

Microwave transistors

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Philips Components



PHILIPS

MICROWAVE TRANSISTORS

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SELECTION GUIDE

(Maintenance types not included)

1. Radar pulsed power transistors

1.1 L-band

type	f GHz	V _{CC} V	t _p at δ		P _L W	G _p dB	η _C %	page
			μ s	%				
RZ1214B35Y	1.2 - 1.4	42	50	10	40	7.8	40	353
	1.2 - 1.4	50	300	10	40	7	35	353
RZ1214B65Y	1.2 - 1.4	42	50	10	80	7	38	359
	1.2 - 1.4	50	300	10	80	7	30	359
RZ1214B125Y	1.2 - 1.4	42	50	10	150	7	38	365
	1.2 - 1.4	50	300	10	150	7	30	365
RX1214B150W	1.2 - 1.4	40	1000	10	150	7	42	325
	1.2 - 1.4	50	150	5	240	9	45	325
RX1214B300Y	1.2 - 1.4	50	300	5	300	7.5	35	331
	1.2 - 1.4	50	150	5	320	8	38	331

1.2 S-band

type	f GHz	V _{CC} V	t _p at δ		P _L W	G _p dB	η _C %	page
			μ s	%				
RZ2731B45W	2.7 - 3.1	40	100	10	45	7	40	373
RZ2731B60W	2.7 - 3.1	40	100	10	65	6.3	40	379
RX2731B90W ▲	2.7 - 3.1	40	100	10	100	6.5	40	337
RV2833B5X	2.8 - 3.3	24	100	10	5.6	5.7	47	309
RZ2833B15W	2.8 - 3.3	40	100	10	18	5.5	33	385
RZ2833B30W	2.8 - 3.3	40	100	10	34	5.5	33	389
RZ2833B45W	2.8 - 3.3	40	100	10	45	7	37	393
RZ2833B60W	2.8 - 3.3	40	100	10	60	6	37	399
RV3135B5X	3.1 - 3.5	24	100	10	5.6	5.7	47	313
RZ3135B15W	3.1 - 3.5	40	100	10	18	5.5	33	405
RZ3135B30W	3.1 - 3.5	40	100	10	34	5.5	33	405
RZ3135B40W	3.1 - 3.5	40	100	10	40	6.4	35	409
RZ3135B50W	3.1 - 3.5	40	100	10	55	5.6	35	415
RX3034B70W ▲	3.0 - 3.4	40	100	10	80	6	35	343

▲ Development Data

2. Avionics pulsed power transistors

type	f GHz	V _{CC} V	t _p at δ μs %	P _L W	G _p dB	η _C %	page
MRB11080Y ▲	1.09	50	10 1	100	8.5	40	189
MRB11175Y	1.09	50	10 1	200	8.5	40	193
MRB11350Y	1.09	50	10 1	400	8	35	197
MSB11900Y	1.09	50	10 1	850	7.5	35	209
RZB12050Y	1.09	50	100 10	50	10	45	421
	1.09	50	300 10	50	10	40	421
	1.09	50	see Fig. 1	50	9	40	421
RZB12100Y	1.09	50	100 10	100	10	45	425
	1.09	50	300 10	100	10	40	425
	1.09	50	see Fig. 1	100	9	40	425
RZB12250Y	1.09	50	100 10	250	7.5	25	429
	1.09	50	300 10	200	7.0	30	429
	1.09	50	see Fig. 1	200	7.0	30	429
RXB12350Y	1.09	50	100 10	350	7.8	38	349
	1.09	50	300 10	300	7.5	35	349
	1.09	50	see Fig. 1	300	7.8	38	349
RX1011B250Y ▲	1.03 - 1.09	50	300 10	250	7.5	40	317
RX1011B350Y ▲	1.03 - 1.09	50	300 10	350	7.5	40	321

▲ Development Data.

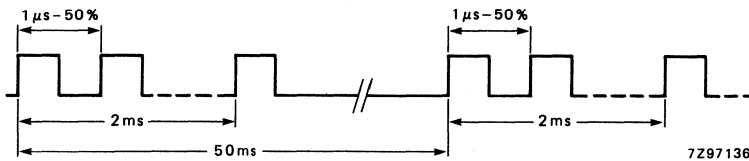


Fig. 1 DABS pulse definition.

3. Linear power transistors

3.1 class-A medium power

type	f GHz	VCE V	IC mA	PL1 (1) mW	G _{po} (2) dB	page
LAE6000Q *	2.0	10	4	—	—	55
LBE2003S	2.0	18	30	250	11	61
LCE2003S	2.0	18	30	250	11	61
LBE2009S	2.0	18	110	900	9.8	61
LCE2009S	2.0	18	110	900	9.8	61
LUE2003S	2.0	18	30	250	11	125
LUE2009S	2.0	18	110	900	9.8	125
LTE21009R ▲	2.1	16	150	1000	8.5	99
LTE21015R ▲	2.1	16	250	1600	8.1	99
LTE21025R ▲	2.1	16	400	2800	7.8	105
LVE21050R ▲	2.1	16	1100	5500	8	157
LWE2015R	2.3	16	250	1600	8.1	161
LWE2025R	2.3	16	400	2800	7.8	167
LAE4001R	4.0	15	25	110	9.5	43
LAE4002S	4.0	18	30	160	8	49
LTE4002S ▲	4.0	18	30	200	8	95
LTE42005S	4.2	18	110	550	7.2	109
LTE42008R	4.2	16	250	940	7.5	109
LTE42012R	4.2	16	400	1250	7	119

* low-noise type $F = 3$ dB; $G_a = 12$ dB

3.2 class-A high power (wideband)

type	f GHz	VCE V	IC A	PL1 (1) W	G _{po} (2) dB	page
LZ1418E100R	1.4 - 1.8	16	2	11	11	173
LV1721E50R	1.7 - 2.1	16	1.1	5.5	8	131
LV2024E45R	2.0 - 2.4	16	1.1	5	7	137
LV2327E40R	2.3 - 2.7	16	1	5	8	143
LV2931E50S ▲	2.9 - 3.1	18	1	5	6.5	147

(1) Load power for 1 dB compressed power gain

(2) Low-level power gain associated with P_{L1} .

▲ Development Data.

4. CW power transistors

4.1 class-C medium power

type	f GHz	V _{CE} V	P _L W	G _p dB	η _C %	page
PTB23001X	2	24	1.8	9	50	241
PTB23003X	2	24	4.0	10	50	241
PTB23005X	2	24	7.0	11	50	241
PTB32001X	3	24	1.8	9.5	45	247
PTB32003X	3	24	3.0	9.5	40	247
PTB32005X	3	24	5.5	9.5	40	247
PTB42001X	4.2	24	1.0	6	33	253
PTB42002X	4.2	24	2.0	6	35	253
PTB42003X	4.2	24	3.0	6	33	257
PVB42004X	1	24	13	11	60	263
	2	24	10	10	48	263
	3	24	7.5	8.8	30	263
	4	24	4	6	25	263

4.2 class-C high power

type	f GHz	V _{CE} V	P _L W	G _p dB	η _C %	page
PZ1418B15U	1.4 - 1.8	28	15	7.8	45	269
PZ1418B30U	1.4 - 1.8	28	35	8.4	45	279
PZB16035U	1.55	28	38	9.8	50	295
PZB16040U ▲	1.64	28	45	9	45	301
PZ1721B12U	1.7 - 2.1	28	16	8	45	269
PZ1721B25U	1.7 - 2.1	28	30	7.8	41	279
PZ2024B10U	2.0 - 2.4	28	12	6.8	45	269
PZ2024B20U	2.0 - 2.4	28	26	7	42	279
PZ2327B15U ▲	2.3 - 2.7	28	16	8	45	289

5. Oscillator power transistors

type	f GHz	V _{CE} V	I _C mA	P _L mW	envelope	page
PPC5001T	5	20	200	450	FO-102	237
PQC5001T	5	20	200	450	FO-85	237

▲ Development Data.

TYPE NUMBER SURVEY

Class-A bipolar transistors

type number	f GHz	V _{CC} V	I _C mA	P _{L1} (1) W	G _{po} (2) dB	page
LAE2001R	2	15	35	0.12	8	39
LAE4000Q	4	15	30	0.09	6.5	41
LAE4001R	4	15	25	0.11	9.5	43
LAE4002S	4	18	30	0.16	8	49
LAE6000Q (3)	2	10	4	—	—	55
LBE1004R	1	15	100	0.5	10	59
LBE1010R	1	15	200	1	9	59
LBE2003S	2	18	30	0.25	11	61
LBE2005Q	1.65	12	80	0.4	9	69
LBE2008T	1.65	20	150	1.1	8	71
LBE2009S	2	18	110	0.9	9.8	61
LCE1004R	1	15	100	0.5	10	59
LCE1010R	1	15	200	1	9	59
LCE2003S	2	18	30	0.25	11	61
LCE2005Q	1.65	12	80	0.4	9	69
LCE2008T	1.65	20	150	1.1	8	71
LCE2009S	2	18	110	0.9	9.8	61
LJE42002T	4	20	65	0.2	7	73
LKE1004R	1	15	100	0.4	11	75
LKE2002T	2	15	70	0.2	8	77
LKE2004T	2	15	140	0.4	7	79
LKE2015T	2	20	200	1.6	8	81
LKE21004R	2.1	15	140	0.6	10	83
LKE21015T	2.1	20	300	1.75	10	85
LKE21050T	2.1	20	1200	5.5	9	87
LKE27010R	2.7	16	200	0.8	9	89
LKE27025R	2.7	16	650	2.5	7	91
LKE32002T	3	20	65	0.31	11.2	93
LKE32004T	3	20	130	0.71	11.0	93
LTE4002S	4.0	18	30	0.2	8	95
LTE21009R	2.1	16	150	1.0	8.5	99
LTE21015R	2.1	16	250	1.6	8.1	99
LTE21025R	2.1	16	400	2.8	7.8	105
LTE42005S	4.2	18	110	0.55	7.2	109
LTE42008R	4.2	16	250	0.94	7.5	109
LTE42012R	4.2	16	400	1.25	7	119
LUE2003S	2.0	18	30	0.25	11	125
LUE2009S	2.0	18	110	0.90	9.8	125

Notes

- (1) Load power for 1 dB compressed power gain.
- (2) Low-level power gain associated with P_{L1}.
- (3) Low-noise type: F = 3 dB; G_a = 12 dB.

TYPE NUMBER SURVEY

Class-A bipolar transistors

type number	f GHz	V _{CC} V	I _C A	P _{L1} (1) W	G _{po} (2) dB	page
LV1721E50R	1.7 - 2.1	16	1.1	5.5	8	131
LV2024E45R	2.0 - 2.4	16	1.1	5	7	137
LV2327E40R	2.3 - 2.7	16	1.0	5	8	143
LV2931E50S	2.9 - 3.1	18	1.0	5	6.5	147
LV3742E16R	3.7 - 4.2	16	0.5	2	5.5	153
LV3742E24R	3.7 - 4.2	16	0.8	2.4	6.5	155
LVE21050R	2.1	16	1.1	5.5	8.0	157
LWE2015R	2.3	16	0.25	1.6	8.1	161
LWE2025R	2.3	16	0.4	2.8	7.8	167
LZ1418E100R	1.4 - 1.8	16	2.0	11	11	173

Notes

- (1) Load power for 1 dB compressed power gain.
- (2) Low-level power gain associated with P_{L1}.

Class-B and pulsed power bipolar transistors

type number	f GHz	V _{CC} V	P _L W	G _p dB	η_c %	page
MKB12040WS	1.09	45	38 (1)	11 (1)	47	179
MKB12100WS	1.09	45	72 (1)	7.6 (1)	40	181
MKB12140W	1.09	45	120 (1)	9.8 (1)	49	183
MO6075B200Z	0.6 - 0.75	48	180 (1)	8.6 (1)	45	185
MO6075B400Z	0.6 - 0.75	48	420 (1)	7.2 (1)	40	187
MRB11080Y	1.09	50	100 (1)	8.5 (1)	40	189
MRB11175Y	1.09	50	200 (1)	8.5 (1)	40	193
MRB11350Y	1.09	50	400 (1)	8 (1)	35	197
MRB12175YR	1.09	50	200 (1)	9 (1)	50	201
MRB12350YR	1.09	50	460 (1)	8 (1)	36	203
MS1011B700Y	1.025 - 1.150	50	700 (1)	6.7 (1)	35	205
MS6075B800Z	0.6 - 0.75	48	850 (1)	7.5 (1)	35	207
MSB11900Y	1.09	50	850 (1)	7.5 (1)	35	209
MSB12900Y	1.09	50	900 (1)	7.8 (1)	35	213
MZ0912B75Y	0.960 - 1.215	50	90 (2)	8.6 (2)	34	215
MZ0912B150Y	0.960 - 1.215	50	175 (2)	7.7 (2)	34	217
PDE1001U	1	28	2	6.4	60	219
PDE1003U	1	28	4.2	6.3	54	219
PDE1005U	1	28	7.6	5.8	58	219
PDE1010U	1	28	11	7.4	68	219
PEE1001U	1	28	2	6.4	60	219
PEE1003U	1	28	4.2	6.3	54	219
PEE1005U	1	28	7.6	5.8	58	219
PEE1010U	1	28	11	7.4	68	219
PKB3001U	3	28	1.2	10	33	221
PKB3003U	3	28	3.5	7	35	223
PKB3005U	3	28	5	5.2	29	225
PKB12005U	1.2	28	6.5	10.5	45	227
	0.960 - 1.215	28	5 (2)	9 (2)	45	227
PKB20010U	1	28	25	11	58	229
	2	28	10	6	42	229
PKB23001U	1	28	2.5	9.5	45	231
	2	28	1.5	7	32	231
PKB23003U	1	28	5	11	70	231
	2	28	3.4	9.3	50	231
PKB23005U	1	28	19	11	58	231
	2	28	8	7.2	53	231
PKB25006T	2.3	21	9	10	40	233
	2.45	21	8	9	35	233
PKB32001U	3	28	1.3	8.1	34	235
PKB32003U	3	28	3.2	6.3	33	235
PKB32005U	3	28	5	5.2	31	235

Notes

- (1) Measured under pulsed condition $t_p = 10 \mu s$; $\delta = 1\%$.
- (2) Measured under pulsed condition $t_p = 10 \mu s$; $\delta = 10\%$.

TYPE NUMBER SURVEY

Class-B and pulsed power bipolar transistors

type number	f GHz	V _{CC} V	P _L W	G _p dB	η _c %	page
PPC5001T	5	20	0.45	in oscillator circuits	—	237
PQC5001T	5	20	0.45		—	237
PTB23001X	2	24	1.8	9	50	241
PTB23003X	2	24	4.0	10	50	241
PTB23005X	2	24	7.0	11	50	241
PTB32001X	3	24	1.8	9.5	45	247
PTB32003X	3	24	3.0	9.5	40	247
PTB32005X	3	24	5.5	9.5	40	247
PTB42001X	4.2	24	1.0	6	33	253
PTB42002X	4.2	24	2.0	6	35	253
PTB42003X	4.2	24	3.0	6	33	257
PV3742B4X	3.7 - 4.2	24	4.5	7.4	32	261
PVB42004X	1	24	13	11	60	263
	2	24	10	10	48	263
	3	24	7.5	8.8	30	263
	4	24	4	6	25	263
PZ1418B15U	1.4 - 1.8	28	15	7.8	45	269
PZ1418B30U	1.4 - 1.8	28	35	8.4	45	274
PZ1721B12U	1.7 - 2.1	28	16	8	45	269
PZ1721B25U	1.7 - 2.1	28	30	7.8	41	279
PZ2024B10U	2.0 - 2.4	28	12	6.8	45	269
PZ2024B20U	2.0 - 2.4	28	26	7	42	279
PZ2327B15U	2.3 - 2.7	28	16	8	45	289
PZB16035U	1.55	28	38	9.8	50	295
PZB16040U	1.64	28	45	9	45	301
PZB27020U	1	28	70	10	62	307
	2	28	40	7.8	48	307
	3	28	22	5	25	307

Class-C and pulsed power bipolar transistors

type number	f GHz	V _{CC} V	P _L W	G _p dB	η_c %	page
RV2833B5X	2.8 - 3.3	24	5.6 (1)	5.7 (1)	47	309
RV3135B5X	3.1 - 3.5	24	5.6 (1)	5.7 (1)	47	313
RX1011B250Y	1.03 - 1.09	50	250 (2)	7.5 (2)	40	317
RX1011B350Y	1.03 - 1.09	50	350 (2)	7.5 (2)	40	321
RX1214B150W	1.2 - 1.4	50	240 (3)	9 (3)	45	325
RX1214B300Y	1.2 - 1.4	50	320 (3)	8 (3)	38	331
RX2731B90W	2.7 - 3.1	40	100 (1)	6.5 (1)	40	337
RX3034B70W	3.0 - 3.4	40	80 (1)	6 (1)	35	343
RXB12350Y	1.09	50	350 (1)	7.8 (1)	38	349
RZ1214B35Y	1.2 - 1.4	50	40 (2)	7 (2)	35	353
RZ1214B65Y	1.2 - 1.4	50	80 (2)	7 (2)	30	359
RZ1214B125Y	1.2 - 1.4	50	150 (2)	7 (2)	30	365
RZ1214B150Y	1.2 - 1.4	50	200 (2)	7 (2)	35	371
RZ2731B45W	2.7 - 3.1	40	45 (1)	7 (1)	40	373
RZ2731B60W	2.7 - 3.1	40	65 (1)	6.3 (1)	40	379
RZ2833B15W	2.8 - 3.3	40	18 (1)	5.5 (1)	33	385
RZ2833B30W	2.8 - 3.3	40	34 (1)	5.5 (1)	33	389
RZ2833B45W	2.8 - 3.3	40	45 (1)	7 (1)	37	393
RZ2833B60W	2.8 - 3.3	40	60 (1)	6 (1)	37	399
RZ3135B15W	3.1 - 3.5	40	18 (1)	5.5 (1)	33	405
RZ3135B30W	3.1 - 3.5	40	34 (1)	5.5 (1)	33	405
RZ3135B40W	3.1 - 3.5	40	40 (1)	6.4 (1)	35	409
RZ3135B50W	3.1 - 3.5	40	55 (1)	5.6 (1)	35	415
RZB12050Y	1.09	50	50 (1)	10 (1)	45	421
RZB12100Y	1.09	50	100 (1)	10 (1)	45	425
RZB12250Y	1.09	50	250 (1)	7.5 (1)	25	429

Notes

- (1) Measured under pulsed condition $t_p = 100 \mu s$; $\delta = 10\%$.
- (2) Measured under pulsed condition $t_p = 300 \mu s$; $\delta = 10\%$.
- (3) Measured under pulsed condition $t_p = 150 \mu s$; $\delta = 5\%$.

MARKING CODES

The range of microwave transistors in this book are normally marked with manufacturer's name or trademark, type designation, and lot identification code.

If space on the transistor envelope is insufficient for full type designation, the following marking codes may be used for identification.

Marking code	Type number	Marking code	Type number
R6	LAE4000Q	1005M	PKB12005U
R7	LAE6000Q	1140S	MKB12140W
R8	LAE4001R	2001M	PKB23001U
R9	LAE4002S	2003M	PKB23003U
104	LJE42002T	2005U	PKB23005U
106	LCE2005Q	2147	PKB25006T
107	LBE2005Q	2301X	PTB23001X
108	LCE1004R	2303X	PTB23003X
109	LBE1004R	2305X	PTB23005X
112	LKE1004R	3001	PKB3001U
116	LKE32004T	3001M	PKB32001U
142	LCE1010R	3003	PKB3003U
144	LKE2015T	3003M	PKB32003U
146	LKE21004R	3005	PKB3005U
148	LKE2002T	3005M	PKB32005U
150	LTE2004T	3201X	PTB32001X
176	LKE27025R	3203X	PTB32003X
190	LKE21050T	3205X	PTB32005X
192	LKE21015T	4002S	LTE4002S
196	LTE42008R	4201X	PTB42001X
198	LTE42012R	4202X	PTB42002X
383	PQC5001T	4203X	PTB42003X
395	PPC5001T	11080	MRB11080Y
400	LUE2003S	11175Y	MRB11175Y
401	LUE2009S	11350Y	MRB11350Y
407	LBE2003S	12175Y	MRB12175Y
408	LCE2009S	2833B5X	RV2833B5X
409	LBE2009S	3135B5X	RV3135B5X
411	LWE2015R	3742B4X	PV3742B4X
413	LWE2025R	42004X	PVB42004X
430	LV2931E50S	1721E50R	LV1721E50R
435	LTE21009R	2024E45R	LV2024E45R
436	LTE210015R	2327E40R	LV2327E40R
439	LTE21025R	3742E16R	LV3742E16R
502	LTE42005S	3742E24R	LV3742E24R
1001	PDE1001U		
1001	PEE1001U		
1003	PDE1003U		
1003	PEE1003U		

LETTER SYMBOLS FOR MICROWAVE TRANSISTORS

C_{cb}	= collector-base capacitance
C_{ce}	= collector-emitter capacitance
C_{eb}	= emitter-base capacitance
δ	= duty factor
f	= signal frequency
h_{FE}	= DC current gain
G_a	= associated gain (for a low noise transistor)
G_{ma}	= maximum available gain
G_{ms}	= maximum stable gain
G_p	= power gain under specified conditions
G_{po}	= low level power gain associated with P_{L1}
I_C	= DC collector current
I_{CBO}	= collector cut-off current, open emitter
I_{CER}	= collector cut-off current, with specified R_{BE}
I_{EBO}	= emitter cut-off current, open collector
η_C	= collector efficiency $P_L / (I_C \times V_{CC})$
η_{add}	= power added efficiency $(P_{out} - P_{in}) / (I_C \times V_{CC})$
P_{in}	= input power
P_L	= load power under specified conditions
P_{L1}	= load power for 1 dB compressed power gain
P_{out}	= output power
P_{tot}	= total power dissipation
$R_{th\ j-c}$	= thermal resistance from junction to case
$R_{th\ j-mb}$	= thermal resistance from junction to mounting base
$R_{th\ mb-h}$	= thermal resistance from mounting base to heatsink
T_j	= junction temperature
t_p	= pulse width
T_{sld}	= lead soldering temperature
T_{stg}	= storage temperature
V_{CBO}	= collector-base voltage, open emitter
V_{CC}	= collector supply voltage
V_{CE}	= collector-emitter voltage
V_{CEO}	= collector-emitter voltage, open base
V_{CER}	= collector-emitter voltage with specified R_{BE}
V_{EBO}	= emitter-base voltage, open collector
V_{SWR}	= voltage standing wave ratio
z_i	= complex transistor input impedance as seen by the generator
Z_L	= complex transistor load impedance as seen by the transistor
Z_{th}	= thermal impedance

GENERAL

Type designation code

General recommendations

**Mounting recommendations
for flange envelopes**

**Mounting recommendations
for capstan envelopes**

Rating systems

Letter symbols

s-parameters

TYPE DESIGNATION CODE
FOR SILICON POWER BIPOLAR TRANSISTORS

X : Letter

∅ : Number

- a) XXX ∅∅∅∅X : transistors without matching cell
- b) XXX ∅∅∅∅∅X : transistors with input matching cell
- c) XX ∅∅∅∅X ∅∅X
∅∅∅X } transistors with input and output matching cell

X LETTERS

- First letter: mode of operation

L : Linear
M : Short pulse
P : CW class B
R : Long pulse

- Second letter: encapsulation

A : SOT-100	K : FO-53	T : FO-41B
B : FO-45	O : FO-57B	V : FO-83
C : FO-46	P : FO-102	W : FO-93
D : FO-58	Q : FO-85	X : FO-91
E : FO-38	R : FO-67A/B	Z : FO-57C
J : FO-41A	S : FO-96	ZZ : 2xFO-57C

- Third letter: common potential

E : Common emitter
B : Common base
C : Common collector

- Fourth letter: supply voltage

(suffix)

Q : 10 - 12 V	W : 40 - 45 V
R : 15 - 16 V	X : 24 V
S : 18 V	Y : 50 V
T : 20 (18 - 21) V	Z : 48 V
U : 28 - 30 V	

∅ NUMBERS

a) Transistors without matching cell

- first number: frequency of measurement (GHz)
- 2nd, 3rd, 4th numbers: power
 - in watts (W) for P - M and R mode of operation
 - in 100 mW for L mode of operation

b) Transistors with input matching cell

- first and second numbers: frequency of measurement (x 0,1 GHz)
- 2nd, 3rd, 4th numbers: power
 - in watts (W) for P - M and R mode of operation
 - in 100 mW for L mode of operation

c) Transistors with input and output matching cell

- first and second number: lower frequency of use (in 0,1 GHz)
- third and fourth numbers: higher frequency of use (in 0,1 GHz)
- last numbers: power
 - in watt (W) for P - M and R mode of operation
 - in 100 mW for L mode of operation

SILICON BIPOLAR TRANSISTORS

GENERAL OPERATIONAL RECOMMENDATIONS

INTRODUCTION

These devices operate at high frequencies and high powers. To avoid damage or destruction, it is advisable to follow the advice given below during testing, setting-up procedures and final operation.

MECHANICAL

1. Good thermal and electrical conductivity is essential for efficient operation. Any metallic interface may introduce local overheating and an increase in contact resistance. It is therefore essential to use an adequate heatsink and heatsink compound between the rear face of the transistor or its flange and the heatsink.
2. Connections between the test jig or amplifier circuitry must be as short as possible, in any case not more than 100 μm . Special care must be taken to use the shortest possible high frequency earth (ground) connection.
3. When mounting the transistor on its heatsink, the recommended torque must not be exceeded.

POLARIZATION

1. When testing transistors in a new circuit, it is recommended that the supply voltage is reduced to approximately 70% of its nominal value and that series emitter or collector resistors are used (for common base and common emitter configurations respectively). After initial tests have been made, the series resistors may be decreased and the voltage increased.
2. The use of high value capacitors must be avoided as far as possible. If their use cannot be avoided, series resistors of a few ohms must be inserted.

OPERATION

1. Input power

While the circuit is not optimized, it is recommended that the power input should be at a lower level than that specified.

2. Output waveform

It is advisable to check the output waveform with a spectrum analyzer or similar equipment to ensure that no parasitic effects are introduced by the power supply or earth (ground) connections, thus causing unwanted modulation.

3. Junction temperature

If the circuit design is likely to cause a large temperature rise, it is advisable to check the temperature rise with a pulsed input before applying full power.

RECOMMENDATIONS FOR MOUNTING
FLANGE R.F. POWER TRANSISTORS

Flange r.f. transistors are easy to mount but for optimum performance we offer the following recommendations:

- Holes or tapped holes in the heatsink should be free from burrs and spaced at 18,42 mm (+ 0,05; -0,05) between centres. They must have a depth of at least 6 mm.
Recommended screw: for SOT-119, SOT-121 and SOT-161 cheese-head 4-40 UNC/2A, for SOT-123 and SOT-160 also M3. A washer to spread the joint pressure is also recommended.
- For transistors dissipating up to 80 W the heatsink thickness should be at least 3 mm copper (> 99,9%, ETP-Cu) or 5 mm aluminium (> 99,0% Al). For transistors dissipating more power, the thickness should be increased proportionally.
- The flatness of the heatsink mounting surface must be < 0,02 mm with a surface roughness $R_a < 0,5 \mu\text{m}$ (preferably by grinding or lapping).
- The sparing use of evenly distributed heatsink compound on the transistor flange is recommended. Suitable heatsink compound brands are: Dow Corning 340, Eccotherm TC-5 (E&C), Wakefield 120.
- The screws through the flange holes should first both be tightened to 0,05 Nm (finger tight), and then tightened to 0,6 to 0,75 Nm, to achieve the published thermal resistance between the mounting base and heatsink.
- When a transistor is removed from the heatsink, the flange will almost certainly have been distorted by the joint pressure. Grinding or lapping of the flange according to the information above is necessary if the transistor is remounted.

RECOMMENDATIONS FOR MOUNTING ¼", ⅜" AND ½" CAPSTAN HEADERS AS USED FOR R.F. POWER TRANSISTORS

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

Screw threads, diameter and nuts:

mounting base diameter	thread	maximum diameter of threaded stud	nut thickness
¼"	8-32UNC-2A(B)	4,14 mm	3,5 and 5 mm
⅜"	10-32UNF-2A(B)	4,80 mm	5 mm
½"	¼" x 28UNF-2A(B)	6,33 mm	5,5 mm

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

– Diameter of the mounting hole in the heatsink:

¼" stud	diameter 4,15 +0,05; –0 mm
⅜" stud	diameter 4,85 +0,05; –0 mm
½" stud	diameter 6,35 +0,05; –0 mm

Heatsink surfaces at the mounting hole to be flat, parallel, and free of burrs or oxidation.

– Mounting nut torque:

¼" nut	minimum 0,75 Nm (7,5 kg cm)	maximum 0,85 Nm (8,5 kg cm)
⅜" nut	minimum 1,5 Nm (15 kg cm)	maximum 1,7 Nm (17 kg cm)
½" nut	minimum 2,3 Nm (23 kg cm)	maximum 2,7 Nm (27 kg cm)

– Recommended distance from the surface of the heatsink to the top surface of the printed-circuit board:

¼" capstan header	2,9 + 0; –0,2 mm
⅜" capstan header	3,8 + 0; –0,2 mm
½" capstan header	4,8 + 0; –0,2 mm

It is important that the above maximum printed-circuit board mounting heights are not exceeded in order to prevent stress being applied to the encapsulation. Upward lead bending, in particular, can damage the encapsulation and impair the sealing of the header.

- Experience indicates that flux or flux solutions can penetrate even hermetically sealed ceramic-capped transistors. To prevent this, tin and wash the printed-circuit boards before mounting the power transistors, then solder the transistors in place without using flux.
- The leads may be tinned by dipping them, full length, into a solder bath at about 230 °C. Note, no flux should be used during tinning.
- The full mounting-nut torque (specified above) should be applied only once during the life of the transistor. For pre-assembly testing, apply no more than two thirds of the specified torque.
- Since locking washers are much harder than most heatsink materials, their locking action might deteriorate during the life of the transistor. The use of locking washers is therefore not recommended. Instead, tighten the nuts to their specified torque, allow about 30 minutes for them to bed down, then re-tighten. After this, apply locking paint.

RATING SYSTEMS

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

DEFINITIONS OF TERMS USED

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

Note

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

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

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

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

Note

Limiting conditions may be either maxima or minima.

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

Note

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

ABSOLUTE MAXIMUM RATING SYSTEM

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

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

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

DESIGN MAXIMUM RATING SYSTEM

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

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

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

DESIGN CENTRE RATING SYSTEM

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

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

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

LETTER SYMBOLS FOR TRANSISTORS AND SIGNAL DIODES

based on IEC Publication 148

LETTER SYMBOLS FOR CURRENTS, VOLTAGES AND POWERS

Basic letters

The basic letters to be used are:

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

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

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

Subscripts

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

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

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

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

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

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

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

Additional rules for subscripts

Subscripts for currents

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

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

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

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

Subscripts for voltages

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

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

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

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

Subscripts for supply voltages or supply currents

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

Examples: V_{CC} , I_{EE}

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

Example: V_{CCE}

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

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

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

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

Subscripts for multiple devices

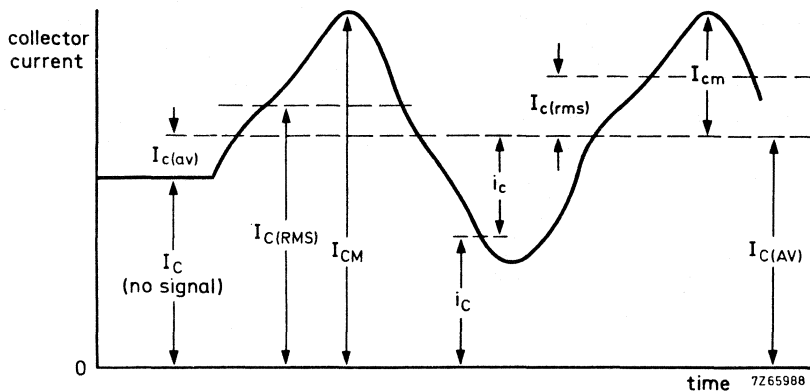
For multiple unit devices, the subscripts are modified by a number preceding the letter subscript; in the case of multiple subscripts, hyphens may be necessary to avoid misunderstanding.

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

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

Application of the rules

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



LETTER SYMBOLS FOR ELECTRICAL PARAMETER METERS

Definition

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

Basic letters

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

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

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

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

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

Subscripts

General subscripts

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

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

Examples: Z_S , h_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 (d.c. current gain)

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

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

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

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

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

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

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

Subscripts for four-pole matrix parameters

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

$$\begin{aligned} \text{Examples: } & h_i \text{ (or } h_{11}) \\ & h_o \text{ (or } h_{22}) \\ & h_f \text{ (or } h_{21}) \\ & h_r \text{ (or } h_{12}) \end{aligned}$$

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

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

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.

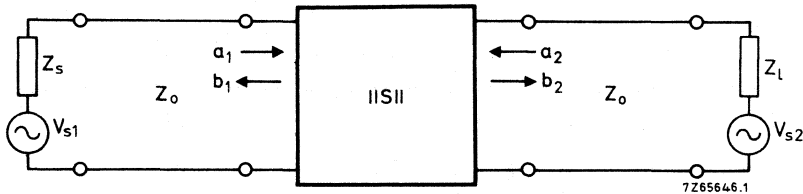
$$\begin{aligned} \text{Examples: } Z_i &= R_i + jX_i \\ y_{fe} &= g_{fe} + jb_{fe} \end{aligned}$$

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

$$\begin{aligned} \text{Examples: } \operatorname{Re}(h_{ib}) \text{ etc.} & \quad \text{for the real part of } h_{ib} \\ \operatorname{Im}(h_{ib}) \text{ etc.} & \quad \text{for the imaginary part of } h_{ib} \end{aligned}$$

SCATTERING PARAMETERS

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



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

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

1)

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

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

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

V_i = incident voltage

V_r = reflected (generated) voltage

The four-pole equations for s-parameters are:

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

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

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

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

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

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

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

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

S-PARAMETERS

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

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

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

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

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

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

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

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

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

DEVICE DATA

MICROWAVE LINEAR POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates in c.w. conditions and is recommended in common-emitter class-A amplifiers up to 2 GHz.

It offers the following technological advantages.

- Interdigitated structure: high emitter efficiency
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has a SOT-100 metal ceramic package.

It is mounted in a common-emitter configuration, specified in class-A and operates in c.w. conditions.

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25^{\circ}\text{C}$ in an unneutralized common-emitter class-A selective amplifier.

Typical values

mode of operation	f GHz	V_{CE} V	I_C mA	PL_1 mW	G_{po} dB
c.w. class-A	2	15	35	120	8

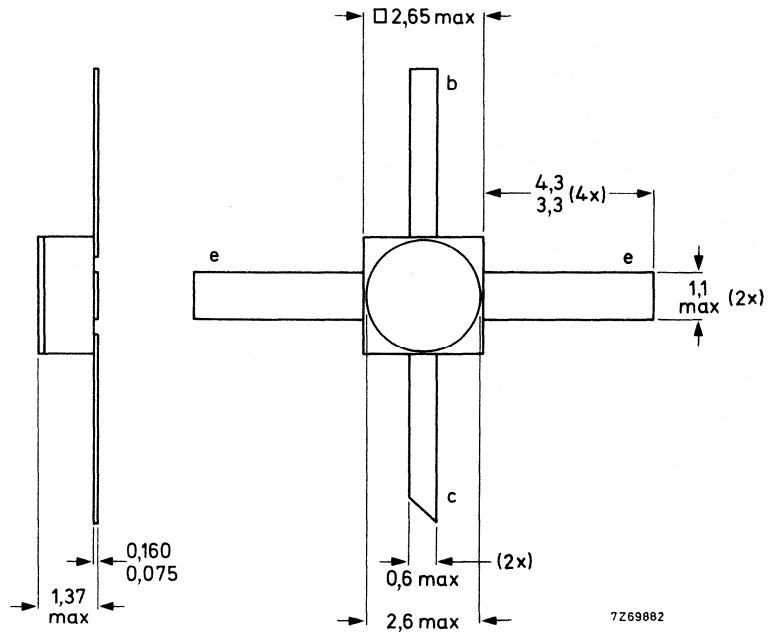
MECHANICAL DATA

SOT-100 (see Fig. 1)

MECHANICAL DATA

Fig. 1 SOT-100.

Dimensions in mm



RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	35 V
Collector-emitter voltage ($R_{BE} = 50 \Omega$) (open base)	V_{CER}	max.	30 V
	V_{CEO}	max.	22 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2,5 V
Collector current	I_C	max.	60 mA
Total power dissipation	P_{tot}	max.	0,8 W
Storage temperature	T_{stg}		-65 to 200 °C
Junction temperature	T_j	max.	+200 °C
Soldering temperature at 0,1 mm from case; $t_{sld} \leq 10$ s	T_{sld}	max.	+235 °C

THERMAL RESISTANCE

From junction to case	$R_{th\ j-c}$	180 K/W
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MICROWAVE LINEAR POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates in c.w. conditions and is recommended in common-emitter class-A amplifiers up to 4 GHz.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an SOT-100 metal ceramic package.

It is mounted in a common-emitter configuration, specified in class-A and operates in c.w. conditions.

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class-A selective amplifier.

Typical values

mode of operation	f GHz	V _{CE} V	I _C mA	P _{L1} mW	G _{po} dB	\bar{z}_i Ω	\bar{z}_L Ω
c.w. class-A	4	15	30	90	6,5	8 + j28	10 + j28

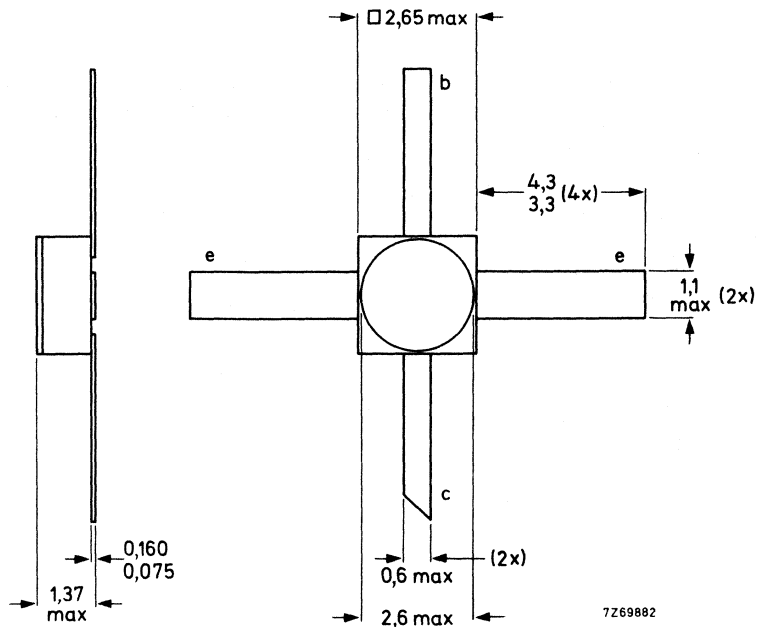
MECHANICAL DATA

SOT-100 (see Fig. 1)

MECHANICAL DATA

Fig. 1 SOT-100.

Dimensions in mm



RATINGS

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

Collector-base voltage (open emitter)	V_{CB0}	max.	30 V
Collector-emitter voltage ($R_{BE} = 220 \Omega$) (open base)	V_{CER}	max.	25 V
	V_{CEO}	max.	15 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3 V
Collector current	I_C	max.	140 mA
Total power dissipation ($T_{mb} = 75 \text{ }^\circ\text{C}$)	P_{tot}	max.	700 mW
Junction temperature	T_j		-65 to 200 $^\circ\text{C}$
Soldering temperature at 0,1 mm from case; $t_{sld} \leq 10 \text{ s}$	T_{sld}	max.	+235 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to case	$R_{th \text{ j-c}}$	180 K/W
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MICROWAVE LINEAR POWER TRANSISTOR

N-P-N transistor for common-emitter class-A linear power amplifiers up to 4 GHz. Self-aligned process entirely ion implanted and gold sandwich metallization ensure an optimum temperature profile, excellent performance and reliability.

A miniature ceramic encapsulation is used for compatibility with stripline and microwave circuits.

QUICK REFERENCE DATA

R.F. performance up to $T_{\text{case}} = 25^{\circ}\text{C}$ in an unneutralized common-emitter class-A circuit

mode of operation	f GHz	V_{CE} V	I_{C} mA	P_{L1} mW	G_{po} dB	\bar{z}_i Ω	\bar{Z}_L Ω
c.w.; linear amplifier	4	15	25	typ. 110	typ. 9,5	typ. $7 + j22$	typ. $10 + j38$

MECHANICAL DATA

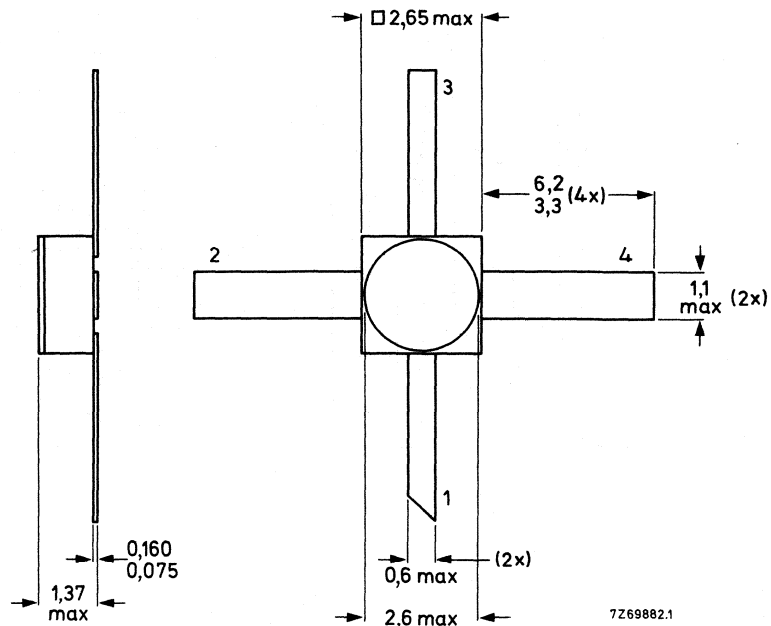
Dimensions in mm

Fig. 1 SOT-100.

Emitter connected to metallized lid

Pinning :

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



Marking code

R8 = LAE4001R

7269882.1

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC134).

Collector-base voltage (open emitter)	V_{CBO}	max.	30 V
Collector-emitter voltage ($R_{BE} = 220 \Omega$) (open base)	V_{CER}	max.	25 V
	V_{CEO}	max.	16 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2 V
Collector current (d.c.)	I_C	max.	80 mA
Total power dissipation up to $T_{case} = 100 \text{ }^\circ\text{C}$	P_{tot}	max.	480 mW
Storage temperature	T_{stg}		-65 to +200 $^\circ\text{C}$
Junction temperature	T_j	max.	200 $^\circ\text{C}$
Lead soldering temperature at 0,1 mm from the case; $t_{sld} \leq 10 \text{ s}$	T_{sld}	max.	235 $^\circ\text{C}$

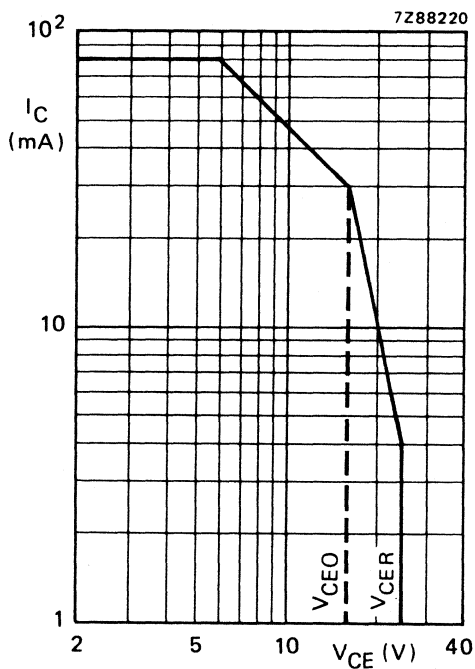


Fig. 2 D.C. SOAR at $T_{case} \leq 100 \text{ }^\circ\text{C}$;
 $R_{BE} < 220 \Omega$.

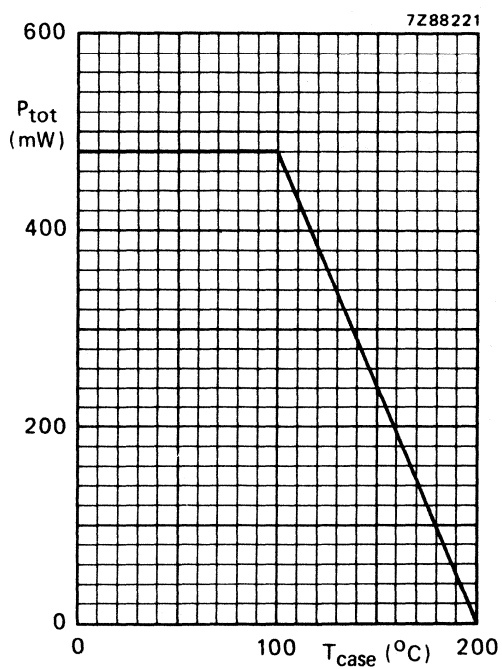


Fig. 3 Power derating curve vs. temperature.

→ **THERMAL RESISTANCE** (at $T_j = 75 \text{ }^\circ\text{C}$)
From junction to case

$R_{th\ j-c} = 210 \text{ K/W}^*$

*K/W is SI unit for $^\circ\text{C/W}$.

CHARACTERISTICS

$T_{\text{case}} = 25 \text{ }^{\circ}\text{C}$

Collector cut-off current

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

$I_{CBO} < 100 \text{ nA}$

$I_E = 0; V_{CB} = 30 \text{ V}$

$I_{CBO} < 100 \text{ } \mu\text{A}$

$V_{CB} = 25 \text{ V}; R_{BE} = 220 \text{ } \Omega$

$I_{CER} < 500 \text{ } \mu\text{A}$

Emitter cut-off current

$I_C = 0; V_{EB} = 1,5 \text{ V}$

$I_{EBO} < 35 \text{ nA}$

$I_C = 0; V_{EB} = 2,0 \text{ V}$

$I_{EBO} < 0,15 \text{ } \mu\text{A}$

D.C. current gain

$I_C = 25 \text{ mA}; V_{CE} = 5 \text{ V}$

$h_{FE} \quad 20 \text{ to } 220$

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

$I_E = I_C = 0; V_{CB} = 15 \text{ V}; V_{EB} = 1,5 \text{ V}$

$C_{cb} \text{ typ. } 0,25 \text{ pF}$

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

$I_E = I_C = 0; V_{CE} = 15; V_{EB} = 1,5 \text{ V}$

$C_{ce} \text{ typ. } 0,5 \text{ pF}$

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

$I_E = I_C = 0; V_{EB} = 1,0 \text{ V}; V_{CB} = 15 \text{ V}$

$C_{eb} \text{ typ. } 1,3 \text{ pF}$

Forward power gain

$I_C = 25 \text{ mA}; V_{CE} = 15 \text{ V}; f = 2 \text{ GHz}$

$|s_{fe}|^2 \text{ typ. } 9,6 \text{ dB}$

$I_C = 25 \text{ mA}; V_{CE} = 15 \text{ V}; f = 4 \text{ GHz}$

$|s_{fe}|^2 \text{ typ. } 3,8 \text{ dB}$

Maximum available gain

$I_C = 25 \text{ mA}; V_{CE} = 15 \text{ V}; f = 2 \text{ GHz}$

$G_{AM} \text{ typ. } 16 \text{ dB}$

$I_C = 25 \text{ mA}; V_{CE} = 15 \text{ V}; f = 4 \text{ GHz}$

$G_{AM} \text{ typ. } 10 \text{ dB}$

s-parameters (common emitter)

Typical values; $V_{CE} = 15 \text{ V}$; $I_C = 25 \text{ mA}$; $T_{case} = 25 \text{ }^\circ\text{C}$; $Z_O = 50 \text{ } \Omega$

f MHz	S_{ie}	S_{re}	S_{fe}	S_{oe}
500	0,63/-165°	0,014(-37,1)/47°	10,7 (20,6)/ 101°	0,59/- 28°
600	0,64/-171°	0,015(-36,2)/47°	9,01(19,1)/ 96°	0,58/- 29°
700	0,65/-177°	0,018(-35,1)/47°	8,03(18,1)/ 89°	0,56/- 30°
800	0,65/ 180°	0,019(-34,5)/47°	7,08(17,0)/ 84°	0,55/- 31°
900	0,65/ 176°	0,021(-33,7)/48°	6,31(16,0)/ 80°	0,54/- 32°
1000	0,66/ 172°	0,023(-32,9)/49°	5,75(15,2)/ 76°	0,53/- 34°
1200	0,67/ 167°	0,026(-31,8)/50°	4,85(13,7)/ 69°	0,53/- 37°
1400	0,67/ 163°	0,030(-30,5)/50°	4,17(12,4)/ 62°	0,52/- 41°
1600	0,67/ 155°	0,034(-29,3)/50°	3,67(11,3)/ 56°	0,52/- 44°
1800	0,67/ 150°	0,038(-28,4)/51°	3,31(10,4)/ 50°	0,52/- 49°
2000	0,68/ 146°	0,043(-27,4)/50°	3,02(9,6)/ 45°	0,52/- 53°
2500	0,70/ 134°	0,053(-25,5)/47°	2,46(7,8)/ 31°	0,52/- 64°
3000	0,72/ 123°	0,064(-23,9)/43°	2,05(6,2)/ 18°	0,51/- 76°
3500	0,74/ 113°	0,075(-22,5)/38°	1,76(4,9)/ 3°	0,50/- 90°
4000	0,76/ 104°	0,085(-21,4)/33°	1,55(3,8)/ -11°	0,50/-105°
4500	0,77/ 95°	0,095(-20,4)/26°	1,37(2,7)/ -23°	0,51/-123°
5000	0,79/ 88°	0,107(-19,4)/19°	1,19(1,5)/ -35°	0,52/-141°
5500	0,80/ 81°	0,120(-18,4)/12°	1,06(0,5)/ -48°	0,57/-158°
6000	0,80/ 75°	0,133(-17,5)/ 6°	0,96(-0,4)/ -60°	0,62/-173°

The figures given between brackets are values in dB.

APPLICATION INFORMATION

R.F. performance up to $T_{case} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class-A circuit *

mode of operation	f GHz	$V_{CE}^{(1)}$ V	$I_C^{(1)}$ mA	$P_{L1}^{(2)}$ mW(dBm)	$G_{po}^{(3)}$ dB	\bar{z}_i Ω	\bar{Z}_L Ω
c.w.; linear amplifier	4	15	25	> 85(19,3) typ. 110(20,4)	> 8,5 typ. 9,5	typ.7+j22	typ.10+j38

Notes

- 1 I_C and V_{CE} regulated.
- 2 Load power for 1 dB compressed power gain.
- 3 Low-level power gain associated with P_{L1} .

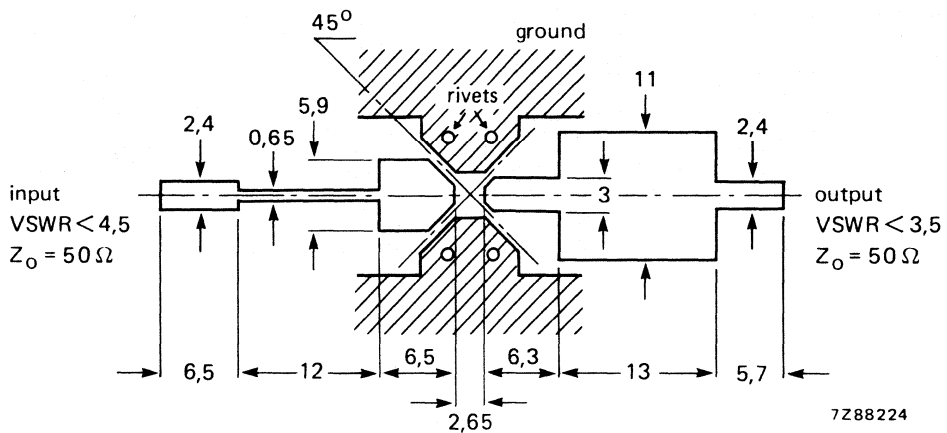


Fig. 4 Prematching test circuit board for 4 GHz. (Dimensions in mm.)

Striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric ($\epsilon_r = 2,54$); thickness 0,8 mm.

* Circuit consists of prematching circuit board in combination with input and output slug tuners.

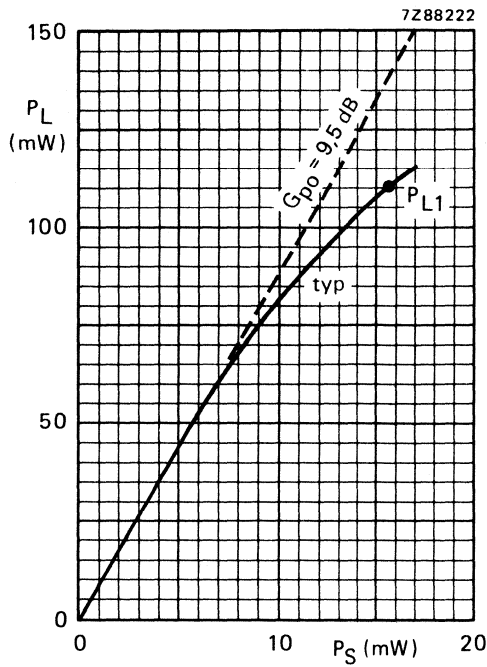


Fig. 5 $V_{CE} = 15 \text{ V}$; $I_C = 25 \text{ mA}$; $f = 4 \text{ GHz}$;
 $T_{case} = 25^\circ\text{C}$.

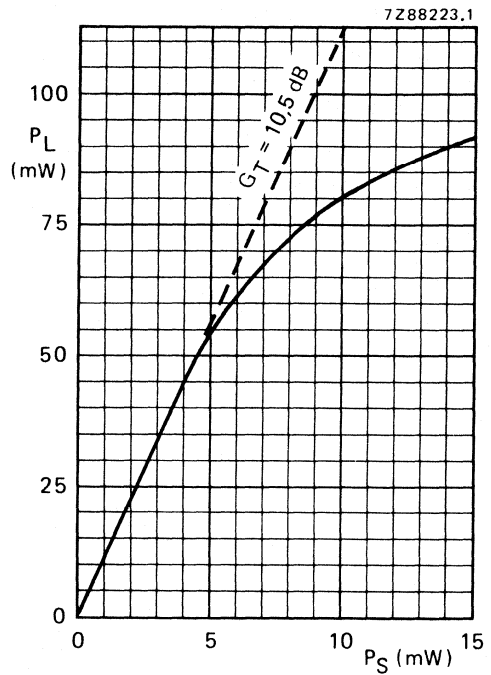


Fig. 6 $V_{CE} = 15 \text{ V}$; $I_C = 25 \text{ mA}$; $f = 4 \text{ GHz}$;
 maximum low-level linear power gain.

MICROWAVE LINEAR POWER TRANSISTOR

N-P-N transistor for common-emitter class-A linear power amplifiers up to 4 GHz. Diffused emitter ballasting resistors, self-aligned process entirely ion implanted and gold sandwich metallization ensure an optimum temperature profile, excellent performance and reliability.

A miniature ceramic encapsulation is used for compatibility with stripline and microwave circuits.

QUICK REFERENCE DATA

R.F. performance up to $T_{\text{case}} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class-A circuit

mode of operation	f GHz	V_{CE} V	I_{C} mA	P_{L1} mW	G_{po} dB	\bar{Z}_{i} Ω	\bar{Z}_{L} Ω
c.w.; linear amplifier	4	18	30	typ. 160	typ. 8	typ. $4 + j23$	typ. $6,5 + j32$

MECHANICAL DATA

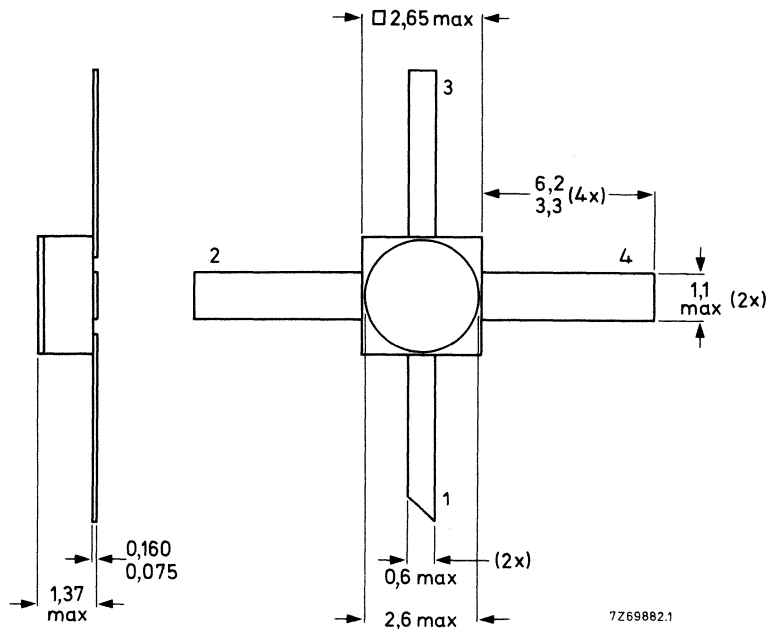
Dimensions in mm

Fig. 1 SOT-100.

Emitter connected to metallized lid

Pinning :

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



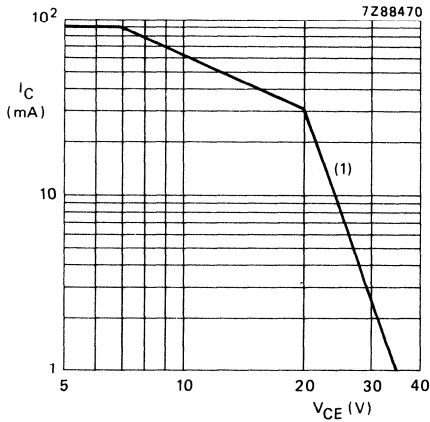
Marking code

R9 = LAE4002S

RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	40 V
Collector-emitter voltage ($R_{BE} = 220 \Omega$) (open base)	V_{CER}	max.	35 V
	V_{CEO}	max.	16 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3 V
Collector current (d.c.)	I_C	max.	90 mA
Total power dissipation up to $T_{case} = 75 \text{ }^\circ\text{C}$	P_{tot}	max.	625 mW
Storage temperature	T_{stg}		-65 to +200 $^\circ\text{C}$
Junction temperature	T_j	max.	200 $^\circ\text{C}$
Lead soldering temperature at 0,1 mm from the case; $t_{sld} \leq 10 \text{ s}$	T_{sld}	max.	235 $^\circ\text{C}$



(1) Second breakdown limit (independent of temperature).

Fig. 2 D.C. SOAR at $T_{case} \leq 75 \text{ }^\circ\text{C}$;
 $R_{BE} < 220 \Omega$.

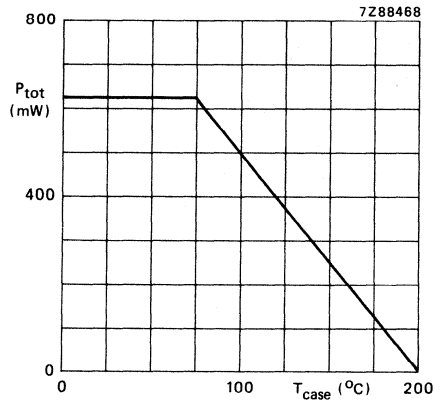


Fig. 3 Power derating curve vs. temperature.

→ **THERMAL RESISTANCE** (at $T_j = 75 \text{ }^\circ\text{C}$)

From junction to case

$$R_{th\ j-c} = 200 \text{ K/W}^*$$

* K/W is SI unit for $^\circ\text{C/W}$.

CHARACTERISTICS

 $T_{\text{case}} = 25\text{ }^{\circ}\text{C}$

Collector cut-off current

 $I_E = 0; V_{CB} = 20\text{ V}$ $I_{CBO} < 100\text{ nA}$ $I_E = 0; V_{CB} = 40\text{ V}$ $I_{CBO} < 150\text{ }\mu\text{A}$ $V_{CB} = 35\text{ V}; R_{BE} = 220\text{ }\Omega$ $I_{CER} < 500\text{ }\mu\text{A}$

Emitter cut-off current

 $I_C = 0; V_{EB} = 1,5\text{ V}$ $I_{EBO} < 50\text{ nA}$ $I_C = 0; V_{EB} = 3,0\text{ V}$ $I_{EBO} < 25\text{ }\mu\text{A}$

D.C. current gain

 $I_C = 30\text{ mA}; V_{CE} = 5\text{ V}$ $h_{FE} \quad 15\text{ to }150$ Collector-base capacitance at $f = 1\text{ MHz}$ $I_E = I_C = 0; V_{CB} = 18\text{ V}; V_{EB} = 1,5\text{ V}$ $C_{cb} \quad \text{typ.} \quad 0,3\text{ pF}$ Collector-emitter capacitance at $f = 1\text{ MHz}$ $I_E = I_C = 0; V_{CE} = 18\text{ V}; V_{EB} = 1,5\text{ V}$ $C_{ce} \quad \text{typ.} \quad 0,55\text{ pF}$ Emitter-base capacitance at $f = 1\text{ MHz}$ $I_E = I_C = 0; V_{EB} = 1,0\text{ V}; V_{CB} = 18\text{ V}$ $C_{eb} \quad \text{typ.} \quad 1,8\text{ pF}$

Forward power gain

 $I_C = 30\text{ mA}; V_{CE} = 18\text{ V}; f = 2\text{ GHz}$ $|s_{fe}|^2 \quad \text{typ.} \quad 8,8\text{ dB}$ $I_C = 30\text{ mA}; V_{CE} = 18\text{ V}; f = 4\text{ GHz}$ $|s_{fe}|^2 \quad \text{typ.} \quad 2,8\text{ dB}$

Maximum available gain

 $I_C = 30\text{ mA}; V_{CE} = 18\text{ V}; f = 2\text{ GHz}$ $G_{AM} \quad \text{typ.} \quad 14\text{ dB}$ $I_C = 30\text{ mA}; V_{CE} = 18\text{ V}; f = 3\text{ GHz}$ $G_{AM} \quad \text{typ.} \quad 11\text{ dB}$

s-parameters (common emitter)

Typical values; $V_{CE} = 18\text{ V}$; $I_C = 30\text{ mA}$; $T_{case} = 25\text{ }^\circ\text{C}$; $Z_o = 50\text{ }\Omega$

f MHz	S_{ie}	S_{re}	S_{fe}	S_{oe}
500	0,63/−153°	0,023(−32,7)/38°	9,89(19,9)/ 98°	0,55/ −34°
600	0,63/−161°	0,024(−32,2)/38°	8,22(18,3)/ 94°	0,53/ −35°
700	0,63/−168°	0,026(−31,6)/38°	7,33(17,3)/ 87°	0,51/ −36°
800	0,64/−173°	0,028(−30,9)/38°	6,46(16,2)/ 82°	0,50/ −37°
900	0,64/−177°	0,030(−30,4)/38°	5,82(15,3)/ 78°	0,50/ −38°
1000	0,64/ 179°	0,032(−29,9)/40°	5,25(14,4)/ 74°	0,49/ −40°
1200	0,64/ 172°	0,035(−29,0)/40°	4,47(13,0)/ 66°	0,48/ −44°
1400	0,65/ 165°	0,039(−28,1)/41°	3,80(11,6)/ 59°	0,48/ −49°
1600	0,65/ 159°	0,044(−27,1)/41°	3,35(10,5)/ 52°	0,48/ −53°
1800	0,65/ 154°	0,048(−26,3)/41°	3,02(9,6)/ 46°	0,48/ −59°
2000	0,66/ 147°	0,053(−25,5)/40°	2,75(8,8)/ 40°	0,48/ −64°
2500	0,67/ 134°	0,064(−23,9)/37°	2,24(7,0)/ 25°	0,48/ −77°
3000	0,70/ 122°	0,076(−22,4)/33°	1,84(5,3)/ 11°	0,48/ −91°
3500	0,71/ 111°	0,088(−21,1)/28°	1,58(4,0)/ −4°	0,48/−108°
4000	0,73/ 101°	0,101(−19,9)/22°	1,38(2,8)/−12°	0,50/−125°
4500	0,75/ 92°	0,112(−19,0)/16°	1,21(1,7)/−32°	0,52/−143°
5000	0,76/ 85°	0,125(−18,1)/ 8°	1,05(0,4)/−45°	0,56/−161°
5500	0,77/ 78°	0,138(−17,2)/ 2°	0,92(−0,7)/−58°	0,61/−178°
6000	0,77/ 71°	0,150(−16,5)/−4°	0,81(−1,8)/−69°	0,67/ 168°

Typical values; $V_{CE} = 15\text{ V}$; $I_C = 15\text{ mA}$; $T_{case} = 25\text{ }^\circ\text{C}$; $Z_o = 50\text{ }\Omega$

f MHz	S_{ie}	S_{re}	S_{fe}	S_{oe}
500	0,63/−145°	0,030(−30,5)/36°	9,22(19,3)/ 103°	0,58/ −38°
600	0,63/−154°	0,031(−30,1)/35°	7,76(17,8)/ 97°	0,56/ −39°
700	0,63/−161°	0,033(−29,6)/33°	6,92(16,8)/ 90°	0,52/ −40°
800	0,64/−167°	0,035(−29,2)/33°	6,16(15,8)/ 85°	0,51/ −41°
900	0,64/−172°	0,036(−28,8)/32°	5,56(14,9)/ 81°	0,50/ −42°
1000	0,64/−177°	0,038(−28,4)/32°	5,01(14,0)/ 76°	0,49/ −44°
1200	0,65/ 176°	0,041(−27,8)/33°	4,26(12,6)/ 68°	0,48/ −48°
1400	0,65/ 170°	0,045(−27,0)/36°	3,67(11,3)/ 61°	0,47/ −53°
1600	0,65/ 162°	0,048(−26,3)/34°	3,23(10,2)/ 55°	0,47/ −57°
1800	0,65/ 157°	0,052(−25,7)/35°	2,92(9,3)/ 48°	0,47/ −63°
2000	0,66/ 149°	0,056(−25,0)/33°	2,66(8,5)/ 42°	0,47/ −67°
2500	0,67/ 136°	0,066(−23,6)/32°	2,14(6,6)/ 26°	0,47/ −80°
3000	0,69/ 124°	0,076(−22,3)/28°	1,78(5,0)/ 12°	0,47/ −95°
3500	0,71/ 112°	0,089(−21,0)/24°	1,53(3,7)/ −2°	0,47/−112°
4000	0,73/ 102°	0,100(−20,0)/20°	1,29(2,2)/−17°	0,49/−130°
4500	0,75/ 93°	0,112(−19,0)/13°	1,16(1,3)/−31°	0,52/−148°
5000	0,76/ 86°	0,125(−18,1)/ 6°	1,01(0,1)/−43°	0,56/−166°
5500	0,77/ 78°	0,136(−17,3)/ 0°	0,88(−1,1)/−56°	0,61/−177°
6000	0,77/ 72°	0,148(−16,6)/−7°	0,79(−2,1)/−67°	0,67/ 168°

The figures given between brackets are values in dB.

s-parameters (common emitter)Typical values; $V_{CE} = 18 \text{ V}$; $I_C = 10 \text{ mA}$; $T_{\text{case}} = 25 \text{ }^\circ\text{C}$; $Z_0 = 50 \text{ } \Omega$

f MHz	S_{ie}	S_{re}	S_{fe}	S_{oe}
500	0,65/-135°	0,032(-29,8)/34°	8,41(18,5)/105°	0,64/ -34°
600	0,65/-147°	0,033(-29,5)/33°	7,16(17,1)/100°	0,62/ -36°
700	0,65/-154°	0,036(-28,9)/30°	6,46(16,2)/ 92°	0,59/ -37°
800	0,65/-161°	0,037(-28,6)/29°	5,68(15,1)/ 87°	0,57/ -38°
900	0,65/-166°	0,038(-28,3)/28°	5,13(14,2)/ 82°	0,56/ -40°
1000	0,65/-172°	0,040(-28,0)/28°	4,68(13,4)/ 78°	0,55/ -42°
1200	0,65/ 180°	0,042(-27,5)/29°	3,98(12,0)/ 69°	0,54/ -46°
1400	0,65/ 174°	0,045(-27,0)/29°	3,43(10,7)/ 62°	0,53/ -50°
1600	0,65/ 165°	0,048(-26,4)/29°	3,06(9,7)/ 55°	0,53/ -55°
1800	0,66/ 159°	0,051(-25,9)/30°	2,75(8,8)/ 48°	0,53/ -61°
2000	0,67/ 152°	0,054(-25,4)/30°	2,49(7,9)/ 42°	0,53/ -65°
2500	0,68/ 138°	0,063(-24,1)/29°	2,02(6,1)/ 25°	0,53/ -78°
3000	0,69/ 125°	0,072(-22,8)/27°	1,67(4,5)/ 12°	0,52/ -93°
3500	0,71/ 114°	0,083(-21,6)/24°	1,44(3,2)/ -4°	0,53/-109°
4000	0,74/ 103°	0,095(-20,4)/20°	1,26(2,0)/-19°	0,55/-127°
4500	0,75/ 94°	0,106(-19,5)/14°	1,10(0,8)/-32°	0,57/-145°
5000	0,76/ 86°	0,118(-18,6)/ 7°	0,94(-0,5)/-44°	0,61/-163°
5500	0,77/ 79°	0,132(-17,6)/ 0°	0,83(-1,7)/-57°	0,65/-179°
6000	0,77/ 72°	0,145(-16,8)/-6°	0,72(-2,8)/-68°	0,71/ 168°

The figures given between brackets are values in dB.

APPLICATION INFORMATION

R.F. performance up to $T_{case} = 25\text{ }^\circ\text{C}$ in an unneutralized common-emitter class-A circuit*

mode of operation	f GHz	$V_{CE}^{(1)}$ V	$I_C^{(1)}$ mA	$P_{L1}^{(2)}$ mW(dBm)	$G_{po}^{(3)}$ dB	\bar{Z}_i Ω	\bar{Z}_L Ω
c.w.; linear amplifier	4	18	30	> 126(21) typ. 160(22)	> 7,5 typ. 8,0	typ. $4 + j23$	typ. $6,5 + j32$

Notes

1. I_C and V_{CE} regulated.
2. Load power for 1 dB compressed power gain.
3. Low-level power gain associated with P_{L1} .

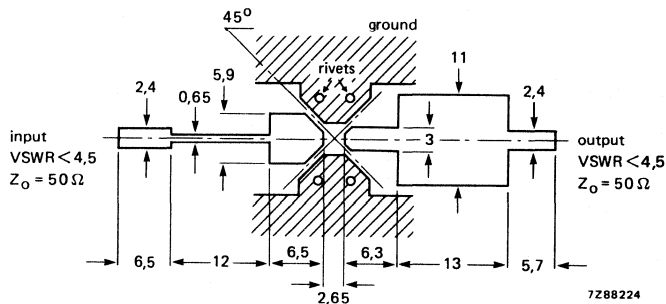


Fig. 4 Prematching test circuit board for 4 GHz. (Dimensions in mm.)

Striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric ($\epsilon_r = 2,54$); thickness 0,8 mm.

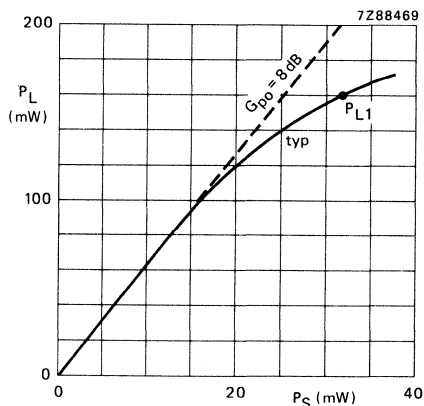


Fig. 5 $V_{CE} = 18\text{ V}$; $I_C = 30\text{ mA}$;
 $f = 4\text{ GHz}$; $T_{case} = 25\text{ }^\circ\text{C}$.

* Circuit consists of prematching circuit board in combination with input and output slug tuners.

LOW-NOISE MICROWAVE TRANSISTOR

N-P-N transistor for common-emitter class-A low-noise amplifiers up to 4 GHz. Self-aligned process entirely ion implanted and gold sandwich metallization ensure an optimum temperature profile, excellent performance and reliability.

A miniature ceramic encapsulation is used for compatibility with stripline and microwave circuits.

QUICK REFERENCE DATA

R.F. performance up to $T_{case} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class-A circuit

mode of operation	f GHz	V_{CE} V	I_C mA	F_{min} dB	G_a dB
c.w.; linear amplifier	2	10	4	typ. 3	typ. 12 ←

MECHANICAL DATA

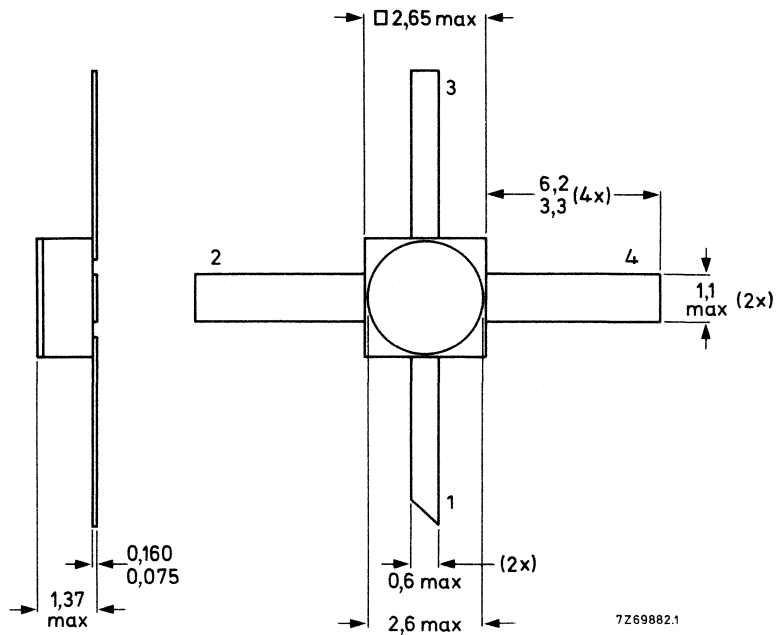
Dimensions in mm

Fig. 1 SOT-100.

Emitter connected to metallized lid

Pinning :

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



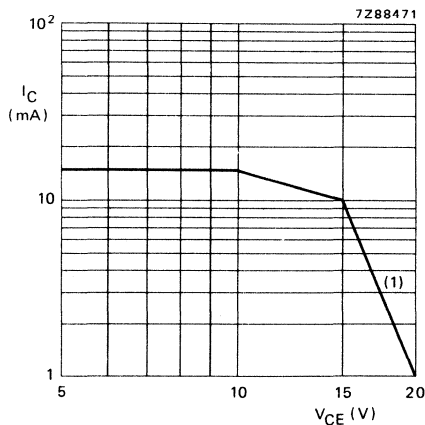
Marking code

R7 = LAE6000Q

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 ($R_{BE} = 150 \Omega$) (open base)	V_{CER} V_{CEO}	max.	20 V 12 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2 V
Collector current (d.c.)	I_C	max.	15 mA
Total power dissipation up to $T_{case} = 150 \text{ }^\circ\text{C}$	P_{tot}	max.	150 mW
Storage temperature	T_{stg}		-65 to + 200 $^\circ\text{C}$
Junction temperature	T_j	max.	200 $^\circ\text{C}$
Lead soldering temperature at 0,1 mm from the case; $t_{sld} \leq 10 \text{ s}$	T_{sld}	max.	235 $^\circ\text{C}$



(1) Second breakdown limit (independent of temperature).

Fig. 2 D.C. SOAR at $T_{case} \leq 150 \text{ }^\circ\text{C}$; $R_{BE} \leq 150 \Omega$.

→ **THERMAL RESISTANCE** (at $T_j = 75 \text{ }^\circ\text{C}$)

From junction to case

$$R_{th \text{ j-c}} = 300 \text{ K/W}^*$$

* K/W is SI unit for $^\circ\text{C/W}$.

CHARACTERISTICS

$T_{case} = 25\text{ }^{\circ}\text{C}$

Collector cut-off current

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

$I_{CBO} < 100\text{ nA}$

Emitter cut-off current

$I_C = 0; V_{EB} = 1,5\text{ V}$

$I_{EBO} < 15\text{ nA}$

D.C. current gain

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

$h_{FE} \quad 20\text{ to }250$

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

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

$C_{cb} \quad \text{typ. } 0,15\text{ pF}$

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

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

$C_{ce} \quad \text{typ. } 0,50\text{ pF}$

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

$I_E = I_C = 0; V_{EB} = 1,0\text{ V}; V_{CB} = 10\text{ V}$

$C_{eb} \quad \text{typ. } 0,70\text{ pF}$

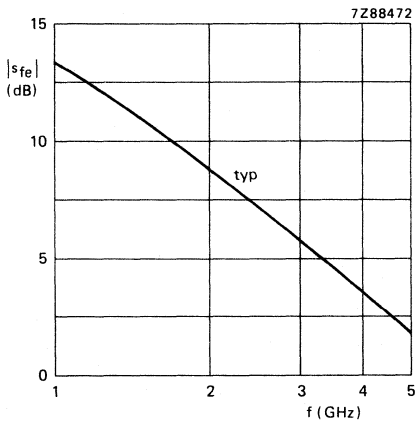


Fig. 3 $V_{CE} = 10\text{ V}; I_C = 4\text{ mA}; T_{case} = 25\text{ }^{\circ}\text{C}; Z_o = 50\text{ }\Omega$.

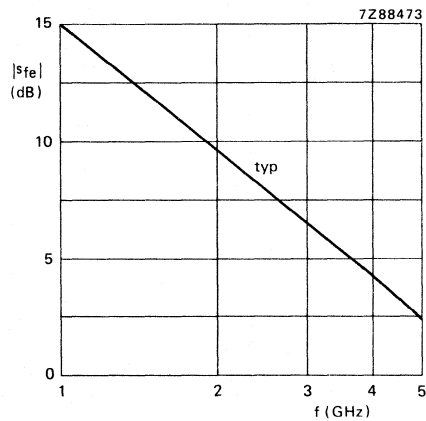


Fig. 4 $V_{CE} = 10\text{ V}; I_C = 8\text{ mA}; T_{case} = 25\text{ }^{\circ}\text{C}; Z_o = 50\text{ }\Omega$.

s-parameters (common emitter)

Typical values; $V_{CE} = 10 \text{ V}$; $I_C = 4 \text{ mA}$; $T_{case} = 25 \text{ }^\circ\text{C}$; $Z_O = 50 \text{ } \Omega$

f MHz	S_{ie}	S_{re}	S_{fe}	S_{oe}
500	0,65/ -78°	0,025(-32,1)/50°	6,53(16,4)/126°	0,83/ -16°
600	0,62/ -94°	0,028(-30,9)/47°	6,16(15,8)/121°	0,83/ -18°
700	0,59/-100°	0,032(-30,0)/43°	5,82(15,3)/113°	0,83/ -25°
800	0,57/-111°	0,034(-29,4)/39°	5,40(14,6)/107°	0,80/ -27°
900	0,56/-120°	0,036(-29,0)/36°	5,00(14,0)/101°	0,79/ -29°
1000	0,55/-129°	0,039(-28,6)/34°	4,71(13,5)/96°	0,78/ -31°
1200	0,53/-143°	0,040(-27,9)/32°	4,19(12,4)/86°	0,76/ -34°
1400	0,52/-156°	0,042(-27,5)/29°	3,70(11,4)/77°	0,74/ -40°
1600	0,51/-168°	0,045(-26,8)/28°	3,35(10,5)/70°	0,74/ -41°
1800	0,51/-176°	0,047(-26,5)/28°	3,04(9,7)/62°	0,73/ -45°
2000	0,51/ 175°	0,049(-26,1)/27°	2,78(8,9)/56°	0,73/ -49°
2500	0,51/ 156°	0,055(-25,2)/26°	2,30(7,3)/41°	0,71/ -57°
3000	0,52/ 139°	0,062(-24,2)/24°	1,95(5,8)/27°	0,70/ -68°
3500	0,55/ 126°	0,069(-23,3)/22°	1,70(4,6)/12°	0,70/ -80°
4000	0,57/ 114°	0,076(-22,0)/20°	1,54(3,7)/-2°	0,70/ -93°
4500	0,60/ 104°	0,084(-21,5)/14°	1,38(2,8)/-15°	0,70/-108°
5000	0,61/ 95°	0,094(-20,5)/8°	1,22(1,8)/-29°	0,70/-124°
5500	0,63/ 87°	0,105(-19,6)/3°	1,11(0,8)/-42°	0,71/-141°
6000	0,63/ 80°	0,114(-18,9)/-3°	1,00(0)/-55°	0,74/-157°

Typical values; $V_{CE} = 10 \text{ V}$; $I_C = 8 \text{ mA}$; $T_{case} = 25 \text{ }^\circ\text{C}$; $Z_O = 50 \text{ } \Omega$

f MHz	S_{ie}	S_{re}	S_{fe}	S_{oe}
500	0,52/-111°	0,019(-34,6)/47°	9,43(19,5)/117°	0,80/ -21°
600	0,51/-126°	0,020(-33,9)/45°	8,19(18,3)/109°	0,78/ -23°
700	0,50/-134°	0,022(-33,1)/43°	7,53(17,5)/102°	0,76/ -25°
800	0,50/-143°	0,024(-32,5)/42°	6,70(16,5)/97°	0,74/ -26°
900	0,50/-150°	0,025(-32,0)/42°	6,17(15,8)/92°	0,73/ -28°
1000	0,50/-157°	0,027(-31,4)/41°	5,68(15,1)/87°	0,73/ -29°
1200	0,50/-168°	0,030(-30,5)/41°	4,88(13,8)/79°	0,72/ -33°
1400	0,50/-176°	0,033(-29,7)/43°	4,22(12,5)/70°	0,70/ -38°
1600	0,50/ 173°	0,036(-28,8)/39°	3,76(11,5)/64°	0,70/ -39°
1800	0,50/ 167°	0,039(-28,1)/40°	3,40(10,6)/58°	0,70/ -43°
2000	0,50/ 160°	0,042(-27,5)/41°	3,08(9,8)/52°	0,70/ -47°
2500	0,52/ 144°	0,050(-26,0)/38°	2,54(8,1)/38°	0,69/ -56°
3000	0,54/ 131°	0,060(-24,5)/35°	2,13(6,6)/24°	0,68/ -66°
3500	0,56/ 119°	0,068(-23,3)/32°	1,86(5,4)/10°	0,67/ -78°
4000	0,59/ 108°	0,078(-22,2)/28°	1,66(4,4)/-4°	0,67/ -91°
4500	0,61/ 99°	0,086(-21,3)/22°	1,48(3,4)/-17°	0,67/-106°
5000	0,63/ 91°	0,098(-20,2)/14°	1,31(2,4)/-30°	0,67/-122°
5500	0,64/ 84°	0,110(-19,2)/8°	1,19(1,5)/-43°	0,69/-139°
6000	0,64/ 77°	0,119(-18,5)/2°	1,07(0,6)/-56°	0,73/-155°

The figures given between brackets are values in dB.

MICROWAVE LINEAR POWER TRANSISTORS

N-P-N bipolar transistors for use in a common-emitter class-A linear power amplifier up to 1 GHz.

Diffused emitter ballasting resistors, interdigitated structure, multicell geometry and gold sandwich metallization ensure an optimum temperature profile, excellent performance and reliability.

The LBE1004R and LBE1010R have a metal ceramic studless envelope.

The LCE1004R and LCE1010R have a metal ceramic capstan envelope.

QUICK REFERENCE DATA

R.F. performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class-A circuit

type number	mode of operation	f GHz	V_{CE} V	I_C mA	P_{L1} mW	G_{po} dB	\bar{Z}_i Ω	\bar{Z}_L Ω
LBE/LCE1004R	c.w.; linear amplifier	1	15	100	typ. 500	typ. 10	$5 + j10$	$25 + j25$
LBE/LCE1010R	c.w.; linear amplifier	1	15	200	typ. 1000	typ. 9	$4 + j9$	$20 + j15$

MECHANICAL DATA

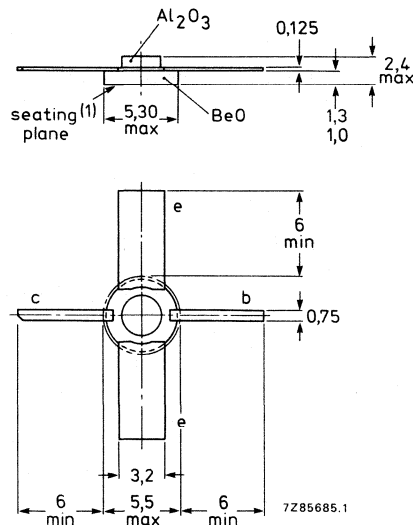
Dimensions in mm

Fig. 1a LBE1004R and LBE1010R (FO-45).

Marking code

RTC109 = LBE1004R

RTC143 = LBE1010R



(1) Metallized.

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 (continued)

Fig. 1b LCE1004R and LCE1010R (FO-46).

Marking code

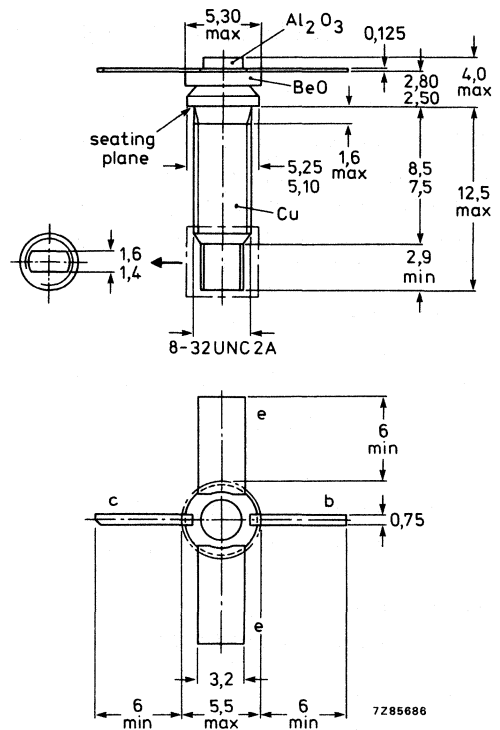
RTC108 = LCE1004R

RTC142 = LCE1010R

Torque on nut: min. 0,75 Nm
0,85 Nm

Diameter of clearance hole
in heatsink: max. 4,2 mm.

Dimensions in mm



RATINGS

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

		LBE/LCE 1004R	LBE/LCE 1010R	
Collector-base voltage open emitter	V_{CBO}	max. 30	30	V
Collector-emitter voltage $R_{BE} = 250 \Omega$ $R_{BE} = 500 \Omega$ open base	V_{CER}	max. —	30	V
	V_{CER}	max. 30	—	V
	V_{CEO}	max. 14	14	V
Emitter-base voltage open collector	V_{EBO}	max. 3	3	V
Collector current d.c.	I_C	max. 400	800	mA
peak value; $f > 1$ MHz	I_{CM}	max. 800	1600	mA
Total power dissipation up to $T_{mb} = 75^\circ C$	P_{tot}	max. 3	6	W
Storage temperature	T_{stg}	-65 to +150		$^\circ C$
Operating junction temperature	T_j	max.	200	$^\circ C$
Lead soldering temperature at 0,3 mm from the case; $t_{sld} = 10$ s	T_{sld}	max.	235	$^\circ C$

MICROWAVE LINEAR POWER TRANSISTORS

N-P-N transistors for use in a common-emitter class-A linear power amplifier up to 4 GHz.

Diffused emitter ballasting resistors, self-aligned process entirely ion implanted and gold metallization ensure an optimum temperature profile, excellent performance and reliability.

The LBE2003S and LBE2009S have a metal ceramic studless envelope.

The LCE2003S and LCE2009S have a metal ceramic capstan envelope.

QUICK REFERENCE DATA

R.F. performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class-A circuit

type number	mode of operation	f GHz	V_{CE} V	I_C mA	P_{L1} mW	G_{po} dB	\bar{z}_i Ω	\bar{z}_L Ω
LBE/LCE2003S	c.w.; linear amplifier	2	18	30	typ. 250	typ. 11	$6,2 + j30$	$17,5 + j7$
LBE/LCE2009S	c.w.; linear amplifier	2	18	110	typ. 900	typ. 9,8	$7,5 + j15$	$17,5 + j39$

MECHANICAL DATA

Dimensions in mm

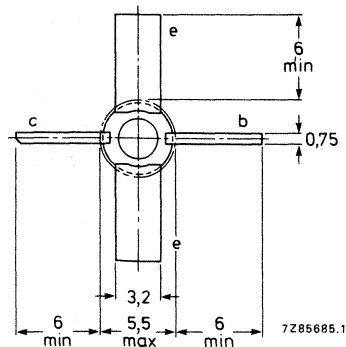
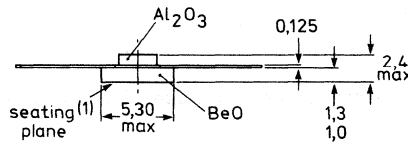
Fig. 1a LBE2003S and LBE2009S.

FO-45

Marking code

RTC407 = LBE2003S

RTC409 = LBE2009S



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 (continued)

Fig. 1b LCE2003S and LCE2009S.

FO-46

Marking code

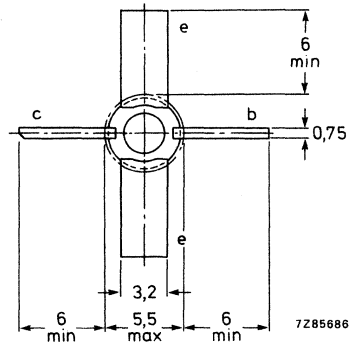
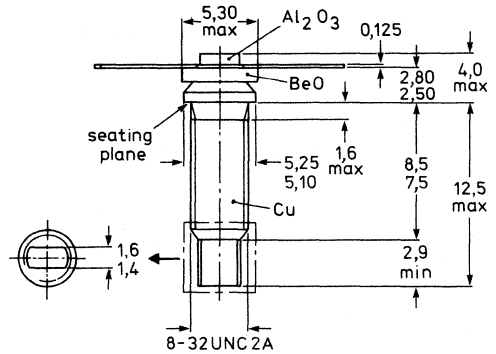
RTC406 = LCE2003S

RTC408 = LCE2009S

Torque on nut: min. 0,75 Nm
max. 0,85 Nm

Diameter of clearance hole in
heatsink: max. 4,2 mm.

Dimensions in mm

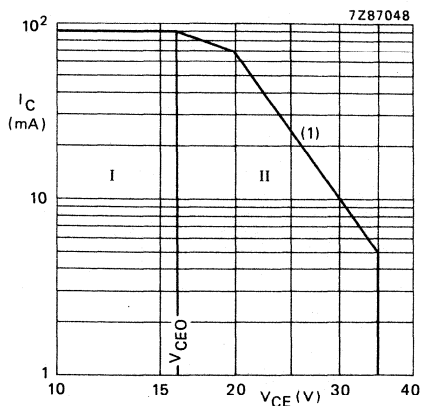


RATINGS

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

		LBE/LCE 2003S	LBE/LCE 2009S	
Collector-base voltage (open emitter)	V_{CBO}	max. 40	40	V
Collector-emitter voltage $R_{BE} = 100 \Omega$	V_{CER}	max. —	35	V
$R_{BE} = 220 \Omega$ (open base)	V_{CER}	max. 35	—	V
Emitter-base voltage (open collector)	V_{CEO}	max. 16	16	V
Collector current (d.c.)	V_{EBO}	max. 3	3	V
Total power dissipation up to $T_{mb} = 75 \text{ }^\circ\text{C}$	I_C	max. 90	250	mA
Storage temperature	P_{tot}	max. 1,4	3,5	W
Operating junction temperature	T_{stg}	-65 to + 150		$^\circ\text{C}$
Lead soldering temperature at 0,3 mm from the case; $t_{sld} = 10 \text{ s}$	T_j	max.	200	$^\circ\text{C}$
	T_{sld}	max.	235	$^\circ\text{C}$

LBE/LCE2003S



(1) Second breakdown limit (independent of temperature).

Fig. 2 D.C. SOAR at $T_{mb} \leq 75^\circ\text{C}$.

I Region of permissible d.c. operation.

II Permissible extension provided $R_{BE} \leq 220 \Omega$.

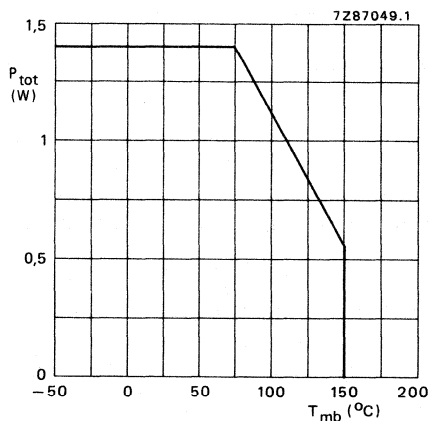
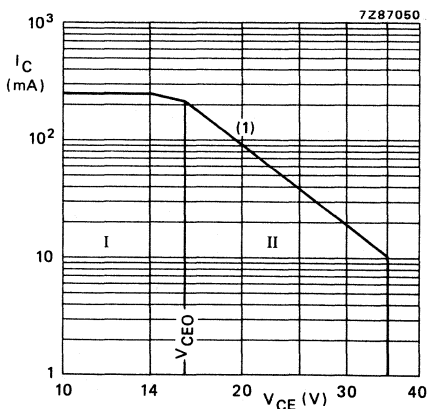


Fig. 3 Power derating curve vs. mounting base temperature.

LBE/LCE2009S



(1) Second breakdown limit (independent of temperature).

Fig. 4 D.C. SOAR at $T_{mb} \leq 75^\circ\text{C}$.

I Region of permissible d.c. operation.

II Permissible extension provided $R_{BE} \leq 100 \Omega$.

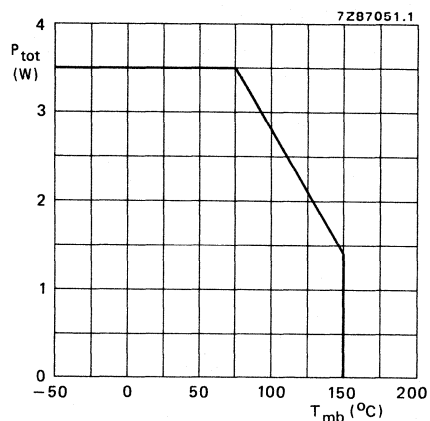


Fig. 5 Power derating curve vs. mounting base temperature.

→ THERMAL RESISTANCE (at $T_j = 75\text{ }^\circ\text{C}$)

From junction to mounting base
From mounting base to heatsink

		LBE/LCE 2003S	LBE/LCE 2009S	
$R_{th\ j-mb}$	=	65	36	K/W*
$R_{th\ mb-h}$	=	1,5	1,5	K/W*

CHARACTERISTICS

$T_{mb} = 25\text{ }^\circ\text{C}$

Collector cut-off current

$I_E = 0; V_{CB} = 20\text{ V}$

$I_E = 0; V_{CB} = 40\text{ V}$

$V_{CB} = 35\text{ V}; R_{BE} = 220\ \Omega$

$V_{CB} = 35\text{ V}; R_{BE} = 100\ \Omega$

Emitter cut-off current

$I_C = 0; V_{EB} = 1,5\text{ V}$

$I_C = 0; V_{EB} = 3,0\text{ V}$

D.C. current gain

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

$I_C = 110\text{ mA}; V_{CE} = 5\text{ V}$

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

$I_E = I_C = 0; V_{CB} = 18\text{ V}; V_{EB} = 1,5\text{ V}$

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

$I_E = I_C = 0; V_{CE} = 18\text{ V}; V_{EB} = 1,5\text{ V}$

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

$I_E = I_C = 0; V_{EB} = 1\text{ V}; V_{CB} = 10\text{ V}$

		LBE/LCE 2003S	LBE/LCE 2009S	
I_{CBO}	<	0,1	0,1	μA
I_{CBO}	<	150	250	μA
I_{CER}	<	500	—	μA
I_{CER}	<	—	1000	μA
I_{EBO}	<	0,05	0,2	μA
I_{EBO}	<	25	50	μA
h_{FE}	>	15	—	
h_{FE}	<	150	—	
h_{FE}	>	—	15	
h_{FE}	<	—	150	
C_{cb}	typ.	0,3	0,6	pF
C_{ce}	typ.	0,45	0,6	pF
C_{eb}	typ.	1,7	3,3	pF

* K/W is SI unit for $^\circ\text{C}/\text{W}$.

s-parameters (common emitter)

LBE/LCE2003S: Typical values; $V_{CE} = 18 \text{ V}^*$; $I_C = 30 \text{ mA}^*$; $T_{mb} = 25 \text{ }^\circ\text{C}$; $Z_0 = 50 \text{ } \Omega$

f GHz	S_{ie}	S_{re}	S_{fe}	S_{oe}
0,5	0,56/−143°	0,037(−28,6)/ 41°	9,50(19,6)/ 101°	0,56/ −34°
0,6	0,55/−154°	0,040(−28,0)/ 39°	8,28(18,4)/ 93°	0,51/ −35°
0,7	0,55/−164°	0,040(−27,9)/ 40°	7,13(17,1)/ 88°	0,50/ −36°
0,8	0,55/−171°	0,041(−27,7)/ 40°	6,35(16,1)/ 82°	0,49/ −37°
0,9	0,55/−178°	0,043(−27,4)/ 41°	5,69(15,1)/ 77°	0,47/ −38°
1,0	0,55/+ 176°	0,045(−26,9)/ 40°	5,14(14,2)/ 72°	0,46/ −39°
1,1	0,55/+ 170°	0,048(−26,4)/ 40°	4,72(13,5)/ 68°	0,46/ −39°
1,2	0,55/+ 165°	0,051(−25,9)/ 41°	4,37(12,8)/ 64°	0,45/ −41°
1,3	0,56/+ 159°	0,056(−25,1)/ 41°	4,05(12,2)/ 60°	0,44/ −44°
1,4	0,55/+ 158°	0,060(−24,5)/ 41°	3,76(11,5)/ 57°	0,45/ −46°
1,5	0,55/+ 149°	0,062(−24,2)/ 40°	3,52(10,9)/ 53°	0,43/ −48°
1,6	0,55/+ 146°	0,065(−23,8)/ 42°	3,33(10,5)/ 50°	0,43/ −50°
1,7	0,56/+ 142°	0,068(−23,3)/ 42°	3,15(10,0)/ 46°	0,43/ −53°
1,8	0,57/+ 137°	0,070(−23,1)/ 41°	2,96(9,4)/ 42°	0,43/ −54°
1,9	0,57/+ 132°	0,072(−22,9)/ 40°	2,80(8,9)/ 39°	0,43/ −56°
2,0	0,58/+ 128°	0,074(−22,7)/ 40°	2,66(8,5)/ 36°	0,42/ −57°
2,2	0,60/+ 121°	0,081(−21,8)/ 39°	2,43(7,7)/ 28°	0,41/ −61°
2,4	0,62/+ 114°	0,091(−20,8)/ 37°	2,24(7,0)/ 23°	0,40/ −67°
2,6	0,64/+ 108°	0,099(−20,1)/ 36°	2,08(6,4)/ 16°	0,39/ −75°
2,8	0,66/+ 102°	0,105(−19,6)/ 33°	1,90(5,6)/ 10°	0,38/ −82°
3,0	0,68/ +96°	0,108(−19,4)/ 31°	1,79(5,1)/ 4°	0,39/ −87°
3,2	0,71/ +92°	0,124(−18,7)/ 29°	1,63(4,3)/ −2°	0,37/ −94°
3,4	0,73/ +89°	0,125(−18,0)/ 27°	1,58(4,0)/ −7°	0,40/ −101°
3,6	0,75/ +86°	0,137(−17,3)/ 25°	1,46(3,3)/ −13°	0,39/ −112°
3,8	0,76/ +82°	0,142(−17,0)/ 23°	1,40(2,9)/ −18°	0,38/ −120°
4,0	0,77/ +79°	0,149(−16,6)/ 20°	1,31(2,3)/ −24°	0,38/ −128°
4,2	0,78/ +75°	0,155(−16,2)/ 17°	1,25(1,9)/ −28°	0,38/ −133°
4,4	0,80/ +73°	0,167(−15,5)/ 15°	1,20(1,6)/ −34°	0,39/ −142°
4,6	0,81/ +69°	0,177(−15,0)/ 12°	1,14(1,1)/ −38°	0,39/ −151°
4,8	0,81/ +68°	0,187(−14,6)/ 10°	1,10(0,8)/ −43°	0,42/ −159°
5,0	0,81/ +65°	0,194(−14,3)/ 6°	1,04(0,4)/ −47°	0,44/ −165°
5,2	0,80/ +60°	0,203(−13,8)/ 4°	1,03(0,3)/ −53°	0,47/ −169°
5,4	0,81/ +56°	0,219(−13,2)/ −1°	0,98(−0,2)/ −57°	0,48/ −175°
5,6	0,81/ +51°	0,229(−12,8)/ −3°	0,97(−0,3)/ −62°	0,49/+ 178°
5,8	0,81/ +48°	0,243(−12,3)/ −8°	0,92(−0,7)/ −68°	0,51/+ 171°
6,0	0,80/ +44°	0,245(−12,2)/ −12°	0,90(−0,9)/ −72°	0,55/+ 165°

The figures given between brackets are values in dB.

* V_{CE} and I_C regulated.

s-parameters (common emitter)

LBE/LCE2009S: Typical values; $V_{CE} = 18 \text{ V}^*$; $I_C = 110 \text{ mA}^*$; $T_{mb} = 25 \text{ }^\circ\text{C}$; $Z_0 = 50 \text{ } \Omega$

f GHz	S_{ie}	S_{re}	S_{fe}	S_{oe}
0,5	0,70/177 $^\circ$	0,029(-30,7)/ 50 $^\circ$	7,55(17,6)/ 83 $^\circ$	0,25/ -48 $^\circ$
0,6	0,70/171 $^\circ$	0,033(-29,6)/ 51 $^\circ$	6,43(16,2)/ 77 $^\circ$	0,22/ -50 $^\circ$
0,7	0,70/168 $^\circ$	0,036(-29,0)/ 53 $^\circ$	5,46(14,6)/ 73 $^\circ$	0,23/ -52 $^\circ$
0,8	0,70/163 $^\circ$	0,039(-28,4)/ 54 $^\circ$	4,80(13,6)/ 68 $^\circ$	0,22/ -54 $^\circ$
0,9	0,71/159 $^\circ$	0,041(-27,8)/ 54 $^\circ$	4,27(12,6)/ 64 $^\circ$	0,22/ -56 $^\circ$
1,0	0,71/155 $^\circ$	0,045(-27,0)/ 55 $^\circ$	3,84(11,7)/ 60 $^\circ$	0,21/ -59 $^\circ$
1,1	0,71/151 $^\circ$	0,049(-26,2)/ 54 $^\circ$	3,53(11,0)/ 56 $^\circ$	0,21/ -62 $^\circ$
1,2	0,71/148 $^\circ$	0,054(-25,4)/ 54 $^\circ$	3,27(10,3)/ 52 $^\circ$	0,21/ -65 $^\circ$
1,3	0,71/144 $^\circ$	0,060(-24,5)/ 53 $^\circ$	3,01(9,6)/ 48 $^\circ$	0,20/ -74 $^\circ$
1,4	0,72/143 $^\circ$	0,066(-23,6)/ 54 $^\circ$	2,80(9,0)/ 45 $^\circ$	0,20/ -79 $^\circ$
1,5	0,72/136 $^\circ$	0,070(-23,1)/ 52 $^\circ$	2,61(8,3)/ 41 $^\circ$	0,21/ -80 $^\circ$
1,6	0,72/133 $^\circ$	0,075(-22,5)/ 53 $^\circ$	2,47(7,9)/ 38 $^\circ$	0,21/ -83 $^\circ$
1,7	0,72/130 $^\circ$	0,080(-21,9)/ 51 $^\circ$	2,33(7,3)/ 34 $^\circ$	0,22/ -87 $^\circ$
1,8	0,73/127 $^\circ$	0,084(-21,5)/ 49 $^\circ$	2,18(6,8)/ 30 $^\circ$	0,22/ -90 $^\circ$
1,9	0,73/123 $^\circ$	0,087(-21,2)/ 48 $^\circ$	2,05(6,3)/ 26 $^\circ$	0,22/ -94 $^\circ$
2,0	0,74/120 $^\circ$	0,090(-20,9)/ 46 $^\circ$	1,97(5,9)/ 23 $^\circ$	0,22/ -97 $^\circ$
2,2	0,75/114 $^\circ$	0,100(-20,0)/ 43 $^\circ$	1,78(5,0)/ 15 $^\circ$	0,22/-109 $^\circ$
2,4	0,77/108 $^\circ$	0,112(-19,0)/ 40 $^\circ$	1,63(4,3)/ 10 $^\circ$	0,21/-122 $^\circ$
2,6	0,79/103 $^\circ$	0,123(-18,2)/ 37 $^\circ$	1,51(3,6)/ 2 $^\circ$	0,24/-133 $^\circ$
2,8	0,80/ 97 $^\circ$	0,129(-17,8)/ 33 $^\circ$	1,36(2,7)/ -4 $^\circ$	0,25/-143 $^\circ$
3,0	0,81/ 92 $^\circ$	0,134(-17,5)/ 30 $^\circ$	1,28(2,1)/ -11 $^\circ$	0,27/-151 $^\circ$
3,2	0,83/ 88 $^\circ$	0,143(-16,9)/ 26 $^\circ$	1,15(1,2)/ -17 $^\circ$	0,28/-163 $^\circ$
3,4	0,85/ 85 $^\circ$	0,152(-16,4)/ 24 $^\circ$	1,10(0,9)/ -21 $^\circ$	0,30/-173 $^\circ$
3,6	0,86/ 82 $^\circ$	0,163(-15,8)/ 20 $^\circ$	1,00(0)/ -28 $^\circ$	0,34/+ 178 $^\circ$
3,8	0,87/ 79 $^\circ$	0,168(-15,5)/ 17 $^\circ$	0,96(-0,4)/ -32 $^\circ$	0,37/+ 173 $^\circ$
4,0	0,88/ 75 $^\circ$	0,175(-15,2)/ 14 $^\circ$	0,88(-1,1)/ -39 $^\circ$	0,41/+ 168 $^\circ$
4,2	0,88/ 71 $^\circ$	0,180(-14,9)/ 11 $^\circ$	0,83(-1,6)/ -42 $^\circ$	0,42/+ 162 $^\circ$
4,4	0,89/ 69 $^\circ$	0,193(-14,3)/ 8 $^\circ$	0,79(-2,1)/ -48 $^\circ$	0,45/+ 155 $^\circ$
4,6	0,90/ 66 $^\circ$	0,200(-14,0)/ 5 $^\circ$	0,74(-2,6)/ -51 $^\circ$	0,48/+ 149 $^\circ$
4,8	0,90/ 64 $^\circ$	0,211(-13,5)/ 2 $^\circ$	0,71(-3,0)/ -56 $^\circ$	0,52/+ 145 $^\circ$
5,0	0,90/ 61 $^\circ$	0,214(-13,4)/ -2 $^\circ$	0,66(-3,6)/ -59 $^\circ$	0,55/+ 144 $^\circ$

The figures given between brackets are values in dB.

* V_{CE} and I_C regulated.

APPLICATION INFORMATION

Microwave performance in c.w. operation for the LBE/LCE2003S up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class-A circuit*.

f GHz	V_{CE} (1) V	I_C (1) mA	P_{L1} (2) mW(dBm)	G_{po} (3) dB	\bar{z}_i Ω	\bar{Z}_L Ω
2	18	30	≥ 200 (23) typ. 250(24)	≥ 10 typ. 11	$6,2 + j30$	$17,5 + j7$

Notes

1. V_{CE} and I_C regulated.
2. Load power for 1 dB compressed power gain.
3. Low-level power gain associated with P_{L1} .

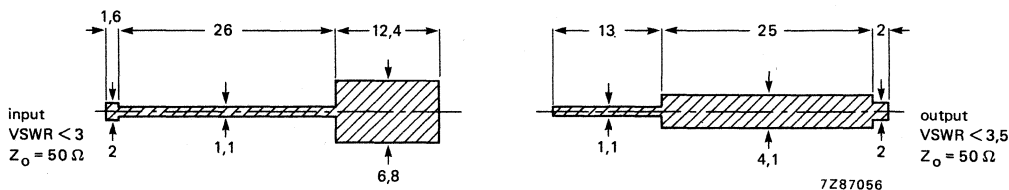


Fig. 6 Prematching test circuit board for 2 GHz. (Dimensions in mm.)

Striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric ($\epsilon_r \approx 2,54$); thickness 0,8 mm.

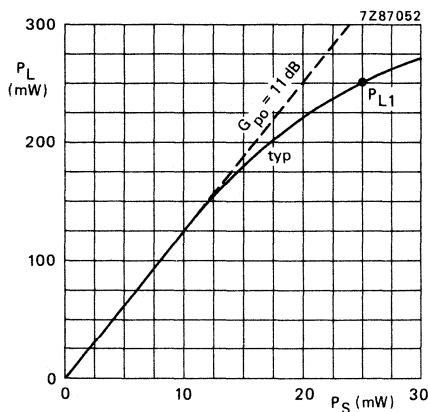


Fig. 7 $V_{CE} = 18\text{ V}$; $I_C = 30\text{ mA}$;
 $f = 2\text{ GHz}$; $T_{mb} = 25\text{ }^{\circ}\text{C}$.

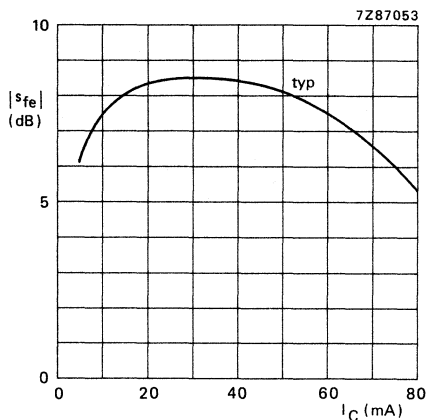


Fig. 8 $V_{CE} = 18\text{ V}$; class-A
operation; $f = 2\text{ GHz}$; $T_{mb} = 25\text{ }^{\circ}\text{C}$.

* Circuit consists of prematching circuit board in combination with input and output slug tuners.

APPLICATION INFORMATION

Microwave performance in c.w. operation for the LBE/LCE2009S up to $T_{mb} = 75\text{ }^\circ\text{C}$ in an unneutralized common-emitter class-A circuit*.

f GHz	V_{CE} (1) V	I_C (1) mA	P_{L1} (2) mW(dBm)	G_{po} (3) dB	\bar{z}_i Ω	\bar{Z}_L Ω
2	18	100	$\geq 700(28,5)$ typ. 900(29,5)	≥ 9 typ. 9,8	$7,5 + j14,5$	$17,5 + j38,5$

Notes

- V_{CE} and I_C regulated.
- Load power for 1 dB compressed power gain.
- Low-level power gain associated with P_{L1} .

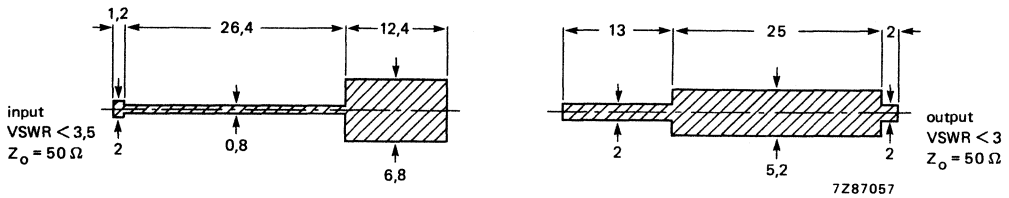


Fig. 9 Prematching test circuit board for 2 GHz. (Dimensions in mm.)

Striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric ($\epsilon_r \approx 2,54$); thickness 0,8 mm.

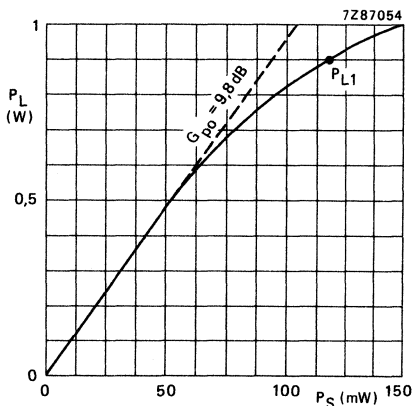


Fig. 10 $V_{CE} = 18\text{ V}$; $I_C = 110\text{ mA}$;
 $f = 2\text{ GHz}$; $T_{mb} = 25\text{ }^\circ\text{C}$.

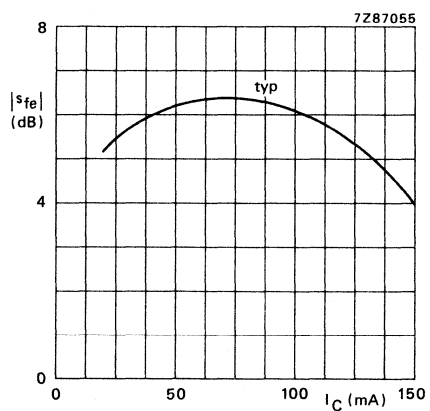


Fig. 11 $V_{CE} = 18\text{ V}$; class-A
operation; $f = 2\text{ GHz}$; $T_{mb} = 25\text{ }^\circ\text{C}$.

* Circuit consists of prematching circuit board in combination with input and output slug tuners.

MICROWAVE LINEAR POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates in c.w. conditions and is recommended in common-emitter class-A amplifiers up to 2 GHz.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

LBE2005Q has an FO 45 metal ceramic studless package.

LCE2005Q has an FO 46 metal ceramic capstan package.

It is mounted in a common-emitter configuration, specified in class-A and operates in c.w. conditions.

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class-A selective amplifier.

Typical values

mode of operation	f GHz	V _{CE} V	I _C mA	P _{L1} mW	G _{po} dB	\bar{z}_i Ω	\bar{Z}_L Ω
c.w. class-A	1,65	12	80	400	9	7,5 + j9	18 + j31

MECHANICAL DATA

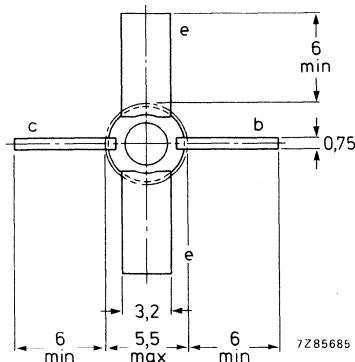
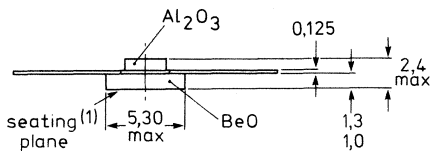
FO-45 and FO-46 (see Fig. 1)

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.

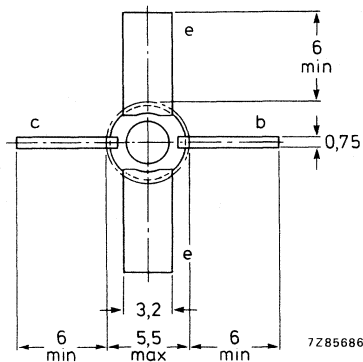
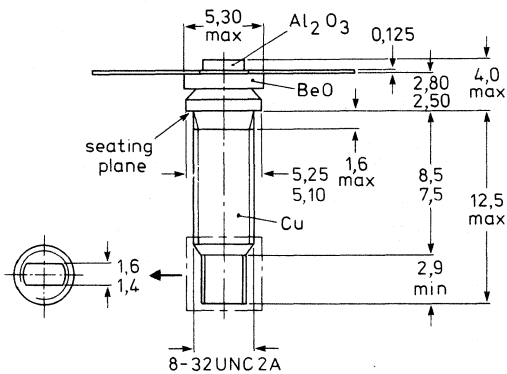
MECHANICAL DATA

Fig. 1a LBE2005Q (FO-45).



Dimensions in mm

Fig. 1b LCE2005Q (FO-46).



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.	16 V
Emitter-base voltage (open collector)	V_{EBO} max.	3 V
Collector current	I_C max.	200 mA
Total power dissipation ($T_{mb} \leq 75^\circ\text{C}$)	P_{tot} max.	1,5 W
Storage temperature	T_{stg}	-65 to 200 °C
Junction temperature	T_j max.	200 °C
Soldering temperature at 0,1 mm from case; $t_{sld} \leq 10$ s	T_{sld} max.	235 °C

THERMAL RESISTANCE

From junction to mounting base	$R_{th j-mb}$	45 K/W
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MICROWAVE LINEAR POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates in c.w. conditions and is recommended in common-emitter class-A amplifiers up to 2 GHz.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

LBE2008T has an FO 45 metal ceramic studless package.

LCE2008T has an FO 46 metal ceramic capstan package.

It is mounted in a common-emitter configuration, specified in class-A and operates in c.w. conditions.

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class-A selective amplifier.

Typical values

mode of operation	F GHz	V_{CE} V	I_C mA	P_{L1} mW	G_{po} dB	\bar{z}_i Ω	\bar{Z}_L Ω
c.w. class-A	1,65	20	150	1100	8	$4,5 + j14,5$	$12,5 + j38$

MECHANICAL DATA

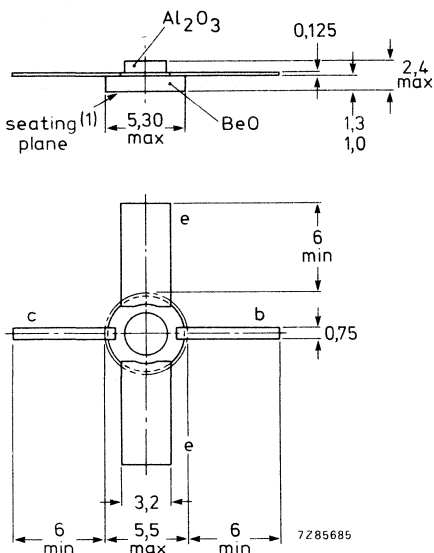
FO-45 and FO-46 (see Fig. 1)

PRODUCT SAFETY

These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe, provided that the BeO is not damaged.

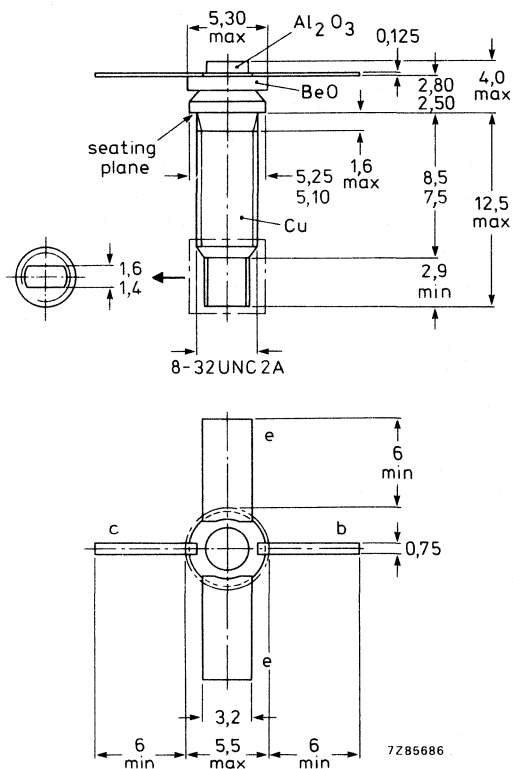
MECHANICAL DATA

Fig. 1a LBE2008T (FO-45).



Dimensions in mm

Fig. 1b LCE2008T (FO-46).



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 ($R_{BE} = 150\ \Omega$) (open base)	V_{CER}	max.	21 V
	V_{CEO}	max.	14 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3 V
Collector current	I_C	max.	0,3 mA
Total power dissipation ($T_{mb} \leq 75\ ^\circ C$)	P_{tot}	max.	3,5 W
Storage temperature	T_{stg}		-65 to 200 $^\circ C$
Junction temperature	T_j	max.	200 $^\circ C$
Soldering temperature at 0,1 mm from case; $t_{sld} \leq 10\ s$	T_{sld}	max.	230 $^\circ C$

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j-mb}$	26 K/W
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MICROWAVE LINEAR POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates in c.w. conditions and is recommended in common-emitter class-A amplifiers up to 4 GHz.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 41A metal ceramic flange package.

It is mounted in a common-emitter configuration, specified in class-A and operates in c.w. conditions.

An input matching cell improves the input impedance and allows an easier design of broadband circuits.

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class-A selective amplifier.

Typical values

mode of operation	f GHz	V _{CE} V	I _C mA	P _{L1} mW	G _{po} dB	\bar{z}_i Ω	\bar{z}_L Ω
c.w.; class-A	4	20	65	200	7	50 + j65	2,5 + j6

MECHANICAL DATA

FO-41A (see Fig. 1).

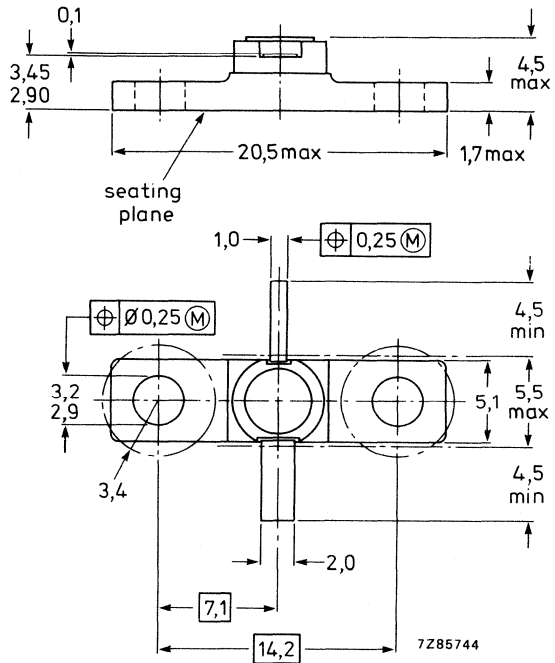
PRODUCT SAFETY

This device contains beryllium oxide, the dust of which is toxic. The device is entirely safe, provided that the beryllium oxide disc is not damaged.

MECHANICAL DATA

Fig. 1 FO-41A.

Dimensions in mm



RATINGS

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

Collector-base voltage (open emitter)	V_{CB0}	max.	45 V
Collector-emitter voltage ($R_{BE} = 220 \Omega$) (open base)	V_{CER}	max.	25 V
	V_{CEO}	max.	20 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5 V
Collector current	I_C	max.	400 mA
Total power dissipation ($T_{mb} \leq 75 \text{ }^\circ\text{C}$)	P_{tot}	max.	1,5 W
Storage temperature	T_{stg}		-65 to 200 $^\circ\text{C}$
Junction temperature	T_j	max.	200 $^\circ\text{C}$
Soldering temperature at 0,1 mm from case; $t_{sld} \leq 10 \text{ s}$	T_{sld}	max.	235 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to mounting base	$R_{th \text{ j-mb}}$	41 K/W
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MICROWAVE LINEAR POWER TRANSISTOR

N-P-N transistor for use in a common-emitter class-A linear power amplifier up to 1 GHz.

Diffused emitter ballasting resistors, interdigitated structure, multicell geometry and gold sandwich metallization ensure an optimum temperature profile and excellent performance and reliability.

QUICK REFERENCE DATA

R.F. performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class-A circuit.

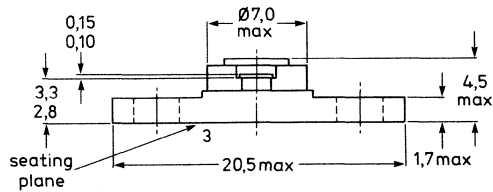
mode of operation	f GHz	V_{CE} V	I_C mA	P_{L1} mW	G_{po} dB	\bar{Z}_i Ω	\bar{Z}_L Ω
c.w.; linear amplifier	1	15	100	typ. 400	typ. 11	$6,5 + j4$	$13 + j23$

MECHANICAL DATA

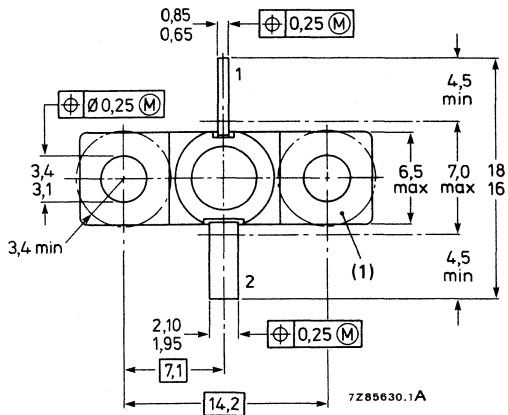
Dimensions in mm

Fig. 1 FO-53.

Emitter connected
to flange.



Torque on nut: max. 0,5 Nm
Recommended screw: M3



Marking code

RTC112 = LKE1004R

(1) Flatness of this area ensures full thermal contact with bolt head.

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.

RATINGS

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

Collector-base voltage (open emitter)	V_{CB0}	max.	30 V
Collector-emitter voltage	V_{CER}	max.	30 V
$R_{BE} \leq 500 \Omega$	V_{CEO}	max.	14 V
open base			
Emitter-base voltage (open collector)	V_{EBO}	max.	3 V
Collector current (d.c.)	I_C	max.	400 mA
Total power dissipation up to $T_{mb} = 75 \text{ }^\circ\text{C}$	P_{tot}	max.	3 W
Storage temperature	T_{stg}		-65 to +200 $^\circ\text{C}$
Junction temperature	T_j	max.	200 $^\circ\text{C}$
Lead soldering temperature			
at 0,3 mm from the case; $t_{sld} \leq 10 \text{ s}$	T_{sld}	max.	235 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to mounting base	$R_{th \text{ j-mb}}$	=	30 K/W
From mounting base to heatsink	$R_{th \text{ mb-h}}$	=	0,7 K/W

MICROWAVE LINEAR POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates in c.w. conditions and is recommended in common-emitter class-A amplifiers up to 2 GHz.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 53 metal ceramic flange package.

It is mounted in a common-emitter configuration, specified in class-A and operates in c.w. conditions.

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class-A selective amplifier.

Typical values

mode of operation	f GHz	V_{CE} V	I_C mA	P_{L1} mW	G_{po} dB	\bar{z}_i Ω	\bar{Z}_L Ω
c.w.; class-A	2	15	70	200	8	$5 + j19$	$10 + j38$

MECHANICAL DATA

FO-53 (see Fig. 1).

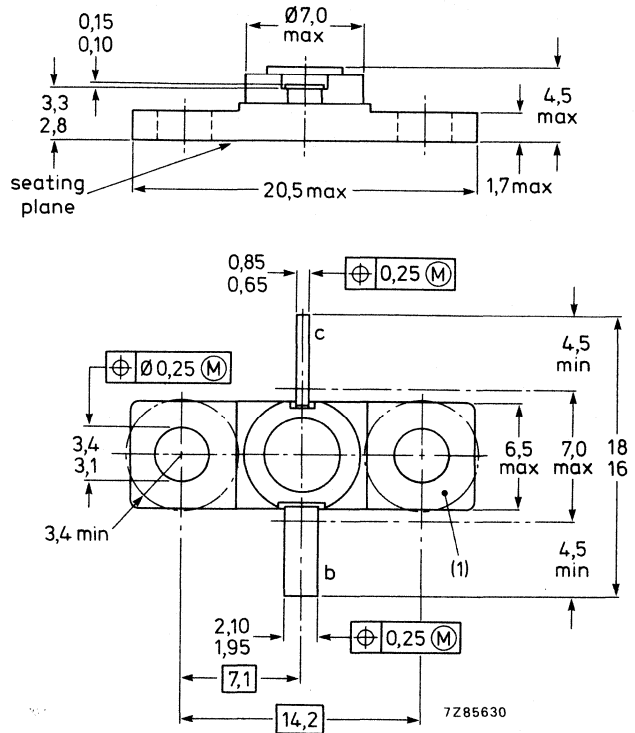
PRODUCT SAFETY

This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe, provided that the beryllium oxide disc is not damaged.

MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-53.



RATINGS

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

Collector-base voltage (open emitter)	V_{CB0}	max.	45 V
Collector-emitter voltage ($R_{BE} = 330 \Omega$) (open base)	V_{CER} V_{CEO}	max.	20 V 18 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3 V
Collector current	I_C	max.	80 mA
Total power dissipation ($T_{mb} \leq 75 \text{ }^\circ\text{C}$)	P_{tot}	max.	1,5 W
Storage temperature	T_{stg}		-65 to 200 $^\circ\text{C}$
Junction temperature	T_j	max.	200 $^\circ\text{C}$
Soldering temperature at 0,1 mm from case; $t_{sld} \leq 10 \text{ s}$	T_{sld}	max.	235 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to mounting base	$R_{th \text{ j-mb}}$	45 K/W
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MICROWAVE LINEAR POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates in c.w. conditions and is recommended in common-emitter class-A amplifiers up to 2 GHz.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 53 metal ceramic flange package.

It is mounted in a common-emitter configuration, specified in class-A and operates in c.w. conditions.

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class-A selective amplifier.

Typical values

mode of operation	f GHz	V _{CE} V	I _C mA	P _{L1} mW	G _{po} dB	\bar{z}_i Ω	\bar{Z}_L Ω
c.w. class-A	2	15	140	400	7	2,5 + j15	12 + j23

MECHANICAL DATA

FO-53 (see Fig. 1)

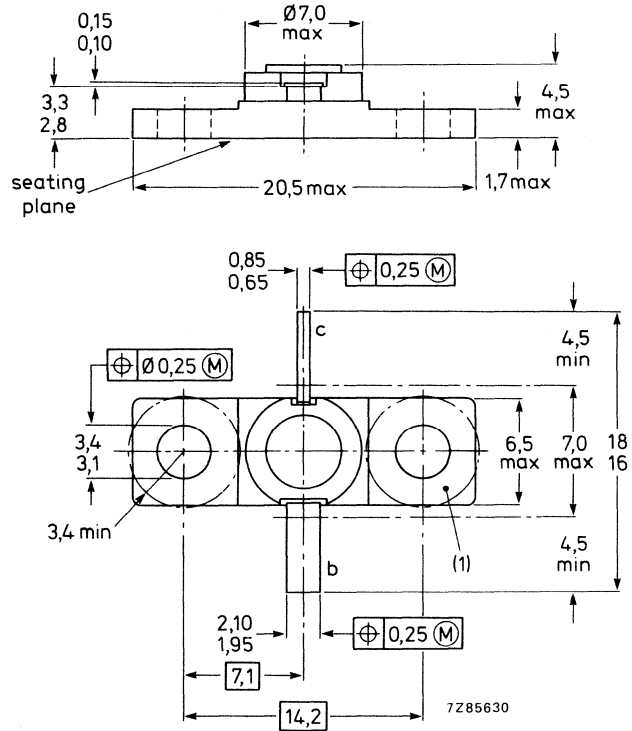
PRODUCT SAFETY

This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe, provided that the BeO disc is not damaged.

MECHANICAL DATA

Fig. 1 FO-53.

Dimensions in mm



RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	45 V
Collector-emitter voltage ($R_{BE} = 220 \Omega$) (open base)	V_{CER}	max.	20 V
	V_{CEO}	max.	18 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3 V
Collector current	I_C	max.	160 mA
Total power dissipation ($T_{mb} \leq 75 \text{ }^\circ\text{C}$)	P_{tot}	max.	3,0 W
Storage temperature	T_{stg}		-65 to 200 $^\circ\text{C}$
Junction temperature	T_j	max.	200 $^\circ\text{C}$
Soldering temperature at 0,1 mm from case; $t_{sld} \leq 10 \text{ s}$	T_{sld}	max.	235 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to mounting base	$R_{th \text{ j-mb}}$	22 K/W
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MICROWAVE LINEAR POWER TRANSISTOR

N-P-N transistor for use in a common-emitter class-A linear power amplifier up to 2 GHz.

Diffused emitter ballasting resistors, interdigitated structure, multicell geometry and gold sandwich metallization ensure an optimum temperature profile and excellent performance and reliability.

QUICK REFERENCE DATA

R.F. performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class-A circuit

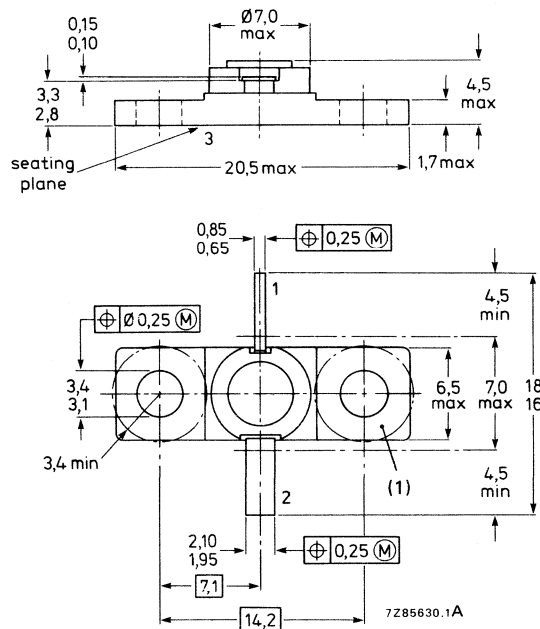
mode of operation	f GHz	V_{CE} V	I_C mA	P_{L1} W	G_{p0} dB	\bar{z}_i Ω	\bar{z}_L Ω
c.w.; linear amplifier	2	20	200	typ. 1,6	typ. 8	$2,5 + j12$	$4 + j4$

MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-53.

Emitter connected
to flange



Torque on nut: max. 0,5 Nm
Recommended screw: M3

Marking code

RTC144 = LKE2015T

(1) Flatness of this area ensures full thermal contact with bolt head.

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.

RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	45 V
Collector-emitter voltage $R_{be} = 120 \Omega$ open base	V_{CER}	max.	25 V
	V_{CEO}	max.	20 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5 V
Collector current (d.c.)	I_C	max.	800 mA
Total power dissipation up to $T_{mb} = 75 \text{ }^\circ\text{C}$	P_{tot}	max.	8 W
Storage temperature	T_{stg}		-65 to + 200 $^\circ\text{C}$
Junction temperature	T_j	max.	200 $^\circ\text{C}$
Lead soldering temperature at 0,3 mm from the case; $t_{sld} \leq 10 \text{ s}$	T_{sld}	max.	235 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to mounting base	$R_{th \text{ j-mb}}$	=	11 K/W
From mounting base to heatsink	$R_{th \text{ mb-h}}$	=	0,7 K/W

MICROWAVE LINEAR POWER TRANSISTOR

N-P-N transistor for use in a common-emitter class-A linear power amplifier up to 2,1 GHz.

Diffused emitter ballasting resistors, interdigitated structure, multicell geometry and gold sandwich metallization ensure an optimum temperature profile and excellent performance and reliability.

QUICK REFERENCE DATA

R.F. performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class-A circuit

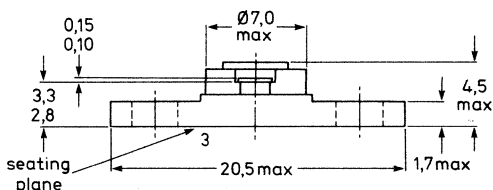
mode of operation	f GHz	V _{CE} V	I _C mA	P _{L1} mW	G _{po} dB	\bar{z}_i Ω	\bar{z}_L Ω
c.w.; linear amplifier	2,1	15	140	typ. 600	typ. 10	6 + j8	4 + j8

MECHANICAL DATA

Dimensions in mm

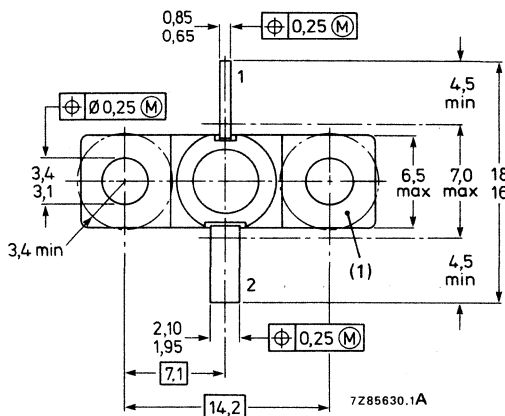
Fig. 1 FO-53.

Emitter connected to flange



Torque on nut: max. 0,5 Nm

Recommended screw: M3



Marking code

RTC146 = LKE21004R

(1) Flatness of this area ensures full thermal contact with bolt head.

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.

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 $R_{be} = 500 \Omega$ open base	V_{CER}	max.	20 V
	V_{CEO}	max.	14 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3 V
Collector current (d.c.)	I_C	max.	600 mA
Total power dissipation up to $T_{mb} = 75 \text{ }^\circ\text{C}$	P_{tot}	max.	2,8 W
Storage temperature	T_{stg}		-65 to + 200 $^\circ\text{C}$
Junction temperature	T_j	max.	200 $^\circ\text{C}$
Lead soldering temperature at 0,3 mm from the case; $t_{sld} \leq 10 \text{ s}$	T_{sld}	max.	235 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to mounting base	$R_{th \text{ j-mb}}$	=	22 K/W
From mounting base to heatsink	$R_{th \text{ mb-h}}$	=	0,7 K/W

MICROWAVE LINEAR POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates in c.w. conditions and is recommended in common-emitter class-A amplifiers up to 2,1 GHz.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 53 metal ceramic flange package.

It is mounted in a common-emitter configuration, specified in class-A and operates in c.w. conditions.

An input matching cell improves the input impedance and allows an easier design of broadband circuits.

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class-A selective amplifier.

Typical values

mode of operation	f GHz	V_{CE} V	I_C mA	P_{L1} mW	G_{po} dB	\bar{z}_i Ω	\bar{Z}_L Ω
c.w. class-A	2,1	20	300	1750	10	$5 + j15$	$3 - j1$

MECHANICAL DATA

FO-53 (see Fig. 1)

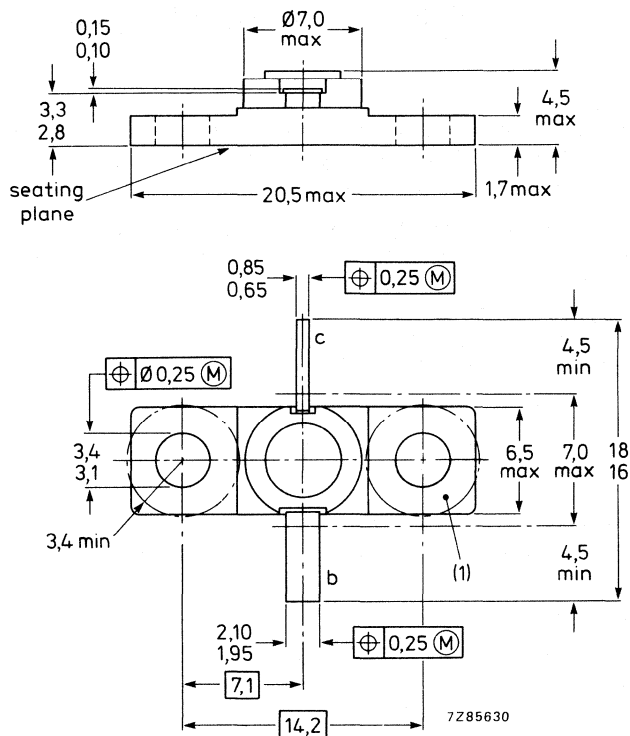
PRODUCT SAFETY

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 FO-53.



RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	45 V
Collector-emitter voltage ($R_{BE} = 10 \Omega$) (open base)	V_{CER}	max.	40 V
	V_{CEO}	max.	22 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5 V
Collector current	I_C	max.	800 mA
Total power dissipation ($T_{mb} \leq 75 \text{ }^\circ\text{C}$)	P_{tot}	max.	8 W
Storage temperature	T_{stg}		-65 to 200 $^\circ\text{C}$
Junction temperature	T_j	max.	200 $^\circ\text{C}$
Soldering temperature at 0,1 mm from case; $t_{sld} \leq 10 \text{ s}$	T_{sld}	max.	235 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to mounting base	$R_{th \text{ j-mb}}$	11 K/W
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MICROWAVE LINEAR POWER TRANSISTOR

N-P-N transistor for use in a common-emitter class-A linear power amplifier up to 2,1 GHz.

Diffused emitter ballasting resistors, interdigitated structure, multicell geometry and gold sandwich metallization ensure an optimum temperature profile and excellent performance and reliability.

An internal input matching network facilitates wideband operation.

QUICK REFERENCE DATA

R.F. performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class-A circuit

mode of operation	f GHz	V_{CE} V	I_C A	P_{L1} W	G_{po} dB	\bar{Z}_i Ω	\bar{Z}_L Ω
c.w.; linear amplifier	2,1	20	1,2	typ. 5,5	typ. 9	$2,5 + j8$	$2,5 - j7$

MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-53.

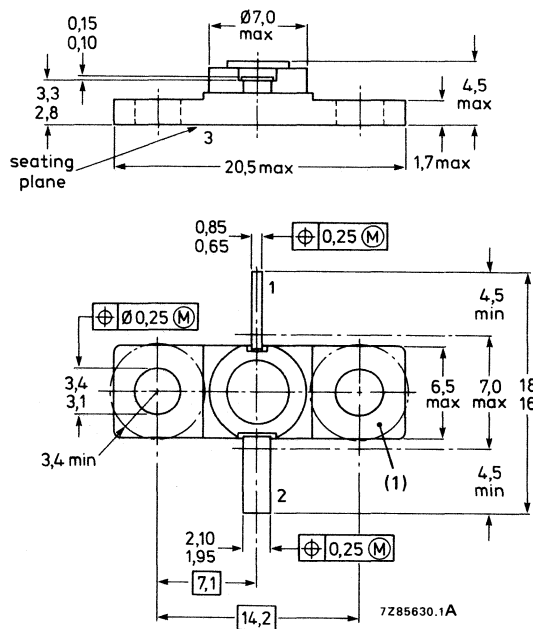
Emitter connected to flange.

Pinning:

- 1 = collector
- 2 = base
- 3 = emitter

Torque on nut: max. 0,5 Nm

Recommended screw: M3



Marking code

RTC190 = LKE21050T

(1) Flatness of this area ensures full thermal contact with bolt head.

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.

RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	45 V
Collector-emitter voltage $R_{be} = 47 \Omega$ open base	V_{CER}	max.	40 V
	V_{CEO}	max.	22 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5 V
Collector current (d.c.)	I_C	max.	3 A
Total power dissipation up to $T_{mb} = 75 \text{ }^\circ\text{C}$	P_{tot}	max.	30 W
Storage temperature	T_{stg}		-65 to +200 $^\circ\text{C}$
Junction temperature	T_j	max.	200 $^\circ\text{C}$
Lead soldering temperature at 0,3 mm from the case; $t_{sld} \leq 10 \text{ s}$	T_{sld}	max.	235 $^\circ\text{C}$

THERMAL RESISTANCE (at $T_j = 75^\circ\text{C}$)

From junction to mounting base	$R_{th \text{ j-mb}}$	=	4 K/W
From mounting base to heatsink	$R_{th \text{ mb-h}}$	=	0,7 K/W

RATINGS

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

Collector-base voltage (open emitter)	V _{CBO}	max.	35 V
Collector-emitter voltage (R _{BE} ≤ 150 Ω)	V _{CER}	max.	25 V
(open base)	V _{CEO}	max.	12 V
Emitter-base voltage (open collector)	V _{EBO}	max.	3 V
Collector current (d.c.)	I _C	max.	550 mA
Total power dissipation up to T _{mb} = 75 °C	P _{tot}	max.	5 W
Storage temperature	T _{stg}		-65 to 200 °C
Junction temperature	T _j	max.	200 °C
Lead soldering temperature at 0,3 mm from the case; t _{slid} ≤ 10 s	T _{slid}	max.	230 °C

THERMAL RESISTANCE

From junction to mounting base	R _{th j-mb}	12 K/W
From mounting base to heatsink	R _{th mb-h}	0,7 K/W

MICROWAVE LINEAR POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates in c.w. conditions and is recommended in common-emitter class-A amplifiers up to 2,7 GHz.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 53 metal ceramic flange package.

It is mounted in a common-emitter configuration, specified in class-A and operates in c.w. conditions.

Internal input prematching ensures good stability and easy broadband usage.

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class-A selective amplifier.

Typical values

mode of operation	f GHz	V _{CE} V	I _C mA	P _{L1} W	G _{po} dB	\bar{z}_i Ω	\bar{Z}_L Ω
c.w. class-A	2,7	16	650	2,5	7	2,5 + j11	2 - j9

MECHANICAL DATA

FO-53 (see Fig. 1)

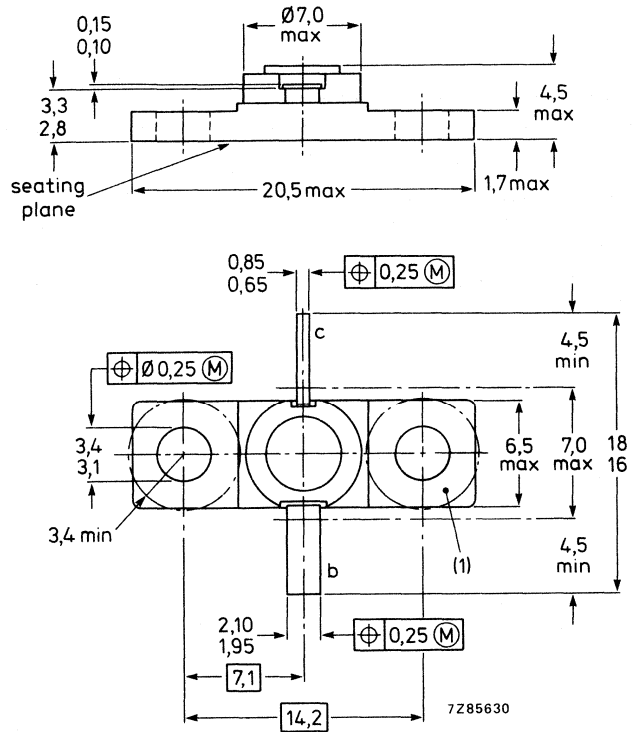
PRODUCT SAFETY

This device contains 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 FO-53.



RATINGS

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

Collector-base voltage (open emitter)	V_{CB0}	max.	35 V
Collector-emitter voltage ($R_{BE} = 10 \Omega$) (open base)	V_{CER}	max.	35 V
	V_{CEO}	max.	15 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3 V
Collector current	I_C	max.	1,5 A
Total power dissipation	P_{tot}	max.	15 W
Storage temperature	T_{stg}		-65 to 200 °C
Junction temperature	T_j	max.	+200 °C
Soldering temperature at 0,1 mm from case; $t_{sld} \leq 10$ s	T_{sld}	max.	+235 °C

THERMAL RESISTANCE

From junction to mounting base	$R_{th j-mb}$	6 K/W
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MICROWAVE LINEAR POWER TRANSISTORS

N-P-N transistors for use in a common-emitter class-A linear power amplifier up to 3 GHz.

Diffused emitter ballasting resistors, interdigitated structure, multicell geometry and gold sandwich metallization ensure an optimum temperature profile and excellent performance and reliability.

An input matching cell improves the input impedance and facilitates the design of wideband circuits.

QUICK REFERENCE DATA

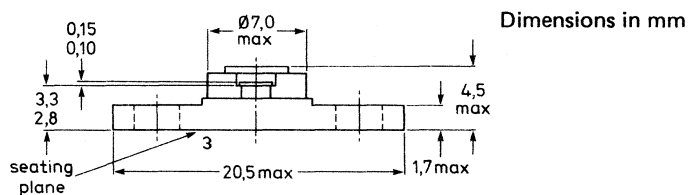
R.F. performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class-A circuit

type no.	mode of operation	f GHz	V_{CE} V	I_C mA	P_{L1} mW	G_{po} dB	\bar{Z}_i Ω	\bar{Z}_L Ω
LKE32002T	c.w.; linear amplifier	3	20	65	typ. 310	typ. 11,2	$19 + j44$	$3,0 + j12$
LKE32004T	c.w.; linear amplifier	3	20	130	typ. 710	typ. 11,0	$7,5 + j22$	$2,5 + j5$

MECHANICAL DATA

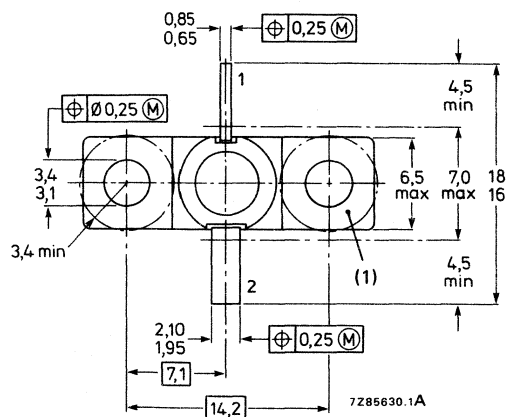
Fig. 1 FO-53.

Emitter connected to flange.



Torque on nut: max. 0,5 Nm

Recommended screw: M3



Marking code

RTC114 = LKE32002T

RTC116 = LKE32004T

(1) Flatness of this area ensures full thermal contact with bolt head.

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.

RATINGS

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

		LKE32002T	LKE32004T	
Collector-base voltage open emitter	V_{CBO}	max. 45	45	V
Collector-emitter voltage $R_{BE} = 220 \Omega$ open base	V_{CER} V_{CEO}	max. 25 max. 20	25 20	V
Emitter-base voltage open collector	V_{EBO}	max. 3,5	3,5	V
Collector current (d.c.)	I_C	max. 400	800	mA
Total power dissipation up to $T_{mb} = 75 \text{ }^\circ\text{C}$	P_{tot}	max. 1,5	3	W
Storage temperature	T_{stg}	-65 to + 200		$^\circ\text{C}$
Junction temperature	T_j	max. 200		$^\circ\text{C}$
Lead soldering temperature at 0,3 mm from the case; $t_{sld} = 10 \text{ s}$	T_{sld}	max. 235		$^\circ\text{C}$

THERMAL RESISTANCE

		LKE32002T	LKE32004T	
From junction to mounting base	$R_{th \text{ j-mb}}$	= 45	22	K/W
From mounting base to heatsink	$R_{th \text{ mb-h}}$	= 0,7	0,7	K/W

MICROWAVE LINEAR POWER TRANSISTOR

N-P-N silicon transistor for use in common-emitter class-A linear amplifiers up to 4 GHz.

Diffused emitter ballasting resistors, self-aligned process entirely ion implanted and gold sandwich metallization ensure an optimum temperature profile with excellent performance and reliability.

QUICK REFERENCE DATA

R.F. performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class-A circuit.

mode of operation	f GHz	V _{CE} V	I _C mA	P _{L1} mW	G _{p0} dB
c.w.; linear amplifier	4	18	30	typ. 200	typ. 8

MECHANICAL DATA

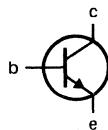
Dimensions in mm

Fig. 1 FO-41B.

Emitter and metallic cap connected to the seating plane.

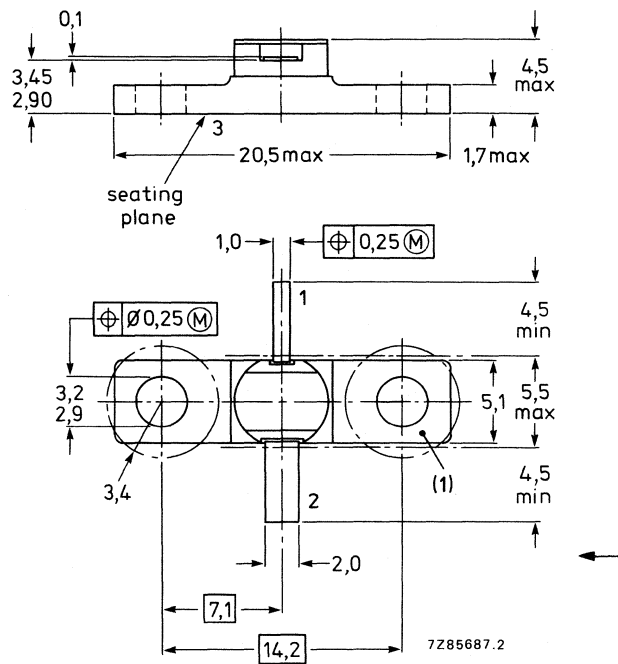
Pinning:

- 1 = collector
- 2 = base
- 3 = emitter



Torque on screw: max. 0,5 Nm
Recommended screw: M2,5

Marking code: RTC4002S = LTE4002S



(1) Flatness of this area ensures full thermal contact with bolt head.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided the BeO disc is not damaged.

RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	40 V
Collector-emitter voltage	V_{CEO}	max.	16 V
open base	V_{CER}	max.	35 V
$R_{BE} = 220 \Omega$			
Emitter-base voltage (open collector)	V_{EBO}	max.	3 V
Collector current (d.c.)	I_C	max.	90 mA
Total power dissipation up to $T_{mb} = 75^\circ C$	P_{tot}	max.	1 W
Storage temperature range	T_{stg}		-65 to +200 °C
Junction temperature	T_j	max.	200 °C
Lead soldering temperature			
at 0,3 mm from the case; $t_{sld} \leq 10$ s	T_{sld}	max.	235 °C

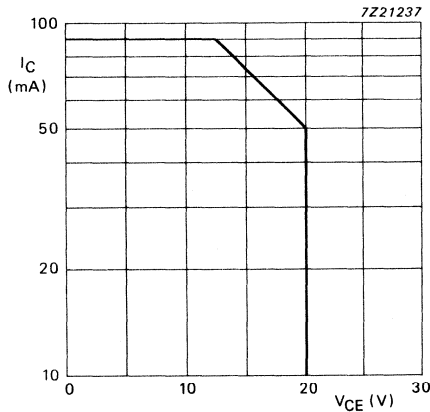


Fig. 2 D.C. SOAR at $T_{mb} \leq 75^\circ C$; $R_{BE} < 220 \Omega$.

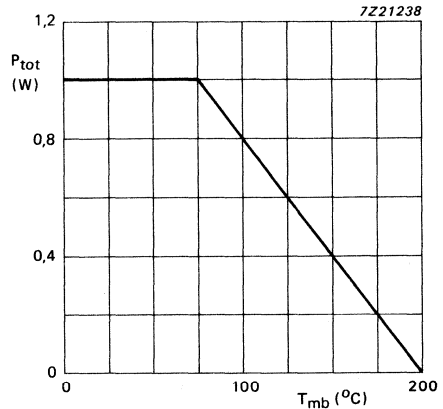


Fig. 3 Power derating curve.

→ **THERMAL RESISTANCE** (at $T_j=75^\circ C$)

From junction to mounting base

$R_{th\ j-mb} = 65\ K/W$

CHARACTERISTICS

$T_{mb} = 25^\circ C$; unless otherwise specified

Collector cut-off currents

$I_E = 0; V_{CB} = 20\ V$

$I_E = 0; V_{CB} = 40\ V$

$V_{BC} = 35\ V; R_{BE} = 200\ \Omega$

$I_{CBO} < 100\ nA$

$I_{CBO} < 150\ \mu A$

$I_{CER} < 500\ \mu A$

Emitter cut-off currents

$I_C = 0; V_{EB} = 1,5\ V$

$I_C = 0; V_{EB} = 3,0\ V$

$I_{EBO} < 50\ nA$

$I_{EBO} < 25\ \mu A$

D.C. current gain

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

$h_{FE} \quad 15\ to\ 150$

s-parameters (common-emitter)

 $V_{CE} = 18 \text{ V}$; $I_C = 30 \text{ mA}$; $T_{mb} = 25 \text{ }^\circ\text{C}$; $Z_0 = 50 \text{ } \Omega$; typical values

f GHz	S_{ie}	S_{re}	S_{fe}	S_{oe}
0.25	0.63/ -111°	0.022/ 41.4°	15.60/ 120.2°	0.74/ -30.2°
0.50	0.66/ -149°	0.027/ 29.8°	9.38/ 93.4°	0.61/ -40.3°
0.75	0.66/ -167°	0.030/ 26.8°	6.51/ 76.9°	0.58/ -49.0°
1.00	0.66/ -180°	0.031/ 26.9°	4.94/ 63.7°	0.58/ -57.8°
1.25	0.65/ 171°	0.033/ 26.9°	3.96/ 52.1°	0.58/ -57.2°
1.50	0.65/ 164°	0.035/ 29.1°	3.29/ 41.7°	0.60/ -75.9°
1.75	0.63/ 156°	0.039/ 30.0°	2.84/ 31.3°	0.63/ -84.8°
2.00	0.61/ 148°	0.042/ 29.0°	2.47/ 21.3°	0.65/ -93.2°
2.25	0.60/ 141°	0.046/ 28.5°	2.19/ 11.2°	0.67/ -102.3°
2.50	0.58/ 135°	0.051/ 27.0°	1.96/ 1.8°	0.71/ -109.4°
2.75	0.55/ 128°	0.058/ 24.2°	1.78/ -7.3°	0.74/ -115.7°
3.00	0.50/ 118°	0.063/ 19.4°	1.66/ -17.2°	0.76/ -121.4°
3.25	0.47/ 105°	0.067/ 14.3°	1.53/ -27.7°	0.78/ -127.8°
3.50	0.43/ 94°	0.070/ 7.2°	1.41/ -38.2°	0.81/ -134.5°
3.75	0.37/ 80°	0.073/ 0.2°	1.30/ -48.7°	0.83/ -139.8°
4.00	0.31/ 58°	0.074/ -8.0°	1.21/ -59.7°	0.83/ -144.0°
4.25	0.29/ 30°	0.073/ -17.9°	1.23/ -72.0°	0.84/ -149.6°
4.50	0.29/ 7°	0.069/ -28.7°	1.03/ -84.3°	0.86/ -157.0°
4.75	0.28/ -19°	0.060/ -42.0°	0.93/ -97.3°	0.86/ -164.2°
5.00	0.30/ -48°	0.047/ -56.3°	0.83/ -110.5°	0.85/ -169.9°
5.25	0.35/ -71°	0.032/ -76.3°	0.73/ -124.2°	0.84/ -175.9°
5.50	0.38/ -88°	0.015/ -124.9°	0.64/ -138.4°	0.84/ 176.2°
5.75	0.39/ -106°	0.023/ 141.5°	0.56/ -154.4°	0.83/ 167.2°
6.00	0.42/ -128°	0.051/ 108.0°	0.47/ -172.3°	0.81/ 159.8°

DEVELOPMENT DATA

This data sheet contains advance information and specifications are subject to change without notice.

LTE21009R
LTE21015R

MICROWAVE LINEAR POWER TRANSISTOR

N-P-N silicon transistor for use in common-emitter class-A linear power amplifiers up to 4,2 GHz.

Diffused emitter ballasting resistors, self-aligned process entirely ion implanted and gold sandwich metallization ensure an optimum temperature profile with excellent performance and reliability.

An input matching cell improves the input impedance and facilitates the design of wideband circuits.

The transistors are housed in a metal-ceramic envelope (FO-41B).

QUICK REFERENCE DATA

R.F. performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class-A circuit.

Type number	mode of operation	f GHz	V _{CC} V	I _C mA	P _{L1} W	G _{po} dB
LTE21009R	c.w. class-A	2,1	16	150	typ. 1,0	typ. 8,5
LTE21015R	c.w. class-A	2,1	16	250	typ. 1,6	typ. 8,1

MECHANICAL DATA

Dimensions in mm

FO-41B (see Fig. 1)

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

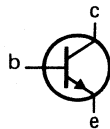
Fig. 1 FO-41B

Dimensions in mm

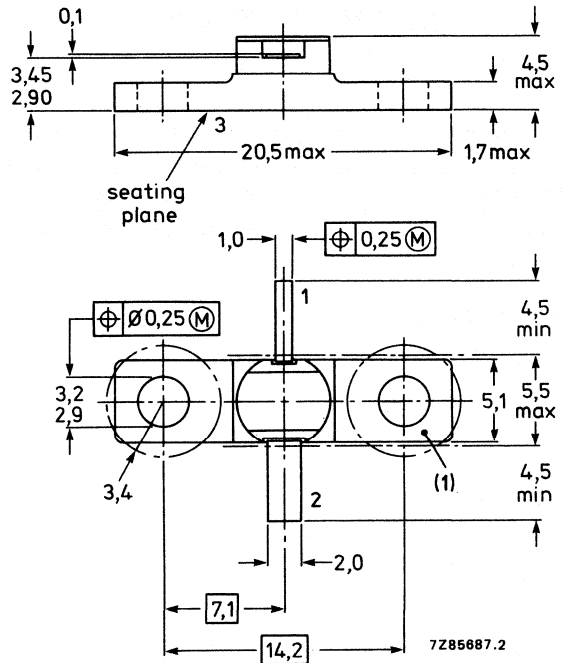
Emitter and metallic cap are connected to the seating plane.

Pinning:

- 1 = collector
- 2 = base
- 3 = emitter



Torque on nut: max. 0,4 Nm
Recommended screw: M2,5

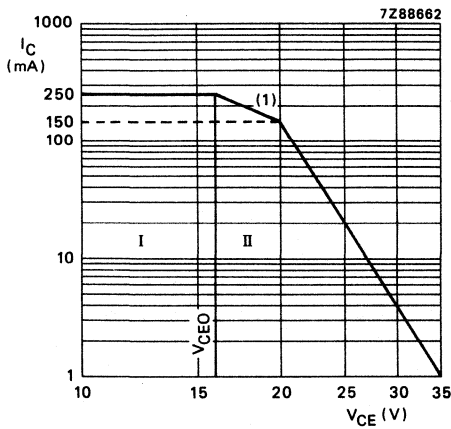


(1) Flatness of this area ensures full thermal contact with bold head.

RATINGS

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

		LTE21009R	LTE21015R
Collector-base voltage open emitter	V _{CBO}	max. 40	40 V
Collector-emitter voltage R _{BE} = 100 Ω R _{BE} = 250 Ω open base	V _{CER}	max. 35	— V
	V _{CER}	max. —	20 V
	V _{CEO}	max. 16	16 V
Emitter-base voltage open collector	V _{EBO}	max. 3,0	3,5 V
Collector current (d.c.)	I _C	max. 250	450 mA
Total power dissipation up to T _{mb} = 75 °C	P _{tot}	max. 4,0	6,0 W
Storage temperature range	T _{stg}	-65 to +200 °C	
Junction temperature	T _j	max. 200	°C
Lead soldering temperature at 0,3 mm from case; t _{std} ≤ 10 s	T _{slid}	max. 235	°C



(1) Second breakdown limit
(independent of temperature).

Fig. 2 D.C. SOAR at $T_{mb} \leq 75^\circ\text{C}$.

- I Region of permissible d.c. operation.
- II Permissible extension provided $R_{BE} \leq 100 \Omega$.

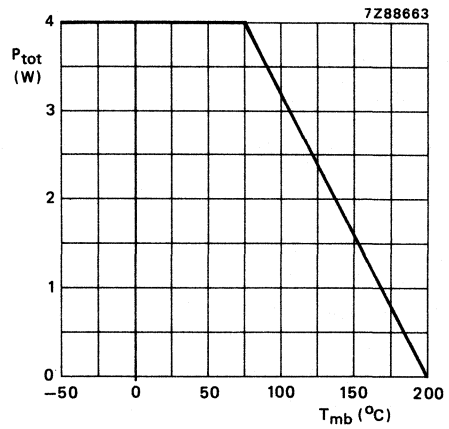
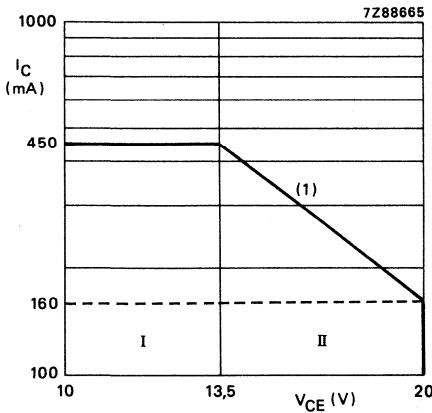


Fig. 3 Power derating curve.

DEVELOPMENT DATA



(1) Second breakdown limit
(independent of temperature).

Fig. 4 D.C. SOAR at $T_{mb} \leq 75^\circ\text{C}$.

- I Region of permissible d.c. operation.
- II Permissible extension provided $R_{BE} \leq 250 \Omega$.

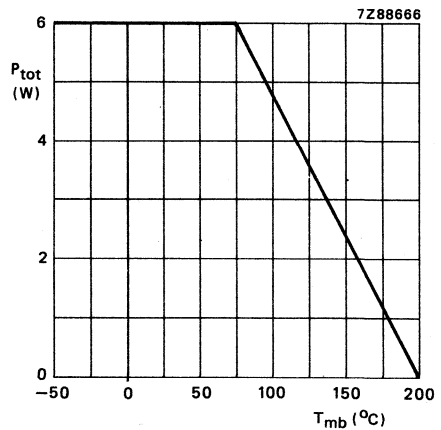


Fig. 5 Power derating curve.

THERMAL RESISTANCE ($T_{mb} = 25\text{ }^{\circ}\text{C}$)

		LTE21009R	LTE21015R	
From junction to mounting base	$R_{th\ j-mb} =$	30	12	K/W
From mounting base to heatsink	$R_{th\ mb-h} =$	0,7	0,7	K/W

CHARACTERISTICS

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

		LTE21009R	LTE21015R	
Collector cut-off current				
$I_E = 0; V_{CB} = 20\text{ V}$	$I_{CBO} <$	50	150	μA
$I_E = 0; V_{CB} = 40\text{ V}$	$I_{CBO} <$	0,4	1,0	mA
Emitter cut-off current				
$I_C = 0; V_{EB} = 1,5\text{ V}$	$I_{EBO} <$	200	400	nA
$I_C = 0; V_{EB} = 3,5\text{ V}$	$I_{EBO} <$	0,1	0,2	mA
D.C. current gain				
$I_C = 150\text{ mA}; V_{CE} = 5\text{ V}$	$h_{FE} <$	150	—	
$I_C = 250\text{ mA}; V_{CE} = 5\text{ V}$	$h_{FE} >$	—	15	
	$h_{FE} <$	—	150	

LTE21009R

s-parameters (common emitter)

 $V_{CE} = 16 \text{ V}$
 $I_C = 150 \text{ mA}$ } regulated; $T_{mb} = 25 \text{ }^\circ\text{C}$; $Z_O = 50 \text{ } \Omega$; typical values.

DEVELOPMENT DATA

f GHz	S _{ie}	S _{re}	S _{fe}	S _{oe}
0,5	0,76/-176°	0,022(-33,2)/37°	8,13(18,2)/85°	0,35/-62°
0,6	0,75/+180°	0,023(-32,8)/37°	6,95(16,8)/78°	0,34/-66°
0,7	0,76/+177°	0,023(-32,8)/40°	5,95(15,5)/73°	0,34/-71°
0,8	0,76/+174°	0,024(-32,5)/41°	5,25(14,4)/67°	0,35/-75°
0,9	0,76/+171°	0,024(-32,3)/42°	4,69(13,4)/62°	0,35/-79°
1,0	0,75/+168°	0,026(-31,8)/43°	4,23(12,5)/57°	0,36/-83°
1,1	0,75/+165°	0,028(-31,0)/43°	3,88(11,8)/53°	0,37/-87°
1,2	0,74/+163°	0,031(-30,1)/43°	3,61(11,2)/49°	0,39/-90°
1,3	0,75/+160°	0,035(-29,2)/43°	3,36(10,5)/44°	0,40/-95°
1,4	0,74/+162°	0,037(-28,5)/44°	3,12(9,9)/41°	0,43/-98°
1,5	0,73/+157°	0,041(-27,8)/46°	2,95(9,4)/37°	0,43/-101°
1,6	0,73/+155°	0,045(-27,0)/46°	2,83(9,0)/32°	0,45/-104°
1,7	0,71/+154°	0,047(-26,5)/44°	2,70(8,6)/28°	0,47/-107°
1,8	0,70/+151°	0,049(-26,1)/43°	2,56(8,2)/23°	0,48/-110°
1,9	0,69/+148°	0,050(-25,9)/42°	2,44(7,7)/19°	0,50/-114°
2,0	0,68/+143°	0,051(-25,9)/39°	2,34(7,4)/ 14°	0,51/-116°
2,2	0,67/+138°	0,058(-24,7)/36°	2,16(6,7)/ 4°	0,55/-124°
2,4	0,65/+134°	0,067(-23,5)/34°	2,02(6,1)/ -2°	0,59/-129°
2,6	0,62/+129°	0,077(-22,3)/31°	1,95(5,8)/-12°	0,64/-134°
2,8	0,57/+122°	0,082(-21,7)/25°	1,84(5,3)/-21°	0,68/-138°
3,0	0,52/+113°	0,086(-21,3)/21°	1,78(5,0)/-32°	0,72/-143°
3,2	0,49/+104°	0,093(-20,6)/16°	1,67(4,5)/-42°	0,74/-150°
3,4	0,45/+99°	0,102(-19,8)/13°	1,62(4,2)/-52°	0,80/-157°
3,6	0,38/+92°	0,113(-18,9)/ 8°	1,52(3,6)/-64°	0,80/-163°
3,8	0,29/+83°	0,119(-18,5)/ 6°	1,43(3,1)/-76°	0,82/-170°
4,0	0,24/+69°	0,137(-17,3)/ 2°	1,27(2,1)/ -88°	0,80/-179°
4,2	0,20/+54°	0,165(-15,7)/ -5°	1,08(0,7)/ -98°	0,68/+171°
4,4	0,15/+28°	0,202(-13,9)/-20°	0,92(-0,8)/-100°	0,51/+172°
4,6	0,12/-36°	0,206(-13,7)/-38°	0,93(-0,6)/-102°	0,52/-174°
4,8	0,17/-86°	0,195(-14,2)/-52°	0,97(-0,3)/-110°	0,63/-171°
5,0	0,24/-114°	0,177(-15,0)/-65°	0,97(-0,3)/-122°	0,73/-174°
5,2	0,31/-137°	0,164(-15,7)/-73°	0,93(-0,6)/-133°	0,79/-180°
5,4	0,41/-152°	0,154(-16,2)/-83°	0,88(-1,1)/-145°	0,83/+174°
5,6	0,48/-161°	0,134(-17,4)/-90°	0,81(-1,8)/-156°	0,85/+166°
5,8	0,53/-168°	0,122(-18,2)/-97°	0,77(-2,3)/-167°	0,87/+160°
6,0	0,56/-179°	0,105(-19,6)/-104°	0,70(-3,1)/-178°	0,89/+154°

The figures given between brackets are values in dB.

LTE21015R

s-parameters (common emitter)

$V_{CE} = 16\text{ V}$
 $I_C = 250\text{ mA}$ } regulated; $T_{mb} = 25\text{ }^\circ\text{C}$; $Z_0 = 50\ \Omega$; typical values.

f GHz	S _{ie}	S _{re}	S _{fe}	S _{oe}
0,5	0,91/175°	0,021(33,6)/50°	4,25(12,6)/76°	0,42/-177°
0,6	0,91/173°	0,024(-32,5)/52°	3,59(11,1)/72°	0,42/-180°
0,7	0,91/171°	0,027(-31,4)/53°	3,11(9,9)/68°	0,42/+179°
0,8	0,90/169°	0,030(-30,4)/53°	2,75(8,8)/64°	0,42/+178°
0,9	0,90/167°	0,033(-34,7)/54°	2,45(7,8)/59°	0,42/+177°
1,0	0,89/165°	0,036(-28,8)/53°	2,21(6,9)/55°	0,42/+176°
1,1	0,88/163°	0,039(-28,1)/54°	2,02(6,1)/53°	0,43/+174°
1,2	0,88/162°	0,042(-27,4)/54°	1,88(5,5)/49°	0,43/+174°
1,3	0,88/160°	0,046(-26,8)/53°	1,75(4,9)/46°	0,43/+174°
1,4	0,89/159°	0,048(-26,3)/54°	1,64(4,3)/42°	0,43/+173°
1,5	0,89/158°	0,054(-25,4)/57°	1,55(3,9)/40°	0,43/+173°
1,6	0,89/157°	0,059(-24,6)/54°	1,52(3,7)/36°	0,43/+172°
1,7	0,89/155°	0,063(-24,0)/52°	1,47(3,3)/32°	0,43/+172°
1,8	0,88/153°	0,066(-23,6)/50°	1,40(2,9)/28°	0,44/+171°
2,0	0,88/151°	0,076(-22,4)/49°	1,30(2,3)/22°	0,44/+169°
2,2	0,87/147°	0,085(-21,4)/47°	1,23(1,8)/ 15°	0,46/+168°
2,4	0,87/144°	0,092(-20,7)/44°	1,16(1,3)/ 8°	0,47/+168°
2,6	0,86/142°	0,102(-19,8)/42°	1,15(1,2)/ 2°	0,49/+170°
2,8	0,85/139°	0,110(-19,2)/37°	1,11(0,9)/ -7°	0,49/+170°
3,0	0,83/135°	0,119(-18,5)/34°	1,12(1,0)/-15°	0,50/+169°
3,2	0,82/129°	0,125(-18,1)/29°	1,08(0,7)/-25°	0,54/+166°
3,4	0,81/126°	0,132(-17,6)/26°	1,08(0,7)/-33°	0,57/+165°
3,6	0,79/122°	0,138(-17,2)/21°	1,06(0,5)/-44°	0,62/+165°
3,8	0,76/120°	0,143(-16,9)/19°	1,08(0,6)/-55°	0,65/+165°
4,0	0,73/117°	0,148(-16,6)/13°	1,07(0,6)/-69°	0,70/+160°
4,2	0,69/115°	0,147(-16,7)/10°	1,04(0,4)/ -85°	0,76/+155°
4,4	0,67/112°	0,147(-16,6)/ 7°	1,00(0,0)/-104°	0,83/+149°
4,6	0,67/112°	0,140(-17,1)/ 6°	0,88(-1,1)/-122°	0,90/+142°
4,8	0,70/112°	0,147(-16,7)/ 9°	0,75(-2,5)/-142°	0,93/+134°
5,0	0,72/114°	0,152(-16,3)/10°	0,59(-4,6)/-164°	0,92/+125°

The figures given between brackets are values in dB.

MICROWAVE LINEAR POWER TRANSISTOR

N-P-N Silicon transistor for use in common-emitter class-A linear power amplifiers up to 4,2 GHz. Diffused emitter ballasting resistors, self-aligned process entirely ion implanted and gold sandwich metallization ensure an optimum temperature profile with excellent performance and reliability. An input matching cell improves the input impedance and facilitates the design of wideband circuits. The transistor is housed in a metal-ceramic envelope (FO-41B).

QUICK REFERENCE DATA

R.F. performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class-A circuit.

Mode of operation	f GHz	V _{CC} V	I _C mA	PL1 W	G _{po} dB
c.w. class-A	2,1	16	400	typ. 2,8	typ. 7,8

MECHANICAL DATA

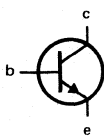
Dimensions in mm

Fig. 1 FO-41B

Emitter and metallic cap are connected to the seating plane.

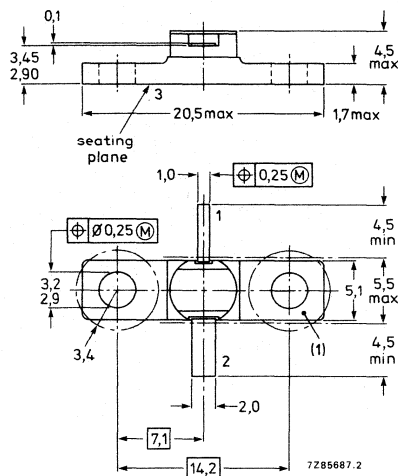
Pinning;

- 1 = collector
- 2 = base
- 3 = emitter



Torque on nut: max. 0,4 Nm
Recommended screw : M2,5

Marking code;
RTC439 = LTE21050R



(1) Flatness of this area ensures full thermal contact with bolt head.

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 (see also page 3).

RATINGS

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

Collector-base voltage open emitter	V_{CBO}	max.	40 V
Collector-emitter voltage $R_{BE} = 70 \Omega$ open base	V_{CER}	max.	20 V
	V_{CEO}	max.	16 V
Emitter-base voltage open collector	V_{EBO}	max.	3,5 V
Collector current (d.c.)	I_C	max.	800 mA
Total power dissipation up to $T_{mb} = 75 \text{ }^\circ\text{C}$	P_{tot}	max.	8,0 W
Storage temperature range	T_{stg}		-65 to +200 $^\circ\text{C}$
Junction temperature	T_j	max.	200 $^\circ\text{C}$
Lead soldering temperature at 0,3 mm from case; $t_{std} \leq 10 \text{ s}$	T_{sld}	max.	235 $^\circ\text{C}$

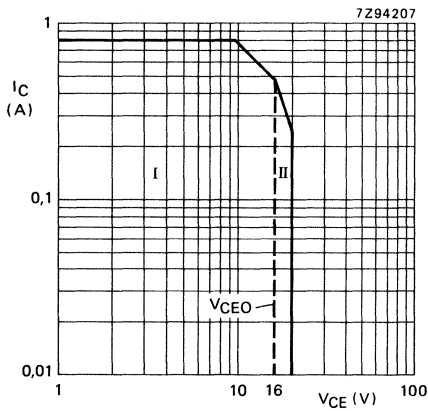


Fig. 2 D.C. SOAR at $T_{mb} \leq 75 \text{ }^\circ\text{C}$.
 I Region of permissible d.c. operation.
 II Permissible extension provided $R_{BE} \leq 70 \Omega$.

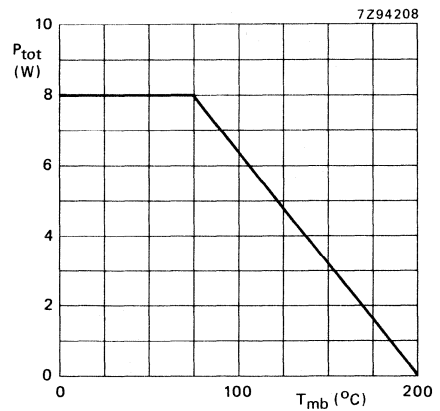


Fig. 3 Power derating curve.

THERMAL RESISTANCE ($T_j = 75\text{ }^\circ\text{C}$)

From junction to mounting base

$$R_{th\ j-mb} = 10\text{ K/W}$$

From mounting base to heatsink

$$R_{th\ mb-h} = 0,7\text{ K/W}$$

CHARACTERISTICS $T_{mb} = 25\text{ }^\circ\text{C}$ unless otherwise specified

Collector cut-off current

$$I_E = 0; V_{CB} = 20\text{ V}$$

$$I_{CBO} < 225\text{ }\mu\text{A}$$

$$I_E = 0; V_{CB} = 40\text{ V}$$

$$I_{CBO} < 1,5\text{ mA}$$

Emitter cut-off current

$$I_C = 0; V_{EB} = 1,5\text{ V}$$

$$I_{EBO} < 600\text{ nA}$$

$$I_C = 0; V_{EB} = 3,5\text{ V}$$

$$I_{EBO} < 0,3\text{ mA}$$

D.C. current gain

$$I_C = 400\text{ mA}; V_{CE} = 5\text{ V}$$

$$h_{FE} > 15$$

$$< 150$$

DEVELOPMENT DATA

s-parameters (common-emitter)

Typical values; $V_{CE} = 16 \text{ V}$; $I_C = 400 \text{ mA}$; $Z_0 = 50 \Omega$; $T_{mb} = 25 \text{ }^\circ\text{C}$.

f GHz	S _{ie}	S _{re}	S _{fe}	S _{oe}
0,5	0,94/176°	0,017(-35,4)/ 43°	2,79(8,9)/ 81°	0,49/-173°
0,6	0,94/174°	0,018(-34,7)/ 46°	2,39(7,6)/ 77°	0,54/-173°
0,7	0,94/173°	0,019(-34,4)/ 47°	2,07(6,3)/ 72°	0,52/-176°
0,8	0,93/172°	0,020(-34,1)/ 49°	1,85(5,3)/ 68°	0,52/-177°
0,9	0,93/170°	0,021(-33,8)/ 49°	1,66(4,4)/ 64°	0,53/-179°
1,0	0,93/168°	0,022(-33,3)/ 50°	1,50(3,5)/ 60°	0,53/ 179°
1,1	0,92/167°	0,023(-32,6)/ 50°	1,39(2,9)/ 57°	0,53/ 179°
1,2	0,93/166°	0,026(-31,6)/ 50°	1,31(2,4)/ 53°	0,54/ 177°
1,3	0,93/164°	0,029(-30,6)/ 49°	1,23(1,8)/ 49°	0,54/ 176°
1,4	0,93/167°	0,032(-29,9)/ 54°	1,16(1,3)/ 48°	0,55/ 179°
1,5	0,93/163°	0,037(-28,7)/ 54°	1,11(0,9)/ 43°	0,54/ 176°
1,6	0,93/162°	0,040(-27,9)/ 53°	1,07(0,6)/ 39°	0,55/ 175°
1,7	0,93/161°	0,042(-27,5)/ 51°	1,03(0,3)/ 35°	0,55/ 176°
1,8	0,92/159°	0,043(-27,3)/ 49°	0,99(-0,1)/ 30°	0,56/ 174°
2,0	0,88/151°	0,046(-26,7)/ 46°	0,99(-0,1)/ 22°	0,56/ 170°
2,2	0,89/148°	0,052(-25,7)/ 43°	0,92(-0,7)/ 14°	0,57/ 168°
2,4	0,90/147°	0,059(-24,6)/ 41°	0,88(-1,1)/ 9°	0,58/ 168°
2,6	0,90/147°	0,069(-23,2)/ 38°	0,90(-0,9)/ 1°	0,59/ 168°
2,8	0,87/142°	0,073(-22,8)/ 32°	0,88(-1,1)/ -8°	0,60/ 169°
3,0	0,83/134°	0,075(-22,5)/ 26°	0,90(-0,9)/ -18°	0,61/ 168°
3,2	0,82/129°	0,077(-22,2)/ 21°	0,87(-1,2)/ -27°	0,63/ 166°
3,4	0,83/130°	0,085(-21,4)/ 18°	0,90(-1,0)/ -37°	0,65/ 165°
3,6	0,80/130°	0,091(-20,8)/ 11°	0,91(-0,8)/ -50°	0,69/ 165°
3,8	0,73/127°	0,091(-20,8)/ 3°	0,94(-0,5)/ -64°	0,74/ 164°
4,0	0,69/122°	0,087(-21,2)/ -7°	0,95(-0,5)/ -82°	0,79/ 162°
4,2	0,67/122°	0,078(-22,2)/-15°	0,89(-1,0)/-100°	0,84/ 157°
4,4	0,69/126°	0,071(-23,0)/-19°	0,83(-1,7)/-121°	0,89/ 150°
4,6	0,72/130°	0,059(-24,6)/-18°	0,70(-3,1)/-141°	0,92/ 143°
4,8	0,76/128°	0,054(-25,4)/-11°	0,60(-4,4)/-160°	0,94/ 136°

The figures between brackets are values in dB.

MICROWAVE LINEAR POWER TRANSISTORS

N-P-N transistors for use in a common-emitter class-A linear power amplifier up to 4,2 GHz.

Diffused emitter ballasting resistors, self-aligned process entirely ion implanted and gold sandwich metallization ensure an optimum temperature profile and excellent performance and reliability.

An input matching cell improves the input impedance and facilitates the design of wideband circuits.

QUICK REFERENCE DATA

R.F. performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class-A circuit.

type no.	mode of operation	f GHz	V_{CE} V	I_C mA	P_{L1} mW	G_{po} dB	\bar{Z}_i Ω	\bar{Z}_L Ω
LTE42005S	c.w. linear ampl.	4,2	18	110	typ. 550	typ. 7,2	$100 + j40$	$4 + j4$
LTE42008R	c.w. linear ampl.	4,2	16	250	typ. 940	typ. 7,5	$7,5 + j23,5$	$2,5 - j9$

MECHANICAL DATA

Fig. 1 FO-41B.

Emitter and metallic cap are connected to the seating plane.

Pinning.

- 1 = collector
- 2 = base
- 3 = emitter

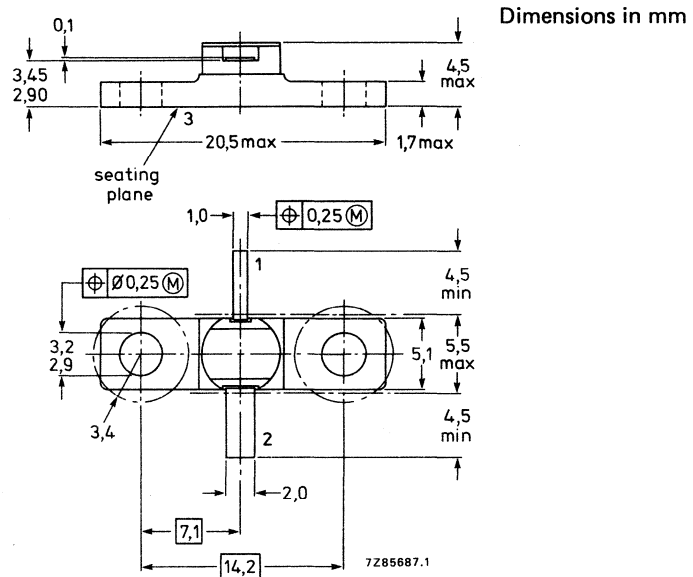
Torque on nut: max. 0,4 Nm

Recommended screw: M2,5

Marking code

RTC502 = LTE42005S

RTC196 = LTE42008R



(1) Flatness of this area ensures full thermal contact with bolt head.

CAUTION These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.

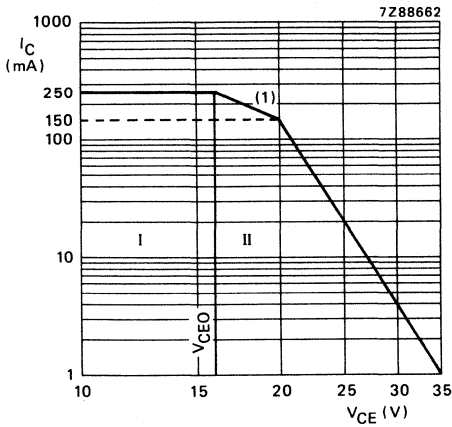
RATINGS

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

		<u>LTE42005S</u>		<u>LTE42008R</u>	
Collector-base voltage (open emitter)	V_{CBO}	max.	40		40 V
Collector-emitter voltage $R_{BE} = 100 \Omega$	V_{CER}	max.	35		– V
$R_{BE} = 250 \Omega$ (open base)	V_{CER}	max.	–		20 V
	V_{CEO}	max.	16		16 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3		3 V
Collector current (d.c.)	I_C	max.	250		500 mA
Total power dissipation up to $T_{mb} = 75 \text{ }^\circ\text{C}$	P_{tot}	max.	4		7,5 W
Storage temperature range	T_{stg}		–65 to +200		$^\circ\text{C}$
Junction temperature	T_j	max.	200		$^\circ\text{C}$
Lead soldering temperature at 0,3 mm from the case; $t_{sld} = 10 \text{ s}$	T_{sld}	max.	235		$^\circ\text{C}$
→ THERMAL RESISTANCE (at $T_j = 75 \text{ }^\circ\text{C}$)					
			<u>LTE42005S</u>		<u>LTE42008R</u>
From junction to mounting base	$R_{th\ j-mb}$	=	36		12 K/W*
From mounting base to heatsink	$R_{th\ mb-h}$	=	0,7		0,7 K/W*

* K/W is SI unit for $^\circ\text{C}/\text{W}$.

LTE42005S



(1) Second breakdown limit (independent of temperature).

Fig. 2 D.C. SOAR at $T_{mb} \leq 75^\circ\text{C}$.

- I Region of permissible d.c. operation.
- II Permissible extension provided $R_{BE} \leq 100 \Omega$.

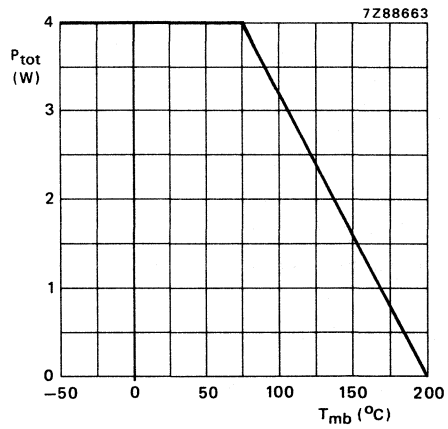
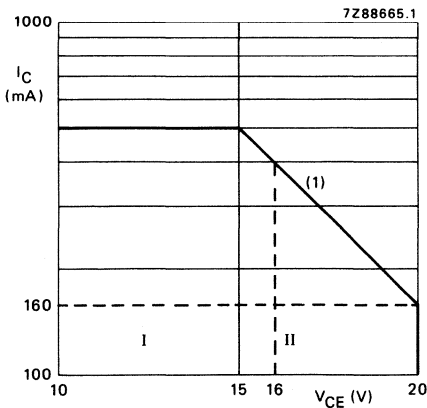


Fig. 3 Power derating curve vs. mounting base temperature.

LTE42008R



(1) Second breakdown limit (independent of temperature).

Fig. 4 D.C. SOAR at $T_{mb} \leq 75^\circ\text{C}$.

- I Region of permissible d.c. operation.
- II Permissible extension provided $R_{BE} \leq 250 \Omega$.

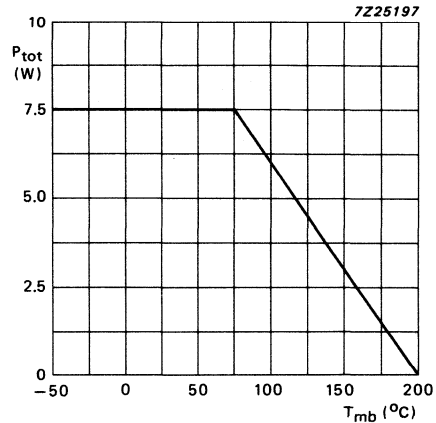


Fig. 5 Power derating curve vs. mounting base temperature.

CHARACTERISTICS

$T_{mb} = 25\text{ }^{\circ}\text{C}$

		LTE42005S	LTE42008R
Collector cut-off current			
	$I_E = 0; V_{CB} = 20\text{ V}$	I_{CBO} max. 0,1	150 μA
	$I_E = 0; V_{CB} = 40\text{ V}$	I_{CBO} max. 0,25	1 mA
→	$V_{CE} = 35\text{ V}; R_{BE} = 100\ \Omega$	I_{CER} max. 1	— mA
→	$V_{CE} = 20\text{ V}; R_{BE} = 250\ \Omega$	max. —	0,5 mA
Emitter cut-off current			
	$I_C = 0; V_{EB} = 1,5\text{ V}$	I_{EBO} max. 200	400 nA
	$I_C = 0; V_{EB} = 3,5\text{ V}$	I_{EBO} max. 50	200 μA
D.C. current gain			
	$I_C = 110\text{ mA}; V_{CE} = 5\text{ V}$	h_{FE} min. 15	—
		max. 150	—
	$I_C = 250\text{ mA}; V_{CE} = 5\text{ V}$	h_{FE} min. —	15
		max. —	150
Collector-base capacitance at $f = 1\text{ MHz}$			
	$I_E = I_C = 0; V_{CB} = 20\text{ V}; V_{EB} = 1,5\text{ V}$	C_{cb} typ. 0,5	— pF
	$I_E = I_C = 0; V_{CB} = 16\text{ V}; V_{EB} = 1,5\text{ V}$	C_{cb} typ. —	2 pF
Collector-emitter capacitance at $f = 1\text{ MHz}$			
	$I_C = I_E = 0; V_{CE} = 20\text{ V}; V_{EB} = 1,5\text{ V}$	C_{ce} typ. 1,5	— pF
	$I_C = I_E = 0; V_{CE} = 16\text{ V}; V_{EB} = 1,5\text{ V}$	C_{ce} typ. —	1,5 pF
Emitter-base capacitance at $f = 1\text{ MHz}$			
	$I_C = I_E = 0; V_{EB} = 1\text{ V}; V_{CB} = 10\text{ V}$	C_{eb} typ. 6,5	20 pF

LTE42005S

s-parameters (common-emitter)

$$\left. \begin{array}{l} V_{CE} = 18 \text{ V} \\ I_C = 110 \text{ mA} \end{array} \right\} \text{regulated; } T_{mb} = 25 \text{ }^\circ\text{C; } Z_O = 50 \text{ } \Omega; \text{ typical values.}$$

f GHz	S _{ie}	S _{re}	S _{fe}	S _{oe}
0,5	0,76/-176°	0,022(-33,2)/37°	8,13(18,2)/85°	0,35/-62°
0,6	0,75/+180°	0,023(-32,8)/37°	6,95(16,8)/78°	0,34/-66°
0,7	0,76/+177°	0,023(-32,8)/40°	5,95(15,5)/73°	0,34/-71°
0,8	0,76/+174°	0,024(-32,5)/41°	5,25(14,4)/67°	0,35/-75°
0,9	0,76/+171°	0,024(-32,3)/42°	4,69(13,4)/62°	0,35/-79°
1,0	0,75/+168°	0,026(-31,8)/43°	4,23(12,5)/57°	0,36/-83°
1,1	0,75/+165°	0,028(-31,0)/43°	3,88(11,8)/53°	0,37/-87°
1,2	0,74/+163°	0,031(-30,1)/43°	3,61(11,2)/49°	0,39/-90°
1,3	0,75/+160°	0,035(-29,2)/43°	3,36(10,5)/44°	0,40/-95°
1,4	0,74/+162°	0,037(-28,5)/44°	3,12(9,9)/41°	0,43/-98°
1,5	0,73/+157°	0,041(-27,8)/46°	2,95(9,4)/37°	0,43/-101°
1,6	0,73/+155°	0,045(-27,0)/46°	2,83(9,0)/32°	0,45/-104°
1,7	0,71/+154°	0,047(-26,5)/44°	2,70(8,6)/28°	0,47/-107°
1,8	0,70/+151°	0,049(-26,1)/43°	2,56(8,2)/23°	0,48/-110°
1,9	0,69/+148°	0,050(-25,9)/42°	2,44(7,7)/19°	0,50/-114°
2,0	0,68/+143°	0,051(-25,9)/39°	2,34(7,4)/ 14°	0,51/-116°
2,2	0,67/+138°	0,058(-24,7)/36°	2,16(6,7)/ 4°	0,55/-124°
2,4	0,65/+134°	0,067(-23,5)/34°	2,02(6,1)/ -2°	0,59/-129°
2,6	0,62/+129°	0,077(-22,3)/31°	1,95(5,8)/-12°	0,64/-134°
2,8	0,57/+122°	0,082(-21,7)/25°	1,84(5,3)/-21°	0,68/-138°
3,0	0,52/+113°	0,086(-21,3)/21°	1,78(5,0)/-32°	0,72/-143°
3,2	0,49/+104°	0,093(-20,6)/16°	1,67(4,5)/-42°	0,74/-150°
3,4	0,45/+99°	0,102(-19,8)/13°	1,62(4,2)/-52°	0,80/-157°
3,6	0,38/+92°	0,113(-18,9)/ 8°	1,52(3,6)/-64°	0,80/-163°
3,8	0,29/+83°	0,119(-18,5)/ 6°	1,43(3,1)/-76°	0,82/-170°
4,0	0,24/+69°	0,137(-17,3)/ 2°	1,27(2,1)/ -88°	0,80/-179°
4,2	0,20/+54°	0,165(-15,7)/ -5°	1,08(0,7)/ -98°	0,68/+171°
4,4	0,15/+28°	0,202(-13,9)/-20°	0,92(-0,8)/-100°	0,51/+172°
4,6	0,12/-36°	0,206(-13,7)/-38°	0,93(-0,6)/-102°	0,52/-174°
4,8	0,17/-86°	0,195(-14,2)/-52°	0,97(-0,3)/-110°	0,63/-171°
5,0	0,24/-114°	0,177(-15,0)/-65°	0,97(-0,3)/-122°	0,73/-174°
5,2	0,31/-137°	0,164(-15,7)/-73°	0,93(-0,6)/-133°	0,79/-180°
5,4	0,41/-152°	0,154(-16,2)/-83°	0,88(-1,1)/-145°	0,83/+174°
5,6	0,48/-161°	0,134(-17,4)/-90°	0,81(-1,8)/-156°	0,85/+166°
5,8	0,53/-168°	0,122(-18,2)/-97°	0,77(-2,3)/-167°	0,87/+160°
6,0	0,56/-179°	0,105(-19,6)/-104°	0,70(-3,1)/-178°	0,89/+154°

The figures given between brackets are values in dB.

LTE42008R

→ s-parameters (common-emitter)

$V_{CE} = 16\text{ V}$
 $I_C = 250\text{ mA}$ } regulated; $T_{mb} = 25\text{ }^\circ\text{C}$; $Z_o = 50\ \Omega$; typical values.

f GHz	S _{ie}	S _{re}	S _{fe}	S _{oe}
2.0	0.80/160°	0.061/ 61.5°	1.40/ 42.4°	0.45/- 172.7°
2.1	0.79/157°	0.065/ 59.4°	1.37/ 38.0°	0.44/-173.7°
2.2	0.79/155°	0.068/ 56.5°	1.36/ 34.0°	0.44/-175.5°
2.3	0.80/153°	0.071/ 54.3°	1.35/ 29.9°	0.45/-176.5°
2.4	0.79/151°	0.074/ 52.2°	1.35/ 25.3°	0.45/-176.9°
2.5	0.79/150°	0.079/ 50.1°	1.35/ 21.1°	0.45/- 177.6°
2.6	0.78/148°	0.085/ 48.4°	1.34/ 16.2°	0.46/-178.0°
2.7	0.77/147°	0.090/ 45.1°	1.34/ 11.8°	0.47/-178.3°
2.8	0.75/146°	0.095/ 41.7°	1.35/ 7.6°	0.48/-178.6°
2.9	0.73/144°	0.099/ 38.3°	1.38/ 2.9°	0.50/-178.9°
3.0	0.71/143°	0.104/ 35.4°	1.40/ -2.6°	0.52/-178.8°
3.1	0.67/143°	0.111/ 31.8°	1.42/ -8.3°	0.55/-179.2°
3.2	0.64/141°	0.116/ 27.4°	1.43/ -14.1°	0.58/-179.9°
3.3	0.60/141°	0.121/ 21.7°	1.44/ -20.4°	0.62/ 178.8°
3.4	0.56/142°	0.124/ 15.7°	1.48/ -28.1°	0.66/ 176.9°
3.5	0.52/143°	0.124/ 11.2°	1.49/ -36.4°	0.70/ 174.4°
3.6	0.49/146°	0.124/ 5.2°	1.48/ -45.1°	0.74/ 171.3°
3.7	0.47/149°	0.122/ -2.2°	1.47/ -53.9°	0.79/ 166.8°
3.8	0.46/154°	0.118/ -9.7°	1.45/ -63.1°	0.84/ 161.9°
3.9	0.48/159°	0.112/ -15.7°	1.41/ -72.9°	0.87/ 156.7°
4.0	0.51/161°	0.106/ -22.8°	1.34/ -82.5°	0.91/ 150.7°
4.1	0.56/162°	0.096/ -29.4°	1.26/ -91.7°	0.94/ 144.8°
4.2	0.61/161°	0.083/ -34.5°	1.18/ -100.1°	0.96/ 138.6°
4.3	0.67/158°	0.068/ -37.4°	1.08/ -108.8°	0.97/ 132.5°
4.4	0.71/155°	0.054/ -38.7°	0.99/ -117.8°	0.98/ 127.3°
4.5	0.76/152°	0.042/ -35.4°	0.90/ -126.5°	0.99/ 122.2°
4.6	0.79/147°	0.031/ -26.6°	0.81/ -134.7°	0.99/ 117.2°
4.7	0.81/143°	0.025/ -5.6°	0.73/ -143.0°	0.99/ 113.7°
4.8	0.82/140°	0.026/ 28.8°	0.66/ -151.2°	0.99/ 110.0°
4.9	0.82/136°	0.034/ 40.1°	0.59/ -158.8°	0.99/ 106.5°
5.0	0.82/132°	0.043/ 52.4°	0.53/ -167.3°	0.98/ 103.2°

APPLICATION INFORMATION

R.F. performance in c.w. operation for the LTE42005S up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class-A circuit*

f GHz	V_{CE} (1) V	I_C (1) mA	P_{L1} (2) mW (dBm)	G_{po} (3) dB	\bar{z}_i Ω	\bar{Z}_L Ω
4,2	18	110	$\geq 450(26,5)$ typ. 550(27,4)	$\geq 6,6$ typ. 7,2	100 + j40	4 + j4

Notes

1. V_{CE} and I_C regulated.
2. Load power for 1 dB compressed power gain.
3. Low-level power gain associated with P_{L1} .

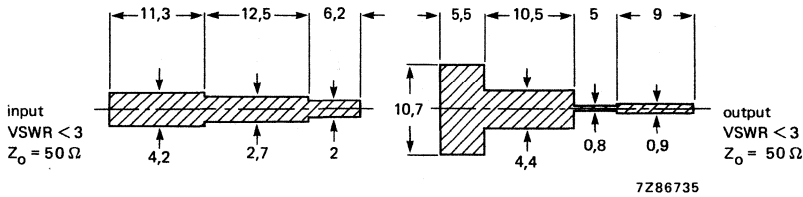


Fig. 6 Prematching test circuit board for 4,2 GHz. (Dimensions in mm.)

Input striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric ($\epsilon_r = 2,54$); thickness 1,6 mm.

Output striplines on a double Cu=clad Rexolite printed-circuit board with dielectric ($\epsilon_r = 2,4$); thickness 0,25 mm.

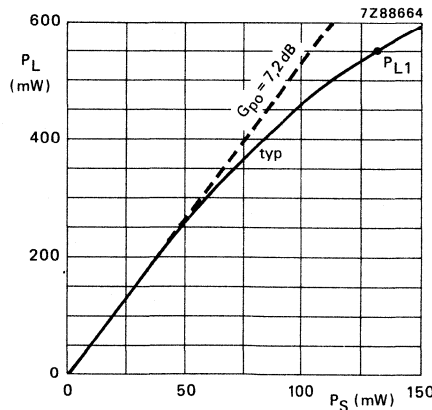


Fig. 7 Load power as a function of source power. $f = 4,2\text{ GHz}$; $T_{mb} = 25\text{ }^{\circ}\text{C}$;
 $V_{CE} = 18\text{ V}$
 $I_C = 110\text{ mA}$ } regulated

* Circuit consists of prematching circuit boards in combination with complementary input and output slug tuners.

APPLICATION INFORMATION

R.F. performance in c.w. operation for the LTE42008R up to $T_{mb} = 25\text{ }^\circ\text{C}$ in an unneutralized common-emitter class-A circuit*.

f GHz	V_{CE} (1) V	I_C (1) mA	P_{L1} (2) mW (dBm)	G_{po} (3) dB	\bar{z}_i Ω	\bar{z}_L Ω
→ 4,2	16	250	$\geq 800(29)$ typ. 940(29,7)	≥ 7 typ. 7,5	$7,5 + j23,5$	$2,5 - j9$

Notes

- V_{CE} and I_C regulated.
- Load power for 1 dB compressed power gain.
- Low-level power gain associated with P_{L1} .

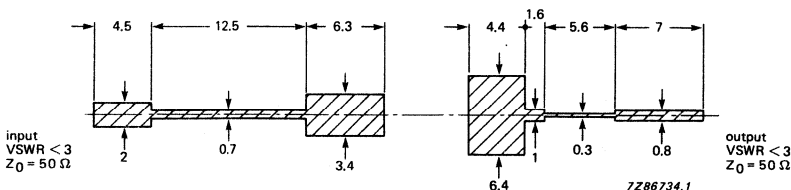


Fig. 8 Prematching test circuit board for 4,2 GHz. (Dimensions in mm.)

Input striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric ($\epsilon_r = 2,54$); thickness 0,8 mm.

Output striplines on a double Cu-clad Rexolite printed-circuit board with dielectric ($\epsilon_r = 2,4$); thickness 0,25 mm.

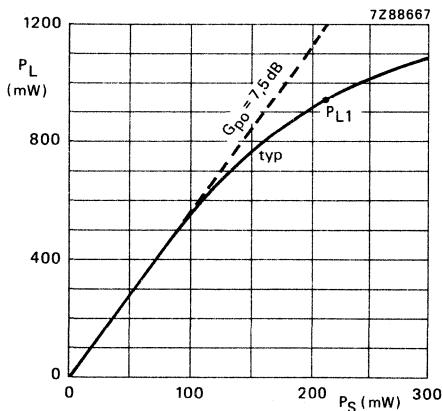


Fig. 9 Load power as a function of source power at 4,2 GHz.

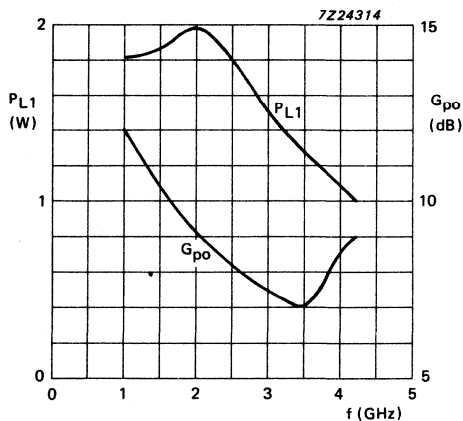


Fig. 10 Load power and power gain, associated with 1 dB compressed power gain, as a function of frequency.

Conditions for Figs 9 and 10:

$V_{CE} = 16\text{ V}$
 $I_C = 250\text{ mA}$ } regulated; typical values; $T_{mb} = 25\text{ }^\circ\text{C}$.

* Circuit consists of prematching circuit boards in combination with complementary input and output slug tuners.

LTE42008R

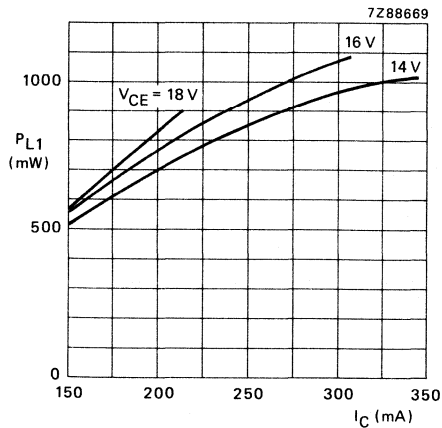


Fig. 11 Load power associated with 1 dB compressed power gain, as a function of collector current.

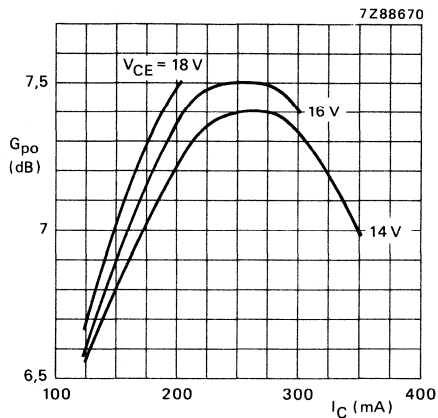


Fig. 12 Low-level power gain associated with P_{L1} as a function of collector current.

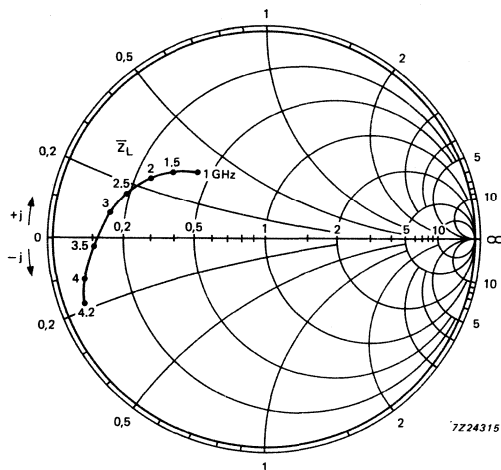


Fig. 14 Optimum load impedance as a function of frequency for P_{L1} .

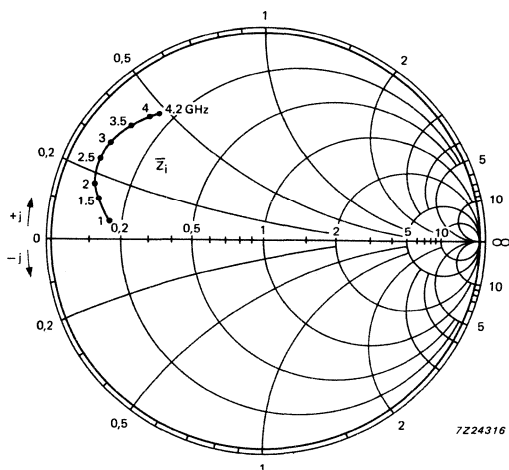


Fig. 13 Input impedance as a function of frequency for P_{L1} .

Conditions for Figs 11 and 12:

V_{CE} and I_C regulated; typical values; $T_{mb} = 25^\circ C$.

Conditions for Figs 13 and 14:

$V_{CE} = 16V$
 $I_C = 250mA$ } regulated; typical values; $Z_O = 50\Omega$; $T_{mb} = 25^\circ C$.

MICROWAVE LINEAR POWER TRANSISTOR

N-P-N silicon power transistor for use in a common-emitter, class-A amplifier up to a frequency of 4,2 GHz in c.w. conditions in military and professional applications.

Features :

- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistor providing excellent current sharing and withstanding a high VSWR
- Gold metallization realizing a very good stability of the characteristics and excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance
- An input matching cell improving the input impedance and allowing an easier design of wideband circuits
- New 5 GHz technology

The transistor is housed in a metal ceramic flange envelope (FO 41B).

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class-A selective amplifier, typical values.

mode of operation	f GHz	V _{CE} V	P _{L1} mW	G _{po} dB	I _C mA	\bar{z}_i Ω	\bar{Z}_L Ω
c.w.; class-A	4,2	16	1250	7	400	7,5+j12	4-j8
c.w.; class-A	2	16	2450	8,2	400	2,8+j2,25	7,9-j1,3

MECHANICAL DATA

FO-41B (see Fig. 1).

PRODUCT SAFETY

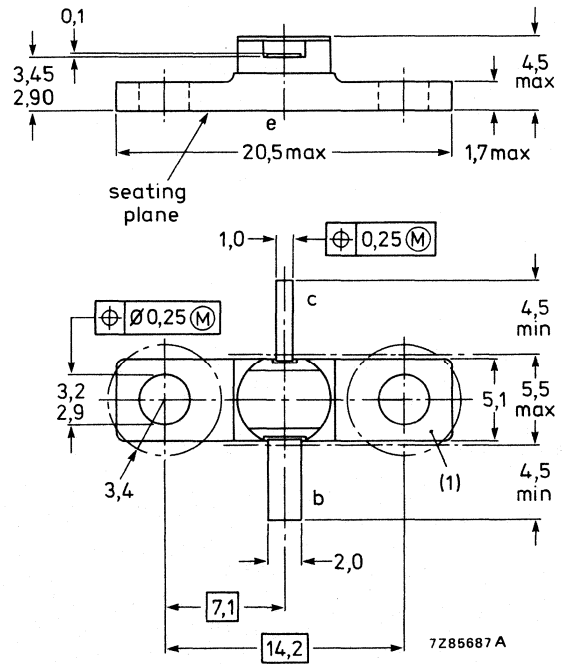
This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-41B.

Emitter and metallic cap
connected to flange.



Torque on screw: max. 0,4 Nm
Recommended screw : M2,5

Marking code: RTC198

(1) Flatness of this area ensures full thermal contact with bolt head.

RATINGS

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

Collector-base voltage, open emitter	V _{CBO}	max.	40 V
Collector-emitter voltage, open base	V _{CEO}	max.	16 V
R _{BE} = 70 Ω	V _{CER}	max.	20 V
Emitter-base voltage, open collector	V _{EBO}	max.	3,5 V
Collector current (d.c.)	I _C	max.	800 mA
Total power dissipation up to T _{mb} = 75 °C	P _{tot}	max.	8 W
Storage temperature	T _{stg}		-65 to +200 °C
Junction temperature	T _j	max.	200 °C
Soldering temperature at 0,1 mm from ceramic; t _{sld} ≤ 10 s	T _{sld}	max.	235 °C

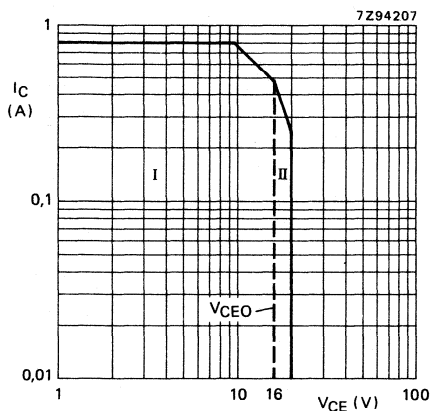


Fig. 2 D.C. SOAR; T_{mb} ≤ 75 °C.
 I Region of permissible d.c. operation
 II Permissible extension provided
 1 R_{BE} ≤ 70 Ω

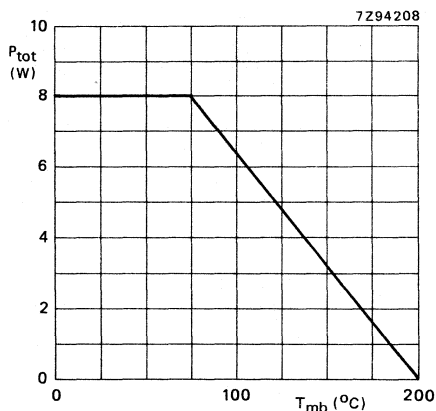


Fig. 3 Power derating curve versus mounting base temperature.

THERMAL RESISTANCE (at T_j = 75 °C)
 From junction to mounting base

R_{th j-mb} = 10 K/W

CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Collector cut-off current

I_E = 0; V_{CB} = 20 V

I_{CBO} max. 200 μA

Emitter cut-off current

I_C = 0; V_{EB} = 1,5 V

I_{EBO} max. 600 nA

D.C. current gain

I_C = 400 mA; V_{CE} = 5 V

h_{FE} = 15 to 100

Collector-base capacitance at f = 1 MHz

I_E = I_C = 0; V_{CB} = 16 V; V_{EB} = 1,5 V

C_{cb} typ. 3 pF

→ s-parameters (common-emitter)

Typical values; $V_{CE} = 16\text{ V}$; $I_C = 400\text{ mA}$; $Z_O = 50\ \Omega$; $T_{mb} = 25\text{ }^\circ\text{C}$.

f GHz	S _{ie}	S _{re}	S _{fe}	S _{oe}
2.0	0.84/163°	0.049/64.0°	0.96/ 47.2°	0.60/179.3°
2.1	0.84/161°	0.051/62.7°	0.94/ 43.3°	0.59/178.0°
2.2	0.84/159°	0.054/60.4°	0.93/ 39.8°	0.59/175.6°
2.3	0.85/158°	0.055/58.8°	0.91/ 36.2°	0.59/174.2°
2.4	0.85/156°	0.057/57.5°	0.91/ 32.2°	0.60/172.6°
2.5	0.85/155°	0.060/56.1°	0.90/ 29.1°	0.60/171.1°
2.6	0.85/154°	0.064/54.9°	0.89/ 24.6°	0.60/169.8°
2.7	0.85/153°	0.067/53.1°	0.89/ 21.2°	0.60/168.6°
2.8	0.85/152°	0.071/51.3°	0.89/ 17.2°	0.61/167.1°
2.9	0.84/150°	0.073/49.5°	0.90/ 13.8°	0.62/165.7°
3.0	0.83/149°	0.076/48.0°	0.90/ 9.3°	0.62/164.7°
3.1	0.82/149°	0.080/46.0°	0.91/ 5.2°	0.63/163.8°
3.2	0.80/147°	0.084/44.1°	0.92/ 0.6°	0.64/163.0°
3.3	0.78/146°	0.088/40.5°	0.93/ -4.3°	0.65/161.5°
3.4	0.76/145°	0.091/36.1°	0.95/ -9.7°	0.67/160.9°
3.5	0.74/144°	0.093/34.4°	0.97/ -16.1°	0.69/159.6°
3.6	0.71/143°	0.095/30.7°	0.98/ -23.2°	0.70/158.3°
3.7	0.70/142°	0.095/26.3°	0.99/ -30.6°	0.73/156.2°
3.8	0.67/142°	0.093/21.6°	0.99/ -37.9°	0.76/153.6°
3.9	0.66/142°	0.091/17.0°	1.00/ -46.6°	0.79/150.7°
4.0	0.64/142°	0.088/13.2°	0.98/ -55.8°	0.82/147.0°
4.1	0.64/142°	0.084/ 9.7°	0.95/ -64.9°	0.85/143.1°
4.2	0.65/143°	0.077/ 7.0°	0.91/ -73.8°	0.88/138.4°
4.3	0.67/143°	0.068/ 5.9°	0.86/ -82.6°	0.90/133.6°
4.4	0.69/143°	0.060/ 8.2°	0.81/ -92.3°	0.93/129.3°
4.5	0.72/141°	0.054/13.8°	0.74/ -101.7°	0.94/124.9°
4.6	0.75/139°	0.050/20.5°	0.68/ -110.6°	0.95/120.1°
4.7	0.76/137°	0.050/31.2°	0.61/ -119.7°	0.96/116.5°
4.8	0.78/135°	0.054/43.5°	0.56/ -129.1°	0.97/113.5°
4.9	0.79/133°	0.061/46.6°	0.50/ -139.5°	0.97/110.1°
5.0	0.77/130°	0.068/54.3°	0.44/ -148.6°	0.97/106.7°

APPLICATION INFORMATION

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class-A selective circuit

mode of operation	f GHz	V _{CE} V	P _{L1} mW	G _{po} dB	I _C mA	\bar{z}_i Ω	\bar{Z}_L Ω
c.w.; class-A	4,2	16	> 1000	> 6	400	7,5+j12	4-j8

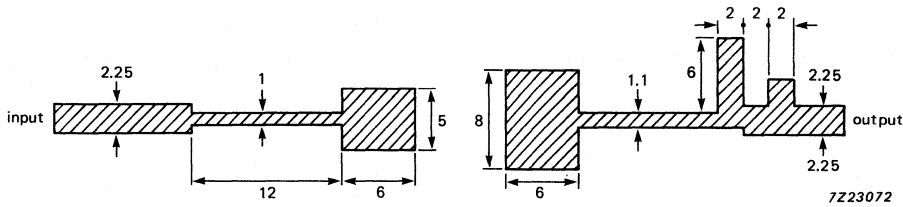


Fig. 4 Prematching test circuit board for c.w.; class-A application (dimensions in mm).

Striplines on a double Cu-clad printed circuit board with PTFE fibre-glass dielectric ($\epsilon_r = 2.54$); thickness 0.8 mm.

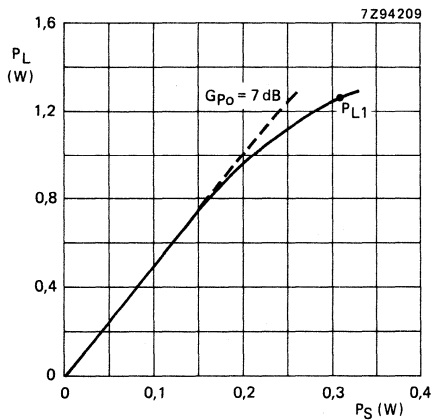


Fig. 5 Load power as a function of input power; $f = 4,2\text{ GHz}$; $V_{CE} = 16\text{ V}$; $I_C = 400\text{ mA}$ regulated.

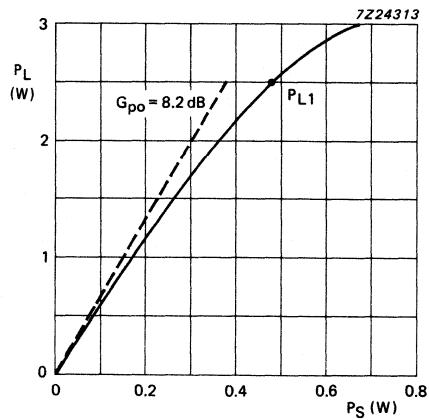


Fig. 6 Load power as a function of input power; $f = 2\text{ GHz}$; $V_{CE} = 16\text{ V}$; $I_C = 400\text{ mA}$ regulated.

* Circuit consists of prematching boards in combination with complementary input and output slug tuners.

MICROWAVE LINEAR POWER TRANSISTORS

NPN silicon transistors for use in common-emitter class-A linear power amplifiers up to 4 GHz.
Diffused emitter ballasting resistors, a self-aligned process entirely ion implanted and gold sandwich metallization ensure an optimum temperature profile with excellent performance and reliability.
The transistors are housed in a FO-163 metal-ceramic studless envelope.

QUICK REFERENCE DATA

R.F. performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class-A circuit

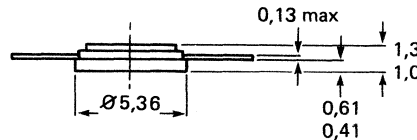
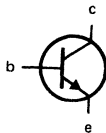
type number	mode of operation	f GHz	V_{CC} V	I_C mA	P_{L1} mW	G_{po} dB
LUE2003S	c.w. class-A	2,0	18	30	typ. 250	typ. 11
LUE2009S	c.w. class-A	2,0	18	110	typ. 900	typ. 9,8

MECHANICAL DATA

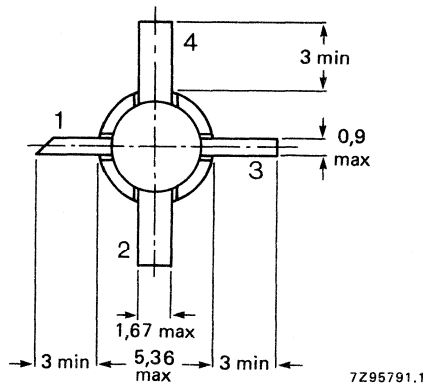
Dimensions in mm

Fig. 1 FO-163

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



Marking codes:
RTC 400 = LUE2003S
RTC 401 = LUE2009S



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.

RATINGS

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

			LUE2003S	LUE2009S	
Collector-base voltage open emitter	V _{CB0}	max.	40	40	V
Collector-emitter voltage R _{BE} = 100 Ω	V _{CER}	max.	—	35	V
R _{BE} = 220 Ω	V _{CER}	max.	35	—	V
open base	V _{CEO}	max.	16	16	V
Emitter-base voltage open collector	V _{EBO}	max.	3	3	V
Collector current (DC)	I _C	max.	90	250	mA
Total power dissipation up to T _{mb} = 75 °C	P _{tot}	max.	1,4	3,5	W
Storage temperature range	T _{stg}		-65 to + 200		°C
Junction temperature	T _j	max.	200		°C
Lead soldering temperature at 0,3 mm from case; t _{std} ≤ 10 s	T _{sld}	max.	235		°C

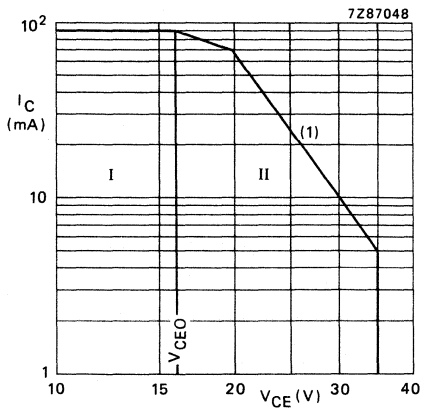


Fig. 2 DC SOAR at $T_{mb} \leq 75^\circ\text{C}$.

- (1) Second breakdown limit (independent of temperature)
- I Region of permissible DC operation.
- II Permissible extension provided $R_{BE} \leq 220 \Omega$.

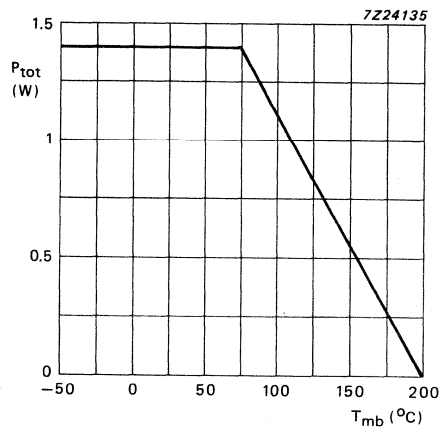


Fig. 3 Power derating curve as a function of base temperature.

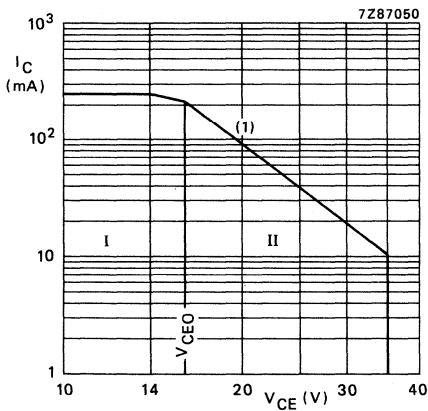


Fig. 4 DC SOAR at $T_{mb} \leq 75^\circ\text{C}$.

- (1) Second breakdown limit (independent of temperature)
- I Region of permissible DC operation.
- II Permissible extension provided $R_{BE} \leq 100 \Omega$.

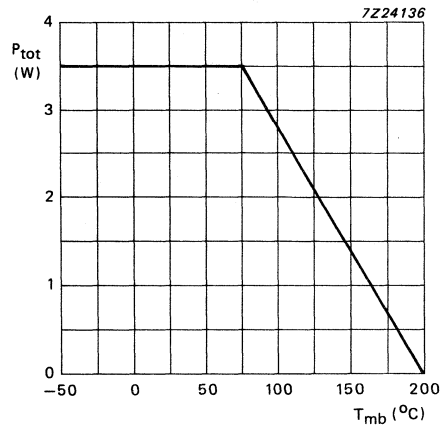


Fig. 5 Power derating curve as a function of base temperature.

THERMAL RESISTANCE (at $T_j = 75\text{ }^\circ\text{C}$)

		LUE2003S	LUE2009S	
From junction to mounting base	$R_{th\ j-mb}$	= 65	36	K/W
From mounting base to heatsink	$R_{th\ mb-h}$	= 1,5	1,5	K/W

CHARACTERISTICS

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

		LUE2003S	LUE2009S	
Collector cut-off current				
$I_E = 0; V_{CB} = 20\text{ V}$	I_{CBO}	< 0,1	0,1	μA
$I_E = 0; V_{CB} = 40\text{ V}$	I_{CBO}	< 150	250	μA
$V_{CB} = 35\text{ V}; R_{BE} = 220\ \Omega$	I_{CER}	< 500	—	μA
$V_{CB} = 35\text{ V}; R_{BE} = 100\ \Omega$	I_{CER}	< —	1000	μA
Emitter cut-off current				
$I_C = 0; V_{EB} = 1,5\text{ V}$	I_{EBO}	< 0,05	0,2	μA
$I_C = 0; V_{EB} = 3,0\text{ V}$	I_{EBO}	< 25	50	μA
DC current gain				
$I_C = 30\text{ mA}; V_{CE} = 5\text{ V}$	h_{FE}	> 15	—	
		< 150	—	
$I_C = 110\text{ mA}; V_{CE} = 5\text{ V}$	h_{FE}	> —	15	
		< —	150	
Collector-base capacitance at $f = 1\text{ MHz}; I_E = I_C = 0;$ $V_{CB} = 18\text{ V}; V_{EB} = 1,5\text{ V}$	C_{cb}	typ. 0,3	0,6	pF
Collector-emitter capacitance at $f = 1\text{ MHz}; I_E = I_C = 0;$ $V_{CE} = 18\text{ V}; V_{EB} = 1,5\text{ V}$	C_{ce}	typ. 0,45	0,6	pF
Emitter-base capacitance at $f = 1\text{ MHz}; I_E = I_C = 0;$ $V_{EB} = 18\text{ V}; V_{CB} = 10\text{ V}$	C_{eb}	typ. 1,7	3,3	pF

LUE2003S

s-parameters (common-emitter)

 $V_{CE} = 18 \text{ V}$; $I_C = 30 \text{ mA}$; $T_{mb} = 25 \text{ }^\circ\text{C}$; $Z_O = 50 \text{ } \Omega$; typical values.

f GHz	S_{ie}	S_{re}	S_{fe}	S_{oe}
0,5	0,56/−146°	0,029(−30,8)/52°	8,98(19,1)/99°	0,61/−37°
0,6	0,55/−152°	0,031(−30,1)/55°	7,64(17,7)/93°	0,60/−40°
0,7	0,54/−156°	0,034(−29,4)/58°	6,64(16,4)/88°	0,60/−41°
0,8	0,53/−162°	0,037(−28,7)/60°	5,91(15,4)/84°	0,61/−44°
0,9	0,52/−166°	0,040(−28,1)/62°	5,34(14,6)/80°	0,61/−46°
1,0	0,51/−170°	0,043(−27,4)/64°	4,87(13,8)/77°	0,61/−48°
1,1	0,50/−174°	0,046(−26,8)/66°	4,48(13,0)/73°	0,62/−51°
1,2	0,49/−179°	0,049(−26,1)/67°	4,16(12,4)/70°	0,62/−54°
1,3	0,48/−177°	0,054(−25,4)/69°	3,88(11,8)/67°	0,63/−56°
1,4	0,47/−172°	0,058(−24,7)/70°	3,65(11,2)/65°	0,63/−59°
1,5	0,47/−167°	0,063(−24,0)/71°	3,45(10,8)/62°	0,64/−61°
1,6	0,48/−161°	0,068(−23,4)/72°	3,27(10,3)/59°	0,64/−65°
1,7	0,48/−156°	0,073(−22,8)/73°	3,10(9,8)/56°	0,64/−68°
1,8	0,48/−152°	0,078(−22,2)/73°	2,93(9,4)/52°	0,65/−72°
1,9	0,49/−147°	0,082(−21,7)/73°	2,79(8,9)/49°	0,65/−75°
2,0	0,50/−143°	0,086(−21,3)/73°	2,65(8,5)/46°	0,65/−79°

LUE2009S

s-parameters (common-emitter)

 $V_{CE} = 18 \text{ V}$; $I_C = 110 \text{ mA}$; $T_{mb} = 25 \text{ }^\circ\text{C}$; $Z_O = 50 \text{ } \Omega$; typical values.

f GHz	S_{ie}	S_{re}	S_{fe}	S_{oe}
0,5	0,69/−170°	0,031(−30,2)/54°	6,61(16,4)/85°	0,43/ −48°
0,6	0,69/−173°	0,035(−29,1)/57°	5,57(14,9)/80°	0,44/ −51°
0,7	0,69/−177°	0,039(−28,2)/60°	4,81(13,6)/77°	0,45/ −54°
0,8	0,68/−180°	0,043(−27,3)/62°	4,26(12,6)/73°	0,46/ −57°
0,9	0,68/−177°	0,047(−26,5)/63°	3,84(11,7)/69°	0,47/ −61°
1,0	0,67/−174°	0,052(−25,7)/65°	3,50(10,9)/65°	0,49/ −64°
1,1	0,66/−170°	0,056(−25,0)/66°	3,22(10,2)/62°	0,50/ −67°
1,2	0,66/−166°	0,062(−24,2)/67°	2,98(9,5)/59°	0,51/ −70°
1,3	0,66/−162°	0,068(−23,4)/68°	2,77(8,9)/55°	0,52/ −73°
1,4	0,65/−158°	0,074(−22,6)/68°	2,60(8,3)/52°	0,53/ −76°
1,5	0,65/−153°	0,080(−21,9)/68°	2,45(7,8)/49°	0,54/ −80°
1,6	0,65/−149°	0,087(−21,2)/68°	2,32(7,3)/45°	0,54/ −84°
1,7	0,66/−145°	0,093(−20,6)/68°	2,18(6,8)/41°	0,55/ −88°
1,8	0,66/−141°	0,100(−20,0)/67°	2,06(6,3)/38°	0,56/ −92°
1,9	0,67/−137°	0,105(−19,5)/67°	1,94(5,8)/34°	0,56/ −96°
2,0	0,68/−134°	0,110(−19,2)/66°	1,84(5,3)/32°	0,57/−100°

The figures given between brackets are values in dB.

MICROWAVE LINEAR POWER TRANSISTOR

N-P-N silicon power transistor for use in a common-emitter, class-A amplifier from 1,7 GHz to 2,1 GHz in c.w. conditions in military and professional applications.

Features:

- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistor providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizing a very good stability of the characteristics and excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance
- Internal input and output prematching ensuring a good stability and allowing an easier design of wideband circuits
- New 5 GHz technology.

The transistor is housed in a metal ceramic flange envelope (FO 83).

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class-A wideband amplifier.

mode of operation	f GHz	V_{CE} V	I_C A	P_{L1} W	G_{po} dB	\bar{z}_i Ω	\bar{z}_l Ω
c.w.; class-A	1,7 to 2,1	16	1,1	typ. 5,5	typ. 8	see Fig. 6	

MECHANICAL DATA

FO-83 (see Fig. 1).

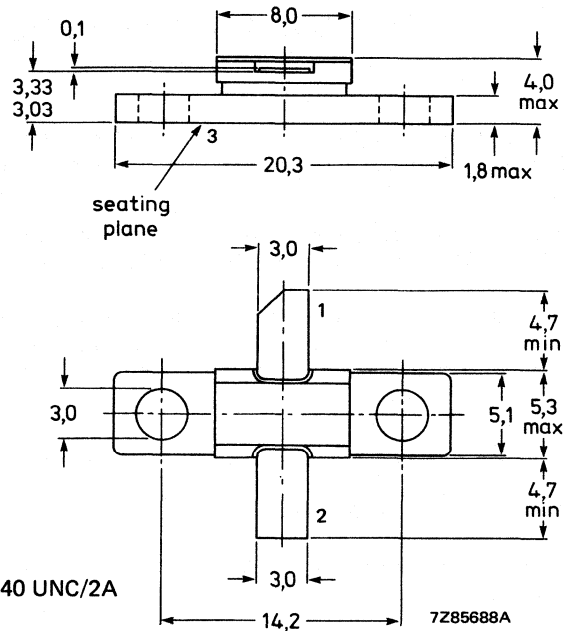
Dimensions in mm

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Fig. 1 FO-83.

Dimensions in mm



Pinning:

1 = collector

2 = base

3 = emitter

Torque on screw: max. 0,4 Nm

Recommended screw: M2,5 or cheesehead 4-40 UNC/2A

RATINGS

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

Collector-base voltage, open emitter	V_{CBO}	max.	40 V
Collector-emitter voltage open base $R_{BE} = 47 \Omega$	V_{CEO}	max.	15 V
	V_{CER}	max.	20 V
Emitter-base voltage, open collector	V_{EBO}	max.	3,5 V
Collector current (d.c.)	I_C	max.	2 A
Total power dissipation up to $T_{mb} = 75 \text{ }^\circ\text{C}$	P_{tot}	max.	18 W
Storage temperature	T_{stg}		-65 to + 200 $^\circ\text{C}$
Junction temperature	T_j	max.	200 $^\circ\text{C}$
Soldering temperature at 0,1 mm from case; $t_{sld} \leq 10 \text{ s}$	T_{sld}	max.	235 $^\circ\text{C}$

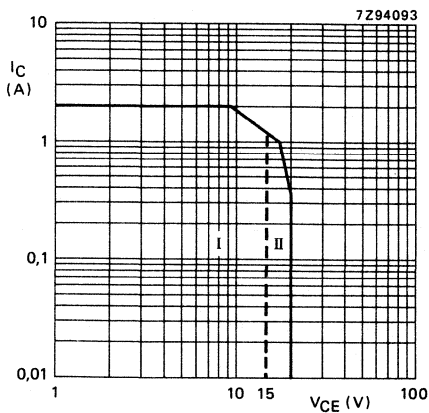


Fig. 2 D.C. SOAR; $T_{mb} \leq 75 \text{ }^\circ\text{C}$.

I Region of permissible d.c. operation

II Permissible extension provided

$R_{BE} \leq 47 \text{ } \Omega$.

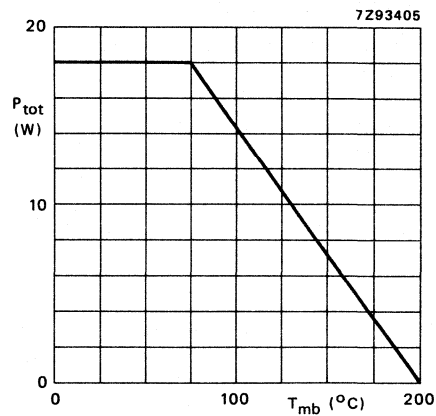


Fig. 3 Power derating curve versus mounting base temperature.

THERMAL RESISTANCE (at $T_j = 75 \text{ }^\circ\text{C}$)

From junction to mounting base

From mounting base to heatsink

$R_{th \text{ j-mb}} = 4 \text{ K/W}$

$R_{th \text{ mb-h}} = 0,7 \text{ K/W}$

CHARACTERISTICS

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

Collector cut-off currents

$I_E = 0; V_{CB} = 20 \text{ V}$

$I_E = 0; V_{CB} = 40 \text{ V}$

$V_{CE} = 20 \text{ V}; R_{BE} = 47 \text{ } \Omega$

$V_{CE} = 15 \text{ V}; I_B = 0$

$I_{CBO} \leq 0,5 \text{ mA}$

$I_{CER} \leq 2,5 \text{ mA}$

$I_{CEO} \leq 2 \text{ mA}$

Emitter cut-off current

$I_C = 0; V_{EB} = 1,5 \text{ V}$

$I_C = 0; V_{EB} = 3,5 \text{ V}$

$I_{EBO} \leq 100 \text{ } \mu\text{A}$

$\leq 500 \text{ } \mu\text{A}$

D.C. current gain

$I_C = 1 \text{ A}; V_{CE} = 3 \text{ V}$

$h_{FE} \text{ 15 to 100}$

APPLICATION INFORMATION

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class-A wideband amplifier.

mode of operation	f GHz	V_{CE} V	I_C A	P_{L1} W	G_{po} dB	\bar{Z}_i Ω	\bar{Z}_L Ω
c.w.; class-A	1,7 to 2,1	16	1,1	≥ 5	≥ 7	see Fig. 6	

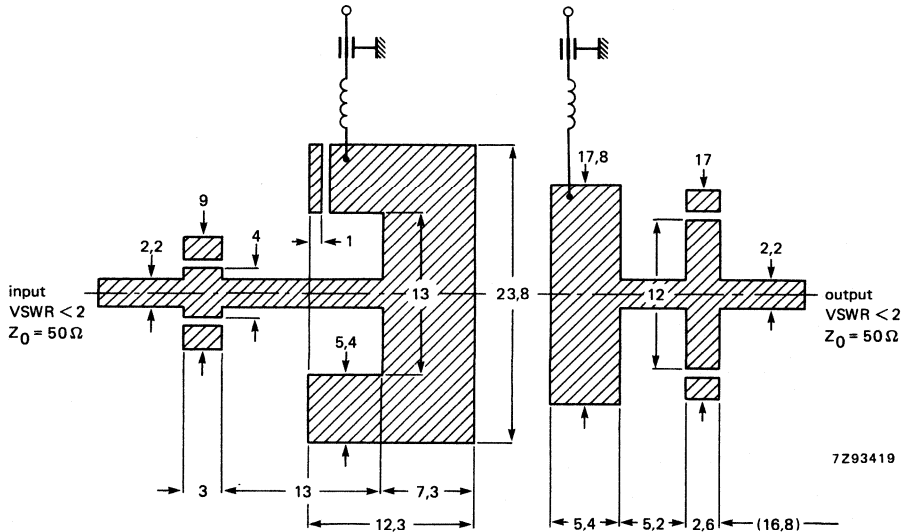


Fig. 4 Wideband test circuit board for 1,7 to 2,1 GHz, c.w., class-A application (Dimensions in mm).

Striplines on a double Cu-clad printed circuit board with Teflon fibre-glass ($\epsilon_r = 2,5$); thickness 0,8 mm. (Dimensions in mm).

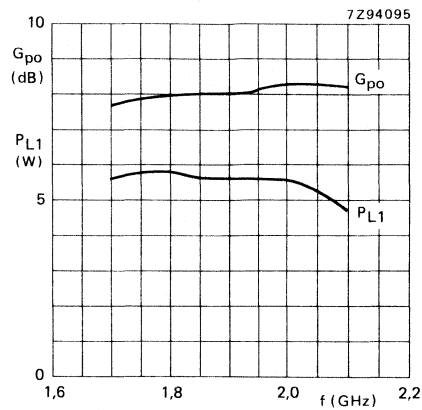


Fig. 5 Load power and power gain versus frequency;
 $V_{CE} = 16 \text{ V}$; $I_C = 1,1 \text{ A}$; V_{CE} and I_C regulated.

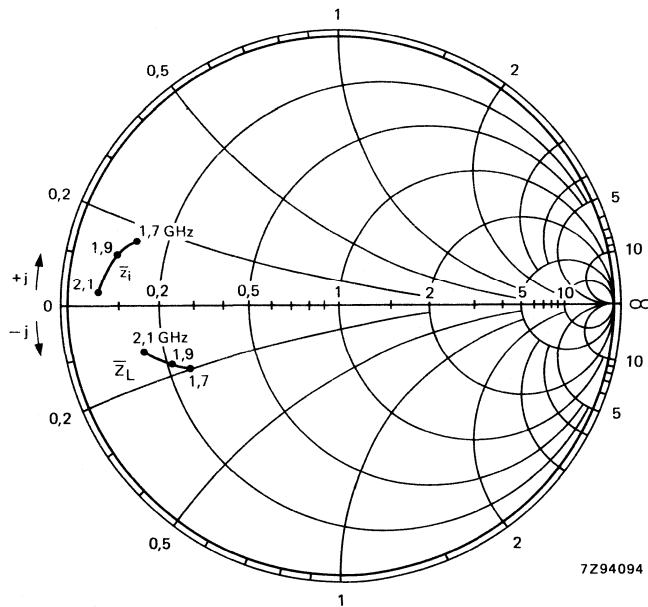


Fig. 6 Input and optimum load impedances versus frequency;
 $P_{L1} = 5,5 \text{ W}$; $Z_0 = 50 \Omega$; typical values.

MICROWAVE LINEAR POWER TRANSISTOR

N-P-N silicon power transistor for use in a common-emitter, class-A amplifier from 2,0 GHz to 2,4 GHz in c.w. conditions in military and professional applications.

Features:

- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistor providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizing a very good stability of the characteristics and excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance
- Internal input and output prematching ensuring a good stability and allowing an easier design of wideband circuits
- New 5 GHz technology

The transistor is housed in a metal ceramic flange envelope (FO 83).

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class-A wideband amplifier

mode of operation	f GHz	V_{CE} V	I_C A	P_{L1} W	G_{po} dB	\bar{z}_i Ω	\bar{z}_L Ω
c.w.; class-A	2,0 to 2,4	16	1,1	typ. 5	typ. 7	see Fig. 6	

MECHANICAL DATA

Dimensions in mm

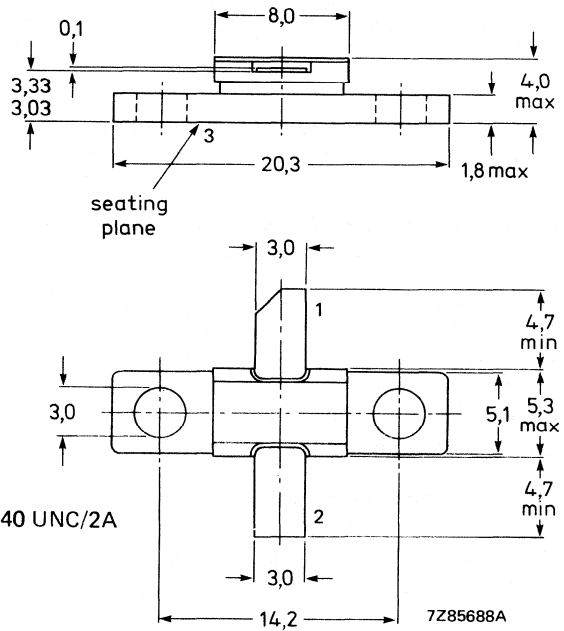
FO-83 (see Fig. 1).

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 FO-83.



Pinning:

- 1 = collector
- 2 = base
- 3 = emitter

Torque on screw: max. 0,4 Nm

Recommended screw: M2,5 or cheesehead 4-40 UNC/2A

RATINGS

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

Collector-base voltage, open emitter	V_{CBO}	max.	40 V
Collector-emitter voltage, open base	V_{CEO}	max.	15 V
open base	V_{CER}	max.	20 V
$R_{BE} = 47 \Omega$	V_{EBO}	max.	3,5 V
Emitter-base voltage, open collector	I_C	max.	2 A
Collector current (d.c.)	P_{tot}	max.	18 W
Total power dissipation	T_{stg}	-65 to + 200 °C	
up to $T_{mb} = 75 \text{ °C}$	T_j	max.	200 °C
Storage temperature	T_{slid}	max.	235 °C
Junction temperature			
Soldering temperature			
at 0,1 mm from case; $t_{sld} \leq 10 \text{ s}$			

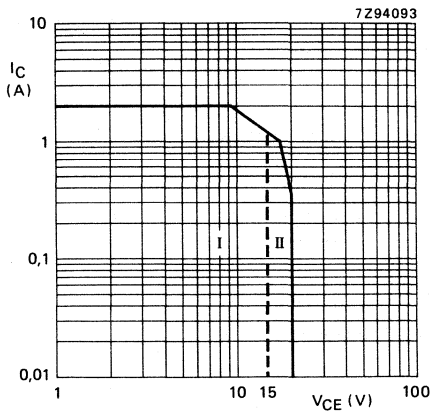


Fig. 2 D.C. SOAR; $T_{mb} \leq 75 \text{ }^\circ\text{C}$.

- I Region of permissible d.c. operation
- II Permissible extension provided $R_{BE} \leq 47 \text{ } \Omega$.

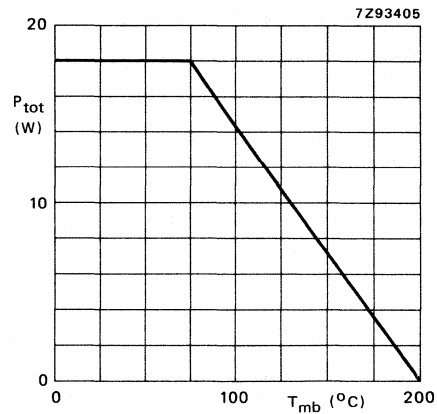


Fig. 3 Power derating curve versus mounting base temperature.

THERMAL RESISTANCE (at $T_j = 75 \text{ }^\circ\text{C}$)

From junction to mounting base

From mounting base to heatsink

$$R_{th\ j-mb} = 4 \text{ K/W}$$

$$R_{th\ mb-h} = 0,7 \text{ K/W}$$

CHARACTERISTICS

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

Collector cut-off currents

$$I_E = 0; V_{CB} = 20 \text{ V}$$

$$I_E = 0; V_{CB} = 40 \text{ V}$$

$$V_{CE} = 20 \text{ V}; R_{BE} = 47 \text{ } \Omega$$

$$V_{CE} = 15 \text{ V}; I_B = 0$$

$$I_{CBO} \leq 0,5 \text{ mA}$$

$$\leq 2,5 \text{ mA}$$

$$I_{CER} \leq 25 \text{ mA}$$

$$I_{CEO} \leq 2 \text{ mA}$$

Emitter cut-off current

$$I_C = 0; V_{EB} = 1,5 \text{ V}$$

$$I_C = 0; V_{EB} = 3,5 \text{ V}$$

$$I_{EBO} \leq 100 \text{ } \mu\text{A}$$

$$\leq 500 \text{ } \mu\text{A}$$

D.C. current gain

$$I_C = 1 \text{ A}; V_{CE} = 3 \text{ V}$$

$$h_{FE} \quad 15 \text{ to } 100$$

APPLICATION INFORMATION

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class-A wideband amplifier.

mode of operation	f GHz	V_{CE} V	I_C A	P_{L1} W	G_{po} dB	\bar{z}_i Ω	\bar{z}_L Ω
c.w.; class-A	2,0 to 2,4	16	1,1	≥ 4	≥ 6	see Fig. 6	

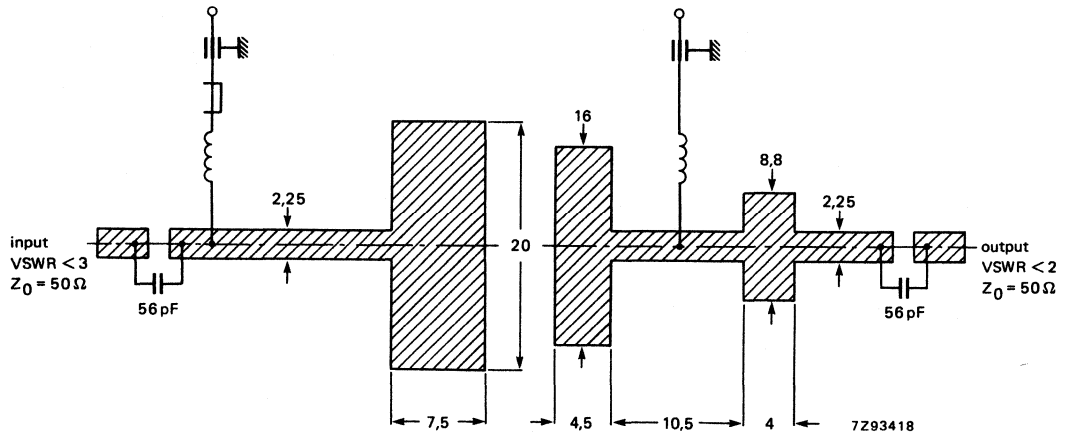


Fig. 4 Wideband test circuit board, class-A application. (Dimensions in mm).

Striplines on a Cu-clad printed circuit board with PTFE fibre-glass dielectric ($\epsilon_r = 2,55$), thickness 0,8 mm.

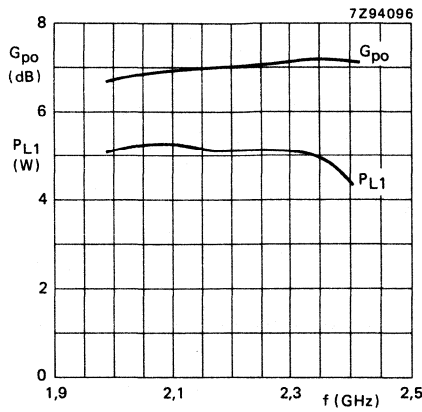


Fig. 5 Load power and power gain versus frequency; $V_{CE} = 16 \text{ V}$; $I_C = 1,1 \text{ A}$; V_{CE} and I_C regulated.

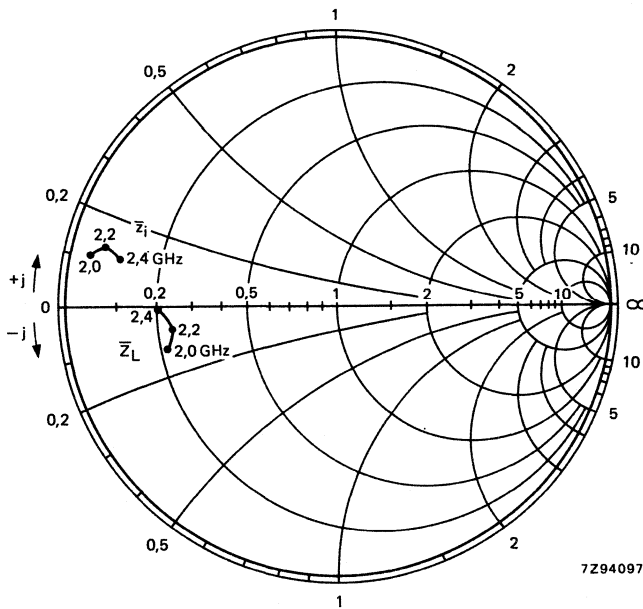


Fig. 6 Input and optimum load impedance versus frequency; $Z_0 = 50 \Omega$; typical values.

MICROWAVE LINEAR POWER TRANSISTOR

N-P-N transistor for use in a common-emitter class-A linear wideband power amplifier from 2,3 to 2,7 GHz.

Diffused emitter ballasting resistors, interdigitated structure, multicell geometry, localized thick oxide and gold sandwich metallization ensure an optimum temperature profile and excellent performance and reliability.

An input and output matching cell improves the impedances and facilitates the design of wideband circuits.

QUICK REFERENCE DATA

R.F. performance up to $T_{\text{case}} = 25\text{ }^{\circ}\text{C}$ in an unneutralized wideband common-emitter class-A circuit

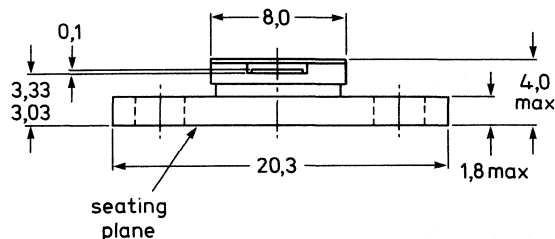
mode of operation	f GHz	V_{CE} V	I_{C} A	P_{L1} W	G_{po} dB	\bar{Z}_{i} Ω	\bar{Z}_{L} Ω
c.w.; linear amplifier	2,3 to 2,7	16	1	typ. 5	typ. 8	$11 + j3$	$7,5 - j9$

MECHANICAL DATA

Dimensions in mm

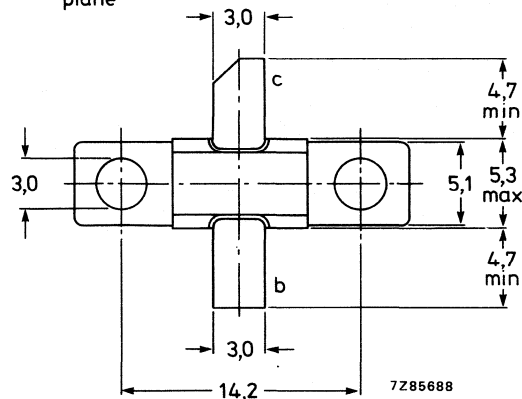
Fig. 1 FO-83.

Metallic cap is connected to the flange



Torque on nut: max. 0,4 Nm

Recommended screw: M2,5



Marking code

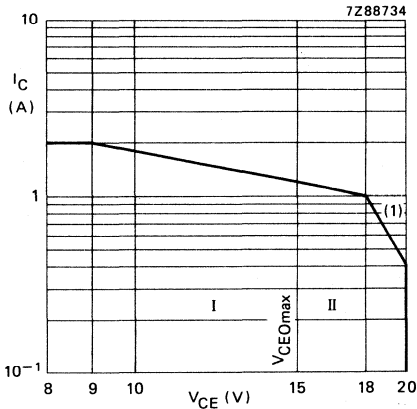
RTC2327E40R = LV2327E40R

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.

RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	40 V
Collector-emitter voltage	V_{CER}	max.	20 V
$R_{BE} = 47 \Omega$ open base	V_{CEO}	max.	15 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5 V
Collector current (d.c.)	I_C	max.	2 A
Total power dissipation up to $T_{mb} = 75 \text{ }^\circ\text{C}$	P_{tot}	max.	18 W
Storage temperature	T_{stg}		-65 to + 200 $^\circ\text{C}$
Junction temperature	T_j	max.	200 $^\circ\text{C}$
Lead soldering temperature at 0,3 mm from the case; $t_{sld} \leq 10 \text{ s}$	T_{sld}	max.	235 $^\circ\text{C}$



(1) Second breakdown limit (independent of temperature)

Fig. 2 D.C. SOAR at $T_{mb} \leq 75 \text{ }^\circ\text{C}$.

- I Region of permissible d.c. operation.
- II Permissible extension provided $R_{BE} \leq 47 \Omega$.

→ **THERMAL RESISTANCE** (at $T_j = 75 \text{ }^\circ\text{C}$)

- From junction to mounting base
- From mounting base to heatsink

$$R_{th\ j-mb} = 4 \text{ K/W}$$

$$R_{th\ mb-h} = 0,7 \text{ K/W}$$

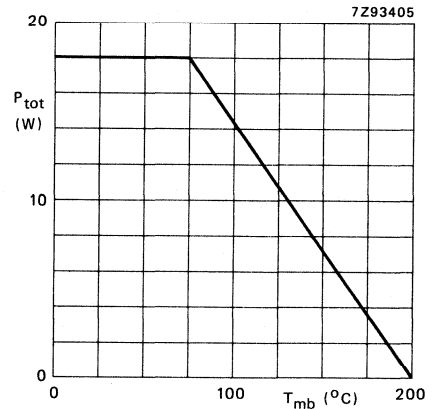


Fig. 3 Power derating curve versus mounting base temperature.

CHARACTERISTICS

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

Collector cut-off currents

$V_{CB} = 20\text{ V}; I_E = 0$

$V_{CB} = 40\text{ V}; I_E = 0$

$V_{CE} = 20\text{ V}; R_{BE} = 47\ \Omega$

$V_{CE} = 15\text{ V}; I_B = 0$

$I_{CBO} \leq 0,5\text{ mA}$

$I_{CBO} \leq 2,5\text{ mA}$

$I_{CER} \leq 25\text{ mA}$

$I_{CEO} \leq 2\text{ mA}$

Emitter cut-off current

$V_{EB} = 1,5\text{ V}; I_C = 0$

$V_{EB} = 3,5\text{ V}; I_C = 0$

$I_{EBO} \leq 100\ \mu\text{A}$

$I_{EBO} \leq 500\ \mu\text{A}$

D.C. current gain

$V_{CE} = 3\text{ V}; I_C = 1\text{ A}$

$h_{FE} \geq 15$

$h_{FE} \leq 100$

APPLICATION INFORMATION

R.F. performance in c.w. operation up to $T_{case} = 25\text{ }^{\circ}\text{C}$ in an unneutralized wideband common-emitter class-A circuit

mode of operation	f GHz	$V_{CE(1)}$ V	$I_C(1)$ mA	$P_{L1(2)}$ mW	$G_{po(3)}$ dB	\bar{z}_i Ω	\bar{z}_L Ω
c.w. class-A	2,3 to 2,7	16	1000	≥ 4000	≥ 7	typ. $11 + j3$	typ. $7,5 - j9$

Notes

1. V_{CE} and I_C regulated.
2. Load power for 1 dB compressed power gain.
3. Low-level power gain associated with P_{L1} .

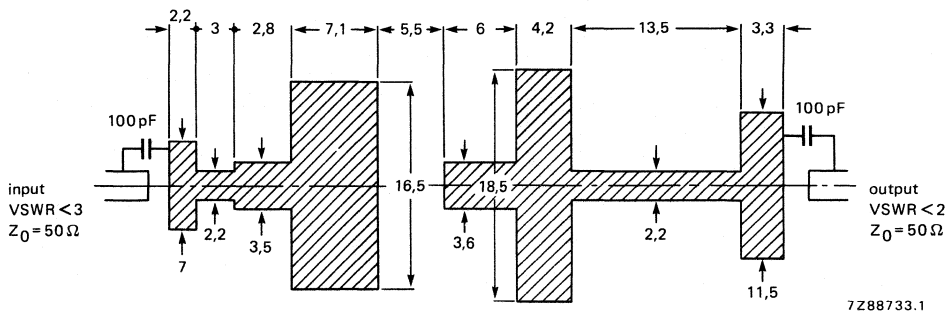


Fig. 4 Wideband test circuit board for 2,3 to 2,7 GHz. (Dimensions in mm).

Striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric ($\epsilon_r = 2,55$); thickness 0,8 mm.

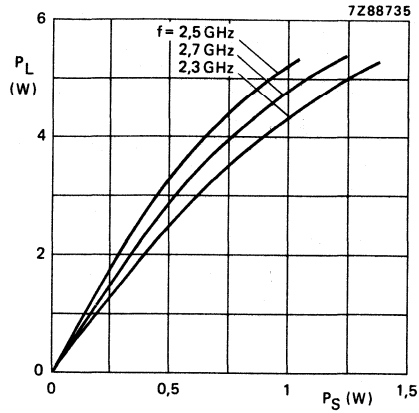


Fig. 5 Load power as a function of source power.

Conditions for Fig. 5:

$V_{CE} = 16 \text{ V}$
 $I_C = 1 \text{ A}$ } regulated; typical values; $T_{case} = 25 \text{ }^\circ\text{C}$.

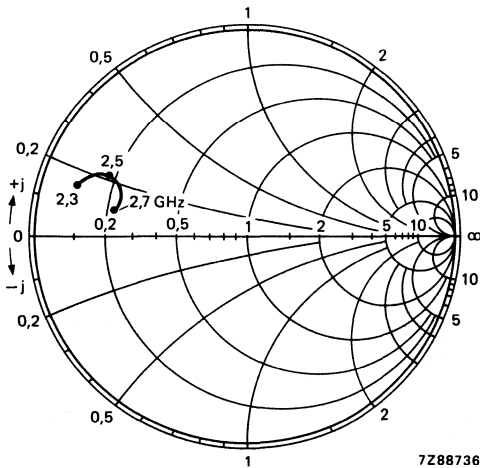


Fig. 6 Input impedance as a function of frequency for P_{L1} .

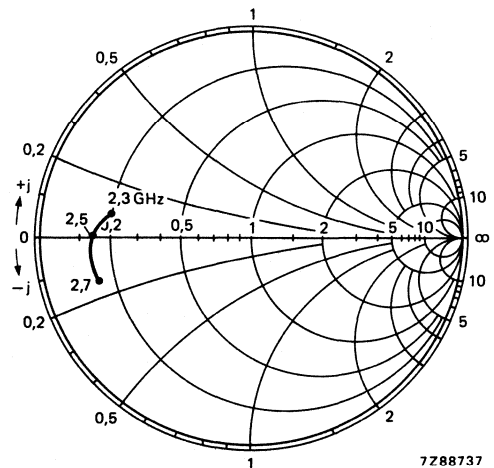


Fig. 7 Optimum load impedance as a function of frequency for P_{L1} .

Conditions for Figs 6 and 7:

$V_{CE} = 16 \text{ V}$
 $I_C = 1 \text{ A}$ } regulated; typical values; $Z_o = 50 \text{ } \Omega$; $T_{case} = 25 \text{ }^\circ\text{C}$.

DEVELOPMENT DATA

This data sheet contains advance information and specifications are subject to change without notice.

LV2931E50S

MICROWAVE LINEAR POWER TRANSISTOR

NPN silicon planar microwave power transistor intended for use in common-emitter class-A broadband linear power amplifiers, in the 2.9 to 3.1 GHz frequency range.

Features

- Interdigitated structure; giving a high emitter efficiency
- Diffused emitter ballasting resistors; capable of withstanding a high VSWR and providing excellent current sharing
- Gold metallization; ensuring excellent stability of the characteristics and giving a prolonged working life
- Multicell geometry; giving good balance of dissipated power and low thermal resistance
- Input and output matching cells; for an easier design of broadband circuits

The transistor is housed in a metal-ceramic flange envelope (FO-83B).

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class-A broadband amplifier.

mode of operation	f GHz	V_{CE} V	I_C A	P_{L1} W	G_{po} dB	$\bar{z}_i; \bar{Z}_L$
class-A CW	2.9 to 3.1	18	1.0	typ. 5	typ. 6.5	see Fig. 6

MECHANICAL DATA

Dimensions in mm

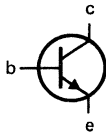
FO-83B (see Fig. 1)

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Fig. 1 FO-83B

Pinning:
 1 = collector
 2 = base
 3 = emitter

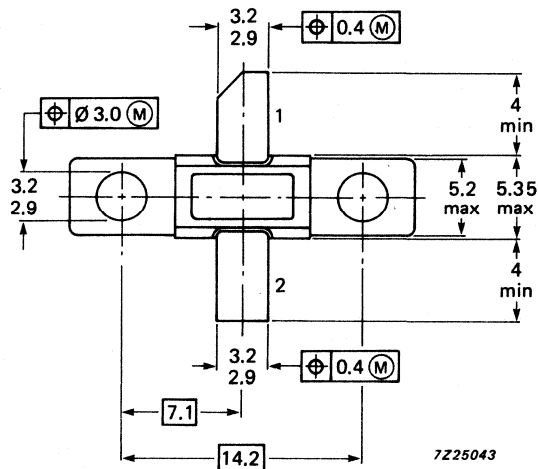
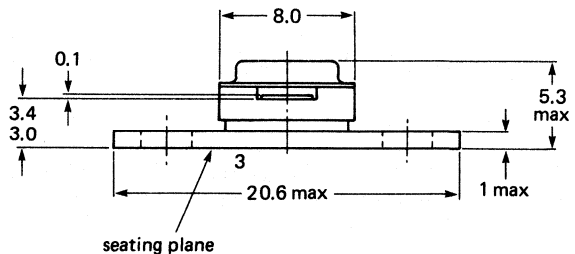


Emitter is connected to the seating plane

Marking code:
 430 = LV2931E50S

Torque on screw: max. 0.4 Nm
 Recommended screw: M2.5 or 4-40 UNC/2A

Dimensions in mm



RATINGS

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

Collector-base voltage, open emitter	V_{CB0}	max.	40 V
Collector-emitter voltage, $R_{BE} = 100 \Omega$ open base	V_{CER} V_{CEO}	max.	20 V 15 V
Emitter-base voltage, open collector	V_{EBO}	max.	3.5 V
Collector current (DC)	I_C	max.	1.6 A
Total power dissipation up to $T_{mb} = 75^\circ\text{C}$	P_{tot}	max.	20 W
Storage temperature range	T_{stg}		-65 to $+200^\circ\text{C}$
Junction temperature	T_j	max.	200°C
Soldering temperature at 0.3 mm from the case; $t_{sld} \leq 10$ s	T_{sld}	max.	235°C

THERMAL RESISTANCE (at $T_j = 75^\circ\text{C}$)

From junction to mounting base	$R_{th\ j-mb}$	=	6 K/W
From mounting base to heat sink	$R_{th\ mb-h}$	=	0.7 K/W

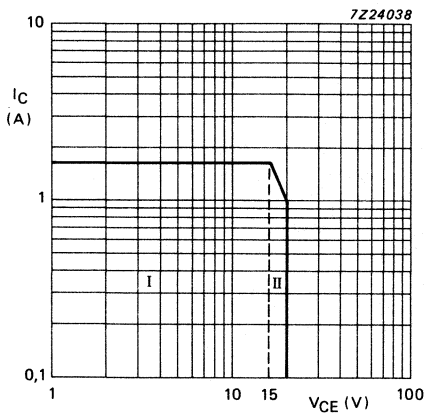


Fig. 2 DC SOAR at $T_{mb} = 75\text{ }^{\circ}\text{C}$

- I Region of permissible DC operation
- II Permissible extension provided $R_{BE} \leq 100\ \Omega$

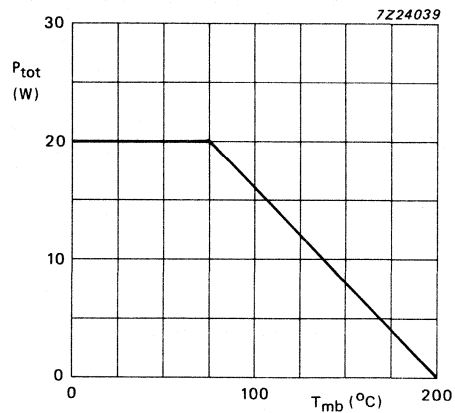


Fig. 3 Power derating curve.

DEVELOPMENT DATA

CHARACTERISTICS

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

Collector cut-off currents

$V_{CB} = 40\text{ V}; I_E = 0$

$V_{CB} = 30\text{ V}; I_E = 0$

$V_{CE} = 20\text{ V}; R_{BE} = 100\ \Omega$

$V_{CE} = 15\text{ V}; I_B = 0$

I_{CBO}	\leq	6.0 mA
I_{CBO}	\leq	60 μA
I_{CER}	\leq	100 μA
I_{CEO}	\leq	600 μA

Emitter cut-off currents

$V_{EB} = 1.5\text{ V}; I_C = 0$

$V_{EB} = 3.5\text{ V}; I_C = 0$

I_{EBO}	\leq	6 μA
I_{EBO}	\leq	60 μA

DC current gain

$V_{CE} = 5\text{ V}; I_C = 1\text{ A}$

h_{FE}	\geq	15
	\leq	150

APPLICATION INFORMATION

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class-A broadband amplifier.

mode of operation	f GHz	$V_{CE}(1)$ V	$I_C(1)$ mA	$P_{L1}(2)$ W	$G_{PO}(3)$ dB
class-A; CW	2.9 to 3.1	18	1000	≥ 4.5	≥ 6.0

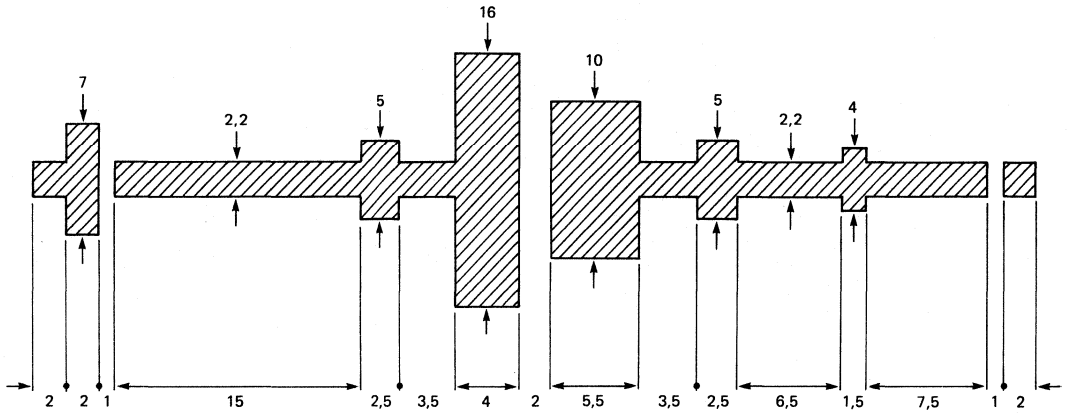
Notes:

(1) I_C and V_{CE} regulated

(2) Load power for 1 dB compressed power gain

(3) Low level power gain associated with P_{L1}

APPLICATION INFORMATION (continued)



7224037

Fig. 4 Broadband test circuit for 2.9 to 3.1 GHz (dimensions in mm).
 Double Cu clad p.c. board with PTFE fibreglass dielectric,
 thickness 0.8 mm, $\epsilon_r = 2.54$.

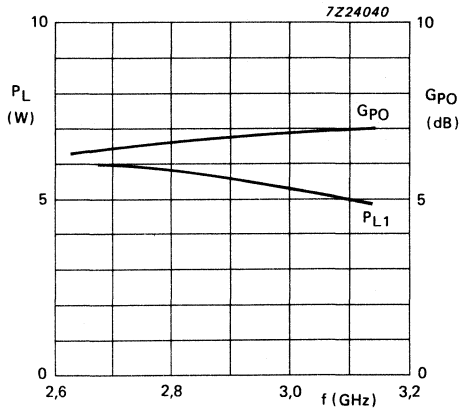


Fig. 5 Load power and power gain as a function of frequency.

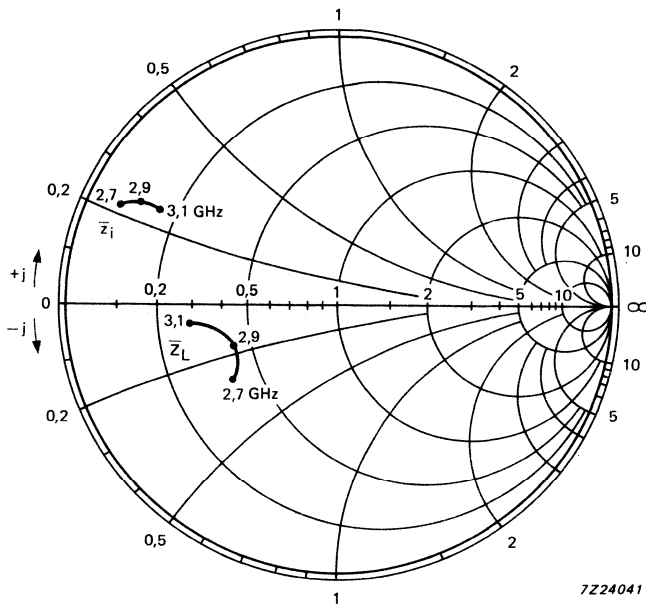


Fig. 6 Input and optimum load impedances as a function of frequency;
 $P_{L1} = 5 \text{ W}$; $Z_0 = 50 \Omega$.

DEVELOPMENT DATA

MICROWAVE LINEAR POWER TRANSISTOR

N-P-N silicon power transistor for use in a common-emitter, class-A amplifier from 3,7 GHz to 4,2 GHz in c.w. conditions in military and professional applications.

Features:

- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistor providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizing a very good stability of the characteristics and excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance
- Internal input and output prematching ensuring a good stability and allowing an easier design of wideband circuits
- New 5 GHz technology

The transistor is housed in a metal ceramic flange envelope (FO 83).

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class-A wideband amplifier

mode of operation	f GHz	V_{CE} V	I_C mA	P_{L1} W	G_{po} dB	\bar{z}_i Ω	\bar{z}_L Ω
c.w.; class-A	3,7 to 4,2	16	500	typ. 2	typ. 5,5	see Fig. 6	

MECHANICAL DATA

FO-83 (see Fig. 1).

Dimensions in mm

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

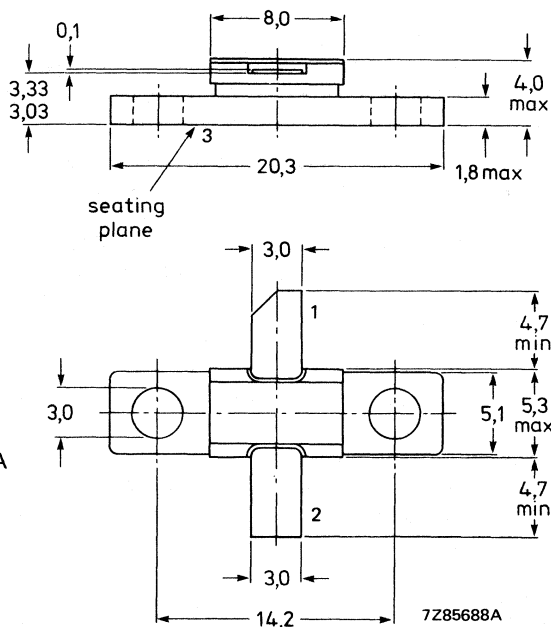
MECHANICAL DATA

Fig. 1 FO-83.

Dimensions in mm

Pinning:

- 1 = collector
- 2 = base
- 3 = emitter



Torque on screw: max. 0,4 Nm

Recommended screw: M2,5 or 4-40 UNC/2A

RATINGS

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

Collector-base voltage, open emitter	V_{CB0}	max.	40 V
Collector-emitter voltage open base	V_{CE0}	max.	16 V
$R_{BE} = 10 \Omega$	V_{CER}	max.	20 V
Emitter-base voltage, open collector	V_{EB0}	max.	3,5 V
Collector current (d.c.)	I_C	max.	1 A
Total power dissipation	P_{tot}	max.	10 W
Storage temperature	T_{stg}		-65 to + 200 °C
Junction temperature	T_j	max.	200 °C
Soldering temperature at 0,1 mm from case; $t_{sld} \leq 10$ s	T_{sld}	max.	235 °C

MICROWAVE LINEAR POWER TRANSISTOR

N-P-N transistor for use in a common-emitter class-A linear power amplifier from 3,7 to 4,2 GHz.

Diffused emitter ballasting resistors, interdigitated structure, multicell geometry, localized thick oxide and gold sandwich metallization ensure an optimum temperature profile and excellent performance and reliability.

An input and output matching cell improves the impedances and facilitates the design of wideband circuits.

QUICK REFERENCE DATA

R.F. performance up to T_{case} is 25 °C in an unneutralized common-emitter class-A circuit

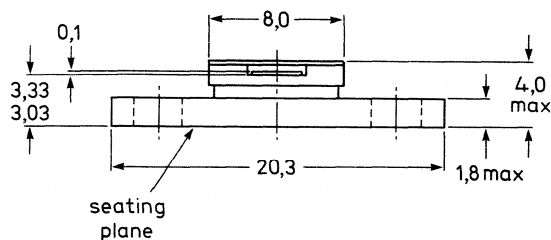
mode of operation	f GHz	V_{CE} V	I_C mA	P_{L1} W	G_{pO} dB	\bar{z}_i Ω	\bar{Z}_L Ω
c.w.; linear amplifier	3,7 to 4,2	16	800	typ. 2,4	typ. 6,5	$6 + j7,5$	$5,5 - j1$

MECHANICAL DATA

Dimensions in mm

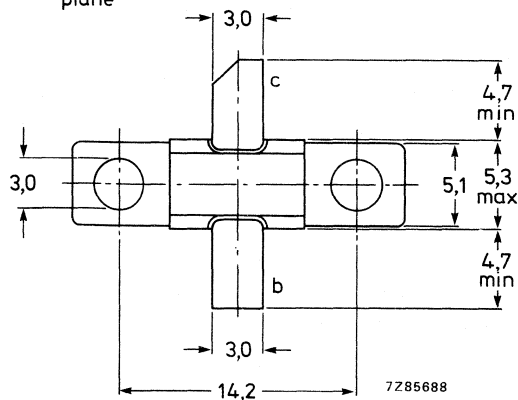
Fig. 1 FO-83.

Metallic cap is connected to the flange



Torque on nut: max. 0,4 Nm

Recommended screw: M3



Marking code

RTC3742E24R = LV3742E24R

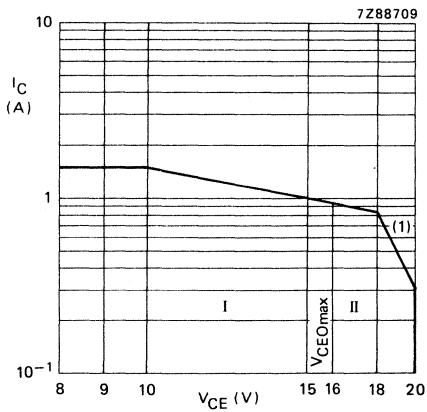
PRODUCT SAFETY

These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.

RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	40 V
Collector-emitter voltage $R_{BE} = 47 \Omega$ open base	V_{CER}	max.	20 V
	V_{CEO}	max.	16 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5 V
Collector current (d.c.)	I_C	max.	1,5 A
Total power dissipation up to $T_{mb} = 75 \text{ }^\circ\text{C}$	P_{tot}	max.	15 W
Storage temperature	T_{stg}		-65 to +200 $^\circ\text{C}$
Junction temperature	T_j	max.	200 $^\circ\text{C}$
Lead soldering temperature at 0,3 mm from the case; $t_{sld} \leq 10 \text{ s}$	T_{sld}	max.	235 $^\circ\text{C}$



(1) Second breakdown limit (independent of temperature).

Fig. 2 D.C. SOAR at $T_{mb} \leq 75 \text{ }^\circ\text{C}$.

- I Region of permissible d.c. operation.
- II Permissible extension provided $R_{BE} \leq 47 \Omega$.

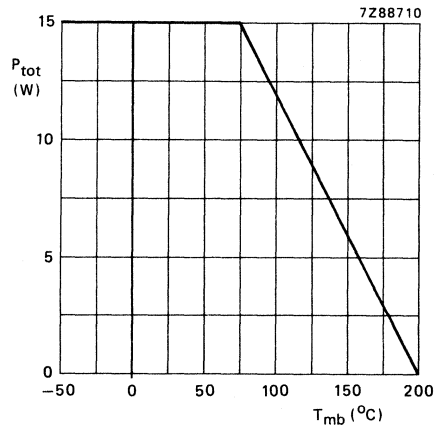


Fig. 3 Power derating curve vs. mounting base temperature.

→ **THERMAL RESISTANCE** (at $T_j = 75 \text{ }^\circ\text{C}$)

- From junction to mounting base
- From mounting base to heatsink

$R_{th \text{ j-mb}} = 5 \text{ K/W}$
 $R_{th \text{ mb-h}} = 0,7 \text{ K/W}$

MICROWAVE LINEAR POWER TRANSISTOR

NPN silicon transistor for use in common-emitter class-A linear power amplifier up to 4,2 GHz. Diffused emitter ballasting resistors, self-aligned process entirely ion implanted, and gold sandwich metallization ensure an optimum temperature profile with excellent performance and reliability. An input matching cell improves the input impedance and facilitates the design of wideband circuits. The transistor is housed in a metal-ceramic envelope (FO-83).

QUICK REFERENCE DATA

R.F. performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class-A circuit.

Mode of operation	f GHz	V _{CC} V	I _C A	P _{L1} W	G _{po} dB
c.w. class-A	2,1	16	1,1	typ. 5,5	typ. 8,0

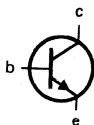
MECHANICAL DATA

Dimensions in mm

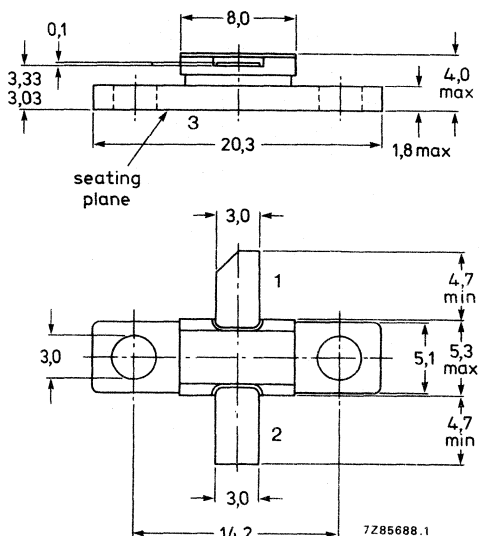
Fig. 1 FO-83.

Pinning

- 1 = collector
- 2 = base
- 3 = emitter



Emitter is connected to the seating plane



Torque on screw: max. 0,4 Nm

Recommended screw: M2,5 or 4-40 UNC/2A

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.

RATINGS

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

Collector-base voltage open emitter	V_{CBO}	max.	40 V
Collector-emitter voltage $R_{BE} = 47 \Omega$ open base	V_{CER} V_{CEO}	max.	20 V 16 V
Emitter-base voltage open collector	V_{EBO}	max.	3,5 V
Collector current (d.c.)	I_C	max.	2 A
Total power dissipation up to $T_{mb} = 75 \text{ }^\circ\text{C}$	P_{tot}	max.	18 W
Storage temperature range	T_{stg}		-65 to + 200 $^\circ\text{C}$
Junction temperature	T_j	max.	200 $^\circ\text{C}$
Lead soldering temperature at 0,3 mm from case; $t_{sld} \leq 10 \text{ s}$	T_{sld}	max.	235 $^\circ\text{C}$

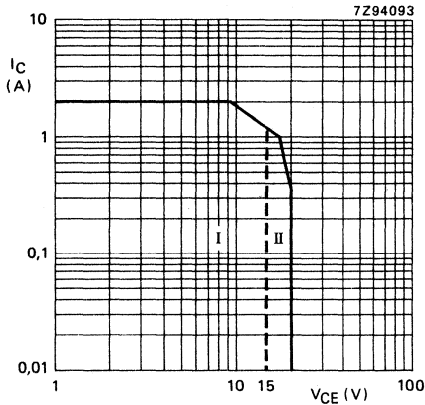


Fig. 2 D.C. SOAR at $T_{mb} \leq 75 \text{ }^\circ\text{C}$.
 I Region of permissible d.c. operation.
 II Permissible extension provided $R_{BE} \leq 47 \Omega$.

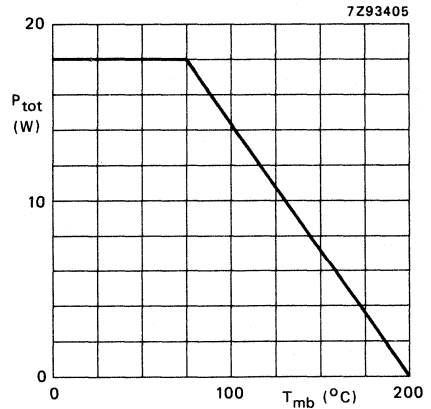


Fig. 3 Power derating curve.

THERMAL RESISTANCE ($T_j = 75\text{ }^\circ\text{C}$)

From junction to mounting base

$$R_{th\ j-mb} = 4\text{ K/W}$$

From mounting base to heatsink

$$R_{th\ mb-h} = 0,7\text{ K/W}$$

CHARACTERISTICS

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

Collector cut-off current

$$I_E = 0; V_{CB} = 20\text{ V}$$

$$I_{CBO} = \text{max. } 500\text{ }\mu\text{A}$$

$$I_E = 0; V_{CB} = 40\text{ V}$$

$$I_{CBO} = \text{max. } 3\text{ mA}$$

Emitter cut-off current

$$I_C = 0; V_{EB} = 1,5\text{ V}$$

$$I_{EBO} = \text{max. } 10\text{ }\mu\text{A}$$

$$I_C = 0; V_{EB} = 3,5\text{ V}$$

$$I_{EBO} = \text{max. } 0,5\text{ mA}$$

D.C. current gain

$$I_C = 1100\text{ mA}; V_{CE} = 5\text{ V}$$

$$h_{FE} = 15\text{ to }100$$

DEVELOPMENT DATA

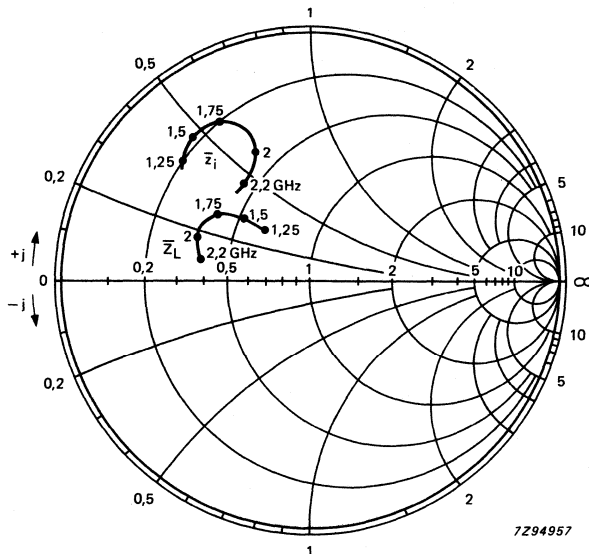


Fig. 4 Input and optimum load impedance as a function of frequency; $Z_0 = 10\text{ }\Omega$; typical values.

MICROWAVE LINEAR POWER TRANSISTOR

N-P-N silicon power transistor for use in a common-emitter, class-A amplifier up to 2,3 GHz in c.w. conditions in military and professional applications.

Features:

- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistor providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizing a very good stability of the characteristics and excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance
- New 5 GHz technology

The transistor is housed in a metal ceramic studless envelope (FO 93).

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class-A selective amplifier

mode of operation	f GHz	V_{CE} V	I_C mA	P_{L1} W	G_{po} dB	\bar{z}_i Ω	\bar{z}_L Ω
c.w.; class-A	2,3	16	250	typ. 1,6	typ. 8,1	$3,5 + j11$	$6,4 + j2$

MECHANICAL DATA

Dimensions in mm

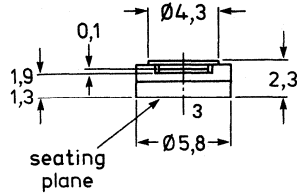
FO-93 (see Fig. 1).

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Fig. 1 FO-93.

Dimensions in mm

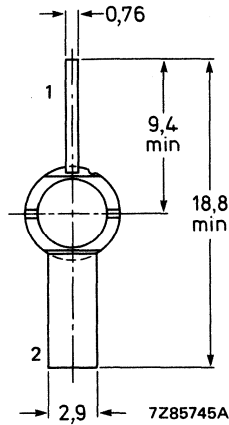


Pinning:

1 = collector

2 = base

3 = emitter



RATINGS

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

Collector-base voltage, open emitter	V_{CBO}	max.	35 V
Collector-emitter voltage open base	V_{CEO}	max.	16 V
$R_{BE} = 70 \Omega$	V_{CER}	max.	20 V
Emitter-base voltage, open collector	V_{EBO}	max.	3,5 V
Collector current (d.c.)	I_C	max.	450 mA
Total power dissipation up to $T_{mb} = 75 \text{ }^\circ\text{C}$	P_{tot}	max.	6 W
Storage temperature	T_{stg}		-65 to + 200 $^\circ\text{C}$
Junction temperature	T_j	max.	200 $^\circ\text{C}$
Soldering temperature at 0,1 mm from case; $t_{sld} \leq 10 \text{ s}$	T_{sld}	max.	235 $^\circ\text{C}$

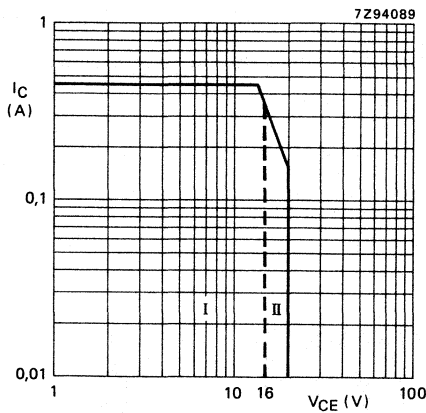


Fig. 2 D.C. SOAR; $T_{mb} \leq 75^\circ\text{C}$.

- I Region of permissible d.c. operation
- II Permissible extension at $R_{BE} \leq 70 \Omega$.

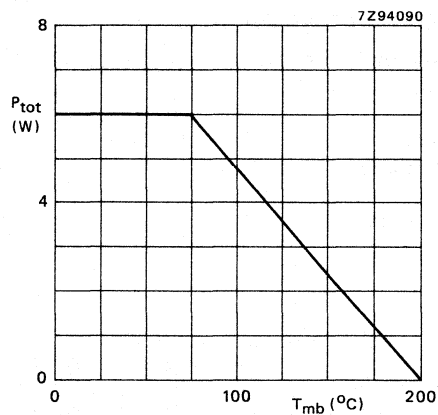


Fig. 3 Power derating curve versus mounting base temperature.

THERMAL RESISTANCE (at $T_j=75^\circ\text{C}$)

From junction to mounting base

$$R_{th\ j-mb} = 12\ \text{K/W}$$

CHARACTERISTICS

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

Collector cut-off current

$$I_E = 0; V_{CB} = 25\ \text{V}$$

$$I_E = 0; V_{CB} = 35\ \text{V}$$

$$I_{CBO} \leq 10\ \mu\text{A}$$

$$\leq 500\ \mu\text{A}$$

Emitter cut-off current

$$I_C = 0; V_{EB} = 1,5\ \text{V}$$

$$I_C = 0; V_{EB} = 3,5\ \text{V}$$

$$I_{EBO} \leq 10\ \mu\text{A}$$

$$\leq 100\ \mu\text{A}$$

D.C. current gain

$$I_C = 230\ \text{mA}; V_{CE} = 5\ \text{V}$$

$$h_{FE} \text{ typ. } 40$$

Collector-base capacitance

$$I_E = I_C = 0; V_{CB} = 16\ \text{V}; V_{EB} = 1,5\ \text{V}$$

$$C_{cb} \text{ typ. } 2\ \text{pF}$$

Collector-emitter capacitance

$$I_E = I_C = 0; V_{CE} = 16\ \text{V}; V_{EB} = 1,5\ \text{V}$$

$$C_{ce} \text{ typ. } 2\ \text{pF}$$

Emitter-base capacitance

$$I_E = I_C = 0; V_{CB} = 10\ \text{V}; V_{EB} = 1\ \text{V}$$

$$C_{eb} \text{ typ. } 15\ \text{pF}$$

APPLICATION INFORMATION

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class-A selective amplifier*.

mode of operation	f GHz	V_{CE} V	I_C mA	P_{L1} W	G_{po} dB	\bar{z}_i Ω	\bar{z}_L Ω
c.w.; class-A	2,3	16	250	$\geq 1,2$	$\geq 7,5$	$3,5 + j11$	$6,4 + j2$

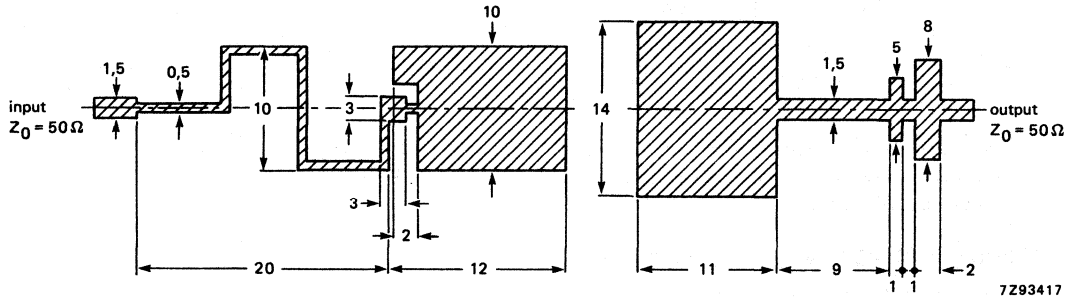


Fig. 4 Prematching test circuit board with PTFE fibre-glass dielectric ($\epsilon_r = 2,54$), thickness 0,8 mm.

* Circuit consists of prematching circuit board in combination with complementary input and output slug tuners.

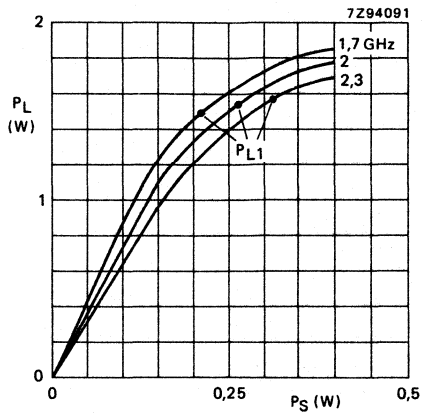


Fig. 5 Output power versus source power.

Conditions for Figs 5 and 6:

$V_{CE} = 16 \text{ V}$ } regulated; typical values.
 $I_C = 250 \text{ mA}$ }

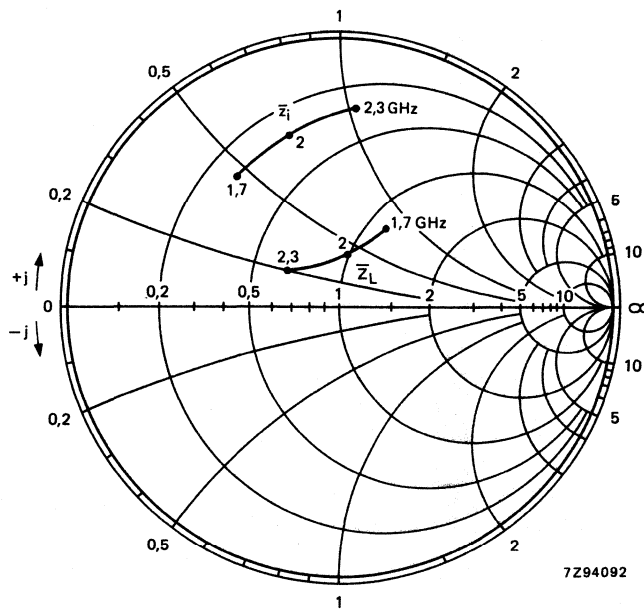


Fig. 6 Input and optimum load impedances versus frequency;
 $Z_0 = 10 \Omega$; $P_{L1} = 1,6 \text{ W}$; $T_{mb} = 25 \text{ }^\circ\text{C}$.

MICROWAVE LINEAR POWER TRANSISTOR

N-P-N silicon power transistor for use in a common-emitter, class-A amplifier up to 2,3 GHz in c.w. conditions in military and professional applications.

Features:

- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistor providing excellent current sharing and withstanding a high V.W.S.R.
- Gold metallization realizing a very good stability of the characteristics and excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance
- New 5 GHz technology

The transistor is housed in a metal ceramic studless envelope (FO 93).

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class-A selective amplifier

mode of operation	f GHz	V_{CE} V	I_C mA	P_{L1} W	G_{po} dB	\bar{z}_i Ω	\bar{z}_L Ω
c.w.; class-A	2,3	16	400	typ. 2,8	typ. 7,8	$2 + j8$	$5,5 - j1,8$

MECHANICAL DATA

Dimensions in mm

FO-93 (see Fig. 1).

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Fig. 1 FO-93.

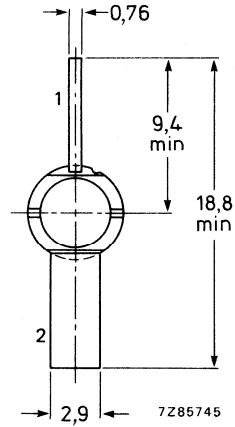
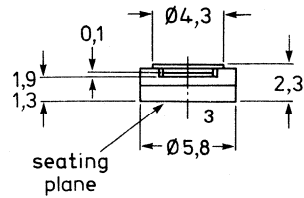
Dimensions in mm

Pinning:

1 = collector

2 = base

3 = emitter



RATINGS

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

Collector-base voltage, open emitter	V_{CBO}	max.	35 V
Collector-emitter voltage open base	V_{CEO}	max.	16 V
$R_{BE} = 70 \Omega$	V_{CER}	max.	20 V
Emitter-base voltage, open collector	V_{EBO}	max.	3,5 V
Collector current (d.c.)	I_C	max.	800 mA
Total power dissipation up to $T_{mb} = 75 \text{ }^\circ\text{C}$	P_{tot}	max.	8 W
Storage temperature	T_{stg}		-65 to + 200 $^\circ\text{C}$
Junction temperature	T_j	max.	200 $^\circ\text{C}$
Soldering temperature at 0,1 mm from case; $t_{sld} \leq 10 \text{ s}$	T_{sld}	max.	235 $^\circ\text{C}$

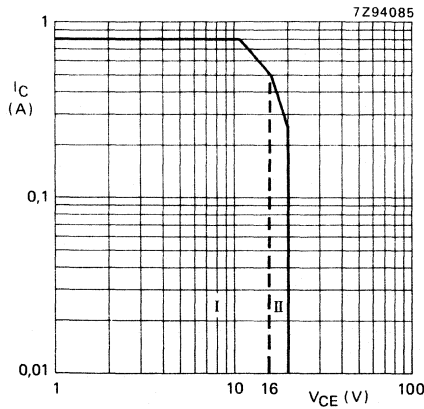


Fig. 2 D.C. SOAR; $T_{mb} \leq 75^\circ\text{C}$.

- I Region of permissible d.c. operation
- II Permissible extension provided $R_{BE} \leq 70 \Omega$.

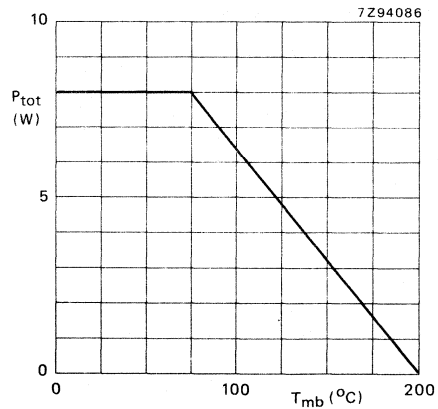


Fig. 3 Power derating curve versus mounting base temperature.

THERMAL RESISTANCE (at $T_j = 75^\circ\text{C}$)

From junction to mounting base

$$R_{th\ j-mb} = 8\ \text{K/W}$$

CHARACTERISTICS

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

Collector cut-off current

$$I_E = 0; V_{CB} = 25\ \text{V}$$

$$I_E = 0; V_{CB} = 35\ \text{V}$$

$$I_{CBO} \leq 15\ \mu\text{A}$$

$$\leq 700\ \mu\text{A}$$

Emitter cut-off current

$$I_C = 0; V_{EB} = 1,5\ \text{V}$$

$$I_C = 0; V_{EB} = 3,5\ \text{V}$$

$$I_{EBO} \leq 15\ \mu\text{A}$$

$$\leq 150\ \mu\text{A}$$

D.C. current gain

$$I_C = 400\ \text{mA}; V_{CE} = 5\ \text{V}$$

$$h_{FE} \text{ typ. } 40$$

Collector-base capacitance

$$I_E = I_C = 0; V_{CB} = 16\ \text{V}; V_{EB} = 1,5\ \text{V}$$

$$C_{cb} \text{ typ. } 3\ \text{pF}$$

Collector-emitter capacitance

$$I_E = I_C = 0; V_{CE} = 16\ \text{V}; V_{EB} = 1,5\ \text{V}$$

$$C_{ce} \text{ typ. } 2,2\ \text{pF}$$

Emitter-base capacitance

$$I_E = I_C = 0; V_{CB} = 10\ \text{V}; V_{EB} = 1\ \text{V}$$

$$C_{eb} \text{ typ. } 83\ \text{pF}$$

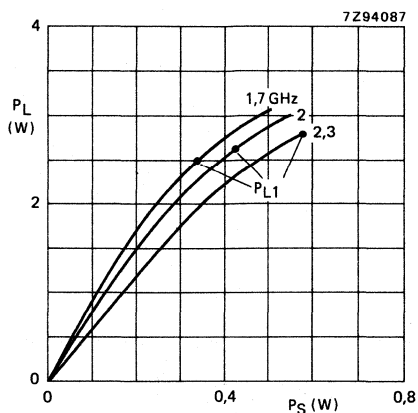


Fig. 5 Output power versus source power.

Conditions for Figs 5 and 6:

$V_{CE} = 16 \text{ V}$
 $I_C = 400 \text{ mA}$ } regulated; typical values.

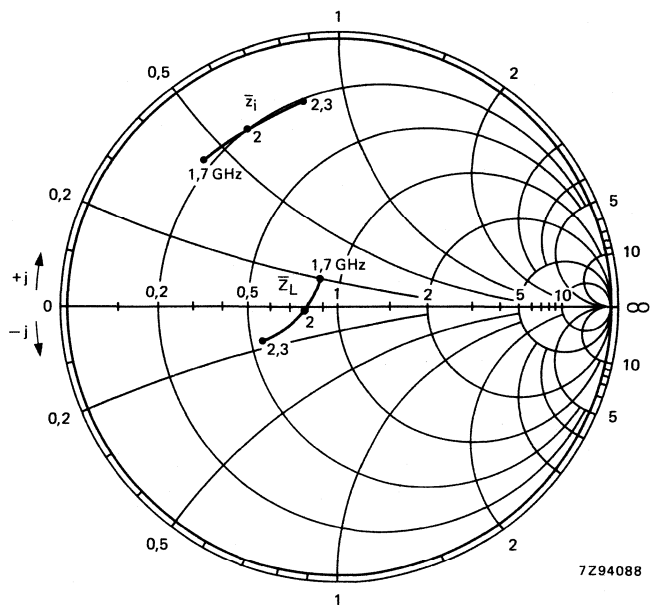


Fig. 6 Input and optimum load impedance versus frequency;
 $Z_o = 10 \Omega$; $T_{mb} = 25 \text{ }^\circ\text{C}$.

MICROWAVE LINEAR POWER TRANSISTOR

N-P-N silicon power transistor for use in a common-emitter, class-A amplifier from 1,4 GHz to 1,8 GHz in c.w. conditions in military and professional applications.

Features:

- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistor providing excellent current sharing and withstanding a high VSWR
- Gold metallization realizing a very good stability of the characteristics and excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance
- Internal input and output prematching ensuring a good stability and allowing an easier design of wideband circuits
- New 5 GHz technology .

The transistor is housed in a metal ceramic flange envelope (FO 57C).

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class-A wideband amplifier, typical values

mode of operation	f GHz	V _{CE} V	P _{L1} W	G _{po} dB	I _C A	\bar{z}_i Ω	\bar{Z}_L Ω
c.w.; class-A	1,4 to 1,8	16	11	11	2	see Fig. 7	

MECHANICAL DATA

FO-57C (see Fig. 1).

PRODUCT SAFETY

This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

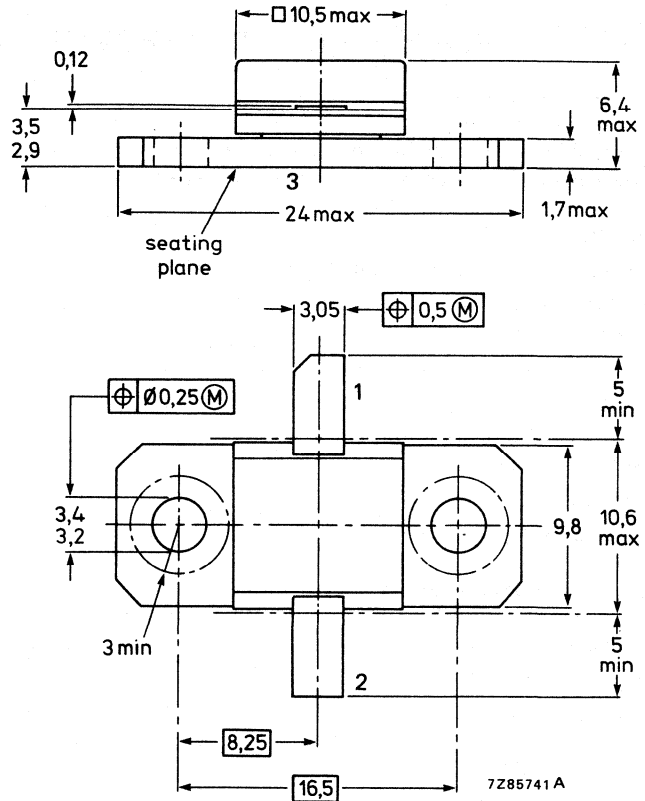
Fig. 1 FO-57C.

Dimensions in mm

Pinning:

- 1 = collector
- 2 = base
- 3 = emitter

Torque on screw: max. 0,5 Nm
 Recommended screw: M3



RATINGS

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

Collector-base voltage, open emitter	V _{CBO}	max.	40 V
Collector-emitter voltage open base	V _{CEO}	max.	15 V
R _{BE} = 47 Ω	V _{CER}	max.	20 V
→ Emitter-base voltage, open collector	V _{EBO}	max.	3,5 V
Collector current (d.c.)	I _C	max.	4 A
Total power dissipation up to T _{mb} = 75 °C	P _{tot}	max.	36 W
Storage temperature	T _{stg}		-65 to +200 °C
Junction temperature	T _j	max.	200 °C
Soldering temperature at 0,1 mm from flange; t _{slid} ≤ 10 s	T _{slid}	max.	235 °C

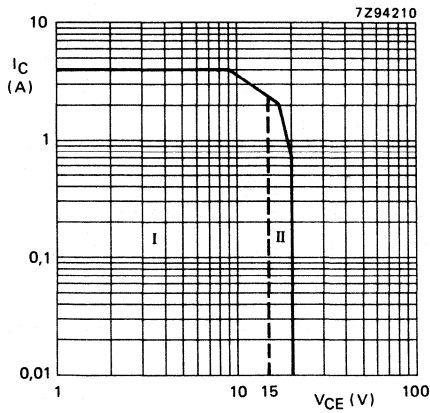


Fig. 2 D.C. SOAR; $T_{mb} \leq 75^\circ\text{C}$.
 I Region of permissible D.C. operation
 II Permissible extension provided
 $R_{BE} \leq 47 \Omega$

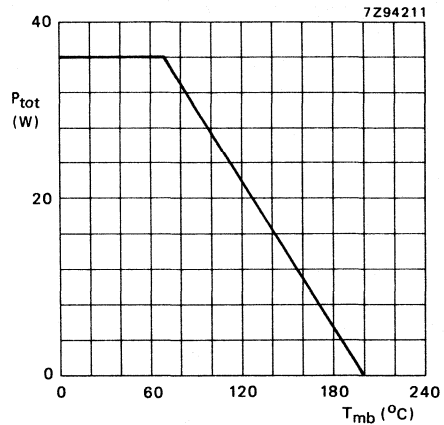


Fig. 3 Power derating curve versus mounting base temperature.

THERMAL RESISTANCE (at $T_j = 75^\circ\text{C}$)

From junction to mounting base
 From mounting base to heatsink

$R_{th\ j-mb} = 2,2\ \text{K/W}$
 $R_{th\ mb-h} = 0,5\ \text{K/W}$

CHARACTERISTICS

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

Collector cut-off current

$I_E = 0; V_{CB} = 20\ \text{V}$
 $I_E = 0; V_{CB} = 40\ \text{V}$

$I_{CBO} \leq 1\ \text{mA}$
 $I_{CBO} \leq 5\ \text{mA}$

$V_{CE} = 20\ \text{V}; R_{BE} = 47\ \Omega$

$I_{CER} \leq 50\ \text{mA}$

$V_{CE} = 15\ \text{V}; I_B = 0$

$I_{CEO} \leq 4\ \text{mA}$

Emitter cut-off current

$I_C = 0; V_{EB} = 1,5\ \text{V}$
 $I_C = 0; V_{EB} = 3,5\ \text{V}$

$I_{EBO} \leq 200\ \mu\text{A}$
 $I_{EBO} \leq 1\ \text{mA}$

D.C. current gain

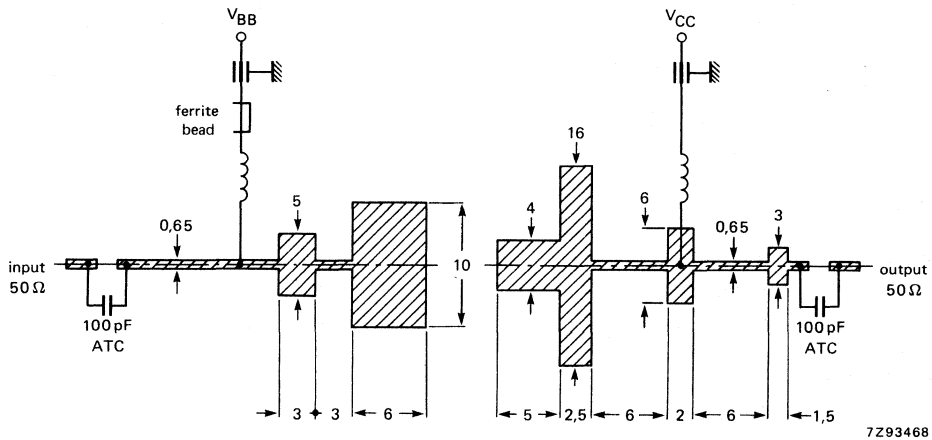
$I_C = 2\ \text{A}; V_{CE} = 3\ \text{V}$

$h_{FE} = 15\ \text{to}\ 100$

APPLICATION INFORMATION

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class-A wideband amplifier *.

mode of operation	f GHz	V _{CE} V	P _{L1} W	G _{po} dB	I _C A	\bar{z}_i Ω	\bar{Z}_L Ω
c.w.; class-A	1,4 to 1,8	16	≥ 9	≥ 10	2	see Fig. 7	



→ Fig. 4 Wideband test circuit board for 1,4 to 1,8 GHz, c.w., class-A application (dimensions in mm). Epsilam p.c. board, thickness 0,635 mm, $\epsilon_r = 10$.

* Amplifier consists of test circuit board without any additional tuning.

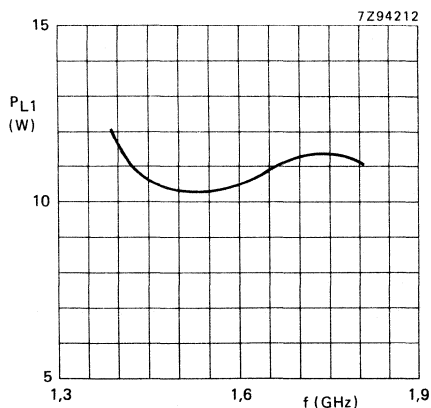


Fig. 5 Load power versus frequency.

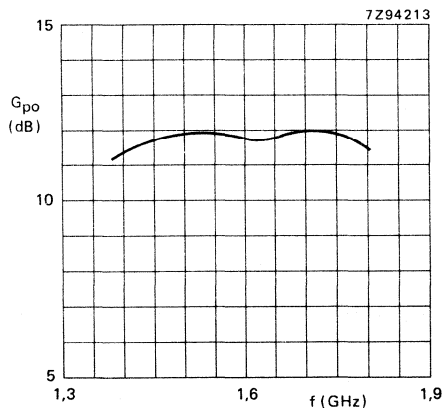


Fig. 6 Linear power gain versus frequency.

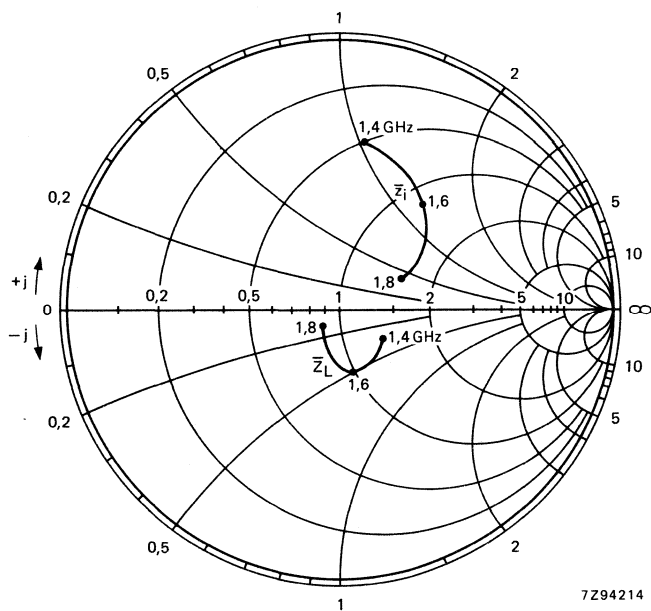


Fig. 7 Input and load impedances versus frequency; $Z_0 = 5 \Omega$; typical values.

Conditions for Figs 5 to 7:

$V_{CE} = 16 \text{ V}$
 $I_C = 2 \text{ A}$
} regulated; $T_{mb} = 25 \text{ }^\circ\text{C}$; typical values.

PULSED MICROWAVE POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates only in pulsed conditions and is recommended for IFF applications at 1,09 GHz.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 53 metal ceramic flange package.

It is mounted in a common-base configuration, specified in class-B and operates in pulsed conditions.

An input matching cell improves the input impedance and allows an easier design of broadband circuits.

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-B selective amplifier.

Typical values

mode of operation	f GHz	V _{CC} V	P _L W	G _p dB	η_c %	\bar{z}_i Ω	\bar{Z}_L Ω
pulsed $t_p = 10\ \mu\text{s}$ $\delta = 1\%$	1,09	45	38	11	47	$2,2 + j6,4$	$6 + j3$

MECHANICAL DATA

FO-53 (see Fig. 1)

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.

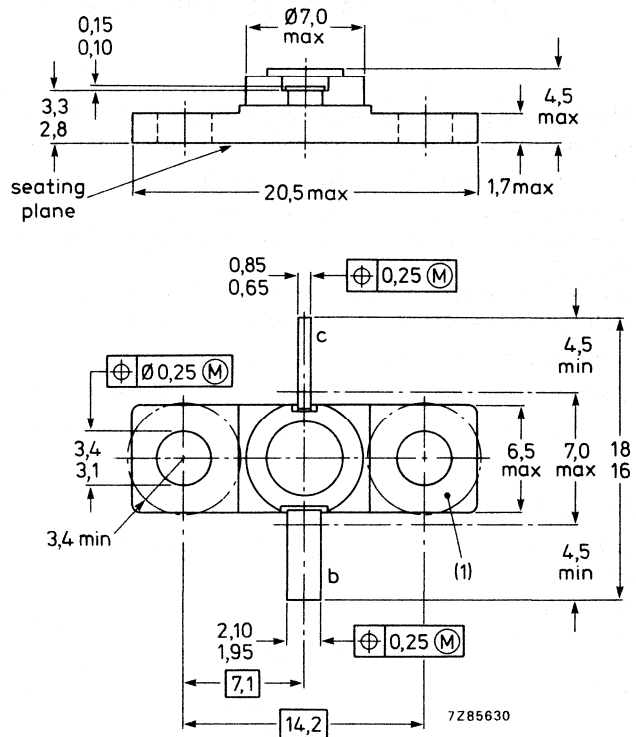
MECHANICAL DATA

Fig. 1 FO-53.

Dimensions in mm

Marking code:

RTC 1040 S



RATINGS

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

Collector-base voltage (open emitter)	V_{CB0}	max.	55 V
Collector-emitter voltage ($R_{BE} = 10 \Omega$) (open base)	V_{CER}	max.	50 V
	V_{CEO}	max.	35 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3 V
Collector current ($t_p \leq 10 \mu s, \delta \leq 1\%$)	I_C	max.	3 A
Total power dissipation ($t_p \leq 10 \mu s, \delta \leq 1\%, T_{mb} \leq 75 \text{ }^\circ\text{C}$)	P_{tot}	max.	60 W
Storage temperature	T_{stg}		-65 to 200 $^\circ\text{C}$
Junction temperature	T_j	max.	200 $^\circ\text{C}$
Soldering temperature at 0,1 mm from case; $t_{sld} \leq 10 \text{ s}$	T_{sld}	max.	235 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to mounting base under pulsed conditions; $t_p = 10 \mu s, \delta = 1\%$	$R_{th \text{ j-mb}}$	8 K/W
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PULSED MICROWAVE POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates only in pulsed conditions and is recommended for IFF applications.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 53 metal ceramic flange package.

It is mounted in a common-base configuration, specified in class-B and operates in pulsed conditions.

An input matching cell improves the input impedance and allows an easier design of broadband circuits.

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-B selective amplifier.

Typical values

mode of operation	f GHz	V _{CC} V	P _L W	G _p dB	η_c %	\bar{z}_i Ω	\bar{Z}_L Ω
pulsed $t_p = 10\ \mu\text{s}$ $\delta = 1\%$	1,09	45	72	7,6	40	$2,2 + j4$	$4,3 - j1$

MECHANICAL DATA

FO-53 (see Fig. 1)

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.

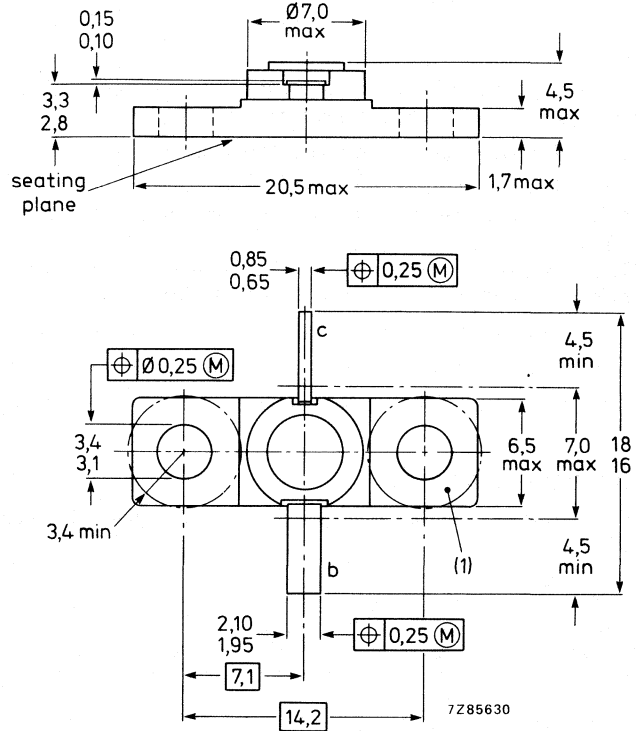
MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-53.

Marking code:

RTC 1100 S



RATINGS

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

Collector-base voltage (open emitter)	V_{CB0}	max.	50 V
Collector-emitter voltage ($R_{BE} = 10 \Omega$) (open base)	V_{CER}	max.	45 V
	V_{CEO}	max.	35 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5 V
Collector current ($t_p \leq 10 \mu s, \delta \leq 1\%$)	I_C	max.	6 A
Total power dissipation ($t_p \leq 10 \mu s, \delta \leq 1\%, T_{mb} \leq 75 \text{ }^\circ\text{C}$)	P_{tot}	max.	140 W
Storage temperature	T_{stg}		-65 to 200 $^\circ\text{C}$
Junction temperature	T_j	max.	200 $^\circ\text{C}$
Soldering temperature at 0,1 mm from case; $t_{sld} \leq 10 \text{ s}$	T_{sld}	max.	235 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to mounting base under pulsed conditions; $t_p = 10 \mu s, \delta = 1\%$	$R_{th \text{ j-mb}}$	3,5 K/W
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PULSED MICROWAVE POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates only in pulsed conditions and is recommended for IFF applications.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 53 metal ceramic flange package.

It is mounted in a common-base configuration, specified in class-B and operates in pulsed conditions.

An input matching cell improves the input impedance and allows an easier design of broadband circuits.

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-B selective amplifier.

Typical values

mode of operation	f GHz	V _{CC} V	P _L W	G _p dB	η_c %	\bar{z}_i Ω	\bar{Z}_L Ω
pulsed $t_p = 10\ \mu\text{s}$ $\delta = 1\%$	1,09	45	120	9,8	49	1,4 + j5	3 - j4

MECHANICAL DATA

FO-53 (see Fig. 1)

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.

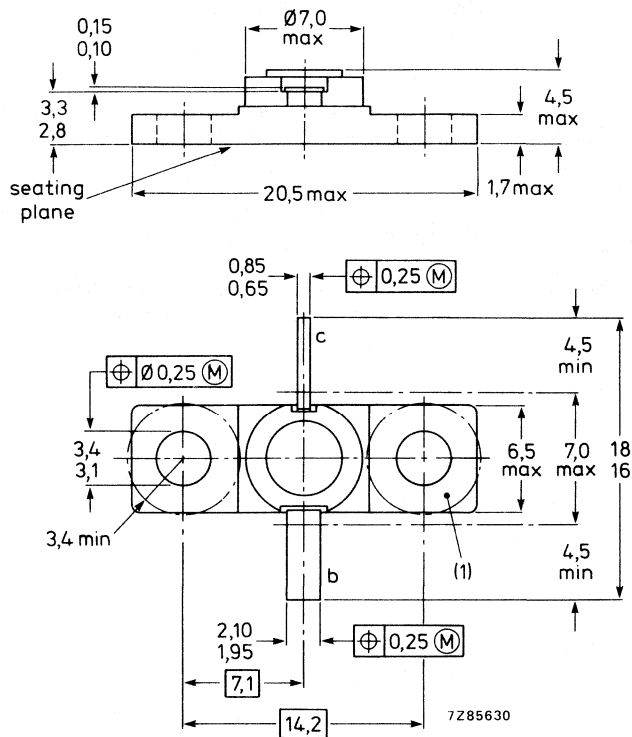
MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-53.

Marking code:

RTC 1140 S



RATINGS

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

Collector-base voltage (open emitter)	V_{CB0}	max.	55 V
Collector-emitter voltage ($R_{BE} = 10 \Omega$) (open base)	V_{CER}	max.	50 V
	V_{CEO}	max.	35 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5 V
Collector current ($t_p \leq 10 \mu s, \delta \leq 1\%$)	I_C	max.	8 A
Total power dissipation ($t_p \leq 10 \mu s, \delta \leq 1\%, T_{mb} \leq 75 \text{ }^\circ\text{C}$)	P_{tot}	max.	190 W
Storage temperature	T_{stg}		-65 to 200 $^\circ\text{C}$
Junction temperature	T_j	max.	200 $^\circ\text{C}$
Soldering temperature at 0,1 mm from case; $t_{sld} \leq 10 \text{ s}$	T_{sld}	max.	235 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to mounting base under pulsed conditions; $t_p = 10 \mu s, \delta = 1\%$	$R_{th \text{ j-mb}}$	2,5 K/W
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PULSED MICROWAVE POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates only in pulsed conditions and is recommended for IFF applications.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 57 B metal ceramic flange package.

It is mounted in a common-base configuration, specified in class-B and operates in pulsed conditions.

An input matching cell improves the input impedance and allows an easier design of broadband circuits.

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-B broadband amplifier.

Typical values

mode of operation	f GHz	V _{CC} V	P _L W	G _p dB	η_c %
pulsed $t_p = 10\ \mu\text{s}$ $\delta = 1\%$	0,6 to 0,75	48	180	8,6	45

MECHANICAL DATA

FO-57B (see Fig. 1)

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.

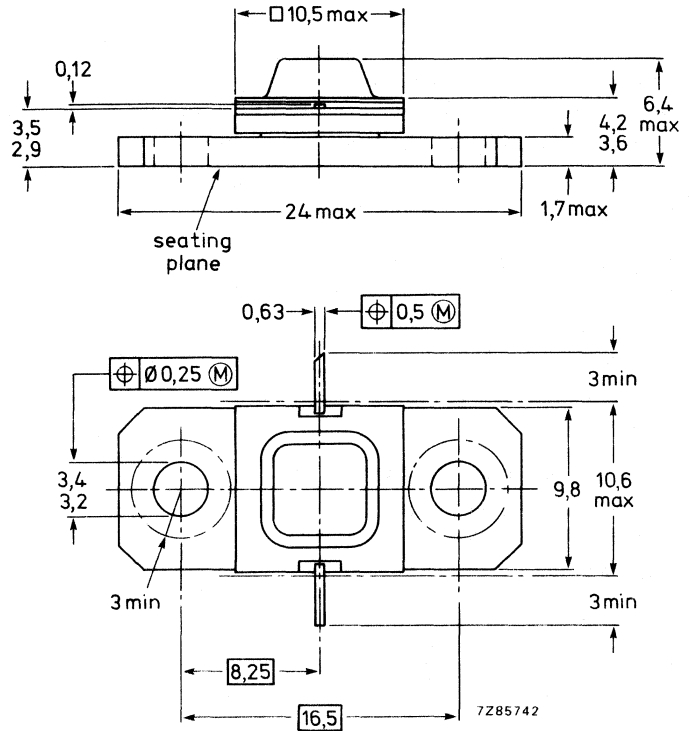
MECHANICAL DATA

Fig. 1 FO-57B.

Dimensions in mm

Marking code:

RTC MO 6075 B 200 Z



RATINGS

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

Collector-base voltage (open emitter)	V_{CB0}	max.	65 V
Collector-emitter voltage ($R_{BE} = 10 \Omega$) (open base)	V_{CE0}	max.	35 V
Emitter-base voltage (open collector)	V_{EB0}	max.	3.5 V
Collector current ($t_p \leq 10 \mu s, \delta \leq 1\%$)	I_C	max.	10 A
Total power dissipation ($t_p \leq 10 \mu s, \delta \leq 1\%, T_{mb} \leq 75 \text{ }^\circ\text{C}$)	P_{tot}	max.	500 W
Storage temperature	T_{stg}		-65 to 200 $^\circ\text{C}$
Junction temperature	T_j	max.	200 $^\circ\text{C}$
Soldering temperature at 0,1 mm from case; $t_{sld} \leq 10 \text{ s}$	T_{sld}	max.	235 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to mounting base under pulsed conditions; $t_p = 10 \mu s, \delta = 1\%$	$R_{th \text{ j-mb}}$	0,075 K/W
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PULSED MICROWAVE POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates only in pulsed conditions and is recommended for IFF applications.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 57 B metal ceramic flange package.

It is mounted in a common-base configuration, specified in class-B and operates in pulsed conditions.

An input matching cell improves the input impedance and allows an easier design of broadband circuits.

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-B broadband amplifier.

Typical values

mode of operation	f GHz	V _{CC} V	P _L W	G _p dB	η_c %
pulsed $t_p = 10\text{ }\mu\text{s}$ $\delta = 1\%$	0,6 to 0,75	48	420	7,2	40

MECHANICAL DATA

FO-57B (see Fig. 1)

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.

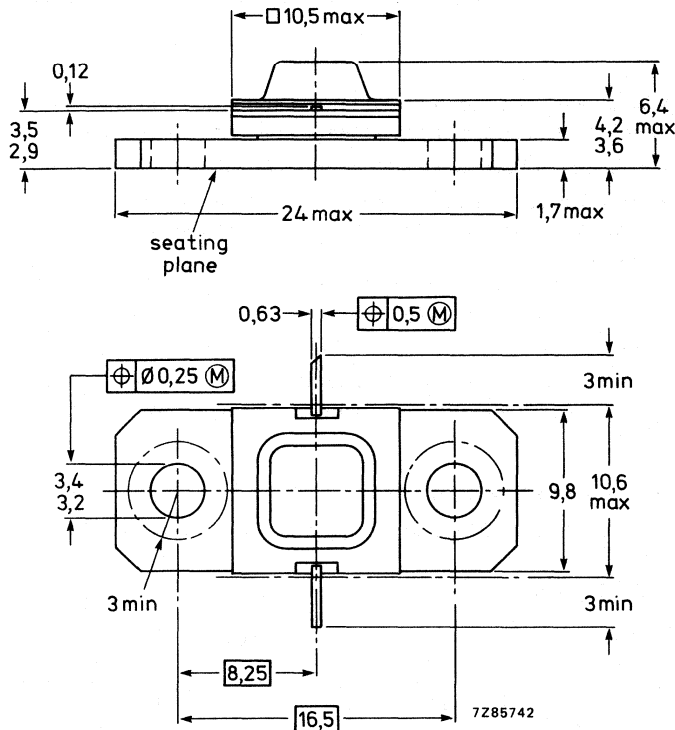
MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-57B.

Marking code:

RTC MO 6075 B 400 Z



RATINGS

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

Collector-base voltage (open emitter)	V_{CB0}	max.	65 V
Collector-emitter voltage ($R_{BE} = 10 \Omega$) (open base)	V_{CER}	max.	65 V
	V_{CEO}	max.	35 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5 V
Collector current ($t_p \leq 10 \mu s, \delta \leq 1\%$)	I_C	max.	32 A
Total power dissipation ($t_p \leq 10 \mu s, \delta \leq 1\%, T_{mb} = 75 \text{ }^\circ\text{C}$)	P_{tot}	max.	1200 W
Storage temperature	T_{stg}		-65 to 200 $^\circ\text{C}$
Junction temperature	T_j	max.	200 $^\circ\text{C}$
Soldering temperature at 0,1 mm from case; $t_{sld} \leq 10 \text{ s}$	T_{sld}	max.	235 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to mounting base under pulsed conditions; $t_p = 10 \mu s, \delta = 1\%$	$R_{th \text{ j-mb}}$	0,04 K/W
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PULSED MICROWAVE POWER TRANSISTOR

N-P-N silicon power transistor intended for use in military and professional applications. It operates only in pulsed conditions and is recommended for IFF applications at 1,09 GHz.

It offers the following technological advantages:

- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and thermal resistance

The transistor has an FO-67 metal ceramic flange package.

It is mounted in a common-base configuration, specified in class-C and operates in pulsed conditions. An input matching cell improves the input impedance and allows an easier design of wideband circuits.

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-C selective amplifier.

Typical values

mode of operation	f GHz	V _{CC} V	P _L W	G _p dB	η_c %	Z _i Ω	Z _L Ω
pulsed: t _p = 10 μ s δ = 1%	1,09	50	100	8,5	40	10 + j22	1,75 - j5

MECHANICAL DATA

FO-67 (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.

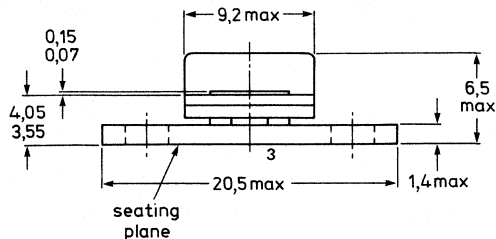
MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-67.

Pinning:

- 1 = collector
- 2 = emitter
- 3 = base

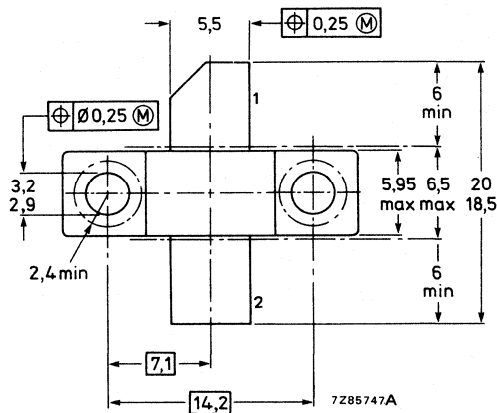


Marking code:

RTC 11080Y

Torque on screw: max. 0,4 Nm

Recommended screw: M2,5



RATINGS

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

Collector-base voltage, open emitter	V_{CBO}	max.	65 V
Collector-emitter voltage	V_{CER}	max.	65 V
$R_{BE} \leq 10 \Omega$	V_{CEO}	max.	25 V
open base	V_{EBO}	max.	3,5 V
Emitter-base voltage, open collector			
Collector current	I_C	max.	7 A
$t_p \leq 10 \mu s, \delta \leq 1\%$			
Total power dissipation	P_{tot}	max.	250 W
$t_p \leq 10 \mu s, \delta \leq 1\%; T_{mb} \leq 75 \text{ }^\circ\text{C}$			
Storage temperature	T_{stg}		-65 to 150 $^\circ\text{C}$
Junction temperature	T_j	max.	200 $^\circ\text{C}$
Soldering temperature			
at 0,1 mm from case; $t_{sld} \leq 10 \text{ s}$	T_{sld}	max.	235 $^\circ\text{C}$

THERMAL RESISTANCE (at $T_j=75 \text{ }^\circ\text{C}$)

From junction to mounting base under pulsed conditions:

$t_p \leq 10 \mu s, \delta \leq 1\%$ $R_{th \text{ j-mb}} = 0,16 \text{ K/W}$

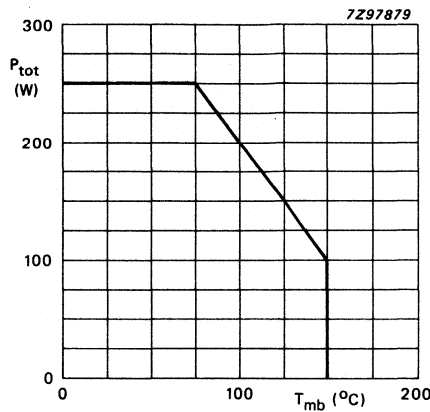


Fig. 2 Power derating curve versus mounting base temperature in pulsed condition.

DEVELOPMENT DATA

CHARACTERISTICS

$T_{mb} = 25$ °C unless otherwise specified

Breakdown voltages

$I_C = 20$ mA; $I_E = 0$

$I_C = 20$ mA; $R_{BE} = 10$ Ω

$I_C = 0$; $I_E = 2,5$ mA

$V(BR)CBO \geq 65$ V

$V(BR)CER \geq 65$ V

$V(BR)EBO \geq 3,5$ V

Collector cut-off current

$I_E = 0$; $V_{CB} = 50$ V

$I_{CBO} \leq 2,5$ mA

Emitter cut-off current

$I_C = 0$; $V_{EB} = 1,5$ V

$I_{EBO} \leq 0,25$ mA

Collector-base capacitance

$I_E = I_C = 0$; $V_{CB} = 50$ V

C_{cb} typ. 22 pF

APPLICATION INFORMATION

Microwave performance up to $T_{mb} = 25$ °C in an unneutralized common-base class-B selective amplifier.

mode of operation	f GHz	V _{CC} V	P _L W	G _p dB	η_c %	z _i Ω	Z _L Ω
pulsed: t _p = 10 μs δ = 1%	1,09	50	≥ 80	≥ 8,5	≥ 35	10 + j22	1,75 - j5

PULSED MICROWAVE POWER TRANSISTOR

N-P-N silicon power transistor intended for use in military and professional applications. It operates only in pulsed conditions and is recommended for IFF applications at 1,09 GHz.

It offers the following technological advantages:

- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and thermal resistance

The transistor has an FO-67 metal ceramic flange package.

It is mounted in a common-base configuration, specified in class-C and operates in pulsed conditions. An input matching cell improves the input impedance and allows an easier design of wideband circuits.

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-C selective amplifier.

Typical values

mode of operation	f GHz	V _{CC} V	P _L W	G _p dB	η_c %	Z _i Ω	Z _L Ω
pulsed: t _p = 10 μ s δ = 1%	1,09	50	200	8,5	40	see Fig. 3 and 4	

MECHANICAL DATA

FO-67 (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.

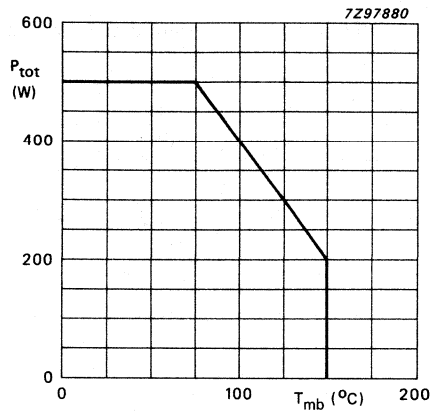


Fig. 2 Power derating curve versus mounting base temperature in pulsed condition.

CHARACTERISTICS

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

Breakdown voltages

$I_C = 40\text{ mA}; I_E = 0$

$I_C = 40\text{ mA}; R_{BE} = 10\ \Omega$

$I_C = 0; I_E = 5\text{ mA}$

$V_{(BR)CBO} \geq 65\text{ V}$

$V_{(BR)CER} \geq 65\text{ V}$

$V_{(BR)EBO} \geq 3,5\text{ V}$

Collector cut-off current

$I_E = 0; V_{CB} = 50\text{ V}$

$I_{CBO} \leq 5\text{ mA}$

Emitter cut-off current

$I_C = 0; V_{EB} = 1,5\text{ V}$

$I_{EBO} \leq 0,5\text{ mA}$

Collector-base capacitance

$I_E = I_C = 0; V_{CB} = 50\text{ V}$

C_{cb} typ. 45 pF

APPLICATION INFORMATION

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-B selective amplifier.

mode of operation	f GHz	V _{CC} V	P _L W	G _p dB	η_c %	z _i Ω	Z _L Ω
pulsed: t _p = 10 μ s δ = 1%	1,09	50	≥ 175	$\geq 7,5$	≥ 35	see Fig. 3 and 4	

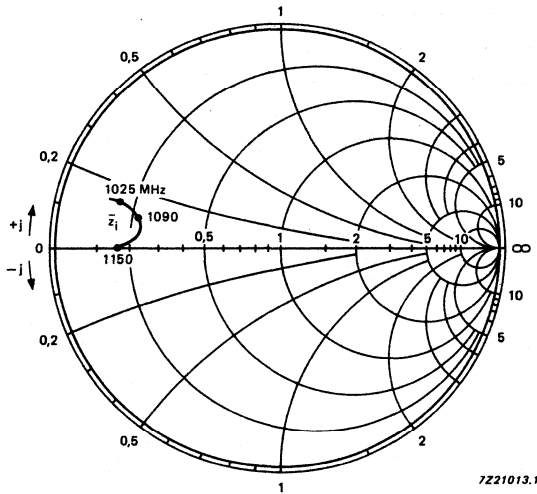


Fig. 3 Input impedance versus frequency; $Z_0 = 50\ \Omega$; typical values.

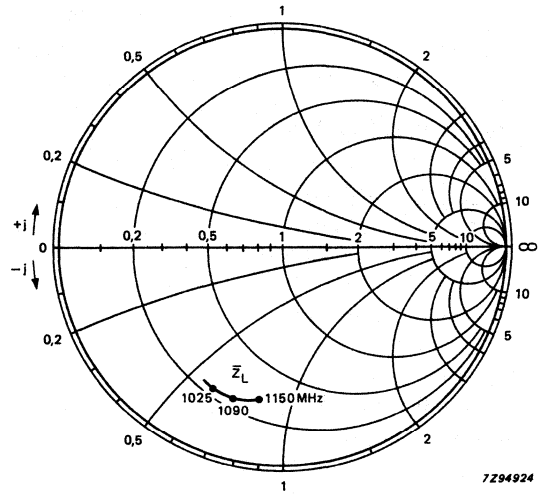


Fig. 4 Optimum load impedance versus frequency; $Z_0 = 5\ \Omega$; typical values.

PULSED MICROWAVE POWER TRANSISTOR

N-P-N silicon power transistor intended for use in military and professional applications. It operates only in pulsed conditions and is recommended for IFF applications at 1,09 GHz.

It offers the following technological advantages:

- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and thermal resistance

The transistor has an FO-67 metal ceramic flange package.

It is mounted in a common-base configuration, specified in class-C and operates in pulsed conditions. An input matching cell improves the input impedance and allows an easier design of wideband circuits.

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-C selective amplifier.

Typical values

mode of operation	f GHz	V _{CC} V	P _L W	G _p dB	η_c %	Z _i Ω	Z _L Ω
pulsed: t _p = 10 μ s δ = 1%	1,09	50	400	8	35	see Fig. 3	

MECHANICAL DATA

FO-67 (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.

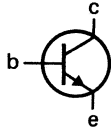
MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-67.

Pinning:

- 1 = collector
- 2 = emitter
- 3 = base

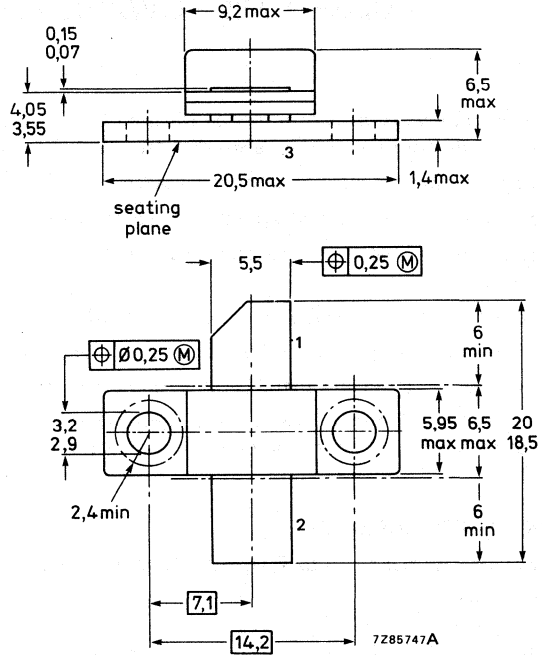


Marking code:

RTC 11350Y

Torque on screw: max. 0,4 Nm

Recommended screw: M2,5



RATINGS

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

Collector-base voltage, open emitter	V_{CBO}	max.	65 V
Collector-emitter voltage	V_{CE}	max.	65 V
$R_{BE} \leq 10 \Omega$	V_{CEO}	max.	25 V
open base	V_{EBO}	max.	3,5 V
Emitter-base voltage, open collector	V_{EBO}	max.	3,5 V
Collector current	I_C	max.	25 A
$t_p \leq 10 \mu s, \delta \leq 1\%$			
Total power dissipation	P_{tot}	max.	1000 W
$t_p \leq 10 \mu s, \delta \leq 1\%; T_{mb} \leq 75^\circ C$	T_{stg}		-65 to 150 °C
Storage temperature	T_j	max.	200 °C
Junction temperature	T_{sld}	max.	235 °C
Soldering temperature			
at 0,1 mm from case; $t_{sld} \leq 10 s$			

THERMAL RESISTANCE (at $T_j=75^\circ C$)

From junction to mounting base under pulsed conditions:

$t_p \leq 10 \mu s, \delta \leq 1\%$ $R_{th j-mb} = 0,04 \text{ K/W}$

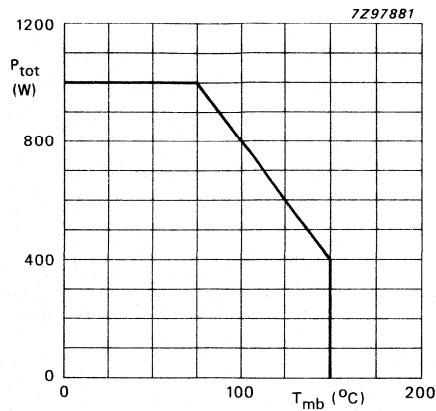


Fig. 2 Power derating curve versus mounting base temperature; pulsed condition.

CHARACTERISTICS

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

Breakdown voltages

$I_C = 80\text{ mA}; I_E = 0$

$V(\text{BR})\text{CBO} \geq 65\text{ V}$

$I_C = 80\text{ mA}; R_{BE} = 10\ \Omega$

$V(\text{BR})\text{CER} \geq 65\text{ V}$

$I_C = 0; I_E = 10\text{ mA}$

$V(\text{BR})\text{EBO} \geq 3,5\text{ V}$

Collector cut-off current

$I_E = 0; V_{CB} = 50\text{ V}$

$I_{CBO} \leq 10\text{ mA}$

Emitter cut-off current

$I_C = 0; V_{EB} = 1,5\text{ V}$

$I_{EBO} \leq 1\text{ mA}$

Collector-base capacitance

$I_E = I_C = 0; V_{CB} = 50\text{ V}$

C_{cb} typ. 90 pF

APPLICATION INFORMATION

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-C selective amplifier.

mode of operation	f GHz	V_{CC} V	P_L W	G_p dB	η_c %	z_i Ω	Z_L Ω
pulsed: $t_p = 10\ \mu\text{s}$ $\delta = 1\%$	1,09	50	≥ 350	≥ 7	≥ 30	see Fig. 3	

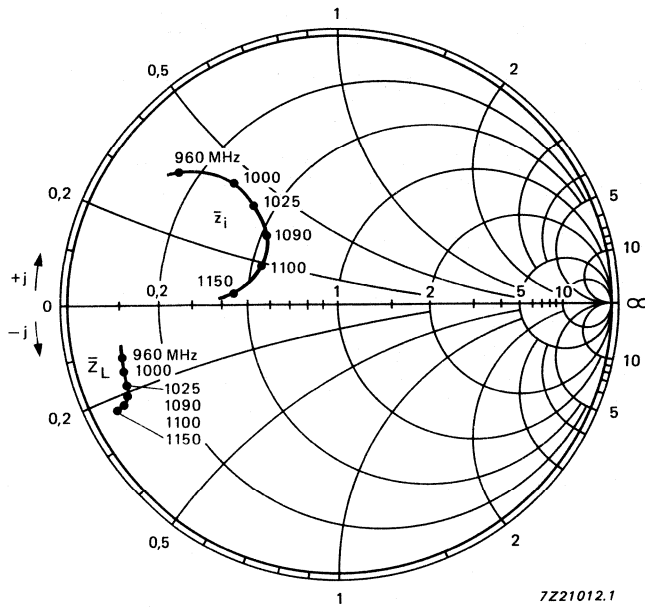


Fig. 3 Optimal load impedance and input impedance in large signal conditions; $Z_0 = 10 \Omega$; typical values.

PULSED MICROWAVE POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates only in pulsed conditions and is recommended for IFF applications.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 67 A metal ceramic flange package.

It is mounted in a common-base configuration, specified in class-B and operates in pulsed conditions.

An input matching cell improves the input impedance and allows an easier design of broadband circuits.

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-B selective amplifier.

Typical values

mode of operation	f HGz	V _{CC} V	P _L W	G _p dB	η_c %	\bar{z}_i Ω	\bar{Z}_L Ω
pulsed $t_p = 10\ \mu\text{s}$ $\delta = 1\%$	1,09	50	200	9	50	3,5 + j9	1,5 - j2

MECHANICAL DATA

FO-67A (see Fig. 1)

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.

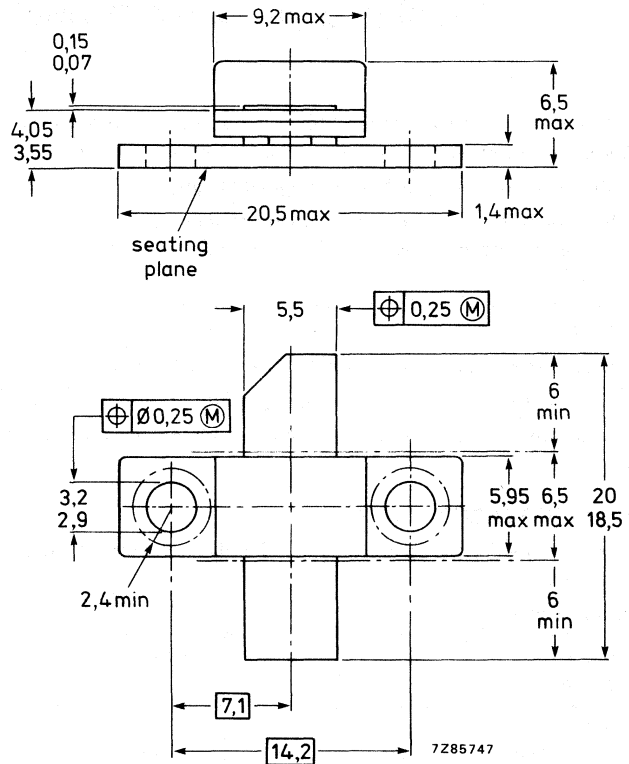
MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-67A.

Marking code:

RTC 12 175 YR



RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	65 V
Collector-emitter voltage ($R_{BE} = 10 \Omega$) (open base)	V_{CER}	max.	65 V
	V_{CEO}	max.	35 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5 V
Collector current ($t_p \leq 10 \mu s, \delta \leq 1\%$)	I_C	max.	12,5 A
Total power dissipation ($t_p \leq 10 \mu s, \delta \leq 1\%, T_{mb} \leq 75 \text{ }^\circ\text{C}$)	P_{tot}	max.	500 W
Storage temperature	T_{stg}		-65 to 200 $^\circ\text{C}$
Junction temperature	T_j	max.	200 $^\circ\text{C}$
Soldering temperature at 0,1 mm from case; $t_{slid} \leq 10 \text{ s}$	T_{slid}	max.	235 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to mounting base under pulsed conditions; $t_p = 10 \mu s, \delta = 1\%$	$R_{th \text{ j-mb}}$	0,08 K/W
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PULSED MICROWAVE POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates only in pulsed conditions and is recommended for IFF applications at 1,09 GHz.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 67 A metal ceramic flange package.

It is mounted in a common-base configuration, specified in class-B and operates in pulsed conditions.

An input matching cell improves the input impedance and allows an easier design of broadband circuits.

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-B selective amplifier.

Typical values

mode of operation	f GHz	V _{CC} V	P _L W	G _p dB	η_c %	\bar{z}_i Ω	\bar{Z}_L Ω
pulsed $t_p = 10\ \mu\text{s}$ $\delta = 1\%$	1,09	50	460	8	36	$1,9 + j4,5$	$0,9 - j2$

MECHANICAL DATA

FO-67A (see Fig. 1)

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.

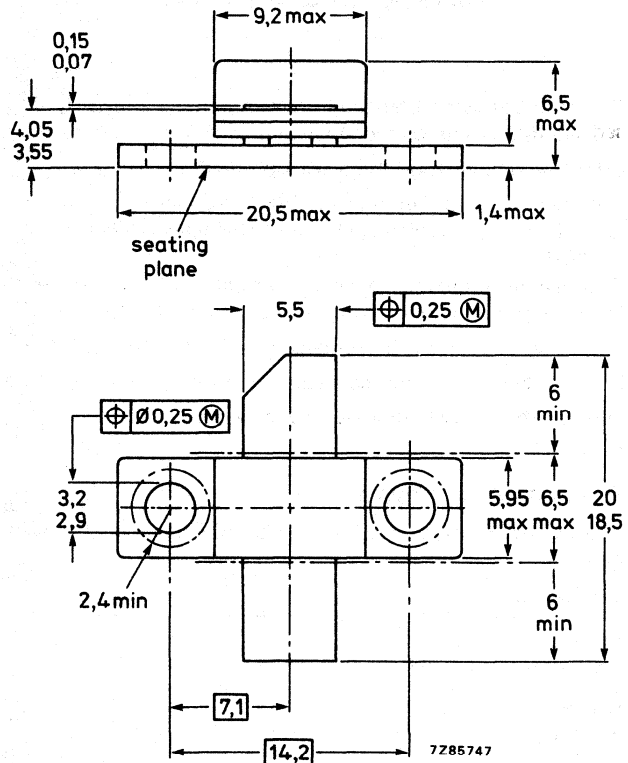
MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-67A.

Marking code:

RTC 12 350 YR



RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	65 V
Collector-emitter voltage ($R_{BE} = 10 \Omega$) (open base)	V_{CER}	max.	65 V
	V_{CEO}	max.	35 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5 V
Collector current ($t_p \leq 10 \mu s, \delta \leq 1\%$)	I_C	max.	25 A
Total power dissipation ($t_p \leq 10 \mu s, \delta \leq 1\%, T_{mb} \leq 75 \text{ }^\circ\text{C}$)	P_{tot}	max.	1000 W
Storage temperature	T_{stg}		-65 to 200 $^\circ\text{C}$
Junction temperature	T_j	max.	200 $^\circ\text{C}$
Soldering temperature at 0,1 mm from case; $t_{sld} \leq 10 \text{ s}$	T_{sld}	max.	235 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to mounting base under pulsed conditions: $t_p = 10 \mu s, \delta = 1\%$	$R_{th \text{ j-mb}}$	0,04 K/W
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PULSED MICROWAVE POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates only in pulsed conditions and is recommended for DME applications.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 96 metal ceramic flange package.

It is mounted in a common-base configuration, specified in class-B and operates in pulsed conditions.

An input matching cell improves the input impedance and allows an easier design of broadband circuits.

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-B broadband amplifier.

Typical values

mode of operation	f GHz	V_{CC} V	PL W	G_p dB	η_c %
pulsed $t_p = 10\ \mu\text{s}$ $\delta = 1\%$	1,025 to 1,150	50	700	6,7	35

MECHANICAL DATA

FO-96 (see Fig. 1)

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.

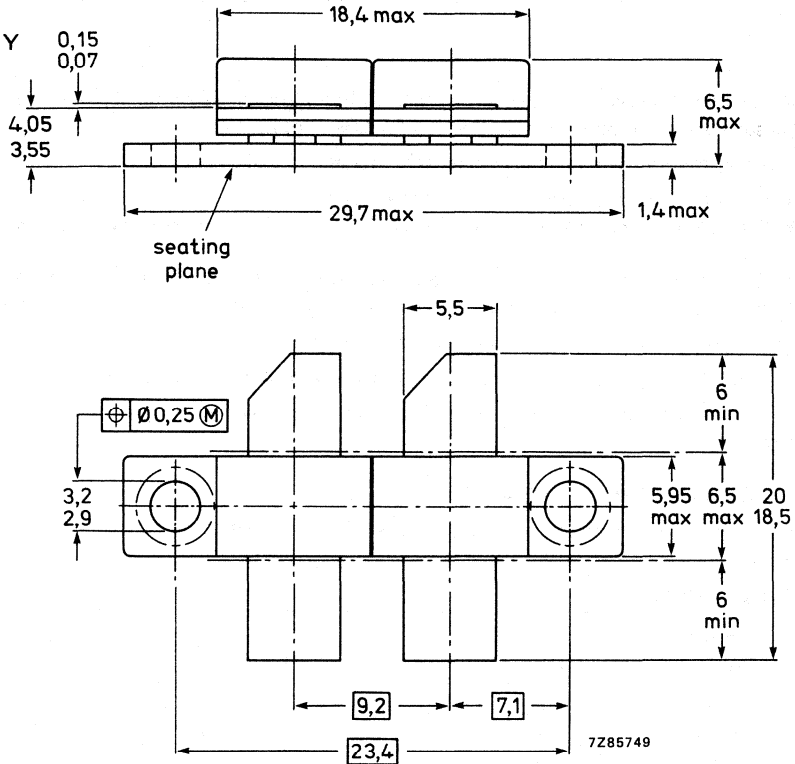
MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-96.

Marking code:

RTC MS 1011 B 700 Y



RATINGS

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

Collector-base voltage (open emitter)	V _{CB0}	max.	65 V
Collector-emitter voltage (R _{BE} = 10 Ω) (open base)	V _{CER}	max.	65 V
	V _{CEO}	max.	35 V
Emitter-base voltage (open collector)	V _{EB0}	max.	3,5 V
Collector current (t _p ≤ 10 μs, δ ≤ 1%)	I _C	max.	50 A
Total power dissipation (t _p ≤ 10 μs, δ ≤ 1%, T _{mb} ≤ 75 °C)	P _{tot}	max.	2000 W
Storage temperature	T _{stg}		-65 to 200 °C
Junction temperature	T _j	max.	200 °C
Soldering temperature at 0,1 mm from case; t _{slid} ≤ 10 s	T _{slid}	max.	235 °C

THERMAL RESISTANCE

From junction to mounting base

under pulsed conditions; t_p = 10 μs, δ = 1%

R_{th j-mb} 0,02 K/W

PULSED MICROWAVE POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates only in pulsed conditions and is recommended for IFF applications.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 96 metal ceramic flange package.

It is mounted in a common-base configuration, specified in class-B and operates in pulsed conditions.

An input matching cell improves the input impedance and allows an easier design of broadband circuits.

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-B broadband amplifier.

Typical values

mode of operation	f GHz	V _{CC} V	P _L W	G _p dB	η_c %
pulsed $t_p = 10\ \mu\text{s}$ $\delta = 1\%$	0,6 to 0,75	48	850	7,5	35

MECHANICAL DATA

FO-96 (see Fig. 1)

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.

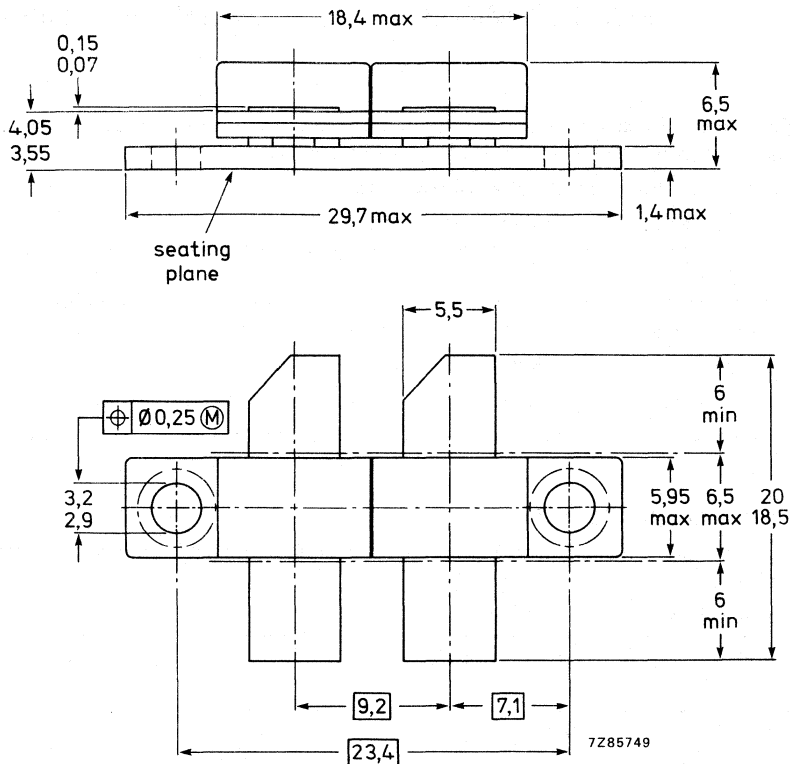
MECHANICAL DATA

Fig. 1 FO-96.

Dimensions in mm

Marking code:

MS 6075 B 800 Z



RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	65 V
Collector-emitter voltage ($R_{BE} = 10 \Omega$) (open base)	V_{CER}	max.	65 V
	V_{CEO}	max.	35 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5 V
Collector current ($t_p \leq 10 \mu s, \delta \leq 1\%$)	I_C	max.	50 A
Total power dissipation ($t_p \leq 10 \mu s, \delta \leq 1\%, T_{mb} \leq 75 \text{ }^\circ\text{C}$)	P_{tot}	max.	1800 W
Storage temperature	T_{stg}		-65 to 200 $^\circ\text{C}$
Junction temperature	T_j	max.	200 $^\circ\text{C}$
Soldering temperature at 0,1 mm from case; $t_{slid} \leq 10 \text{ s}$	T_{slid}	max.	235 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to mounting base

under pulsed conditions; $t_p = 10 \mu s, \delta = 1\%$

$R_{th \text{ j-mb}}$ 0,02 K/W

PULSED MICROWAVE POWER TRANSISTOR

N-P-N silicon power transistor (two transistor sections) intended for use in military and professional applications. It operates only in pulsed conditions and is recommended for IFF applications at 1,09 GHz.

It offers the following technological advantages:

- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and thermal resistance

The transistor has an FO-96 metal-ceramic flange package.

It is mounted in a common-base configuration, specified in class-C and operates in pulsed conditions. An input matching cell improves the input impedance and allows an easier design of wideband circuits.

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-C selective amplifier.

Typical values (per transistor section)

mode of operation	f GHz	V_{CC} V	P_L W	G_p dB	η_c %	z_j Ω	Z_L Ω
pulsed: $t_p = 10\ \mu\text{s}$ $\delta = 1\%$	1,09	50	850	7,5	35	see Fig. 3	

MECHANICAL DATA

FO-96 (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.

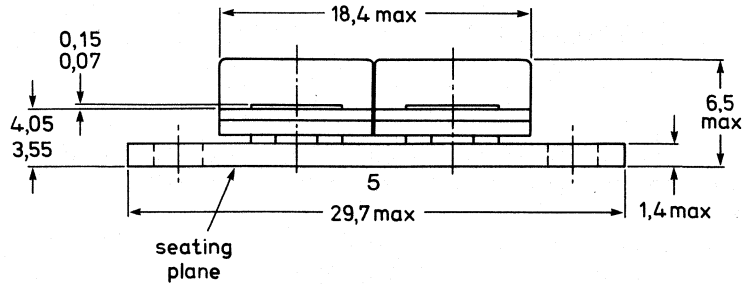
MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-96.

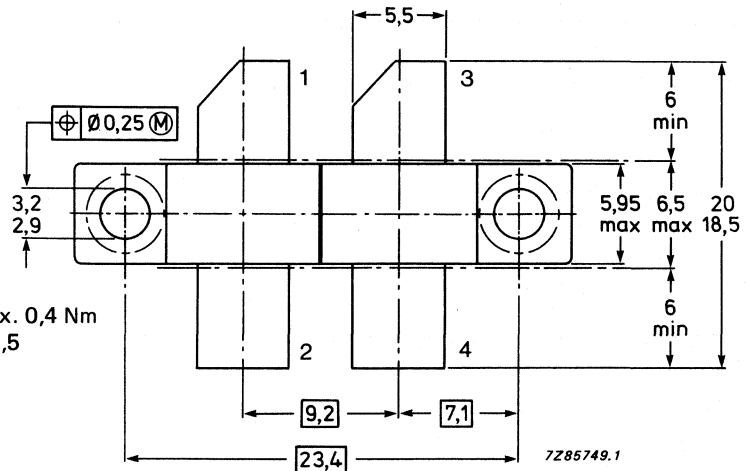
Pinning:

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



Marking code:
RTC MSB11900Y

Torque on screw: max. 0,4 Nm
Recommended screw: M2,5



RATINGS

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

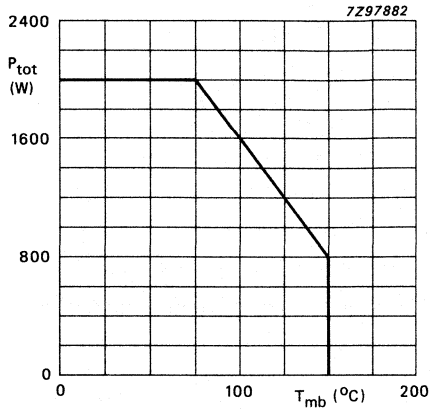
Collector-base voltage, open emitter	V_{CBO}	max.	65 V
Collector-emitter voltage	V_{CER}	max.	65 V
$R_{BE} \leq 10 \Omega$	V_{CEO}	max.	25 V
open base	V_{EBO}	max.	3,5 V
Emitter-base voltage, open collector	I_C	max.	50 A
Collector current, per transistor section	P_{tot}	max.	2x1000 W
$t_p \leq 10 \mu s, \delta \leq 1\%$	T_{stg}		-65 to 150 °C
Total power dissipation	T_j	max.	200 °C
$t_p \leq 10 \mu s, \delta \leq 1\%; T_{mb} \leq 75 \text{ °C}$	T_{slid}	max.	235 °C
Storage temperature			
Junction temperature			
Soldering temperature			
at 0,1 mm from case; $t_{sld} \leq 10 \text{ s}$			

→ **THERMAL RESISTANCE*** (at $T_j = 75 \text{ °C}$)

From junction to mounting base under pulsed conditions:
 $t_p \leq 10 \mu s, \delta \leq 1\%$

$R_{th \text{ j-mb}} = 0,02 \text{ K/W}$

* Dissipation of either transistor section shall not exceed half rated power.



*Dissipation of either transistor section shall not exceed half rated power.

Fig. 2 Power derating curve versus mounting base temperature; pulsed condition.*

CHARACTERISTICS, per transistor section

T_{mb} = 25 °C unless otherwise specified

Breakdown voltages

I_C = 80 mA; I_E = 0

I_C = 80 mA; R_{BE} = 10 Ω

I_C = 0; I_E = 5 mA

V(BR)CBO ≥ 65 V

V(BR)CER ≥ 65 V

V(BR)EBO ≥ 3,5 V

Collector cut-off current

I_E = 0; V_{CB} = 50 V

I_{CBO} ≤ 10 mA

Emitter cut-off current

I_C = 0; V_{EB} = 1,5 V

I_{EBO} ≤ 1 mA

Collector-base capacitance

I_E = I_C = 0; V_{CB} = 50 V

C_{cb} typ. 2x160 pF

APPLICATION INFORMATION

Microwave performance up to T_{mb} = 25 °C in an unneutralized common-base class-B selective amplifier.

mode of operation	f GHz	V _{CC} V	P _L W	G _p dB	η _c %	z _i Ω	Z _L Ω
pulsed: t _p = 10 μs δ = 1%	1,09	50	≥ 800	≥ 7	≥ 30	see Fig. 3	

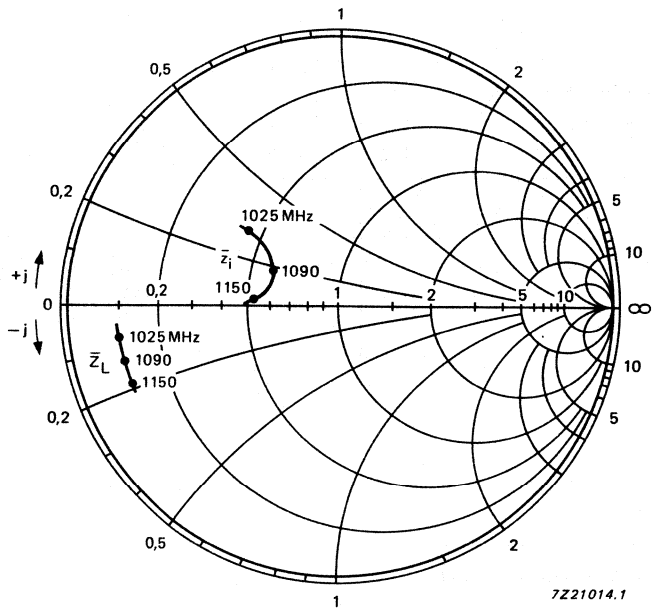


Fig. 3 Input and optimum load impedance in large signal conditions;
 $Z_o = 10 \Omega$; typical values.

PULSED MICROWAVE POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates only in pulsed conditions and is recommended for IFF applications at 1,09 GHz.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 96 metal ceramic flange package.

It is mounted in a common-base configuration, specified in class-B and operates in pulsed conditions.

An input matching cell improves the input impedance and allows an easier design of broadband circuits.

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in a unneutralized common-base class-B selective amplifier.

Typical values

mode of operation	f GHz	V_{CC} V	PL W	G_p dB	η_c %	\bar{Z}_i Ω	\bar{Z}_L Ω
pulsed $t_p = 10\text{ }\mu\text{s}$ $\delta = 1\%$	1,09	50	900	7,8	35	$2,5 + j4$	$10 - j11$

MECHANICAL DATA

FO-96 (see Fig. 1)

PRODUCT SAFETY

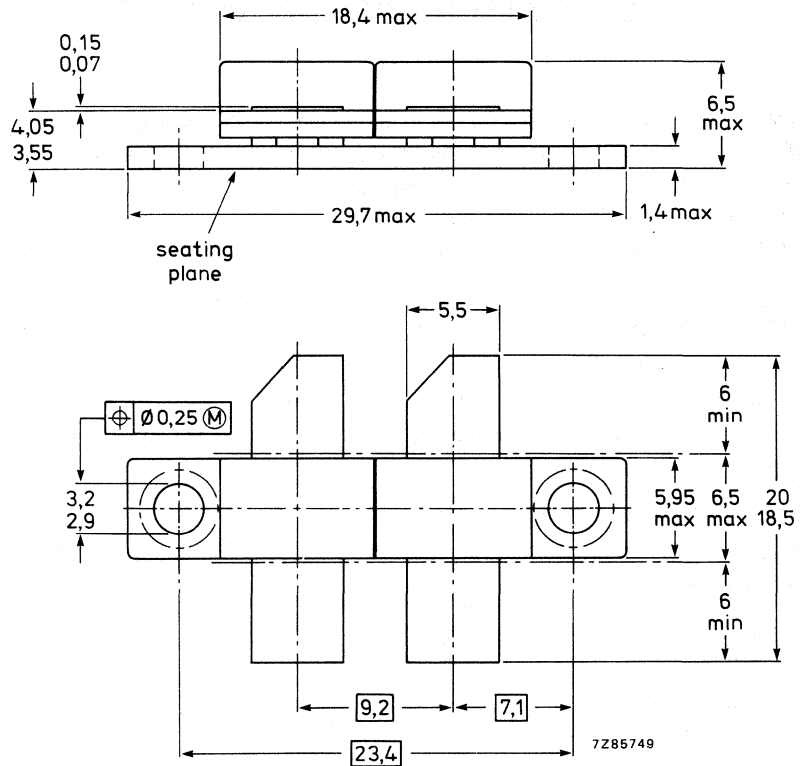
These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-96.

Marking code:
RTC MSB 12 900 Y



RATINGS

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

Collector-base voltage (open emitter)	V_{CB0}	max.	65 V
Collector-emitter voltage ($R_{BE} = 10 \Omega$) (open base)	V_{CER} V_{CEO}	max.	65 V 35 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5 V
Collector current ($t_p \leq 10 \mu s, \delta \leq 1\%$)	I_C	max.	50 A
Total power dissipation ($t_p \leq 10 \mu s, \delta \leq 1\%, T_{mb} \leq 75 \text{ }^\circ\text{C}$)	P_{tot}	max.	2000 W
Storage temperature	T_{stg}		-65 to 200 $^\circ\text{C}$
Junction temperature	T_j	max.	200 $^\circ\text{C}$
Soldering temperature at 0,1 mm from case, $t_{sld} \leq 10 \text{ s}$	T_{sld}	max.	235 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to mounting base under pulsed conditions; $t_p = 10 \mu s, \delta = 1\%$	$R_{th \text{ j-mb}}$	0,02 K/W
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PULSED MICROWAVE POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates only in pulsed conditions and is recommended for TACAN applications.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 57 C metal ceramic flange package.

It is mounted in a common-base configuration, specified in class-B and operates in pulsed conditions. Internal input and output prematching ensure a good stability and easy broadband using.

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-B broadband amplifier.

Typical values

mode of operation	f GHz	V_{CC} V	P_L W	G_p dB	η_c %
pulsed $t_p = 10\text{ }\mu\text{s}$ $\delta = 10\%$	0,960 to 1,215	50	90	8,6	34

MECHANICAL DATA

FO-57C (see Fig. 1)

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.

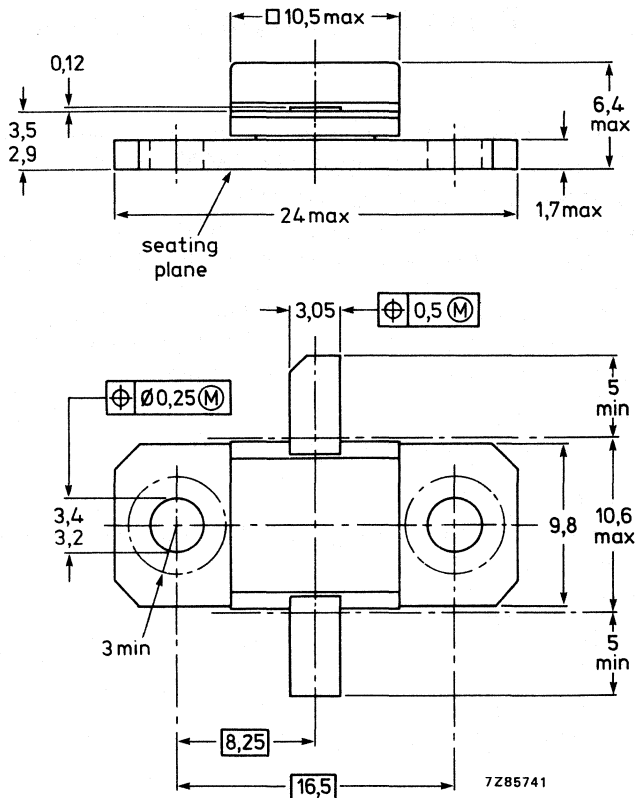
MECHANICAL DATA

Fig. 1 FO-57C.

Marking code:

RTC MZ 0912 B 75 Y

Dimensions in mm



RATINGS

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

Collector-base voltage (open emitter)	V _{CB0}	max.	65 V
Collector-emitter voltage (R _{BE} = 10 Ω) (open base)	V _{CER}	max.	65 V
	V _{CEO}	max.	35 V
Emitter-base voltage (open collector)	V _{EBO}	max.	3,5 V
Collector current (t _p ≤ 10 μs, δ ≤ 10%)	I _C	max.	7 A
Total power dissipation (t _p ≤ 10 μs, δ ≤ 10%, T _{mb} ≤ 75 °C)	P _{tot}	max.	300 W
Storage temperature	T _{stg}		-65 to 200 °C
Junction temperature	T _j	max.	200 °C
Soldering temperature at 0,1 mm from case; t _{slid} ≤ 10 s	T _{slid}	max.	235 °C

THERMAL RESISTANCE

From junction to mounting base under pulsed conditions; t _p = 10 μs, δ = 10%	R _{th j-mb}	0,2 K/W
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PULSED MICROWAVE POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates only in pulsed conditions and is recommended for TACAN applications.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 57 C metal ceramic flange package.

It is mounted in a common-base configuration, specified in class-B and operates in pulsed conditions.

Internal input and output prematching ensure a good stability and easy broadband usage.

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-B broadband amplifier.

Typical values

mode of operation	f GHz	V_{CC} V	P_L W	G_p dB	η_c %
pulsed $t_p = 10\ \mu\text{s}$ $\delta = 10\%$	0,960 to 1,215	50	175	7,7	34

MECHANICAL DATA

FO-57C (see Fig. 1)

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.

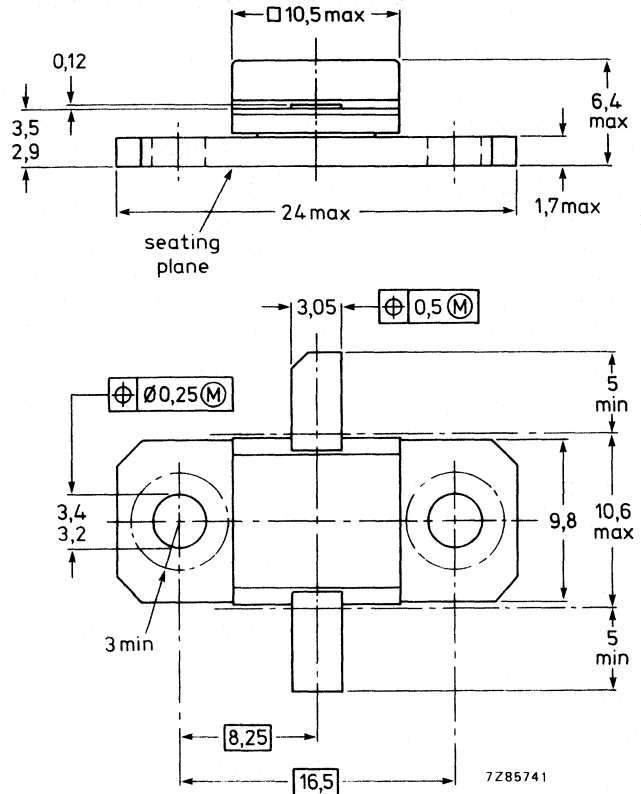
MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-57C.

Marking code:

RTC MZ 0912 B 150 Y



RATINGS

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

Collector-base voltage (open emitter)	V_{CB0}	max.	65 V
Collector-emitter voltage ($R_{BE} = 10 \Omega$) (open base)	V_{CER}	max.	65 V
	V_{CEO}	max.	35 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5 V
Collector current ($t_p \leq 10 \mu s, \delta \leq 10\%$)	I_C	max.	14 A
Total power dissipation ($t_p \leq 10 \mu s, \delta \leq 10\%, T_{mb} \leq 75 \text{ }^\circ\text{C}$)	P_{tot}	max.	600 W
Storage temperature	T_{stg}		-65 to 200 $^\circ\text{C}$
Junction temperature	T_j	max.	200 $^\circ\text{C}$
Soldering temperature at 0,1 mm from case, $t_{slid} \leq 10 \text{ s}$	T_{slid}	max.	235 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to mounting base under pulsed conditions; $t_p = 10 \mu s, \delta = 10\%$	$R_{th \text{ j-mb}}$	0,1 K/W
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MICROWAVE POWER TRANSISTORS

N-P-N silicon transistors for use in space, military and professional applications.

They offer the following technological advantages:

- Interdigitated structure: high emitter efficiency.
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high VSWR.
- Gold metallization realizes very good stability of the characteristics and excellent lifetime.
- Multicell geometry gives good balance of dissipated power and low thermal resistance.

The PEE family has an envelope with stud to be mounted with a nut and the PDE family an envelope without stud to be soldered directly onto the heatsink.

Transistors are mounted in a common-emitter configuration in class-B but they also can operate in class-A or C.

QUICK REFERENCE DATA

R.F. performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-emitter class-B circuit

type number	mode of operation	f GHz	V_{CE} V	P_L W	G_p dB	η %
PEE1001U PDE1001U	c.w.	1	28	typ. 2	typ. 6,4	typ. 60
PEE1003U PDE1003U	c.w.	1	28	typ. 4,2	typ. 6,3	typ. 54
PEE1005U PDE1005U	c.w.	1	28	typ. 7,6	typ. 5,8	typ. 58
PEE1010U PDE1010U	c.w.	1	28	typ. 11	typ. 7,4	typ. 68

MECHANICAL DATA

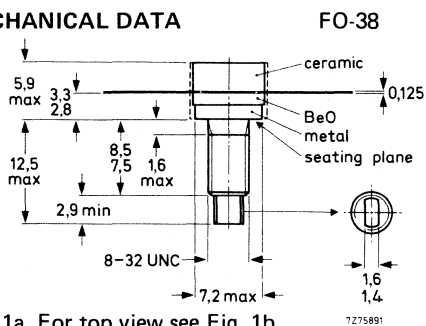
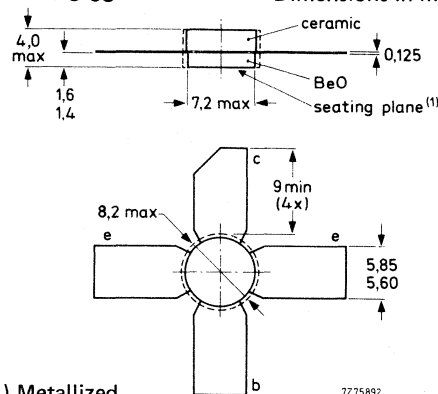


Fig. 1a For top view see Fig. 1b.

Torque on nut: min. 0,75 Nm
max. 0,85 Nm

Diameter of clearance hole in heatsink: max. 4,2 mm.

FO-58 Dimensions in mm



(1) Metallized.

Fig. 1b.

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.

RATINGS

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

		PEE/PDE1001U	1003U	1005U	1010U	
Collector-base voltage open emitter	V _{CB0}	max. 39	39	39	45	V
Collector-emitter voltage R _{BE} = 10 Ω	V _{CER}	max. 39	39	39	45	V
Emitter-base voltage open collector	V _{EBO}	max. 3,5	3,5	3,5	3,5	V
Collector current (peak value)	I _{CM}	max. 250	450	900	1000	mA
Total power dissipation up to T _{mb} = 25 °C	P _{tot}	max. 5	7	12,5	20	W
Storage temperature	T _{stg}	-65 to +150				°C
Operating junction temperature	T _j	max. 200				°C
Lead soldering temperature at 0,7 mm from ceramic; t _{sld} ≤ 10 s	T _{sld}	max. 235				°C

THERMAL RESISTANCE

From junction to mounting base

		PEE/PDE1001U	1003U	1005U	1010U	
From junction to mounting base	R _{th j-mb}	max. 25	18	10	6	K/W

MICROWAVE POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates in c.w. conditions and is recommended in common-base class-B amplifiers up to 3 GHz.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 53 metal ceramic flange package.

It is mounted in a common-base configuration, specified in class-B and operates in c.w. conditions.

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-B selective amplifier.

Typical values

mode of operation	f GHz	V _{CC} V	P _L W	G _p dB	η_c %	\bar{z}_i Ω	\bar{Z}_L Ω
c.w. class-B	3	28	1,2	10	33	50 + j30	2,5 + j5

MECHANICAL DATA

FO-53 (see Fig. 1)

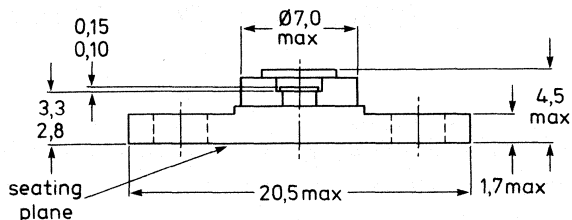
PRODUCT SAFETY

This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that BeO disc is not damaged.

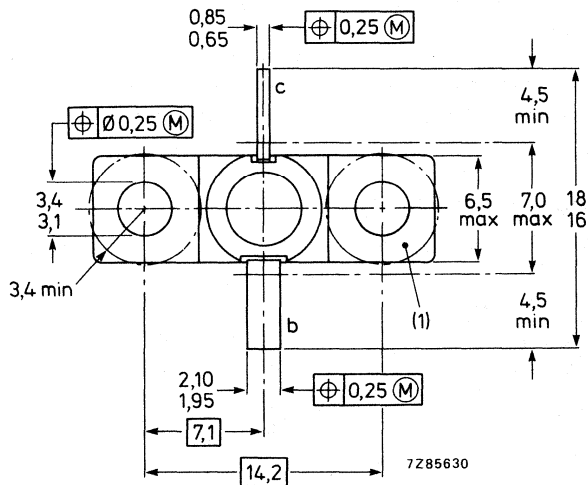
MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-53.



Torque on nut: max 0,4 Nm
Recommended screw: M2,5



RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	45 V
Collector-emitter voltage (open base)	V_{CEO}	max.	20 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3 V
Collector current	I_C	max.	160 mA
Total power dissipation $T_{mb} = 75\text{ }^\circ\text{C}$	P_{tot}	max.	4,5 W
Storage temperature	T_{stg}		-65 to 200 $^\circ\text{C}$
Junction temperature	T_j	max.	200 $^\circ\text{C}$
Soldering temperature at 0,1 mm from case; $t_{sld} \leq 10\text{ s}$	T_{sld}	max.	235 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j-mb}$	22 K/W
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MICROWAVE POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates in c.w. conditions and is recommended in common-base class-B amplifiers up to 3 GHz.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 53 metal ceramic flange package.

It is mounted in a common-base configuration, specified in class-B and operates in c.w. conditions.

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-B selective amplifier.

Typical values

mode of operation	f GHz	V_{CC} V	P_L W	G_p dB	η_c %	\bar{z}_i Ω	\bar{Z}_L Ω
c.w. class-B	3	28	3,5	7	35	$9 + j18$	$2 - j6$

MECHANICAL DATA

FO-53 (see Fig. 1)

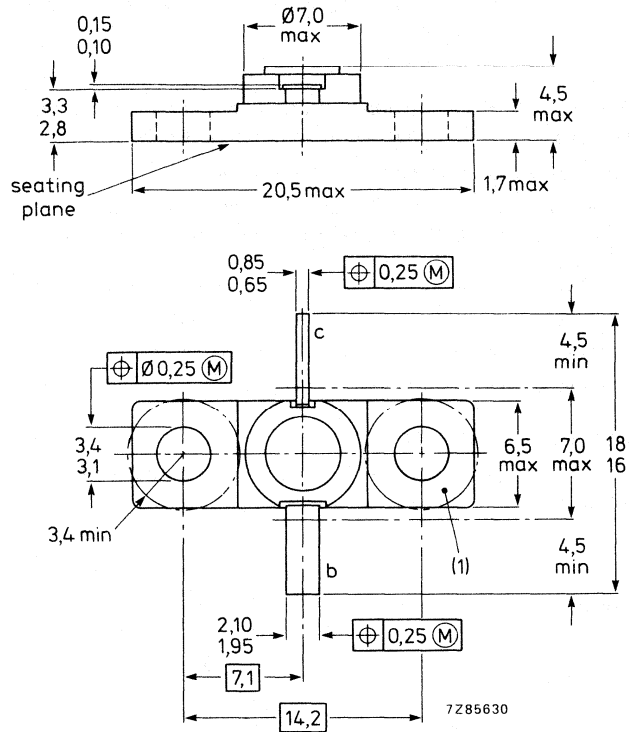
PRODUCT SAFETY

This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that BeO disc is not damaged.

MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-53.



Torque on nut: max 0,4 Nm
Recommended screw: M2,5

RATINGS

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

Collector-base voltage (open emitter)	V_{CB0}	max.	45 V
Collector-emitter voltage (open base)	V_{CE0}	max.	20 V
Emitter-base voltage (open collector)	V_{EB0}	max.	3 V
Collector current	I_C	max.	900 mA
Total power dissipation	P_{tot}	max.	11 W
Storage temperature	T_{stg}		-65 to 200 °C
Junction temperature	T_j	max.	200 °C
Soldering temperature at 0,1 mm from case; $t_{sld} \leq 10$ s	T_{sld}	max.	235 °C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j-mb}$	11 K/W
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MICROWAVE POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates in c.w. conditions and is recommended in common-base class-B amplifiers up to 3 GHz.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance.

The transistor has an FO 53 metal ceramic flange package.

It is mounted in a common-base configuration, specified in class-B and operates in c.w. conditions.

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-B selective amplifier.

Typical values

mode of operation	f GHz	V _{CC} V	P _L W	G _p dB	η_c %	\bar{z}_i Ω	\bar{Z}_L Ω
c.w. class-B	3	28	5	5,2	29	5 + j25	1 + j14

MECHANICAL DATA

FO-53 (see Fig. 1)

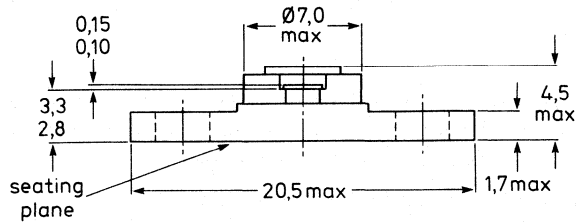
PRODUCT SAFETY

This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

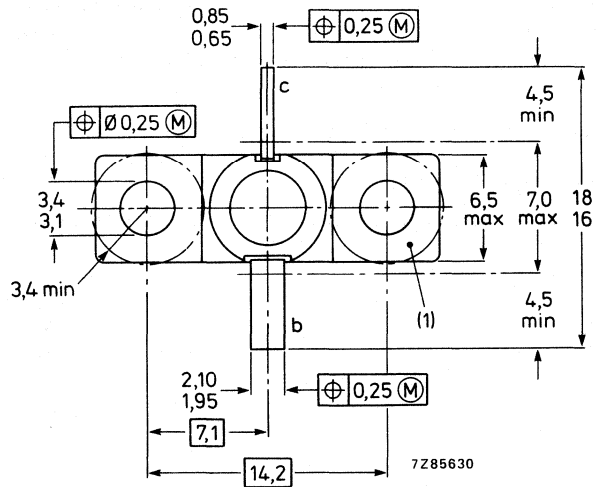
MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-53.



Torque on nut: max. 0,4 Nm
Recommended screw: M2,5



RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	45 V
Collector-emitter voltage ($R_{BE} = 10 \Omega$) (open base)	V_{CER}	max.	45 V
	V_{CEO}	max.	20 V
Emitter-base voltage	V_{EBO}	max.	3 V
Collector current	I_C	max.	1500 mA
Total power dissipation	P_{tot}	max.	18 W
Storage temperature	T_{stg}		-65 to 200 °C
Junction temperature	T_j	max.	200 °C
Soldering temperature at 0,1 mm from case; $t_{sld} \leq 10$ s	T_{sld}	max.	235 °C

THERMAL RESISTANCE

From junction to mounting base	$R_{th j-mb}$	7 K/W
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C.W. AND PULSED MICROWAVE POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates in c.w. and pulsed conditions and is recommended for NAVAID applications (IFF, DME, TACAN) in common-base class-B amplifier up to 1,3 GHz.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 53 metal ceramic flange package.

It is mounted in a common-base configuration, specified in class-B and operates in pulsed and c.w. conditions.

Internal input prematching ensures a good stability and easy broadband usage.

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-B broadband amplifier.

Typical values

mode of operation	f GHz	V _{CC} V	P _L W	G _p dB	η_c %	\bar{z}_i Ω	\bar{z}_L Ω
pulsed $t_p = 10\ \mu\text{s}$ $\delta = 10\%$	0,960 to 1,215	28	5	9	45	7 + 5,5 (at f = 1,09 GHz)	8 + j13
c.w.	1,2	28	6,5	10,5	45	—	—

MECHANICAL DATA

FO-53 (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.

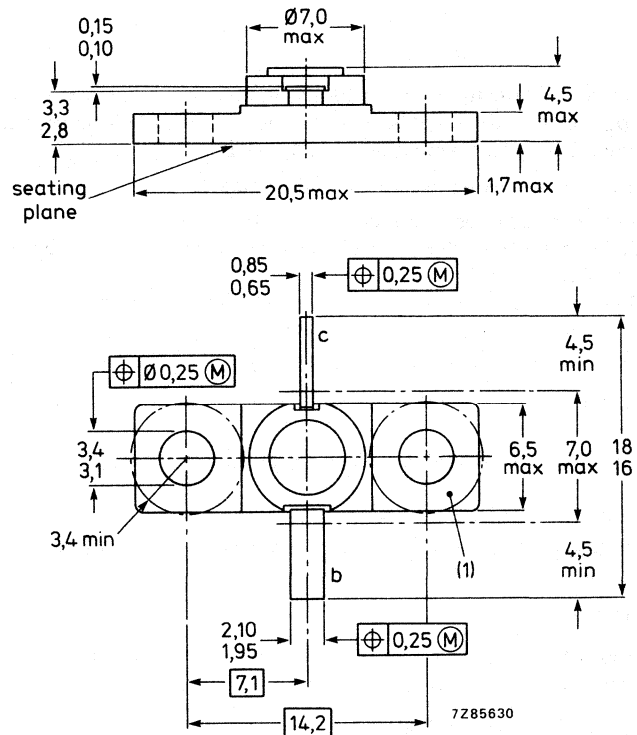
MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-53.

Marking code:

RTC1005M



RATINGS

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

Collector-base voltage (open emitter)	V_{CB0}	max.	40 V
Collector-emitter voltage ($R_{BE} = 10 \Omega$)	V_{CER}	max.	40 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3 V
Collector current ($t_p \leq 10 \mu s, \delta \leq 10\%$)	I_C	max.	1,2 A
Total power dissipation ($t_p \leq 10 \mu s, \delta \leq 10\%, T_{mb} \leq 75 \text{ }^\circ\text{C}$)	P_{tot}	max.	17,5 W
Storage temperature	T_{stg}		-65 to 200 $^\circ\text{C}$
Junction temperature	T_j	max.	200 $^\circ\text{C}$
Soldering temperature at 0.1 mm from case; $t_{sld} \leq 10$ s	T_{sld}	max.	235 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to mounting base	$R_{th j-mb}$	7,5 K/W
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MICROWAVE POWER TRANSISTOR

N-P-N silicon transistor for use in space, military and professional applications.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency.
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high VSWR.
- Gold metallization realizes very good stability of the characteristics and excellent lifetime.
- Multicell geometry gives good balance of dissipated power and low thermal resistance.

QUICK REFERENCE DATA

R.F. performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-C circuit

mode of operation	f GHz	V_{CE} V	P_L W	G_p dB	η_c %	\bar{z}_i Ω	\bar{z}_L Ω
c.w.	1	28	typ. 25	typ. 11	typ. 58	$2 + j6,5$	$5 + j1$
c.w.	2	28	typ. 10	typ. 6	typ. 42	$7 + j6,75$	$1,5 - j7$

MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-53.

Base connected to flange

Pinning ;

- 1 = collector
- 2 = emitter
- 3 = base

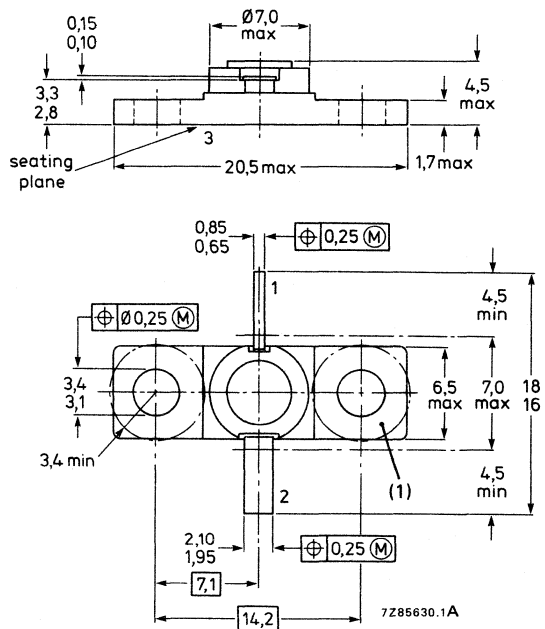
Torque on nut: max. 0,5 Nm

Recommended screw: M3

Marking code

RTC2010M = PKB20010U

(1) Flatness of this area ensures full thermal contact with bolt head.



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.

RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	40 V
Collector-emitter voltage	V_{CER}	max.	40 V
$R_{BE} \leq 10 \Omega$	V_{CEO}	max.	22 V
open base	V_{EBO}	max.	3 V
Emitter-base voltage (open collector)	I_C	max.	2 A
Collector current (d.c.)	P_{tot}	max.	25 W
Total power dissipation up to $T_{mb} = 75 \text{ }^\circ\text{C}$	T_{stg}	-65 to +200	$^\circ\text{C}$
Storage temperature	T_j	max.	200 $^\circ\text{C}$
Junction temperature	T_{sld}	max.	235 $^\circ\text{C}$
Lead soldering temperature			
at 0,3 mm from the case; $t_{sld} \leq 10 \text{ s}$			

THERMAL RESISTANCE

From junction to mounting base	$R_{th \text{ j-mb}}$	=	4 K/W
From mounting base to heatsink	$R_{th \text{ mb-h}}$	=	0,7 K/W

MICROWAVE POWER TRANSISTORS

NPN silicon transistors primarily intended for use in space, military and professional applications up to 2 GHz.

They offer the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistors have an FO 53 metal ceramic hermetic flange package.

Transistors are mounted in a common-base configuration specified in class-B and operates in c.w. conditions.

An input matching cell improves the input impedance and allows an easier design of broadband circuits.

QUICK REFERENCE DATA

R.F. performances, common-base, class-B.

Typical values

type	mode of operation	f GHz	V _{CC} V	PL W	G _p dB	η_c %	\bar{z}_i Ω	\bar{Z}_L Ω
PKB23001U	c.w. class-B	1	28	2,5	9,5	45	6 + j2	33 + j22
		2		1,5	7	32	8 + j0	10 + j14
PKB23003U	c.w. class-B	1	28	5	11	70	4 + j4	17 + j19
		2		3,4	9,3	50	7 + j5	4 + j2
PKB23005U	c.w. class-B	1	28	19	11	58	3,5 + j6,5	10 + j6
		2		8	7,2	53	6 + j8	3 - j1,5

MECHANICAL DATA

FO-53 (see Fig. 1)

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.

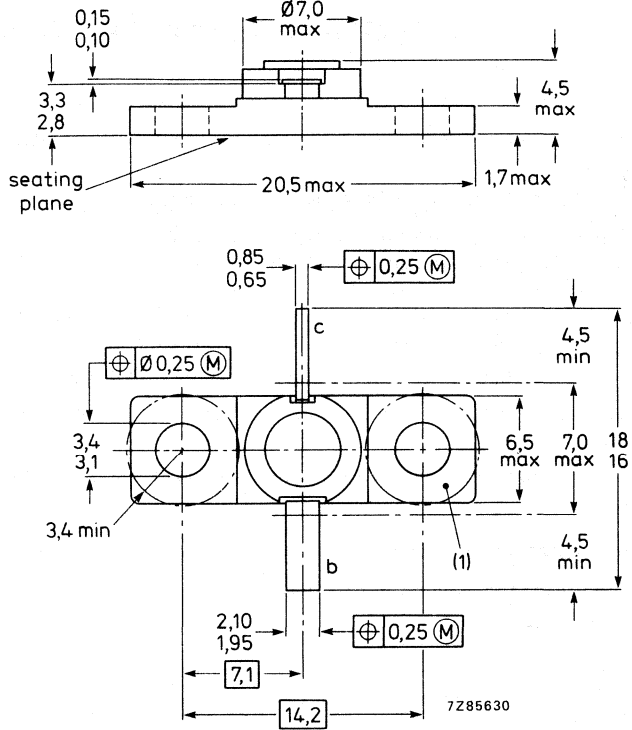
MECHANICAL DATA

Fig. 1 FO-53.

Dimensions in mm

Marking code:

PKB23001U: 2001M
 PKB23003U: 2003M
 PKB23005U: 2005M



RATINGS

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

		PKB23001U	PKB23003U	PKB23005U	
Emitter-base voltage (open collector)	V_{EBO}	max. 3	3	3	V
Collector-base voltage (open emitter)	V_{CBO}	max. 45	45	45	V
Collector-emitter voltage ($R_{BE} = 10 \Omega$)	V_{CER}	max. 45	45	45	V
Collector-emitter voltage (open base)	V_{CEO}	max. 20	20	20	V
Collector current	I_C	max. 0,3	0,6	1,5	A
Total power dissipation class-B; $T_{mb} \leq 75 \text{ }^\circ\text{C}$	P_{tot}	max. 4	7,5	18	W
Junction temperature	T_j	max. 200	200	200	$^\circ\text{C}$
Storage temperature	T_{stg}	min. -65 max. 200	-65 200	-65 200	$^\circ\text{C}$
Soldering temperature ($d = 0,7 \text{ mm}$; $t_{sld} = 10 \text{ s}$)	T_{sld}	max. 235	235	235	$^\circ\text{C}$
THERMAL RESISTANCE					
Junction-mounting base	$R_{th j-mb}$	30	18	7	K/W
From mounting base to heatsink	$R_{th mb-h}$	0,7	0,7	0,7	K/W

MICROWAVE POWER TRANSISTOR

NPN bipolar transistor intended for use in common-base class-B power amplifiers up to 2,45 GHz. Diffused emitter ballasting resistors, multicell geometry, interdigitated structure, localized thick oxide and gold metallization ensure an optimum temperature profile and excellent performances at such frequencies.

The transistor has an FO 53 metal ceramic hermetic package.

QUICK REFERENCE DATA

R.F. performances, common-base, class-B

Typical values

mode of operation	f GHz	V _{CE} V	P _L W	G _p dB	η _c %	\bar{z}_i Ω	\bar{z}_L Ω
c.w. class-B	2,3	21	9	10	40	5 + j10	2,5 - j5
c.w. class-B	2,45	21	8	9	35	7,5 + j25	2,5 - j6,5

MECHANICAL DATA

FO-53 (see Fig. 1).

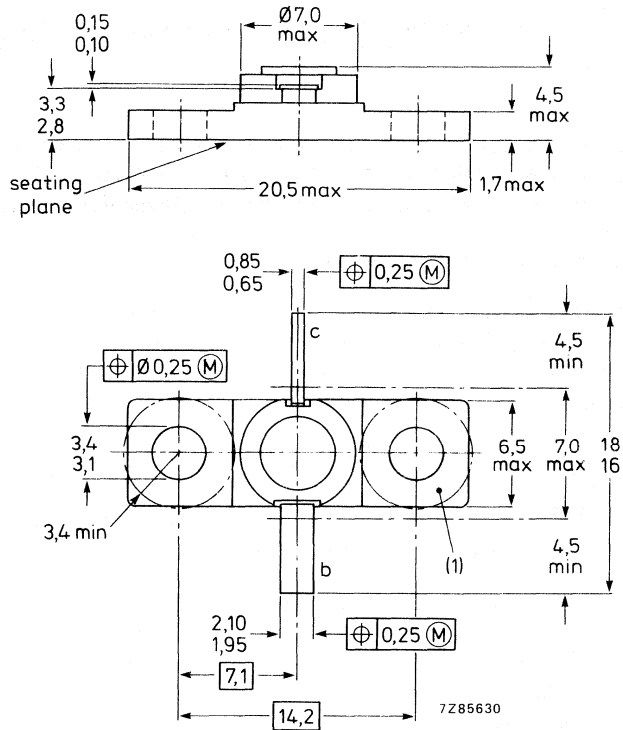
PRODUCT SAFETY

These devices contain 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 FO-53.



RATINGS

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

Collector-base voltage (open emitter)	V_{CB0}	max.	35 V
Collector-emitter voltage ($R_{BE} = 10 \Omega$)	V_{CER}	max.	35 V
Collector-emitter voltage (open base)	V_{CEO}	max.	15 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5 V
Collector current (d.c.)	I_C	max.	1,7 A
Total power dissipation ($T_{mb} \leq 75 \text{ }^\circ\text{C}$)	P_{tot}	max.	16,5 W
Storage temperature	T_{stg}	min.	-65 $^\circ\text{C}$
Operating junction temperature	T_j	max.	200 $^\circ\text{C}$
Soldering temperature at 0,7 mm from case; $t_{sld} \leq 10 \text{ s}$	T_{sld}	max.	230 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to mounting base	$R_{th \text{ j-mb}}$	=	6 K/W
From mounting base to heatsink (torque on nut: 0,5 Nm with M3 screw)	$R_{th \text{ mb-h}}$	=	0,7 K/W

MICROWAVE POWER TRANSISTORS

N-P-N silicon transistors for use in common-base class-B power amplifiers up to 3 GHz.

Diffused emitter ballasting resistors, interdigitated structure, multicell geometry and gold sandwich metallization ensure an optimum temperature profile and excellent performance and reliability.

QUICK REFERENCE DATA

R.F. performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-B circuit

type number	mode of operation	f GHz	V_{CE} V	P_L W	G_p dB	η %	\bar{z}_i Ω	\bar{Z}_L Ω
PKB32001U	c.w.	3	28	typ. 1,3	typ. 8,1	typ. 34	$11 + j1,8$	$3 + j3,5$
PKB32003U	c.w.	3	28	typ. 3,2	typ. 6,3	typ. 33	$14 - j4$	$2,5 - j1$
PKB32005U	c.w.	3	28	typ. 5	typ. 5,2	typ. 31	$13 + j2$	$2 - j4$

MECHANICAL DATA

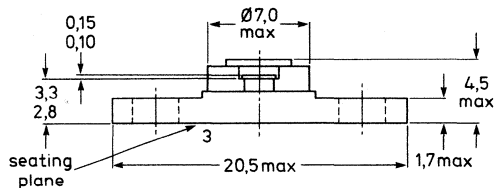
Dimensions in mm

Fig. 1 FO-53.

Base connected to flange

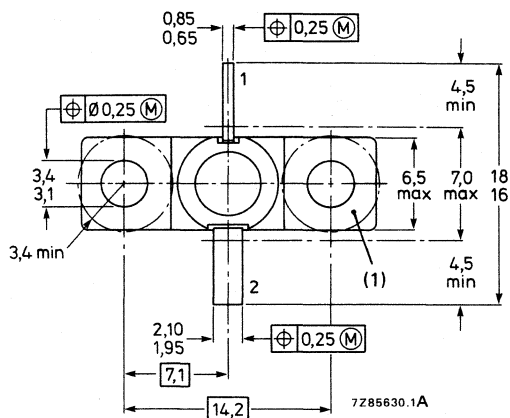
Pinning ;

- 1 = collector
- 2 = emitter
- 3 = base



Torque on nut: max. 0,5 Nm

Recommended screw: M3



Marking code

- RTC3001M = PKB32001U
- RTC3003M = PKB32003U
- RTC3005M = PKB32005U

(1) Flatness of this area ensures full thermal contact with bolt head.

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.

RATINGS

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

		PKB32001U	32003U	32005U	
Collector-base voltage open emitter	V_{CBO}	max. 45	45	45	V
Collector-emitter voltage $R_{BE} = 10 \Omega$	V_{CER}	max. 45	45	45	V
Emitter-base voltage open collector	V_{EBO}	max. 3	3	3	V
Collector current (d.c.)	I_C	max. 0,4	0,8	2	A
R.F. power dissipation ($f > 1$ MHz) up to $T_{mb} = 75^\circ C$	P_{rf}	max. 4,5	9	15	W
Storage temperature	T_{stg}	max. -65 to + 200			$^\circ C$
Junction temperature	T_j	max.	200		$^\circ C$
Lead soldering temperature at 0,3 mm from ceramic; $t_{sld} \leq 10$ s	T_{sld}	max.	235		$^\circ C$

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j-mb}$	max. 22	11	6,6	K/W
From mounting base to heatsink	$R_{th\ mb-h}$	max. 0,7	0,7	0,7	K/W

MICROWAVE POWER TRANSISTORS

N-P-N silicon power transistor for use in a common-collector oscillator circuits in military and professional applications.

The transistors operate in c.w. conditions and are recommended for applications up to 8 GHz.

Features:

- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high VSWR
- Gold metallization realizing a very good stability of the characteristics and excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance
- New 5 GHz technology.

The PPC5001T is housed in a metal ceramic flange envelope (FO-102).

The PQC5001T is housed in a metal ceramic flange envelope (FO-85).

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an oscillator circuit up to 5 GHz.

mode of operation	f GHz	V _{CE} V	I _C mA	P _L mW
class-B; c.w.	5	20	200	450

MECHANICAL DATA

Dimensions in mm

PPC5001T FO-102 (see Fig. 1a)

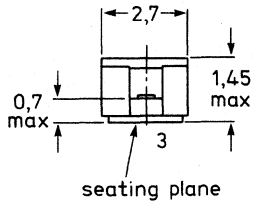
PQC5001T FO-85 (see Fig. 1b).

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Fig. 1a FO-102.

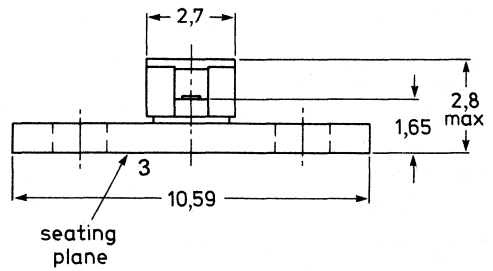
PPC5001T



Dimensions in mm

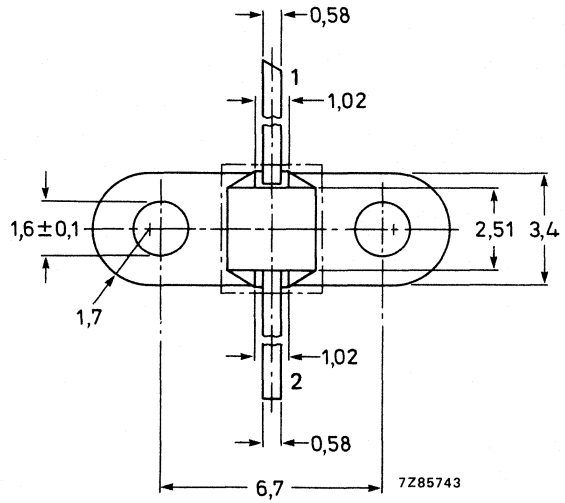
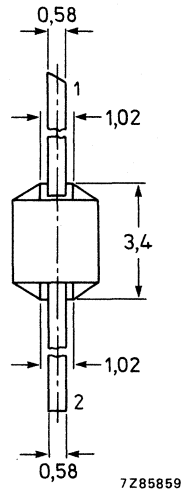
Fig. 1b FO-85.

PQC5001T



Pinning:

- 1 = base
- 2 = emitter
- 3 = collector



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.	40 V
Collector-emitter voltage, $R_{BE} = 70 \Omega$ open emitter	V_{CER} V_{CEO}	max.	35 V 16 V
Emitter-base voltage, open collector	V_{EBO}	max.	3,5 V
Collector current, d.c.	I_C	max.	0,25 A
Total power dissipation up to $T_{amb} = 75 \text{ }^\circ\text{C}$	P_{tot}	max.	4 W
Storage temperature	T_{stg}		-65 to +200 $^\circ\text{C}$
Junction temperature	T_j	max.	200 $^\circ\text{C}$
Soldering temperature at 0,1 mm from the case, $t_{sld} \leq 10 \text{ s}$	T_{sld}	max.	235 $^\circ\text{C}$

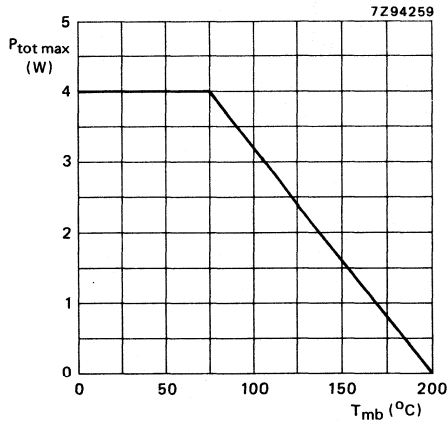


Fig. 2 Power derating curve versus mounting base temperature.

THERMAL RESISTANCE (at $T_j = 75 \text{ }^\circ\text{C}$)

From junction to mounting base	$R_{th \text{ j-mb}}$	=	24 K/W
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CHARACTERISTICS

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

Breakdown voltages

$I_C = 500 \mu\text{A}; I_E = 0$	$V(\text{BR})_{CBO}$	\geq	40 V
$I_C = 2,5 \text{ mA}; R_{BE} = 70 \Omega$	$V(\text{BR})_{CER}$	\geq	35 V
$I_C = 0; I_E = 100 \mu\text{A}$	$V(\text{BR})_{EBO}$	\geq	3,5 V

Collector cut-off current

$I_E = 0; V_{CB} = 24 \text{ V}$	I_{CBO}	\leq	100 μA
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Emitter cut-off current

$I_C = 0; V_{EB} = 1,5 \text{ V}$	I_{EBO}	\leq	0,2 μA
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Collector-base capacitance at $f = 1 \text{ MHz}$

$I_E = I_C = 0; V_{CB} = 18 \text{ V}; V_{EB} = 1,5 \text{ V}$	C_{cb}	typ.	1,4 pF
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Emitter-base capacitance at $f = 1 \text{ MHz}$

$I_E = I_C = 0$; $V_{EB} = 1 \text{ V}$; $V_{CB} = 10 \text{ V}$

C_{eb} typ. 5,5 pF

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

$I_E = I_C = 0$; $V_{CE} = 18 \text{ V}$; $V_{EB} = 1,5 \text{ V}$

C_{ce} typ. 0,9 pF

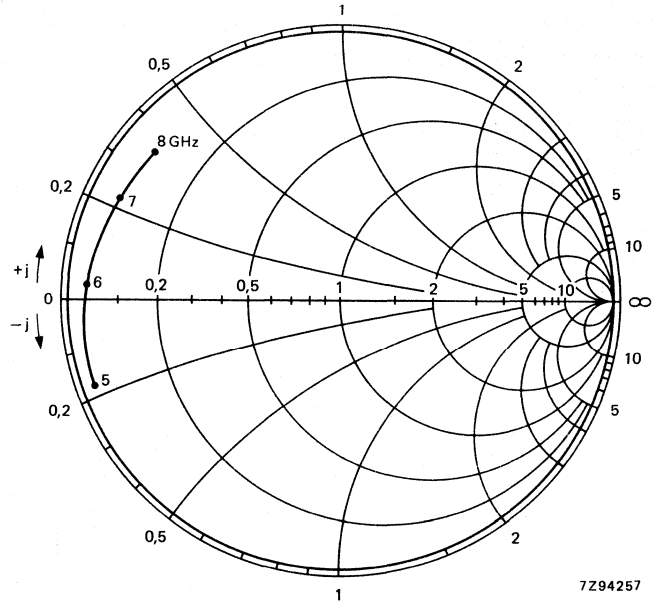


Fig. 3 Emitter reflection coefficient.

Conditions for Figs 3 and 4:

$V_{CE} = 20 \text{ V}$; $I_C = 200 \text{ mA}$;
 $Z_0 = 50 \Omega$

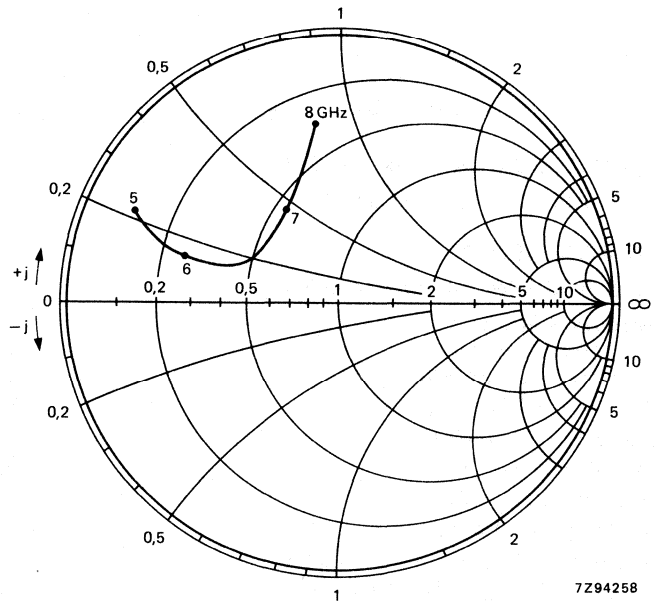


Fig. 4 Base reflection coefficient.

MICROWAVE POWER TRANSISTORS

N-P-N silicon transistors for use in common-base class-B power amplifiers up to 4,2 GHz.

Diffused emitter ballasting resistors, interdigitated structure, multicell geometry, localized thick oxide auto-alignment process and gold sandwich metallization ensure an optimum temperature profile and excellent performance and reliability.

QUICK REFERENCE DATA

R.F. performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-B circuit

type number	mode of operation	f GHz	V _{CE} V	P _L W	G _p dB	η %	\bar{z}_i Ω	\bar{z}_L Ω
PTB23001X	c.w.	2	24	typ. 1,8	typ. 9	typ. 50	8 + j14	8 + j20
PTB23003X	c.w.	2	24	typ. 4,0	typ. 10	typ. 50	2,5 + j14	8 + j6
PTB23005X	c.w.	2	24	typ. 7,0	typ. 11	typ. 50	1,9 + j12	7,5 + j3

MECHANICAL DATA

Fig. 1 FO-41B.

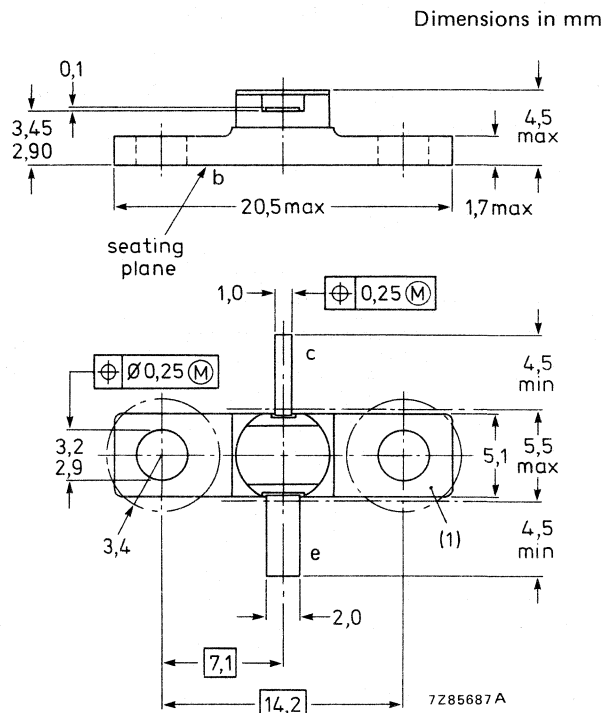
Base and metallic cap connected to flange.

Torque on screw: max. 0,5 Nm

Recommended screw: M2,5

Marking code: 2301X for PTB23001X
 2303X for PTB23003X
 2305X for PTB23005X

(1) Flatness of this area ensures full thermal contact with bolt head.



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.

RATINGS

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

			PTB23001X	23003X	23005X
Collector-base voltage open emitter	V_{CBO}	max.	40	40	40 V
Collector-emitter voltage $R_{BE} = 10 \Omega$ open base	V_{CER} V_{CEO}	max. max.	40 15	40 15	40 V 15 V
Emitter-base voltage open collector	V_{EBO}	max.	3,5	3,5	3,5 V
Collector current (d.c.)	I_C	max.	0,25	0,5	0,75 A
Total power dissipation ($f > 1$ MHz) up to $T_{mb} = 75^\circ C$	P	max.	5,5	10	14,5 W
Storage temperature	T_{stg}		-65 to + 200		
Junction temperature	T_j	max.	200		
Lead soldering temperature at 0,3 mm from ceramic; $t_{sld} \leq 10$ s	T_{sld}	max.	235 $^\circ C$		

→ **THERMAL RESISTANCE** (at $T_j = 75^\circ C$)

			PTB23001X	23003X	23005X
From junction to mounting base	$R_{th\ j-mb}$	max.	22	12	8,5 K/W
From mounting base to heatsink	$R_{th\ mb-h}$	max.	0,7	0,7	0,7 K/W

PTB23001X

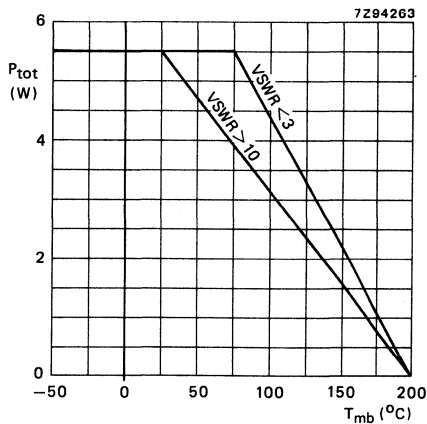


Fig. 2 Maximum permissible R.F. power dissipation as a function of mounting base temperature. $f > 1$ MHz.

PTB23003X

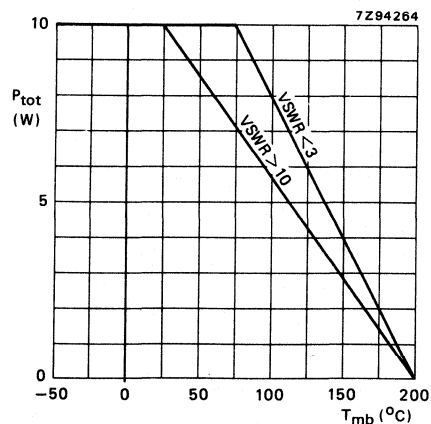
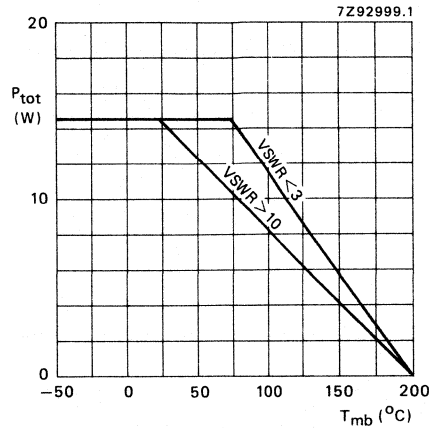


Fig. 3 Maximum permissible R.F. power dissipation as a function of mounting base temperature. $f > 1$ MHz.



PTB23005X

Fig. 4 Maximum permissible R.F. power dissipation as a function of mounting base temperature. $f > 1$ MHz.

CHARACTERISTICS

		PTB23001X	23003X	23005X
Collector-base breakdown voltage				
open emitter; $I_C = 1$ mA	\geq	40	—	— V
open emitter; $I_C = 2$ mA	$V(BR)_{CBO} \geq$	—	40	— V
open emitter; $I_C = 3$ mA	\geq	—	—	40 V
Collector-emitter breakdown voltage				
$R_{BE} = 10 \Omega$; $I_C = 10$ mA	$V(BR)_{CER} \geq$	40	40	40 V
Emitter-base breakdown voltage				
open collector; $I_E = 0,5$ mA	\geq	3,5	—	— V
open collector; $I_E = 1,0$ mA	$V(BR)_{EBO} \geq$	—	3,5	— V
open collector; $I_E = 1,5$ mA	\geq	—	—	3,5 V
Collector cut-off current				
$I_E = 0$; $V_{CB} = 24$ V	$I_{CBO} \leq$	10	20	30 μA
Emitter cut-off current				
$I_C = 0$; $V_{EB} = 1,5$ V	$I_{EBO} \leq$	0,2	0,4	0,6 μA
Collector-base capacitance at $f = 1$ MHz				
$I_E = I_C = 0$; $V_{CB} = 24$ V; $V_{EB} = 1,5$ V	C_{cb} typ.	2,2	3	3,8 pF
Collector-emitter capacitance at $f = 1$ MHz				
$I_E = I_C = 0$; $V_{CB} = 24$ V; $V_{EB} = 1,5$ V	C_{ce} typ.	0,3	0,6	0,9 pF

APPLICATION INFORMATION

Microwave performance in an unneutralized common-base class-B selective amplifier circuit.*

type number	mode of operation	f GHz	V _{CE} V	P _L W	G _p dB	η _C %
PTB23001X	c.w. class-B	2	24	> 1	> 7	> 45
PTB23003X		2	24	> 3	> 8,75	> 45
PTB23005X		2	24	> 5	> 9,2	> 40

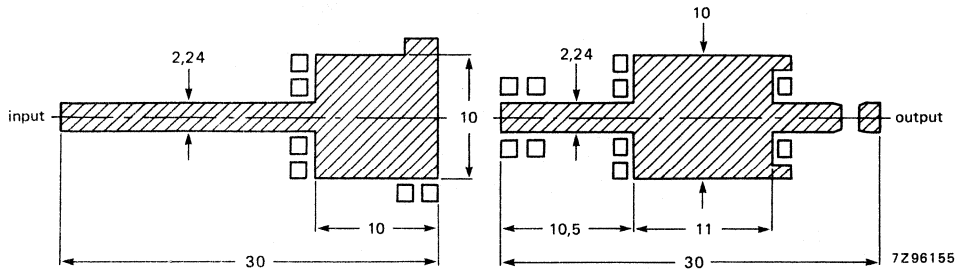


Fig. 5 Prematching test circuit board for PTB23001X.

Circuit on a double Cu-clad printed-circuit board Teflon fibre-glass dielectric ($\epsilon_r = 2,55$); thickness 0,8 mm.

* Circuit consists of prematching circuit board in combination with complementary input and output slug tuners.

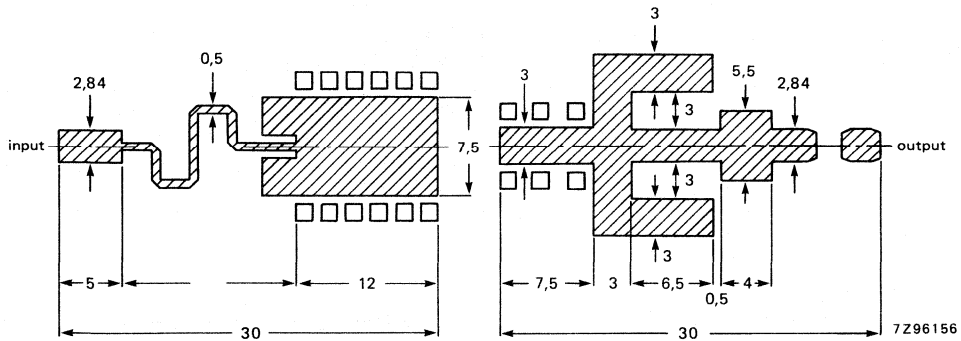


Fig. 6 Prematching test circuit board for PTB23003X.

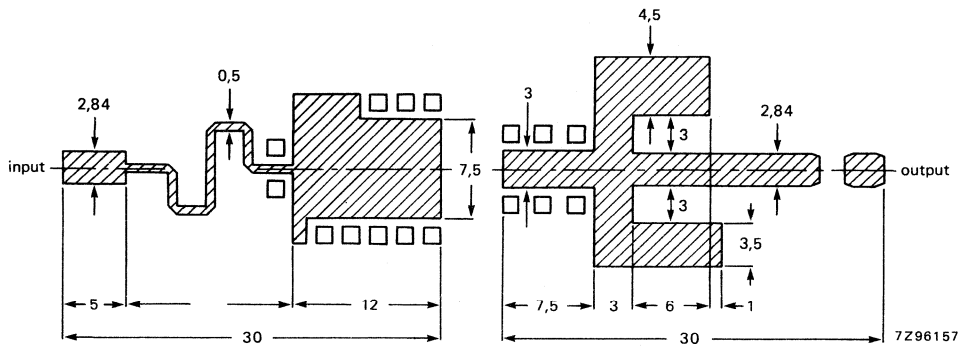


Fig. 7 Prematching test circuit board for PTB23005X.

Circuits on a double Cu-clad printed-circuit board Teflon fibre-glass dielectric ($\epsilon_r = 2,55$ for PTB23003X; $\epsilon_r = 0,55$ for PTB23005X); thickness 0,8 mm.

MICROWAVE POWER TRANSISTORS

N-P-N silicon transistors for use in common-base class-B power amplifiers up to 4,2 GHz.

Diffused emitter ballasting resistors, interdigitated structure, multicell geometry, localized thick oxide auto-alignment process and gold sandwich metallization ensure an optimum temperature profile and excellent performance and reliability.

QUICK REFERENCE DATA

R.F. performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-B circuit

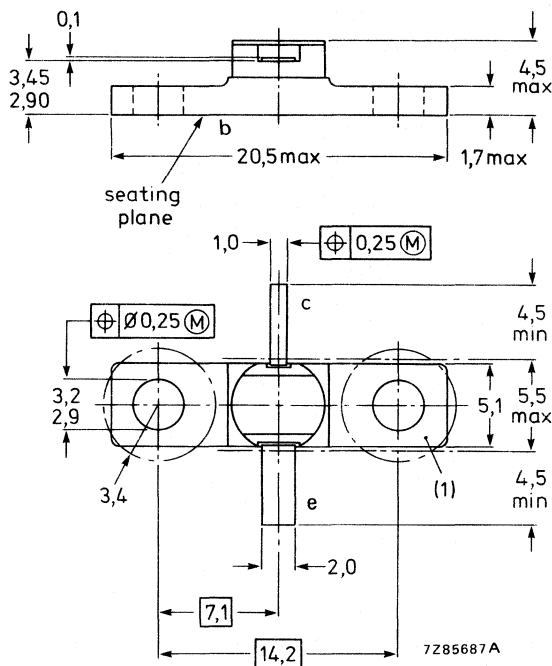
type number	mode of operation	f GHz	V _{CE} V	P _L W	G _p dB	η %	\bar{z}_i Ω	\bar{Z}_L Ω
PTB32001X	c.w.	3	24	typ. 1,8	typ. 9,5	typ. 45	15 + j31	5,5 + j10
PTB32003X	c.w.	3	24	typ. 3,0	typ. 9,5	typ. 40	5,5 + j29	5 - j2,2
PTB32005X	c.w.	3	24	typ. 5,5	typ. 9,5	typ. 40	2,8 + j20	4 - j7

MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-41B.

Base and metallic cap connected to flange.



Torque on screw: max. 0,5 Nm
Recommended screw: M 2,5

Marking code: 3201X for PTB32001X
3203X for PTB32003X
3205X for PTB32005X

(1) Flatness of this area ensures full thermal contact with bolt head.

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.

RATINGS

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

			PTB32001X	32003X	32005X
Collector-base voltage open emitter	V_{CBO}	max.	40	40	40 V
Collector-emitter voltage $R_{BE} = 10 \Omega$ open base	V_{CER}	max.	40	40	40 V
	V_{CEO}	max.	15	15	15 V
Emitter-base voltage open collector	V_{EBO}	max.	3,5	3,5	3,5 V
Collector current (d.c.)	I_C	max.	0,25	0,5	0,75 A
Total power dissipation ($f > 1$ MHz) up to $T_{mb} = 75 \text{ }^\circ\text{C}$	P	max.	5,5	10	14,5 W
Storage temperature	T_{stg}		-65 to + 200		
Junction temperature	T_j	max.	200		
Lead soldering temperature at 0,3 mm from ceramic; $t_{sld} \leq 10$ s	T_{sld}	max.	235 $^\circ\text{C}$		

THERMAL RESISTANCE (at $T_j = 75 \text{ }^\circ\text{C}$)

			PTB32001X	32003X	32005X
From junction to mounting base	$R_{th j-mb}$	max.	22	12	8,5 K/W
From mounting base to heatsink	$R_{th mb-h}$	max.	0,7	0,7	0,7 K/W

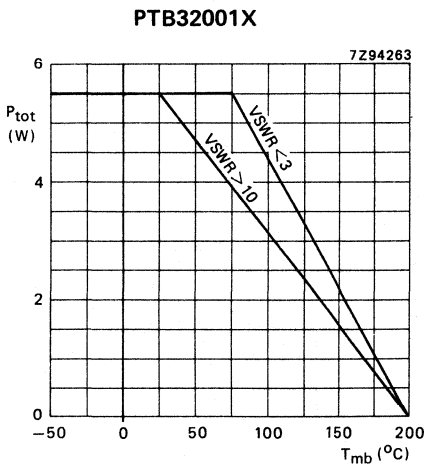


Fig. 2 Maximum permissible R.F. power dissipation as a function of mounting base temperature. $f > 1$ MHz.

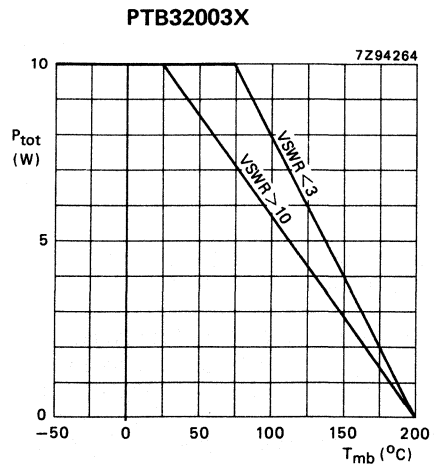
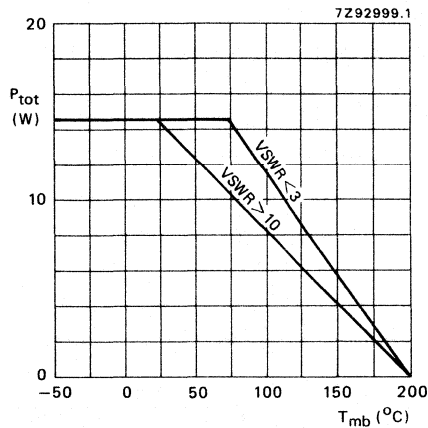


Fig. 3 Maximum permissible R.F. power dissipation as a function of mounting base temperature. $f > 1$ MHz.



PTB23005X

Fig. 4 Maximum permissible R.F. power dissipation as a function of mounting base temperature. $f > 1$ MHz.

CHARACTERISTICS

		PTB32001X	32003X	32005X	
Collector-base breakdown voltage					
open emitter; $I_C = 1$ mA	\geq	40	—	—	V
open emitter; $I_C = 2$ mA	$V(BR)CBO \geq$	—	40	—	V
open emitter; $I_C = 3$ mA	\geq	—	—	40	V
Collector-emitter breakdown voltage					
$R_{BE} = 10 \Omega$; $I_C = 10$ mA	$V(BR)CER \geq$	40	40	40	V
Emitter-base breakdown voltage					
open collector; $I_E = 0,5$ mA	\geq	3,5	—	—	V
open collector; $I_E = 1,0$ mA	$V(BR)EBO \geq$	—	3,5	—	V
open collector; $I_E = 1,5$ mA	\geq	—	—	3,5	V
Collector cut-off current					
$I_E = 0$; $V_{CB} = 24$ V	$I_{CBO} \leq$	10	20	30	μA
Emitter cut-off current					
$I_C = 0$; $V_{EB} = 1,5$ V	$I_{EBO} \leq$	0,2	0,4	0,6	μA
Collector-base capacitance at $f = 1$ MHz					
$I_E = I_C = 0$; $V_{CB} = 24$ V; $V_{EB} = 1,5$ V	C_{cb} typ.	2,2	3	3,8	pF
Collector-emitter capacitance at $f = 1$ MHz					
$I_E = I_C = 0$; $V_{CB} = 24$ V; $V_{EB} = 1,5$ V	C_{ce} typ.	0,3	0,6	0,9	pF

APPLICATION INFORMATION

Microwave performance in an unneutralized common-base class-B selective amplifier circuit.*

type number	mode of operation	f GHz	V _{CE} V	P _L W	G _p dB	η _C %
PTB32001X	c.w. class-B	3	24	> 1,3	> 8	> 35
PTB32003X		3	24	> 2,5	> 8	> 35
PTB32005X		3	24	> 4,5	> 8	> 35

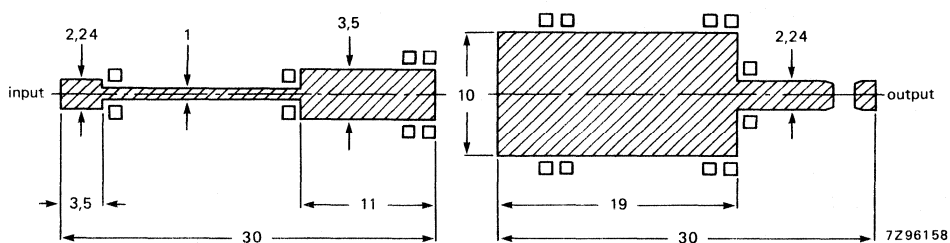


Fig. 5 Prematching test circuit board for PTB32001X.

Circuit on a double Cu-clad printed-circuit board Teflon fibre-glass dielectric ($\epsilon_r = 2,55$); thickness 0,8 mm.

* Circuit consists of prematching circuit board in combination with complementary input and output slug tuners.

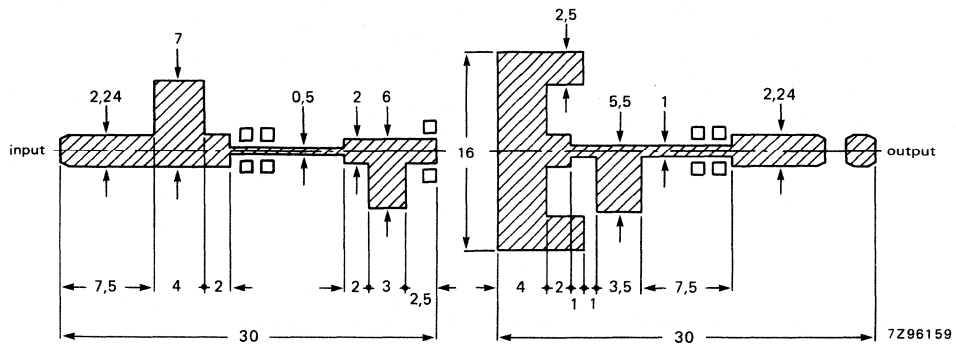


Fig. 6 Prematching test circuit board for PTB32003X.

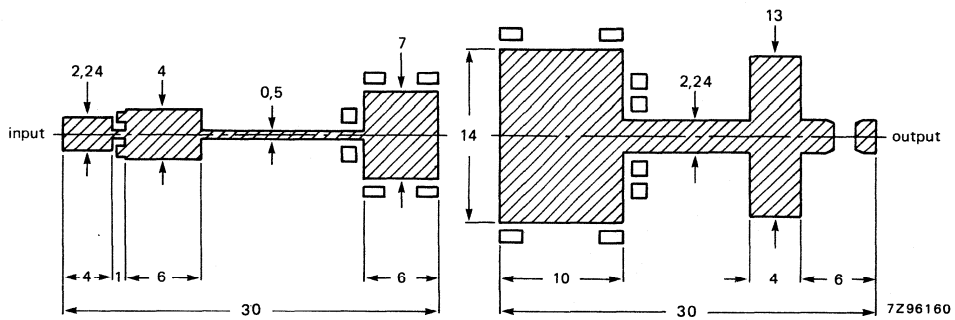


Fig. 7 Prematching test circuit board for PTB32005X.

Circuits on a double Cu-clad printed-circuit board Teflon fibre-glass dielectric ($\epsilon_r = 0,55$); thickness 0,8 mm.

MICROWAVE POWER TRANSISTORS

N-P-N silicon transistors for use in common-base class-B power amplifiers up to 4,2 GHz.

Diffused emitter ballasting resistors, interdigitated structure, multicell geometry, localized thick oxide auto-alignment process and gold sandwich metallization ensure an optimum temperature profile and excellent performance and reliability.

QUICK REFERENCE DATA

R.F. performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-B circuit

type number	mode of operation	f GHz	V _{CC} V	P _L W	G _p dB	η %	\bar{z}_i Ω	\bar{z}_L Ω
PTB42001X	c.w.	4,2	24	typ. 1,0	typ. 6	typ. 33	235 + j0	3,3 - j5,8
PTB42002X	c.w.	4,2	24	typ. 2,0	typ. 6	typ. 35	44,5 + j85	2,4 - j15,5

MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-41B.

Base and metallic cap connected to flange.

Pinning ;

- 1 = collector
- 2 = emitter
- 3 = base

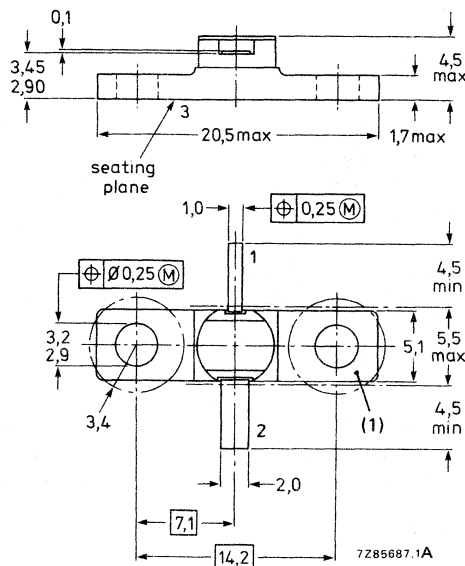
Torque on nut: max. 0,4 Nm

Recommended screw: M2,5

Marking code

RTC4201X = PTB42001X

RTC4202X = PTB42002X



(1) Flatness of this area ensures full thermal contact with bolt head.

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.

RATINGS

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

		PTB42001X	42002X	
Collector-base voltage open emitter	V _{CBO} max.	40	40	V
Collector-emitter voltage R _{BE} = 10 Ω open base	V _{CER} max.	40	40	V
Emitter-base voltage open collector	V _{CEO} max.	15	15	V
Collector current (d.c.)	V _{EBO} max.	3,5	3,5	V
R.F. power dissipation (f > 1 MHz) up to T _{mb} = 75 °C	I _C max.	0,25	0,5	A
Storage temperature	P _{tot} max.	5,5	10	W
Junction temperature	T _{stg}	-65 to +200		°C
Lead soldering temperature at 0,3 mm from ceramic; t _{sld} ≤ 10 s	T _j max.	200		°C
	T _{sld} max.	235		°C

PTB42001X

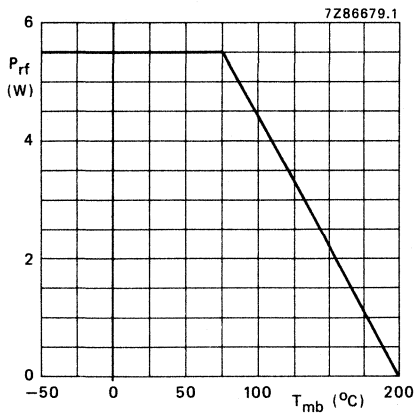


Fig. 2 Maximum permissible R.F. power dissipation as a function of mounting base temperature. f > 1 MHz.

PTB42002X

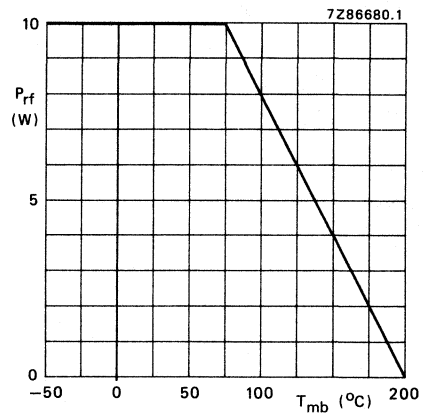


Fig. 3 Maximum permissible R.F. power dissipation as a function of mounting base temperature. f > 1 MHz.

- **THERMAL RESISTANCE** (at T_j = 75 °C)
- From junction to mounting base
 - From mounting base to heatsink

	PTB42001X	42002X	
R _{th j-mb} max.	22	12	K/W
R _{th mb-h} max.	0,7	0,7	K/W

CHARACTERISTICS

Collector-base breakdown voltage

open emitter; $I_C = 1 \text{ mA}$

open emitter; $I_C = 2 \text{ mA}$

Collector-emitter breakdown voltage

$R_{BE} = 10 \Omega$; $I_C = 10 \text{ mA}$

Emitter-base breakdown voltage

open collector; $I_E = 0,5 \text{ mA}$

open collector; $I_E = 1,0 \text{ mA}$

Collector cut-off current

$I_E = 0$; $V_{CB} = 24 \text{ V}$

Emitter cut-off current

$I_C = 0$; $V_{EB} = 1,5 \text{ V}$

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

$I_E = I_C = 0$; $V_{CB} = 24 \text{ V}$; $V_{EB} = 1,5 \text{ V}$

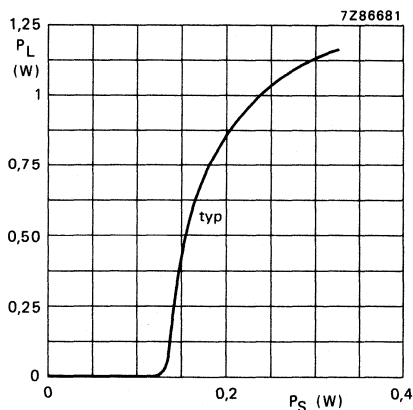
Collector-emitter capacitance at $f = 1 \text{ MHz}$

$I_E = I_C = 0$; $V_{CB} = 24 \text{ V}$; $V_{EB} = 1,5 \text{ V}$

		PTB42001X	42002X	
$V_{(BR)CBO} \geq$		40	—	V
$V_{(BR)CBO} \geq$		—	40	V
$V_{(BR)CER} \geq$		40	40	V
$V_{(BR)EBO} \geq$		3,5	—	V
$V_{(BR)EBO} \geq$		—	3,5	V
$I_{CBO} \leq$		10	20	μA
$I_{EBO} \leq$		0,2	0,4	μA
C_{cb}	typ.	2,2	3	pF
C_{ce}	typ.	0,3	0,6	pF

APPLICATION INFORMATION (see also next page)

PTB42001X



PTB42002X

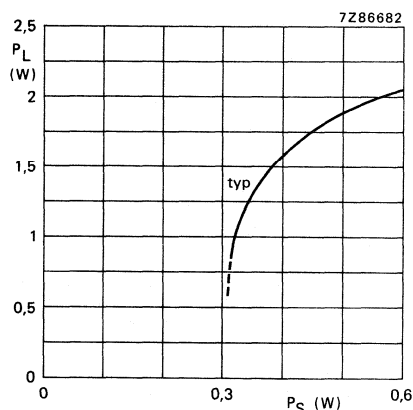


Fig. 4 Load power as a function of source power.

Fig. 5 Load power as a function of source power.

Conditions for Figs 4 and 5:

Class-B operation; $V_{CE} = 24 \text{ V}$; $f = 4,2 \text{ GHz}$; $T_{mb} = 25 \text{ }^\circ\text{C}$.

APPLICATION INFORMATION (see also previous page)

R.F. performance up to $T_{mb} = 25\text{ }^\circ\text{C}$ in an unneutralized common-base class-B circuit*

type number	mode of operation	f GHz	V_{CC} V	P_L W	G_p dB	η %	\bar{z}_i Ω	\bar{z}_L Ω
PTB42001X	c.w.	4,2	24	> 0,8 typ. 1,0	> 5 typ. 6	> 28 typ. 33	$235 + j0$	$3,3 - j5,8$
PTB42002X	c.w.	4,2	24	> 1,6 typ. 2,0	> 5 typ. 6	> 28 typ. 35	$44,5 + j85$	$2,4 - j15,5$

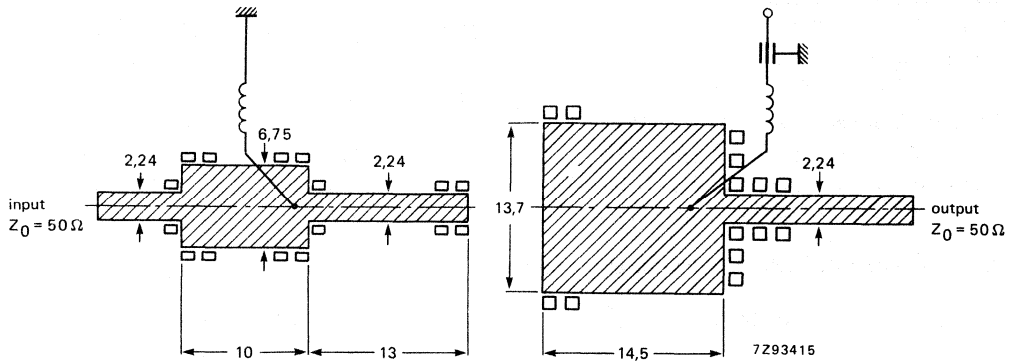


Fig. 6 Prematching test circuit boards for the PTB42001X at 4,2 GHz (Dimensions in mm.)

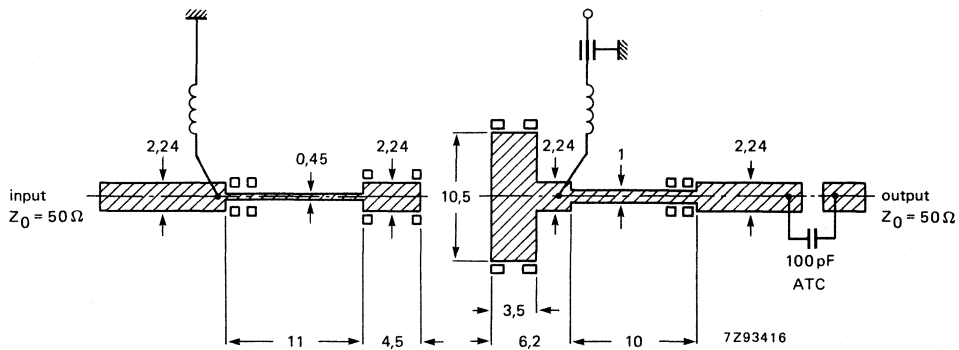


Fig. 7 Prematching test circuit boards for the PTB42002X at 4,2 GHz. (Dimensions in mm.)

Circuits on a double Cu-clad printed-circuit board PTFE fibre-glass dielectric ($\epsilon_r = 2,5$); thickness 0,8 mm.

* Circuit consists of prematching circuit board in combination with complementary input and output slug tuners.

MICROWAVE POWER TRANSISTOR

N-P-N silicon power transistor for use in a common-base, class-C amplifier up to a frequency of 4,2 GHz in c.w. conditions in military and professional applications.

Features:

- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistor providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizing a very good stability of the characteristics and excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance
- An input matching cell improving the input impedance and allowing an easier design of wideband circuits

The transistor is housed in a metal ceramic flange envelope (FO 41B).

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-C selective amplifier.

mode of operation	f GHz	V_{CC} V	P_L W	G_p dB	η_C %	\bar{z}_i Ω	\bar{Z}_L Ω
c.w.; class-C	4,2	24	typ. 3,0	typ. 6,0	typ. 33	$12 + j35$	$2,5 - j10$

MECHANICAL DATA

Dimensions in mm

FO-41B (see Fig. 1).

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Fig. 1 FO-41B.

Dimensions in mm

Base and metallic cap
connected to flange

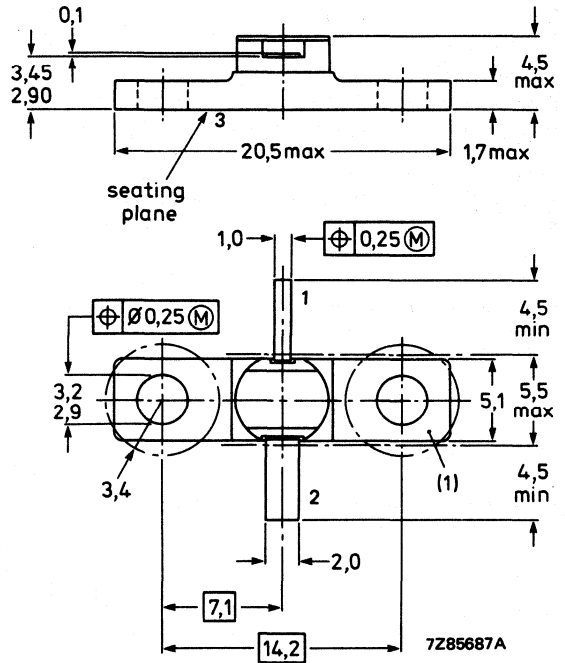
Pinning:

- 1 = collector
- 2 = emitter
- 3 = base



Torque on screw: max. 0,4 Nm

Recommended screw: M2,5 or 4-40 UNC/2A



Marking code: RTC 4203X

(1) Flatness of this area ensures full thermal contact with bolt head.

RATINGS

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

Collector-base voltage, open emitter	V_{CBO}	max.	40 V
Collector-emitter voltage open base	V_{CEO}	max.	15 V
$R_{BE} = 10 \Omega$	V_{CER}	max.	40 V
Emitter-base voltage, open collector	V_{EBO}	max.	3,5 V
Collector current (d.c.)	I_C	max.	0,75 A
Total power dissipation	P_{tot}	max.	14,5 W
Storage temperature	T_{stg}		-65 to + 200 °C
Junction temperature	T_j	max.	200 °C
Soldering temperature at 0,1 mm from ceramic; $t_{sld} \leq 10$ s	T_{sld}	max.	235 °C

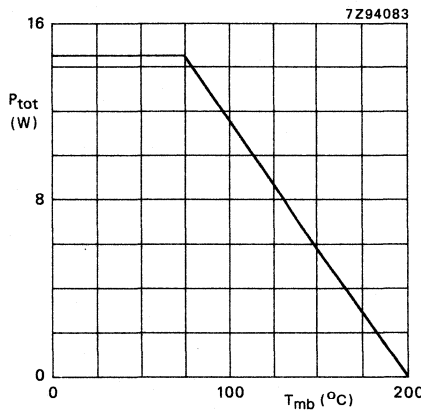


Fig. 2 Power derating curve versus mounting base temperature.

THERMAL RESISTANCE (at $T_j = 75$ °C)

From junction to mounting base	$R_{th j-mb}$	=	8,5 K/W
From mounting base to heatsink	$R_{th mb-h}$	=	0,7 K/W

CHARACTERISTICS

$T_{mb} = 25$ °C unless otherwise specified

Breakdown voltages

$I_C = 3$ mA; $I_E = 0$	$V_{(BR)CBO}$	\geq	40 V
$I_C = 10$ mA; $R_{BE} = 10 \Omega$	$V_{(BR)CER}$	\geq	40 V
$I_C = 0$; $I_E = 1$ mA	$V_{(BR)EBO}$	\geq	3,5 V

Collector cut-off current

$I_E = 0$; $V_{CB} = 24$ V	I_{CBO}	\leq	30 μ A
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Emitter cut-off current

$I_C = 0$; $V_{EB} = 1,5$ V	I_{EBO}	\leq	0,6 μ A
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Collector-base capacitance

$I_E = I_C = 0$; $V_{CB} = 24$ V	C_{cb}	typ.	3,8 pF
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APPLICATION INFORMATION

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-C selective amplifier*

mode of operation	f GHz	V _{CC} V	P _L W	G _D dB	η _C %	\bar{Z}_i Ω	\bar{Z}_L Ω
c.w.; class-C	4,2	24	≥ 2,5	≥ 5	≥ 28	12 + j35	2,5 - j10

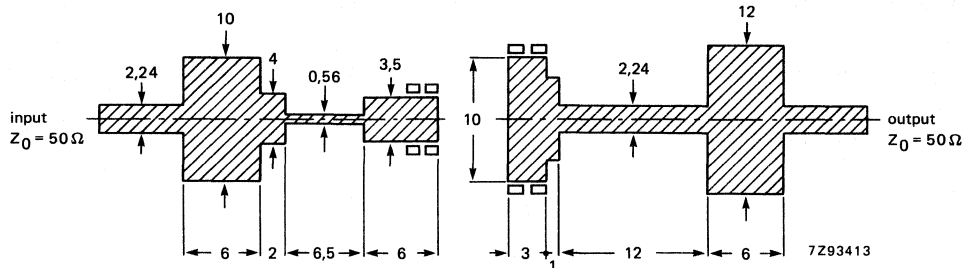


Fig. 3 Prematching test circuit board for 4,2 GHz. (Dimensions in mm).

Striplines on a double Cu-clad printed circuit board with PTFE fibre-glass dielectric ($\epsilon_r = 2,54$), thickness 0,8 mm.

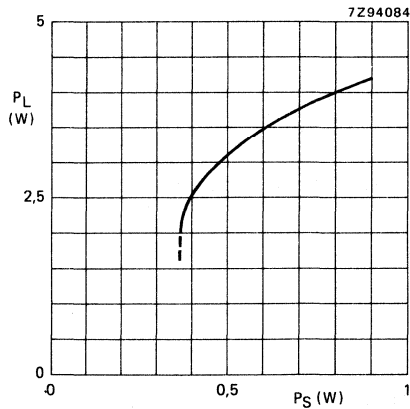


Fig. 4 Load power versus source power.

* Circuit consists of prematching circuit board in combination with complementary input and output slug tuners.

MICROWAVE POWER TRANSISTOR

N-P-N silicon transistor for use in common-base class-B power amplifiers up to 4,2 GHz.

Diffused emitter ballasting resistors, interdigitated structure, multicell geometry, localized thick oxide and gold sandwich metallization ensure an optimum temperature profile and excellent performance and reliability.

QUICK REFERENCE DATA

R.F. performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-B circuit

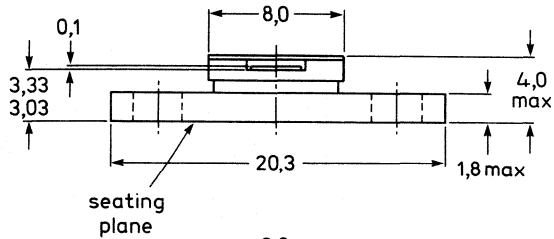
mode of operation	f GHz	V _{CC} V	P _L W	G _p dB	η %	\bar{z}_i Ω	\bar{z}_L Ω
c.w.	3,7 to 4,2	24	typ. 4,5	typ. 7,4	typ. 32	35 + j15	6 + j2

MECHANICAL DATA

Dimensions in mm

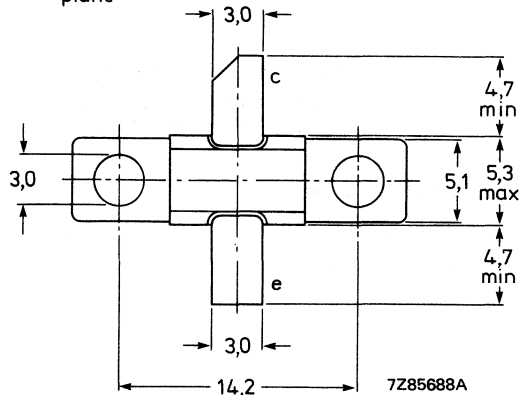
Fig.1 FO-83.

Base connected to flange



Torque on nut: max. 0,5 Nm

Recommended screw: M3



Marking code

RTC3742B4X = PV3742B4X

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.

RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	40 V
Collector-emitter voltage ($R_{BE} \leq 10 \Omega$) (open base)	V_{CER}	max.	40 V
	V_{CEO}	max.	15 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5 V
Collector current (d.c.)	I_C	max.	1 A
Total r.f. power dissipation up to $T_{mb} = 75 \text{ }^\circ\text{C}$	P_{rf}	max.	18 W
Storage temperature	T_{stg}		-65 to +200 $^\circ\text{C}$
Junction temperature	T_j	max.	200 $^\circ\text{C}$
Lead soldering temperature at 0,3 mm from the case; $t_{sld} \leq 10 \text{ s}$	T_{sld}	max.	235 $^\circ\text{C}$

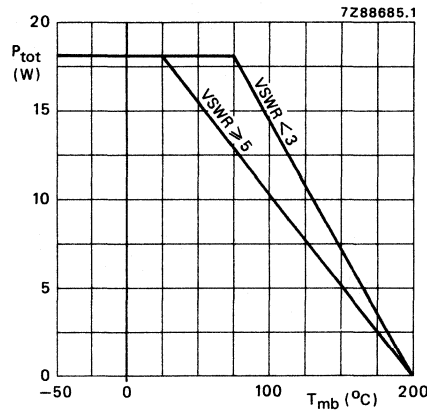


Fig. 2 Maximum permissible r.f. power dissipation as a function of mounting base temperature. $f > 3,6 \text{ GHz}$; $V_{CE} = 24 \text{ V}$.

→ **THERMAL RESISTANCE** (at $T_j = 75 \text{ }^\circ\text{C}$)

From junction to mounting base
From mounting base to heatsink

$R_{th \text{ j-mb}} = 6,5 \text{ K/W}$
 $R_{th \text{ mb-h}} = 0,7 \text{ K/W}$

MICROWAVE POWER TRANSISTOR

N-P-N silicon microwave power transistor for use in a common-base, class-B power amplifier up to 4,2 GHz.

Features:

- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistor providing excellent current sharing and withstanding a high VSWR
- Local thick oxide and gold sandwich metallization realizing a very good stability of the characteristics and excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance

The transistor is housed in a metal ceramic flange envelope (FO-83).

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-B circuit, $P_S = 1\text{ W}$.

mode of operation	f GHz	V_{CC} V	P_L W	G_p dB	η_C %
class-B; c.w.	1	24	typ. 13	typ. 11	typ. 60
	2	24	typ. 10	typ. 10	typ. 48
	3	24	typ. 7,5	typ. 8,8	typ. 30
	4	24	typ. 4	typ. 6	typ. 25

MECHANICAL DATA

FO-83 (see Fig. 1).

Dimensions in mm

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided the BeO disc is not damaged.

MECHANICAL DATA

Fig. 1 FO-83.

Base connected to flange.

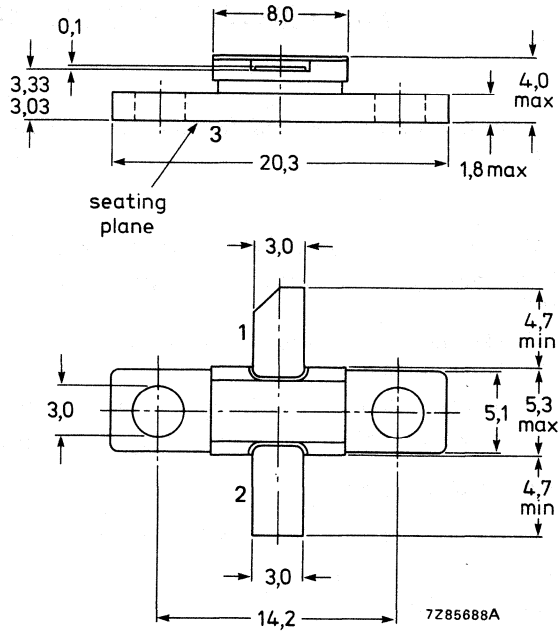
Pinning:

- 1 = collector
- 2 = emitter
- 3 = base

Torque on nut: 0,4 Nm

Recommended screw: M2,5

Dimensions in mm



RATINGS

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

Collector-base voltage, open emitter	V_{CB0}	max.	40 V
Collector-emitter voltage open base	V_{CEO}	max.	15 V
$R_{BE} = 10 \Omega$	V_{CER}	max.	40 V
Emitter-base voltage, open collector	V_{EBO}	max.	3,5 V
Collector current (d.c.)	I_C	max.	1 A
Total power dissipation up to $T_{mb} = 75 \text{ }^\circ\text{C}$	P_{tot}	max.	18 W
Storage temperature	T_{stg}		-65 to 200 $^\circ\text{C}$
Junction temperature	T_j	max.	200 $^\circ\text{C}$
Lead soldering temperature at 0,1 mm from the case; $t_{sld} \leq 10 \text{ s}$	T_{sld}	max.	235 $^\circ\text{C}$

→ **THERMAL RESISTANCE** (at $T_j = 75 \text{ }^\circ\text{C}$)

From junction to mounting base	$R_{th \text{ j-mb}}$	=	6,5 K/W
From mounting base to heatsink	$R_{th \text{ mb-h}}$	=	0,7 K/W

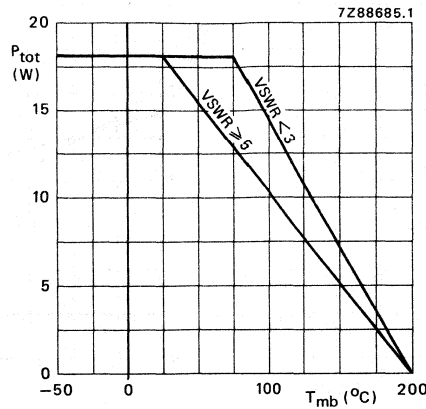


Fig. 2 Power derating curve versus mounting base temperature; $V_{CE} = 24 \text{ V}$; $f > 1 \text{ MHz}$.

CHARACTERISTICS

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

Collector-emitter breakdown voltage

$I_C = 30 \text{ mA}$; $R_{BE} = 10 \text{ } \Omega$

$V_{(BR)CER} \geq 40 \text{ V}$

Emitter-base breakdown voltage

$I_C = 0$; $I_E = 0,5 \text{ mA}$

$V_{(BR)EBO} \geq 3,5 \text{ V}$

Collector cut-off current

$I_E = 0$; $V_{CB} = 24 \text{ V}$

$I_{CBO} \leq 50 \text{ mA}$

Emitter cut-off current

$I_C = 0$; $V_{EB} = 1,5 \text{ V}$

$I_{EBO} \leq 1,5 \text{ mA}$

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

$I_E = I_C = 0$; $V_{CB} = 24 \text{ V}$; $V_{EB} = 1,5 \text{ V}$

C_{cb} typ. 50 pF

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

$I_E = I_C = 0$; $V_{CB} = 24 \text{ V}$; $V_{EB} = 1,5 \text{ V}$

C_{ce} typ. $1,2 \text{ pF}$

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

$I_E = I_C = 0$; $V_{CB} = 24 \text{ V}$; $V_{EB} = 1 \text{ V}$

C_{eb} typ. 30 pF

LARGE SIGNAL IMPEDANCES

f GHz	\bar{z}_i Ω	\bar{Z}_L Ω
1	2,3 + j2,8	7,8 + j11,6
2	1,4 + j9,5	3,9 + j2,6
3	4,2 + j21	2,3 - j2,5
4	38 - j32	1,9 - j8,5



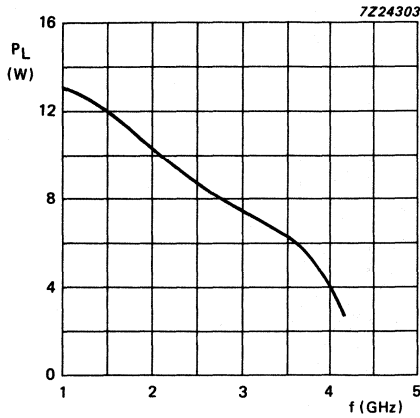


Fig. 3 Load power as a function of frequency. $V_{CC} = 24 \text{ V}$; $P_S = 1 \text{ W}$.

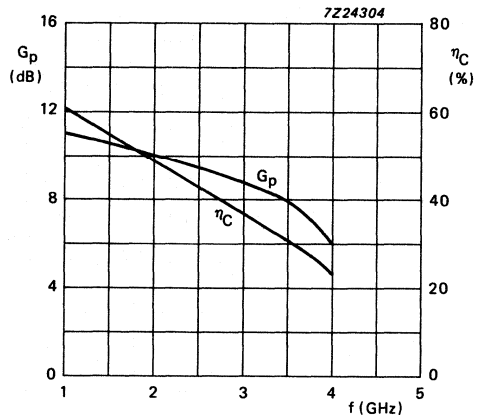


Fig. 4 Power gain and efficiency as a function of frequency. $V_{CC} = 24 \text{ V}$; $P_S = 1 \text{ W}$.

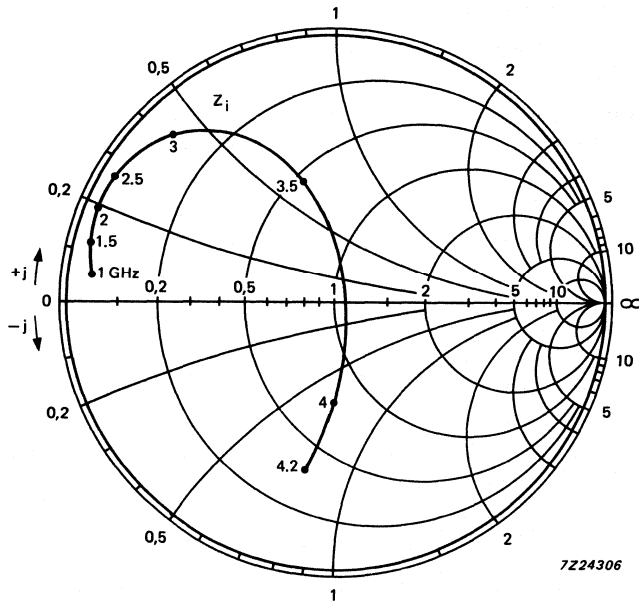


Fig. 5 Input impedance as a function of frequency. $V_{CC} = 24 \text{ V}$; $P_S = 1 \text{ W}$.

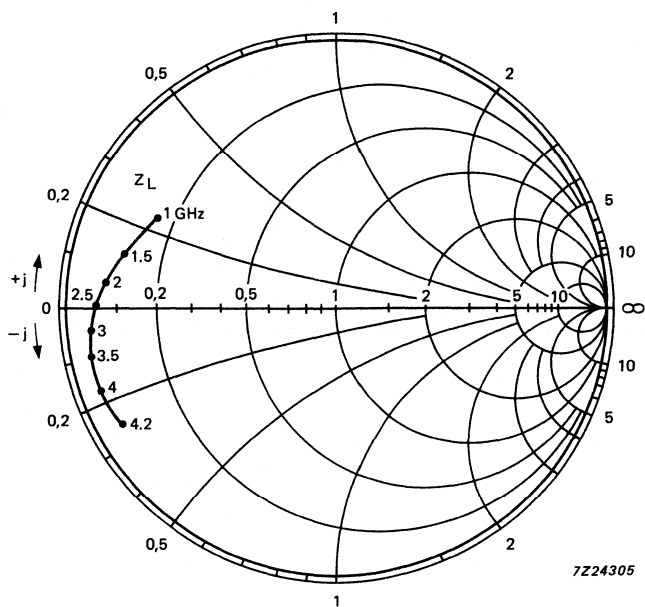


Fig. 6 Output impedance as a function of frequency.
 $V_{CC} = 24 \text{ V}$; $P_S = 1 \text{ W}$.

MICROWAVE POWER TRANSISTORS FOR BROADBAND AMPLIFIERS

N-P-N transistors for use in common-base, class-B, wideband amplifiers under c.w. conditions in military and professional applications and intended to drive PZ1418B30U/PZ1721B25U/PZ2024B20U family.

Features

- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high VSWR
- Gold metallization realizing a very good stability of the characteristics and an excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance
- New 5 GHz technology

The transistors are housed in a ceramic flange envelope (F057C).

Internal input and output prematching ensures good stability and easy broadband use.

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-B wideband amplifier (typical values).

type number	f GHz	V _{CC} V	P _L W	G _p dB	η_C %	z _i Ω	Z _L Ω
PZ1418B15U	1,4 to 1,8	28	typ. 15	typ. 7,8	typ. 45	see Fig. 6	see Fig. 7
PZ1721B12U	1,7 to 2,1	28	typ. 16	typ. 8	typ. 45	see Fig. 11	see Fig. 12
PZ2024B10U	2,0 to 2,4	28	typ. 12	typ. 6,8	typ. 45	see Fig. 16	see Fig. 17

MECHANICAL DATA

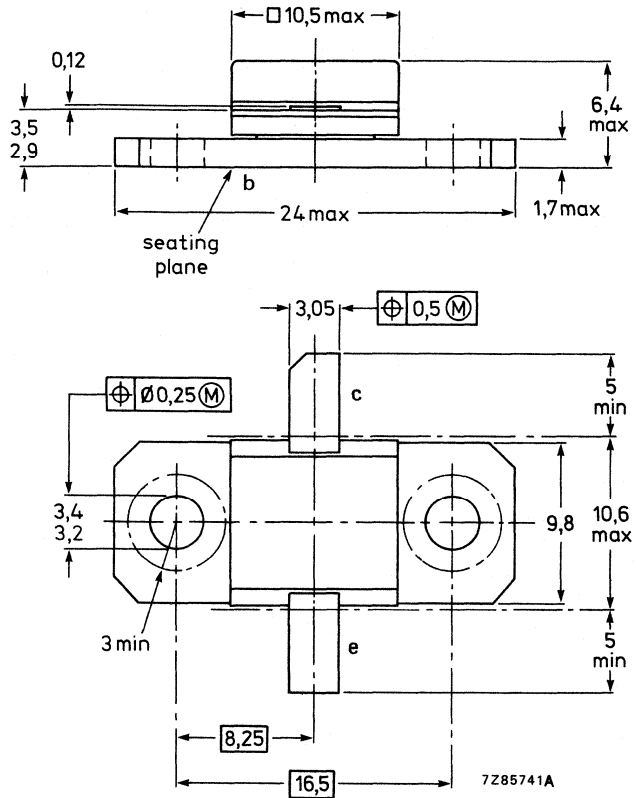
Dimensions in mm

FO-57C (see Fig. 1)

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.

Fig. 1 FO-57C.

Torque on screw: max. 0,5 Nm
Recommended screw: M3



RATINGS

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

Collector-base voltage open emitter	V_{CBO}	max.	40 V
Collector-emitter voltage $R_{BE} = 10 \Omega$ open base	V_{CER} V_{CEO}	max.	35 V 15 V
Emitter-base voltage open collector	V_{EBO}	max.	3 V
Collector current (d.c.)	I_C	max.	2 A
Total power dissipation up to $T_{mb} = 75 \text{ }^\circ\text{C}$	P_{tot}	max.	27 W
Storage temperature	T_{stg}		-65 to + 200 $^\circ\text{C}$
Junction temperature	T_j	max.	+ 200 $^\circ\text{C}$
Lead soldering temperature	T_{slid}	max.	+ 235 $^\circ\text{C}$

→ **THERMAL RESISTANCE** (at $T_j = 75 \text{ }^\circ\text{C}$)

From junction to mounting base $R_{th \text{ j-mb}} = 4 \text{ K/W}$

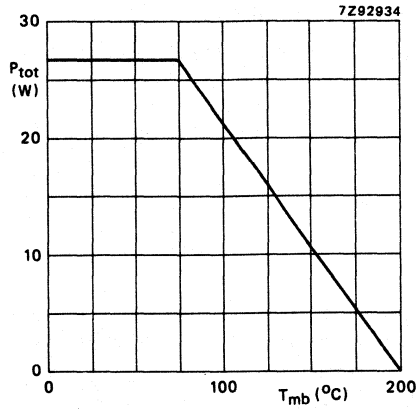


Fig. 2 Power derating curve versus mounting base temperature.

CHARACTERISTICS

$T_{mb} = 25\text{ }^{\circ}\text{C}$

Collector cut-off current

$I_E = 0; V_{CB} = 30\text{ V}$

$I_E = 0; V_{CB} = 40\text{ V}$

$R_{BE} = 10\text{ }\Omega; V_{CE} = 35\text{ V}$

Emitter cut-off current

$I_C = 0; V_{EB} = 1,5\text{ V}$

$I_C = 0; V_{EB} = 3\text{ V}$

$I_{CBO} < 2,5\text{ mA}$

$I_{CBO} < 5\text{ mA}$

$I_{CER} < 25\text{ mA}$

$I_{EBO} < 100\text{ }\mu\text{A}$

$I_{EBO} < 0,5\text{ mA}$

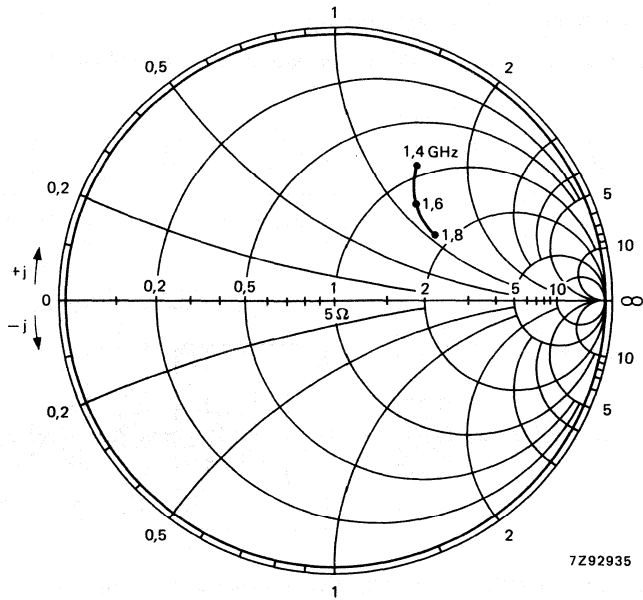


Fig. 6 Input impedance vs. frequency; typical values; $Z_0 = 5 \Omega$.

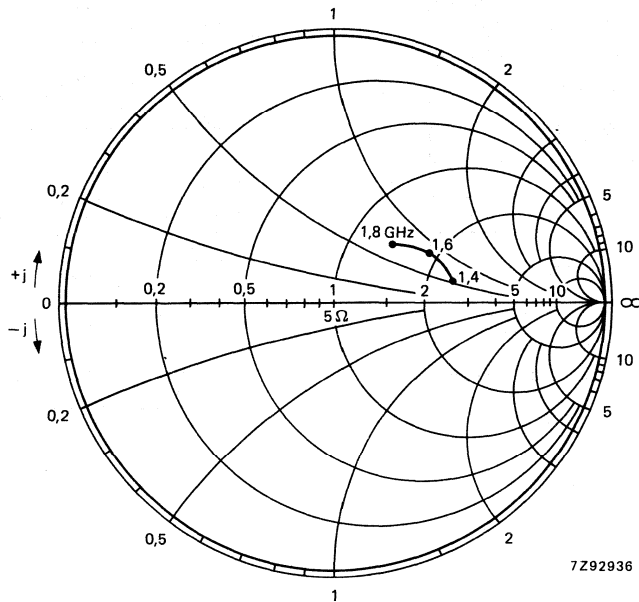
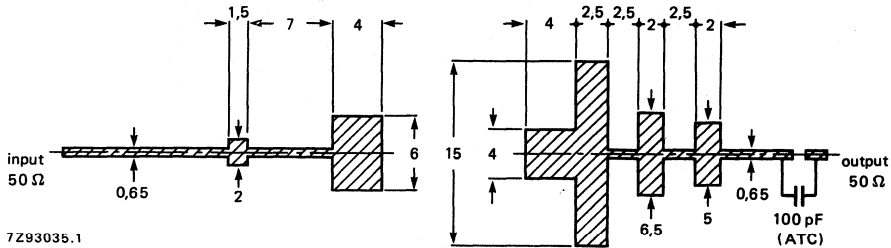


Fig. 7 Optimum load impedance vs. frequency; typical values; $Z_0 = 5 \Omega$.

APPLICATION INFORMATION (type PZ1721B12U)

Microwave performance up to $T_{mb} = 25\text{ }^\circ\text{C}$ in an unneutralized common-base class-B wideband amplifier.

type number	f GHz	V _{CC} V	P _L W	G _p dB	η_C %	z _i Ω	Z _L Ω
→ PZ1721B12U	1,7 to 2,1	28	> 12	> 6,8	> 35	see Fig. 11	see Fig. 12



→ Fig. 8 Wideband test circuit boards for 1,7 to 2,1 GHz (dimensions in mm); Epsilam p.c. board; thickness 0,635 mm; $\epsilon_r = 10$.

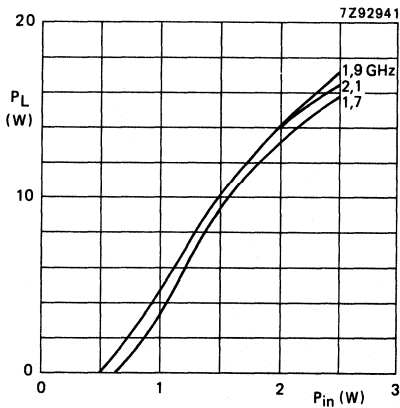


Fig. 9 Load power vs. input power; typical values.

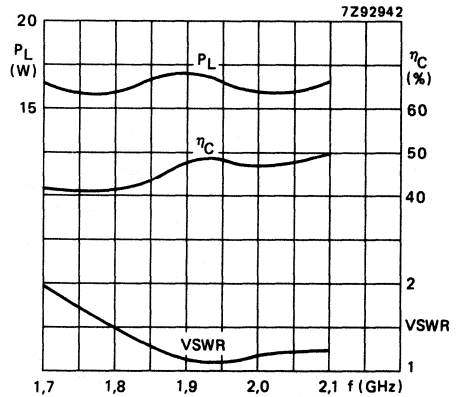


Fig. 10 Load power, efficiency and VSWR vs. frequency; typical values; $P_{in} = 2,5\text{ W}$.

Conditions for Figs 9 and 10:

V_{CC} = 28 V; class-B operation; $T_{mb} = 25\text{ }^\circ\text{C}$.

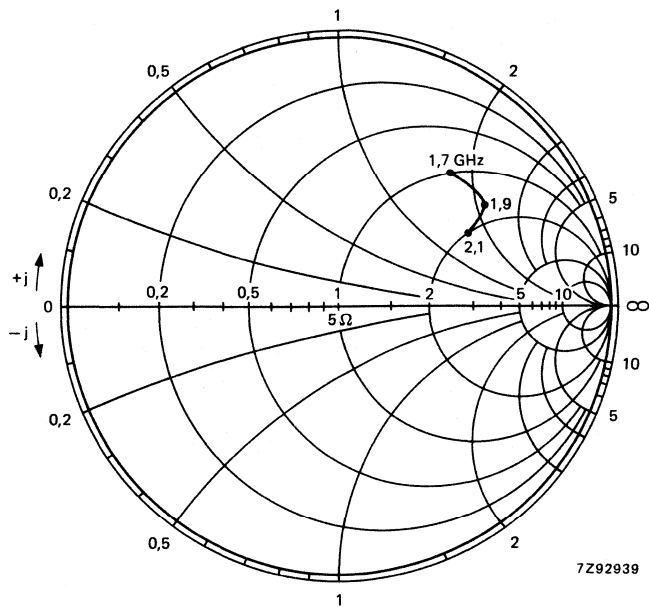


Fig. 11 Input impedance vs. frequency;
typical values; $Z_0 = 5 \Omega$.

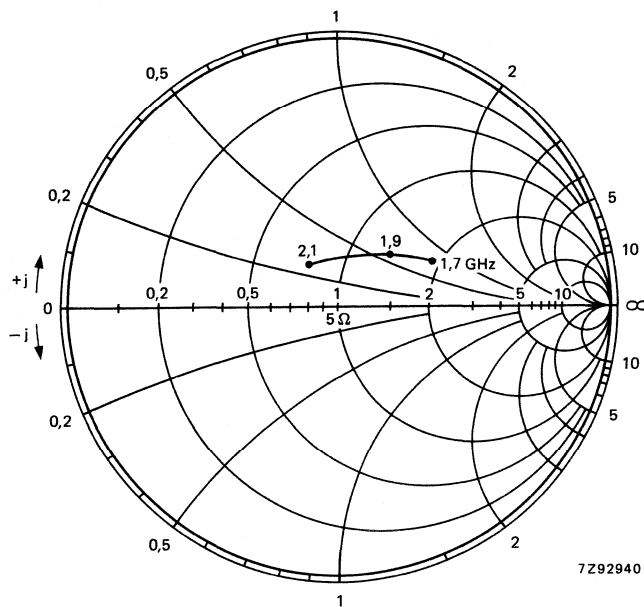
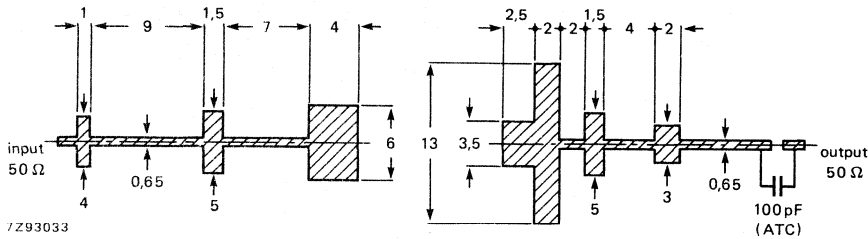


Fig. 12 Optimum load impedance vs. frequency;
typical values; $Z_0 = 5 \Omega$.

APPLICATION INFORMATION (type PZ2024B10U)

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-B wideband amplifier.

type number	f GHz	V _{CC} V	P _L W	G _p dB	η_C %	z _i Ω	Z _L Ω
PZ2024B10U	2,0 to 2,4	28	> 9	> 5,6	> 30	see Fig. 16	see Fig. 17



→ Fig. 13 Wideband test circuit boards for 2,0 to 2,4 GHz (dimensions in mm); Epsilam p.c. board; thickness 0,635 mm; $\epsilon_r = 10$.

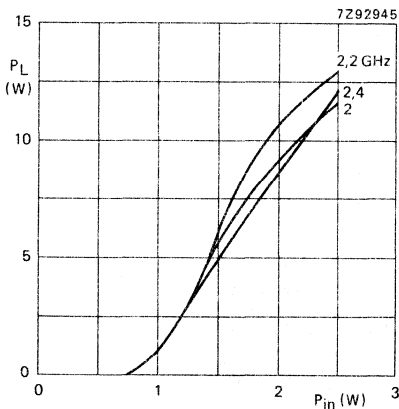


Fig. 14 Load power vs. input power. typical values.

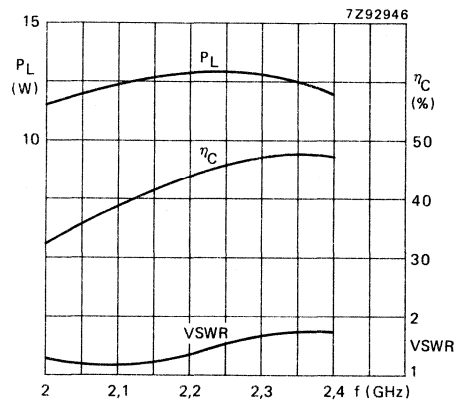


Fig. 15 Load power, efficiency and VSWR vs. frequency; typical values; $P_{in} = 2,5\text{ W}$.

Conditions for Figs 14 and 15:

V_{CC} = 28 V; class-B operation; $T_{mb} = 25\text{ }^{\circ}\text{C}$.

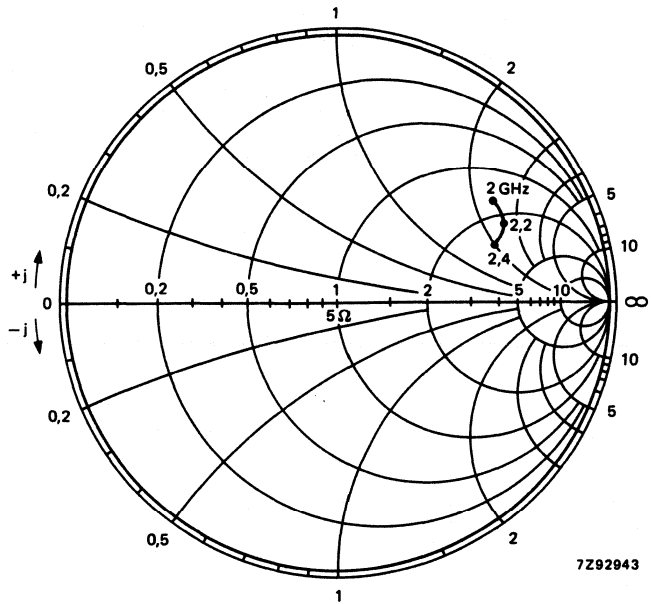


Fig. 16 Input impedance vs. frequency; typical values; $Z_0 = 5 \Omega$.

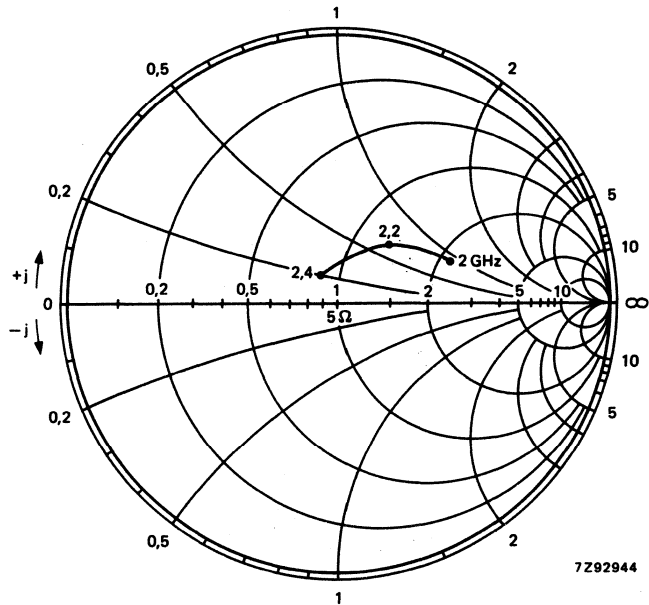


Fig. 17 Optimum load impedance vs. frequency; typical values; $Z_0 = 5 \Omega$.

MICROWAVE POWER TRANSISTORS FOR WIDEBAND AMPLIFIERS

N-P-N transistors for use in common-base, class-B, broadband amplifiers under c.w. conditions in military and professional applications.

Features

- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high VSWR
- Gold metallization realising a very good stability of the characteristics and an excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance
- New 5 GHz technology

The transistors are housed in a ceramic flange envelope.

Internal input and output prematching ensures good stability and easy broadband use.

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-B wideband amplifier (typical values).

type number	f GHz	V _{CC} V	P _L W	G _p dB	η_C %	z _i Ω	Z _L Ω
PZ1418B30U	1,4 to 1,8	28	typ. 35	typ. 8,4	typ. 45	see Fig. 6	see Fig. 7
PZ1721B25U	1,7 to 2,1	28	typ. 30	typ. 7,8	typ. 41	see Fig. 11	see Fig. 12
PZ2024B20U	2,0 to 2,4	28	typ. 26	typ. 7	typ. 42	see Fig. 16	see Fig. 17

MECHANICAL DATA

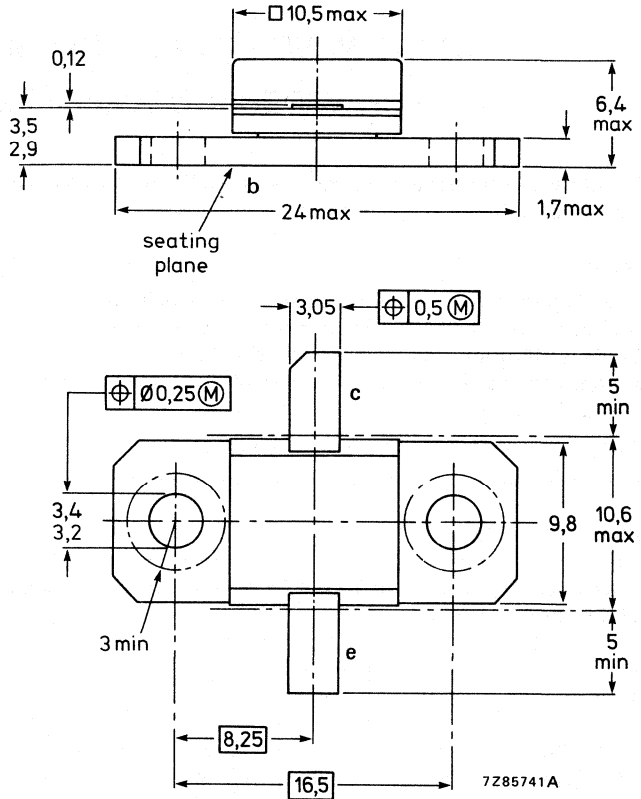
Dimensions in mm

FO-57C (see Fig. 1)

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.

Fig. 1 FO-57C.

Torque on screw: max. 0,5 Nm
Recommended screw: M3



RATINGS

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

Collector-base voltage open emitter	V_{CBO}	max.	40 V
Collector-emitter voltage $R_{BE} = 10 \Omega$ open base	V_{CER}	max.	35 V
	V_{CEO}	max.	15 V
Emitter-base voltage open collector	V_{EBO}	max.	3 V
Collector current (d.c.)	I_C	max.	4 A
Total power dissipation up to $T_{mb} = 75 \text{ }^\circ\text{C}$	P_{tot}	max.	45 W
Storage temperature	T_{stg}		-65 to +200 $^\circ\text{C}$
Junction temperature	T_j	max.	+200 $^\circ\text{C}$
Lead soldering temperature	T_{sld}	max.	+235 $^\circ\text{C}$

→ **THERMAL RESISTANCE** (at $T_j = 75 \text{ }^\circ\text{C}$)

From junction to mounting base

$R_{th j-mb} = 2,2 \text{ K/W}$

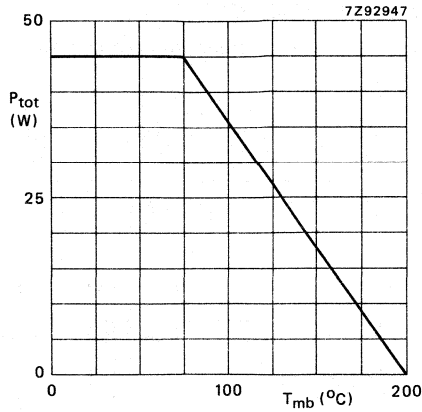


Fig. 2 Power derating curve versus mounting base temperature.

CHARACTERISTICS

$T_{mb} = 25$ °C

Collector cut-off current

$I_E = 0; V_{CB} = 30$ V

$I_E = 0; V_{CB} = 40$ V

$R_{BE} = 10 \Omega; V_{CE} = 35$ V

Emitter cut-off current

$I_C = 0; V_{EB} = 1,5$ V

$I_C = 0; V_{EB} = 3$ V

$I_{CBO} < 5$ mA

$I_{CBO} < 10$ mA

$I_{CER} < 50$ mA

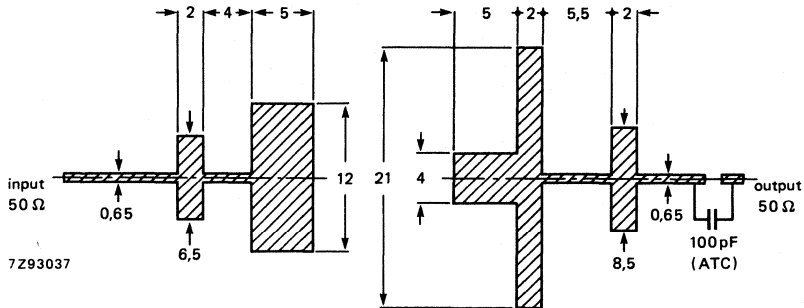
$I_{EBO} < 200 \mu A$

$I_{EBO} < 1$ mA

APPLICATION INFORMATION (type PZ1418B30U)

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-B wideband amplifier.

type number	f GHz	V _{CC} V	P _L W	G _p dB	η_C %	z _i Ω	Z _L Ω
PZ1418B30U	1,4 to 1,8	28	> 27	> 7,3	> 38	see Fig. 6	see Fig. 7



→ Fig. 3 Wideband test circuit boards for 1,4 to 1,8 GHz (dimensions in mm); Epsilam p.c. board; thickness 0,635 mm; $\epsilon_r = 10$.

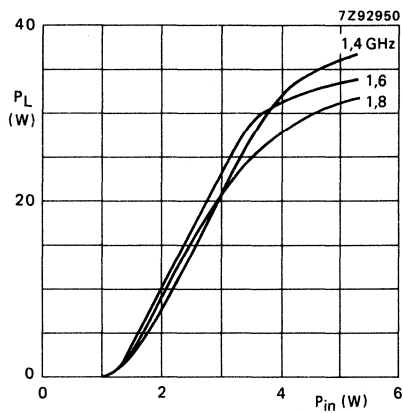


Fig. 4 Load power versus input power; typical values.

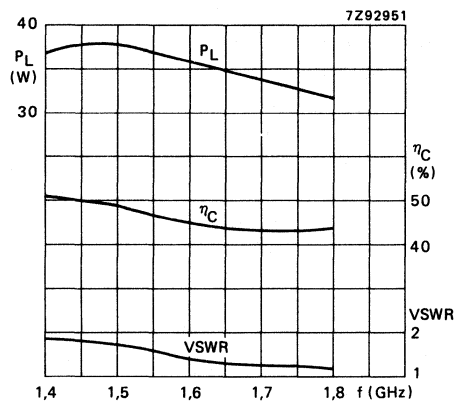


Fig. 5 Load power, efficiency and VSWR versus frequency; typical values; $P_{in} = 5\text{ W}$.

Conditions for Figs 4 and 5:

V_{CC} = 28 V; class-B operation; $T_{mb} = 25\text{ }^{\circ}\text{C}$.

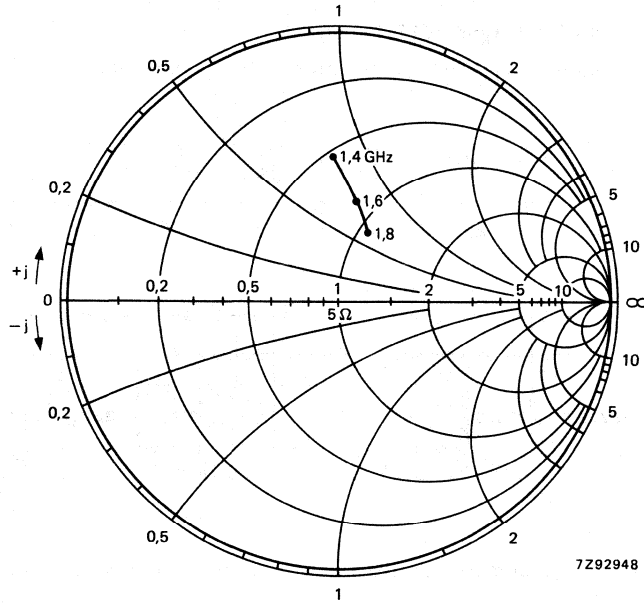


Fig. 6 Input impedance vs. frequency; typical values; $Z_0 = 5 \Omega$.

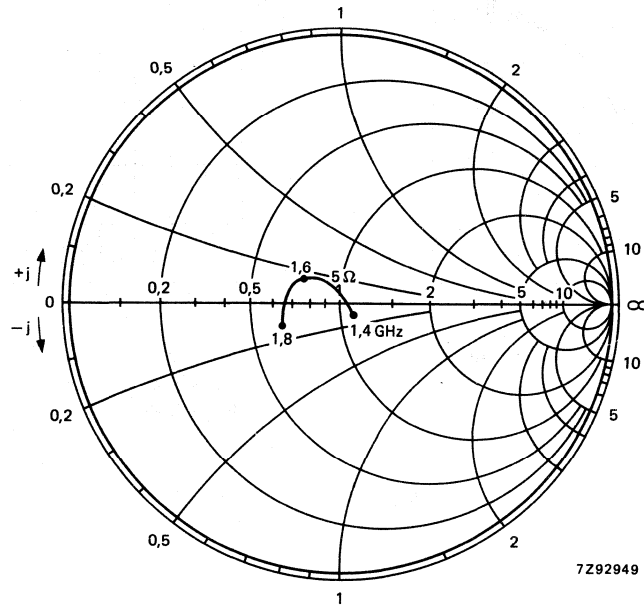
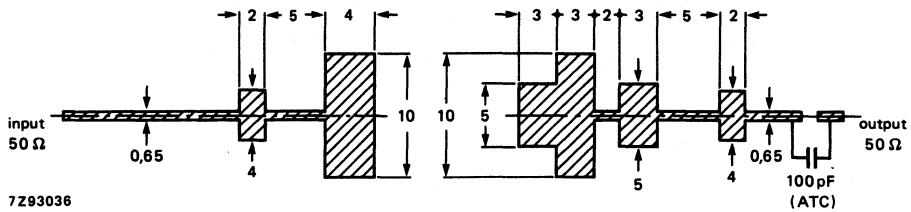


Fig. 7 Optimum load impedance vs. frequency; typical values; $Z_0 = 5 \Omega$.

APPLICATION INFORMATION (type PZ1721B25U)

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-B wideband amplifier.

type number	f GHz	V _{CC} V	P _L W	G _p dB	η _C %	Z _i Ω	Z _L Ω
PZ1721B25U	1,7 to 2,1	28	> 25	> 7	> 35	see Fig. 11	see Fig. 12



→ Fig. 8 Wideband test circuit boards for 1,7 to 2,1 GHz (dimensions in mm); Epsilam p.c. board; thickness 0,635 mm; $\epsilon_r = 10$.

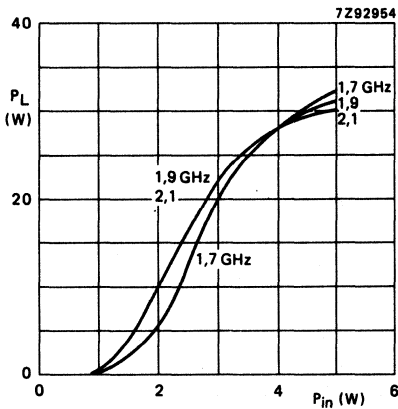


Fig. 9 Load power vs. input power; typical values.

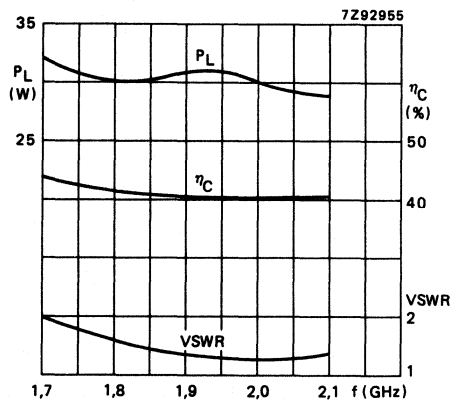


Fig. 10 Load power, efficiency and VSWR vs. frequency; typical values; $P_{in} = 5\text{ W}$.

Conditions for Figs 9 and 10:

V_{CC} = 28 V; class-B operation; $T_{mb} = 25\text{ }^{\circ}\text{C}$.

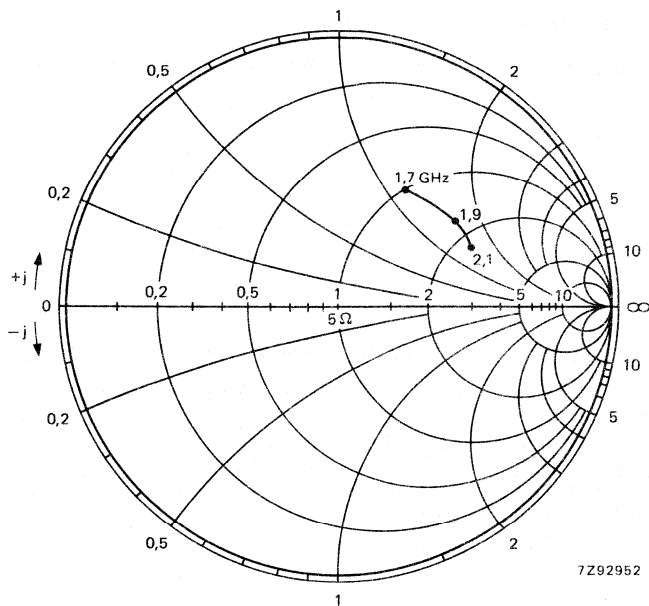


Fig. 11 Input impedance vs. frequency; typical values; $Z_0 = 5 \Omega$.

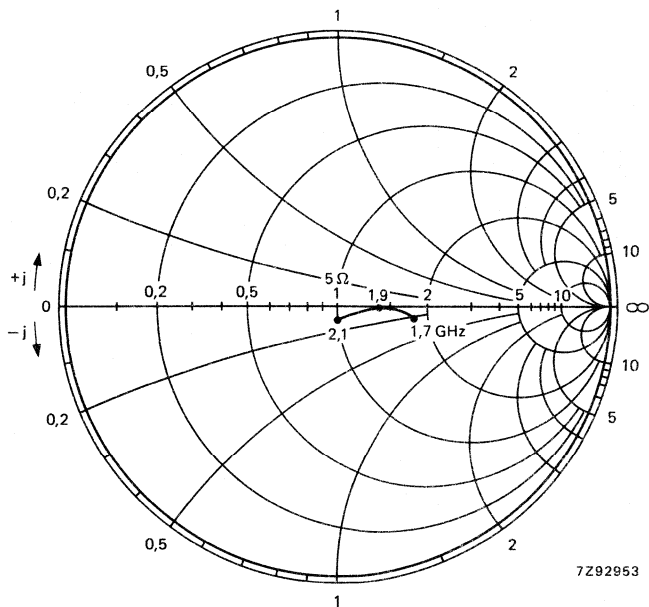
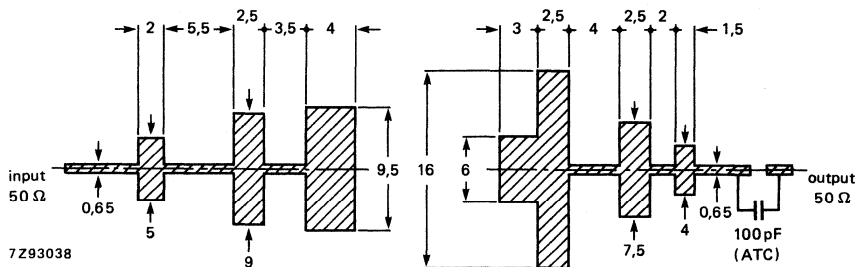


Fig. 12 Optimum load impedance vs. frequency; typical values; $Z_0 = 5 \Omega$.

APPLICATION INFORMATION (type PZ2024B20U)

Microwave performance up to $T_{mb} = 25\text{ }^\circ\text{C}$ in an unneutralized common-base class-B wideband amplifier.

type number	f GHz	V _{CC} V	P _L W	G _p dB	η_C %	z _i Ω	Z _L Ω
PZ2024B20U	2,0 to 2,4	28	> 20	> 6	> 35	see Fig. 16	see Fig. 17



→ Fig. 13 Wideband test circuit boards for 2,0 to 2,4 GHz (dimensions in mm); Epsilam p.c. board; thickness 0,635 mm; $\epsilon_r = 10$.

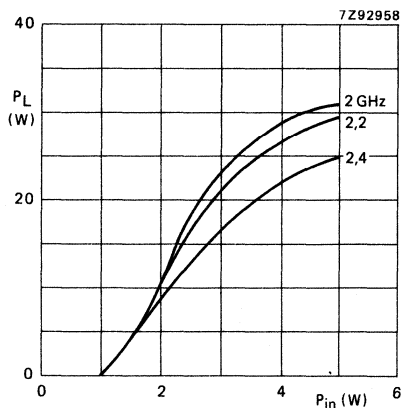


Fig. 14 Load power versus input power; typical values.

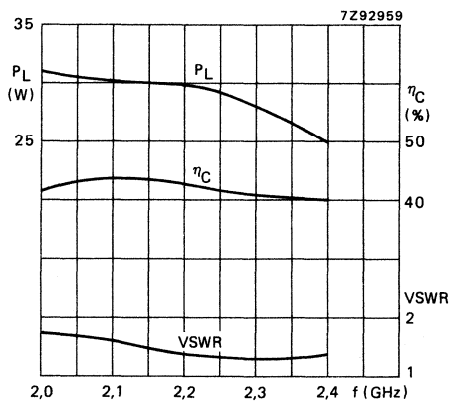


Fig. 15 Load power, efficiency and VSWR versus frequency; typical values; $P_{in} = 5\text{ W}$.

Conditions for Figs 14 and 15:

V_{CC} = 28 V; class-B operation; $T_{mb} = 25\text{ }^\circ\text{C}$.

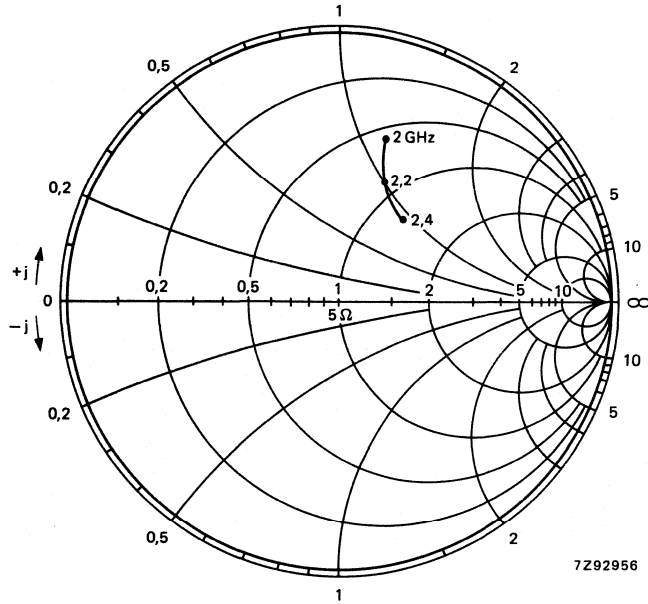


Fig. 16 Input impedance vs. frequency; typical values; $Z_0 = 5 \Omega$.

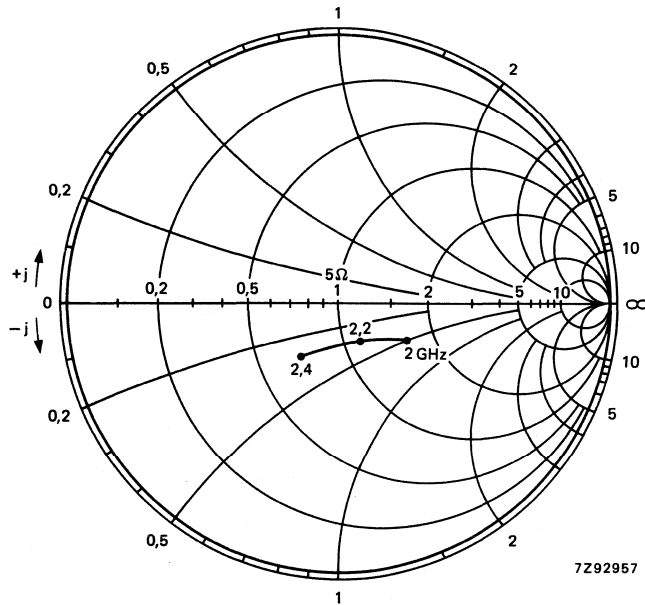


Fig. 17 Optimum load impedance vs. frequency; typical values; $Z_0 = 5 \Omega$.

DEVELOPMENT DATA

This data sheet contains advance information and specifications are subject to change without notice.

PZ2327B15U

MICROWAVE POWER TRANSISTOR

NPN silicon epitaxial microwave power transistor, intended for use in a common-base, class-C broadband power amplifier, operating in the 2.3 to 2.7 GHz frequency range.

Features

- Interdigitated structure; giving a high emitter efficiency
- Diffused emitter ballasting resistors; capable of withstanding a high VSWR and providing excellent current sharing
- Gold metallization; ensuring excellent stability of the characteristics and giving a prolonged working life
- Multicell geometry; giving good balance of dissipated power and low thermal resistance
- Internal input and output matching cells; simplifying circuit design

The transistor is housed in a metal-ceramic flange envelope (FO-57D).

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-C broadband amplifier; typical values.

mode of operation	f GHz	V_{CC} V	P_L W	G_p dB	η_C %	$\bar{z}_i; \bar{Z}_L$ Ω
class-C; CW	2.3 to 2.7	28	16	8	45	see Figs 6 and 7

MECHANICAL DATA

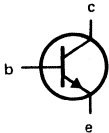
Dimensions in mm

FO-57D (see Fig. 1).

MECHANICAL DATA

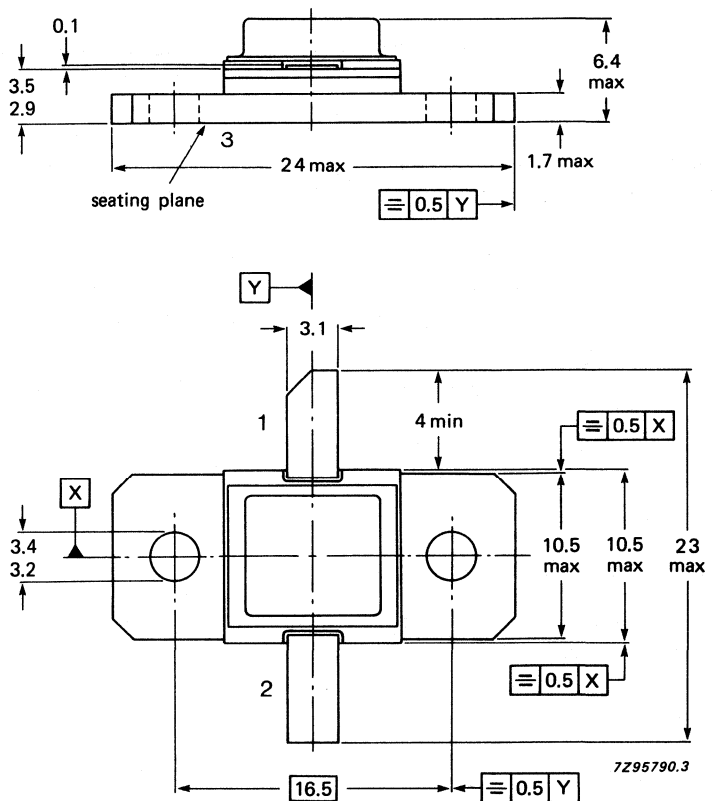
Fig. 1 FO-57D.

Pinning
 1 = collector
 2 = emitter
 3 = base



Base is connected to the seating plane

Dimensions in mm



RATINGS

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

Collector-base voltage; open emitter	V_{CBO}	max.	40 V
Collector-emitter voltage; $R_{BE} = 10 \Omega$	V_{CER}	max.	30 V
Collector-emitter voltage; open base	V_{CEO}	max.	15 V
Emitter-base voltage; open collector	V_{EBO}	max.	3.5 V
Collector current (DC)	I_C	max.	2.1 A
Total power dissipation at $T_{mb} \leq 75 \text{ }^\circ\text{C}$	P_{tot}	max.	32 W
Storage temperature range	T_{stg}		$-65 \text{ to } +200 \text{ }^\circ\text{C}$
Operating junction temperature	T_j	max.	200 $^\circ\text{C}$
Soldering temperature at 0.3 mm from the case; $t_{sld} \leq 10 \text{ s}$	T_{sld}	max.	235 $^\circ\text{C}$

THERMAL RESISTANCE (at $T_j = 75 \text{ }^\circ\text{C}$)

From junction to mounting base	$R_{th\ j-mb}$	max.	4 K/W
From mounting base to heatsink	$R_{th\ mb-h}$	typ.	0.5 K/W

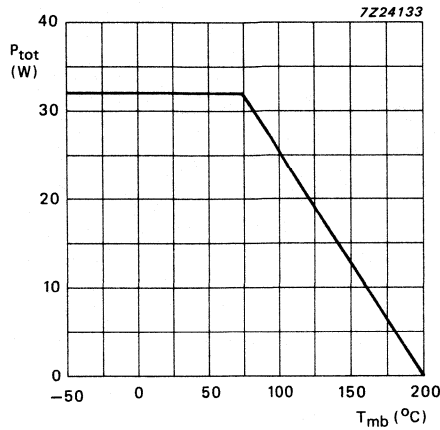


Fig. 2 Power derating curve.

CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Collector cut-off current

V_{CB} = 40 V; I_E = 0

V_{CB} = 30 V; I_E = 0

V_{CE} = 30 V; R_{BE} = 10 Ω

V_{CE} = 40 V; I_B = 0

I_{CBO} ≤ 8 mA

I_{CBO} ≤ 80 μA

I_{CER} ≤ 130 μA

I_{CEO} ≤ 1 mA

Emitter cut-off current

V_{EB} = 1.5 V; I_C = 0

V_{EB} = 3.5 V; I_C = 0

I_{EBO} ≤ 100 μA

I_{EBO} ≤ 1 mA

DEVELOPMENT DATA

APPLICATION INFORMATION

Microwave performance at T_{mb} = 25 °C measured in a common-base broadband test circuit as shown in Fig. 3.

mode of operation	f GHz	V _{CC} V	P _L W	G _p dB	η _C %	$\bar{z}_i; \bar{z}_L$ Ω
class-C; CW	2.3 to 2.7	28	≥ 15	≥ 7	≥ 40	see Figs 6 and 7

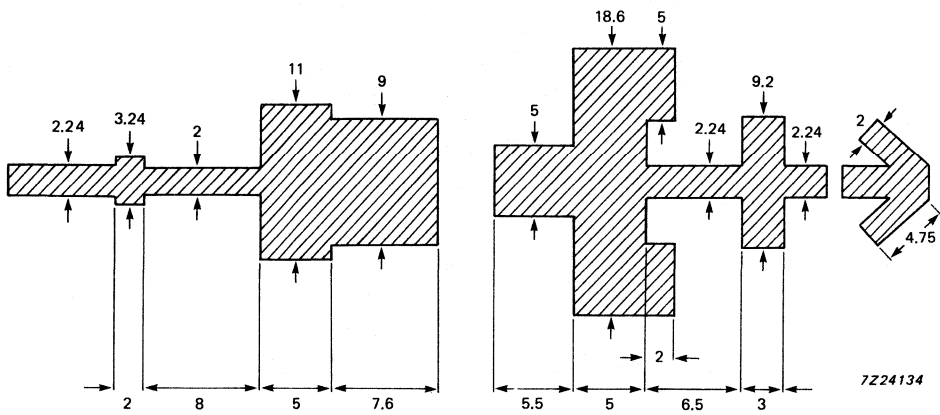


Fig. 3 Broadband test circuit for 2.3 to 2.7 GHz; class-C; CW application
Teflon fibreglass; $\epsilon_r = 2.55$; thickness 0.8 mm (dimensions in mm).

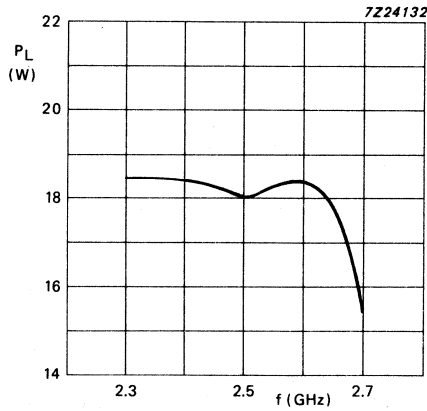


Fig. 4 Load power as a function of frequency;
 $P_{in} = 2.5$ W; typical values.

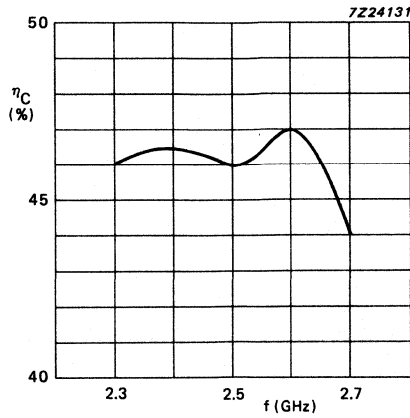


Fig. 5 Power gain as a function of frequency; typical values.

DEVELOPMENT DATA

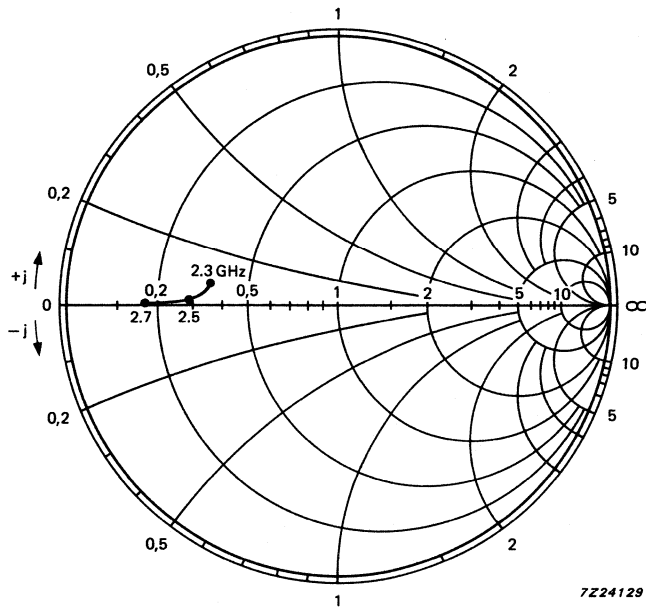


Fig. 6 Input impedance as a function of frequency;
 $V_{CC} = 28 \text{ V}$; $P_L = 16 \text{ W}$; $Z_O = 50 \Omega$.

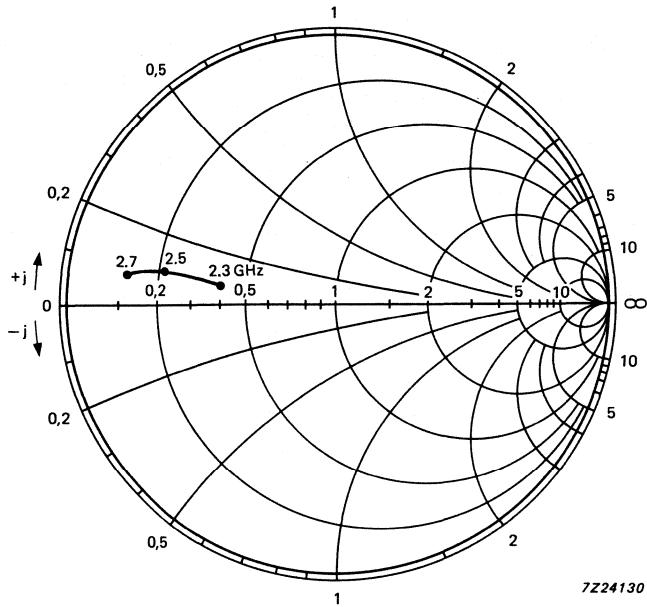


Fig. 7 Optimum load impedance as a function of frequency;
 $V_{CC} = 28 \text{ V}$; $P_L = 16 \text{ W}$; $Z_O = 50 \Omega$.

MICROWAVE POWER TRANSISTORS

N-P-N transistor for use in common-base, class-B, amplifier under c.w. conditions in military and professional applications up to 1,6 GHz.

Features

- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high VSWR
- Gold metallization realizing a very good stability of the characteristics and an excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance
- New 5 GHz technology

The transistor is housed in a ceramic flange envelope.

An input matching cell improves the input impedance and allows an easier design of wideband circuits.

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-B selective amplifier.

Envelope	F057C		
Mode of operation	c.w.; class-B		
Frequency	f		1,55 GHz
Collector-emitter voltage	V _{CC}	typ.	28 V
Load power	P _L	typ.	38 W
Power gain	G _p	typ.	9,8 dB
Collector efficiency	η_C	typ.	50 %
Input impedance	z _i	typ.	2 + j4,5 Ω
Load impedance	Z _L	typ.	1,5 + j0 Ω

MECHANICAL DATA

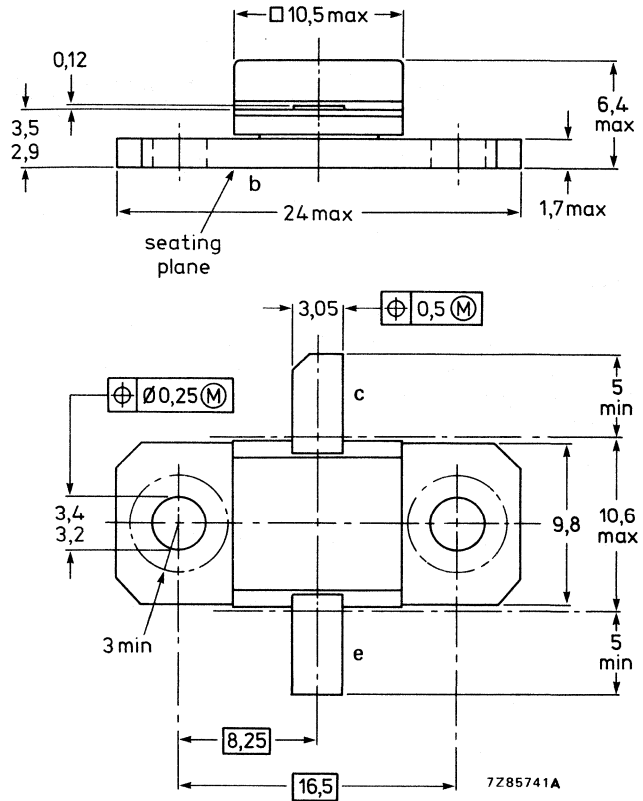
Dimensions in mm

FO-57C (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.

Fig. 1 FO-57C.

Torque on nut: max. 0,5 Nm
 Recommended screw: M3



RATINGS

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

Collector-base voltage open emitter	V_{CBO}	max.	40 V
Collector-emitter voltage $R_{BE} = 10 \Omega$ open base	V_{CER} V_{CEO}	max.	35 V 15 V
Emitter-base voltage open collector	V_{EBO}	max.	3 V
Collector current (d.c.)	I_C	max.	4 A
Total power dissipation up to $T_{mb} = 75 \text{ }^\circ\text{C}$	P_{tot}	max.	45 W
Storage temperature	T_{stg}		-65 to + 200 $^\circ\text{C}$
Junction temperature	T_j	max.	+ 200 $^\circ\text{C}$
Lead soldering temperature > 0,1 mm from flange; $t_{sld} < 10 \text{ s}$	T_{sld}	max.	+ 235 $^\circ\text{C}$

→ **THERMAL RESISTANCE** (at $T_j = 75 \text{ }^\circ\text{C}$)

From junction to mounting base	$R_{th j-mb}$	max.	2,2 K/W
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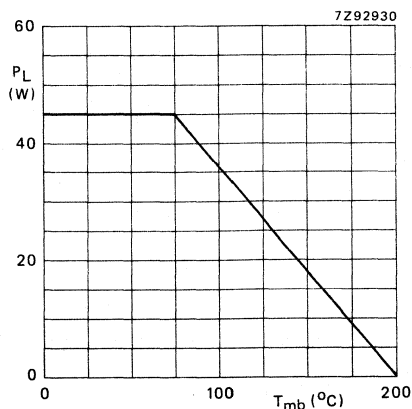


Fig. 2 Power derating curve versus mounting base temperature.

CHARACTERISTICS

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

Collector cut-off currents

$V_{CB} = 40\text{ V}; I_E = 0$

$V_{CB} = 30\text{ V}; I_E = 0$

$V_{CER} = 35\text{ V}; R_{BE} = 10\ \Omega$

$I_{CBO} \leq 10\text{ mA}$

$I_{CBO} \leq 5\text{ mA}$

$I_{CER} \leq 50\text{ mA}$

Emitter cut-off currents

$V_{EB} = 3\text{ V}; I_C = 0$

$V_{EB} = 1,5\text{ V}; I_C = 0$

$I_{EBO} \leq 1\text{ mA}$

$I_{EBO} \leq 200\ \mu\text{A}$

Collector-base capacitance

$I_E = I_C = 0; V_{CB} = 28\text{ V}$

C_{cb} typ. 17 pF

APPLICATION INFORMATION

Microwave performance up to $T_{mb} = 25\text{ }^\circ\text{C}$ in an unneutralized common-base class-B selective amplifier.*

mode of operation	f GHz	V _{CC} V	P _L W	G _p dB	η_C %	z _i Ω	Z _L Ω
C.W. class-B	1,55	28	> 35	> 8	> 45	2 + j4,5 typ. value	1,5 + j0 typ. value

* Amplifier consists of pre-matching test circuit with complementary input and output slug tuners.

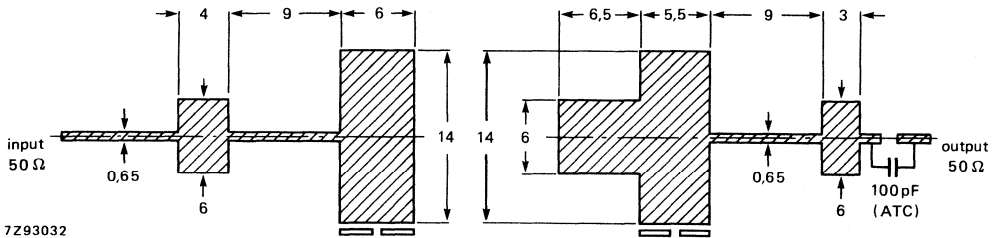


Fig. 3 Prematching test circuit boards, c.w., class-B at 1,55 GHz (dimensions in mm); Epsilam p.c. board; thickness 0,65 mm; $\epsilon_r = 10$.

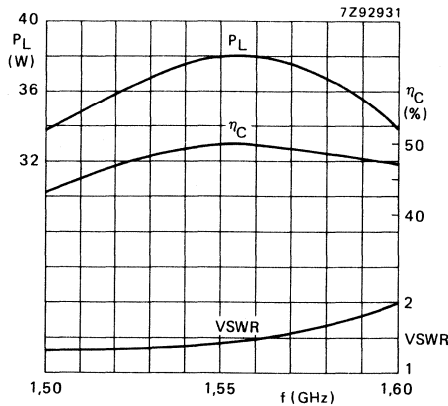


Fig. 4 Load power, efficiency and VSWR versus frequency; $V_{CE} = 28\text{ V}$; $T_{mb} = 25\text{ }^\circ\text{C}$; class-B operation; typical values.

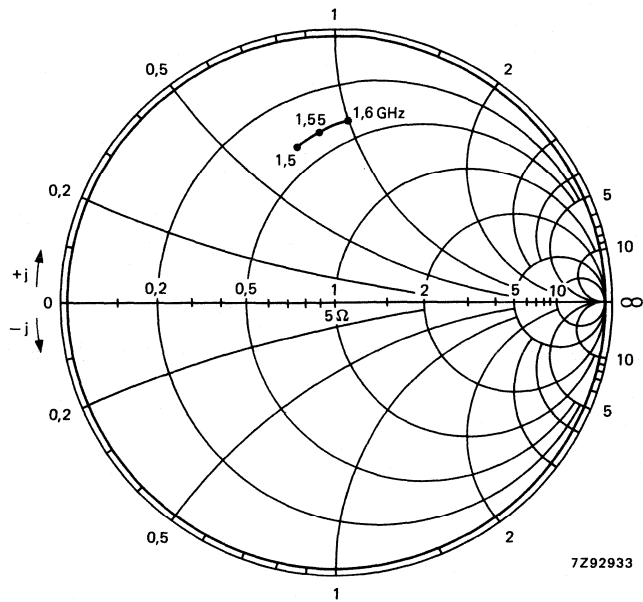


Fig. 5 Input impedance versus frequency;
 $P_L = 38 \text{ W}$; $Z_O = 5 \Omega$; typical values.

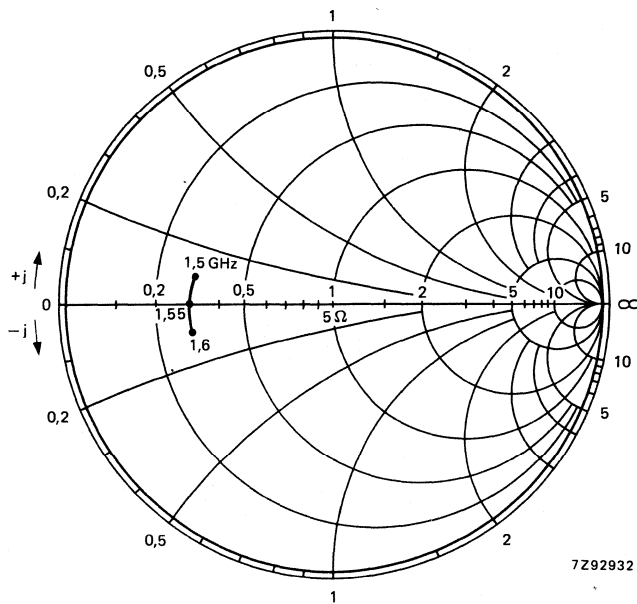


Fig. 6 Optimum load impedance versus frequency;
 $P_L = 38 \text{ W}$; $Z_O = 5 \Omega$; typical values.

MICROWAVE POWER TRANSISTOR

NPN silicon planar epitaxial microwave power transistor, intended for use in a common-base class-C narrowband power amplifier, operating at a frequency of 1.64 GHz.

Features

- Interdigitated structure; giving a high emitter efficiency
- Diffused emitter ballasting resistors; capable of withstanding a high VSWR and providing excellent current sharing
- Gold metallization; ensuring excellent stability of the characteristics and giving a prolonged working life
- Multicell geometry; giving good balance of dissipated power and low thermal resistance
- Internal input matching cell; simplifying circuit design

The transistor is housed in a metal ceramic flange envelope (FO-57D).

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-C narrowband amplifier; typical values.

mode of operation	f GHz	V_{CC} V	P_L W	G_p dB	η_C %	$\bar{z}_i; \bar{z}_L$ Ω
class-C; CW	1.64	28	45	9	45	see Fig. 5

MECHANICAL DATA

FO-57D (see Fig. 1).

Dimensions in mm

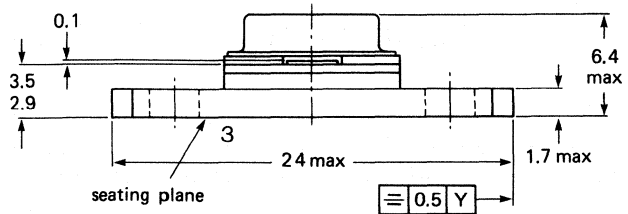
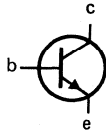
MECHANICAL DATA

Fig. 1 FO-57D

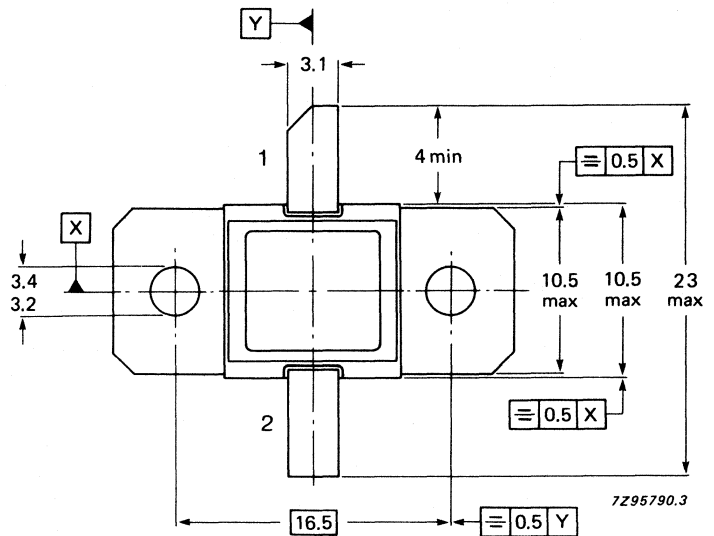
Dimensions in mm

Pinning

- 1 = collector
- 2 = emitter
- 3 = base



Base is connected to the seating plane



RATINGS

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

Collector-base voltage; open emitter	V_{CBO}	max.	40 V
Collector-emitter voltage; $R_{BE} = 10 \Omega$	V_{CER}	max.	35 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.	6 A
Total power dissipation at $T_{mb} \leq 75 \text{ }^\circ\text{C}$	P_{tot}	max.	67.5 W
Storage temperature range	T_{stg}		-65 to 200 $^\circ\text{C}$
Operating junction temperature	T_j	max.	200 $^\circ\text{C}$
Soldering temperature at 0.3 mm from the case; $t_{sld} \leq 10 \text{ s}$	T_{sld}	max.	235 $^\circ\text{C}$

THERMAL RESISTANCE (at $T_j = 200 \text{ }^\circ\text{C}$)

From junction to mounting base	$R_{th j-mb}$	max.	2.5 K/W
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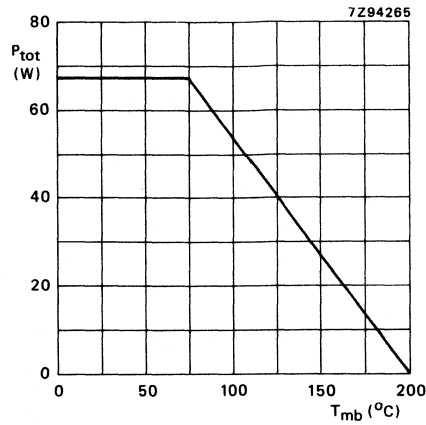


Fig. 2 Power derating curve versus mounting base temperature.

CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Collector cut-off current

V_{CB} = 40 V; I_E = 0

V_{CB} = 30 V; I_E = 0

V_{CE} = 35 V; R_{BE} = 10 Ω

I_{CBO} ≤ 20 mA

I_{CBO} ≤ 10 mA

I_{CER} ≤ 100 mA

Emitter cut-off current

V_{EB} = 1.5 V; I_C = 0

V_{EB} = 3 V; I_C = 0

I_{EBO} ≤ 400 μA

I_{EBO} ≤ 2 mA

DEVELOPMENT DATA

APPLICATION INFORMATION

Microwave performance at T_{mb} = 25 °C measured in a common-base, narrowband test circuit as shown in Fig. 3.

mode of operation	f GHz	V _{CC} V	P _L W	G _p dB	η _C %	$\bar{z}_i; \bar{z}_L$ Ω
class-C; CW	1.64	28	≥ 40	≥ 8.6	≥ 43	see Fig. 5

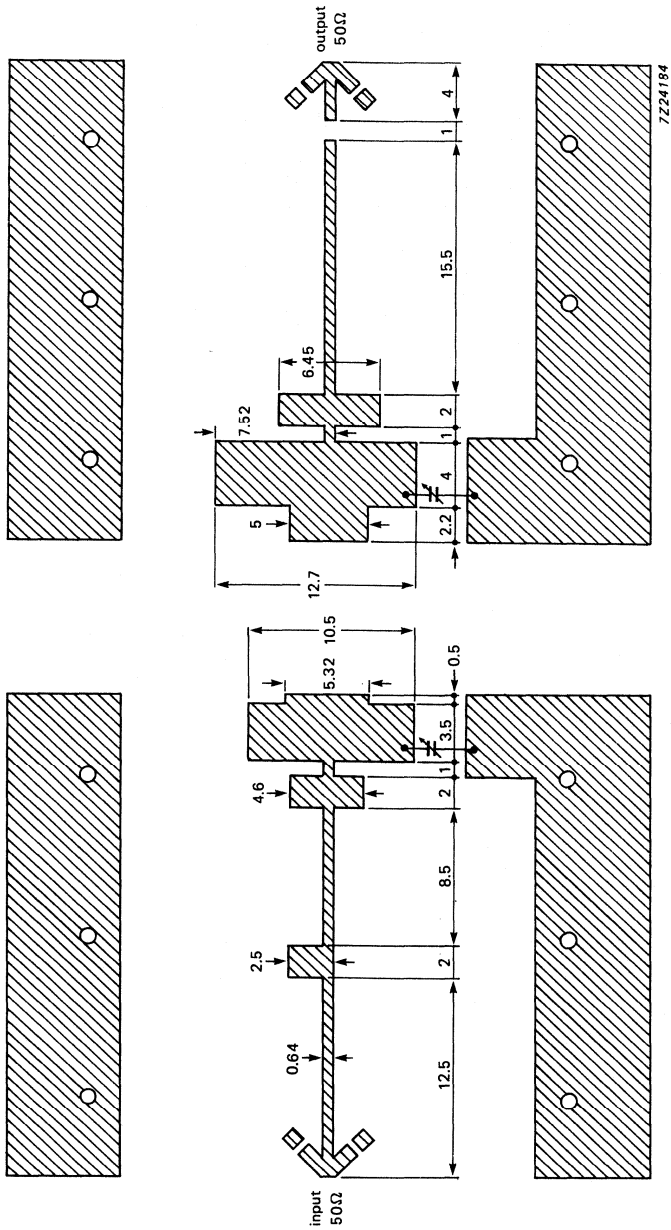


Fig. 3 Narrowband test circuit for 1.64 GHz; class-C; pulsed application; Epsilam printed circuit board; thickness 0.635 mm; $\epsilon_r = 10$; dimensions in mm.

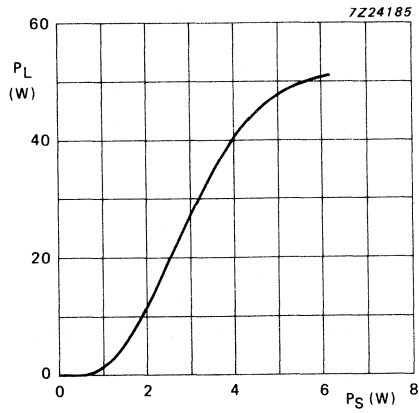


Fig. 4 Load power as a function of input power; $V_{CC} = 28$ V; $f = 1.64$ MHz; $T_{mb} = 25$ °C; typical values.

DEVELOPMENT DATA

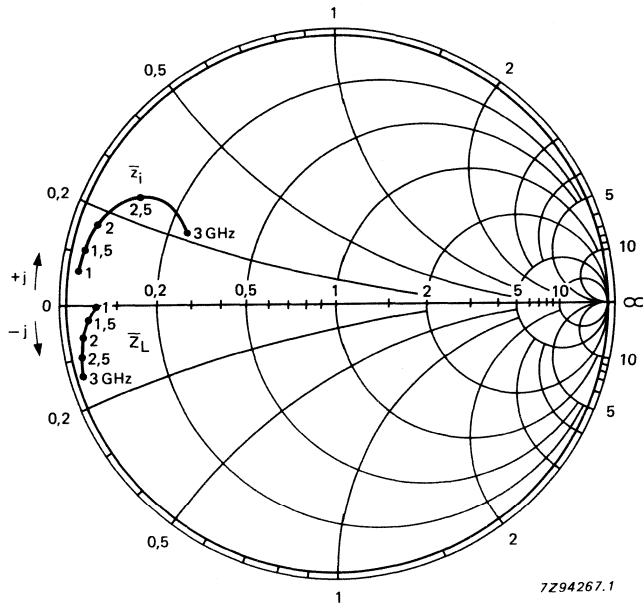


Fig. 5 Input and optimum load impedance as a function of frequency; $V_{CC} = 28$ V; $Z_O = 50$ Ω.



MICROWAVE POWER TRANSISTOR

N-P-N silicon power transistor for use in a common-base, class-B amplifier up to a frequency of 3 GHz in c.w. conditions in military and professional applications.

Features

- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistor providing excellent current sharing and withstanding a high VSWR
- Gold metallization realizing a very good stability of the characteristics and excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance
- New 5 GHz technology

The transistor is housed in a metal ceramic flange envelope (FO-57C).

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-B selective amplifier.

mode of operation	f GHz	V_{CC} V	P_L W	G_p dB	η_C %	$\bar{z}_i; \bar{Z}_L$ Ω
c.w.; class-B	1	28	typ. 70	typ. 10	typ. 62	see Fig. 6
	2	28	typ. 40	typ. 7,8	typ. 48	
	3	28	typ. 22	typ. 5	typ. 25	

MECHANICAL DATA

FO-57C (see Fig. 1)

Dimensions in mm

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

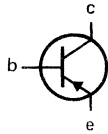
MECHANICAL DATA

Fig. 1 FO-57C.

Dimensions in mm

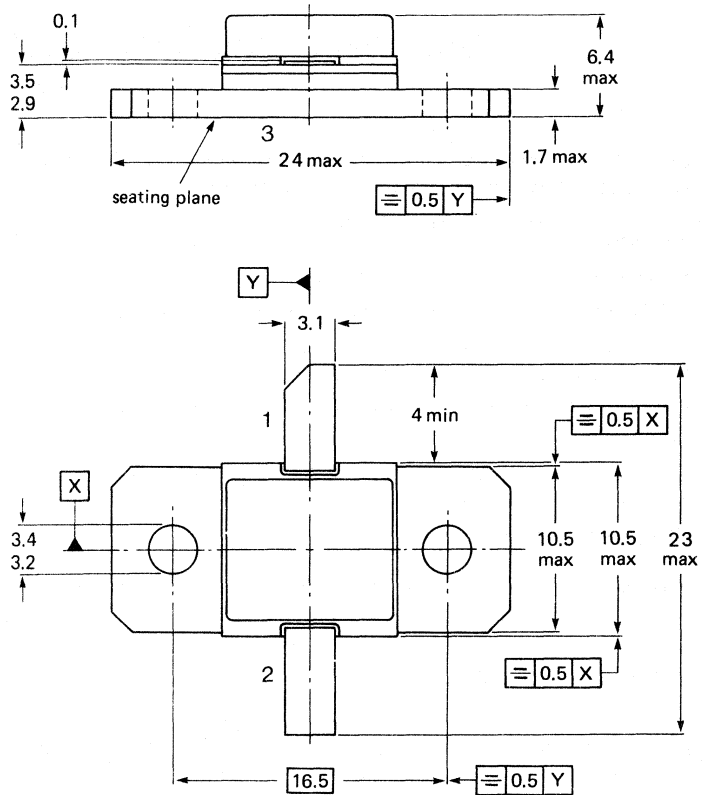
Pinning:

- 1 = collector
- 2 = emitter
- 3 = base



Torque on screw: max. 0,5 Nm

Recommended screw: M3



7285741.2

RATINGS

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

Collector-base voltage, open emitter	V_{CBO}	max.	40 V
Collector-emitter voltage open base	V_{CEO}	max.	15 V
$R_{BE} = 10 \Omega$	V_{CER}	max.	35 V
Emitter-base voltage, open collector	V_{EBO}	max.	3 V
Collector current (DC)	I_C	max.	6 A
Total power dissipation up to $T_{mb} = 75 \text{ }^\circ\text{C}$	P_{tot}	max.	67,5 W
Storage temperature	T_{stg}		-65 to +200 $^\circ\text{C}$
Junction temperature	T_j	max.	200 $^\circ\text{C}$
Soldering temperature at 0,1 mm from case; $t_{sld} \leq 10 \text{ s}$	T_{sld}	max.	235 $^\circ\text{C}$

MICROWAVE POWER POWER TRANSISTOR

NPN silicon planar epitaxial microwave power transistor, intended for use in a common-base class-C broadband pulse power amplifier, operating in the 2.8 to 3.3 GHz frequency range.

It is recommended for radar applications.

Features

- Interdigitated structure; giving a high emitter efficiency
- Diffused emitter ballasting resistors; capable of withstanding a high VSWR and providing excellent current sharing
- Gold metallization; ensuring excellent stability of the characteristics and giving a prolonged working life
- Multicell geometry; giving good balance of dissipated power and low thermal resistance
- Internal input and output matching cells; simplifying circuit design.

The transistor is housed in a metal-ceramic flange envelope (FO-83).

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-C broadband amplifier; typical values.

mode of operation	f GHz	V _{CC} V	P _L W	G _p dB	η_C %
class-C $t_p = 100\ \mu\text{s}$ $\delta = 10\%$	2.8 to 3.3	24	5.6	5.7	47

MECHANICAL DATA

FO-83 (see Fig. 1).

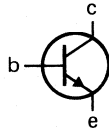
Dimensions in mm

MECHANICAL DATA

Dimensions in mm

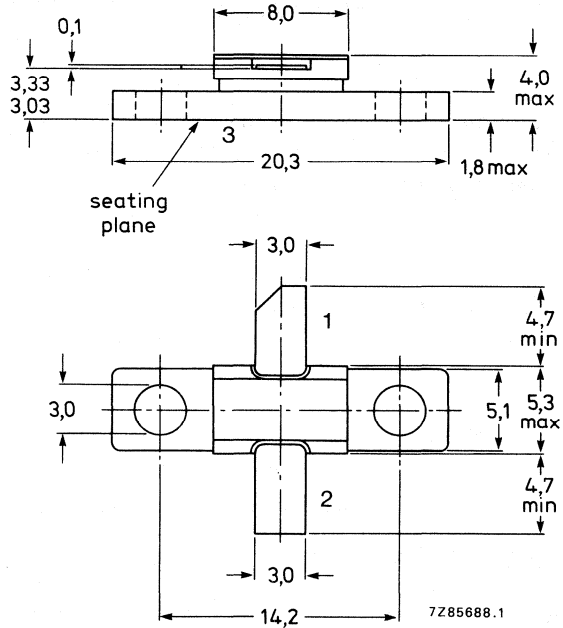
Fig. 1 FO-83

Pinning:
 1 = collector
 2 = emitter
 3 = base



Base is connected to the seating plane

Marking code;
 RTC2833B5X = RV2833B5X



RATINGS

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

Collector-base voltage; open emitter	V_{CBO}	max.	35 V
Collector-emitter voltage; $R_{BE} = 10 \Omega$	V_{CER}	max.	35 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.	1 A
Total power dissipation at $T_{mb} \leq 75 \text{ }^\circ\text{C}$ *	P_{tot}	max.	45 W
Storage temperature range	T_{stg}		-65 to +200 $^\circ\text{C}$
Operating junction temperature	T_j	max.	200 $^\circ\text{C}$
Soldering temperature at 0.3 mm from the case; $t_{sld} \leq 10 \text{ s}$	T_{sld}	max.	235 $^\circ\text{C}$

THERMAL RESISTANCE (at $T_j = 75 \text{ }^\circ\text{C}$)

From junction to mounting base (CW)	$R_{th \text{ j-mb}}$	max.	6.5 K/W
From mounting base to heatsink	$R_{th \text{ mb-h}}$	typ.	0.5 K/W
Equivalent thermal impedance under pulsed microwave conditions $t_p = 100 \mu\text{s}$; $\delta = 10\%$	$Z_{th \text{ j-mb}}$	typ.	2 K/W

* Maximum values under nominal pulse microwave operating conditions.

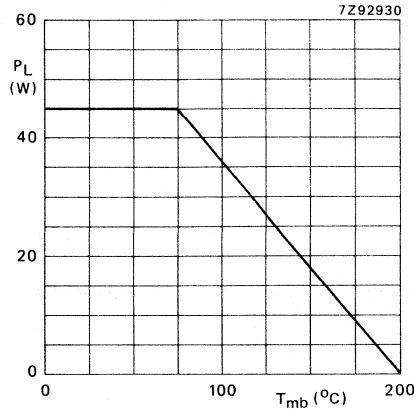


Fig. 2 Power derating curve; $t_p = 100 \mu s$; $\delta = 10\%$.

CHARACTERISTICS

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

Collector cut-off current

$V_{CB} = 35 \text{ V}; I_E = 0$

$I_{CB0} \leq 3 \text{ mA}$

$V_{CB} = 24 \text{ V}; I_E = 0$

$I_{CB0} \leq 0.1 \text{ mA}$

$V_{CE} = 35 \text{ V}; R_{BE} = 10 \Omega$

$I_{CER} \leq 3 \text{ mA}$

Emitter cut-off current

$V_{EB} = 1.5 \text{ V}; I_C = 0$

$I_{EBO} \leq 10 \mu\text{A}$

$V_{EB} = 3 \text{ V}; I_C = 0$

$I_{EBO} \leq 0.5 \text{ mA}$

APPLICATION INFORMATION

Microwave performance at $T_{mb} = 25 \text{ }^\circ\text{C}$ measured in a class-C broadband pulse test circuit as shown in Fig. 3.

mode of operation	f GHz	V_{CC} V	P_L W	G_p dB	η_C %
class-C $t_p = 100 \mu s$ $\delta = 10\%$	2.8 to 3.3	24	≥ 4	≥ 4.3	≥ 30

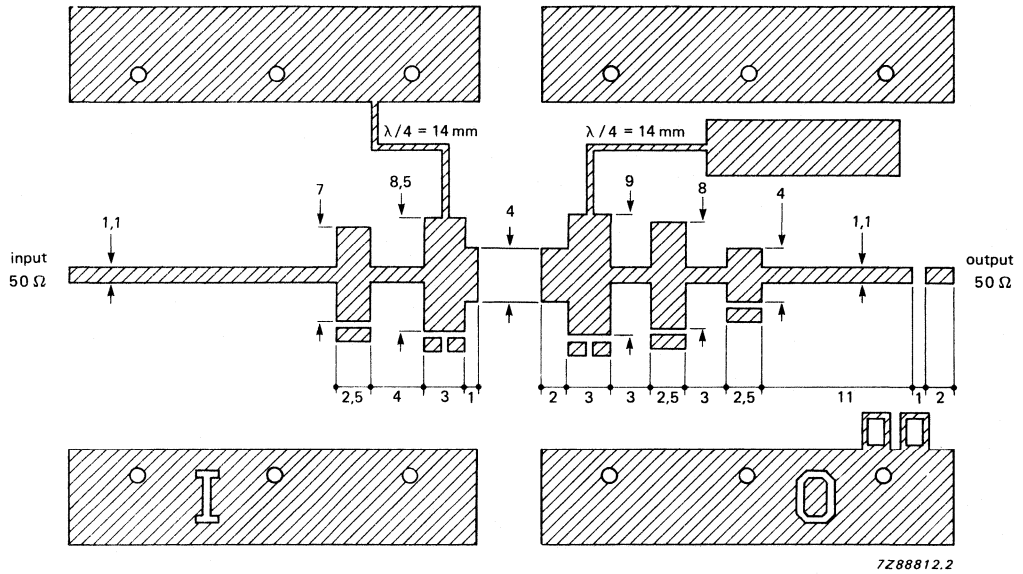


Fig. 3 Broadband test circuit for 2.8 to 3.3 GHz; class-C; pulse application. Cu-clad printed circuit board with PTFE fibreglass dielectric ($\epsilon_r = 2.54$); thickness = 0.4 mm.

PULSED POWER TRANSISTOR FOR S-BAND RADAR

N-P-N transistor for use in common-base pulsed power amplifiers for S-band radar (3,1 to 3,5 GHz).

Diffused emitter ballasting resistors, interdigitated structure, multicell geometry and gold sandwich metallization ensure an optimum temperature profile and reliability. Owing to the entirely ion-implanted, self-aligning process an excellent wideband performance is obtained.

Internal input and output prematching ensures good stability and easy broadband use.

QUICK REFERENCE DATA

R.F. performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized wideband common-base class-B circuit under pulse conditions.

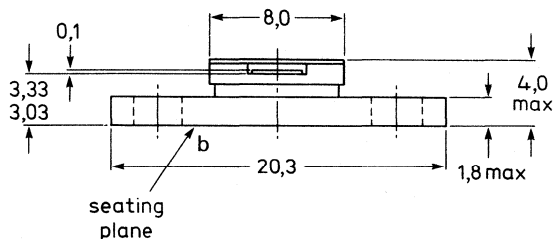
mode of operation	f GHz	V _{CC} V	t _p μs	δ %	P _L W	G _p dB	η _C %
class-B	3,1 to 3,5	24	100	10	typ. 5,6	typ. 5,7	typ. 47

MECHANICAL DATA

Dimensions in mm

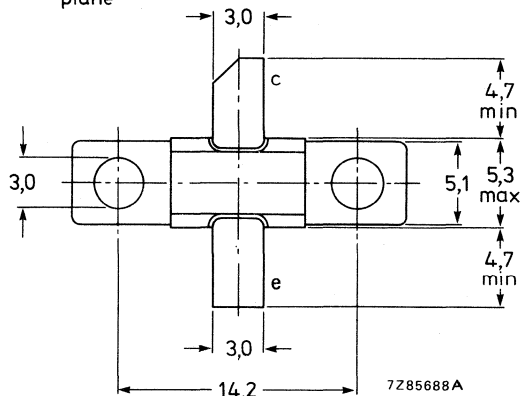
Fig. 1 FO-83.

Base connected to flange



Torque on nut: max. 0,5 Nm

Recommended screw: M3



Marking code

RTC3135B5X = RV3135B5X

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.

RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	35 V
Collector-emitter voltage ($R_{BE} = 10 \Omega$) (open base)	V_{CER} V_{CEO}	max.	35 V 15 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3 V
Collector current (d.c.) ($t_p = 100 \mu s$; $\delta = 10\%$)	I_C	max.	1 A
Total power dissipation up to $T_{mb} = 75 \text{ }^\circ\text{C}$ ($t_p = 100 \mu s$; $\delta = 10\%$)	P_{tot}	max.	25 W
Storage temperature	T_{stg}		-65 to +200 $^\circ\text{C}$
Junction temperature	T_j	max.	200 $^\circ\text{C}$
Lead soldering temperature at 0,3 mm from the case $t_{sld} \leq 10 \text{ s}$	T_{sld}	max.	235 $^\circ\text{C}$

→ **THERMAL RESISTANCE** (at $T_j = 75 \text{ }^\circ\text{C}$)

From junction to mounting base	$R_{th \text{ j-mb}}$	max.	6,5 K/W
From mounting base to heatsink	$R_{th \text{ mb-h}}$	max.	0,6 K/W

CHARACTERISTICS $T_{mb} = 25 \text{ }^\circ\text{C}$

Collector-base breakdown voltage $I_C = 3 \text{ mA}$; open emitter	$V_{(BR)CBO}$	\geq	35 V
Collector-emitter breakdown voltage $R_{BE} = 10 \Omega$; $I_C = 3 \text{ mA}$	$V_{(BR)CER}$	\geq	35 V
Emitter-base breakdown voltage $I_E = 0,5 \text{ mA}$; open collector	$V_{(BR)EBO}$	\geq	3 V
Collector cut-off current $I_E = 0$; $V_{CB} = 24 \text{ V}$	I_{CBO}	\leq	0,1 mA
Emitter cut-off current $I_C = 0$; $V_{EB} = 1,5 \text{ V}$	I_{EBO}	\leq	10 μA

APPLICATION INFORMATION

R.F. performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized wideband common-base class-B circuit under pulsed conditions.

type number	f GHz	V _{CC} V	t _p μs	δ %	P _L W	G _p dB	η _C %
RV3135B5X	3,1 to 3,5	24	100	10	> 4 typ. 5,6	> 4,3 typ. 5,7	> 30 typ. 47

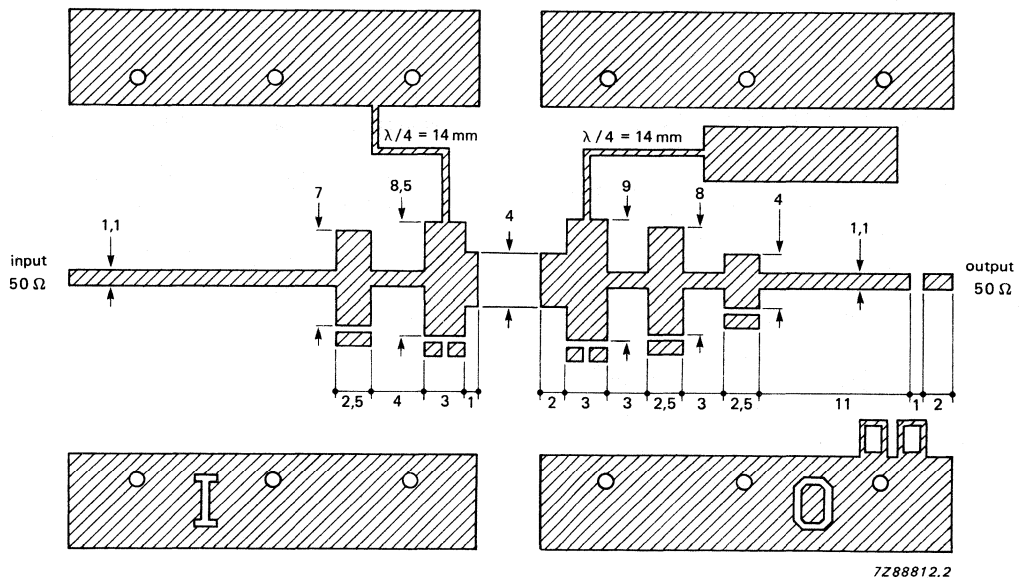


Fig. 2 Wideband test circuit boards for 3,1 to 3,5 GHz (dimensions in mm); striplines on a double CU-clad p.c. board with PTFE fibre-glass dielectric ($\epsilon_r = 2,54$); thickness 0,4 mm.

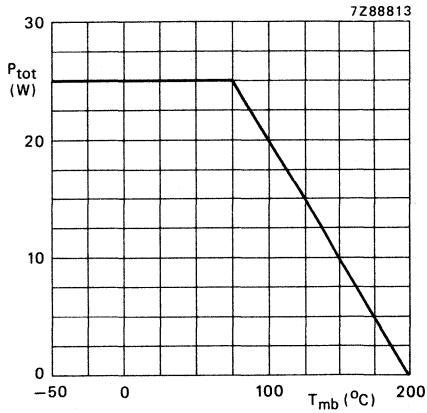


Fig. 3

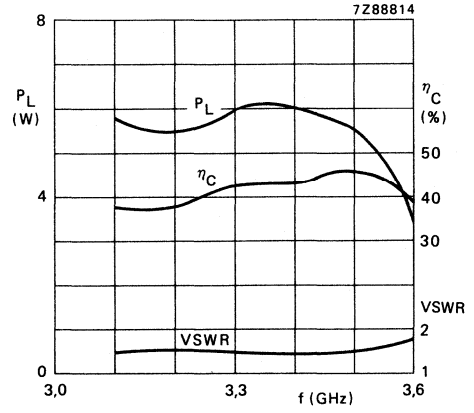


Fig. 4.

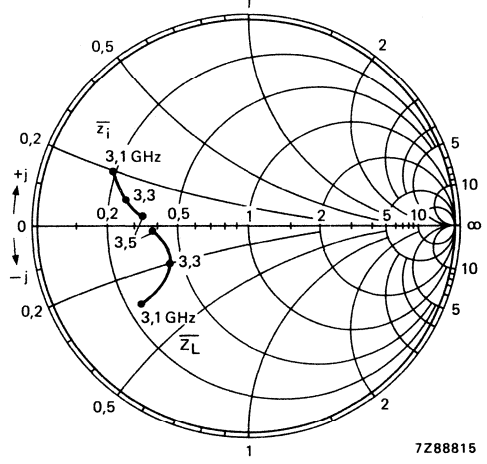


Fig. 5.

Fig. 3 Power derating curve vs. mounting base temperature; $t_p = 100 \mu s$; $\delta = 10\%$.

Fig. 4 Load power, collector efficiency and VSWR vs. frequency; $P_{in} = 1,5 W$.

Fig. 5 Input and optimum load impedance vs. frequency; typical values; $Z_0 = 50 \Omega$; $T_{mb} = 25 \text{ }^\circ\text{C}$.

PULSED MICROWAVE POWER TRANSISTOR

NPN silicon planar epitaxial microwave power transistor intended for use in common-base, class-C broadband pulse power amplifiers operating in the 1.03 to 1.09 GHz frequency range.

It is recommended for IFF long pulse applications.

Features

- Interdigitated structure; giving a high emitter efficiency
- Diffused emitter ballasting resistors; capable of withstanding a high VSWR and providing excellent current sharing
- Gold metallization; ensuring excellent stability of the characteristics and giving a prolonged working life
- Multicell geometry; giving good balance of dissipated power and low thermal resistance
- Input and output matching cells; simplifying circuit design

The transistor is housed in a metal-ceramic flange envelope (FO-91).

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-C broadband amplifier.

mode of operation	f GHz	V_{CC} V	P_L W	G_p dB	η_C %
class-C; $t_p = 300\text{ }\mu\text{s}$; $\delta = 10\%$ (see Fig. 2)	1.03 to 1.09	50	typ. 250	typ. 7.5	typ. 40

MECHANICAL DATA

FO-91 (see Fig. 1).

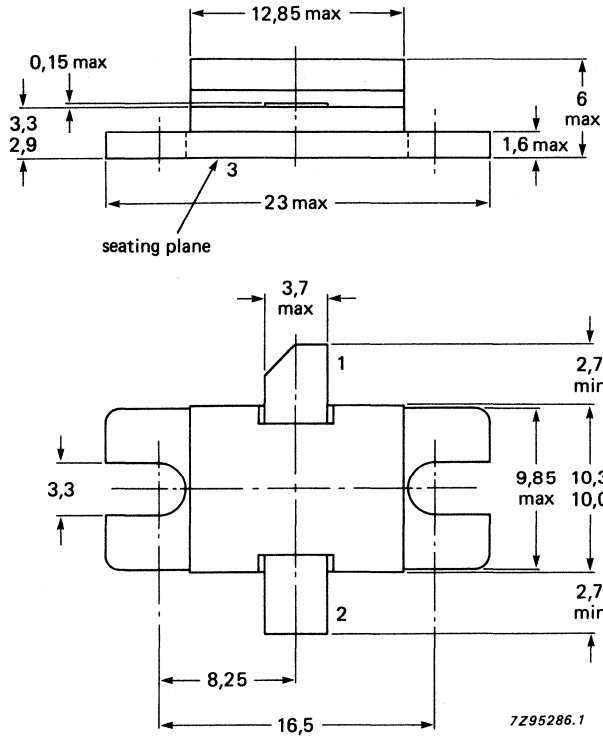
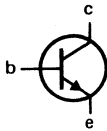
Dimensions in mm

MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-91.

Pinning:
 1 = collector
 2 = emitter
 3 = base



RATINGS

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

Collector-base voltage, open emitter	V_{CB0}	max.	60 V
Collector-emitter voltage, $R_{BE} = 10 \Omega$	V_{CER}	max.	60 V
Collector-emitter voltage, open base	V_{CEO}	max.	20 V
Emitter-base voltage, open collector	V_{EBO}	max.	3 V
Collector current (peak)*	I_C	max.	15 A
Total power dissipation at $T_{mb} \leq 75 \text{ }^\circ\text{C}^*$	P_{tot}	max.	650 W
Storage temperature range	T_{stg}		-65 to +200 $^\circ\text{C}$
Operating junction temperature	T_j	max.	200 $^\circ\text{C}$
Soldering temperature at 0.3 mm from the case; $t_{sld} \leq 10 \text{ s}$	T_{sld}	max.	235 $^\circ\text{C}$

THERMAL RESISTANCE (at $T_j = 100 \text{ }^\circ\text{C}$)

From junction to mounting base in CW	$R_{th j-mb}$	max.	1.2 K/W
From mounting base to heatsink in CW	$R_{th mb-h}$	max.	0.2 K/W
From junction to mounting base**	Z_{th}	typ.	0.14 K/W

* Maximum value under nominal pulsed microwave operating conditions.

** Equivalent thermal impedance under nominal pulsed microwave operating conditions (see Fig. 2).

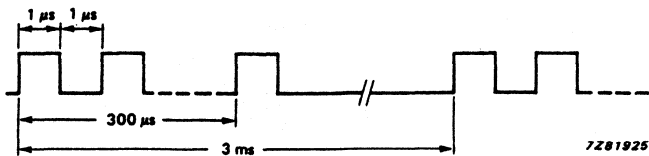


Fig. 2 Pulse definition.

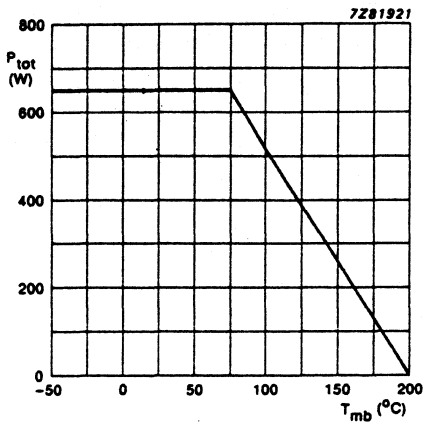


Fig. 3 Power derating curve.
 $t_p = 300 \mu s; \delta = 10\%$ (see Fig. 2).

DEVELOPMENT DATA

CHARACTERISTICS

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

Collector cut-off current

$V_{CB} = 50 \text{ V}; I_E = 0$

$V_{CB} = 60 \text{ V}; I_E = 0$

$V_{CE} = 50 \text{ V}; R_{BE} = 10 \Omega$

$V_{CE} = 20 \text{ V}; I_B = 0$

I_{CBO}	\leq	10 mA
I_{CBO}	\leq	50 mA
I_{CER}	\leq	50 mA
I_{CEO}	\leq	50 mA

Emitter cut-off current

$V_{EB} = 1.5 \text{ V}; I_B = 0$

$V_{EB} = 3.5 \text{ V}; I_B = 0$

I_{EBO}	\leq	500 μA
I_{EBO}	\leq	5 mA

APPLICATION INFORMATION

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-C wideband amplifier.

mode of operation	f GHz	V_{CC} V	P_L W	G_p dB	η_C %
pulsed $t_p = 300\ \mu\text{s}$ $\delta = 10\%$ (see Fig. 2)	1.03 to 1.09	50	≥ 210	≥ 7	≥ 38

DEVELOPMENT DATA

This data sheet contains advance information and specifications are subject to change without notice.

RX1011B350Y

PULSED MICROWAVE POWER TRANSISTOR

NPN silicon planar epitaxial microwave power transistor intended for use in common-base, class-C broadband pulse power amplifiers operating in the 1.03 to 1.09 GHz range.

It is recommended for IFF long pulse applications.

Features

- Interdigitated structure; giving a high emitter efficiency
- Diffused emitter ballasting resistors; capable of withstanding a high VSWR and providing excellent current sharing
- Gold metallization; ensuring excellent stability of the characteristics and giving a prolonged working life
- Multicell geometry; giving good balance of dissipated power and low thermal resistance
- Input and output matching cells; simplifying circuit design

The transistor is housed in a metal-ceramic flange envelope (FO-91).

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-C broadband amplifier.

mode of operation	f GHz	V_{CE} V	P_L W	G_p dB	η_C %
class-C $t_p = 300\ \mu\text{s}$ $\delta = 10\%$ (see Fig. 2)	1.03 to 1.09	50	typ. 350	typ. 7.5	typ. 40

MECHANICAL DATA

Dimensions in mm

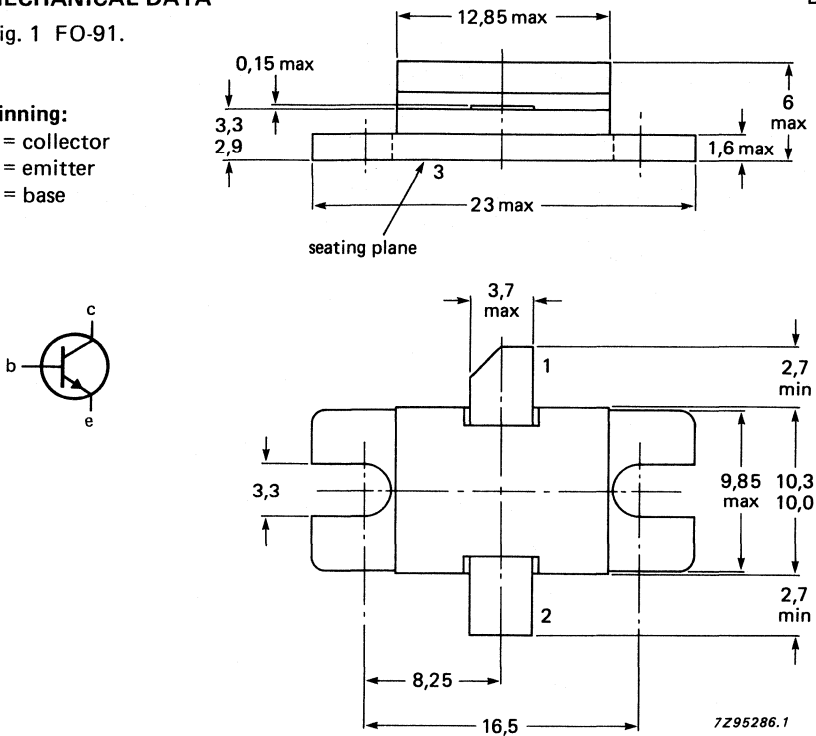
FO-91 (see Fig. 1).

MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-91.

Pinning:
 1 = collector
 2 = emitter
 3 = base



RATINGS

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

Collector-base voltage, open emitter	V_{CBO}	max.	60 V
Collector-emitter voltage, $R_{BE} = 10 \Omega$	V_{CER}	max.	60 V
Collector-emitter voltage, open base	V_{CEO}	max.	20 V
Emitter-base voltage, open collector	V_{EBO}	max.	3 V
Collector current (peak)*	I_C	max.	21 A
Total power dissipation at $T_{mb} \leq 75 \text{ }^\circ\text{C}$ *	P_{tot}	max.	880 W
Storage temperature range	T_{stg}		-65 to 200 $^\circ\text{C}$
Operating junction temperature	T_j	max.	200 $^\circ\text{C}$
Soldering temperature at 0.3 mm from the case; $t_{sld} \leq 10 \text{ s}$	T_{sld}	max.	235 $^\circ\text{C}$

THERMAL RESISTANCE (at $T_j = 100 \text{ }^\circ\text{C}$)

From junction to mounting base in CW	$R_{th j-mb}$	max.	0.8 K/W
From mounting base to heatsink in CW	$R_{th mb-h}$	max.	0.2 K/W
From junction to mounting base**	Z_{th}	typ.	0.1 K/W

* Maximum value under nominal pulsed microwave operating conditions.

** Equivalent thermal impedance under nominal pulsed microwave operating conditions (see Fig. 2).

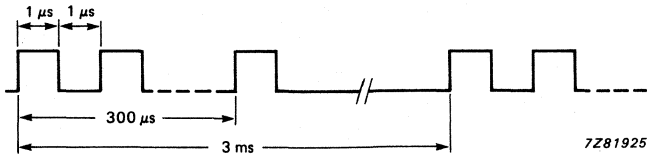


Fig. 2 Pulse definition.

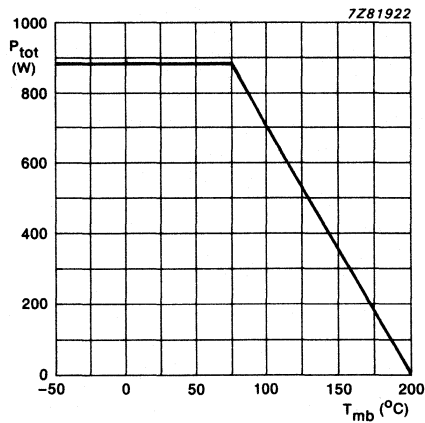


Fig. 3 Power derating curve.
 $t_p = 300 \mu\text{s}$; $\delta = 10\%$ (see Fig. 2).

DEVELOPMENT DATA

CHARACTERISTICS

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

Collector cut-off current

$V_{\text{CB}} = 50 \text{ V}; I_{\text{E}} = 0$

$V_{\text{CB}} = 60 \text{ V}; I_{\text{E}} = 0$

$V_{\text{CE}} = 50 \text{ V}; R_{\text{BE}} = 10 \Omega$

$V_{\text{CE}} = 20 \text{ V}; I_{\text{B}} = 0$

I_{CBO}	\leq	10 mA
I_{CBO}	\leq	50 mA
I_{CER}	\leq	50 mA
I_{CEO}	\leq	50 mA

Emitter cut-off current

$V_{\text{EB}} = 1.5 \text{ V}; I_{\text{B}} = 0$

$V_{\text{EB}} = 3.5 \text{ V}; I_{\text{B}} = 0$

I_{EBO}	\leq	500 μA
I_{EBO}	\leq	5 mA

APPLICATION INFORMATION

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-C wideband amplifier.

mode of operation	f GHz	V_{CC} V	P_L W	G_p dB	η_C %
pulsed $t_p = 300\text{ }\mu\text{s}$ $\delta = 10\%$ (see Fig. 2)	1.03 to 1.09	50	≥ 300	≥ 7	≥ 38

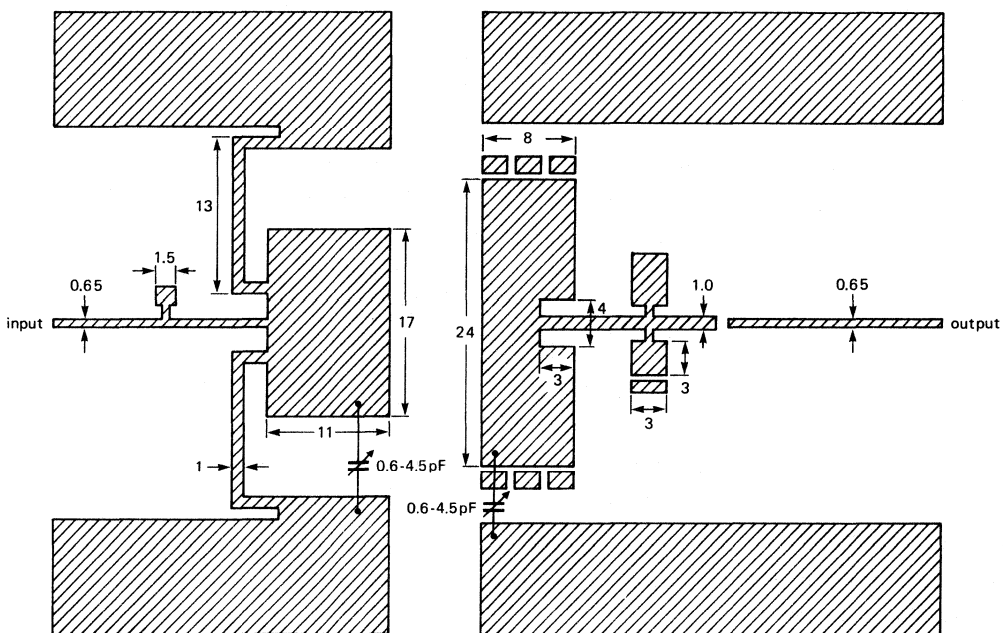


Fig. 4 Broadband test circuit for 1.03 to 1.09 GHz; class-C; pulse application. Epsilam printed circuit board thickness 0.635 mm; $\epsilon_r = 10$ (dimensions in mm).

MICROWAVE POWER TRANSISTOR

NPN silicon planar epitaxial microwave power transistor, intended for use in a common-base class-C broadband pulse power amplifier, operating in the 1.2 to 1.4 GHz frequency range.

It is recommended for radar applications.

Features

- Interdigitated structure; giving a high emitter efficiency
- Diffused emitter ballasting resistors; capable of withstanding a high VSWR and providing excellent current sharing
- Gold metallization; ensuring excellent stability of the characteristics and giving a prolonged working life
- Multicell geometry; giving good balance of dissipated power and low thermal resistance
- Internal input and output matching cells; simplifying circuit design

The transistor is housed in a metal ceramic flange envelope (FO-91).

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-C broadband amplifier; typical values.

mode of operation	f GHz	V_{CC} V	P_L W	G_p dB	η_C %	$\bar{z}_i; \bar{Z}_L$ Ω
$t_p = 1\text{ ms};$ $\delta = 10\%$	1.2 to 1.4	40	150	7	42	see Fig. 6
$t_p = 150\text{ }\mu\text{s}$ $\delta = 5\%$	1.2 to 1.4	50	240	9	45	see Fig. 6

MECHANICAL DATA

FO-91 (see Fig. 1).

Dimensions in mm

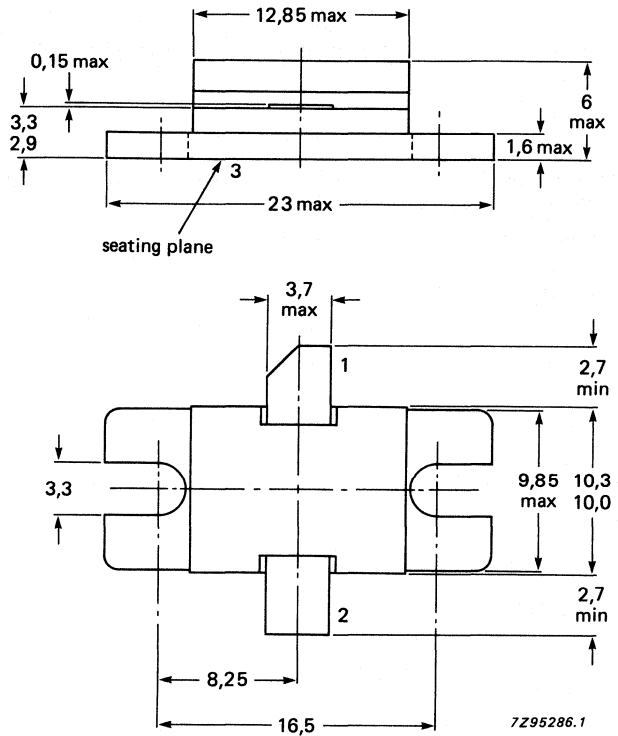
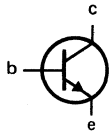
MECHANICAL DATA

Fig. 1 FO-91.

Dimensions in mm

Pinning:
 1 = collector
 2 = emitter
 3 = base

Base is connected to the seating plane.



RATINGS

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

Collector-base voltage; open emitter	V_{CBO}	max.	60 V
Collector-emitter voltage; $R_{BE} = 10 \Omega$	V_{CER}	max.	60 V
Collector-emitter voltage; open base	V_{CEO}	max.	20 V
Emitter-base voltage; open collector	V_{EBO}	max.	3 V
Collector current (peak)*	I_C	max.	15 A
Total power dissipation at $T_{mb} \leq 75 \text{ }^\circ\text{C}$ *	P_{tot}	max.	300 W
Storage temperature range	T_{stg}		-65 to + 200 $^\circ\text{C}$
Operating junction temperature	T_j	max.	200 $^\circ\text{C}$
Soldering temperature at 0.3 mm from the case; $t_{slid} \leq 10 \text{ s}$	T_{slid}	max.	235 $^\circ\text{C}$

THERMAL RESISTANCE (at $T_j = 75 \text{ }^\circ\text{C}$)

From junction to mounting base (CW)	$R_{th j-mb}$	max.	1 K/W
From junction to mounting base**	$Z_{th j-mb}$	typ.	0.3 K/W
From mounting base to heatsink (CW)	$R_{th mb-h}$	typ.	0.2 K/W

* Maximum values under nominal pulsed microwave operating conditions.

** Equivalent thermal impedance under nominal pulsed microwave operating conditions ($t_{on} = 1 \text{ ms}$; $\delta = 10\%$).

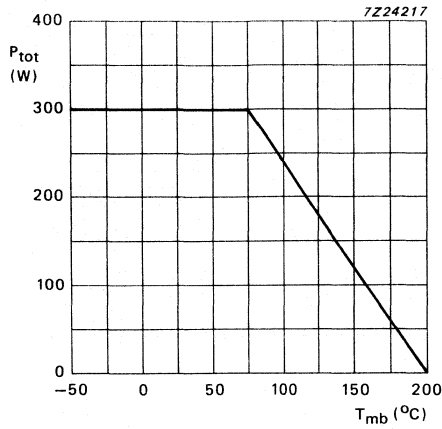


Fig. 2 Power derating curve $t_p = 1 \text{ ms}$; $\delta = 10\%$.

CHARACTERISTICS

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

Breakdown voltages

$I_C = 35 \text{ mA}$; $I_E = 0$

$I_C = 35 \text{ mA}$; $I_B = 0$

$I_C = 35 \text{ mA}$; $R_{BE} = 10 \text{ } \Omega$

$I_C = 0$; $I_E = 10 \text{ mA}$

$V_{(BR)CBO} \geq 60 \text{ V}$

$V_{(BR)CEO} \geq 20 \text{ V}$

$V_{(BR)CER} \geq 50 \text{ V}$

$V_{(BR)EBO} \geq 3 \text{ V}$

Collector cut-off current

$I_E = 0$; $V_{CB} = 50 \text{ V}$

$I_{CBO} \leq 7 \text{ mA}$

APPLICATION INFORMATION

Microwave performance at $T_{mb} = 25 \text{ }^\circ\text{C}$ measured in a common-base broadband test circuit as shown in Fig. 3.

mode of operation	f GHz	V_{CC} V	P_L W	G_p dB	η_C %	$\bar{z}_i; \bar{Z}_L$
class-C; $t_p = 1 \text{ ms}$; $\delta = 10\%$	1.2 to 1.4	40	≥ 135	≥ 6.5	≥ 35	see Fig. 6

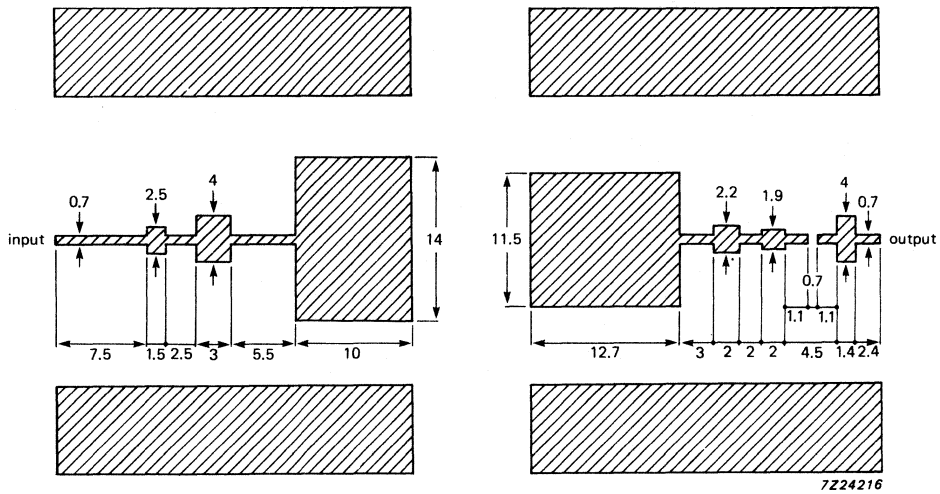


Fig. 3 Broadband test circuit for 1.2 to 1.4 GHz; class-C; pulse applications (dimensions in mm). Epsilam printed circuit board; thickness 0.635 mm; $\epsilon_r = 10$.

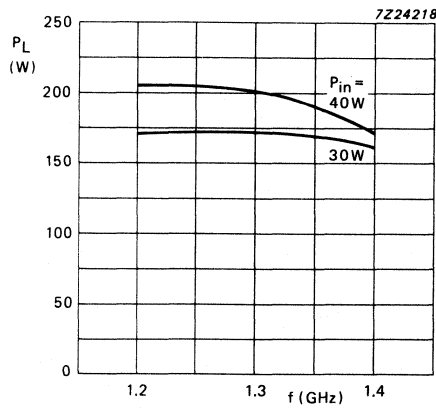


Fig. 4 Load power as a function of frequency; $V_{CC} = 40\text{ V}$; $t_p = 1\text{ ms}$; $\delta = 10\%$; typical values.

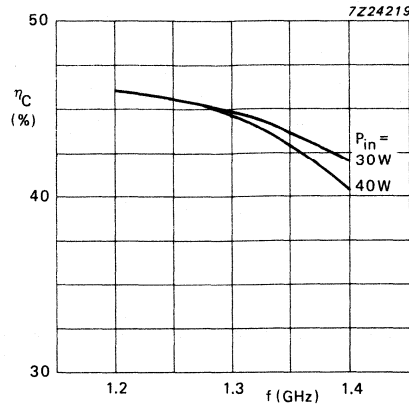


Fig. 5 Power gain as a function of frequency;
 $t_p = 1 \text{ ms}$; $\delta = 10\%$; typical values.

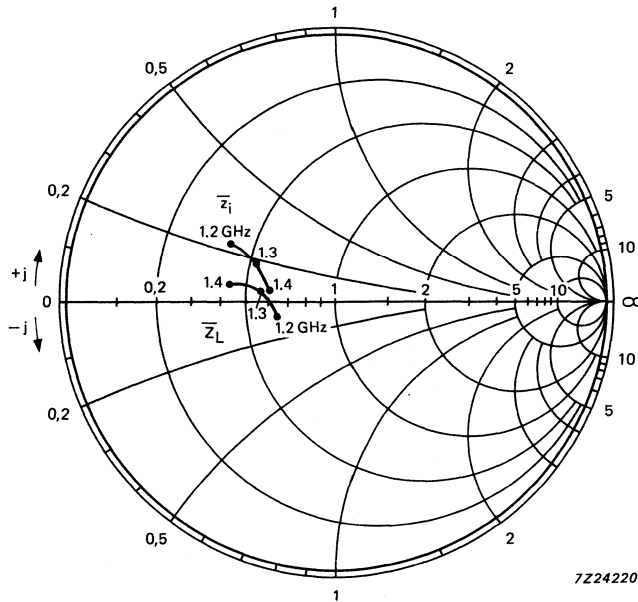


Fig. 6 Input and optimum load impedance as a function of frequency;
 $V_{CC} = 40 \text{ V}$; $Z_0 = 5 \Omega$.

PULSED MICROWAVE POWER TRANSISTOR

NPN silicon microwave power transistor for use in common-base, class-C wideband amplifiers operating under pulsed conditions.

It is recommended for L-band radar applications.

Features

- Interdigitated structure; giving a high emitter efficiency
- Diffused emitter ballasting resistors; capable of withstanding a high VSWR and providing excellent current sharing
- Gold metallization; ensuring excellent stability of the characteristics and giving a prolonged working life
- Multicell geometry; giving good balance of dissipated power and low thermal resistance
- Internal input and output matching cells; simplifying circuit design

The transistor is housed in a metal-ceramic flange envelope (FO-91).

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-C wideband amplifier.

mode of operation	f GHz	V_{CC} V	P_L W	G_p dB	η_C %	$\bar{z}_i; \bar{Z}_L$
class-C; $t_p = 150\ \mu\text{s}$; $\delta = 5\%$	1.2 to 1.4	50	typ. 320	typ. 8	typ. 38	see Fig. 6
class-C; $t_p = 300\ \mu\text{s}$; $\delta = 5\%$	1.2 to 1.4	50	typ. 300	typ. 7.5	typ. 35	see Fig. 6

MECHANICAL DATA

FO-91 (see Fig. 1).

Dimensions in mm

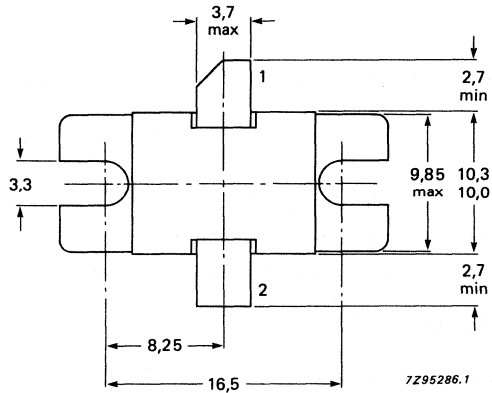
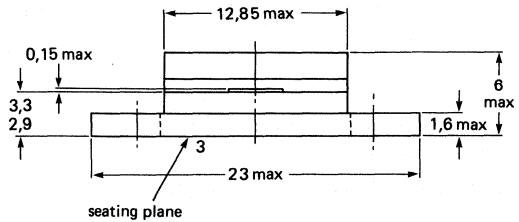
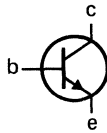
MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-91.

Pinning:

- 1 = collector
- 2 = emitter
- 3 = base



RATINGS

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

Collector-base voltage, open emitter	V_{CB0}	max.	60 V
Collector-emitter voltage, $R_{BE} \leq 10 \Omega$	V_{CER}	max.	60 V
Emitter-base voltage, open collector	V_{EBO}	max.	3 V
Collector current (DC) $t_p \leq 150 \mu s; \delta \leq 5\%$	I_C	max.	21 A
Total power dissipation up to $T_{mb} = 75 \text{ }^\circ\text{C}$ $t_p \leq 150 \mu s; \delta \leq 5\%$	P_{tot}	max.	630 W
Storage temperature range	T_{stg}		-65 to 200 $^\circ\text{C}$
Junction temperature	T_j	max.	200 $^\circ\text{C}$
Lead soldering temperature at 0.1 mm from the case; $t_{sld} \leq 10 \text{ s}$	T_{sld}	max.	235 $^\circ\text{C}$

THERMAL RESISTANCE (at $T_j = 100 \text{ }^\circ\text{C}$)

From junction to mounting base	$R_{th \text{ j-mb}}$	max.	0.8 K/W
Equivalent thermal impedance under pulsed microwave conditions; $t_p = 150 \mu s; \delta = 5\%$	Z_{th}	typ.	0.19 K/W

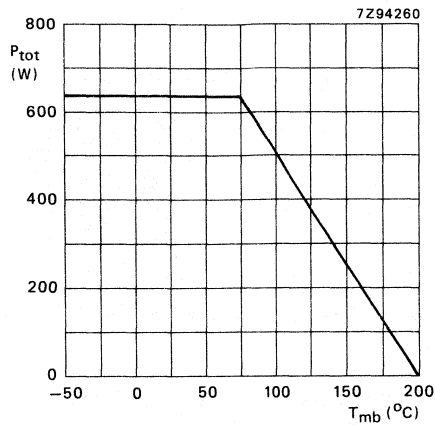


Fig. 2 Power derating curve; pulsed conditions; $t_p = 150 \mu s$; $\delta = 5\%$.

CHARACTERISTICS

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

Collector-base breakdown voltage

$I_C = 50 \text{ mA}$; $I_E = 0$

$V_{(BR)CBO}$ min. 60 V

Collector-emitter breakdown voltage

$I_C = 50 \text{ mA}$; $R_{BE} = 10 \Omega$

$V_{(BR)CER}$ min. 50 V

Emitter-base breakdown voltage

$I_C = 0$; $I_E = 5 \text{ mA}$

$V_{(BR)EBO}$ min. 3 V

Collector cut-off current

$I_E = 0$; $V_{CB} = 50 \text{ V}$

I_{CBO} max. 10 mA

Emitter cut-off current

$I_C = 0$; $V_{EB} = 1.5 \text{ V}$

I_{EBO} max. 0.5 mA

APPLICATION INFORMATION

Microwave performance up to $T_{mb} = 25 \text{ }^\circ\text{C}$ in an unneutralized common-base class-C wideband amplifier.

mode of operation	f GHz	V _{CC} V	P _L W	G _p dB	η_C %	\bar{z}_i ; \bar{z}_L
pulsed; $t_p = 150 \mu s$; $\delta = 5\%$	1.2 to 1.4	50	≥ 250	≥ 7	≥ 35	see Fig. 6

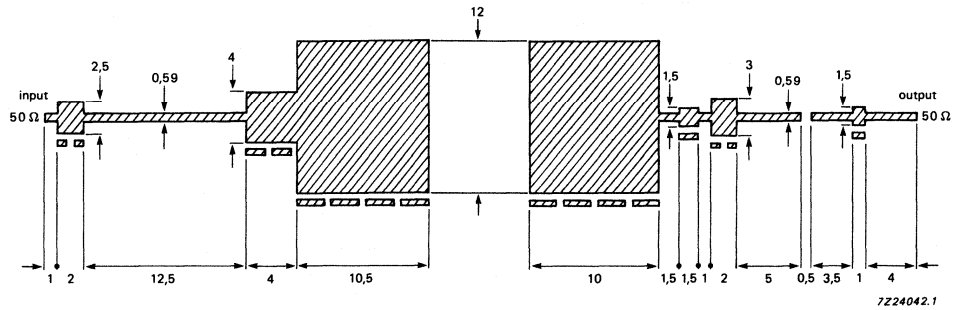


Fig. 3 Wideband test circuit for 1.2 to 1.4 GHz (dimensions in mm).
Epsilam printed circuit board; thickness 0.635 mm; $\epsilon_r = 10$.

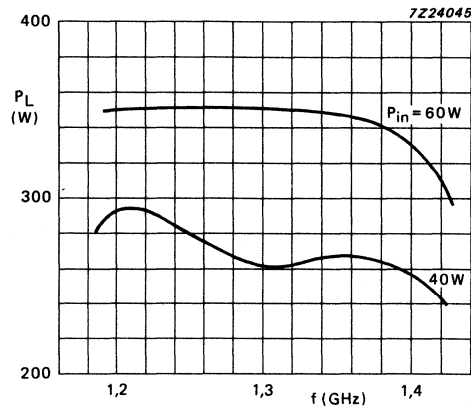


Fig. 4 Load power as a function of frequency; typical values;
 $t_p = 150 \mu s$; $\delta = 5\%$.

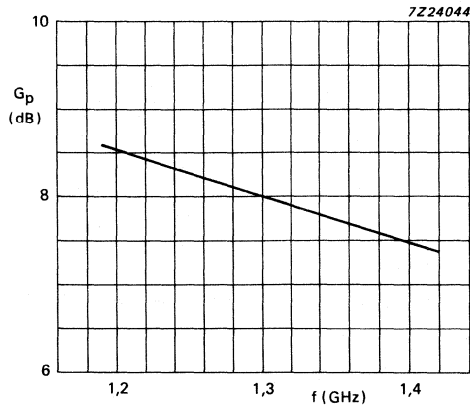


Fig. 5 Power gain as a function of frequency; $t_p = 150 \mu s$; $\delta = 5\%$.

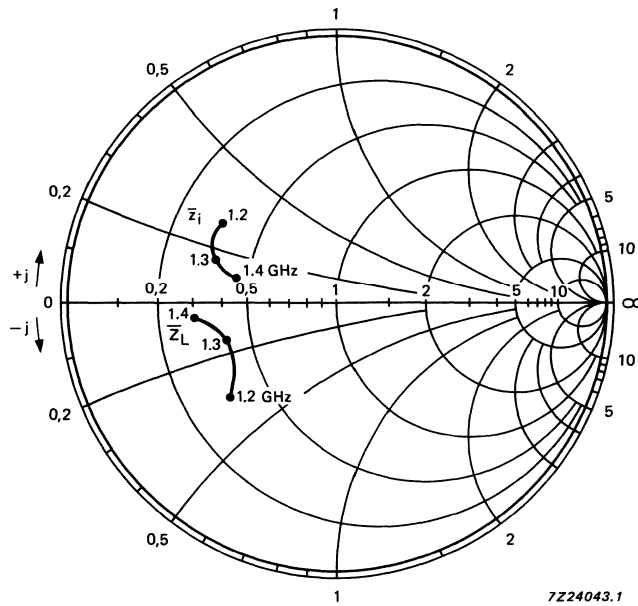


Fig. 6 Input and optimum load impedance as a function of frequency; $V_{CC} = 50 V$; $P_L = 250 W$; $t_p = 150 \mu s$; $\delta = 5\%$; class-C operation; $Z_0 = 5 \Omega$; typical values.

PULSED MICROWAVE POWER TRANSISTOR

NPN silicon planar epitaxial microwave power transistor, intended for use in a common-base class-C broadband pulse power amplifier with a frequency range of 2.7 to 3.1 GHz.

It is recommended for radar applications.

Features

- Interdigitated structure; giving a high emitter efficiency
- Diffused emitter ballasting resistors; capable of withstanding a high VSWR and providing excellent current sharing
- Gold metallization; ensuring excellent stability of the characteristics and giving a prolonged working life
- Multicell geometry; giving good balance of dissipated power and low thermal resistance
- Input and output matching cells; simplifying circuit design.

The transistor is housed in a metal-ceramic flange envelope (FO-125A).

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-C broadband amplifier, typical values.

mode of operation	f GHz	V_{CC} V	P_L W	G_p dB	η_C %	$\bar{z}_i; \bar{Z}_L$ Ω
class-C $t_p = 100\ \mu\text{s};$ $\delta = 10\%$	2.7 to 3.1	40	100	6.5	40	see Fig. 5

MECHANICAL DATA

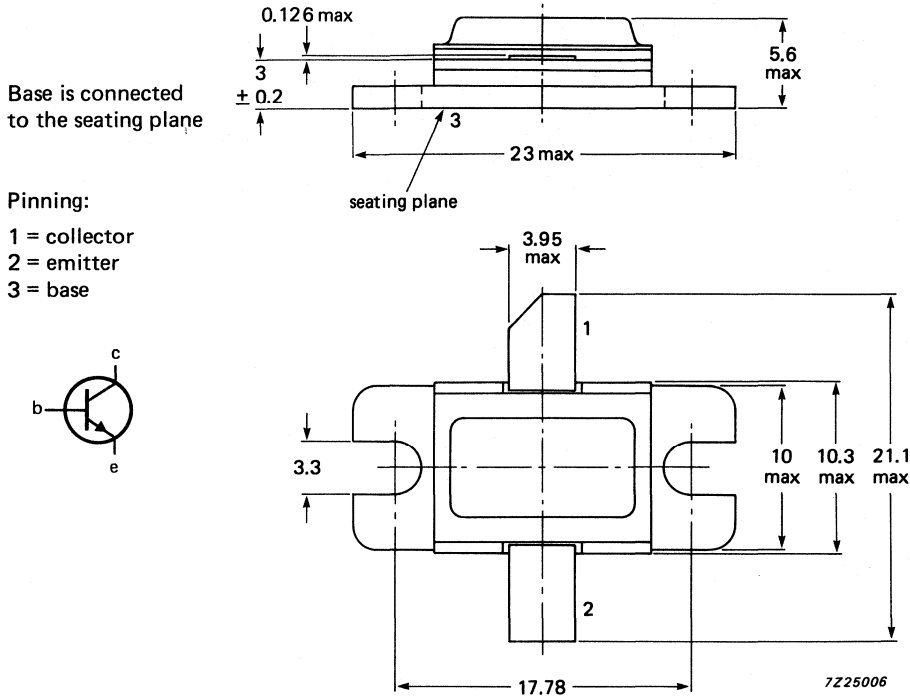
FO-125A (see Fig. 1).

Dimensions in mm

MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-125A.



Base is connected to the seating plane

Pinning:

- 1 = collector
- 2 = emitter
- 3 = base

RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	50 V
Collector-emitter voltage, $R_{BE} = 10 \Omega$ open base	V_{CER}	max.	50 V
	V_{CEO}	max.	15 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3.5 V
Collector current (peak)*	I_C	max.	8.5 A
Total power dissipation up to $T_{mb} = 75 \text{ }^\circ\text{C}$ *	P_{tot}	max.	185 W
Storage temperature range	T_{stg}		-65 to +200 $^\circ\text{C}$
Junction temperature	T_j	max.	200 $^\circ\text{C}$
Soldering temperature up to 0.3 mm from the case; $t_{sld} \leq 10 \text{ s}$	T_{sld}	max.	235 $^\circ\text{C}$

THERMAL RESISTANCE (at $T_j = 100 \text{ }^\circ\text{C}$)

From junction to mounting base	$R_{th \text{ j-mb}}$	max.	1.7 K/W
From mounting base to heatsink	$R_{th \text{ mb-h}}$	typ.	0.3 K/W
Equivalent thermal impedance under pulse microwave conditions $t_p = 100 \mu\text{s}$; $\delta = 10\%$	$Z_{th \text{ j-mb}}$	typ.	0.55 K/W

* Maximum value under normal pulsed microwave operating conditions.

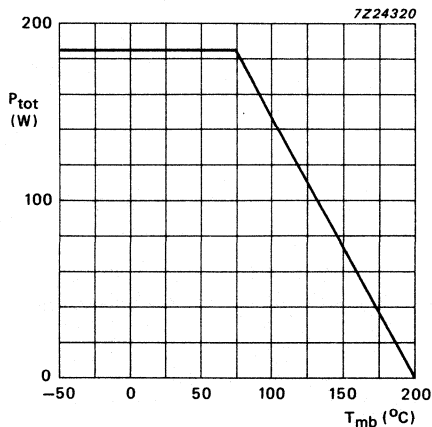


Fig. 2 Power derating curve; $t_p = 100 \mu s$; $\delta = 10\%$.

DEVELOPMENT DATA

CHARACTERISTICS

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

Collector cut-off current

$V_{CB} = 50 \text{ V}; I_E = 0$

$V_{CB} = 30 \text{ V}; I_E = 0$

$V_{CB} = 50 \text{ V}; R_{BE} = 10 \Omega$

I_{CBO} max. 30 mA

I_{CBO} max. 150 μA

I_{CER} max. 150 mA

Emitter cut-off current

$V_{EB} = 1.5 \text{ V}; I_C = 0$

$V_{EB} = 3.5 \text{ V}; I_C = 0$

I_{EBO} max. 150 μA

I_{EBO} max. 7 mA

APPLICATION INFORMATION

Microwave performance up to $T_{mb} = 25 \text{ }^\circ\text{C}$ in a class-C broadband amplifier under pulsed conditions.

mode of operation	f GHz	V _{CC} * V	PL W	Gp dB	η_C %	$\bar{z}_i; \bar{Z}_L$ Ω
class-C $t_p = 100 \mu s$; $\delta = 10\%$	2.7 to 3.1	40	≥ 90	≥ 6	≥ 35	see Fig. 5

* During pulse.

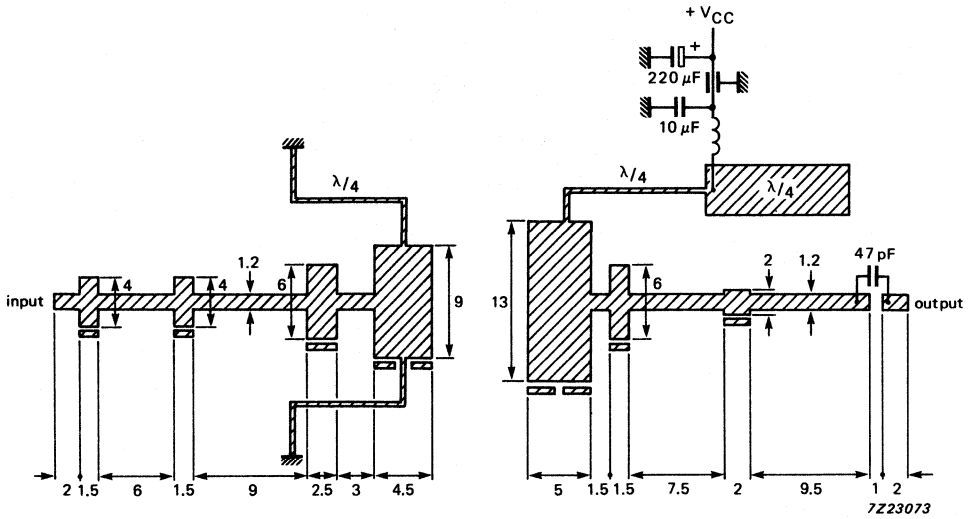


Fig. 3 Broadband test circuit for 3.0 to 3.4 GHz. (dimensions in mm).
PTFE fibreglass printed circuit board; $\epsilon_r = 2.55$; thickness 0.4 mm.

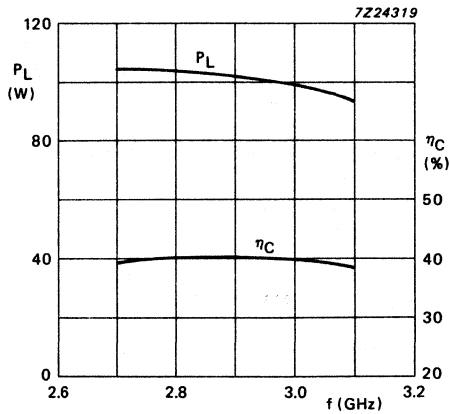


Fig. 4 Load power and collector efficiency as a function of frequency*;
 $V_{CC} = 40 \text{ V}$; $t_p = 100 \mu\text{s}$; $\delta = 10\%$; typical values.

* In a broadband test circuit as shown in Fig. 3.

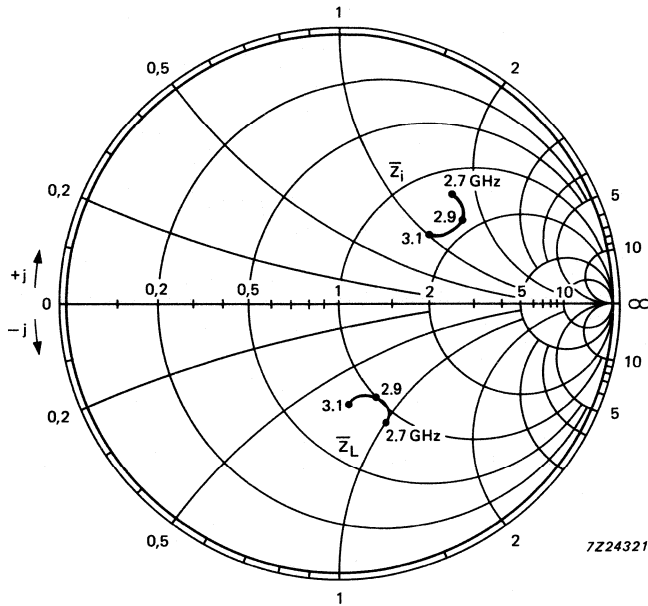


Fig. 5 Input and optimum load impedance as a function of frequency; $Z_0 = 5 \Omega$; $V_{CC} = 40 \text{ V}$; typical values.

DEVELOPMENT DATA

PULSED MICROWAVE POWER TRANSISTORS

NPN silicon planar epitaxial microwave power transistor, intended for use in a common-base class-C broadband pulse power amplifier with a frequency range of 3.0 to 3.4 GHz.

It is recommended for radar applications.

Features

- Interdigitated structure; giving a high emitter efficiency
- Diffused emitter ballasting resistors; capable of withstanding a high VSWR and providing excellent current sharing
- Gold metallization; ensuring excellent stability of the characteristics and giving a prolonged working life
- Multicell geometry; giving good balance of dissipated power and low thermal resistance
- Input and output matching cells; simplifying circuit design.

The transistor is housed in a metal-ceramic flange envelope (FO-125A).

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-C broadband amplifier, typical values.

mode of operation	f GHz	V _{CC} V	P _L W	G _p dB	η_C %	$\bar{z}_i; \bar{Z}_L$ Ω
class-C $t_p = 100\ \mu\text{s};$ $\delta = 10\%$	3.0 to 3.4	40	80	6	35	see Fig. 5

MECHANICAL DATA

FO-125A (see Fig. 1).

Dimensions in mm

MECHANICAL DATA

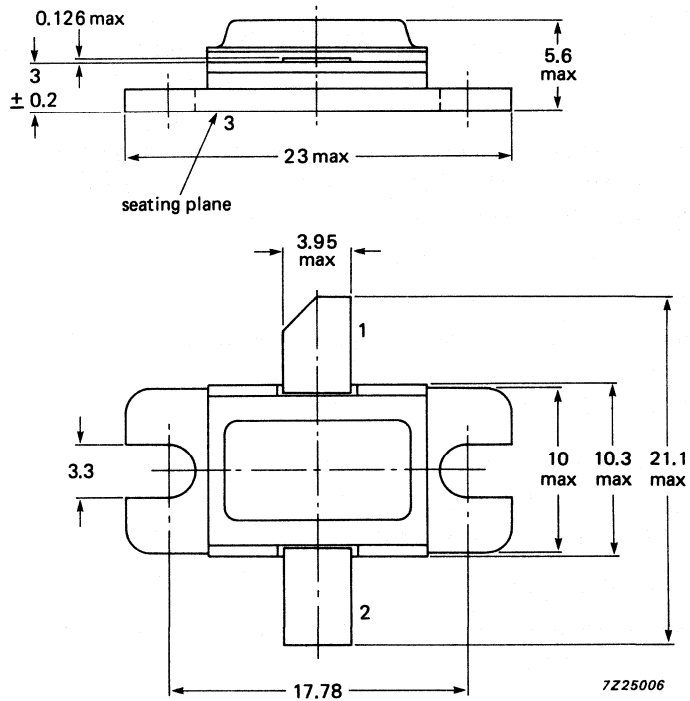
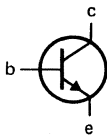
Fig. 1 FO-125A.

Dimensions in mm

Base is connected to the seating plane

Pinning:

- 1 = collector
- 2 = emitter
- 3 = base



RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	50 V
Collector-emitter voltage, $R_{BE} = 10 \Omega$ open base	V_{CER}	max.	50 V
	V_{CEO}	max.	15 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3.5 V
Collector current (peak)*	I_C	max.	8.5 A
Total power dissipation up to $T_{mb} = 75 \text{ }^\circ\text{C}^*$	P_{tot}	max.	185 W
Storage temperature range	T_{stg}		-65 to +200 $^\circ\text{C}$
Junction temperature	T_j	max.	200 $^\circ\text{C}$
Soldering temperature up to 0.3 mm from the case; $t_{slid} \leq 10 \text{ s}$	T_{slid}	max.	235 $^\circ\text{C}$

THERMAL RESISTANCE (at $T_j = 100 \text{ }^\circ\text{C}$)

From junction to mounting base	$R_{th \text{ j-mb}}$	max.	1.7 K/W
From mounting base to heatsink	$R_{th \text{ mb-h}}$	typ.	0.3 K/W
Equivalent thermal impedance under pulse microwave conditions $t_p = 100 \mu\text{s}; \delta = 10\%$	$Z_{th \text{ j-mb}}$	typ.	0.55 K/W

* Maximum value under normal pulsed microwave operating conditions.

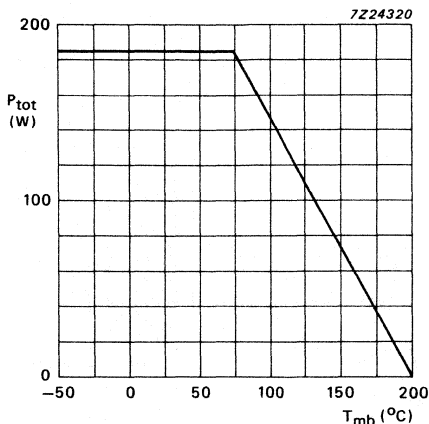


Fig. 2 Power derating curve; $t_p = 100 \mu s$; $\delta = 10\%$.

DEVELOPMENT DATA

CHARACTERISTICS

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

Collector cut-off current

$V_{CB} = 50 \text{ V}; I_E = 0$

$V_{CB} = 30 \text{ V}; I_E = 0$

$V_{CB} = 50 \text{ V}; R_{BE} = 10 \Omega$

I_{CBO} max. 30 mA

I_{CBO} max. 150 μA

I_{CER} max. 150 mA

Emitter cut-off current

$V_{EB} = 1.5 \text{ V}; I_C = 0$

$V_{EB} = 3.5 \text{ V}; I_C = 0$

I_{EBO} max. 150 μA

I_{EBO} max. 7 mA

APPLICATION INFORMATION

Microwave performance up to $T_{mb} = 25 \text{ }^\circ\text{C}$ in a class-C broadband amplifier under pulsed conditions.

mode of operation	f GHz	V_{CC}^* V	P_L W	G_p dB	η_C %	\bar{z}_i, \bar{Z}_L Ω
class-C $t_p = 100 \mu s$; $\delta = 10\%$	3.0 to 3.4	40	≥ 70	≥ 5.4	≥ 30	see Fig. 5

* During pulse.

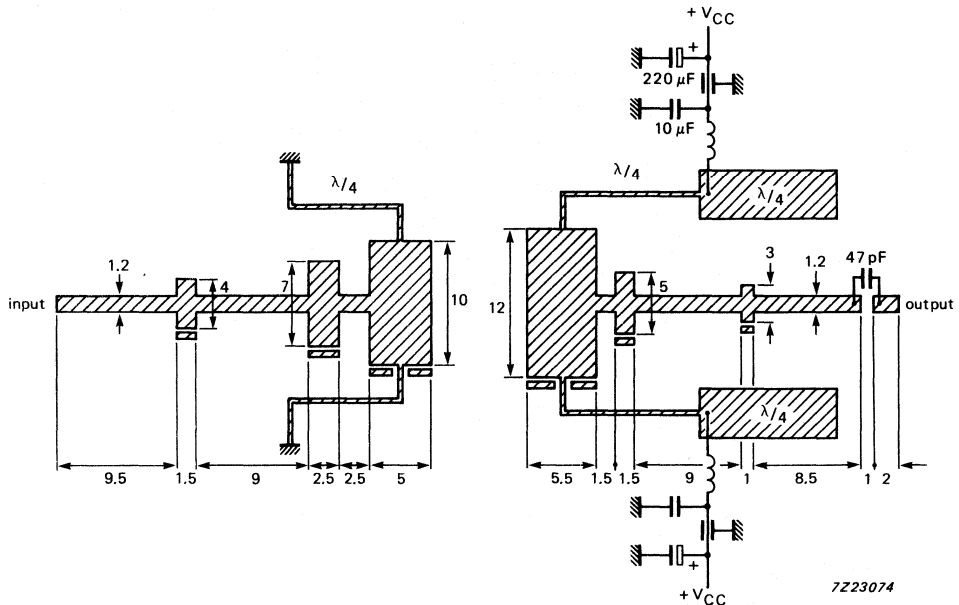


Fig. 3 Broadband test circuit for 3.0 to 3.4 GHz. (dimensions in mm). PTFE fibreglass printed circuit board; $\epsilon_r = 2.55$; thickness 0.4 mm.

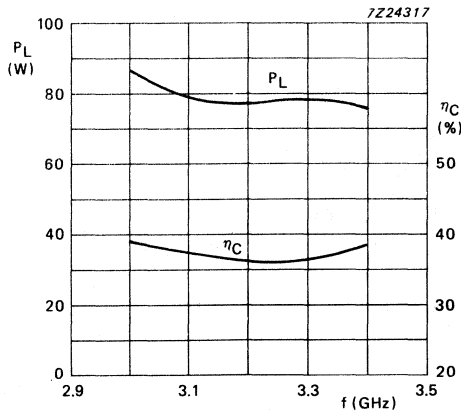


Fig. 4 Load power and collector efficiency as a function of frequency*; $V_{CC} = 40 \text{ V}$, $t_p = 100 \mu\text{s}$; $\delta = 10\%$; typical values.

* In a broadband test circuit as shown in Fig. 3.

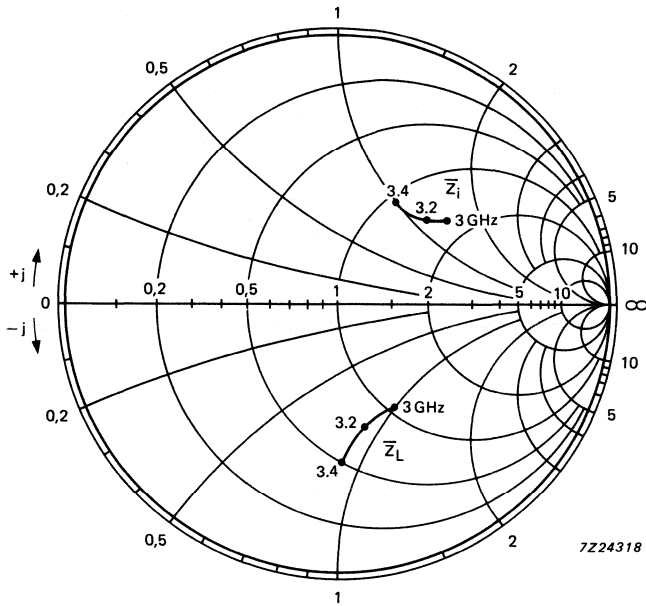


Fig. 5 Input and optimum load impedance as a function of frequency; $Z_0 = 5 \Omega$; $V_{CC} = 40 \text{ V}$; typical values.

DEVELOPMENT DATA

PULSED MICROWAVE POWER TRANSISTOR

N-P-N silicon power transistor for use in a common-base, class-C narrowband amplifier in avionics applications.

It operates in pulsed conditions only and is recommended for IFF applications.

Features

- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high VSWR
- Gold metallization realizing a very good stability of the characteristics and excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance

The transistor is housed in a metal ceramic flange envelope (FO-91).

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-C narrowband amplifier.

mode of operation	f GHz	V _{CE} V	P _L W	G _p dB	η_C %	\bar{z}_i Ω	\bar{Z}_L
class-B						see table	
$t_p = 100\ \mu\text{s}, \delta = 10\%$	1,09	50	typ. 350	typ. 7,8	typ. 38		
$t_p = 300\ \mu\text{s}, \delta = 10\%$	1,09	50	typ. 300	typ. 7,5	typ. 35		
DABS (see Fig. 2)	1,09	50	typ. 300	typ. 7,8	typ. 38		

MECHANICAL DATA

Dimensions in mm

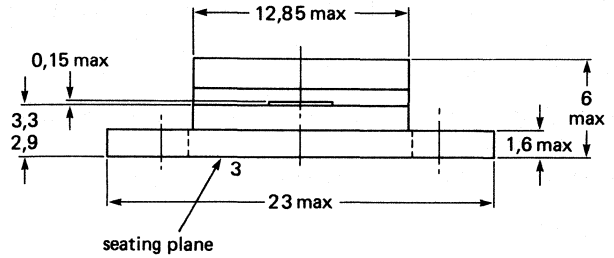
FO-91 (see Fig. 1)

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 FO-91.



Pinning:

- 1 = collector
- 2 = emitter
- 3 = base

Torque on screw: max. 0,5 Nm
 Recommended screw: M3

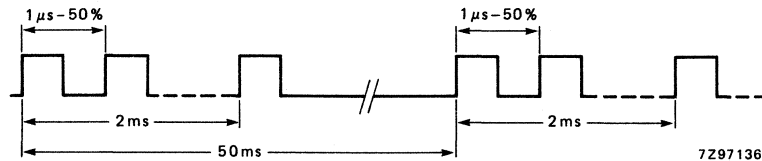
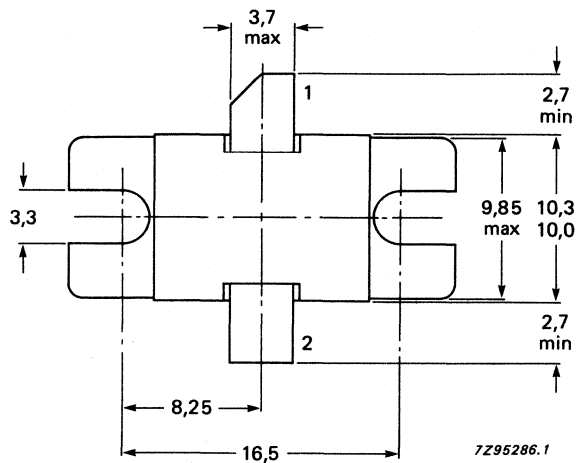


Fig. 2 DABS pulse definition.

RATINGS

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

Collector-base voltage, open emitter	V_{CBO}	max.	60 V
Collector-emitter voltage, $R_{BE} = 10 \Omega$	V_{CER}	max.	60 V
Emitter-base voltage, open collector	V_{EBO}	max.	3 V

Collector current (DC)

$t_p = 100 \mu s, \delta \leq 10\%$

I_C max. 21 A

Total power dissipation up to $T_{mb} = 75 \text{ }^\circ\text{C}$

$t_p = 100 \mu s, \delta \leq 10\%$

P_{tot} max. 630 W

Storage temperature

T_{stg} -65 to +200 $^\circ\text{C}$

Junction temperature

T_j max. 200 $^\circ\text{C}$

Soldering temperature

at 0,1 mm from the case, $t_{sld} \leq 10 \text{ s}$

T_{sld} max. 235 $^\circ\text{C}$

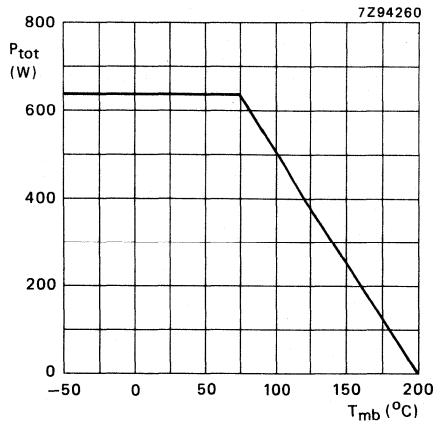


Fig. 3 Power derating curve versus mounting base temperature; $t_p = 100 \mu s, \delta = 10\%$.

THERMAL RESISTANCE (at $T_j = 100 \text{ }^\circ\text{C}$)

From junction to mounting base

$R_{th \text{ j-mb}}$ max. 0,8 K/W

Equivalent thermal impedance;

$t_p = 100 \mu s; \delta = 10\%$

Z_{th} typ. 0,2 K/W

CHARACTERISTICS

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

Breakdown voltages

$I_C = 50 \text{ mA}; I_E = 0$

$V_{(BR)CBO} \geq 60 \text{ V}$

$I_C = 50 \text{ mA}; R_{BE} = 10 \Omega$

$V_{(BR)CER} \geq 60 \text{ V}$

$I_C = 0; I_E = 5 \text{ mA}$

$V_{(BR)EBO} \geq 3 \text{ V}$

Collector cut-off current

$I_E = 0; V_{CB} = 50 \text{ V}$

$I_{CBO} \leq 10 \text{ mA}$

IMPEDANCES

frequency GHz	input (\bar{z}_i) Ω	load (\bar{Z}_L) Ω
1,03	1,45 + j3,71	0,72 - j1,09
1,09	1,7 + j3,93	0,68 - j1,13

APPLICATION INFORMATION

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in a class-C narrowband amplifier under pulsed conditions and measured in the test circuit shown in Fig. 4.

mode of operation	f GHz	V _{CC} V	P _L W	G _p dB	η_C %
class-C $t_p = 100\text{ }\mu\text{s}$; $\delta = 10\%$	1,09	50	≥ 300	≥ 7	≥ 30

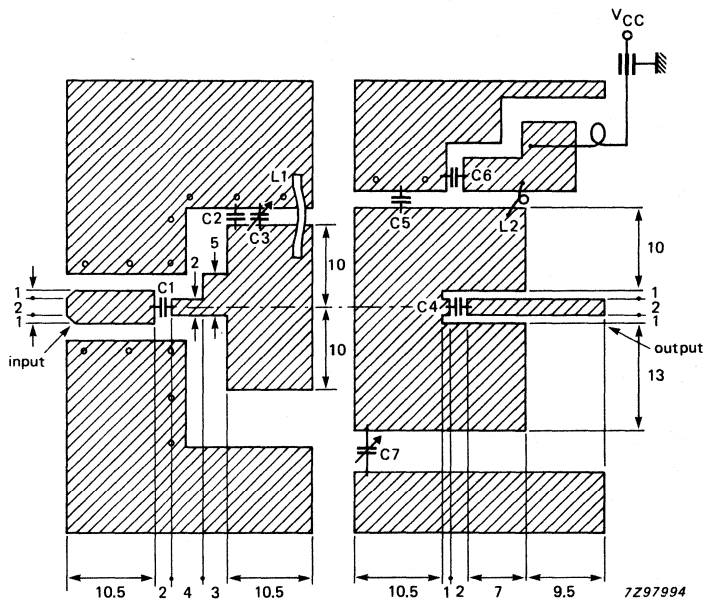


Fig. 4 Narrowband test circuit for 1,09 GHz (dimensions in mm).
PTFE printed circuit board; thickness 0,8 mm; $\epsilon_r = 2,55$.

List of components

- C1 = C4 = 100 pF ATC capacitor
- C2 = C5 = 2,2 pF ATC capacitor
- C3 = 0,8 - 12,3 pF Gigatrim capacitor
- C6 = 47 pF ATC capacitor
- C7 = 0,6 - 8 pF Gigatrim capacitor
- L1 = Rectangular loop 10 x 5,5 mm of 3 mm copper strip
- L2 = One turn diameter 6 mm; wire diameter 0,8 mm

PULSED MICROWAVE POWER TRANSISTOR

N-P-N silicon microwave power transistor for use in a common-base, class-C wideband amplifier and operating under pulsed conditions in L-band radar applications.

Features:

- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistor providing excellent current sharing and withstanding a high VSWR
- Gold metallization realizing a very good stability of the characteristics and excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance
- Internal input matching ensuring a good stability and allowing an easier design of wideband circuits.

The transistor is housed in a metal ceramic flange envelope (FO 57C).

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-C wideband amplifier.

mode of operation	f GHz	V _{CC} V	P _L W	G _p dB	η_C %	\bar{z}_i Ω	\bar{Z}_L Ω
class-C; $t_p = 50\ \mu\text{s}$; $\delta = 10\%$	1,2 to 1,4	42	typ. 40	typ. 7,8	typ. 40	see Fig. 6	
class-C; $t_p = 300\ \mu\text{s}$; $\delta = 10\%$	1,2 to 1,4	50	typ. 40	typ. 7	typ. 35	see Fig. 6	

MECHANICAL DATA

FO-57C (see Fig. 1).

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided the BeO disc is not damaged.

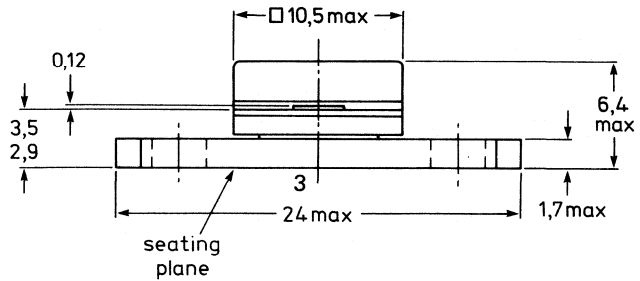
MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-57C.

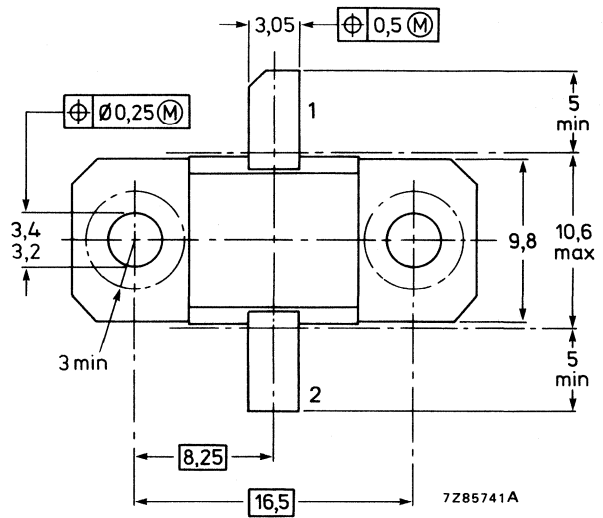
Pinning:

- 1 = collector
- 2 = emitter
- 3 = base



Torque on screw: max. 0,5 Nm

Recommended screw: M3



RATINGS

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

Collector-base voltage, open emitter	V_{CBO}	max.	60 V
Collector-emitter voltage, $R_{BE} \leq 10 \Omega$	V_{CER}	max.	60 V
Emitter-base voltage, open collector	V_{EBO}	max.	3 V
Collector current (d.c.) $t_p \leq 50 \mu s; \delta \leq 10 \%$	I_C	max.	3 A
Total power dissipation up to $T_{mb} = 75 \text{ }^\circ\text{C}$ $t_p \leq 50 \mu s; \delta \leq 10 \%$	P_{tot}	max.	90 W
Storage temperature	T_{stg}		-65 to 200 $^\circ\text{C}$
Junction temperature	T_j	max.	200 $^\circ\text{C}$
Lead soldering temperature at 0,1 mm from the case; $t_{sld} \leq 10 \text{ s}$	T_{sld}	max.	235 $^\circ\text{C}$

THERMAL RESISTANCE (at $T_j = 75 \text{ }^\circ\text{C}$)

From junction to mounting base	$R_{th \text{ j-mb}}$	max.	5,0 K/W
Transient thermal impedance; $t_p = 50 \mu s$, single pulse	Z_{th}	typ.	0,6 K/W

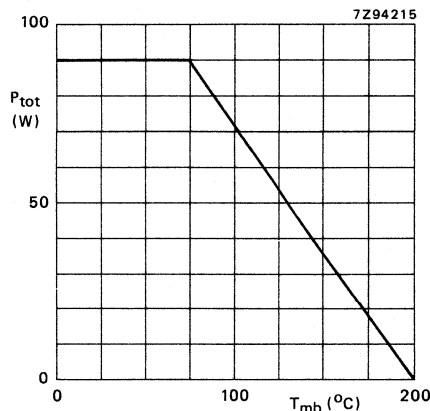


Fig. 2 Power derating curve versus mounting base temperature (under pulsed conditions: $t_p = 50 \mu s$, $\delta = 10 \%$).

CHARACTERISTICS

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

Collector-base breakdown voltage $I_C = 2 \text{ mA}; I_E = 0$	$V_{(BR)CBO} \geq$	60 V
Collector-emitter breakdown voltage $I_C = 2 \text{ mA}; R_{BE} = 10 \Omega$	$V_{(BR)CER} \geq$	60 V
Emitter-base breakdown voltage $I_C = 0; I_E = 0,2 \text{ mA}$	$V_{(BR)EBO} \geq$	3 V
Collector cut-off current $I_E = 0; V_{CB} = 50 \text{ V}$	$I_{CBO} \leq$	1 mA
Emitter cut-off current $I_C = 0; V_{EB} = 1,5 \text{ V}$	$I_{EBO} \leq$	50 μA

PRODUCT TEST

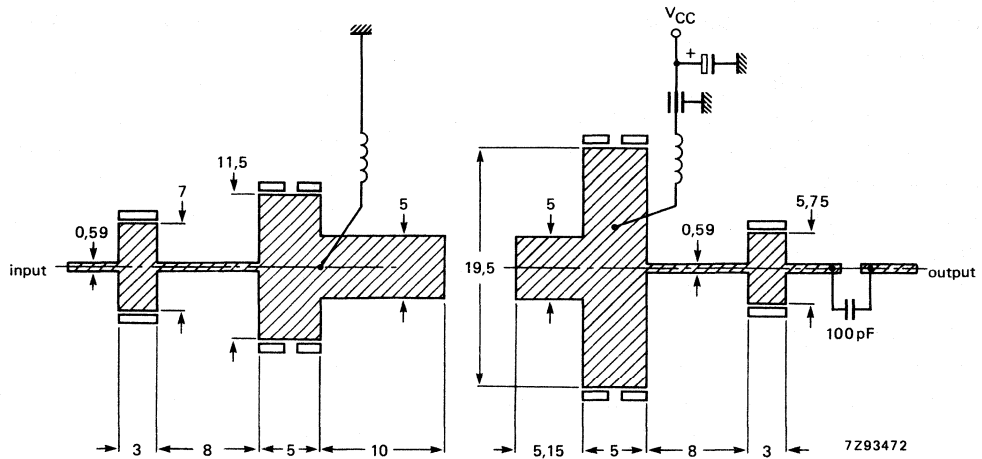


Fig. 3 Wideband test circuit for 1,2 to 1,4 GHz (dimensions in mm).
Epsilam p.c. board, thickness 0,635 mm, $\epsilon_r = 10$.

The transistors are 100% tested on above test circuit and under the following conditions:

mode of operation	f GHz	V _{CC} V	P _L W	G _p dB	η_C %	\bar{z}_i Ω	\bar{z}_L Ω
class-C; $t_p = 50 \mu s$; $\delta = 10 \%$	1,2 to 1,4	42	> 35	> 7	> 35	see Fig. 6	

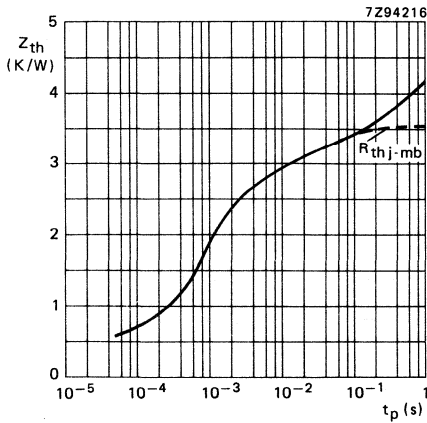


Fig. 4 Transient thermal impedance.

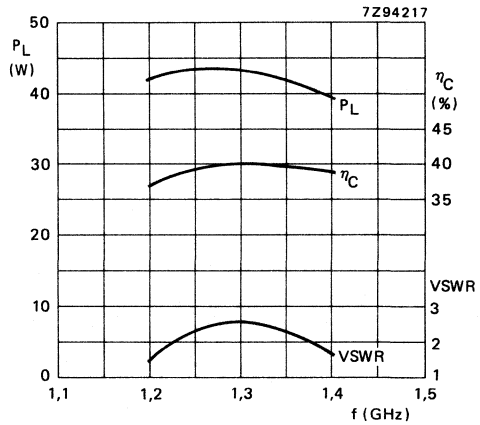


Fig. 5 Load power, collector efficiency and VSWR versus frequency; $V_{CE} = 42 \text{ V}$; $P_S = 7 \text{ W}$.

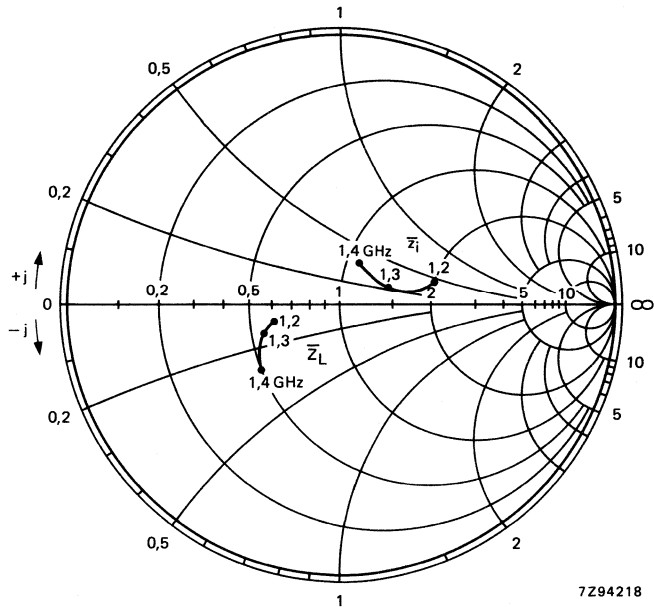


Fig. 6 Input and optimum load impedances versus frequency; $Z_0 = 5 \Omega$.

Conditions for Fig. 6:

$V_{CE} = 42 \text{ V}$; $P_L = 35 \text{ W}$; $t_p = 50 \mu\text{s}$; $\delta = 10 \%$; class-C operation.

PULSED MICROWAVE POWER TRANSISTOR

N-P-N silicon microwave power transistor for use in a common-base, class-B wideband amplifier and operating under pulsed conditions in L-band radar applications.

Features:

- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistor providing excellent current sharing and withstanding a high VSWR
- Gold metallization realizing a very good stability of the characteristics and excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance
- Internal input and output matching ensuring a good stability and allowing an easier design of wideband circuits.

The transistor is housed in a metal ceramic flange envelope (FO 57C).

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-B wideband amplifier.

mode of operation	f GHz	V _{CC} V	P _L W	G _p dB	η_C %	\bar{Z}_i Ω	\bar{Z}_L Ω
class-B; $t_p = 50\ \mu\text{s}$; $\delta = 10\%$	1,2 to 1,4	42	typ. 80	typ. 7	typ. 38	see Fig. 6	
class-B; $t_p = 300\ \mu\text{s}$; $\delta = 10\%$	1,2 to 1,4	50	typ. 80	typ. 7	typ. 30	see Fig. 6	

MECHANICAL DATA

FO-57C (see Fig. 1).

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided the BeO disc is not damaged.

MECHANICAL DATA

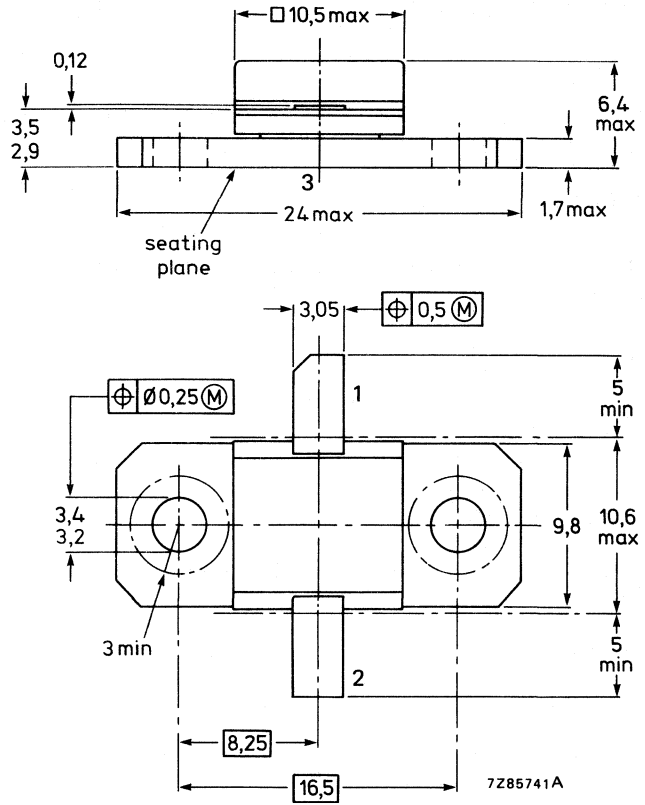
Fig. 1 FO-57C.

Dimensions in mm

Pinning:

- 1 = collector
- 2 = emitter
- 3 = base

Torque on screw: max. 0,5 Nm
 Recommended screw: M3



RATINGS

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

Collector-base voltage, open emitter	V_{CBO}	max.	60 V
Collector-emitter voltage, $R_{BE} \leq 10 \Omega$	V_{CER}	max.	60 V
Emitter-base voltage, open collector	V_{EBO}	max.	3 V
Collector current (d.c.) $t_p \leq 50 \mu s; \delta \leq 10 \%$	I_C	max.	6 A
Total power dissipation up to $T_{mb} = 75 \text{ }^\circ\text{C}$ $t_p \leq 50 \mu s; \delta \leq 10 \%$	P_{tot}	max.	180 W
Storage temperature	T_{stg}		-65 to 200 $^\circ\text{C}$
Junction temperature	T_j	max.	200 $^\circ\text{C}$
Lead soldering temperature at 0,1 mm from the case; $t_{sld} \leq 10 \text{ s}$	T_{sld}	max.	235 $^\circ\text{C}$

THERMAL RESISTANCE (at $T_j = 75 \text{ }^\circ\text{C}$)

From junction to mounting base	$R_{th \text{ j-mb}}$	max.	2,5 K/W
Transient thermal impedance, $t_p = 50 \mu s$, (single pulse)	Z_{th}	typ.	0,3 K/W

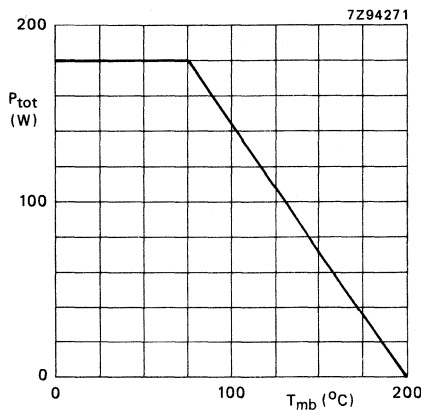


Fig. 2 Power derating curve versus mounting base temperature (under pulsed conditions: $t_p = 50 \mu s$, $\delta = 10 \%$).

CHARACTERISTICS

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

Collector-base breakdown voltage $I_C = 4 \text{ mA}; I_E = 0$	$V_{(BR)CBO} \geq$	60 V
Collector-emitter breakdown voltage $I_C = 4 \text{ mA}; R_{BE} = 10 \Omega$	$V_{(BR)CER} \geq$	60 V
Emitter-base breakdown voltage $I_C = 0; I_E = 0,4 \text{ mA}$	$V_{(BR)EBO} \geq$	3 V
Collector cut-off current $I_E = 0; V_{CB} = 50 \text{ V}$	$I_{CBO} \leq$	2 mA
Emitter cut-off current $I_C = 0; V_{EB} = 1,5 \text{ V}$	$I_{EBO} \leq$	100 μA

PRODUCT TEST

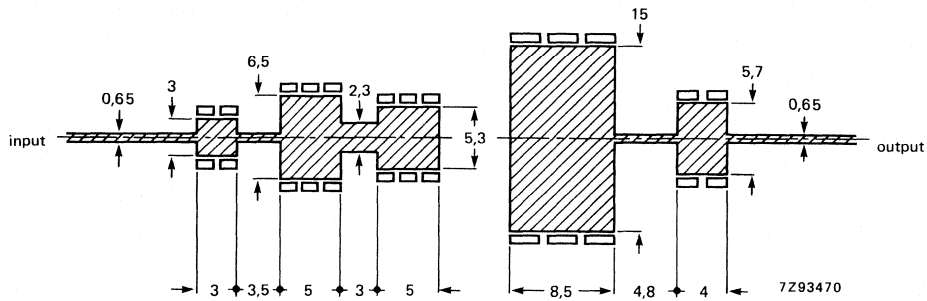


Fig. 3 Wideband test circuit for 1,2 to 1,4 GHz (dimensions in mm).
Epsilam p.c. board, thickness 0,635 mm, $\epsilon_r = 10$.

The transistors are 100% tested on above test circuit and under the following conditions:

mode of operation	f GHz	V _{CC} V	P _L W	G _p dB	η_C %	\bar{z}_i Ω	\bar{z}_L Ω
class-C; t _p = 50 μ s; δ = 10 %	1,2 to 1,4	42	> 65	> 6	> 32	see Fig. 6	

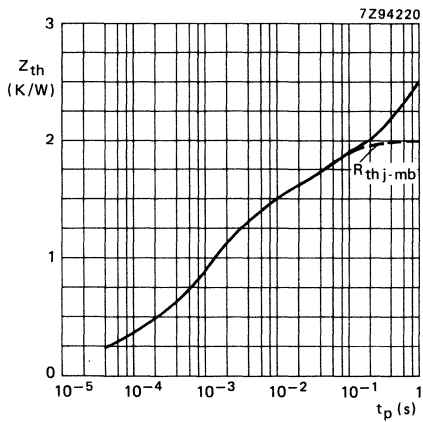


Fig. 4 Transient thermal impedance.

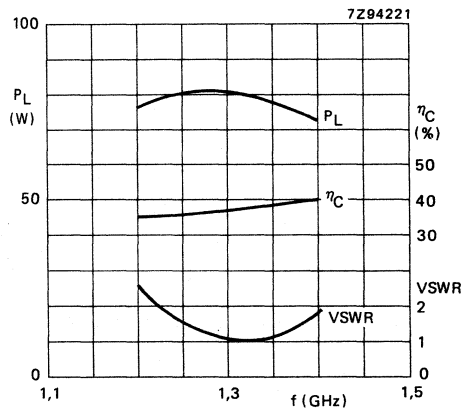


Fig. 5 Load power (at $P_S = 16$ W), and collector efficiency and VSWR (at $P_L = 65$ W) versus frequency; $V_{CE} = 42$ V.

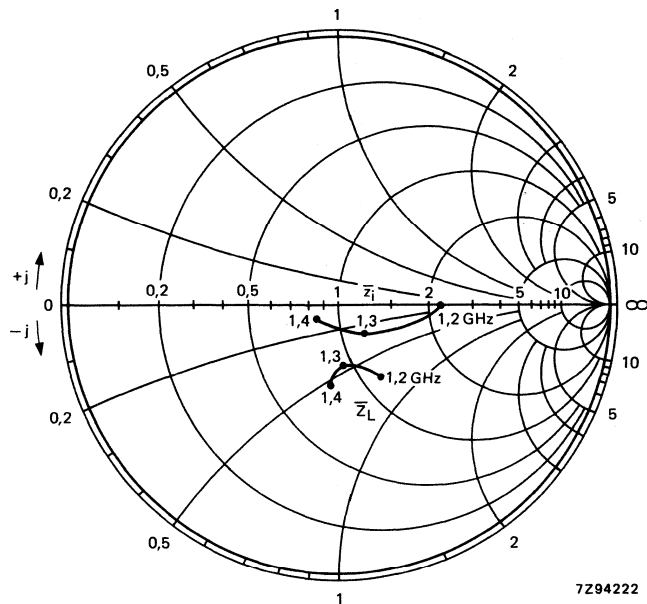


Fig. 6 Input and optimum load impedance versus frequency; $Z_0 = 5 \Omega$.

Conditions for Fig. 6:

$V_{CE} = 42$ V; $P_L = 65$ W; $t_p = 50 \mu s$; $\delta = 10$ %; class-C operation.

PULSED MICROWAVE POWER TRANSISTOR

N-P-N silicon microwave power transistor for use in a common-base, class-C wideband amplifier and operating under pulsed conditions in L-band radar applications.

Features:

- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistor providing excellent current sharing and withstanding a high VSWR
- Gold metallization realizing a very good stability of the characteristics and excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance
- Internal input and output matching ensuring a good stability and allowing an easier design of wideband circuits.

The transistor is housed in a metal ceramic flange envelope (FO 57C).

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-C wideband amplifier.

mode of operation	f GHz	V_{CC} V	P_L W	G_p dB	η_C %	\bar{z}_i Ω	\bar{Z}_L Ω
class-C; $t_p = 50\ \mu\text{s}$; $\delta = 10\%$	1,2 to 1,4	42	typ. 150	typ. 7	typ. 38	see Fig. 7	
class-C; $t_p = 300\ \mu\text{s}$; $\delta = 10\%$	1,2 to 1,4	50	typ. 150	typ. 7	typ. 30	see Fig. 7	

MECHANICAL DATA

FO-57C (see Fig. 1).

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided the BeO disc is not damaged.

MECHANICAL DATA

Fig. 1 FO-57C.

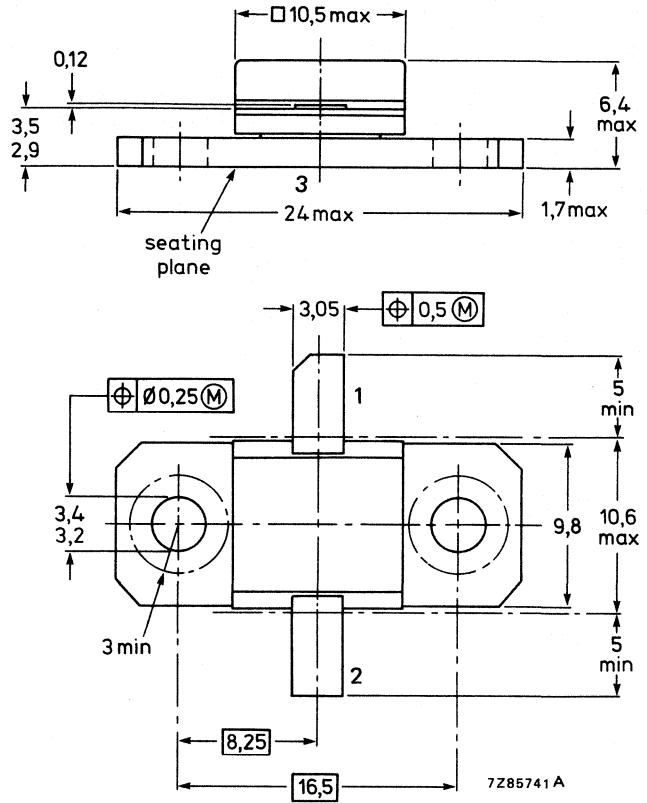
Dimensions in mm

Pinning:

- 1 = collector
- 2 = emitter
- 3 = base

Torque on screw: max. 0,5 Nm

Recommended screw: M3



RATINGS

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

Collector-base voltage, open emitter	V_{CBO}	max.	60 V
Collector-emitter voltage, $R_{BE} \leq 10 \Omega$	V_{CER}	max.	60 V
Emitter-base voltage, open collector	V_{EBO}	max.	3 V
Collector current (d.c.) $t_p \leq 50 \mu s; \delta \leq 10 \%$	I_C	max.	12 A
Total power dissipation up to $T_{mb} = 75 \text{ }^\circ\text{C}$ $t_p \leq 50 \mu s; \delta \leq 10 \%$	P_{tot}	max.	360 W
Storage temperature	T_{stg}		-65 to 200 $^\circ\text{C}$
Junction temperature	T_j	max.	200 $^\circ\text{C}$
Lead soldering temperature at 0,1 mm from the case; $t_{sld} \leq 10 \text{ s}$	T_{sld}	max.	235 $^\circ\text{C}$

THERMAL RESISTANCE (at $T_j = 75 \text{ }^\circ\text{C}$)

From junction to mounting base	$R_{th \text{ j-mb}}$	max.	1,25 K/W
Transient thermal impedance, $t_p = 50 \mu s$ single pulse	Z_{th}	typ.	0,15 K/W

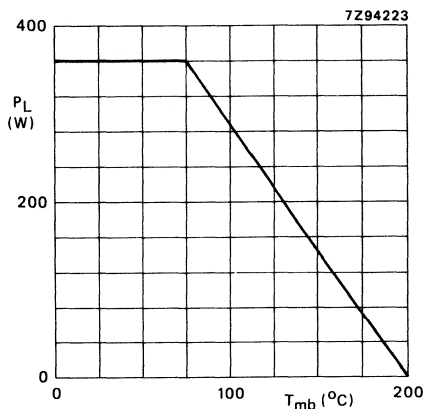


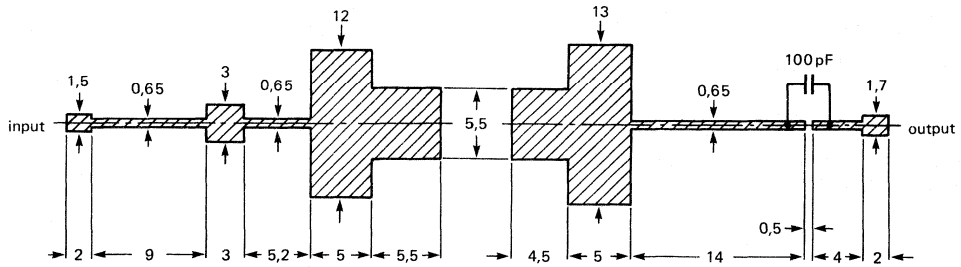
Fig. 2 Power derating curve versus mounting base temperature; pulsed conditions, $t_p = 50 \mu s, \delta = 10 \%$.

CHARACTERISTICS

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

Collector-base breakdown voltage $I_C = 8 \text{ mA}; I_E = 0$	$V_{(BR)CBO} \geq$	60 V
Collector-emitter breakdown voltage $I_C = 8 \text{ mA}; R_{BE} = 10 \Omega$	$V_{(BR)CER} \geq$	60 V
Emitter-base breakdown voltage $I_C = 0; I_E = 0,8 \text{ mA}$	$V_{(BR)EBO} \geq$	3 V
Collector cut-off current $I_E = 0; V_{CB} = 50 \text{ V}$	$I_{CBO} \leq$	4 mA
Emitter cut-off current $I_C = 0; V_{EB} = 1,5 \text{ V}$	$I_{EBO} \leq$	200 μA

PRODUCT TEST



7293471

Fig. 3 Wideband test circuit for 1,2 to 1,4 GHz (dimensions in mm).
Epsilam p.c. board, thickness 0,635 mm, $\epsilon_r = 10$.

The transistors are 100% tested on above test circuit and under the following conditions:

mode of operation	f GHz	V _{CC} V	P _L W	G _p dB	η_C %	\bar{z}_i Ω	\bar{Z}_L Ω
class-C; $t_p = 50 \mu s$; $\delta = 10 \%$	1,2 to 1,4	42	> 125	> 6	38	see Fig. 7	

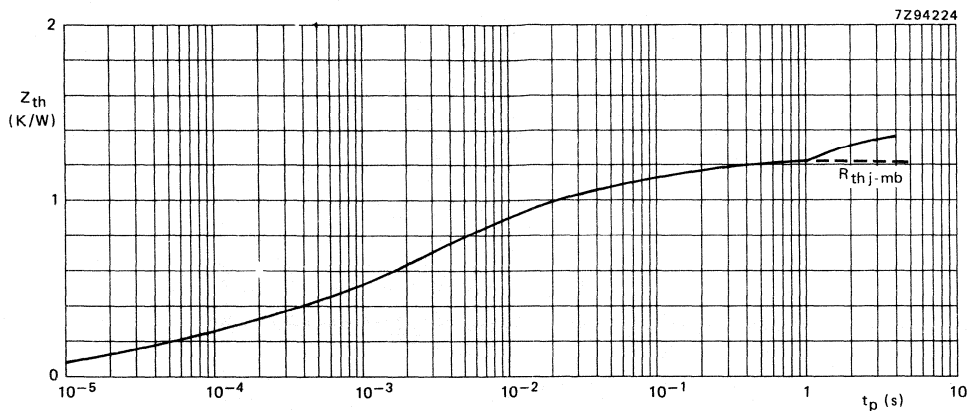


Fig. 4 Transient thermal impedance.

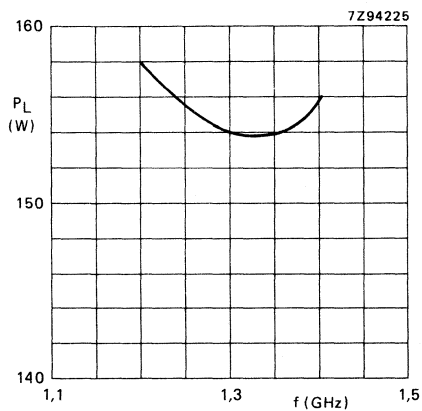


Fig. 5 Load power versus frequency;
 $P_S = 30$ W.

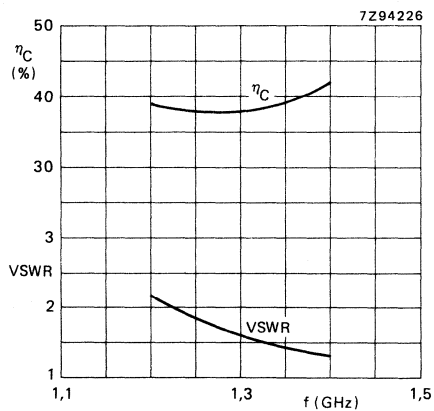


Fig. 6 Collector efficiency and VSWR
 versus frequency; $P_L = 125$ W.

Conditions for Figs 5 and 6:

$V_{CE} = 42$ V; $t_p = 50$ μ s, $\delta = 10$ %.

PULSED MICROWAVE POWER TRANSISTOR

N-P-N silicon microwave power transistor for use in a common-base, class-C wideband amplifier and operating under pulsed conditions in L-band radar applications.

Features:

- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistor providing excellent current sharing and withstanding a high VSWR
- Gold metallization realizing a very good stability of the characteristics and excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance
- Internal input and output matching ensuring a good stability and allowing an easier design of wideband circuits.

The transistor is housed in a metal ceramic flange envelope (FO 57C).

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-C wideband amplifier.

mode of operation	f GHz	VCC V	P _L W	G _p dB	η_C %	\bar{z}_i Ω	\bar{z}_L Ω
class-C; $t_p = 50\ \mu\text{s}$; $\delta = 10\%$	1,2 to 1,4	42	typ. 200	typ. 7	typ. 38	see Fig. 6	
class-C; $t_p = 300\ \mu\text{s}$; $\delta = 10\%$	1,2 to 1,4	50	typ. 200	typ. 7	typ. 35	see Fig. 6	

MECHANICAL DATA

FO-57C (see Fig. 1).

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided the BeO disc is not damaged.

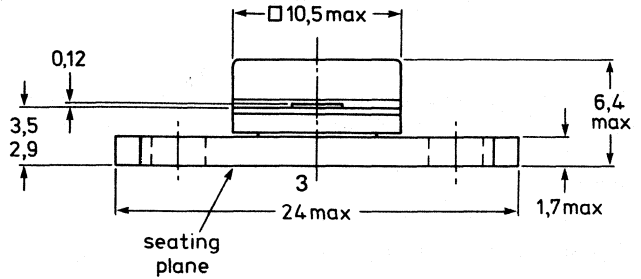
MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-57C.

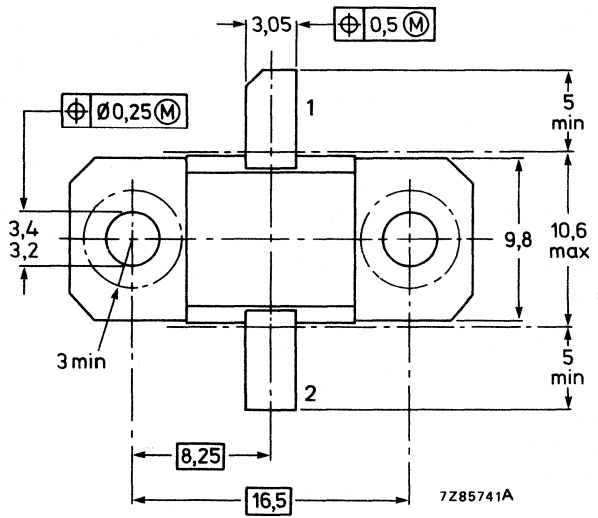
Pinning:

- 1 = collector
- 2 = emitter
- 3 = base



Torque on screw: max. 0,5 Nm

Recommended screw: M3



PULSED MICROWAVE POWER TRANSISTOR

NPN silicon planar epitaxial microwave power transistor, intended for use in a common-base class-C broadband pulse power amplifier with a frequency range of 2,7 to 3,1 GHz.

It is recommended for radar applications.

Features

- Interdigitated structure; giving a high emitter efficiency
- Diffused emitter ballasting resistors; capable of withstanding a high VSWR and providing excellent current sharing
- Gold metallization; ensuring excellent stability of the characteristics and giving a prolonged working life
- Multicell geometry; giving good balance of dissipated power and low thermal resistance
- Input and output matching cells; simplifying circuit design.

The transistor is housed in a metal-ceramic flange envelope (FO-57D).

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-C broadband amplifier.

mode of operation	f GHz	V_{CC} V	P_L W	G_p dB	η_C %	$\bar{z}_i; \bar{Z}_L$ Ω
class-C $t_p = 100\ \mu\text{s}$ $\delta = 10\%$	2,7 to 3,1	40	typ. 45	typ. 7	typ. 40	see Fig. 6

MECHANICAL DATA

FO-57D (see Fig. 1)

Dimensions in mm

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

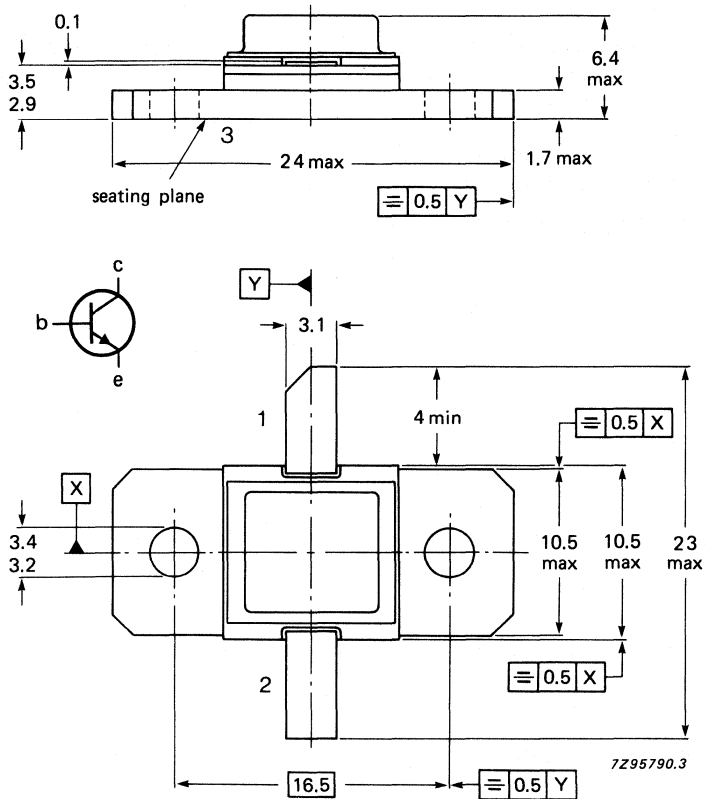
MECHANICAL DATA

Fig. 1 FO-57D

Dimensions in mm

Base is connected to the seating plane

Pinning:
 1 = collector
 2 = emitter
 3 = base



RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	50 V
Collector-emitter voltage	V_{CER}	max.	50 V
$R_{BE} = 10 \Omega$	V_{CEO}	max.	15 V
open base			
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5 V
Collector current (peak)*	I_C	max.	4,4 A
Total power dissipation up to $T_{mb} = 75 \text{ }^\circ\text{C}^*$	P_{tot}	max.	90 W
Storage temperature range	T_{stg}		-65 to +200 $^\circ\text{C}$
Junction temperature	T_j	max.	200 $^\circ\text{C}$
Soldering temperature up to 0,3 mm from the case; $t_{sld} \leq 10 \text{ s}$	T_{sld}	max.	235 $^\circ\text{C}$

* Maximum value under normal pulsed microwave operating conditions.

THERMAL RESISTANCE (at $T_j = 100\text{ }^\circ\text{C}$)

From junction to mounting base	$R_{th\ j-mb}$	max.	3,3 K/W
From mounting base to heatsink	$R_{th\ mb-h}$	typ.	0,3 K/W
Equivalent thermal impedance under pulsed microwave conditions $t_p = 100\ \mu\text{s}; \delta = 10\%$	$Z_{th\ j-mb}$	typ.	1,07 K/W

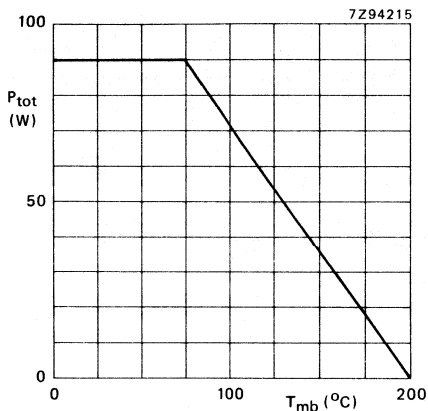


Fig. 2 Power derating curve; $t_p = 100\ \mu\text{s}; \delta = 10\%$.

CHARACTERISTICS

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

Collector cut-off current

$V_{CB} = 50\text{ V}; I_E = 0$	I_{CBO}	\leq	16 mA
$V_{CB} = 30\text{ V}; I_E = 0$	I_{CBO}	\leq	0,16 mA
$V_{CB} = 50\text{ V}; R_{BE} = 10\ \Omega$	I_{CBO}	\leq	160 mA

Emitter cut-off current

$V_{EB} = 3,5\text{ V}; I_C = 0$	I_{EBO}	\leq	1 mA
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APPLICATION INFORMATION

Microwave performance up to $T_{mb} = 25\text{ }^\circ\text{C}$ in a class-C broadband amplifier under pulsed conditions.

mode of operation	f GHz	V_{CC}^* V	P_L W	G_p dB	η_C %	$\bar{z}_i; \bar{z}_L$ Ω
class-C $t_p = 100\ \mu\text{s}$ $\delta = 10\%$	2,7 to 3,1	40	≥ 40	$\geq 6,4$	≥ 35	see Fig. 6

* During pulse.

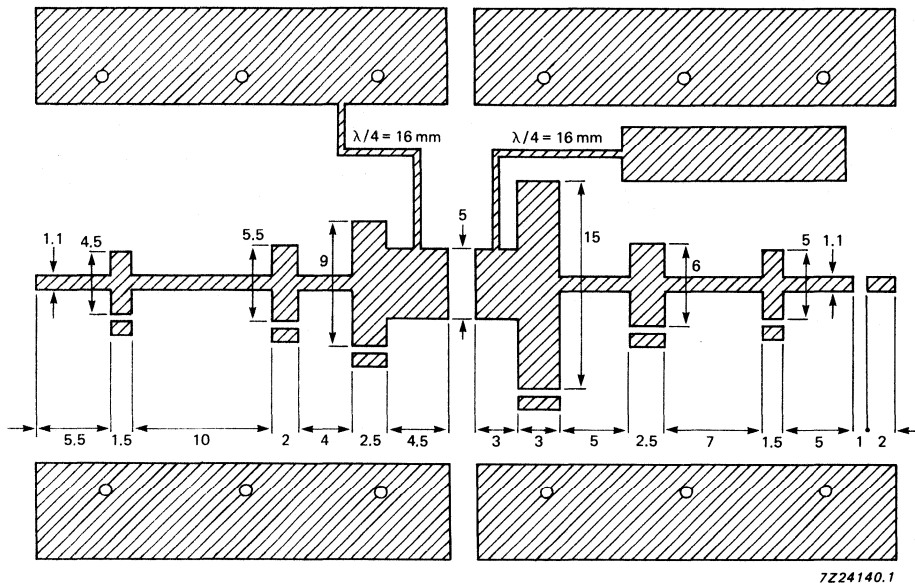


Fig. 3 Broadband test circuit for 2,7 to 3,1 GHz. (dimensions in mm).
PTFE fiberglass printed circuit board, thickness 0,4 mm; $\epsilon_r = 2,54$.

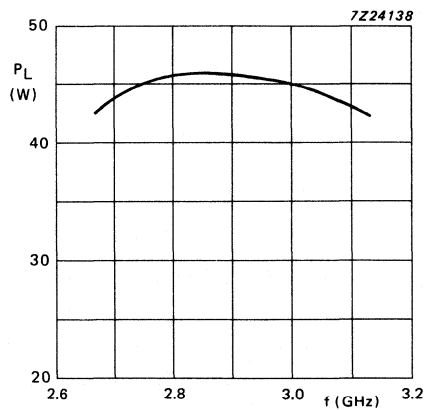


Fig. 4 Load power as a function of frequency*; $V_{CC} = 40$ V;
 $P_{in} = 9$ W; $t_p = 100$ μ s; $\delta = 10\%$; typical values.

* In a broadband test circuit as shown in Fig. 3.

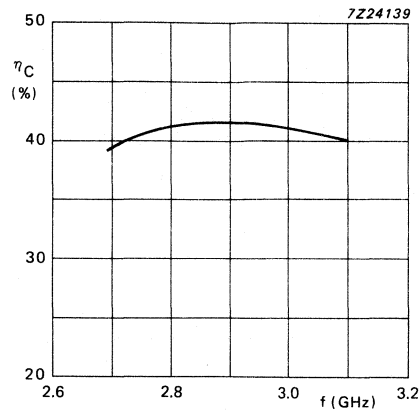


Fig. 5 Collector efficiency as a function of frequency*; $V_{CC} = 40$ V; $t_p = 100 \mu s$; $\delta = 10\%$; typical values.

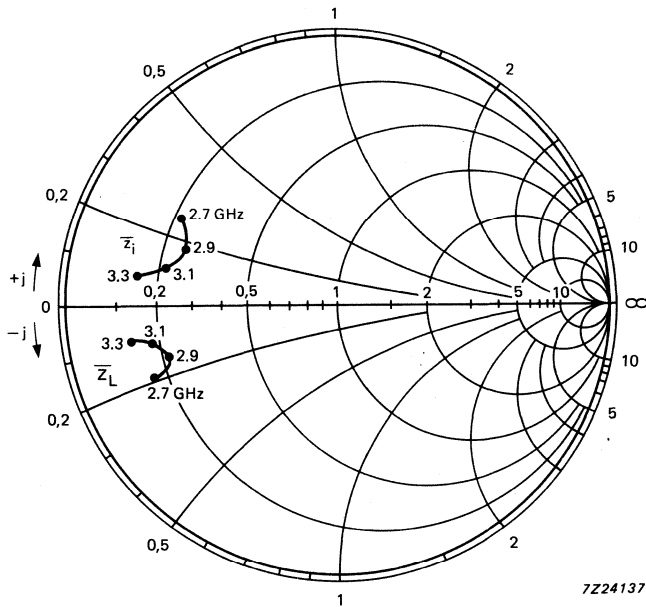


Fig. 6 Input and optimum load impedance as a function of frequency; $Z_0 = 50 \Omega$; $V_{CC} = 40$ V; typical values.

* In a broadband test circuit as shown in Fig. 3.

PULSED MICROWAVE POWER TRANSISTOR

NPN silicon planar epitaxial microwave power transistor, intended for use in a common-base class-C broadband pulse power amplifier with a frequency range of 2,7 to 3,1 GHz.

It is recommended for radar applications.

Features

- Interdigitated structure; giving a high emitter efficiency
- Diffused emitter ballasting resistors; capable of withstanding a high VSWR and providing excellent current sharing
- Gold metallization; ensuring excellent stability of the characteristics and giving a prolonged working life
- Multicell geometry; giving good balance of dissipated power and low thermal resistance
- Input and output matching cells; simplifying circuit design.

The transistor is housed in a metal-ceramic flange envelope (FO-57D).

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-C broadband amplifier.

mode of operation	f GHz	V_{CC} V	P_L W	G_p dB	η_C %	$\bar{z}_i; \bar{Z}_L$ Ω
class-C $t_p = 100\ \mu\text{s}$ $\delta = 10\%$	2,7 to 3,1	40	typ. 65	typ. 6,3	typ. 40	see Fig. 6

MECHANICAL DATA

FO-57D (see Fig. 1)

Dimensions in mm

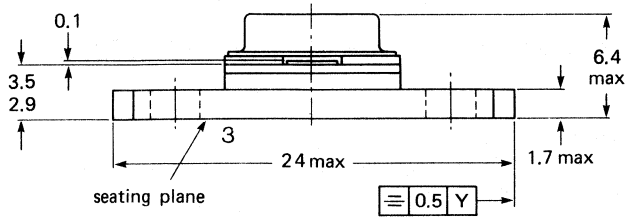
PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

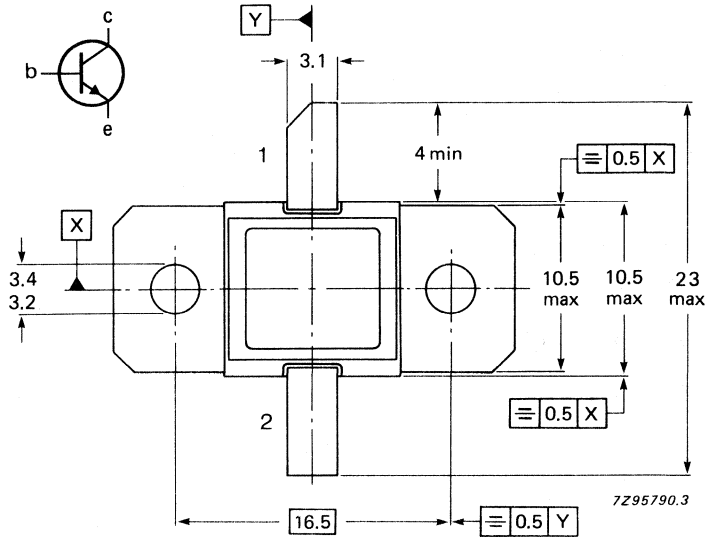
Dimensions in mm

Fig. 1 FO-57D

Base is connected to the seating plane



Pinning:
 1 = collector
 2 = emitter
 3 = base



RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	50 V
Collector-emitter voltage	V_{CER}	max.	50 V
$R_{BE} = 10 \Omega$	V_{CEO}	max.	15 V
open base			
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5 V
Collector current (peak)*	I_C	max.	5,7 A
Total power dissipation at $T_{mb} \leq 75 \text{ }^\circ\text{C}$ *	P_{tot}	max.	125 W
Storage temperature range	T_{stg}		-65 to + 200 $^\circ\text{C}$
Junction temperature	T_j	max.	200 $^\circ\text{C}$
Soldering temperature up to 0,3 mm from the case; $t_{sld} \leq 10 \text{ s}$	T_{sld}	max.	235 $^\circ\text{C}$

* Maximum value under normal pulsed microwave operating conditions.

THERMAL RESISTANCE (at $T_j = 100\text{ }^\circ\text{C}$)

From junction to mounting base (CW)

$R_{th\ j-mb}$ max. 2,5 K/W

Equivalent thermal impedance under pulsed microwave conditions
 $t_p = 100\ \mu\text{s}; \delta = 10\%$

$Z_{th\ j-mb}$ typ. 0,8 K/W

From mounting base to heatsink

$R_{th\ mb-h}$ typ. 0,3 K/W

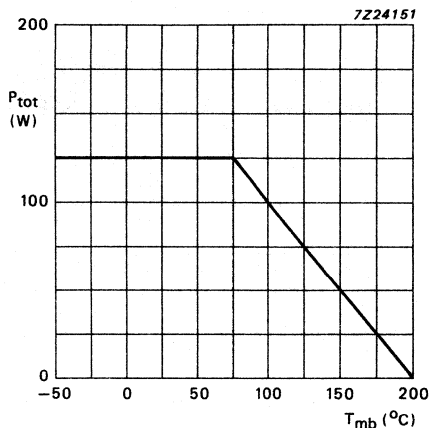


Fig. 2 Power derating curve; $t_p = 100\ \mu\text{s}; \delta = 10\%$.

CHARACTERISTICS

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

Collector cut-off current

$V_{CB} = 50\text{ mA}; I_E = 0$

$I_{CBO} \leq 24\text{ mA}$

$V_{CB} = 30\text{ mA}; I_E = 0$

$I_{CBO} \leq 80\ \mu\text{A}$

$V_{CB} = 50\text{ mA}; R_{BE} = 10\ \Omega$

$I_{CBO} \leq 240\text{ mA}$

Emitter cut-off current

$V_{EB} = 3,5\text{ V}; I_C = 0$

$I_{EBO} \leq 5\text{ mA}$

APPLICATION INFORMATION

Microwave performance up to $T_{mb} = 25\text{ }^\circ\text{C}$ in a class-C broadband amplifier under pulsed conditions.

mode of operation	f GHz	V_{CC}^* V	P_L W	G_p dB	η_C %	$\bar{z}_i; \bar{Z}_L$ Ω
class-C $t_p = 100\ \mu\text{s}$ $\delta = 10\%$	2,7 to 3,1	40	≥ 60	$\geq 6,0$	≥ 35	see Fig. 6

* During pulse.

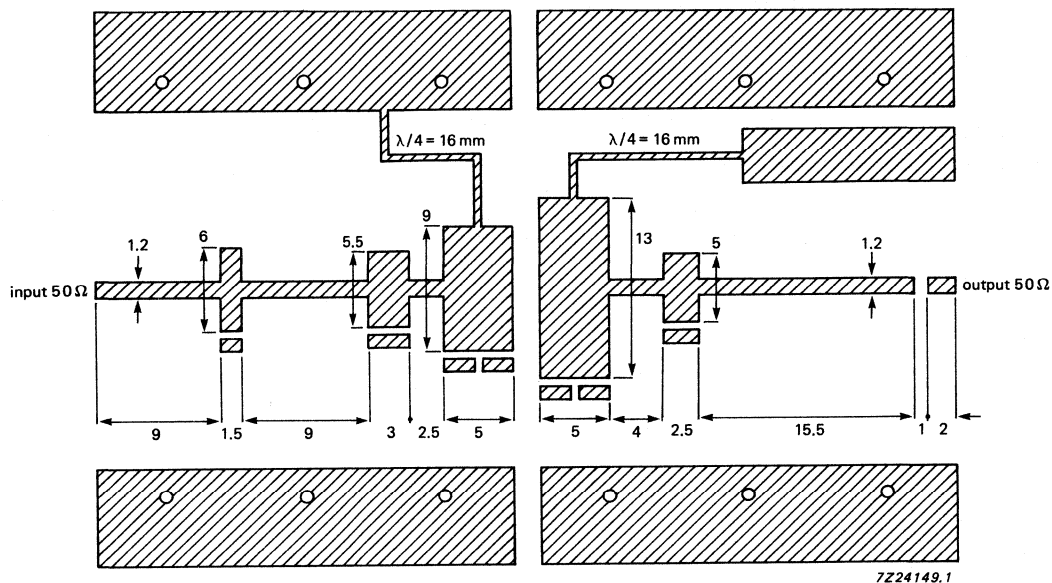


Fig. 3 Broadband test circuit for 2,7 to 3,1 GHz. (dimensions in mm).
PTFE fiberglass printed circuit board, thickness 0,4 mm; $\epsilon_r = 2,54$.

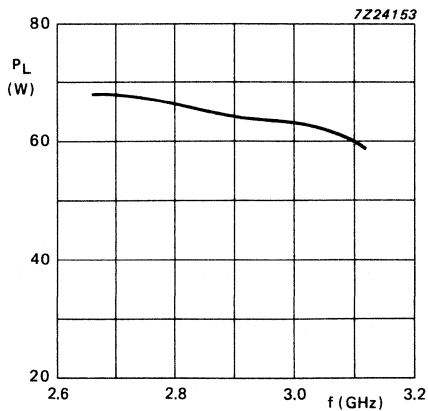


Fig. 4 Load power as a function of frequency*; $V_{CC} = 40$ V;
 $P_{in} = 15$ W; $t_p = 100 \mu s$; $\delta = 10\%$; typical values.

* In a broadband test circuit as shown in Fig. 3.

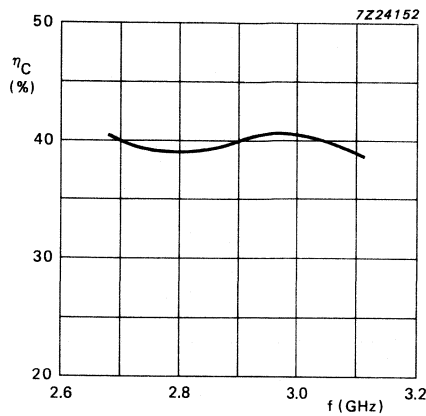


Fig. 5 Collector efficiency as a function of frequency* ;
 $V_{CC} = 40 \text{ V}$; $P_{in} = 15 \text{ W}$; $t_p = 100 \mu\text{s}$; $\delta = 10\%$;
 typical values.

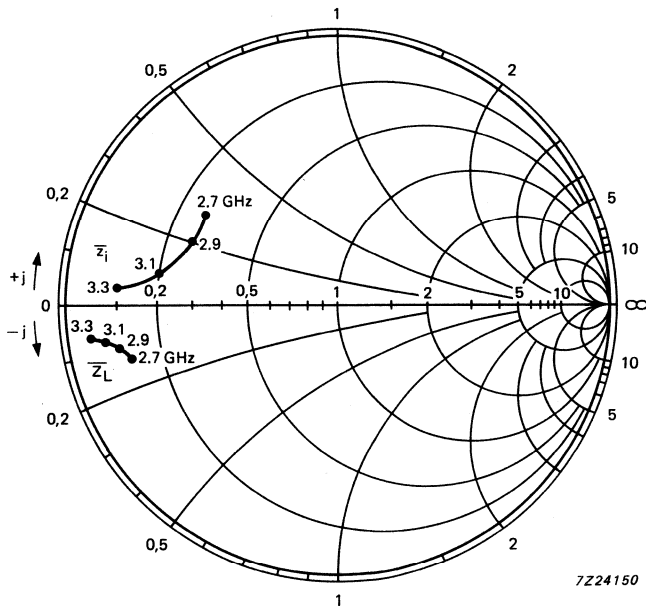


Fig. 6 Input and optimum load impedance as a function of frequency;
 $Z_0 = 50 \Omega$; $V_{CC} = 40 \text{ V}$; typical values.

* In a broadband test circuit as shown in Fig. 3.

MICROWAVE POWER TRANSISTOR

NPN silicon planar epitaxial microwave power transistor, intended for use in a common-base class-C broadband pulse power amplifier, operating in the 2.8 to 3.3 GHz frequency range.

It is recommended for radar applications.

Features

- Interdigitated structure; giving a high emitter efficiency
- Diffused emitter ballasting resistors; capable of withstanding a high VSWR and providing excellent current sharing
- Gold metallization; ensuring excellent stability of the characteristics and giving a prolonged working life
- Multicell geometry; giving good balance of dissipated power and low thermal resistance
- Internal input and output matching cells; simplifying circuit design

The transistor is housed in a metal ceramic flange envelope (FO-57C).

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-C broadband amplifier; typical values.

mode of operation	f GHz	V_{CC} V	P_L W	G_p dB	η_C %
class-C $t_p = 100\ \mu\text{s}$ $\delta = 10\%$	2.8 to 3.3	40	18	5.5	33

MECHANICAL DATA

Dimensions in mm

FO-57C (see Fig. 1).

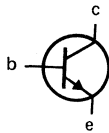
PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Fig. 1 FO-57C.

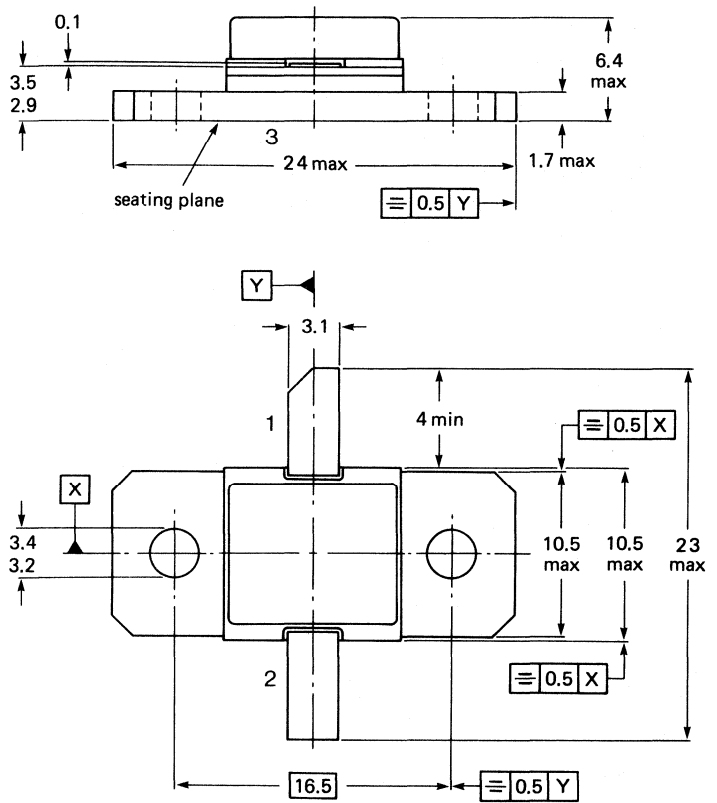
Pinning:
 1 = collector
 2 = emitter
 3 = base

Base is connected to the seating plane



Torque on screw: max. 0.5 Nm
 Recommended screw: M3

Dimensions in mm



7285741.2

RATINGS

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

Collector-base voltage; open emitter	V_{CB0}	max.	50 V
Collector-emitter voltage; $R_{BE} = 10 \Omega$	V_{CER}	max.	50 V
Collector-emitter voltage; open base	V_{CEO}	max.	15 V
Emitter-base voltage; open collector	V_{EBO}	max.	2.5 V
Collector current (peak)*	I_C	max.	A
Total power dissipation at $T_{mb} \leq 75 \text{ }^\circ\text{C}^*$	P_{tot}	max.	75 W
Storage temperature range	T_{stg}		-65 to +200 $^\circ\text{C}$
Operating junction temperature	T_j	max.	200 $^\circ\text{C}$
Soldering temperature at 0.3 mm from the case; $t_{sld} \leq 10 \text{ s}$	T_{sld}	max.	235 $^\circ\text{C}$

* Maximum values under nominal pulse microwave operating conditions.

THERMAL RESISTANCE (at $T_j = 75\text{ }^\circ\text{C}$)

From junction to mounting base (CW)	$R_{th\ j-mb}$	max.	3.5 K/W
Equivalent thermal impedance under pulsed microwave conditions			
$t_p = 100\ \mu\text{s}; \delta = 10\%$	$Z_{th\ j-mb}$	typ.	1.2 K/W
From mounting base to heatsink	$R_{th\ mb-h}$	typ.	0.3 K/W

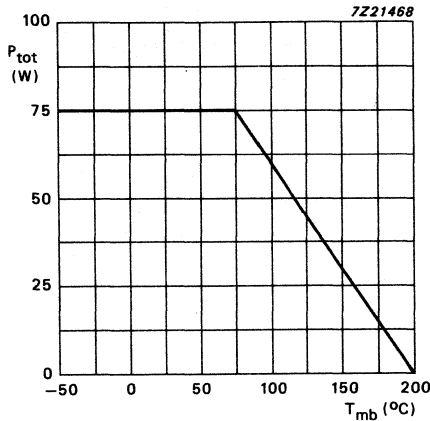


Fig. 2 Power derating curve versus mounting base temperature; $t_p = 100\ \mu\text{s}; \delta = 10\%$.

CHARACTERISTICS

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

Collector cut-off current

$V_{CB} = 50\text{ V}; I_E = 0$	I_{CBO}	\leq	10 mA
$V_{CB} = 30\text{ V}; I_E = 0$	I_{CBO}	\leq	0.1 mA
$V_{CE} = 50\text{ V}; R_{BE} = 10\ \Omega$	I_{CER}	\leq	50 mA

Emitter cut-off current

$V_{EB} = 1.5\text{ V}; I_C = 0$	I_{EBO}	\leq	10 μA
$V_{EB} = 3.5\text{ V}; I_C = 0$	I_{EBO}	\leq	0.1 mA

APPLICATION INFORMATION

Microwave performance at $T_{mb} = 25\text{ }^\circ\text{C}$ measured in a common-base broadband test circuit.

mode of operation	f GHz	V_{CC} V	P_L W	G_p dB	η_C %
class-C $t_p = 100\ \mu\text{s}$ $\delta = 10\%$	2.8 to 3.3	40	≥ 15	≥ 5	≥ 30

MICROWAVE POWER TRANSISTOR

NPN silicon planar epitaxial microwave power transistor, intended for use in a common-base class-C broadband pulse power amplifier, operating in the 2.8 to 3.3 GHz frequency range.

It is recommended for radar applications.

Features

- Interdigitated structure; giving a high emitter efficiency
- Diffused emitter ballasting resistors; capable of withstanding a high VSWR and providing excellent current sharing
- Gold metallization; ensuring excellent stability of the characteristics and giving a prolonged working life
- Multicell geometry; giving good balance of dissipated power and low thermal resistance
- Internal input and output matching cells; simplifying circuit design.

The transistor is housed in a metal-ceramic flange envelope (FO-57C).

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-C broadband amplifier; typical values.

mode of operation	f GHz	V_{CC} V	P_L W	G_p dB	η_C %
class-C; $t_p = 100\text{ }\mu\text{s}$; $\delta = 10\%$	2.8 to 3.3	40	34	5.5	33

MECHANICAL DATA

FO-57C (see Fig. 1)

Dimensions in mm

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

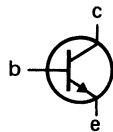
MECHANICAL DATA

Fig. 1 FO-57C

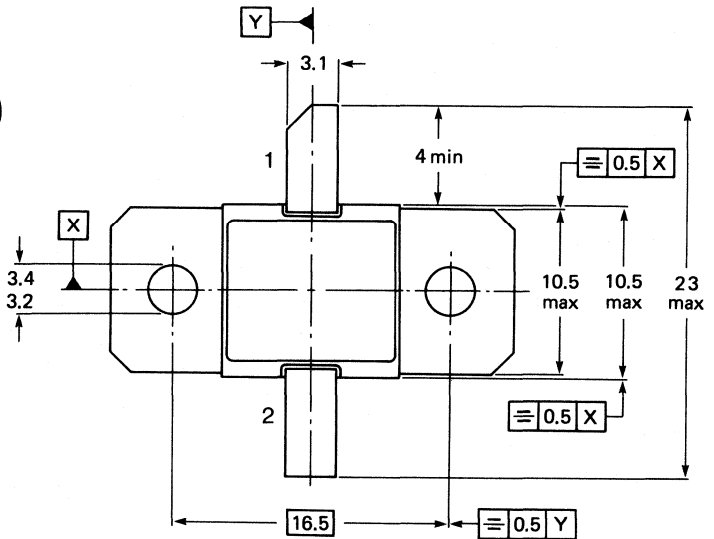
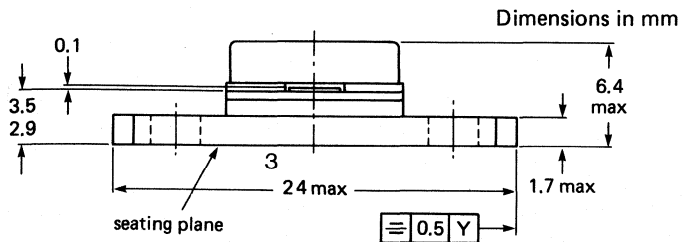
Pinning:

- 1 = collector
- 2 = emitter
- 3 = base

Base is connected to the seating plane



Torque on screw: max. 0.5 Nm
Recommended screw: M3



7Z85741.2

RATINGS

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

Collector-base voltage; open emitter	V_{CB0}	max.	50 V
Collector-emitter voltage; $R_{BE} = 10 \Omega$	V_{CER}	max.	50 V
Collector-emitter voltage; open base	V_{CEO}	max.	15 V
Emitter-base voltage; open collector	V_{EBO}	max.	3.5 V
Collector current (peak) *	I_C	max.	4 A
Total power dissipation at $T_{mb} \leq 75 \text{ }^\circ\text{C}$ *	P_{tot}	max.	150 W
Storage temperature range	T_{stg}		-65 to + 200 $^\circ\text{C}$
Operating junction temperature	T_j	max.	200 $^\circ\text{C}$
Soldering temperature at 0.3 mm from the case; $t_{sld} \leq 10 \text{ s}$	T_{sld}	max.	235 $^\circ\text{C}$

THERMAL RESISTANCE (at $T_j = 75 \text{ }^\circ\text{C}$)

From junction to mounting base (CW)	$R_{th \text{ j-mb}}$	max.	1.75 K/W
From junction to mounting base *	$R_{th \text{ j-mb}}$	typ.	0.6 K/W

* Maximum values under nominal pulse microwave operating conditions.

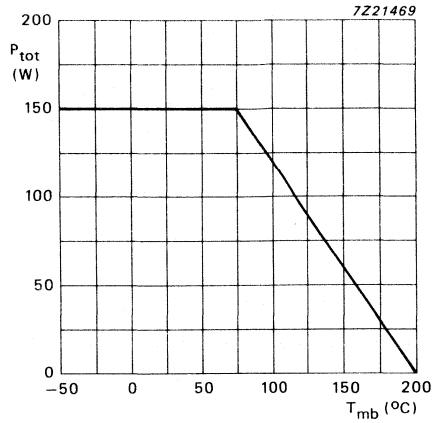


Fig. 2 Power derating curve; $t_p = 100 \mu s$; $\delta = 10\%$.

CHARACTERISTICS

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

Collector cut-off current

$V_{CB} = 50 \text{ V}; I_E = 0$	$I_{CBO} \leq$	20 mA
$V_{CB} = 30 \text{ V}; I_E = 0$	$I_{CBO} \leq$	200 mA
$V_{CE} = 50 \text{ V}; R_{BE} = 10 \Omega$	$I_{CER} \leq$	100 mA

Emitter cut-off current

$V_{EB} = 1.5 \text{ V}; I_C = 0$	$I_{EBO} \leq$	20 μA
$V_{EB} = 3.5 \text{ V}; I_C = 0$	$I_{EBO} \leq$	0.2 mA

APPLICATION INFORMATION

Microwave performance at $T_{mb} = 25 \text{ }^\circ\text{C}$ measured in a common-base broadband test circuit.

mode of operation	f GHz	V_{CC} V	P_L W	G_p dB	η_C %
class-C; $t_p = 100 \mu s$; $\delta = 10\%$	2.8 to 3.3	40	≥ 30	≥ 5	≥ 30

PULSED MICROWAVE POWER TRANSISTOR

NPN silicon planar epitaxial microwave power transistor intended for use in a common-base class-C broadband pulse power amplifier with a frequency range of 2,8 to 3,3 GHz.

It is recommended for radar applications.

Features

- Interdigitated structure; giving a high emitter efficiency
- Diffused emitter ballasting resistors; capable of withstanding a high VSWR and providing excellent current sharing
- Gold metallization; ensuring excellent stability of the characteristics and giving a prolonged working life
- Multicell geometry; giving good balance of dissipated power and low thermal resistance
- Input and output matching cells; simplifying circuit design

The transistor is housed in a metal-ceramic flange envelope (FO-57D).

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-C broadband amplifier.

mode of operation	f GHz	V_{CC} V	P_L W	G_p dB	η_C %	$\bar{z}_i; \bar{Z}_L$ Ω
class-C $t_p = 100\ \mu\text{s}$ $\delta = 10\%$	2,8 to 3,3	40	typ. 45	typ. 7	typ. 37	see Fig. 6

MECHANICAL DATA

FO-57D (see Fig. 1)

Dimensions in mm

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.

THERMAL RESISTANCE (at $T_j = 100\text{ }^\circ\text{C}$)

From junction to mounting base	$R_{th\ j-mb}$	max.	3,3 K/W
From mounting base to heatsink	$R_{th\ mb-h}$	typ.	0,3 K/W
Equivalent thermal impedance under pulse microwave conditions; $t_p = 100\ \mu\text{s}$; $\delta = 10\%$	$Z_{th\ j-mb}$	typ.	1,07 K/W

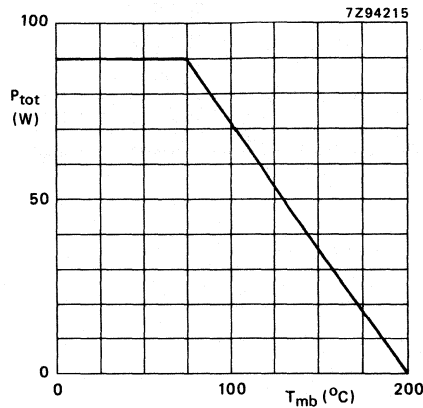


Fig. 2 Power derating curve; $t_p = 100\ \mu\text{s}$; $\delta = 10\%$.

CHARACTERISTICS

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

Collector cut-off current

$V_{CB} = 50\text{ V}; I_E = 0$	I_{CBO}	\leq	16 mA
$V_{CB} = 30\text{ V}; I_E = 0$	I_{CBO}	\leq	0,16 mA
$V_{CB} = 50\text{ V}; R_{BE} = 10\ \Omega$	I_{CBO}	\leq	160 mA

Emitter cut-off current

$V_{EB} = 3,5\text{ V}; I_C = 0$	I_{EBO}	\leq	1 mA
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APPLICATION INFORMATION

Microwave performance up to $T_{mb} = 25\text{ }^\circ\text{C}$ in a class-C broadband amplifier under pulsed conditions.

mode of operation	f GHz	V_{CC}^* V	P_L W	G_p dB	η_C %	$\bar{z}_i; \bar{Z}_L$ Ω
class-C $t_p = 100\ \mu\text{s}$ $\delta = 10\%$	2,8 to 3,3	40	≥ 37	≥ 6	≥ 33	see Fig. 6

* During pulse.

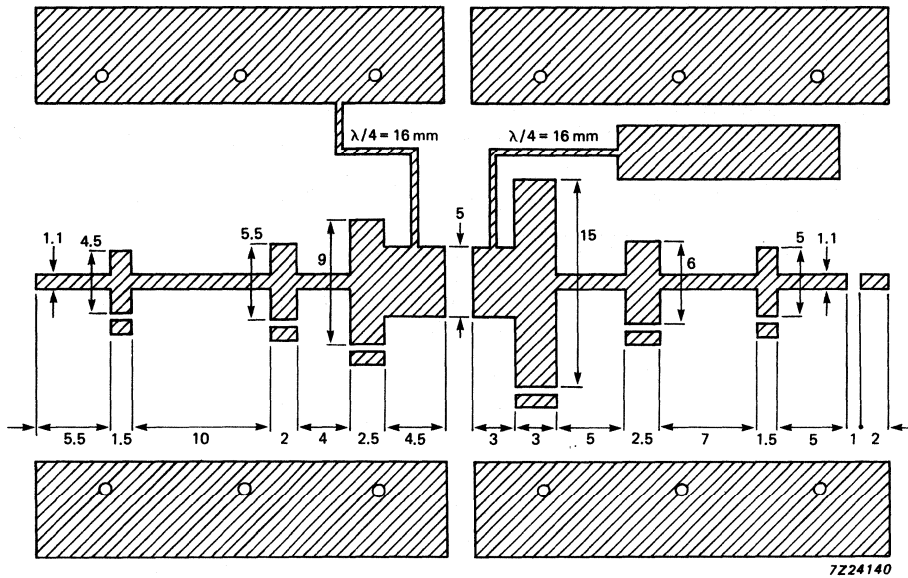


Fig. 3 Broadband test circuit for 2,8 to 3,3 GHz. (dimensions in mm).
PTFE fibreglass printed circuit board; thickness 0,4 mm; $\epsilon_r = 2,54$.

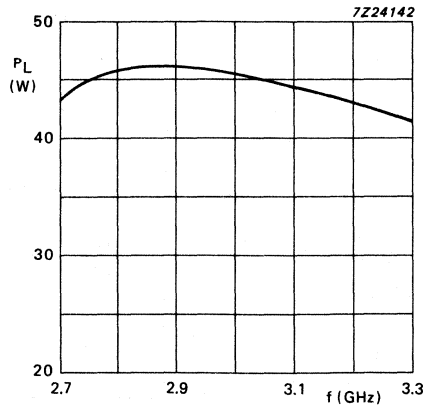


Fig. 4 Load power as a function of frequency*; $V_{CC} = 40 \text{ V}$;
 $P_{in} = 9 \text{ W}$; $t_p = 100 \mu\text{s}$; $\delta = 10\%$; typical values.

* In a broadband test circuit as shown in Fig. 3.

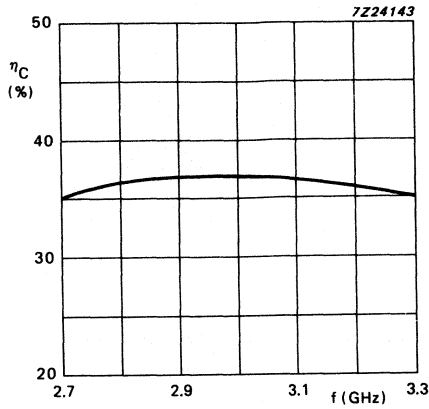


Fig. 5 Collector efficiency as a function of frequency*; $V_{CC} = 40 \text{ V}$; $t_p = 100 \mu\text{s}$; $\delta = 10\%$; typical values.

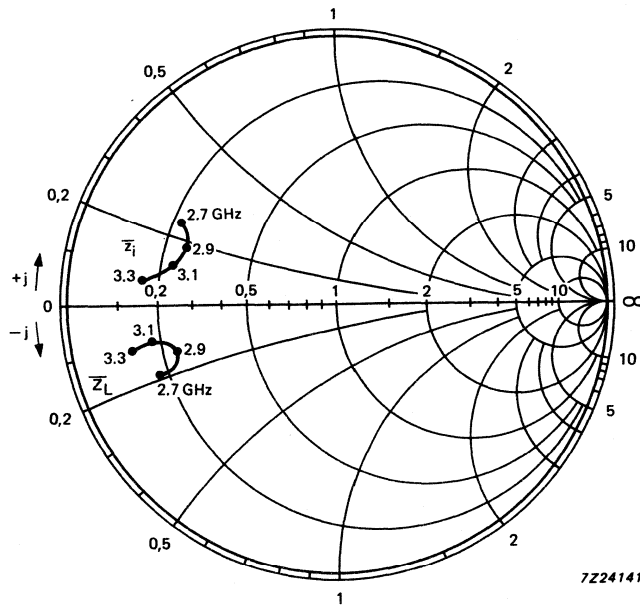


Fig. 6 Input and optimum load impedance as a function of frequency; $Z_0 = 50 \Omega$; $V_{CC} = 40 \text{ V}$; typical values.

* In a broadband test circuit as shown in Fig. 3.

PULSED MICROWAVE POWER TRANSISTOR

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Features

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- Diffused emitter ballasting resistors; capable of withstanding a high VSWR and providing excellent current sharing
- Gold metallization; ensuring excellent stability of the characteristics and giving a prolonged working life
- Multicell geometry; giving good balance of dissipated power and low thermal resistance
- Input and output matching cells; allowing an easier design of circuits

The transistor is housed in a metal-ceramic flange envelope (FO-57D).

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-C broadband amplifier.

mode of operation	f GHz	V_{CC} V	P_L W	G_p dB	η_C %	$\bar{z}_i; \bar{z}_L$ Ω
class-C $t_p = 100\ \mu\text{s}$ $\delta = 10\%$	2,8 to 3,3	40	typ. 60	typ. 6	typ. 37	see Fig. 6

MECHANICAL DATA

Dimensions in mm

FO-57D (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.

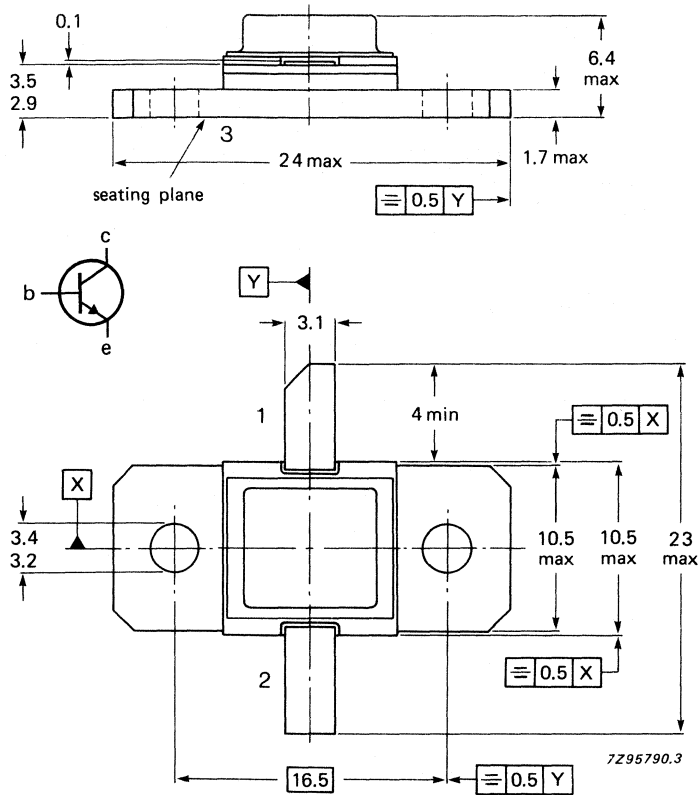
MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-57D

Base is connected to the seating plane

Pinning:
 1 = collector
 2 = emitter
 3 = base



RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	50 V
Collector-emitter voltage	V_{CER}	max.	50 V
$R_{BE} = 10 \Omega$	V_{CEO}	max.	15 V
open base	V_{EBO}	max.	3,5 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5 V
Collector current (peak)*	I_C	max.	5,7 A
Total power dissipation up to $T_{mb} = 75 \text{ }^\circ\text{C}$ *	P_{tot}	max.	125 W
Storage temperature range	T_{stg}		-65 to +200 $^\circ\text{C}$
Junction temperature	T_j	max.	200 $^\circ\text{C}$
Soldering temperature up to 0,3 mm from the case; $t_{sld} \leq 10 \text{ s}$	T_{sld}	max.	235 $^\circ\text{C}$

* Maximum value under normal pulsed microwave operating conditions.

THERMAL RESISTANCE (at $T_j = 100\text{ }^\circ\text{C}$)

From junction to mounting base (CW)	$R_{th\ j-mb}$	max.	2,5 K/W
Equivalent thermal impedance under pulsed microwave conditions $t_p = 100\ \mu\text{s}; \delta = 10\%$	$Z_{th\ j-mb}$	typ.	0,8 K/W
From mounting base to heatsink	$R_{th\ mb-h}$	typ.	0,3 K/W

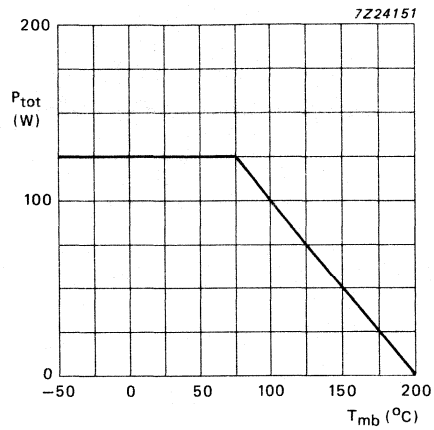


Fig. 2 Power derating curve; $t_p = 100\ \mu\text{s}; \delta = 10\%$.

CHARACTERISTICS

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

Collector cut-off current

$V_{CB} = 50\text{ V}; I_E = 0$	I_{CBO}	\leq	24 mA
$V_{CB} = 30\text{ V}; I_E = 0$	I_{CBO}	\leq	80 μA
$V_{CB} = 50\text{ V}; R_{BE} = 10\ \Omega$	I_{CBO}	\leq	240 mA

Emitter cut-off current

$V_{EB} = 3,5\text{ V}; I_C = 0$	I_{EBO}	\leq	5 mA
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APPLICATION INFORMATION

Microwave performance up to $T_{mb} = 25\text{ }^\circ\text{C}$ in a class-C broadband amplifier under pulsed conditions.

mode of operation	f GHz	V_{CC}^* V	P_L W	G_p dB	η_C %	$\bar{z}_i; \bar{Z}_L$ Ω
class-C $t_p = 100\ \mu\text{s}$ $\delta = 10\%$	2,8 to 3,3	40	≥ 55	$\geq 5,6$	≥ 33	see Fig. 6

* During pulse.

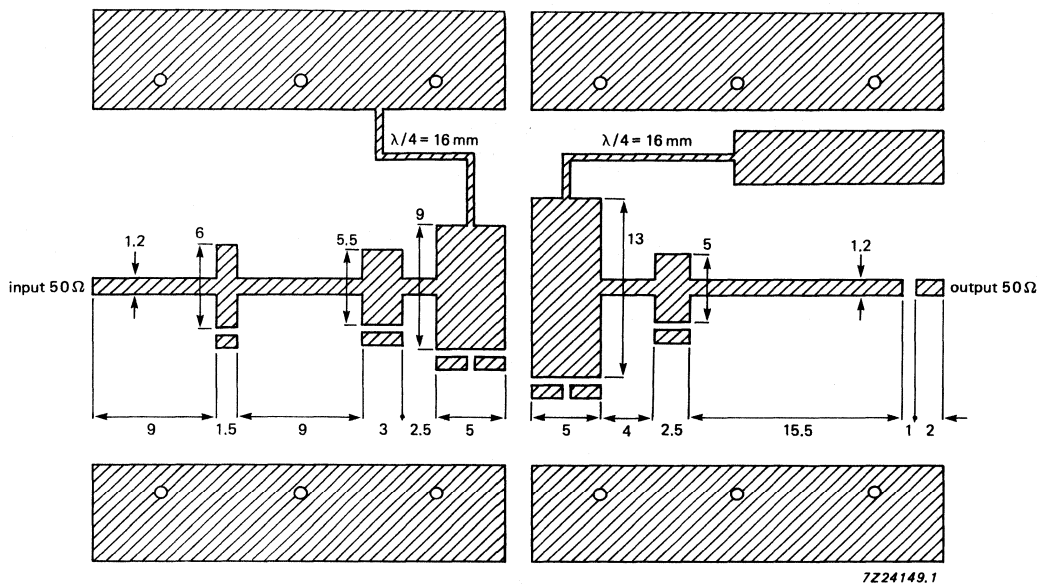


Fig. 3 Broadband test circuit for 2,8 to 3,3 GHz. (dimensions in mm).
PTFE fibreglass printed circuit board, thickness 0,4 mm.

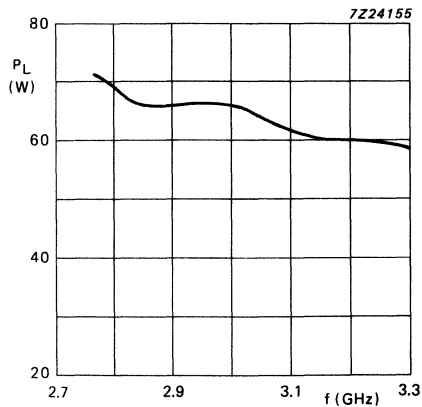


Fig. 4 Load power as a function of frequency*; $V_{CC} = 40 \text{ V}$;
 $P_{in} = 15 \text{ W}$; $t_p = 100 \mu\text{s}$; $\delta = 10\%$; typical values.

* In a broadband test circuit as shown in Fig. 3.

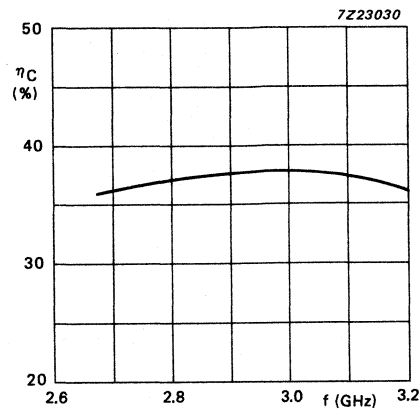


Fig. 5 Collector efficiency as a function of frequency*; $V_{CC} = 40 \text{ V}$; $t_p = 100 \mu\text{s}$; $\delta = 10\%$; typical values.

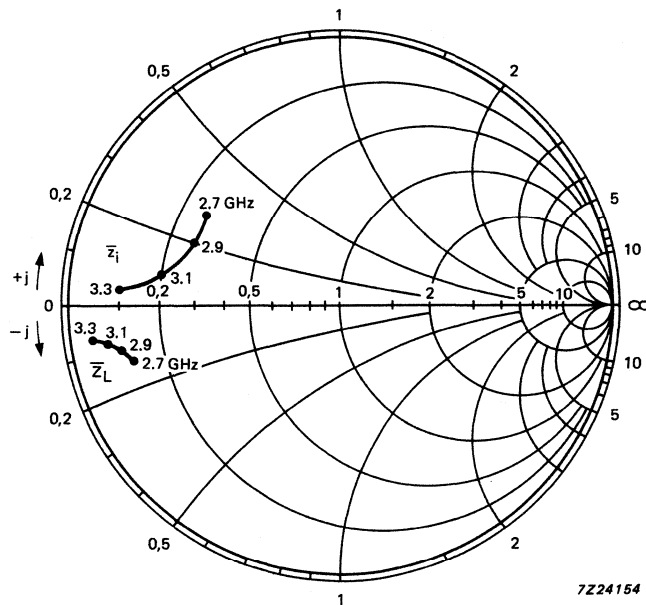


Fig. 6 Input and optimum load impedance as a function of frequency; $Z_0 = 50 \Omega$; $V_{CC} = 40 \text{ V}$; typical values.

* In a broadband test circuit as shown in Fig. 3.

PULSED POWER TRANSISTORS FOR S-BAND RADAR

N-P-N transistors for use in common-base pulsed power amplifiers for S-band radar (3,1 to 3,5 GHz).

Diffused emitter ballasting resistors, interdigitated structure, multicell geometry and gold sandwich metallization ensure an optimum temperature profile and reliability. Owing to the entirely ion-implanted, self-aligning process an excellent wideband performance is obtained.

Internal input and output prematching ensures good stability and easy broadband use.

QUICK REFERENCE DATA

R.F. performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized wideband common-base class-B circuit under pulse conditions

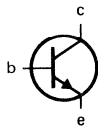
type number	f GHz	V _{CC} V	t _p μs	δ %	P _L W	G _p dB	η _C %
RZ3135B15W	3,1 to 3,5	40	100	10	typ. 18	typ. 5,5	typ. 33
RZ3135B30W	3,1 to 3,5	40	100	10	typ. 34	typ. 5,5	typ. 33

MECHANICAL DATA

Fig. 1 FO-57C.

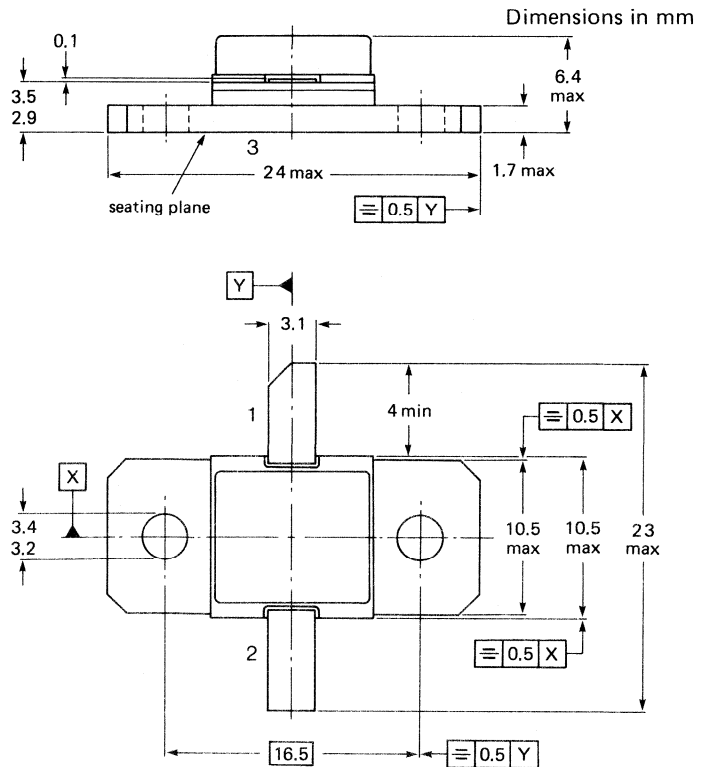
Pinning:

- 1 = collector
- 2 = emitter
- 3 = base



Torque on nut: max. 0,5 Nm

Recommended screw: M3



7285741.2

RATINGS

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

			RZ3135B15W	RZ3135B30W
Collector-base voltage open emitter	V_{CBO}	max.	50	50 V
Collector-emitter voltage $R_{BE} = 10 \Omega$ open base	V_{CER}	max.	50	50 V
	V_{CEO}	max.	15	15 V
Emitter-base voltage open collector	V_{EBO}	max.	3,5	3,5 V
Collector current (DC)*	I_C	max.	2	4 A
Total power dissipation* up to $T_{mb} = 75 \text{ }^\circ\text{C}$	P_{tot}	max.	75	150 W
Storage temperature	T_{stg}		-65 to + 200 $^\circ\text{C}$	
Junction temperature	T_j	max.	200 $^\circ\text{C}$	
Lead soldering temperature at 0,3 mm from the case $t_{sld} \leq 10 \text{ s}$	T_{sld}	max.	235 $^\circ\text{C}$	

THERMAL RESISTANCE ($T_j = 75 \text{ }^\circ\text{C}$)

			RZ3135B15W	RZ3135B30W
From junction to mounting base in (CW)	$R_{th j-mb}$	max.	3,5	1,75 K/W
From mounting base to heatsink	$R_{th mb-h}$	max.	0,3	0,3 K/W
From junction to mounting base	$R_{th-peak}$	typ.	1,2	0,6 K/W

CHARACTERISTICS

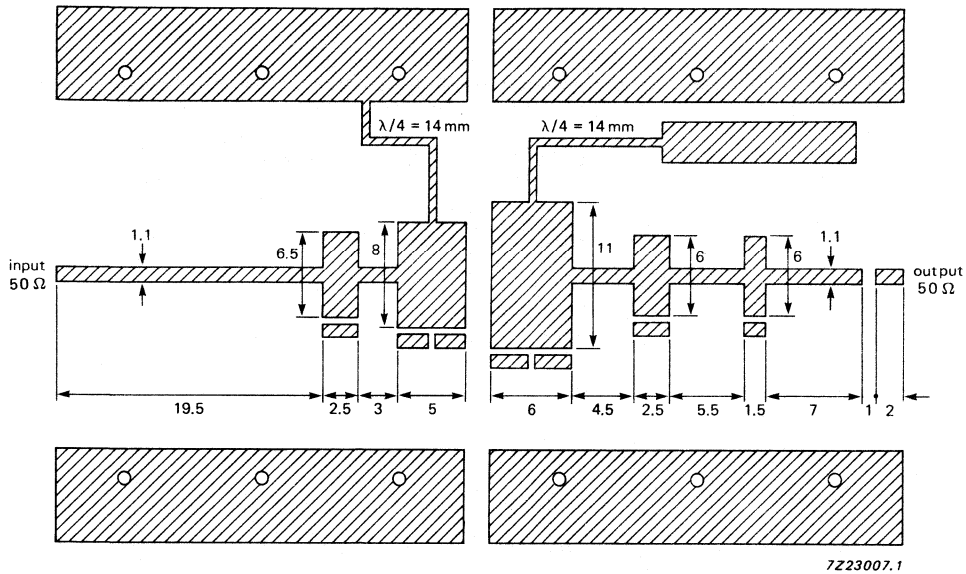
			RZ3135B15W	RZ3135B30W
$T_{mb} = 25 \text{ }^\circ\text{C}$				
Collector-base breakdown voltage open emitter; $I_C = 10 \text{ mA}$ open emitter; $I_C = 20 \text{ mA}$	$V_{(BR)CBO}$	\geq	50	V
	$V_{(BR)CBO}$	\geq		50 V
Collector-emitter breakdown voltage $R_{BE} = 10 \Omega$; $I_C = 50 \text{ mA}$ $R_{BE} = 10 \Omega$; $I_C = 100 \text{ mA}$	$V_{(BR)CER}$	\geq	50	V
	$V_{(BR)CER}$	\geq		50 V
Emitter-base breakdown voltage open collector; $I_E = 0,1 \text{ mA}$ open collector; $I_E = 0,2 \text{ mA}$	$V_{(BR)EBO}$	\geq	3,5	V
	$V_{(BR)EBO}$	\geq		3,5 V
Collector cut-off current $I_E = 0$; $V_{CB} = 30 \text{ V}$	I_{CBO}	\leq	0,1	0,2 mA
Emitter cut-off current $I_C = 0$; $V_{EB} = 1,5 \text{ V}$	I_{EBO}	\leq	10	20 μA

* In normal pulse conditions; $t_{on} = 100 \mu\text{s}$; $\delta = 10\%$.

APPLICATION INFORMATION (type RZ3135B15W)

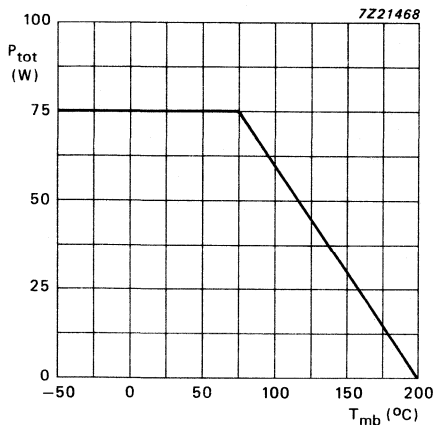
R.F. performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized wideband common-base class-B circuit under pulse conditions.

type number	f GHz	V _{CC} V	t _p μs	δ %	P _L W	G _p dB	η _C %
RZ3135B15W	3,1 to 3,5	40	100	10	> 15 typ. 18	> 5 typ. 5,5	> 30 typ. 33



7Z23007.1

Fig. 2 Test circuit boards for 3,1 to 3,5 GHz (dimensions in mm); striplines on a double Cu-clad p.c. board with PTFE fibre-glass dielectric ($\epsilon_r = 2,54$); thickness 0,8 mm.



base temperature; $t_p = 100\text{ }\mu\text{s}$; $\delta = 10\%$.

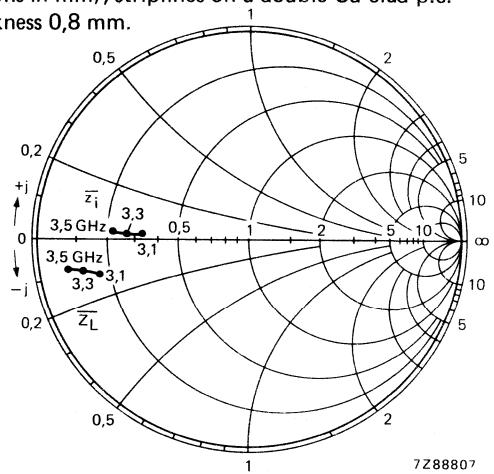
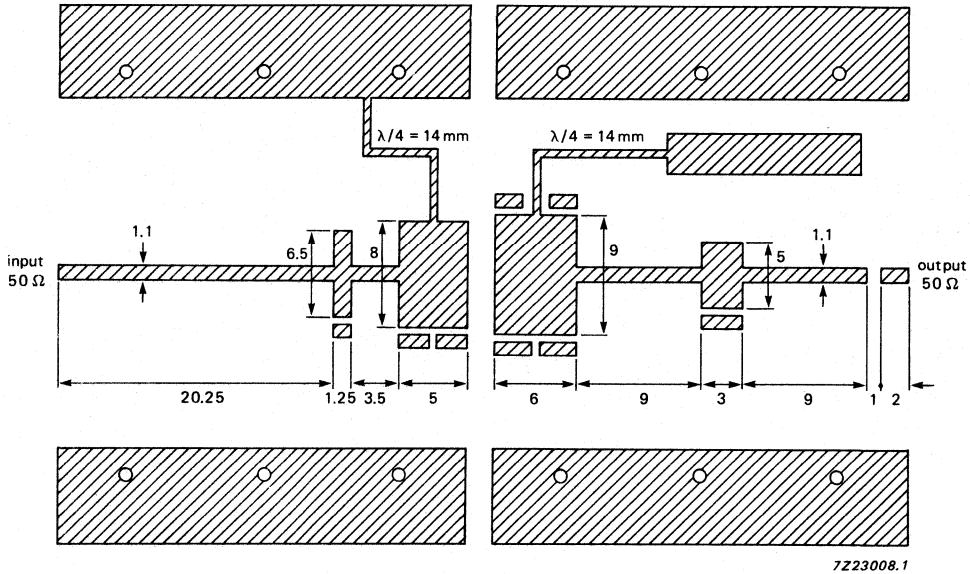


Fig. 4 Input and optimum load impedance vs. frequency; typical values; $Z_0 = 50\text{ }\Omega$; $T_{mb} = 25\text{ }^{\circ}\text{C}$.

APPLICATION INFORMATION (type RZ3135B30W)

R.F. performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized wideband common-base class-B circuit under pulse conditions.

type number	f GHz	V _{CC} V	t _p μs	δ %	P _L W	G _p dB	η _C %
RZ3135B30W	3,1 to 3,5	40	100	10	> 30 typ. 34	> 5 typ. 5,5	> 30 typ. 33



7Z23008.1

Fig. 5 Test circuit boards for 3,1 to 3,5 GHz (dimensions in mm); striplines on a double Cu-clad p.c board with PTFE fibre-glass dielectric ($\epsilon_r = 2,54$); thickness 0,8 mm.

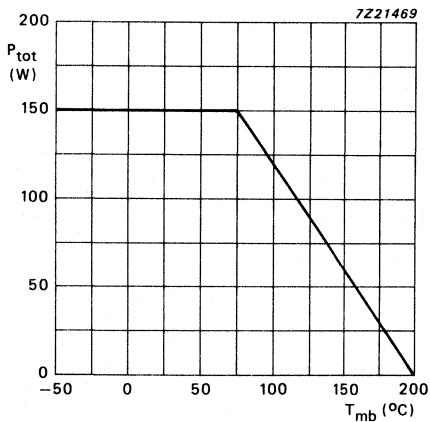


Fig. 6 Power derating curve vs. mounting base temperature; $t_p = 100\text{ }\mu\text{s}$; $\delta = 10\%$.

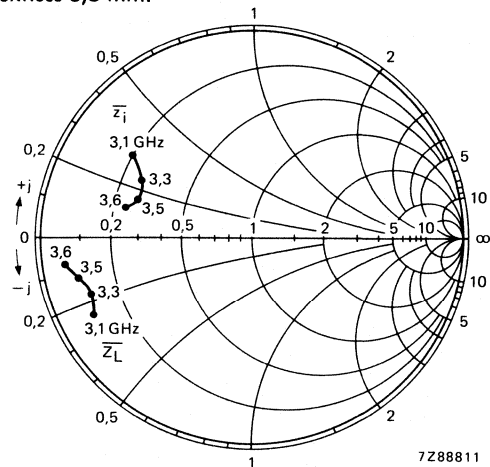


Fig. 7 Input and optimum load impedance vs. frequency; typical values; $Z_0 = 50\text{ }\Omega$; $T_{mb} = 25\text{ }^{\circ}\text{C}$.

PULSED MICROWAVE POWER TRANSISTOR

NPN silicon planar epitaxial microwave power transistor intended for use in a common-base class-C broadband pulse power amplifier with a frequency range of 3.1 to 3.5 GHz.

It is recommended for radar applications.

Features

- Interdigitated structure; giving a high emitter efficiency
- Diffused emitter ballasting resistors; capable of withstanding a high VSWR and providing excellent current sharing
- Gold metallization; ensuring excellent stability of the characteristics and giving a prolonged working life
- Multicell geometry; giving good balance of dissipated power and low thermal resistance
- Input and output matching cells; allowing an easier design of circuits

The transistor is housed in a metal-ceramic flange envelope (FO-57D).

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-C broadband amplifier.

mode of operation	f GHz	V _{CC} V	P _L W	G _p dB	η_C %	$\bar{z}_i; \bar{z}_L$ Ω
class-C $t_p = 100\ \mu\text{s};$ $\delta = 10\%$	3.1 to 3.5	40	typ. 40	typ. 6.4	typ. 35	see Fig. 6

MECHANICAL DATA

FO-57D (see Fig. 1).

Dimensions in mm

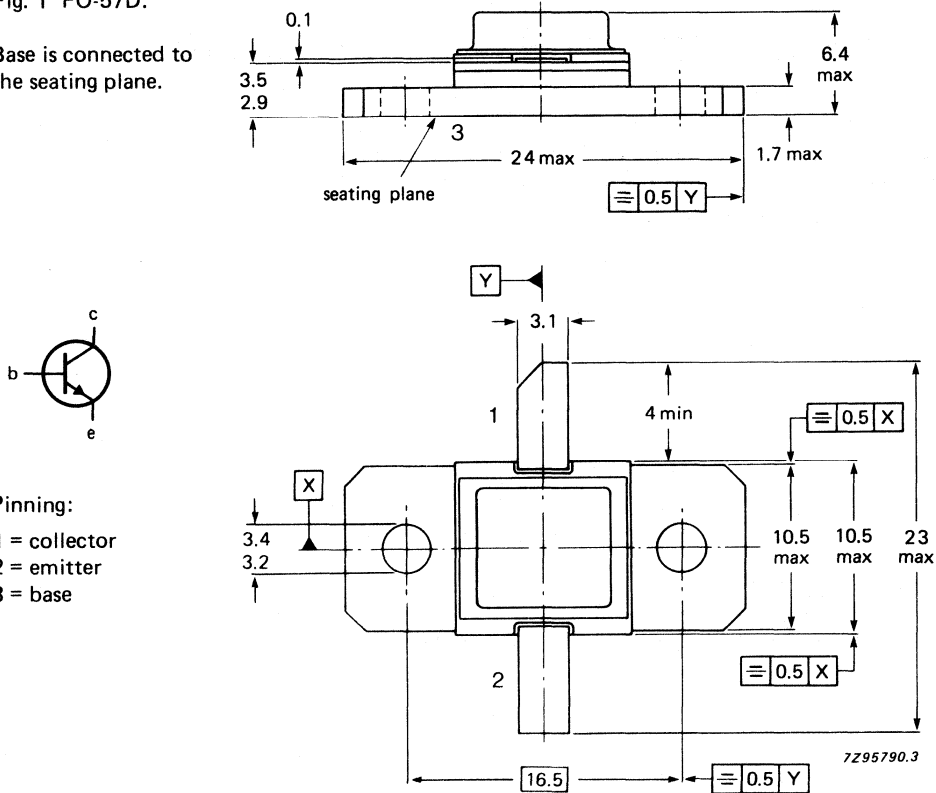
PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Fig. 1 FO-57D.

Base is connected to the seating plane.

Dimensions in mm



RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	50 V
Collector-emitter voltage	V_{CER}	max.	50 V
$R_{BE} = 10 \Omega$	V_{CEO}	max.	15 V
open base	V_{EBO}	max.	3.5 V
Emitter-base voltage (open collector)	I_C	max.	4.4 A
Collector current (peak) *	P_{tot}	max.	90 W
Total power dissipation	T_{stg}	-65 to +200	$^{\circ}C$
at $T_{mb} \leq 75^{\circ}C$ *	T_j	max.	200 $^{\circ}C$
Storage temperature range	T_{sld}	max.	235 $^{\circ}C$
Junction temperature			
Soldering temperature up to 0.3 mm			
from the case; $t_{sld} \leq 10$ s			

* Maximum value under pulsed microwave operating conditions; $t_p = 100 \mu s$, $\delta = 10\%$.

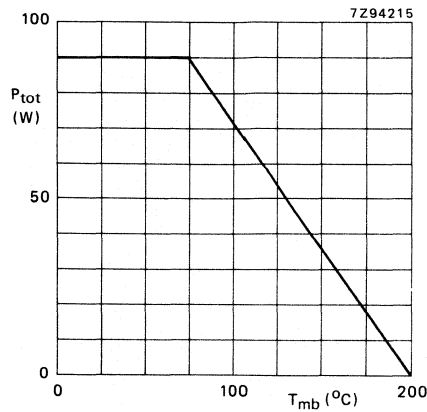


Fig. 2 Power derating curve; $t_p = 100 \mu s$; $\delta = 10\%$.

THERMAL RESISTANCE (at $T_j = 100 \text{ }^\circ\text{C}$)

From junction to mounting base	$R_{th \text{ j-mb}}$	max.	3.3 K/W
From mounting base to heatsink	$R_{th \text{ mb-h}}$	typ.	0.3 K/W
Equivalent thermal impedance under pulse microwave conditions; $t_p = 100 \mu s$; $\delta = 10\%$.	$Z_{th \text{ j-mb}}$	typ.	1.07 K/W

CHARACTERISTICS

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

Collector cut-off current

$V_{CB} = 50 \text{ V}; I_E = 0$	I_{CBO}	\leq	16 mA
$V_{CB} = 30 \text{ V}; I_E = 0$	I_{CBO}	\leq	0.16 mA
$V_{CB} = 50 \text{ V}; R_{BE} = 10 \Omega$	I_{CBO}	\leq	160 mA

Emitter cut-off current

$V_{EB} = 3.5 \text{ V}; I_C = 0$	I_{EBO}	\leq	1 mA
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APPLICATION INFORMATION

Microwave performance up to $T_{mb} = 25 \text{ }^\circ\text{C}$ in a class-C broadband amplifier under pulsed conditions.

mode of operation	f GHz	V_{CC}^* V	P_L W	G_p dB	η_C %	$\bar{z}_i; \bar{Z}_L$ Ω
class-C $t_p = 100 \mu s$; $\delta = 10\%$	3.1 to 3.5	40	≥ 35	≥ 5.9	≥ 30	see Fig. 6

* During pulsed conditions.

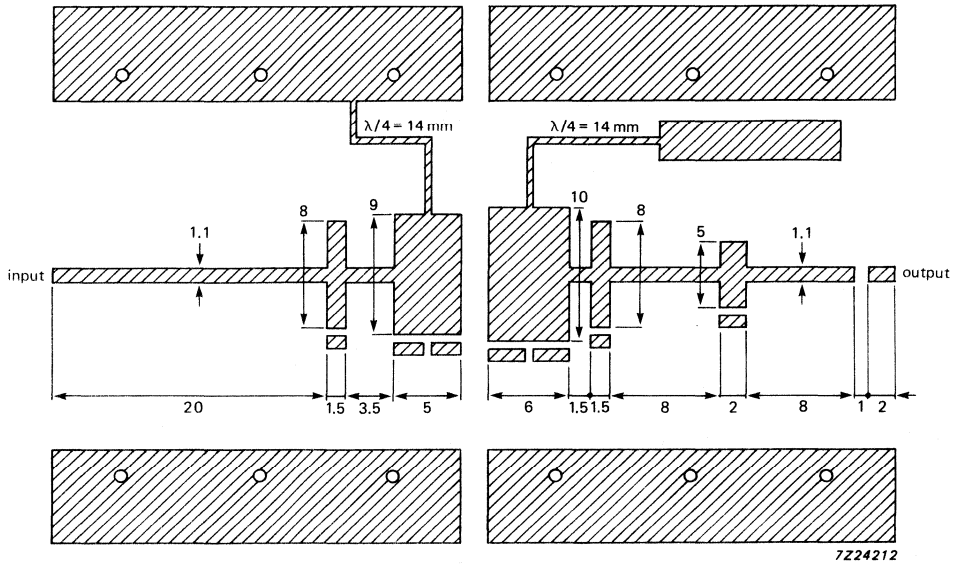


Fig. 3 Broadband test circuit for 3.1 to 3.5 GHz. (dimensions in mm). PTFE fibreglass printed circuit board; thickness 0.4 mm; $\epsilon_r = 2.54$.

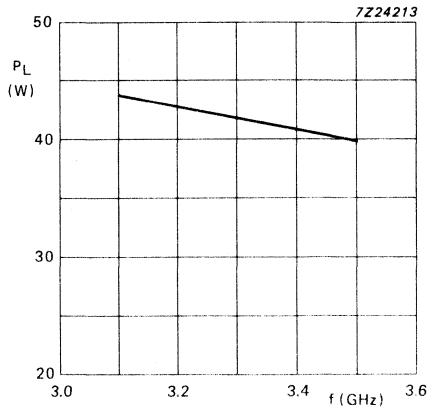


Fig. 4 Load power as a function of frequency*; $V_{CC} = 40\text{ V}$; $P_{in} = 9\text{ W}$; $t_p = 100\ \mu\text{s}$; $\delta = 10\%$; typical values.

* In a broadband test circuit as shown in Fig. 3.

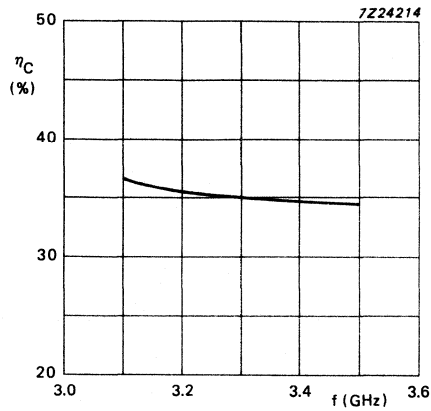


Fig. 5 Collector efficiency as a function of frequency*; $V_{CC} = 40$ V; $t_p = 100$ μ s; $\delta = 10\%$; typical values.

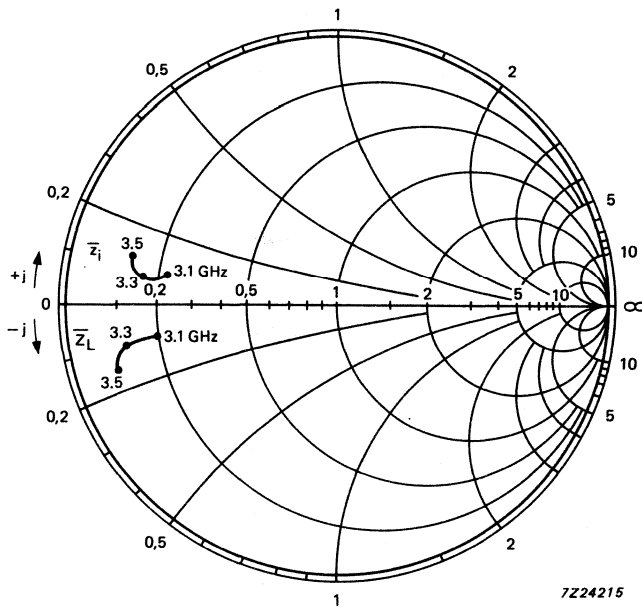


Fig. 6 Input and optimum load impedance as a function of frequency; $Z_0 = 50$ Ω ; $V_{CC} = 40$ V; typical values.

* In a broadband test circuit as shown in Fig. 3.

PULSED MICROWAVE POWER TRANSISTOR

NPN silicon planar epitaxial microwave power transistor, intended for use in a common-base class-C broadband pulse power amplifier with a frequency range of 3,1 to 3,5 GHz.

It is recommended for radar applications.

Features

- Interdigitated structure; giving a high emitter efficiency
- Diffused emitter ballasting resistors; capable of withstanding a high VSWR and providing excellent current sharing
- Gold metallization; ensuring excellent stability of the characteristics and giving a prolonged working life
- Multicell geometry; giving good balance of dissipated power and low thermal resistance
- Input and output matching cells; simplifying circuit design.

The transistor is housed in a metal-ceramic flange envelope (FO-57D).

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-C broadband amplifier.

mode of operation	f GHz	V_{CC} V	P_L W	G_p dB	η_C %	$\bar{z}_i; \bar{z}_L$ Ω
class-C $t_p = 100\ \mu\text{s}$ $\delta = 10\%$	3,1 to 3,5	40	typ. 55	typ. 5,6	typ. 35	see Fig. 6

MECHANICAL DATA

FO-57D (see Fig. 1)

Dimensions in mm

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

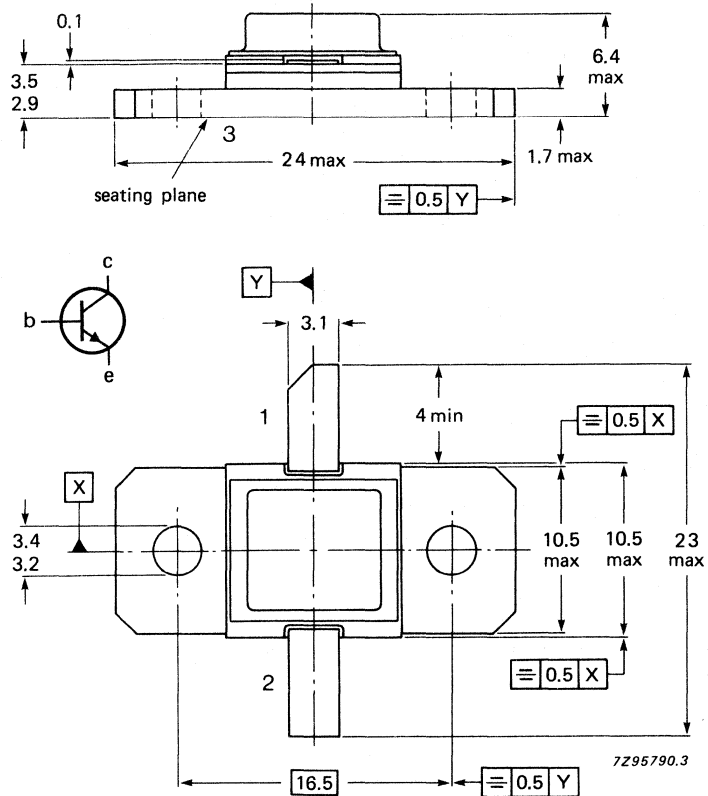
MECHANICAL DATA

Fig. 1 FO-57D

Dimensions in mm

Base is connected to the seating plane

Pinning:
1 = collector
2 = emitter
3 = base



RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	50 V
Collector-emitter voltage	V_{CER}	max.	50 V
$R_{BE} = 10 \Omega$	V_{CEO}	max.	15 V
open base			
Emitter-base voltage (open collector)	V_{EBO}	max.	3.5 V
Collector current (peak)*	I_C	max.	5.7 A
Total power dissipation at $T_{mb} \leq 75 \text{ }^\circ\text{C}$ *	P_{tot}	max.	125 W
Storage temperature range	T_{stg}		-65 to + 200 $^\circ\text{C}$
Junction temperature	T_j	max.	200 $^\circ\text{C}$
Soldering temperature up to 0,3 mm from the case; $t_{slid} \leq 10 \text{ s}$	T_{slid}	max.	235 $^\circ\text{C}$

* Maximum value under normal pulsed microwave operating conditions.

THERMAL RESISTANCE (at $T_j = 100\text{ }^\circ\text{C}$)

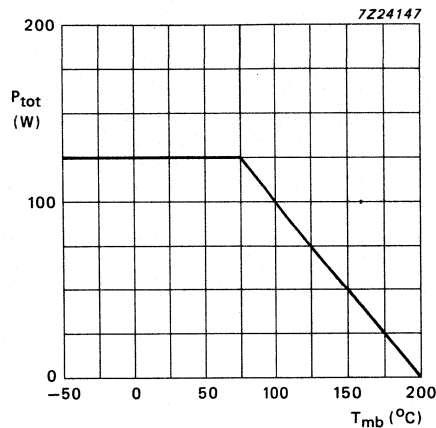
From junction to mounting base (CW)

 $R_{th\ j-mb}$ max. 2,5 K/W

Equivalent thermal impedance under pulsed microwave conditions

 $t_p = 100\ \mu\text{s}; \delta = 10\%$ $Z_{th\ j-mb}$ typ. 0,8 K/W

From mounting base to heatsink

 $R_{th\ mb-h}$ typ. 0,3 K/WFig. 2 Power derating curve; $t_p = 100\ \mu\text{s}; \delta = 10\%$.**CHARACTERISTICS** $T_{mb} = 25\text{ }^\circ\text{C}$ unless otherwise specified

Collector cut-off current

 $V_{CB} = 50\text{ V}; I_E = 0$ $I_{CBO} \leq 24\text{ mA}$ $V_{CB} = 30\text{ V}; I_E = 0$ $I_{CBO} \leq 80\ \mu\text{A}$ $V_{CB} = 50\text{ V}; R_{BE} = 10\ \Omega$ $I_{CBO} \leq 240\text{ mA}$

Emitter cut-off current

 $V_{EB} = 3,5\text{ V}; I_C = 0$ $I_{EBO} \leq 5\text{ mA}$ **APPLICATION INFORMATION**Microwave performance up to $T_{mb} = 25\text{ }^\circ\text{C}$ in a class-C broadband amplifier under pulsed conditions.

mode of operation	f GHz	V_{CC}^* V	P_L W	G_p dB	η_C %	$\bar{z}_i; \bar{z}_L$ Ω
class-C $t_p = 100\ \mu\text{s}$ $\delta = 10\%$	3,1 to 3,5	40	≥ 50	$\geq 5,2$	≥ 30	see Fig. 6

* During pulse.

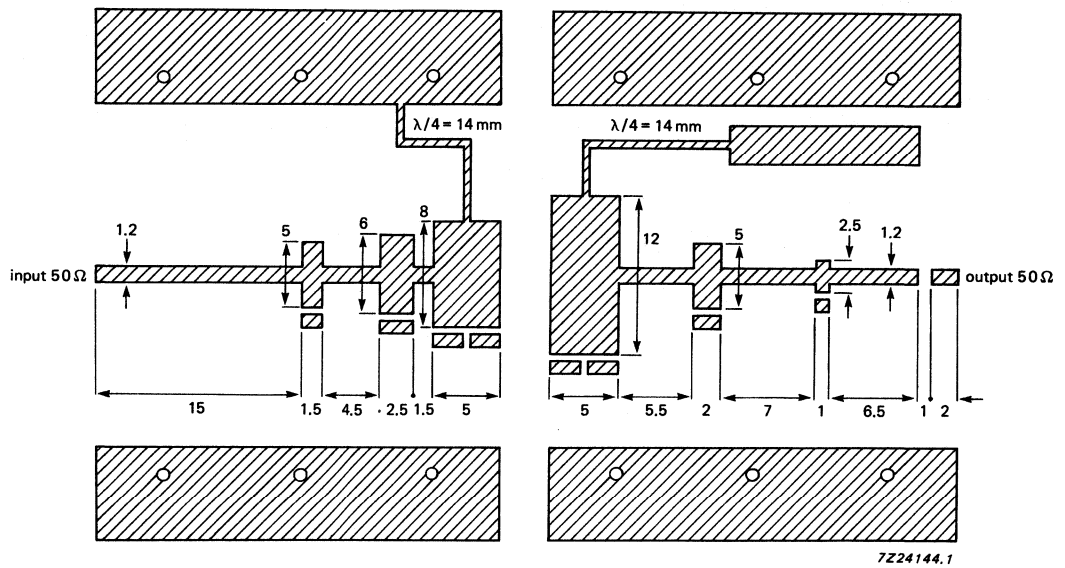


Fig. 3 Broadband test circuit for 3,1 to 3,5 GHz. (dimensions in mm).
PTFE fibreglass printed circuit board, thickness 0,4 mm; $\epsilon_r = 2,54$.

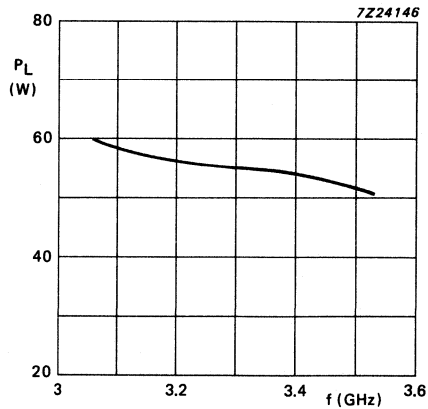


Fig. 4 Load power as a function of frequency*; $V_{CC} = 40\text{ V}$;
 $P_{in} = 15\text{ W}$; $t_p = 100\ \mu\text{s}$; $\delta = 10\%$; typical values.

*In a broadband test circuit as shown in Fig. 3.

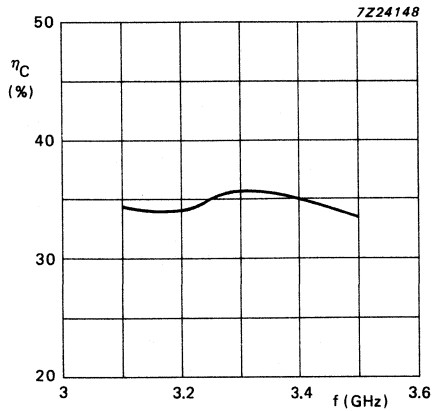


Fig. 5 Collector efficiency as a function of frequency*; $V_{CC} = 40\text{ V}$; $t_p = 100\ \mu\text{s}$; $\delta = 10\%$; typical values.

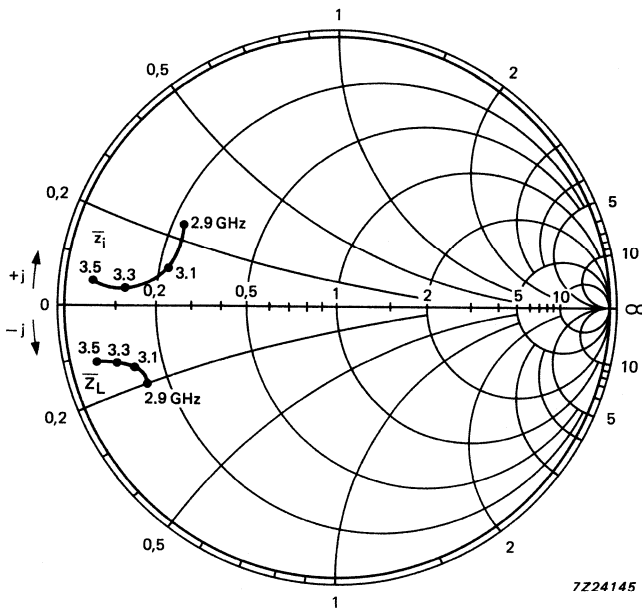


Fig. 6 Input and optimum load impedance as a function of frequency; $Z_0 = 50\ \Omega$; $V_{CC} = 40\text{ V}$; typical values.

* In a broadband test circuit as shown in Fig. 3.

PULSED MICROWAVE POWER TRANSISTOR

NPN silicon microwave power transistor intended for use in a common-base, class-C narrowband amplifier operating under pulsed conditions.

It recommended for IFF applications.

Features

- Interdigitated structure; giving a high emitter efficiency
- Diffused emitter ballasting resistors; capable of withstanding a high VSWR and providing excellent current sharing
- Gold metallization; ensuring excellent stability of the characteristics and giving a prolonged working life
- Multicell geometry; giving good balance of dissipated power and low thermal resistance

The transistor is housed in a metal-ceramic flange envelope (FO-57C).

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-C narrowband amplifier.

mode of operation	f GHz	V _{CC} V	P _L W	G _p dB	η_C %
$t_p = 100\text{ }\mu\text{s}; \delta = 10\%$	1.09	50	typ. 50	typ. 10	typ. 45
$t_p = 300\text{ }\mu\text{s}; \delta = 10\%$	1.09	50	typ. 50	typ. 10	typ. 40
DABS (see Fig. 2)	1.09	50	typ. 50	typ. 9	typ. 40

MECHANICAL DATA

FO-57C (see Fig. 1)

Dimensions in mm

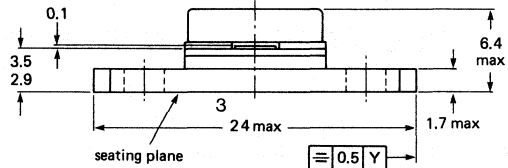
PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Fig. 1 FO-57C

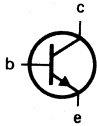
Dimensions in mm

Base is connected to the seating plane

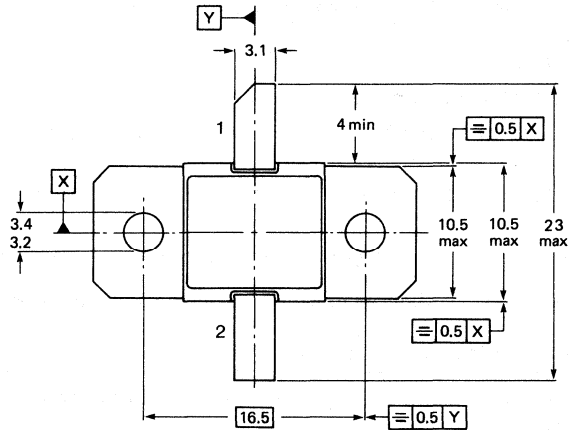


Pinning;

- 1 = collector
- 2 = emitter
- 3 = base



Torque on screw: max. 0.5 Nm
Recommended screw: M3



7Z85741.2

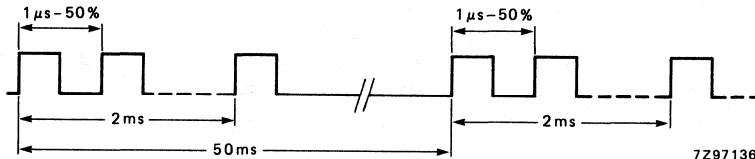


Fig. 2 DABS pulse definition.

RATINGS

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

Collector-base voltage, open emitter	V_{CBO}	max.	60 V
Collector-emitter voltage, $R_{BE} \leq 10 \Omega$	V_{CER}	max.	60 V
Emitter-base voltage, open collector	V_{EBO}	max.	3 V
Collector current (DC) $t_p = 100 \mu s; \delta \leq 10\%$	I_C	max.	3 V
Total power dissipation up to $T_{mb} = 75 \text{ }^\circ\text{C};$ $t_p = 100 \mu s; \delta \leq 10\%$	P_{tot}	max.	90 W
Storage temperature range	T_{stg}		-65 to +200 $^\circ\text{C}$
Junction temperature	T_j	max.	200 $^\circ\text{C}$
Soldering temperature up to 0.1 mm from the case; $t_{slid} \leq 10 \text{ s}$	T_{slid}	max.	235 $^\circ\text{C}$

THERMAL RESISTANCE (at $T_j = 75\text{ }^\circ\text{C}$)

From junction to mounting base

$R_{th\ j-mb}$ max. 5.0 K/W

Equivalent thermal impedance;

$t_p = 100\ \mu\text{s}; \delta = 10\%$

Z_{th} max. 1.9 K/W

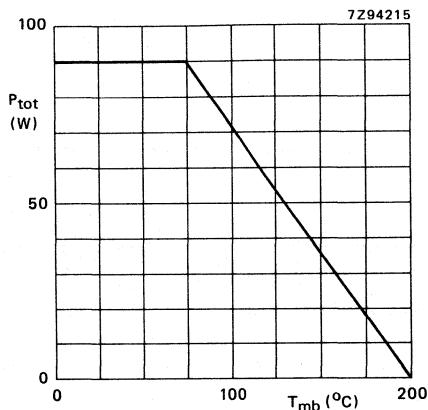


Fig. 3 Power derating curve as a function of base temperature; $t_p = 100\ \mu\text{s}; \delta = 10\%$; pulsed conditions.

CHARACTERISTICS

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

Collector-base breakdown voltage

$I_C = 7\text{ mA}; I_E = 0$

$V_{(BR)CBO}$ min. 60 V

Collector-emitter breakdown voltage

$I_C = 7\text{ mA}; R_{BE} = 10\ \Omega$

$V_{(BR)CER}$ min. 60 V

Emitter-base breakdown voltage

$I_C = 0; I_E = 0.5\text{ mA}$

$V_{(BR)EBO}$ min. 3 V

Collector cut-off current

$I_E = 0; V_{CB} = 50\text{ V}$

I_{CBO} max. 1.5 mA

APPLICATION INFORMATION

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in a class-C narrowband amplifier under pulsed conditions (measured in the test circuit shown in Fig. 4).

mode of operation	f GHz	V _{CC} V	P _L W	G _p dB	η_C %
class-C $t_p = 100\ \mu\text{s}$; $\delta = 10\%$	1.09	50	≥ 35	≥ 7	≥ 30

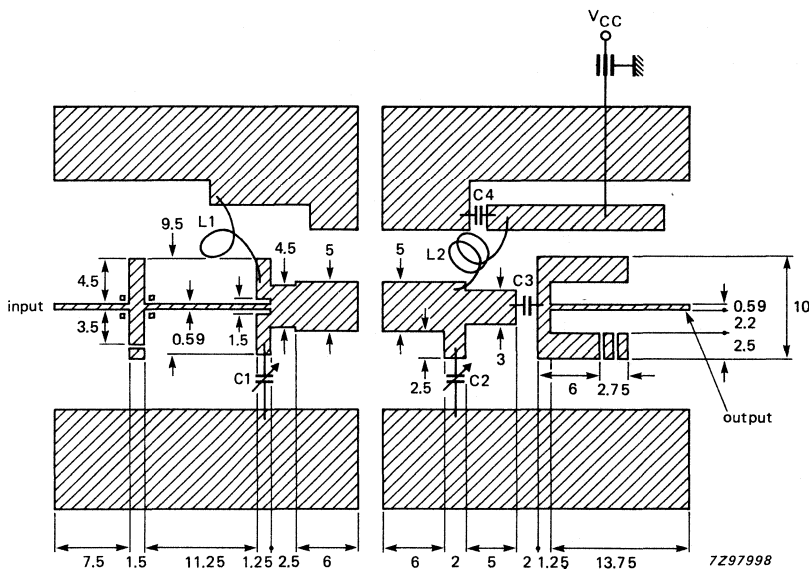


Fig. 4 Narrowband test circuit for 1.09 GHz. (dimensions in mm).
Epsilon printed circuit board; thickness = 0.635 mm; $\epsilon_r = 10$.

List of components

- C1 = C2 0.6 to 8 pF Gigatrim capacitor
 C3 100 pF ATC capacitor (small size)
 C4 1000 pF (approximately) decoupling capacitor
 L1 One turn diameter 4 mm; wire diameter 0.5 mm
 L2 Two turns diameter 4.5 mm; wire diameter 0.5 mm

IMPEDANCE DATA

Frequency GHz	z_i Ω	Z_L Ω
1.1	$9.0 + j3.8$	$4.3 + j1.3$
1.0	$7.2 + j3.7$	$3.9 + j1.1$
0.9	$5.5 + j1.9$	$3.8 + j0$

PULSED MICROWAVE POWER TRANSISTOR

N-P-N silicon power transistor for use in a common-base, class-C narrowband amplifier in avionics applications.

It operates in pulsed conditions only and is recommended for IFF applications.

Features

- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high VSWR
- Gold metallization realizing a very good stability of the characteristics and excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance

The transistor is housed in a metal ceramic flange envelope (FO-57C).

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-C narrowband amplifier.

mode of operation	f GHz	V _{CC} V	P _L W	G _p dB	η _C %	\bar{z}_i Ω	\bar{Z}_L
class-C						see table	
t _p = 100 μs, δ = 10%	1,09	50	typ. 100	typ. 10	typ. 45		
t _p = 300 μs, δ = 10%	1,09	50	typ. 100	typ. 10	typ. 40		
DABS (see Fig. 2)	1,09	50	typ. 100	typ. 9	typ. 40		

MECHANICAL DATA

FO-57C (see Fig. 1)

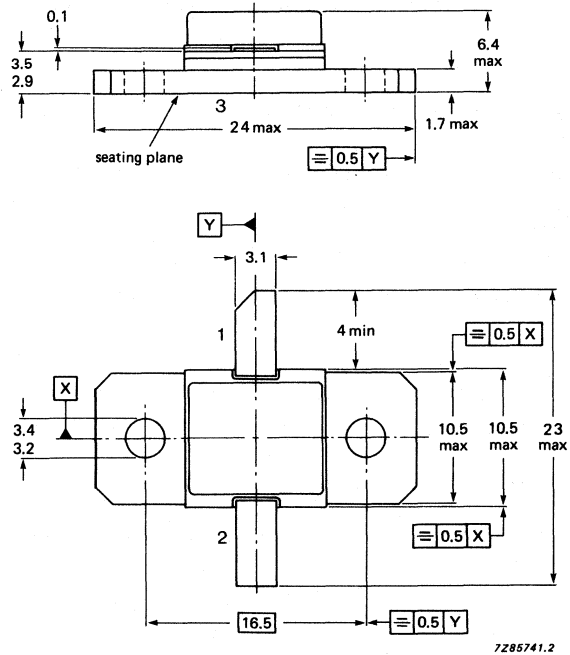
Dimensions in mm

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 FO-57C.



Pinning:

- 1 = collector
- 2 = emitter
- 3 = base

Torque on screw: max. 0,5 Nm

Recommended screw: M3

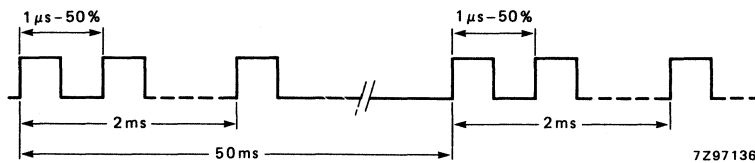


Fig. 2 DABS pulse definition.

RATINGS

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

Collector-base voltage, open emitter	V_{CBO}	max.	60 V
Collector-emitter voltage, $R_{BE} = 10 \Omega$	V_{CER}	max.	60 V
Emitter-base voltage, open collector	V_{EBO}	max.	3 V

Collector current (d.c.)

$t_p = 100 \mu s; \delta \leq 10\%$

I_C max. 6 A

Total power dissipation up to $T_{mb} = 75 \text{ }^\circ\text{C}$

$t_p = 100 \mu s; \delta \leq 10\%$

P_{tot} max. 180 W

Storage temperature

T_{stg} -65 to +200 $^\circ\text{C}$

Junction temperature

T_j max. 200 $^\circ\text{C}$

Soldering temperature

at 0,1 mm from the case, $t_{sld} \leq 10 \text{ s}$

T_{sld} max. 235 $^\circ\text{C}$

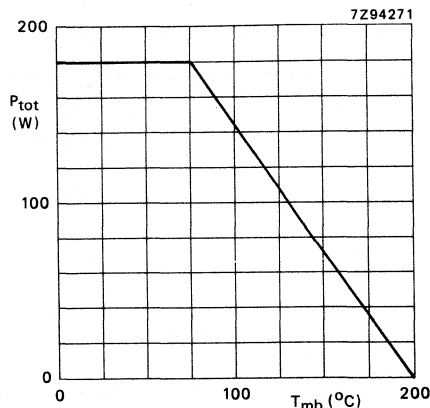


Fig. 3 Power derating curve versus mounting base temperature; $t_p = 100 \mu s, \delta = 10\%$.

THERMAL RESISTANCE (at $T_j = 75 \text{ }^\circ\text{C}$)

From junction to mounting base

$R_{th \text{ j-mb}}$ max. 2,5 K/W

Equivalent thermal impedance;

$t_p = 100 \mu s; \delta = 10\%$

Z_{th} typ. 0,9 K/W

CHARACTERISTICS

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

Breakdown voltages

$I_C = 15 \text{ mA}; I_E = 0$

$V_{(BR)CBO}$ min. 60 V

$I_C = 15 \text{ mA}; R_{BE} = 10 \Omega$

$V_{(BR)CER}$ min. 60 V

$I_C = 0; I_E = 1 \text{ mA}$

$V_{(BR)EBO}$ min. 3 V

Collector cut-off current

$I_E = 0; V_{CB} = 60 \text{ V}$

I_{CBO} max. 3 mA

IMPEDANCES

frequency GHz	input (\bar{Z}_i) Ω	load (\bar{Z}_L) Ω
1,03	$3,5 + j4,5$	$2,6 + j1,75$
1,09	$4,2 + j4,5$	$1,9 - j0,9$

PULSED MICROWAVE POWER TRANSISTOR

N-P-N silicon power transistor for use in a common-base, class-C narrowband amplifier in avionics applications.

It operates in pulsed conditions only and is recommended for IFF applications.

Features:

- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high VSWR
- Gold metallization realizing a very good stability of the characteristics and excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance

The transistor is housed in a metal ceramic flange envelope (FO-57C).

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in an unneutralized common-base class-C narrowband amplifier.

mode of operation	f GHz	V _{CC} V	P _L W	G _p dB	η_C %	\bar{z}_i \bar{z}_L Ω
class-C						see table
$t_p = 100\ \mu\text{s}, \delta = 10\%$	1,09	50	typ. 250	typ. 7,5	typ. 25	
$t_p = 300\ \mu\text{s}, \delta = 10\%$	1,09	50	typ. 200	typ. 7,0	typ. 30	
DABS (see Fig. 2)	1,09	50	typ. 200	typ. 7,0	typ. 30	

MECHANICAL DATA

FO-57C (see Fig. 1)

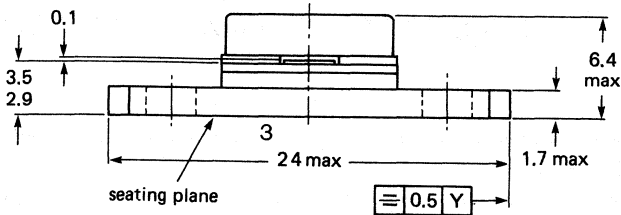
Dimensions in mm

PRODUCT SAFETY. This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Fig. 1 FO-57C.

Dimensions in mm

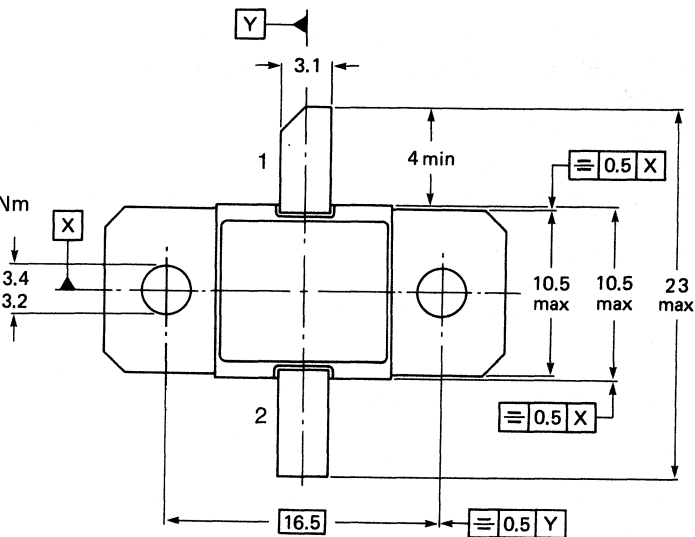


Pinning:

- 1 = collector
- 2 = emitter
- 3 = base

Torque on screw: max. 0,5 Nm

Recommended screw: M3



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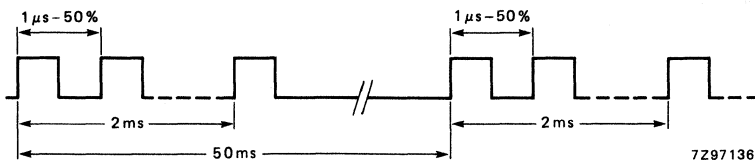


Fig. 2 DABS pulse definition.

RATINGS

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

Collector-base voltage, open emitter	V_{CBO}	max.	60 V
Collector-emitter voltage, $R_{BE} = 10 \Omega$	V_{CER}	max.	60 V
Emitter-base voltage, open collector	V_{EBO}	max.	3 V

Collector current (d.c.)

$t_p = 100 \mu s, \delta \leq 10\%$

I_C max. 15 A

Total power dissipation up to $T_{mb} = 75 \text{ }^\circ\text{C}$

$t_p = 100 \mu s, \delta \leq 10\%$

P_{tot} max. 450 W

Storage temperature

T_{stg} -65 to +200 $^\circ\text{C}$

Junction temperature

T_j max. 200 $^\circ\text{C}$

Soldering temperature

at 0,1 mm from the case. $t_{sld} \leq 10 \text{ s}$

T_{sld} max. 235 $^\circ\text{C}$

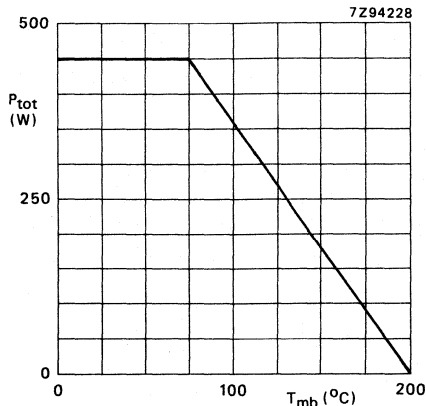


Fig. 3 Power derating curve versus mounting base temperature; $t_p = 100 \mu s, \delta = 10\%$.

THERMAL RESISTANCE (at $T_j = 75 \text{ }^\circ\text{C}$)

From junction to mounting base

$R_{th \text{ j-mb}}$ max. 1,1 K/W

Equivalent thermal impedance; $t_p = 100 \mu s; \delta = 10\%$

Z_{th} typ. 0,35 K/W

CHARACTERISTICS

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

Breakdown voltages

$I_C = 35 \text{ mA}; I_E = 0$

$V(BR)CBO \geq 60 \text{ V}$

$I_C = 35 \text{ mA}; R_{BE} = 10 \Omega$

$V(BR)CER \geq 60 \text{ V}$

$I_C = 0; I_E = 3,5 \text{ mA}$

$V(BR)EBO \geq 3 \text{ V}$

Collector cut-off current

$I_E = 0; V_{CB} = 50 \text{ V}$

$I_{CBO} \leq 7 \text{ mA}$

IMPEDANCES

frequency GHz	input (\bar{z}_i) Ω	load (\bar{z}_L) Ω
1,03	$1,9 + j4$	$1,3 - j1$
1,09	$2,3 + j4,5$	$1,1 - j1,8$

APPLICATION INFORMATION

Microwave performance up to $T_{mb} = 25\text{ }^{\circ}\text{C}$ in a class-C narrowband amplifier under pulsed conditions (measured in the test circuit shown in Fig. 4).

mode of operation	f GHz	V_{CC} V	P_L W	G_p dB	η_C %
class-C $t_p = 100\text{ }\mu\text{s}$; $\delta = 10\%$	1,09	50	≥ 200	≥ 7	≥ 30

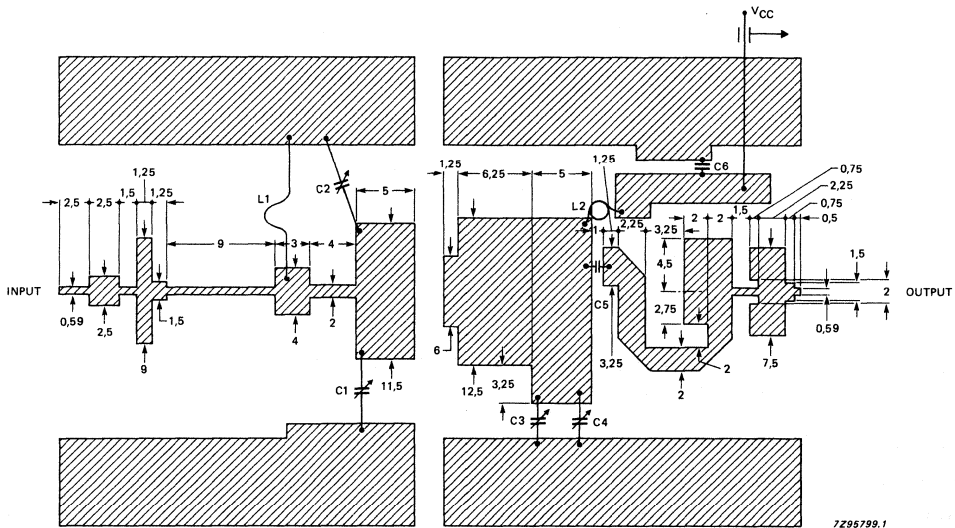


Fig. 4 Narrowband test circuit for 1,09 GHz (dimensions in mm).
Epsilon printed circuit board; thickness 0.635 mm; $\epsilon_r = 10$.

List of components:

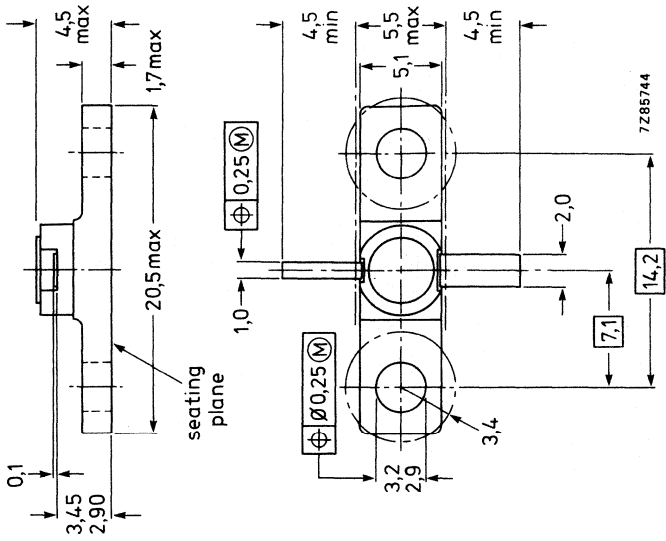
- C1 = C3 0,6 - 8 pF Gigatrim capacitor
- C2 0,8 - 12,3 pF Gigatrim capacitor
- C4 10 pF capacitor
- C5 100 pF ATC capacitor
- C6 1000 pF decoupling capacitor
- L1 Square loop 6 x 6 mm; wire diameter 0,8 mm
- L2 One turn diameter 5 mm; wire diameter 0,5 mm

ENVELOPES

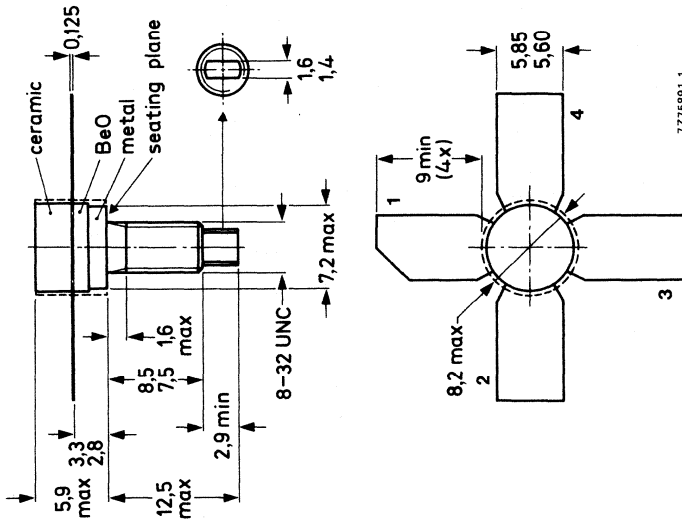
MECHANICAL DATA

Dimensions in mm

FO-41A.



FO-38.

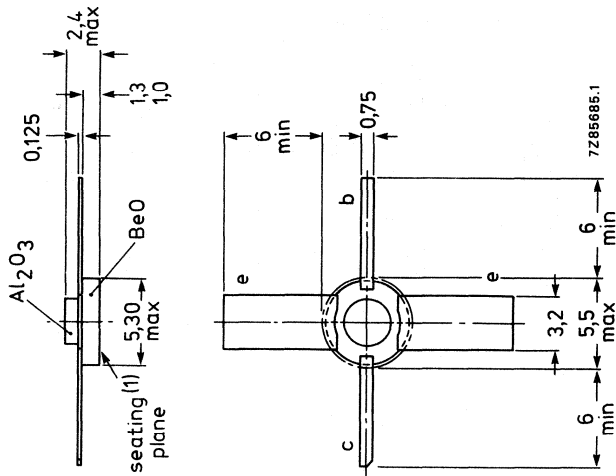


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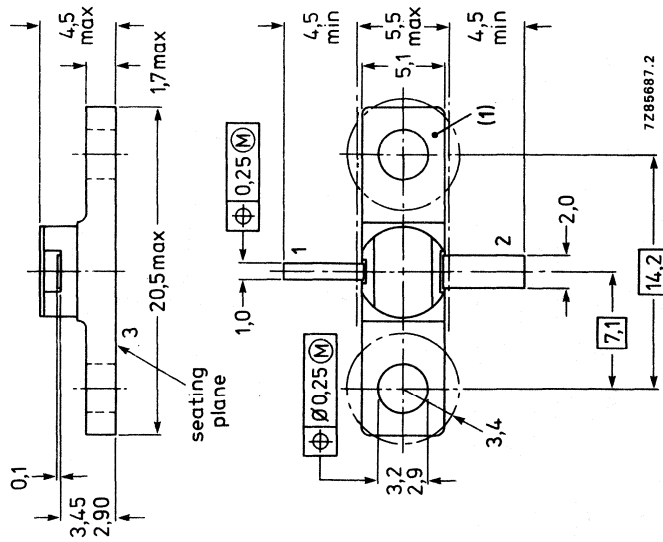
MECHANICAL DATA

Dimensions in mm

FO-45.



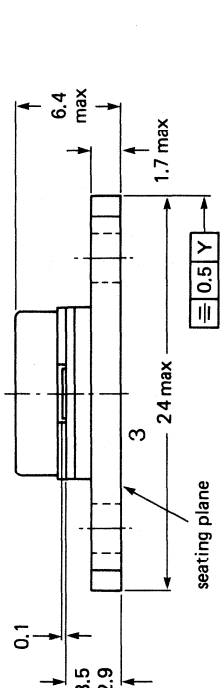
FO-41B.



MECHANICAL DATA

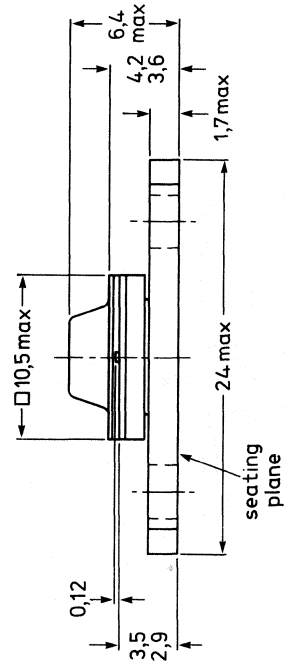
Dimensions in mm

FO-57C.



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FO-57B.

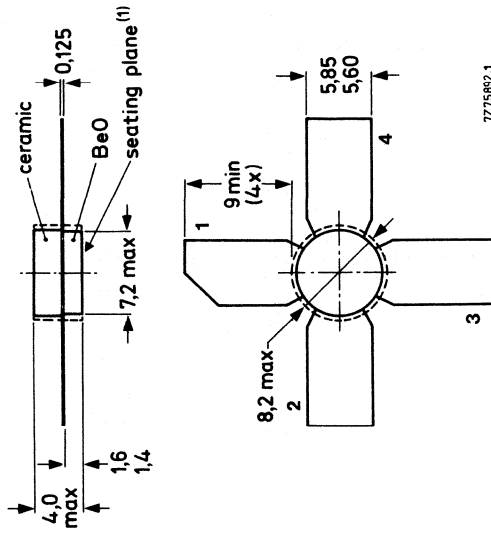


7286742

MECHANICAL DATA

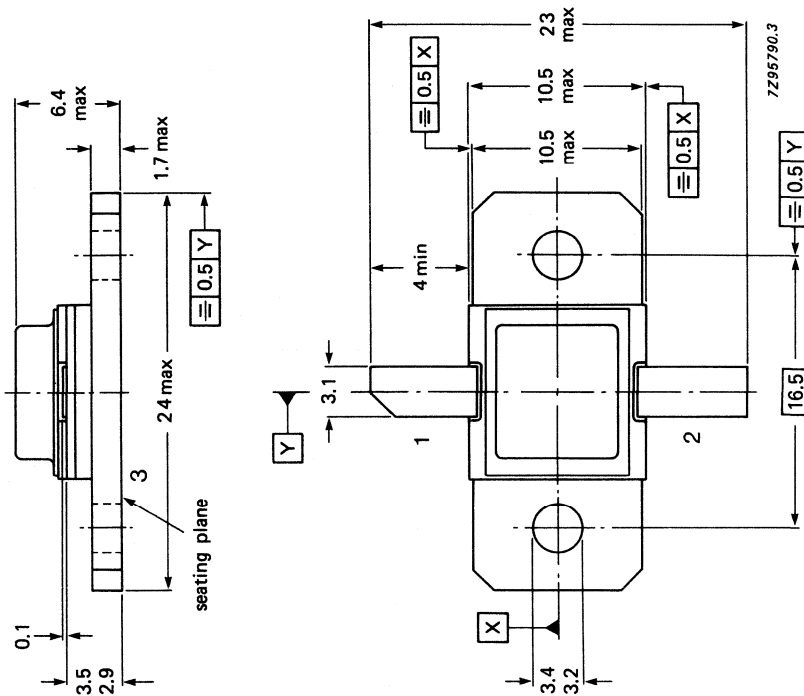
Dimensions in mm

FO-58.



7Z75862.1

FO-57D.

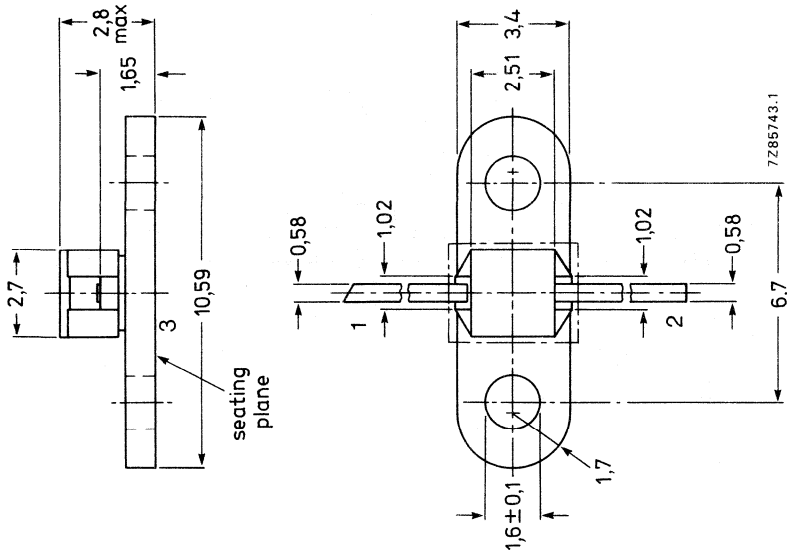


7Z95790.3

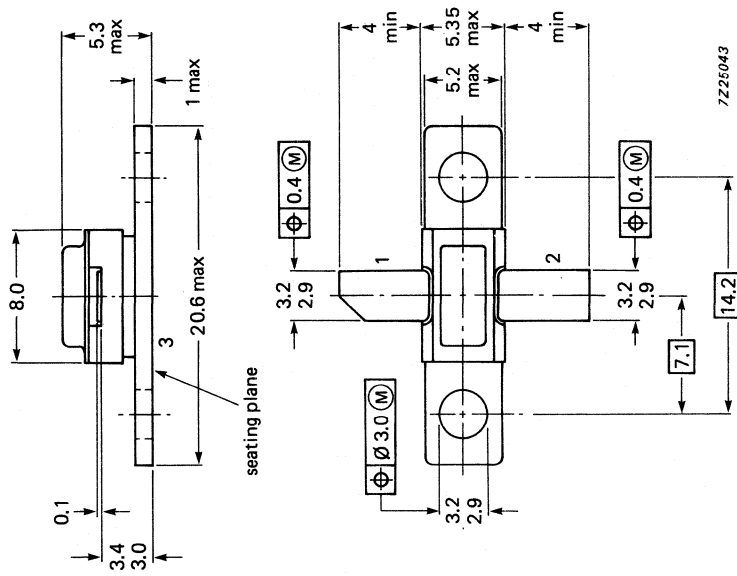
MECHANICAL DATA

Dimensions in mm

FO-85.



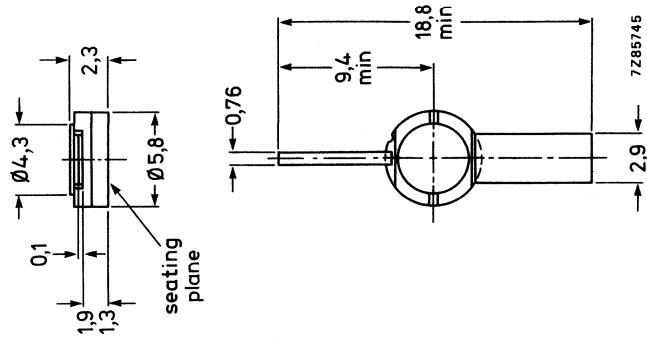
FO-83B.



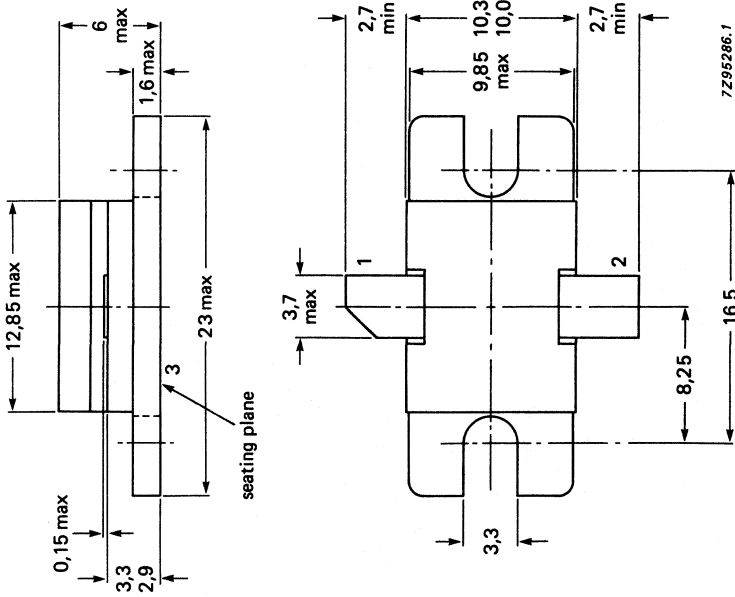
MECHANICAL DATA

Dimensions in mm

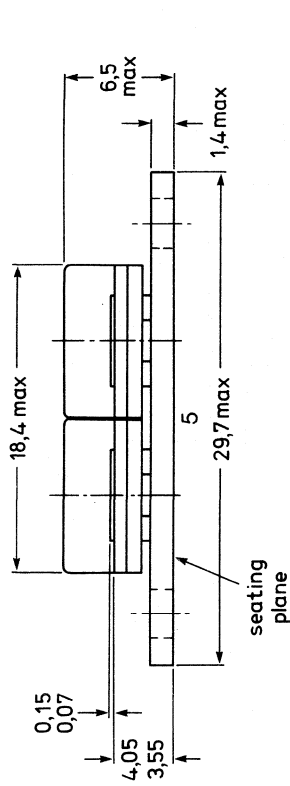
FO-93.



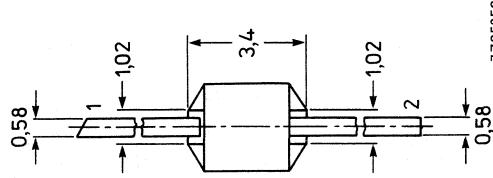
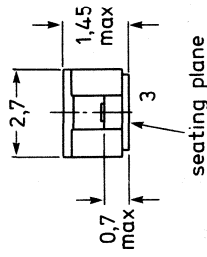
FO-91.



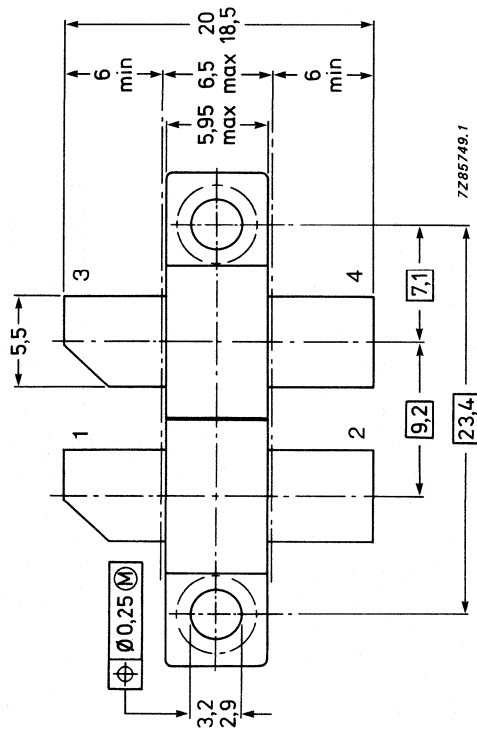
FO-96.



FO-102.



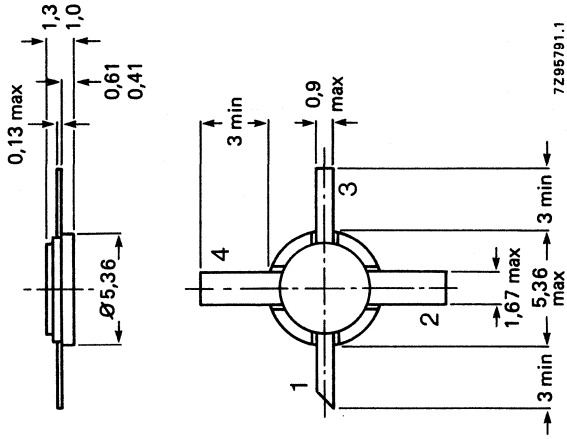
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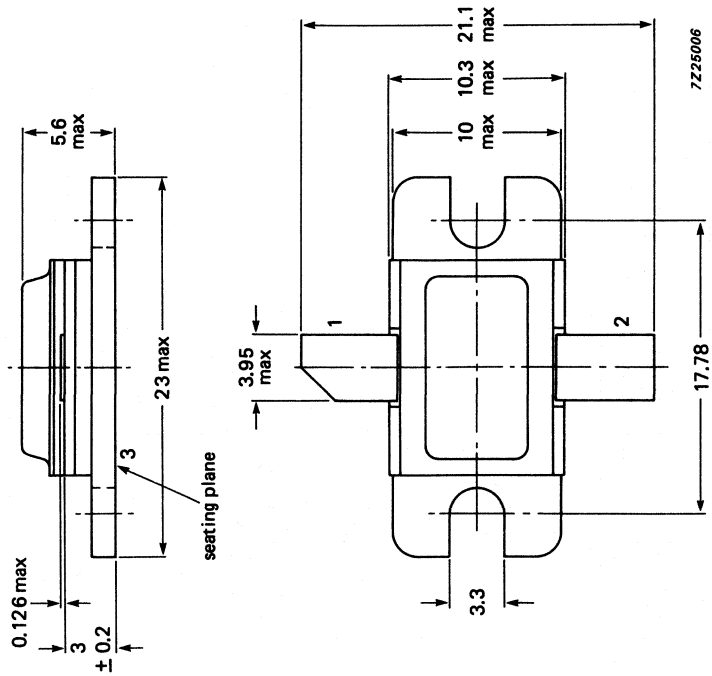
7Z85749.1

MECHANICAL DATA

FO-163.



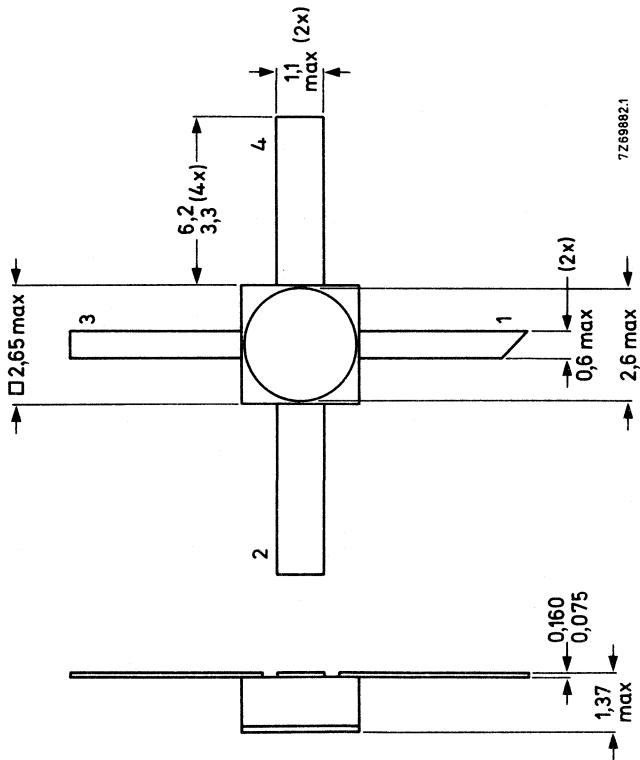
FO-125A.



MECHANICAL DATA

Dimensions in mm

SOT-100.



NOTES

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INDEX OF TYPE NUMBERS

The inclusion of a type number in this publication does not necessarily imply its availability.

type no.	book	section	type no.	book	section	type no.	book	section
BA220	S1	SD	BAS29	S7/S1	Mm/SD	BAV99	S7/S1	Mm/SD
BA221	S1	SD	BAS31	S7/S1	Mm/SD	BAV100	S7/S1	Mm/SD
BA223	S1	T	BAS32	S7/S1	Mm/SD	BAV101	S7/S1	Mm/SD
BA281	S1	SD	BAS35	S7/S1	Mm/SD	BAV102	S7/S1	Mm/SD
BA314	S1	Vrg	BAS45	S1	SD	BAV103	S7/S1	Mm/SD
BA315	S1	Vrg	BAS56	S1/S7	SD/Mm	BAW56	S7/S1	Mm/SD
BA316	S1	SD	BAT17	S7/S1	Mm/T	BAW62	S1	SD
BA317	S1	SD	BAT18	S7/S1	Mm/T	BAX12	S1	SD
BA318	S1	SD	BAT54	S1/S7	SD/Mm	BAX14	S1	SD
BA423	S1	T	BAT74	S1/S7	SD/Mm	BAX18	S1	SD
BA480	S1	T	BAT81	S1	T	BAY80	S1	SD
BA481	S1	T	BAT82	S1	T	BB112	S1	T
BA482	S1	T	BAT83	S1	T	BB119	S1	T
BA483	S1	T	BAT85	S1	T	BB130	S1	T
BA484	S1	T	BAT86	S1	T	BB204B	S1	T
BA682	S1/S7	T/Mm	BAV10	S1	SD	BB204G	S1	T
BA683	S1/S7	T/Mm	BAV18	S1	SD	BB212	S1	T
BAS11	S1	SD	BAV19	S1	SD	BB215	S7/S1	Mm/SD
BAS15	S1	SD	BAV20	S1	SD	BB219	S7/S1	Mm/SD
BAS16	S7/S1	Mm/SD	BAV21	S1	SD	BB405B	S1	T
BAS17	S7/S1	Mm/Vrg	BAV23	S7/S1	Mm/SD	BB417	S1	T
BAS19	S7/S1	Mm/SD	BAV45	S1	Sp	BB809	S1	T
BAS20	S7/S1	Mm/SD	BAV45A	S1	Sp	BB909A	S1	T
BAS21	S7/S1	Mm/SD	BAV70	S7/S1	Mm/SD	BB909B	S1	T
BAS28	S7/S1	Mm/SD	BAV74	S1	SD	BBY31	S7/S1	Mm/T

Mm = Microminiature semiconductors
for hybrid circuits
SD = Small-signal diodes

Sp = Special diodes
T = Tuner diodes
Vrg = Voltage regulator diodes
Sm = Small-signal transistors

INDEX

type no.	book	section	type no.	book	section	type no.	book	section
BBY39	S1	T	BC639	S3	Sm	BCW69;R	S7	Mm
BBY40	S7/S1	Mm/T	BC640	S3	Sm	BCW70;R	S7	Mm
BC107	S3	Sm	BC807	S7	Mm	BCW71;R	S7	Mm
BC108	S3	Sm	BC808	S7	Mm	BCW72;R	S7	Mm
BC109	S3	Sm	BC817	S7	Mm	BCW81;R	S7	Mm
BC140	S3	Sm	BC818	S7	Mm	BCW89;R	S7	Mm
BC141	S3	Sm	BC846	S7	Mm	BCX17;R	S7	Mm
BC160	S3	Sm	BC847	S7	Mm	BCX18;R	S7	Mm
BC161	S3	Sm	BC848	S7	Mm	BCX19;R	S7	Mm
BC177	S3	Sm	BC849	S7	Mm	BCX20;R	S7	Mm
BC178	S3	Sm	BC850	S7	Mm	BCX51	S7	Mm
BC179	S3	Sm	BC856	S7	Mm	BCX52	S7	Mm
BC264A	S5	FET	BC857	S7	Mm	BCX53	S7	Mm
BC264B	S5	FET	BC858	S7	Mm	BCX54	S7	Mm
BC264C	S5	FET	BC859	S7	Mm	BCX55	S7	Mm
BC264D	S5	FET	BC860	S7	Mm	BCX56	S7	Mm
BC327;A	S3	Sm	BC868	S7	Mm	BCX58	S3	Sm
BC328	S3	Sm	BC869	S7	Mm	BCX59	S3	Sm
BC337;A	S3	Sm	BCF29;R	S7	Mm	BCX70*	S7	Mm
BC338	S3	Sm	BCF30;R	S7	Mm	BCX71*	S7	Mm
BC368	S3	Sm	BCF32;R	S7	Mm	BCX78	S3	Sm
BC369	S3	Sm	BCF33;R	S7	Mm	BCX79	S3	Sm
BC375	S3	Sm	BCF70;R	S7	Mm	BCY56	S3	Sm
BC376	S3	Sm	BCF81;R	S7	Mm	BCY57	S3	Sm
BC516	S3	Sm	BCV26	S7	Mm	BCY58	S3	Sm
BC517	S3	Sm	BCV27	S7	Mm	BCY59	S3	Sm
BC546	S3	Sm	BCV61	S7	Mm	BCY65	S3	Sm
BC547	S3	Sm	BCV62	S7	Mm	BCY70	S3	Sm
BC548	S3	Sm	BCV63	S7	Mm	BCY71	S3	Sm
BC549	S3	Sm	BCV64	S7	Mm	BCY72	S3	Sm
BC550	S3	Sm	BCV65	S7	Mm	BCY78	S3	Sm
BC556	S3	Sm	BCV71;R	S7	Mm	BCY79	S3	Sm
BC557	S3	Sm	BCV72;R	S7	Mm	BCY87	S3	Sm
BC558	S3	Sm	BCW29;R	S7	Mm	BCY88	S3	Sm
BC559	S3	Sm	BCW30;R	S7	Mm	BCY89	S3	Sm
BC560	S3	Sm	BCW31;R	S7	Mm	BD131	S4a	P
BC635	S3	Sm	BCW32;R	S7	Mm	BD132	S4a	P
BC636	S3	Sm	BCW33;R	S7	Mm	BD135	S4a	P
BC637	S3	Sm	BCW60*	S7	Mm	BD136	S4a	P
BC638	S3	Sm	BCW61*	S7	Mm	BD137	S4a	P

* = series

FET = Field-effect transistors

Mm = Microminiature semiconductors
for hybrid circuits

P = Low-frequency power transistors

Sm = Small-signal transistors

type no.	book	section	type no.	book	section	type no.	book	section
BD138	S4a	P	BD244A	S4a	P	BD816	S4a	P
BD139	S4a	P	BD244B	S4a	P	BD817	S4a	P
BD140	S4a	P	BD244C	S4a	P	BD818	S4a	P
BD201	S4a	P	BD329	S4a	P	BD825	S4a	P
BD202	S4a	P	BD330	S4a	P	BD826	S4a	P
BD203	S4a	P	BD331	S4a	P	BD827	S4a	P
BD204	S4a	P	BD332	S4a	P	BD828	S4a	P
BD226	S4a	P	BD333	S4a	P	BD829	S4a	P
BD227	S4a	P	BD334	S4a	P	BD830	S4a	P
BD228	S4a	P	BD335	S4a	P	BD839	S4a	P
BD229	S4a	P	BD336	S4a	P	BD840	S4a	P
BD230	S4a	P	BD337	S4a	P	BD841	S4a	P
BD231	S4a	P	BD338	S4a	P	BD842	S4a	P
BD233	S4a	P	BD433	S4a	P	BD843	S4a	P
BD234	S4a	P	BD434	S4a	P	BD844	S4a	P
BD235	S4a	P	BD435	S4a	P	BD845	S4a	P
BD236	S4a	P	BD436	S4a	P	BD846	S4a	P
BD237	S4a	P	BD437	S4a	P	BD847	S4a	P
BD238	S4a	P	BD438	S4a	P	BD848	S4a	P
BD239	S4a	P	BD645	S4a	P	BD849	S4a	P
BD239A	S4a	P	BD646	S4a	P	BD850	S4a	P
BD239B	S4a	P	BD647	S4a	P	BD933	S4a	P
BD239C	S4a	P	BD648	S4a	P	BD934	S4a	P
BD240	S4a	P	BD649	S4a	P	BD935	S4a	P
BD240A	S4a	P	BD650	S4a	P	BD936	S4a	P
BD240B	S4a	P	BD651	S4a	P	BD937	S4a	P
BD240C	S4a	P	BD652	S4a	P	BD938	S4a	P
BD241	S4a	P	BD675	S4a	P	BD939	S4a	P
BD241A	S4a	P	BD676	S4a	P	BD940	S4a	P
BD241B	S4a	P	BD677	S4a	P	BD941	S4a	P
BD241C	S4a	P	BD678	S4a	P	BD942	S4a	P
BD242	S4a	P	BD679	S4a	P	BD943	S4a	P
BD242A	S4a	P	BD680	S4a	P	BD944	S4a	P
BD242B	S4a	P	BD681	S4a	P	BD945	S4a	P
BD242C	S4a	P	BD682	S4a	P	BD946	S4a	P
BD243	S4a	P	BD683	S4a	P	BD947	S4a	P
BD243A	S4a	P	BD684	S4a	P	BD948	S4a	P
BD243B	S4a	P	BD813	S4a	P	BD949	S4a	P
BD243C	S4a	P	BD814	S4a	P	BD950	S4a	P
BD244	S4a	P	BD815	S4a	P	BD951	S4a	P

P = Low-frequency power transistors

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type no.	book	section	type no.	book	section	type no.	book	section
BD952	S4a	P	BDT60A	S4a	P	BDV64C	S4a	P
BD953	S4a	P	BDT60B	S4a	P	BDV65	S4a	P
BD954	S4a	P	BDT60C	S4a	P	BDV65A	S4a	P
BD955	S4a	P	BDT61	S4a	P	BDV65B	S4a	P
BD956	S4a	P	BDT61A	S4a	P	BDV65C	S4a	P
BDT20	S4a	P	BDT61B	S4a	P	BDV66A	S4a	P
BDT21	S4a	P	BDT61C	S4a	P	BDV66B	S4a	P
BDT29	S4a	P	BDT62	S4a	P	BDV66C	S4a	P
BDT29A	S4a	P	BDT62A	S4a	P	BDV66D	S4a	P
BDT29B	S4a	P	BDT62B	S4a	P	BDV67A	S4a	P
BDT29C	S4a	P	BDT62C	S4a	P	BDV67B	S4a	P
BDT30	S4a	P	BDT63	S4a	P	BDV67C	S4a	P
BDT30A	S4a	P	BDT63A	S4a	P	BDV67D	S4a	P
BDT30B	S4a	P	BDT63B	S4a	P	BDV91	S4a	P
BDT30C	S4a	P	BDT63C	S4a	P	BDV92	S4a	P
BDT31	S4a	P	BDT64	S4a	P	BDV93	S4a	P
BDT31A	S4a	P	BDT64A	S4a	P	BDV94	S4a	P
BDT31B	S4a	P	BDT64B	S4a	P	BDV95	S4a	P
BDT31C	S4a	P	BDT64C	S4a	P	BDV96	S4a	P
BDT32	S4a	P	BDT65	S4a	P	BDW55	S4a	P
BDT32A	S4a	P	BDT65A	S4a	P	BDW56	S4a	P
BDT32B	S4a	P	BDT65B	S4a	P	BDW57	S4a	P
BDT32C	S4a	P	BDT65C	S4a	P	BDW58	S4a	P
BDT41	S4a	P	BDT81	S4a	P	BDW59	S4a	P
BDT41A	S4a	P	BDT82	S4a	P	BDW60	S4a	P
BDT41B	S4a	P	BDT83	S4a	P	BDX35	S4a	P
BDT41C	S4a	P	BDT84	S4a	P	BDX36	S4a	P
BDT42	S4a	P	BDT85	S4a	P	BDX37	S4a	P
BDT42A	S4a	P	BDT86	S4a	P	BDX42	S4a	P
BDT42B	S4a	P	BDT87	S4a	P	BDX43	S4a	P
BDT42C	S4a	P	BDT88	S4a	P	BDX44	S4a	P
BDT51	S4a	P	BDT91	S4a	P	BDX45	S4a	P
BDT52	S4a	P	BDT92	S4a	P	BDX46	S4a	P
BDT53	S4a	P	BDT93	S4a	P	BDX47	S4a	P
BDT54	S4a	P	BDT94	S4a	P	BDX62	S4a	P
BDT55	S4a	P	BDT95	S4a	P	BDX62A	S4a	P
BDT56	S4a	P	BDT96	S4a	P	BDX62B	S4a	P
BDT57	S4a	P	BDV64	S4a	P	BDX62C	S4a	P
BDT58	S4a	P	BDV64A	S4a	P	BDX63	S4a	P
BDT60	S4a	P	BDV64B	S4a	P	BDX63A	S4a	P

P = Low-frequency power transistors

type no.	book	section	type no.	book	section	type no.	book	section
BDX63B	S4a	P	BF240	S3	Sm	BF622	S7	Mm
BDX63C	S4a	P	BF241	S3	Sm	BF623	S7	Mm
BDX64	S4a	P	BF245A	S5	FET	BF660;R	S7	Mm
BDX64A	S4a	P	BF245B	S5	FET	BF689K	S10	WBT
BDX64B	S4a	P	BF245C	S5	FET	BF763	S10	WBT
BDX64C	S4a	P	BF247A	S5	FET	BF767	S7	Mm
BDX65	S4a	P	BF247B	S5	FET	BF820	S7	Mm
BDX65A	S4a	P	BF247C	S5	FET	BF821	S7	Mm
BDX65B	S4a	P	BF256A	S5	FET	BF822	S7	Mm
BDX65C	S4a	P	BF256B	S5	FET	BF823	S7	Mm
BDX66	S4a	P	BF256C	S5	FET	BF824	S7	Mm
BDX66A	S4a	P	BF324	S3	Sm	BF840	S7	Mm
BDX66B	S4a	P	BF370	S3	Sm	BF841	S7	Mm
BDX66C	S4a	P	BF410A	S5	FET	BF926	S3	Sm
BDX67	S4a	P	BF410B	S5	FET	BF936	S3	Sm
BDX67A	S4a	P	BF410C	S5	FET	BF939	S3	Sm
BDX67B	S4a	P	BF410D	S5	FET	BF960	S5	FET
BDX67C	S4a	P	BF420	S3	Sm	BF964	S5	FET
BDX68	S4a	P	BF421	S3	Sm	BF966	S5	FET
BDX68A	S4a	P	BF422	S3	Sm	BF967	S3	Sm
BDX68B	S4a	P	BF423	S3	Sm	BF970	S3	Sm
BDX68C	S4a	P	BF450	S3	Sm	BF970A	S3	Sm
BDX69	S4a	P	BF451	S3	Sm	BF979	S3	Sm
BDX69A	S4a	P	BF483	S3	Sm	BF980	S5	FET
BDX69B	S4a	P	BF485	S3	Sm	BF981	S5	FET
BDX69C	S4a	P	BF487	S3	Sm	BF982	S5	FET
BDX77	S4a	P	BF494	S3	Sm	BF989	S7/S5	Mm/FET
BDX78	S4a	P	BF495	S3	Sm	BF990	S7/S5	Mm/FET
BDX91	S4a	P	BF496	S3	Sm	BF991	S7/S5	Mm/FET
BDX92	S4a	P	BF510	S7/S5	Mm/FET	BF992	S7/S5	Mm/FET
BDX93	S4a	P	BF511	S7/S5	Mm/FET	BF994	S7/S5	Mm/FET
BDX94	S4a	P	BF512	S7/S5	Mm/FET	BF994S	S7	Mm/FET
BDX95	S4a	P	BF513	S7/S5	Mm/FET	BF996	S7/S5	Mm/FET
BDX96	S4a	P	BF536	S7	Mm	BF996S	S7	Mm/FET
BDY90	S4a	P	BF550;R	S7	Mm	BF997	S7	Mm/FET
BDY90A	S4a	P	BF569	S7	Mm	BFG23	S10	WBT
BDY91	S4a	P	BF570	S7	Mm	BFG32	S10	WBT
BDY92	S4a	P	BF579	S7	Mm	BFG34	S10	WBT
BF198	S3	Sm	BF620	S7	Mm	BFG51	S10	WBT
BF199	S3	Sm	BF621	S7	Mm	BFG65	S10	WBT

FET = Field-effect transistors
HVP = High-voltage power transistors
Mm = Microminiature semiconductors
for hybrid circuits

P = Low-frequency power transistors
Sm = Small-signal transistors
WBT = Wideband hybrid IC transistors

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type no.	book	section	type no.	book	section	type no.	book	section
BFG67	S7/S10	Mm	BFQ65	S10	WBT	BFT45	S3	Sm
BFG90A	S10	WBT	BFQ66	S10	WBT	BFT46	S7/S5	Mm/FET
BFG91A	S10	WBT	BFQ67	S7/S10	Mm/WBT	BFT92	S7/S10	Mm/WBT
BFG92A	S10	WBT	BFQ68	S10	WBT	BFT93	S7/S10	Mm/WBT
BFG93A	S10	WBT	BFQ136	S10	WBT	BFW10	S5	FET
BFG96	S10	WBT	BFR29	S5	FET	BFW11	S5	FET
BFG195	S10	WBT	BFR30	S7/S5	Mm/FET	BFW12	S5	FET
BFP90A	S10	WBT	BFR31	S7/S5	Mm/FET	BFW13	S5	FET
BFP91A	S10	WBT	BFR49	S10	WBT	BFW16A	S10	WBT
BFP96	S10	WBT	BFR53	S7/S10	Mm/WBT	BFW17A	S10	WBT
BFQ10	S5	FET	BFR54	S3	Sm	BFW30	S10	WBT
BFQ11	S5	FET	BFR64	S10	WBT	BFW61	S5	FET
BFQ12	S5	FET	BFR65	S10	WBT	BFW92	S10	WBT
BFQ13	S5	FET	BFR84	S5	FET	BFW92A	S10	WBT
BFQ14	S5	FET	BFR90	S10	WBT	BFW93	S10	WBT
BFQ15	S5	FET	BFR90A	S10	WBT	BFX34	S3	Sm
BFQ16	S5	FET	BFR91	S10	WBT	BFX89	S10	WBT
BFQ17	S7/S10	Mm/WBT	BFR91A	S10	WBT	BFY50	S3	Sm
BFQ18A	S7/S10	Mm/WBT	BFR92	S7/S10	Mm/WBT	BFY51	S3	Sm
BFQ19	S7/S10	Mm/WBT	BFR92A	S7/S10	Mm	BFY52	S3	Sm
BFQ22S	S10	WBT	BFR93	S7/S10	Mm/WBT	BFY55	S3	Sm
BFQ23	S10	WBT	BFR93A	S7/S10	Mm/WBT	BFY90	S10	WBT
BFQ23C	S10	WBT	BFR94	S10	WBT	BG2000	S1	RT
BFQ24	S10	WBT	BFR95	S10	WBT	BG2097	S1	RT
BFQ32	S10	WBT	BFR96	S10	WBT	BGD102	S10	WBM
BFQ32C	S10	WBT	BFR96S	S10	WBT	BGD102E	S10	WBM
BFQ32M	S10	WBT	BFR101A;B	S7/S5	Mm/FET	BGD104	S10	WBM
BFQ32S	S10	WBT	BFS17	S7/S10	Mm/WBT	BGD104E	S10	WBM
BFQ33	S10	WBT	BFS17A	S10	WBT	BGD502	S10	WBM
BFQ33C	S10	WBT	BFS18;R	S7	Mm	BGD504	S10	WBM
BFQ34	S10	WBT	BFS19;R	S7	Mm	BGX885	S10	WBM
BFQ34T	S10	WBT	BFS20;R	S7	Mm	BGY22	S6	RFP
BFQ42	S6	RFP	BFS21	S5	FET	BGY22A	S6	RFP
BFQ43	S6	RFP	BFS21A	S5	FET	BGY23	S6	RFP
BFQ43S	S6	RFP	BFS22A	S6	RFP	BGY23A	S6	RFP
BFQ51	S10	WBT	BFS23A	S6	RFP	BGY32	S6	RFP
BFQ51C	S10	WBT	BFT24	S10	WBT	BGY33	S6	RFP
BFQ52	S10	WBT	BFT25	S7/S10	Mm/WBT	BGY35	S6	RFP
BFQ53	S10	WBT	BFT25R	S7	Mm	BGY36	S6	RFP
BFQ63	S10	WBT	BFT44	S3	Sm	BGY40A	S6	RFP

* = series

FET = Field-effect transistors

Mm = Microminiature semiconductors
for hybrid circuits

RFP = R.F. power transistors and modules

RT = Tripler

Sm = Small-signal transistors

ThM = Thyristor modules

WBM = Wideband hybrid IC modules

WBT = Wideband hybrid IC transistors

type no.	book	section	type no.	book	section	type no.	book	section
BGY40B	S6	RFP	BGY93 *	S6	RFP	BLV45/12	S6	RFP
BGY41A	S6	RFP	BGY94 *	S6	RFP	BLV57	S6	RFP
BGY41B	S6	RFP	BGY95A	S6	RFP	BLV59	S6	RFP
BGY43	S6	RFP	BGY95B	S6	RFP	BLV75/12	S6	RFP
BGY45A	S6	RFP	BGY96A	S6	RFP	BLV80/28	S6	RFP
BGY45B	S6	RFP	BGY96B	S6	RFP	BLV90	S6	RFP
BGY46A	S6	RFP	BGY584A	S10	WBM	BLV90/SL	S6	RFP
BGY46B	S6	RFP	BGY585A	S10	WBM	BLV91	S6	RFP
BGY47 *	S6	RFP	BGY586	S10	WBM	BLV91/SL	S6	RFP
BGY48 *	S6	RFP	BGY587	S10	WBM	BLV92	S6	RFP
BGY50	S10	WBM	BLF146	S6	RFP/FET	BLV93	S6	RFP
BGY51	S10	WBM	BLF242	S6	RFP/FET	BLV94	S6	RFP
BGY52	S10	WBM	BLF244	S6	RFP/FET	BLV95	S6	RFP
BGY53	S10	WBM	BLF245	S6	RFP/FET	BLV97	S6	RFP
BGY54	S10	WBM	BLT90/SL	S6	RFP	BLV98	S6	RFP
BGY55	S10	WBM	BLT91/SL	S6	RFP	BLV99	S6	RFP
BGY56	S10	WBM	BLT92/SL	S6	RFP	BLW29	S6	RFP
BGY57	S10	WBM	BLU20/12	S6	RFP	BLW31	S6	RFP
BGY58	S10	WBM	BLU30/12	S6	RFP	BLW32	S6	RFP
BGY58A	S10	WBM	BLU45/12	S6	RFP	BLW33	S6	RFP
BGY59	S10	WBM	BLU50	S6	RFP	BLW34	S6	RFP
BGY60	S10	WBM	BLU51	S6	RFP	BLW50F	S6	RFP
BGY61	S10	WBM	BLU52	S6	RFP	BLW60	S6	RFP
BGY65	S10	WBM	BLU53	S6	RFP	BLW60C	S6	RFP
BGY67	S10	WBM	BLU60/12	S6	RFP	BLW76	S6	RFP
BGY67A	S10	WBM	BLU97	S6	RFP	BLW77	S6	RFP
BGY70	S10	WBM	BLU98	S6	RFP	BLW78	S6	RFP
BGY71	S10	WBM	BLU99	S6	RFP	BLW79	S6	RFP
BGY74	S10	WBM	BLV10	S6	RFP	BLW80	S6	RFP
BGY75	S10	WBM	BLV11	S6	RFP	BLW81	S6	RFP
BGY78	S10	WBM	BLV20	S6	RFP	BLW83	S6	RFP
BGY84	S10	WBM	BLV21	S6	RFP	BLW84	S6	RFP
BGY84A	S10	WBM	BLV25	S6	RFP	BLW85	S6	RFP
BGY85	S10	WBM	BLV30	S6	RFP	BLW86	S6	RFP
BGY85A	S10	WBM	BLV30/12	S6	RFP	BLW87	S6	RFP
BGY86	S10	WBM	BLV31	S6	RFP	BLW89	S6	RFP
BGY87	S10	WBM	BLV32F	S6	RFP	BLW90	S6	RFP
BGY88	S10	WBM	BLV33	S6	RFP	BLW91	S6	RFP
BGY90A	S6	RFP	BLV33F	S6	RFP	BLW95	S6	RFP
BGY90B	S6	RFP	BLV36	S6	RFP	BLW96	S6	RFP

* = series

RFP = R.F. power transistors and modules

WBM = Wideband hybrid IC modules

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type no.	book	section	type no.	book	section	type no.	book	section
BLW97	S6	RFP	BPW50	S8a/b	PDT	BSR20; A	S7	Mm
BLW98	S6	RFP	BPW71	S8b	PDT	BSR30	S7	Mm
BLW99	S6	RFP	BPX25	S8b	PDT	BSR31	S7	Mm
BLX13	S6	RFP	BPX29	S8b	PDT	BSR32	S7	Mm
BLX13C	S6	RFP	BPX40	S8b	PDT	BSR33	S7	Mm
BLX14	S6	RFP	BPX41	S8b	PDT	BSR40	S7	Mm
BLX15	S6	RFP	BPX42	S8b	PDT	BSR41	S7	Mm
BLX39	S6	RFP	BPX61	S8b	PDT	BSR42	S7	Mm
BLX65	S6	RFP	BPX61P	S8b	PDT	BSR43	S7	Mm
BLX65E	S6	RFP	BPX71	S8b	PDT	BSR50	S3	Sm
BLX65ES	S6	RFP	BPX72	S8b	PDT	BSR51	S3	Sm
BLX67	S6	RFP	BR100/03	S2b	Th	BSR52	S3	Sm
BLX68	S6	RFP	BR101	S3	Sm	BSR56	S7/S5	Mm/FET
BLX69A	S6	RFP	BR210*	S2a	Th	BSR57	S7/S5	Mm/FET
BLX91A	S6	RFP	BR216*	S2a	Th	BSR58	S7/S5	Mm/FET
BLX91CB	S6	RFP	BR220*	S2a	Th	BSR60	S3	Sm
BLX92A	S6	RFP	BRY39	S3	Sm	BSR61	S3	Sm
BLX93A	S6	RFP	BRY56	S3	Sm	BSR62	S3	Sm
BLX94A	S6	RFP	BRY61	S7	Mm	BSS38	S3	Sm
BLX94C	S6	RFP	BRY62	S7	Mm	BSS50	S3	Sm
BLX95	S6	RFP	BS107	S5	FET	BSS51	S3	Sm
BLX96	S6	RFP	BS170	S5	FET	BSS52	S3	Sm
BLX97	S6	RFP	BSD10	S5	FET	BSS60	S3	Sm
BLX98	S6	RFP	BSD12	S5	FET	BSS61	S3	Sm
BLY87A	S6	RFP	BSD20	S5/7	FET	BSS62	S3	Sm
BLY87C	S6	RFP	BSD22	S5/7	FET	BSS63;R	S7	Mm
BLY88A	S6	RFP	BSD212	S5	FET	BSS64;R	S7	Mm
BLY88C	S6	RFP	BSD213	S5	FET	BSS68	S3	Sm
BLY89A	S6	RFP	BSD214	S5	FET	BSS83	S5/7	FET/Mm
BLY89C	S6	RFP	BSD215	S5	FET	BST15	S7	Mm
BLY90	S6	RFP	BSR12;R	S7	Mm	BST16	S7	Mm
BLY91A	S6	RFP	BSR13;R	S7	Mm	BST39	S7	Mm
BLY91C	S6	RFP	BSR14;R	S7	Mm	BST40	S7	Mm
BLY92A	S6	RFP	BSR15;R	S7	Mm	BST50	S7	Mm
BLY92C	S6	RFP	BSR16;R	S7	Mm	BST51	S7	Mm
BLY93A	S6	RFP	BSR17;R	S7	Mm	BST52	S7	Mm
BLY93C	S6	RFP	BSR17A;R	S7	Mm	BST60	S7	Mm
BLY94	S6	RFP	BSR18;R	S7	Mm	BST61	S7	Mm
BPF24	S8b	PDT	BSR18A;R	S7	Mm	BST62	S7	Mm
BPW22A	S8a/b	PDT	BSR19; A	S7	Mm	BST70A	S5	FET

FET = Field-effect transistors
Mm = Microminiature semiconductors
for hybrid circuits
Sm = Small-signal transistors

PDT = Photodiodes or transistors
Th = Thyristors
RFP = R.F. power transistors and modules

type no.	book	section	type no.	book	section	type no.	book	section
BST72A	S5	FET	BT138F*	S2b	Tri	BU505DF	S4b	SP
BST74A	S5	FET	BT139*	S2b	Tri	BU506;D	S4b	SP
BST76A	S5	FET	BT139F*	S2b	Tri	BU603	S4b	SP
BST78	S5	FET	BT145*	S2b	Tri	BU705	S4b	SP
BST80	S5/S7	FET/Mm	BT149*	S2b	Th	BU705F	S4b	SP
BST82	S5/S7	FET/Mm	BT150	S2b	Th	BU706;D	S4b	SP
BST84	S5/S7	FET/Mm	BT151*	S2b	Th	BU706F	S4b	SP
BST86	S5/S7	FET/Mm	BT151F*	S2b	Th	BU706DF	S4b	SP
BST90	S5	FET	BT152*	S2b	Th	BU724;A	S4b	SP
BST97	S5	FET	BT153	S2b	Th	BU808	S4b	SP
BST100	S5	FET	BT157*	S2b	Th	BU824	S4b	SP
BST110	S5	FET	BT169*	S2b	Th	BU826;A	S4b	SP
BST120	S5/S7	FET/Mm	BTA140*	S2b	Tri	BU903	S4b	SP
BST122	S5/S7	FET/Mm	BTR59*	S2b	Tri	BUP22*	S4b	SP
BSV15	S3	Sm	BTS59*	S2b	Tri	BUP22BF	S4b	SP
BSV16	S3	Sm	BTV58*	S2b	Th	BUP22CF	S4b	SP
BSV17	S3	Sm	BTV59*	S2b	Th	BUP23*	S4b	SP
BSV52;R	S7	Mm	BTV59D*	S2b	Th	BUP23BF	S4b	SP
BSV64	S3	Sm	BTV60*	S2b	Th	BUP23CF	S4b	SP
BSV78	S5	FET	BTV60D*	S2b	Th	BUS11;A	S4b	SP
BSV79	S5	FET	BTV70*	S2b	Th	BUS12;A	S4b	SP
BSV80	S5	FET	BTV70D*	S2b	Th	BUS13;A	S4b	SP
BSV81	S5	FET	BTW23*	S2b	Th	BUS14;A	S4b	SP
BSW66A	S3	Sm	BTW38*	S2b	Th	BUS21*	S4b	SP
BSW67A	S3	Sm	BTW40*	S2b	Th	BUS22*	S4b	SP
BSW68A	S3	Sm	BTW42*	S2b	Th	BUS23*	S4b	SP
BSX19	S3	Sm	BTW43*	S2b	Tri	BUS24*	S4b	SP
BSX20	S3	Sm	BTW45*	S2b	Th	BUS131*	S4b	SP
BSX32	S3	Sm	BTW58*	S2b	Th	BUS132*	S4b	SP
BSX45	S3	Sm	BTW62*	S2b	Th	BUS133*	S4b	SP
BSX46	S3	Sm	BTW62D*	S2b	Th	BUT11;A	S4b	SP
BSX47	S3	Sm	BTW63*	S2b	Th	BUT11F	S4b	SP
BSX59	S3	Sm	BTY79*	S2b	Th	BUT11AF	S4b	SP
BSX60	S3	Sm	BTY91*	S2b	Th	BUT12;A	S4b	SP
BSX61	S3	Sm	BU306F	S4b	SP	BUT18;A	S4b	SP
BT136*	S2b	Tri	BU307F	S4b	SP	BUT18F	S4b	SP
BT136F*	S2b	Tri	BU406F	S4b	SP	BUT18AF	S4b	SP
BT137*	S2b	Tri	BU407F	S4b	SP	BUT21B	S4b	SP
BT137F*	S2b	Tri	BU505;D	S4b	SP	BUT21C	S4b	SP
BT138*	S2b	Tri	BU505F	S4b	SP	BUT21BF	S4b	SP

* = series

PM = Power MOS transistors

SP = Low-frequency switching power transistors

Sm = Small-signal transistors

Th = Thyristors

Tri = Triacs

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type no.	book	section	type no.	book	section	type no.	book	section
BUT21CF	S4b	SP	BUX85AF	S4b	SP	BUZ72A	S9	PM
BUT22B	S4b	SP	BUX86	S4b	SP	BUZ73	S9	PM
BUT22C	S4b	SP	BUX87	S4b	SP	BUZ73A	S9	PM
BUV26;A	S4b	SP	BUX88	S4b	SP	BUZ74	S9	PM
BUV26F	S4b	SP	BUX98	S4b	SP	BUZ74A	S9	PM
BUV26BF	S4b	SP	BUX98A	S4b	SP	BUZ76	S9	PM
BUV27;A	S4b	SP	BUX99	S4b	SP	BUZ76A	S9	PM
BUV27F	S4b	SP	BUY89	S4b	SP	BUZ78	S9	PM
BUV27AF	S4b	SP	BUZ10	S9	PM	BUZ80	S9	PM
BUV28;A	S4b	SP	BUZ11	S9	PM	BUZ80A	S9	PM
BUV28F	S4b	SP	BUZ11A	S9	PM	BUZ83	S9	PM
BUV28AF	S4b	SP	BUZ14	S9	PM	BUZ83A	S9	PM
BUV82	S4b	SP	BUZ15	S9	PM	BUZ84	S9	PM
BUV83	S4b	SP	BUZ20	S9	PM	BUZ84A	S9	PM
BUV89	S4b	SP	BUZ21	S9	PM	BUZ90	S9	PM
BUV90	S4b	SP	BUZ23	S9	PM	BUZ90A	S9	PM
BUV98;A	S4b	SP	BUZ24	S9	PM	BUZ94	S9	PM
BUV298(V)	S4b	SP	BUZ25	S9	PM	BUZ211	S9	PM
BUW11;A	S4b	SP	BUZ31	S9	PM	BUZ307	S9	PM
BUW11F	S4b	SP	BUZ32	S9	PM	BUZ308	S9	PM
BUW11AF	S4b	SP	BUZ34	S9	PM	BUZ310	S9	PM
BUW12;A	S4b	SP	BUZ35	S9	PM	BUZ311	S9	PM
BUW12F	S4b	SP	BUZ36	S9	PM	BUZ326	S9	PM
BUW12AF	S4b	SP	BUZ41A	S9	PM	BUZ330	S9	PM
BUW13;A	S4b	SP	BUZ42	S9	PM	BUZ331	S9	PM
BUW13F	S4b	SP	BUZ45	S9	PM	BUZ347	S9	PM
BUW13AF	S4b	SP	BUZ45A	S9	PM	BUZ348	S9	PM
BUW84	S4b	SP	BUZ45B	S9	PM	BUZ349	S9	PM
BUW85	S4b	SP	BUZ50A	S9	PM	BUZ350	S9	PM
BUW86	S4b	SP	BUZ50B	S9	PM	BUZ351	S9	PM
BUW87	S4b	SP	BUZ50C	S9	PM	BUZ355	S9	PM
BUW87A	S4b	SP	BUZ53A	S9	PM	BUZ356	S9	PM
BUW132*	S4b	SP	BUZ54	S9	PM	BUZ357	S9	PM
BUW133*	S4b	SP	BUZ54A	S9	PM	BUZ358	S9	PM
BUX46;A	S4b	SP	BUZ60	S9	PM	BUZ384	S9	PM
BUX47;A	S4b	SP	BUZ63	S9	PM	BUZ385	S9	PM
BUX48;A	S4b	SP	BUZ64	S9	PM	BY224*	S2a	R
BUX84	S4b	SP	BUZ71	S9	PM	BY225*	S2a	R
BUX85	S4b	SP	BUZ71A	S9	PM	BY228	S1	R
BUX84F	S4b	SP	BUZ72	S9	PM	BY229*	S2a	R

* = series

R = Rectifier diodes

PM = Power MOS transistors

type no.	book	section	type no.	book	section	type no.	book	section
BY229F*	S2a	R	BYP22*	S2a	R	BYV95B	S1	R
BY249*	S2a	R	BYP59*	S2a	R	BYV95C	S1	R
BY260*	S2a	R	BYQ28*	S2a	R	BYV96D	S1	R
BY261*	S2a	R	BYR29*	S2a	R	BYV96E	S1	R
BY329*	S2a	R	BYR29F*	S2a	R	BYW25*	S2a	R
BY359*	S2a	R	BYT28*	S2a	R	BYW29*	S2a	R
BY438	S1	R	BYT79*	S2a	R	BYW29F*	S2a	R
BY448	S1	R	BYV10	S1	R	BYW30*	S2a	R
BY458	S1	R	BYV18*	S2a	R	BYW31*	S2a	R
BY505	S1	R	BYV19*	S2a	R	BYW54	S1	R
BY509	S1	R	BYV20*	S2a	R	BYW55	S1	R
BY527	S1	R	BYV21*	S2a	R	BYW56	S1	R
BY584	S1	R	BYV22*	S2a	R	BYW92*	S2a	R
BY588	S1	R	BYV23*	S2a	R	BYW93*	S2a	R
BY609	S1	R	BYV24*	S2a	R	BYW95A	S1	R
BY610	S1	R	BYV26 *	S1/S2a	R	BYW95B	S1	R
BY614	S1	R	BYV27*	S1/S2a	R	BYW95C	S1	R
BY619	S1	R	BYV28*	S1/S2a	R	BYW96D	S1	R
BY620	S1	R	BYV29*	S2a	R	BYW96E	S1	R
BY627	S1	R	BYV29F*	S2a	R	BYX10G	S1	R
BY707	S1	R	BYV30*	S2a	R	BYX25*	S2a	R
BY708	S1	R	BYV31*	S2a	R	BYX30*	S2a	R
BY709	S1	R	BYV32*	S2a	R	BYX32*	S2a	R
BY710	S1	R	BYV32F*	S2a	R	BYX38*	S2a	R
BY711	S1	R	BYV33*	S2a	R	BYX39*	S2a	R
BY712	S1	R	BYV33F*	S2a	R	BYX42*	S2a	R
BY713	S1	R	BYV34*	S2a	R	BYX46*	S2a	R
BY714	S1	R	BYV36 *	S1	R	BYX50*	S2a	R
BYD13 *	S1	R	BYV39*	S2a	R	BYX52*	S2a	R
BYD14 *	S1	R	BYV42*	S2a	R	BYX56*	S2a	R
BYD17 *	S1/7	R	BYV43*	S2a	R	BYX90G	S1	R
BYD33 *	S1	R	BYV43F*	S2a	R	BYX96*	S2a	R
BYD37 *	S1/7	R	BYV44*	S2a	R	BYX97*	S2a	R
BYD73 *	S1	R	BYV60*	S2a	R	BYX98*	S2a	R
BYD74 *	S1	R	BYV72*	S2a	R	BYX99*	S2a	R
BYD77 *	S1	R	BYV73*	S2a	R	BZD23	S1	Vrg
BYM26 *	S1	R	BYV74*	S2a	R	BZD27	S1/7	Vrg
BYM36 *	S1	R	BYV79*	S2a	R	BZT03	S1	Vrg
BYM56 *	S1	R	BYV92*	S2a	R	BZV10	S1	Vrf
BYP21*	S2a	R	BYV95A	S1	R	BZV11	S1	Vrf

* = series

D = Displays

LED = Light-emitting diodes

M = Microwave transistors

Mm = Microminiature semiconductors

Ph = Photoconductive devices

PhC = Photocouplers

R = Rectifier diodes

TS = Transient suppressor diodes

Vrf = Voltage reference diodes

Vrg = Voltage regulator diodes

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type no.	book	section	type no.	book	section	type no.	book	section
BZV12	S1	Vrf	CNX46	S8b	PhC	CQT60	S8a	LED
BZV13	S1	Vrf	CNX48	S8b	PhC	CQT70	S8a	LED
BZV14	S1	Vrf	CNX48U	S8b	PhC	CQT80L	S8a	LED
BZV37	S1	Vrf	CNX62	S8b	PhC	CQV70(L)	S8a	LED
BZV46	S1	Vrg	CNX72	S8b	PhC	CQV70A(L)	S8a	LED
BZV49*	S1/S7	Vrg/Mm	CNX82	S8b	PhC	CQV70U(L)	S8a	LED
BZV55*	S7	Mm	CNX83	S8b	PhC	CQV71A(L)	S8a	LED
BZV80	S1	Vrf	CNX91	S8b	PhC	CQV72(L)	S8a	LED
BZV81	S1	Vrf	CNX92	S8b	PhC	CQV80L	S8a	LED
BZV85 *	S1	Vrg	CNY17-1	S8b	PhC	CQV80AL	S8a	LED
BZW03 *	S1	Vrg	CNY17-2	S8b	PhC	CQV80UL	S8a	LED
BZW14	S1	Vrg	CNY17-3	S8b	PhC	CQV81L	S8a	LED
BZW86*	S2a	TS	CNY50	S8b	PhC	CQV82L	S8a	LED
BZX55 *	S1	Vrg	CNY57	S8b	PhC	CQW10A(L)	S8a	LED
BZX70*	S2a	Vrg	CNY57A	S8b	PhC	CQW10B(L)	S8a	LED
BZX75 *	S1	Vrg	CNY57AU	S8b	PhC	CQW10U(L)	S8a	LED
BZX79*	S1	Vrg	CNY57U	S8b	PhC	CQW11B(L)	S8a	LED
BZX84*	S7/S1	Mm/Vrg	CNY62	S8b	PhC	CQW12B(L)	S8a	LED
BZY91*	S2a	Vrg	CNY63	S8b	PhC	CQW20A	S8a	LED
BZY93*	S2a	Vrg	CQF24	S8b	Ph	CQW21	S8a	LED
CFX13	S11	M	CQL10A	S8b	Ph	CQW22	S8a	LED
CFX21	S11	M	CQL13A	S8b	Ph	CQW24(L)	S8a	LED
CFX30	S11	M	CQL16	S8b	Ph	CQW54	S8a	LED
CFX31	S11	M	CQS51L	S8a	LED	CQW60(L)	S8a	LED
CFX32	S11	M	CQS54	S8a	LED	CQW60A(L)	S8a	LED
CFX33	S11	M	CQS82L	S8a	LED	CQW60U(L)	S8a	LED
CNG35	S8b	PhC	CQS82AL	S8a	LED	CQW61(L)	S8a	LED
CNG36	S8b	PhC	CQS84L	S8a	LED	CQW62(L)	S8a	LED
CNR36	S8b	PhC	CQS86L	S8a	LED	CQW89A	S8a/b	I
CNX21	S8b	PhC	CQS93	S8a	LED	CQW93	S8a	LED
CNX35	S8b	PhC	CQS93E	S8a	LED	CQW95	S8a	LED
CNX35U	S8b	PhC	CQS93L	S8a	LED	CQW97	S8a	LED
CNX36	S8b	PhC	CQS95	S8a	LED	CQX24(L)	S8a	LED
CNX36U	S8b	PhC	CQS95E	S8a	LED	CQX51(L)	S8a	LED
CNX38	S8b	PhC	CQS95L	S8a	LED	CQX54(L)	S8a	LED
CNX38U	S8b	PhC	CQS97	S8a	LED	CQX54D	S8a	LED
CNX39	S8b	PhC	CQS97E	S8a	LED	CQX64(L)	S8a	LED
CNX39U	S8b	PhC	CQS97L	S8a	LED	CQX64D	S8a	LED
CNX44	S8b	PhC	CQT10B	S8a	LED	CQX74(L)	S8a	LED
CNX44A	S8b	PhC	CQT24	S8a	LED	CQX74D	S8a	LED

* = series

FET = Field-effect transistors

LED = Light-emitting diodes

M = Microwave transistors

P = Low-frequency power transistors

St = Rectified stacks

WBM = Wideband hybrid IC modules

type no.	book	section	type no.	book	section	type no.	book	section
CQY11B	S8b	LED	KP101A	S13	SEN	LTE42005S	S11	M
CQY11C	S8b	LED	KP220G	S13	SEN	LTE42008R	S11	M
CQY24B(L)	S8a	LED	KP221G	S13	SEN	LTE42012R	S11	M
CQY49B	S8b	LED	KP221GE	S13	SEN	LV1721E50R	S11	M
CQY49C	S8b	LED	KRX10	S13	SEN	LV2024E45R	S11	M
CQY50	S8b	LED	KRX11	S13	SEN	LV2327E40R	S11	M
CQY52	S8b	LED	KTY81*	S13	SEN	LV3742E16R	S11	M
CQY53S	S8b	LED	KTY83*	S13	SEN	LV3742E24R	S11	M
CQY54A	S8a	LED	KTY84*	S13	SEN	LWE2015R	S11	M
CQY58A	S8a/b	I	KTY85*	S13	SEN	LWE2025R	S11	M
CQY89A	S8a/b	I	KTY86	S13	SEN	LZ1418E100RS11		M
CQY94B(L)	S8a	LED	KTY87	S13	SEN	MCA230	S8b	PhC
CQY95B	S8a	LED	LAE2001R	S11	M	MCA231	S8b	PhC
CQY96(L)	S8a	LED	LAE4000Q	S11	M	MCA255	S8b	PhC
CQY97A	S8a	LED	LAE4001R	S11	M	MCT2	S8b	PhC
ESM3045A	S4b	SP	LAE4002S	S11	M	MCT26	S8b	PhC
ESM3045D	S4b	SP	LAE6000Q	S11	M	MJE13004	S4b	SP
ESM4045A	S4b	SP	LBE1004R	S11	M	MJE13005	S4b	SP
ESM4045D	S4b	SP	LBE1010R	S11	M	MJE13006	S4b	SP
ESM5045D	S4b	SP	LBE2003S	S11	M	MJE13007	S4b	SP
ESM6045A	S4b	SP	LBE2005Q	S11	M	MJE13008	S4b	SP
ESM6045D	S4b	SP	LBE2008T	S11	M	MJE13009	S4b	SP
Fresnel- lens	S13	A	LBE2009S	S11	M	MKB12040WS	S11	M
H11A1	S8b	PhC	LCE1010R	S11	M	MKB12100WS	S11	M
H11A2	S8b	PhC	LCE2003S	S11	M	MKB12140W	S11	M
H11A3	S8b	PhC	LCE2005Q	S11	M	MO6075B200ZS11		M
H11A4	S8b	PhC	LCE2008T	S11	M	MO6075B400ZS11		M
H11A5	S8b	PhC	LCE2009S	S11	M	MPS6513	S3	Sm
H11B1	S8b	PhC	LJE42002T	S11	M	MPS6514	S3	Sm
H11B2	S8b	PhC	LKE1004R	S11	M	MPS6515	S3	Sm
H11B3	S8b	PhC	LKE2002T	S11	M	MPS6517	S3	Sm
H11B255	S8b	PhC	LKE2004T	S11	M	MPS6518	S3	Sm
KG210	S13	SEN	LKE2015T	S11	M	MPS6519	S3	Sm
KG220/21	S13	SEN	LKE21004R	S11	M	MPS6520	S3	Sm
KMZ10A	S13	SEN	LKE21015T	S11	M	MPS6521	S3	Sm
KMZ10B	S13	SEN	LKE21050T	S11	M	MPS6522	S3	Sm
KMZ10C	S13	SEN	LKE27010R	S11	M	MPS6523	S3	Sm
KP100A	S13	SEN	LKE27025R	S11	M	MPSA05	S3	Sm
KP100A1	S13	SEN	LKE32002T	S11	M	MPSA06	S3	Sm
			LKE32004T	S11	M	MPSA13	S3	Sm

* = series

I = Infrared devices

M = Microwave transistors

P = Low-frequency power transistors

Ph = Photoconductive diodes

R = Rectifier diodes

Sm = Small-signal transistors

SP = Low-frequency switching power transistors

Vrf = Voltage reference diodes

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type no.	book	section	type no.	book	section	type no.	book	section
MPSA14	S3	Sm	OM961	S4a	P	PKB12005U	S11	M
MPSA42	S3	Sm	OSB9115	S2a	St	PKB20010U	S11	M
MPSA43	S3	Sm	OSB9215	S2a	St	PKB23001U	S11	M
MPSA55	S3	Sm	OSB9415	S2a	St	PKB23003U	S11	M
MPSA56	S3	Sm	OSM9115	S2a	St	PKB23005U	S11	M
MPSA63	S3	Sm	OSM9215	S2a	St	PKB25006T	S11	M
MPSA64	S3	Sm	OSM9415	S2a	St	PKB32001U	S11	M
MPSA92	S3	Sm	OSM9510	S2a	St	PKB32003U	S11	M
MPSA93	S3	Sm	OSM9511	S2a	St	PKB32005U	S11	M
MRB12175YR	S11	M	OSM9512	S2a	St	PMBF4391	S7	Mm
MRB12350YR	S11	M	OSS9115	S2a	St	PMBF4392	S7	Mm
MS1011B700YS11	M		OSS9215	S2a	St	PMBF4393	S7	Mm
MS6075B800ZS11	M		OSS9415	S2a	St	PMBT2222/A	S7	Mm
MSB12900Y	S11	M	P2105	S13	I	PMBT2907/A	S7	Mm
MZ0912B75Y	S11	M	PBMF4391	S5	FET	PMBT3903/4	S7	Mm
MZ0912B150YS11	M		PBMF4392	S5	FET	PMBT3906	S7	Mm
OM286; M	S13	SEN	PBMF4393	S5	FET	PMBT6428/9	S7	Mm
OM287; M	S13	SEN	PDE1001U	S11	M	PMBTA05/06	S7	Mm
OM320	S10	WBM	PDE1003U	S11	M	PMBTA13/14	S7	Mm
OM321	S10	WBM	PDE1005U	S11	M	PMBTA42/43	S7	Mm
OM322	S10	WBM	PDE1010U	S11	M	PMBTA55/56	S7	Mm
OM323	S10	WBM	PEE1001U	S11	M	PMBTA63/64	S7	Mm
OM323A	S10	WBM	PEE1003U	S11	M	PMBTA92/93	S7	Mm
OM335	S10	WBM	PEE1005U	S11	M	PMLL4148	S1	SD
OM336	S10	WBM	PEE1010U	S11	M	PMLL4150	S1	SD
OM337	S10	WBM	PH2222	S3	Sm	PMLL4151	S1	SD
OM337A	S10	WBM	PH2222A	S3	Sm	PMLL4153	S1	SD
OM339	S10	WBM	PH2369	S3	Sm	PMLL4446	S1	SD
OM345	S10	WBM	PH2907	S3	Sm	PMLL4448	S1	SD
OM350	S10	WBM	PH2907A	S3	Sm	PMLL5225B		
OM360	S10	WBM	PH2955T	S4a	P	to	S1/S7	SD
OM361	S10	WBM	PH3055T	S4a	P	PMLL5267B		
OM370	S10	WBM	PH5415	S3	Sm	PN2222	S3	Sm
OM386B	S13	SEN	PH5416	S3	Sm	PN2222A	S3	Sm
OM386M	S13	SEN	PH13002	S4b	SP	PN2369	S3	Sm
OM387B; M	S13	SEN	PH13003	S4b	SP	PN2369A	S3	Sm
OM388B	S13	SEN	PHSD51	S2a	R	PN2907	S3	Sm
OM389B	S13	SEN	PKB3001U	S11	M	PN2907A	S3	Sm
OM390; 391	S13	SEN	PKB3003U	S11	M	PN3439	S3	Sm
OM931	S4a	SEN	PKB3005U	S11	M	PN3440	S3	Sm

A = Accessories
 FET = Field-effect transistors
 I = Infrared devices
 Ph = Photoconductive devices
 R = Rectified diodes

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PN5416	S3	Sm	RZ1214B35Y	S11	M	TIP121	S4a	P
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PO44A	S8b	PhC	RZ1214B65Y	S11	M	TIP125	S4a	P
PPC5001T	S11	M	RZ1214B125WS11		M	TIP126	S4a	P
PQC5001T	S11	M	RZ1214B125YS11		M	TIP127	S4a	P
PTB23001X	S11	M	RZ1214B150YS11		M	TIP130	S4a	P
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PTB23005X	S11	M	RZ3135B15U	S11	M	TIP132	S4a	P
PTB32001X	S11	M	RZ3135B15W	S11	M	TIP135	S4a	P
PTB32003X	S11	M	RZ3135B25U	S11	M	TIP136	S4a	P
PTB32005X	S11	M	RZ3135B30W	S11	M	TIP137	S4a	P
PTB42001X	S11	M	RZB12100Y	S11	M	TIP140	S4a	P
PTB42002X	S11	M	RZB12250Y	S11	M	TIP141	S4a	P
PTB42003X	S11	M	RZZ1214B300YS11		M	TIP145	S4a	P
PV3742B4X	S11	M	SL5500	S8b	PhC	TIP146	S4a	P
PVB42004X	S11	M	SL5501	S8b	PhC	TIP147	S4a	P
PXT3904	S7	Mm	SL5502R	S8b	PhC	TIP2955	S4a	P
PXT3906	S7	Mm	SL5504	S8b	PhC	TIP3055	S4a	P
PZ1418B15U	S11	M	SL5504S	S8b	PhC	1N821;A	S1	Vrf
PZ1418B30U	S11	M	SL5505S	S8b	PhC	1N823;A	S1	Vrf
PZ1721B12U	S11	M	SL5511	S8b	PhC	1N825;A	S1	Vrf
PZ1721B25U	S11	M	TIP29*	S4a	P	1N827;A	S1	Vrf
PZ2024B10U	S11	M	TIP30*	S4a	P	1N829;A	S1	Vrf
PZ2024B20U	S11	M	TIP31*	S4a	P	1N914	S1	SD
PZB16035U	S11	M	TIP32*	S4a	P	1N916	S1	SD
PZB27020U	S11	M	TIP33*	S4a	P	1N3879	S2a	R
RPW100	S13	I	TIP34*	S4a	P	1N3880	S2a	R
RPW101	S13	I	TIP41*	S4a	P	1N3881	S2a	R
RPW102	S13	I	TIP42*	S4a	P	1N3882	S2a	R
RPY97	S13	I	TIP47	S4b	P	1N3883	S2a	R
RPY100	S13	I	TIP48	S4b	P	1N3889	S2a	R
RPY102	S13	I	TIP49	S4b	P	1N3890	S2a	R
RPY107	S13	I	TIP50	S4b	P	1N3891	S2a	R
RPY109	S13	I	TIP110	S4a	P	1N3892	S2a	R
RPY222	S13	I	TIP111	S4a	P	1N3893	S2a	R
RV3135B5X	S11	M	TIP112	S4a	P	1N3909	S2a	R
RX1214B300YS11		M	TIP115	S4a	P	1N3910	S2a	R
			TIP116	S4a	P	1N3911	S2a	R
			TIP117	S4a	P	1N3912	S2a	R

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1N4002G	S1	R	2N2907A	S3	Sm	2N4859	S5	FET
1N4003G	S1	R	2N3019	S3	Sm	2N4860	S5	FET
1N4004G	S1	R	2N3020	S3	Sm	2N4861	S5	FET
1N4005G	S1	R	2N3053	S3	Sm	2N5086	S3	Sm
1N4006G	S1	R	2N3375	S6	RFP	2N5087	S3	Sm
1N4007G	S1	R	2N3553	S6	RFP	2N5088	S3	Sm
1N4148	S1	SD	2N3632	S6	RFP	2N5089	S3	Sm
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1N5060	S1	R	2N3926	S6	RFP	2N6661	S5	FET
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56363	S2, 4b	A
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56367	S2a/b	A
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56368c	S2, 4b	A
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DATA HANDBOOK SYSTEM

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- S4a Low-frequency power transistors and hybrid modules**
- S4b High-voltage and switching power transistors**
- S5 Small-signal field-effect transistors**
- S6 RF power transistors and modules**
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current code		new handbook code
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C5	Ferroxcube for power, audio/video and accelerators	
C7	Variable capacitors	PA04 [△]
C8	Variable mains transformers	PC10 ^{△△}
C9	Piezoelectric quartz devices	PA07 [△]
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C20	Wire-wound components for TVs and monitors	DC05*
C22	Film capacitors	PA05 [△]

* These handbooks will be re-issued in the future in the new series of handbooks (Display Components).

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