DISCRETE SEMICONDUCTORS

DATA HANDBOOK

Wideband Transistors and Wideband Hybrid IC Modules

BOOK SC14 1991

Philips Components

PHILIPS

WIDEBAND TRANSISTORS AND WIDEBAND HYBRID IC MODULES

GENERAL

SELECTION GUIDE

Wideband transistors

Selection guide

FIRST-GENERATION NPN WIDEBAND TRANSISTORS (f_T up to 3.5 GHz)

f_T/I_C CHAR., SEE CHART	ENVELOPE								
	METAL CAN		PLASTIC			SURFACE MOUNT			
	TO-39	TO-72	TO-92	SOT37	SOT48	SOT23	SOT89	SOT143	SOT223
(1)				BFT24		BFT25			
(18)			BF748			BF747			
(2)		BFY90	BF689K BF763	BFW92		BFS17			
(3)				BFW92A		BFS17A		BFG17A	
(4)		BFW30		BFW93		BFR53			
(5)	BFW16A BFW17A				BFR64 BFR65		BFQ17		BFG16A
(6)	BFR95				BFR94				

SECOND-GENERATION WIDEBAND TRANSISTORS (f_T up to 6 GHz)

f_T/I_C CHAR., SEE CHART	POLARITY	ENVELOPE								
		METAL CAN	PLASTIC		CERAMIC		SURFACE MOUNT			
		TO-72	SOT37	SOT103	SOT122	SOT173	SOT23	SOT89	SOT143	SOT223
(7)	npn pnp	BFQ53 BFQ52	BFR90(A) BFQ51	BFG90A BFG51		BFP90A BFQ51C	BFR92(A) BFT92		BFG92A(X)	
(8)	npn	BFQ22S	BFR91(A)	BFG91A		BFP91A	BFR93(A)		BFG93A(X)	BFG94
(9)	pnp	BFQ24	BFQ23	BFG23		BFQ23C	BFT93			
(10)	npn pnp	BFQ63 BFQ32M	BFR96(S) BFQ32(S)	BFG96 BFG32		BFP96 BFQ32C	BFR106	BFQ19 BFQ149		BFG97 BFG31
(11)	npn pnp		BFQ34T BFQ54T	BFG34				BFQ18A		BFG35 BFG55
(11)	npn pnp				BFQ34 BFQ54					
(12)	npn pnp				BFQ68					
(13)	npn pnp				BFQ136					

THIRD-GENERATION NPN WIDEBAND TRANSISTORS (f_T up to 12 GHz)

f_T/I_C CHAR., SEE CHART	ENVELOPE						
	PLASTIC		CERAMIC		SURFACE MOUNT		
	SOT37	SOT103	SOT172	SOT173	SOT23	SOT143	SOT223
(19)					BFT25A	BFG25AX	
(14)	BFQ65	BFG65		BFQ66	BFQ67	BFG67(X)	
(15)		BFG195				BFG197(X)	BFG198
(16)	BFR134	BFG134	BFQ135				BFG135
(17)				BFQ33C		BFG33(X)	
(20)			BFQ270				

Wideband transistors

Selection guide

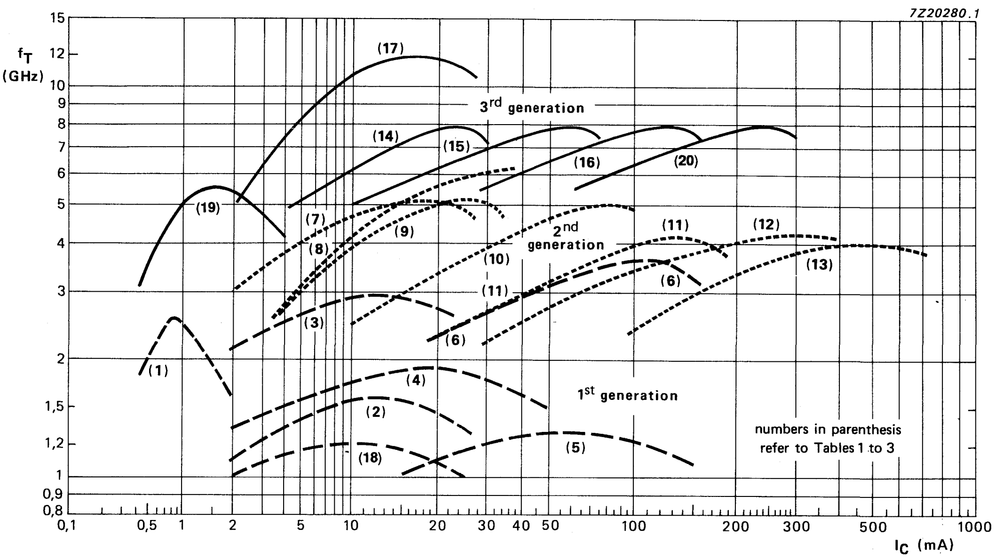


Fig.1 Characteristics for Wideband transistors.

WIDEBAND TRANSISTORS FOR APPLICATION IN CRT VIDEO OUTPUT AMPLIFIERS

APPLICATION	TYPE NUMBERS GROUPED BY ENVELOPE				
	SOT54 (TO-92)	SOT5 (TO-39)	SOT32 (TO-126)	SOT128 (TO-202)	SOT172
NPN Cascode driver	BFQ161	BFQ163	BFQ162		
NPN low current cascode output (I_{CM} = 300 mA)			BFQ232 BFQ232A	BFQ235 BFQ235A	BFQ234
NPN high current cascode output (I_{CM} = 400 mA)		BFQ263 (note 1) BFQ263A (note 1)	BFQ262 BFQ262A	BFQ265 BFQ265A	BFQ268
NPN buffer	BFQ231 BFQ231A	BFQ233 BFQ233A	BFQ232 BFQ232A	BFQ235 BFQ235A	BFQ234 (note 1)
PNP buffer	BFQ251 BFQ251A	BFQ253 BFQ253A	BFQ252 BFQ252A	BFQ255 BFQ255A	BFQ254 (note 1)

Note

1. Available, but not recommended for this socket position.

Standard versions: $-BV_{CBO}$ = 100 V; $-BV_{CEO}$ = 65 V; $-BV_{CER}$ = 100 V.
'A' versions: $-BV_{CBO}$ = 115 V; $-BV_{CEO}$ = 95 V; $-BV_{CER}$ = 115 V.

CATV AMPLIFIER MODULES

type number	frequency range MHz	power gain (dB) at f = 50 MHz	application	page
BGY61		12.5 to 13.5		883
BGY65	5 to 200	18.0 to 19.0	reverse amplifier	887
BGY67		21.5 to 22.5		891
BGY67A		23.5 to 24.5		895
BGY59	40 to 300	37.5 to 39.5	line extender	875
BGY60	40 to 300	32.5 to 34.5	interstage amp post amplifier	879
BGD102	40 to 450	18.0 to 19	power doubler	843
BGD104	40 to 450	19.5 to 20.5	amplifiers	843
BGD102E	40 to 450	18.0 to 19.0	power doubler	845
BGD104E	40 to 450	19.5 to 20.5	amplifiers	845
BGD106	40 to 450	21.5 to 22.5	power doubler	847
BGD108	40 to 450	35 to 37	power doubler	849
BGE85A	40 to 450	17.6 to 19.2	output amplifier	859
BGE88	40 to 450	33 to 36	amplifier	863
BGY80	40 to 450	12.1 to 12.9	preamplifier	899
BGY81			post amplifier	899
BGY82	40 to 450	13.5 to 14.5	amplifier	903
BGY83			amplifier	903
BGY84	40 to 450	16.5 to 17.5	preamplifier	905
BGY85			post amplifier	905
BGY84A	40 to 450	18 to 18.8	preamplifier	909
BGY85A			post amplifier	909
BGY84H	40 to 450	14.6 to 16.2	trunk amplifier	913
BGY85H			trunk amplifier	913
BGY85H/01	40 to 450	14.8 to 16.4	trunk amplifier	917

Notes

1. Specifications also supplied for 450 MHz bandwidth operation.
2. Power gain measured at f = 470 MHz.

CATV AMPLIFIER MODULES (continued)

type number	frequency range MHz	power gain (dB) at f = 50 MHz	application	page
BGY86	40 to 450	21.5 to 22.5	preamplifier	921
BGY87			post amplifier	921
BGY87B	40 to 450	26.2 to 27.8	amplifier	925
BGY88	40 to 450	33.5 to 35.5	line extender	927
BGY89	40 to 450	37 to 39	line extender	931
BGY580	40 to 550	12 to 13	preamplifier	935
BGY581			post amplifier	935
BGY582	50 to 550	13.5 to 14.5	amplifier	939
BGY583			amplifier	939
BGY584 (note 1)	40 to 550	16.5 to 17.5	preamplifier	943
BGY585 (note 1)			post amplifier	943
BGY584A (note 1)	40 to 550	17.7 to 18.7	preamplifier	947
BGY585A (note 1)			post amplifier	947
BGY586	40 to 550	21.5 to 22.5	preamplifier	951
BGY587			post amplifier	951
BGY587B	40 to 550	26.2 to 27.8	amplifier	955
BGD502 (note 1)	40 to 550	18 to 19	power doubler	851
BGD504 (note 1)		19.5 to 20.5	power doubler	851
BGD506	40 to 550	21.5 to 22.5	power doubler	855
BGD508	40 to 550	35 to 37	power doubler	857
BGE885	40 to 860	16.5 to 17.5	amplifier	867
BGE887 (note 2)	470 to 860	22 to 24	amplifier	869
BGX885	40 to 860	16.5 to 17.5	40 to 860 MHz amp	871

Notes

1. Specifications also supplied for 450 MHz bandwidth operation.
2. Power gain measured at f = 470 MHz.

Hybrid ICs for wideband amplifiers

12 V supply voltage; 'Low noise'

	type	stage	gain (dB)	$V_{o(RMS)}$ (dBμV) −60 dB IMD (note 1) min. values	noise figure (dB)	max. VSWR typ. values (note 2) input	output	supply current (mA)	page
low output	OM2045	1	12	99	3.6	2.0	1.4	11.5	1041
	OM2050	2	18	100	5.2	1.5	1.9	18	1047
medium output	OM2060	3	23	107	5.4	1.4	1.6	56	1053
	OM2061	3	28	107	4.4	1.5	1.7	51	1059
	OM2062	3	28	105	4.4	1.3	1.4	50	(note 3)
	OM2063	3	29	105	3.6	2.2	1.5	52	(note 3)
high output	OM2070	3	28	112	4.8	2.3	1.9	100	1065

12 V supply voltage

	type	stage	gain (dB)	$V_{o(RMS)}$ (dBμV)	noise figure (dB)	VSWR input	VSWR output	supply current (mA)	page
low	OM345	1	12	97	5.5	2.0	1.4	11.5	1011
medium	OM350	2	18	98	6.0	1.5	1.9	18	1017
medium output	OM360	3	23	105	7.0	1.3	1.5	55	1023
	OM361	3	28	105	6.0	1.5	1.7	50	1029
high output	OM370	3	28	111	7.0	2.3	1.9	105	1035

24 V supply voltage

	type	stage	gain (dB)	$V_{o(RMS)}$ (dBμV)	noise figure (dB)	VSWR input	VSWR output	supply current (mA)	page
low output	OM320	2	15.5	92	5.5	2.2	2.5	33	965
	OM321	2	15.5	98	6.0	2.5	2.0	33	971
	OM335	3	27	98	5.5	1.9	3.2	35	989
medium output	OM322	2	15	103	7.0	1.7	1.7	60	977
	OM336	3	22	105	7.0	1.4	1.6	65	995
	OM339	3	28	105	6.0	1.5	1.5	66	1007
high output	OM323*	2	15	112	9.0	1.9	2.3	100	983
	OM337*	3	26	113	9.8	2.3	1.8	115	999

* 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.
3. In development.

TYPE NUMBER SURVEY
(alphanumeric)

TYPE NUMBER SURVEY

Wideband transistors

TYPE NUMBER	NPN OR PNP	XTAL NAME	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)	PL_1** (dBm)	ITO** (dBm)	@ I_C (mA)	& V_{CE} (V)	page
BF689K	n	BFW92	TO-92	15	25	360	1.8	3.0	200	16	200	-	-	-	-	-	87
BF747	n	BF747	SOT23	20	50	150	1.2	4.2	100	20	100	-	-	-	-	-	89
BF763	n	BFW92	TO-92	15	25	500	1.8	5.0	800	-	-	-	-	-	-	-	101
BFG16A	n	BFW16A	SOT223	25	150	1000	1.5	-	-	10	500	-	-	-	-	-	103
BFG17A	n	BFW92A	SOT143	15	50	300	2.8	2.5	800	15	800	-	-	-	-	-	111
BFG23	p	BFT93	SOT103	12	35	180	5.0	3.7	800	14.5	800	400	16	35	30	8	119
BFG25A/XΔ	n	BFT25A	SOT143	5	6.5	35	5.0	1.6	1000	18	1000	-	-	-	-	-	125
BFG31	p	BFQ32	SOT223	15	100	1000	5.0	-	-	12	800	600	-	-	70	10	129
BFG32	p	BFQ32	SOT103	15	75	700	4.5	4.3	800	13.5	800	500	18	37	70	10	135
BFG33(/X)	n	BFQ33	SOT143	7	20	300	12	2.5	2000	10.5	2000	-	-	-	-	-	141
BFG34	n	BFQ34	SOT103	18	150	1000	3.7	2.3	800	14.5	800	750	22	41	90	10	143
BFG35	n	BFQ34	SOT223	18	150	1000	4.0	-	-	11	800	750	-	-	100	10	149
BFG51	p	BFT92	SOT103	15	25	180	5.0	3.4	800	16.5	800	150	7	26	14	10	161
BFG55	p	BFQ54	SOT223	18	150	1000	4.0	-	-	11	800	750	-	-	100	10	169
BFG65	n	BFQ65	SOT103	10	50	300	8.0	2.5	2000	10.5	2000	-	-	-	-	-	175
BFG67(/X)	n	BFQ65	SOT143	10	50	300	8.0	2.5	2000	10	2000	-	-	-	-	-	183
BFG90A	n	BFR90A	SOT103	15	25	180	5.0	2.4	800	19	800	150	8	27	14	10	187
BFG91A	n	BFR91A	SOT103	12	35	300	6.0	2.0	800	17.5	800	425	17	36	30	8	197
BFG92A(/X)	n	BFR90A	SOT143	15	25	300	5.0	1.8	800	9.5	2000	-	-	-	-	-	207
BFG93A(/X)	n	BFR91A	SOT143	12	35	300	6.0	1.6	800	9	2000	-	-	-	-	-	213
BFG94	n	BFR91A	SOT223	12	60	700	4.0	3.0	1000	13.5	1000	500	21.5	34	45	10	219
BFG96	n	BFR96	SOT103	15	75	700	5.0	4.0	800	15	800	700	21	40	70	10	231
BFG97	n	BFR96	SOT223	15	100	1000	5.5	2.0	500	12	800	700	-	-	70	10	241
BFG134	n	BFR134	SOT103	15	150	1000	7.0	-	-	14.5	800	900	-	-	100	10	251
BFG135	n	BFR134	SOT223	15	150	1000	7.0	-	-	12	800	900	-	-	100	10	261
BFG195	n	BFQ195	SOT103	10	100	500	7.5	1.4	800	11	2000	-	-	-	-	-	273
BFG197(/X)	n	BFQ195	SOT143	10	100	300	7.5	1.4	800	11	2000	-	-	-	-	-	277
BFG198	n	BFQ195	SOT223	10	100	1000	8.0	1.5	800	15	800	700	-	-	50	8	287
BFP90A	n	BFR90A	SOT173(X)	15	30	250	5.0	2.4	800	19.5	800	150	80	27	14	10	297
BFP91A	n	BFR91A	SOT173(X)	12	50	350	6.0	2.3	800	18.5	800	425	17	36	30	8	307

Notes

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

** Typical reference values.

Δ In development.

TYPE NUMBER	NPN OR PNP	XTAL NAME	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)	PL_1** (dBm)	ITO** (dBm)	@ I_C (mA)	& V_{CE} (V)	page
BFP96	n	BFR96	SOT173(X)	15	100	500	5.0	2.5	800	15	800	700	21	40	70	10	313
BFQ17	n	BFW16A	SOT89	25	150	1000	1.2	-	-	6.5	800	-	-	-	-	-	319
BFQ18A	n	BFQ34	SOT89	15	150	1000	3.6	-	-	-	-	700	21	40	80	10	325
BFQ19	n	BFR96	SOT89	15	75	500	5.0	-	-	7.5	800	500	18	37	50	10	329
BFQ22S	n	BFR91A	TO-72	12	35	150	5.0	1.9	500	16	500	300	14	33	30	5	335
BFQ23	p	BFT93	SOT37	12	35	180	5.0	2.4	500	16.5	500	300	14	33	30	5	339
BFQ23C	p	BFT93	SOT173(X)	12	50	350	5.0	3.7	800	15	800	400	16	35	30	8	347
BFQ24	p	BFT93	TO-72	12	35	150	5.0	2.4	500	15	500	300	14	33	30	5	353
BFQ32	p	BFQ32	SOT37	15	75	500	4.2	3.8	500	14	500	500	18	37	50	10	357
BFQ32C	p	BFQ32	SOT173(X)	15	100	500	4.5	4.3	800	13	800	500	19	38	70	10	361
BFQ32M	p	BFQ32	TO-72	15	75	250	4.5	2.3	500	11	500	-	-	-	-	-	369
BFQ32S	p	BFQ32	SOT37	15	100	700	4.5	4.3	800	10	800	600	20	39	70	10	373
BFQ33	n	BFQ33	SOT100	7	20	140	12.0	2.5	2000	13	2000	-	-	-	-		381
BFQ33C	n	BFQ33	SOT173(X)	7	20	140	12.0	3.0	2000	13.3	2000	-	-	-	-	-	387
BFQ34	n	BFQ34	SOT122	18	150	2250	3.9	8.0	500	16.3	500	1200	26	45	120	15	393
BFQ34T	n	BFQ34	SOT37	18	150	1000	3.7	-	-	19.5	300	1000	24	432	100	10	403
BFQ51	p	BFT92	SOT37	15	25	180	5.0	2.4	800	18	500	150	7	26	14	10	413
BFQ51C	p	BFT92	SOT173(X)	15	30	250	5.0	2.5	800	16.5	800	150	8	27	14	10	421
BFQ52	p	BFT92	TO-72	15	25	150	5.0	2.7	500	17	500	150	7	26	14	10	429
BFQ53	n	BFR90A	TO-72	15	25	150	5.0	2.4	500	18	500	150	7	26	14	10	433
BFQ54	p	BFQ54	SOT122	18	150	2250	4.5	-	-	16	500	-	-	-	-	-	437
BFQ54T	p	BFQ54	SOT37	18	150	1000	4.5	-	-	18	300	-	-	-	-	-	441
BFQ63	n	BFR96	TO-72	15	75	250	4.5	2.3	500	11.5	500	500	18	37	50	10	445
BFQ65	n	BFQ65	SOT37	10	50	300	8.0	2.5	2000	8	2000	-	-	-	-	-	449
BFQ66	n	BFQ65	SOT173(X)	10	50	350	8.0	2.5	2000	11.5	2000	-	-	-	-	-	453
BFQ67	n	BFQ65	SOT23	10	50	180	8.0	2.5	2000	8	2000	-	-	-	-	-	459
BFQ68	n	BFQ68	SOT122	18	300	4500	4.0	-	-	13	800	1600	28	47	240	15	463
BFQ135	n	BFR134	SOT172A2	19	150	2700	6.5	-	-	13.5	800	1200	-	-	120	18	473
BFQ136	n	BFQ136	SOT122	18	600	9000	4.0	-	-	12.5	800	2500	33	52	500	15	479
BFQ149	p	BFQ32	SOT89	15	75	1000	3.6	3.75	500	12	500	-	-	-	-	-	487
BFQ270	n	BFQ270	SOT172	19	500	1000	6.0	-	-	10	800	1600	-	-	240	18	555
BFR49	n	BFR90A	SOT100	15	25	180	5.0	2.5	1000	17	1000	-	-	-	-	-	559
BFR53	n	BFW30	SOT23	10	100	300	2.0	5.0	500	10.5	800	100	5	24	30	5	565
BFR64	n	BFW16A	SOT48	25	200	3500	1.0	6.0	200	-	-	-	-	-	-	-	573
BFR65	n	BFW17A	SOT48	25	400	5000	1.2	-	-	-	-	-	-	-	-	-	581

Notes

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

** Typical reference values.

Δ In development.

Wideband transistors and wideband hybrid IC modules

Type number survey

TYPE NUMBER	NPN OR PNP	XTAL NAME	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)	PL_1** (dBm)	ITO** (dBm)	@ I_C (mA)	& V_{CE} (V)	page
BFR90	n	BFR90	SOT37	15	25	180	5.0	2.4	500	19.5	500	150	7	26	14	10	589
BFR90A	n	BFR90A	SOT37	15	25	180	5.0	1.8	800	15.5	800	150	80	27	14	10	597
BFR91	n	BFR91	SOT37	12	35	180	5.0	1.9	500	18	500	300	14	33	30	5	611
BFR91A	n	BFR91A	SOT37	12	35	300	6.0	1.6	800	14	800	425	17	36	30	8	619
BFR92	n	BFR90	SOT23	15	25	300	5.0	2.4	500	18	500	150	7	25	14	10	631
BFR92A	n	BFR90A	SOT23	15	25	300	5.0	1.8	800	15.5	800	150	8	27	14	10	639
BFR93	n	BFR91	SOT23	12	35	300	5.0	1.9	500	16.5	500	300	14	33	30	5	651
BFR93A	n	BFR91A	SOT23	12	35	300	5.0	1.6	800	14	800	425	16	35	30	8	659
BFR94	n	BFR94	SOT48	25	150	3500	3.5	5.0	500	13.5	500	700	21	40	90	20	671
BFR95	n	BFR94	TO-39	25	150	1500	3.5	9.0	200	-	-	1000	24	43	80	18	681
BFR96	n	BFR96	SOT37	15	75	500	5.0	3.3	500	15.2	500	500	18	37	50	10	685
BFR96S	n	BFR96S	SOT37	15	100	700	5.0	4.0	800	11.5	800	700	21	40	70	10	693
BFR106	n	BFR96	SOT23	15	100	350	3.3	3.5	800	11	800	-	-	-	-	-	705
BFR134	n	BFR134	SOT37	15	150	1000	7.0	-	-	11.5	800	850	-	-	-	-	711
BFS17	n	BPS17	SOT23	15	25	250	1.3	4.5	500	-	-	-	-	-	-	-	721
BFS17A	n	BFW92A	SOT23	15	25	300	2.8	2.5	800	13.5	800	150	7	26	14	10	727
BFT24	n	BFT24	SOT37	5	2.5	30	2.3	3.8	500	17	500	-	-	-	-	-	733
BFT25	n	BFT24	SOT23	5	6.5	50	2.3	3.8	500	18	500	-	-	-	-	-	741
BFT25A Δ	n	BFT25A	SOT23	5	6.5	35	5.0	1.6	1000	15	1000	-	-	-	-	-	749
BFT92	p	BFT92	SOT23	15	25	200	5.0	2.7	500	18	500	150	7	26	14	10	751
BFT93	p	BFT93	SOT23	12	35	200	5.0	2.4	500	16.5	500	300	14	33	30	5	757
BFW16A	n	BFW16A	TO-39	25	150	1500	1.2	6.0	200	-	-	-	-	-	-	-	763
BFW17A	n	BFW16A	TO-39	25	150	1500	1.1	-	-	-	-	-	-	-	-	-	773
BFW30	n	BFW30	TO-72	10	50	250	1.6	5.0	500	-	-	100	5	24	30	6	781
BFW92	n	BFW92	SOT37	15	25	190	1.6	4.0	500	-	-	-	-	-	-	-	787
BFW92A	n	BFW92A	SOT37	15	25	200	2.8	2.5	800	13	800	150	7	26	14	10	795
BFW93	n	BFW30	SOT37	10	50	190	1.7	<5.0	500	10.5	800	100	5	24	30	5	799
BFX89	n	BFY90	TO-72	15	25	200	1.2	3.3	200	-	-	-	-	-	-	-	807
BFY90	n	BFY90	TO-72	15	25	200	1.4	2.5	200	-	-	-	-	-	-	-	819
2N918	n	BFY90	TO-72	15	50	200	<0.9	<0.6	60	36	200	-	-	-	-	-	835

Notes

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

** Typical reference values.

Δ In development.

Wideband transistors and wideband hybrid IC modules

Type number survey

TYPE NUMBER SURVEY

Wideband transistors for video output amplifiers.

	PARAMETER							APPLICATION			
	$V_{(BR)CBO}$ (V) max.	$V_{(BR)CEO}$ (V) max.	I_C (mA) max.	h_{FE} min.	C_{cb} (pF) max.	T_j (°C)	f_T (MHz) min.	NPN DRIVER	NPN LOW CURRENT O/P OR BUFFER	PNP BUFFER	NPN HIGH CURRENT O/P
SOT32/TO-126	20	10	500	25	4.2	175	1000	BFQ162			
ECB	100	65	300	20	2.0	175	1000		BFQ232		
	115	95	300	20	2.0	175	800		BFQ232A		
	100	65	300	20	2.5	175	1000			BFQ252	
	115	95	300	20	2.5	175	800			BFQ252A	
	100	65	400	15	2.0	175	1000				BFQ262
	115	95	400	15	2.0	175	800				BFQ262A
SOT5/TO-39	20	10	500	25	4.5	200	1000	BFQ163			
	100	65	300	20	2.0	200	1000		BFQ233		
	115	95	300	20	2.0	200	800		BFQ233A		
	100	65	300	20	2.5	200	1000			BFQ253	
	115	95	300	20	2.5	200	800			BFQ253A	
	100	65	400	15	2.0	200	1000				BFQ263
	115	95	400	15	2.0	200	800				BFQ263A
SOT172A1	100	65	300	20	2.0	200	1000		BFQ234		
	100	65	300	20	2.5	200	1000			BFQ254	
	100	65	400	15	2.0	200	1000				BFQ268
SOT128/TO-202	100	65	300	20	2.0	175	800		BFQ235		
	115	95	300	20	2.0	175	800		BFQ235A		
	100	65	300	20	2.0	175	800			BFQ255	
	115	95	300	20	2.0	175	800			BFQ255A	
	100	65	400	15	2.5	175	800				BFQ265
	115	95	400	15	2.5	175	800				BFQ265A
SOT54/TO-92	20	10	500	25	4	175	1000	BFQ161			
	100	65	300	20	1.7	175	1000		BFQ231		
	115	95	300	20	1.7	175	800		BFQ231A		
	100	65	300	20	1.7	175	1000			BFQ251	
	115	95	300	20	1.7	175	800			BFQ251A	

CATV AMPLIFIER MODULES

type number	frequency range MHz	power gain at f = 50 MHz dB	slope cable equivalent dB	application	page
BGD102	40 to 450	18.0 to 19.9	0.5 to 2.5	power doubler	843
BGD102E	40 to 450	18.0 to 19	0.5 to 2.0	power doubler	845
BGD104	40 to 450	19.5 to 20.5	0.5 to 2.5	power doubler	843
BGD104E	40 to 450	19.5 to 20.5	0.5 to 2.0	power doubler	845
BGD106	40 to 450	21.5 to 22.5	0 to 2	power doubler	847
BGD108	40 to 450	35 to 37	0.5 to 2	power doubler	849
BGD502	40 to 450	19 to 20	0.2 to 1.8	power doubler	851
BGD504	40 to 450	19.5 to 20.5	0 to 1.65	power doubler	851
BGD506	40 to 550	21.5 to 22.5	0 to 2	power doubler	855
BGD508	40 to 550	35 to 37	0.5 to 2.5	power doubler	857
BGE85A	40 to 450	17.6 to 19.2	0.3 to 1.8	output amplifier	859
BGE88	40 to 450	33 to 36	0.5 to 2.5	amplifier	863
BGE88-01	40 to 450	33 to 36	0.5 to 2.5	amplifier	863
BGE885	40 to 860	16.5 to 17.5	0.2 to 1.4	amplifier	867
BGE887 (note 1)	470 to 860	22 to 24	−0.5 to 0.5	amplifier	869
BGX885	40 to 860	16.5 to 17.5	0.2 to 1.2	amplifier	871
BGY59	40 to 300	37.5 to 39.5	0 to 1.5	line extender	875
BGY60	40 to 300	32.5 to 34.5	0.5 to 1.5	interstage amplifier (2 x 17 dB)	879
BGY61	5 to 200	12.5 to 13.5	−0.2 to 0.5	reverse amplifier	883
BGY65	5 to 200	18.0 to 19.0	−0.2 to 0.5	reverse amplifier	887
BGY67	5 to 200	21.5 to 22.5	−0.2 to 0.5	reverse amplifier	891
BGY67A	5 to 200	23.5 to 24.5	−0.2 to 0.5	reverse amplifier	895
BGY80	40 to 450	12.1 to 12.9	0.2 to 1.5	preamplifier	899
BGY81	40 to 450	12.1 to 12.9	0.2 to 1.5	post amplifier	899
BGY82	40 to 450	13.5 to 14.5	0.2 to 1.5	amplifier	903
BGY83	40 to 450	13.5 to 14.5	0.2 to 1.5	amplifier	903
BGY84	40 to 450	16.5 to 17.5	0.5 to 1.5	preamplifier	905
BGY84A	40 to 450	18.0 to 18.8	0.3 to 1.5	preamplifier	909
BGY84H	40 to 450	14.6 to 16.2		trunk amplifier	913
BGY85	40 to 450	16.5 to 17.5	0.5 to 1.5	post amplifier	905
BGY85A	40 to 450	18 to 18.8	0.3 to 1.5	post amplifier	909
BGY85H	40 to 450	14.6 to 16.2		trunk amplifier	913
BGY85H/01	40 to 450	14.8 to 16.4		trunk amplifier	917
BGY86	40 to 450	21.5 to 22.5	0.2 to 1.5	preamplifier	921
BGY87	40 to 450	21.5 to 22.5	0.2 to 1.5	post amplifier	921
BGY87B	40 to 450	26.2 to 27.8	0.5 to 2.5	amplifier	925
BGY88	40 to 450	33.5 to 35.5	0.5 to 2.5	line extender	927

CATV AMPLIFIER MODULES (continued)

type number	frequency range MHz	power gain at f = 50 MHz dB	slope cable equivalent dB	application	page
BGY89	40 to 450	37 to 39	0 to 2.5	line extender	931
BGY580	40 to 550	12 to 13	0.5 to 2	preamplifier	935
BGY581	40 to 550	12 to 13	0.5 to 2	postamplifier	935
BGY582	50 to 550	13.5 to 14.5	0.2 to 1.5	amplifier	939
BGY583	50 to 550	13.5 to 14.5	0.2 to 1.5	amplifier	939
BGY584	40 to 550	16.5 to 17.5	0.5 to 2	preamplifier	943
BGY584A	40 to 550	17.7 to 18.7	0.5 to 2	preamplifier	947
BGY585	40 to 550	16.5 to 17.5	0.5 to 2	post amplifier	943
BGY585A	40 to 550	17.7 to 18.7	0.5 to 2	post amplifier	947
BGY586	40 to 550	21.5 to 22.5	0.5 to 2	preamplifier	951
BGY587	40 to 550	21.5 to 22.5	0.5 to 2	post amplifier	951
BGY587B	40 to 550	26.2 to 27.8	0.5 to 2.5	amplifier	955
BGY588	40 to 550	33.5 to 35.5	0 to 2.5	line extender	957

Note

1. Power gain measured at f = 470 MHz.

Hybrid wideband amplifiers

type	frequency range MHz	transducer gain dB	output voltage at d_{im} = –60 dB dBμV	supply voltage V	page
OM320	40-860	15.5	⩾92	24	965
OM321	40-860	15.5	⩾98	24	971
OM322	40-860	15	⩾103	24	977
OM323	40-860	15	⩾112	24	983
OM323A	40-860	15	⩾112	24	983
OM335	40-860	27	⩾98	24	989
OM336	40-860	22	⩾105	24	995
OM337	40-860	26	⩾113	24	999
OM337A	40-860	26	⩾113	24	999
OM339	40-860	28	⩾105	24	1007
OM345	40-860	12	⩾97	12	1011
OM350	40-860	18	⩾98	12	1017
OM360	40-860	23	⩾105	12	1023
OM361	40-860	28	⩾105	12	1029
OM370	40-860	28	⩾111	12	1035
OM926*	10-2000	19	⩾103	15	
OM2045	40-860	12	⩾99	12	1041
OM2050	40-860	18	⩾100	12	1047
OM2060	40-860	23	⩾107	12	1053
OM2061	40-860	28	⩾107	12	1059
OM2062*		28	⩾105	12	
OM2063*		28	⩾105	12	
OM2070	40-860	28	⩾112	12	1065

Hybrid video amplifiers

OM325*	Video amplifier for monitors.
OM375*	Buffered video amplifier for monitors.
OM3016*	Video preamplifier >200 MHz for monitors.
OM3026*	Video preamplifier >300 MHz for monitors.

* In development.

Wideband transistors — Marking

Types in SOT23, SOT89, SOT143 and SOT173(X) 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.
A1	BAW56
A2	BAT18
A3	BAT17
A4	BAV70
A5	BRY61
A51	BRY62
A6	BAS16
A61	BAS28
A7	BAV99
A8	BAS19
A81	BAS20
A82	BAS21
A9	
A91	BAS17
AA	BCW60A (SOT23)
AA	BCX51 (SOT89)
AB	BCW60B (SOT23)
AB	BCX51-6 (SOT89)
AC	BCW60C (SOT23)
AC	BCX51-10 (SOT89)
AD	BCX60D (SOT23)
AD	BCX51-16 (SOT89)
AE	BCX52
AF	BCX52-6
AG	BCX70G
AH	BCX70H (SOT23)
AH	BCX53 (SOT89)
AJ	BCX70J (SOT23)
AJ	BCX53-6 (SOT89)
AK	BCX70K (SOT23)
AK	BCX53-10 (SOT89)
AL	BCX53-16
AM	BCX52-16
AR1	BSR40
AR2	BSR41
AR3	BSR42
AR4	BSR43
AS1	BST50
AS2	BST51
AS3	BST52
AT1	BST39
AT2	BST40
B1	
B2	BSV52

MARK	TYPE NO.
B3	
B4	BSV52R
B5	BSR12
B6	
B7	
B8	BSR12R
BA	BCW61A (SOT23)
BA	BCX54 (SOT89)
BB	BCW61B (SOT23)
BB	BCX54-6 (SOT89)
BC	BCW61C (SOT23)
BC	BCX54-10 (SOT89)
BD	BCW61D (SOT23)
BD	BCX54-16 (SOT89)
BE	BCX55
BF	BCX55-6
BG	BCX71G (SOT23)
BG	BCX55-10 (SOT89)
BH	BCX71H (SOT23)
BH	BCX56 (SOT89)
BJ	BCX71J (SOT23)
BJ	BCX56-6 (SOT89)
BK	BCX71K (SOT23)
BK	BCX56-10 (SOT89)
BL	BCX56-16
BM	BCX55-16
BR1	BSR30
BR2	BSR31
BR3	BSR32
BR4	BSR33
BS1	BST60
BS2	BST61
BS3	BST62
BT1	BST15
BT2	BST16
C1	BCW29
C1	BFQ51C (SOT173X)
C2	BCW30
C2	BFQ32C (SOT173X)
C3	
C3	BFQ23C (SOT173X)
C4	BCW29R
C5	BCW30R

MARK	TYPE NO.
C6	
C7	BCF29
C77	BCF29R
C8	BCF30
C9	BCF30R
C91	BCV62
CA	BCX68
CAC	BC868
CE	BCX69
CEC	BC869
D1	BCW31
D2	BCW32
D3	BCW33
D4	BCW31R
D5	BCW32R
D6	BCW33R
D7	BCF32
D77	BCF32R
D8	BCF33
D81	BCF33R
D91	BCV61
DA	BF622
DB	BF623
DC	BF620
DF	BF621
E1	BFS17
E2	BFS17A
E3	
E4	BFS17R
E5	BFS17AR
E6	BFG17A
E7	
E8	
E15	BF747
E16	BF747/01
F1	BFS18
F2	BFS19
F3	BF840
F31	BF841
F4	BFS18R
F5	BFS19R
F6	
F7	
F8	BF824
FA	BFQ17

Wideband transistors

Marking

MARK	TYPE NO.
FB	BFQ19
FD	BFV26
FF	BCV27 (SOT23)
FF	BFQ18A (SOT89)
FG	BFQ149
G1	BFS20
G2	BF550
G3	BF536
G4	BFS20R
G5	BF550R
G6	BF569
G7	BF579
G8	BF660
G81	BF660R
G9	BF767
H1	BCW69
H2	BCW70
H3	BCW89
H31	BCW89R
H4	BCW69R
H5	BCW70R
H6	
H7	BCF70
H71	BCF70R
H8	
H9	
H91	
K1	BCW71
K2	BCW72
K3	BCW81
K31	BCW81R
K4	BCW71R
K5	BCW72R
K6	
K7	BCV71
K71	BCV71R
K8	BCV72
K81	BCV72R
K9	BCF81
K91	BCF81R
KM	BST80
KN	BST84
KO	BST86
L2	
L20	BAS29
L21	BAS31
L22	BAS35
L3	
L30	BAV23

MARK	TYPE NO.
L4	BAT54
L41	BAT74
L5	
L51	BAS56
LM	BST120
LN	BST122
M1	BFR30
M2	BFR32
M3	BFT46
M31	BSD20
M32	BSD22
M4	BSR56
M5	BSR57
M6	BSR58
M61	
M62	PBMF4391
M63	PBMF4392
M64	PBMF4393
M74	BSS83
M8	
M89	BF989
M9	
M90	BF990
M91	BF991
M92	BF992
M94	BF994
M96	BF996
M97	BFR101A
M98	BFR101B
N1	BFR53
N2	
N3	
N4	BFR53R
N5	
O1	
02	BST82
03	
04	
P0	BFP90A
P1	BFP91A (SOT173X)
P1	BFR92
P2	BFR92A
P3	
P4	BFR92R
P5	BFR92AR
P6	
P6	BFP96 (SOT173X)
P7	
P8	BFG92A
P9	

MARK	TYPE NO.
P25	BFG92AR
P26	BFG93AR
Q3	BFQ33C
Q6	BFQ66
R1	BFR93
R2	BFR93A
R3	
R4	BFR93R
R5	BFR93AR
R6	
R7	BFR106
R8	BFG93A
R9	
S1	BBY31
S2	BBY40
S3	
S4	
S5	
S6	BF510
S7	BF511
S8	BF512
S9	BF513
T1	BCX17
T2	BCX18
T3	BSS63
T4	BCX17R
T5	BCX18R
T6	BSS63R
T7	BSR15
T71	BSR15R
T8	BSR16
T81	BSR16R
T9	BSR18
T91	BSR18R
T92	BSR18A
T93	BSR18AR
U1	BCX19
U2	BCX20
U3	BSS64
U4	BCX19R
U5	BCX20R
U6	BSS64R
U7	BSR13
U8	BSR14
U81	BSR14R
U9	BSR17
U91	BSR17R
U92	BSR17A
U93	BSR17AR

MARK	TYPE NO.
V1	BFT25
V2	BFQ67
V3	BFG67
V4	BFT25R
V5	BFG197
V6	BFG33
V7	
V8	
V9	
V10	BFT25A
V11	BFG25AX
V12	BFG67X
V13	BFG197X
V14	BFG92AX
V15	BFG93AX
V16	BFG33X
V25	PMBT3640
V26	BFG67XR
V27	BFG67R
W1	BFT92
W2	
W3	
W4	BFT92R
W5	
W6	
W7	
W8	
W9	
X1	BFT93
X2	
X3	
X4	BFT93R
X5	
X6	
X7	
X8	
X9	
Y1	BZX84-C11
Y2	BZX84-C12
Y3	BZX84-C13
Y4	BZX84-C15
Y5	BZX84-C16
Y6	BZX84-C18
Y7	BZX84-C20
Y8	BZX84-C22
Y9	BZX84-C24
Y10	BZX84-C27
Y11	BZX84-C30
Y12	BZX84-C33
Y13	BZX84-C36

MARK	TYPE NO.
Y14	BZX84-C39
Y15	BZX84-C43
Y16	BZX84-C47
Y17	BZX84-C51
Y18	BZX84-C56
Y19	BZX84-C62
Y20	BZX84-C68
Y21	BZX84-C75
Z1	BZX84-C4V7
Z2	BZX84-C5V1
Z3	BZX84-C5V6
Z4	BZX84-C6V2
Z5	BZX84-C6V8
Z6	BZX84-C7V5
Z7	BZX84-C8V2
Z8	BZX84-C9V1
Z9	BZX84-C10
Z11	BZX84-C2V4
Z12	BZX84-C2V7
Z13	BZX84-C3V0
Z14	BZX84-C3V3
Z15	BZX84-C3V6
Z16	BZX84-C3V9
Z17	BZX84-C4V3
1A	BC846A
1BR	BC846AR
1E	BC847A
1ER	BC847AR
1F	BC847B
1FR	BC847BR
1G	BC847C
1GR	BC847CR
1J	BC848A
1JR	BC848AR
1K	BC848B
1KR	BC848BR
1L	BC848C
1LR	BC848CR
1V	BF820
1W	BF821
1X	BF822
1Y	BF823
2B	BC849B
2BR	BC849BR
2C	BC849C
2CR	BC849CR
2F	BC850B
2FR	BC850BR
2G	BC850C
2GR	BC850CR

MARK	TYPE NO.
2Y4	BZV49-C2V4
2Y7	BZV49-C2V7
3A	BC856A
3AR	BC856AR
3B	BC856B
3BR	BC856BR
3E	BC857A
3ER	BC857AR
3F	BC857B
3FR	BC857BR
3J	BC858A
3JR	BC858AR
3G	BC857C
3GR	BC857CR
3K	BC858B
3KR	BC858BR
3L	BC858C
3LR	BC858CR
3Y0	BZV49-C3V0
3Y3	BZV49-C3V3
3Y6	BZV49-C3V6
3Y9	BZV49-C3V9
4A	BC859A
4AR	BC859AR
4B	BC859B
4BR	BC859BR
4C	BC859C
4CR	BC859CR
4E	BC860A
4ER	BC860AR
4F	BC860B
4FR	BC860BR
4G	BC860C
4GR	BC860CR
4Y3	BZV49-C4V3
4Y7	BZV49-C4V7
5A	BC807-16
5AR	BC807-16R
5B	BC807-25
5BR	BC807-25R
5C	BC807-40
5CR	BC807-40R
5E	BC808-16
5ER	BC808-16R
5F	BV808-25
5FR	BV808-25R
5G	BV808-40
5GR	BV808-40R
5Y1	BZV49-C5V1
5Y6	BZV49-C5V6

Wideband transistors

Marking

MARK	TYPE NO.
6A	BC817-16
6AR	BC817-16R
6B	BC817-25
6BR	BC817-25R
6C	BC817-40
6CR	BC817-40R
6E	BC818-16
6ER	BC818-16R
6F	BC818-25
6FR	BC818-25R
6G	BC818-40
6GR	BC818-40R
6Y2	BZV49-C6V2
6Y8	BZV49-C6V8
7Y5	BZV49-C7V5
8Y2	BZV49-C8V2
9Y1	BZV49-C9V1
10Y	BZV49-C10
11Y	BZV49-C11
12Y	BZV49-C12
13Y	BZV49-C13
15Y	BZV49-C15
16Y	BZV49-C16
18Y	BZV49-C18
20Y	BZV49-C20
22Y	BZV49-C22
24Y	BZV49-C24
27Y	BZV49-C27
30Y	BZV49-C30
33Y	BZV49-C33
36Y	BZV49-C36
39Y	BZV49-C39
43Y	BZV49-C43
47Y	BZV49-C47
51Y	BZV49-C51
56Y	BZV49-C56
62Y	BZV49-C62
68Y	BZV49-C68
75Y	BZV49-C75

GENERAL

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 ($R_{th\ j\text{-}mb} > 15$ K/W)
D. TRANSISTOR; power, audio frequency ($R_{th\ j\text{-}mb} \leqslant 15$ K/W)
E. DIODE; tunnel
F. TRANSISTOR; low power, high frequency ($R_{th\ j\text{-}mb} > 15$ K/W)
G. MULTIPLE OF DISSIMILAR DEVICES – MISCELLANEOUS; e.g. oscillator
H. DIODE; magnetic sensitive
L. TRANSISTOR; power, high frequency ($R_{th\ j\text{-}mb} \leqslant 15$ 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 ($R_{th\ j\text{-}mb} > 15$ K/W)
S. TRANSISTOR; low power, switching ($R_{th\ j\text{-}mb} > 15$ K/W)
T. CONTROL AND SWITCHING DEVICE; e.g. thyristor, power ($R_{th\ j\text{-}mb} \leqslant 15$ K/W)
U. TRANSISTOR; power, switching ($R_{th\ j\text{-}mb} \leqslant 15$ 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)

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)	Root-mean-square 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 DC values.

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

a) continuous (DC) 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 (DC) current flowing into the second base terminal

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

Subscripts for multiple devices

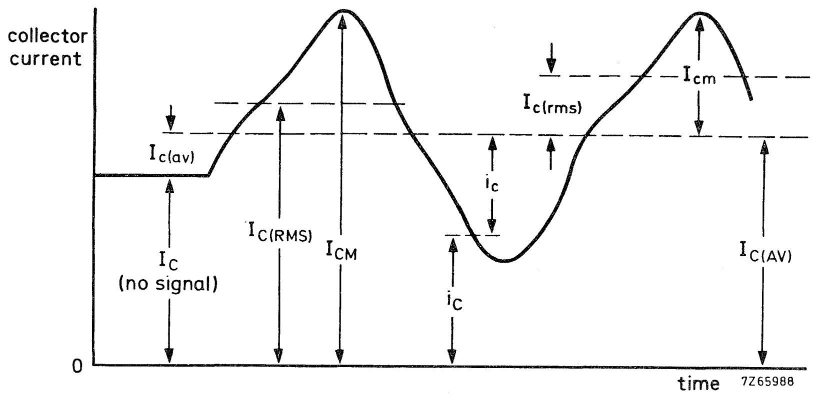
For multiple unit devices, the subscripts are modified by a number preceding the letter subscript; in the case of multiple subscripts, hyphens may be necessary to avoid misunderstanding.

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

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

Application of the rules

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



LETTER SYMBOLS FOR ELECTRICAL PARAMETERS

Defenition

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_f, 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 (DC current gain)

R_E = DC 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.

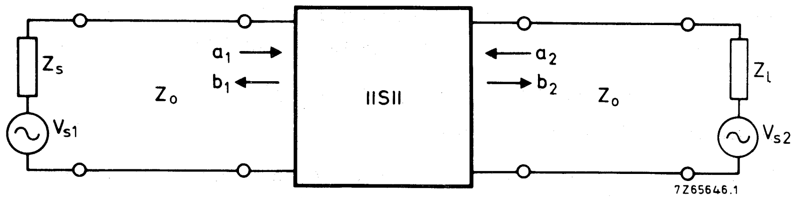
Examples: $Z_i = R_i + jX_i$
$y_{fe} = g_{fe} + jb_{fe}$

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

Examples: Re (h_{ib}) etc. for the real part of h_{ib}
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.



$$a_1 = \frac{V_{i1}}{\sqrt{Z_o}} \qquad a_2 = \frac{V_{i2}}{\sqrt{Z_o}}$$

$$b_1 = \frac{V_{r1}}{\sqrt{Z_o}} \qquad b_2 = \frac{V_{r2}}{\sqrt{Z_o}} \qquad ^{1)}$$

Z_o = 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:

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

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

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

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

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

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

s_{11} = Input reflection coefficient.
The complex ratio of the reflected wave and the incident wave at the input, under the conditions $Z_l = Z_o = 50\ \Omega$ and $V_{s2} = 0$.

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 $Z_s = Z_o = 50\ \Omega$ and $V_{s1} = 0$.

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 $Z_l = Z_o = 50\ \Omega$ and $V_{s2} = 0$.

s_{22} = Output reflection coefficient.
The complex ratio of the reflected wave and the incident wave at the output, under the conditions $Z_s = Z_o = 50\ \Omega$ and $V_{s1} = 0$.

S-PARAMETERS ON 3.5" DISKETTE; VERSION 2.0

S-parameters and noise figures are now available on 3.5" diskette for use with the Touchstone ® and LIBRA ® simulation programs. Version 2.0 contains the parameters of almost all wideband transistors contained in this book. The disc is available from your local Philips Sales Office.

Note

Touchstone ® and LIBRA ® are registered trade marks from:

EEsof, Inc. 5795 Lindero Canyon Road, Westlake Village, CA91362, USA.

Phone: (818) - 991 - 7530.

Fax: (818) - 991 - 710.

TAPE AND REEL SPECIFICATION

Semiconductors in SOT23 and SOT143 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.

Separate reel packing for SOT223, SOT89 and SOT173X encapsulations are given in Figs 2, 3 and 4 respectively.

The configuration of the reel and flange is given in Fig.5.

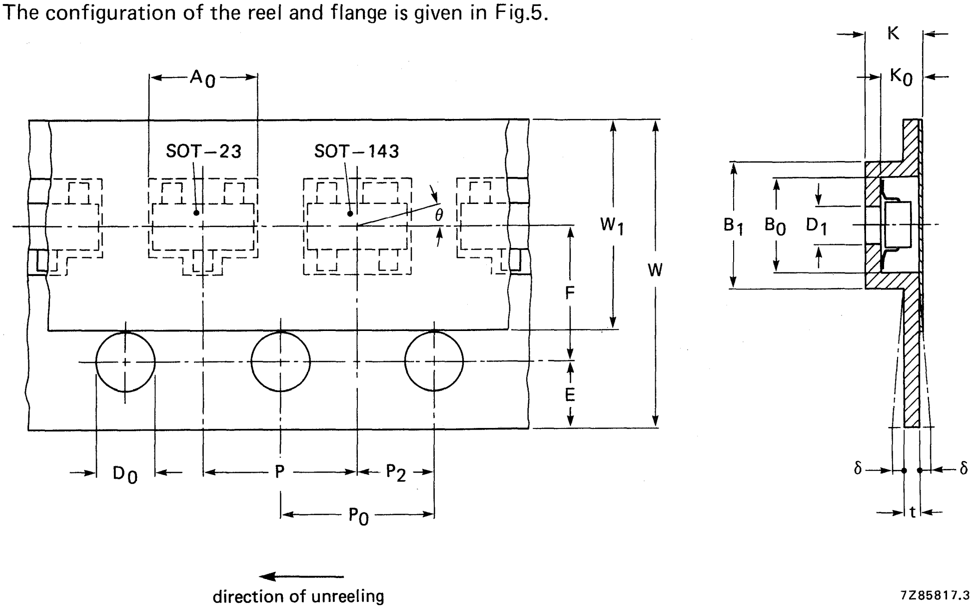


Fig.1 Configuration of bandolier. Dimensions in mm.

Note

Total number of devices per reel: 3000

Compartment			tol.
length	A_0	component length	+0,2
width	B_0	component width	+0,2
depth	K_0	0,95	+0,2
width outside	B_1	3,3	max.
pitch	P	4,0	±0,1
deviation	Θ	15°	max.
hole diameter	D_1	1	min.
Sprocket hole			
diameter	D_0	1,5	+0,1
pitch	P_0	4,0	±0,1
distance	E	1,75	±0,1
cumulative (10) pitch error		±0,1	

Centre line dimensions			tol.
length direction	P_2	2,0	±0,05
width direction	F	3,5	±0,05
Fixing tape			
width	W_1	5,5	±0,25
thickness	—	0,1	max.
Carrier tape			
width	W	8,0	±0,2
bending	δ	0,3	max.
thickness	t	0,4	max.
Overall thickness	K	1,5	max.

Amount of devices per reel (SOT23 and SOT143)

The bandolier of a 180 mm reel contains at least 3000 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.

Semiconductors in SOT223 encapsulations can also 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.

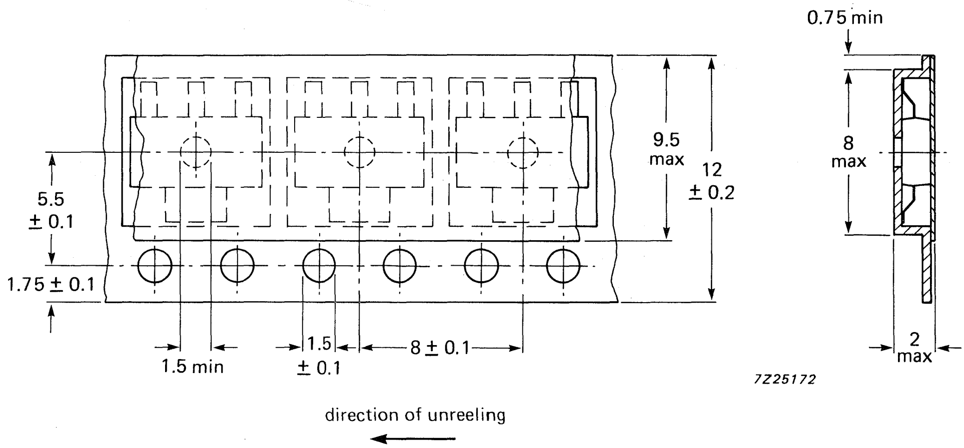


Fig.2 Configuration of bandolier. Dimensions in mm.

Note

Total number of devices per reel: 1000

Semiconductors in SOT89 encapsulations can also 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.

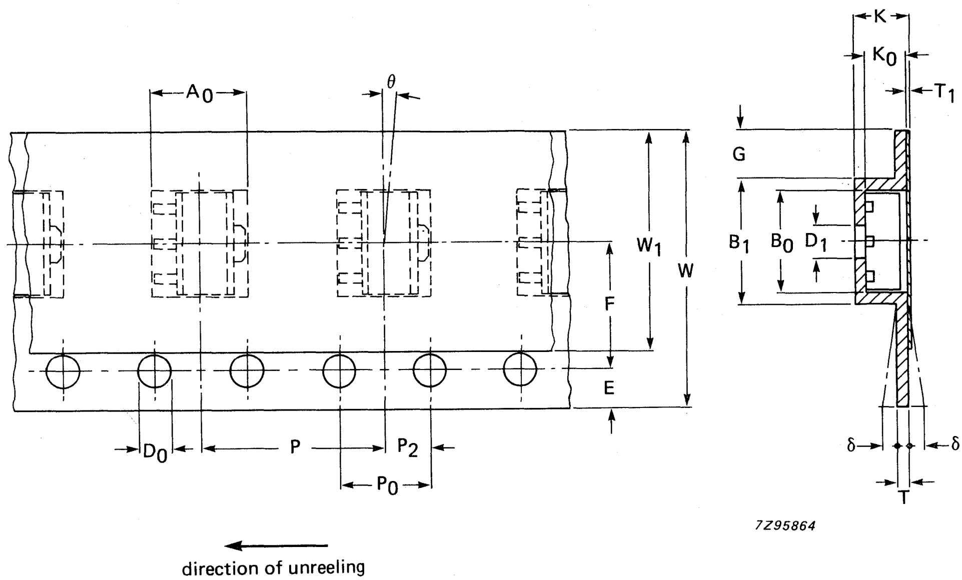


Fig.3 Configuration of bandolier. Dimensions in mm.

Note

Total number of devices per reel: 1000

Compartment			tol.
length	A_0 component length		
width	B_0 component width		
depth	K_0 component depth		
width outside	B_1	5,7	max.
pitch	P	8,0	± 0,1
deviation	Θ	± 5°	max.
hole diam.	D_1	1,5	min.
Sprocket hole			
diameter	D_0	1,5	+ 0,1
pitch	P_0	4,0	± 0,1
distance	E	1,75	± 0,1
cumulative (10) pitch error		± 0,1	

Centre line dimensions			tol.
length direction	P_2	2,0	± 0,05
width direction	F	5,5	± 0,1
Fixing tape			
width	W_1	9,5	max.
thickness	T_1	0,1	max.
Carrier tape			
width	W	12	± 0,2
bending	δ	0,3	max.
thickness	T	0,4	max.
Overall thickness	K	2,4	max.
distance	G	1,8	min.

Semiconductors in SOT173X are 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.

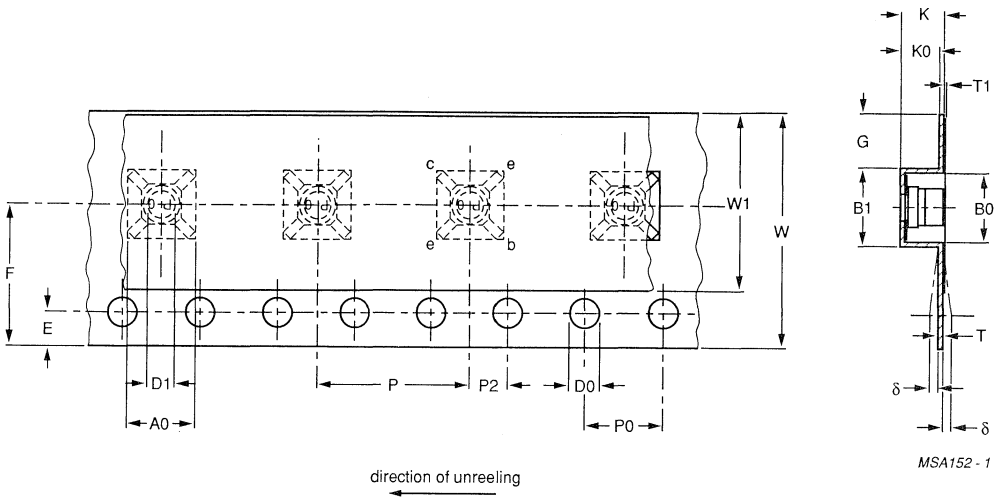


Fig.4 Configuration of bandolier. Dimensions in mm.

Note

Total number of devices per reel: 1000

Carrier tape dimensions (SOT173X)

item		symbol	specification		
			dimension		tolerance
			min.	max.	
overall dimensions	tape width	W	12		± 0.2
	height	K		2.25	
	distance	G	2.75		
	outside width	B1		4	
sprocket holes	diameter	D0	1.5		+ 0.1
	distance	E	1.75		± 0.1
	pitch	P0	4		± 0.1
distance between centre lines	length directions	P2	2		± 0.05
	width direction	F	5.5		± 0.1
compartments	length	A0	3.5		+ 0.1
	width	B0	3.5		+ 0.1
	depth	K0	2		± 0.1
	hole diameter	D1	1.5		
	pitch	P	8		± 0.1
device	outline				
	tilt	θ			
carrier tape	anti-static		yes		
	film thickness	T		0.25	
	bend	δ			
cover tape	width	W1		9.35	
	film thickness	T1		0.062	
bending radius	in winding direction	R			

Amount of devices in reel (SOT173X)

The bandolier contains 1000 devices. The carrier tape (leader) starts with at least 75 empty positions (equivalent to 600 mm); the covering foil is at least 600 mm. In order to fix the carrier tape a self-adhesive tape of 20 - 50 mm is applied.

At the end of the bandolier (trailer) at least 75 empty positions (equivalent to a length of 600 mm) and 600 mm foil. For fixing into the reel a self-adhesive tape of 20 to 50 mm is applied.

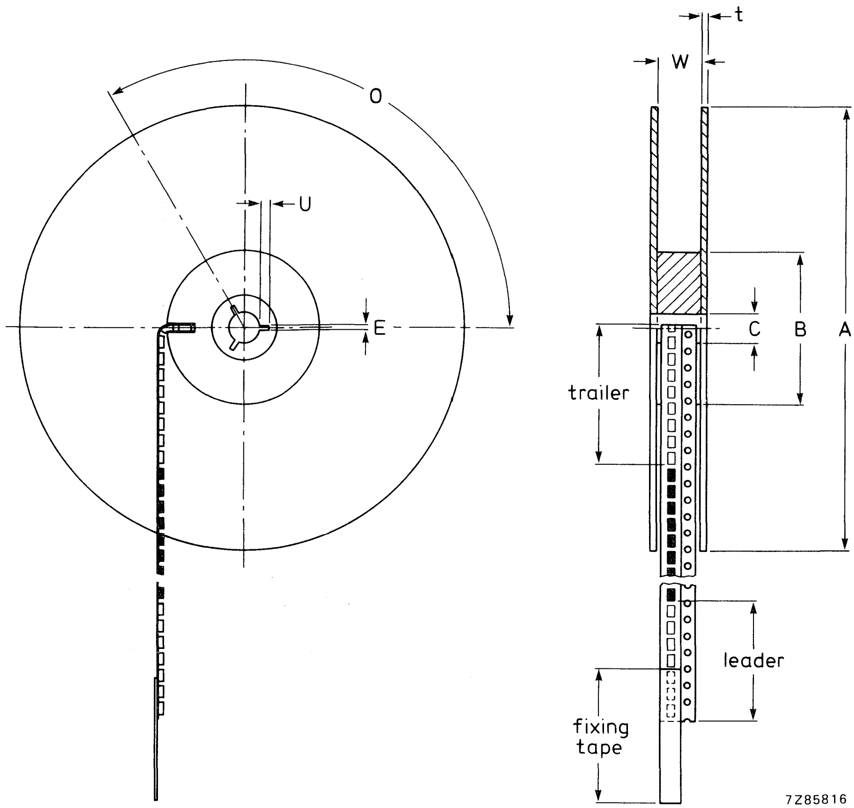


Fig.5 Configuration of reel and flange (dimensions in mm).

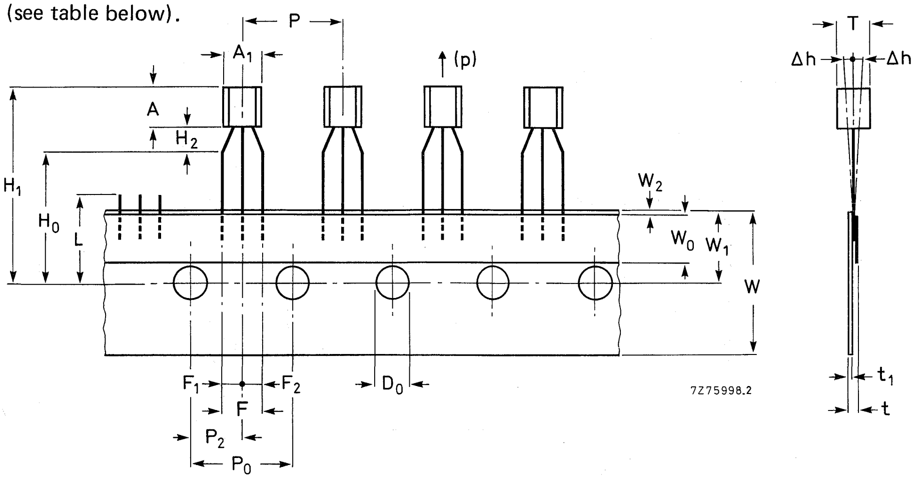
Flange			tol.
diameter	A	180	+0 −2
thickness	t	1,5	+0,5 −0,1
space between flanges	W	9,5	± 0,5

Hub			tol.
diameter	B	62	± 1,5
spindle hole	C	12,75	+0,15 −0
key slit			
width	E	2	± 0,5
depth	U	4	± 0,5
location	O	120	degrees

TO-92 VARIANT TRANSISTORS ON TAPE

MECHANICAL DATA Dimensions in mm

Fig.6 (see table below).



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_o		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_o		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_o		16		± 0,5	
Component height	H_1			32,25		
Length of snipped leads	L			11,0		
Feed hole diameter	D_o		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				

PACKING

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

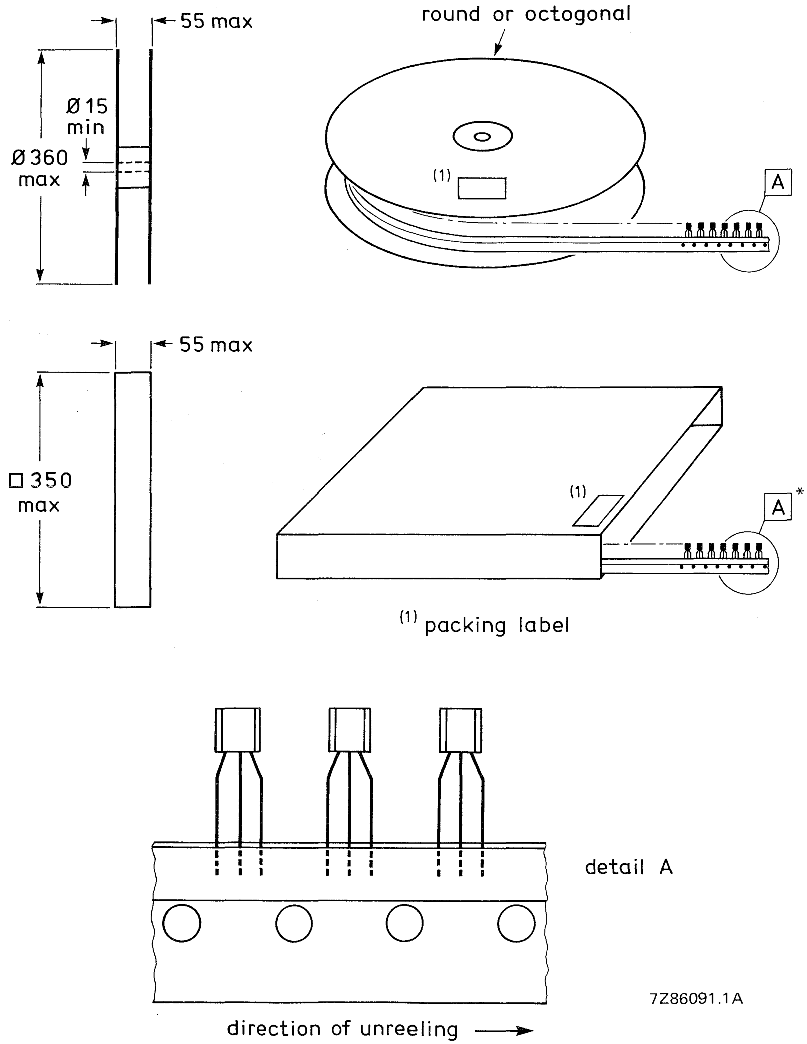


Fig.7 Dimensions (in mm) of reel and box.

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.8).

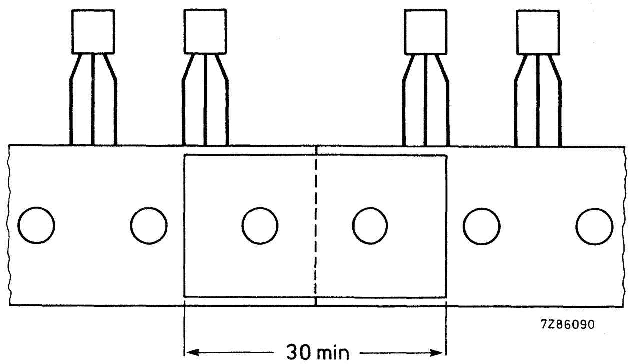


Fig.8 Jointing tape with splicing patch.

* 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.7) and "reverse" tape.

SOLDERING RECOMMENDATIONS
SOT23, SOT143, SOT89, SOT223

SMD devices are ideally suited for placement onto thick and thin film substrates and printed 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 techique for mounting microminiature components on hybrid thick and thin-film is the method of reflow soldering.

The tags of SOT23, SOT143, SOT223 and SOT89 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 SOT23, SOT143, SOT223 or SOT89 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 affect 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 concentrally arranged. This problem can be solved using a standard contact pattern, which leaves sufficient scope for the self-positioning effect (see Figs 4 to 7).

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.

WAVE SOLDERING

The normal (dual) wave soldering process can also be applied to SOT23, SOT143 and SOT223 envelopes. We do not recommend SOT89 to be used with wave soldering process.

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.

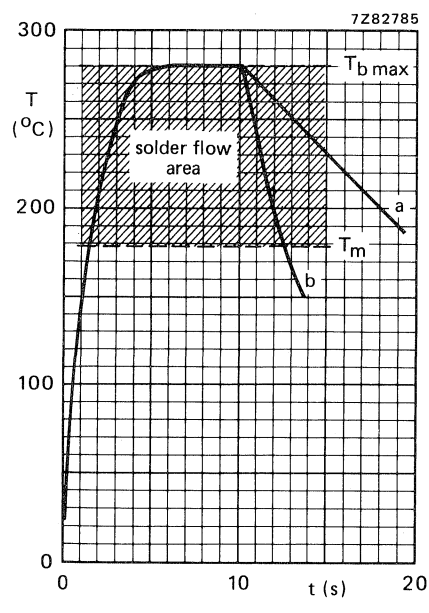
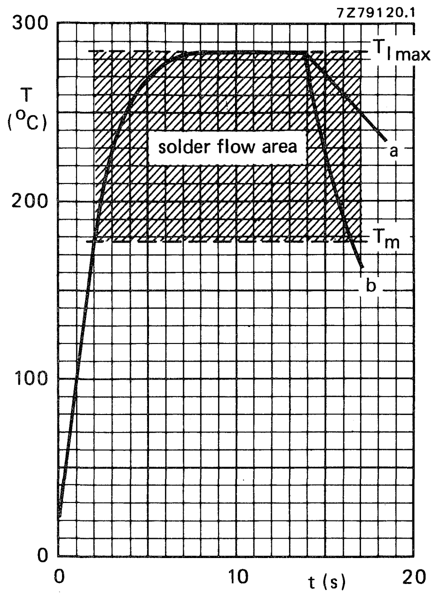


Fig.1 Device temperature during *immersion* soldering.

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

a = free convection cooling; b = forced cooling.
$T_{b\,max}$ = 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 ^oC

T_m = melting point of the solder is 179 ^oC

T_{amb} = 25 ^oC

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.

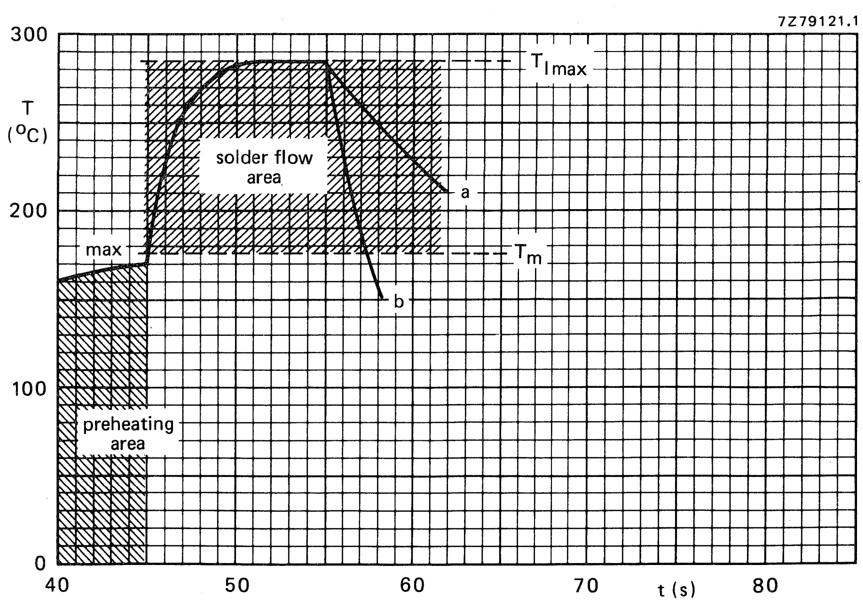


Fig.3 Reflow soldering with preheating.

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

Dimensions in mm

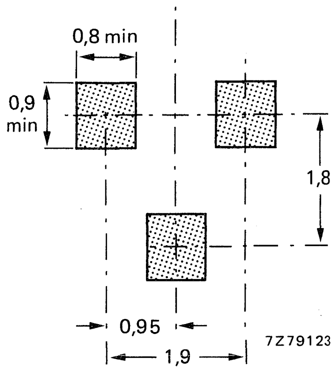


Fig.4 SOT23 pattern.

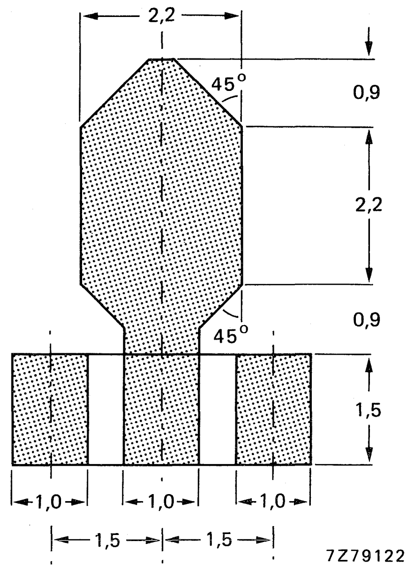


Fig.5 SOT89 pattern.

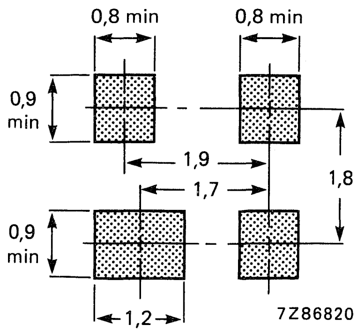


Fig.6 SOT143 pattern.

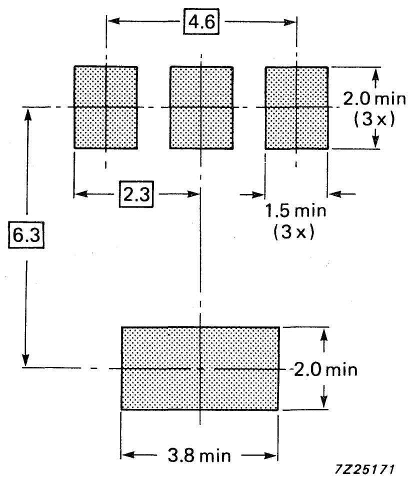


Fig.7 SOT223 pattern.

SOLDERING RECOMMENDATIONS SOT37 AND SOT103

Transistors in SOT37 and SOT103 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 four leads one at a time, *not* simultaneously.

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

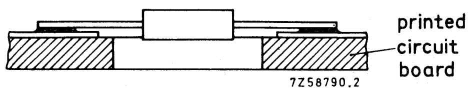


Fig. 1

Solder temperature	max.	300	^{o}C
Soldering time	max.	5	s
Solder-to-case distance	min.	2	mm

BENT-LEAD MOUNTING

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

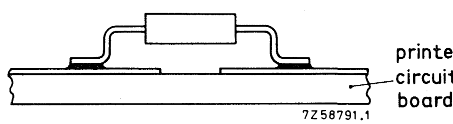


Fig. 2

Solder temperature	max.	300	^{o}C
Soldering time	max.	10	s

DIP OR WAVE SOLDERING

When dip or wave soldering, the maximum allowable temperature of the solder is 260 ^{o}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.

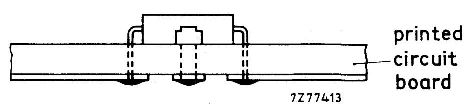


Fig. 3

Solder temperature	max.	260	^{o}C
Soldering time	max.	5	s

SOLDER RECOMMENDATIONS FOR SOT48, SOT122 AND SOT172

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 SOT48 and SOT172 5,0 mm SOT122

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 oxidation.
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, oxidation 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.

   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 ^{o}C for not more than 3 s when the soldered joints are a minimum of 3 mm from the module.

MOUNTING INSTRUCTIONS FOR TO-126 ENVELOPES

GENERAL DATA AND INSTRUCTIONS

General rules

1. First fasten the devices to the heatsink before soldering the leads.
2. Avoid axial stress to the leads.
3. Keep mounting tool (e.g. screwdriver) clear of the plastic body.

Heatsink requirements

Minimum thickness: 2 mm.
Flatness in the mounting area: 0,02 mm maximum deviation per 10 mm.
Mounting holes must be deburred and should also be perpendicular to the plane of the heatsink, within 10^o tolerance for M2,5 thread and within 2^o tolerance for M3 thread. If the hole in the heatsink is threaded, it should be counter-sunk and free of burrs.

Heatsink compound

Values of the thermal resistance from mounting base to heatsink ($R_{th\ mb\text{-}h}$) given for mounting with heatsink compound refer to the use of a metallic oxide-loaded compound. Ordinary silicone grease is not recommended.

For insulated mounting, the compound should be applied to the bottom of both device and insulator.

Mounting methods for power transistors

1. Clip mounting (TO-126).

   Mounting by means of spring clip offers:

   a. A good thermal contact under the crystal area.
   b. Safe insulation for mains and high voltage operation

2. M2,5 and M3 screw mounting.

   The spacing washer should be inserted between screw head and body.

   Mounting torque for screw mounting:

Minimum torque (for good heat transfer)	0,4 Nm (4 kgcm)
Maximum torque (to avoid damaging the device)	0,6 Nm (6 kgcm)

   N.B. when the driven nut or screw is in direct contact with a toothed lock washer the torques are as follows:

Minimum torque (for good heat transfer)	0,55 Nm (5,5 kgcm)
Maximum torque (to avoid damaging the device)	0,80 Nm (8,0 kgcm)

Thermal data

From mounting base to heatsink

	$R_{th\ mb\text{-}h}$ (K/W)			
	clip mounting		screw mounting	
	direct	insulated	direct	insulated
TO-126, with heatsink compound	1,0	3,0	0,5	3,0
TO-126, without heatsink compound	3,0	6,0	1,0	6,0

Lead bending

Maximum permissible tensile force on the body, for 5 seconds is 20 N (2 kgf).

The leads can be bent through 90° maximum, twisted or straightened. To keep forces within the above-mentioned limits, the leads are generally clamped near the body, using pliers. The leads should neither be bent nor twisted less than 2,4 mm from the body.

Lead soldering

For devices with a maximum junction temperature ⩽ 150 °C.

a. Dip or wave soldering
   Temperature ⩽ 260 °C at a distance from the body > 5 mm and for a total contact time with soldering bath or waves < 7 s.
b. Hand soldering
   Temperature at a distance from the body > 3 mm for a total contact time < 5 s is < 275 °C or < 250 °C for a total contact time of < 10 s.

The body of the device must be kept clear of anything with a temperature > 200 °C.
Avoid any force on body and leads during or after soldering; do not correct the position of the device or of its leads after soldering.

Mounting base soldering

Recommended metal-alloy of solder paste (85% metal weight)
62 Sm/36 Pb/2 Ag or 60 Sn/40 Pb.
Maximum soldering temperature ⩽ 200 °C (tab-temperature).
Soldering cycle duration including pre-heating ⩽ 30 sec.

For good soldering and avoiding damage to the encapsulation pre-heating is recommended to a temperature ⩽ 165 °C at a duration ⩽ 10 s.

INSTRUCTIONS FOR CLIP MOUNTING

Direct mounting with clip 56353

1. Place the device on the heatsink, applying heatsink compound to the mounting base.
2. Push the short end of the clip into the narrow slot in the heatsink with the clip at an angle of 10° to 30° to the vertical (see Figs 1 and 2).
3. Push down the clip over the device until the long end of the clip snaps into the wide slot in the heatsink. The clip should bear on the plastic body (see Fig. 3).

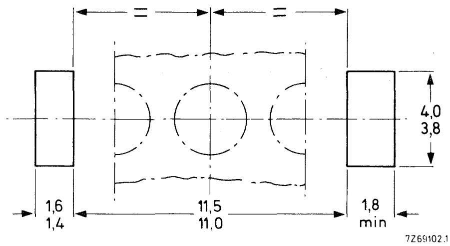


Fig. 1 Heatsink requirements.

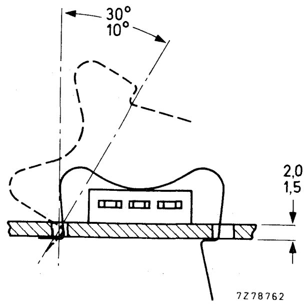


Fig. 2 Mounting spring clip.

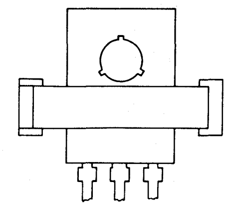


Fig. 3 Position of transistor (top view).

Insulated mounting with clip 56353 and mica 56354 (up to 1000 V insulation)

1. Place the device with the insulator on the heatsink, applying heatsink compound to the bottom of both device and insulator.
2. Push the short end of the clip into the narrow slot in the heatsink with the clip at an angle of 10° to 30° to the vertical (see Figs 4 and 5).
3. Push down the clip over the device until the long end of the clip snaps into the wide slot in the heatsink. The clip should bear on the plastic body (Fig. 6). Ensure that the device is centred on the mica insulator to prevent creepage.

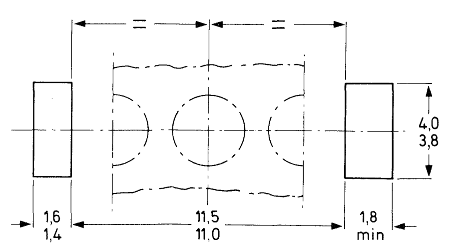
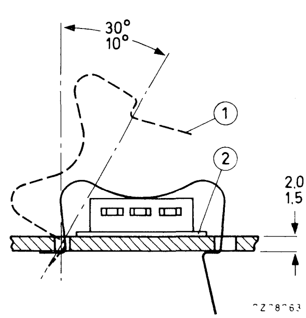


Fig. 4 Heatsink requirements.



(1) spring clip 56353.
(2) insulator 56354.
Fig. 5 Mounting.

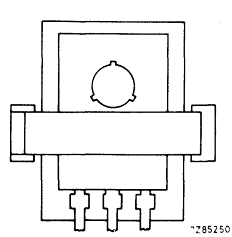


Fig. 6 Position of transistor (top view).

INSTRUCTIONS FOR SCREW MOUNTING

Dimensions in mm

Direct mounting with screw and spacing washer

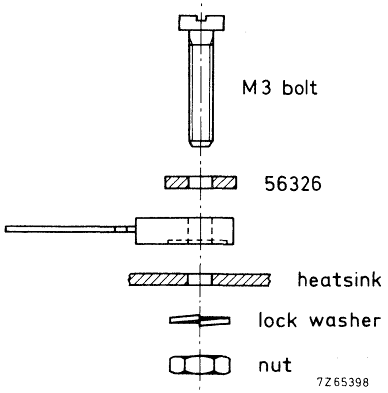


Fig. 7 Assembly through heatsink with nut.

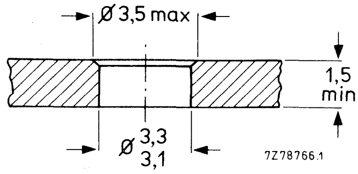


Fig. 8 Heatsink requirements.

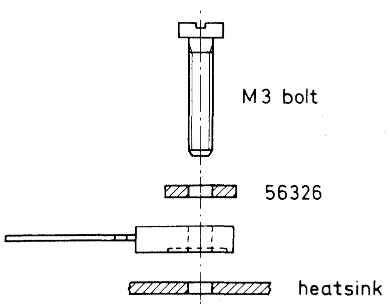


Fig. 9 Assembly into tapped heatsink.

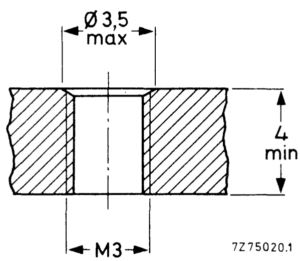
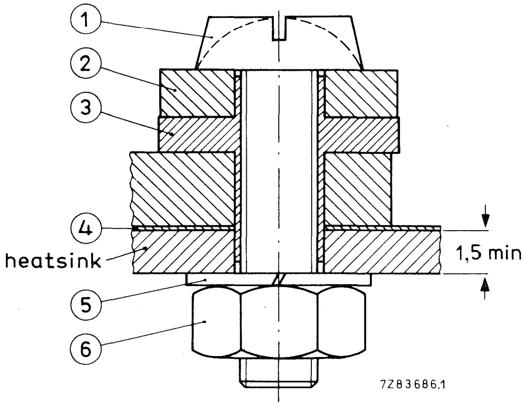


Fig. 10 Heatsink requirements.

INSTRUCTIONS FOR SCREW MOUNTING

Insulated mounting with 56326, 56387a and 56387b (up to 300 V)



(1) M2,5 screw
(2) metal washer 56326
(3) insulating bush 56387b
(4) mica washer 56387a
(5) lock washer
(6) M2,5 nut

Fig. 15 Assembly through heatsink with nut.

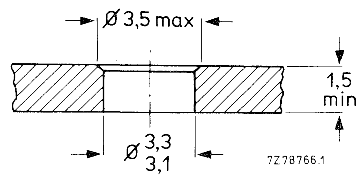
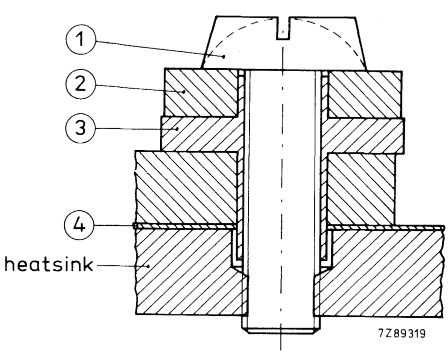


Fig. 16 Heatsink requirements.



(1) M2,5 screw
(2) metal washer 56326
(3) insulating bush 56387b
(4) mica washer 56387a

Fig. 17 Assembly with tapped heatsink.

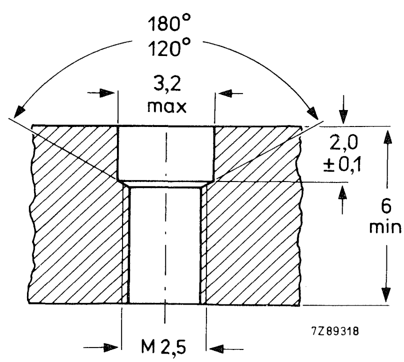


Fig. 18 Heatsink requirements.

THERMAL CHARACTERISTICS
SOT23/SOT143/SOT223/SOT37/SOT103

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

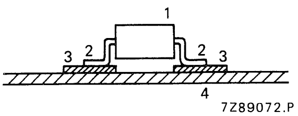


Fig.1.

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

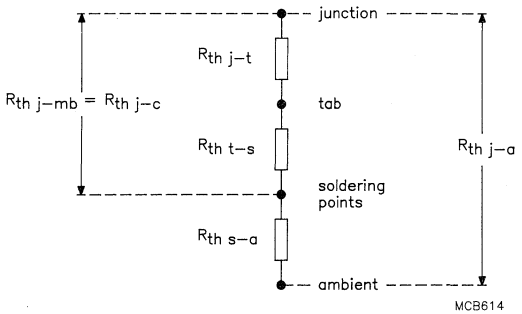
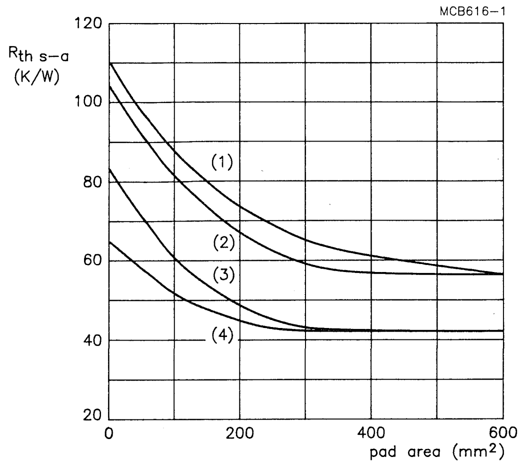


Fig. 2 Thermal behaviour of heat flow when the device is mounted on a substrate or printed board.

$R_{th\ j\text{-}t}$ = Thermal resistance from junction to tab.
$R_{th\ t\text{-}s}$ = Thermal resistance from tab to soldering points.
$R_{th\ s\text{-}a}$ = Thermal resistance from soldering points to ambient.
$R_{th\ j\text{-}a}$ = Thermal resistance from junction to ambient.
$R_{th\ j\text{-}c}$ = Thermal resistance from junction to case.
$R_{th\ j\text{-}mb}$ = Thermal resistance from junction to mounting base.

Thermal resistance from soldering point to ambient (Fig. 3).

The thermal resistance depends on the shape and material of the tracks and substrate. Figures 4 to 9 show standard mounting conditions on epoxy fibre-glass board and are given to set up the maximum power ratings for SOT23, SOT143, SOT89, SOT223, SOT37 and SOT103 encapulations.



1. single sided, unplated.
2. single siedd, plated.
3. double sided, unplated.
4. double sided, plated.

Fig. 3 Thermal resistance from soldering point to ambient (on epoxy fibre-glass).

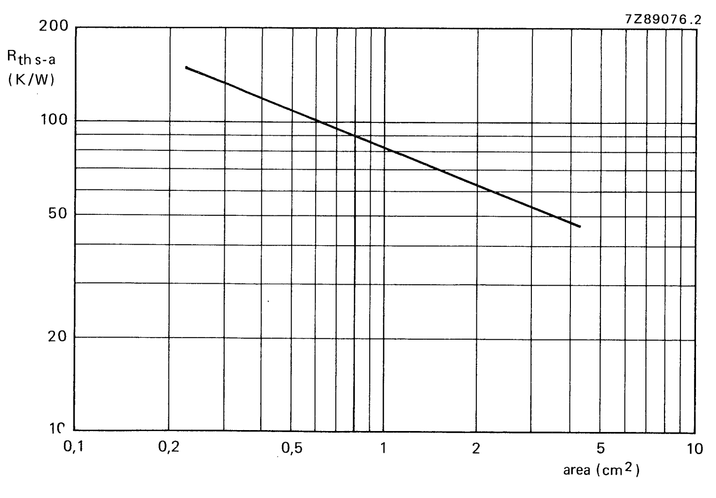


Fig. 3a Thermal resistance from soldering point to ambient (on ceramic substrate).

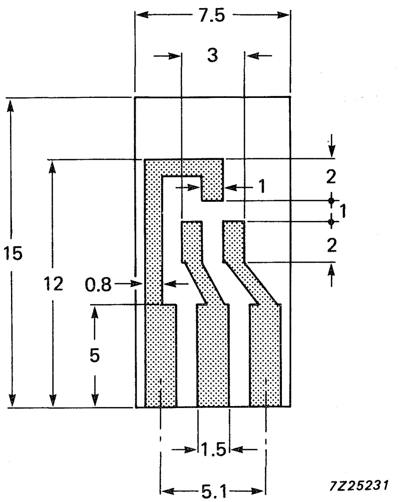


Fig.4 Test circuit for SOT23.

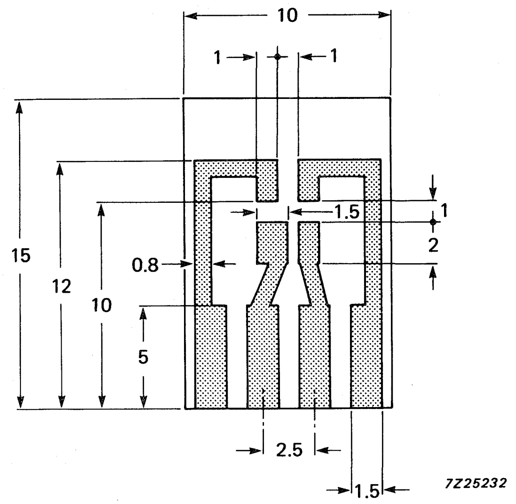


Fig.5 Test circuit for SOT143.

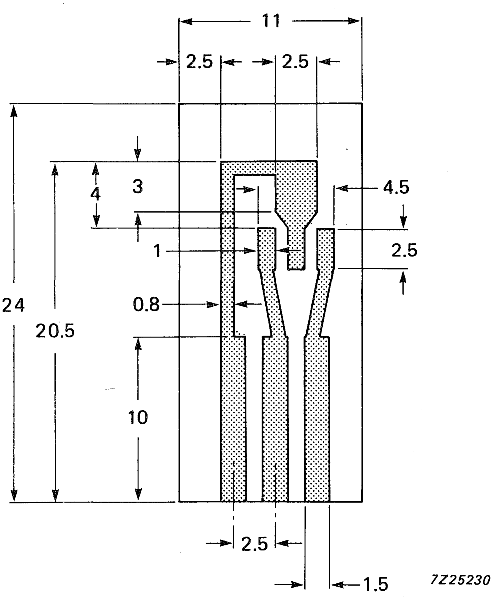


Fig.6 Test circuit for SOT89.

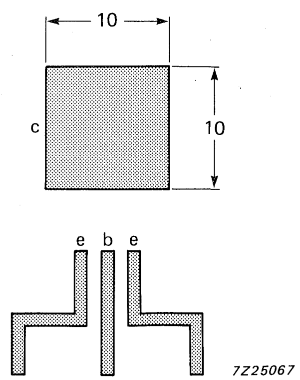
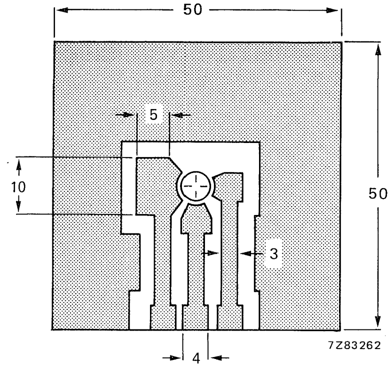
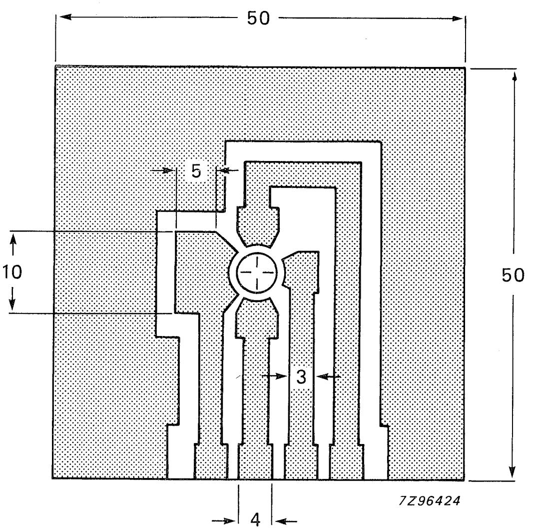


Fig.7 Test circuit for SOT223.



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.

Fig. 8 Test circuit for SOT37.



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 solder-tinned. Shaded area is copper.

Fig. 9 Test circuit for SOT103.

Thermal characteristics (SOT223).

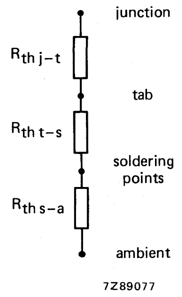


Fig. 10 Thermal behaviour of heatflow.

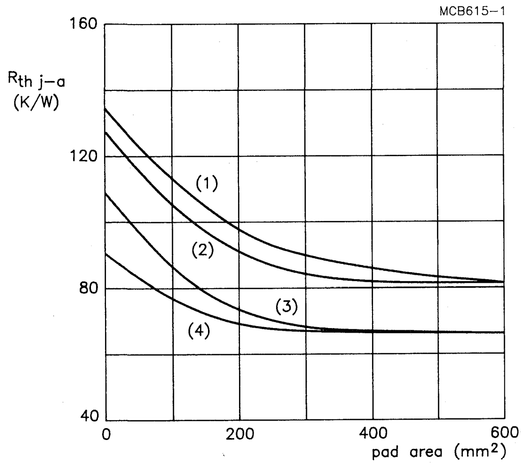


Fig. 11 Thermal resistance from junction to ambient.

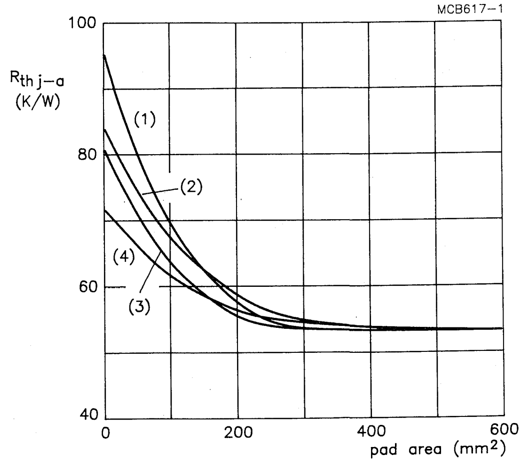


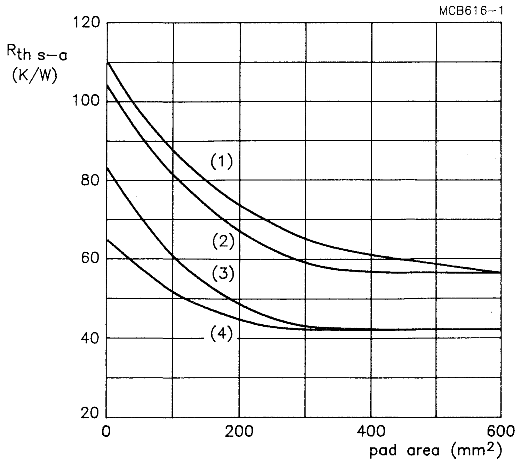
Fig. 12 Thermal resistance from junction to ambient.

1. unmetallized, uncladded.
2. unmetallized, cladded.
3. metallized, uncladded.
4. metallized, cladded.

Fig. 11 Thermal resistance from junction to ambient.

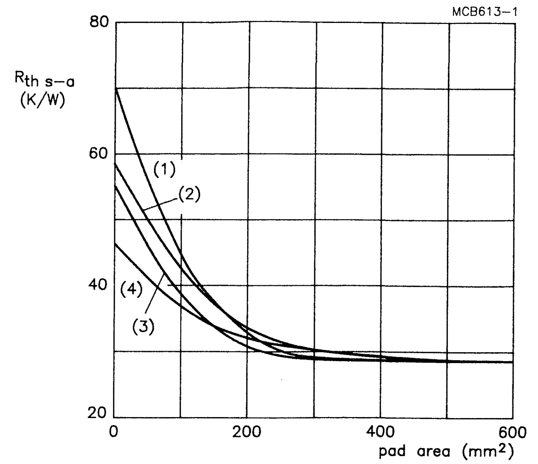
1. metallized back, uncladded on infinite heatsinks.
2. unmetallized back, uncladded on infinite heatsinks.
3. metallized back, cladded on infinite heatsinks.
4. unmetallized back, cladded on infinite heatsinks.

Fig. 12 Thermal resistance from junction to ambient.



1. unmetallized, uncladded.
2. unmetallized, cladded.
3. metallized, uncladded.
4. metallized, cladded.

Fig. 13 Thermal resistance from soldering point to ambient.



1. metallized back, uncladded on infinite heatsinks.
2. unmetallized back, uncladded on infinite heatsinks.
3. metallized back, cladded on infinite heatsinks.
4. unmetallized back, cladded on infinite heatsinks.

Fig. 14 Thermal resistance from soldering point to ambient.

CATV parameters

CATV parameters

CATV PARAMETERS

G_p	-	power gain
FL	-	flatness of frequency response (√f-curve and S-curve)
SL	-	slope (√f-curve and S-curve)
ΔG	-	delta gain (√f-curve and S-curve)
d_{im}	-	3-tone third order distortion
CTB	-	composite triple beat
X_{mod}	-	composite cross modulation
d_2	-	single second order distortion
CSO	-	composite second order distortion
S_{11} and S_{22}	-	S-parameters (return losses)
F	-	noise

GAIN (G_p)

Definition

The power gain, expressed in dB, is the ratio of output and input power of a module, operating in a 75 Ω (Z_o) system.

Measurement

The power gain is measured at several frequencies throughout the band, although most of the time, the gain performances at only the start and stop frequencies are given.

The gain is measured by applying a single tone signal to the module and measuring the output power. The input power is measured before by replacing the module with a thru-line and feeding the system with exactly the same signals.

Equipment

Input and output power are measured with a power meter.

FLATNESS OF FREQUENCY RESPONSE (FL)

Definition

The flatness of gain of a CATV amplifier module is defined as the maximum deviation from an absolute flat gain over a given frequency range, after the slope of the amplifier over this frequency range is optimally equalised by means of a certain cable length, which gives best result for flatness (see Figs 1 and 2). This means that an 'ideal gain curve' for the module is calculated and the flatness is the maximum deviation of this 'ideal gain curve'.

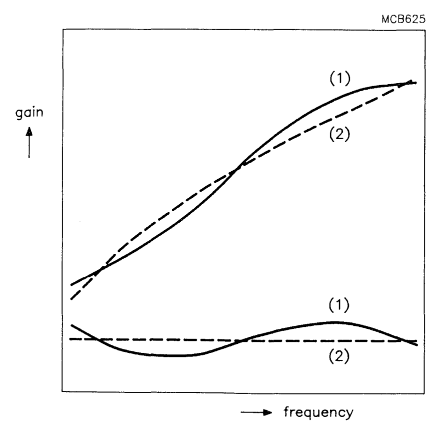


Fig.1 Flatness of gain curve (before optimizing).

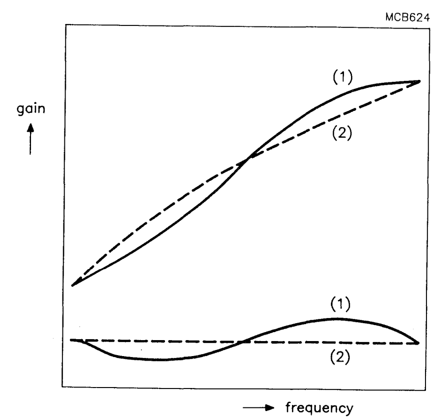


Fig.2 Flatness of gain curve (after optimizing).

CATV parameters

Calculation

The flatness is calculated from the measured gain values. To be able to determine flatness, a mathematical model for the 'ideal gain' of a module is used. This 'ideal gain curve' is described with the following formula:

Gain = $G + C \sqrt{(fx/f1)}$ where:

G = constant gain (frequency independent)
C = cable constant
fx = desired frequency
f1 = start frequency.

The cable constant (C) must be optimized during the flatness determination, in a way that the gain curve will best fit the measured gain figures. The start value for C is calculated with the formula:

$$C_{start} = \frac{G_n - G_1}{\sqrt{(fn/f1)} - 1}$$ where:

Gn = measured gain at stop frequency
G_1 = measured gain at start frequency
fn = stop frequency

The 'G' value is chosen so that the maximal positive deviation of the measured gain to the 'ideal curve' is the same as the maximum negative deviation.
The value of 'C' is adapted by ± 0.001 until the 'ideal curve' fits best to the measured curve.
The flatness of the module is now the maximum deviation in measured gain from the optimized gain formula.

SLOPE (SL)

Definition

The slope of a module is the difference between the 'ideal gain' at start frequency and the 'ideal gain' at stop frequency, (see flatness).

FLATNESS ACCORDING TO S-CURVE METHOD

Definition

For some high slope modules, the flatness is calculated in a different way, by using the so called S-curve method, instead of the regular –(f)-curve method detailed previously.

The 'ideal' S-curve is defined as:
$G_f = G_{f1} + \delta G.a.(f \circledR f1) + \delta G.b.(f - f1)^2 + \delta G.c.(f - f1)^3$
where:

δG = $G_{fn} - G_{f1}$
f1 = start frequency
fn = stop frequency
a = $3.1224\ 10^{-3}$
b = $1.9932\ 10^{-6}$
c = $-8.934\ 10^{-9}$

The flatness is the maximum deviation between the measured gain and the 'ideal curve'.

DELTA GAIN (ΔG)

Definition

Delta gain is the difference in gain between two given frequencies (mostly the start and stop frequencies).

THIRD ORDER DISTORTION (d_{im})

In accordance with DIN 45004B 6.3, 3-tone

Definition

The third order distortion product is the difference in dB, between the peak of the RF signal in the measuring channel and the peak of the distortion signal, caused by the influence of the signal in a neighbouring channel (see Fig 3).

To measure 3-tone d_{im}, three CW signals are applied to the module:

f_p = f 0 dB
f_q = f + 7 MHz –6 dB
f_r = f + 9 MHz –6 dB

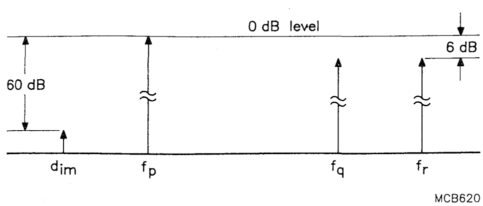


Fig.3 Third order distortion.

The distortion product is measured at f - 2 MHz. This distortion product consists of the $(f_p+f_q-f_r)$ beats and is expressed in dB, referred to the 0 dB level (signal level of f_p).
This 0 dB level should be chosen so that the distortion product (d_{im}) is –60 dB. For practical reasons the given output level (V_o) for 3-tone distortion is defined as the 0 dB level and the modules are rejected if the distortion level is worse than –60 dB.

Equipment

3-tone d_{im} is measured with a spectrum analyzer. The settings of the spectrum analyzer are as follows:

Internal attenuator	:	40 dB
Resolution bandwidth	:	3 kHz
Video bandwidth	:	100 Hz
Span	:	50 kHz

The 3 signals are obtained from 3 different generators. For frequency see Appendix II.

COMPOSITE THIRD ORDER DISTORTION : CW CARRIERS
COMPOSITE TRIPLE BEAT (CTB) :

In accordance with National Cable Television Association recommendations.

Definition

Composite third order distortion is the amplitude distortion of desired signals, caused by third order curvature of non-linear transfer characteristics in system equipment. It is the ratio, expressed in dB, of the peak level of the RF signal to the peak level of the cluster of distortion components centred around the carrier.

Measurement

To measure CTB, a signal at the measuring frequency is levelled to the specified V_o. This output level is defined as the 0 dB level. During the measurement (see note 1) all channels in the band are levelled to the specified V_o. Now at the measuring frequency the distortion product is measured by use of a spectrum analyzer or distortion analyzer.
The CTB distortion is measured high in the band, because here the distortion products have the highest amplitude (although the greatest number of beats ($f_1 \pm f_2 \pm f_3$ and $2 \times f_1 \pm f_2$) are found in the centre of the band).

Equipment

Spectrum analyzer settings:

Resolution bandwidth	:	30 kHz
Video bandwidth	:	100 Hz
Span	:	500 kHz

A bandpass filter is used to eliminate the distortion products produced by the spectrum analyzer itself.A distortion analyzer can be used instead of a spectrum analyzer if desired.
The carrier signals are obtained from a multi-channel generator. The frequency deviation of each channel must be smaller than 5 kHz.

COMPOSITE THIRD ORDER DISTORTION : MODULATE CARRIERS
CROSS MODULATION (X_{mod}):

In accordance with National Cable Television Association recommendations.

Definition

Cross modulation distortion (X_{mod}) is a form of distortion where modulation of interfering stations appears as a modulation of the desired station, caused by third order curvature of non-linear transfer characteristics in system equipment. It is the ratio, expressed in dB, of the peak level of the modulated RF signal to the peak level distortion components centred around the carrier (see Figs 4, 5 and 6).

Measurement

To measure X_{mod}, the carrier of the desired channel is levelled to the specified V_o. Then this channel is 100% modulated with a 15.75 kHz square wave (see note 2). The peak level of this modulation signal (15.75 kHz besides the carrier) is defined as the 0 dB level. The distortion product is now measured by levelling each individual channel (CW) to the specified V_o and switching them on in modulated mode. Only the carrier in the channel in which the X_{mod} distortion is to be measured, is not modulated. The X_{mod} distortion peak now appears 15.75 kHz besides the carrier.
The X_{mod} distortion is measured mostly at a low frequency in the band, because this distortion is most apparent.

Equipment

X_{mod} is measured with a spectrum analyzer, with use of a bandpass filter tuned to the channel in which the distortion product is measured.

Spectrum analyzer setting for most types;

Resolution bandwidth	:	300 kHz
Video bandwidth	:	30 Hz
Span	:	5 kHz

The signals used for this measurement are obtained from a multi-channel generator.
When measuring X_{mod} at a high frequency in the band, a distortion analyzer must be used, because phase noise will make spectrum analyzer measurements inaccurate.

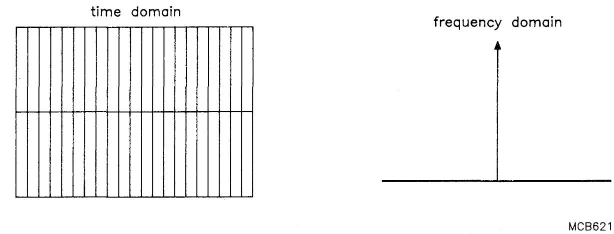


Fig.4 Carrier wave (CW) signal (sine wave) no other signals switched on.

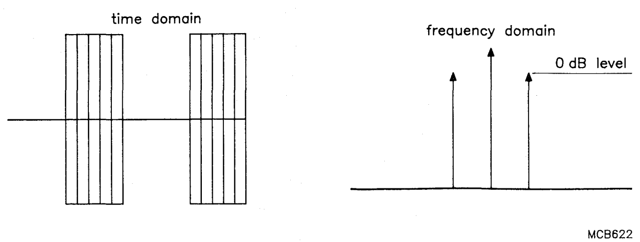


Fig.5 One signal switched on 100% modulated.

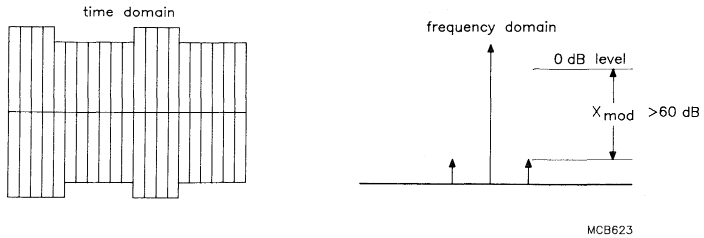


Fig.6 CW signal with X_{mod} distortion caused by other modulated signals.

SECOND ORDER DISTORTION (d_2)

In accordance with DIN 45004-A1

Definition

The second order distortion product is the difference in dB between the peak level of a RF signal at the measuring frequency and the peak level of the signal at the measuring frequency, caused by 2 CW signals with their second order modulation product ($f_1 \pm f_2$) at measuring frequency (see Fig.7).

Measurement

The second order modulation is measured at the frequency in the band where distortion product turns out to be worst. In general this will be at the high end of the band.
Therefore in most cases the measuring procedure will be as follows:
Signals f_1 and f_2 are chosen in a way, that f_1 is the lowest channel in the band and f_2 is the highest one; this means that $f_1 + f_2$ lays within the band.
The peak levels of f_1 and f_2 are equal and they are defined as the 0 dB level.
For frequency sets see Appendix II.

Equipment

Second order distortion is measured with a spectrum analyzer.

Spectrum analyzer settings:

Resolution bandwidth	:	3 kHz
Video bandwidth	:	100 Hz
Span	:	50 kHz

A tunable bandpass filter is used to eliminate the distortion product produced by the spectrum analyzer.

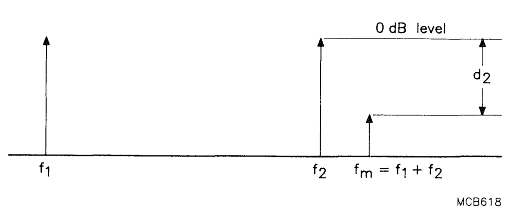


Fig.7 Second order distortion (d_2).

CATV parameters

COMPOSITE SECOND ORDER (CSO)

Definition

Composite second order distortion is the ratio, expressed in dB, of the peak level of the RF signal to the peak level of the cluster of distortion components centred around the desired signal. CSO distortion is caused by a compilation of components of second order intermodulation products of interfering signals with frequencies f_1 and f_2, so that $f_m = f_1 \pm f_2$ or $f_m = 2 \times f_1$ or $f_m = 2 \times f_2$.

Measurement

CSO distortion is measured by levelling a signal with the desired frequency to the specified V_o. This V_o level is defined as the 0 dB level.
During the measurement (see note 1) all channels in the band are levelled to the specified V_o. Now at the measurement frequency the distortion product is measured by use of a spectrum analyzer.
The CSO distortion is measured high in the band, because here this distortion product turns out to be of most influence.

Equipment

Setting of the spectrum analyzer;

Resolution bandwidth	:	30 kHz
Video bandwidth	:	100 Hz
Span	:	400 kHz

A bandpass filter is used at the input of the spectrum analyzer.

S-PARAMETERS S_{11} AND S_{22} (return losses)

In accordance with IEC 747-7

Definition

The return losses or reflection coefficients of a module can be defined as the S_{11} and S_{22} of a two-port network (see Fig.8).

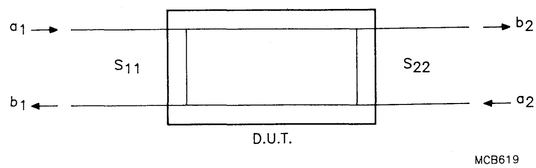


Fig.8 Two-port network with reflection coefficients S_{11} and S_{22}.

$b_1 = S_{11}.a_1 + S_{12}.a_2$ (1)
$b_2 = S_{21}.a_1 + S_{22}.a_2$ (2) where

$$a_1 = \frac{1}{2.\sqrt{Z_o}} \cdot (V_1 + Z_o.i_1) = \text{signal into port 1} \quad (3)$$

$$a_2 = \frac{1}{2.\sqrt{Z_o}} \cdot (V_2 + Z_o.i_2) = \text{signal into port 2} \quad (4)$$

$$b_1 = \frac{1}{2.\sqrt{Z_o}} \cdot (V_1 + Z_o.i_1) = \text{signal out of port 1} \quad (5)$$

$$b_1 = \frac{1}{2.\sqrt{Z_o}} \cdot (V_2 + Z_o.i_2) = \text{signal out of port 2} \quad (6)$$

From formulas 1 and 2, the formulas for the return losses can be derived:

$$S_{11} = \frac{b_1}{a_1} \quad a_2 = 0$$

$a_2 = 0$ means: output port terminated with Z_o (derived from formula 4)

$$S_{22} = \frac{b_2}{a_2} \quad a_1 = 0$$

$a_1 = 0$ means: input port terminated with Z_o (formula 3)

CATV parameters

Measurement

The return losses are measured with a network analyzer after calibration, where the influence of the test-jig is eliminated. The necessary termination of the other port with Z_0 is done by the network analyzer automatically. The network analyzer must have a directivity of at least 40 dB, to get a measurement accuracy of 0.5 dB when measuring return loss figures of 20 dB.
A full two port correction method can be used to improve the accuracy.

NOISE (F)

In accordance with IEC 747-7

Definition

The noise figure is defined as the ratio of the total available noise power output from the device, when connected to a source, to that which is generated solely by the source.

Measurement

Noise figures are measured with a noise figure meter at the output of the module, while a noise source is connected to the input of the module.
The measurements should be done in a shielded room, to prevent pick-up of unwanted signals.

Notes

1. In the USA, an equally spaced frequency raster is used with a space of 6 MHz between the channels. In the German frequency distribution the space between the channels is 7 MHz up to 300 MHz, and 8 MHz above 300 MHz. In general, the Philips measurements are done in accordance with the American frequency raster. For the German market, measurements can be made with a set-up which approximates to the German raster as closely as possible.
   A list of both frequency rasters is given in Appendix I.
2. The 15.75 kHz square wave modulation signal, used with X_{mod} measurements, found its origin in the American broadcasting method. Using the NTSC system, the 15.75 kHz is defined by the 60 Hz mains frequency and the number of 525 TV lines i.e: modulation frequency

   $$(\text{NTSC}) = \frac{60 \times 525}{2} = 15.75 \text{ KHz}$$

   The modulation frequency for PAL (one of the European methods) is 15.625 kHz. This is because in Europe the mains frequency is 50 Hz and the number of TV lines using PAL is 625.

CATV parameters

APPENDIX I

USA	
Channel	Frequency (MHz)
2	55.25
3	61.25
4	67.25
5	77.25
6	83.25
A2	109.25
A1	115.25
A	121.25
B	127.25
C	133.25
D	139.25
E	145.25
F	151.25
G	157.25
H	163.25
I	169.25
7	175.25
8	181.25
9	187.25
10	193.25
11	199.25
12	205.25
13	211.25
J	217.25
K	223.25
L	229.25
M	235.25
N	241.25
O	247.25
P	253.25
Q	259.25
R	265.25
S	271.25
T	277.25
U	283.25
V	289.25
W	295.25
X	301.25
Y	307.25
Z	313.25
H1	319.25
H2	325.25
H3	331.25
H4	337.25
H5	343.25
H6	349.25
H7	355.25
H8	361.25
H9	367.25
H10	373.25
H11	379.25
H12	385.25
H13	391.25
H14	397.25
H15	403.25
H16	409.25

USA	
Channel	Frequency (MHz)
H17	415.25
H18	421.25
H19	427.25
H20	433.25
H21	439.25
H22	445.25
H23	451.25
H24	457.25
H25	463.25
14	469.25
15	475.25
16	481.25
17	487.25
18	493.25
19	499.25
20	505.25
21	511.25
22	517.25
23	523.25
24	529.25
25	535.25
26	541.25
27	547.25
28	553.25
29	559.25
30	565.25
31	571.25
32	577.25
33	583.25
34	589.25
35	595.25

CATV parameters

GERMANY	
Channel	Frequency (MHz)
K2	48.25
K3	55.25
K4	62.25
K5	69.25
K6	76.25
S2	112.25
S3	119.25
S4	126.25
S5	133.25
S6	140.25
S7	147.25
S8	154.25
S10	168.25
K5	175.25
K6	182.25
K7	189.25
K8	196.25
K9	203.25
K10	210.25
K11	217.25
K12	224.25
S11	231.25
S12	238.25
S13	245.25
S14	252.25
S15	259.25
S16	266.25
S17	273.25
S18	280.25
S19	287.25
S20	294.25
S21	303.25
S22	311.25
S23	319.25
S24	327.25
S25	335.25
S26	343.25
S27	351.25
S28	359.25
S29	367.25
S30	375.25
S31	383.25
S32	391.25
S33	399.25
S34	407.25
S35	415.25
S36	423.25
S37	431.25
S38	439.25
S39	445.25

APPENDIX II

Most used frequency sets for d_2 measurements

f_p [MHz]	f_q [MHz]	f_m [MHz]
83.25	109.25	192.50
66.00	144.00	210.00
55.25	211.25	266.50
55.25	343.35	398.50
55.25	391.25	446.50
55.25	493.25	548.50
300.00	450.00	750.00

Measuring frequency for second order distortion:
$f_m = f_p + f_q$, level f_p = level f_q = 0 dB.

APPENDIX II

Most used frequency sets for d_{im} measurements

f_m [MHz]	f_p [MHz]	f_q [MHz]	f_r [MHz]
33.25	35.25	42.25	44.25
163.25	165.25	172.25	174.25
185.25	187.25	194.25	196.25
285.25	287.25	294.25	296.25
335.25	337.25	344.25	346.25
339.25	341.25	348.25	350.25
385.25	387.25	394.25	396.25
438.25	440.25	447.25	449.25
481.25	483.25	490.25	492.25
538.25	540.25	547.25	549.25
849.25	851.25	858.25	860.25

Measuring frequency for third order distortion:
$f_m = f_p + f_q - f_r$ level f_p = 0 dB,
level f_p = level f_r = -6 dB.

CATV parameters

APPENDIX III

Used channels during CTB/X_{mod}/CSO measurements

range	names	frequencies	channels
40 - 300 MHz	2-4	55.25 - 67.25	3 channels
32 channels	5-6	77.25 - 83.25	2 channels
	A-2	109.25	1 channel
	A-F	121.25 - 151.25	6 channels
	H-S	163.25 - 271.25	19 channels
	W	295.25	1 channel
40 - 450 MHz	2-4	55.25 - 67.25	3 channels
52 channels	5-6	77.25 - 83.25	2 channels
	A-2	109.25	1 channel
	A-F	121.25 - 151.25	6 channels
	H-H14	163.25 - 397.25	40 channels
5 - 200 MHz	T7-T13	7.00 - 43.00	7 channels
22 channels	2-4	55.25 - 67.25	3 channels
	5-6	77.25 - 83.25	2 channels
	A-7	121.25 - 175.25	10 channels
40 - 450 MHz	2-4	55.25 - 67.25	3 channels
60 channels	5-6	77.25 - 83.25	2 channels
	A-H22	121.25 - 445.25	55 channels
40 - 550 MHz	2-4	55.25 - 67.25	3 channels
77 channels	5-6	77.25 - 83.25	2 channels
	A-27	121.25 - 445.25	77 channels
40 - 600 MHz	2-4	55.25 - 67.25	3 channels
85 channels	5-6	77.25 - 83.25	2 channels
	A-35	121.25 - 445.25	80 channels
40 - 450 MHz	2-3	55.25 - 61.25	2 channels
36 channels	C-F	133.25 - 151.25	4 channels
German raster	H	163.25	1 channel
	7	175.25	1 channel
	9	187.25	1 channel
	12	205.25	1 channel
	J	217.25	1 channel
	L-M	229.25 - 235.25	2 channels
	O-S	247.25 - 271.25	5 channels
	U-X	283.25 - 301.25	4 channels
	Z-H2	313.25 - 325.25	3 channels
	H 4	337.25	1 channel
	H 6	349.25	1 channel
	H8-H10	361.25 - 373.25	3 channels
	H12-H13	385.25 - 391.25	2 channels
	H16-H18	409.25 - 421.25	3 channels
	H 20	433.25	1 channel

Note

1. The picture carrier frequencies in accordance with the USA frequency raster with 6 MHz space.
2. The frequencies of setup 10 are selected as close as possible to the German frequency raster with 7 MHz space up to 300 MHz and 8 MHz space above 300 MHz.

DEVICE DATA

Wideband transistors

NPN 2 GHz WIDEBAND TRANSISTOR

NPN transistor in a TO-92 envelope intended for application as an amplifier or oscillator in the VHF and UHF range.

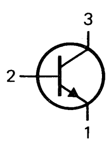
QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	25	V
Collector-emitter voltage (open base)	V_{CEO}	max.	15	V
Collector current DC	I_C	max.	25	mA
Total power dissipation up to T_{amb} = 60 °C	P_{tot}	max.	360	mW
DC current gain				
I_C = 2 mA; V_{CE} = 5 V	h_{FE}	min.	20	
I_C = 20 mA; V_{CE} = 5 V		min.	35	
Transition frequency at f = 500 MHz		max.	70	
I_C = 15 mA; V_{CE} = 5 V	f_T	typ.	1.8	GHz

MECHANICAL DATA

TO-92 variant (see outline section)

1. emitter
2. base
3. collector



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
$R_{BE} \leqslant 50\ \Omega$	V_{CER}	max.	25	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3.5	V
Collector current				
DC	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 °C	P_{tot}	max.	360	mW
Junction temperature range	T_j	max.	150	°C
Storage temperature	T_{stg}		−55 to +150	°C

THERMAL RESISTANCE

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

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current V_{CB} = 15 V; I_E = 0	I_{CBO}	max.	50 nA
Emitter cut-off current V_{EB} = 2 V; I_C = 0	I_{EBO}	max.	1.0 μA
Saturation voltages I_C = 25 mA; I_B = 1.25 mA	V_{CEsat} V_{BEsat}	max. max.	1.0 V 1.0 V
DC current gain I_C = 2 mA; V_{CE} = 5 V I_C = 20 mA; V_{CE} = 5 V	h_{FE}	min. min. max.	20 35 70
Transition frequency at f = 500 MHz I_C = 15 mA; V_{CE} = 5 V	f_T	typ.	1.8 GHz
Feedback capacitance I_C = 2 mA; V_{CE} = 5 V; T_{amb} = 25 °C	C_{re}	typ.	1.1 pF
Noise figure at f = 100 MHz I_C = 2 mA; V_{CE} = 5 V; Z_S = 60 Ω; T_{amb} = 25 °C	F	typ.	4.0 dB
Noise figure at f = 200 MHz I_C = 2 mA; V_{CE} = 5 V; Z_S = 60 Ω; T_{amb} = 25 °C	F	typ.	3.0 dB
Power gain at f = 100 MHz I_C = 2 mA; V_{CE} = 5 V; Z_S = 60 Ω; R_L = 2 kΩ; T_{amb} = 25 °C	G_p	typ.	16 dB
Power gain at f = 200 MHz I_C = 2 mA; V_{CE} = 5 V; Z_S = 60 Ω; R_L = 920 Ω; T_{amb} = 25 °C	G_p	typ.	16 dB

Philips Components

Data sheet	
status	Product specification
date of issue	June 1990

BF747

NPN 1 GHz wideband transistor

FEATURES

- Stable oscillator operation
- High current gain
- Good thermal stability.

DESCRIPTION

The BF747 is a low cost NPN transistor in a plastic SOT23 envelope. It is intended for VHF and UHF TV-tuner applications and can be used as a mixer and/or oscillator.

MECHANICAL DATA

Plastic SOT23.

PIN	DESCRIPTION
1	base
2	emitter
3	collector

Marking code : E15

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CEO}	collector-emitter voltage		-	20	V
V_{CBO}	collector-base voltage		-	30	V
V_{EBO}	emitter-base voltage		-	3	V
I_{CM}	collector current (DC)	peak value	-	50	mA
P_{tot}	total power dissipation	up to $T_s = 100°C$ note 1	-	150	mW
T_{stg}	storage temperature range		–55	+150	°C
T_j	junction temperature		-	+150	°C

Note

1. T_s temperature measured on soldering point of collector tab.

ORDERING AND PACKAGE INFORMATION

EXTENDED TYPE NUMBER	PACKAGE		
	CODE	PACKING METHOD	PACKING QUANTITY
BF747	SOT23	12 mm reel	3000

NPN 1 GHz wideband transistor BF747

LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CEO}	collector-emitter voltage		-	20	V
V_{EBO}	emitter-base voltage		-	3	V
V_{CBO}	collector-base voltage		-	30	V
I_{CM}	collector current (DC)	peak value	-	50	mA
P_{tot}	total power dissipation	up to T_s = 100 °C	-	150	mW
T_{stg}	storage temperature range		–55	+150	°C
T_j	operating junction temperature		-	+150	°C

THERMAL RESISTANCE

SYMBOL	PARAMETER	NOM.	UNIT
$R_{th\ j\text{-}s}$	from junction to soldering point	320	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{CBO}	collector cut-off current	$I_E = 0$; $V_{CB} = 10$ V	-	-	100	nA
h_{FE}	DC current gain	$I_C = 2$ mA; $V_{CE} = 10$ V	40	-	250	
f_T	transition frequency	f = 500 MHz; $I_C = 15$ mA; $V_{CE} = 10$ V	0.8	1.2	1.6	GHz
C_{re}	feedback capacitance	f = 1 MHz; $I_E = i_e = 0$; $V_{CB} = 10$ V	-	0.5	-	pF
G_{UM}	maximum unilateral power gain	f = 100 MHz; $I_C = 1$ mA; $V_{CE} = 10$ V note 1	-	20	-	dB

Note

1. Maximum Unilateral Gain (G_{UM}) is defined as:

$$G_{UM} = \frac{1}{1 - |S_{11}|^2} |S_{21}|^2 \frac{1}{1 - |S_{22}|^2}$$

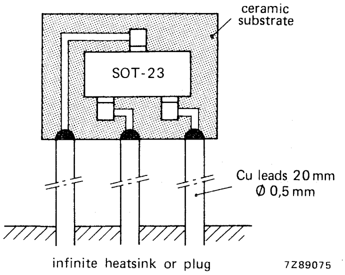


Fig.1 Test circuit for SOT23 $R_{th\ j\text{-}s}$ measurement; ceramic substrate 8 x 10 x 0.7 mm.

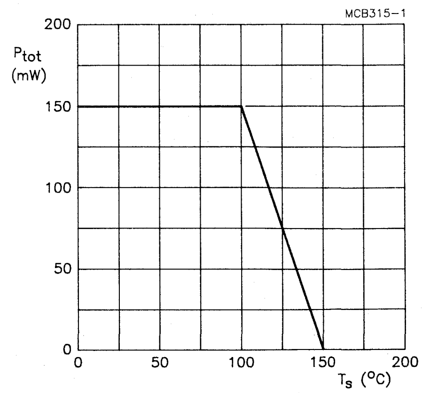


Fig.2 Power derating curve, junction to case.

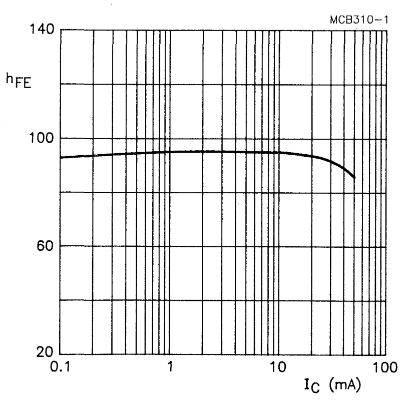


Fig.3 Current gain as a function of collector current; V_{CE} = 10 V.

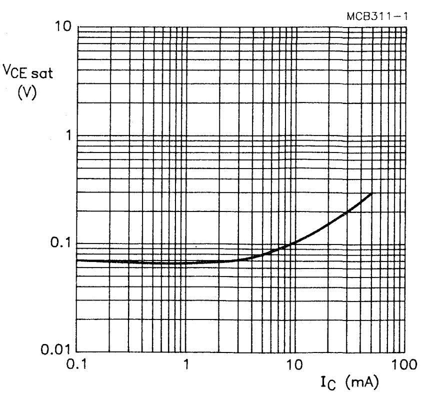


Fig.4 Collector-emitter saturation voltage as a function of collector current; I_C/I_B = 10.

NPN 1 GHz wideband transistor

BF747

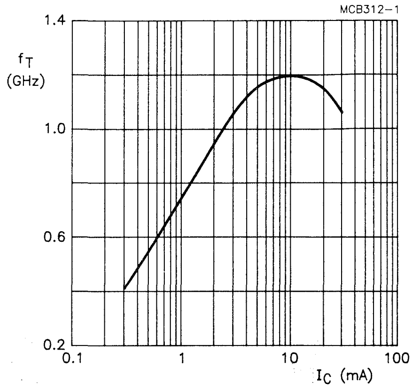


Fig.5 Transition frequency as a function of collector current; V_{CE} = 10 V; f = 500 MHz.

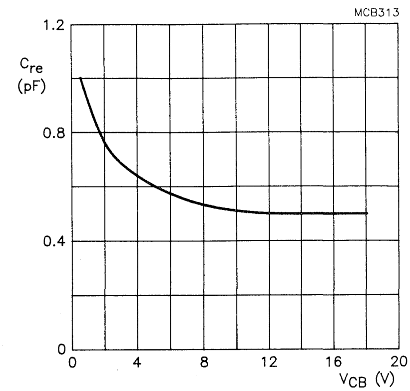


Fig.6 Feedback capacitance as a function of voltage; $I_E = i_e = 0$; f = 1 MHz.

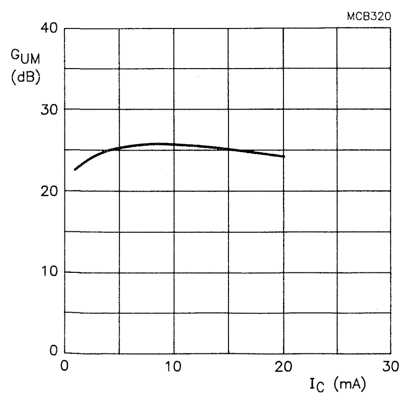


Fig.7 Common-emitter G_{UM} as a function of collector current; V_{CE} = 10 V; f = 100 MHz.

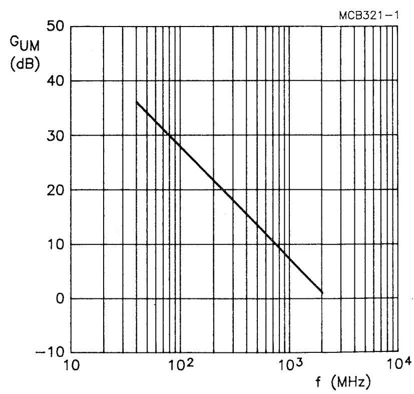


Fig.8 Common-emitter G_{UM} as a function of frequency; V_{CE} = 10 V; I_C = 15 mA.

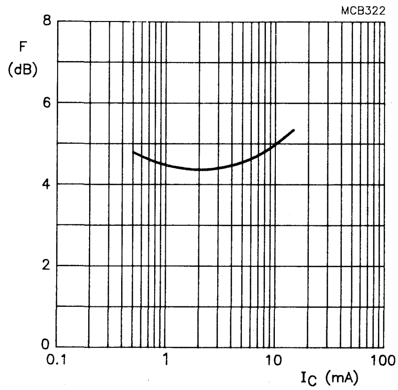


Fig.9 Common-emitter noise figure as a function of collector current; V_{CE} = 10 V; f = 100 MHz; $Z_S = Z_L$ = 50 Ω.

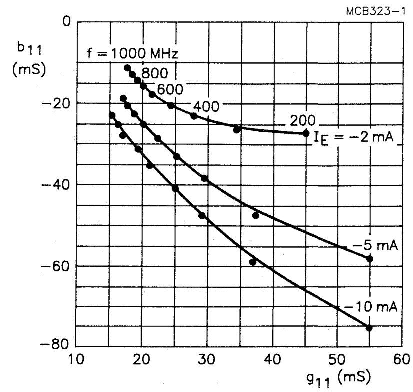


Fig.10 Common-base input admittance, Y_{11}; V_{CB} = 10 V.

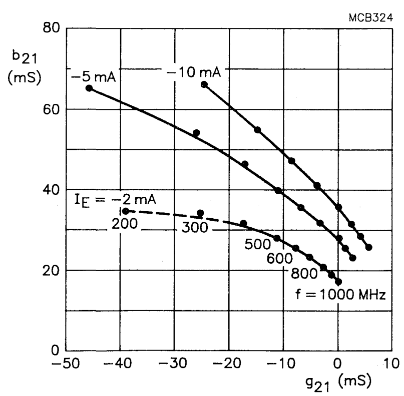


Fig.11 Common-base forward admittance, Y_{21}; V_{CB} = 10 V.

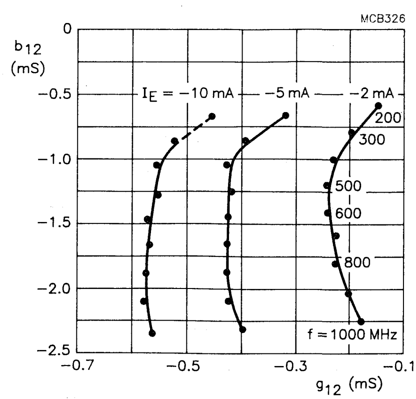


Fig.12 Common-base reverse admittance, Y_{12}; V_{CB} = 10 V.

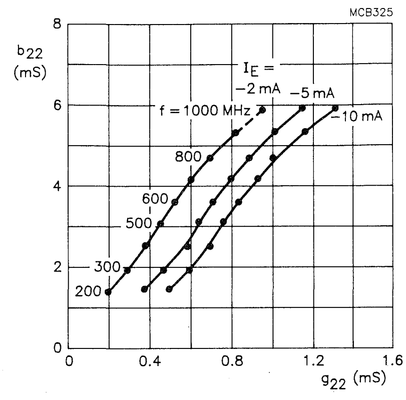


Fig.13 Common-base output admittance, Y_{22}; V_{CB} = 10 V.

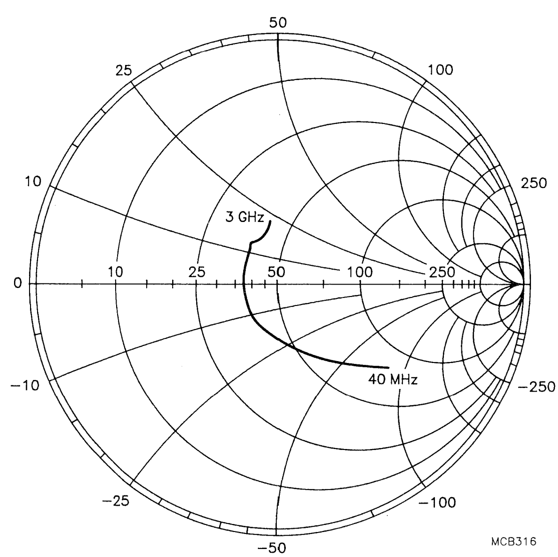


Fig.14 Common-emitter input reflection coefficient, S_{11}; V_{CE} = 10 V; I_C = 15 mA.

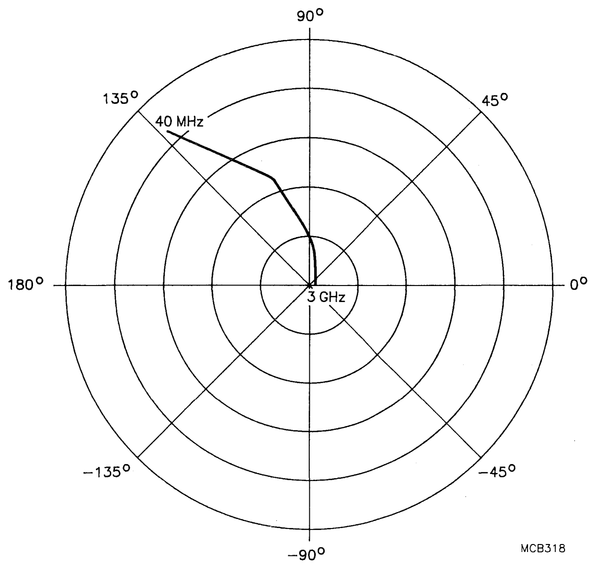


Fig.15 Common-emitter forward transmission coefficient, S_{21}; V_{CE} = 10 V; I_C = 15 mA.

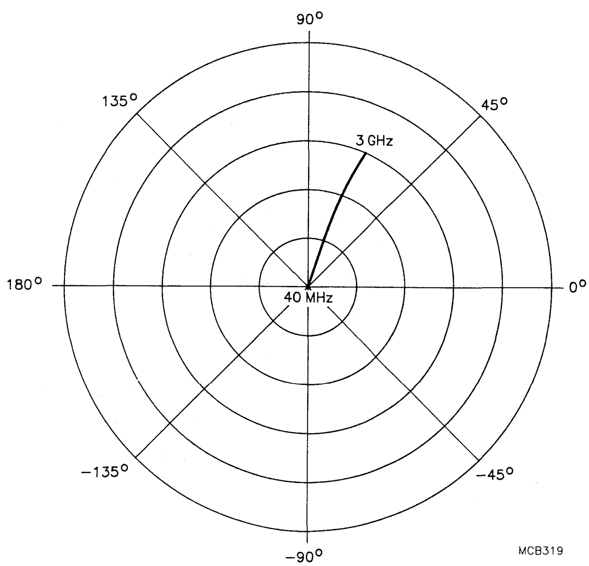


Fig.16 Common-emitter reverse transmission coefficient, S_{12}; V_{CE} = 10 V; I_C = 15 mA.

NPN 1 GHz wideband transistor

BF747

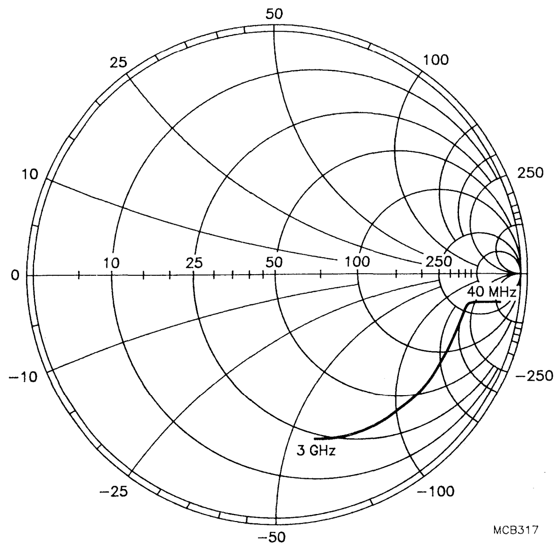


Fig.17 Common-emitter output transmission coefficient, S_{22}; V_{CE} = 10 V; I_C = 15 mA.

Y-Parameters (common-base) at V_{CB} = 10 V; I_E = −2 mA; typical values.

FREQUENCY (MHz)	Y_{11}		Y_{21}		Y_{12}		Y_{22}	
	Real (mS)	Imag (mS)	Real (mS)	Imag (mS)	Real (mS)	Imag (mS)	Real (mS)	Imag (mS)
40.00	68.9746	−10.271	−67.9160	12.3298	−.0200	− .1000	−.0130	.29080
100.00	60.4233	−20.585	−57.9200	25.6144	−.0600	− .3000	−.0840	.70980
200.00	45.0125	−27.430	−39.0830	34.4796	−.1000	− .6000	.1943	1.35389
300.00	34.2639	−26.441	−25.4210	33.9009	−.2000	− .8000	.2948	1.91811
400.00	27.6753	−23.366	−17.2450	31.1112	−.2000	−1.0036	.3728	2.50881
500.00	23.9258	−20.416	−11.6530	27.6373	−.2000	−1.2020	.4471	3.04457
600.00	21.4986	−17.909	− 7.8471	25.0050	−.2000	−1.4026	.5253	3.59467
700.00	20.0348	−15.630	− 5.3109	22.6341	−.2000	−1.5963	.5974	4.17222
800.00	18.6263	−14.039	− 2.9007	20.1675	−.2000	−1.8013	.6929	4.70894
900.00	18.2579	−12.788	− 1.3647	18.7133	−.2000	−2.0306	.8206	5.29419
1000.00	17.8426	−11.684	− .0660	17.1226	−.2000	−2.2498	.9520	5.88614

Y-Parameters (common-base) at V_{CB} = 10 V; I_E = –5 mA; typical values.

FREQUENCY (MHz)	Y_{11}		Y_{21}		Y_{12}		Y_{22}	
	Real (mS)	Imag (mS)	Real (mS)	Imag (mS)	Real (mS)	Imag (mS)	Real (mS)	Imag (mS)
40.00	132.6450	–35.658	–130.47000	38.7532	–.060	– .2000	–.05600	.36870
100.00	96.3278	–62.045	– 91.06400	67.9477	–.200	– .5000	.20970	.83980
200.00	54.7356	–57.831	– 45.98500	64.7007	–.300	– .7000	.37680	1.42279
300.00	37.5006	–46.867	– 26.38900	53.7615	–.400	– .8000	.46800	1.95355
400.00	29.1994	–38.645	– 16.63700	45.7605	–.400	–1.0430	.58050	2.52321
500.00	25.2687	–32.798	– 11.03600	39.7522	–.400	–1.2500	.63100	3.09770
600.00	22.0303	–28.445	– 6.27570	34.9583	–.400	–1.4469	.70520	3.63913
700.00	20.2654	–25.198	– 3.34920	31.4025	–.400	–1.6459	.80310	4.21016
800.00	18.6656	–22.649	– .60000	27.6064	–.400	–1.8593	.87660	4.73938
900.00	17.8189	–20.746	1.38032	25.2334	–.400	–2.0839	1.00727	5.31269
1000.00	17.2772	–19.065	2.92948	23.0084	–.400	–2.3053	1.15011	5.92755

Y-Parameters (common-base) at V_{CB} = 10 V; I_E = –10 mA; typical values.

FREQUENCY (MHz)	Y_{11}		Y_{21}		Y_{12}		Y_{22}	
	Real (mS)	Imag (mS)	Real (mS)	Imag (mS)	Real (mS)	Imag (mS)	Real (mS)	Imag (mS)
40.00	189.0470	–79.568	–185.47000	82.9150	–.090	– .3000	–.08600	.43550
100.00	108.5130	–99.005	–101.43000	105.3800	–.300	– .5000	.32930	.87400
200.00	55.2449	–76.232	– 44.63200	82.8056	–.500	– .7000	.49110	1.40994
300.00	37.1349	–59.012	– 24.28100	65.6604	–.500	– .9000	.60430	1.96058
400.00	28.8268	–47.567	– 14.57300	54.4220	–.600	–1.0467	.68940	2.52179
500.00	24.6784	–40.178	– 8.56610	46.6501	–.600	–1.2644	.75390	3.09189
600.00	21.2460	–35.017	– 3.39520	40.7817	–.600	–1.4688	.84080	3.63543
700.00	19.2824	–30.939	– .20000	36.2027	–.600	–1.6715	.93220	4.20978
800.00	17.1543	–27.470	2.55300	31.1491	–.600	–1.8634	.99920	4.71616
900.00	16.4469	–25.237	4.57622	28.3362	–.600	–2.1025	1.15185	5.31337
1000.00	15.8137	–23.001	6.03713	25.4579	–.600	–2.3336	1.31127	5.90833

Y-Parameters (common-base) at V_{CB} = 10 V; I_E = –15 mA; typical values.

FREQUENCY (MHz)	Y_{11}		Y_{21}		Y_{12}		Y_{22}	
	Real (mS)	Imag (mS)	Real (mS)	Imag (mS)	Real (mS)	Imag (mS)	Real (mS)	Imag (mS)
40.00	206.4780	–113.760	–202.64000	118.0530	–.200	– .3000	.18780	.47790
100.00	104.3290	–113.970	– 96.42500	120.0870	–.400	– .5000	.41900	.87720
200.00	53.0622	– 81.120	– 41.70000	87.7035	–.500	– .7000	.57550	1.41575
300.00	35.9283	– 62.076	– 21.91000	68.6039	–.600	– .8000	.65550	1.93670
400.00	28.0704	– 50.027	– 12.48400	56.9216	–.600	–1.0609	.75580	2.52909
500.00	23.4107	– 42.306	– 6.08020	48.2499	–.600	–1.2607	.81790	3.07778
600.00	20.1019	– 36.373	– 1.22150	41.5856	–.600	–1.4610	.89420	3.61247
700.00	18.1804	– 32.035	2.01096	36.6737	–.600	–1.6677	.99970	4.18590
800.00	16.1524	– 28.238	4.48487	31.3273	–.600	–1.8612	1.09358	4.71538
900.00	15.4557	– 25.677	6.45024	28.0793	–.600	–2.1019	1.26238	5.28396
1000.00	14.6838	– 23.452	7.89223	24.8572	–.600	–2.3163	1.39668	5.87286

NPN 1 GHz wideband transistor | BF747

S-Parameters (common-base) at V_{CE} = 10 V; I_C = 2 mA; typical values.

FREQUENCY (MHz)	S_{11} Mag (rat)	S_{11} Ang (deg)	S_{21} Mag (rat)	S_{21} Ang (deg)	S_{12} Mag (rat)	S_{12} Ang (deg)	S_{22} Mag (rat)	S_{22} Ang (deg)	G_{UM} (dB)
40	.891	− 17.1	5.90	160.4	.013	79.3	.986	− 4.0	37.7
100	.741	− 37.1	4.89	137.9	.027	69.4	.936	− 7.8	26.2
200	.522	− 55.9	3.38	115.3	.044	64.0	.882	−10.6	18.4
300	.404	− 65.8	2.48	103.2	.057	63.2	.857	−12.6	14.4
400	.332	− 73.3	1.97	94.4	.070	63.0	.847	−14.6	11.8
500	.288	− 78.7	1.62	88.0	.081	63.2	.839	−16.9	9.8
600	.258	− 84.7	1.39	82.5	.092	63.1	.835	−19.3	8.3
700	.233	− 89.2	1.23	77.9	.102	62.7	.833	−21.7	7.1
800	.213	− 95.0	1.10	73.8	.112	62.5	.829	−24.0	6.0
900	.199	−100.3	1.00	70.0	.122	62.0	.827	−26.4	5.1
1000	.184	−106.5	.93	66.6	.131	61.9	.822	−28.8	4.4
1200	.154	−120.2	.82	59.6	.148	61.1	.812	−33.5	3.0
1400	.142	−134.3	.74	53.9	.164	60.8	.807	−38.5	2.0
1600	.131	−146.0	.68	50.0	.178	60.9	.799	−43.2	1.1
1800	.121	−161.9	.64	45.9	.194	60.9	.792	−47.6	.4
2000	.117	−179.8	.60	41.0	.207	60.4	.771	−52.2	−.3

S-Parameters (common-base) at V_{CE} = 10 V; I_C = 5 mA; typical values.

FREQUENCY (MHz)	S_{11} Mag (rat)	S_{11} Ang (deg)	S_{21} Mag (rat)	S_{21} Ang (deg)	S_{12} Mag (rat)	S_{12} Ang (deg)	S_{22} Mag (rat)	S_{22} Ang (deg)	G_{UM} (dB)
40	.767	− 26.3	11.30	149.3	.011	75.8	.956	− 6.0	35.6
100	.542	− 49.1	7.60	123.2	.022	67.6	.875	− 8.8	25.4
200	.359	− 65.2	4.49	104.5	.036	66.7	.827	−10.1	18.6
300	.283	− 75.2	3.14	95.4	.049	66.7	.811	−11.8	14.9
400	.244	− 84.2	2.45	88.6	.061	66.5	.804	−13.9	12.5
500	.214	− 92.4	1.99	83.5	.073	66.5	.798	−16.0	10.5
600	.196	−100.7	1.69	78.7	.083	66.6	.797	−18.5	9.1
700	.180	−108.6	1.48	74.7	.093	66.6	.797	−20.8	7.9
800	.170	−115.6	1.31	71.2	.102	66.5	.796	−23.1	6.8
900	.156	−123.6	1.19	67.7	.112	66.1	.792	−25.4	5.9
1000	.146	−131.7	1.10	64.4	.121	66.0	.790	−27.8	5.2
1200	.132	−150.4	.96	57.6	.138	65.9	.783	−32.5	3.9
1400	.132	−164.8	.85	52.4	.155	65.9	.778	−37.4	2.7
1600	.133	−176.8	.78	48.4	.172	66.2	.776	−42.1	1.9
1800	.132	169.3	.72	44.4	.189	66.3	.770	−46.5	1.2
2000	.140	152.4	.67	39.3	.205	65.5	.752	−50.9	.3

NPN 1 GHz wideband transistor BF747

S-Parameters (common-base) at V_{CE} = 10 V; I_C = 10 mA; typical values.

FREQUENCY (MHz)	S_{11}		S_{21}		S_{12}		S_{22}		G_{UM} (dB)
	Mag (rat)	Ang (deg)	Mag (rat)	Ang (deg)	Mag (rat)	Ang (deg)	Mag (rat)	Ang (deg)	
40	.637	− 34.1	15.48	139.4	.010	72.6	.921	− 7.3	34.2
100	.416	− 54.7	8.90	114.2	.020	68.9	.837	− 8.5	25.0
200	.283	− 71.9	4.95	99.1	.033	68.5	.802	− 9.4	18.7
300	.236	− 84.8	3.42	91.6	.046	68.3	.790	−11.1	15.1
400	.204	− 97.7	2.64	85.3	.057	68.0	.785	−13.2	12.7
500	.186	−108.3	2.14	80.6	.068	68.5	.781	−15.5	10.8
600	.173	−117.8	1.81	76.1	.077	68.8	.780	−17.7	9.4
700	.155	−127.4	1.58	72.3	.087	69.2	.781	−20.1	8.2
800	.151	−134.7	1.40	68.8	.097	69.4	.781	−22.5	7.1
900	.143	−143.3	1.26	65.3	.106	69.3	.778	−24.7	6.1
1000	.139	−152.2	1.16	62.3	.115	69.4	.779	−27.0	5.4
1200	.135	−170.8	1.01	55.5	.134	69.4	.773	−31.7	4.1
1400	.139	177.6	.89	50.3	.152	69.2	.768	−36.7	2.9
1600	.143	167.4	.80	46.4	.170	69.4	.766	−41.4	2.0
1800	.146	152.2	.74	42.6	.188	69.4	.762	−45.9	1.3
2000	.161	140.1	.69	37.5	.205	68.3	.746	−50.4	.4

S-Parameters (common-base) at V_{CE} = 10 V; I_C = 15 mA; typical values.

FREQUENCY (MHz)	S_{11}		S_{21}		S_{12}		S_{22}		G_{UM} (dB)
	Mag (rat)	Ang (deg)	Mag (rat)	Ang (deg)	Mag (rat)	Ang (deg)	Mag (rat)	Ang (deg)	
40	.564	− 37.9	16.88	133.4	.009	73.0	.901	− 7.4	33.4
100	.365	− 57.3	8.99	110.3	.019	69.4	.826	− 7.9	24.7
200	.260	− 75.7	4.93	96.9	.032	69.3	.797	− 8.9	18.5
300	.216	− 91.4	3.41	89.8	.044	69.2	.786	−10.8	15.0
400	.187	−105.1	2.63	83.7	.055	69.3	.781	−12.9	12.6
500	.174	−116.4	2.12	79.0	.066	69.9	.779	−15.1	10.7
600	.160	−126.6	1.80	74.4	.075	70.1	.778	−17.4	9.2
700	.152	−136.3	1.56	70.5	.085	70.7	.781	−19.8	8.1
800	.143	−145.0	1.38	67.0	.095	71.0	.780	−22.1	6.9
900	.138	−152.1	1.24	63.7	.104	70.9	.780	−24.4	6.0
1000	.136	−161.8	1.14	60.5	.113	71.0	.778	−26.7	5.3
1200	.137	−178.2	.99	53.9	.132	70.9	.774	−31.5	3.9
1400	.144	168.8	.87	48.6	.151	70.6	.770	−36.4	2.8
1600	.145	159.4	.78	44.6	.169	70.9	.768	−41.2	1.9
1800	.150	146.2	.73	41.0	.188	70.8	.764	−45.7	1.1
2000	.167	134.2	.67	35.9	.206	69.5	.748	−50.3	.3

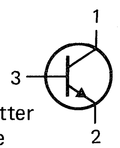
NPN 2 GHz WIDEBAND TRANSISTOR

NPN transistor in a TO-92 envelope. It is primarily intended for use in HF amplifiers and UHF 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 DC	I_C	max.	25	mA
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	500	mW
Junction temperature	T_j	max.	150	°C
DC current gain I_C = 5 mA; V_{CE} = 10 V	h_{FE}	min. max.	25 250	
Transition frequency at f = 100 MHz I_C = 5 mA; V_{CE} = 10 V	f_T	typ.	1.8	GHz
Noise figure at Z_S = 60 Ω I_C = 5 mA; V_{CE} = 10 V; f = 800 MHz	F	typ.	5.0	dB

Fig. 1 TO-92 variant (see outlines section)



1. emitter
2. base
3. collector

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 DC	I_C	max.	25	mA
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	500	mW
Junction temperature	T_j	max.	150	°C
Storage temperature range	T_{stg}		−65 to +150	°C

THERMAL RESISTANCE

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

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-emitter breakdown voltage I_C = 1 mA; I_B = 0	$V_{(BR)CEO}$	max.	15	V
Collector-base breakdown voltage I_C = 10 μA; I_E = 0	$V_{(BR)CBO}$	max.	25	V
Collector cut-off current I_E = 0; V_{CB} = 10 V	I_{CBO}	max.	50	nA
DC current gain I_C = 5 mA; V_{CE} = 10 V	h_{FE}	min. max.	25 250	
Collector-emitter saturation voltage I_C = 10 mA, I_B = 1 mA	V_{CEsat}	max.	0.5	V
Transition frequency at f = 100 MHz I_C = 5 mA; V_{CE} = 10 V	f_T	typ.	1.8	GHz
Noise figure at Z_S = 60 Ω I_C = 5 mA; V_{CE} = 10 V; f = 800 MHz; T_{amb} = 25 °C	F	typ.	5.0	dB

Philips Components

Data sheet	
status	Product specification
date of issue	June 1990

BFG16A

NPN 1 GHz wideband transistor

DESCRIPTION

NPN transistor primarily intended for wideband amplifier, aerial amplifiers and vertical amplifiers in high speed oscilloscopes.
The BFG16A is mounted in a SOT223 plastic envelope.

FEATURES

- High power gain
- Good thermal stability
- Gold metallization ensures excellent reliability.

MECHANICAL DATA

Plastic SOT223 envelope

PINNING

PIN	DESCRIPTION
1	emitter
2	base
3	emitter
4	collector

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	-	-	40	V
V_{CEO}	collector-emitter voltage	open base	-	-	25	V
I_C	collector current (DC)		-	-	150	mA
P_{tot}	total power dissipation	T_{case} = 135 °C; (note 1)	-	-	1	W
T_j	junction temperature		-	-	175	°C
h_{FE}	DC current gain	I_C = 150 mA; V_{CE} = 5 V	25	-	-	
f_T	transition frequency	f = 500 MHz; I_C = 100 mA; V_{CE} = 10 V; T_{amb} = 25 °C	-	1.5	-	GHz
G_{UM}	maximum power gain	f = 500 MHz; I_C = 100 mA; V_{CE} = 10 V	-	10	-	dB

Note

1. T_{case} temperature measured on soldering point of collector tab.

ORDERING AND PACKAGE INFORMATION

EXTENDED TYPE NUMBER	PACKAGE		
	CODE	PACKING METHOD	PACKING QUANTITY
BFG16A	SOT223	bulk	500
BFG16A	SOT223	12 mm REEL	1000

LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	-	40	V
V_{CEO}	collector-emitter voltage	open base	-	25	V
V_{EBO}	emitter-base voltage	open collector	-	2	V
I_C	collector current (DC)		-	150	mA
P_{tot}	total power dissipation	T_{case} = 135 °C	-	1	W
T_{stg}	storage temperature range		−65	+150	°C
T_j	junction temperature		-	175	°C

THERMAL RESISTANCE

SYMBOL	PARAMETER	MAX.	UNIT
$R_{th\ j\text{-}c}$	from junction to case.	40	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)CBO}$	collector-base breakdown voltage	open emitter I_C = 0.1 mA	25	-	-	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	open base I_C = 10 mA	18	-	-	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	open collector I_E = 0.1 mA	3	-	-	V
I_{CBO}	collector cut-off current	I_E = 0; V_{CB} = 28 V	-	-	20	μA
h_{FE}	DC current gain	I_C = 50 mA/ 150 mA; V_{CE} = 5 V	25	-	-	
C_c	collector capacitance	f = 1 MHz; $I_E = i_e$ = 0; V_{CB} = 10 V	-	2.5	-	pF
C_e	emitter capacitance	f = 1 MHz; $I_C = i_c$ = 0; V_{EB} = 0.5 V	-	10.0	-	pF
C_{re}	feedback capacitance	f = 1 MHz; I_C = 0 mA; V_{CB} = 10 V	-	1.8	-	pF
f_T	transition frequency	f = 500 MHz; I_C = 100 mA; V_{CE} = 10 V; T_{amb} = 25 °C	-	1.5	-	GHz
G_{UM}	maximum power gain	f = 500 MHz; I_C = 100 mA; V_{CE} = 10 V; T_{amb} = 25 °C	-	10	-	dB

NPN 1 GHz wideband transistor BFG16A

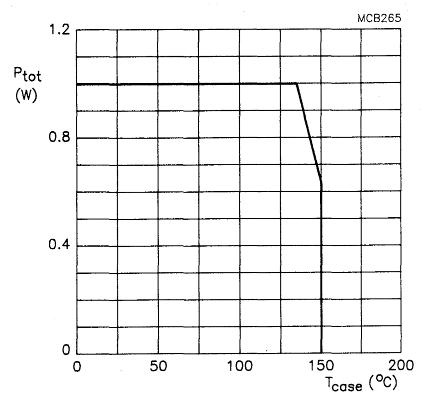


Fig.1 Power derating curve.

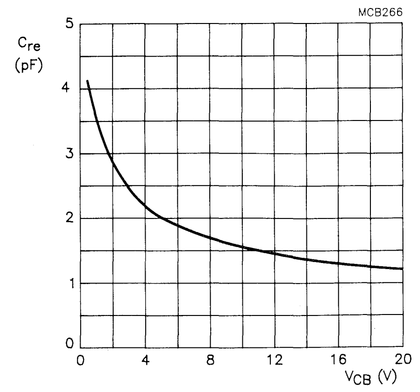


Fig.2 Feedback capacitance as function of collector-base voltage; $I_C = i_c = 0$; f = 1 MHz.

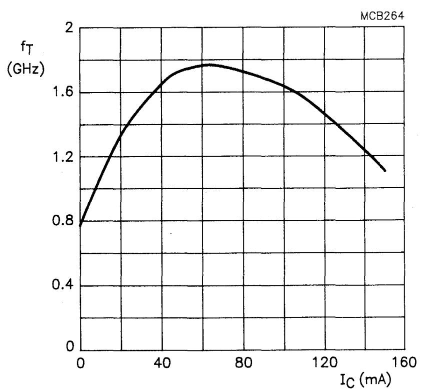


Fig.3 Transition frequency as function of collector current; V_{CE} = 10 V; f = 500 MHz.

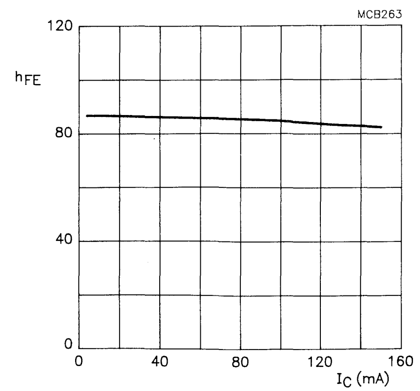


Fig.4 Current gain as function of collector current; V_{CE} = 10 V.

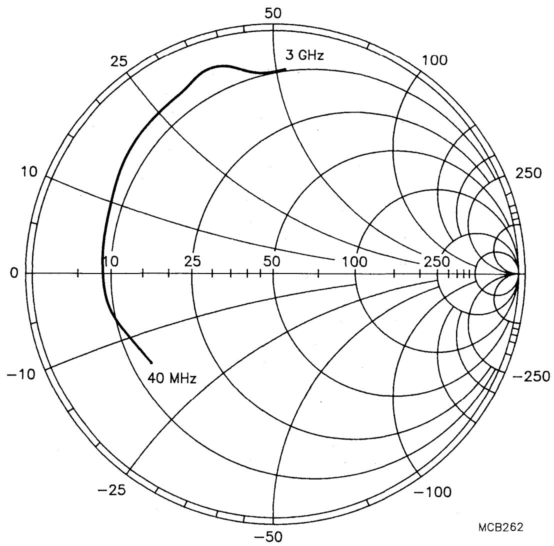


Fig.5 Common emitter input reflection coefficient, S_{11}; V_{CE} = 15 V; I_C = 70 mA.

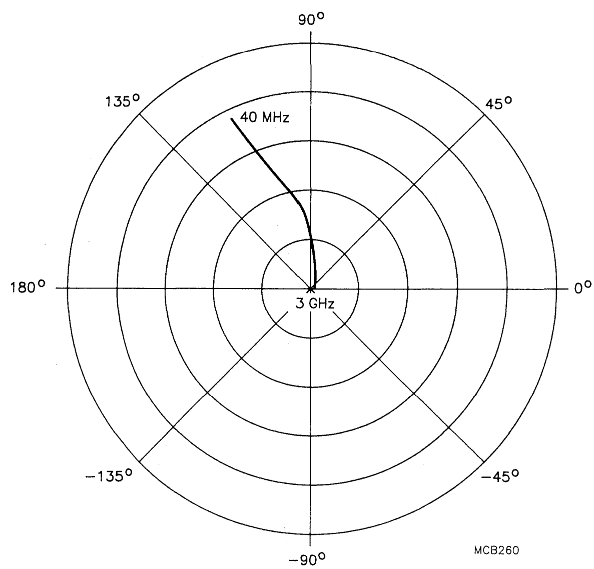


Fig.6 Common emitter forward transmission coefficient, S_{21}; V_{CE} = 15 V; I_C = 70 mA.

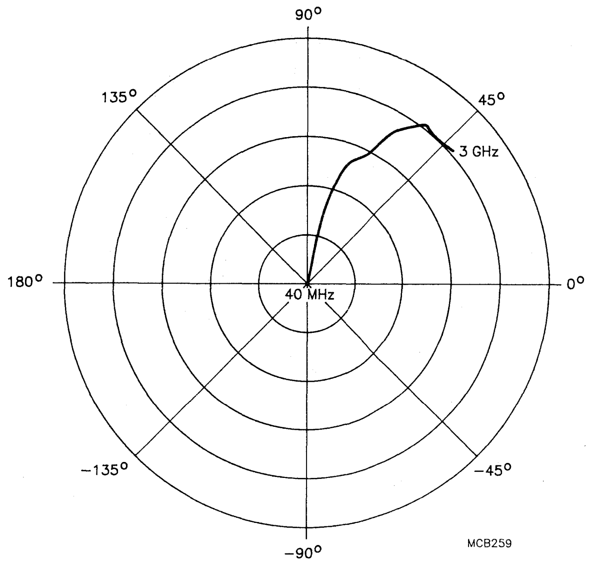


Fig.7 Common emitter reverse transmission coefficient, S_{12}; V_{CE} = 15 V; I_C = 70 mA.

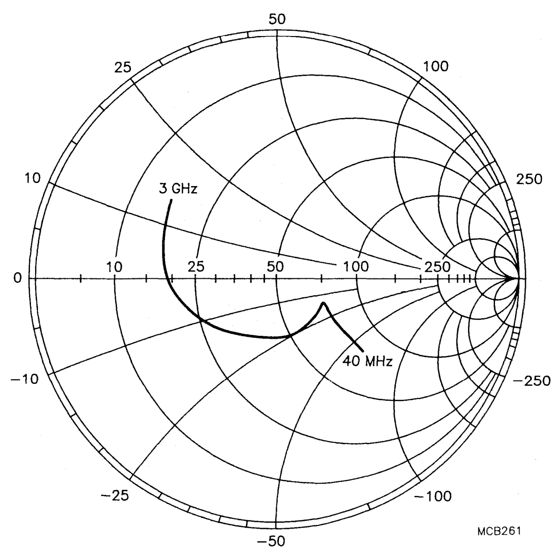


Fig.8 Common emitter output transmission coefficient, S_{22}; V_{CE} = 15 V; I_C = 70 mA.

NPN 1 GHz wideband transistor | BFG16A

S-Parameters (common-emitter) at V_{CE} = 15 V; I_C = 70 mA; typical values.

FREQUENCY (MHz)	S_{11} M (rat)	S_{11} Φ (deg)	S_{21} M (rat)	S_{21} Φ (deg)	S_{12} M (rat)	S_{12} Φ (deg)	S_{22} M (rat)	S_{22} Φ (deg)	G_{UM} (dB)
40	.622	−144.5	36.80	113.9	.011	50.6	.465	− 41.8	34.51
100	.679	−167.0	16.10	96.5	.016	57.8	.278	− 36.4	27.23
200	.694	−177.9	8.24	85.9	.026	67.8	.230	− 29.4	21.42
300	.699	176.7	5.54	79.1	.038	71.3	.220	− 29.1	18.01
400	.707	172.6	4.15	73.1	.049	73.4	.218	− 31.4	15.60
500	.710	168.6	3.32	67.9	.060	74.2	.218	− 35.0	13.69
600	.714	164.9	2.79	62.8	.071	75.8	.219	− 39.8	12.23
700	.721	161.5	2.39	58.0	.082	76.0	.221	− 45.2	10.98
800	.726	157.9	2.10	53.5	.093	76.1	.222	− 51.8	9.95
900	.733	154.2	1.88	49.1	.105	76.0	.226	− 58.6	9.08
1000	.740	150.6	1.70	44.9	.116	75.9	.229	− 66.0	8.34
1200	.760	144.2	1.42	36.6	.140	76.9	.240	− 81.7	7.06
1400	.778	137.8	1.20	29.2	.171	75.7	.258	− 98.1	5.97
1600	.786	132.2	1.04	21.7	.199	74.0	.281	−115.1	4.88
1800	.795	124.4	.92	15.1	.230	72.4	.309	−132.0	4.11
2000	.820	118.0	.82	9.5	.270	69.0	.346	−148.4	3.67

S-Parameters (common-emitter) at V_{CE} = 10 V; I_C = 100 mA; typical values.

FREQUENCY (MHz)	S_{11} M (rat)	S_{11} Φ (deg)	S_{21} M (rat)	S_{21} Φ (deg)	S_{12} M (rat)	S_{12} Φ (deg)	S_{22} M (rat)	S_{22} Φ (deg)	G_{UM} (dB)
40	.656	−157.2	34.60	109.7	.009	52.0	.376	− 51.1	33.90
100	.709	−172.5	14.80	94.4	.016	63.2	.201	− 46.9	26.64
200	.718	179.3	7.49	84.6	.028	71.6	.154	− 39.2	20.76
300	.729	174.6	5.03	77.9	.041	73.9	.145	− 38.3	17.43
400	.733	170.7	3.78	71.9	.053	75.2	.143	− 41.0	14.99
500	.736	167.4	3.01	66.6	.065	75.5	.144	− 45.3	13.08
600	.742	163.6	2.52	61.7	.077	76.1	.146	− 51.2	11.63
700	.745	160.1	2.18	56.5	.089	75.9	.150	− 58.3	10.40
800	.751	156.7	1.91	52.1	.101	75.7	.154	− 66.4	9.35
900	.757	152.8	1.71	47.7	.114	75.3	.161	− 74.8	8.51
1000	.764	149.5	1.55	43.3	.126	75.0	.169	− 83.9	7.77
1200	.781	142.8	1.28	35.3	.152	75.2	.190	−101.6	6.46
1400	.798	136.7	1.09	28.2	.184	73.4	.219	−118.9	5.43
1600	.804	130.6	.94	21.4	.213	71.1	.252	−135.6	4.34
1800	.809	123.4	.83	14.8	.244	69.1	.291	−151.4	3.48
2000	.832	116.7	.74	9.6	.284	65.4	.340	−166.2	3.05

S-Parameters (common-emitter) at V_{CE} = 10 V; I_C = 70 mA; typical values.

FREQUENCY (MHz)	S_{11} M (rat)	S_{11} Φ (deg)	S_{21} M (rat)	S_{21} Φ (deg)	S_{12} M (rat)	S_{12} Φ (deg)	S_{22} M (rat)	S_{22} Φ (deg)	G_{UM} (dB)
40	.644	−150.5	35.00	112.5	.011	50.8	.417	− 51.5	34.06
100	.700	−169.8	15.20	95.7	.017	58.0	.218	− 50.4	26.81
200	.715	−179.5	7.75	85.5	.028	68.1	.157	− 43.2	21.01
300	.721	175.4	5.21	78.6	.041	71.7	.145	− 41.7	17.62
400	.725	171.5	3.91	72.7	.053	73.7	.141	− 43.9	15.17
500	.731	167.8	3.12	67.4	.065	74.2	.141	− 47.9	13.31
600	.734	163.9	2.62	62.2	.077	75.0	.143	− 53.6	11.83
700	.740	160.6	2.25	57.3	.090	75.1	.146	− 60.4	10.61
800	.743	157.2	1.98	52.8	.101	74.7	.152	− 68.0	9.57
900	.748	153.4	1.78	48.5	.114	74.5	.158	− 76.2	8.69
1000	.758	149.9	1.61	44.2	.126	74.2	.166	− 85.0	7.96
1200	.776	143.2	1.34	35.9	.151	74.5	.188	−102.5	6.73
1400	.791	137.2	1.13	28.6	.183	72.8	.218	−119.2	5.61
1600	.794	131.0	.98	21.7	.213	70.7	.253	−135.7	4.51
1800	.804	123.8	.87	15.1	.243	68.9	.293	−151.2	3.72
2000	.827	117.0	.76	10.1	.282	65.2	.342	−166.0	3.26

S-Parameters (common-emitter) at V_{CE} = 5 V; I_C = 150 mA; typical values.

FREQUENCY (MHz)	S_{11} M (rat)	S_{11} Φ (deg)	S_{21} M (rat)	S_{21} Φ (deg)	S_{12} M (rat)	S_{12} Φ (deg)	S_{22} M (rat)	S_{22} Φ (deg)	G_{UM} (dB)
40	.791	−172.2	16.70	104.0	.009	53.8	.178	− 80.7	28.87
100	.810	−179.6	7.15	94.4	.017	67.4	.100	− 99.1	21.78
200	.815	175.1	3.77	86.1	.031	75.1	.088	−114.9	16.32
300	.818	171.1	2.62	78.8	.047	76.2	.094	−123.8	13.23
400	.824	167.7	2.00	72.3	.061	77.0	.105	−130.3	11.02
500	.821	164.1	1.62	66.4	.076	76.8	.117	−135.8	9.14
600	.826	160.1	1.37	61.0	.091	76.9	.132	−141.0	7.85
700	.826	156.5	1.20	55.5	.106	76.2	.149	−145.8	6.68
800	.828	153.0	1.06	50.9	.122	75.0	.167	−150.6	5.72
900	.833	149.2	.96	46.4	.138	74.0	.186	−155.2	5.02
1000	.840	145.6	.88	42.2	.151	72.7	.207	−159.9	4.41
1200	.845	138.7	.74	35.4	.183	71.1	.248	−169.2	3.17
1400	.853	132.5	.64	29.9	.219	67.6	.293	−178.4	2.25
1600	.845	126.1	.56	25.3	.249	63.8	.339	171.9	1.08
1800	.844	119.2	.51	20.8	.278	60.6	.382	162.6	.30
2000	.856	112.5	.47	18.7	.315	56.2	.429	153.4	.21

NPN 2 GHz WIDEBAND TRANSISTOR

BFG17A is a npn wideband transistor in a microminature SOT143 envelope with double emitter bonding. The device contains a BFW92A crystal. This transistor is intended for use in wideband (40 to 860 MHz) aerial amplifiers using SMD technology.

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 (DC)	I_C	max.	50	mA
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	300	mW
Junction temperature	T_j	max.	150	°C
DC current gain	h_{FE}	min. max.	20 150	
Transition frequency at f = 500 MHz I_C = 25 mA; V_{CE} = 5 V	f_T	typ.	2.8	GHz
Feedback capacitance at f = 1 MHz I_C = 0; V_{CE} = 5 V	C_{re}	typ.	0.06	pF
Noise figure I_C = 2 mA; V_{CE} = 5 V; f = 800 MHz; Z_s = 600 Ω; T_{amb} = 25 °C	F	typ.	2.5	dB
Maximum unilateral power gain at f = 800 MHz; I_C = 14 mA; V_{CE} = 10 V; T_{amb} = 25 °C	G_{UM}	typ.	15	dB

MECHANICAL DATA

SOT143 (see outlines section).

Pinning

1 = collector
2 = base
3,4 = emitter

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 (DC)	I_C	max.	25 mA
Total power dissipation up to T_{amb} = 25 °C mounted on a ceramic substrate 8 x 10 x 0.7 mm	P_{tot}	max.	300 mW
Storage temperature range	T_{stg}		−65 to 150 °C
Junction temperature	T_j	max.	150 °C

THERMAL RESISTANCE

From junction to ambient mounted on ceramic substrate 8 x 10 x 0.7 mm	$R_{th\,j\text{-}a}$	=	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.	50 nA
DC current gain I_C = 2 mA; V_{CE} = 1 V	h_{FE}	min.	20
I_C = 25 mA; V_{CE} = 1 V	h_{FE}	max.	150
Transition frequency at f = 500 MHz I_C = 25 mA; V_{CE} = 5 V	f_T	typ.	2.8 GHz
Noise figure I_C = 2 mA; V_{CE} = 5 V; f = 800 MHz Z_s = 60 Ω; T_{amb} = 25 °C	F	typ.	2.5 dB
Collector capacitance at f = 1 MHz I_E = 0; V_{CB} = 10 V	C_c	typ.	0.7 pF
Emitter capacitance at f = 1 MHz I_C = 0; V_{EB} = 0.5 V	C_e	typ.	1.25 pF
Feedback capacitance at f = 1 MHz I_C = 0; V_{CE} = 5 V	C_{re}	typ.	0.6 pF
Maximum unilateral power gain at f = 800 MHz I_C = 14 mA; V_{CE} = 10 V; T_{amb} = 25 °C; S_{12} = 0			
$G_{UM} = 10 \log \dfrac{\lvert S_{21}\rvert^2}{(1-\lvert S_{11}\rvert^2)(1-\lvert S_{22}\rvert^2)}$	G_{UM}	typ.	15 dB

Output voltage at d_{im} = −60 dB
(DIN 45004B, para. 6,3: 3-tone)
I_C = 14 mA; V_{CE} = 10 V; Z_L = 75 Ω
$V_p = V_O$; 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

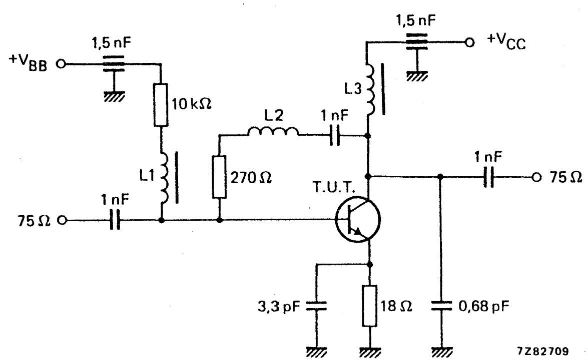


Fig.1 Intermodulation distortion and second harmonic distortion MATV test circuit.
L1 = L3 = 5 μH Ferroxcube choke.
L2 = 3 turns Copper wire (0.4 mm), internal diameter 3 mm, winding pitch 1 mm.

Table 1 S-parameters (common emitter)
Conditions: T_{amb} = 25 °C; V_{CE} = 10 V; typical values.

I_C (mA)	f (MHz)	S_{11} M Φ	S_{21} M Φ	S_{12} M Φ	S_{22} M Φ	G_{UM} (dB)
5	40	0.84/–19.4	14.3/168.2	0.02/67.7	0.98/–5.1	41.9
	100	0.77/–50.0	12.83/147.8	0.02/65.6	0.95/–13.0	35.7
	200	0.61/–84.3	9.31/128.7	0.03/54.4	0.80/–19.3	25.9
	500	0.51/–136;7	5.21/99.3	0.05/47.0	0.69/–26.2	18.5
	800	0.47/–157.4	3.51/84.6	0.06/50.3	0.63/–32.0	14.2
	1000	0.46/–168.7	2.86/75.4	0.07/51.4	0.64/–34.2	12.5
	1200	0.47/179.8	2.36/68.1	0.07/53.5	0.63/–38.9	10.7
	1500	0.46/173.4	1.96/60.2	0.09/56.8	0.57/–42.7	8.6
	2000	0.47/157.3	1.44/45.6	0.11/59.8	0.56/–55.6	5.9
10	40	0.75/–27.9	24.57/163.4	0.02/67.9	0.96/–8.1	42.8
	100	0.65/–68.5	19.95/138.6	0.02/58.9	0.86/–17.9	34.3
	200	0.52/–107.8	13.04/118.2	0.03/51.3	0.70/–22.3	26.6
	500	0.48/–152.8	6.31/91.7	0.04/54.2	0.59/–25.4	19.0
	800	0.45/–170.1	4.11/79.0	0.06/59.1	0.56/–30.5	14.9
	1000	0.46/–178.9	3.30/71.0	0.06/60.4	0.57/–32.2	13.1
	1200	0.47/171.4	2.72/64.6	0.07/62.0	0.56/–36.5	11.4
	1500	0.46/167.3	2.22/57.0	0.09/63.6	0.51/–40.8	9.3
	2000	0.47/152.7	1.63/43.4	0.11/64.3	0.51/–53.7	6.7
15	40	0.69/–34.4	31.29/159.8	0.02/62.6	0.94/–10.2	42.3
	100	0.59/–80.7	23.65/132.7	0.02/55.5	0.81/–20.2	34.0
	200	0.49/–120.7	14.46/112.6	0.02/52.5	0.64/–22.6	26.7
	500	0.47/–160.1	6.61/88.3	0.04/58.2	0.55/–23.7	19.1
	800	0.45/–174.7	4.25/76.3	0.05/63.3	0.53/–28.8	15.0
	1000	0.46/177.6	3.39/68.7	0.06/64.0	0.55/–30.6	13.2
	1200	0.47/168.6	2.79/62.6	0.07/65.0	0.54/–34.8	11.5
	1500	0.47/165.2	2.27/55.2	0.09/65.7	0.50/–39.6	9.4
	2000	0.48/151.1	1.65/42.0	0.11/66.0	0.51/–52.8	6.8
20	40	0.65/–39.4	35.51/157.2	0.02/54.5	0.93/–11.4	42.3
	100	0.56/–89.4	25.64/128.6	0.02/57.3	0.77/–20.9	33.7
	200	0.47/–128.5	14.99/109.0	0.02/53.5	0.61/–21.7	26.6
	500	0.47/–163.8	6.62/86.0	0.04/61.0	0.54/–22.0	19.0
	800	0.45/–176.8	4.21/74.5	0.05/66.0	0.52/–27.4	14.9
	1000	0.46/175.9	3.35/67.1	0.06/65.9	0.55/–29.4	13.1
	1200	0.47/167.4	2.75/61.2	0.07/66.7	0.55/–33.8	11.4
	1500	0.47/164.2	2.23/53.8	0.09/67.3	0.50/–38.8	9.3
	2000	0.48/150.4	1.62/40.9	0.11/67.1	0.51/–52.5	6.6
30	40	0.58/–51.2	39.39/150.7	0.01/57.5	0.89/–13.0	40.6
	100	0.50/–105.8	25.05/121.1	0.02/54.2	0.72/–19.3	32.3
	200	0.45/–141.0	13.65/103.2	0.02/55.2	0.60/–17.9	25.6
	500	0.46/–169.0	5.79/82.5	0.03/64.8	0.57/–19.0	18.0
	800	0.45/179.7	3.65/71.7	0.05/67.9	0.56/–25.7	13.8
	1000	0.46/173.1	2.89/64.5	0.06/67.9	0.58/–28.6	12.1
	1200	0.48/165.1	2.37/58.9	0.07/68.4	0.58/–33.9	10.4
	1500	0.48/161.8	1.91/51.9	0.09/69.2	0.53/–39.1	8.2
	2000	0.49/148.0	1.40/39.3	0.11/69.0	0.54/–53.8	5.6

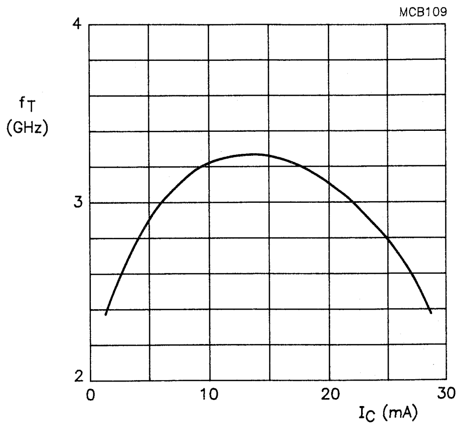


Fig.2 Transition frequency as a function of collector current; V_{CE} = 5 V; f = 500 MHz; T_{amb} = 25 °C.

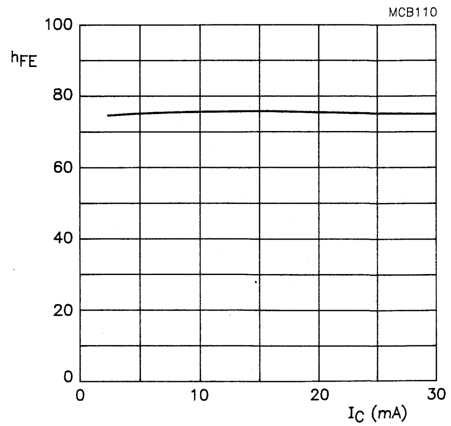


Fig.3 Current gain as a function of collector current; V_{CE} = 1 V; T_{amb} = 25 °C.

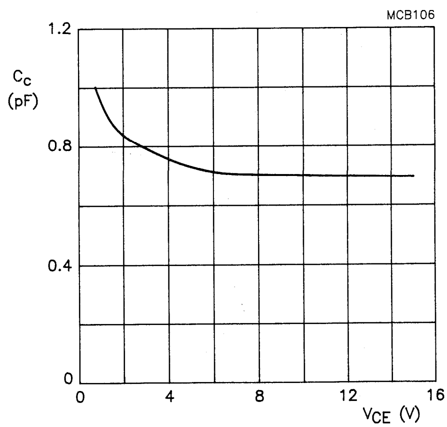


Fig.4 Collector capacitance as a function of collector-emitter voltage; f = 1 MHz; I_E = 0; T_{amb} = 25 °C.

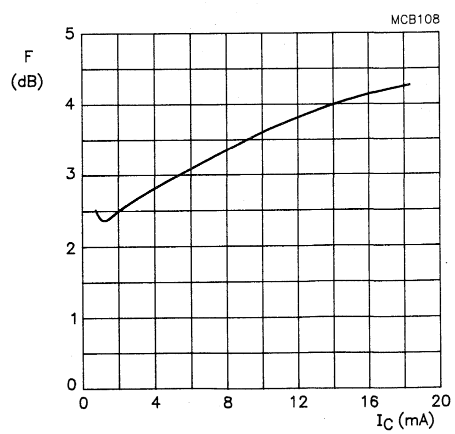


Fig.5 Noise figure as a function of collector current; V_{CE} = 5 V; f = 800 MHz; R_S = 60 Ω; b_s = opt.; T_{amb} = 25 °C.

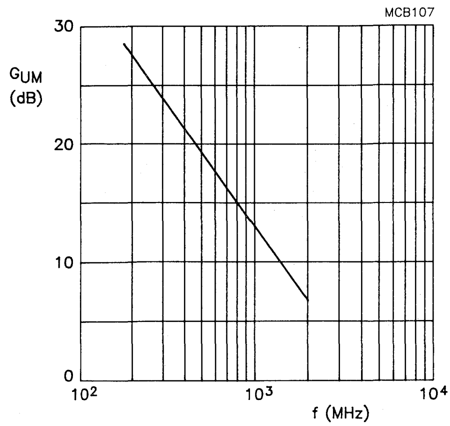


Fig.6 Maximum power gain as a function of frequency; V_{CE} = 10 V; I_C = 15 mA; T_{amb} = 25 °C.

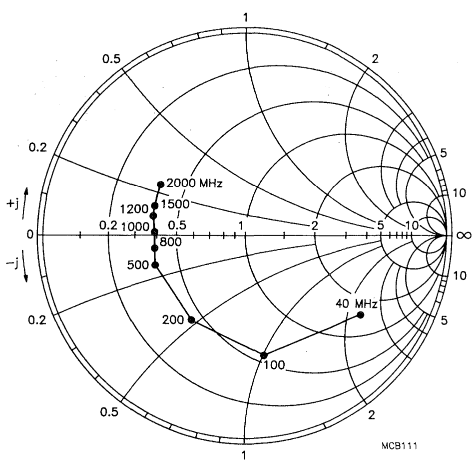


Fig.7 Input impedance derived from S_{11} (in Ohm x 50); V_{CE} = 10 V; I_C = 15 mA; T_{amb} = 25 °C.

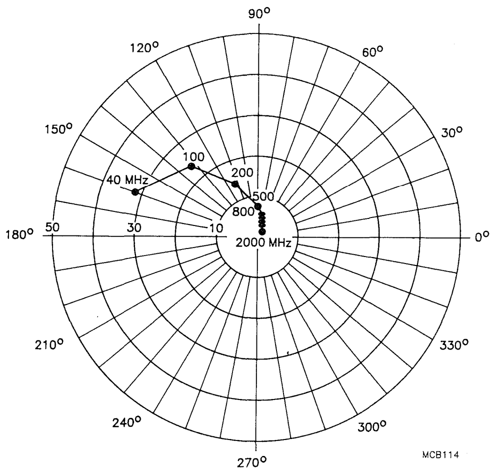


Fig.8 Forward transmission coefficient S_{21}; V_{CE} = 10 V; I_C = 15 mA; T_{amb} = 25 °C.

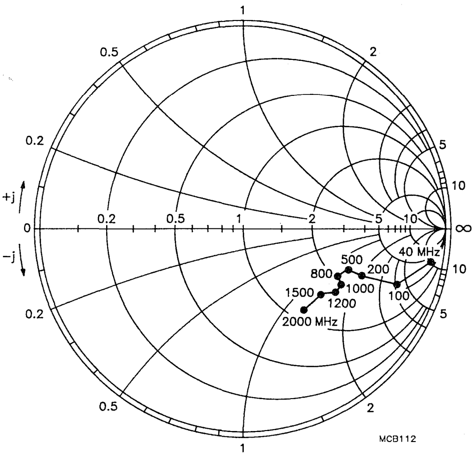


Fig.9 Output impedance derived from S_{22} (in Ohm x 50); V_{CE} = 10 V; I_C = 15 mA; T_{amb} = 25 °C.

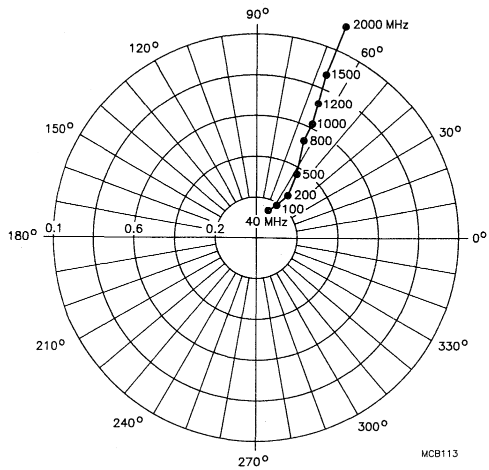


Fig.10 Reverse transmission coefficient S_{12}; V_{CE} = 10 V; I_C = 15 mA; T_{amb} = 25 °C.

PNP 5 GHz WIDEBAND TRANSISTOR

PNP transistor in a four-lead dual emitter plastic envelope (SOT103). This device is designed for application in wideband amplifiers, such as MATV and CATV systems, up to 5 GHz.

NPN 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 (DC)	$-I_C$	max.	35	mA
Total power dissipation up to T_{amb} = 60 °C	P_{tot}	max.	200	mW
Junction temperature	T_j	max.	175	°C
DC 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
Feedback capacitance at f = 1 MHz I_C = 0; $-V_{CE}$ = 10 V	C_{re}	typ.	0.8	pF
Noise figure at optimum source impedance $-I_C$ = 30 mA; $-V_{CE}$ = 8 V; f = 800 MHz	F	typ.	3.7	dB

MECHANICAL DATA

SOT103 (see outlines section).

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				
DC	$-I_C$	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.	200	mW
Storage temperature range	T_{stg}		−65 to +150	°C
Junction temperature	T_j	max.	175	°C

THERMAL RESISTANCE

From junction to ambient (free air) mounted on a fibre-glass print	$R_{th\ j\text{-}a}$	=	500	K/W
From junction to soldering point	$R_{th\ j\text{-}s}$	=	65	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
DC 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
Noise figure at optimum source impedance and $-V_{CE} = 8$ V; f = 800 MHz; T_{amb} = 25 °C				
at $-I_C = 4$ mA	F	typ.	2.3	dB
at $-I_C = 30$ mA	F	typ.	3.7	dB
Collector capacitance at f = 1 MHz				
$I_E = i_e = 0$; $-V_{CB} = 10$ V	C_c	typ.	1.2	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_{12} assumed to be zero)

$$G_{UM} = 10 \log \frac{|S_{21}|^2}{[1-|S_{11}|^2]\ [1-|S_{22}|^2]}$$

$-I_C = 30$ mA; $-V_{CE} = 5$ V; f = 800 MHz; T_{amb} = 25 °C	G_{UM}	typ.	14.5	dB
$-I_C = 30$ mA; $-V_{CE} = 5$ V; f = 2 GHz; T_{amb} = 25 °C	G_{UM}	typ.	7.0	dB

Output voltage at d_{im} = −60 dB I_C = −30 mA; $-V_{CE}$ = 8 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.	400 mV
Second harmonic distortion (see Fig. 1) $-I_C$ = 30 mA; $-V_{CE}$ = 8 V; R_L = 75 Ω; VSWR < 2; T_{amb} = 25 °C			
$V_p = V_O$ = 60 mV at f_p = 250 MHz $V_q = V_O$ = 60 mV at f_q = 560 MHz			
measured at $f_{(p+q)}$ = 810 MHz	d_2	typ.	−50 dB

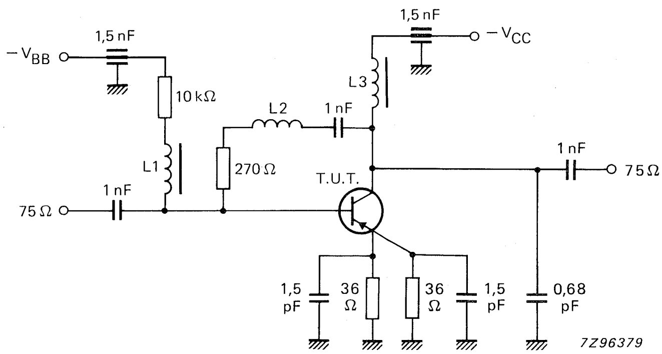


Fig.1 Intermodulation distortion and second harmonic distortion MATV test circuit.

L1 = L3 = 5 μH 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 V; typical values

$-I_C$ mA	f MHz	s_{11}	s_{21}	s_{12}	s_{22}	G_{UM} dB
	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
5	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
	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
10	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
	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
20	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
	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
30	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

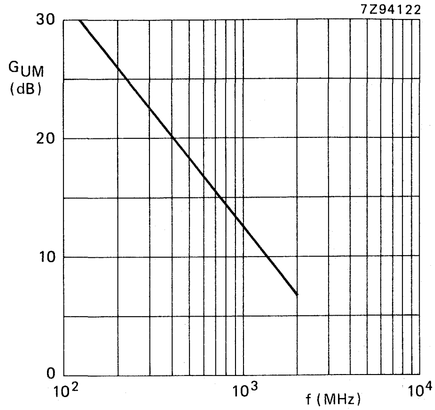


Fig.2 $-V_{CE} = 5$ V; $-I_C = 30$ mA; $T_{amb} = 25$ °C; typical values.

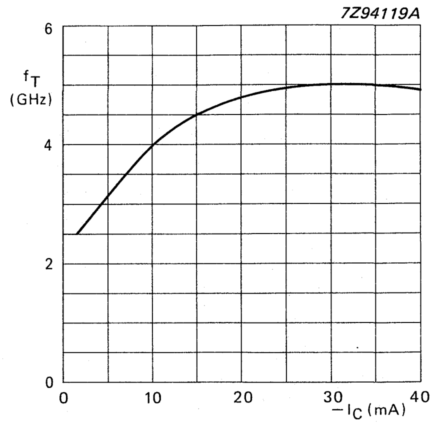


Fig.3 $-V_{CE} = 5$ V; f = 500 MHz; $T_{amb} = 25$ °C; typical values.

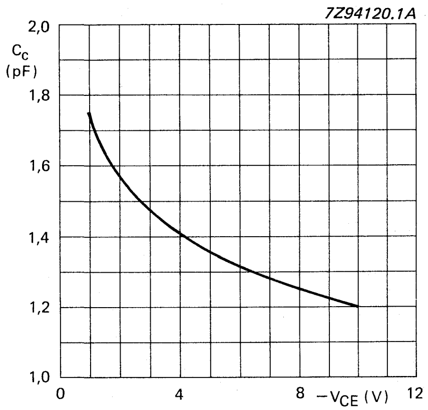


Fig.4 $I_E = i_e = 0$; f = 1 MHz; $T_j = 25$ °C; typical values.

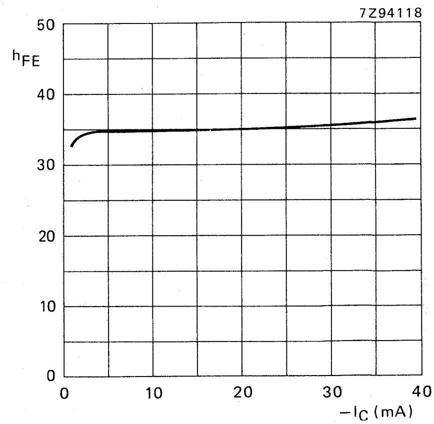


Fig.5 $-V_{CE} = 5$ V; $T_j = 25$ °C; typical values.

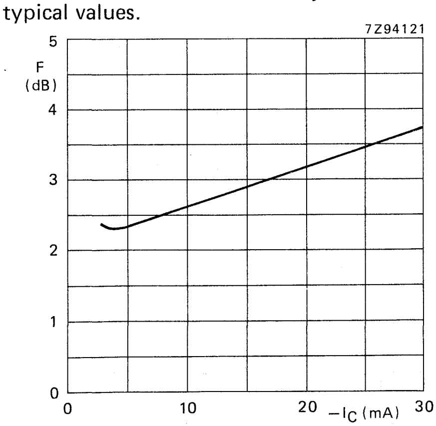


Fig.6 $-V_{CE} = 8$ V; f = 800 MHz; Z_S = opt.; $T_{amb} = 25$ °C; typical values.

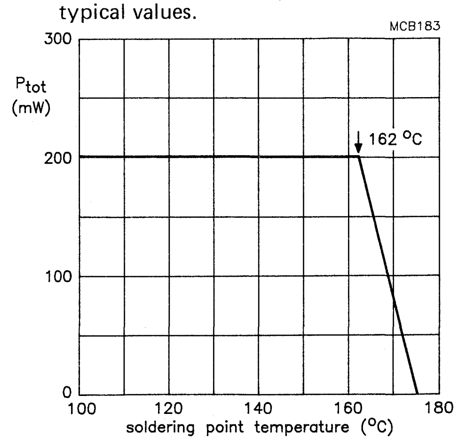


Fig.7 Power derating curve.

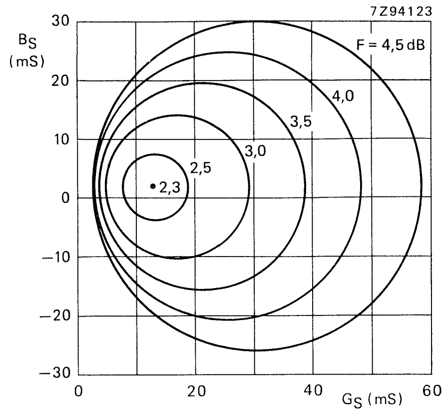


Fig.8 Circles of constant noise figure; $-V_{CE}$ = 8 V $-I_C$ = 4 mA; f = 800 MHz; T_{amb} = 25 °C; typical values.

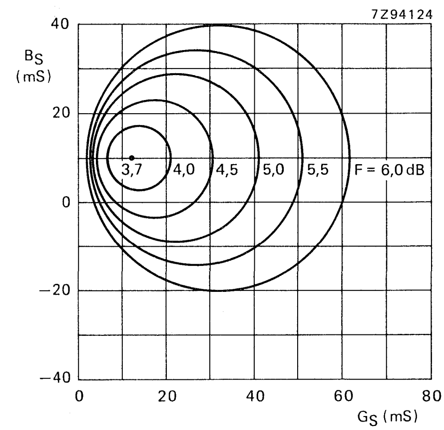


Fig.9 Circles of constant noise figure; $-V_{CE}$ = 8 V; $-I_C$ = 30 mA; f = 800 MHz; T_{amb} = 25 °C; typical values.

Philips Components

Data sheet	
status	Preliminary specification
date of issue	June 1990

BFG25AX
NPN HF wideband transistor

DESCRIPTION

NPN transistor in a plastic SOT143 envelope, primarily for use on low power amplifiers. Ideal for pagers and other battery operated systems where low power consumption is critical.

MECHANICAL DATA

Plastic SOT143 envelope.

Marking code: V11

PINNING

PIN	DESCRIPTION
1	collector
2,4	emitter
3	base

PIN CONFIGURATION

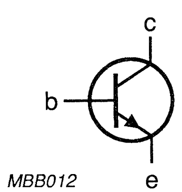


Fig.1 Pin configuration.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	-	-	8	V
V_{CEO}	collector-emitter voltage	open base	-	-	5	V
I_C	collector current		-	-	6.5	mA
P_{tot}	total power dissipation (DC)	note 1	-	-	32	mW
T_j	junction temperature		-	-	150	°C
h_{FE}	DC current gain	I_C = 0.5 mA; V_{CE} = 1 V	50	80	200	
f_T	transition frequency	f = 500 MHz; I_C = 1 mA; V_{CE} = 1 V	3.5	5	-	GHz

Note

1. Up to T_s = 140 °C; T_s = temperature measured on soldering point of collector tab.

LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	-	8	V
V_{CEO}	collector-emitter voltage	open base	-	5	V
V_{EBO}	emitter-base voltage	open collector	-	2	V
I_C	collector current		-	6.5	mA
P_{tot}	total power dissipation (DC)	note 1	-	32	mW
T_{stg}	storage temperature range		−65	+150	°C
T_j	junction temperature		-	150	°C

Note

1. Up to T_s = 140 °C; T_s = temperature measured on soldering point of collector tab.

THERMAL RESISTANCE

SYMBOL	PARAMETER	MAX.	UNIT
$R_{th\ j\text{-}s}$	from junction to soldering point	320	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)\,CBO}$	collector-base breakdown voltage	open emitter I_C = 10 μA	8	-	–	V
$V_{(BR)\,CEO}$	collector-emitter breakdown voltage	open base I_C = 100 μA	5	-	–	V
$V_{(BR)\,EBO}$	emitter-base breakdown voltage	open collector I_E = 10 μA	2	-	–	V
h_{FE}	DC current gain	I_C = 0.5 mA; V_{CE} = 1 V	50	80	200	
C_{re}	feedback capacitance	f = 1 MHz; I_C = 0; V_{CE} = 1 V	-	0.22	0.3	pF
G_{UM}	unilateral gain	f = 500 MHz; I_C = 0.5 mA; V_{CE} = 1 V	-	30	–	dB
G_{UM}	unilateral gain	f = 1 GHz; I_C = 0.5 mA; V_{CE} = 1 V	–	18	–	dB
F	noise figure	f = 500 MHz; I_C = 0.5 mA; V_{CE} = 1 V	-	1.6	2.0	dB
F	noise figure	f = 1 GHz; I_C = 1.0 mA; V_{CE} = 1 V	–	1.8	2.5	dB
f_T	transition frequency	f = 500 MHz; I_C = 1 mA; V_{CE} = 1 V	3.5	5		GHz

Philips Components

Data sheet	
status	Product specification
date of issue	September 1990

BFG31

PNP 5 GHz wideband transistor

FEATURES

- High output voltage capability
- High gain bandwidth product
- Good thermal stability
- Gold metallization ensures excellent reliability
- Complementary npn type BFG97.

DESCRIPTION

PNP planar epitaxial transistor intended for wideband amplifier applications.
The BFG31 is mounted in a SOT223 plastic envelope.

MECHANICAL DATA

Plastic SOT223 envelope.

PINNING

PIN	DESCRIPTION
1	emitter
2	base
3	emitter
4	collector

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$-V_{CBO}$	collector-base voltage	open emitter	-	-	20	V
$-V_{CEO}$	collector-emitter voltage	open base	-	-	15	V
$-I_C$	collector current (DC)		-	-	100	mA
P_{tot}	total power dissipation	T_{case} = 135 °C; note 1	-	-	1	W
T_j	junction temperature		-	-	175	°C
h_{FE}	DC current gain	$-I_C$ = 70 mA; $-V_{CE}$ = 10 V	25	-	-	
f_T	transition frequency	f = 500 MHz; $-I_C$ = 70 mA; $-V_{CE}$ = 10 V; T_{amb} = 25 °C	5.0	-	-	GHz
G_{UM}	maximum power gain	f = 800 MHz; $-I_C$ = 70 mA; $-V_{CE}$ = 10 V; T_{amb} = 25 °C	-	12	-	dB
V_o	output voltage	d_{im} = −60 dB; $-I_C$ = 100 mA; $-V_{CE}$ = 10 V; R_L = 75 Ω; $f_{(p+q-r)}$ = 848.25 MHz	-	600	-	mV

Note

1. T_{case} temperature measured on soldering point of collector tab.

PNP 5 GHz wideband transistor BFG31

ORDERING AND PACKAGE INFORMATION

EXTENDED TYPE NUMBER	PACKAGE		
	CODE	PACKING METHOD	PACKING QUANTITY
BFG31	SOT223	bulk	500
BFG31	SOT223	12 mm tape	1000

LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$-V_{CBO}$	collector-base voltage	open emitter	-	20	V
$-V_{CEO}$	collector-emitter voltage	open base	-	15	V
$-V_{EBO}$	emitter-base voltage	open collector	-	3	V
$-I_C$	collector current (DC)		-	100	mA
P_{tot}	total power dissipation	T_{case} = 135 °C	-	1	W
T_{stg}	storage temperature range		−65	+150	°C
T_j	junction temperature		-	175	°C

THERMAL RESISTANCE

SYMBOL	PARAMETER	NOM.	UNIT
$R_{th\ j\text{-}c}$	from junction to case.	40	K/W

PNP 5 GHz wideband transistor BFG31

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$-V_{(BR)CBO}$	collector-base breakdown voltage	open emitter $-I_C$ = 10 mA	20	-	-	V
$-V_{(BR)CEO}$	collector-emitter breakdown voltage	open base $-I_C$ = 10 mA	18	-	-	V
$-V_{(BR)EBO}$	emitter-base breakdown voltage	open collector $-I_E$ = 0.1 mA	3	-	-	V
$-I_{CBO}$	collector cut-off current	$-I_E$ = 0; $-V_{CB}$ = 10 V	-	-	1	μA
h_{FE}	DC current gain	$-I_C$ = 100 mA; $-V_{CE}$ = 10 V	25	-	-	
C_{cb}	collector-base capacitance	f = 1 MHz; $-I_C$ = 0; $-V_{CB}$ = 10 V	-	1.8	-	pF
C_{eb}	emitter-base capacitance	f = 1 MHz; $-I_C$ = 0; $-V_{EB}$ = 10 V	-	5	-	pF
C_{re}	feedback capacitance	f = 1 MHz; $-I_C$ = 0; $-V_{CE}$ = 10 V	-	1.6	-	pF
f_T	transition frequency	f = 500 MHz; $-I_C$ = 70 mA; $-V_{CE}$ = 10 V; T_{amb} = 25 °C	-	5	-	GHz
G_{UM}	maximum power gain	f = 500 MHz; $-I_C$ = 70 mA; $-V_{CE}$ = 10 V; T_{amb} = 25 °C	-	16	-	dB
G_{UM}	maximum power gain	f = 800 MHz; $-I_C$ = 70 mA; $-V_{CE}$ = 10 V; T_{amb} = 25 °C;	-	12	-	dB
V_o	output voltage	note 1	-	600	-	mV
V_o	output voltage	note 2	-	650	-	mV

Note

1. d_{im} = −60 dB (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 = 850.25 MHz; $V_q = V_o$ −6 dB;
   f_q = 858.25 MHz; $V_r = V_o$ −6 dB;
   f_r = 860.25 MHz; Measured at $f_{(p+q+r)}$ = 848.25 MHz.

2. d_{im} = −60 dB (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 = 445.25 MHz; $V_q = V_o$ −6 dB;
   f_q = 453.25 MHz; $V_r = V_o$ −6 dB;
   f_r = 455.25 MHz; Measured at $f_{(p+q-r)}$ = 443.25 MHz.

PNP 5 GHz wideband transistor BFG31

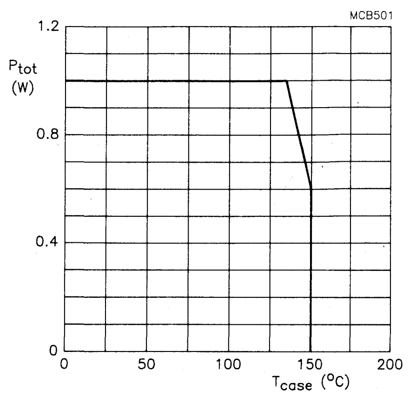


Fig.1 Power derating curve.

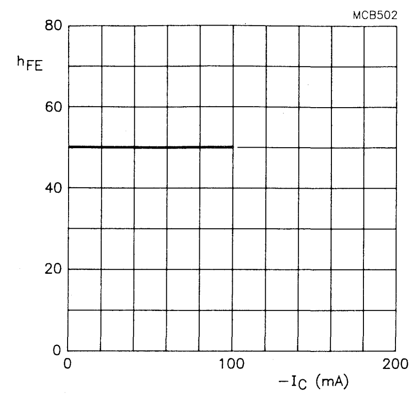


Fig.2 DC current gain as a function of collector current; $-V_{CE} = 10$ V; $T_{amb} = 25$ °C.

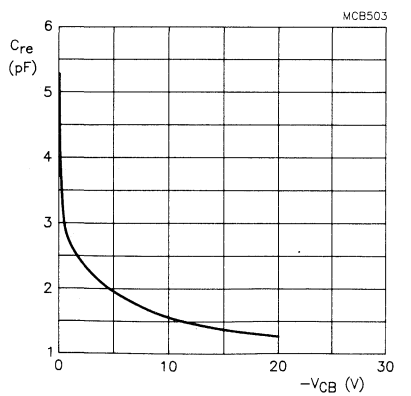


Fig.3 Feedback capacitance as a function of collector-base voltage; f = 1 MHz; $T_{amb} = 25$ °C; typical values.

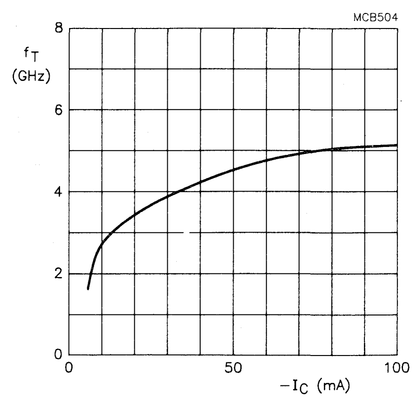


Fig.4 Transition frequency as a function of collector current; $-V_{CE} = 10$ V; $T_{amb} = 25$ °C; typical values.

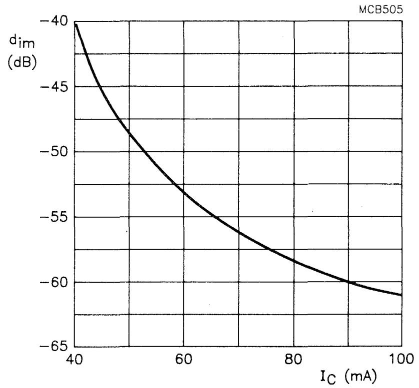


Fig.5 Intermodulation distortion as a function of collector current; $-V_{CE}$ = 10 V; V_o = 650 mV; T_{amb} = 25 °C; $f_{(p+q-r)}$ = 443.25 MHz.

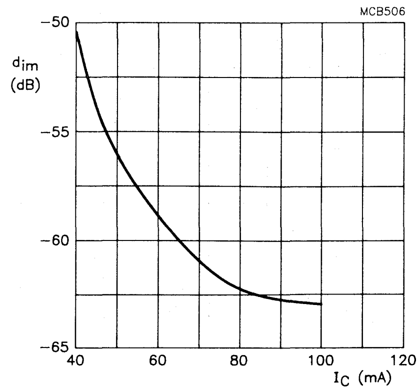


Fig.6 Intermodulation distortion as a function of collector current; $-V_{CE}$ = 10 V; V_o = 600 mV; T_{amb} = 25 °C; $f_{(p+q-r)}$ = 848.25 MHz.

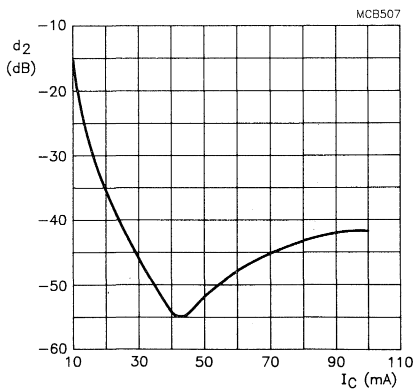


Fig.7 Second order beat as a function of collector current; $-V_{CE}$ = 10 V; V_o = 50 dBmV; T_{amb} = 25 °C; $f_{(p+q)}$ = 450 MHz.

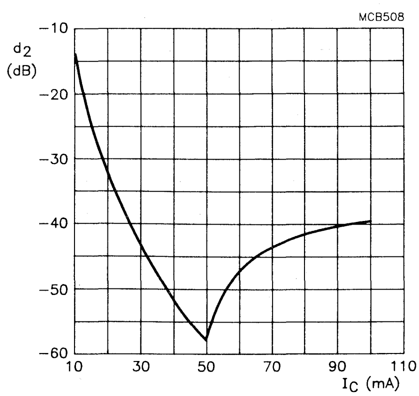


Fig.8 Second order beat as a function of collector current; $-V_{CE}$ = 10 V; V_o = 50 dBmV; T_{amb} = 25 °C; $f_{(p+q)}$ = 810 MHz.

PNP 5 GHz WIDEBAND TRANSISTOR

PNP transistor in a four-lead dual emitter plastic envelope (SOT103). This device is designed for application in wideband amplifiers, such as MATV and CATV systems, up to 5 GHz.

NPN 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 (DC)	$-I_C$	max.	75	mA
Total power dissipation up to T_{amb} = 70 °C	P_{tot}	max.	700	mW
Junction temperature	T_j	max.	175	°C
DC current gain $-I_C$ = 50 mA; $-V_{CE}$ = 10 V	h_{FE}	min.	20	
Transition frequency at f = 500 MHz $-I_C$ = 50 mA; $-V_{CE}$ = 10 V	f_T	typ.	4.5	GHz
Feedback capacitance at f = 1 MHz I_C = 0; $-V_{CE}$ = 10 V	C_{re}	typ.	1.4	pF
Noise figure at optimum source impedance $-I_C$ = 50 mA; $-V_{CE}$ = 10 V; f = 800 MHz	F	typ.	4.3	dB

MECHANICAL DATA

SOT103 (see outlines section).

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				
DC	$-I_C$	max.	75	mA
peak value; > 1 MHz	$-I_{CM}$	max.	150	mA
Total power dissipation up to T_{amb} = 70 °C	P_{tot}	max.	700	mW
Storage temperature range	T_{stg}		−65 to + 150	°C
Junction temperature	T_j	max.	175	°C

THERMAL RESISTANCE

From junction to ambient (free air) mounted on a fibre-glass print	$R_{th\ j\text{-}a}$	=	150	K/W
From junction to soldering point	$R_{th\ j\text{-}s}$	=	55	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current $I_E = 0$; $-V_{CB} = 10$ V	$-I_{CBO}$	max.	100	nA
DC current gain $-I_C = 50$ mA; $-V_{CE} = 10$ V	h_{FE}	min.	20	
Transition frequency at f = 500 MHz $-I_C = 50$ mA; $-V_{CE} = 10$ V	f_T	typ.	4.5	GHz
Noise figure at optimum source impedance and $-I_C = 50$ mA; $-V_{CE} = 10$ V; f = 800 MHz; T_{amb} = 25 °C	F	typ.	4.3	dB
Collector capacitance at f = 1 MHz $I_E = i_e = 0$; $-V_{CB} = 10$ V	C_c	typ.	2.0	pF
Emitter capacitance at f = 1 MHz $I_C = i_c = 0$; $-V_{EB} = 0.5$ V	C_e	typ.	5.0	pF
Feedback capacitance at f = 1 MHz $I_C = 0$; $-V_{CE} = 10$ V	C_{re}	typ.	1.4	pF

Maximum unilateral power gain (S_{12} assumed to be zero)

$$G_{UM} = 10 \log \frac{|S_{21}|^2}{[1-|S_{11}|^2]\ [1-|S_{22}|^2]}$$

$-I_C = 50$ mA; $-V_{CE} = 10$ V; f = 800 MHz ; T_{amb} = 25 °C	G_{UM}	typ.	13.5	dB
$-I_C = 50$ mA; $-V_{CE} = 10$ V; f = 2 GHz ; T_{amb} = 25 °C	G_{UM}	typ.	6.0	dB

Output voltage at d_{im} = –60 dB $-I_C$ = 70 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.	500 mV
Second harmonic distortion (see Fig.1) $-I_C$ = 70 mA; $-V_{CE}$ = 10 V; R_L = 75 Ω; 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

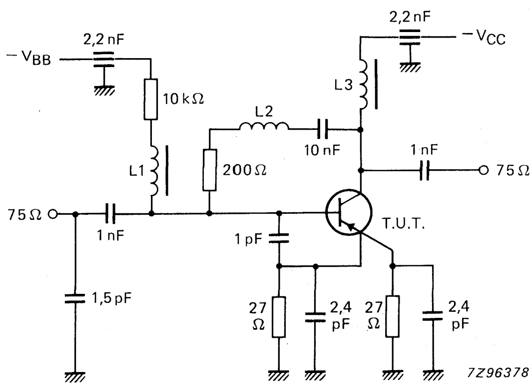


Fig.1 Intermodulation distortion and second harmonic distortion test circuit.

L1 = L3 = 5 μH 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 V, T_{amb} = 25 °C; typical values.

I_C mA	f MHz	s_{11}	s_{21}	s_{12}	s_{22}	G_{UM} dB
	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
5	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
	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
10	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
	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
20	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
	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
30	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
	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
50	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

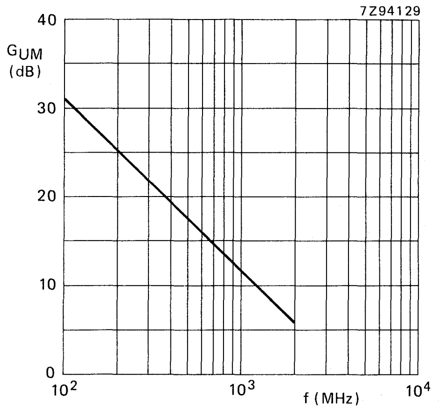


Fig.2 $-V_{CE}$ = 10 V; $-I_C$ = 50 mA; T_{amb} = 25 °C; typical values.

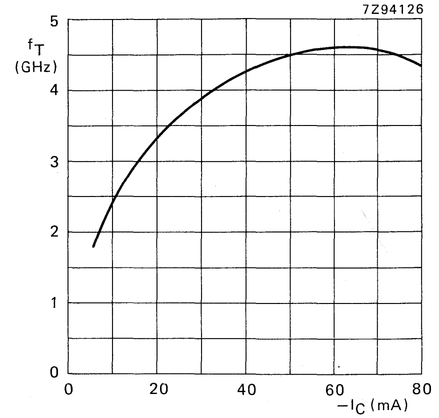


Fig.3 $-V_{CE}$ = 10 V; f = 500 MHz; T_j = 25 °C; typical values.

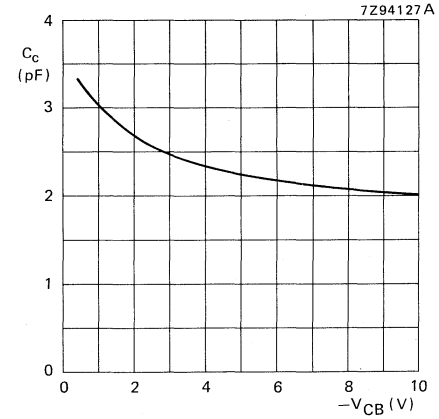


Fig.4 $I_E = i_e = 0$; f = 1 MHz; T_j = 25 °C; typical values.

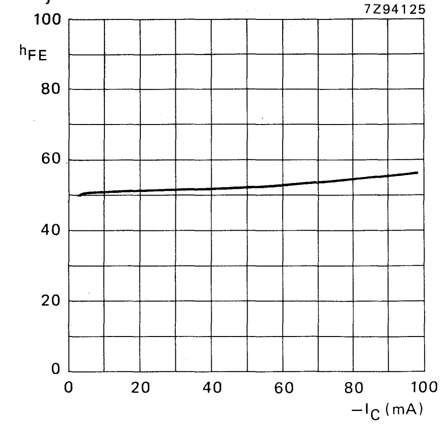


Fig.5 $-V_{CE}$ = 10 V; T_j = 25 °C; typical values.

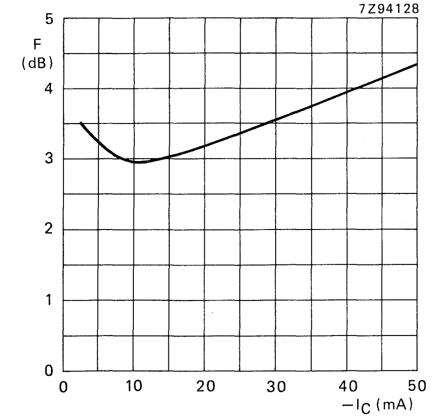


Fig.6 $-V_{CE}$ = 10 V; f = 800 MHz; Z_S = opt.; T_{amb} = 25 °C; typical values.

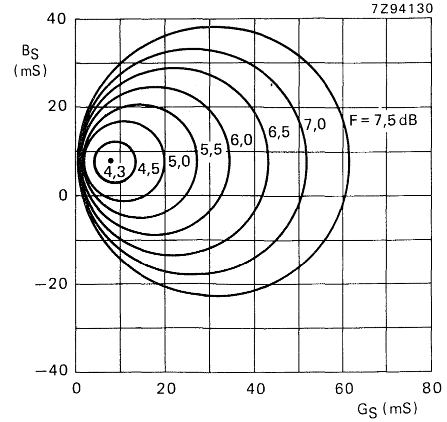


Fig.7 Circles of constant noise figure; $-V_{CE}$ = 10 V; $-I_C$ = 50 mA; f = 800 MHz; T_{amb} = 25 °C; typical values.

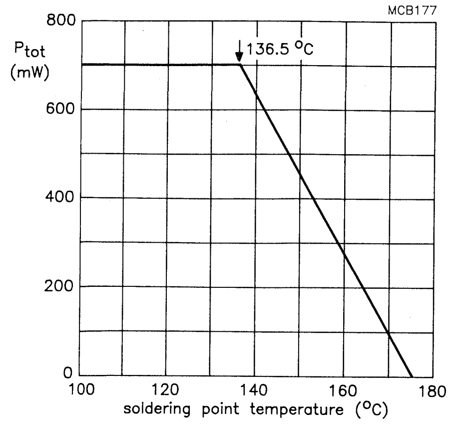


Fig.8 Power derating curve.

NPN 12 GHz WIDEBAND TRANSISTOR

BFG33 is an npn transistor in a microminiature SOT143 envelope with double emitter bonding. The device contains a BFQ33 crystal and is for use in circuits using SMD technology.

Features

- Extremely high transition frequency
- Very low noise at high frequencies.

QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	9.0	V
Collector-emitter voltage (open base)	V_{CEO}	max.	7.0	V
Collector current (DC)	I_C	max.	20	mA
Total power dissipation up to T_{amb} = 25 °C mounted on a ceramic substrate 8 x 10 x 0.7 mm	P_{tot}	max.	300	mW
Junction temperature	T_j	max.	150	°C
Transition frequency at f = 1.5 GHz I_C = 14 mA; V_{CE} = 5 V; T_{amb} = 25 °C	f_T	typ.	12	GHz
Noise figure at optimum source impedance I_C = 5 mA; V_{CE} = 5 V; f = 2 GHz; T_{amb} = 25 °C	F	typ.	2.5	dB

MECHANICAL DATA

SOT143.

BFG33 Marking code: V6
BFG33X Marking code: V16

Pinning

BFG33	BFG33X
1 = collector	1 = collector
2 = base	2, 4 = emitter
3, 4 = emitter	3 = base

RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	9.0 V
Collector-emitter voltage (open base)	V_{CEO}	max.	7.0 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2.0 V
Collector current (DC)	I_C	max.	20 mA
Total power dissipation up to T_{amb} = 25 °C mounted on a ceramic substrate 8 x 10 x 0.7 mm	P_{tot}	max.	300 mW
Storage temperature range	T_{stg}		−65 to 150 °C
Junction temperature	T_j	max.	150 °C

THERMAL RESISTANCE

From junction to ambient mounted on ceramic substrate 8 x 10 x 0.7 mm	$R_{th\ j\text{-}a}$	=	430 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
DC current gain $I_C = 14$ mA; $V_{CE} = 5$ V	h_{FE}	min.	50
Transition frequency at f = 1.5 GHz $I_C = 14$ mA; $V_{CE} = 5$ V; $T_{amb} = 25$ °C	f_T	typ.	12 GHz
Noise figure at optimum source impedance $I_C = 5$ mA; $V_{CE} = 5$ V; f = 2 GHz; $T_{amb} = 25$ °C	F	typ.	2.5 dB
Maximum unilateral power gain $I_C = 14$ mA; $V_{CE} = 5$ V; f = 2 GHz; $T_{amb} = 25$ °C; $S_{12} = 0$			

$$G_{UM} = 10 \log \frac{|S_{21}|^2}{(1 - |S_{11}|^2)(1 - |S_{22}|^2)}$$ G_{UM} typ. 10.5 dB

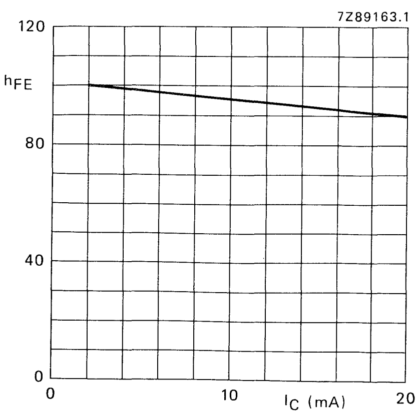


Fig.1 Gain as a function of collector current.

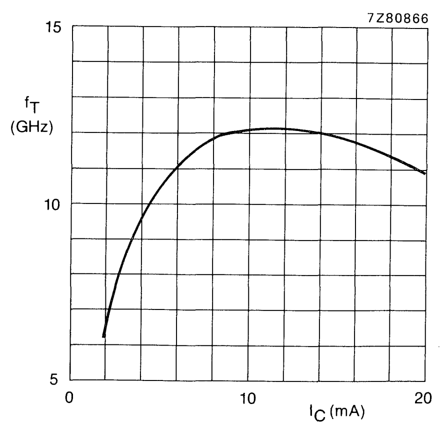


Fig.2 Transitional frequency as a function of collector current.

NPN 3 GHz WIDEBAND TRANSISTOR

NPN transistor in a four-lead dual emitter plastic envelope (SOT103). This device is designed for wideband application in CATV and MATV amplifier systems and features high output voltage capabilities.

A TO-39 version is available on request: ON4497.

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 (DC)	I_C	max.	150 mA
Total power dissipation up to T_{amb} = 45 °C	P_{tot}	max.	1 W
Junction temperature	T_j	max.	175 °C
DC current gain I_C = 100 mA; V_{CE} = 10 V	h_{FE}	min.	25
Transition frequency at f = 500 MHz I_C = 100 mA; V_{CE} = 10 V	f_T	typ.	3.7 GHz
Noise figure at optimum source impedance I_C = 20 mA; V_{CE} = 10 V; f = 800 MHz	F	typ.	2.3 dB
Output power at 1 dB gain compression V_{CE} = 10 V; I_C = 90 mA; f = 800 MHz	P_{L1}	typ.	+22 dBm
Third order intercept point V_{CE} = 10 V; I_C = 90 mA; f = 800 MHz	ITO	typ.	+41 dBm

MECHANICAL DATA

SOT103 (see outlines section).

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 (DC)	I_C	max.	150	mA
Total power dissipation up to T_{amb} = 45 °C	P_{tot}	max.	1	W
Storage temperature range	T_{stg}		−65 to + 150	°C
Junction temperature	T_j	max.	175	°C

THERMAL RESISTANCE

From junction to ambient mounted on a glass-fibre pcb	$R_{th\ j\text{-}a}$	=	130	K/W
From junction to soldering point	$R_{th\ j\text{-}s}$	=	55	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current $I_E = 0$; $V_{CB} = 15$ V	I_{CBO}	max.	100	μA
DC current gain $I_C = 100$ mA; $V_{CE} = 10$ V	h_{FE}	min.	25	
Transition frequency at f = 500 MHz $I_C = 100$ mA; $V_{CE} = 10$ V	f_T	typ.	3.7	GHz
Collector output capacitance at f = 1 MHz $I_E = i_e = 0$; $V_{CB} = 10$ V	C_c	typ.	2.3	pF
Emitter capacitance at f = 1 MHz $I_C = i_e = 0$; $V_{EB} = 0.5$ V	C_e	typ.	10	pF
Feedback capacitance at f = 1 MHz $I_E = 0$; $V_{CE} = 10$ V	C_{re}	typ.	1.2	pF

Maximum unilateral power gain (S_{12} assumed to be zero)

$$G_{UM} = 10 \log \frac{|S_{21}|^2}{[1-|S_{11}|^2]\ [1-|S_{22}|^2]}$$

$I_C = 100$ mA; $V_{CE} = 10$ V; f = 800 MHz; T_{amb} = 25 °C	G_{UM}	typ.	14.5	dB
$I_C = 100$ mA; $V_{CE} = 10$ V; f = 2 GHz; T_{amb} = 25 °C	G_{UM}	typ.	7.0	dB
Noise figure at optimum source impedance $I_C = 20$ mA; $V_{CE} = 10$ V; f = 800 MHz; T_{amb} = 25 °C	F	typ.	2.3	dB
Output power at 1 dB gain compression $V_{CE} = 10$ V; $I_C = 90$ mA; f = 800 MHz; T_{amb} = 25 °C	P_{L1}	typ.	+22	dBm
$V_{CE} = 10$ V; $I_C = 100$ mA; f = 300 MHz; T_{amb} = 25 °C	P_{L1}	typ.	+24	dBm
Third order intercept point $V_{CE} = 10$ V; $I_C = 90$ mA; f = 800 MHz; T_{amb} = 25 °C	ITO	typ.	+41	dBm
$V_{CE} = 10$ V; $I_C = 100$ mA; f = 300 MHz; T_{amb} = 25 °C	ITO	typ.	+43	dBm

Output voltage at d_{im} = −60 dB I_C = 500 mA; V_{CE} = 15 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 at f_q = 803.25 MHz $V_r = V_O$ − 6 dB at f_r = 805.25 MHz measured at $f_{(p+q-r)}$ = 793.25 MHz	V_O	typ.	750 mV
Second harmonic distortion (see Fig. 1) I_C = 100 mA; V_{CE} = 10 V; R_L = 75 Ω; VSWR < 2; T_{amb} = 25 °C $V_p = V_O$ = 316 mV at f_p = 250 MHz $V_q = V_O$ = 316 mV at f_q = 560 MHz measured at $f_{(p+q)}$ = 810 MHz	d_2	typ.	−55 dB

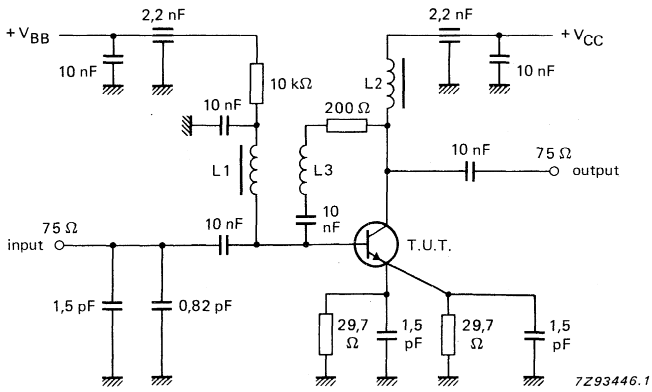


Fig. 1 Intermodulation distortion and second harmonic distortion test circuit.

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 V; T_{amb} = 25 °C; typical values.

I_C mA	f MHz	s_{11}	s_{21}	s_{12}	s_{22}	G_{UM} dB
	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
5	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
	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
10	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
	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
20	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
	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
30	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
	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
50	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 V; T_{amb} = 25 °C; typical values.

I_C mA	f MHz	S_{11}	S_{21}	S_{12}	S_{22}	G_{UM} dB
75	40	0,78/ −67,3°	38,4/146,4°	0,02/ 59,1°	0,84/ −42,8°	41,1
	100	0,74/−112,0°	23,5/118,2°	0,04/ 39,3°	0,55/ −81,1°	32,4
	200	0,73/−151,1°	13,3/102,3°	0,04/ 33,9°	0,37/−110,4°	26,4
	500	0,72/−178,4°	5,5/ 84,4°	0,06/ 43,8°	0,27/−149,1°	18,3
	800	0,72/ +170,2°	3,5/ 73,1°	0,07/ 50,3°	0,27/−148,8°	14,4
	1000	0,72/ +164,6°	2,8/ 65,6°	0,09/ 52,1°	0,30/−151,7°	12,4
	1200	0,76/ +157,8°	2,3/ 63,8°	0,09/ 58,3°	0,30/−166,8°	11,3
	2000	0,75/ +139,5°	1,5/ 41,7°	0,16/ 59,7°	0,24/ +175,2°	7,2
100	40	0,78/ −68,3°	38,9/145,2°	0,02/ 58,2°	0,83/ −44,4°	41,0
	100	0,74/−121,6°	23,5/117,2°	0,04/ 38,8°	0,54/ −83,1°	23,3
	200	0,73/−151,6°	13,1/101,3°	0,04/ 33,7°	0,37/−112,7°	26,4
	500	0,73/−179,4°	5,4/ 83,8°	0,06/ 44,3°	0,27/−151,3°	18,2
	800	0,73/ +170,6°	3,5/ 73,4°	0,07/ 50,6°	0,27/−150,9°	14,5
	1000	0,72/ +165,3°	2,8/ 65,4°	0,09/ 52,2°	0,30/−153,4°	12,4
	1200	0,77/ +157,3°	2,3/ 64,1°	0,09/ 58,3°	0,30/−168,6°	11,3
	2000	0,75/ +139,4°	1,5/ 41,9°	0,15/ 59,7°	0,24/ +175,2°	7,0

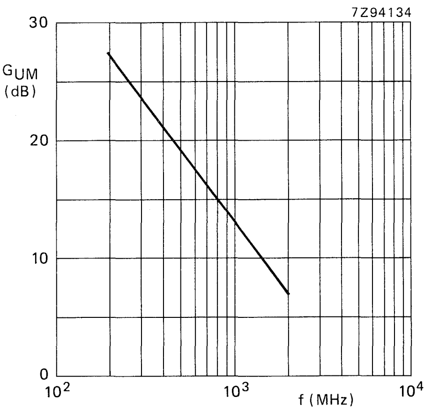


Fig.2 V_{CE} = 10 V; I_C = 100 mA; T_{amb} = 25 °C; typical values.

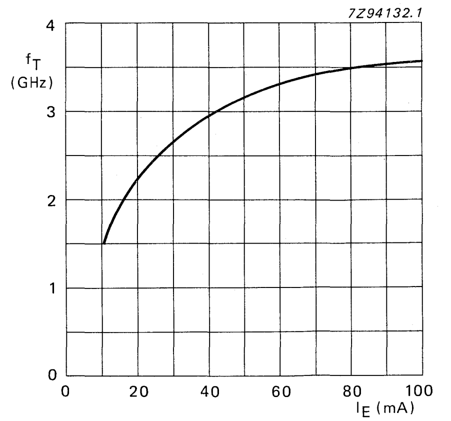


Fig.3 V_{CE} = 10 V; f = 500 MHz; T_j = 25 °C; typical values.

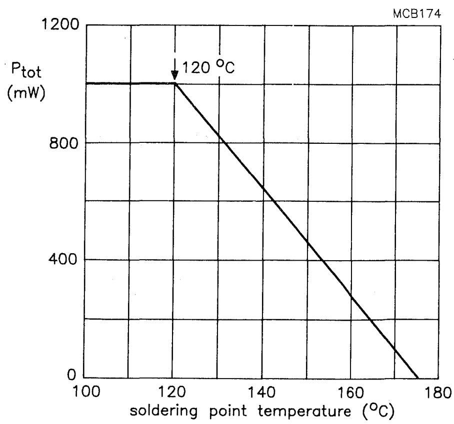


Fig.4 Power derating curve.

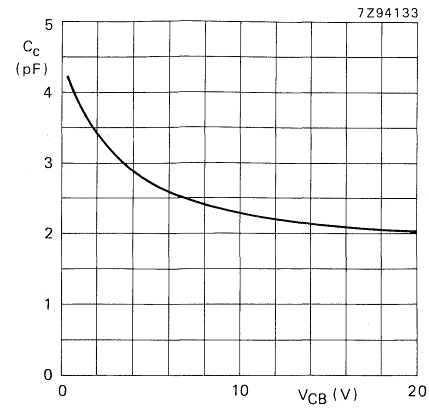


Fig.5 $I_E = i_e = 0$; f = 1 MHz; T_j = 25 °C; typical values.

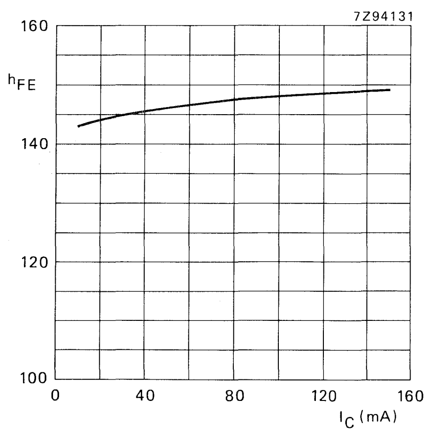


Fig.6 V_{CE} = 10 V; T_j = 25 °C; typical values.

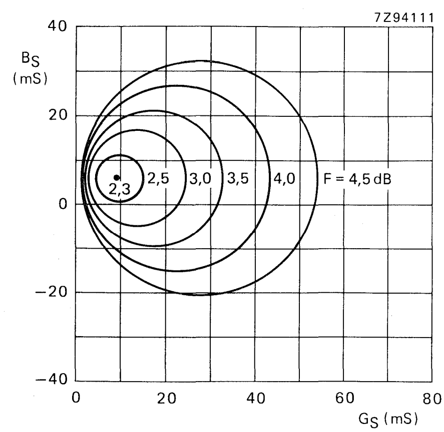


Fig.7 Circles of constant noise figure; V_{CE} = 10 V; I_C = 20 mA; f = 800 MHz; T_{amb} = 25 °C; typical values.

Philips Components

Data sheet	
status	Product specification
date of issue	June 1990

BFG35

NPN 4 GHz wideband transistor

DESCRIPTION

NPN planar epitaxial transistor in a plastic SOT223 envelope, intended for wideband amplifier applications. The device features high output voltage capabilities.
Its pnp complement is the BFG55.

MECHANICAL DATA

Plastic SOT223 envelope.

PINNING

PIN	DESCRIPTION
1	emitter
2	base
3	emitter
4	collector

PIN CONFIGURATION

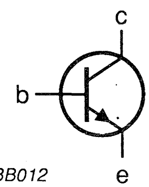


Fig.1 Pin configuration

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	-	-	25	V
V_{CEO}	collector-emitter voltage	open base	-	-	18	V
I_C	collector current (DC)		-	-	150	mA
P_{tot}	total power dissipation	T_{case} = 135 °C; note 1	-	-	1	W
T_j	junction temperature		-	-	175	°C
h_{FE}	DC current gain	I_C = 100 mA; V_{CE} = 10 V	25	-	-	
f_T	transition frequency	f = 500 MHz; I_C = 100 mA; V_{CE} = 10 V; T_{amb} = 25 °C	-	4.0	-	GHz
G_{UM}	maximum power gain	f = 500 MHz; I_C = 100 mA; V_{CE} = 10 V	-	15	-	dB
G_{UM}	maximum power gain	f = 800 MHz; I_C = 100 mA; V_{CE} = 10 V	-	11	-	dB
V_o	output voltage	d_{im} = −60 dB; I_C = 100 mA; V_{CE} = 10 V; R_L = 75 Ω; $f_{(p+q-r)}$ = 793.25 MHz	-	750	-	mV

Note

1. T_{case} temperature measured on soldering point of collector tab.

NPN 4 GHz wideband transistor BFG35

ORDERING AND PACKAGE INFORMATION

EXTENDED TYPE NUMBER	PACKAGE		
	CODE	PACKING METHOD	PACKING QUANTITY
BFG35	SOT223	bulk	500
BFG35	SOT223	12 mm reel	1000

LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	-	25	V
V_{CEO}	collector-emitter voltage	open base	-	18	V
V_{EBO}	emitter-base voltage	open collector	-	2	V
I_C	collector current (DC)		-	150	mA
P_{tot}	total power dissipation	T_{case} = 135 °C	-	1	W
T_{stg}	storage temperature range		−65	+150	°C
T_j	junction temperature		-	175	°C

THERMAL RESISTANCE

SYMBOL	PARAMETER	NOM.	UNIT
$R_{th\ j\text{-}c}$	from junction to case	40	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{CBO}	collector cut-off current	$I_E = 0$; $V_{CB} = 10$ V	-	-	1	μA
h_{FE}	DC current gain	$I_C = 100$ mA; $V_{CE} = 10$ V	25	-	-	
C_c	collector capacitance	f = 1 MHz; $I_E = i_e = 0$; $V_{CB} = 10$ V	-	2.0	-	pF
C_e	emitter capacitance	f = 1 MHz; $I_C = i_c = 0$; $V_{EB} = 0.5$ V	-	10.0	-	pF
C_{re}	feedback capacitance	f = 1 MHz; $I_C = 0$; $V_{CE} = 10$ V	-	1.2	-	pF
f_T	transition frequency	f = 500 MHz; $I_C = 100$ mA; $V_{CE} = 10$ V; $T_{amb} = 25$ °C	-	4.0	-	GHz
G_{UM}	maximum power gain	f = 500 MHz; $I_C = 100$ mA; $V_{CE} = 10$ V; $T_{amb} = 25$ °C	-	15	-	dB
G_{UM}	maximum power gain	f = 800 MHz; $I_C = 100$ mA; $V_{CE} = 10$ V; $T_{amb} = 25$ °C;	-	11	-	dB
V_o	output voltage	see note 1	-	750	-	mV
V_o	output voltage	see note 2	-	800	-	mV

Note

1. $d_{im} = -60$ dB (DIN 45004B); $T_{amb} = 25$ °C; $I_C = 100$ mA; $V_{CE} = 10$ V; $R_L = 75\ \Omega$; $V_p = V_o$ 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.

2. $d_{im} = -60$ dB (DIN 45004B); $T_{amb} = 25$ °C; $I_C = 100$ mA; $V_{CE} = 10$ V; $R_L = 75\ \Omega$; $V_p = V_o$ at $d_{im} = -60$ dB; $f_p = 445.25$ MHz; $V_q = V_o$ −6 dB; $f_q = 453.25$ MHz; $V_r = V_o$ −6 dB; $f_r = 455.25$ MHz; Measured at $f_{(p+q-r)} = 443.25$ MHz.

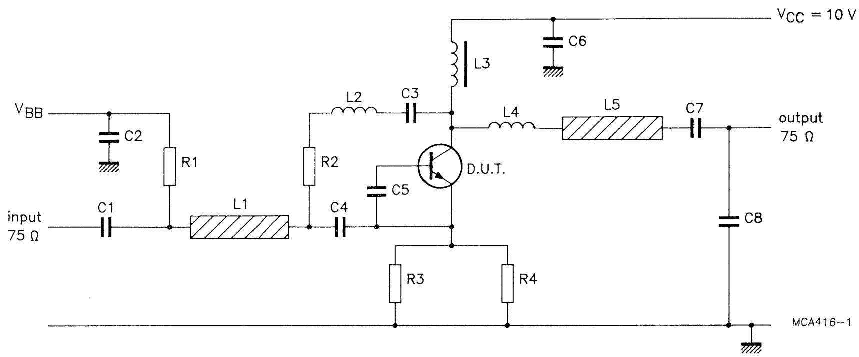


Fig.2 Intermodulation and second harmonic test circuit.

List of components:

R1 = 10 kΩ metal film resistor	(cat. no. 2322 180 73103)
R2 = 200 Ω metal film resistor	(cat. no. 2322 180 73201)
R3 = R4 = 27 Ω metal film resistor	(cat. no. 2322 180 73279)
C1 = C3 = C5 = C6 = 10 nF ceramic multilayer capacitor	(cat. no. 2222 590 08627)
C2 = C7 = 1 pF ceramic multilayer capacitor	(cat. no. 2222 851 12108)
C4 = 10 nF miniature ceramic plate capacitor	(cat. no. 2222 629 08103)
L1 = 75 Ω microstripline	(L = 7 mm; W = 2.5 mm)
L2 = 75 Ω microstripline	(L = 22 mm; W = 2.5 mm)
L3 = 1.5 turn Cu wire (0.4 mm), internal diameter 3 mm, winding pitch 1 mm	
L4 = 75 Ω microstripline	(L = 19 mm; W = 2.5 mm)
L5 = 5 μH Ferroxcube choke	(cat. no. 3122 108 20153)
L6 = 30 mm Cu-wire (0.4 mm; L ≈ 24 nH)	

The circuit has been built on a double Cu clad printed circuit board with PTFE. dielectric (ε_r = 2.2); thickness 1/16 inch; thickness of copper-sheet 2 x 35 μm; see Figs 3a, 3b and 3c.

The components R2, L6, C5 and L3 are mounted on the underside of the PCB.

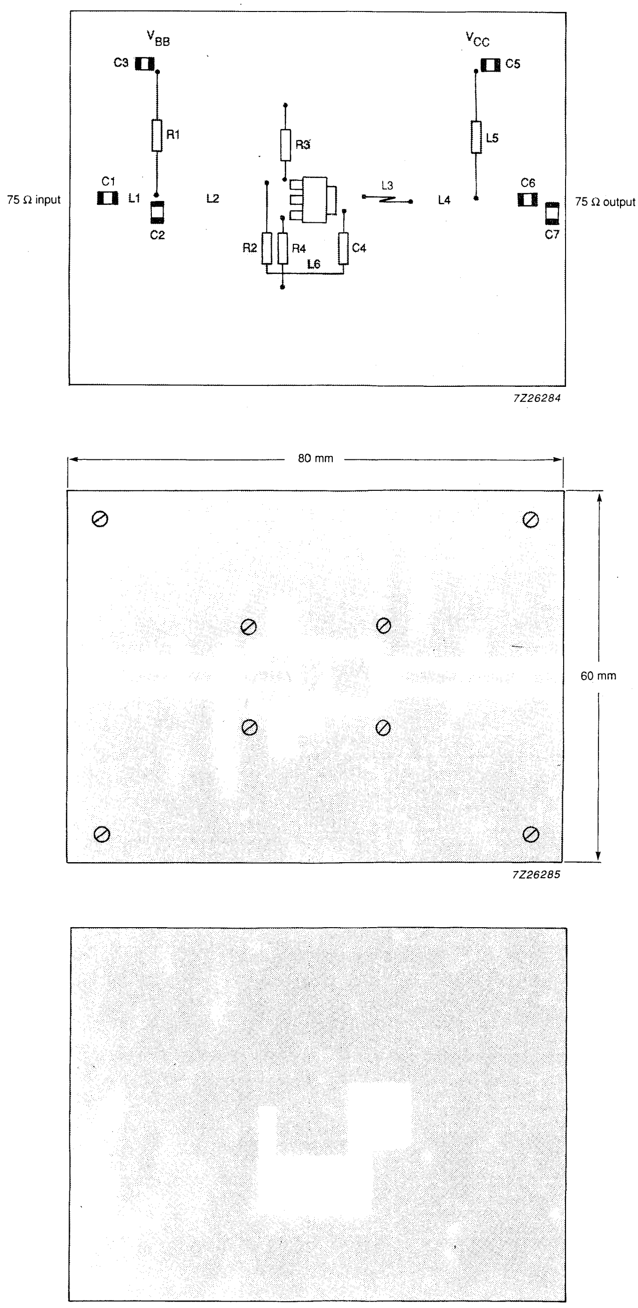


Fig.3 Intermodulation test circuit printed circuit board.

NPN 4 GHz wideband transistor BFG35

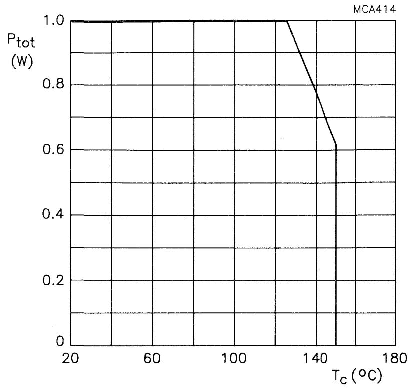


Fig.4 Power derating curve.

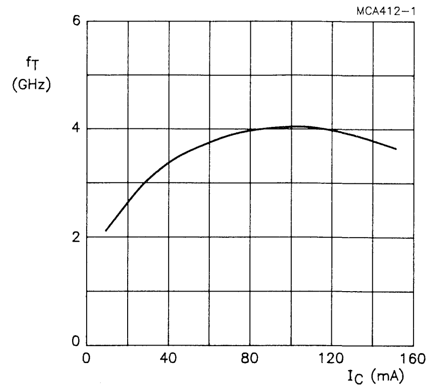


Fig.5 Transition frequency as a function of collector current; V_{CE} = 10 V; f = 500 MHz; T_j = 25 °C; typical values.

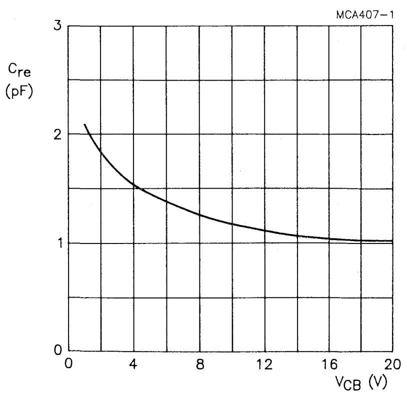


Fig.6 Feedback capacitance as a function of collector-base voltage; I_E = 0; f = 1 MHz; T_j = 25 °C.

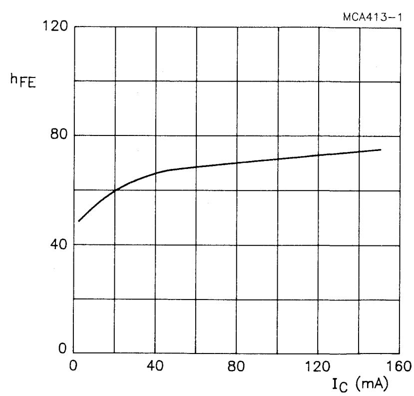


Fig.7 DC current gain as a function of collector current; V_{CE} = 10 V; T_j = 25 °C.

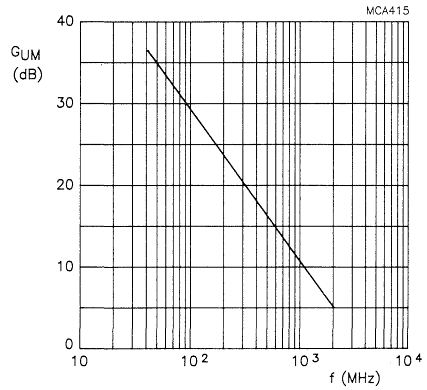


Fig.8 Maximum gain as a function of frequency; V_{CE} = 10 V; I_C = 100 mA; T_{amb} = 25 °C; typical values.

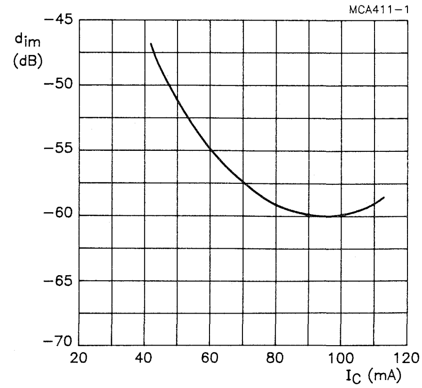


Fig.9 Intermodulation distortion as a function of collector current; V_{CE} = 10 V; V_o = 800 mV; $f_{(p+q-r)}$ = 443.25 MHz; T_{amb} = 25 °C; typical values.

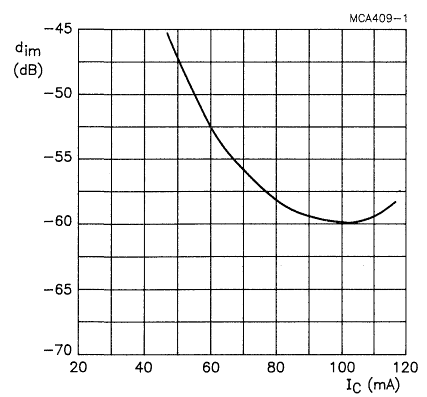


Fig.10 Intermodulation distortion as a function of collector current; V_{CE} = 10 V; V_o = 750 mV; $f_{(p+q-r)}$ = 793.25 MHz; T_{amb} = 25 °C; typical values.

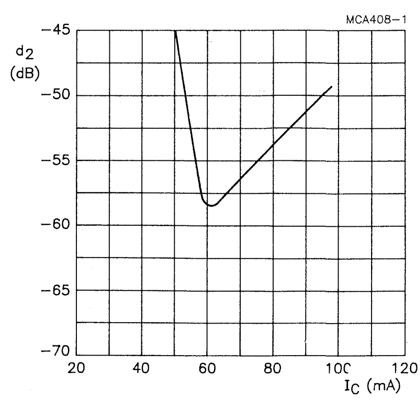


Fig.11 Second order beat as a function of collector current; V_{CE} = 10 V; V_o = 50 dBmV; $f_{(p+q)}$ = 450 MHz; T_{amb} = 25 °C; typical values.

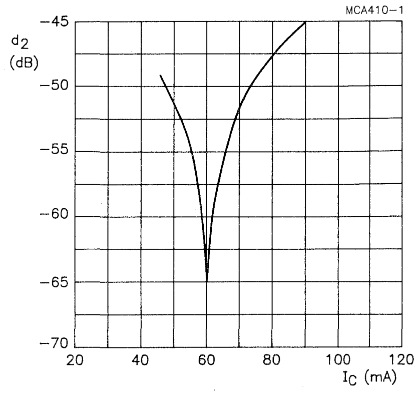


Fig.12 Second order beat as a function of collector current; V_{CE} = 10 V; V_o = 50 dBmV; $f_{(p+q)}$ = 810 MHz; T_{amb} = 25 °C; typical values.

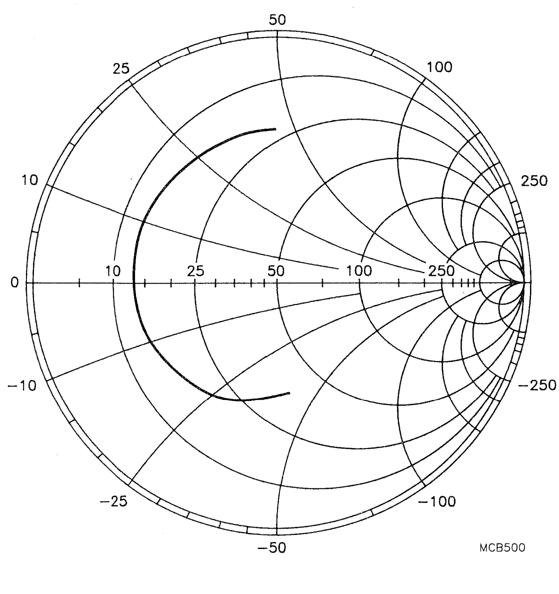


Fig.13 Input reflection coefficient, S_{11}; V_{CE} = 10 V; I_C = 100 mA; T_{amb} = 25 °C; typical values.

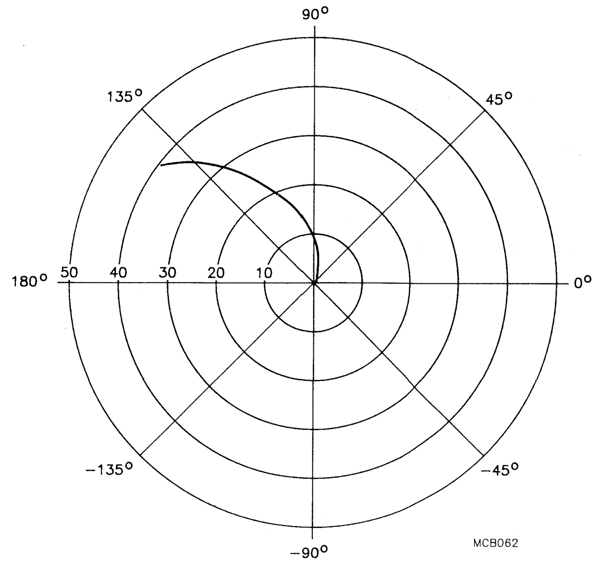


Fig.14 Forward transmission coefficient, S_{21}; V_{CE} = 10 V; I_C = 100 mA; T_{amb} = 25 °C; typical values.

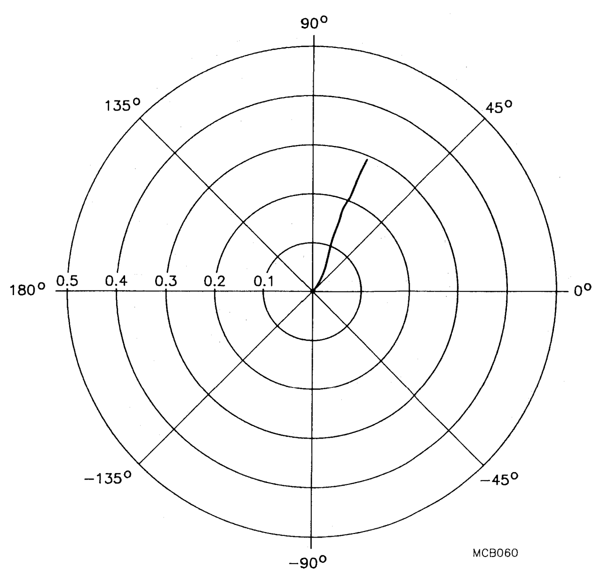


Fig.15 Reverse transmission coefficient, S_{12}; V_{CE} = 10 V; I_C = 100 mA; T_{amb} = 25 °C; typical values.

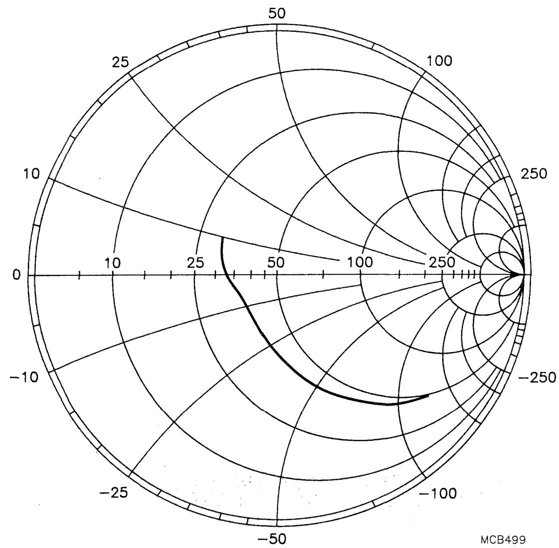


Fig.16 Output reflection coefficient, S_{22}; V_{CE} = 10 V; I_C = 100 mA; T_{amb} = 25 °C; typical values.

S-Parameters (common emitter) at V_{CE} = 10 V; T_{amb} = 25 °C; typical values.

I_C (mA)	f (MHz)	S_{11} M Φ	S_{21} M Φ	S_{12} M Φ	S_{22} M Φ	G_{UM} (dB)
10	40	0.60/- 53.6	17.3/153.9	0.02/71.2	0.91/- 20.3	34.4
	100	0.63/-104.6	12.6/127.3	0.04/49.2	0.70/- 38.4	27.0
	200	0.66/-144.8	7.7/105.2	0.05/39.5	0.48/- 50.4	21.4
	500	0.68/-174.0	3.4/ 77.4	0.06/48.9	0.34/- 65.4	13.8
	800	0.68/ 151.8	2.1/ 61.1	0.09/64.5	0.33/- 84.2	9.7
	1000	0.68/ 139.9	1.7/ 51.0	0.11/71.0	0.33/- 99.4	7.8
	1200	0.68/ 128.8	1.4/ 42.6	0.13/77.8	0.34/-115.2	5.9
	1500	0.67/ 112.8	1.1/ 33.5	0.18/78.3	0.36/-138.8	3.5
	2000	0.66/ 89.5	0.7/ 22.0	0.28/77.1	0.42/-175.3	0.5
20	40	0.49/- 66.9	24.3/150.1	0.02/68.7	0.87/- 27.3	35.0
	100	0.56/-119.1	16.5/123.2	0.04/52.2	0.60/- 50.5	28.0
	200	0.61/-153.9	9.7/102.7	0.05/46.3	0.38/- 65.8	22.5
	500	0.63/ 170.6	4.1/ 78.3	0.07/59.9	0.22/- 85.3	14.8
	800	0.63/ 150.4	2.6/ 63.7	0.10/68.2	0.21/-103.9	10.8
	1000	0.64/ 139.2	2.1/ 54.5	0.12/70.3	0.21/-118.3	8.9
	1200	0.64/ 128.5	1.7/ 47.0	0.15/72.7	0.22/-132.5	7.0
	1500	0.63/ 113.7	1.4/ 37.7	0.19/73.7	0.26/-153.5	5.2
	2000	0.63/ 91.0	0.9/ 25.1	0.28/72.6	0.33/ 173.4	2.1
50	40	0.43/- 80.9	31.7/145.8	0.02/62.5	0.82/- 35.3	35.7
	100	0.53/-130.9	20.0/118.8	0.03/51.7	0.52/- 64.5	28.8
	200	0.59/-160.8	11.3/100.3	0.04/53.5	0.31/- 86.6	23.3
	500	0.60/ 168.2	4.7/ 78.8	0.08/64.3	0.18/-119.6	15.6
	800	0.61/ 149.2	3.0/ 65.5	0.11/69.3	0.17/-139.1	11.6
	1000	0.61/ 138.6	2.4/ 57.4	0.14/69.8	0.17/-155.0	9.6
	1200	0.61/ 128.5	1.9/ 50.6	0.16/70.7	0.19/-165.9	7.9
	1500	0.61/ 114.1	1.6/ 41.6	0.21/68.9	0.22/ 179.2	6.2
	2000	0.61/ 91.9	1.1/ 29.7	0.28/67.3	0.29/ 154.6	3.2
70	40	0.44/- 83.3	33.6/144.3	0.02/65.8	0.80/- 37.8	35.9
	100	0.53/-132.9	20.7/117.5	0.03/53.1	0.50/- 68.4	29.0
	200	0.58/-162.0	11.6/ 99.5	0.04/55.3	0.30/- 92.3	23.5
	500	0.59/ 167.7	4.8/ 78.7	0.08/66.2	0.18/-127.6	15.7
	800	0.60/ 149.2	3.0/ 65.7	0.12/67.6	0.16/-148.8	11.7
	1000	0.60/ 138.6	2.4/ 57.1	0.14/68.7	0.17/-160.7	9.8
	1200	0.60/ 128.4	2.0/ 51.2	0.17/70.6	0.19/-172.3	8.0
	1500	0.60/ 114.2	1.6/ 42.0	0.21/68.2	0.23/ 172.8	6.3
	2000	0.61/ 92.1	1.1/ 30.7	0.29/67.0	0.29/ 149.1	3.4
100	40	0.45/- 85.7	35.2/142.8	0.02/65.1	0.78/- 40.4	36.0
	100	0.53/-134.7	21.2/116.1	0.03/51.6	0.48/- 71.7	29.1
	200	0.58/-163.0	11.8/ 98.6	0.04/54.1	0.29/- 97.7	23.5
	500	0.59/ 167.1	4.9/ 78.6	0.08/65.5	0.17/-134.9	15.8
	800	0.60/ 148.8	3.0/ 65.4	0.12/67.7	0.17/-154.8	11.8
	1000	0.60/ 138.2	2.4/ 57.7	0.14/68.3	0.18/-167.5	9.8
	1200	0.60/ 128.4	2.0/ 51.2	0.17/69.9	0.19/-178.9	8.1
	1500	0.60/ 113.8	1.6/ 42.3	0.21/67.7	0.22/ 168.5	6.3
	2000	0.61/ 92.0	1.1/ 31.1	0.29/65.7	0.29/ 146.1	3.4

PNP 5 GHz WIDEBAND TRANSISTOR

PNP transistor in a four-lead dual emitter plastic envelope (SOT103). This device is designed for application in wideband amplifiers, such as MATV and CATV systems, up to 5 GHz.

NPN 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 (DC)	$-I_C$	max.	25	mA
Total power dissipation up to T_{amb} = 60 °C	P_{tot}	max.	200	mW
Junction temperature	T_j	max.	175	°C
DC 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	GHz
Feedback capacitance at f = 1 MHz I_C = 0; $-V_{CE}$ = 10 V	C_{re}	typ.	0.45	pF
Noise figure at optimum source impedance $-I_C$ = 14 mA; $-V_{CE}$ = 10 V; f = 800 MHz	F	typ.	3.4	dB

MECHANICAL DATA

SOT103 (see outlines section).

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			
DC	$-I_C$	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.	200 mW
Storage temperature range	T_{stg}		−65 to +150 °C
Junction temperature	T_j	max.	175 °C

THERMAL RESISTANCE

From junction to ambient (free air) mounted on a fibre-glass print	$R_{th\ j\text{-}a}$	=	500 K/W
From junction to soldering point	$R_{th\ j\text{-}s}$	=	55 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current			
$I_E = 0$; $-V_{CB} = 10$ V	$-I_{CBO}$	max.	50 nA
DC 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	F	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_{12} assumed to be zero)

$$G_{UM} = 10 \log \frac{|S_{21}|^2}{[1-|S_{11}|^2]\ [1-|S_{22}|^2]}$$

$-I_C = 14$ 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	G_{UM}	typ.	8.5 dB

Output voltage at d_{im} = −60 dB			
$-I_C$ = 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
Second harmonic distortion (see Fig.1)			
$-I_C$ = 14 mA; $-V_{CE}$ = 10 V; R_L = 75 Ω;			
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

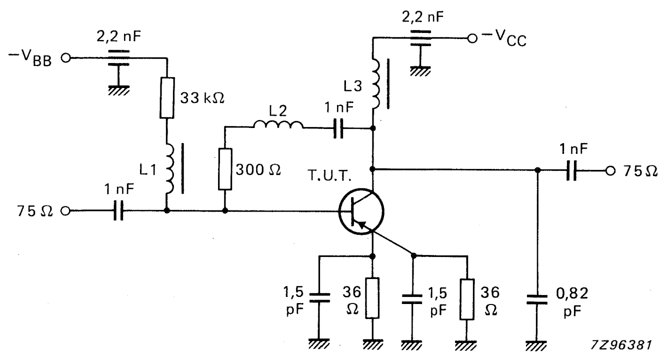


Fig.1 Intermodulation distortion and second harmonic distortion MATV test circuit.

L1 = L3 = 5 μH 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 V; T_{amb} = 25 °C; typical values.

$-I_C$ mA	f MHz	s_{11}	s_{21}	s_{12}	s_{22}	G_{UM} dB
	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
5	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
	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
10	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
	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
14	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 V; T_{amb} = 25 °C; typical values.

$-I_C$ mA	f MHz	s_{11}	s_{21}	s_{12}	s_{22}	G_{UM} dB
	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
20	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
	1500	0,54/+150,9°	2,2/ 56,0°	0,11/ 67,6°	0,18/ −36,0°	8,3
	2000	0,58/+132,1°	1,9/ −6,2°	0,14/ 16,0°	0,19/−108,6°	7,4
	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
25	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
	1500	0,56/+151,1°	2,2/ 75,3°	0,10/ 68,9°	0,18/ −24,3°	8,4
	2000	0,60/+131,8°	1,8/ −6,7°	0,14/ 17,6°	0,19/ −96,0°	7,4
	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
30	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
	1500	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

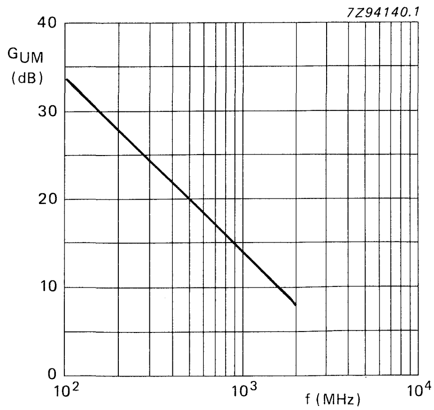


Fig.2 $-V_{CE} = 10$ V; $-I_C = 14$ mA; $T_{amb} = 25$ °C; typical values.

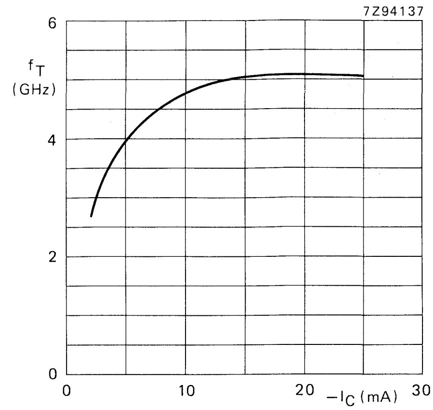


Fig.3 $-V_{CE} = 10$ V; f = 500 MHz; $T_j = 25$ °C; typical values.

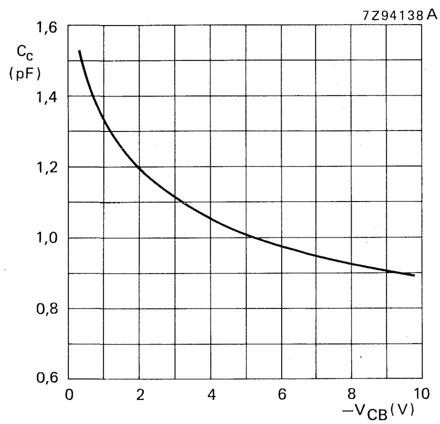


Fig.4 $I_E = i_e = 0$; f = 1 MHz; $T_j = 25$ °C; typical values.

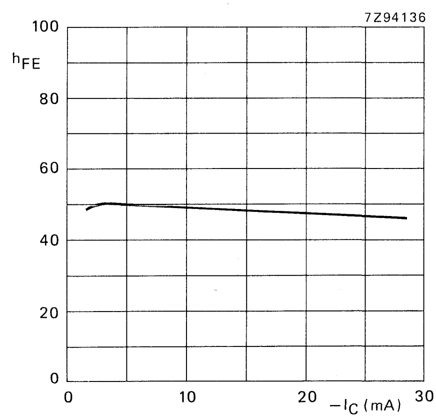


Fig.5 $-V_{CE} = 10$ V; $T_j = 25$ °C; typical values.

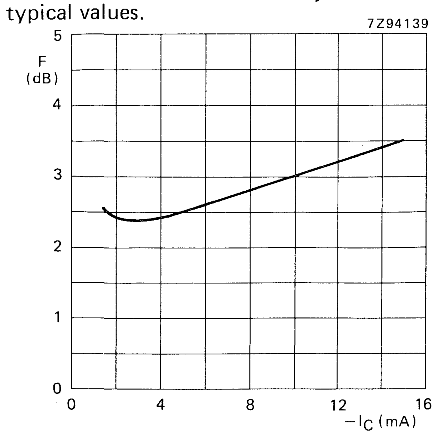


Fig.6 $-V_{CE} = 10$ V; f = 800 MHz; Z_S = opt.; $T_{amb} = 25$ °C.

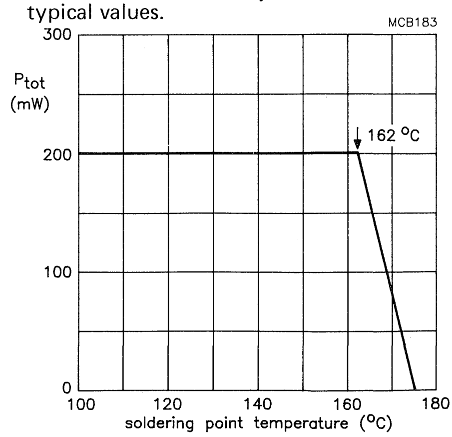


Fig.7 Power derating curve.

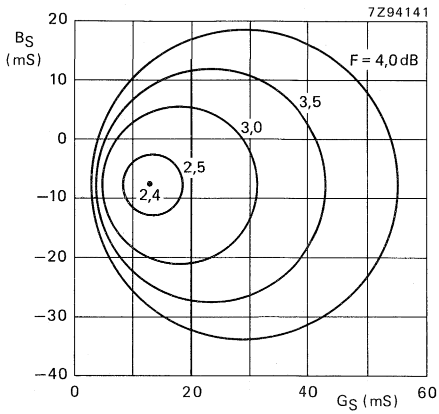


Fig.8 Circles of constant noise figure; $-V_{CE}$ = 10 V; $-I_C$ = 4 mA; f = 800 MHz; typical values.

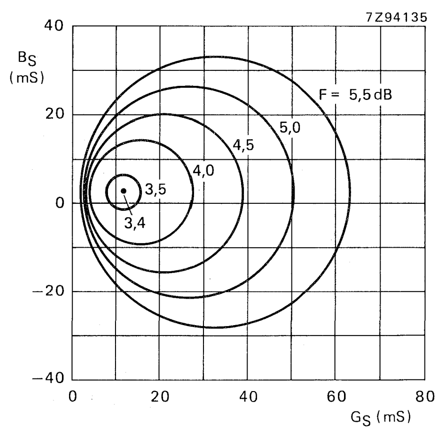


Fig.9 Circles of constant noise figure; $-V_{CE}$ = 10 V; $-I_C$ = 14 mA; f = 800 MHz; typical values.

Philips Components

Data sheet	
status	Product specification
date of issue	September 1990

BFG55

PNP 4 GHz wideband transistor

FEATURES

- High output voltage capability
- High gain bandwidth product
- Good thermal stability
- Gold metallization ensures excellent reliability
- Complementary npn type BFG35.

DESCRIPTION

PNP planar epitaxial transistor intended for wideband amplifier applications.
The BFG55 is mounted in a SOT223 plastic envelope.

MECHANICAL DATA

Plastic SOT223 envelope.

PINNING

PIN	DESCRIPTION
1	emitter
2	base
3	emitter
4	collector

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$-V_{CBO}$	collector-base voltage	open emitter	-	-	25	V
$-V_{CEO}$	collector-emitter voltage	open base	-	-	18	V
$-I_C$	collector current (DC)		-	-	150	mA
P_{tot}	total power dissipation	T_{case} = 135 °C; note 1	-	-	1	W
T_j	junction temperature		-	-	175	°C
h_{FE}	DC current gain	$-I_C$ = 100 mA; $-V_{CE}$ = 10 V; T_{amb} = 25 °C	25	-	-	
f_T	transition frequency	f = 500 MHz; $-I_C$ = 100 mA; $-V_{CE}$ = 10 V; T_{amb} = 25 °C	-	4	-	GHz
G_{UM}	maximum power gain	f = 800 MHz; $-I_C$ = 100 mA; $-V_{CE}$ = 10 V; T_{amb} = 25 °C	-	11	-	dB
V_o	output voltage	d_{im} = −60 dB; $-I_C$ = 100 mA; $-V_{CE}$ = 10 V; R_L = 75 Ω; $f_{(p+q-r)}$ = 848.25 MHz	-	750	-	mV

Note

1. T_{case} temperature measured on soldering point of collector tab.

PNP 4 GHz wideband transistor BFG55

ORDERING AND PACKAGE INFORMATION

EXTENDED TYPE NUMBER	PACKAGE		
	CODE	PACKING METHOD	PACKING QUANTITY
BFG55	SOT223	bulk	500
BFG55	SOT223	12 mm reel	1000

LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$-V_{CBO}$	collector-base voltage	open emitter	-	25	V
$-V_{CEO}$	collector-emitter voltage	open base	-	18	V
$-V_{EBO}$	emitter-base voltage	open collector	-	2	V
$-I_C$	collector current (DC)		-	150	mA
P_{tot}	total power dissipation	T_{case} = 135 °C	-	1	W
T_{stg}	storage temperature range		−65	+150	°C
T_j	junction temperature		-	175	°C

THERMAL RESISTANCE

SYMBOL	PARAMETER	NOM.	UNIT
$R_{th\ j-c}$	from junction to case	35	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$-V_{(BR)CBO}$	collector-base breakdown voltage	open emitter $-I_C$ = 0.1 mA	25	-	-	V
$-V_{(BR)CEO}$	collector-emitter breakdown voltage	open base $-I_C$ = 10 mA	18	-	-	V
$-V_{(BR)EBO}$	emitter-base breakdown voltage	open collector $-I_E$ = 0.1 mA	3	-	-	V
$-I_{CBO}$	collector cut-off current	$-I_E$ = 0; $-V_{CB}$ = 10 V	-	-	1	μA
h_{FE}	DC current gain	$-I_C$ = 100 mA; $-V_{CE}$ = 10 V	-	25	-	
C_c	collector-base capacitance	f = 1 MHz; $-I_C$ = 0; $-V_{CB}$ = 10 V	-	2.3	-	pF
C_e	emitter-base capacitance	f = 1 MHz; $-I_C$ = 0; $-V_{EB}$ = 10 V	-	8	-	pF
C_{re}	feedback capacitance	f = 1 MHz; $-I_C$ = 0; $-V_{CE}$ = 10 V	-	1.7	-	pF
f_T	transition frequency	f = 500 MHz; $-I_C$ = 100 mA; $-V_{CE}$ = 10 V; T_{amb} = 25 °C	-	4	-	GHz
G_{UM}	maximum power gain	f = 500 MHz; $-I_C$ = 100 mA; $-V_{CE}$ = 10 V; T_{amb} = 25 °C	-	15	-	dB
G_{UM}	maximum power gain	f = 800 MHz; $-I_C$ = 100 mA; $-V_{CE}$ = 10 V; T_{amb} = 25 °C;	-	11	-	dB
V_o	output voltage	see note 1	-	750	-	mV
V_o	output voltage	see note 2	-	800	-	mV

Note

1. d_{im} = −60 dB (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 = 850.25 MHz;
   $V_q = V_o$ −6 dB; f_q = 858.25 MHz;
   $V_r = V_o$ −6 dB; f_r = 860.25 MHz;
   Measured at $f_{(p+q+r)}$ = 848.25 MHz.

2. d_{im} = −60 dB (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 = 445.25 MHz;
   $V_q = V_o$ −6 dB; f_q = 453.25 MHz;
   $V_r = V_o$ −6 dB; f_r = 455.25 MHz;
   Measured at $f_{(p+q-r)}$ = 443.25 MHz.

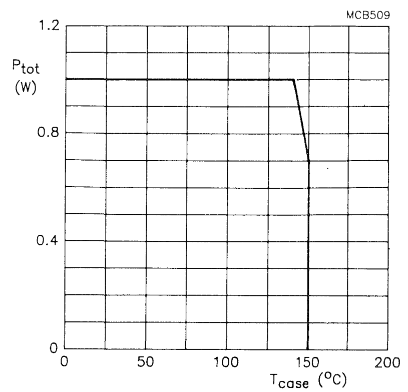


Fig.1 Power derating curve.

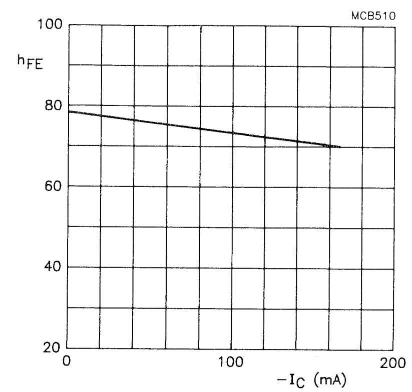


Fig.2 DC current gain as a function of collector current; $-V_{CE}$ = 10 V; T_{amb} = 25 °C.

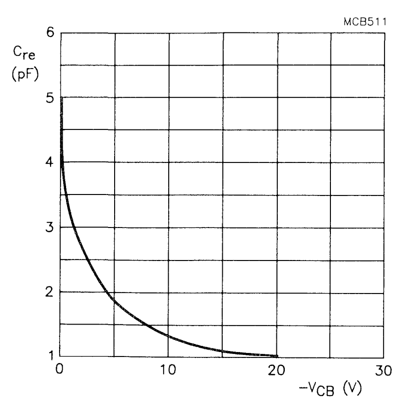


Fig.3 Feedback capacitance as a function of collector-base voltage; f = 1 MHz; T_{amb} = 25 °C; typical values.

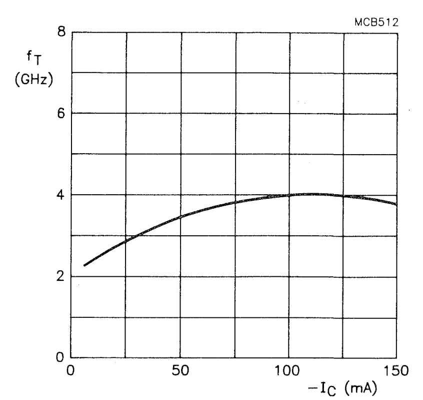


Fig.4 Transition frequency as a function of collector current; $-V_{CE}$ = 10 V; T_{amb} = 25 °C; typical values.

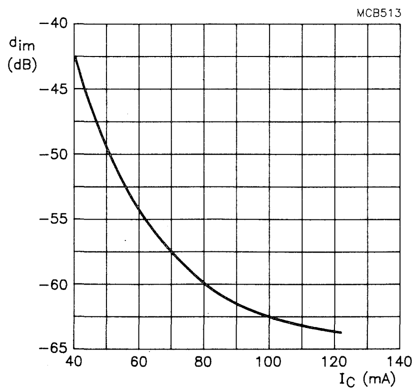


Fig.5 Intermodulation distortion as a function of collector current; $-V_{CE}$ = 10 V; V_o = 650 mV; T_{amb} = 25 °C; $f_{(p+q-r)}$ = 443.25 MHz.

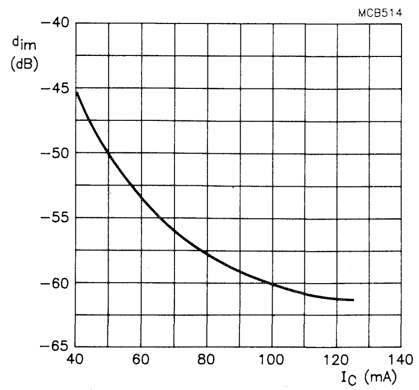


Fig.6 Intermodulation distortion as a function of collector current; $-V_{CE}$ = 10 V; V_o = 600 mV; T_{amb} = 25 °C; $f_{(p+q-r)}$ = 848.25 MHz.

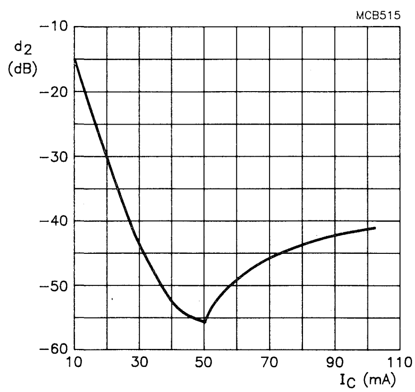


Fig.7 Second order beat as a function of collector current; $-V_{CE}$ = 10 V; V_o = 50 dBmV; T_{amb} = 25 °C; $f_{(p+q)}$ = 450 MHz.

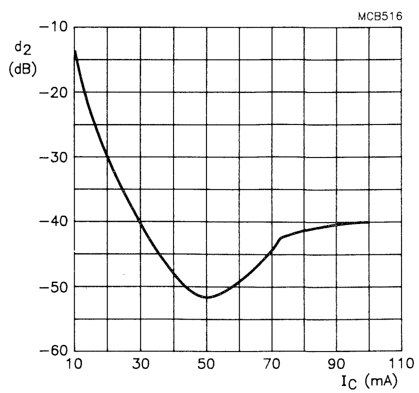


Fig.8 Second order beat as a function of collector current; $-V_{CE}$ = 10 V; V_o = 50 dBmV; T_{amb} = 25 °C; $f_{(p+q)}$ = 810 MHz.

NPN 7 GHz WIDEBAND TRANSISTOR

NPN transistor in a four-lead dual emitter plastic envelope (SOT103). 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 (DC)	I_C	max.	50 mA
Total power dissipation up to T_{amb} = 60 °C	P_{tot}	max.	300 mW
Junction temperature	T_j	max.	175 °C
DC current gain I_C = 15 mA; V_{CE} = 5 V	h_{FE}	min. typ.	60 100
Transition frequency at f = 500 MHz I_C = 15 mA; V_{CE} = 8 V	f_T	typ.	7.5 GHz
Noise figure at Z_S = 60 Ω; I_C = 15 mA; V_{CE} = 8 V; f = 2 GHz	F	typ.	3.0 dB
Maximum unilateral power gain at f = 2 GHz I_C = 15 mA; V_{CE} = 8 V	G_{UM}	typ.	10.5 dB

MECHANICAL DATA

SOT103 (see outlines section).

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 (DC)	I_C	max.	50 mA
Total power dissipation up to T_{amb} = 60 °C mounted on a fibre-glass pcb	P_{tot}	max.	300 mW
Storage temperature range	T_{stg}		−65 to +150 °C
Junction temperature	T_j	max.	175 °C

THERMAL RESISTANCE

From junction to ambient (free air) mounted on a glass-fibre pcb	$R_{th\ j\text{-}a}$	=	300 K/W
From junction to soldering point	$R_{th\ j\text{-}s}$	=	55 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
DC 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
Collector capacitance at f = 1 MHz $I_E = i_e = 0$; V_{CB} = 8 V	C_c	typ.	1.1 pF
Emitter capacitance at f = 1 MHz $I_C = i_c = 0$; V_{EB} = 0.5 V	C_e	typ.	1.3 pF
Feedback capacitance at f = 1 MHz $I_E = 0$; V_{CE} = 8 V	C_{re}	typ.	0.5 pF

Maximum unilateral power gain (S_{12} assumed to be zero)

$$G_{UM} = 10 \log \frac{|S_{21}|^2}{[1-|S_{11}|^2]\ [1-|S_{22}|^2]}$$

I_C = 15 mA; V_{CE} = 8 V; f = 800 MHz; T_{amb} 25 °C	G_{UM}	typ.	18.5 dB
I_C = 15 mA; V_{CE} = 8 V; f = 2 GHz; T_{amb} = 25 °C	G_{UM}	typ.	10.5 dB

Noise figure at optimum source impedance and V_{CE} = 8 V; f = 800 MHz; T_{amb} = 25 °C;

I_C = 5 mA	F	typ.	0.8 dB
I_C = 15 mA	F	typ.	1.5 dB

Noise figure at Z_S = 60 Ω and V_{CE} = 8 V; f = 2 GHz; T_{amb} = 25 °C;

I_C = 5 mA	F	typ.	2.5 dB
I_C = 15 mA	F	typ.	3.0 dB

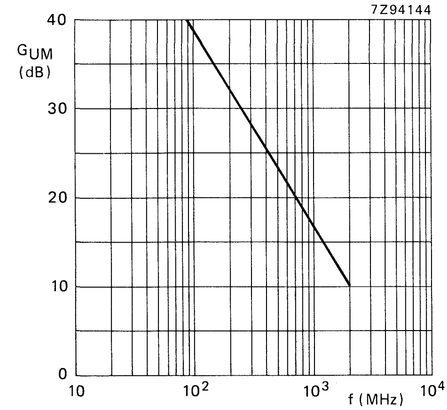


Fig.1 V_{CE} = 8 V; I_C = 15 mA; T_{amb} = 25 °C; typical values.

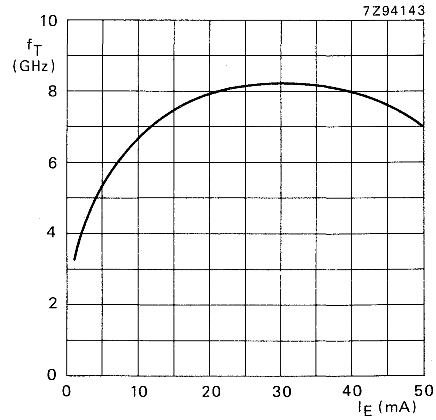


Fig.2 V_{CE} = 8 V; f = 500 MHz; typical values.

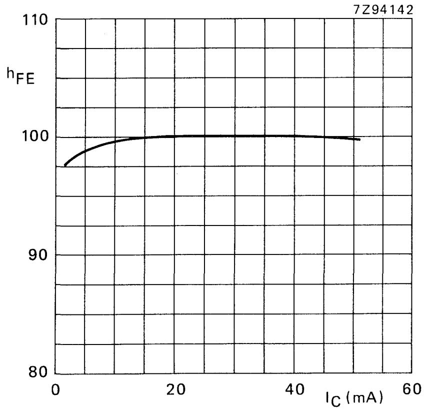


Fig.3 V_{CE} = 5 V; T_j = 25 °C; typical values.

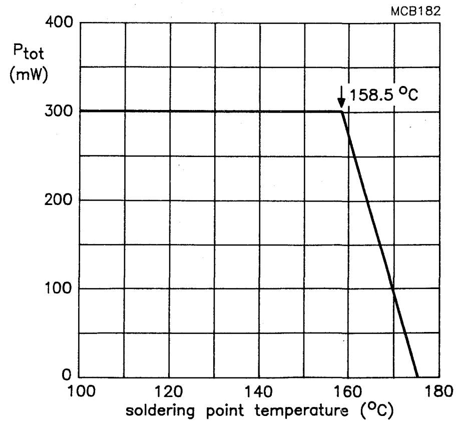


Fig.4 Power derating curve.

s-parameters (common emitter) at V_{CE} = 8 V; T_{amb} = 25 °C; typical values

I_C mA	f MHz	s_{11}	s_{21}	s_{12}	s_{22}	G_{UM} dB
	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
5	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
	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
10	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
	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
15	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
	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
20	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
	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
30	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

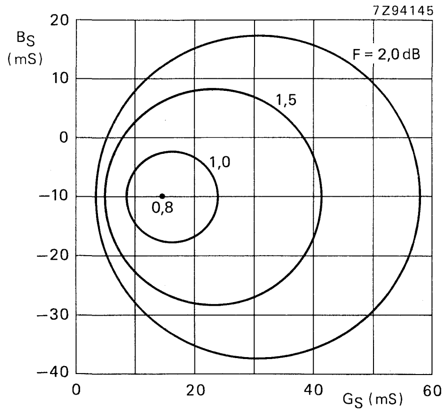


Fig.5 Circles of constant noise figure; V_{CE} = 8 V; I_C = 5 mA; f = 800 MHz; T_{amb} = 25 °C; typical values.

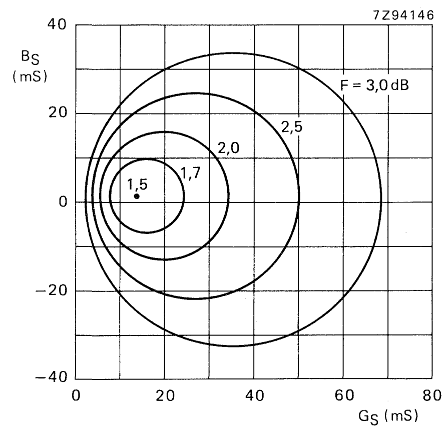


Fig.6 Circles of constant noise figure; V_{CE} = 8 V; I_C = 15 mA; f = 800 MHz; T_{amb} = 25 °C; typical values.

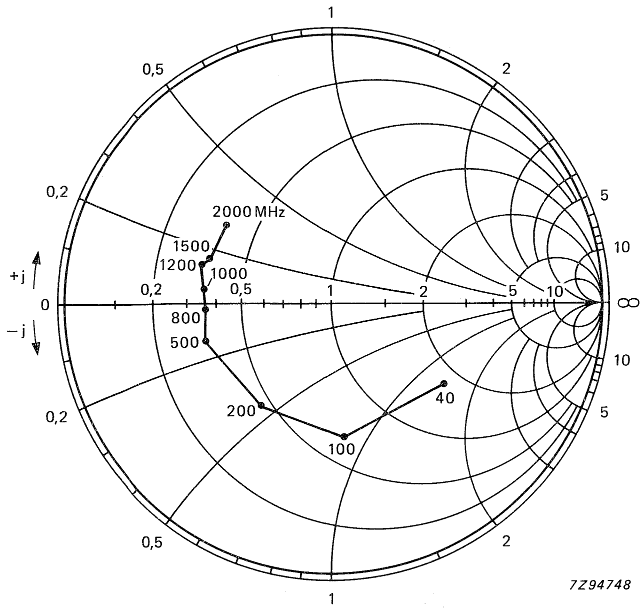


Fig. 7 Input impedance, derived from input reflection coefficient S_{11} coordinates, in ohm x 50.

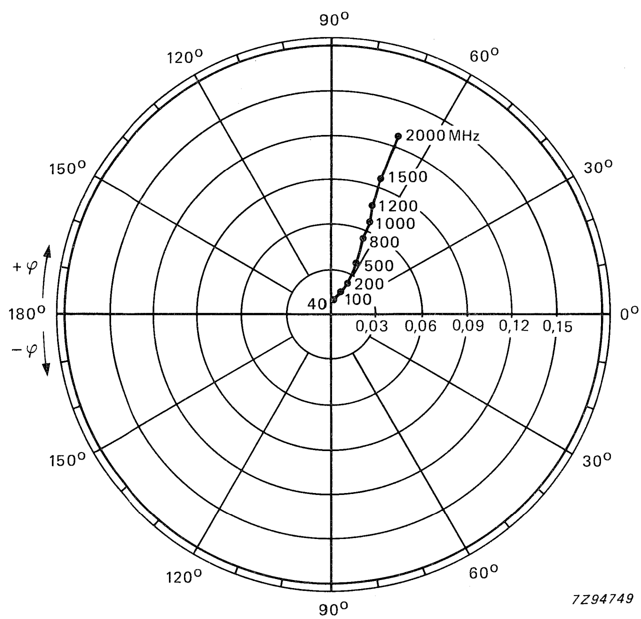


Fig.8 Reverse transmission coefficient S_{12}.

Conditions for Figs 7, 8, 9 and 10: V_{CE} = 8 V; I_C = 30 mA; T_{amb} = 25 °C; typical values.

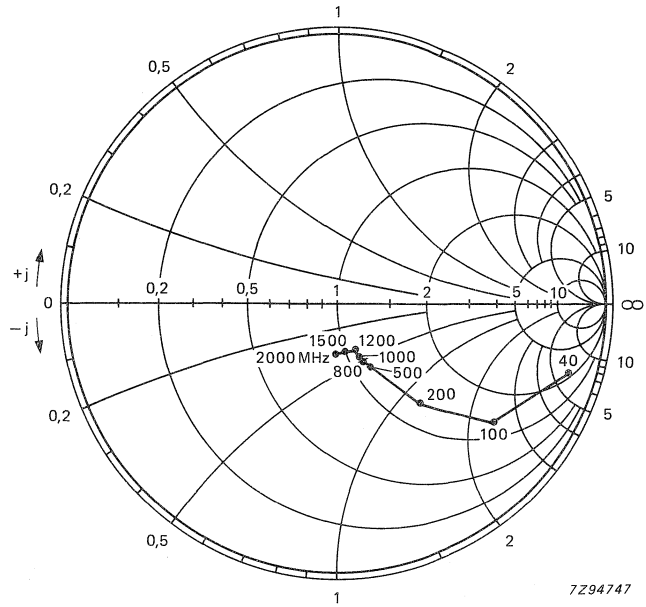


Fig.9 Output impedance, derived from output reflection coefficient S_{22} coordinates, in ohm x 50.

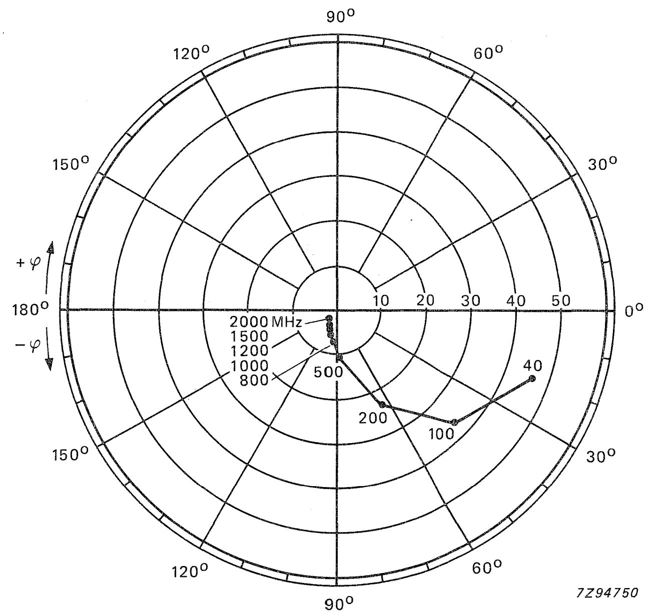


Fig.10 Forward transmission coefficient S_{21}.

NPN 7 GHz WIDEBAND TRANSISTOR

NPN transistor in a four-lead dual emitter plastic envelope (SOT143). A version with reverse pinning is available on request. 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 (DC)	I_C	max.	50	mA
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	300	mW
Junction temperature	T_j	max.	150	°C
DC 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
Maximum unilateral power gain at f = 2 GHz I_C = 15 mA; V_{CE} = 8 V; T_{amb} = 25 °C	G_{UM}	typ.	10.0	dB
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

MECHANICAL DATA

SOT143 (see outlines section).

Marking code:

BFG67 : V3
BFG67X: V12

Pinning:

BFG67	BFG67X
1 = collector	1 = collector
2 = base	2,4 = emitter
3,4 = emitter	3 = base

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 (DC)	I_C	max.	50	mA
Total power dissipation up to T_{amb} = 25 °C mounted on a ceramic substrate of 8 mm x 10 mm x 0.7 mm	P_{tot}	max.	300	mW
Storage temperature range	T_{stg}	−65 to + 150		°C
Junction temperature	T_j	max.	150	°C

THERMAL RESISTANCE

From junction to ambient mounted on a ceramic substrate of 8 mm x 10 mm x 0.7 mm	$R_{th\ j\text{-}a}$	=	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.	50	nA
DC current gain $I_C = 15$ mA; $V_{CE} = 5$ V	h_{FE}	min. typ.	60 100	
Transition frequency at f = 500 MHz $I_C = 15$ mA; $V_{CE} = 8$ V	f_T	typ.	7.5	GHz
Collector capacitance at f = 1 MHz $I_E = I_e = 0$; $V_{CB} = 8$ 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.	1.3	pF
Feedback capacitance at f = 1 MHz $I_C = 0$; $V_{CE} = 8$ V	C_{re}	typ.	0.5	pF

Maximum unilateral power gain (S_{12} assumed to be zero)

$$G_{UM} = 10 \log \frac{|S_{21}|^2}{[1-|S_{11}|^2]\ [1-|S_{22}|^2]}$$

at $I_C = 15$ mA; $V_{CE} = 8$ V; f = 2 GHz; T_{amb} = 25 °C	G_{UM}	typ.	10.0	dB
Noise figures at f = 800 MHz; Z_S = opt.; T_{amb} = 25 °C; $V_{CE} = 8$ V				
$I_C = 5$ mA	F	typ.	0.8	dB
$I_C = 15$ mA	F	typ.	1.5	dB
Noise figures at f = 2 GHz; $Z_S = 60\ \Omega$ T_{amb} = 25 °C; $V_{CE} = 8$ V				
$I_C = 5$ mA	F	typ.	2.5	dB
$I_C = 15$ mA	F	typ.	3.0	dB

s-parameters (common emitter) at V_{CE} = 8 V; T_{amb} = 25 °C; typical values.

I_C mA	f MHz	S_{11} M Φ	S_{21} M Φ	S_{12} M Φ	S_{22} M Φ	G_{UM} dB
	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
2	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
	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
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
	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
10	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
	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
15	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
	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
20	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

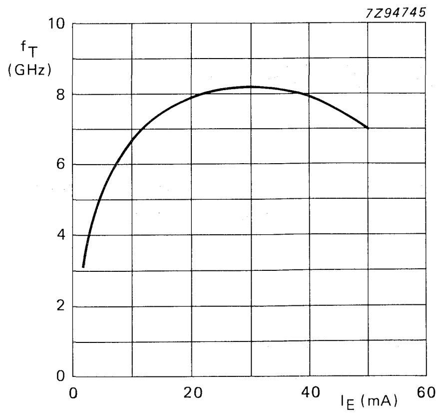


Fig.1 V_{CE} = 8 V; f = 500 MHz; T_{amb} = 25 °C; typical values.

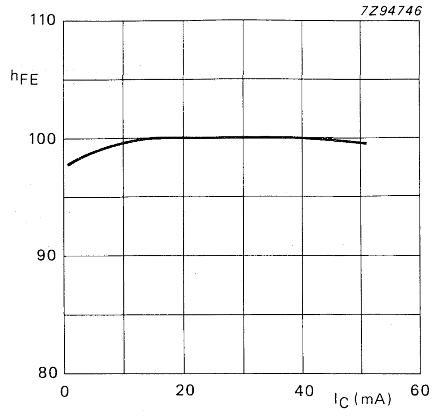


Fig.2 V_{CE} = 5 V; T_{amb} = 25 °C; typical values.

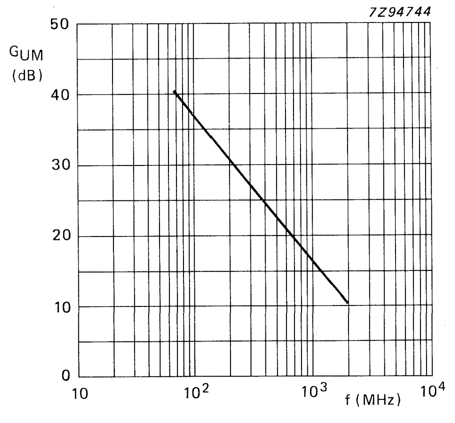


Fig.3 V_{CE} = 8 V; I_C = 15 mA; T_{amb} = 25 °C; typical values.

NPN 5 GHz WIDEBAND TRANSISTOR

NPN transistor in a four-lead dual-emitter plastic envelope (SOT103). A TO-92 version is available on request: Ref. ON 4184. This device is designed for application in wideband amplifiers, such as in CATV and MATV systems, up to 5 GHz.

PNP 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 (DC)	I_C	max.	25	mA
Total power dissipation up to T_{amb} = 60 °C	P_{tot}	max.	200	mW
Junction temperature	T_j	max.	175	°C
DC current gain I_C = 14 mA; V_{CE} = 10 V	h_{FE}	min.	40	
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
Noise figure at Z_S = opt.; T_{amb} = 25 °C; I_C = 14 mA; V_{CE} = 10 V; f = 800 MHz	F	typ.	2.4	dB
Maximum unilateral power gain at f = 800 MHz I_C = 14 mA; V_{CE} = 10 V	G_{UM}	typ.	19	dB
Output power at 1 dB gain compression V_{CE} = 10 V; I_C = 14 mA; f = 800 MHz	P_{L1}	typ.	+8	dBm
Third order intercept point V_{CE} = 10 V; I_C = 14 mA; f = 800 MHz	ITO	typ.	+27	dBm

MECHANICAL DATA

SOT103 (see outlines section).

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 (DC)	I_C	max.	25 mA
Total power dissipation up to T_{amb} = 60 °C	P_{tot}	max.	200 mW
Storage temperature range	T_{stg}		−65 to +150 °C
Junction temperature	T_j	max.	175 °C

THERMAL RESISTANCE

From junction to ambient in free air and mounted on glass-fibre pcb	$R_{th\ j\text{-}a}$	=	500 K/W
From junction to soldering point	$R_{th\ j\text{-}s}$	=	65 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current $I_E = 0$; V_{CB} = 10 V	I_{CBO}	max.	50 nA
DC current gain I_C = 14 mA; V_{CE} = 10 V	h_{FE}	min. typ.	40 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_{12} assumed to be zero)

$$G_{UM} = 10 \log \frac{|S_{21}|^2}{[1-|S_{11}|^2]\ [1-|S_{22}|^2]}$$

I_C = 14 mA; V_{CE} = 10 V; f = 800 MHz; T_{amb} = 25 °C	G_{UM}	typ.	19.0 dB
I_C = 14 mA; V_{CE} = 10 V; f = 2 GHz; T_{amb} = 25 °C	G_{UM}	typ.	10.5 dB

Noise figure at T_{amb} = 25 °C

I_C = 4 mA; V_{CE} = 10 V; f = 800 MHz; Z_S = opt.	F	typ.	1.7 dB
I_C = 14 mA; V_{CE} = 10 V; f = 800 MHz; Z_S = opt.	F	typ.	2.4 dB
I_C = 4 mA; V_{CE} = 10 V; f = 2 GHz; Z_S = 60 Ω	F	typ.	3.6 dB

Output power at 1 dB gain compression I_C = 14 mA; V_{CE} = 10 V; T_{amb} = 25 °C; R_L = 75 Ω; measured at f = 800 MHz	P_{L1}	typ.	+8 dBm
Third order intercept point (see Fig.1) I_C = 14 mA; V_{CE} = 10 V; R_L = 75 Ω; 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
Output voltage at d_{im} = −60 dB 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
Second harmonic distortion (see Fig.1) I_C = 14 mA; V_{CE} = 10 V; R_L = 75 Ω; VSWR < 2; T_{amb} = 25 °C V_p = V_O = 60 mV at f_p = 250 MHz V_q = V_O = 60 mV at f_q = 560 MHz measured at $f_{(p+q)}$ = 810 MHz	d_2	typ.	−50 dB

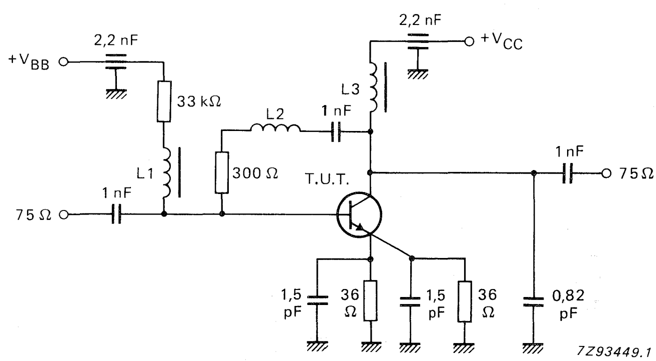


Fig.1 Intermodulation distortion and second harmonic distortion MATV test circuit.

L1 = L3 = 5 μH 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 V; T_{amb} = 25 °C; typical values

I_C mA	f MHz	S_{11}	S_{21}	S_{12}	S_{22}	G_{UM} 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 V; T_{amb} = 25 °C; typical values

I_C mA	f MHz	S_{11}	S_{21}	S_{12}	S_{22}	G_{UM} 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

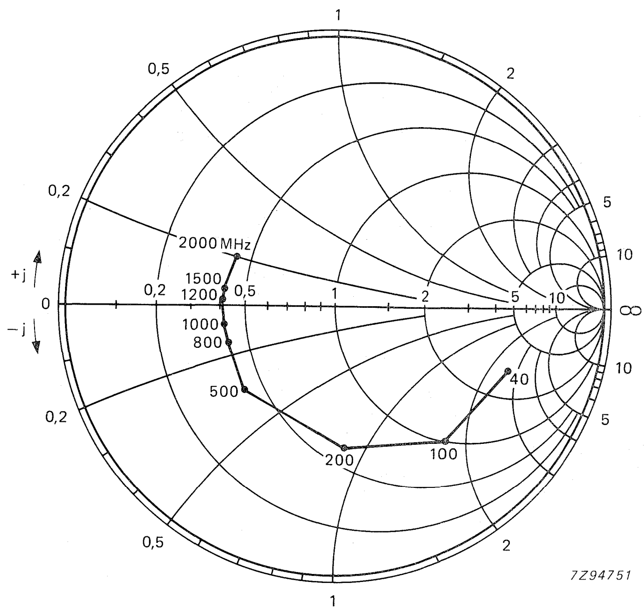


Fig.2 Input impedance, derived from input reflection coefficient S_{11} coordinates, in ohm x 50.

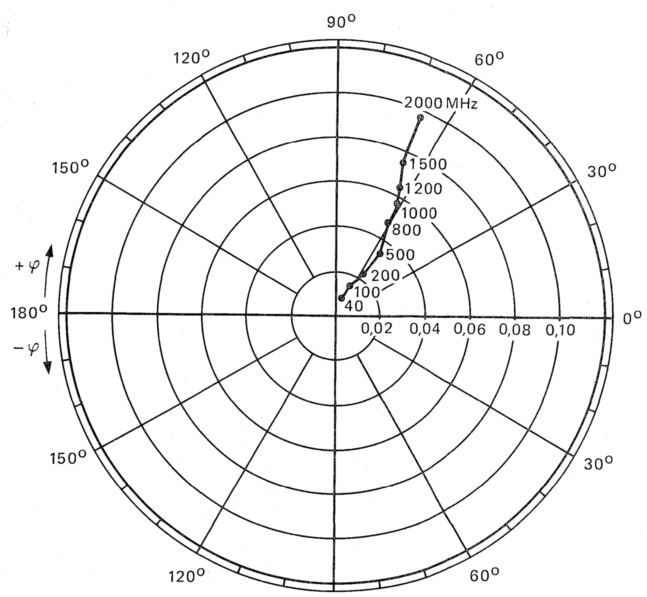


Fig.3 Reverse transmission coefficient S_{12}.

Conditions for Figs 2 to 5: V_{CE} = 10 V; I_C = 14 mA; T_{amb} = 25 °C.

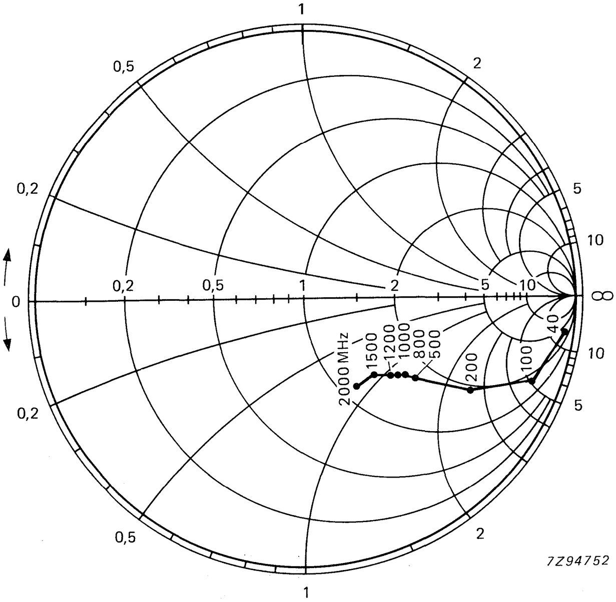


Fig.4 Output impedance, derived from output reflection coefficient S_{22} coordinates, in ohm x 50.

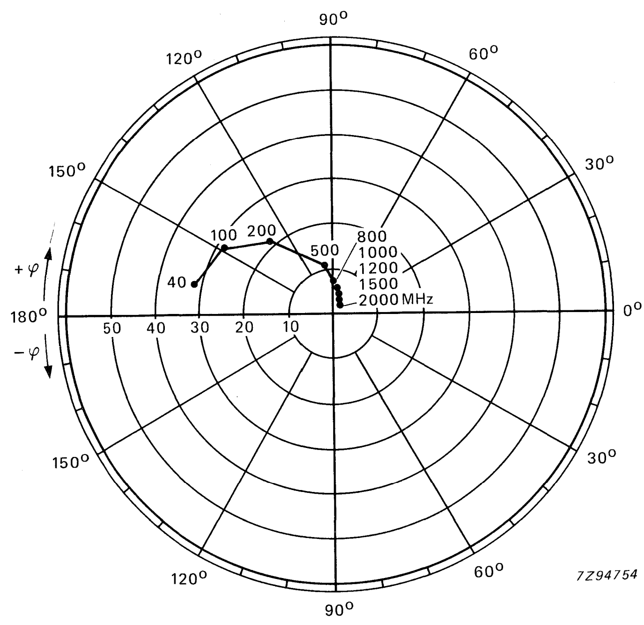


Fig.5 Forward transmission coefficient S_{21}.

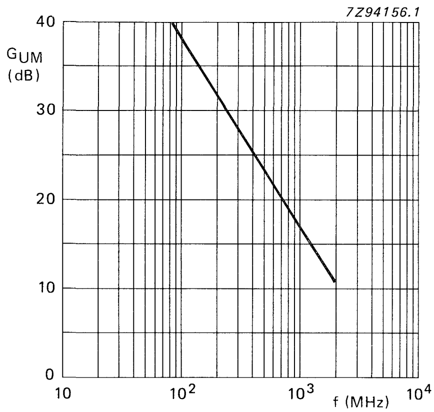


Fig.6 V_{CE} = 10 V; I_C = 14 mA; T_{amb} = 25 °C; typical values.

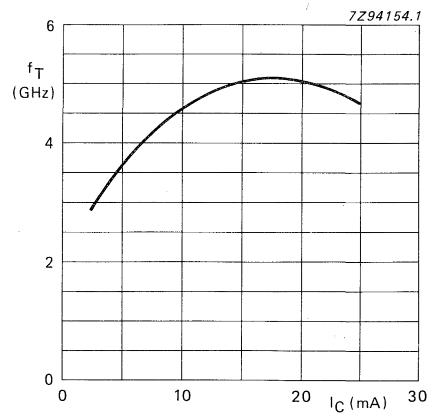


Fig.7 V_{CE} = 10 V; f = 500 MHz; T_j = 25 °C; typical values.

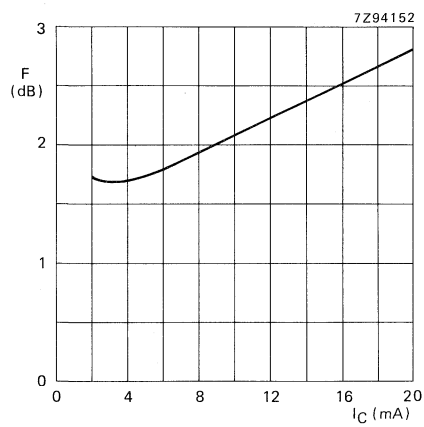


Fig.8 V_{CE} = 10 V; f = 800 MHz; Z_S = opt.; T_{amb} = 25 °C; typical values.

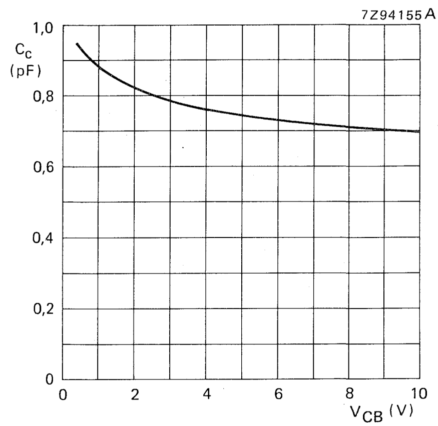


Fig.9 I_E = i_e = 0; f = 1 MHz; T_j = 25 °C; typical values.

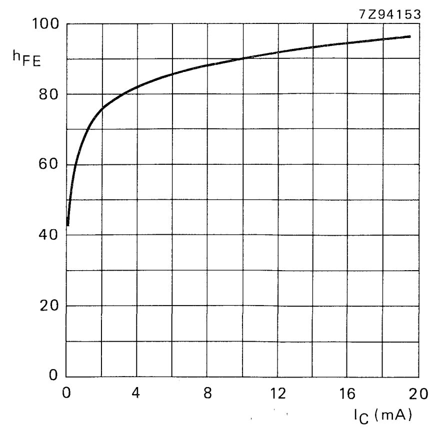


Fig.10 V_{CE} = 10 V; T_j = 25 °C; typical values.

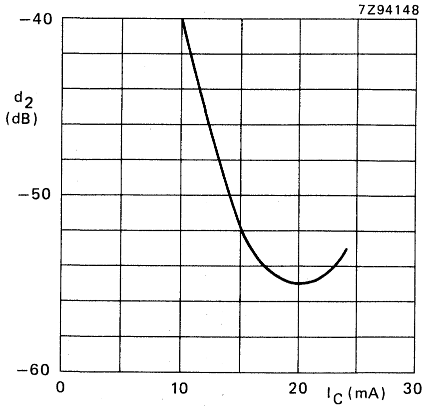


Fig.11 V_{CE} = 10 V; V_O = 60 mV; $f_{(p+q)}$ = 810 MHz; T_{amb} = 25 °C; typical values.

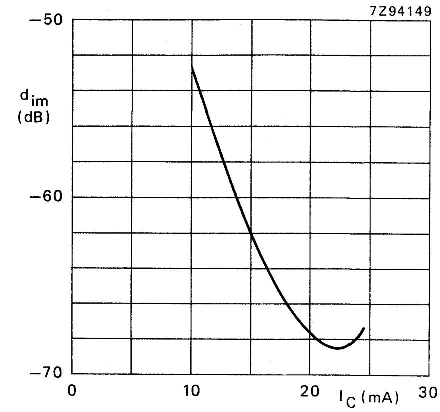


Fig.12 V_{CE} = 10 V; V_O = 150 mV; $f_{(p+q)}$ = 793.25 MHz; T_{amb} = 25 °C; typical values.

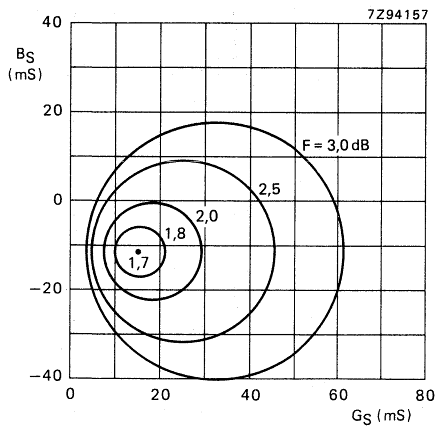


Fig.13 Circles of constant noise figure; I_C = 4 mA; V_{CE} = 10 V; f = 800 MHz; typical values.

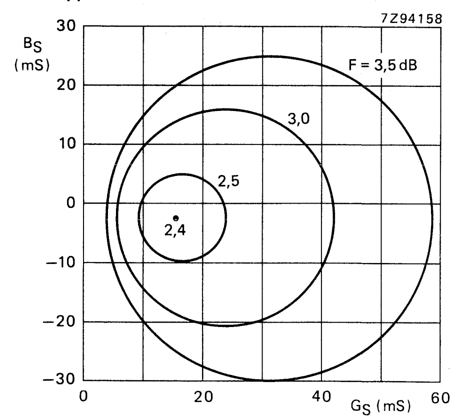


Fig.14 Circles of constant noise figure; I_C = 14 mA; V_{CE} = 10 V; f = 800 MHz; typical values.

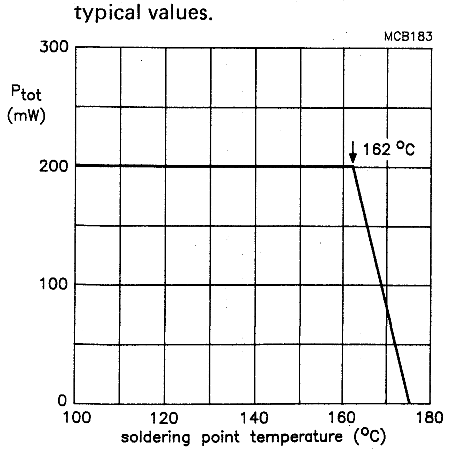


Fig.15 Power derating curve.

CLASS-B OPERATION

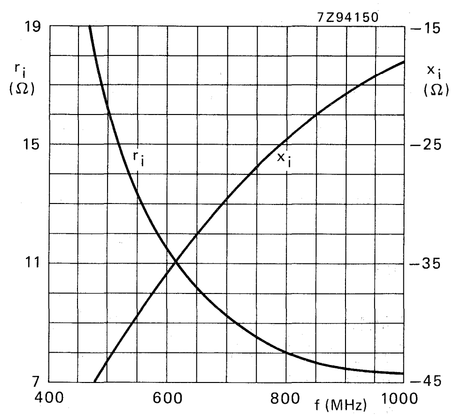


Fig.16 Input impedance (series components).

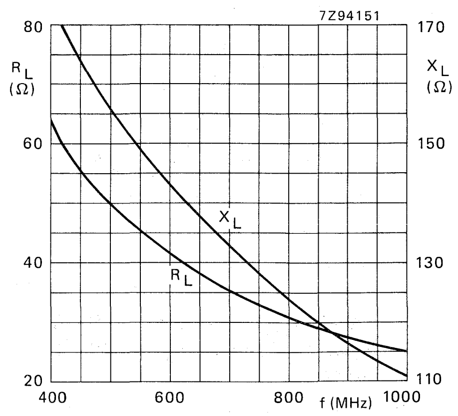


Fig.17 Load impedance (series components).

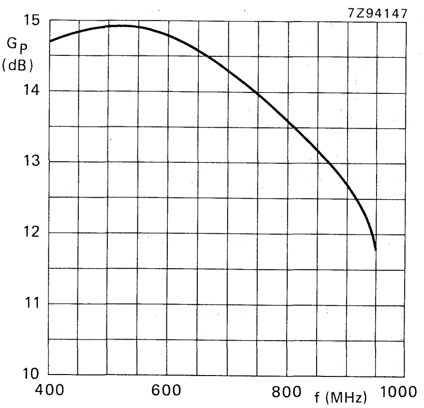


Fig.18 Power gain as a function of frequency.

Conditions for Figs 16 to 18:

V_{CE} = 10 V; P_L = 100 mW; T_{amb} = 25 °C; typical values.

OPERATING NOTE for Figs 16 to 18:

A base-emitter resistor of 82 Ω is recommended to avoid oscillation. This resistor must be effective for RF only.

NPN 6 GHz WIDEBAND TRANSISTOR

NPN transistor in a four-lead dual-emitter plastic envelope (SOT103). A TO-92 version is available on request: Ref. ON 4185. This device is designed for application in wideband amplifiers, such as in CATV and MATV systems.

PNP 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 (DC)	I_C	max.	35	mA
Total power dissipation up to T_{amb} = 60 °C	P_{tot}	max.	300	mW
Junction temperature	T_j	max.	175	°C
DC current gain I_C = 30 mA; V_{CE} = 5 V	h_{FE}	min.	40	
Transition frequency at f = 500 MHz I_C = 30 mA; V_{CE} = 5 V	f_T	typ.	6.0	GHz
Feedback capacitance at f = 1 MHz I_C = 0; V_{CE} = 5 V	C_{re}	typ.	0.5	pF
Noise figure at optimum source impedance I_C = 30 mA; V_{CE} = 8 V; f = 800 MHz	F	typ.	2.3	dB
Maximum unilateral power gain at f = 800 MHz I_C = 30 mA; V_{CE} = 8 V	G_{UM}	typ.	17.5	dB
Output power at 1 dB gain compression V_{CE} = 8 V; I_C = 30 mA; f = 800 MHz	P_{L1}	typ.	+17	dBm
Third order intercept point V_{CE} = 8 V; I_C = 30 mA; f = 800 MHz	ITO	typ.	+36	dBm

MECHANICAL DATA

SOT103 (see outlines section).

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				
DC	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 range	T_{stg}		−65 to +150	°C
Junction temperature	T_j	max.	175	°C

THERMAL RESISTANCE

From junction to ambient in free air mounted on glass-fibre pcb	$R_{th\ j\text{-}a}$	=	300	K/W
From junction to soldering point	$R_{th\ j\text{-}s}$	=	55	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
DC 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
Collector output 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.	2.5	pF
Feedback capacitance at f = 1 MHz				
$I_E = 0$; $V_{CE} = 10$ V	C_{re}	typ.	0.6	pF

Maximum unilateral power gain (S_{12} assumed to be zero)

$$G_{UM} = 10 \log \frac{|S_{21}|^2}{[1-|S_{11}|^2]\ [1-|S_{22}|^2]}$$

$I_C = 30$ mA; $V_{CE} = 8$ V; f = 800 MHz; $T_{amb} = 25$ °C	G_{UM}	typ.	17.5	dB
$I_C = 30$ mA; $V_{CE} = 8$ V; f = 2 GHz; $T_{amb} = 25$ °C	G_{UM}	typ.	9.5	dB

Noise figure at optimum source impedance

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

$I_C = 4$ mA	F	typ.	1.6	dB
$I_C = 30$ mA	F	typ.	2.3	dB

Output power at 1 dB gain compression V_{CE} = 8 V; I_C = 30 mA; T_{amb} = 25 °C; R_L = 75 Ω; measured at f = 800 MHz	P_{L1}	typ.	+17 dBm
Third order intercept point (see Fig. 1) I_C = 30 mA; V_{CE} = 8 V; R_L = 75 Ω; 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
Output voltage at d_{im} = −60 dB I_C = 30 mA; V_{CE} = 8 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.	425 mV
Second harmonic distortion (see Fig. 1) V_{CE} = 8 V; I_C = 30 mA; R_L = 75 Ω; VSWR < 2; T_{amb} = 25 °C V_p = V_O = 200 mV at f_p = 250 MHz V_q = V_O = 200 mV at f_q = 560 MHz measured at $f_{(p+q)}$ = 810 MHz	d_2	typ.	−50 dB

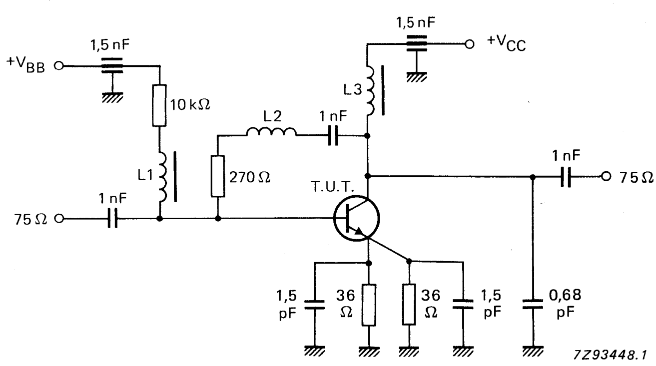


Fig. 1 Intermodulation distortion and second harmonic distortion MATV test circuit.

L1 = L3 = 5 μH 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 V; T_{amb} = 25 °C; typical values

I_C mA	f MHz	S_{11}	S_{21}	S_{12}	S_{22}	G_{UM} 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

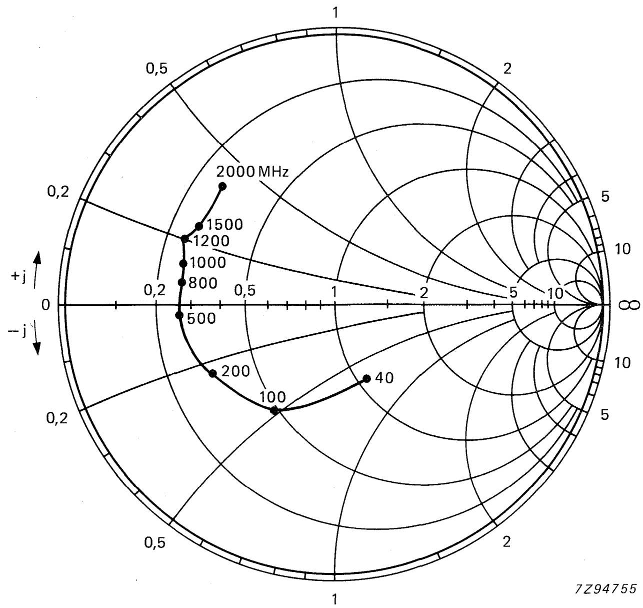


Fig.2 Input impedance, derived from input reflection coefficient S_{11} coordinates, in ohm x 50.

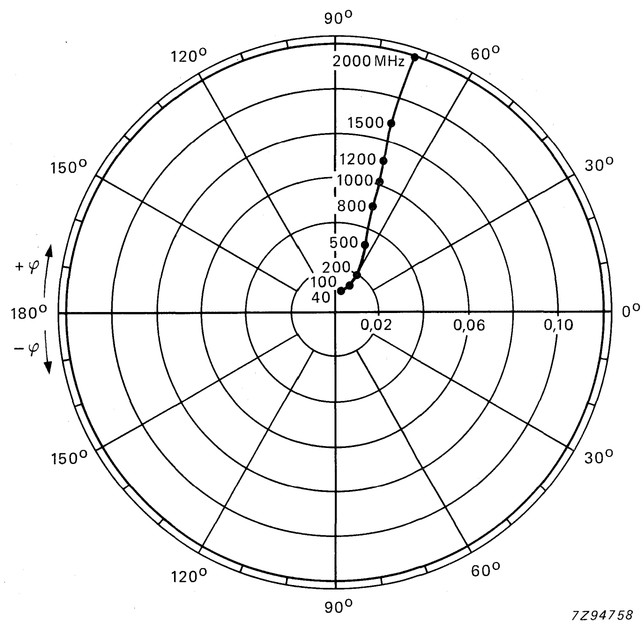


Fig.3 Reverse transmission coefficient S_{12}.

Conditions for Figs 2 to 5: V_{CE} = 8 V; I_C = 30 mA; T_{amb} = 25 °C.

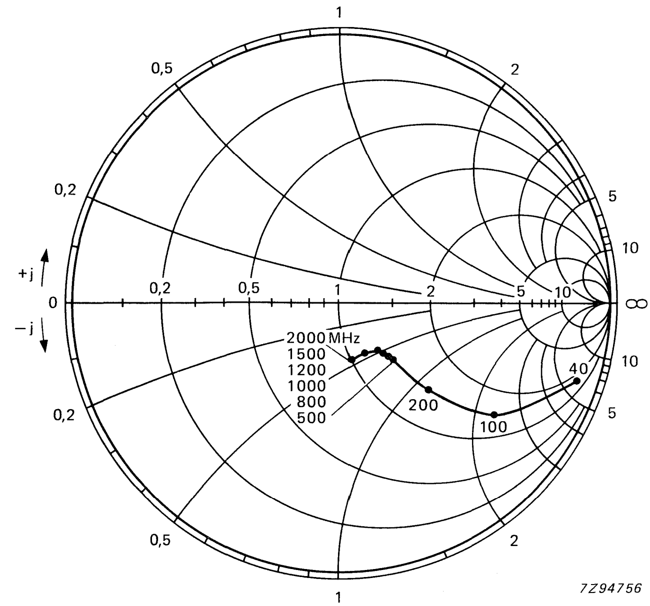


Fig.4 Output impedance, derived from output reflection coefficient S_{22} coordinates, in ohm x 50.

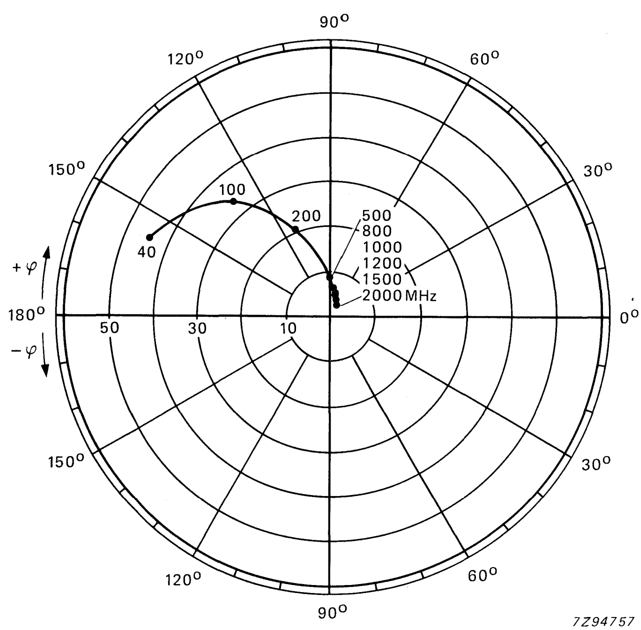


Fig.5 Forward transmission coefficient S_{21}.

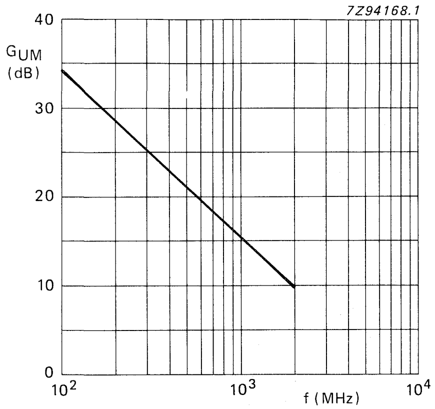


Fig.6 V_{CE} = 8 V; I_C = 30 mA; T_{amb} = 25 °C; typical values.

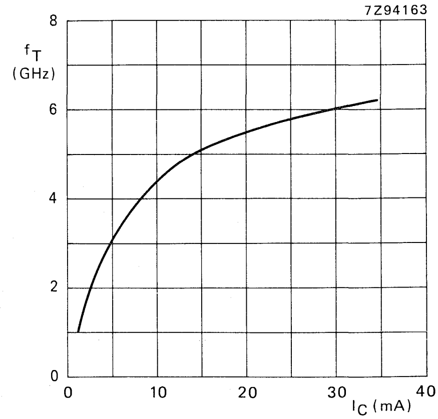


Fig.7 V_{CE} = 8 V; f = 500 MHz; T_j = 25 °C; typical values.

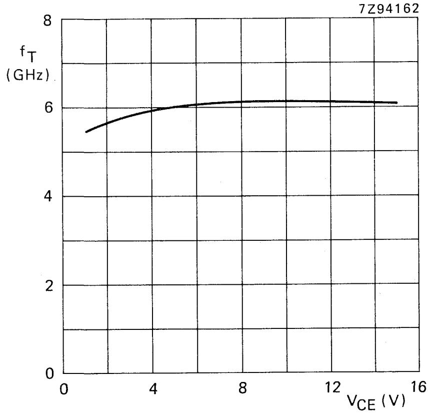


Fig.8 I_C = 30 mA; f = 500 MHz; T_j = 25 °C; typical values.

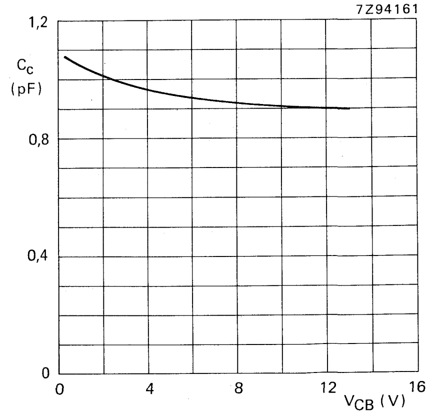


Fig.9 I_E = i_e = 0; f = 1 MHz; T_j = 25 °C; typical values.

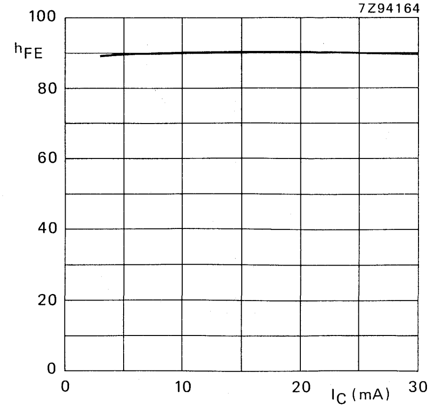


Fig.10 V_{CE} = 5 V; T_j = 25 °C; typical values.

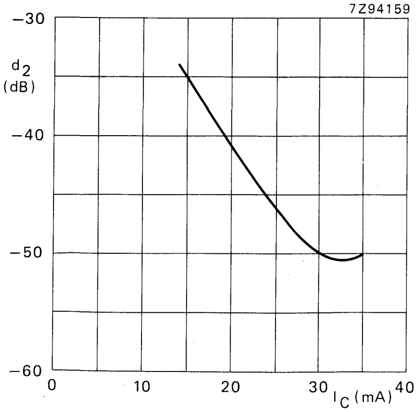


Fig.11 V_{CE} = 8 V; V_O = 200 mV; $f_{(p+q)}$ = 810 MHz; T_{amb} = 25 °C; typical values.

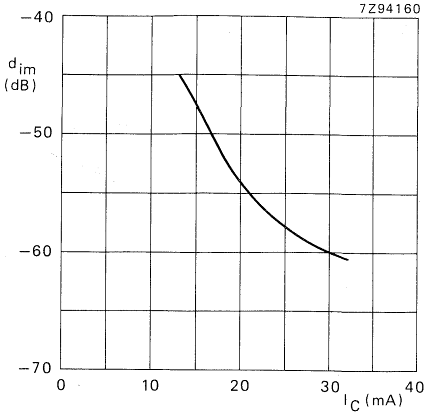


Fig.12 V_{CE} = 8 V; V_O = 425 mV; $f_{(p+q-r)}$ = 793.25 MHz; T_{amb} = 25 °C; typical values.

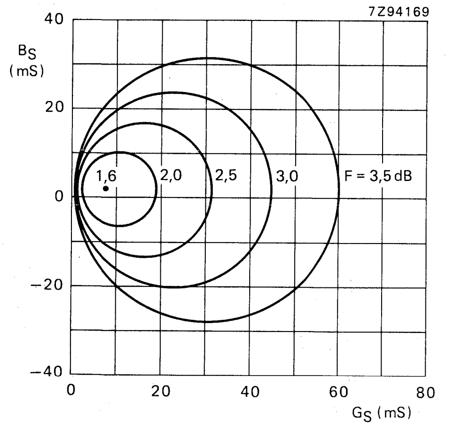


Fig.13 Circles of constant noise figure; I_C = 4 mA; V_{CE} = 8 V; f = 800 MHz; T_{amb} = 25 °C; typical values.

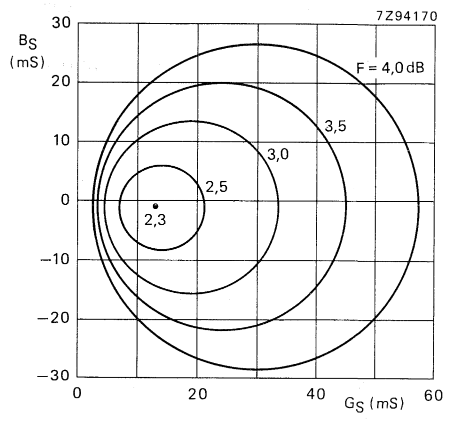


Fig.14 Circles of constant noise figure; I_C = 30 mA; V_{CE} = 8 V; f = 800 MHz; T_{amb} = 25 °C; typical values.

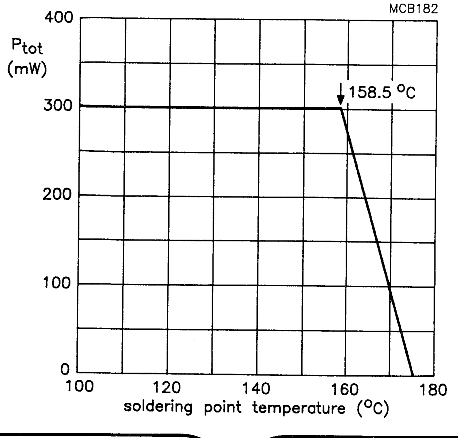


Fig.15 Power derating curve.

CLASS-B OPERATION

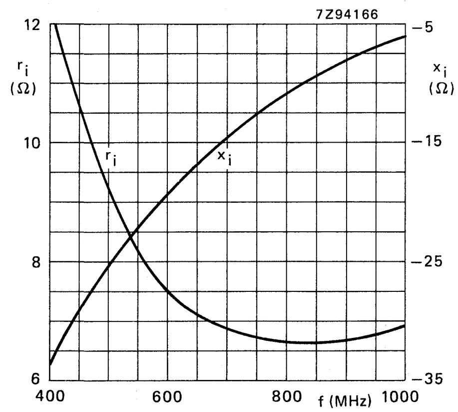


Fig.16 Input impedance (series components).

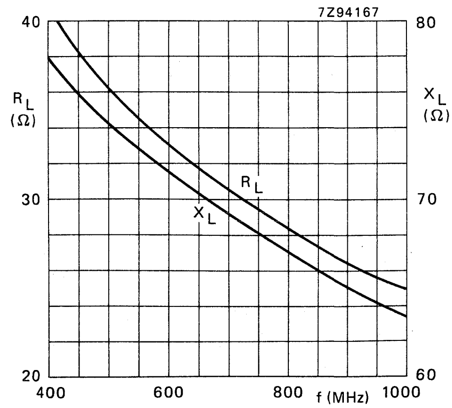


Fig.17 Load impedance (series components).

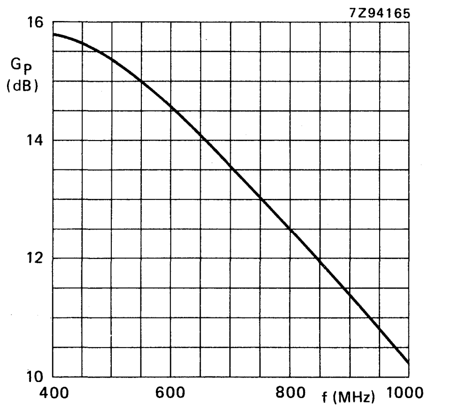


Fig.18 Power gain as a function of frequency.

Conditions for Figs 16 to 18:

V_{CE} = 7.5 V; P_L = 160 mW; T_{amb} = 25 °C; typical values.

OPERATING NOTE for Figs 16 to 18:

A base-emitter resistor of 82 Ω is recommended to avoid oscillation. This resistor must be effective for RF only.

NPN 5 GHz WIDEBAND TRANSISTOR

NPN transistor in a four-lead dual-emitter SOT143 envelope. The device is primarily intended for use in vhf and uhf 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 (DC)	I_C	max.	25	mA
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	300	mW
Junction temperature	T_j	max.	150	°C
DC 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
Feedback capacitance at f = 1 MHz I_C = 0; V_{CE} = 10 V	C_{re}	typ.	0.35	pF
Noise figure at f = 800 MHz I_C = 4 mA; V_{CE} = 10 V; Z_S = opt.	F	typ.	1.8	dB
Maximum unilateral power gain I_C = 14 mA; V_{CE} = 10 V f = 800 MHz	G_{UM}	typ.	17.5	dB
f = 2 GHz		typ.	9.5	dB

MECHANICAL DATA

SOT143 (see outlines section)

Marking code:
BFG92A: P8
BFG92AX: V14

Pinning

BFG92A
1 = collector
2 = base
3, 4 = emitter

BFG92AX
1 = collector
2, 4 = emitter
3 = base

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 (DC)	I_C	max.	25	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 range	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	$R_{th\ j\text{-}a}$	=	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.	50	nA
DC 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	C_{re}	typ.	0.35	pF

Maximum unilateral power gain (S_{12} assumed to be zero)

$$G_{UM} = 10 \log \frac{|S_{21}|^2}{[1-|S_{11}|^2]\ [1-|S_{22}|^2]}$$

I_C = 14 mA; V_{CE} = 10 V; T_{amb} = 25 °C: f = 800 MHz	G_{UM}	typ.	17.5	dB
f = 2 GHz	G_{UM}	typ.	9.5	dB
Noise figure at f = 800 MHz and T_{amb} = 25 °C I_C = 4 mA; V_{CE} = 10 V; Z_S = opt.	F	typ.	1.8	dB

s-parameters (common emitter) at V_{CE} = 5 V; T_{amb} = 25 °C; typical values

I_C mA	f MHz	S_{11} M / Φ	S_{21} M / Φ	S_{12} M / Φ	S_{22} M / Φ	G_{UM} dB
	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
2	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
	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
5	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
	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
10	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
	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
14	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
	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
20	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 V; T_{amb} = 25 °C; typical values.

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

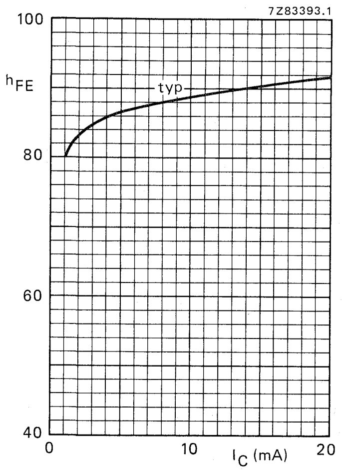


Fig.1 Gain as a function of collector current.
V_{CE} = 10 V; T_j = 25 °C; typical values.

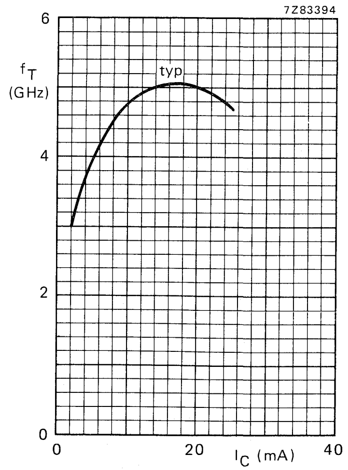


Fig.2 Transition frequency as a function of collector current.
V_{CE} = 10 V; f = 500 MHz; T_j = 25 °C; typical values.

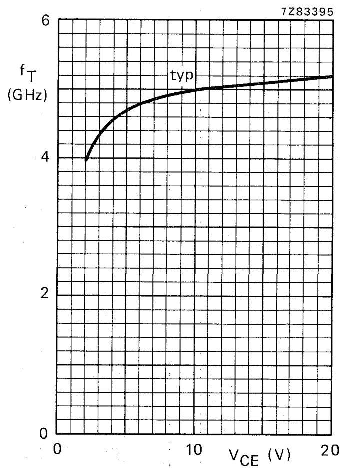


Fig.3 Transition frequency as a function of V_{CE}.
I_C = 14 mA; f = 500 MHz; T_j = 25 °C; typical values.

NPN 5 GHz WIDEBAND TRANSISTOR

NPN transistor in a four-lead dual-emitter SOT143 envelope. The device is primarily intended for use in UHF 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 (DC)	I_C	max.	35	mA
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	300	mW
Junction temperature	T_j	max.	150	°C
DC 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
Feedback capacitance at f = 1 MHz I_C = 0; V_{CE} = 5 V	C_{re}	typ.	0.6	pF
Noise figure at f = 800 MHz I_C = 4 mA; V_{CE} = 8 V; Z_S = opt.	F	typ.	1.6	dB
Maximum unilateral power gain I_C = 30 mA; V_{CE} = 8 V				
f = 800 MHz	G_{UM}	typ.	17.0	dB
f = 2 GHz	G_{UM}	typ.	9.0	dB

MECHANICAL DATA

Dimensions in mm

SOT143: see outlines section.

Marking code:
BFG93A : R8
BFG93AX: V15

Pinning

BFG93A	BFG93AX
1 = collector	1 = collector
3,4 = emitter	2,4 = emitter
2 = base	3 = base

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 (DC)	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 range	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	$R_{th\ j\text{-}a}$	=	430	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
DC 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
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.	2.5	pF
Feedback capacitance at f = 1 MHz $I_C = 0$; $V_{CE} = 5$ V	C_{re}	typ.	0.6	pF

Maximum unilateral power gain (S_{12} assumed to be zero)

$$G_{UM} = 10 \log \frac{|S_{21}|^2}{[1 - |S_{11}|^2]\ [1 - |S_{22}|^2]}$$

$I_C = 30$ mA; $V_{CE} = 8$ V; $T_{amb} = 25$ °C:				
f = 800 MHz	G_{UM}	typ.	17.0	dB
f = 2 GHz	G_{UM}	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

s-parameters (common emitter) at V_{CE} = 5 V; T_{amb} = 25 °C; typical values

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

s-parameters (common-emitter) at V_{CE} = 8 V; T_{amb} = 25 °C; typical values

I_C mA	f MHz	s_{11} M Φ	s_{21} M Φ	s_{12} M Φ	s_{22} M Φ	G_{UM} dB
	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
2	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
	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
5	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
	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
10	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
	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
20	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
	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
30	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

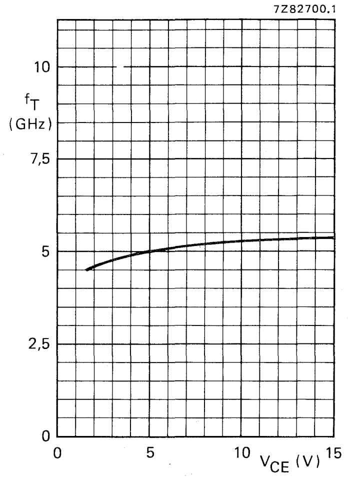


Fig.1 Transition frequency as a function of collector-emitter voltage.

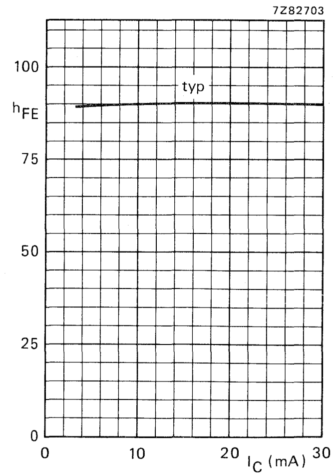


Fig.2 Current gain as a function of collector current.

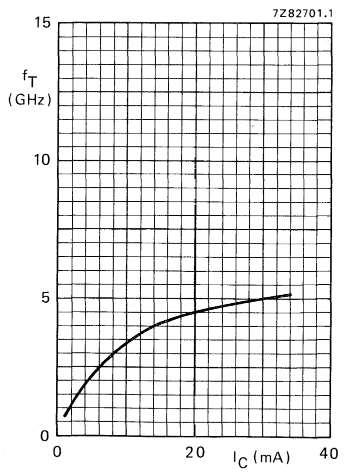


Fig.3 Transition frequency as a function of collector current.

Philips Components

Data sheet	
status	Product specification
date of issue	October 1990

BFG94

NPN 6 GHz wideband transistor

FEATURES

- High power gain.
- Low noise figure.
- Low intermodulation distortion.
- Gold metallization ensures excellent reliability.

DESCRIPTION

The BFG94 is a npn transistor primarily intended for use in communication and instrumentation systems.
The BFG94 is mounted in a SOT223 plastic envelope.

MECHANICAL DATA

Plastic SOT223 envelope.

PINNING

PIN	DESCRIPTION
1,3	emitter
2	base
4	collector

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	-	-	15	V
V_{CEO}	collector-emitter voltage	open base	-	-	12	V
I_C	collector current (DC)		-	-	60	mA
P_{tot}	total power dissipation	T_{case} = 140 °C; note 1	-	-	700	mW
T_j	junction temperature		-	-	175	°C
C_{re}	feedback capacitance	f = 1 MHz; I_C = 0; V_{CB} = 10 V	-	-	0.8	pF
f_T	transition frequency	f = 1 GHz; I_C = 45 mA; V_{CE} = 10 V; T_{amb} = 25 °C	4	-	-	GHz
G_{UM}	maximum power gain	f = 1 GHz; I_C = 45 mA; V_{CE} = 10 V; note 2	11.5	13.5	-	dB
V_o	output voltage	d_{im} = −60 dB; I_C = 45 mA; V_{CE} = 10 V; R_L = 75 Ω; f = 800 MHz	-	500	-	mV
P_{L1}	output power at 1 dB gain compression	I_C = 45 mA; V_{CE} = 10 V; f = 1 GHz	-	21.5	-	dBm

Notes to the Quick Reference Data

1. T_{case} temperature measured on soldering point of collector tab.
2. $G_{UM} = 10 \log \frac{|S_{21}|^2}{(1-|S_{11}|^2)(1-|S_{22}|^2)}$ [dB]

   (S_{12} assumed to be zero)

LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	-	15	V
V_{CEO}	collector-emitter voltage	open base	-	12	V
V_{EBO}	emitter-base voltage	open collector	-	2	V
I_C	collector current (DC)		-	60	mA
P_{tot}	total power dissipation	T_{case} = 140 °C note 1	-	700	mW
T_{stg}	storage temperature range		−65	+150	°C
T_j	junction temperature		-	175	°C

THERMAL RESISTANCE

SYMBOL	PARAMETER	NOM.	UNIT
$R_{th\ j\text{-}s}$	from junction to soldering point	50	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{CBO}	collector cut-off current	I_E = 0; V_{CB} = 10 V	-	-	100	nA
h_{FE}	DC current gain	I_C = 30 mA; V_{CE} = 5 V	45	-	-	
		I_C = 45 mA; V_{CE} = 10 V	-	100	-	
C_c	collector capacitance	f = 1 MHz; $I_E = i_e$ = 0; V_{CB} = 10 V	-	0.9	2.0	pF
C_e	emitter capacitance	f = 1 MHz; $I_C = i_e$ = 0; V_{EB} = 0.5 V	-	2.9	4.5	pF
C_{re}	feedback capacitance	f = 1 MHz; $I_C = i_c$ = 0; V_{CB} = 10 V	-	0.5	0.8	pF
f_T	transition frequency	f = 1 GHz; I_C = 45 mA; V_{CE} = 10 V; T_{amb} = 25 °C	4	-	-	GHz
		f = 1 GHz; I_C = 30 mA; V_{CE} = 5 V; T_{amb} = 25 °C	-	6	-	GHz

NPN 6 GHz wideband transistor BFG94

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
G_{UM}	maximum power gain	f = 1 GHz; T_{amb} = 25 °C; I_C = 45 mA; V_{CE} = 10 V; note 2	11.5	13.5	-	dB
F_{min}	noise figure	Γs = Γopt; I_C = 45 mA; V_{CE} = 10 V; f = 500 MHz	-	2.7	-	dB
		Γs = Γopt; I_C = 45 mA; V_{CE} = 10 V; f = 1000 MHz	-	3	-	dB
V_o	output voltage	note 3	-	500	-	mV
V_o	output voltage	note 4	-	280	-	mV
P_{L1}	output power at 1 dB gain compression	I_C = 45 mA; V_{CE} = 10 V; R_L = 50 Ω; T_{amb} = 25 °C; measured at f = 1 GHz	-	21.5	-	dBm
ITO	third order intercept point	note 5	-	34	-	dBm

Notes

1. T_{case} temperature measured on soldering point of collector tab.
2. $G_{UM} = 10 \text{ LOG} \dfrac{|S_{21}|^2}{(1-|S_{11}|^2)(1-|S_{22}|^2)}$ [dB]

   (S_{12} assumed to be zero)

3. d_{im} = −60 dB (DIN 45004B, par.6.3 : 3-tone); T_{amb} = 25 °C; I_C = 45 mA; V_{CE} = 10 V; R_L = 75 Ω; $V_p = V_o$ at d_{im} = −60 dB; f_p = 795.25 MHz; $V_q = V_o$ −6 dB; $V_r = V_o$ −6 dB; f_q = 803.25 MHz; f_r = 805.25 MHz; measured at $f_{(p+q-r)}$ = 793.25 MHz.

4. d_2 = −50 dB; T_{amb} = 25 °C; I_C = 45 mA;V_{CE} = 10 V; R_L = 75 Ω; $V_p = V_o$ at d_2 = −50 dB; $V_q = V_o$ at d_2 = −50 dB; f_p = 250 MHz; f_q = 560 MHz; measured at $f_{(p+qr)}$ = 810 MHz.

5. I_C = 45 mA; V_{CE} = 10 V; R_L = 50 Ω; T_{amb} = 25 °C; P_p = ITO = −6 dB; f_p = 1000 MHz; P_q = ITO = −6 dB; f_q = 1001 MHz; measured at $f_{(2p-q)}$ and $f_{(2q-p)}$.

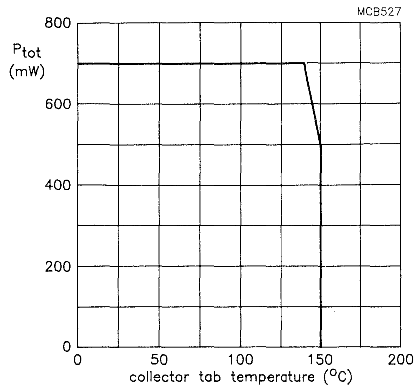


Fig.1 Power derating curve as a function of collector tab temperature.

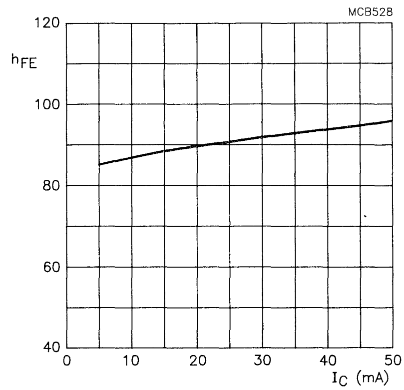


Fig.2 DC current gain as a function of collector current; V_{CE} = 10 V.

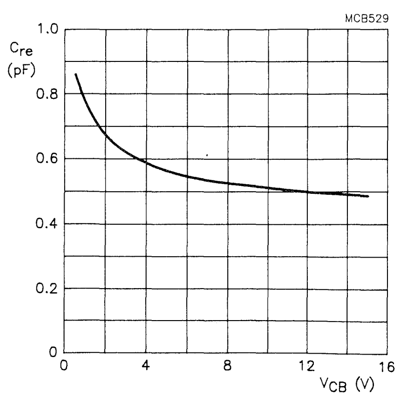


Fig.3 Feedback capacitance as a function of collector voltage; $I_C = i_c = 0$; f = 1 MHz.

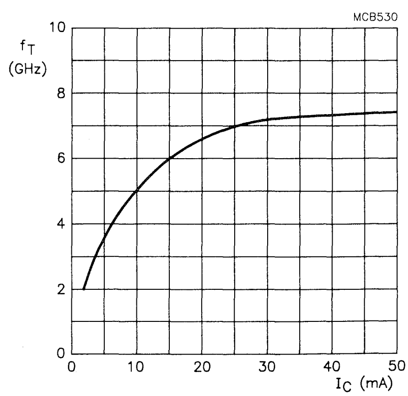


Fig.4 Transition frequency as a function of collector current; V_{CE} = 10 V; f = 1 GHz.

NPN 6 GHz wideband transistor BFG94

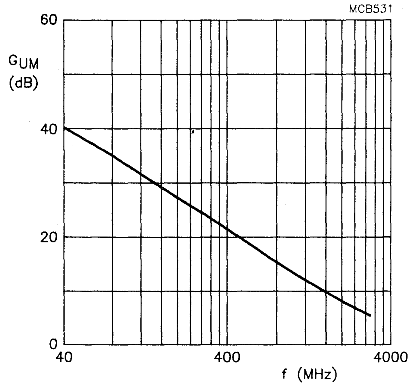


Fig.5 Maximum unilateral power gain as a function of frequency; V_{CE} = 10 V; I_C = 45 mA.

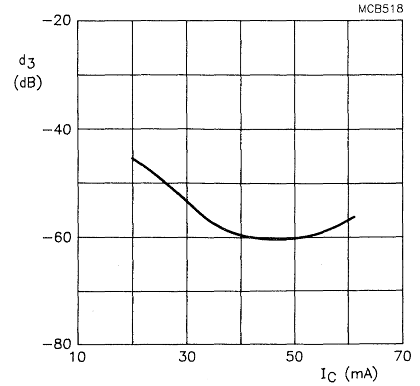


Fig.6 Third order intermodulation distortion. See test circuit (Fig.14); V_{CE} = 10 V; I_C = 45 mA; fm = 793.25 MHz.

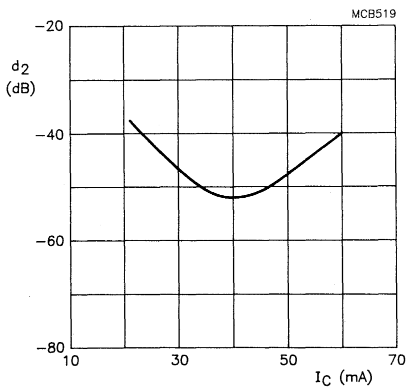


Fig.7 Second order distortion. See test circuit (Fig.14); V_{CE} = 10 V; I_C = 45 mA; fm = 810 MHz.

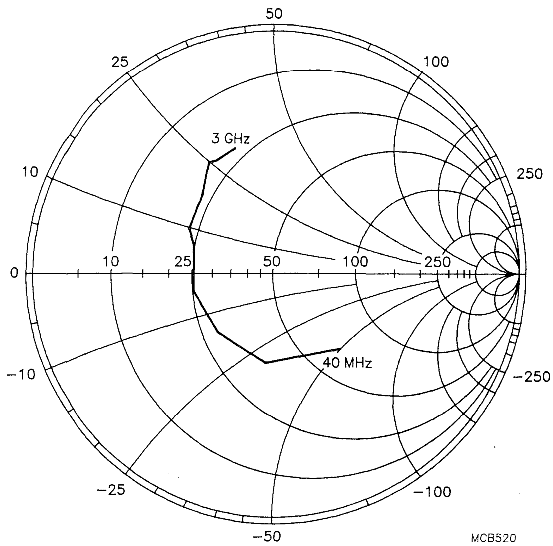


Fig.8 Common emitter input reflection coefficient S_{11}; V_{CE} = 10 V; I_C = 45 mA.

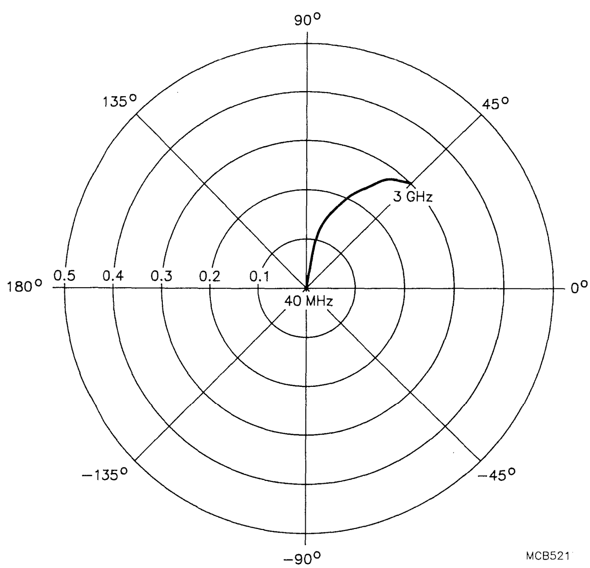


Fig.9 Common emitter forward transmission coefficient S_{21}; V_{CE} = 10 V; I_C = 45 mA.

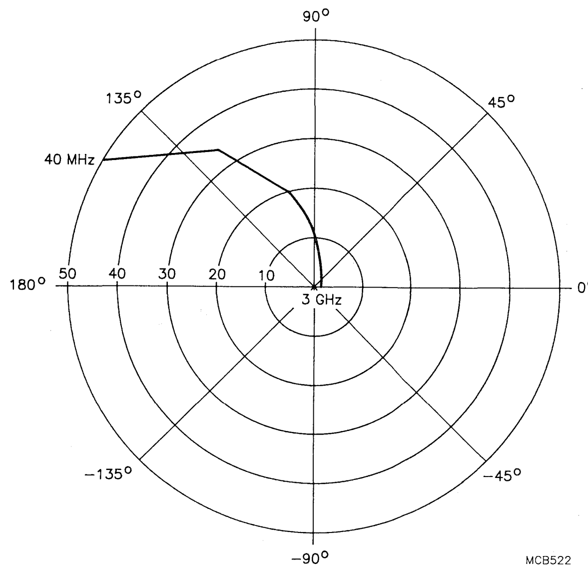


Fig.10 Common emitter reverse transmission coefficient S_{12}; V_{CE} = 10 V; I_C = 45 mA.

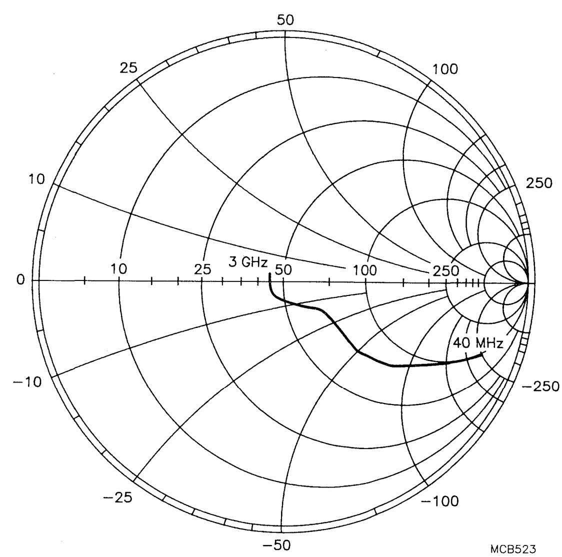


Fig.11 Common emitter output reflection coefficient S_{22}; V_{CE} = 10 V; I_C = 45 mA.

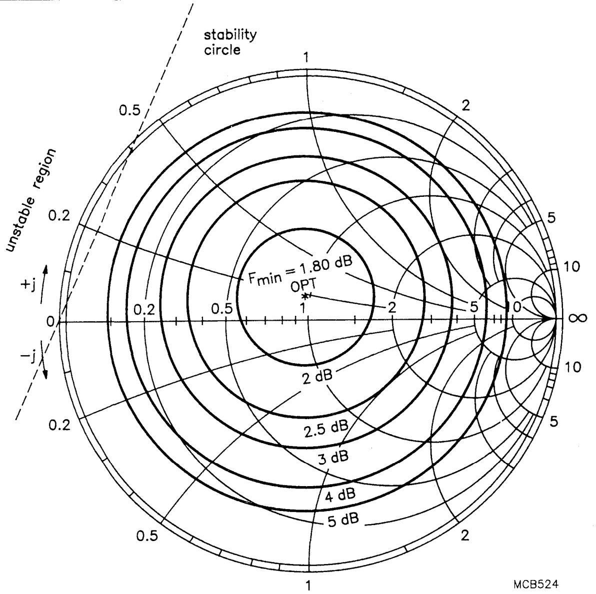


Fig.12 Location of optimum source reflection coefficient for minimum noise figure; V_{CE} = 10 V; I_C = 15 mA; f = 500 MHz.

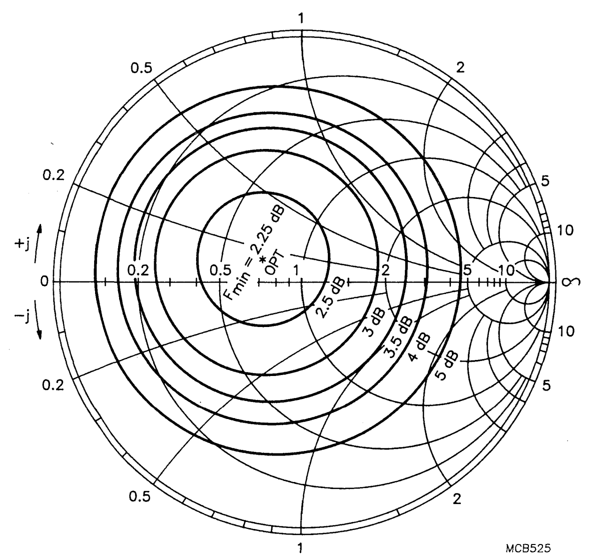


Fig.13 Location of optimum source reflection coefficient for minimum noise figure; V_{CE} = 10 V; I_C = 15 mA; f = 1 GHz.

Common emitter S and noise parameters at V_{CE} = 10 V; I_C = 15 mA.

FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}		G_{UM}
	M	Φ	M	Φ	M	Φ	M	Φ	
(MHz)	(rat)	(deg)	(rat)	(deg)	(rat)	(deg)	(rat)	(deg)	(dB)
40	.404	− 48.4	50.03	150.0	.009	74.3	.836	− 22.0	40.0
100	.347	− 97.6	33.55	124.0	.017	66.9	.587	− 38.4	32.9
200	.319	−134.5	19.73	105.9	.027	67.6	.385	− 43.0	27.1
300	.316	−152.0	13.62	97.2	.037	70.5	.304	− 41.8	23.6
400	.320	−162.4	10.46	91.3	.048	71.4	.262	− 40.1	21.2
500	.325	−169.4	8.42	86.8	.058	72.1	.239	− 39.2	19.3
600	.328	−175.0	7.07	83.3	.068	72.3	.222	− 38.5	17.7
700	.321	179.8	6.10	80.1	.078	72.2	.210	− 38.6	16.4
800	.325	175.1	5.37	77.0	.089	71.4	.199	− 38.8	15.3
900	.329	170.0	4.81	74.2	.099	70.8	.189	− 39.4	14.3
1000	.336	164.9	4.37	71.2	.108	69.9	.178	− 40.1	13.5
1200	.364	157.5	3.65	65.7	.129	68.8	.158	− 43.1	12.0
1400	.392	152.6	3.15	60.9	.149	66.8	.139	− 48.2	10.8
1600	.391	147.8	2.79	55.6	.168	64.9	.120	− 54.1	9.7
1800	.407	140.5	2.51	50.4	.186	63.0	.099	− 60.5	8.8
2000	.426	133.4	2.31	45.9	.207	60.7	.078	− 70.5	8.2
2200	.465	127.8	2.11	41.8	.224	57.7	.057	− 92.9	7.6
2400	.491	124.8	1.95	37.8	.238	56.1	.050	−125.7	7.0
2600	.511	121.6	1.79	33.0	.255	54.6	.052	−155.3	6.4
2800	.506	115.7	1.68	27.9	.279	52.0	.054	179.9	5.8
3000	.527	108.7	1.61	23.7	.290	46.8	.066	154.9	5.6

FREQUENCY	F_{min}	Γopt		Rn	rn (= Rn/50)
		M	Φ		
(MHz)	(dB)	(rat)	(deg)	(Ω)	(Ω)
500	2.70	.168	159.1	12.1	.241
1000	3.00	.295	−177.3	10.2	.204

NPN 6 GHz wideband transistor BFG94

Common emitter S and noise parameters at V_{CE} = 10 V; I_C = 15 mA.

FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}		G_{UM}
(MHz)	M (rat)	Φ (deg)	M (rat)	Φ (deg)	M (rat)	Φ (deg)	M (rat)	Φ (deg)	(dB)
40	.438	− 41.5	44.41	153.0	.009	74.6	.865	− 19.7	39.9
100	.374	− 87.1	31.75	128.2	.018	66.3	.641	− 36.3	33.0
200	.320	−126.9	19.27	108.7	.028	66.9	.429	− 43.2	27.1
300	.314	−147.0	13.58	99.2	.038	68.6	.338	− 43.0	23.6
400	.315	−158.3	10.38	92.9	.048	69.9	.291	− 41.7	21.2
500	.314	−166.3	8.38	88.3	.058	70.6	.263	− 40.5	19.2
600	.315	−174.1	7.05	84.3	.068	71.6	.245	− 40.1	17.7
700	.316	−178.9	6.08	80.8	.078	71.3	.230	− 40.4	16.4
800	.316	175.3	5.35	77.7	.088	70.7	.217	− 40.8	15.2
900	.318	170.3	4.79	74.8	.099	70.1	.206	− 41.6	14.3
1000	.325	165.1	4.36	71.9	.108	69.3	.196	− 43.1	13.5
1200	.348	157.1	3.66	66.2	.128	68.4	.176	− 46.7	12.0
1400	.372	150.9	3.14	61.1	.149	66.6	.160	− 51.8	10.7
1600	.386	146.8	2.79	56.0	.168	64.5	.144	− 57.8	9.7
1800	.389	139.1	2.52	51.4	.186	62.8	.124	− 63.8	8.8
2000	.413	132.5	2.29	46.2	.206	60.7	.103	− 73.7	8.1
2200	.455	126.1	2.12	42.3	.223	57.6	.084	− 92.2	7.6
2400	.481	122.7	1.96	38.2	.238	55.7	.079	−113.2	7.0
2600	.489	118.3	1.81	33.0	.256	54.4	.075	−130.0	6.4
2800	.496	113.4	1.67	29.1	.279	51.8	.065	−149.4	5.8
3000	.514	106.1	1.60	24.3	.287	46.7	.064	−179.0	5.5

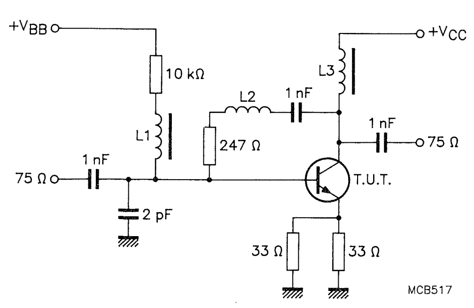
FREQUENCY	F_{min}	Γopt		Rn	rn (= Rn/50)
(MHz)	(dB)	M (rat)	Φ (deg)	(Ω)	(Ω)
500	2.30	.134	155.2	11.00	.222
1000	2.70	.253	175.6	10.80	.216

NPN 6 GHz wideband transistor BFG94

Common emitter S and noise parameters at V_{CE} = 10 V; I_C = 15 mA.

FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}		G_{UM}
(MHz)	M (rat)	Φ (deg)	M (rat)	Φ (deg)	M (rat)	Φ (deg)	M (rat)	Φ (deg)	(dB)
40	.609	− 29.1	32.10	159.5	.010	76.7	.925	− 14.6	40.6
100	.526	− 65.4	25.66	136.9	.022	65.5	.758	− 30.1	33.3
200	.427	−104.2	17.25	115.9	.033	59.5	.539	− 40.5	27.1
300	.385	−128.2	12.43	104.5	.042	60.7	.425	− 43.1	23.5
400	.367	−143.8	9.72	96.9	.051	62.2	.360	− 43.4	21.0
500	.361	−154.5	7.91	91.4	.059	63.6	.323	− 43.7	19.1
600	.359	−163.1	6.66	87.0	.068	64.7	.297	− 43.6	17.5
700	.346	−169.8	5.78	83.1	.077	65.6	.280	− 43.5	16.2
800	.350	−176.3	5.08	79.8	.087	65.6	.266	− 44.1	15.0
900	.348	177.6	4.55	76.4	.096	66.0	.253	− 44.7	14.0
1000	.355	171.6	4.13	73.3	.104	65.5	.240	− 45.8	13.2
1200	.374	162.4	3.48	67.2	.122	65.6	.219	− 49.3	11.7
1400	.394	155.5	2.99	61.7	.142	64.2	.199	− 54.9	10.4
1600	.395	150.1	2.65	56.6	.159	63.0	.183	− 61.1	9.4
1800	.414	143.3	2.40	51.3	.176	61.8	.166	− 66.8	8.6
2000	.430	135.8	2.21	46.5	.197	60.2	.146	− 73.9	7.9
2200	.466	130.3	2.03	42.4	.214	57.4	.127	− 86.9	7.3
2400	.486	125.5	1.87	37.8	.227	56.1	.117	−104.2	6.7
2600	.508	121.9	1.73	32.9	.245	55.0	.110	−119.0	6.1
2800	.505	117.2	1.61	28.3	.270	52.5	.100	−129.7	5.5
3000	.527	109.4	1.55	24.0	.281	47.7	.090	−144.9	5.3

FREQUENCY	F_{min}	Γopt		Rn	rn (= Rn/50)
(MHz)	(dB)	M (rat)	Φ (deg)	(Ω)	(Ω)
500	1.80	.112	98.1	10.55	.211
1000	2.25	.203	152.1	10.50	.210



L1 = L3 5 µH micro choke
L2 = 1 turn Cu wire 0.4 mm dia., internal dia. 4 mm

Fig.14 Test circuit for third order intermodulation distortion (d_{im}) and second order distortion (d_2).

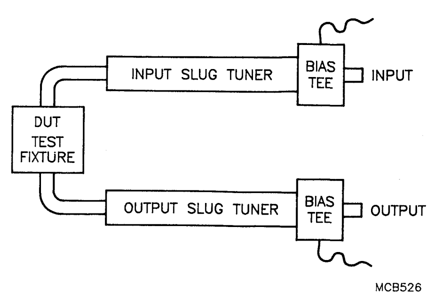


Fig.15 Measurement set-up for third order intercept point (ITO) and 1 dB gain compression (P_{L1}).

NPN 5 GHz WIDEBAND TRANSISTOR

NPN transistor in a four-lead dual-emitter plastic envelope (SOT103). This device is designed for application in wideband amplifiers, such as CATV and MATV systems.

PNP 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 (DC)	I_C	max.	75	mA
Total power dissipation up to T_{amb} = 70 °C	P_{tot}	max.	700	mW
Junction temperature	T_j	max.	175	°C
DC current gain I_C = 50 mA; V_{CE} = 10 V	h_{FE}	min.	25	
Transition frequency at f = 500 MHz I_C = 50 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.	1.0	pF
Maximum unilateral power gain at f = 800 MHz I_C = 50 mA; V_{CE} = 10 V	G_{UM}	typ.	15.0	dB
Output power at 1 dB gain compression V_{CE} = 10 V; I_C = 70 mA; f = 800 MHz	P_{L1}	typ.	+21	dBm
Third order intercept point V_{CE} = 10 V; I_C = 70 mA; f = 800 MHz	ITO	typ.	+40	dBm

MECHANICAL DATA

SOT103 (see outlines section).

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 (DC)	I_C	max.	75 mA
Total power dissipation up to T_{amb} = 70 °C mounted on a pcb	P_{tot}	max.	700 mW
Storage temperature range	T_{stg}		−65 to + 150 °C
Junction temperature	T_j	max.	175 °C

THERMAL RESISTANCE

From junction to ambient in free air mounted on glass-fibre pcb	$R_{th\ j\text{-}a}$	=	150 K/W
From junction to soldering point	$R_{th\ j\text{-}s}$	=	55 K/W

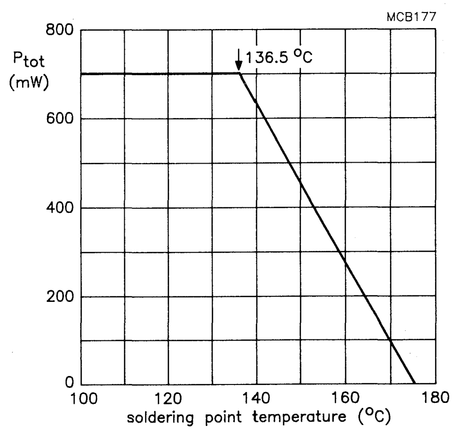
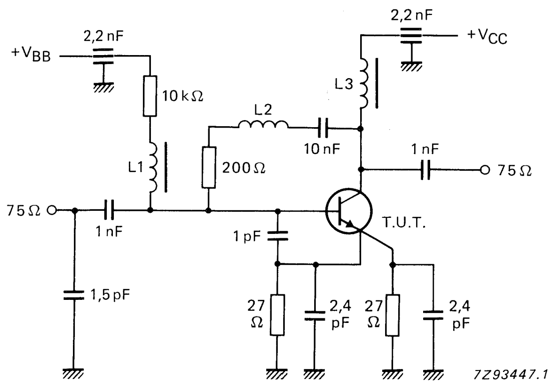


Fig.1 Power derating curve.

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current $I_E = 0$; $V_{CB} = 10$ V	I_{CBO}	max.	100 nA
DC current gain $I_C = 50$ mA; $V_{CE} = 10$ V	h_{FE}	min. typ.	25 50
Transition frequency at f = 500 MHz $I_C = 50$ 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.	1.5 pF
Emitter capacitance at f = 1 MHz $I_C = i_c = 0$; $V_{EB} = 0.5$ V	C_e	typ.	6.5 pF
Feedback capacitance at f = 1 MHz $I_C = 0$; $V_{CE} = 10$ V	C_{re}	typ.	1.0 pF
Noise figure at Z_S = opt. and $T_{amb} = 25$ °C $I_C = 70$ mA; $V_{CE} = 10$ V; f = 800 MHz	F	typ.	4.0 dB
Maximum unilateral power gain (S_{12} assumed to be zero) $G_{UM} = 10 \log \frac{\lvert S_{21}\rvert^2}{[1-\lvert S_{11}\rvert^2]\,[1-\lvert S_{22}\rvert^2]}$ $I_C = 50$ mA; $V_{CE} = 10$ V; f = 800 MHz; $T_{amb} = 25$ °C $I_C = 50$ mA; $V_{CE} = 10$ V; f = 2 GHz; $T_{amb} = 25$ °C	G_{UM}	typ. typ.	15.0 dB 8.0 dB
Output power at 1 dB gain compression $I_C = 70$ mA; $V_{CE} = 10$ V; $T_{amb} = 25$ °C; $R_L = 75\ \Omega$; measured at f = 800 MHz	P_{L1}	typ.	+21 dBm
Third order intercept point (see Fig.2) $I_C = 70$ 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; measured at $f_{(2q-p)}$ = 802 MHz and at $f_{(2p-q)}$ = 799 MHz	ITO	typ.	+40 dBm
Output voltage at $d_{im} = -60$ dB $I_C = 70$ 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 Fig.2) $I_C = 70$ mA; $V_{CE} = 10$ V; $R_L = 75\ \Omega$; VSWR < 2; $T_{amb} = 25$ °C $V_p = V_O$ = 320 mV at f_p = 250 MHz $V_q = V_O$ = 320 mV at f_q = 560 MHz measured at $f_{(p+q)}$ = 810 MHz	d_2	typ.	−52 dB



L1 = L3 = 5 μH micro-choke
L2 = 1.5 turns Cu wire (0.4 mm), internal diameter 3 mm, winding pitch 1 mm.

Fig.2 Intermodulation distortion and second harmonic distortion MATV test circuit.

s-parameters (common emitter) at V_{CE} = 10 V; T_{amb} = 25 °C; typical values

I_C mA	f MHz	s_{11}	s_{21}	s_{12}	s_{22}	G_{UM} dB
	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
10	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
	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
15	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
	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
20	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
	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
30	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
	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
50	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

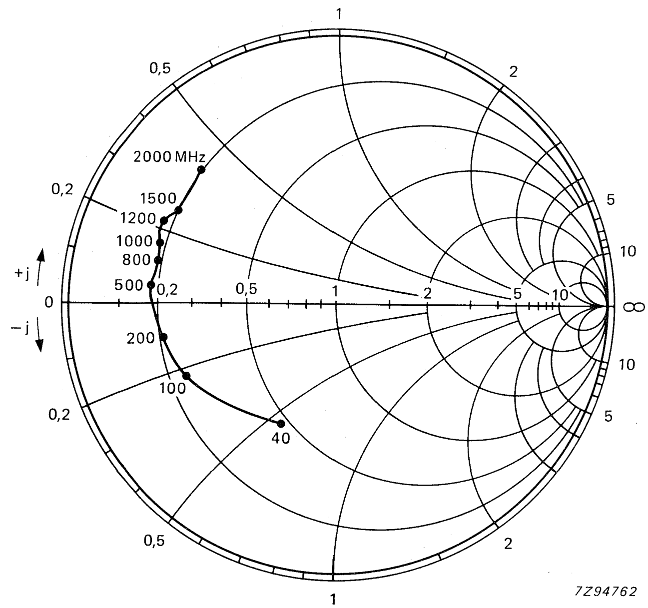


Fig.3 Input impedance, derived from input reflection coefficient S_{11} coordinates, in ohm x 50.

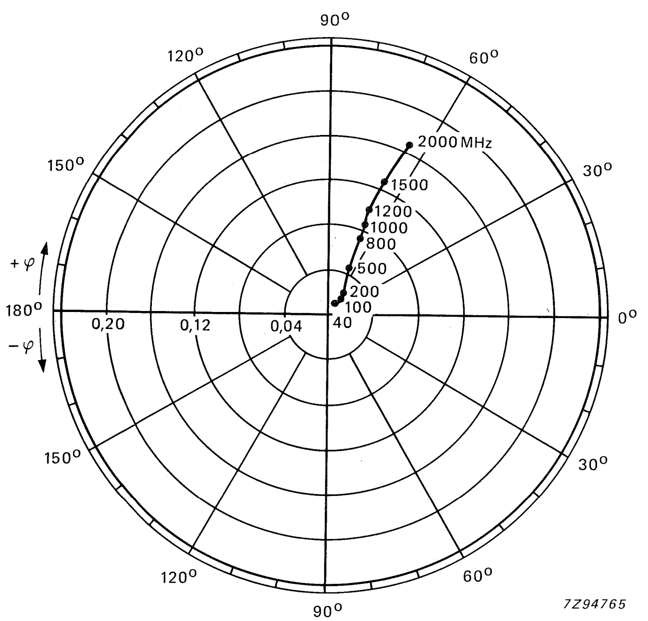


Fig.4 Reverse transmission coefficient S_{12}.

Conditions for Figs 3 to 6: V_{CE} = 10 V; I_C = 50 mA; T_{amb} = 25 °C.

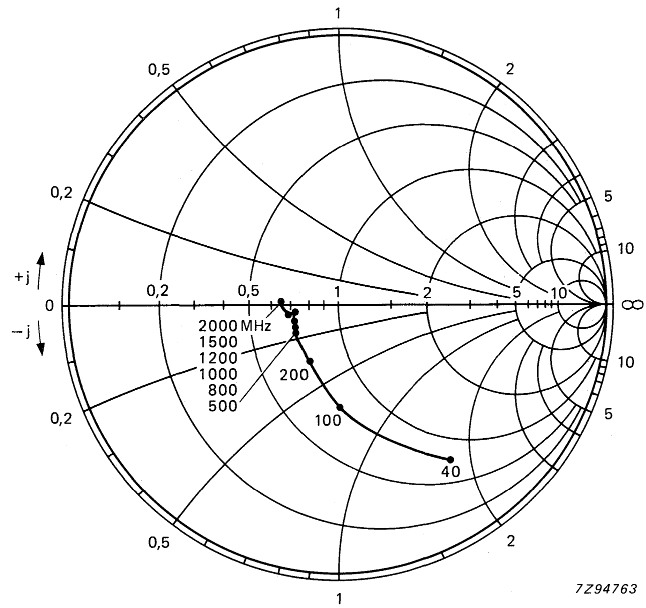


Fig.5 Output impedance, derived from output reflection coefficient S_{22} coordinates, in ohm x 50.

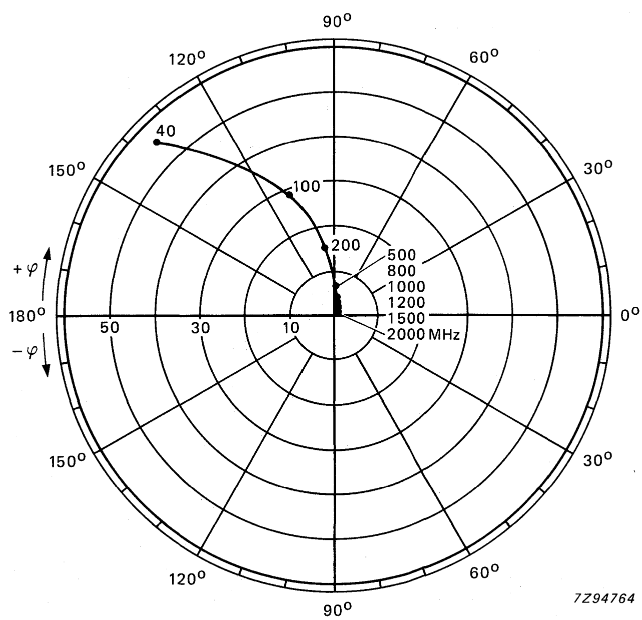


Fig.6 Forward transmission coefficient S_{21}.

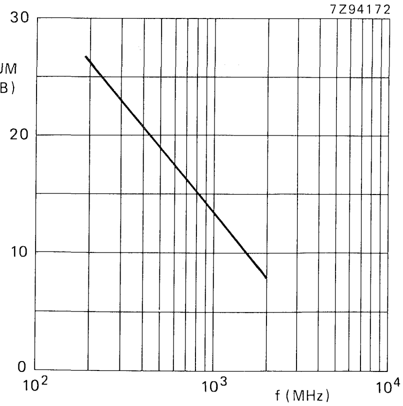


Fig.7 V_{CE} = 10 V; I_C = 50 mA; T_{amb} = 25 °C; typical values.

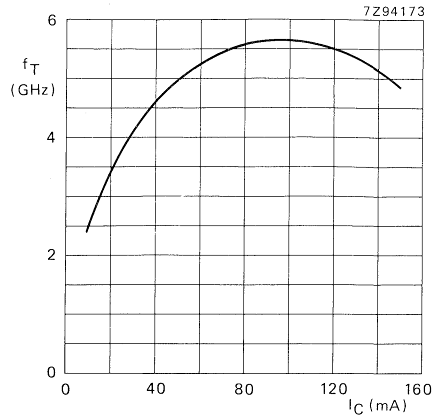


Fig.8 V_{CE} = 10 V; f = 500 MHz; T_j = 25 °C; typical values.

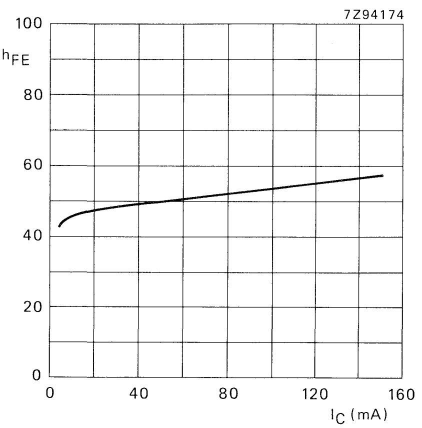


Fig.9 V_{CE} = 10 V; T_j = 25 °C; typical values.

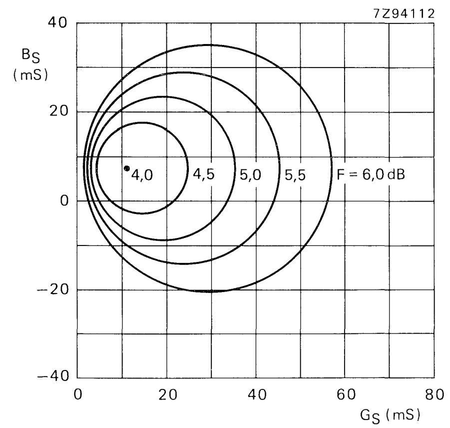


Fig.10 Circles of constant noise figure I_C = 70 mA; V_{CE} = 10 V; f = 800 MHz; typical values.

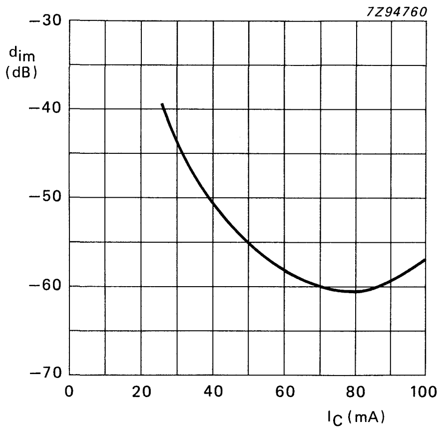


Fig.11 V_{CE} = 10 V; V_O = 700 mV; $f_{(p+q-r)}$ = 793.25 MHz; T_{amb} = 25 °C; typical values.

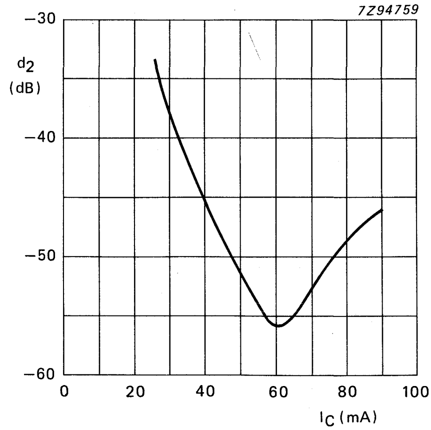


Fig.12 V_{CE} = 10 V; V_O = 320 mV; $f_{(p+q)}$ = 810 MHz; T_{amb} = 25 °C; typical values.

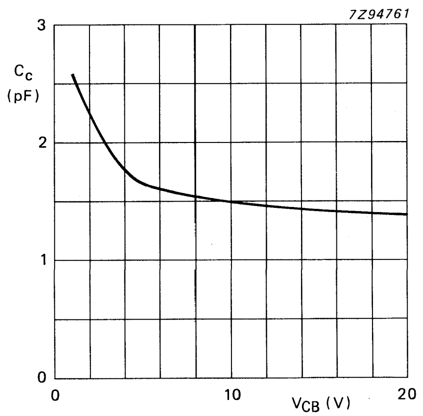


Fig.13 $I_E = i_e = 0$; f = 1 MHz; T_j = 25 °C; typical values.

CLASS-B OPERATION

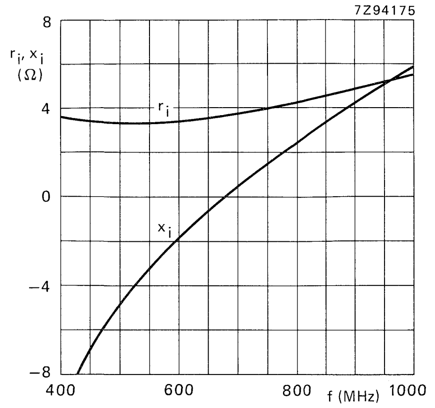


Fig.14 Input impedance (series components).

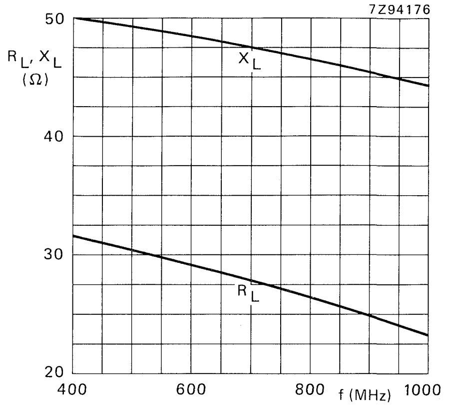


Fig.15 Load impedance (series components).

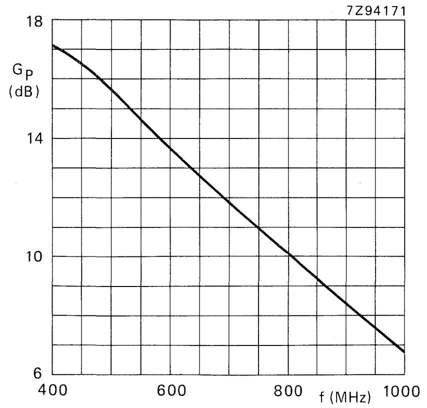


Fig.16 Power gain as a function of frequency.

Conditions for Figs 14 to 16:

V_{CE} = 10 V; P_L = 500 mW; T_{amb} = 25 °C; typical values.

OPERATING NOTE for Figs 14 to 16:

A resistance of 39 Ω between base and emitter is recommended to avoid oscillation. This resistance must be effective for RF only.

Philips Components

Data sheet	
status	Product specification
date of issue	October 1990

BFG97

NPN 5 GHz wideband transistor

NPN planar epitaxial transistor in a plastic SOT223 envelope, primarily intended for MATV applications.

The device features excellent output voltage capabilities.
Its pnp complement is the BFG31.

MECHANICAL DATA

SOT223.

PINNING

PIN	DESCRIPTION
1,3	emitter
2	base
4	collector

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	-	-	20	V
V_{CEO}	collector-emitter voltage	open base	-	-	15	V
I_C	collector current (DC)		-	-	100	mA
P_{tot}	total power dissipation	T_{case} = 125 °C; note 1	-	-	1	W
T_j	junction temperature		-	-	175	°C
h_{FE}	DC current gain	I_C = 70 mA; V_{CE} = 10 V	25	-	-	
f_T	transition frequency	f = 500 MHz; I_C = 70 mA; V_{CE} = 10 V; T_{amb} = 25 °C	-	5.5	-	GHz
G_{UM}	maximum power gain	f = 500 MHz; I_C = 70 mA; V_{CE} = 10 V	-	16	-	dB
G_{UM}	maximum power gain	f = 800 MHz; I_C = 70 mA; V_{CE} = 10 V	-	12	-	dB
V_o	output voltage	d_{im} = −60 dB; I_C = 70 mA; V_{CE} = 10 V; R_L = 75 Ω; $f_{(p+q-r)}$ = 793.25 MHz	-	700	-	mV

Note

1. T_{case} temperature measured on soldering point of collector tab.

NPN 5 GHz wideband transistor BFG97

ORDERING AND PACKAGE INFORMATION

EXTENDED TYPE NUMBER	PACKAGE		
	CODE	PACKING METHOD	PACKING QUANTITY
BFG97	SOT223	bulk	500
BFG97	SOT223	12 mm reel	1000

LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	-	20	V
V_{CEO}	collector-emitter voltage	open base	-	15	V
V_{EBO}	emitter-base voltage	open collector	-	3	V
I_C	collector current (DC)		-	100	mA
P_{tot}	total power dissipation	T_{case} = 125 °C	-	1	W
T_{stg}	storage temperature range		−65	+150	°C
T_j	junction temperature		-	175	°C

THERMAL RESISTANCE

SYMBOL	PARAMETER	NOM.	UNIT
$R_{th\ j-c}$	from junction to case	50	K/W

NPN 5 GHz wideband transistor BFG97

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{CBO}	collector cut-off current	I_E = 0; V_{CB} = 10 V	-	-	100	nA
h_{FE}	DC current gain	I_C = 70 mA; V_{CE} = 10 V	25	-	-	
f_T	transition frequency	f = 500 MHz; I_C = 70 mA; V_{CE} = 10 V; T_{amb} = 25 °C	-	5.5	-	GHz
C_c	collector capacitance	f = 1 MHz; $I_E = i_e$ = 0; V_{CB} = 10 V	-	1.5	-	pF
C_e	emitter capacitance	f = 1 MHz; $I_C = i_c$ = 0; V_{EB} = 0.5 V	-	6.5	-	pF
C_{re}	feedback capacitance	f = 1 MHz; I_C = 0; V_{CE} = 10 V	-	1.0	-	pF
G_{UM}	maximum power gain	f = 500 MHz; T_{amb} = 25 °C; I_C = 70 mA; V_{CE} = 10 V	-	16	-	dB
G_{UM}	maximum power gain	f = 800 MHz; T_{amb} = 25 °C; I_C = 70 mA; V_{CE} = 10 V	-	12	-	dB
V_o	output voltage	note 1	-	750	-	mV
V_o	output voltage	note 2	-	700	-	mV

Notes

1. d_{im} = −60 dB (DIN 45004B); T_{amb} = 25 °C; I_C = 70 mA; V_{CE} = 10 V; R_L = 75 Ω; $V_p = V_o$ at d_{im} = −60 dB; $V_q = V_o$ −6 dB; f_p = 445.25 MHz; $V_r = V_o$ −6 dB; f_q = 453.25 MHz; f_r = 445.25 MHz; measured at $f_{(p+q-r)}$ = 443.25 MHz.

2. d_{im} = −60 dB (DIN 45004B); T_{amb} = 25 °C; I_C = 70 mA; V_{CE} = 10 V; R_L = 75 Ω; $V_p = V_o$ at d_{im} = −60 dB; $V_q = V_o$ −6 dB; f_p = 795.25 MHz; $V_r = V_o$ −6 dB; f_q = 803.25 MHz; f_r = 805.25 MHz; measured at $f_{(p+q-r)}$ = 793.25 MHz

List of components:

R1 = 10 kΩ metal film resistor	(cat. no. 2322 180 73103)
R2 = 220 Ω metal film resistor	(cat. no. 2322 180 73221)
R3 = R4 = 30 Ω metal film resistor	(cat. no. 2322 180 73309)
C2 = C3 = C7 = C8 = 10 nF ceramic multilayer capacitor	(cat. no. 2222 590 08627)
C1 = C4 = C6 = 1.2 pF ceramic multilayer capacitor	(cat. no. 2222 851 12128)
C5 = 10 nF miniature ceramic plate capacitor	(cat. no. 2222 629 08103)
L1 = 0.5 turn Cu wire (0.4 mm), internal diameter 3 mm	
L2 = 75 Ω microstripline	(L = 14 mm; W = 2.5 mm)
L3 = 75 Ω microstripline	(L = 8 mm; W = 2.5 mm)
L4 = L5 = 1.5 turns Cu wire (0.4 mm), internal diameter 3 mm, winding pitch 1 mm	
L6 = 75 Ω microstripline	(L = 19 mm; W = 2.5 mm)
L7 = 5 μH Ferroxcube choke	(cat. no. 3122 108 20153)

The circuit has been built on a double Cu clad printed circuit board with PTFE dielectric ($\varepsilon_r = 2.2$); thickness 1/16 inch; thickness of copper-sheet 2 x 35 μm.

The components L1, R2, L4, C5 and L5 are mounted on the underside of the PCB.

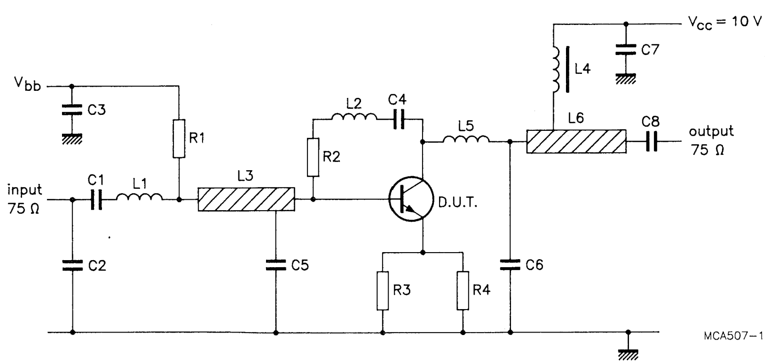


Fig.1 Intermodulation and second harmonic test circuit.

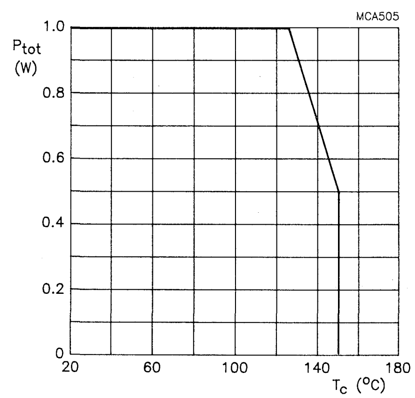


Fig.2 Power derating curve as a function of case temperature.

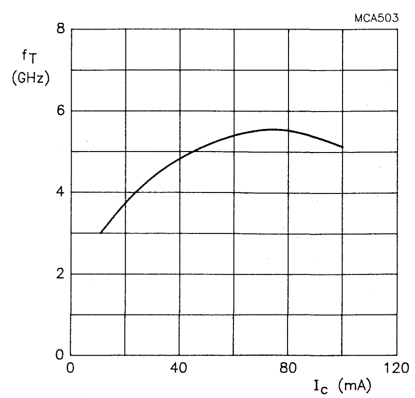


Fig.3 Transition frequency as a function of collector current; V_{CE} = 10 V; f = 500 MHz; T_j = 25 °C; typical values.

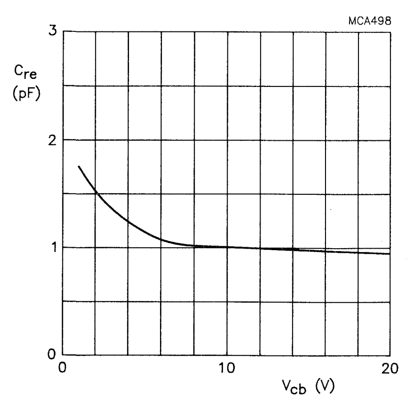


Fig.4 Feedback capacitance as a function of collector-base voltage; I_E = 0; f = 1 MHz; T_j = 25 °C; typical values.

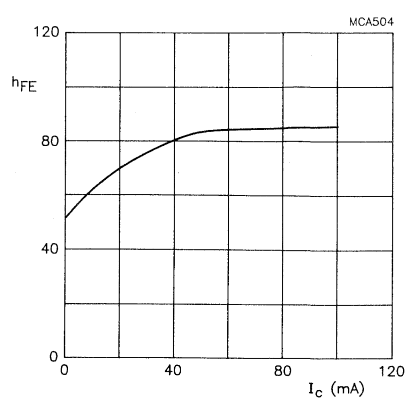


Fig.5 DC current gain as a function of collector current; V_{CE} = 10 V; T_j = 25 °C; typical values.

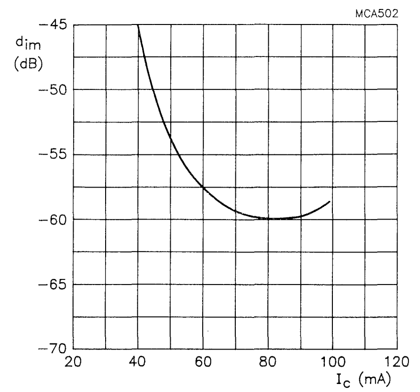


Fig.6 Intermodulation distortion as a function of collector current; V_{CE} = 10 V; V_o = 750 mV; $f_{(p+q-r)}$ = 443.25 MHz; T_{amb} = 25 °C; typical values.

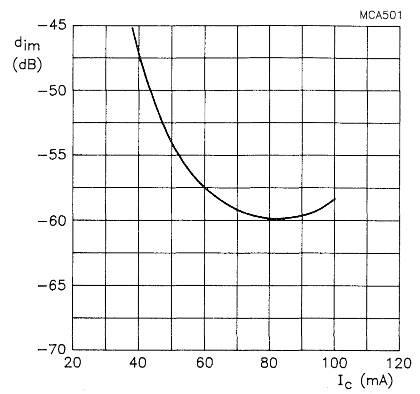


Fig.7 Intermodulation distortion as a function of collector current; V_{CE} = 10 V; V_o = 700 mV; $f_{(p+q-r)}$ = 793.25 MHz; T_{amb} = 25 °C; typical values.

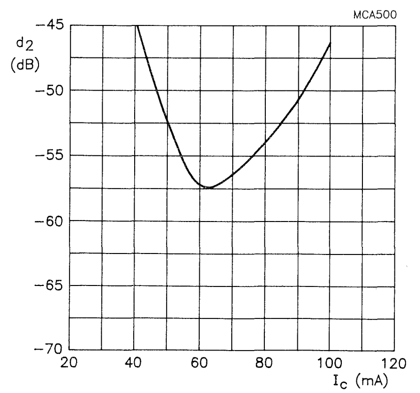


Fig.8 Intermodulation distortion as a function of collector current; V_{CE} = 10 V; V_o = 50 dBmV; $f_{(p+q)}$ = 450 MHz; T_{amb} = 25 °C; typical values.

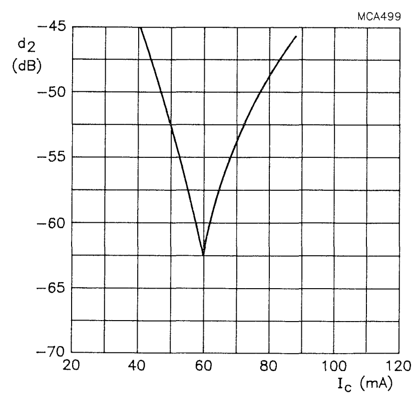


Fig.9 Intermodulation distortion as a function of collector current; V_{CE} = 10 V; V_o = 50 dBmV; $f_{(p+q)}$ = 810 MHz; T_{amb} = 25 °C; typical values.

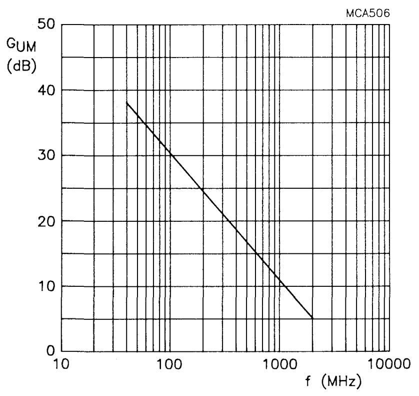


Fig.10 Gain as a function of frequency; V_{CE} = 10 V; I_C = 70 mA; T_{amb} = 25 °C; typical values.

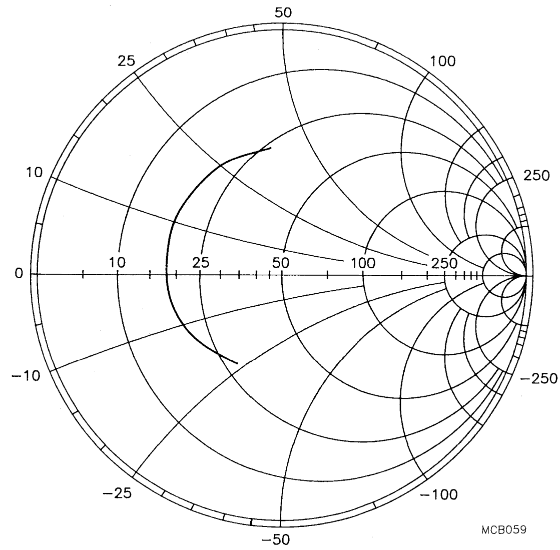


Fig.11 Input reflection coefficient S_{11}; V_{CE} = 10 V; I_C = 70 mA; T_{amb} = 25 °C; typical values.

NPN 5 GHz wideband transistor BFG97

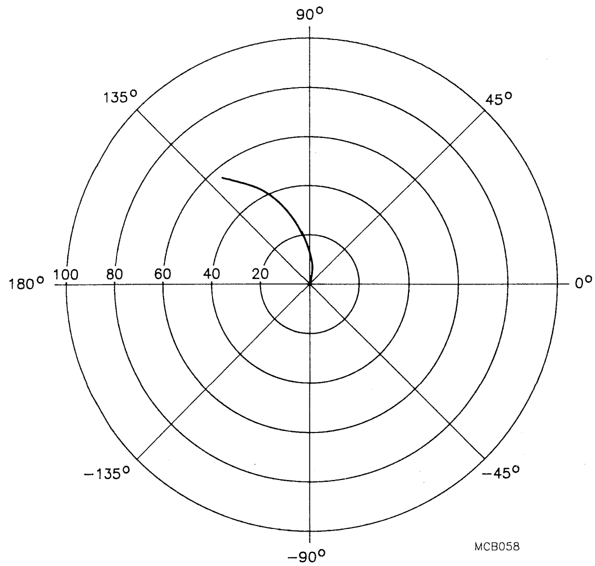


Fig.12 Forward transmission coefficient S_{21}; V_{CE} = 10 V; I_C = 70 mA; T_{amb} = 25 °C; typical values.

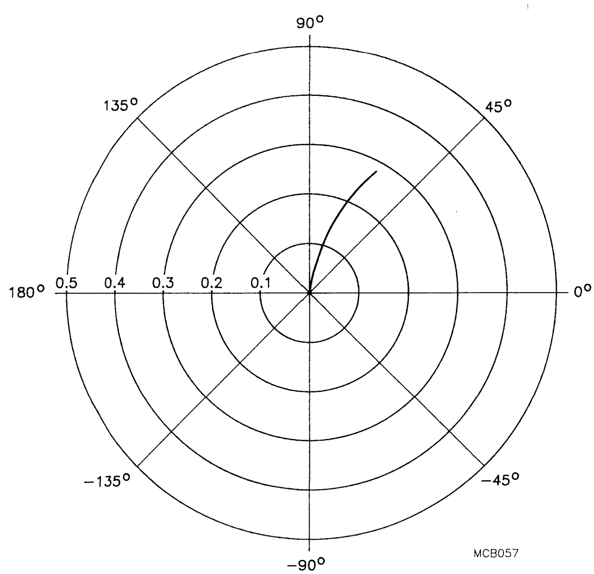


Fig.13 Reverse transmission coefficient S_{12}; V_{CE} = 10 V; I_C = 70 mA; T_{amb} = 25 °C; typical values.

NPN 5 GHz wideband transistor
BFG97

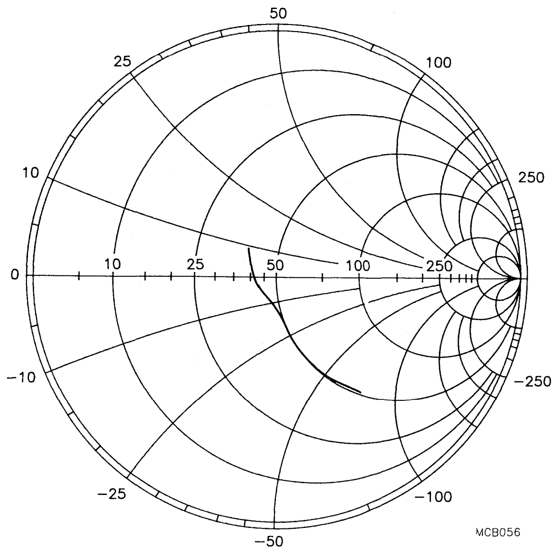


Fig.14 Output reflection coefficient S_{22}; V_{CE} = 10 V; I_C = 70 mA; T_{amb} = 25 °C; typical values.

NPN 5 GHz wideband transistor BFG97

S-Parameters (common emitter) at V_{CE} = 10 V; T_{amb} = 25 °C; typical values.

I_C (mA)	f (MHz)	S_{11} M Φ	S_{21} M Φ	S_{12} M Φ	S_{22} M Φ	G_{UM} (dB)
5	40	0.84/- 32.9	13.1/160.1	0.02/74.0	0.95/- 12.8	37.8
	100	0.76/- 73.1	10.2/138.1	0.04/56.3	0.79/- 27.3	28.2
	200	0.69/-117.6	7.4/114.1	0.06/43.1	0.62/- 35.4	22.2
	500	0.63/-171.8	3.4/ 84.6	0.07/41.3	0.45/- 44.7	13.8
	800	0.61/ 159.8	2.2/ 69.3	0.09/48.3	0.42/- 55.8	9.6
	1000	0.61/ 146.0	1.8/ 60.5	0.10/55.1	0.40/- 65.1	7.7
	1200	0.61/ 133.8	1.5/ 52.2	0.11/63.4	0.37/- 75.8	6.1
	1500	0.59/ 117.1	1.2/ 43.9	0.14/67.2	0.36/- 93.4	4.0
	2000	0.59/ 82.8	0.8/ 30.6	0.21/72.5	0.33/-126.2	0.6
10	40	0.71/- 46.9	24.2/152.2	0.02/66.8	0.89/- 21.4	37.5
	100	0.63/- 95.9	17.0/126.6	0.04/52.3	0.65/- 38.7	29.2
	200	0.59/-137.8	10.3/106.0	0.05/47.2	0.44/- 46.9	23.0
	500	0.56/ 177.7	4.5/ 82.6	0.07/56.0	0.29/- 51.3	15.0
	800	0.56/ 154.7	2.8/ 69.5	0.10/61.6	0.25/- 61.1	11.0
	1000	0.56/ 142.8	2.3/ 61.6	0.11/63.7	0.23/- 69.4	9.0
	1200	0.56/ 131.6	1.9/ 54.7	0.14/66.6	0.22/- 80.2	7.3
	1500	0.56/ 116.3	1.5/ 46.4	0.17/67.9	0.21/- 99.1	5.3
	2000	0.56/ 93.2	1.1/ 34.1	0.23/68.8	0.19/-136.7	2.4
30	40	0.47/- 85.5	44.5/137.3	0.02/65.4	0.73/- 39.1	37.3
	100	0.48/-135.9	24.8/112.1	0.02/58.7	0.41/- 60.0	29.8
	200	0.50/-163.5	13.4/ 97.2	0.04/65.9	0.24/- 69.3	24.0
	500	0.50/ 167.5	5.5/ 80.5	0.07/70.5	0.12/- 80.5	16.2
	800	0.51/ 149.5	3.5/ 69.4	0.11/70.7	0.09/- 91.9	12.2
	1000	0.52/ 139.2	2.8/ 62.8	0.13/70.7	0.08/-106.3	10.2
	1200	0.52/ 129.5	2.3/ 57.3	0.16/71.5	0.07/-126.8	8.5
	1500	0.52/ 115.2	1.8/ 49.2	0.19/67.0	0.08/-154.7	6.7
	2000	0.53/ 93.7	1.3/ 39.0	0.25/65.6	0.10/ 158.6	4.0
50	40	0.42/-105.0	51.8/131.1	0.01/63.4	0.65/- 46.5	37.5
	100	0.46/-148.6	26.6/107.7	0.02/64.8	0.34/- 68.4	30.1
	200	0.48/-170.0	14.0/ 94.9	0.03/64.4	0.19/- 80.7	24.3
	500	0.49/ 165.2	5.7/ 79.7	0.07/73.8	0.09/-100.5	16.4
	800	0.50/ 148.5	3.6/ 69.2	0.11/71.4	0.07/-119.4	12.4
	1000	0.51/ 138.5	2.9/ 63.1	0.14/71.9	0.07/-140.3	10.5
	1200	0.51/ 128.9	2.4/ 57.5	0.16/71.8	0.07/-157.3	8.8
	1500	0.52/ 114.9	1.9/ 49.9	0.20/67.6	0.09/ 174.1	7.0
	2000	0.53/ 93.6	1.4/ 40.2	0.26/65.7	0.13/ 141.3	4.2
70	40	0.40/-117.5	55.2/127.4	0.01/64.0	0.60/- 51.0	37.5
	100	0.46/-154.5	27.2/105.3	0.02/62.6	0.30/- 72.6	30.1
	200	0.48/-173.1	14.2/ 93.6	0.03/70.8	0.16/- 86.1	24.3
	500	0.49/ 164.1	5.8/ 79.3	0.07/75.0	0.08/-109.8	16.4
	800	0.51/ 148.0	3.6/ 69.1	0.11/73.1	0.06/-131.5	12.5
	1000	0.51/ 138.3	2.9/ 62.8	0.14/70.8	0.06/-155.7	10.5
	1200	0.51/ 128.7	2.4/ 57.8	0.16/70.9	0.07/-172.6	8.8
	1500	0.51/ 114.7	1.9/ 49.9	0.20/68.1	0.10/ 165.6	7.0
	2000	0.53/ 93.5	1.4/ 40.6	0.27/64.4	0.14/ 136.3	4.3

NPN 7 GHz WIDEBAND TRANSISTOR

NPN planar epitaxial transistor in a plastic SOT103F envelope, intended for wideband amplifier applications. The small emitter structures ensure high output voltage capabilities at a low distortion level. The distribution of the active areas across the surface of the device gives an excellent temperature profile.

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 (DC)	I_C	max.	150 mA
Total power dissipation up to T_c = 140 °C (note 1)	P_{tot}	max.	1.0 W
Junction temperature	T_j	max.	175 °C
DC current gain I_C = 100 mA; V_{CE} = 10 V	h_{FE}	min.	80
Transition frequency at f = 1000 MHz I_C = 100 mA; V_{CE} = 10 V; T_{amb} = 25 °C	f_T	typ.	7.0 GHz
Maximum power gain at f = 800 MHz I_C = 100 mA; V_{CE} = 10 V	G_{UM}	typ;	14.5 dB
Maximum power gain at f = 2 GHz I_C = 100 mA; V_{CE} = 10 V	G_{UM}	typ.	8.0 dB
Output voltage at d_{im} = −60 dB I_C = 100 mA; V_{CE} = 10 V; R_L = 75 Ω; $f_{(p+q-r)}$ = 793.25 MHz	V_o	typ.	850 mV

MECHANICAL DATA

SOT103

Pinning:

1, 3 = emitter
2 = collector
4 = base

Note

1. T_c; Case temperature measured on soldering point of collector tab.

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.	2.0	V
Collector current (DC)	I_C	max.	150	mA
Total power dissipation up to T_c = 140 °C	P_{tot}	max.	1	W
Storage temperature range	T_{stg}		−65 to 150	°C
Junction temperature	T_j	max.	175	°C

THERMAL RESISTANCE

From junction to soldering point	$R_{th\,j\text{-}s}$	=	30	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current $I_E = 0$, V_{CB} = 10 V	I_{CBO}	max.	1 μA
DC current gain I_C = 100 mA; V_{CE} = 10 V	h_{FE}	min.	80
Transition frequency at f = 1000 MHz I_C = 100 mA; V_{CE} = 10 V; T_{amb} = 25 °C	f_T	typ.	7.0 GHz
Collector capacitance at f = 1 MHz $I_E = i_e = 0$; V_{CB} = 10 V	C_c	typ.	2.0 pF
Emitter capacitance at f = 1 MHz $I_C = i_c = 0$; V_{EB} = 0.5 V	C_e	typ.	6.0 pF
Feedback capacitance at f = 1 MHz $I_C = 0$; V_{CE} = 10 V	C_{re}	typ.	1.2 pF
Maximum power gain at f = 800 MHz I_C = 100 mA; V_{CE} = 10 V; T_{amb} = 25 °C	G_{UM}	typ.	14.5 dB
Maximum power gain at f = 2 GHz I_C = 100 mA; V_{CE} = 10 V; T_{amb} = 25 °C	G_{UM}	typ.	7.0 dB
Output voltage at d_{im} = –60 dB (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 = 445.25 MHz $V_q = V_o$ –6 dB; f_q = 453.25 MHz $V_r = V_o$ –6 dB; f_r = 455.25 MHz Measured at $f_{(p+q-r)}$ = 443.25 MHz	V_o	typ.	900 mV
Output voltage at d_{im} = –60 dB (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 = 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.	850 mV

S-parameters (common emitter) at V_{CE} = 10 V; T_{amb} = 25 °C; typical values.

I_C mA	f MHz	S_{11} (rat)	S_{11} (deg)	S_{21} (rat)	S_{21} (dB)	S_{21} (deg)	S_{12} (rat)	S_{12} (deg)	S_{22} (rat)	S_{22} (deg)	G_{UM} (dB)
	40	0.830	−36.5	20.264	26.1	158.3	0.0249	70.5	0.926	−21.4	39.65
	100	0.755	−79.1	15.908	24.0	134.3	0.0490	51.9	0.739	−45.4	31.13
	200	0.685	−120.4	10.424	20.4	112.0	0.0646	36.8	0.510	−68.0	24.43
	500	0.662	−165.3	4.694	13.4	85.5	0.0746	31.5	0.322	−97.0	16.42
10	800	0.667	175.7	3.003	9.6	71.0	0.0817	38.8	0.312	−110.5	12.56
	1000	0.676	166.2	2.425	7.7	62.8	0.0876	44.3	0.320	−118.8	10.82
	1200	0.697	158.1	2.016	6.1	55.4	0.0956	51.2	0.339	−128.4	9.50
	1500	0.723	147.9	1.593	4.0	46.0	0.1130	57.1	0.396	−141.2	8.00
	2000	0.763	132.1	1.178	1.4	31.3	0.1567	63.1	0.486	−156.5	6.38
	40	0.771	−44.3	27.966	28.9	154.5	0.0235	68.0	0.893	−28.4	39.80
	100	0.699	−91.5	20.416	26.2	129.3	0.0435	49.0	0.670	−58.8	31.71
	200	0.651	−131.3	12.606	22.0	108.6	0.0551	37.6	0.448	−87.0	25.38
	500	0.645	−171.0	5.508	14.8	85.5	0.0681	39.1	0.299	−123.6	17.56
20	800	0.651	171.7	3.519	10.9	72.9	0.0826	47.2	0.287	−136.5	13.69
	1000	0.659	163.1	2.851	9.1	65.8	0.0935	51.2	0.290	−143.6	11.96
	1200	0.677	155.2	2.374	7.5	59.3	0.1051	55.7	0.307	−151.1	10.60
	1500	0.701	145.8	1.895	5.6	50.7	0.1253	58.3	0.356	−159.6	9.08
	2000	0.736	130.9	1.426	3.1	36.6	0.1675	60.8	0.424	−169.2	7.34
	40	0.718	−52.7	35.587	31.0	150.6	0.0223	65.0	0.856	−36.1	39.91
	100	0.659	−103.0	24.214	27.7	124.7	0.0387	46.9	0.618	−72.6	32.24
	200	0.630	−140.4	14.296	23.1	105.7	0.0480	39.3	0.428	−105.7	26.18
	500	0.635	−175.5	6.107	15.7	85.6	0.0644	45.5	0.329	−144.2	18.45
50	800	0.640	168.7	3.903	11.8	74.3	0.0845	52.9	0.319	−156.8	14.58
	1000	0.648	160.2	3.161	10.0	67.8	0.0985	55.7	0.319	−163.4	12.83
	1200	0.667	153.0	2.641	8.4	62.2	0.1124	58.7	0.333	−169.7	11.50
	1500	0.687	144.0	2.118	6.5	54.4	0.1347	59.4	0.371	−176.1	9.94
	2000	0.718	129.6	1.608	4.1	41.6	0.1767	59.3	0.416	176.9	8.10
	40	0.707	−55.0	37.233	31.4	149.5	0.0221	63.7	0.844	−38.2	39.84
	100	0.653	−105.9	24.885	27.9	123.7	0.0378	46.3	0.605	−76.1	32.31
	200	0.628	−142.5	14.538	23.3	105.0	0.0468	39.6	0.425	−109.9	26.29
	500	0.635	−176.3	6.179	15.8	85.5	0.0637	46.8	0.338	−147.9	18.59
70	800	0.639	168.1	3.953	11.9	74.6	0.0847	54.0	0.329	−160.2	14.72
	1000	0.648	159.6	3.194	10.1	68.1	0.0991	56.5	0.329	−166.8	12.95
	1200	0.665	152.4	2.673	8.5	62.6	0.1138	59.3	0.343	−173.0	11.62
	1500	0.686	143.5	2.145	6.6	55.0	0.1363	59.6	0.379	−178.9	10.07
	2000	0.716	129.4	1.629	4.2	42.3	0.1786	59.2	0.419	174.3	8.20
	40	0.702	−57.0	38.064	31.6	148.6	0.0221	62.9	0.831	−39.8	39.66
	100	0.651	−108.3	25.022	28.0	122.7	0.0374	45.6	0.591	−78.6	32.22
	200	0.651	−144.2	14.492	23.2	104.4	0.0461	39.5	0.419	−112.7	26.25
	500	0.637	−177.1	6.141	15.8	85.2	0.0632	47.6	0.340	−150.0	18.56
100	800	0.641	167.6	3.927	11.9	74.3	0.0849	54.7	0.332	−161.9	14.69
	1000	0.648	159.3	3.169	10.0	68.0	0.0993	57.0	0.333	−168.3	12.89
	1200	0.666	152.1	2.655	8.5	62.5	0.1142	59.7	0.347	−174.3	11.58
	1500	0.687	143.1	2.130	6.6	55.0	0.1370	59.9	0.382	179.9	10.03
	2000	0.716	128.6	1.619	4.2	42.4	0.1794	59.2	0.421	173.3	8.16

INTERMODULATION DISTORTION AND SECOND ORDER DISTORTION MATV TEST CIRCUIT

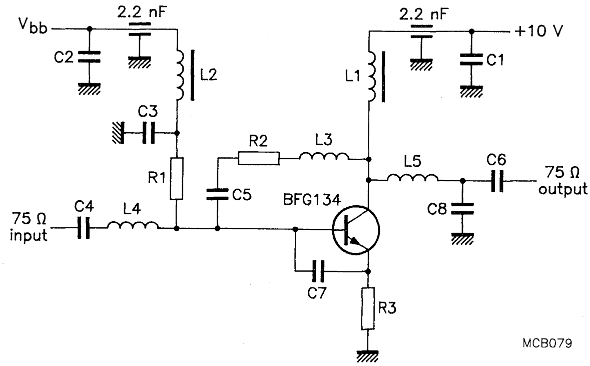


Fig.1 Intermodulation distortion and second harmonic MATV test circuit.

List of components:

C1 = C2 = 10 nF, miniature ceramic capacitor (cat. no. 2222 629 08103)
C3 = C4 = C5 = C6 = 10 nF, ceramic multilayer capacitor (cat. no. 2222 851 06627)
C7 = 1.2 pF, ceramic multilayer capacitor (cat. no. 2222 851 12128)
C8 = 1.0 pF, ceramic multilayer capacitor (cat. no. 2222 851 12108)

R1 = 10 kΩ, chip resistor (cat. no. 2322 712 30103)
R2 = 220 Ω, chip resistor (cat. no. 2322 712 30221)
R3 = 15 Ω, chip resistor (cat. no. 2322 712 30158)

L1 = L2 = 5 μH ferroxcube choke (cat. no. 3122 108 20153)
L3 = 4 turns Cu-wire (0.4 mm), internal diameter 3 mm, winding pitch 1 mm
L4 = L5 = 1.5 turns Cu-wire (0.4 mm), internal diameter 3 mm

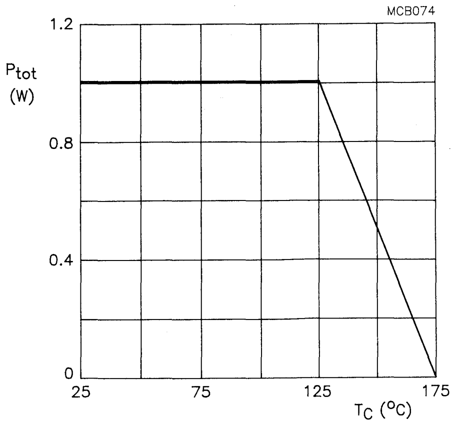


Fig.2 Power derating curve as a function of case temperature.

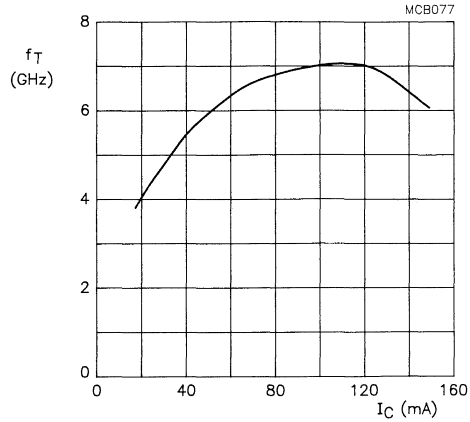


Fig.3 Transition frequency as a function of collector current.
V_{CE} = 10 V; f = 1 GHZ; T_j = 25 °C; typical values.

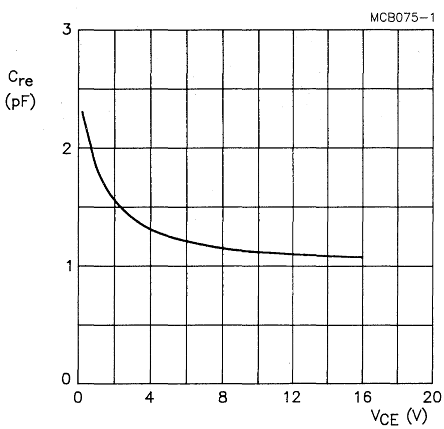


Fig.4 $I_E = i_e = 0$; f = 1 MHz; T_j = 25 °C; typical values.

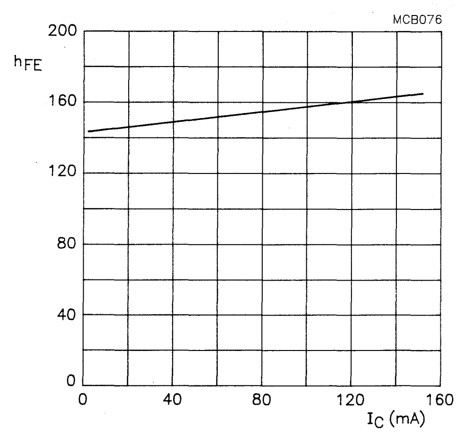


Fig.5 V_{CE} = 10 V; T_j = 25 °C; typical values.

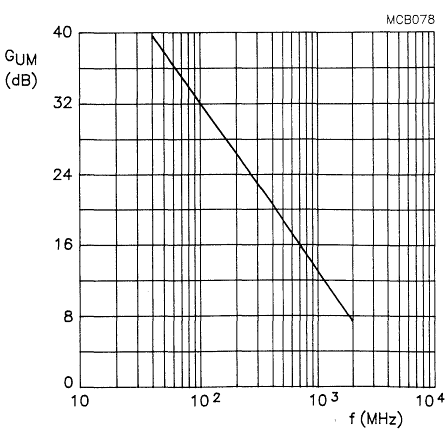


Fig.6 Gain as a function of frequency.
V_{CE} = 10 V; I_C = 100 mA; T_{amb} = 25 °C; typical values.

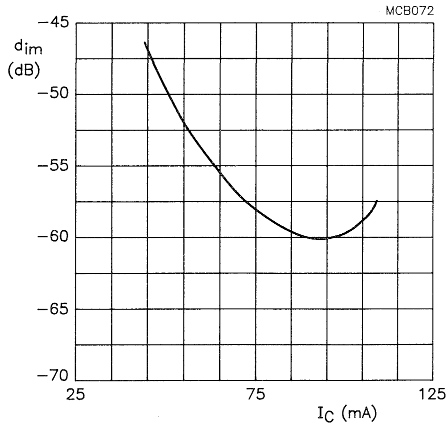


Fig.7 Intermodulation distortion.
V_{CE} = 10 V; V_O = 900 mV;
$f_{(p+q-r)}$ = 443.25 MHz;
T_{amb} = 25 °C; typical values.

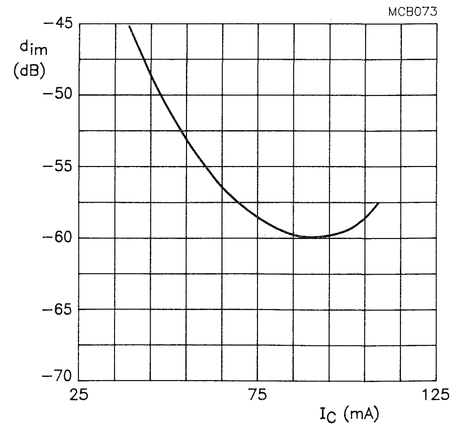


Fig.8 Intermodulation distortion.
V_{CE} = 10 V; V_O = 850 mV;
$f_{(p+q-r)}$ = 793.25 MHz;
T_{amb} = 25 °C; typical values.

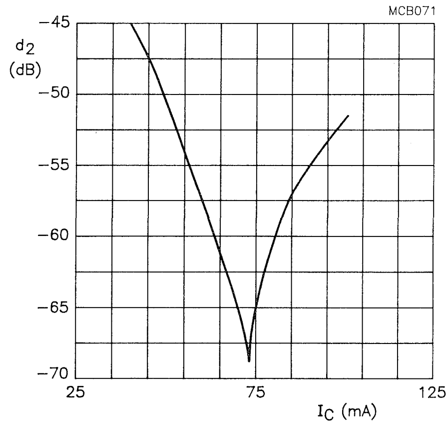


Fig.9 Intermodulation distortion.
V_{CE} = 10 V; f_p = 10 MHz;
f_q = 400 MHz; $f_{(p+q)}$ = 450 MHz;
T_{amb} = 25 °C; V_O = 50 dB/mV;
typical values.

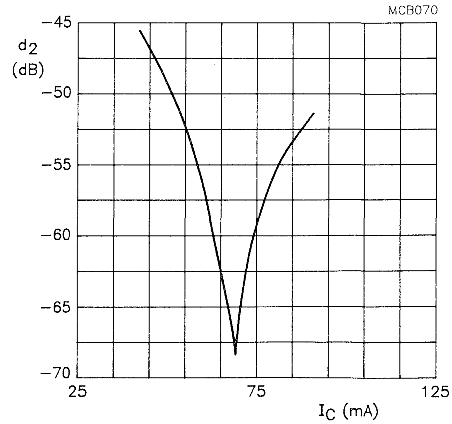


Fig.10 Intermodulation distortion.
V_{CE} = 10 V; f_p = 250 MHz;
f_q = 560 MHz; $f_{(p+q)}$ = 810 MHz;
T_{amb} = 25 °C; V_O = 50 dB/mV;
typical values.

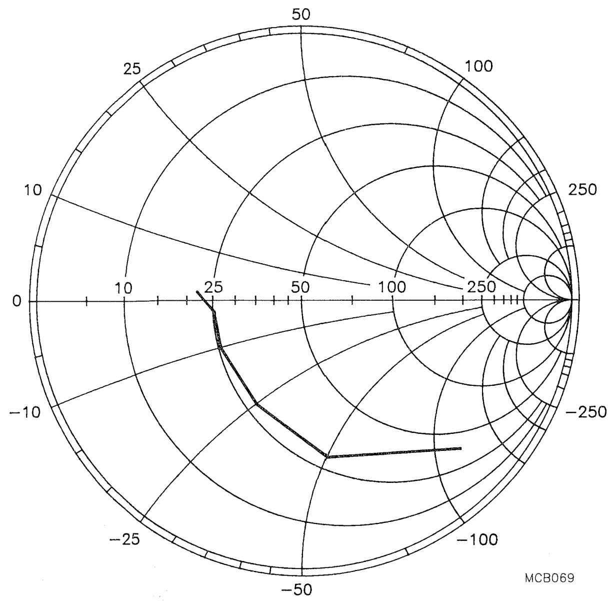


Fig.11 Input reflection coefficient S_{11}.

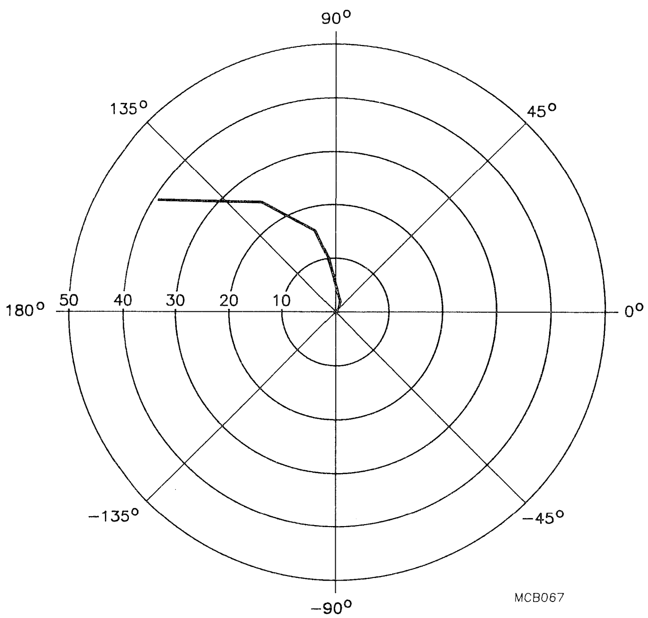


Fig.12 Forward transmission coefficient S_{21}.

Conditions for Figs 11 to 14: V_{CE} = 10 V; I_C = 100 mA; T_{amb} = 25 °C; typical values.

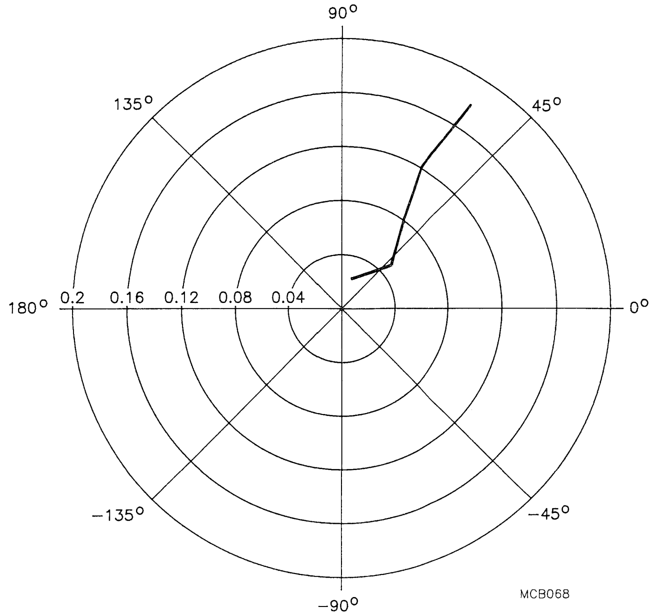


Fig.13 Reverse transmission coefficient S_{12}.

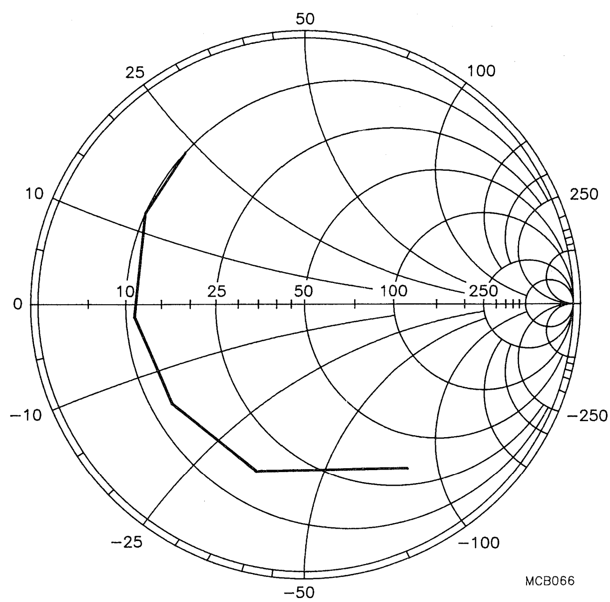


Fig.14 Output reflection coefficient S_{22}.

Philips Components

Data sheet	
status	Product specification
date of issue	October 1990

BFG135

NPN 7 GHz wideband transistor

NPN planar epitaxial transistor in a plastic SOT223 envelope, intended for wideband amplifier applications. The small emitter structures ensure high output voltage capabilities at a low distortion level.
The distribution of the active areas across the surface of the device, gives an excellent temperature profile.

MECHANICAL DATA

SOT223.

PINNING

PIN	DESCRIPTION
1	emitter
2	base
3	emitter
4	collector

PIN CONFIGURATION

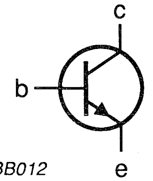


Fig.1 Pin configuration.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	-	-	25	V
V_{CEO}	collector-emitter voltage	open base	-	-	15	V
I_C	collector current (DC)		-	-	150	mA
P_{tot}	total power dissipation	T_{case} = 145 °C note 1	-	-	1	W
T_j	junction temperature		-	-	175	°C
h_{FE}	DC current gain	I_C = 100 mA; V_{CE} = 10 V	80	-	-	
f_T	transition frequency	f = 1 GHz; I_C = 100 mA; V_{CE} = 10 V; T_{amb} = 25 °C	-	7.0	-	GHz
G_{UM}	maximum power gain	f = 500 MHz; I_C = 100 mA; V_{CE} = 10 V	-	16	-	dB
G_{UM}	maximum power gain	f = 800 MHz; I_C = 100 mA; V_{CE} = 10 V	-	12	-	dB
V_o	output voltage	d_{im} = −60 dB; I_C = 100 mA; V_{CE} = 10 V; R_L = 75 Ω; $f_{(p+q-r)}$ = 793.25 MHz	-	850	-	mV

Note

1. T_{case} temperature measured on soldering point of collector tab.

NPN 7 GHz wideband transistor BFG135

ORDERING AND PACKAGE INFORMATION

EXTENDED TYPE NUMBER	PACKAGE		
	CODE	PACKING METHOD	PACKING QUANTITY
BFG135	SOT223	bulk	500
BFG135	SOT223	12 mm reel	1000

LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	-	25	V
V_{CEO}	collector-emitter voltage	open base	-	15	V
V_{EBO}	emitter-base voltage	open collector	-	2	V
I_C	collector current (DC)		-	150	mA
P_{tot}	total power dissipation	T_{case} = 145 °C	-	1	W
T_{stg}	storage temperature range		–65	+150	°C
T_j	junction temperature		-	175	°C

THERMAL RESISTANCE

SYMBOL	PARAMETER	NOM.	UNIT
$R_{th\ j\text{-}c}$	from junction to case	30	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{CBO}	collector cut-off current	I_E = 0; V_{CB} = 10 V	-	-	1	μA
h_{FE}	DC current gain	I_C = 100 mA; V_{CE} = 10 V	80	-	-	
f_T	transition frequency	f = 1 GHz; I_C = 100 mA; V_{CE} = 10 V; T_{amb} = 25 °C	-	7.0	-	GHz
C_c	collector capacitance	f = 1 MHz; $I_e = i_e$ = 0; V_{CB} = 10 V	-	2.0	-	pF
C_e	emitter capacitance	f = 1 MHz; $I_c = i_c$ = 0; V_{EB} = 0.5 V	-	7.0	-	pF
C_{re}	feedback capacitance	f = 1 MHz; I_C = 0; V_{CE} = 10 V	-	1.2	-	pF
G_{UM}	maximum power gain	f = 500 MHz; T_{amb} = 25 °C; I_C = 100 mA; V_{CE} = 10 V	-	16	-	dB
G_{UM}	maximum power gain	f = 800 MHz; T_{amb} = 25 °C; I_C = 100 mA; V_{CE} = 10 V	-	12	-	dB
V_o	output voltage	note 1	-	900	-	mV
V_o	output voltage	note 2	-	850	-	mV

Notes

1. d_{im} = –60 dB (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; $V_q = V_o$ –6 dB; f_p = 445.25 MHz; $V_r = V_o$ –6 dB; f_q = 453.25 MHz; f_r = 455.25 MHz; measured at $f_{(p+q-r)}$ = 443.25 MHz

2. d_{im} = –60 dB (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; $V_q = V_o$ –6 dB; f_p = 795.25 MHz; $V_r = V_o$ –6 dB; f_q = 803.25 MHz; f_r = 805.25 MHz; measured at $f_{(p+q-r)}$ = 793.25 MHz

S-Parameters (common emitter) at V_{CE} = 10 V; T_{amb} = 25 °C; typical values.

I_C (mA)	f (MHz)	S_{11} M Φ	S_{21} M Φ	S_{12} M Φ	S_{22} M Φ	G_{UM} (dB)
10	40	0.79/- 25.3	12.7/165.9	0.02/75.7	0.97/- 11.1	38.3
	100	0.70/- 57.4	12.1/146.9	0.04/62.4	0.87/- 25.4	31.7
	200	0.64/-100.7	9.0/125.7	0.06/46.1	0.69/- 41.2	25.3
	500	0.60/-162.7	4.6/ 92.7	0.08/32.6	0.44/- 60.4	17.0
	800	0.60/ 168.5	2.9/ 75.6	0.08/34.3	0.35/- 73.9	12.7
	1000	0.60/ 154.0	2.4/ 65.9	0.08/41.3	0.34/- 82.6	10.8
	1200	0.60/ 141.4	1.9/ 57.5	0.08/50.5	0.33/- 93.4	8.9
	1500	0.60/ 124.7	1.5/ 48.5	0.09/61.3	0.32/-111.5	6.7
	2000	0.61/ 100.0	1.1/ 34.3	0.41/76.3	0.32/-144.0	3.2
20	40	0.69/- 38.7	24.8/159.3	0.02/72.6	0.93/- 17.4	38.7
	100	0.62/- 81.3	18.7/138.5	0.04/57.9	0.74/- 39.9	31.0
	200	0.58/-127.1	13.1/115.7	0.05/45.3	0.53/- 56.9	25.9
	500	0.56/ 174.8	6.0/ 88.8	0.06/44.4	0.32/- 72.4	18.3
	800	0.56/ 159.5	3.7/ 74.8	0.07/54.9	0.22/- 91.6	13.9
	1000	0.56/ 148.2	3.0/ 66.5	0.08/58.2	0.20/-103.6	11.9
	1200	0.57/ 136.6	2.5/ 59.8	0.10/63.9	0.19/-114.9	10.2
	1500	0.57/ 121.5	1.9/ 51.4	0.12/67.9	0.20/-135.1	8.0
	2000	0.58/ 99.8	1.4/ 39.3	0.17/73.3	0.22/-167.3	5.1
50	40	0.60/- 83.2	44.8/148.9	0.01/69.2	0.82/- 33.1	38.4
	100	0.55/-131.0	29.7/123.0	0.02/52.4	0.55/- 62.4	32.2
	200	0.54/-159.8	17.3/104.4	0.03/55.6	0.33/- 86.9	26.9
	500	0.54/ 169.9	7.3/ 84.9	0.05/68.7	0.18/-124.2	19.2
	800	0.54/ 152.0	4.6/ 73.7	0.08/71.1	0.15/-147.1	15.2
	1000	0.54/ 142.0	3.6/ 67.0	0.09/71.1	0.15/-160.5	13.1
	1200	0.54/ 132.6	3.0/ 61.8	0.12/72.1	0.15/-174.7	11.4
	1500	0.54/ 119.1	2.4/ 54.2	0.15/72.3	0.18/-170.8	9.4
	2000	0.56/ 98.3	1.6/ 44.2	0.20/71.1	0.22/ 148.3	6.4
70	40	0.33/-117.0	53.4/143.7	0.01/73.3	0.76/- 39.7	38.8
	100	0.49/-147.8	32.6/117.1	0.02/65.0	0.46/- 74.6	32.5
	200	0.56/-169.3	18.2/101.0	0.03/66.7	0.28/-102.7	27.2
	500	0.58/ 166.0	7.5/ 83.9	0.05/72.8	0.17/-141.6	19.4
	800	0.59/ 149.8	4.7/ 73.2	0.08/73.2	0.16/-164.9	15.4
	1000	0.59/ 140.1	3.7/ 66.8	0.10/72.2	0.17/-177.0	13.4
	1200	0.58/ 131.1	3.0/ 61.9	0.12/73.9	0.17/-173.4	11.6
	1500	0.58/ 117.9	2.4/ 54.5	0.15/71.8	0.20/ 161.2	9.7
	2000	0.58/ 97.8	1.7/ 45.3	0.20/70.6	0.25/ 138.5	6.7
100	40	0.35/-130.4	58.2/140.3	0.01/59.3	0.70/- 44.7	38.8
	100	0.50/-156.7	33.7/114.7	0.02/64.8	0.42/- 79.1	32.7
	200	0.56/-173.5	18.4/ 99.3	0.03/67.8	0.26/-108.5	27.2
	500	0.58/ 164.4	7.6/ 82.9	0.05/75.5	0.18/-150.7	19.5
	800	0.59/ 148.8	4.7/ 72.7	0.08/74.8	0.17/-169.5	15.5
	1000	0.59/ 139.4	3.7/ 66.3	0.10/75.8	0.18/-177.7	13.4
	1200	0.58/ 130.5	3.0/ 61.7	0.12/74.6	0.18/-166.9	11.6
	1500	0.58/ 117.5	2.4/ 54.4	0.16/73.2	0.21/ 156.6	9.8
	2000	0.59/ 97.7	1.7/ 45.1	0.20/70.6	0.26/ 135.2	6.7

NPN 7 GHz wideband transistor | BFG135

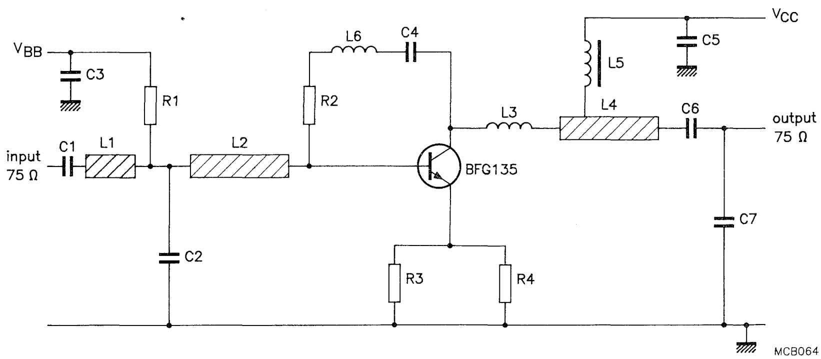


Fig.2 Intermodulation and second harmonic test circuit.

List of components:

R1 = 10 kΩ metalfilm resistor (cat. no. 2322 180 73103)
R2 = 200 Ω metalfilm resistor (cat. no. 2322 180 73201)
R3 = R4 = 27 Ω metalfilm resistor (cat. no. 2322 180 73279)

C1 = C3 = C5 = C6 = 10 nF ceramic multilayer capacitor (cat. no. 2222 590 08627)
C2 = C7 = 1 pF ceramic multilayer capacitor (cat. no. 2222 851 12108)
C4 = 10 nF miniature ceramic plate capacitor (cat. no. 2222 629 08103)

L1 = 75 Ω microstripline (L = 7 mm; W = 2.5 mm)
L2 = 75 Ω microstripline (L = 22 mm; W = 2.5 mm)
L3 = 1.5 turn Cu wire (0.4 mm), internal diameter 3 mm, winding pitch 1 mm
L4 = 75 Ω microstripline (L = 19 mm; W = 2.5 mm)
L5 = 5 μH Ferroxcube choke (cat. no. 3122 108 20153)
L6 = 30 mm Cu wire (0.4 mm; L ≈ 24 nH)

The circuit has been build on a double Cu clad printed circuit board with P.T.F.E. dielectric (ε_r = 2.2); thickness 1/16 inch; thickness of copper-sheet 2 x 35 μm; see Fig 3.

The components R2, L6, C4 and L3 are mounted on the underside of the PCB

NPN 7 GHz wideband transistor BFG135

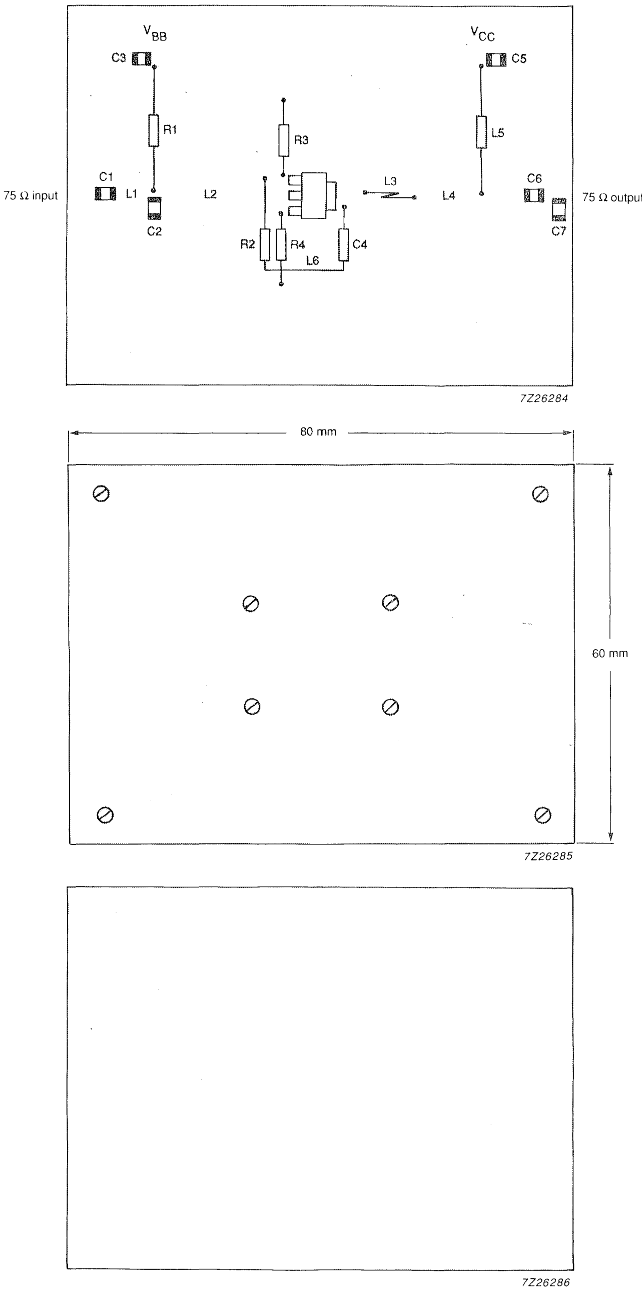


Fig.3 Intermodulation test circuit printed circuit board.

NPN 7 GHz wideband transistor | BFG135

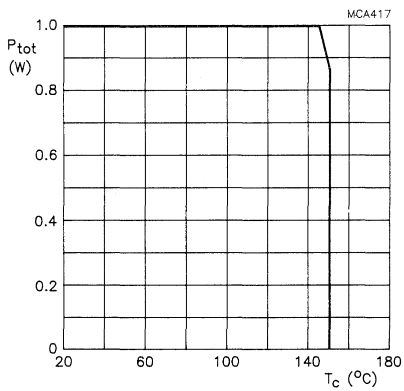


Fig.4 Power derating curve.

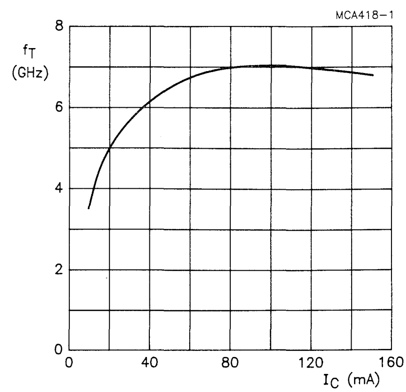


Fig.5 Transition frequency as a function of collector current; V_{CE} = 10 V; f = 1 GHz; T_j = 25 °C; typical values.

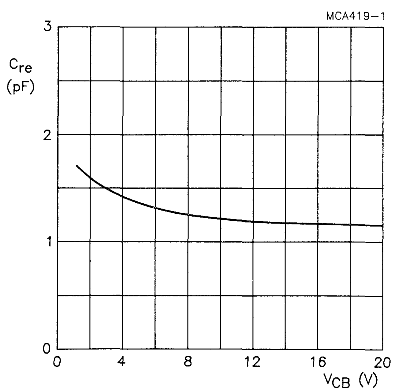


Fig.6 Feedback capacitance as a function of collector-base voltage; I_E = 0; f = 1 MHz; T_j = 25 °C; typical values.

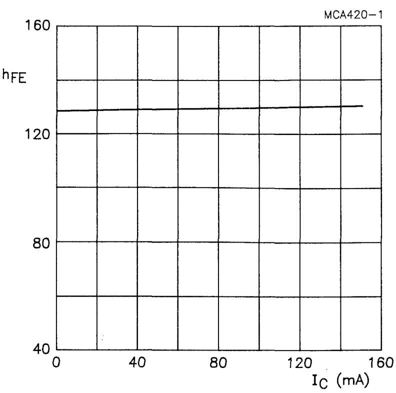


Fig.7 DC current gain as a function of collector current; V_{CE} = 10 V; T_j = 25 °C; typical values.

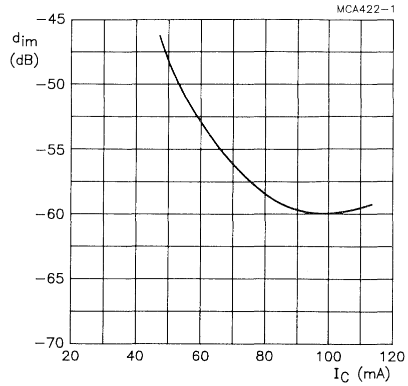


Fig.8 Intermodulation distortion; V_{CE} = 10 V; V_o = 900 mV; $f_{(p+q-r)}$ = 443.25 MHz; T_{amb} = 25 °C; typical values.

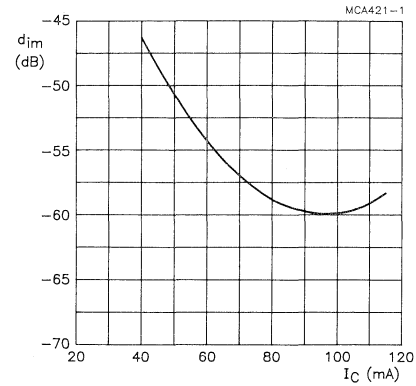


Fig.9 Intermodulation distortion; V_{CE} = 10 V; V_o = 850 mV; $f_{(p+q-r)}$ = 793.25 MHz; T_{amb} = 25 °C; typical values.

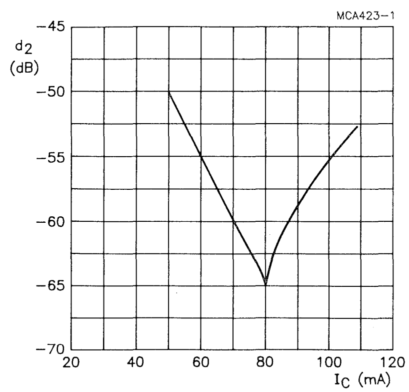


Fig.10 Second order beat; V_{CE} = 10 V; V_o = 50 dBmV; $f_{(p+q)}$ = 450 MHz; T_{amb} = 25 °C; typical values.

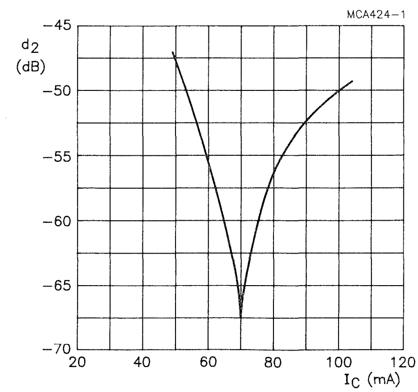


Fig.11 Second order beat; V_{CE} = 10 V; V_o = 50 dBmV; $f_{(p+q)}$ = 810 MHz; T_{amb} = 25 °C; typical values.

NPN 7 GHz wideband transistor BFG135

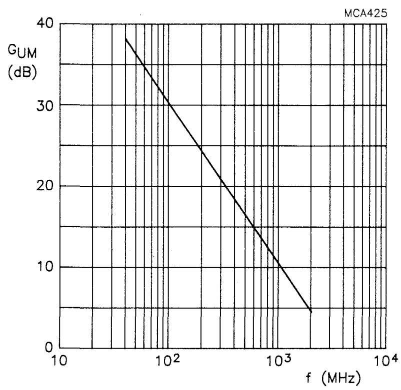


Fig.12 Maximum unilateral gain as a function of frequency; V_{CE} = 10 V; I_C = 100 mA; T_{amb} = 25 °C; typical values.

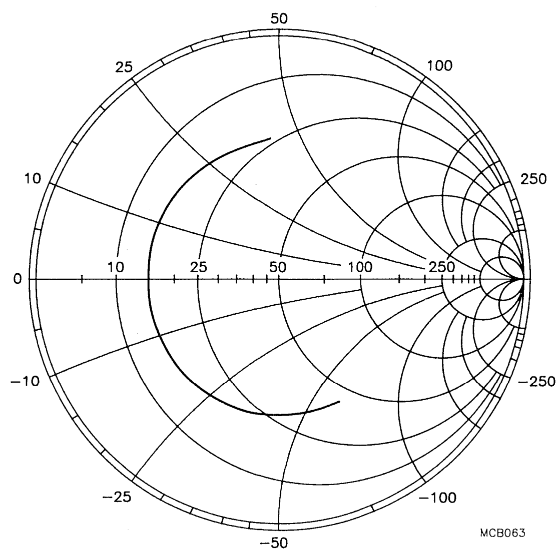


Fig.13 Input reflection coefficient S_{11}; V_{CE} = 10 V; I_C = 100 mA; T_{amb} = 25 °C; typical values.

NPN 7 GHz wideband transistor BFG135

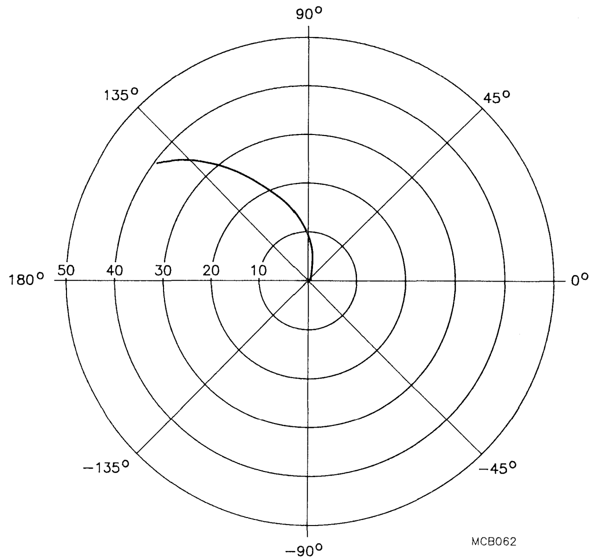


Fig.14 Forward transmission coefficient S_{21}; V_{CE} = 10 V; I_C = 100 mA; T_{amb} = 25 °C; typical values.

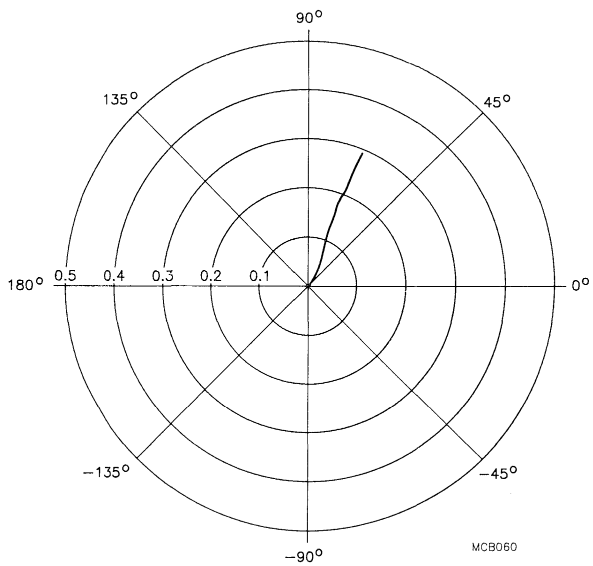


Fig.15 Reverse transmission coefficient S_{12}; V_{CE} = 10 V; I_C = 100 mA; T_{amb} = 25 °C; typical values.

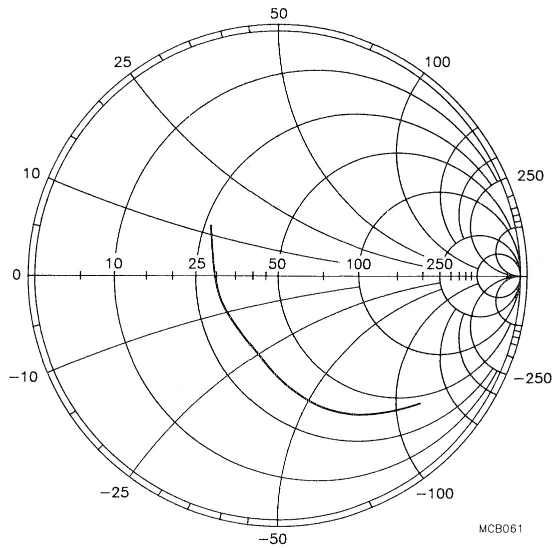


Fig.16 Output reflection coefficient S_{22}; V_{CE} = 10 V; I_C = 100 mA; T_{amb} = 25 °C; typical values.

NPN 7 GHz WIDEBAND TRANSISTOR

NPN transistor in a four-lead dual-emitter plastic envelope (SOT103). 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 (DC)	I_C	max.	100	mA
Total power dissipation up to T_{amb} = 50 °C	P_{tot}	max.	500	mW
Junction temperature	T_j	max.	175	°C
DC 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
Maximum unilateral power gain at f = 2 GHz I_C = 50 mA; V_{CE} = 8 V	G_{UM}	typ.	11.0	dB

MECHANICAL DATA

SOT103 (see outlines section).

Pinning

1 = emitter
2 = collector
3 = emitter
4 = base

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 (DC)	I_C	max.	100	mA
Total power dissipation up to T_{amb} = 50 °C (see note)	P_{tot}	max.	500	mW
Storage temperature range	T_{stg}		−65 to +150	°C
Junction temperature	T_j	max.	175	°C

THERMAL RESISTANCE

From junction to ambient (see note)	$R_{th\ j\text{-}a}$	=	200	K/W
From junction to soldering point	$R_{th\ j\text{-}s}$	=	55	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current $I_E = 0$; $V_{CB} = 5$ V	I_{CBO}	max.	100	nA
DC 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
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_{12} assumed to be zero)

$$G_{UM} \text{ (in dB)} = 10 \log \frac{|S_{21}|^2}{[1-|S_{11}|^2]\,[1-|S_{22}|^2]}$$

$I_C = 50$ 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

Note: mounted on a printed-circuit board of 40 mm x 25 mm x 1.5 mm.

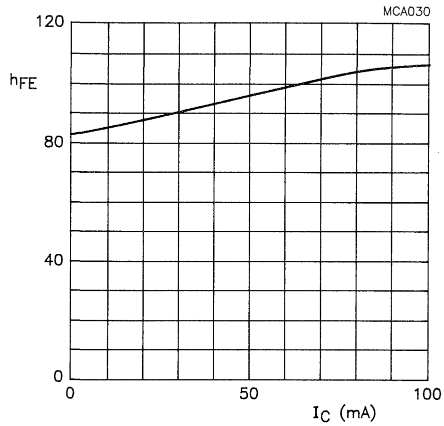


Fig.1 DC current gain as a function of collector current.

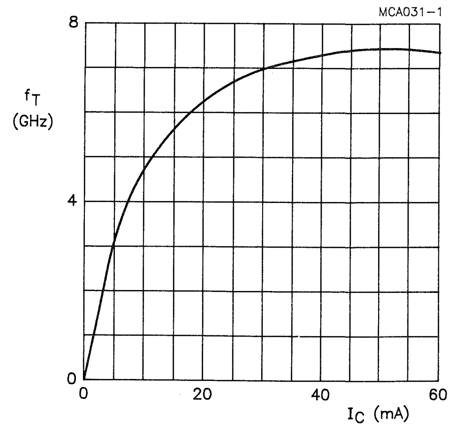


Fig.2 Transition frequency as a function of collector current.

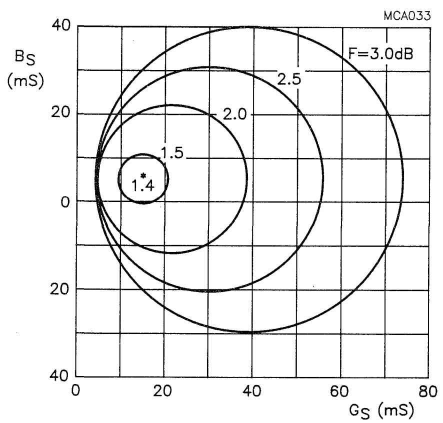


Fig.3 Circles of constant noise.

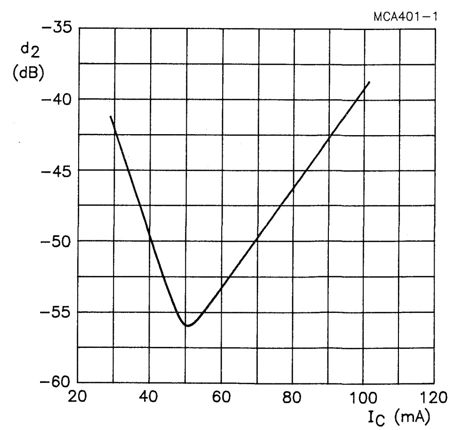


Fig.4 Second order distortion as a function of collector current.

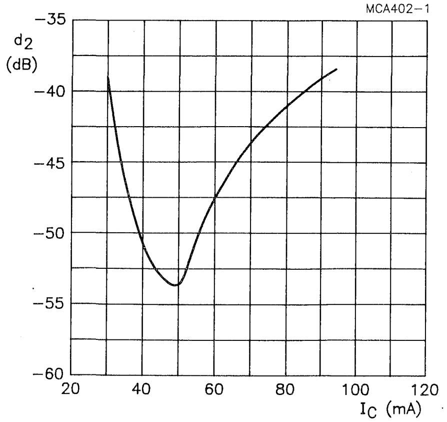


Fig.5 Second order distortion as a function of collector current.

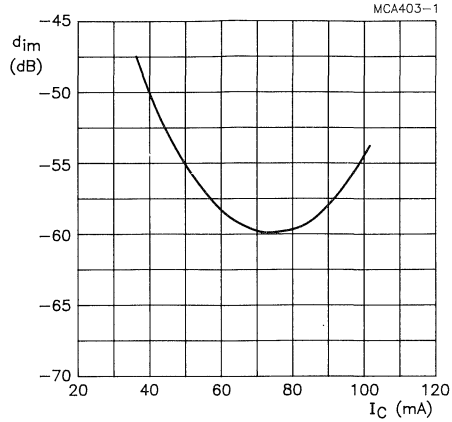


Fig.6 Intermodulation distortion as a function of collector current.

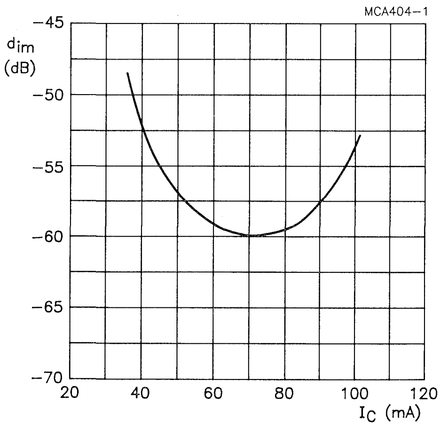


Fig.7 Intermodulation distortion as a function of collector current.

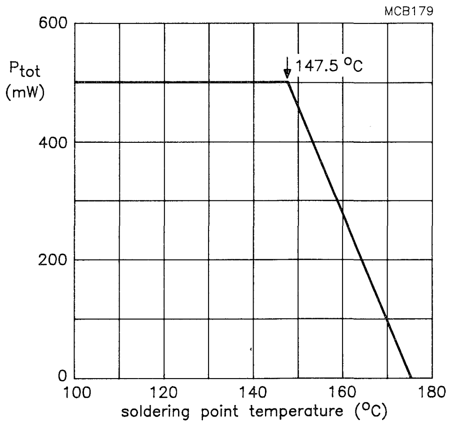


Fig.8 Power derating curve.

Philips Components

Data sheet	
status	Product specification
date of issue	June 1990

BFG197/197X

NPN 7 GHz wideband transistor

DESCRIPTION

NPN transistor in a microminiature SOT143 envelope. It is designed for wideband application in the 7 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.

PIN CONFIGURATION

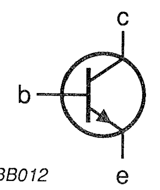


Fig.1 Symbol

PINNING

BFG 197

PIN	DESCRIPTION
1	collector
2	base
3	emitter
4	emitter

BFG197X

PIN	DESCRIPTION
1	collector
2	emitter
3	base
4	emitter

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	TYP.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	-	20	V
V_{CEO}	collector-emitter voltage	open base	-	10	V
I_C	collector current (DC)		-	100	mA
P_{tot}	total power dissipation	$T_s = 80$ °C	-	300	W
T_j	junction temperature		-	150	°C
f_T	transition frequency	f = 2 GHz; $I_C = 50$ mA; $V_{CE} = 4$ V; $T_{amb} = 25$ °C	7.5	-	GHz
C_{re}	feedback capacitance	f = 1 MHz; $I_C = 0$; $V_{CE} = 8$ V	0.85	-	pF
G_{UM}	maximum power gain	f = 2 GHz; $I_C = 50$ mA; $T_{amb} = 25$ °C; $V_{CE} = 4$ V; $V_{CE} = 6$ V;	- -	11 11	dB dB

NPN 7 GHz wideband transistor BFG197/197X

ORDERING AND PACKAGE INFORMATION

EXTENDED TYPE NUMBER	PACKAGE		
	CODE	PACKING METHOD	PACKING QUANTITY
BFG197	SOT143	bulk	500
BFG197	SOT143	12 mm tape	3000
BFG197X	SOT143 note 1	bulk	500
BFG197X	SOT143 note 1	12 mm tape	3000

Note

1. Cross emitter pinning.

LIMITING VALUES

In accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	-	20	V
V_{CEO}	collector-emitter voltage	open base	-	10	V
V_{EBO}	emitter-base voltage	open collector	-	2.5	V
I_C	collector current (DC)		-	100	mA
P_{tot}	total power dissipation	$T_s = 80\ °C$ note 1	-	300	mW
T_{stg}	storage temperature range		−65	150	°C
T_j	junction temperature		-	150	°C

THERMAL RESISTANCE

SYMBOL	PARAMETER	CONDITIONS	NOM.	UNIT
$R_{th\ j\text{-}s}$	from junction to soldering point	note 1	320	K/W

Note

1. Mounted on a ceramic substrate measuring 8 x 10 x 0.7 mm.
   T_s = temperature measured at soldering pont of collector tab.

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{CBO}	collector cut-off current	$I_E = 0$; $V_{CB} = 5$ V	-	-	100	nA
h_{FE}	DC current gain	$I_C = 50$ mA; $V_{CE} = 5$ V	40	90	-	
f_T	transition frequency	f = 2 GHz; $I_C = 50$ mA; $V_{CE} = 4$ V; $T_{amb} = 25$ °C	-	7.5	-	GHz
F	noise figure at optimum source impedance	$I_C = 15$ mA; $V_{CE} = 8$ V; f = 1 GHz; $T_{amb} = 25$ °C	-	1.7	-	dB
F	noise figure at optimum source impedance	$I_C = 50$ mA; $V_{CE} = 6$ V; f = 1 GHz; $T_{amb} = 25$ °C	-	2.3	-	dB
C_c	collector capacitance	$I_E = i_e = 0$; $V_{CB} = 8$ V; f = 1 MHz	-	1.5	-	pF
C_e	emitter capacitance	f = 1 MHz; $I_C = i_c = 0$; $V_{EB} = 0.5$ V	-	3.3	-	pF
C_{re}	feedback capacitance	f = 1 MHz; $I_C = 0$; $V_{CE} = 8$ V	-	0.85	-	pF
G_{UM}	maximum unilateral power gain	note 1 f = 2 GHz; $T_{amb} = 25$ °C; $I_E = 50$ mA; $V_{CE} = 4$ V	-	11	-	dB
G_{UM}	maximum unilateral power gain	note 1 f = 2 GHz; $T_{amb} = 25$ °C; $I_E = 50$ mA; $V_{CE} = 6$ V	-	11	-	dB

Note

1. $G_{UM} = 10 \log \dfrac{|S_{21}|^2}{(1-|S_{11}|^2)\ (1-|S_{22}|^2)}$

S-parameters (common emitter) at V_{CE} = 4.00 V

I_C (mA)	f (MHz)	S_{11} M Φ	S_{21} M Φ	S_{12} M Φ	S_{22} M Φ	G_{UM} (dB)
10	40	0.36/- 49.6	20.42/165.1	0.02/69.8	1.08/- 14.9	34.7
	100	0.54/-100.4	17.36/141.8	0.03/57.2	0.94/- 38.0	35.7
	200	0.69/-134.8	11.94/120.5	0.04/43.6	0.65/- 59.6	26.7
	500	0.82/-166.8	5.61/ 91.2	0.05/34.6	0.40/- 89.5	20.6
	800	0.84/-178.7	3.68/ 78.0	0.06/40.2	0.37/- 99.9	17.1
	1000	0.85/ 175.2	2.89/ 70.1	0.06/44.3	0.35/-103.5	15.2
	1200	0.86/ 169.3	2.37/ 66.2	0.07/50.9	0.34/-109.2	13.8
	1500	0.84/ 164.4	2.02/ 56.5	0.08/54.9	0.37/-113.9	12.0
	2000	0.84/ 153.5	1.49/ 46.1	0.11/62.6	0.40/-123.6	9.7
15	40	0.29/- 72.8	26.00/162.3	0.02/66.9	1.06/- 18.9	37.6
	100	0.55/-119.0	20.87/137.3	0.03/55.1	0.88/- 46.2	34.4
	200	0.70/-146.8	13.71/116.5	0.04/44.0	0.58/- 70.3	27.5
	500	0.83/-172.1	6.12/ 89.5	0.04/41.6	0.36/-104.2	21.5
	800	0.84/ 177.8	4.00/ 77.5	0.06/49.0	0.34/-113.8	17.7
	1000	0.85/ 172.4	3.14/ 70.3	0.06/52.8	0.32/-117.5	15.9
	1200	0.86/ 166.8	2.58/ 66.9	0.07/58.0	0.31/-123.5	14.5
	1500	0.84/ 162.5	2.20/ 57.3	0.09/59.9	0.34/-125.7	12.6
	2000	0.83/ 151.9	1.64/ 47.8	0.12/64.6	0.37/-133.1	10.1
20	40	0.28/- 93.5	30.55/160.2	0.02/65.4	1.05/- 22.1	40.3
	100	0.57/-130.7	23.42/133.8	0.02/54.4	0.83/- 52.5	34.2
	200	0.72/-153.7	14.69/113.8	0.03/45.8	0.54/- 78.4	28.0
	500	0.83/-175.1	6.43/ 88.5	0.04/47.4	0.35/-114.5	21.8
	800	0.83/ 175.8	4.19/ 77.2	0.06/54.6	0.33/-137.8	18.1
	1000	0.85/ 170.8	3.28/ 70.3	0.06/57.8	0.32/-126.9	16.2
	1200	0.86/ 165.3	2.71/ 67.4	0.07/62.2	0.31/-133.5	14.9
	1500	0.83/ 161.4	2.31/ 57.8	0.09/62.6	0.33/-133.8	12.8
	2000	0.83/ 151.0	1.73/ 48.7	0.12/65.2	0.36/-139.9	10.3
30	40	0.31/-119.7	36.73/157.0	0.02/62.3	1.01/- 26.9	47.3
	100	0.62/-143.8	26.39/129.3	0.02/52.4	0.76/- 61.3	34.3
	200	0.75/-161.8	15.92/110.3	0.03/47.9	0.48/- 89.9	28.7
	500	0.83/-178.4	6.74/ 87.3	0.04/54.9	0.34/-126.7	22.2
	800	0.83/ 173.6	4.38/ 76.7	0.05/61.5	0.33/-133.6	18.5
	1000	0.85/ 169.0	3.43/ 70.3	0.06/63.0	0.32/-138.0	16.6
	1200	0.86/ 163.8	2.84/ 67.8	0.07/66.9	0.32/-144.6	15.3
	1500	0.83/ 160.2	2.42/ 58.3	0.10/65.1	0.34/-143.1	13.2
	2000	0.83/ 149.8	1.82/ 49.6	0.13/66.4	0.35/-148.1	10.8
50	40	0.40/-140.6	44.62/152.6	0.02/54.8	0.96/- 33.5	45.4
	100	0.68/-155.5	29.14/124.0	0.02/51.8	0.68/- 72.5	34.6
	200	0.77/-167.8	16.87/106.6	0.02/53.7	0.44/-103.1	29.4
	500	0.84/ 178.7	6.92/ 86.0	0.04/62.3	0.35/-112.1	22.7
	800	0.84/ 171.7	4.49/ 75.8	0.06/66.2	0.34/-143.8	18.8
	1000	0.85/ 167.5	3.51/ 70.0	0.07/67.5	0.33/-147.8	16.9
	1200	0.86/ 162.5	2.91/ 67.8	0.08/70.2	0.33/-154.4	15.6
	1500	0.83/ 159.0	2.48/ 58.3	0.10/67.2	0.34/-151.3	13.4
	2000	0.82/ 148.8	1.88/ 50.0	0.13/66.9	0.36/-155.2	11.0

S-parameters (common emitter) at V_{CE} = 8.00 V

I_C (mA)	f (MHz)	S_{11} M Φ	S_{21} M Φ	S_{12} M Φ	S_{22} M Φ	G_{UM} (dB)
	40	0.57/- 25.7	12.45/169.2	0.02/74.6	1.10/- 9.0	30.5
	100	0.63/- 66.0	11.47/149.8	0.04/62.3	1.03/- 24.9	35.1
	200	0.70/-106.1	8.71/129.0	0.06/46.8	0.80/- 41.5	26.2
	500	0.83/-152.5	4.63/ 95.3	0.07/25.7	0.54/- 64.8	19.9
5	800	0.84/-169.0	3.08/ 79.8	0.07/24.3	0.48/- 75.6	16.3
	1000	0.86/-177.1	2.43/ 70.3	0.07/25.2	0.47/- 79.4	14.5
	1200	0.86/ 175.9	1.98/ 65.2	0.07/31.4	0.46/- 86.3	12.8
	1500	0.86/ 169.5	1.68/ 55.3	0.07/40.1	0.47/- 93.2	11.3
	2000	0.86/ 157.5	1.22/ 43.6	0.09/57.2	0.50/-107.6	9.0
	40	0.41/- 42.3	20.42/165.6	0.02/69.2	1.08/- 14.1	34.9
	100	0.56/- 92.9	17.56/142.8	0.03/58.8	0.95/- 36.5	36.6
	200	0.68/-129.6	12.22/121.8	0.04/44.1	0.66/- 57.3	27.0
	500	0.81/-164.6	5.83/ 92.0	0.05/33.9	0.41/- 86.5	20.8
10	800	0.83/-177.1	3.82/ 78.8	0.06/39.0	0.37/- 96.7	17.2
	1000	0.84/ 176.5	3.01/ 70.8	0.06/43.0	0.35/-100.4	15.4
	1200	0.85/ 170.3	2.47/ 66.9	0.07/49.0	0.34/-105.8	13.9
	1500	0.83/ 165.3	2.10/ 57.3	0.08/53.8	0.36/-110.9	12.1
	2000	0.83/ 154.3	1.55/ 47.0	0.11/61.8	0.40/-121.0	9.7
	40	0.34/- 59.1	26.30/163.0	0.02/66.9	1.06/- 18.1	37.9
	100	0.55/-110.2	21.36/138.3	0.03/55.3	0.89/- 44.6	34.9
	200	0.69/-141.8	14.19/117.5	0.04/44.4	0.59/- 68.1	27.7
	500	0.81/-170.0	6.40/ 90.3	0.05/40.1	0.36/-101.5	21.4
15	800	0.82/ 179.3	4.18/ 78.3	0.06/47.2	0.33/-111.1	17.7
	1000	0.83/ 173.6	3.28/ 71.0	0.06/51.4	0.32/-114.4	15.9
	1200	0.84/ 167.7	2.70/ 67.7	0.07/56.7	0.31/-120.9	14.3
	1500	0.82/ 163.5	2.30/ 58.2	0.09/58.9	0.33/-123.3	12.6
	2000	0.82/ 152.6	1.71/ 48.5	0.12/63.6	0.36/-130.8	10.1
	40	0.31/- 74.2	30.90/160.9	0.02/66.7	1.04/- 21.2	41.3
	100	0.57/-121.5	24.24/134.8	0.02/53.8	0.83/- 50.9	34.5
	200	0.70/-148.9	15.38/114.7	0.03/44.9	0.54/- 76.3	28.2
	500	0.81/-173.1	6.75/ 89.3	0.04/45.5	0.35/-112.2	21.8
20	800	0.82/ 177.2	4.39/ 77.8	0.06/53.0	0.32/- 44.9	18.1
	1000	0.83/ 171.9	3.45/ 71.0	0.06/55.9	0.31/-124.9	16.2
	1200	0.84/ 166.3	2.84/ 68.1	0.07/61.1	0.30/-131.5	14.7
	1500	0.82/ 162.3	2.42/ 58.7	0.09/61.2	0.33/-131.9	13.0
	2000	0.81/ 151.7	1.81/ 49.5	0.12/64.5	0.35/-138.1	10.3
	40	0.31/- 95.5	37.63/157.6	0.02/63.8	1.01/- 26.0	47.5
	100	0.60/-134.2	27.51/130.3	0.02/53.1	0.77/- 59.7	34.6
	200	0.72/-156.5	16.67/111.1	0.03/46.6	0.49/- 87.7	28.8
	500	0.82/-176.4	7.10/ 87.8	0.04/51.9	0.34/-125.0	22.3
30	800	0.82/ 175.0	4.62/ 77.3	0.06/59.4	0.32/-132.0	18.5
	1000	0.83/ 170.2	3.62/ 71.0	0.06/61.4	0.31/-136.5	16.6
	1200	0.84/ 164.6	2.99/ 68.4	0.07/64.7	0.30/-143.4	15.2
	1500	0.81/ 161.1	2.54/ 59.0	0.10/63.6	0.32/-141.8	13.2
	2000	0.81/ 150.6	1.92/ 50.4	0.13/65.1	0.34/-146.6	10.7

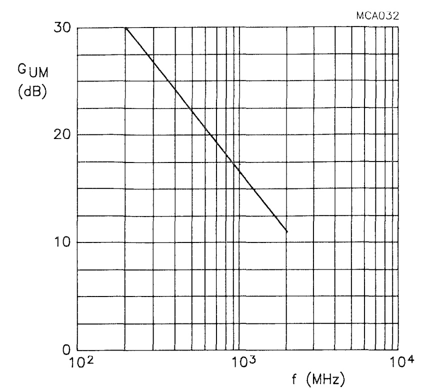


Fig.2 Gain as a function of frequency; V_{CE} = 8 V; I_C = 50 mA; T_{amb} = 25 °C; typical values.

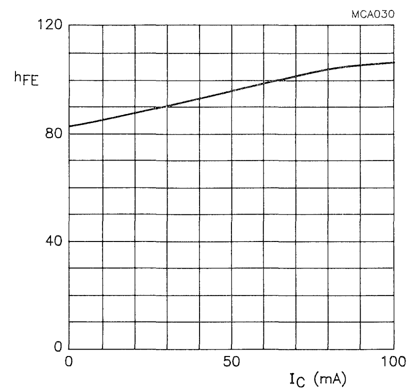


Fig.3 DC current gain; typical values.

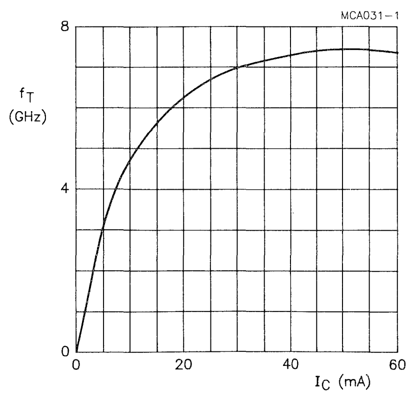


Fig.4 Transition frequency; V_{CE} = 4 V; f = 2 GHz; T_{amb} = 25 °C; typical values.

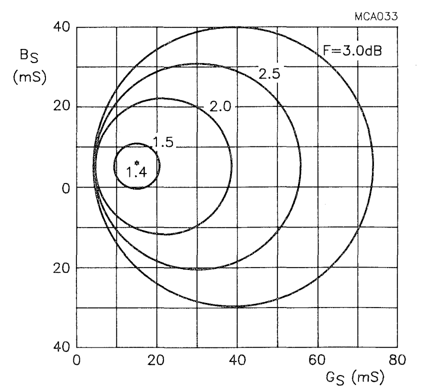


Fig.5 Circles of constant noise; V_{CE} = 8 V; I_C = 15 mA; f = 800 MHz; typical values.

NPN 7 GHz wideband transistor BFG197/197X

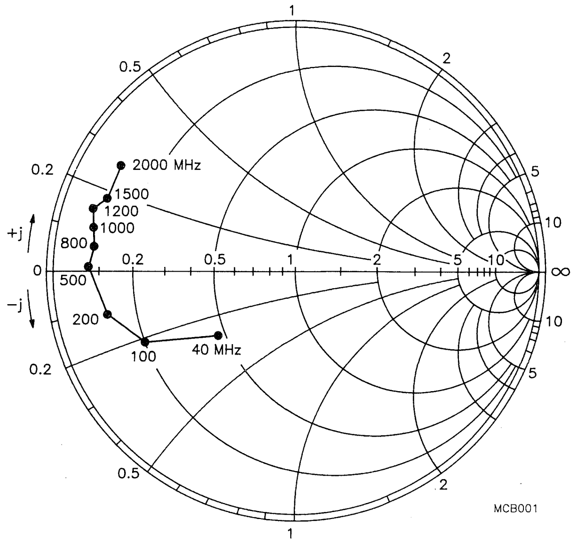


Fig.6 Input impedance derived from S_{11} (Ω x 50); V_{CE} = 4 V; I_C = 50 mA; T_{amb} = 25 °C.

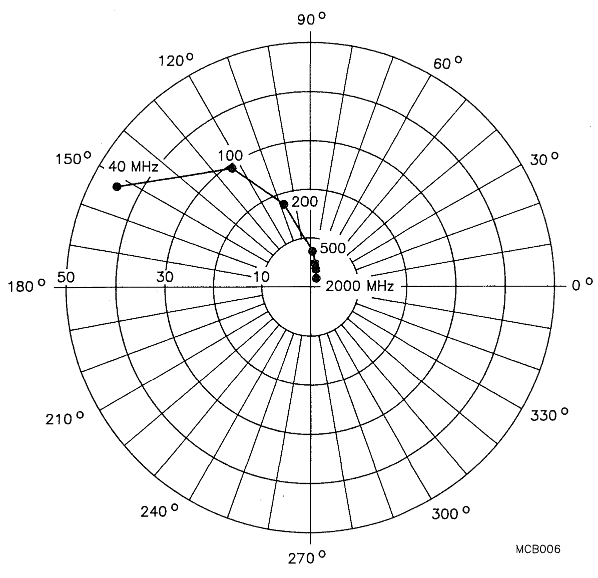


Fig.7 Forward transmission coefficient S_{21}; V_{CE} = 4 V; I_C = 50 mA; T_{amb} = 25 °C.

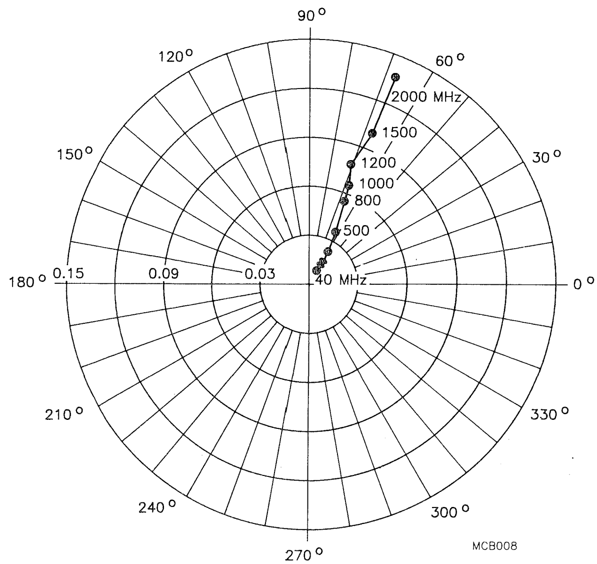


Fig.8 Reverse transmission coefficient S_{12}; V_{CE} = 4 V; I_C = 50 mA; T_{amb} = 25 °C.

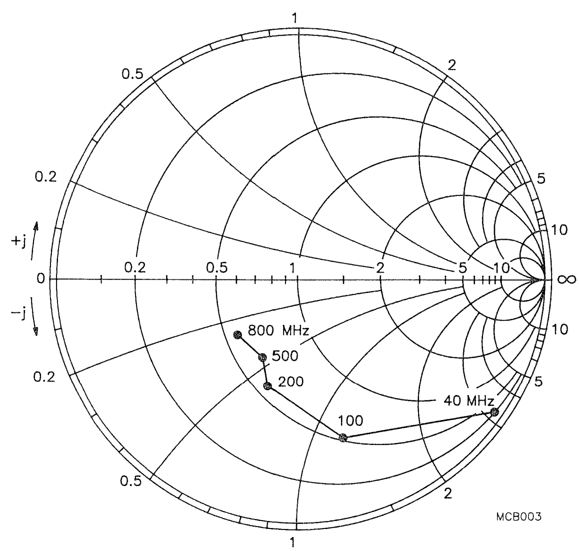


Fig.9 Output impedance derived from S_{22} (Ω x 50); V_{CE} = 4 V; I_C = 50 mA; T_{amb} = 25 °C.

NPN 7 GHz wideband transistor BFG197/197X

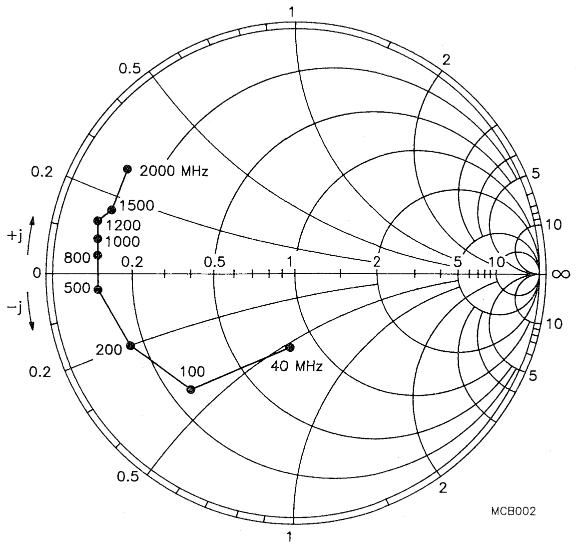


Fig.10 Input impedance derived from S_{11} (Ω x 50); V_{CE} = 8 V; I_C = 30 mA; T_{amb} = 25 °C.

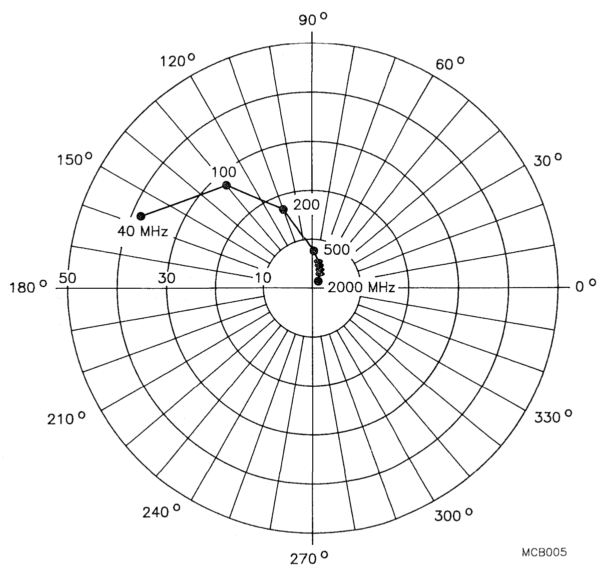


Fig.11 Forward transmission coefficient S_{21}; V_{CE} = 8 V; I_C = 30 mA; T_{amb} = 25 °C.

NPN 7 GHz wideband transistor BFG197/197X

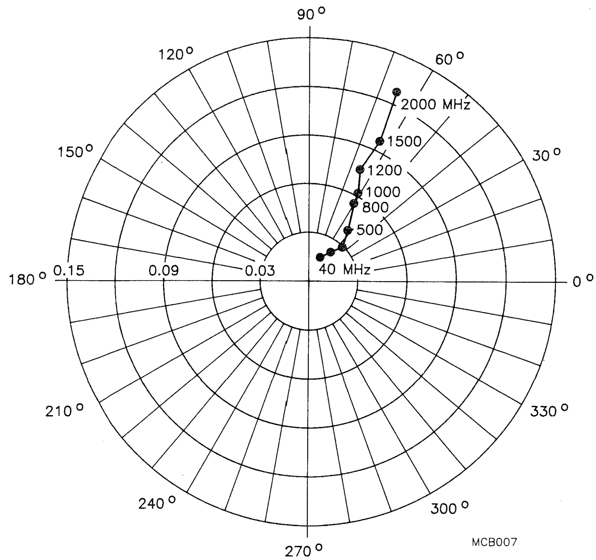


Fig.12 Reverse transmission coefficient S_{12}; V_{CE} = 8 V; I_C = 30 mA; T_{amb} = 25 °C.

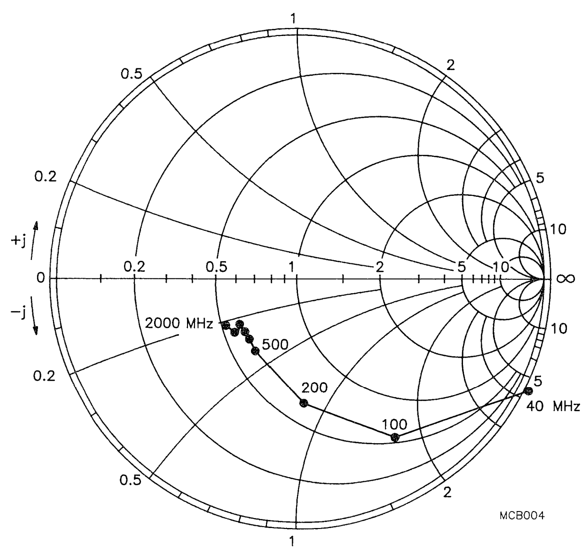


Fig.13 Output impedance derived from S_{22} (Ω x 50); V_{CE} = 8 V; I_C = 30 mA; T_{amb} = 25 °C.

Philips Components

Data sheet	
status	Product specification
date of issue	June 1990

BFG198

NPN 7 GHz wideband transistor

DESCRIPTION

NPN planar epitaxial transistor in a plastic SOT223 envelope, intended for wideband amplifier applications. The device features a high gain, and excellent output voltage capabilities.

MECHANICAL DATA

SOT223.

PINNING

PIN	DESCRIPTION
1	emitter
2	base
3	emitter
4	collector

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	-	-	20	V
V_{CEO}	collector-emitter voltage	open base	-	-	10	V
I_C	collector current (DC)		-	-	100	mA
P_{tot}	total power dissipation	T_{case} = 135 °C note 1	-	-	1	W
T_j	junction temperature		-	-	175	°C
h_{FE}	DC current gain	I_C = 50 mA; V_{CE} = 5 V	40	-	-	
f_T	transition frequency	f = 1000 MHz; I_C = 50 mA; V_{CE} = 8 V; T_{amb} = 25 °C	-	8.0	-	GHz
G_{UM}	maximum power gain	f = 500 MHz; I_C = 50 mA; V_{CE} = 8 V	-	18	-	dB
G_{UM}	maximum power gain	f = 800 MHz; I_C = 50 mA; V_{CE} = 8 V	-	15	-	dB
V_o	output voltage	d_{im} = −60 dB; I_C = 70 mA; V_{CE} = 8 V; R_L = 75 Ω; $f_{(p+q-r)}$ = 793.25 MHz	-	700	-	mV

Note

1. T_{case} temperature measured on soldering point of collector tab.

NPN 7 GHz wideband transistor BFG198

ORDERING AND PACKAGE INFORMATION

EXTENDED TYPE NUMBER	PACKAGE		
	CODE	PACKING METHOD	PACKING QUANTITY
BFG198	SOT223	bulk	500
BFG198	SOT223	12 mm reel	1000

LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	-	20	V
V_{CEO}	collector-emitter voltage	open base	-	10	V
V_{EBO}	emitter-base voltage	open collector	-	2.5	V
I_C	collector current (DC)		-	100	mA
P_{tot}	total power dissipation	T_{case} = 135 °C	-	1	W
T_{stg}	storage temperature range		−65	+150	°C
T_j	junction temperature		-	175	°C

THERMAL RESISTANCE

SYMBOL	PARAMETER	NOM.	UNIT
$R_{th\ j\text{-}c}$	from junction to case	40	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{CBO}	collector cut-off current	$I_E = 0$; $V_{CB} = 10$ V	-	-	100	nA
h_{FE}	DC current gain	$I_C = 50$ mA; $V_{CE} = 5$ V	40	-	-	
f_T	transition frequency	f = 1000 MHz; $I_C = 50$ mA; $V_{CE} = 8$ V; $T_{amb} = 25$ °C	-	8.0	-	GHz
C_c	collector capacitance	f = 1 MHz; $I_e = i_e = 0$; $V_{CB} = 8$ V	-	1.5	-	pF
C_e	emitter capacitance	f = 1 MHz; $I_c = i_c = 0$; $V_{EB} = 0.5$ V	-	4.0	-	pF
C_{re}	feedback capacitance	f = 1 MHz; $I_C = 0$; $V_{CE} = 8$ V	-	0.8	-	pF
G_{UM}	maximum power gain	f = 500 MHz; $T_{amb} = 25$ °C; $I_C = 50$ mA; $V_{CE} = 8$ V	-	18	-	dB
G_{UM}	maximum power gain	f = 800 MHz; $T_{amb} = 25$ °C; $I_C = 50$ mA; $V_{CE} = 8$ V	-	15	-	dB
V_o	output voltage	note 1	-	750	-	mV
V_o	output voltage	note 2	-	700	-	mV

Notes

1. $d_{im} = -60$ dB (DIN 45004B); $T_{amb} = 25$ °C; $I_C = 70$ mA;
   $V_{CE} = 8$ V; $R_L = 75\ \Omega$; $V_p = V_o$ at $d_{im} = -60$ dB;
   $V_q = V_o$ −6 dB; $f_p = 445.25$ MHz;
   $V_r = V_o$ −6 dB; $f_q = 453.25$ MHz; $f_r = 445.25$ MHz;
   measured at $f_{(p+q-r)} = 443.25$ MHz

2. $d_{im} = -60$ dB (DIN 45004B); $T_{amb} = 25$ °C; $I_C = 70$ mA;
   $V_{CE} = 8$ V; $R_L = 75\ \Omega$; $V_p = V_o$ at $d_{im} = -60$ dB;
   $V_q = V_o$ −6 dB; $f_p = 795.25$ MHz;
   $V_r = V_o$ −6 dB; $f_q = 803.25$ MHz; $f_r = 805.25$ MHz;
   measured at $f_{(p+q-r)} = 793.25$ MHz

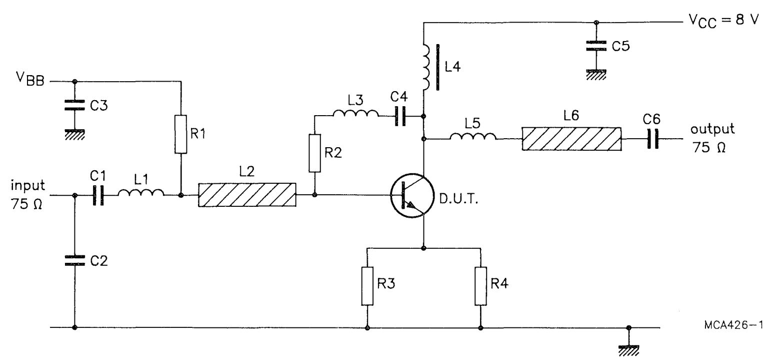


Fig.1 Intermodulation and second harmonic test circuit.

List of components:

R1 = 10 kΩ metal film resistor	(cat. no. 2322 180 73103)
R2 = 220 Ω metal film resistor	(cat. no. 2322 180 73221)
R3 = R4 = 30 Ω metal film resistor	(cat. no. 2322 180 73309)
C2 = C4 = C6 = C7 = 10 nF ceramic multilayer capacitor	(cat. no. 2222 590 08627)
C1 = 1.2 pF ceramic multilayer capacitor	(cat. no. 2222 851 12128)
C3 = 2.2 pF ceramic multilayer capacitor	(cat. no. 2222 851 12128)
C5 = 10 nF miniature ceramic plate capacitor	(cat. no. 2222 629 08103)
C8 = 1.5 pF ceramic multilayer capacitor	(cat. no. 2222 851 12158)
L1 = 1.5 turn Cu wire (0.4 mm), internal diameter 3 mm, winding pitch 1 mm	
L2 = 75 Ω microstripline	(L = 22 mm; W = 2.5 mm)
L3 = 30 mm Cu wire (0.4 mm; L ≈ 24 nH)	
L4 = 4 mm Cu wire (0.4 mm; L ≈ 3.6 nH)	
L5 = 75 Ω microstripline	(L = 19 mm; W = 2.5 mm)
L6 = 5 µH Ferroxcube choke	(cat. no. 3122 108 20153)

The circuit has been built on a double Cu clad printed circuit board with PTFE dielectric (ε_r = 2.2); thickness 1/16 inch; thickness of copper-sheet 2 x 35 µm; see Fig.1.
The components L1, R2, L3, C5 and L4 are mounted on the underside of the PCB.

NPN 7 GHz wideband transistor

BFG198

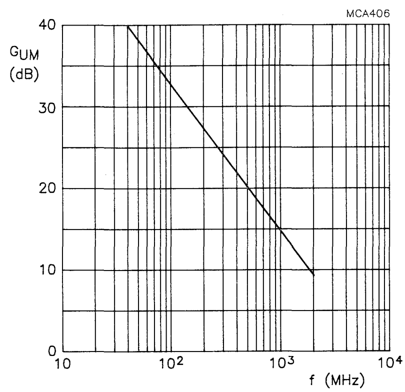


Fig.2 Maximum unilateral power gain;
V_{CE} = 8 V; I_C = 50 mA; T_{amb} = 25 °C; typical values.

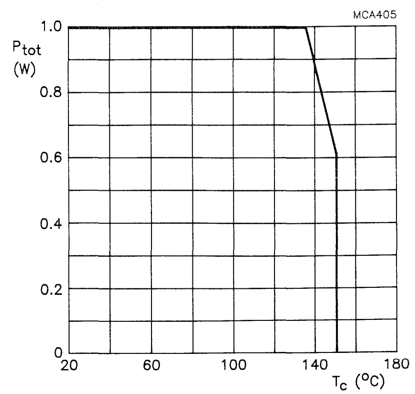


Fig.3 Power derating curve as a function of case temperature.

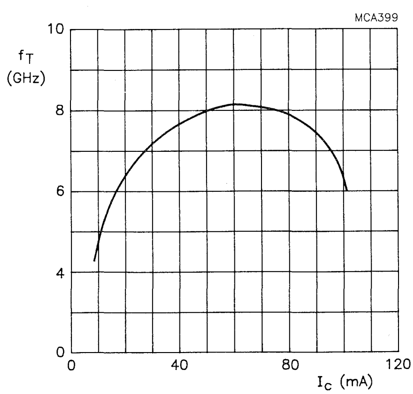


Fig.4 Transition frequency as a function of collector current; V_{CE} = 8 V; f = 1 GHz; T_j = 25 °C; typical values.

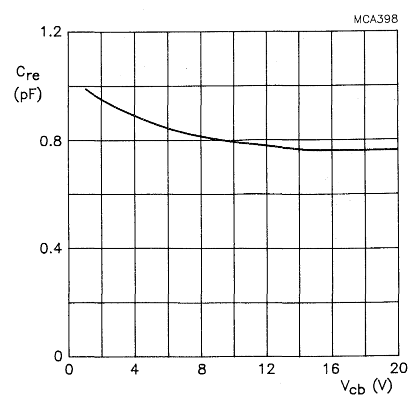


Fig.5 Feedback capacitance as a function of collector-base voltage; I_E = 0; f = 1 MHz;
T_j = 25 °C; typical values.

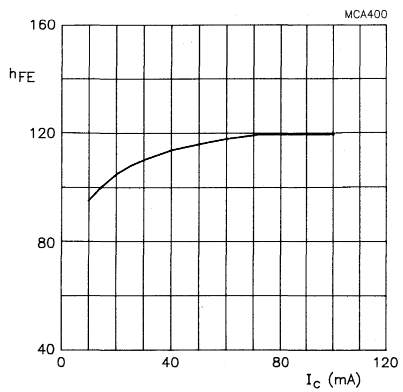


Fig.6 DC current gain as a function of collector current; V_{CE} = 5 V; T_j = 25 °C; typical values.

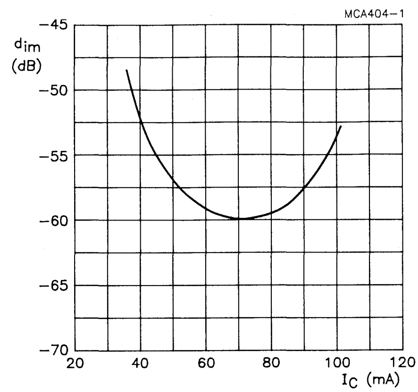


Fig.7 Intermodulation distortion; V_{CE} = 8 V; V_o = 750 mV; $f_{(p+q-r)}$ = 443.25 MHz; T_{amb} = 25 °C; typical values.

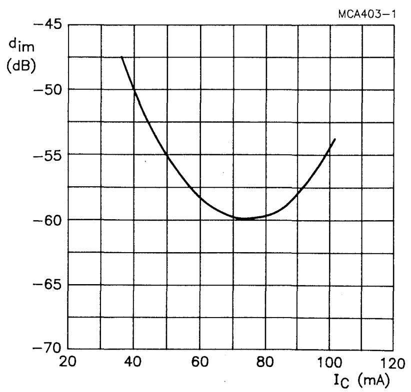


Fig.8 Intermodulation distortion; V_{CE} = 8 V; V_o = 700 mV; $f_{(p+q-r)}$ = 793.25 MHz; T_{amb} = 25 °C; typical values.

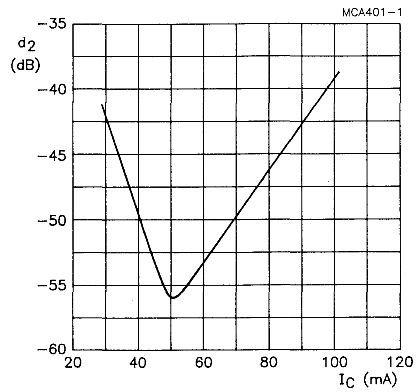


Fig.9 Intermodulation distortion; V_{CE} = 8 V; V_o = 50 dBmV; $f_{(p+q)}$ = 450 MHz; T_{amb} = 25 °C; typical values.

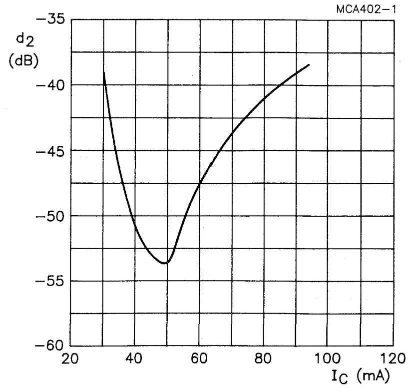


Fig.10 Intermodulation distortion; V_{CE} = 8 V; V_o = 50 dBmV; $f_{(p+q)}$ = 810 MHz; T_{amb} = 25 °C; typical values.

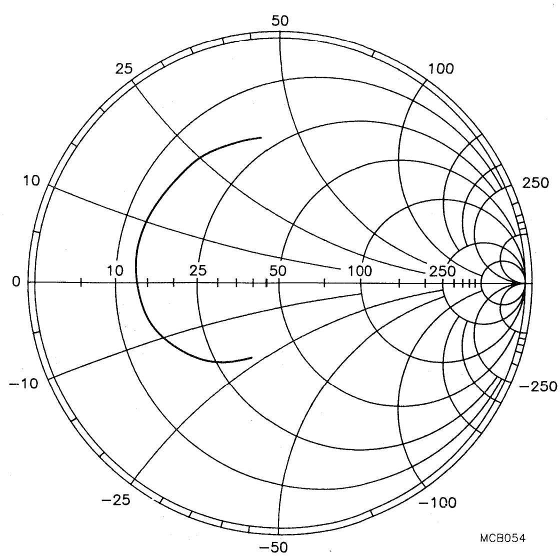


Fig.11 Input reflection coefficient S11; V_{CE} = 8 V; I_C = 50 mA; T_{amb} = 25 °C; typical values.

NPN 7 GHz wideband transistor BFG198

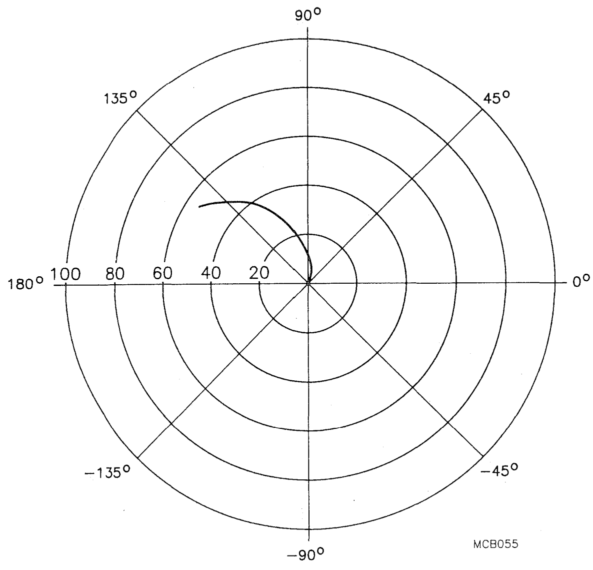


Fig.12 Forward transmission coefficient S21; V_{CE} = 8 V; I_C = 50 mA; T_{amb} = 25 °C; typical values.

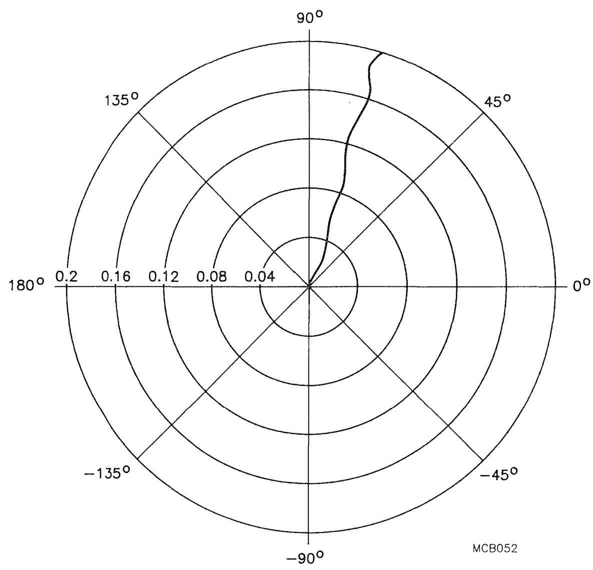


Fig.13 Reverse transmission coefficient S12; V_{CE} = 8 V; I_C = 50 mA; T_{amb} = 25 °C; typical values.

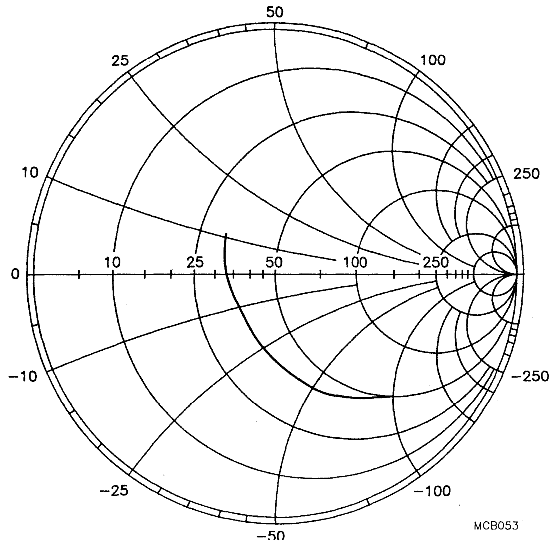


Fig.14 Output reflection coefficient S22; V_{CE} = 8 V; I_C = 50 mA; T_{amb} = 25 °C; typical values.

NPN 7 GHz wideband transistor

BFG198

S-Parameters (common emitter) at V_{CE} = 8 V; T_{amb} = 25 °C; typical values.

I_C (mA)	f (MHz)	S11	S21	S12	S22	G_{UM} (dB)
5	40	0.79/- 25.3	12.7/165.9	0.02/75.7	0.97/- 11.1	38.3
	100	0.77/- 57.4	12.1/146.9	0.04/62.4	0.87/- 25.4	31.7
	200	0.74/-100.7	9.0/125.7	0.06/46.1	0.69/- 41.2	25.3
	500	0.70/-162.7	4.6/ 92.7	0.08/32.6	0.44/- 60.4	17.0
	800	0.70/ 168.5	2.9/ 75.6	0.08/34.3	0.35/- 73.9	12.7
	1000	0.69/ 154.0	2.4/ 65.9	0.08/41.3	0.34/- 82.6	10.8
	1200	0.68/ 141.4	1.9/ 57.5	0.08/50.5	0.33/- 93.4	8.9
	1500	0.67/ 124.7	1.5/ 48.5	0.09/61.3	0.32/-111.5	6.7
	2000	0.64/ 100.0	1.1/ 34.3	0.41/76.3	0.32/-144.0	3.2
10	40	0.61/- 38.7	24.8/159.3	0.02/72.6	0.93/- 17.4	38.7
	100	0.62/- 81.3	18.7/138.5	0.04/57.9	0.74/- 39.9	31.0
	200	0.63/-127.1	13.1/115.7	0.05/45.3	0.53/- 56.9	25.9
	500	0.64/ 174.8	6.0/ 88.8	0.06/44.4	0.32/- 72.4	18.3
	800	0.63/ 159.5	3.7/ 74.8	0.07/54.9	0.22/- 91.6	13.9
	1000	0.64/ 148.2	3.0/ 66.5	0.08/58.2	0.20/-103.6	11.9
	1200	0.63/ 136.6	2.5/ 59.8	0.10/63.9	0.19/-114.9	10.2
	1500	0.62/ 121.5	1.9/ 51.4	0.12/67.9	0.20/-135.1	8.0
	2000	0.62/ 99.8	1.4/ 39.3	0.17/73.3	0.22/-167.3	5.1
30	40	0.36/- 83.2	44.8/148.9	0.01/69.2	0.82/- 33.1	38.4
	100	0.49/-131.0	29.7/123.0	0.02/52.4	0.55/- 62.4	32.2
	200	0.56/-159.8	17.3/104.4	0.03/55.6	0.33/- 86.9	26.9
	500	0.58/ 169.9	7.3/ 84.9	0.05/68.7	0.18/-124.2	19.2
	800	0.60/ 152.0	4.6/ 73.7	0.08/71.1	0.15/-147.1	15.2
	1000	0.59/ 142.0	3.6/ 67.0	0.09/71.1	0.15/-160.5	13.1
	1200	0.59/ 132.6	3.0/ 61.8	0.12/72.1	0.15/-174.7	11.4
	1500	0.59/ 119.1	2.4/ 54.2	0.15/72.3	0.18/-170.8	9.4
	2000	0.59/ 98.3	1.6/ 44.2	0.20/71.1	0.22/ 148.3	6.4
50	40	0.33/-117.0	53.4/143.7	0.01/73.3	0.76/- 39.7	38.8
	100	0.49/-147.8	32.6/117.1	0.02/65.0	0.46/- 74.6	32.5
	200	0.56/-169.3	18.2/101.0	0.03/66.7	0.28/-102.7	27.2
	500	0.58/ 166.0	7.5/ 83.9	0.05/72.8	0.17/-141.6	19.4
	800	0.59/ 149.8	4.7/ 73.2	0.08/73.2	0.16/-164.9	15.4
	1000	0.59/ 140.1	3.7/ 66.8	0.10/72.2	0.17/-177.0	13.4
	1200	0.58/ 131.1	3.0/ 61.9	0.12/73.9	0.17/-173.4	11.6
	1500	0.58/ 117.9	2.4/ 54.5	0.15/71.8	0.20/ 161.2	9.7
	2000	0.58/ 97.8	1.7/ 45.3	0.20/70.6	0.25/ 138.5	6.7
70	40	0.35/-130.4	58.2/140.3	0.01/59.3	0.70/- 44.7	38.8
	100	0.50/-156.7	33.7/114.7	0.02/64.8	0.42/- 79.1	32.7
	200	0.56/-173.5	18.4/ 99.3	0.03/67.8	0.26/-108.5	27.2
	500	0.58/ 164.4	7.6/ 82.9	0.05/75.5	0.18/-150.7	19.5
	800	0.59/ 148.8	4.7/ 72.7	0.08/74.8	0.17/-169.5	15.5
	1000	0.59/ 139.4	3.7/ 66.3	0.10/75.8	0.18/-177.7	13.4
	1200	0.58/ 130.5	3.0/ 61.7	0.12/74.6	0.18/-166.9	11.6
	1500	0.58/ 117.5	2.4/ 54.4	0.16/73.2	0.21/ 156.6	9.8
	2000	0.59/ 97.7	1.7/ 45.1	0.20/70.6	0.26/ 135.2	6.7

NPN 5 GHz WIDEBAND TRANSISTOR

NPN transistor in a sub-miniature HERMETICALLY SEALED micro-stripline SOT173 and SOT173X envelope. The BFP90A features low noise, high gain and low distortion figures.

This device is designed for VHF and UHF wideband amplifiers and applications in the GHz range.

PNP complement is BFQ51C.

QUICK REFERENCE DATA

Collector-base voltage	V_{CBO}	max.	20	V
Collector-emitter voltage	V_{CEO}	max.	15	V
Collector current (DC)	I_C	max.	30	mA
Total power dissipation up to T_{amb} = 125 °C	P_{tot}	max.	250	mW
Junction temperature	T_j	max.	175	°C
DC current gain		min.	40	
I_C = 14 mA; V_{CE} = 10 V	h_{FE}	typ.	90	
Transition frequency at f = 500 MHz I_C = 14 mA; V_{CE} = 10 V	f_T	typ.	5.0	GHz
Maximum unilateral power gain I_C = 14 mA; V_{CE} = 10 V				
at f = 500 MHz	G_{UM}	typ.	23.5	dB
at f = 800 MHz	G_{UM}	typ.	19.5	dB

MECHANICAL DATA

Marking code: P0

SOT173, SOT173X (see outlines section).

ORDERING AND PACKAGE INFORMATION

EXTENDED TYPE NUMBER	PACKAGE		
	CODE	PACKING METHOD	PACKING QUANTITY
BFP90A	SOT173	BULK	50
BFP90A	SOT173X	12 mm REEL	1000

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 (DC)	I_C	max.	30	mA
Total power dissipation up to T_{amb} = 125 °C mounted on a ceramic cubstrate of 0.7 mm x 10 cm²	P_{tot}	max.	250	mW
Storage temperature range	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	$R_{th\ j\text{-}a}$	=	200	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current $I_E = 0$; $V_{CB} = 10$ V	I_{CBO}	max.	50	nA
DC 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.	0.5	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.	0.3	pF

Maximum unilateral power gain (S_{12} assumed to be zero)

$$G_{UM} = 10 \log \frac{|S_{21}|^2}{(1-|S_{11}|^2)\,[1-|S_{22}|^2]}$$

at $I_C = 14$ mA; $V_{CE} = 10$ V; $T_{amb} = 25$ °C				
f = 500 MHz	G_{UM}	typ.	23.5	dB
f = 800 MHz		typ.	19.5	dB

Noise figure at f = 800 MHz; Z_S = opt.; $T_{amb} = 25$ °C				
$I_C = 4$ mA; $V_{CE} = 10$ V	F	typ.	1.7	dB
$I_C = 14$ mA; $V_{CE} = 10$ V		typ.	2.4	dB

s-parameters (common emitter) at V_{CE} = 10 V; T_{amb} = 25 °C; typical values

I_C mA	f MHz	S_{11}	S_{21}	S_{12}	S_{22}	G_{UM} dB
	40	0,89/ −8,4°	7,0/174,9°	0,006/83,5°	0,99/ −2,3°	40,7
	100	0,88/ −20,8°	6,9/167,0°	0,015/79,6°	0,98/ −5,4°	37,3
	200	0,84/ −40,7°	6,6/154,0°	0,028/70,2°	0,95/−10,2°	31,8
	500	0,72/ −87,4°	5,0/126,0°	0,053/51,7°	0,86/−19,6°	23,0
2	800	0,64/−116,6°	3,7/107,3°	0,063/43,9°	0,81/−24,9°	18,3
	1000	0,59/−132,4°	3,1/ 98,1°	0,066/42,4°	0,79/−27,8°	15,9
	1200	0,56/−145,7°	2,7/ 90,6°	0,068/41,1°	0,77/−30,4°	14,2
	1500	0,55/−162,1°	2,0/ 77,6°	0,073/36,9°	0,82/−34,0°	12,5
	2000	0,54/+175,6°	1.6/ 64,3°	0,076/41,3°	0,80/−39,6°	10,2
	40	0,78/ −12,7°	14,8/172,3°	0,006/81,4°	0,98/ −3,7°	41,5
	100	0,76/ −30,9°	14,0/160,8°	0,014/75,3°	0,96/ −8,8°	37,7
	200	0,70/ −58,3°	12,4/144,1°	0,024/64,9°	0,89/−15,1°	31,6
	500	0,58/−112,1°	7,8/114,7°	0,040/50,6°	0,74/−23,5°	23,1
5	800	0,52/−138,8°	5,5/ 98,5°	0,048/50,1°	0,69/−26,4°	19,0
	1000	0,49/−153,6°	4,4/ 91,2°	0,052/51,7°	0,67/−28,5°	16,6
	1200	0,48/−163,4°	3,8/ 84,5°	0,056/53,2°	0,66/−30,5°	15,2
	1500	0,49/−178,1°	3,0/ 73,8°	0,064/50,8°	0,70/−33,9°	13,7
	2000	0,48/+162,9°	2,3/ 62,7°	0,075/56,0°	0,70/−38,8°	11,3
	40	0,65/ −18,3°	23,5/169,2°	0,005/79,9°	0,98/ −5,4°	43,8
	100	0,63/ −43,4°	21,5/154,2°	0,012/71,9°	0,93/−12,3°	37,5
	200	0,56/ −78,1°	17,4/134,5°	0,020/61,1°	0,82/−19,0°	31,3
	500	0,49/−132,4°	9,5/107,0°	0,032/54,4°	0,65/−24,0°	23,1
10	800	0,46/−154,9°	0,4/ 93,3°	0,041/58,0°	0,62/−26,1°	19,3
	1000	0,44/−167,1°	5,1/ 87,4°	0,047/60,6°	0,61/−27,6°	17,1
	1200	0,44/−174,8°	4,3/ 81,7°	0,052/62,5°	0,60/−29,7°	15,5
	1500	0,46/+171,1°	3,5/ 71,3°	0,060/60,4°	0,64/−32,7°	14,3
	2000	0,45/+154,8°	2,7/ 61,4°	0,075/63,5°	0,64/−37,6°	11,8
	40	0,56/ −22,6°	28,1/167,9°	0,005/78,8°	0,98/ −6,3°	44,4
	100	0,54/ −53,4°	25,2/150,4°	0,011/69,5°	0,92/−14,0°	37,4
	200	0,51/ −91,1°	19,6/130,4°	0,018/59,7°	0,79/−20,8°	31,5
	500	0,47/−143,6°	10,1/103,3°	0,028/56,0°	0,63/−24,5°	23,5
14	800	0,47/−164,4°	6,6/ 70,0°	0,037/59,9°	0,60/−26,0°	19,5
	1000	0,44/−174,9°	5,4/ 84,7°	0,043/62,4°	0,59/−27,5°	17,5
	1200	0,45/+177,0°	4,5/ 79,3°	0,049/64,0°	0,59/−29,4°	15,9
	1500	0,47/+167,8°	3,7/ 70,4°	0,059/62,5°	0,62/−32,4°	14,5
	2000	0,46/+152,2°	2,9/ 61,0°	0,075/64,7°	0,62/−37,5°	12,3

S-parameters (common emitter) at V_{CE} = 10 V; T_{amb} = 25 °C; typical values (continued)

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

s-parameters (common emitter) at V_{CE} = 5 V; T_{amb} = 25 °C; typical values

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

s-parameters (common emitter) at V_{CE} = 5 V; T_{amb} = 25 °C; typical values (continued)

I_C mA	f MHz	S_{11}	S_{21}	S_{12}	S_{22}	G_{UM} dB
	40	0,59/ −20,3°	23,3/169,2°	0,006/79,7°	0,98/ −5,8°	43,8
	100	0,57/ −48,4°	21,4/152,9°	0,013/70,4°	0,93/−13,3°	37,0
	200	0,54/ −84,5°	17,1/133,6°	0,021/59,5°	0,81/−20,4°	30,9
	500	0,49/−139,3°	9,2/105,3°	0,032/52,2°	0,64/−25,4°	22,8
10	800	0,49/−162,1°	6,1/ 91,0°	0,040/55,4°	0,60/−26,9°	18,8
	1000	0,47/−173,0°	4,9/ 85,1°	0,046/58,1°	0,59/−27,9°	16,8
	1200	0,47/+178,0°	4,1/ 79,4°	0,051/59,8°	0,59/−30,0°	15,3
	1500	0,48/+169,1°	3,4/ 70,7°	0,064/59,8°	0,61/−34,3°	13,8
	2000	0,48/+153,0°	2,6/ 60,5°	0,080/62,6°	0,60/−39,4°	11,4
	40	0,51/ −25,7°	28,1/167,4°	0,005/78,8°	0,98/ −6,9°	43,5
	100	0,50/ −59,3°	25,0/149,1°	0,012/68,4°	0,91/−15,3°	36,6
	200	0,49/ −98,5°	19,1/128,7°	0,019/58,4°	0,77/−22,3°	30,8
	500	0,48/−149,2°	9,7/102,2°	0,029/55,2°	0,61/−25,8°	22,9
14	800	0,48/−168,9°	6,3/ 89,1°	0,038/59,3°	0,57/−27,2°	18,9
	1000	0,47/−178,5°	5,1/ 83,6°	0,044/61,8°	0,57/−28,6°	16,9
	1200	0,48/+173,6°	4,3/ 78,2°	0,050/63,1°	0,56/−30,6°	15,5
	1500	0,48/+164,7°	3,5/ 69,5°	0,062/63,3°	0,60/−33,6°	13,9
	2000	0,48/+149,7°	2,7/ 59,5°	0,079/65,2°	0,59/−38,8°	11,5
	40	0,42/ −34,0°	33,1/165,0°	0,005/77,1°	0,97/ −8,0°	43,1
	100	0,44/ −74,8°	28,2/144,4°	0,011/66,3°	0,87/−17,0°	36,2
	200	0,46/−115,0°	20,3/123,6°	0,016/57,7°	0,73/−22,8°	30,5
	500	0,48/−159,0°	9,8/ 99,1°	0,026/58,9°	0,58/−24,3°	22,8
20	800	0,49/−174,7°	6,3/ 87,0°	0,036/63,8°	0,56/−26,0°	18,9
	1000	0,48/+176,5°	5,1/ 82,0°	0,042/65,9°	0,56/−27,7°	16,9
	1200	0,49/+169,6°	4,3/ 76,8°	0,049/66,9°	0,56/−30,0°	15,4
	1500	0,49/+160,6°	3,4/ 68,0°	0,061/66,8°	0,60/−32,6°	13,8
	2000	0,49/+146,6°	2,6/ 58,7°	0,079/68,4°	0,60/−38,0°	11,4
	40	0,35/ −67,3°	33,6/155,3°	0,005/69,1°	0,91/−10,0°	38,9
	100	0,45/−116,5°	24,2/130,1°	0,010/56,5°	0,78/−16,4°	32,7
	200	0,50/−147,5°	14,8/112,3°	0,013/54,2°	0,67/−17,0°	27,3
	500	0,53/−174,4°	6,6/ 95,1°	0,022/63,7°	0,62/−18,9°	19,9
30	800	0,54/+175,0°	4,3/ 85,5°	0,032/69,0°	0,61/−23,0°	16,2
	1000	0,53/+168,1°	3,5/ 81,2°	0,039/70,9°	0,61/−25,9°	14,4
	1200	0,55/+162,6°	3,0/ 76,1°	0,045/71,9°	0,61/−29,1°	13,0
	1500	0,57/+154,5°	2,4/ 67,8°	0,057/71,4°	0,64/−33,2°	11,5
	2000	0,57/+141,1°	1,8/ 58,7°	0,075/73,4°	0,64/−39,8°	9,2

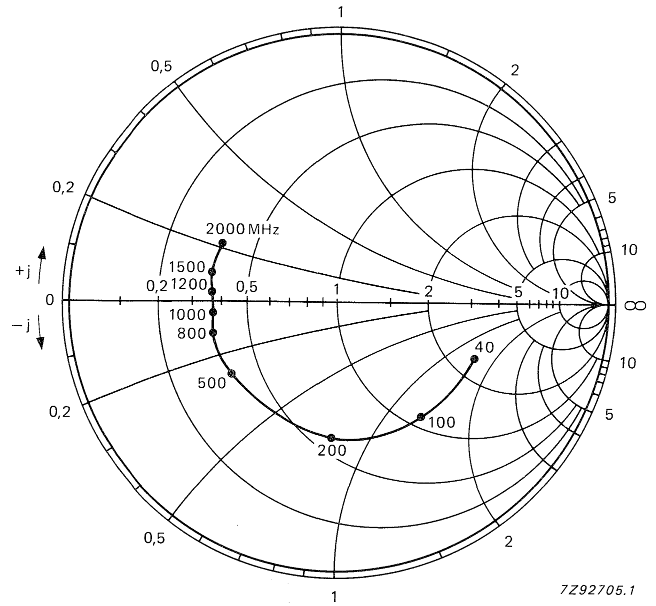


Fig. 1 Input impedance, derived from input reflection coefficient S_{11} coordinates, in ohm x 50.

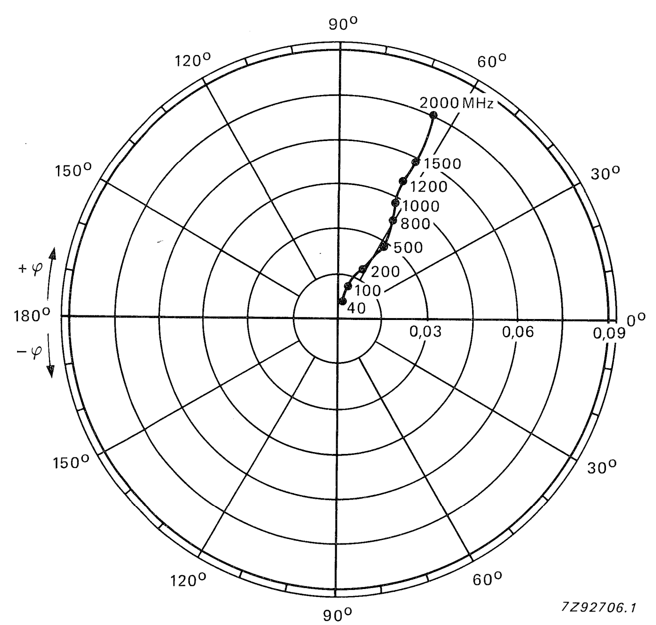


Fig. 2 Reverse transmission coefficient S_{12}.

Conditions for Figs 1 to 4: V_{CE} = 10 V; I_C = 14 mA; T_{amb} = 25 °C.

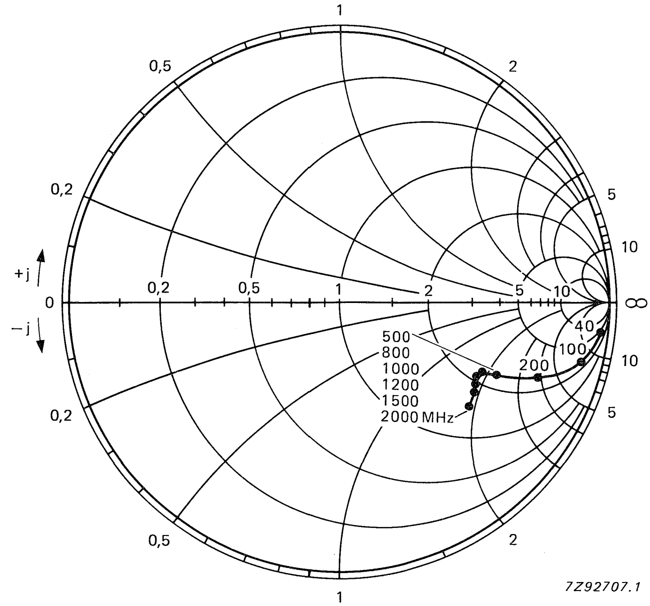


Fig. 3 Output impedance, derived from output reflection coefficient S_{22} coordinates, in ohm x 50.

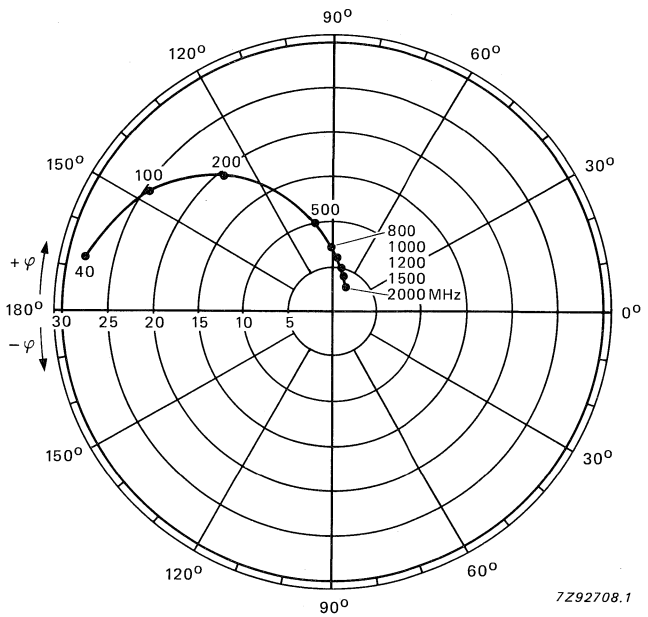


Fig. 4 Forward transmission coefficient S_{21}.

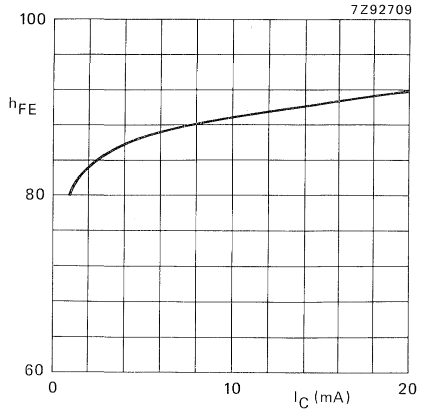


Fig. 5 V_{CE} = 10 V; T_j = 25 °C; typical values.

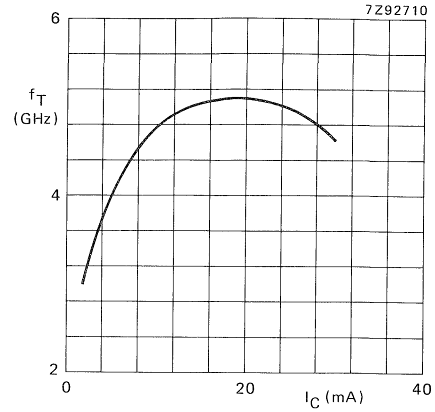


Fig. 6 V_{CE} = 10 V; f = 500 MHz; T_j = 25 °C; typical values.

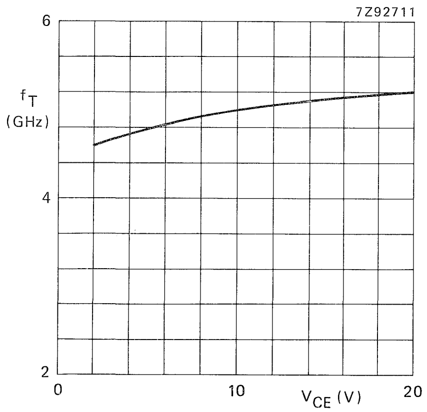


Fig. 7 I_C = 14 mA; f = 500 MHz; T_j = 25 °C; typical values.

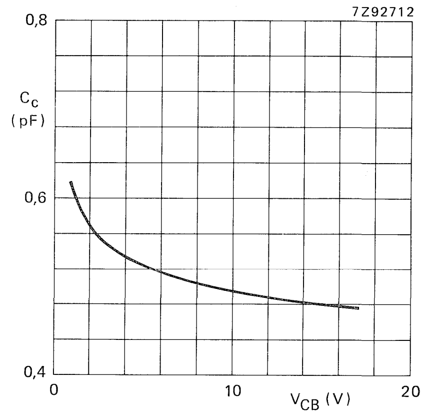


Fig. 8 $I_E = i_e = 0$; f = 1 MHz; T_j = 25 °C; typical values.

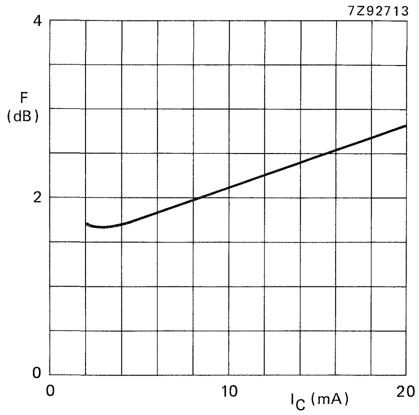


Fig. 9 V_{CE} = 10 V; f = 800 MHz; Z_S = opt.; T_{amb} = 25 °C; typical values.

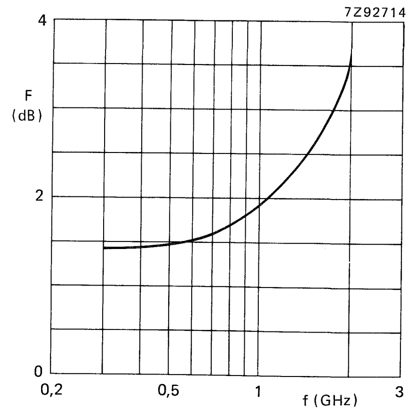


Fig. 10 V_{CE} = 10 V; I_C = 4 mA; Z_S = opt.; T_{amb} = 25 °C; typical values.

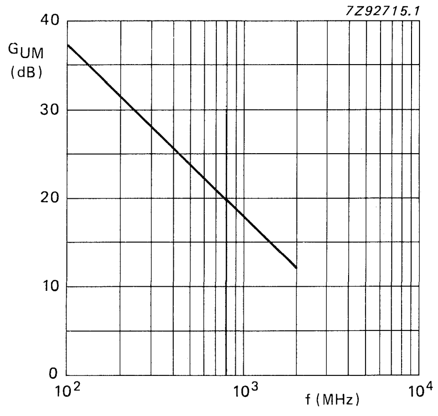


Fig. 11 V_{CE} = 10 V; I_C = 14 mA; T_{amb} = 25 °C. typical values.

NPN 6 GHz WIDEBAND TRANSISTOR

Gold-metallized NPN transistor in a sub-miniature HERMETICALLY SEALED micro-stripline SOT173 and SOT173X envelope. The BFP91A features low noise, high gain and low distortion figures.

This device is designed for VHF and UHF wideband amplifiers and applications in the GHz range.

PNP complement is BFQ23C.

QUICK REFERENCE DATA

Collector-base voltage	V_{CBO}	max.	15	V
Collector-emitter voltage	V_{CEO}	max.	12	V
Collector current (DC)	I_C	max.	50	mA
Total power dissipation up to T_{amb} = 105 °C	P_{tot}	max.	350	mW
Junction temperature	T_j	max.	175	°C
DC current gain I_C = 30 mA; V_{CE} = 5 V	h_{FE}	min.	40	
Transition frequency at f = 500 MHz I_C = 30 mA; V_{CE} = 5 V	f_T	typ.	6.0	GHz
Maximum unilateral power gain I_C = 30 mA; V_{CE} = 8 V at f = 500 MHz	G_{UM}	typ.	22.5	dB
at f = 800 MHz	G_{UM}	typ.	18.5	dB

MECHANICAL DATA

Marking code: P1

SOT173, SOT173X.

ORDERING AND PACKAGE INFORMATION

EXTENDED TYPE NUMBER	PACKAGE		
	CODE	PACKING METHOD	PACKING QUANTITY
BFP91A	SOT173	BULK	50
BFP91A	SOT173X	12 mm REEL	1000

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 (DC)	I_C	max.	50	mA
Total power dissipation up to T_{amb} = 105 °C mounted on a ceramic substrate of 0.7 mm x 10 cm^2	P_{tot}	max.	350	mW
Storage temperature range	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	$R_{th\ j\text{-}a}$	=	200	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current $I_E = 0$; V_{CB} = 10 V	I_{CBO}	max.	50	nA
DC current gain I_C = 30 mA; V_{CE} = 5 V	h_{FE}	min. typ.	40 90	
Transition frequency at f = 500 MHz I_C = 30 mA; V_{CE} = 5 V	f_T	typ.	6.0	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} = 10 V	C_{re}	typ.	0.5	pF

Maximum unilateral power gain (S_{12} assumed to be zero)

$$G_{UM} = 10 \log \frac{|S_{21}|^2}{[1-|S_{11}|^2]\,[1-|S_{22}|^2]}$$

at I_C = 30 mA; V_{CE} = 8 V; T_{amb} = 25 °C f = 500 MHz f = 800 MHz	G_{UM}	typ. typ.	22.5 18.5	dB dB
Noise figure 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. typ.	1.6 2.3	dB dB

s-parameters (common emitter) at V_{CE} = 8 V; T_{amb} = 25 °C; typical values.

I_C mA	f MHz	s_{11}	s_{21}	s_{12}	s_{22}	G_{UM} dB
	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
2	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
	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
5	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
	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
10	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
	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
20	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
	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
30	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

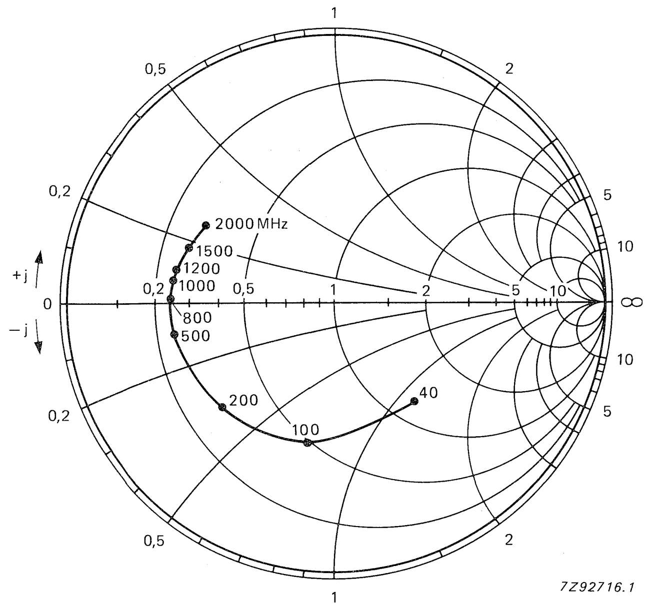


Fig. 1 Input impedance, derived from input reflection coefficient S_{11} coordinates, in ohm x 50.

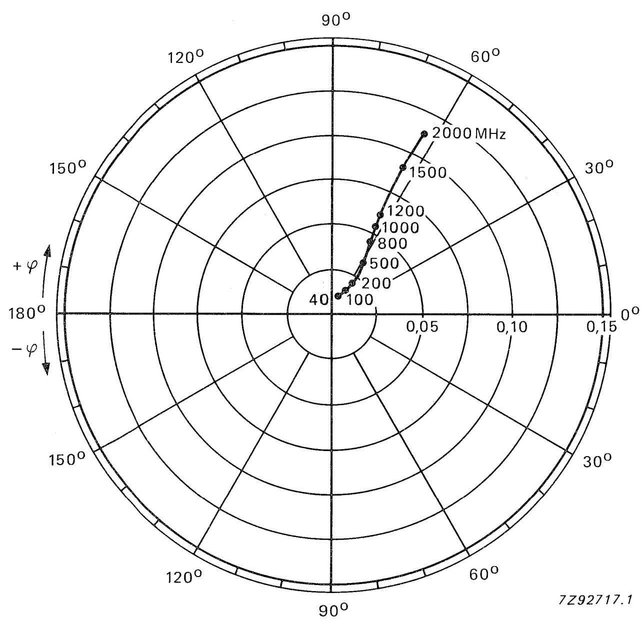


Fig. 2 Reverse transmission coefficient S_{12}.

Conditions for Figs 1 to 4: V_{CE} = 8 V; I_C = 30 mA; T_{amb} = 25 °C.

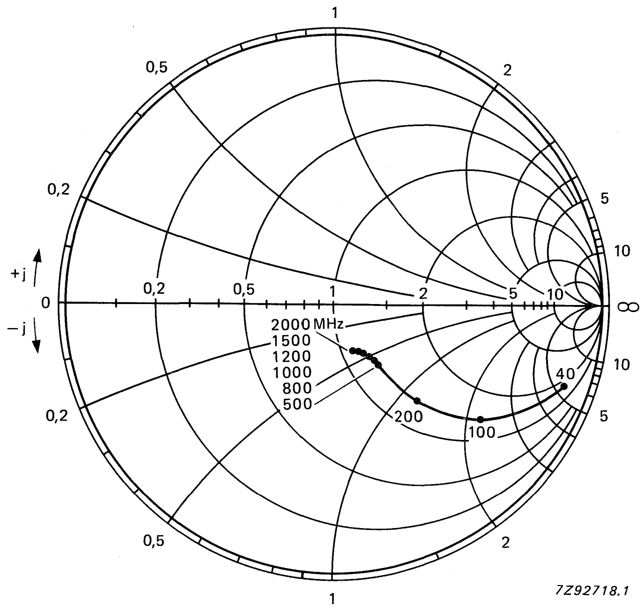


Fig. 3 Output impedance, derived from output reflection coefficient S_{22} coordinates, in ohm x 50.

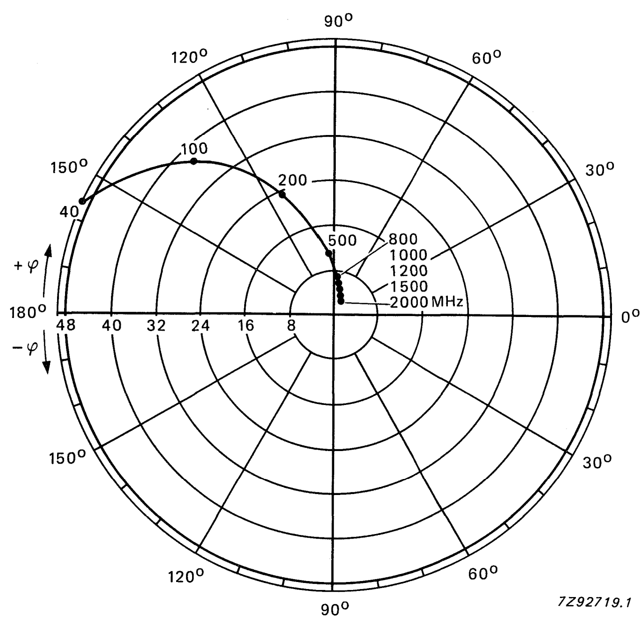


Fig. 4 Forward transmission coefficient S_{21}.

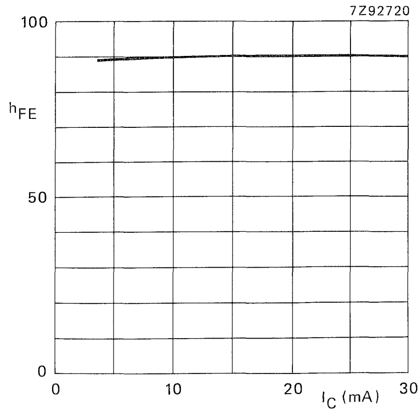


Fig. 5 V_{CE} = 5 V; T_j = 25 °C; typical values.

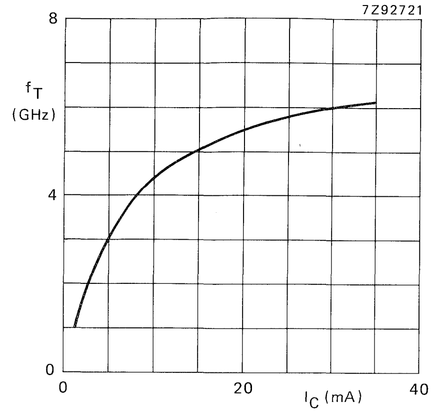


Fig. 6 V_{CE} = 5 V; f = 500 MHz; T_j = 25 °C; typical values.

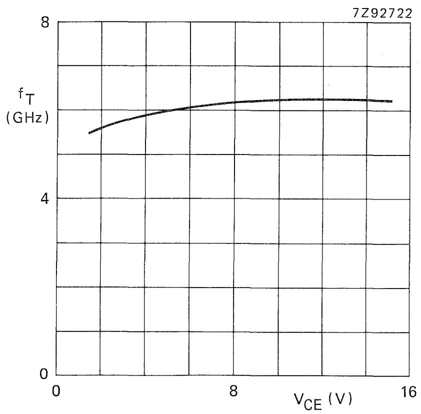


Fig. 7 I_C = 30 mA; f = 500 MHz; T_j = 25 °C; typical values.

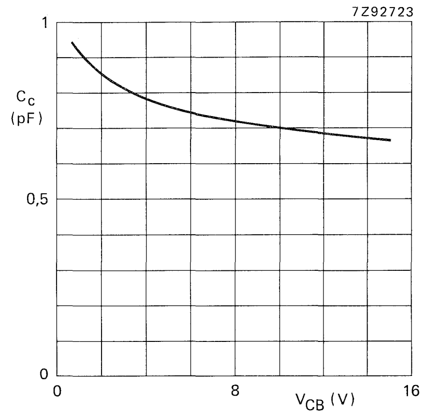


Fig. 8 $I_E = i_e = 0$; f = 1 MHz; T_j = 25 °C; typical values.

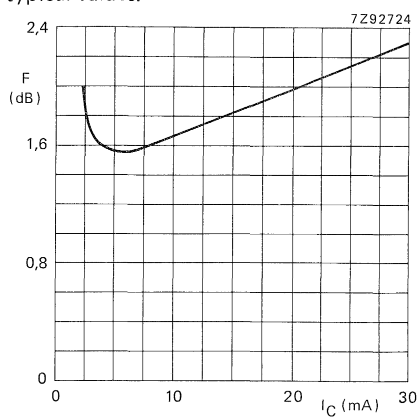


Fig. 9 V_{CE} = 8 V; f = 800 MHz; Z_S = opt.; T_{amb} = 25 °C; typical values.

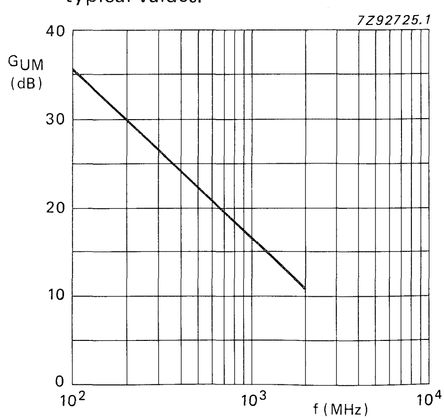


Fig. 10 V_{CE} = 8 V; I_C = 30 mA; T_{amb} = 25 °C; typical values.

NPN 5 GHz WIDEBAND TRANSISTOR

NPN transistor in a sub-miniature HERMETICALLY SEALED micro-stripline SOT173 and SOT173X envelope. The BFP96 features low noise, high gain and low distortion figures.

This device is designed for VHF and UHF wideband amplifiers and applications in the GHz range.

PNP complement is BFQ32C.

QUICK REFERENCE DATA

Collector-base voltage	V_{CBO}	max.	20	V
Collector-emitter voltage	V_{CEO}	max.	15	V
Collector current (DC)	I_C	max.	100	mA
Total power dissipation up to T_{amb} = 75 °C	P_{tot}	max.	500	mW
Junction temperature	T_j	max.	175	°C
DC current gain I_C = 50 mA; V_{CE} = 10 V	h_{FE}	min.	25	
Transition frequency at f = 500 MHz I_C = 50 mA; V_{CE} = 10 V	f_T	typ.	5.0	GHz
Maximum unilateral power gain I_C = 50 mA; V_{CE} = 10 V at f = 500 MHz	G_{UM}	typ.	19.0	dB
at f = 800 MHz	G_{UM}	typ.	15.0	dB

MECHANICAL DATA

Marking code: P6

SOT173 and SOT173X (see outlines section).

ORDERING AND PACKAGE INFORMATION

EXTENDED TYPE NUMBER	PACKAGE		
	CODE	PACKING METHOD	PACKING QUANTITY
BFP96	SOT173	BULK	50
BFP96	SOT173X	12 mm REEL	1000

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 (DC)	I_C	max.	100	mA
Total power dissipation up to T_{amb} = 75 °C mounted on a ceramic substrate of 0.7 mm x 10 cm^2	P_{tot}	max.	500	mW
Storage temperature range	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 cubstrate of 0.7 mm x 10 cm^2	$R_{th\ j\text{-}a}$	=	200	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current $I_E = 0$; $V_{CB} = 10$ V	I_{CBO}	max.	100	nA
DC current gain $I_C = 50$ mA; $V_{CE} = 10$ V	h_{FE}	min.	25	
Transition frequency at f = 500 MHz $I_C = 50$ 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.	1.3	pF
Emitter capacitance at f = 1 MHz $I_C = i_c = 0$; $V_{EB} = 0.5$ V	C_e	typ.	5.5	pF
Feedback capacitance at f = 1 MHz $I_C = 0$; $V_{CE} = 10$ V	C_{re}	typ.	1.0	pF

Maximum unilateral power gain (S_{12} assumed to be zero)

$$G_{UM} = 10 \log \frac{|S_{21}|^2}{[1-|S_{11}|^2]\,[1-|S_{22}|^2]}$$

at $I_C = 50$ mA; $V_{CE} = 10$ V; $T_{amb} = 25$ °C

f = 500 MHz	G_{UM}	typ.	19.0	dB
f = 800 MHz	G_{UM}	typ.	15.0	dB

Noise figure at f = 800 MHz; Z_S = opt.; $T_{amb} = 25$ °C $I_C = 50$ mA; $V_{CE} = 10$ V	F	typ.	3.7	dB

s-parameters (common emitter) at V_{CE} = 10 V; T_{amb} = 25 °C; typical values.

I_C mA	f MHz	s_{11}	s_{21}	s_{12}	s_{22}	G_{UM} dB
	40	0,73/ −50,1°	26,3/153,9°	0,020/67,3°	0,90/ −22,1°	38,9
	100	0,72/ −99,3°	18,7/128,4°	0,036/47,4°	0,67/ −41,7°	31,2
	200	0,71/−136,2°	11,2/108,6°	0,045/37,3°	0,44/ −51,9°	25,0
	500	0,71/−167,7°	4,8/ 88,2°	0,057/38,8°	0,29/ −58,8°	17,1
10	800	0,71/−179,3°	3,1/ 75,9°	0,070/45,0°	0,29/ −63,8°	13,3
	1000	0,70/+174,9°	2,5/ 71,1°	0,078/48,9°	0,29/ −66,8°	11,3
	1200	0,70/+170,2°	2,1/ 65,5°	0,087/51,1°	0,30/ −71,5°	9,8
	1500	0,71/+161,3°	1,7/ 55,4°	0,098/50,5°	0,34/ −74,2°	8,1
	2000	0,72/+152,0°	1,3/ 42,8°	0,119/52,1°	0,35/ −87,0°	5,9
	40	0,67/ −60,5°	32,9/150,2°	0,018/64,0°	0,87/ −27,4°	39,1
	100	0,69/−111,5°	22,0/123,6°	0,031/44,8°	0,60/ −50,0°	31,5
	200	0,70/−144,2°	12,9/105,5°	0,038/37,5°	0,38/ −62,3°	25,8
	500	0,71/−171,5°	5,5/ 86,8°	0,051/43,0°	0,23/ −69,8°	18,0
15	800	0,71/+178,5°	3,5/ 75,4°	0,064/49,2°	0,22/ −73,2°	14,1
	1000	0,69/+173,1°	2,8/ 70,4°	0,075/52,1°	0,22/ −75,1°	12,1
	1200	0,70/+169,0°	2,4/ 65,1°	0,085/53,7°	0,23/ −80,0°	10,6
	1500	0,70/+159,7°	1,9/ 57,0°	0,100/54,0°	0,26/ −82,8°	8,8
	2000	0,71/+151,3°	1,5/ 45,0°	0,121/54,1°	0,26/ −93,0°	6,6
	40	0,64/ −69,4°	38,8/146,7°	0,017/61,9°	0,84/ −32,3°	39,3
	100	0,67/−120,4°	24,3/120,1°	0,027/43,8°	0,54/ −57,4°	31,8
	200	0,69/−149,7°	13,9/103,5°	0,034/39,4°	0,33/ −71,9°	26,2
	500	0,71/−173,4°	5,8/ 86,5°	0,048/47,3°	0,20/ −83,3°	18,5
20	800	0,71/+177,4°	3,7/ 75,6°	0,063/52,6°	0,18/ −86,7°	14,5
	1000	0,70/+172,2°	3,0/ 71,0°	0,075/55,0°	0,18/ −87,5°	12,6
	1200	0,70/+168,5°	2,5/ 65,7°	0,085/56,0°	0,19/ −91,8°	11,1
	1500	0,69/+159,0°	2,1/ 58,1°	0,102/56,6°	0,21/ −91,4°	9,3
	2000	0,70/+151,0°	1,5/ 46,4°	0,124/55,7°	0,22/−100,8°	7,0
	40	0,61/ −79,4°	45,6/142,2°	0,016/59,2°	0,79/ −39,3°	39,4
	100	0,66/−128,6°	26,8/116,6°	0,025/43,9°	0,48/ −68,1°	32,2
	200	0,68/−155,2°	14,8/101,3°	0,031/43,0°	0,28/ −87,0°	26,5
	500	0,70/−176,0°	6,1/ 86,1°	0,047/53,4°	0,17/−107,7°	18,8
30	800	0,69/+175,6°	3,9/ 76,3°	0,066/58,7°	0,16/−110,7°	14,7
	1000	0,68/+170,5°	3,1/ 72,2°	0,079/60,9°	0,16/−109,9°	12,6
	1200	0,69/+167,1°	2,6/ 67,2°	0,090/61,3°	0,16/−111,5°	11,2
	1500	0,69/+158,4°	2,2/ 59,2°	0,107/59,5°	0,17/−104,7°	9,9
	2000	0,70/+150,5°	1,6/ 47,9°	0,132/57,5°	0,17/−112,6°	7,4
	40	0,58/ −91,5°	52,3/136,8°	0,015/56,4°	0,71/ −47,1°	39,3
	100	0,64/−137,0°	28,4/112,4°	0,022/44,8°	0,41/ −78,0°	32,2
	200	0,66/−159,6°	15,5/ 99,2°	0,028/17,9°	0,25/−100,3°	26,6
	500	0,68/−176,9°	6,6/ 85,6°	0,048/57,9°	0,17/−124,8°	19,0
50	800	0,68/−175,5°	4,2/ 76,1°	0,069/61,0°	0,16/−128,5°	15,0
	1000	0,68/+170,4°	3,3/ 72,8°	0,082/62,4°	0,15/−128,1°	13,2
	1200	0,68/+166,8°	2,8/ 66,8°	0,094/62,1°	0,16/−129,4°	11,8
	1500	0,69/+157,6°	2,3/ 59,7°	0,106/60,7°	0,14/−122,7°	10,3
	2000	0,70/+149,6°	1,7/ 48,7°	0,130/58,0°	0,19/−129,8°	7,8

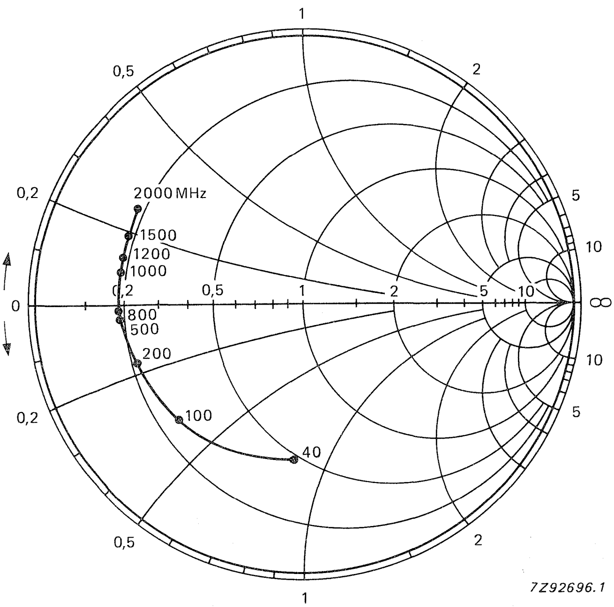


Fig. 1 Input impedance, derived from input reflection coefficient S_{11} coordinates, in ohm x 50.

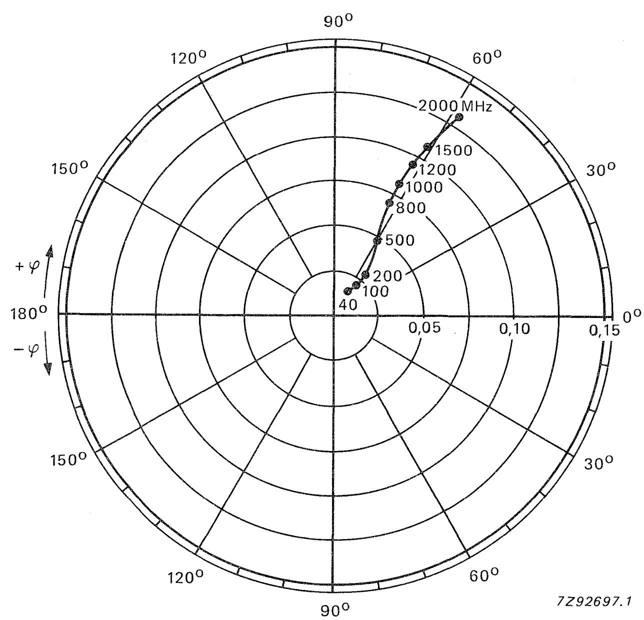


Fig. 2 Reverse transmission coefficient S_{12}.

Conditions for Figs 1 to 4: V_{CE} = 10 V; I_C = 50 mA; T_{amb} = 25 °C.

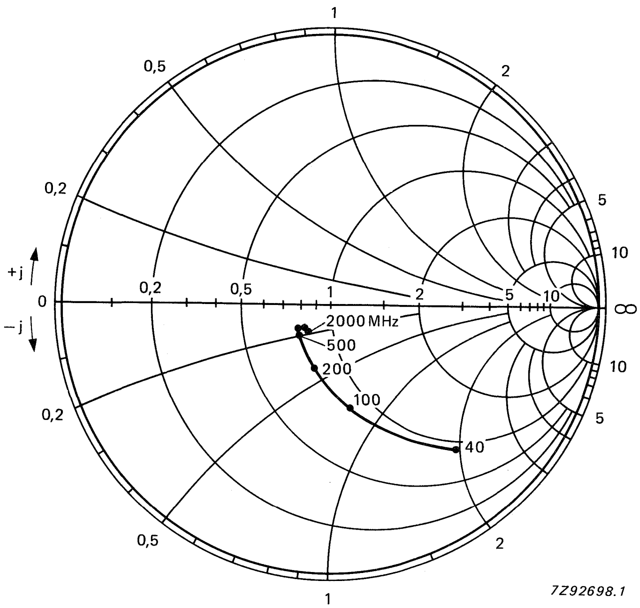


Fig. 3 Output impedance, derived from output reflection coefficient S_{22} coordinates, in ohm x 50.

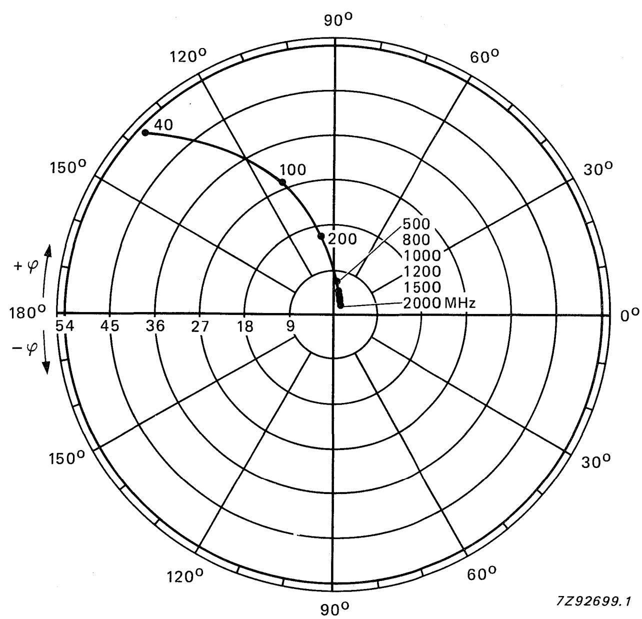


Fig. 4 Forward transmission coefficient S_{21}.

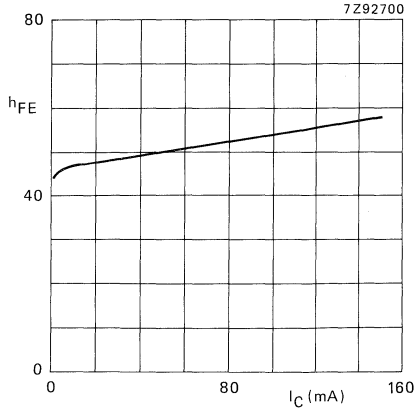


Fig. 5 V_{CE} = 10 V; T_j = 25 °C; typical values.

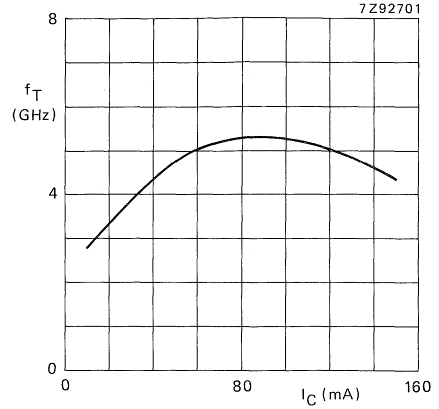


Fig. 6 V_{CE} = 10 V; f = 500 MHz; T_j = 25 °C; typical values.

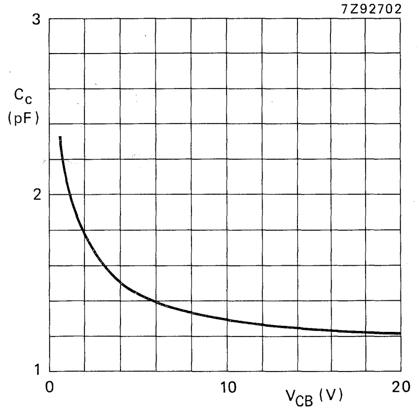


Fig. 7 $I_E = i_e$; f = 1 MHz; T_j = 25 °C; typical values.

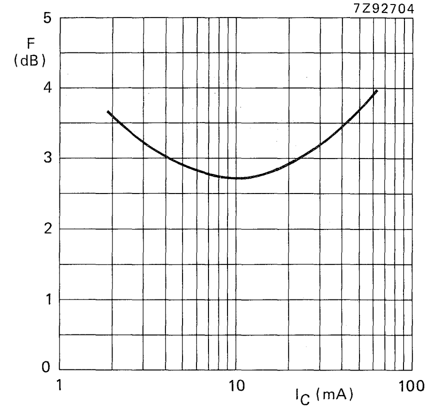


Fig. 8 V_{CE} = 10 V; f = 800 MHz; Z_S = opt.; T_{amb} = 25 °C; typical values.

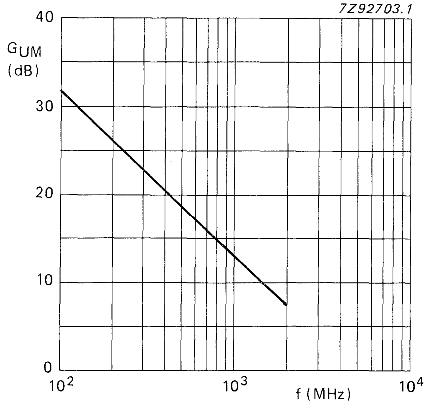


Fig. 9 V_{CE} = 10 V; I_C = 50 mA; T_{amb} = 25 °C; typical values.

NPN 1 GHz WIDEBAND TRANSISTOR

NPN multi-emitter transistor in a SOT89 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.	175	°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

SOT89 (see outlines section).

See also *Soldering recommendations*.

Marking code

BFQ17 = FA

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 ($R_{BE} \leqslant 50\ \Omega$; 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 (DC)	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 °C mounted on a ceramic substrate area = 2.5 cm^2; thickness = 0.7 mm	P_{tot}	max.	1	W
Storage temperature range	T_{stg}	−65 to + 150		°C
Junction temperature	T_j	max.	175	°C

THERMAL RESISTANCE

From junction to collector tab	$R_{th\ j\text{-}tab}$	=	30	K/W
From junction to ambient in free air mounted on a ceramic substrate area = 2.5 cm^2; thickness = 0.7 mm	$R_{th\ j\text{-}a}$	=	125	K/W

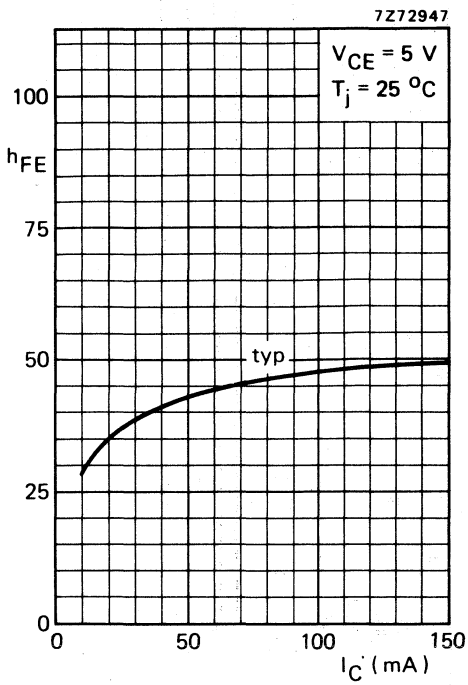
* I_C = 10 mA.

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

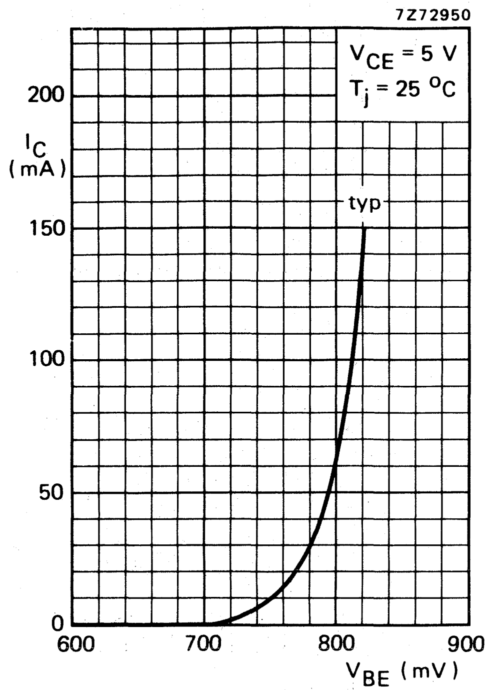
Collector cut-off current			
$I_E = 0$; $V_{CB} = 20$ V; $T_j = 150$ °C	I_{CBO}	max.	20 µA
Saturation voltage			
$I_C = 100$ mA; $I_B = 10$ mA	V_{CEsat}	max.	0.5 V
DC current gain			
$I_C = 50$ mA; $V_{CE} = 5$ V	h_{FE}	min.	25
$I_C = 150$ mA; $V_{CE} = 5$ V	h_{FE}	min.	25
Transition frequency at f = 500 MHz*			
$I_C = 150$ mA; $V_{CE} = 15$ V	f_T	typ.	1.2 GHz
Collector capacitance at f = 1 MHz			
$I_E = I_e = 0$; $V_{CB} = 15$ V	C_c	max.	4 pF
Feedback capacitance at f = 1 MHz			
$I_C = 10$ mA; $V_{CE} = 15$ V; $T_{amb} = 25$ °C	C_{re}	typ.	1.9 pF
Maximum unilateral power gain (S_{12} assumed to be zero)			
$G_{UM} = 10 \log \frac{\lvert S_{21}\rvert^2}{(1 - \lvert S_{11}\rvert^2)(1 - \lvert S_{22}\rvert^2)}$			
$I_C = 60$ mA; $V_{CE} = 15$ V; $T_{amb} = 25$ °C			
f = 200 MHz	G_{UM}	typ.	16 dB
f = 800 MHz	G_{UM}	typ.	6.5 dB

* Measured under pulse conditions.



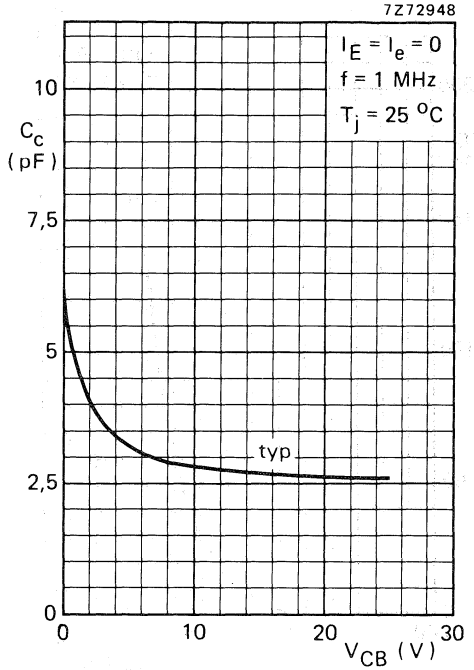
DC current gain as a function of collector current

Fig.1; V_{CE} = 5 V; T_j = 25 °C; typical values.



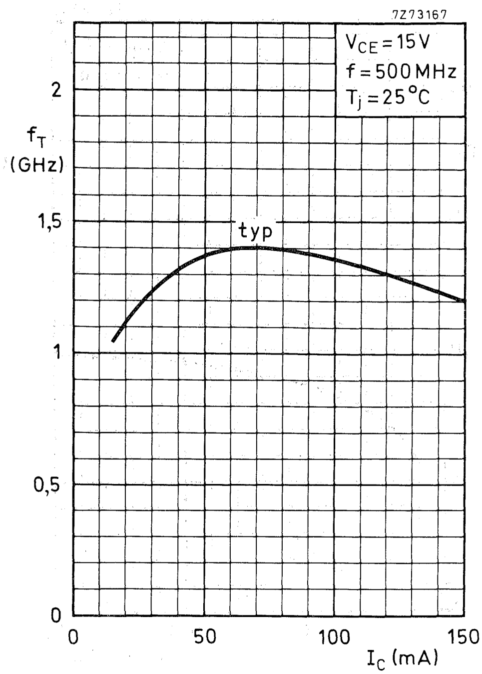
Collector current as a function of base-emitter voltage.

Fig.2; V_{CE} = 5 V; T_j = 25 °C; typical values.



Collector capacitance as a function of collector-base voltage.

Fig.3; $I_E = i_e = 0$; f = 1 MHz; T_j = 25 °C; typical values.



Transition frequency as a function of collector current.

Fig.4; V_{CE} = 15 V; f = 500 MHz; T_j = 25 °C; typical values.

NPN 3 GHz WIDEBAND TRANSISTOR

NPN transistor in a plastic SOT89 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 (DC)	I_C	max.	150	mA
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	1	W
Junction temperature	T_j	max.	175	°C
Transition frequency at f = 500 MHz I_C = 100 mA; V_{CE} = 10 V	f_T	typ.	3.6	GHz
Feedback capacitance at f = 10.7 MHz I_C = 0; V_{CE} = 10 V	C_{re}	typ.	1.2	pF
Intermodulation distortion I_C = 80 mA; V_{CE} = 10 V; R_L = 75 Ω measured at $f_{(p + q - r)}$ = 793.25 MHz	d_{im}	max.	−60	dB

MECHANICAL DATA

SOT89 (see outlines section).

See also soldering recommendations.

Marking code

BFQ18A = FF

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 (DC)	I_C	max.	150	mA
Total power dissipation up to T_{amb} = 25 °C (note 1)	P_{tot}	max.	1	W
Storage temperature range	T_{stg}	−65 to + 150		°C
Junction temperature	T_j	max.	175	°C

THERMAL RESISTANCE

From junction to collector tab	$R_{th\ j\text{-}tab}$	=	25	K/W
From junction to ambient in free air (note 1)	$R_{th\ j\text{-}a}$	=	125	K/W

CHARACTERISTICS

T_{amb} = 25 °C unless otherwise specified

DC current gain (note 2)				
I_C = 50 mA; V_{CE} = 10 V	h_{FE}	min.	25	
I_C = 100 mA; V_{CE} = 10 V	h_{FE}	min.	25	
Transition frequency at f = 500 MHz (note 2)				
I_C = 50 mA; V_{CE} = 10 V	f_T	typ.	3.2	GHz
I_C = 100 mA; V_{CE} = 10 V	f_T	typ.	3.6	GHz
Collector capacitance at f = 1 MHz				
$I_E = I_e = 0$; V_{CB} = 10 V	C_c	typ.	2.0	pF
Emitter capacitance at f = 1 MHz				
$I_C = I_c = 0$; V_{EB} = 0.5 V	C_e	typ.	11	pF
Feedback capacitance at f = 10.7 MHz				
$I_C = 0$; V_{CE} = 10 V	C_{re}	typ.	1.2	pF

Notes

1. The device mounted on a ceramic substrate area = 2.5 cm^2; thickness = 0.7 mm.
2. Measured under pulse conditions.

Intermodulation distortion (see Fig. 1)
I_C = 80 mA; V_{CE} = 10 V; R_L = 75 Ω
V_p = V_o = 700 mV at f_p = 795.25 MHz
V_q = V_o −6 dB at f_q = 803.25 MHz
V_r = V_o −6 dB at f_r = 805.25 MHz
Measured at $f_{(p+q-r)}$ = 793.25 MHz — d_{im} max. −60 dB

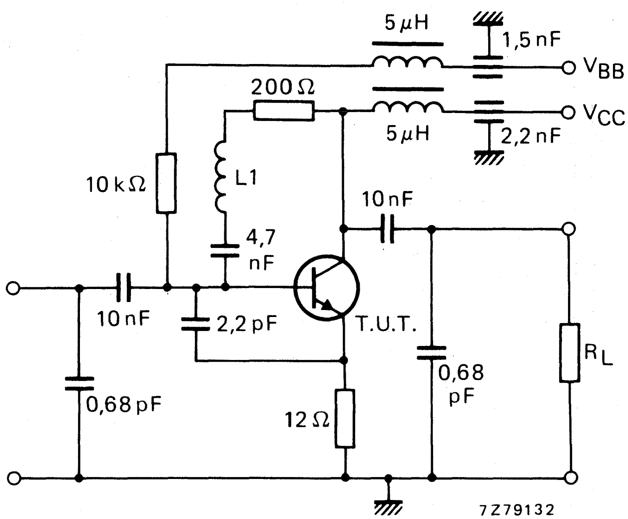


Fig.1 MATV test circuit (40–860 MHz).

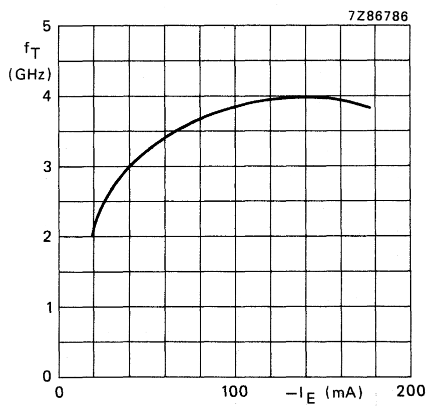


Fig.2 Transition frequency as a function of emitter current.

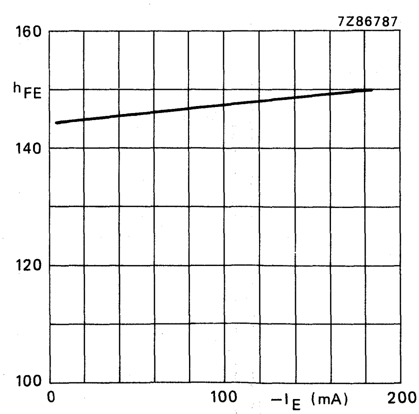


Fig.3 DC current gain as a function of emitter current.

NPN 5 GHz WIDEBAND TRANSISTOR

NPN transistor in a SOT89 plastic envelope intended for application in thick- and thin-film circuits.
It is primarily intended for use in UHF 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 (DC)	I_C	max.	75	mA
Total power dissipation up to T_{amb} = 87.5 °C	P_{tot}	max.	500	mW
Junction temperature	T_j	max.	175	°C
Transition frequency at f = 500 MHz I_C = 50 mA; V_{CE} = 10 V	f_T	typ.	5	GHz
Feedback capacitance at f = 1 MHz I_C = 10 mA; V_{CE} = 10 V	C_{re}	typ.	1.3	pF
Noise figure at optimum source imperance I_C = 50 mA; V_{CE} = 10 V; f = 500 MHz	F	typ.	3.3	dB

MECHANICAL DATA

SOT89 (see outlines section)

See also *Soldering recommendations.*

Marking code

BFQ19 = FB

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.	3.3	V
Collector current (DC)	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
Storage temperature	T_{stg}	–65 to + 150		°C
Junction temperature	T_j	max.	175	°C

THERMAL RESISTANCE

From junction to collector tab	$R_{th\ j\text{-}tab}$	=	40	K/W
From junction to ambient in free air mounted on a ceramic substrate area = 2.5 cm^2; thickness = 0.7 mm	$R_{th\ j\text{-}a}$	=	125	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current			
I_E = 0; V_{CB} = 10 V	I_{CBO}	max.	100 nA
DC current gain (see note)			
I_C = 50 mA; V_{CE} = 10 V	h_{FE}	min. typ.	25 50
I_C = 75 mA; V_{CE} = 10 V	h_{FE}	min. typ.	25 52
Transition frequency at f = 500 MHz (see note)			
I_C = 50 mA; V_{CE} = 10 V	f_T	min. typ.	4.0 GHz 5.0 GHz
I_C = 75 mA; V_{CE} = 10 V	f_T	min. typ.	4.4 GHz 5.5 GHz
Collector capacitance at f = 1 MHz			
$I_E = I_e$ = 0; V_{CB} = 10 V	C_c	typ.	1.6 pF
Emitter capacitance at f = 1 MHz			
$I_C = I_c$ = 0; V_{EB} = 0.5 V	C_e	typ.	5.0 pF
Feedback capacitance at f = 1 MHz			
I_C = 10 mA; V_{CE} = 10 V; T_{amb} = 25 °C	C_{re}	typ.	1.3 pF
Noise figure at optimum source impedance			
I_C = 50 mA; V_{CE} = 10 V; f = 500 MHz; T_{amb} = 25 °C	F	typ.	3.3 dB

Maximum unilateral power gain (S_{12} assumed to be zero)

$$G_{UM} = 10 \log \frac{|S_{21}|^2}{(1 - |S_{11}|^2)(1 - |S_{22}|^2)}$$

I_C = 50 mA; V_{CE} = 10 V; T_{amb} = 25 °C

f = 200 MHz	G_{UM}	typ.	18.5 dB
f = 500 MHz	G_{UM}	typ.	11.5 dB
f = 800 MHz	G_{UM}	typ.	7.5 dB

Note: measured under pulse conditions.

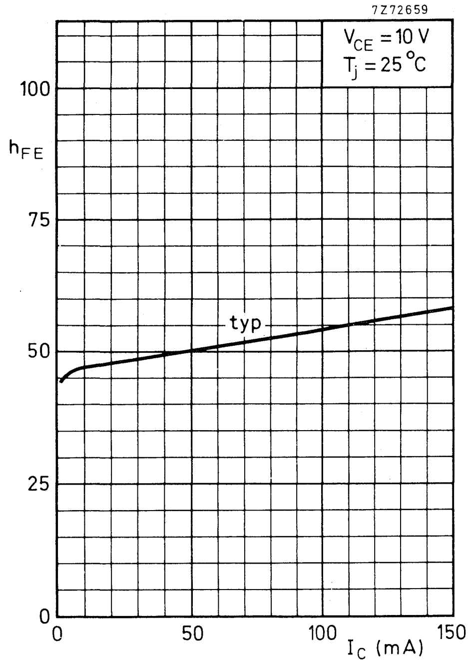


Fig.1 DC current gain as a function of collector current.

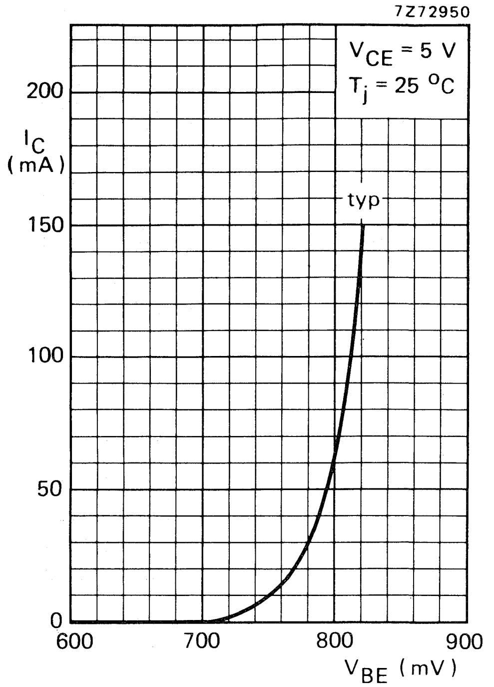


Fig.2 Collector current as a function of base-emitter voltage.

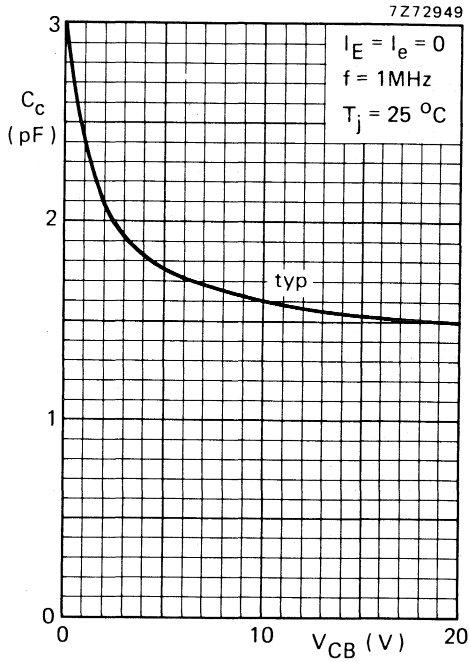


Fig.3 Collector capacitance as a function of collector-base voltage.

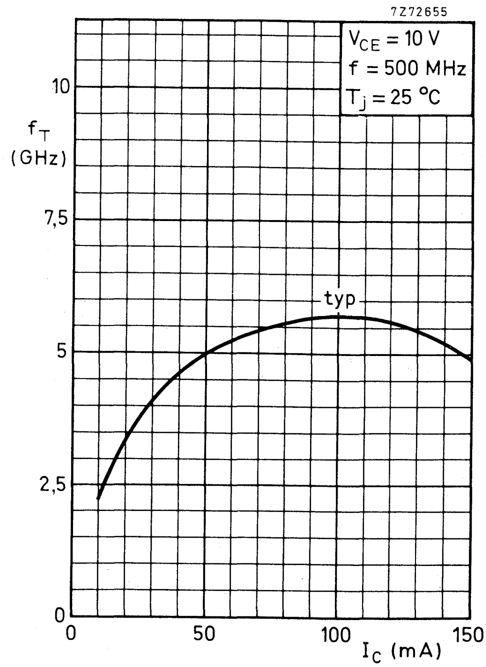


Fig.4 Transition frequency as a function of collector current.

NPN 5 GHz WIDEBAND TRANSISTOR

NPN 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 UHF and microwave aerial amplifiers, radar systems, oscilloscopes, spectrum analysers etc.

The transistor has extremely high power gain and good low noise performance.

PNP 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 (DC)	I_C	max.	35	mA
Total power dissipation up to T_{amb} = 65 °C	P_{tot}	max.	150	mW
Junction temperature	T_j	max.	200	°C
Transition frequency at f = 500 MHz I_C = 30 mA; V_{CE} = 5 V	f_T	typ.	5.0	GHz
Feedback capacitance at f = 1 MHz I_C = 0; V_{CE} = 5 V	C_{re}	typ.	0.65	pF
Noise figure at optimum source impedance I_C = 2 mA; V_{CE} = 5 V; f = 500 MHz	F	typ.	1.9	dB
Maximum unilateral power gain I_C = 30 mA; V_{CE} = 5 V; f = 500 MHz	G_{UM}	typ.	16.0	dB

MECHANICAL DATA

TO-72 with insulated electrodes (see outlines section).

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 (DC)	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 range	T_{stg}	−65 to + 200		°C
Junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	900	K/W
From junction to case	$R_{th\ j\text{-}c}$	=	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
DC current gain $I_C = 10$ mA; $V_{CE} = 5$ V	h_{FE}	min. max.	50 150	
Transition frequency (note) $I_C = 30$ mA; $V_{CE} = 5$ V; f = 500 MHz	f_T	typ.	5.0	GHz
Feedback capacitance (note) $I_C = 0$; $V_{CE} = 5$ V; f = 1 MHz; $T_{amb} = 25$ °C	C_{re}	typ.	0.65	pF
Noise figure at optimum source impedance (note) $I_C = 2$ mA; $V_{CE} = 5$ V; f = 500 MHz; $T_{amb} = 25$ °C	F	typ.	1.9	dB
$I_C = 10$ mA; $V_{CE} = 5$ V; f = 200 MHz; $T_{amb} = 25$ °C	F	max.	2.5	dB

Maximum unilateral power gain (note)

S_{12} assumed to be zero

$$G_{UM} = 10 \log \frac{|S_{21}|^2}{(1 - |S_{11}|^2)(1 - |S_{22}|^2)}$$

$I_C = 10$ mA; $V_{CE} = 5$ V; f = 200 MHz; $T_{amb} = 25$ °C	G_{UM}	min.	21.0	dB
$I_C = 30$ mA; $V_{CE} = 5$ V; f = 500 MHz; $T_{amb} = 25$ °C	G_{UM}	typ.	16.0	dB

Note

Shield lead grounded.

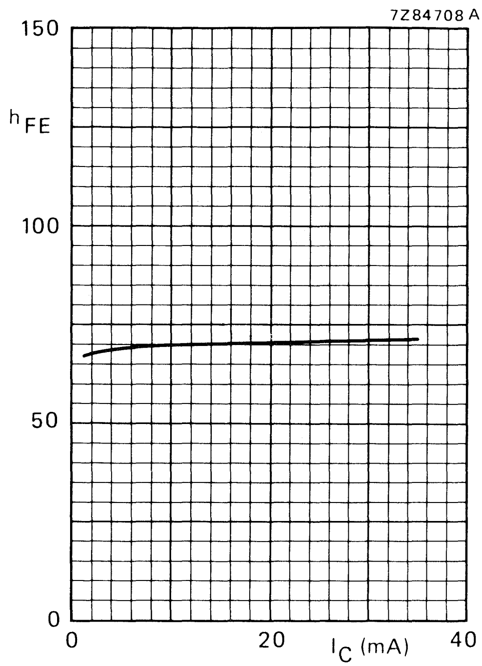


Fig.1 DC current gain as a function of collector current.

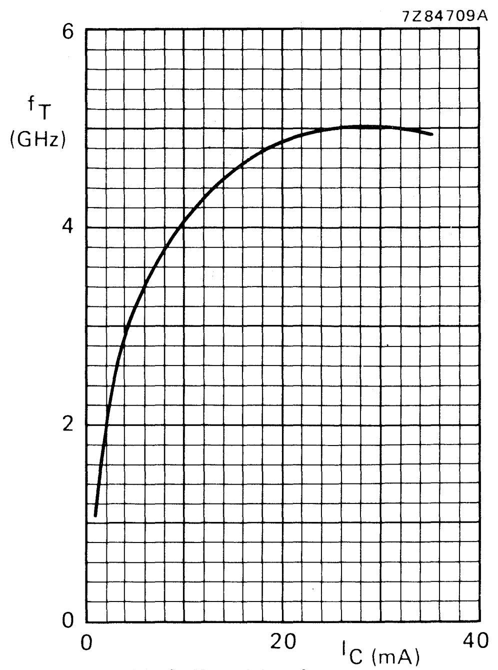
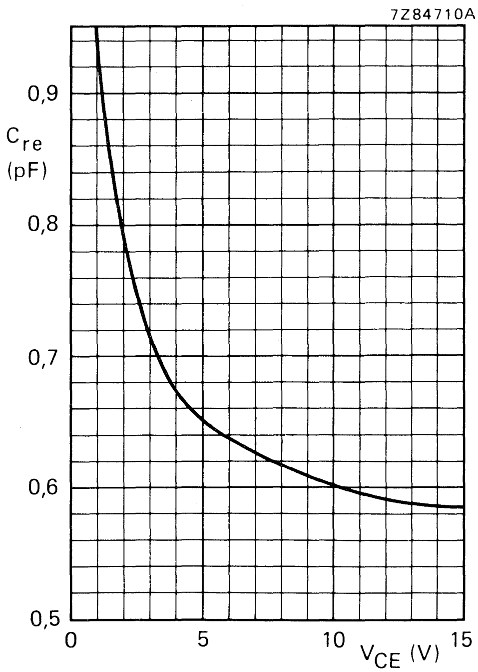


Fig.2 Transition frequency as a function of collector current.



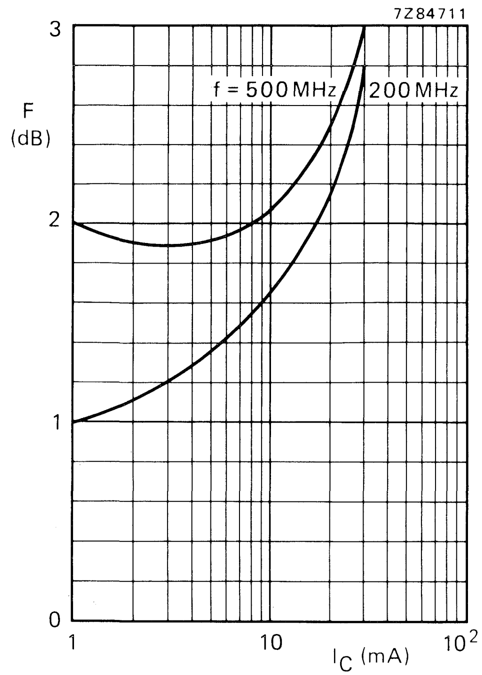
Conditions for Figs 1, 2 and 3:

Fig. 1 V_{CE} = 5 V; T_j = 25 °C; typical values.

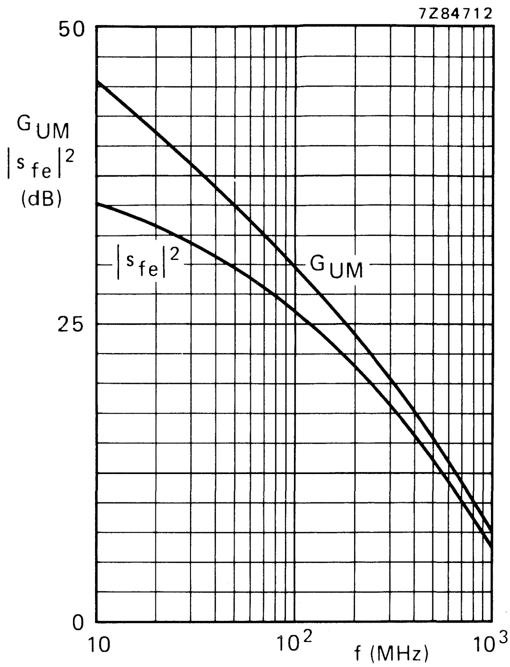
Fig. 2 V_{CE} = 5 V; f = 500 MHz; T_j = 25 °C; shield lead grounded; typical values.

Fig. 3 I_C = 0; f = 1 MHz; T_{amb} = 25 °C; shield lead grounded; typical values.

Fig.3 Feedback capacitance as a function of collector-emitter voltage.



Noisie as a function of collector current.
Fig.4 V_{CE} = 5 V; Z_S = optimum; T_{amb} = 25 °C; typical values; shield lead grounded; typ. values.



Maximum unilateral gain as a function of frequency.
Fig.5 V_{CE} = 5 V; I_C = 30 mA; T_{amb} = 25 °C; typical values; shield lead grounded; typ. values.

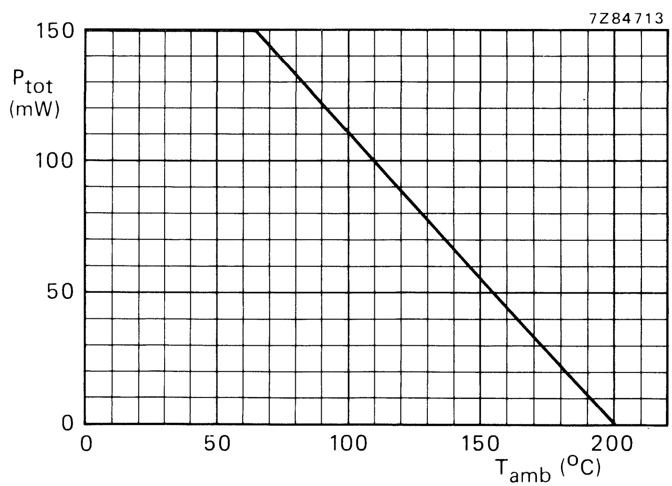


Fig.6 Power derating curve as a function of ambient temperature.

PNP 5 GHz WIDEBAND TRANSISTOR

PNP transistor in a plastic SOT37 envelope. It is primarily intended for use in UHF 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.

NPN complements are BFR91 and BFR91A.

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 (DC)	$-I_C$	max.	35	mA
Total power dissipation up to T_{amb} = 60 °C	P_{tot}	max.	200	mW
Junction temperature	T_j	max.	175	°C
Transition frequency at f = 500 MHz $-I_C$ = 30 mA; $-V_{CE}$ = 5 V	f_T	typ.	5.0	GHz
Feedback capacitance at f = 1 MHz $-I_C$ = 2 mA; $-V_{CE}$ = 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	F	typ.	2.4	dB

MECHANICAL DATA

SOT37.

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 (DC)	$-I_C$	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.	200	mW
Storage temperature range	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 fibre-glass print	$R_{th\ j\text{-}a}$	=	500	K/W
From junction to soldering point	$R_{th\ j\text{-}s}$	=	65	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
DC current gain $-I_C = 30$ mA; $-V_{CE} = 5$ V	h_{FE}	min. typ.	20 50
Transition frequency f = 500 MHz; $-I_C = 30$ mA; $-V_{CE} = 5$ V	f_T	typ.	5.0 GHz
Collector capacitance f = 1 MHz; $I_E = I_e = 0; -V_{CB} = 10$ V	C_c	typ.	1.2 pF
Emitter capacitance f = 1 MHz; $I_C = I_c = 0; -V_{EB} = 0.5$ V	C_e	typ.	1.8 pF
Feedback capacitance f = 1 MHz; $I_C = 0; -V_{CE} = 10$ 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.	2.4 dB
Maximum unilateral power gain (S_{12} assumed to be zero) $-I_C = 30$ mA; $-V_{CE} = 5$ V; f = 500 MHz; T_{amb} = 25 °C $G_{UM} = 10 \log \frac{\|S_{21}\|^2}{[1-\|S_{11}\|^2]\,[1-\|S_{22}\|^2]}$	G_{UM}	typ.	15.0 dB
Output voltage at $d_{im} = -60$ dB $I_C = 30$ mA; $V_{CE} = 5$ V; $R_L = 75\ \Omega$; 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 $f_{(p+q-r)}$ = 495.25 MHz	V_o	typ.	300 mV

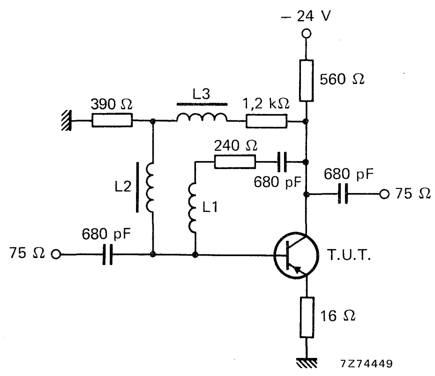


Fig.1 Intermodulation distortion test circuit.

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)

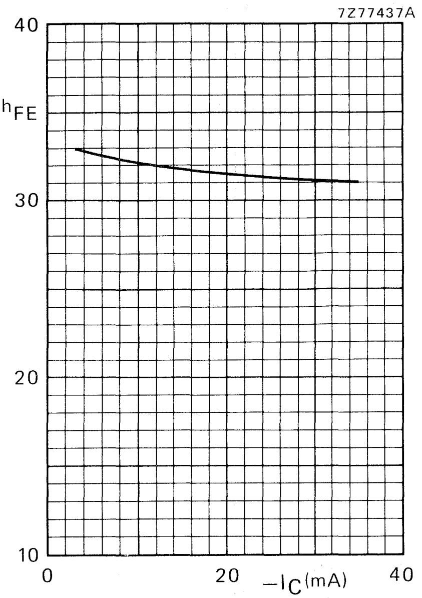


Fig.2 DC current gain as a function of collector capacitance; $-V_{CE}$ = 5 V; T_j = 25 °C; typical values.

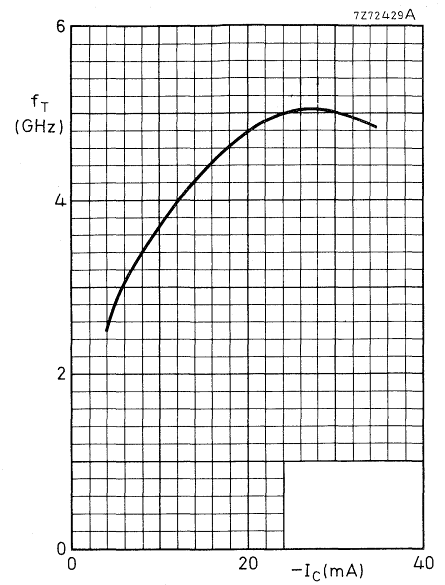


Fig.3 Transition frequency as a function of collector capacitance; $-V_{CE}$ = 5 V; f = 500 MHz; T_j = 25 °C; typical values.

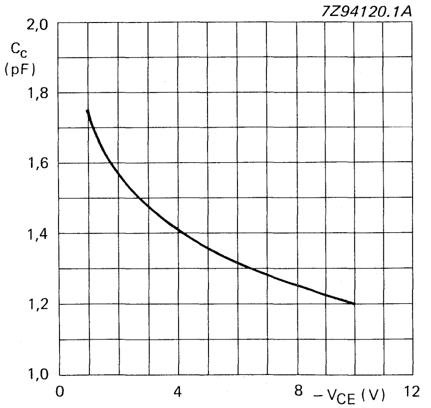


Fig.4 Collector capacitance as a function of collector-emitter voltage; $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C; typical values.

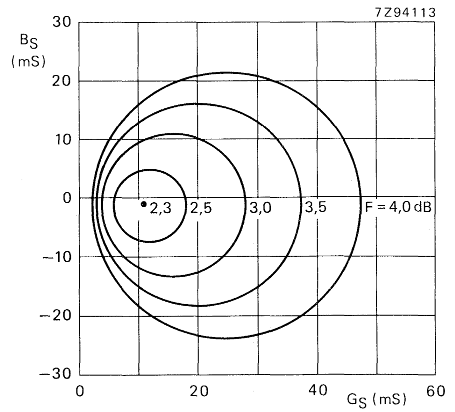


Fig.5 Circles of constant noise figure; $-V_{CE}$ = 8 V; $-I_C$ = 4 mA; f = 800 MHz; T_{amb} = 25 °C; typical values.

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

I_C mA	f MHz	S_{11}	S_{21}	S_{12}	S_{22}	G_{UM} dB
	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
5	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
	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
10	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
	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
15	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
	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
20	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
	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
30	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

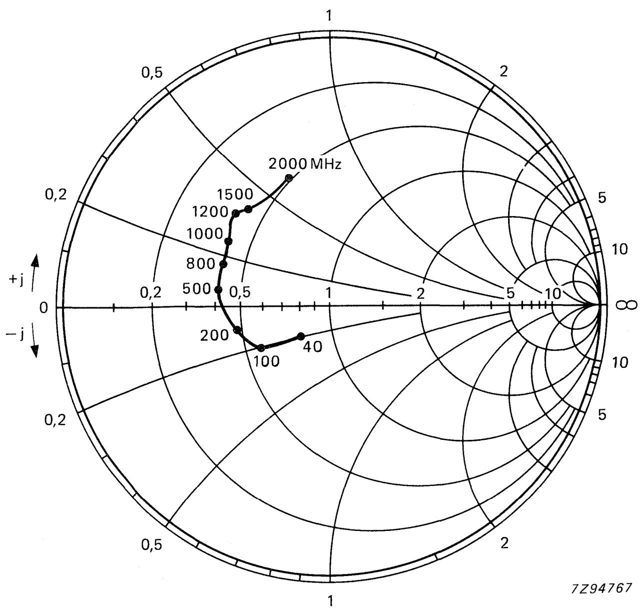


Fig.6 Input impedance, derived from input reflection coefficient S_{11} coordinates, in ohm x 50.

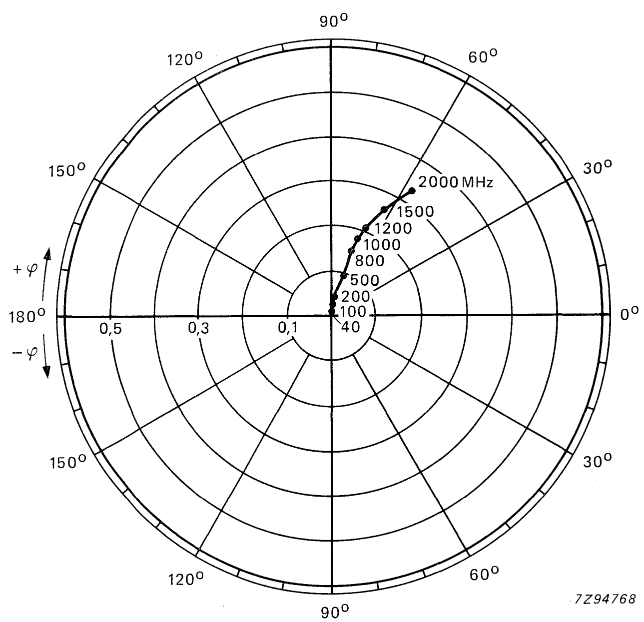


Fig.7 Reverse transmission coefficient S_{12}.

Conditions for Figs 6 to 9: $-V_{CE}$ = 5 V; $-I_C$ = 30 mA; T_{amb} = 25 °C; typical values.

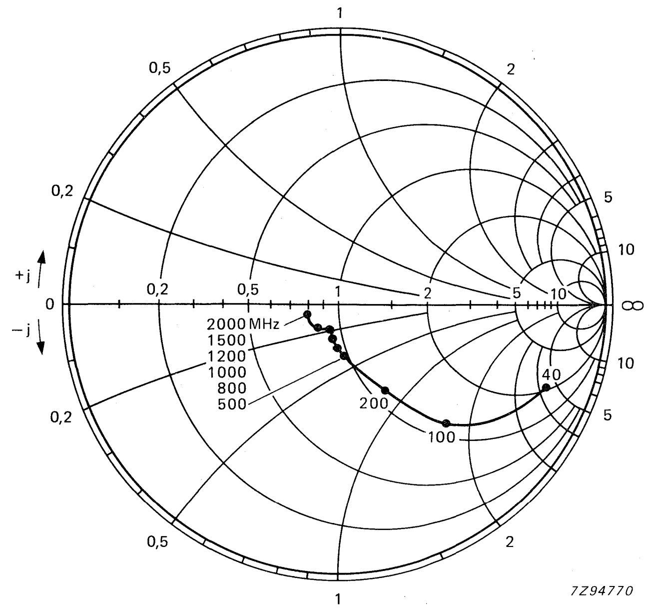


Fig.8 Output impedance, derived from output reflection coefficient S_{22} coordinates, in ohm x 50.

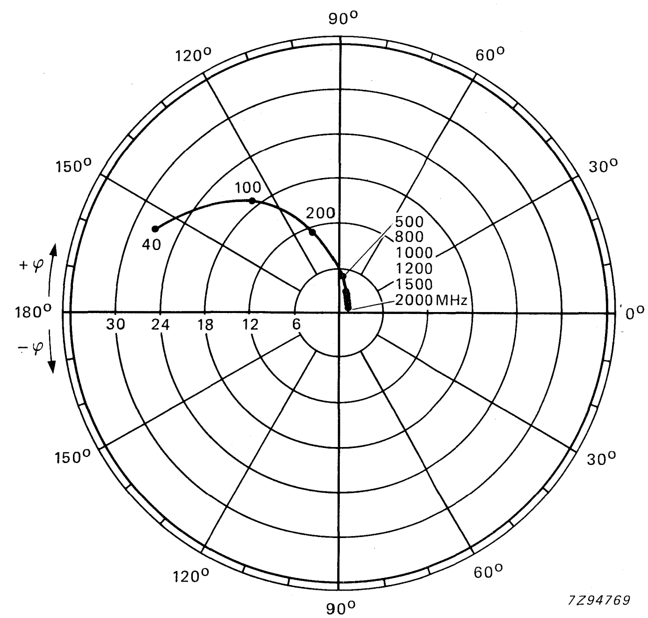


Fig.9 Forward transmission coefficient S_{21}.

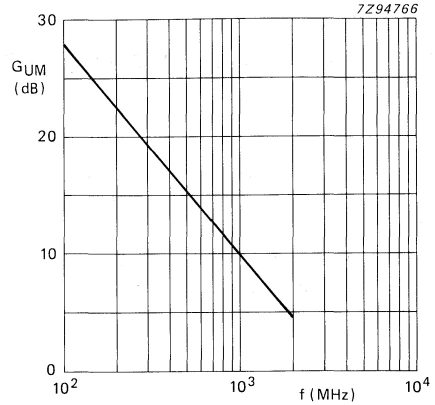


Fig.10 Maximum unilateral power gain as a function of frequency; $-V_{CE}$ = 5 V; $-I_C$ = 30 mA; T_{amb} = 25 °C; typical values.

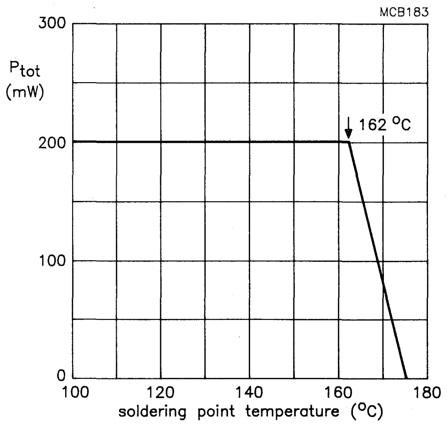


Fig.11 Power derating curve.

PNP 5 GHz WIDEBAND TRANSISTOR

PNP transistor in a sub-miniature HERMETICALLY SEALED micro-stripline SOT173 and SOT173X envelope. It is primarily intended for use in UHF and microwave amplifiers such as aerial amplifiers, radar system, 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.

NPN complement is BFP91A.

QUICK REFERENCE DATA

Collector-base voltage	$-V_{CBO}$	max.	15	V
Collector-emitter voltage	$-V_{CEO}$	max.	12	V
Collector current (DC)	$-I_C$	max.	50	mA
Total power dissipation up to T_{amb} = 105 °C	P_{tot}	max.	350	mW
Junction temperature	T_j	max.	175	°C
DC 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
Maximum unilateral power gain $-I_C$ = 30 mA; $-V_{CE}$ = 8 V at f = 500 MHz	G_{UM}	typ.	20.0	dB
at f = 800 MHz	G_{UM}	typ.	16.0	dB

MECHANICAL DATA

Marking code: C3

SOT173 and SOT173X.

ORDERING AND PACKAGE INFORMATION

EXTENDED TYPE NUMBER	PACKAGE		
	CODE	PACKING METHOD	PACKING QUANTITY
BFQ23C	SOT173	BULK	50
BFQ23C	SOT173X	12 mm REEL	1000

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 (DC)	$-I_C$	max.	50 mA
Total power dissipation up to T_{amb} = 105 °C mounted on a ceramic substrate of 0.7 mm x 10 cm^2	P_{tot}	max.	350 mW
Storage temperature range	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	$R_{th\ j\text{-}a}$	=	200 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
DC 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_{12} assumed to be zero)

$$G_{UM} = 10 \log \frac{|S_{21}|^2}{[1-|S_{11}|^2]\,[1-|S_{22}|^2]}$$

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

f = 500 MHz	G_{UM}	typ.	20.0 dB
f = 800 MHz	G_{UM}	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	F	typ.	2.3 dB
$-I_C = 30$ mA; $-V_{CE} = 8$ V	F	typ.	3.7 dB

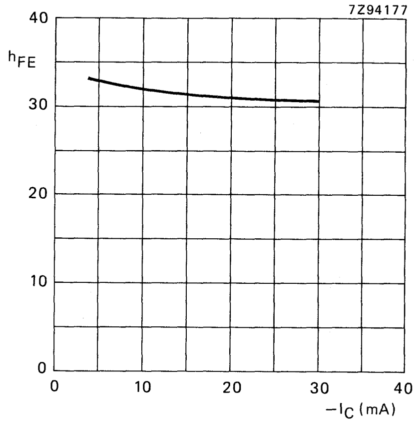


Fig.1 DC current gain as a function of collector current; $-V_{CE} = 5$ V; $T_j = 25$ °C; typical values.

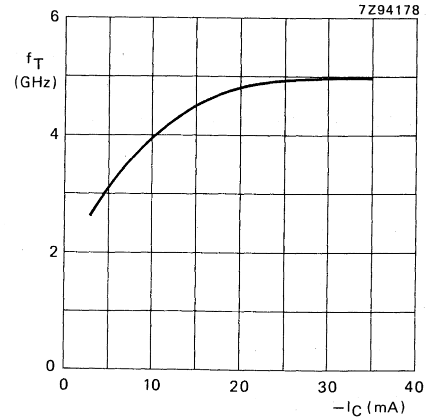


Fig.2 Transition frequency as a function of collector current; $-V_{CE} = 5$ V; f = 500 MHz; $T_j = 25$ °C; typical values.

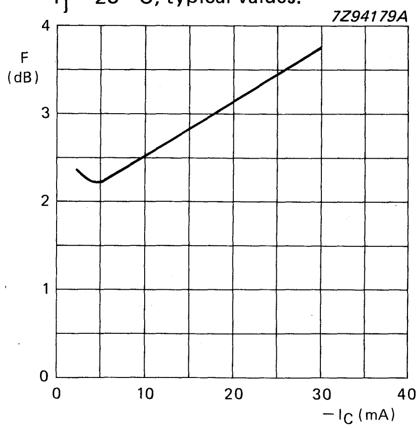


Fig.3 Noise as a function of collector current; $-V_{CE} = 8$ V; f = 800 MHz; $T_{amb} = 25$ °C; Z_s = optimum; typical values.

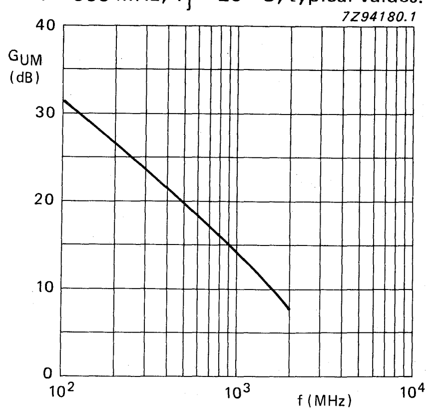


Fig.4 Maximum unilateral power gain as a function of frequency; $-V_{CE} = 8$ V; $-I_C = 30$ mA; $T_{amb} = 25$ °C; typical values.

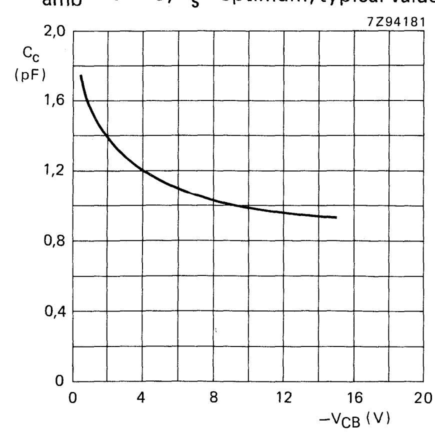
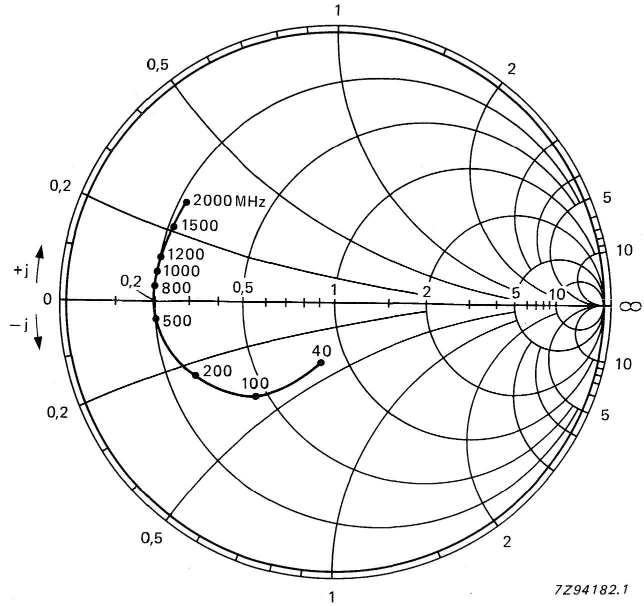


Fig.5 Collector capacitance as a function of collector-base voltage; $I_E = I_e = 0$; f = 1 MHz; $T_j = 25$ °C; typical values.

s-parameters (common emitter) at $-V_{CE}$ = 8 V; T_{amb} = 25 °C

I_C mA	f MHz	s_{11}	s_{21}	s_{12}	s_{22}	G_{UM} dB
2	40	0,84/ −13,4°	6,6/172,9°	0,019/ 82,8°	0,99/ −5,7°	38,7
	100	0,83/ −32,3°	6,4/161,1°	0,047/ 73,3°	0,95/ −14,1°	31,3
	200	0,80/ −60,8°	5,7/143,8°	0,083/ 59,4°	0,87/ −25,7°	25,7
	500	0,74/−114,6°	3,7/112,1°	0,136/ 35,8°	0,66/ −45,8°	17,3
	800	0,71/−142,7°	2,6/ 92,5°	0,149/ 25,7°	0,55/ −54,2°	12,9
	1000	0,68/−154,3°	2,1/ 83,3°	0,153/ 23,1°	0,52/ −58,0°	10,5
	1200	0,67/−164,3°	1,7/ 75,5°	0,153/ 20,8°	0,50/ −62,2°	8,4
	1500	0,65/−178,0°	1,4/ 63,9°	0,156/ 17,3°	0,53/ −65,3°	6,9
	2000	0,66/+165,5°	1,1/ 48,9°	0,154/ 16,4°	0,50/ −75,3°	4,8
5	40	0,66/ −22,5°	13,5/169,4°	0,017/ 79,7°	0,97/ −10,2°	37,4
	100	0,66/ −52,0°	12,4/153,7°	0,039/ 67,5°	0,90/ −24,2°	31,6
	200	0,66/ −89,6°	10,1/132,9°	0,064/ 52,4°	0,74/ −41,3°	26,0
	500	0,68/−141,5°	5,5/103,0°	0,091/ 34,5°	0,46/ −64,5°	18,5
	800	0,67/−162,7°	3,7/ 87,8°	0,100/ 31,9°	0,36/ −72,6°	14,6
	1000	0,66/−172,1°	3,0/ 80,6°	0,106/ 32,6°	0,34/ −75,4°	12,6
	1200	0,67/−179,7°	2,5/ 73,8°	0,111/ 33,0°	0,32/ −79,4°	11,0
	1500	0,63/+168,5°	2,0/ 64,9°	0,122/ 34,1°	0,33/ −76,7°	8,7
	2000	0,64/+155,6°	1,5/ 51,9°	0,136/ 35,6°	0,30/ −84,8°	6,5
10	40	0,47/ −35,4°	20,4/165,5°	0,014/ 76,9°	0,93/ −14,9°	36,0
	100	0,52/ −76,4°	17,7/146,4°	0,032/ 62,8°	0,82/ −33,9°	31,2
	200	0,59/−115,9°	13,1/124,3°	0,048/ 49,2°	0,62/ −54,7°	26,3
	500	0,65/−157,4°	6,4/ 97,9°	0,066/ 40,4°	0,35/ −80,0°	19,1
	800	0,65/−173,4°	4,2/ 84,7°	0,078/ 43,3°	0,27/ −89,0°	15,2
	1000	0,65/+178,9°	3,4/ 78,8°	0,087/ 45,7°	0,24/ −91,3°	13,3
	1200	0,65/+172,9°	2,9/ 72,9°	0,096/ 47,0°	0,23/ −94,9°	11,9
	1500	0,63/+161,2°	2,4/ 65,1°	0,111/ 46,5°	0,23/ −91,9°	10,0
	2000	0,65/+150,1°	1,8/ 53,0°	0,133/ 46,8°	0,20/ −99,0°	7,5
20	40	0,29/ −63,8°	26,8/162,1°	0,012/ 74,1°	0,89/ −19,5°	35,8
	100	0,45/−108,1°	22,0/140,1°	0,025/ 59,7°	0,74/ −43,0°	31,3
	200	0,58/−139,5°	15,1/118,3°	0,036/ 49,0°	0,52/ −66,6°	26,7
	500	0,65/−168,7°	7,0/ 94,6°	0,051/ 47,8°	0,29/ −95,4°	19,7
	800	0,66/−179,3°	4,5/ 82,9°	0,066/ 52,3°	0,22/−106,4°	15,8
	1000	0,66/+173,0°	3,7/ 77,4°	0,077/ 54,7°	0,20/−109,3°	14,0
	1200	0,66/+168,2°	3,1/ 72,0°	0,088/ 55,3°	0,19/−112,9°	12,5
	1500	0,65/+156,7°	2,5/ 64,7°	0,108/ 55,0°	0,18/−107,3°	10,6
	2000	0,66/+146,8°	1,9/ 53,1°	0,132/ 53,4°	0,16/−114,3°	8,1
30	40	0,23/ −93,3°	29,3/160,2°	0,010/ 72,3°	0,86/ −21,6°	35,4
	100	0,45/−125,5°	23,5/137,3°	0,021/ 59,0°	0,70/ −47,1°	31,3
	200	0,58/−149,5°	15,5/115,7°	0,030/ 50,6°	0,48/ −71,6°	26,7
	500	0,66/−173,2°	7,1/ 93,2°	0,046/ 52,8°	0,26/−101,2°	20,0
	800	0,66/+176,4°	4,6/ 81,9°	0,062/ 57,4°	0,21/−112,3°	16,0
	1000	0,66/+170,5°	3,7/ 76,5°	0,074/ 59,1°	0,19/−115,4°	14,0
	1200	0,66/+165,8°	3,1/ 71,1°	0,085/ 59,5°	0,18/−118,5°	12,5
	1500	0,65/+154,9°	2,5/ 63,7°	0,106/ 58,4°	0,16/−113,0°	10,7
	2000	0,66/+145,5°	1,9/ 52,4°	0,132/ 56,3°	0,14/−120,0°	8,1

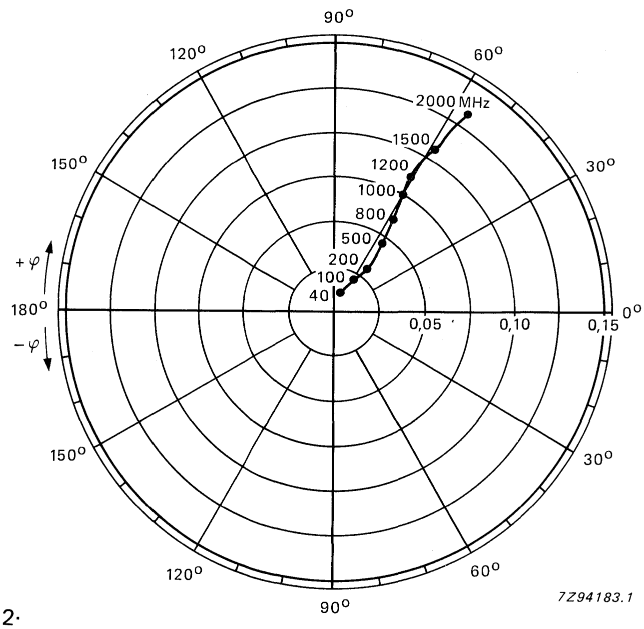
$-V_{CE}$ = 8 V
$-I_C$ = 30 mA
T_{amb} = 25 °C



Input impedance derived from input reflection coefficient S_{11} co-ordinates in ohm x 50.

Fig.6.

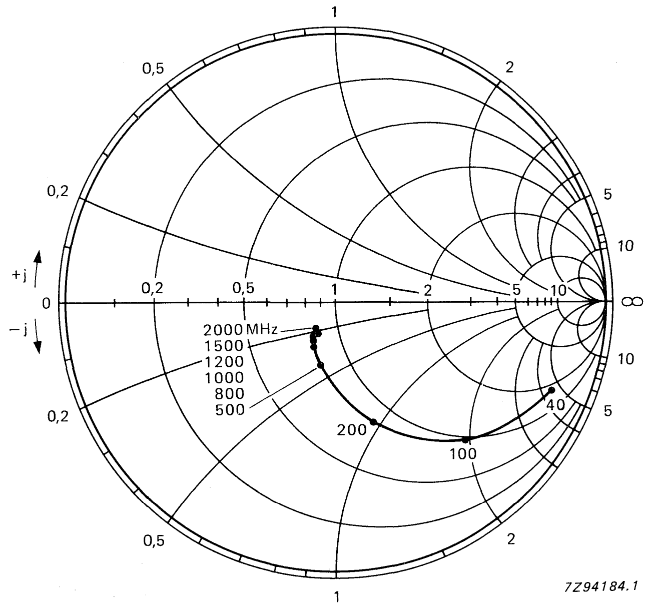
$-V_{CE}$ = 8 V
$-I_C$ = 30 mA
T_{amb} = 25 °C



Reverse transmission coefficient S_{12}.

Fig.7.

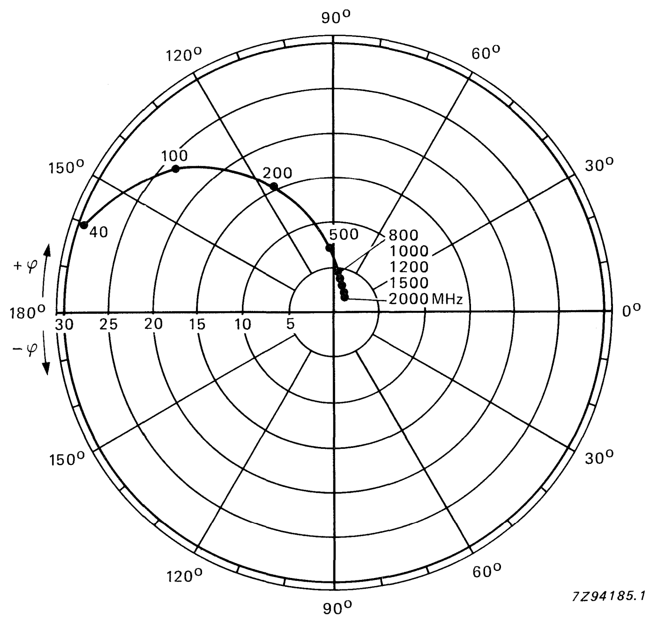
$-V_{CE}$ = 8 V
$-I_C$ = 30 mA
T_{amb} = 25 °C



Output impedance derived from output reflection coefficient S_{22} co-ordinates on ohm x 50.

Fig.8.

$-V_{CE}$ = 8 V
$-I_C$ = 30 mA
T_{amb} = 25 °C



Forward transmission coefficient S_{21}.

Fig.9.

PNP 5 GHz WIDEBAND TRANSISTOR

PNP 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 UHF 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.

NPN 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 (DC)	$-I_C$	max.	35	mA
Total power dissipation up to T_{amb} = 65 °C	P_{tot}	max.	150	mW
Junction temperature	T_j	max.	200	°C
Transition frequency at f = 500 MHz $-I_C$ = 30 mA; $-V_{CE}$ = 5 V	f_T	typ.	5.0	GHz
Feedback capacitance at f = 1 MHz I_C = 0; $-V_{CE}$ = 5 V; T_{amb} = 25 °C	C_{re}	typ.	0.8	pF
Noise figure at optimum source impedance $-I_C$ = 2 mA; $-V_{CE}$ = 5 V; f = 500 MHz	F	typ.	2.4	dB
Maximum unilateral power gain $-I_C$ = 30 mA; $-V_{CE}$ = 5 V; f = 500 MHz	G_{UM}	typ.	15.0	dB

MECHANICAL DATA

TO-72 with insulated electrodes (see outlines section).

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 (DC)	$-I_C$	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 range	T_{stg}		−65 to +200	°C
Junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	900	K/W
From junction to case	$R_{th\ j\text{-}c}$	=	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
DC current gain $-I_C = 30$ mA; $-V_{CE} = 5$ V	h_{FE}	min. typ.	20 50	
Transition frequency (note 1) $-I_C = 30$ mA; $-V_{CE} = 5$ V; f = 500 MHz	f_T	typ.	5.0	GHz
Collector capacitance (note 2) $I_E = I_e = 0$; $-V_{CB} = 5$ V; f = 1 MHz	C_c	typ.	1.2	pF
Emitter capacitance $I_C = I_c = 0$; $-V_{EB} = 0{,}5$ V; f = 1 MHz	C_e	typ.	2.5	pF
Feedback capacitance (note 1) $I_C = 0$; $-V_{CE} = 5$ V; f = 1 MHz	C_{re}	typ.	0.8	pF
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

Maximum unilateral power gain (note 1)
S_{12} assumed to be zero

$$G_{UM} = 10 \log \frac{|S_{21}|^2}{[1 - |S_{11}|^2]\ [1 - |S_{22}|^2]}$$

$-I_C = 30$ mA; $-V_{CE} = 5$ V; f = 500 MHz; T_{amb} = 25 °C	G_{UM}	typ.	15.0	dB

Notes

1. Shield lead grounded.
2. Shield lead not connected.

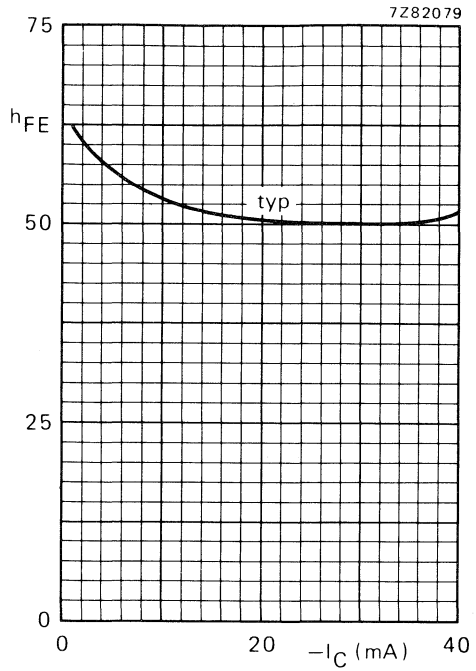


Fig.1 DC current gain as a function of collector current; $-V_{CE}$ = 5 V; T_j = 25 °C; typical values.

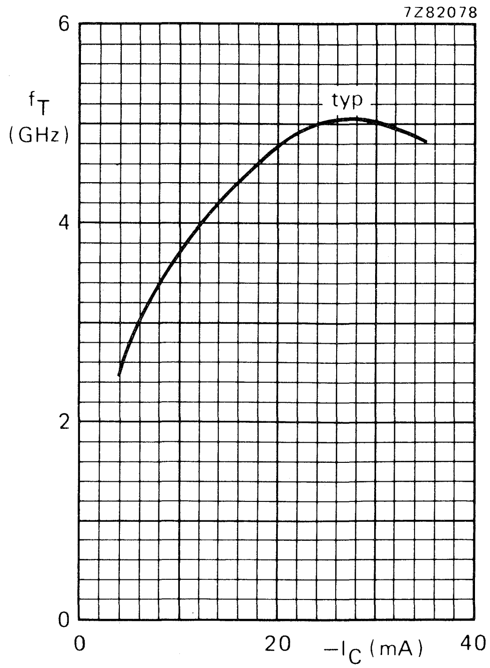


Fig.2 Transition frequency as a function of collector current; $-V_{CE}$ = 5 V; f = 500 MHz; T_j = 25 °C; typical values.

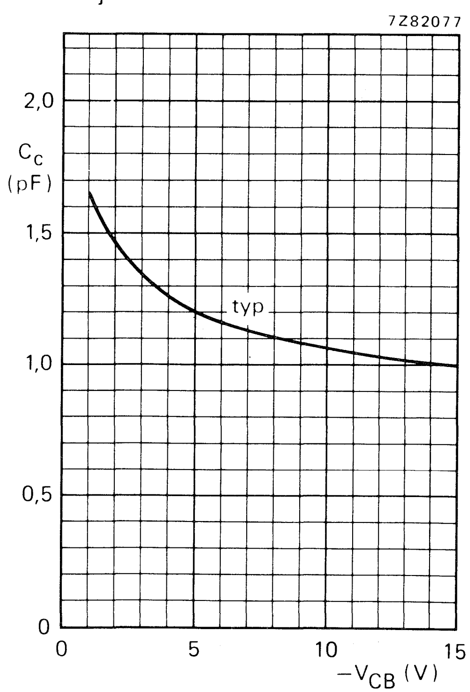


Fig.3 Collector capacitance as a function of collector-base voltage; $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C; typical values.

PNP 3 GHz WIDEBAND TRANSISTOR

PNP transistor in a plastic SOT37 envelope.

It is intended for use in UHF 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.

NPN 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 (DC)	$-I_C$	max.	75	mA
Total power dissipation up to T_{amb} = 60 °C	P_{tot}	max.	500	mW
Junction temperature	T_j	max.	175	°C
Transition frequency at f = 500 MHz $-I_C$ = 50 mA; $-V_{CE}$ = 10 V	f_T	min.	3.6	GHz
Feedback capacitance at f = 1 MHz $-I_C$ = 10 mA; $-V_{CE}$ = 10 V	C_{re}	max.	1.4	pF
Noise figure at optimum source impedance $-I_C$ = 50 mA; $-V_{CE}$ = 10 V; f = 500 MHz	F	typ.	3.75	dB
Output voltage at d_{im} = −60 dB $-I_C$ = 50 mA; $-V_{CE}$ = 10 V; R_L = 75 Ω; $f_{(p+q-r)}$ = 493.25 MHz	V_o	typ.	500	mV

MECHANICAL DATA

SOT37.

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 (DC)	$-I_C$	max.	75	mA
Collector current (peak value); $f > 1$ MHz	$-I_{CM}$	max.	150	mA
Total power dissipation up to T_{amb} = 60 °C	P_{tot}		500	mW
Storage temperature range	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 fibre-glass print	$R_{th\ j\text{-}a}$	=	230	K/W
From junction to soldering point	$R_{th\ j\text{-}s}$	=	45	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current $I_E = 0$; $-V_{CB} = 10$ V	$-I_{CBO}$	max.	100	nA
DC current gain $-I_C = 50$ mA; $-V_{CE} = 10$ V	h_{FE}	min.	20	
$-I_C = 75$ mA; $-V_{CE} = 10$ V	h_{FE}	min.	20	
Transition frequency at f = 500 MHz $-I_C = 50$ mA; $-V_{CE} = 10$ V	f_T	min. typ.	3.6 4.2	GHz GHz
$-I_C = 75$ mA; $-V_{CE} = 10$ V	f_T	min. typ.	4.0 4.6	GHz 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
Feedback capacitance at f = 1 MHz $-I_C = 10$ mA; $-V_{CE} = 10$ V	C_{re}	max. typ.	1.4 1.25	pF pF

Noise figure at optimum source impedance			
$-I_C$ = 50 mA; $-V_{CE}$ = 10 V; f = 500 MHz; T_{amb} = 25 °C	F	typ.	3.75 dB
Maximum unilateral power gain (S_{12} assumed to be zero)			
$G_{UM} = 10 \log \frac{\|S_{21}\|^2}{[1-\|S_{11}\|^2][1-\|S_{22}\|^2]}$			
$-I_C$ = 50 mA; $-V_{CE}$ = 10 V; f = 500 MHz; T_{amb} = 25 °C	G_{UM}	typ.	14.0 dB
Output voltage at d_{im} = −60 dB			
$-I_C$ = 50 mA; $-V_{CE}$ = 10 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 $f_{(p+q-r)}$ = 495.25 MHz	V_o	typ.	500 mV

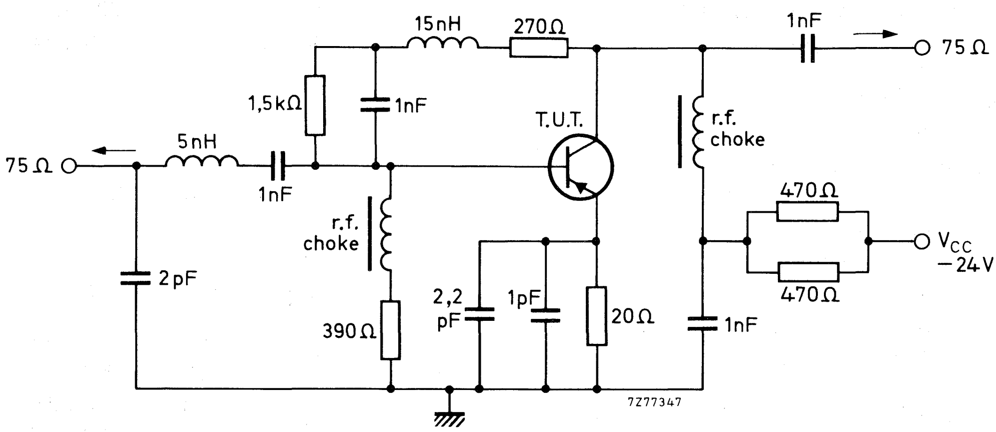


Fig.1 Intermodulation test circuit.

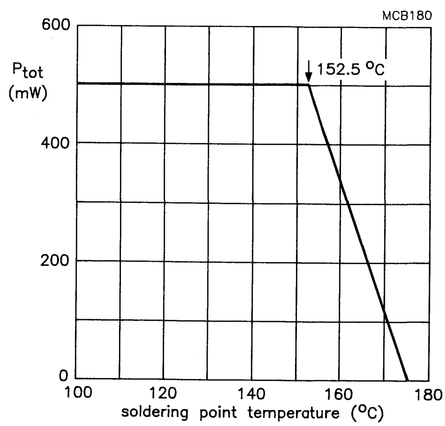


Fig.2 Power derating curve.

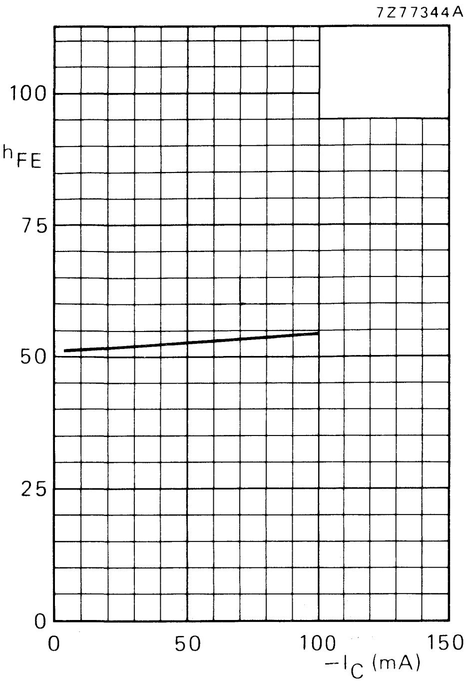


Fig.3 DC current gain as a function of collector current.
$-V_{CE}$ = 10 V; T_j = 25 °C; typical values.

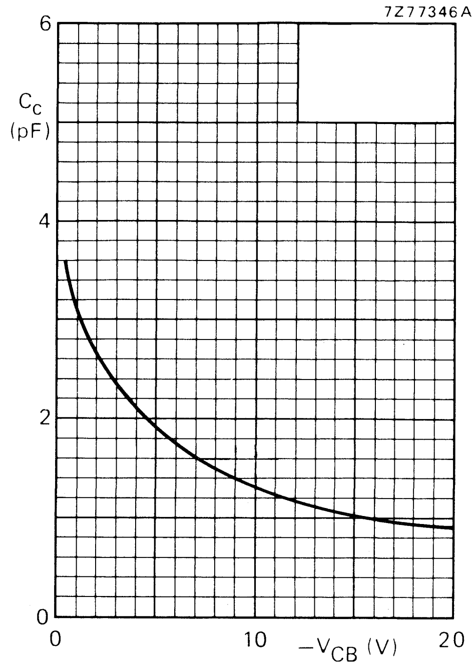


Fig.4 Collector capacitance as a function of collector-base voltage.
$I_E = i_e = 0$; f = 1 MHz; T_j = 25 °C; typical values.

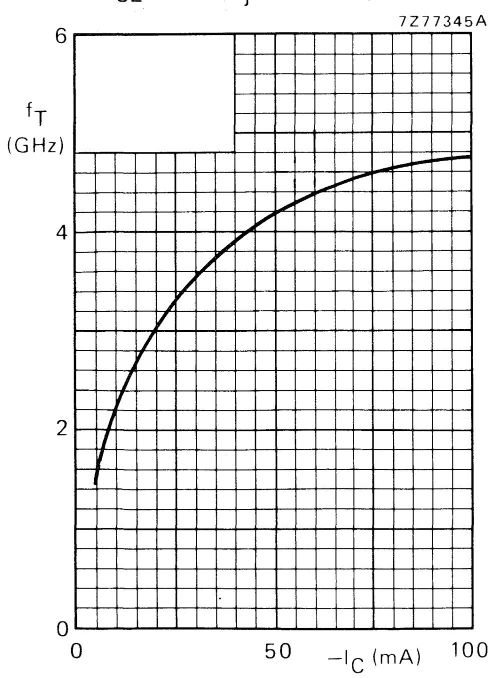


Fig.5 Transition frequency as a function of collector current.
$-V_{CE}$ = 10 V; f = 500 MHz; T_j = 25 °C; typical values.

PNP 4 GHz WIDEBAND TRANSISTOR

PNP transistor in a sub-miniature HERMETICALLY SEALED micro-stripline SOT173 and SOT173X envelope. It is intended for use in UHF 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.

NPN complement is BFP96.

QUICK REFERENCE DATA

Collector-base voltage	$-V_{CBO}$	max.	20	V
Collector-emitter voltage	$-V_{CEO}$	max.	15	V
Collector current (DC)	$-I_C$	max.	100	mA
Total power dissipation up to T_{amb} = 75 °C	P_{tot}	max.	500	mW
Junction temperature	T_j	max.	175	°C
DC current gain $-I_C$ = 50 mA; $-V_{CE}$ = 10 V	h_{FE}	min.	20	
Transition frequency at f = 500 MHz $-I_C$ = 50 mA; $-V_{CE}$ = 10 V	f_T	typ.	4.5	GHz
Maximum unilateral power gain $-I_C$ = 50 mA; $-V_{CE}$ = 10 V at f = 500 MHz	G_{UM}	typ.	18.0	dB
at f = 800 MHz	G_{UM}	typ.	14.0	dB

MECHANICAL DATA

Marking code: C2

SOT173 and SOT173X (see outlines section).

ORDERING AND PACKAGE INFORMATION

EXTENDED TYPE NUMBER	PACKAGE		
	CODE	PACKING METHOD	PACKING QUANTITY
BFQ32C	SOT173	BULK	50
BFQ32C	SOT173X	12 mm REEL	1000

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 (DC)	$-I_C$	max.	100	mA
Total power dissipation up to T_{amb} = 75 °C mounted on a ceramic substrate of 0.7 mm x 10 cm^2	P_{tot}	max.	500	mW
Storage temperature range	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	$R_{th\ j\text{-}a}$	=	200	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current $I_E = 0$; $-V_{CB} = 10$ V	$-I_{CBO}$	max.	100 nA
DC current gain $-I_C = 50$ mA; $-V_{CE} = 10$ V	h_{FE}	min.	20
Transition frequency at f = 500 MHz $-I_C = 50$ mA; $-V_{CE} = 10$ V	f_T	typ.	4.5 GHz
Collector capacitance at f = 1 MHz $I_E = I_e = 0$; $-V_{CB} = 10$ V	C_c	typ.	1.9 pF
Emitter capacitance at f = 1 MHz $I_C = I_c = 0$; $-V_{EB} = 0.5$ V	C_e	typ.	5.0 pF
Feedback capacitance at f = 1 MHz $I_C = 0$; $-V_{CE} = 10$ V	C_{re}	typ.	1.4 pF

Maximum unilateral power gain (S_{12} assumed to be zero)

$$G_{UM} = 10 \log \frac{|S_{21}|^2}{[1-|S_{11}|^2]\,[1-|S_{22}|^2]}$$

at $-I_C = 50$ mA; $-V_{CE} = 10$ V; $T_{amb} = 25$ °C			
f = 500 MHz	G_{UM}	typ.	18.0 dB
f = 800 MHz	G_{UM}	typ.	14.0 dB
Noise figure at f = 800 MHz; Z_S = opt.; $T_{amb} = 25$ °C; $-I_C = 50$ mA; $-V_{CE} = 10$ V	F	typ.	4.3 dB

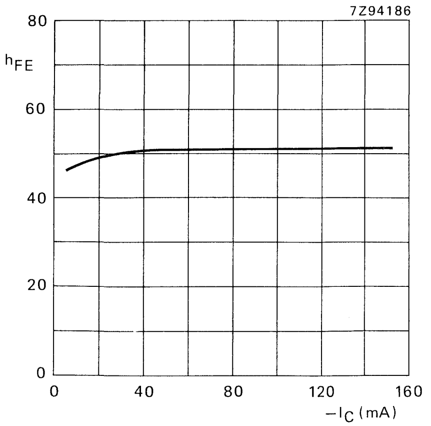


Fig. 1 DC current gain as a function of collector current; $-V_{CE}$ = 10 V; T_j = 25 °C; typical values.

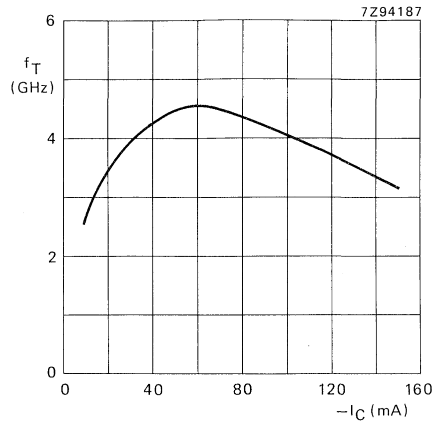


Fig. 2 Transition frequency as a function of collector current; $-V_{CE}$ = 10 V; f = 500 MHz; T_j = 25 °C; typical values.

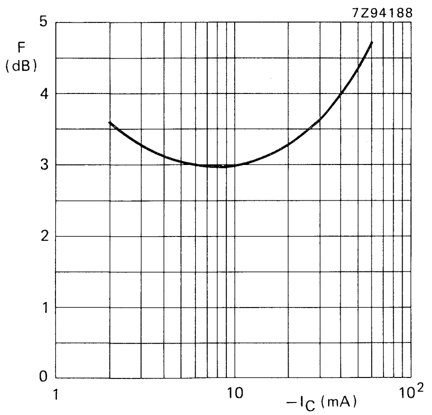


Fig. 3 Noise as a function of collector current; $-V_{CE}$ = 10 V; f = 800 MHz; T_{amb} = 25 °C; Z_S = optimum; typical values.

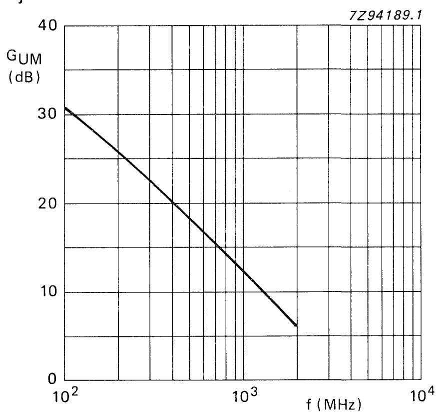


Fig. 4 Maximum unilateral power gain as a function of frequency; $-V_{CE}$ = 10 V; $-I_C$ = 50 mA; T_{amb} = 25 °C; typical values.

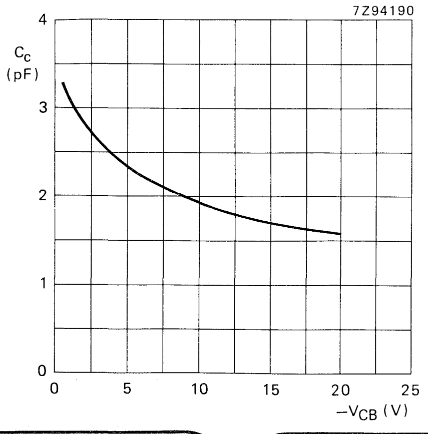


Fig. 5 Collector capacitance as a function of collector-base voltage. I_E = I_e = 0; f = 1 MHz; T_j = 25 °C; typical values.

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

I_C mA	f MHz	S_{11}	S_{21}	S_{12}	S_{22}	G_{UM} dB
	40	0,49/ −69,3°	20,4/153,8°	0,023/ 66,3°	0,88/ −26,1°	33,9
	100	0,64/−117,9°	14,7/127,8°	0,042/ 45,4°	0,65/ −51,6°	28,0
	200	0,72/−148,5°	8,8/107,1°	0,051/ 33,3°	0,41/ −70,4°	22,9
	500	0,76/−173,5°	3,8/ 85,3°	0,061/ 32,9°	0,26/ −88,9°	15,6
10	800	0,76/+176,5°	2,4/ 73,4°	0,071/ 38,7°	0,25/ −96,4°	11,6
	1000	0,76/+171,4°	2,0/ 66,9°	0,079/ 42,5°	0,26/−100,5°	10,1
	1200	0,76/+167,0°	1,7/ 60,7°	0,087/ 45,0°	0,27/−105,9°	8,7
	1500	0,73/+157,7°	1,3/ 51,6°	0,111/ 50,7°	0,29/−102,5°	6,0
	2000	0,75/+147,2°	1,0/ 39,5°	0,136/ 53,3°	0,31/−115,7°	3,9
	40	0,45/ −81,6°	24,5/151,2°	0,021/ 64,7°	0,85/ −31,0°	34,5
	100	0,62/−127,4°	16,6/124,3°	0,036/ 44,9°	0,60/ −60,6°	28,4
	200	0,71/−154,0°	9,8/105,7°	0,044/ 36,4°	0,38/ −83,1°	23,5
	500	0,75/−176,8°	4,2/ 85,4°	0,057/ 40,7°	0,24/−106,2°	16,1
15	800	0,75/+174,1°	2,6/ 72,9°	0,071/ 46,8°	0,22/−113,4°	12,2
	1000	0,74/+168,5°	2,2/ 67,6°	0,083/ 50,1°	0,22/−115,9°	10,3
	1200	0,74/+164,4°	1,8/ 61,9°	0,093/ 51,9°	0,23/−120,1°	8,9
	1500	0,73/+156,9°	1,5/ 54,1°	0,114/ 54,3°	0,26/−122,0°	7,0
	2000	0,76/+147,5°	1,1/ 42,1°	0,138/ 54,7°	0,28/−131,5°	5,0
	40	0,42/ −95,3°	27,9/148,7°	0,019/ 63,2°	0,83/ −35,6°	34,8
	100	0,63/−136,0°	18,1/121,9°	0,032/ 44,6°	0,56/ −68,5°	29,0
	200	0,71/−158,8°	10,5/104,2°	0,039/ 38,7°	0,36/ −94,6°	24,1
	500	0,74/−178,8°	4,4/ 85,3°	0,053/ 45,7°	0,20/−117,4°	16,6
20	800	0,74/+173,0°	2,8/ 73,5°	0,070/ 51,6°	0,23/−129,4°	12,7
	1000	0,74/+167,6°	2,3/ 68,5°	0,083/ 54,4°	0,22/−131,6°	10,8
	1200	0,74/+163,5°	1,9/ 63,0°	0,094/ 55,6°	0,23/−134,6°	9,4
	1500	0,73/+156,7°	1,6/ 55,2°	0,116/ 56,7°	0,23/−137,0°	7,5
	2000	0,75/+147,3°	1,2/ 43,4°	0,142/ 55,8°	0,25/−145,7°	5,4
	40	0,42/−120,4°	32,2/145,8°	0,016/ 61,2°	0,79/ −42,2°	35,2
	100	0,65/−148,4°	20,1/119,5°	0,025/ 44,4°	0,53/ −80,2°	29,9
	200	0,73/−165,5°	11,3/102,0°	0,031/ 41,5°	0,36/−111,0°	25,0
	500	0,76/+179,3°	4,7/ 84,6°	0,046/ 51,1°	0,27/−141,8°	17,5
30	800	0,76/+172,1°	3,0/ 74,7°	0,064/ 56,4°	0,26/−150,4°	13,6
	1000	0,76/+167,5°	2,4/ 69,5°	0,077/ 58,5°	0,25/−153,6°	11,6
	1200	0,76/+163,8°	2,0/ 64,5°	0,088/ 59,0°	0,25/−156,1°	10,0
	1500	0,74/+155,7°	1,7/ 56,8°	0,119/ 59,7°	0,24/−150,9°	8,1
	2000	0,76/+146,1°	1,3/ 45,3°	0,146/ 57,8°	0,25/−157,6°	6,0
	40	0,46/−137,3°	36,6/141,9°	0,013/ 58,9°	0,73/ −50,0°	35,6
	100	0,68/−157,1°	21,5/116,3°	0,020/ 45,6°	0,49/ −92,1°	30,5
	200	0,74/−170,4°	11,8/100,1°	0,026/ 46,9°	0,36/−124,6°	25,5
	500	0,76/−177,5°	4,9/ 84,0°	0,043/ 57,7°	0,30/−153,4°	18,0
50	800	0,76/+171,0°	3,1/ 74,9°	0,063/ 61,4°	0,28/−161,8°	14,0
	1000	0,76/+166,6°	2,5/ 69,8°	0,076/ 62,5°	0,27/−165,5°	12,0
	1200	0,76/+162,9°	2,1/ 64,9°	0,089/ 62,4°	0,27/−168,1°	10,5
	1500	0,74/+155,2°	1,7/ 57,6°	0,123/ 61,0°	0,23/−165,0°	8,2
	2000	0,76/+146,1°	1,3/ 46,7°	0,151/ 58,4°	0,23/−172,4°	6,2

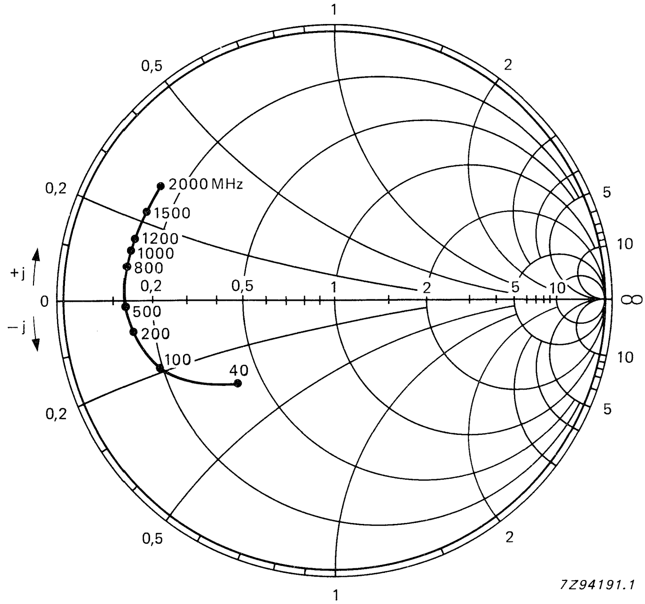


Fig. 6 $-V_{CE} = 10$ V; $-I_C = 50$ mA; $T_{amb} = 25$ °C; typical values.

Input impedance derived from input reflection coefficient S_{11} co-ordinates in ohm x 50.

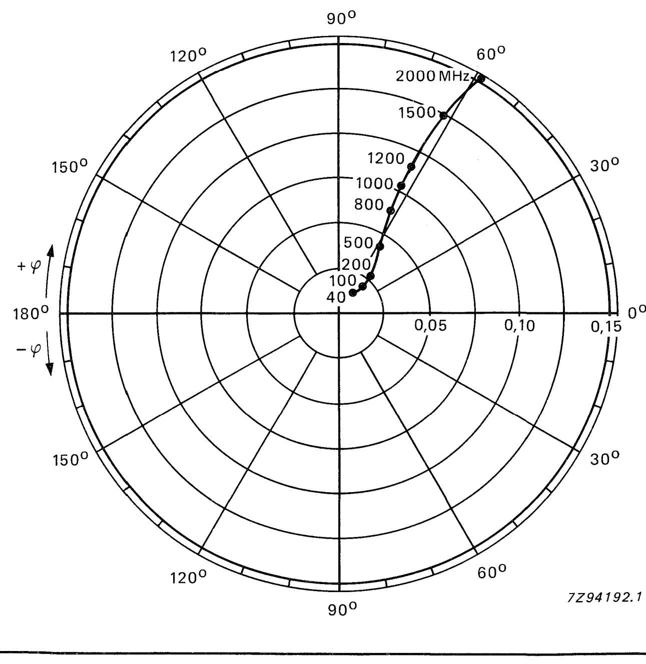


Fig. 7 $-V_{CE} = 10$ V; $-I_C = 50$ mA; $T_{amb} = 25$ °C; typical values.

Reverse transmission coefficient S_{12}.

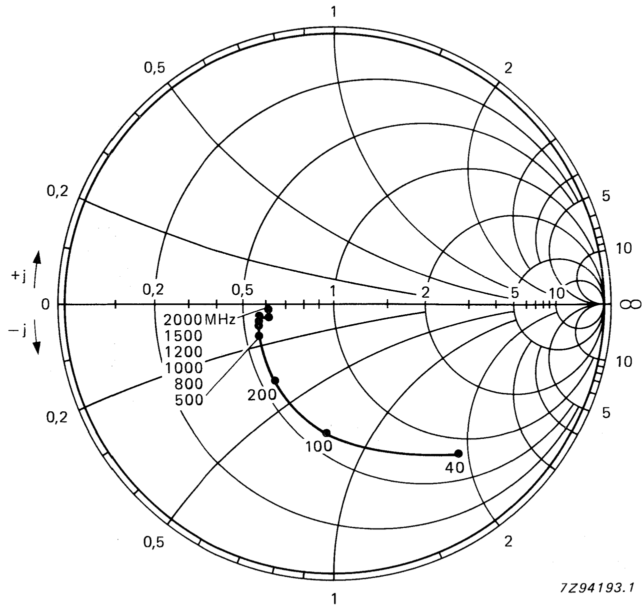


Fig. 8 $-V_{CE}$ = 10 V; $-I_C$ = 50 mA; T_{amb} = 25 °C; typical values.

Output impedance derived from output reflection coefficient S_{22} co-ordinates in ohm x 50.

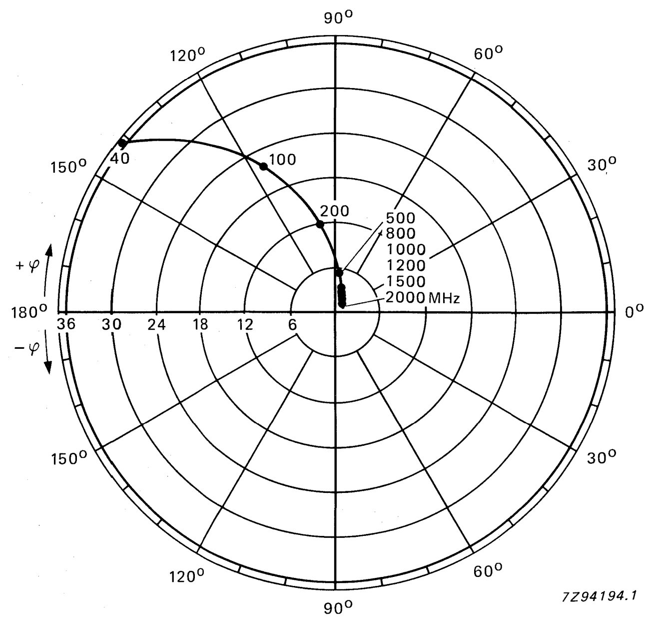


Fig. 9 $-V_{CE}$ = 10 V; $-I_C$ = 50 mA; T_{amb} = 25 °C; typical values.

Forward transmission coefficient S_{21}.

PNP 4 GHz WIDEBAND TRANSISTOR

PNP 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 UHF 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.

NPN 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 (DC)	$-I_C$	max.	75	mA
Total power dissipation up to T_{amb} = 50 °C	P_{tot}	max.	250	mW
Junction temperature	T_j	max.	200	°C
Transition frequency at f = 500 MHz $-I_C$ = 50 mA; $-V_{CE}$ = 5 V	f_T	typ.	4.5	GHz
Feedback capacitance at f = 1 MHz $-I_C$ = 10 mA; $-V_{CE}$ = 10 V	C_{re}	typ.	1.4	pF
Noise figure at optimum source impedance $-I_C$ = 10 mA; $-V_{CE}$ = 5 V; f = 200 MHz	F	typ.	1.9	dB
Maximum unilateral power gain $-I_C$ = 20 mA; $-V_{CE}$ = 5 V; f = 200 MHz	G_{UM}	typ.	18.0	dB

MECHANICAL DATA

TO-72.

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 (DC)	$-I_C$	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 range	T_{stg}	−65 to	+ 200	°C
Junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	600	K/W
From junction to case	$R_{th\ j\text{-}c}$	=	350	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current				
$-I_E = 0$; $-V_{CB} = 10$ V	$-I_{CBO}$	max.	100	nA
DC current gain				
$-I_C = 20$ mA; $-V_{CE} = 5$ V	h_{FE}	min.	20	
$-I_C = 50$ mA; $-V_{CE} = 5$ V	h_{FE}	min.	20	
Transition frequency (note 1)				
$-I_C = 50$ mA; $-V_{CE} = 5$ V; f = 500 MHz	f_T	typ.	4.5	GHz
Collector capacitance (note 2)				
$I_E = i_e = 0$; $-V_{CB} = 10$ V; f = 1 MHz	C_c	typ.	1.8	pF
Emitter capacitance				
$I_C = i_c = 0$; $-V_{EB} = 0.5$ V; f = 1 MHz	C_e	typ.	0.4	pF
Feedback capacitance (note 1)				
$-I_C = 10$ mA; $-V_{CE} = 10$ V; f = 1 MHz; T_{amb} = 25 °C	C_{re}	typ.	1.4	pF
Noise figure at optimum source impedance (note 1)				
$-I_C = 10$ mA; $-V_{CE} = 5$ V; f = 200 MHz; T_{amb} = 25 °C	F	typ.	1.9	dB
$-I_C = 10$ mA; $-V_{CE} = 5$ V; f = 500 MHz; T_{amb} = 25 °C	F	typ.	2.3	dB

Maximum unilateral power gain (note 1)

S_{12} assumed to be zero

$$G_{UM} = 10 \log \frac{|S_{21}|^2}{[1-|S_{11}|^2]\ [1-|S_{22}|^2]}$$

$-I_C = 20$ mA; $-V_{CE} = 5$ V; f = 200 MHz; T_{amb} = 25 °C	G_{UM}	typ.	18.0	dB
$-I_C = 50$ mA; $-V_{CE} = 5$ V; f = 500 MHz; T_{amb} = 25 oC	G_{UM}	typ.	11.0	dB

Notes

1. Shield lead grounded.
2. Shield lead and emitter lead connected to bridge earth.

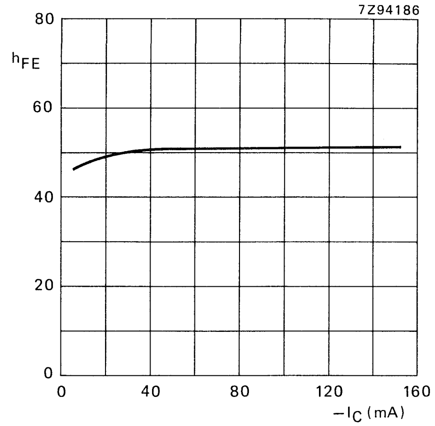


Fig.1 DC current gain as a function of collector current.

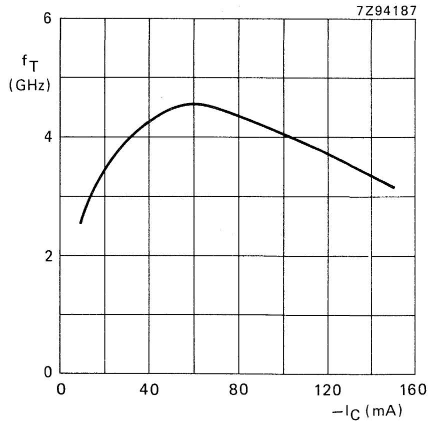


Fig.2 Transition frequency as a function of collector current.

PNP 4 GHz WIDEBAND TRANSISTOR

PNP transistor in a plastic SOT37 envelope.

It is intended for use in UHF 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.

NPN 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 (DC)	$-I_C$	max.	100	mA
Total power dissipation up to T_{amb} = 70 °C	P_{tot}	max.	700	mW
Junction temperature	T_j	max.	175	°C
Transition frequency at f = 500 MHz $-I_C$ = 70 mA; $-V_{CE}$ = 10 V	f_T	typ.	4.5	GHz
Output voltage at d_{im} = −60 dB $-I_C$ = 70 mA; $-V_{CE}$ = 10 V $f_{(p+q-r)}$ = 793.25 MHz	V_o	typ.	600	mV
Noise figure at optimum source impedance $-I_C$ = 50 mA; $-V_{CE}$ = 10 V; f = 800 MHz	F	typ.	4.3	dB
Maximum unilateral power gain $-I_C$ = 70 mA; $-V_{CE}$ = 10 V; f = 800 MHz	G_{UM}	typ.	10.0	dB

MECHANICAL DATA (see outlines section)

SOT37.

Pinning:

1 = base
2 = emitter
3 = collector

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 (DC)	$-I_C$	max.	100	mA
Total power dissipation up to T_{amb} = 70 °C	P_{tot}	max.	700	mW
Storage temperature range	T_{stg}	–65 to + 150		°C
Junction temperature	T_j	max.	175	°C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	150	K/W
From junction to soldering point	$R_{th\ j\text{-}s}$	=	45	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current $I_E = 0; -V_{CB} = 10$ V	$-I_{CBO}$	max.	100 nA
DC current gain $-I_C = 70$ mA; $-V_{CE} = 10$ V	h_{FE}	min.	20
Transition frequency at f = 500 MHz $-I_C = 70$ mA; $-V_{CE} = 10$ V	f_T	typ.	4.5 GHz
Collector capacitance at f = 1 MHz $I_E = 0; -V_{CB} = 10$ V	C_c	typ.	1.8 pF
Emitter capacitance at f = 1 MHz $I_C = 0; -V_{EB} = 0.5$ V	C_e	typ.	6.0 pF
Feedback capacitance at f = 1 MHz $I_C = 0; -V_{CE} = 10$ V	C_{re}	typ.	1.3 pF
Output voltage at $d_{im} = -60$ dB (see Fig.1) $-I_C = 70$ 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.	600 mV
Noise figure at optimum source impedance $-I_C = 50$ mA; $-V_{CE} = 10$ V; f = 800 MHz; $T_{amb} = 25$ °C	F	typ.	4.3 dB
Maximum unilateral power gain (S_{12} assumed to be zero) $G_{UM} = 10 \log \frac{\lvert S_{21} \rvert}{[1-\lvert S_{11}\rvert^2]\,[1-\lvert S_{22}\rvert^2]}$ $-I_C = 70$ mA; $-V_{CE} = 10$ V; f = 800 MHz; $T_{amb} = 25$ °C	G_{UM}	typ.	10.0 dB

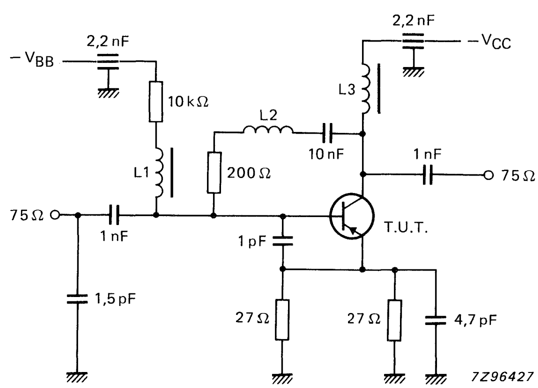


Fig.1 Intermodulation distortion and second harmonic distortion test circuit.

L1 = L3 = 5 μH micro choke.
L2 = 1½ turns Cu wire (0.4 mm); internal diameter 3.0 mm; winding pitch 1 mm.

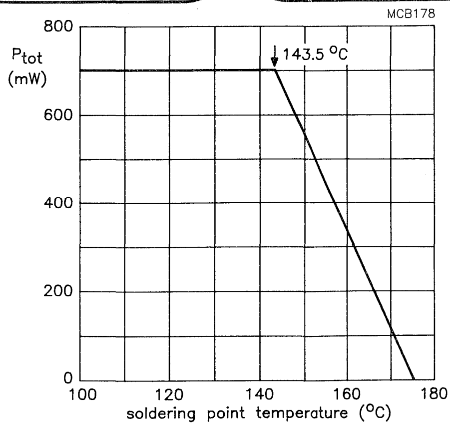


Fig.2 Power derating curve.

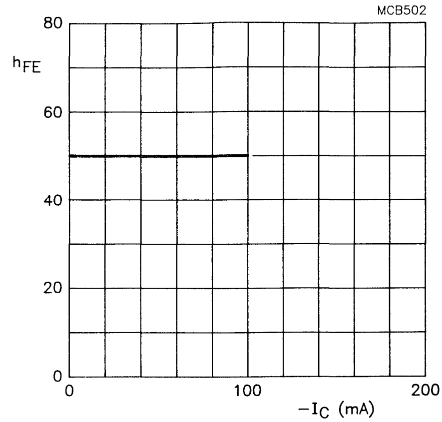


Fig.3 DC current gain as a function of collector current; $-V_{CE}$ = 10 V; T_{amb} = 25 °C.

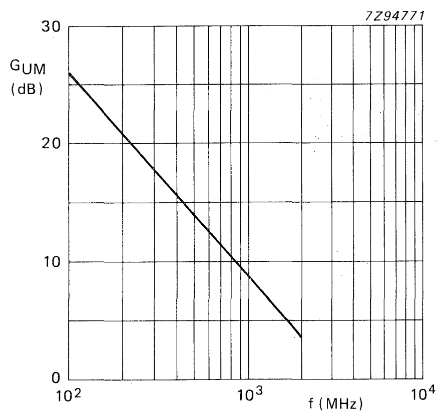


Fig.4 $-V_{CE}$ = 10 V; $-I_C$ = 70 mA; T_{amb} = 25 °C; typical values.

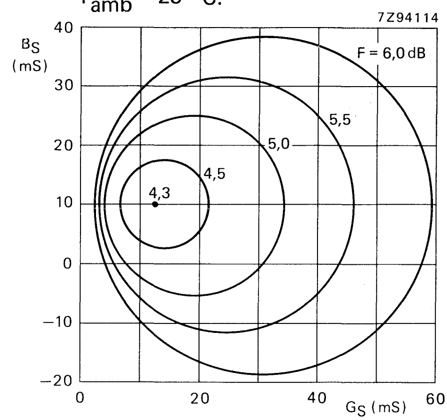


Fig.5 Circles of constant noise figure; $-V_{CE}$ = 10 V; $-I_C$ = 50 mA; f = 800 MHz; T_{amb} = 25 °C; typical values.

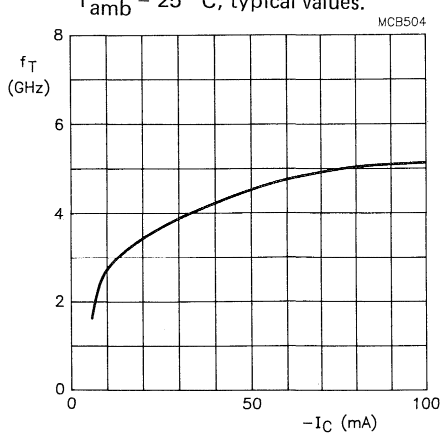


Fig.6 Transition frequency as a function of collector current; $-V_{CE}$ = 10 V; T_{amb} = 25 °C; typical values.

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

I_C mA	f MHz	S_{11}	S_{21}	S_{12}	S_{22}	G_{UM} dB
	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
10	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
	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
20	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
	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
30	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
	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
50	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
	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
70	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

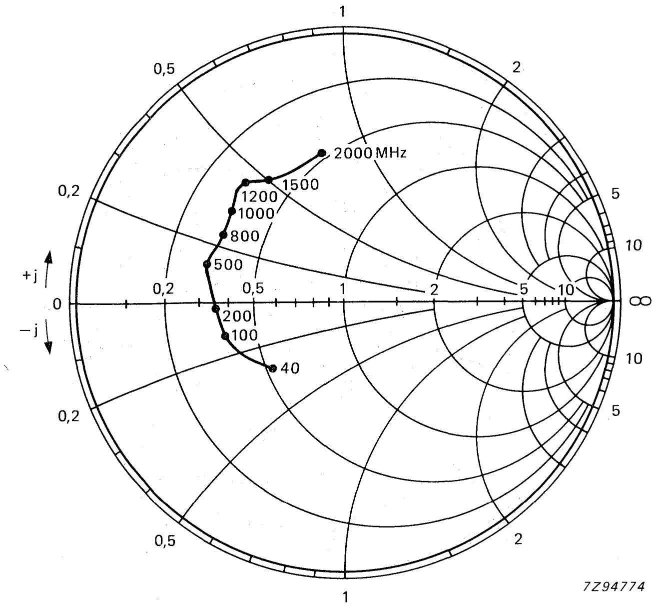


Fig.7 Input impedance, derived from input reflection coefficient S_{11} coordinates, in ohm x 50.

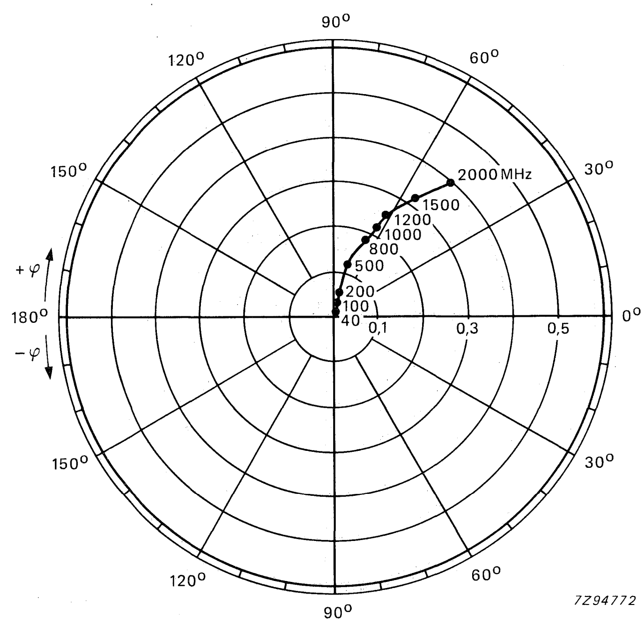


Fig.8 Reverse transmission coefficient S_{12}.

Conditions for Figs 7 to 10: $-V_{CE}$ = 10 V; $-I_C$ = 70 mA; T_{amb} = 25 °C; typical values.

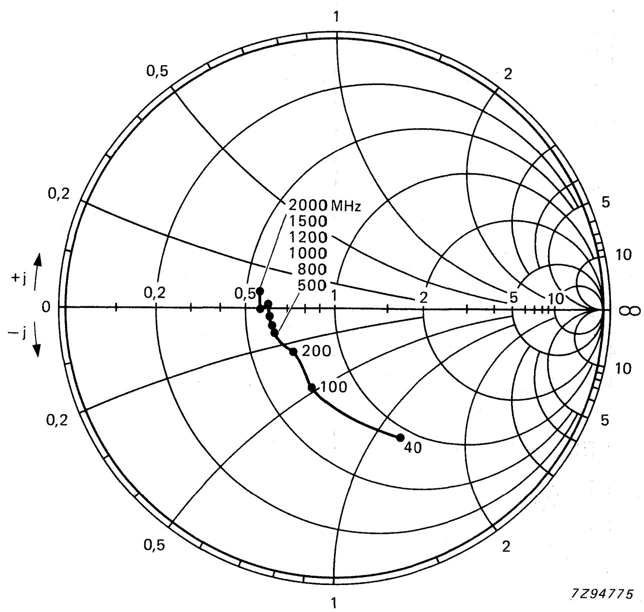


Fig.9 Output impedance, derived from output reflection coefficient S_{22} coordinates, in ohm x 50.

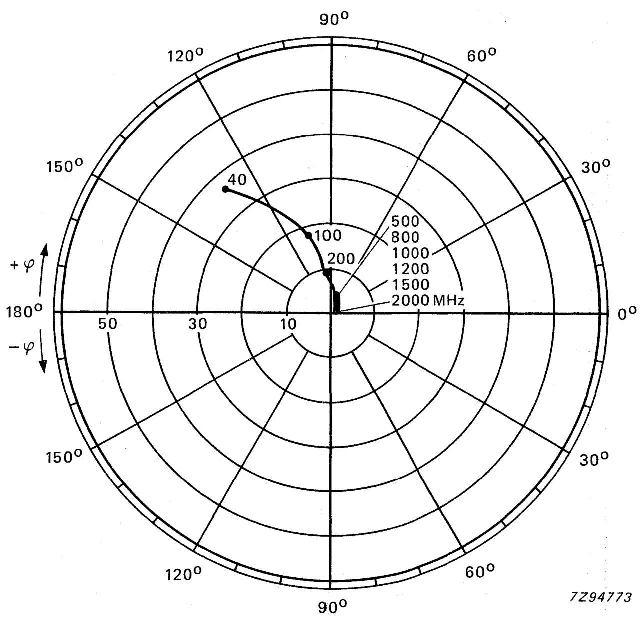


Fig.10 Forward transmission coefficient S_{21}.

NPN 12 GHz WIDEBAND TRANSISTOR

The BFQ33 is an NPN 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 (DC)	I_C	max.	20	mA
Total power dissipation up to T_{amb} = 80 °C	P_{tot}	max.	140	mW
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
Maximum unilateral power gain I_C = 14 mA; V_{CE} = 5 V; f = 2 GHz; T_{amb} = 25 °C	G_{UM}	typ.	13.7	dB

MECHANICAL DATA

SOT100

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 (DC)	I_C	max.	20	mA
Total power dissipation up to T_{amb} = 80 °C	P_{tot}	max.	140	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 fibre-glass print of 40 mm x 25 mm x 1 mm	$R_{th\ j\text{-}a}$	=	500	K/W

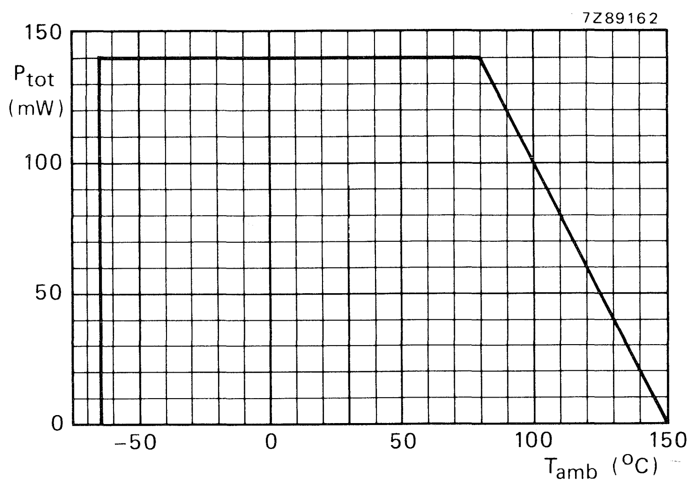


Fig.1 Power derating curve versus ambient temperature.

CHARACTERISTICS

T_{amb} = 25 °C unless otherwise specified

Collector cut-off current			
$I_E = 0$; $V_{CB} = 5$ V	I_{CBO}	<	50 nA
DC current gain (note 1)			
$I_C = 14$ 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 (note 1)			
$I_C = 14$ 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_{12} assumed to be zero)

$$G_{UM} = 10 \log \frac{|S_{21}|^2}{[1-|S_{11}|^2]\,[1-|S_{22}|^2]}$$

$I_C = 14$ 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; $R_S = R_L = 50\ \Omega$; f = 2 GHz			
Input reflection coefficient	S_{11}	typ.	0.18/−155°
Reverse transmission coefficient	S_{12}	typ.	0.10/ +49°
Forward transmission coefficient	S_{21}	typ.	4.3 / +75°
Output reflection coefficient	S_{22}	typ.	0.43/ −56°
$I_C = 14$ mA; $V_{CE} = 5$ V; $R_S = R_L = 50\ \Omega$; f = 4 GHz			
Input reflection coefficient	S_{11}	typ.	0.19/+171°
Reverse transmission coefficient	S_{12}	typ.	0.14/ +34°
Forward transmission coefficient	S_{21}	typ.	2.0 / +48°
Output reflection coefficient	S_{22}	typ.	0.50/ −89°

Notes

1. Measured under pulse conditions.

Conditions for Figs 2 and 3:
V_{CE} = 5 V; I_C = 14 mA;
T_{amb} = 25 °C; typical values.

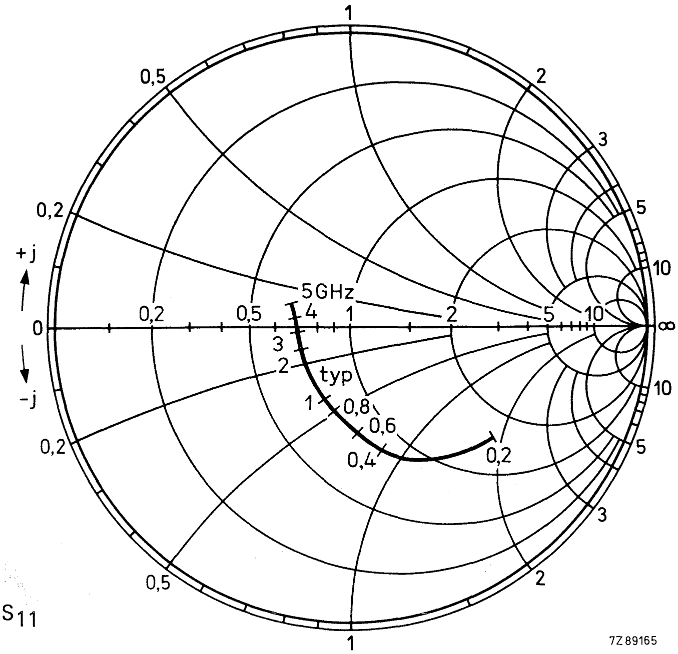


Fig.2 Input impedance derived from input reflection coefficient S_{11} co-ordinates in ohm x 50.

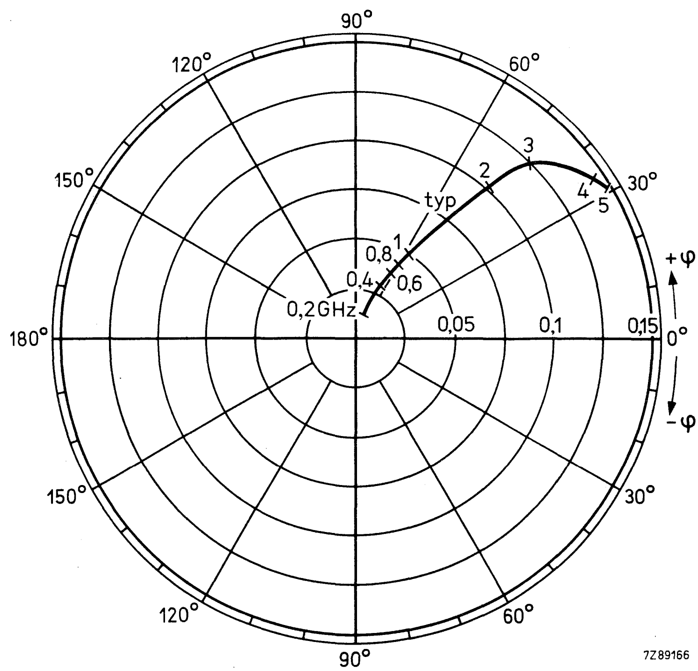


Fig.3 Reverse transmission coefficient S_{12}.

Conditions for Figs 4 and 5:
V_{CE} = 5 V; I_C = 14 mA;
T_{amb} = 25 °C; typical values.

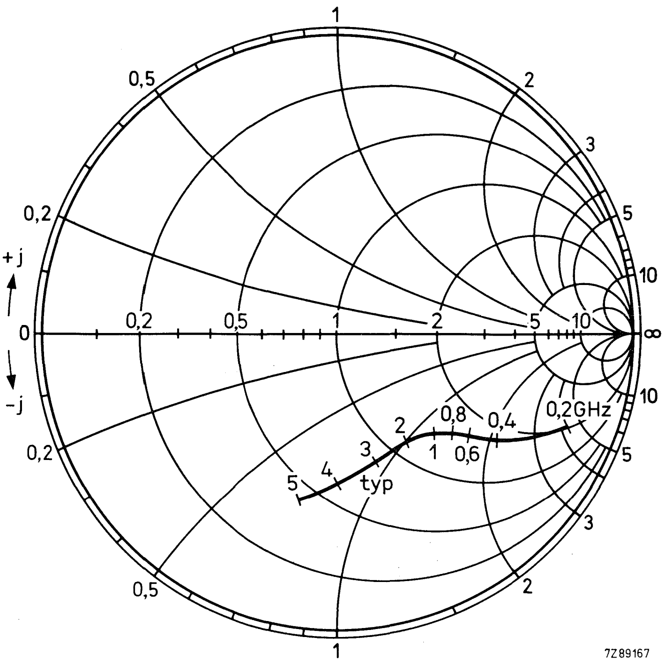


Fig.4 Output impedance derived from output reflection coefficient S_{22} co-ordinates in ohm x 50.

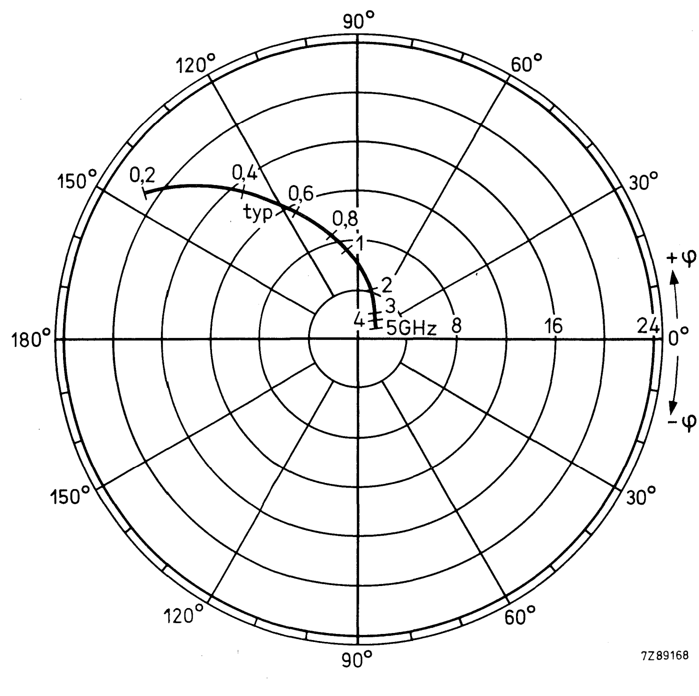


Fig.5 Forward transmission coefficient S_{21}.

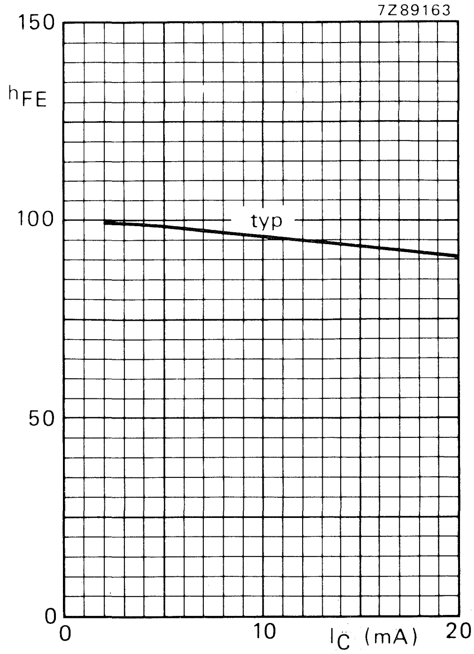


Fig.6 V_{CE} = 5 V; T_j = 25 °C.

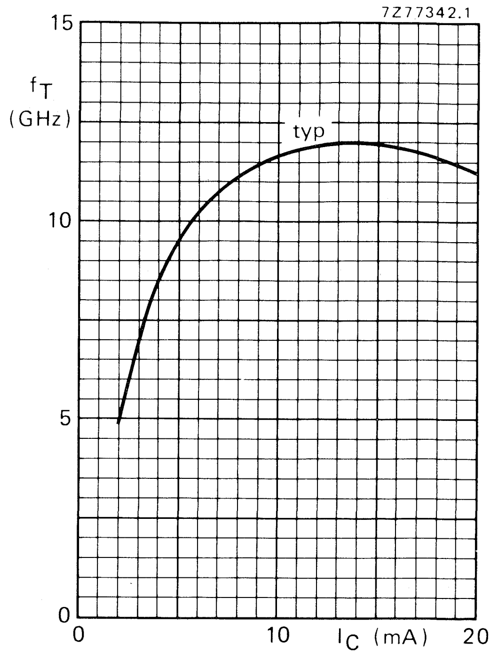


Fig.7 V_{CE} = 5 V; f = 1.5 GHz; T_j = 25 °C.

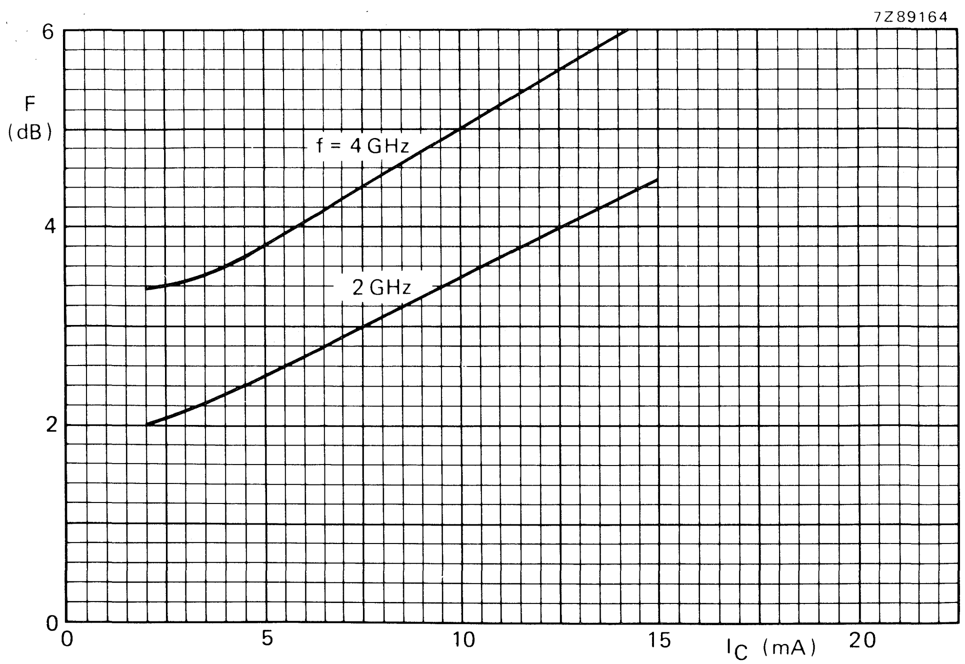


Fig.8 V_{CE} = 5 V; Z_S = optimum; T_{amb} = 25 °C; typical values.

NPN 12 GHz WIDEBAND TRANSISTOR

NPN transistor in a sub-miniature HERMETICALLY sealed microstripline encapsulation, SOT173 and SOT173X.

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 (DC)	I_C	max.	20 mA
Total power dissipation up to T_{amb} = 120 °C	P_{tot}	max.	140 mW
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.	3.0 dB
Maximum unilateral power gain at f = 2 GHz; I_C = 14 mA; V_{CE} = 5 V	G_{UM}	typ.	12.5 dB

MECHANICAL DATA

Marking code: Q3

SOT173 and SOT173X

ORDERING AND PACKAGE INFORMATION

EXTENDED TYPE NUMBER	PACKAGE		
	CODE	PACKING METHOD	PACKING QUANTITY
BFQ33C	SOT173	BULK	50
BFQ33C	SOT173X	12 mm REEL	1000

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 (DC)	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.	175	°C

THERMAL RESISTANCE

From junction to ambient in free air mounted on a ceramic substrate of 0,7 mm x 10 cm^2	$R_{th\ j\text{-}a}$		200	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
D.C. current gain $I_C = 14$ mA; $V_{CE} = 5$ V	h_{FE}	min.	50	
Transition frequency at f = 1,5 GHz $I_C = 14$ mA; $V_{CE} = 5$ V; $T_{amb} = 25$ °C	f_T	typ.	12	GHz
Collector capacitance at f = 1 MHz $I_E = I_e = 0$; $V_{CB} = 5$ V	C_c	typ.	0.35	pF
Feedback capacitance at f = 1 MHz $I_C = 0$; $V_{CE} = 5$ V	C_{re}	typ.	0.2	pF
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

Maximum unilateral power gain (s_{12} assumed to be zero)

$$G_{UM} = 10 \log \frac{|s_{21}|^2}{[1-|s_{11}|^2]\,[1-|s_{22}|^2]}$$

at $I_C = 14$ mA; $V_{CE} = 5$ V; $T_{amb} = 25$ °C

f = 2 GHz	G_{UM}	typ.	12.5	dB
f = 4 GHz	G_{UM}	typ.	7.5	dB

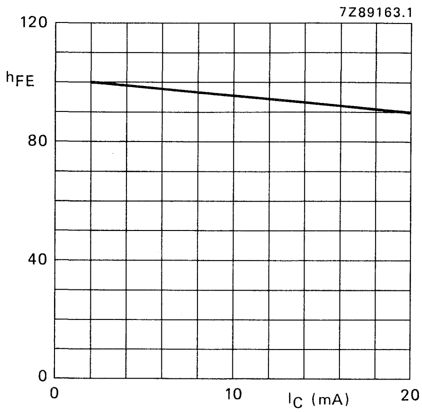


Fig. 1 V_{CE} = 5 V; T_j = 25 °C; typical values.

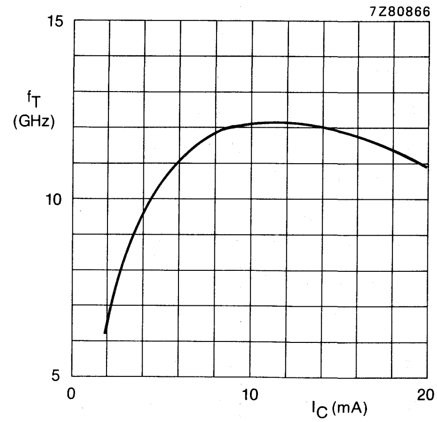


Fig. 2 V_{CE} = 5 V; f = 1.5 GHz; T_{amb} = 25 °C; typical values.

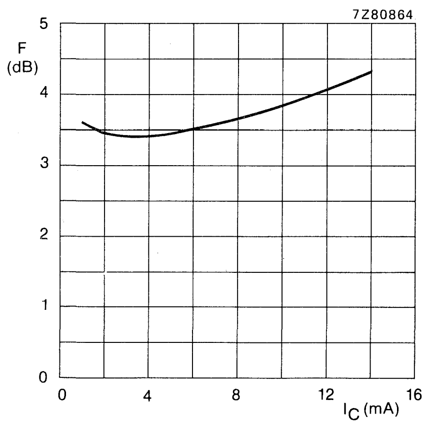


Fig. 3 V_{CE} = 5 V; Z_S = 60 Ω; T_{amb} = 25 °C; f = 2 GHz; typical values.

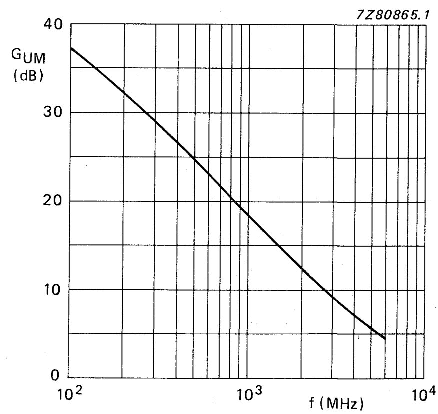


Fig. 4 V_{CE} = 5 V; I_C = 14 mA; T_{amb} = 25 °C; Z_S = 60 Ω; typical values.

s-parameters (common-emitter) at V_{CE} = 5 V; T_{amb} = 25 °C; typical values.

I_C mA	f MHz	s_{11}	s_{21}	s_{12}	s_{22}	G_{UM} dB
	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
5	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
	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
14	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 5 and 6:

V_{CE} = 5 V; I_C = 14 mA;
T_{amb} = 25 °C; typical values.

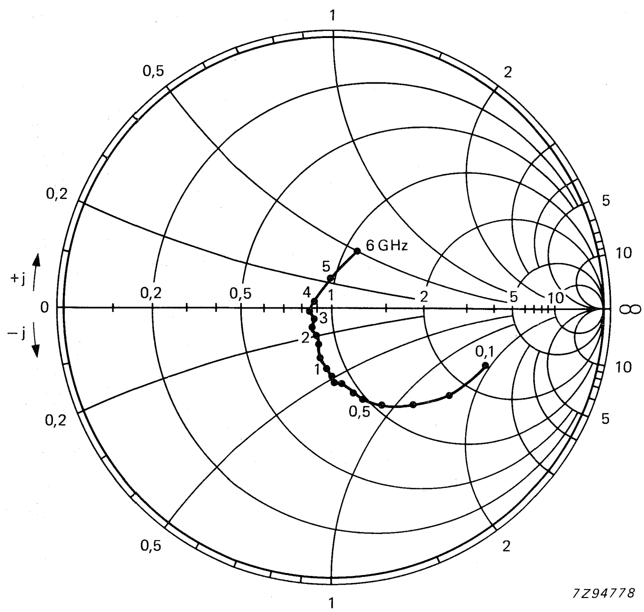


Fig. 5 Input impedance derived from input reflection coefficient s_{11} co-ordinates in ohms x 50.

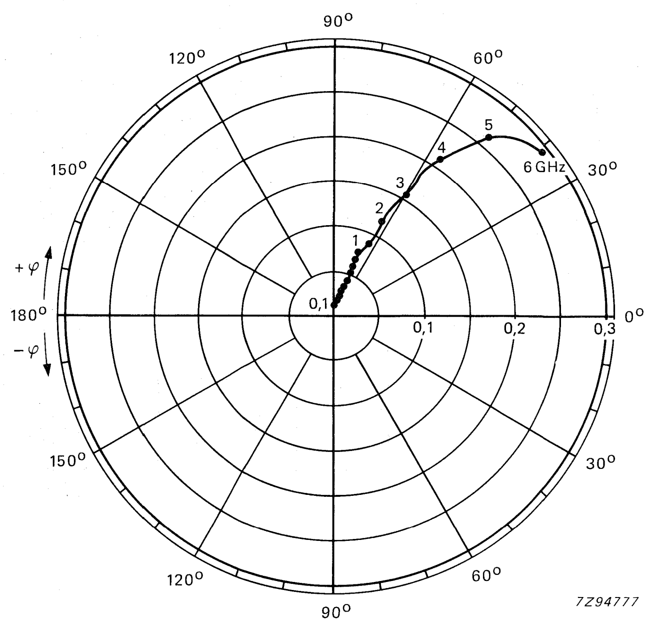


Fig. 6 Reverse transmission coefficient s_{12}.

Conditions for Figs 7 and 8:

V_{CE} = 5 V; I_C = 14 mA;
T_{amb} = 25 °C; typical values.

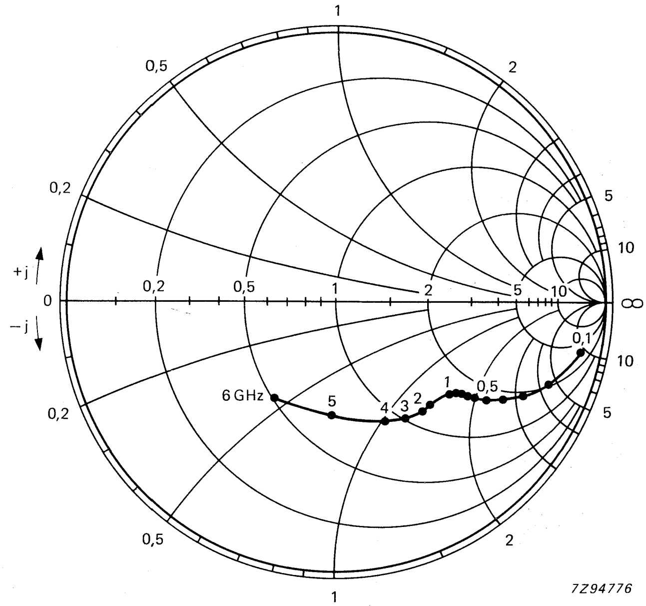


Fig. 7 Output impedance derived from output reflection coefficient s_{22} co-ordinates in ohms x 50.

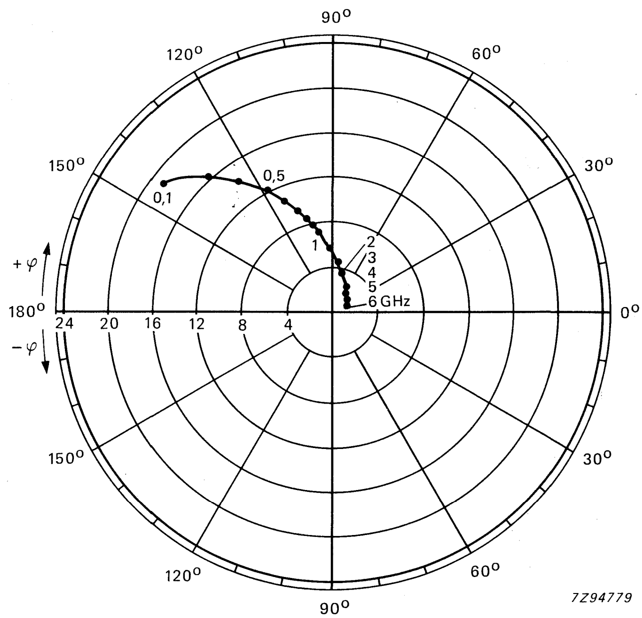


Fig. 8 Forward transmission coefficient s_{21}.

N-P-N 4 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 SOT122 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 °C	P_{tot}	max.	2,25	W
Operating junction temperature	T_j	max.	200	°C
Transition frequency at f = 500 MHz I_C = 150 mA; V_{CE} = 15 V	f_T	min.	4	GHz
Output voltage at d_{im} = −60 dB I_C = 120 mA; V_{CE} = 15 V; R_L = 75 Ω $f_{(p+q-r)}$ = 793,25 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.

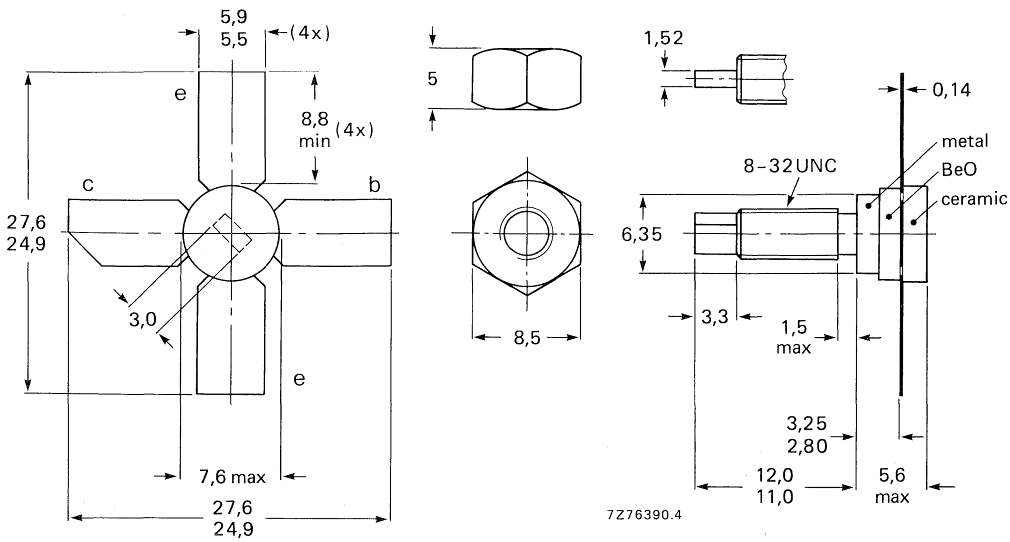
Ordering code: BFQ34/01.

* TO39 version is available on request; ref. ON4497.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-122.



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	$R_{th\ j\text{-}mb}$ =	15,0	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$ =	0,6	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current			
$I_E = 0$; $V_{CB} = 15$ V	I_{CBO}	max.	100 μA
D.C. current gain			
$I_C = 75$ mA; $V_{CE} = 15$ V	h_{FE}	min.	25
$I_C = 150$ mA; $V_{CE} = 15$ V	h_{FE}	min.	25
Transition frequency at f = 500 MHz			
$I_C = 75$ mA; $V_{CE} = 15$ V	f_T	min.	3,0 GHz
		typ.	3,5 GHz
$I_C = 150$ mA; $V_{CE} = 15$ V	f_T	min.	3,5 GHz
		typ.	4,0 GHz
Collector capacitance at f = 1 MHz			
$I_E = I_e = 0$; $V_{CB} = 15$ V	C_c	typ.	2,0 pF
		max.	2,75 pF
Emitter capacitance at f = 1 MHz			
$I_C = I_c = 0$; $V_{EB} = 0{,}5$ V	C_e	typ.	11 pF
Feedback capacitance at f = 1 MHz			
$I_C = 10$ mA; $V_{CE} = 15$ V; $T_{amb} = 25$ °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)			
$I_C = 120$ mA; $V_{CE} = 15$ V; f = 500 MHz; $T_{amb} = 25$ °C	F	typ.	8 dB
Maximum unilateral power gain (s_{12} assumed to be zero)			
$G_{UM} = 10 \log \frac{\lvert s_{21}\rvert^2}{[1-\lvert s_{11}\rvert^2]\,[1-\lvert s_{22}\rvert^2]}$			
$I_C = 120$ mA; $V_{CE} = 15$ V; f = 500 MHz; $T_{amb} = 25$ °C	G_{UM}	typ.	16,3 dB
Output voltage at $d_{im} = -60$ dB (see Figs 2 and 4)			
(DIN 45004B, par. 6.3.: 3-tone)			
$I_C = 120$ mA; $V_{CE} = 15$ 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			
$R_r = V_o - 6$ dB ; $f_r = 805{,}25$ MHz			
measured at $f_{(p+q-r)} = 793{,}25$ 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 mA; V_{CE} = 15 V R_L = 75 Ω; T_{amb} = 25 °C measured at f = 800 MHz	P_{L1}	typ.	+26 dBm
Third order intercept point (see Fig. 2) I_C = 120 mA; V_{CE} = 15 V R_L = 75 Ω; 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.	+45 dBm

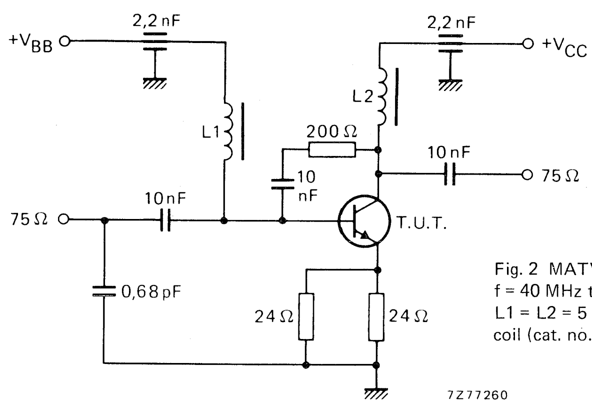


Fig. 2 MATV test circuit
f = 40 MHz to 860 MHz.
L1 = L2 = 5 μH Ferroxcube
coil (cat. no. 3122 108 20153).

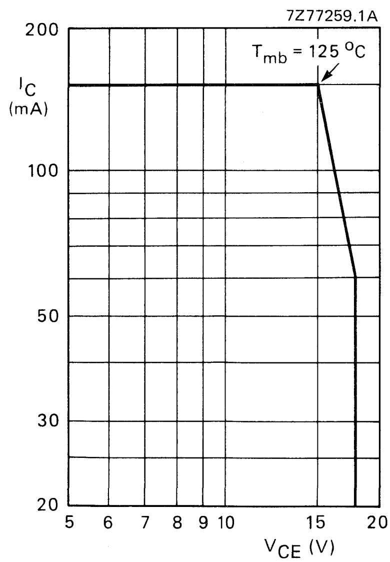


Fig. 3 D.C. SOAR.

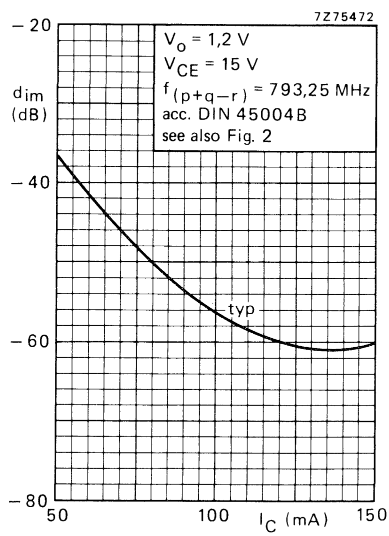


Fig. 4.

s-parameters (common emitter) at V_{CE} = 7,5 V; T_{amb} = 25 °C; typical values.

I_C mA	f MHz	s_{11}	s_{12}	s_{21}	s_{22}	G_{UM} dB
50	40	0,47/ −72°	0,02/64°	30,5/147°	0,85/ −34°	36,3
	200	0,55/−154°	0,06/52°	11,3/101°	0,36/ −84°	23,2
	500	0,54/+177°	0,08/58°	4,9/ 78°	0,25/−104°	15,6
	800	0,52/+160°	0,12/58°	3,2/ 63°	0,25/−113°	11,8
	1000	0,50/+150°	0,15/57°	2,6/ 54°	0,26/−118°	9,9
	1200	0,48/+142°	0,18/54°	2,2/ 46°	0,28/−122°	8,3
75	40	0,45/ −76°	0,02/64°	32,1/144°	0,83/ −36°	36,2
	200	0,54/−156°	0,05/53°	11,6/100°	0,35/ −90°	23,4
	500	0,54/+176°	0,08/59°	5,0/ 78°	0,24/−112°	15,7
	800	0,51/+160°	0,13/59°	3,3/ 63°	0,24/−121°	11,9
	1000	0,49/+150°	0,16/57°	2,7/ 55°	0,24/−124°	10,1
	1200	0,46/+142°	0,18/54°	2,3/ 47°	0,26/−128°	8,6
100	40	0,44/ −79°	0,02/63°	33,0/145°	0,82/ −37°	36,2
	200	0,54/−157°	0,06/54°	11,8/100°	0,35/ −93°	23,5
	500	0,53/+175°	0,09/60°	5,1/ 78°	0,23/−117°	15,8
	800	0,51/+159°	0,13/59°	3,3/ 64°	0,23/−126°	11,9
	1000	0,49/+150°	0,16/57°	2,7/ 55°	0,24/−129°	10,1
	1200	0,46/+142°	0,19/54°	2,3/ 47°	0,26/−131°	8,6
120	40	0,43/ −81°	0,02/63°	33,5/145°	0,82/ −38°	36,2
	200	0,54/−157°	0,05/55°	11,9/ 99°	0,35/ −95°	23,6
	500	0,53/+175°	0,09/60°	5,1/ 77°	0,23/−119°	15,8
	800	0,51/+159°	0,13/59°	3,3/ 63°	0,23/−128°	11,9
	1000	0,48/+149°	0,16/56°	2,7/ 55°	0,24/−131°	10,0
	1200	0,46/+141°	0,19/53°	2,3/ 47°	0,25/−132°	8,5
150	40	0,43/ −82°	0,02/63°	33,6/145°	0,81/ −39°	36,1
	200	0,54/−158°	0,05/55°	11,8/ 99°	0,34/ −96°	23,5
	500	0,53/+175°	0,09/60°	5,1/ 77°	0,23/−121°	15,8
	800	0,51/+159°	0,13/59°	3,3/ 63°	0,23/−129°	11,9
	1000	0,49/+149°	0,16/56°	2,7/ 55°	0,24/−132°	10,1
	1200	0,47/+141°	0,19/53°	2,3/ 47°	0,25/−134°	8,6

s-parameters (common emitter) at V_{CE} = 15 V; T_{amb} = 25 °C; typical values.

I_C mA	f MHz	s_{11}	s_{12}	s_{21}	s_{22}	G_{UM} 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 V; I_C = 120 mA;
T_{amb} = 25 °C; typical values.

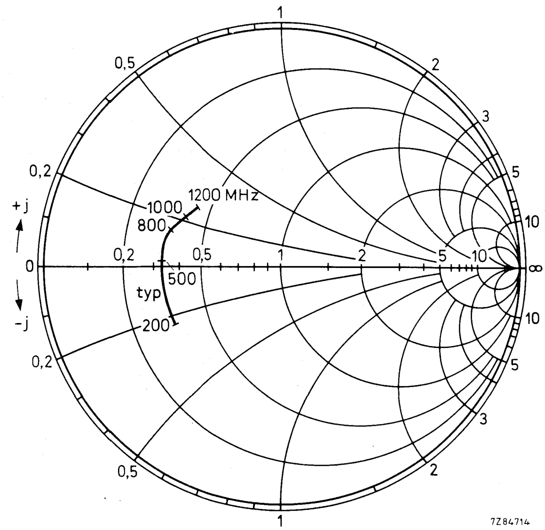


Fig. 5 Input impedance derived from input reflection coefficient s_{11} co-ordinates in ohm x 50.

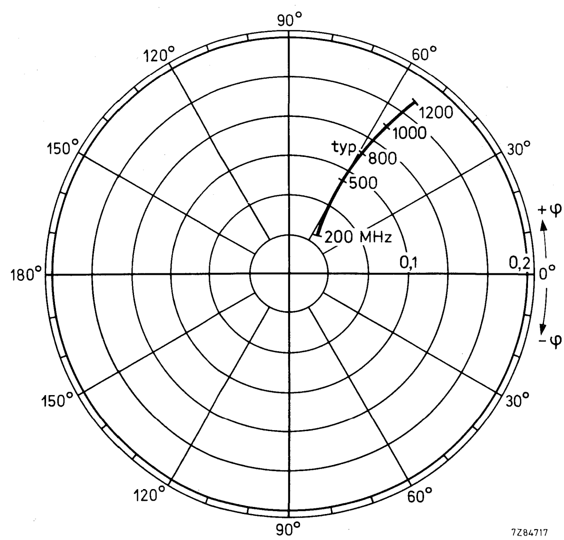


Fig. 6 Reverse transmission coefficient s_{12}.

Conditions for Figs 7 and 8:
V_{CE} = 15 V; I_C = 120 mA;
T_{amb} = 25 °C; typical values.

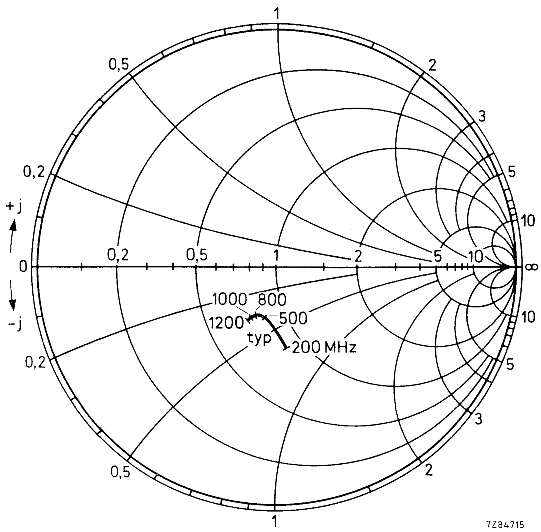


Fig. 7 Output impedance derived from output reflection coefficient s_{22} co-ordinates in ohm x 50.

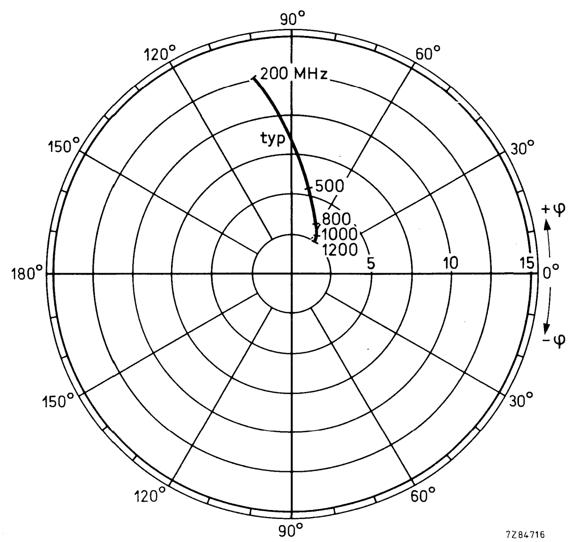


Fig. 8 Forward transmission coefficient s_{21}.

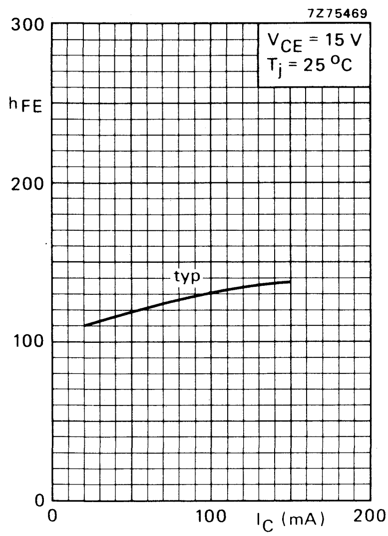


Fig. 9 V_{CE} = 15 V; T_j = 25 °C; typical values.

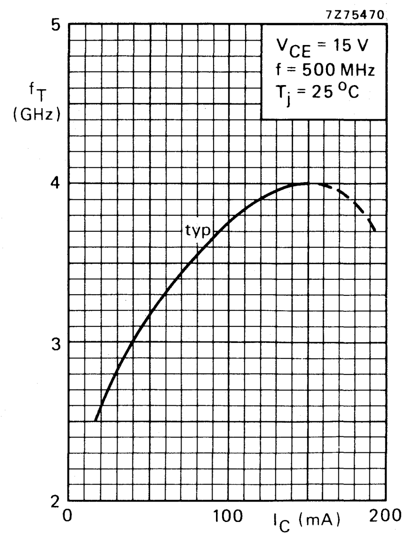


Fig. 10 V_{CE} = 15 V; f = 500 MHz; T_j = 25 °C; typical values.

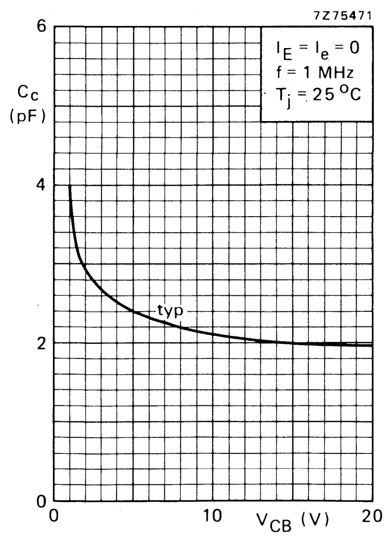


Fig. 11 I_E = i_e = 0; f = 1 MHz; T_j = 25 °C; typical values.

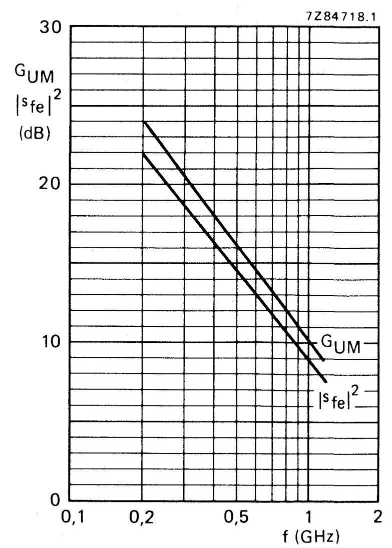


Fig. 12 V_{CE} = 15 V; I_C = 120 mA; T_{amb} = 25 °C; typical values

N-P-N 3 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 ^oC	P_{tot}	max.	1	W
Junction temperature	T_j	max.	175	^oC
D.C. current gain I_C = 100 mA; V_{CE} = 10 V	h_{FE}	min.	25	
Transition frequency at f = 500 MHz I_C = 100 mA; V_{CE} = 10 V	f_T	typ.	3,7	GHz
Maximum power gain at f = 300 MHz I_C = 100 mA; V_{CE} = 10 V	G_{UM}	typ.	19,5	dB
Output voltage at d_{im} = –60 dB I_C = 100 mA; V_{CE} = 10 V; R_L = 75 Ω; $f_{(p + q - r)}$ = 285,25 MHz	V_o	typ.	1,0	V
Output power at 1 dB gain compression V_{CE} = 10 V; I_C = 100 mA; f = 300 MHz	P_{L1}	typ.	+ 24	dBm
Third order intercept point V_{CE} = 10 V; I_C = 100 mA; f = 300 MHz	ITO	typ.	+ 43	dBm

MECHANICAL DATA

SOT-37 (see Fig. 1).

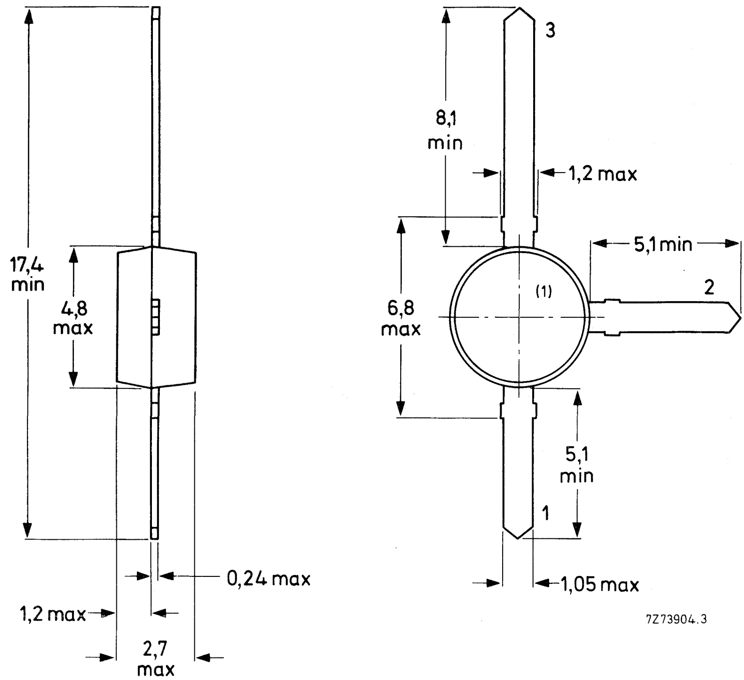
* TO39 version is available on request: ON4497.

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.	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 °C	P_{tot}	max.	1	W
Storage temperature	T_{stg}	−65 to + 150		°C
Junction temperature	T_j	max.	175	°C

THERMAL RESISTANCE

From junction to soldering point	$R_{th\ j\text{-}s}$	=	30	K/W
From junction to ambient (free air) mounted on a fibre-glass print	$R_{th\ j\text{-}a}$	=	130	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current $I_E = 0$; V_{CB} = 15 V	I_{CBO}	max.	100 μA
D.C. current gain I_C = 100 mA; V_{CE} = 10 V	h_{FE}	min.	25
Transition frequency at f = 500 MHz I_C = 100 mA; V_{CE} = 10 V	f_T	typ.	3,7 GHz
Collector capacitance at f = 1 MHz $I_E = i_e = 0$; V_{CB} = 10 V	C_c	typ.	2,0 pF
Emitter capacitance at f = 1 MHz $I_C = i_c = 0$; V_{EB} = 0,5 V	C_e	typ.	10 pF
Feedback capacitance at f = 1 MHz $I_C = 0$; V_{CE} = 10 V	C_{re}	typ.	1,2 pF
Maximum power gain at f = 300 MHz; T_{amb} = 25 °C I_C = 100 mA; V_{CE} = 10 V	G_{UM}	typ.	19,5 dB
Second harmonic distortion (see Fig.2) I_C = 100 mA; V_{CE} = 10 V; R_L = 75 Ω; T_{amb} = 25 °C $V_p = V_o$ = 316 mV = 50 dBmV ; 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	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	P_{L1}	typ.	+ 24 dBm
V_{CE} = 10 V; I_C = 90 mA; f = 800 MHz; T_{amb} = 25 °C	P_{L1}	typ.	+ 22 dBm
Third order intercept point			
V_{CE} = 10 V; I_C = 100 mA; f = 300 MHz; T_{amb} = 25 °C	ITO	typ.	+ 43 dBm
V_{CE} = 10 V; I_C = 90 mA; f = 800 MHz; T_{amb} = 25 °C	ITO	typ.	+ 41 dBm

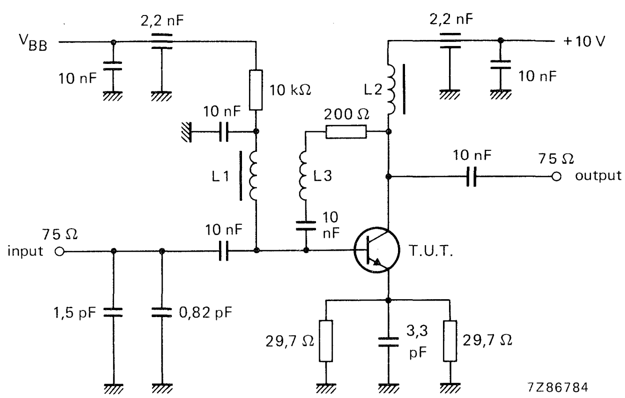


Fig.2 Intermodulation distortion and second harmonic distortion MATV test circuit.

L1 = L2 = 5 μH Ferroxcube choke

L3 = 2 turns Cu wire (0,5 mm), internal diameter 4 mm, winding pitch 2 mm.

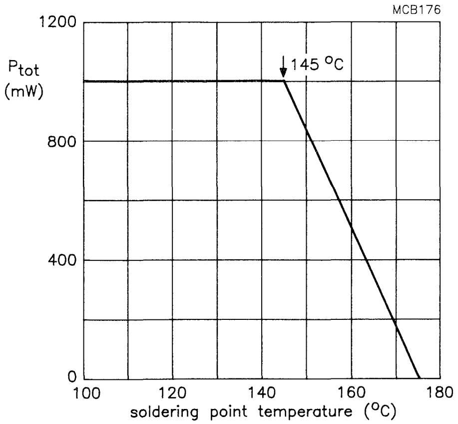


Fig.3 Power derating curve.

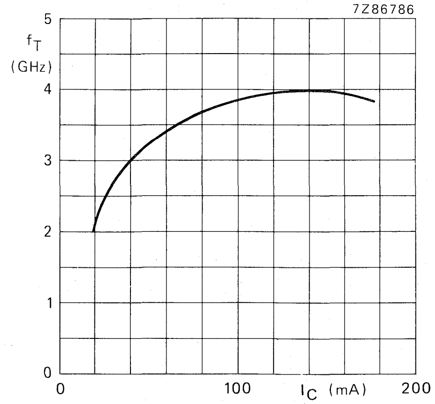


Fig.4 V_{CE} = 10 V; f = 500 MHz; T_j = 25 °C; typical values.

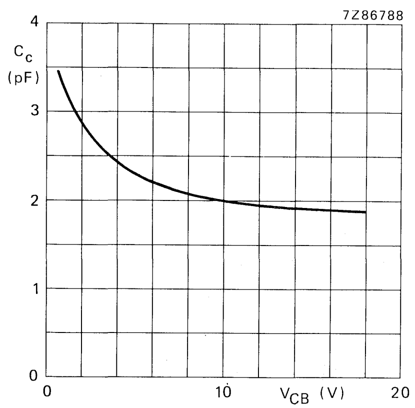


Fig.5 I_E = 0; f = 1 MHz; T_j = 25 °C; typical values.

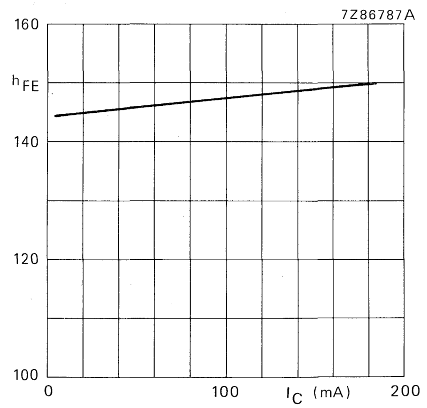


Fig.6 V_{CE} = 10 V; T_j = 25 °C; typical values.

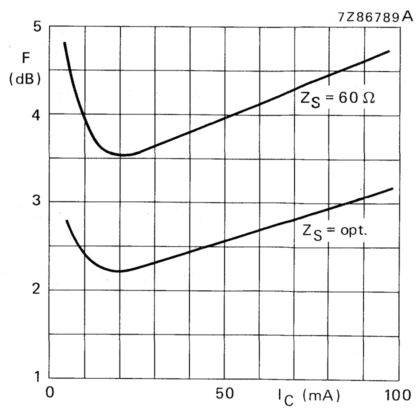


Fig.7 V_{CE} = 10 V; f = 800 MHz; T_{amb} = 25 °C; typical values.

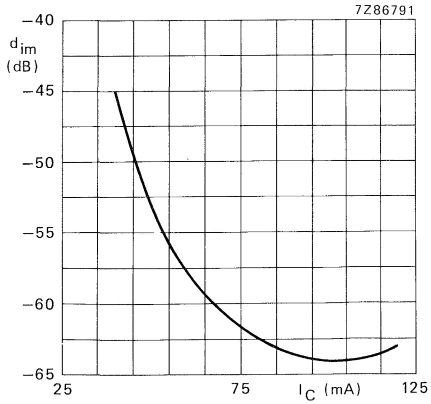


Fig.8 V_{CE} = 10 V; V_o = 58 dBmV; $f_{(p+q-r)}$ = 285,25 MHz; T_{amb} = 25 °C; typical values.

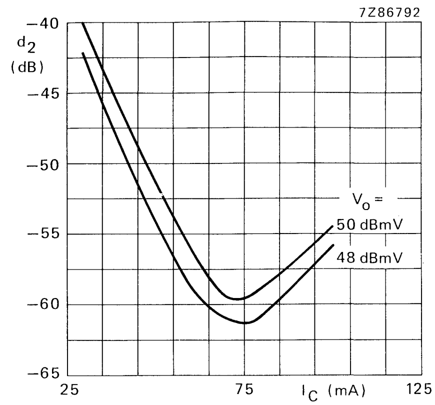


Fig.9 V_{CE} = 10 V; f_p = 66 MHz; f_p = 144 MHz; $f_{(p+q)}$ = 210 MHz; T_{amb} = 25 °C; typical values.

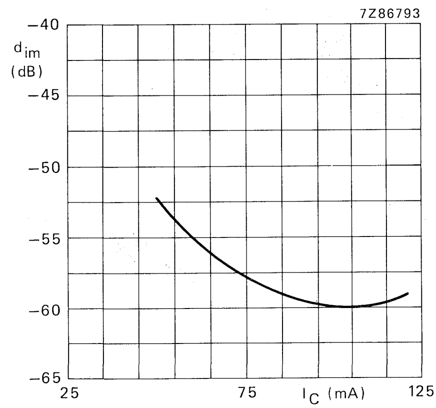


Fig.10 V_{CE} = 19 V; V_o = 750 mV; $f_{(p+q-r)}$ = 793,25 MHz; T_{amb} = 25 °C; typical values.

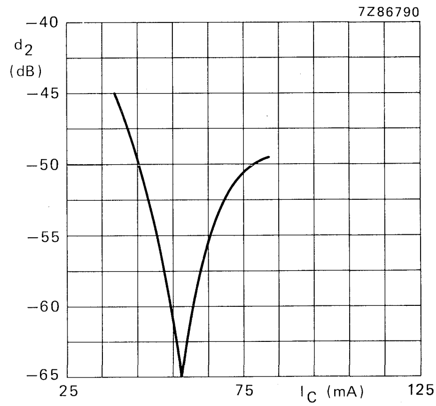


Fig.11 V_{CE} = 10 V; V_o = 48 dBmV; f_p = 560 MHz; f_q = 250 MHz; $f_{(p+q-r)}$ = 810 MHz; T_{amb} = 25 °C; typical values.

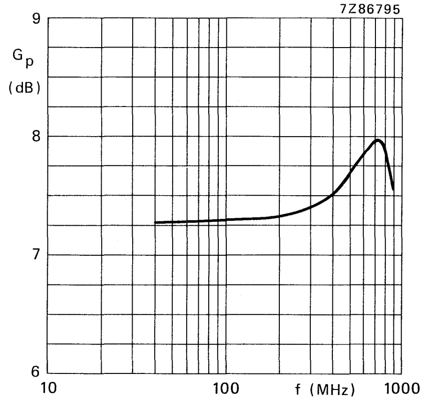


Fig.12 Gain measured in test circuit (see Fig. 3); T_{amb} = 25 °C; typical values.

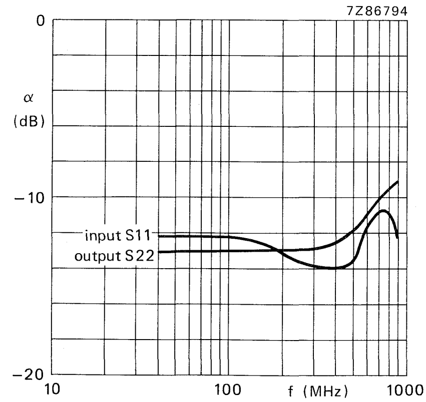


Fig.13 Return losses measured in test circuit (see Fig. 3); T_{amb} = 25 °C; typical values.

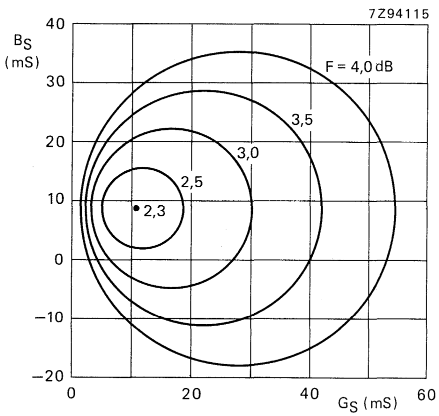


Fig.14 Circles of constant noise figure; V_{CE} = 10 V; I_C = 20 mA; f = 800 MHz; T_{amb} = 25 °C; typical values.

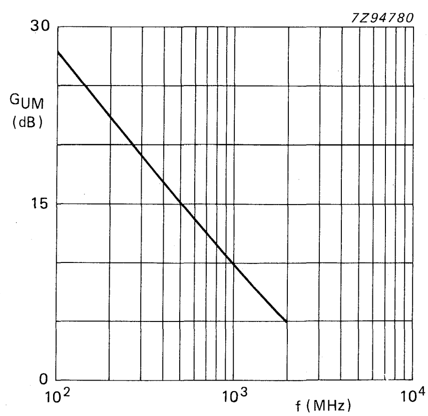


Fig.15 V_{CE} = 10 V; I_C = 100 mA; T_{amb} = 25 °C; typical values.

s-parameters (common emitter) at V_{CE} = 10 V; T_{amb} = 25 °C; typical values.

I_C mA	f MHz	s_{11}	s_{21}	s_{12}	s_{22}	G_{UM} dB
	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
10	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
	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
20	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
	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
50	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
	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
70	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
	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
100	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

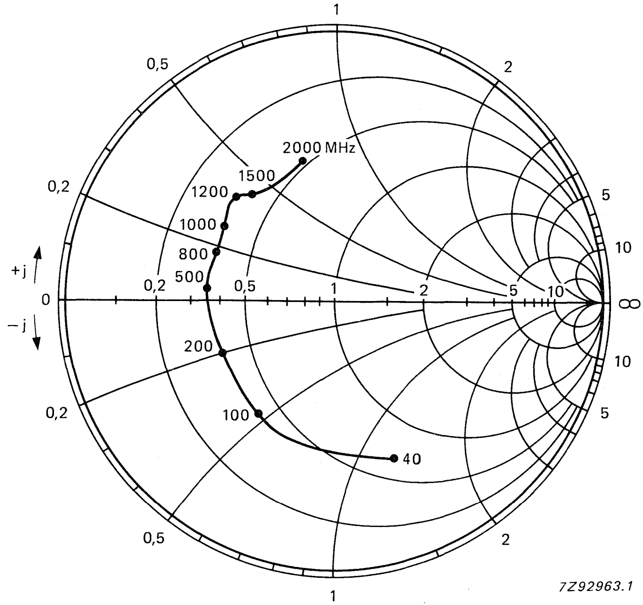


Fig.16 Input reflection coefficient s_{11}.

Conditions for Figs 16 and 17:
V_{CE} = 10 V; I_C = 100 mA; T_{amb} = 25 °C; typical values.

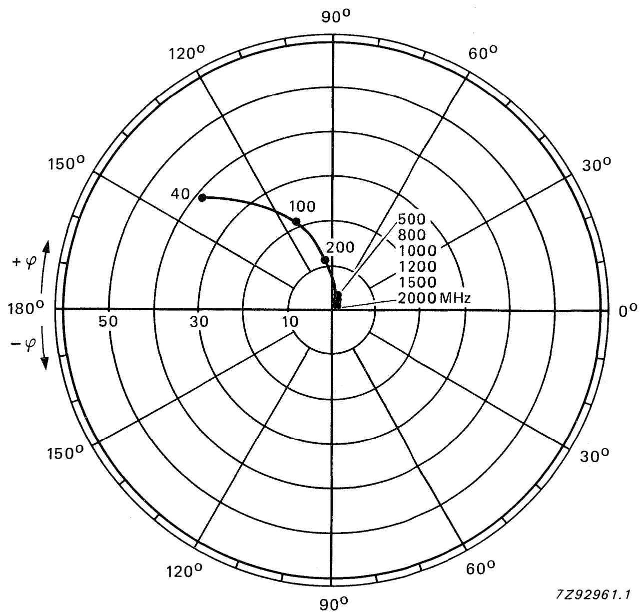


Fig.17 Forward transmission coefficient s_{21}.

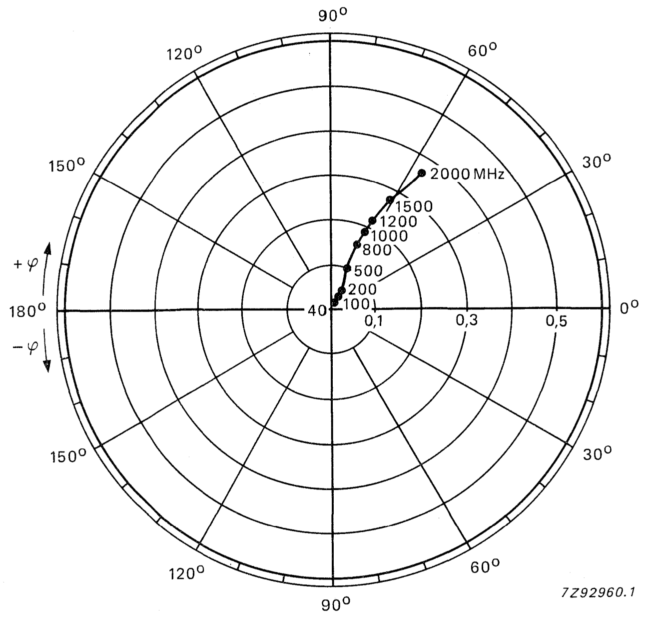


Fig.18 Reverse transmission coefficient s_{12}.

Conditions for Figs 18 and 19:
V_{CE} = 10 V; I_C = 100 mA; T_{amb} = 25 °C; typical values.

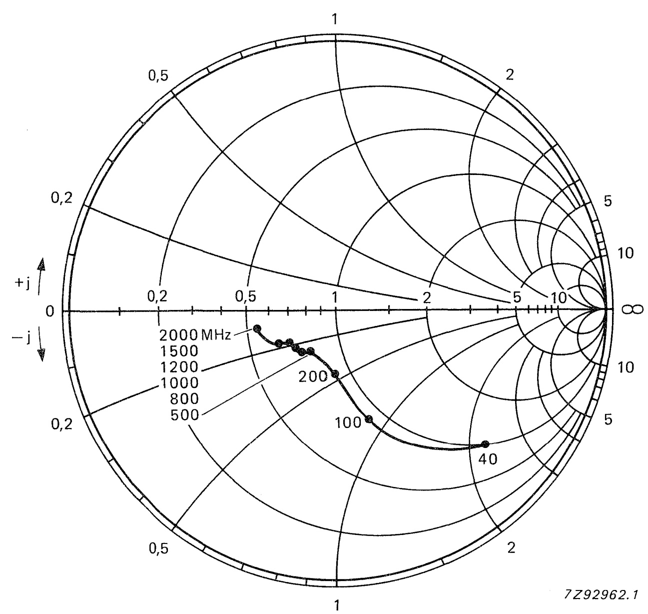


Fig.19 Output reflection coefficient s_{22}.

P-N-P 5 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 °C	P_{tot}	max.	200	mW
Junction temperature	T_j	max.	175	°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.	0,45	pF
Noise figure at optimum source impedance $-I_C$ = 4 mA; $-V_{CE}$ = 10 V; f = 800 MHz; T_{amb} = 25 °C	F	typ.	2,4	dB

MECHANICAL DATA (see Fig. 1)

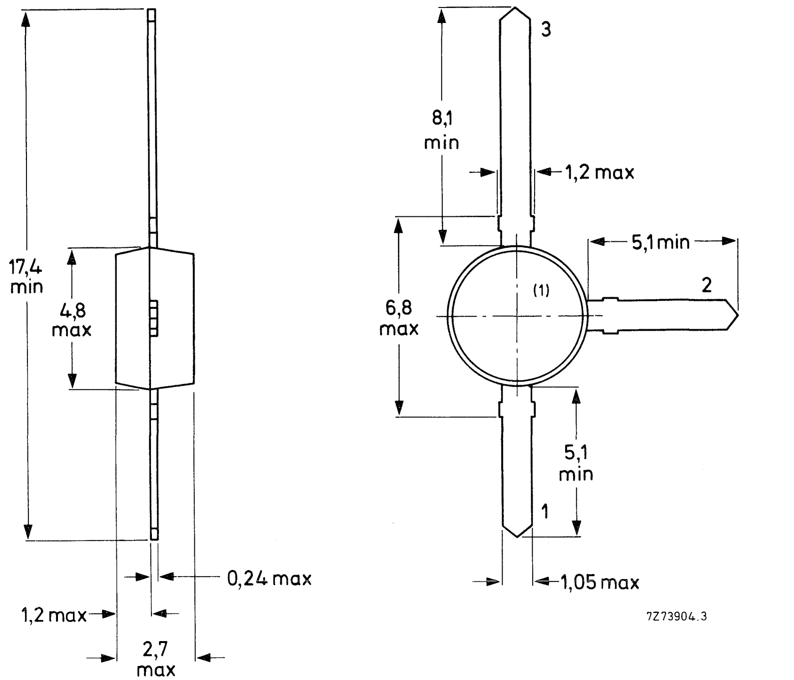
MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-37.

Connections

1. Base
2. Emitter
3. Collector



(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.	200 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 fibre-glass print	$R_{th\ j\text{-}a}$	=	500 K/W
From junction to soldering point	$R_{th\ j\text{-}s}$	=	65 K/W

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
Collector capacitance at f = 1 MHz $I_E = I_e = 0; -V_{CB} = 10$ V	C_c	typ.	0,65 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.	0,45 pF
Noise figure at optimum source impedance $-I_C = 4$ mA; $-V_{CE} = 10$ V; f = 800 MHz; $T_{amb} = 25$ °C	F	typ.	2,4 dB

Maximum unilateral power gain (s_{12} assumed to be zero)

$$G_{UM} = 10 \log \frac{|s_{21}|^2}{[1-|s_{11}|^2]\,[1-|s_{22}|^2]}$$

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

f = 500 MHz	G_{UM}	typ.	18,0 dB
f = 800 MHz	G_{UM}	typ.	14,0 dB

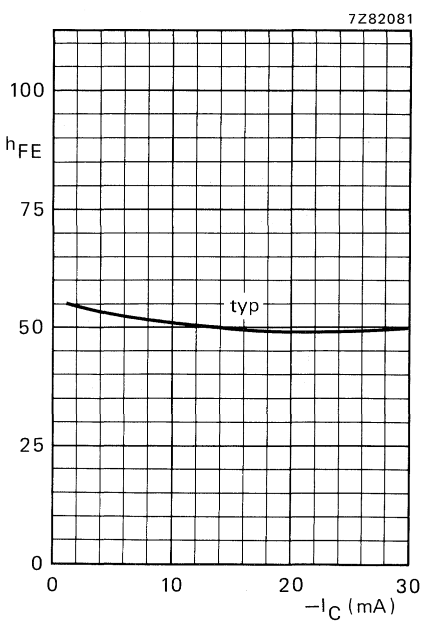


Fig. 2 $-V_{CE} = 10$ V; $T_j = 25$ °C; typical values.

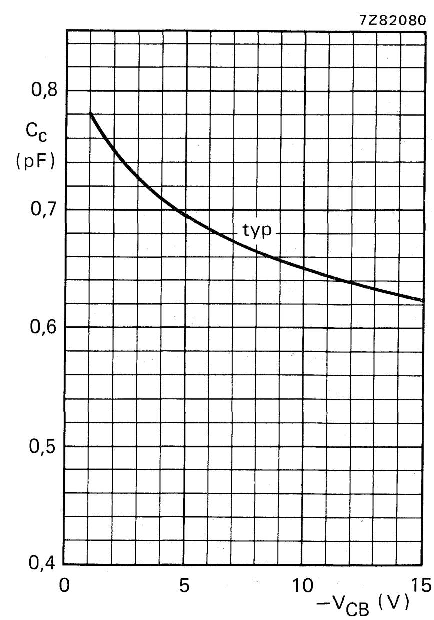


Fig. 3 $I_E = i_e = 0$; f = 1 MHz; $T_j = 25$ °C; typical values.

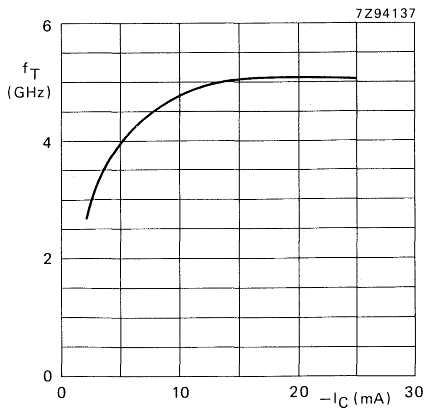


Fig. 4 $-V_{CE}$ = 10 V; f = 500 MHz; T_j = 25 ^oC; typical values.

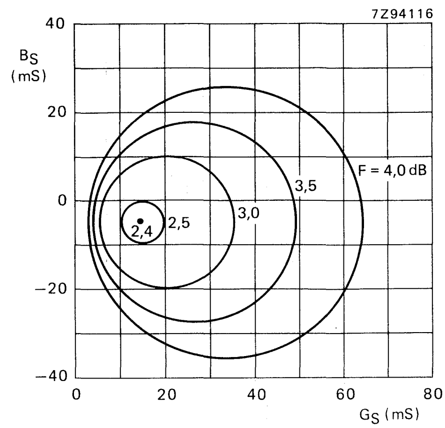


Fig. 5 Circles of constant noise figure. $-V_{CE}$ = 10 V; $-I_C$ = 4 mA; f = 800 MHz; T_{amb} = 25 ^oC; typical values.

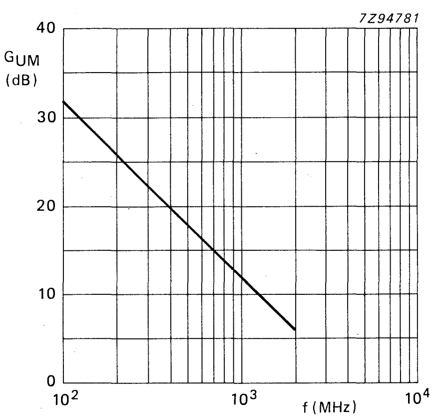


Fig.6 $-V_{CE}$ = 10 V; $-I_C$ = 14 mA; T_{amb} = 25 ^oC; typical values.

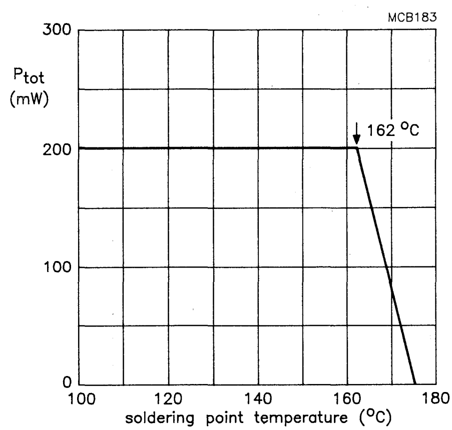


Fig.7 Power derating curve.

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

I_C mA	f MHz	s_{11}	s_{21}	s_{12}	s_{22}	G_{UM} dB
	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
2	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
	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
5	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
	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
10	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
	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
14	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

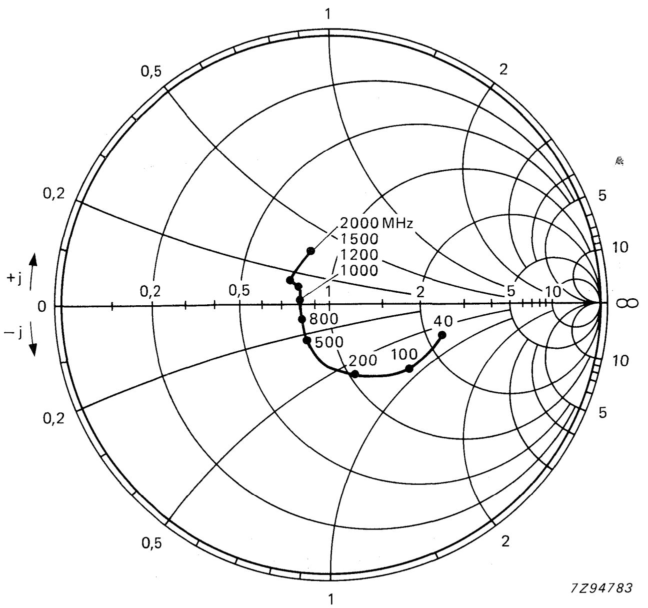


Fig.8 Input impedance, derived from input reflection coefficient s_{11} coordinates, in ohm x 50.

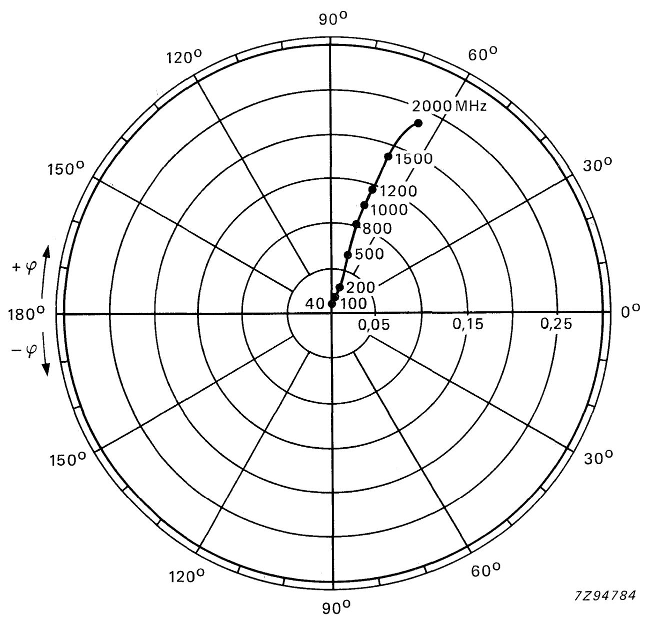


Fig.9 Reverse transmission coefficient s_{12}.

Conditions for Figs 8 to 11: $-V_{CE}$ = 10 V; $-I_C$ = 14 mA; T_{amb} = 25 °C; typical values.

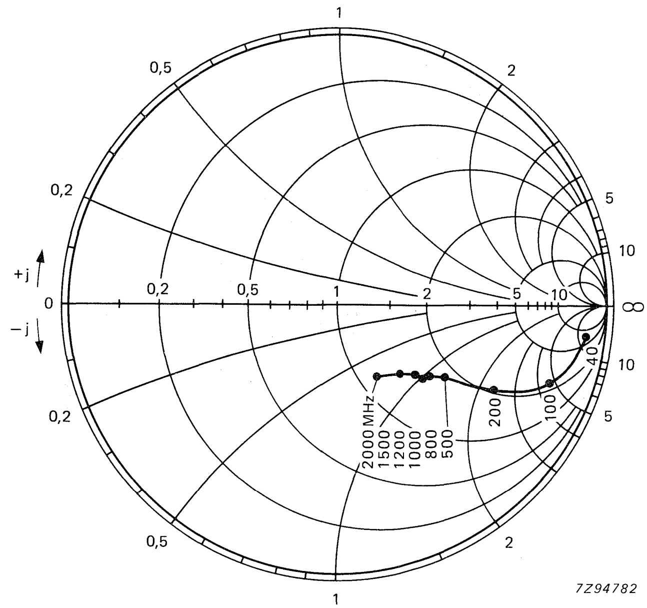


Fig.10 Output impedance, derived from output reflection coefficient s_{22} coordinates, in ohm x 50.

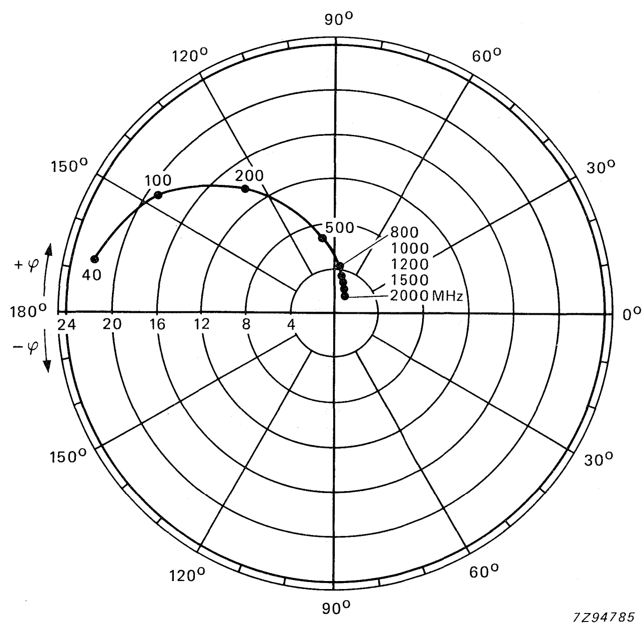


Fig.11 Forward transmission coefficient s_{21}.

PNP 5 GHz WIDEBAND TRANSISTOR

PNP transistor in a sub-miniature HERMETICALLY SEALED micro-stripline envelope SOT173 and SOT173X. 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.

NPN complement is BFP90A.

QUICK REFERENCE DATA

Collector-base voltage	$-V_{CBO}$	max.	20	V
Collector-emitter voltage	$-V_{CEO}$	max.	15	V
Collector current (DC)	$-I_C$	max.	30	mA
Total power dissipation up to T_{amb} = 125 °C	P_{tot}	max.	250	mW
Junction temperature	T_j	max.	175	°C
DC 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
Maximum unilateral power gain $-I_C$ = 14 mA; $-V_{CE}$ = 10 V at f = 500 MHz	G_{UM}	typ.	20.5	dB
at f = 800 MHz	G_{UM}	typ.	16.5	dB

MECHANICAL DATA

Marking code: C1

SOT173 and SOT173X

ORDERING AND PACKAGE INFORMATION

EXTENDED TYPE NUMBER	PACKAGE		
	CODE	PACKING METHOD	PACKING QUANTITY
BFQ51C	SOT173	BULK	50
BFQ51C	SOT173X	12 mm REEL	1000

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 (DC)	$-I_C$	max.	30	mA
Total power dissipation up to T_{amb} = 125 °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	$R_{th\ j\text{-}a}$	200	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current $I_E = 0$; $-V_{CB} = 10$ V	$-I_{CBO}$	max.	50 nA
DC current gain $-I_C = 14$ mA; $-V_{CE} = 10$ V	h_{FE}	min. typ.	20 50
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.	0.65 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_{12} assumed to be zero)

$$G_{UM} = 10 \log \frac{|s_{21}|^2}{[1-|s_{11}|^2]\,[1-|s_{22}|^2]}$$

at $-I_C = 14$ mA; $-V_{CE} = 10$ V; $T_{amb} = 25$ °C f = 500 MHz f = 800 MHz	G_{UM}	 typ. typ.	 20.5 dB 16.5 dB
Noise figures at f = 800 MHz; Z_S = opt.; $T_{amb} = 25$ °C $-I_C = 4$ mA; $-V_{CE} = 10$ V $-I_C = 14$ mA; $-V_{CE} = 10$ V	F	 typ. typ.	 2.5 dB 3.5 dB

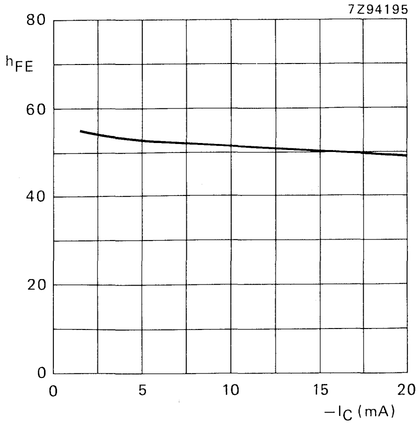


Fig. 1 $-V_{CE}$ = 10 V; T_j = 25 °C; typical values.

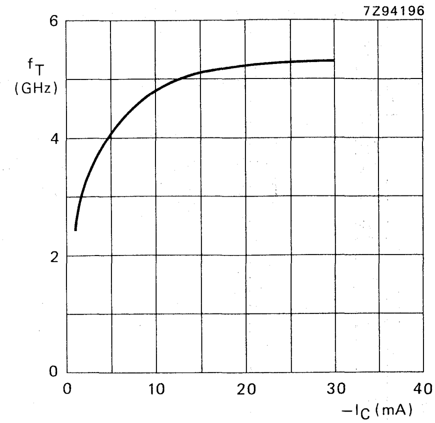


Fig. 2 $-V_{CE}$ = 10 V; f = 500 MHz; T_j = 25 °C; typical values.

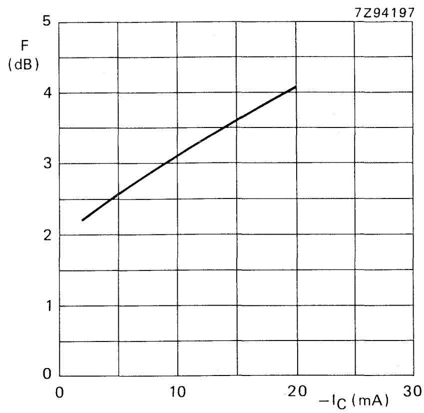


Fig. 3 $-V_{CE}$ = 10 V; f = 800 MHz; T_{amb} = 25 °C; Z_s = optimum; typical values.

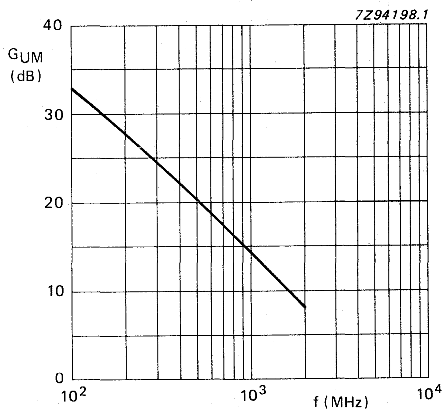


Fig. 4 $-V_{CE}$ = 10 V; $-I_C$ = 14 mA; T_{amb} = 25 °C; typical values.

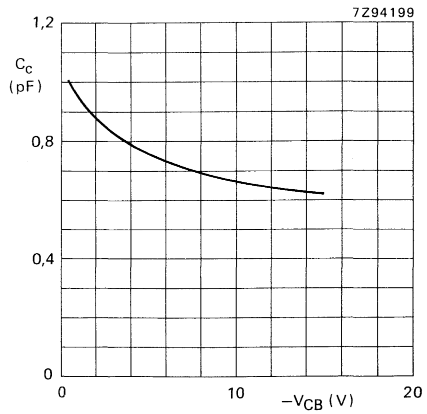


Fig. 5 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C; typical values.

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

I_C mA	f MHz	s_{11}	s_{21}	s_{12}	s_{22}	G_{UM} dB
	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
2	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
	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
5	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
	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
10	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 V; T_{amb} = 25 °C; typical values.

I_C mA	f MHz	s_{11}	s_{21}	s_{12}	s_{22}	G_{UM} dB
	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
14	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
	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
20	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
	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
25	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

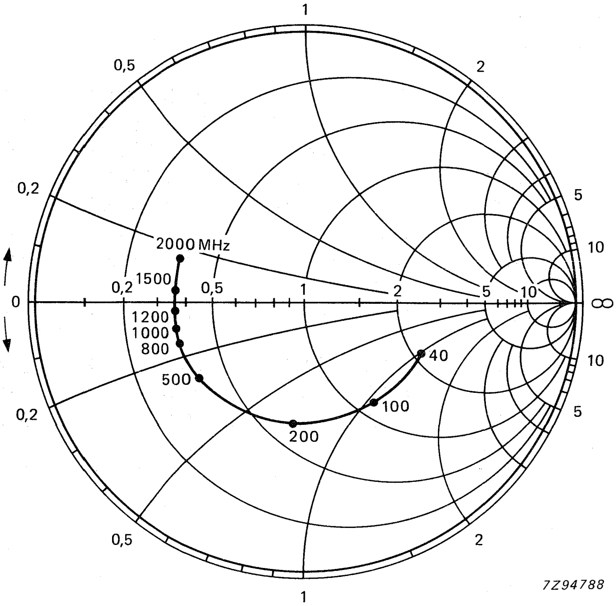


Fig. 6 $-V_{CE}$ = 10 V; $-I_C$ = 14 mA; T_{amb} = 25 °C; typical values.

Input impedance derived from input reflection coefficient s_{11} co-ordinates in ohm x 50.

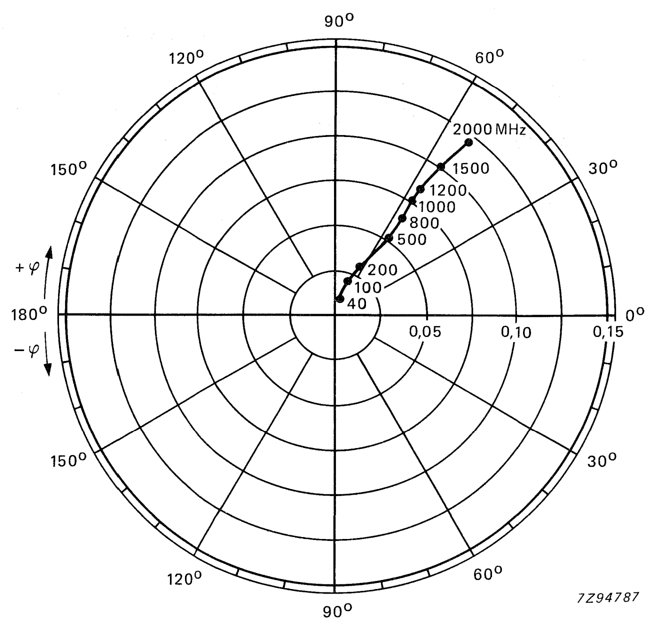


Fig. 7 $-V_{CE}$ = 10 V; $-I_C$ = 14 mA; T_{amb} = 25 °C; typical values.

Reverse transmission coefficient s_{12}.

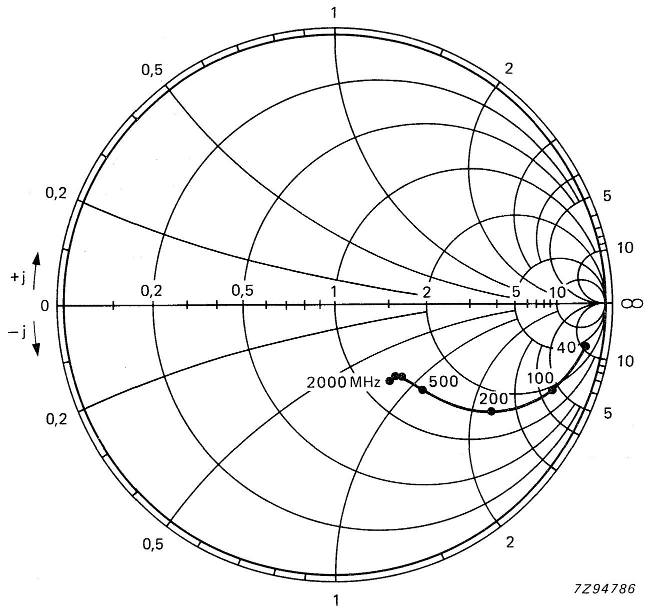


Fig. 8 $-V_{CE}$ = 10 V; $-I_C$ = 14 mA; T_{amb} = 25 °C; typical values.

Output impedance derived from output reflection coefficient s_{22} co-ordinates in ohm x 50.

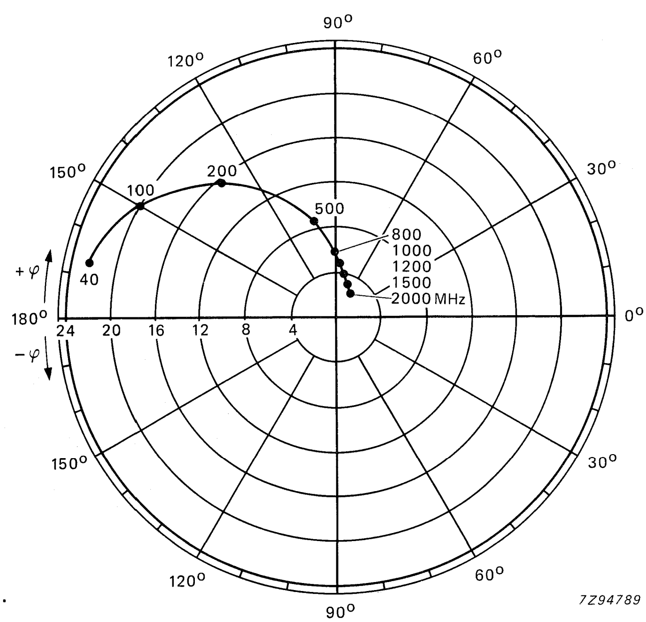


Fig. 9 $-V_{CE}$ = 10 V; $-I_C$ = 14 mA; T_{amb} = 25 °C; typical values.

Forward transmission coefficient s_{21}.

P-N-P 5 GHz 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.

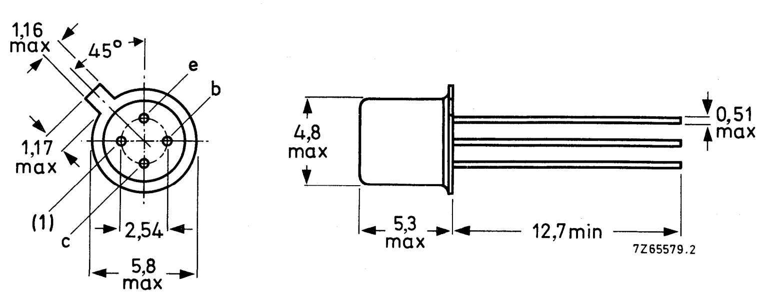
QUICK REFERENCE DATA

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 °C	P_{tot}	max.	150	mW
Junction temperature	T_j	max.	200	°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	G_{UM}	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 °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	$R_{th\ j\text{-}a}$	=	900	K/W
From junction to case	$R_{th\ j\text{-}c}$	=	600	K/W

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. typ.	20 50	
Transition frequency (note 1) $-I_C$ = 14 mA; $-V_{CE}$ = 10 V; f = 500 MHz	f_T	typ.	5,0	GHz
Collector capacitance (note 2) $I_E = I_e = 0$; $-V_{CB}$ = 10 V; f = 1 MHz	C_c	typ.	0,85	pF
Emitter capacitance $I_C = I_c = 0$; $-V_{EB}$ = 0,5 V; f = 1 MHz	C_e	typ.	1,2	pF
Feedback capacitance (note 1) $I_C = 0$; $-V_{CE}$ = 10 V; f = 1 MHz	C_{re}	typ.	0,5	pF
Noise figure at optimum source impedance (note 1) $-I_C$ = 2 mA; $-V_{CE}$ = 10 V; f = 500 MHz; T_{amb} = 25 °C	F	typ.	2,7	dB

Maximum unilateral power gain (note 1)
(s_{12} assumed to be zero)

$$G_{UM} = 10 \log \frac{|s_{21}|^2}{[1-|s_{11}|^2]\,[1-|s_{22}|^2]}$$

$-I_C$ = 14 mA; $-V_{CE}$ = 10 V; f = 500 MHz; T_{amb} = 25 °C	G_{UM}	typ.	17,0	dB

Notes

1. Shield lead grounded.
2. Shield lead not connected.

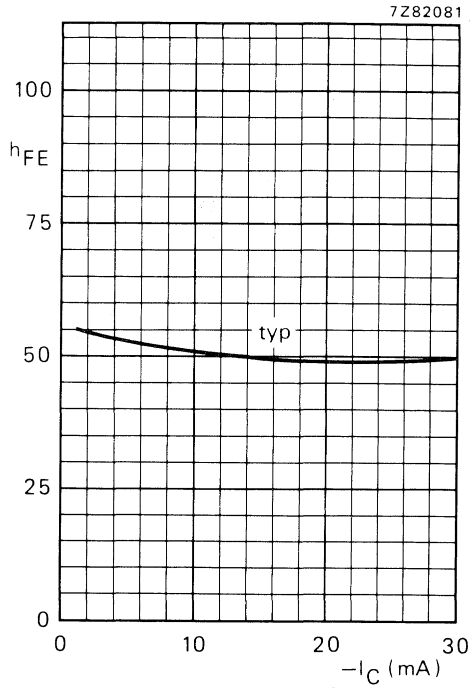


Fig. 2 $-V_{CE}$ = 10 V; T_j = 25 °C; typ. values.

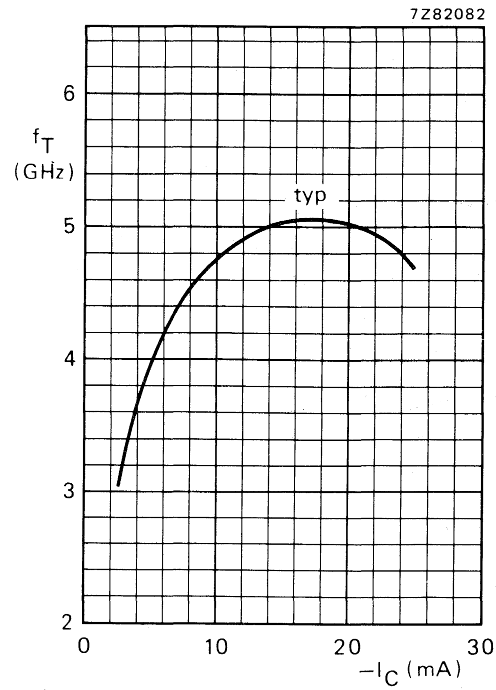


Fig. 3 $-V_{CE}$ = 10 V; f = 500 MHz; T_j = 25 °C; typical values.

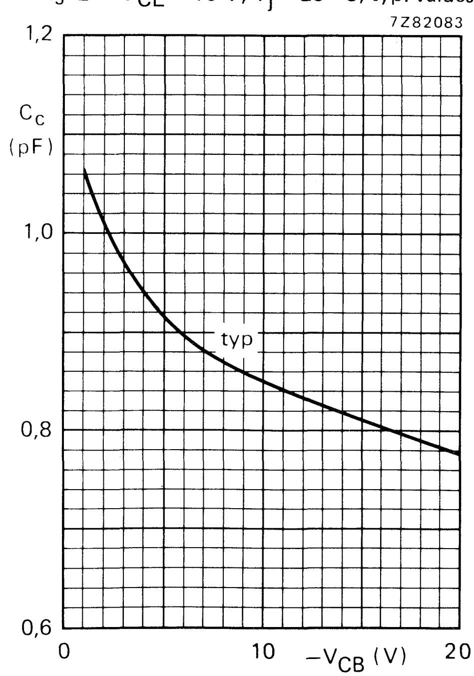


Fig. 4 I_E = I_e = 0; f = 1 MHz; T_j = 25 °C; typical values.

N-P-N 5 GHz 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.

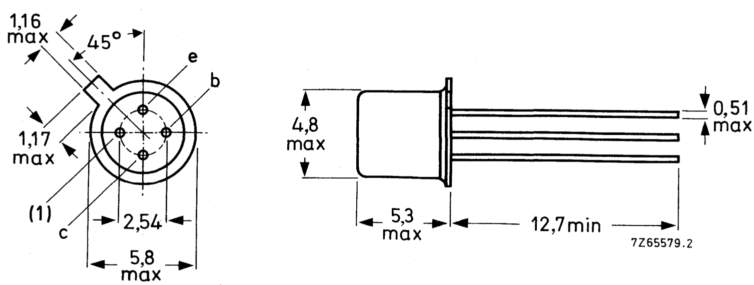
QUICK REFERENCE DATA

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 °C	P_{tot}	max.	150	mW
Junction temperature	T_j	max.	200	°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.	0,45	pF
Noise figure at optimum source impedance I_C = 2 mA; V_{CE} = 10 V; f = 500 MHz	F	typ.	2,4	dB
Maximum unilateral power gain I_C = 14 mA; V_{CE} = 10 V; f = 500 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.	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	$R_{th\ j\text{-}a}$	=	900 K/W
From junction to case	$R_{th\ j\text{-}c}$	=	600 K/W

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. typ.	25 50
Transition frequency (note 1) I_C = 14 mA; V_{CE} = 10 V; f = 500 MHz	f_T	typ.	5,0 GHz
Collector capacitance (note 2) $I_E = I_e = 0$; V_{CB} = 10 V; f = 1 MHz	C_c	typ.	0,75 pF
Emitter capacitance $I_C = I_c = 0$; V_{EB} = 0,5 V; f = 1 MHz	C_e	typ.	1,2 pF
Feedback capacitance (note 1) $I_C = 0$; V_{CE} = 10 V; f = 1 MHz	C_{re}	typ.	0,45 pF
Noise figure at optimum source impedance (note 1) I_C = 2 mA; V_{CE} = 10 V; f = 500 MHz; T_{amb} = 25 °C	F	typ.	2,4 dB

Maximum unilateral power gain (note 1)

s_{12} assumed to be zero

$$G_{UM} = \frac{|s_{21}|^2}{[1-|s_{11}|^2]\,[1-|s_{22}|^2]}$$

I_C = 14 mA; V_{CE} = 10 V; f = 500 MHz; T_{amb} = 25 °C	G_{UM}	typ.	18,0 dB

Notes

1. Shield lead connected
2. Shield lead not connected.

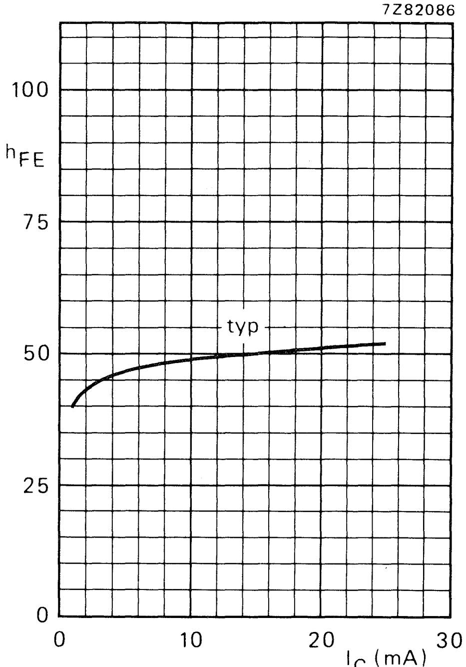


Fig. 2 V_{CE} = 10 V; T_j = 25 °C; typ. values.

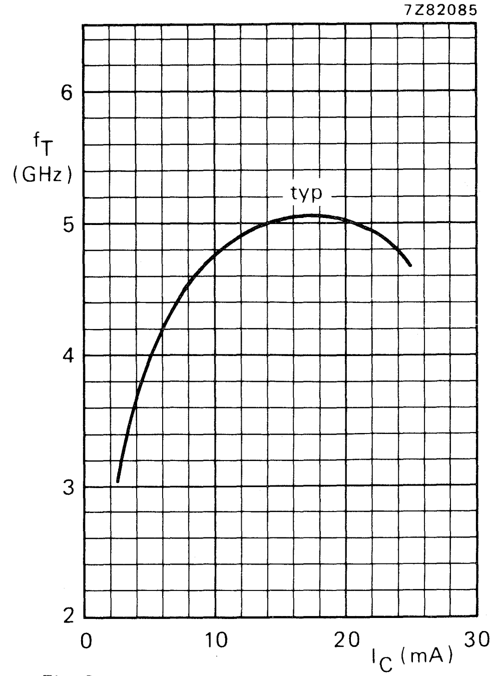


Fig. 3 V_{CE} = 10 V; f = 500 MHz; T_j = 25 °C; typical values.

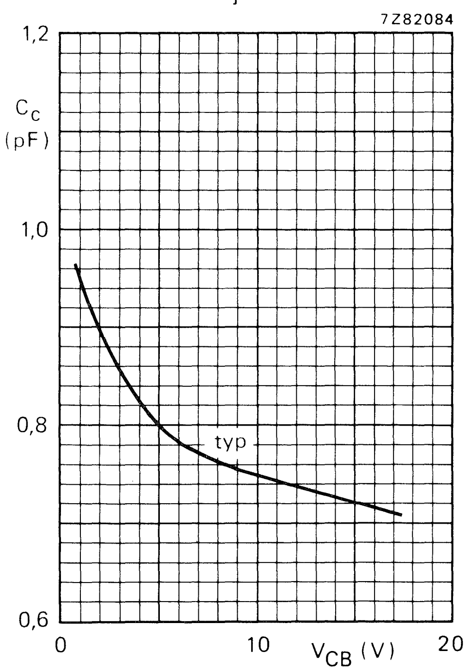


Fig. 4 I_E = I_e = 0; f = 1 MHz; T_j = 25 °C; typical values.

PNP 4.5 GHz WIDEBAND TRANSISTOR

The BFQ54 is a pnp transistor in a SOT122 package, primarily intended for MATV and microwave amplifiers, such as radar systems, spectrum analysers etc.

Emitter ballasting resistors ensure an optimum temperature profile and excellent reliability properties.

Its npn complement is the BFQ34.

The transistor has a 1/4" 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 (DC)	$-I_C$	max.	150	mA
Total power dissipation up to T_{mb} = 125 °C	P_{tot}	max.	2.25	W
Operating junction temperature	T_j	max.	200	°C
Transition frequency at f = 500 MHz $-I_C$ = 150 mA; $-V_{CE}$ = 15 V; T_j = 25 °C	f_T	typ.	4.5	GHz
Output voltage at d_{im} = −60 dB $-I_C$ = 120 mA; $-V_{CE}$ = 15 V; R_L = 75 Ω; T_{amb} = 25 °C; $f_{(p+q-r)}$ = 793.25 MHz	V_o	typ.	900	mV

MECHANICAL DATA

SOT122 (see Fig. 1).

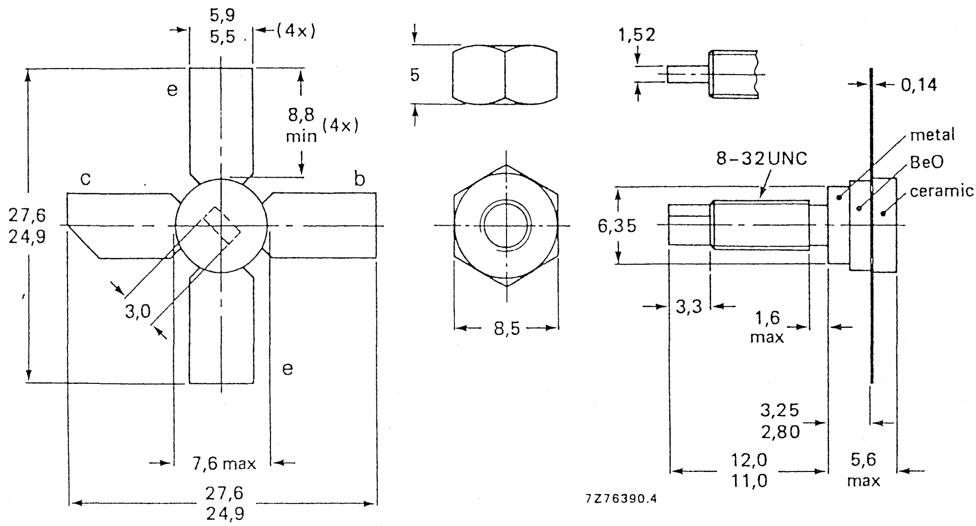
PRODUCT SAFETY

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

Dimensions in mm

Fig. 1 SOT122.



Torque on nut:	min.	0.75 Nm	diameter of clearance hole in heatsink: max. 4.2 mm
		(7.5 kg cm)	mounting hole to have no burrs at either end.
	max.	0.85 Nm	de-burrings must leave surface flat; do not chamfer or
		(8.5 kg cm)	countersink either end of the 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 (DC)	$-I_C$	max.	150	mA
Total power dissipation up to T_{mb} = 125 °C	P_{tot}	max.	2.25	W
Storage temperature range	T_{stg}		−65 to +150	°C
Operating junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	28	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0.6	K/W

CHARACTERISTICS

T_{amb} = 25 °C unless otherwise specified

Collector cut-off current $I_E = 0; -V_{CB} = 15$ V	I_{CBO}	max.	50 μA
DC current gain $-I_C = 150$ mA; $-V_{CE} = 15$ V	h_{FE}	min.	25
	h_{FE}	typ.	75
Transition frequency at f = 500 MHz (note 1) $-I_C = 150$ mA; $-V_{CE} = 15$ V	f_T	typ.	4.5 GHz
Collector capacitance at f = 1 MHz $I_E = i_e = 0; -V_{CB} = 15$ V	C_c	typ.	2.0 pF
Emitter capacitance at f = 1 MHz $I_C = i_c = 0; -V_{EB} = 0.5$ V	C_e	typ.	6.5 pF
Feedback capacitance at f = 1 MHz $I_C = 0$ mA; $V_{CE} = 15$ V	C_{re}	typ.	1.3 pF
Collector-stud capacitance	C_{cs}	typ.	1.2 pF
Maximum unilateral power gain (s_{12} assumed to be zero) $-I_C = 120$ mA; $-V_{CE} = 15$ V; f = 500 MHz $G_{UM} = 10 \log \frac{\lvert s_{21}\rvert^2}{[1-\lvert s_{11}\rvert^2][1-\lvert s_{22}\rvert^2]}$	G_{UM}	typ.	16 dB
Output voltage at $d_{im} = -60$ dB (DIN 45005B, para 6.3: 3-tone) $-I_C = 120$ mA; $-V_{CE} = 15$ V; $R_L = 75\ \Omega$ $V_p = V_o$ 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.	900 mV

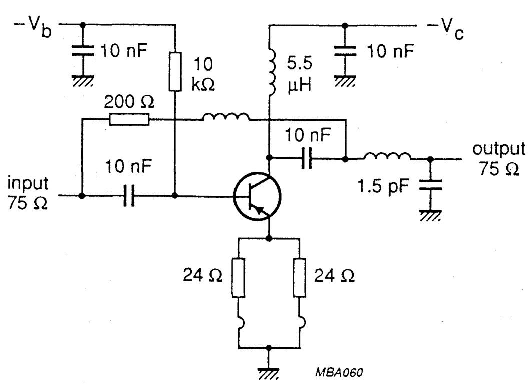


Fig. 2 MATV-test circuit F = 40 to 860 MHz

Note

1. Measured under pulse conditions.

PNP 4.5 GHz WIDEBAND TRANSISTOR

PNP transistor in a plastic SOT37 package. It is primarily intended for use in MATV and microwave amplifiers such as in aerial amplifiers, radar systems, oscilloscopes, spectrum analysers etc.

Emitter ballasting resistors and application of gold sandwich metallization ensure an optimum temperature profile and excellent reliability properties.

NPN complement is BFQ34T.

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 (DC)	$-I_C$	max.	150	mA
Total power dissipation up to T_{amb} = 45 °C	P_{tot}	max.	1000	mW
Junction temperature	T_j	max.	175	°C
Transition frequency at f = 500 MHz $-I_C$ = 100 mA; $-V_{CE}$ = 10 V	f_T	typ.	4.5	GHz
Feedback capacitance at f = 1 MHz I_C = 0; $-V_{CE}$ = 10 V; T_{amb} = 25 °C	C_{re}	typ.	1.7	pF
Output voltage at d_{im} = −60 dB $-I_C$ = 100 mA; $-V_{CE}$ = 10 V; R_L = 75 Ω; T_{amb} = 25 °C; $f_{(p+q-r)}$ = 793.25 MHz	V_o	typ.	700	mV

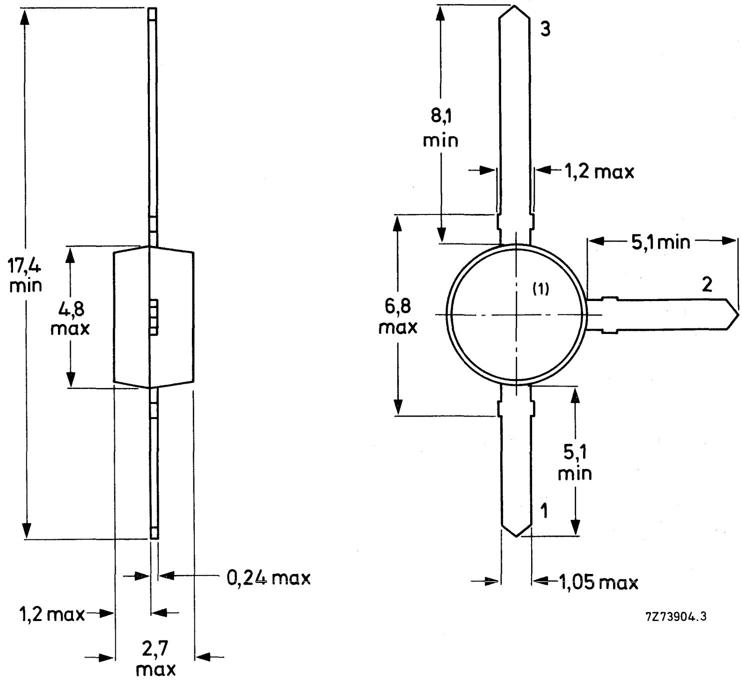
MECHANICAL DATA

SOT37 (see Fig. 1).

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT37.



Pinning

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.	18	V
Emitter-base voltage (open collector)	$-V_{EBO}$	max.	2	V
Collector current (DC)	$-I_C$	max.	150	mA
Total power dissipation up to T_{amb} = 45 °C	P_{tot}	max.	1	W
Storage temperature range	T_{stg}		−65 to + 150	°C
Junction temperature	T_j	max.	175	°C

THERMAL RESISTANCE

From junction to soldering point	$R_{th\ j\text{-}s}$	=	45	K/W
From junction to ambient (free air) mounted on a fibre-glass print	$R_{th\ j\text{-}a}$	=	130	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified.

Collector cut-off current			
I_E = 0; $-V_{CB}$ = 15 V	I_{CBO}	max.	50 μA
DC current gain (note 1)			
$-I_C$ = 100 mA; $-V_{CE}$ = 10 V	h_{FE}	min.	25
		typ.	50
Transition frequency at f = 500 MHz (note 1)			
$-I_C$ = 100 mA; $-V_{CE}$ = 10 V	f_T	typ.	4.5 GHz
Collector capacitance at f = 1 MHz			
$I_E = i_e$ = 0; $-V_{CB}$ = 10 V	C_c	typ.	2.7 pF
Emitter capacitance at f = 1 MHz			
$I_C = i_c$ = 0; $-V_{EB}$ = 0.5 V	C_e	typ.	6.5 pF
Feedback capacitance at f = 1 MHz			
I_C = 0; V_{CE} = 10 V	C_{re}	typ.	1.7 pF
Maximum power gain at f = 300 MHz; T_{amb} = 25 °C			
I_C = 100 mA; $-V_{CE}$ = 10 V	G_{UM}	typ.	18 dB
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 = 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.	700 mV

Note

1. Measured under pulse conditions.

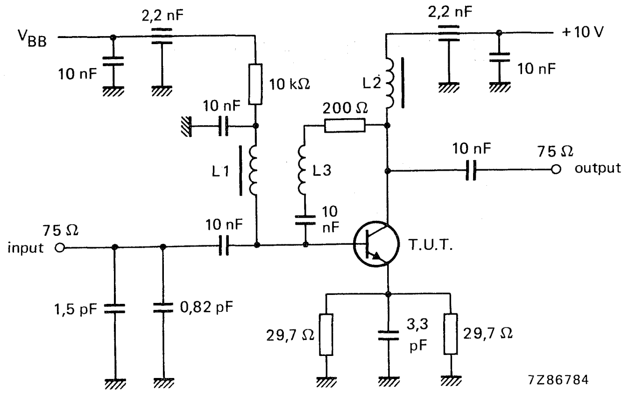


Fig. 2 Intermodulation distortion and second harmonic distortion MATV test circuit.
L1 = L2 = 5 μH Ferroxcube choke
L3 = 2 turns Cu wire (0.5 mm) internal diameter 4 mm, winding pitch 2 mm.

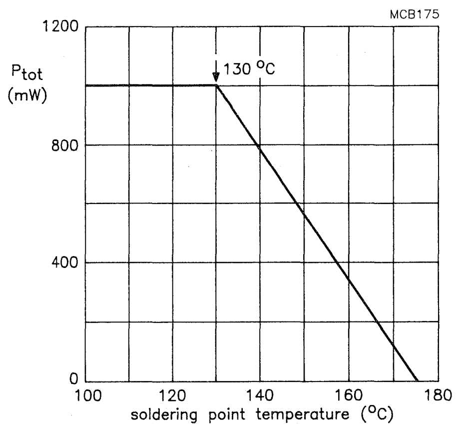


Fig.3 Power derating curve.

N-P-N 4.5 GHz 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.

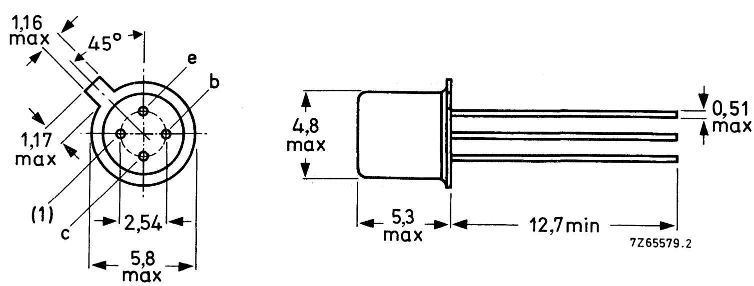
QUICK REFERENCE DATA

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 °C	P_{tot}	max.	250	mW
Junction temperature	T_j	max.	200	°C
Transition frequency at f = 500 MHz I_C = 50 mA; V_{CE} = 5 V	f_T	typ.	4,5	GHz
Feedback capacitance at f = 1 MHz I_C = 0; V_{CE} = 10 V	C_{re}	typ.	1,0	pF
Noise figure at optimum source impedance I_C = 10 mA; V_{CE} = 5 V; f = 200 MHz	F	max.	3,0	dB
Maximum unilateral power gain I_C = 20 mA; V_{CE} = 5 V; f = 200 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_{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	$R_{th\ j\text{-}a}$	=	600 K/W
From junction to case	$R_{th\ j\text{-}c}$	=	350 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current $I_E = 0$; $V_{CB} = 10$ V	I_{CBO}	max.	100 nA
D.C. current gain $I_C = 20$ mA; $V_{CE} = 5$ V	h_{FE}	min. max.	50 150
Transition frequency (note 1) $I_C = 50$ mA; $V_{CE} = 5$ V; f = 500 MHz	f_T	typ.	4,5 GHz
Collector capacitance (note 2) $I_C = i_c = 0$; $V_{CB} = 5$ V; f = 1 MHz	C_c	typ.	1,3 pF
Feedback capacitance (note 2) $I_C = 0$; $V_{CE} = 10$ V; f = 1 MHz	C_{re}	typ. max.	1,0 pF 1,4 pF
Noise figure at optimum source impedance (note 1) $I_C = 10$ mA; $V_{CE} = 5$ V; f = 200 MHz; T_{amb} = 25 °C $I_C = 10$ mA; $V_{CE} = 5$ V; f = 500 MHz; T_{amb} = 25 °C	F F	max. typ.	3,0 dB 2,3 dB

Maximum unilateral power gain (note 1)
s_{12} assumed to be zero

$$G_{UM} = 10 \log \frac{|s_{21}|^2}{[1-|s_{11}|^2]\,[1-|s_{22}|^2]}$$

$I_C = 20$ mA; $V_{CE} = 5$ V; f = 200 MHz; T_{amb} = 25 °C	G_{UM}	min.	17,5 dB
$I_C = 50$ mA; $V_{CE} = 5$ V; f = 500 MHz; T_{amb} = 25 °C	G_{UM}	typ.	11,5 dB

Notes

1. Shield lead grounded.
2. Shield lead and emitter lead connected to bridge earth.

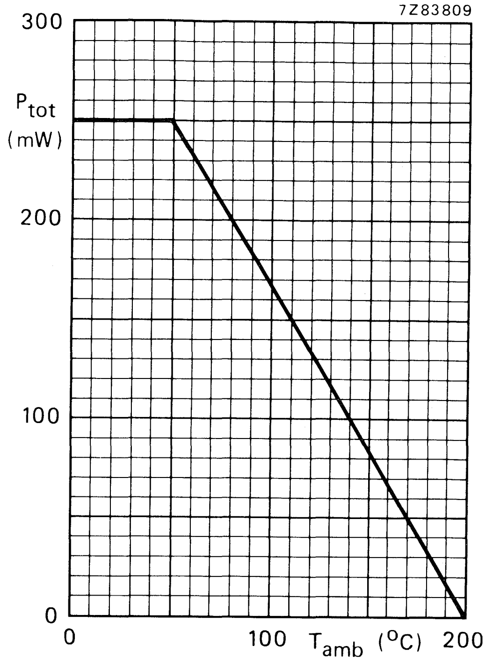


Fig. 2 Maximum permissible power dissipation in free air as a function of ambient temperature.

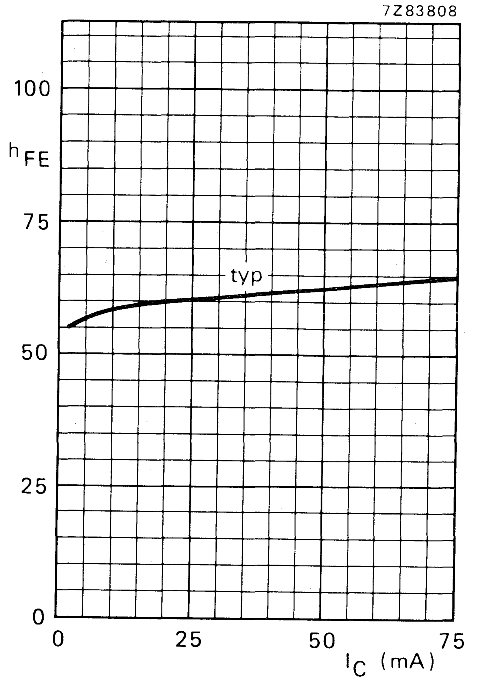


Fig. 3 $V_{CE} = 5$ V; $T_j = 25$ ^oC; typical values.

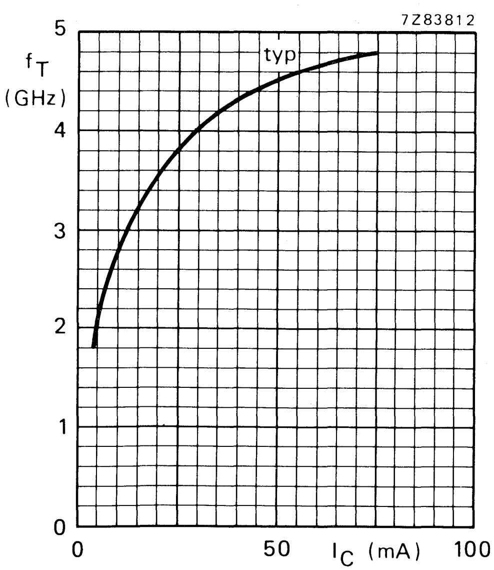


Fig. 4 $V_{CE} = 5$ V; f = 500 MHz; $T_j = 25$ ^oC; typical values.

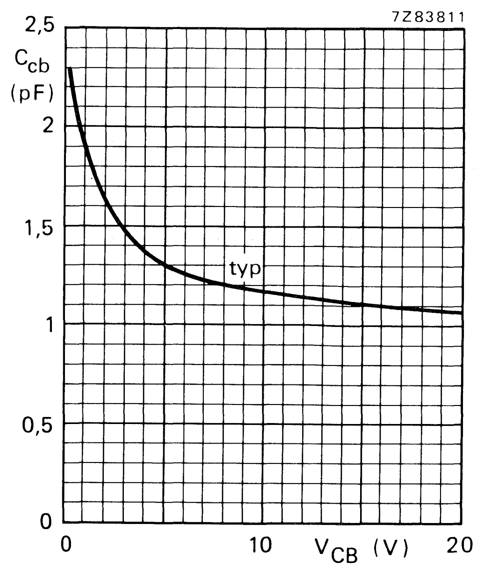


Fig. 5 $I_C = i_c = 0$; f = 1 MHz; $T_j = 25$ ^oC; typical values.

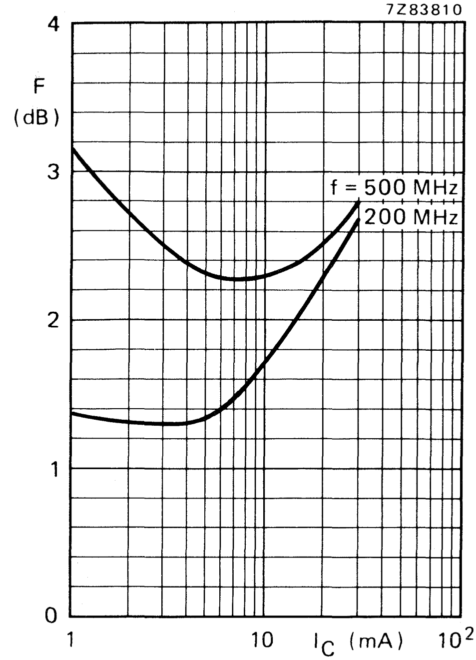


Fig. 6 V_{CE} = 5 V; Z_S = optimum; T_{amb} = 25 °C; typical values.

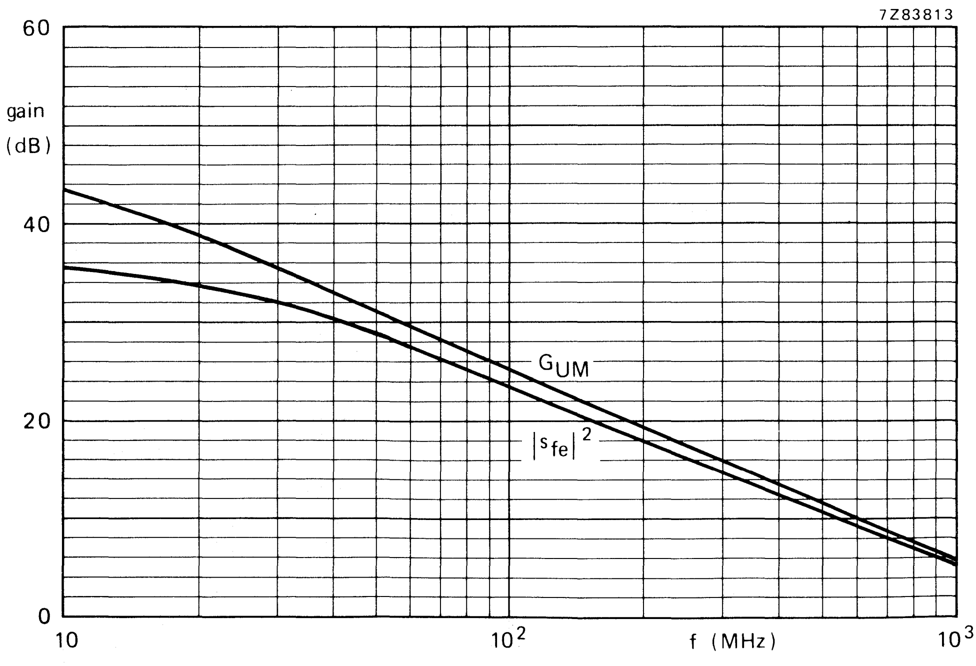


Fig. 7 V_{CE} = 5 V; I_C = 50 mA; T_{amb} = 25 °C; typical values.

N-P-N 7.5 GHz WIDEBAND TRANSISTOR

N-P-N transistor in a three-lead plastic envelope (SOT-37). 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 °C	P_{tot}	max.	300	mW
Junction temperature	T_j	max.	175	°C
D.C. current gain I_C = 15 mA; V_{CE} = 5 V	h_{FE}	min. typ.	60 100	
Transition frequency at f = 500 MHz I_C = 15 mA; V_{CE} = 8 V	f_T	typ.	7,5	GHz
Maximum unilateral power gain at f = 2 GHz I_C = 15 mA; V_{CE} = 8 V	G_{UM}	typ.	8,0	dB
Noise figure at f = 2 GHz I_C = 15 mA; V_{CE} = 8 V; Z_s = 60 Ω	F	typ.	3,0	dB

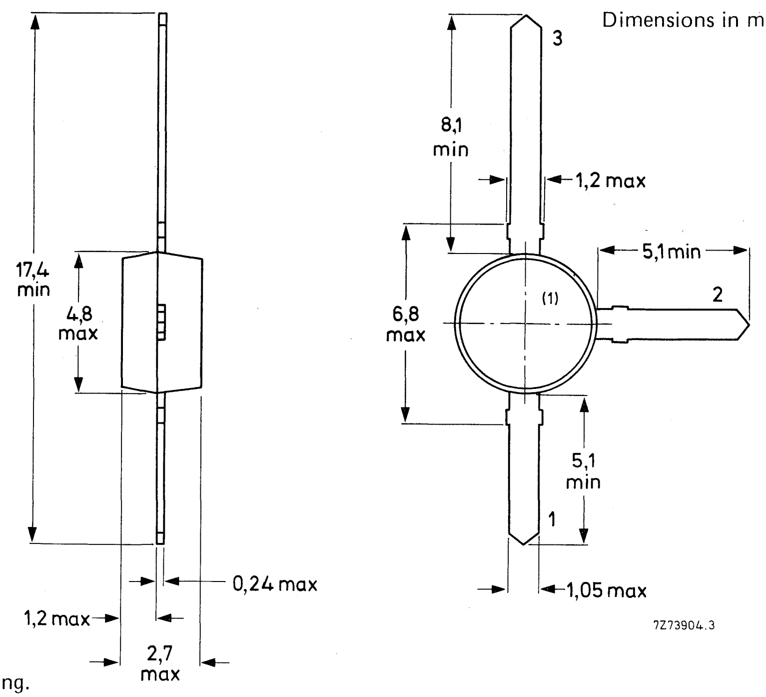
MECHANICAL DATA

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.	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 °C	P_{tot}	max.	300	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 fibre-glass print	$R_{th\ j\text{-}a}$	=	300	K/W
From junction to soldering point	$R_{th\ j\text{-}s}$	=	65	K/W

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 = 15 mA; V_{CE} = 5 V	h_{FE}	min. typ.	60 100	
Transition frequency at f = 500 MHz I_C = 15 mA; V_{CE} = 8 V	f_T	typ.	7,5	GHz
Collector capacitance at f = 1 MHz $I_E = i_e = 0$; V_{CB} = 8 V	C_c	typ.	0,8	pF
Emitter capacitance at f = 1 MHz $I_C = i_c = 0$; V_{EB} = 0,5 V	C_e	typ.	1,3	pF
Feedback capacitance $I_C = 0$; V_{CE} = 8 V	C_{re}	typ.	0,5	pF

Maximum unilateral power gain (s_{12} assumed to be zero)

$$G_{UM} = 10 \log \frac{|s_{21}|^2}{[1-|s_{11}|^2]\,[1-|s_{22}|^2]}$$

I_C = 15 mA; V_{CE} = 8 V; f = 800 MHz; T_{amb} = 25 °C	G_{UM}	typ.	16,0	dB
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
I_C = 15 mA; V_{CE} = 8 V	F	typ.	1,5	dB
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 V; T_{amb} = 25 °C; typical values

I_C mA	f MHz	s_{11}	s_{21}	s_{12}	s_{22}	GUM dB
	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
5	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
	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
10	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
	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
15	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
	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
20	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
	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
30	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

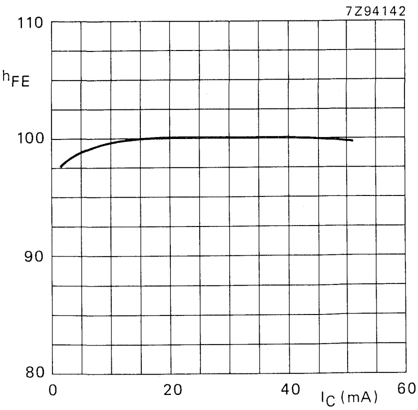


Fig. 2 V_{CE} = 8 V; T_j = 25 °C; typical values.

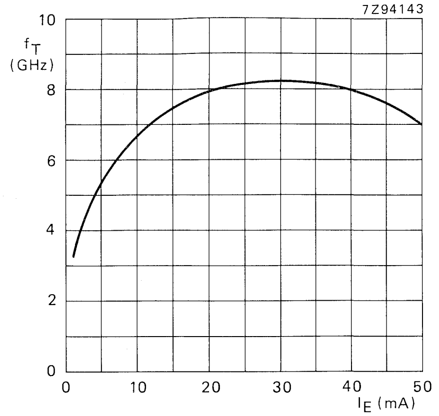


Fig. 3 V_{CE} = 8 V; T_j = 25 °C; typical values.

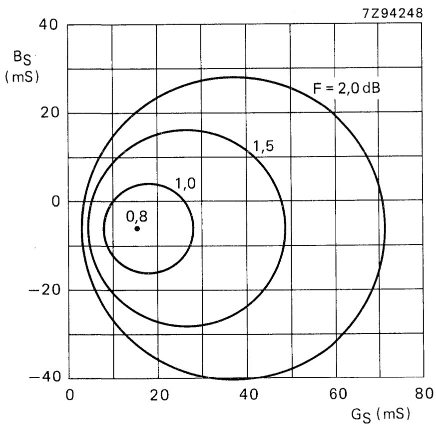


Fig. 4 Circles of constant noise figure;
V_{CE} = 8 V; I_C = 5 mA; f = 800 MHz; typical values.

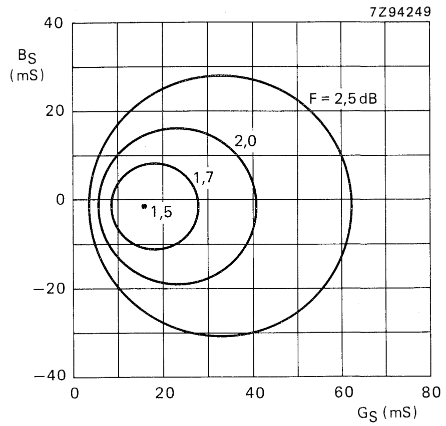


Fig. 5 Circles of constant noise figure;
V_{CE} = 8 V; I_C = 15 mA; f = 800 MHz; typ. values.

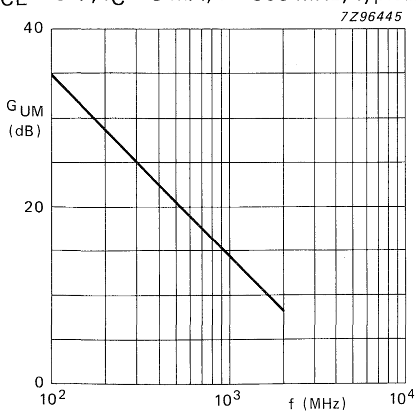


Fig.6 V_{CE} = 8 V; I_C = 15 mA;
T_{amb} = 25 °C; typical values.

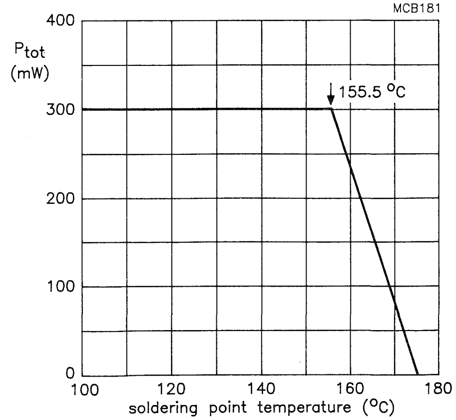


Fig.7 Power derating curve.

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 (DC)	I_C	max.	50 mA
Total power dissipation up to T_{amb} = 105 °C	P_{tot}	max.	350 mW
Junction temperature	T_j	max.	175 °C
D.C. current gain I_C = 15 mA; V_{CE} = 5 V	h_{FE}	min. typ.	60 100
Transition frequency at f = 500 MHz I_C = 15 mA; V_{CE} = 8 V	f_T	typ.	7.5 GHz
Maximum unilateral power gain at f = 2 GHz I_C = 15 mA; V_{CE} = 8 V	G_{UM}	typ.	11.5 dB

MECHANICAL DATA

SOT173 and SOT173X

Marking code: Q6

ORDERING AND PACKAGE INFORMATION

EXTENDED TYPE NUMBER	PACKAGE		
	CODE	PACKING METHOD	PACKING QUANTITY
BFQ66	SOT173	BULK	50
BFQ66	SOT173X	12 mm REEL	1000

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 (DC)	I_C	max.	50	mA
Total power dissipation up to T_{amb} = 105 °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	$R_{th\ j\text{-}a}$		200	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
DC 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
Collector capacitance at f = 1 MHz $I_E = i_e = 0$; $V_{CB} = 8$ 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.	1.3	pF
Feedback capacitance $I_C = 0$; $V_{CE} = 8$ V	C_{re}	typ.	0.4	pF

Maximum unilateral power gain (s_{12} assumed to be zero)

$$G_{UM} = 10 \log \frac{|s_{21}|^2}{(1 - |s_{11}|^2)\,(1 - |s_{22}|^2)}$$

$I_C = 15$ mA; $V_{CE} = 8$ V; f = 2 GHz; T_{amb} = 25 °C	G_{UM}	typ.	11.5	dB
Noise figure at f = 2 GHz; $Z_S = 60\ \Omega$; 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
		max.	4.0	dB

s-parameters (common emitter) at V_{CE} = 8 V; T_{amb} = 25 °C; typical values.

I_C mA	f MHz	s_{11}	s_{21}	s_{12}	s_{22}	G_{UM} dB
	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
5	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_{11}	s_{21}	s_{12}	s_{22}	G_{UM} dB
	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
15	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

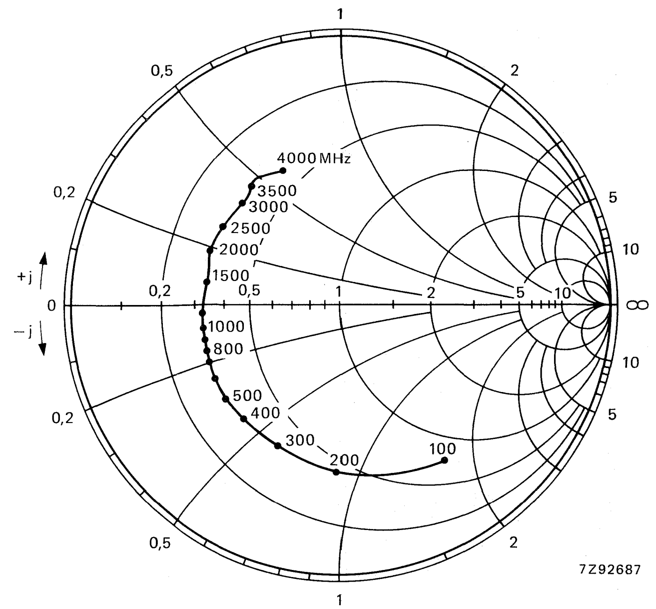


Fig. 1 Input impedance, derived from input reflection coefficient s_{11} oordinates, in ohm x 50.

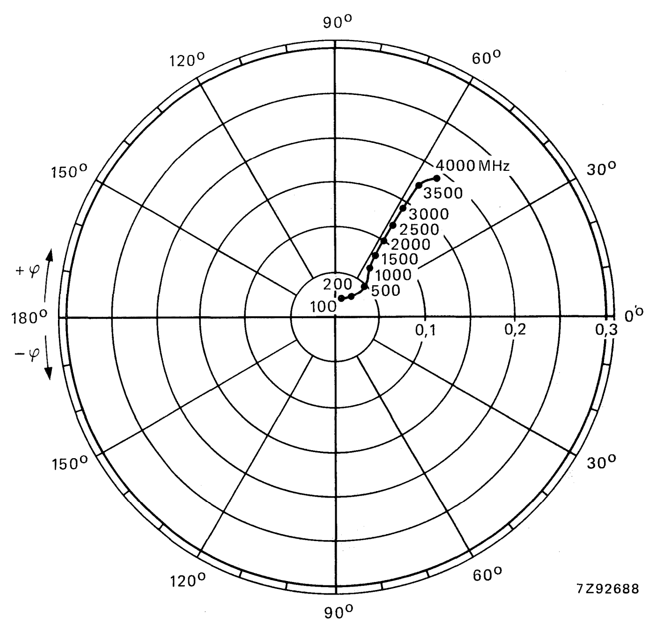


Fig. 2 Reverse transmission coefficient s_{12}.

Conditions for Figs 1 to 4: V_{CE} = 8 V; I_C = 15 mA; T_{amb} = 25 °C; typical values.

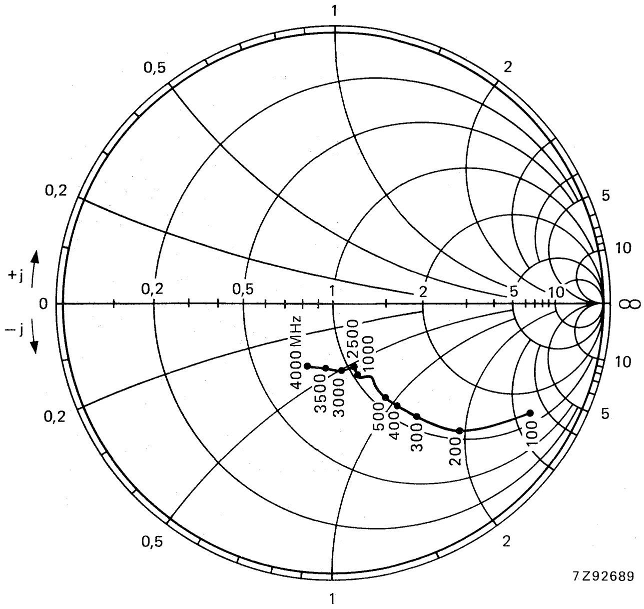


Fig. 3 Output impedance, derived from output reflection coefficient s_{22} coordinates, in ohm x 50.

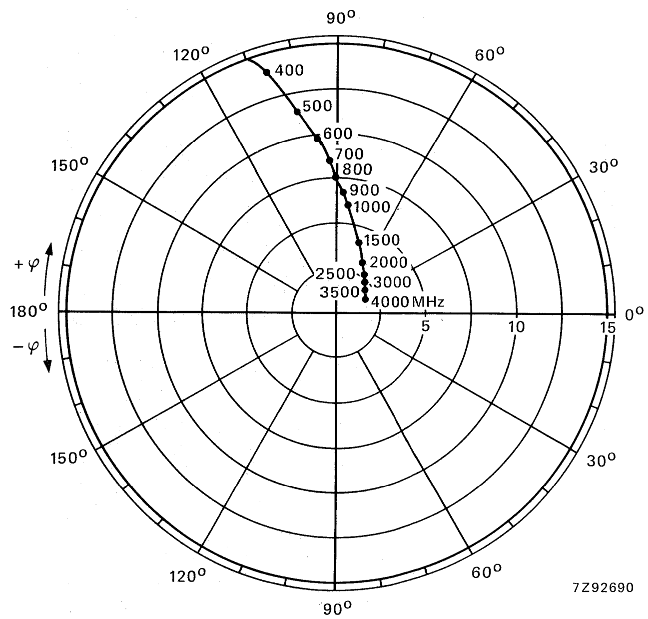


Fig. 4 Forward transmission coefficient s_{21}.

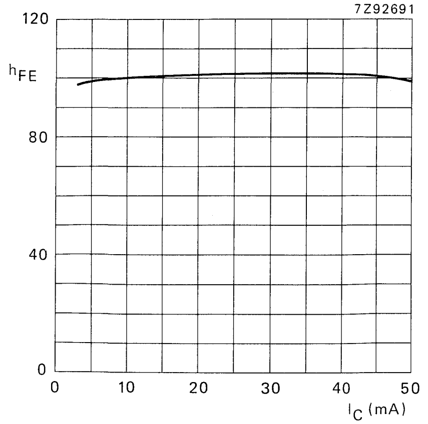


Fig. 5 V_{CE} = 5 V; T_j = 25 °C; typ. values.

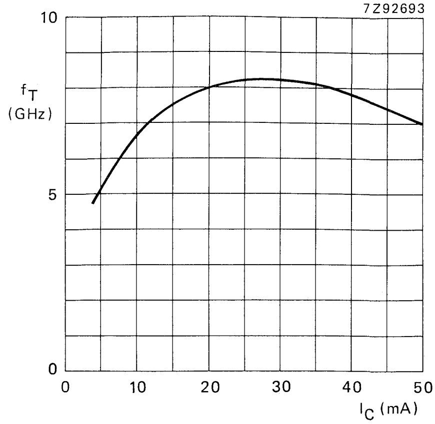


Fig. 6 V_{CE} = 8 V; f = 500 MHz; T_j = 25 °C; typ. values.

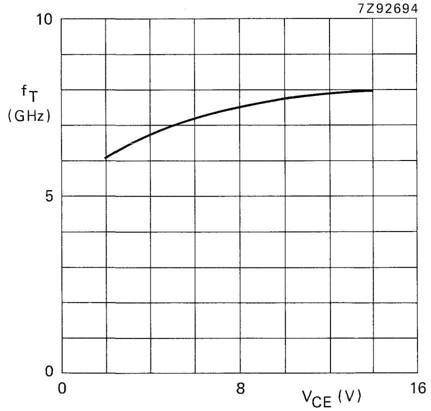


Fig. 7 I_C = 15 mA; f = 500 MHz; T_j = 25 °C; typ. values.

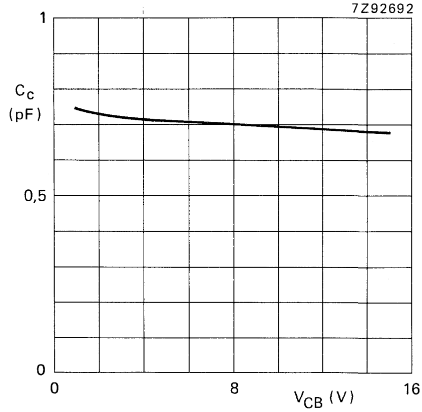


Fig. 8 $I_E = i_e = 0$; f = 1 MHz; T_j = 25 °C; typ. values.

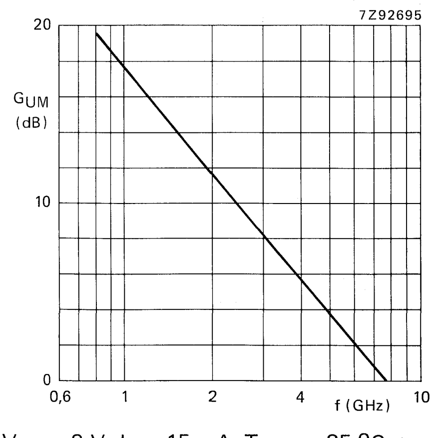


Fig. 9 V_{CE} = 8 V; I_C = 15 mA; T_{amb} = 25 °C; typ. values.

N-P-N 7.5 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} = 25 °C	P_{tot}	max.	300	mW
Junction temperature	T_j	max.	150	°C
D.C. current gain I_C = 15 mA; V_{CB} = 5 V	h_{FE}	typ.	100	
Transition frequency at f = 500 MHz I_C = 15 mA; V_{CE} = 8 V	f_T	typ.	7,5	GHz
Maximum unilateral power gain at f = 2 GHz I_C = 15 mA; V_{CE} = 8 V	G_{UM}	typ.	8,0	dB

MECHANICAL DATA

Dimensions in mm

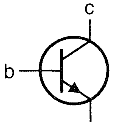
Fig. 1 SOT-23.

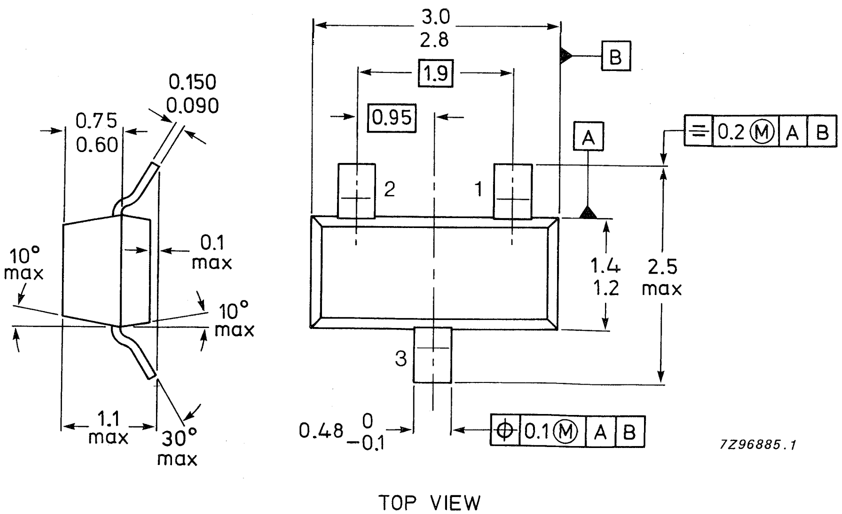
Marking code

BFQ67 = $V2_p$

Pinning

1 = base
2 = emitter
3 = collector





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} = 25 °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*	$R_{th\ j\text{-}a}$	=	430	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
D.C. current gain I_C = 15 mA; V_{CB} = 5 V	h_{FE}	typ.	100	
Transition frequency at f = 500 mHz I_C = 15 mA; V_{CE} = 8 V	f_T	typ.	7,5	GHz
Collector capacitance at f = 1 MHz $I_E = i_e = 0$; V_{CB} = 8 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.	1,3	pF
Feedback capacitance at f = 1 MHz $I_C = 0$; V_{CE} = 8 V	C_{re}	typ.	0,5	pF

Maximum unilateral power gain (s_{12} assumed to be zero)

$$G_{UM} = 10 \log \frac{|s_{21}|^2}{[1-|s_{11}|^2]\,[1-|s_{22}|^2]}$$

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 = 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
Noise figure at f = 800 MHz; Z_S = optimum; T_{amb} = 25 °C				
I_C = 5 mA; V_{CE} = 8 V	F	typ.	0.8	dB
I_C = 15 mA; V_{CE} = 8 V	F	typ.	1.5	dB

* Mounted on a ceramic substrate of 8 mm x 10 mm x 0,7 mm.

s-parameters (common emitter) at V_{CE} = 8 V; typical values.

I_C mA	f MHz	s_{11}	s_{21}	s_{12}	s_{22}	G_{UM} dB
	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
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°	2,78/ 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
	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
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
	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
10	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
	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
15	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
	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
20	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

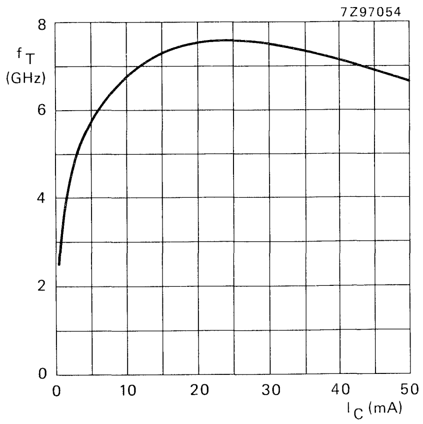


Fig. 2 V_{CE} = 8 V; f = 500 MHz; typical values.

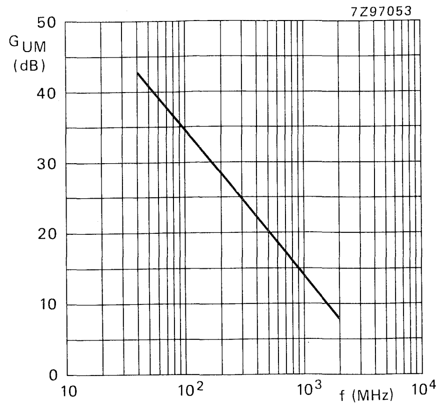


Fig. 3 V_{CE} = 8 V; I_C = 15 mA; T_{amb} = 25 °C; typical values.

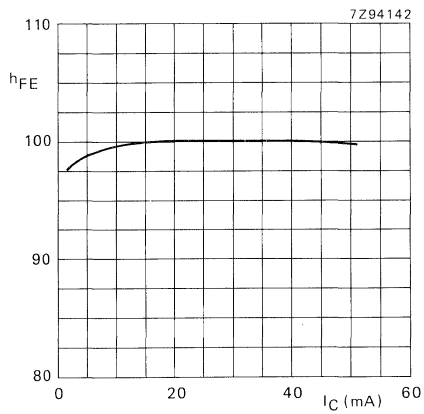


Fig.4 DC current gain as a function of collector current.

N-P-N 4 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 °C	P_{tot}	max.	4,5	W
Operating junction temperature	T_j	max.	200	°C
Transition frequency at f = 500 MHz I_C = 240 mA; V_{CE} = 15 V	f_T	typ.	4,0	GHz
Output voltage at d_{im} = −60 dB I_C = 240 mA; V_{CE} = 15 V; R_L = 75 Ω $f_{(p+q-r)}$ = 793,25 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).

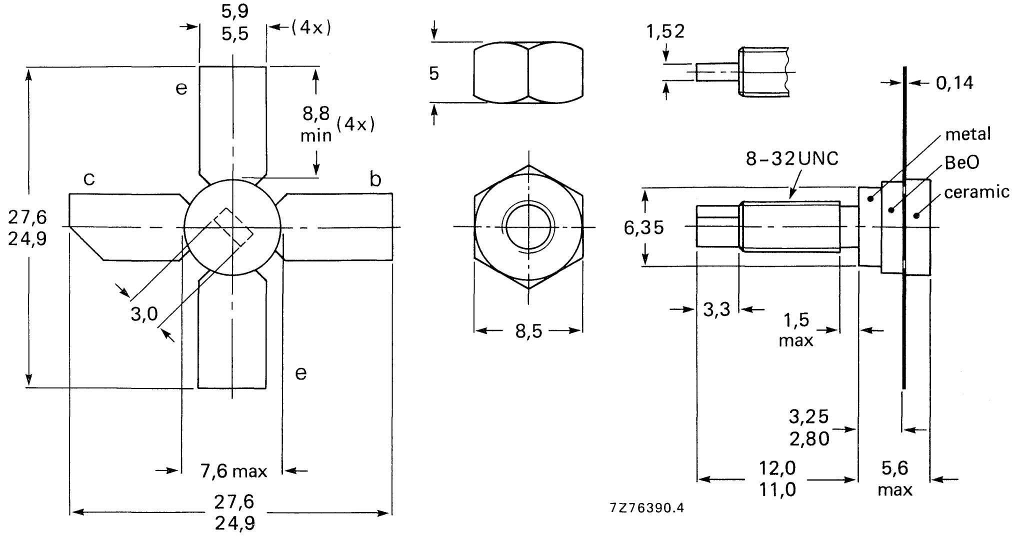
PRODUCT SAFETY

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

Dimensions in mm

Fig. 1 SOT-122.



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	$R_{th\ j\text{-}mb}$	=	20,0	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,6	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current $I_E = 0$; V_{CB} = 15 V	I_{CBO}	max.	50 μA
D.C. current gain I_C = 240 mA; V_{CE} = 15 V	h_{FE}	min.	25
Transition frequency at f = 500 MHz I_C = 240 mA; V_{CE} = 15 V	f_T	typ.	4 GHz
Collector capacitance at f = 1 MHz $I_E = I_e = 0$; V_{CB} = 15 V	C_c	typ.	3,8 pF
Emitter capacitance at f = 1 MHz $I_C = I_c = 0$; V_{EB} = 0,5 V	C_e	typ.	20 pF
Feedback capacitance at f = 1 MHz $I_C = 0$; V_{CE} = 15 V	C_{re}	typ.	2,3 pF
Collector-stud capacitance*	C_{cs}	typ.	0,8 pF

Maximum unilateral power gain (s_{12} assumed to be zero)

$$G_{UM} = 10 \log \frac{|s_{21}|^2}{[1-|s_{11}|^2]\,[1-|s_{22}|^2]}$$

I_C = 240 mA; V_{CE} = 15 V; f = 800 MHz; T_{amb} = 25 °C	G_{UM}	typ.	13 dB

Output voltage at d_{im} = −60 dB (see Figs 2 and 12)
(DIN 45004B, par. 6.3: 3-tone)
I_C = 240 mA; V_{CE} = 15 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.	1,6 V

* Measured with emitter and base grounded.

Output power at 1 dB gain compression (see Fig. 2) I_C = 240 mA; V_{CE} = 15 V R_L = 75 Ω; T_{amb} = 25 °C measured at f = 800 MHz	P_{L1}	typ.	+28 dBm
Third order intercept point (see Fig. 2) I_C = 240 mA; V_{CE} = 15 V R_L = 75 Ω; 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.	+47 dBm

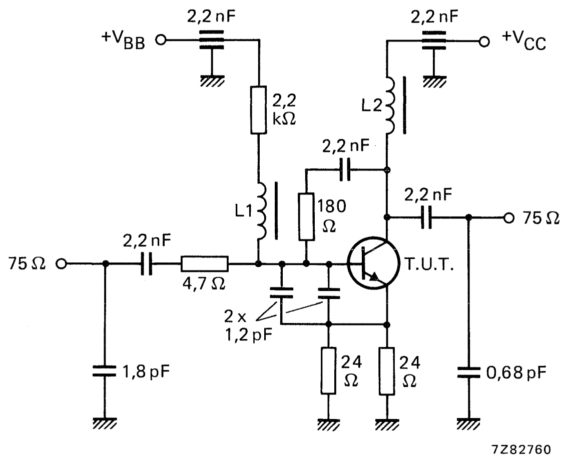


Fig. 2 Intermodulation distortion MATV test circuit. Power gain at f = 40 MHz to 860 MHz is typical 7 dB.

L1 = L2 = 5 μH micro choke.

s-parameters (common emitter) at V_{CE} = 7,5 V; T_{amb} = 25 °C; typical values.

I_C mA	f MHz	s_{11}	s_{12}	s_{21}	s_{22}	G_{UM} dB
	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
50	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
	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
100	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
	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
150	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
	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
200	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
	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
250	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
	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
300	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 V; T_{amb} = 25 °C; typical values.

I_C mA	f MHz	s_{11}	s_{12}	s_{21}	s_{22}	G_{UM} 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 V; I_C = 240 mA;
T_{amb} = 25 °C; typical values.

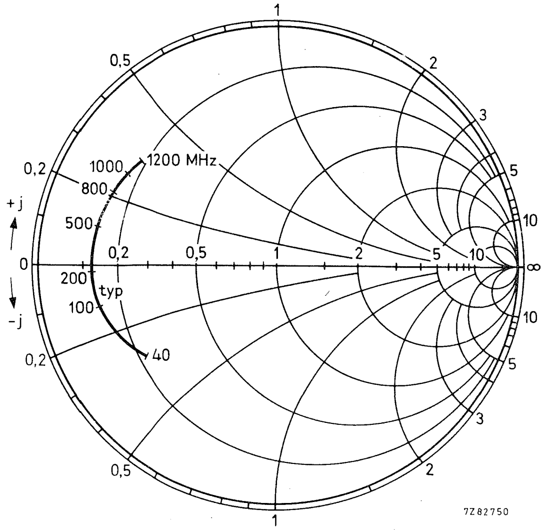


Fig. 3 Input impedance derived from input reflection coefficient s_{11} co-ordinates in ohm x 50.

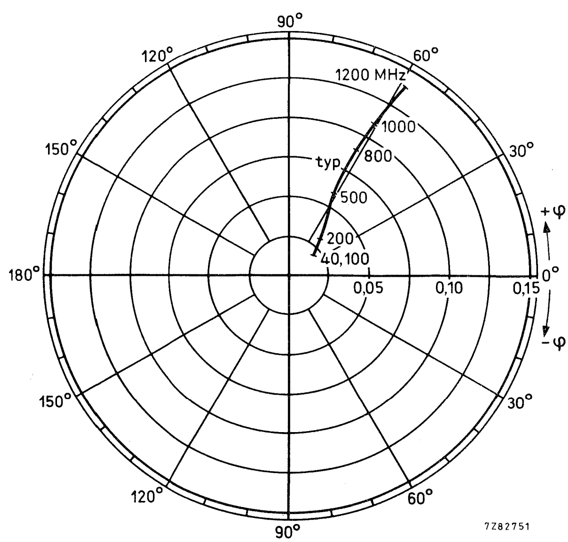


Fig. 4 Reverse transmission coefficient s_{12}.

Conditions for Figs 5 and 6:
V_{CE} = 15 V; I_C = 240 mA;
T_{amb} = 25 °C; typical values.

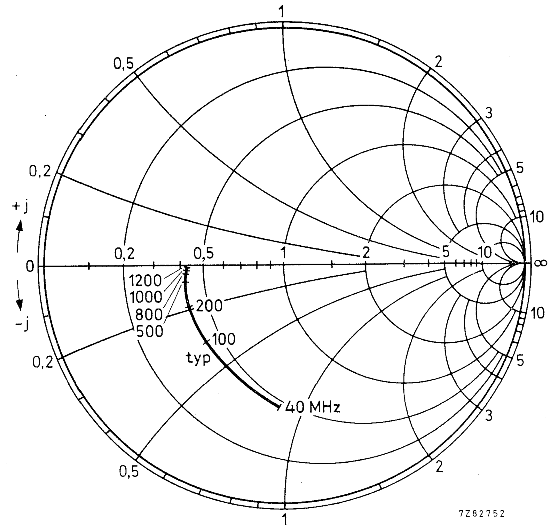


Fig. 5 output impedance derived from output reflection coefficient s_{22} co-ordinates in ohm x 50.

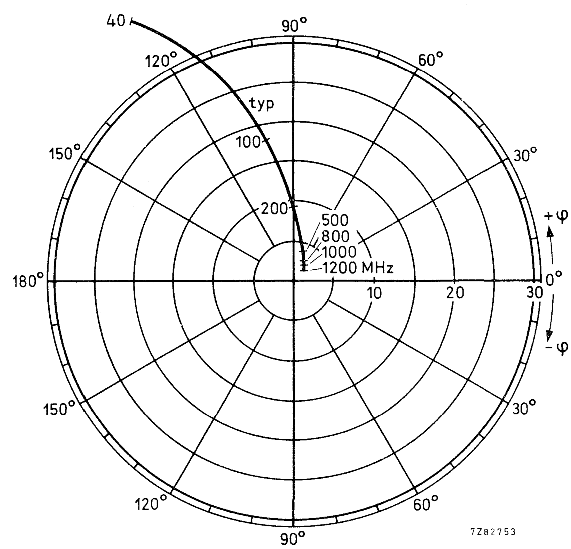


Fig. 6 Forward transmission coefficient s_{21}.

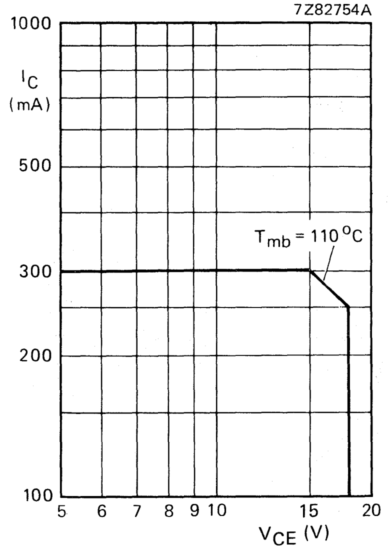


Fig. 7 D.C. SOAR.

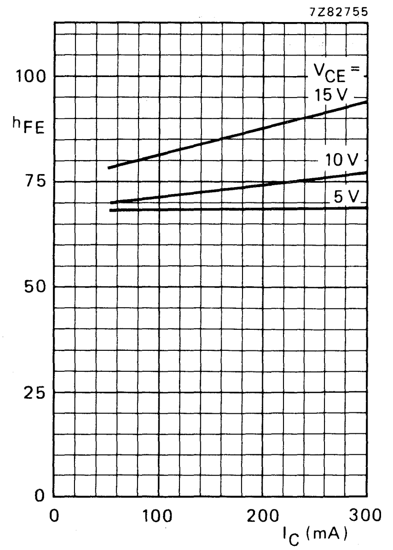


Fig. 8 T_j = 25 °C; typical values.

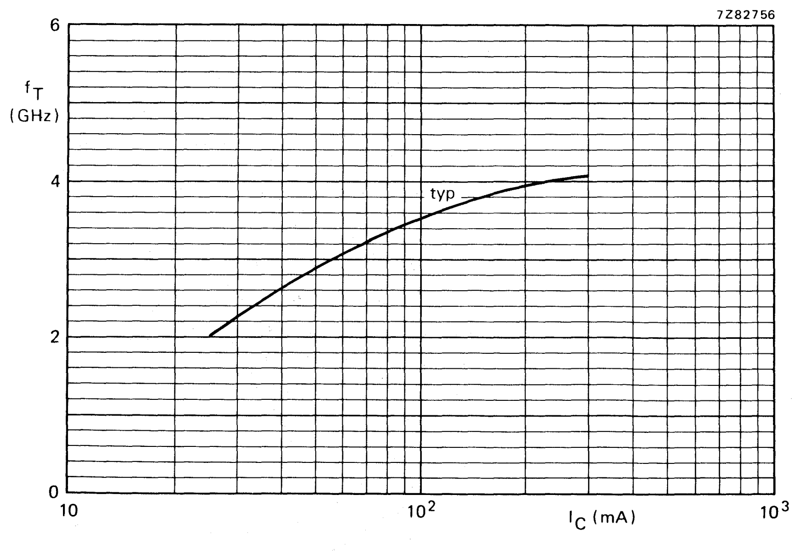


Fig. 9 V_{CE} = 15 V; f = 500 MHz; T_j = 25 °C; typical values.

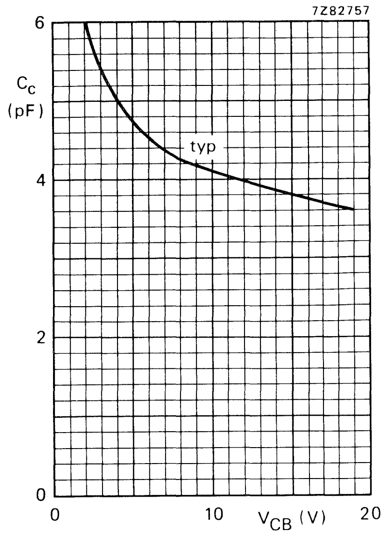


Fig. 10.

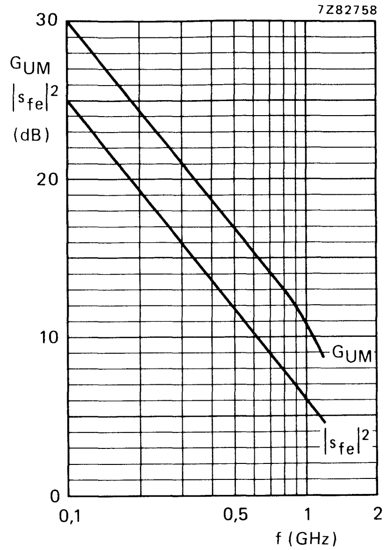


Fig. 11.

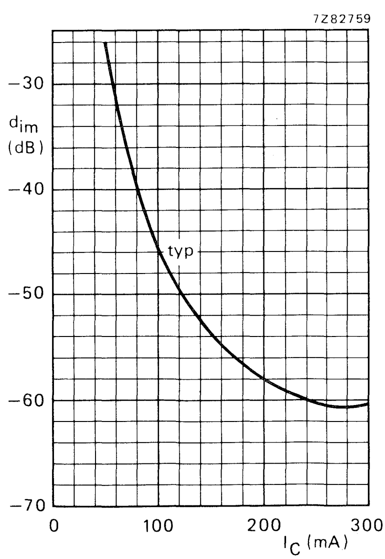


Fig. 12.

Conditions for Figs 10, 11 and 12:

Fig. 10 $I_E = I_e = 0$; $T_{amb} = 25\ ^oC$; typ. values.

Fig. 11 $V_{CE} = 15$ V; $I_C = 240$ mA; $T_{amb} = 25\ ^oC$; typical values.

Fig. 12 $V_{CE} = 15$ V; $V_o = 1,6$ V; $f_{(p + q - r)} = 793,25$ MHz; $T_{amb} = 25\ ^oC$; measured in MATV test circuit (see Fig. 2); typical values.

NPN 6.5 GHz WIDEBAND TRANSISTOR

NPN transistor in a ceramic SOT172A2 package. It is primarily intended for use in MATV and microwave amplifiers, such as in aerial amplifiers, radar systems, oscilloscopes, spectrum analysers etc.

Emitter ballasting resistors and application of gold sandwich metallization ensure an optimum temperature profile and excellent reliability properties.

QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	25	V
Collector-emitter voltage (open base)	V_{CEO}	max.	19	V
Collector current (DC)	I_C	max.	150	mA
Total power dissipation up to T_{mb} = 145 °C	P_{tot}	max.	2.7	W
Junction temperature	T_j	max.	200	°C
DC current gain I_C = 120 mA; V_{CE} = 18 V	h_{FE}	min.	55	
Transition frequency at f = 1000 MHz I_C = 120 mA; V_{CE} = 18 V; T_{amb} = 25 °C	f_T	typ.	6.5	GHz
Maximum power gain at f = 500 MHz I_C = 120 mA; V_{CE} = 18 V	G_{UM}	typ.	17	dB
Maximum power gain at f = 800 MHz I_C = 120 mA; V_{CE} = 18 V	G_{UM}	typ.	13.5	dB
Output voltage at d_{im} = −60 dB I_C = 120 mA; $-V_{CE}$ = 18 V; R_L = 75 Ω; $f_{(p+q-r)}$ = 793.25 MHz	V_o	typ.	1.2	V

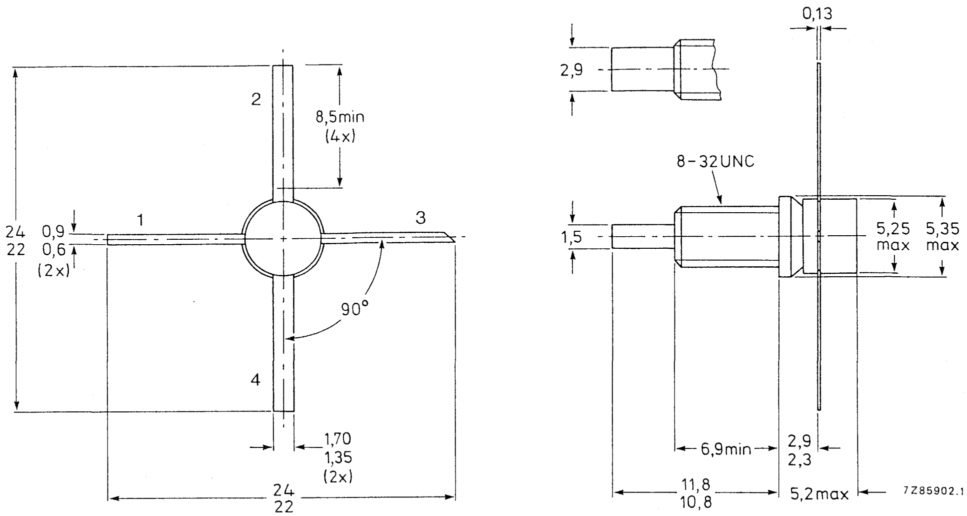
MECHANICAL DATA

SOT172A2 (see Fig. 1)

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT172A2.



Pinning

1. Base
2/4. Emitter
3. Collector

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.	19	V
Emitter-base voltage (open collector)	V_{EBO}	max.	2	V
Collector current (DC)	I_C	max.	150	mA
Total power dissipation up to T_{mb} = 145 °C	P_{tot}	max.	2.7	W
Storage temperature range	T_{stg}		−65 to +150	°C
Junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE

From junction to case	$R_{th\ j\text{-}c}$	=	30 K/W

CHARACTERISTICS

$T_j = 25\ ^oC$ unless otherwise specified

Collector cut-off current $I_E = 0$; $V_{CB} = 18$ V	I_{CBO}	max.	50 μA
DC current gain $I_C = 120$ mA; $V_{CE} = 18$ V	h_{FE}	min.	55
Transition frequency at f = 1000 MHz $I_C = 120$ mA; $V_{CE} = 18$ V; $T_{amb} = 25\ ^oC$	f_T	typ.	6.5 GHz
Collector capacitance at f = 1 MHz $I_E = i_e = 0$; $V_{CB} = 18$ V	C_c	typ.	1.8 pF
Emitter capacitance at f = 1 MHz $I_C = i_c = 0$; $-V_{EB} = 0.5$ V	C_e	typ.	5.5 pF
Feedback capacitance at f = 1 MHz $I_C = 0$ mA; $V_{CE} = 18$ V	C_{re}	typ. max.	1.0 pF 1.2 pF
Maximum power gain at f = 500 MHz; $T_{amb} = 25\ ^oC$ $I_C = 120$ mA; $V_{CE} = 18$ V;	G_{UM}	typ.	17 dB
Maximum power gain at f = 800 MHz; $T_{amb} = 25\ ^oC$ $I_C = 120$ mA; $V_{CE} = 18$ V	G_{UM}	typ.	13.5 dB
Output voltage at $d_{im} = -60$ dB (DIN 45004B) $T_{amb} = 25\ ^oC$; $I_C = 120$ mA; $V_{CE} = 18$ V; $R_L = 75\ \Omega$ $V_p = V_o$ at $d_{im} = -60$ dB; $f_p = 445.25$ MHz $V_q = V_o$ −6 dB; $f_q = 453.25$ MHz $V_r = V_o$ −6 dB; $f_r = 455.25$ MHz Measured at $f_{(p+q-r)} = 443.25$ MHz	V_o	typ.	1.35 V
Output voltage at $d_{im} = -60$ dB (DIN 45004B); $T_{amb} = 25\ ^oC$; $I_C = 120$ mA; $V_{CE} = 18$ V; $R_L = 75\ \Omega$ $V_p = V_o$ 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.	1.2 V

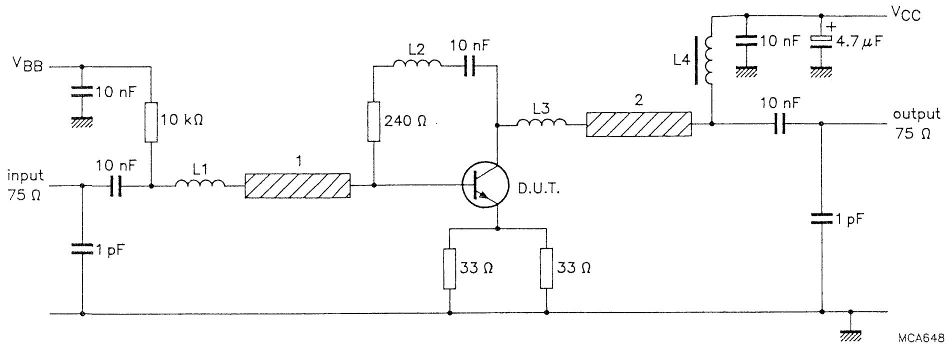


Fig. 2 Test circuit

COMPONENTS:

Stripline 1: Lp = 21 mm L1 = 8 nH
Rc = 75 Ohm L2 = 15 nH (2 turns/2 mm diameter)

Stripline 2: Lp = 16 mm L3 = 10 nH (2 turns/1.5 mm diameter)
Rc = 75 Ohm

S-parameters (common emitter) at V_{CE} = 15 V; T_{amb} = 25 ^{o}C; typical values

IC mA	f MHz	S_{11}		S_{21}		S_{12}		S_{22}		GUM dB
		M	Φ	M	Φ	M	Φ	M	Φ	
50	40	.53	−47	28.5	153	.02	59	.81	−28	35.2
	100	.50	−95	20.6	127	.038	53	.61	−58	29.6
	200	.48	−133	12.7	105	.05	50	.42	−84	24.6
	500	.52	−169	5.8	80	.08	56	.31	−108	17.1
	800	.50	170	3.7	67	.11	54	.31	−125	13.1
	1000	.50	159	3.0	59	.13	54	.31	−132	11.2
	1200	.48	152	2.5	50	.15	53	.33	−135	9.6
70	40	.52	−51	30.0	153	.02	57	.79	−31	35.1
	100	.52	−100	21.9	128	.037	49	.61	−63	30.2
	200	.53	−138	13.3	106	.05	46	.42	−92	24.7
	500	.51	−174	5.9	81	.081	52	.31	−120	17.0
	800	.49	168	3.8	67	.115	55	.29	−131	13.1
	1000	.48	159	3.1	59	.139	55	.29	−138	11.2
	1200	.47	151	2.6	50	.16	53	.32	−142	9.7
100	40	.48	−50	30.2	153	.019	57	.77	−30	34.7
	100	.48	−100	21.8	128	.036	52	.59	−62	29.8
	200	.48	−137	13.1	106	.051	51	.41	−89	24.3
	500	.45	−171	5.7	82	.091	56	.31	−115	16.7
	800	.44	166	3.8	68	.11	56	.29	−131	13.1
	1000	.45	157	3.1	59	.14	57	.29	−138	11.2
	1200	.47	148	2.7	53	.16	53	.31	−144	9.9
120	40	.48	−51	30.9	153	.019	57	.77	−30	34.9
	100	.49	−101	22.5	127	.036	51	.59	−63	30.0
	200	.50	−137	13.4	106	.051	48	.42	−93	24.5
	500	.49	−172	5.9	82	.086	54	.32	−122	17.1
	800	.47	169	3.8	69	.12	55	.30	−132	13.2
	1000	.46	159	3.1	61	.15	55	.30	−138	11.3
	1200	.46	151	2.6	52	.17	53	.32	−143	9.8

N-P-N 4 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} = 100 °C	P_{tot}	max.	9	W
Junction temperature	T_j	max.	200	°C
Transition frequency at f = 500 MHz I_C = 500 mA; V_{CE} = 15 V	f_T	typ.	4,0	GHz
Maximum unilateral power gain at f = 800 MHz I_C = 500 mA; V_{CE} = 15 V	G_{UM}	typ.	12,5	dB
Output voltage at d_{im} = −60 dB I_C = 500 mA; V_{CE} = 15 V; R_L = 75 Ω; $f_{(p+q-r)}$ = 793,25 MHz	V_o	typ.	2,5	V

MECHANICAL DATA

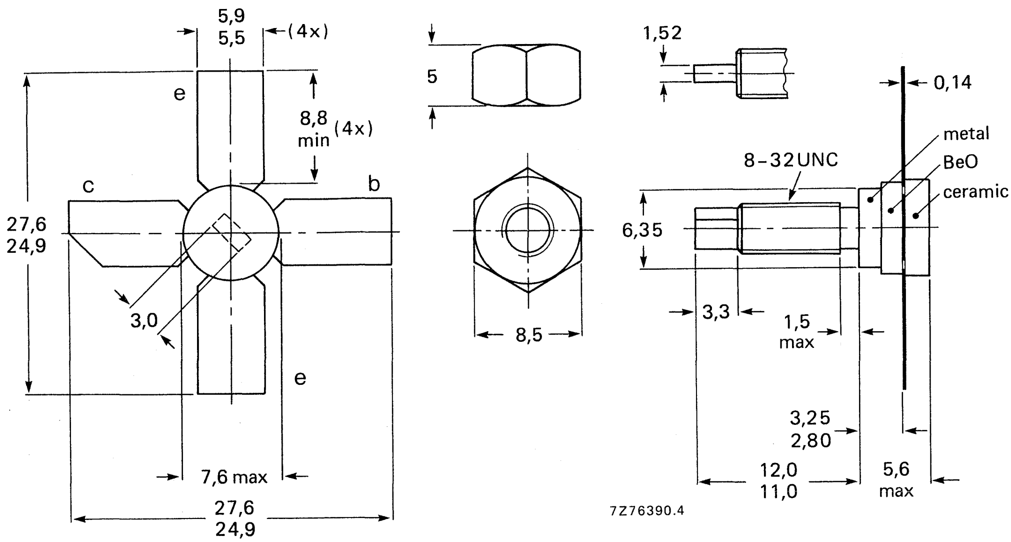
SOT-122 (see Fig. 1).

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

Dimensions in mm

Fig. 1 SOT-122.



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} = 100 °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	$R_{th\ j\text{-}mb}$	=	11	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,6	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current $I_E = 0$; $V_{CB} = 15$ V	I_{CBO}	max.	75 μA
D.C. current gain $I_C = 500$ mA; $V_{CE} = 15$ V	h_{FE}	min.	25
Transition frequency at f = 500 MHz $I_C = 500$ mA; $V_{CE} = 15$ V	f_T	typ.	4,0 GHz
Collector capacitance at f = 1 MHz $I_E = i_e = 0$; $V_{CB} = 15$ V	C_c	typ.	7,0 pF
Emitter capacitance at f = 1 MHz $I_C = i_c = 0$; $V_{EB} = 0,5$ V	C_e	typ.	40 pF
Feedback capacitance $I_C = 0$; $V_{CE} = 15$ V	C_{re}	typ.	4,0 pF
Collector-stud capacitance*	C_{cs}	typ.	0,8 pF
Maximum unilateral power gain (s_{12} assumed to be zero) $G_{UM} = 10 \log \frac{\lvert s_{21}\rvert^2}{[1-\lvert s_{11}\rvert^2][1-\lvert s_{22}\rvert^2]}$ $I_C = 500$ mA; $V_{CE} = 15$ V; f = 800 MHz; $T_{amb} = 25$ °C	G_{UM}	typ.	12,5 dB
Output voltage at $d_{im} = -60$ dB (see Fig. 2) $I_C = 500$ mA; $V_{CE} = 15$ 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.	2,5 V

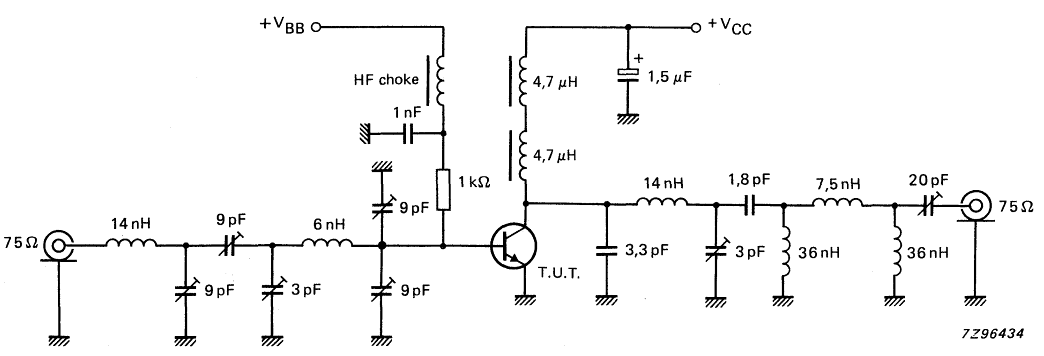


Fig. 2 High gain test circuit.

* Measured with emitter and base grounded.

s-parameters (common emitter) at V_{CE} = 15 V; T_{amb} = 25 °C; typical values

I_C mA	f MHz	s_{11}	s_{21}	s_{12}	s_{22}	G_{UM} dB
	40	0,87/−161,9°	27,9/104,8°	0,017/24,5°	0,60/−140,2°	37,0
	100	0,89/−174,2°	11,7/ 92,6°	0,019/29,3°	0,58/−163,7°	30,0
	200	0,90/+ 180,0°	5,8/ 85,8°	0,024/43,0°	0,58/−172,5°	24,3
100	500	0,89/+ 171,6°	2,4/ 70,3°	0,044/59,9°	0,59/−178,3°	16,3
	800	0,82/+ 164,3°	1,6/ 58,1°	0,068/64,2°	0,60/+ 179,0°	12,3
	1000	0,86/+ 159,9°	1,2/ 51,7°	0,086/66,1°	0,60/+ 176,4°	9,4
	1200	0,86/+ 155,6°	1,1/ 42,4°	0,105/63,7°	0,60/+ 173,8°	8,6
	40	0,87/−165,2°	29,3/103,8°	0,014/26,2°	0,65/−146,8°	37,9
	100	0,90/−175,8°	12,1/ 92,7°	0,017/34,9°	0,65/−167,3°	31,3
	200	0,90/+ 179,1°	6,1/ 86,9°	0,023/49,7°	0,65/−175,5°	25,3
200	500	0,89/+ 170,7°	2,5/ 72,7°	0,046/63,5°	0,65/+ 177,7°	17,2
	800	0,88/+ 163,5°	1,6/ 61,4°	0,072/65,8°	0,64/+ 173,6°	12,6
	1000	0,86/+ 159,2°	1,3/ 55,3°	0,090/66,5°	0,63/+ 170,6°	10,5
	1200	0,84/+ 155,1°	1,2/ 48,9°	0,109/63,3°	0,62/+ 167,8°	9,0
	40	0,88/−166,4°	29,6/103,2°	0,013/26,8°	0,67/−149,3°	38,5
	100	0,90/−176,1°	12,3/ 92,7°	0,016/36,2°	0,67/−168,5°	31,6
	200	0,90/+ 178,6°	6,2/ 86,9°	0,023/51,8°	0,67/−176,2°	25,6
300	500	0,89/+ 171,0°	2,5/ 73,5°	0,046/69,6°	0,67/+ 176,6°	17,4
	800	0,88/+ 163,8°	1,6/ 63,2°	0,072/66,2°	0,66/+ 172,0°	12,6
	1000	0,86/+ 159,5°	1,4/ 56,9°	0,091/66,7°	0,64/+ 168,7°	11,1
	1200	0,85/+ 154,5°	1,2/ 49,5°	0,110/63,3°	0,63/+ 165,8°	9,3
	40	0,88/−166,8°	29,6/102,7°	0,013/26,8°	0,69/−150,8°	38,7
	100	0,90/−176,4°	12,1/ 92,4°	0,016/36,9°	0,68/+ 169,2°	31,6
	200	0,90/+ 178,5°	6,1/ 87,1°	0,023/52,4°	0,68/−176,7°	25,6
400	500	0,89/+ 170,7°	2,5/ 74,1°	0,047/65,2°	0,68/+ 176,0°	17,5
	800	0,88/+ 163,4°	1,6/ 64,1°	0,073/66,3°	0,66/+ 171,4°	12,5
	1000	0,86/+ 159,0°	1,3/ 56,4°	0,092/66,7°	0,65/+ 168,0°	10,5
	1200	0,85/+ 154,6°	1,2/ 50,7°	0,111/63,1°	0,64/+ 164,9°	9,4
	40	0,88/−167,0°	29,3/102,2°	0,013/27,0°	0,69/−151,8°	38,6
	100	0,90/−176,6°	12,1/ 92,2°	0,016/37,0°	0,69/−169,5°	31,7
	200	0,90/+ 178,6°	6,1/ 86,8°	0,023/52,8°	0,68/−176,8°	25,6
500	500	0,89/+ 170,5°	2,5/ 73,5°	0,047/65,2°	0,68/+ 175,8°	17,5
	800	0,88/+ 164,0°	1,6/ 62,5°	0,073/66,5°	0,67/+ 171,0°	12,5
	1000	0,86/+ 159,2°	1,3/ 56,6°	0,092/66,7°	0,65/+ 167,7°	10,5
	1200	0,84/+ 154,8°	1,2/ 50,6°	0,112/63,1°	0,64/+ 164,7°	9,2

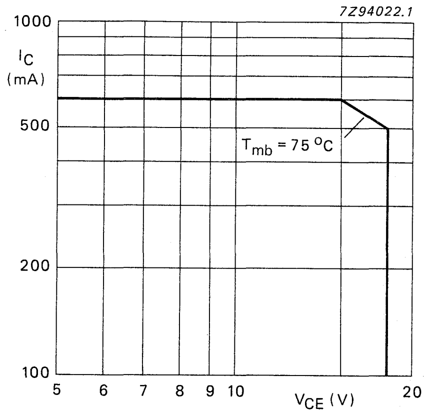


Fig. 3 D.C. SOAR.

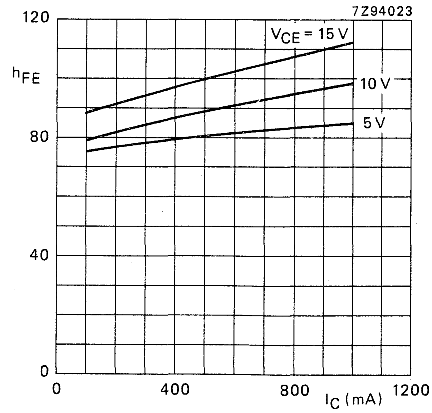


Fig. 4 T_j = 25 °C; typ. values.

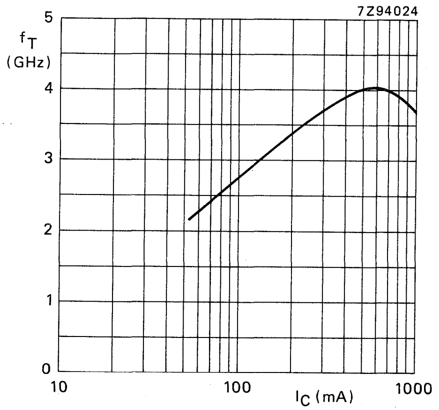


Fig. 5 V_{CE} = 15 V; f = 500 MHz;
T_j = 25 °C; typical values.

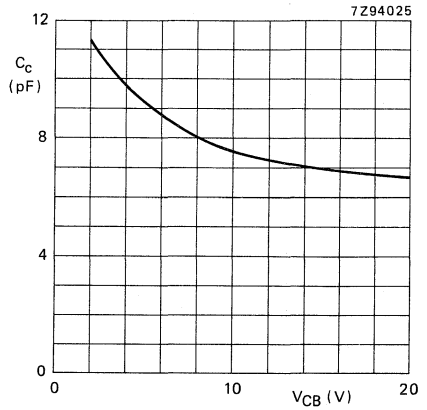


Fig. 6 $I_E = i_e = 0$; f = 1 MHz;
T_j = 25 °C; typical values.

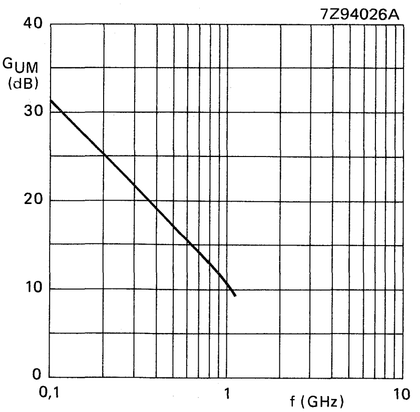
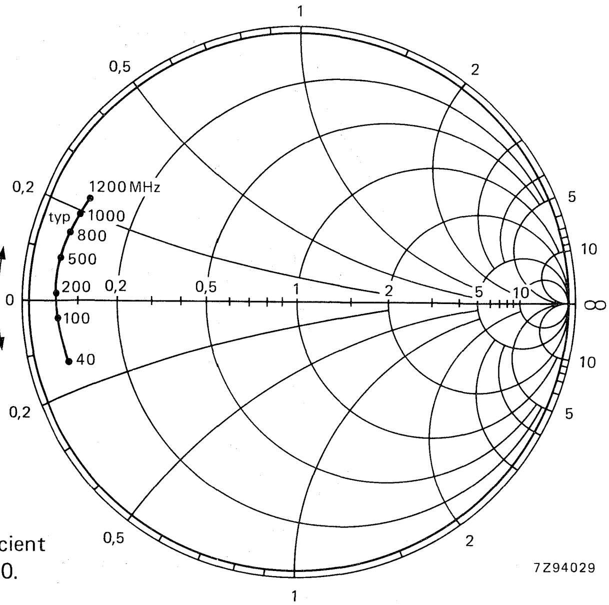


Fig. 7 V_{CE} = 15 V; I_C = 500 mA;
T_{amb} = 25 °C; typical values.

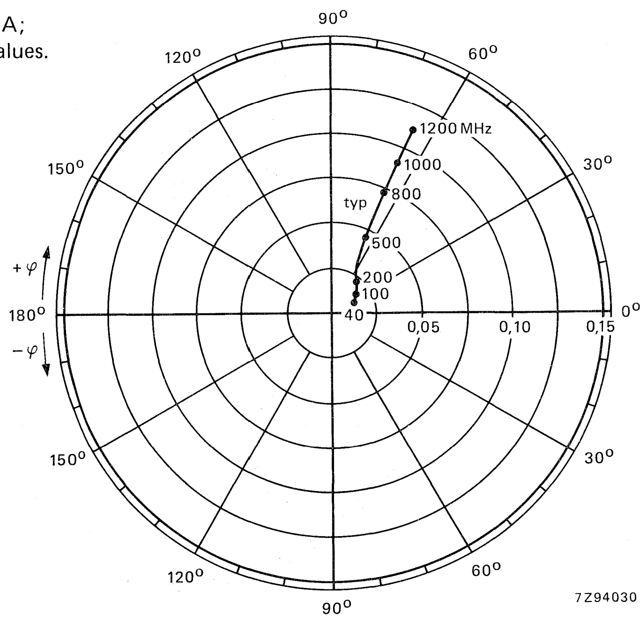


Input impedance derived from input reflection coefficient s_{11} co-ordinates in ohm x 50.

Fig. 8.

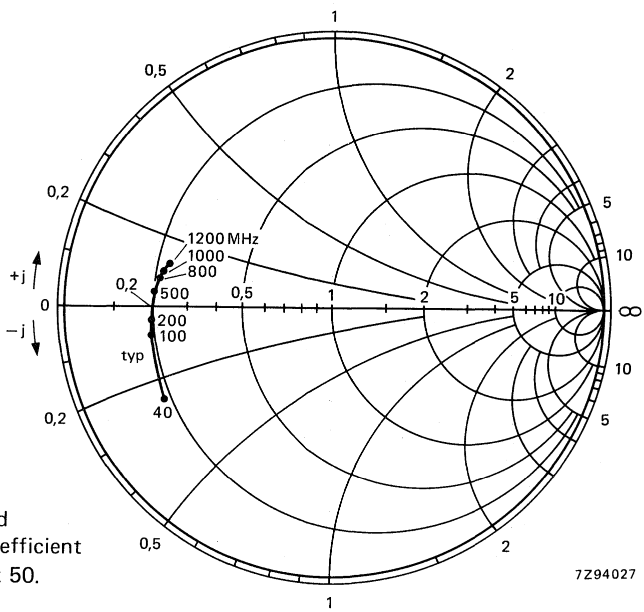
Conditions for Figs 8 and 9:

V_{CE} = 15 V; I_C = 500 mA;
T_{amb} = 25 °C; typical values.



Reverse transmission coefficient s_{12}.

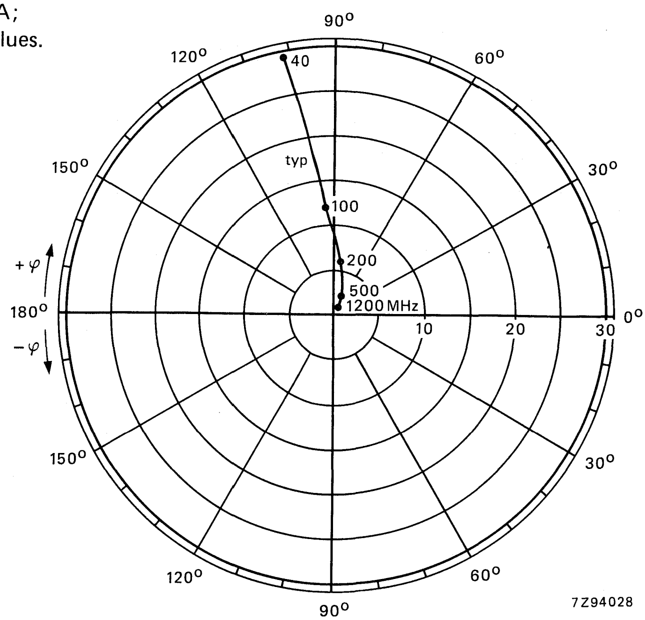
Fig. 9.



Output impedance derived from output reflection coefficient s_{22} co-ordinates in ohm x 50.

Fig. 10.

Conditions for Figs 9 and 10:
V_{CE} = 15 V; I_C = 500 mA;
T_{amb} = 25 °C; typical values.



Forward transmission coefficient s_{21}.

Fig. 11.

SILICON PLANAR EPITAXIAL TRANSISTOR

The BFQ149 is a PNP transistor in a SOT89 envelope, containing a BFQ32 crystal. The transistor is intended for use in UHF applications such as broadband aerial amplifiers (30 MHz to 860 MHz) and in microwave amplifiers such as radar systems, spectrum analyzers etc. using SMD technology.

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 (DC)	$-I_C$	max.	75	mA
Total power dissipation up to T_{amb} = 25 °C mounted on a ceramic substrate, area 2.5 cm², thickness = 0.7 mm	P_{tot}	max.	1	W
Junction temperature	T_j	max.	150	°C
DC current gain				
$-I_C$ = 50 mA; $-V_{CE}$ = 10 V	h_{FE}	min.	20	
$-I_C$ = 75 mA; $-V_{CE}$ = 10 V	h_{FE}	min.	20	
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
Noise figure at f = 500 MHz, R_S = 60 Ω				
$-I_C$ = 50 mA; $-V_{CE}$ = 10 V; T_{amb} = 25 °C	F	typ.	3.75	dB
Maximum unilateral power gain at f = 500 MHz				
$-I_C$ = 50 mA; $-V_{CE}$ = 10 V; T_{amb} = 25 °C	G_{um}	typ.	12	dB

MECHANICAL DATA

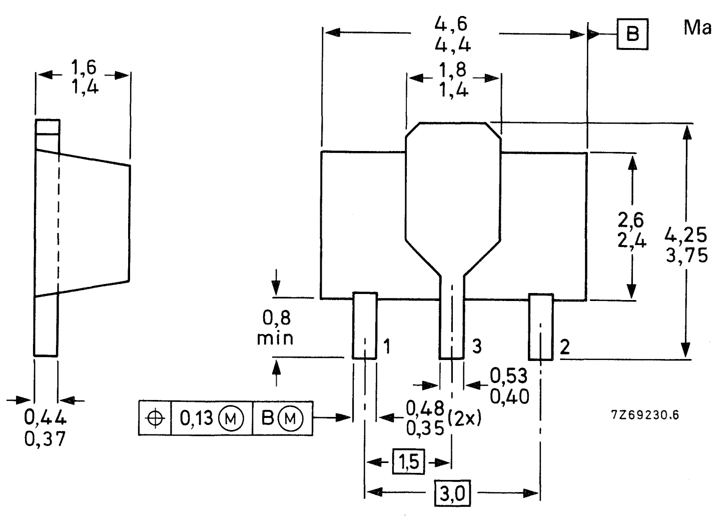
Dimensions in mm

Fig.1 SOT89.

Marking code: FG

Pinning

1 = emitter
2 = base
3 = collector



BOTTOM VIEW

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.	3.0	V
Collector current (DC)	$-I_C$	max.	75	mA
Collector current (peak value); f > 1 MHz	$-I_{CM}$	max.	150	mA
Total power dissipation up to T_{amb} = 25 °C mounted on a ceramic substrate, area = 2.5 cm^2, thickness = 0.7 mm	P_{tot}	max.	1	W
Storage temperature range	T_{stg}		−65 to 150	°C
Junction temperature	T_j	max.	175	°C

THERMAL RESISTANCE

From junction to ambient mounted on a ceramic substrate, area = 2.5 cm^2, thickness = 0.7 mm	$R_{th\,j\text{-}a}$		125 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified.

Collector cut off current			
$I_E = 0$, $-V_{CB} = 10$ V	I_{CBO}	max.	100 nA
DC current gain			
$-I_C = 50$ mA; $-V_{CE} = 10$ V	h_{FE}	min.	20
$-I_C = 75$ mA; $-V_{CE} = 10$ V	h_{FE}	min.	20
Transition frequency at f = 500 MHz			
$-I_C = 50$ mA; $-V_{CE} = 10$ V; $T_{amb} = 25$ °C	f_T	min.	3.6 GHz
		typ.	4.2 GHz
$-I_C = 75$ mA; $-V_{CE} = 10$ V; $T_{amb} = 25$ °C	f_T	min.	4.0 GHz
		typ.	4.6 GHz
Collector capacitance			
$-V_{CB} = 10$ V; $I_E = 0$; f = 1 MHz	C_c	typ.	2.0 pF
Emitter capacitance			
$-V_{EB} = 0.5$ V; $I_C = 0$; f = 1 MHz	C_e	typ.	4.0 pF
Feedback capacitance			
$-V_{CE} = 10$ V; $I_C = 0$; f = 1 MHz	C_{re}	typ.	1.7 pF
Noise figure at f = 500 MHz; $R_s = 60\ \Omega$			
$-V_{CE} = 10$ V; $-I_C = 50$ mA; $T_{amb} = 25$ °C	F	typ.	3.75 dB
Maximum unilateral power gain (S_{12} assumed to be zero)			
$-V_{CE} = 10$ V; $-I_C = 50$ mA; f = 500 MHz; $T_{amb} = 25$ °C			
$G_{UM} = 10 \log \frac{\lvert S_{21}\rvert^2}{(1-\lvert S_{11}\rvert^2)(1-\lvert S_{22}\rvert^2)}$	G_{UM}	typ.	12 dB

Table 1 S-parameters (common emitter) at V_{CE} = 10 V; typical values.

I_C mA	f MHz	S_{11} M(X)/ANG.	S_{21} M(X)/ANG.	S_{12} M(X)/ANG.	S_{22} M(X)/ANG.	G_{UM} dB
10	40	0.42/−56.8	18.15/153.9	0.02/71.9	0.90/−21.2	33.3
	100	0.48/−115.9	12.21/123.6	0.04/56.5	0.64/−44.0	25.1
	200	0.49/−151.0	6.99/103.3	0.06/55.7	0.40/−53.0	18.8
	500	0.51/−176.5	2.99/78.0	0.11/63.6	0.27/−62.6	11.1
	800	0.52/159.3	1.98/63.7	0.17/66.1	0.27/−70.6	7.6
	1000	0.54/149.0	1.60/55.6	0.20/66.2	0.27/−76.0	5.9
	1200	0.57/137.7	1.37/50.3	0.24/66.7	0.27/−82.1	4.7
	1500	0.53/129.6	1.17/40.7	0.30/63.2	0.30/−89.4	3.2
	2000	0.56/104.4	0.96/31.2	0.41/58.9	0.31/−104.4	1.7
20	40	0.29/−88.4	24.14/148.1	0.02/70.4	0.84/−28.7	33.4
	100	0.43/−139.9	14.51/117.6	0.03/61.0	0.52/−54.8	25.5
	200	0.46/−164.5	7.95/99.7	0.05/65.6	0.31/−64.8	19.5
	500	0.49/170.8	3.31/77.5	0.12/70.0	0.20/−79.5	11.7
	800	0.50/155.9	2.18/64.4	0.18/68.6	0.20/−85.6	8.2
	1000	0.51/146.2	1.77/57.0	0.22/67.1	0.20/−91.5	6.5
	1200	0.54/135.0	1.51/52.1	0.26/66.3	0.20/−95.1	5.3
	1500	0.50/128.5	1.30/42.2	0.32/61.3	0.24/−100.2	3.8
	2000	0.52/103.8	1.08/32.3	0.42/56.1	0.25/−112.2	2.3
30	40	0.27/−111.5	27.56/144.5	0.02/69.9	0.79/−33.3	33.5
	100	0.43/−151.5	15.55/114.5	0.03/64.3	0.46/−60.8	25.8
	200	0.46/−170.6	8.30/97.8	0.05/70.2	0.26/−71.5	19.7
	500	0.48/168.5	3.42/77.0	0.12/72.0	0.17/−89.8	11.9
	800	0.49/154.4	2.25/64.4	0.19/69.6	0.18/−94.2	8.4
	1000	0.51/145.0	1.82/57.3	0.22/67.3	0.18/13.1	6.7
	1200	0.53/133.0	1.56/52.4	0.27/66.1	0.17/−103.9	5.5
	1500	0.49/128.0	1.34/42.7	0.33/60.7	0.22/−106.9	4.0
	2000	0.50/103.4	1.11/32.6	0.43/55.0	0.23/−117.2	2.4
50	40	0.29/−134.0	30.36/140.3	0.02/68.9	0.73/−38.2	33.3
	100	0.44/−161.4	16.10/111.3	0.03/69.8	0.40/−66.3	25.8
	200	0.46/−175.9	8.44/95.8	0.05/74.5	0.22/−77.6	19.8
	500	0.48/166.6	3.44/76.4	0.12/73.9	0.16/−98.7	12.0
	800	0.49/153.2	2.27/64.0	0.19/70.2	0.17/−101.6	8.4
	1000	0.51/144.2	1.84/57.0	0.23/67.7	0.17/−107.5	6.7
	1200	0.54/133.2	1.58/52.3	0.27/66.3	0.16/−111.6	5.5
	1500	0.49/127.5	1.36/42.5	0.34/60.2	0.21/−112.3	4.0
	2000	0.50/103.1	1.12/32.5	0.43/54.5	0.22/−121.6	2.5
70	40	0.32/−144.1	31.28/137.7	0.02/69.0	0.68/−40.8	33.0
	100	0.46/−165.9	15.91/109.3	0.03/72.2	0.36/−68.2	25.6
	200	0.47/−178.2	8.24/94.5	0.05/75.9	0.20/−78.3	19.6
	500	0.49/165.8	3.35/75.7	0.12/74.6	0.15/−99.6	11.8
	800	0.50/152.8	2.21/63.2	0.19/70.6	0.17/−101.9	8.2
	1000	0.52/143.9	1.78/56.3	0.23/68.0	0.17/−107.6	6.5
	1200	0.54/133.0	1.53/51.6	0.27/66.6	0.16/−112.0	5.4
	1500	0.50/127.2	1.32/41.7	0.34/60.5	0.21/−122.9	3.9
	2000	0.52/102.9	1.09/32.0	0.44/54.7	0.23/−122.7	2.3

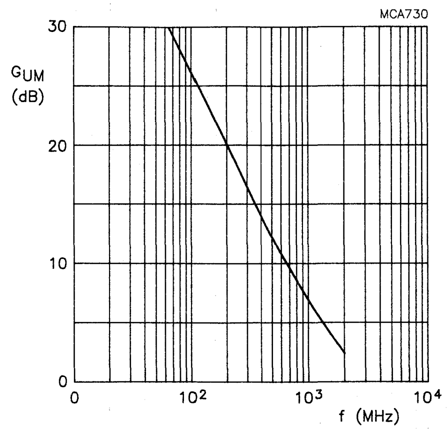


Fig.2 Maximum unilateral power gain as a function of frequency. $-V_{CE}$ = 10 V; I_C = 50 mA; T_{amb} = 25 °C.

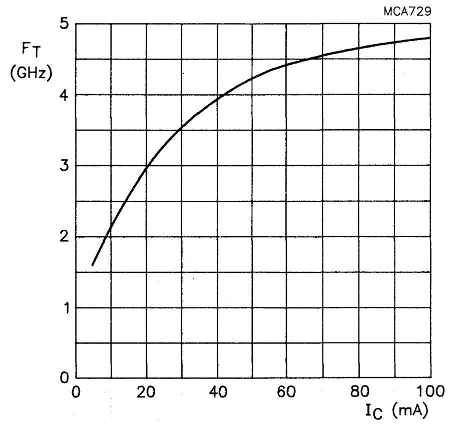


Fig.3 Transition frequency as a function of collector current. $-V_{CE}$ = 10 V; f = 500 MHz; T_j = 25 °C.

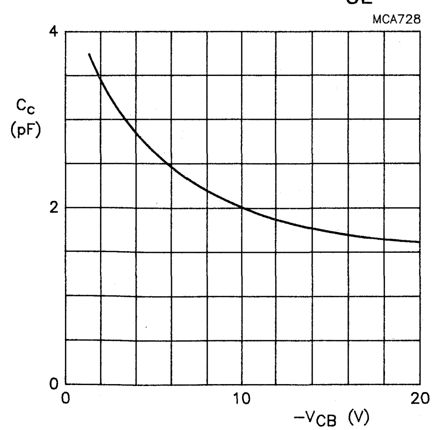


Fig.4 Collector capacitance as a function of collector base voltage. I_E = 0; f = 1 MHz; T_j = 25 °C.

Philips Components

Data sheet	
status	Product specification
date of issue	October 1990

BFQ161

NPN high frequency high voltage transistor

FEATURES

- Low output capacitance
- High gain bandwidth product
- High current applicability
- Good thermal stability
- Gold metallization ensures excellent reliability.

DESCRIPTION

NPN silicon epitaxial transistor for use as pre-stage driver in high-resolution colour graphics monitors. The BFQ161 is mounted in a TO-92 plastic envelope.

MECHANICAL DATA

TO-92.

PIN CONFIGURATION

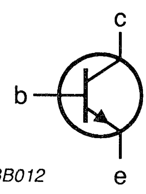


Fig.1 Pin configuration.

PINNING

PIN	DESCRIPTION
1	base
2	emitter
3	collector

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	-	20	V
V_{CEO}	collector-emitter voltage	open base	-	10	V
I_C	collector current (DC)		-	500	mA
P_{tot}	total power dissipation	T_{amb} = 25 °C	-	600	mW
T_j	junction temperature		-	150	°C
h_{FE}	DC current gain	I_C = 50 mA; V_{CE} = 10 V	25	-	
f_T	transition frequency	I_C = 300 mA; V_{CE} = 5 V; T_{amb} = 25 °C	1	-	GHz

NPN HIGH FREQUENCY TRANSISTOR

NPN silicon epitaxial transistor with a gold sandwich metallization to ensure optimum temperature profile and excellent reliability properties. It features high frequency behaviour and a low output capacitance.

This device is primarily intended for application in the pre-stage of the driver for high-resolution colour graphics monitors.

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 (DC)	I_C	max.	500 mA
Total power dissipation up to T_{mb} = 115 °C	P_{tot}	max.	3 W
Junction temperature	T_j	max.	175 °C
DC current gain I_C = 300 mA; V_{CE} = 5 V	h_{FE}	min.	25
Transition frequency at f = 100 MHz I_C = 300 mA; V_{CE} = 5 V; T_{amb} = 25 °C	f_T	min.	1.0 GHz

MECHANICAL DATA

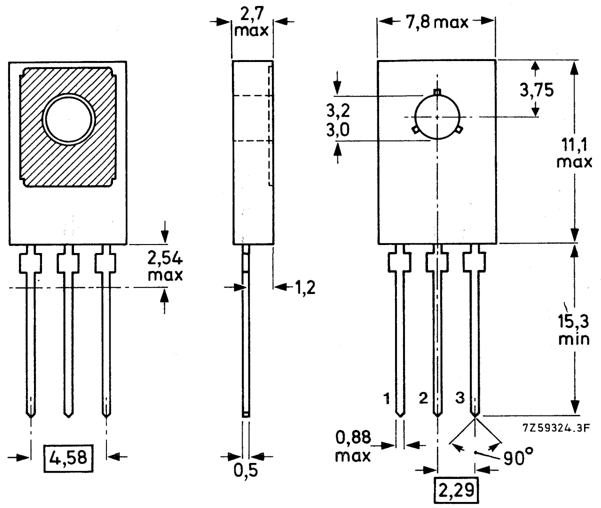
SOT32 (see Fig. 1)

MECHANICAL DATA

Dimensions in mm

Fig. 1 Plastic TO-126 (SOT32).

Collector connected
to metal part of
mounting surface.



Pinning

1 = emitter
2 = collector
3 = base

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.	3 V
Collector current (DC)	I_C	max.	500 mA
Total power dissipation up to T_{mb} = 115 °C	P_{tot}	max.	3 W
Storage temperature range	T_{stg}		−65 to +175 °C
Junction temperature	T_j	max.	175 °C

THERMAL RESISTANCE

From junction to mounting-base	$R_{th\,j\text{-}mb}$	=	20 K/W
From junction to ambient (in free air)	$R_{th\,j\text{-}a}$	=	100 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-base breakdown voltage open emitter; I_C = 5 mA	$V_{(BR)CBO}$	min.	20 V
Collector-emitter breakdown voltage open base; I_C = 10 mA	$V_{(BR)CEO}$	min.	10 V
Emitter-base breakdown voltage open collector; I_E = 1 mA	$V_{(BR)EBO}$	min.	3 V
Collector cut-off current V_{BE} = 0; V_{CE} = 10 V	I_{CES}	max.	2.5 mA
DC current gain I_C = 300 mA; V_{CE} = 5 V	h_{FE}	min.	25
Collector-base capacitance at f = 1 MHz I_C = 0; V_{CB} = 5 V	C_{cb}	typ.	4.2 pF
Collector capacitance at f = 1 MHz I_E = i_e = 0; V_{CB} = 5 V	C_c	typ.	5.8 pF
Transition frequency at f = 100 MHz I_C = 300 mA; V_{CE} = 5 V	f_T	min.	1.0 GHz

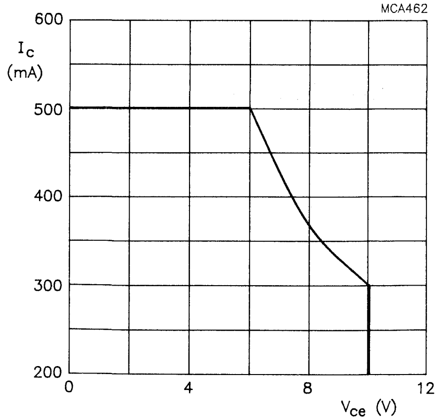


Fig.2 Safe operating area.

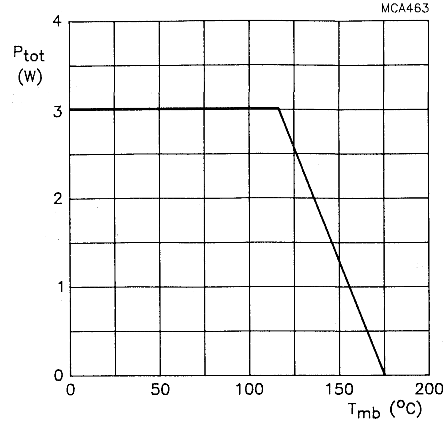


Fig.3 Maximum power dissipation as a function of temperature.

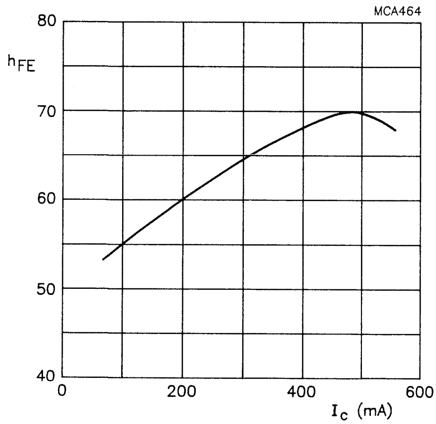


Fig.4 h_{FE} as a function of I_C; V_{CE} = 5 V; T_{amb} = 25 °C; typical values.

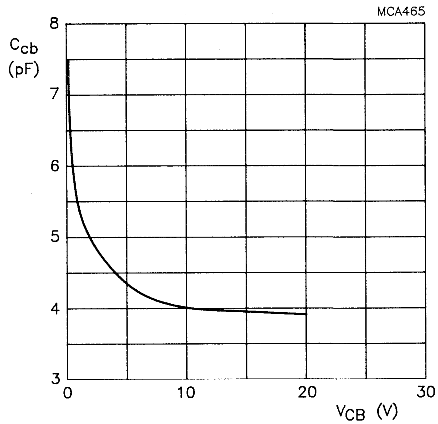


Fig.5 C_{cb} as a function of V_{CB}; f = 1 MHz; T_{amb} = 25 °C; typical values.

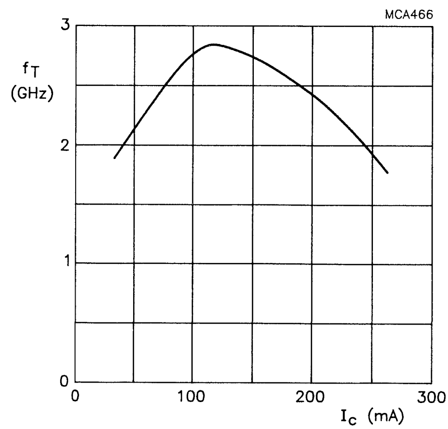


Fig. 6 f_T as a function of I_C; V_{CE} = 5V; f = 100 MHz; T_{amb} = 25 °C; typical values.

NPN HIGH FREQUENCY TRANSISTOR

NPN silicon epitaxial transistor with a gold sandwich metallization to ensure optimum temperature profile and excellent reliability properties. It features high frquency behaviour and a low output capacitance.

This transistor is primarily intended for application in the pre-stage of the driver for high-resolution colour graphics monitors.

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 (DC)	I_C	max.	500 mA
Total power dissipation up to T_{case} = 95 °C	P_{tot}	max.	3 W
Junction temperature	T_j	max.	200 °C
DC current gain I_C = 300 mA; V_{CE} = 5 V	h_{FE}	min.	25
Transition frequency at f = 500 MHz I_C = 300 mA; V_{CE} = 5 V; T_{amb} = 25 °C	f_T	min.	1.0 GHz

MECHANICAL DATA

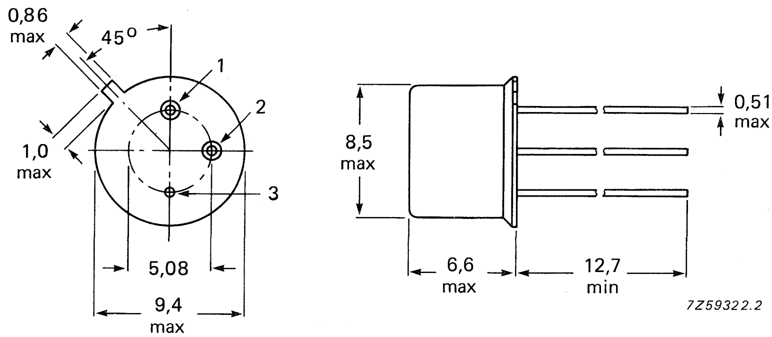
SOT5 (see Fig. 1)

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-39 (SOT5).

Collector connected to case



Pinning

1 = emitter
2 = base
3 = collector

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.	3	V
Collector current (DC)	I_C	max.	500	mA
Total power dissipation up to T_{case} = 95 °C	P_{tot}	max.	3	W
Storage temperature range	T_{stg}		−65 to +175	°C
Junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE

From junction to case	$R_{th\,j\text{-}ca}$	=	35 K/W
From junction to ambient (in free air)	$R_{th\,j\text{-}a}$	=	250 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-base breakdown voltage open emitter; I_C = 5 mA	$V_{(BR)CBO}$	min.	20 V
Collector-emitter breakdown voltage open base; I_C = 10 mA	$V_{(BR)CEO}$	min.	10 V
Emitter-base breakdown voltage open collector; I_E = 1 mA	$V_{(BR)EBO}$	min.	3 V
Collector cut-off current V_{BE} = 0; V_{CE} = 10 V	I_{CES}	max.	2.5 mA
DC current gain I_C = 300 mA; V_{CE} = 5 V	h_{FE}	min.	25
Collector-base capacitance at f = 1 MHz I_C = 0; V_{CB} = 5 V	C_{cb}	typ.	4.5 pF
Collector capacitance at f = 1 MHz $I_E = i_e$ = 0; V_{CB} = 5 V	C_c	typ.	6.0 pF
Transition frequency at f = 500 MHz I_C = 300 mA; V_{CE} = 5 V	f_T	min.	1 GHz

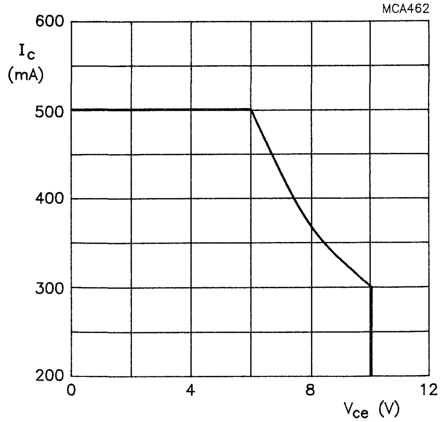


Fig.2 Safe operating area.

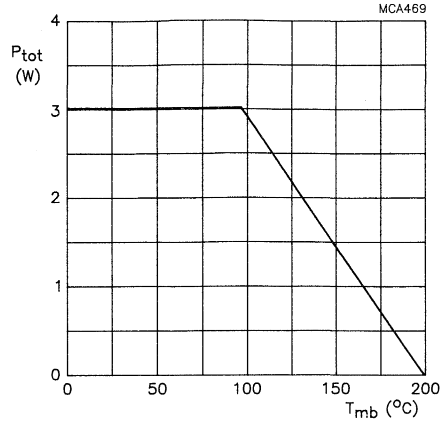


Fig.3 Maximum power dissipation as a function of temperature.

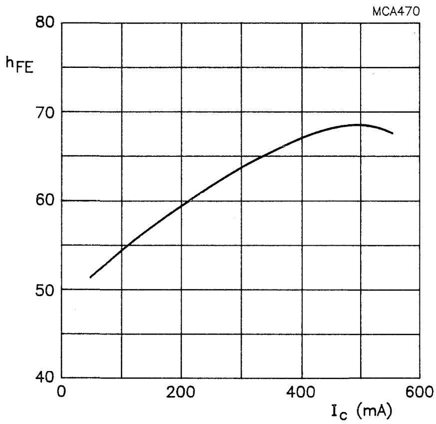


Fig.4 h_{FE} as a function of I_C; V_{CE} = 10 V; T_{amb} = 25 °C; typical values.

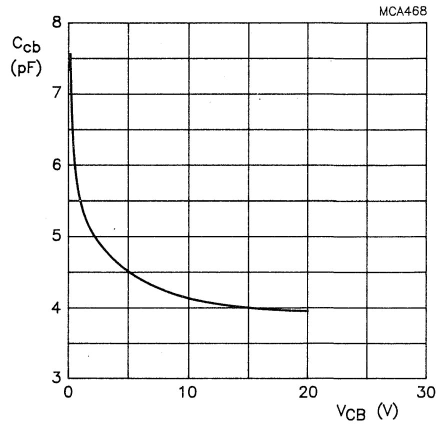


Fig.5 C_{cb} as a function of V_{CB}; f = 1 MHz; T_{amb} = 25 °C; typical values.

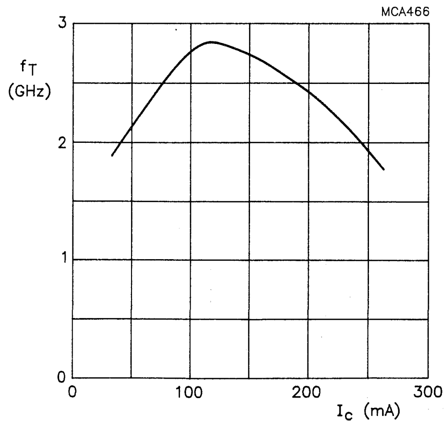


Fig. 6 f_T as a function of I_C; V_{CE} = 5V; f = 100 MHz; T_{amb} = 25 °C; typical values.

Philips Components

Data sheet	
status	Product specification
date of issue	October 1990

BFQ231/231A

NPN high frequency high voltage transistor

FEATURES

- High breakdown voltages
- Low output capacitance
- High gain bandwidth product
- Good thermal stability
- Gold metallization ensures excellent reliability.

DESCRIPTION

NPN silicon epitaxial transistor in plastic TO-92 envelope, intended for use as buffer driver in high-resolution colour graphics monitors. Its pnp complement is the BFQ251(A).

MECHANICAL DATA

TO-92.

PINNING

PIN	DESCRIPTION
1	base
2	emitter
3	collector

PIN CONFIGURATION

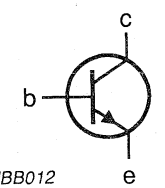


Fig.1 Pin configuration.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	BFQ231			BFQ231A			UNIT
			MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
V_{CBO}	collector-base voltage	open emitter	-	-	100	-	-	115	V
V_{CEO}	collector-emitter voltage	open base	-	-	65	-	-	95	V
I_C	collector current (DC)		-	-	300	-	-	300	mA
P_{tot}	total power dissipation	T_{amb} = 25 °C	-	-	675	-	-	675	mW
T_j	junction temperature		-	-	150	-	-	150	°C
h_{FE}	DC current gain	I_C = 50 mA; V_{CE} = 10 V	20	-	-	20	-	-	
f_T	transition frequency	I_C = 50 mA; V_{CE} = 10 V; T_{amb} = 25 °C	1	-	-	0.8	-	-	GHz
C_{cb}	collector-base capacitance	f = 1 MHz; I_C = 0 ; V_{CE} = 10 V	-	1.8	-	-	1.8	-	pF

THERMAL RESISTANCE

SYMBOL	PARAMETER	NOM.	UNIT
$R_{th\ j\text{-}s}$	junction to soldering point	85	K/W
$R_{th\ j\text{-}a}$	junction to ambient	185	K/W

Philips Components

Data sheet	
status	Product specification
date of issue	June 1990

BFQ232/BFQ232A

NPN high frequency high voltage transistor

DESCRIPTION

NPN silicon epitaxial transistor with emitter ballasting resistors and a gold sandwich metallization to ensure optimum temperature profile and excellent reliability properties. It features high breakdown voltages and a low output capacitance. This transistor is primarily intended for application in the buffer stage of the driver for high-resolution colour graphics monitors. Its pnp complement is the BFQ252(A).

MECHANICAL DATA

TO-126 (SOT32).

Collector connected to metal part of mounting surface.

PINNING

PIN	DESCRIPTION
1	emitter
2	collector
3	base

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	BFQ232		BFQ232A		UNIT
			MIN.	MAX.	MIN.	MAX.	
V_{CBO}	collector-base voltage	open emitter	-	100	-	115	V
V_{CEO}	collector-emitter voltage	open base	-	65	-	95	V
V_{CER}	collector-emitter voltage	$R_B = 1\ k\Omega$	-	100	-	115	V
I_C	collector current (DC)		-	300	-	300	mA
P_{tot}	total power dissipation	$T_{case} = 115\ °C$	-	3	-	3	W
T_j	junction temperature		-	175	-	175	°C
h_{FE}	DC current gain	$I_C = 50$ mA; $V_{CE} = 10$ V	20	-	20	-	
f_T	transition frequency	f = 100 MHz; $I_C = 50$ mA; $V_{CE} = 10$ V; $T_{amb} = 25\ °C$	1	-	0.8	-	GHz

LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	BFQ232		BFQ232A		UNIT
			MIN.	MAX.	MIN.	MAX.	
V_{CBO}	collector-base voltage	open emitter	-	100	-	115	V
V_{CEO}	collector-emitter voltage	open base	-	65	-	95	V
V_{CER}	collector-emitter voltage	$R_B = 1\ k\Omega$	-	100	-	115	V
V_{EBO}	emitter-base voltage	open collector	-	3	-	3	V
I_C	collector current (DC)		-	300	-	300	mA
P_{tot}	total power dissipation	$T_{case} = 115\ °C$	-	3	-	3	W
T_{stg}	storage temperature range		−65	+150	−65	+150	°C
T_j	junction temperature		-	175	-	175	°C

THERMAL RESISTANCE

SYMBOL	PARAMETER	NOM.	UNIT
$R_{th\ j\text{-}mb}$	from junction to mounting base	20	K/W
$R_{th\ j\text{-}a}$	from junction to ambient (in free air)	100	K/W

CHARACTERISTICS

$T_j = 25\ °C$ unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	BFQ232			BFQ232A			UNIT
			MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
$V_{(BR)\ CBO}$	collector-base breakdown voltage	open emitter $I_C = 0.1$ mA	100	-	-	115	-	-	V
$V_{(BR)\ CEO}$	collector-emitter breakdown voltage	open base $I_C = 10$ mA	65	-	-	95	-	-	V
$V_{(BR)\ EBO}$	emitter-base breakdown voltage	open collector $I_E = 0.1$ mA	3	-	-	3	-	-	V
I_{CES}	collector cut-off current	$I_B = 0$; $V_{CE} = 50$ V	-	-	100	-	-	100	μA
I_{CBO}	collector cut-off current	$I_E = 0$; $V_{CB} = 50$ V	-	-	20	-	-	20	μA
h_{FE}	DC current gain	$I_C = 50$ mA; $V_{CE} = 10$ V	20	-	-	20	-	-	
C_{cb}	collector-base capacitance	f = 1 MHz; $I_C = 0$; $V_{CB} =$ 10 V	-	2.0	-	-	2.0	-	pF
f_T	transition frequency	f = 100 MHz; $I_C = 50$ mA; $V_{CE} = 10$ V	1	1.4	-	0.8	1.2	-	GHz

NPN high frequency high voltage transistor
BFQ232/BFQ232A

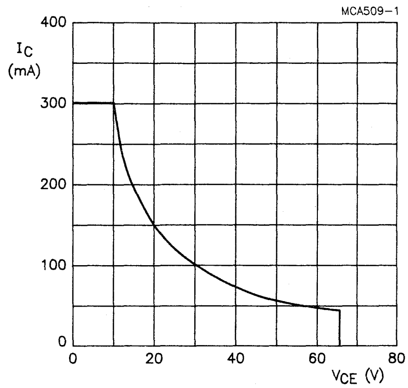


Fig.1 Safe operating area.

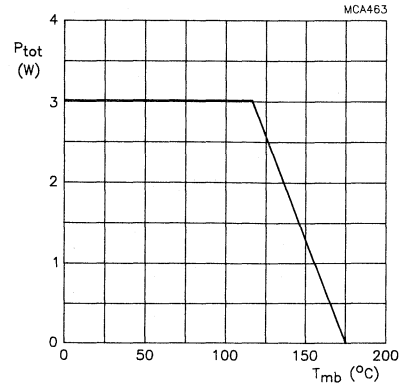


Fig.2 Power derating curve.

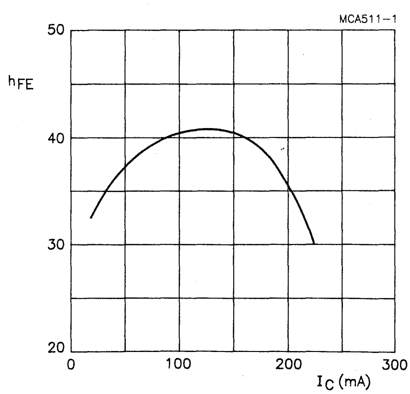


Fig.3 DC current gain as a function of collector current; V_{CE} = 10 V; T_{amb} = 25 °C; typical values.

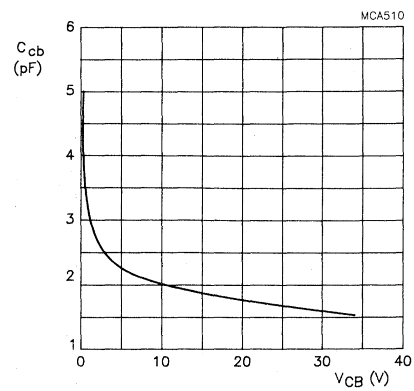


Fig.4 Collector-base capacitance as a function of collector-base voltage; f = 1 MHz; T_{amb} = 25 °C; typical values.

NPN high frequency high voltage transistor BFQ232/BFQ232A

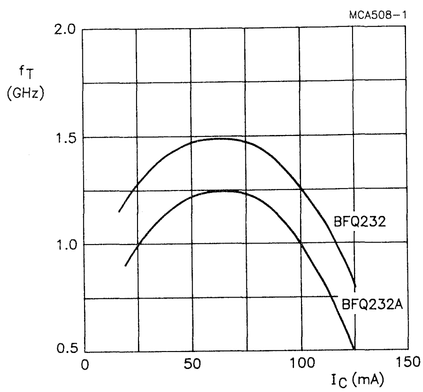


Fig.5 Transition frequency as a function of collector current; V_{CE} = 10 V; f = 100 MHz; T_{amb} = 25 °C; typical values.

Philips Components

Data sheet	
status	Product specification
date of issue	June 1990

BFQ233/233A

NPN high frequency high voltage transistor

DESCRIPTION

NPN silicon epitaxial transistor with emitter ballasting resistors and a gold sandwich metallization to ensure optimum temperature profile and excellent reliability properties. It features high breakdown voltage and low output capacitance.

This transistor is primarily intended for application in the buffer stage of the driver for high-resolution colour graphics monitors.

Its pnp complement is the BFQ253 and BFQ253A respectively.

MECHANICAL DATA

TO-39 (SOT5).

Collector connected to case.

PINNING

PIN	DESCRIPTION
1	emitter
2	base
3	collector

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	BFQ233		BFQ233A		UNIT
			MIN.	MAX.	MIN.	MAX.	
V_{CBO}	collector-base voltage	open emitter	-	100	-	115	V
V_{CEO}	collector-emitter voltage	open base	-	65	-	95	V
I_C	collector current (DC)		-	300	-	300	mA
P_{tot}	total power dissipation	T_{case} = 122 °C	-	3	-	3	W
T_j	junction temperature		-	200	-	200	°C
h_{FE}	DC current gain	I_C = 50 mA; V_{CE} = 10 V	20	-	20	-	
f_T	transition frequency	f = 500 MHz; I_C = 50 mA; V_{CE} = 10 V; T_{amb} = 25 °C	1	-	0.8	-	GHz

NPN high frequency high voltage transistor BFQ233/233A

LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	BFQ233		BFQ233A		UNIT
			MIN.	MAX.	MIN.	MAX.	
V_{CBO}	collector-base voltage	open emitter	-	100	-	115	V
V_{CEO}	collector-emitter voltage	open base	-	65	-	95	V
V_{EBO}	emitter-base voltage	open collector	-	3	-	3	V
I_C	collector current (DC)		-	300	-	300	mA
P_{tot}	total power dissipation	T_{case} = 122 °C	-	3	-	3	W
T_{stg}	storage temperature range		−65	+175	−65	+175	°C
T_j	junction temperature		-	200	-	200	°C

THERMAL RESISTANCE

SYMBOL	PARAMETER	NOM.	UNIT
$R_{th\ j-c}$	from junction to case	26	K/W
$R_{th\ j-a}$	from junction to ambient (in free air)	250	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	BFQ233			BFQ233A			UNIT
			MIN.	TYP	MAX.	MIN.	TYP.	MAX.	
$V_{(BR)\ CBO}$	collector-base breakdown voltage	open emitter I_C = 0.1 mA	100	-	-	115	-	-	V
$V_{(BR)\ CEO}$	collector-emitter breakdown voltage	open base I_C = 10 mA	65	-	-	95	-	-	V
$V_{(BR)\ EBO}$	emitter-base breakdown voltage	open collector I_E = 0.1 mA	3	-	-	3	-	-	V
I_{CES}	collector cut-off current	I_B = 0; V_{CE} = 50 V	-	-	100	-	-	100	µA
I_{CBO}	collector cut-off current	I_E = 0; V_{CB} = 50 V	-	-	20	-	-	20	µA
h_{FE}	DC current gain	I_C = 50 mA; V_{CE} = 10 V	20	-	-	20	-	-	
f_T	transition frequency	I_C = 50 mA; V_{CE} = 10 V; f = 500 MHz	1	1.4	-	0.8	1.2	-	GHz
C_{cb}	collector-base capacitance	f = 1 MHz; I_C = 0; V_{CB} = 10 V	-	2	-	-	2	-	pF

NPN high frequency high voltage transistor
BFQ233/233A

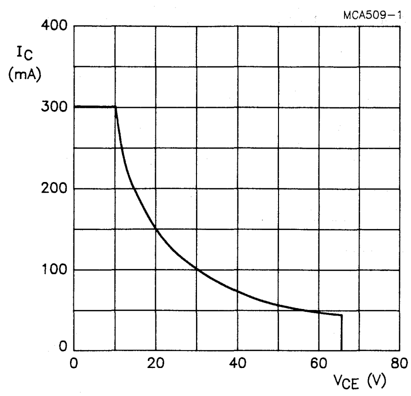


Fig.1 Safe operating area.

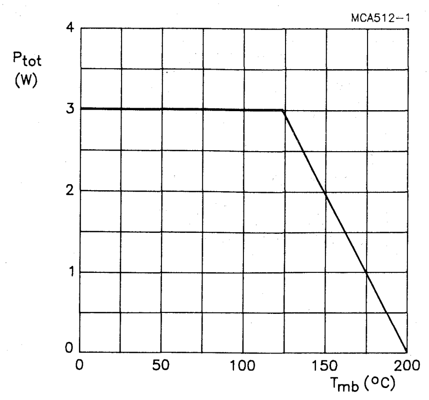


Fig.2 Power derating curve.

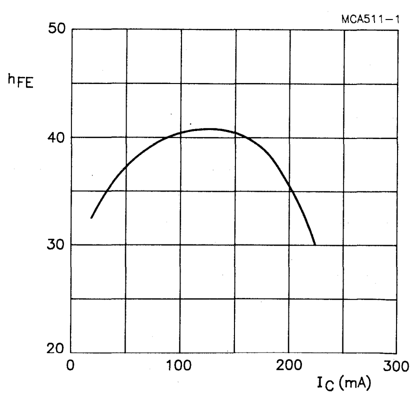


Fig.3 DC current gain as a function of collector current; V_{CE} = 10 V; T_{amb} = 25 °C; typical values.

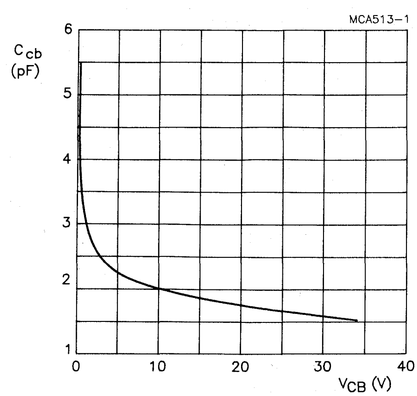


Fig.4 Collector-base capacitance as a function of collector-base voltage; f = 1 MHz; T_{amb} = 25 °C; typical values.

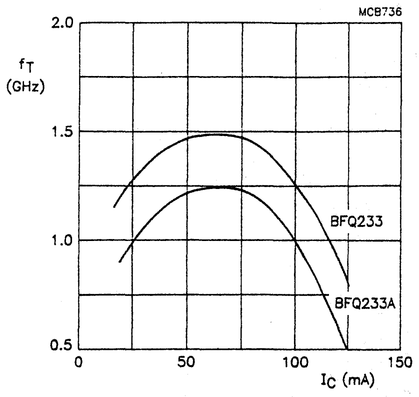


Fig.5 Transition frequency as a function of collector current; V_{CE} = 10 V; f = 500 MHz; T_{amb} = 25 °C; typical values.

NPN HIGH FREQUENCY HIGH VOLTAGE TRANSISTOR

NPN silicon epitaxial transistor with emitter ballasting resistors and a gold sandwich metallization to ensure optimum temperature profile and excellent reliability properties. It features high break-down voltages and a low output capacitance.

This transistor is primarily intended for application in the driver for high-resolution colour graphics monitors.

Its pnp complement is the BFQ254.

The transistor has a 4-lead stud envelope with a ceramic cap (SOT172). All leads are isolated from the stud.

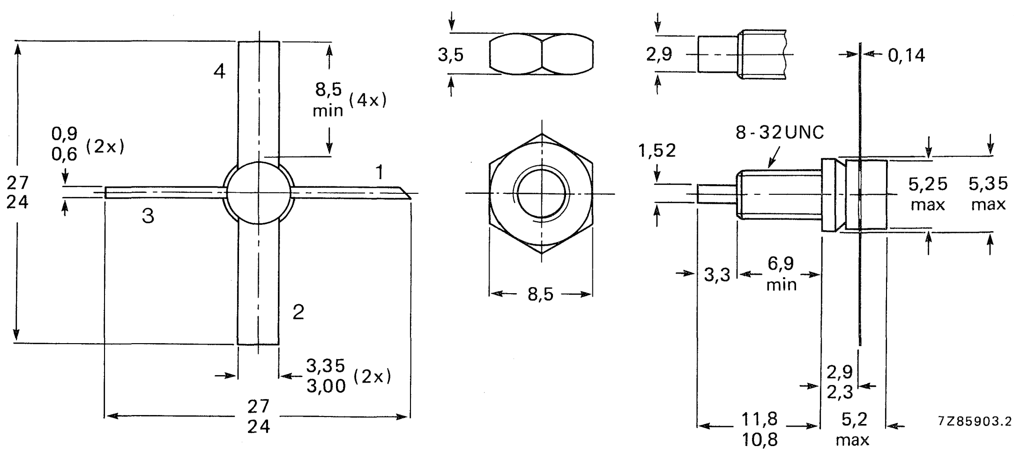
QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	100 V
Collector-emitter voltage (open base)	V_{CEO}	max.	65 V
Collector current (DC)	I_C	max.	300 mA
Total power dissipation up to T_{case} = 140 °C	P_{tot}	max.	3 W
Junction temperature	T_j	max.	200 °C
DC current gain I_C = 50 mA; V_{CE} = 10 V	h_{FE}	min.	20
Transition frequency at f = 500 MHz I_C = 50 mA; V_{CE} = 10 V; T_{amb} = 25 °C	f_T	min.	1.0 GHz

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT172



Pinning

1 = collector
2,4 = base
3 = emitter

RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	100	V
Collector-emitter voltage (open base)	V_{CEO}	max.	65	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3	V
Collector current (DC)	I_C	max.	300	mA
Total power dissipation up to T_{case} = 140 °C	P_{tot}	max.	3	W
Storage temperature range	T_{stg}		−65 to +175	°C
Junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE

From junction to mounting-base	$R_{th\ j\text{-}mb}$	=	20 K/W
From mounting-base to heatsink	$R_{th\ mb\text{-}hs}$	=	0.8 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-base breakdown voltage open emitter; I_C = 0.1 mA	$V_{(BR)CBO}$	min.	100 V
Collector-emitter breakdown voltage open base; I_C = 10 mA	$V_{(BR)CEO}$	min.	65 V
Emitter-base breakdown voltage open collector; I_E = 0.1 mA	$V_{(BR)EBO}$	min.	3 V
Collector cut-off current I_B = 0; V_{CE} = 50 V	I_{CES}	max.	100 μA
Collector cut-off current I_E = 0; V_{CB} = 50	I_{CBO}	max.	20 μA
DC current gain I_C = 50 mA; V_{CE} = 10 V	h_{FE}	min.	20
Collector-base capacitance at f = 1 MHz I_C = 0; V_{CB} = 10 V	C_{cb}	typ.	2.0 pF
Transition frequency at f = 500 MHz I_C = 50 mA; V_{CE} = 10 V	f_T	min. typ.	1.0 GHz 1.4 GHz

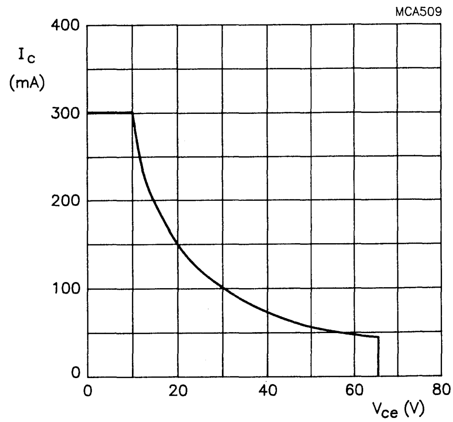


Fig.2 Safe operating area.

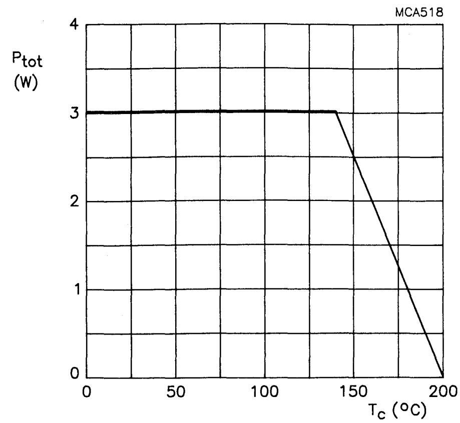


Fig.3 Power dissipation as a function of temperature.

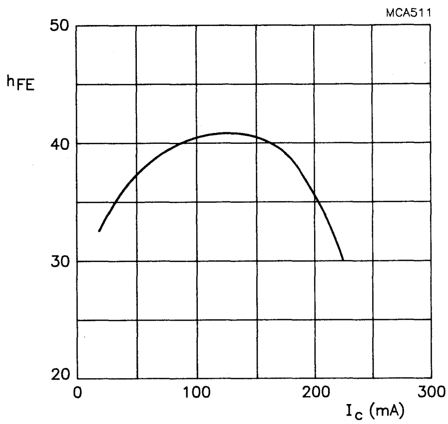


Fig.4 h_{FE} as a function of I_C; V_{CE} = 10 V; T_{amb} = 25 °C; typical values.

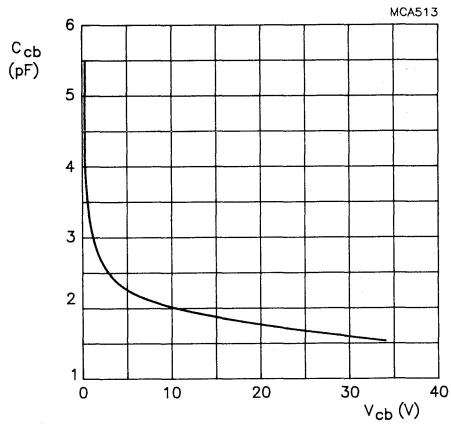


Fig.5 C_{cb} as a function of V_{CB}; f = 1 MHz; T_{amb} = 25 °C; typical values.

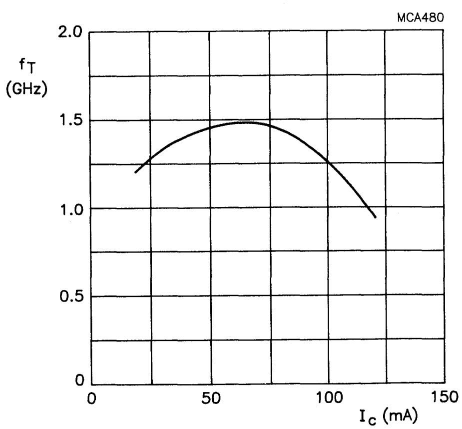


Fig.6 f_T as a function of I_C; V_{CE} = 10 V; f = 500 MHz; T_{amb} = 25 °C; typical values.

Philips Components

Data sheet	
status	Product specification
date of issue	September 1990

BFQ235/BFQ235A

NPN high frequency high voltage transistor

FEATURES

- High breakdown voltages
- Low output capacitance
- High gain bandwidth product
- Good thermal stability
- Gold metallization ensures excellent reliability
- Complementary pnp type BFQ255(A).

DESCRIPTION

NPN silicon epitaxial transistor intended for use as buffer/ driver in CRT amplifiers in high-resolution colour graphics monitors. The BFQ235(A) is mounted in a SOT128B plastic envelope, with the collector connected to mounting base.

MECHANICAL DATA

Plastic TO-202 (SOT128B).

PIN CONFIGURATION

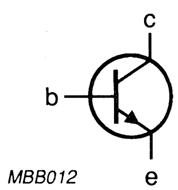


Fig.1 Pin configuration.

PINNING

PIN	DESCRIPTION
1	emitter
2	collector
3	base

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	BFQ235		BFQ235A		UNIT
			MIN.	MAX.	MIN.	MAX.	
V_{CBO}	collector-base voltage	open emitter	-	100	-	115	V
V_{CEO}	collector-emitter voltage	open base	-	65	-	95	V
I_C	collector current (DC)		-	300	-	300	mA
P_{tot}	total power dissipation	T_{case} = 97 °C	-	3	-	3	W
T_j	junction temperature		-	175	-	175	°C
h_{FE}	DC current gain	I_C = 50 mA; V_{CE} = 10 V; T_{amb} = 25 °C	20	-	20	-	
f_T	transition frequency	I_C = 50 mA; V_{CE} = 10 V; T_{amb} = 25 °C	1	-	0.8	-	GHz

NPN high frequency high voltage transistor — BFQ235/BFQ235A

ORDERING AND PACKAGE INFORMATION

EXTENDED TYPE NUMBER	PACKAGE		
	CODE	PACKING METHOD	PACKING QUANTITY
BFQ235	SOT128B	railpack	50
BFQ235A	SOT128B	railpack	50

LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	BFQ235		BFQ235A		UNIT
			MIN.	MAX.	MIN.	MAX.	
V_{CBO}	collector-base voltage	open emitter	-	100	-	115	V
V_{CEO}	collector-emitter voltage	open base	-	65	-	95	V
V_{EBO}	emitter-base voltage	open collector	-	3	-	3	V
I_C	collector current (DC)		-	300	-	300	mA
P_{tot}	total power dissipation	T_{case} = 97 °C	-	3	-	3	W
T_{stg}	storage temperature range		−65	+150	−65	+150	°C
T_j	junction temperature		-	175	-	175	°C

THERMAL RESISTANCE

SYMBOL	PARAMETER	NOM.	UNIT
$R_{th\ j\text{-}mb}$	from junction to mounting base	26	K/W
$R_{th\ j\text{-}a}$	from junction to ambient (in free air)	75	K/W

NPN high frequency high voltage transistor — BFQ235/BFQ235A

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	BFQ235			BFQ235A			UNIT
			MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
$V_{(BR)CBO}$	collector-base breakdown voltage	open emitter I_C = 0.1 mA	100	-	-	115	-	-	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	open base I_C = 10 mA	65	-	-	95	-	-	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	open collector I_E = 0.1 mA	3	-	-	3	-	-	V
I_{CES}	collector cut-off current	I_B = 0; V_{CE} = 50 V	-	-	100	-	-	100	μA
I_{CBO}	collector cut-off current	I_E = 0; V_{CB} = 50 V	-	-	20	-	-	20	μA
h_{FE}	DC current gain	I_C = 50 mA; V_{CE} = 10 V	20	-	-	20	-	-	
C_{cb}	collector-base capacitance	f = 1 MHz; I_C = 0; V_{CB} = 10 V	-	2.0	-	-	2.0	-	pF
f_T	transition frequency	f = 100 MHz; I_C = 50 mA; V_{CE} = 10 V	1	1.4	-	0.8	1.2	-	GHz

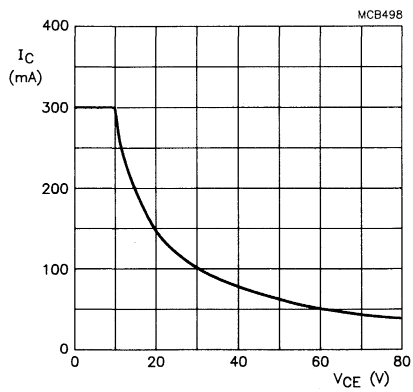


Fig.2 Safe operating area.

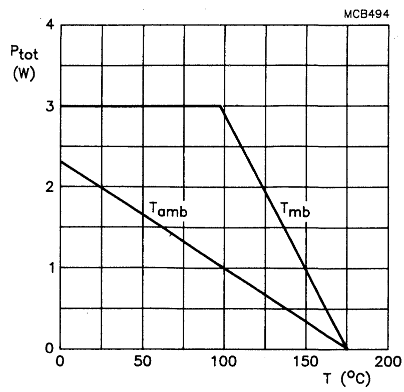


Fig.3 Power derating curve.

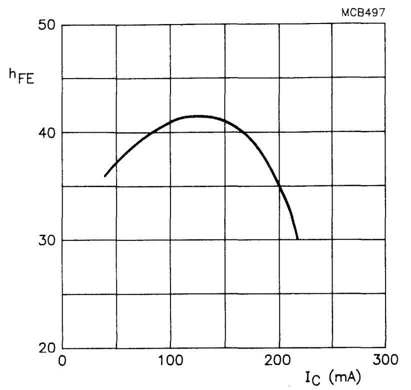


Fig.4 DC current gain as a function of collector current; V_{CE} = 10 V; T_{amb} = 25 °C; typical values.

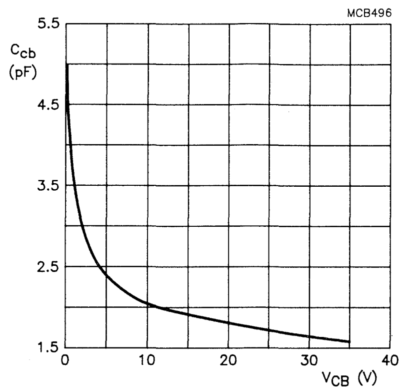


Fig.5 Collector-base capacitance as a function of collector-base voltage; T_{amb} = 25 °C; typical values.

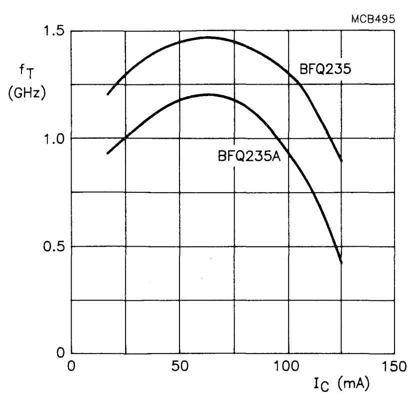


Fig.6 Transition frequency as a function of collector current; V_{CE} = 10 V; f = 100 MHz; T_{amb} = 25 °C; typical values.

Philips Components

Data sheet	
status	Product specification
date of issue	October 1990

BFQ251/251A

PNP high frequency high voltage transistor

DESCRIPTION

PNP silicon epitaxial transistor in plastic TO-92 envelope, intended for use as buffer stage in CRT amplifier in high-resolution colour graphics monitors.

FEATURES

- High breakdown voltages
- Low output capacitance
- High gain bandwidth product
- Good thermal stability
- Gold metallization ensures excellent reliability
- Complementary npn types BFQ231/231A.

MECHANICAL DATA

TO-92

PINNING

PIN	DESCRIPTION
1	base
2	emitter
3	collector

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	BFQ251			BFQ251A			UNIT
			MIN.	TYP	MAX.	MIN.	TYP.	MAX.	
$-V_{CBO}$	collector-base voltage (open emitter)		-	-	100	-	-	115	V
$-V_{CEO}$	collector-emitter voltage (open base)		-	-	65	-	-	95	V
$-I_C$	collector current (DC)		-	-	300	-	-	300	mA
P_{tot}	total power dissipation	T_{amb} = 25 °C	-	-	600	-	-	600	mW
T_j	junction temperature		-	-	150	-	-	150	°C
h_{FE}	DC current gain	$-I_C$ = 50 mA; $-V_{CE}$ = 10 V	20	-	-	20	-	-	
f_T	transition frequency	$-I_C$ = 50 mA; $-V_{CE}$ = 10 V; T_{amb} = 25 °C	1	-	-	0.8	-	-	GHz
C_{cb}	collector-base capacitance	f = 1 MHz; I_C = 0; $-V_{CB}$ = 10 V	-	1.9	-	-	1.9	-	pF

Philips Components

Data sheet	
status	Product specification
date of issue	April 1990

BFQ252/BFQ252A

PNP high frequency high voltage transistor

DESCRIPTION

PNP silicon epitaxial transistor with emitter ballasting resistors and a gold sandwich metallization ensure optimum temperature profile and excellent reliability properties. It features high breakdown voltages and a low output capacitance.

This transistor is primarily intended for application in the buffer stage of the driver for high-resolution colour graphics monitors.

Its npn complement is the BFQ232/232A.

MECHANICAL DATA

TO-126 (SOT32).

PINNING

PIN	DESCRIPTION
1	emitter
2	collector
3	base

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	BFQ252		BFQ252A		UNIT
			MIN.	MAX.	MIN.	MAX.	
$-V_{CBO}$	collector-base voltage	open emitter	-	100	-	115	V
$-V_{CEO}$	collector-emitter voltage	open base	-	65	-	95	V
$-I_C$	collector current (DC)		-	300	-	300	mA
P_{tot}	total power dissipation	T_{case} = 115 °C	-	3	-	3	W
T_j	junction temperature		-	175	-	175	°C
h_{FE}	DC current gain	$-I_C$ = 50 mA; $-V_{CE}$ = 10 V	20	-	20	-	
f_T	transition frequency	f = 100 MHz; $-I_C$ = 50 mA; $-V_{CE}$ = 10 V; T_{amb} = 25 °C	1.0	-	0.8	-	GHz

LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	BFQ252		BFQ252A		UNIT
			MIN.	MAX.	MIN.	MAX.	
$-V_{CBO}$	collector-base voltage	open emitter	-	100	-	115	V
$-V_{CEO}$	collector-emitter voltage	open base	-	65	-	95	V
$-V_{EBO}$	emitter-base voltage	open collector	-	3	-	3	V
$-I_C$	collector current (DC)		-	300	-	300	mA
P_{tot}	total power dissipation	T_{case} = 115 °C	-	3	-	3	W
T_{stg}	storage temperature range		−65	+150	−65	+150	°C
T_j	junction temperature		-	175	-	175	°C

THERMAL RESISTANCE

SYMBOL	PARAMETER	NOM.	UNIT
$R_{th\ j\text{-}mb}$	from junction to mounting base	20	K/W
$R_{th\ j\text{-}a}$	from junction to ambient (in free air)	100	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	BFQ252			BFQ252A			UNIT
			MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
$-V_{(BR)CBO}$	collector-base breakdown voltage	open emitter I_C = 0.1 mA	100	-	-	115	-	-	V
$-V_{(BR)CEO}$	collector-emitter breakdown voltage	open base I_C = 10 mA	65	-	-	95	-	-	V
$-V_{(BR)EBO}$	emitter-base breakdown voltage	open collector I_E = 0.1 mA	3	-	-	3	-	-	V
$-I_{CES}$	collector cut-off current	I_B = 0; $-V_{CE}$ = 50 V	-	-	100	-	-	100	μA
$-I_{CBO}$	collector cut-off current	I_E = 0; $-V_{CB}$ = 50 V	-	-	20	-	-	20	μA
h_{FE}	DC current gain	$-I_C$ = 50 mA; $-V_{CE}$ = 10 V	20	-	-	20	-	-	
C_{cb}	collector-base capacitance	f = 1 MHz; I_C = 0; $-V_{CB}$ = 10 V	-	2.5	-	-	2.5	-	pF
f_T	transition frequency	f = 100 MHz; $-I_C$ = 50 mA; $-V_{CE}$ = 10 V	1.0	1.3	-	0.8	1.2	-	GHz

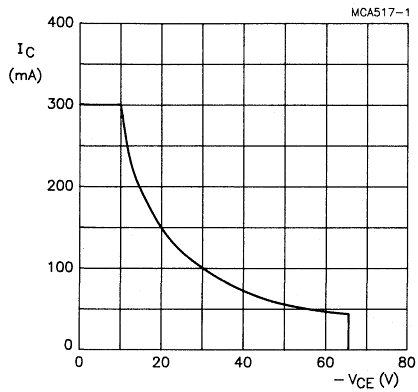


Fig.1 Safe operating area.

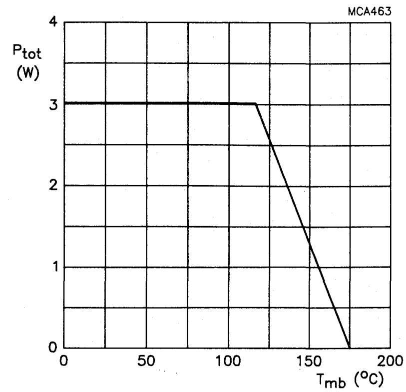


Fig.2 Power derating curve.

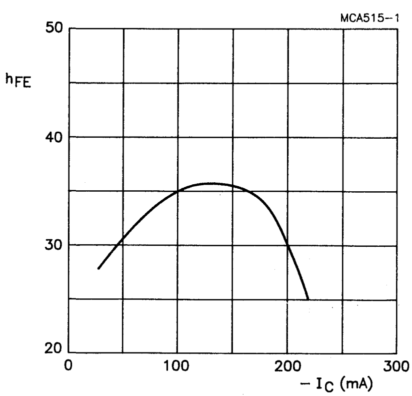


Fig.3 DC current gain as a function of collector current; V_{CE} = 10 V; T_{amb} = 25 °C; typical values.

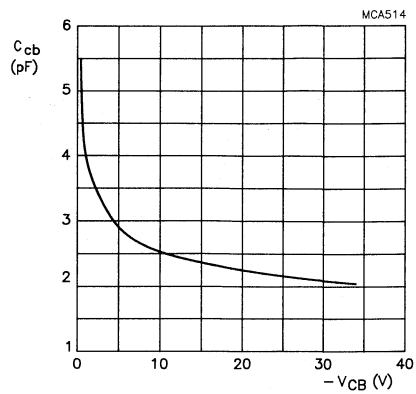


Fig.4 Collector-base capacitance as a function of collector-base voltage; f = 1 MHz; T_{amb} = 25 °C; typical values.

PNP high frequency high voltage transistor

BFQ252/BFQ252A

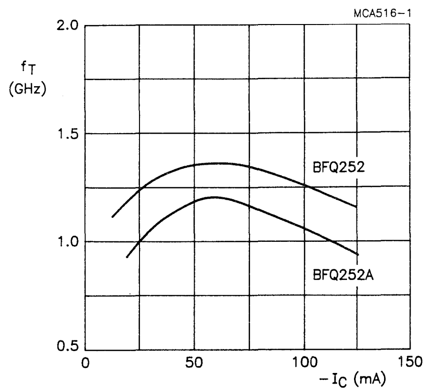


Fig.5 Transition frequency as a function of collector current; V_{CE} = 10 V; f = 500 MHz; T_{amb} = 25 °C; typical values.

Philips Components

Data sheet	
status	Product specification
date of issue	June 1990

BFQ253/253A

PNP high frequency high voltage transistor

DESCRIPTION

PNP silicon epitaxial transistor with emitter ballasting resistors and a gold sandwich metallization to ensure optimum temperature profile and excellent reliability properties. It features high breakdown voltage and low output capacitance.

This transistor is primarily intended for application in the buffer stage of the driver for high-resolution colour graphics monitors.

Its npn complement is the BFQ233 and BFQ233A respectively.

MECHANICAL DATA

TO-39 (SOT5).

Collector connected to case.

PINNING

PIN	DESCRIPTION
1	emitter
2	base
3	collector

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	BFQ253		BFQ253A		UNIT
			MIN.	MAX.	MIN.	MAX.	
$-V_{CBO}$	collector-base voltage	open emitter	-	100	-	115	V
$-V_{CEO}$	collector-emitter voltage	open base	-	65	-	95	V
$-I_C$	collector current (DC)		-	300	-	300	mA
P_{tot}	total power dissipation	T_{case} = 122 °C	-	3	-	3	W
T_j	junction temperature		-	200	-	200	°C
h_{FE}	DC current gain	$-I_C$ = 50 mA; $-V_{CE}$ = 10 V	20	-	20	-	
f_T	transition frequency	$-I_C$ = 50 mA; $-V_{CE}$ = 10 V; T_{amb} = 25 °C	1	-	0.8	-	GHz

LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	BFQ253		BFQ253A		UNIT
			MIN.	MAX.	MIN.	MAX.	
$-V_{CBO}$	collector-base voltage	open emitter	-	100	-	115	V
$-V_{CEO}$	collector-emitter voltage	open base	-	65	-	95	V
$-V_{EBO}$	emitter-base voltage	open collector	-	3	-	3	V
$-I_C$	collector current (DC)		-	300	-	300	mA
P_{tot}	total power dissipation	T_{case} = 122 °C	-	3	-	3	W
T_{stg}	storage temperature range		−65	+175	−65	+175	°C
T_j	junction temperature		-	200	-	200	°C

THERMAL RESISTANCE

SYMBOL	PARAMETER	NOM.	UNIT
$R_{th\ j\text{-}c}$	from junction to case	26	K/W
$R_{th\ j\text{-}a}$	from junction to ambient (in free air)	250	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	BFQ253			BFQ253A			UNIT
			MIN.	TYP	MAX.	MIN.	TYP.	MAX.	
$-V_{(BR)\ CBO}$	collector-base breakdown voltage	open emitter I_C = 0.1 mA	100	-	-	115	-	-	V
$-V_{(BR)\ CEO}$	collector-emitter breakdown voltage	open base I_C = 10 mA	65	-	-	95	-	-	V
$-V_{(BR)\ EBO}$	emitter-base breakdown voltage	open collector I_E = 0.1 mA	3	-	-	3	-	-	V
$-I_{CES}$	collector cut-off current	I_B = 0; $-V_{CE}$ = 50 V	-	-	100	-	-	100	μA
$-I_{CBO}$	collector cut-off current	I_E = 0; $-V_{CB}$ = 50 V	-	-	20	-	-	20	μA
h_{FE}	DC current gain	$-I_C$ = 50 mA; $-V_{CE}$ = 10 V	20	-	-	20	-	-	
f_T	transition frequency	$-I_C$ = 50 mA; $-V_{CE}$ = 10 V; f = 500 MHz	1	1.3	-	0.8	1.2	-	GHz
C_{cb}	collector-base capacitance	f = 1 MHz; I_C = 0; $-V_{CB}$ = 10 V	-	2.5	-	-	2.5	-	pF

PNP high frequency high voltage transistor

BFQ253/253A

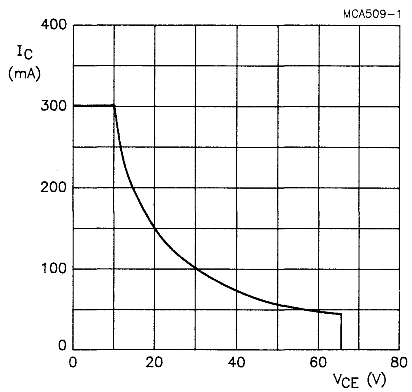


Fig.1 Safe operating area.

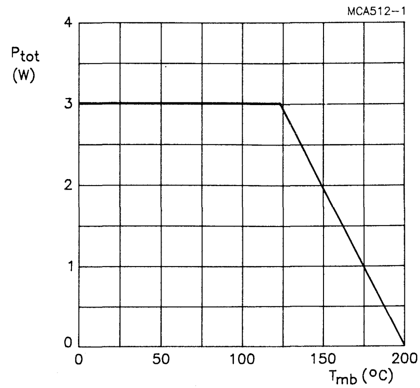


Fig.2 Power derating curve.

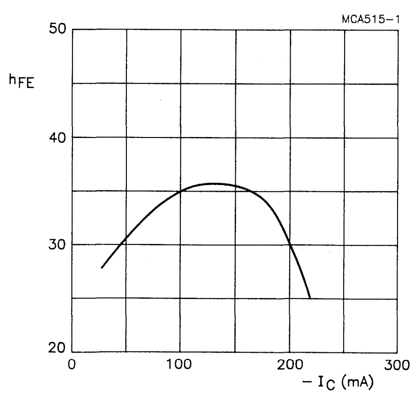


Fig.3 DC current gain as a function of collector current; V_{CE} = 10 V; T_{amb} = 25 °C; typical values.

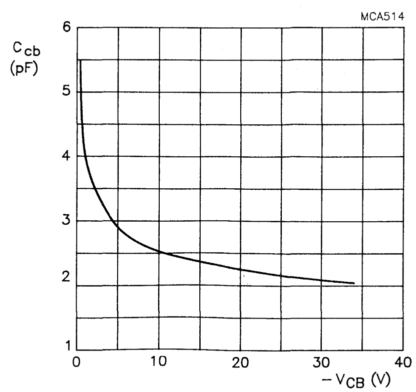


Fig.4 Collector-base capacitance as a function of collector-base voltage; f = 1 MHz; T_{amb} = 25 °C; typical values.

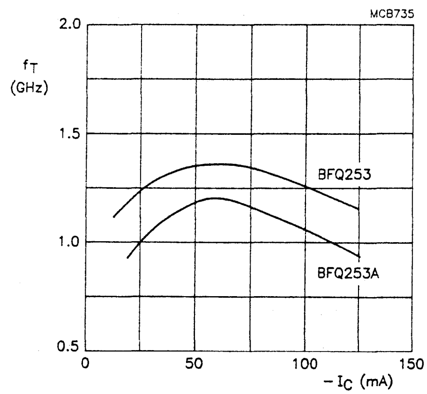


Fig.5 Transition frequency as a function of collector current; V_{CE} = 10 V; f = 500 MHz; T_{amb} = 25 °C; typical values.

PNP HIGH FREQUENCY HIGH VOLTAGE TRANSISTOR

PNP silicon epitaxial transistor with emitter ballasting resistors and a gold sandwich metallization to ensure optimum temperature profile and excellent reliability properties. It features high break-down voltages and a low output capacitance.

This transistor is primarily intended for application in the buffer stage of the driver for high-resolution colour graphics monitors.

Its npn complement is the BFQ234.

The transistor has a 4-lead stud envelope with a ceramic cap (SOT172).

All leads are isolated from the stud.

QUICK REFERENCE DATA

Collector-base voltage (open emitter)	$-V_{CBO}$	max.	100	V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	65	V
Collector current (DC)	$-I_C$	max.	300	mA
Total power dissipation up to T_{case} = 140 °C	P_{tot}	max.	3	W
Junction temperature	T_j	max.	200	°C
DC current gain $-I_C$ = 50 mA; $-V_{CE}$ = 10 V	h_{FE}	min.	20	
Transition frequency at f = 500 MHz $-I_C$ = 50 mA; $-V_{CE}$ = 10 V; T_{amb} = 25 °C	f_T	min.	1.0	GHz

MECHANICAL DATA

Dimensions in mm

SOT172

Pinning

1 = collector
2,4 = base
3 = emitter

RATINGS

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

Collector-base voltage (open emitter)	$-V_{CBO}$	max.	100 V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	65 V
Emitter-base voltage (open collector)	$-V_{EBO}$	max.	3 V
Collector current (DC)	$-I_C$	max.	300 mA
Total power dissipation up to T_{case} = 140 °C	P_{tot}	max.	3 W
Storage temperature range	T_{stg}		−65 to +175 °C
Junction temperature	T_j	max.	200 °C

THERMAL RESISTANCE

From junction to mounting-base	$R_{th\ j\text{-}mb}$	=	20 K/W
From mounting-base to heatsink	$R_{th\ mb\text{-}hs}$	=	0.8 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-base breakdown voltage open emitter; I_C = 0.1 mA	$-V_{(BR)CBO}$	min.	100 V
Collector-emitter breakdown voltage open base; I_C = 10 mA	$-V_{(BR)CEO}$	min.	65 V
Emitter-base breakdown voltage open collector; I_E = 0.1 mA	$-V_{(BR)EBO}$	min.	3 V
Collector cut-off current I_B = 0; $-V_{CE}$ = 50 V	$-I_{CES}$	max.	100 μA
Collector cut-off current I_E = 0; $-V_{CB}$ = 50 V	$-I_{CBO}$	max.	20 μA
DC current gain $-I_C$ = 50 mA; $-V_{CE}$ = 10 V	h_{FE}	min.	20
Collector-base capacitance at f = 1 MHz I_C = 0; $-V_{CB}$ = 10 V	C_{cb}	typ.	2.5 pF
Transition frequency at f = 500 MHz $-I_C$ = 50 mA; $-V_{CE}$ = 10 V	f_T	min. typ.	1.0 GHz 1.3 GHz

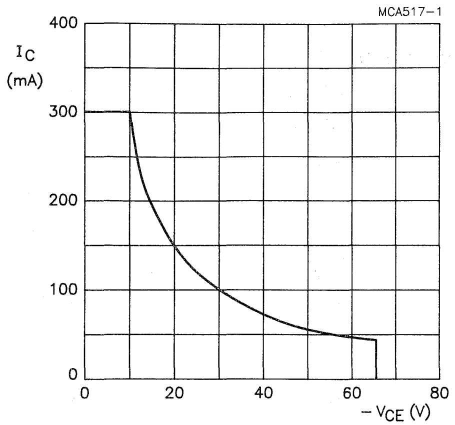


Fig.1 Safe operating area.

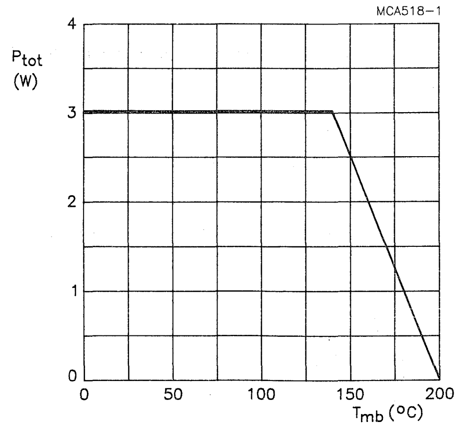


Fig.2 Power dissipation as a function of temperature.

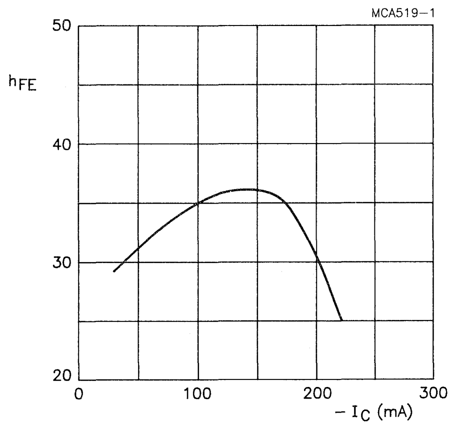


Fig.3 h_{FE} as a function of I_C; V_{CE} = −10 V; T_{amb} = 25 °C; typical values.

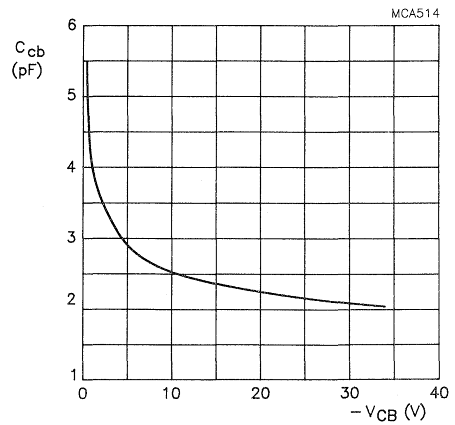


Fig.4 C_{cb} as a function of V_{CB}; f = 1 MHz; T_{amb} = 25 °C; typical values.

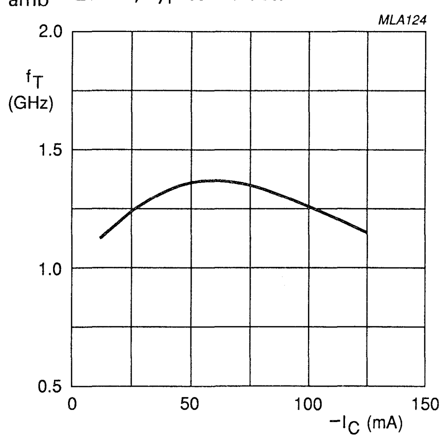


Fig.5 f_T as a function of I_C; V_{CE} = −10 V; f = 500 MHz; T_{amb} = 25 °C; typical values.

Data sheet	
status	Product specification
date of issue	September 1990

BFQ255/BFQ255A

PNP high frequency high voltage transistor

FEATURES

- High breakdown voltages
- Low output capacitance
- High gain bandwidth product
- Good thermal stability
- Gold metallization ensures excellent reliability
- Complementary npn type BFQ235(A).

DESCRIPTION

PNP silicon epitaxial transistor intended for use as a buffer driver in high-resolution colour graphics monitors.
The BFQ255(A) is mounted in a SOT128B plastic envelope, with the collector connected to mounting base.

PIN CONFIGURATION

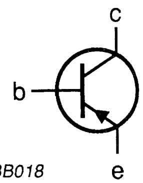


Fig.1 Pin configuration.

PINNING

PIN	DESCRIPTION
1	emitter
2	collector
3	base

MECHANICAL DATA

TO-202 (SOT128B).

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	BFQ255		BFQ255A		UNIT
			MIN.	MAX.	MIN.	MAX.	
$-V_{CBO}$	collector-base voltage	open emitter	-	100	-	115	V
$-V_{CEO}$	collector-emitter voltage	open base	-	65	-	95	V
$-I_C$	collector current (DC)		-	300	-	300	mA
P_{tot}	total power dissipation	T_{case} = 97 °C	-	3	-	3	W
T_j	junction temperature (mounting base)		-	175	-	175	°C
h_{FE}	DC current gain	$-I_C$ = 50 mA; $-V_{CE}$ = 10 V	20	-	20	-	
f_T	transition frequency	$-I_C$ = 50 mA; $-V_{CE}$ = 10 V; T_{amb} = 25 °C	1.0	-	0.8	-	GHz

PNP high frequency high voltage transistor BFQ255/BFQ255A

ORDERING AND PACKAGE INFORMATION

EXTENDED TYPE NUMBER	PACKAGE	PACKING METHOD	PACKING QUANTITY
BFQ255	SOT128B	railpack	50
BFQ255A	SOT128B	railpack	50

LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	BFQ255		BFQ255A		UNIT
			MIN.	MAX.	MIN.	MAX.	
$-V_{CBO}$	collector-base voltage	open emitter	-	100	-	115	V
$-V_{CEO}$	collector-emitter voltage	open base	-	65	-	95	V
$-V_{EBO}$	emitter-base voltage	open collector	-	3	-	3	V
$-I_C$	collector current (DC)		-	300	-	300	mA
P_{tot}	total power dissipation	T_{case} = 97 °C	-	3	-	3	W
T_{stg}	storage temperature range		−65	+150	−65	+150	°C
T_j	junction temperature		-	175	-	175	°C

THERMAL RESISTANCE

SYMBOL	PARAMETER	NOM.	UNIT
$R_{th\ j\text{-}c}$	from junction to case	26	K/W
$R_{th\ j\text{-}a}$	from junction to ambient (in free air)	75	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	BFQ255 MIN.	BFQ255 TYP.	BFQ255 MAX.	BFQ255A MIN.	BFQ255A TYP.	BFQ255A MAX.	UNIT
$-V_{(BR)CBO}$	collector-base breakdown voltage	open emitter; $-I_C$ = 0.1 mA	100	-	-	115	-	-	V
$-V_{(BR)CEO}$	collector-emitter breakdown voltage	open base; $-I_C$ = 10 mA	65	-	-	95	-	-	V
$-V_{(BR)EBO}$	emitter-base breakdown voltage	open collector; $-I_E$ = 0.1 mA	3	-	-	3	-	-	V
$-I_{CES}$	collector cut-off current	I_B = 0; V_{CE} = 50 V	-	-	100	-	-	100	μA
$-I_{CBO}$	collector cut-off current	I_E = 0; V_{CB} = 50 V	-	-	20	-	-	20	μA
h_{FE}	DC current gain	$-I_C$ = 50 mA; $-V_{CE}$ = 10 V	20	-	-	20	-	-	
C_{cb}	collector-base capacitance	f = 1 MHz; I_C = 0; $-V_{CB}$ = 10 V	-	2.0	-	-	2.0	-	pF
f_T	transition frequency	f = 100 MHz; $-I_C$ = 50 mA; $-V_{CE}$ = 10 V	1	1.3	-	0.8	1.2	-	GHz

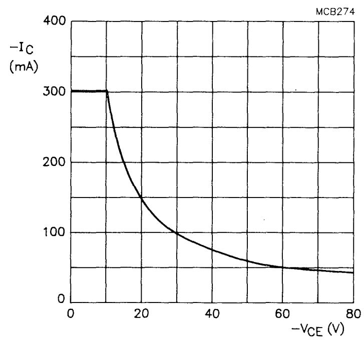


Fig.2 Safe operating area.

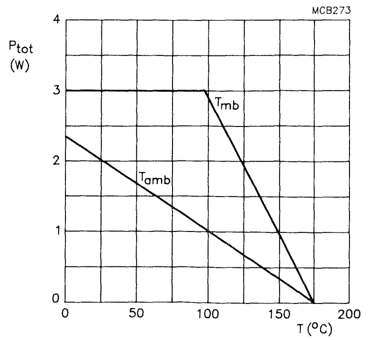


Fig.3 Power derating curve.

PNP high frequency high voltage transistor BFQ255/BFQ255A

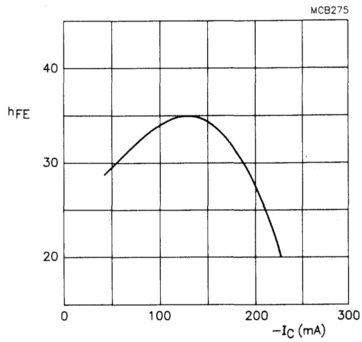


Fig.4 DC current gain as a function of collector current; V_{CE} = 10 V; T_{amb} = 25 °C; typical values.

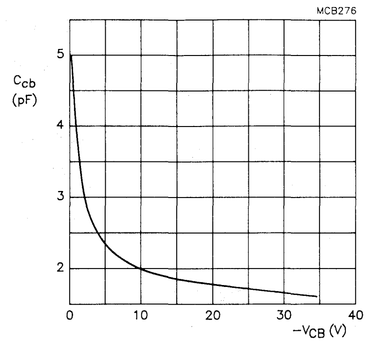


Fig.5 Collector capacitance as a function of collector voltage; f = 1 MHz; T_{amb} = 25 °C; typical values.

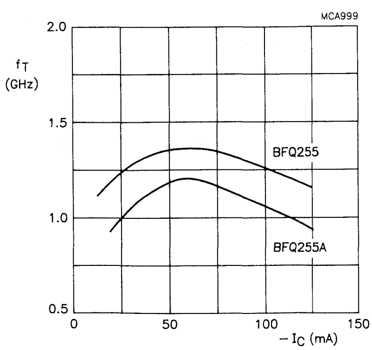


Fig.6 Transition frequency as a function of collector current; $-V_{CE}$ = 10 V; f = 500 MHz; T_{amb} = 25 °C; typical values.

Philips Components

Data sheet	
status	Product specification
date of issue	April 1990

BFQ262/BFQ262A

NPN high frequency high voltage transistor

DESCRIPTION

NPN silicon epitaxial transistor with emitter ballasting resistors and a gold sandwich metallization ensure optimum temperature profile and excellent reliability properties. It features high breakdown voltages and a low output capacitance.

This transistor is primarily intended for application in the cascode stage of the driver for high-resolution colour graphics monitors.

MECHANICAL DATA

TO-126 (SOT32).

PINNING

PIN	DESCRIPTION
1	emitter
2	collector
3	base

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	BFQ262		BFQ262A		UNIT
			MIN.	MAX.	MIN.	MAX.	
V_{CBO}	collector-base voltage	open emitter	-	100	-	115	V
V_{CEO}	collector-emitter voltage	open base	-	65	-	95	V
I_C	collector current (DC)		-	400	-	400	mA
P_{tot}	total power dissipation	T_{case} = 85 °C	-	5	-	5	W
T_j	junction temperature		-	175	-	175	°C
h_{FE}	DC current gain	I_C = 100 mA; V_{CE} = 10 V	15	-	15	-	
f_T	transition frequency	f = 100 MHz; I_C = 100 mA; V_{CE} = 10 V; T_{amb} = 25 °C	1.0	-	0.8	-	GHz

LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	BFQ262		BFQ262A		UNIT
			MIN.	MAX.	MIN.	MAX.	
V_{CBO}	collector-base voltage	open emitter	-	100	-	115	V
V_{CEO}	collector-emitter voltage	open base	-	65	-	95	V
V_{EBO}	emitter-base voltage	open collector	-	3	-	3	V
I_C	collector current (DC)		-	400	-	400	mA
P_{tot}	total power dissipation	T_{case} = 85 °C	-	5	-	5	W
T_{stg}	storage temperature range		−65	+150	−65	+150	°C
T_j	junction temperature		-	175	-	175	°C

THERMAL RESISTANCE

SYMBOL	PARAMETER	BFQ262	BFQ262A	UNIT
		NOM.	NOM.	
$R_{th\ j\text{-}mb}$	from junction to mounting base	18	18	K/W
$R_{th\ j\text{-}a}$	from junction to ambient (in free air)	100	100	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	BFQ262			BFQ262A			UNIT
			MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
$V_{(BR)CBO}$	collector-base breakdown voltage	open emitter I_C = 0.1 mA	100	-	-	115	-	-	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	open base I_C = 10 mA	65	-	-	95	-	-	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	open collector I_E = 0.1 mA	3	-	-	3	-	-	V
I_{CES}	collector cut-off current	I_B = 0; V_{CE} = 50 V	-	-	100	-	-	100	μA
I_{CBO}	collector cut-off current	I_E = 0; V_{CB} = 50 V	-	-	20	-	-	20	μA
h_{FE}	DC current gain	I_C = 100 mA; V_{CE} = 10 V	15	-	-	15	-	-	
C_{cb}	collector-base capacitance	f = 1 MHz; I_C = 0; V_{CB} = 10 V	-	2.0	-	-	2.0	-	pF
C_c	collector capacitance	f = 1 MHz; $I_E = i_e$ = 0; V_{CB} = 10 V	-	3.5	-	-	3.5	-	pF
f_T	transition frequency	f = 100 MHz; I_C = 100 mA; V_{CE} = 10 V	1.0	1.4	-	0.8	1.2	-	GHz

NPN high frequency high voltage transistor BFQ262/BFQ262A

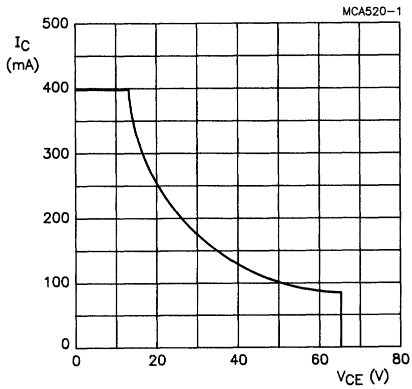


Fig.1 Safe operating area.

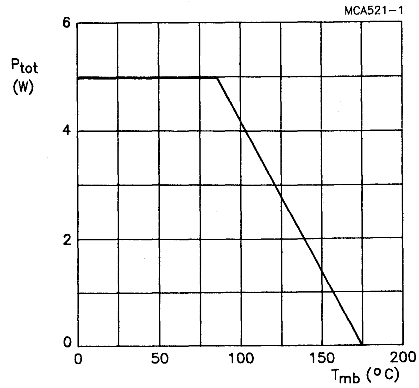


Fig.2 Power derating curve.

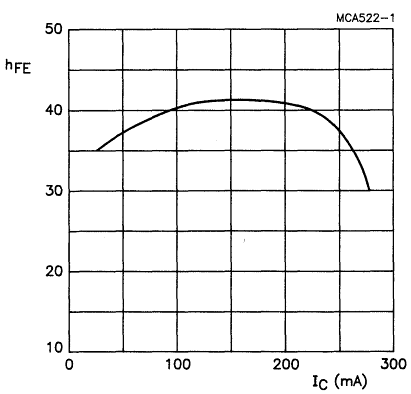


Fig.3 DC current gain as a function of collector current; V_{CE} = 10 V; T_{amb} = 25 °C; typical values.

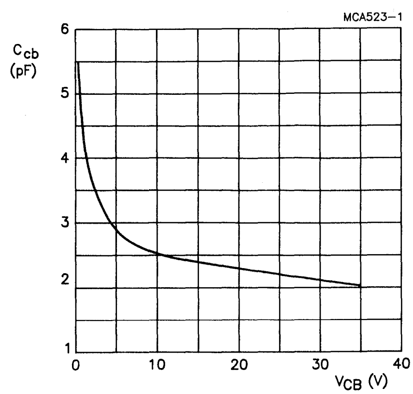


Fig.4 Collector-base capacitance as a function of collector-base voltage; f = 1 MHz; T_{amb} = 25 °C; typical values.

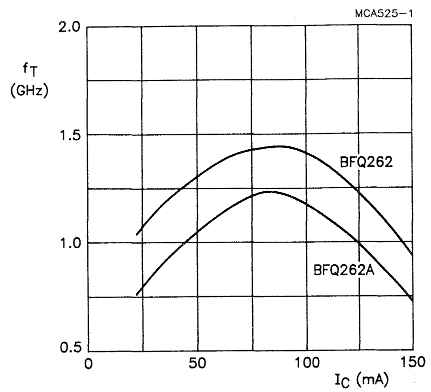


Fig.5 Transition frequency as a function of collector current; V_{CE} = 10 V; f = 500 MHz; T_{amb} = 25 °C; typical values.

Philips Components

Data sheet	
status	Product specification
date of issue	April 1990

BFQ263/BFQ263A

NPN high frequency high voltage transistor

DESCRIPTION

NPN silicon epitaxial transistor with emitter ballasting resistors and a gold sandwich metallization ensure optimum temperature profile and excellent reliability properties. It features high breakdown voltages and a low output capacitance.

This transistor is primarily intended for application in the buffer stage of the driver for high-resolution colour graphics monitors.

MECHANICAL DATA

SOT5 (TO-39).

PINNING

PIN	DESCRIPTION
1	emitter
2	base
3	collector

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	BFQ263		BFQ263A		UNIT
			MIN.	MAX.	MIN.	MAX.	
V_{CBO}	collector-base voltage	open emitter	-	100	-	115	V
V_{CEO}	collector-emitter voltage	open base	-	65	-	95	V
I_C	collector current (DC)		-	400	-	400	mA
P_{tot}	total power dissipation	T_{case} = 95 °C	-	5	-	5	W
T_j	junction temperature		-	200	-	200	°C
h_{FE}	DC current gain	I_C = 100 mA; V_{CE} = 10 V	15	-	15	-	
f_T	transition frequency	f = 100 MHz; I_C = 100 mA; V_{CE} = 10 V; T_{amb} = 25 °C	1.0	-	0.8	-	GHz

NPN high frequency high voltage transistor BFQ263/BFQ263A

LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	BFQ263		BFQ263A		UNIT
			MIN.	MAX.	MIN.	MAX.	
V_{CBO}	collector-base voltage	open emitter	-	100	-	115	V
V_{CEO}	collector-emitter voltage	open base	-	65	-	95	V
V_{EBO}	emitter-base voltage	open collector	-	3	-	3	V
I_C	collector current (DC)		-	400	-	400	mA
P_{tot}	total power dissipation	T_{case} = 95 °C	-	5	-	5	W
T_{stg}	storage temperature range		−65	+175	−65	+175	°C
T_j	junction temperature		-	200	-	200	°C

THERMAL RESISTANCE

SYMBOL	PARAMETER	BFQ263	BFQ263A	UNIT
		NOM.	NOM.	
$R_{th\ j\text{-}c}$	from junction to case	21	21	K/W
$R_{th\ j\text{-}a}$	from junction to ambient (in free air)	250	250	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	BFQ263			BFQ263A			UNIT
			MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
$V_{(BR)CBO}$	collector-base breakdown voltage	open emitter I_C = 0.1 mA	100	-	-	115	-	-	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	open base I_C = 10 mA	65	-	-	95	-	-	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	open collector I_E = 0.1 mA	3	-	-	3	-	-	V
I_{CES}	collector cut-off current	I_B = 0; V_{CE} = 50 V	-	-	100	-	-	100	µA
I_{CBO}	collector cut-off current	I_E = 0; V_{CB} = 50 V	-	-	20	-	-	20	µA
h_{FE}	DC current gain	I_C = 100 mA; V_{CE} = 10 V	15	-	-	15	-	-	
C_{cb}	collector-base capacitance	f = 1 MHz; I_C = 0; V_{CB} = 10 V	-	2.0	-	-	2.0	-	pF
f_T	transition frequency	f = 500 MHz; I_C = 100 mA; V_{CE} = 10 V	1	1.4	-	0.8	1.2	-	GHz

NPN high frequency high voltage transistor BFQ263/BFQ263A

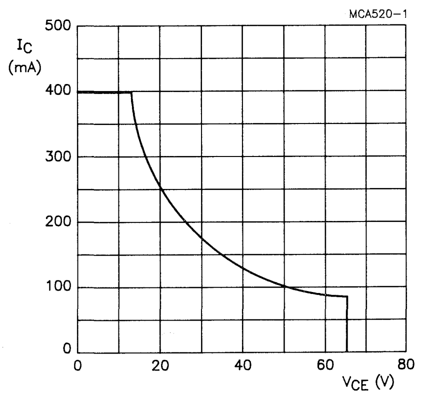


Fig.1 Safe operating area.

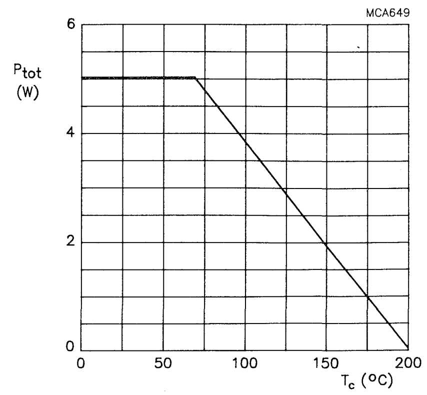


Fig.2 Power derating curve.

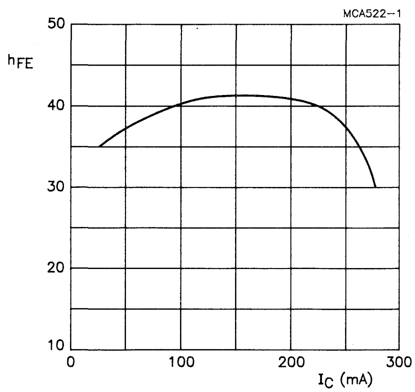


Fig.3 DC current gain as a function of collector current; V_{CE} = 10 V; T_{amb} = 25 °C; typical values.

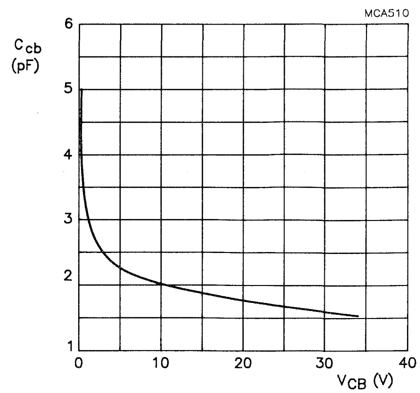


Fig.4 Collector-base capacitance as a function of collector-base voltage; f = 1 MHz; T_{amb} = 25 °C; typical values.

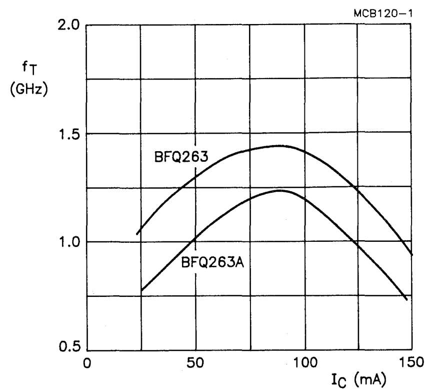


Fig.5 Transition frequency as a function of collector current; V_{CE} =10 V; f = 500 MHz; T_{amb} = 25 °C; typical values.

Philips Components

Data sheet	
status	Product specification
date of issue	September 1990

BFQ265/BFQ265A

NPN high frequency high voltage transistor

FEATURES

- High breakdown voltages
- Low output capacitance
- High gain bandwidth product
- Good thermal stability
- Gold metallization ensures excellent reliability.

DESCRIPTION

NPN silicon epitaxial transistor intended for use in the cascode stage in the driver in high-resolution colour graphics monitors.

The BFQ265(A) is mounted in a SOT128B plastic envelope, with the collector connected to mounting base.

PINNING

PIN	DESCRIPTION
1	emitter
2	collector
3	base

MECHANICAL DATA

TO-202 (SOT128B).

PIN CONFIGURATION

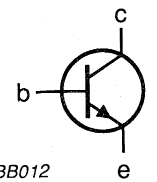


Fig.1 Pin configuration.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	BFQ265		BFQ265A		UNIT
			MIN.	MAX.	MIN.	MAX.	
V_{CBO}	collector-base voltage	open emitter	-	100	-	115	V
V_{CEO}	collector-emitter voltage	open base	-	65	-	95	V
I_C	collector current (DC)		-	400	-	400	mA
P_{tot}	total power dissipation	T_{case} = 65 °C	-	5	-	5	W
T_j	junction temperature		-	175	-	175	°C
h_{FE}	DC current gain	I_C = 100 mA; V_{CE} = 10 V	15	-	15	-	
f_T	transition frequency	I_C = 100 mA; V_{CE} = 10 V; T_{amb} = 25 °C	1.0	-	0.8	-	GHz

ORDERING AND PACKAGE INFORMATION

EXTENDED TYPE NUMBER	PACKAGE	PACKING METHOD	PACKING QUANTITY
BFQ265	SOT128B	railpack	50
BFQ265A	SOT128B	railpack	50

LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	BFQ265		BFQ265A		UNIT
			MIN.	MAX.	MIN.	MAX.	
V_{CBO}	collector-base voltage	open emitter	-	100	-	115	V
V_{CEO}	collector-emitter voltage	open base	-	65	-	95	V
V_{EBO}	emitter-base voltage	open collector	-	3	-	3	V
I_C	collector current (DC)		-	400	-	400	mA
P_{tot}	total power dissipation	T_{case} = 65 °C	-	5	-	5	W
T_{stg}	storage temperature range		−65	+150	−65	+150	°C
T_j	junction temperature		-	175	-	175	°C

THERMAL RESISTANCE

SYMBOL	PARAMETER	NOM.	UNIT
$R_{th\ j\text{-}mb}$	from junction to mounting base	22	K/W
$R_{th\ j\text{-}a}$	from junction to ambient (in free air)	75	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	BFQ265			BFQ265A			UNIT
			MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
$V_{(BR)CBO}$	collector-base breakdown voltage	open emitter I_C = 0.1 mA	100	-	-	115	-	-	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	open base I_C = 10 mA	65	-	-	95	-	-	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	open collector I_E = 0.1 mA	3	-	-	3	-	-	V
I_{CES}	collector cut-off current	I_B = 0; V_{CE} = 50 V	-	-	100	-	-	100	μA
I_{CBO}	collector cut-off current	I_E = 0; V_{CB} = 50 V	-	-	20	-	-	20	μA
h_{FE}	DC current gain	I_C = 100 mA; V_{CE} = 10 V	15	-	-	15	-	-	
C_{cb}	collector-base capacitance	f = 1 MHz; I_C = 0; V_{CB} = 10 V	-	2.5	-	-	2.5	-	pF
f_T	transition frequency	f = 100 MHz; I_C = 100 mA; V_{CE} = 10 V	1	1.4	-	0.8	1.2	-	GHz

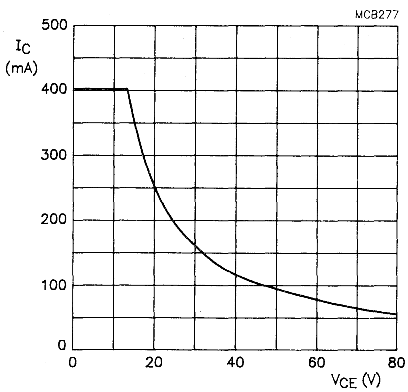


Fig.2 Safe operating area.

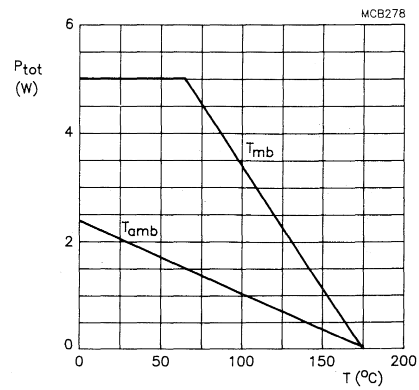


Fig.3 Power derating curve.

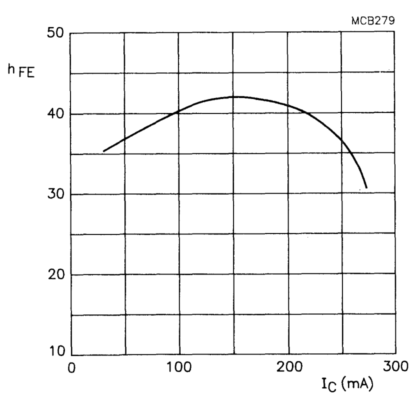


Fig.4 DC current gain as a function of collector current; V_{CE} = 10 V; T_{amb} = 25 °C.

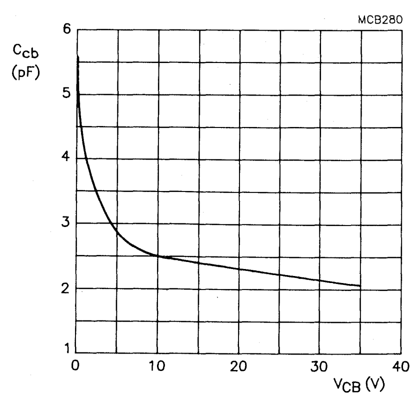


Fig.5 Collector-base capacitance as a function of collector-base voltage; f = 1 MHz; T_{amb} = 25 °C; typical values.

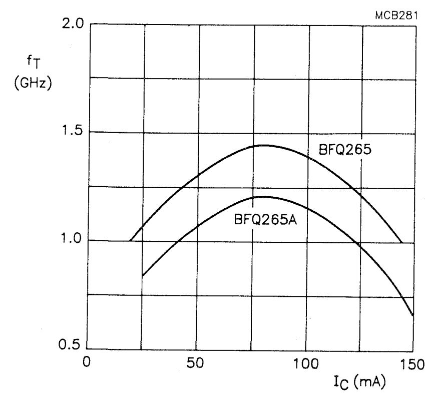


Fig.6 Transition frequency as a function of collector current; V_{CE} = 10 V; f = 100 MHz; T_{amb} = 25 °C; typical values.

NPN HIGH FREQUENCY HIGH VOLTAGE TRANSISTOR

NPN silicon epitaxial transistor with emitter ballasting resistors and a gold sandwich metallization to ensure optimum temperature profile and excellent reliability properties. It features high break-down voltages and a low output capacitance.

This transistor is primarily intended for application in the driver for high-resolution colour graphics monitors.

The transistor has a 4-lead stud envelope with a ceramic cap (SOT172).

All leads are isolated from the stud.

QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	100 V
Collector-emitter voltage (open base)	V_{CEO}	max.	65 V
Collector current (DC)	I_C	max.	400 mA
Total power dissipation up to T_{mb} = 100 °C	P_{tot}	max.	5 W
Junction temperature	T_j	max.	200 °C
DC current gain I_C = 100 mA; V_{CE} = 10 V	h_{FE}	min.	15
Transition frequency at f = 500 MHz I_C = 100 mA; V_{CE} = 10 V; T_{amb} = 25 °C	f_T	min.	1.0 GHz

MECHANICAL DATA

SOT172

Pinning

1 = collector
2,4 = base
3 = emitter

RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	100	V
Collector-emitter voltage (open base)	V_{CEO}	max.	65	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3	V
Collector current (DC)	I_C	max.	400	mA
Total power dissipation up to T_{mb} = 100 °C	P_{tot}	max.	5	W
Storage temperature range	T_{stg}		−65 to +175	°C
Junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE

From junction to mounting-base	$R_{th\ j\text{-}mb}$	=	20	K/W
From mounting-base to heatsink	$R_{th\ mb\text{-}hs}$	=	0.8	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-base breakdown voltage open emitter; I_C = 0.1 mA	$V_{(BR)CBO}$	min.	100	V
Collector-emitter breakdown voltage open base; I_C = 10 mA	$V_{(BR)CEO}$	min.	65	V
Emitter-base breakdown voltage open collector; I_E = 0.1 mA	$V_{(BR)EBO}$	min.	3	V
Collector cut-off current I_B = 0; V_{CE} = 50 V	I_{CES}	max.	100	μA
Collector cut-off current I_E = 0; V_{CB} = 50 V	I_{CBO}	max.	20	μA
DC current gain I_C = 100 mA; V_{CE} = 10 V	h_{FE}	min.	15	
Collector-base capacitance at f = 1 MHz I_C = 0; V_{CB} = 10 V	C_{cb}	typ.	2.0	pF
Output capacitance at f = 1 MHz I_E = i_e = 0; V_{CB} = 10 V	C_{ob}	typ.	4.0	pF
Transition frequency at f = 500 MHz I_C = 100 mA; V_{CE} = 10 V	f_T	min.	1.0	GHz
		typ.	1.4	GHz

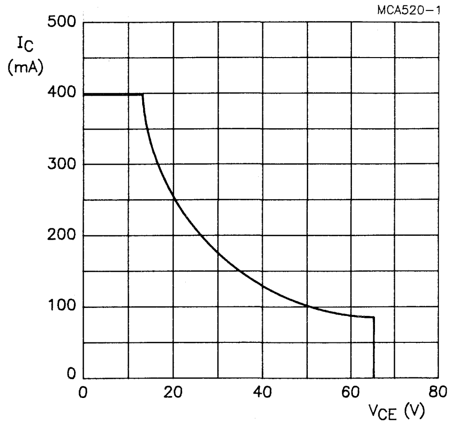


Fig.1 Safe operating area.

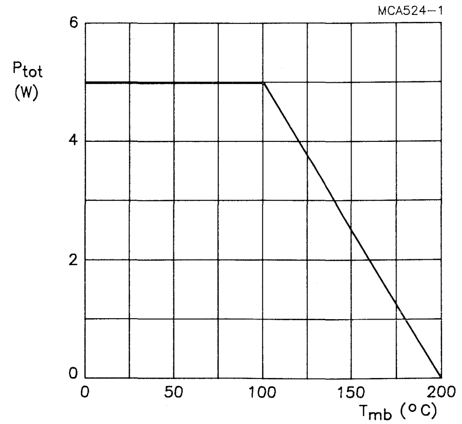


Fig.2 Power dissipation as a function of temperature.

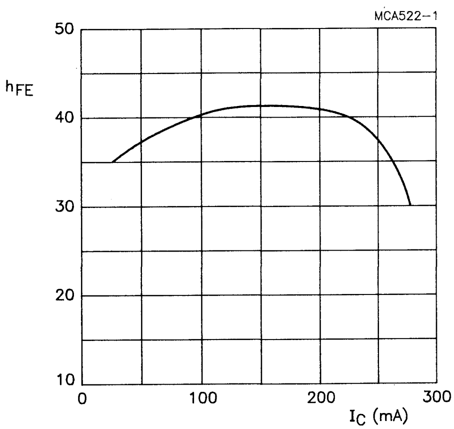


Fig.3 h_{FE} as a function of I_C; V_{CE} = 10 V; T_{amb} = 25 °C; typical values.

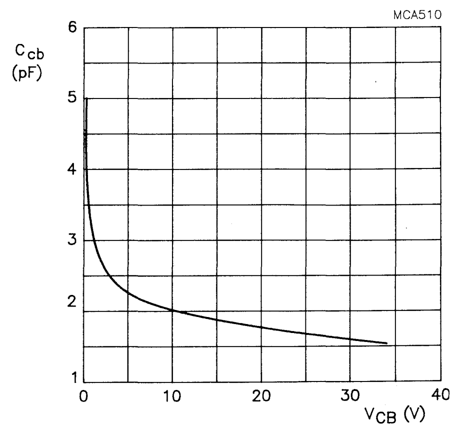


Fig.4 C_{cb} as a function of V_{CB}; f = 1 MHz; T_{amb} = 25 °C; typical values.

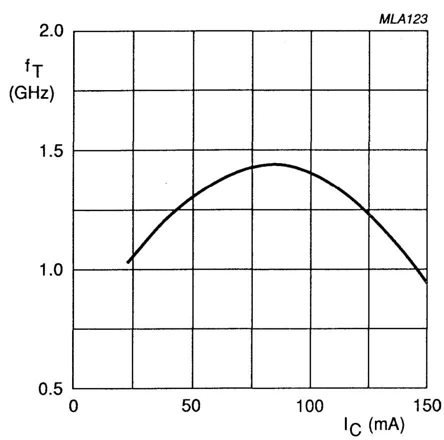


Fig.5 f_T as a function of I_C; V_{CE} = 10 V; f = 500 MHz; T_{amb} = 25 °C; typical values.

Philips Components

Data sheet	
status	Preliminary specification
date of issue	June 1990

BFQ270
NPN 6 GHz wideband transistor

DESCRIPTION

NPN silicon epitaxial transistor with emitter ballasting resistors and a gold sandwich metallization to ensure optimum temperature profile and excellent reliability properties. It features high breakdown voltages and a low output capacitance.

This transistor is primarily intended for application in the buffer stage of the driver for high-resolution colour graphics monitors.

The transistor has a 4-lead stud envelope with a ceramic cap (SOT172). All leads are isolated from the stud.

MECHANICAL DATA

SOT172.

PINNING

PIN	DESCRIPTION
1	base
2,4	emitter
3	collector

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{CBO}	collector-base voltage		-	-	25	V
V_{CEO}	collector-emitter voltage		-	-	19	V
I_C	collector current		-	-	500	mA
P_{tot}	total power dissipation (DC)		-	-	10	mW
T_j	junction temperature		-	-	200	°C
h_{FE}	DC current gain	I_C = 240 mA; V_{CE} = 18 V	-	110	-	
f_T	transition frequency	f = 500 MHz; I_C = 240 mA; V_{CE} = 18 V	5	6	-	GHz

NPN 6 GHz wideband transistor BFQ270

LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage		-	25	V
V_{CEO}	collector-emitter voltage		-	19	V
V_{EBO}	emitter-base voltage		-	2	V
I_C	collector current		-	500	mA
P_{tot}	total power dissipation (DC)	T_{mb} = 100 °C	-	10	mW
T_{stg}	storage temperature range		−65	+150	°C
T_j	junction temperature		-	200	°C

THERMAL RESISTANCE

SYMBOL	PARAMETER	MAX.	UNIT
$R_{th\ j\text{-}mb}$	from junction to mounting base	10	K/W
$R_{th\ mb\text{-}h}$	from mounting base to heatsink	0.6	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)CBO}$	collector-base breakdown voltage	I_C = 0.1 mA	25	-	-	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	I_C = 10 mA	19	-	-	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	I_E = 0.1 mA	2	-	-	V
h_{FE}	DC current gain	I_C = 240 mA; V_{CE} = 18 V	60	110		
C_c	collector capacitance	f = 1 MHz; I_E = 0; V_{CB} = 18 V	-	3.6	-	pF
C_e	emitter capacitance	f = 1 MHz; I_C = 0; $-V_{EB}$ = 0.5 V	-	11	-	pF
C_{re}	feedback capacitance	f = 1 MHz; I_C = 0; V_{CB} = 18 V	-	2	2.6	pF
G_{UM}	unilateral gain	f = 500 MHz; I_C = 240 mA; V_{CE} = 18 V	-	16	-	dB
G_{UM}	unilateral gain	f = 1 GHz; I_C = 240 mA; V_{CE} = 18 V	-	10	-	dB
f_T	transition frequency	f = 500 MHz; I_C = 240 mA; V_{CE} = 18 V	5	6	-	GHz
V_o	output voltage	note 1	-	1.6	-	V

Note

1. d_{im} = –60 dB; V_{CE} = 18 V; I_C = 240 mA; Z_L = 75 Ω; f_p = 795.25 MHz; f_q = 803.25 MHz; f_r = 805.25 MHz; measured at $f_{(p+q-r)}$ = 793.25 MHz.

N-P-N 5 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

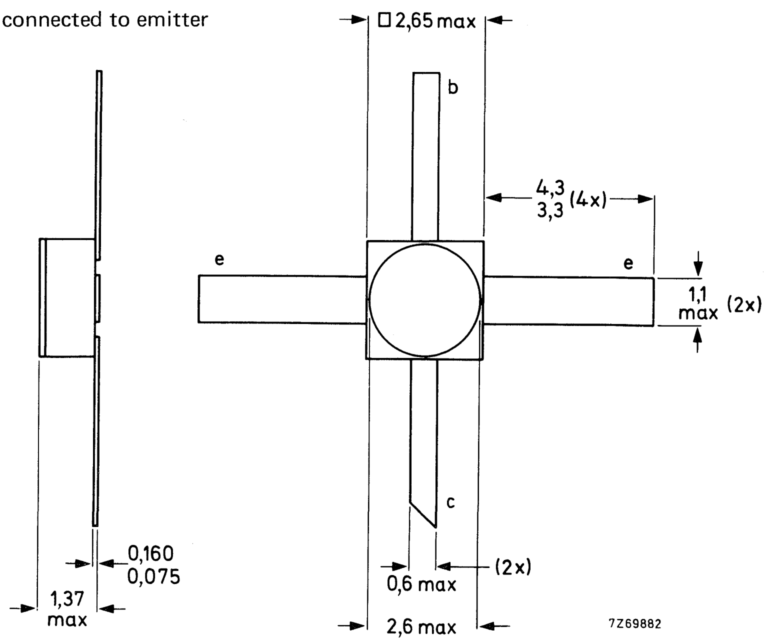
Collector-base voltage (open emitter)	V_{CBO}	max	20	V
Collector-emitter voltage (open base)	V_{CEO}	max	15	V
Collector current (d.c.)	I_C	max	25	mA
Total power dissipation up to T_{amb} = 110 °C	P_{tot}	max	180	mW
Transition frequency I_C = 14 mA; V_{CE} = 10 V	f_T	typ	5,0	GHz
Noise figure at optimum source impedance I_C = 2 mA; V_{CE} = 10 V; f = 1 GHz	F	typ	2,5	dB
Transducer power gain I_C = 14 mA; V_{CE} = 10 V; f = 1 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 μA)	V_{CBO}	max	20	V
Collector-emitter voltage (open base; I_C = 10 mA)	V_{CEO}	max	15	V
Emitter-base voltage (open collector; I_E = 10 μA)	V_{EBO}	max	2	V
Collector current (d.c.)	I_C	max	25	mA
Total power dissipation up to T_{amb} = 110 °C	P_{tot}	max	180	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 mounted on a fibre-glass print of 40 mm x 25 mm x 1 mm	$R_{th\ j\text{-}a}$	=	500	K/W

CHARACTERISTICS

T_{amb} = 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.	25	
Transition frequency				
I_C = 14 mA; V_{CE} = 10 V; f = 500 MHz	f_T	typ	5,0	GHz
Collector capacitance at f = 1 MHz				
$I_E = I_e = 0$; V_{CB} = 10 V	C_c	typ	0,35	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 = 2 mA; V_{CE} = 10 V	C_{re}	typ	0,3	pF
Noise figure at optimum source impedance				
I_C = 2 mA; V_{CE} = 10 V; f = 1 GHz	F	typ	2,5	dB
I_C = 2 mA; V_{CE} = 10 V; f = 4 GHz	F	typ	6,5	dB

Maximum unilateral power gain (s_{12} assumed to be zero)

$$G_{UM} = 10 \log \frac{|s_{21}|^2}{[1-|s_{11}|^2]\,[1-|s_{22}|^2]}$$

I_C = 14 mA; V_{CE} = 10 V; f = 1 GHz	G_{UM}	typ	17,0	dB
I_C = 14 mA; V_{CE} = 10 V; f = 4 GHz	G_{UM}	typ	6,5	dB
Transducer power gain				
I_C = 14 mA; V_{CE} = 10 V; f = 1 GHz	$\|s_{fe}\|^2$	typ	15,5	dB
I_C = 14 mA; V_{CE} = 10 V; f = 4 GHz	$\|s_{fe}\|^2$	typ	3,5	dB

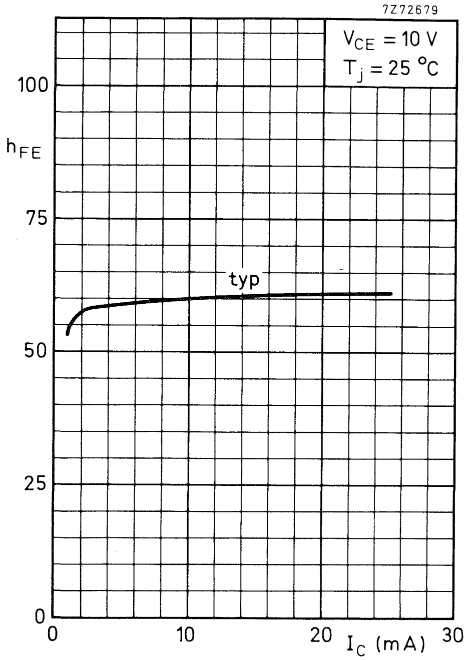


Fig. 2 V_{CE} = 10 V; T_j = 25 °C; typical values.

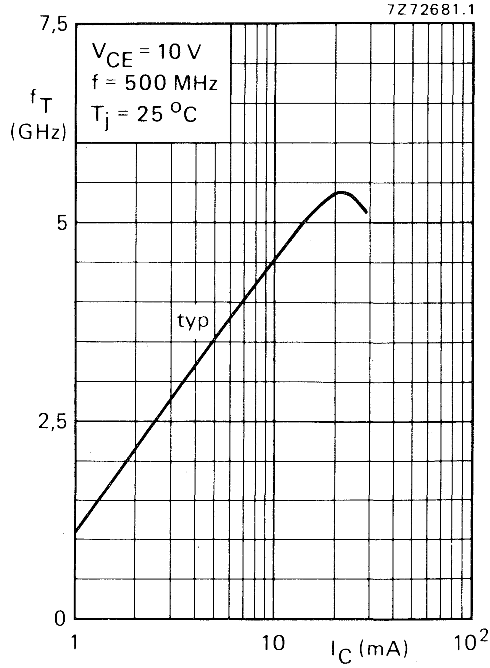


Fig. 3 V_{CE} = 10 V; f = 500 MHz; T_j = 25 °C; typical values.

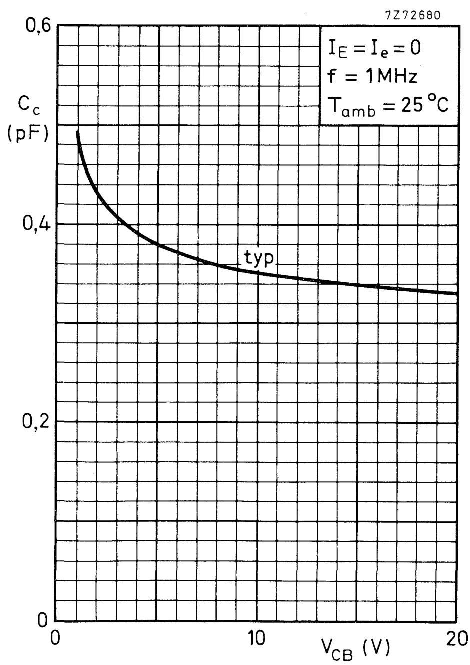


Fig. 4 $I_E = i_e = 0$; f = 1 MHz; T_{amb} = 25 °C; typical values.

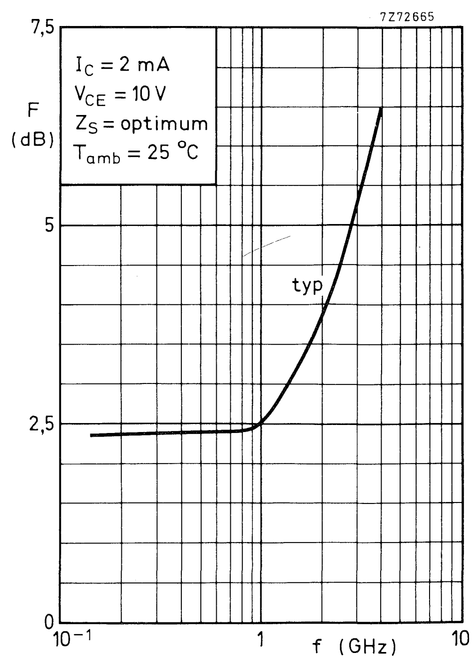


Fig. 5 V_{CE} = 10 V; I_C = 2 mA; Z_S = opt.; T_{amb} = 25 °C; typical values.

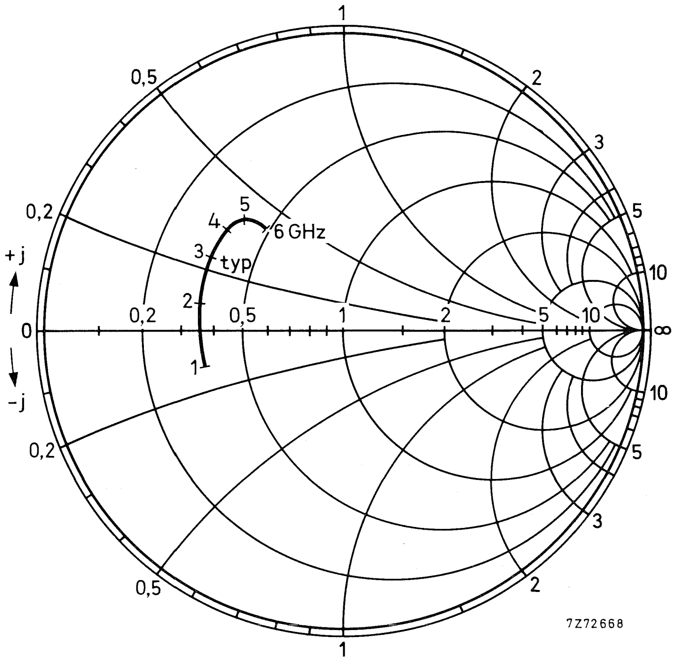


Fig. 6 V_{CE} = 10 V; I_C = 14 mA; T_{amb} = 25 °C; typical values.

Input impedance derived from input reflection coefficient s_{11} co-ordinates in ohm x 50.

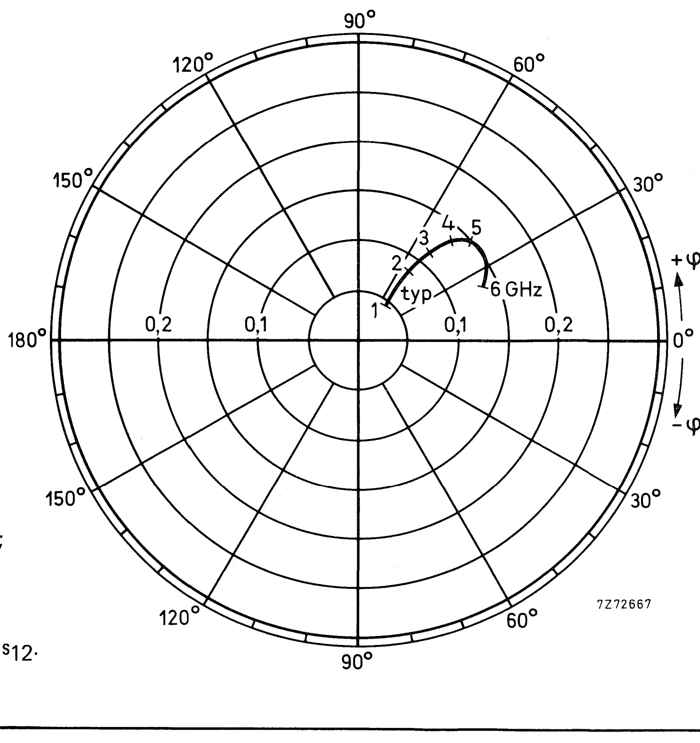


Fig. 7 V_{CE} = 10 V; I_C = 14 mA; T_{amb} = 25 °C; typical values.

Reverse transmission coefficient s_{12}.

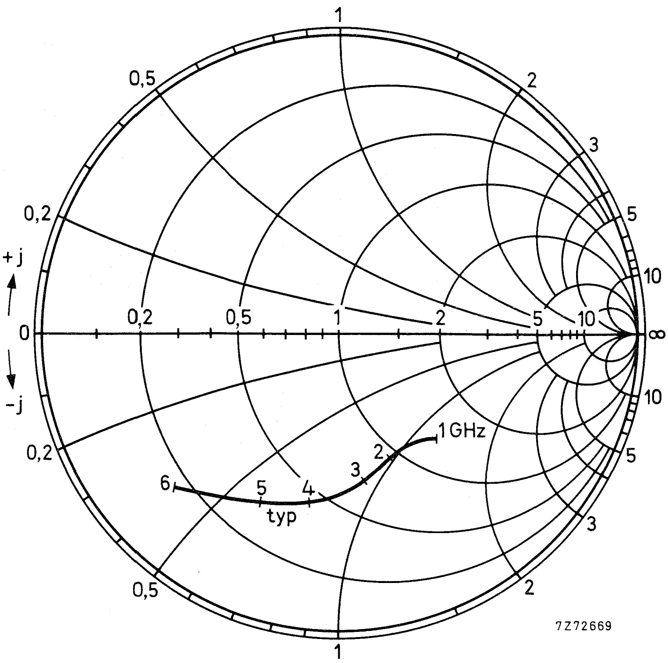


Fig. 8 V_{CE} = 10 V; I_C = 14 mA; T_{amb} = 25 ^oC; typical values.

Output impedance derived from output reflection coefficient s_{22} co-ordinates in ohm x 50.

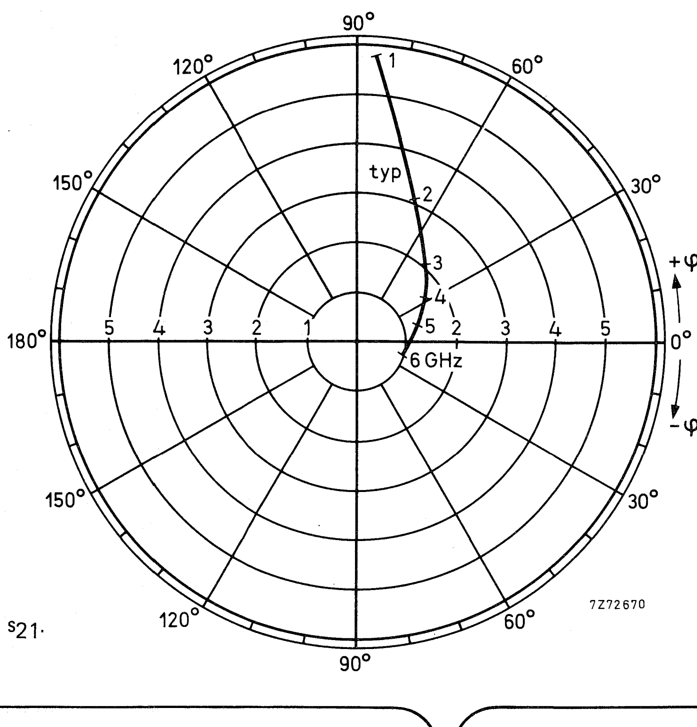


Fig. 9 V_{CE} = 10 V; I_C = 14 mA; T_{amb} = 25 ^oC; typical values.

Forward transmission coefficient s_{21}.

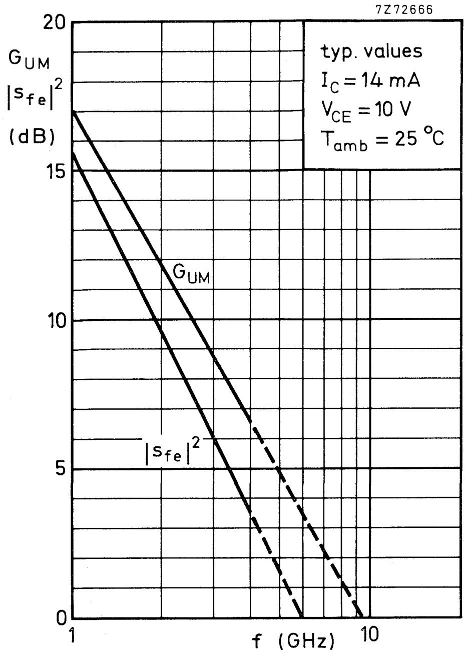


Fig. 10 V_{CE} = 10 V; I_C = 14 mA; T_{amb} = 25 °C; typical values.

N-P-N 2 GHz 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} = 25 °C	P_{tot}	max.	300	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.	0,9	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	G_{UM}	typ.	22	dB
I_C = 30 mA; V_{CE} = 5 V; f = 800 MHz	G_{UM}	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	d_{im}	typ.	−60	dB

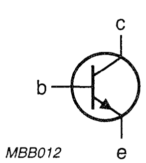
MECHANICAL DATA

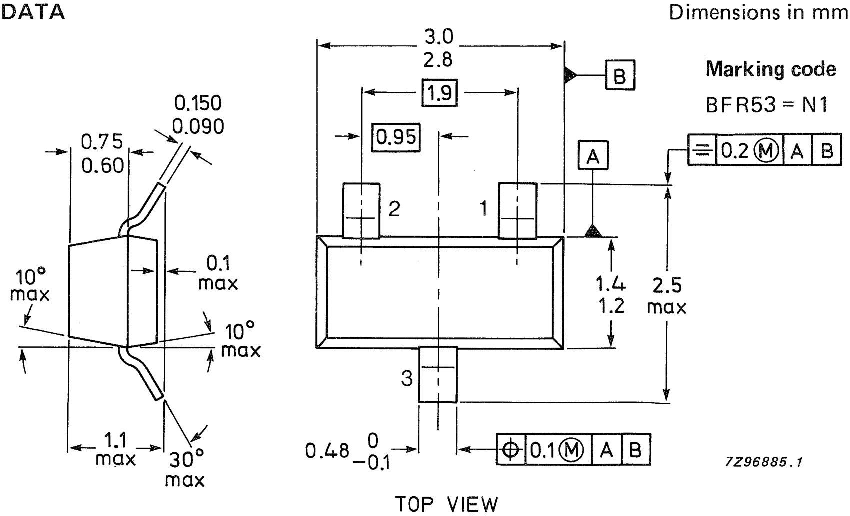
Dimensions in mm

Fig. 1 SOT-23.

Pinning

1 = base
2 = emitter
3 = collector





Marking code

BFR53 = N1

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.	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} = 25 °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*	$R_{th\ j\text{-}a}$	=	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.	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 = 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

* Mounted on a ceramic substrate of 8 mm x 10 mm x 0,7 mm.

Noise figure at f = 500 MHz *

I_C = 2 mA; V_{CE} = 5 V; T_{amb} = 25 °C G_S = 20 mS; B_S is tuned	F	max.	5,0 dB

Max. unilateral power gain (s_{12} assumed to be zero)

$$G_{UM} = 10 \log \frac{|s_{21}|^2}{[1-|s_{11}|^2]\,[1-|s_{22}|^2]}$$

I_C = 30 mA; V_{CE} = 5 V; f = 200 MHz; T_{amb} = 25 °C	G_{UM}	typ.	22 dB
I_C = 30 mA; V_{CE} = 5 V; f = 800 MHz; T_{amb} = 25 °C	G_{UM}	typ.	10,5 dB

Intermodulation distortion *

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	d_{im}	typ.	−60 dB

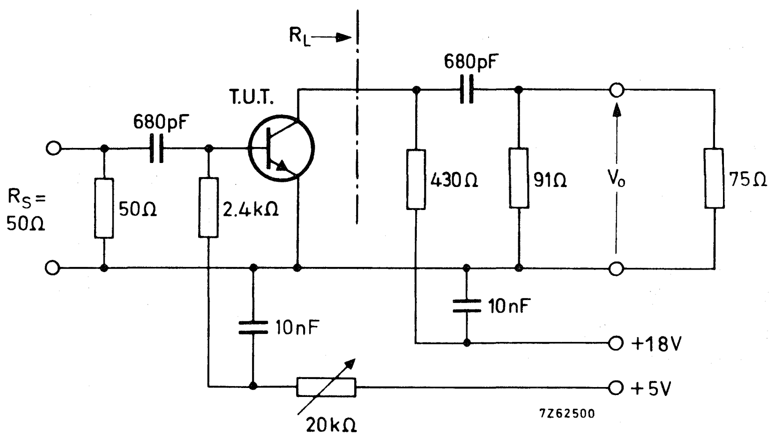


Fig. 2 Test circuit.

* Crystal mounted in a BFW30 envelope.

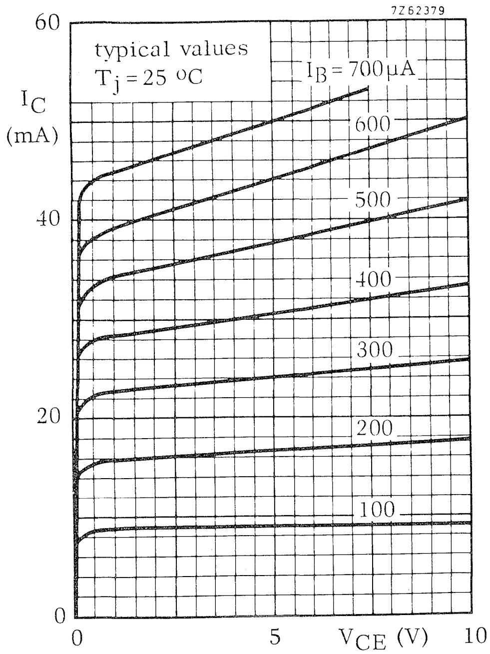


Fig. 3 $T_j = 25\ ^oC$; typical values.

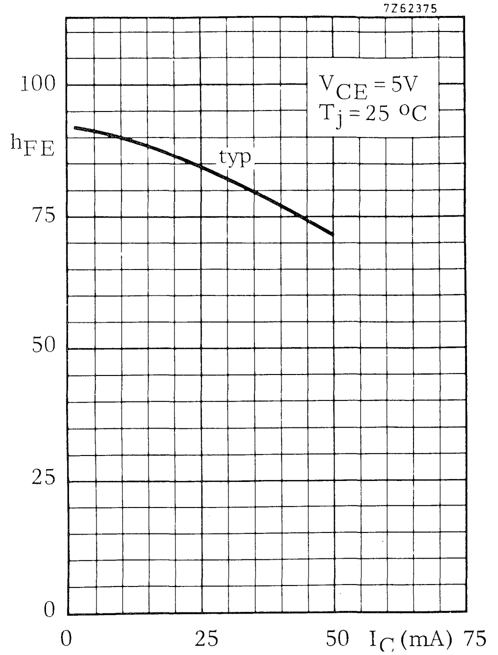


Fig. 4 $V_{CE} = 5$ V; $T_j = 25\ ^oC$; typical values.

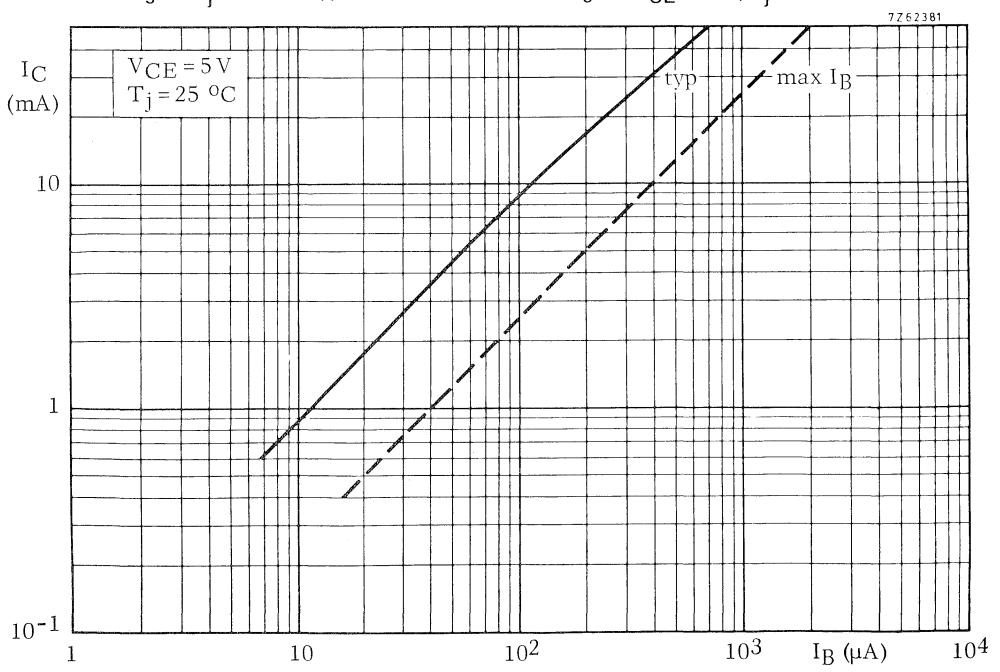


Fig. 5 $V_{CE} = 5$ V; $T_j = 25\ ^oC$.

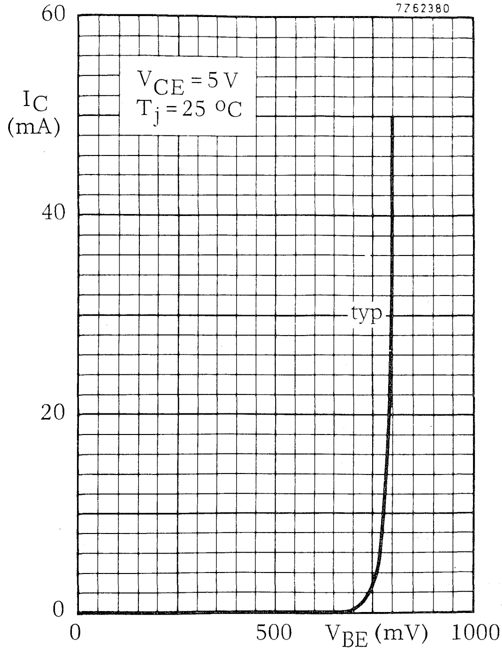


Fig. 6 V_{CE} = 5 V; T_j = 25 °C; typical values.

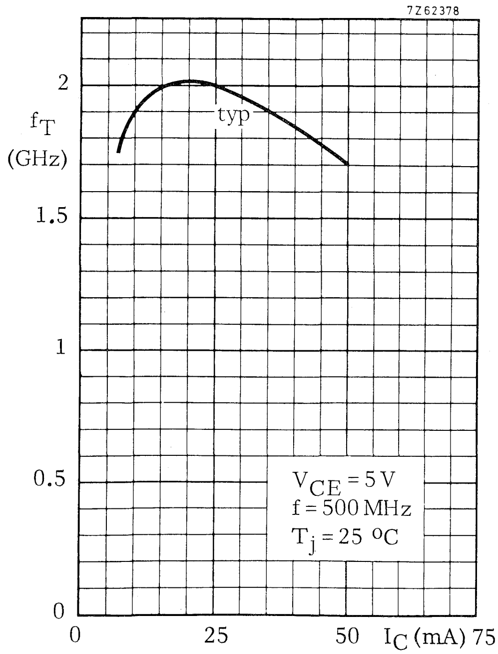


Fig. 7 V_{CE} = 5 V; f = 500 MHz; T_j = 25 °C; typical values.

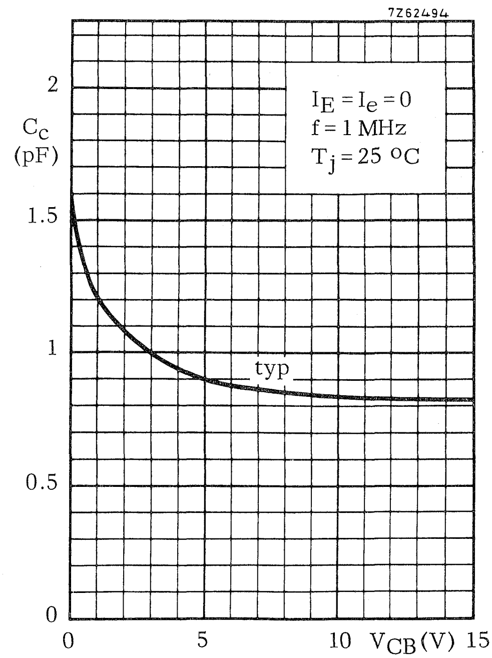


Fig. 8 $I_E = i_e = 0$; f = 1 MHz; T_j = 25 °C; typical values.

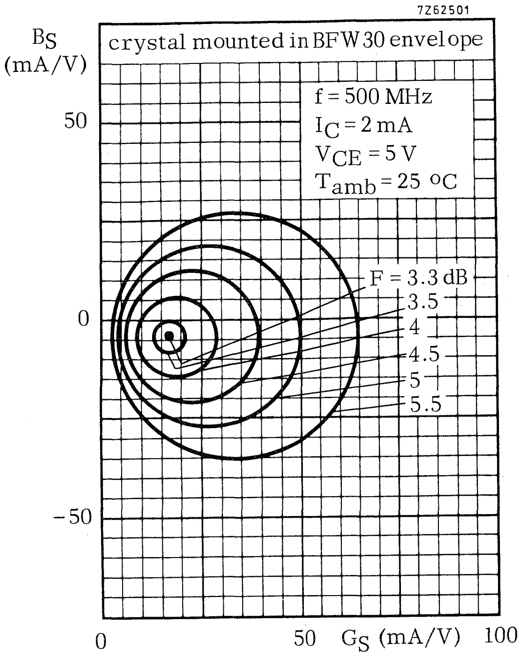


Fig. 9 Circles of constant noise figure; V_{CE} = 5 V; I_C = 2 mA; f = 500 MHz; T_{amb} = 25 °C; typ. values.

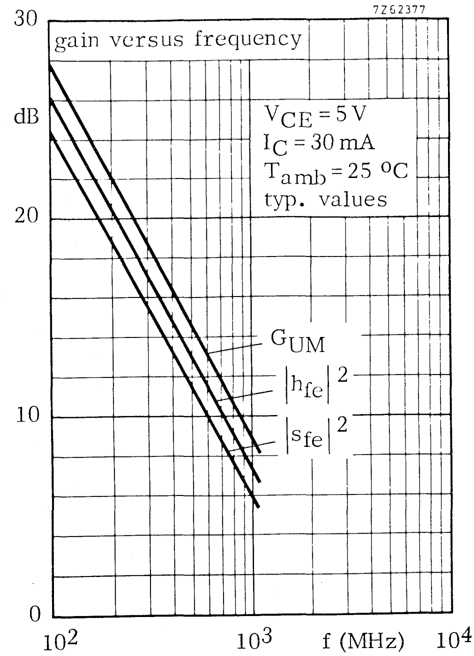


Fig. 10 V_{CE} = 5 V; I_C = 30 mA; T_{amb} = 25 °C; typical values.

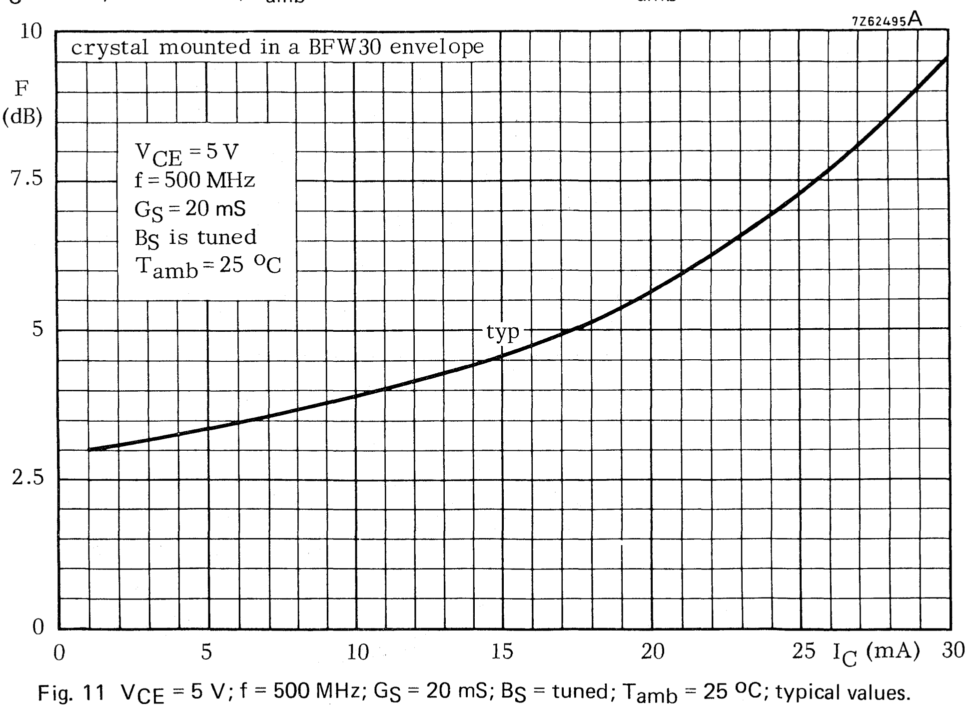


Fig. 11 V_{CE} = 5 V; f = 500 MHz; G_S = 20 mS; B_S = tuned; T_{amb} = 25 °C; typical values.

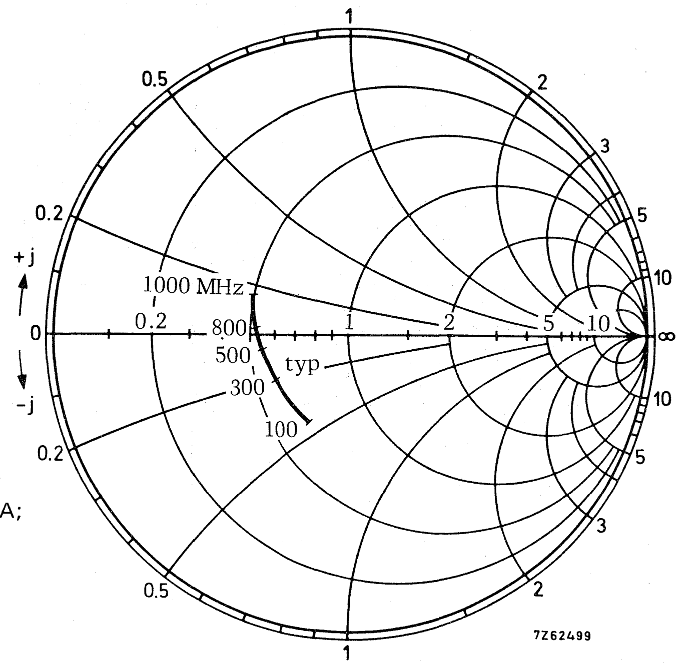


Fig. 12 V_{CE} = 5 V; I_C = 30 mA; T_{amb} = 25 °C; typical values.

Input impedance derived from input reflection coefficient s_{11} coordinates in ohm x 50.

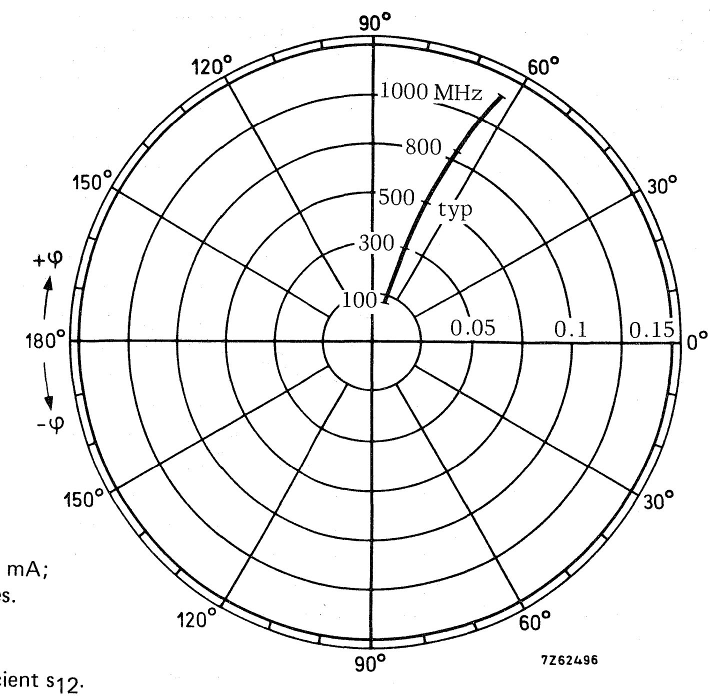


Fig. 13 V_{CE} = 5 V; I_C = 30 mA; T_{amb} = 25 °C; typical values.

Reverse transmission coefficient s_{12}.

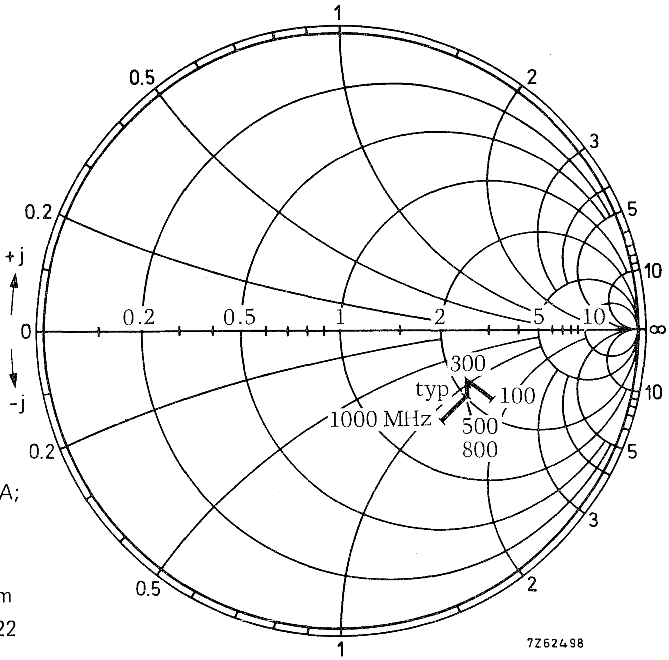


Fig. 14 V_{CE} = 5 V; I_C = 30 mA; T_{amb} = 25 °C; typical values.

Output impedance derived from output reflection coefficient s_{22} coordinates in ohm x 50.

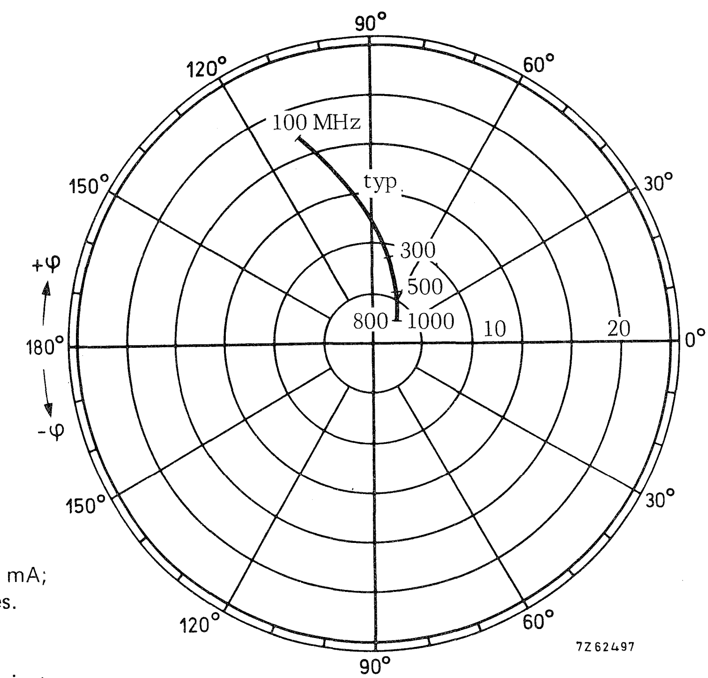


Fig. 15 V_{CE} = 5 V; I_C = 30 mA; T_{amb} = 25 °C; typical values.

Forward transmission coefficient s_{21}.

N-P-N 1 GHz 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 °C; f ⩾ 1 MHz	P_{tot}	max.	3,5	W
Junction temperature	T_j	max.	175	°C
Transition frequency at f = 500 MHz I_C = 75 mA; V_{CE} = 20 V	f_T	min.	1200	MHz
Output power at f = 200 MHz I_C = 70 mA; V_{CE} = 20 V; d_{im} = −30 dB	P_o	typ.	150	mW
Power gain at f = 200 MHz I_C = 70 mA; V_{CE} = 20 V	G_p	typ.	16	dB

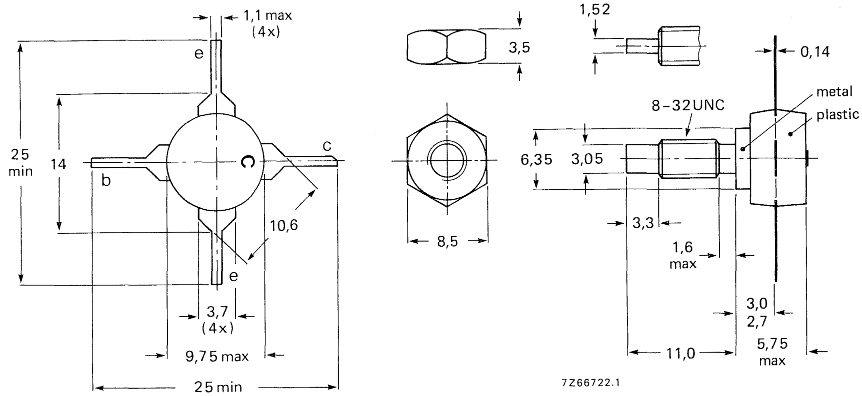
MECHANICAL DATA (see next page)

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 Ω; 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)					
Total power dissipation up to T_{mb} = 60 °C	P_{tot}	max.	3,5	W	
Storage temperature	T_{stg}	−40 to +150		°C	
Junction temperature	T_j	max.	175	°C	

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	25	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,5	K/W

1) at I_C = 100 μA.
2) at I_C = 10 mA.
3) at I_E = 100 μA.

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current				
$I_E = 0$; V_{CB} = 20 V	I_{CBO}	max.	10	μA
Saturation voltage				
I_C = 100 mA; I_B = 10 mA	V_{CEsat}	max.	0,75	V
D.C. current gain				
I_C = 50 mA; V_{CE} = 5 V	h_{FE}	min.	25	
I_C = 150 mA; V_{CE} = 5 V	h_{FE}	min.	25	
Collector capacitance at f = 1 MHz				
$I_E = I_e = 0$; V_{CB} = 20 V	C_c	max.	4,5	pF
Feedback capacitance at f = 1 MHz				
I_C = 10 mA; V_{CE} = 20 V; T_{mb} = 25 °C	C_{re}	typ.	1,7	pF
Noise figure at f = 200 MHz				
I_C = 40 mA; V_{CE} = 20 V; R_S = 75 Ω; T_{mb} = 25 °C	F	typ.	6	dB
Transition frequency at f = 500 MHz				
I_C = 15 mA; V_{CE} = 20 V	f_T	typ.	1000	MHz
I_C = 75 mA; V_{CE} = 20 V	f_T	min.	1200	MHz
I_C = 150 mA; V_{CE} = 20 V	f_T	typ.	1200	MHz
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 $f_{(2q\text{-}p)}$ = 208 MHz (channel 9)	P_o	min.	130	mW
		typ.	150	mW
Output power at f = 800 MHz; T_{mb} = 25 °C				
I_C = 70 mA; V_{CE} = 20 V; VSWR at output < 2				
f_p = 798 MHz; f_q = 802 MHz; d_{im} = −30 dB				
measured at $f_{(2q\text{-}p)}$ = 806 MHz (channel 62)	P_o	min.	70	mW
		typ.	90	mW
Power gain (not neutralized) T_{mb} = 25 °C				
I_C = 70 mA; V_{CE} = 20 V; f = 200 MHz	G_p	min.	15	dB
		typ.	16	dB
I_C = 70 mA; V_{CE} = 20 V; f = 800 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)

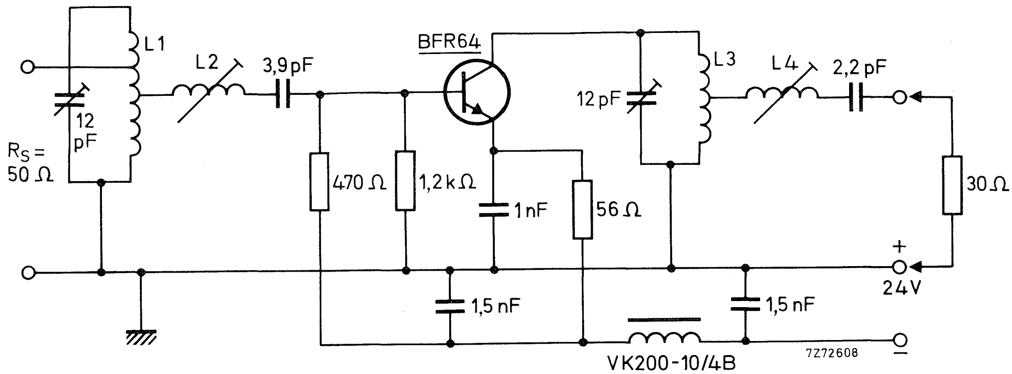


Fig. 2.

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 Ω; C_L = −4 pF.

Adjustment procedure

1. Remove the transistor and connect a dummy consisting of a 220 Ω resistor in parallel with a 4 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 (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 MHz; T_{mb} = 25 °C
   I_C = 70 mA; V_{CE} = 20 V; VSWR at output < 2
   f_p = 798 MHz; f_q = 802 MHz; d_{im} = −30 dB
   measured at $f_{(2q-p)}$ = 806 MHz (channel 62)

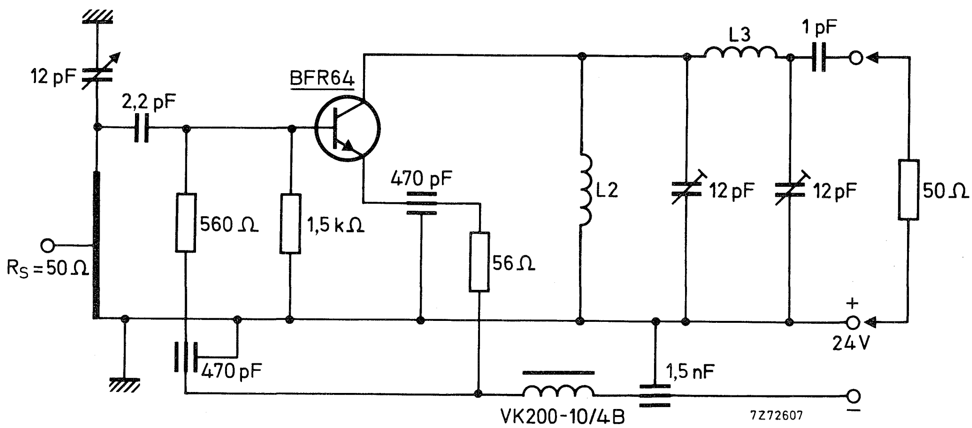


Fig. 3 Test circuit.

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. dia. 8 mm
L3 = 1,5 turns Cu wire (1,3 mm); int. dia. 8 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 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 soos 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 $\leqslant 2$ over the whole channel.

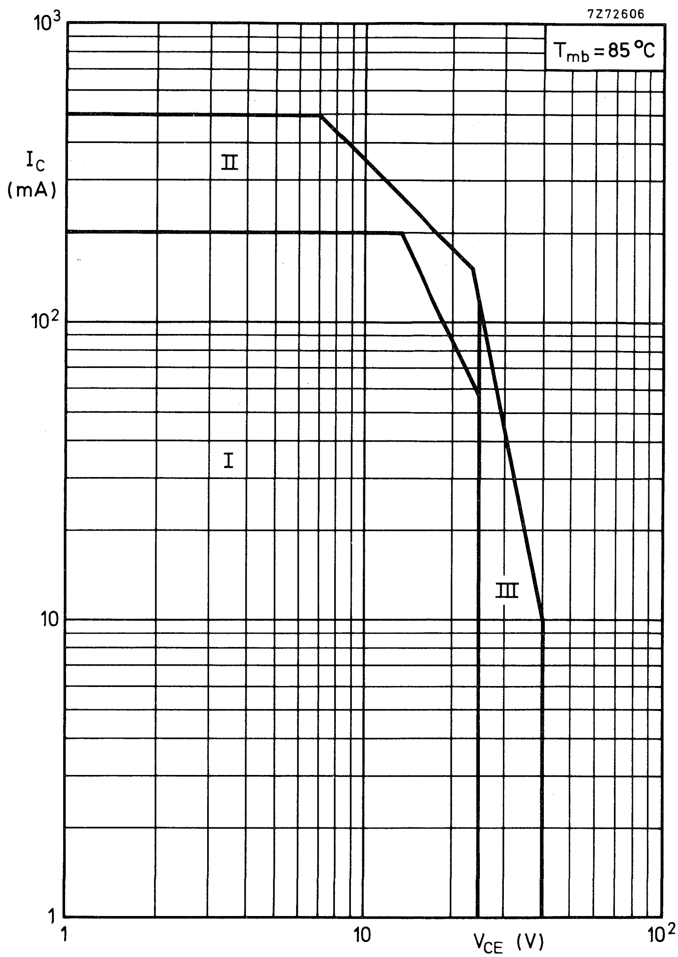


Fig. 4 Safe Operating Area with the transistor forward biased.

I Region of permissible d.c. operation
II Permissible extension for repetitive pulsed operation; $f > 1$ MHz
III Repetitive pulse operation in this region is allowable; provided $R_{BE} < 10\ \Omega$ and $f > 1$ MHz

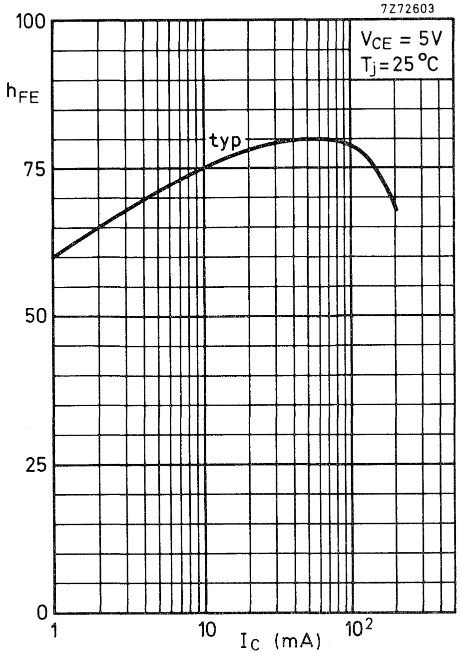


Fig. 5 V_{CE} = 5 V; T_j = 25 °C; typical values.

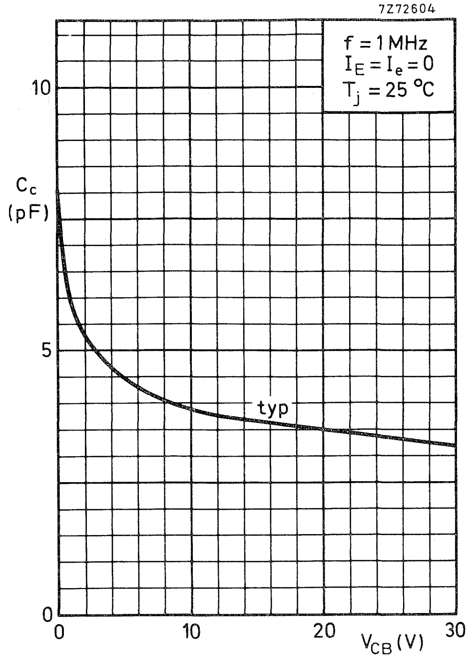


Fig. 6 $I_E = i_e = 0$; T_j = 25 °C; typical values.

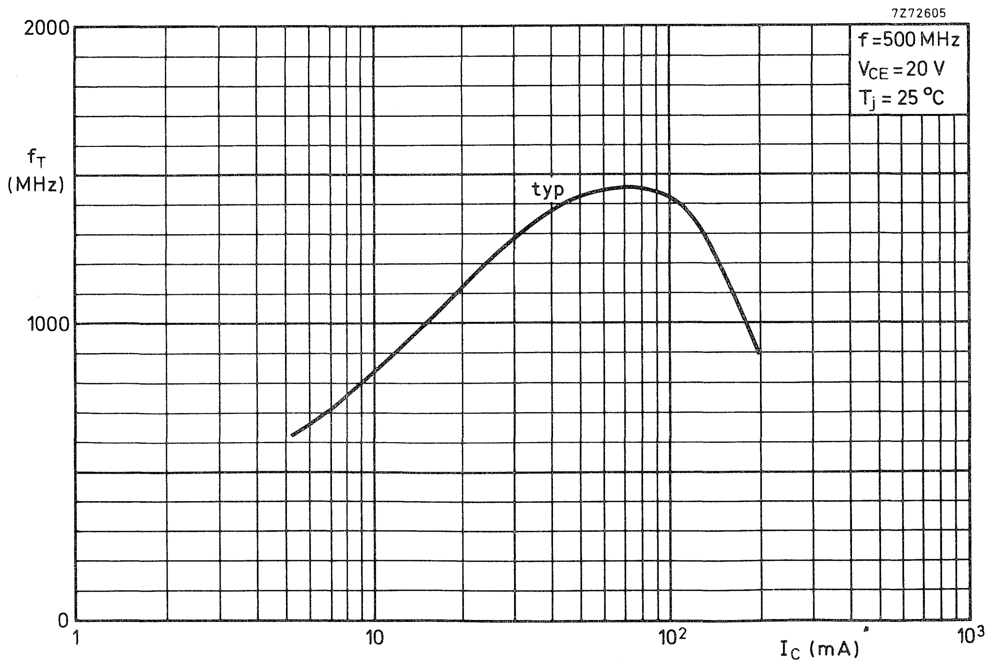


Fig. 7 V_{CE} = 5 V; f = 500 MHz; T_j = 25 °C; typical values.

N-P-N 1 GHz 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	^oC
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

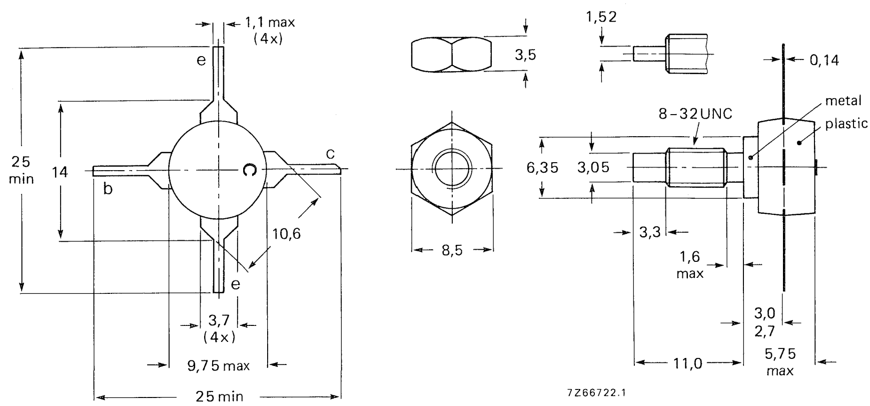
MECHANICAL DATA (see next page)

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)	Diameter of clearance hole in heatsink: max. 4,17 mm.
0,85 Nm (8,5 kg cm)	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 Ω; 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 °C	P_{tot}	max.	5	W
Storage temperature	T_{stg}		−65 to +200	°C
Junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	15	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,5	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-base breakdown voltage open emitter, I_C = 1 mA	$V_{(BR)CBO}$	min.	40 V
Collector-emitter breakdown voltage R_{BE} = 10 Ω, I_C = 5 mA	$V_{(BR)CER}$	min.	40 V
open base, I_C = 5 mA	$V_{(BR)CEO}$	min.	25 V
Emitter-base breakdown voltage open collector; I_E = 1 mA	$V_{(BR)EBO}$	min.	3,5 V
Collector cut-off current I_E = 0; V_{CB} = 20 V	I_{CBO}	max.	100 μA
Saturation voltage I_C = 200 mA; I_B = 20 mA	V_{CEsat}	max.	0,75 V
D.C. current gain I_C = 200 mA; V_{CE} = 20 V	h_{FE}	min.	30
I_C = 400 mA; V_{CE} = 20 V	h_{FE}	min.	20
Collector capacitance at f = 1 MHz I_E = I_e = 0; V_{CB} = 20 V	C_c	max.	10 pF
Feedback capacitance at f = 1 MHz I_C = 10 mA; V_{CE} = 20 V; T_{mb} = 25 °C	C_{re}	typ.	3,5 pF
Collector-stud capacitance	C_{cs}	typ.	2 pF
Transition frequency at f = 500 MHz I_C = 200 mA; V_{CE} = 20 V	f_T	min.	1200 MHz
I_C = 400 mA; V_{CE} = 20 V	f_T	min.	1000 MHz
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)	P_o	typ.	450 mW
Power gain (not neutralized) T_{mb} = 25 °C I_C = 200 mA; V_{CE} = 20 V; f = 200 MHz	G_p	min. typ.	15 dB 19 dB
I_C = 200 mA; V_{CE} = 20 V; f = 800 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)

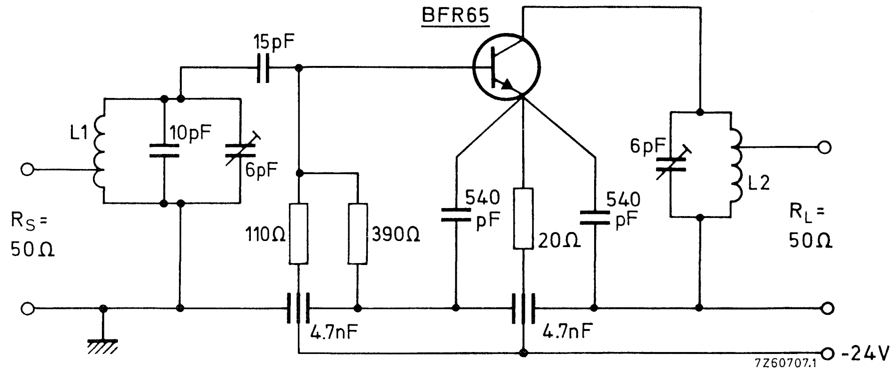


Fig. 2.

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 Ω; C_L = −6,8 pF.

Adjustment procedure

1. Remove the transistor and connect a dummy consisting of a 91 Ω resistor in parallel with a 6,8 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 (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 $\leqslant 2$ over the whole channel.

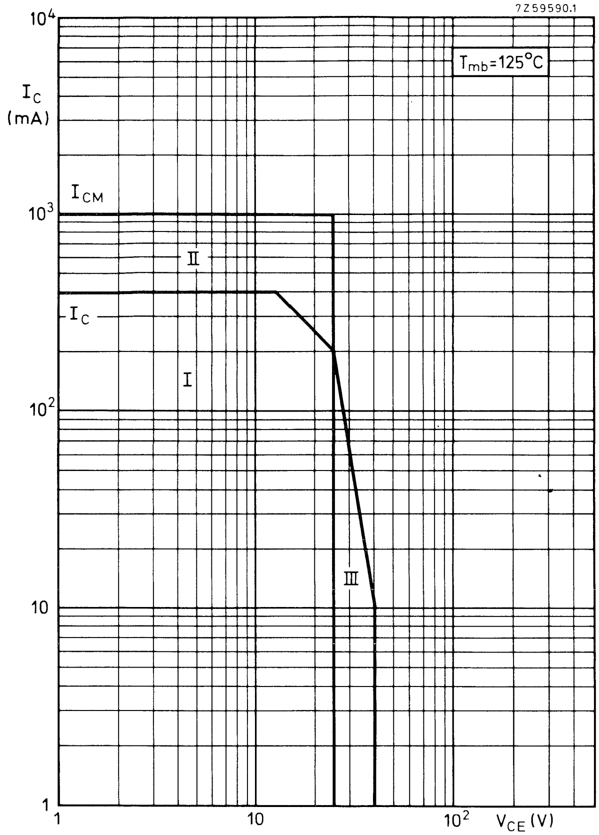


Fig. 3 Safe Operating Area with the transistor forward biased; T_{mb} = 125 °C.

I Region of permissible d.c. operation
II Permissible extension for repetitive pulsed operation; f > 1 MHz
III Repetitive pulsed operation in this region is allowable, provided f > 1 MHz; $R_{BE} < 10\ \Omega$

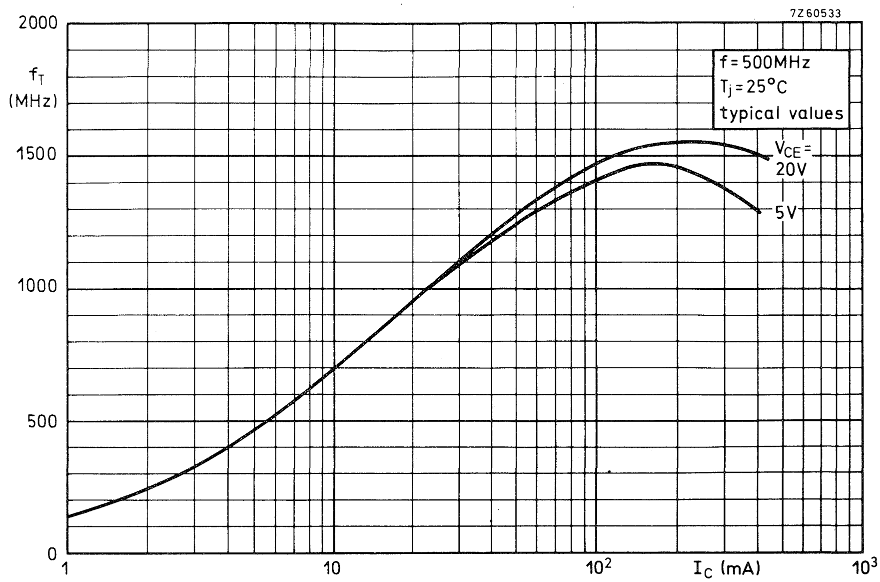


Fig. 4 f = 500 MHz; T_j = 25 °C; typical values.

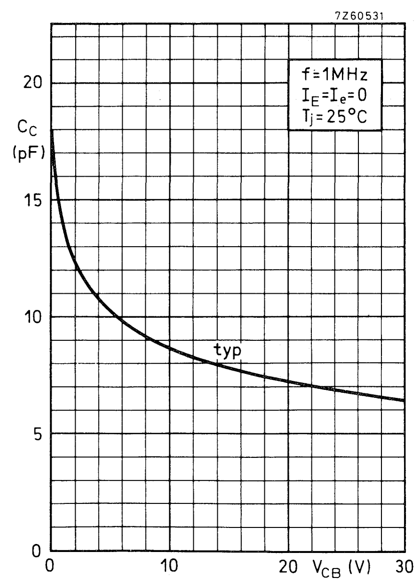


Fig. 5 $I_E = i_e = 0$; f = 1 MHz; T_j = 25 °C; typical values.

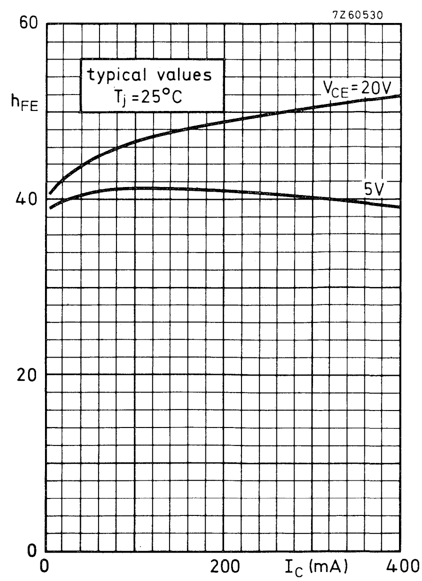


Fig. 6 T_j = 25 °C; typical values.

N-P-N 5 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 °C	P_{tot}	max.	200	mW
Junction temperature	T_j	max.	175	°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.	0,4	pF
Noise figure at optimum source impedance I_C = 2 mA; V_{CE} = 10 V; f = 500 MHz	F	typ.	2,4	dB
Max. unilateral power gain I_C = 14 mA; V_{CE} = 10 V; f = 500 MHz	G_{UM}	typ.	19,5	dB
Output voltage at d_{im} = –60 dB I_C = 14 mA; V_{CE} = 10 V; R_L = 75 Ω; $f_{(p+q-r)}$ = 493,25 MHz	V_o	typ.	150	mV

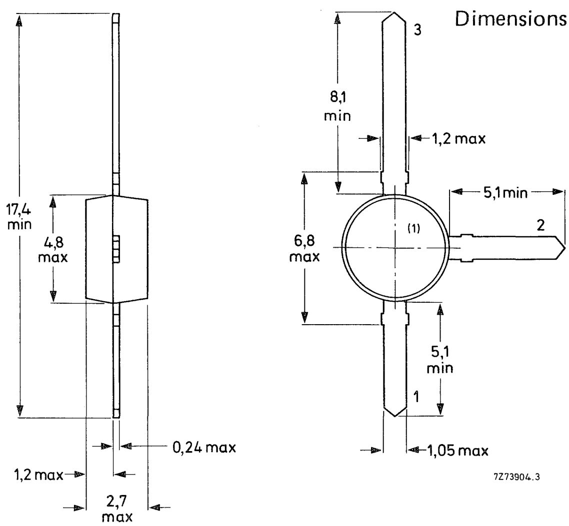
MECHANICAL DATA

Fig. 1 SOT-37.

Dimensions in mm

Connections

1. Base
2. Emitter
3. Collector



(1) = type number marking.

* TO92 version is available on request: ref. ON4183.

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 °C	P_{tot}	max.	200	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 and mounted on a glass-fibre print	$R_{th\ j\text{-}a}$	=	500	K/W
From junction to soldering point	$R_{th\ j\text{-}s}$	=	65	K/W

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. typ.	40 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.	0,5 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.	0,4 pF
Noise figure at optimum source impedance $I_C = 2$ mA; $V_{CE} = 10$ V; f = 500 MHz; $T_{amb} = 25$ °C	F	typ.	2,4 dB

Max. unilateral power gain (s_{12} assumed to be zero)

$$G_{UM} = 10 \log \frac{|s_{21}|^2}{[1-|s_{11}|^2]\,[1-|s_{22}|^2]}$$

$I_C = 14$ mA; $V_{CE} = 10$ V; f = 500 MHz; $T_{amb} = 25$ °C	G_{UM}	typ.	19,5 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 ; $f_p = 495{,}25$ 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 $f_{(p+q-r)} = 495{,}25$ MHz	V_o	typ.	150 mV

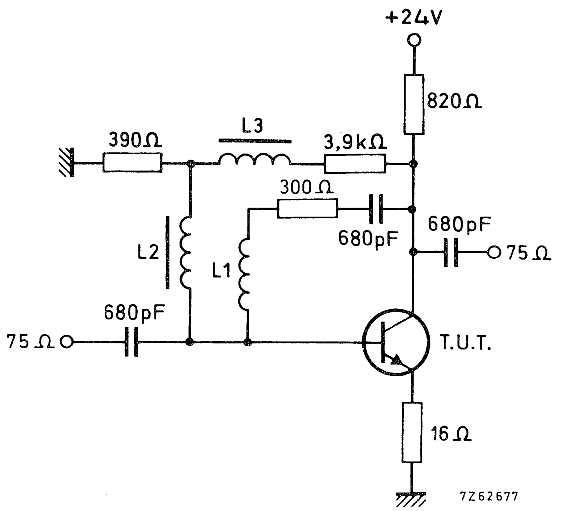


Fig.2 Intermodulation test circuit.

L1 = 4 turns Cu wire (0,35 mm); winding pitch 1 mm; int. diam. 4 mm
L2 and L3 5 μH (code number: 3122 108 20150)

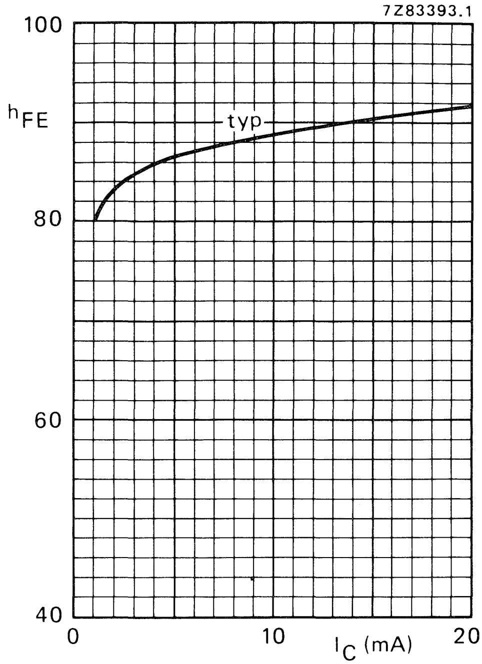


Fig.3 V_{CE} = 10 V; T_j = 25 °C; typical values.

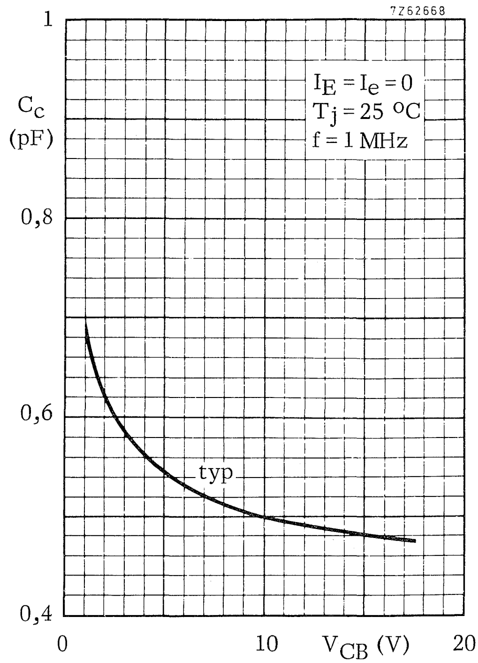


Fig.4 $I_E = i_e = 0$; T_j = 25 °C; typical values.

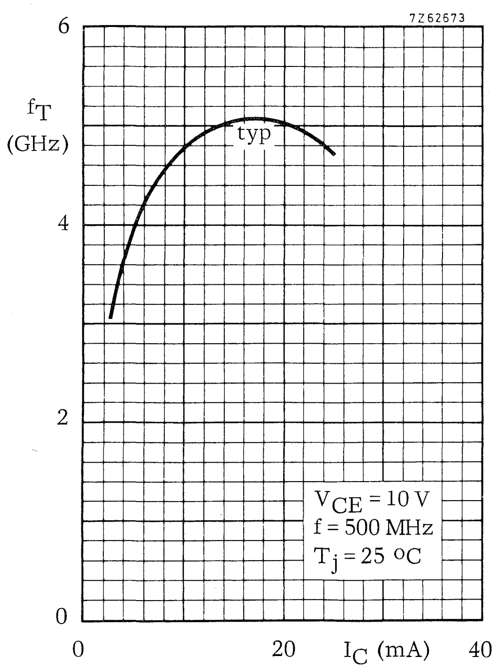


Fig.5 V_{CE} = 10 V; f = 500 MHz; T_j = 25 °C; typical values.

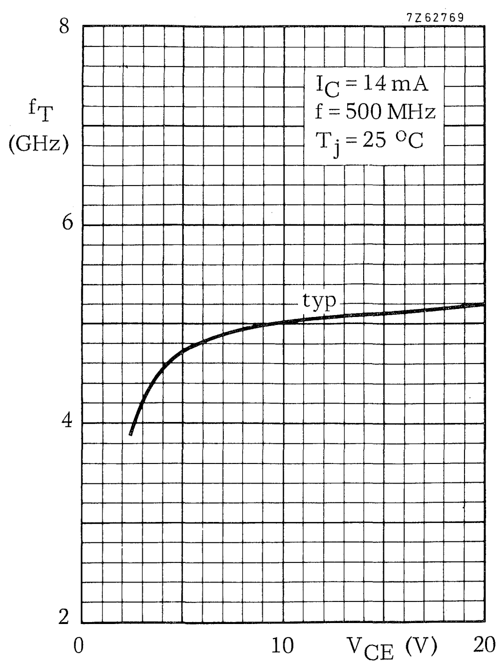


Fig.6 I_C = 14 mA; f = 500 MHz; T_j = 25 °C; typical values.

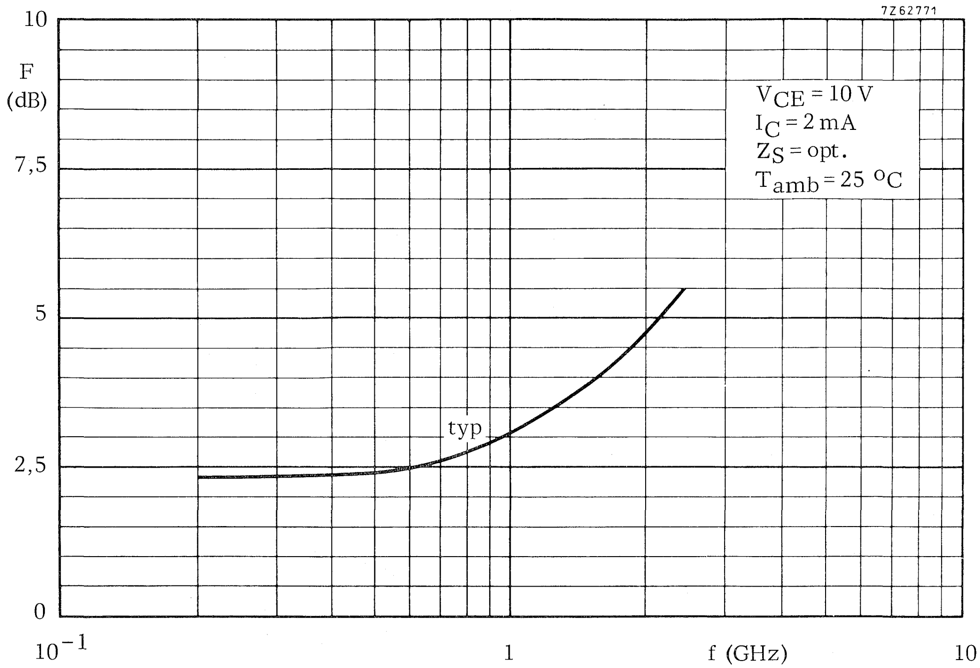


Fig.7 $V_{CE} = 10$ V; $I_C = 2$ mA; Z_S = opt.; $T_{amb} = 25$ °C; typical values.

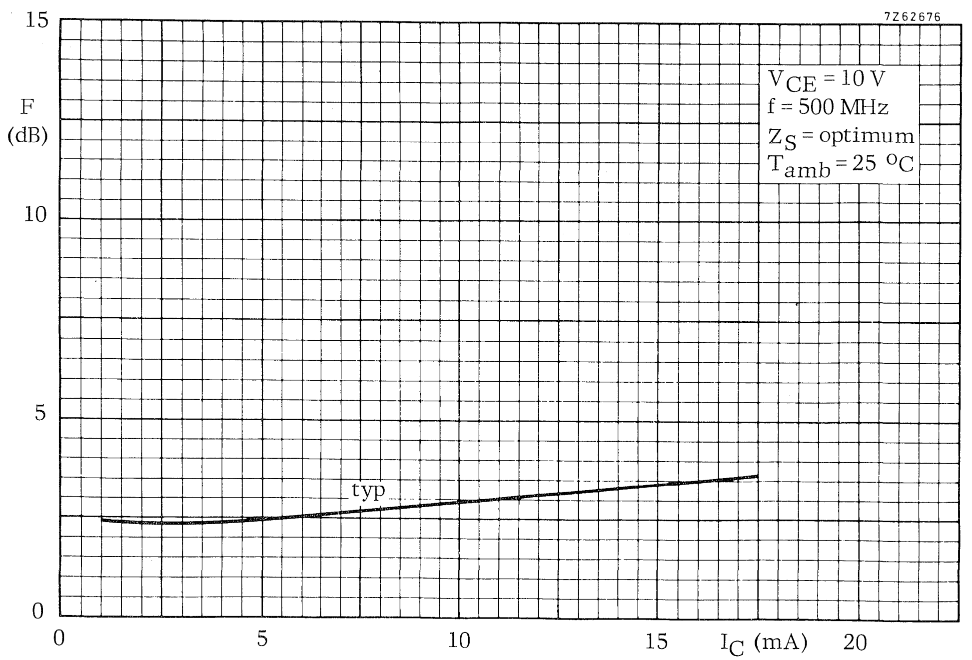


Fig.8 $V_{CE} = 10$ V; f = 500 MHz; Z_S = opt.; $T_{amb} = 25$ °C; typical values.

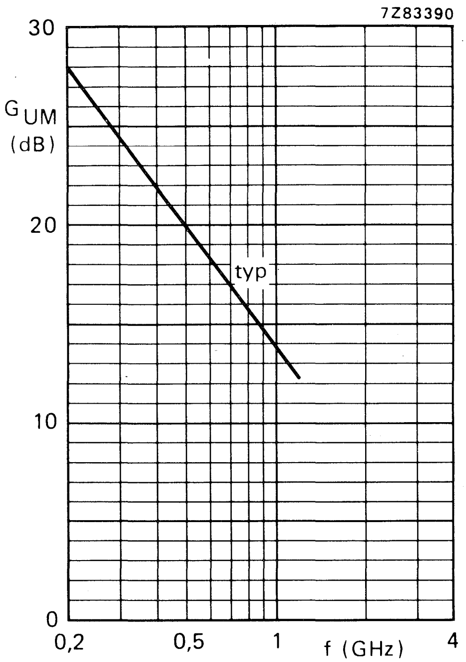


Fig.9 V_{CE} = 10 V; I_C = 14 mA; T_{amb} = 25 °C; typical values.

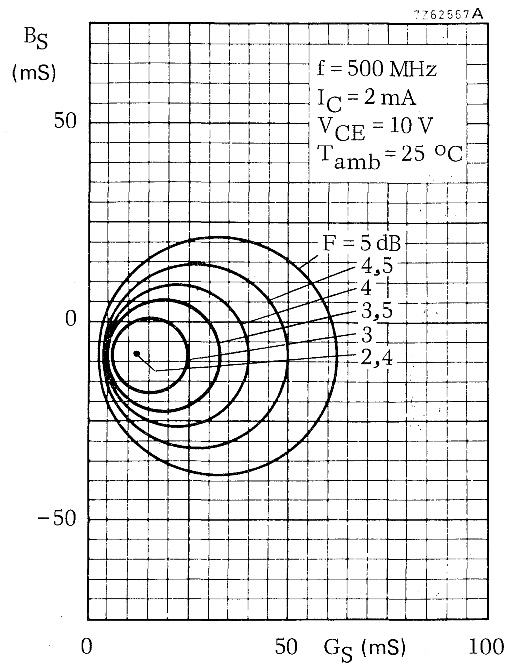


Fig.10 Circles of constant noise figure; V_{CE} = 10 V; I_C = 2 mA; f = 500 MHz; T_{amb} = 25 °C; typical values.

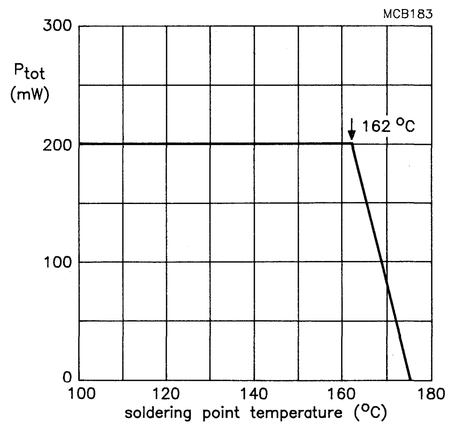


Fig.11 Power derating curve.

N-P-N 5 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 °C	P_{tot}	max.	200	mW
Junction temperature	T_j	max.	175	°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 Ω 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 Ω $f_{(p+q-r)}$ = 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).

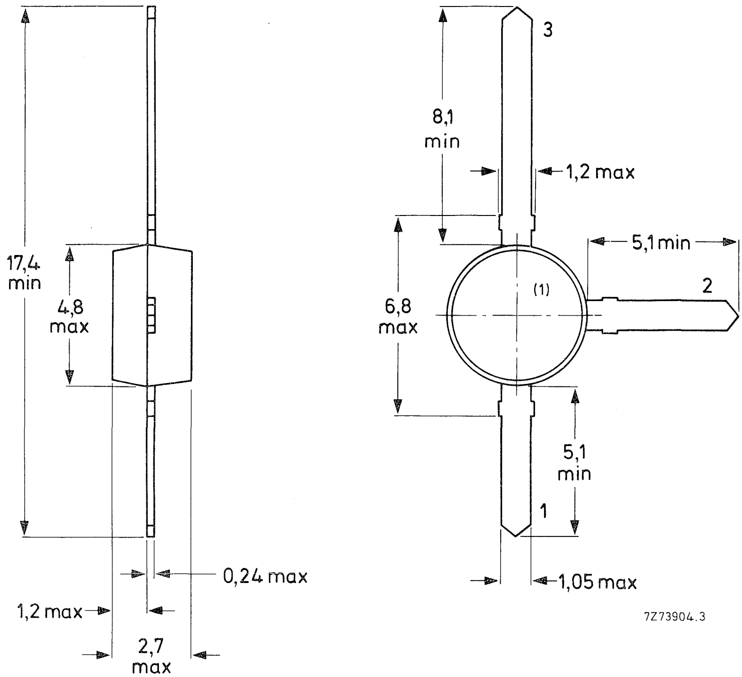
* TO92 version available on request: ref. ON4184.

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 °C	P_{tot}	max.	200 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 fibre-glass print	$R_{th\ j\text{-}a}$	=	500 K/W
From junction to soldering point	$R_{th\ j\text{-}s}$	=	65 K/W

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.	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	C_{re}	typ.	0,35 pF
Noise figure at $T_{amb} = 25$ °C			
$I_C = 4$ mA; $V_{CE} = 10$ V; $Z_S = 60\ \Omega$; f = 800 MHz	F	typ.	1,7 dB
$I_C = 4$ mA; $V_{CE} = 10$ V; $Z_S = Z_{opt}$; f = 2 GHz	F	typ.	3,6 dB

Maximum unilateral power gain (s_{12} assumed to be zero)

$$G_{UM} = 10 \log \frac{|s_{21}|^2}{[1-|s_{11}|^2]\,[1-|s_{22}|^2]}$$

$I_C = 14$ mA; $V_{CE} = 10$ V; f = 800 MHz; $T_{amb} = 25$ °C	G_{UM}	typ.	15,5 dB

Output voltage at d_{im} = –60 dB (see Figs 2 and 14) (DIN 45004B, par. 6.3: 3-tone) I_C = 14 mA; V_{CE} = 10 V; R_L = 75 Ω; 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 2 and 15) I_C = 14 mA; V_{CE} = 10 V; R_L = 75 Ω; 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. 2) I_C = 14 mA; V_{CE} = 10 V R_L = 75 Ω; T_{amb} = 25 °C measured at f = 800 MHz	P_{L1}	typ.	8	dBm
Third order intercept point (see Fig. 2) I_C = 14 mA; V_{CE} = 10 V R_L = 75 Ω; 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

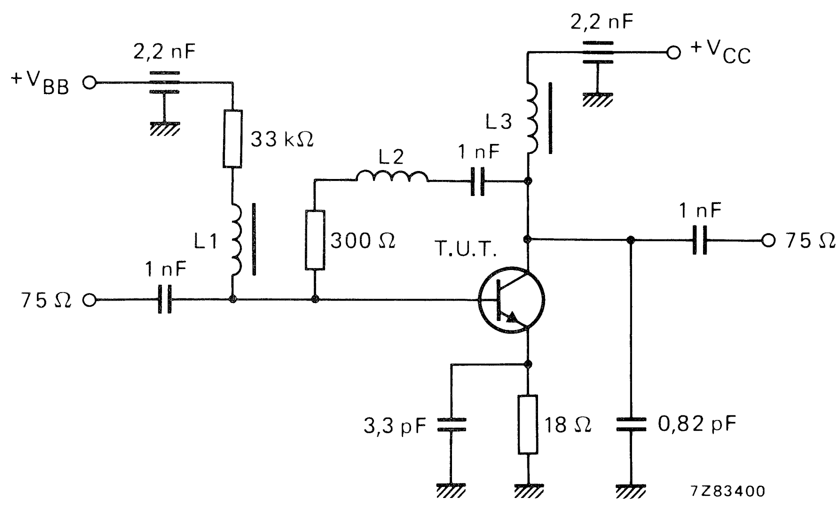


Fig.2 Intermodulation distortion and second harmonic distortion test circuit.

L1 = L3 = 5 μH 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 V; T_{amb} = 25 °C; typical values.

I_C mA	f MHz	s_{11}	s_{12}	s_{21}	s_{22}	G_{UM} dB
2	40	0,91/ −7,7°	0,01/84°	6,8/173°	0,99/ −2,7°	46,0
	200	0,79/ −37,3°	0,03/71°	6,5/143°	0,93/−12,5°	29,2
	500	0,52/ −81,0°	0,06/59°	4,6/116°	0,80/−22,5°	19,1
	800	0,34/−114,5°	0,08/58°	3,3/ 97°	0,73/−27,0°	14,2
	1000	0,26/−137,6°	0,09/59°	2,8/ 87°	0,70/−30,0°	12,2
	1200	0,22/−165,0°	0,10/61°	2,4/ 79°	0,67/−33,0°	10,4
5	40	0,80/ −11,7°	0,01/81°	14,4/169°	0,99/ −4,5°	44,6
	200	0,59/ −51,0°	0,03/68°	11,2/134°	0,85/−17,0°	28,4
	500	0,29/ −95,0°	0,05/66°	6,3/103°	0,70/−22,0°	19,3
	800	0,16/−130,0°	0,07/69°	4,2/ 88°	0,64/−26,0°	14,9
	1000	0,12/−162,0°	0,09/70°	3,4/ 81°	0,63/−28,0°	12,9
	1200	0,12/+ 158,0°	0,10/71°	2,9/ 74°	0,61/−31,0°	11,3
10	40	0,67/ −16,7°	0,01/80°	23,3/164°	0,97/ −6,6°	42,2
	200	0,39/ −63,0°	0,02/70°	14,5/122°	0,76/−18,0°	27,7
	500	0,15/−109,0°	0,05/73°	7,0/ 96°	0,64/−20,0°	19,3
	800	0,09/−152,0°	0,07/75°	4,6/ 84°	0,60/−24,0°	15,2
	1000	0,07/+ 155,0°	0,09/75°	3,7/ 77°	0,59/−26,0°	13,2
	1200	0,10/+ 124,0°	0,11/74°	3,1/ 72°	0,58/−29,0°	11,7
14	40	0,58/ −20,0°	0,01/79°	28,3/160°	0,96/ −7,8°	41,9
	200	0,30/ −71,0°	0,02/72°	15,5/117°	0,72/−18,0°	27,9
	500	0,11/−119,0°	0,05/75°	7,2/ 93°	0,62/−19,0°	19,3
	800	0,07/−177,0°	0,07/77°	4,6/ 82°	0,59/−23,0°	15,1
	1000	0,08/+ 138,0°	0,09/76°	3,8/ 76°	0,58/−25,0°	13,4
	1200	0,12/+ 118,0°	0,11/76°	3,2/ 71°	0,57/−28,0°	11,9
20	40	0,49/ −25,0°	0,01/78°	32,9/157°	0,94/ −9,0°	40,9
	200	0,22/ −82,0°	0,02/74°	15,9/112°	0,69/−17,0°	27,1
	500	0,09/−143,0°	0,05/78°	7,1/ 91°	0,61/−18,0°	19,1
	800	0,08/+ 160,0°	0,07/78°	4,5/ 80°	0,59/−22,0°	15,0
	1000	0,10/+ 130,0°	0,09/78°	3,7/ 75°	0,58/−24,0°	13,2
	1200	0,14/+ 115,0°	0,11/77°	3,1/ 69°	0,57/−28,0°	11,6
30	40	0,36/ −38,9°	0,01/76°	31,2/151°	0,90/−10,3°	37,7
	200	0,18/−122,0°	0,02/75°	14,0/106°	0,66/−14,0°	25,5
	500	0,15/−175,0°	0,05/80°	6,1/ 88°	0,61/−16,0°	17,8
	800	0,17/+ 148,0°	0,07/80°	3,9/ 78°	0,59/−21,0°	13,8
	1000	0,19/+ 131,0°	0,09/79°	3,1/ 72°	0,59/−24,0°	11,8
	1200	0,23/+ 119,0°	0,11/79°	2,7/ 67°	0,57/−28,0°	10,6

s-parameters (common emitter) at V_{CE} = 10 V; T_{amb} = 25 °C; typical values.

I_C mA	f MHz	s_{11}	s_{12}	s_{21}	s_{22}	G_{UM} dB
2	40	0,91/ −7,5°	0,01/84°	7,0/173°	0,99/ −2,6°	46,0
	200	0,81/ −36,0°	0,03/72°	6,3/149°	0,94/−12,0°	30,0
	500	0,54/ −78,0°	0,06/59°	4,6/118°	0,82/−21,0°	19,6
	800	0,35/−110,0°	0,08/58°	3,4/ 98°	0,74/−26,0°	14,6
	1000	0,27/−132,0°	0,08/59°	2,8/ 89°	0,72/−29,0°	12,4
	1200	0,22/−159,0°	0,09/61°	2,5/ 80°	0,69/−0,32°	11,0
5	40	0,81/ −11,1°	0,01/82°	14,4/169°	0,99/ −4,3°	44,8
	200	0,61/ −48,0°	0,03/69°	11,1/135°	0,86/−16,0°	28,8
	500	0,31/ −90,0°	0,05/66°	6,4/105°	0,71/−22,0°	21,2
	800	0,17/−120,0°	0,07/69°	4,3/ 90°	0,66/−25,0°	15,3
	1000	0,11/−148,0°	0,08/70°	3,5/ 82°	0,64/−27,0°	13,2
	1200	0,10/+167,0°	0,10/71°	3,0/ 76°	0,63/−30,0°	11,8
10	40	0,70/ −15,2°	0,01/80°	23,0/164°	0,97/ −6,1°	42,4
	200	0,42/ −58,0°	0,02/70°	14,8/124°	0,78/−17,0°	28,3
	500	0,17/ −95,0°	0,05/73°	7,3/ 97°	0,65/−20,0°	19,8
	800	0,07/−104,0°	0,07/75°	4,7/ 85°	0,62/−23,0°	15,6
	1000	0,04/−174,0°	0,09/75°	3,9/ 79°	0,61/−25,0°	13,8
	1200	0,07/+120,0°	0,10/75°	3,3/ 73°	0,59/−28,0°	12,2
14	40	0,63/ −18,0°	0,01/79°	28,2/161°	0,96/ −7,2°	42,3
	200	0,34/ −63,0°	0,02/72°	15,9/119°	0,74/−17,0°	28,0
	500	0,13/ −98,0°	0,05/75°	7,5/ 95°	0,63/−19,0°	19,8
	800	0,05/−136,0°	0,07/77°	4,8/ 83°	0,61/−22,0°	15,5
	1000	0,04/+133,0°	0,09/76°	3,9/ 77°	0,60/−25,0°	13,8
	1200	0,08/+108,0°	0,10/76°	3,3/ 72°	0,58/−28,0°	12,2

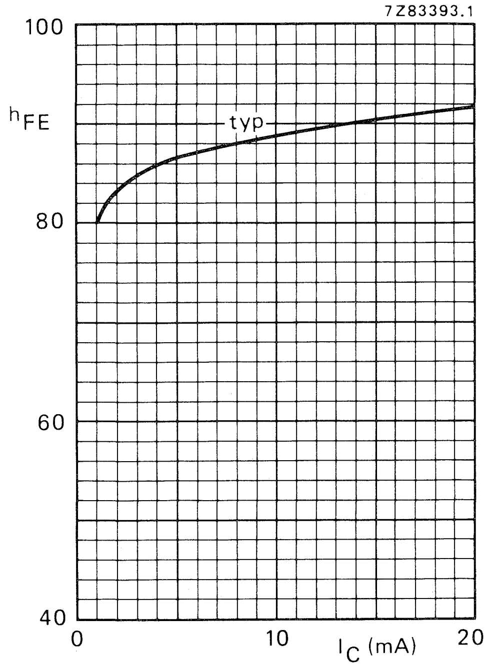


Fig.3 V_{CE} = 10 V; T_j = 25 °C; typ. values.

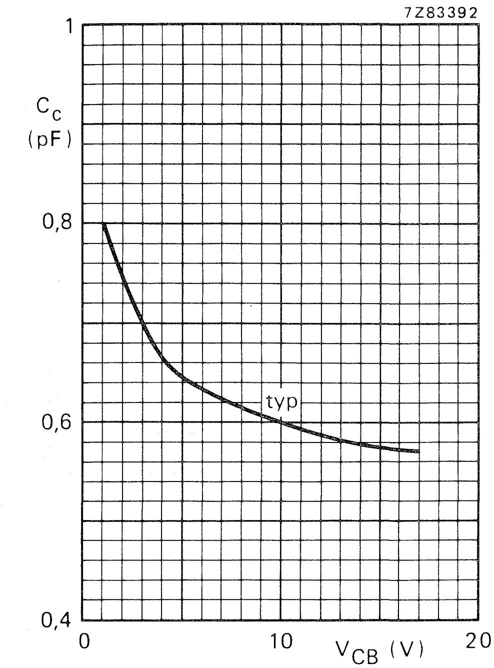


Fig.4 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C; typ. values.

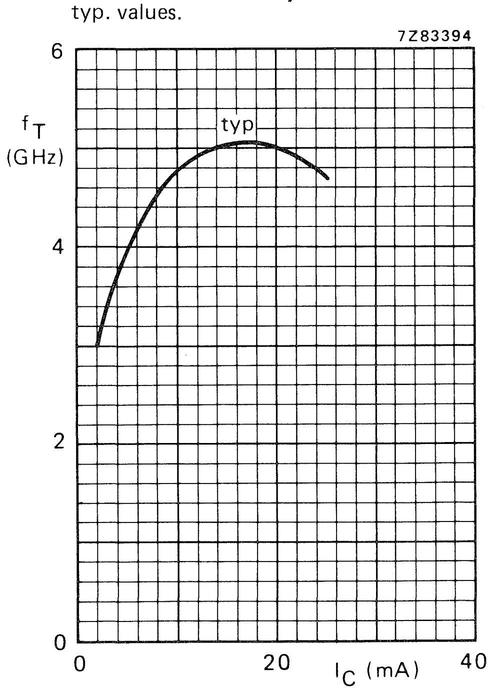


Fig.5 V_{CE} = 10 V; f = 500 MHz; T_j = 25 °C; typical values.

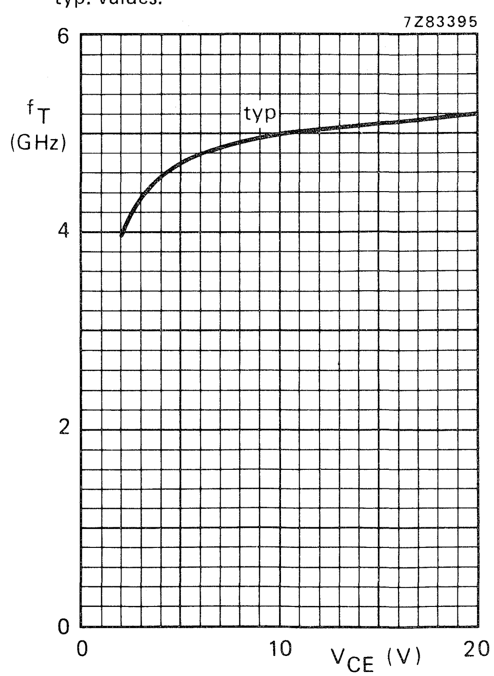


Fig.6 I_C = 14 mA; f = 500 MHz; T_j = 25 °C; typical values.

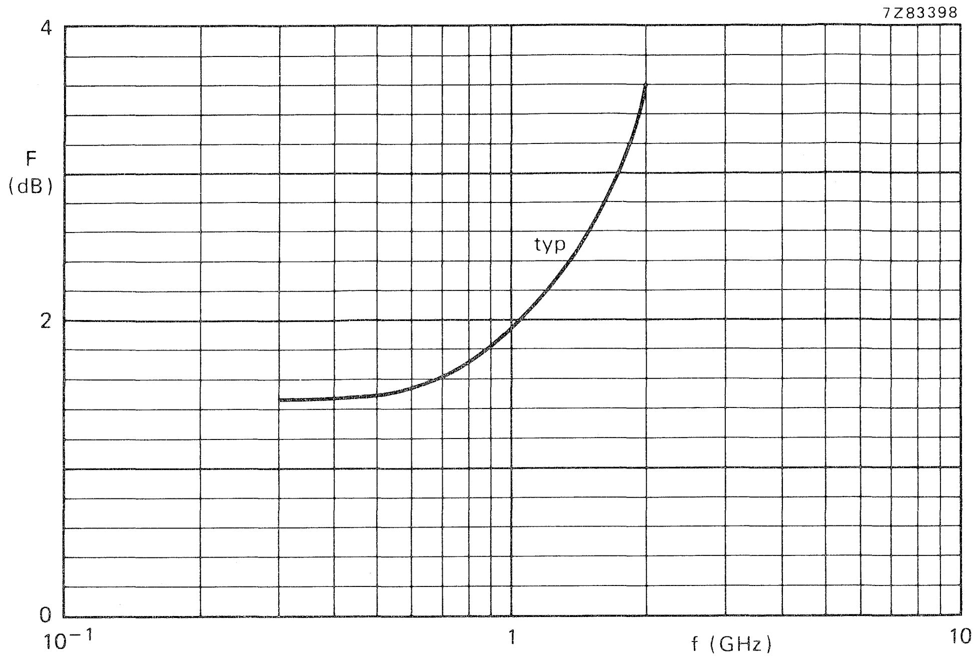


Fig.7 V_{CE} = 10 V; I_C = 4 mA; Z_S = optimum; T_{amb} = 25 °C; typical values.

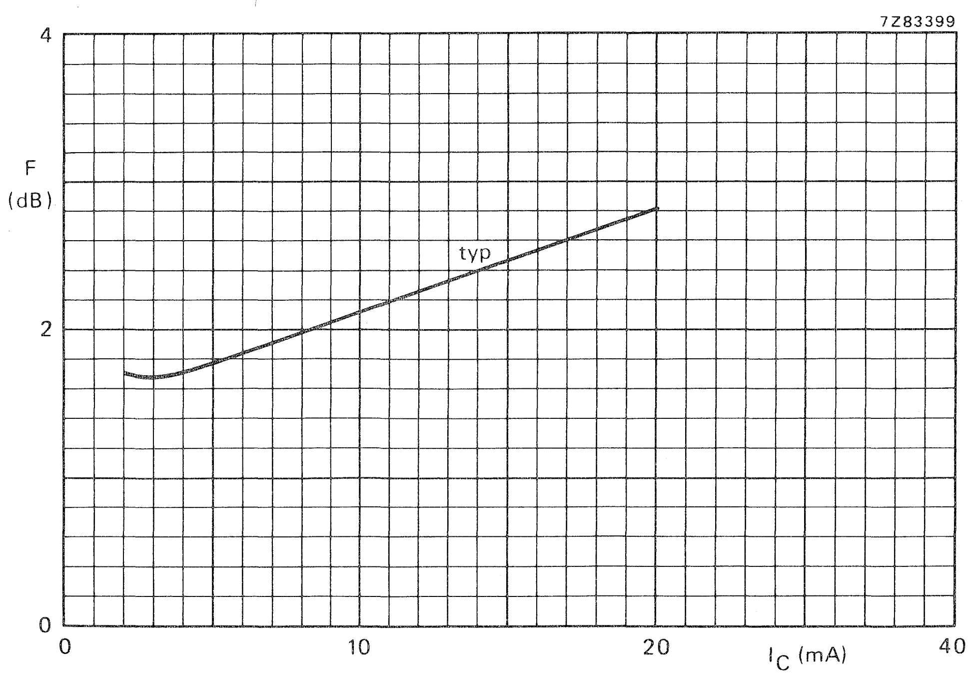


Fig.8 V_{CE} = 10 V; f = 800 MHz; Z_S = optimum; T_{amb} = 25 °C; typical values.

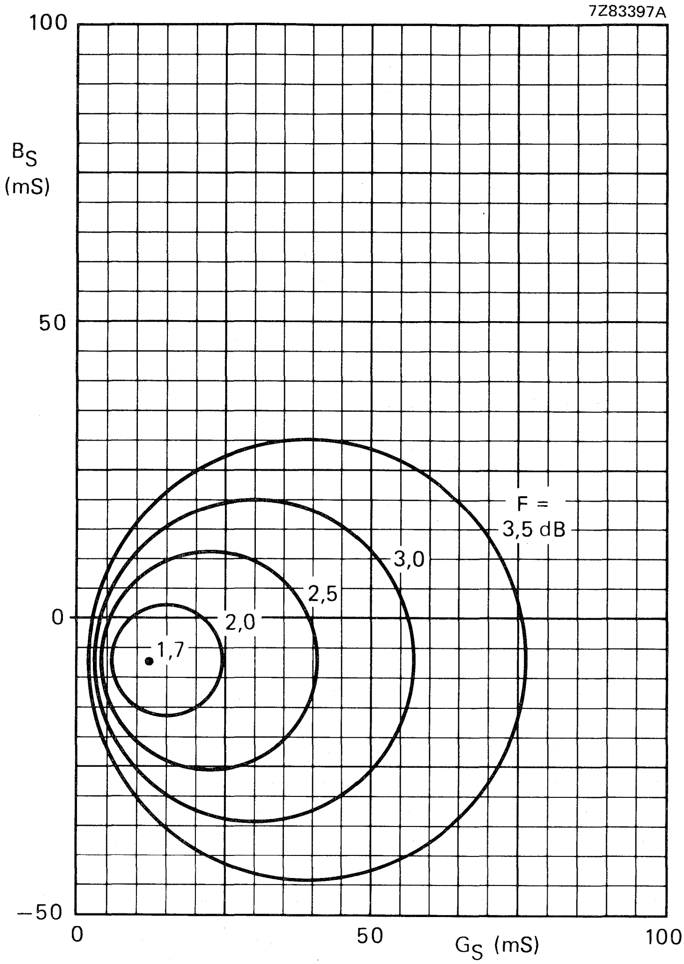


Fig.9 Circles of constant noise figure.
V_{CE} = 10 V; I_C = 4 mA; f = 800 MHz; T_{amb} = 25 °C;
typical values.

Conditions for Figs 10 and 11:
V_{CE} = 10 V; I_C = 14 mA;
T_{amb} = 25 °C; typical values.

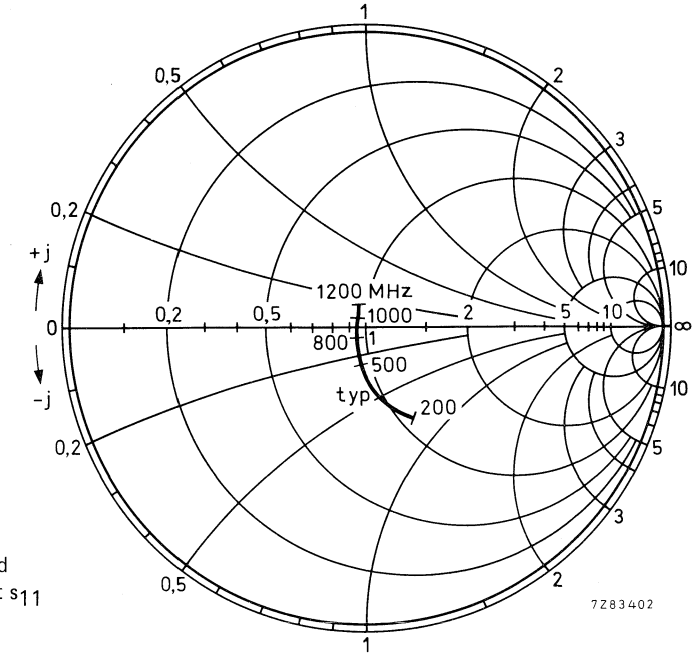


Fig.10 Input impedance derived from input reflection coefficient s_{11} co-ordinates in ohm x 50.

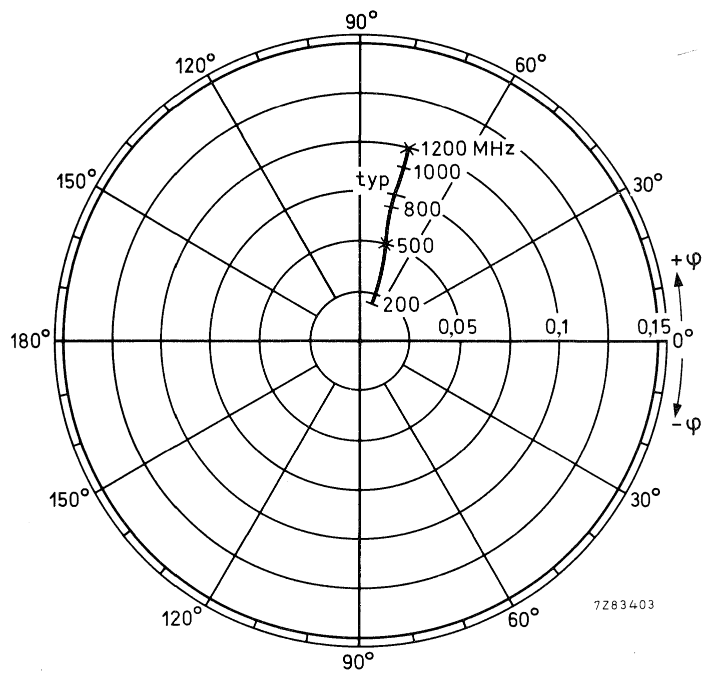


Fig.11 Reverse transmission coefficient s_{12}.

Conditions for Figs 12 and 13:
V_{CE} = 10 V; I_C = 14 mA;
T_{amb} = 25 °C; typical values.

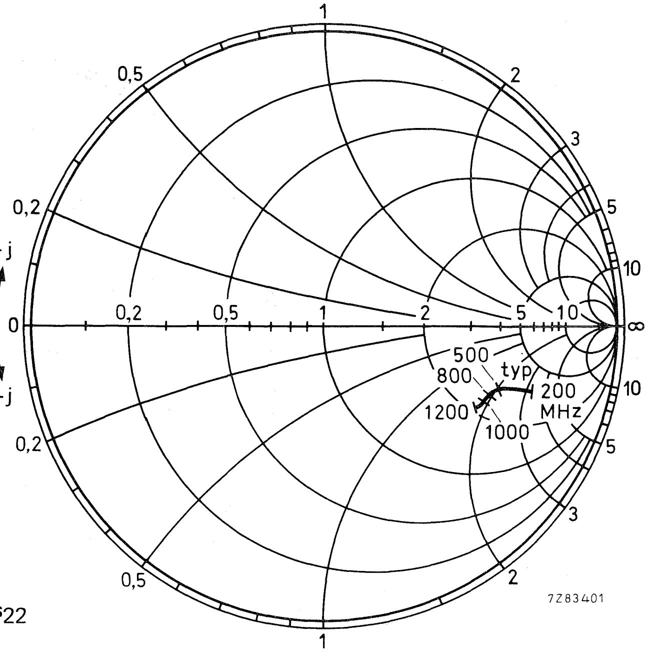


Fig.12 Output impedance derived from output reflection coefficient s_{22} co-ordinates in ohm x 50.

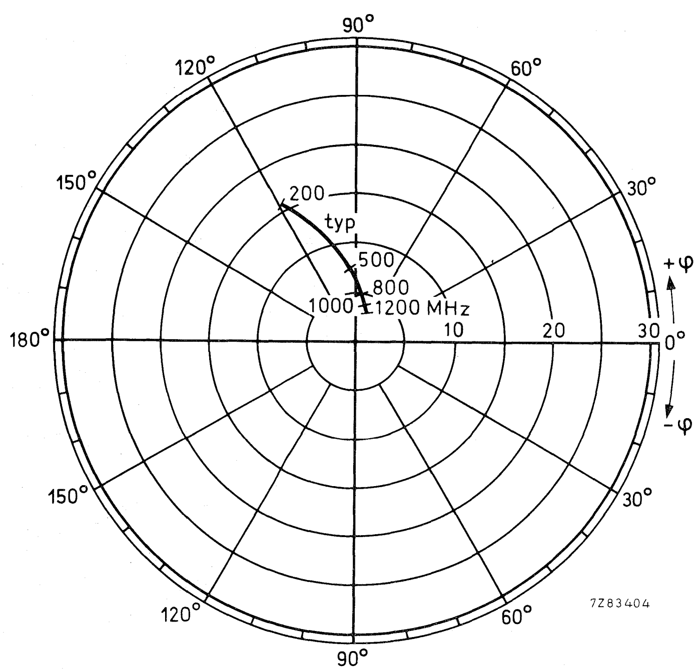


Fig.13 Forward transmission coefficient s_{21}.

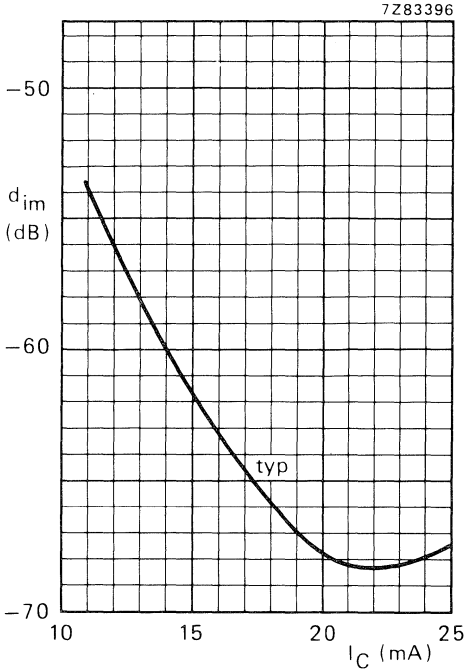


Fig.14.

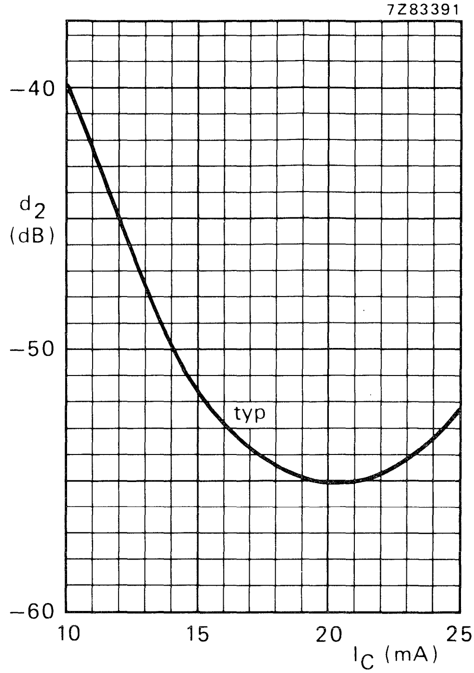


Fig.15.

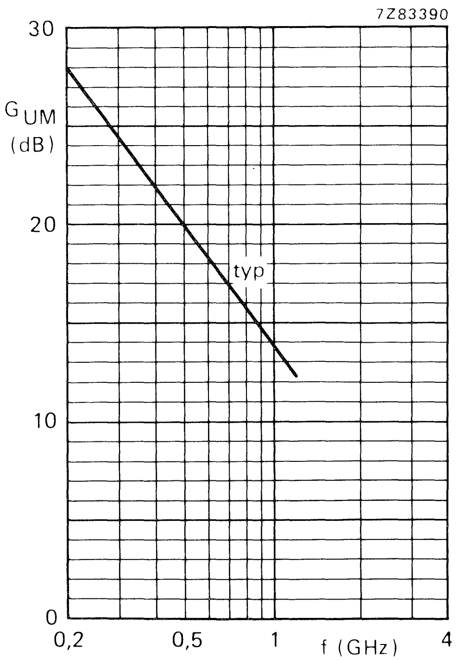


Fig.14 V_{CE} = 10 V; V_o = 43,5 dBmV = 150 mV; $f_{(p+q-r)}$ = 793,25 MHz; T_{amb} = 25 °C; typ. values; measured in test circuit (see Fig.2).

Fig.15 V_{CE} = 10 V; V_o = 60 mV; $f_{(p+q)}$ = 810 MHz; T_{amb} = 25 °C; measured in test circuit (see Fig.2); typical values.

Fig.16 V_{CE} = 10 V; I_C = 14 mA; T_{amb} = 25 °C; typical values.

CLASS-B OPERATION

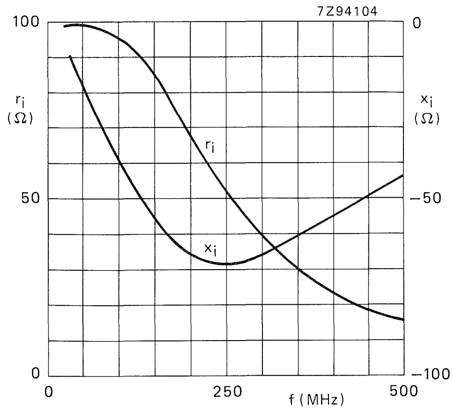


Fig.17 Input impedance (series components).

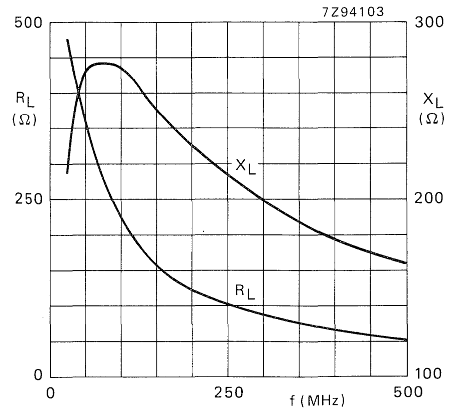


Fig.18 Load impedance (series components).

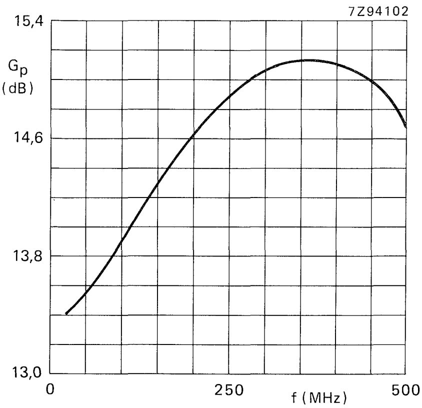


Fig. 19 Power gain versus frequency.

Conditions for Figs 17 to 19:

V_{CE} = 10 V; P_L = 100 mW; T_{amb} = 25 °C; typical values.

OPERATING NOTE for Figs 17 to 19:

A base-emitter resistor of 100 Ω is recommended to avoid oscillation. This resistor must be effective for r.f. only.

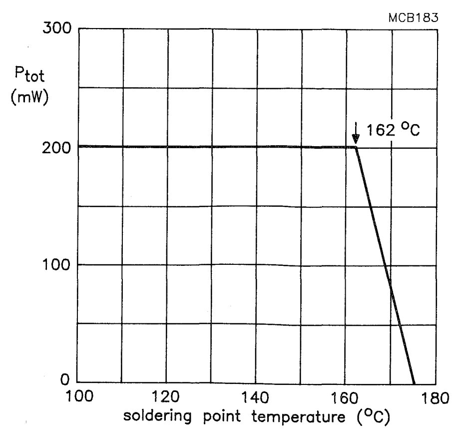


Fig.20 Power derating curve.

N-P-N 5 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 °C	P_{tot}	max.	200	mW
Junction temperature	T_j	max.	175	°C
Transition frequency at f = 500 MHz I_C = 30 mA; V_{CE} = 5 V	f_T	typ.	5,0	GHz
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	F	typ.	1,9	dB
Max. unilateral power gain I_C = 30 mA; V_{CE} = 5 V; f = 500 MHz	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; $f_{(p+q-r)}$ = 493,25 MHz	V_o	typ.	300	mV

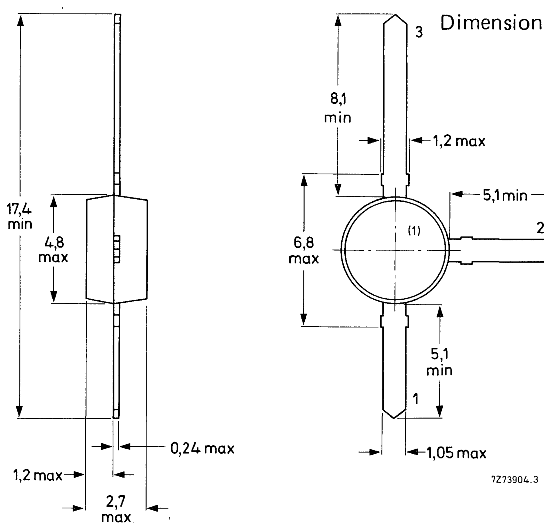
MECHANICAL DATA

Fig. 1 SOT-37.

Dimensions in mm

Connections

1. Base
2. Emitter
3. Collector



(1) = type number marking.

* TO92 version is available on request: ref. ON4185.

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 °C	P_{tot}	max.	200	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 and mounted on a glass-fibre print	$R_{th\ j\text{-}a}$	=	500	K/W
From junction to soldering point	$R_{th\ j\text{-}s}$	=	65	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
D.C. current gain $I_C = 30$ mA; $V_{CE} = 5$ V	h_{FE}	min. typ.	40 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_{12} assumed to be zero)

$$G_{UM} = 10 \log \frac{|s_{21}|^2}{[1-|s_{11}|^2]\,[1-|s_{22}|^2]}$$

$I_C = 30$ 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;
$R_L = 75\ \Omega$; $T_{amb} = 25$ °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

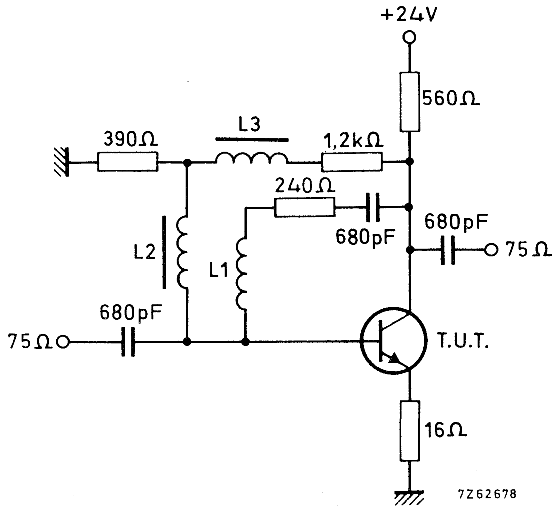


Fig.2 Intermodulation test circuit.

L1 = 4 turns Cu wire (0,35 mm); winding pitch 1 mm; int. diam. 4 mm
L2 and L3 5 μH (code number: 3122 108 20150)

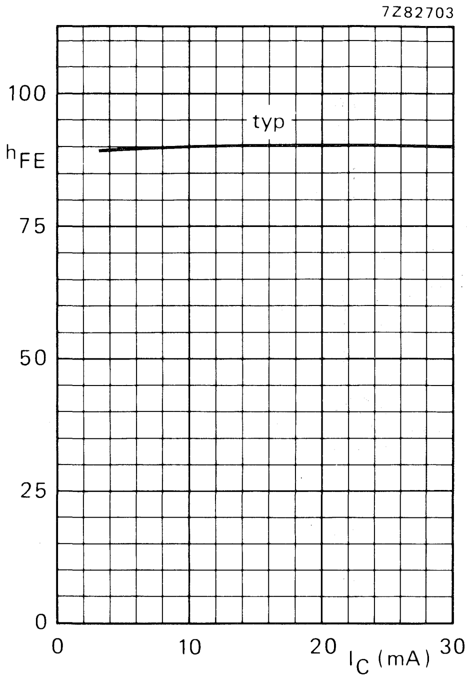


Fig.3 V_{CE} = 5 V; T_j = 25 °C; typical values.

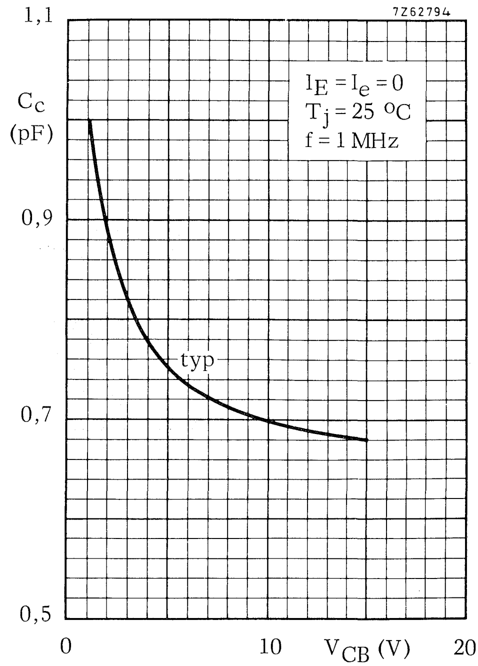


Fig.4 $I_E = i_e = 0$; T_j = 25 °C; f = 1 MHz; typical values.

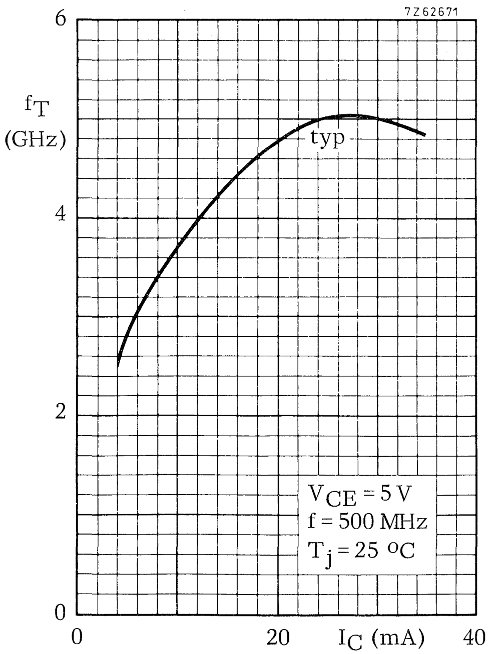


Fig.5 V_{CE} = 5 V; f = 500 MHz; T_j = 25 °C.

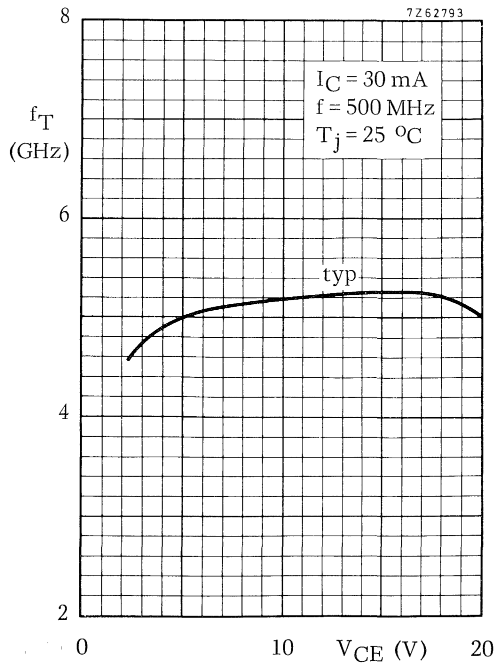


Fig.6 I_C = 30 mA; f = 300 MHz; T_j = 25 °C.

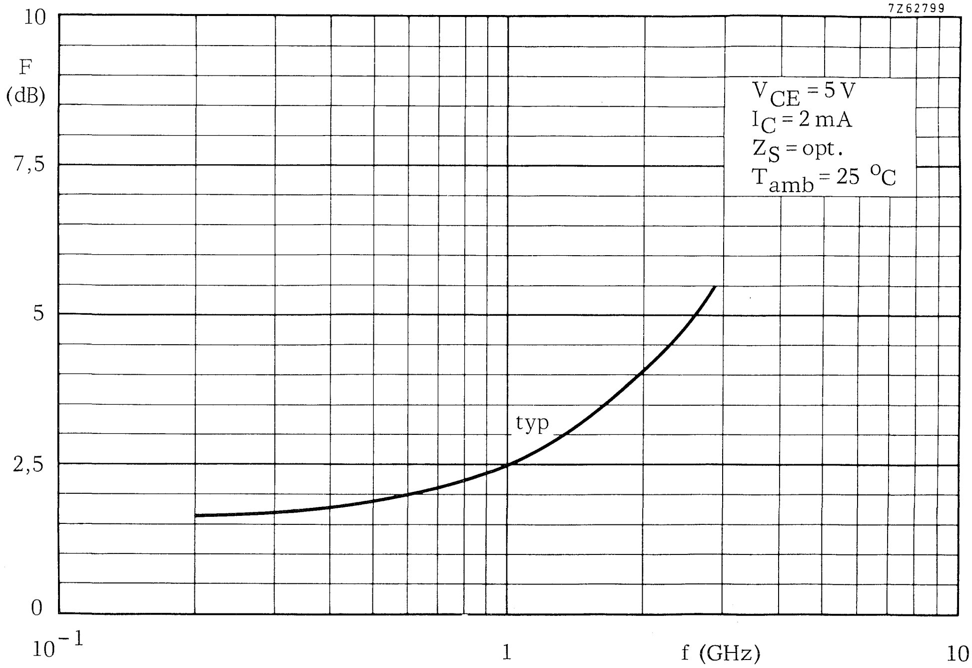


Fig.7 V_{CE} = 5 V; I_C = 2 mA; Z_S = opt.; T_{amb} = 25 °C; typical values.

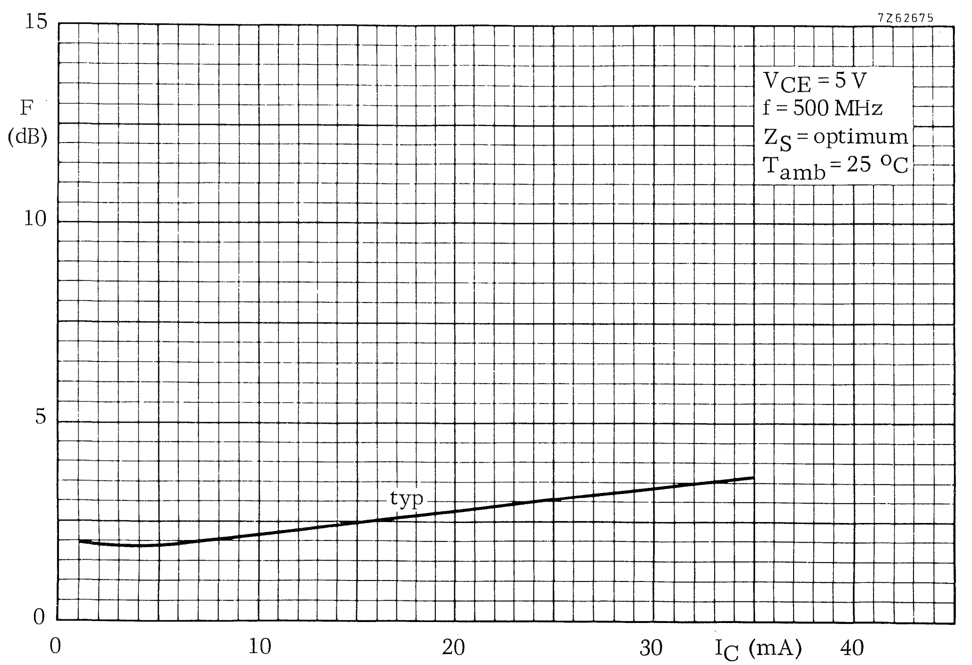


Fig.8 V_{CE} = 5 V; f = 500 MHz; Z_S = opt.; T_{amb} = 25 °C; typical values.

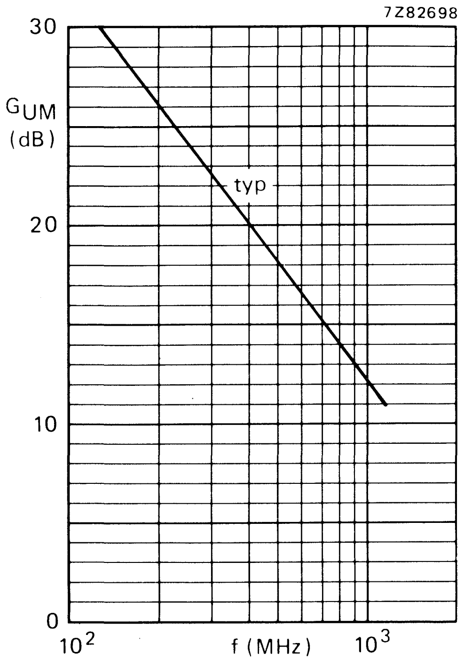


Fig.9 V_{CE} = 5 V; I_C = 30 mA; T_{amb} = 25 °C; typical values.

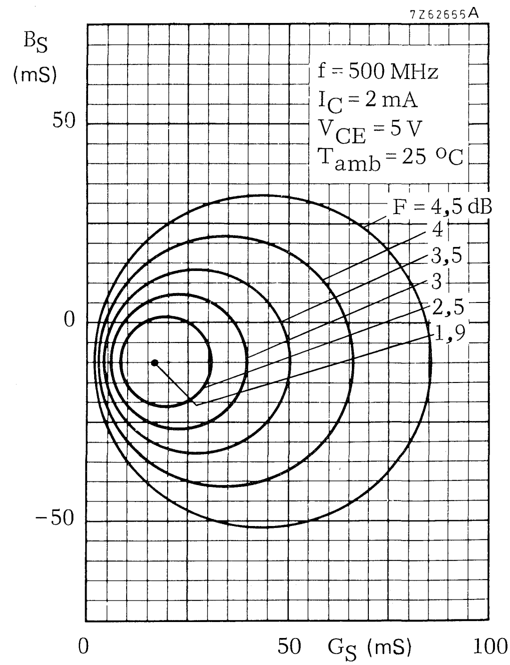


Fig.10 Circles of constant noise figure; V_{CE} = 5 V; I_C = 2 mA; f = 500 MHz; T_{amb} = 25 °C; typical values.

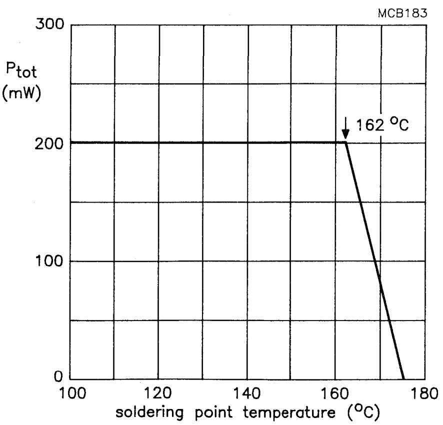


Fig.11 Power derating curve.

N-P-N 6 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_{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 °C	P_{tot}	max.	300	mW
Junction temperature	T_j	max.	175	°C
Transition frequency at f = 500 MHz I_C = 30 mA; V_{CE} = 5 V	f_T	typ.	6,0	GHz
Feedback capacitance at f = 1 MHz I_C = 0; V_{CE} = 10 V	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
Maximum unilateral power gain I_C = 30 mA; V_{CE} = 8 V; f = 800 MHz	G_{UM}	typ.	14,0	dB
Output voltage at d_{im} = −60 dB (see Fig. 3) I_C = 30 mA; V_{CE} = 8 V; R_L = 75 Ω $f_{(p+q-r)}$ = 793,25 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).

* TO92 version is available on request: ref. ON4186.

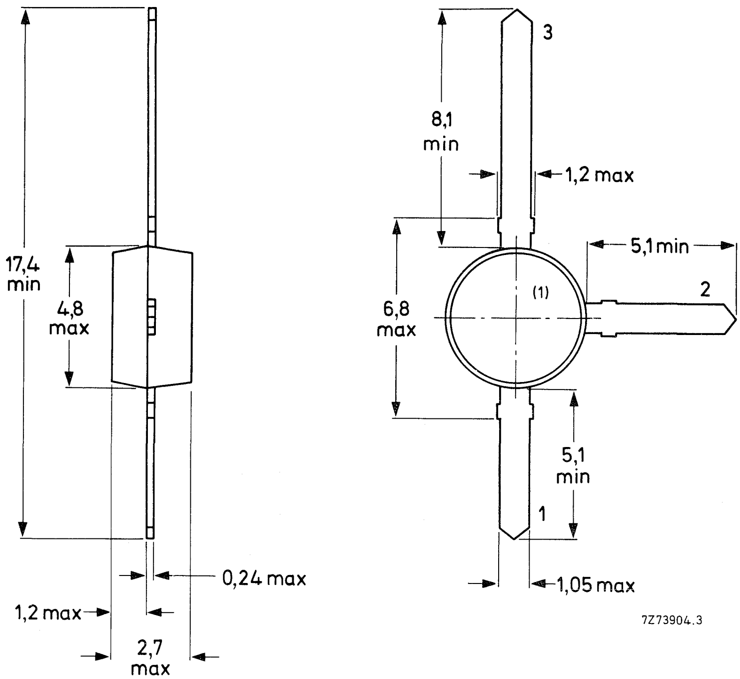
MECHANICAL DATA

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 °C	P_{tot}	max.	300	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 fibre-glass print	$R_{th\ j\text{-}a}$	=	300	K/W
From junction to soldering point	$R_{th\ j\text{-}s}$	=	65	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
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
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.	2,5 pF
Feedback capacitance at f = 1 MHz			
$I_C = 0$; $V_{CE} = 10$ 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; $T_{amb} = 25$ °C	F	typ.	1,6 dB
$I_C = 30$ mA; $V_{CE} = 8$ V; f = 800 MHz; $T_{amb} = 25$ °C	F	typ.	2,3 dB

Maximum unilateral power gain (s_{12} assumed to be zero)

$$G_{UM} = 10 \log \frac{|s_{21}|^2}{[1-|s_{11}|^2]\,[1-|s_{22}|^2]}$$

$I_C = 30$ mA; $V_{CE} = 8$ V; f = 800 MHz; $T_{amb} = 25$ °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 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.	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 Ω; 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} = 8V			
R_L = 75 Ω; T_{amb} = 25 °C	P_{L1}	typ.	+ 17 dBm
measured at f = 800 MHz			
Third order intercept point (see Fig. 3)			
I_C = 30 mA; V_{CE} = 8 V			
R_L = 75 Ω; 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

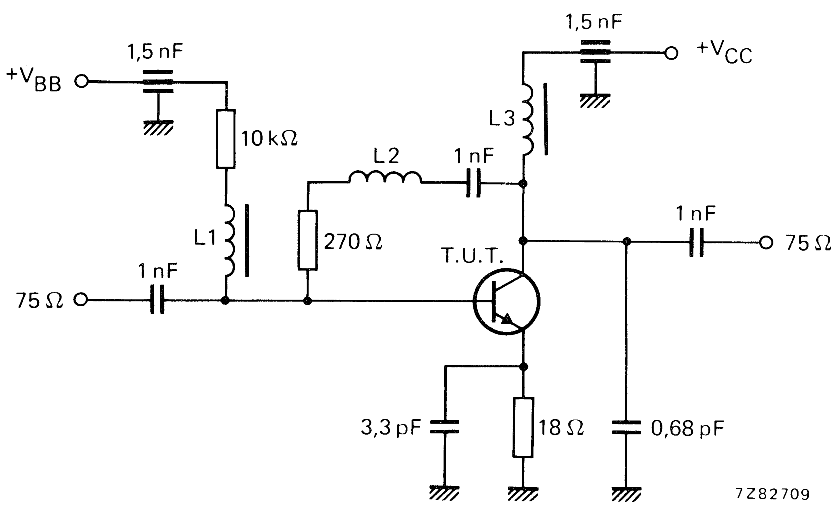


Fig.2 Intermodulation distortion and second harmonic distortion test circuit.

L1 = L3 = 5 μH 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 V; T_{amb} = 25 °C; typical values.

The figures given in the tables below can also be used for operation at V_{CE} = 5 V. Only slight differences for the s-parameters may occur.

I_C mA	f MHz	s_{11}	s_{12}	s_{21}	s_{22}	G_{UM} dB
	40	0,89/ −12,9°	0,01/75°	9,5/166°	0,97/ −6,1°	38,7
	100	0,85/ −30,7°	0,03/70,6°	8,7/155°	0,94/−13,5°	33,7
	200	0,75/ −57,1°	0,05/61,5°	7,4/138°	0,87/−22,5°	27,1
2	500	0,48/−113°	0,08/50,9°	4,4/106°	0,72/−34,2°	17,2
	800	0,37/−153°	0,09/51,9°	3,0/ 86,3°	0,64/−40,0°	12,5
	1000	0,34/−178°	0,10/55,0°	2,6/ 77,0°	0,61/−47,8°	10,9
	1200	0,34/+ 159°	0,11/58,5°	2,2/ 68,0°	0,58/−53,9°	9,2
	40	0,79/ −18,4°	0,01/74°	17,8/162°	0,94/ −9,1°	38,6
	100	0,71/ −42,1°	0,03/67,1°	15,2/146°	0,87/−19,5°	32,8
	200	0,57/ −72,8°	0,04/60,0°	11,5/126°	0,75/−28,7°	26,5
5	500	0,31/−127°	0,07/60,1°	5,8/ 98,2°	0,59/−36,1°	17,6
	800	0,25/−168°	0,09/63,6°	3,8/ 82,0°	0,54/−41,0°	13,4
	1000	0,25/+ 165°	0,11/65,2°	3,2/ 74,4°	0,51/−46,7°	11,7
	1200	0,26/+ 141°	0,13/66,1°	2,7/ 66,7°	0,49/−52,2°	10,1
	40	0,67/ −25,3°	0,01/71°	27,9/156°	0,90/−12,8°	38,7
	100	0,55/ −55,1°	0,02/65,1°	21,8/136°	0,78/−25,6°	32,4
	200	0,40/ −88,2°	0,04/62,4°	14,7/116°	0,62/−33,4°	26,2
10	500	0,20/−141°	0,06/68,3°	6,7/ 93,0°	0,51/−35,9°	18,0
	800	0,16/+ 177°	0,09/70,0°	4,3/ 79,3°	0,48/−40,3°	13,9
	1000	0,18/+ 151°	0,12/69,7°	3,5/ 72,5°	0,46/−44,2°	12,1
	1200	0,21/+ 130°	0,14/68,9°	3,0/ 65,1°	0,43/−50,7°	10,6
	40	0,51/ −34,7°	0,01/69°	39,7/149°	0,84/−17,4°	38,6
	100	0,38/ −70,5°	0,02/65,8°	27,7/126°	0,66/−29,5°	32,0
	200	0,26/−104°	0,03/68,0°	16,8/109°	0,51/−32,5°	26,1
20	500	0,16/−158°	0,06/74,0°	7,3/ 89,3°	0,45/−33,4°	18,4
	800	0,14/+ 155°	0,10/73,6°	4,6/ 77,5°	0,42/−39,1°	14,2
	1000	0,17/+ 133°	0,12/72,3°	3,8/ 71,2°	0,41/−43,6°	12,5
	1200	0,21/+ 115°	0,14/70,5°	3,2/ 64,4°	0,39/−51,0°	11,0
	40	0,46/ −36,5°	0,01/73°	43,3/150°	0,87/−16,9°	39,9
	100	0,32/ −73,7°	0,02/69,2°	29,1/124°	0,66/−27,2°	32,2
	200	0,20/−109°	0,03/72,0°	17,1/106°	0,50/−28,1°	26,1
30	500	0,14/−174°	0,06/75,6°	7,4/ 87,2°	0,41/−31,7°	18,3
	800	0,15/+ 143°	0,10/74,7°	4,8/ 74,9°	0,39/−41,0°	14,0
	1000	0,16/+ 124°	0,12/72,9°	3,9/ 70,5°	0,38/−42,8°	12,6
	1200	0,21/+ 111°	0,15/71,0°	3,3/ 63,8°	0,37/−51,0°	11,2

Conditions for Figs 3 and 4:
V_{CE} = 8 V; I_C = 30 mA;
T_{amb} = 25 °C; typical values.

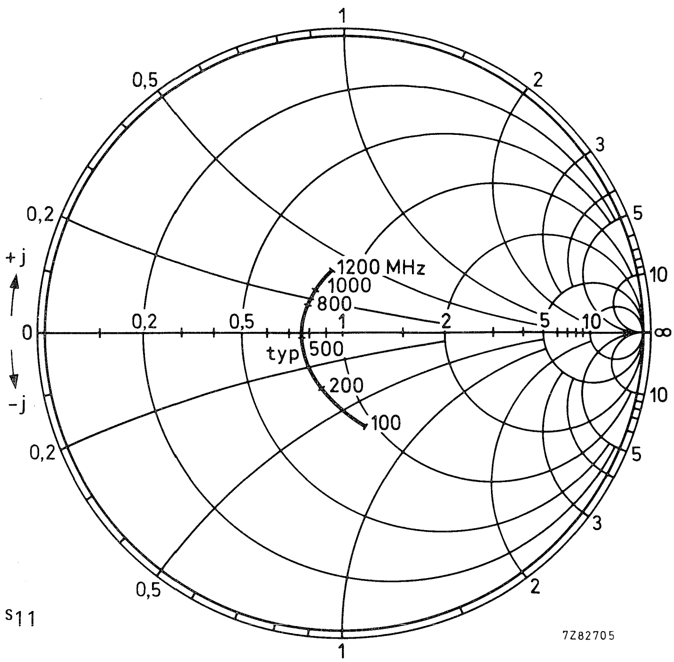


Fig.3 Input impedance derived from input reflection coefficient s_{11} co-ordinates in ohm x 50.

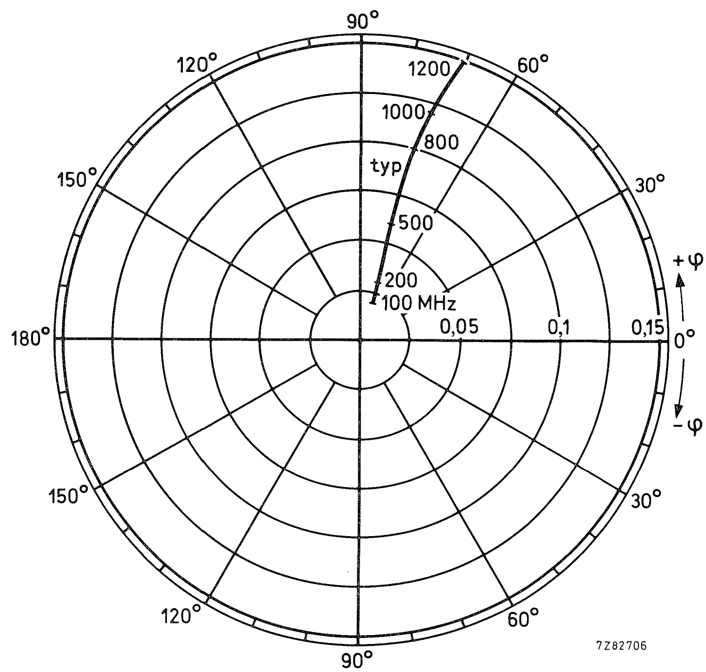


Fig.4 Reverse transmission coefficient s_{12}.

Conditions for Figs 5 and 6:
V_{CE} = 8 V; I_C = 30 mA;
T_{amb} = 25 °C; typical values.

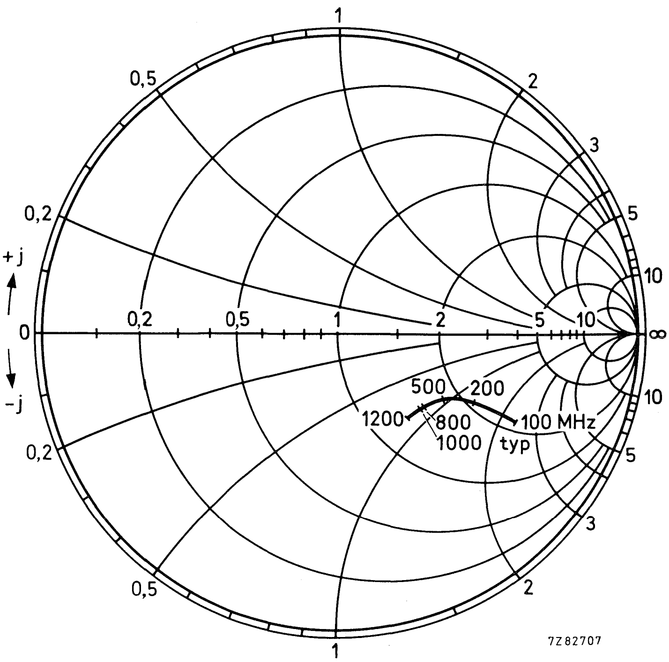


Fig.5 Output impedance derived from output reflection coefficient s_{22} co-ordinates in ohm x 50.

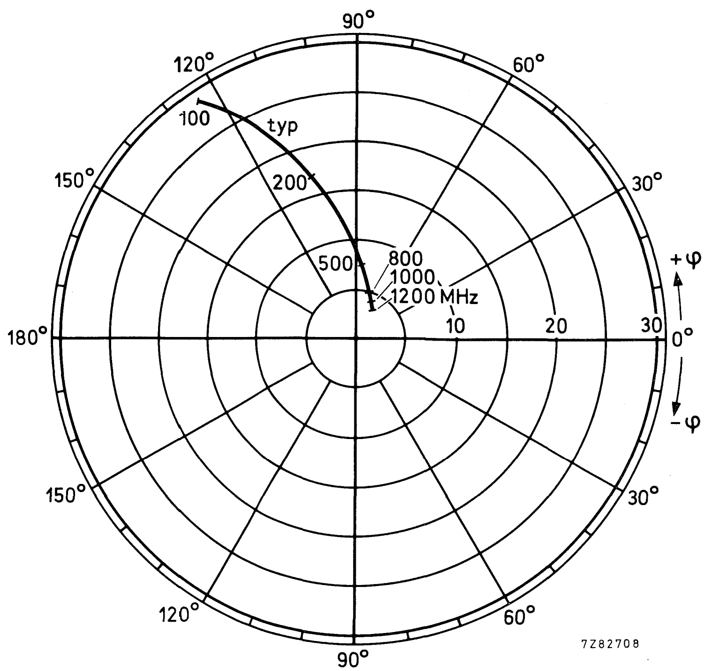


Fig.6 Forward transmission coefficient s_{21}.

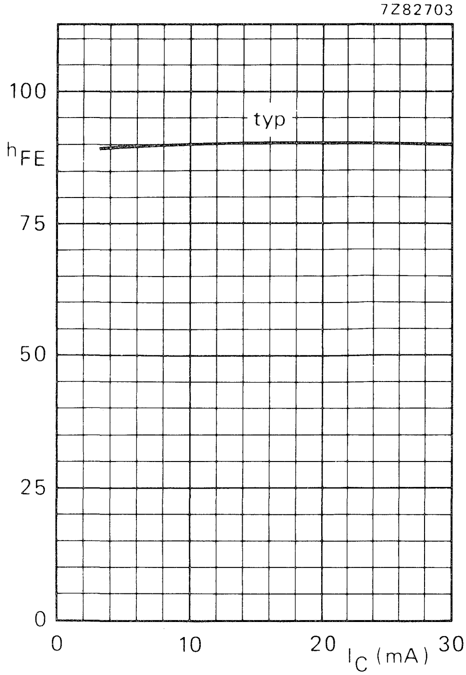


Fig.7 V_{CE} = 5 V; T_j = 25 °C; typ. values.

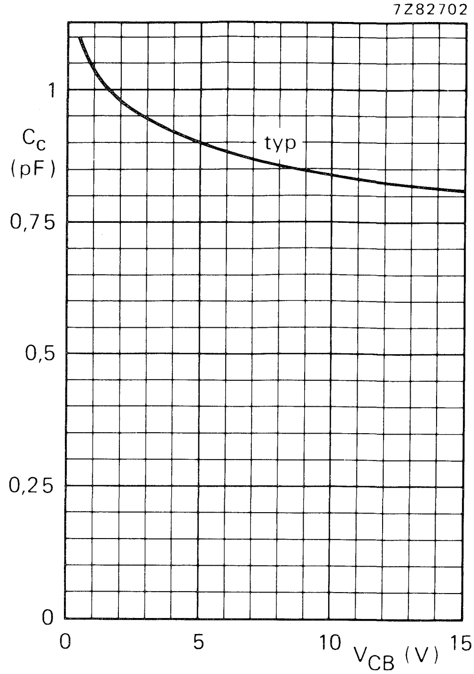


Fig.8 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C; typical values.

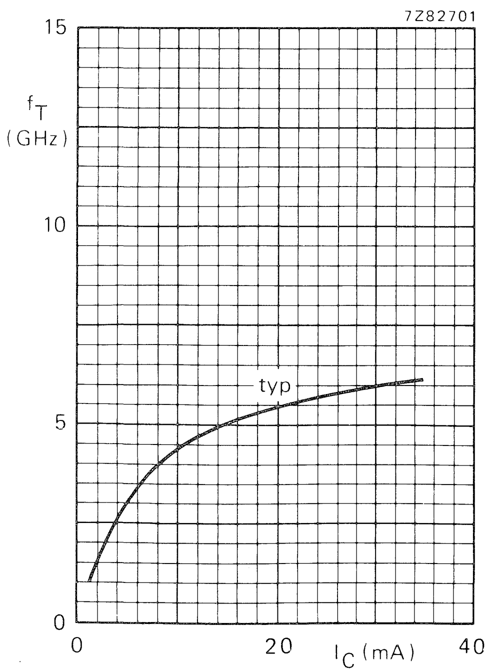


Fig.9 V_{CE} = 5 V; f = 500 MHz; T_j = 25 °C; typical values.

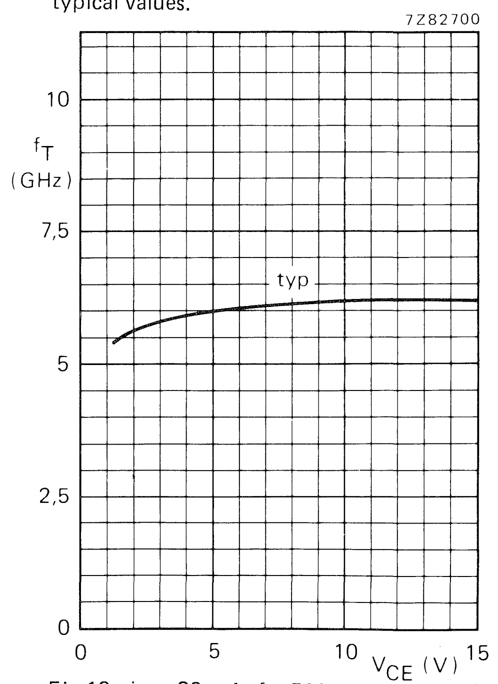


Fig.10 I_C = 30 mA; f = 500 MHz; T_j = 25 °C; typical values.

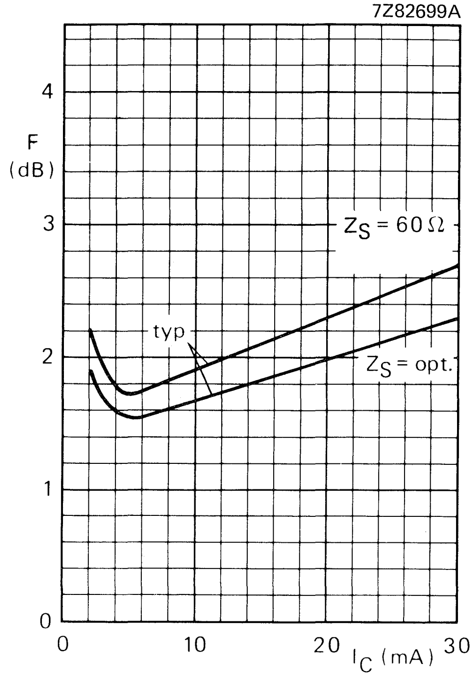


Fig.11 V_{CE} = 8 V; f = 800 MHz; T_{amb} = 25 °C; typ. values.

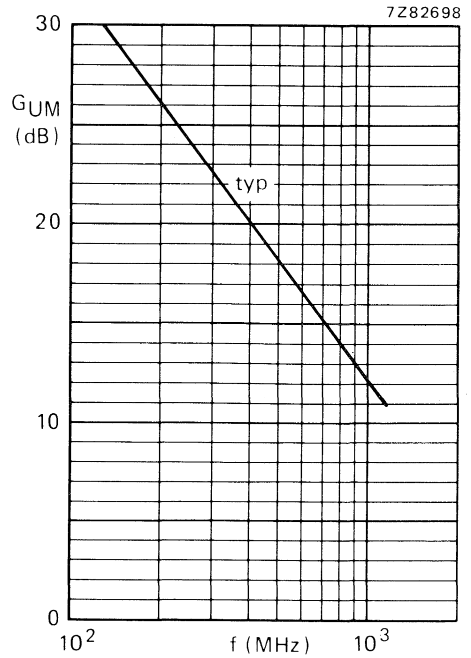


Fig.12 V_{CE} = 8 V; I_C = 30 mA; T_{amb} = 25 °C; typ. values.

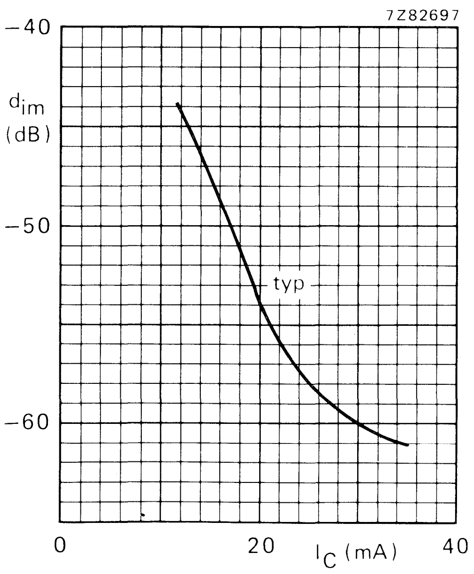


Fig.13 V_{CE} = 8 V; V_o = 425 mV = 52,6 dBmV; $f_{(p+q-r)}$ = 793,25 MHz; T_{amb} = 25 °C; measured in test circuit (see Fig.2); typical values.

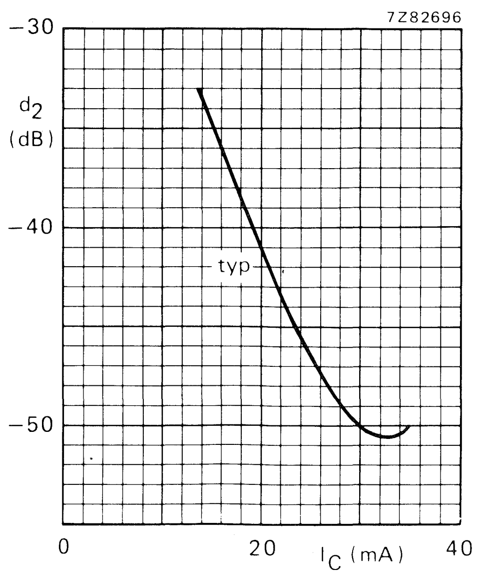


Fig.14 V_{CE} = 8 V; V_o = 200 mV = 46 dBmV; $f_{(p+q)}$ = 810 MHz; T_{amb} = 25 °C; measured in test circuit (see Fig.2); typical values.

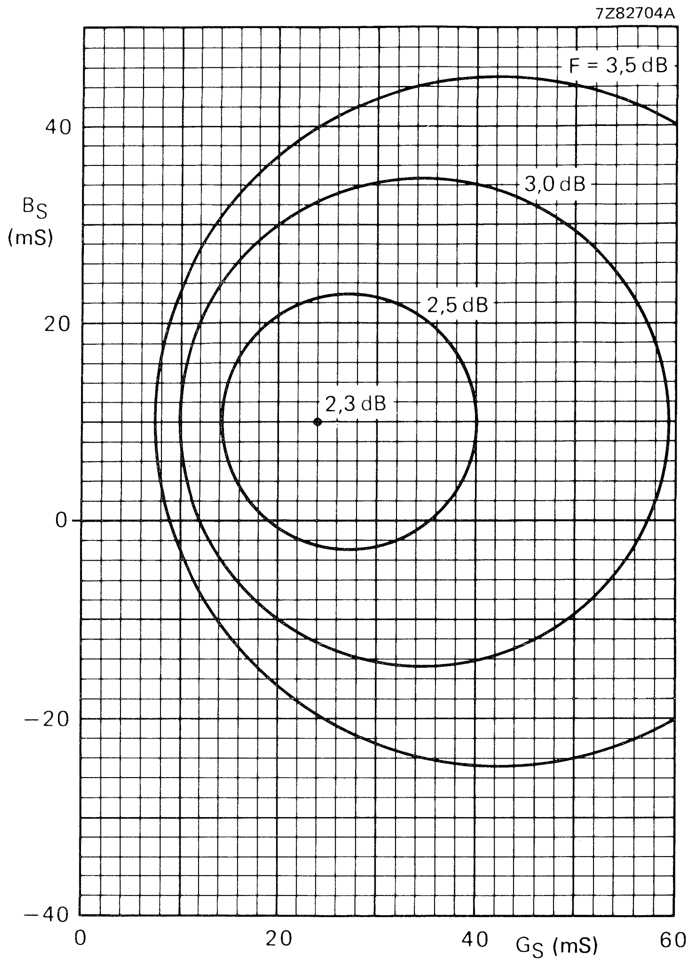


Fig.15 Circles of constant noise figure.
V_{CE} = 8 V; I_C = 30 mA; f = 800 MHz;
T_{amb} = 25 °C; typical values.

CLASS-B OPERATION

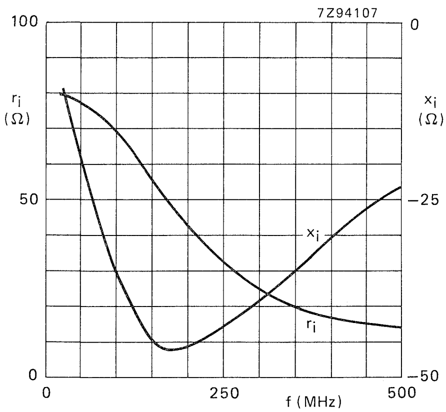


Fig.16 Input impedance (series components).

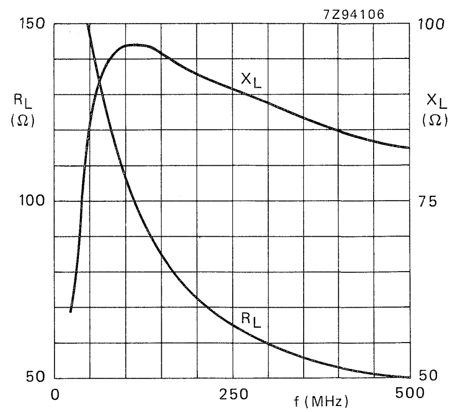


Fig.17 Load impedance (series components).

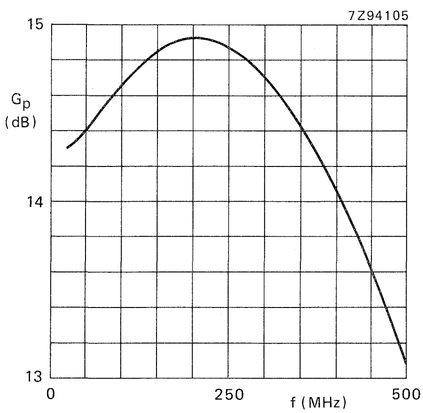


Fig.18 Power gain versus frequency.

Conditions for Figs 16 to 18:

V_{CE} = 7,5 V; P_L = 160 mW; T_{amb} = 25 °C; typical values.

OPERATING NOTE for Figs 16 to 18:

A base-emitter resistor of 82 Ω is recommended to avoid oscillation. This resistor must be effective for r.f. only.

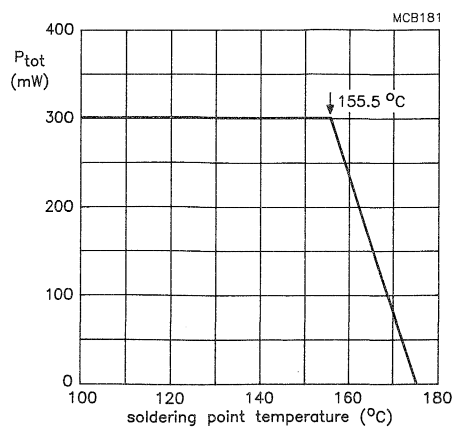


Fig.19 Power derating curve.

N-P-N 5 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} = 25 °C	P_{tot}	max.	300	mW
Junction temperature	T_j	max.	150	°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 = 2 mA; V_{CE} = 10 V	C_{re}	typ.	0,4	pF
Noise figure at optimum source impedance I_C = 2 mA; V_{CE} = 10 V; f = 500 MHz	F	typ.	2,4	dB
Max. unilateral power gain I_C = 14 mA; V_{CE} = 10 V; f = 500 MHz	G_{UM}	typ.	18,0	dB
Output voltage at d_{im} = −60 dB (see Fig. 2) I_C = 14 mA; V_{CE} = 10 V; R_L = 75 Ω; T_{amb} = 25 °C $f_{(p+q-r)}$ = 493,25 MHz	V_o	typ.	150	mV

MECHANICAL DATA

Dimensions in mm

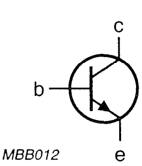
Fig. 1 SOT-23.

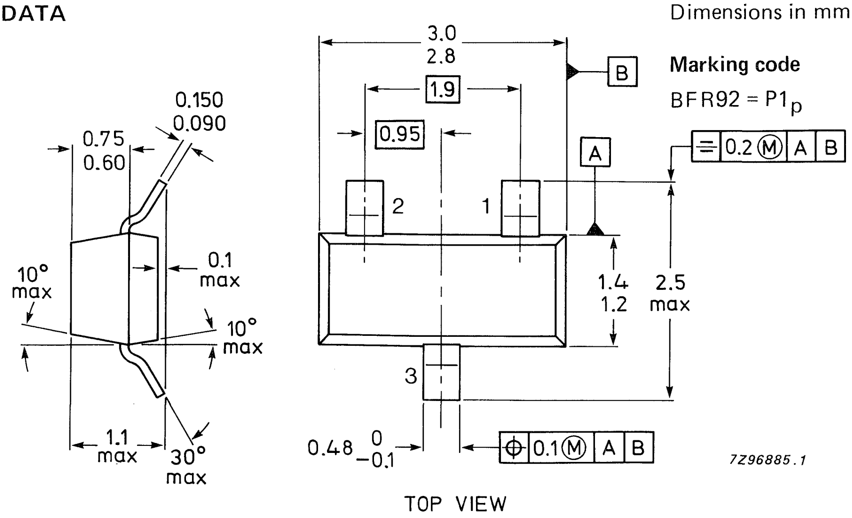
Pinning

1 = base
2 = emitter
3 = collector

Marking code

BFR92 = $P1_p$





* If required, the R-version (reverse pinning) is available on request.
TO92 version is also available on request: ref. ON4183.

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 °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	$R_{th\ j\text{-}a}$	=	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.	50	nA
D.C. current gain I_C = 14 mA; V_{CE} = 10 V	h_{FE}	min. typ.	25 50	
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.	0,75	pF
Emitter capacitance at f = 1 MHz $I_C = I_c = 0$; V_{EB} = 0,5 V	C_e	typ.	0,8	pF
Feedback capacitance at f = 1 MHz I_C = 2 mA; V_{CE} = 10 V; T_{amb} = 25 °C	C_{re}	typ.	0,4	pF

* Mounted on a ceramic substrate of 8 mm x 10 mm x 0,7 mm.

Noise figure at optimum source impedance*			
I_C = 2 mA; V_{CE} = 10 V; f = 500 MHz; T_{amb} = 25 °C	F	typ.	2,4 dB
Max. unilateral power gain (s_{12} assumed to be zero)			
$G_{UM} = 10 \log \dfrac{\|s_{21}\|^2}{[1-\|s_{11}\|^2][1-\|s_{22}\|^2]}$			
I_C = 14 mA; V_{CE} = 10 V; f = 500 MHz; T_{amb} = 25 °C	G_{UM}	typ.	18,0 dB
Output voltage at d_{im} = −60 dB (see Fig. 2) (DIN 45004B; par. 6.3.: 3-tone)			
I_C = 14 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			
$V_r = V_o$ −6 dB ; f_r = 505,25 MHz			
measured at $f_{(p+q-r)}$ = 493,25 MHz	V_o	typ.	150 mV

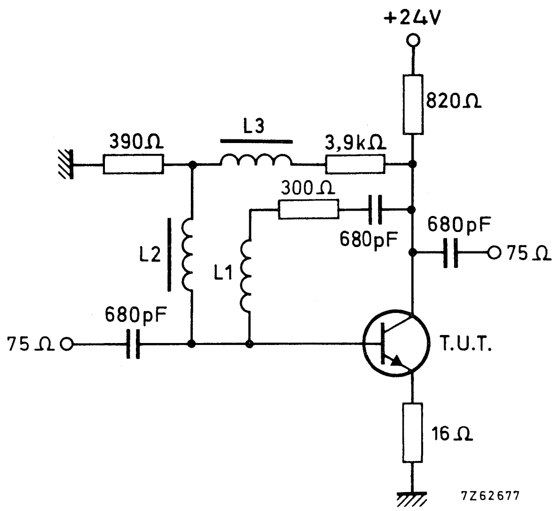


Fig. 2 Intermodulation test circuit.

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.

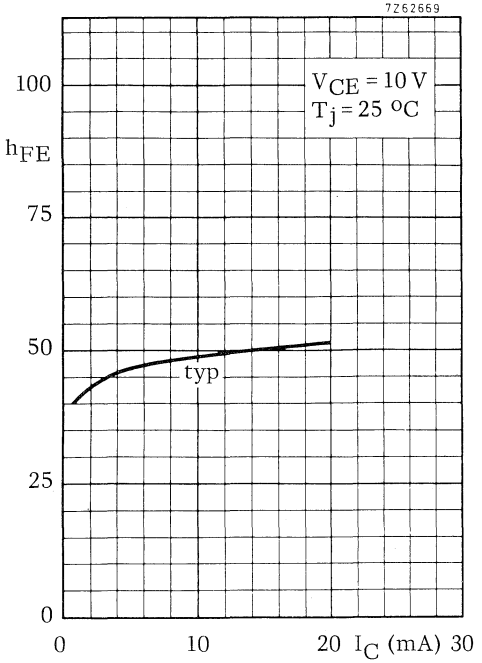


Fig. 3 V_{CE} = 10 V; T_j = 25 °C; typical values.

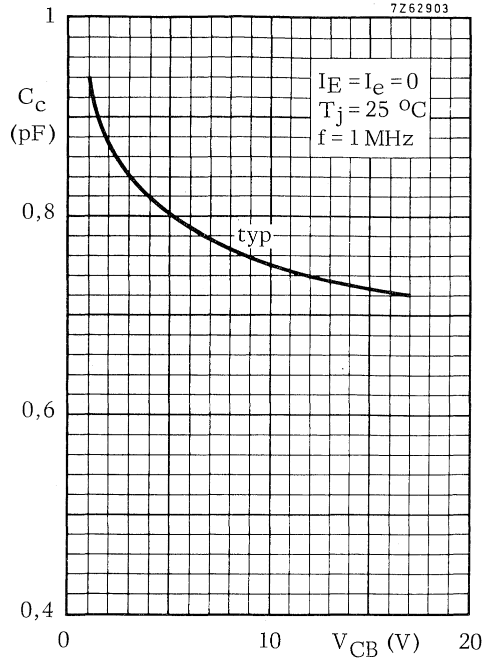


Fig. 4 I_E = I_e = 0; f = 1 MHz; T_j = 25 °C; typical values.

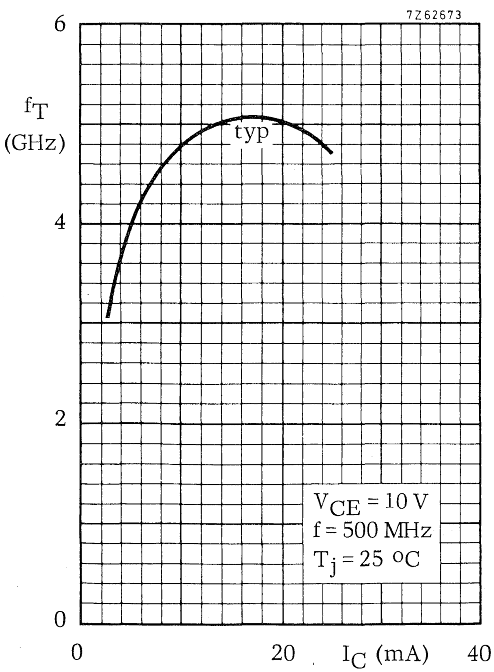


Fig. 5 V_{CE} = 10 V; f = 500 MHz; T_j = 25 °C; typical values.

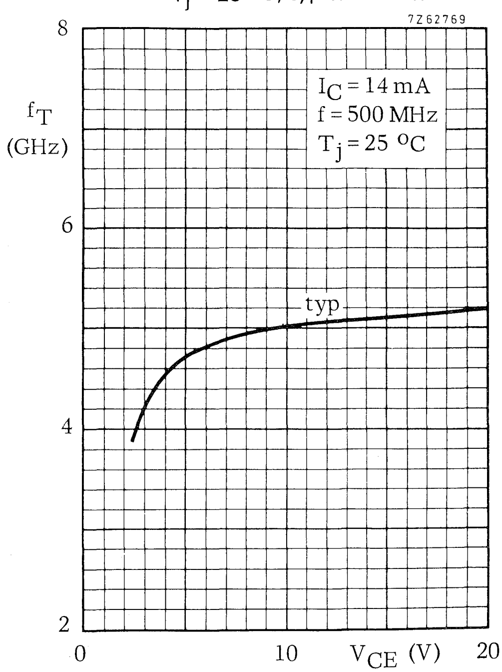


Fig. 6 I_C = 14 mA; f = 500 MHz; T_j = 25 °C; typical values.

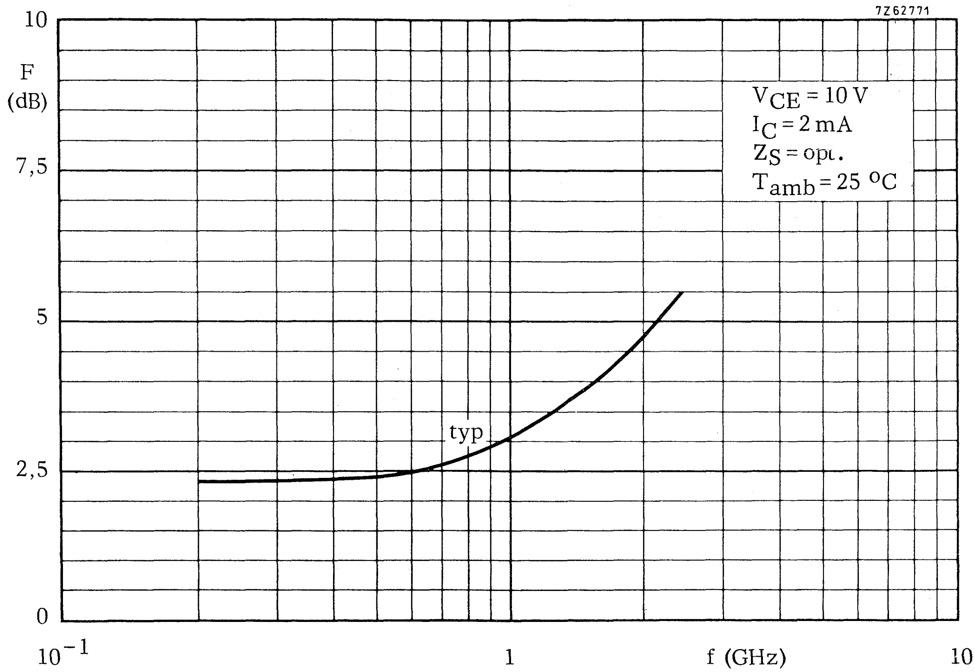


Fig. 7 V_{CE} = 10 V; I_C = 2 mA; Z_S = opt.; T_{amb} = 25 °C; typical values.

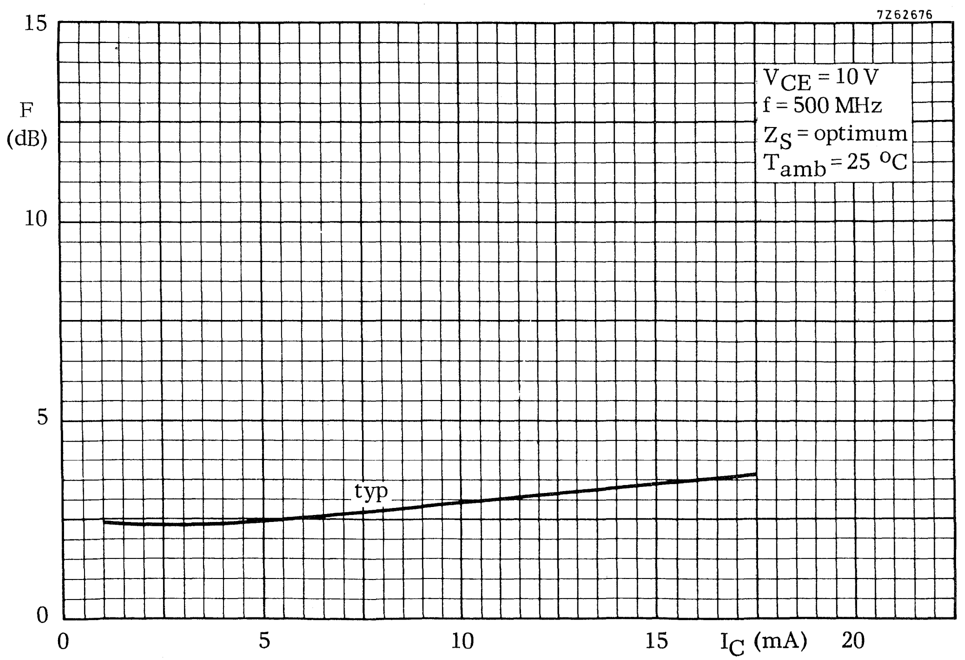


Fig. 8 V_{CE} = 10 V; f = 500 MHz; Z_S = opt.; T_{amb} = 25 °C; typical values.

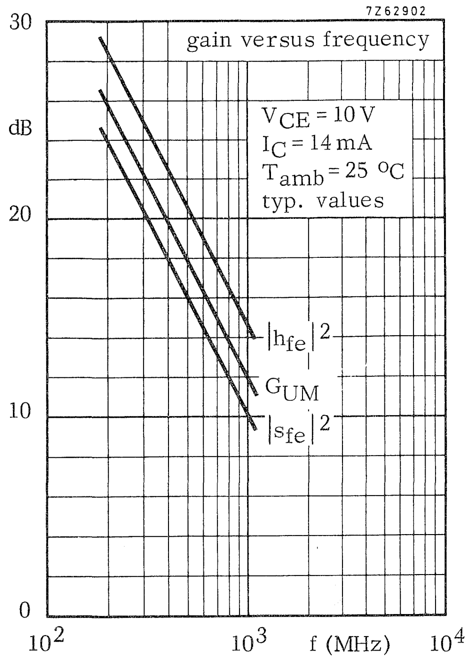


Fig. 9 V_{CE} = 10 V; I_C = 14 mA; T_{amb} = 25 °C; typical values.

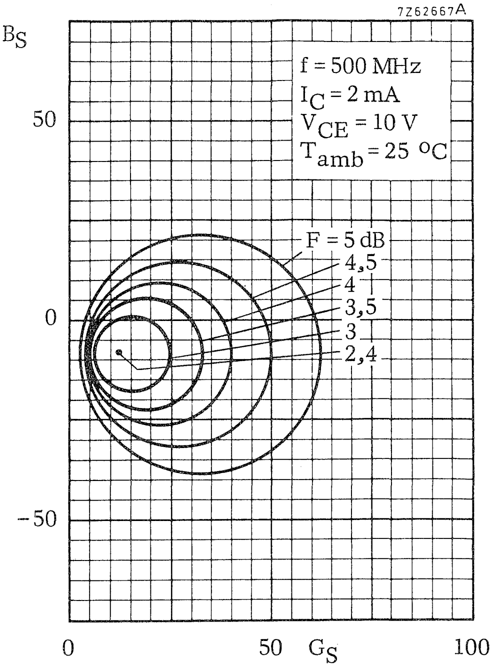


Fig. 10 Circles of constant noise figure; V_{CE} = 10 V; I_C = 2 mA; f = 500 MHz; T_{amb} = 25 °C; typical values.

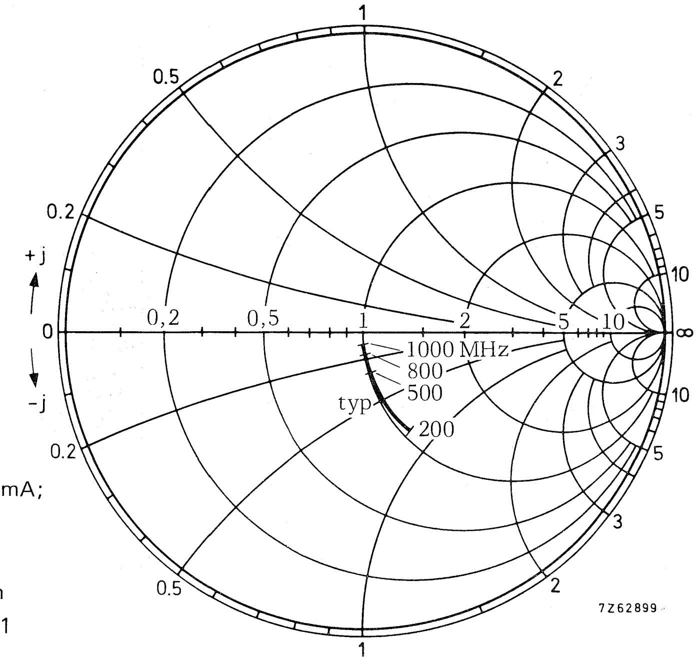


Fig. 11 V_{CE} = 10 V; I_C = 14 mA; T_{amb} = 25 °C; typical values.

Input impedance derived from input reflection coefficient s_{11} coordinates in ohm x 50

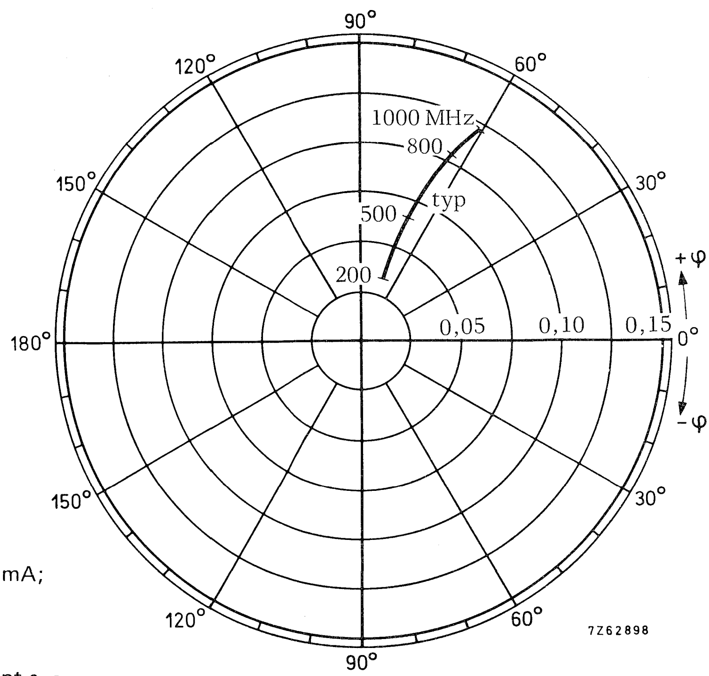


Fig. 12 V_{CE} = 10 V; I_C = 14 mA; T_{amb} = 25 °C; typical values.

Reverse transmission coefficient s_{12}

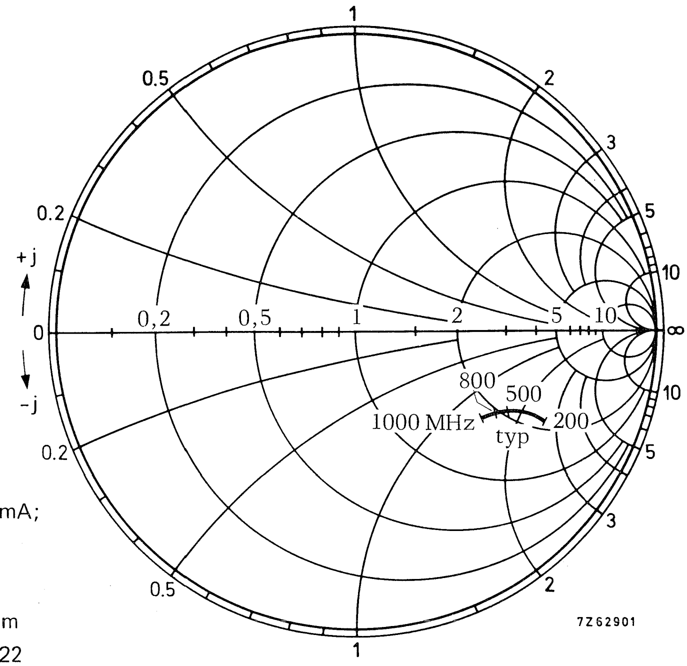


Fig. 13 V_{CE} = 10 V; I_C = 14 mA; T_{amb} = 25 °C; typical values.

Output impedance derived from output reflection coefficient s_{22} coordinates in ohm x 50

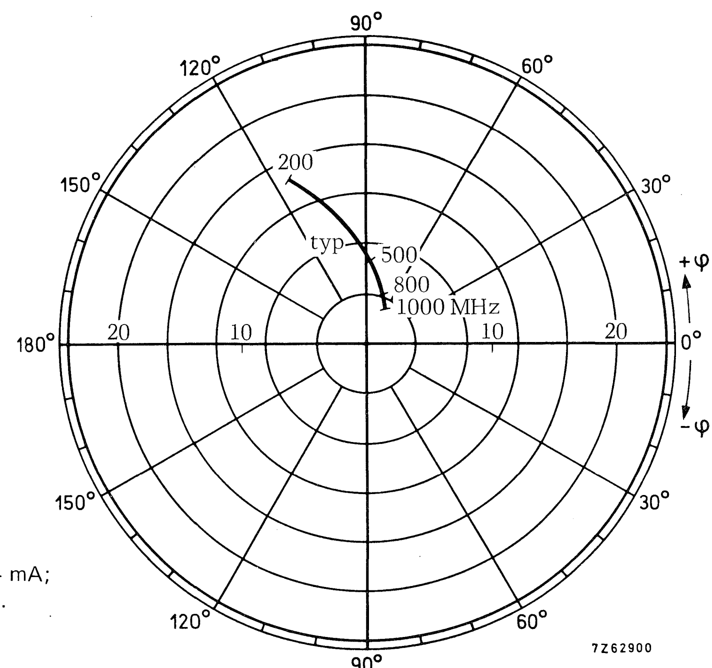


Fig. 14 V_{CE} = 10 V; I_C = 14 mA; T_{amb} = 25 °C; typical values.

Forward transmission coefficient s_{21}

N-P-N 5 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_{CEO}	max.	15	V
Collector current (d.c.)	I_C	max.	25	mA
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	300	mW
Junction temperature	T_j	max.	150	°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
Noise figure at R_S = 60 Ω 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 Ω $f_{(p+q-r)}$ = 793,25 MHz	V_o	typ.	150	mV

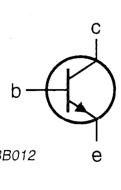
MECHANICAL DATA

Fig. 1 SOT-23.

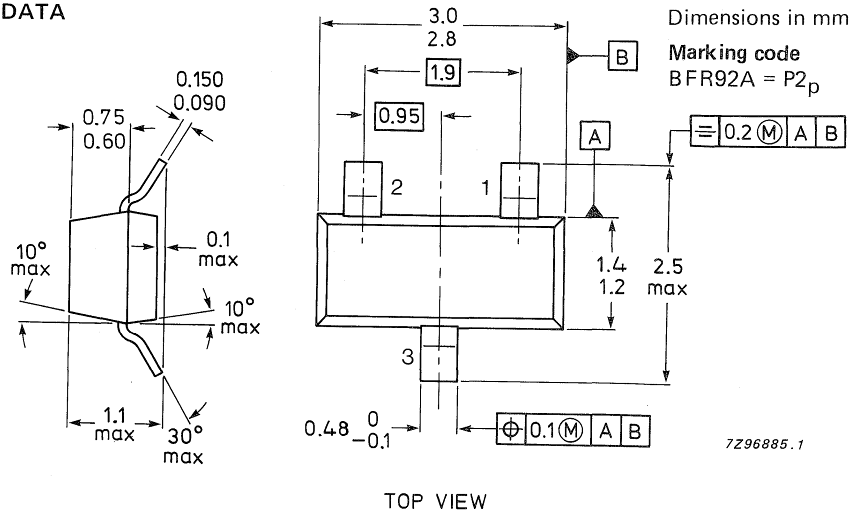
Dimensions in mm

Pinning

1 = base
2 = emitter
3 = collector



Marking code
BFR92A = $P2_p$



* If required, the R-version (reverse pinning) is available on request.
TO92 version is also available on request: ref. ON4184.

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} = 25 °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*	$R_{th\ j\text{-}a}$	=	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. typ.	40 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_{12} assumed to be zero)

$$G_{UM} = 10 \log \frac{|s_{21}|^2}{[1-|s_{11}|^2]\,[1-|s_{22}|^2]}$$

I_C = 14 mA; V_{CE} = 10 V; f = 800 MHz; T_{amb} = 25 °C	G_{UM}	typ.	15,5	dB

* 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 = 14 mA; V_{CE} = 10 V; R_L = 75 Ω; 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 2 and 18)*			
I_C = 14 mA; V_{CE} = 10 V; R_L = 75 Ω; 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

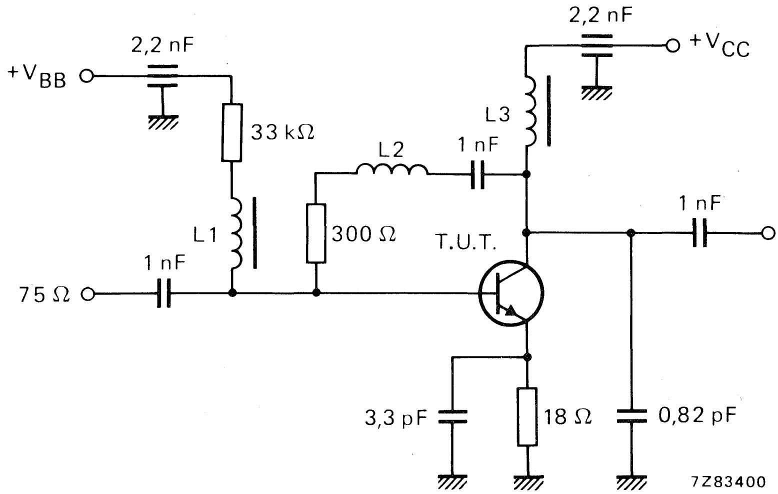


Fig. 2 Intermodulation distortion and second harmonic distortion MATV test circuit.

L1 = L3 = 5 μH 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 V; T_{amb} = 25 °C; typical values.

I_C mA	f MHz	s_{11}	s_{12}	s_{21}	s_{22}
	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°
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°
	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°
5	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°
	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°
10	500	0,30/−132,3°	0,050/69,0°	7,1/ 99,6°	0,59/−20,5°
	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°
14	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°
	200	0,31/−110,6°	0,023/68,3°	16,0/114,6°	0,66/−20,1°
20	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 V; T_{amb} = 25 °C; typical values.

I_C mA	f MHz	s_{11}	s_{12}	s_{21}	s_{22}
	40	0,89/ −8,7°	0,008/83,6°	6,8/174,4°	1,00/ −2,5°
	100	0,86/ −21,2°	0,021/78,5°	6,5/164,6°	0,98/ −6,1°
	200	0,80/ −40,9°	0,038/69,5°	6,0/149,6°	0,94/−11,3°
2	500	0,61/ −85,3°	0,069/55,8°	4,3/119,8°	0,82/−18,7°
	800	0,48/−115,4°	0,081/53,8°	3,1/101,2°	0,75/−21,3°
	1000	0,44/−131,4°	0,086/55,5°	2,6/ 92,1°	0,73/−22,5°
	1200	0,40/−145,6°	0,093/58,9°	2,2/ 85,0°	0,72/−23,9°
	40	0,77/ −13,6°	0,008/81,8°	14,2/170,5°	0,99/ −4,5°
	100	0,73/ −32,3°	0,019/74,7°	13,2/155,8°	0,95/−10,3°
	200	0,62/ −58,8°	0,032/65,6°	11,0/136,8°	0,85/−16,6°
5	500	0,41/−107,2°	0,054/61,4°	6,3/107,7°	0,69/−20,4°
	800	0,32/−135,9°	0,071/65,9°	4,2/ 92,9°	0,64/−20,8°
	1000	0,30/−150,0°	0,082/68,6°	3,5/ 86,1°	0,63/−21,3°
	1200	0,28/−162,9°	0,095/71,5°	2,9/ 80,5°	0,62/−22,4°
	40	0,66/ −19,4°	0,007/80,1°	22,5/165,9°	0,97/ −6,6°
	100	0,58/ −44,7°	0,017/71,8°	19,5/147,0°	0,90/−14,1°
	200	0,45/ −76,2°	0,027/65,4°	14,5/126,0°	0,76/−19,3°
10	500	0,29/−125,1°	0,049/68,7°	7,2/100,6°	0,62/−19,2°
	800	0,24/−151,8°	0,070/73,5°	4,7/ 88,8°	0,59/−19,0°
	1000	0,24/−162,9°	0,084/75,2°	3,8/ 82,6°	0,58/−19,7°
	1200	0,23/−174,8°	0,099/76,8°	3,2/ 78,3°	0,58/−20,9°
	40	0,60/ −23,2°	0,007/78,6°	27,2/163,0°	0,96/ −7,9°
	100	0,51/ −52,5°	0,016/70,6°	22,6/141,8°	0,86/−15,8°
	200	0,38/ −86,2°	0,025/66,4°	15,7/120,7°	0,72/−19,6°
14	500	0,26/−134,3°	0,047/72,0°	7,5/ 97,8°	0,60/−18,0°
	800	0,22/−159,3°	0,069/76,2°	4,8/ 86,8°	0,57/−18,0°
	1000	0,22/−169,0°	0,085/77,3°	3,9/ 81,3°	0,57/−18,7°
	1200	0,22/ 179,8°	0,100/78,5°	3,3/ 76,8°	0,57/−20,1°
	40	0,54/ −28,2°	0,007/77,4°	31,7/159,9°	0,95/ −9,1°
	100	0,45/ −61,7°	0,015/69,5°	24,7/136,8°	0,82/−16,8°
	200	0,33/ −97,5°	0,023/67,5°	16,3/116,2°	0,68/−18,8°
20	500	0,24/−143,7°	0,046/74,4°	7,4/ 95,3°	0,59/−16,4°
	800	0,22/−166,4°	0,069/78,0°	4,8/ 85,2°	0,57/−16,9°
	1000	0,22/−174,7°	0,084/78,7°	3,8/ 80,1°	0,57/−17,8°
	1200	0,22/ 176,3°	0,100/79,7°	3,3/ 76,0°	0,57/−19,4°

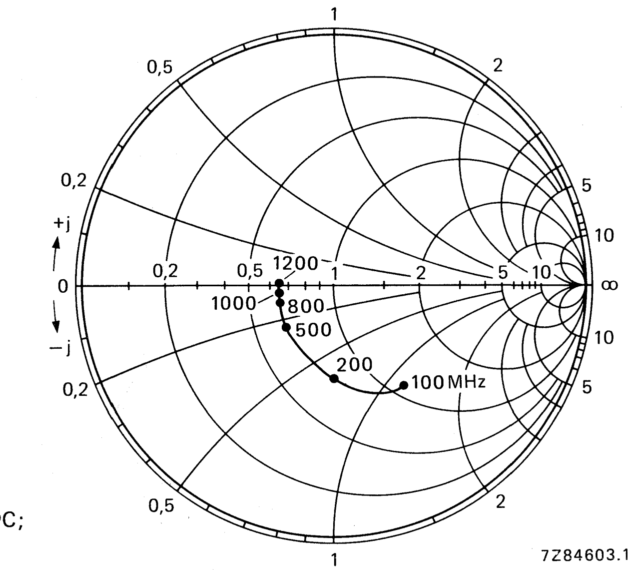


Fig. 3 Input impedance derived from input reflection coefficient s_{11} co-ordinates in ohm x 50.
V_{CE} = 10 V; I_C = 14 mA; T_{amb} = 25 °C; typical values.

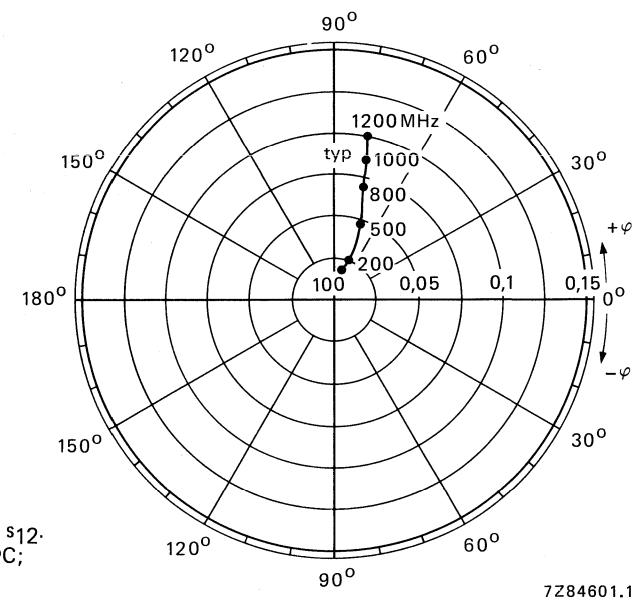


Fig. 4 Reverse transmission coefficient s_{12}.
V_{CE} = 10 V; I_C = 14 mA; T_{amb} = 25 °C; typical values.

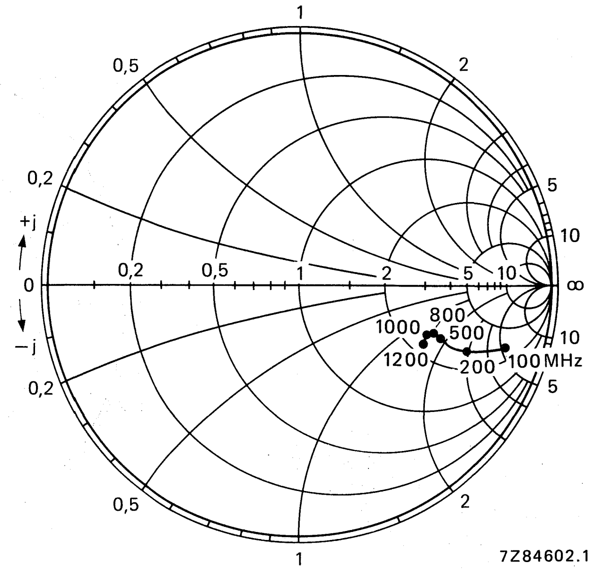


Fig. 5 Output impedance derived from output reflection coefficient s_{22} co-ordinates in ohm x 50.
V_{CE} = 10 V; I_C = 14 mA; T_{amb} = 25 °C; typical values.

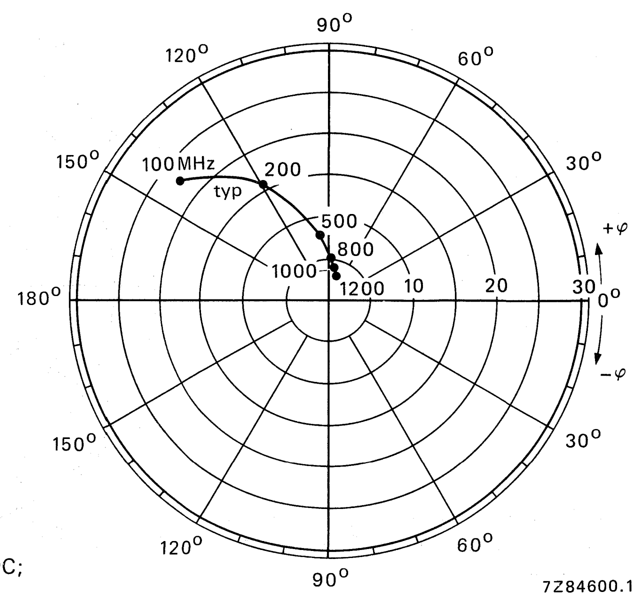


Fig. 6 Forward transmission coefficient s_{21}.
V_{CE} = 10 V; I_C = 14 mA; T_{amb} = 25 °C; typical values.

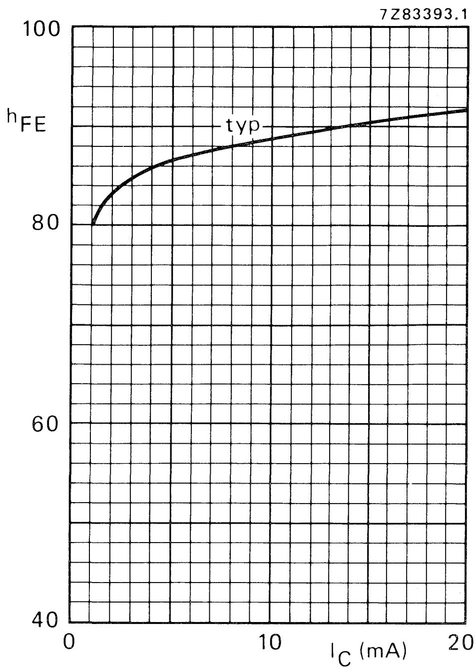


Fig. 7 V_{CE} = 10 V; T_j = 25 °C; typical values.

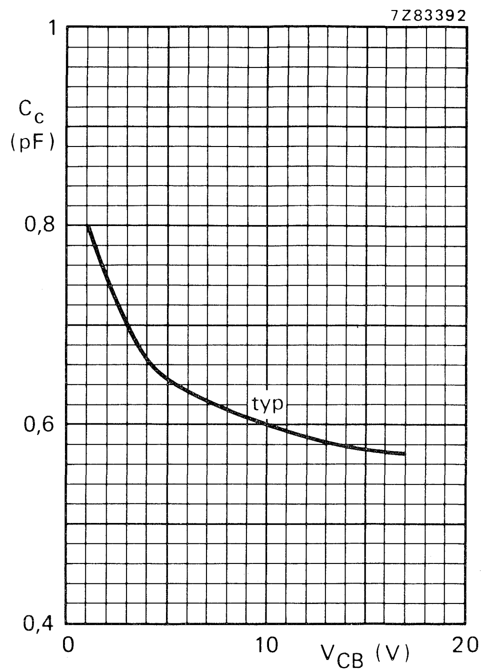


Fig. 8 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C; typical values.

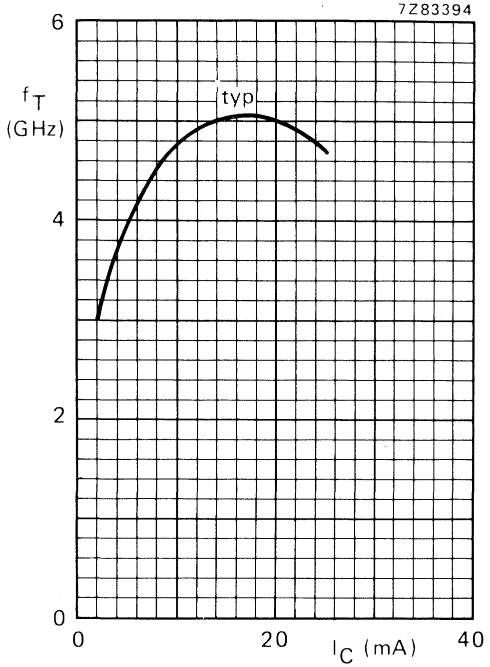


Fig. 9 V_{CE} = 10 V; f = 500 MHz; T_j = 25 °C; typical values.

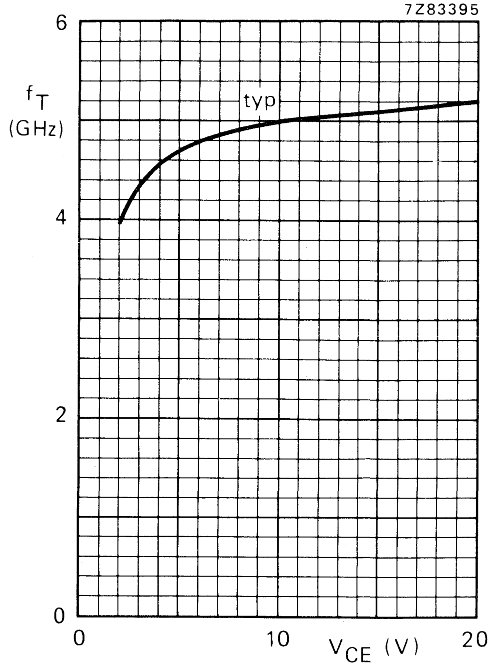


Fig. 10 I_C = 14 mA; f = 500 MHz; T_j = 25 °C; typical values.

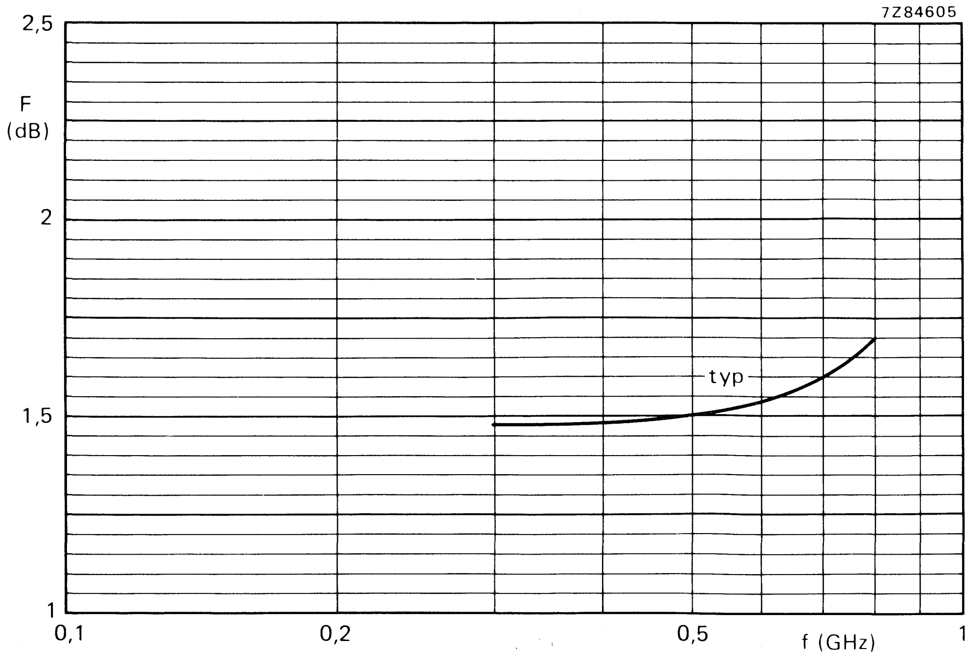


Fig. 11 V_{CE} = 10 V; I_C = 4 mA; Z_S = optimum; T_{amb} = 25 °C; typical values.

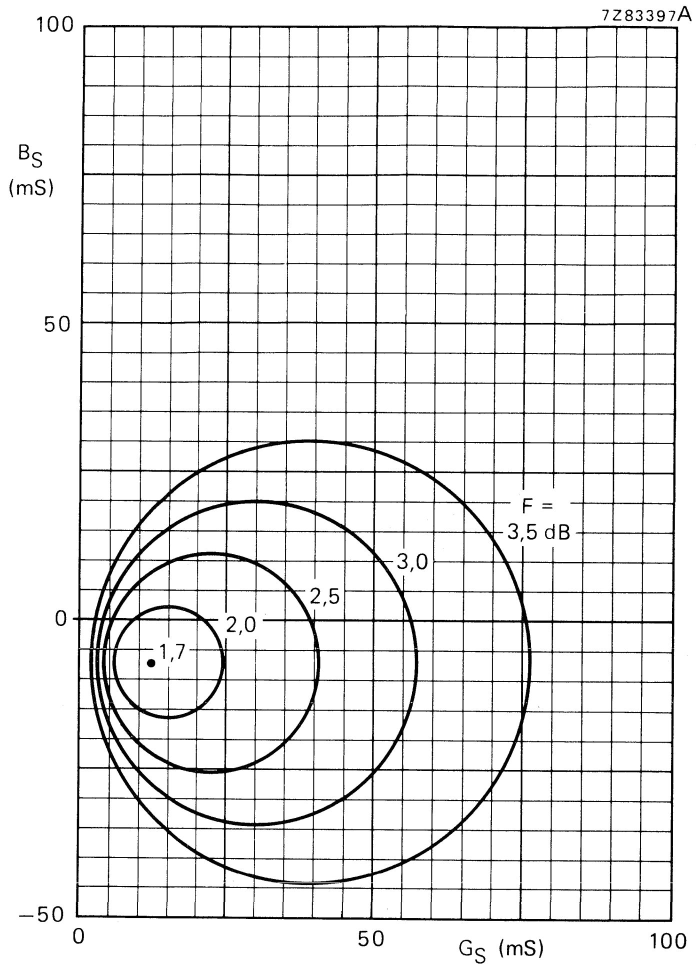


Fig. 12 Circles of constant noise figure.
V_{CE} = 10 V; I_C = 4 mA; f = 800 MHz; T_{amb} = 25 °C;
typical values.

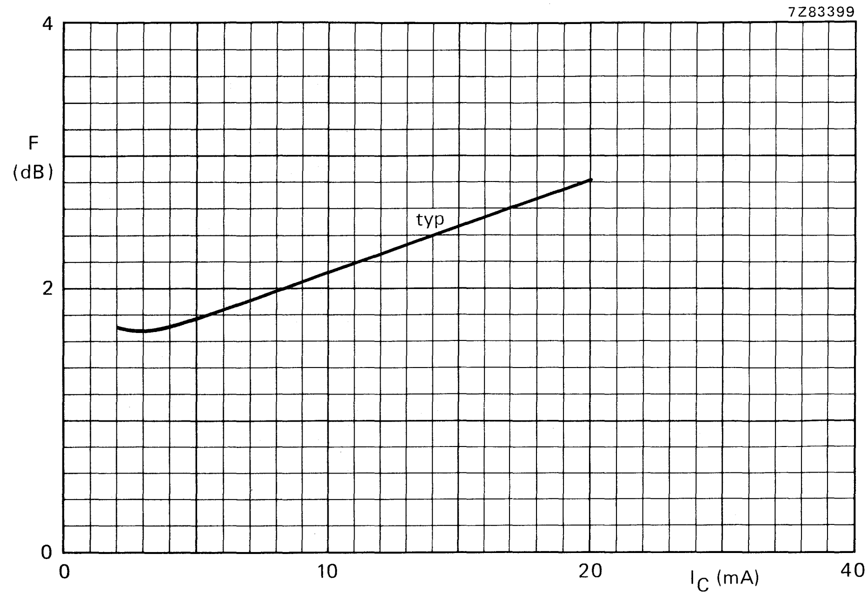


Fig. 13 V_{CE} = 10 V; f = 800 MHz; Z_S = optimum; T_{amb} = 25 °C; typical values.

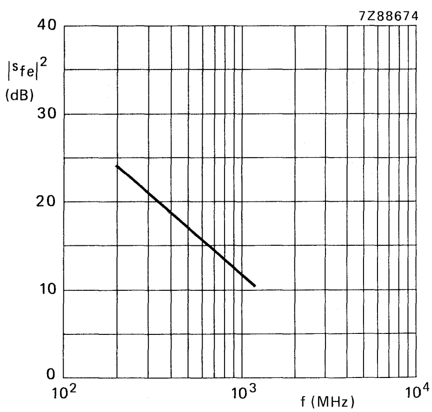


Fig. 14 V_{CE} = 10 V; I_C = 14 mA; T_{amb} = 25 °C; typical values.

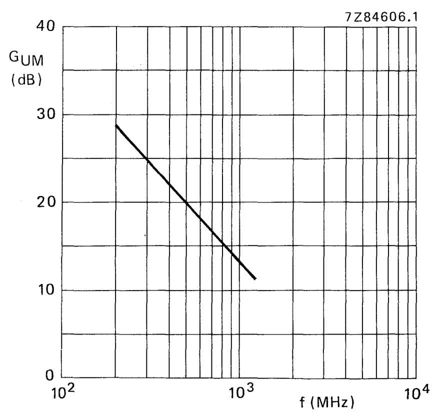


Fig. 15 V_{CE} = 10 V; I_C = 14 mA; T_{amb} = 25 °C; typical values.

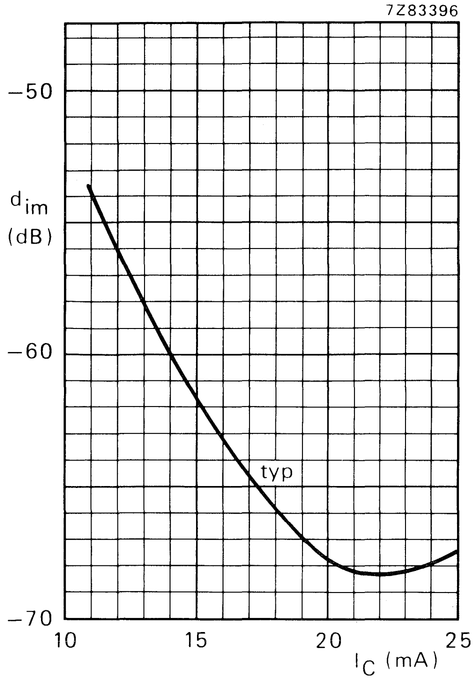


Fig. 16 V_{CE} = 10 V; V_o = 43,5 dBmV = 150 mV; $f_{(p+q-r)}$ = 793,25 MHz; T_{amb} = 25 °C; measured in MATV test circuit (see Fig. 2); typical values.

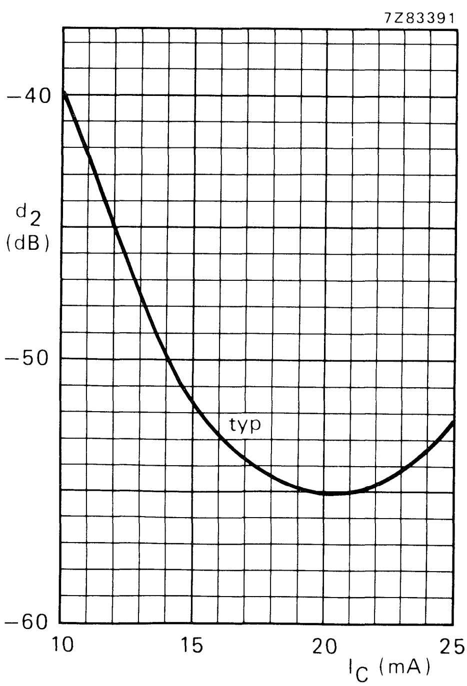


Fig. 17 V_{CE} = 10 V; V_o = 60 mV; $f_{(p+q)}$ = 810 MHz; T_{amb} = 25 °C; measured in MATV test circuit (see Fig. 2); typical values.

N-P-N 5 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_{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 °C	P_{tot}	max.	300	mW
Junction temperature	T_j	max.	150	°C
Transition frequency at f = 500 MHz I_C = 30 mA; V_{CE} = 5 V	f_T	typ.	5	GHz
Feedback capacitance at f = 1 MHz I_C = 2 mA; 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;	F	typ.	1,9	dB
Max. unilateral power gain I_C = 30 mA; V_{CE} = 5 V; f = 500 MHz;	G_{UM}	typ.	16,5	dB
Intermodulation distortion at T_{amb} = 25 °C I_C = 30 mA; V_{CE} = 5 V; R_L = 75 Ω; V_o = 300 mV $f_{(p+q-r)}$ = 493,25 MHz	d_{im}	typ.	−60	dB

MECHANICAL DATA

Dimensions in mm

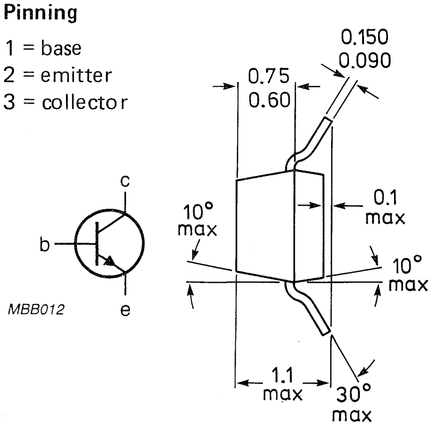
Fig. 1 SOT-23.

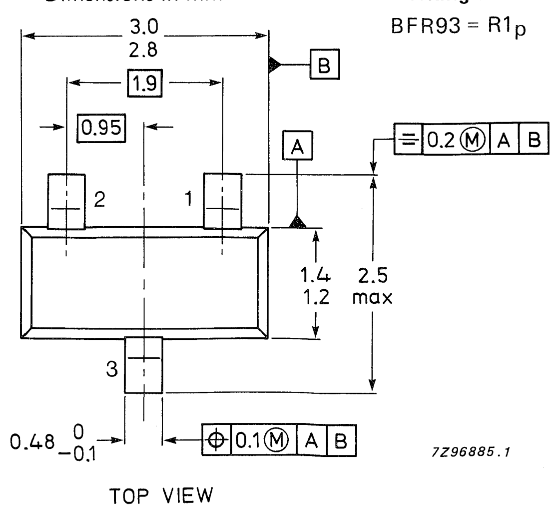
Pinning

1 = base
2 = emitter
3 = collector

Marking code

BFR93 = $R1_p$





* If required, the R-version (reverse pinning) is available on request.
TO92 version is also available on request: ref. ON4186.

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} = 25 °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*	$R_{th\ j\text{-}a}$	=	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.	50 nA
D.C. current gain ** I_C = 30 mA; V_{CE} = 5 V	h_{FE}	min. typ.	25 50
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} = 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.	1,8 pF
Feedback capacitance at f = 1 MHz I_C = 2 mA; V_{CE} = 5 V; T_{amb} = 25 °C	C_{re}	typ.	0,8 pF

* Mounted on a ceramic substrate of 8 mm x 10 mm x 0,7 mm.
** Measured under pulse conditions.

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_{12} assumed to be zero)			
$$G_{UM} = 10 \log \frac{|s_{21}|^2}{[1-|s_{11}|^2]\,[1-|s_{22}|^2]}$$			
I_C = 30 mA; V_{CE} = 5 V; f = 500 MHz; T_{amb} = 25 °C	G_{UM}	typ.	16,5 dB
Intermodulation distortion at T_{amb} = 25 °C *			
I_C = 30 mA; V_{CE} = 5 V; R_L = 75 Ω; V.S.W.R. < 2			
$V_p = V_o$ = 300 mV at f_p = 495,25 MHz			
$V_q = V_o$ − 6 dB at f_q = 503,25 MHz			
$V_r = V_o$ − 6 dB at f_r = 505,25 MHz			
Measured at $f_{(p+q-r)}$ = 493,25 MHz	d_{im}	typ.	−60 dB

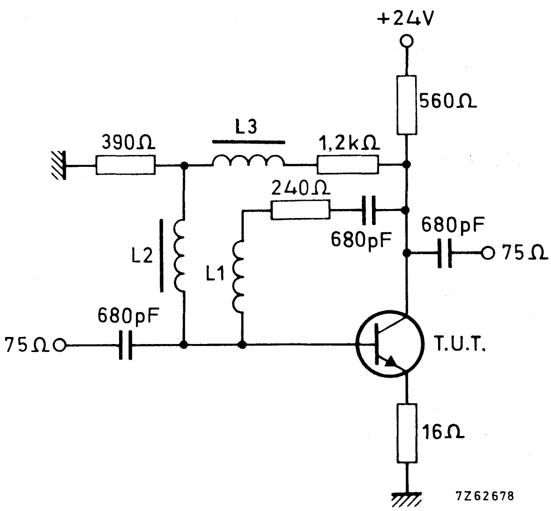


Fig. 2 Intermodulation test circuit.

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.

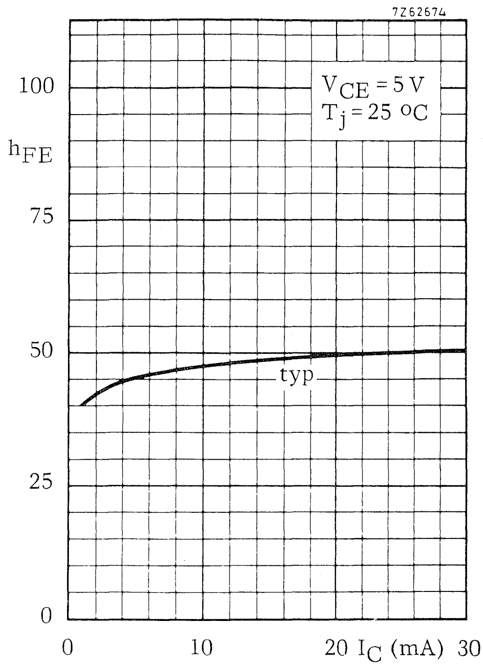


Fig. 3.

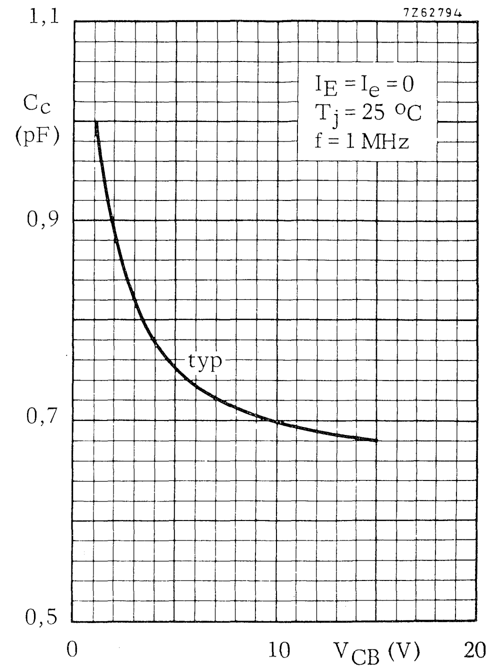


Fig. 4.

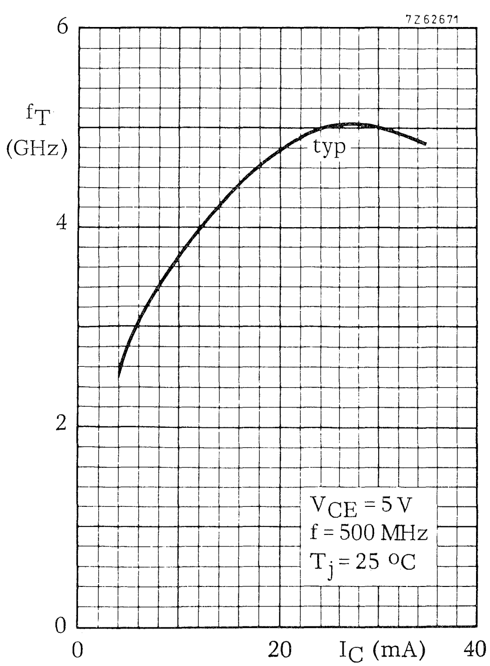


Fig. 5.

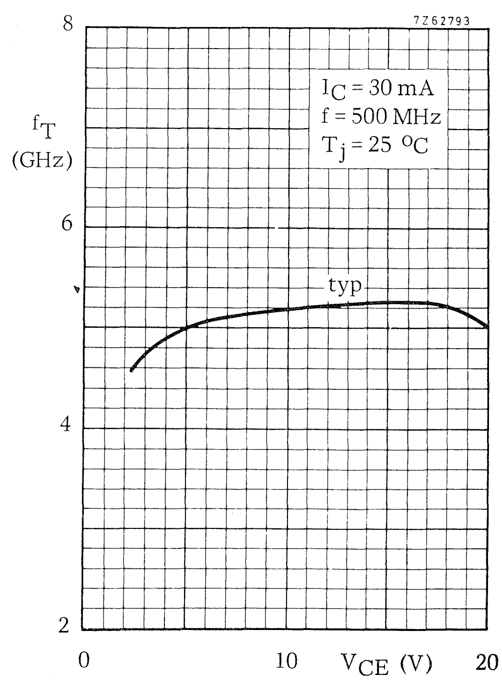


Fig. 6.

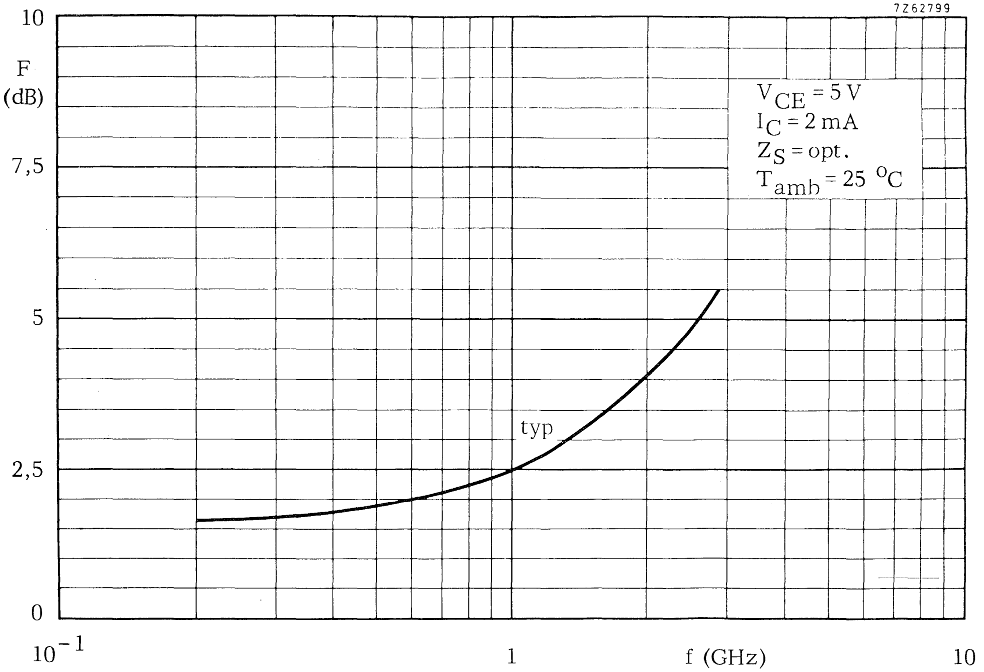

7Z62799
10
F
(dB)
7,5
5
2,5
0
V_{CE} = 5 V
I_C = 2 mA
Z_S = opt.
T_{amb} = 25 °C
typ
10^{-1}
1
f (GHz)
10

Fig. 7.

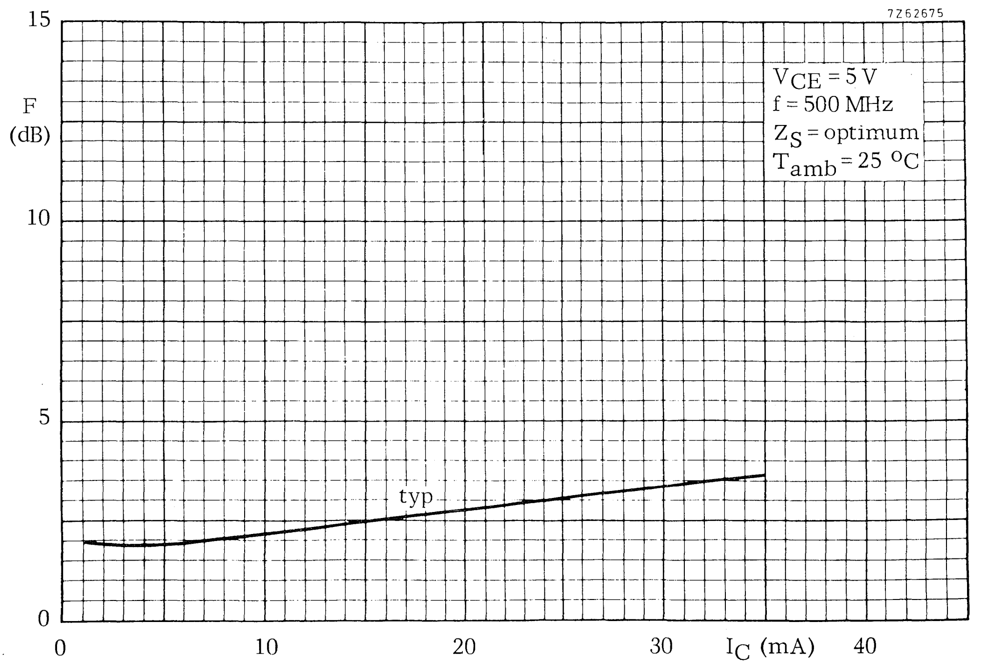

7Z62675
15
F
(dB)
10
5
0
V_{CE} = 5 V
f = 500 MHz
Z_S = optimum
T_{amb} = 25 °C
typ
0
10
20
30
I_C (mA)
40

Fig. 8.

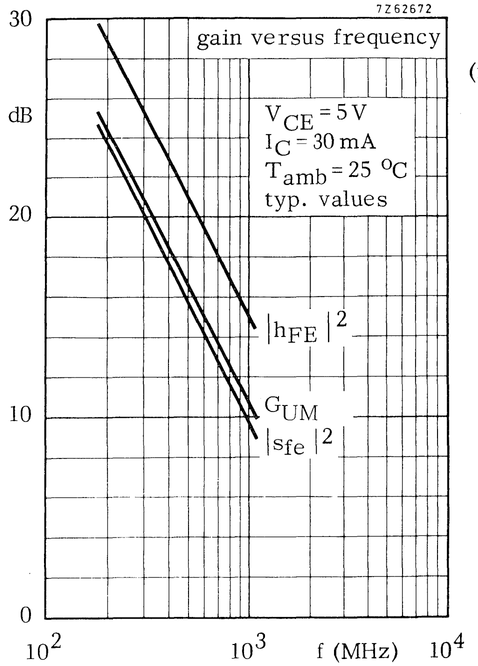

7Z62672
gain versus frequency
30
dB
20
10
0
V_{CE} = 5 V
I_C = 30 mA
T_{amb} = 25 °C
typ. values
$|h_{FE}|^2$
G_{UM}
$|s_{fe}|^2$
10^2
10^3
f (MHz)
10^4

Fig. 9.

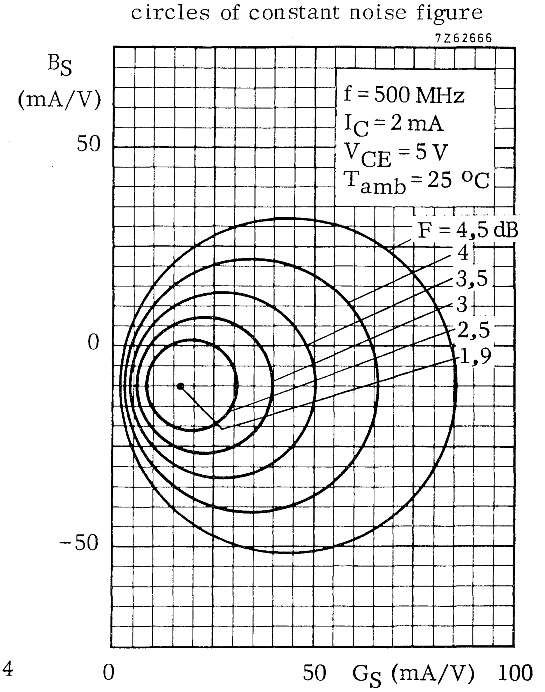

circles of constant noise figure
7Z62666
B_S
(mA/V)
50
0
−50
f = 500 MHz
I_C = 2 mA
V_{CE} = 5 V
T_{amb} = 25 °C
F = 4,5 dB
4
3,5
3
2,5
1,9
0
50
G_S (mA/V)
100

Fig. 10.

V_{CE} = 5 V

I_C = 30 mA

T_{amb} = 25 °C

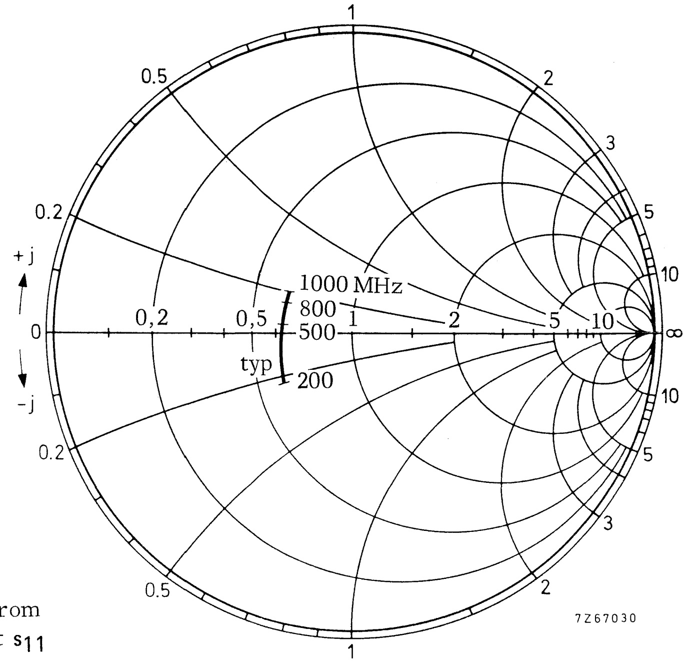


Fig. 11.

Input impedance derived from input reflection coefficient s_{11} coordinates in ohm x 50

V_{CE} = 5 V

I_C = 30 mA

T_{amb} = 25 °C

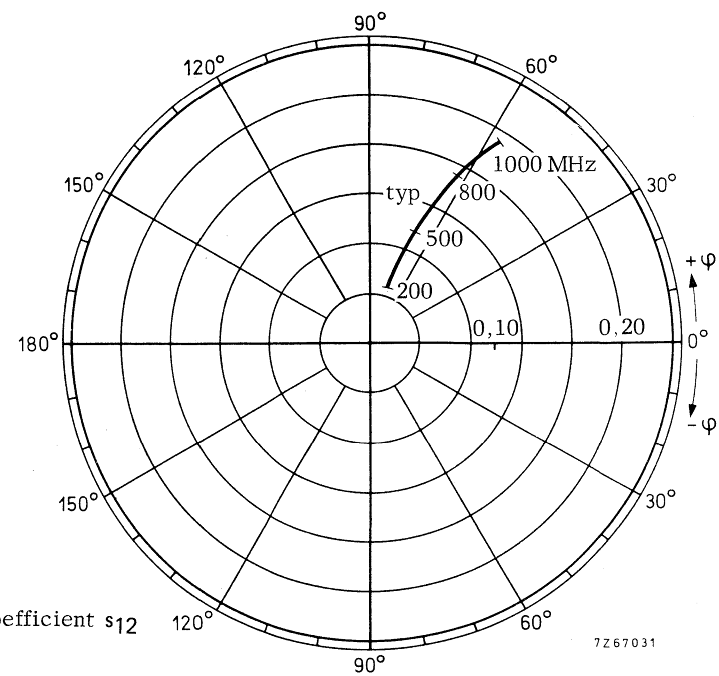


Fig. 12.

Reverse transmission coefficient s_{12}

V_{CE} = 5 V
I_C = 30 mA
T_{amb} = 25 °C

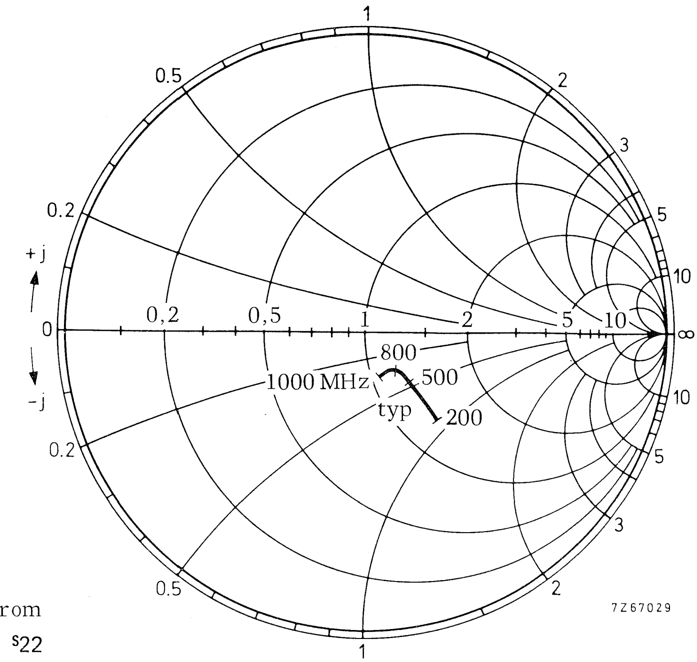


Fig. 13.

Output impedance derived from output reflection coefficient s_{22} coordinates in ohm x 50

V_{CE} = 5 V
I_C = 30 mA
T_{amb} = 25 °C

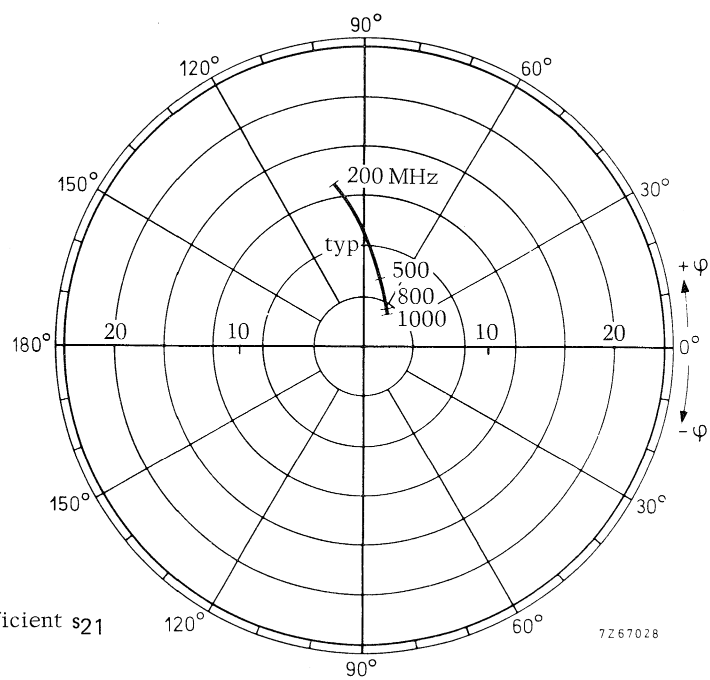


Fig. 14.

Forward transmission coefficient s_{21}

N-P-N 5 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 is the BFT93

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 (DC)	I_C	max.	35	mA
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	300	mW
Junction temperature	T_j	max.	150	°C
Transition frequency at f = 500 MHz I_C = 30 mA; V_{CE} = 5 V	f_T	typ.	5	GHz
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
Output voltage at d_{im} = −60 dB I_C = 30 mA; V_{CE} = 8 V; R_L = 75 Ω; T_{amb} = 25 °C $f_{(p+q-r)}$ = 793.25 MHz	V_o	typ.	425	mV

MECHANICAL DATA

Dimensions in mm

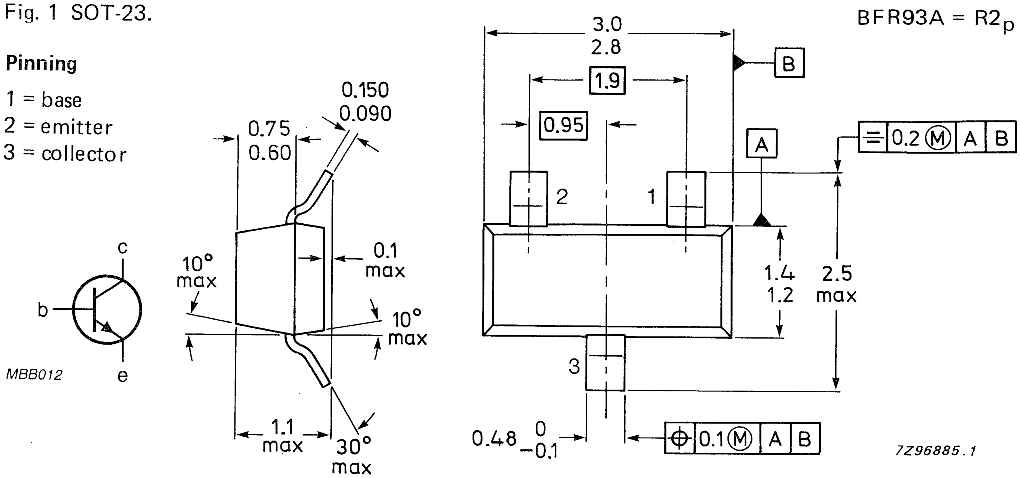
Fig. 1 SOT-23.

Marking code

BFR93A = $R2_p$

Pinning

1 = base
2 = emitter
3 = collector



TOP VIEW

* If required, the R-version (reverse pinning) is available on request
TO92 version is also available on request: ref. ON 4186

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 (DC)	I_C	max.	35	mA
Total power dissipation up to T_{amb} = 25 °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*	$R_{th\ j\text{-}a}$	=	430	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
DC current gain▲ $I_C = 30$ mA; $V_{CE} = 5$ V	h_{FE}	min. typ.	40 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_{12} assumed to be zero)
See Figs 10 to 15

$$G_{UM}\ (\text{in dB}) = 10 \log \frac{|s_{21}|^2}{[1-|s_{11}|^2]\ [1-|s_{22}|^2]}$$

$I_C = 30$ mA; $V_{CE} = 8$ V; f = 800 MHz; $T_{amb} = 25$ °C	G_{UM}	typ.	14	dB

▲ Measured under pulse conditions.
* 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 15)*
(DIN 45004B, par. 6.3: 3-tone)
I_C = 30 mA; V_{CE} = 8 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. 425 mV

Second harmonic distortion (see Figs 2 and 16)*
I_C = 30 mA; V_{CE} = 8 V; R_L = 75 Ω; 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

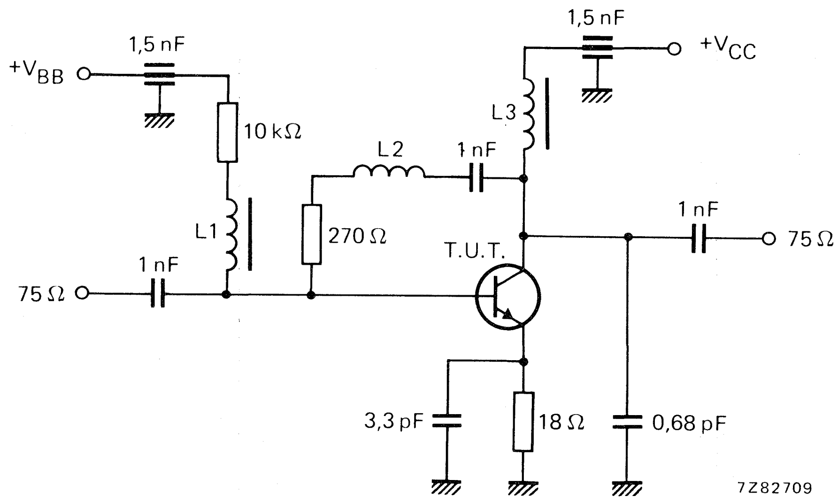


Fig. 2 Intermodulation distortion and second harmonic distortion MATV test circuit.

L1 = L3 = 5 μH 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_{11}	s_{12}	s_{21}	s_{22}
		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°
5	2	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°
		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°
5	5	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°
		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°
5	10	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°
		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°
5	20	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°
		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°
5	30	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_{11}	s_{12}	s_{21}	s_{22}
		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°
8	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°
		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°
8	5	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°
		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°
8	10	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°
		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°
8	20	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°
		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°
8	30	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°

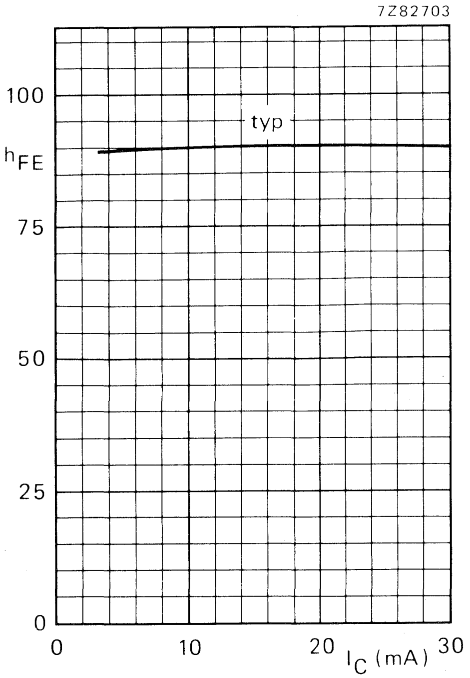


Fig. 3 V_{CE} = 5 V; T_j = 25 °C.

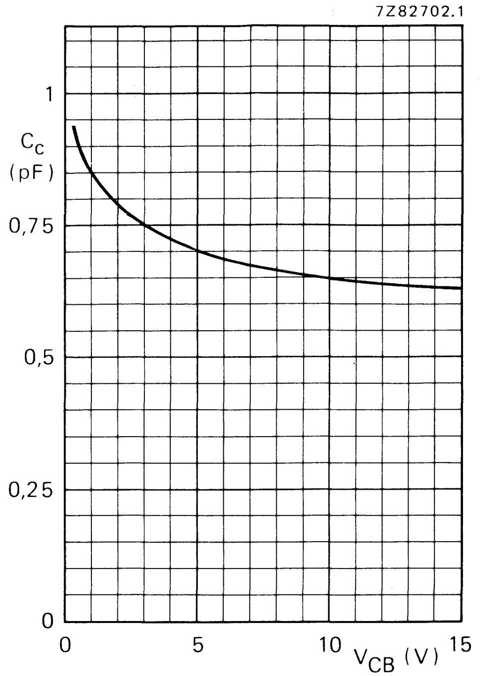


Fig. 4 Typical values collector capacitance
$I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

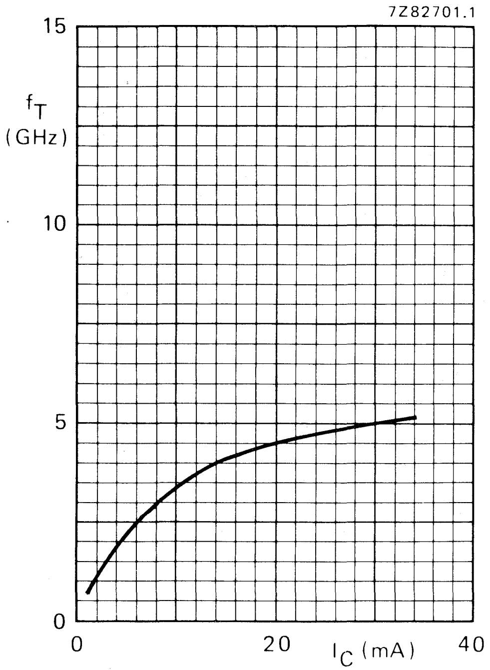


Fig. 5 Typical values transition frequency at V_{CE} = 5 V; f = 500 MHz; T_j = 25 °C.

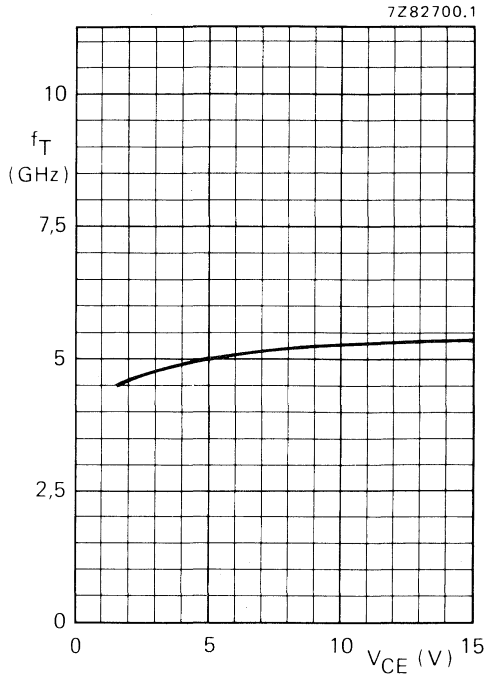


Fig. 6 Typical values transition frequency at I_C = 30 mA; f = 500 MHz; T_j = 25 °C.

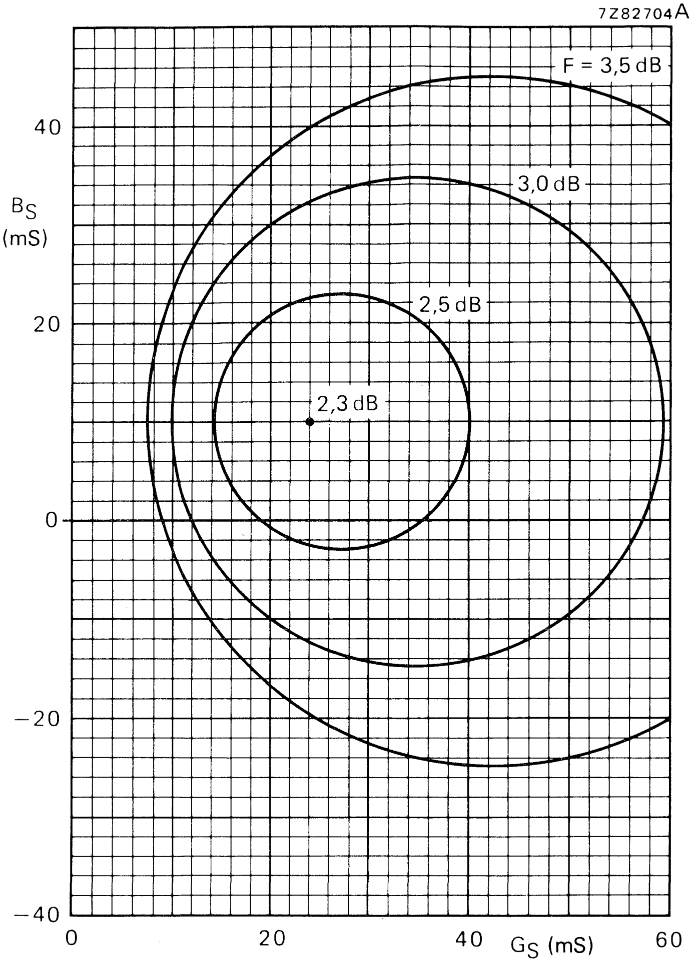


Fig. 7 Circles of constant noise figure.
V_{CE} = 8 V; I_C = 30 mA; f = 800 MHz;
T_{amb} = 25 °C; typical values.

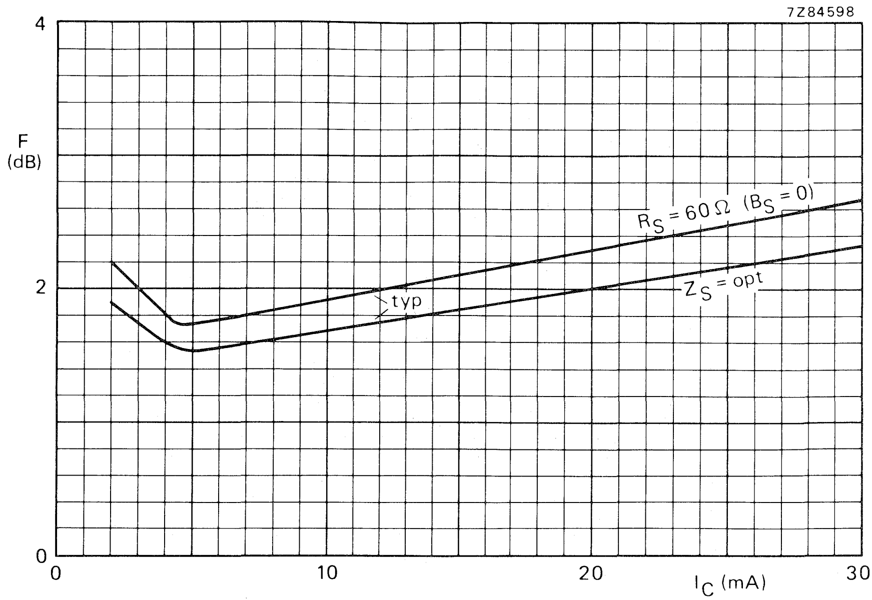


Fig. 8 V_{CE} = 8 V; f = 800 MHz; T_{amb} = 25 °C.

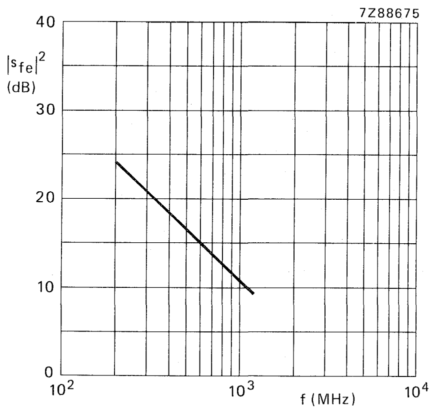


Fig. 9 Typical values forward transmission coefficient as a function of frequency. V_{CE} = 8 V; I_C = 30 mA; T_{amb} = 25 °C.

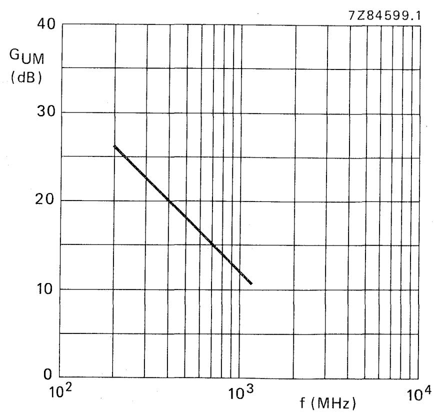


Fig. 10 Typical values unilateral power power gain as a function of frequency. V_{CE} = 8 V; I_C = 30 mA; T_{amb} = 25 °C.

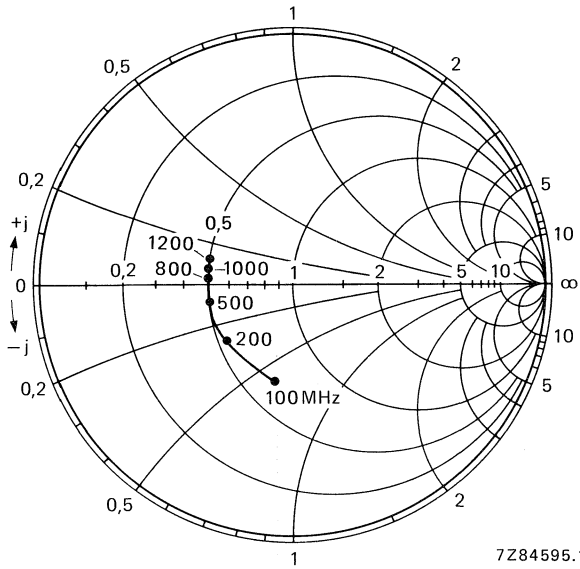


Fig. 11 Input impedance derived from input reflection coefficient s_{11} co-ordinates in ohm x 50.
V_{CE} = 8 V; I_C = 30 mA; T_{amb} = 25 °C.

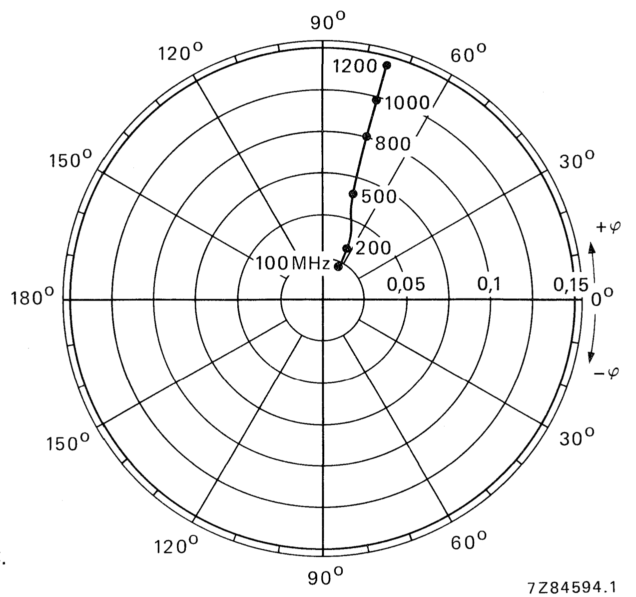


Fig. 12 Reverse transmission coefficient s_{12}
V_{CE} = 8 V; I_C = 30 mA; T_{amb} = 25 °C.

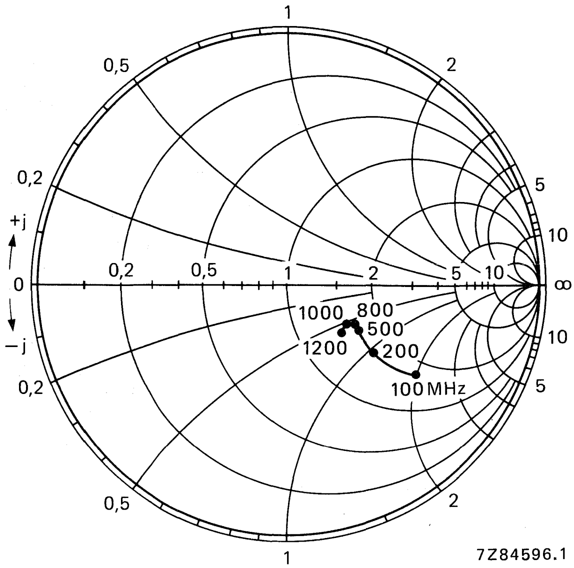


Fig. 13 Output impedance derived from output reflection coefficient s_{22} co-ordinates in ohm x 50.
V_{CE} = 8 V; I_C = 30 mA; T_{amb} = 25 °C.

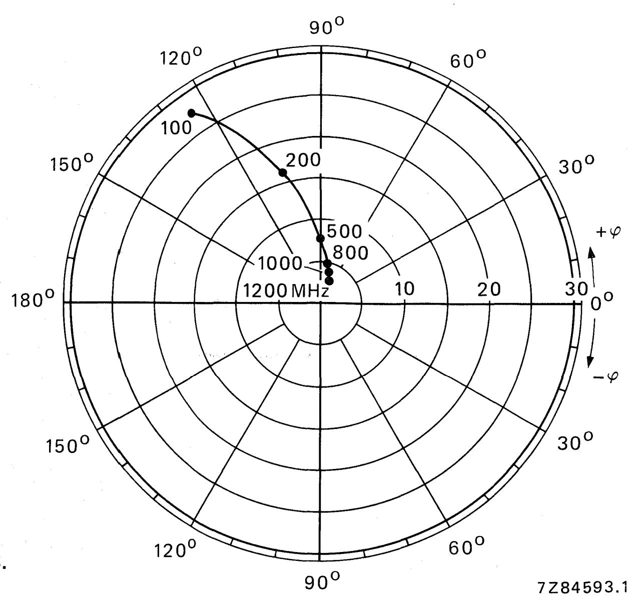


Fig. 14 Forward transmission coefficient s_{21}
V_{CE} = 8 V; I_C = 30 mA; T_{amb} = 25 °C.

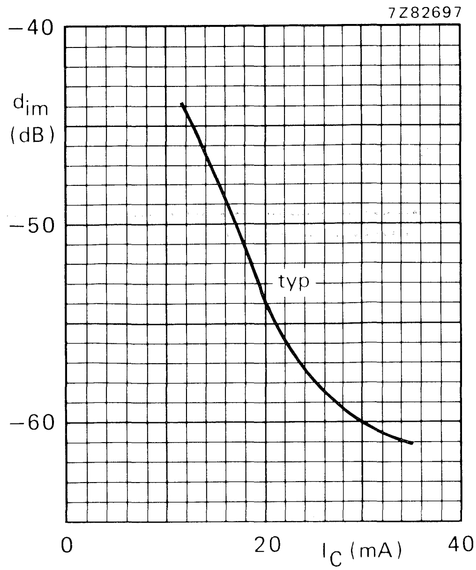


Fig. 15 V_{CE} = 8 V; V_o = 425 mV = 52,6 dBmV; $f_{(p+q-r)}$ = 793,25 MHz; T_{amb} = 25 °C; measured in MATV test circuit (see Fig. 2).

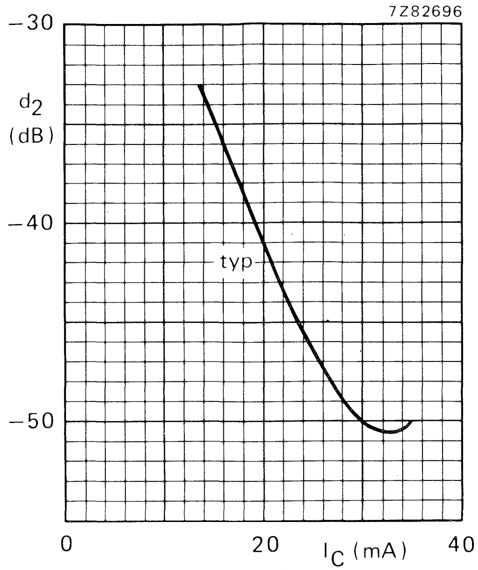


Fig. 16 V_{CE} = 8 V; V_o = 200 mV = 46 dBmV; $f_{(p+q)}$ = 810 MHz; T_{amb} = 25 °C; measured in MATV test circuit (see Fig. 2).

N-P-N 3.5 GHz 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 (DC)	I_C	max.	150	mA
Total power dissipation up to T_h = 145 °C; f > 1 MHz	P_{tot}	max.	3.5	W
Junction temperature	T_j	max.	200	°C
Transition frequency at f = 500 MHz I_C = 90 mA; V_{CE} = 20 V	f_T	typ.	3.5	GHz
Cross modulation distortion (channel 13) I_C = 90 mA; V_{CE} = 20 V; V_o = 48 dBmV	d_{cm}	typ. max.	−61 −57	dB dB
I_C = 90 mA; V_{CE} = 20 V; V_o = 32 dBmV	d_{cm}	typ. max.	−93 −89	dB dB
Intermodulation distortion at $f_{(p+q-r)}$ = 194.25 MHz I_C = 90 mA; V_{CE} = 20 V; V_o = 60 dBmV	d_{im}	typ.	−63	dB
Broadband power gain I_C = 90 mA; V_{CE} = 20 V	G_p	min. typ.	10 11	dB dB
Noise figure at f = 200 MHz I_C = 90 mA; V_{CE} = 20 V	F	typ. max.	8 10	dB dB
2nd harmonic distortion at $f_p + f_q$ = 210 MHz I_C = 90 mA; V_{CE} = 20 V; V_o = 48 dBmV	d_2	max.	−56	dB

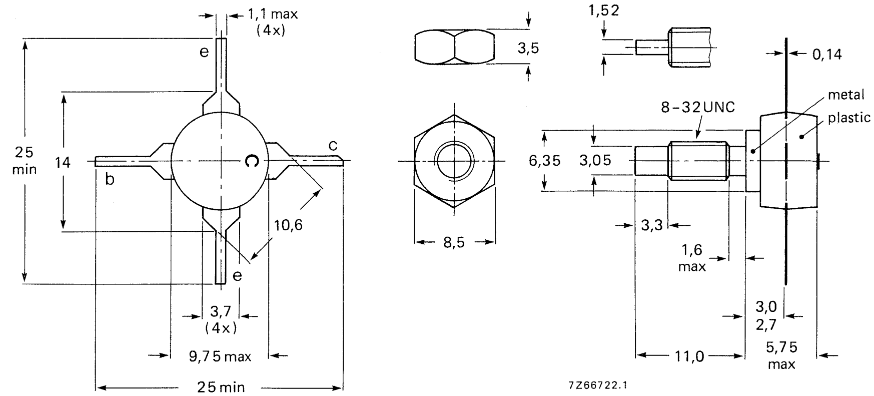
MECHANICAL DATA (see next page)

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	Diameter of clearance hole in heatsink: max. 4.17 mm.
		(7.5 kg cm)	Mounting hole to have no burrs at either end.
	max.	0.85 Nm	De-burring must leave surface flat; do not
		(8.5 kg cm)	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_{CBO}	max.	30	V
Collector-emitter voltage (R_{BE} = 10 Ω)	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 (DC)	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 °C	P_{tot}	max.	2.5	W
Total power dissipation up to T_h = 145 °C; f > 1 MHz	P_{tot}	max.	3.5	W
Storage temperature	T_{stg}	−65 to +	200	°C
Junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	15	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0.6	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current			
$I_E = 0$; V_{CB} = 20 V	I_{CBO}	max.	50 μA
DC current gain			
I_C = 50 mA; V_{CE} = 20 V	h_{FE}	min.	30
I_C = 150 mA; V_{CE} = 20 V	h_{FE}	min.	30
Transition frequency at f = 500 MHz			
I_C = 90 mA; V_{CE} = 20 V	f_T	typ.	3.5 GHz
I_C = 150 mA; V_{CE} = 20 V	f_T	typ.	3.5 GHz
Collector capacitance at f = 1 MHz			
$I_E = I_e = 0$; V_{CB} = 20 V	C_c	typ.	3.5 pF
Emitter capacitance at f = 1 MHz			
$I_C = I_c = 0$; V_{EB} = 0.5 V	C_e	typ.	12 pF
Feedback capacitance at f = 1 MHz			
I_C = 10 mA; V_{CE} = 20 V	C_{re}	typ.	1.3 pF
Collector-stud capacitance at f = 1 MHz	C_{cs}	typ.	2 pF
Noise figure at optimum source impedance			
I_C = 90 mA; V_{CE} = 20 V; f = 500 MHz; T_{amb} = 25 °C	F	typ.	5 dB
Maximum unilateral power gain (s_{12} assumed to be zero)			
$G_{UM} = 10 \log \frac{\lvert s_{21}\rvert^2}{[1-\lvert s_{11}\rvert^2]\,[1-\lvert s_{22}\rvert^2]}$			
I_C = 90 mA; V_{CE} = 20 V; f = 500 MHz; T_{amb} = 25 °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 MHz
measured at $f_{(p+q-r)}$ = 493.25 MHz — V_o typ. 700 mV

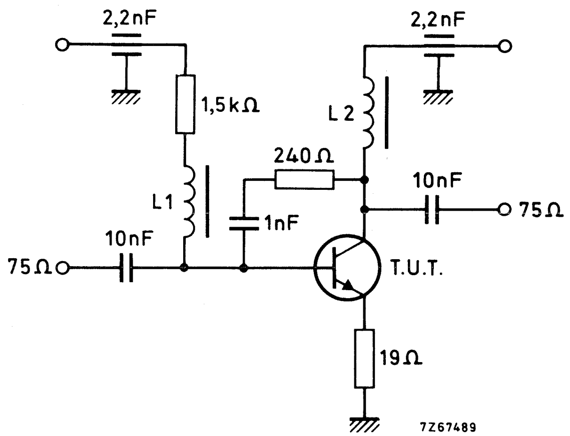


Fig. 2 MATV test circuit.

L1 = L2 = 5 μH Ferroxcube coil (code number: 3122 108 20153)

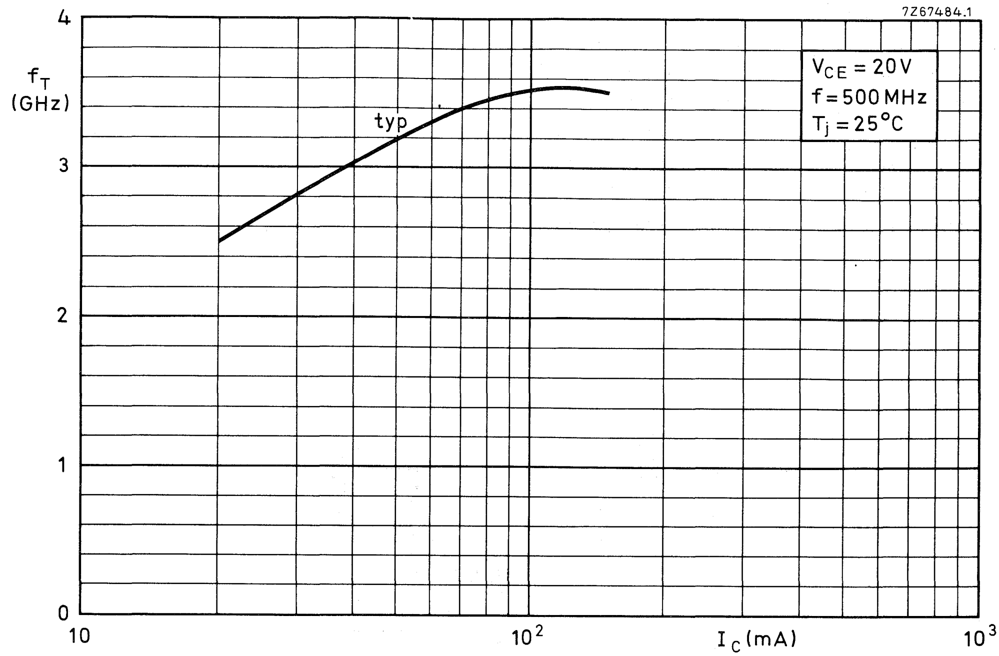


Fig. 3 V_{CE} = 20 V; f = 500 MHz; T_j = 25 °C; typical values.

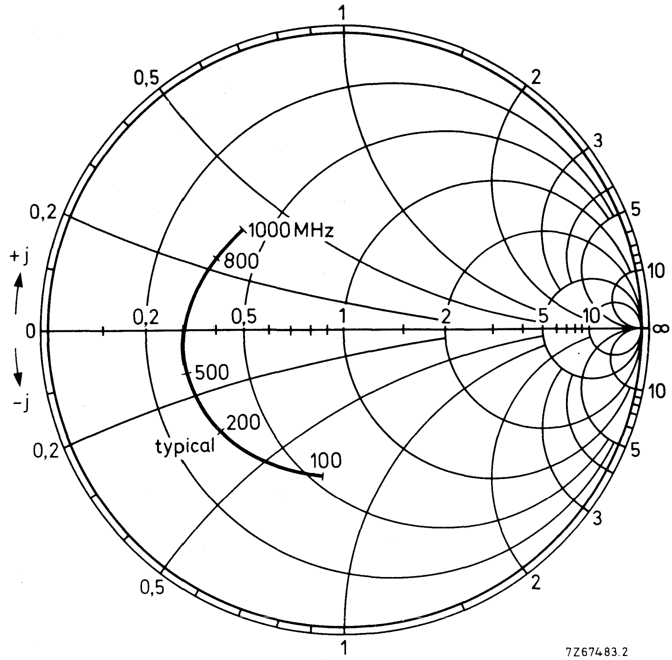


Fig. 4 V_{CE} = 20 V; I_C = 90 mA;
T_{amb} = 25 °C; typical values.

Input reflection coefficient s_{11}

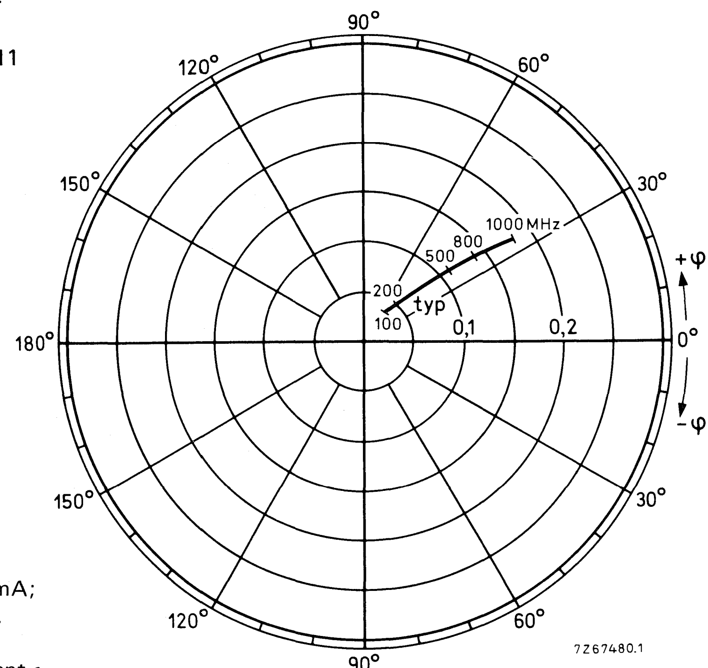


Fig. 5 V_{CE} = 20 V; I_C = 90 mA;
T_{amb} = 25 °C; typical values.

Reverse transmission coefficient s_{12}

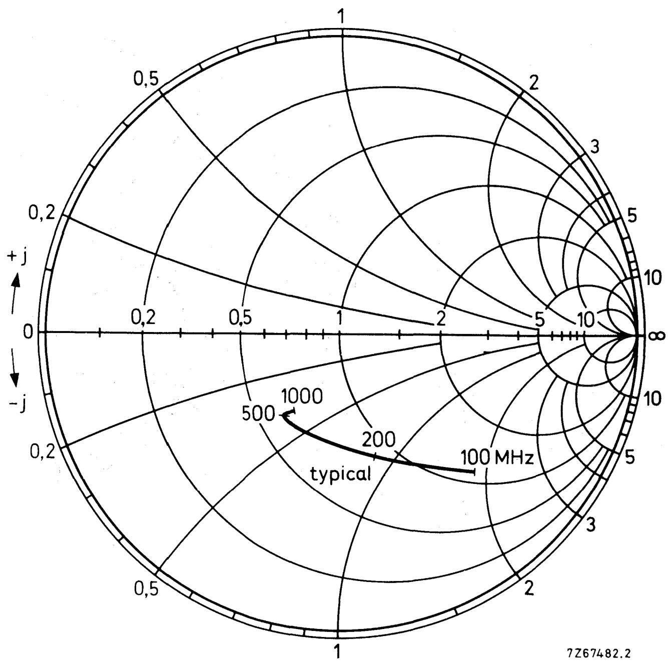


Fig. 6 V_{CE} = 20 V; I_C = 90 mA; T_{amb} = 25 °C; typical values.

Output reflection coefficient s_{22}

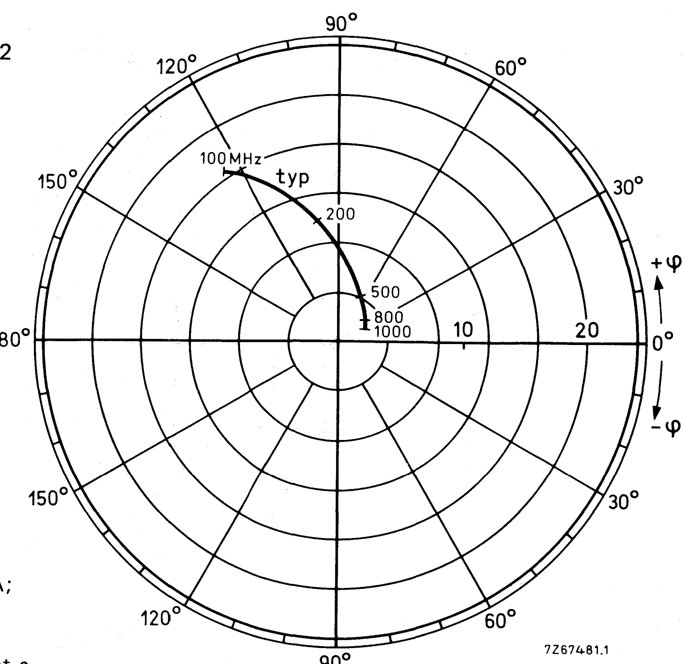


Fig. 7 V_{CE} = 20 V; I_C = 90 mA; T_{amb} = 25 °C; typical values.

Forward transmission coefficient s_{21}

APPLICATION INFORMATION

T_{amb} = 25 °C unless otherwise specified

Cross modulation distortion (channel 13)*			
I_C = 90 mA; V_{CE} = 20 V; V_o = 48 dBmV	d_{cm}	typ. max.	−61 dB −57 dB
I_C = 90 mA; V_{CE} = 20 V; V_o = 32 dBmV	d_{cm}	typ. max.	−93 dB −89 dB
Intermodulation distortion I_C = 90 mA; V_{CE} = 20 V; R_L = 75 Ω V_p = V_o = 60 dBmV at f_p = 196.25 MHz V_q = V_o −6 dB at f_q = 203.25 MHz V_r = V_o −6 dB at f_r = 205.25 MHz Measured at $f_{(p+q-r)}$ = 194.25 MHz	d_{im}	typ.	−63 dB
Power gain I_C = 90 mA; V_{CE} = 20 V	G_p	min. typ.	10 dB 11 dB
Noise figure I_C = 90 mA; V_{CE} = 20 V; f = 200 MHz	F	typ. max.	8 dB 10 dB
2nd harmonic distortion I_C = 90 mA; V_{CE} = 20 V f_p = 66 MHz; f_q = 144 MHz; $f_p + f_q$ = 210 MHz; V_o = 48 dBmV	d_2	max.	−56 dB

* In 12-channel measuring equipment; channel 13 unmodulated.
V_o = output level/signal, according to NCTA measuring standard.

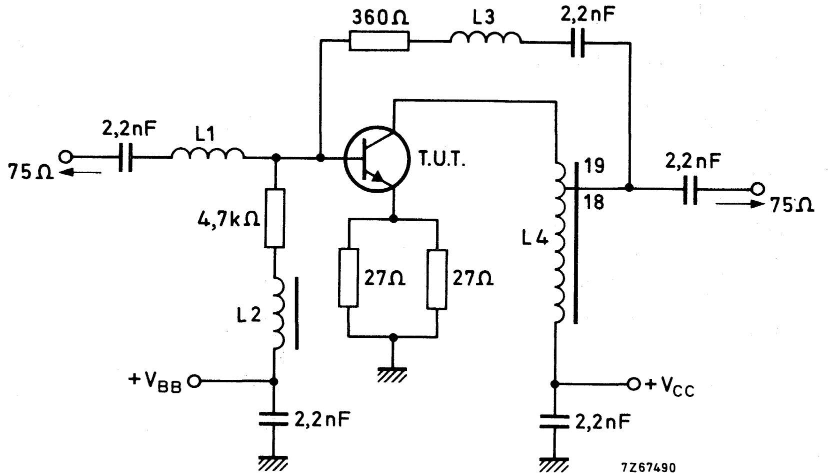


Fig. 8 CATV test circuit.

Frequency range 40 to 300 MHz (flatness gain ± 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 μH 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)

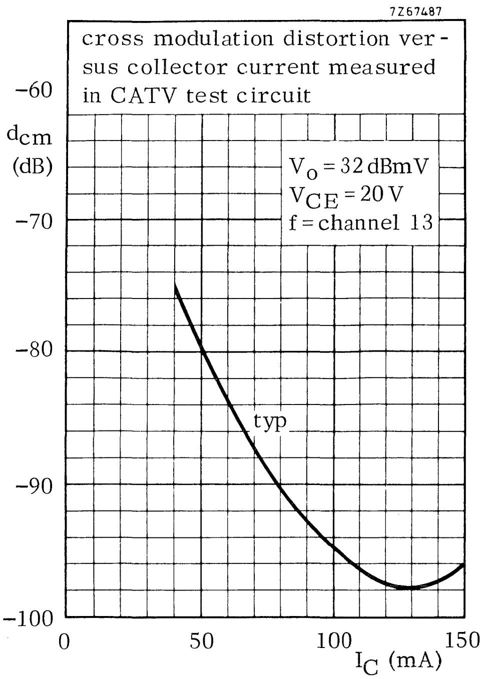


Fig. 9 V_o = 32 dBmV; V_{CE} = 20 V; f = ch. 13; typical values.

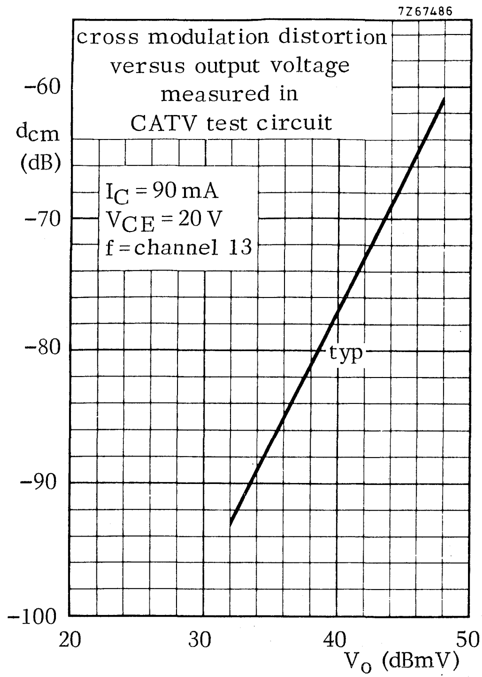


Fig. 10 V_{CE} = 20 V; I_C = 90 mA; f = ch. 13; typical values.

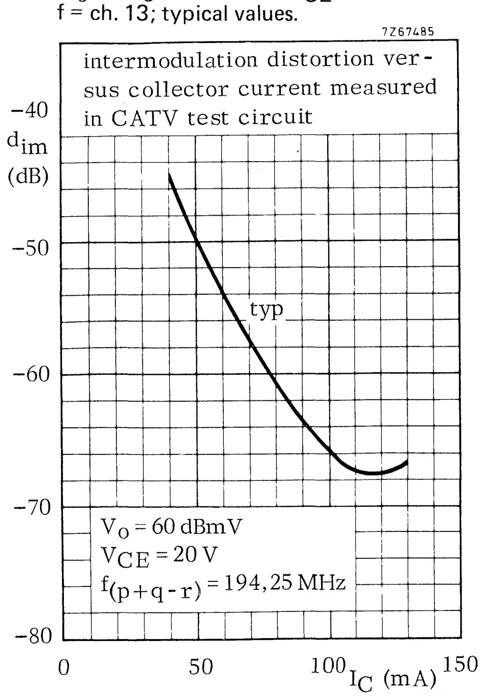


Fig. 11 V_{CE} = 20 V; V_o = 60 dBmV; $f_{(p+q-r)}$ = 194.25 MHz; typical values.

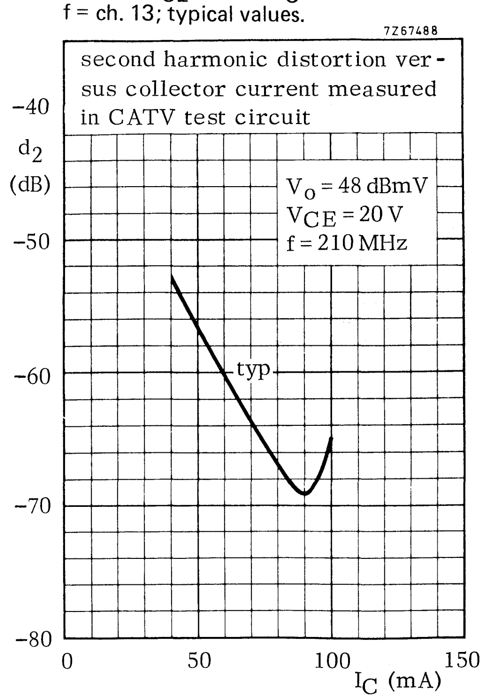


Fig. 12 V_{CE} = 20 V; V_o = 48 dBmV; f = 210 MHz; typical values.

N-P-N 3.5 GHz 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 (DC)	I_C	max.	150	mA
Total power dissipation up to T_{mb} = 125 °C	P_{tot}	max.	1.5	W
Junction temperature	T_j	max.	200	°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 −57	dB dB
I_C = 80 mA; V_{CE} = 18 V; V_o = 32 dBmV	d_{cm}	typ. max.	−93 −89	dB 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 9	dB dB
Noise figure at f = 200 MHz I_C = 80 mA; V_{CE} = 18 V	F	typ. max.	9 10	dB 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

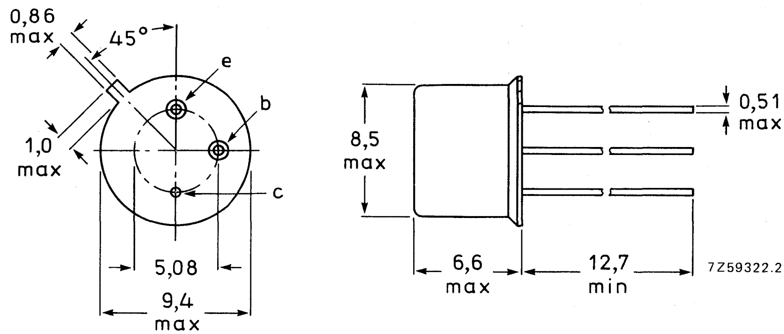
MECHANICAL DATA (see next page)

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-39

Collector connected to case



Maximum lead diameter guaranteed only for 12.7 mm.

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 Ω) 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 (DC)	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 °C	P_{tot}	max.	0.7	W
up to T_{mb} = 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	$R_{th\ j\text{-}a}$	=	250	K/W
From junction to mounting base	$R_{th\ j\text{-}mb}$	=	50	K/W

Notes

1. At I_C = 100 μA.
2. At I_C = 10 mA.
3. At I_E = 100 μA.

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current			
$I_E = 0$; $V_{CB} = 20$ V	I_{CBO}	max.	50 μA
DC current gain			
I_C = 50 mA; V_{CE} = 20 V	h_{FE}	min.	30
I_C = 150 mA; V_{CE} = 20 V	h_{FE}	min.	30
Transition frequency at f = 500 MHz			
I_C = 80 mA; V_{CE} = 20 V	f_T	typ.	3.5 GHz
I_C = 150 mA; V_{CE} = 20 V	f_T	typ.	3.5 GHz
Collector capacitance at f = 1 MHz			
$I_E = I_e = 0$; V_{CB} = 20 V	C_c	typ.	3.5 pF
Feedback capacitance at f = 1 MHz			
I_C = 10 mA; V_{CE} = 20 V	C_{re}	typ.	1.6 pF

APPLICATION INFORMATION

Measuring conditions: I_C = 80 mA; V_{CE} = 18 V; T_{amb} = 25 °C

Cross modulation (channel 13) (note)			
V_o = 48 dBmV	d_{cm}	typ. max.	−61 dB −57 dB
V_o = 32 dBmV	d_{cm}	typ. max.	−93 dB −89 dB
Intermodulation distortion			
$V_p = V_o$ = 60 dBmV at f_p = 196.25 MHz $V_q = V_o$ −6 dB at f_q = 203.25 MHz $V_r = V_o$ −6 dB at f_r = 205.25 MHz			
Measured at $f_{(p+q-r)}$ = 194.25 MHz	d_{im}	typ.	−64 dB
Power gain	G_p	min. typ.	8 dB 9 dB
Noise figure at f = 200 MHz	F	typ. max.	9 dB 10 dB
2nd harmonic distortion at $f_{(p+q)}$ = 210 MHz f_p = 66 MHz; f_q = 144 MHz; V_o = 48 dBmV	d_2	typ. max.	−62 dB −56 dB

Note

In 12-channel measuring equipment; channel 13 unmodulated.
V_o = output level/signal, in accordance with NCTA measuring standard.

APPLICATION INFORMATION

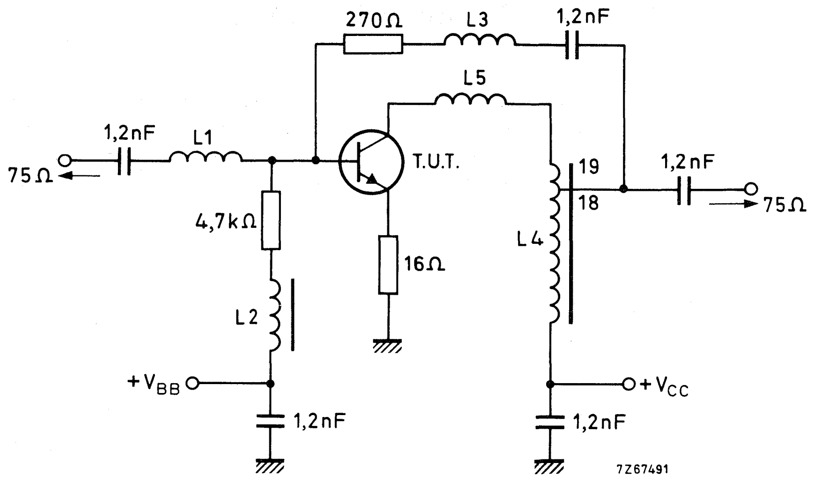


Fig. 2 CATV test circuit.
Frequency range 40 to 300 MHz
Power gain G_p typ. 9 dB

L1 = 2 turns closely wound enamelled Cu wire (0.7 mm); int. dia. 3 mm
L2 = 5 μH 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 5 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 °C	P_{tot}	max.	500	mW
Junction temperature	T_j	max.	175	°C
Transition frequency at f = 500 MHz I_C = 50 mA; V_{CE} = 10 V	f_T	typ.	5,0	GHz
Feedback capacitance at f = 1 MHz I_C = 10 mA; V_{CE} = 10 V	C_{re}	max.	1,4	pF
Noise figure at optimum source impedance I_C = 50 mA; V_{CE} = 10 V; f = 500 MHz	F	typ.	3,3	dB
Maximum unilateral power gain I_C = 50 mA; V_{CE} = 10 V; f = 500 MHz	G_{UM}	typ.	15,2	dB
Output voltage at d_{im} = –60 dB I_C = 50 mA; V_{CE} = 10 V; R_L = 75 Ω $f_{(p+q-r)}$ = 493,25 MHz	V_o	typ.	500	mV

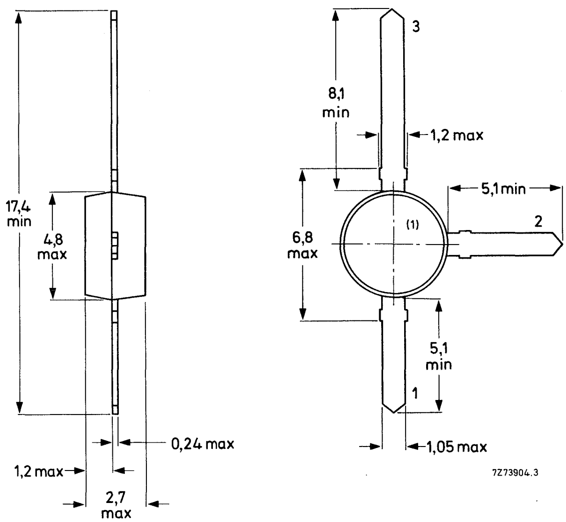
MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-37.

Connections

1. Base
2. Emitter
3. Collector



(1) = type number marking.

* TO92 version is available on request: ON4487.

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	P_{tot}	max.	500	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 fibre-glass print	$R_{th\ j-a}$	=	230	K/W
From junction to soldering point	$R_{th\ j-s}$	=	45	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current				
$I_E = 0$; V_{CB} = 10 V	I_{CBO}	max.	100	nA
D.C. current gain				
I_C = 50 mA; V_{CE} = 10 V	h_{FE}	min.	25	
		typ.	50	
I_C = 75 mA; V_{CE} = 10 V	h_{FE}	min.	25	
		typ.	52	
Transition frequency at f = 500 MHz				
I_C = 50 mA; V_{CE} = 10 V	f_T	min.	4,0	GHz
		typ.	5,0	GHz
I_C = 75 mA; V_{CE} = 10 V	f_T	min.	4,4	GHz
		typ.	5,5	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.	6,5	pF
Feedback capacitance at f = 1 MHz				
I_C = 10 mA; V_{CE} = 10 V; T_{amb} = 25 °C	C_{re}	typ.	1,0	pF
		max.	1,4	pF
Noise figure at optimum source impedance				
I_C = 50 mA; V_{CE} = 10 V; f = 500 MHz; T_{amb} = 25 °C	F	typ.	3,3	dB
I_C = 50 mA; V_{CE} = 10 V; f = 800 MHz; T_{amb} = 25 °C	F	typ.	3,8	dB
Maximum unilateral power gain (s_{12} assumed to be zero)				
$G_{UM} = 10 \log \frac{\lvert s_{21}\rvert^2}{[1-\lvert s_{11}\rvert^2]\,[1-\lvert s_{22}\rvert^2]}$				
I_C = 50 mA; V_{CE} = 10 V; f = 500 MHz; T_{amb} = 25 °C	G_{UM}	typ.	15,2	dB
I_C = 50 mA; V_{CE} = 10 V; f = 800 MHz; T_{amb} = 25 °C	G_{UM}	typ.	11,5	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 = 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

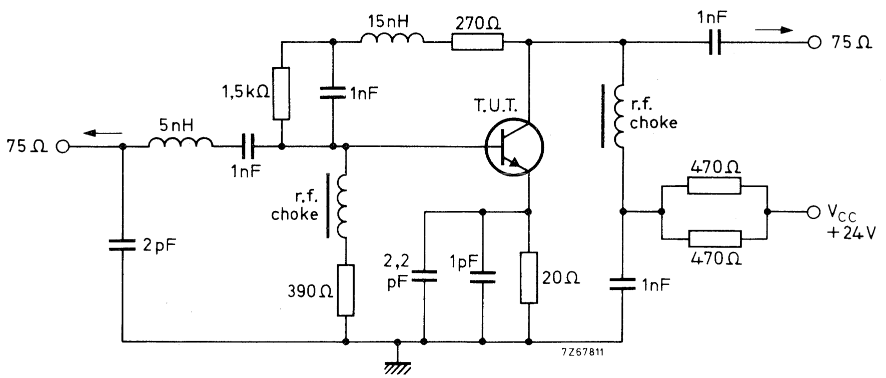


Fig.2 Intermodulation test circuit.

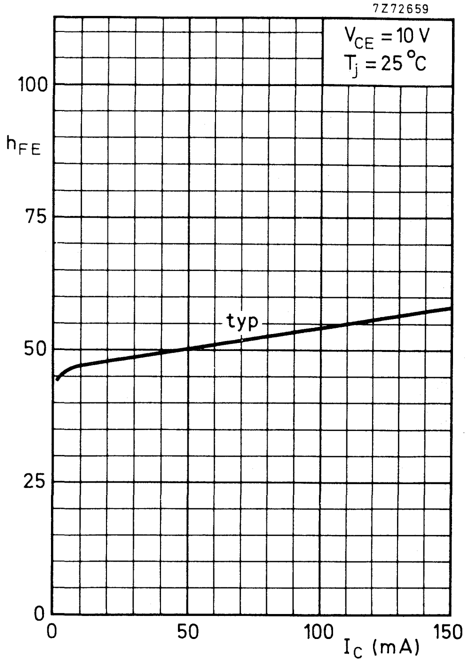


Fig.3 V_{CE} = 10 V; T_j = 25 °C; typ. values.

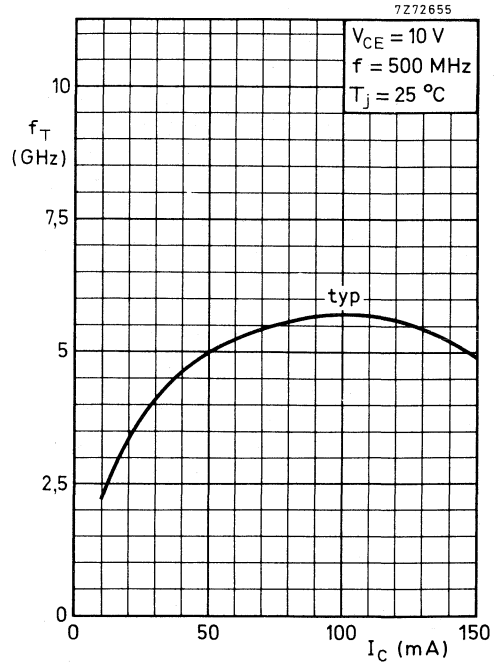


Fig.4 V_{CE} = 10 V; f = 500 MHz; T_j = 25 °C; typical values.

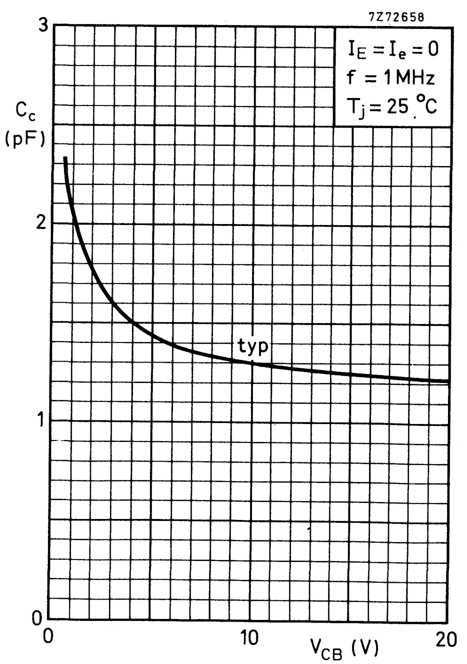


Fig.5 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C; typical values.

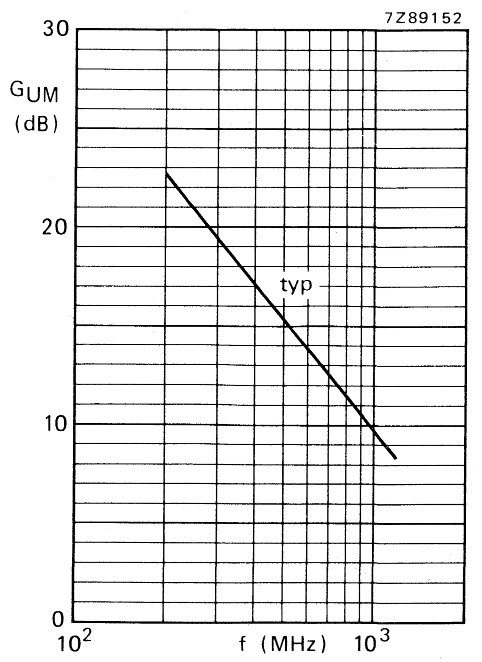


Fig.6 V_{CE} = 10 V; I_C = 50 mA; T_{amb} = 25 °C; typical values.

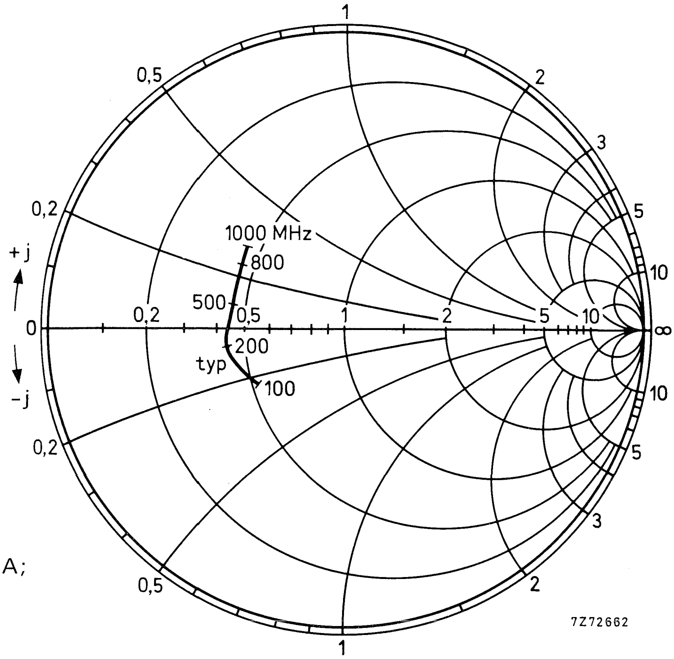


Fig.7 V_{CE} = 10 V; I_C = 50 mA; T_{amb} = 25 °C; typical values.

Input impedance derived from input reflection coefficient s_{11} co-ordinates in ohm x 50

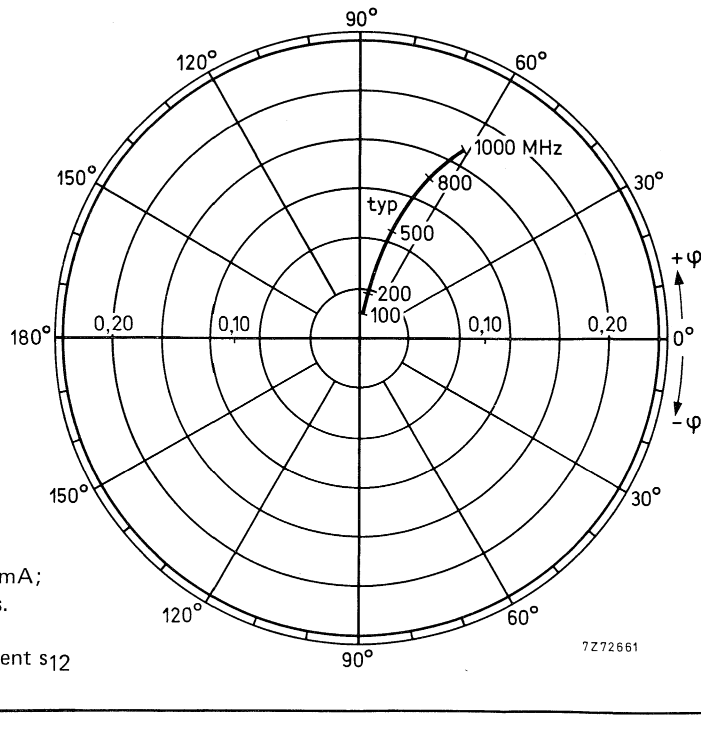


Fig.8 V_{CE} = 10 V; I_C = 50 mA; T_{amb} = 25 °C; typical values.

Reverse transmission coefficient s_{12}

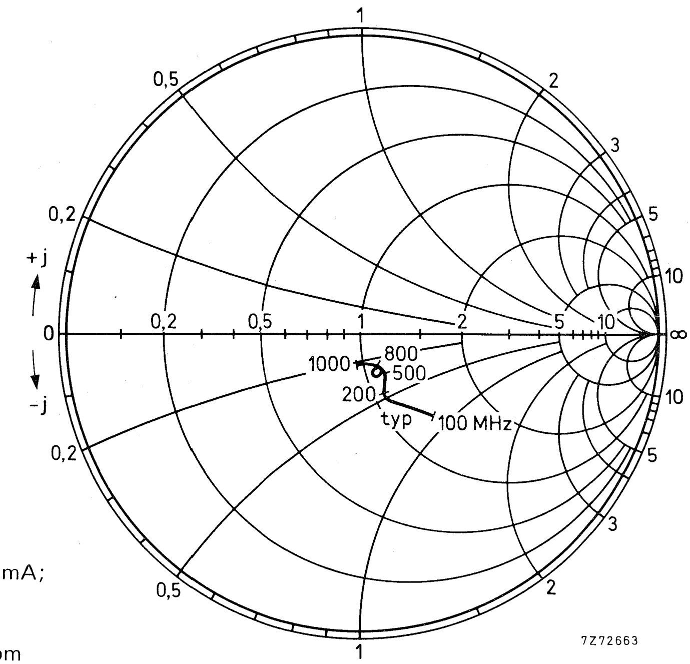


Fig.9 V_{CE} = 10 V; I_C = 50 mA; T_{amb} = 25 °C; typical values.

Output impedance derived from output reflection coefficient s_{22} co-ordinates in ohm x 50

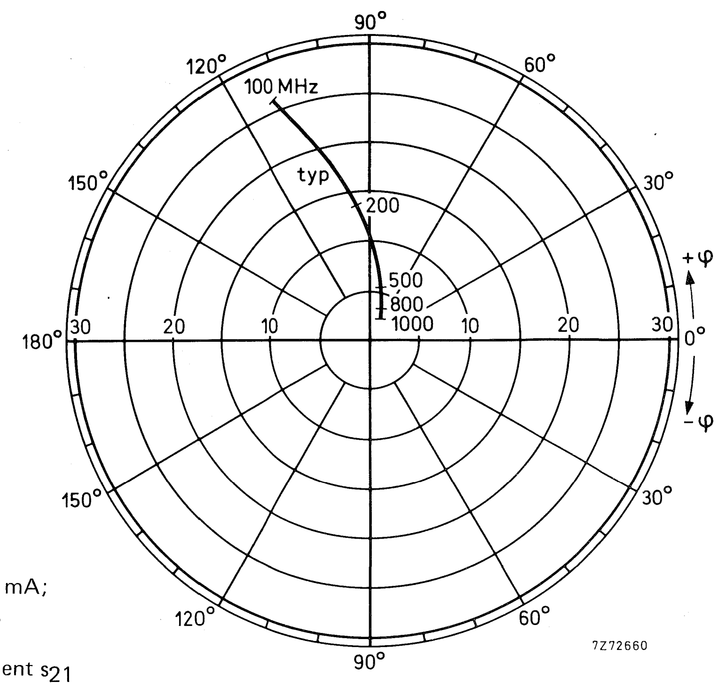


Fig.10 V_{CE} = 10 V; I_C = 50 mA; T_{amb} = 25 °C; typical values.

Forward transmission coefficient s_{21}

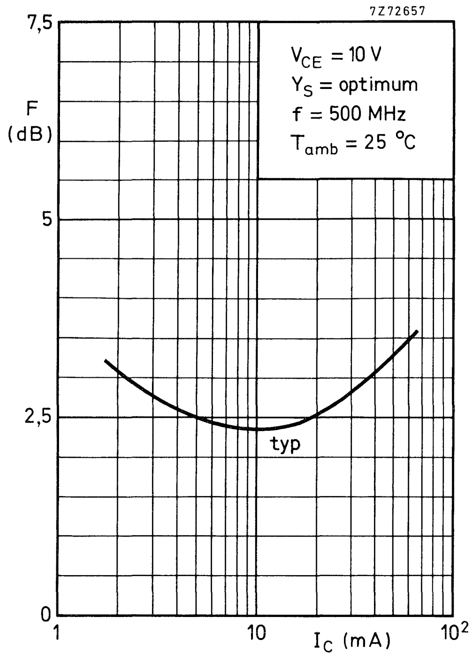


Fig.11 V_{CE} = 10 V; f = 500 MHz; Y_S = optimum; T_{amb} = 25 °C; typical values.

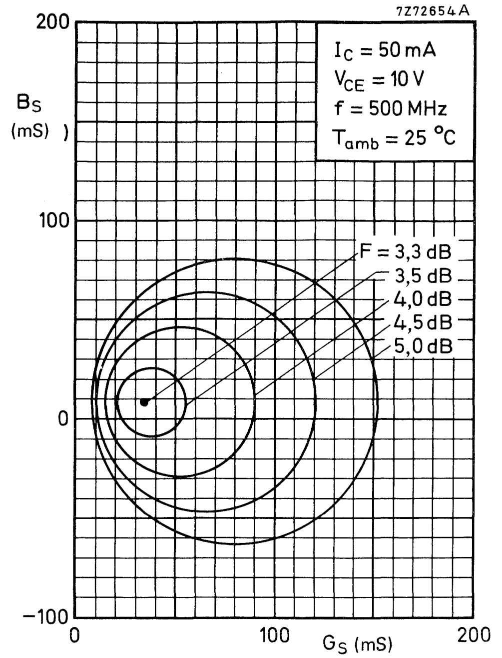


Fig.12 Circles of constant noise figure. I_C = 50 mA; V_{CE} = 10 V; f = 500 MHz; T_{amb} = 25 °C; typical values.

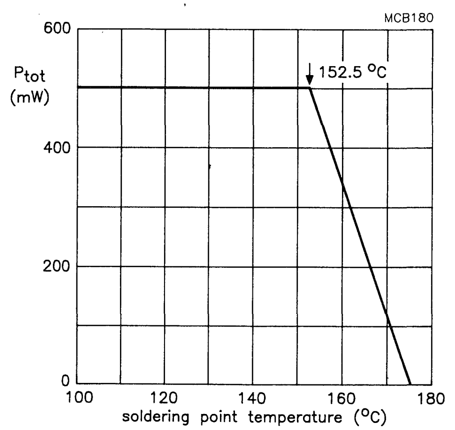


Fig.13 Power derating curve.

N-P-N 5 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 °C	P_{tot}	max.	700	mW
Junction temperature	T_j	max.	175	°C
Transition frequency at f = 500 MHz I_C = 70 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.	1,0	pF
Noise figure at optimum source impedance I_C = 70 mA; V_{CE} = 10 V; f = 800 MHz	F	typ.	4,0	dB
Maximum unilateral power gain I_C = 70 mA; V_{CE} = 10 V; f = 800 MHz	G_{UM}	typ.	11,5	dB
Output voltage at d_{im} = −60 dB (see Fig. 3) I_C = 70 mA; V_{CE} = 10 V; R_L = 75 Ω $f_{(p+q-r)}$ = 793,25 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

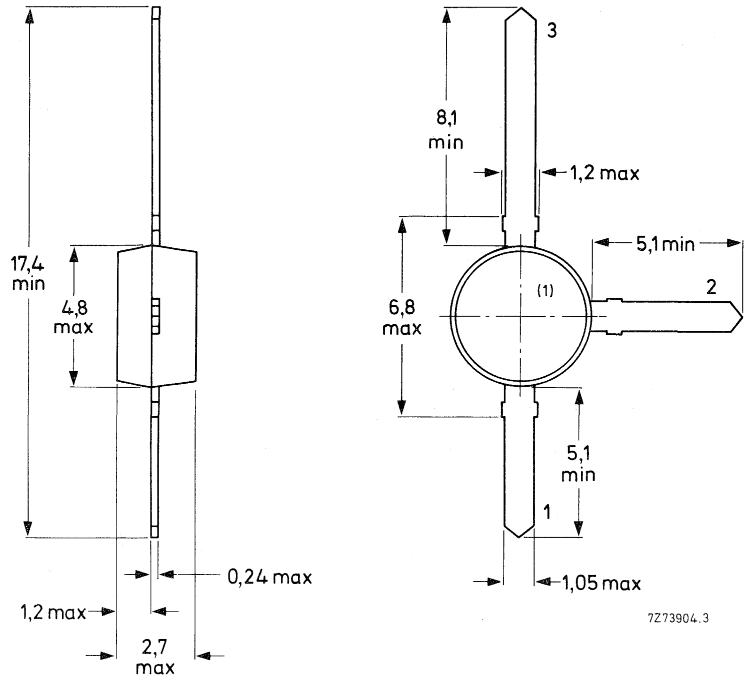
SOT-37 (see Fig. 1).

MECHANICAL DATA

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 °C	P_{tot}	max.	700	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 fibre-glass print	$R_{th\ j\text{-}a}$	=	150	K/W
From junction to soldering point	$R_{th\ j\text{-}s}$	=	45	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current $I_E = 0$; $V_{CB} = 10$ V	I_{CBO}	max.	100	nA
D.C. current gain $I_C = 70$ mA; $V_{CE} = 10$ V	h_{FE}	min.	25	
Transition frequency at f = 500 MHz $I_C = 70$ 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.	1,5	pF
Emitter capacitance at f = 1 MHz $I_C = I_c = 0$; $V_{EB} = 0,5$ V	C_e	typ.	6,5	pF
Feedback capacitance at f = 1 MHz $I_C = 0$; $V_{CE} = 10$ V	C_{re}	typ.	1,0	pF
Noise figure at optimum source impedance $I_C = 70$ mA; $V_{CE} = 10$ V; f = 800 MHz; $T_{amb} = 25$ °C	F	typ.	4,0	dB
Maximum unilateral power gain (s_{12} assumed to be zero) $G_{UM} = 10 \log \frac{|s_{21}|^2}{[1-|s_{11}|^2]\,[1-|s_{22}|^2]}$ $I_C = 70$ mA; $V_{CE} = 10$ V; f = 800 MHz; $T_{amb} = 25$ °C	G_{UM}	typ.	11,5	dB

Output voltage at d_{im} = −60 dB (see Figs 2 and 4)
(DIN45004B, par. 6.3: 3-tone)
I_C = 70 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.	700 mV

Second harmonic distortion (see Figs 2 and 5)
I_C = 70 mA; V_{CE} = 10 V; R_L = 75 Ω; 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.2)
I_C = 70 mA; V_{CE} = 10 V
R_L = 75 Ω; T_{amb} = 25 °C

measured at f = 800 MHz	P_{L1}	typ.	+ 21 dBm

Third order intercept point (see Fig. 2)
I_C = 70 mA; V_{CE} = 10 V
R_L = 75 Ω; 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

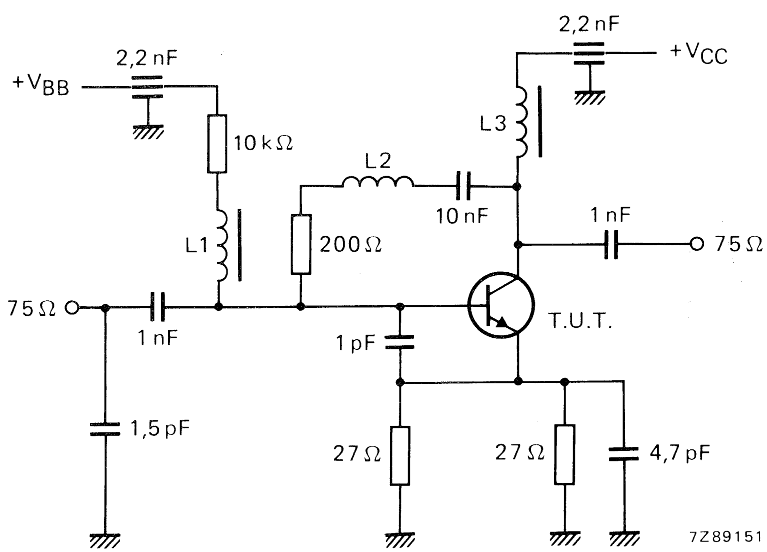


Fig.2 Intermodulation distortion and second harmonic distortion test circuit.

L1 = L3 = 5 μH micro choke
L2 = 1½ turns Cu wire (0,4 mm); internal diameter 3,0 mm; winding pitch 1 mm

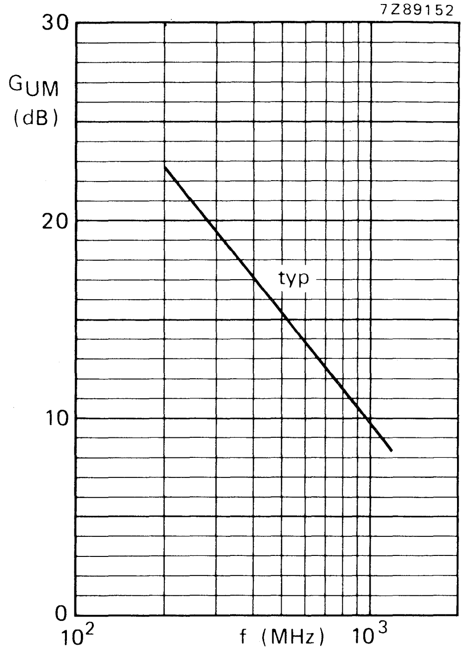


Fig.3 V_{CE} = 10 V; I_C = 70 mA; T_{amb} = 25 °C; typical values.

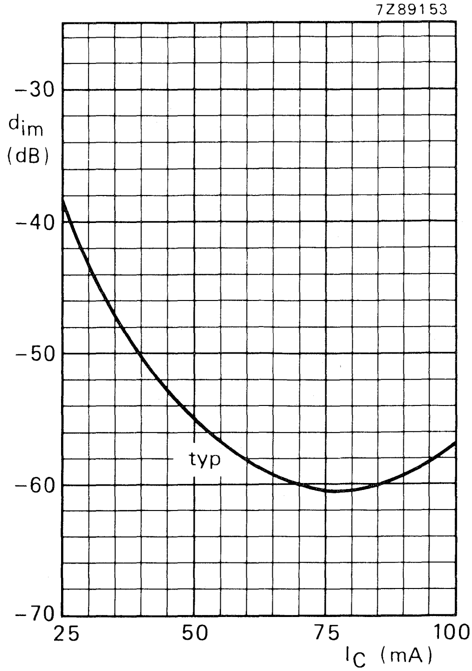


Fig.4.

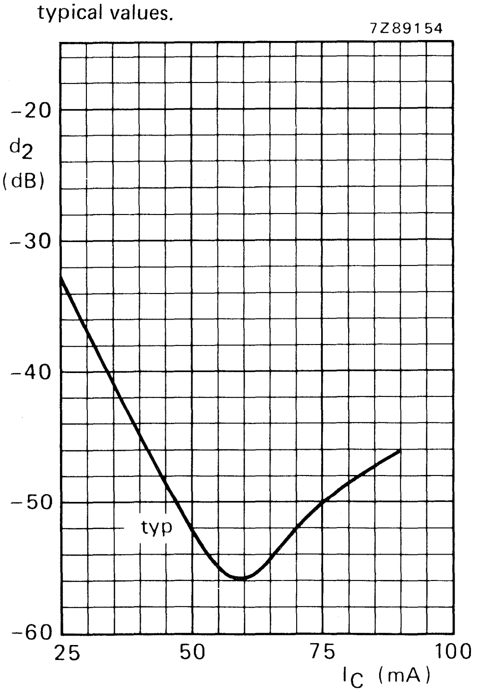


Fig.5.

Intermodulation distortion (Fig.4) and second harmonic distortion (Fig.5) are measured in circuit (see Fig.2).

Fig.4 V_{CE} = 10 V; V_o = 700 mV = 56,9 dBmV; $f_{(p+q-r)}$ = 793,25 MHz; T_{amb} = 25 °C; typ. values.

Fig.5 V_{CE} = 10 V; V_o = 316 mV = 50 dBmV; $f_{(p+q)}$ = 810 MHz; T_{amb} = 25 °C; typ. values.

s-parameters (common emitter) at V_{CE} = 5 V; T_{amb} = 25 °C; typical values.

I_C mA	f MHz	s_{11}	s_{12}	s_{21}	s_{22}	G_{UM} dB
5	40	0,75/ −41,5°	0,026/+69,1°	15,1/+155,2°	0,93/ −17,4°	35,9
	200	0,62/−128,1°	0,064/+41,9°	7,1/+106,9°	0,53/ −43,3°	20,6
	500	0,55/−174,6°	0,087/+47,0°	3,2/ +79,8°	0,40/ −53,2°	12,4
	800	0,56/+158,7°	0,115/+56,5°	2,1/ +65,0°	0,39/ −63,2°	8,8
	1000	0,58/+146,7°	0,135/+59,2°	1,7/ +56,6°	0,39/ −72,5°	7,1
	1200	0,61/+135,5°	0,159/+61,7°	1,4/ +48,9°	0,39/ −83,0°	5,7
10	40	0,60/ −59,1°	0,022/+64,1°	24,3/+147,2°	0,86/ −26,6°	35,5
	200	0,54/−146,1°	0,050/+49,4°	9,1/+100,7°	0,38/ −54,7°	21,4
	500	0,50/+175,8°	0,087/+59,3°	3,9/ +78,6°	0,27/ −62,8°	13,4
	800	0,52/+152,4°	0,129/+63,7°	2,5/ +65,8°	0,27/ −72,2°	9,7
	1000	0,53/+141,0°	0,157/+63,9°	2,1/ +58,0°	0,27/ −80,7°	8,2
	1200	0,56/+130,7°	0,186/+63,3°	1,7/ +51,2°	0,27/ −90,9°	6,6
30	40	0,39/−105,6°	0,015/+60,7°	39,6/+133,3°	0,69/ −44,1°	35,5
	200	0,44/−168,4°	0,041/+65,9°	11,1/ +94,3°	0,23/ −78,2°	22,1
	500	0,46/+165,1°	0,094/+70,3°	4,7/ +77,3°	0,16/ −88,4°	14,6
	800	0,48/+145,4°	0,146/+69,2°	3,0/ +66,5°	0,16/ −98,3°	10,8
	1000	0,51/+135,6°	0,175/+66,6°	2,5/ +60,1°	0,16/−109,3°	9,4
	1200	0,53/+126,2°	0,206/+64,2°	2,1/ +54,0°	0,17/−119,7°	8,0
50	40	0,37/−129,3°	0,013/+63,4°	44,6/+127,8°	0,62/ −51,4°	35,7
	200	0,43/−174,7°	0,040/+71,5°	11,5/ +92,5°	0,19/ −89,2°	22,7
	500	0,45/+162,4°	0,095/+72,7°	4,8/ +76,8°	0,14/−101,5°	14,7
	800	0,48/+143,4°	0,151/+70,1°	3,1/ +66,5°	0,14/−111,5°	11,1
	1000	0,50/+134,3°	0,182/+67,4°	2,5/ +60,4°	0,14/−121,5°	9,3
	1200	0,52/+124,9°	0,215/+64,8°	2,1/ +54,6°	0,15/−130,7°	7,9
70	40	0,38/−141,7°	0,011/+65,1°	46,9/+124,9°	0,57/ −55,8°	35,8
	200	0,43/−177,6°	0,040/+73,7°	11,6/ +91,6°	0,18/ −96,3°	22,3
	500	0,46/+161,2°	0,095/+73,9°	4,9/ +76,5°	0,13/−109,5°	14,9
	800	0,49/+143,1°	0,150/+70,6°	3,1/ +66,4°	0,13/−120,7°	11,1
	1000	0,49/+133,5°	0,186/+67,7°	2,5/ +60,2°	0,14/−126,2°	9,2
	1200	0,52/+124,1°	0,218/+65,0°	2,1/ +54,6°	0,15/−135,3°	7,9

s-parameters (common emitter) at V_{CE} = 10 V; T_{amb} = 25 °C; typical values.

I_C mA	f MHz	s_{11}	s_{12}	s_{21}	s_{22}	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 6 and 7:
V_{CE} = 10 V; I_C = 70 mA;
T_{amb} = 25 °C; typical values.

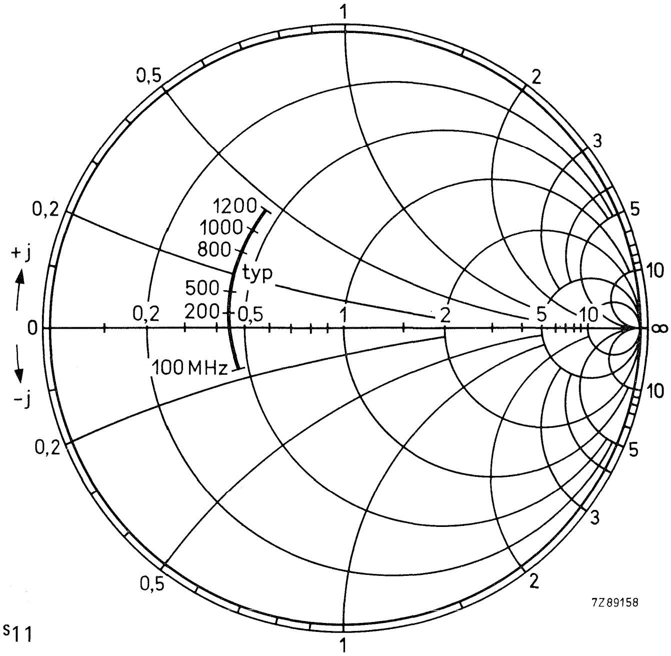


Fig.6 Input impedance derived from input reflection coefficient s_{11} co-ordinates in ohm x 50.

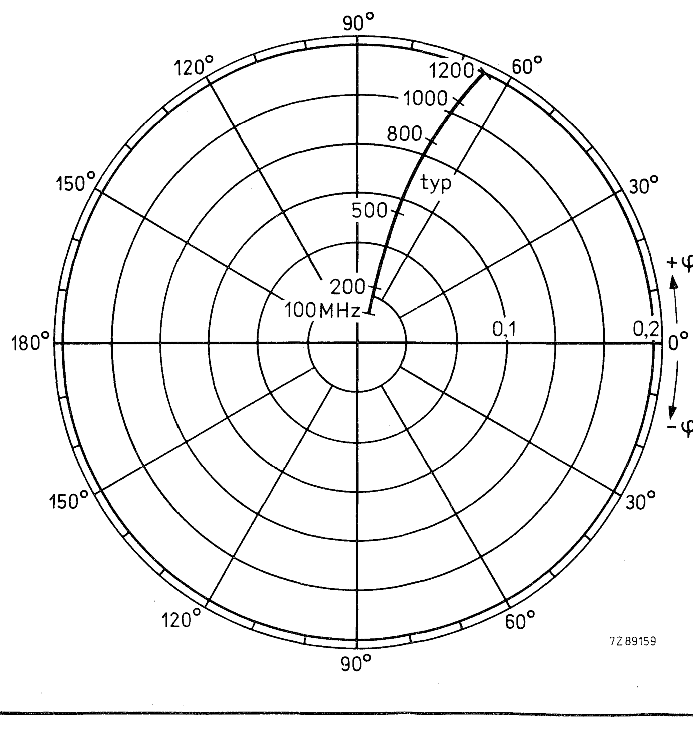


Fig.7 Reverse transmission coefficient s_{12}.

Conditions for Figs 8 and 9:
V_{CE} = 10 V; I_C = 70 mA;
T_{amb} = 25 °C; typical values.

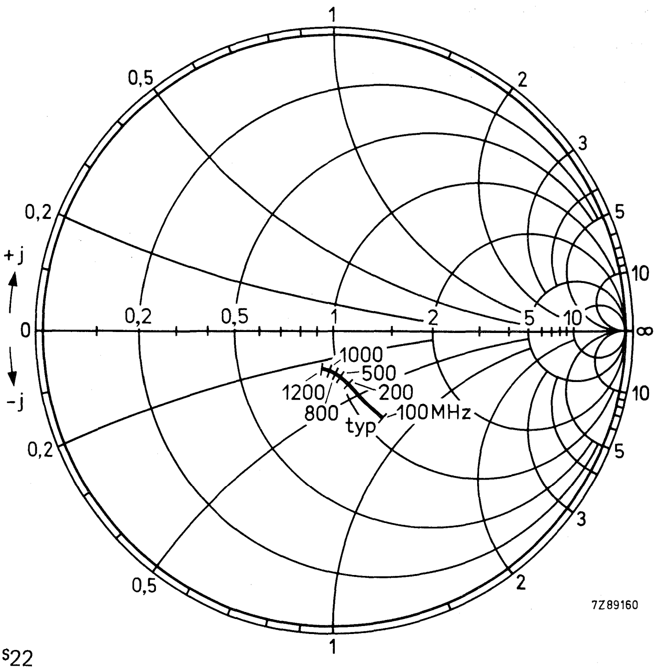


Fig.8 Output impedance derived from output reflection coefficient s_{22} co-ordinates in ohm x 50.

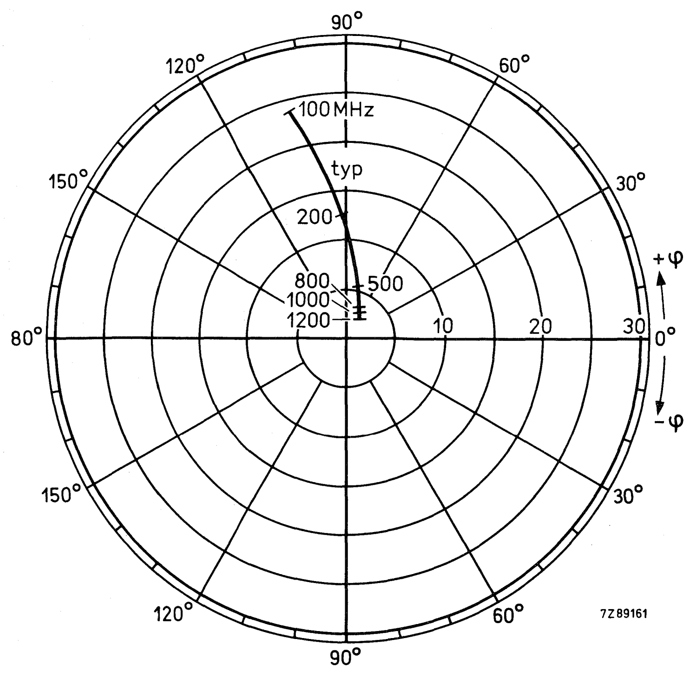


Fig.9 Forward transmission coefficient s_{21}.

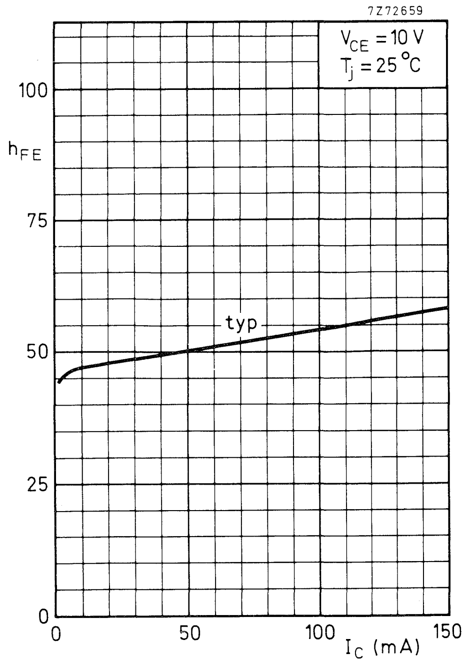


Fig.10 V_{CE} = 10 V; T_j = 25 °C; typical values.

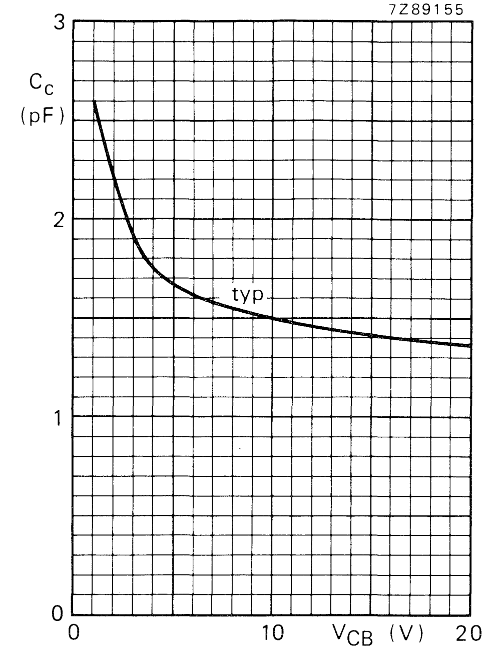


Fig.11 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C; typical values.

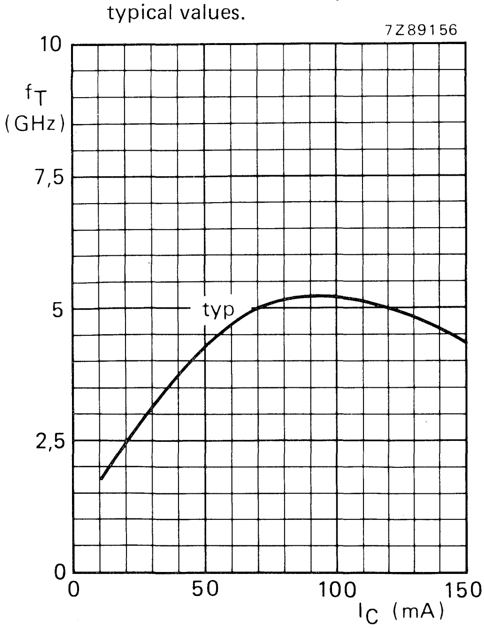


Fig.12 V_{CE} = 10 V; f = 500 MHz; T_j = 25 °C; typical values.

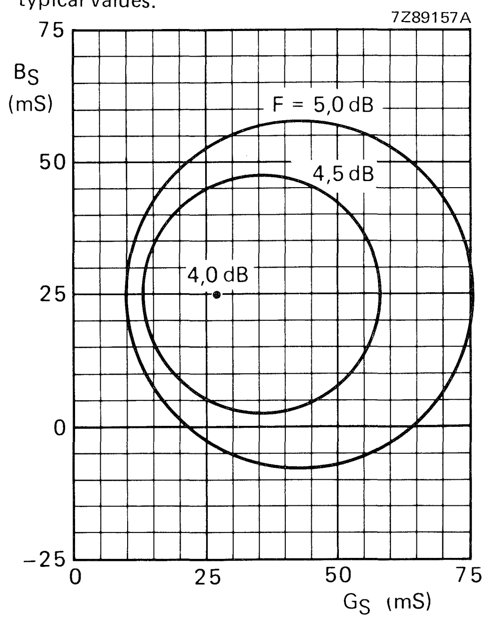


Fig.13 Circles of constant noise figure. V_{CE} = 10 V; I_C = 70 mA; f = 800 MHz; T_{amb} = 25 °C; typical values.

CLASS-B OPERATION

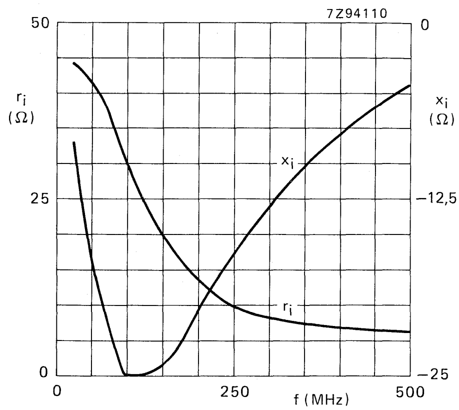


Fig.14 Input impedance (series components).

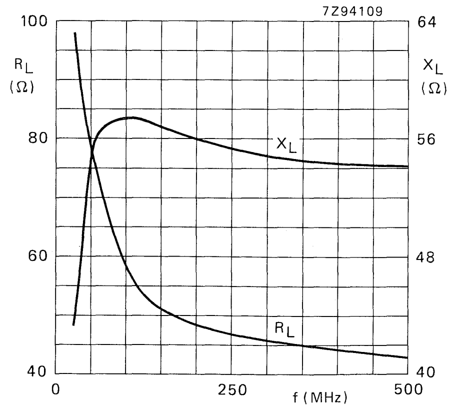


Fig.15 Load impedance (series components).

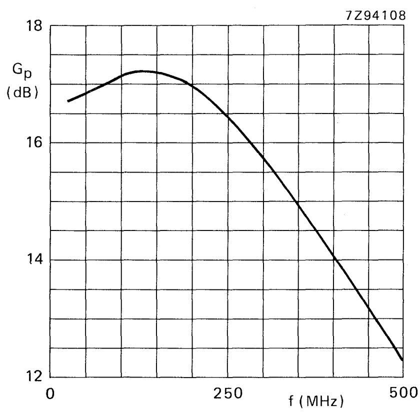


Fig.16 Power gain versus frequency.

Conditions for Figs 14 to 16:

V_{CE} = 10 V; P_L = 500 mW; T_{amb} = 25 °C; typical values.

OPERATING NOTE for Figs 14 to 16:

A base-emitter resistor of 47 Ω is recommended to avoid oscillation. This resistor must be effective for r.f. only.

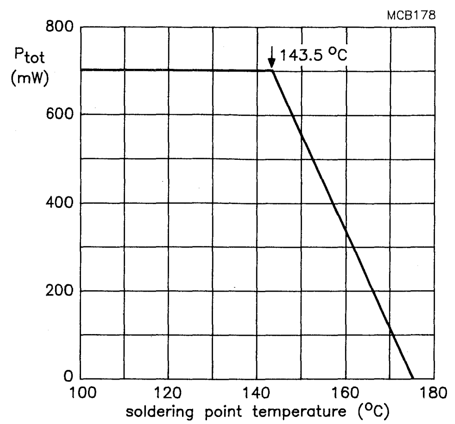


Fig.17 Power derating curve.

NPN 3 GHz WIDEBAND TRANSISTOR

The BFR106 is a npn silicon planar epitaxial transistor in a SOT23 microminiature plastic envelope. It is primarily intended for low noise, general RF applications using SMD-technology.

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 (DC)	I_C	max.	100	mA
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	350	mW
Junction temperature	T_j	max.	150	°C
DC current gain I_C = 30 mA; V_{CE} = 6 V	h_{FE}	min.	25	
Transition frequency at f = 500 MHz I_C = 30 mA; V_{CE} = 6 V	f_T	typ.	3.7	GHz
Maximum unilateral power gain at f = 800 MHz I_C = 30 mA; V_{CE} = 6 V; T_{amb} = 25 °C	G_{UM}	typ.	11.5	dB
Output voltage at d_{im} = –60 dB I_C = 30 mA; V_{CE} = 6 V; R_L = 75 Ω; T_{amb} 25 °C $f_{(p+q-r)}$ = 793.25 MHz	V_O	typ.	250	mV

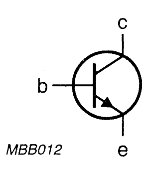
MECHANICAL DATA

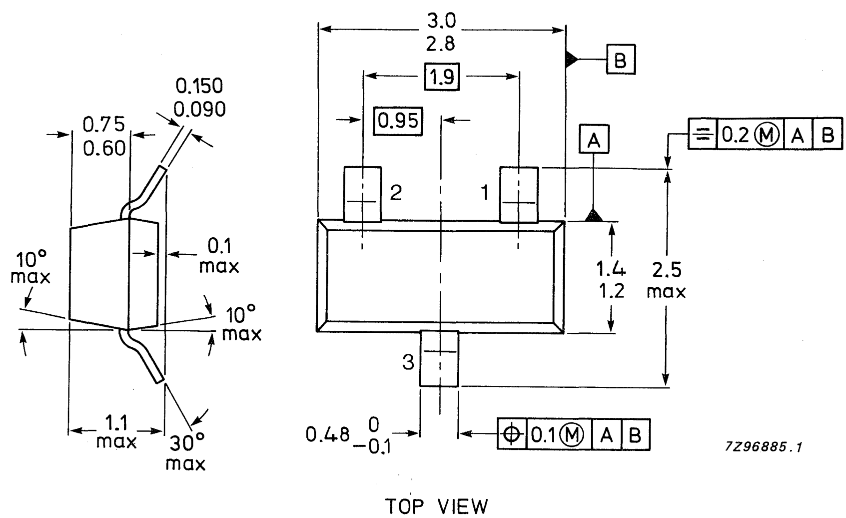
Fig.1 SOT23.

Marking code: R7

Pinning

1 = base
2 = emitter
3 = collector





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 (DC)	I_C	max.	100	mA
Total power dissipation up to T_{amb} = 25 °C (note 1)	P_{tot}	max.	350	mW
Storage temperature range	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 8 x 10 x 0.7 mm	$R_{th\ j\text{-}a}$	=	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.	100	nA
DC current gain $I_E = 30$ mA; $V_{CE} = 6$ V	h_{FE}	min.	25	
Transition frequency at f = 500 MHz $I_E = 30$ mA; $V_{CE} = 6$ V; $T_{amb} = 25$ °C	f_T	typ.	3.7	GHz
Collector capacitance at f = 1 MHz $I_E = i_e = 0$; $V_{CB} = 10$ 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.	4.5	pF
Feedback capacitance at f = 1 MHz $I_C = 0$; $V_{CE} = 10$ V	C_{re}	typ.	1.2	pF
Noise figure at optimum source impedance $I_C = 30$ mA; $V_{CE} = 6$ V; $T_{amb} = 25$ °C; f = 800 MHz	F	typ.	3.5	dB
Maximum unilateral power gain at f = 800 MHz; $I_E = 30$ mA; $V_{CE} = 6$V; $T_{amb} = 25$ °C $G_{UM} = 10 \log \frac{\lvert S_{21}\rvert^2}{(1 - \lvert S_{11}\rvert^2)(1 - \lvert S_{22}\rvert^2)}$	G_{UM}	typ.	11.5	dB
Output voltage at $d_{im} = -60$ dB $T_{amb} = 25$ °C; $I_C = 50$ mA; $V_{CE} = 7$ V; $R_L = 75\ \Omega$; $f_{(p+q-r)} = 793.25$ MHz	V_O	typ.	350	mV
Second harmonic distortion $T_{amb} = 25$ °C $I_C = 30$ mA; $V_{CE} = 6$ V; $R_L = 75\ \Omega$; $f_{(p+q)} = 810$ MHz; $V_O = 100$ mV	d_2	typ.	−50	dB

Note

1. Mounted on a ceramic substrate measuring 8 x 10 x 0.7 mm.

S-parameters (common emitter) at V_{CE} = 6 V; T_{amb} = 25 °C; typical values.

I_C mA	f MHz	S_{11} M Φ	S_{21} M Φ	S_{12} M Φ	S_{22} M Φ	G_{UM} dB
5	40	0.64/ −34.5	13.18/161.8	0.03/ 73.7	0.95/ −14.3	35.3
	100	0.64/ −82.0	10.59/136.0	0.05/ 55.7	0.80/ −33.1	27.3
	200	0.62/−123.3	6.88/114.5	0.07/ 43.8	0.56/ −45.8	20.5
	500	0.62/−165.0	3.20/ 86.8	0.09/ 42.0	0.40/ −58.3	13.0
	800	0.62/−177.7	2.11/ 74.0	0.11/ 51.8	0.40/ −66.7	9.4
	1000	0.63/ 173.8	1.69/ 66.5	0.12/ 57.3	0.41/ −70.5	7.6
	1200	0.64/ 166.0	1.40/ 61.9	0.13/ 63.9	0.40/ −76.7	6.0
	1500	0.62/ 159.5	1.21/ 54.1	0.17/ 68.7	0.41/ −84.0	4.6
	2000	0.60/ 142.6	.97/ 46.2	0.24/ 75.1	0.44/ −97.1	2.6
10	40	0.50/ −50.7	21.09/156.1	0.02/ 70.8	0.92/ −22.0	35.9
	100	0.55/−105.9	14.96/128.3	0.04/ 53.1	0.68/ −46.5	27.7
	200	0.57/−141.8	8.99/109.0	0.05/ 47.9	0.43/ −61.3	21.7
	500	0.59/−173.6	3.94/ 85.6	0.08/ 54.6	0.27/ −77.5	14.1
	800	0.59/ 176.7	2.59/ 74.7	0.11/ 62.5	0.28/ −82.4	10.4
	1000	0.59/ 169.0	2.07/ 68.1	0.13/ 65.5	0.28/ −84.8	8.6
	1200	0.60/ 161.6	1.73/ 64.4	0.15/ 69.1	0.26/ −88.8	7.0
	1500	0.58/ 156.9	1.49/ 56.3	0.19/ 69.6	0.29/ −93.9	5.6
	2000	0.55/ 140.8	1.19/ 48.0	0.26/ 71.4	0.31/−102.0	3.5
15	40	0.43/ −64.3	26.39/152.1	0.02/ 68.2	0.88/ −27.6	35.8
	100	0.52/−120.3	17.38/123.8	0.03/ 53.9	0.60/ −55.5	28.1
	200	0.56/−151.1	10.12/106.0	0.05/ 52.2	0.36/ −72.4	22.3
	500	0.58/−177.5	4.29/ 85.1	0.08/ 61.3	0.23/ −93.2	14.6
	800	0.57/ 174.0	2.82/ 75.0	0.12/ 66.9	0.23/ −95.8	10.9
	1000	0.58/ 166.8	2.25/ 69.0	0.14/ 68.3	0.23/ −97.8	9.0
	1200	0.59/ 159.5	1.89/ 65.4	0.16/ 71.0	0.21/−100.0	7.5
	1500	0.56/ 155.6	1.63/ 57.5	0.21/ 69.9	0.24/−103.1	6.1
	2000	0.52/ 139.7	1.30/ 49.1	0.28/ 70.1	0.26/−107.7	4.0
20	40	0.40/ −76.0	30.55/148.9	0.02/ 64.9	0.85/ −32.1	36.1
	100	0.51/−129.8	19.05/120.7	0.03/ 54.2	0.55/ −62.2	28.5
	200	0.55/−156.8	10.72/104.0	0.04/ 55.8	0.33/ −80.9	22.7
	500	0.57/−179.9	4.49/ 84.6	0.08/ 65.1	0.21/−105.3	15.0
	800	0.56/ 172.5	2.95/ 75.0	0.12/ 69.1	0.21/−106.4	11.2
	1000	0.57/ 165.5	2.36/ 69.3	0.14/ 69.9	0.20/−107.7	9.3
	1200	0.58/ 158.1	1.98/ 66.1	0.17/ 71.8	0.18/−110.9	7.8
	1500	0.54/ 154.7	1.71/ 58.0	0.21/ 69.9	0.21/−111.3	6.4
	2000	0.51/ 138.9	1.37/ 49.8	0.29/ 69.2	0.22/−113.1	4.3
30	40	0.37/ −92.2	36.02/144.4	0.02/ 63.6	0.80/ −38.5	36.3
	100	0.51/−140.5	20.70/116.7	0.03/ 55.5	0.49/ −71.4	28.8
	200	0.54/−161.9	11.40/101.8	0.04/ 60.71	0.29/ −92.7	23.0
	500	0.56/ 177.6	4.70/ 84.1	0.08/ 69.0	0.20/−120.5	15.3
	800	0.55/ 170.8	3.09/ 75.0	0.12/ 71.6	0.20/ 161.4	11.5
	1000	0.56/ 164.1	2.46/ 69.5	0.15/ 71.2	0.19/−122.1	9.6
	1200	0.57/ 156.8	2.07/ 66.6	0.17/ 73.0	0.16/−126.6	8.1
	1500	0.53/ 153.9	1.79/ 58.5	0.22/ 70.1	0.19/−122.2	6.7
	2000	0.49/ 138.0	1.44/ 50.5	0.29/ 68.6	0.19/−121.1	4.5

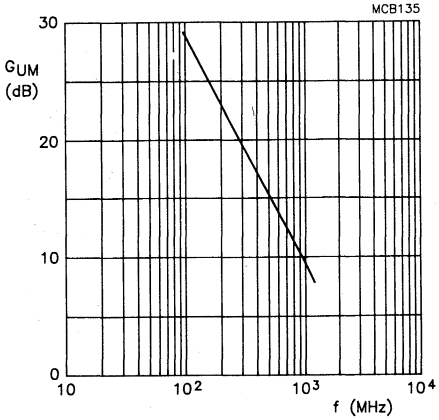


Fig. 2 Maximum power gain as a function of frequency; V_{CE} = 6 V; I_C = 30 mA; T_{amb} = 25 °C.

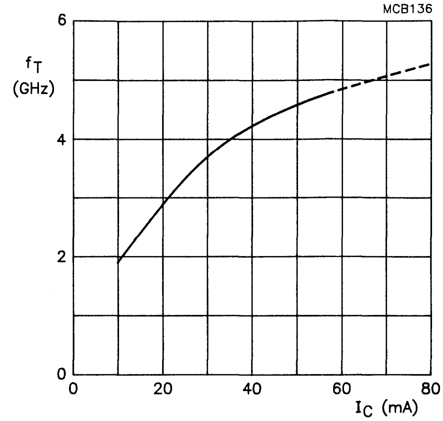


Fig. 3 Transition frequency as a function of collector current; V_{CE} = 6 V; f = 500 MHz; T_j = 25 °C.

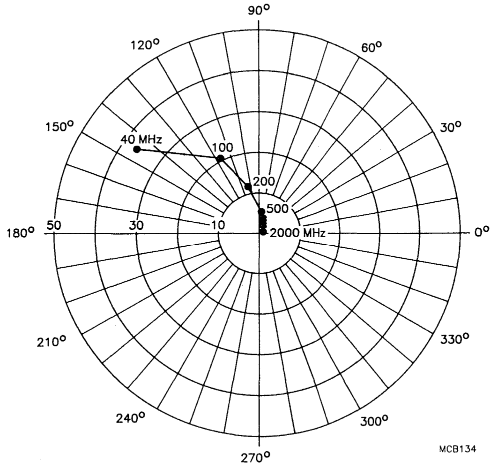


Fig. 4 Forward transmission coefficient S_{21}; V_{CE} = 6 V; I_C = 30 mA; T_{amb} = 25 °C.

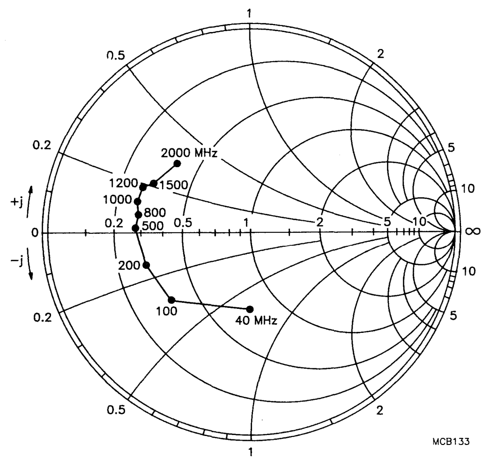


Fig. 5 Input impedance derived from S_{11} (in Ohm x 50); V_{CE} = 6 V; I_C = 30 mA; T_{amb} = 25 °C.

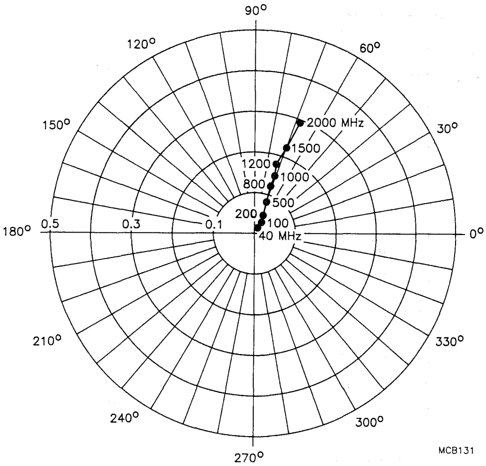


Fig.6 Reverse transmission coefficient S_{12}; V_{CE} = 6 V; I_C = 30 mA; T_{amb} = 25 °C.

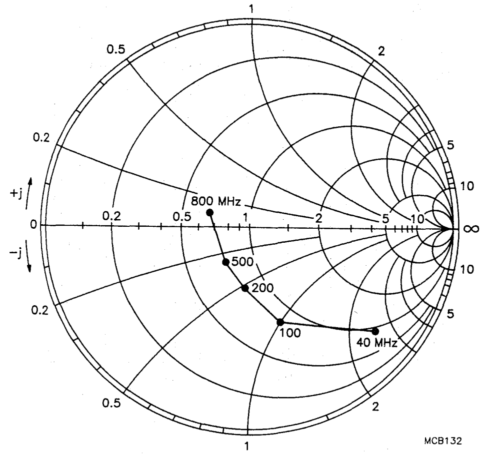


Fig.7 Output impedance derived from S_{22} (in Ohm x 50); V_{CE} = 6 V; I_C = 30 mA; T_{amb} = 25 °C.

Philips Components

Data sheet	
status	Product specification
date of issue	April 1990

BFR134

NPN 7 GHz wideband transistor

NPN transistor in a plastic SOT37 package. It is primarily intended for use in MATV and microwave amplifiers, such as in aerial amplifiers, radar systems, oscilloscopes, spectrum analyzers, etc.
Emitter ballasting resistors and application of gold sandwich metallization ensure an optimum temperature profile and excellent reliability properties.

MECHANICAL DATA

SOT37.

PINNING

PIN	DESCRIPTION
1	base
2	emitter
3	collector

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	-	-	25	V
V_{CEO}	collector-emitter voltage	open base	-	-	15	V
I_C	collector current (DC)		-	-	150	mA
P_{tot}	total power dissipation	T_{case} = 60 °C	-	-	1	W
T_j	junction temperature		-	-	175	°C
h_{FE}	DC current gain	I_C = 100 mA; V_{CE} = 10 V	80	-	-	
f_T	transition frequency	f = 1 GHz; I_C = 100 mA; V_{CE} = 10 V; T_{amb} = 25 °C	-	7	-	GHz
G_{UM}	maximum power gain	f = 500 MHz; I_C = 100 mA; V_{CE} = 10 V	-	16	-	dB
G_{UM}	maximum power gain	f = 800 MHz; I_C = 100 mA; V_{CE} = 10 V	-	11.5	-	dB
V_o	output voltage	d_{im} = −60 dB; I_C = 90 mA; V_{CE} = 10 V; R_L = 75 Ω; $f_{(p+q-r)}$ = 793.25 MHz	-	850	-	mV

NPN 7 GHz wideband transistor BFR134

LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	-	25	V
V_{CEO}	collector-emitter voltage	open base	-	15	V
V_{EBO}	emitter-base voltage	open collector	-	2	V
I_C	collector current (DC)		-	150	mA
P_{tot}	total power dissipation	T_{case} = 60 °C	-	1	W
T_{stg}	storage temperature range		−65	+150	°C
T_j	junction temperature		-	175	°C

THERMAL RESISTANCE

SYMBOL	PARAMETER	NOM.	UNIT
$R_{th\ j-s}$	from junction to soldering point	30	K/W
$R_{th\ j-a}$	from junction to ambient (free air) mounted on a fibre-glass print	115	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{CBO}	collector cut-off current	I_E = 0; V_{CB} = 10 V	-	-	50	μA
h_{FE}	DC current gain	I_C = 100 mA; V_{CE} = 10 V	80	-	-	
f_T	transition frequency	f = 1 GHz; I_C = 100 mA; V_{CE} = 10 V; T_{amb} = 25 °C	-	7.0	-	GHz
C_c	collector capacitance	f = 1 MHz; I_E = i_e = 0; V_{CB} = 10 V	-	2.5	-	pF
C_e	emitter capacitance	f = 1 MHz; I_C = i_c = 0; V_{EB} = 0.5 V	-	6.0	-	pF
C_{re}	feedback capacitance	f = 1 MHz; I_C = 0; V_{CE} = 10 V	-	1.2	-	pF
G_{UM}	maximum power gain	f = 500 MHz; T_{amb} = 25 °C; I_C = 100 mA; V_{CE} = 10 V	-	16	-	dB
G_{UM}	maximum power gain	f = 800 MHz; T_{amb} = 25 °C; I_C = 100 mA; V_{CE} = 10 V	-	11.5	-	dB
V_o	output voltage	note 1	-	900	-	mV
V_o	output voltage	note 2	-	850	-	mV

Notes

1. d_{im} = –60 dB (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 = 445.25 MHz; V_q = V_o –6 dB; f_q = 453.25 MHz; V_r = V_o –6 dB; f_r = 455.25 MHz; measured at $f_{(p+q-r)}$ = 443.25 MHz
2. d_{im} = –60 dB (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; See Fig.3

S-Parameters (common emitter) at V_{CE} = 10 V; T_{amb} = 25 °C; typical values.

I_C(mA)	f(MHz)	S_{11}	S_{21}	S_{12}	S_{22}	G_{UM} (dB)
		M Φ	M Φ	M Φ	M Φ	
10	40	0.80/- 37.3	19.5/154.9	0.024/ 70.6	0.91/- 20.3	38.1
	100	0.66/- 80.1	14.4/129.0	0.046/ 54.4	0.70/- 40.4	28.5
	200	0.53/-121.6	8.8/106.5	0.061/ 48.0	0.48/- 53.3	21.6
	500	0.47/-170.6	4.0/ 80.0	0.080/ 56.4	0.35/- 70.2	13.6
	800	0.47/ 165.5	2.6/ 63.5	0.128/ 65.5	0.35/- 84.2	9.8
	1000	0.49/ 152.3	2.1/ 55.4	0.158/ 69.9	0.35/- 95.9	8.1
	1200	0.52/ 140.9	1.7/ 47.0	0.193/ 70.3	0.37/-109.0	6.9
	1500	0.59/ 128.4	1.4/ 33.7	0.251/ 64.7	0.42/-124.5	5.6
	2000	0.63/ 105.3	1.1/ 20.5	0.363/758.1	0.52/-149.3	4.3
20	40	0.73/- 43.8	26.4/150.5	0.023/68.6	0.87/- 26.6	37.9
	100	0.57/- 89.9	18.0/123.9	0.041/54.6	0.61/- 50.9	28.9
	200	0.46/-130.3	10.7/103.5	0.056/52.9	0.39/- 66.1	22.4
	500	0.42/-175.5	4.6/ 80.4	0.096/61.4	0.27/- 85.2	14.5
	800	0.43/ 162.4	3.0/ 65.7	0.142/65.9	0.26/- 97.8	10.7
	1000	0.44/ 149.4	2.4/ 58.5	0.174/67.4	0.26/-108.7	8.7
	1200	0.47/ 138.3	2.0/ 51.0	0.207/66.8	0.28/-120.8	7.6
	1500	0.53/ 127.6	1.6/ 37.6	0.261/60.6	0.33/-134.0	6.2
	2000	0.57/ 106.2	1.3/ 23.6	0.359/54.4	0.42/-154.2	4.9
50	40	0.65/- 50.5	33.1/146.2	0.022/66.6	0.82/- 33.4	37.7
	100	0.55/- 98.9	21.0/119.7	0.038/55.8	0.54/- 61.7	29.2
	200	0.41/-138.0	12.0/101.2	0.054/57.8	0.33/- 81.1	22.9
	500	0.38/-178.1	5.1/ 80.8	0.102/64.9	0.22/-104.8	15.1
	800	0.39/ 158.7	3.3/ 67.5	0.153/66.4	0.21/-117.2	11.2
	1000	0.40/ 145.9	2.7/ 60.9	0.188/66.4	0.21/-128.5	9.5
	1200	0.45/ 135.5	2.3/ 53.9	0.222/64.9	0.23/-138.8	8.2
	1500	0.48/ 124.5	1.8/ 41.2	0.279/57.8	0.28/-147.9	6.7
	2000	0.52/ 104.4	1.5/ 27.4	0.363/51.2	0.36/-162.5	5.3
70	40	0.64/- 52.2	34.4/145.2	0.21 /66.0	0.81/- 35.2	37.7
	100	0.48/-100.8	21.5/118.7	0.037/56.0	0.52/- 64.6	29.2
	200	0.40/-139.7	12.2/100.7	0.054/58.6	0.32/- 85.0	22.9
	500	0.38/-179.6	5.2/ 80.7	0.103/65.3	0.22/-109.8	15.2
	800	0.38/ 158.1	3.3/ 67.4	0.157/66.2	0.21/-122.1	11.3
	1000	0.39/ 144.8	2.7/ 61.6	0.191/66.0	0.21/-133.0	9.6
	1200	0.42/ 134.0	2.3/ 53.9	0.225/64.2	0.23/-152.5	8.2
	1500	0.47/ 123.8	1.8/ 41.8	0.282/57.1	0.28/-152.2	6.7
	2000	0.51/ 104.0	1.5/ 28.1	0.365/50.3	0.35/-165.6	5.3
100	40	0.63/- 54.1	35.3/144.3	0.022/65.2	0.80/- 36.8	37.5
	100	0.48/-103.2	21.8/118.0	0.037/55.4	0.51/- 67.2	29.2
	200	0.41/-141.7	12.3/ 00.3	0.053/58.3	0.31/- 89.1	23.0
	500	0.38/ 178.4	5.2/ 80.7	0.103/65.2	0.22/-115.3	15.3
	800	0.39/ 175.3	3.4/ 67.8	0.156/66.0	0.21/-127.7	11.4
	1000	0.44/ 144.6	2.7/ 61.8	0.189/65.8	0.21/-138.9	9.6
	1200	0.43/ 133.9	2.3/ 54.5	0.223/63.9	0.23/-147.8	8.4
	1500	0.48/ 123.4	1.9/ 42.3	0.279/56.7	0.28/-155.3	7.0
	2000	0.52/ 103.4	1.5/ 23.9	0.360/49.4	0.35/-167.5	5.5

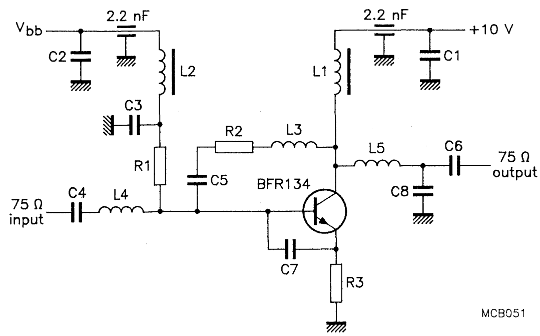


Fig.1 Intermodulation and second harmonic test circuit.

List of components:

R1 = 10 kΩ chip resistor R2 = 220 Ω chip resistor R3 = 15 Ω chip resistor	(cat. no. 2322 712 30103) (cat. no. 2322 712 30221) (cat. no. 2322 712 30159)
C1 = C2 = 10 nF miniature ceramic capacitor C3 = C4 = C5 = C6 = 10 nF ceramic multilayer capacitor C7 = 1.2 pF ceramic multilayer capacitor C8 = 1.0 pF ceramic multilayer capacitor	(cat. no. 2222 629 08103) (cat. no. 2222 851 06627) (cat. no. 2222 851 12128) (cat. no. 2222 851 12108)
L1 = L2 = 5 μH Ferroxcube choke L3 = 4 turns Cu wire (0.4 mm), internal diameter 3 mm, winding pitch 1 mm L4 = L5 = 1.5 turns Cu wire (0.4 mm), internal diameter 3 mm.	(cat. no. 3122 108 20153)

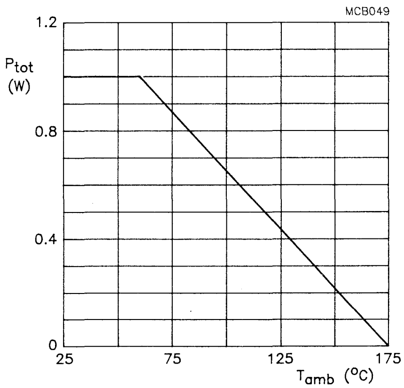


Fig.2 Power derating curve.

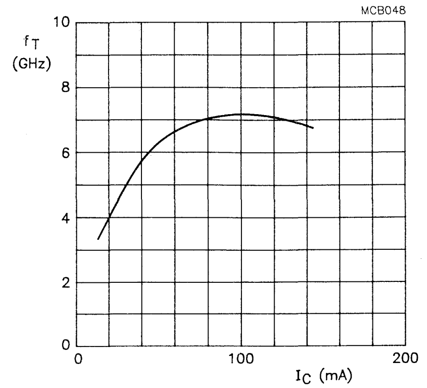


Fig.3 Transition frequency as a function of collector current;
V_{CE} = 10 V; f = 1 GHz; T_j = 25 °C; typical values.

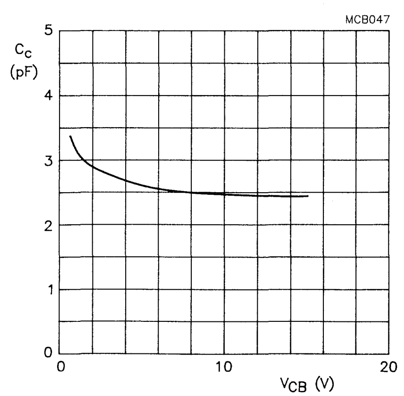


Fig.4 Collector capacitance as a function of V_{CB};
I_E = 0; f = 1 MHz; T_j = 25 °C; typical values.

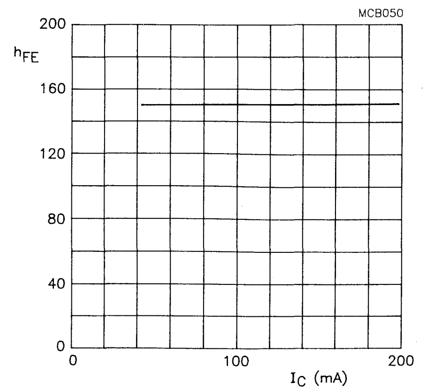


Fig.5 DC current gain; V_{CE} = 10 V; T_j = 25 °C; typical values.

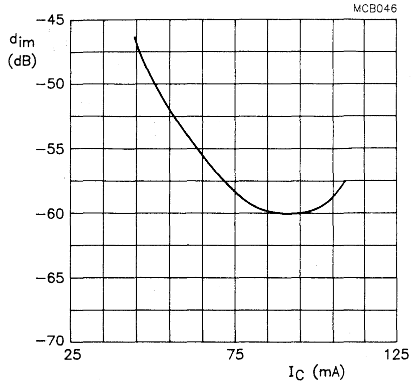


Fig.6 Intermodulation distortion; V_{CE} = 10 V; V_o = 900 mV; $f_{(p+q-r)}$ = 443.25 MHz; T_{amb} = 25 °C; typical values.

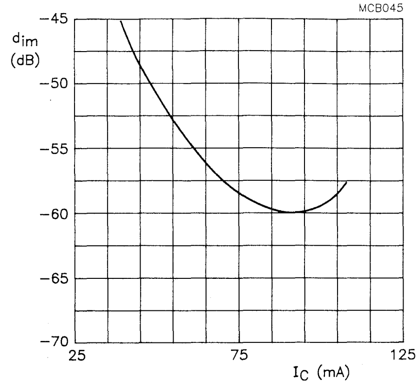


Fig.7 Intermodulation distortion; V_{CE} = 10 V; V_o = 850 mV; $f_{(p+q-r)}$ = 793.25 MHz; T_{amb} = 25 °C; typical values.

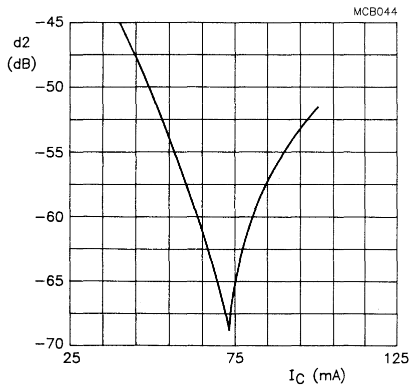


Fig.8 Second order distortion; V_{CE} = 10 V; f_p = 50 MHz; f_q = 400 MHz; $f_{(p+q)}$ = 450 MHz; V_o = 50 dB/mV; T_{amb} = 25 °C; typical values.

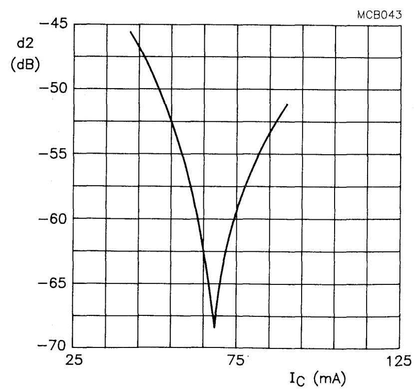


Fig.9 Second order distortion; V_{CE} = 10 V; f_p = 250 MHz; f_q = 560 MHz; $f_{(p+q)}$ = 810 MHz; V_o = 50 dB/mV; T_{amb} = 25 °C; typical values.

NPN 7 GHz wideband transistor

BFR134

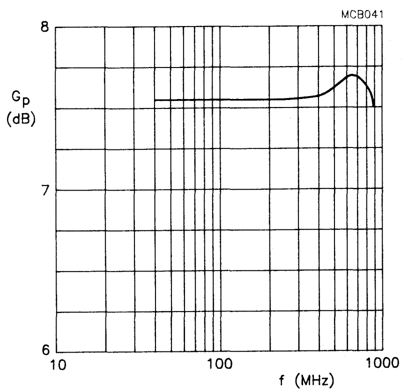


Fig.10 Gain measured in test circuit; T_{amb} = 25 °C; typical values.

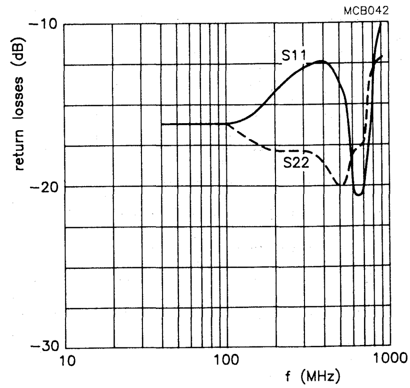


Fig.11 Return losses measured in test circuit; T_{amb} = 25 °C; typical values.

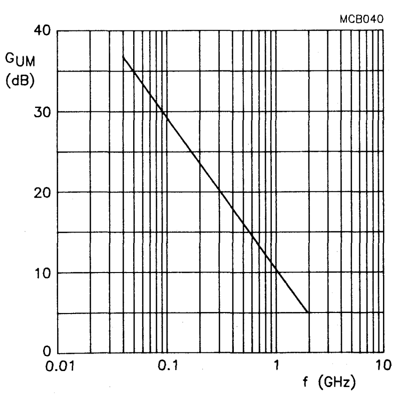


Fig.12 Maximum power gain as a function of frequency; V_{CE} = 10 V; I_C = 100 mA; T_{amb} = 25 °C; typical values.

NPN 7 GHz wideband transistor BFR134

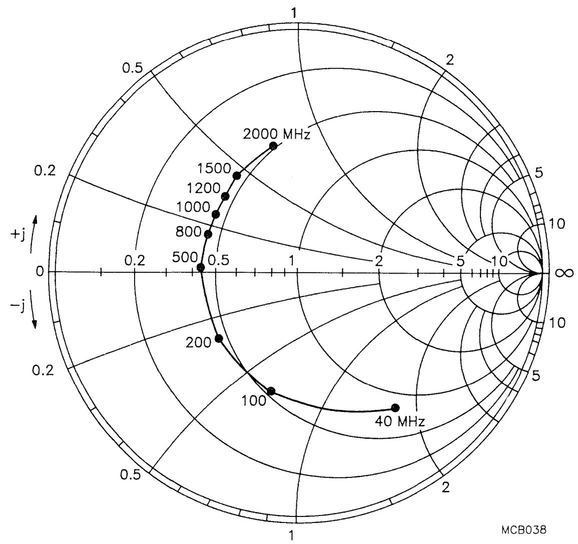


Fig.13 Input impedance S_{11} derived from input reflection coefficient; V_{CE} = 10 V; I_C = 100 mA; T_{amb} = 25 °C; typical values.

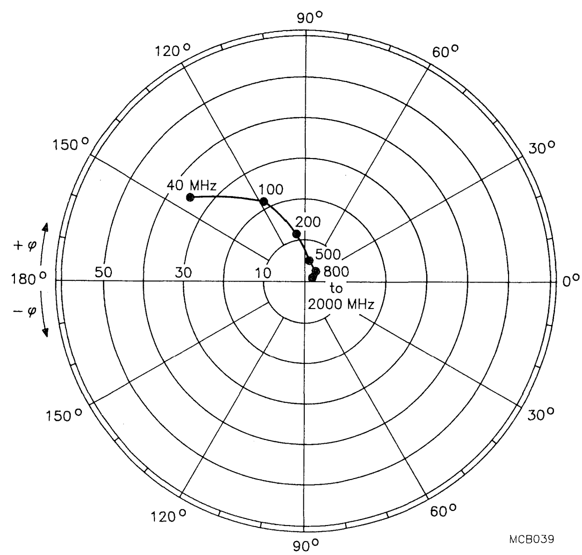


Fig.14 Forward transmission coefficient S_{21}; V_{CE} = 10 V; I_C = 100 mA; T_{amb} = 25 °C; typical values.

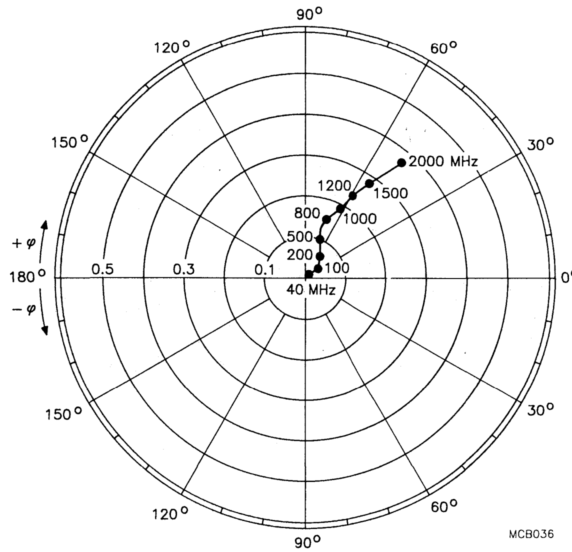


Fig.15 Reverse transmission coefficient S_{12}; V_{CE} = 10 V; I_C = 100 mA; T_{amb} = 25 °C; typical values.

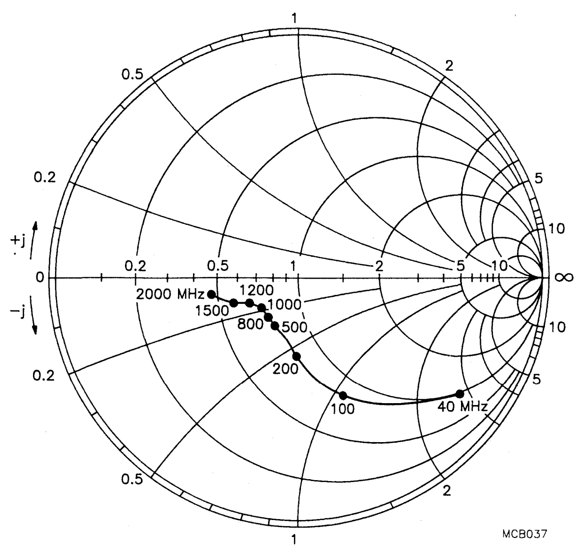


Fig.16 Output impedance S_{22} derived from output reflection coefficient; V_{CE} = 10 V; I_C = 100 mA; T_{amb} = 25 °C; typical values.

N-P-N 4 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.

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} = 25 °C	P_{tot}	max.	300	mW
Junction temperature	T_j	max.	150	°C
DC current gain I_C = 2 mA; V_{CE} = 1 V	h_{FE}		20 to 150	
Transition frequency I_C = 25 mA; V_{CE} = 5 V; f = 500 MHz	f_T	typ.	1.3	GHz
Noise figure I_C = 2 mA; V_{CE} = 5 V; R_S = 50 Ω; f = 500 MHz	F	typ.	4.5	dB

MECHANICAL DATA

Dimensions in mm

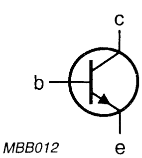
Fig. 1 SOT-23.

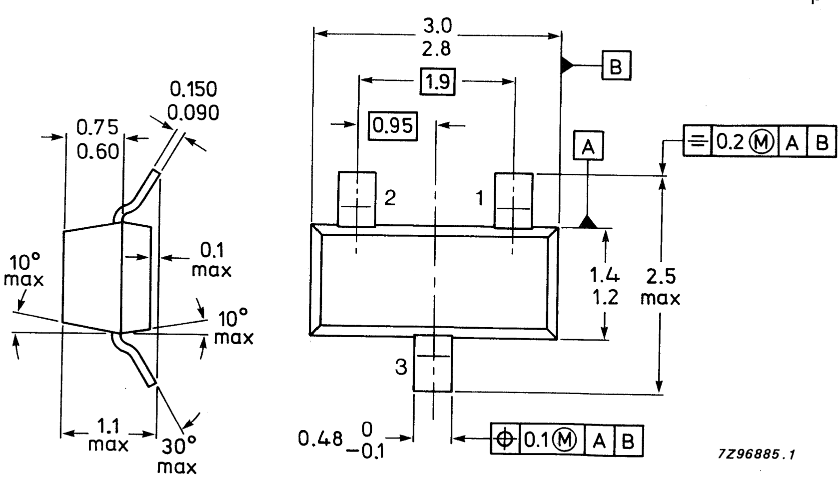
Marking code

BFS17 = E1p

Pinning

1 = base
2 = emitter
3 = collector





TOP VIEW

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 mA	V_{CEO}	max.	15	V
Emitter-base voltage (open collector)	V_{EBO}	max.	2.5	V
Collector current (DC)	I_C	max.	25	mA
Collector current (peak value)	I_{CM}	max.	50	mA
Total power dissipation up to T_{amb} = 25 °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 (note 1)	$R_{th\ j\text{-}a}$	=	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.	10	nA
$I_E = 0$; V_{CB} = 10 V; T_j = 100 °C	I_{CBO}	max.	10	μA
DC current gain				
I_C = 2 mA; V_{CE} = 1 V	h_{FE}	20 to 150		
I_C = 25 mA; V_{CE} = 1 V	h_{FE}	min.	20	
Transition frequency				
I_C = 2 mA; V_{CE} = 5 V; f = 500 MHz	f_T	typ.	1.0	GHz
I_C = 25 mA; V_{CE} = 5 V; f = 500 MHz	f_T	typ.	1.3	GHz
Collector capacitance at f = 1 MHz				
$I_E = I_e = 0$; V_{CB} = 10 V	C_c	max.	1.5	pF

Notes

1. Mounted on a ceramic substrate of 8 mm x 10 mm x 0.7 mm.
2. Crystal mounted in a BFY90 envelope.

Emitter capacitance at f = 1 MHz $I_C = I_c = 0$; $V_{EB} = 0.5$ V	C_e	max.	2.0 pF
Feedback capacitance at f = 1 MHz $I_C = 1$ mA; $V_{CE} = 5$ V	C_{re}	typ.	0.65 pF
Noise figure (note 2) $I_C = 2$ mA; $V_{CE} = 5$ V; f = 500 MHz; $R_S = 50\ \Omega$	F	typ.	4.5 dB
Intermodulation distortion $I_C = 10$ mA; $V_{CE} = 6$ V; $R_L = 37{,}5\ \Omega$; $T_{amb} = 25\ ^oC$ $V_o = 100$ 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.	−45 dB

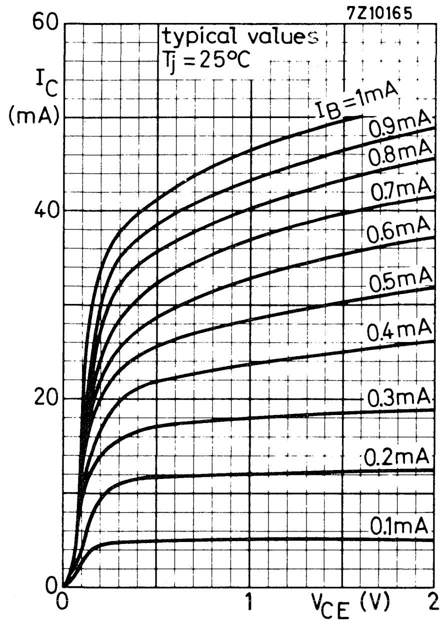


Fig. 2 T_j = 25 °C; typical values.

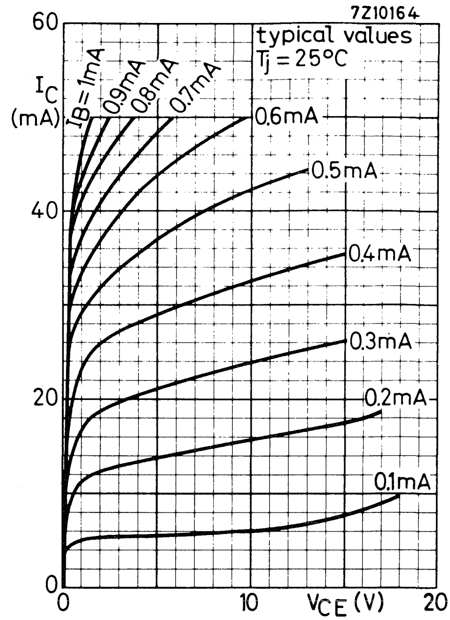


Fig. 3 T_j = 25 °C; typical values.

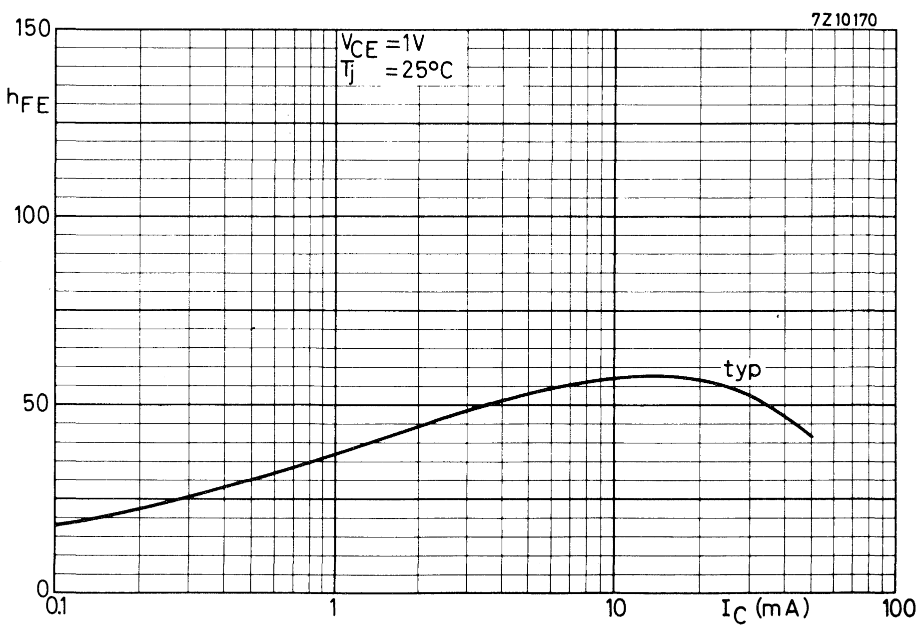


Fig. 4 V_{CE} = 1 V; T_j = 25 °C; typical values.

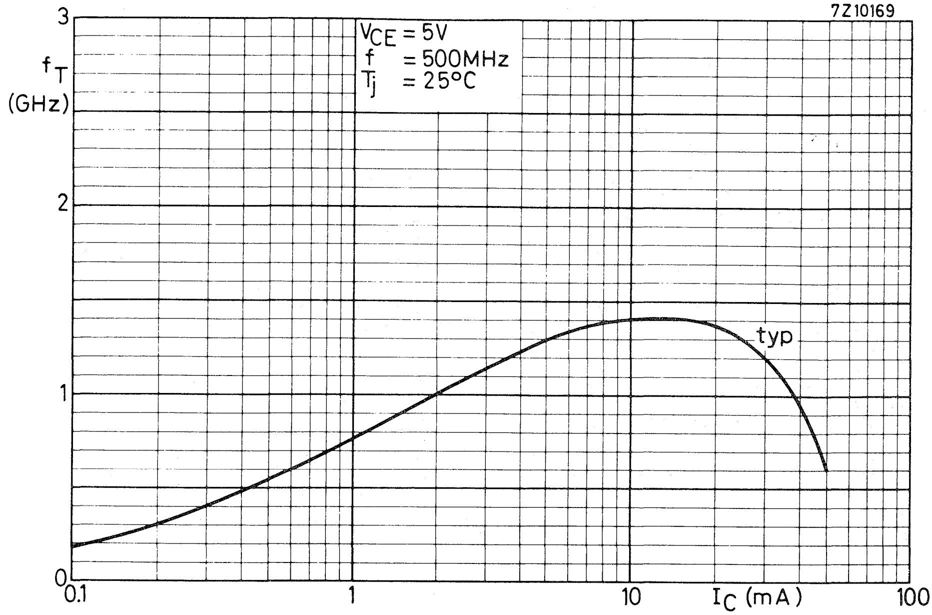


Fig. 5 V_{CE} = 5 V; f = 500 MHz; T_j = 25 °C; typical values.

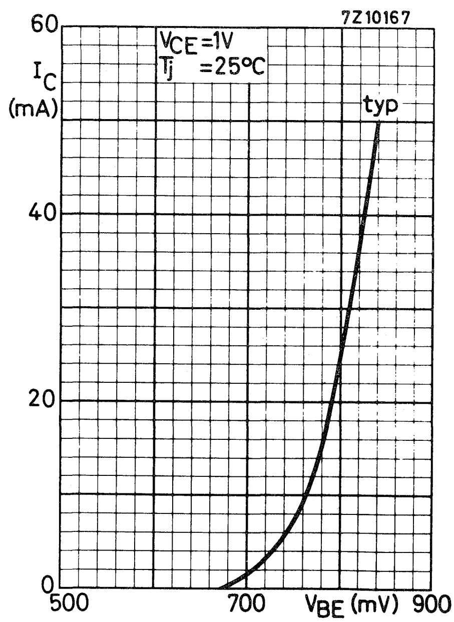


Fig. 6 V_{CE} = 1 V; T_j = 25 °C; typical values.

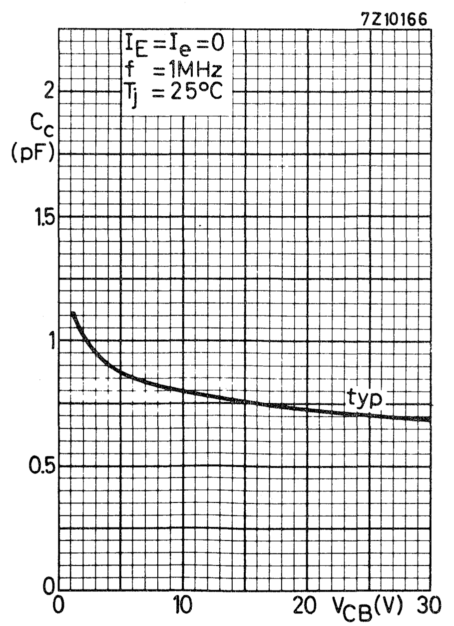


Fig. 7 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C; typical values.

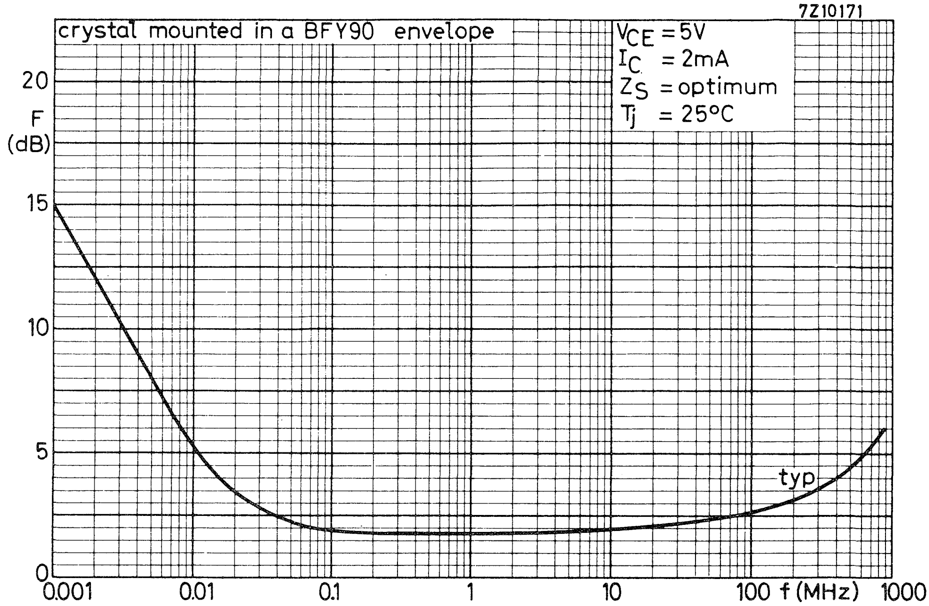


Fig. 8 V_{CE} = 5 V; I_C = 2 mA; Z_S = optimum; T_j = 25 °C; typical values.

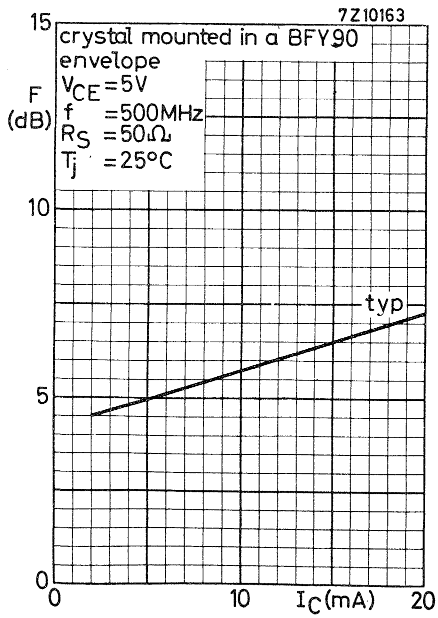


Fig. 9 V_{CE} = 5 V; f = 500 MHz; R_S = 50 Ω; T_j = 25 °C; typical values.

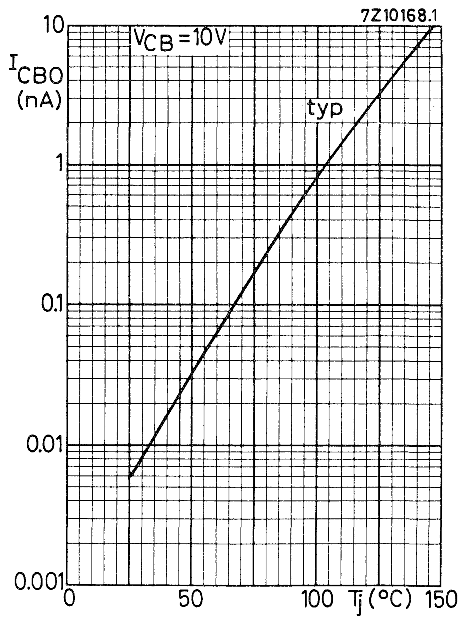


Fig. 10 V_{CB} = 10 V; typical values.

N-P-N 2 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 (DC)	I_C	max.	25	mA
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	300	mW
Junction temperature	T_j	max.	150	°C
D.C. current gain I_C = 2 mA; V_{CE} = 1 V	h_{FE}	min. max.	20 150	
Transition frequency at f = 500 MHz I_C = 25 mA; V_{CE} = 5 V	f_T	typ.	2.8	GHz
Noise figure I_C = 2 mA; V_{CE} = 5 V; f = 800 MHz	F	typ.	2.5	dB
Output voltage at d_{im} = −60 dB V_{CE} = 10 V; I_C = 14 mA; Z_L = 75 Ω $f_{(p+q-r)}$ = 793.25 MHz	V_o	typ.	150	mV
Maximum unilateral power gain at f = 800 MHz V_{CE} = 10 V; I_C = 14 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

Dimensions in mm

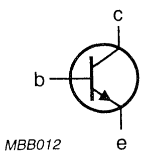
Marking code

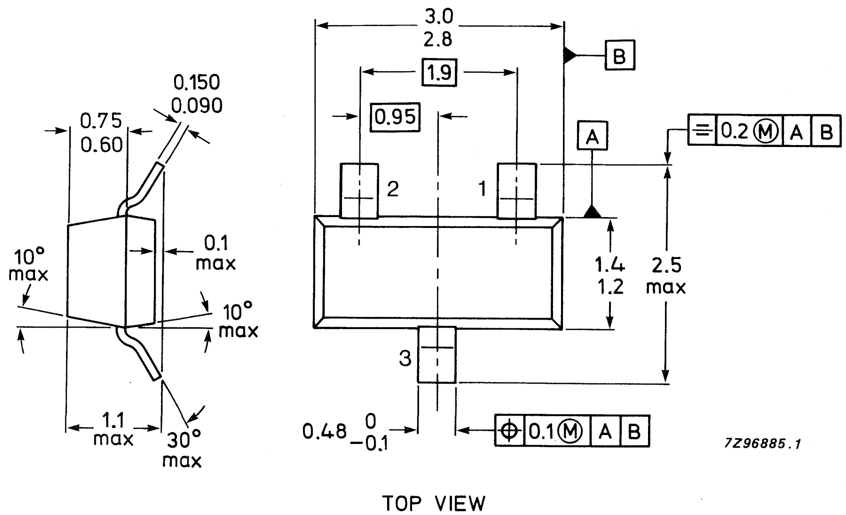
BFS17A = E2

Fig. 1 SOT-23.

Pinning

1 = base
2 = emitter
3 = collector





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 (DC)	I_C	max.	25 mA
Collector current (peak value)	I_{CM}	max.	50 mA
Total power dissipation up to T_{amb} = 25 °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*	$R_{th\ j\text{-}a}$	=	430 K/W

* Mounted on a ceramic substrate of 8 mm x 10 mm x 0,7 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
DC current gain I_C = 2 mA; V_{CE} = 1 V	h_{FE}		20 to 150	
I_C = 25 mA; V_{CE} = 1 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.	0.7	pF
Emitter capacitance at f = 1 MHz $I_C = 0$; V_{EB} = 0.5 V	C_e	typ.	1.25	pF
Feedback capacitance at f = 1 MHz $I_C = 0$; V_{CE} = 5 V	C_{re}	typ.	0.6	pF
Maximum unilateral power gain (s_{12} assumed to be zero) $G_{UM} = 10 \log \frac{\lvert s_{21}\rvert^2}{[1-\lvert s_{11}\rvert^2]\ [1-\lvert s_{22}\rvert^2]}$ I_C = 14 mA; V_{CE} = 10 V; f = 800 MHz	G_{UM}	typ.	13.5	dB
Noise figure at f = 800 MHz I_C = 2 mA; V_{CE} = 5 V; Z_S = 60 Ω; T_{amb} = 25 °C	F	typ.	2.5	dB
Output voltage at d_{im} = –60 dB (DIN 45004B, par. 6,3: 3-tone) I_C = 14 mA; V_{CE} = 10 V; Z_L = 75 Ω $V_p = V_o$; 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

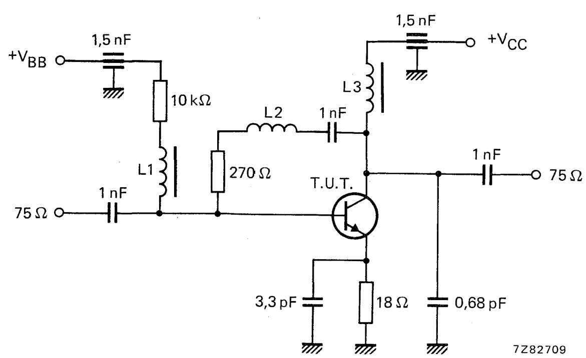


Fig. 2 Intermodulation distortion and second harmonic distortion MATV test circuit.

L1 = L3 = 5 μH 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 V; typical values.

I_C mA	f MHz	s_{11}	s_{21}	s_{12}	s_{22}	G_{UM} 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_{11}	s_{21}	s_{12}	s_{22}	G_{UM} 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

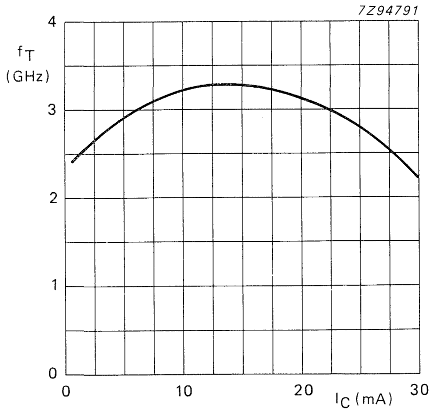


Fig. 3 V_{CE} = 5 V; f = 500 MHz; T_{amb} = 25 ^{o}C; typical values.

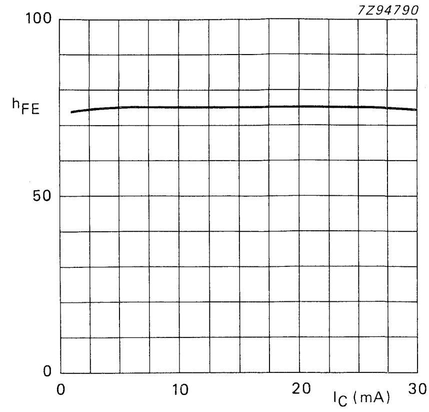


Fig. 4 V_{CE} = 1 V; T_{amb} = 25 ^{o}C; typical values.

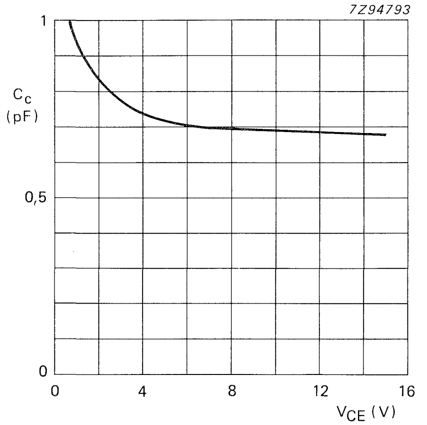


Fig. 5 I_E = 0; f = 1 MHz; T_{amb} = 25 ^{o}C; typical values.

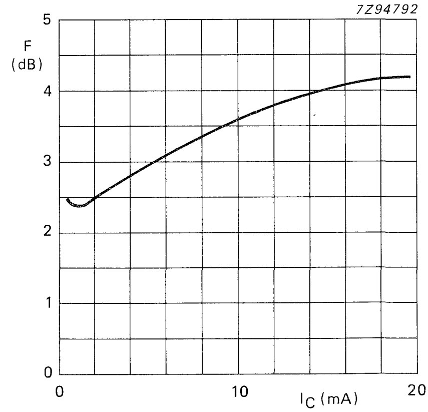


Fig. 6 V_{CE} = 5 V; T_{amb} = 25 ^{o}C; f = 800 MHz; Z_S = 60 Ω; typical values.

N-P-N 2 GHz 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 μA – 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.	2,5	mA
Total power dissipation up to T_{amb} = 135 °C	P_{tot}	max.	30	mW
Junction temperature	T_j	max.	175	°C
Transition frequency at f = 500 MHz I_C = 1 mA; V_{CE} = 1 V	f_T	typ.	2,3	GHz
Feedback capacitance at f = 1 MHz I_C = 1 mA; V_{CE} = 1 V	C_{re}	max.	0,4	pF
Noise figure at optimum source impedance I_C = 1 mA; V_{CE} = 1 V; f = 500 MHz	F	typ.	3,8	dB
Max. unilateral power gain I_C = 1 mA; V_{CE} = 1 V; f = 500 MHz	G_{UM}	typ.	17	dB

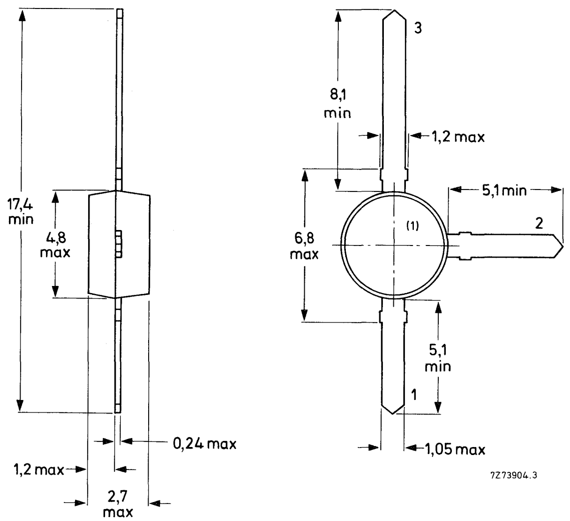
MECHANICAL DATA

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.	175	°C

THERMAL RESISTANCE

From junction to ambient in free air mounted on a glass-fibre print	$R_{th\ j\text{-}a}$	=	500	K/W
From junction to soldering point	$R_{th\ j\text{-}s}$	=	75	K/W

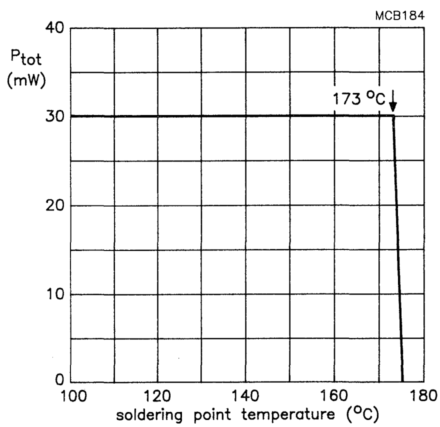


Fig.2 Power derating curve.

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				
$I_C = 10\ \mu A$; $V_{CE} = 1$ 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
Collector capacitance at f = 1 MHz				
$I_E = I_e = 0$; $V_{CB} = 0{,}5$ V	C_c	max.	0,55	pF
Emitter capacitance at f = 1 MHz				
$I_C = I_c = 0$; $V_{EB} = 0$	C_e	max.	0,45	pF
Feedback capacitance at f = 1 MHz				
$I_C = 1$ mA; $V_{CE} = 1$ V; $T_{amb} = 25$ °C	C_{re}	max.	0,4	pF
Noise figure at optimum source impedance				
$I_C = 0{,}1$ mA; $V_{CE} = 1$ V; f = 500 MHz; $T_{amb} = 25$ °C	F	typ.	5,5	dB
$I_C = 1$ mA; $V_{CE} = 1$ V; f = 500 MHz; $T_{amb} = 25$ °C	F	typ.	3,8	dB
Max. unilateral power gain (s_{12} assumed to be zero)				
$G_{UM} = 10 \log \frac{\lvert s_{21}\rvert^2}{[1-\lvert s_{11}\rvert^2]\,[1-\lvert s_{22}\rvert^2]}$				
$I_C = 1$ mA; $V_{CE} = 1$ V; f = 200 MHz; $T_{amb} = 25$ °C	G_{UM}	typ.	24	dB
$I_C = 1$ mA; $V_{CE} = 1$ V; f = 500 MHz; $T_{amb} = 25$ °C	G_{UM}	typ.	17	dB
$I_C = 1$ mA; $V_{CE} = 1$ V; f = 800 MHz; $T_{amb} = 25$ °C	G_{UM}	typ.	11	dB

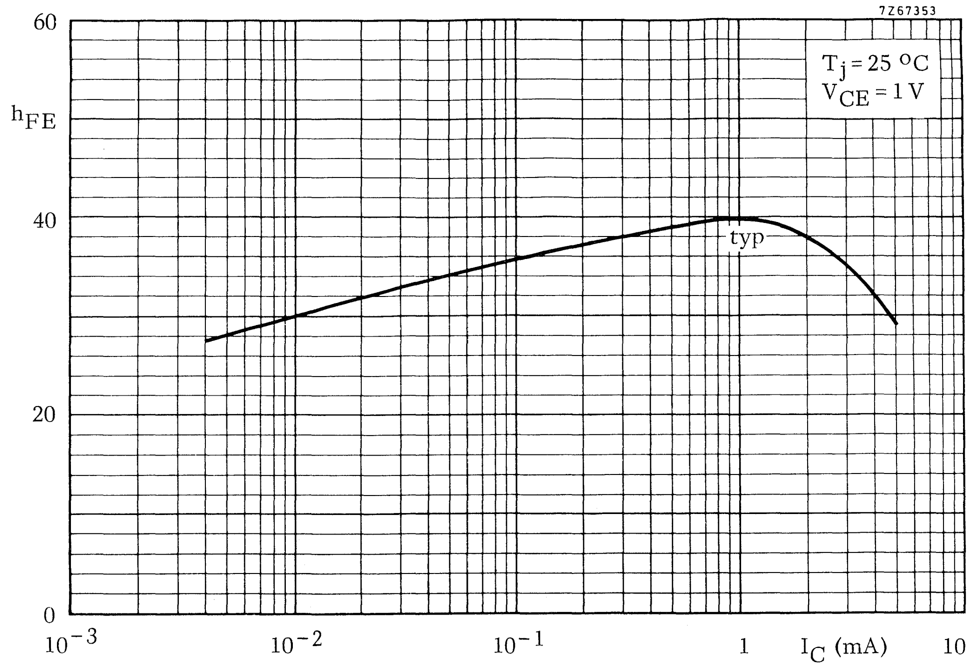


Fig. 3 $V_{CE} = 1$ V; $T_j = 25\ ^oC$; typical values.

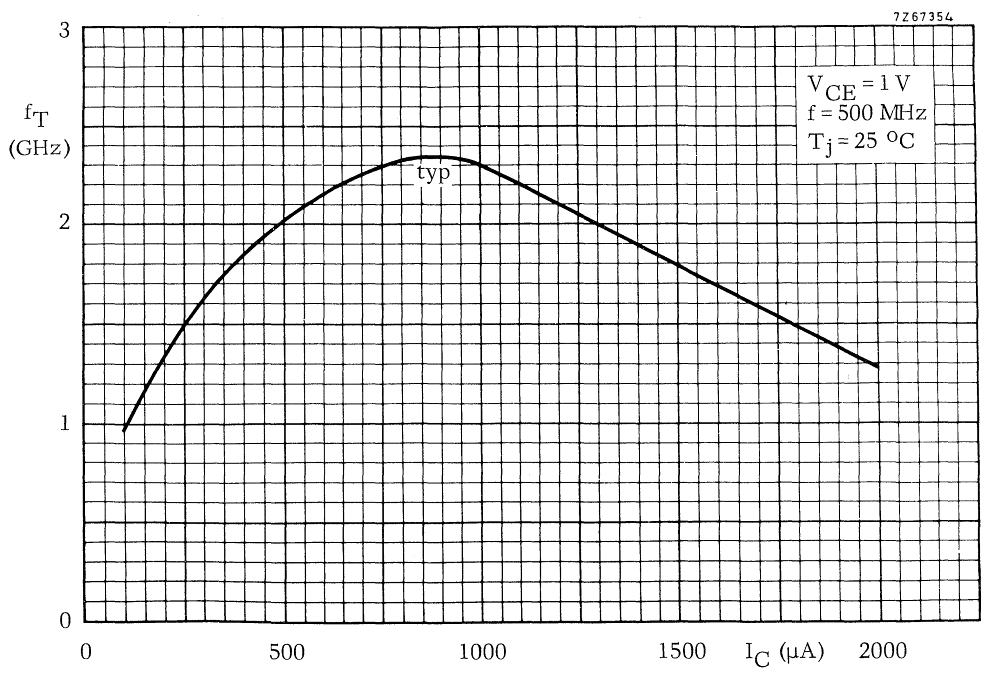


Fig. 4 $V_{CE} = 1$ V; f = 500 MHz; $T_j = 25\ ^oC$; typical values.

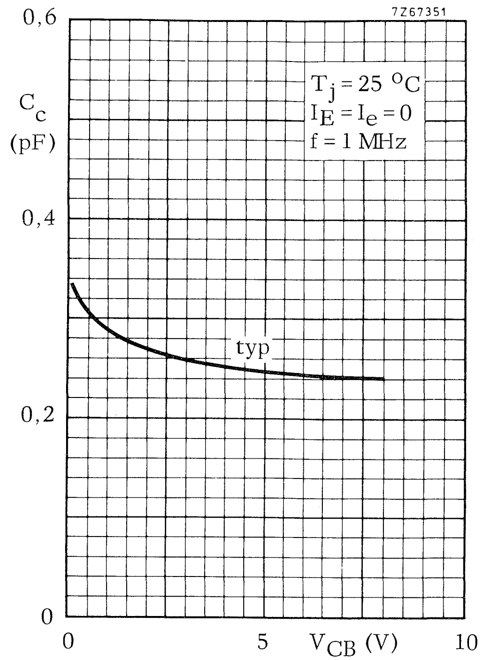


Fig. 5 $I_E = I_e = 0$; f = 1 MHz; $T_j = 25\ ^oC$; typical values.

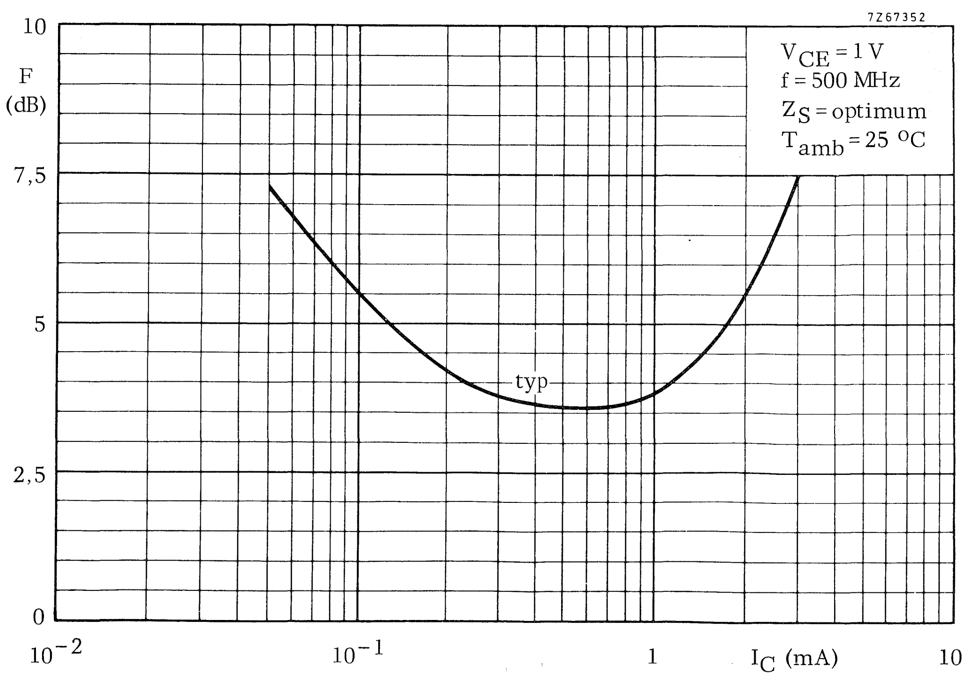


Fig. 6 $V_{CE} = 1$ V; f = 500 MHz; Z_S = opt.; $T_{amb} = 25\ ^oC$; typical values.

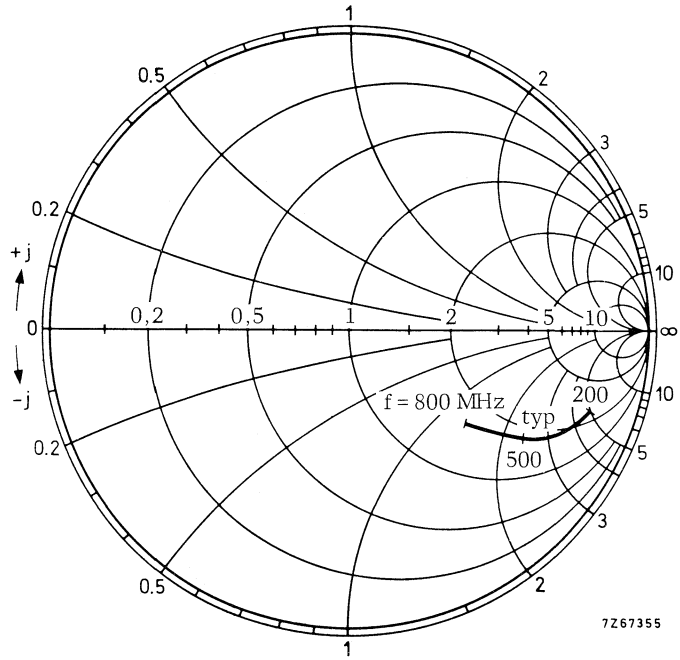


Fig. 7 V_{CE} = 1 V; I_C = 1 mA;
T_{amb} = 25 °C; typical values.

Input impedance derived from
input reflection coefficient s_{11}
coordinates in ohm x 50

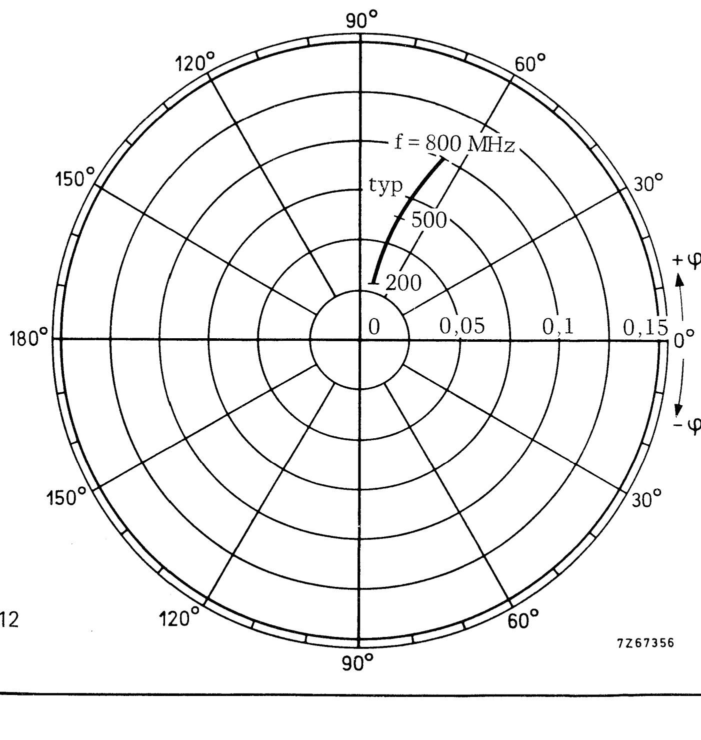


Fig. 8 V_{CE} = 1 V; I_C = 1 mA;
T_{amb} = 25 °C; typical values.

Reverse transmission coefficient s_{12}

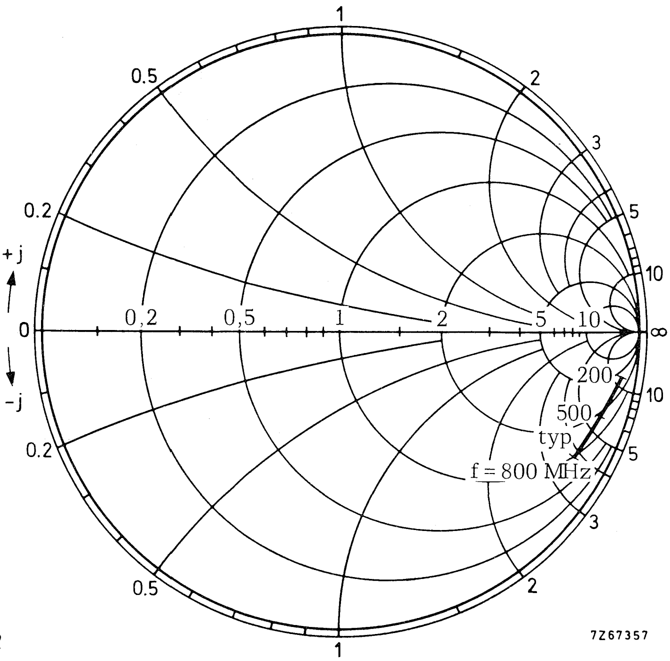


Fig. 9 V_{CE} = 1 V; I_C = 1 mA; T_{amb} = 25 °C; typical values.

Output impedance derived from output reflection coefficient s_{22} coordinates in ohm x 50

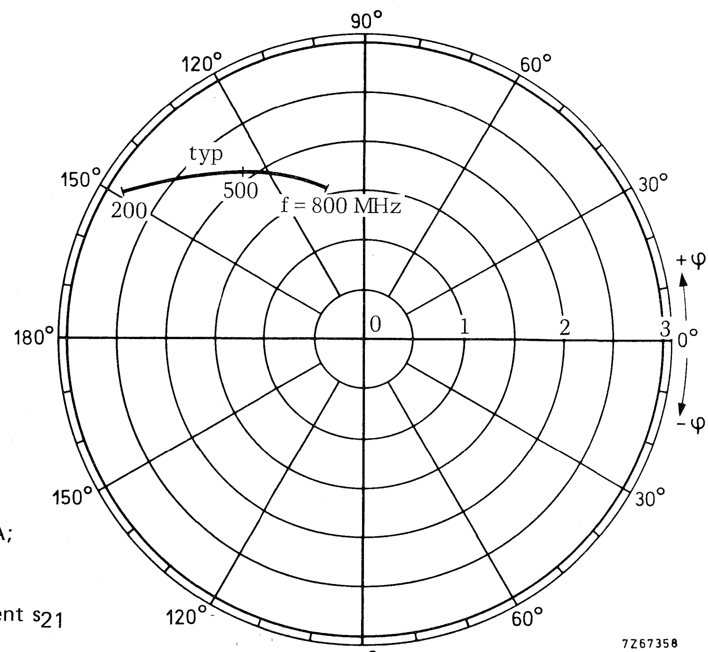


Fig. 10 V_{CE} = 1 V; I_C = 1 mA; T_{amb} = 25 °C; typical values.

Forward transmission coefficient s_{21}

N-P-N 2 GHz 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 μA – 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 (DC)	I_C	max.	6.5	mA
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	300	mW
Junction temperature	T_j	max.	150	°C
Transition frequency at f = 500 MHz I_C = 1 mA; V_{CE} = 1 V	f_T	typ.	2.3	GHz
Feedback capacitance at f = 1 MHz I_C = 1 mA; V_{CE} = 1 V	C_{re}	max.	0.45	pF
Noise figure at optimum source impedance I_C = 1 mA; V_{CE} = 1 V; f = 500 MHz	F	typ.	3.8	dB
Max. unilateral power gain I_C = 1 mA; V_{CE} = 1 V; f = 500 MHz	G_{UM}	typ.	18	dB

MECHANICAL DATA

Dimensions in mm

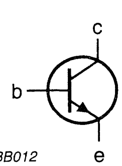
Fig. 1 SOT-23.

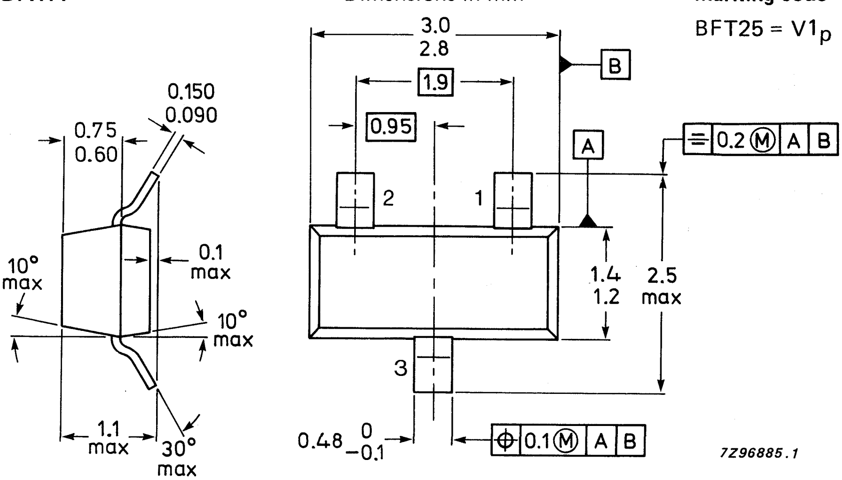
Marking code

BFT25 = V1p

Pinning

1 = base
2 = emitter
3 = collector





TOP VIEW

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.	8	V
Collector-emitter voltage (open base)	V_{CEO}	max.	5	V
Emitter-base voltage (open collector)	V_{EBO}	max.	2	V
Collector current (DC)	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} = 25 °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*	$R_{th\ j\text{-}a}$	=	430	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
D.C. current gain $I_C = 10\ \mu A$; $V_{CE} = 1$ V	h_{FE}	min. typ.	20 30	
$I_C = 1$ mA; $V_{CE} = 1$ V	h_{FE}	min. typ.	20 40	
Saturation voltages $I_C = 10\ \mu A$; $I_B = 1\ \mu A$	V_{CEsat} V_{BEsat}	max. max.	200 750	mV mV
$I_C = 1$ mA; $I_B = 0.1$ mA	V_{CEsat} V_{BEsat}	max. max.	175 900	mV mV
Transition frequency at $f = 500$ MHz $I_C = 1$ mA; $V_{CE} = 1$ V	f_T	min. typ.	1.2 2.3	GHz GHz

* Mounted on a ceramic substrate of 8 mm x 10 mm x 0.7 mm.

Collector capacitance at f = 1 MHz $I_E = I_e = 0$; $V_{CB} = 0.5$ 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 $I_C = 1$ mA; $V_{CE} = 1$ V; $T_{amb} = 25$ °C	C_{re}	max.	0.45 pF
Noise figure at optimum source impedance $I_C = 0{,}1$ mA; $V_{CE} = 1$ V; f = 500 MHz; $T_{amb} = 25$ °C	F	typ.	5.5 dB
$I_C = 1$ mA; $V_{CE} = 1$ V; f = 500 MHz; $T_{amb} = 25$ °C	F	typ.	3.8 dB

Maximum unilateral power gain (s_{12} assumed to be zero)

$$G_{UM} \text{ (in dB)} = 10 \log \frac{|s_{21}|^2}{[1-|s_{11}|^2]\ [1-|s_{22}|^2]}$$

$I_C = 1$ mA; $V_{CE} = 1$ V; f = 200 MHz; $T_{amb} = 25$ °C	G_{UM}	typ.	25.0 dB
$I_C = 1$ mA; $V_{CE} = 1$ V; f = 500 MHz; $T_{amb} = 25$ °C	G_{UM}	typ.	18.0 dB
$I_C = 1$ mA; $V_{CE} = 1$ V; f = 800 MHz; $T_{amb} = 25$ °C	G_{UM}	typ.	12.0 dB

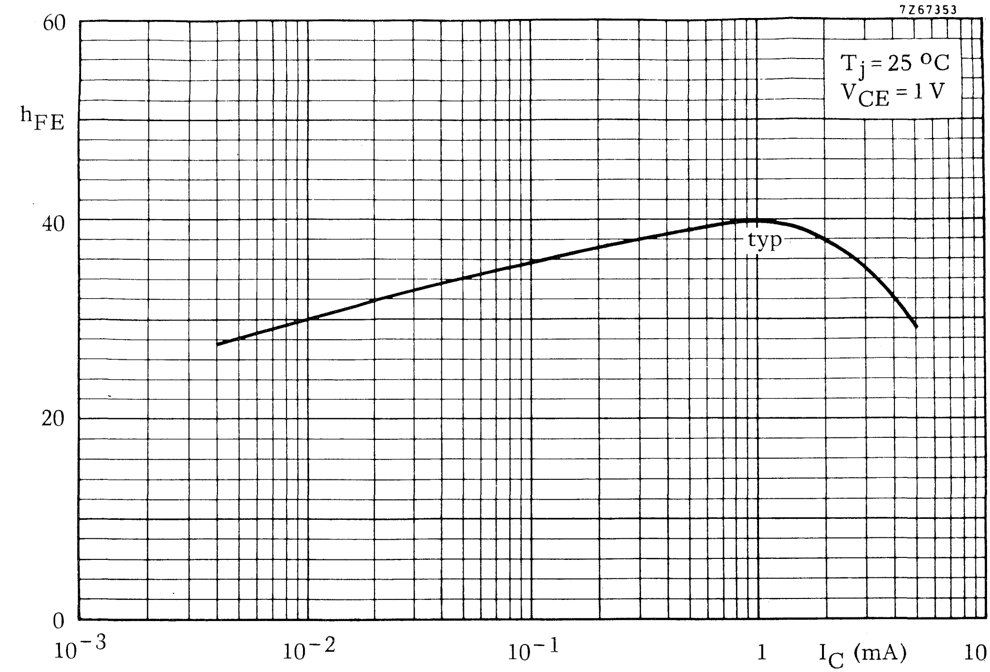


Fig. 2 V_{CE} = 1 V; T_j = 25 °C; typical values.

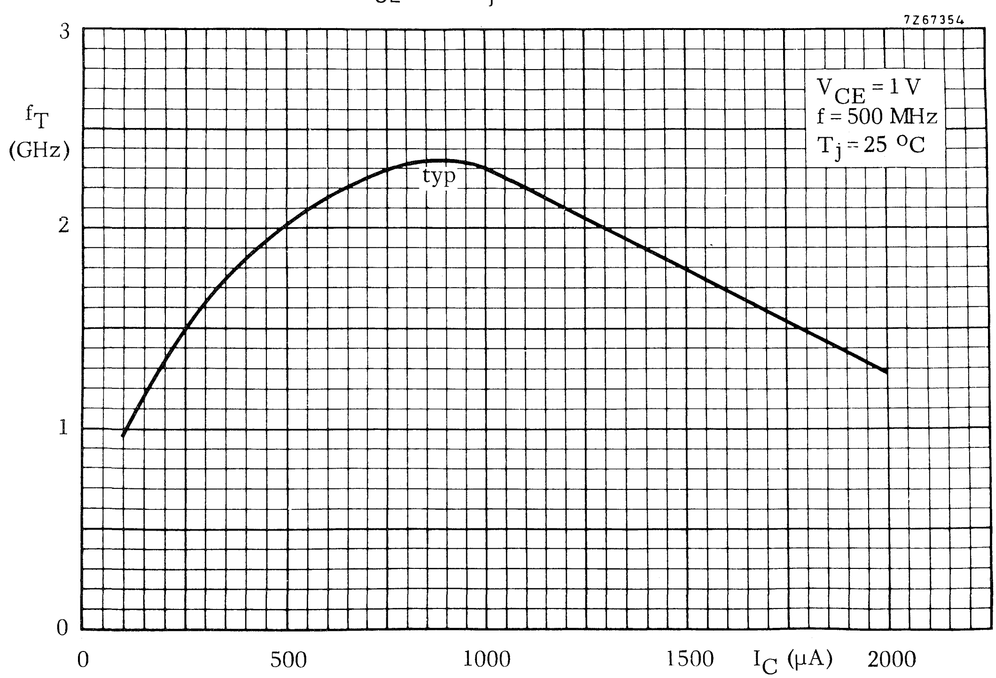


Fig. 3 V_{CE} = 1 V; f = 500 MHz; T_j = 25 °C; typical values.

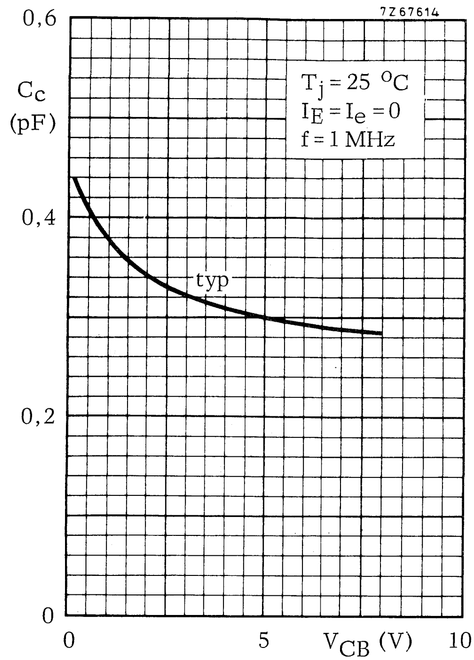


Fig. 4 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C; typical values.

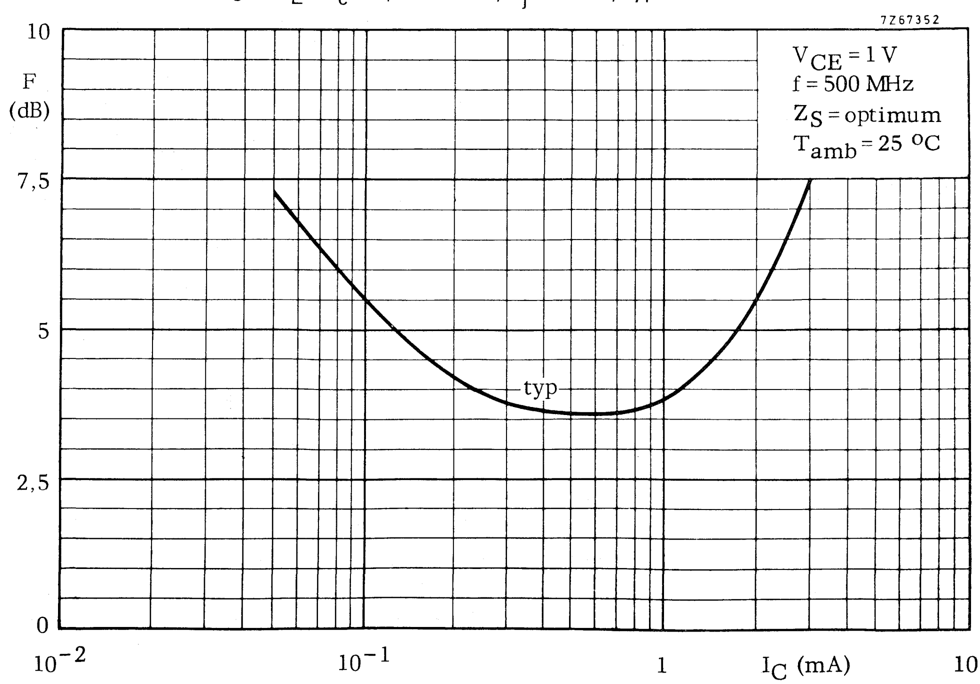


Fig. 5 V_{CE} = 1 V; f = 500 MHz; Z_S = opt.; T_{amb} = 25 °C; typical values.

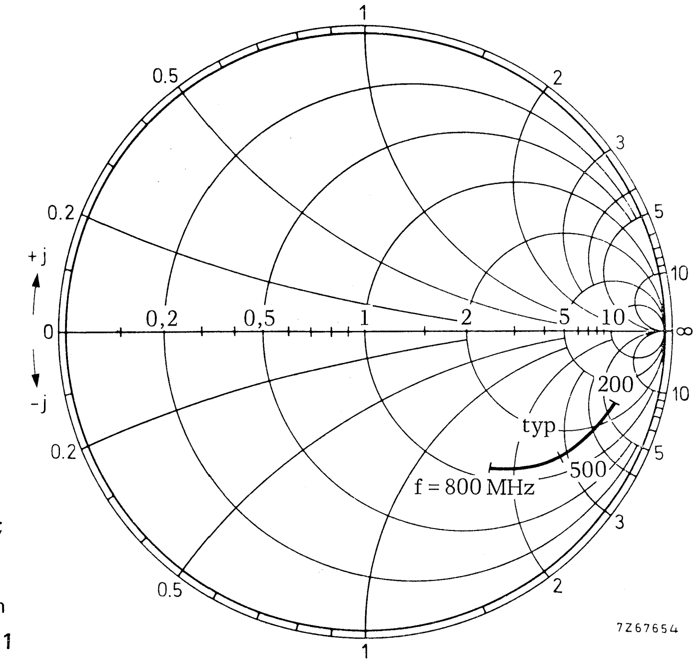


Fig. 6 V_{CE} = 1 V; I_C = 1 mA;
T_{amb} = 25 °C; typical values.

Input impedance derived from input reflection coefficient s_{11} coordinates in ohm x 50

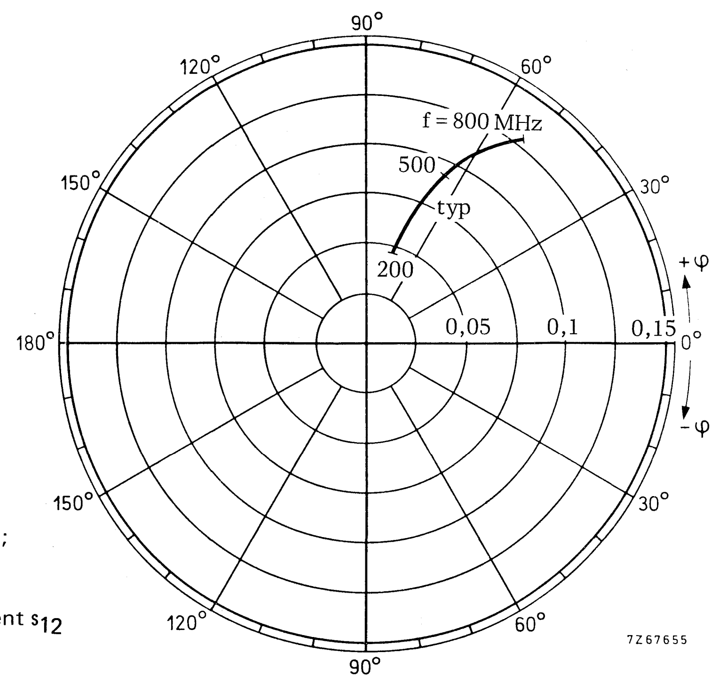


Fig. 7 V_{CE} = 1 V; I_C = 1 mA;
T_{amb} = 25 °C; typical values.

Reverse transmission coefficient s_{12}

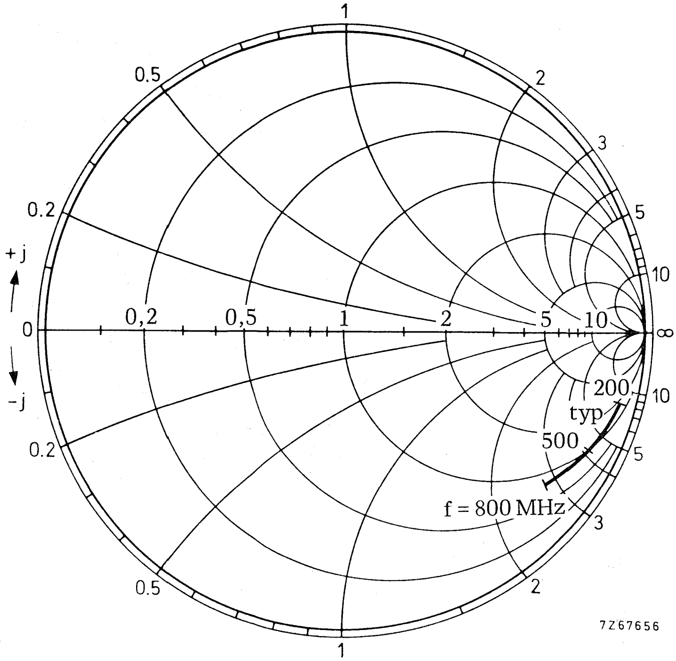


Fig. 8 V_{CE} = 1 V; I_C = 1 mA; T_{amb} = 25 °C; typical values.

Output impedance derived from output reflection coefficient s_{22} coordinates in ohm x 50

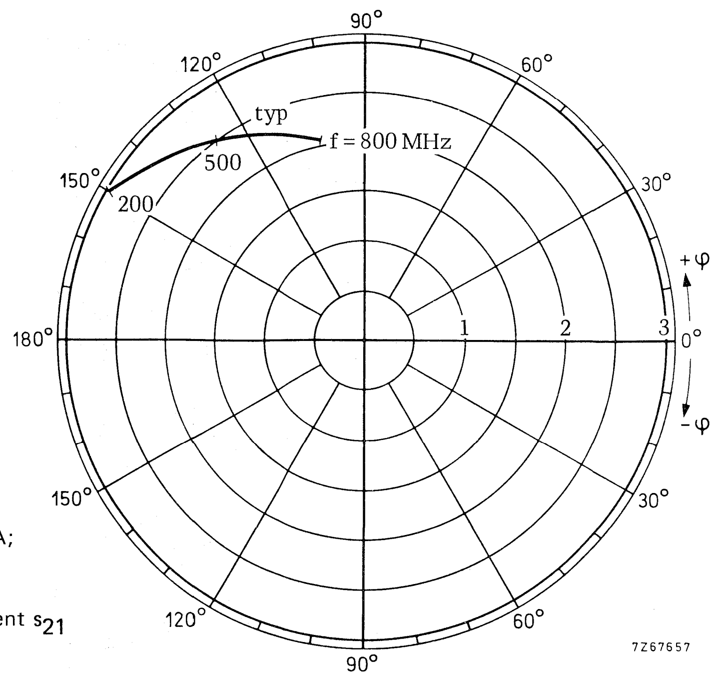


Fig. 9 V_{CE} = 1 V; I_C = 1 mA; T_{amb} = 25 °C; typical values.

Forward transmission coefficient s_{21}

Philips Components

Data sheet	
status	Preliminary specification
date of issue	June 1990

BFT25A
NPN HF wideband transistor

DESCRIPTION

NPN transistor in a plastic SOT23 envelope, primarily for use on low power amplifiers. Ideal for pagers and other battery operated systems where low power consumption is critical.

PINNING

PIN	DESCRIPTION
1	base
2	emitter
3	collector

MECHANICAL DATA

SOT23.

Marking code: V10

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	-	-	8	V
V_{CEO}	collector-emitter voltage	open base	-	-	5	V
I_C	collector current		-	-	6.5	mA
P_{tot}	total power dissipation (DC)		-	-	50	mW
T_j	junction temperature		-	-	150	°C
h_{FE}	DC current gain	I_C = 0. mA; V_{CE} = V	-	80	-	
f_T	transition frequency	f = 500 MHz; I_C = 1 mA; V_{CE} = V	3.5	5	-	GHz

LIMITING VALUES

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

SYMBOL	PARAMETER	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	-	8	V
V_{CEO}	collector-emitter voltage	-	5	V
V_{EBO}	emitter-base voltage	-	2	V
I_C	collector current	-	6.5	mA
P_{tot}	total power dissipation (DC)	-	50	mW
T_{stg}	storage temperature range	−65	+150	°C
T_j	junction temperature	-	150	°C

THERMAL RESISTANCE

SYMBOL	PARAMETER	MAX.	UNIT
$R_{th\ j\text{-}c}$	from junction to case	320	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)\ CBO}$	collector-base breakdown voltage	open emitter I_C = 10 μA	8	-	-	V
$V_{(BR)\ CEO}$	collector-emitter breakdown voltage	open base I_C = 100 μA	5	-	-	V
$V_{(BR)\ EBO}$	emitter-base breakdown voltage	open collector I_E = 10 μA	2	-	-	V
h_{FE}	DC current gain	I_C = 0.5 mA; V_{CE} = 1 V	-	80	-	
C_{re}	feedback capacitance	f = 1 MHz; I_C = 0; V_{CE} = 1 V	-	0.22	-	pF
G_{UM}	maximum unilateral gain	f = 500 MHz; I_C = 0.5 mA; V_{CE} = 1 V	-	24	-	dB
G_{UM}	maximum unilateral gain	f = 1 GHz; I_C = 0.5 mA; V_{CE} = 1 V	-	15	-	dB
F	noise figure	f = 500 MHz; I_C = 0.5 mA; V_{CE} = 1 V	-	1.7	2	dB
F	noise figure	f = 1 GHz; I_C = 0.5 mA; V_{CE} = 1 V	-	2	2.5	dB
f_T	transition frequency	f = 500 MHz; I_C = 1 mA; V_{CE} = 1 V	3.5	5	-	GHz

PNP 5 GHz WIDEBAND TRANSISTOR

P-N-P transistor in a microminiature 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 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 (DC)	$-I_C$	max.	25	mA
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	300	mW
Junction temperature	T_j	max.	150	°C
Transition frequency at f = 500 MHz $-I_C$ = 14 mA; $-V_{CE}$ = 10 V	f_T	typ.	5	GHz
Feedback capacitance at f = 1 MHz $-I_C$ = 2 mA; $-V_{CE}$ = 10 V; T_{amb} = 25 °C	C_{re}	typ.	0.7	pF
Noise figure at optimum source impedance $-I_C$ = 2 mA; $-V_{CE}$ = 10 V; f = 500 MHz; T_{amb} = 25 °C	F	typ.	2.7	dB
Max. unilateral power gain $-I_C$ = 14 mA; $-V_{CE}$ = 10 V; f = 500 MHz; T_{amb} = 25 °C	G_{UM}	typ.	18	dB
Intermodulation distortion at T_{amb} = 25 °C $-I_C$ = 14 mA; $-V_{CE}$ = 10 V; R_L = 75 Ω; V_o = 150 mV $f_{(p+q-r)}$ = 493.25 MHz	d_{im}	typ.	−60	dB

MECHANICAL DATA

(See next page).

See also *Soldering recommendations.*

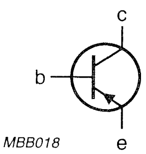
MECHANICAL DATA

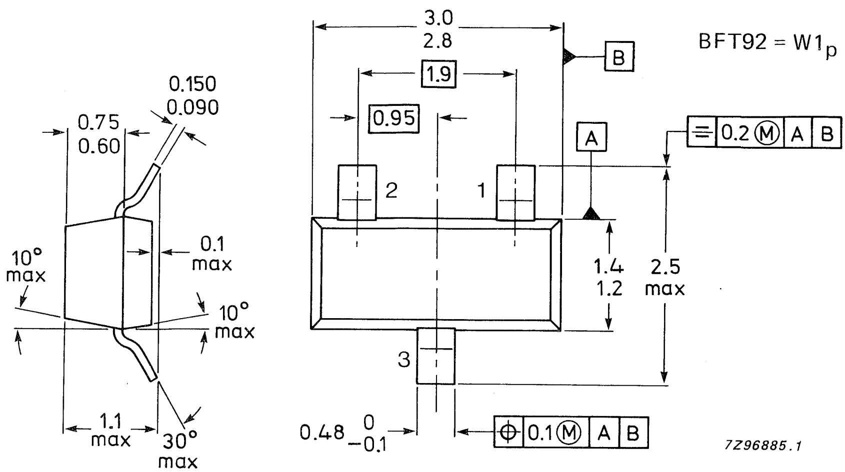
Dimensions in mm

Fig. 1 SOT-23.

Pinning

1 = base
2 = emitter
3 = collector





TOP VIEW

Marking code

BFT92 = W1p

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 (DC)	$-I_C$	max.	25	mA
Collector current (peak value; f > 1 MHz)	$-I_{CM}$	max.	35	mA
Total power dissipation up to T_{amb} = 25 °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*	$R_{th\ j\text{-}a}$	=	430 K/W

* Mounted on a ceramic substrate of 8 mm x 10 mm x 0,7 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
DC current gain $-I_C = 14$ mA; $-V_{CE} = 10$ V	h_{FE}	min. typ.	20 50	
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.	0.75	pF
Emitter capacitance at f = 1 MHz $I_C = I_c = 0; -V_{EB} = 0.5$ V	C_e	typ.	0.8	pF
T_{amb} = 25 °C				
Feedback capacitance at f = 1 MHz $-I_C = 2$ mA; $-V_{CE} = 10$ V	C_{re}	typ.	0.7	pF
Noise figure at optimum source impedance * $-I_C = 2$ mA; $-V_{CE} = 10$ V; f = 500 MHz	F	typ.	2.7	dB
Max. unilateral power gain (s_{re} assumed to be zero) $G_{UM} = 10 \log \frac{\lvert s_{21}\rvert^2}{[1-\lvert s_{11}\rvert^2]\ [1-\lvert s_{22}\rvert^2]}$ $-I_C = 14$ mA; $-V_{CE} = 10$ V; f = 500 MHz	G_{UM}	typ.	18.0	dB
Output voltage at $d_{im} = -60$ dB (see Fig. 2) (DIN 45004B, par. 6.3.: 3-tone) $-I_C = 14$ mA; $-V_{CE} = 10$ V; $R_L = 75\ \Omega$ $V_p = V_o$ 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.	150	mV

* Crystal mounted in SOT-37 envelope.

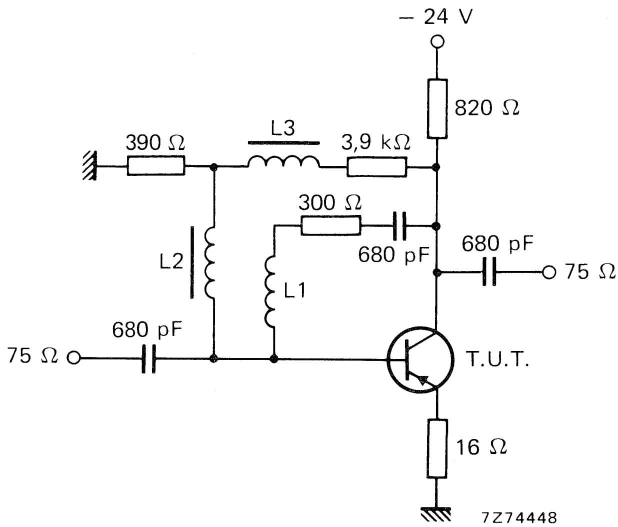


Fig. 2 Intermodulation test circuit.

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).

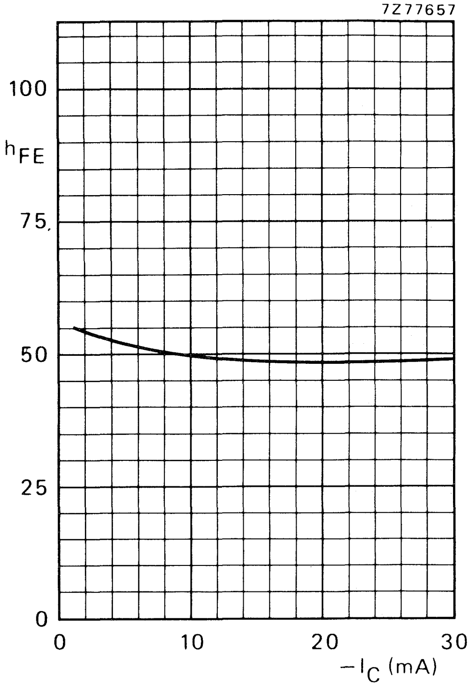


Fig. 3 $-V_{CE}$ = 10 V; T_j = 25 °C; typical values.

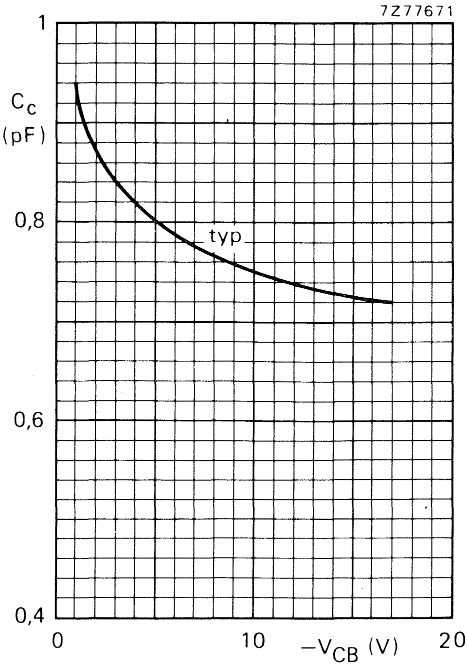


Fig. 4 $I_E = I_e = 0$; T_j = 25 °C; f = 1 MHz; typical values.

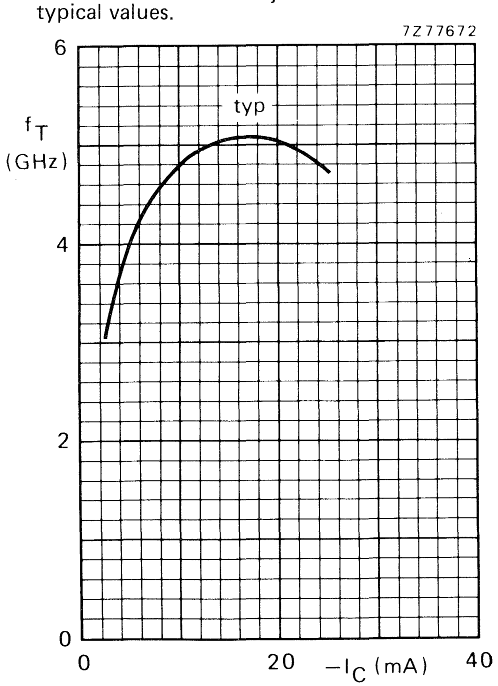


Fig. 5 $-V_{CE}$ = 10 V; f = 500 MHz; T_j = 25 °C; typical values.

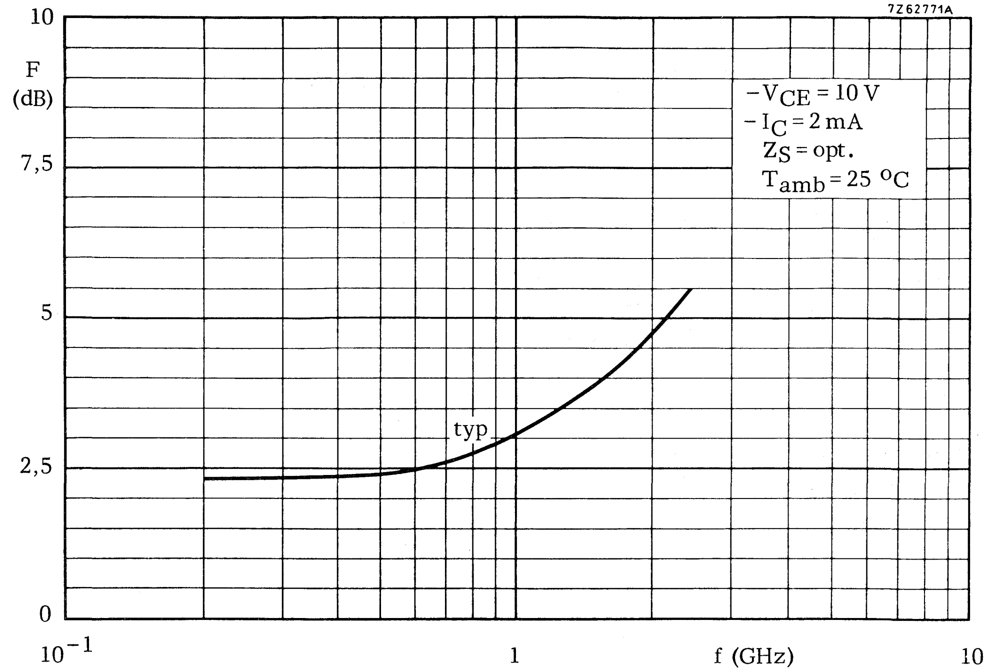


Fig. 6 $-V_{CE}$ = 10 V; $-I_C$ = 2 mA; Z_S = opt.; T_{amb} = 25 °C; typical values.

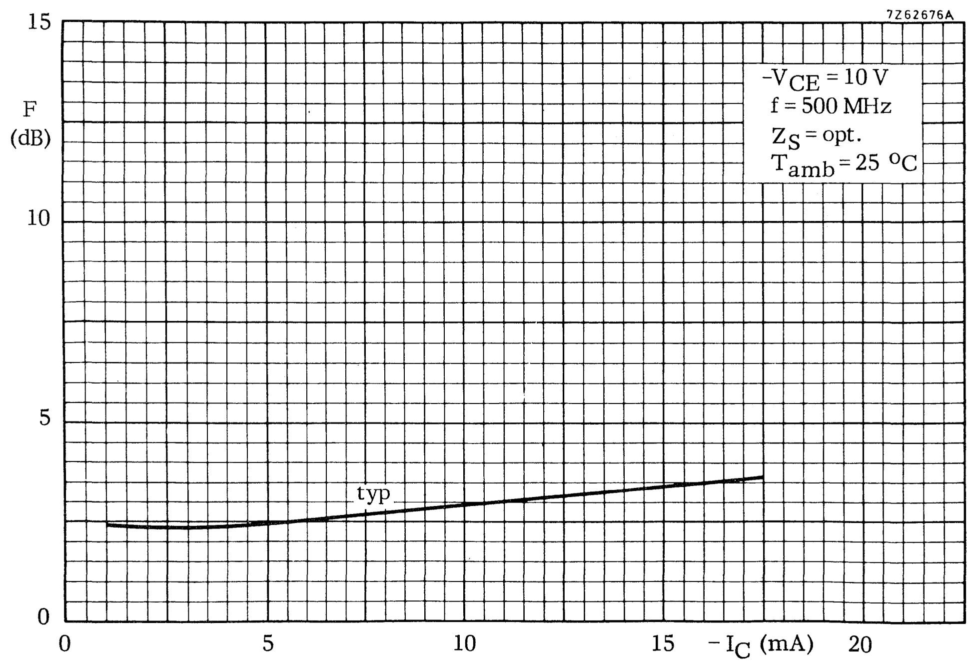


Fig. 7 $-V_{CE}$ = 10 V; f = 500 MHz; Z_S = opt.; T_{amb} = 25 °C; typical values.

P-N-P 5 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 (DC)	$-I_C$	max.	35	mA
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	300	mW
Junction temperature	T_j	max.	150	°C
Transition frequency at f = 500 MHz $-I_C$ = 30 mA; $-V_{CE}$ = 5 V	f_T	typ.	5.0	GHz
Feedback capacitance at f = 1 MHz $-I_C$ = 2 mA; $-V_{CE}$ = 5 V	C_{re}	typ.	1.0	pF
Noise figure at optimum source impedance $-I_C$ = 2 mA; $-V_{CE}$ = 5 V; f = 500 MHz	F	typ.	2.4	dB
Max. unilateral power gain $-I_C$ = 30 mA; $-V_{CE}$ = 5 V; f = 500 MHz	G_{UM}	typ.	16.5	dB
Output voltage at d_{im} = −60 dB $-I_C$ = 30 mA; $-V_{CE}$ = 5 V; R_L = 75 Ω $f_{(p+q-r)}$ = 493.25 MHz	V_o	typ.	300	mV

MECHANICAL DATA

Dimensions in mm

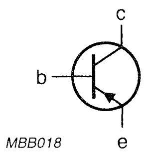
Marking code

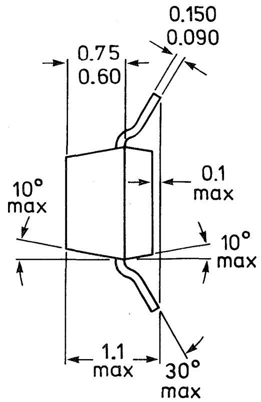
BFT93 = $X1_p$

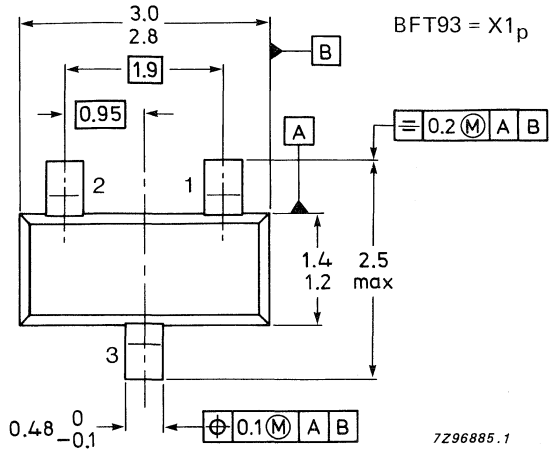
Fig. 1 SOT-23.

Pinning

1 = base
2 = emitter
3 = collector







TOP VIEW

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.	15	V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	12	V
Emitter-base voltage (open collector)	$-V_{EBO}$	max.	2	V
Collector current (DC)	$-I_C$	max.	35	mA
Collector current (peak value; f > 1 MHz)	$-I_{CM}$	max.	50	mA
Total power dissipation up to T_{amb} = 25 °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*	$R_{th\ j\text{-}a}$	=	430 K/W

* Mounted on a ceramic substrate of 8 mm x 10 mm x 0.7 mm.

CHARACTERISTICS

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

Collector cut-off current				
$I_E = 0$; $-V_{CB} = 5$ V	$-I_{CBO}$	max.	50	nA
DC current gain				
$-I_C = 30$ mA; $-V_{CE} = 5$ V	h_{FE}	min.	20	
		typ.	50	
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.	0.95	pF
Emitter capacitance at f = 1 MHz				
$I_C = I_c = 0$; $-V_{EB} = 0.5$ V	C_e	typ.	1.8	pF
$T_{amb} = 25\ ^{o}C$				
Feedback capacitance at f = 1 MHz				
$-I_C = 2$ mA; $-V_{CE} = 5$ V	C_{re}	typ.	1.0	pF
Noise figure at optimum source impedance *				
$-I_C = 2$ mA; $-V_{CE} = 5$ V; f = 500 MHz	F	typ.	2.4	dB
Max. unilateral power gain (s_{12} assumed to be zero)				
$G_{UM} = 10 \log \frac{\lvert s_{21}\rvert^2}{[1-\lvert s_{11}\rvert^2]\ [1-\lvert s_{22}\rvert^2]}$				
$-I_C = 30$ mA; $-V_{CE} = 5$ V; f = 500 MHz	G_{UM}	typ.	16.5	dB
Output voltage at $d_{im} = -60$ dB (see Fig. 2)				
$-I_C = 30$ mA; $-V_{CE} = 5$ V; $R_L = 75\ \Omega$				
$V_p = V_o$ 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 $f_{(p+q-r)} = 443.25$ MHz	V_o	typ.	300	mV

* Crystal mounted in SOT-37 envelope.

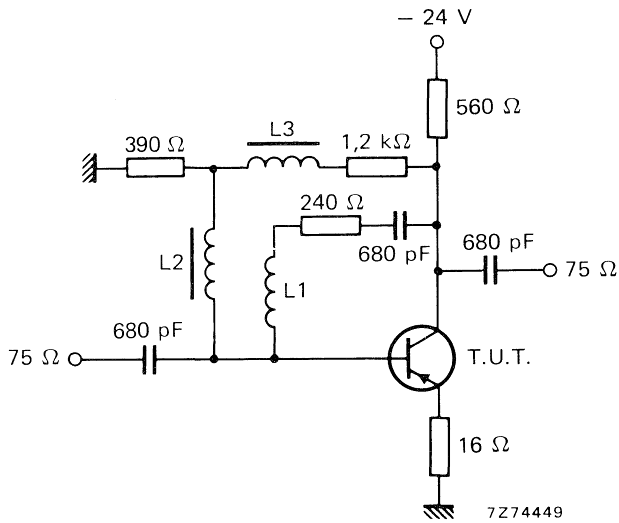


Fig. 2 Intermodulation test circuit.

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).

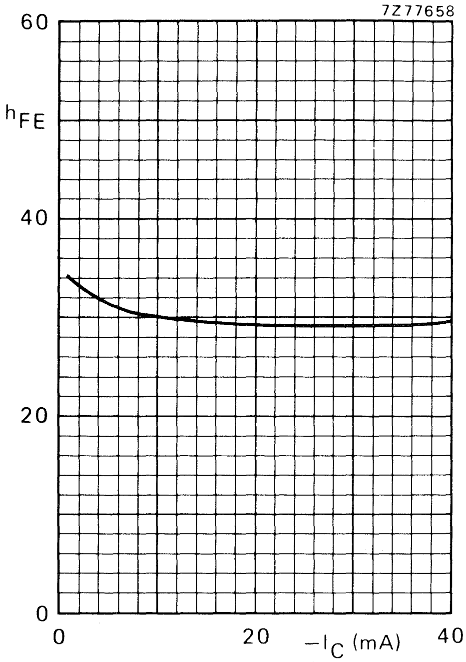


Fig. 3 $-V_{CE}$ = 5 V; T_j = 25 °C; typical values.

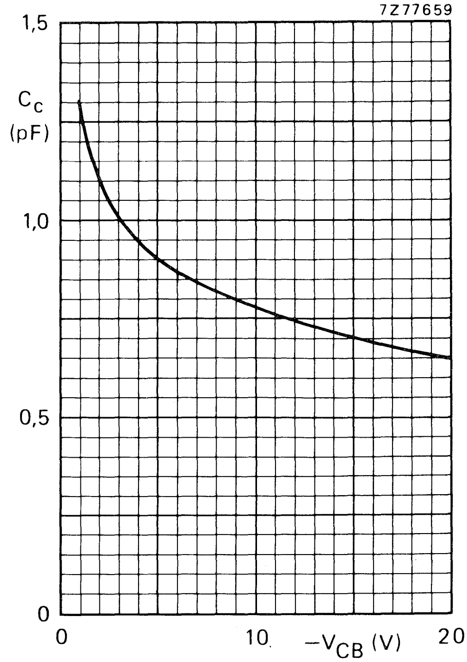


Fig. 4 $I_E = I_e = 0$; T_j = 25 °C; f = 1 MHz; typical values.

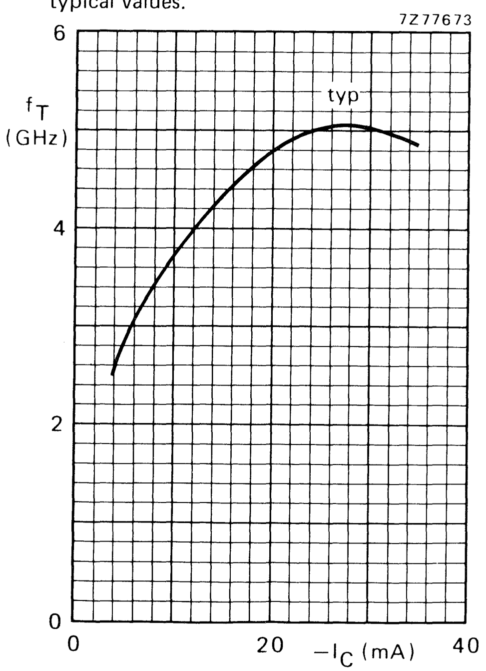


Fig. 5 $-V_{CE}$ = 5 V; T_j = 25 °C; f = 500 MHz; typical values.

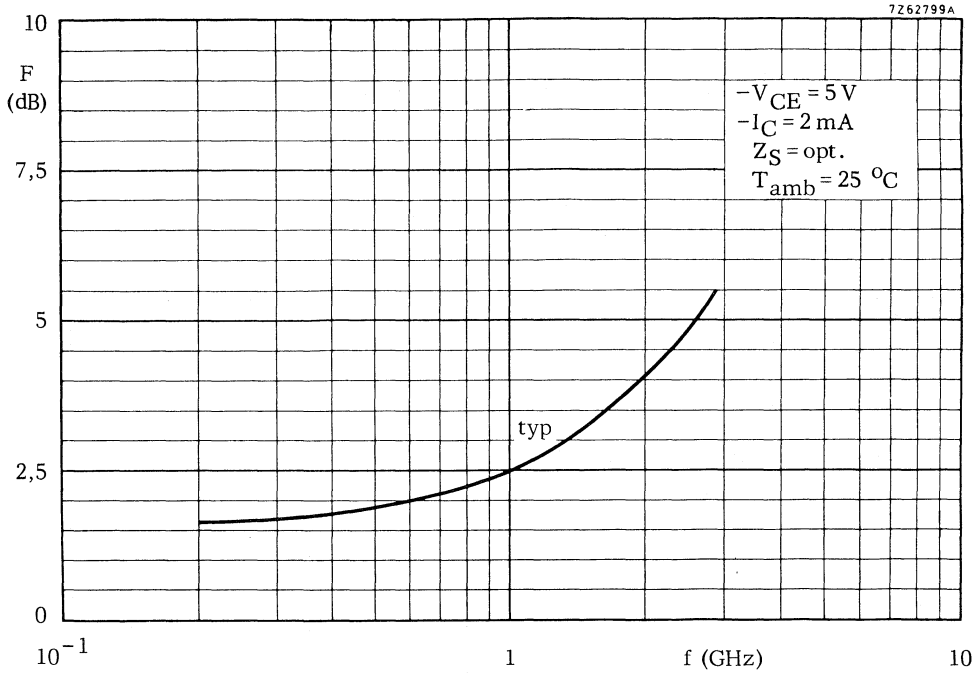


Fig. 6 $-V_{CE} = 5$ V; $-I_C = 2$ mA; Z_S = opt.; $T_{amb} = 25$ °C; typical values.

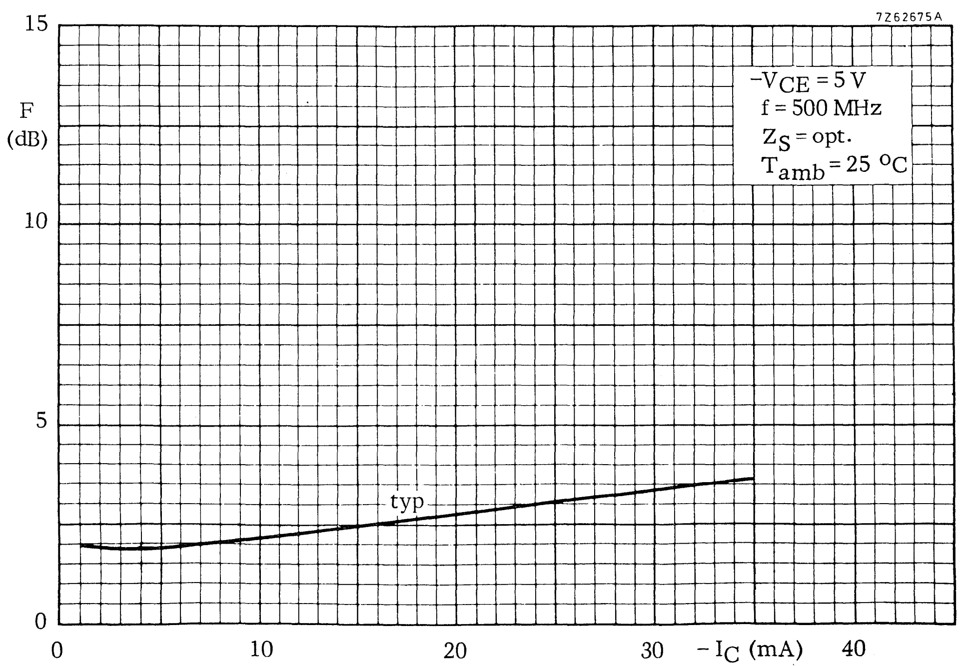


Fig. 7 $-V_{CE} = 5$ V; f = 500 MHz; Z_S = opt.; $T_{amb} = 25$ °C; typical values.

N-P-N 1 GHz 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

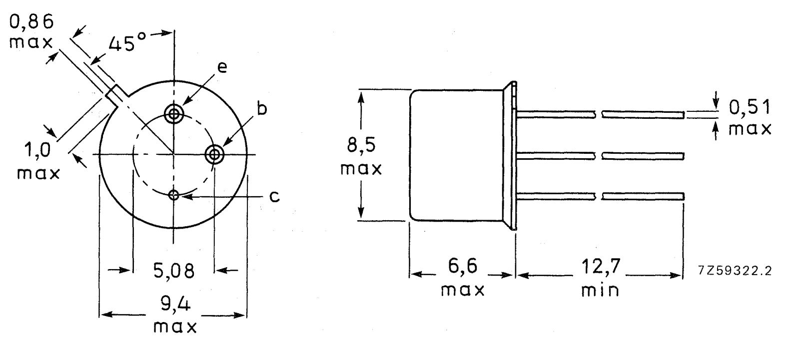
Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	40	V
Collector-emitter voltage (open base)	V_{CEO}	max.	25	V
Collector current (peak value; f > 1 MHz)	I_{CM}	max.	300	mA
Total power dissipation up to T_{amb} = 125 °C	P_{tot}	max.	1.5	W
Junction temperature	T_j	max.	200	°C
Feedback capacitance 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. typ.	16 6.5	dB 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. typ.	150 90	mW 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 ($R_{BE} \leqslant 50\ \Omega$) 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 (DC)	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	$R_{th\ j\text{-}a}$	=	250	K/W
From junction to mounting base	$R_{th\ j\text{-}mb}$	=	50	K/W
From mounting base to heatsink mounted with top clamping washer of 56218 and a boron nitride washer for electrical insulation	$R_{th\ mb\text{-}h}$	=	1.2	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current			
I_E = 0; V_{CB} = 20 V; T_j = 150 °C	I_{CBO}	max.	20 μA
Knee voltage			
I_C = 100 mA; I_B = value for which			
I_C = 110 mA at V_{CE} = 1 V	V_{CEK}	max.	0.75 V

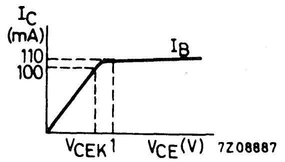


Fig. 2

DC current gain			
I_C = 50 mA; V_{CE} = 5 V	h_{FE}	min.	25
I_C = 150 mA; V_{CE} = 5 V	h_{FE}	min.	25
Transition frequency			
I_C = 150 mA; V_{CE} = 15 V; f = 500 MHz	f_T	typ.	1.2 GHz
Collector capacitance at f = 1 MHz			
I_E = I_e = 0; V_{CB} = 15 V	C_c	max.	4 pF
Feedback capacitance at f = 1 MHz			
I_C = 10 mA; V_{CE} = 15 V; T_{amb} = 25 °C	C_{re}	typ.	1.7 pF
Noise figure at f = 200 MHz			
I_C = 30 mA; V_{CE} = 15 V; Z_S = 75 Ω; T_{amb} = 25 °C	F	max.	6 dB
Power gain (not neutralized)			
I_C = 70 mA; V_{CE} = 18 V; T_{amb} = 25 °C			
f = 200 MHz	G_p	typ.	16 dB
f = 800 MHz	G_p	typ.	6.5 dB

CHARACTERISTICS (continued)

Intermodulation characteristics

1. Output power at f = 200 MHz; T_{amb} = 25 °C
   I_C = 70 mA; V_{CE} = 18 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.	130	mW
	typ.	150	mW

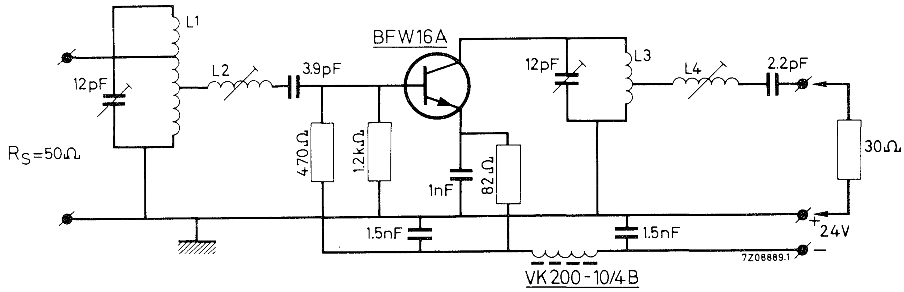


Fig. 3 Test circuit.

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:
$R_L = 220\ \Omega$; $C_L = -5.6$ 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 220 Ω 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 MHz; T_{amb} = 25 °C
   I_C = 70 mA; V_{CE} = 18 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	min.	70	mW
	typ.	90	mW

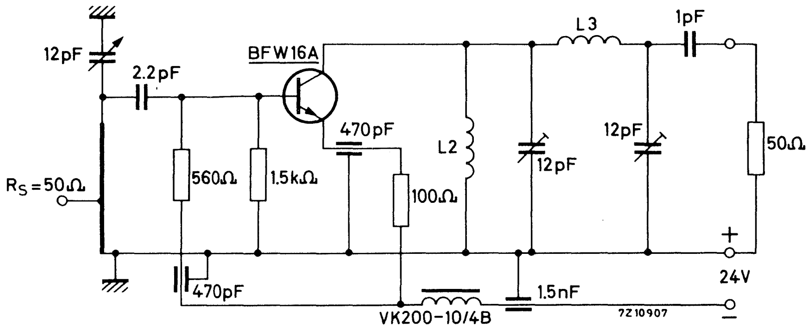


Fig. 4 Test circuit.

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 linearily 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 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). Therefor 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.

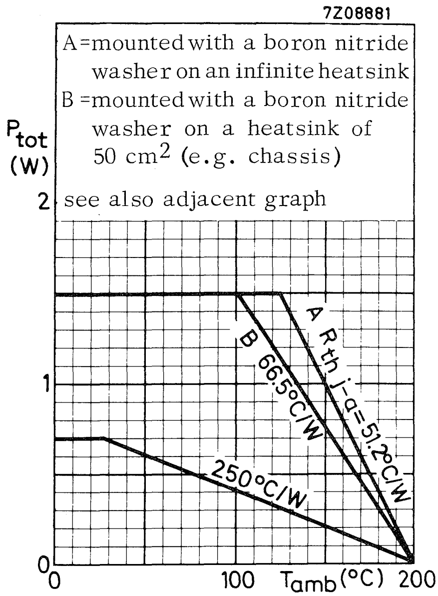


Fig. 5

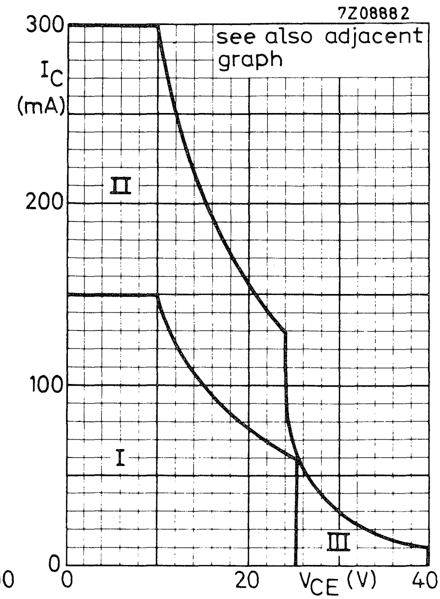


Fig. 6

I = Region of permissible operation under all base-emitter conditions and at all frequencies, including d.c.

II = Additional region of operation at $f \geqslant 1$ MHz.

III = Operating under pulsed conditions is allowed, provided the transistor is cut-off with $R_{BE} \leqslant 50\ \Omega$ and $f \geqslant 1$ MHz.

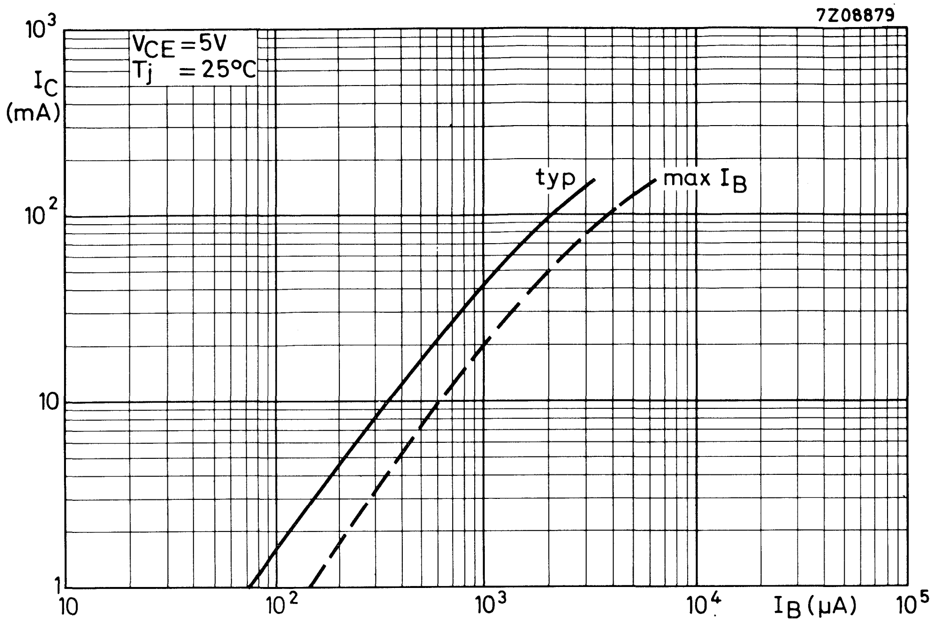


Fig. 7 V_{CE} = 5 V; T_j = 25 °C

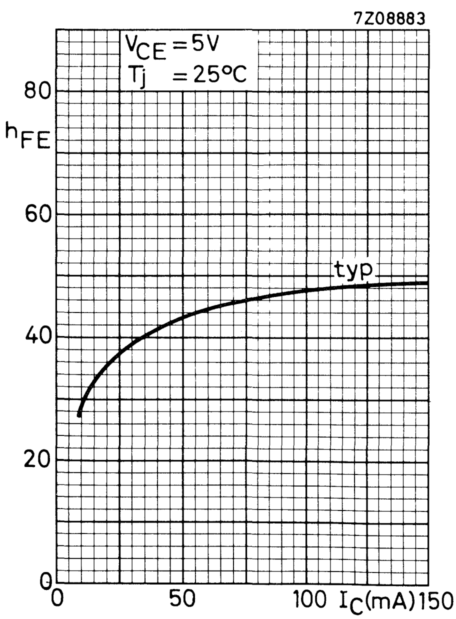


Fig. 8 V_{CE} = 5 V; T_j = 25 °C; typical values.

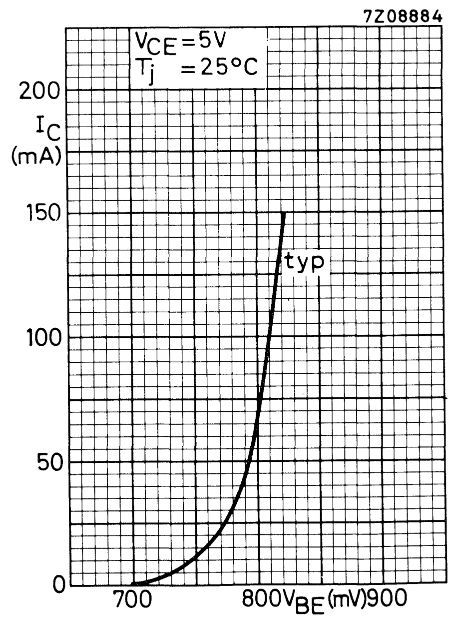


Fig. 9 V_{CE} = 5 V; T_j = 25 °C; typical values.

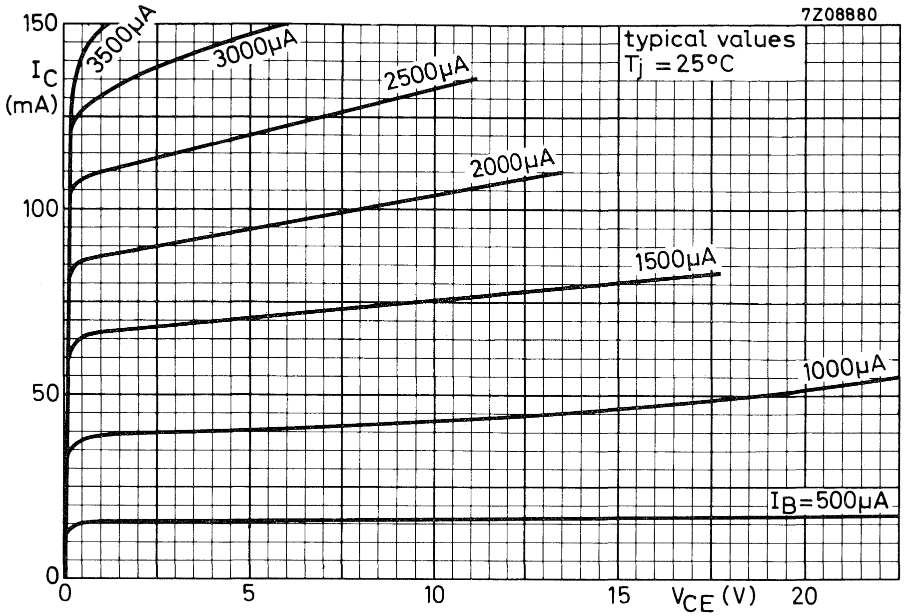


Fig. 10 T_j = 25 °C; typical values.

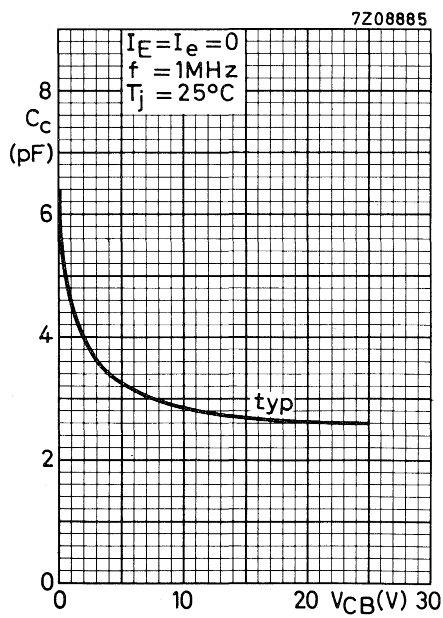


Fig. 11 I_E = I_e = 0; f = 1 MHz; T_j = 25 °C; typical values.

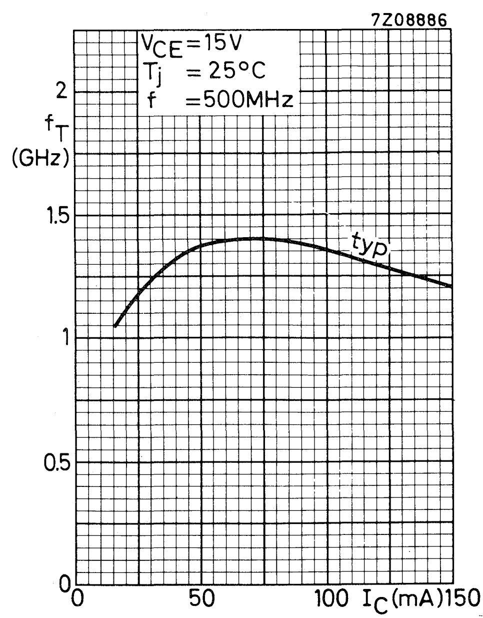


Fig. 12 V_{CE} = 15 V; f = 500 MHz; T_j = 25 °C; typical values.

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			BFY90				
first stage	BFY90	BFY90	BFY90	BFY90	BFY90	BFY90	
Output power at							
d_{im} = −30 dB	150**	150**	100				mW
d_{im} = −50 dB					30		mW
d_{im} = −60 dB				10		10	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 Ω or
V_o = 3 V over R_L = 60 Ω.

N-P-N 1 GHz 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

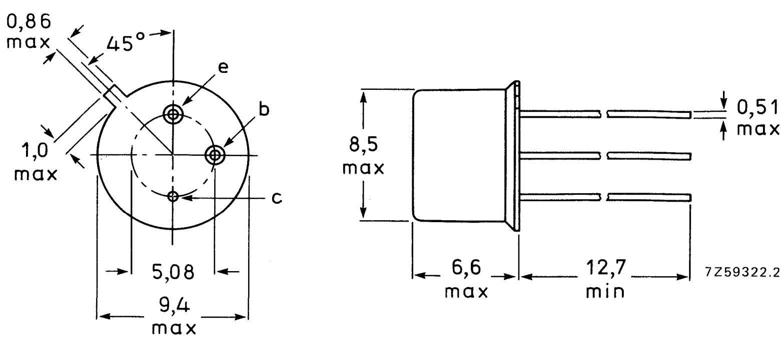
Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	40	V
Collector-emitter voltage (open base)	V_{CEO}	max.	25	V
Collector current (peak value; $f > 1$ MHz)	I_{CM}	max.	300	mA
Total power dissipation up to T_{mb} = 125 °C	P_{tot}	max.	1.5	W
Junction temperature	T_j	max.	200	°C
Feedback capacitance 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 (DC)	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 °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	$R_{th\ j\text{-}a}$	=	250	K/W
From junction to mounting base	$R_{th\ j\text{-}mb}$	=	50	K/W
From mounting base to heatsink mounted with top clamping washer of 56218 and a boron nitride washer for electrical insulation	$R_{th\ mb\text{-}h}$	=	1.2	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current $I_E = 0$; V_{CB} = 20 V; T_j = 150 °C	I_{CBO}	max.	20	μA
Knee voltage I_C = 100 mA; I_B = value for which I_C = 110 mA at V_{CE} = 1 V	V_{CEK}	max.	0.75	V

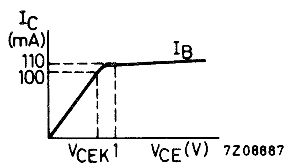


Fig. 2.

DC current gain			
I_C = 50 mA; V_{CE} = 5 V	h_{FE}	min.	25
I_C = 150 mA; V_{CE} = 5 V	h_{FE}	min.	25
Transition frequency			
I_C = 150 mA; V_{CE} = 15 V; f = 500 MHz	f_T	typ.	1.1 GHz
Collector capacitance at f = 1 MHz			
$I_E = I_e = 0$; V_{CB} = 15 V	C_c	max.	4.0 pF
Feedback capacitance at f = 1 MHz			
I_C = 10 mA; V_{CE} = 15 V; T_{amb} = 25 °C	C_{re}	typ.	1.7 pF
Power gain (not neutralized)			
I_C = 70 mA; V_{CE} = 18 V; f = 200 MHz; T_{amb} = 25 °C	G_p	typ.	16 dB
Intermodulation characteristics			
Output power at f = 200 MHz; T_{amb} = 25 °C; I_C = 70 mA; V_{CE} = 18 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.	150 mW

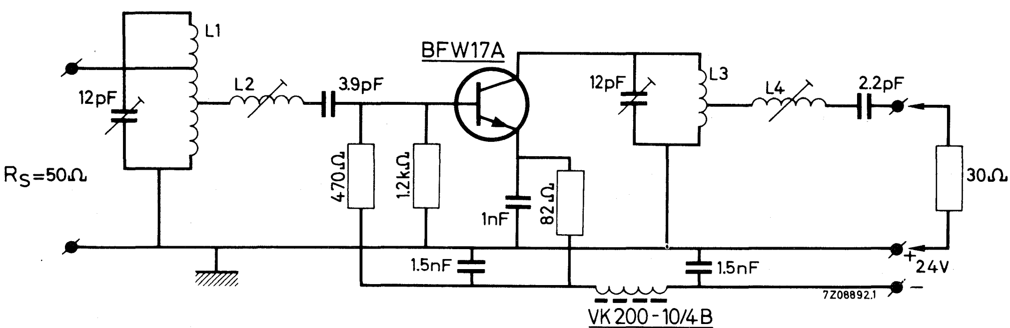


Fig. 3 Test circuit.

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:
$R_L = 220\ \Omega$; $C_L = -5.6$ 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 220 Ω 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.

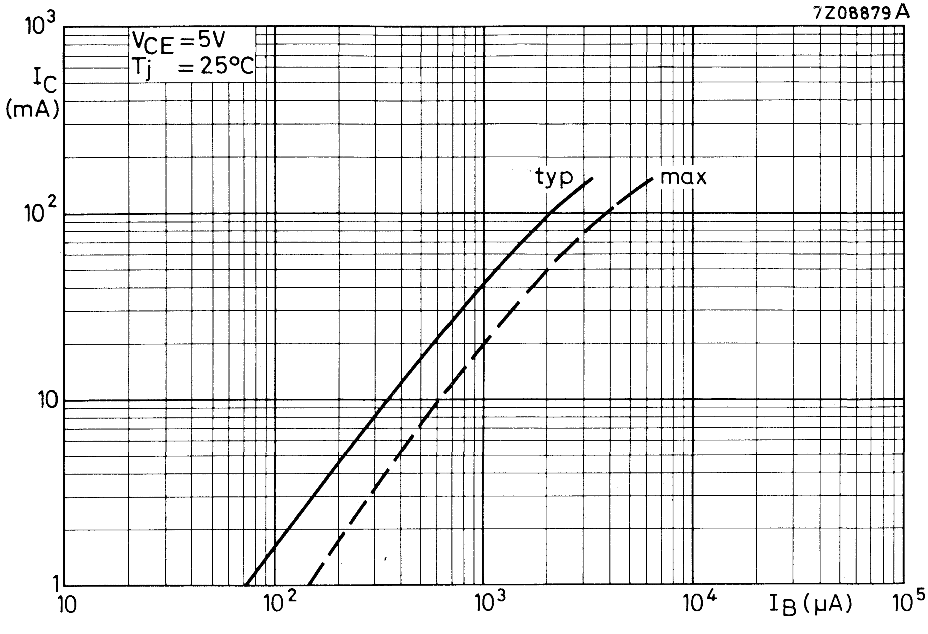


Fig. 4 V_{CE} = 5 V; T_j = 25 °C.

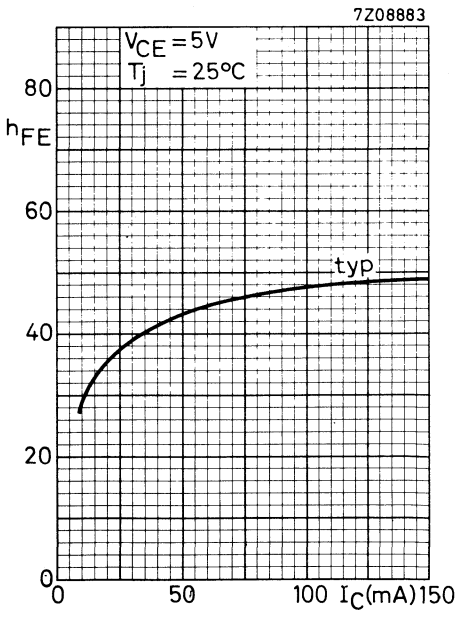


Fig. 5 V_{CE} = 5 V; T_j = 25 °C; typical values.

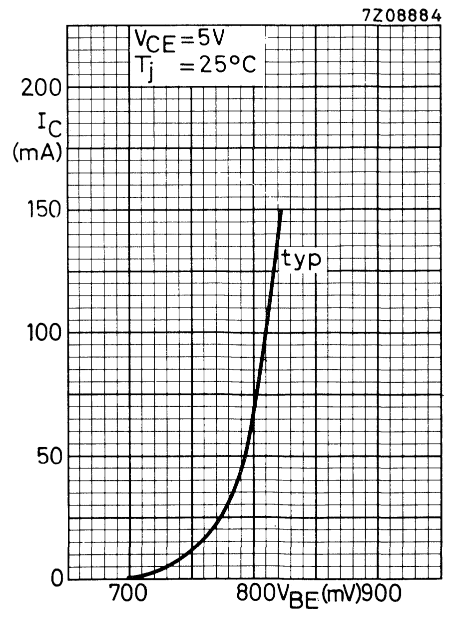


Fig. 6 V_{CE} = 5 V; T_j = 25 °C; typical values.

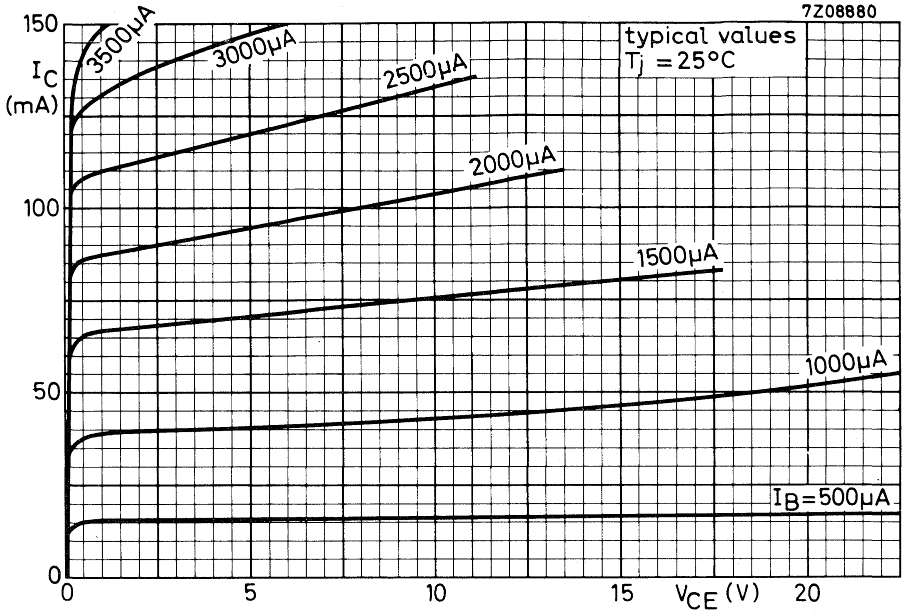


Fig. 7 T_j = 25 °C; typical values.

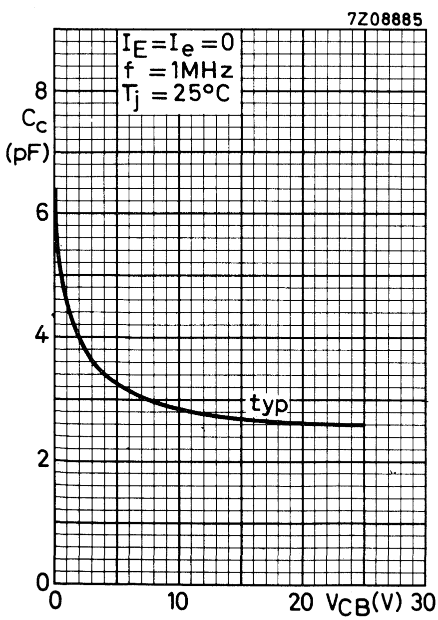


Fig. 8 $I_E = i_e = 0$; f = 1 MHz; T_j = 25 °C; typical values.

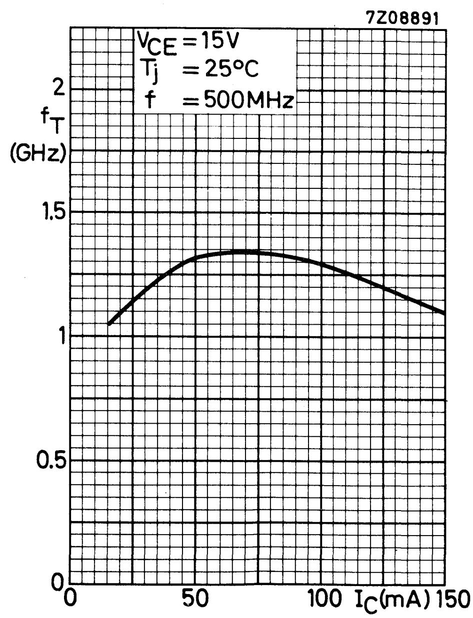


Fig. 9 V_{CE} = 15 V; f = 500 MHz; T_j = 25 °C; typical values.

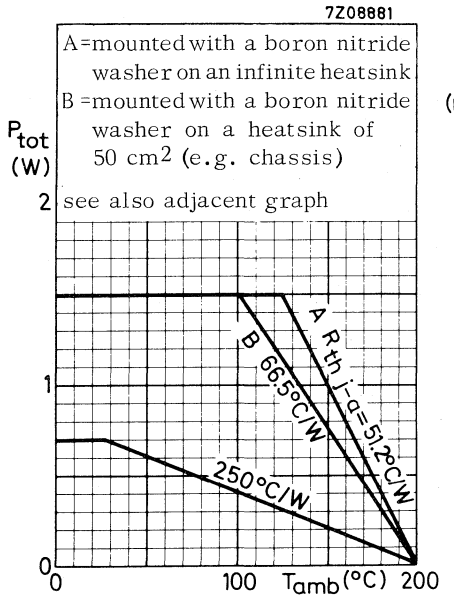


Fig. 10.

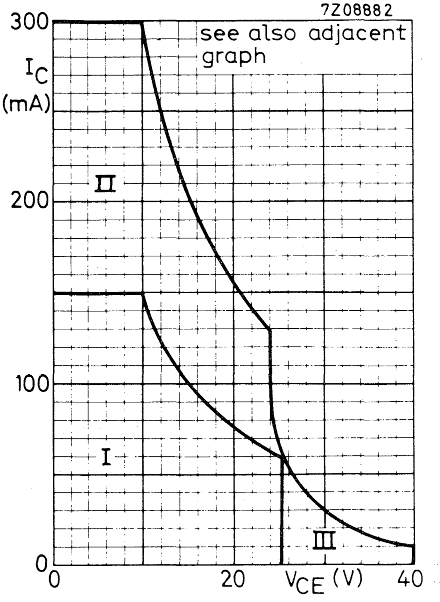


Fig. 11.

I = Region of permissible operation under all base-emitter conditions and at all frequencies, including d.c.

II = Additional region of operation at f ⩾ 1 MHz

III = Operating under pulsed conditions is allowed, provided the transistor is cut-off with $R_{BE} \leqslant 50\,\Omega$ and f ⩾ 1 MHz.

N-P-N 1 GHz 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.

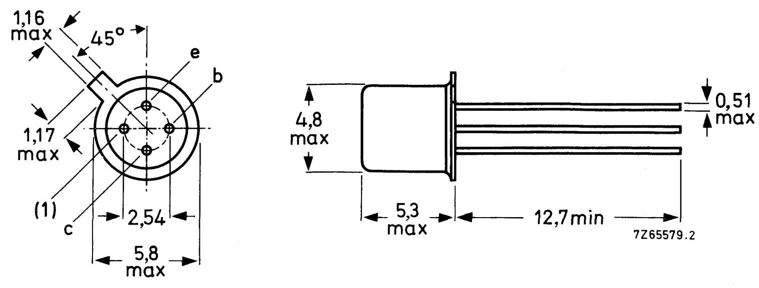
QUICK REFERENCE DATA

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. typ.	2.1 7.5	dB 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 (DC)	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	$R_{th\ j\text{-}a}$	=	700	K/W
From junction to case	$R_{th\ j\text{-}c}$	=	500	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current			
$I_E = 0$; $V_{CB} = 10$ V	I_{CBO}	max.	50 nA
DC 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*			
$I_C = 50$ mA; $V_{CE} = 5$ V; f = 500 MHz	f_T	typ.	1.6 GHz
Collector capacitance at f = 1 MHz**			
$I_E = I_e = 0$; $V_{CB} = 5$ V	C_c	max.	1.5 pF
Feedback capacitance at f = 1 MHz*			
$I_C = 2$ mA; $V_{CE} = 5$ V	$-C_{re}$	typ.	0.8 pF
Noise figure*			
$I_C = 2$ mA; $V_{CE} = 5$ V			
f = 500 MHz; $Z_s = 50\ \Omega$	F	max.	5.0 dB
Power gain (not neutralized)*		f = 200	800 MHz
$I_C = 30$ mA; $V_{CE} = 5$ V; $T_{amb} = 25$ °C	G_p	> 19	dB
		typ. 21	7.5 dB
Intermodulation distortion*			
$I_C = 30$ mA; $V_{CE} = 6$ V; $R_L = 37.5\ \Omega$; $T_{amb} = 25$ °C			
$V_o = 100$ 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

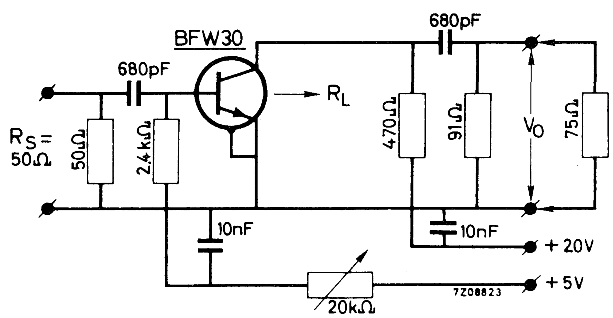


Fig. 2 Test circuit.

* Shield lead grounded.
** Shield lead not connected.

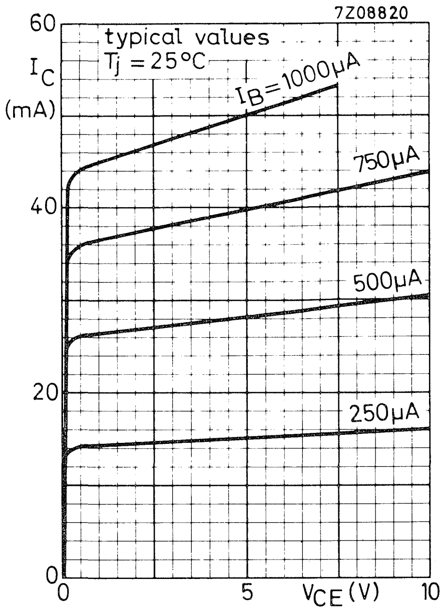


Fig. 3 T_j = 25 °C; typical values.

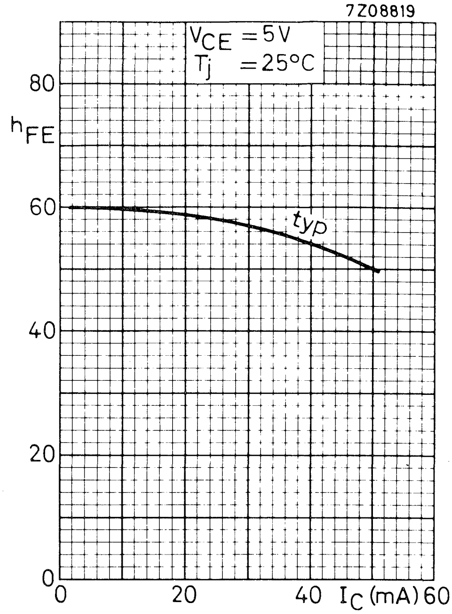


Fig. 4 V_{CE} = 5 V; T_j = 25 °C; typical values.

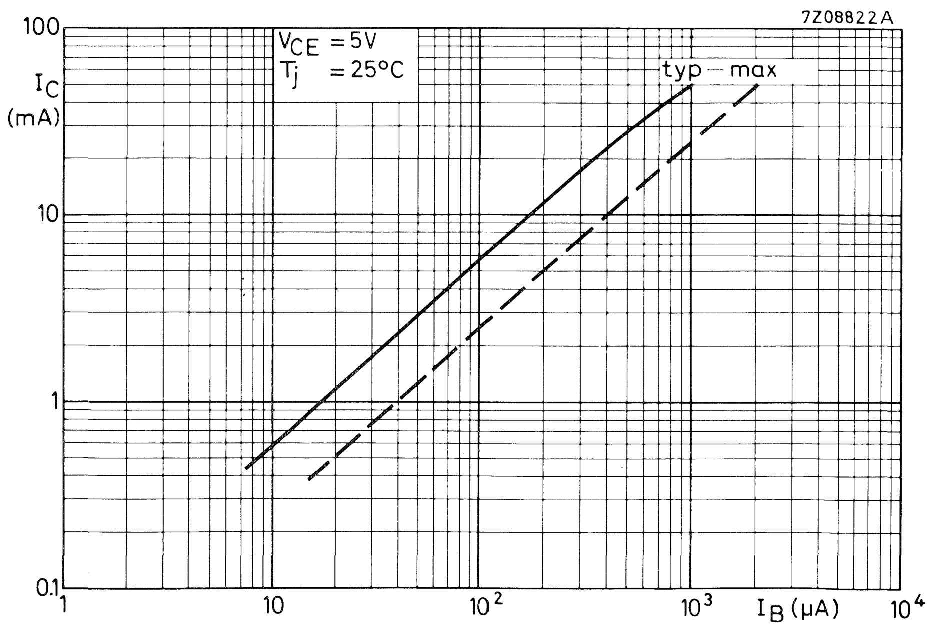


Fig. 5 V_{CE} = 5 V; T_j = 25 °C.

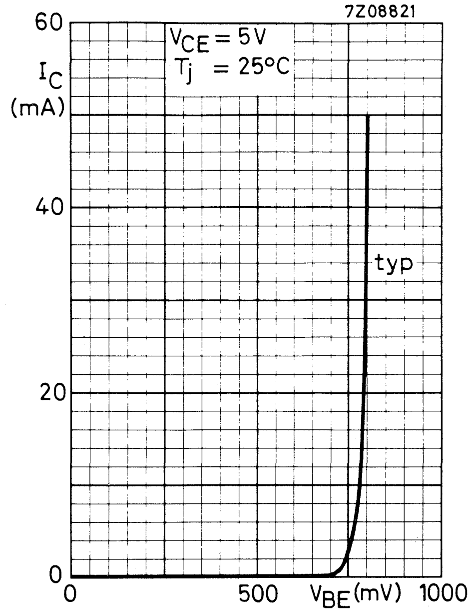


Fig. 6 V_{CE} = 5 V; T_j = 25 °C; typical values.

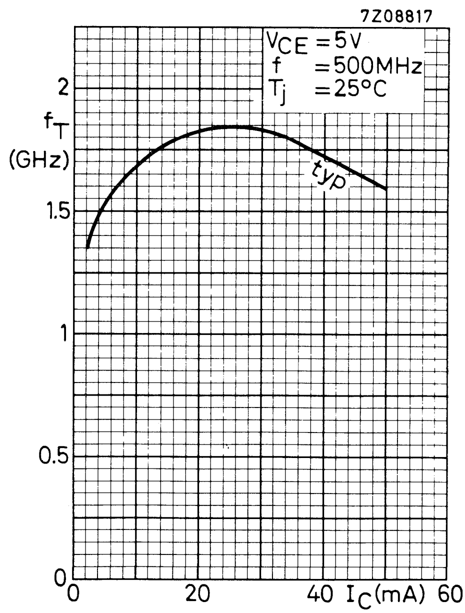


Fig. 7 V_{CE} = 5 V; f = 500 MHz;
T_j = 25 °C; typical values.

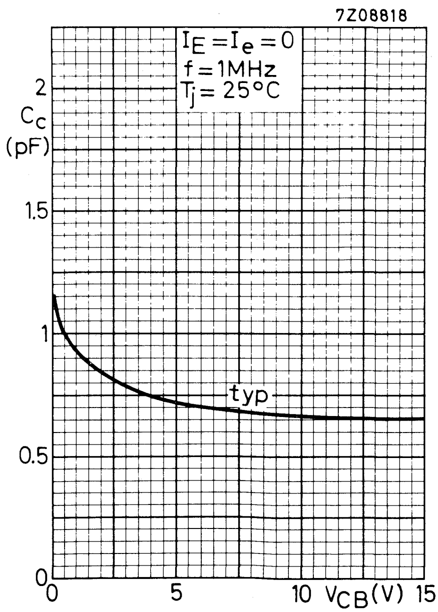


Fig. 8 I_E = i_e = 0; f = 1 MHz;
T_j = 25 °C; typical values.

N-P-N 1.5 GHz 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

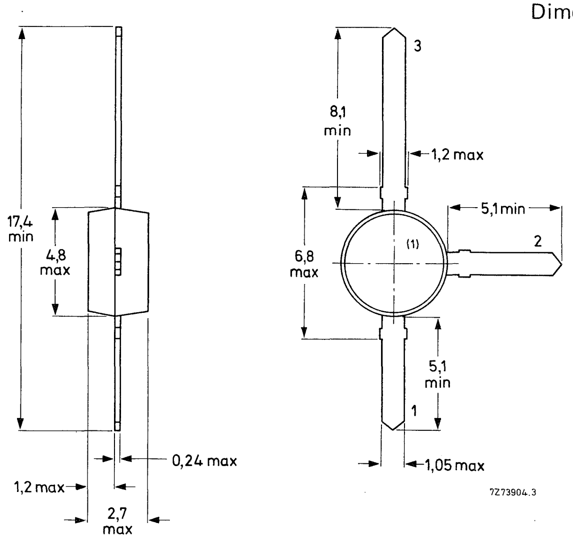
Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	25		V
Collector-emitter voltage (open base)	V_{CEO}	max.	15		V
Collector current (peak value; f > 1 MHz)	I_{CM}	max.	50		mA
Total power dissipation up to T_{amb} = 70 °C	P_{tot}	max.	200		mW
Junction temperature	T_j	max.	175		°C
Transition 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)		f =	200	800	MHz
I_C = 10 mA; V_{CE} = 10 V	G_p	typ.	23	11	dB
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



(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 $T_{amb} = 70\ ^oC$	P_{tot}	max.	200	mW
Storage temperature	T_{stg}		−65 to +150	^oC
Junction temperature	T_j	max.	175	^oC

THERMAL RESISTANCE

From junction to ambient in free air mounted on a glass-fibre print	$R_{th\ j\text{-}a}$	=	400	K/W
From junction to soldering point	$R_{th\ j\text{-}s}$	=	65	K/W

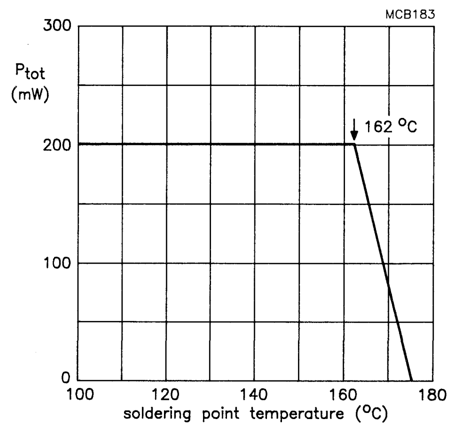


Fig.2 Power derating curve.

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current			
$I_E = 0$; $V_{CB} = 10$ V	I_{CBO}	max.	50 nA
Knee voltage			
$I_C = 20$ mA; I_B = value for which $I_C = 22$ mA at $V_{CE} = 1$ V	V_{CEK}	max.	0,75 V

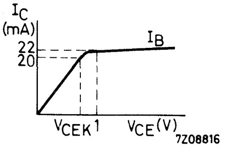


Fig. 3.

D.C. current gain			
$I_C = 2$ mA; $V_{CE} = 1$ V	h_{FE}	min.	20
		max.	150
$I_C = 25$ mA; $V_{CE} = 1$ V	h_{FE}	min.	20
Transition frequency at f = 500 MHz			
$I_C = 2$ mA; $V_{CE} = 5$ V	f_T	typ.	1,0 GHz
$I_C = 25$ mA; $V_{CE} = 5$ V	f_T	typ.	1,6 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.	1,5 pF
Feedback capacitance at f = 1 MHz			
$I_C = 2$ mA; $V_{CE} = 5$ V; $T_{amb} = 25$ °C	C_{re}	typ.	0,6 pF
Noise figure at f = 500 MHz			
$I_C = 2$ mA; $V_{CE} = 5$ V; $R_S = 50\ \Omega$; $T_{amb} = 25$ °C	F	typ.	4,0 dB
Power gain (not neutralized)			
$I_C = 10$ mA; $V_{CE} = 10$ V; $T_{amb} = 25$ °C;			
f = 200 MHz	G_p	typ.	23 dB
f = 800 MHz	G_p	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

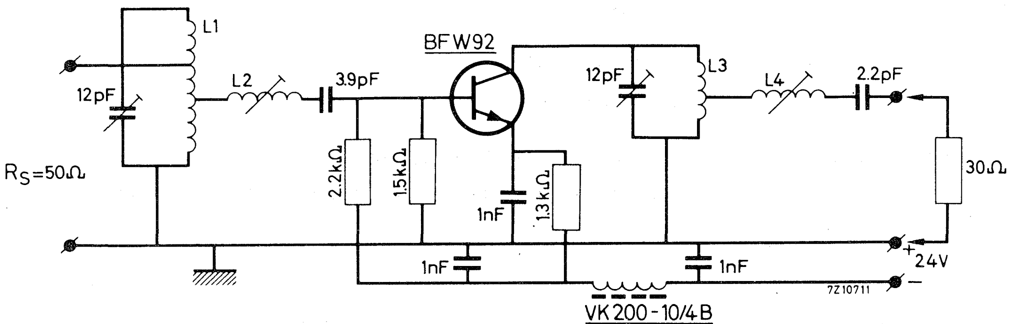


Fig. 4 Test circuit.

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 820 Ω 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 (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 $\leqslant 2$ 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 MHz; T_{amb} = 25 °C
   I_C = 10 mA; V_{CE} = 10 V; VSWR 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. 8 mW

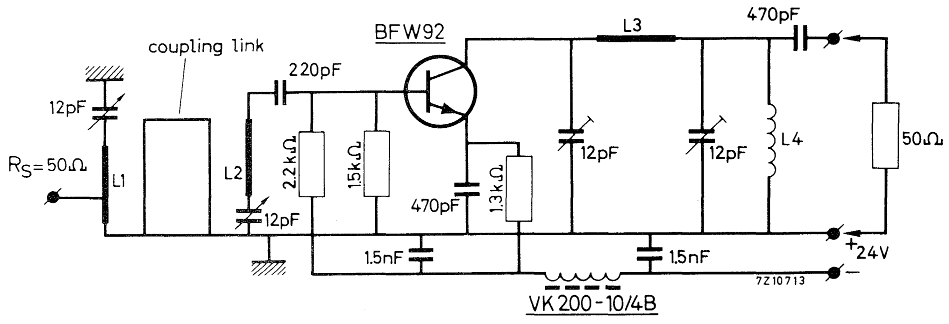


Fig. 5 Test circuit.

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 linearily 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 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 mA; V_{CE} = 6 V; R_L = 37,5 Ω; T_{amb} = 25 °C
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. | −45 dB

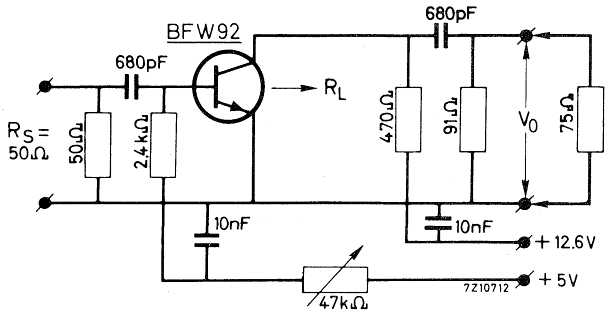


Fig. 6 Test circuit.

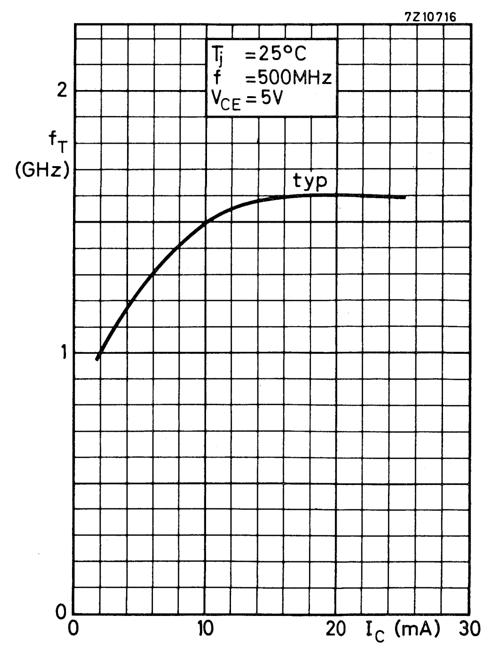


Fig. 7 V_{CE} = 5 V; f = 500 MHz; T_j = 25 °C; typical values.

N-P-N 3 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_{CEO}	max.	15	V
Collector current (d.c.)	I_C	max.	25	mA
Total power dissipation up to T_{amb} = 70 °C	P_{tot}	max.	200	mW
Junction temperature	T_j	max.	175	°C
Transition frequency at f = 500 MHz I_C = 25 mA; V_{CE} = 5 V	f_T	typ.	2,8	GHz
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 I_C = 2 mA; V_{CE} = 5 V; Z_S = 60 Ω	F	typ.	2,5	dB
Maximum unilateral power gain at f = 800 MHz I_C = 14 mA; V_{CE} = 10 V	G_{UM}	typ.	13	dB
Output voltage at d_{im} = −60 dB I_C = 14 mA; V_{CE} = 10 V; R_L = 75 Ω $f_{(p+q-r)}$ = 793,25 MHz	V_o	typ.	150	mV

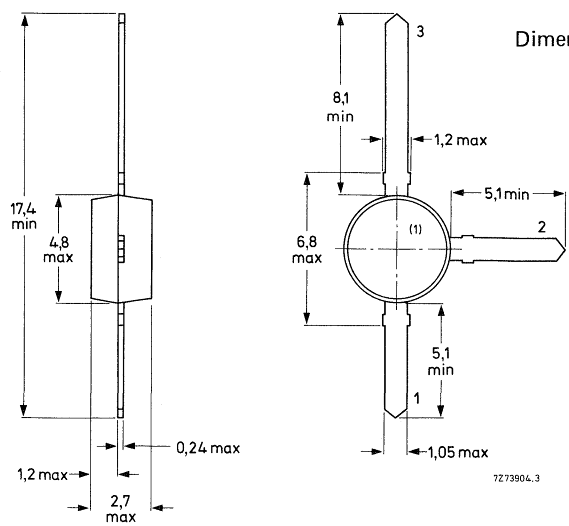
MECHANICAL DATA

Fig. 1 SOT-37.

Connections

1. Base
2. Emitter
3. Collector

Dimensions in mm



(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 °C	P_{tot}	max.	200	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 fibre-glass print	$R_{th\ j\text{-}a}$	=	400	K/W
From junction to soldering point	$R_{th\ j\text{-}s}$	=	65	K/W

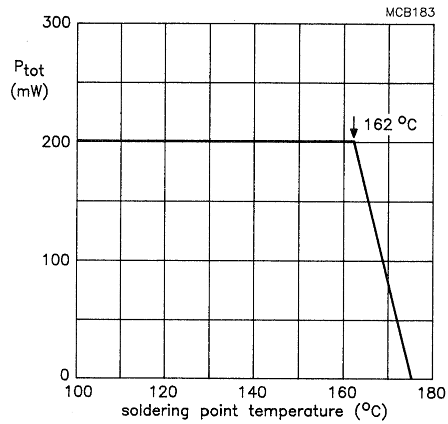


Fig.2 Power derating curve.

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 = 2 mA; V_{CE} = 1 V	h_{FE}	min.	20	
		max.	150	
I_C = 25 mA; V_{CE} = 1 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

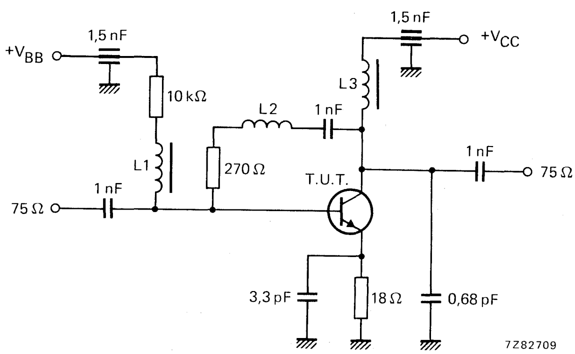


Fig. 3 Intermodulation distortion and second harmonic distortion MATV test circuit.

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_{11}	s_{12}	s_{21}	s_{22}
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°

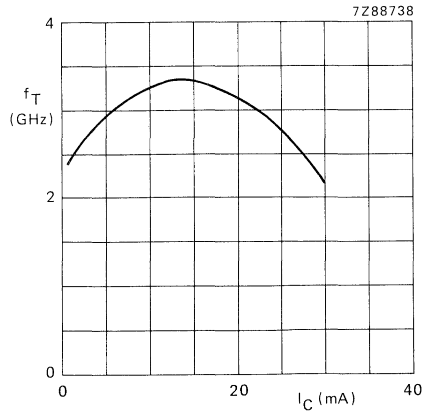


Fig. 4 V_{CE} = 5 V; f = 500 MHz; T_j = 25 °C; typical values.

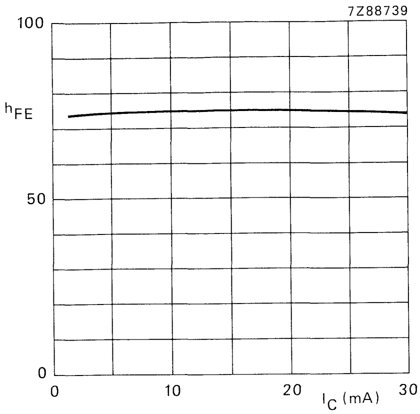


Fig. 5 V_{CE} = 5 V; T_j = 25 °C; typical values.

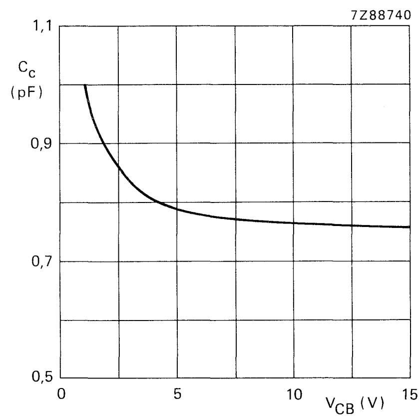


Fig. 6 $I_E = i_e = 0$; T_j = 25 °C; typical values.

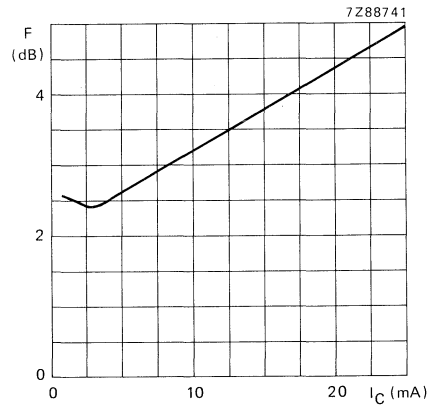


Fig. 7 V_{CE} = 5 V; T_{amb} = 25 °C; f = 800 MHz; Z_S = 60 Ω; typical values.

N-P-N 1.5 GHz 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.	175	°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	G_{UM}	typ.	22	dB
I_C = 30 mA; V_{CE} = 5 V; f = 800 MHz	G_{UM}	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	d_{im}	typ.	−60	dB

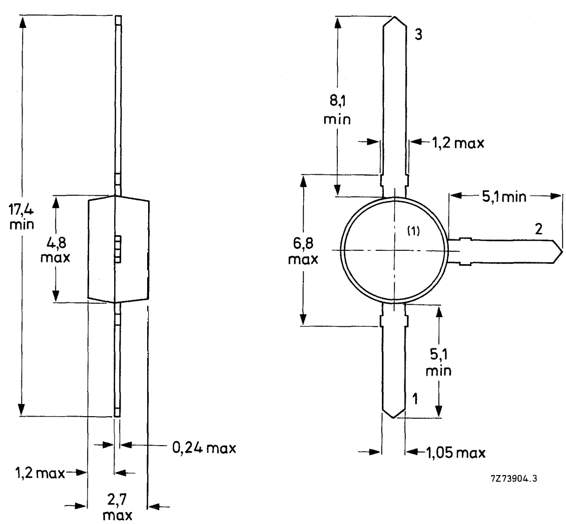
MECHANICAL DATA

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.	200	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 glass-fibre print	$R_{th\ j\text{-}a}$	=	400	K/W
From junction to soldering point	$R_{th\ j\text{-}s}$	=	65	K/W

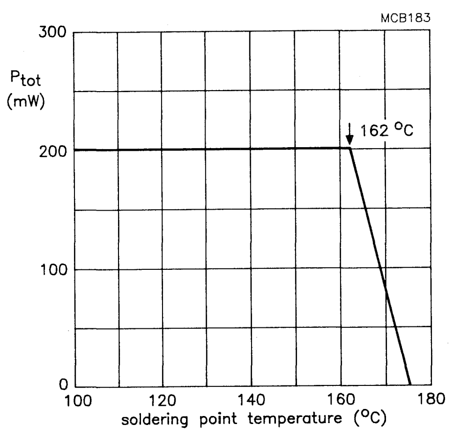


Fig.2 Power derating curve.

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 MHz			
I_C = 2 mA; V_{CE} = 5 V; T_{amb} = 25 °C	C_{re}	typ.	0,6 pF
Noise figure at f = 500 MHz			
I_C = 2 mA; V_{CE} = 5 V; G_S = 20 mS			
B_S is tuned; T_{amb} = 25 °C	F	max.	5,0 dB
Max. unilateral power gain (s_{12} assumed to be zero)			
$G_{UM} = 10 \log \frac{\lvert s_{21}\rvert^2}{[1-\lvert s_{11}\rvert^2][1-\lvert s_{22}\rvert^2]}$			
I_C = 30 mA; V_{CE} = 5 V; f = 200 MHz; T_{amb} = 25 °C	G_{UM}	typ.	22 dB
I_C = 30 mA; V_{CE} = 5 V; f = 800 MHz; T_{amb} = 25 °C	G_{UM}	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	d_{im}	typ.	−60 dB

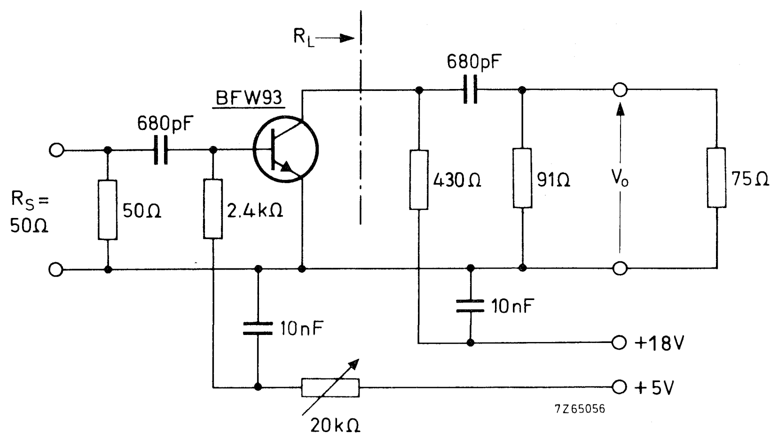


Fig. 3 Test circuit.

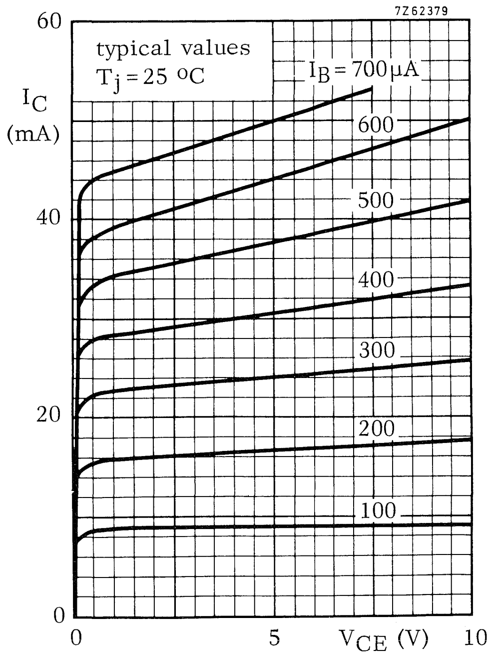


Fig. 4 $T_j = 25\ ^oC$; typical values.

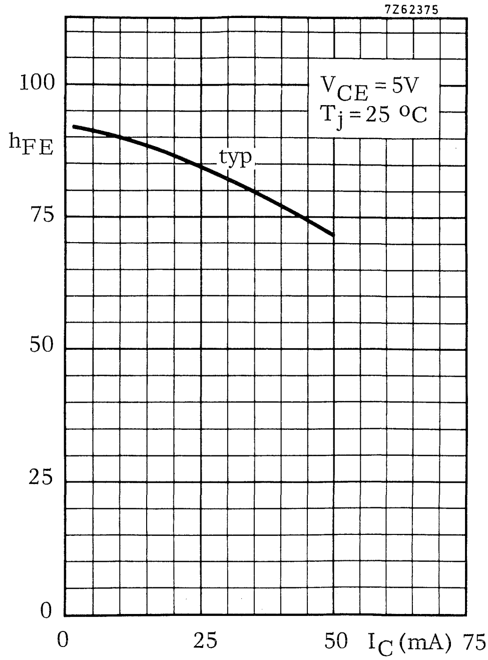


Fig. 5 $V_{CE} = 5$ V; $T_j = 25\ ^oC$; typical values.

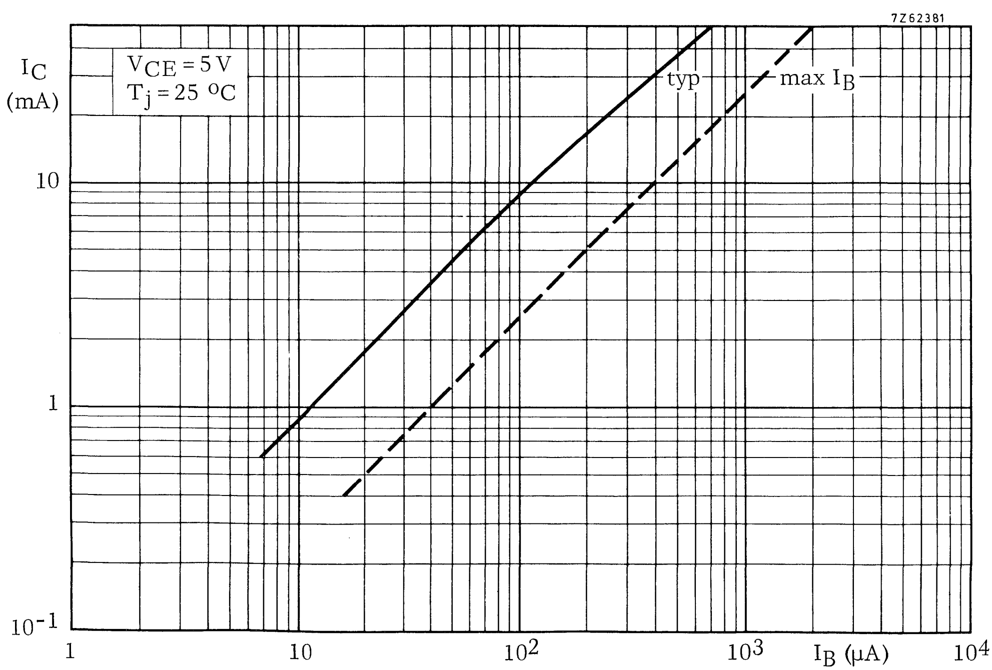


Fig. 6 $V_{CE} = 5$ V; $T_j = 25\ ^oC$.

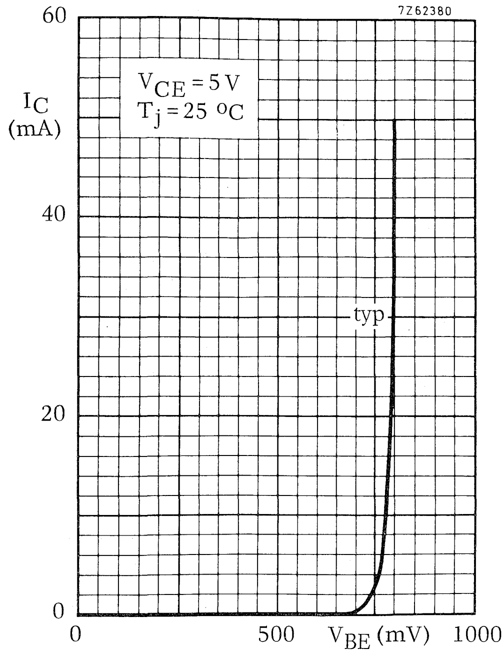


Fig. 7 V_{CE} = 5 V; T_j = 25 °C; typical values.

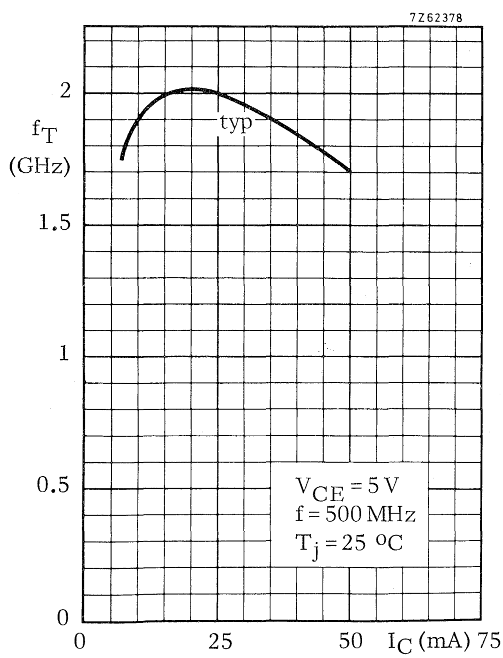


Fig. 8 V_{CE} = 5 V; f = 500 MHz; T_j = 25 °C; typical values.

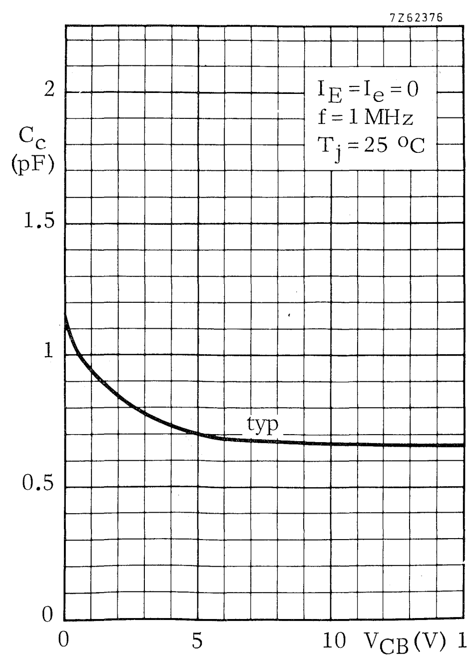


Fig. 9 $I_E = i_e = 0$; f = 1 MHz; T_j = 25 °C; typical values.

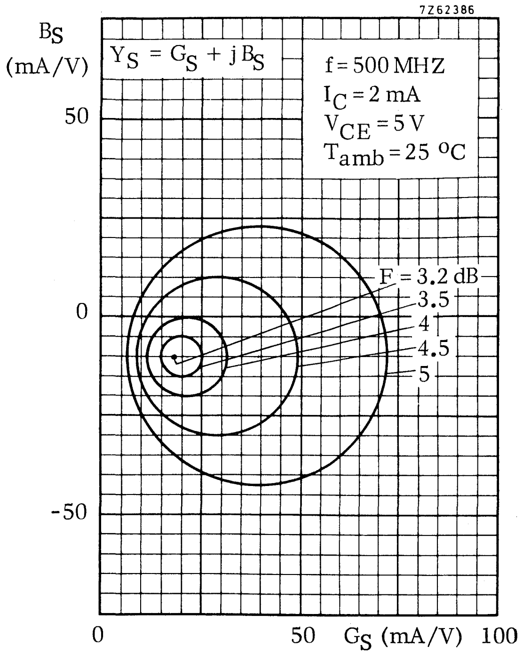


Fig. 10 V_{CE} = 5 V; I_C = 2 mA; f = 500 MHz; T_{amb} = 25 °C; typical values.

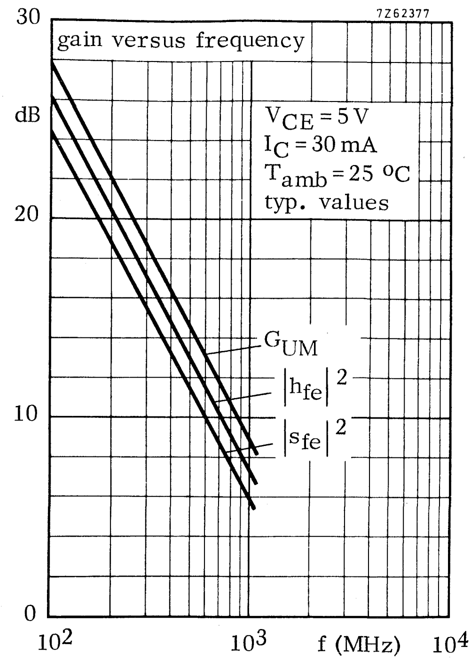


Fig. 11 V_{CE} = 5 V; I_C = 30 mA; T_{amb} = 25 °C; typical values.

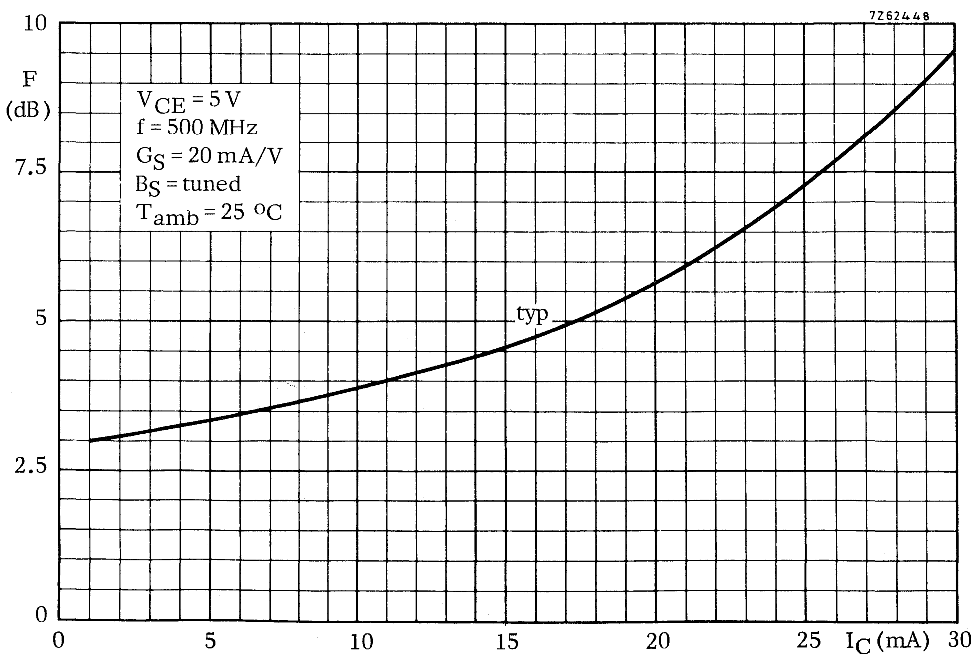


Fig. 12 V_{CE} = 5 V; f = 500 MHz; G_S = 20 mS; B_S = tuned; T_{amb} = 25 °C; typical values.

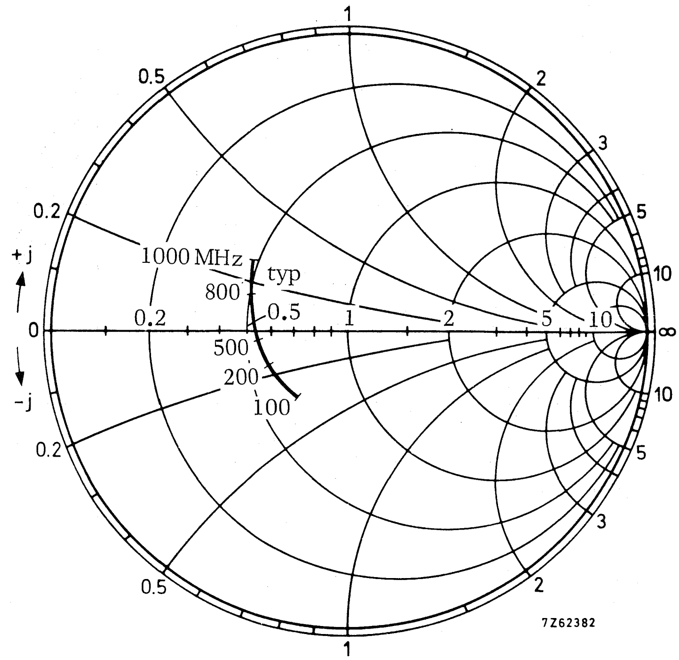


Fig. 13 V_{CE} = 5 V; I_C = 30 mA; T_{amb} = 25 °C; typical values.

Input impedance derived from input reflection coefficient s_{11} coordinates in ohm x 50

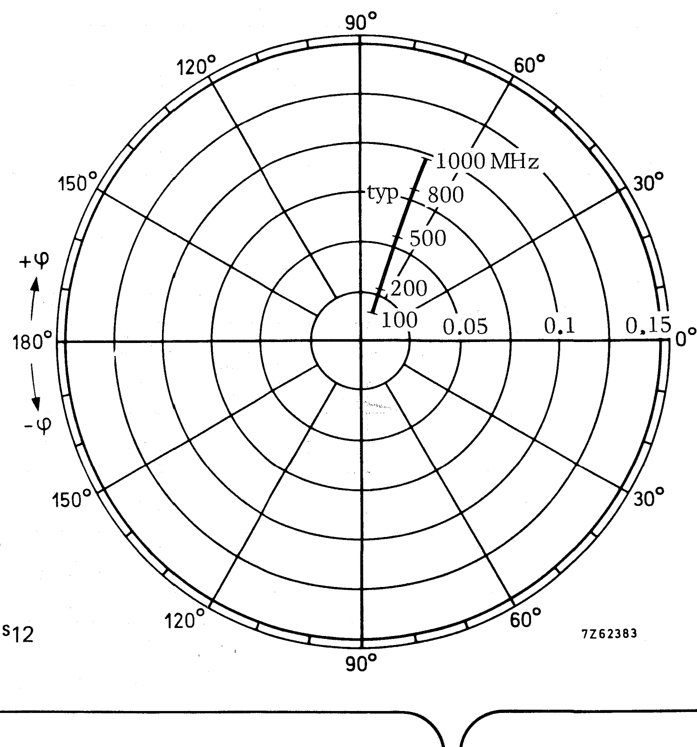


Fig. 14 V_{CE} = 5 V; I_C = 30 mA; T_{amb} = 25 °C; typical values.

Reverse transmission coefficient s_{12}

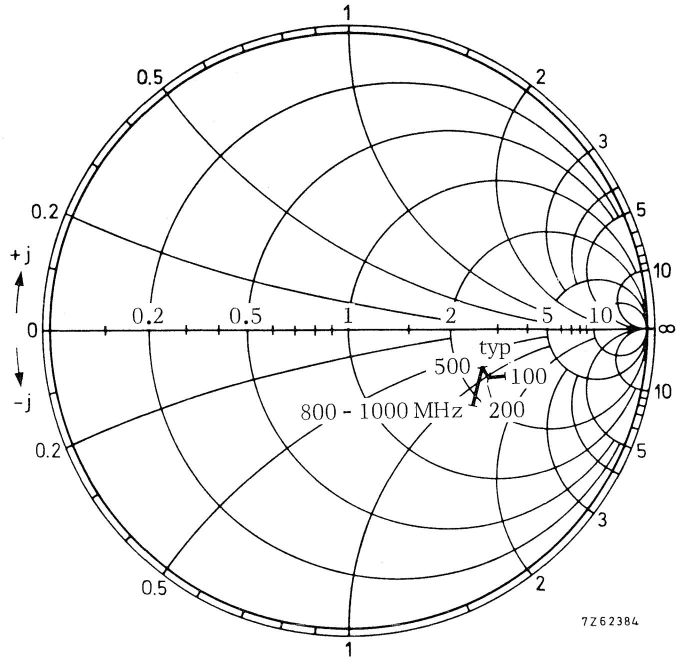


Fig. 15 V_{CE} = 5 V; I_C = 30 mA; T_{amb} = 25 °C; typical values.

Output impedance derived from output reflection coefficient s_{22} coordinates in ohm x 50

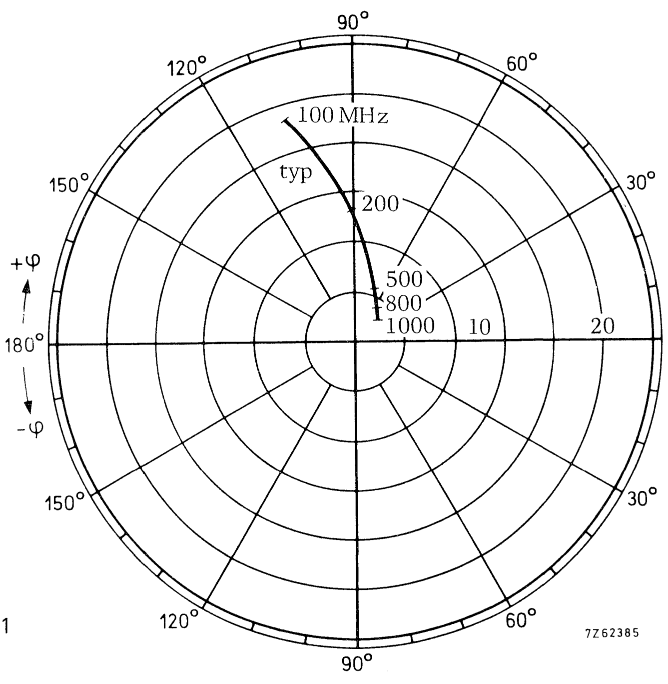


Fig. 16 V_{CE} = 5 V; I_C = 30 mA; T_{amb} = 25 °C; typical values.

Forward transmission coefficient s_{21}

N-P-N 1 GHz 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).

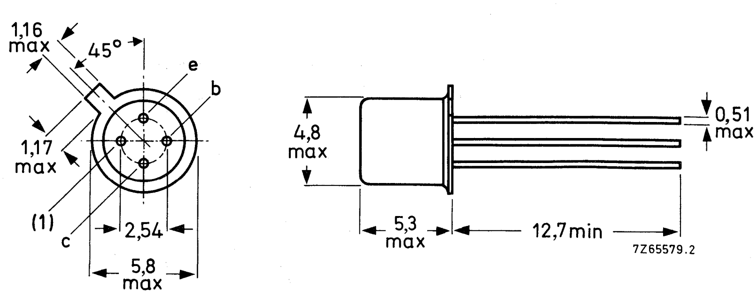
QUICK REFERENCE DATA

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
			f = 200	800	MHz
Noise figure at optimum source impedance I_C = 2 mA; V_{CE} = 5 V	F	typ.	3.3	7	dB
Power gain (not neutralized) I_C = 8 mA; V_{CE} = 10 V	G_p	typ.	22	7	dB
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) $R_{BE} \leqslant 50\ \Omega$	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 (DC)	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 °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	$R_{th\ j\text{-}a}$	=	880	K/W
From junction to case	$R_{th\ j\text{-}c}$	=	580	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current			
$I_E = 0$; $V_{CB} = 15$ V	I_{CBO}	max.	10 nA
Knee voltage			
$I_C = 20$ mA; I_B = value for which $I_C = 22$ mA at $V_{CE} = 1$ V	V_{CEK}	max.	0.75 V

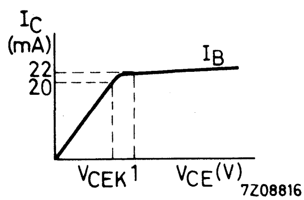


Fig. 2.

DC current gain			
$I_C = 2$ mA; $V_{CE} = 1$ V	h_{FE}		20 to 150
$I_C = 25$ mA; $V_{CE} = 1$ V	h_{FE}		20 to 125
Transition frequency*			
$I_C = 2$ mA; $V_{CE} = 5$ V; f = 500 MHz	f_T	typ.	1.0 GHz
$I_C = 25$ mA; $V_{CE} = 5$ V; f = 500 MHz	f_T	typ.	1.2 GHz
Collector capacitance at f = 1 MHz**			
$I_E = I_e = 0$; $V_{CB} = 10$ V	C_c	max.	1.7 pF
Feedback capacitance at f = 1 MHz*			
$I_C = 2$ mA; $V_{CE} = 5$ V; $T_{amb} = 25$ °C	C_{re}	typ.	0.6 pF
Noise figure*			
$I_C = 2$ mA; $V_{CE} = 5$ V; $T_{amb} = 25$ °C			
f = 200 MHz; optimum source impedance	F	max.	4.0 dB
f = 500 MHz; $Z_S = 50\ \Omega$	F	max.	6.5 dB
f = 800 MHz; optimum source impedance	F	typ.	7.0 dB

Power gain (not neutralized)*

			f = 200	800 MHz
$I_C = 8$ mA; $V_{CE} = 10$ V; $T_{amb} = 25$ °C	G_p	min.	19	— dB
		typ.	22	7.0 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 = 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

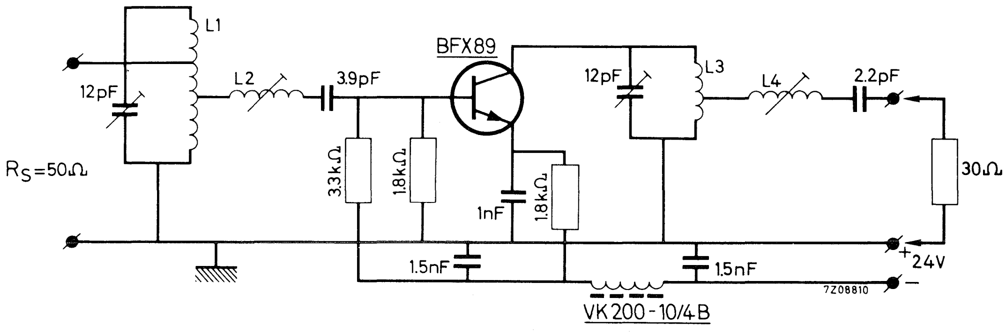


Fig. 3 Test circuit.

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:
$R_L = 1\ k\Omega$; $C_L = -1.8\ pF$

Adjustment procedure

1. Remove the transistor and connect a dummy consisting of a 1 kΩ resistor in parallel with a 1.8 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 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

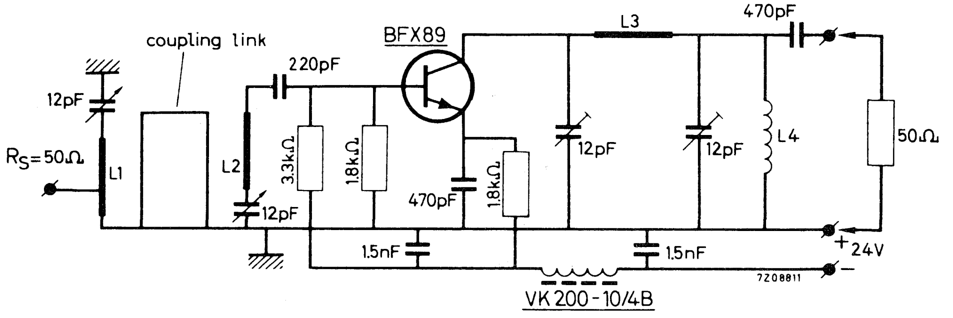


Fig. 4 Test circuit.

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 linearily 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 mA; V_{CE} = 6 V; R_L = 37.5 Ω; T_{amb} = 25 °C
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. −40 dB

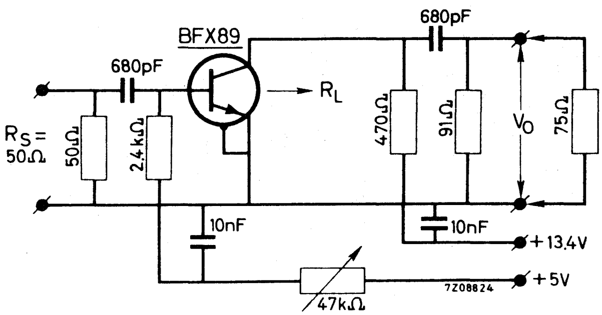


Fig. 5 Test circuit.

* Shield lead grounded.

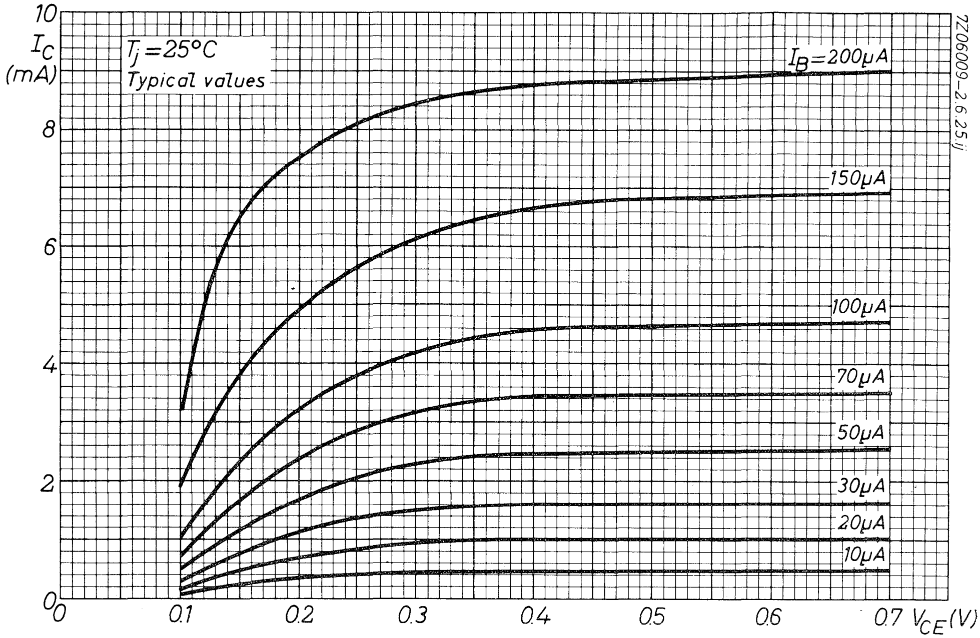


Fig. 6 T_j = 25 °C; typical values.

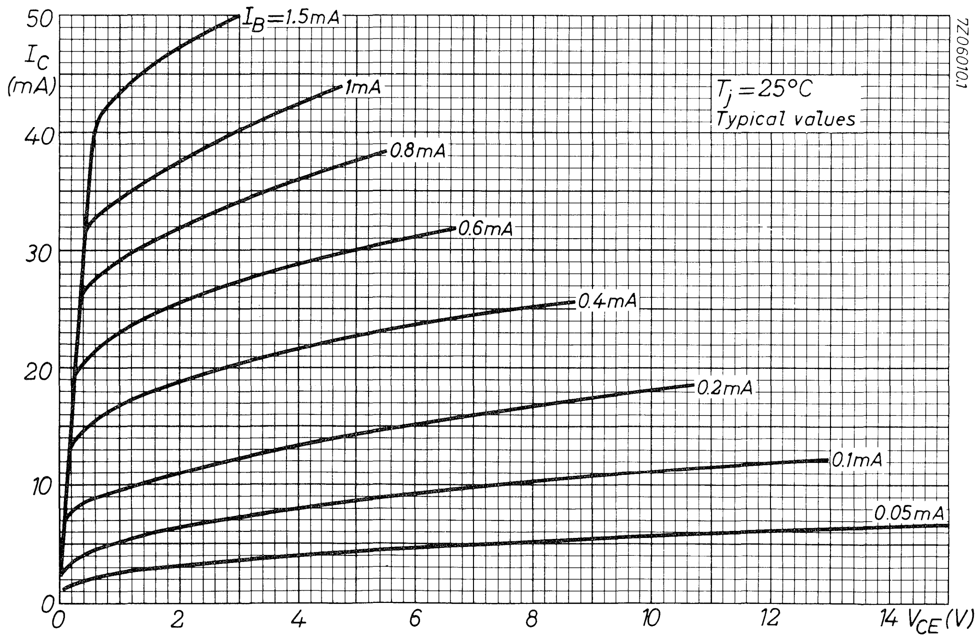


Fig. 7 T_j = 25 °C; typical values.

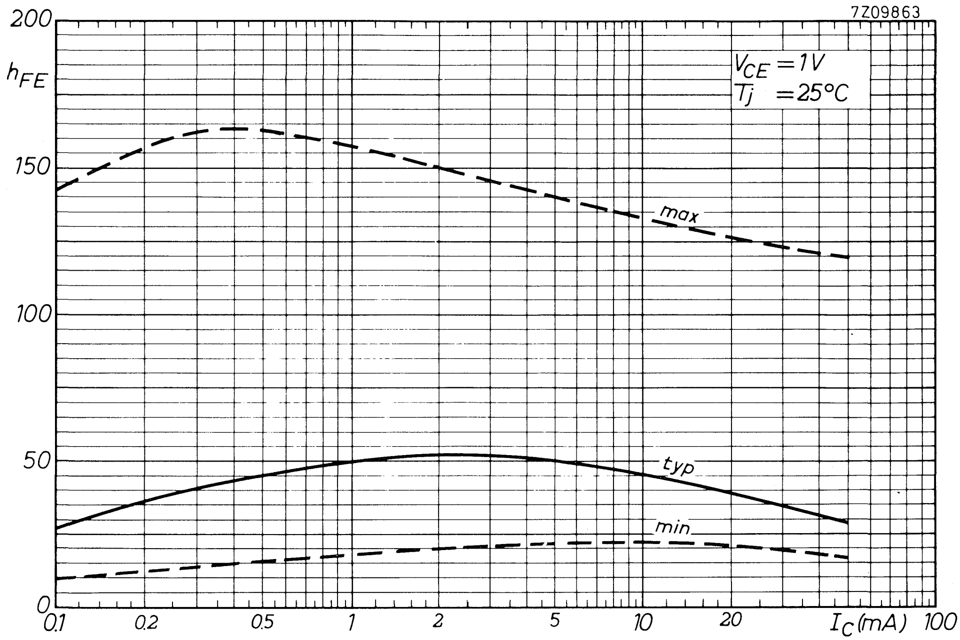


Fig. 8 V_{CE} = 1 V; T_j = 25 °C.

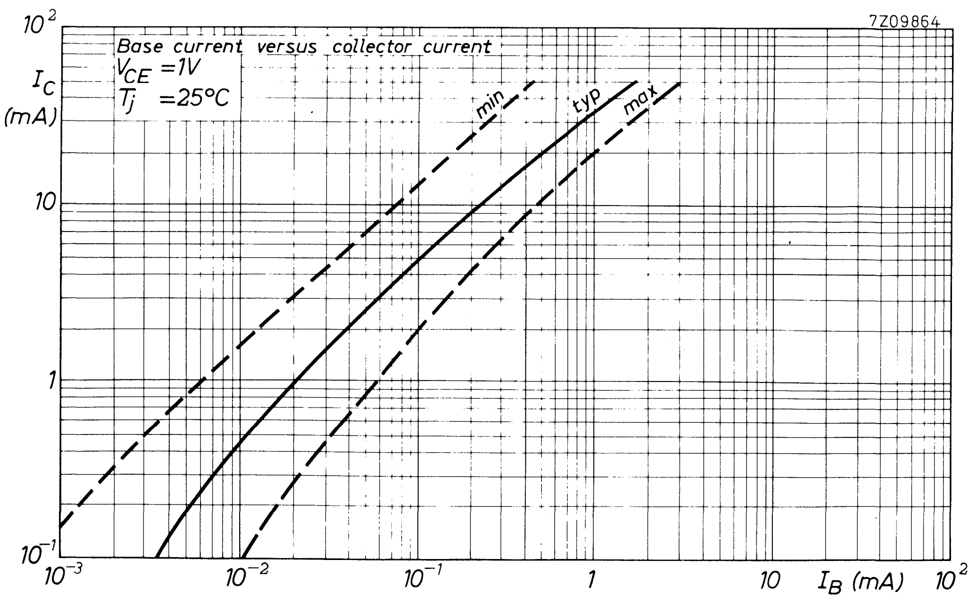


Fig. 9 V_{CE} = 1 V; T_j = 25 °C.

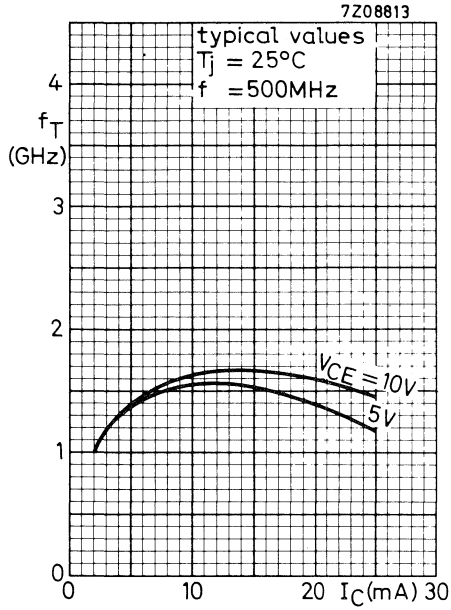


Fig. 10 f = 500 MHz; T_j = 25 °C; typical values.

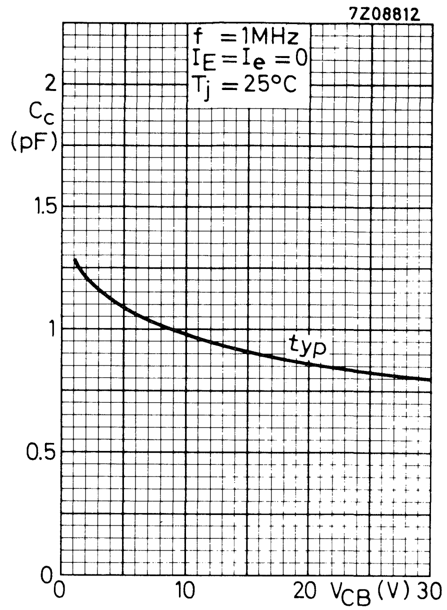


Fig. 11 $I_E = i_e = 0$; f = 1 MHz; T_j = 25 °C; typical values.

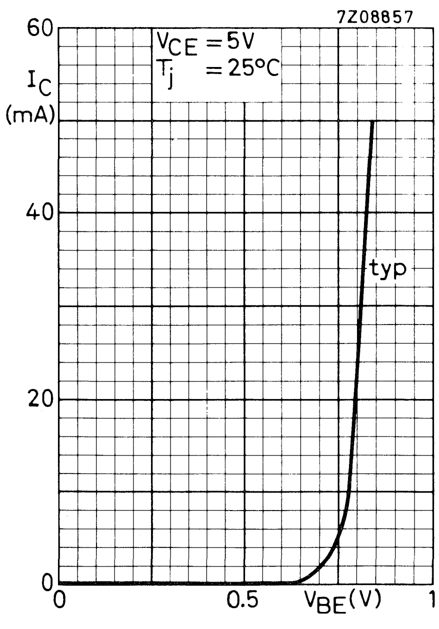


Fig. 12 V_{CE} = 5 V; T_j = 25 °C; typical values.

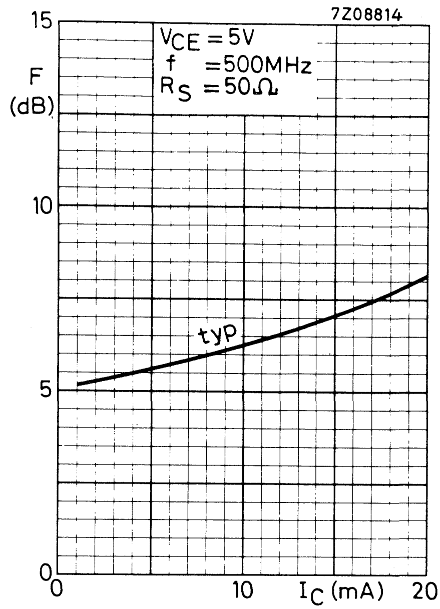


Fig. 13 V_{CE} = 5 V; f = 500 MHz; Z_S = 50 Ω; T_{amb} = 25 °C; typical values.

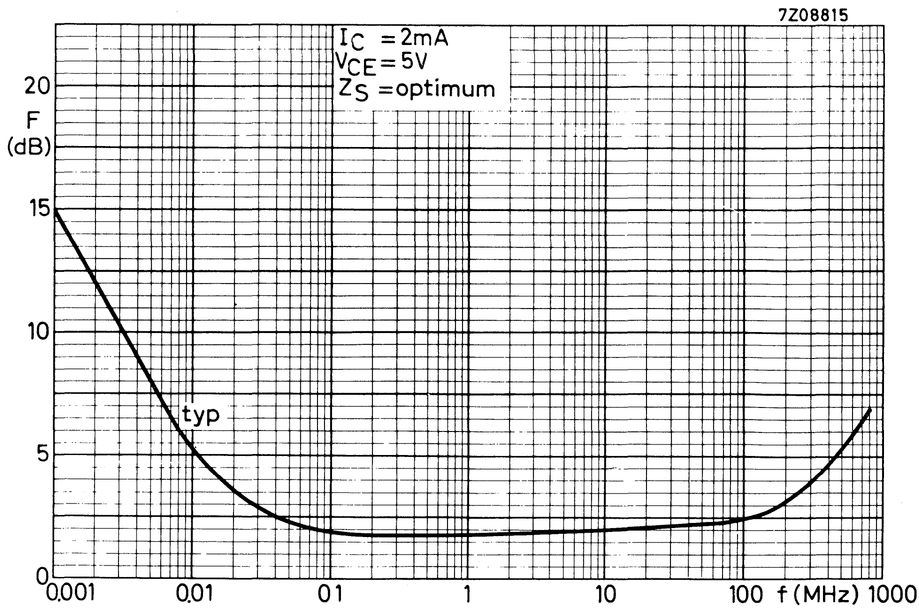


Fig. 14 V_{CE} = 5 V; I_C = 2 mA; Z_S = opt.; T_{amb} = 25 °C; typical values.

N-P-N 1 GHz 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

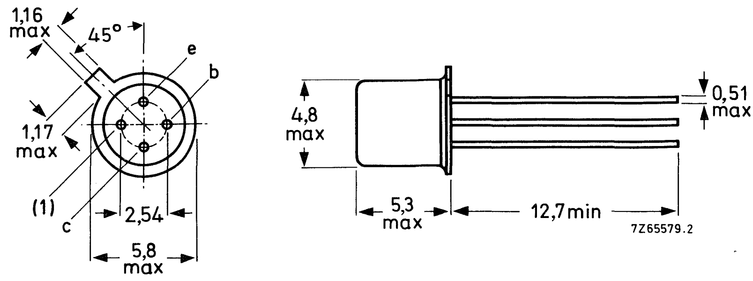
Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	30	V
Collector-emitter voltage (open base)	V_{CEO}	max.	15	V
Collector current (peak value; f > 1 MHz)	I_{CM}	max.	50	mA
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	200	mW
Junction temperature	T_j	max.	200	°C
Transition frequency 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. typ.	2.5 5.5	dB dB
Power gain (not neutralized) I_C = 14 mA; V_{CE} = 10 V f = 200 MHz f = 800 MHz	G_p	typ. typ.	23 8	dB 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. typ.	12 12	mW mW

MECHANICAL DATA (see next page)

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-72.



(1) = shield lead (connected to case).

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) $R_{BE} \leqslant 50\,\Omega$; $I_C = 10$ mA	V_{CERM}	max.	30 V
Collector-emitter voltage (open base); I_C = 10 mA	V_{CEO}	max.	15 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2.5 V
Collector current (DC)	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 °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	$R_{th\ j\text{-}a}$	=	880 K/W
From junction to case	$R_{th\ j\text{-}c}$	=	580 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current			
I_E = 0; V_{CB} = 15 V	I_{CBO}	min.	10 nA
Knee voltage			
I_C = 20 mA; I_B = value for which I_C = 22 mA at V_{CE} = 1 V	V_{CEK}	min.	0.75 V

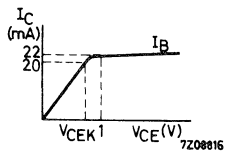


Fig. 2.

DC current gain			
I_C = 2 mA; V_{CE} = 1 V	h_{FE}		25 to 150
I_C = 25 mA; V_{CE} = 1 V	h_{FE}		20 to 125
Transition frequency*			
I_C = 2 mA; V_{CE} = 5 V; f = 500 MHz	f_T	min.	1.0 GHz
		typ.	1.1 GHz
I_C = 25 mA; V_{CE} = 5 V; f = 500 MHz	f_T	min.	1.3 GHz
		typ.	1.4 GHz
Collector capacitance at f = 1 MHz**			
I_E = I_e = 0; V_{CB} = 10 V	C_c	max.	1.5 pF
Feedback capacitance at f = 1 MHz*			
I_C = 2 mA; V_{CE} = 5 V; T_{amb} = 25 °C	C_{re}	typ.	0.6 pF
		max.	0.8 pF
Noise figure*			
I_C = 2 mA; V_{CE} = 5 V; T_{amb} = 25 °C			
f = 100 kHz; optimum source resistance	F	max.	4 dB
f = 200 MHz; optimum source impedance	F	max.	3.5 dB
f = 500 MHz; Z_S = 50 Ω	F	max.	5 dB
f = 800 MHz; optimum source impedance	F	typ.	5.5 dB
Power gain (not neutralized)*			
I_C = 14 mA; V_{CE} = 10 V; T_{amb} = 25 °C			
f = 200 MHz	G_p	min.	21 dB
		typ.	23 dB
f = 800 MHz	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. typ.	10 mW 12 mW

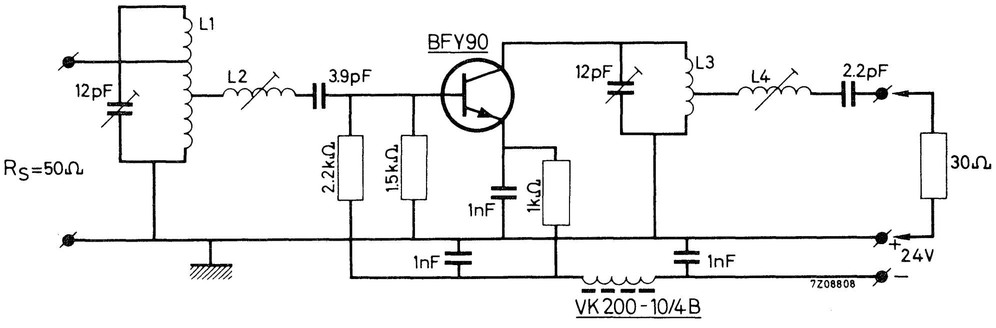


Fig. 3 Test circuit.

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:
$R_L = 560\ \Omega$; $C_L = -1.8$ pF

Adjustment procedure

1. Remove the transistor and connect a dummy consisting of a 560 Ω resistor in parallel with a 1.8 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 MHz; T_{amb} = 25 °C
   I_C = 14 MHz; 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. 12 mW

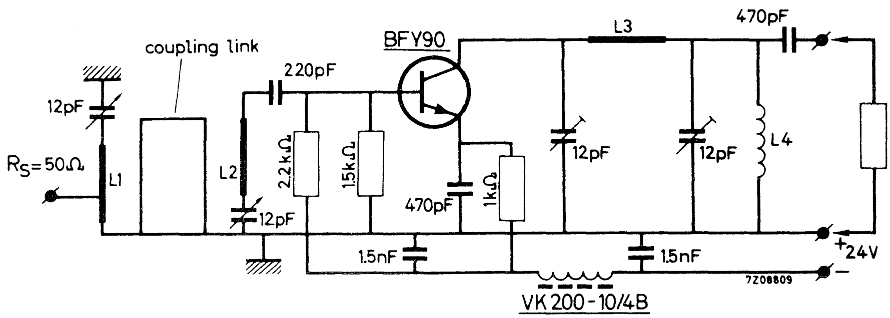


Fig. 4 Test circuit.

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 linearily 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 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 mA; V_{CE} = 6 V; R_L = 37.5 Ω; T_{amb} = 25 °C 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.	−50 dB

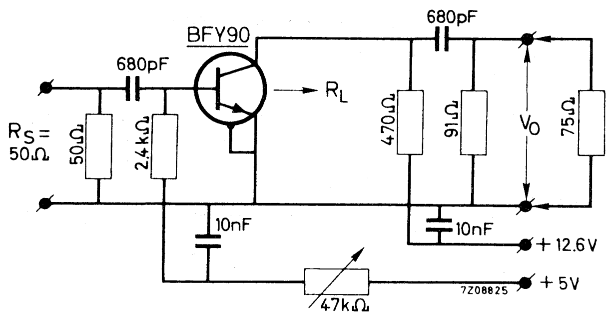


Fig. 5 Test circuit.

y parameters at f = 500 MHz (common emitter)*

I_C = 2 mA; V_{CE} = 5 V; T_{amb} = 25 °C

Input conductance	g_{ie}	typ.	16 mS
Input capacitance	C_{ie}	typ.	3.75 pF
Feedback admittance	$\lvert y_{re} \rvert$	typ.	1.55 mS
Phase angle of feedback admittance	φ_{re}	typ.	258°
Transfer admittance	$\lvert y_{fe} \rvert$	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

$$G_{UM} = 10 \log \frac{|s_{21}|^2}{[1-|s_{11}|^2]\ [1-|s_{22}|^2]}$$

I_C = 2 mA; V_{CE} = 5 V; f = 500 MHz; T_{amb} = 25 °C	G_{UM}	typ.	22 dB

* Shield lead grounded.

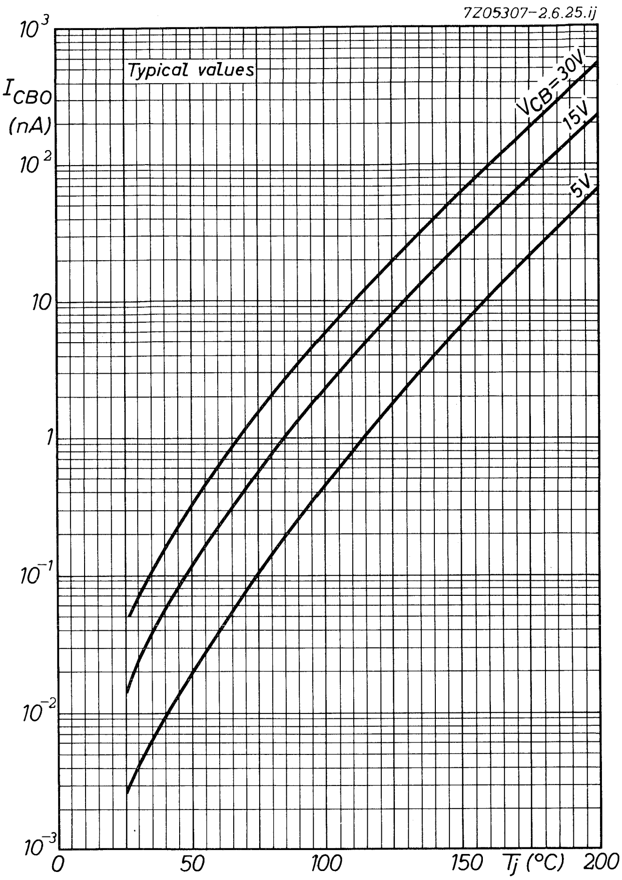


Fig. 6 Typical values.

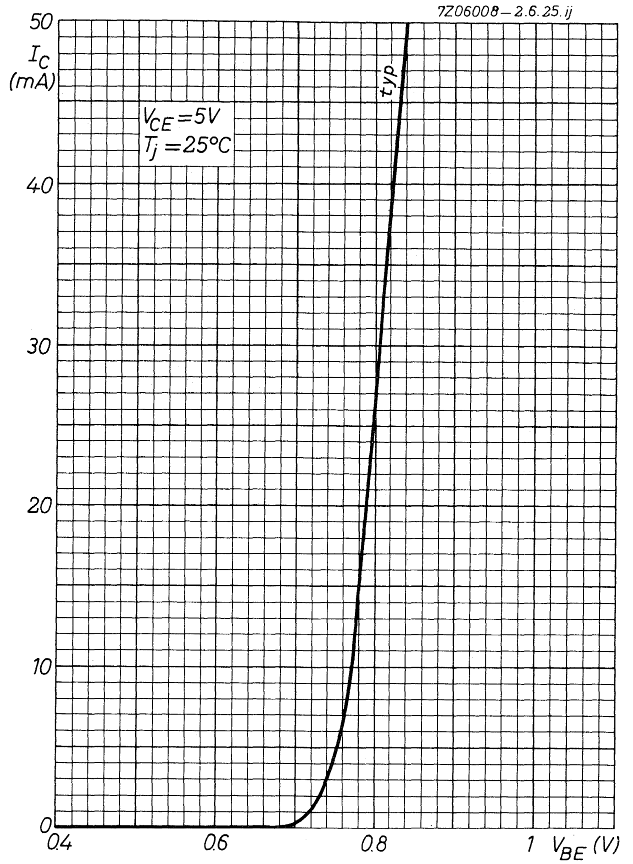


Fig. 7 V_{CE} = 5 V; T_j = 25 °C; typical values.

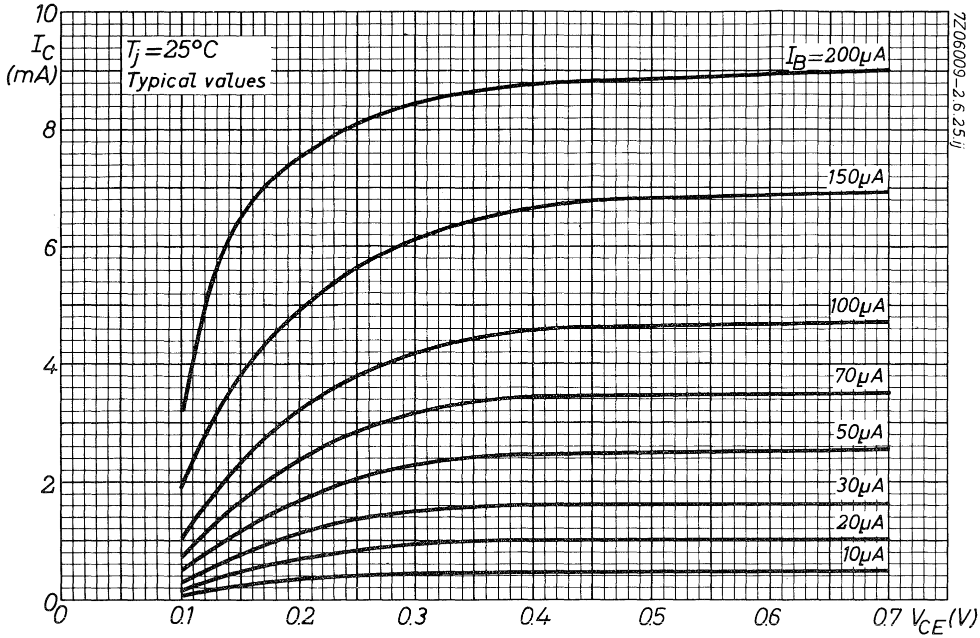


Fig. 8 T_j = 25 °C; typical values.

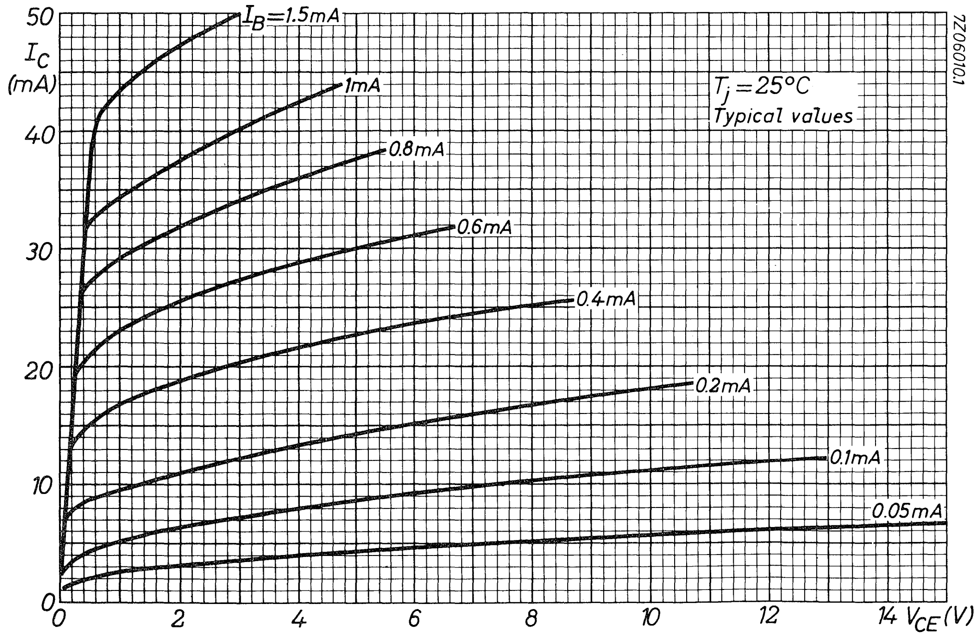


Fig. 9 T_j = 25 °C; typical values.

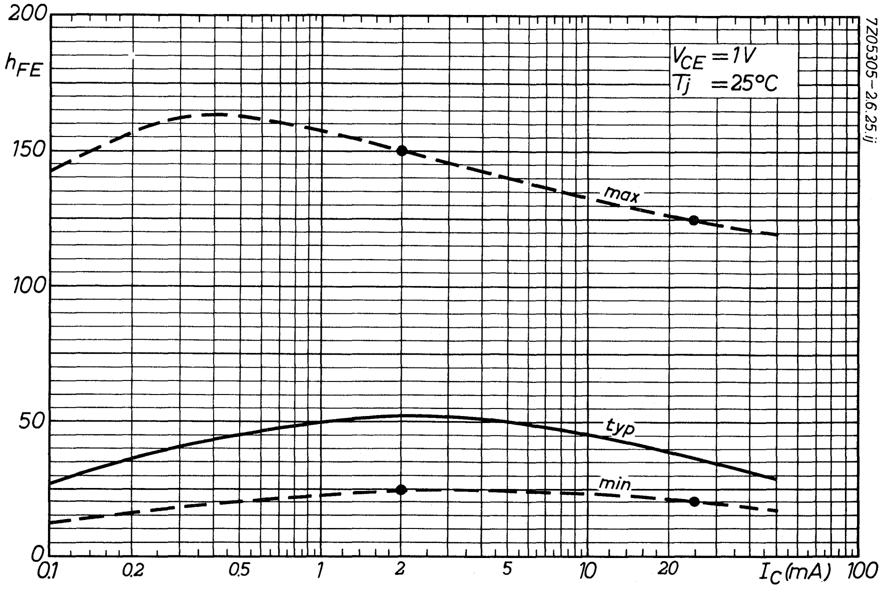


Fig. 10 V_{CE} = 1 V; T_j = 25 °C.

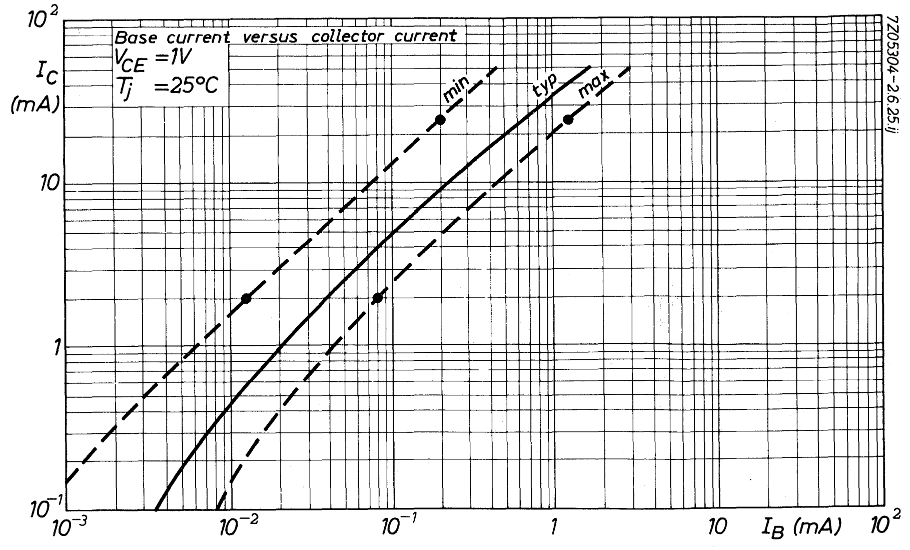


Fig. 11 V_{CE} = 1 V; T_j = 25 °C.

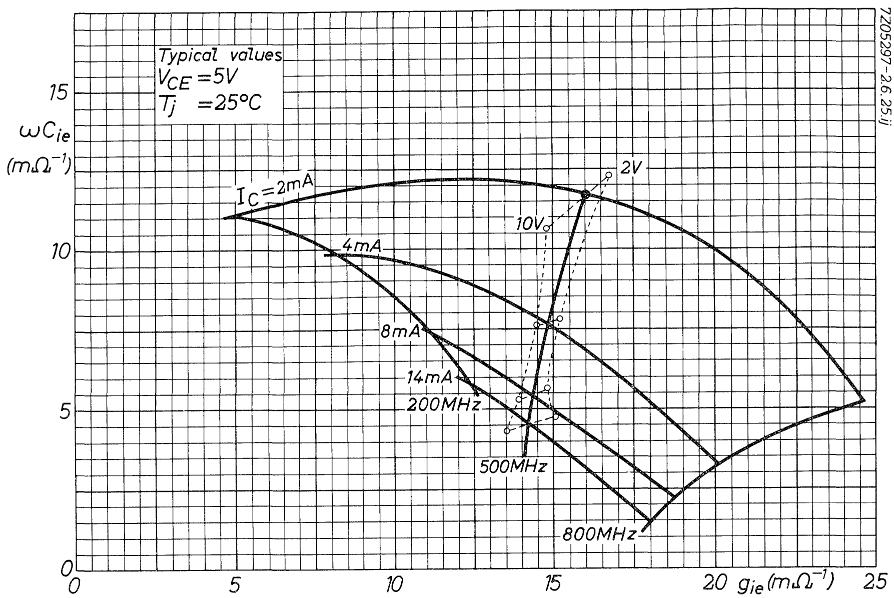


Fig. 12 V_{CE} = 5 V; T_{amb} = 25 °C; typical values.

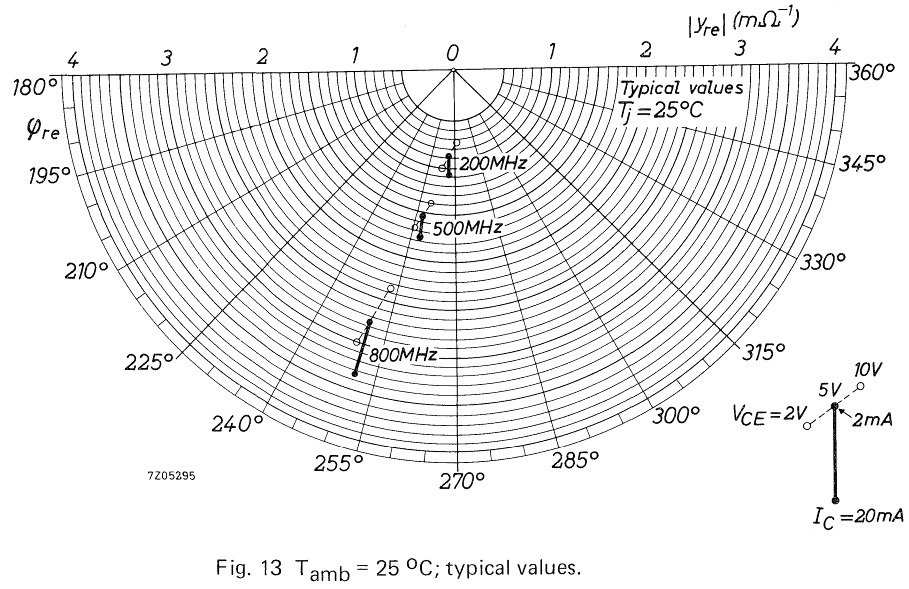


Fig. 13 T_{amb} = 25 °C; typical values.

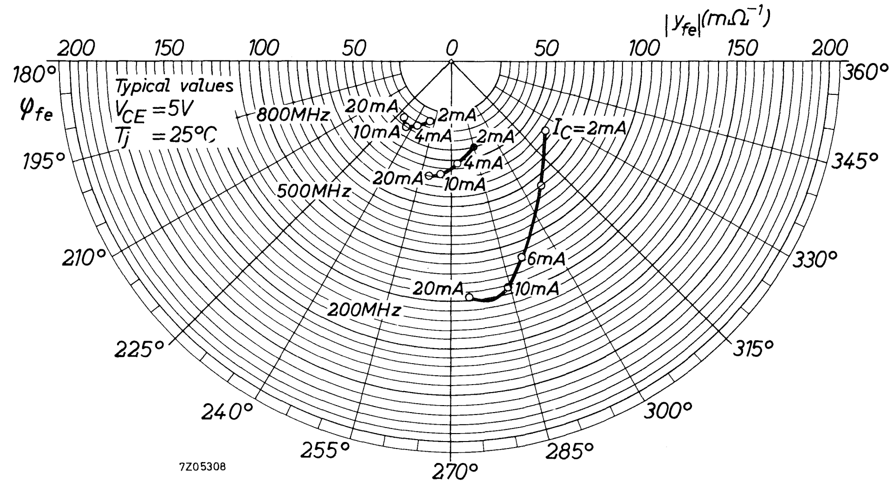


Fig. 14 V_{CE} = 5 V; T_{amb} = 25 °C; typical values.

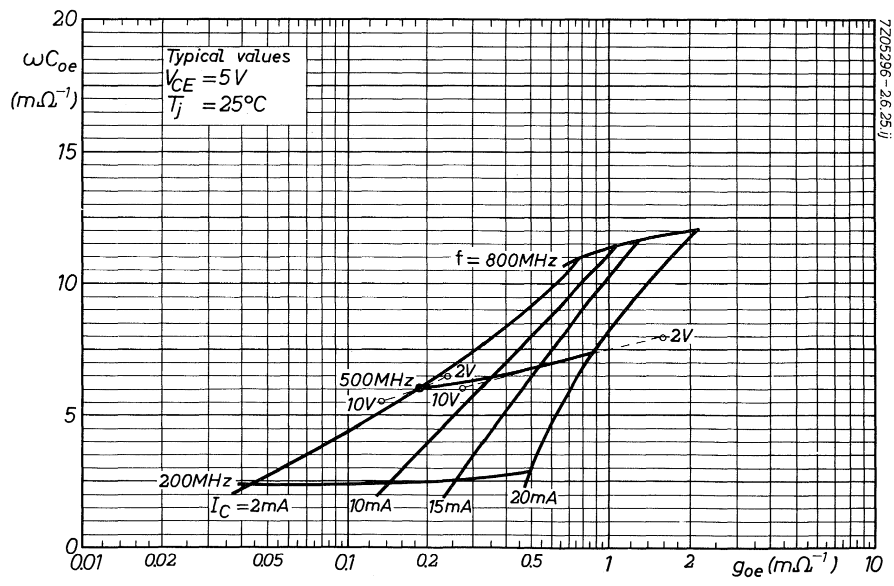


Fig. 15 V_{CE} = 5 V; T_{amb} = 25 °C; typical values.

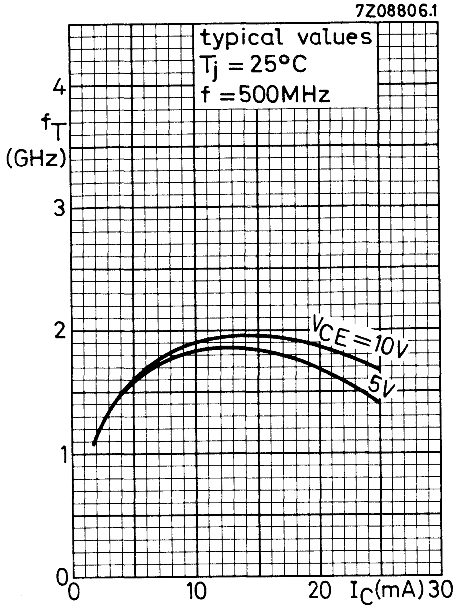


Fig. 16 f = 500 MHz; T_j = 25 °C; typical values.

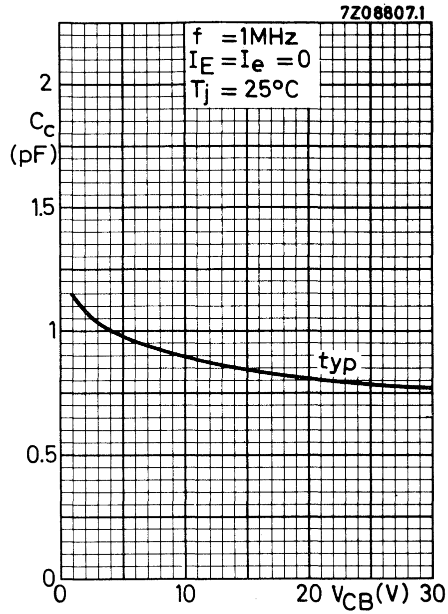


Fig. 17 $I_E = i_e = 0$; f = 1 MHz; T_j = 25 °C; typical values.

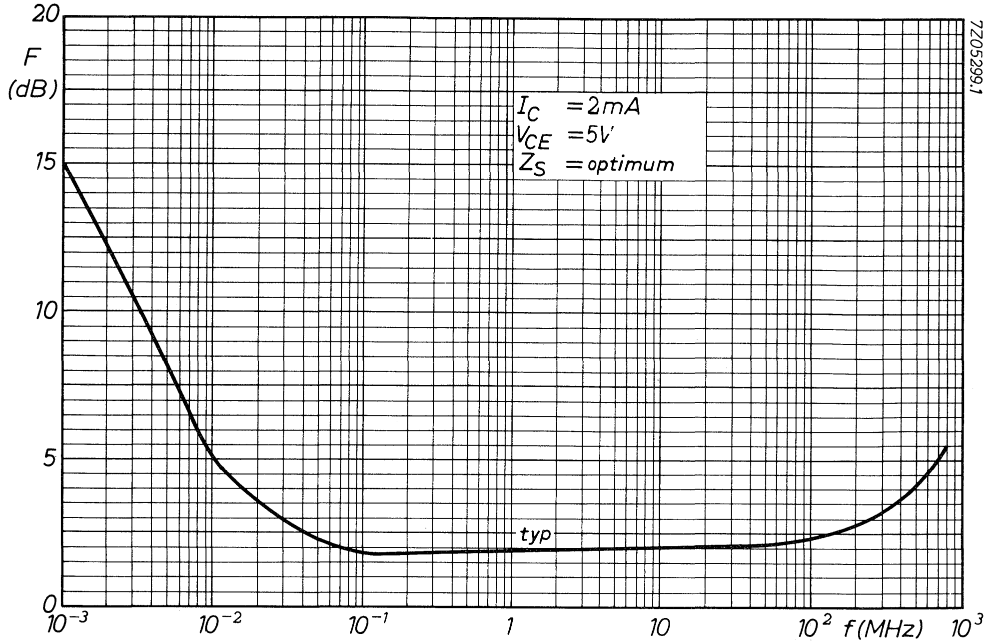


Fig. 18 V_{CE} = 5 V; I_C = 2 mA; Z_S = opt.; T_{amb} = 25 °C; typical values.

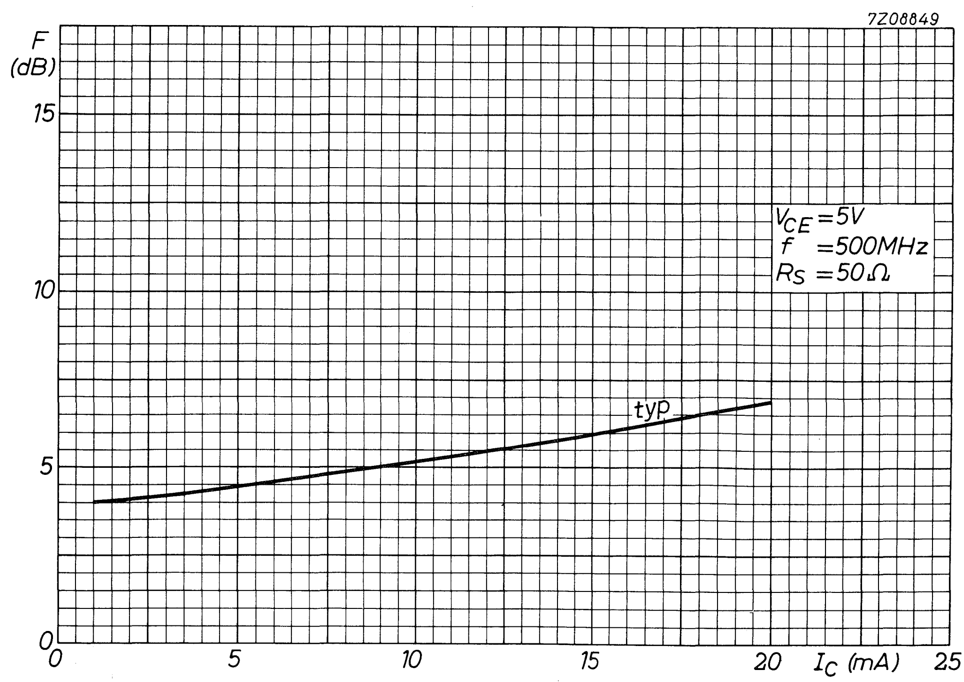


Fig. 19 V_{CE} = 5 V; f = 500 MHz; Z_S = 50 Ω; T_{amb} = 25 °C; typical values.

N-P-N 900 MHz 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.

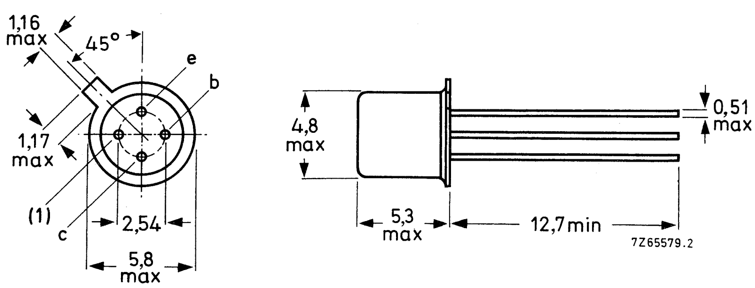
QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	30	V
Collector-emitter voltage (open base)	V_{CEO}	max.	15	V
Collector current (DC)	I_C	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 = 6 mA; V_{CE} = 10 V	f_T	min.	900	MHz
Maximum unilateralized power gain I_C = 6 mA; V_{CE} = 12 V; f = 200 MHz	G_{UM}	typ.	36	dB
Noise figure at f = 60 MHz I_C = 1 mA; V_{CE} = 6 V; Z_S = 400 Ω	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_{CBO}	max.	30	V
Collector-emitter voltage (open base)	V_{CEO}	max.	15	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3	V
Collector current (DC)	I_C	max.	50	mA
Total power dissipation up to T_{amb} = 25 °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	$R_{th\ j\text{-}a}$	=	880	K/W
From junction to case	$R_{th\ j\text{-}c}$	=	580	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified. All measurements taken with ungrounded shield lead.

Collector cut-off current			
$I_E = 0$; $V_{CB} = 15$ V	I_{CBO}	max.	10 nA
$I_E = 0$; $V_{CB} = 15$ V; $T_j = 150$ °C	I_{CBO}	max.	1 μA
Saturation voltages			
$I_C = 10$ mA; $I_B = 1$ mA	V_{CEsat}	max.	0.4 V
	V_{BEsat}	max.	1 V
DC current gain			
$I_C = 3$ mA; $V_{CE} = 1$ V	h_{FE}	min.	20
Collector capacitance at f = 140 kHz			
$I_E = I_e = 0$; $V_{CB} = 10$ V	C_c	max.	1.7 pF
$I_E = I_e = 0$; $V_{CB} = 0$	C_c	max.	3.0 pF
Emitter capacitance at f = 140 kHz			
$I_C = I_c = 0$; $V_{EB} = 0.5$ V	C_e	max.	2.0 pF
Transition frequency			
$I_C = 6$ mA; $V_{CE} = 10$ V*	f_T	min.	900 MHz
Noise figure at f = 60 MHz			
$I_C = 1$ mA; $V_{CE} = 6$ V; $Z_S = 400\ \Omega$; $T_{amb} = 25$ °C	F	max.	6.0 dB
Oscillator power output at f = 500 MHz			
$-I_E = 8$ mA; $V_{CB} = 15$ V; $T_{amb} = 25$ °C	P_o	min.	30 mW

Maximum unilateralised power gain (s_{12} is assumed to be zero)

$$G_{UM} = 10 \log \frac{|s_{21}|^2}{[1-|s_{11}|^2]\ [1-|s_{22}|^2]}$$

$I_C = 6$ mA; $V_{CE} = 12$ V; f = 200 MHz; $T_{amb} = 25$ °C	G_{UM}	typ.	36 dB

* JEDEC registration: $I_C = 4$ mA; $V_{CE} = 10$ V, $f_T > 600$ MHz.

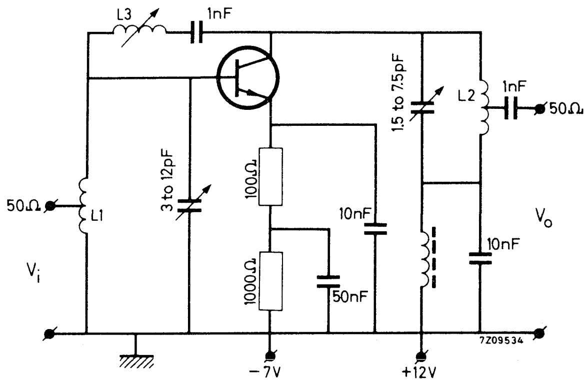
CHARACTERISTICS (continued)

Available power gain at f = 200 MHz

I_C = 6 mA; V_{CE} = 12 V; T_{amb} = 25 °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

CATV AMPLIFIER MODULES

type number	frequency range MHz	power gain (dB) at f = 50 MHz	application	page
BGY61		12.5 to 13.5		883
BGY65	5 to 200	18.0 to 19.0	reverse amplifier	887
BGY67		21.5 to 22.5		891
BGY67A		23.5 to 24.5		895
BGY59	40 to 300	37.5 to 39.5	line extender	875
BGY60	40 to 300	32.5 to 34.5	interstage amp post amplifier	879
BGD102	40 to 450	18.0 to 19	power doubler	843
BGD104	40 to 450	19.5 to 20.5	amplifiers	843
BGD102E	40 to 450	18.0 to 19.0	power doubler	845
BGD104E	40 to 450	19.5 to 20.5	amplifiers	845
BGD106	40 to 450	21.5 to 22.5	power doubler	847
BGD108	40 to 450	35 to 37	power doubler	849
BGE85A	40 to 450	17.6 to 19.2	output amplifier	859
BGE88	40 to 450	33 to 36	amplifier	863
BGY80	40 to 450	12.1 to 12.9	preamplifier	899
BGY81			post amplifier	899
BGY82	40 to 450	13.5 to 14.5	amplifier	903
BGY83			amplifier	903
BGY84	40 to 450	16.5 to 17.5	preamplifier	905
BGY85			post amplifier	905
BGY84A	40 to 450	18 to 18.8	preamplifier	909
BGY85A			post amplifier	909
BGY84H	40 to 450	14.6 to 16.2	trunk amplifier	913
BGY85H			trunk amplifier	913
BGY85H/01	40 to 450	14.8 to 16.4	trunk amplifier	917

Notes

1. Specifications also supplied for 450 MHz bandwidth operation.
2. Power gain measured at f = 470 MHz.

CATV AMPLIFIER MODULES (continued)

type number	frequency range MHz	power gain (dB) at f = 50 MHz	application	page
BGY86	40 to 450	21.5 to 22.5	preamplifier	921
BGY87			post amplifier	921
BGY87B	40 to 450	26.2 to 27.8	amplifier	925
BGY88	40 to 450	33.5 to 35.5	line extender	927
BGY89	40 to 450	37 to 39	line extender	931
BGY580	40 to 550	12 to 13	preamplifier	935
BGY581			post amplifier	935
BGY582	50 to 550	13.5 to 14.5	amplifier	939
BGY583			amplifier	939
BGY584 (note 1)	40 to 550	16.5 to 17.5	preamplifier	943
BGY585 (note 1)			post amplifier	943
BGY584A (note 1)	40 to 550	17.7 to 18.7	preamplifier	947
BGY585A (note 1)			post amplifier	947
BGY586	40 to 550	21.5 to 22.5	preamplifier	951
BGY587			post amplifier	951
BGY587B	40 to 550	26.2 to 27.8	amplifier	955
BGD502 (note 1)	40 to 550	18 to 19	power doubler	851
BGD504 (note 1)		19.5 to 20.5	power doubler	851
BGD506	40 to 550	21.5 to 22.5	power doubler	855
BGD508	40 to 550	35 to 37	power doubler	857
BGE885	40 to 860	16.5 to 17.5	amplifier	867
BGE887 (note 2)	470 to 860	22 to 24	amplifier	869
BGX885	40 to 860	16.5 to 17.5	40 to 860 MHz amp	871

Notes

1. Specifications also supplied for 450 MHz bandwidth operation.
2. Power gain measured at f = 470 MHz.

CATV POWER-DOUBLER AMPLIFIER MODULES

Power-doubler amplifier modules for CATV systems operating at frequencies up to 450 MHz.

Features:

- excellent linearity
- high output level
- optimal reliability ensured by TiPtAu metallized crystals, silicon nitride passivation and rugged construction.

QUICK REFERENCE DATA

			BGD102	BGD104	
Power gain at f = 50 MHz	G_P		18.5 ± 0.5	20.0 ± 0.5	dB
DC supply voltage (note 1)	$+V_B$	=	24	24	V
Total DC current consumption at V_B = +24 V	I_{tot}	max.	435	435	mA

MECHANICAL DATA

SOT115.

Note

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)

RF 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} = 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 (55.25 MHz) V_o = 46 dBmV; channel H5 (343.25 MHz) Measured at channel H14 (403.25 MHz)	d_2	max.	−73	−73	dB
Composite triple beat at 60 channels V_o = 46 dBmV; tested in channel H22 (445.25 MHz)	CTB	max.	−65	−64	dB
Cross modulation at 60 channels V_o = 46 dBmV; tested in channel 2 (55.25 MHz)	X_{mod}	max.	−67	−66	dB
Noise figure f = 40 MHz to 450 MHz	F	max.	7	7	dB
Total DC 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.

Features:

- excellent linearity
- high output level
- optimal reliability ensured by TiPtAu metallized crystals, silicon nitride passivation and rugged construction.

QUICK REFERENCE DATA

			BGD102E	BGD104E	
Power gain at f = 50 MHz	G_P		18.5 ± 0.5	20.0 ± 0.5	dB
DC supply voltage (note 1)	$+V_B$	=	24	24	V
Total DC current consumption at V_B = +24 V	I_{tot}	max.	435	435	mA

MECHANICAL DATA

SOT115.

Note

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)

RF 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} = 35 °C

			BGD102E	BGD104E	
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 2.0	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 $Z_S = Z_L$ = 75 Ω;					
f = 40 MHz to 80 MHz	$S_{11\text{-}22}$	min.	20	20	dB
f = 80 MHz to 160 MHz	$S_{11\text{-}22}$	min.	19	19	dB
f = 160 MHz to 450 MHz	$S_{11\text{-}22}$	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.	65.0	64.5	dBmV
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 DC current consumption	I_{tot}	max.	435	435	mA

Philips Components

Data sheet	
status	Product specification
date of issue	October 1990

BGD106

CATV power doubler amplifier module

FEATURES

- Excellent linearity
- Extremely low noise
- Optimal reliability ensured by TiptAu metallized crystals, silicon nitride passivation and rugged construction.

DESCRIPTION

Hybrid amplifier module for CATV systems operating over a frequency range of 40 to 450 MHz at a voltage supply of +24 V (see note).

PINNING

PIN	DESCRIPTION
1	input
2	common
3	common
5	$+V_B$
7	common
8	common
9	output

MECHANICAL DATA

SOT115.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
G_p	power gain	f = 50 MHz	21.5	22.5	dB
I_{tot}	total DC current consumption	V_B = +24 V (DC)	-	435	mA

Note

The module normally operates at V_B = +24 V, but is able to withstand supply transients up to +30 V.

LIMITING VALUES

In accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	MIN.	MAX.	UNIT
V_B	DC supply voltage	-	+28	V
V_i	RF input voltage	-	60	dBmV
T_{stg}	storage temperature range	−40	+100	°C
T_{mb}	mounting base operating temperature range	−20	+100	°C

CHARACTERISTICS

T_{case} = 35 °C; $Z_S = Z_L$ = 75 Ω.

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
G_p	power gain	f = 50 MHz	21.5	22.5	dB
		f = 450 MHz	22.1	-	dB
I_{tot}	total DC current consumption	V_B = +24 V (DC)	-	435	mA
SL	slope cable equivalent	f = 40 to 450 MHz	0	2	dB
FL	flatness of frequency response	f = 40 to 450 MHz	-	± 0.3	dB
S_{11}/S_{22}	input/output return losses	f = 40 to 80 MHz	-	20	dB
		f = 80 to 160 MHz	-	19	dB
		f = 160 to 450 MHz	-	18	dB
d_2	second order beat	V_o = 46 dBmV see note 1	-	−68	dB
CTB	composite triple beat	60 chs flat; V_o = 46 dBmV; measured in ch.H22 (445.25 MHz)	-	−63	dB
CSO	composite second order distortion	60 chs flat; V_o = 46 dBmV; measured in ch.H22 (446.5 MHz)	-	−57	dB
X_{mod}	cross modulation	60 chs flat; V_o = 46 dBmV; measured in ch.2 (55.25 MHz)	-	−61	dB
V_o	output voltage	d_{im} = −60 dB see note 2	66.5	-	dBmV
F	noise figure	f = 450 MHz	-	6.5	dB

Note

1. f_p = 55.25 MHz; V_p = 46 dBmV;
   f_q = 391.25 MHz; V_q = 46 dBmV;
   Measured at $f_p + f_q$ = 446.5 MHz (H22)

2. Measured according to DIN45004B;
   f_p = 440.25 MHz; $V_p = V_o$ = 66.5 dBmV;
   f_q = 447.25 MHz; $V_q = V_o$ −6 dB;
   f_r = 449.25 MHz; $V_r = V_o$ −6 dB.

Philips Components

Data sheet	
status	Preliminary specification
date of issue	October 1990

BGD108

CATV power doubler amplifier module

FEATURES

- Excellent linearity
- Extremely low noise
- Optimal reliability ensured by TiPtAu metallized crystals, silicon nitride passivation and rugged construction.

PINNING

PIN	DESCRIPTION
1	input
2	common
3	common
5	$+V_B$
7	common
8	common
9	output

MECHANICAL DATA

SOT115.

DESCRIPTION

Hybrid amplifier module for CATV systems operating over a frequency range of 40 to 450 MHz at a voltage supply of +24 V (see note).

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
G_p	power gain	f = 50 MHz	35	37	dB
I_{tot}	total DC current consumption	V_B = +24 V (DC)	-	625	mA

Note

The module normally operates at V_B = +24 V, but is able to withstand supply transients up to +30 V.

LIMITING VALUES

In accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	MIN.	MAX.	UNIT
V_B	DC supply voltage	-	+28	V
V_i	RF input voltage	-	55	dBmV
T_{stg}	storage temperature range	−40	+100	°C
T_{mb}	mounting base operating temperature range	−20	+100	°C

CHARACTERISTICS

T_{case} = 35 °C; $Z_S = Z_L$ = 75 Ω.

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
G_p	power gain	f = 50 MHz	35	37	dB
		f = 450 MHz	37	-	dB
I_{tot}	total DC current consumption	V_B = +24 V (DC)	-	625	mA
SL	slope cable equivalent	f = 40 to 450 MHz	0.5	2.5	dB
FL	flatness of frequency response	f = 40 to 450 MHz	-	± 0.4	dB
S_{11}/S_{22}	input/output return losses	f = 40 to 80 MHz	-	20	dB
		f = 80 to 160 MHz	-	19	dB
		f = 160 to 450 MHz	-	18	dB
d_2	second order beat	V_o = 46 dBmV see note 1	-	−73	dB
CTB	composite triple beat	60 chs flat; V_o = 46 dBmV; measured in ch.H22 (445.25 MHz)	-	−65	dB
CSO	composite second order distortion	60 chs flat; V_o = 46 dBmV; measured in ch.H22 (446.5 MHz)	-	−65	dB
X_{mod}	cross modulation	60 chs flat; V_o = 46 dBmV; measured in ch.2 (55.25 MHz)	-	−65	dB
V_o	output voltage	d_{im} = −60 dB see note 2	67	-	dBmV
F	noise figure	f = 450 MHz	-	7	dB

Note

1. f_p = 55.25 MHz; V_p = 46 dBmV;
   f_q = 391.25 MHz; V_q = 46 dBmV;
   Measured at $f_p + f_q$ = 446.5 MHz (H22)

2. Measured according to DIN45004B;
   f_p = 450.25 MHz; $V_p = V_o$ = 67 dBmV;
   f_q = 447.25 MHz; $V_q = V_o$ −6 dB;
   f_r = 449.25 MHz; $V_r = V_o$ −6 dB.

CATV POWER-DOUBLER AMPLIFIER MODULES

Hybrid amplifier modules for use in CATV systems and operating at frequencies up to 550 MHz.

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	
Power gain at f = 50 MHz	G_p		18.0 to 19.0	19.5 to 20.5	
DC supply voltage (note 1)	$+V_B$	=	24	24	V
Total DC current consumption at $V_B = +24$ V	I_{tot}	max.	435	435	mA

Note

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

MECHANICAL DATA

SOT115.

Pinning

1	= input
2, 3, 7, 8	= common
5	= $+V_B$
9	= output

RATINGS

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

RF input voltage	V_i	max.	60	dBmV
Storage temperature range	T_{stg}		−40 to +100	°C
Operating case temperature range	T_{case}		−20 to +100	°C

CHARACTERISTICS (bandwidth = 40 MHz to 550 MHz)

Supply voltage V_B = +24 V; $Z_S = Z_L$ = 75 Ω; T_{case} = 35 °C.

			BGD502	BGD504	
Power gain at f = 50 MHz	G_p		18.0 to 19.0	19.5 to 20.5	dB
Power gain at f = 550 MHz	G_p		18.8 to 20.8	20.2 to 22.2	dB
Slope cable equivalent f = 40 MHz to 550 MHz	SL		0.2 to 2.2	0.2 to 2.2	dB
Flatness of frequency response f = 40 MHz to 550 MHz	FL	max.	±0.3	±0.3	dB
Return losses at input and output $Z_S = Z_L$ = 75 Ω f = 40 MHz to 80 MHz	$S_{11\text{-}22}$	min.	20	20	dB
f = 80 MHz to 160 MHz		min.	19	19	dB
f = 160 MHz to 550 MHz	$S_{11\text{-}22}$	min.	18	18	dB
Output voltage at d_{im} = −60 dB (DIN 45004B; para 6.3: 3-tone) $V_p = V_O$; f_p = 540.25 MHz $V_q = V_O$ − 6 dB; f_q = 547.25 MHz $V_r = V_O$ − 6 dB; f_r = 549.25 MHz Tested at $f_{(p+q-r)}$ = 538.25 MHz	V_O	min.	64	63.5	dBmV
2nd-order distortion V_p = 44 dBmV; f_p = 55.25 MHz (ch. 2) V_q = 44 dBmV; f_q = 493.25 MHz (ch. 18) Measured at $f_{(p+q)}$ = 548.5 MHz (ch. 27)	d_2	max.	−72	−70	dB
Composite triple beat at 77 channels V_O = 44 dBmV; tested at channel 27	CTB	max.	−65	−64	dB
Cross modulation at 77 channels V_O = 44 dBmV; tested in channel 2	X_{mod}	max.	−68	−67	dB
Noise figure f = 550 MHz	F	max.	8.0	8.0	dB
Total DC current consumption	I_{tot}	typ.	415	415	mA
		max.	435	435	mA

CHARACTERISTICS (bandwidth = 40 MHz to 450 MHz)

V_B = +24V; $Z_s = Z_b = 75\ \Omega$; T_{case} = 35 °C.

			BGD502	BGD504	
Power gain					
f = 50 MHz	G_p		19.0 to 20.0	19.5 to 20.5	dB
f = 450 MHz			18.6 to 20.6	20.0 to 22.0	dB
Slope cable equivalent					
f = 40 MHz to 450 MHz	SL		0.2 to 1.8	0 to 1.65	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 80 MHz	$S_{11\text{-}22}$	min.	20	20	dB
f = 80 MHz to 160 MHz		min.	19	19	dB
f = 160 MHz to 450 MHz		min.	18	18	dB
Second order distortion					
V_p = 46 dBmV; f_p = 55.25 MHz					
V_q = 46 dBmV; f_q = 391.25 MHz					
Measured at $f_p + f_q$ = 446.5 MHz	d_2	max.	−75	−73	dB
Composite triple beat at 60					
channels flat; V_O = 46 dBmV					
Measured in channel H22	CTB	max.	−67	−66	dB
Cross-modulation distortion on 60					
channels flat; V_O = 46 dBmV					
Measured at channel 2	X_{mod}	max.	−67	−66	dB
Output voltage at d_{im} = −60					
$V_p = V_O$; f_p = 440.25 MHz;					
$V_q = V_p$ − 6 dB; f_q = 447.25 MHz;					
$V_r = V_p$ − 6 dB; f_r = 449.25 MHz;					
Measured at					
$f_p + f_q - f_r$ = 438.25 MHz	V_O	min.	67	66.5	dBmV
Noise figure at f = 450 MHz	F	max.	7.0	7.0	dB
Total DC current consumption	I_{tot}	typ.	415	415	mA
		max.	435	435	mA

BGD506
CATV amplifier module

RES

- cellent linearity.
- xtremely low noise.
- Optimal reliability ensured by TiPtAu metallized crystals, silicon nitride passivation and rugged construction.

PINNING

PIN	DESCRIPTION
1	input
2	common
3	common
5	$+V_B$
7	common
8	common
9	output

MECHANICAL DATA

SOT115.

DESCRIPTION

Hybrid amplifier module for CATV systems operating over a frequency range of 40 to 550 MHz at a voltage supply of +24 V (see note).

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
G_p	power gain	f = 50 MHz	21.5	22.5	dB
I_{tot}	total DC current consumption	V_B = +24 V (DC)	-	435	mA

Note

The module normally operates at V_B = +24 V, but is able to withstand supply transients up to +30 V.

LIMITING VALUES

In accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	MIN.	MAX.	UNIT
V_B	DC supply voltage	-	+28	V
V_i	RF input voltage	-	60	dBmV
T_{stg}	storage temperature	−40	+100	°C
T_{mb}	mounting base operating temperature range	−20	+100	°C

CATV amplifier module

CHARACTERISTICS

T_{case} = 35 °C; $Z_S = Z_L$ = 75 Ω.

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	
G_p	power gain	f = 50 MHz	21.5	22.5	dB
		f = 550 MHz	22.1	-	dB
I_{tot}	total DC current consumption	V_B = +24 V (DC)	-	435	mA
SL	slope cable equivalent	f = 40 to 550 MHz	0	2	dB
FL	flatness of frequency response	f = 40 to 550 MHz	-	± 0.3	dB
S_{11}/S_{22}	input/output return losses	f = 40 to 80 MHz	-	20	dB
		f = 80 to 160 MHz	-	19	dB
		f = 160 to 550 MHz	-	18	dB
d_2	second order beat	V_o = 44 dBmV see note 1	-	−66	dB
CTB	composite triple beat	77 chs flat; V_o = 44 dBmV; measured in ch.27 (547.25 MHz)	-	−62	dB
CSO	composite second order distortion	77 chs flat; V_o = 44 dBmV; measured in ch.27 (548.5 MHz)	-	−55	dB
X_{mod}	cross modulation	77 chs flat; V_o = 44 dBmV; measured in ch.2 (55.25 MHz)	-	−63	dB
V_o	output voltage	d_{im} = −60 dB see note 2	62.5	-	dBmV
F	noise figure	f = 550 MHz	-	6.5	dB

Note

1. f_p = 55.25 MHz; V_p = 44 dBmV;
   f_q = 493.25 MHz; V_q = 44 dBmV;
   Measured at $f_p + f_q$ = 548.5 MHz (ch.27)

2. Measured according to DIN45004B;
   f_p = 540.25 MHz; $V_o = V_p$;
   f_q = 547.25 MHz; $V_q = V_o$ −6 dB;
   f_r = 549.25 MHz; $V_r = V_o$ −6 dB;
   measured at: $f_p + f_q - f_r$ = 538.25 MHz;
   V_o = 62.5 dBmV.

Philips Components

Product specification

BGD

ATA

data sheet status: Preliminary specification

date of issue: October 19

FEATURES

- cellent linea
- xtremely lo
- Optimal reli
- TiPtAu me
- nitride pa
- constru

...rd ...ystem operating over a frequency range ...0 to 550 MHz at a voltage supply ...f +24 V (see note).

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
G_p	power gain	f = 50 MHz	35	37	dB
I_{tot}	total DC current consumption	V_B = +24 V (DC)	-	625	mA

Note

The module normally operates at V_B = +24 V, but is able to withstand supply transients up to +30 V.

LIMITING VALUES

In accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	MIN.	MAX.	UNIT
V_B	DC supply voltage	-	+28	V
V_i	RF input voltage	-	55	dBmV
T_{stg}	storage temperature range	−40	+100	°C
T_{mb}	mounting base operating temperature range	−20	+100	°C

CATV amplifier m

CHARACTERISTICS

T_{case} = 35 °C; $Z_S = Z_L$ = 75 Ω.

SYMBOL	PARAMETER	CON			
G_p	power gain	f = 50 MHz f = 550 MHz			
I_{tot}	total DC current consumption	V_B = +24 V (DC)			
SL	slope cable equivalent	f = 40 to 550 MHz			
FL	flatness of frequency response	f = 40 to 550 MHz			
S_{11}/S_{22}	input/output return losses	f = 40 to 80 MHz f = 80 to 160 MHz f = 160 to 550 MHz	- - -		
d_2	second order beat	V_o = 44 dBmV see note 1	-	−70	
CTB	composite triple beat	77 chs flat; V_o = 44 dBmV; measured in ch.27 (547.25 MHz)	-	−63	dB
CSO	composite second order distortion	77 chs flat; V_o = 44 dBmV; measured in ch.27 (548.5 MHz)	-	−58	dB
X_{mod}	cross modulation	77 chs flat; V_o = 44 dBmV; measured in ch.2 (55.25 MHz)	-	−65	dB
V_o	output voltage	d_{im} = −60 dB see note 2	63	-	dBmV
F	noise figure	f = 550 MHz	-	7.5	dB

Note

1. f_p = 55.25 MHz; V_p = 44 dBmV;
   f_q = 493.25 MHz; V_q = 44 dBmV;
   Measured at $f_p + f_q$ = 548.5 MHz (ch.27)

2. Measured according to DIN45004B;
   f_p = 540.25 MHz; $V_o = V_p$;
   f_q = 547.25 MHz; $V_q = V_o$ −6 dB;
   f_r = 549.25 MHz; $V_r = V_o$ −6 dB;
   measured at: $f_p + f_q - f_r$ = 538.25 MHz;
   V_o = 63 dBmV.

CATV AMPLIFIER MODULES

Hybrid amplifier modules for CATV systems operating at frequencies up to 450 MHz.
BGE85A: 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

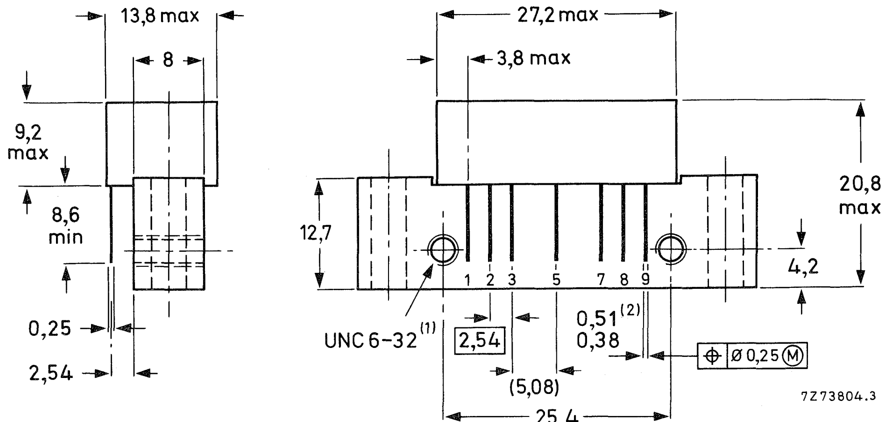
Frequency range	f		40-450	MHz
Source and load impedance	$Z_S = Z_L$		75	Ω
Power gain at f = 50 MHz	G_p		17.6 to 19.2	dB
Slope cable equivalent f = 40 MHz to 450 MHz	SL		0.3 to 1.8	dB
Flatness of frequency response f = 40 MHz to 450 MHz	FL	max.	±0.2	dB
Return losses at input and output f = 40 MHz	$S_{11\text{-}22}$	min.	20	dB
f = 450 MHz		min.	18	dB
Output voltage at d_{im} = –60 dB (DIN 45004B, par. 6.3: 3-tone)	V_O	min.	60.5	dBmV
Second order distortion V_O = 46 dBmV	d_2	max.	–72	dB
Noise figure f = 40 MHz to 450 MHz	F	max.	7.0	dB
DC supply voltage	$+V_B$		24	V
Total DC current consumption at V_B = +24 V	I_{tot}	typ.	200	mA

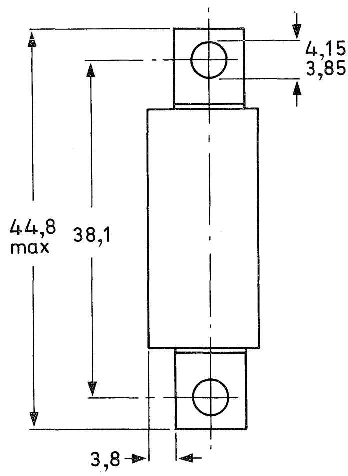
MECHANICAL DATA

SOT115 (see Fig. 1).

MECHANICAL DATA

Fig. 1 SOT115.





Terminal connections

1	= input
2, 3, 7, 8	= common
5	= $+V_B$
9	= output

(1) Screw 6-32 UNC-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).

RF input voltage	V_i	max.	65	dBmV
Storage temperature range	T_{stg}		−40 to +100	^oC
Operating case temperature range	T_{case}		−20 to +100	^oC

CHARACTERISTICS

V_B = +24 V; T_{case} = 30 °C.

Power gain at f = 50 MHz	G_p		17.6 to 19.2 dB
Slope cable equivalent f = 40 MHz to 450 MHz	SL		0.3 to 1.8 dB
Flatness of frequency response f = 40 MHz to 450 MHz	FL	max.	±0.2 dB
Return losses at input and output $Z_S = Z_L$ = 75 Ω			
f = 40 MHz to 80 MHz	$S_{11\text{-}22}$	min.	20 dB
f = 80 MHz to 160 MHz		min.	19 dB
f = 160 MHz to 450 MHz		min.	18 dB
Output voltage at d_{im} = –60 dB (DIN 45004B, para 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	V_O	min.	60.5 dBmV
2nd order distortion V_O = 46 dBmV; channel 2 V_O = 46 dBmV; channel H5 Measured at channel H14	d_2	max.	–72 dB
Noise figure f = 40 MHz to 450 MHz	F	max.	7.0 dB
Total DC current consumption	I_{tot}	typ.	200 mA
		max.	230 mA

CATV AMPLIFIER MODULES

Low cost hybrid amplifier modules for use in CATV Systems, operating at frequencies up to 450 MHz.

BGE88: 34.5 dB
BGE88/01: 34.5 dB

FEATURES

- Excellent linearity
- Extremely low noise
- Optimal reliability ensured by application of TiPtAu metallized crystals, silicon nitride glass barrier and a rugged construction.

QUICK REFERENCE DATA

			BGE88	BGE88/01	
Frequency range	f		40 to 450	40 to 450	MHz
Source and load impedance	$Z_S = Z_L$		75	75	Ω
Power gain at f = 50 MHz	G_p		33 to 36	33 to 36	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	$S_{11\text{-}22}$	min.	15.5	15.5	dB
Second order distortion V_O = 46 dBmV	d_2	max.	−70	−70	dB
Output voltage at d_{im} = −60 dB (DIN 45004B, par. 6.3: 3-tone)	V_O	min.	60	59	dBmV
Noise figure at 450 MHz	F	max.	6.0	6.0	dB
DC supply voltage (note 1)	$+V_B$		24	24	V
Total DC current consumption	I_{tot}		290	250	mA
Operating case temperature range	T_{case}		−20 to +100	−20 to +100	°C

MECHANICAL DATA

SOT115 (see Fig. 1).

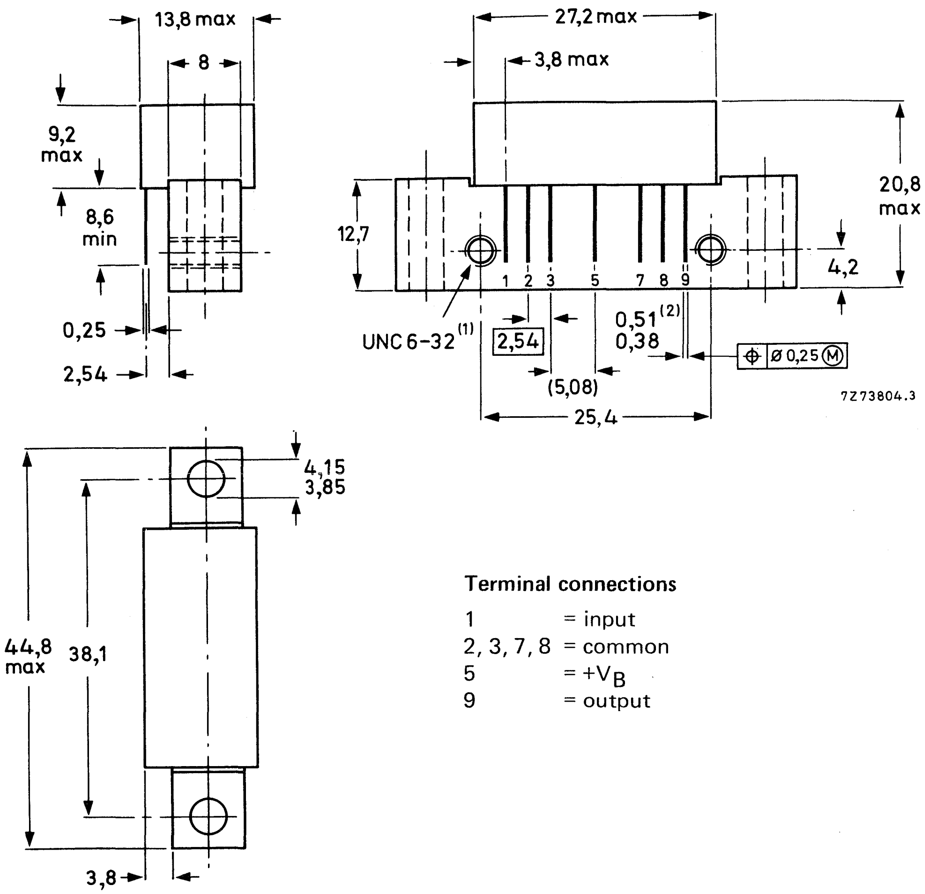
Note

1. The modules normally operate at V_B = +24 V DC, but are able to withstand supply transients up to 30 V.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT115.



Terminal connections

1	= input
2, 3, 7, 8	= common
5	= $+V_B$
9	= output

(1) Screw 6-32 UNC-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).

RF input voltage	V_i	max.	60	dBmV
Storage temperature range	T_{stg}		−40 to +100	°C
Operating case temperature range	T_{case}		−20 to +100	°C

CHARACTERISTICS

Supply voltage V_B = +24 V DC; T_{case} = 30 °C.

			BGE88	BGE88/01	
Power gain at f = 50 MHz	G_p		33 to 36	33 to 36	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 80 MHz	$S_{11\text{-}22}$	min.	20	20	dB
f = 80 MHz to 160 MHz		min.	18.5	18.5	dB
f = 160 MHz to 320 MHz		min.	17	17	dB
f = 320 MHz to 450 MHz		min.	15.5	15.5	dB
Second order distortion V_p = 46 dBmV; f_p = 55.25 MHz V_q = 46 dBmV; f_q = 343.25 MHz Measured at $f_p + f_q$ = 398.5 MHz	d_2	max.	–70	–70	dB
Output voltage at d_{im} = –60 dB $V_p = V_O$; 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 $f_p + f_q - f_r$ = 438.25 MHz	V_O	min.	60	59	dBmV
Noise figure at f = 450 MHz	F		6.0	6.0	dB
Total DC current consumption V_B = +24 V DC	I_{tot}	typ.	290	250	mA
		max.	330	260	mA

Philips Components

Data sheet	
status	Preliminary specification
date of issue	October 1990

BGE885

CATV amplifier module

FEATURES

- Excellent linearity.
- Extremely low noise.
- TiPtAu metallized crystals.
- Rugged construction.

DESCRIPTION

Hybrid amplifier module for CATV systems operating over a frequency range of 40 to 860 MHz. The module is intended for use as an amplifier in CATV systems at a voltage supply of +24 V.

PINNING

PIN	DESCRIPTION
1	input
2	common
3	common
4	12 V –60 mA supply terminal
5	common
6	common
7	common
8	$+V_B$
9	output

Caution

Pins 1 and 9 carry DC voltages.

MECHANICAL DATA

SOT115.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
G_p	power gain	f = 50 MHz	16.5	17.5	dB
I_{tot}	total DC current consumption	V_B = +24 V (DC)	-	240	mA

Note

The module normally operates at V_B = +24 V, but is able to withstand supply transients up to +30 V.

LIMITING VALUES

In accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	MIN.	MAX.	UNIT
V_B	DC supply voltage	-	+28	V
V_i	RF input voltage	-	60	dBmV
T_{stg}	storage temperature range	–40	+100	°C
T_{mb}	operating mounting base temperature	–20	+100	°C

CHARACTERISTICS

T_{case} = 30 °C; Z_S = Z_L = 75 Ω.

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
G_p	power gain	f = 50 MHz	16.5	17.5	dB
I_{tot}	total DC current consumption	V_B = +24 V (DC)	220	240	mA
SL	slope cable equivalent	f = 40 to 860 MHz	0.2	+1.2	dB
FL	flatness of frequency response	f = 40 to 860 MHz	-	± 0.5	dB
S_{11}	input return loss	f = 40 to 450 MHz f = 450 to 860 MHz	- -	14 10	dB dB
S_{22}	output return loss	f = 40 to 450 MHz f = 450 to 860 MHz	- -	14 10	dB dB
d_2	second order beat	see note 2	-	−53	dB
V_o	output voltage	d_{im} = -60 dB see note 1	-	59	dBmV
F	noise figure	f = 350 MHz f = 860 MHz	- -	7.5 8.0	dB dB

Notes

1. Measured according to DIN45004B;
   f_p = 851.25 MHz; V_p = V_o = 59.0 dBmV;
   f_q = 858.25 MHz; V_q = V_o −6 dB;
   f_r = 860.25 MHz; V_r = V_o −6 dB;
   $f_{(p+q-r)}$ = 849.25 MHz.

2. V_p = 59 dBmV at f_p = 350 MHz;
   V_p = 59 dBmV at f_p = 400 MHz;
   Measured at $f_{(p+q)}$ = 750 MHz.

Philips Components

Data sheet	
status	Preliminary specification
date of issue	October 1990

BGE887

CATV amplifier module

FEATURES

- Excellent linearity
- Extremely low noise
- Silicon nitride passivated transistors
- Rugged construction.

PINNING

PIN	DESCRIPTION
1	input
2	common
5	$+V_B$
6	common
8	common
9	output

MECHANICAL DATA

SOT115.

DESCRIPTION

Hybrid amplifier module for CATV systems operating over a frequency range of 470 to 860 MHz. The module is intended for use in the UHF part of VHF/UHF split-band CATV systems at a supply voltage of +24 V.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
G_p	power gain	f = 470 MHz	22	24	dB
I_{tot}	total DC current consumption	V_B = +24 V (DC)	-	280	mA

Note

The module normally operates at V_B = +24 V, but is able to withstand supply transients up to +30 V.

LIMITING VALUES

In accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	MIN.	MAX.	UNIT
V_B	DC supply voltage	-	+28	V
V_i	RF input voltage	-	60	dBmV
T_{stg}	storage temperature range	−40	+100	°C
T_{mb}	mounting base operating temperature range	−20	+80	°C

CHARACTERISTICS

T_{case} = 30 °C; $Z_S = Z_L$ = 75 Ω.

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
G_p	power gain	f = 470 MHz	22	24	dB
I_{tot}	total DC current consumption	V_B = +24 V (DC)	250	280	mA
ΔG	delta gain	f = 470 to 860 MHz	−0.5	+0.5	dB
FL	flatness of frequency response	f = 470 to 860 MHz	-	± 0.3	dB
S_{11}	input return losses	f = 470 to 860 MHz	-	12	dB
S_{22}	output return losses	f = 470 to 860 MHz	-	17	dB
V_o	output voltage	d_{im} = −60 dB see note 1	60.5	-	dBmV
		d_{im} = -60 dBmV see note 2	60.5	-	dBmV
F	noise figure	f = 470 MHz f = 860 MHz	- -	8.0 8.5	dB dB

Note

1. Measured according to DIN45004B;
   f_p = 851.25 MHz; $V_p = V_o$ = 60.5 dBmV
   f_q = 858.25 MHz; $V_q = V_o$ −6 dB;
   f_r = 860.25 MHz; $V_r = V_o$ −6 dB;
   $f_{(p+q-r)}$ = 849.25 MHz.

2. f_p = 483.25 MHz; $V_p = V_o$ = 60.5 dBmV
   f_q = 490.25 MHz; $V_q = V_o$ −6 dB;
   f_r = 492.25 MHz; $V_r = V_o$ −6 dB;
   $f_{(p+q-r)}$ = 481.25 MHz.

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 ± 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.	± 0.5	dB
Return losses at input and output f = 40 MHz (decrease 1.5 dB/octave)	$S_{11\text{-}22}$	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. min.	61 60	dBmV dBmV
2nd order distortion $f_{(p+q)}$ = 750 MHz	d_2	max.	−53	dB
Noise figures f = 350 MHz f = 860 MHz	F	max. max.	7.5 8.0	dB dB
DC supply voltage (note 1)	$+V_B$	=	24	V
Total DC current consumption V_B = + 24 V	I_{tot}	typ.	240	mA
Operating case temperature	T_c		−20 to 100	°C

MECHANICAL DATA

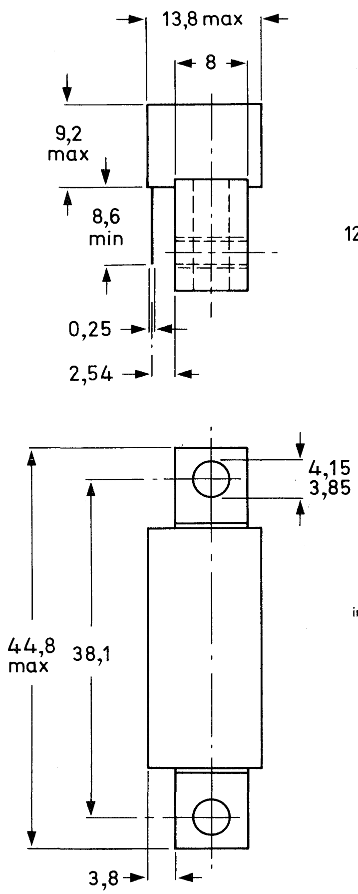
SOT-115 (see Fig. 1).

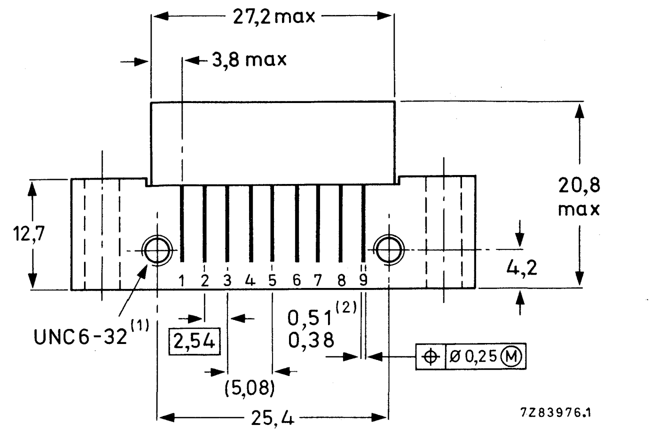
Note

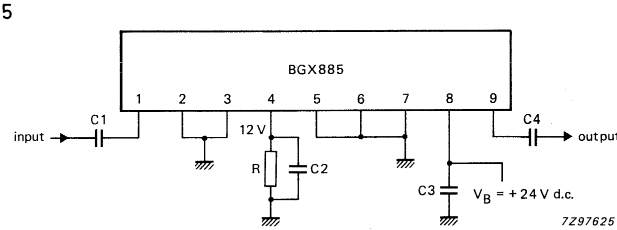
1. The module normally operates at V_B = 24 V, but is able to withstand incidental supply transients up to 30 V.

MECHANICAL DATA Dimensions in mm

Fig. 1 SOT-115.







C1, C2, C3 and C4 are 10 nF ceramic multilayer capacitors

R is a 200 Ω — 1 Watt resistor.

(1) Screw 6-32UNC-2A available upon request.

See "Mounting and Soldering Recommendations".

PINNING

1	= input (note 1)
2, 3, 5, 6, 7	= common
8	= + V_B (24 V dc)
9	= output (note 1)
4	= 12 V—60 mA supply terminal

RATINGS

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

RF input voltage	V_i	max.	60 dBmV
Storage temperature	T_{stg}	−40 to + 100	°C
Operating case temperature	T_c	−20 to + 100	°C

CAUTION

Pins 1 and 9 carry DC voltages.

CHARACTERISTICS

Supply voltage V_B = + 24 V; $Z_S = Z_L$ = 75 Ω; T_c = 30 °C

Power gain at f = 50 MHz	G_p		17 ± 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.	± 0.5 dB
Return losses at input and output $Z_S = Z_L$ = 75 Ω f = 40 MHz Decrease per octave (note 1)	$S_{11\text{-}22}$	min.	20 dB 1.5 dB
Voltage output at d_{im} = −60 dB (DIN 45004B, par. 6.3: 3-tone) $V_p = V_o$; f_p = 341.25 MHz $V_q = V_p$−6 dB; f_q = 348.25 MHz $V_r = V_p$−6 dB; f_r = 350.25 MHz Measured at $f_{(p+q-r)}$ = 339.25 MHz	V_o	min.	61 dBmV
$V_p = V_o$; f_p = 851.25 MHz $V_q = V_p$−6 dB; f_q = 858.25 MHz $V_r = V_p$−6 dB; f_r = 860.25 MHz Measured at $f_{(p+q-r)}$ = 849.25 MHz	V_o	min.	60 dBmV
Second harmonic distortion V_p = 59 dBmV at f_p = 350 MHz V_q = 59 dBmV at f_q = 400 MHz Measured at $f_{(p+q)}$ = 750 MHz	d_2	max.	−53 dB
Noise figures f = 350 MHz f = 860 MHz	F	max. max.	7.5 dB 8.0 dB
Total DC current consumption	I_{tot}	typ. max.	220 mA 240 mA

Note

1. $S_{11\text{-}22}$ has a minimum of 10 dB at f between 800 MHz and 860 MHz.

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 ±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.	± 0,3	dB
Return losses at input and output f = 40 MHz to 300 MHz	$S_{11\text{-}22}$	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	°C

MECHANICAL DATA

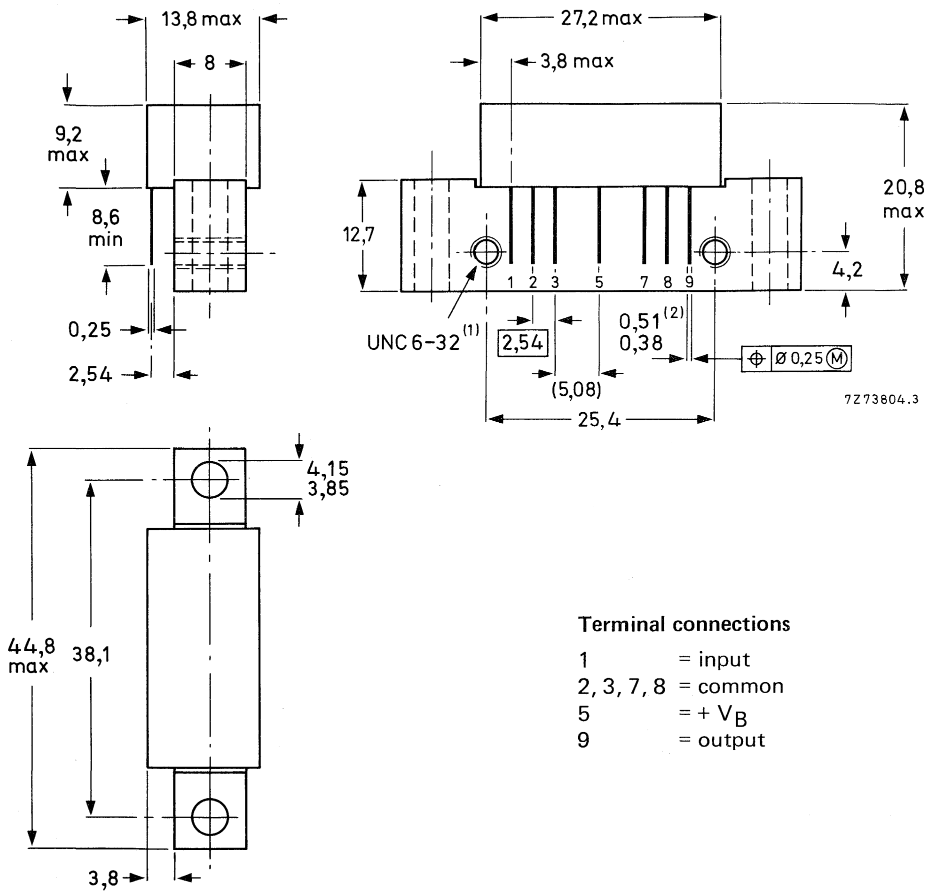
SOT-115 (see Fig. 1).

* 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 ± 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. ± 0,3	dB
Return losses at input and output $Z_S = Z_L$ = 75 Ω; f = 40 MHz to 300 MHz	$S_{11\text{-}22}$	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 max. 340	mA 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 ± 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.	±0,3		dB
			pre-stage	**final stage**	
Return losses at input and output f = 40 MHz to 300 MHz	s_{11}	min.	20	18	dB
	s_{22}	min.	18	20	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.	−66		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		°C

MECHANICAL DATA

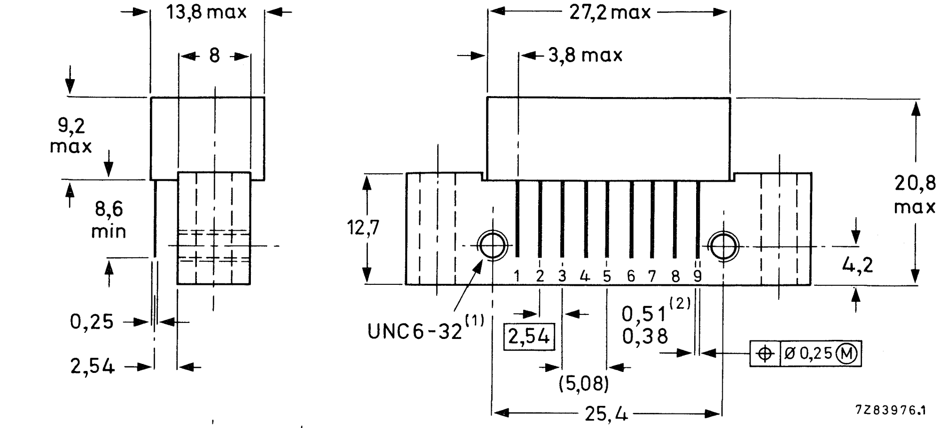
SOT-115 (see Fig. 1).

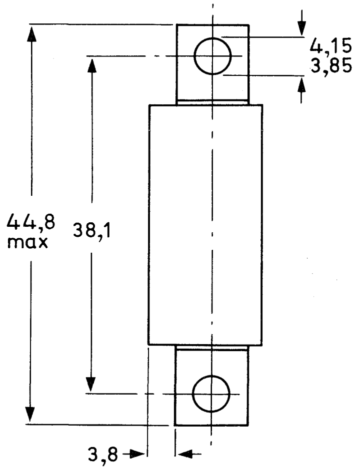
* The module normally operates at V_B = 24 V, but is able to withstand supply transients up to 30 V.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-115.





Terminal connections

1 = input pre-stage
2, 3 = common
4 = output pre-stage
5 = $+V_B$
6 = input final stage
7, 8 = common
9 = output final stage

(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 V; T_{amb} = 25 °C

Power gain at f = 50 MHz	G_p		33,5 ± 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.	± 0,3		dB
			pre-stage	final stage	
Return losses at input and output $Z_S = Z_L$ = 75 Ω; f = 40 MHz to 300 MHz	s_{11}	min.	20	18	dB
	s_{22}	min.	18	20	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.	−66		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

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 ± 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	$S_{11\text{-}22}$	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	°C

MECHANICAL DATA

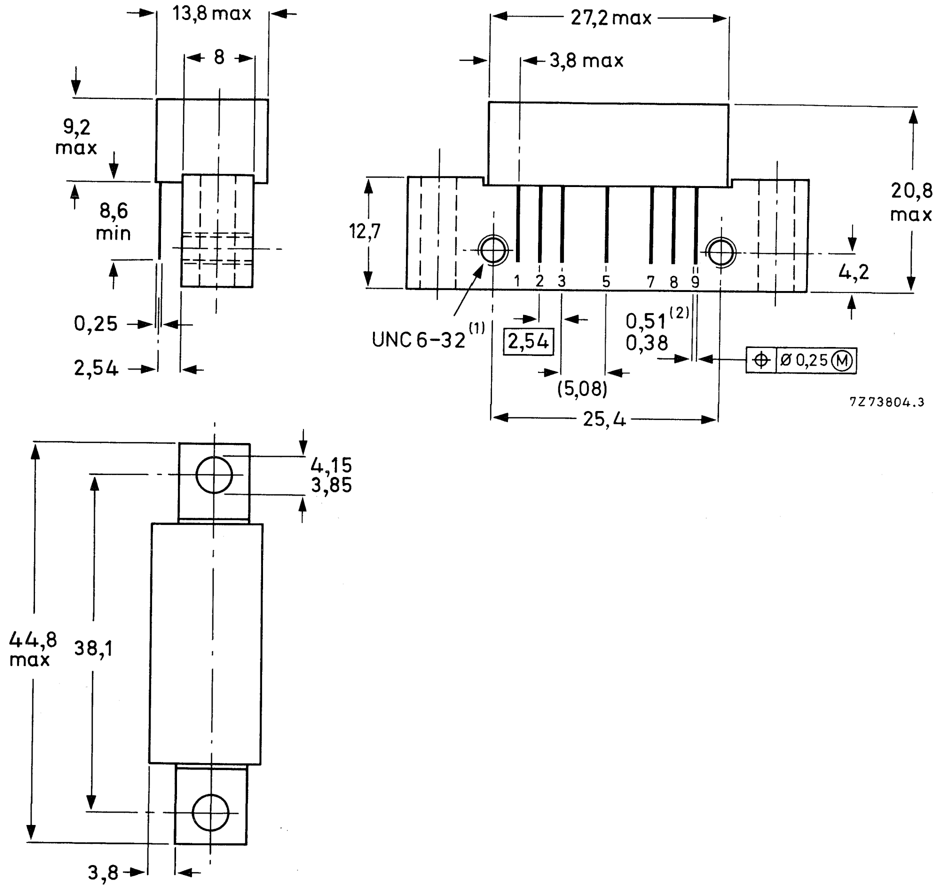
SOT-115 (see Fig. 1).

* 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 ^oC unless otherwise specified

Supply voltage V_B = + 24 V

Power gain at f = 10 MHz	G_p		13,0 ± 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 $Z_S = Z_L$ = 75 Ω; f = 5 MHz to 200 MHz	$S_{11\text{-}22}$	min.	20 dB
Output voltage at d_{im} = −60 dB (DIN 45004B, par. 6.3: 3-tone) $V_p = V_o$; f_p = 35,25 MHz $V_q = V_o$ −6 dB; f_q = 42,25 MHz $V_r = V_o$ − 6 dB; f_r = 44,25 MHz Measured at $f_{(p+q-r)}$ = 33,25 MHz	V_o	min.	67 dBmV
Output voltage at d_{im} = −60 dB (DIN 45004B, par. 6.3: 3-tone) $V_p = V_o$; f_p = 187,25 MHz $V_q = V_o$ −6 dB; f_q = 194,25 MHz $V_r = V_o$ −6 dB; f_r = 196,25 MHz Measured at $f_{(p+q-r)}$ = 185,25 MHz	V_o	min.	64 dBmV
2nd-order distortion V_o = 50 dBmV; f_p = 83,25 MHz V_o = 50 dBmV; f_q = 109,25 MHz Measured at $f_{(p+q)}$ = 192,5 MHz	d_2	max.	−72 dB
Composite triple beat on 22 channels V_o = 50 dBmV; measured in channel 7	CTB	max.	−68 dB
Cross modulation at 22 channels V_o = 50 dBmV; measured in channel 2	X_{mod}	max.	−61 dB
Noise figure f = 200 MHz	F	max.	7,0 dB
Total d.c. current consumption	I_{tot}	typ. max.	215 mA 230 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 ± 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	$S_{11\text{-}22}$	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	°C

MECHANICAL DATA

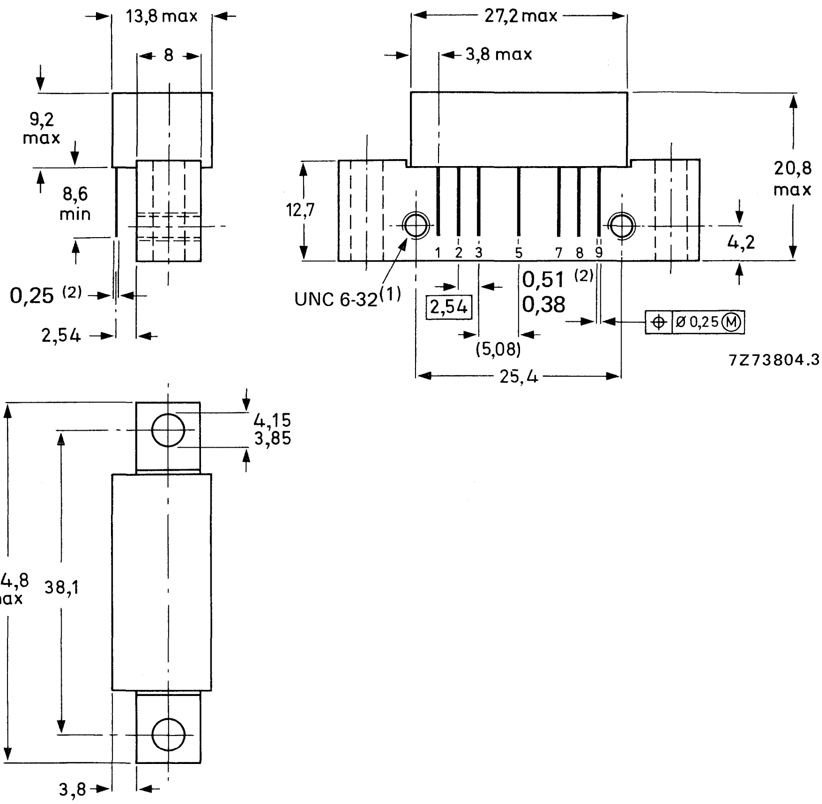
SOT-115 (see Fig. 1).

* 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 V at T_{mb} = 30 °C unless otherwise specified

Power gain at f = 10 MHz	G_p		18,5 ± 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 $Z_S = Z_L$ = 75 Ω; f = 5 MHz to 200 MHz	S_{11-22}	min.	20	dB
Output voltage at d_{im} = −60 dB (DIN 45004B; par. 6.3: 3-tone) $V_p = V_o$; f_p = 33,25 MHz $V_q = V_o$ −6 dB; f_q = 42,25 MHz $V_r = V_o$ −6 dB; f_r = 44,25 MHz Measured at $f_{(p+q)}$ = 33,25 MHz	V_o	min.	67	dBmV
Output voltage at d_{im} = −60 dB (DIN 45004B; par. 6.3: 3-tone) $V_p = V_o$; f_p = 187,25 MHz $V_q = V_o$ −6 dB; f_q = 194,25 MHz $V_r = V_o$ −6 dB; f_r = 196,25 MHz Measured at $f_{(p+q-r)}$ = 185,25 MHz	V_o	min.	64	dBmV
2nd-order distorion V_o = 50 dBmV; f_p = 83,25 MHz V_o = 50 dBmV; f_q = 109,25 MHz Measured at $f_{(p+q)}$ = 192,5 MHz	d_2	max.	−72	dB
Composite triple beat at 22 channels V_o = 50 dBmV; measured in channel 7	CTB	max.	−68	dB
Cross modulation at 22 channels V_o = 50 dBmV; measured in channel 2	X_{mod}	max.	−61	dB
Noise figure f = 200 MHz	F	max.	5,5	dB
Total d.c. current consumption	I_{tot}	typ. max.	215 230	mA 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 ± 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	$S_{11\text{-}22}$	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	°C

MECHANICAL DATA

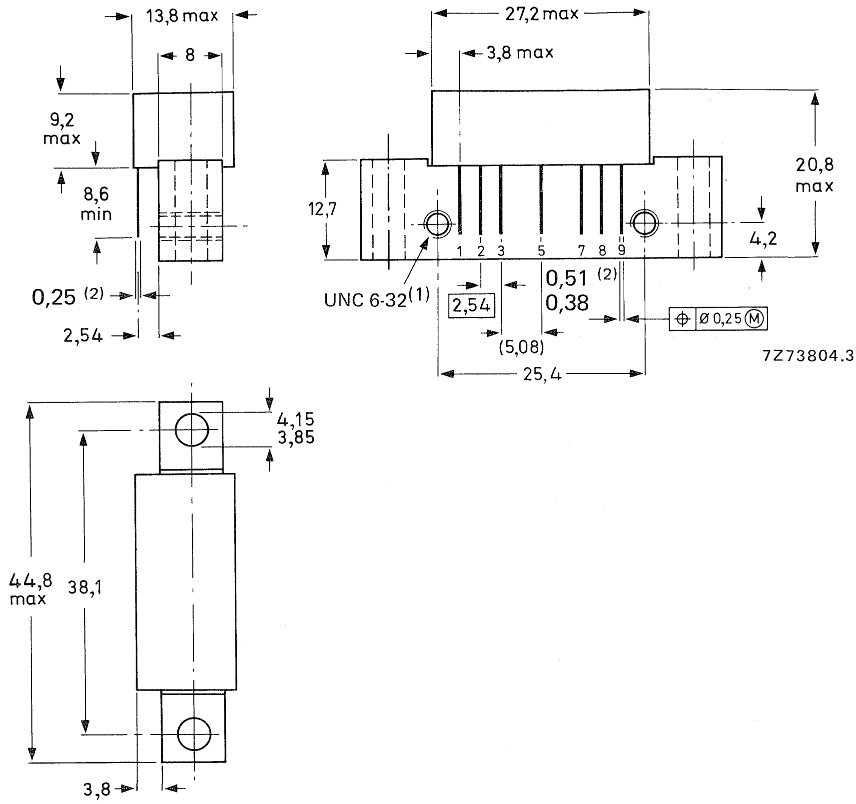
Sot-115 (see Fig. 1).

* 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 °C unless otherwise specified

Supply voltage V_B = + 24 V

Power gain at f = 10 MHz	G_p		22,0 ± 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 $Z_S = Z_L$ = 75 Ω; f = 5 MHz to 200 MHz	$S_{11\text{-}22}$	min.	20	dB
Output voltage at d_{im} = −60 dB (DIN 45004B, par. 6.3: 3-tone) $V_p = V_o$; f_p = 33,25 MHz $V_q = V_o$ −6 dB; f_q = 42,25 MHz $V_r = V_o$ −6 dB; f_r = 44,25 MHz Measured at $f_{(p+q-r)}$ = 33,25 MHz	V_o	min.	67	dBmV
Output voltage at d_{im} = −60 dB (DIN 45004B, par. 6.3: 3-tone) $V_p = V_o$; f_p = 187,25 MHz $V_q = V_o$ −6 dB; f_q = 194,25 MHz $V_r = V_o$ −6 dB; f_r = 196,25 MHz Measured at $f_{(p+q-r)}$ = 185,25 MHz	V_o	min.	64	dBmV
2nd-order distortion V_o = 50 dBmV; f_p = 83,25 MHz V_o = 50 dBmV; f_q = 109,25 MHz Measured at $f_{(p+q)}$ = 192,5 MHz	d_2	max.	−67	dB
Composite triple beat at 22 channels V_o = 50 dBmV; measured on channel 7	CTB	max.	−67	dB
Cross modulation at 22 channels V_o = 50 dBmV; measured in channel 2	X_{mod}	max.	−60	dB
Noise figure f = 200 MHz	F	max.	5,5	dB
Total d.c. current consumption	I_{tot}	typ. max.	215 230	mA 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 ± 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	$S_{11\text{-}22}$	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	°C

MECHANICAL DATA

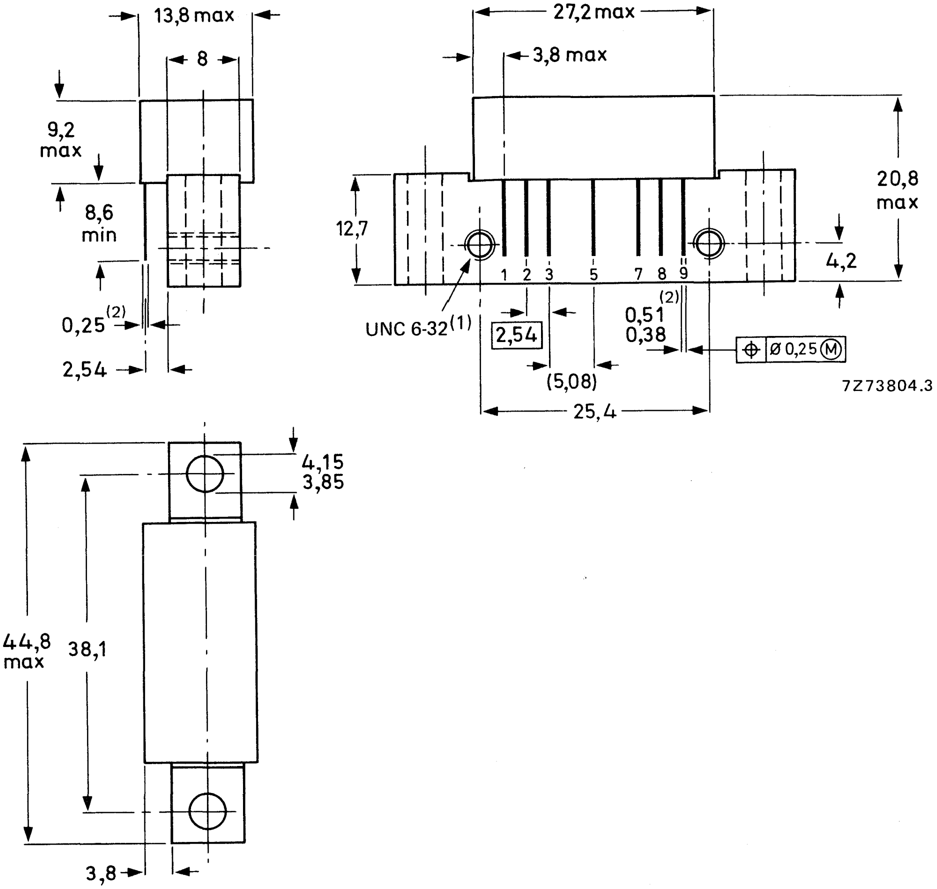
SOT-115 (see Fig. 1).

* 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 available in gold-plated and tin-plated execution.

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 at T_{mb} = 30 °C unless otherwise specified

Supply voltage V_B = + 24 V

Power gain at f = 10 MHz	G_p		24,0 ± 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 $Z_S = Z_L$ = 75 Ω; f = 5 MHz to 200 MHz	$S_{11\text{-}22}$	min.	20	dB
Output voltage at d_{im} = −60 dB (DIN 45004B, par. 6,3: 3-tone) $V_p = V_o$; f_p = 35,25 MHz $V_q = V_o$ −6 dB; f_q = 42,25 MHz $V_r = V_o$ −6 dB; f_r = 44,25 MHz Measured at $f_{(p+q-r)}$ = 33,25 MHz	V_o	min.	67	dBmV
Output voltage at d_{im} = −60 dB (DIN 45004B, par. 6,3: 3-tone) $V_p = V_o$; f_p = 187,25 MHz $V_q = V_o$ −6 dB; f_q = 194,25 MHz $V_r = V_o$ −6 dB; f_r = 196,25 MHz Measured at $f_{(p+q-r)}$ = 185,25 MHz	V_o	min.	64	dBmV
2nd order distortion V_o = 50 dBmV; f_p = 83,25 MHz V_o = 50 dBmV; f_q = 109,25 MHz Measured at $f_{(p+q)}$ =192,5 MHz	d_2	max.	−67	dB
Composite triple beat at 22 channels V_o = 50 dBmV; measured on channel 7	CTB	max.	−67	dB
Cross modulation at 22 channels V_o = 50 dBmV; measured in channel 2	X_{mod}	max.	−59	dB
Noise figure f = 200 MHz	F	max.	5,5	dB
Total d.c. current consumption	I_{tot}	typ. max.	215 230	mA mA

CATV AMPLIFIER MODULES

Hybrid amplifier modules for use in CATV systems and operating at frequencies up to 450 MHz.

BGY80: 12.5 dB pre-amplifier
BGY81: 12.5 dB final-amplifier.

FEATURES

- Excellent linearity
- Extremely low noise
- Optimal reliability ensured by application of TiPtAu metallized crystals, silicon nitride glass barrier and a rugged construction.

QUICK REFERENCE DATA

			BGY80	BGY81	
Frequency range	f		40 to 450	40 to 450	MHz
Source and load impedance	$Z_S = Z_L$		75	75	Ω
Power gain at 50 MHz	G_p		12 to 13	12 to 13	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.	± 0.2	± 0.2	dB
Return losses at input and output	$S_{11\text{-}22}$	min.	18	18	dB
Second order distortion at V_O = 46 dBmV	d_2	max.	−72	−74	dB
Composite triple beat at V_O = 46 dBmV	CTB	max.	−54	−58	dB
Cross-modulation distortion at V_O = 46 dBmV	X_{mod}	max.	−59	−62	dB
Output voltage at d_{im} = −60 dB (DIN45004B, par. 6.3: 3-tone)	V_O	min.	61.5	64	dBmV
Noise figure at 450 MHz	F	max.	7.5	8.0	dB
DC supply voltage (note 1)	$+V_B$	=	24	24	V
Total DC current consumption	I_{tot}	max.	200	240	mA
Operating case temperature range	T_{case}		−20 to +100	−20 to +100	°C

MECHANICAL DATA

SOT115 (see Fig. 1).

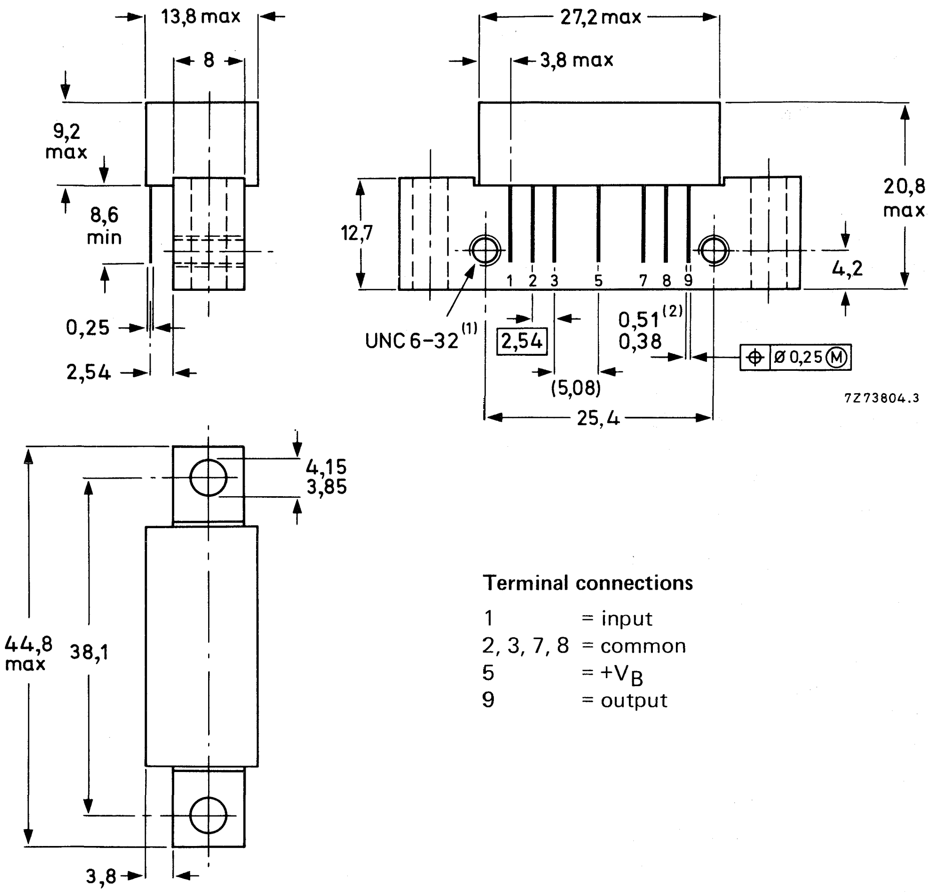
Note

1. The modules normally operate at V_B = +24 V DC, but are able to withstand supply transients up to 30 V.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT115.



Terminal connections

1	= input
2, 3, 7, 8	= common
5	= $+V_B$
9	= output

(1) Screw 6-32 UNC-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).

RF input voltage	V_i	max.	60 dBmV
Storage temperature range	T_{stg}		−40 to +100 °C
Operating case temperature range	T_{case}		−20 to +100 °C

CHARACTERISTICS

			BGY80	BGY81	
Power gain					
f = 50 MHz	G_p		12.0 to 13.0	12.0 to 13.0	dB
f = 450 MHz	G_p		12.5 to 14	12.5 to 14	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.	± 0.2	± 0.2	dB
Return losses at input and output					
$Z_S = Z_L = 75\ \Omega$;					
f = 40 MHz to 80 MHz	$S_{11\text{-}22}$	min.	20	20	dB
f = 80 MHz to 160 MHz		min.	19	19	dB
f = 160 MHz to 450 MHz		min.	18	18	dB
Second order distortion					
V_p = 46 dBmV; f_p = 55.25 MHz					
V_q = 46 dBmV; f_q = 391.25 MHz					
Measured at $f_p + f_q$ = 446.5 MHz	d_2	max.	−72	−74	dB
Composite triple beat at 60 channels flat; V_O = 46 dBmV					
Measured in channel H22	CTB	max.	−54	−58	dB
Cross-modulation distortion on 60 channels flat; V_O = 46 dBmV					
Measured at channel 2	X_{mod}	max.	−59	−62	dB
Composite second order distortion on 60 channels flat; V_O = 46 dBmV					
Measured at channel H22 on 446.5 MHz	CSO	max.	−58	−61	dB
Output voltage at d_{im} = −60					
$V_p = V_O$; 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 $f_p + f_q - f_r$ = 438.25 MHz	V_O	min.	61.5	64	dBmV
Noise figure at f = 450 MHz	F	max.	7.5	8.0	dB
Total DC current consumption	I_{tot}	typ.	180	220	mA

Philips Components

Data sheet	
status	Product specification
date of issue	June 1990

BGY82/83

CATV amplifier modules

FEATURES

- Excellent linearity
- Extremely low noise
- Optimal reliability ensured by TiPtAu metallized crystals, silicon nitride passivation and rugged construction

DESCRIPTION

Hybrid amplifier module for CATV systems operating with a voltage supply of +24 V DC at frequencies up to 450 MHz.

PINNING

PIN	DESCRIPTION
1	input
2, 3, 7, 8	common
5	$+V_B$
9	output

MECHANICAL DATA

SOT115.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	BGY82			BGY83			UNIT
			MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
G_p	power gain	f = 50 MHz f = 450 MHz	13.5 14.5	- -	14.5 -	13.5 14.5	- -	14.5 -	dB dB
I_{tot}	total current consumption	$+V_B$ = 24 V (DC)	-	180	200	-	220	240	mA

Note

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

LIMITING VALUES

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

SYMBOL	PARAMETER	BGY82		BGY83		UNIT
		MIN.	MAX.	MIN.	MAX.	
V_i	RF input voltage	-	60	-	60	dBmV
T_{stg}	storage temperature range	−40	+100	−40	+100	°C
T_{case}	operating case temperature range	−20	+100	−20	+100	°C

CHARACTERISTICS

Measured at T_{case} = 30 °C

SYMBOL	PARAMETER	CONDITIONS	BGY82			BGY83			UNIT
			MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
I_{tot}	total current consumption	$+V_B$ = 24 V (DC)	-	180	200	-	220	240	mA
G_p	power gain	f = 50 MHz; f = 450 MHz	13.5 14.5	- -	14.5 -	13.5 14.5	- -	14.5 -	dB dB
SL	slope cable equivalent	f = 40 to 450 MHz	0.2	-	1.5	0.2	-	1.5	dB
FL	flatness of frequency response	f = 40 to 450 MHz	-	-	± 0.2	-	-	± 0.2	dB
S_{11}/ S_{22}	input/output return losses	f = 40 to 80 MHz; f = 80 to 160 MHz; f = 160 to 450 MHz; $Z_S = Z_L$ = 75 Ω	20 19 18	- - -	- - -	20 19 18	- - -	- - -	dB dB dB
d_2	second order distortion	see note 1	-	-	−72.0	-	-	−74.0	dB
CTB	composite triple beat	66 chs flat; V_o = 46 dBmV; measured in H22 = 445.25 MHz	-	-	−55.0	-	-	−59.0	dB
X_{mod}	cross modulation	60 chs flat; V_o = 46 dBmV; measured in H22 = 445.25 MHz	-	-	−56.0	-	-	−59.0	dB
CSO	composite second order distortion	60 chs flat; V_o = 46 dBmV; measured in H22 = 445.25 MHz	-	-	−55.0	-	-	−59.0	dB
V_B	DC supply voltage	note 2	-	24	-	-	24	-	V
V_o	output voltage	d_{im} = −60 dB; note 3	61.5	-	-	64	-	-	dB/mV
F	noise figure	f = 450 MHz	-	-	7.0	-	-	8.0	dB

Note

1. f_p = 55.25 MHz; V_p = 46 dBmV;
   f_q = 391.25 MHz; V_p = 46 dBmV;
   Measured: $f_p + f_q$ = 446.5 MHz.

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

3. Measured according to DIN 45004B;
   f_p = 440.25 MHz; $V_p = V_o$;
   f_q = 447.25 MHz; fq = V_o −6 dB;
   f_r = 449.25 MHz; $V_r = V_o$ −6 dB;
   measured at $f_p + f_q$ - fr = 438.25 MHz.

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 ± 0,5	17,0 ± 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 f = 450 MHz	$S_{11\text{-}22}$	 min. min.	 20 18	 20 18	 dB 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

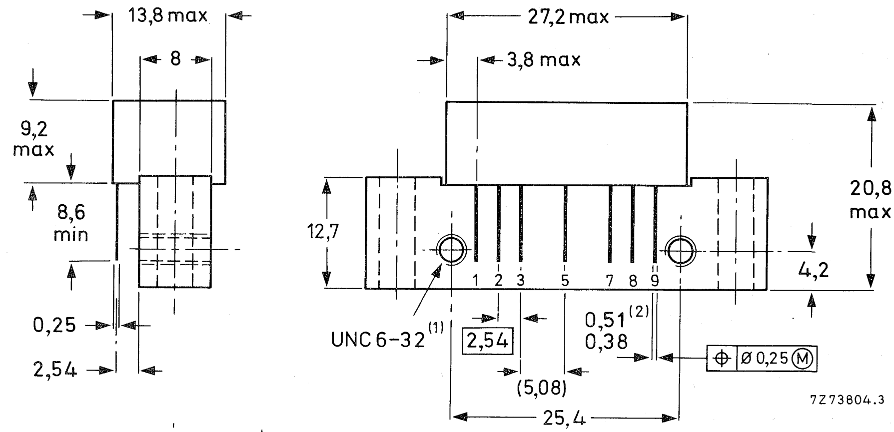
SOT-115 (see Fig. 1).

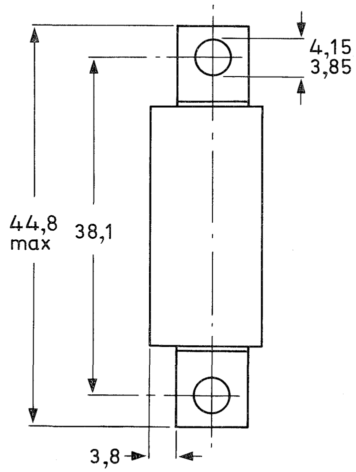
* The modules normally operate at V_B = 24 V, but are able to withstand supply transients up to 30 V.

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 f = 450 MHz	G_p		 17,0 ± 0,5 17,3 to 18,8	 17,0 ± 0,5 17,3 to 18,8	 dB 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 f = 80 to 160 MHz f = 160 to 450 MHz	$S_{11\text{-}22}$	 min. min. min.	 20 19 18	 20 19 18	 dB dB 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.	−70	−70	dB
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 Measured at channel 2	X_{mod}	max.	−57	−60	dB
Noise figure f = 40 MHz to 450 MHz	F	max.	6,5	7,0	dB
Total d.c. current consumption	I_{tot}	typ. max.	180 200	220 240	mA 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 ± 0,4	18,4 ± 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.	± 0,2	± 0,2	dB
Return losses at input and output f = 40 MHz	$S_{11\text{-}22}$	min.	20	20	dB
f = 450 MHz	$S_{11\text{-}22}$	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

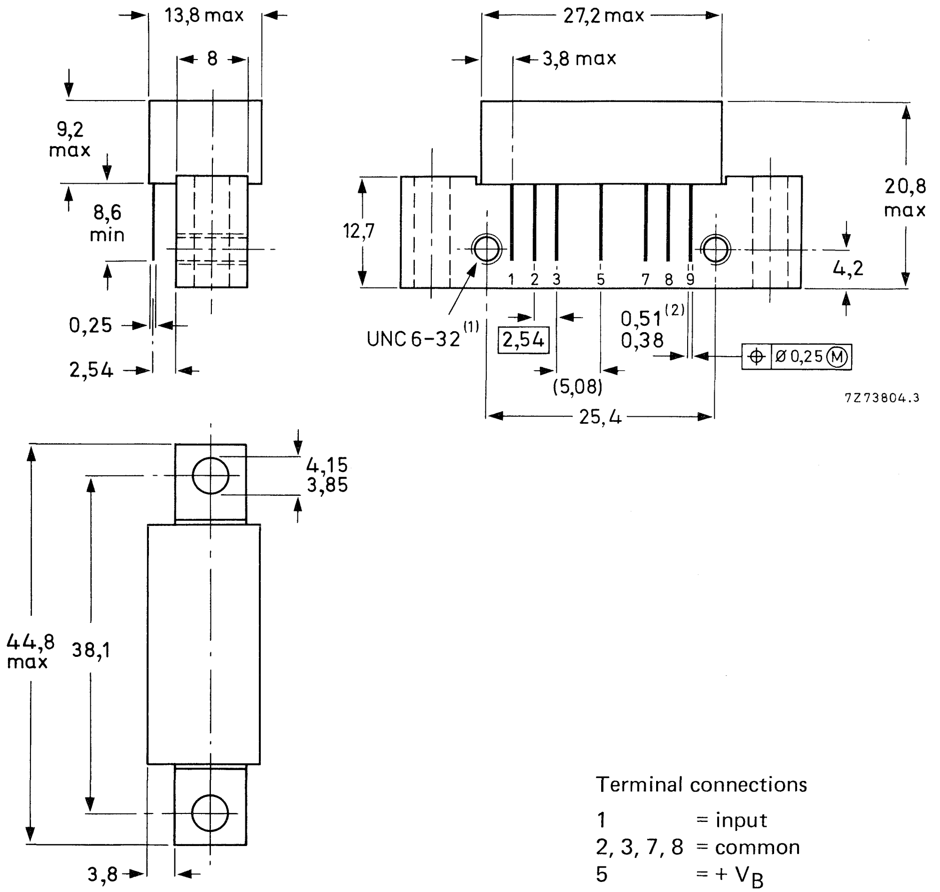
SOT-115 (see Fig. 1).

* 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		min.	20	20 dB
f = 80 to 160 MHz	$S_{11\text{-}22}$	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	220 mA
		max.	200	240 mA

CATV AMPLIFIER MODULES

High slope pre-emphasis hybrid amplifier for use in CATV systems.

BGY84H: 20.5 dB trunk amplifier.
BGY85H: 20.5 dB trunk amplifier with improved performance.

FEATURES

- Excellent linearity
- High slope of 5.1 dB so that total cable slope can be equalised by the slope of the module.
- Optimal reliability ensured by application of TiPtAu metallized crystals, silicon nitride glass barrier and a rugged construction.

QUICK REFERENCE DATA

			BGY84H	BGY85H	
Frequency range	f		50 to 450	50 to 450	MHz
Source and load impedance	$Z_S = Z_L$		75	75	Ω
Power gain					
f = 50 MHz (note 1)	G_p		14.6 to 16.2	14.6 to 16.2	dB
f = 450 MHz			20.0 to 21.0	20.0 to 21.0	dB
Delta gain	Δ_{gain}		4.7 to 5.5	4.7 to 5.5	dB
Flatness of frequency response					
f = 40 MHz to 450 MHz	FL	max.	0.2	0.2	dB
Return losses at input and output	$S_{11\text{-}22}$	min.	18	18	dB
Intermodulation distortion	d_{im}		−60	−60	dB
Second order distortion	d_2	max.	−72	−72	dB
Composite triple beat	CTB		−63	−65	dB
Cross-modulation distortion	x_{mod}		−63	−65	dB
Noise figure	F	max.	7.0	7.0	dB
DC supply voltage (note 2)	$+V_B$		24	24	V
Total DC current consumption	I_{tot}		220	220	mA
Operating case temperature	T_{case}	max.	100	100	°C

MECHANICAL DATA

SOT115 (see Fig. 1).

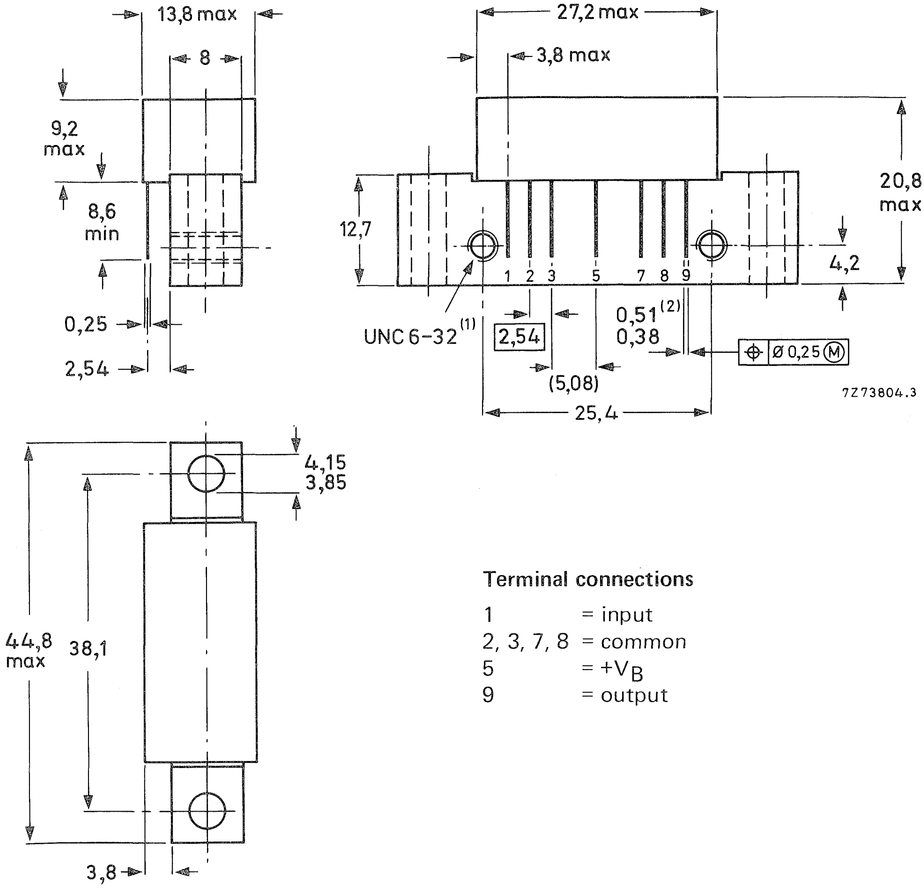
Note

1. Gain at 50 MHz with respect to the limits of gain at 450 MHz and delta gain.
2. The module normally operate at V_B = +24 V DC, but are able to withstand supply transients up to 30 V.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT115.



Terminal connections

1	= input
2, 3, 7, 8	= common
5	= $+V_B$
9	= output

(1) Screw 6-32 UNC-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).

RF input voltage	V_i	max.	65	dBmV
Storage temperature range	T_{stg}		−40 to +100	°C
Operating case temperature range	T_{case}		−20 to +100	°C

CHARACTERISTICS

Supply voltage V_B = +24 V DC; T_{case} = 30 °C; $Z_S = Z_L$ = 75 Ω.

			BGY84H	BGY85H	
Power gain					
f = 50 MHz	G_p		14.6 to 16.2	14.6 to 16.2	dB
f = 450 MHz			20.0 to 21.0	20.0 to 21.0	dB
Delta gain					
f = 50 MHz to 450 MHz (note 1)	Δ_{gain}		4.7 to 5.5	4.7 to 5.5	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 Ω;					
f = 40 MHz to 80 MHz	$S_{11\text{-}22}$	min.	20	20	dB
f = 80 MHz to 160 MHz		min.	19	19	dB
f = 160 MHz 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 = 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 $f_p + f_q - f_r$ = 285.25 MHz	V_O	min.	64.0	65.0	dBmV
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 $f_p + f_q - f_r$ = 385.25 MHz	V_O	min.	63.0	64.0	dBmV

Note

1. Flatness calculation is based upon the following formula which describes the 'ideal' gain versus frequency curve:

$$G_f = G_{50} + \Delta G\,(a \cdot (f\text{-}50) + b \cdot (f\text{-}50)^2 + c \cdot (f\text{-}50)^3)$$

in which: G_{50} = measured gain at 50 MHz;
ΔG = measured difference in gain between 450 and 50 MHz;
a = 3.132×10^{-3}
b = 1.993×10^{-6}
c = -8.934×10^{-9}.

CHARACTERISTICS (continued)

			BGY84H	BGY85H	
Output voltage at d_{im} = −60 dB (DIN 45005B, 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 $f_p + f_q - f_r$ = 438.25 MHz	V_O	min.	−61.5	−62.5	dBmV
Second order distortion V_p = 46 dBmV; f_p = 55.25 MHz V_q = 46 dBmV; f_q = 343.25 MHz Measured at $f_p + f_q$ = 398.5 MHz	d_2	max.	−72	−72	dB
Composite triple beat on 36 channels flat V_O = 46 dBmV Measured in channel H20 (433.25 MHz)	CTB	max.	−63	−65	dB
Cross-modulation distortion V_O = 46 dBmV; on 36 channels flat measured in channel 2 (55.25 MHz)	X_{mod}	max.	−63	−65	dB
Noise figure at f = 450 MHz	F	max.	7.0	7.0	dB
Total DC current consumption V_B = +24 V DC	I_{tot}	typ.	220	220	mA
		max.	240	240	mA

Philips Components

Data sheet	
status	Product specification
date of issue	October 1990

BGY85H/01
CATV amplifier module

FEATURES

- Excellent linearity
- High slope of 5.1 dB so that total cable slope can be equalised by the slope of the module.
- Optimal reliability ensured by TiPtAu metallized crystals, silicon nitride passivation and rugged construction

DESCRIPTION

High slope pre-emphasis hybrid amplifier for use as a 20.7 dB trunk amplifier in CATV systems, operating over a frequency range of 40 to 450 MHz at a voltage supply of +24 V (see note).

PINNING

PIN	DESCRIPTION
1	input
2	common
3	common
5	+ V_B
7	common
8	common
9	output

MECHANICAL DATA

SOT115.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
G_p	power gain	f = 50 MHz	14.8	16.4	dB
		f = 450 MHz	20.2	21.2	dB
I_{tot}	total DC current consumption	V_B = +24 V (DC)	-	230	mA

Note

The module normally operates at a supply voltage of +24 V, but is able to withstand supply transients up to +30 V.

LIMITING VALUES

In accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	MIN.	MAX.	UNIT
V_B	DC supply voltage	-	+28	V
V_i	RF input voltage	-	65	dBmV
T_{stg}	storage temperature range	−40	+100	°C
T_{mb}	mounting base operating temperature range	−20	+100	°C

CHARACTERISTICS

T_{case} = 30 °C; Z_S = Z_L = 75 Ω

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
G_p	power gain	f = 50 MHz	14.8	-	16.4	dB
		f = 450 MHz	20.2	-	21.2	dB
I_{tot}	total DC current consumption	V_B = +24 V (DC)	-	215	230	mA
Δ_G	delta gain	f = 40 to 450 MHz	4.7	-	5.5	dB
FL	flatness of frequency response	f = 40 to 450 MHz note 1	-	-	± 0.2	dB
S_{11}/S_{22}	input/output return losses	f = 40 to 80 MHz	20	-	-	dB
		f = 80 to 160 MHz	19	-	-	dB
		f = 160 to 450 MHz	18	-	-	dB
d_2	second order beat	note 2	-	-	−72	dB
CTB	composite triple beat	36 chs flat; V_o = 46 dBmV; measured in ch.H20 (433.25 MHz)	-	-	−65	dB
		60 chs flat; V_o = 46 dBmV; measured in ch.H22 (445.25 MHz)	-	−59	-	dB
X_{mod}	cross modulation	36 chs flat; V_o = 46 dBmV (ch.2)	-	-	−65	dB
		60 chs flat; V_o = 46 dBmV (ch.2) (55.25 Hz)	-	−61	-	dB
V_o	output voltage	d_{im} = −60 dB note 3	65	-	-	dBmV
		d_{im} = −60 dB note 4	64	-	-	dBmV
		d_{im} = −60 dB note 5	62.5	-	-	dBmV
F	noise figure	f = 450 MHz	-	-	6.8	dB

Notes

1. Flatness calculation is based upon the following formula which describes the 'ideal' gain versus frequency curve:

$$G_f = G_{50} + \Delta G\,(a \bullet (f\text{-}50) + b \bullet 0(f\text{-}50)^2 + c \bullet (f\text{-}50)^3)$$

in which: G_{50} = measured gain at 50 MHz;
ΔG = measured difference in gain between 450 and 50 MHz;
a = 3.132×10^{-3}
b = 1.993×10^{-6}
c = -8.934×10^{-9}.

2. f_p = 55.25 MHz; V_p = 44 dBmV;
f_q = 343.25 MHz; V_p = 46 dBmV;
measured at: $f_p + f_q$ = 398.5 MHz

3. measured according to DIN 45004B
   f_p = 287.25 MHz; $V_p = V_o$;
   f_q = 294.25 MHz; $V_q = V_o$ −6 dB;
   f_r = 296.25 MHz; $V_r = V_o$ −6 dB;
   measured at: $f_p + f_q - f_r$ = 285.25 MHz

4. measured according to DIN 45004B
   f_p = 387.25 MHz; $V_p = V_o$;
   f_q = 394.25 MHz; $V_q = V_o$ −6 dB;
   f_r = 396.25 MHz; $V_r = V_o$ −6 dB;
   measured at: $f_p + f_q - f_r$ = 385.25 MHz

5. f_p = 440.25 MHz; $V_p = V_o$;
   f_q = 447.25 MHz; $V_q = V_o$ −6 dB;
   f_r = 449.25 MHz; $V_r = V_o$ −6 dB;
   measured at: $f_p + f_q - f_r$ = 438.25 MHz

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 ± 0.5	22.0 ± 0.5	dB
Slope cable equivalent f = 40 MHz to 450 MHz	SL		0 to 1.5	0 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 f = 40 MHz to 450 MHz	$S_{11\text{-}22}$	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.	–54	–58	dB
Cross modulation V_o = 46 dBmV	X_{mod}	max.	–53	–55	dB
Noise figure f = 450 MHz	F	max.	6.0	6.5	dB
DC supply voltage (note 1)	$+V_B$	=	24	24	V
Total DC current consumption at V_B = + 24 V	I_{tot}	max.	200	240	mA
Operating case temperature	T_c		–20 to + 100		°C

MECHANICAL DATA

SOT-115 (see Fig. 1).

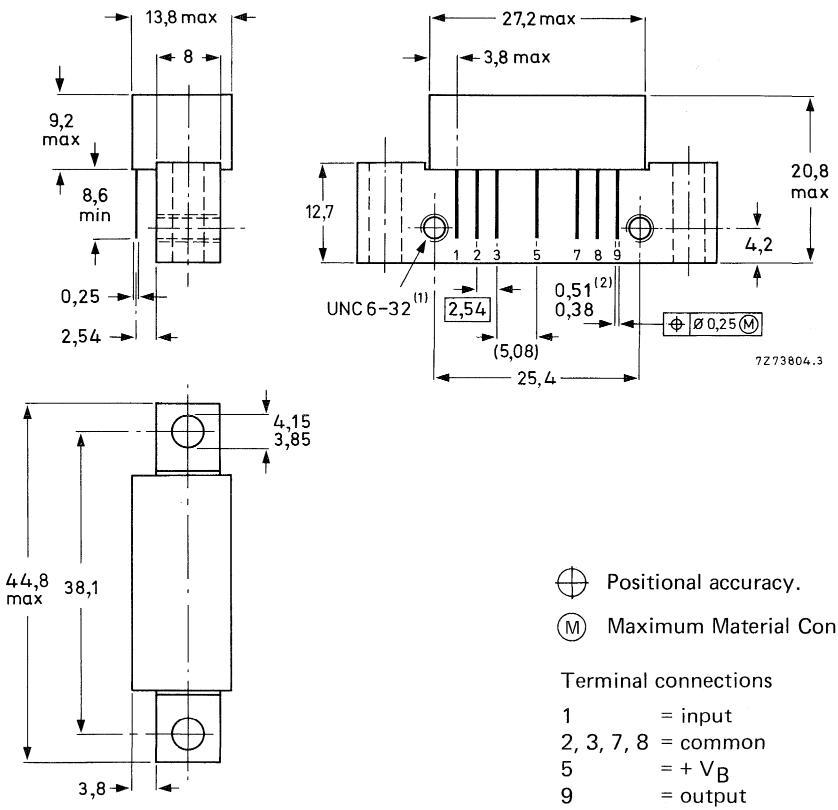
Note

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)

RF 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 Ω; T_c = 30 °C

			BGY86	BGY87	
Power gain at f = 50 MHz	G_p		22.0 ± 0.5	22.0 ± 0.5	dB
Power gain at f = 450 MHz	G_p		22.0 to 23.5	22.0 to 23.5	dB
Slope cable equivalent f = 40 MHz to 450 MHz	SL		0 to 1.5	0 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 Ω					
f = 40 MHz to 80 MHz	$S_{11\text{-}22}$	min.	20	20	dB
f = 80 MHz to 160 MHz	$S_{11\text{-}22}$	min.	19	19	dB
f = 160 MHz to 450 MHz	$S_{11\text{-}22}$	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.	61.5	64.0	dBmV
2nd-order distortion V_o = 46 dBmV; f_p = 55.25 MHz (ch. 2) V_o = 46 dBmV; f_q = 391.25 MHz (ch. H13) Tested at $f_{(p+q)}$ = 446.5 MHz (ch. H22)	d_2	max.	−68	−72	dB
Composite triple beat at 60 channels V_o = 46 dBmV; tested at channel H22	CTB	max.	−54	−58	dB
Cross modulation at 60 channels V_o = 46 dBmV; tested in channel 2	X_{mod}	max.	−53	−55	dB
Noise figure f = 450 MHz	F	max.	6.0	6.5	dB
Total DC current consumption	I_{tot}	typ.	180	220	mA
		max.	200	240	mA

Philips Components

Data sheet	
status	Product specification
date of issue	October 1990

BGY87B

CATV amplifier module

FEATURES

- Excellent linearity.
- Extremely low noise.
- Optimal reliability ensured by TiPtAu metallized crystals, silicon nitride passivation and rugged construction.

PINNING

PIN	DESCRIPTION
1	input
2	common
3	common
5	$+V_B$
7	common
8	common
9	output

MECHANICAL DATA

SOT115.

DESCRIPTION

Hybrid amplifier module for CATV systems operating over a frequency range of 40 to 450 MHz at a voltage supply of +24 V (see note).

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
G_p	power gain	f = 50 MHz	26.2	27.8	dB
I_{tot}	total DC current consumption	V_B = +24 V (DC)	-	340	mA

Note

The module normally operates at V_B = +24 V, but is able to withstand supply transients up to +30 V.

LIMITING VALUES

In accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	MIN.	MAX.	UNIT
V_B	DC supply voltage	-	+28	V
V_i	RF input voltage	-	55	dBmV
T_{stg}	storage temperature range	−40	+100	°C
T_{mb}	mounting base operating temperature range	−20	+100	°C

CHARACTERISTICS

T_{case} = 35 °C; $Z_S = Z_L$ = 75 Ω.

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
G_p	power gain	f = 50 MHz	26.2	27.8	dB
		f = 450 MHz	27.5	-	dB
I_{tot}	total DC current consumption	V_B = +24 V (DC)	-	340	mA
SL	slope cable equivalent	f = 40 to 450 MHz	0.5	2.5	dB
FL	flatness of frequency response	f = 40 to 450 MHz	-	± 0.4	dB
S_{11}/S_{22}	input/output return losses	f = 40 to 80 MHz	-	20	dB
		f = 80 to 160 MHz	-	19	dB
		f = 160 to 450 MHz	-	18	dB
d_2	second order beat	V_o = 46 dBmV see note 1	-	–70	dB
CTB	composite triple beat	60 chs flat; V_o = 46 dBmV; measured in ch.H22 (445.25 MHz)	-	–58	dB
CSO	composite second order distortion	60 chs flat; V_o = 46 dBmV; measured in ch.H22 (446.5 MHz)	-	–60	dB
X_{mod}	cross modulation	60 chs flat; V_o = 46 dBmV; measured in ch.2 (55.25 MHz)	-	–58	dB
V_o	output voltage	d_{im} = -60 dB see note 2	64	-	dBmV
F	noise figure	f = 450 MHz	-	6	dB

Notes

1. f_p = 55.25 MHz; V_p = 46 dBmV;
   f_q = 391.25 MHz; V_q = 46 dBmV;
   Measured at $f_p + f_q$ = 446.5 MHz (ch.H22)

2. Measured according to DIN45004B;
   f_p = 440.25 MHz; $V_p = V_o$;
   f_q = 447.25 MHz; $V_q = V_o$ –6 dB;
   f_r = 449.25 MHz; $V_r = V_o$ –6 dB;
   measured at: $f_p + f_q - f_r$ = 438.25 MHz.

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 f = 450 MHz	G_P		 34,5 ± 1,0 35 to 37	 dB 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 f = 40 MHz to 450 MHz	$S_{11\text{-}22}$	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	°C

MECHANICAL DATA

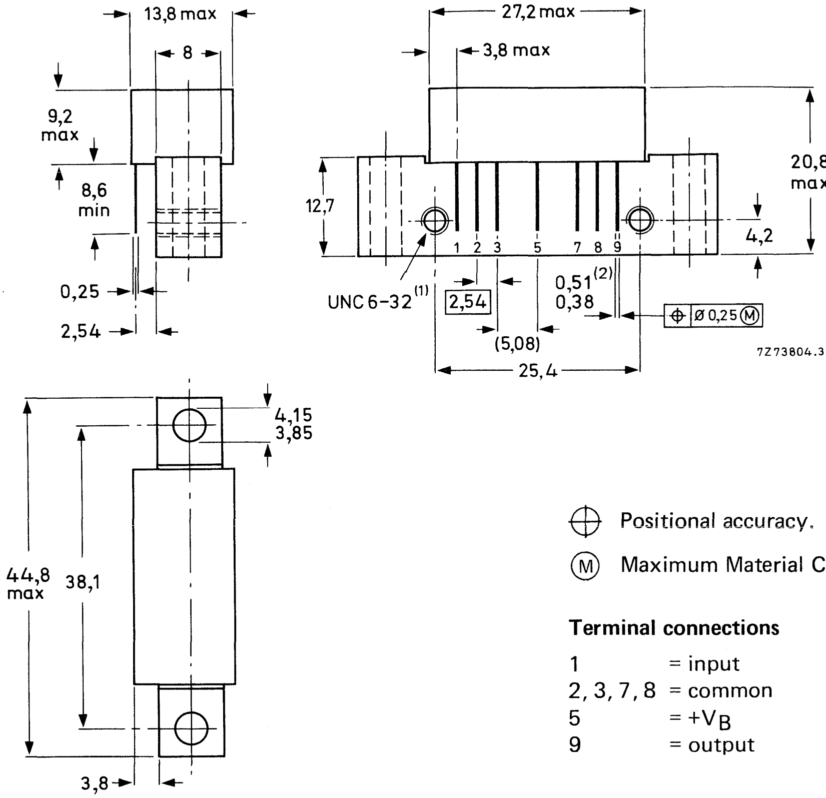
SOT-115 (see Fig. 1).

* 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

CHARACTERISTICS

Supply voltage V_B = +24 V; $Z_S = Z_L$ = 75 Ω; T_{mb} = 35 °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 Ω; f = 40 MHz to 80 MHz f = 80 MHz to 160 MHz f = 160 MHz to 450 MHz	$S_{11\text{-}22}$	min. min. min.	20 dB 19 dB 18 dB
Intermodulation distortion (DIN 45004B, par. 6.3: 3-tone) $V_p = V_o$ = 62 dBmV 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	d_{im}	max.	−60 dB
2nd-order distortion V_p = 46 dBmV; f_p = 55,25 MHz V_q = 46 dBmV; f_q = 343,25 MHz tested at $f_{(p+q)}$ = 398,50 in channel H14	d_2	max.	−70 dB
Composite triple beat 60 channels flat V_o = 46 dBmV; tested in channel H22	CTB	max.	−58 dB
Cross modulation distortion 60 channels flat V_o = 46 dBmV; tested in channel 2	X_{mod}	max.	−59 dB
Noise figure f = 450 MHz	F	max.	6 dB
Total d.c. current consumption	I_{tot}	typ. max.	320 mA 340 mA

CATV AMPLIFIER MODULES

Hybrid amplifier module for use as a 38 dB line extender in CATV systems and operating at frequencies up to 450 MHz.

FEATURES

- Excellent linearity
- Extremely low noise
- Optimal reliability ensured by application of TiPtAu metallized crystals, silicon nitride glass barrier and a rugged construction.

QUICK REFERENCE DATA

Frequency range	f		40 to 450	MHz
Source and load impedance	$Z_S = Z_L$		75	Ω
Power gain at f = 50 MHz	G_p		37 to 39	dB
Slope cable equivalent f = 40 MHz to 450 MHz	SL		0 to 2.5	dB
Flatness of frequency response f = 40 MHz to 450 MHz	FL	max.	0.4	dB
Return losses at input and output f = 40 MHz to 450 MHz	$S_{11\text{-}22}$	min.	18	dB
Output voltage at d_{im} = −60 dB (DIN 45004B, par. 6.3: 3-tone)	V_O	min.	63	dBmV
Second order distortion V_O = 46 dBmV	d_2	max.	−70	dB
Composite triple beat V_O = 46 dBmV; 60 channels	CTB	max.	−58	dB
Cross modulation distortion V_O = 46 dBmV; 60 channels	X_{mod}	max.	−58	dB
Noise figure at f = 450 MHz	F	max.	5.5	dB
DC supply voltage (note 1)	$+V_B$		24	V
Total DC current consumption	I_{tot}	typ.	320	mA
Operating case temperature range	T_{case}		−20 to 100	°C

MECHANICAL DATA

SOT115 (see Fig. 1).

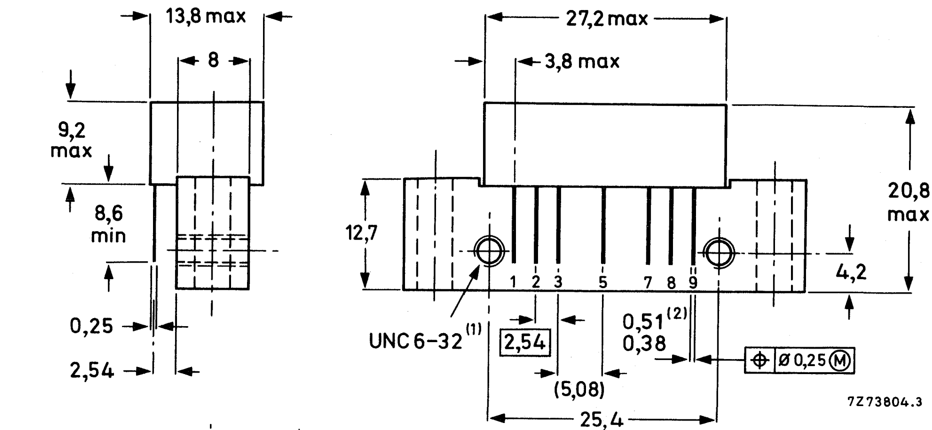
Note

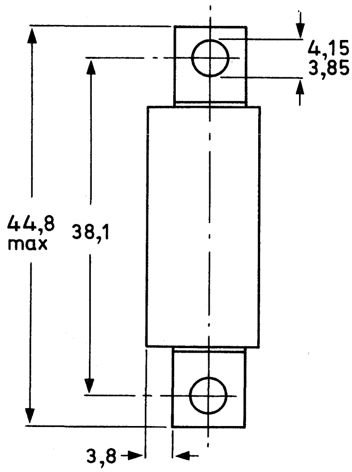
1. The module normally operates at V_B = 24 V, but is able to withstand incidental supply transients up to 30 V.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT115.





Terminal constructions

1	= input
2, 3, 7, 8	= common
5	= $+V_B$
9	= output

(1) Screw 6-32 UNC-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).

RF input voltage	V_i	max.	55	dBmV
Storage temperature range	T_{stg}		−40 to +100	°C
Operating case temperature range	T_{case}		−20 to +100	°C

CHARACTERISTICS

Supply voltage V_B = +24 V; $Z_S = Z_L$ = 75 Ω; T_{case} = 35 °C.

Power gain at f = 50 MHz	G_p		37 to 39 dB
Slope cable equivalent f = 40 MHz to 450 MHz	SL		0 tp 2.5 dB
Flatness of frequency response f = 40 MHz to 450 MHz	FL	max.	0.4 dB
Return losses at input and output $Z_S = Z_L$ = 75 Ω; f = 40 MHz to 80 MHz f = 80 MHz to 160 MHz f = 160 MHz to 450 MHz	$S_{11\text{-}22}$	min. min. min.	20 dB 19 dB 18 dB
Intermodulation distortion (DIN 45004B, par. 6.3; 3-tone) $V_p = V_O$ = 63 dBmV; 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	d_{im}	max.	−60 dB
Second order distortion V_p = 46 dBmV; f_p = 55.25 MHz V_q = 46 dBmV; f_q = 343.25 MHz tested at $f_{(p+q)}$ = 398.50 in channel H14	d_2	max.	−70 dB
Composite triple beat 60 channels flat V_O = 46 dBmV; tested in channel H22	CTB	max.	−58 dB
Cross-modulation distortion on 60 channels flat V_O = 46 dBmV; tested in channel 2	X_{mod}	max.	−58 dB
Noise figure at f = 450 MHz	F	max.	5.5 dB
Total DC current consumption	I_{tot}	typ. max.	320 mA 340 mA
Composite second order distortion 60 channels flat; V_O = 46 dBmV Measured in channel H22 at 446.5 MHz	CSO	max.	−58 dB

CATV AMPLIFIER MODULES

Hybrid amplifier modules for use in CATV systems and operating at frequencies up to 550 MHz.

BGY580: 12.5 dB pre-amplifier
BGY585: 12.5 dB final-amplifier

FEATURES

- Excellent linearity
- Extremely low noise
- Optimal reliability ensured by application of TiPtAu metallized crystals, silicon nitride glass barrier and a rugged construction.

QUICK REFERENCE DATA

			BGY580	BGY581	
Frequency range	f		40 to 550	40 to 550	MHz
Source and load impedance	$Z_S = Z_L$		75	75	Ω
Power gain at f = 50 MHz	G_p		12 to 13	12 to 13	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.	± 0.2	± 0.2	dB
Return losses at input and output	S_{11-22}	min.	18	18	dB
Second order distortion V_O = 44 dBmV	d_2	max.	−70	−72	dB
Output voltage at d_{im} = −60 dB (DIN 45004B; 6.3: 3-tone)	V_O	min.	59	61.5	dBmV
Composite triple beat V_O = 44 dBmV	CTB	max.	−52	−56	dB
Cross-modulation distortion V_O = 44 dBmV	x_{mod}	max.	−59	−62	dB
Noise figure at 550 MHz	F	max.	8.5	9.0	dB
DC supply voltage (note 1)	$+V_B$		24	24	V
Total DC current	I_{tot}	max.	220	240	mA
Operating case temperature range	T_{case}		−20 to +100	−20 to +100	°C

MECHANICAL DATA

SOT115 (see Fig. 1).

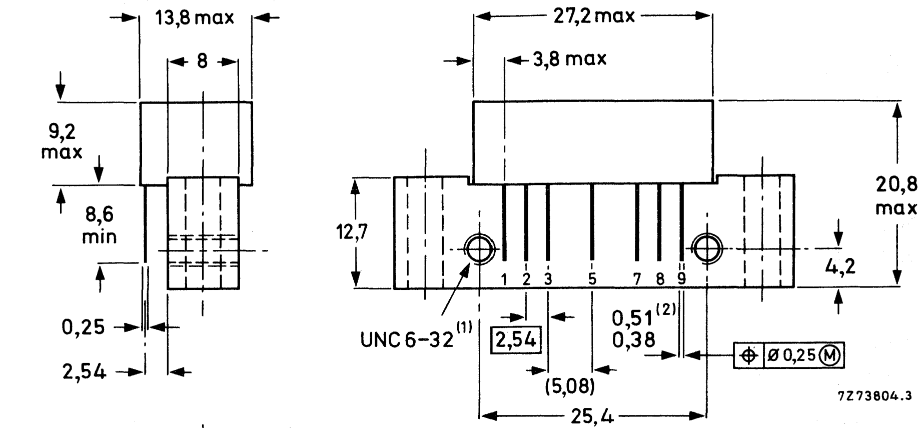
Note

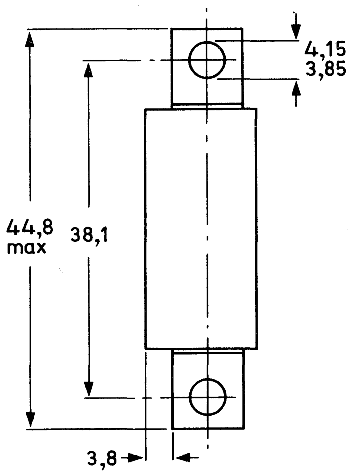
1. The modules normally operate at V_B = +24 V DC, but are able to withstand supply transients up to 30 V.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT115.





Terminal connections

1	= input
2, 3, 7, 8	= common
5	= $+V_B$
9	= output

(1) Screw 6-32 UNC-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).

RF input voltage	V_i	max.	60	dBmV
Storage temperature range	T_{stg}		−40 to +100	°C
Operating case temperature range	T_{case}		−20 to +100	°C

CHARACTERISTICS

V_B = +24 V DC; T_{case} = 30 °C.

			BGY580	BGY581	
Power gain					
f = 50 MHz	G_p		12.0 to 13.0	12.0 to 13.0	dB
f = 550 MHz	G_p		12.5 to 14.5	12.5 to 14.5	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 450 MHz	FL	max.	± 0.2	± 0.2	dB
Return losses at input and output $Z_S = Z_L$ = 75 Ω;					
f = 40 MHz to 80 MHz	$S_{11\text{-}22}$	min.	20	20	dB
f = 80 MHz to 160 MHz		min.	19	19	dB
f = 160 MHz to 550 MHz		min.	18	18	dB
Second order distortion V_p = 44 dBmV; f_p = 55.25 MHz; V_q = 44 dBmV; f_q = 493.25 MHz; Measured on $f_p + f_q$ = 548.5 MHz	d_2	max.	−70	−72	dB
Composite triple beat on 77 channels flat V_O = 44 dBmV Measured in channel 27	CTB	max.	−52	−56	dB
Cross-modulation distortion on 77 channels flat; V_O = 44 dBmV Measured in channel 2	X_{mod}	max.	−59	−62	dB
Composite second order distortion on 77 channels flat; V_O = 44 dBmV Measured in channel 27 on 548.5 MHz	CSO	max.	−56	−59	dB
Output voltage at d_{im} = −60 dB (DIN 4500B, 6.3: 3-tone) $V_p = V_O$; f_p = 540.25 MHz; $V_q = V_p$ − 6 dB; f_q = 547.25 MHz; $V_r = V_p$ − 6 dB; f_r = 549.25 MHz; Measured at $f_p + f_q - f_r$ = 538.25 MHz	V_O	min.	59	61.5	dBmV
Noise figure at f = 550 MHz	F	max.	8.5	9.0	dB
Total DC current consumption					
V_B = +24 V DC	I_{tot}	typ.	180	220	mA
		max.	220	240	mA

Data sheet	
status	Product specification
date of issue	July 1990

BGY582/583
CATV amplifier modules

FEATURES

- Excellent linearity
- Extremely low noise
- Optimal reliability ensured by TiPtAu metallized crystals, silicon nitride passivation and rugged construction

DESCRIPTION

Hybrid amplifier module for CATV systems operating with a voltage supply of +24 V (DC) at frequencies up to 550 MHz.

MECHANICAL DATA

SOT115.

PINNING

PIN	DESCRIPTION
1	input
2, 3, 7, 8	common
5	$+V_B$
9	output

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	BGY582			BGY583			UNIT
			MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
G_p	power gain	f = 50 MHz f = 550 MHz	13.5 14.5	- -	14.5 -	13.5 14.5	- -	14.5 -	dB dB
I_{tot}	total current consumption	$+V_B$ = 24 V (DC)	-	180	200	-	220	240	mA

Note

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

LIMITING VALUES

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

SYMBOL	PARAMETER	BGY582		BGY583		UNIT
		MIN.	MAX.	MIN.	MAX.	
V_i	RF input voltage	-	60	-	60	dBmV
T_{stg}	storage temperature range	−40	+100	−40	+100	°C
T_{mb}	mounting base operating temperature range	−20	+100	−20	+100	°C

CHARACTERISTICS

Measured at T_{case} = 30 °C

SYMBOL	PARAMETER	CONDITIONS	BGY582			BGY583			UNIT
			MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
I_{tot}	total current consumption	$+V_B$ = 24 V DC	-	180	200	-	220	240	mA
G_p	power gain	f = 50 MHz	13.5	-	14.5	13.5	-	14.5	dB
		f = 550 MHz	14.5	-	-	14.5	-	-	dB
SL	slope cable equivalent	f = 40 to 550 MHz	0.2	-	1.5	0.2	-	1.5	dB
FL	flatness of frequency response	f = 40 to 550 MHz	-	-	±0.2	-	-	±0.2	dB
S_{11}/S_{22}	input/output return losses	f = 40 to 80 MHz f = 80 to 160 MHz f = 160 to 550 MHz $Z_S = Z_L$ = 75 Ω	20 19 18	- - -	- - -	20 19 18	- - -	- - -	dB dB dB
d_2	second order beat	see note 1	-	-	−70	-	-	−72	dB
CTB	composite triple beat	77 chs flat; V_o = 44 dBmV; measured in ch.27 (547.25 MHz)	-	-	−55	-	-	−59	dB
X_{mod}	cross modulation	77 chs flat; V_o = 44 dBmV; measured in ch.2 (55.25 MHz)	-	-	−58	-	-	−61	dB
CSO	composite second order distortion	77 chs flat; V_o = 44 dBmV; measured in ch.27 (547.25 MHz)	-	-	−55	-	-	−59	dB
V_B	DC supply voltage	see note 2	-	24	-	-	24	-	V
T_{mb}	mounting base operating temperature range		−20	-	+100	−20	-	+100	°C
V_o	output voltage	d_{im} = −60 dB see note 3	61.5	-	-	64	-	-	dB(mV)
F	noise figure	f = 550 MHz	-	-	7.5	-	-	8.5	dB

Note

1. f_p = 55.25 MHz; V_p = 44 dB(mV);
   f_q = 493.25 MHz; V_p = 44 dB(mV);
   Measured: $f_p + f_q$ = 548.5 MHz; ch.27

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

3. Measured according to DIN 45004B;
   f_p = 440.25 MHz; $V_p = V_o$;
   f_q = 447.25 MHz; $V_q = V_o$ −6 dB;
   f_r = 449.25 MHz; $V_r = V_o$ −6 dB;
   measured at $f_p + f_q - f_r$ = 438.25 MHz.

CATV AMPLIFIER MODULES

Hybrid amplifier modules for use in CATV systems and operating at frequencies up to 550 MHz.
BGY584: 17.0 dB pre-amplifier
BGY585: 17.0 final-amplifier.

FEATURES

- Excellent linearity
- Extremely low noise
- Optimal reliability ensured by application of TiPtAu metallized crystals, silicon nitride glass barrier and a rugged construction.

QUICK REFERENCE DATA

			BGY584	BGY585	
Frequency range	f		40 to 550	40 to 550	MHz
Source and load impedance	$Z_S = Z_L$		75	75	Ω
Power gain at f = 50 MHz	G_p		16.5 to 17.5	16.5 to 17.5	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.	± 0.2	± 0.2	dB
Return losses at input and output	$S_{11\text{-}22}$		20	20	dB
Second order distortion	d_2	max.	−68	−70	dB
Output voltage at d_{im} = −60 dB	V_O	min.	58.5	61	dBmV
Composite triple beat	CTB	max.	−56	−59	dB
Cross-modulation distortion	X_{mod}	max.	−59	−62	dB
Composite second order	CSO	max.	−56	−59	dB
Noise figure at 550 MHz	F	max.	7.0	8.0	dB
DC supply voltage (note 1)	$+V_B$		24	24	V
Total DC current	I_{tot}	max.	200	240	mA
Operating case temperature range	T_{case}		−20 to +100	−20 to +100	°C

MECHANICAL DATA

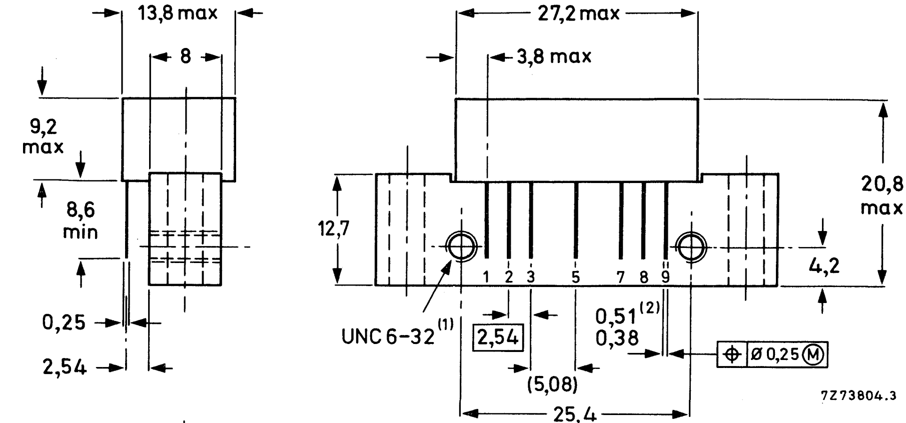
SOT115 (see Fig. 1).

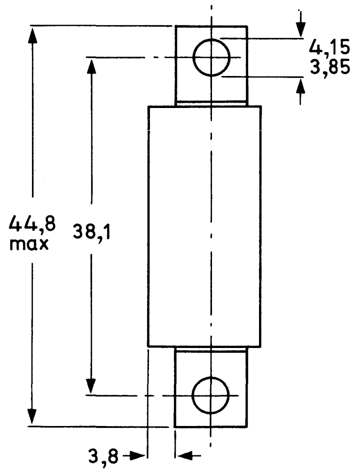
Note

1. The module normally operate at V_B = +24 V DC, but are able to withstand supply transients up to 30 V.

MECHANICAL DATA

Fig. 1 SOT115.





Terminal connections

1	= input
2, 3, 7, 8	= common
5	= $+V_B$
9	= output

(1) Screw 6-32 UNC-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).

RF input voltage	V_I	max.	60	dBmV
Storage temperature range	T_{stg}		−40 to +100	°C
Operating case temperature range	T_{case}		−20 to +100	°C

CHARACTERISTICS

V_B = +24 V DC; T_{case} = 30 °C; Bandwidth = 40 MHz to 550 MHz.

			BGY584	BGY585	
Power gain f = 50 MHz	G_p		16.5 to 17.5	16.5 to 17.5	dB
f = 550 MHz	G_p		17.6 to 19.0	17.6 to 19.0	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.	± 0.2	± 0.2	dB
Return losses at input and output $Z_S = Z_L$ = 75 Ω; f = 40 MHz to 550 MHz	$S_{11\text{-}22}$		20	20	dB
Second order distortion V_p = 44 dBmV; f_p = 55.25 MHz V_q = 44 dBmV; f_q = 493.25 MHz Measured on $f_p + f_q$ = 548.5 MHz	d_2	max.	−68	−70	dB
Output voltage at d_{im} = −60 dB (DIN 45004B, par. 6.3: 3-tone) $V_p = V_O$; f_p = 540.25 MHz; $V_q = V_p$ − 6 dB; f_q = 547.25 MHz; $V_r = V_p$ − 6 dB; f_r = 549.25 MHz; Measured at $f_p + f_q - f_r$ = 538.25 MHz	V_O	min.	58.5	61	dBmV
Composite triple beat 77 channels flat; V_O = 44 dBmV Measured in channel 27 (547.25 MHz)	CTB	max.	−56	−59	dB
Cross-modulation distortion 77 channels flat V_O = 44 dBmV Measured in channel 2 (55.25 MHz)	X_{mod}	max.	−59	−62	dB
Composite second order distortion on 77 channels flat; V_O = 44 dBmV Measured in channel 27 on 548.5 MHz	CSO	max.	−56	−59	dB
Noise figure at f = 550 MHz	F	max.	7.0	8.0	dB
Total DC current consumption V_B = +24 V DC	I_{tot}	typ.	180	220	mA
		max.	200	240	mA

CHARACTERISTICS

V_B = +24 V DC; T_{case} = 30 °C; bandwidth = 40 MHz to 450 MHz.

			BGY584	BGY585	
Power gain					
f = 50 MHz	G_p		16.5 to 17.5	16.5 to 17.5	dB
f = 450 MHz	G_p		17.4 to 18.8	17.4 to 18.8	dB
Slope cable equivalent					
f = 40 MHz to 450 MHz	SL		0.5 to 1.8	0.5 to 1.8	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 Ω;					
f = 40 MHz to 80 MHz	$S_{11\text{-}22}$	min.	20	20	dB
f = 80 MHz to 160 MHz		min.	19	19	dB
f = 160 MHz to 450 MHz		min.	18	18	dB
Second order distortion					
V_p = 46 dBmV; f_p = 55.25 MHz					
V_q = 46 dBmV; f_q = 391.25 MHz					
Measured on $f_p + f_q$ = 446.5 MHz	d_2	max.	−73	−75	dB
Composite triple beat					
60 channels flat; V_O = 46 dBmV					
Measured at channel H22 (445.25 MHz)	CTB	max.	−58	−61	dB
Cross-modulation distortion					
60 channels flat; V_O = 46 dBmV					
Measured at channel 2 (55.25 MHz)	x_{mod}	max.	−58	−61	dB
Composite second order distortion					
60 channels flat; V_O = 46 dBmV					
Measured in channel H22 at 446.5 MHz	CSO	max.	−58	−61	dB
Output voltage at d_{im} = −60 dB					
(DIN 45004B, par. 6: 3-tone)					
f_p = 440.25 MHz; $V_p = V_O$;					
f_q = 447.25 MHz; $V_q = V_p$ − 6 dB;					
f_r = 449.25 MHz; $V_r = V_p$ − 6 dB;					
Measured at					
$f_p + f_q - f_r$ = 438.25 MHz	V_O	min.	61.5	64	dBmV
Noise figure at f = 450 MHz	F	max.	6.0	7.0	dB
Total DC current consumption					
V_B = +24 V DC	I_{tot}	typ.	180	220	mA
		max.	200	240	mA

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 ± 0.5	18.2 ± 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 reponse f = 40 MHz to 550 MHz	FL	max.	± 0.2	± 0.2	dB
Return losses at input and output f = 40 MHz to 550 MHz	$S_{11\text{-}22}$	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.	–55	–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
DC supply voltage (note 1)	+ V_B	=	24	24	V
Total DC current consumption at V_B = + 24 V	I_{tot}	max.	200	240	mA
Operating case temperature	T_c		–20 to + 100		°C

MECHANICAL DATA

SOT-115 (see Fig. 1).

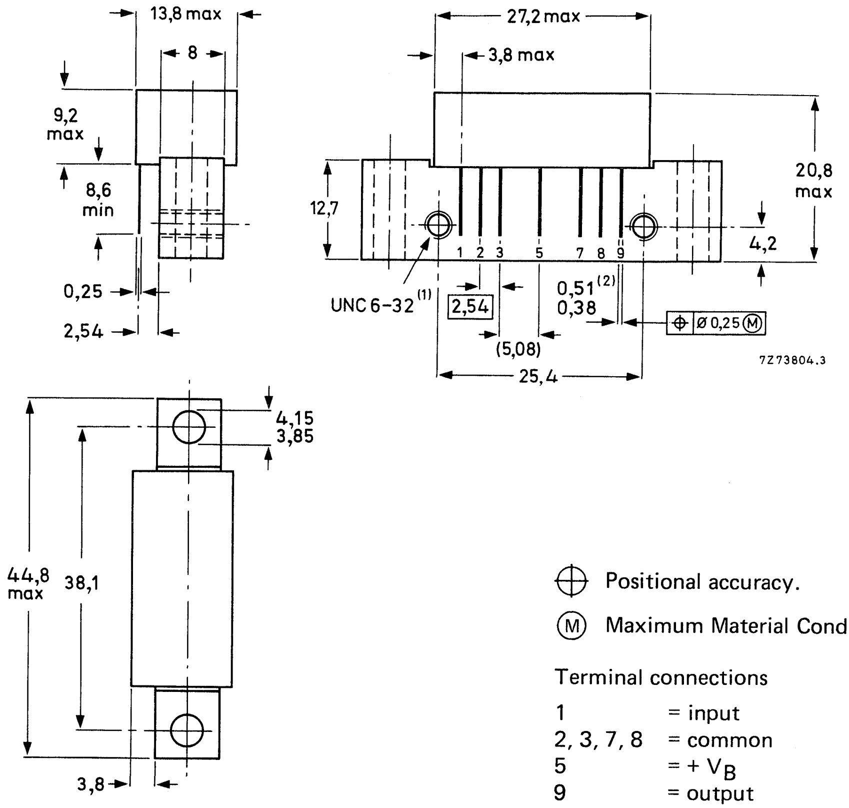
Note

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".

CHARACTERISTICS (continued)

Supply voltage V_B = + 24 V; $Z_S = Z_L$ = 75 Ω; T_c = 30 °C; bandwidth = 550 MHz.

			BGY584A	BGY585A	
Power gain at f = 50 MHz	G_p		18.2 ± 0.5	18.2 ± 0.5	dB
Power gain at f = 550 MHz	G_p		18.8 to 20.0	18.8 to 20.0	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.	± 0.2	± 0.2	dB
Return losses at input and output $Z_S = Z_L$ = 75 Ω					
f = 40 MHz to 80 MHz		min.	20	20	dB
f = 80 MHz to 160 MHz	$S_{11\text{-}22}$	min.	19	19	dB
f = 160 MHz to 550 MHz		min.	18	18	dB
Output voltage at d_{im} = –60 dB (DIN 45004B, 6.3: 3-tone) $V_p = V_o$; f_p = 540.25 MHz $V_q = V_o$ –6 dB; f_q = 547.25 MHz $V_r = V_o$ –6 dB; f_r = 549.25 MHz Measured at $f_{(p+q-r)}$ = 538.25 MHz	V_o	min.	59.0	61.5	dBmV
2nd-order distortion V_o = 44 dBmV; f_p = 55.25 MHz (ch. 2) V_o = 44 dBmV; f_q = 493.25 MHz (ch. 18) Tested at $f_{(p+q)}$ = 548.5 MHz (ch. 27)	d_2	max.	–70	–72	dB
Composite triple beat at 77 channels V_o = 44 dBmV; tested at channel 27 (547.25 MHz)	CTB	max.	–56	–59	dB
Cross modulation at 77 channels V_o = 44 dBmV; tested in channel 2 (55.25 MHz)	X_{mod}	max.	–59	–62	dB
Noise figure f = 550 MHz	F	max.	7.0	8.0	dB
Total DC current consumption	I_{tot}	typ.	180	220	mA
		max.	200	240	mA

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

V_B = +24 V DC; T_{case} = 30 °C; $Z_S = Z_L$ = 75 Ω; bandwidth = 450 MHz.

			BGY584A	BGY585A	
Power gain					
f = 50 MHz	G_p		17.7 to 18.7	17.7 to 18.7	dB
f = 450 MHz			18.6 to 19.8	18.6 to 19.8	dB
Slope cable equivalent					
f = 40 MHz to 450 MHz	SL		0.5 to 1.8	0.5 to 1.8	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 Ω;					
f = 40 MHz to 80 MHz	$S_{11\text{-}22}$	min.	20	20	dB
f = 80 MHz to 160 MHz		min.	19	19	dB
f = 160 MHz to 450 MHz		min.	18	18	dB
Second order distortion					
V_P = 46 dBmV; f_p = 55.25 MHz					
V_q = 46 dBmV; f_q = 391.25 MHz					
Measured on $f_p + f_q$ = 446.5 MHz	d_2	max.	−73	−75	dB
Composite triple beat					
60 channels flat; V_O = 46 dBmV					
Measured at channel H22 (445.25 MHz)	CTB	max.	−57	−61	dB
Cross-modulation distortion					
60 channels flat; V_O = 46 dBmV					
Measured at channel 2 (55.25 MHz)	X_{mod}	max.	−58	−61	dB
Composite second order distortion					
60 channels flat; V_O = 46 dBmV					
Measured in channel H22 at 446.5 MHz	CSO	max.	−58	−61	dB
Output voltage at d_{im} = −60 dB					
(DIN 45004B, par. 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					
$f_p + f_q - f_r$ = 438.25 MHz	V_O	min.	61.5	64	dBmV
Noise figure at f = 450 MHz	F	max.	6.0	7.0	dB
Total DC current consumption					
V_B = +24 V DC	I_{tot}	typ.	180	220	mA
		max.	200	240	mA

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 ± 0.5	22.0 ± 0.5	dB
Slope cable equivalent f = 40 MHz to 550 MHz	SL		0.2 to 1.5	0.2 to 1.5	dB
Flatness of frequency response f = 40 MHz to 550 MHz	FL	max.	± 0.2	± 0.2	dB
Return losses at input and output f = 40 MHz to 550 MHz	$S_{11\text{-}22}$	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
DC supply voltage (note 1)	$+V_B$	=	24	24	V
Total DC current consumption at V_B = + 24 V	I_{tot}	max.	200	240	mA
Operating case temperature	T_c		−20 to + 100		°C

MECHANICAL DATA

SOT-115 (see Fig. 1).

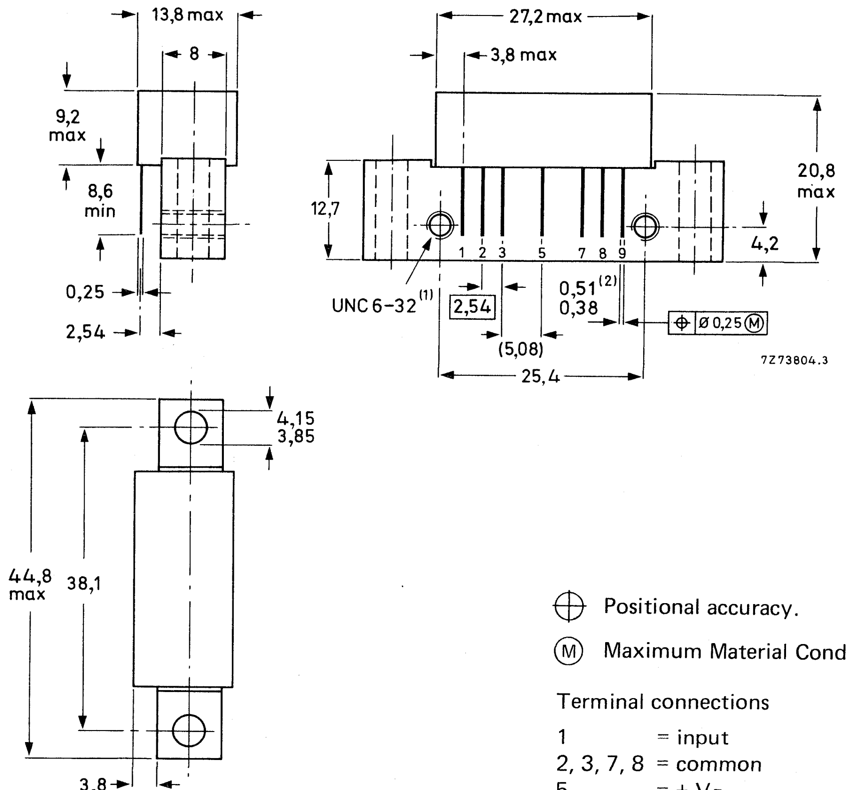
Note

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)

RF 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 Ω; T_c = 30 °C

			BGY586	BGY587	
Power gain at f = 50 MHz	G_p		22.0 ± 0.5	22.0 ± 0.5	dB
Power gain at f = 550 MHz	G_p	min.	22.0	22.0	dB
Slope cable equivalent f = 40 MHz to 550 MHz	SL		0.2 to 1.5	0.2 to 1.5	dB
Flatness of frequency response f = 40 MHz to 550 MHz	FL	max.	± 0.2	± 0.2	dB
Return losses at input and output $Z_S = Z_L$ = 75 Ω f = 40 MHz to 80 MHz f = 80 MHz to 160 MHz f = 160 MHz to 550 MHz	$S_{11\text{-}22}$	 min. min. min.	 20 19 18	 20 19 18	 dB dB dB
Output voltage at d_{im} = −60 dB (DIN 45004B, 6.3: 3-tone) $V_p = V_o$; f_p = 540.25 MHz $V_q = V_o$ −6 dB; f_q = 547.25 MHz $V_r = V_o$ −6 dB; f_r = 549.25 MHz Measured at $f_{(p+q-r)}$ = 538.25 MHz	V_o	min.	58.5	61.0	dBmV
2nd-order distortion V_o = 44 dBmV; f_p = 55.25 MHz (ch. 2) V_o = 44 dBmV; f_q = 493.25 MHz (ch. 18) Tested at $f_{(p+q)}$ = 548.5 MHz (ch. 27)	d_2	max.	−62	−66	dB
Composite triple beat at 77 channels V_o = 44 dBmV; tested at channel 27	CTB	max.	−53	−57	dB
Cross modulation at 77 channels V_o = 44 dBmV; tested in channel 2	X_{mod}	max.	−55	−59	dB
Noise figure f = 550 MHz	F	max.	6.5	7.0	dB
Total DC current consumption	I_{tot}	typ. max.	180 200	220 240	mA mA

Philips Components

Data sheet	
status	Product specification
date of issue	July 1990

BGY587B
CATV amplifier module

FEATURES

- Excellent linearity.
- Extremely low noise.
- Optimal reliability ensured by TiPtAu metallized crystals, silicon nitride passivation and rugged construction.

DESCRIPTION

Hybrid amplifier module for CATV systems operating over a frequency range of 40 to 550 MHz at a voltage supply of +24 V (see note).

PINNING

PIN	DESCRIPTION
1	input
2	common
3	common
5	$+V_B$
7	common
8	common
9	output

MECHANICAL DATA

SOT115.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
G_p	power gain	f = 50 MHz	26.2	27.8	dB
I_{tot}	total DC current consumption	V_B = +24 V (DC)	-	340	mA

Note

The module normally operates at V_B = +24 V, but is able to withstand supply transients up to +30 V.

LIMITING VALUES

In accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	MIN.	MAX.	UNIT
V_B	DC supply voltage	-	+28	V
V_i	RF input voltage	-	55	dBmV
T_{stg}	storage temperature range	–40	+100	°C
T_{mb}	mounting base operating temperature range	–20	+100	°C

CHARACTERISTICS

T_{case} = 35 °C; Z_S = Z_L = 75 Ω.

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
G_p	power gain	f = 50 MHz f = 550 MHz	26.2 27.5	27.8 -	dB dB
I_{tot}	total DC current consumption	V_B = +24 V (DC)	-	340	mA
SL	slope cable equivalent	f = 40 to 550 MHz	0.5	2.5	dB
FL	flatness of frequency response	f = 40 to 550 MHz	-	± 0.4	dB
S_{11}/S_{22}	input/output return losses	f = 40 to 80 MHz f = 80 to 160 MHz f = 160 to 550 MHz	- - -	20 19 18	dB dB dB
d_2	second order beat	see note 1	-	−68	dB
CTB	composite triple beat	77 chs flat; V_o = 44 dBmV; measured in ch.27 (547.25 MHz)	-	−57	dB
CSO	composite second order distortion	77 chs flat; V_o = 44 dBmV; measured in ch.27 (548.5 MHz)	-	−57	dB
X_{mod}	cross modulation	77 chs flat; V_o = 44 dBmV; measured in ch.2 (55.25 MHz)	-	−60	dB
V_o	output voltage	d_{im} = −60 dB; see note 2	61	-	dBmV
F	noise figure	f = 550 MHz	-	6.5	dB

Note

1. f_p = 55.25 MHz; V_p = 44 dBmV;
   f_q = 493.25 MHz; V_q = 44 dBmV;
   Measured at $f_p + f_q$ = 548.5 MHz (ch.27)

2. Measured according to DIN45004B;
   f_p = 540.25 MHz; $V_p = V_o$;
   f_q = 547.25 MHz; $V_q = V_o$ −6 dB;
   f_r = 549.25 MHz; $V_r = V_o$ −6 dB;
   measured at: $f_p + f_q - f_r$ = 538.25 MHz;

CATV AMPLIFIER MODULES

Hybrid amplifier modules for use in CATV systems and operating at frequencies up to 550 MHz.
BGY588: 34.5 dB line-extender.

FEATURES

- Excellent linearity
- Extremely low noise
- Optimal reliability ensured by application of TiPtAu metallized crystals, silicon nitride glass barrier and a rugged construction.

QUICK REFERENCE DATA

Frequency range	f		40 to 550	MHz
Source and load impedance	$Z_S = Z_L$		75	Ω
Power gain at f = 50 MHz	G_p		33.5 to 35.5	dB
Slope cable equivalent f = 40 MHz to 550 MHz	SL		0 to 2.5	dB
Flatness of frequency response f = 40 MHz to 550 MHz	FL	max.	0.4	dB
Return losses at input and output	$S_{11\text{-}22}$	min.	18	dB
Second order distortion V_O = 44 dBmV	d_2	max.	−68	dB
Composite triple beat V_O = 44 dBmV	CTB	max.	−57	dB
Cross-modulation distortion V_O = 44 dBmV	x_{mod}	max.	−59	dB
Output voltage at d_{im} = −60 dB (DIN 45004B, para 6.3: 3-tone)	V_O	min.	61	dBmV
Noise figure at 550 MHz	F	max.	6.5	dB
DC supply voltage (note 1)	V_B		24	V
Total DC current	I_{tot}		320	mA
Operating case temperature	T_{case}		−20 to +100	°C

MECHANICAL DATA

SOT115 (see Fig. 1).

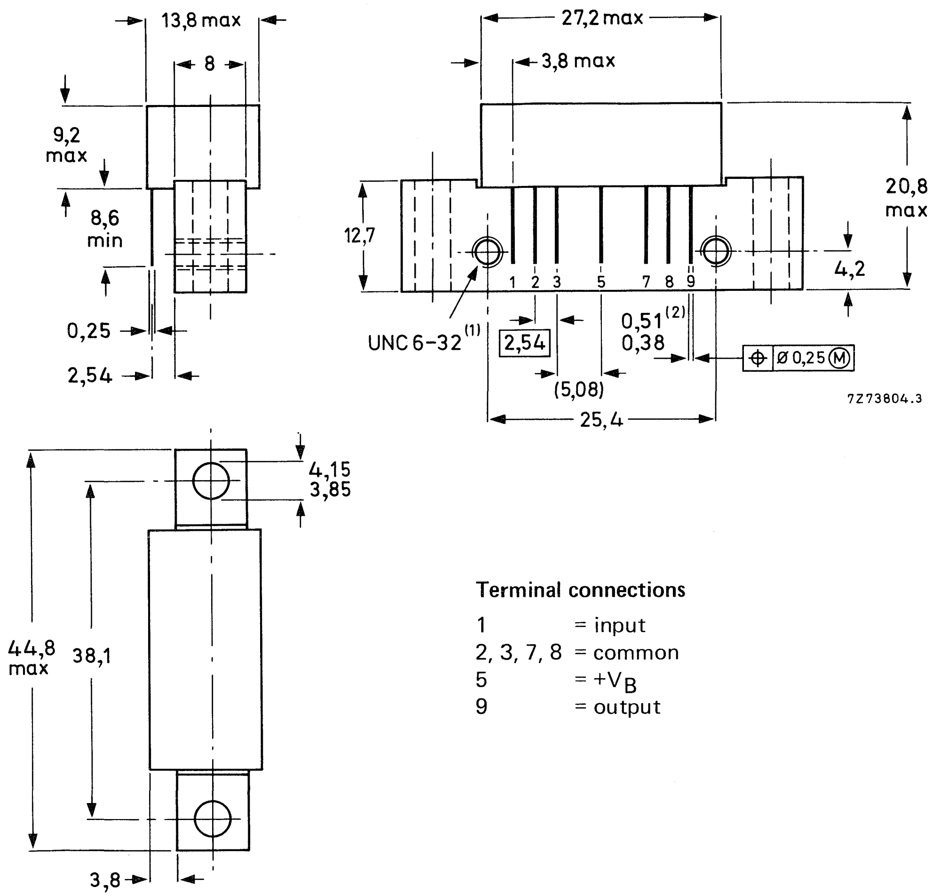
Note

1. The module normally operates at V_B = +24 V DC, but is able to withstand incidental supply transients up to 30 V.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT115.



Terminal connections

1	= input
2, 3, 7, 8	= common
5	= $+V_B$
9	= output

(1) Screw 6-32 UNC-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).

RF input voltage	V_i	max.	60 dBmV
Storage temperature range	T_{stg}	−40 to +100	°C
Operating case temperature range	T_{case}	−20 to +100	°C

CHARACTERISTICS (bandwidth = 40 MHz to 550 MHz)

V_B = +24 V DC; T_{case} = 30 °C

Power gain				
f = 50 MHz	G_p		33.5 to 35.5	dB
f = 550 MHz			35.0 to 37	dB
Slope cable equivalent				
f = 40 MHz to 550 MHz	SL		0 to 2.5	dB
Flatness of frequency response				
f = 40 MHz to 550 MHz	FL	max.	0.4	dB
Return losses at input and output				
$Z_S = Z_L$ = 75 Ω;				
f = 40 MHz to 80 MHz	s_{11-22}	min.	20	dB
f = 80 MHz to 160 MHz		min.	19	dB
f = 160 MHz to 550 MHz		min.	18	dB
Second order distortion				
V_p = 44 dBmV; f_p = 55.25 MHz				
V_q = 44 dBmV; f_q = 493.25 MHz				
Measured on $f_p + f_q$ = 548.5 MHz	d_2	max.	−68	dB
Composite triple beat				
77 channels flat V_O = 44 dBmV				
Measured at channel 27	CTB	max.	−57	dB
Cross-modulation distortion				
77 channels flat V_O = 44 dBmV				
Measured at channel 2	x_{mod}	max.	−59	dB
Composite second order distortion				
77 channels flat; V_O = 44 dBmV				
Measured in channel 27 on 548.5 MHz	CSO	max.	−57	dB
Output voltage at d_{im} = −60 dB				
(DIN 45004B, para 6.3: 3-tone)				
$V_p = V_O$; f_p = 540.25 MHz;				
$V_q = V_O$ − 6 dB; f_q = 547.25 MHz;				
$V_r = V_O$ − 6 dB; f_r = 549.25 MHz;				
Measured on $f_p + f_q - f_r$ = 538.25 MHz	V_O	min.	61	dBmV
Noise figure at f = 550 MHz	F	max.	6.5	dB
Total DC current consumption				
V_B = +24 V DC	I_{tot}	typ.	320	mA
		max.	340	mA

CHARACTERISTICS (bandwidth = 40 MHz to 450 MHz)

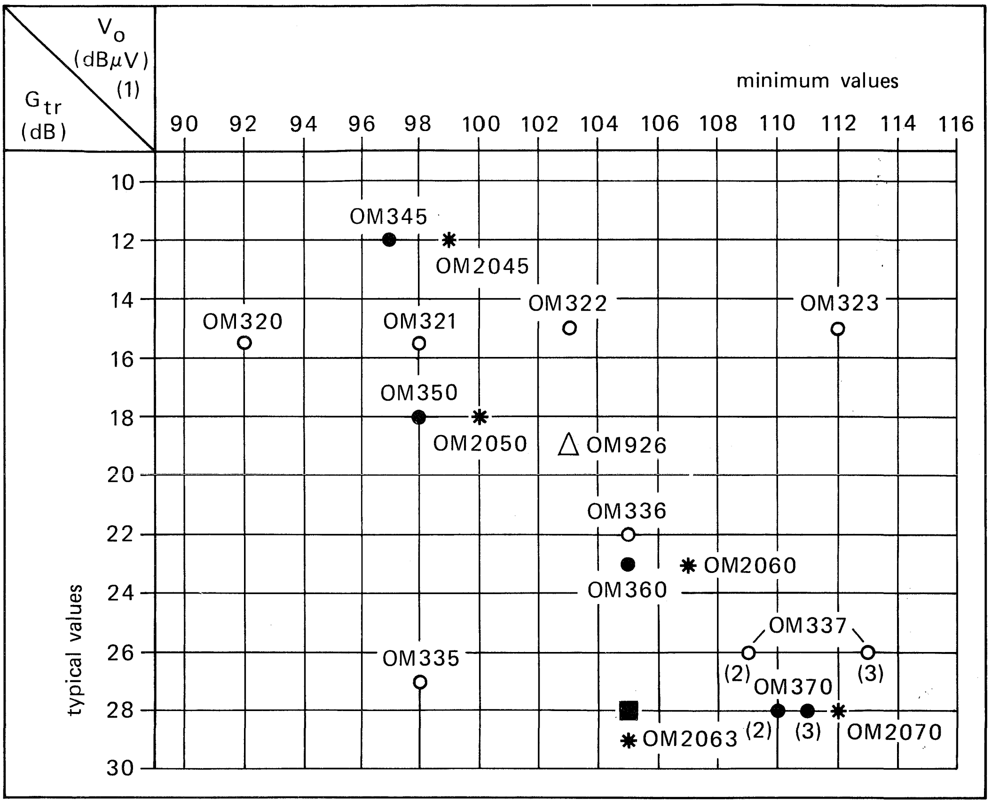
V_B = +24 V DC; T_{case} = 35 °C

Power gain				
f = 50 MHz	G_p		33.5 to 35.5	dB
f = 450 MHz	G_p		35 to 37	dB
Slope cable equivalent				
f = 40 MHz to 450 MHz	SL		0.5-2.5	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	$s_{11\text{-}22}$	min.	20	dB
f = 80 MHz to 160 MHz		min.	19	dB
f = 160 MHz to 450 MHz		min.	18	dB
Second order distortion				
V_p = 46 dBmV; f_p = 55.25 MHz				
V_q = 46 dBmV; f_q = 391.25 MHz				
Measured on $f_p + f_q$ = 446.5 MHz	d_2	max.	72	dB
Composite triple beat				
60 channels flat; V_O = 46 dBmV				
Measured in channel H22	CTB	max.	61	dB
Cross modulation				
60 channels flat; V_O = 46 dBmV				
Measured in channel 2	x_{mod}	max.	59	dB
Composite second order distortion				
60 channels flat; V_O = 46 dBmV				
Measured in channel H22 at 446.5 MHz	CSO	max.	−59	dB
Noise figure at f = 450 MHz	F	max.	6.0	dB
Output voltage at d_{im} = −60 dB				
(DIN 45004B, para 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 on $f_p = f_q - f_r$ = 438.25 MHz	V_O	min.	64	dBmV
Total DC current consumption				
V_B = +24 V DC	I_{tot}	typ.	320	mA
		max.	340	mA

DEVICE DATA

Hybrid ICs for wideband amplifiers

HYBRID ICs FOR WIDE-BAND AMPLIFIERS



● 12 V types
○ 24 V types
✱ 12 V-low noise types
△ in development
■ ○ OM339
● OM369
△ OM2062

7Z83427.1

(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.

Hybrid IC's for wideband amplifiers

12 V supply voltage; 'Low noise'

	type	stage	gain (dB)	Vo(RMS) (dBμV) −60 dB IMD (note 1) min. values	noise figure (dB)	max. VSWR typ. values (note 2) input	output	supply current (mA)	page
low output	OM2045	1	12	99	3.6	2.0	1.4	11.5	1041
	OM2050	2	18	100	5.2	1.5	1.9	18	1047
medium output	OM2060	3	23	107	5.4	1.4	1.6	56	1053
	OM2061	3	28	107	4.4	1.5	1.7	51	1059
	OM2062	3	28	105	4.4	1.3	1.4	50	(note 3)
	OM2063	3	29	105	3.6	2.2	1.5	52	(note 3)
high output	OM2070	3	28	112	4.8	2.3	1.9	100	1065

12 V supply voltage

	type	stage	gain (dB)	Vo(RMS)	noise figure	input	output	supply current	page
low medium	OM345	1	12	97	5.5	2.0	1.4	11.5	1011
	OM350	2	18	98	6.0	1.5	1.9	18	1017
medium output	OM360	3	23	105	7.0	1.3	1.5	55	1023
	OM361	3	28	105	6.0	1.5	1.7	50	1029
high output	OM370	3	28	111	7.0	2.3	1.9	105	1035

24 V supply voltage

	type	stage	gain (dB)	Vo(RMS)	noise figure	input	output	supply current	page
low output	OM320	2	15.5	92	5.5	2.2	2.5	33	965
	OM321	2	15.5	98	6.0	2.5	2.0	33	971
	OM335	3	27	98	5.5	1.9	3.2	35	989
medium output	OM322	2	15	103	7.0	1.7	1.7	60	977
	OM336	3	22	105	7.0	1.4	1.6	65	995
	OM339	3	28	105	6.0	1.5	1.5	66	1007
high output	OM323*	2	15	112	9.0	1.9	2.3	100	983
	OM337*	3	26	113	9.8	2.3	1.8	115	999

* 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.
3. In development.

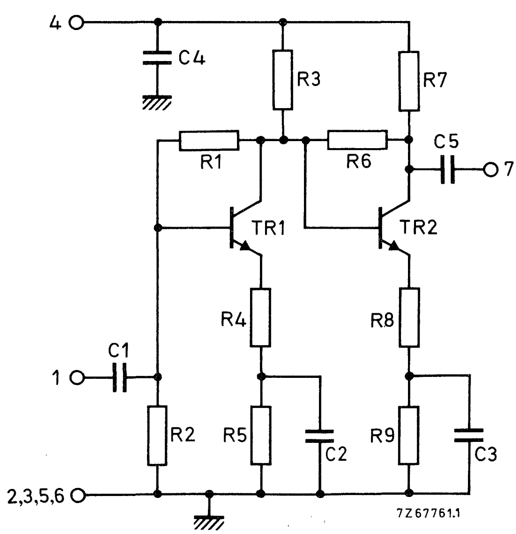
HYBRID VHF/UHF WIDE-BAND AMPLIFIER

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	$R_S = R_\ell = Z_o$	=	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	dBμV
Noise figure	F	typ.	5,5	dB
D.C. supply voltage	V_B	=	24	V ± 10%
Operating ambient temperature	T_{amb}		−20 to +70	°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				
f = 100 MHz	$\|s_r\|^2$	typ.	30	dB
f = 860 MHz	$\|s_r\|^2$	typ.	24	dB
Output voltage at −60 dB intermodulation distortion (DIN45004, par. 6.3: 3-tone)	$V_{o(rms)}$	>	92	dBμV
		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

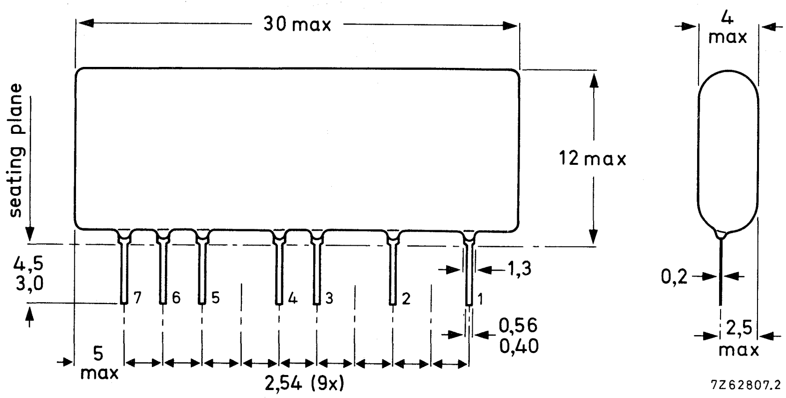
Ambient temperature range	T_{amb}		−20 to +70	^{o}C
D.C. supply voltage	V_B	=	24	V ±10%
Frequency range	f		40 to 860	MHz
Source impedance and load impedance	R_S, R_ℓ	=	75	Ω

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

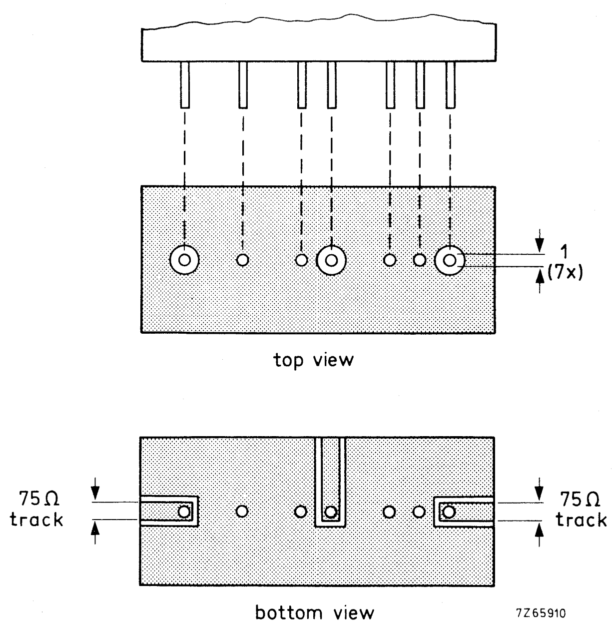
Maximum contact time for a soldering-iron temperature of 260 ^{o}C; up to seating plane: 5 s

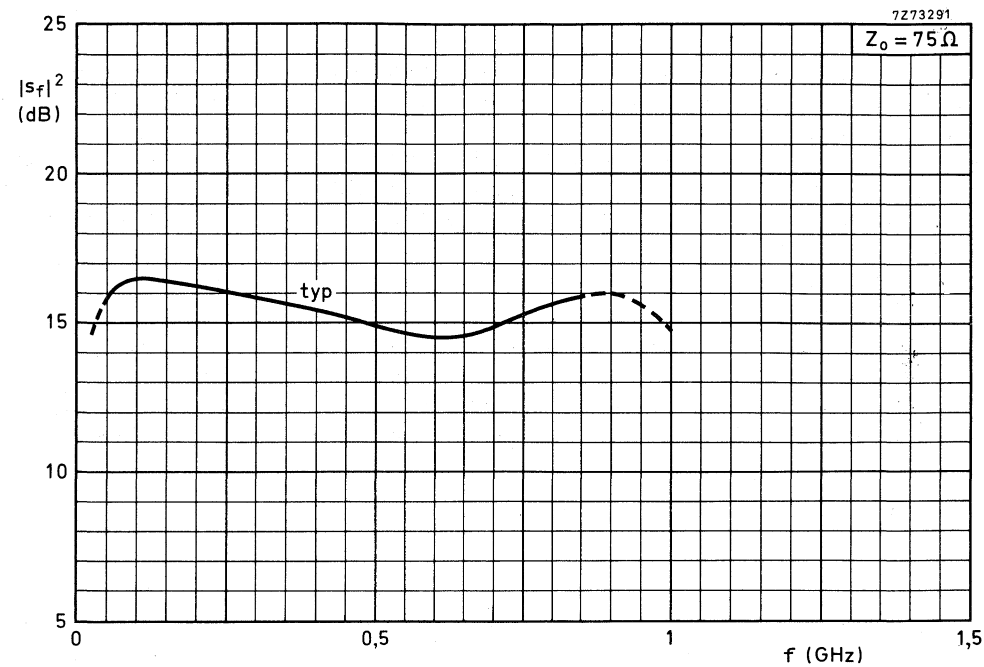
Dip or wave soldering

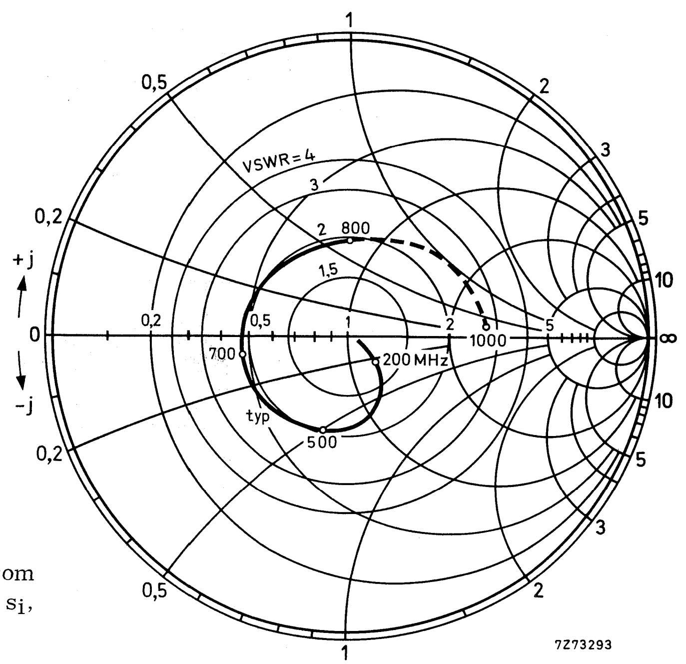
260 °C is the maximum permissible temperature of the solder; it must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds.
The device may be mounted against the printed-circuit board, but the temperature of the device must 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

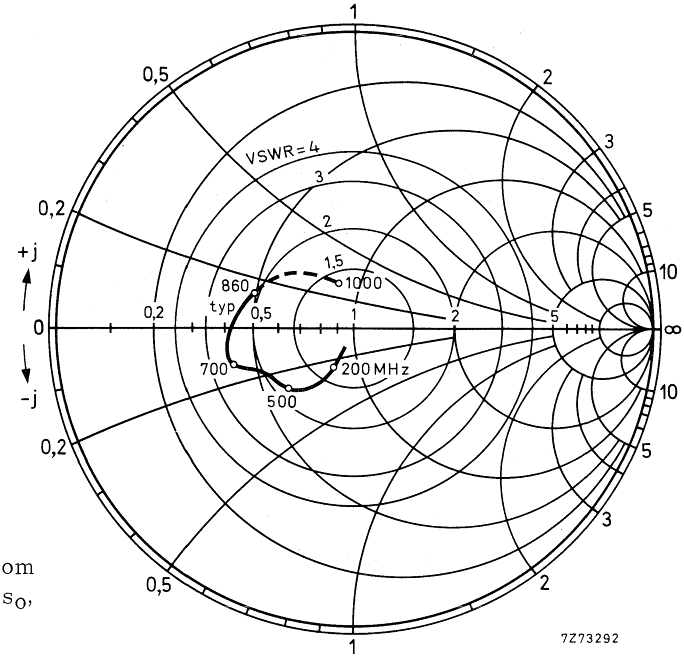
The module should preferably be mounted on double-sided printed-circuit board, see the example shown below.
Input and output should be connected to 75 Ω tracks.
The connections to the "common" pins should be as close to the seating plane as possible.







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.

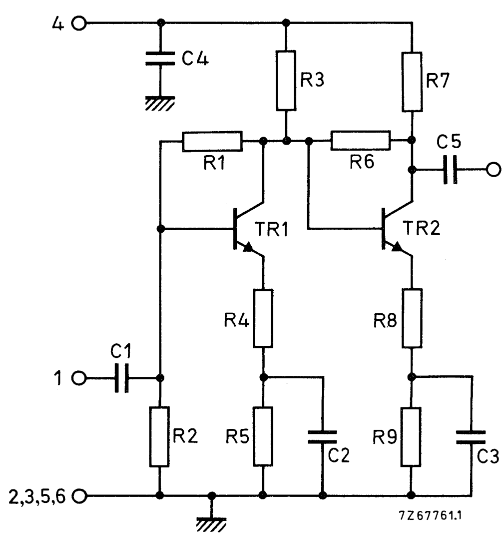
HYBRID VHF/UHF WIDE BAND AMPLIFIER

Two-stage wide-band amplifier in the hybrid technique, designed for use 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	$R_S = R_\ell = Z_o$	=	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	dBμV
Noise figure	F	typ.	6	dB
D.C. supply voltage	V_B	=	24	V ±10%
Operating ambient temperature	T_{amb}		−20 to +70	°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	$G_{tr} = \lvert s_f \rvert^2$		13 to 18	dB
		typ.	15,5	dB
Flatness of frequency response	$\pm\Delta \lvert s_f \rvert^2$	typ.	1	dB
Individual maximum v.s.w.r.				
input	$VSWR_{(i)}$	typ.	2,5	**
output	$VSWR_{(o)}$	typ.	2,0	**
Back attenuation				
f = 100 MHz	$\lvert s_r \rvert^2$	typ.	30	dB
f = 860 MHz	$\lvert s_r \rvert^2$	typ.	26	dB
Output voltage at −60 dB intermodulation distortion (DIN45004, par. 6.3: 3-tone)	$V_{o(rms)}$	>	98	dBμV
		typ.	100	dBμV
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

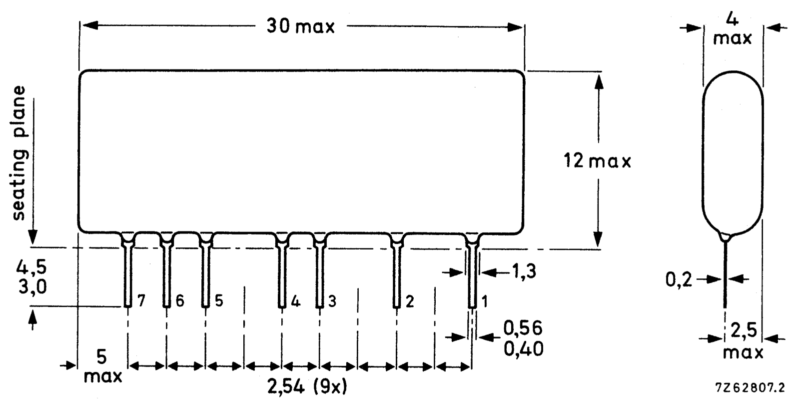
Ambient temperature range	T_{amb}		−20 to + 70	°C
D.C. supply voltage	V_B	=	24	V ±10%
Frequency range	f		40 to 860	MHz
Source impedance and load impedance	R_s, R_ℓ	=	75	Ω

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

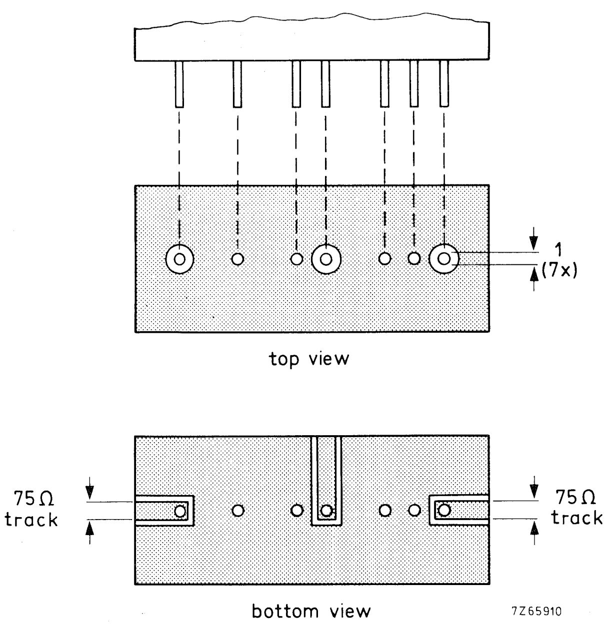
Maximum contact time for a soldering-iron temperature of 260 °C; up to seating plane: 5 s

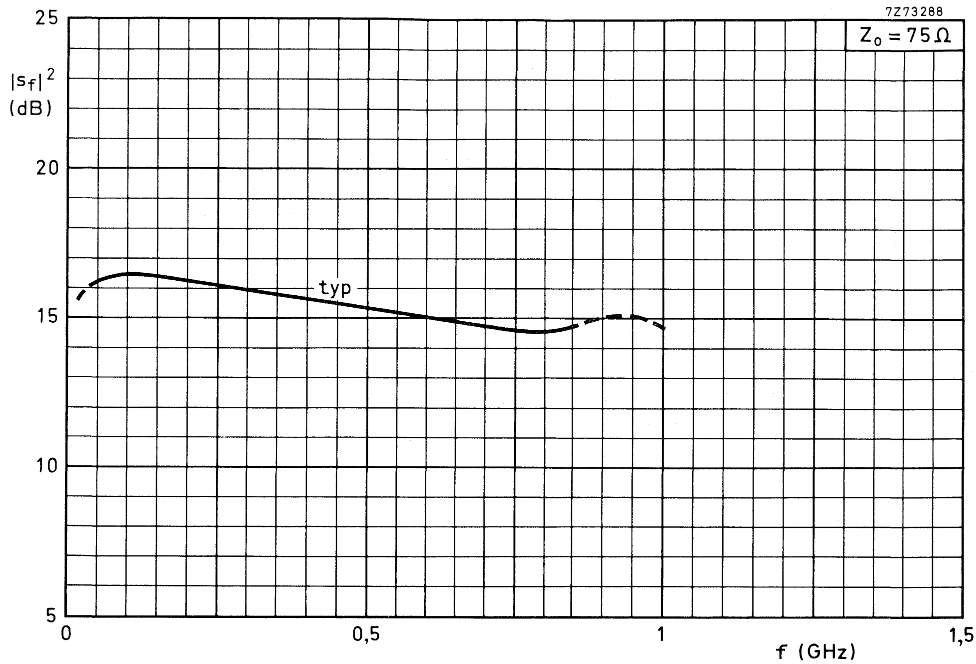
Dip or wave soldering

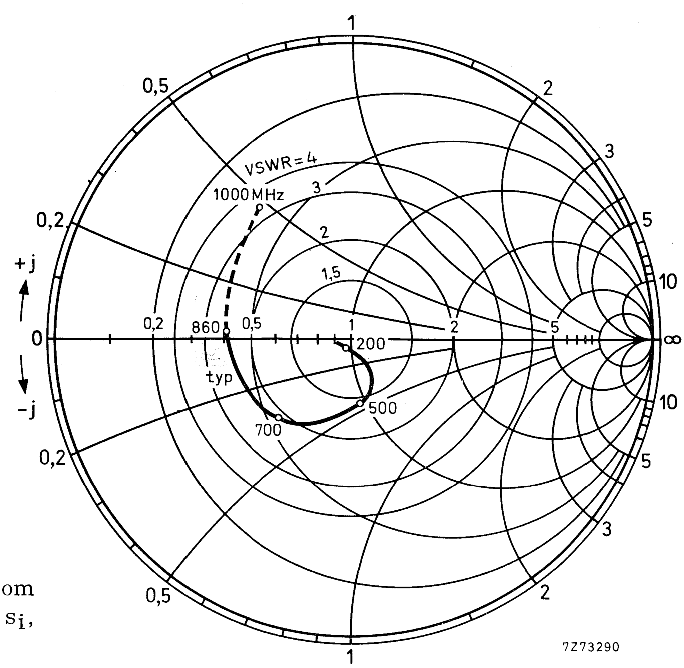
260 °C is the maximum permissible temperature of the solder; it must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds.
The device may be mounted against the printed-circuit board, but the temperature of the device must 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

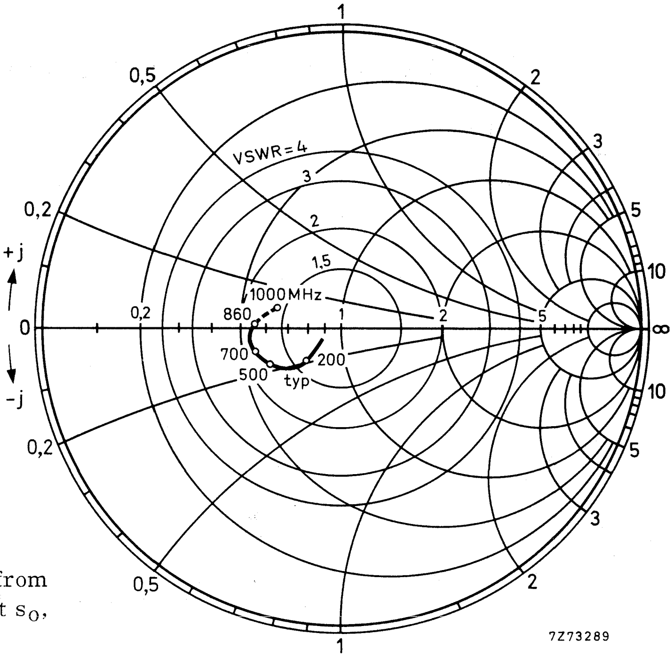
The module should preferably be mounted on double-sided printed-circuit board, see the example shown below.
Input and output should be connected to 75 Ω tracks.
The connections to the "common" pins should be as close to the seating plane as possible.







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.

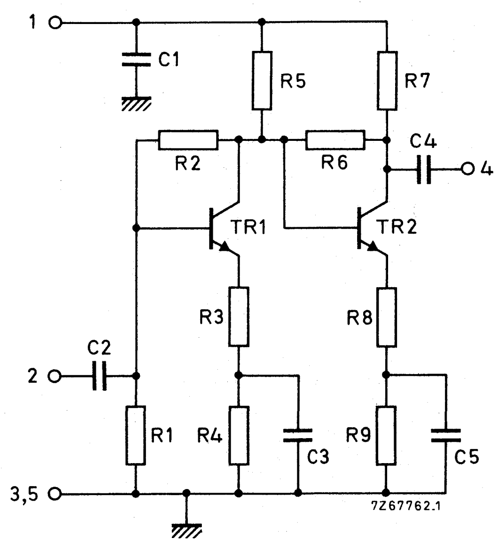
HYBRID VHF/UHF WIDE-BAND AMPLIFIER

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	$R_S = R_\ell = Z_o$		75	Ω
Transducer gain	$G_{tr} = \|s_f\|^2$	typ.	15	dB
Flatness of frequency response	$\pm\Delta\|s_f\|^2$	typ.	0,3	dB
Output voltage at −60 dB intermodulation distortion (DIN45004, 3-tone)	$V_{o(rms)}$	>	103	dBμV
Noise figure	F	typ.	7	dB
D.C. supply voltage	V_B	=	24	V ±10%
Operating ambient temperature	T_{amb}		−20 to +70	°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_o	=	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	$VSWR_{(i)}$	typ.	1,7		1)
output	$VSWR_{(o)}$	typ.	1,7		1)
Back attenuation					
f = 100 MHz	$\|s_r\|^2$	typ.	31	dB	
f = 860 MHz	$\|s_r\|^2$	typ.	25	dB	
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:	$s_f = s_{21}$	$s_i = s_{11}$
	$s_r = s_{12}$	$s_o = s_{22}$

1) Highest value, for a sample, occurring in the frequency range.

OPERATING CONDITIONS

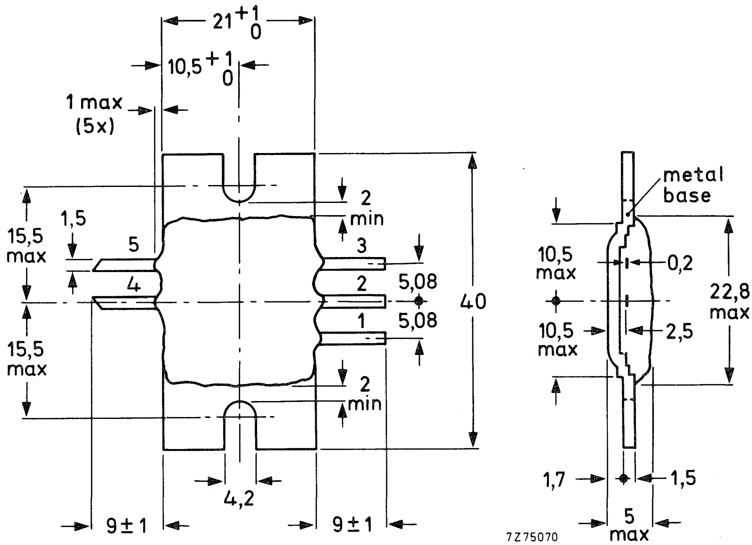
Ambient temperature range	T_{amb}	−20 to +70	°C
D.C. supply voltage	V_B	= 24	V ±10%
Frequency range	f	40 to 860	MHz
Source impedance and load impedance	R_S, R_ℓ	= 75	Ω

MECHANICAL DATA

Dimensions in mm

Encapsulation

The device is resin coated and mounted on a metal mounting base.



Terminal connections

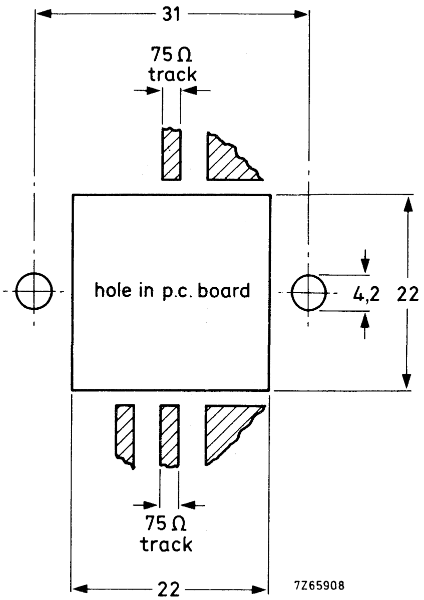
1	= Supply (+)
2	= Input
3 and 5	= Common (internally connected to metal base)
4	= Output

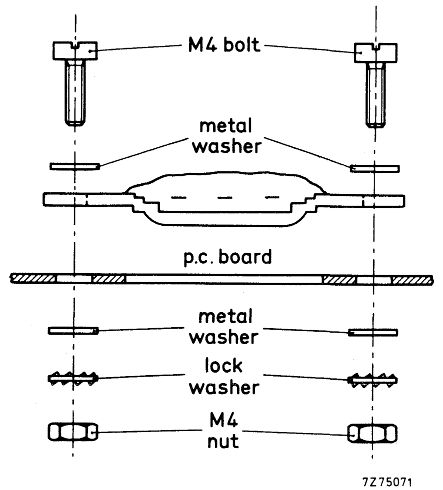
Soldering recommendations

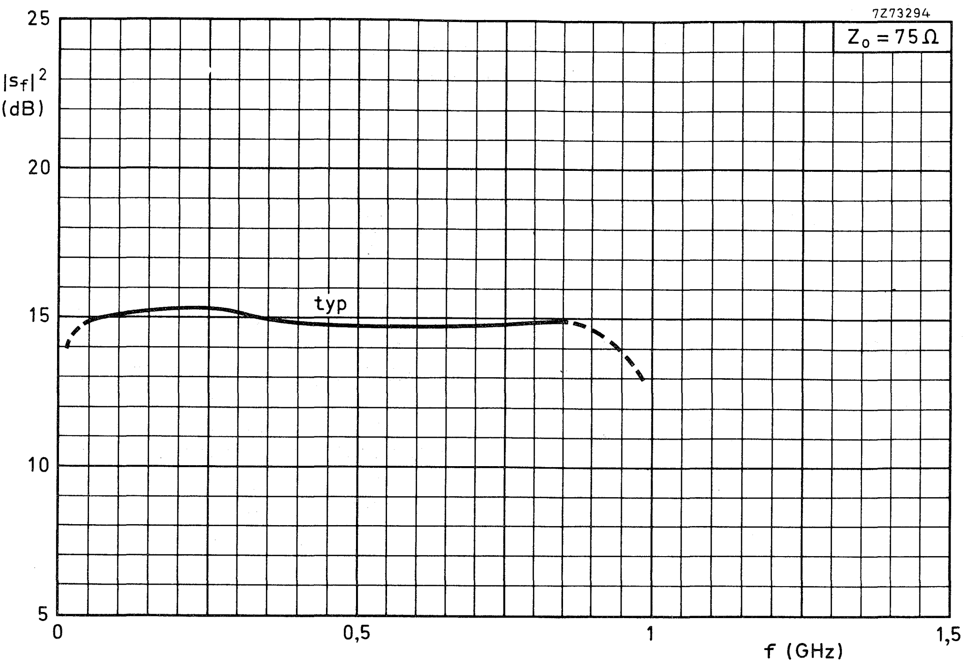
Maximum contact time for a soldering-iron temperature of 260 °C 5 s

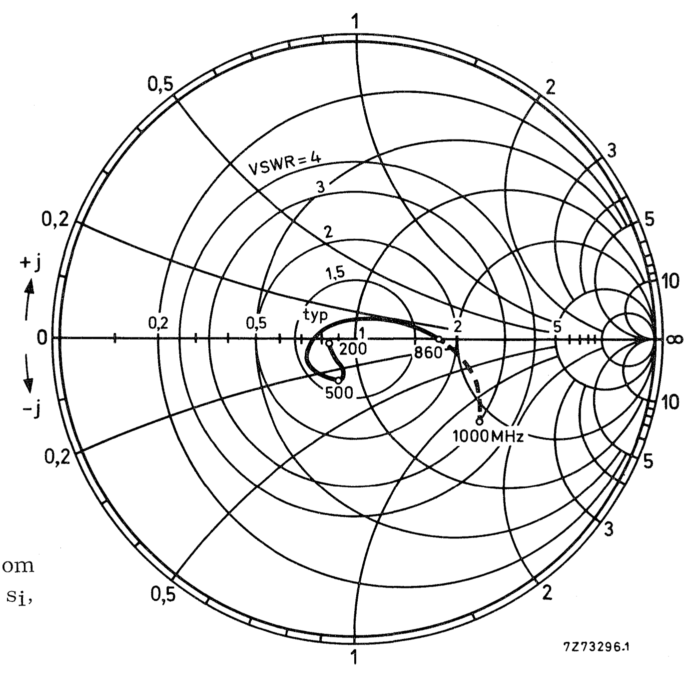
Mounting recommendations

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.

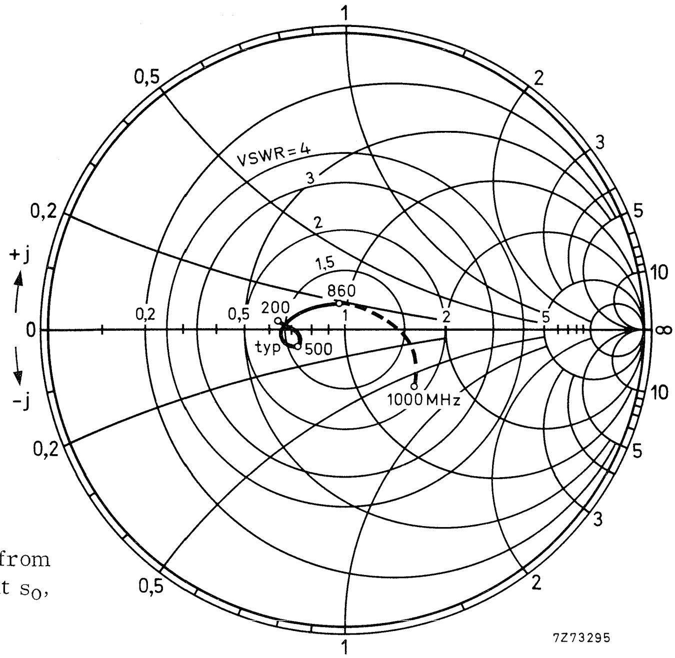








Input impedance derived from input reflection coefficient s_i, co-ordinates in ohm x 75



Output impedance derived from output reflection coefficient s_o, co-ordinates in ohm x 75

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	$R_s = R_\ell = Z_o$	=	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	dBμV
Noise figure	F	typ	9	dB
D.C. supply voltage	V_B	=	24	V ± 10%
Operating mounting-base temperature	T_{mb}		−30 to +100	°C

ENCAPSULATION 9-pin, in-line, resin-coated body on a right-angled metal mounting tab, see MECHANICAL DATA

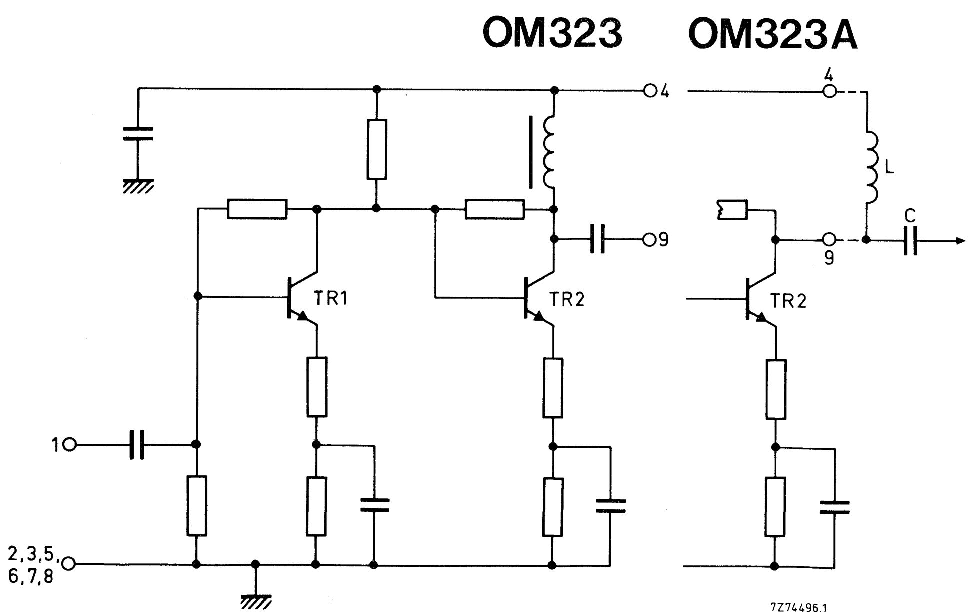


Fig. 1 Circuit diagram.

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_{I1M}, P_{I9M}	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	$G_{tr} = \lvert s_f \rvert^2$		14 to 17	dB
		typ	15	dB
Flatness of frequency response	$\pm\Delta \lvert s_f \rvert^2$	typ	0,5	dB
Individual maximum v.s.w.r.				
input	$VSWR_{(i)}$	typ	1,9	**
output	$VSWR_{(o)}$	typ	2,3	**
Back attenuation				
f = 100 MHz	$\lvert s_r \rvert^2$	typ	29	dB
f = 650 MHz	$\lvert s_r \rvert^2$	typ	25,5	dB
f = 860 MHz	$\lvert s_r \rvert^2$	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 dBμV
		typ	114 dBμV
f = 470 MHz	$V_{o(rms)}$	typ	113 dBμV
f = 860 MHz	$V_{o(rms)}$	typ	112 dBμV
Noise figure			
channel 2	F	typ	8 dB
channel 65	F	typ	9 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 ± 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

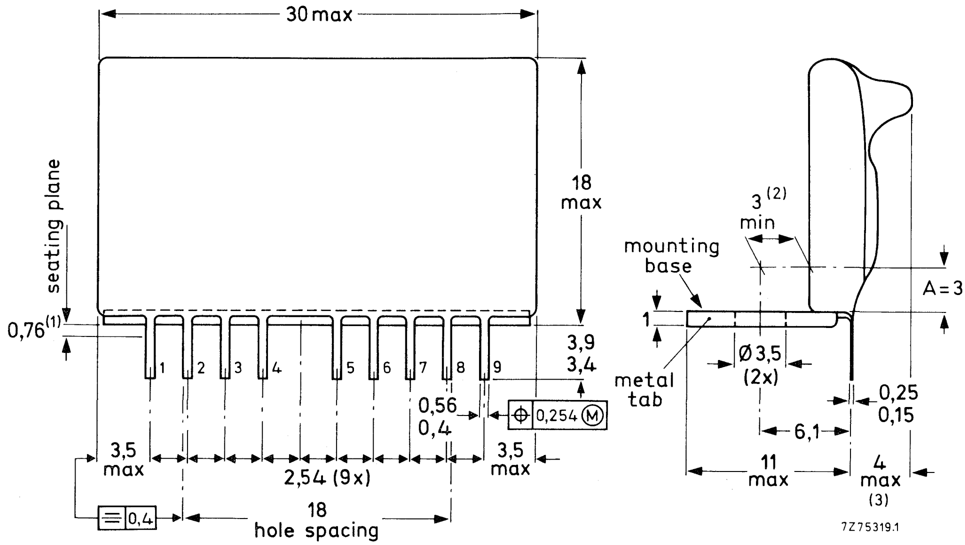
1. When the device is fixed only to a heatsink, not to a printed-circuit board, the values of the second column of the table should be increased by 2 °C and those of the third column decreased by 2 °C.
2. The user is free to realize proper cooling by using differently shaped sinks, or, preferably, by 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

MECHANICAL DATA

Dimensions in mm

The amplifier is resin coated and has a metal mounting tab at a right angle to the encapsulation part.



(1) Tolerance applies within this zone.
(2) Distance applies within zone A.
(3) For the OM323A: 3 mm maximum.

Fig. 2 Encapsulation.

Terminal connections

1	= Input
2, 3, 5, 6, 7, 8	= Common, connected to mounting tab
4	= Supply (+)
9	= Output

Soldering recommendations

Hand soldering

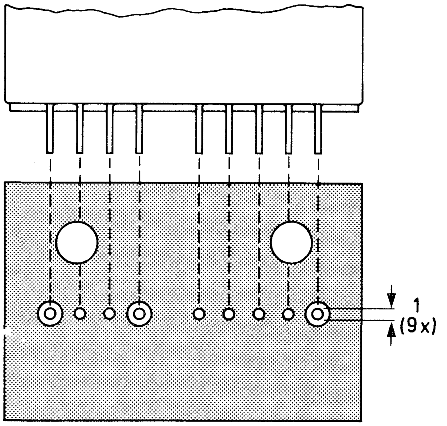
Maximum contact time for a soldering-iron temperature of 260 °C up to the seating plane is 5 s.

Dip or wave soldering

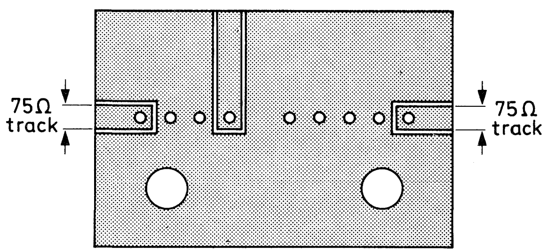
260 °C is the maximum permissible temperature of the solder; it must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds. The device may be mounted against the printed-circuit board, but the temperature of the device must 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

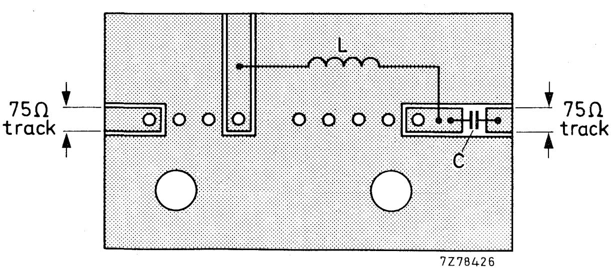
The module should preferably be mounted on a double-sided printed-circuit board, see the following example. An example is also given of heatsink mounting.
Input and output should be connected to 75 Ω tracks.
The connections to the common pins should be as close to the seating plane as possible.



top view



OM323: bottom view



OM323A: bottom view

Fig. 3 Printed-circuit board holes and tracks for the OM323 and OM323A.

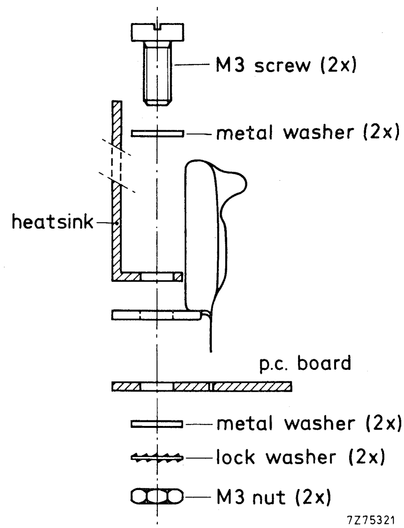


Fig. 4 Example of heatsink mounting.

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.

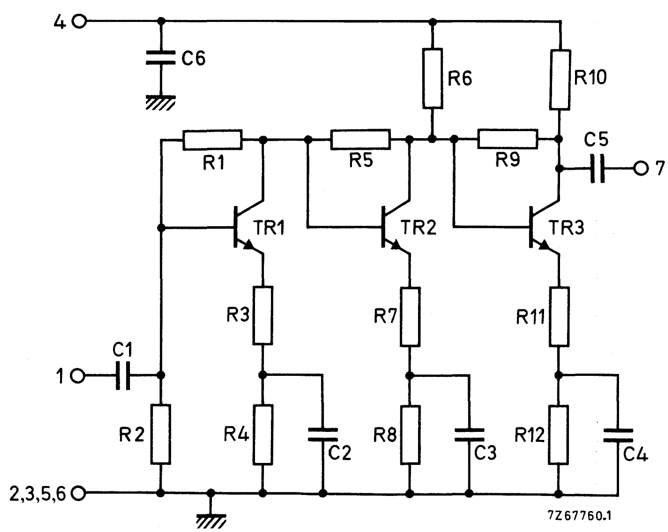
HYBRID VHF/UHF WIDE-BAND AMPLIFIER

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	$R_S = R_\ell = Z_o$	=	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	dBμV
Noise figure	F	typ.	5,5	dB
D.C. supply voltage	V_B	=	24	V ±10%
Operating ambient temperature	T_{amb}		−20 to +70	°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.	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				
f = 100 MHz	$\|s_r\|^2$	typ.	46	dB
f = 860 MHz	$\|s_r\|^2$	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:	$s_f = s_{21}$	$s_i = s_{11}$
	$s_r = s_{12}$	$s_o = s_{22}$

* This socket can be made available for customer reference purposes.

** Highest value, for a sample, occurring in the frequency range.

OPERATING CONDITIONS

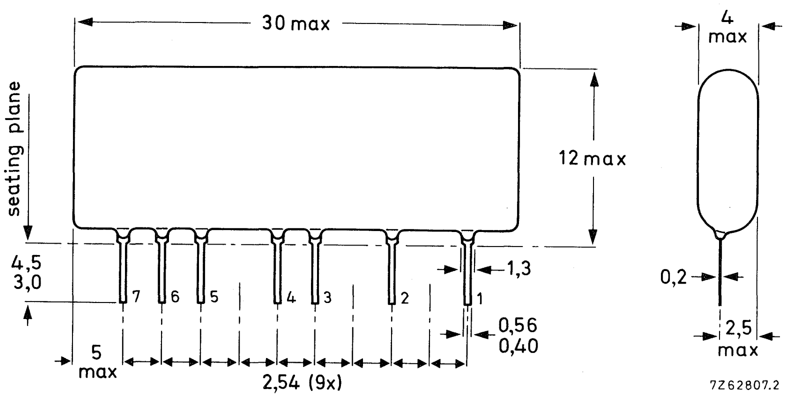
Ambient temperature range	T_{amb}		−20 to +70	^{o}C
D.C. supply voltage	V_B	=	24	V ±10%
Frequency range	f		40 to 860	MHz
Source impedance and load impedance	R_s, R_ℓ	=	75	Ω

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

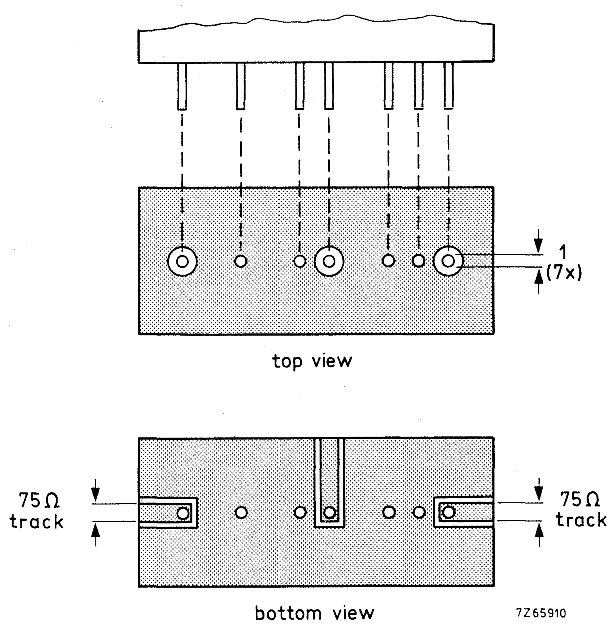
Maximum contact time for a soldering-iron temperature of 260 ^{o}C; up to seating plane: 5 s

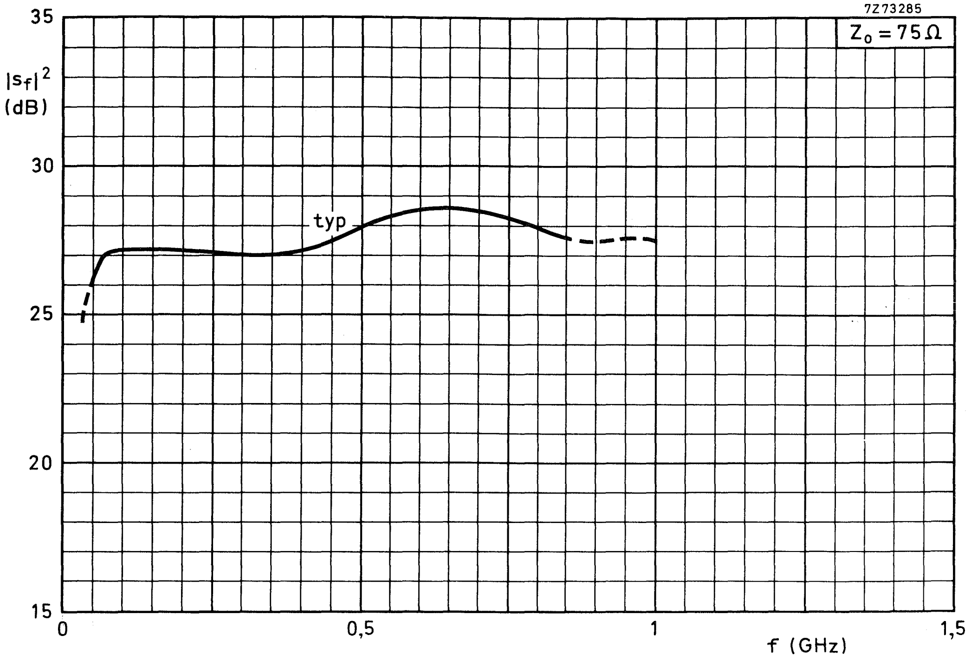
Dip or wave soldering

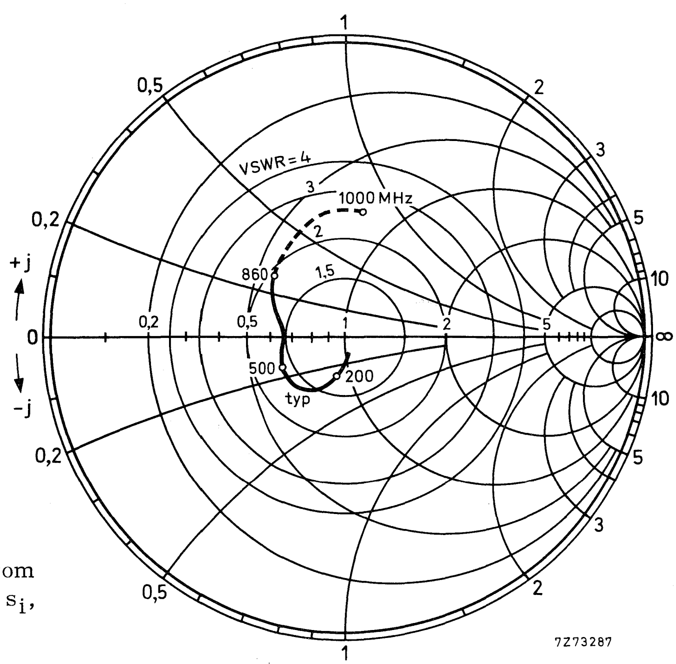
260 °C is the maximum permissible temperature of the solder; it must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds.
The device may be mounted against the printed-circuit board, but the temperature of the device must 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

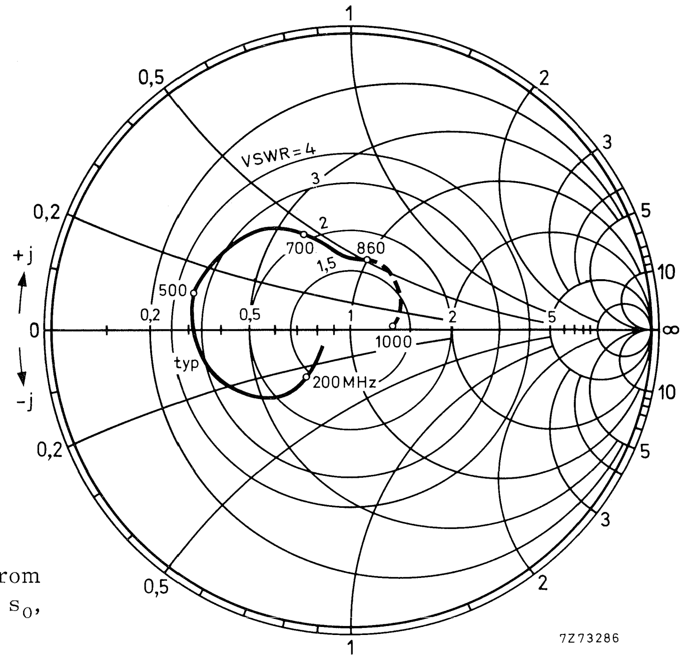
The module should preferably be mounted on double-sided printed-circuit board, see the example shown below.
Input and output should be connected to 75 Ω tracks.
The connections to the "common" pins should be as close to the seating plane as possible.







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.

HYBRID VHF/UHF WIDE-BAND AMPLIFIER

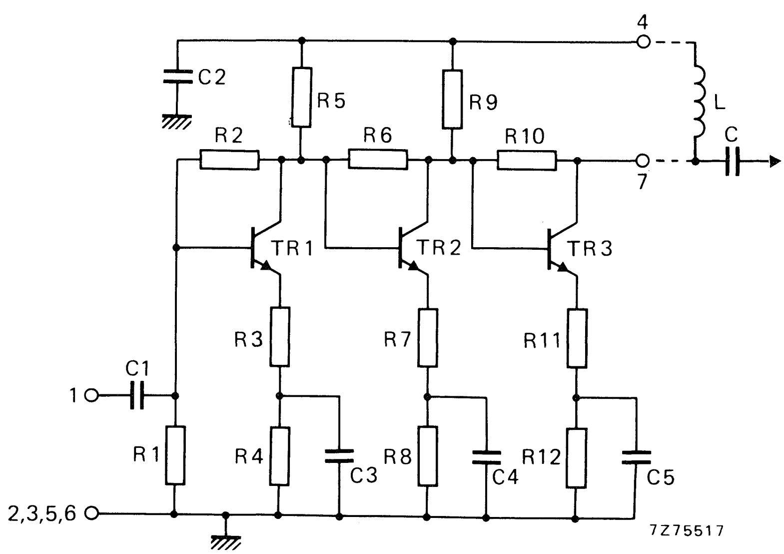
Three-stage wide-band amplifier in the hybrid technique, designed for use in mast-head booster-amplifiers, as preamplifier in MATV systems, and as general-purpose amplifier for v.h.f. and u.h.f. applications.

QUICK REFERENCE DATA

Frequency range	f		40 to 860	MHz
Source and load (characteristic) impedance	$R_S = R_\ell = Z_o$	=	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	dBμV
Noise figure	F	typ.	7	dB
D.C. supply voltage	V_B	=	24	V ±10%
Operating ambient temperature	T_{amb}		−20 to +70	°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.	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

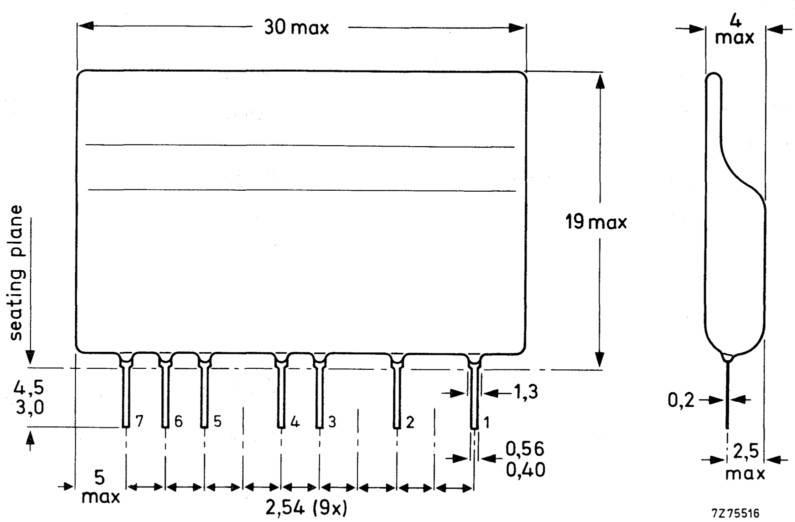
Ambient temperature range	T_{amb}	−20 to +70 °C
D.C. supply voltage	V_B	= 24 V ±10%
Frequency range	f	40 to 860 MHz
Source impedance and load impedance	R_s, R_ℓ	= 75 Ω

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

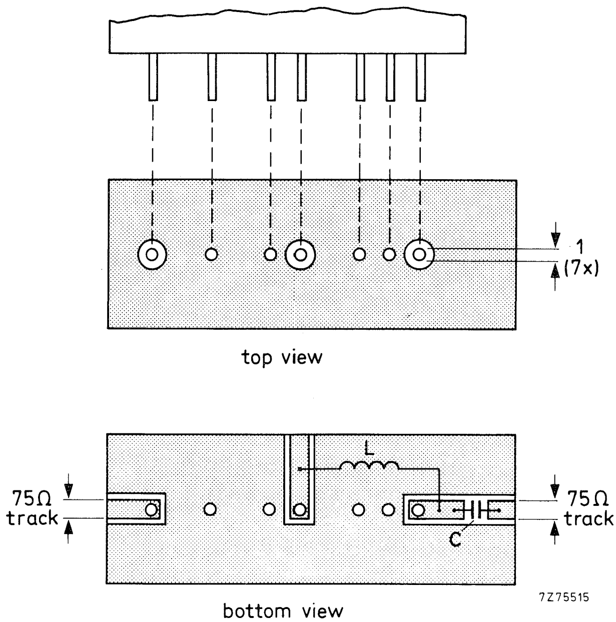
260 °C is the maximum permissible temperature of the solder; it must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds. The device may be mounted against the printed-circuit board, but the temperature of the device must 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.

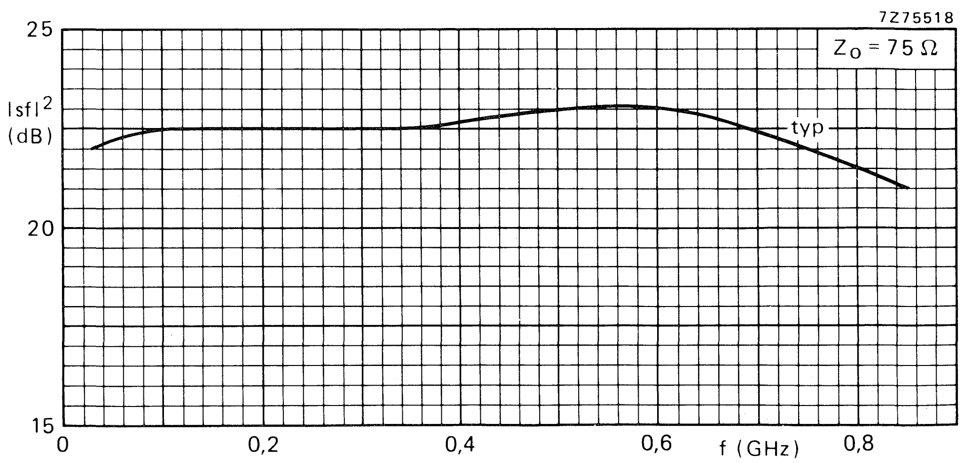
Input and output should be connected to 75 Ω tracks.

The connections to the 'common' pins should be as close to the seating plane as possible.



L > 5 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 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	$R_s = R_\ell = Z_o$	=	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	dBμV
Noise figure	F	typ.	9,8	dB
D.C. supply voltage	V_B	=	24	V ± 10%
Operating mounting-base temperature	T_{mb}		−30 to +100	°C

ENCAPSULATION 9-pin, in-line, resin-coated body on a right-angled metal mounting tab, see MECHANICAL DATA

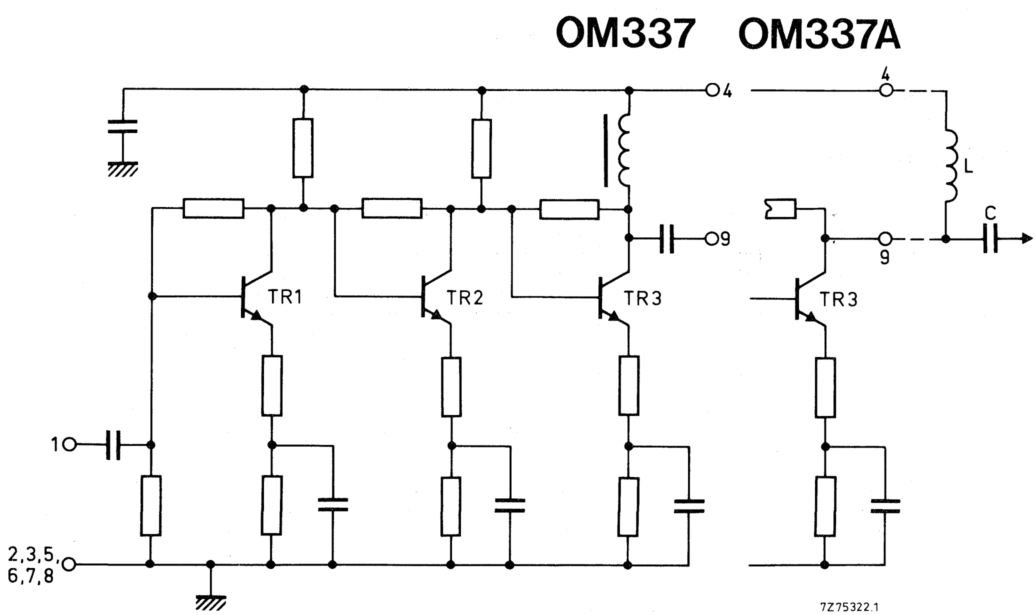


Fig. 1 Circuit diagram.

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_{I1M}, P_{I9M}	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		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.					
input	$VSWR_{(i)}$	typ.	2,3		**
output	$VSWR_{(o)}$	typ.	1,8		**
Back attenuation					
f = 100 MHz	$\|s_r\|^2$	typ.	44	dB	
f = 650 MHz	$\|s_r\|^2$	typ.	41	dB	
f = 860 MHz	$\|s_r\|^2$	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	dBμV
		typ.	114	dBμV
f = 470 MHz	$V_{o(rms)}$	typ.	112	dBμV
f = 860 MHz	$V_{o(rms)}$	typ.	110	dBμV
Noise figure				
channel 2	F	typ.	7	dB
channel 65	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 ± 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:

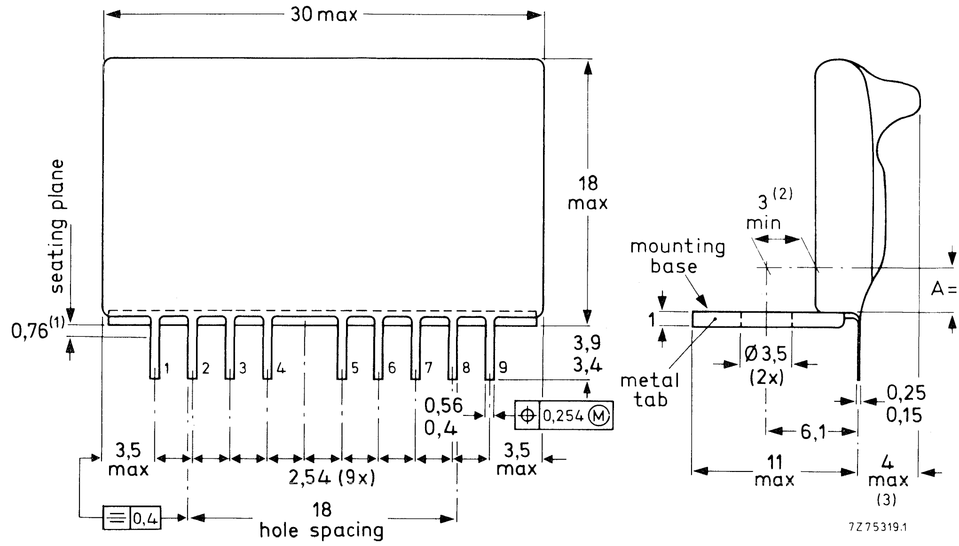
1. When the device is fixed only to a heatsink, not to a printed-circuit board, the values of the second column of the table should be increased by 2 °C and those of the third column decreased by 2 °C.
2. The user is free to realize proper cooling by using differently shaped sinks, or, preferably, by 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 65 mm	27,5	72,5
Blackened aluminium heatsink L-shaped bar; length 50 mm, height 70 mm	26,5	73,5

MECHANICAL DATA

Dimensions in mm

The amplifier is resin coated and has a metal mounting tab at a right angle to the encapsulated part.



(1) Tolerance applies within this zone.
(2) Distance applies within zone A.
(3) For the OM337A: 3 mm maximum.

Fig. 2 Encapsulation.

Terminal connections

1 = Input
2, 3, 5, 6, 7, 8 = Common, connected to mounting tab
4 = Supply (+)
9 = Output

Soldering recommendations

Hand soldering

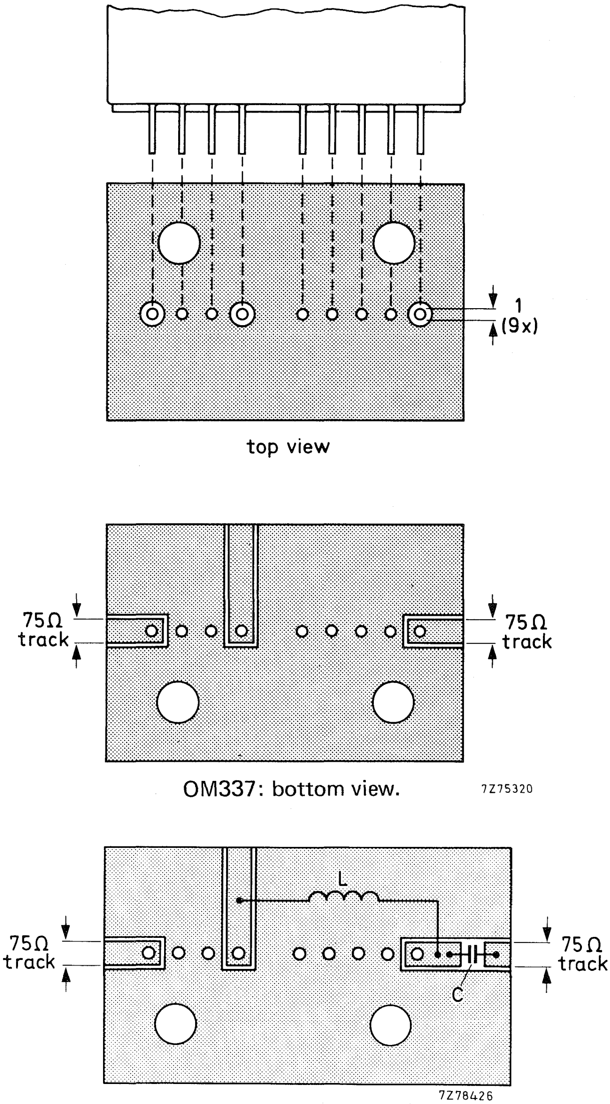
Maximum contact time for a soldering-iron temperature of 260 °C up to the seating plane is 5 s.

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 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.



OM337A: bottom view.

Fig. 3 Printed-circuit board holes and tracks for the OM337 and OM337A.

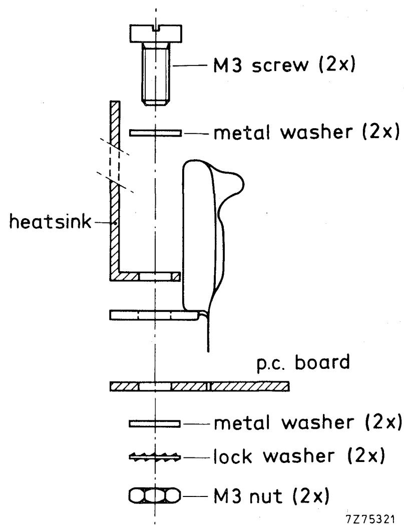


Fig. 4 Example of heatsink mounting.

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 a diameter of 1,6 mm.
C > 220 pF ceramic capacitor.

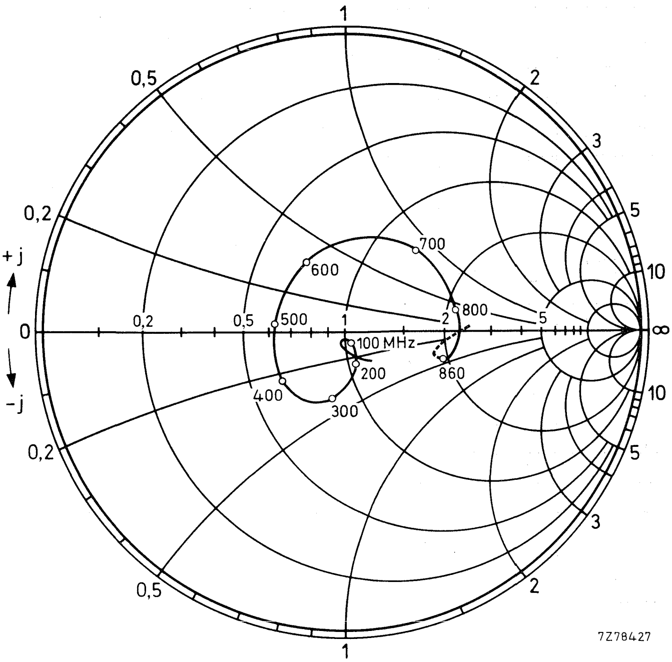


Fig. 5 Input impedance derived from input reflection coefficient s_i, co-ordinates in ohm x 75; typical values.

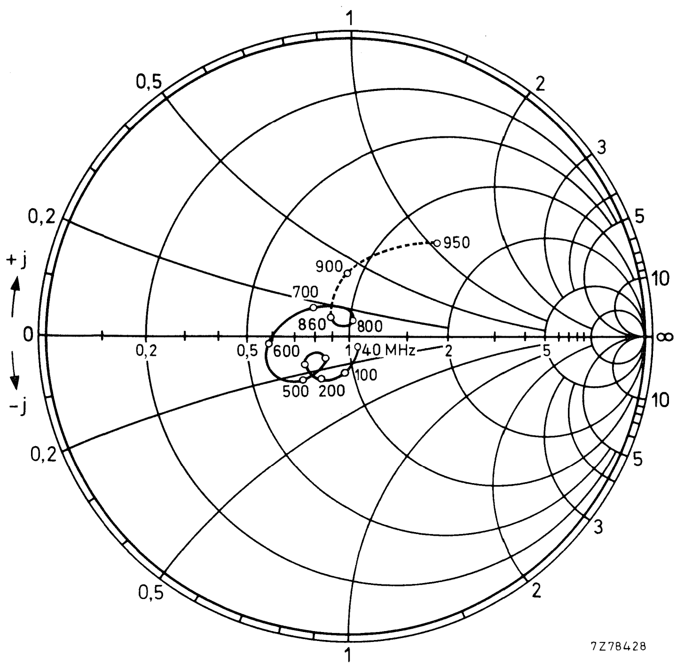


Fig. 6 Output impedance derived from output reflection coefficient s_o, co-ordinates in ohm x 75; typical values.

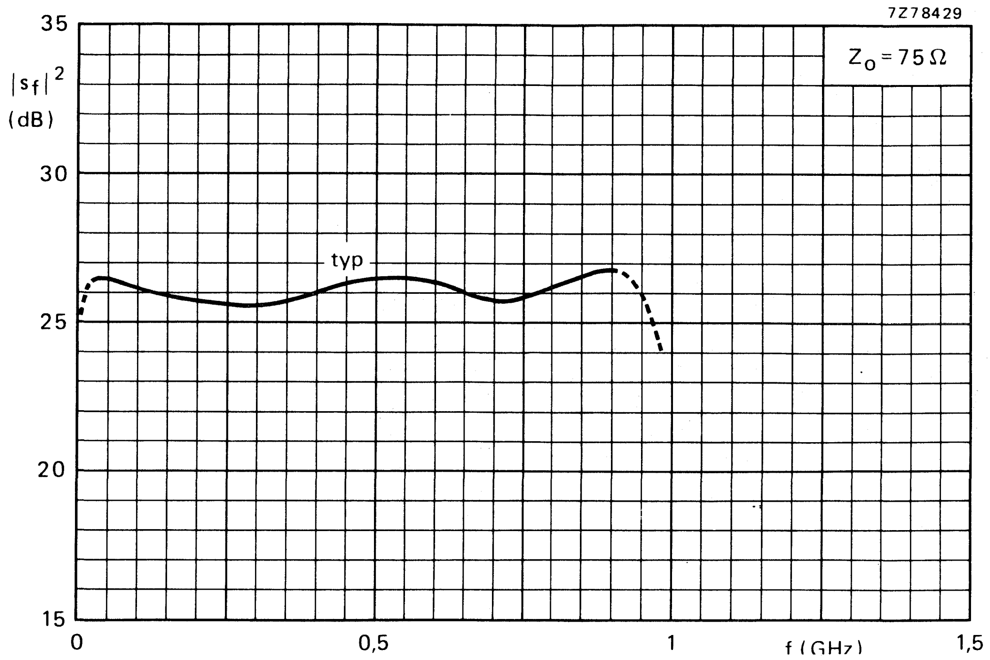


Fig. 7 Transducer gain as a function of frequency.

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	$R_s = R_\ell = Z_o$	=	75	Ω
Transducer gain	$G_{tr} = \|s_f\|^2$	typ.	28	dB
Flatness of frequency response	$\pm\Delta\|s_f\|^2$	typ.	1,5	dB
Output voltage at −60 dB intermodulation distortion (DIN 45004, 3-tone)	$V_{o(rms)}$	>	105	dBμV
Noise figure	F	typ.	6	dB
D.C. supply voltage	V_B	=	24	V ±10%
Operating ambient temperature	T_{amb}		−20 to +70	°C

ENCAPSULATION 7-pin, in-line, resin-coated body, see MECHANICAL DATA (Fig. 2)

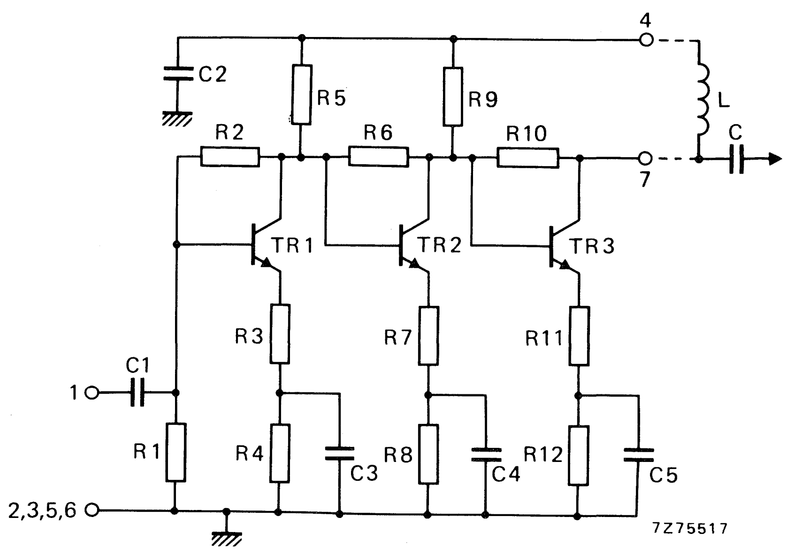


Fig. 1 Circuit diagram.

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_{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.	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.				
input	$VSWR_{(i)}$	typ.	1,5	**
output	$VSWR_{(o)}$	typ.	1,5	**
Back attenuation				
f = 100 MHz	$\|s_r\|^2$	typ.	46	dB
f = 860 MHz	$\|s_r\|^2$	typ.	31	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.	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

The device is resin coated.

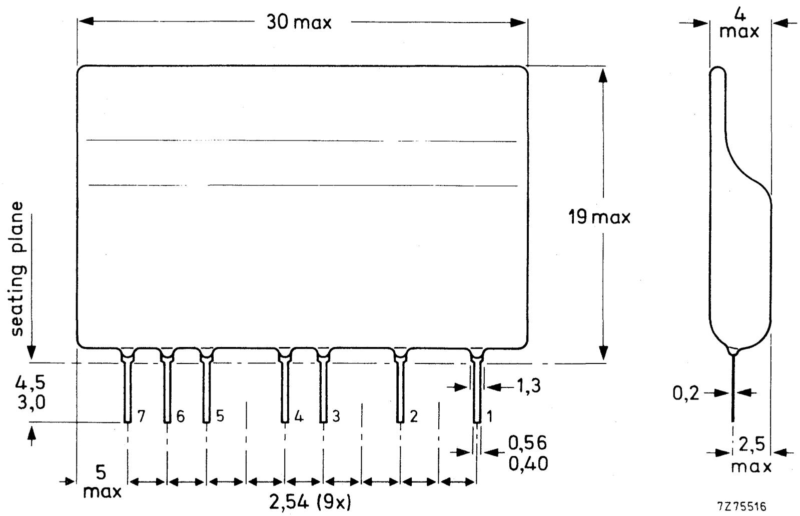


Fig. 2 Encapsulation.

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

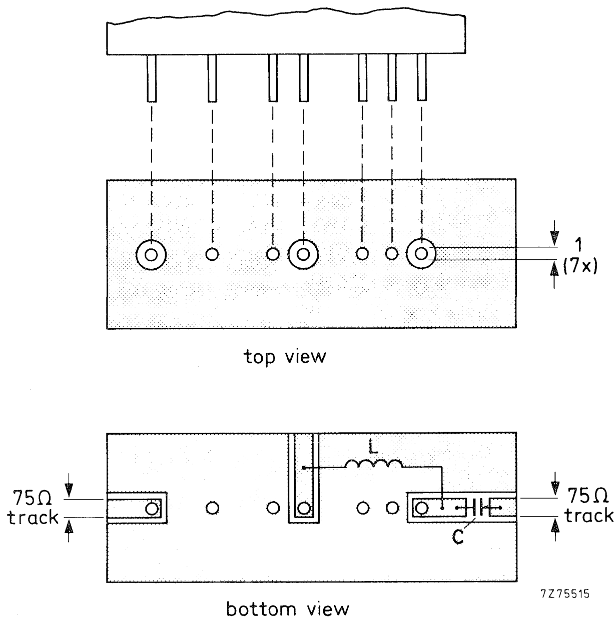
260 °C is the maximum permissible temperature of the solder; it must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds. The device may be mounted against the printed-circuit board, but the temperature of the device must 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.



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.

Fig. 3 Printed-circuit board holes and tracks.

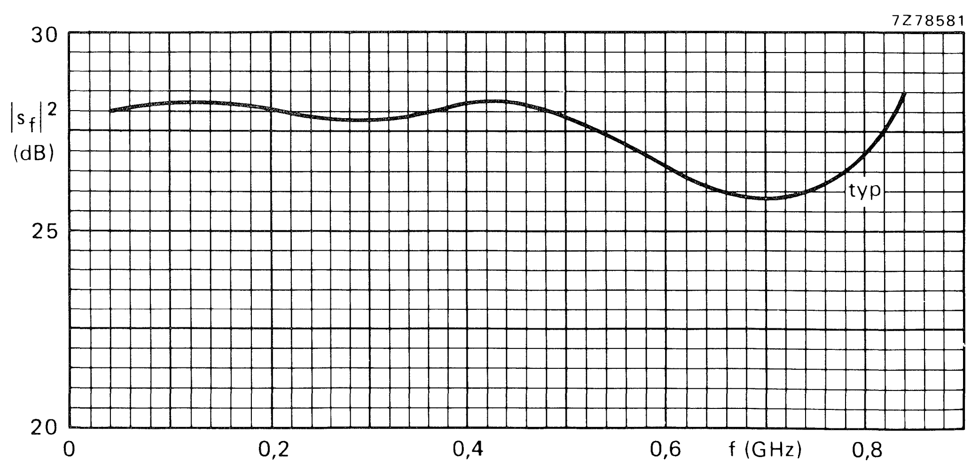


Fig. 4 Transducer gain as a function of frequency; Z_o = 75 Ω.

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 ± 10%
Frequency range	f		40 to 860	MHz
Source and load (characteristic) impedance	$R_s = R_\ell = Z_o$	=	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	dBμV
Noise figure	F	typ.	5,5	dB
Operating ambient temperature	T_{amb}		−20 to + 70	°C

ENCAPSULATION 5-pin, in-line, resin-coated body, see MECHANICAL DATA (Fig. 2)

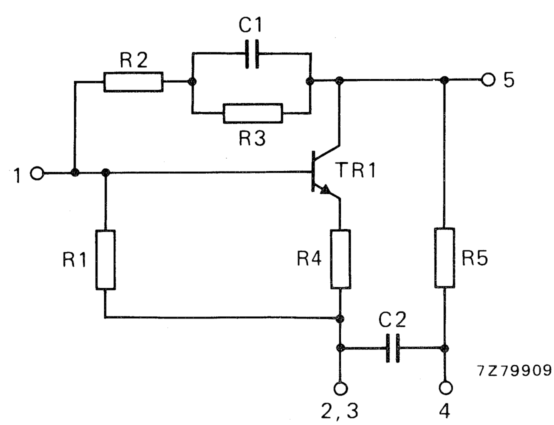


Fig. 1 Circuit diagram.

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_{I1M}, P_{I5M}	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	dBμV
Noise figure	F	typ.	5,5	dB

s-parameters: $s_f = s_{21}$ $s_i = s_{11}$
$s_r = s_{12}$ $s_o = s_{22}$

* Highest value, for a sample, occuring in the frequency range.

OPERATING CONDITIONS

Ambient temperature range	T_{amb}		−20 to + 70	°C
D.C. supply voltage	V_B	=	12	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

The device is resin coated.

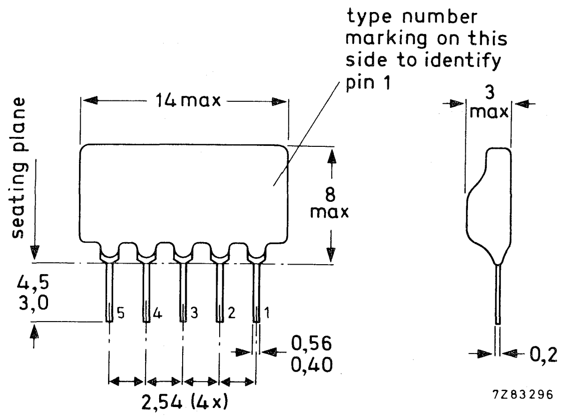


Fig. 2 Encapsulation.

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.

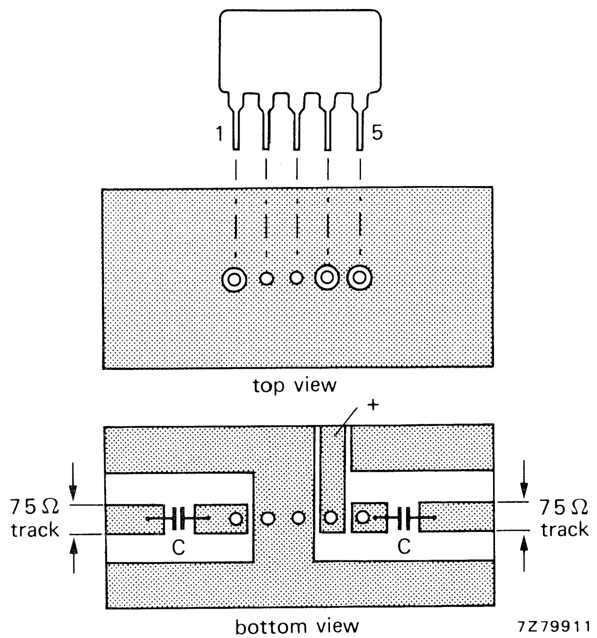


Fig. 3 Printed-circuit board holes and tracks.
C > 220 pF ceramic capacitor.

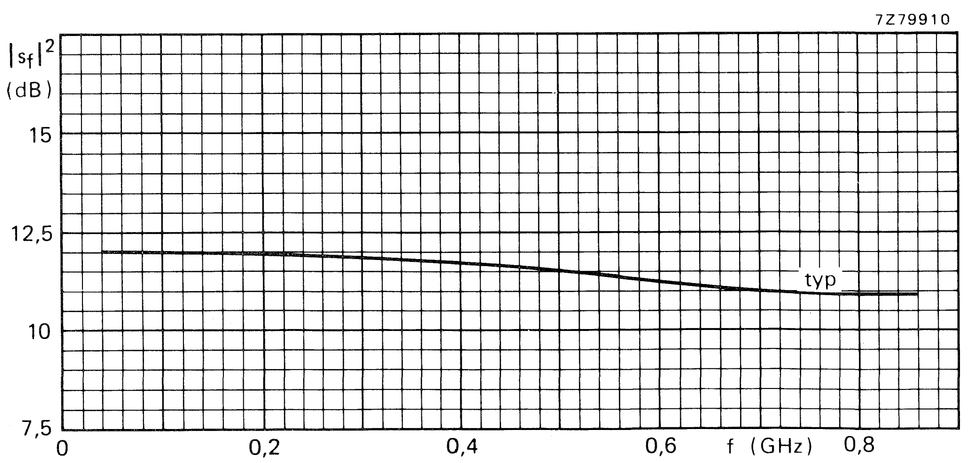


Fig. 4 Transducer gain as a function of frequency; $Z_o = 75\ \Omega$.

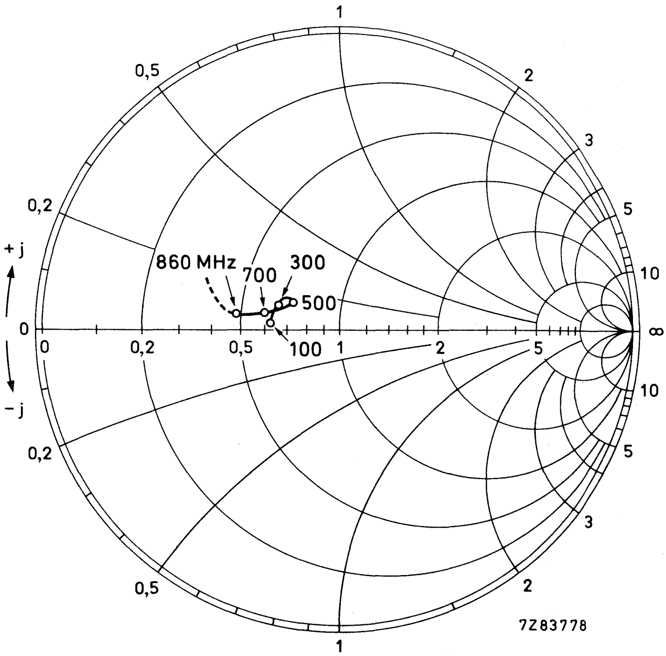


Fig. 5 Input impedance derived from input reflection coefficient s_i, co-ordinates in ohm x 75; typical values.

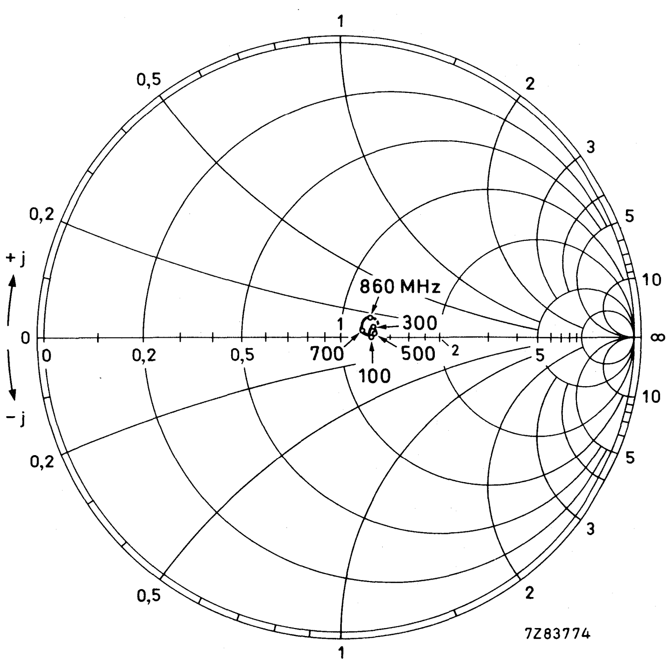


Fig. 6 Output impedance derived from output reflection coefficient s_o, co-ordinates in ohm x 75; typical values.

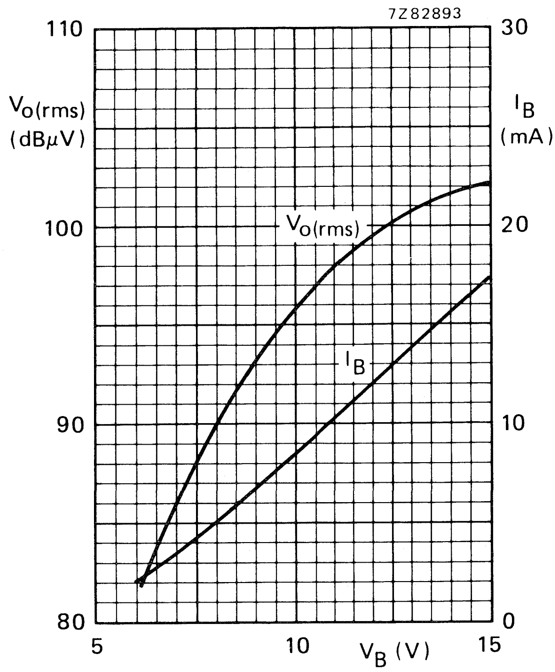


Fig. 7 Output voltage and supply current as a function of the supply voltage; typical values.

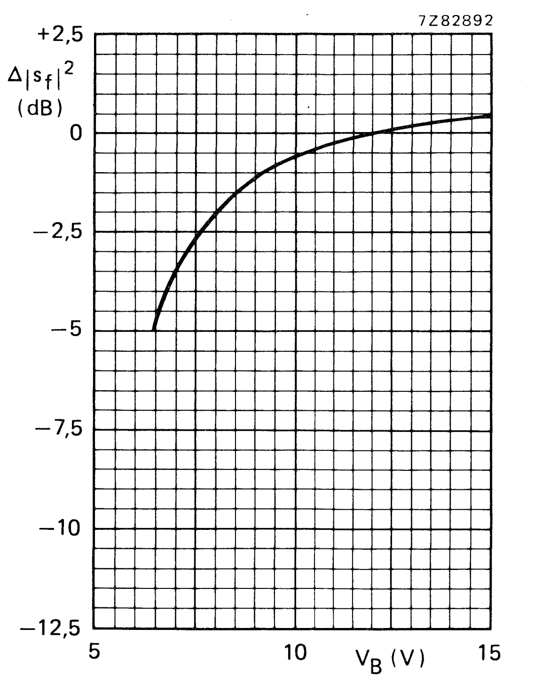


Fig. 8 Variation of transducer gain with supply voltage; reference 0 dB at 12 V; f = 100 to 860 MHz; typical values.

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 ± 10%
Frequency range	f		40 to 860	MHz
Source and load (characteristic) impedance	$R_s = R_\ell = Z_o$	=	75	Ω
Transducer gain	$G_{tr} = \lvert s_f \rvert^2$	typ.	18	dB
Flatness of frequency response	$\pm \Delta \lvert s_f \rvert^2$	typ.	1	dB
Output voltage at −60 dB intermodulation distortion (DIN 45004, 3-tone)	$V_{o(rms)}$	typ.	100	dBμV
Noise figure	F	typ.	6	dB
Operating ambient temperature	T_{amb}		−20 to +70	°C

ENCAPSULATION 5-pin, in-line, resin-coated body, see MECHANICAL DATA (Fig. 2)

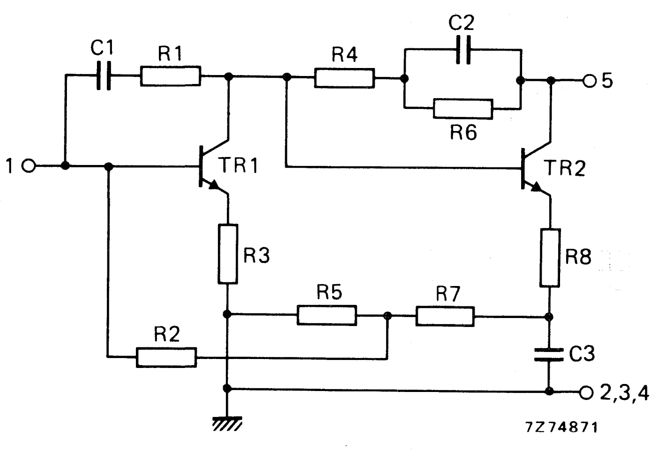


Fig. 1 Circuit diagram.

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_{I1M}, P_{I5M}	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.	18	mA
Transducer gain	$G_{tr} = \lvert s_f \rvert^2$	typ.	18	dB
Flatness of frequency response	$\pm \Delta \lvert s_f \rvert^2$	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	$\lvert s_r \rvert^2$	typ.	29	dB
f = 860 MHz	$\lvert s_r \rvert^2$	typ.	25	dB
Output voltage at −60 dB intermodulation distortion (DIN 45004, par. 6.3: 3-tone)	$V_{o(rms)}$	typ.	100	dBμV
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, occuring in the frequency range.

OPERATING CONDITIONS

Ambient temperature range	T_{amb}	−20 to + 70 °C
D.C. supply voltage	V_B	= 12 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

The device is resin coated.

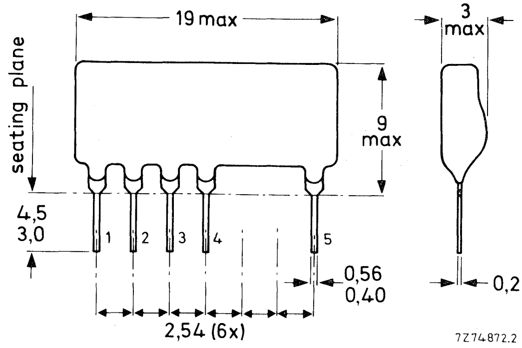


Fig. 2 Encapsulation.

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

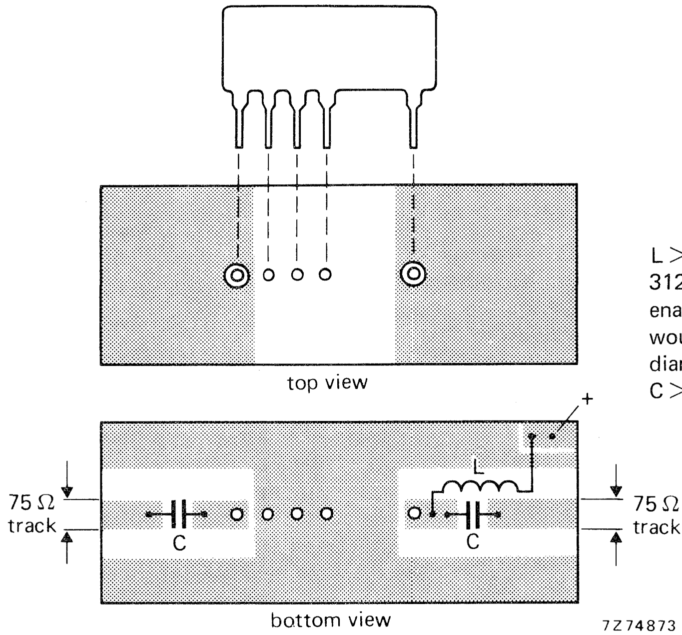
260 °C is the maximum permissible temperature of the solder; it must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds. The device may be mounted against the printed-circuit board, but the temperature of the device must 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.



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.

Fig. 3 Printed-circuit board holes and tracks.

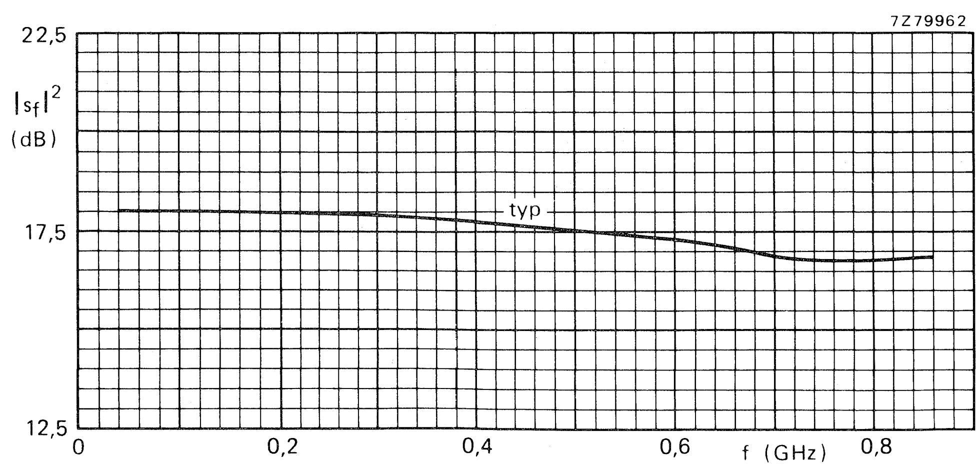


Fig. 4 Transducer gain as a function of frequency; Z_o = 75 Ω.

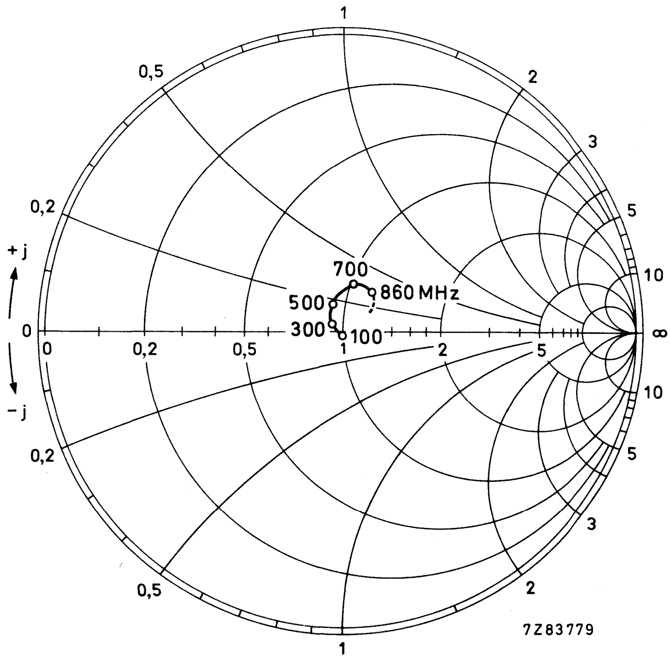


Fig. 5 Input impedance derived from input reflection coefficient s_i, co-ordinates in ohm x 75; typical values.

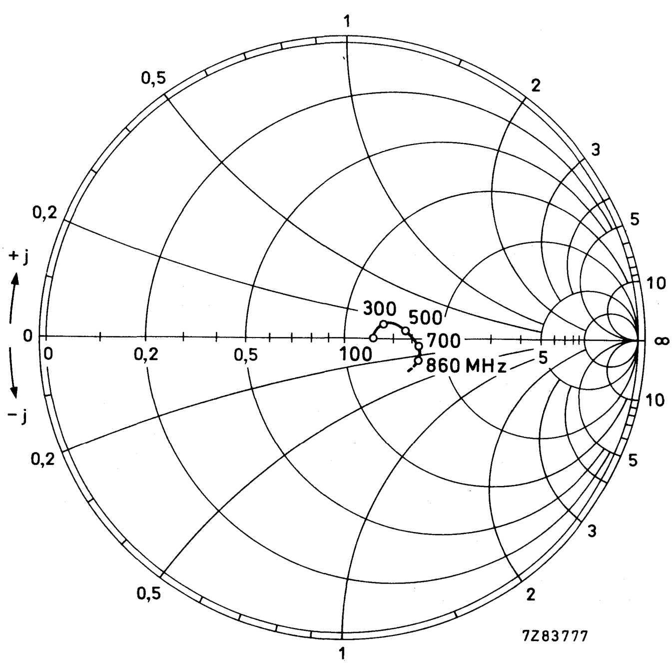


Fig. 6 Output impedance derived from output reflection coefficient s_o, co-ordinates in ohm x 75; typical values.

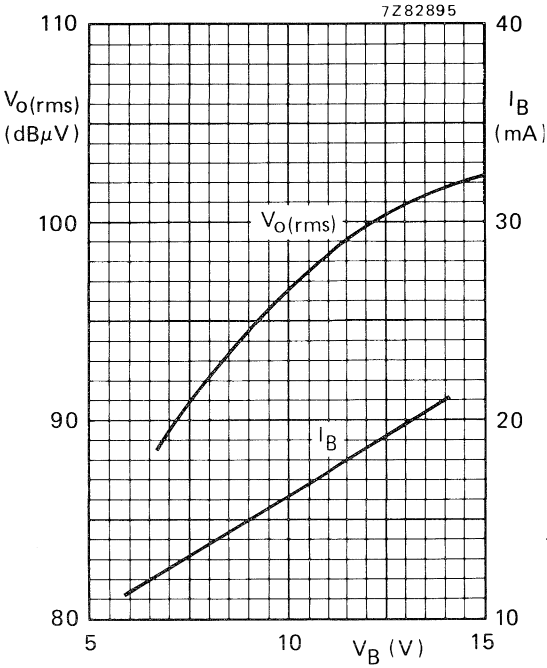


Fig. 7 Output voltage and supply current as a function of the supply voltage; typical values.

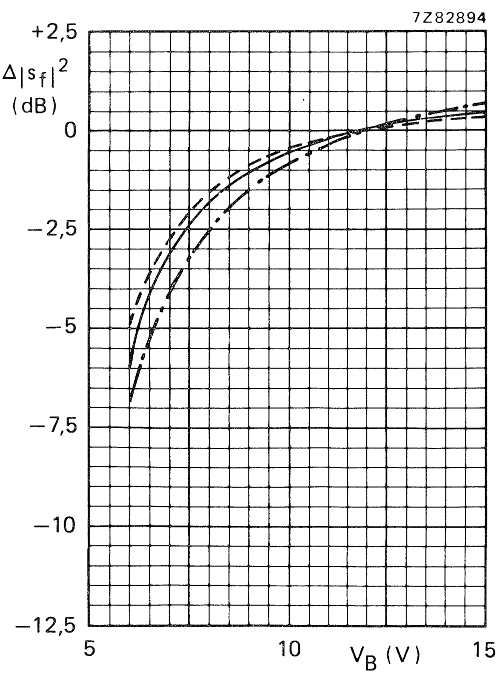


Fig. 8 Variation of transducer gain with supply voltage; reference 0 dB at 12 V:
——— f = 500 MHz;
– – – – f = 100 MHz;
—·—·—· f = 860 MHz;
typical values.

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	$R_s = R_\ell = Z_o$	=	75	Ω
Transducer gain	$G_{tr} = \lvert s_f \rvert^2$	typ.	23	dB
Flatness of frequency response	$\pm\Delta\lvert s_f \rvert^2$	typ.	0,5	dB
Output voltage at −60 dB intermodulation distortion (DIN 45004, 3-tone)	$V_{o(rms)}$	>	105	dBμV
Noise figure	F	typ.	7	dB
D.C. supply voltage	V_B	=	12	V ± 10%
Operating ambient temperature	T_{amb}		−20 to +70	°C

ENCAPSULATION 8-pin, in-line, resin-coated body, see MECHANICAL DATA (Fig. 2)

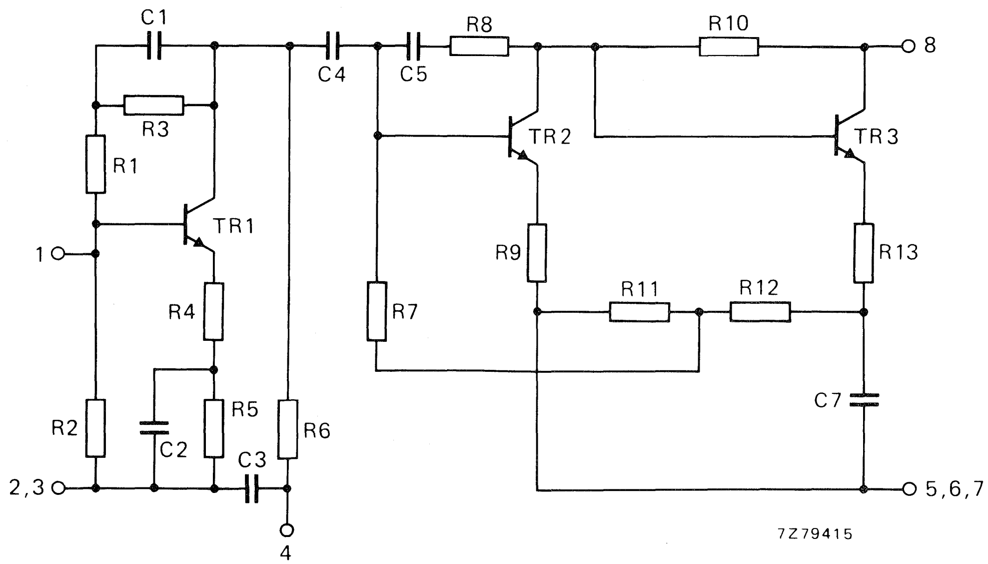


Fig. 1 Circuit diagram.

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_{I1M}, P_{I7M}	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.	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	dBμV
		typ.	107	dBμV
Noise figure	F	typ.	7	dB

s-parameters:	$s_f = s_{21}$	$s_i = s_{11}$
	$s_r = s_{12}$	$s_o = s_{22}$

* 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 ± 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.

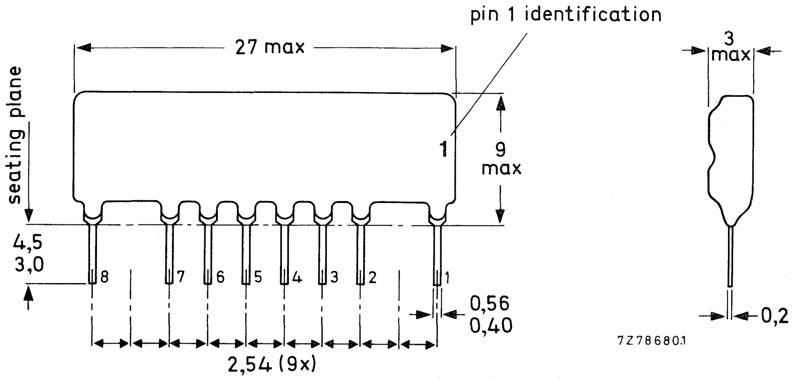


Fig. 2 Encapsulation.

Terminal connections

1 = input
2, 3, 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

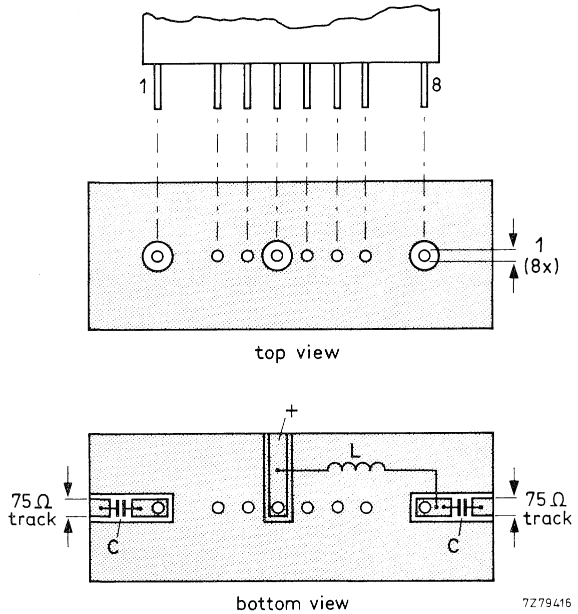
260 °C is the maximum permissible temperature of the solder; it must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds. The device may be mounted against the printed-circuit board, but the temperature of the device must 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 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.

Fig. 3 Printed-circuit board holes and tracks.

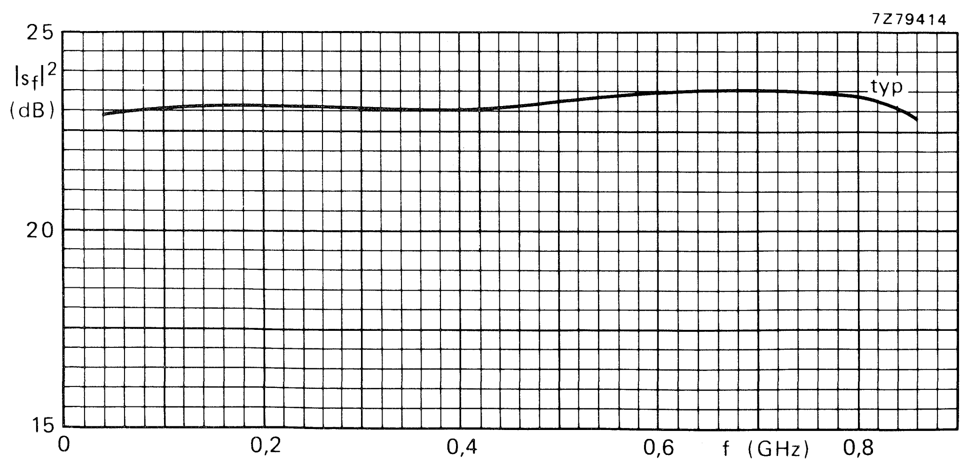


Fig. 4 Transducer gain as a function of frequency; Z_o = 75 Ω.

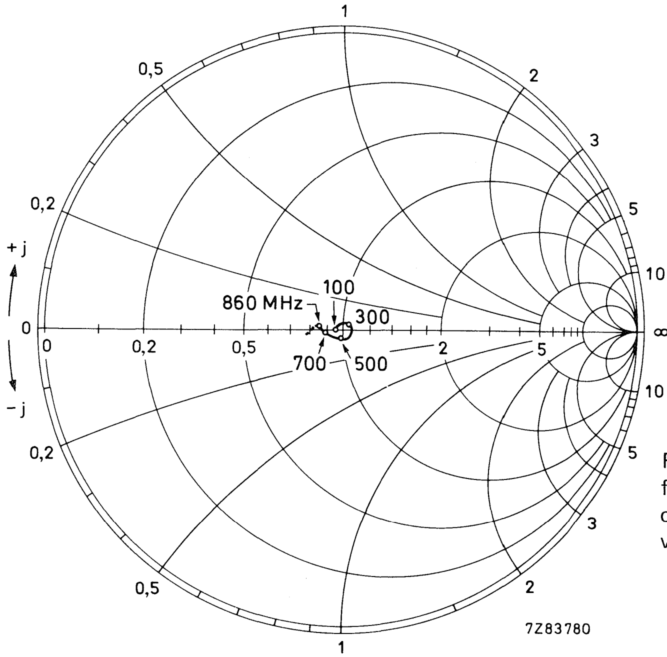


Fig. 5 Input impedance derived from input reflection coefficient s_i, co-ordinates in ohm x 75; typical values.

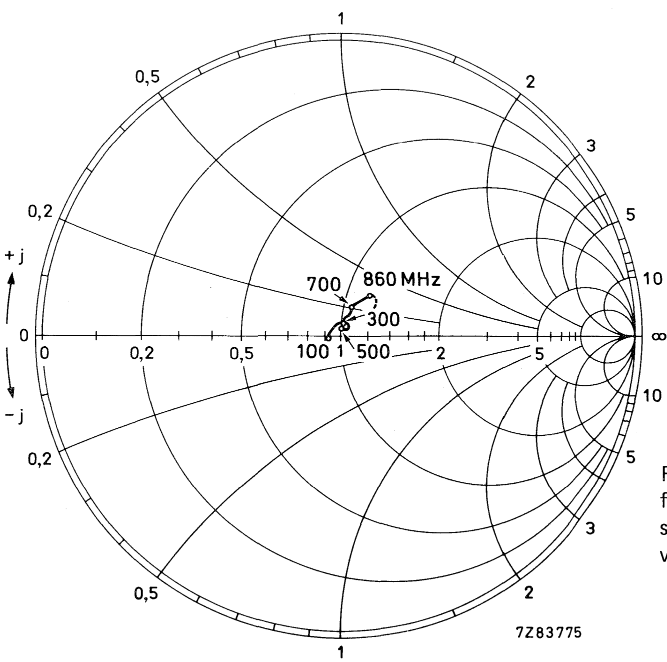


Fig. 6 Output impedance derived from output reflection coefficient s_o, co-ordinates in ohm x 75; typical values.

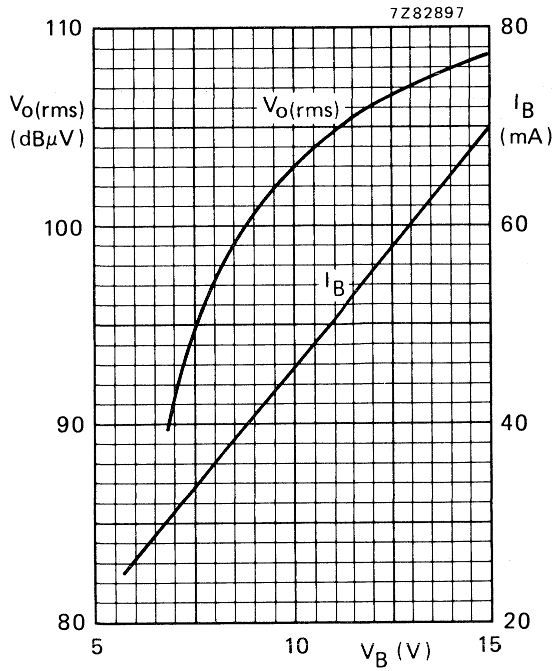


Fig. 7 Output voltage and supply current as a function of the supply voltage; typical values.

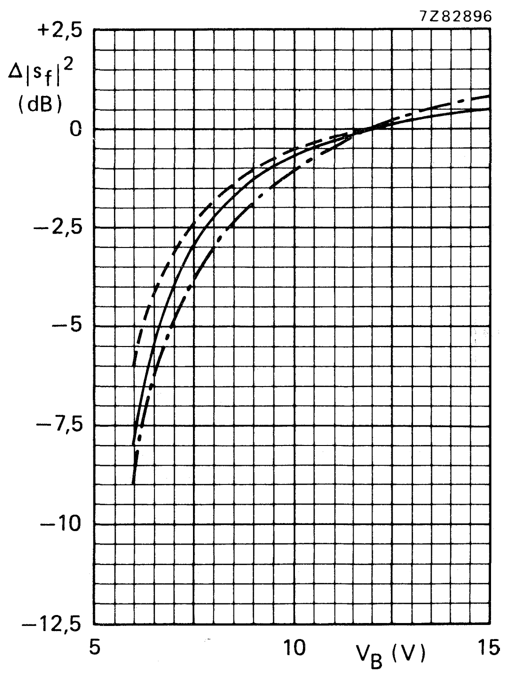


Fig. 8 Variation of transducer gain with supply voltage; reference 0 dB at 12 V;
——— f = 500 MHz;
– – – – f = 100 MHz;
—.—.— f = 860 MHz;
typical values.

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 an 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	$R_s = R_\ell = Z_o$	=	75	Ω
Transducer gain	$G_{tr} = \|s_f\|^2$	typ.	28	dB
Flatness of frequency response	$\pm\Delta\|s_f\|^2$	typ.	1	dB
Output voltage at −60 dB intermodulation distortion (DIN 45004, 3-tone)	$V_{o(rms)}$	>	105	dBμV
Noise figure	F	typ.	6	dB
D.C. supply voltage	V_B	=	12	V ± 10%
Operating ambient temperature	T_{amb}		−20 to +70	°C

ENCAPSULATION 8-pin, in-line, resin-coated body, see MECHANICAL DATA (Fig. 2)

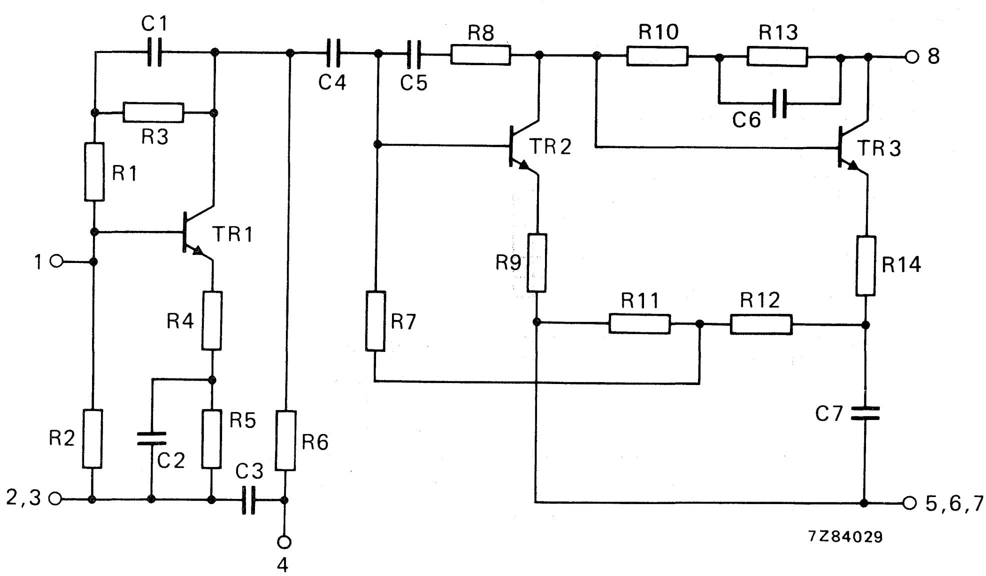


Fig. 1 Circuit diagram.

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 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.	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)	$V_{o(rms)}$	>	105	dBμV
		typ.	107	dBμV
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 ± 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.

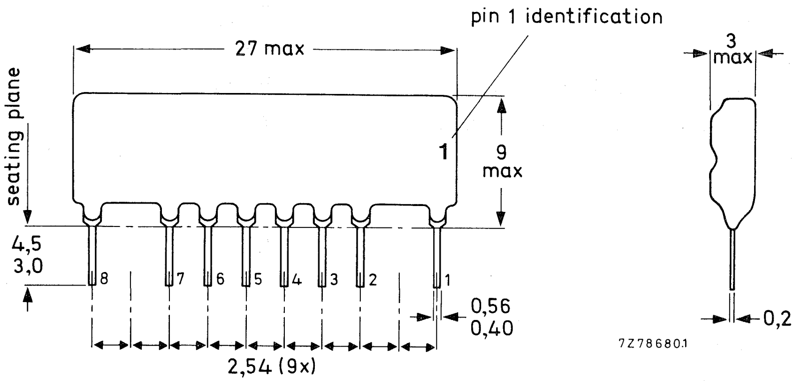


Fig. 2 Encapsulation.

Terminal connections

1	= input
2, 3, 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

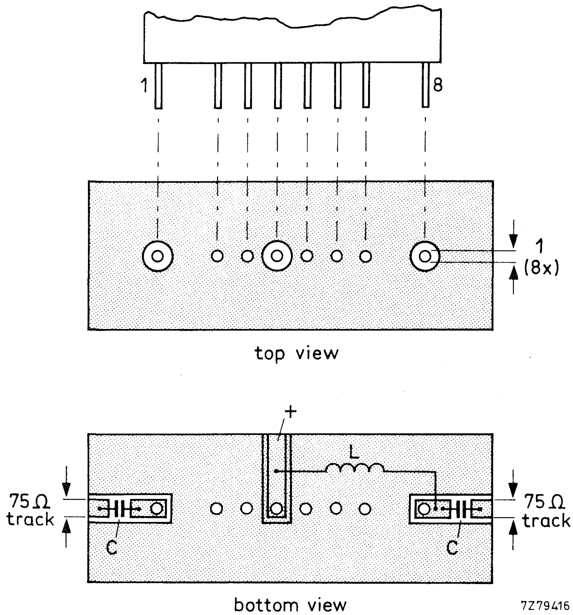
260 °C is the maximum permissible temperature of the solder; it must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds. The device may be mounted against the printed-circuit board, but the temperature of the device must 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 μH; 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 pF ceramic capacitor.

Fig. 3 Printed-circuit board holes and tracks.

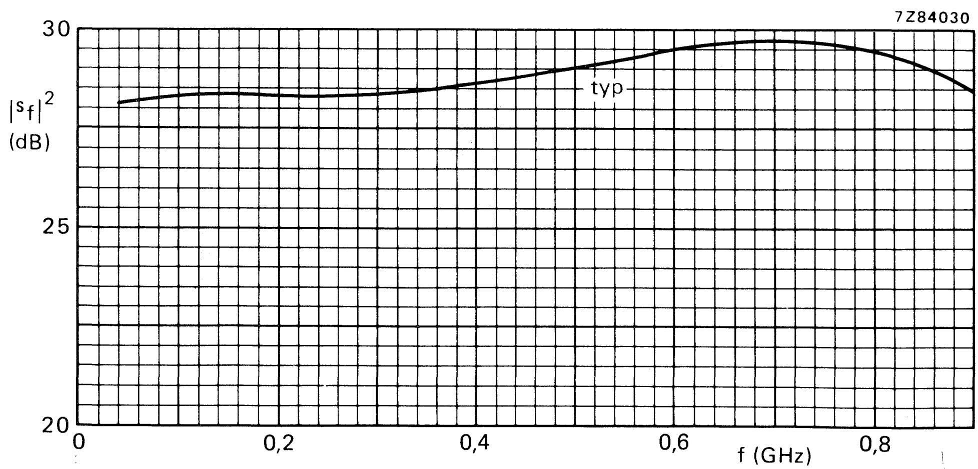


Fig. 4 Transducer gain as a function of frequency; $Z_o = 75\ \Omega$.

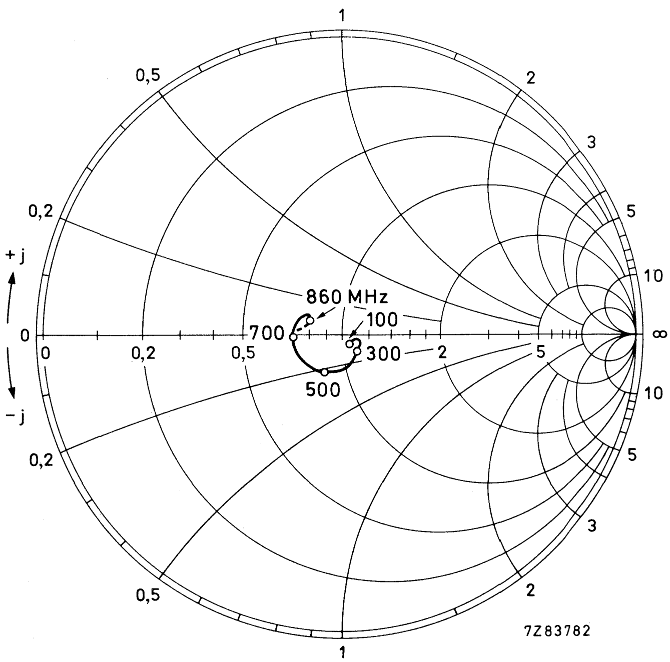


Fig. 5 Input impedance derived from input reflection coefficient s_i, co-ordinates in ohm x 75; typical values.

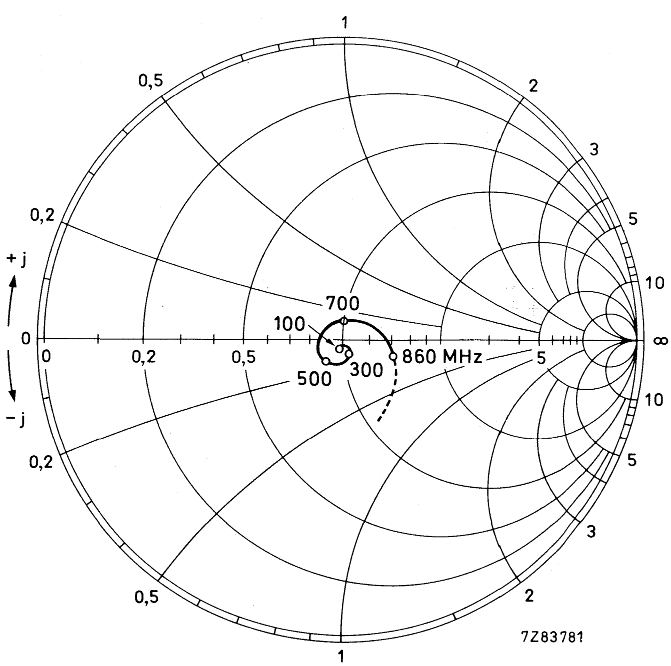


Fig. 6 Output impedance derived from output reflection coefficient s_o, co-ordinates in ohm x 75; typical values.

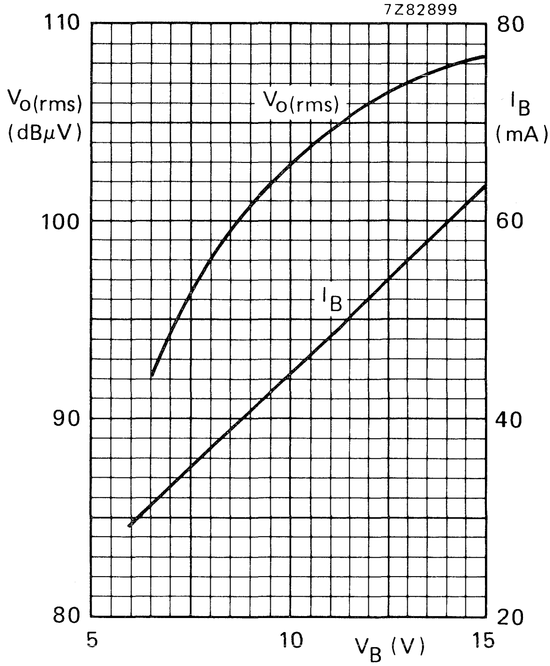


Fig. 7 Output voltage and supply current as a function of the supply voltage; typical values.

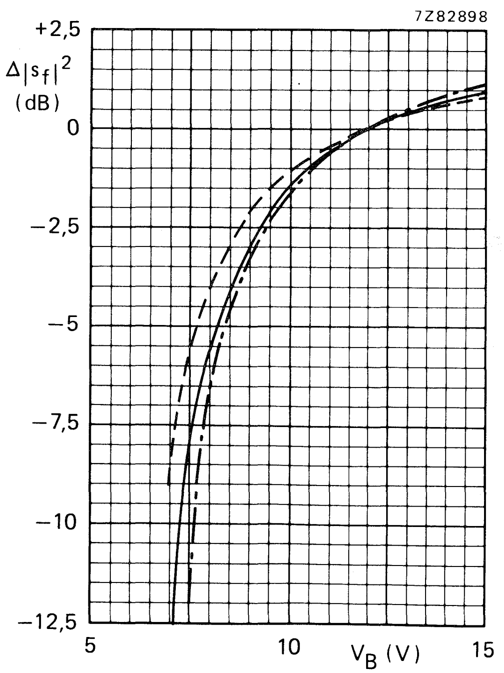


Fig. 8 Variation of transducer gain with supply voltage; reference 0 dB at 12 V;
——— f = 500 MHz;
– – – – f = 100 MHz;
—·—·—· f = 860 MHz;
typical values.

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 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	$R_s = R_\ell = Z_o$	=	75	Ω
Transducer gain	$G_{tr} = \|s_f\|^2$	typ.	28	dB
Flatness of frequency response	$\pm\Delta\|s_f\|^2$	typ.	1	dB
Output voltage at −60 dB intermodulation distortion (DIN 45004, 3-tone)				
VHF	$V_{o(rms)}$	typ.	113	dBμV
UHF	$V_{o(rms)}$	typ.	112	dBμV
Noise figure	F	typ.	7	dB
D.C. supply voltage	V_B	=	12	V ± 10%
Operating ambient temperature	T_{amb}		−20 to +70	°C

ENCAPSULATION 9-pin, in-line, resin-coated body, see MECHANICAL DATA (Fig.2)

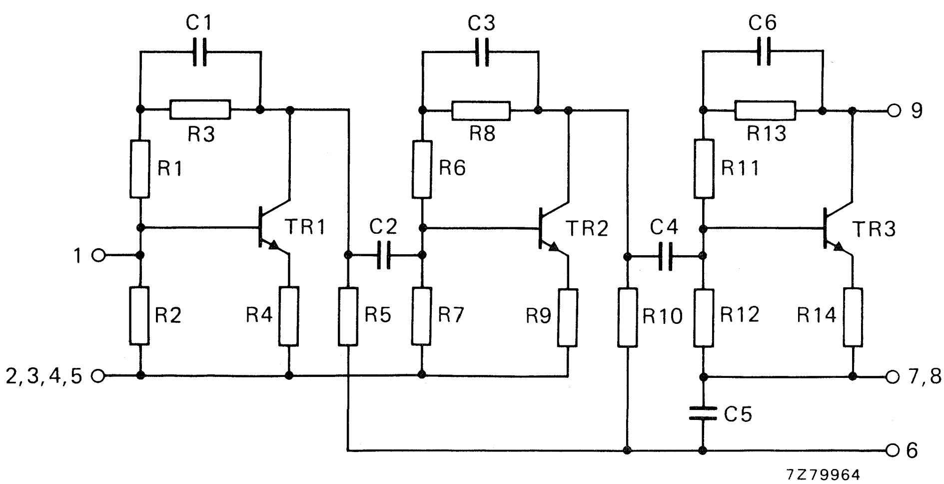


Fig. 1 Circuit diagram.

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	$V_{o(rms)}$	>	111	dBμV
		typ.	113	dBμV
UHF	$V_{o(rms)}$	>	110	dBμV
		typ.	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	T_{amb}		−20 to +70	°C
D.C. supply voltage	V_B	=	12	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

The device is resin coated.

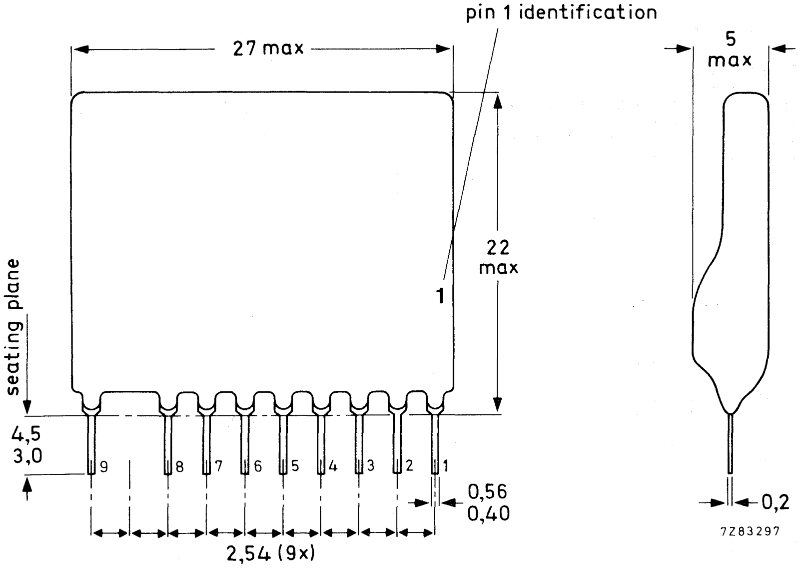


Fig. 2 Encapsulation.

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

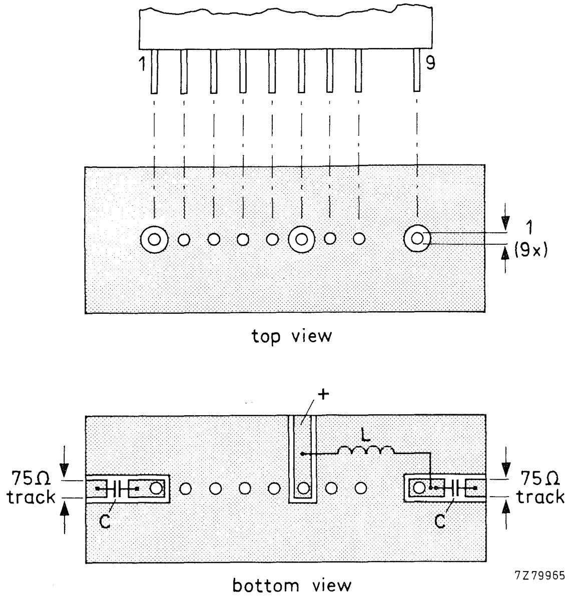
260 °C is the maximum permissible temperature of the solder; it must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds. The device may be mounted against the printed-circuit board, but the temperature of the device must 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 μH; 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 pF ceramic capacitor.

Fig. 3 Printed-circuit board holes and tracks.

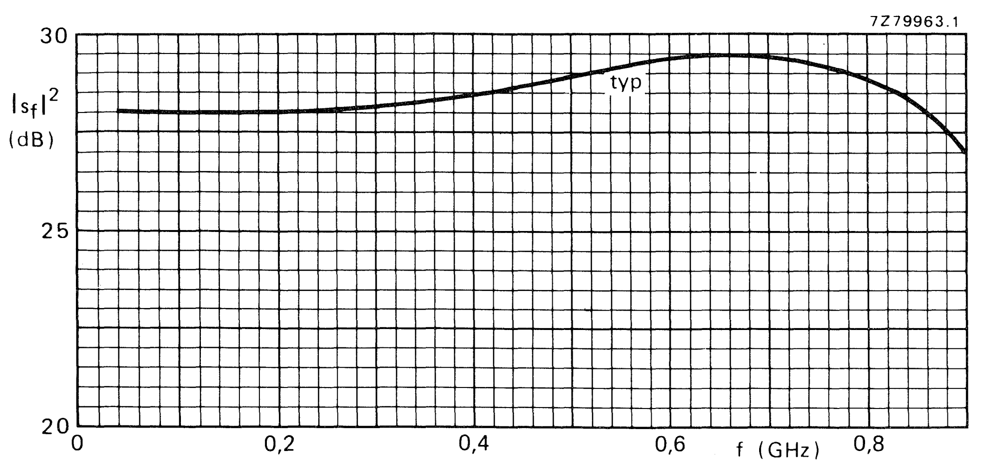


Fig. 4 Transducer gain as a function of frequency; Z_o = 75 Ω.

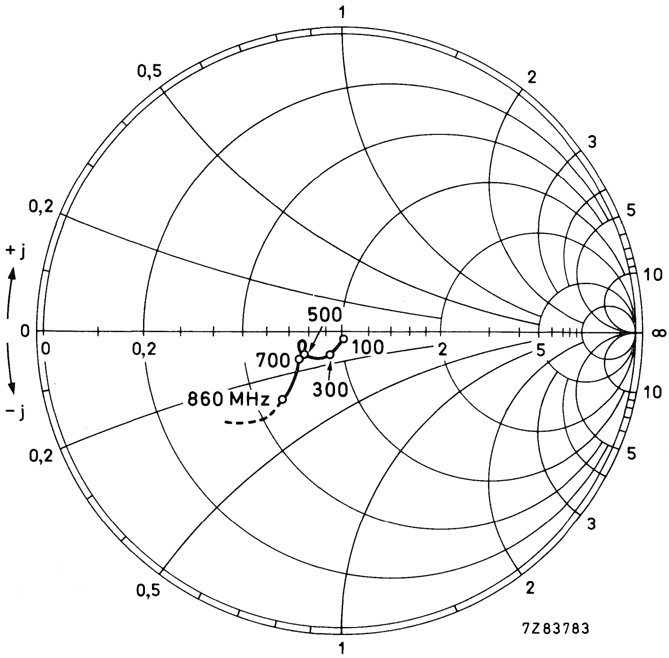


Fig. 5 Input impedance derived from input reflection coefficient s_i, co-ordinates in ohm x 75; typical values.

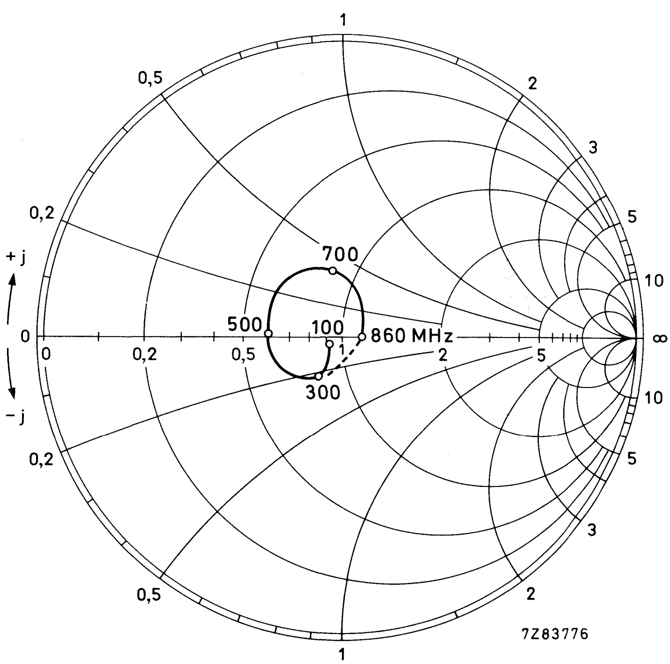


Fig. 6 Output impedance derived from output reflection coefficient s_o, co-ordinates in ohm x 75; typical values.

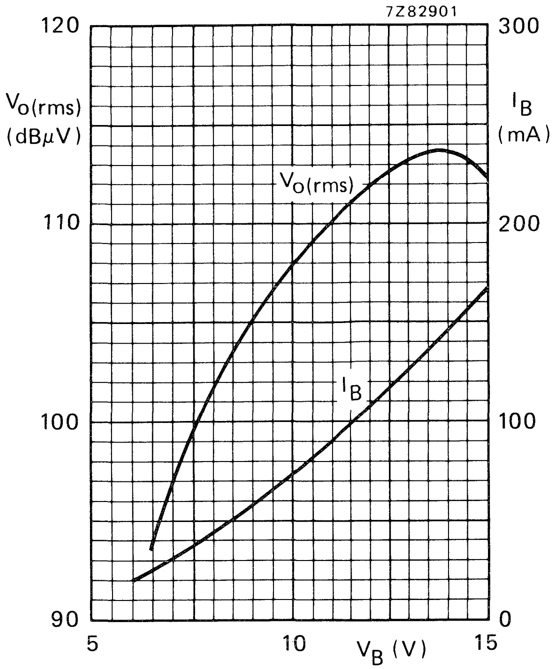


Fig. 7 Output voltage and supply current as a function of the supply voltage; typical values.

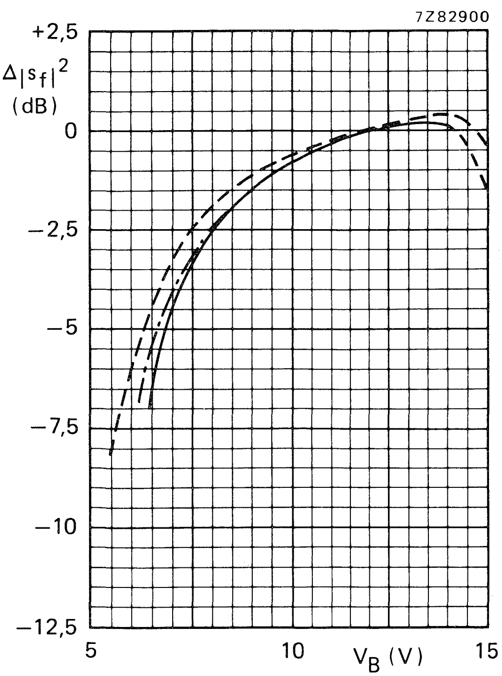


Fig. 8 Variation of transducer gain with supply voltage; reference 0 dB at 12 V;
——— f = 500 MHz;
– – – – f = 100 MHz;
—.—.—. f = 860 MHz;
typical values.

HYBRID INTEGRATED CIRCUIT VHF/UHF WIDE-BAND AMPLIFIER

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 ± 10%
Frequency range	f		40 to 860	MHz
Source and load (characteristic) impedance	$R_s = R_\ell = Z_o$	=	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	dBμV
Noise figure	F	typ.	3,6	dB
Operating ambient temperature	T_{amb}		−20 to + 70	°C

ENCAPSULATION 5-pin, in-line, resin-coated body, see MECHANICAL DATA (Fig. 2)

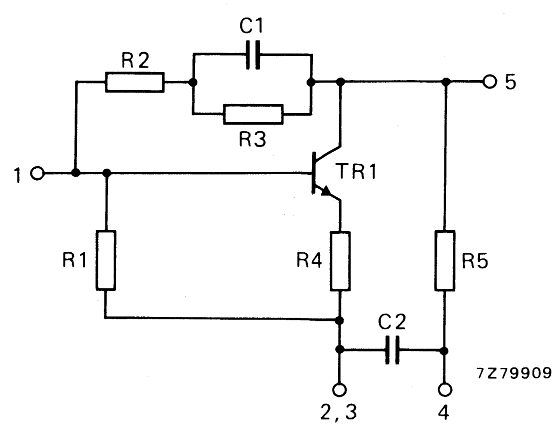


Fig. 1 Circuit diagram.

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_{I1M}, P_{I5M}	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	dBμV
Noise figure	F	typ.	3,6	dB

s-parameters: $s_f = s_{21}$ $s_i = s_{11}$
$s_r = s_{12}$ $s_o = s_{22}$

* Highest value, for a sample, occuring in the frequency range.

OPERATING CONDITIONS

Ambient temperature range	T_{amb}		−20 to + 70 °C
D.C. supply voltage	V_B	=	12 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

The device is resin coated.

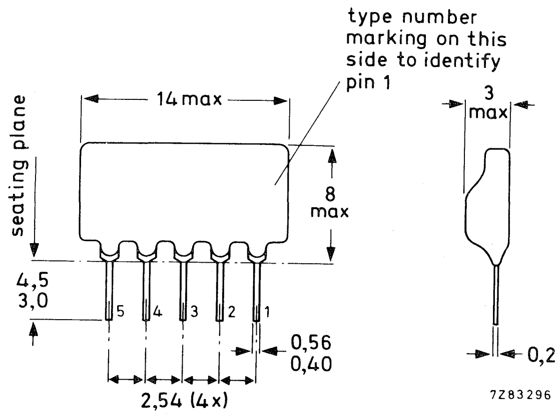


Fig. 2 Encapsulation.

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.

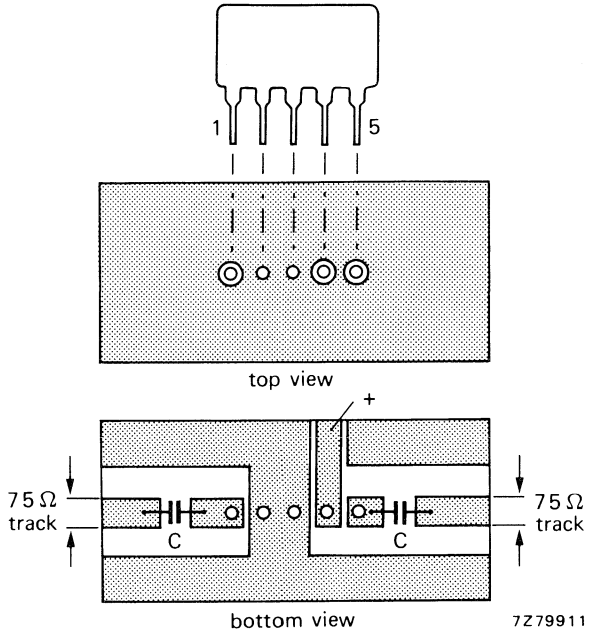


Fig. 3 Printed-circuit board holes and tracks.
C > 220 pF ceramic capacitor.

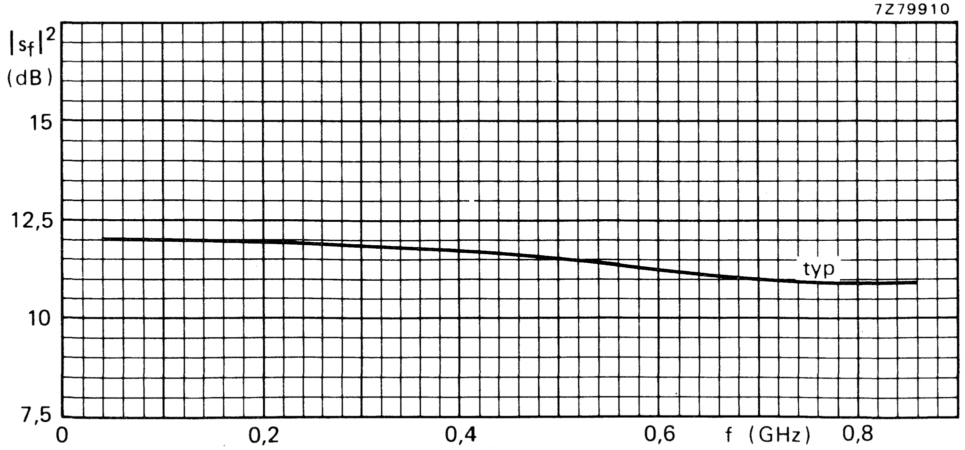


Fig. 4 Transducer gain as a function of frequency; Z_o = 75 Ω.

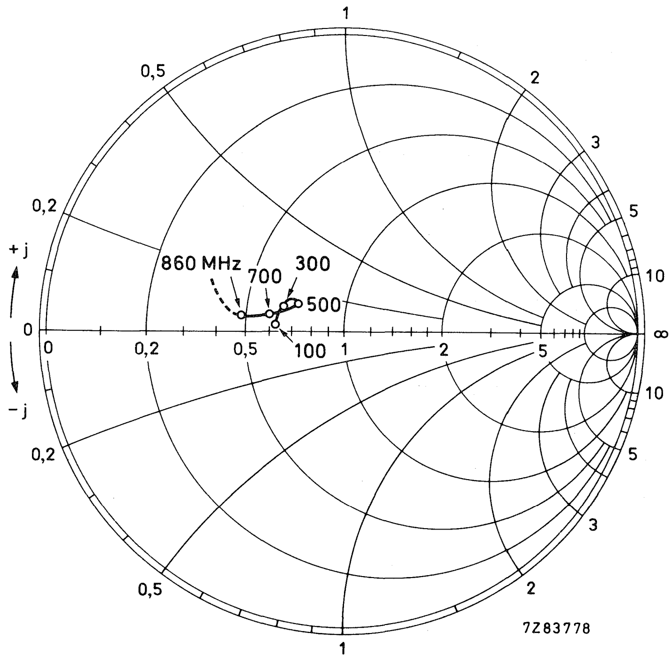


Fig. 5 Input impedance derived from input reflection coefficient s_i, co-ordinates in ohm x 75; typical values.

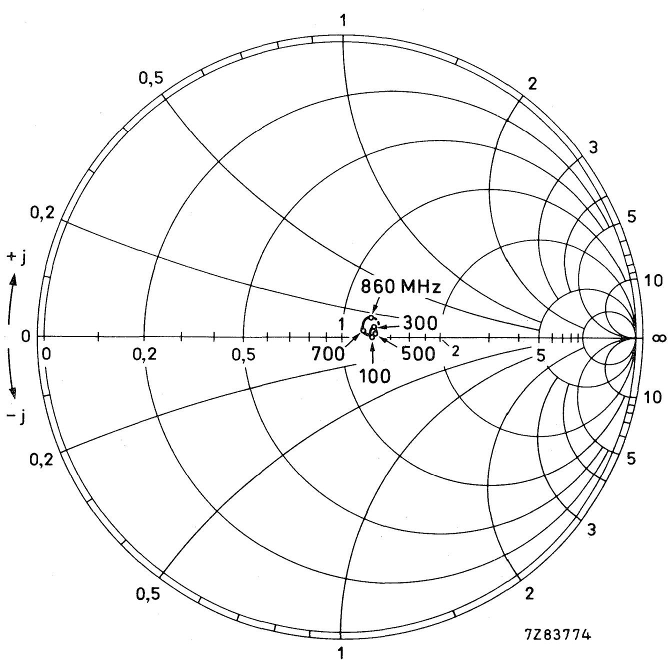


Fig. 6 Output impedance derived from output reflection coefficient s_o, co-ordinates in ohm x 75; typical values.

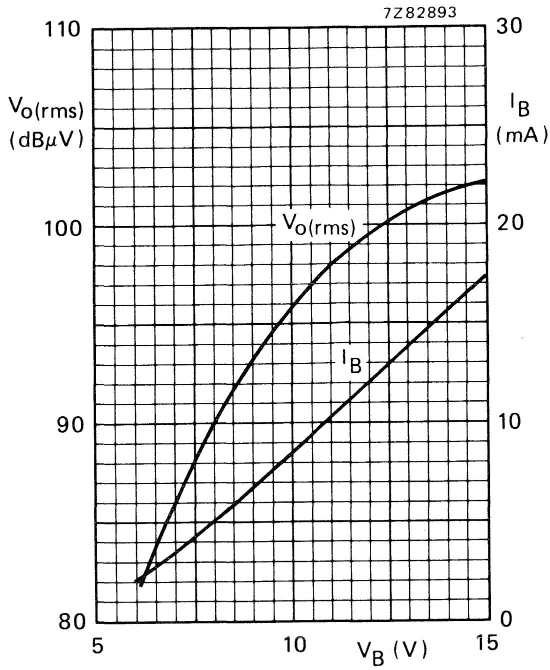


Fig. 7 Output voltage and supply current as a function of the supply voltage; typical values.

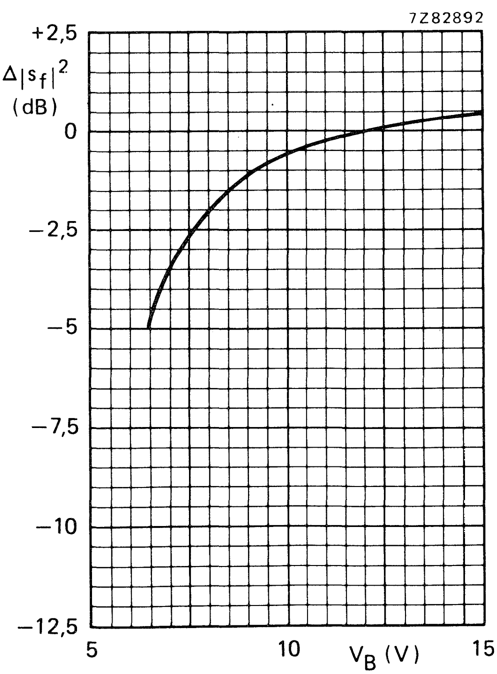


Fig. 8 Variation of transducer gain with supply voltage; reference 0 dB at 12 V; f = 100 to 860 MHz; typical values.

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 ± 10%
Frequency range	f		40 to 860	MHz
Source and load (characteristic) impedance	$R_s = R_\ell = Z_o$	=	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	dBμV
Noise figure	F	typ.	5,2	dB
Operating ambient temperature	T_{amb}		−20 to +70	°C

ENCAPSULATION 5-pin, in-line, resin-coated body, see MECHANICAL DATA (Fig. 2)

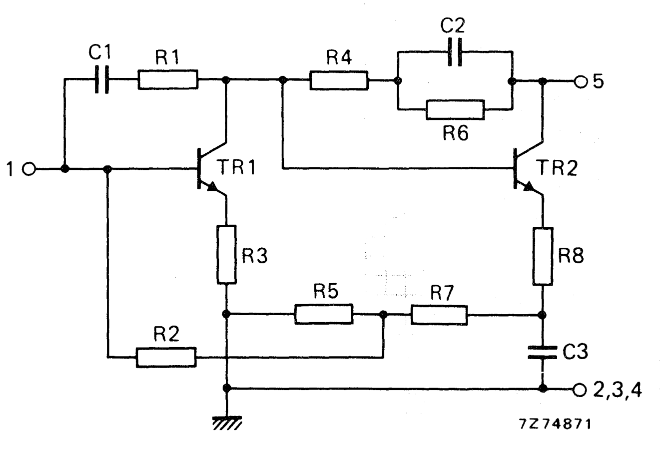


Fig. 1 Circuit diagram.

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_{I1M}, P_{I5M}	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.	18	mA
Transducer gain	$G_{tr} = \lvert s_f \rvert^2$	typ.	18	dB
Flatness of frequency response	$\pm\Delta \lvert s_f \rvert^2$	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	$\lvert s_r \rvert^2$	typ.	29	dB
f = 860 MHz	$\lvert s_r \rvert^2$	typ.	25	dB
Output voltage at −60 dB intermodulation distortion (DIN 45004, par. 6.3: 3-tone)	$V_{o(rms)}$	typ.	100	dBμV
Noise figure	F	typ.	5,2	dB

s-parameters: $s_f = s_{21}$ $s_i = s_{11}$

$s_r = s_{12}$ $s_o = s_{22}$

* Highest value, for a sample, occuring in the frequency range.

OPERATING CONDITIONS

Ambient temperature range	T_{amb}	−20 to + 70 °C
D.C. supply voltage	V_B	= 12 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

The device is resin coated.

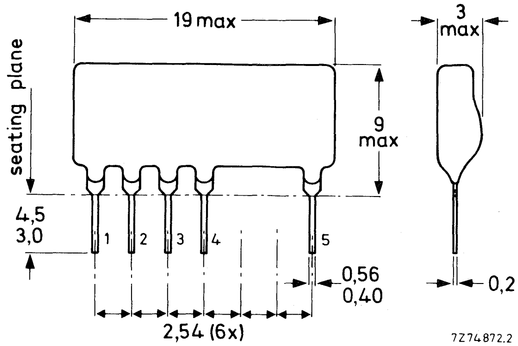


Fig. 2 Encapsulation.

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

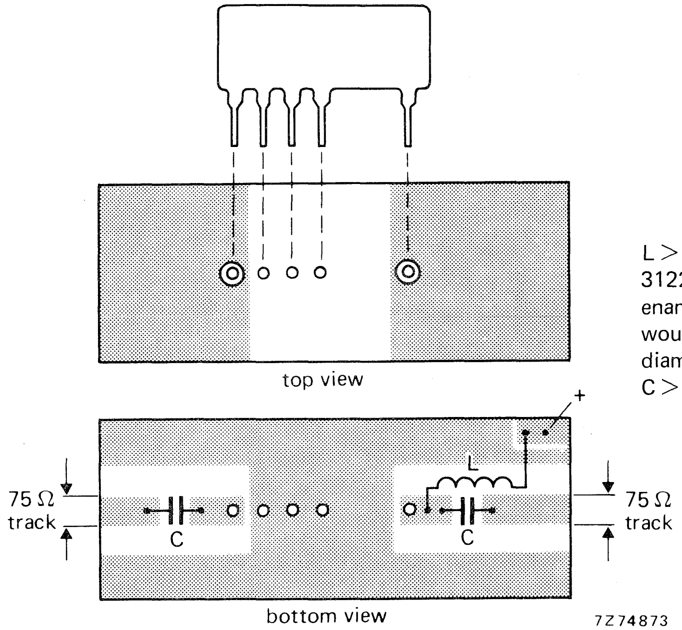
260 °C is the maximum permissible temperature of the solder; it must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds. The device may be mounted against the printed-circuit board, but the temperature of the device must 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.



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.

Fig. 3 Printed-circuit board holes and tracks.

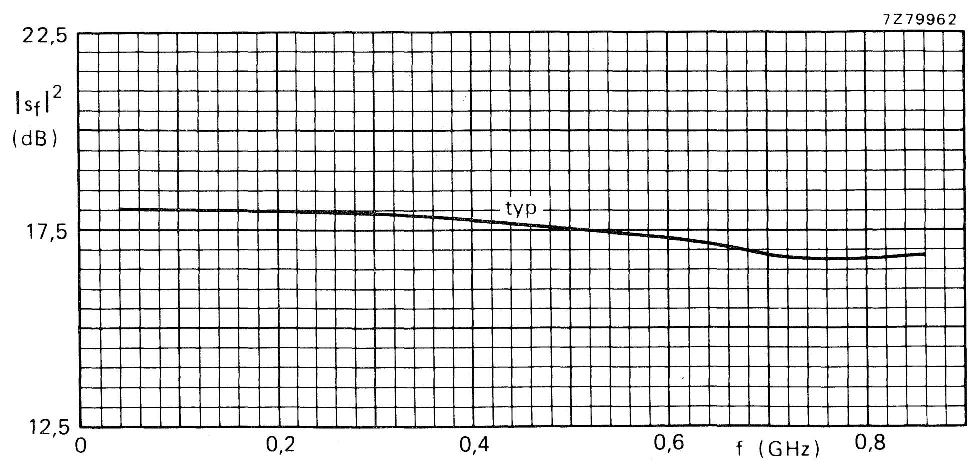


Fig. 4 Transducer gain as a function of frequency; Z_o = 75 Ω.

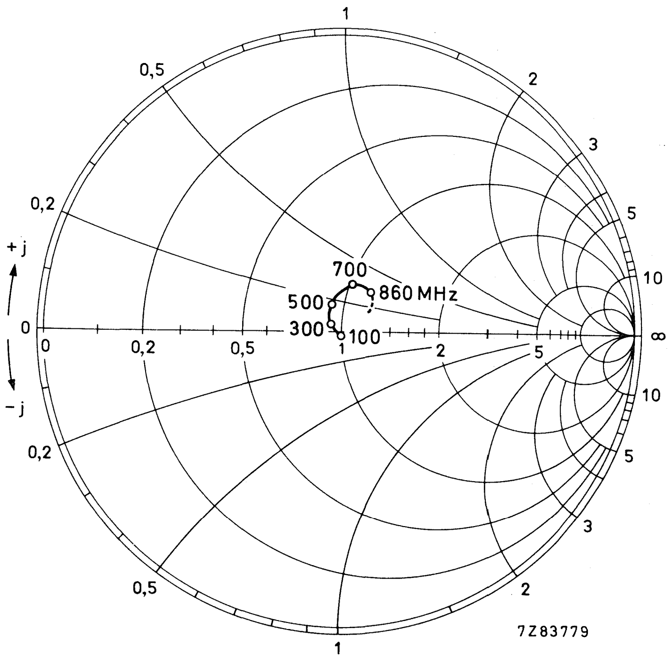


Fig. 5 Input impedance derived from input reflection coefficient s_i, co-ordinates in ohm x 75; typical values.

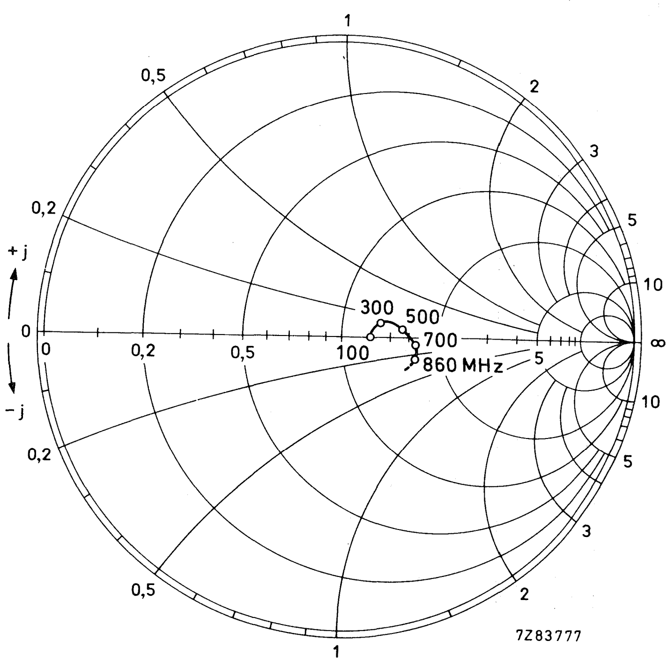


Fig. 6 Output impedance derived from output reflection coefficient s_o, co-ordinates in ohm x 75; typical values.

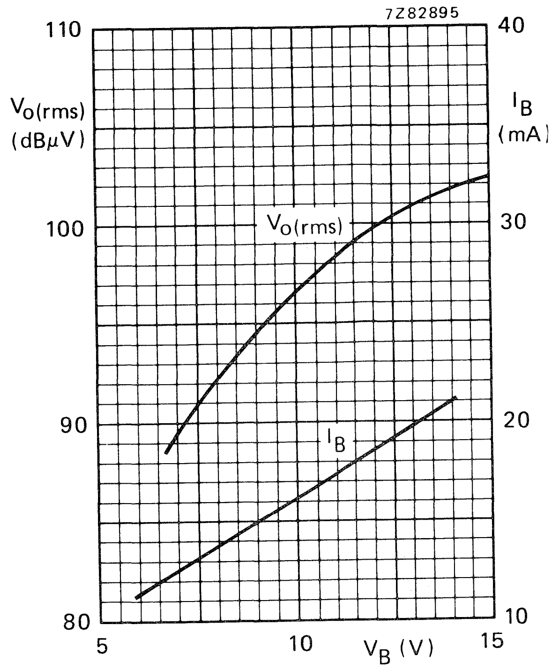


Fig. 7 Output voltage and supply current as a function of the supply voltage; typical values.

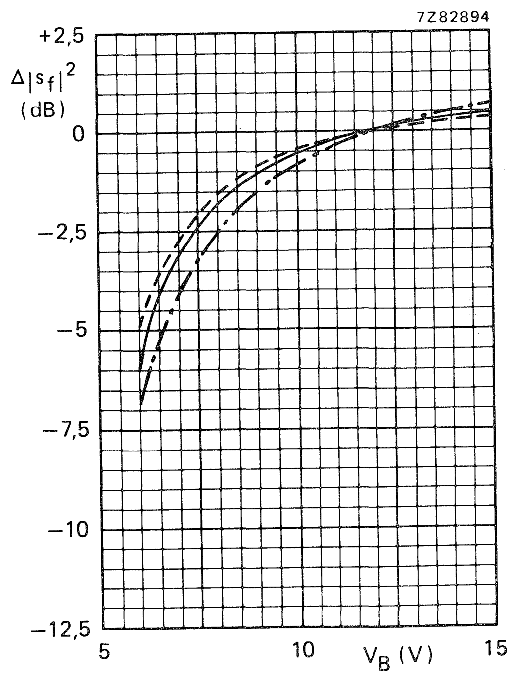


Fig. 8 Variation of transducer gain with supply voltage; reference 0 dB at 12 V:
——— f = 500 MHz;
– – – – f = 100 MHz;
—.—.—. f = 860 MHz;
typical values.

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	$R_s = R_\ell = Z_o$	=	75	Ω
Transducer gain	$G_{tr} = \lvert s_f \rvert^2$	typ.	23	dB
Flatness of frequency response	$\pm\Delta\lvert s_f \rvert^2$	typ.	0,5	dB
Output voltage at −60 dB intermodulation distortion (DIN 45004, 3-tone)	$V_{o(rms)}$	>	105	dBμV
Noise figure	F	typ.	5,4	dB
D.C. supply voltage	V_B	=	12	V ± 10%
Operating ambient temperature	T_{amb}		−20 to +70	°C

ENCAPSULATION 8-pin, in-line, resin-coated body, see MECHANICAL DATA (Fig. 2)

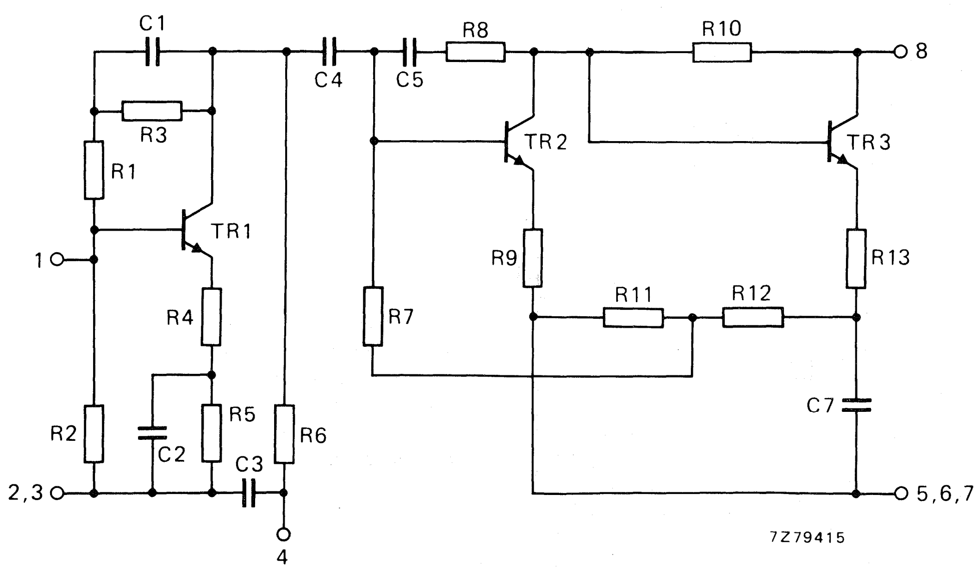


Fig. 1 Circuit diagram.

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_{I1M}, P_{I7M}	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.	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	dBμV
		typ.	107	dBμV
Noise figure	F	typ.	5,4	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 ± 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.

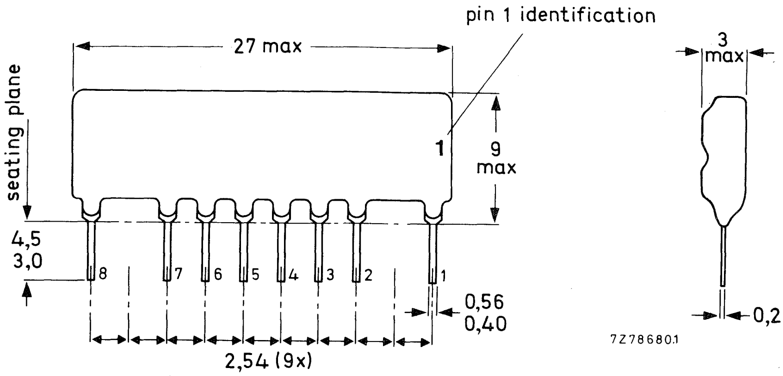


Fig. 2 Encapsulation.

Terminal connections

1	= input
2, 3, 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

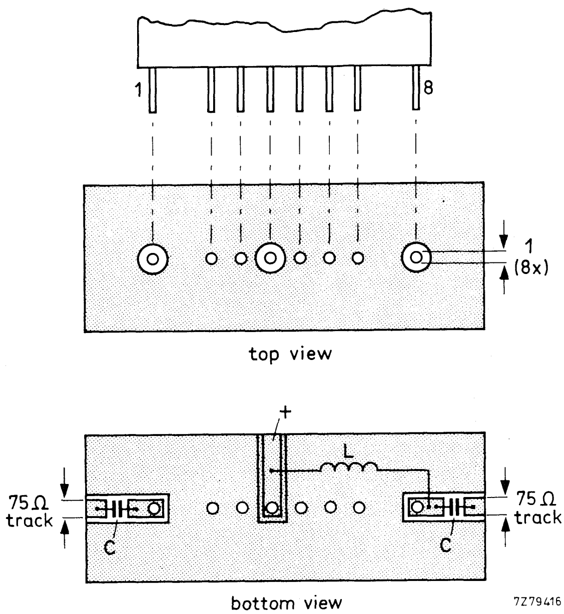
260 °C is the maximum permissible temperature of the solder; it must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds. The device may be mounted against the printed-circuit board, but the temperature of the device must 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 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.

Fig. 3 Printed-circuit board holes and tracks.

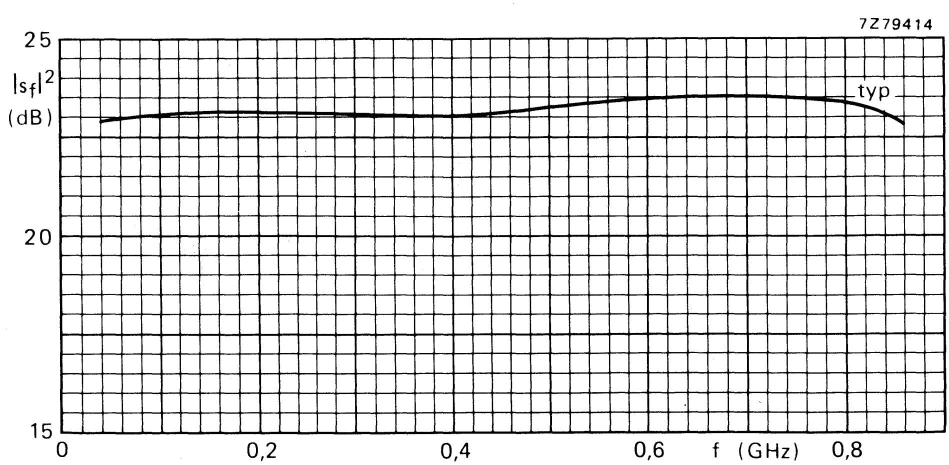


Fig. 4 Transducer gain as a function of frequency; Z_o = 75 Ω.

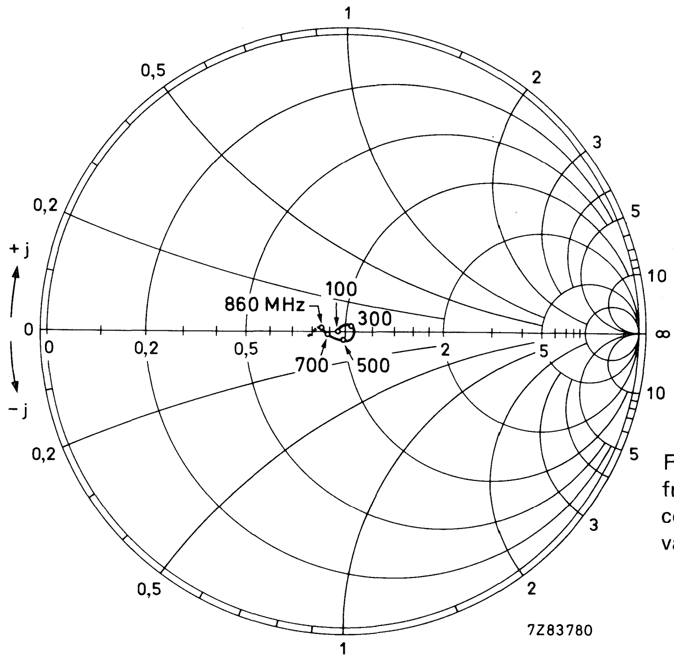


Fig. 5 Input impedance derived from input reflection coefficient s_i, co-ordinates in ohm x 75; typical values.

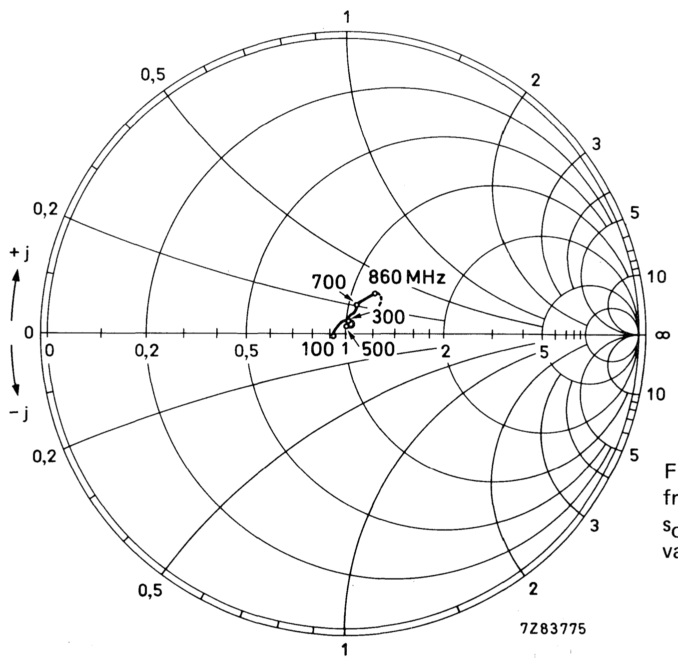


Fig. 6 Output impedance derived from output reflection coefficient s_o, co-ordinates in ohm x 75; typical values.

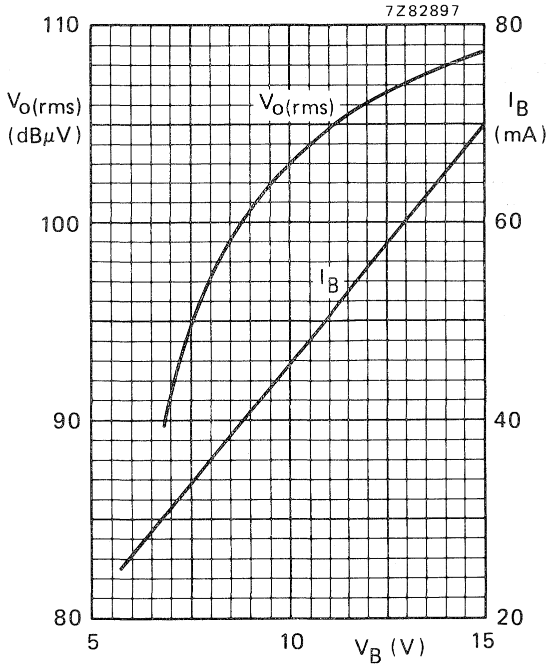


Fig. 7 Output voltage and supply current as a function of the supply voltage; typical values.

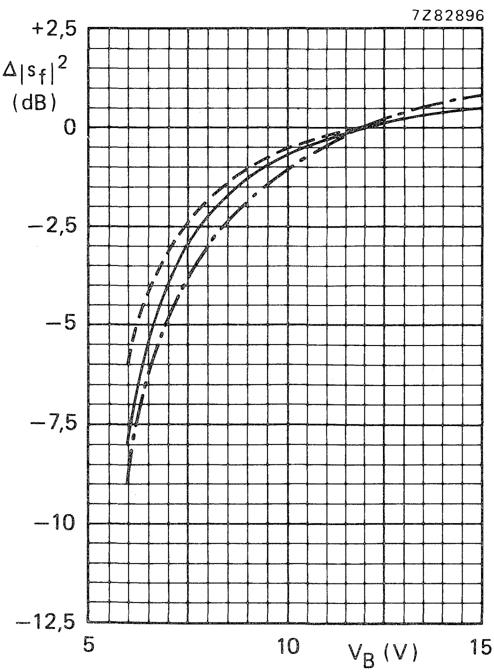


Fig. 8 Variation of transducer gain with supply voltage; reference 0 dB at 12 V;
——— f = 500 MHz;
– – – – f = 100 MHz;
—.—.— f = 860 MHz;
typical values.

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 an 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	$R_s = R_\ell = Z_o$	=	75	Ω
Transducer gain	$G_{tr} = \lvert s_f \rvert^2$	typ.	28	dB
Flatness of frequency response	$\pm\Delta \lvert s_f \rvert^2$	typ.	1	dB
Output voltage at −60 dB intermodulation distortion (DIN 45004, 3-tone)	$V_{o(rms)}$	>	105	dBμV
Noise figure	F	typ.	4,4	dB
D.C. supply voltage	V_B	=	12	V ± 10%
Operating ambient temperature	T_{amb}		−20 to +70	°C

ENCAPSULATION 8-pin, in-line, resin-coated body, see MECHANICAL DATA (Fig. 2)

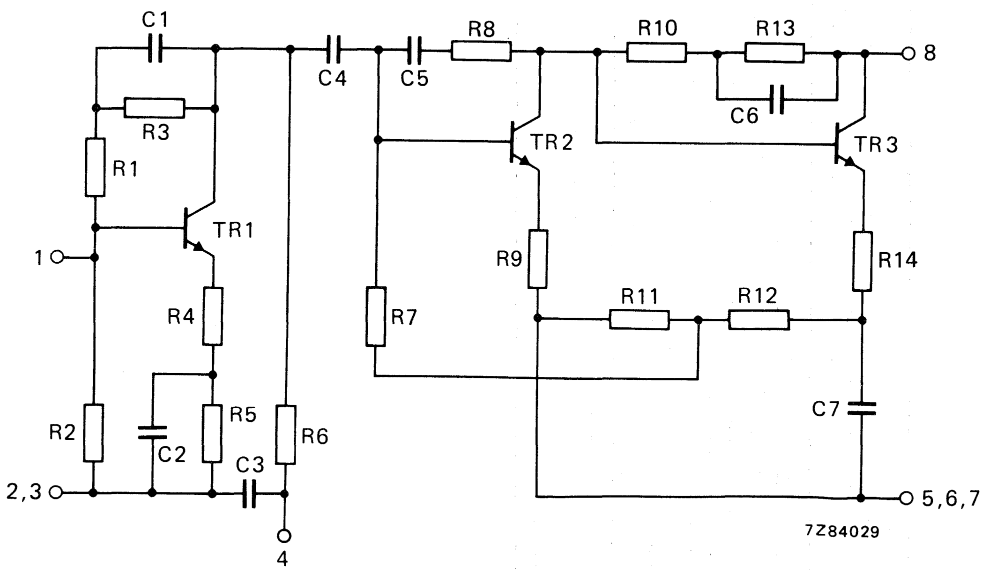


Fig. 1 Circuit diagram.

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 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.	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)	$V_{o(rms)}$	>	105	dBμV
		typ.	107	dBμV
Noise figure	F	typ.	4,4	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 ± 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.

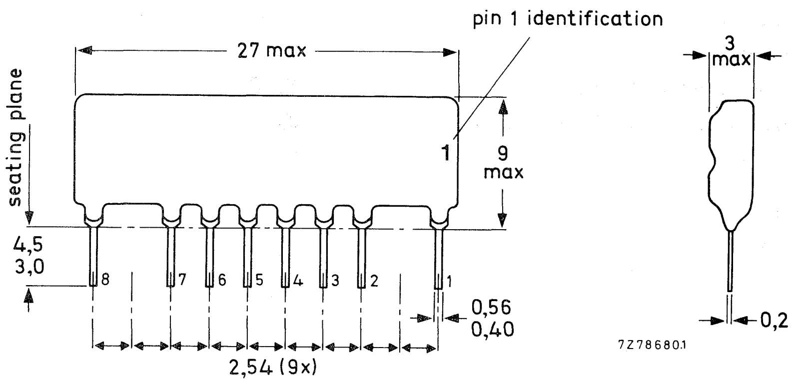


Fig. 2 Encapsulation.

Terminal connections

1 = input
2, 3, 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

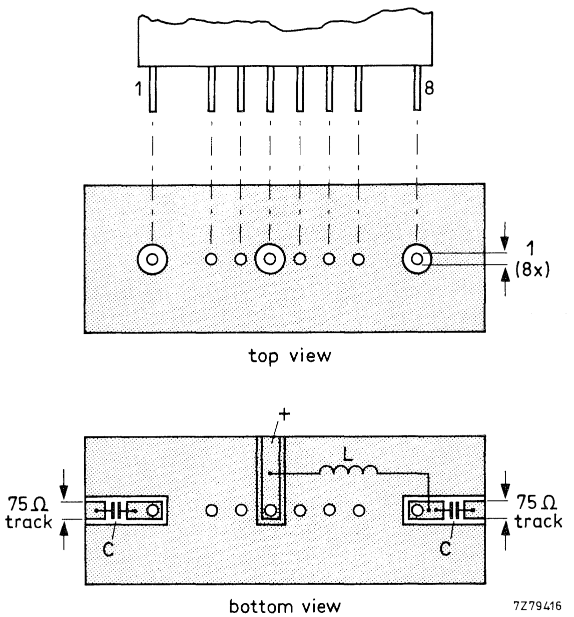
260 °C is the maximum permissible temperature of the solder; it must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds. The device may be mounted against the printed-circuit board, but the temperature of the device must 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 μH; 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 pF ceramic capacitor.

Fig. 3 Printed-circuit board holes and tracks.

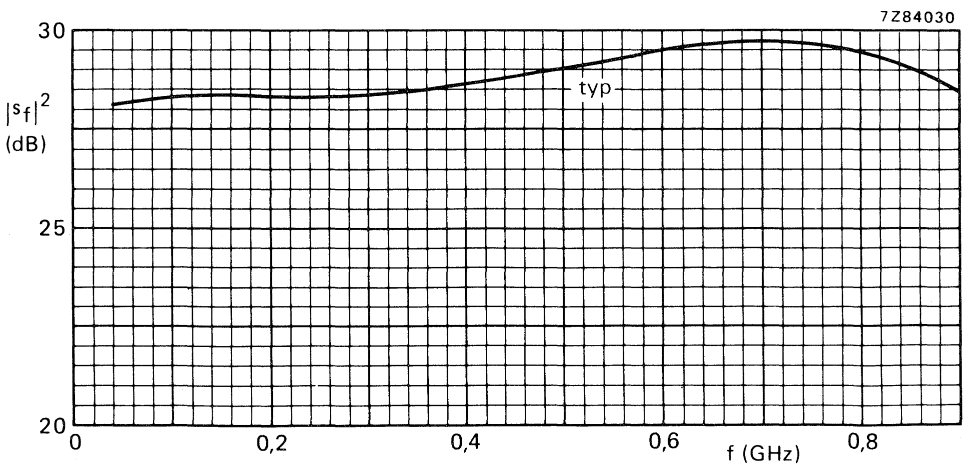


Fig. 4 Transducer gain as a function of frequency; Z_o = 75 Ω.

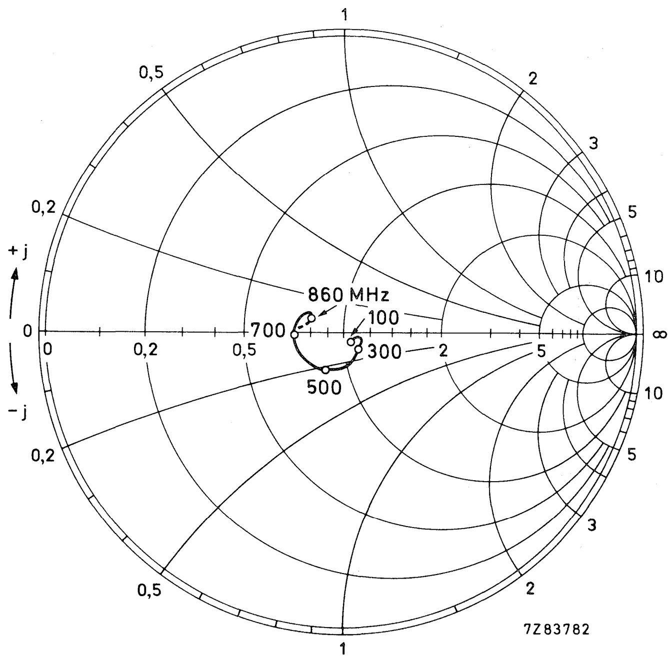


Fig. 5 Input impedance derived from input reflection coefficient s_i, co-ordinates in ohm x 75; typical values.

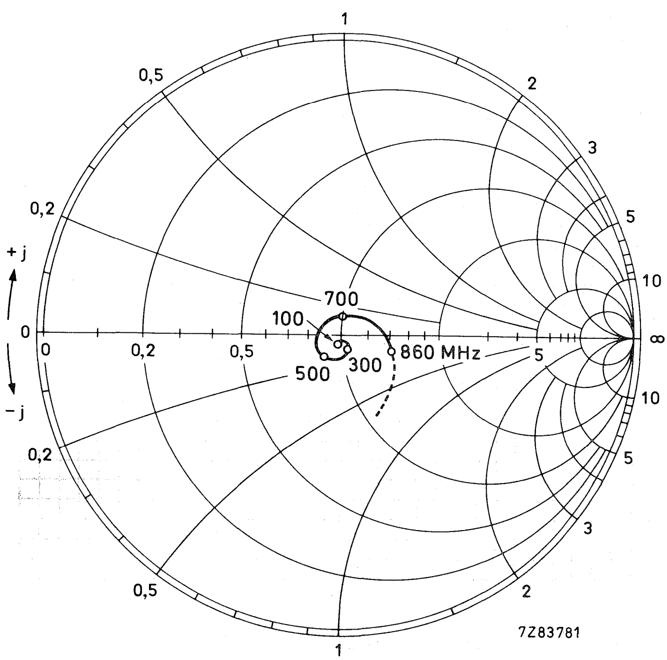


Fig. 6 Output impedance derived from output reflection coefficient s_o, co-ordinates in ohm x 75; typical values.

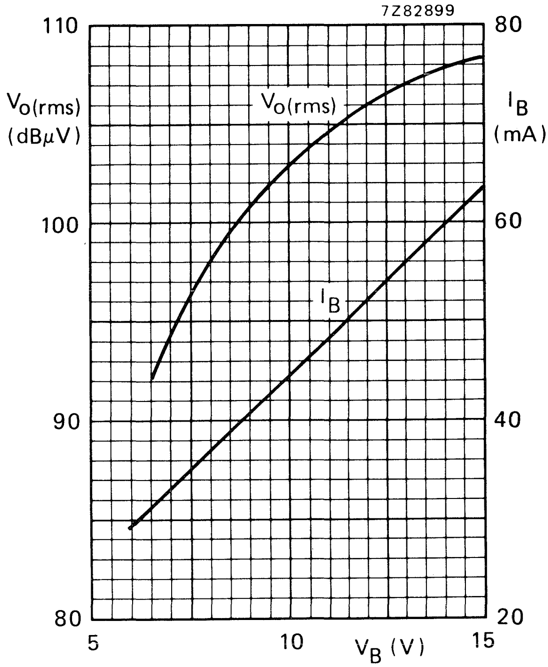


Fig. 7 Output voltage and supply current as a function of the supply voltage; typical values.

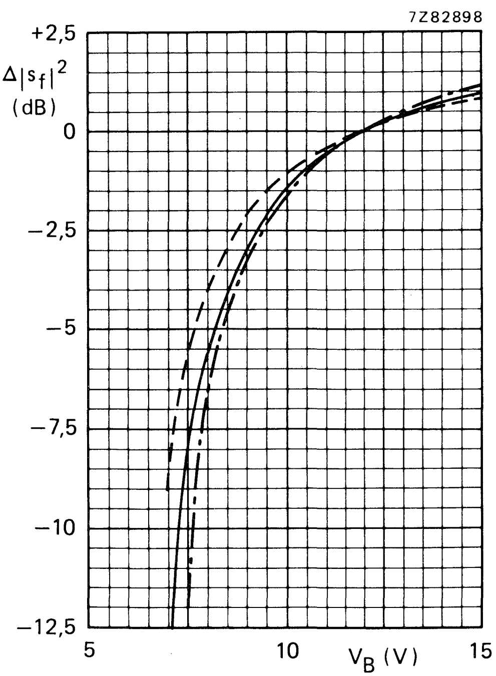


Fig. 8 Variation of transducer gain with supply voltage; reference 0 dB at 12 V;
——— f = 500 MHz;
– – – – f = 100 MHz;
—.—.—. f = 860 MHz;
typical values.

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 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	$R_s = R_\ell = Z_o$	=	75	Ω
Transducer gain	$G_{tr} = \|s_{f}\|^2$	typ.	28	dB
Flatness of frequency response	$\pm\Delta\|s_{f}\|^2$	typ.	1	dB
Output voltage at −60 dB intermodulation distortion (DIN 45004, 3-tone)				
VHF	$V_{o(rms)}$	typ.	113	dBμV
UHF	$V_{o(rms)}$	typ.	112	dBμV
Noise figure	F	typ.	4,8	dB
D.C. supply voltage	V_B	=	12	V ± 10%
Operating ambient temperature	T_{amb}		−20 to +70	°C

ENCAPSULATION 9-pin, in-line, resin-coated body, see MECHANICAL DATA (Fig.2)

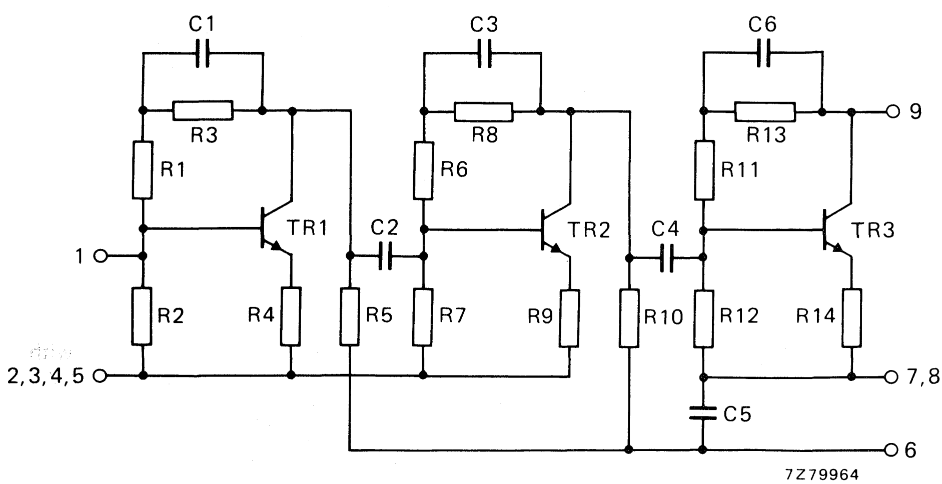


Fig. 1 Circuit diagram.

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	$V_{o(rms)}$	>	111	dBμV
		typ.	113	dBμV
UHF	$V_{o(rms)}$	>	110	dBμV
		typ.	112	dBμV
Noise figure	F	typ.	4,8	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 ± 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.

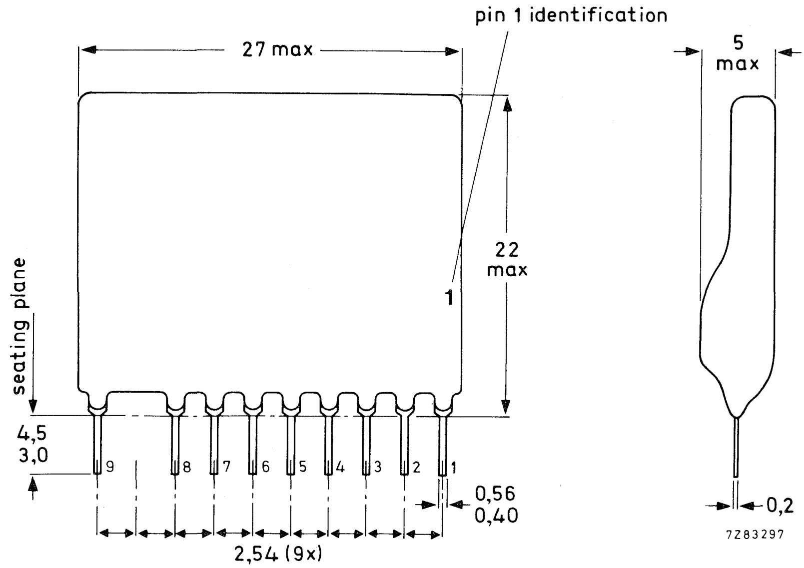


Fig. 2 Encapsulation.

Terminal connections

1	= input
2, 3, 4, 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

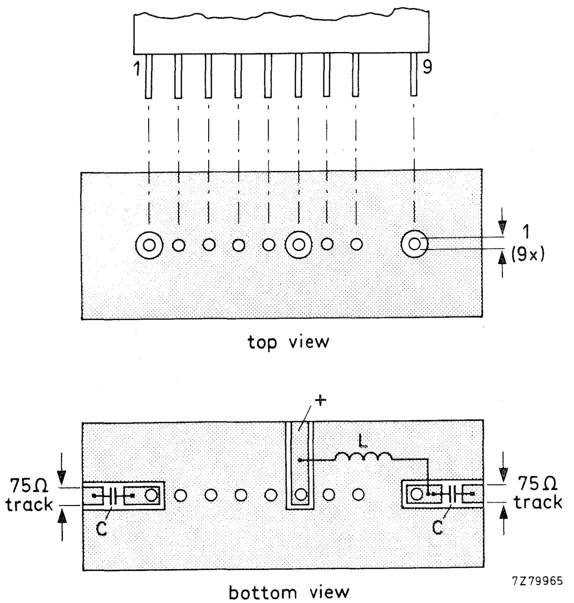
260 °C is the maximum permissible temperature of the solder; it must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds. The device may be mounted against the printed-circuit board, but the temperature of the device must 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 μH; 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 pF ceramic capacitor.

Fig. 3 Printed-circuit board holes and tracks.

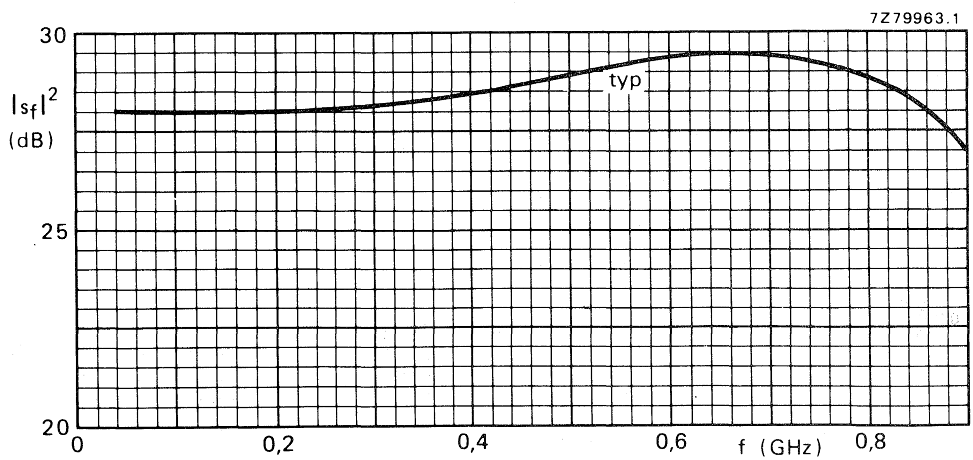


Fig. 4 Transducer gain as a function of frequency; $Z_o = 75\ \Omega$.

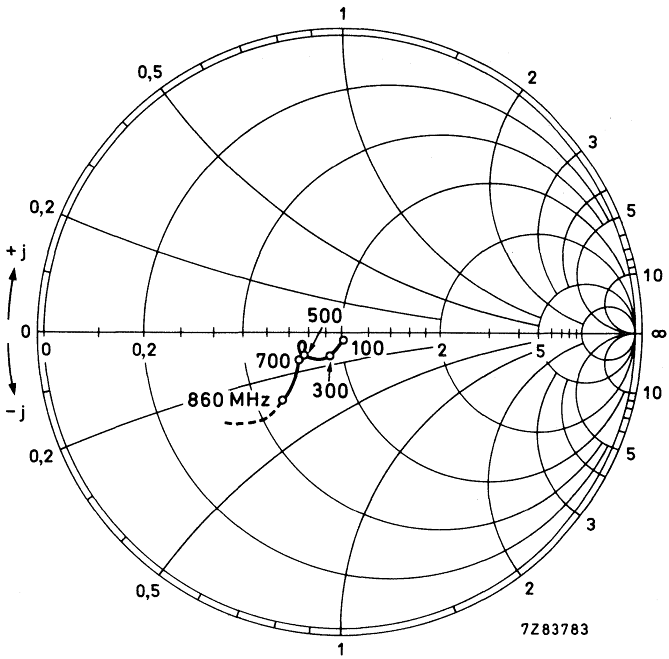


Fig. 5 Input impedance derived from input reflection coefficient s_i, co-ordinates in ohm x 75; typical values.

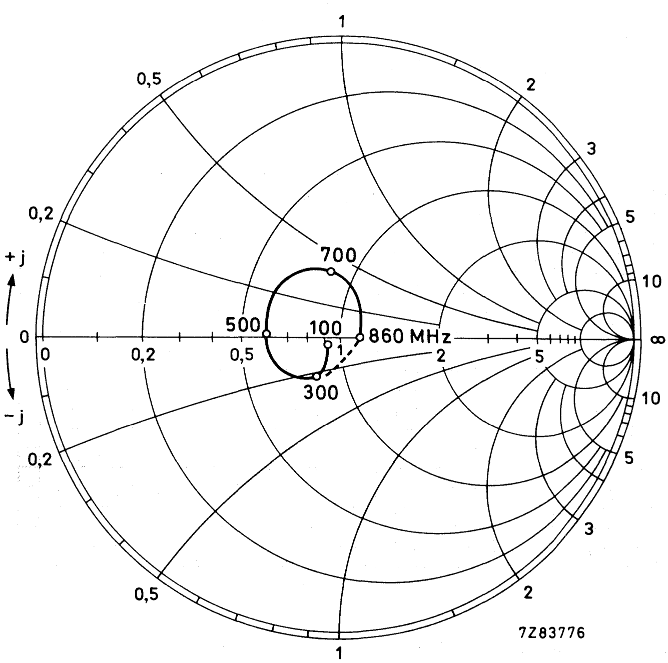


Fig. 6 Output impedance derived from output reflection coefficient s_o, co-ordinates in ohm x 75; typical values.

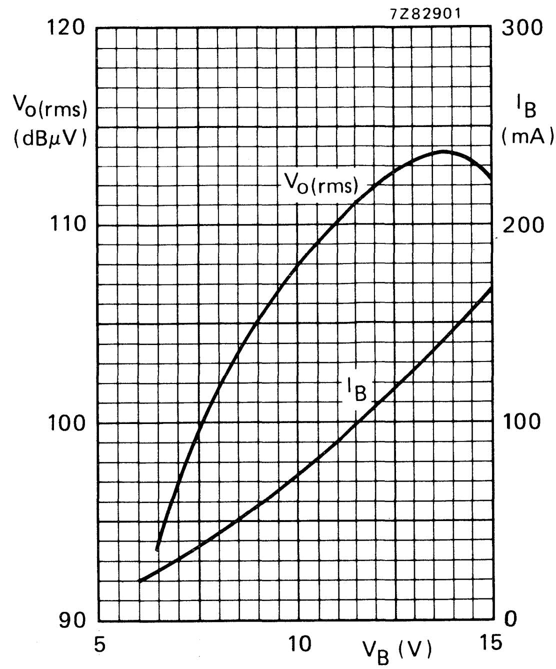


Fig. 7 Output voltage and supply current as a function of the supply voltage; typical values.

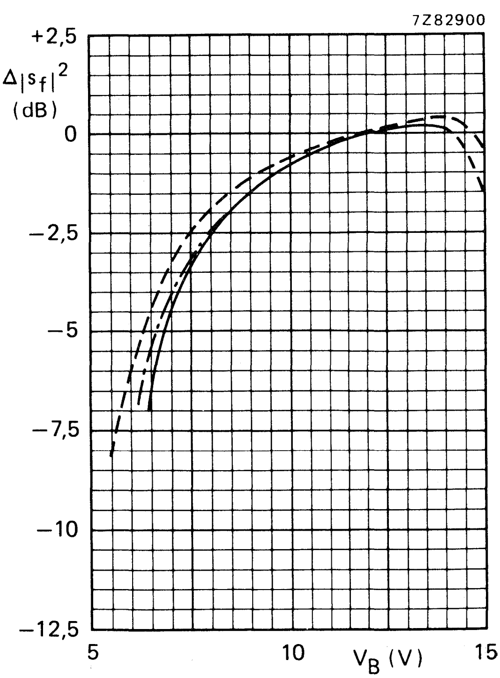
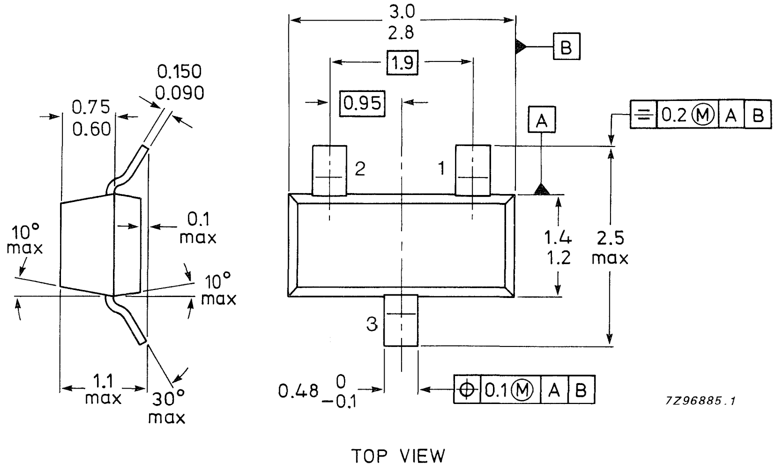


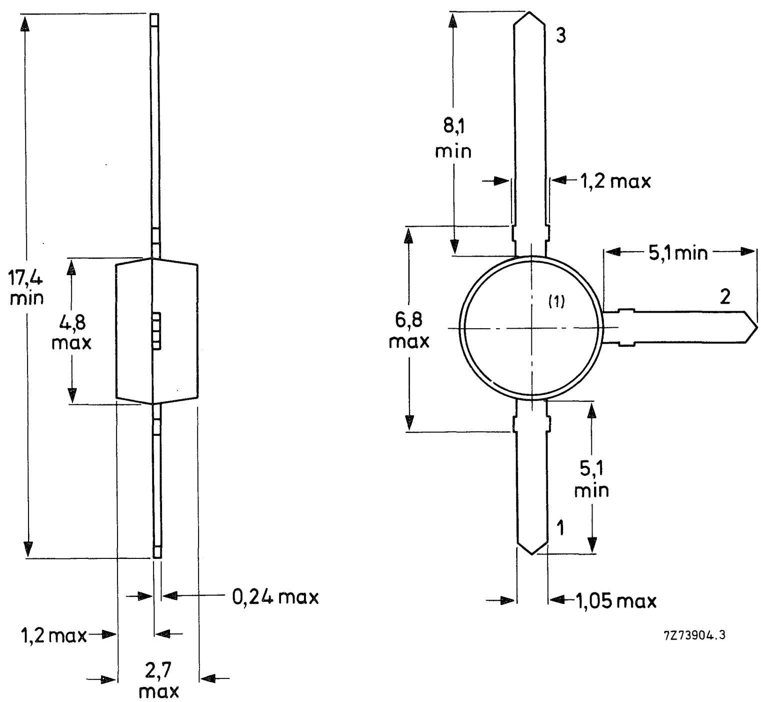
Fig. 8 Variation of transducer gain with supply voltage; reference 0 dB at 12 V;
——— f = 500 MHz;
– – – – f = 100 MHz;
—.—.—. f = 860 MHz;
typical values.

Envelopes

SOT23



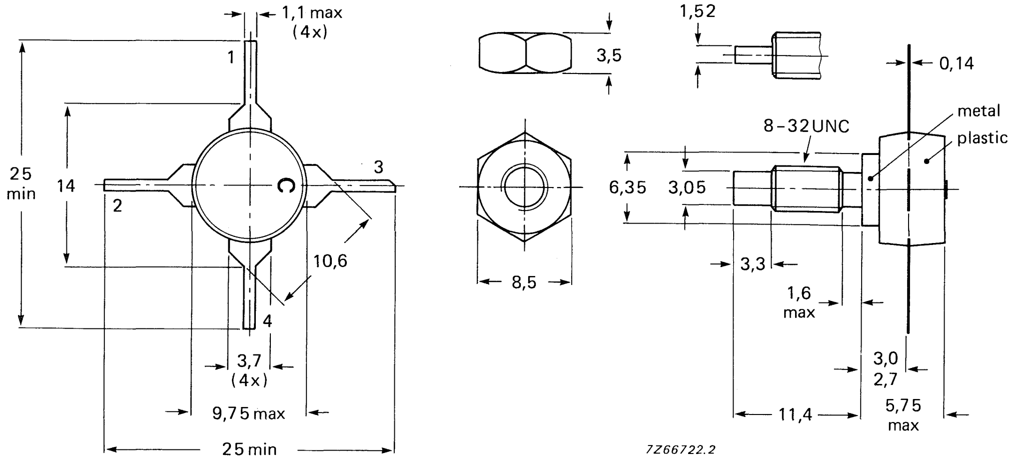
SOT37



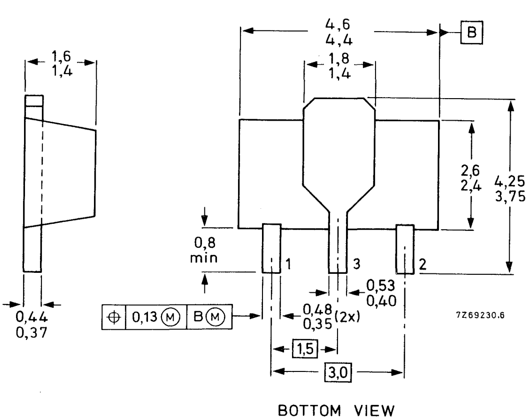
Note

1. Type number marking.

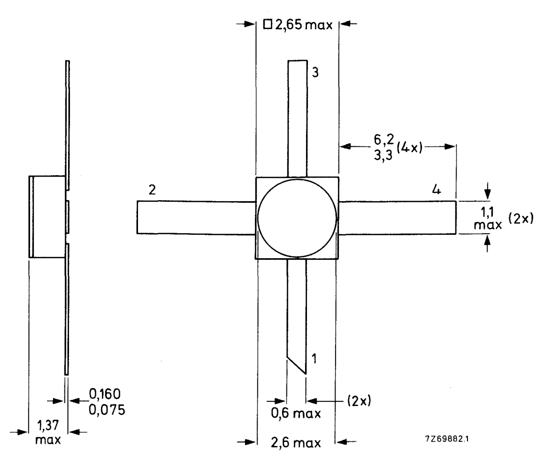
SOT48/1/3



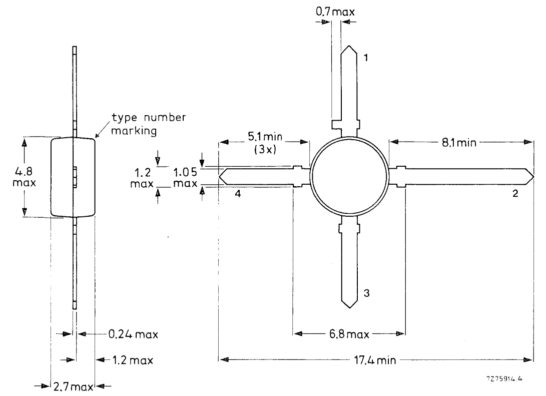
SOT89



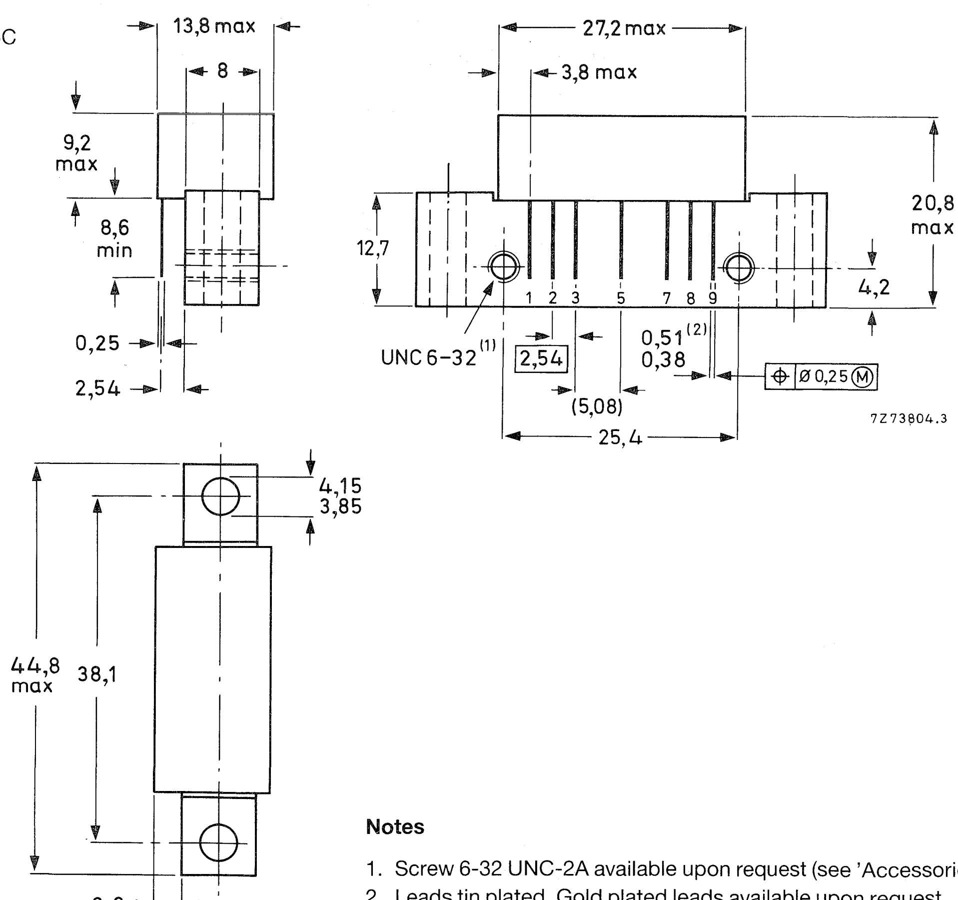
SOT100



SOT103



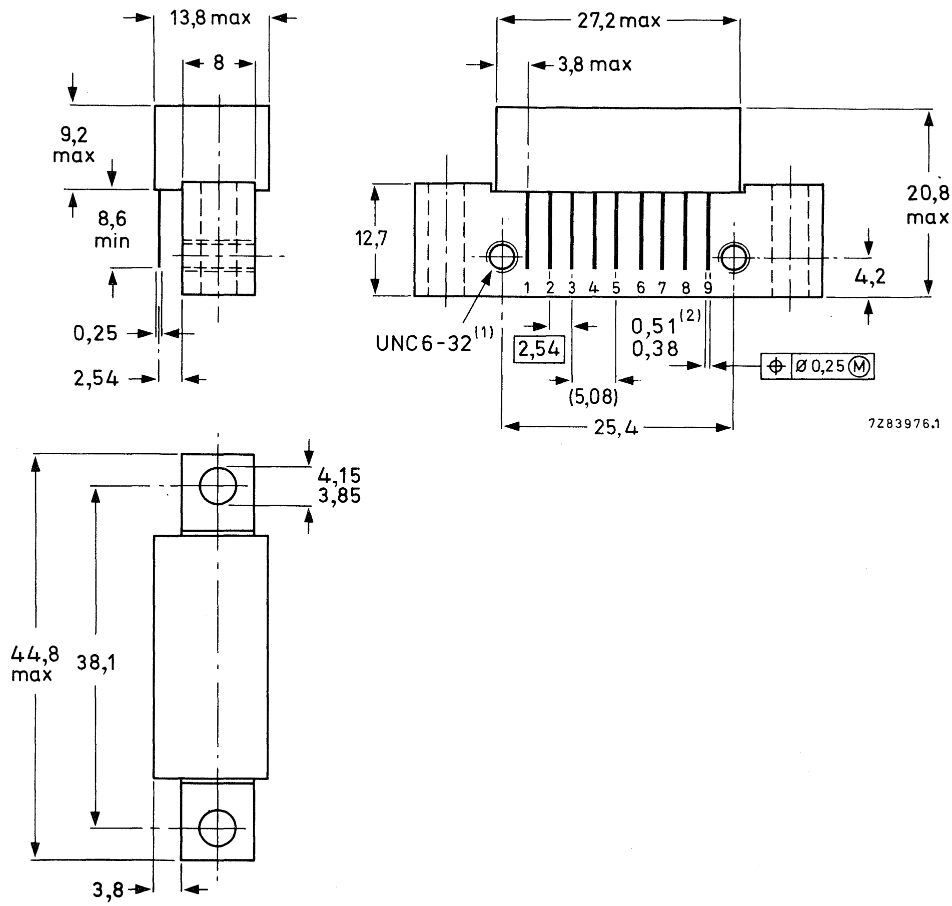
SOT115C



Notes

1. Screw 6-32 UNC-2A available upon request (see 'Accessories').
2. Leads tin plated. Gold plated leads available upon request.

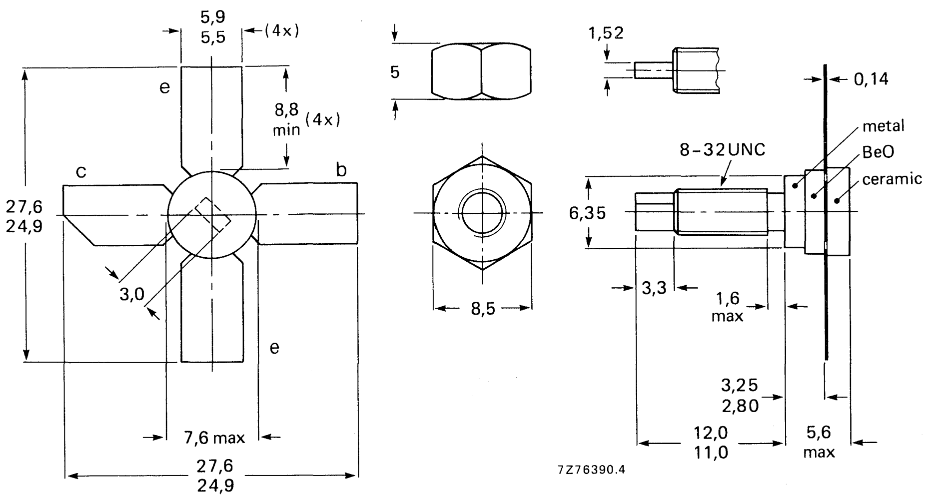
SOT115



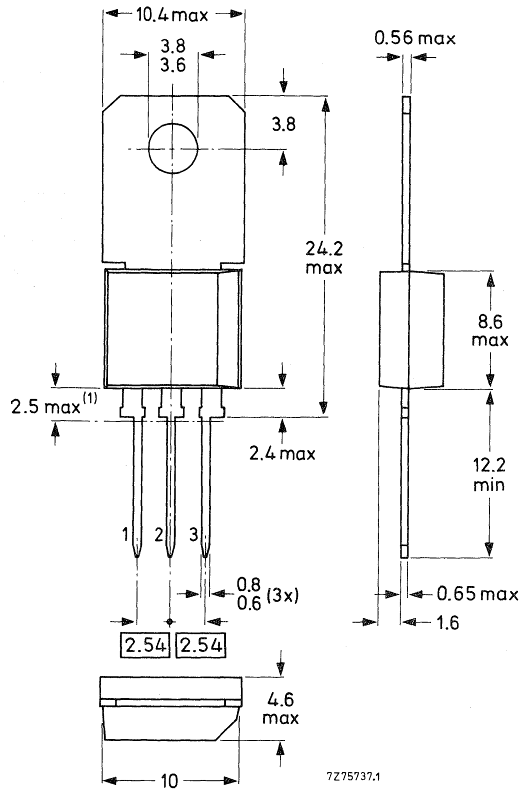
Notes

1. Screw 6-32 UNC-2A available upon request (see 'Accessories').
2. Leads tin plated. Gold plated leads available upon request.

SOT122


5,9
5,5
(4x)
e
8,8
min
(4x)
c
b
27,6
24,9
3,0
e
7,6 max
27,6
24,9
5
8,5
1,52
0,14
metal
BeO
ceramic
8-32UNC
6,35
3,3
1,6
max
3,25
2,80
12,0
11,0
5,6
max
7Z76390.4

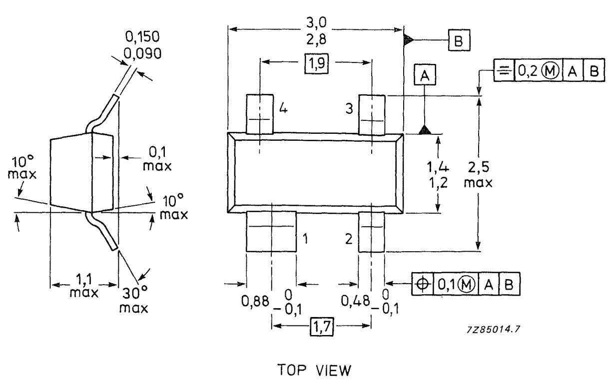
SOT128/TO-202



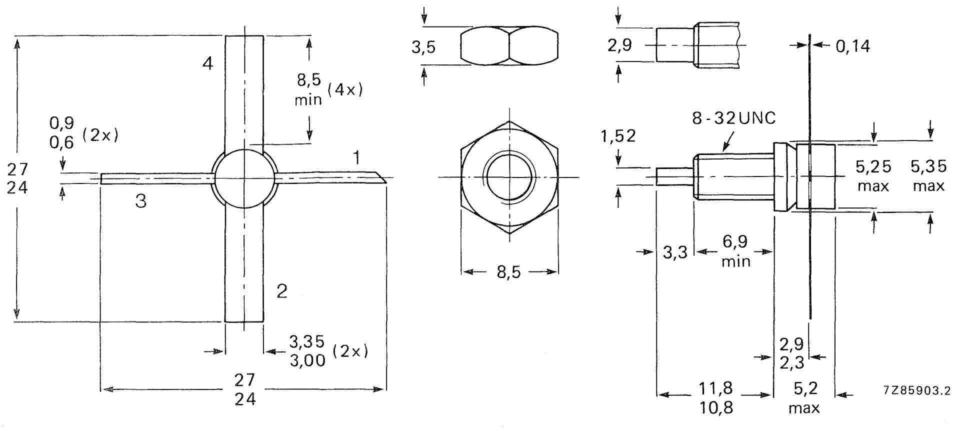
Note

1. Plastic flash allowed within this zone.

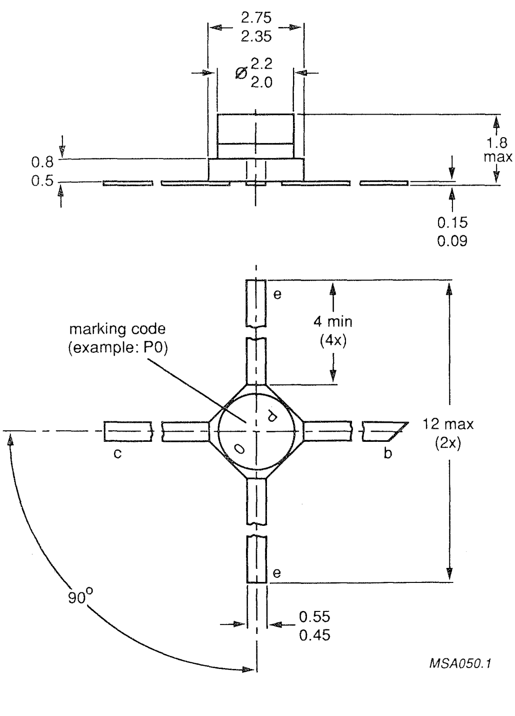
SOT143



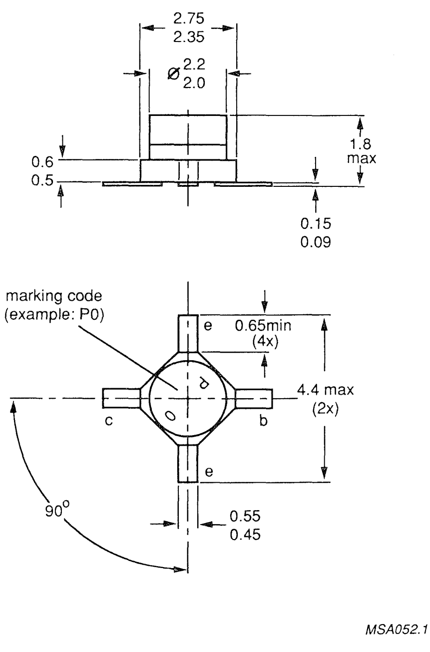
SOT172



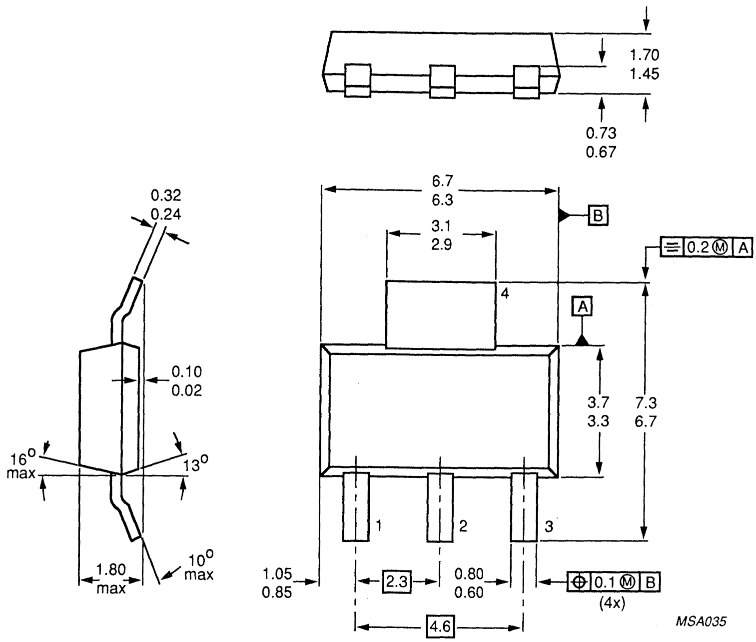
SOT173



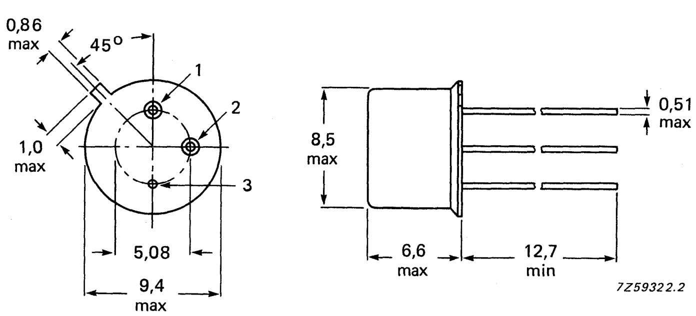
SOT173X



SOT223



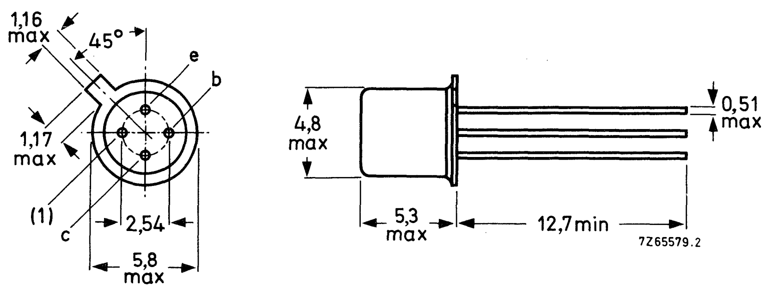
TO-39/SOT5



Wideband transistors

Envelopes

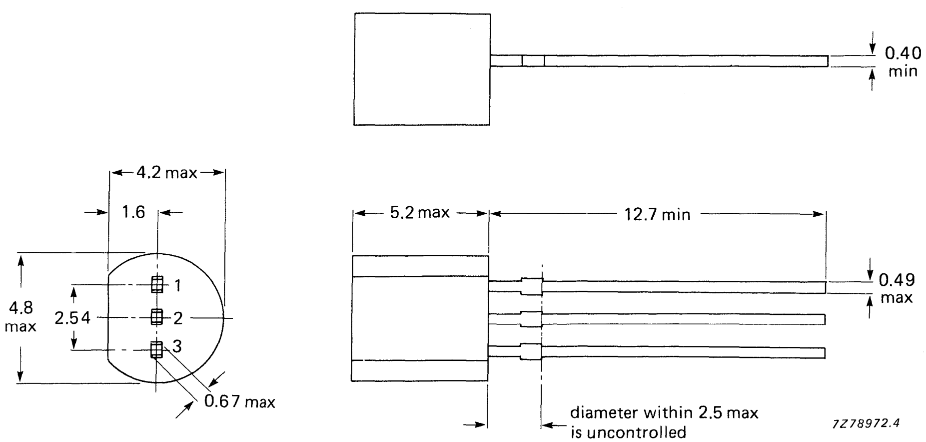
TO-72



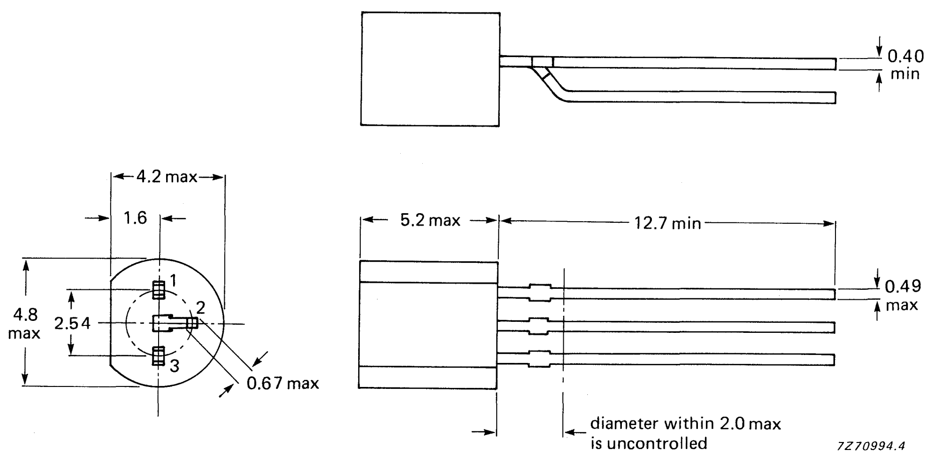
Note

1. Shield lead (connected to core).

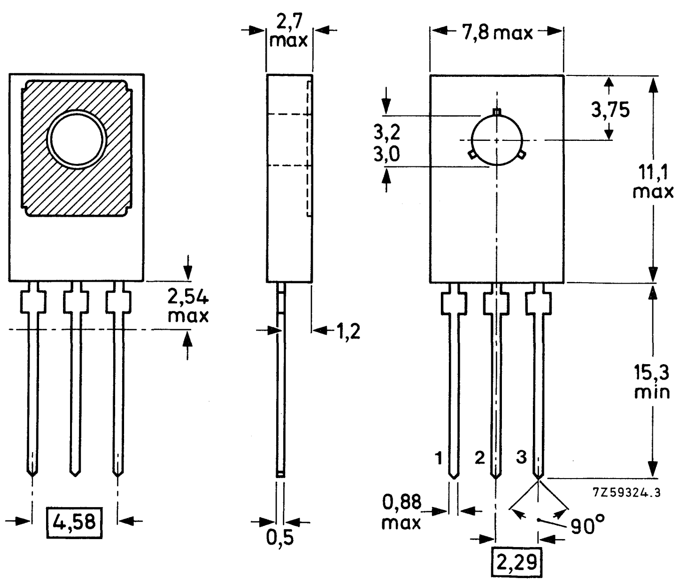
TO-92/SOT54



TO-92 variant/SOT54 variant



TO-126/SOT32



Collector connected to metal part of mounting surface.

SPECIFICATION FOR CATV TEST JIG

(range 5 - 600 MHz)

Impedance	:	75 Ω
Return loss	:	< –40 dB (Measured with thru-line system and other port terminated with a very good 75 Ω load)
Cross talk	:	< –80 dB
Insertion loss	:	< 0.1 dB (Measured with thru-line system)

Note

The above parameters are in the frequency range from 5 - 600 MHz.

DC current	:	max. 1 A.
Voltage	:	max. 50 V. (The DC is automatically switched to the device, by means of a micro-switch, after closing the pressing system.)
Temperature range	:	–25 to +75 °C.
RF connectors	:	N-type female (75 Ω)
DC connectors	:	Banana plug
Dimensions	:	110 x 60 x 55 mm (l x b x h, dimensions without pressing system, RF connectors and cooling connections). Distance between the centre contact of the RF connectors is 35.2 mm.
Cooling	:	possibility for water cooling available on the fixture.
Devices	:	suitable only for devices with positive and negative power requirement, (by means of switch).
Ordering information	:	CATV test fixture 600 MHz, 12NC : 7322 142 54250.

CATV test jig

SPECIFICATION FOR CATV TEST JIG

(range 40 - 860 MHz)

Impedance	:	75 Ω
Return loss	:	< –40 dB at 40 MHz. Decreases 1.5 dB/octave up to 860 MHz. < –32 dB at 860 MHz. (Measured with thru-line system and other port terminated with a very good 75 Ω load)
Cross talk	:	< –80 dB
Insertion loss	:	< 0.1 dB (Measured with thru-line system)

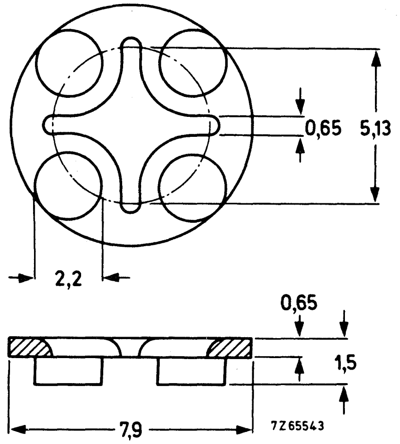
Note

The above parameters are in the frequency range from 40-860 MHz.

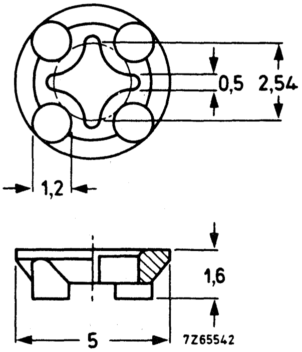
DC current	:	max. 1 A.
Voltage	:	max. 50 V. (The DC is automatically switched to the device, by means of a micro-switch, after closing the pressing system.)
Temperature range	:	–25 to +75 °C.
RF connectors	:	N-type female (75 Ω)
DC connectors	:	Banana plug
Dimensions	:	110 x 60 x 55 mm (l x b x h, dimensions without pressing system, RF connectors and cooling connections). Distance between the centre contact of the RF connectors is 35.2 mm.
Cooling	:	possibility for water cooling available on the fixture.
Devices	:	suitable only for BGX885 and BGD885
Ordering information	:	CATV test fixture 860 MHz, 12NC : 7322 142 89060.

MECHANICAL DATA

Dimensions in mm



Distance disc 56245 for TO-5 or TO-39; insulating material.

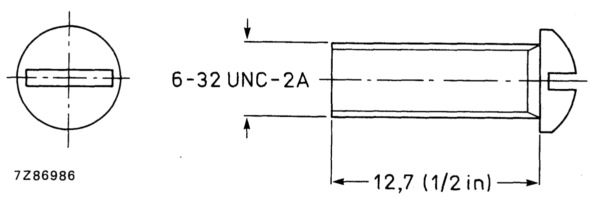


Distance disc 56246 for TO-18 or TO-72; insulating material.

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 10xx0.



INDEX OF TYPE NUMBERS

The inclusion of a type number in this publication does not necessarily imply its availability.

Key to handbook sections

A = Accessories
FET = Field-effect transistors
I = Infrared devices
LED = Light-emitting diodes
LCD = Liquid crystal displays
Mm = Surface-mounted devices
M = Microwave transistors
P = Low-frequency power transistors and modules
PDT = Photodiodes or transistors
Ph = Photoconductive devices
PhC = Photocouplers
PM = Power MOS transistors
R = Rectifier diodes
RFP = RF power transistors and modules
RT = Triplers
Sen = Semiconductor sensors
SD = Small-signal diodes
Sm = Small-signal transistors
Sp = Special diodes
SP = Low-frequency switching power diodes
St = Rectifier stacks
T = Tuner diodes
Th = Thyristors
Tri = Triacs
TS = Transient suppressor diodes
Vrf = Voltage reference diodes
Vrg = Voltage regulator diodes
WBT = Wideband hybrid IC transistors
WBM = Wideband hybrid IC modules

* series.

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DATA HANDBOOK SYSTEM

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INTEGRATED CIRCUITS

DISCRETE SEMICONDUCTORS

DISPLAY COMPONENTS

PASSIVE COMPONENTS*

PROFESSIONAL COMPONENTS**

MAGNETIC PRODUCTS*

LIQUID CRYSTAL DISPLAYS

The contents of each series are listed on pages iii to ix.

The data handbooks contain all pertinent data available at the time of publication, and each is revised and reissued periodically.

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Product specialists are at your service and enquiries will be answered promptly.

* Will replace the Components and materials (green) series of handbooks.
** Will replace the Electron tubes (blue) series of handbooks.

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This series of handbooks comprises:

code	handbook title
IC01	**Radio, audio and associated systems** Bipolar, MOS
IC02a/b	**Video and associated systems** Bipolar, MOS
IC03	**ICs for Telecom** Bipolar, MOS Subscriber sets, Cordless Telephones
IC04	**HE4000B logic family** CMOS
IC05	**Advanced Low-power Schottky (ALS) Logic Series**
IC06	**High-speed CMOS; PC74HC/HCT/HCU** Logic family
IC07	**Advanced CMOS logic (ACL)**
IC08	**10/100K ECL Logic/Memory/PLD**
IC09	**TTL logic series**
IC10	**Memories** MOS, TTL, ECL
IC11	**Linear Products**
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Supplement to IC15	**FAST TTL logic series**
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IC23	**Advanced BiCMOS interface logic**

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S2b	SC03	**Thyristors and triacs**
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S4a	SC05	**Low-frequency power transistors and hybrid IC power modules**
S4b	SC06	**High-voltage and switching power transistors**
S5	SC07	**Small-signal field-effect transistors**
S6	SC08a*	**RF power bipolar transistors**
	SC08b	**RF power MOS transistors**
	SC09	**RF power modules**
S7	SC10	**Surface mounted semiconductors**
S8b	SC12	**Optocouplers**
S9	SC13*	**PowerMOS transistors**
S10	SC14	**Wideband transistors and wideband hybrid IC modules**
S11	SC15	**Microwave transistors**
S15**	SC16	**Laser diodes**
S13	SC17	**Semiconductor sensors**

* Not yet issued with the new code in this series of handbooks.

** New handbook in this series; will be issued shortly.

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code	handbook title
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DC02	**Monochrome monitor tubes and deflection units**
DC03	**Television tuners, coaxial aerial input assemblies**
DC04	**Loudspeakers**
DC05	**Flyback transformers, mains transformers and general-purpose FXC assemblies**

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C11	**PA02**	**Varistors, thermistors and sensors**
C12	**PA03**	**Potentiometers and switches**
C7	**PA04**	**Variable capacitors**
C22	**PA05***	**Film capacitors**
C15	**PA06**	**Ceramic capacitors**
C9	**PA07***	**Piezoelectric quartz devices**
C13	**PA08**	**Fixed resistors**

* Not yet issued with the new code in this series of handbooks.

PROFESSIONAL COMPONENTS

This series of data handbooks comprises:

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T5	PC02*	**Cathode-ray tubes**
T6	PC03*	**Geiger-Müller tubes**
T9	PC04	**Photo multipliers**
T10	PC05	**Plumbicon camera tubes and accessories**
T11	PC06	**Circulators and Isolators**
T12	PC07	**Vidicon and Newvicon camera tubes and deflection units**
T13	PC08	**Image intensifiers**
T15	PC09	**Dry-reed switches**
	PC11**	**Solid state image sensors and peripherals integrated circuits**
T9	PC12*	**Electron multipliers**

* Not yet issued with the new code in this series of handbooks.

** Will be issued as IC23 in the future.

MAGNETIC PRODUCTS

This series of data handbooks comprises:

current code	new code	handbook title
C4 } C5 }	MA01	**Soft Ferrites**
C16	MA02*	**Permanent magnet materials**
C19	MA03*	**Piezoelectric ceramics**

* Not yet issued with the new code in this series of handbooks.

LIQUID CRYSTAL DISPLAYS

current code	new code	handbook title
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