} = 25\text{ °C}$

Power gain at $f = 50\text{ MHz}$ G_p 33,5 ± 1,0 dB

Slope cable equivalent
 $f = 40\text{ MHz to }300\text{ MHz}$ SL +0,5 to +1,5 dB

Flatness of frequency response
 $f = 40\text{ MHz to }300\text{ MHz}$ FL max. ± 0,3 dB

Return losses at input and output $Z_S = Z_L = 75\ \Omega$; $f = 40\text{ MHz to }300\text{ MHz}$	s_{11} s_{22}	pre-stage final stage		dB
		min. 20	18	
		min. 18	20	

Output voltage at $d_{im} = -60\text{ dB}$
 (DIN45004B, par. 6.3: 3-tone)
 $V_p = V_o$; $f_p = 287,25\text{ MHz}$
 $V_q = V_o -6\text{ dB}$; $f_q = 294,25\text{ MHz}$
 $V_r = V_o -6\text{ dB}$; $f_r = 296,25\text{ MHz}$
 Measured at $f_{(p+q-r)} = 285,25\text{ MHz}$
 V_o min. 64 dBmV ←

2nd harmonic distortion
 $V_p = V_o = 50\text{ dBmV}$; $f_p = 55,25\text{ MHz}$
 $V_q = V_o = 50\text{ dBmV}$; $f_q = 211,25\text{ MHz}$
 Measured at $f_{(p+q)} = 266,5\text{ MHz}$
 d_2 max. -66 dB

Noise figure
 $f = 40\text{ MHz to }300\text{ MHz}$ F max. 6 dB

Total d.c. current consumption I_{tot} typ. 320 mA
 max. 340 mA

CATV AMPLIFIER MODULE

Hybrid amplifier module for use in CATV systems and operating at frequencies from 5 MHz to 200 MHz.
The device is intended as a reverse amplifier for use in two-way systems.

QUICK REFERENCE DATA

Frequency range	f	5 to 200 MHz
Source impedance and load impedance	$Z_S = Z_L$	75 Ω
Power gain at f = 10 MHz	G_p	13,0 \pm 0,5 dB
Slope cable equivalent f = 5 MHz to 200 MHz	SL	-0,2 to + 0,5 dB
Flatness of frequency response f = 5 MHz to 200 MHz	FL	max. \pm 0,2 dB
Return losses at input and output f = 5 MHz to 200 MHz	S_{11-22}	min. 20 dB
Output voltage at $d_{im} = -60$ dB; measured at 33,25 MHz (DIN 45004B, par. 6.3: 3-tone)	V_o	min. 67 dBmV
2nd-order distortion $V_o = 50$ dBmV	d_2	max. -72 dB
Composite triple beat; 22 channels $V_o = 50$ dBmV	CTB	max. -68 dB
Cross modulation at 22 channels $V_o = 50$ dBmV	X_{mod}	max. -61 dB
Noise figure f = 200 MHz	F	max. 7 dB
D.C. supply voltage	+ V_B	= 24 V*
Total d.c. current consumption $V_B = + 24$ V	I_{tot}	typ. 215 mA ←
Operating mounting base temperature	T_{mb}	-20 to + 90 $^{\circ}$ C

MECHANICAL DATA

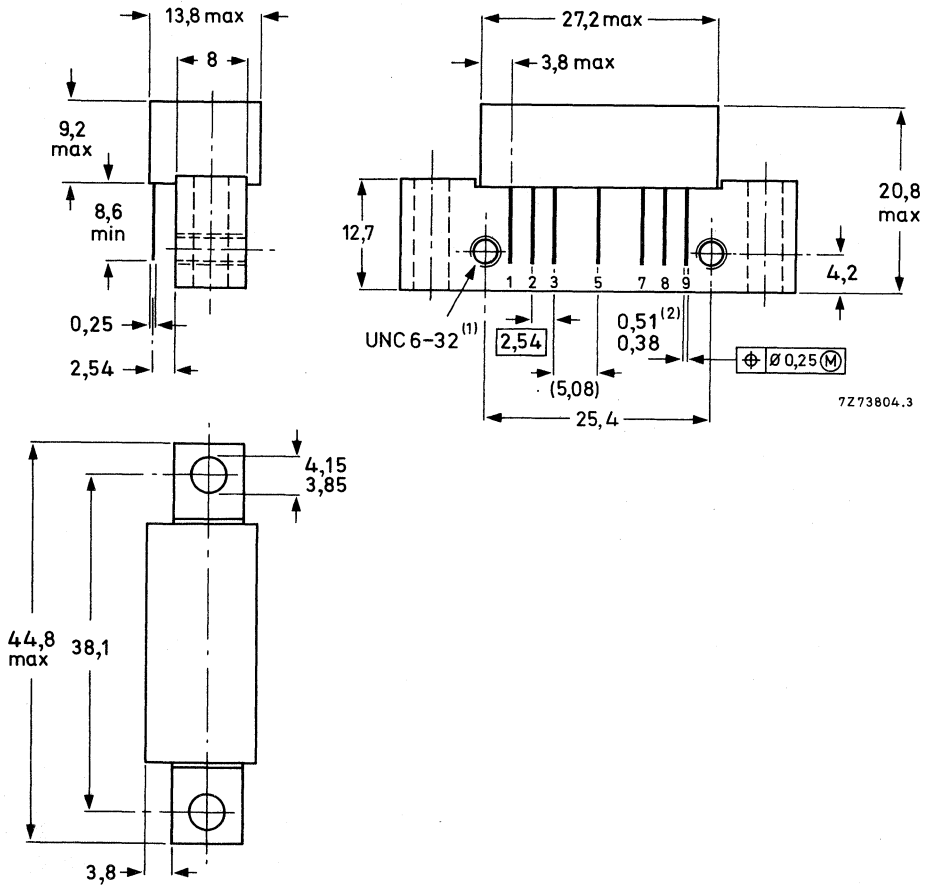
SOT-115 (see Fig. 1).

* The module normally operates at $V_B = 24$ V, but is able to withstand supply transient up to 30 V.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-115.



(1) Screw 6-32UNC-2A available upon request (see "Accessories").

(2) Leads gold-plated.

→ See "Mounting and Soldering Recommendations".

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

R.F. input voltage	V_i	max.	67 dBmV
Storage temperature	T_{stg}	-40 to + 100 °C	
Operating mounting base temperature	T_{mb}	-20 to + 90 °C	

CHARACTERISTICS at $T_{mb} = 30\text{ }^{\circ}\text{C}$ unless otherwise specified

Supply voltage $V_B = +24\text{ V}$

Power gain at $f = 10\text{ MHz}$

G_p $13,0 \pm 0,5\text{ dB}$

Slope cable equivalent

$f = 5\text{ MHz to }200\text{ MHz}$

SL $-0,2\text{ to }+0,5\text{ dB}$

Flatness of frequency response

$f = 5\text{ MHz to }200\text{ MHz}$

FL $\text{max. } \pm 0,2\text{ dB}$

Return losses at input and output

$Z_S = Z_L = 75\text{ }\Omega$; $f = 5\text{ MHz to }200\text{ MHz}$

S_{11-22} $\text{min. } 20\text{ dB}$

Output voltage at $d_{im} = -60\text{ dB}$

(DIN 45004B, par. 6.3: 3-tone)

$V_p = V_o$; $f_p = 35,25\text{ MHz}$

$V_q = V_o - 6\text{ dB}$; $f_q = 42,25\text{ MHz}$

$V_r = V_o - 6\text{ dB}$; $f_r = 44,25\text{ MHz}$

Measured at $f_{(p+q-r)} = 33,25\text{ MHz}$

V_o $\text{min. } 67\text{ dBmV}$

Output voltage at $d_{im} = -60\text{ dB}$

(DIN 45004B, par. 6.3: 3-tone)

$V_p = V_o$; $f_p = 187,25\text{ MHz}$

$V_q = V_o - 6\text{ dB}$; $f_q = 194,25\text{ MHz}$

$V_r = V_o - 6\text{ dB}$; $f_r = 196,25\text{ MHz}$

Measured at $f_{(p+q-r)} = 185,25\text{ MHz}$

V_o $\text{min. } 64\text{ dBmV}$

2nd-order distortion

$V_o = 50\text{ dBmV}$; $f_p = 83,25\text{ MHz}$

$V_o = 50\text{ dBmV}$; $f_q = 109,25\text{ MHz}$

Measured at $f_{(p+q)} = 192,5\text{ MHz}$

d_2 $\text{max. } -72\text{ dB}$

Composite triple beat on 22 channels

$V_o = 50\text{ dBmV}$; measured in channel 7

CTB $\text{max. } -68\text{ dB}$

Cross modulation at 22 channels

$V_o = 50\text{ dBmV}$; measured in channel 2

X_{mod} $\text{max. } -61\text{ dB}$

Noise figure

$f = 200\text{ MHz}$

F $\text{max. } 7,0\text{ dB}$

Total d.c. current consumption

I_{tot} $\text{typ. } 215\text{ mA}$
 $\text{max. } 230\text{ mA}$



CATV REVERSE AMPLIFIER MODULE

Hybrid amplifier module for use in CATV systems and operating at frequencies from 5 MHz to 200 MHz. This device is intended as a reverse amplifier for use in two-way systems.

QUICK REFERENCE DATA

Frequency range	f	5 to 200 MHz
Source impedance and load impedance	$Z_S = Z_L$	75 Ω
Power gain at f = 10 MHz	G_p	18,5 \pm 0,5 dB
Slope cable equivalent f = 5 MHz to 200 MHz	SL	-0,2 to + 0,5 dB
Flatness of frequency response f = 5 MHz to 200 MHz	FL	max. \pm 0,2 dB
Return losses at input and output f = 5 MHz to 200 MHz	S_{11-22}	min. 20 dB
Output voltage at $d_{im} = -60$ dB; measured at 33,25 MHz (DIN 45004B, par. 6.3: 3-tone)	V_o	min. 67 dBmV
2nd-order distortion $V_o = 50$ dBmV	d_2	max. -72 dB
Composite triple beat; 22 channels $V_o = 50$ dBmV	CTB	max. -68 dB
Cross modulation at 22 channels $V_o = 50$ dBmV	X_{mod}	max. -61 dB
Noise figure f = 200 MHz	F	max. 5,5 dB
D.C. supply voltage	+ V_B	= 24 V*
Total d.c. current consumption $V_B = + 24$ V	I_{tot}	typ. 215 mA ←
Operating mounting base temperature	T_{mb}	-20 to + 90 $^{\circ}$ C

MECHANICAL DATA

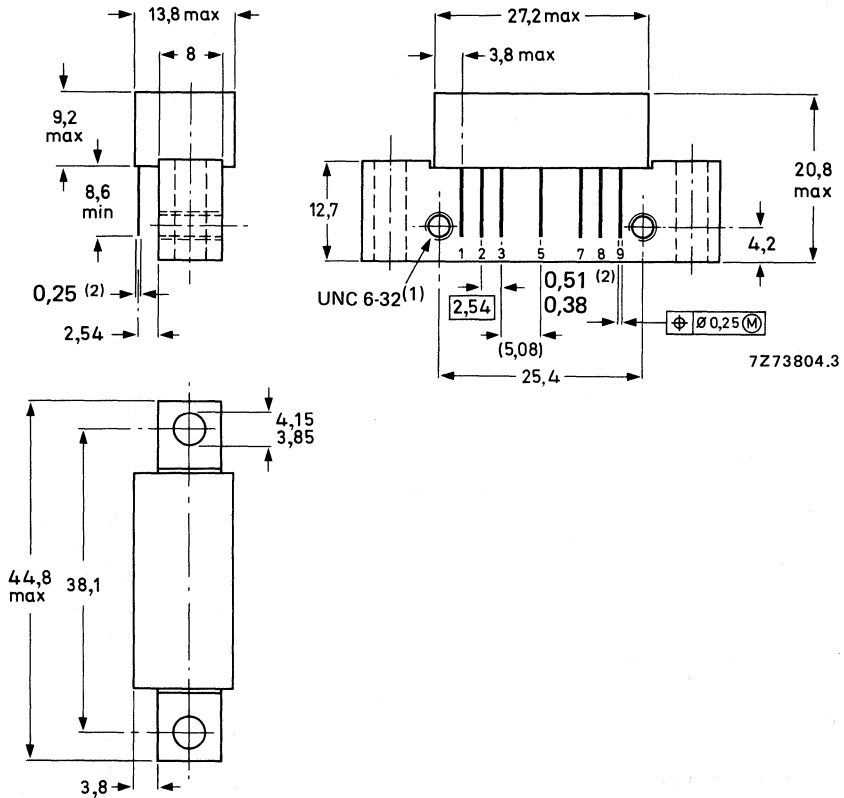
SOT-115 (see Fig. 1).

* The module normally operates at $V_B = 24$ V, but is able to withstand supply transients up to 30 V.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-115.



- (1) Screw 6-32UNC-2A available upon request (see "Accessories").
- (2) Leads gold-plated.

→ See "Mounting and Soldering Recommendations".

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

R.F. input voltage	V_i	max.	65 dBmV
Storage temperature	T_{stg}	-40 to + 100 °C	
Operating mounting base temperature	T_{mb}	-20 to + 90 °C	

CHARACTERISTICS

Supply voltage $V_B = +24\text{ V}$ at $T_{mb} = 30\text{ }^\circ\text{C}$ unless otherwise specified

Power gain at $f = 10\text{ MHz}$	G_p	$18,5 \pm 0,5\text{ dB}$	
Slope cable equivalent $f = 5\text{ MHz to } 200\text{ MHz}$	SL	$-0,2\text{ to } +0,5\text{ dB}$	
Flatness of frequency response $f = 5\text{ MHz to } 200\text{ MHz}$	FL	max. $\pm 0,2\text{ dB}$	
Return losses at input and output $Z_S = Z_L = 75\ \Omega$; $f = 5\text{ MHz to } 200\text{ MHz}$	S_{11-22}	min. 20 dB	
Output voltage at $d_{im} = -60\text{ dB}$ (DIN 45004B; par. 6.3; 3-tone) $V_p = V_o$; $f_p = 33,25\text{ MHz}$ $V_q = V_o - 6\text{ dB}$; $f_q = 42,25\text{ MHz}$ $V_r = V_o - 6\text{ dB}$; $f_r = 44,25\text{ MHz}$ Measured at $f_{(p+q)} = 33,25\text{ MHz}$	V_o	min. 67 dBmV	
Output voltage at $d_{im} = -60\text{ dB}$ (DIN 45004B; par. 6.3; 3-tone) $V_p = V_o$; $f_p = 187,25\text{ MHz}$ $V_q = V_o - 6\text{ dB}$; $f_q = 194,25\text{ MHz}$ $V_r = V_o - 6\text{ dB}$; $f_r = 196,25\text{ MHz}$ Measured at $f_{(p+q-r)} = 185,25\text{ MHz}$	V_o	min. 64 dBmV	
2nd-order distortion $V_o = 50\text{ dBmV}$; $f_p = 83,25\text{ MHz}$ $V_o = 50\text{ dBmV}$; $f_q = 109,25\text{ MHz}$ Measured at $f_{(p+q)} = 192,5\text{ MHz}$	d_2	max. -72 dB	←
Composite triple beat at 22 channels $V_o = 50\text{ dBmV}$; measured in channel 7	CTB	max. -68 dB	
Cross modulation at 22 channels $V_o = 50\text{ dBmV}$; measured in channel 2	X_{mod}	max. -61 dB	
Noise figure $f = 200\text{ MHz}$	F	max. $5,5\text{ dB}$	
Total d.c. current consumption	I_{tot}	typ. 215 mA max. 230 mA	←

CATV REVERSE AMPLIFIER MODULE

Hybrid amplifier module for use in CATV systems and operating at frequencies from 5 MHz to 200 MHz. The device is intended as a reverse amplifier for use in two-way systems.

QUICK REFERENCE DATA

Frequency range	f	5 to 200 MHz
Source impedance and load impedance	$Z_S = Z_L$	75 Ω
Power gain at f = 10 MHz	G_p	22,0 \pm 0,5 dB
Slope cable equivalent f = 5 MHz to 200 MHz	SL	-0,2 to + 0,5 dB
Flatness of frequency response f = 5 MHz to 200 MHz	FL	max. \pm 0,2 dB
Return losses at input and output f = 5 MHz to 200 MHz	S_{11-22}	min. 20 dB
Output voltage at $d_{im} = -60$ dB; measured at 33,25 MHz (DIN 45004B, par. 6.3: 3-tone)	V_o	min. 67 dBmV
2nd-order distortion $V_o = 50$ dBmV	d_2	max. -67 dB
Composite triple beat; 22 channels $V_o = 50$ dBmV	CTB	max. -67 dB
Cross modulation at 22 channels $V_o = 50$ dBmV	X_{mod}	max. -60 dB
Noise figure f = 200 MHz	F	max. 5,5 dB
D.C. supply voltage	+ V_B	= 24 V*
Total d.c. current consumption $V_B = + 24$ V	I_{tot}	typ. 215 mA ←
Operating mounting base temperature	T_{mb}	-20 to + 90 $^{\circ}$ C

MECHANICAL DATA

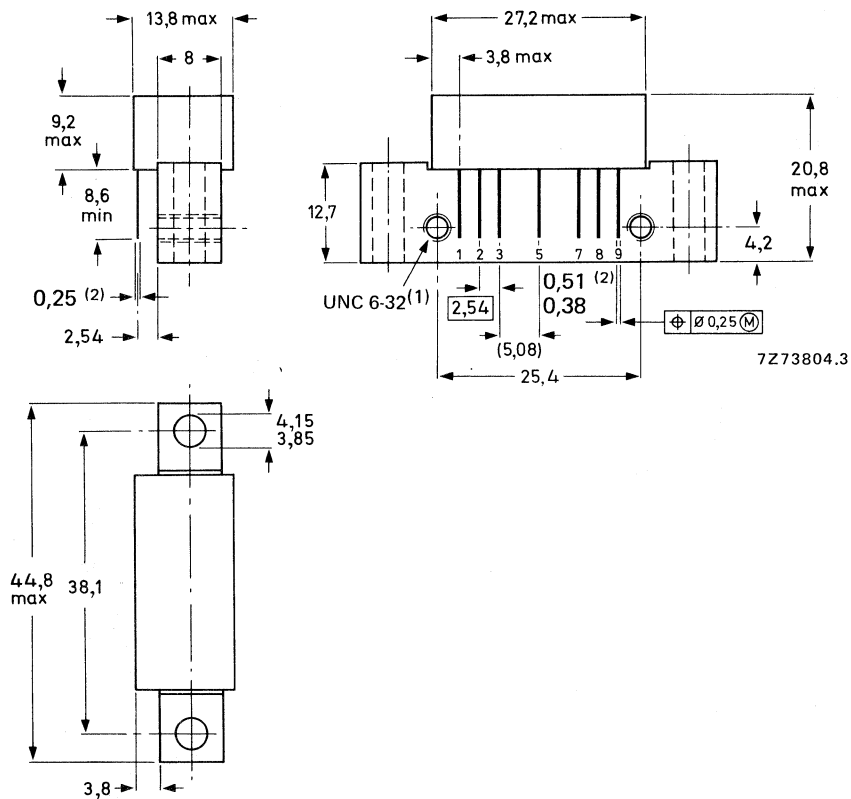
Sot-115 (see Fig. 1).

* The module normally operates at $V_B = 24$ V, but is able to withstand supply transients up to 30 V.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-115.



- (1) Screw 6-32UNC-2A available upon request (see "Accessories").
- (2) Leads gold-plated.

→ See 'Mounting and Soldering Recommendations'.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

R.F. input voltage	V_i	max.	65 dBmV
Storage temperature	T_{stg}		-40 to +100 °C
Operating mounting base temperature	T_{mb}		-20 to +90 °C

CHARACTERISTICS at $T_{mb} = 30\text{ }^{\circ}\text{C}$ unless otherwise specifiedSupply voltage $V_B = +24\text{ V}$

Power gain at $f = 10\text{ MHz}$	G_p	$22,0 \pm 0,5\text{ dB}$	
Slope cable equivalent $f = 5\text{ MHz to } 200\text{ MHz}$	SL	$-0,2\text{ to } +0,5\text{ dB}$	
Flatness of frequency response $f = 5\text{ MHz to } 200\text{ MHz}$	FL	max. $\pm 0,2\text{ dB}$	
Return losses at input and output $Z_S = Z_L = 75\text{ }\Omega$; $f = 5\text{ MHz to } 200\text{ MHz}$	S_{11-22}	min. 20 dB	
Output voltage at $d_{im} = -60\text{ dB}$ (DIN 45004B, par. 6.3: 3-tone) $V_p = V_o$; $f_p = 33,25\text{ MHz}$ $V_q = V_o - 6\text{ dB}$; $f_q = 42,25\text{ MHz}$ $V_r = V_o - 6\text{ dB}$; $f_r = 44,25\text{ MHz}$ Measured at $f_{(p+q-r)} = 33,25\text{ MHz}$	V_o	min. 67 dBmV	
Output voltage at $d_{im} = -60\text{ dB}$ (DIN 45004B, par. 6.3: 3-tone) $V_p = V_o$; $f_p = 187,25\text{ MHz}$ $V_q = V_o - 6\text{ dB}$; $f_q = 194,25\text{ MHz}$ $V_r = V_o - 6\text{ dB}$; $f_r = 196,25\text{ MHz}$ Measured at $f_{(p+q-r)} = 185,25\text{ MHz}$	V_o	min. 64 dBmV	←
2nd-order distortion $V_o = 50\text{ dBmV}$; $f_p = 83,25\text{ MHz}$ $V_o = 50\text{ dBmV}$; $f_q = 109,25\text{ MHz}$ Measured at $f_{(p+q)} = 192,5\text{ MHz}$	d_2	max. -67 dB	
Composite triple beat at 22 channels $V_o = 50\text{ dBmV}$; measured on channel 7	CTB	max. -67 dB	
Cross modulation at 22 channels $V_o = 50\text{ dBmV}$; measured in channel 2	X_{mod}	max. -60 dB	
Noise figure $f = 200\text{ MHz}$	F	max. $5,5\text{ dB}$	
Total d.c. current consumption	I_{tot}	typ. 215 mA max. 230 mA	←

CATV AMPLIFIER MODULE

Hybrid amplifier module for use in CATV systems and operating at frequencies from 5 MHz to 200 MHz.
This device is intended as a reverse amplifier for use in two-way systems.

QUICK REFERENCE DATA

Frequency range	f	5	to	200 MHz
Source impedance and load impedance	$Z_S = Z_L$			75 Ω
Power gain at f = 10 MHz	G_p	24,0 \pm		0,5 dB
Slope cable equivalent f = 5 MHz to 200 MHz	SL	-0,2 to		+0,5 dB
Flatness of frequency response f = 5 MHz to 200 MHz	FL	max.		+0,2 dB
Return losses at input and output f = 5 MHz to 200 MHz	S_{11-22}	min.		20 dB
Output voltage at $d_{im} = -60$ dB; measured at 33,25 MHz (DIN 45004B, par. 6,3: 3-tone)	V_o	min.		67 dBmV
2nd-order distortion $V_o = 50$ dBmV	d_2	max.		-67 dB
Composite triple beat; 22 channels $V_o = 50$ dBmV	CTB	max.		-67 dB
Cross modulation at 22 channels $V_o = 50$ dBmV	X_{mod}	max.		-59 dB
Noise figure f = 200 MHz	F	max.		5,5 dB
D.C. supply voltage	$+V_B$	=		24 V*
Total d.c. current consumption $V_B = +24$ V	I_{tot}	typ.		215 mA ←
Operating mounting base temperature	T_{mb}	-20 to		+90 $^{\circ}C$

MECHANICAL DATA

SOT-115 (see Fig. 1).

* The module normally operates at $V_B = 24$ V, but is able to withstand supply transients up to 30 V.

CHARACTERISTICS at $T_{mb} = 30\text{ }^{\circ}\text{C}$ unless otherwise specifiedSupply voltage $V_B = +24\text{ V}$ Power gain at $f = 10\text{ MHz}$ G_p 24,0 \pm 0,5 dB

Slope cable equivalent

 $f = 5\text{ MHz to }200\text{ MHz}$

SL -0,2 to +0,5 dB

Flatness of frequency response

 $f = 5\text{ MHz to }200\text{ MHz}$ FL max. \pm 0,2 dB

Return losses at input and output

 $Z_S = Z_L = 75\text{ }\Omega$; $f = 5\text{ MHz to }200\text{ MHz}$ S₁₁₋₂₂ min. 20 dBOutput voltage at $d_{im} = -60\text{ dB}$

(DIN 45004B, par. 6,3: 3-tone)

 $V_p = V_o$; $f_p = 35,25\text{ MHz}$ $V_q = V_o - 6\text{ dB}$; $f_q = 42,25\text{ MHz}$ $V_r = V_o - 6\text{ dB}$; $f_r = 44,25\text{ MHz}$ Measured at $f_{(p+q-r)} = 33,25\text{ MHz}$ V_o min. 67 dBmVOutput voltage at $d_{im} = -60\text{ dB}$

(DIN 45004B, par. 6,3: 3-tone)

 $V_p = V_o$; $f_p = 187,25\text{ MHz}$ $V_q = V_o - 6\text{ dB}$; $f_q = 194,25\text{ MHz}$ $V_r = V_o - 6\text{ dB}$; $f_r = 196,25\text{ MHz}$ Measured at $f_{(p+q-r)} = 185,25\text{ MHz}$ V_o min. 64 dBmV

2nd order distortion

 $V_o = 50\text{ dBmV}$; $f_p = 83,25\text{ MHz}$ $V_o = 50\text{ dBmV}$; $f_q = 109,25\text{ MHz}$ Measured at $f_{(p+q)} = 192,5\text{ MHz}$ d_2 max. -67 dB

Composite triple beat at 22 channels

 $V_o = 50\text{ dBmV}$; measured on channel 7

CTB max. -67 dB

Cross modulation at 22 channels

 $V_o = 50\text{ dBmV}$; measured in channel 2 X_{mod} max. -59 dB

Noise figure

 $f = 200\text{ MHz}$

F max. 5,5 dB

Total d.c. current consumption

 I_{tot} typ. 215 mA
max. 230 mA

CATV AMPLIFIER MODULES

Hybrid amplifier modules for CATV systems operating at frequencies up to 450 MHz.

BGY70: 12,5 dB input amplifier module;

BGY71: 12,5 dB output amplifier module.

Features:

- excellent linearity;
- extremely low noise;
- optimal reliability ensured by TiPtAu metallized crystals, silicon nitride passivation and rugged construction.

QUICK REFERENCE DATA

		BGY70	BGY71
Frequency range	f	40 to 450	40 to 450 MHz
Source impedance and load impedance	$Z_S = Z_L$	= 75	75 Ω
Power gain at f = 50 MHz	G_p	12,5 \pm 0,4	12,5 \pm 0,4 dB
Slope cable equivalent f = 40 MHz to 450 MHz	SL	0,5 to 2	0,5 to 2 dB
Flatness of frequency response f = 40 MHz to 450 MHz	FL	max. \pm 0,2	\pm 0,2 dB
Return losses at input and output f = 40 MHz to 450 MHz	S_{11-22}	min. 18	18 dB
Output voltage at $d_{im} = -60$ dB (DIN 45004B, par. 6.3: 3-tone)	V_o	min. 62,5	65 dBmV
2nd order distortion at channel R $V_o = 50$ dBmV on channel 2 and 13	d_2	min. -71	-73 dB
Composite triple beat 52 channels $V_o = 46$ dBmV	CTB	-55	-59 dB
Output capability $X_{mod} = -57$ dB; 52 channels flat	V_o	46,5	49,5 dBmV
Noise figure f = 40 MHz to 450 MHz	F	max. 7,5	8,5 dB
D.C. supply voltage	+ V_B	= 24	24 V*
Total d.c. current consumption at $V_B = +24$ V	I_{tot}	typ. 160	200 mA
Operating mounting base temperature	T_{mb}	-20 to +90	-20 to +90 $^{\circ}$ C

MECHANICAL DATA

SOT-115 (see Fig. 1).

* The modules normally operate at $V_B = 24$ V, but are able to withstand supply transients up to 30 V.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

R.F. input voltage	V_i	max.	67 dBmV
Storage temperature	T_{stg}		-40 to + 100 °C
Operating mounting base temperature	T_{mb}		-20 to + 90 °C

CHARACTERISTICS

Supply voltage $V_B = + 24 \text{ V}$; $T_{amb} = 25 \text{ °C}$

		BGY70	BGY71
Power gain at $f = 50 \text{ MHz}$	G_p	$12,5 \pm 0,4$	$12,5 \pm 0,4 \text{ dB}$
Slope cable equivalent $f = 40 \text{ MHz to } 450 \text{ MHz}$	SL	0,5 to 2	0,5 to 2 dB
Flatness of frequency response $f = 40 \text{ MHz to } 450 \text{ MHz}$	FL	$\pm 0,2$	$\pm 0,2 \text{ dB}$
Return losses at input and output $Z_S = Z_L = 75 \Omega$; $f = 40 \text{ MHz to } 450 \text{ MHz}$	S_{11-22}	18	18 dB
Output voltage at $d_{im} = -60 \text{ dB}$ (DIN 45004B, 6.3: 3-tone) $V_p = V_o$; $f_p = 387,25 \text{ MHz}$ $V_q = V_o - 6 \text{ dB}$; $f_q = 394,25 \text{ MHz}$ $V_r = V_o - 6 \text{ dB}$; $f_r = 396,25 \text{ MHz}$ Measured at $f_{(p+q-r)} = 385,25 \text{ MHz}$	V_o min.	61	63,5 dBmV
Output voltage at $d_{im} = -60 \text{ dB}$ (DIN 45004B, par. 6.3: 3-tone) $V_p = V_o$; $f_p = 287,25 \text{ MHz}$ $V_q = V_o - 6 \text{ dB}$; $f_q = 294,25 \text{ MHz}$ $V_r = V_o - 6 \text{ dB}$; $f_r = 296,25 \text{ MHz}$ Measured at $f_{(p+q-r)} = 285,25 \text{ MHz}$	V_o min.	62,5	65 dBmV
2nd order distortion $V_o = 50 \text{ dBmV}$; channel 2 $V_o = 50 \text{ dBmV}$; channel 13 Measured at channel R	d_2 max.	-71	-73 dB
$V_o = 50 \text{ dBmV}$; channel G $V_o = 50 \text{ dBmV}$; channel N Measured at channel H 14	d_2 typ.	-68	-70 dB
Composite triple beat 52 channels $V_o = 46 \text{ dBmV}$; channel H 14	CTB	-55	-59 dB
Output capability on channel H 14 $X_{mod} = -57 \text{ dB}$; 52 channels flat	V_o	46,5	49,5 dBmV
Noise figure $f = 40 \text{ MHz to } 450 \text{ MHz}$	F max.	7,5	8,5 dB
Total d.c. current consumption	I_{tot} typ.	160	200 mA
	I_{tot} max.	180	220 mA

CATV AMPLIFIER MODULES

Hybrid amplifier modules for CATV systems operating at frequencies up to 450 MHz.

BGY74: 17 dB input amplifier module;

BGY75: 17 dB output amplifier module.

Features:

- excellent linearity;
- extremely low noise;
- optimal reliability ensured by TiPtAu metallized crystals, silicon nitride passivation and rugged construction.

QUICK REFERENCE DATA

		BGY74	BGY75
Frequency range	f	40 to 450	40 to 450 MHz
Source impedance and load impedance	$Z_S = Z_L$	= 75	75 Ω
Power gain at f = 50 MHz	G_p	17,0 \pm 0,4	17,0 \pm 0,4 dB
Slope cable equivalent f = 40 MHz to 450 MHz	SL	0,5 to 1,5	0,5 to 1,5 dB
Flatness of frequency response f = 40 MHz to 450 MHz	FL	max. \pm 0,1	\pm 0,1 dB
Return losses at input and output f = 40 MHz to 450 MHz	S ₁₁₋₂₂	min. 18	18 dB
Output voltage at $d_{im} = -60$ dB (DIN 45004B, par. 6.3: 3-tone)	V_o	min. 62,5	65 dBmV
2nd order distortion at channel R $V_o = 50$ dBmV on channel 2 and 13	d_2	max. -71	-73 dB
Composite triple beat 52 channels $V_o = 46$ dBmV	CTB	-56	-60 dB
Output capability $X_{mod} = -57$ dB; 52 channels flat	V_o	46,5	49,5 dBmV
Noise figure f = 40 MHz to 450 MHz	F	max. 7	7,5 dB
D.C. supply voltage	+ V_B	= 24	24 V*
Total d.c. current consumption at $V_B = + 24$ V	I_{tot}	typ. 180	200 mA
Operating mounting base temperature	T_{mb}	-20 to + 90	-20 to + 90 $^{\circ}$ C

MECHANICAL DATA

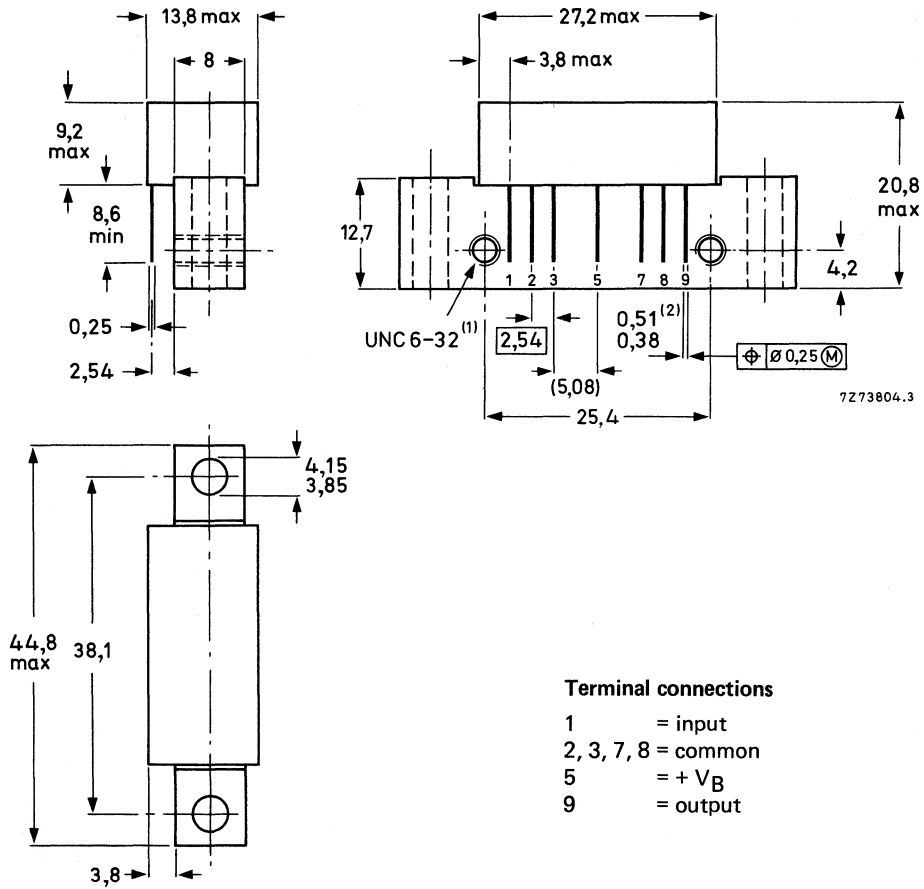
SOT-115 (see Fig. 1).

* The modules normally operate at $V_B = 24$ V, but are able to withstand supply transients up to 30 V.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-115.



Terminal connections

- 1 = input
- 2, 3, 7, 8 = common
- 5 = + V_B
- 9 = output

(1) Screw 6-32UNC-2A available upon request (see "Accessories").

(2) Leads gold-plated.

→ See 'Mounting and Soldering Recommendations'.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

R.F. input voltage	V_i	max.	65 dBmV
Storage temperature	T_{stg}		-40 to + 100 °C
Operating mounting base temperature	T_{mb}		-20 to + 90 °C

CHARACTERISTICS

Supply voltage $V_B = + 24$ V; $T_{amb} = 25$ °C

		BGY74	BGY75
Power gain at $f = 50$ MHz	G_p	$17,0 \pm 0,4$	$17,0 \pm 0,4$ dB
Slope cable equivalent $f = 40$ MHz to 450 MHz	SL	0,5 to 1,5	0,5 to 1,5 dB
Flatness of frequency response $f = 40$ MHz to 450 MHz	FL max.	$\pm 0,1$	$\pm 0,1$ dB
Return losses at input and output $Z_S = Z_L = 75 \Omega$; $f = 40$ MHz to 450 MHz	S_{11-22} min.	18	18 dB ←
Output voltage at $d_{im} = -60$ dB (DIN 45004B, 6.3: 3-tone) $V_p = V_o$; $f_p = 387,25$ MHz $V_q = V_o - 6$ dB; $f_q = 394,25$ MHz $V_r = V_o - 6$ dB; $f_r = 396,25$ MHz Measured at $f_{(p+q-r)} = 385,25$ MHz	V_o min.	61	63,5 dBmV
Output voltage at $d_{im} = -60$ dB (DIN 45004B, par. 6.3: 3-tone) $V_p = V_o$; $f_p = 287,25$ MHz $V_q = V_o - 6$ dB; $f_q = 294,25$ MHz $V_r = V_o - 6$ dB; $f_r = 296,25$ MHz Measured at $f_{(p+q-r)} = 285,25$ MHz	V_o min.	62,5	65 dBmV
2nd order distortion $V_o = 50$ dBmV; channel 2 $V_o = 50$ dBmV; channel 13 Measured at channel R	d_2 max.	-71	-73 dB
$V_o = 50$ dBmV; channel G $V_o = 50$ dBmV; channel N Measured at channel H 14	d_2 typ.	-68	-70 dB
Composite triple beat 52 channels $V_o = 46$ dBmV; channel H 14	CTB	-56	-60 dB
Output capability on channel H 14 $X_{mod} = -57$ dB; 52 channels flat	V_o	46,5	49,5 dBmV
Noise figure $f = 40$ MHz to 450 MHz	F max.	7	7,5 dB
Total d.c. current consumption	I_{tot} typ. max.	180 200	200 mA 220 mA

CATV AMPLIFIER MODULE

Hybrid amplifier module for use as 34 dB line extender in CATV systems operating at frequencies up to 450 MHz.

Features:

- excellent linearity;
- extremely low noise;
- optimum reliability ensured by TiPtAu metallized crystals, silicon nitride glass barrier and rugged construction.

QUICK REFERENCE DATA

Frequency range	f	40 to 450 MHz
Source impedance and load impedance	$Z_S = Z_L$	75 Ω
Power gain at f = 50 MHz	G_p	34,0 \pm 1,0 dB
Slope cable equivalent f = 40 MHz to 450 MHz	SL	0,5 to 2,5 dB
Flatness of frequency response f = 40 MHz to 450 MHz	FL	max. \pm 0,3 dB
Return losses at input and output f = 40 MHz to 450 MHz	S_{11-22}	min. 18 dB
Output voltage at $d_{im} = -60$ dB (DIN 45004, par. 6.3: 3-tone)	V_o	min. 63,5 dBmV
2nd-order distortion at channel R $V_o = 50$ dBmV on channels 2 and 13	d_2	max. -70 dB
Composite triple beat; 52 channels $V_o = 46$ dBmV	CTB	-59 dB
Output capability $X_{mod} = -57$ dB; 52 channels flat	V_o	47 dBmV
Noise figure f = 40 MHz to 450 MHz	F	max. 6 dB
D.C. supply voltage	$+V_B$	= 24 V*
Total d.c. current consumption $V_B = +24$ V	I_{tot}	typ. 320 mA
Operating mounting base temperature	T_{mb}	-20 to +90 $^{\circ}$ C

MECHANICAL DATA

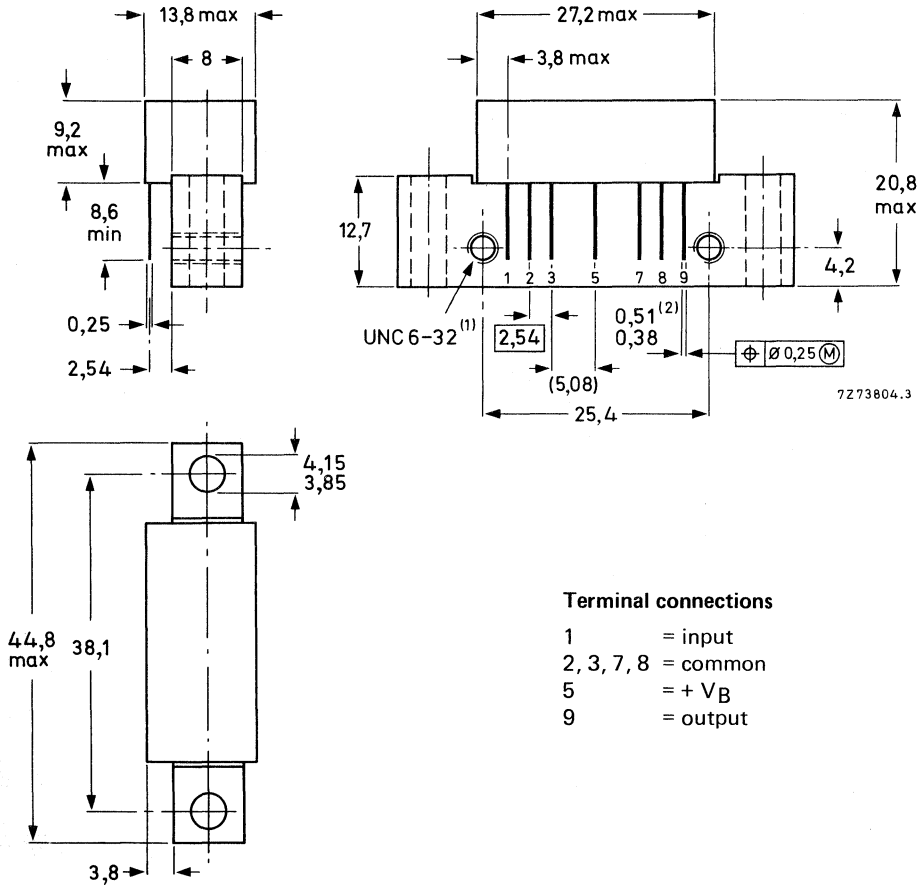
SOT-115 (see Fig. 1).

* The module normally operates at $V_B = 24$ V, but is able to withstand incidental supply transients up to 30 V.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-115.



Terminal connections

- 1 = input
- 2, 3, 7, 8 = common
- 5 = + V_B
- 9 = output

- (1) Screw 6-32UNC-2A available upon request (see "Accessories").
- (2) Leads gold-plated.

→ See 'Mounting and Soldering Recommendations'.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

R.F. input voltage	V _i	max.	55 dBmV
Storage temperature	T _{stg}		-40 to +100 °C
Operating mounting base temperature	T _{mb}		-20 to +90 °C

CHARACTERISTICSSupply voltage $V_B = +24\text{ V}$; $T_{\text{amb}} = 25\text{ }^\circ\text{C}$ Power gain at $f = 50\text{ MHz}$ G_p 34,0 \pm 1,0 dB

Slope cable equivalent

 $f = 40\text{ MHz to } 450\text{ MHz}$

SL 0,5 to 2,5 dB

Flatness of frequency response

 $f = 40\text{ MHz to } 450\text{ MHz}$ FL max. \pm 0,3 dB

Return losses at input and output

 $Z_S = Z_L = 75\ \Omega$; $f = 40\text{ MHz to } 450\text{ MHz}$ S_{11-22} min. 18 dBOutput voltage at $d_{\text{im}} = -60\text{ dB}$

(DIN 45004B, par. 6.3: 3-tone)

 $V_p = V_o$; $f_p = 387,25\text{ MHz}$ $V_q = V_o - 6\text{ dB}$; $f_q = 394,25\text{ MHz}$ $V_r = V_o - 6\text{ dB}$; $f_r = 396,25\text{ MHz}$ Measured at $f_{(p+q-r)} = 385,25\text{ MHz}$ V_o min. 62 dBmVOutput voltage at $d_{\text{im}} = -60\text{ dB}$

(DIN 45004B, par. 6.3: 3-tone)

 $V_p = V_o$; $f_p = 287,25\text{ MHz}$ $V_q = V_o - 6\text{ dB}$; $f_q = 294,25\text{ MHz}$ $V_r = V_o - 6\text{ dB}$; $f_r = 296,25\text{ MHz}$ Measured at $f_{(p+q-r)} = 285,25\text{ MHz}$ V_o min. 63,5 dBmV

2nd-order distortion

 $V_o = 50\text{ dBmV}$; channel 2 $V_o = 50\text{ dBmV}$; channel 13

Measured at channel R

 $V_o = 50\text{ dBmV}$; channel G $V_o = 50\text{ dBmV}$; channel N

Measured at channel H14

 d_2 max. -70 dB d_2 typ. -67 dB

Composite triple beat 52 channels

 $V_o = 46\text{ dBmV}$; channel H14

CTB -59 dB

Output capability on channel H14

 $X_{\text{mod}} = -57\text{ dB}$; 52 channels flat V_o 47 dBmV

Noise figure

 $f = 40\text{ MHz to } 450\text{ MHz}$

F max. 6 dB

Total d.c. current consumption

 I_{tot} typ. 320 mA
max. 340 mA

CATV AMPLIFIER MODULES

Hybrid amplifier modules for CATV systems operating at frequencies up to 450 MHz.

BGY84: 17,0 dB input amplifier module

BGY85: 17,0 dB output amplifier module

Features:

- excellent linearity;
- extremely low noise;
- optimal reliability ensured by TiPtAu metallized crystals, silicon nitride passivation and rugged construction.

QUICK REFERENCE DATA

		BGY84	BGY85
Frequency range	f	40 to 450	40 to 450 MHz
Source impedance and load impedance	$Z_S = Z_L$	75	75 Ω
Power gain at f = 50 MHz	G_p	17,0 \pm 0,5	17,0 \pm 0,5 dB
Slope cable equivalent f = 40 MHz to 450 MHz	SL	0,5 to 1,5	0,5 to 1,5 dB
Return losses at input and output f = 40 MHz	S_{11-22}	min. 20	20 dB
f = 450 MHz		min. 18	18 dB
Output voltage at $d_{im} = -60$ dB (DIN 45004B, par. 6.3: 3-tone)	V_o	min. 60	62,5 dBmV
2nd order distortion $V_o = 46$ dBmV	d_2	max. -70	-70 dB
Composite triple beat 60 channels $V_o = 46$ dBmV	CTB	max. -55	-58 dB
Cross modulation distortion $V_o = 46$ dBmV; 60 channels	X_{mod}	max. -57	-60 dB
Noise figure f = 40 MHz to 450 MHz	F	max. 6,5	7,0 dB
D.C. supply voltage	+ V_B	= 24	24 V*
Total d.c. current consumption at $V_B = + 24$ V	I_{tot}	typ. 180	220 mA

MECHANICAL DATA

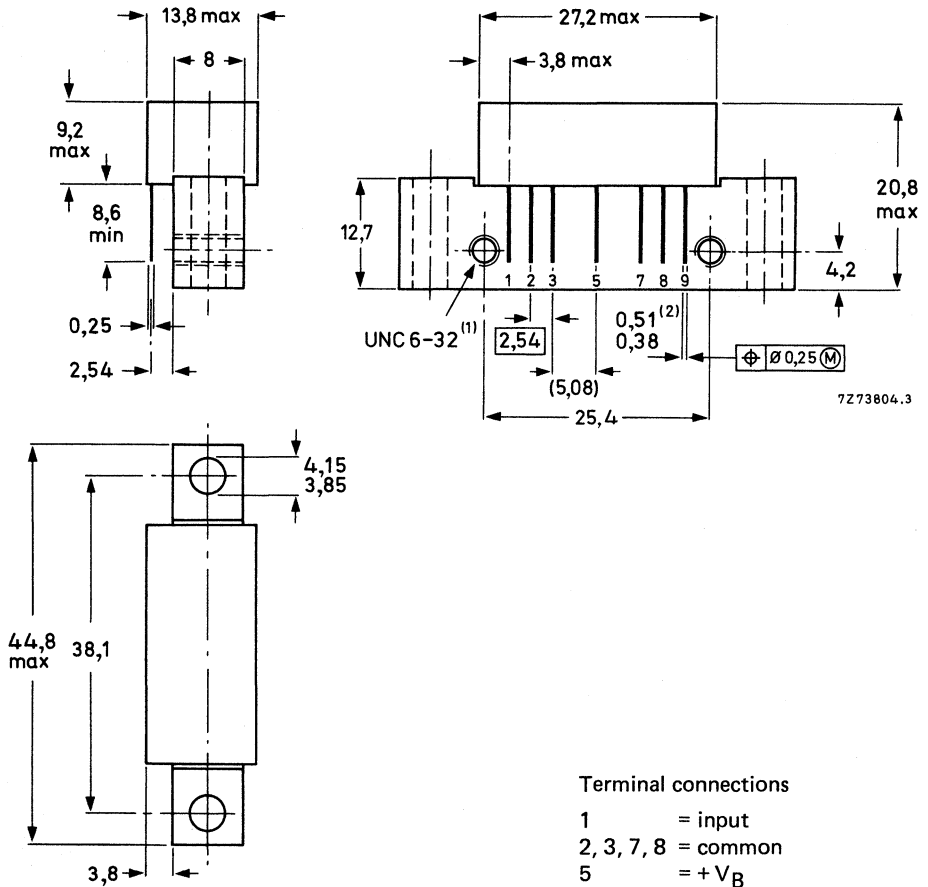
SOT-115 (see Fig. 1).

* The modules normally operate at $V_B = 24$ V, but are able to withstand supply transients up to 30 V.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-115.



Terminal connections

- 1 = input
- 2, 3, 7, 8 = common
- 5 = +V_B
- 9 = output

- (1) Screw 6-32UNC-2A available on request (see "Accessories").
- (2) Gold plated leads.

See "Mounting and Soldering Recommendations".

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

R.F. input voltage	V_i	max.	65 dBmV
Storage temperature	T_{stg}	-40 to + 100 °C	
Operating mounting base temperature	T_{mb}	-20 to + 100 °C	

CHARACTERISTICS

Supply voltage $V_B = + 24 V$; $T_{mb} = 30 °C$

		BGY84	BGY85
Power gain			
f = 50 MHz	G_p	17,0 ± 0,5	17,0 ± 0,5 dB ←
f = 450 MHz		17,3 to 18,8	17,3 to 18,8 dB
Slope cable equivalent			
f = 40 MHz to 450 MHz	SL	+ 0,5 to + 1,5	+ 0,5 to 1,5 dB
Flatness of frequency response			
f = 40 MHz to 450 MHz	FL	max. ± 0,2	± 0,2 dB
Return losses at input and output			
$Z_S = Z_L = 75 \Omega$			
f = 40 to 80 MHz	S_{11-22}	min. 20	20 dB
f = 80 to 160 MHz		min. 19	19 dB
f = 160 to 450 MHz		min. 18	18 dB
Output voltage at $d_{im} = -60$ dB (DIN 45004B, 6.3: 3-tone)			
$V_p = V_o$; $f_p = 440,25$ MHz	V_o	min. 60	62,5 dBmV
$V_q = V_o - 6$ dB; $f_q = 447,25$ MHz			
$V_r = V_o - 6$ dB; $f_r = 449,25$ MHz			
Measured at $f_{(p+q-r)} = 438,25$ MHz			
2nd order distortion			
$V_o = 46$ dBmV; channel 2	d_2	max. -70	-70 dB
$V_o = 46$ dBmV; channel H5			
Measured at channel H14			
Composite triple beat 60 channels			
$V_o = 46$ dBmV; channel H22	CTB	max. -55	-58 dB
Cross modulation distortion			
$V_o = 46$ mVdB; 60 channels	X_{mod}	max. -57	-60 dB
Measured at channel 2			
Noise figure			
f = 40 MHz to 450 MHz	F	max. 6,5	7,0 dB
Total d.c. current consumption			
	I_{tot}	typ. 180	220 mA
		max. 200	240 mA

CATV AMPLIFIER MODULES

Hybrid amplifier modules for CATV systems operating at frequencies up to 450 MHz.

BGY84A: 18,5 dB input amplifier module

BGY85A: 18,5 dB output amplifier module

Features:

- excellent linearity;
- extremely low noise;
- optimal reliability ensured by TiPtAu metallized crystals, silicon nitride passivation and rugged construction.

QUICK REFERENCE DATA

		BGY84A	BGY85A
Frequency range	f	40 to 450	40 to 450 MHz
Source impedance and load impedance	$Z_S = Z_L$	75	75 Ω
Power gain at f = 50 MHz	G_p	18,4 \pm 0,4	18,4 \pm 0,4 dB
Slope cable equivalent f = 40 MHz to 450 MHz	SL	0,3 to 1,5	0,3 to 1,5 dB
Flatness of frequency response f = 40 MHz to 450 MHz	FL	max. \pm 0,2	\pm 0,2 dB
Return losses at input and output f = 40 MHz	S ₁₁₋₂₂	min. 20	20 dB
f = 450 MHz		min. 18	18 dB
Output voltage at $d_{im} = -60$ dB (DIN 45004B, par. 6.3: 3-tone)	V_o	min. 60	62,5 dBmV
2nd order distortion $V_o = 46$ dBmV	d_2	max. -72	-72 dB
Composite triple beat 60 channels $V_o = 46$ dBmV	CTB	max. -55	-59 dB
Cross modulation distortion $V_o = 46$ dBmV; 60 channels	X_{mod}	max. -58	-61 dB
Noise figure f = 40 MHz to 450 MHz	F	max. 6,5	7,0 dB
D.C. supply voltage	+ V_B	= 24	24 V*
Total d.c. current consumption at $V_B = + 24$ V	I_{tot}	typ. 180	220 mA

MECHANICAL DATA

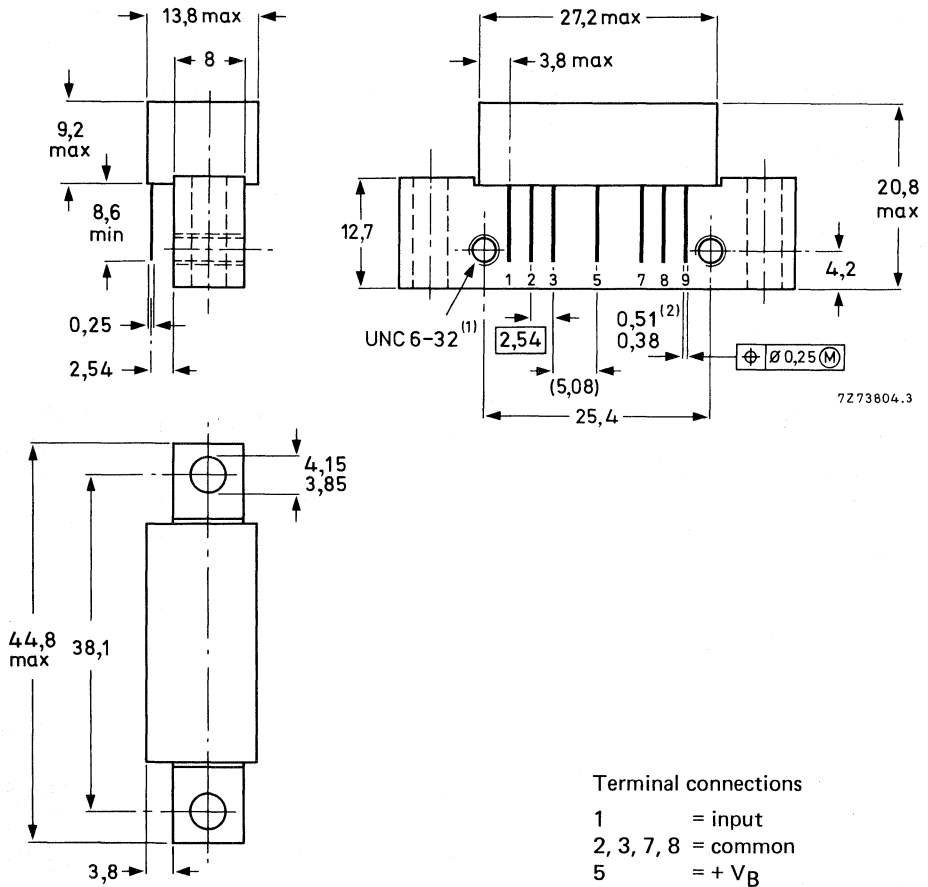
SOT-115 (see Fig. 1).

* The modules normally operate at $V_B = 24$ V, but are able to withstand supply transients up to 30 V.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-115.



Terminal connections

- 1 = input
- 2, 3, 7, 8 = common
- 5 = + V_B
- 9 = output

(1) Screw 6-32UNC-2A available on request (see "Accessories").

(2) Leads gold-plated.

See "Mounting and Soldering Recommendations".

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

R.F. input voltage	V_i	max. 65 dBmV
Storage temperature	T_{stg}	-40 to + 100 °C
Operating mounting base temperature	T_{mb}	-20 to + 100 °C

CHARACTERISTICS

Supply voltage $V_B = + 24 V$; $T_{mb} = 30 °C$

		BGY84A	BGY85A
Power gain at $f = 50$ MHz	G_p	18,4 ± 0,4	18,4 ± 0,4 dB
Power gain at $f = 450$ MHz	G_p	18,7 to 20,2	18,7 to 20,2 dB
Slope cable equivalent $f = 40$ MHz to 450 MHz	SL	+ 0,3 to 1,5	+ 0,3 to 1,5 dB
Flatness of frequency response $f = 40$ MHz to 450 MHz	FL	max. ± 0,2	± 0,2 dB
Return losses at input and output $Z_S = Z_L = 75 \Omega$ $f = 40$ to 80 MHz	S ₁₁₋₂₂	min. 20	20 dB
$f = 80$ to 160 MHz		min. 19	19 dB
$f = 160$ to 450 MHz		min. 18	18 dB
Output voltage at $d_{im} = -60$ dB (DIN 45004B, 6.3: 3-tone) $V_p = V_o$; $f_p = 440,25$ MHz $V_q = V_o - 6$ dB; $f_q = 447,25$ MHz $V_r = V_o - 6$ dB; $f_r = 449,25$ MHz Measured at $f_{(p+q-r)} = 438,25$ MHz	V_o	min. 60	62,5 dBmV
2nd order distortion $V_o = 46$ dBmV; channel 2 $V_o = 46$ dBmV; channel H5 Measured at channel H14	d_2	max. -72	-72 dB
Composite triple beat 60 channels $V_o = 46$ dBmV; measured channel H22	CTB	max. -55	-59 dB
Cross modulation distortion $V_o = 46$ dBmV; 60 channels Measured at channel 2	X_{mod}	max. -58	-61 dB
Noise figure $f = 40$ MHz to 450 MHz	F	max. 6,5	7,0 dB
Total d.c. current consumption	I_{tot}	typ. 180 max. 200	220 mA 240 mA

DEVELOPMENT DATA

This data sheet contains advance information and specifications are subject to change without notice.

BGY86
BGY87

CATV AMPLIFIER MODULES

Hybrid amplifier modules for use in CATV systems and operating at frequencies up to 450 MHz.

BGY86: 22 dB preamplifier

BGY87: 22 dB final amplifier

Features

- excellent linearity
- extremely low noise
- optimal reliability ensured by TiPtAu metallized crystals, silicon nitride glass barrier and rugged construction

QUICK REFERENCE DATA

			BGY86	BGY87
Frequency range	f		40 to 450	40 to 450 MHz
Source impedance and load impedance	$Z_S = Z_L$	=	75	75 Ω
Power gain at f = 50 MHz	G_p		22,0 \pm 0,5	22,0 \pm 0,5 dB
Slope cable equivalent f = 40 MHz to 450 MHz	SL		0,2 to 1,5	0,2 to 1,5 dB
Flatness of frequency response f = 40 MHz to 450 MHz	FL	max.	\pm 0,2	\pm 0,2 dB
Return losses at input and output f = 40 MHz to 450 MHz	S_{11-22}	min.	18	18 dB
Output voltage at $d_{im} = -60$ dB (DIN 45004B, par. 6.3: 3-tone)	V_o	min.	61,5	64 dBmV
2nd-order distortion $V_o = 46$ dBmV	d_2	max.	-68	-72 dB
Composite triple beat $V_o = 46$ dBmV	CTB	max.	-56	-60 dB
Cross modulation $V_o = 46$ dBmV	X_{mod}	max.	-53	-57 dB
Noise figure f = 450 MHz	F	max.	6,0	6,5 dB
D.C. supply voltage*	+ V_B	=	24	24 V*
Total d.c. current consumption at $V_B = + 24$ V	I_{tot}	max.	200	240 mA
Operating case temperature	T_c		-20 to + 100	$^{\circ}$ C

MECHANICAL DATA

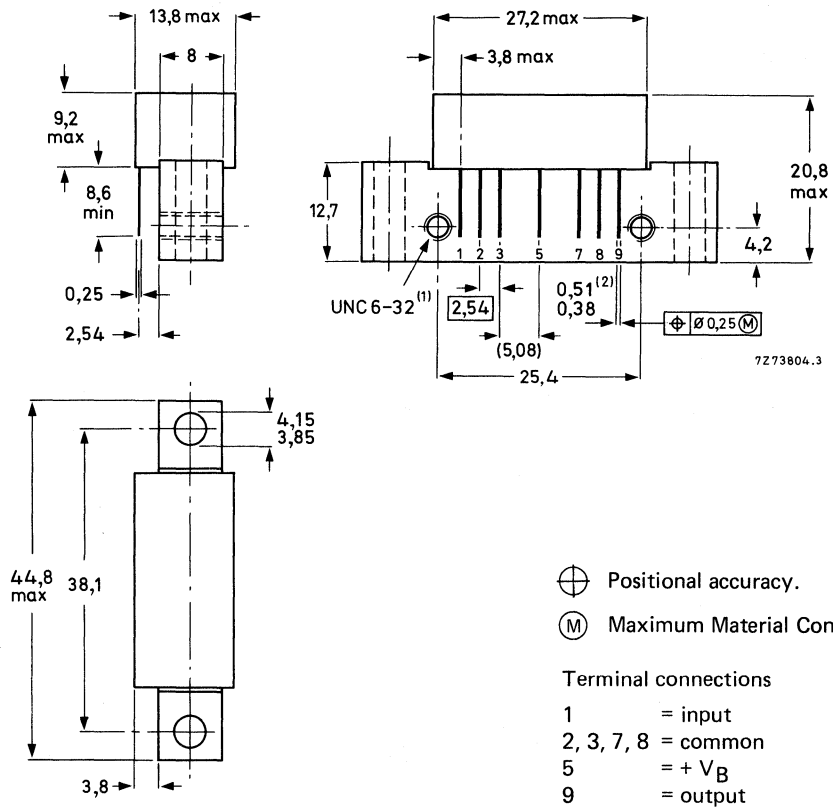
SOT-115 (see Fig. 1).

* The modules normally operate at $V_B = 24$ V, but are able to withstand supply transients up to 30 V.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-115.



- ⊕ Positional accuracy.
- Ⓜ Maximum Material Condition.

Terminal connections

- 1 = input
- 2, 3, 7, 8 = common
- 5 = + V_B
- 9 = output

(1) Screw 6-32UNC-2A available upon request (see "Accessories").
(2) Gold-plated leads.

See "Mounting and Soldering Recommendations".

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

R.F. input voltage	V_i	max.	60 dBmV
Storage temperature	T_{stg}	-40 to + 100	°C
Operating case temperature	T_c	-20 to + 100	°C

CHARACTERISTICS

Supply voltage $V_B = + 24 V$; $Z_S = Z_L = 75 \Omega$; $T_c = 30 \text{ }^\circ\text{C}$

DEVELOPMENT DATA

		BGY86	BGY87
Power gain at $f = 50 \text{ MHz}$	G_p	$22,0 \pm 0,5$	$22,0 \pm 0,5 \text{ dB}$
Power gain at $f = 450 \text{ MHz}$	G_p	22,0 to 23,5	22,0 to 23,5 dB
Slope cable equivalent $f = 40 \text{ MHz to } 450 \text{ MHz}$	SL	0,2 to 1,5	0,2 to 1,5 dB
Flatness of frequency response $f = 40 \text{ MHz to } 450 \text{ MHz}$	FL	max. $\pm 0,2$	$\pm 0,2 \text{ dB}$
Return losses at input and output $Z_S = Z_L = 75 \Omega$			
$f = 40 \text{ MHz to } 80 \text{ MHz}$	S_{11-22}	min. 20	20 dB
$f = 80 \text{ MHz to } 160 \text{ MHz}$	S_{11-22}	min. 19	19 dB
$f = 160 \text{ MHz to } 450 \text{ MHz}$	S_{11-22}	min. 18	18 dB
Output voltage at $d_{im} = -60 \text{ dB}$ (DIN 45004B, 6.3: 3-tone)			
$V_p = V_o$; $f_p = 440,25 \text{ MHz}$			
$V_q = V_o - 6 \text{ dB}$; $f_q = 447,25 \text{ MHz}$			
$V_r = V_o - 6 \text{ dB}$; $f_r = 449,25 \text{ MHz}$			
Measured at $f_{(p+q-r)} = 438,25 \text{ MHz}$	V_o	min. 61,5	64,0 dBmV
2nd-order distortion			
$V_o = 46 \text{ dBmV}$; $f_p = 55,25 \text{ MHz}$ (ch. 2)			
$V_o = 46 \text{ dBmV}$; $f_q = 391,25 \text{ MHz}$ (ch. H13)			
Tested at $f_{(p+q)} = 446,5 \text{ MHz}$ (ch. H22)	d_2	max. -68	-72 dB
Composite triple beat at 60 channels $V_o = 46 \text{ dBmV}$; tested at channel H22	CTB	max. -56	-60 dB
Cross modulation at 60 channels $V_o = 46 \text{ dBmV}$; tested in channel 2	X_{mod}	max. -53	-57 dB
Noise figure $f = 450 \text{ MHz}$	F	max. 6,0	6,5 dB
Total d.c. current consumption	I_{tot}	typ. 180 max. 200	220 mA 240 mA

CATV AMPLIFIER MODULE

Hybrid amplifier module for use as 34,5 dB line extender in CATV systems and operating at frequencies up to 450 MHz.

Features

- excellent linearity
- extremely low noise
- optimum reliability ensured by TiPtAu metallized crystals, silicon nitride glass barrier and rugged construction.

QUICK REFERENCE DATA

Frequency range	f		40 to 450 MHz
Source impedance and load impedance	$Z_S = Z_L$		75 Ω
Power gain			
f = 50 MHz		GP	34,5 \pm 1,0 dB
f = 450 MHz			35 to 37 dB
Slope cable equivalent			
f = 40 MHz to 450 MHz	SL		0,5 to 2,5 dB
Flatness of frequency response			
f = 40 MHz to 450 MHz	FL	max.	\pm 0,3 dB
Return losses at input and output			
f = 40 MHz to 450 MHz	S ₁₁₋₂₂	min.	18 dB
Intermodulation distortion at $V_O = 62$ dBmV (DIN 45004, par. 6.3: 3-tone)	d _{im}	max.	-60 dB
2nd-order distortion			
$V_O = 46$ dBmV	d ₂	max.	-70 dB
Composite triple beat; 60 channels			
$V_O = 46$ dBmV	CTB	max.	-58 dB
Cross modulation distortion			
$V_O = 46$ dBmV; 60 channels	X _{mod}	max.	-59 dB
Noise figure			
f = 450 MHz	F	max.	6 dB
D.C. supply voltage	+V _B	=	24 V*
Total d.c. current consumption			
V _B = +24 V	I _{tot}	typ.	320 mA
Operating mounting base temperature	T _{mb}		-20 to 100 $^{\circ}$ C

MECHANICAL DATA

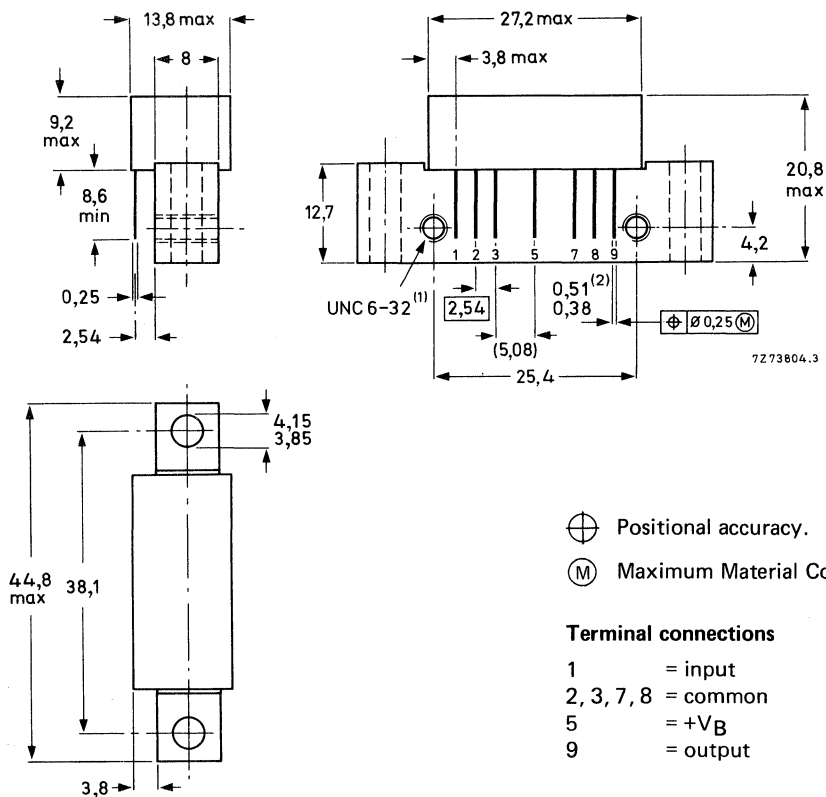
SOT-115 (see Fig. 1).

* The module normally operates at V_B = 24 V, but is able to withstand incidental supply transients up to 30 V.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-115.



⊕ Positional accuracy.

Ⓜ Maximum Material Condition.

Terminal connections

- 1 = input
- 2, 3, 7, 8 = common
- 5 = +V_B
- 9 = output

(1) Screw 6-32UNC-2A available upon request.

(2) Goldplated leads.

See "Mounting and Soldering Recommendations"

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

R.F. input voltage	V _i	max.	55 dBmV
Storage temperature	T _{stg}	-40 to +100 °C	
Operating mounting base temperature	T _{mb}	-20 to +100 °C	

CHARACTERISTICSSupply voltage $V_B = +24 \text{ V}$; $Z_S = Z_L = 75 \Omega$; $T_{mb} = 35 \text{ }^\circ\text{C}$

Power gain

f = 50 MHz

f = 450 MHz

G_P

34,5 ± 1,0 dB

35,0 to 37,0 dB

Slope cable equivalent

f = 40 MHz to 450 MHz

SL

0,5 to 2,5 dB

Flatness of frequency response

f = 40 MHz to 450 MHz

FL

max.

±0,3 dB

Return losses at input and output

 $Z_S = Z_L = 75 \Omega$;

f = 40 MHz to 80 MHz

f = 80 MHz to 160 MHz

f = 160 MHz to 450 MHz

S₁₁₋₂₂

min.

20 dB

min.

19 dB

min.

18 dB

Intermodulation distortion

(DIN 45004B, par. 6.3: 3-tone)

 $V_p = V_o = 62 \text{ dBmV}$ $f_p = 440,25 \text{ MHz}$ $V_q = V_o - 6 \text{ dB}$; $f_q = 447,25 \text{ MHz}$ $V_r = V_o - 6 \text{ dB}$; $f_r = 449,25 \text{ MHz}$ measured at $f_{(p+q-r)} = 438,25 \text{ MHz}$ d_{im}

max.

-60 dB

2nd-order distortion

 $V_p = 46 \text{ dBmV}$; $f_p = 55,25 \text{ MHz}$ $V_q = 46 \text{ dBmV}$; $f_q = 343,25 \text{ MHz}$ tested at $f_{(p+q)} = 398,50$ in channel H14d₂

max.

-70 dB

Composite triple beat 60 channels flat

 $V_o = 46 \text{ dBmV}$; tested in channel H22

CTB

max.

-58 dB

Cross modulation distortion 60 channels flat

 $V_o = 46 \text{ dBmV}$; tested in channel 2X_{mod}

max.

-59 dB

Noise figure

f = 450 MHz

F

max.

6 dB

Total d.c. current consumption

I_{tot}

typ.

320 mA

max.

340 mA

DEVELOPMENT DATA

This data sheet contains advance information and specifications are subject to change without notice.

BGY584A
BGY585A

CATV AMPLIFIER MODULES

Hybrid amplifier modules for use in CATV systems and operating at frequencies up to 550 MHz.

BGY584A: 18,2 dB preamplifier

BGY585A: 18,2 dB final amplifier

Features

- excellent linearity
- extremely low noise
- optimal reliability ensured by TiPtAu metallized crystals, silicon nitride glass barrier and rugged construction

QUICK REFERENCE DATA

			BGY584A	BGY585A
Frequency range	f		40 to 550	40 to 550 MHz
Source impedance and load impedance	$Z_S = Z_L$	=	75	75 Ω
Power gain at f = 50 MHz	G_p		18,2 \pm 0,5	18,2 \pm 0,5 dB
Slope cable equivalent f = 40 MHz to 550 MHz	SL		0,5 to 2,0	0,5 to 2,0 dB
Flatness of frequency response f = 40 MHz to 550 MHz	FL	max.	\pm 0,2	\pm 0,2 dB
Return losses at input and output f = 40 MHz to 550 MHz	S_{11-22}	min.	18	18 dB
Output voltage at $d_{im} = -60$ dB (DIN 45004B, par. 6.3: 3-tone)	V_o	min.	59,0	61,5 dBmV
2-nd order distortion $V_o = 44$ dBmV	d_2	max.	-70	-72 dB
Composite triple beat $V_o = 44$ dBmV	CTB	max.	-56	-59 dB
Cross modulation $V_o = 44$ dBmV	X_{mod}	max.	-59	-62 dB
Noise figure f = 550 MHz	F	max.	7,0	8,0 dB
D.C. supply voltage*	+ V_B	=	24	24 V*
Total d.c. current consumption at $V_B = +24$ V	I_{tot}	max.	200	240 mA
Operating case temperature	T_c		-20 to + 100	$^{\circ}C$

MECHANICAL DATA

SOT-115 (see Fig. 1).

* The modules normally operate at $V_B = 24$ V, but are able to withstand supply transients up to 30 V.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

R.F. input voltage	V_i	max.	60 dBmV
Storage temperature	T_{stg}		-40 to + 100 °C
Operating case temperature	T_c		-20 to + 100 °C

CHARACTERISTICS

Supply voltage $V_B = + 24 V$; $Z_S = Z_L = 75 \Omega$; $T_c = 30 \text{ }^\circ\text{C}$

DEVELOPMENT DATA

		BGY584A	BGY585A
Power gain at $f = 50 \text{ MHz}$	G_p	$18,2 \pm 0,5$	$18,2 \pm 0,5 \text{ dB}$
Power gain at $f = 550 \text{ MHz}$	G_p	$18,8 \text{ to } 20,0$	$18,8 \text{ to } 20,0 \text{ dB}$
Slope cable equivalent $f = 40 \text{ MHz to } 550 \text{ MHz}$	SL	$0,5 \text{ to } 2,0$	$0,5 \text{ to } 2,0 \text{ dB}$
Flatness of frequency response $f = 40 \text{ MHz to } 550 \text{ MHz}$	FL	max. $\pm 0,2$	$\pm 0,2 \text{ dB}$
Return losses at input and output $Z_S = Z_L = 75 \Omega$ $f = 40 \text{ MHz to } 80 \text{ MHz}$ $f = 80 \text{ MHz to } 160 \text{ MHz}$ $f = 160 \text{ MHz to } 550 \text{ MHz}$	S_{11-22}	min. 20 min. 19 min. 18	20 dB 19 dB 18 dB
Output voltage at $d_{im} = -60 \text{ dB}$ (DIN 45004B, 6.3: 3-tone) $V_p = V_o$; $f_p = 540,25 \text{ MHz}$ $V_q = V_o - 6 \text{ dB}$; $f_q = 547,25 \text{ MHz}$ $V_r = V_o - 6 \text{ dB}$; $f_r = 549,25 \text{ MHz}$ Measured at $f_{(p+q-r)} = 538,25 \text{ MHz}$	V_o	min. 59,0	61,5 dBmV
2nd-order distortion $V_o = 44 \text{ dBmV}$; $f_p = 55,25 \text{ MHz (ch. 2)}$ $V_o = 44 \text{ dBmV}$; $f_q = 493,25 \text{ MHz (ch. 18)}$ Tested at $f_{(p+q)} = 548,5 \text{ MHz (ch. 27)}$	d_2	max. -70	-72 dB
Composite triple beat at 77 channels $V_o = 44 \text{ dBmV}$; tested at channel 27	CTB	max. -56	-59 dB
Cross modulation at 77 channels $V_o = 44 \text{ dBmV}$; tested in channel 2	X_{mod}	max. -59	-62 dB
Noise figure $f = 550 \text{ MHz}$	F	max. 7,0	8,0 dB
Total d.c. current consumption	I_{tot}	typ. 180 max. 200	220 mA 240 mA

DEVELOPMENT DATA

This data sheet contains advance information and specifications are subject to change without notice.

BGY586
BGY587

CATV AMPLIFIER MODULES

Hybrid amplifier modules for use in CATV systems and operating at frequencies up to 550 MHz.

BGY586: 22 dB preamplifier

BGY587: 22 dB final amplifier

Features

- excellent linearity
- extremely low noise
- optimal reliability ensured by TiPtAu metallized crystals, silicon nitride glass barrier and rugged construction

QUICK REFERENCE DATA

			BGY586	BGY587
Frequency range	f		40 to 550	40 to 550 MHz
Source impedance and load impedance	$Z_S = Z_L$	=	75	75 Ω
Power gain at f = 50 MHz	G_p		22,0 \pm 0,5	22,0 \pm 0,5 dB
Slope cable equivalent f = 40 MHz to 550 MHz	SL		0,5 to 2,0	0,5 to 2,0 dB
Flatness of frequency response f = 40 MHz to 550 MHz	FL	max.	\pm 0,2	\pm 0,2 dB
Return losses at input and output f = 40 MHz to 550 MHz	S ₁₁₋₂₂	min.	18	18 dB
Output voltage at $d_{im} = -60$ dB (DIN 45004B, par. 6.3: 3-tone)	V_o	min.	58,5	61,0 dBmV
2nd-order distortion $V_o = 44$ dBmV	d_2	max.	-62	-66 dB
Composite triple beat $V_o = 44$ dBmV	CTB	max.	-53	-57 dB
Cross modulation $V_o = 44$ dBmV	X_{mod}	max.	-55	-59 dB
Noise figure f = 550 MHz	F	max.	6,5	7,0 dB
D.C. supply voltage*	+ V_B	=	24	24 V*
Total d.c. current consumption at $V_B = +24$ V	I_{tot}	max.	200	240 mA
Operating case temperature	T_c		-20 to + 100	$^{\circ}C$

MECHANICAL DATA

SOT-115 (see Fig. 1).

* The modules normally operate at $V_B = 24$ V, but are able to withstand supply transients up to 30 V.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

R.F. input voltage	V_i	max.	60 dBmV
Storage temperature	T_{stg}		-40 to + 100 °C
Operating case temperature	T_c		-20 to + 100 °C

CHARACTERISTICS

Supply voltage $V_B = + 24 \text{ V}$; $Z_S = Z_L = 75 \Omega$; $T_c = 30 \text{ °C}$

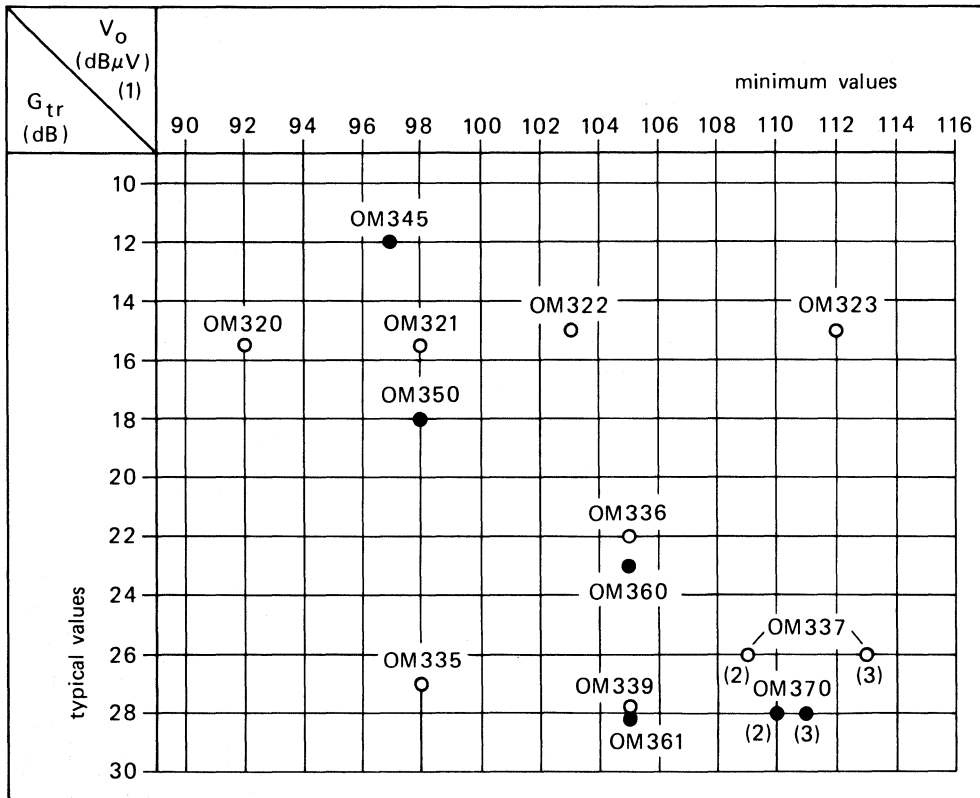
DEVELOPMENT DATA

			BGY586	BGY587
Power gain at $f = 50 \text{ MHz}$	G_p		$22,0 \pm 0,5$	$22,0 \pm 0,5 \text{ dB}$
Power gain at $f = 550 \text{ MHz}$	G_p	min.	22,0	22,0 dB
Slope cable equivalent $f = 40 \text{ MHz to } 550 \text{ MHz}$	SL		0,5 to 2,0	0,5 to 2,0 dB
Flatness of frequency response $f = 40 \text{ MHz to } 550 \text{ MHz}$	FL	max.	$\pm 0,2$	$\pm 0,2 \text{ dB}$
Return losses at input and output $Z_S = Z_L = 75 \Omega$				
$f = 40 \text{ MHz to } 80 \text{ MHz}$		min.	20	20 dB
$f = 80 \text{ MHz to } 160 \text{ MHz}$	S_{11-22}	min.	19	19 dB
$f = 160 \text{ MHz to } 550 \text{ MHz}$		min.	18	18 dB
Output voltage at $d_{im} = -60 \text{ dB}$ (DIN 45004B, 6.3: 3-tone) $V_p = V_o$; $f_p = 540,25 \text{ MHz}$ $V_q = V_o - 6 \text{ dB}$; $f_q = 547,25 \text{ MHz}$ $V_r = V_o - 6 \text{ dB}$; $f_r = 549,25 \text{ MHz}$ Measured at $f_{(p+q-r)} = 538,25 \text{ MHz}$	V_o	min.	58,5	61,0 dBmV
2nd-order distortion $V_o = 44 \text{ dBmV}$; $f_p = 55,25 \text{ MHz (ch. 2)}$ $V_o = 44 \text{ dBmV}$; $f_q = 493,25 \text{ MHz (ch. 18)}$ Tested at $f_{(p+q)} = 548,5 \text{ MHz (ch. 27)}$	d_2	max.	-62	-66 dB
Composite triple beat at 77 channels $V_o = 44 \text{ dBmV}$; tested at channel 27	CTB	max.	-53	-57 dB
Cross modulation at 77 channels $V_o = 44 \text{ dBmV}$; tested in channel 2	X_{mod}	max.	-55	-59 dB
Noise figure $f = 550 \text{ MHz}$	F	max.	6,5	7,0 dB
Total d.c. current consumption	I_{tot}	typ.	180	220 mA
		max.	200	240 mA

DEVICE DATA

**Hybrid ICs for
wideband amplifiers**

HYBRID ICs FOR WIDE-BAND AMPLIFIERS



7283427

- 12 V types
- 24 V types

- (1) At -60 dB intermodulation distortion (DIN 45004, par. 6.3: 3-tone).
- (2) UHF.
- (3) VHF.

Fig. 1 Type/performance in matrix survey.

The matrix survey (Fig. 1) and the tables next page show both the 12 V and 24 V ranges.

Note that the modules are available in the combination of high gain- high output voltage.

12 V supply voltage

	type	stage	gain (dB)	$V_{O(rms)}$ (dB μ V)		max. VSWR		supply current (mA)	page
				-60 dB IMD (note 1) min. values	noise figure (dB)	typ. values (note 2)			
						input	output		
low	OM345	1	12	97	5,5	2,0	1,4	11,5	733
medium	OM350	2	18	98	6,0	1,5	1,9	18	739
medium	OM360	3	23	105	7,0	1,3	1,5	55	745
output	OM361	3	28	105	6,0	1,5	1,7	50	751
high	OM370	3	28	111	7,0	2,3	1,9	105	757
output									

24 V supply voltage

	type	stages	gain (dB)	$V_{O(rms)}$ (dB μ V)		max. VSWR		supply current (mA)	page
				-60 dB IMD (note 1) min. values	noise figure (dB)	typ. values (note 2)			
						input	output		
low	OM320	2	15,5	92	5,5	2,2	2,5	33	687
output	OM321	2	15,5	98	6,0	2,5	2,0	33	693
	OM335	3	27	98	5,5	1,9	3,2	35	711
medium	OM322	2	15	103	7,0	1,7	1,7	60	699
	OM336	3	22	105	7,0	1,4	1,6	65	717
	OM339	3	28	105	6,0	1,5	1,5	66	729
high	OM323*	2	15	112	9,0	1,9	2,3	100	705
output	OM337*	3	26	113	9,8	2,3	1,8	115	721

* Also available in A-version for external coil and output capacitor.

Notes

1. Measured at -60 dB intermodulation distortion to DIN 45004, par. 6.3: 3-tone, $f = 470$ MHz.
2. The typical maximum VSWR occurring in the frequency range 40-860 MHz, for a sample connected to a 75 Ω line.

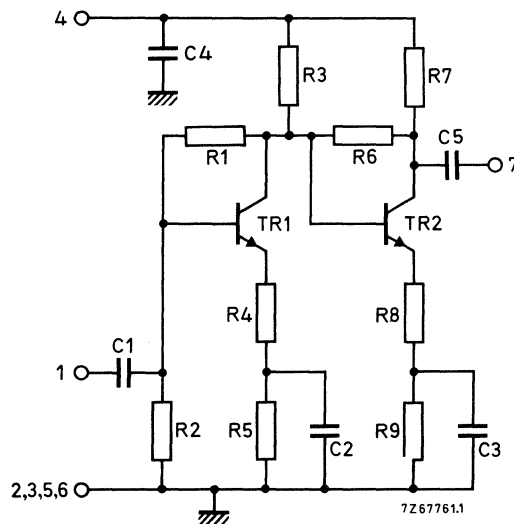
HYBRID VHF/UHF WIDE-BAND AMPLIFIER

Two-stage wide-band amplifier in the hybrid technique, designed for use in mast-head booster amplifiers, as pre-amplifier in MATV systems, and as general-purpose amplifier for v. h. f. and u. h. f. applications

QUICK REFERENCE DATA			
Frequency range	f	40 to 860	MHz
Source and load (characteristic) impedance	$R_S = R_L = Z_0$	= 75	Ω
Transducer gain	$G_{TR} = s_f ^2$	typ. 15,5	dB
Flatness of frequency response	$\pm \Delta s_f ^2$	typ. 1	dB
Output voltage at -60 dB intermodulation distortion (DIN45004, 3-tone)	$V_{O(rms)}$	> 92	dB μ V
Noise figure	F	typ. 5,5	dB
D. C. supply voltage	V_B	= 24	V \pm 10%
Operating ambient temperature	T_{amb}	-20 to +70	$^{\circ}$ C

ENCAPSULATION 7-pin, in-line, resin-coated body, see MECHANICAL DATA

CIRCUIT DIAGRAM



RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Operating ambient temperature	T_{amb}	-20 to +70	°C
Storage temperature	T_{stg}	-40 to +125	°C
D.C. supply voltage	V_B	max. 28	V
Peak voltages on pins 1 and 7	V_{1M}, V_{7M}	max. 28	V
	$-V_{1M}, V_{7M}$	max. 10	V
Peak incident powers on pins 1 and 7	P_{I1M}, P_{I7M}	max. 100	mW

CHARACTERISTICS

Measuring conditions

V. H. F. -U. H. F. test socket	catalogue no. 3504 110 01840 *		
Ambient temperature	T_{amb}	= 25	°C
D.C. supply voltage	V_B	= 24	V
Source impedance and load impedance	R_s, R_l	= 75	Ω
Characteristic impedance of h.f. connections	Z_o	= 75	Ω
Frequency range	f	40 to 860	MHz

Performance

Supply current	I_B	typ. 23	mA	
Transducer gain	$G_{tr} = s_f ^2$	13 to 18	dB	
		typ. 15,5	dB	
Flatness of frequency response	$\pm \Delta s_f ^2$	typ. 1	dB	
Individual maximum v. s. w. r.	input	VSWR(i)	typ. 2,2	**
		output	VSWR(o)	typ. 2,5
Back attenuation	$ s_r ^2$	f = 100 MHz	typ. 30	dB
		f = 860 MHz	typ. 24	dB
Output voltage	$V_o(rms)$	at -60 dB intermodulation distortion	> 92	dBμV
		(DIN45004, par. 6.3: 3-tone)	typ. 94	dBμV
Noise figure	F	typ. 5,5	dB	

s-parameters	$s_f = s_{21}$	$s_i = s_{11}$
	$s_r = s_{12}$	$s_o = s_{22}$

* This socket can be made available for customer reference purposes.
 ** Highest value, for a sample, occurring in the frequency range.

OPERATING CONDITIONS

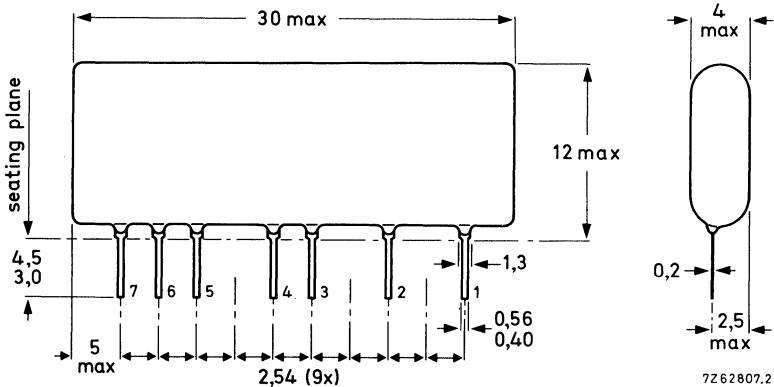
Ambient temperature range	T_{amb}	=	-20 to +70	°C
D.C. supply voltage	V_B	=	24	V ±10%
Frequency range	f	=	40 to 860	MHz
Source impedance and load impedance	R_S, R_L	=	75	Ω

MECHANICAL DATA

Dimensions in mm

Encapsulation

The device is resin coated.



Terminal connections

- 1 = Input
- 2, 3, 5, 6 = Common
- 4 = Supply (+)
- 7 = Output

Soldering recommendations

Hand soldering

Maximum contact time for a soldering-iron temperature of 260 °C; up to seating plane:

5 s

Dip or wave soldering

260 °C is the maximum permissible temperature of the solder; it must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds.

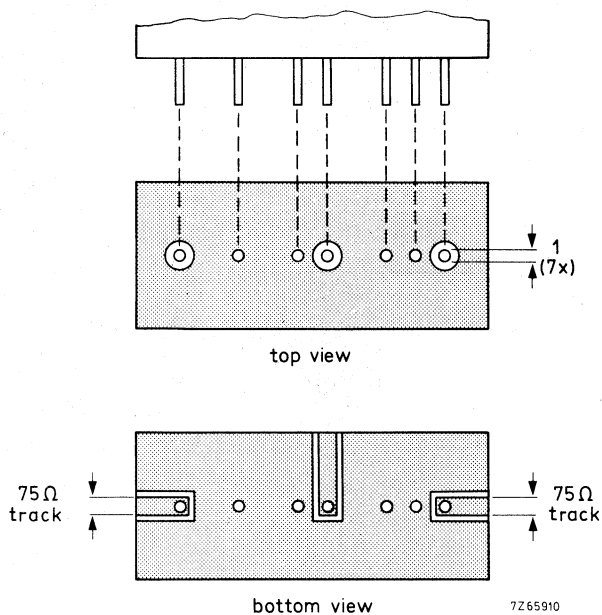
The device may be mounted against the printed-circuit board, but the temperature of the device must not exceed 125 °C. If the printed-circuit board has been pre-heated, forced cooling may be necessary immediately after soldering to keep the temperature below the allowable limit.

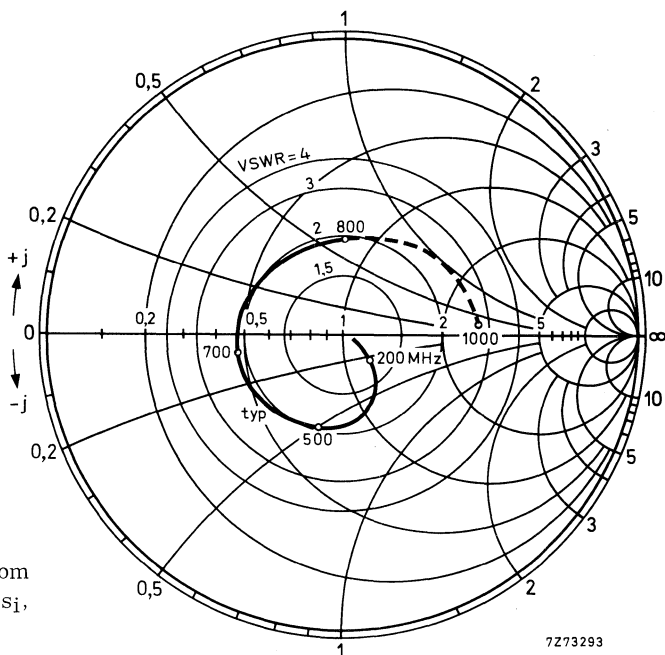
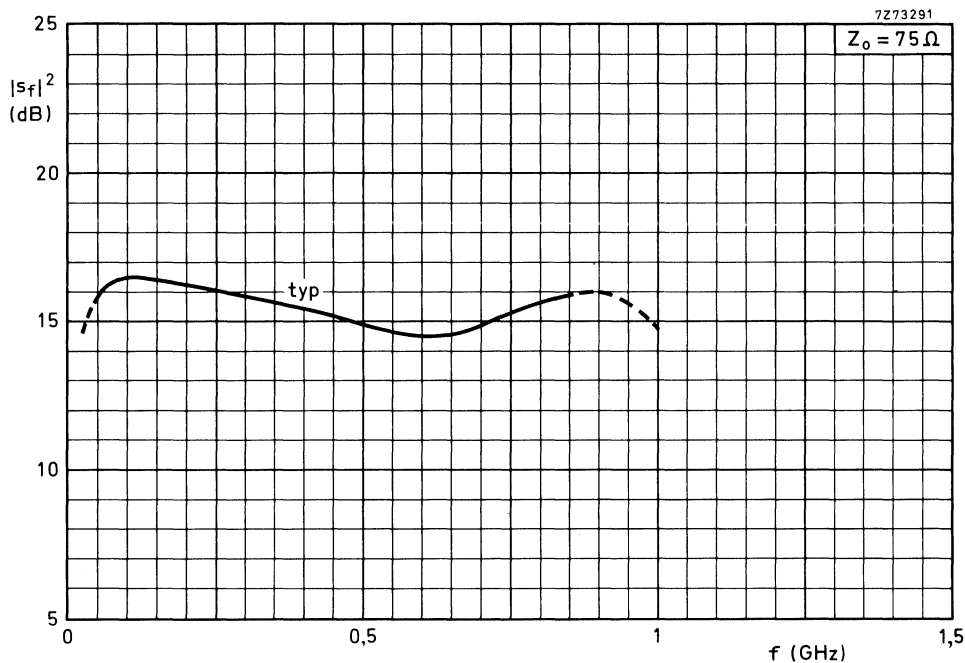
Mounting recommendations

The module should preferably be mounted on double-sided printed-circuit board, see the example shown below.

Input and output should be connected to 75 Ω tracks.

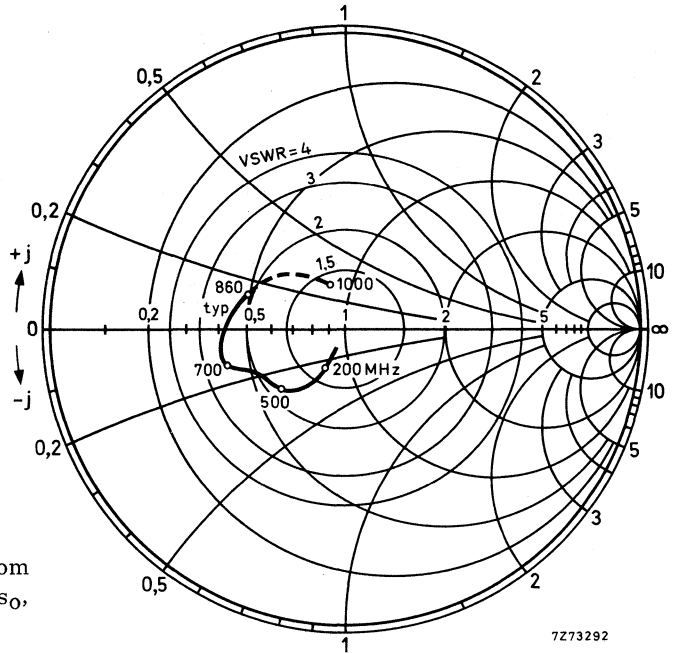
The connections to the "common" pins should be as close to the seating plane as possible.





Input impedance derived from input reflection coefficient s_i , co-ordinates in ohm x 75.

7273293



Output impedance derived from output reflection coefficient s_o , co-ordinates in ohm x 75.

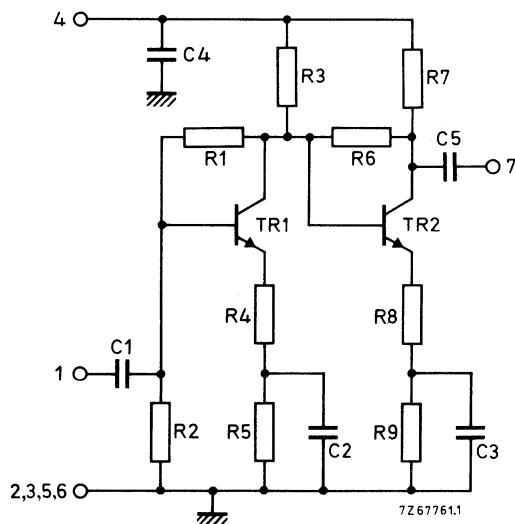
HYBRID VHF/UHF WIDE BAND AMPLIFIER

Two-stage wide-band amplifier in the hybrid technique, designed for use in mast-head booster-amplifiers, as pre-amplifier in MATV systems, and as general-purpose amplifier for v. h. f. and u. h. f. applications.

QUICK REFERENCE DATA			
Frequency range	f	40 to 860	MHz
Source and load (characteristic) impedance	$R_S = R_L = Z_0$	=	75 Ω
Transducer gain	$G_{TR} = s_f ^2$	typ.	15,5 dB
Flatness of frequency response	$\pm \Delta s_f ^2$	typ.	1 dB
Output voltage at -60 dB intermodulation distortion (DIN45004, 3-tone)	$V_{o(rms)}$	>	98 dB μ V
Noise figure	F	typ.	6 dB
D.C. supply voltage	V_B	=	24 V \pm 10%
Operating ambient temperature	T_{amb}	-20 to +70	$^{\circ}$ C

ENCAPSULATION 7-pin, in-line, resin-coated body, see MECHANICAL DATA

CIRCUIT DIAGRAM



RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Operating ambient temperature	T_{amb}	-20 to +70	°C
Storage temperature	T_{stg}	-40 to +125	°C
D.C. supply voltage	V_B	max. 28	V
Peak voltages on pins 1 and 7	V_{1M}, V_{7M}	max. 28	V
	$-V_{1M}, -V_{7M}$	max. 10	V
Peak incident powers on pins 1 and 7	P_{I1M}, P_{I7M}	max. 100	mW

CHARACTERISTICS

Measuring conditions

V.H.F. -U.H.F. test socket	catalogue no. 3504 110 01840 *		
Ambient temperature	T_{amb}	= 25	°C
D.C. supply voltage	V_B	= 24	V
Source impedance and load impedance	R_s, R_l	= 75	Ω
Characteristic impedance of h.f. connections	Z_o	= 75	Ω
Frequency range	f	= 40 to 860	MHz

Performance

Supply current	I_B	typ. 33	mA
Transducer gain	$G_{tr} = s_f ^2$	13 to 18	dB
		typ. 15,5	dB
Flatness of frequency response	$\pm \Delta s_f ^2$	typ. 1	dB
Individual maximum v. s. w. r.	input output	$VSWR_{(i)}$	typ. 2,5 **
		$VSWR_{(o)}$	typ. 2,0 **
Back attenuation	f = 100 MHz f = 860 MHz	$ s_r ^2$	typ. 30 dB
		$ s_r ^2$	typ. 26 dB
Output voltage	at -60 dB intermodulation distortion (DIN45004, par. 6.3; 3-tone)	$V_o(rms)$	> 98 dB μ V
			typ. 100 dB μ V
Noise figure	F	typ. 6	dB

s-parameters:	$s_f = s_{21}$	$s_i = s_{11}$
	$s_r = s_{12}$	$s_o = s_{22}$

* This socket can be made available for customer reference purposes.

** Highest value, for a sample, occurring in the frequency range.

OPERATING CONDITIONS

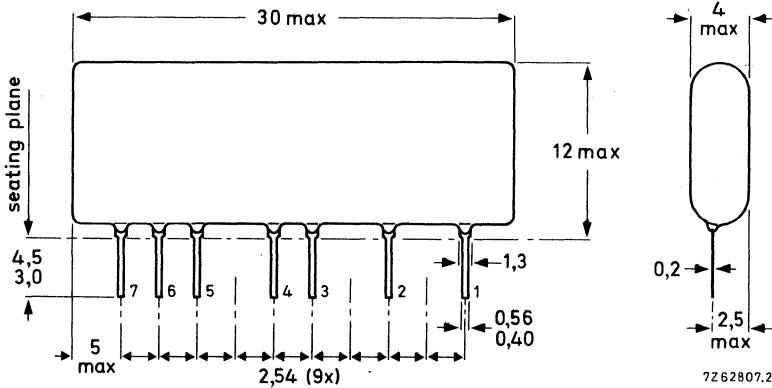
Ambient temperature range	T_{amb}	=	-20 to +70	°C
D.C. supply voltage	V_B	=	24	V ±10%
Frequency range	f	=	40 to 860	MHz
Source impedance and load impedance	R_S, R_L	=	75	Ω

MECHANICAL DATA

Dimensions in mm

Encapsulation

The device is resin coated.



Terminal connections

- 1 = Input
- 2, 3, 5, 6 = Common
- 4 = Supply (+)
- 7 = Output

Soldering recommendations

Hand soldering

Maximum contact time for a soldering-iron temperature of 260 °C; up to seating plane:

5 s

Dip or wave soldering

260 °C is the maximum permissible temperature of the solder; it must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds.

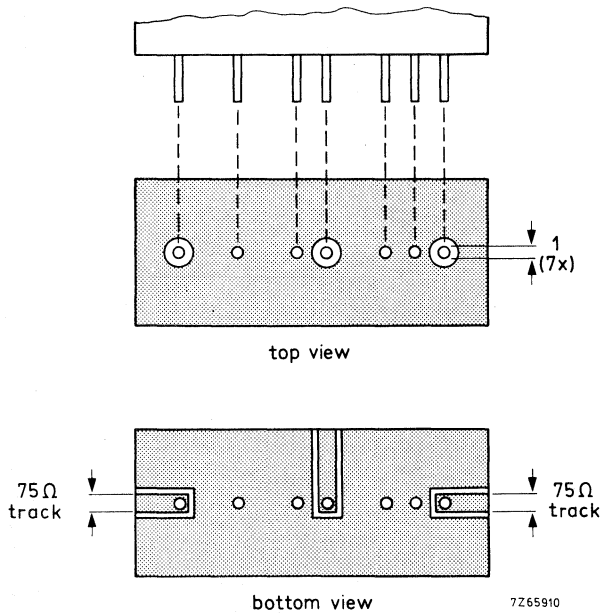
The device may be mounted against the printed-circuit board, but the temperature of the device must not exceed 125 °C. If the printed-circuit board has been pre-heated, forced cooling may be necessary immediately after soldering to keep the temperature below the allowable limit.

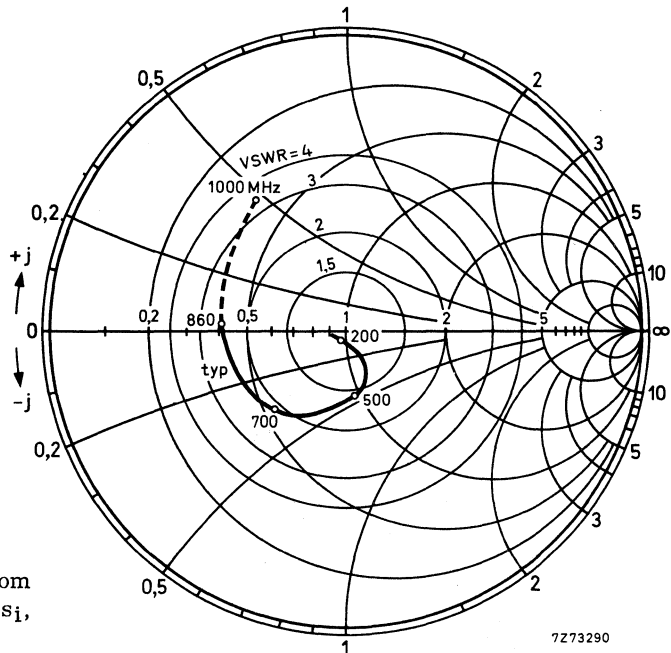
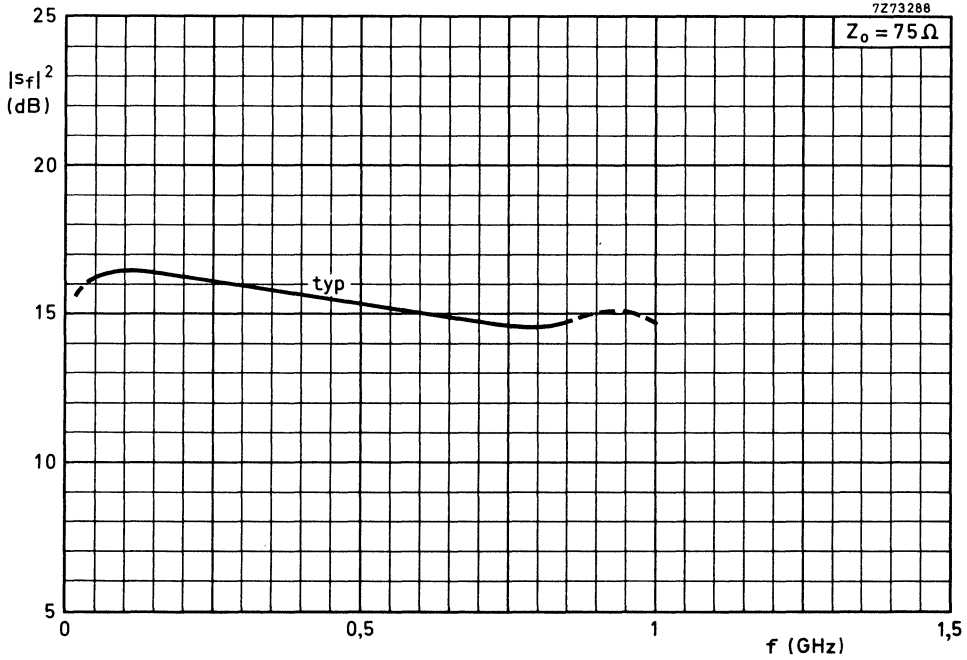
Mounting recommendations

The module should preferably be mounted on double-sided printed-circuit board, see the example shown below.

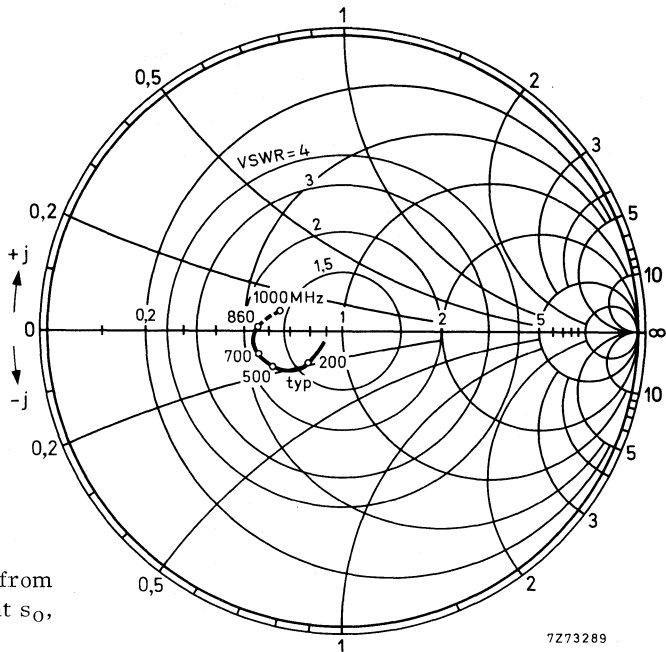
Input and output should be connected to 75 Ω tracks.

The connections to the "common" pins should be as close to the seating plane as possible.





Input impedance derived from input reflection coefficient s_i , co-ordinates in ohm x 75.



Output impedance derived from
output reflection coefficient s_o ,
co-ordinates in ohm x 75.

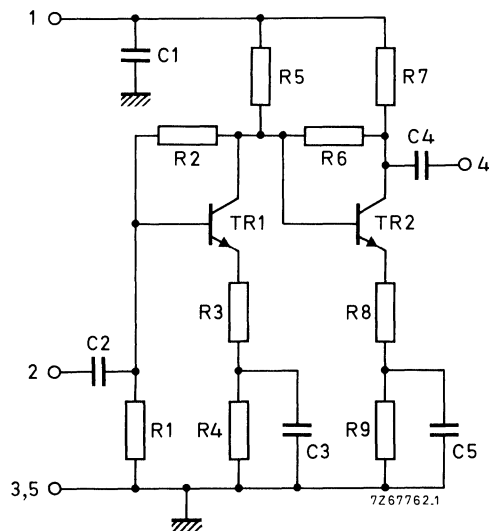
HYBRID VHF/UHF WIDE-BAND AMPLIFIER

Two-stage wide-band amplifier in the hybrid technique, designed for use as distribution amplifier in MATV and CATV systems and as general-purpose amplifier for v.h.f. and u.h.f. applications. Except for the encapsulation coating, the OM322 and OM175 have the same specification. OM322 will replace OM175.

QUICK REFERENCE DATA			
Frequency range	f	40 to 860	MHz
Source and load (characteristic) impedance	$R_S = R_L = Z_0$	75	Ω
Transducer gain	$G_{tr} = s_f ^2$	typ.	15 dB
Flatness of frequency response	$\pm \Delta s_f ^2$	typ.	0,3 dB
Output voltage at -60 dB intermodulation distortion (DIN45004, 3-tone)	$V_{o(rms)}$	>	103 dB μ V
Noise figure	F	typ.	7 dB
D.C. supply voltage	V_B	=	24 V \pm 10%
Operating ambient temperature	T_{amb}	-20 to +70	$^{\circ}$ C

ENCAPSULATION 5-lead, resin coated body on metal base, see MECHANICAL DATA

CIRCUIT DIAGRAM



RATINGS Limiting values in accordance with the Absolute Maximum System (IEC134)

Operating ambient temperature	T_{amb}	-20 to +70	°C
Operating mounting-base temperature	T_{mb}	max. 100	°C
Storage temperature	T_{stg}	-40 to +125	°C
D.C. supply voltage	V_B	max. 28	V
Peak voltages on pins 2 and 4	V_{2M}, V_{4M}	max. 28	V
	$-V_{2M}, -V_{4M}$	max. 10	V
Peak incident powers on pins 2 and 4	P_{I2M}, P_{I4M}	max. 100	mW

CHARACTERISTICS

Measuring conditions

Ambient temperature	T_{amb}	=	25	°C
D.C. supply voltage	V_B	=	24	V
Source impedance and load impedance	R_s, R_l	=	75	Ω
Characteristic impedance of h.f. connections	Z_0	=	75	Ω
Frequency range	f	=	40 to 860	MHz

Performance

Supply current	I_B	typ.	60	mA
Transducer gain	$G_{tr} = s_f ^2$		14 to 16	dB
		typ.	15	dB
Flatness of frequency response	$\pm \Delta s_f ^2$	typ.	0,3	dB
		<	0,5	dB
Individual maximum v. s. w. r.	input output	$V_{SWR(i)}$	typ.	1,7
		$V_{SWR(o)}$	typ.	1,7
Back attenuation	f = 100 MHz f = 860 MHz	$ s_r ^2$	typ.	31
		$ s_r ^2$	typ.	25
Output voltage at -60 dB intermodulation distortion (DIN45004, par. 6.3: 3-tone)	$V_o(rms)$	>	103	dBμV
		typ.	105	dBμV
Noise figure	F	typ.	7	dB

s-parameters: $s_f = s_{21}$ $s_i = s_{11}$ $s_r = s_{12}$ $s_o = s_{22}$
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¹⁾ Highest value, for a sample, occurring in the frequency range.

OPERATING CONDITIONS

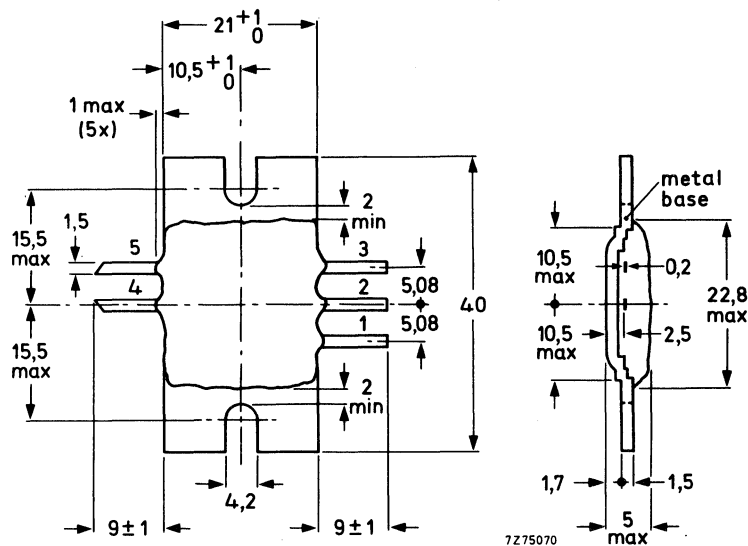
Ambient temperature range	T_{amb}	=	-20 to +70 °C
D.C. supply voltage	V_B	=	24 V \pm 10%
Frequency range	f	=	40 to 860 MHz
Source impedance and load impedance	R_S, R_L	=	75 Ω

MECHANICAL DATA

Dimensions in mm

Encapsulation

The device is resin coated and mounted on a metal mounting base.



Terminal connections

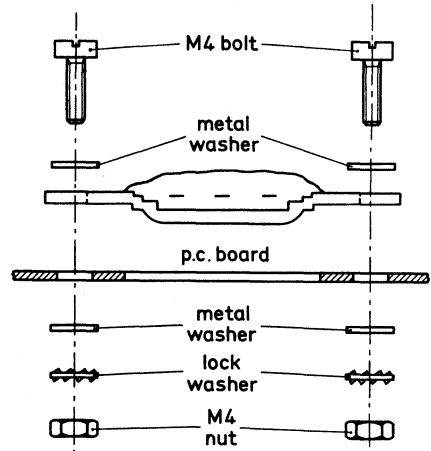
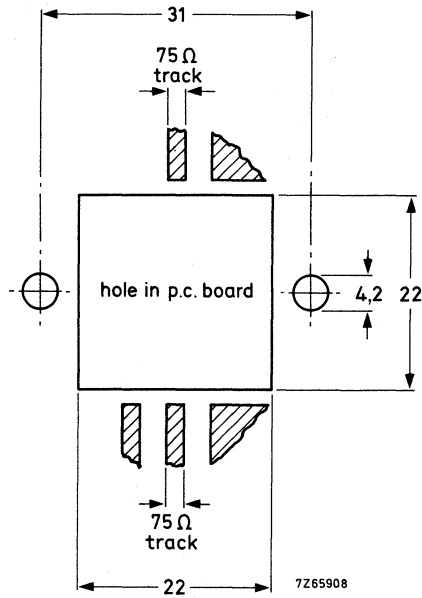
- 1 = Supply (+)
- 2 = Input
- 3 and 5 = Common (internally connected to metal base)
- 4 = Output

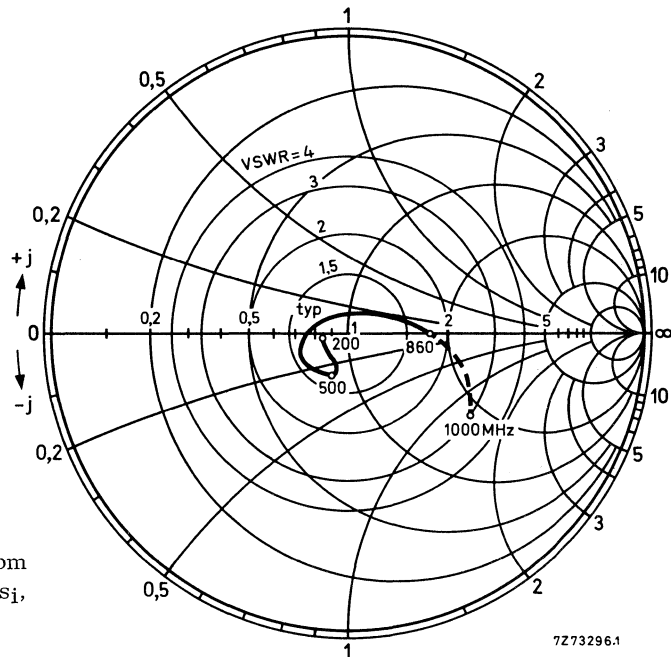
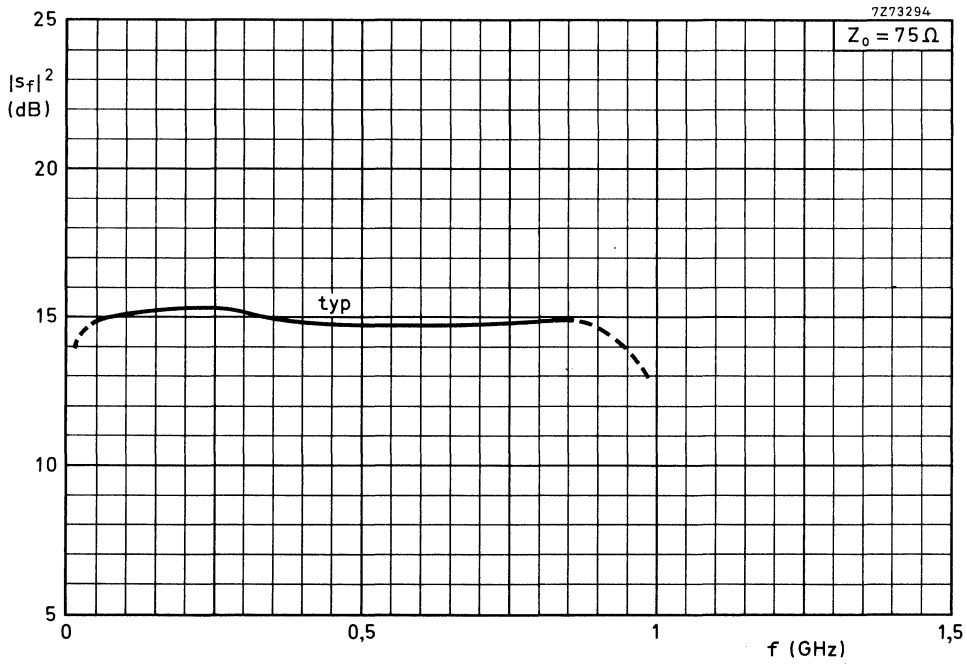
Soldering recommendations

Maximum contact time for a soldering-iron temperature of 260 °C 5 s

Mounting recommendations

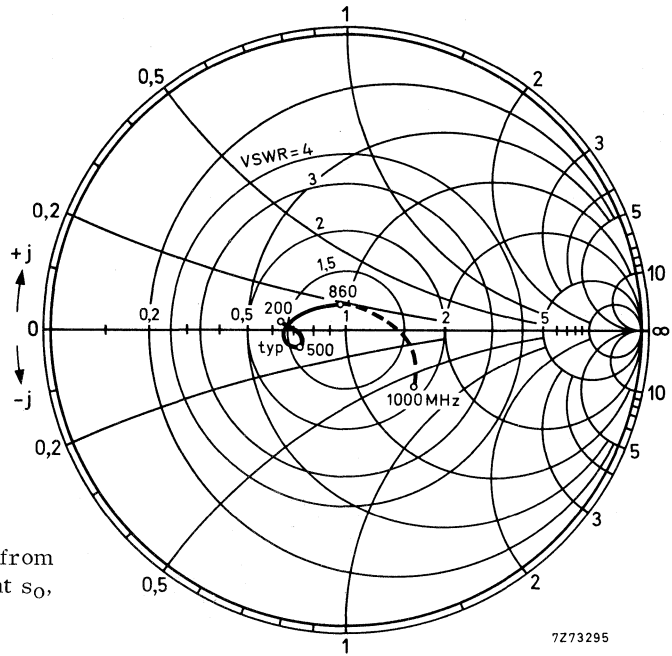
The module should preferably be mounted on a double-sided printed-circuit board, see the examples shown below. Input and output should be connected to 75 Ω tracks.





Input impedance derived from input reflection coefficient s_i , co-ordinates in ohm x 75

7273296.1



Output impedance derived from
output reflection coefficient s_o ,
co-ordinates in ohm x 75

7273295

HYBRID V.H.F./U.H.F. WIDE-BAND AMPLIFIER

Two-stage wide-band amplifier in the hybrid technique, designed for use in MATV systems, and as general purpose amplifier for v.h.f. and u.h.f. applications requiring a high output level. The OM323A needs an external collector-coil and blocking capacitor, whereas, the OM323 has these components built-in.

QUICK REFERENCE DATA

Frequency range	f	40 to 860 MHz
Source and load (characteristic) impedance	$R_s = R_l = Z_o =$	75 Ω
Transducer gain	$G_{tr} = s_f ^2$	typ 15 dB
Flatness of frequency response	$\pm \Delta s_f ^2$	typ 0,5 dB
Output voltage at -60 dB intermodulation distortion (DIN45004, 3-tone); f = 470 MHz	$V_o(rms)$	typ 113 dB μ V
Noise figure	F	typ 9 dB
D.C. supply voltage	V_B	= 24 V \pm 10%
Operating mounting-base temperature	T_{mb}	-30 to +100 $^{\circ}$ C

ENCAPSULATION 9-pin, in-line, resin-coated body on a right-angled metal mounting tab, see MECHANICAL DATA

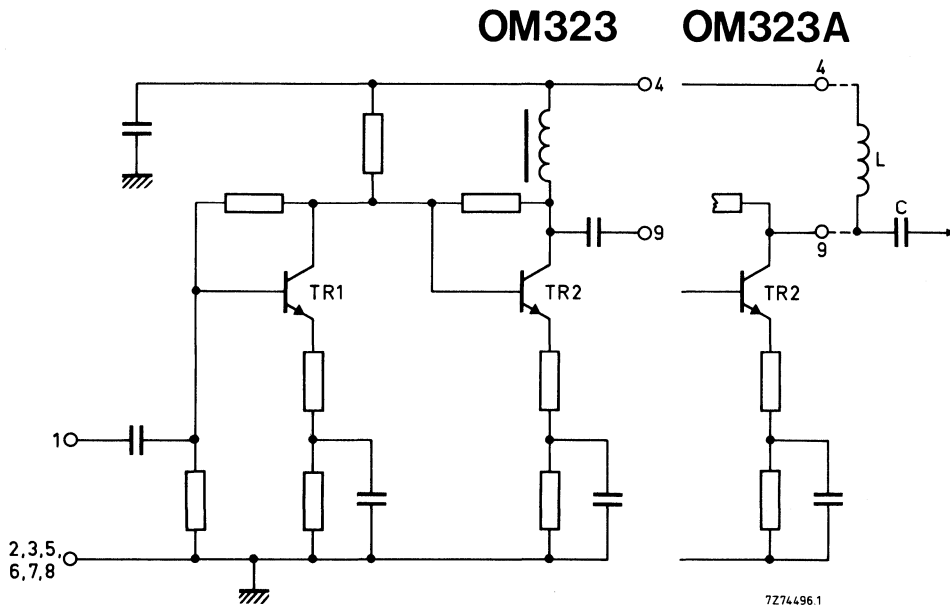


Fig. 1 Circuit diagram.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC134)

Operating mounting-base temperature	T_{mb}	-30 to +100 °C
Storage temperature	T_{stg}	-40 to +125 °C
D.C. supply voltage	V_B	max 28 V
Peak voltages on pin 1	V_{1M}	max 28 V
	$-V_{1M}$	max 24 V
Peak voltages on pin 9	V_{9M}	max 28 V
	$-V_{9M}$	max 4 V
Peak incident powers on pins 1 and 9	P_{11M}, P_{19M}	max 100 mW

CHARACTERISTICS

Measuring conditions

V.H.F.—U.H.F. test socket	catalogue no. 3504 110 01830 *	
Mounting base temperature	T_{mb}	= 25 °C
D.C. supply voltage	V_B	= 24 V
Source impedance and load impedance	R_s, R_l	= 75 Ω
Characteristic impedance of h.f. connections	Z_o	= 75 Ω
Frequency range	f	= 40 to 860 MHz

Performance

Supply current	I_B	95 to 105 mA typ 100 mA
Transducer gain	$G_{tr} = s_f ^2$	14 to 17 dB typ 15 dB
Flatness of frequency response	$\pm \Delta s_f ^2$	typ 0,5 dB
Individual maximum v.s.w.r.	$VSWR_{(i)}$	typ 1,9 **
	$VSWR_{(o)}$	typ 2,3 **
Back attenuation		
f = 100 MHz	$ s_r ^2$	typ 29 dB
f = 650 MHz	$ s_r ^2$	typ 25,5 dB
f = 860 MHz	$ s_r ^2$	typ 24 dB

* This socket can be made available for customer reference purposes.

** Highest value, for a sample, occurring in the frequency range.

Output voltage

at -60 dB intermodulation distortion

(DIN45004, par. 6.3: 3-tone)

f = 40-230 MHz

$V_{O(rms)}$	>	112 dB μ V
	typ	114 dB μ V

f = 470 MHz

$V_{O(rms)}$	typ	113 dB μ V
--------------	-----	----------------

f = 860 MHz

$V_{O(rms)}$	typ	112 dB μ V
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Noise figure

channel 2

F	typ	8 dB
---	-----	------

channel 65

F	typ	9 dB
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s-parameters: $s_f = s_{21}$ $s_j = s_{11}$
 $s_r = s_{12}$ $s_o = s_{22}$

OPERATING CONDITIONS

Mounting-base temperature range

T_{mb}	-30 to +100 °C
----------	----------------

D.C. supply voltage

V_B	= 24 V \pm 10%
-------	------------------

Frequency range

f	40 to 860 MHz
---	---------------

Source impedance and load impedance

R_s, R_l	= 75 Ω
------------	---------------

THERMAL DATA

- a. The maximum permissible temperature at the mounting base is 100 °C.
- b. When the mounting tab is screwed to a double-sided printed-circuit board with dimensions 37 mm x 51 mm, its temperature will be 57 °C above the temperature of the surrounding free air.
- c. When a heatsink is fixed to the mounting tab and the pins are soldered into a double-sided printed-circuit board with dimensions 37 mm x 51 mm, the tab will reach the temperatures stated in the following table.

Notes

- 1. When the device is fixed only to a heatsink, not to a printed-circuit board, the values of the second column of the table should be increased by 2 °C and those of the third column decreased by 2 °C.
- 2. The user is free to realize proper cooling by using differently shaped sinks, or, preferably, by fixing the tab to any convenient part of the equipment (e.g. a wall of the metal cabinet).

heatsink data thickness 1 mm	$T_{mb} - T_{amb}$ °C	T_{amb} max °C
Bright aluminium heatsink L-shaped bar, length 100 mm, height 165 mm	24	76
Blackened aluminium heatsink L-shaped bar; length 50 mm, height 70 mm	23	77

Mounting recommendations

The module should preferably be mounted on a double-sided printed-circuit board, see the following example. An example is also given of heatsink mounting.

Input and output should be connected to 75 Ω tracks.

The connections to the common pins should be as close to the seating plane as possible.

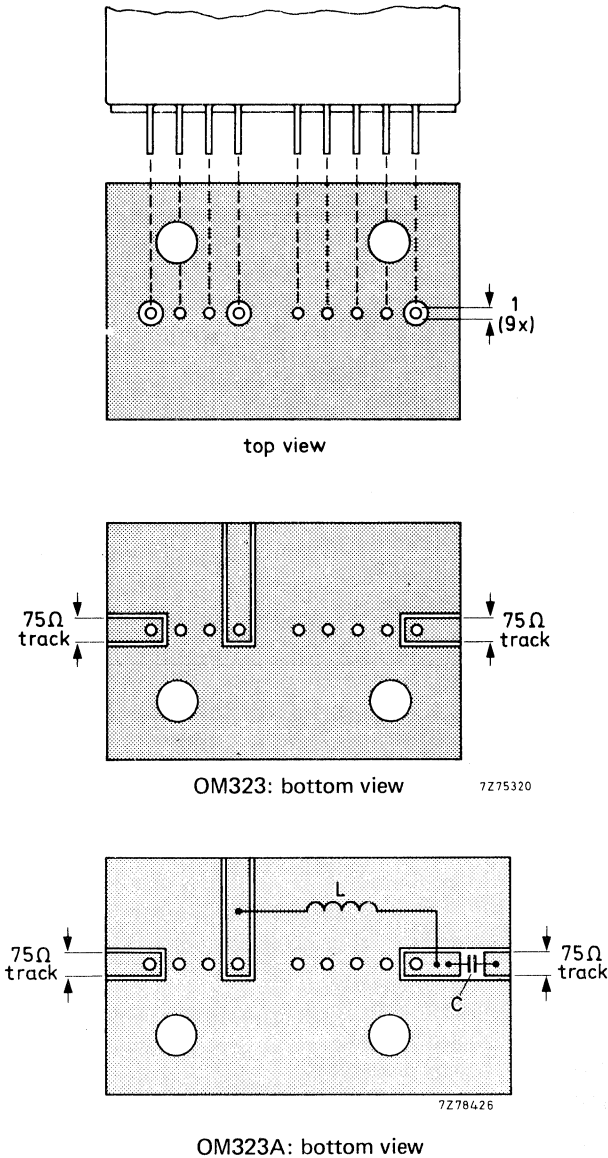


Fig. 3 Printed-circuit board holes and tracks for the OM323 and OM323A.

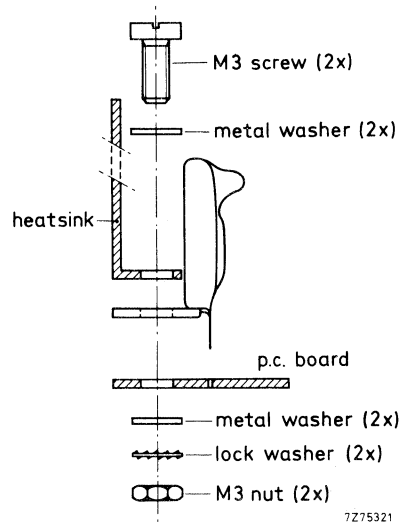


Fig. 4 Example of heatsink mounting.

L > 5 μH; e.g. catalogue no. 3122 108 20150 or 27 turns enamelled Cu wire (0,3 mm) wound on a ferrite core with a diameter of 1,6 mm.
C > 220 pF ceramic capacitor.

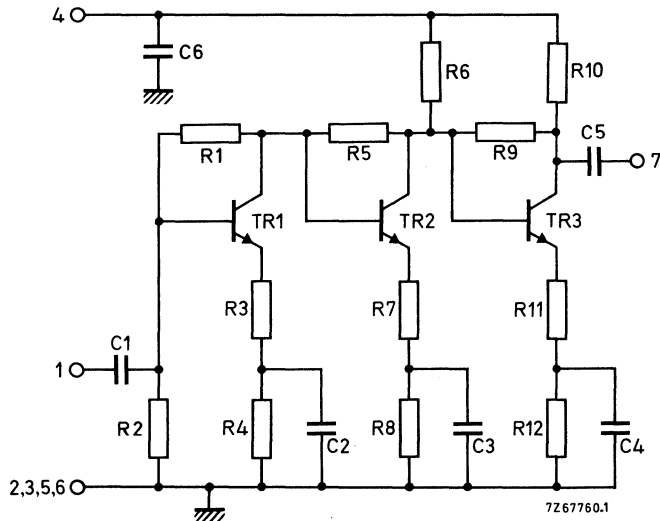
HYBRID VHF/UHF WIDE-BAND AMPLIFIER

Three-stage wide-band amplifier in the hybrid technique, designed for use in mast-head booster-amplifiers, as pre-amplifier in MATV systems, and as general-purpose amplifier for v. h. f. and u. h. f. applications.

QUICK REFERENCE DATA			
Frequency range	f	40 to 860	MHz
Source and load (characteristic) impedance	$R_S = R_L = Z_0 =$	=	75 Ω
Transducer gain	$G_{TR} = s_f ^2$	typ.	27 dB
Flatness of frequency response	$\pm \Delta s_f ^2$	typ.	1,6 dB
Output voltage at -60 dB intermodulation distortion (DIN45004, 3-tone)	$V_{O(rms)}$	>	98 dB μ V
Noise figure	F	typ.	5,5 dB
D.C. supply voltage	V_B	=	24 V $\pm 10\%$
Operating ambient temperature	T_{amb}	-20 to +70	$^{\circ}C$

ENCAPSULATION 7-pin, in-line, resin-coated body, see MECHANICAL DATA

CIRCUIT DIAGRAM



RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Operating ambient temperature	T_{amb}	-20 to +70	°C
Storage temperature	T_{stg}	-40 to +125	°C
D. C. supply voltage	V_B	max. 28	V
Peak voltages on pins 1 and 7	V_{1M}, V_{7M}	max. 28	V
	$-V_{1M}, -V_{7M}$	max. 10	V
Peak incident powers on pins 1 and 7	P_{11M}, P_{17M}	max. 100	mW

CHARACTERISTICS

Measuring conditions

V. H. F. -U. H. F. test socket	catalogue no. 3504 110 01840 *		
Ambient temperature	T_{amb}	= 25	°C
D. C. supply voltage	V_B	= 24	V
Source impedance and load impedance	R_s, R_l	= 75	Ω
Characteristic impedance of h. f. connections	Z_o	= 75	Ω
Frequency range	f	= 40 to 860	MHz

Performance

Supply current	I_B	typ. 35	mA	
Transducer gain	$G_{tr} = s_f ^2$	23 to 31	dB	
		typ. 27	dB	
Flatness of frequency response	$\pm\Delta s_f ^2$	typ. 1, 6	dB	
Individual maximum v. s. w. r.	input	VSWR _(i)	typ. 1, 9	**
		output	VSWR _(o)	typ. 3, 2
Back attenuation	$ s_r ^2$	f = 100 MHz	typ. 46	dB
		f = 860 MHz	typ. 40	dB
Output voltage at -60 dB intermodulation distortion (DIN45004, par. 6.3: 3-tone)	$V_o(rms)$	>	98	dBμV
		typ.	101	dBμV
Noise figure	F	typ. 5, 5	dB	

s-parameters: $s_f = s_{21}$ $s_i = s_{11}$ $s_r = s_{12}$ $s_o = s_{22}$
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* This socket can be made available for customer reference purposes.

** Highest value, for a sample, occurring in the frequency range.

OPERATING CONDITIONS

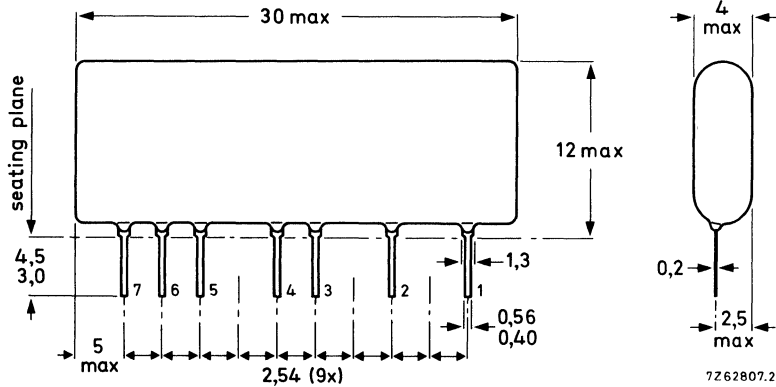
Ambient temperature range	T_{amb}	=	-20 to +70	°C
D.C. supply voltage	V_B	=	24	V $\pm 10\%$
Frequency range	f	=	40 to 860	MHz
Source impedance and load impedance	R_S, R_L	=	75	Ω

MECHANICAL DATA

Dimensions in mm

Encapsulation

The device is resin coated.



Terminal connections

- 1 = Input
- 2, 3, 5, 6 = Common
- 4 = Supply (+)
- 7 = Output

Soldering recommendations

Hand soldering

Maximum contact time for a soldering-iron temperature of 260 °C; up to seating plane:

5 s

Dip or wave soldering

260 °C is the maximum permissible temperature of the solder; it must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds.

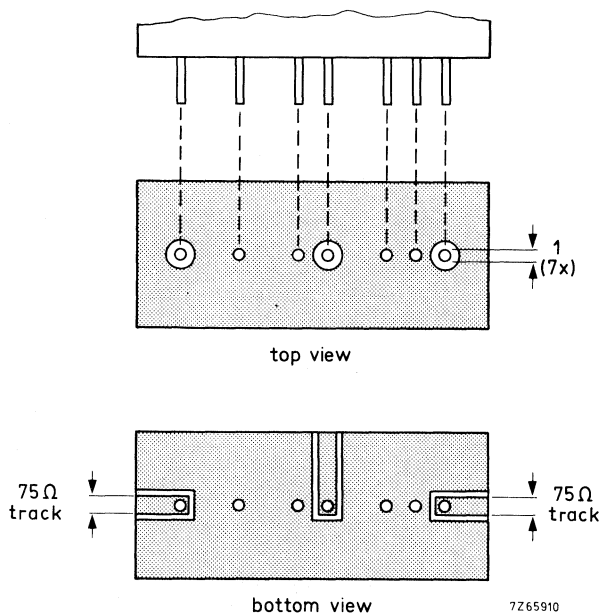
The device may be mounted against the printed-circuit board, but the temperature of the device must not exceed 125 °C. If the printed-circuit board has been pre-heated, forced cooling may be necessary immediately after soldering to keep the temperature below the allowable limit.

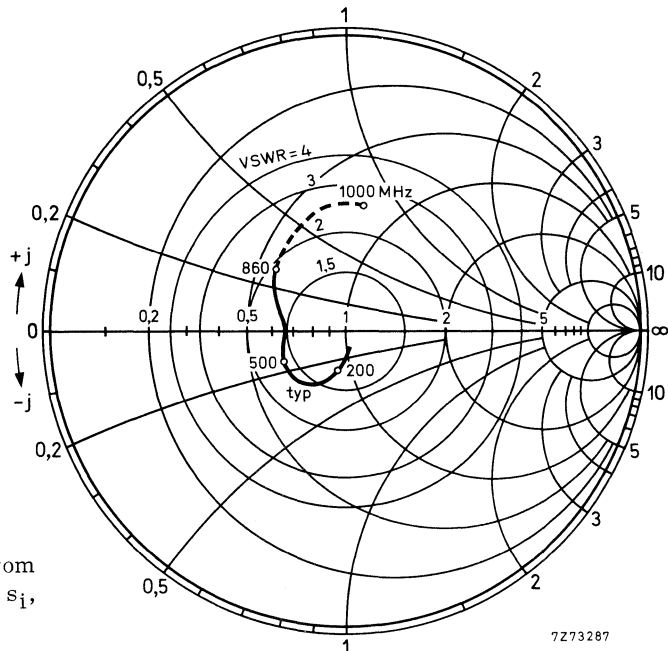
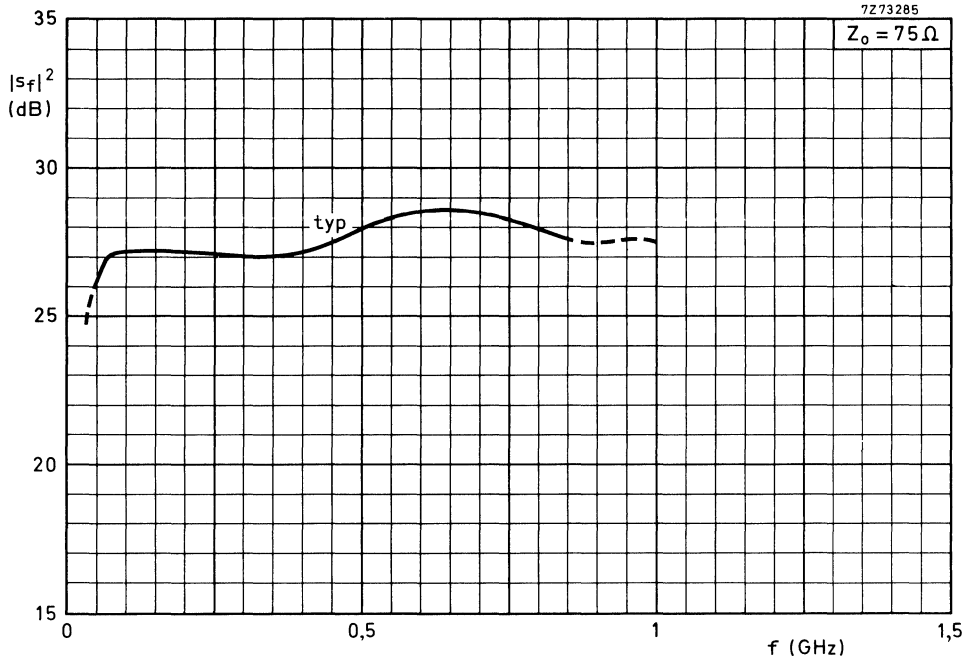
Mounting recommendations

The module should preferably be mounted on double-sided printed-circuit board, see the example shown below.

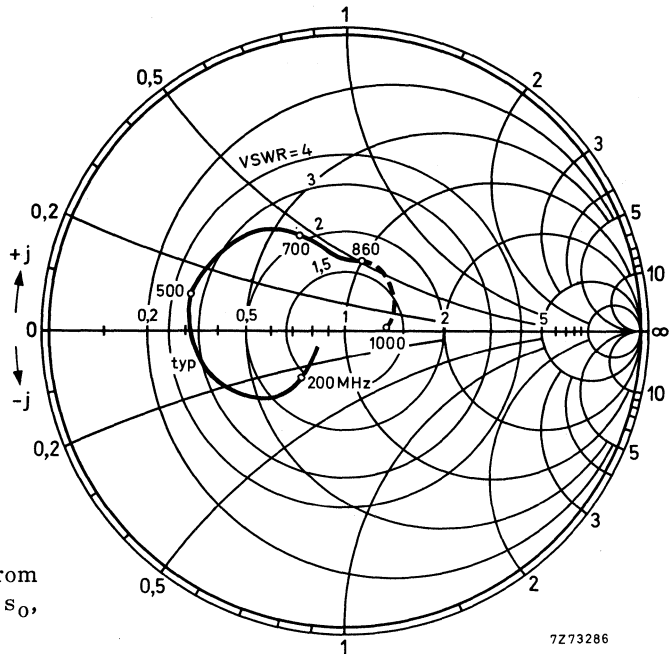
Input and output should be connected to 75 Ω tracks.

The connections to the "common" pins should be as close to the seating plane as possible.





Input impedance derived from input reflection coefficient s_i , co-ordinates in ohm x 75.



Output impedance derived from output reflection coefficient s_0 , co-ordinates in ohm x 75.

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HYBRID VHF/UHF WIDE-BAND AMPLIFIER

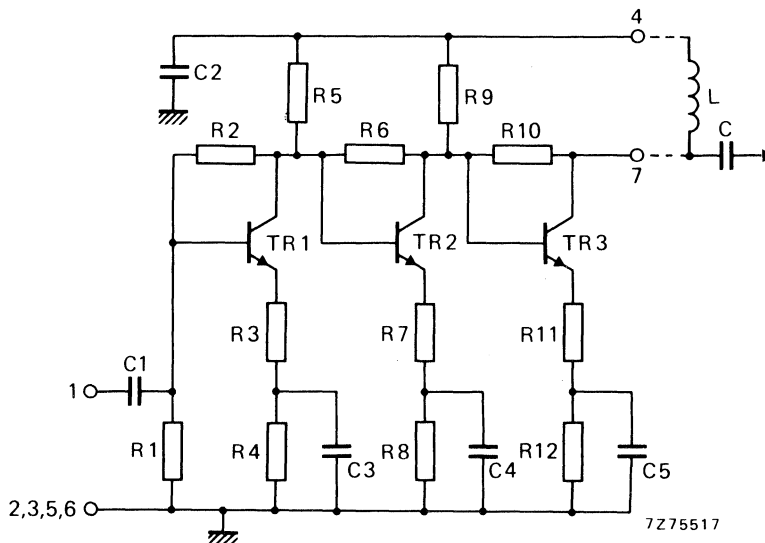
Three-stage wide-band amplifier in the hybrid technique, designed for use in mast-head booster-amplifiers, as preamplifier in MATV systems, and as general-purpose amplifier for v.h.f. and u.h.f. applications.

QUICK REFERENCE DATA

Frequency range	f	40 to 860 MHz
Source and load (characteristic) impedance	$R_s = R_l = Z_o$	= 75 Ω
Transducer gain	$G_{tr} = s_f ^2$	typ. 22 dB
Flatness of frequency response	$\pm \Delta s_f ^2$	typ. 1,0 dB
Output voltage at -60 dB intermodulation distortion (DIN 45004, 3-tone)	$V_{O(rms)}$	> 105 dB μ V
Noise figure	F	typ. 7 dB
D.C. supply voltage	V_B	= 24 V \pm 10%
Operating ambient temperature	T_{amb}	-20 to +70 $^{\circ}$ C

ENCAPSULATION 7-pin, in-line, resin-coated body, see MECHANICAL DATA

CIRCUIT DIAGRAM



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Operating ambient temperature	T_{amb}	-20 to +70 °C
Storage temperature	T_{stg}	-40 to +125 °C
D.C. supply voltage	V_B	max. 28 V
Peak voltages on pins 1 and 7	V_{1M}, V_{7M} $-V_{1M}, -V_{7M}$	max. 28 V max. 10 V
Peak incident powers on pins 1 and 7	P_{11M}, P_{17M}	max. 100 mW

CHARACTERISTICS

Measuring conditions

V.H.F.-U.H.F. test socket	catalogue no. 3504 110 01840 *
Ambient temperature	$T_{amb} = 25$ °C
D.C. supply voltage	$V_B = 24$ V
Source impedance and load impedance	$R_s, R_l = 75$ Ω
Characteristic impedance of h.f. connections	$Z_o = 75$ Ω
Frequency range	$f = 40$ to 860 MHz

Performance

Supply current	I_B	typ. 65 mA
Transducer gain	$G_{tr} = s_f ^2$	20 to 24 dB typ. 22 dB
Flatness of frequency response	$\pm \Delta s_f ^2$	typ. 1,0 dB
Individual maximum v.s.w.r.		
input	VSWR(i)	typ. 1,4 **
output	VSWR(o)	typ. 1,6 **
Back attenuation		
f = 100 MHz	$ s_r ^2$	typ. 42 dB
f = 860 MHz	$ s_r ^2$	typ. 40 dB
Output voltage		
at -60 dB intermodulation distortion (DIN 45004, par. 6.3: 3-tone)	$V_o(rms)$	> 105 dBμV typ. 107 dBμV
Noise figure	F	typ. 7 dB

s-parameters:	$s_f = s_{21}$	$s_i = s_{11}$
	$s_r = s_{12}$	$s_o = s_{22}$

* This socket can be made available for customer reference purposes.

** Highest value, for a sample, occurring in the frequency range.

OPERATING CONDITIONS

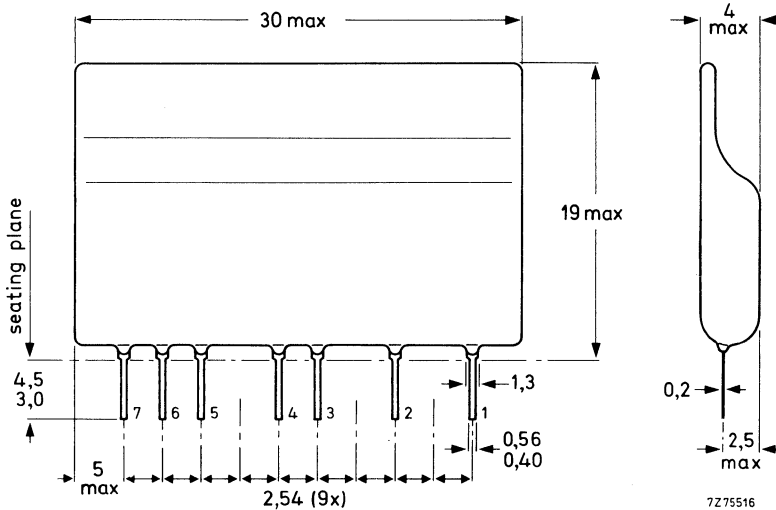
Ambient temperature range	T_{amb}	-20 to +70 °C
D.C. supply voltage	V_B	= 24 V \pm 10%
Frequency range	f	40 to 860 MHz
Source impedance and load impedance	R_s, R_l	= 75 Ω

MECHANICAL DATA

Dimensions in mm

Encapsulation

The device is resin coated.

**Terminal connections**

- 1 = Input
- 2, 3, 5, 6 = Common
- 4 = Supply (+)
- 7 = Output.

Soldering recommendations**Hand soldering**

Maximum contact time for a soldering-iron temperature of 260 °C up to the seating plane is 5 s.

Dip or wave soldering

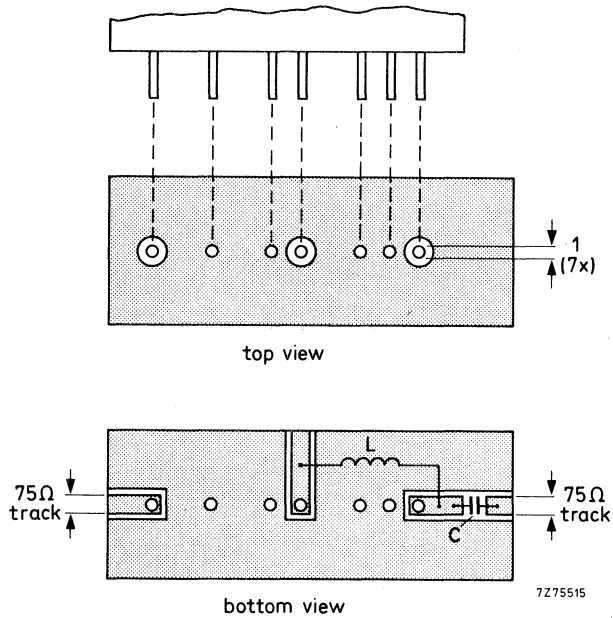
260 °C is the maximum permissible temperature of the solder; it must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds. The device may be mounted against the printed-circuit board, but the temperature of the device must not exceed 125 °C. If the printed-circuit board has been pre-heated, forced cooling may be necessary immediately after soldering to keep the temperature below the allowable limit.

Mounting recommendations

The module should preferably be mounted on double-sided printed-circuit board, see the example shown below.

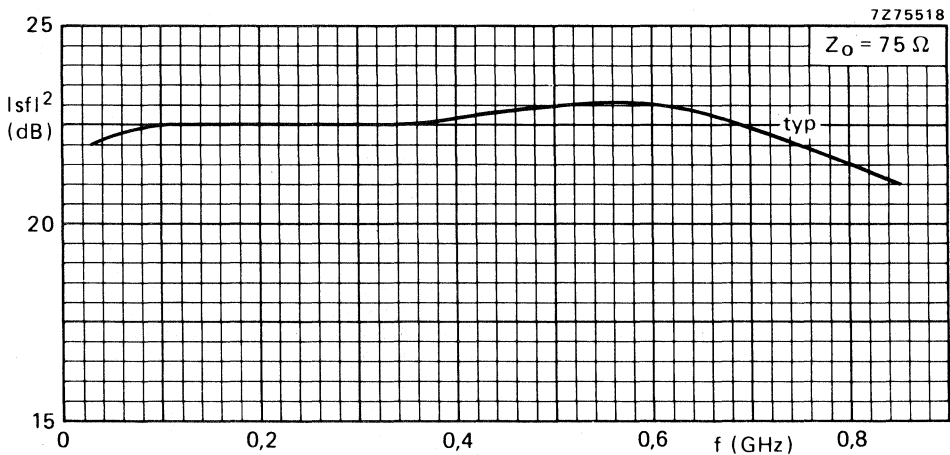
Input and output should be connected to 75 Ω tracks.

The connections to the 'common' pins should be as close to the seating plane as possible.



$L > 5 \mu\text{H}$; e.g. catalogue no. 3122 108 20150 or 27 turns enamelled Cu wire (0,3 mm) wound on a ferrite core with a diameter of 1,6 mm.

$C > 220 \text{ pF}$ ceramic capacitor.



HYBRID V.H.F./U.H.F. WIDE-BAND AMPLIFIER

Three-stage wide-band amplifier in the hybrid technique, designed for use in MATV systems, and as general purpose amplifier for v.h.f. and u.h.f. applications requiring a high output level. The OM337A needs an external collector-coil and blocking capacitor, whereas, the OM337 has these components built-in.

QUICK REFERENCE DATA

Frequency range	f	40 to 860 MHz
Source and load (characteristic) impedance	$R_s = R_l = Z_o$	= 75 Ω
Transducer gain	$G_{tr} = s_f ^2$	typ. 26 dB
Flatness of frequency response	$\pm \Delta s_f ^2$	typ. 1 dB
Output voltage at -60 dB intermodulation distortion (DIN45004, 3-tone); f = 470 MHz	$V_{o(rms)}$	typ. 112 dB μ V
Noise figure	F	typ. 9,8 dB
D.C. supply voltage	V_B	= 24 V \pm 10%
Operating mounting-base temperature	T_{mb}	-30 to +100 $^{\circ}$ C

ENCAPSULATION 9-pin, in-line, resin-coated body on a right-angled metal mounting tab, see **MECHANICAL DATA**

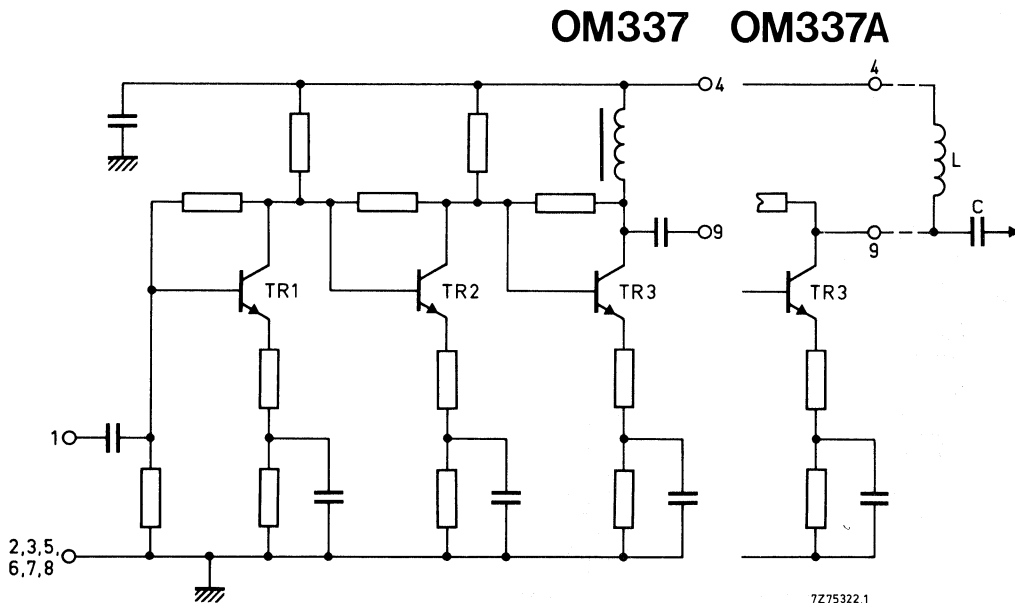


Fig. 1 Circuit diagram.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC134)

Operating mounting-base temperature	T_{mb}	-30 to +100 °C
Storage temperature	T_{stg}	-40 to +125 °C
D.C. supply voltage	V_B	max. 28 V
Peak voltages on pin 1	V_{1M}	max. 28 V
	$-V_{1M}$	max. 24 V
Peak voltages on pin 9	V_{9M}	max. 28 V
	$-V_{9M}$	max. 4 V
Peak incident powers on pins 1 and 9	P_{11M}, P_{19M}	max. 100 mW

CHARACTERISTICS

Measuring conditions

V.H.F.—U.H.F. test socket	catalogue no. 3504 110 01830*
Mounting base temperature	T_{mb} = 25 °C
D.C. supply voltage	V_B = 24 V
Source impedance and load impedance	R_s, R_l = 75 Ω
Characteristic impedance of h.f. connections	Z_0 = 75 Ω
Frequency range	f = 40 to 860 MHz

Performance

Supply current	I_B	110 to 120 mA typ. 115 mA
Transducer gain	$G_{tr} = s_f ^2$	23 to 29 dB typ. 26 dB
Flatness of frequency response	$\pm \Delta s_f ^2$	typ. 1 dB
Individual maximum v.s.w.r.	VSWR(i)	typ. 2,3 **
	VSWR(o)	typ. 1,8 **
Back attenuation	$ s_r ^2$	typ. 44 dB
	$ s_r ^2$	typ. 41 dB
	$ s_r ^2$	typ. 43 dB

* This socket can be made available for customer reference purposes.

** Highest value, for a sample, occurring in the frequency range.

Output voltage

at -60 dB intermodulation distortion
(DIN45004, par. 6.3: 3-tone)
f = 40-230 MHz

$V_{O(rms)}$	>	113 dB μ V
	typ.	114 dB μ V
$V_{O(rms)}$	typ.	112 dB μ V
$V_{O(rms)}$	typ.	110 dB μ V

f = 470 MHz

f = 860 MHz

Noise figure

channel 2
channel 65

F	typ.	7 dB
F	typ.	9,8 dB

s-parameters:	$s_f = s_{21}$	$s_i = s_{11}$
	$s_r = s_{12}$	$s_o = s_{22}$

OPERATING CONDITIONS

Mounting-base temperature range	T_{mb}	-30 to +100 °C
D.C. supply voltage	V_B	= 24 V \pm 10%
Frequency range	f	40 to 860 MHz
Source impedance and load impedance	R_s, R_l	= 75 Ω

THERMAL DATA

- The maximum permissible temperature at the mounting base is 100 °C.
- When the mounting tab is screwed to a double-sided printed-circuit board with dimensions 37 mm x 51 mm, its temperature will be 57 °C above the temperature of the surrounding free air.
- When a heatsink is fixed to the mounting tab and the pins are soldered into a double-sided printed-circuit board with dimensions 37 mm x 51 mm, the tab will reach the temperatures stated in the following table.

Notes:

- When the device is fixed only to a heatsink, not to a printed-circuit board, the values of the second column of the table should be increased by 2 °C and those of the third column decreased by 2 °C.
- The user is free to realize proper cooling by using differently shaped sinks, or, preferably, by fixing the tab to any convenient part of the equipment (e.g. a wall of the metal cabinet).

heatsink data thickness 1 mm	$T_{mb} - T_{amb}$ °C	$T_{amb max}$ °C
Bright aluminium heatsink L-shaped bar; length 100 mm, height 65 mm	27,5	72,5
Blackened aluminium heatsink L-shaped bar; length 50 mm, height 70 mm	26,5	73,5

Mounting recommendations

The module should preferably be mounted on a double-sided printed-circuit board, see the following example. An example is also given of heatsink mounting.

Input and output should be connected to 75 Ω tracks.

The connections to the common pins should be as close to the seating plane as possible.

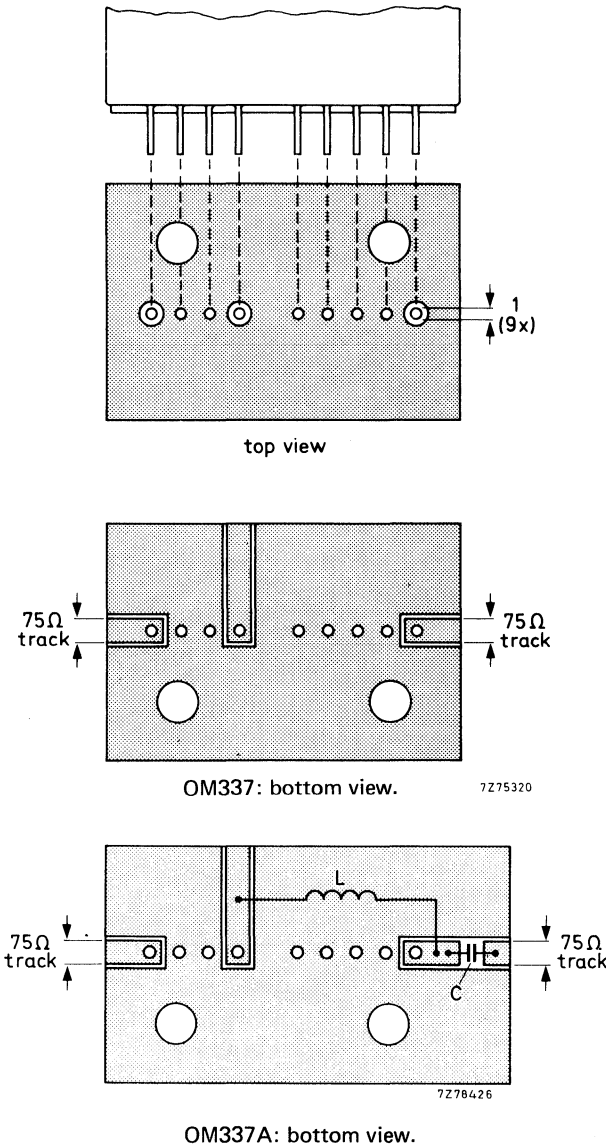


Fig. 3 Printed-circuit board holes and tracks for the OM337 and OM337A.

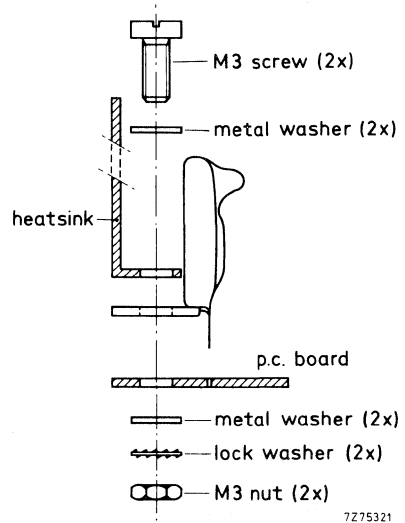


Fig. 4 Example of heatsink mounting.

$L > 5 \mu\text{H}$; e.g. catalogue no. 3122 108 20150 or 27 turns enamelled Cu wire (0,3 mm) wound on a ferrite core with a diameter of 1,6 mm.
 $C > 220 \text{ pF}$ ceramic capacitor.

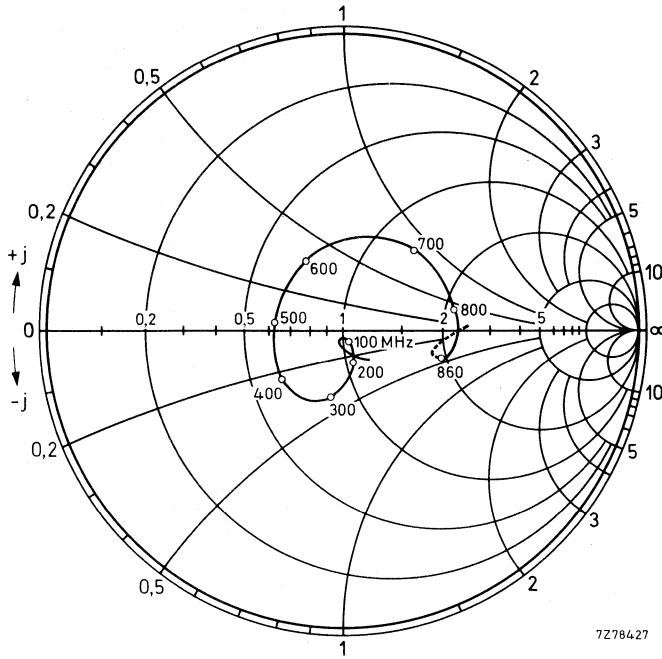


Fig. 5 Input impedance derived from input reflection coefficient s_i , co-ordinates in ohm x 75; typical values.

7Z78427

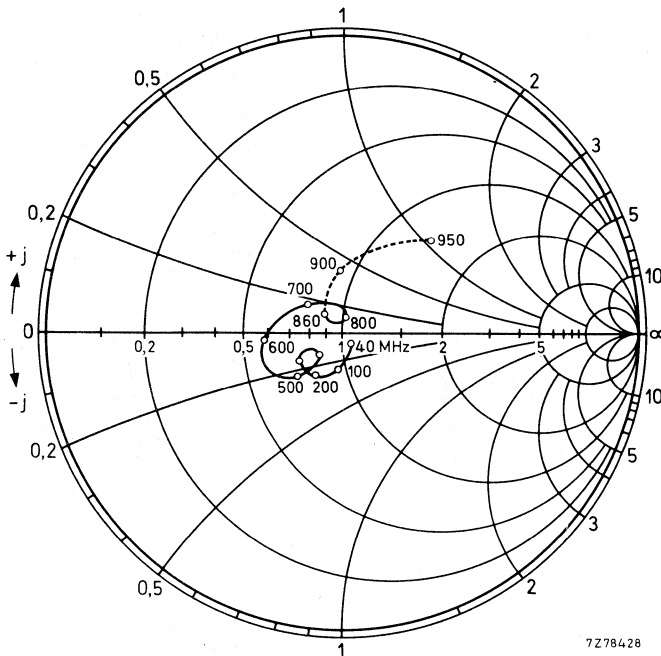


Fig. 6 Output impedance derived from output reflection coefficient s_o , co-ordinates in ohm x 75; typical values.

7Z78428

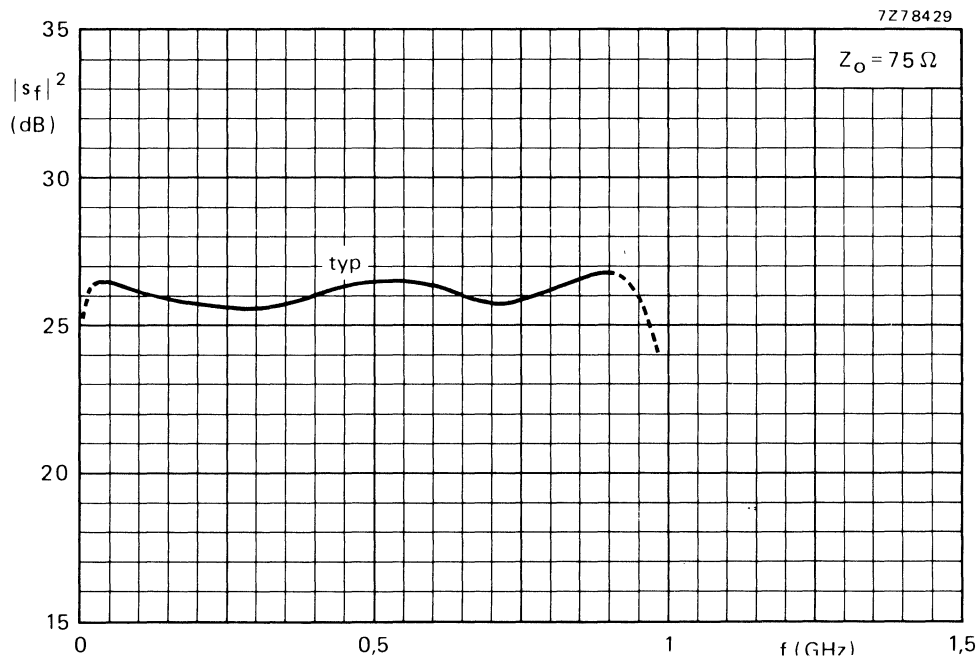


Fig. 7 Transducer gain as a function of frequency.

HYBRID INTEGRATED CIRCUIT VHF/UHF WIDE-BAND AMPLIFIER

Three-stage wide-band amplifier in the hybrid integrated circuit technique, designed for use in mast-head booster-amplifiers, as amplifier in MATV systems, and as general-purpose amplifier for v.h.f. and u.h.f. applications.

QUICK REFERENCE DATA

Frequency range	f	40 to 860 MHz
Source and load (characteristic) impedance	$R_s = R_l = Z_o$	= 75 Ω
Transducer gain	$G_{tr} = s_{f1} ^2$	typ. 28 dB
Flatness of frequency response	$\pm \Delta s_{f1} ^2$	typ. 1,5 dB
Output voltage at -60 dB intermodulation distortion (DIN 45004, 3-tone)	$V_{O(rms)}$	> 105 dB μ V
Noise figure	F	typ. 6 dB
D.C. supply voltage	V_B	= 24 V \pm 10%
Operating ambient temperature	T_{amb}	-20 to +70 $^{\circ}$ C

ENCAPSULATION 7-pin, in-line, resin-coated body, see MECHANICAL DATA (Fig. 2)

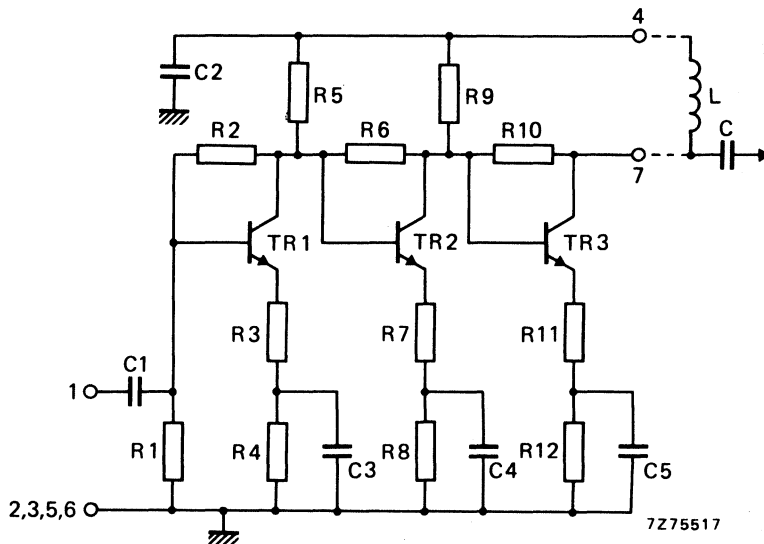


Fig. 1 Circuit diagram.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Operating ambient temperature	T_{amb}	-20 to +70 °C
Storage temperature	T_{stg}	-40 to +125 °C
D.C. supply voltage	V_B	max. 28 V
Peak voltages on pins 1 and 7	V_{1M}, V_{7M}	max. 28 V
	$-V_{1M}, -V_{7M}$	max. 10 V
Peak incident powers on pins 1 and 7	P_{11M}, P_{17M}	max. 100 mW

CHARACTERISTICS

Measuring conditions

V.H.F.-U.H.F. test socket	catalogue no. 3504 110 01840 *	
Ambient temperature	T_{amb}	= 25 °C
D.C. supply voltage	V_B	= 24 V
Source impedance and load impedance	R_s, R_l	= 75 Ω
Characteristic impedance of h.f. connections	Z_0	= 75 Ω
Frequency range	f	= 40 to 860 MHz

Performance

Supply current	I_B	typ. 67 mA
Transducer gain	$G_{tr} = s_f ^2$	25 to 30 dB
		typ. 28 dB
Flatness of frequency response	$\pm \Delta s_f ^2$	typ. 1,5 dB
Individual maximum v.s.w.r.	VSWR _(i)	typ. 1,5 **
		output
Back attenuation	$ s_r ^2$	f = 100 MHz typ. 46 dB
		f = 860 MHz typ. 31 dB
Output voltage at -60 dB intermodulation distortion (DIN 45004, par. 6.3: 3-tone)	$V_{o(rms)}$	> 105 dB μ V
		typ. 107 dB μ V
Noise figure	F	typ. 6 dB

s-parameters:	$s_f = s_{21}$	$s_i = s_{11}$
	$s_r = s_{12}$	$s_o = s_{22}$

* This socket can be made available for customer reference purposes.

** Highest value, for a sample, occurring in the frequency range.

OPERATING CONDITIONS

Ambient temperature range	T_{amb}	-20 to +70 °C
D.C. supply voltage	V_B	= 24 V \pm 10%
Frequency range	f	40 to 860 MHz
Source impedance and load impedance	R_S, R_L	= 75 Ω

MECHANICAL DATA

The device is resin coated.

Dimensions in mm

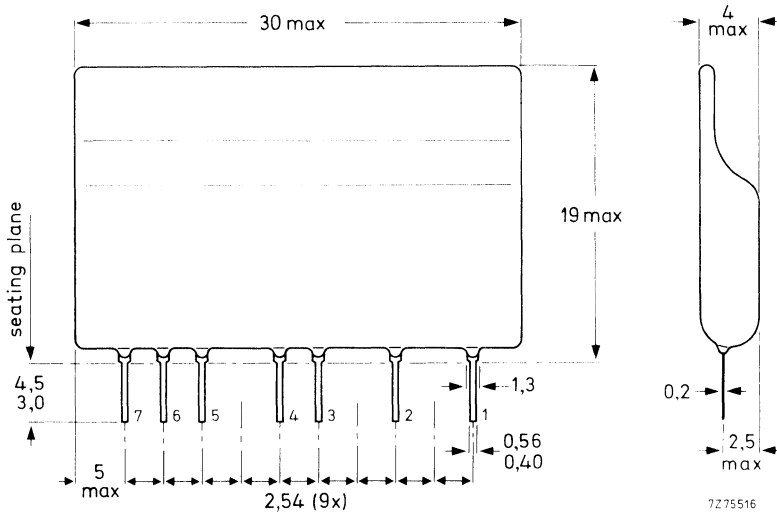


Fig. 2 Encapsulation.

Terminal connections

- 1 = input
- 2, 3, 5, 6 = common
- 4 = supply (+)
- 7 = output

Soldering recommendations*Hand soldering*

Maximum contact time for a soldering-iron temperature of 260 °C up to the seating plane is 5 s.

Dip or wave soldering

260 °C is the maximum permissible temperature of the solder; it must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds. The device may be mounted against the printed-circuit board, but the temperature of the device must not exceed 125 °C. If the printed-circuit board has been pre-heated, forced cooling may be necessary immediately after soldering to keep the temperature below the allowable limit.

Mounting recommendations

The module should preferably be mounted on double-sided printed-circuit board, see the example shown below.

Input and output should be connected to 75 Ω tracks.

The connections to the 'common' pins should be as close to the seating plane as possible.

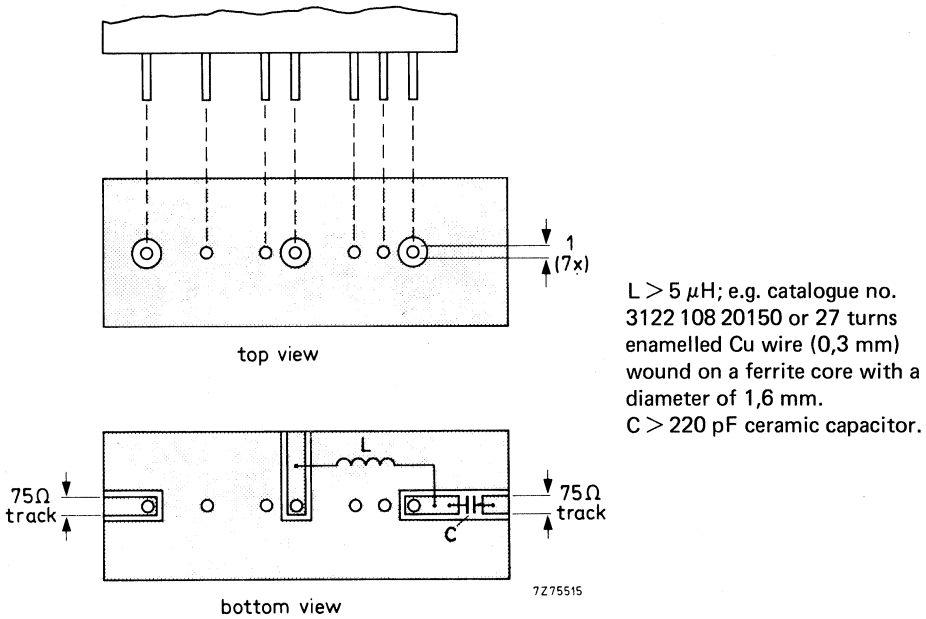


Fig. 3 Printed-circuit board holes and tracks.



Fig. 4 Transducer gain as a function of frequency; $Z_O = 75 \Omega$.

HYBRID INTEGRATED CIRCUIT VHF/UHF WIDE-BAND AMPLIFIER

One-stage wide-band amplifier in hybrid integrated circuit technique on a thin-film substrate, intended for aerial amplifiers in car radios, caravans or RATV and MATV applications.

QUICK REFERENCE DATA

D.C. supply voltage	V_B	=	12 V \pm 10%
Frequency range	f	=	40 to 860 MHz
Source and load (characteristic) impedance	$R_s = R_l = Z_0$	=	75 Ω
Transducer gain	$G_{tr} = s_f ^2$	typ.	12 dB
Flatness of frequency response	$\pm \Delta s_f ^2$	typ.	1 dB
Output voltage at -60 dB intermodulation distortion (DIN 45004, 3-tone)	$V_{O(rms)}$	typ.	99 dB μ V
Noise figure	F	typ.	5,5 dB
Operating ambient temperature	T_{amb}		-20 to +70 $^{\circ}$ C

ENCAPSULATION 5-pin, in-line, resin-coated body, see MECHANICAL DATA (Fig. 2)

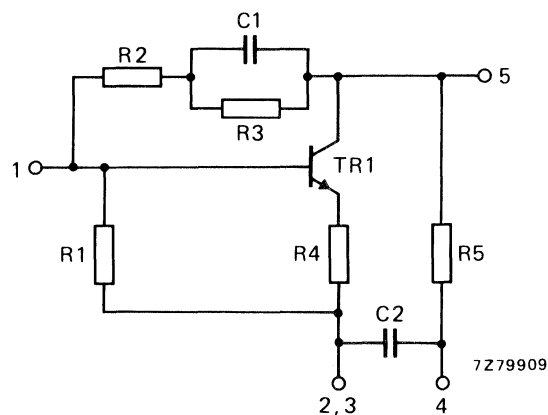


Fig. 1 Circuit diagram.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Operating ambient temperature	T_{amb}	-20 to +70 °C
Storage temperature	T_{stg}	-40 to +125 °C
D.C. supply voltage	V_B	max. 15 V
Peak incident powers on pins 1 and 5	P_{11M}, P_{15M}	max. 100 mW

CHARACTERISTICS**Measuring conditions**

Ambient temperature	T_{amb}	=	25 °C
D.C. supply voltage	V_B	=	12 V
Source impedance and load impedance	R_s, R_l	=	75 Ω
Characteristic impedance of h.f. connections	Z_o	=	75 Ω
Frequency range	f	=	40 to 860 MHz

Performance

Supply current	I_B	typ.	11,5 mA
Transducer gain	$G_{tr} = s_f ^2$	typ.	12 dB
Flatness of frequency response	$\pm \Delta s_f ^2$	typ.	1 dB
Individual maximum v.s.w.r.			
input	$VSWR_{(i)}$	typ.	2,0 *
output	$VSWR_{(o)}$	typ.	1,4 *
Back attenuation			
f = 100 MHz	$ s_r ^2$	typ.	22 dB
f = 860 MHz	$ s_r ^2$	typ.	19 dB
Output voltage			
at -60 dB intermodulation distortion (DIN 45004, par. 6.3: 3-tone)	$V_{O(rms)}$	typ.	99 dB μ V
Noise figure	F	typ.	5,5 dB

s-parameters:	$s_f = s_{21}$	$s_i = s_{11}$
	$s_r = s_{12}$	$s_o = s_{22}$

* Highest value, for a sample, occurring in the frequency range.

OPERATING CONDITIONS

Ambient temperature range

 T_{amb} = -20 to + 70 °C

D.C. supply voltage

 V_B = 12 V \pm 10%

Frequency range

 f = 40 to 860 MHz

Source impedance and load impedance

 R_S, R_L = 75 Ω **MECHANICAL DATA**

Dimensions in mm

The device is resin coated.

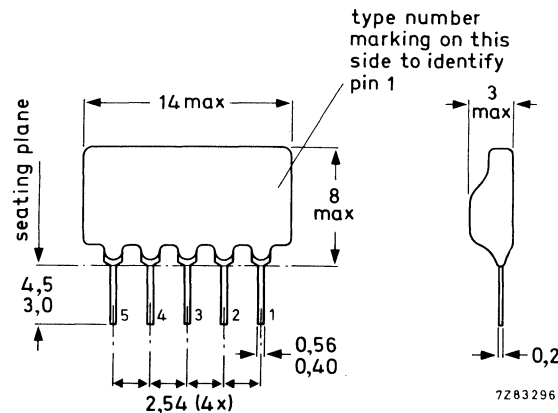


Fig. 2 Encapsulation.

Terminal connections

- 1 = input
- 2,3 = common
- 4 = supply (+)
- 5 = output

Soldering recommendations*Hand soldering*

Maximum contact time for a soldering-iron temperature of 260 °C up to the seating plane is 5 s.

Dip or wave soldering

260 °C is the maximum permissible temperature of the solder; it must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds. The device may be mounted against the printed-circuit board, but the temperature of the device must not exceed 125 °C. If the printed-circuit board has been pre-heated, forced cooling may be necessary immediately after soldering to keep the temperature below the allowable limit.

Mounting recommendations

The module should preferably be mounted on double-sided printed-circuit board, see the example shown below.

Input and output should be connected to 75 Ω tracks.

The connections to the 'common' pins should be as close to the seating plane as possible.

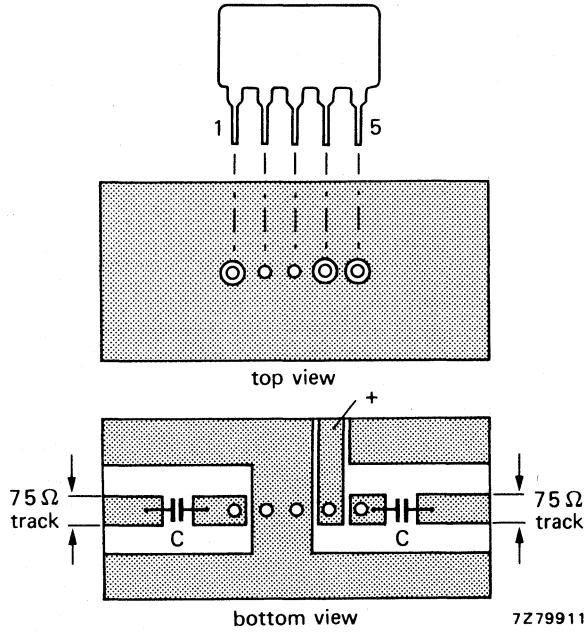


Fig. 3 Printed-circuit board holes and tracks.
C > 220 pF ceramic capacitor.

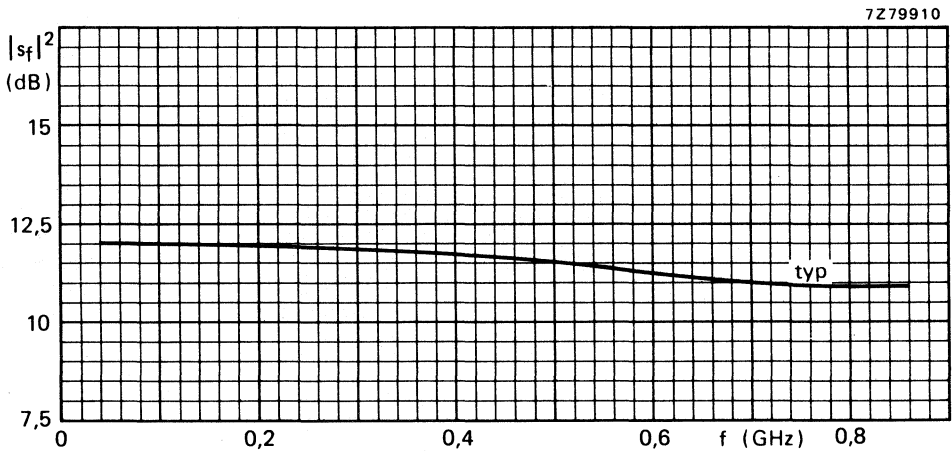


Fig. 4 Transducer gain as a function of frequency; $Z_C = 75 \Omega$.

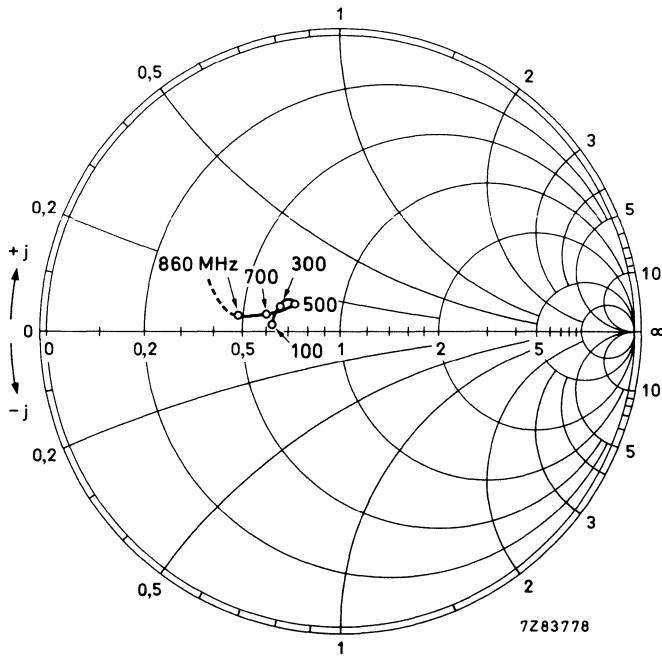


Fig. 5 Input impedance derived from input reflection coefficient s_i , co-ordinates in ohm x 75; typical values.

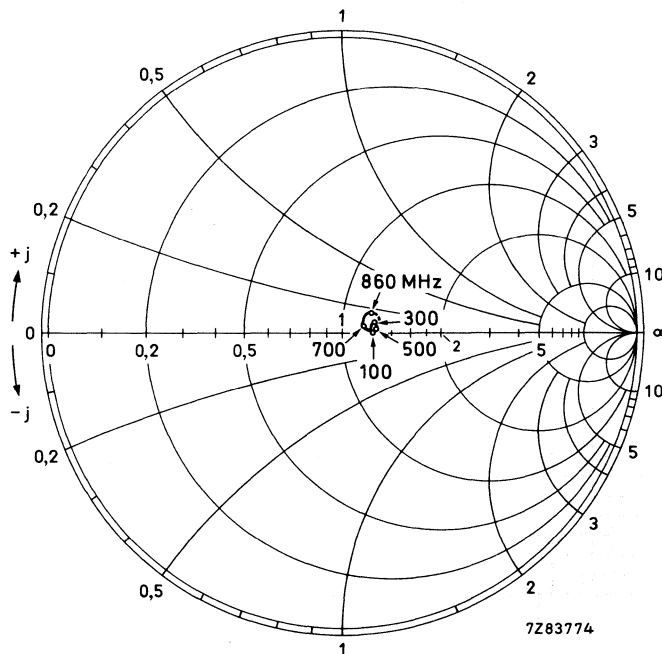


Fig. 6 Output impedance derived from output reflection coefficient s_o , co-ordinates in ohm x 75; typical values.

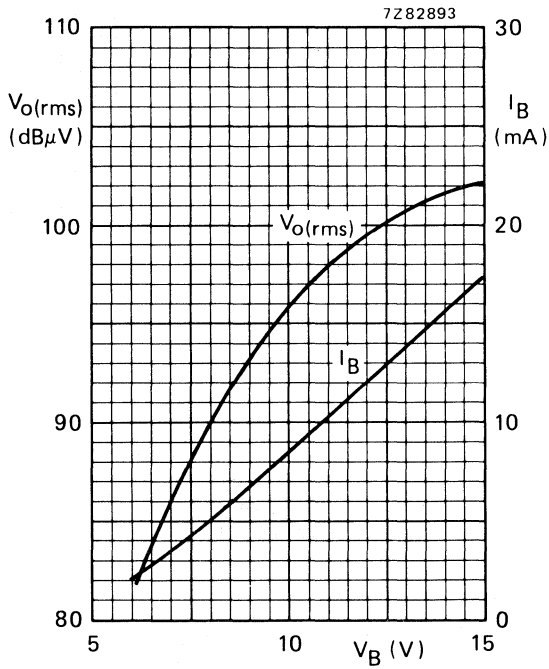


Fig. 7 Output voltage and supply current as a function of the supply voltage; typical values.

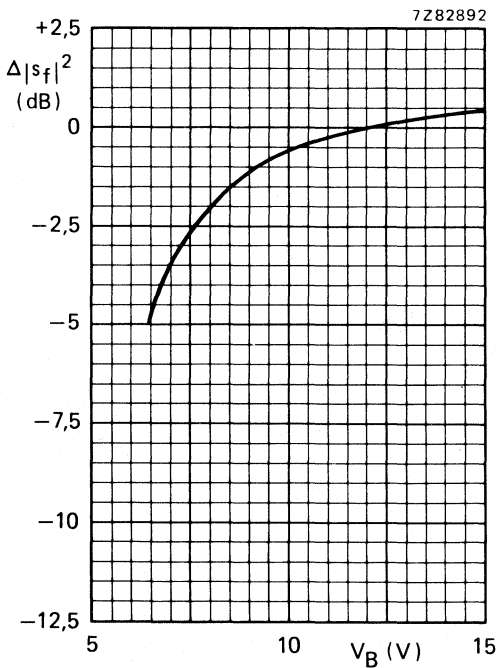


Fig. 8 Variation of transducer gain with supply voltage; reference 0 dB at 12 V; $f = 100$ to 860 MHz; typical values.

HYBRID INTEGRATED CIRCUIT VHF/UHF WIDE-BAND AMPLIFIER

Two-stage wide-band amplifier in hybrid integrated circuit technique on a thin-film substrate, intended for RATV and MATV applications.

QUICK REFERENCE DATA

D.C. supply voltage	V_B	=	12 V \pm 10%
Frequency range	f		40 to 860 MHz
Source and load (characteristic) impedance	$R_s = R_l = Z_0$	=	75 Ω
Transducer gain	$G_{tr} = s_f ^2$	typ.	18 dB
Flatness of frequency response	$\pm \Delta s_f ^2$	typ.	1 dB
Output voltage at -60 dB intermodulation distortion (DIN 45004, 3-tone)	$V_{o(rms)}$	typ.	100 dB μ V
Noise figure	F	typ.	6 dB
Operating ambient temperature	T_{amb}		-20 to +70 $^{\circ}$ C

ENCAPSULATION 5-pin, in-line, resin-coated body, see MECHANICAL DATA (Fig. 2)

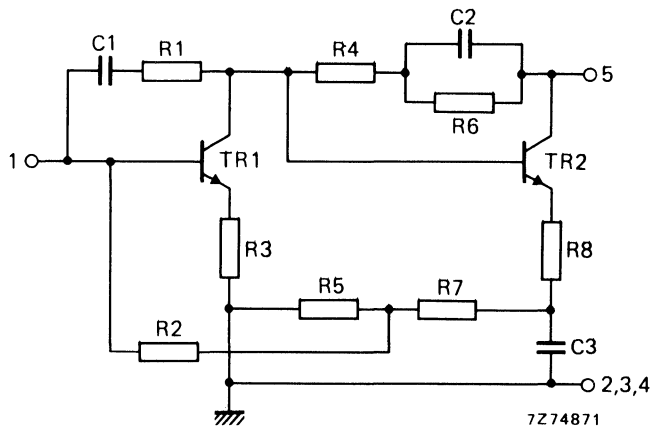


Fig. 1 Circuit diagram.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Operating ambient temperature	T_{amb}	-20 to + 70 °C
Storage temperature	T_{stg}	-40 to + 125 °C
D.C. supply voltage	V_B	max. 15 V
Peak incident powers on pins 1 and 5	P_{11M}, P_{15M}	max. 100 mW

CHARACTERISTICS

Measuring conditions

Ambient temperature	T_{amb}	=	25 °C
D.C. supply voltage	V_B	=	12 V
Source impedance and load impedance	R_s, R_l	=	75 Ω
Characteristic impedance of h.f. connections	Z_0	=	75 Ω
Frequency range	f	=	40 to 860 MHz

Performance

Supply current	I_B	typ.	18 mA
Transducer gain	$G_{tr} = s_f ^2$	typ.	18 dB
Flatness of frequency response	$\pm \Delta s_f ^2$	typ.	1 dB
Individual maximum v.s.w.r.			
input	VSWR(i)	typ.	1,5 *
output	VSWR(o)	typ.	1,9 *
Back attenuation			
f = 100 MHz	$ s_r ^2$	typ.	29 dB
f = 860 MHz	$ s_r ^2$	typ.	25 dB
Output voltage			
at -60 dB intermodulation distortion			
(DIN 45004, par. 6.3: 3-tone)	$V_{O(rms)}$	typ.	100 dB μ V
Noise figure	F	typ.	6 dB

s-parameters:	$s_f = s_{21}$	$s_i = s_{11}$
	$s_r = s_{12}$	$s_o = s_{22}$

* Highest value, for a sample, occurring in the frequency range.

OPERATING CONDITIONS

Ambient temperature range

 T_{amb} = -20 to +70 °C

D.C. supply voltage

 V_B = 12 V \pm 10%

Frequency range

f = 40 to 860 MHz

Source impedance and load impedance

 R_s, R_l = 75 Ω **MECHANICAL DATA**

Dimensions in mm

The device is resin coated.

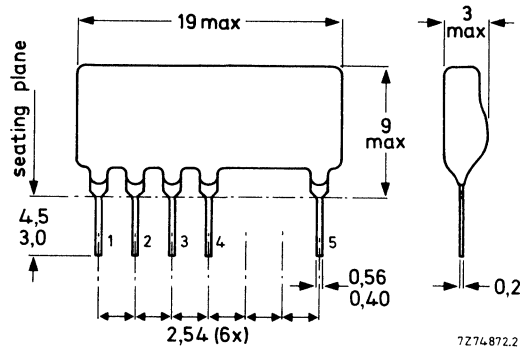


Fig. 2 Encapsulation.

Terminal connections

- 1 = input
- 2,3,4 = common
- 5 = output/supply(+)

Soldering recommendations*Hand soldering*

Maximum contact time for a soldering-iron temperature of 260 °C up to the seating plane is 5 s.

Dip or wave soldering

260 °C is the maximum permissible temperature of the solder; it must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds. The device may be mounted against the printed-circuit board, but the temperature of the device must not exceed 125 °C. If the printed-circuit board has been pre-heated, forced cooling may be necessary immediately after soldering to keep the temperature below the allowable limit.

Mounting recommendations

The module should preferably be mounted on double-sided printed-circuit board, see the example shown below.

Input and output should be connected to 75 Ω tracks.

The connections to the 'common' pins should be as close to the seating plane as possible.

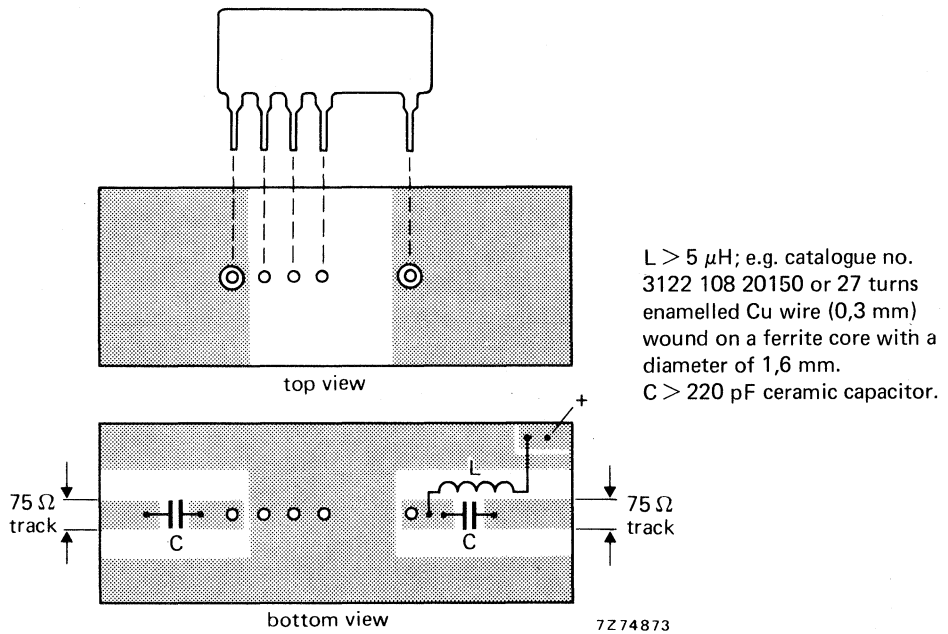


Fig. 3 Printed-circuit board holes and tracks.

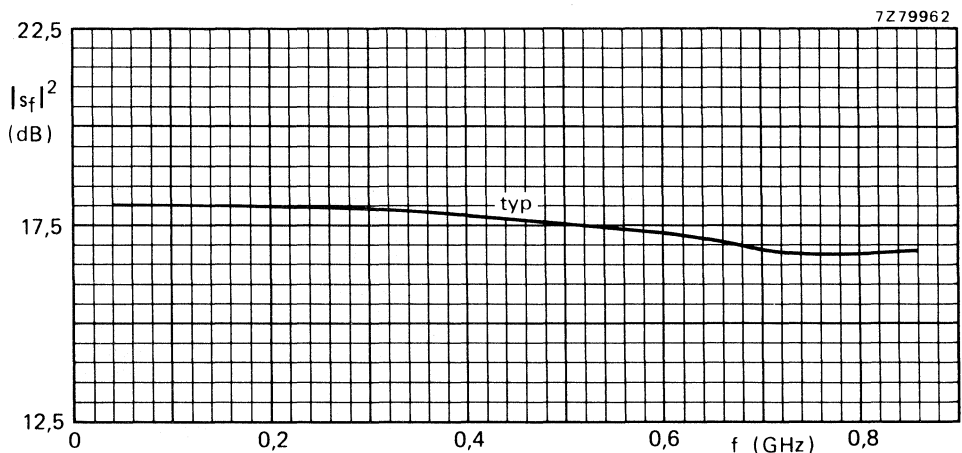


Fig. 4 Transducer gain as a function of frequency; $Z_0 = 75 \Omega$.

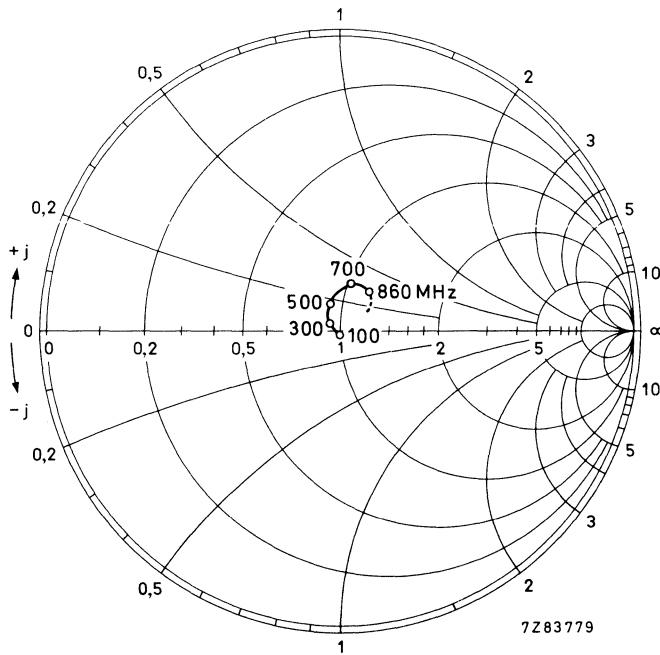


Fig. 5 Input impedance derived from input reflection coefficient s_i , co-ordinates in ohm x 75; typical values.

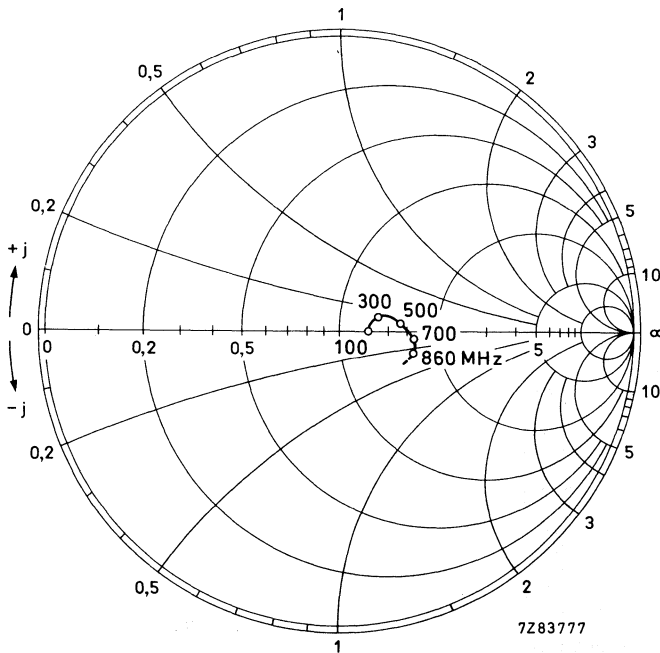


Fig. 6 Output impedance derived from output reflection coefficient s_o , co-ordinates in ohm x 75; typical values.

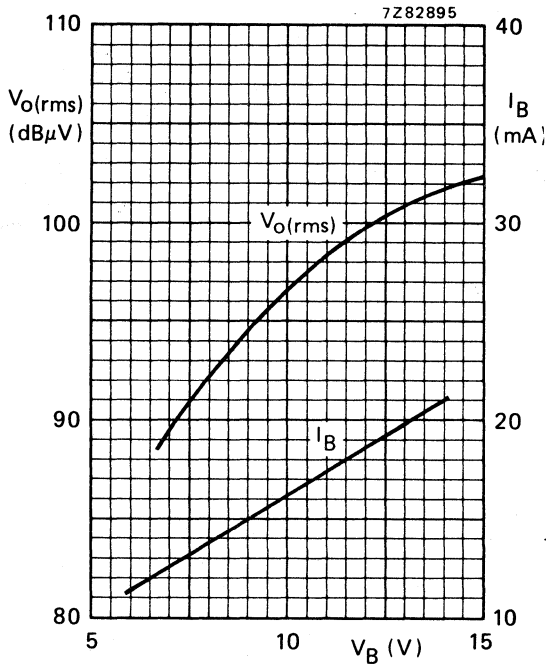


Fig. 7 Output voltage and supply current as a function of the supply voltage; typical values.

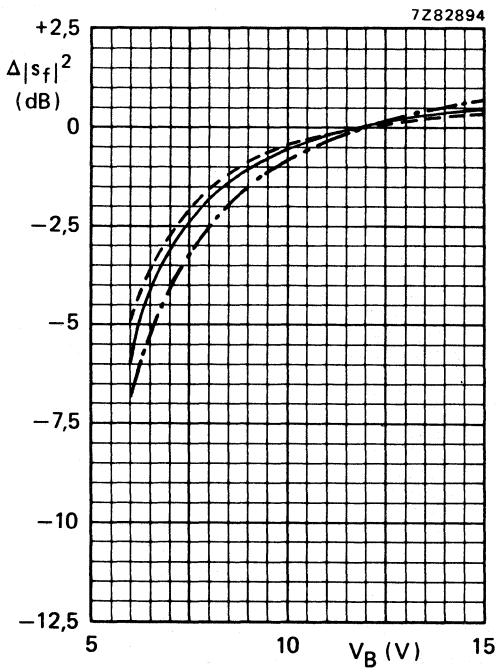


Fig. 8 Variation of transducer gain with supply voltage; reference 0 dB at 12 V:
 — $f = 500$ MHz;
 - - - $f = 100$ MHz;
 - · - $f = 860$ MHz;
 typical values.

HYBRID INTEGRATED CIRCUIT VHF/UHF WIDE-BAND AMPLIFIER

Three-stage wide-band amplifier in hybrid integrated circuit technique on a thin-film substrate, intended for use in mast-head booster-amplifiers, as preamplifier in MATV systems, and as general-purpose amplifier for v.h.f. and u.h.f. applications.

QUICK REFERENCE DATA

Frequency range	f	40 to 860 MHz
Source and load (characteristic) impedance	$R_s = R_l = Z_o =$	75 Ω
Transducer gain	$G_{tr} = s_f ^2$	typ. 23 dB
Flatness of frequency response	$\pm \Delta s_f ^2$	typ. 0,5 dB
Output voltage at -60 dB intermodulation distortion (DIN 45004, 3-tone)	$V_o(\text{rms})$	> 105 dB μ V
Noise figure	F	typ. 7 dB
D.C. supply voltage	V_B	= 12 V \pm 10%
Operating ambient temperature	T_{amb}	-20 to +70 $^{\circ}$ C

ENCAPSULATION 8-pin, in-line, resin-coated body, see MECHANICAL DATA (Fig. 2)

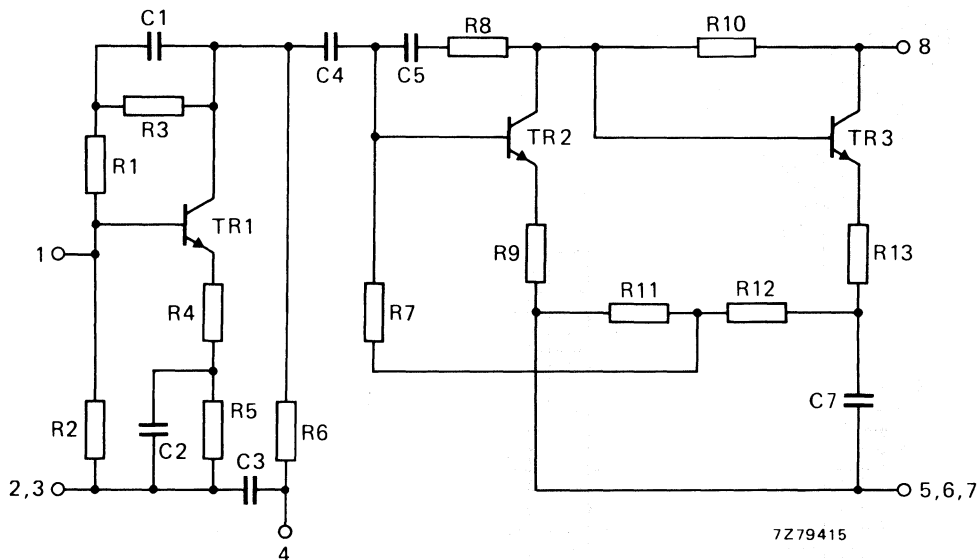


Fig. 1 Circuit diagram.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Operating ambient temperature	T_{amb}	-20 to +70 °C
Storage temperature	T_{stg}	-40 to +125 °C
D.C. supply voltage	V_B	max. 15 V
Peak incident powers on pins 1 and 7	P_{11M}, P_{17M}	max. 100 mW

CHARACTERISTICS**Measuring conditions**

Ambient temperature	T_{amb}	=	25 °C
D.C. supply voltage	V_B	=	12 V
Source impedance and load impedance	R_s, R_l	=	75 Ω
Characteristic impedance of h.f. connections	Z_0	=	75 Ω
Frequency range	f	=	40 to 860 MHz

Performance

Supply current	I_B	typ.	55 mA
Transducer gain	$G_{tr} = s_f ^2$	typ.	23 dB 21 to 25 dB
Flatness of frequency response	$\pm \Delta s_f ^2$	typ.	0,5 dB
Individual maximum v.s.w.r.			
input	$VSWR_{(i)}$	typ.	1,3 *
output	$VSWR_{(o)}$	typ.	1,5 *
Back attenuation			
$f = 100$ MHz	$ s_r ^2$	typ.	42 dB
$f = 860$ MHz	$ s_r ^2$	typ.	33 dB
Output voltage			
at -60 dB intermodulation distortion (DIN 45004, par. 6.3: 3-tone)	$V_{O(rms)}$	>	105 dB μ V typ. 107 dB μ V
Noise figure	F	typ.	7 dB

s-parameters:	$s_f = s_{21}$	$s_i = s_{11}$
	$s_r = s_{12}$	$s_o = s_{22}$

* Highest value, for a sample, occurring in the frequency range.

OPERATING CONDITIONS

Ambient temperature range

 T_{amb}

-20 to +70 °C

D.C. supply voltage

 V_B = 12 V \pm 10%

Frequency range

f

40 to 860 MHz

Source impedance and load impedance

 R_s, R_L = 75 Ω **MECHANICAL DATA**

The device is resin coated.

Dimensions in mm

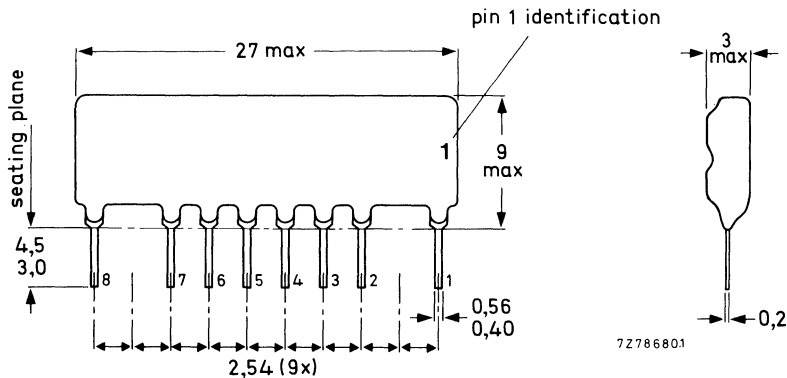


Fig. 2 Encapsulation.

Terminal connections

- 1 = input
- 2, 3, 5, 6, 7 = common
- 4 = supply (+)
- 8 = output/supply (+)

Soldering recommendations*Hand soldering*

Maximum contact time for a soldering-iron temperature of 260 °C up to the seating plane is 5 s.

Dip or wave soldering

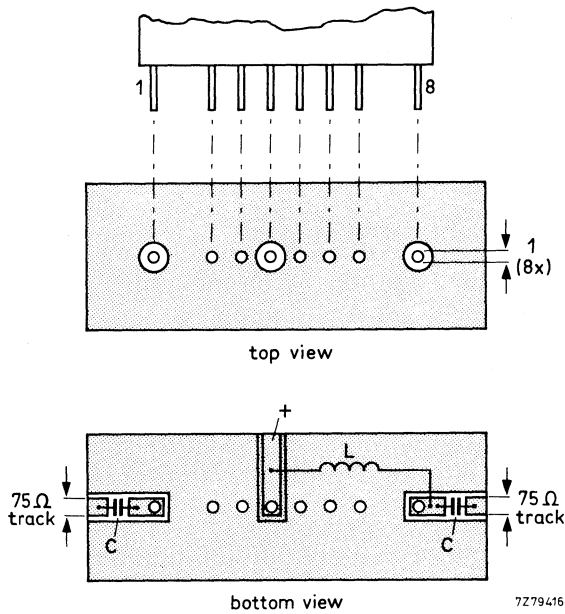
260 °C is the maximum permissible temperature of the solder; it must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds. The device may be mounted against the printed-circuit board, but the temperature of the device must not exceed 125 °C. If the printed-circuit board has been pre-heated, forced cooling may be necessary immediately after soldering to keep the temperature below the allowable limit.

Mounting recommendations

The module should preferably be mounted on double-sided printed-circuit board, see the example shown below.

Input and output should be connected to 75 Ω tracks.

The connections to the 'common' pins should be as close to the seating plane as possible.



$L > 5 \mu\text{H}$; e.g. catalogue no. 3122 108 20150 or 27 turns enamelled Cu wire (0,3 mm) wound on a ferrite core with a diameter of 1,6 mm.
 $C > 220 \text{ pF}$ ceramic capacitor.

Fig. 3 Printed-circuit board holes and tracks.

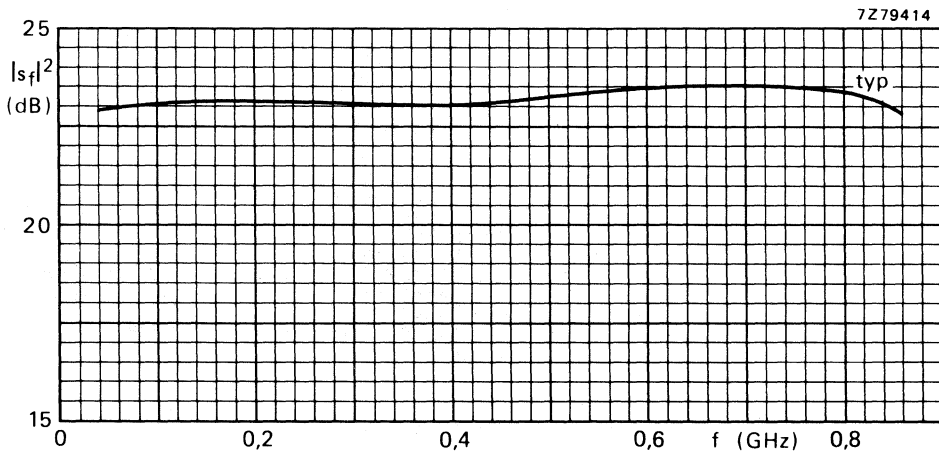


Fig. 4 Transducer gain as a function of frequency; $Z_0 = 75 \Omega$.

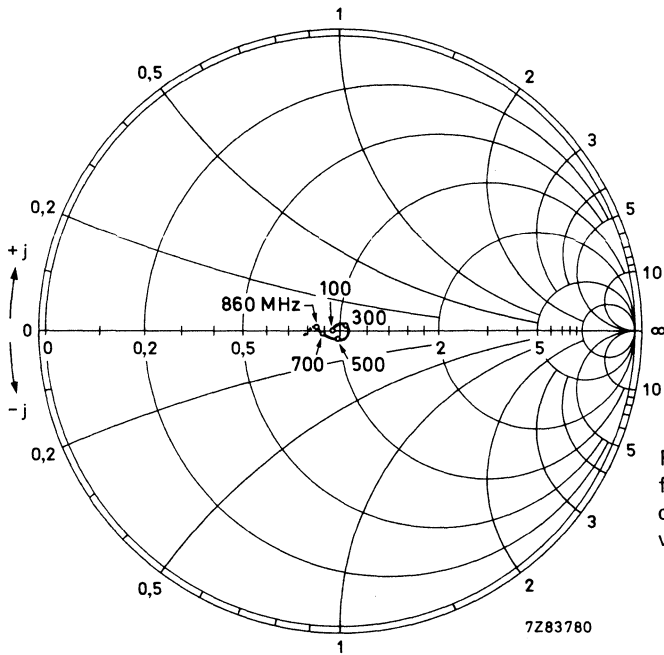


Fig. 5 Input impedance derived from input reflection coefficient s_i , co-ordinates in ohm x 75; typical values.

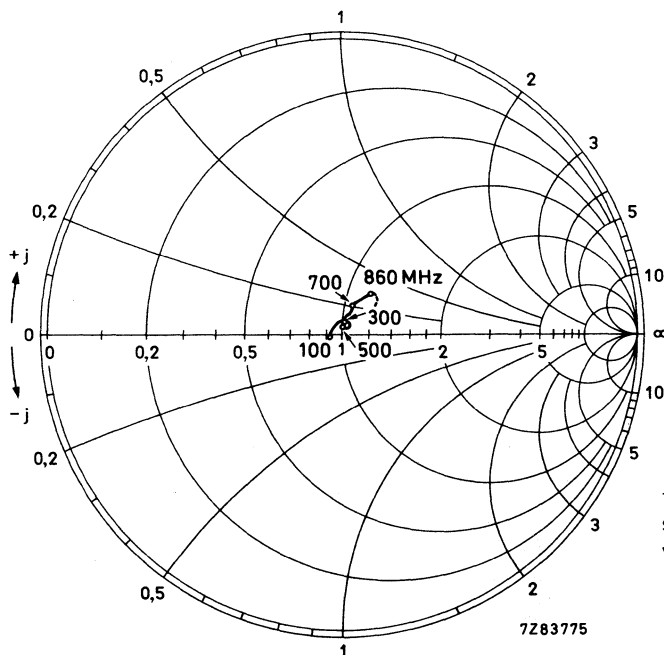


Fig. 6 Output impedance derived from output reflection coefficient s_o , co-ordinates in ohm x 75; typical values.

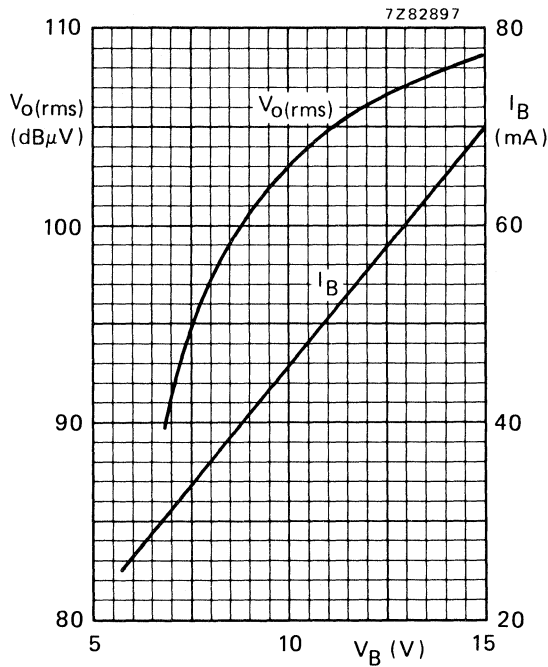


Fig. 7 Output voltage and supply current as a function of the supply voltage; typical values.

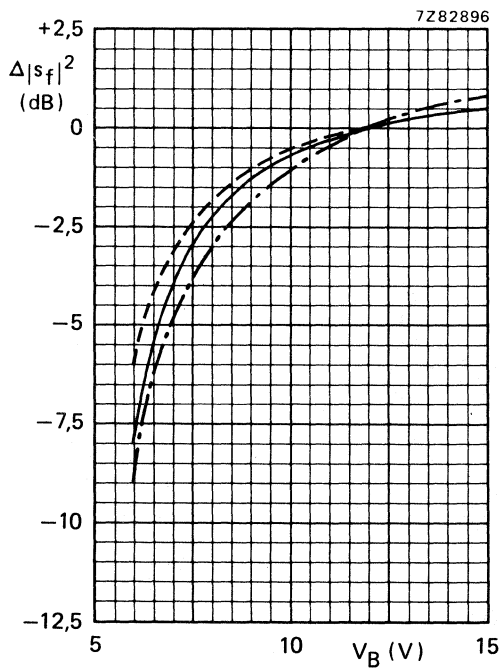


Fig. 8 Variation of transducer gain with supply voltage; reference 0 dB at 12 V;
 — $f = 500$ MHz;
 - - - $f = 100$ MHz;
 - · - $f = 860$ MHz;
 typical values.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Operating ambient temperature	T_{amb}		-20 to +70 °C
Storage temperature	T_{stg}		-40 to +125 °C
D.C. supply voltage	V_B	max.	15 V
Peak incident powers on pins 1 and 8	P_{11M}, P_{18M}	max.	100 mW

CHARACTERISTICS

Measuring conditions

Ambient temperature	T_{amb}	=	25 °C
D.C. supply voltage	V_B	=	12 V
Source impedance and load impedance	R_s, R_l	=	75 Ω
Characteristic impedance of h.f. connections	Z_o	=	75 Ω
Frequency range	f	=	40 to 860 MHz

Performance

Supply current	I_B	typ.	50 mA
Transducer gain	$G_{tr} = s_f ^2$	typ.	28 dB 26 to 31 dB
Flatness of frequency response	$\pm \Delta s_f ^2$	typ.	1 dB
Individual maximum v.s.w.r.			
input	$VSWR_{(i)}$	typ.	1,5 *
output	$VSWR_{(o)}$	typ.	1,7 *
Back attenuation			
f = 100 MHz	$ s_r ^2$	typ.	45 dB
f = 860 MHz	$ s_r ^2$	typ.	35 dB
Output voltage			
at -60 dB intermodulation distortion (DIN 45004, par. 6,3; 3-tone)	$V_{o(rms)}$	> typ.	105 dB μ V 107 dB μ V
Noise figure	F	typ.	6 dB

s-parameters:	$s_f = s_{21}$	$s_i = s_{11}$
	$s_r = s_{12}$	$s_o = s_{22}$

* Highest value, for a sample, occurring in the frequency range.

OPERATING CONDITIONS

Ambient temperature range

 T_{amb} = -20 to +70 °C

D.C. supply voltage

 V_B = 12 V \pm 10%

Frequency range

f = 40 to 860 MHz

Source impedance and load impedance

 R_S, R_L = 75 Ω **MECHANICAL DATA**

The device is resin coated.

Dimensions in mm

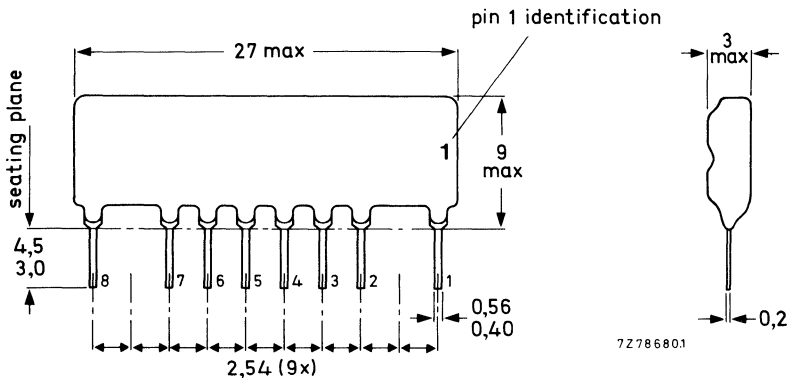


Fig. 2 Encapsulation.

Terminal connections

- 1 = input
- 2, 3, 5, 6, 7 = common
- 4 = supply (+)
- 8 = output/supply (+)

Soldering recommendations*Hand soldering*

Maximum contact time for a soldering-iron temperature of 260 °C up to the seating plane is 5 s.

Dip or wave soldering

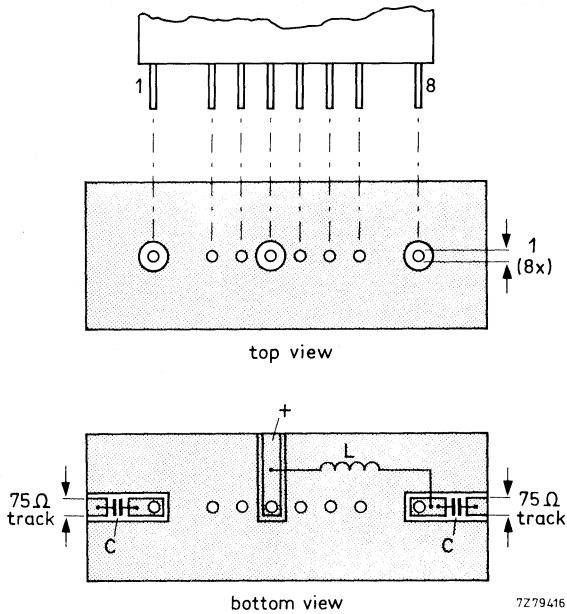
260 °C is the maximum permissible temperature of the solder; it must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds. The device may be mounted against the printed-circuit board, but the temperature of the device must not exceed 125 °C. If the printed-circuit board has been pre-heated, forced cooling may be necessary immediately after soldering to keep the temperature below the allowable limit.

Mounting recommendations

The module should preferably be mounted on double-sided printed-circuit board, see the example shown below.

Input and output should be connected to 75 Ω tracks.

The connections to the 'common' pins should be as close to the seating plane as possible.



$L > 5 \mu\text{H}$; e.g. catalogue no. 3122 108 20150 or 27 turns enamelled Cu wire (0,3 mm) wound on a ferrite core (material 4B1; catalogue number 3122 104 91110) with a diameter of 1,6 mm.
 $C > 220 \text{ pF}$ ceramic capacitor.

Fig. 3 Printed-circuit board holes and tracks.

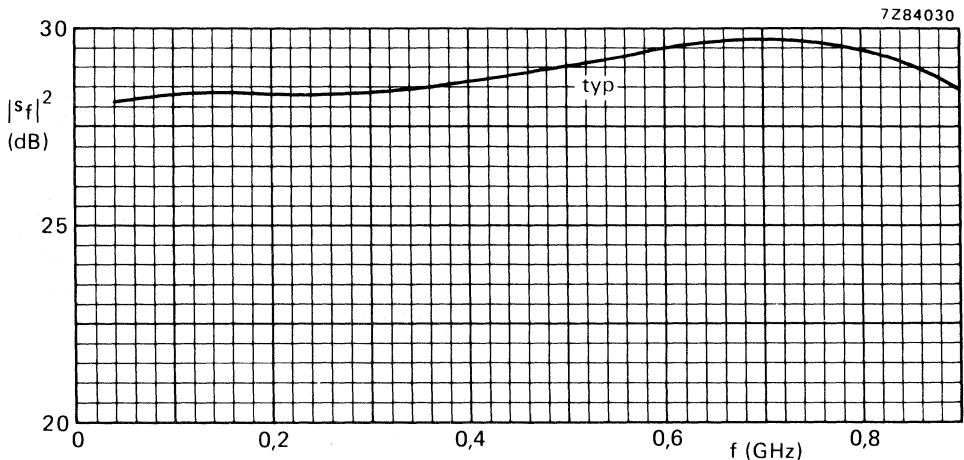


Fig. 4 Transducer gain as a function of frequency; $Z_O = 75 \Omega$.

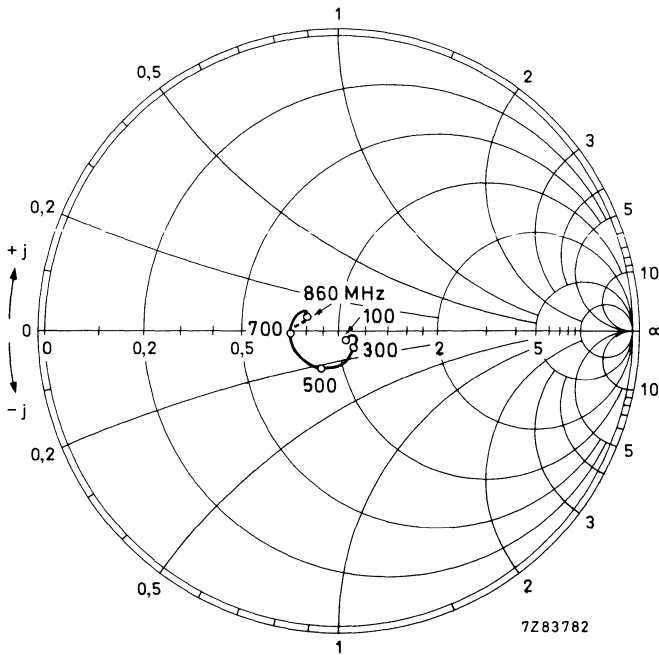


Fig. 5 Input impedance derived from input reflection coefficient s_i , co-ordinates in ohm x 75; typical values.

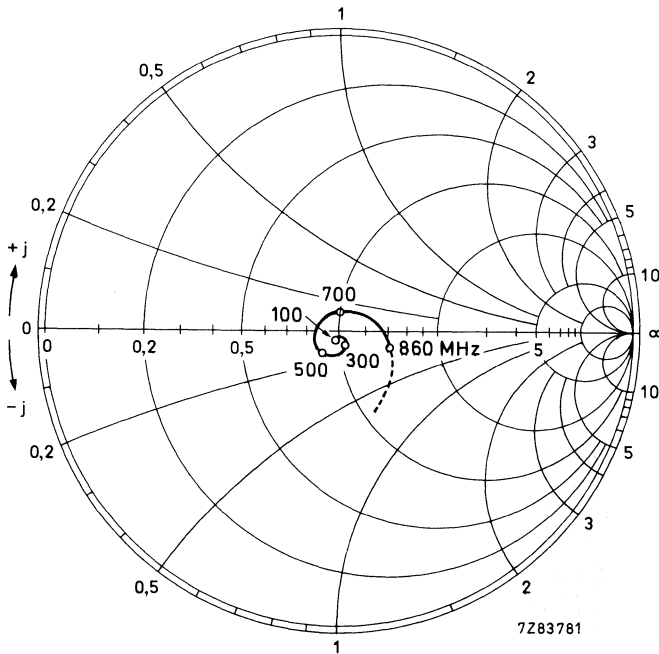


Fig. 6 Output impedance derived from output reflection coefficient s_o , co-ordinates in ohm x 75; typical values.

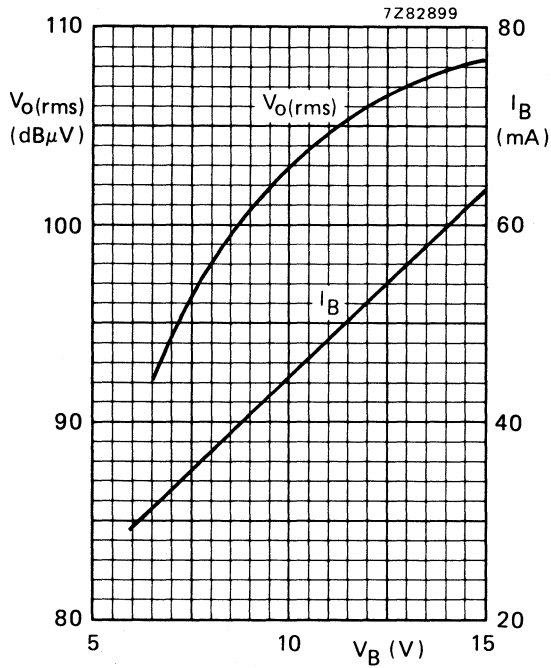


Fig. 7 Output voltage and supply current as a function of the supply voltage; typical values.

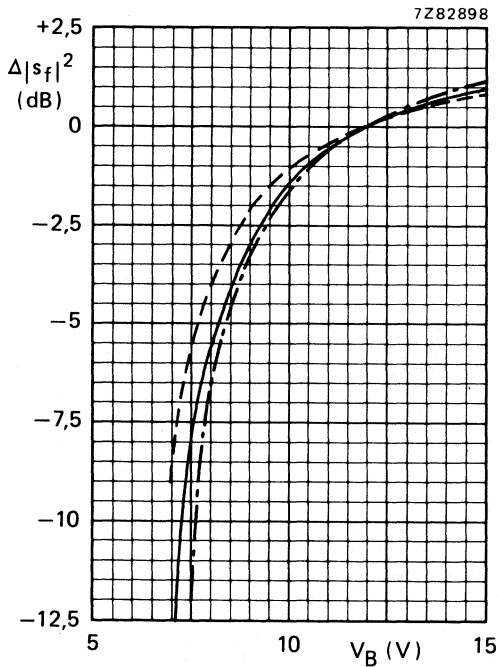


Fig. 8 Variation of transducer gain with supply voltage; reference 0 dB at 12 V;
 — $f = 500 \text{ MHz}$;
 - - - $f = 100 \text{ MHz}$;
 - · - · $f = 860 \text{ MHz}$;
 typical values.

HYBRID INTEGRATED CIRCUIT VHF/UHF WIDE-BAND AMPLIFIER

Three-stage wide-band amplifier in hybrid integrated circuit technique on a thin-film substrate, intended for use in mast-head booster-amplifiers, as an amplifier in MATV and CATV systems, and as general-purpose amplifier for v.h.f. and u.h.f. applications.

QUICK REFERENCE DATA

Frequency range	f		40 to 860 MHz
Source and load (characteristic) impedance	$R_s = R_l = Z_0 =$		75 Ω
Transducer gain	$G_{tr} = s_{f1} ^2$	typ.	28 dB
Flatness of frequency response	$\pm \Delta s_{f1} ^2$	typ.	1 dB
Output voltage at -60 dB intermodulation distortion (DIN 45004, 3-tone)			
VHF	$V_{O(rms)}$	typ.	113 dB μ V
UHF	$V_{O(rms)}$	typ.	112 dB μ V
Noise figure	F	typ.	7 dB
D.C. supply voltage	V_B	=	12 V \pm 10%
Operating ambient temperature	T_{amb}		-20 to +70 $^{\circ}$ C

ENCAPSULATION 9-pin, in-line, resin-coated body, see MECHANICAL DATA (Fig.2)

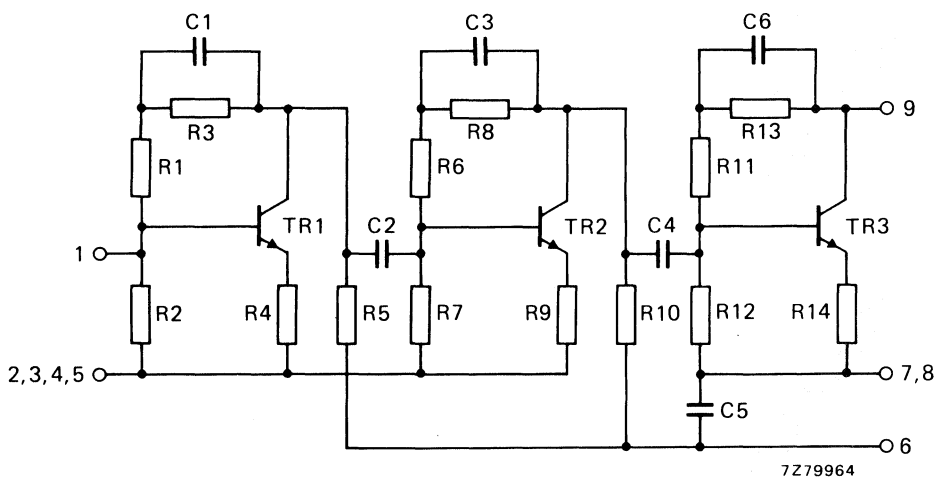


Fig. 1 Circuit diagram.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Operating ambient temperature	T_{amb}		-20 to +70 °C
Storage temperature	T_{stg}		-40 to +125 °C
D.C. supply voltage	V_B	max.	15 V
Peak incident powers on pins 1 and 8	P_{I1M}, P_{I8M}	max.	100 mW

CHARACTERISTICS

Measuring conditions

Ambient temperature	T_{amb}	=	25 °C
D.C. supply voltage	V_B	=	12 V
Source impedance and load impedance	R_s, R_l	=	75 Ω
Characteristic impedance of h.f. connections	Z_o	=	75 Ω
Frequency range	f	=	40 to 860 MHz

Performance

Supply current	I_B	typ.	105 mA
Transducer gain	$G_{tr} = s_f ^2$	typ.	28 dB 26 to 31 dB
Flatness of frequency response	$\pm \Delta s_f ^2$	typ.	1 dB
Individual maximum v.s.w.r.			
input	VSWR _(i)	typ.	2,3 *
output	VSWR _(o)	typ.	1,9 *
Back attenuation			
f = 100 MHz	$ s_r ^2$	typ.	45 dB
f = 860 MHz	$ s_r ^2$	typ.	35 dB
Output voltage			
at -60 dB intermodulation distortion (DIN 45004, par. 6,3; 3-tone)			
VHF	$V_{o(rms)}$	> typ.	111 dBμV 113 dBμV
UHF	$V_{o(rms)}$	> typ.	110 dBμV 112 dBμV
Noise figure	F	typ.	7 dB

s-parameters: $s_f = s_{21}$ $s_i = s_{11}$ $s_r = s_{12}$ $s_o = s_{22}$
--

* Highest value, for a sample, occurring in the frequency range.

OPERATING CONDITIONS

Ambient temperature range
 D.C. supply voltage
 Frequency range
 Source impedance and load impedance

T_{amb} = -20 to +70 °C
 V_B = 12 V ± 10%
 f = 40 to 860 MHz
 R_s, R_l = 75 Ω

MECHANICAL DATA

The device is resin coated.

Dimensions in mm

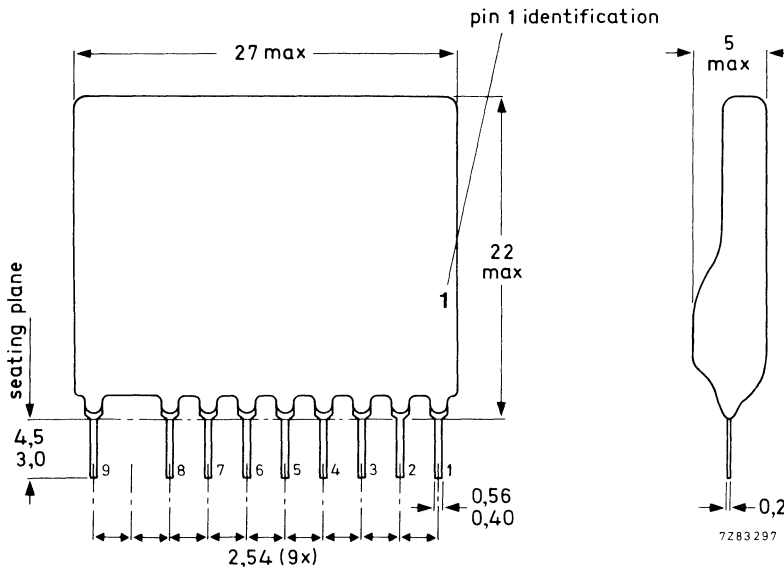


Fig. 2 Encapsulation.

Terminal connections

- 1 = input
- 2, 3, 4, 5 and 7, 8 = common
- 6 = supply (+)
- 9 = output/supply (+)

Soldering recommendations

Hand soldering

Maximum contact time for a soldering-iron temperature of 260 °C up to the seating plane is 5 s.

Dip or wave soldering

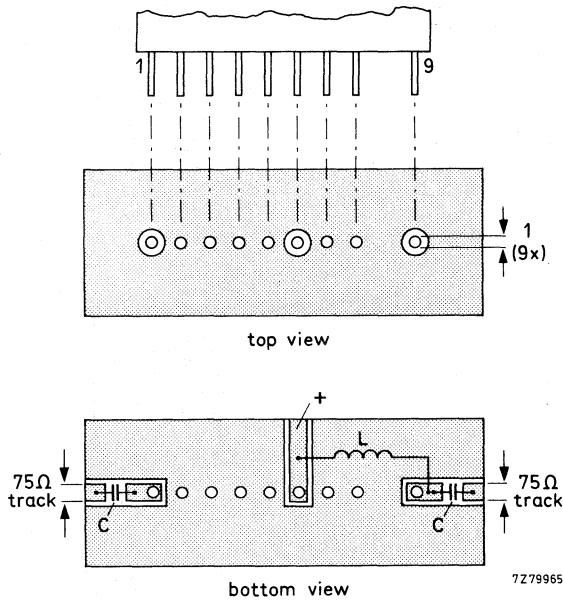
260 °C is the maximum permissible temperature of the solder; it must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds. The device may be mounted against the printed-circuit board, but the temperature of the device must not exceed 125 °C. If the printed-circuit board has been pre-heated, forced cooling may be necessary immediately after soldering to keep the temperature below the allowable limit.

Mounting recommendations

The module should preferably be mounted on double-sided printed-circuit board, see the example shown below.

Input and output should be connected to 75 Ω tracks.

The connections to the 'common' pins should be as close to the seating plane as possible.



$L > 5 \mu\text{H}$; e.g. catalogue no. 3122 108 20150 or 27 turns enamelled Cu wire (0,3 mm) wound on a ferrite core (material 4B1; catalogue no. 3122 104 91110) with a diameter of 1,6 mm.
 $C > 220 \text{ pF}$ ceramic capacitor.

Fig. 3 Printed-circuit board holes and tracks.

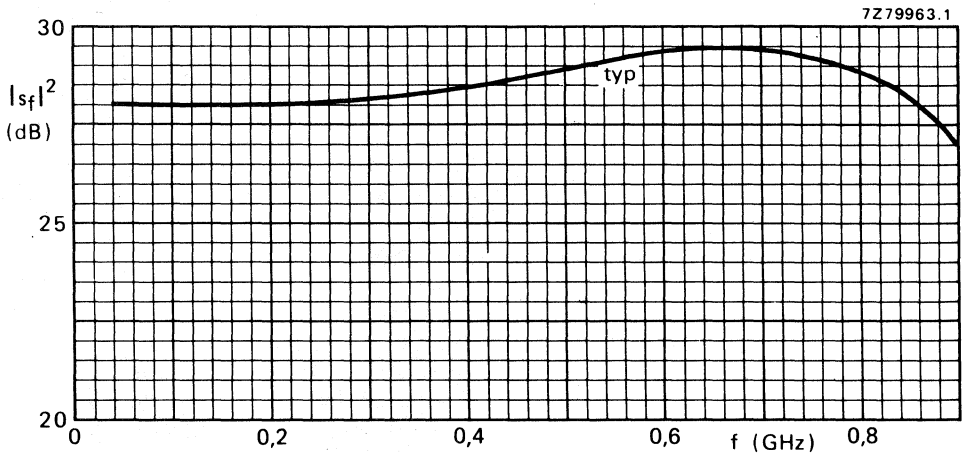


Fig. 4 Transducer gain as a function of frequency; $Z_0 = 75 \Omega$.

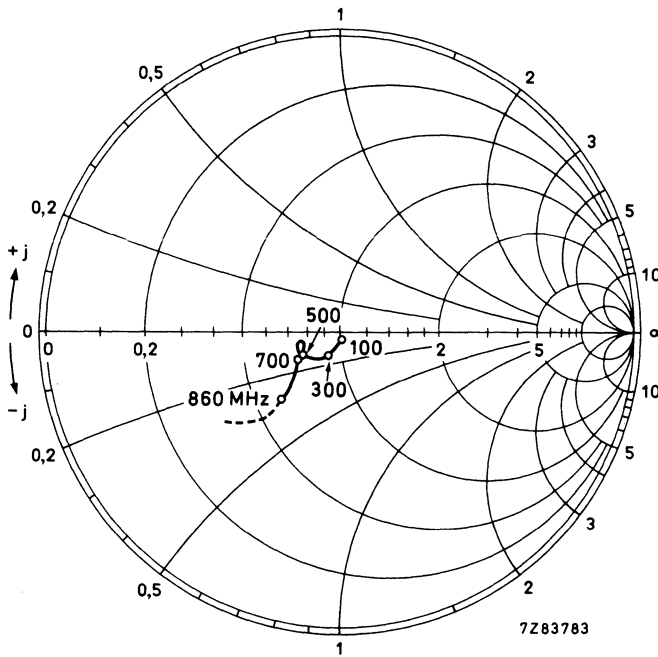


Fig. 5 Input impedance derived from input reflection coefficient s_i , co-ordinates in ohm x 75; typical values.

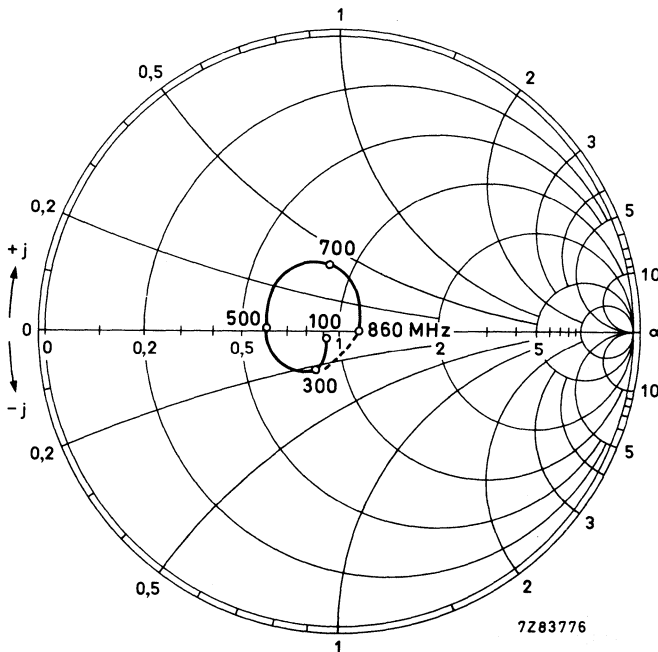


Fig. 6 Output impedance derived from output reflection coefficient s_o , co-ordinates in ohm x 75; typical values.

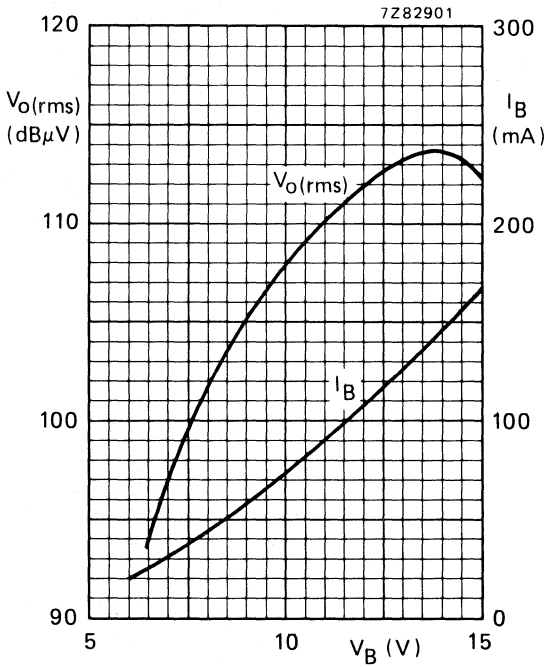


Fig. 7 Output voltage and supply current as a function of the supply voltage; typical values.

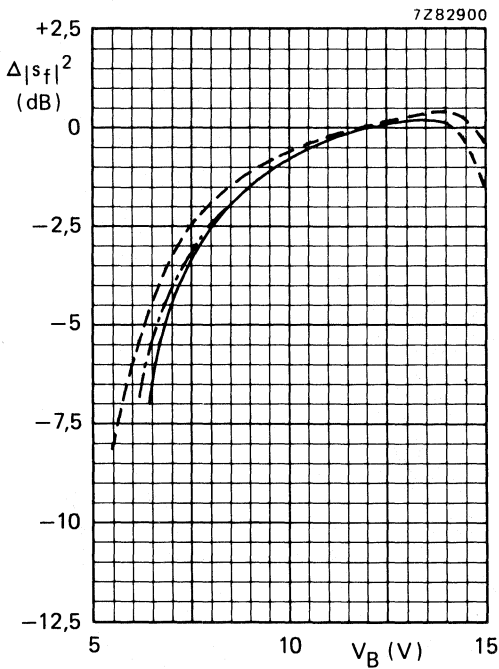
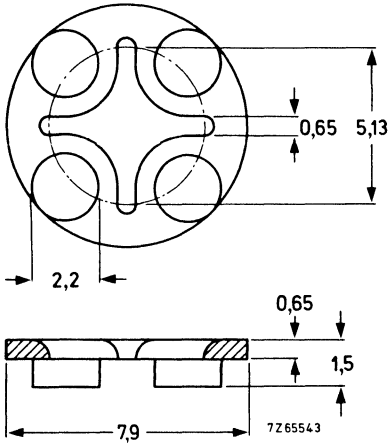


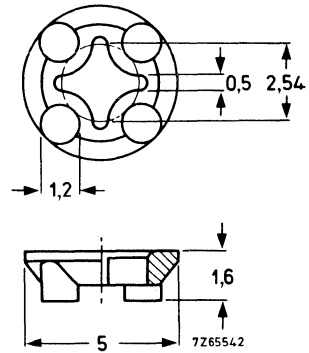
Fig. 8 Variation of transducer gain with supply voltage; reference 0 dB at 12 V;
 — $f = 500$ MHz;
 - - - $f = 100$ MHz;
 - · - · $f = 860$ MHz;
 typical values.

MECHANICAL DATA

Dimensions in mm



Distance disc 56245 for TO-5 or TO-39;
insulating material.

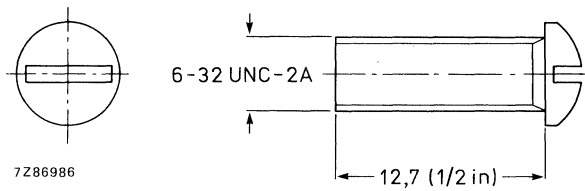


Distance disc 56246 for TO-18 or TO-72;
insulating material.

Maximum permissible temperature: 100 °C.

ROUND HEAD SCREW 6-32 UNC-2A

Available, upon request, under type number 56396 or 12 NC code number 9390 298 10x0.



INDEX OF TYPE NUMBERS

The inclusion of a type number in this publication does not necessarily imply its availability.

type no.	book	section	type no.	book	section	type no.	book	section
BA220	S1	SD	BAS29	S7/S1	Mm/SD	BAV99	S7/S1	Mm/SD
BA221	S1	SD	BAS31	S7/S1	Mm/SD	BAV100	S7/S1	Mm/SD
BA223	S1	T	BAS32	S7/S1	Mm/SD	BAV101	S7/S1	Mm/SD
BA281	S1	SD	BAS35	S7/S1	Mm/SD	BAV102	S7/S1	Mm/SD
BA314	S1	Vrg	BAS45	S1	SD	BAV103	S7/S1	Mm/SD
BA315	S1	Vrg	BAS56	S1/S7	SD/Mm	BAW56	S7/S1	Mm/SD
BA316	S1	SD	BAT17	S7/S1	Mm/T	BAW62	S1	SD
BA317	S1	SD	BAT18	S7/S1	Mm/T	BAX12	S1	SD
BA318	S1	SD	BAT54	S1/S7	SD/Mm	BAX14	S1	SD
BA423	S1	T	BAT74	S1/S7	SD/Mm	BAX18	S1	SD
BA480	S1	T	BAT81	S1	T	BAY80	S1	SD
BA481	S1	T	BAT82	S1	T	BB112	S1	T
BA482	S1	T	BAT83	S1	T	BB119	S1	T
BA483	S1	T	BAT85	S1	T	BB130	S1	T
BA484	S1	T	BAT86	S1	T	BB204B	S1	T
BA682	S1/S7	T/Mm	BAV10	S1	SD	BB204G	S1	T
BA683	S1/S7	T/Mm	BAV18	S1	SD	BB212	S1	T
BAS11	S1	SD	BAV19	S1	SD	BB215	S7/S1	Mm/SD
BAS15	S1	SD	BAV20	S1	SD	BB219	S7/S1	Mm/SD
BAS16	S7/S1	Mm/SD	BAV21	S1	SD	BB405B	S1	T
BAS17	S7/S1	Mm/Vrg	BAV23	S7/S1	Mm/SD	BB417	S1	T
BAS19	S7/S1	Mm/SD	BAV45	S1	Sp	BB809	S1	T
BAS20	S7/S1	Mm/SD	BAV45A	S1	Sp	BB909A	S1	T
BAS21	S7/S1	Mm/SD	BAV70	S7/S1	Mm/SD	BB909B	S1	T
BAS28	S7/S1	Mm/SD	BAV74	S1	SD	BBY31	S7/S1	Mm/T

Mm = Microminiature semiconductors
for hybrid circuits
SD = Small-signal diodes

Sp = Special diodes
T = Tuner diodes
Vrg = Voltage regulator diodes

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type no.	book	section	type no.	book	section	type no.	book	section
BBY39	S1	T	BC639	S3	Sm	BCW72;R	S7	Mm
BBY40	S7/S1	Mm/T	BC640	S3	Sm	BCW81;R	S7	Mm
BC107	S3	Sm	BC807	S7	Mm	BCW89;R	S7	Mm
BC108	S3	Sm	BC808	S7	Mm	BCX17;R	S7	Mm
BC109	S3	Sm	BC817	S7	Mm	BCX18;R	S7	Mm
BC140	S3	Sm	BC818	S7	Mm	BCX19;R	S7	Mm
BC141	S3	Sm	BC846	S7	Mm	BCX20;R	S7	Mm
BC146	S3	Sm	BC847	S7	Mm	BCX51	S7	Mm
BC160	S3	Sm	BC848	S7	Mm	BCX52	S7	Mm
BC161	S3	Sm	BC849	S7	Mm	BCX53	S7	Mm
BC177	S3	Sm	BC850	S7	Mm	BCX54	S7	Mm
BC178	S3	Sm	BC856	S7	Mm	BCX55	S7	Mm
BC179	S3	Sm	BC857	S7	Mm	BCX56	S7	Mm
BC200	S3	Sm	BC858	S7	Mm	BCX68	S7	Mm
BC264A	S5	FET	BC859	S7	Mm	BCX69	S7	mm
BC264B	S5	FET	BC860	S7	Mm	BCX70*	S7	Mm
BC264C	S5	FET	BC868	S7	Mm	BCX71*	S7	Mm
BC264D	S5	FET	BC869	S7	Mm	BCY56	S3	Sm
BC327;A	S3	Sm	BCF29;R	S7	Mm	BCY57	S3	Sm
BC328	S3	Sm	BCF30;R	S7	Mm	BCY58	S3	Sm
BC337;A	S3	Sm	BCF32;R	S7	Mm	BCY59	S3	Sm
BC338	S3	Sm	BCF33;R	S7	Mm	BCY70	S3	Sm
BC368	S3	Sm	BCF70;R	S7	Mm	BCY71	S3	Sm
BC369	S3	Sm	BCF81;R	S7	Mm	BCY72	S3	Sm
BC375	S3	Sm	BCV26	S7	Mm	BCY78	S3	Sm
BC376	S3	Sm	BCV27	S7	Mm	BCY79	S3	Sm
BC546	S3	Sm	BCV61	S7	Mm	BCY87	S3	Sm
BC547	S3	Sm	BCV62	S7	Mm	BCY88	S3	Sm
BC548	S3	Sm	BCV71;R	S7	Mm	BCY89	S3	Sm
BC549	S3	Sm	BCV72;R	S7	Mm	BD131	S4a	P
BC550	S3	Sm	BCW29;R	S7	Mm	BD132	S4a	P
BC556	S3	Sm	BCW30;R	S7	Mm	BD135	S4a	P
BC557	S3	Sm	BCW31;R	S7	Mm	BD136	S4a	P
BC558	S3	Sm	BCW32;R	S7	Mm	BD137	S4a	P
BC559	S3	Sm	BCW33;R	S7	Mm	BD138	S4a	P
BC560	S3	Sm	BCW60*	S7	Mm	BD139	S4a	P
BC635	S3	Sm	BCW61*	S7	Mm	BD140	S4a	P
BC636	S3	Sm	BCW69;R	S7	Mm	BD201	S4a	P
BC637	S3	Sm	BCW70;R	S7	Mm	BD202	S4a	P
BC638	S3	Sm	BCW71;R	S7	Mm	BD203	S4a	P

* = series

FET = Field-effect transistors

Mm = Microminiature semiconductors
for hybrid circuits

P = Low-frequency power transistors

Sm = Small-signal transistors

T = Tuner diodes

type no.	book	section	type no.	book	section	type no.	book	section
BD204	S4a	P	BD332	S4a	P	BD828	S4a	P
BD226	S4a	P	BD333	S4a	P	BD829	S4a	P
BD227	S4a	P	BD334	S4a	P	BD830	S4a	P
BD228	S4a	P	BD335	S4a	P	BD839	S4a	P
BD229	S4a	P	BD336	S4a	P	BD840	S4a	P
BD230	S4a	P	BD337	S4a	P	BD841	S4a	P
BD231	S4a	P	BD338	S4a	P	BD842	S4a	P
BD233	S4a	P	BD433	S4a	P	BD843	S4a	P
BD234	S4a	P	BD434	S4a	P	BD844	S4a	P
BD235	S4a	P	BD435	S4a	P	BD845	S4a	P
BD236	S4a	P	BD436	S4a	P	BD846	S4a	P
BD237	S4a	P	BD437	S4a	P	BD847	S4a	P
BD238	S4a	P	BD438	S4a	P	BD848	S4a	P
BD239	S4a	P	BD645	S4a	P	BD849	S4a	P
BD239A	S4a	P	BD646	S4a	P	BD850	S4a	P
BD239B	S4a	P	BD647	S4a	P	BD933	S4a	P
BD239C	S4a	P	BD648	S4a	P	BD934	S4a	P
BD240	S4a	P	BD649	S4a	P	BD935	S4a	P
BD240A	S4a	P	BD650	S4a	P	BD936	S4a	P
BD240B	S4a	P	BD651	S4a	P	BD937	S4a	P
BD240C	S4a	P	BD652	S4a	P	BD938	S4a	P
BD241	S4a	P	BD675	S4a	P	BD939	S4a	P
BD241A	S4a	P	BD676	S4a	P	BD940	S4a	P
BD241B	S4a	P	BD677	S4a	P	BD941	S4a	P
BD241C	S4a	P	BD678	S4a	P	BD942	S4a	P
BD242	S4a	P	BD679	S4a	P	BD943	S4a	P
BD242A	S4a	P	BD680	S4a	P	BD944	S4a	P
BD242B	S4a	P	BD681	S4a	P	BD945	S4a	P
BD242C	S4a	P	BD682	S4a	P	BD946	S4a	P
BD243	S4a	P	BD683	S4a	P	BD947	S4a	P
BD243A	S4a	P	BD684	S4a	P	BD948	S4a	P
BD243B	S4a	P	BD813	S4a	P	BD949	S4a	P
BD243C	S4a	P	BD814	S4a	P	BD950	S4a	P
BD244	S4a	P	BD815	S4a	P	BD951	S4a	P
BD244A	S4a	P	BD816	S4a	P	BD952	S4a	P
BD244B	S4a	P	BD817	S4a	P	BD953	S4a	P
BD244C	S4a	P	BD818	S4a	P	BD954	S4a	P
BD329	S4a	P	BD825	S4a	P	BD955	S4a	P
BD330	S4a	P	BD826	S4a	P	BD956	S4a	P
BD331	S4a	P	BD827	S4a	P	BDT20	S4a	P

P = Low-frequency power transistors

INDEX

type no.	book	section	type no.	book	section	type no.	book	section
BDT21	S4a	P	BDT61C	S4a	P	BDV66B	S4a	P
BDT29	S4a	P	BDT62	S4a	P	BDV66C	S4a	P
BDT29A	S4a	P	BDT62A	S4a	P	BDV66D	S4a	P
BDT29B	S4a	P	BDT62B	S4a	P	BDV67A	S4a	P
BDT29C	S4a	P	BDT62C	S4a	P	BDV67B	S4a	P
BDT30	S4a	P	BDT63	S4a	P	BDV67C	S4a	P
BDT30A	S4a	P	BDT63A	S4a	P	BDV67D	S4a	P
BDT30B	S4a	P	BDT63B	S4a	P	BDV91	S4a	P
BDT30C	S4a	P	BDT63C	S4a	P	BDV92	S4a	P
BDT31	S4a	P	BDT64	S4a	P	BDV93	S4a	P
BDT31A	S4a	P	BDT64A	S4a	P	BDV94	S4a	P
BDT31B	S4a	P	BDT64B	S4a	P	BDV95	S4a	P
BDT31C	S4a	P	BDT64C	S4a	P	BDV96	S4a	P
BDT32	S4a	P	BDT65	S4a	P	BDW55	S4a	P
BDT32A	S4a	P	BDT65A	S4a	P	BDW56	S4a	P
BDT32B	S4a	P	BDT65B	S4a	P	BDW57	S4a	P
BDT32C	S4a	P	BDT65C	S4a	P	BDW58	S4a	P
BDT41	S4a	P	BDT81	S4a	P	BDW59	S4a	P
BDT41A	S4a	P	BDT82	S4a	P	BDW60	S4a	P
BDT41B	S4a	P	BDT83	S4a	P	BDX35	S4a	P
BDT41C	S4a	P	BDT84	S4a	P	BDX36	S4a	P
BDT42	S4a	P	BDT85	S4a	P	BDX37	S4a	P
BDT42A	S4a	P	BDT86	S4a	P	BDX42	S4a	P
BDT42B	S4a	P	BDT87	S4a	P	BDX43	S4a	P
BDT42C	S4a	P	BDT88	S4a	P	BDX44	S4a	P
BDT51	S4a	P	BDT91	S4a	P	BDX45	S4a	P
BDT52	S4a	P	BDT92	S4a	P	BDX46	S4a	P
BDT53	S4a	P	BDT93	S4a	P	BDX47	S4a	P
BDT54	S4a	P	BDT94	S4a	P	BDX62	S4a	P
BDT55	S4a	P	BDT95	S4a	P	BDX62A	S4a	P
BDT56	S4a	P	BDT96	S4a	P	BDX62B	S4a	P
BDT57	S4a	P	BDV64	S4a	P	BDX62C	S4a	P
BDT58	S4a	P	BDV64A	S4a	P	BDX63	S4a	P
BDT60	S4a	P	BDV64B	S4a	P	BDX63A	S4a	P
BDT60A	S4a	P	BDV64C	S4a	P	BDX63B	S4a	P
BDT60B	S4a	P	BDV65	S4a	P	BDX63C	S4a	P
BDT60C	S4a	P	BDV65A	S4a	P	BDX64	S4a	P
BDT61	S4a	P	BDV65B	S4a	P	BDX64A	S4a	P
BDT61A	S4a	P	BDV65C	S4a	P	BDX64B	S4a	P
BDT61B	S4a	P	BDV66A	S4a	P	BDX64C	S4a	P

P = Low-frequency power transistors

type no.	book	section	type no.	book	section	type no.	book	section
BDX65	S4a	P	BF247B	S5	FET	BF585	S4b	HVP
BDX65A	S4a	P	BF247C	S5	FET	BF587	S4b	HVP
BDX65B	S4a	P	BF256A	S5	FET	BF591	S4b	HVP
BDX65C	S4a	P	BF256B	S5	FET	BF593	S4b	HVP
BDX66	S4a	P	BF256C	S5	FET	BF620	S7	Mm
BDX66A	S4a	P	BF324	S3	Sm	BF621	S7	Mm
BDX66B	S4a	P	BF370	S3	Sm	BF622	S7	Mm
BDX66C	S4a	P	BF410A	S5	FET	BF623	S7	Mm
BDX67	S4a	P	BF410B	S5	FET	BF660;R	S7	Mm
BDX67A	S4a	P	BF410C	S5	FET	BF689K	S10	WBT
BDX67B	S4a	P	BF410D	S5	FET	BF763	S10	WBT
BDX67C	S4a	P	BF419	S4b	HVP	BF767	S7	Mm
BDX68	S4a	P	BF420	S3	Sm	BF819	S4b	HVP
BDX68A	S4a	P	BF421	S3	Sm	BF820	S7	Mm
BDX68B	S4a	P	BF422	S3	Sm	BF821	S7	Mm
BDX68C	S4a	P	BF423	S3	Sm	BF822	S7	Mm
BDX69	S4a	P	BF450	S3	Sm	BF823	S7	Mm
BDX69A	S4a	P	BF451	S3	Sm	BF824	S7	Mm
BDX69B	S4a	P	BF457	S4b	HVP	BF840	S7	Mm
BDX69C	S4a	P	BF458	S4b	HVP	BF841	S7	Mm
BDX77	S4a	P	BF459	S4b	HVP	BF857	S4b	HVP
BDX78	S4a	P	BF469	S4b	HVP	BF858	S4b	HVP
BDX91	S4a	P	BF470	S4b	HVP	BF859	S4b	HVP
BDX92	S4a	P	BF471	S4b	HVP	BF869	S4b	HVP
BDX93	S4a	P	BF472	S4b	HVP	BF870	S4b	HVP
BDX94	S4a	P	BF483	S3	Sm	BF871	S4b	HVP
BDX95	S4a	P	BF485	S3	Sm	BF872	S4b	HVP
BDX96	S4a	P	BF487	S3	Sm	BF926	S3	Sm
BDY90	S4a	P	BF494	S3	Sm	BF936	S3	Sm
BDY90A	S4a	P	BF495	S3	Sm	BF939	S3	Sm
BDY91	S4a	P	BF496	S3	Sm	BF960	S5	FET
BDY92	S4a	P	BF510	S7/S5	Mm/FET	BF964	S5	FET
BF198	S3	Sm	BF511	S7/S5	Mm/FET	BF966	S5	FET
BF199	S3	Sm	BF512	S7/S5	Mm/FET	BF967	S3	Sm
BF240	S3	Sm	BF513	S7/S5	Mm/FET	BF970	S3	Sm
BF241	S3	Sm	BF536	S7	Mm	BF979	S3	Sm
BF245A	S5	FET	BF550;R	S7	Mm	BF980	S5	FET
BF245B	S5	FET	BF569	S7	Mm	BF981	S5	FET
BF245C	S5	FET	BF579	S7	Mm	BF982	S5	FET
BF247A	S5	FET	BF583	S4b	HVP	BF989	S7/S5	Mm/FET

FET = Field-effect transistors

HVP = High-voltage power transistors

Mm = Microminiature semiconductors

for hybrid circuits

P = Low-frequency power transistors

Sm = Small-signal transistors

WBT = Wideband transistors

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type no.	book	section	type no.	book	section	type no.	book	section
BF990	S7/S5	Mm/FET	BFQ34T	S10	WBT	BFR101A;B	S7/S5	Mm/FET
BF991	S7/S5	Mm/FET	BFQ42	S6	RFP	BFS17	S7/S10	Mm/WBT
BF992	S7/S5	Mm/FET	BFQ43	S6	RFP	BFS17A	S10	WBT
BF994	S7/S5	Mm/FET	BFQ43S	S6	RFP	BFS17R	S7	Mm
BF996	S7/S5	Mm/FET	BFQ51	S10	WBT	BFS18;R	S7	Mm
BFG23	S10	WBT	BFQ51C	S10	WBT	BFS19;R	S7	Mm
BFG32	S10	WBT	BFQ52	S10	WBT	BFS20;R	S7	Mm
BFG34	S10	WBT	BFQ53	S10	WBT	BFS21	S5	FET
BFG51	S10	WBT	BFQ63	S10	WBT	BFS21A	S5	FET
BFG65	S10	WBT	BFQ65	S10	WBT	BFS22A	S6	RFP
BFG67	S7	Mm	BFQ66	S10	WBT	BFS23A	S6	RFP
BFG90A	S10	WBT	BFQ67	S7/S10	Mm/WBT	BFT24	S10	WBT
BFG92A	S10	WBT	BFQ68	S10	WBT	BFT25	S7/S10	Mm/WBT
BFG93A	S10	WBT	BFQ136	S10	WBT	BFT25R	S7	Mm
BFG96	S10	WBT	BFR29	S5	FET	BFT44	S3	Sm
BFG195	S10	WBT	BFR30	S7/S5	Mm/FET	BFT45	S3	Sm
BFP90A	S10	WBT	BFR31	S7/S5	Mm/FET	BFT46	S7/S5	Mm/FET
BFP91A	S10	WBT	BFR49	S10	WBT	BFT92	S7/S10	Mm/WBT
BFP96	S10	WBT	BFR53	S7/S10	Mm/WBT	BFT92R	S7	Mm
BFQ10	S5	FET	BFR53R	S7	Mm	BFT93	S7/S10	Mm/WBT
BFQ11	S5	FET	BFR54	S3	Sm	BFT93R	S7	Mm
BFQ12	S5	FET	BFR64	S10	WBT	BFW10	S5	FET
BFQ13	S5	FET	BFR65	S10	WBT	BFW11	S5	FET
BFQ14	S5	FET	BFR84	S5	FET	BFW12	S5	FET
BFQ15	S5	FET	BFR90	S10	WBT	BFW13	S5	FET
BFQ16	S5	FET	BFR90A	S10	WBT	BFW16A	S10	WBT
BFQ17	S7/S10	Mm/WBT	BFR91	S10	WBT	BFW17A	S10	WBT
BFQ18A	S7/S10	Mm/WBT	BFR91A	S10	WBT	BFW30	S10	WBT
BFQ19	S7/S10	Mm/WBT	BFR92	S7/S10	Mm/WBT	BFW61	S5	FET
BFQ22S	S10	WBT	BFR92A	S7/S10	Mm/WBT	BFW92	S10	WBT
BFQ23	S10	WBT	BFR92AR	S7	Mm	BFW92A	S10	WBT
BFQ23C	S10	WBT	BFR92R	S7	Mm	BFW93	S10	WBT
BFQ24	S10	WBT	BFR93	S7/S10	Mm/WBT	BFX29	S3	Sm
BFQ32	S10	WBT	BFR93A	S7/S10	Mm/WBT	BFX30	S3	Sm
BFQ32C	S10	WBT	BFR93AR	S7	Mm	BFX34	S3	Sm
BFQ32M	S10	WBT	BFR93R	S7	Mm	BFX84	S3	Sm
BFQ32S	S10	WBT	BFR94	S10	WBT	BFX85	S3	Sm
BFQ33	S10	WBT	BFR95	S10	WBT	BFX86	S3	Sm
BFQ33C	S10	WBT	BFR96	S10	WBT	BFX87	S3	Sm
BFQ34	S10	WBT	BFR96S	S10	WBT	BFX88	S3	Sm

FET = Field-effect transistors
Mm = Microminiature semiconductors
for hybrid circuits
RFP = R.F. power transistors and modules

RT = Tripler
Sm = Small-signal transistors
WBM = Wideband hybrid IC modules
WBT = Wideband transistors

type no.	book	section	type no.	book	section	type no.	book	section
BFX89	S10	WBT	BGY56	S10	WBM	BLT92/SL	S6	RFP
BFY50	S3	Sm	BGY57	S10	WBM	BLU20/12	S6	RFP
BFY51	S3	Sm	BGY58	S10	WBM	BLU30/12	S6	RFP
BFY52	S3	Sm	BGY58A	S10	WBM	BLU45/12	S6	RFP
BFY55	S3	Sm	BGY59	S10	WBM	BLU50	S6	RFP
BFY90	S10	WBT	BGY60	S10	WBM	BLU51	S6	RFP
BG2000	S1	RT	BGY61	S10	WBM	BLU52	S6	RFP
BG2097	S1	RT	BGY65	S10	WBM	BLU53	S6	RFP
BGD102	S10	WBM	BGY67	S10	WBM	BLU60/12	S6	RFP
BGD102E	S10	WBM	BGY67A	S10	WBM	BLU97	S6	RFP
BGD104	S10	WBM	BGY70	S10	WBM	BLU98	S6	RFP
BGD104E	S10	WBM	BGY71	S10	WBM	BLU99	S6	RFP
BGD502	S10	WBM	BGY74	S10	WBM	BLV10	S6	RFP
BGD504	S10	WBM	BGY75	S10	WBM	BLV11	S6	RFP
BGX885	S10	WBM	BGY78	S10	WBM	BLV20	S6	RFP
BGY22	S6	RFP	BGY84	S10	WBM	BLV21	S6	RFP
BGY22A	S6	RFP	BGY84A	S10	WBM	BLV25	S6	RFP
BGY23	S6	RFP	BGY85	S10	WBM	BLV30	S6	RFP
BGY23A	S6	RFP	BGY85A	S10	WBM	BLV30/12	S6	RFP
BGY32	S6	RFP	BGY86	S10	WBM	BLV31	S6	RFP
BGY33	S6	RFP	BGY87	S10	WBM	BLV32F	S6	RFP
BGY35	S6	RFP	BGY88	S10	WBM	BLV33	S6	RFP
BGY36	S6	RFP	BGY90A	S6	RFP	BLV33F	S6	RFP
BGY40A	S6	RFP	BGY90B	S6	RFP	BLV36	S6	RFP
BGY40B	S6	RFP	BGY93 *	S6	RFP	BLV45/12	S6	RFP
BGY41A	S6	RFP	BGY94 *	S6	RFP	BLV57	S6	RFP
BGY41B	S6	RFP	BGY95A	S6	RFP	BLV59	S6	RFP
BGY43	S6	RFP	BGY95B	S6	RFP	BLV75/12	S6	RFP
BGY45A	S6	RFP	BGY96A	S6	RFP	BLV80/28	S6	RFP
BGY45B	S6	RFP	BGY96B	S6	RFP	BLV90	S6	RFP
BGY46A	S6	RFP	BGY584A	S10	WBM	BLV90/SL	S6	RFP
BGY46B	S6	RFP	BGY585A	S10	WBM	BLV91	S6	RFP
BGY47 *	S6	RFP	BGY586	S10	WBM	BLV91/SL	S6	RFP
BGY48 *	S6	RFP	BGY587	S10	WBM	BLV92	S6	RFP
BGY50	S10	WBM	BLF146	S6	RFP/FET	BLV93	S6	RFP
BGY51	S10	WBM	BLF242	S6	RFP/FET	BLV94	S6	RFP
BGY52	S10	WBM	BLF244	S6	RFP/FET	BLV95	S6	RFP
BGY53	S10	WBM	BLF245	S6	RFP/FET	BLV97	S6	RFP
BGY54	S10	WBM	BLT90/SL	S6	RFP	BLV98	S6	RFP
BGY55	S10	WBM	BLT91/SL	S6	RFP	BLV99	S6	RFP

* = series
 FET = Field-effect transistors
 RFP = R.F. power transistors and modules
 WMB = Wideband hybrid IC modules

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type no.	book	section	type no.	book	section	type no.	book	section
BLW29	S6	RFP	BLX92A	S6	RFP	BRY39	S3	Sm
BLW31	S6	RFP	BLX93A	S6	RFP	BRY56	S3	Sm
BLW32	S6	RFP	BLX94A	S6	RFP	BRY61	S7	Mm
BLW33	S6	RFP	BLX94C	S6	RFP	BRY62	S7	Mm
BLW34	S6	RFP	BLX95	S6	RFP	BS107	S5	FET
BLW50F	S6	RFP	BLX96	S6	RFP	BS170	S5	FET
BLW60	S6	RFP	BLX97	S6	RFP	BSD10	S5	FET
BLW60C	S6	RFP	BLX98	S6	RFP	BSD12	S5	FET
BLW76	S6	RFP	BLY87A	S6	RFP	BSD20	S5/7	FET
BLW77	S6	RFP	BLY87C	S6	RFP	BSD22	S5/7	FET
BLW78	S6	RFP	BLY88A	S6	RFP	BSD212	S5	FET
BLW79	S6	RFP	BLY88C	S6	RFP	BSD213	S5	FET
BLW80	S6	RFP	BLY89A	S6	RFP	BSD214	S5	FET
BLW81	S6	RFP	BLY89C	S6	RFP	BSD215	S5	FET
BLW83	S6	RFP	BLY90	S6	RFP	BSR12;R	S7	Mm
BLW84	S6	RFP	BLY91A	S6	RFP	BSR13;R	S7	Mm
BLW85	S6	RFP	BLY91C	S6	RFP	BSR14;R	S7	Mm
BLW86	S6	RFP	BLY92A	S6	RFP	BSR15;R	S7	Mm
BLW87	S6	RFP	BLY92C	S6	RFP	BSR16;R	S7	Mm
BLW89	S6	RFP	BLY93A	S6	RFP	BSR17;R	S7	Mm
BLW90	S6	RFP	BLY93C	S6	RFP	BSR17A;R	S7	Mm
BLW91	S6	RFP	BLY94	S6	RFP	BSR18;R	S7	Mm
BLW95	S6	RFP	BPF24	S8b	PDT	BSR18A;R	S7	Mm
BLW96	S6	RFP	BPW22A	S8a/b	PDT	BSR19; A	S7	Mm
BLW97	S6	RFP	BPW50	S8a/b	PDT	BSR20; A	S7	Mm
BLW98	S6	RFP	BPW71	S8b	PDT	BSR30	S7	Mm
BLW99	S6	RFP	BPX25	S8b	PDT	BSR31	S7	Mm
BLX13	S6	RFP	BPX29	S8b	PDT	BSR32	S7	Mm
BLX13C	S6	RFP	BPX40	S8b	PDT	BSR33	S7	Mm
BLX14	S6	RFP	BPX41	S8b	PDT	BSR40	S7	Mm
BLX15	S6	RFP	BPX42	S8b	PDT	BSR41	S7	Mm
BLX39	S6	RFP	BPX61	S8b	PDT	BSR42	S7	Mm
BLX65	S6	RFP	BPX61P	S8b	PDT	BSR43	S7	Mm
BLX65E	S6	RFP	BPX71	S8b	PDT	BSR50	S3	Sm
BLX65ES	S6	RFP	BPX72	S8b	PDT	BSR51	S3	Sm
BLX67	S6	RFP	BR100/03	S2b	Th	BSR52	S3	Sm
BLX68	S6	RFP	BR101	S3	Sm	BSR56	S7/S5	Mm/FET
BLX69A	S6	RFP	BR210*	S2a	Th	BSR57	S7/S5	Mm/FET
BLX91A	S6	RFP	BR216*	S2a	Th	BSR58	S7/S5	Mm/FET
BLX91CB	S6	RFP	BR220*	S2a	Th	BSR60	S3	Sm

FET = Field-effect transistors

Mm = Microminiature semiconductors
for hybrid circuits

PDT = Photodiodes or transistors

RFP = R.F. power transistors and modules

Sm = Small-signal transistors

Th = Thyristors

type no.	book	section	type no.	book	section	type no.	book	section
BSR61	S3	Sm	BSV17	S3	Sm	BTV59*	S2b	Th
BSR62	S3	Sm	BSV52;R	S7	Mm	BTV59D*	S2b	Th
BSS38	S3	Sm	BSV64	S3	Sm	BTV60*	S2b	Th
BSS50	S3	Sm	BSV78	S5	FET	BTV60D*	S2b	Th
BSS51	S3	Sm	BSV79	S5	FET	BTV70*	S2b	Th
BSS52	S3	Sm	BSV80	S5	FET	BTV70D*	S2b	Th
BSS60	S3	Sm	BSV81	S5	FET	BTW23*	S2b	Th
BSS61	S3	Sm	BSW66A	S3	Sm	BTW38*	S2b	Th
BSS62	S3	Sm	BSW67A	S3	Sm	BTW40*	S2b	Th
BSS63;R	S7	Mm	BSW68A	S3	Sm	BTW42*	S2b	Th
BSS64;R	S7	Mm	BSX19	S3	Sm	BTW43*	S2b	Tri
BSS68	S3	Sm	BSX20	S3	Sm	BTW45*	S2b	Th
BSS83	S5/7	FET/Mm	BSX45	S3	Sm	BTW58*	S2b	Th
BST15	S7	Mm	BSX46	S3	Sm	BTW62*	S2b	Th
BST16	S7	Mm	BSX47	S3	Sm	BTW62D*	S2b	Th
BST39	S7	Mm	BSX59	S3	Sm	BTW63*	S2b	Th
BST40	S7	Mm	BSX60	S3	Sm	BTY79*	S2b	Th
BST50	S7	Mm	BSX61	S3	Sm	BTY91*	S2b	Th
BST51	S7	Mm	BSY95A	S3	Sm	BU426	S4b	SP
BST52	S7	Mm	BT136*	S2b	Tri	BU426A	S4b	SP
BST60	S7	Mm	BT136F*	S2b	Tri	BU433	S4b	SP
BST61	S7	Mm	BT137*	S2b	Tri	BU505	S4b	SP
BST62	S7	Mm	BT137F*	S2b	Tri	BU506	S4b	SP
BST70A	S5	FET	BT138*	S2b	Tri	BU506D	S4b	SP
BST72A	S5	FET	BT138F*	S2b	Tri	BU508A	S4b	SP
BST74A	S5	FET	BT139*	S2b	Tri	BU508D	S4b	SP
BST76A	S5	FET	BT139F*	S2b	Tri	BU705	S4b	SP
BST78	S5	FET	BT145*	S2b	Tri	BU706	S4b	SP
BST80	S5/S7	FET/Mm	BT149*	S2b	Th	BU706D	S4b	SP
BST82	S5/S7	FET/Mm	BT150	S2b	Th	BU806	S4b	SP
BST84	S5/S7	FET/Mm	BT151*	S2b	Th	BU807	S4b	SP
BST86	S5/S7	FET/Mm	BT151F*	S2b	Th	BU808	S4b	SP
BST90	S5	FET	BT152*	S2b	Th	BU824	S4b	SP
BST97	S5	FET	BT153	S2b	Th	BU826	S4b	SP
BST100	S5	FET	BT157*	S2b	Th	BUP22*	S4b	SP
BST110	S5	FET	BT169*	S2b	Th	BUP23*	S4b	SP
BST120	S5/S7	FET/Mm	BTA140*	S2b	Tri	BUS11;A	S4b	SP
BST122	S5/S7	FET/Mm	BTR59*	S2b	Tri	BUS12;A	S4b	SP
BSV15	S3	Sm	BTS59*	S2b	Tri	BUS13;A	S4b	SP
BSV16	S3	Sm	BTV58*	S2b	Th	BUS14;A	S4b	SP

* = series

FET = Field-effect transistors

Mm = Microminiature semiconductors
for hybrid circuits

Sm = Small-signal transistors

SP = Low-frequency switching power transistors

Th = Thyristors

Tri = Triacs

INDEX

type no.	book	section	type no.	book	section	type no.	book	section
BUS21*	S4b	SP	BUZ20	S9	PM	BUZ76A	S9	PM
BUS22*	S4b	SP	BUZ21	S9	PM	BUZ80	S9	PM
BUS23*	S4b	SP	BUZ23	S9	PM	BUZ80A	S9	PM
BUT11;A	S4b	SP	BUZ24	S9	PM	BUZ83	S9	PM
BUT11A	S4b	SP	BUZ25	S9	PM	BUZ83A	S9	PM
BUT11AF	S4b	SP	BUZ30	S9	PM	BUZ84	S9	PM
BUV82	S4b	SP	BUZ31	S9	PM	BUZ84A	S9	PM
BUV83	S4b	SP	BUZ32	S9	PM	BY224*	S2a	R
BUV89	S4b	SP	BUZ33	S9	PM	BY225*	S2a	R
BUV90;A	S4b	SP	BUZ34	S9	PM	BY228	S1	R
BUW11;A	S4b	SP	BUZ35	S9	PM	BY229*	S2a	R
BUW12;A	S4b	SP	BUZ36	S9	PM	BY229F*	S2a	R
BUW13;A	S4b	SP	BUZ40	S9	PM	BY249*	S2a	R
BUW84	S4b	SP	BUZ41A	S9	PM	BY260*	S2a	R
BUW85	S4b	SP	BUZ42	S9	PM	BY261*	S2a	R
BUX46;A	S4b	SP	BUZ43	S9	PM	BY329*	S2a	R
BUX47;A	S4b	SP	BUZ44A	S9	PM	BY359*	S2a	R
BUX48;A	S4b	SP	BUZ45	S9	PM	BY438	S1	R
BUX80	S4b	SP	BUZ45A	S9	PM	BY448	S1	R
BUX81	S4b	SP	BUZ45B	S9	PM	BY458	S1	R
BUX82	S4b	SP	BUZ45C	S9	PM	BY505	S1	R
BUX83	S4b	SP	BUZ46	S9	PM	BY509	S1	R
BUX84	S4b	SP	BUZ50A	S9	PM	BY527	S1	R
BUX84F	S4b	SP	BUZ50B	S9	PM	BY584	S1	R
BUX85	S4b	SP	BUZ53A	S9	PM	BY588	S1	R
BUX85F	S4b	SP	BUZ54	S9	PM	BY609	S1	R
BUX86	S4b	SP	BUZ54A	S9	PM	BY610	S1	R
BUX87	S4b	SP	BUZ60	S9	PM	BY614	S1	R
BUX88	S4b	SP	BUZ60B	S9	PM	BY619	S1	R
BUX90	S4b	SP	BUZ63	S9	PM	BY620	S1	R
BUX98	S4b	SP	BUZ63B	S9	PM	BY627	S1	R
BUX98A	S4b	SP	BUZ64	S9	PM	BY707	S1	R
BUX99	S4b	SP	BUZ71	S9	PM	BY708	S1	R
BUY89	S4b	SP	BUZ71A	S9	PM	BY709	S1	R
BUZ10	S9	PM	BUZ72	S9	PM	BY710	S1	R
BUZ10A	S9	PM	BUZ72A	S9	PM	BY711	S1	R
BUZ11	S9	PM	BUZ73A	S9	PM	BY712	S1	R
BUZ11A	S9	PM	BUZ74	S9	PM	BY713	S1	R
BUZ14	S9	PM	BUZ74A	S9	PM	BY714	S1	R
BUZ15	S9	PM	BUZ76	S9	PM	BYD13 *	S1	R

* = series

PM = Power MOS transistors

R = Rectifier diodes

SP = Low-frequency switching power transistors

type no.	book	section	type no.	book	section	type no.	book	section
BYD14 *	S1	R	BYV42*	S2a	R	BYX56*	S2a	R
BYD17 *	S1	R	BYV43*	S2a	R	BYX90G	S1	R
BYD33 *	S1	R	BYV43F*	S2a	R	BYX96*	S2a	R
BYD37 *	S1	R	BYV44*	S2a	R	BYX97*	S2a	R
BYD73 *	S1	R	BYV60*	S2a	R	BYX98*	S2a	R
BYD74 *	S1	R	BYV72*	S2a	R	BYX99*	S2a	R
BYD77 *	S1	R	BYV73*	S2a	R	BZD23	S1	Vrg
BYM26 *	S1	R	BYV74*	S2a	R	BZD27	S1	Vrg
BYM36 *	S1	R	BYV79*	S2a	R	BZT03	S1	Vrg
BYM56 *	S1	R	BYV92*	S2a	R	BZV10	S1	Vrf
BYP21*	S2a	R	BYV95A	S1	R	BZV11	S1	Vrf
BYP22*	S2a	R	BYV95B	S1	R	BZV12	S1	Vrf
BYP59*	S2a	R	BYV95C	S1	R	BZV13	S1	Vrf
BYQ28*	S2a	R	BYV96D	S1	R	BZV14	S1	Vrf
BYR29*	S2a	R	BYV96E	S1	R	BZV37	S1	Vrf
BYR29F*	S2a	R	BYW25*	S2a	R	BZV46	S1	Vrg
BYT28*	S2a	R	BYW29*	S2a	R	BZV49*	S1/S7	Vrg/Mm
BYT79*	S2a	R	BYW29F*	S2a	R	BZV55*	S7	Mm
BYV10	S1	R	BYW30*	S2a	R	BZV80	S1	Vrf
BYV18*	S2a	R	BYW31*	S2a	R	BZV81	S1	Vrf
BYV19*	S2a	R	BYW54	S1	R	BZV85 *	S1	Vrg
BYV20*	S2a	R	BYW55	S1	R	BZW03 *	S1	Vrg
BYV21*	S2a	R	BYW56	S1	R	BZW14	S1	Vrg
BYV22*	S2a	R	BYW92*	S2a	R	BZW86*	S2a	TS
BYV23*	S2a	R	BYW93*	S2a	R	BZX55 *	S1	Vrg
BYV24*	S2a	R	BYW95A	S1	R	BZX70*	S2a	Vrg
BYV26 *	S1/S2a	R	BYW95B	S1	R	BZX75 *	S1	Vrg
BYV27*	S1/S2a	R	BYW95C	S1	R	BZX79*	S1	Vrg
BYV28*	S1/S2a	R	BYW96D	S1	R	BZX84*	S7/S1	Mm/Vrg
BYV29*	S2a	R	BYW96E	S1	R	BZY91*	S2a	Vrg
BYV29F*	S2a	R	BYX10G	S1	R	BZY93*	S2a	Vrg
BYV30*	S2a	R	BYX25*	S2a	R	CFX13	S11	M
BYV31*	S2a	R	BYX30*	S2a	R	CFX21	S11	M
BYV32*	S2a	R	BYX32*	S2a	R	CFX30	S11	M
BYV32F*	S2a	R	BYX38*	S2a	R	CFX31	S11	M
BYV33*	S2a	R	BYX39*	S2a	R	CFX32	S11	M
BYV33F*	S2a	R	BYX42*	S2a	R	CFX33	S11	M
BYV34*	S2a	R	BYX46*	S2a	R	CNG35	S8b	PhC
BYV36 *	S1	R	BYX50*	S2a	R	CNG36	S8b	PhC
BYV39*	S2a	R	BYX52*	S2a	R	CNR36	S8b	PhC

* = series

M = Microwave transistors

Mm = Microminiature semiconductors
for hybrid circuits

PhC = Photocouplers

R = Rectifier diodes

TS = Transient suppressor diodes

Vrf = Voltage reference diodes

Vrg = Voltage regulator diodes

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type no.	book	section	type no.	book	section	type no.	book	section
CNX21	S8b	PhC	CQS93	S8a	LED	CQW93	S8a	LED
CNX35	S8b	PhC	CQS93E	S8a	LED	CQW95	S8a	LED
CNX35U	S8b	PhC	CQS93L	S8a	LED	CQW97	S8a	LED
CNX36	S8b	PhC	CQS95	S8a	LED	CQX24(L)	S8a	LED
CNX36U	S8b	PhC	CQS95E	S8a	LED	CQX51(L)	S8a	LED
CNX38	S8b	PhC	CQS95L	S8a	LED	CQX54(L)	S8a	LED
CNX38U	S8b	PhC	CQS97	S8a	LED	CQX54D	S8a	LED
CNX39	S8b	PhC	CQS97E	S8a	LED	CQX64(L)	S8a	LED
CNX39U	S8b	PhC	CQS97L	S8a	LED	CQX64D	S8a	LED
CNX44	S8b	PhC	CQT10B	S8a	LED	CQX74(L)	S8a	LED
CNX44A	S8b	PhC	CQT24	S8a	LED	CQX74D	S8a	LED
CNX46	S8b	PhC	CQT60	S8a	LED	CQY11B	S8b	LED
CNX48	S8b	PhC	CQT70	S8a	LED	CQY11C	S8b	LED
CNX48U	S8b	PhC	CQT80L	S8a	LED	CQY24B(L)	S8a	LED
CNX62	S8b	PhC	CQV70(L)	S8a	LED	CQY49B	S8b	LED
CNX72	S8b	PhC	CQV70A(L)	S8a	LED	CQY49C	S8b	LED
CNX82	S8b	PhC	CQV70U(L)	S8a	LED	CQY50	S8b	LED
CNX83	S8b	PhC	CQV71A(L)	S8a	LED	CQY52	S8b	LED
CNX91	S8b	PhC	CQV72(L)	S8a	LED	CQY53S	S8b	LED
CNX92	S8b	PhC	CQV80L	S8a	LED	CQY54A	S8a	LED
CNY17-1	S8b	PhC	CQV80AL	S8a	LED	CQY58A	S8a/b	I
CNY17-2	S8b	PhC	CQV80UL	S8a	LED	CQY89A	S8a/b	I
CNY17-3	S8b	PhC	CQV81L	S8a	LED	CQY94B(L)	S8a	LED
CNY50	S8b	PhC	CQV82L	S8a	LED	CQY95B	S8a	LED
CNY57	S8b	PhC	CQW10A(L)	S8a	LED	CQY96(L)	S8a	LED
CNY57A	S8b	PhC	CQW10B(L)	S8a	LED	CQY97A	S8a	LED
CNY57AU	S8b	PhC	CQW10U(L)	S8a	LED	Fresnel-	S8b	A
CNY57U	S8b	PhC	CQW11B(L)	S8a	LED	lens		
CNY62	S8b	PhC	CQW12B(L)	S8a	LED	H11A1	S8b	PhC
CNY63	S8b	PhC	CQW20A	S8a	LED	H11A2	S8b	PhC
CQF24	S8b	Ph	CQW21	S8a	LED	H11A3	S8b	PhC
CQL10A	S8b	Ph	CQW22	S8a	LED	H11A4	S8b	PhC
CQL13A	S8b	Ph	CQW24(L)	S8a	LED	H11A5	S8b	PhC
CQL16	S8b	Ph	CQW54	S8a	LED	H11B1	S8b	PhC
CQS51L	S8a	LED	CQW60(L)	S8a	LED	H11B2	S8b	PhC
CQS54	S8a	LED	CQW60A(L)	S8a	LED	H11B3	S8b	PhC
CQS82L	S8a	LED	CQW60U(L)	S8a	LED	H11B255	S8b	PhC
CQS82AL	S8a	LED	CQW61(L)	S8a	LED	KMZ10A	S13	SEN
CQS84L	S8a	LED	CQW62(L)	S8a	LED	KMZ10B	S13	SEN
CQS86L	S8a	LED	CQW89A	S8a/b	I	KMZ10C	S13	SEN

* = series

A = Accessories

I = Infrared devices

LED = Light-emitting diodes

M = Microwave transistors

Ph = Photoconductive devices

PhC = Photocouplers

SEN = Sensors

type no.	book	section	type no.	book	section	type no.	book	section
KP100A	S13	SEN	LV2327E40R	S11	M	OM386B	S13	SEN
KP101A	S13	SEN	LV3742E16R	S11	M	OM386M	S13	SEN
KPZ20G	S13	SEN	LV3742E24R	S11	M	OM387B	S13	SEN
KPZ21G	S13	SEN	LWE2015R	S11	M	OM387M	S13	SEN
KTY81*	S13	SEN	LWE2025R	S11	M	OM388B	S13	SEN
KTY83*	S13	SEN	LZ1418E100RS11		M	OM389B	S13	SEN
KTY84*	S13	SEN	MCA230	S8b	PhC	OM931	S4a	P
LAE2001R	S11	M	MCA231	S8b	PhC	OM961	S4a	P
LAE4001Q	S11	M	MCA255	S8b	PhC	OSB9115	S2a	St
LAE4001R	S11	M	MCT2	S8b	PhC	OSB9215	S2a	St
LAE4002S	S11	M	MCT26	S8b	PhC	OSB9415	S2a	St
LAE6000Q	S11	M	MKB12040WS	S11	M	OSM9115	S2a	St
LBE1004R	S11	M	MKB12100WS	S11	M	OSM9215	S2a	St
LBE1010R	S11	M	MKB12140W	S11	M	OSM9415	S2a	St
LBE2003S	S11	M	MO6075B200ZS11		M	OSM9510	S2a	St
LBE2005Q	S11	M	MO6075B400ZS11		M	OSM9511	S2a	St
LBE2008T	S11	M	MRB12175YR	S11	M	OSM9512	S2a	St
LBE2009S	S11	M	MRB12350YR	S11	M	OSS9115	S2a	St
LCE1010R	S11	M	MS1011B700YS11		M	OSS9215	S2a	St
LCE2003S	S11	M	MS6075B800ZS11		M	OSS9415	S2a	St
LCE2005Q	S11	M	MSB12900Y	S11	M	P2105	S8b	I
LCE2008T	S11	M	MZ0912B75Y	S11	M	PBMF4391	S5	FET
LCE2009S	S11	M	MZ0912B150YS11		M	PBMF4392	S5	FET
IJE42002T	S11	M	OM286; M	S13	SEN	PBMF4393	S5	FET
LKE1004R	S11	M	OM287; M	S13	SEN	PDE1001U	S11	M
LKE2002T	S11	M	OM320	S10	WBM	PDE1003U	S11	M
LKE2004T	S11	M	OM321	S10	WBM	PDE1005U	S11	M
LKE2015T	S11	M	OM322	S10	WBM	PDE1010U	S11	M
LKE21004R	S11	M	OM323	S10	WBM	PEE1001U	S11	M
LKE21015T	S11	M	OM323A	S10	WBM	PEE1003U	S11	M
LKE21050T	S11	M	OM335	S10	WBM	PEE1005U	S11	M
LKE27010R	S11	M	OM336	S10	WBM	PEE1010U	S11	M
LKE27025R	S11	M	OM337	S10	WBM	PH2222;R	S3	Sm
LKE32002T	S11	M	OM337A	S10	WBM	PH2222A;R	S3	Sm
LKE32004T	S11	M	OM339	S10	WBM	PH2369	S3	Sm
LTE42005S	S11	M	OM345	S10	WBM	PH2907;R	S3	Sm
LTE42008R	S11	M	OM350	S10	WBM	PH2907A;R	S3	Sm
LTE42012R	S11	M	OM360	S10	WBM	PH2955T	S4a	P
LV1721E50R	S11	M	OM361	S10	WBM	PH3055T	S4a	P
LV2024E45R	S11	M	OM370	S10	WBM	PH5415	S3	Sm

FET = Field-effect transistors
 I = Infrared devices
 M = Microwave transistors
 Mm = Microminiature semiconductors
 for hybrid circuits
 P = Low-frequency power transistors
 PhC = Photocouplers

R = Rectifier diodes
 SD = Small-signal diodes
 SEN = Sensors
 Sm = Small-signal transistors
 SP = Low-frequency switching power transistors
 St = Rectifier stacks
 WBM = Wideband hybrid IC modules

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type no.	book	section	type no.	book	section	type no.	book	section
PH5416	S3	Sm	PTB42003X	S11	M	SL5505S	S8b	PhC
PH13002	S4b	SP	PV3742B4X	S11	M	SL5511	S8b	PhC
PH13003	S4b	SP	PVB42004X	S11	M	TIP29*	S4a	P
PHSD51	S2a	R	PZ1418B15U	S11	M	TIP30*	S4a	P
PKB3001U	S11	M	PZ1418B30U	S11	M	TIP31*	S4a	P
PKB3003U	S11	M	PZ1721B12U	S11	M	TIP32*	S4a	P
PKB3005U	S11	M	PZ1721B25U	S11	M	TIP33*	S4a	P
PKB12005U	S11	M	PZ2024B10U	S11	M	TIP34*	S4a	P
PKB20010U	S11	M	PZ2024B20U	S11	M	TIP41*	S4a	P
PKB23001U	S11	M	PZB16035U	S11	M	TIP42*	S4a	P
PKB23003U	S11	M	PZB27020U	S11	M	TIP47	S4a	P
PKB23005U	S11	M	RPY97	S8b	I	TIP48	S4a	P
PKB25006T	S11	M	RPY100	S8b	I	TIP49	S4a	P
PKB32001U	S11	M	RPY101	S8b	I	TIP50	S4a	P
PKB32003U	S11	M	RPY102	S8b	I	TIP110	S4a	P
PKB32005U	S11	M	RPY103	S8b	I	TIP111	S4a	P
PMBF4391	S7	Mm	RPY107	S8b	I	TIP112	S4a	P
PMBF4392	S7	Mm	RPY109	S8b	I	TIP115	S4a	P
PMBF4392	S7	Mm	RV3135B5X	S11	M	TIP116	S4a	P
PMLL4148	S1	SD	RX1214B300YS11	M		TIP117	S4a	P
PMLL4150	S1	SD	RXB12350Y	S11	M	TIP120	S4a	P
PMLL4151	S1	SD	RZ1214B35Y	S11	M	TIP121	S4a	P
PMLL4153	S1	SD	RZ1214B60W	S11	M	TIP122	S4a	P
PMLL4446	S1	SD	RZ1214B65Y	S11	M	TIP125	S4a	P
PMLL4448	S1	SD	RZ1214B125WS11	M		TIP126	S4a	P
PMLL5225B			RZ1214B125YS11	M		TIP127	S4a	P
to	S1	SD	RZ1214B150YS11	M		TIP130	S4a	P
PMLL5267B			RZ2833B45W	S11	M	TIP131	S4a	P
PO44	S8b	PhC	RZ3135B15U	S11	M	TIP132	S4a	P
PO44A	S8b	PhC	RZ3135B15W	S11	M	TIP135	S4a	P
PPC5001T	S11	M	RZ3135B25U	S11	M	TIP136	S4a	P
PQC5001T	S11	M	RZ3135B30W	S11	M	TIP137	S4a	P
PTB23001X	S11	M	RZB12100Y	S11	M	TIP140	S4a	P
PTB23003X	S11	M	RZB12350Y	S11	M	TIP141	S4a	P
PTB23005X	S11	M	RZZ1214B300YS11	M		TIP145	S4a	P
PTB32001X	S11	M	SL5500	S8b	PhC	TIP146	S4a	P
PTB32003X	S11	M	SL5501	S8b	PhC	TIP147	S4a	P
PTB32005X	S11	M	SL5502R	S8b	PhC	TIP2955	S4a	P
PTB42001X	S11	M	SL5504	S8b	PhC	TIP3055	S4a	P
PTB42002X	S11	M	SL5504S	S8b	PhC	1N821;A	S1	Vr.f

* = series

I = Infrared devices

M = Microwave transistors

P = Low-frequency power transistors

PhC = Photocouplers

R = Rectifier diodes

SD = Small-signal diodes

Vr.f = Voltage reference diodes

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1N823;A	S1	Vrf	1N5225B			2N3924	S6	RFP
1N825;A	S1	Vrf	to	S1	SD	2N3926	S6	RFP
1N827;A	S1	Vrf	1N5267B			2N3927	S6	RFP
1N829;A	S1	Vrf	2N918	S10	WBT	2N3966	S5	FET
1N914	S1	SD	2N929	S3	Sm	2N4030	S3	Sm
1N916	S1	SD	2N930	S3	Sm	2N4031	S3	Sm
1N3879	S2a	R	2N1613	S3	Sm	2N4032	S3	Sm
1N3880	S2a	R	2N1711	S3	Sm	2N4033	S3	Sm
1N3881	S2a	R	2N1893	S3	Sm	2N4091	S5	FET
1N3882	S2a	R	2N2219	S3	Sm	2N4092	S5	FET
1N3883	S2a	R	2N2219A	S3	Sm	2N4093	S5	FET
1N3889	S2a	R	2N2222	S3	Sm	2N4123	S3	Sm
1N3890	S2a	R	2N2222A	S3	Sm	2N4124	S3	Sm
1N3891	S2a	R	2N2297	S3	Sm	2N4125	S3	Sm
1N3892	S2a	R	2N2368	S3	Sm	2N4126	S3	Sm
1N3893	S2a	R	2N2369	S3	Sm	2N4391	S5	FET
1N3909	S2a	R	2N2369A	S3	Sm	2N4392	S5	FET
1N3910	S2a	R	2N2483	S3	Sm	2N4393	S5	FET
1N3911	S2a	R	2N2484	S3	Sm	2N4427	S6	RFP
1N3912	S2a	R	2N2904	S3	Sm	2N4856	S5	FET
1N3913	S2a	R	2N2904A	S3	Sm	2N4857	S5	FET
1N4001G	S1	R	2N2905	S3	Sm	2N4858	S5	FET
1N4002G	S1	R	2N2905A	S3	Sm	2N4859	S5	FET
1N4003G	S1	R	2N2906	S3	Sm	2N4860	S5	FET
1N4004G	S1	R	2N2906A	S3	Sm	2N4861	S5	FET
1N4005G	S1	R	2N2907	S3	Sm	2N5400	S3	Sm
1N4006G	S1	R	2N2907A	S3	Sm	2N5401	S3	Sm
1N4007G	S1	R	2N3019	S3	Sm	2N5415	S3	Sm
1N4148	S1	SD	2N3020	S3	Sm	2N5416	S3	Sm
1N4150	S1	SD	2N3053	S3	Sm	2N5550	S3	Sm
1N4151	S1	SD	2N3375	S6	RFP	2N5551	S3	Sm
1N4153	S1	SD	2N3553	S6	RFP	2N6659	S5	FET
1N4446	S1	SD	2N3632	S6	RFP	2N6660	S5	FET
1N4448	S1	SD	2N3822	S5	FET	2N6661	S5	FET
1N4531	S1	SD	2N3823	S5	FET	4N25	S8b	PhC
1N4532	S1	SD	2N3866	S6	RFP	4N25A	S8b	PhC
1N5059	S1	R	2N3903	S3	Sm	4N26	S8b	PhC
1N5060	S1	R	2N3904	S3	Sm	4N27	S8b	PhC
1N5061	S1	R	2N3905	S3	Sm	4N28	S8b	PhC
1N5062	S1	R	2N3906	S3	Sm	4N35	S8b	PhC

A = Accessories
 FET = Field-effect transistors
 Ph = Photoconductive devices
 PhC = Photocouplers
 R = Rectifier diodes

RFP = R.F. power transistors and modules
 SD = Small-signal diodes
 Sm = Small-signal transistors
 WBT = Wideband transistors

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A = Accessories

Ph = Photoconductive devices

PhC = Photocouplers

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