DISCRETE SEMICONDUCTORS

Microwave transistors

BOOK SC15 1989

Philips Components

PHILIPS

MICROWAVE TRANSISTORS

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 µs	%	P_L W	G_p dB	η_C %	page
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 µs	%	P_L W	G_p dB	η_C %	page
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.

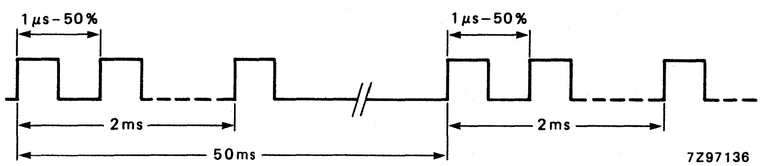


Fig. 1 DABS pulse definition.

3. Linear power transistors

3.1 class-A medium power

type	f GHz	V_{CE} V	I_C mA	P_{L1} (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	V_{CE} V	I_C A	P_{L1} (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.

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 μs; δ = 1%.
(2) Measured under pulsed condition t_p = 10 μs; δ = 10%.

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	–	237
PQC5001T	5	20	0.45	circuits	–	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 μs; δ = 10%.
(2) Measured under pulsed condition t_p = 300 μs; δ = 10%.
(3) Measured under pulsed condition t_p = 150 μs; δ = 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
R6	LAE4000Q
R7	LAE6000Q
R8	LAE4001R
R9	LAE4002S
104	LJE42002T
106	LCE2005Q
107	LBE2005Q
108	LCE1004R
109	LBE1004R
112	LKE1004R
116	LKE32004T
142	LCE1010R
144	LKE2015T
146	LKE21004R
148	LKE2002T
150	LTE2004T
176	LKE27025R
190	LKE21050T
192	LKE21015T
196	LTE42008R
198	LTE42012R
383	PQC5001T
395	PPC5001T
400	LUE2003S
401	LUE2009S
407	LBE2003S
408	LCE2009S
409	LBE2009S
411	LWE2015R
413	LWE2025R
430	LV2931E50S
435	LTE21009R
436	LTE210015R
439	LTE21025R
502	LTE42005S
1001	PDE1001U
1001	PEE1001U
1003	PDE1003U
1003	PEE1003U

Marking code	Type number
1005M	PKB12005U
1140S	MKB12140W
2001M	PKB23001U
2003M	PKB23003U
2005U	PKB23005U
2147	PKB25006T
2301X	PTB23001X
2303X	PTB23003X
2305X	PTB23005X
3001	PKB3001U
3001M	PKB32001U
3003	PKB3003U
3003M	PKB32003U
3005	PKB3005U
3005M	PKB32005U
3201X	PTB32001X
3203X	PTB32003X
3205X	PTB32005X
4002S	LTE4002S
4201X	PTB42001X
4202X	PTB42002X
4203X	PTB42003X
11080	MRB11080Y
11175Y	MRB11175Y
11350Y	MRB11350Y
12175Y	MRB12175Y
2833B5X	RV2833B5X
3135B5X	RV3135B5X
3742B4X	PV3742B4X
42004X	PVB42004X
1721E50R	LV1721E50R
2024E45R	LV2024E45R
2327E40R	LV2327E40R
3742E16R	LV3742E16R
3742E24R	LV3742E24R

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 x V_{CC})
η_{add} = power added efficiency (P_{out} - P_{in}) / (I_C x 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
$R_{th\ j\text{-}c}$ = thermal resistance from junction to case
$R_{th\ j\text{-}mb}$ = thermal resistance from junction to mounting base
$R_{th\ mb\text{-}h}$ = 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
VSWR = 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
FOR SILICON POWER BIPOLAR TRANSISTORS

X : Letter
Ø : Number

a) XXX ØØØØX : transistors without matching cell
b) XXX ØØØØØX : transistors with input matching cell
c) XX ØØØØX ØØX / ØØØX } 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	

Ø 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 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 $R_a < 0{,}5\ \mu m$ (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

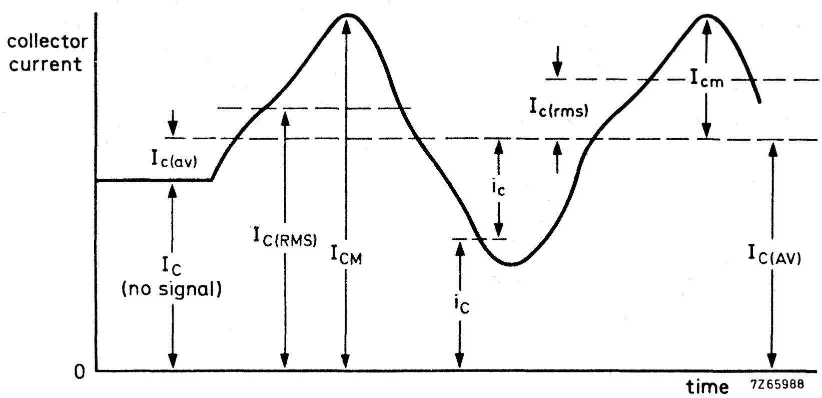
For multiple unit devices, the subscripts are modified by a number preceding the letter subscript; in the case of multiple subscripts, hyphens may be necessary to avoid misunderstanding.

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 PARAMETERE METERS

Defenition

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

Basic letters

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

B, b = susceptance; imaginary part of an admittance

C = capacitance

G, g = conductance; real part of an admittance

H, h = hybrid parameter

L = inductance

R, r = resistance; real part of an impedance

X, x = reactance; imaginary part of an impedance

Y, y = admittance;

Z, z = impedance;

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

a) electrical parameters of external circuits and of circuits in which the device forms only a part;

b) all inductances and capacitances.

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

Subscripts

General subscripts

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

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

Examples: Z_S, h_f, h_F

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

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

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

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

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

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

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

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

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

Subscripts for four-pole matrix parameters

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

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

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

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

Distinction between real and imaginary parts

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

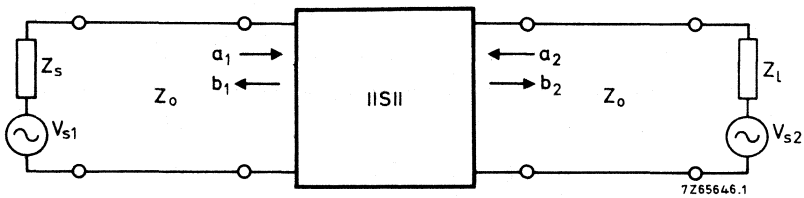
Examples: $Z_i = R_i + jX_i$
$y_{fe} = g_{fe} + jb_{fe}$

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

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

SCATTERING PARAMETERS

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



$$a_1 = \frac{V_{i1}}{\sqrt{Z_o}} \qquad a_2 = \frac{V_{i2}}{\sqrt{Z_o}} \qquad {}^{1)}$$

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

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

V_i = incident voltage

V_r = reflected (generated) voltage

The four-pole equations for s-parameters are:

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

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

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

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

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

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

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

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

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 $Z_l = Z_o = 50\ \Omega$ 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 $Z_s = Z_o = 50\ \Omega$ 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 $Z_l = Z_o = 50\ \Omega$ 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 $Z_s = Z_o = 50\ \Omega$ 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.

- Interdigited 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 °C in an unneutralized common-emitter class-A selective amplifier.

Typical values

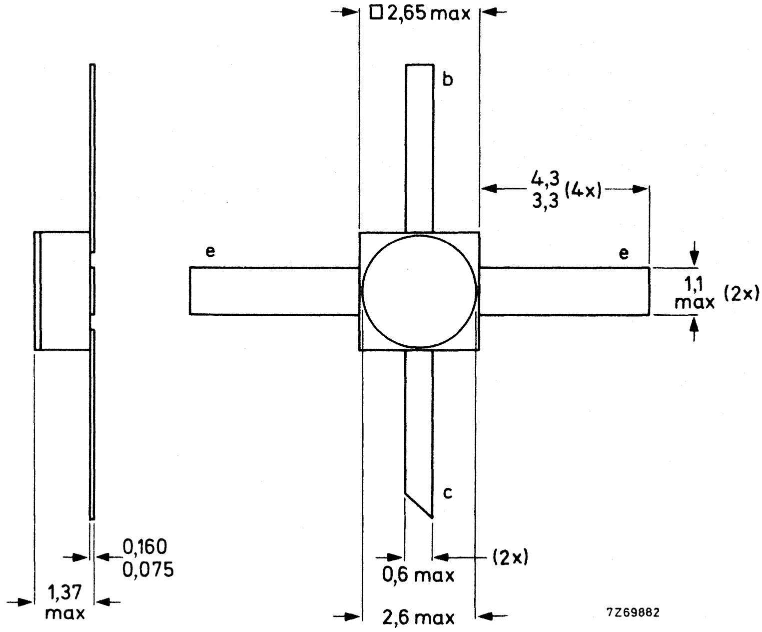
mode of operation	f GHz	V_{CE} V	I_C mA	P_{L1} mW	G_{po} dB
c.w. class-A	2	15	35	120	8

MECHANICAL DATA

SOT-100 (see Fig. 1)

MECHANICAL DATA Dimensions in mm

Fig. 1 SOT-100.



RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	35	V
Collector-emitter voltage (R_{BE} = 50 Ω)	V_{CER}	max.	30	V
(open base)	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	$R_{th\ j\text{-}c}$	180	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 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 °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

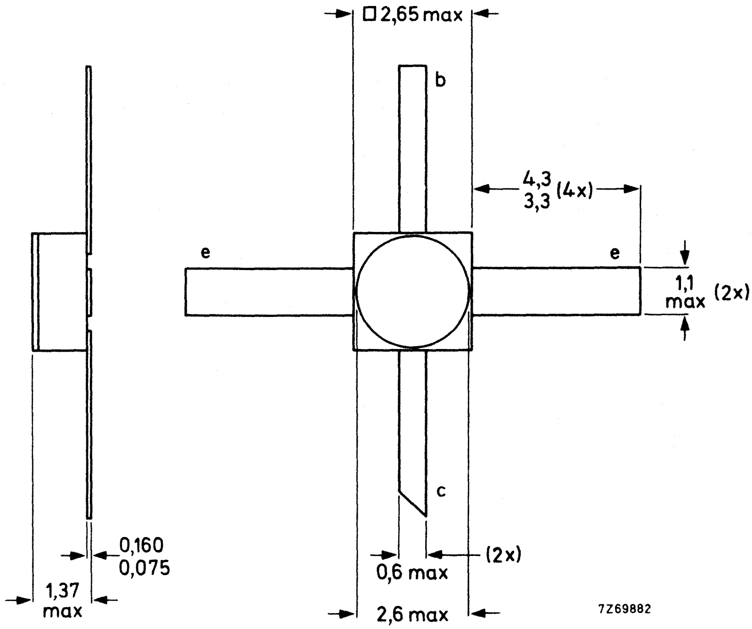
MECHANICAL DATA

SOT-100 (see Fig. 1)

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-100.



RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	30	V
Collector-emitter voltage (R_{BE} = 220 Ω)	V_{CER}	max.	25	V
(open base)	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 °C)	P_{tot}	max.	700	mW
Junction temperature	T_j		−65 to 200	°C
Soldering temperature at 0,1 mm from case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	+235	°C

THERMAL RESISTANCE

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

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_{case} = 25 °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	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω
c.w.; linear amplifier	4	15	25	typ. 110	typ. 9,5	typ. 7 + j22	typ. 10 + j38

MECHANICAL DATA

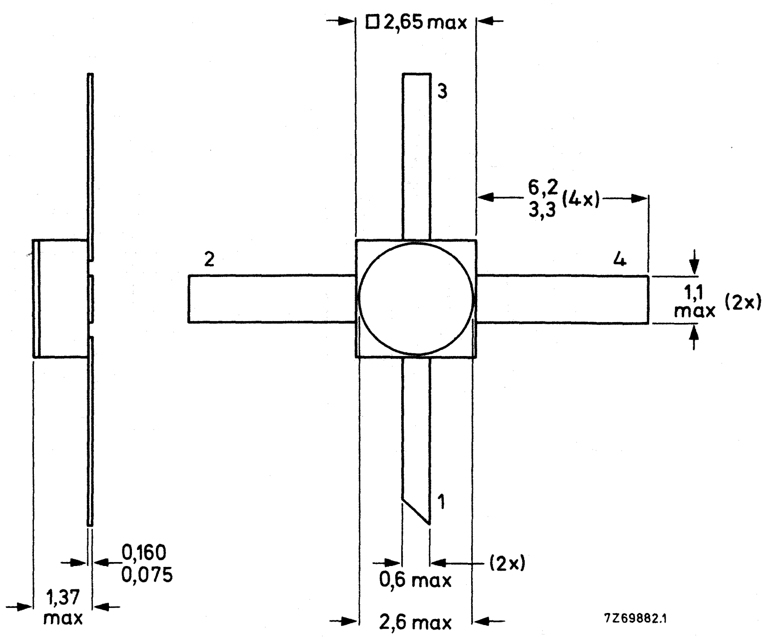
Dimensions in mm

Fig. 1 SOT-100.

Emitter connected to metallized lid

Pinning :

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



Marking code

R8 = LAE4001R

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 Ω)	V_{CER}	max.	25	V
(open base)	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 °C	P_{tot}	max.	480	mW
Storage temperature	T_{stg}	−65 to +200		°C
Junction temperature	T_j	max.	200	°C
Lead soldering temperature at 0,1 mm from the case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	°C

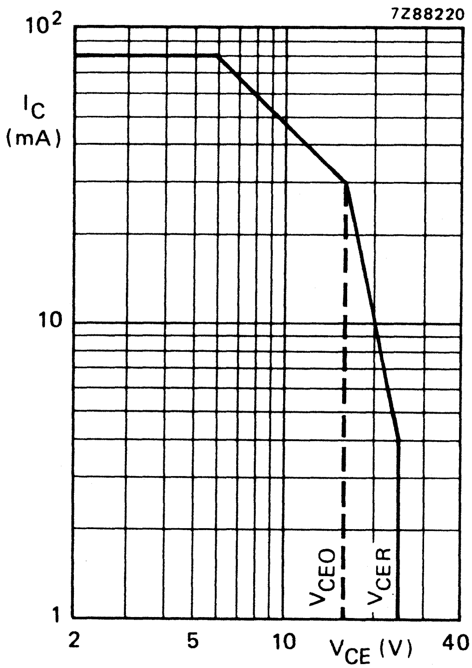


Fig. 2 D.C. SOAR at $T_{case} \leqslant 100$ °C; $R_{BE} < 220$ Ω.

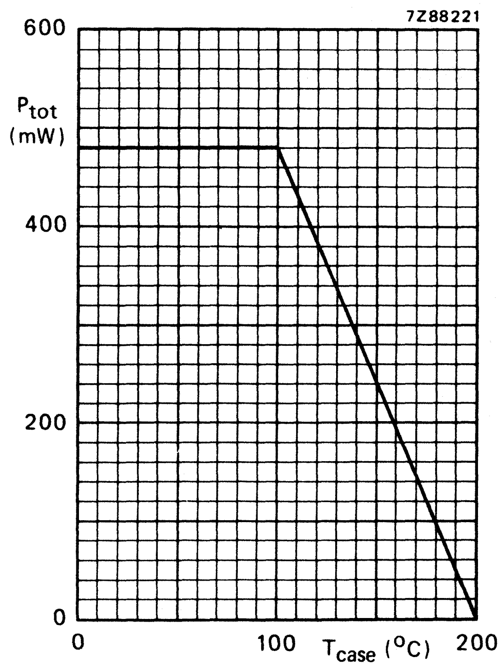


Fig. 3 Power derating curve vs. temperature.

→ **THERMAL RESISTANCE** (at T_j = 75 °C)

From junction to case $R_{th\ j\text{-}c}$ = 210 K/W*

*K/W is SI unit for °C/W.

CHARACTERISTICS

T_{case} = 25 °C

Collector cut-off current				
I_E = 0; V_{CB} = 15 V	I_{CBO}	<	100	nA
I_E = 0; V_{CB} = 30 V	I_{CBO}	<	100	μA
V_{CB} = 25 V; R_{BE} = 220 Ω	I_{CER}	<	500	μA
Emitter cut-off current				
I_C = 0; V_{EB} = 1,5 V	I_{EBO}	<	35	nA
I_C = 0; V_{EB} = 2,0 V	I_{EBO}	<	0,15	μA
D.C. current gain				
I_C = 25 mA; V_{CE} = 5 V	h_{FE}		20 to 220	
Collector-base capacitance at f = 1 MHz				
I_E = I_C = 0; V_{CB} = 15 V; V_{EB} = 1,5 V	C_{cb}	typ.	0,25	pF
Collector-emitter capacitance at f = 1 MHz				
I_E = I_C = 0; V_{CE} = 15; V_{EB} = 1,5 V	C_{ce}	typ.	0,5	pF
Emitter-base capacitance at f = 1 MHz				
I_E = I_C = 0; V_{EB} = 1,0 V; V_{CB} = 15 V	C_{eb}	typ.	1,3	pF
Forward power gain				
I_C = 25 mA; V_{CE} = 15 V; f = 2 GHz	$\|s_{fe}\|^2$	typ.	9,6	dB
I_C = 25 mA; V_{CE} = 15 V; f = 4 GHz	$\|s_{fe}\|^2$	typ.	3,8	dB
Maximum available gain				
I_C = 25 mA; V_{CE} = 15 V; f = 2 GHz	G_{AM}	typ.	16	dB
I_C = 25 mA; V_{CE} = 15 V; f = 4 GHz	G_{AM}	typ.	10	dB

s-parameters (common emitter)

Typical values; V_{CE} = 15 V; I_C = 25 mA; T_{case} = 25 °C; Z_o = 50 Ω

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 °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	$\overline{z_i}$ Ω	$\overline{Z_L}$ 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}.

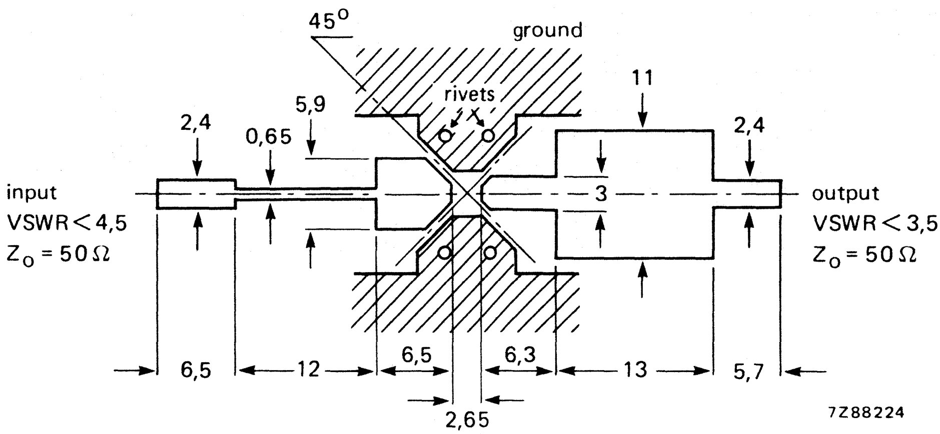


Fig. 4 Prematching test circuit board for 4 GHz. (Dimensions in mm.)

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

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

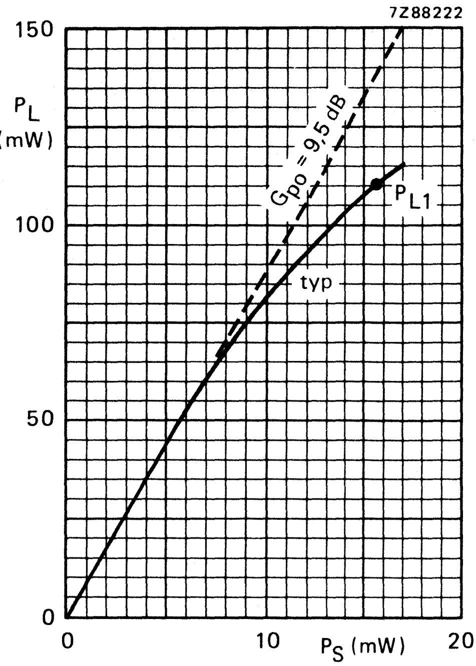


Fig. 5 V_{CE} = 15 V; I_C = 25 mA; f = 4 GHz; T_{case} = 25 °C.

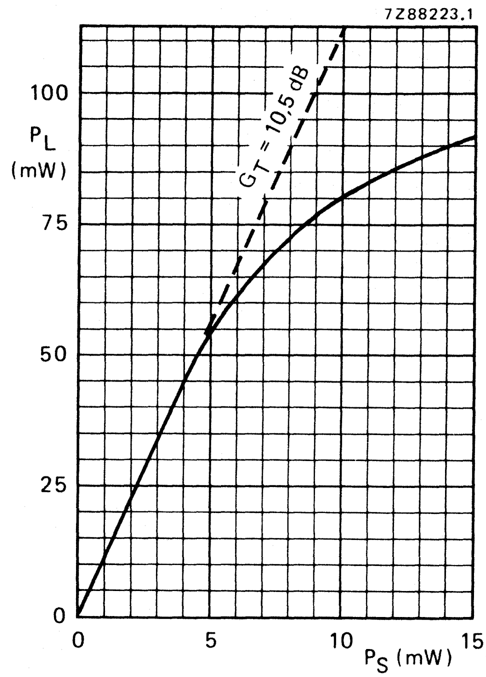


Fig. 6 V_{CE} = 15 V; I_C = 25 mA; f = 4 GHz; maximum low-level linear power gain.

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_{case} = 25 °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	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω
c.w.; linear amplifier	4	18	30	typ. 160	typ. 8	typ. 4 + j23	typ. 6,5 + j32

MECHANICAL DATA

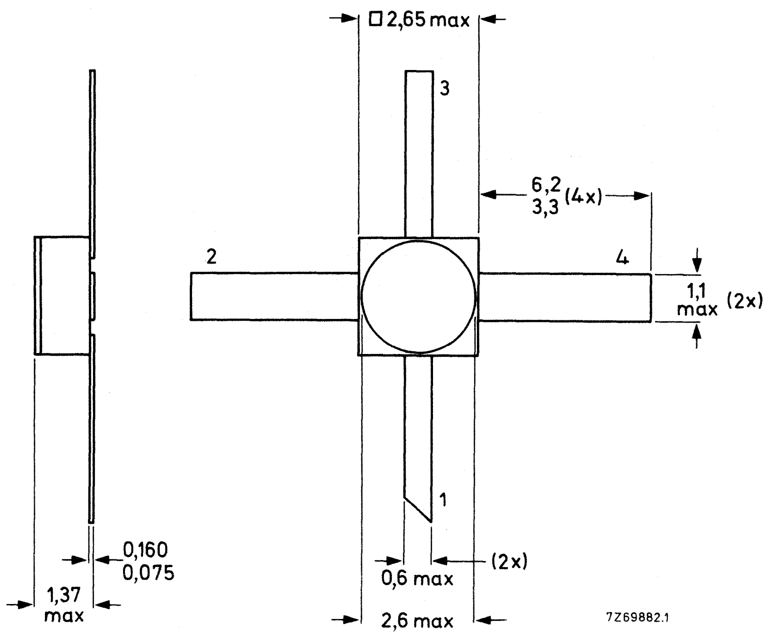
Dimensions in mm

Fig. 1 SOT-100.

Emitter connected to metallized lid

Pinning :

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



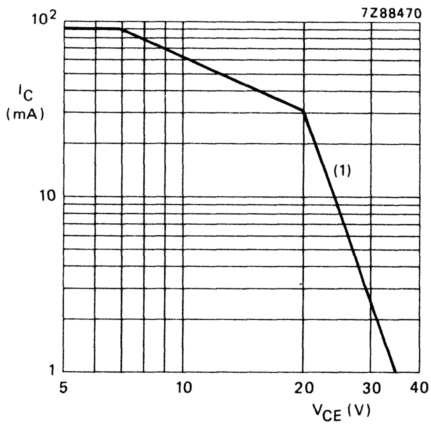
Marking code

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 Ω)	V_{CER}	max.	35 V
(open base)	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 °C	P_{tot}	max.	625 mW
Storage temperature	T_{stg}	−65 to + 200 °C	
Junction temperature	T_j	max.	200 °C
Lead soldering temperature at 0,1 mm from the case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235 °C



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

Fig. 2 D.C. SOAR at $T_{case} \leqslant 75$ °C; $R_{BE} < 220$ Ω.

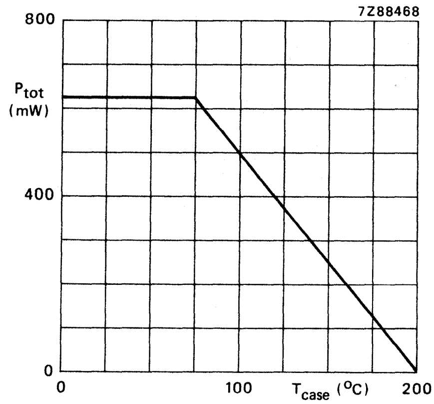


Fig. 3 Power derating curve vs. temperature.

THERMAL RESISTANCE (at T_j = 75 °C)

From junction to case $R_{th\ j\text{-}c}$ = 200 K/W*

* K/W is SI unit for °C/W.

CHARACTERISTICS

T_{case} = 25 °C

Collector cut-off current				
I_E = 0; V_{CB} = 20 V	I_{CBO}	<	100	nA
I_E = 0; V_{CB} = 40 V	I_{CBO}	<	150	µA
V_{CB} = 35 V; R_{BE} = 220 Ω	I_{CER}	<	500	µA
Emitter cut-off current				
I_C = 0; V_{EB} = 1,5 V	I_{EBO}	<	50	nA
I_C = 0; V_{EB} = 3,0 V	I_{EBO}	<	25	µA
D.C. current gain				
I_C = 30 mA; V_{CE} = 5 V	h_{FE}		15 to 150	
Collector-base capacitance at f = 1 MHz				
I_E = I_C = 0; V_{CB} = 18 V; V_{EB} = 1,5 V	C_{cb}	typ.	0,3	pF
Collector-emitter capacitance at f = 1 MHz				
I_E = I_C = 0; V_{CE} = 18 V; V_{EB} = 1,5 V	C_{ce}	typ.	0,55	pF
Emitter-base capacitance at f = 1 MHz				
I_E = I_C = 0; V_{EB} = 1,0 V; V_{CB} = 18 V	C_{eb}	typ.	1,8	pF
Forward power gain				
I_C = 30 mA; V_{CE} = 18 V; f = 2 GHz	$\|s_{fe}\|^2$	typ.	8,8	dB
I_C = 30 mA; V_{CE} = 18 V; f = 4 GHz	$\|s_{fe}\|^2$	typ.	2,8	dB
Maximum available gain				
I_C = 30 mA; V_{CE} = 18 V; f = 2 GHz	G_{AM}	typ.	14	dB
I_C = 30 mA; V_{CE} = 18 V; f = 3 GHz	G_{AM}	typ.	11	dB

s-parameters (common emitter)

Typical values; V_{CE} = 18 V; I_C = 30 mA; T_{case} = 25 °C; Z_o = 50 Ω

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 V; I_C = 15 mA; T_{case} = 25 °C; Z_o = 50 Ω

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 V; I_C = 10 mA; T_{case} = 25 °C; Z_o = 50 Ω

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 °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	$\overline{z_i}$ Ω	$\overline{Z_L}$ 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}.

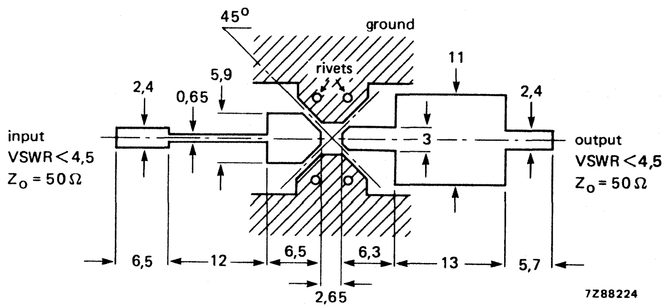


Fig. 4 Prematching test circuit board for 4 GHz. (Dimensions in mm.)

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

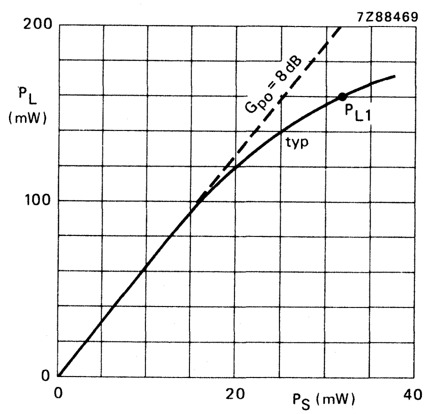


Fig. 5 V_{CE} = 18 V; I_C = 30 mA; f = 4 GHz; T_{case} = 25 °C.

* 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 °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

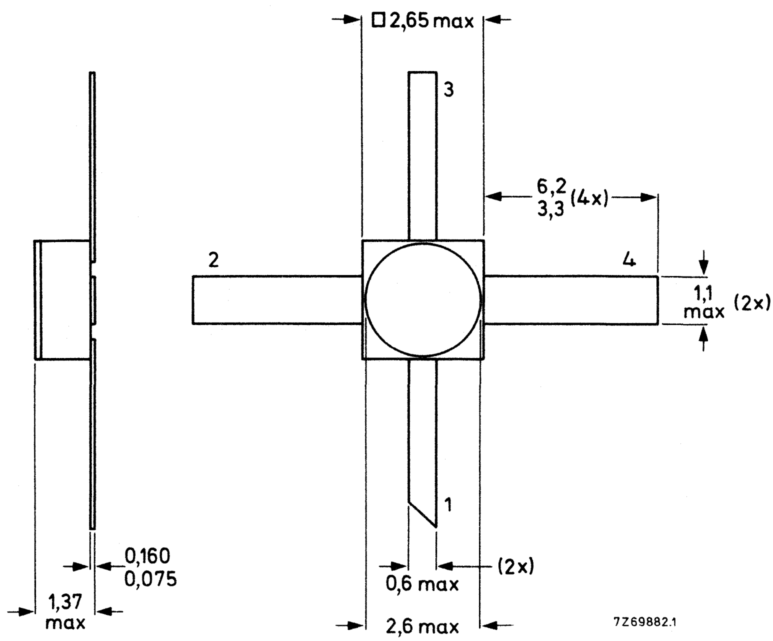
Dimensions in mm

Fig. 1 SOT-100.

Emitter connected to metallized lid

Pinning :

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



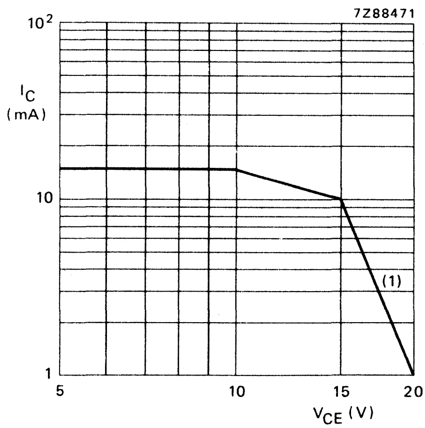
Marking code

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 Ω)	V_{CER}	max.	20	V
(open base)	V_{CEO}	max.	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 °C	P_{tot}	max.	150	mW
Storage temperature	T_{stg}	−65 to + 200		°C
Junction temperature	T_j	max.	200	°C
Lead soldering temperature at 0,1 mm from the case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	°C



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

Fig. 2 D.C. SOAR at $T_{case} \leqslant 150$ °C; $R_{BE} \leqslant 150$ Ω.

→ **THERMAL RESISTANCE** (at T_j = 75 °C)

From junction to case $R_{th\ j\text{-}c}$ = 300 K/W*

* K/W is SI unit for °C/W.

CHARACTERISTICS

T_{case} = 25 °C

Collector cut-off current $I_E = 0$; V_{CB} = 10 V	I_{CBO}	<	100	nA
Emitter cut-off current $I_C = 0$; V_{EB} = 1,5 V	I_{EBO}	<	15	nA
D.C. current gain I_C = 4 mA; V_{CE} = 10 V	h_{FE}		20 to 250	
Collector-base capacitance at f = 1 MHz $I_E = I_C = 0$; V_{CB} = 10 V	C_{cb}	typ.	0,15	pF
Collector-emitter capacitance at f = 1 MHz $I_E = I_C = 0$; V_{CE} = 10 V	C_{ce}	typ.	0,50	pF
Emitter-base capacitance at f = 1 MHz $I_E = I_C = 0$; V_{EB} = 1,0 V; V_{CB} = 10 V	C_{eb}	typ.	0,70	pF

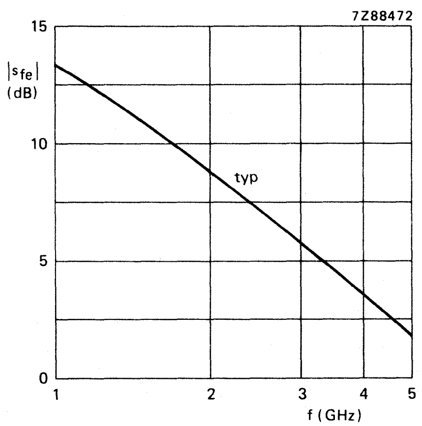


Fig. 3 V_{CE} = 10 V; I_C = 4 mA; T_{case} = 25 °C; Z_o = 50 Ω.

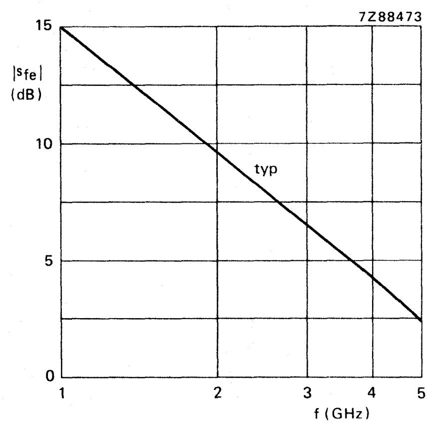


Fig. 4 V_{CE} = 10 V; I_C = 8 mA; T_{case} = 25 °C; Z_o = 50 Ω.

s-parameters (common emitter)

Typical values; V_{CE} = 10 V; I_C = 4 mA; T_{case} = 25 °C; Z_o = 50 Ω

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 V; I_C = 8 mA; T_{case} = 25 °C; Z_o = 50 Ω

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 °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	$\overline{z_i}$ Ω	$\overline{Z_L}$ 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

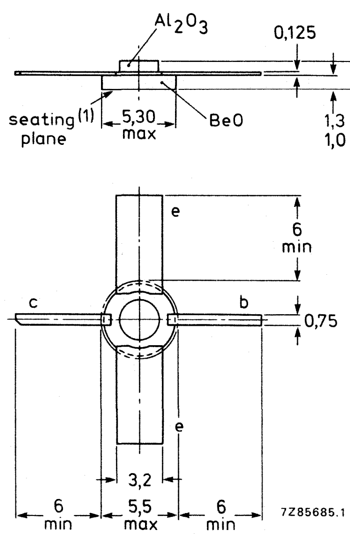
MECHANICAL DATA

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)

Dimensions in mm

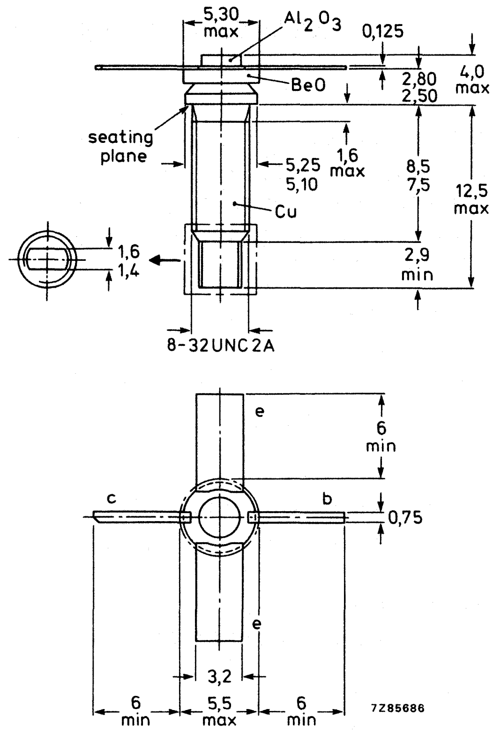
Fig. 1b **LCE1004R** and **LCE1010R** (FO-46).

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.



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 Ω	V_{CER}	max.	–	30	V
R_{BE} = 500 Ω	V_{CER}	max.	30	–	V
open base	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 °C	P_{tot}	max.	3	6	W
Storage temperature	T_{stg}		–65 to + 150		°C
Operating junction temperature	T_j	max.	200		°C
Lead soldering temperature at 0,3 mm from the case; t_{sld} = 10 s	T_{sld}	max.	235		°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 °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	$\overline{z_i}$ Ω	$\overline{Z_L}$ 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

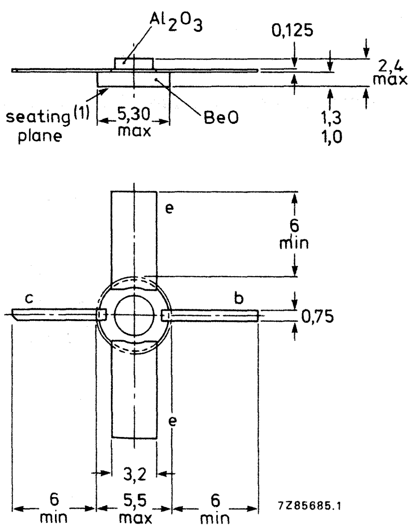
Dimensions in mm

Fig. 1a **LBE2003S** and **LBE2009S.**

FO-45

Marking code

RTC407 = LBE2003S
RTC409 = LBE2009S



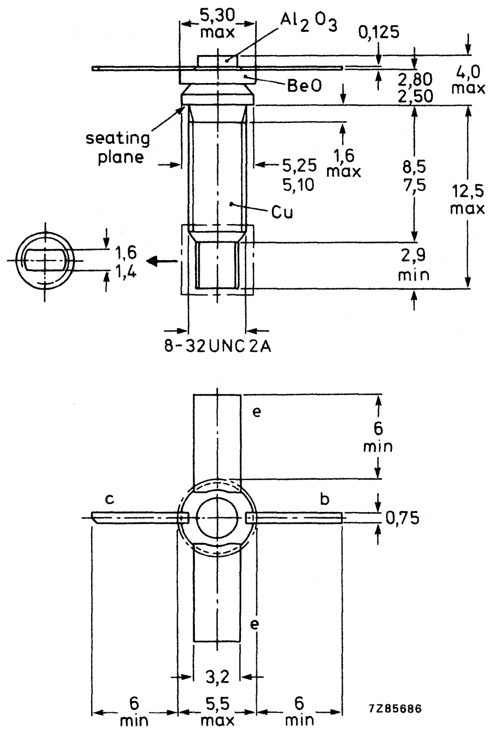
PRODUCT SAFETY These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA (continued)

Dimensions in mm

Fig. 1b **LCE2003S** and **LCE2009S.**

FO-46



Marking code

RTC406 = LCE2003S
RTC408 = LCE2009S

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

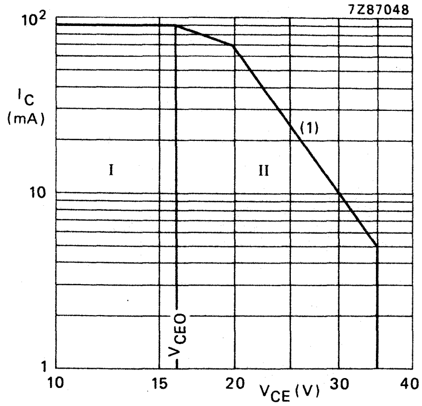
Diameter of clearance hole in heatsink: max. 4,2 mm.

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 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 (d.c.)	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	T_{stg}		–65 to + 150		°C
Operating junction temperature	T_j	max.	200		°C
Lead soldering temperature at 0,3 mm from the case; t_{sld} = 10 s	T_{sld}	max.	235		°C

LBE/LCE2003S



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

Fig. 2 D.C. SOAR at $T_{mb} \leqslant 75\ ^oC$.

I Region of permissible d.c. operation.
II Permissible extension provided $R_{BE} \leqslant 220\ \Omega$.

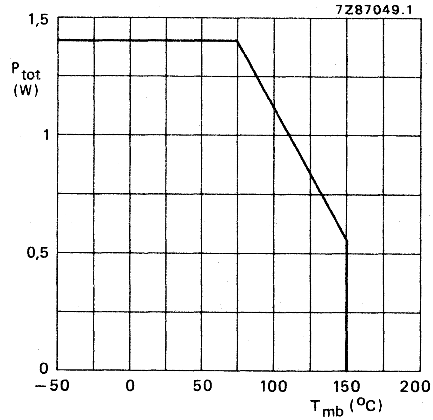
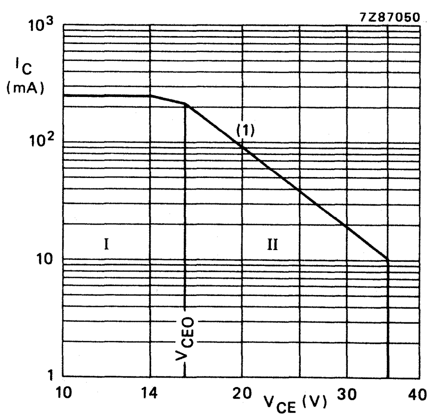


Fig. 3 Power derating curve vs. mounting base temperature.

LBE/LCE2009S



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

Fig. 4 D.C. SOAR at $T_{mb} \leqslant 75\ ^oC$.

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

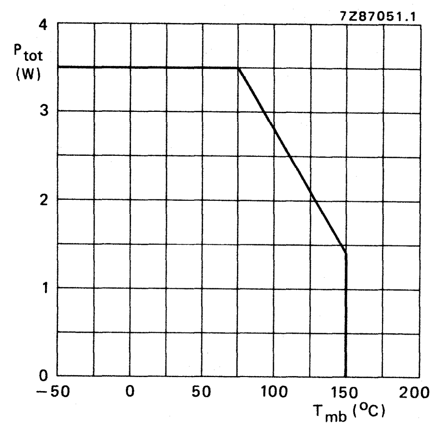


Fig. 5 Power derating curve vs. mounting base temperature.

→ **THERMAL RESISTANCE** (at T_j = 75 °C)

			LBE/LCE 2003S	LBE/LCE 2009S	
From junction to mounting base	$R_{th\ j\text{-}mb}$	=	65	36	K/W*
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	1,5	1,5	K/W*

CHARACTERISTICS

T_{mb} = 25 °C

			LBE/LCE 2003S	LBE/LCE 2009S	
Collector cut-off current					
$I_E = 0$; $V_{CB} = 20$ V	I_{CBO}	<	0,1	0,1	µA
$I_E = 0$; $V_{CB} = 40$ V	I_{CBO}	<	150	250	µA
$V_{CB} = 35$ V; $R_{BE} = 220\ \Omega$	I_{CER}	<	500	–	µA
$V_{CB} = 35$ V; $R_{BE} = 100\ \Omega$	I_{CER}	<	–	1000	µA
Emitter cut-off current					
$I_C = 0$; $V_{EB} = 1,5$ V	I_{EBO}	<	0,05	0,2	µA
$I_C = 0$; $V_{EB} = 3,0$ V	I_{EBO}	<	25	50	µA
D.C. current gain					
$I_C = 30$ mA; $V_{CE} = 5$ V	h_{FE}	>	15	–	
		<	150	–	
$I_C = 110$ mA; $V_{CE} = 5$ V	h_{FE}	>	–	15	
		<	–	150	
Collector-base capacitance at f = 1 MHz					
$I_E = I_C = 0$; $V_{CB} = 18$ V; $V_{EB} = 1,5$ V	C_{cb}	typ.	0,3	0,6	pF
Collector-emitter capacitance at f = 1 MHz					
$I_E = I_C = 0$; $V_{CE} = 18$ V; $V_{EB} = 1,5$ V	C_{ce}	typ.	0,45	0,6	pF
Emitter-base capacitance at f = 1 MHz					
$I_E = I_C = 0$; $V_{EB} = 1$ V; $V_{CB} = 10$ V	C_{eb}	typ.	1,7	3,3	pF

* K/W is SI unit for °C/W.

s-parameters (common emitter)

LBE/LCE2003S: Typical values; V_{CE} = 18 V*; I_C = 30 mA*; T_{mb} = 25 °C; Z_o = 50 Ω

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 V*; I_C = 110 mA*; T_{mb} = 25 °C; Z_o = 50 Ω

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

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 °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	$\overline{z_i}$ Ω	$\overline{Z_L}$ 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}.

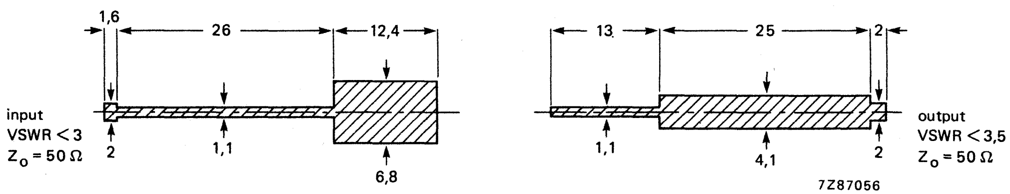


Fig. 6 Prematching test circuit board for 2 GHz. (Dimensions in mm.)

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

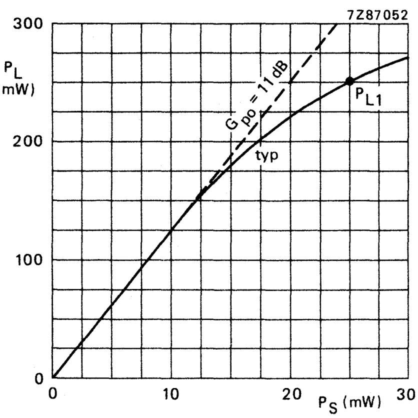


Fig. 7 V_{CE} = 18 V; I_C = 30 mA;
f = 2 GHz; T_{mb} = 25 °C.

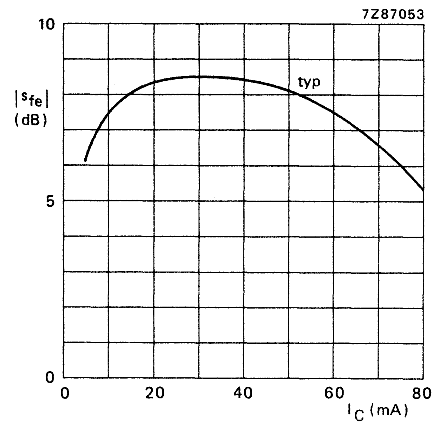


Fig. 8 V_{CE} = 18 V; class-A operation; f = 2 GHz; T_{mb} = 25 °C.

* 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 °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	⩾ 700(28,5) typ. 900(29,5)	⩾ 9 typ. 9,8	7,5 + j14,5	17,5 + j38,5

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}.

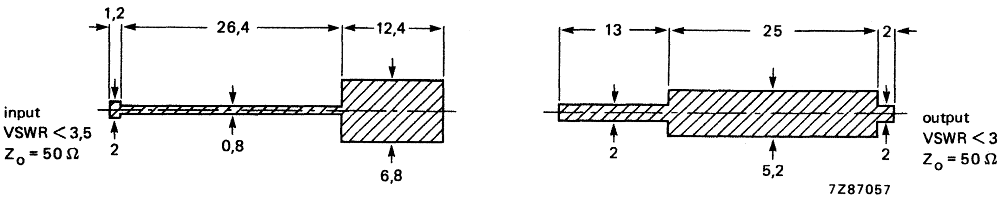


Fig. 9 Prematching test circuit board for 2 GHz. (Dimensions in mm.)

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

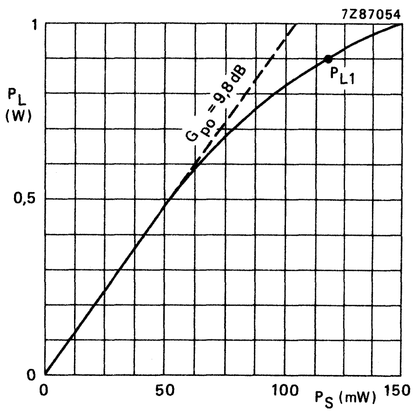


Fig. 10 V_{CE} = 18 V; I_C = 110 mA;
f = 2 GHz; T_{mb} = 25 °C.

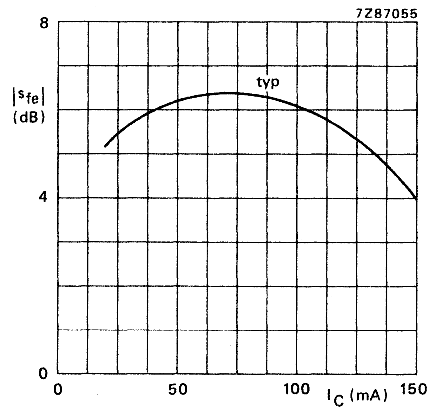


Fig. 11 V_{CE} = 18 V; class-A operation; f = 2 GHz; T_{mb} = 25 °C.

* 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 °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

Dimensions in mm

Fig. 1a LBE2005Q (FO-45).

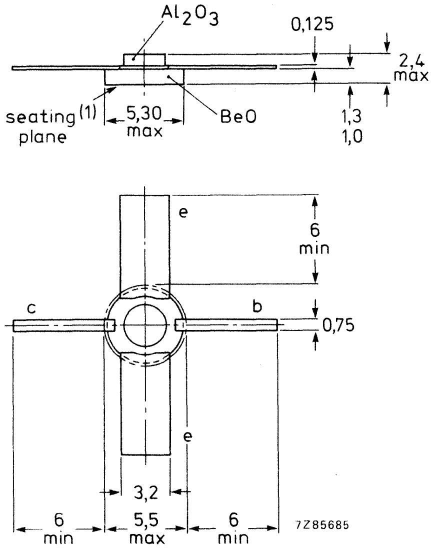
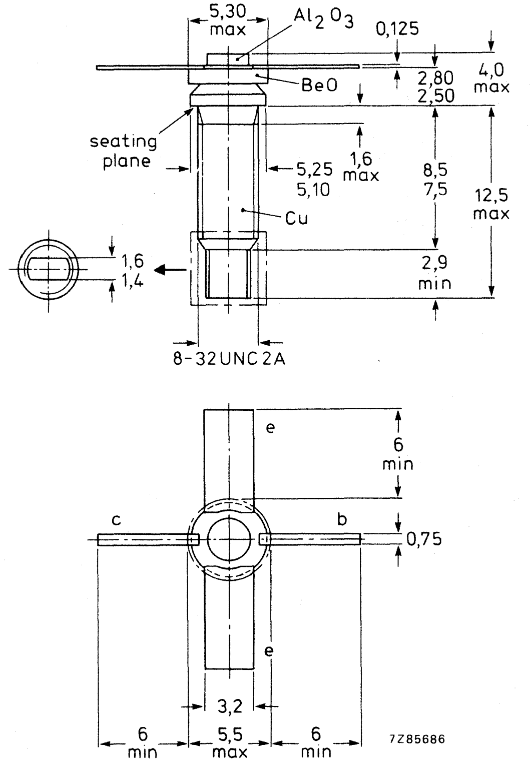


Fig. 1b LCE2005Q (FO-46).



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 ($T_{mb} \leqslant 75^oC$)	P_{tot}	max.	1,5	W
Storage temperature	T_{stg}		–65 to 200	^oC
Junction temperature	T_j	max.	200	^oC
Soldering temperature at 0,1 mm from case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	^oC

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	45	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

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 °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

Dimensions in mm

Fig. 1a LBE2008T (FO-45).

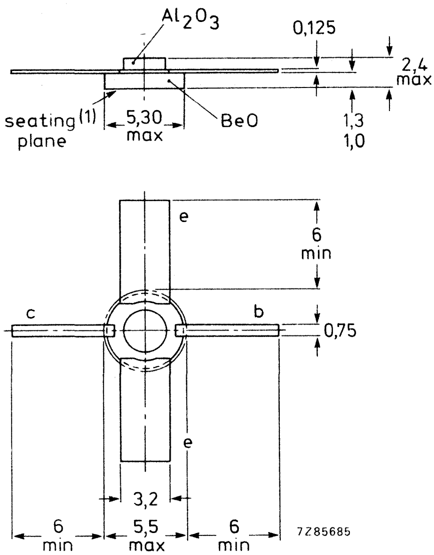
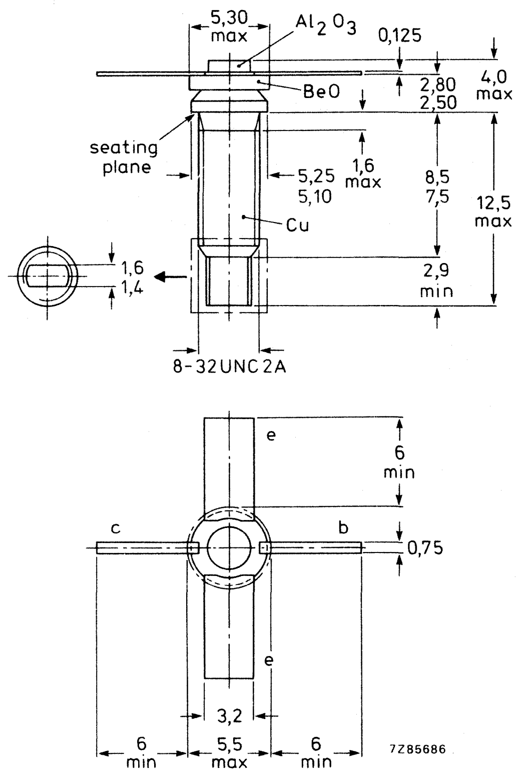


Fig. 1b LCE2008T (FO-46).



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 Ω)	V_{CER}	max.	21	V
(open base)	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 ($T_{mb} \leqslant 75$ °C)	P_{tot}	max.	3,5	W
Storage temperature	T_{stg}		−65 to 200	°C
Junction temperature	T_j	max.	200	°C
Soldering temperature at 0,1 mm from case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	230	°C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	26	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 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 °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).

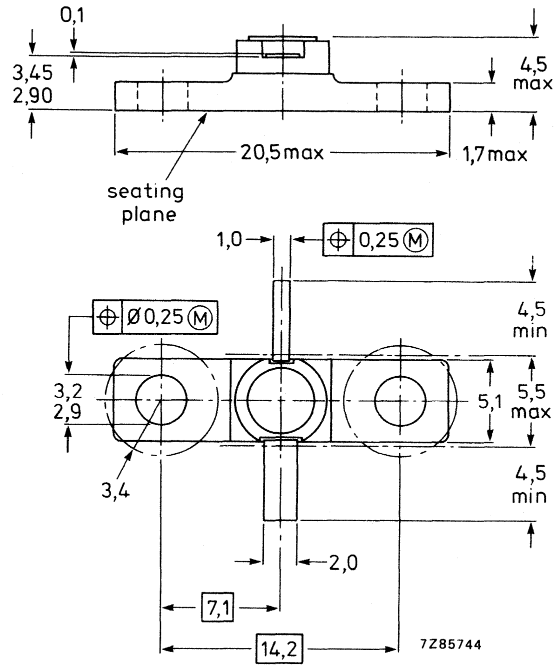
PRODUCT SAFETY

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

Dimensions in mm

Fig. 1 FO-41A.



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 Ω)	V_{CER}	max.	25	V
(open base)	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 ($T_{mb} \leqslant 75$ °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; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	°C

THERMAL RESISTANCE

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

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, interdigited 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 °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

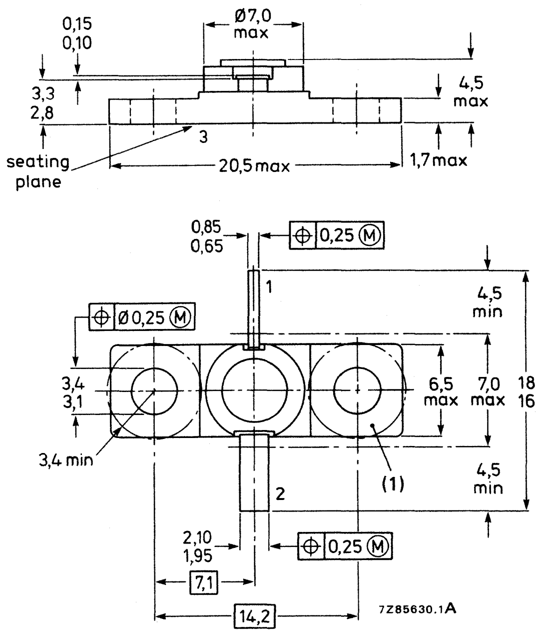
MECHANICAL DATA

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_{CBO}	max.	30	V
Collector-emitter voltage				
$R_{BE} \leq 500\ \Omega$	V_{CER}	max.	30	V
open base	V_{CEO}	max.	14	V
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 °C	P_{tot}	max.	3	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; $t_{sld} \leq 10$ s	T_{sld}	max.	235	°C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	30	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	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 °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).

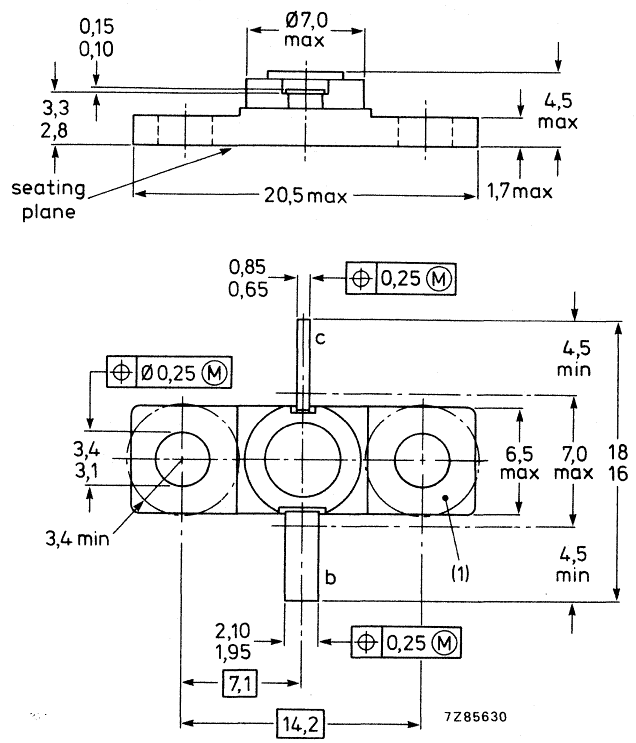
PRODUCT SAFETY

This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe, provided that the beryllium oxyde 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} = 330 Ω)	V_{CER}	max.	20	V
(open base)	V_{CEO}	max.	18	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3	V
Collector current	I_C	max.	80	mA
Total power dissipation ($T_{mb} \leqslant 75$ °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; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	°C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	45	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 °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)

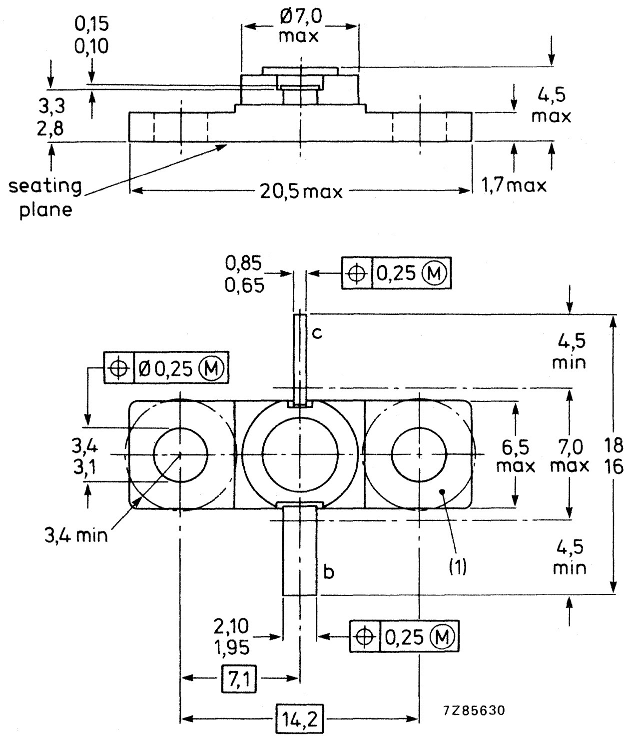
PRODUCT SAFETY

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 Ω)	V_{CER}	max.	20 V
(open base)	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 ($T_{mb} \leqslant 75$ °C)	P_{tot}	max.	3,0 W
Storage temperature	T_{stg}		–65 to 200 °C
Junction temperature	T_j	max.	200 °C
Soldering temperature at 0,1 mm from case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235 °C

THERMAL RESISTANCE

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

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 °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	$\overline{z_i}$ Ω	$\overline{Z_L}$ 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.

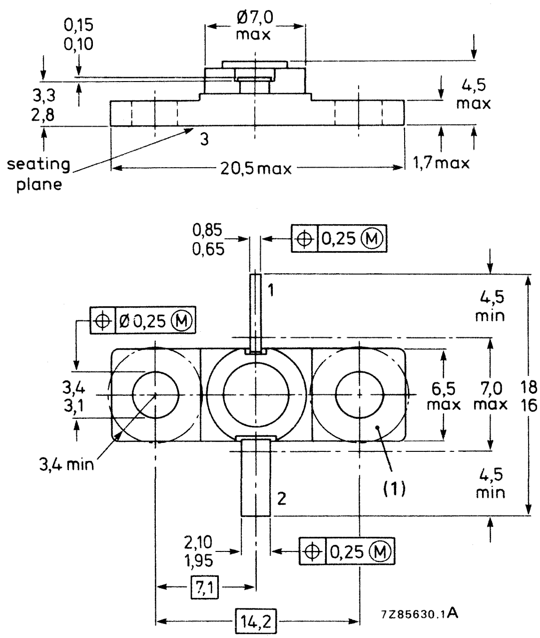
Emitter connected to flange

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 Ω	V_{CER}	max.	25	V
open base	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 °C	P_{tot}	max.	8	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; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	°C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	11	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,7	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 °C in an unneutralized common-emitter class-A circuit

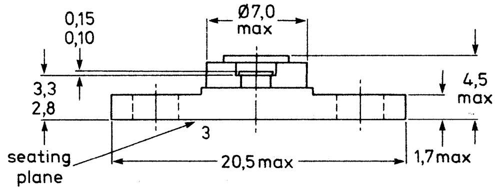
mode of operation	f GHz	V_{CE} V	I_C mA	P_{L1} mW	G_{po} dB	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω
c.w.; linear amplifier	2,1	15	140	typ. 600	typ. 10	6 + j8	4 + j8

MECHANICAL DATA

Dimensions in mm

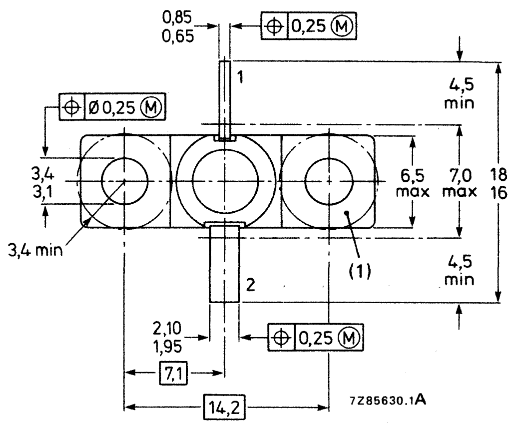
Fig. 1 FO-53.

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 Ω	V_{CER}	max.	20	V
open base	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 °C	P_{tot}	max.	2,8	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; $t_{sld} \leq 10$ s	T_{sld}	max.	235	°C

THERMAL RESISTANCE

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

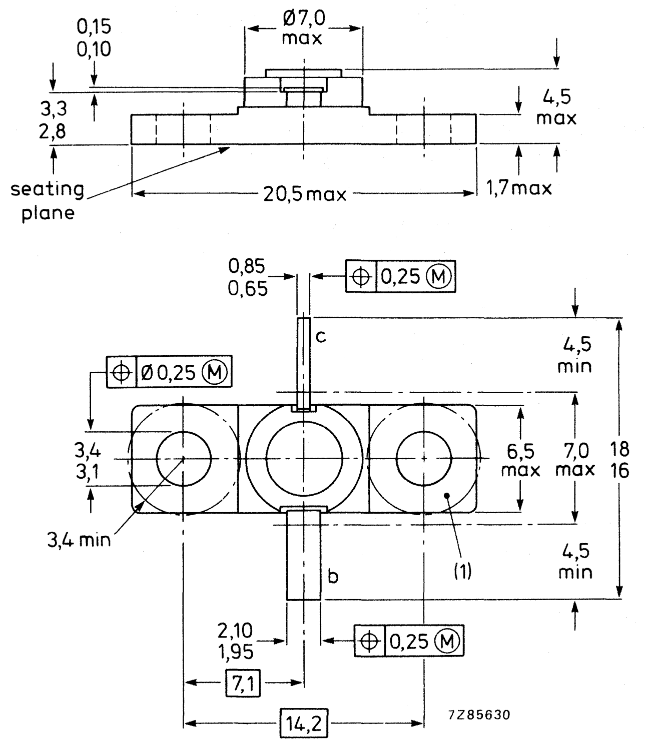
PRODUCT SAFETY

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 Ω)	V_{CER}	max.	40	V
(open base)	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 ($T_{mb} \leq 75\ ^oC$)	P_{tot}	max.	8	W
Storage temperature	T_{stg}		−65 to 200	^oC
Junction temperature	T_j	max.	200	^oC
Soldering temperature at 0,1 mm from case; $t_{sld} \leq 10$ s	T_{sld}	max.	235	^oC

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$		11	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.

An internal input matching network facilitates wideband operation.

QUICK REFERENCE DATA

R.F. performance up to T_{mb} = 25 °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	$\overline{z_i}$ Ω	$\overline{Z_L}$ 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:

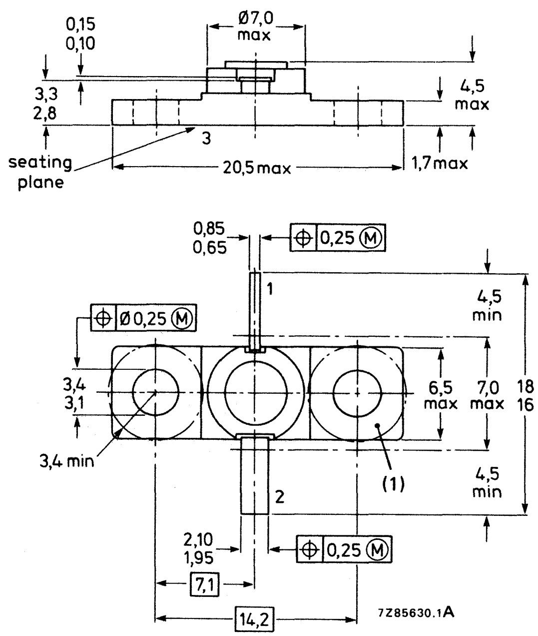
1 = collector
2 = base
3 = emitter

Torque on nut: max. 0,5 Nm

Rceommended 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 Ω	V_{CER}	max.	40	V
open base	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 °C	P_{tot}	max.	30	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; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	°C

THERMAL RESISTANCE (at T_j = 75°C)

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

MICROWAVE LINEAR POWER TRANSISTOR

NPN transistor for use in a common-emitter class-A linear power amplifier up to 3,3 GHz.

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

QUICK REFERENCE DATA

R.F. performance up to T_{mb} = 25 °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	2,7	16	200	typ. 800	typ. 9	4 + j10	4 − j3

MECHANICAL DATA

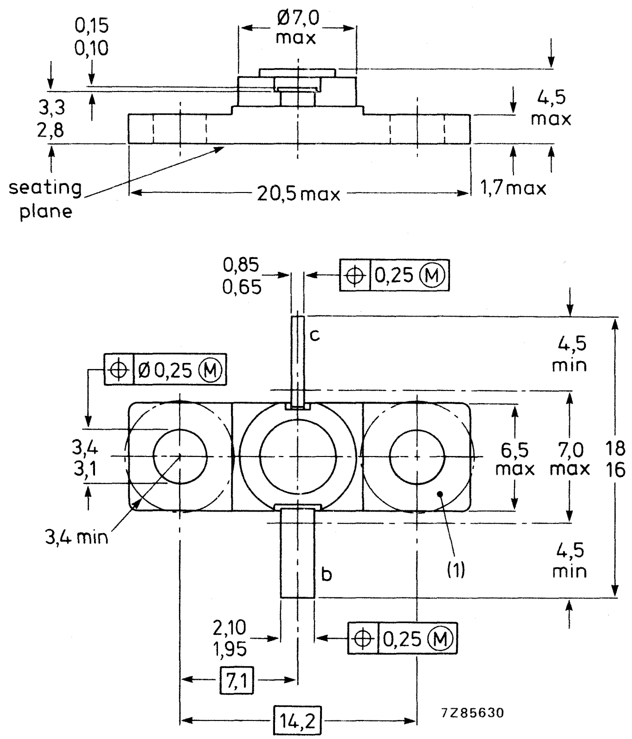
Dimensions in mm

Fig. 1 FO-53.

Emitter connected to flange.

Marking code:

174 = LKE27010R



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.	35	V
Collector-emitter voltage ($R_{BE} \leqslant 150\ \Omega$)	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; $t_{sld} \leqslant 10$ s	T_{sld}	max.	230	°C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	12	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	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 °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

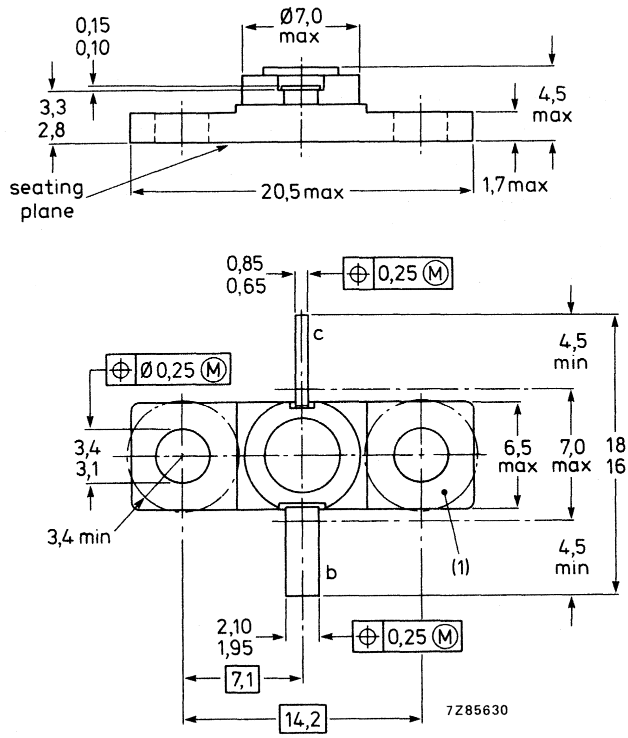
FO-53 (see Fig. 1)

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_{CBO}	max.	35	V
Collector-emitter voltage (R_{BE} = 10 Ω)	V_{CER}	max.	35	V
(open base)	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; $t_{sld} \leqslant 10$ s	T_{sld}	max.	+235	°C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	6	K/W

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 °C in an unneutralized common-emitter class-A circuit

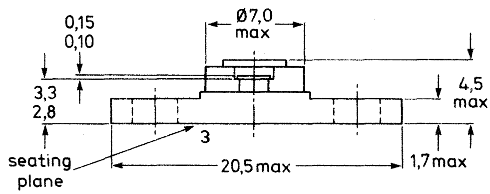
type no.	mode of operation	f GHz	V_{CE} V	I_C mA	P_{L1} mW	G_{po} dB	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω
LKE32002T	c.w.; linear amplifier	3	20	65	typ. 310	typ. 11,2	19 + j44	3,0 + j12
LKE32004T	c.w.; linear amplifier	3	20	130	typ. 710	typ. 11,0	7,5 + j22	2,5 + j5

MECHANICAL DATA

Dimensions in mm

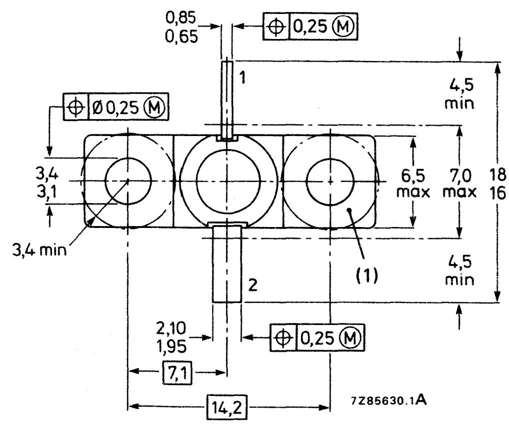
Fig. 1 FO-53.

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 Ω	V_{CER}	max.	25	25	V
open base	V_{CEO}	max.	20	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 °C	P_{tot}	max.	1,5	3	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_{sld} = 10 s	T_{sld}	max.	235		°C

THERMAL RESISTANCE

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

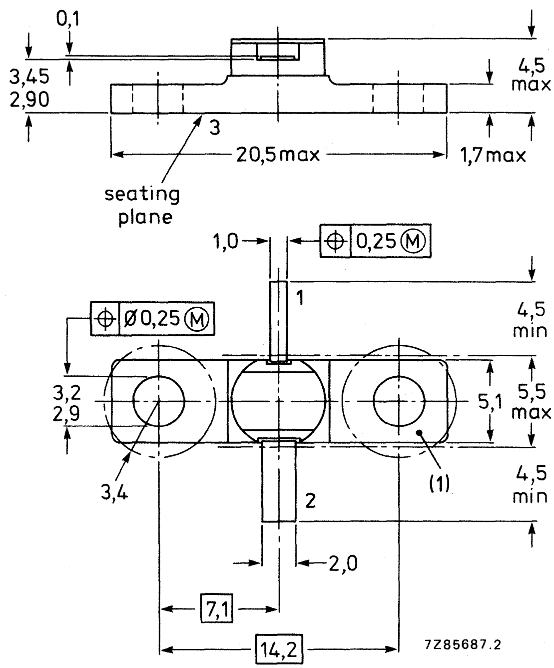
R.F. performance up to T_{mb} = 25 °C in an unneutralized common-emitter class-A circuit.

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

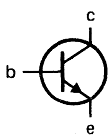
Fig. 1 FO-41B.



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			
open base	V_{CEO}	max.	16 V
$R_{BE} = 220\ \Omega$	V_{CER}	max.	35 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 $T_{mb} = 75\ ^oC$	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; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235 °C

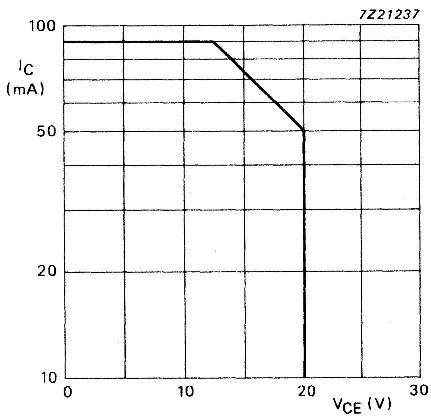


Fig. 2 D.C. SOAR at $T_{mb} \leqslant 75\ ^oC$; $R_{BE} < 220\ \Omega$.

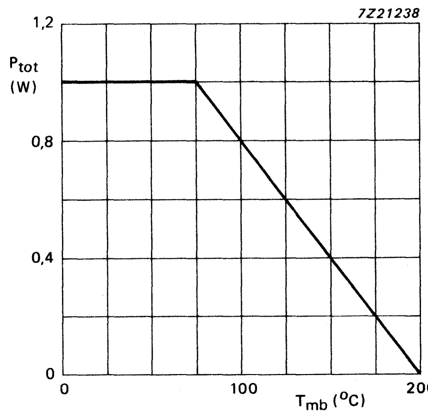


Fig. 3 Power derating curve.

THERMAL RESISTANCE (at Tj=75 °C)

From junction to mounting base	$R_{th\ j\text{-}mb}$ =	65 K/W

CHARACTERISTICS

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

Collector cut-off currents			
$I_E = 0$; $V_{CB} = 20$ V	I_{CBO}	<	100 nA
$I_E = 0$; $V_{CB} = 40$ V	I_{CBO}	<	150 μA
$V_{BC} = 35$ V; $R_{BE} = 200\ \Omega$	I_{CER}	<	500 μA
Emitter cut-off currents			
$I_C = 0$; $V_{EB} = 1{,}5$ V	I_{EBO}	<	50 nA
$I_C = 0$; $V_{EB} = 3{,}0$ V	I_{EBO}	<	25 μA
D.C. current gain			
$I_C = 30$ mA; $V_{CE} = 5$ V	h_{FE}		15 to 150

s-parameters (common-emitter)

V_{CE} = 18 V; I_C = 30 mA; T_{mb} = 25 °C; Z_O = 50 Ω; 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°

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-cermatic envelope (FO-41B).

QUICK REFERENCE DATA

R.F. performance up to T_{mb} = 25 °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)

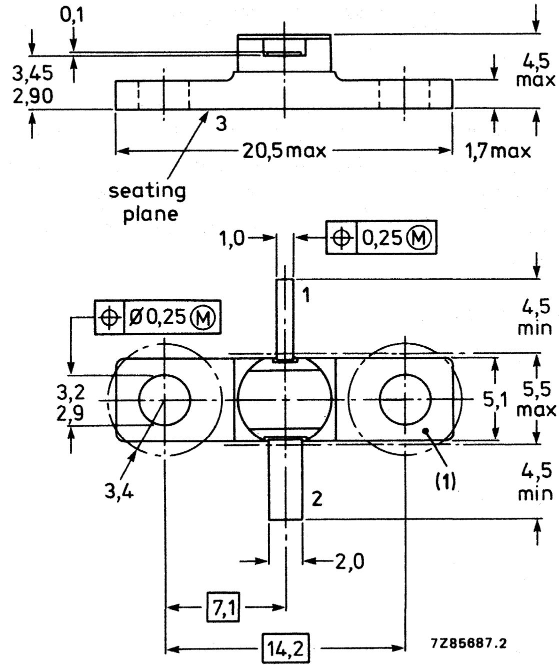
PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Dimensions in mm

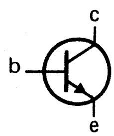
Fig. 1 FO-41B

Emitter and metallic cap are connected to the seating plane.



Pinning:

1 = collector
2 = base
3 = emitter



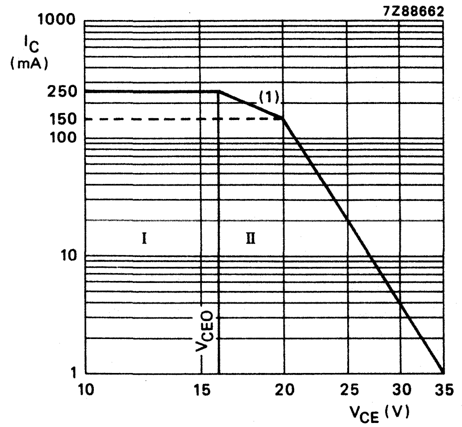
Torque on nut: max. 0,4 Nm
Recommended screw: M2,5

(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	V_{CER}	max.	35	–	V
R_{BE} = 250 Ω	V_{CER}	max.	–	20	V
open base	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; $t_{std} \leqslant 10$ s	T_{sld}	max.	235		°C



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

Fig. 2 D.C. SOAR at $T_{mb} \leqslant 75$ °C.

I Region of permisible d.c. operation.
II Permissible extension provided $R_{BE} \leqslant 100\ \Omega$.

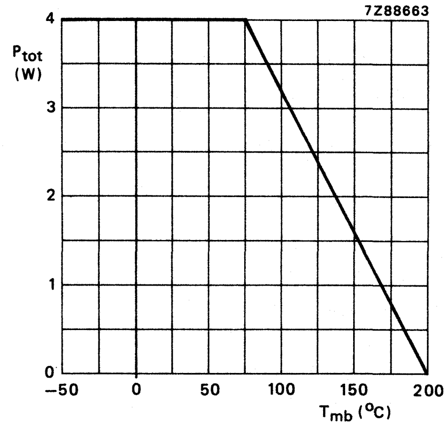
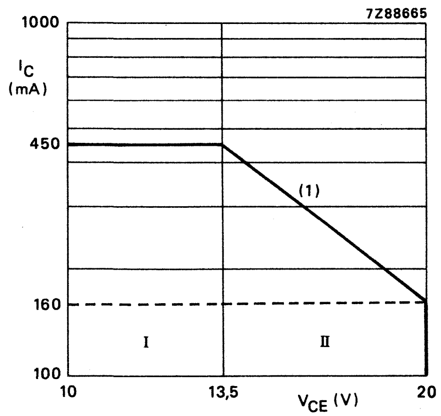


Fig. 3 Power derating curve.

DEVELOPMENT DATA



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

Fig. 4 D.C. SOAR at $T_{mb} \leqslant 75$ °C.

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

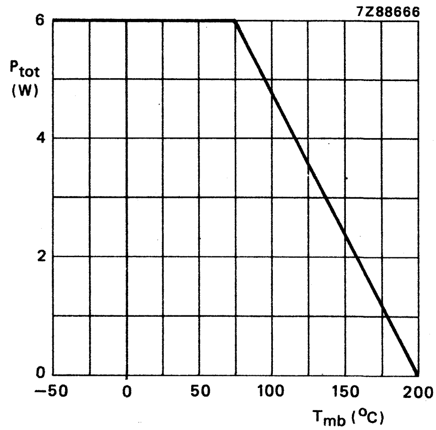


Fig. 5 Power derating curve.

THERMAL RESISTANCE (T_{mb} = 25 °C)

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

CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

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

DEVELOPMENT DATA

LTE21009R

s-parameters (common emitter)

V_{CE} = 16 V, I_C = 150 mA regulated; T_{mb} = 25 °C; Z_o = 50 Ω; 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.

LTE21015R

s-parameters (common emitter)

V_{CE} = 16 V, I_C = = 250 mA } regulated; T_{mb} = 25 °C; Z_o = 50 Ω; 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 °C in an unneutralized common-emitter class-A circuit.

Mode of operation	f GHz	V_{CC} V	I_C mA	P_{L1} W	G_{po} dB
c.w. class-A	2,1	16	400	typ. 2,8	typ. 7,8

MECHANICAL DATA

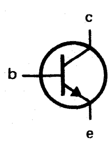
Dimensions in mm

Fig. 1 FO-41B

Emitter and metallic cap are connected to the seating plane.

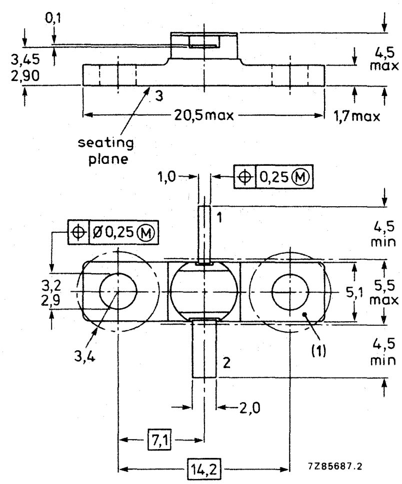
Pinning;

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 Ω	V_{CER}	max.	20 V
open base	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 °C	P_{tot}	max.	8,0 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; $t_{std} \leqslant$ 10 s	T_{sld}	max.	235 °C

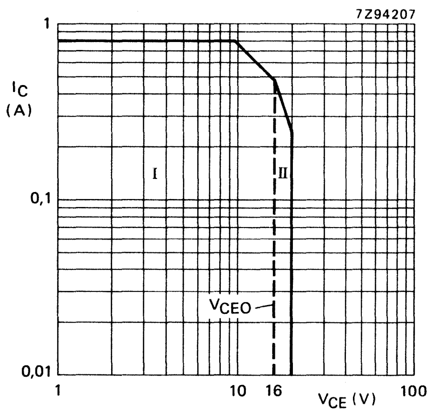


Fig. 2 D.C. SOAR at $T_{mb} \leqslant$ 75 °C.
I Region of permissible d.c. operation.
II Permissible extention provided $R_{BE} \leqslant$ 70 Ω.

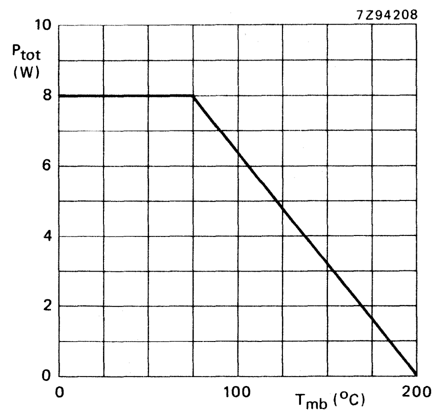


Fig. 3 Power derating curve.

THERMAL RESISTANCE (T_j = 75 °C)

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	10 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,7 K/W

CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Collector cut-off current			
$I_E = 0$; V_{CB} = 20 V	I_{CBO}	<	225 μA
$I_E = 0$; V_{CB} = 40 V	I_{CBO}	<	1,5 mA
Emitter cut-off current			
$I_C = 0$; V_{EB} = 1,5 V	I_{EBO}	<	600 nA
$I_C = 0$; V_{EB} = 3,5 V	I_{EBO}	<	0,3 mA
D.C. current gain			
I_C = 400 mA; V_{CE} = 5 V	h_{FE}	>	15
		<	150

DEVELOPMENT DATA

s-parameters (common-emitter)

Typical values; V_{CE} = 16 V; I_C = 400 mA; Z_0 = 50 Ω; T_{mb} = 25 °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 °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	$\overline{z_i}$ Ω	$\overline{Z_L}$ 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

Dimensions in mm

Fig. 1 FO-41B.

Emitter and metallic cap are connected to the seating plane.

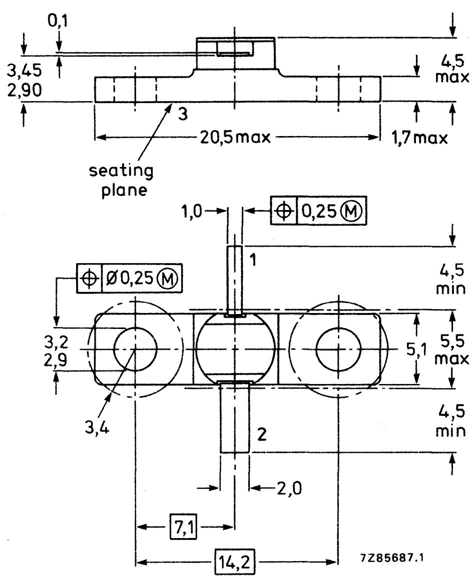
Pinning.

1 = collector
2 = base
3 = emitter

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

Marking code

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)

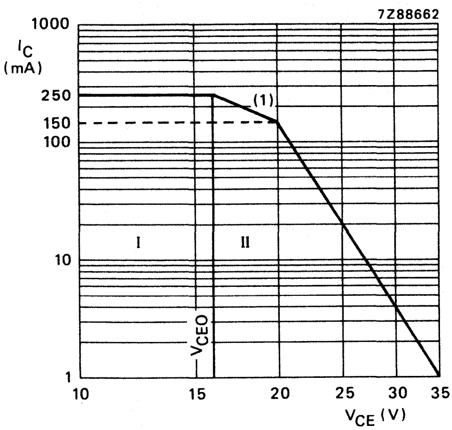
			LTE42005S	LTE42008R	
Collector-base voltage (open emitter)	V_{CBO}	max.	40	40	V
Collector-emitter voltage R_{BE} = 100 Ω	V_{CER}	max.	35	–	V
R_{BE} = 250 Ω	V_{CER}	max.	–	20	V
(open base)	V_{CEO}	max.	16	16	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3	3	V
Collector current (d.c.)	I_C	max.	250	500	mA
Total power dissipation up to T_{mb} = 75 °C	P_{tot}	max.	4	7,5	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 the case; t_{sld} = 10 s	T_{sld}	max.	235		°C

THERMAL RESISTANCE (at T_j = 75 °C)

			LTE42005S	LTE42008R	
From junction to mounting base	$R_{th\ j\text{-}mb}$	=	36	12	K/W*
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,7	0,7	K/W*

* K/W is SI unit for °C/W.

LTE42005S



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

Fig. 2 D.C. SOAR at $T_{mb} \leqslant 75$ °C.

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

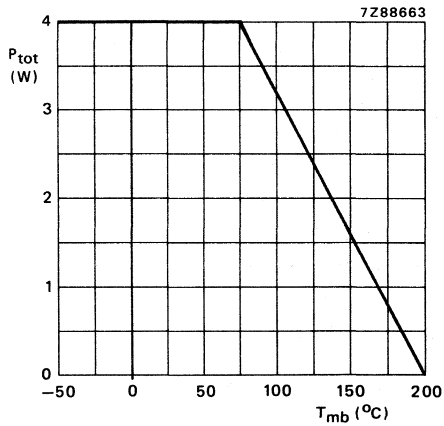
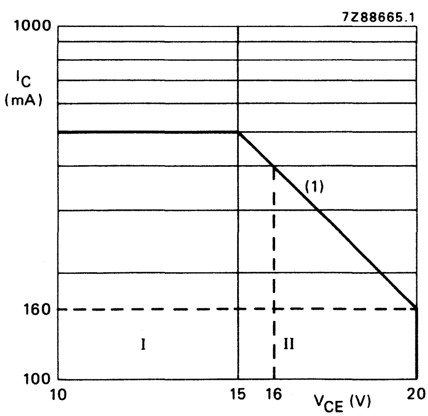


Fig. 3 Power derating curve vs. mounting base temperature.

LTE42008R



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

Fig. 4 D.C. SOAR at $T_{mb} \leqslant 75$ °C.

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

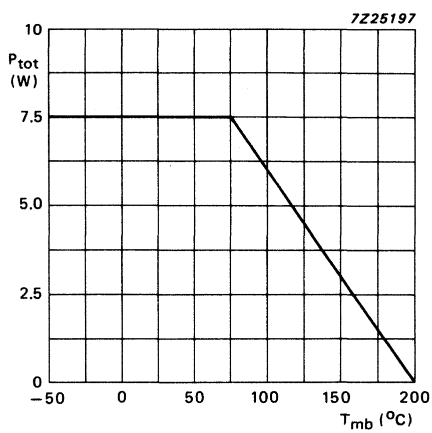


Fig. 5 Power derating curve vs. mounting base temperature.

CHARACTERISTICS

T_{mb} = 25 °C

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

LTE42005S

s-parameters (common-emitter)

V_{CE} = 18 V, I_C = 110 mA regulated; T_{mb} = 25 °C; Z_o = 50 Ω; 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 V, I_C = 250 mA regulated; T_{mb} = 25 °C; Z_o = 50 Ω; 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 °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	≥ 450(26,5) typ. 550(27,4)	≥ 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_{LI}.

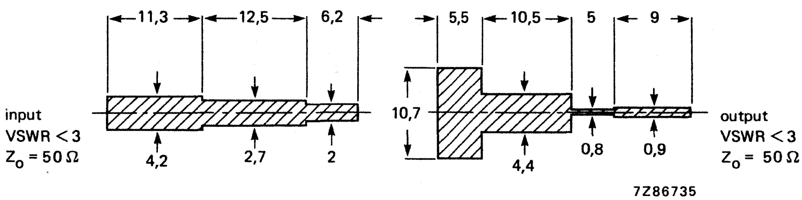


Fig. 6 Prematching test circuit board for 4,2 GHz. (Dimensions in mm.)

Input striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric (ϵ_r = 2,54); thickness 1,6 mm.
Output striplines on a double Cu=clad Rexolite printed-circuit board with dielectric (ϵ_r = 2,4); thickness 0,25 mm.

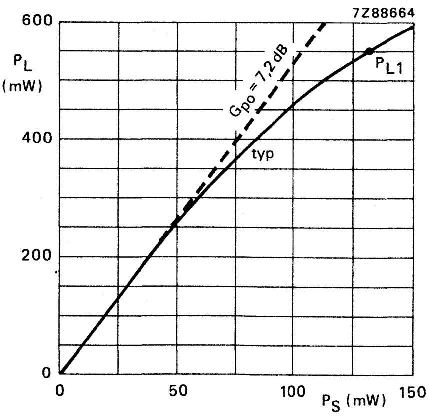


Fig. 7 Load power as a function of source power. f = 4,2 GHz; T_{mb} = 25 °C;
V_{CE} = 18 V, I_C = 110 mA } regulated

* 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 °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	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω
→ 4,2	16	250	≥ 800(29) typ. 940(29,7)	≥ 7 typ. 7,5	7,5 + j 23,5	2,5–j 9

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}.

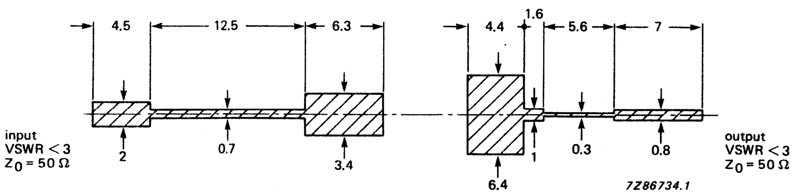


Fig. 8 Prematching test circuit board for 4,2 GHz. (Dimensions in mm.)

Input striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric (ϵ_r = 2,54); thickness 0,8 mm.
Output striplines on a double Cu-clad Rexolite printed-circuit board with dielectric (ϵ_r = 2,4); thickness 0,25 mm.

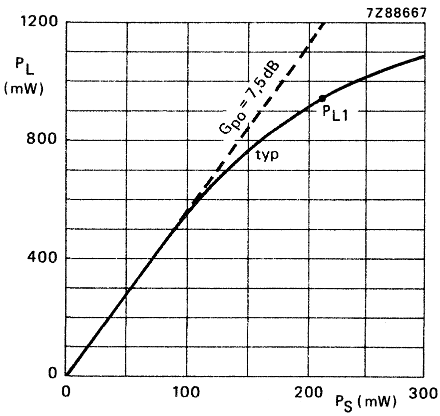


Fig. 9 Load power as a function of source power at 4,2 GHz.

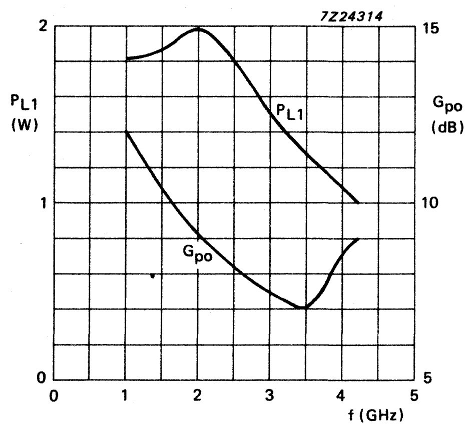


Fig. 10 Load power and power gain, associated with 1 dB compressed power gain, as a function of frequency.

Conditions for Figs 9 and 10:

V_{CE} = 16 V
I_C = 250 mA } regulated; typical values; T_{mb} = 25 °C.

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

LTE42008R

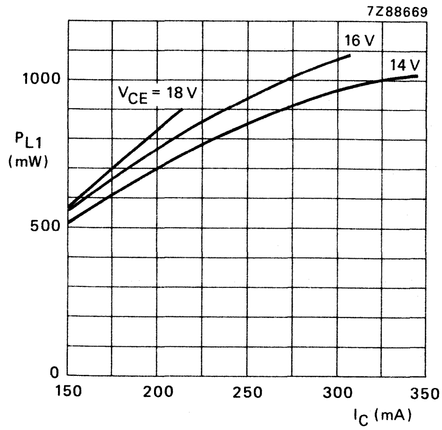


Fig. 11 Load power associated with 1 dB compressed power gain, as a function of collector current.

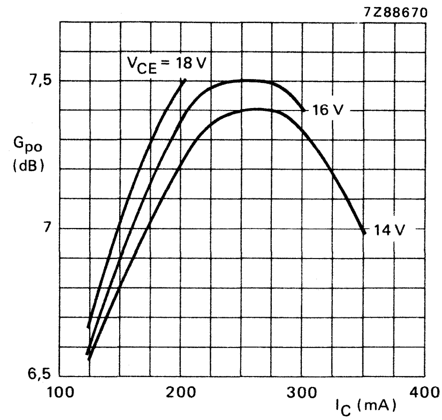


Fig. 12 Low-level power gain associated with P_{L1} as a function of collector current.

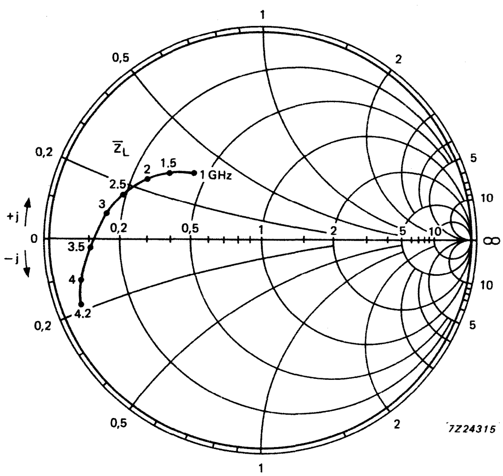


Fig. 14 Optimum load impedance as a function of frequency for P_{L1}.

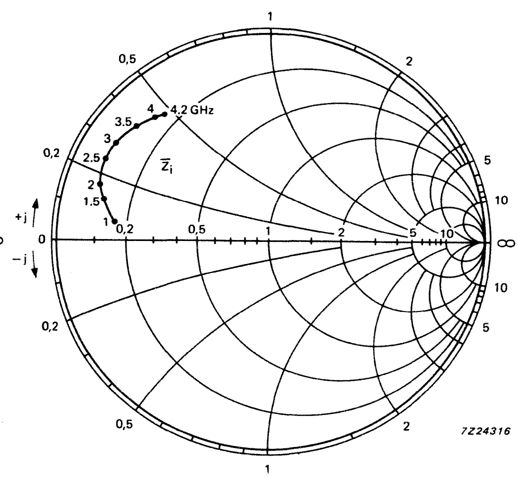


Fig. 13 Input impedance as a function of frequency for P_{L1}.

Conditions for Figs 11 and 12:

V_{CE} and I_C regulated; typical values; T_{mb} = 25 °C.

Conditions for Figs 13 and 14:

V_{CE} = 16 V, I_C = 250 mA } regulated; typical values; Z_o = 50 Ω; T_{mb} = 25 °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 ^{o}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	$\overline{z_i}$ Ω	$\overline{Z_L}$ 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

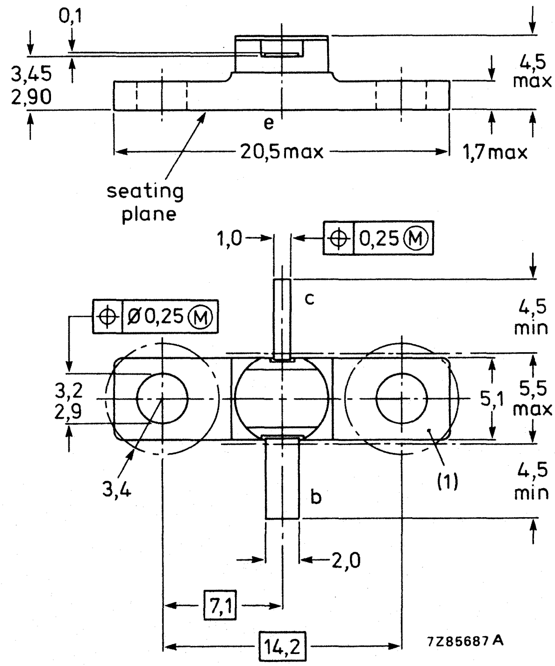
This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

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; $t_{sld} \leqslant$ 10 s	T_{sld}	max.	235 °C

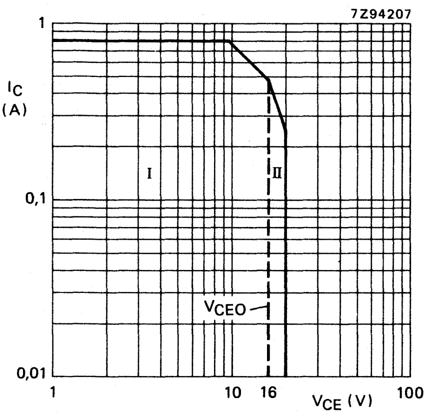


Fig. 2 D.C. SOAR; $T_{mb} \leqslant$ 75 °C.
I Region of permissible d.c. operation
II Permissible extension provided
1 $R_{BE} \leqslant$ 70 Ω

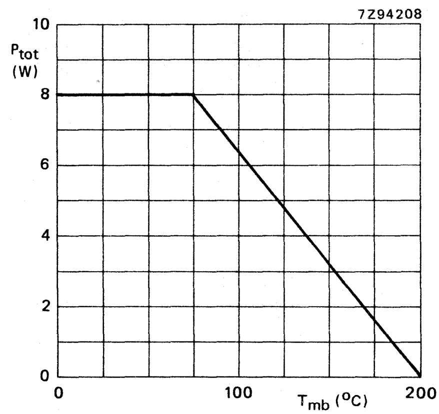


Fig. 3 Power derating curve versus mounting base temperature.

THERMAL RESISTANCE (at T_j = 75 °C)

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	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 V; I_C = 400 mA; Z_O = 50 Ω; T_{mb} = 25 °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 °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

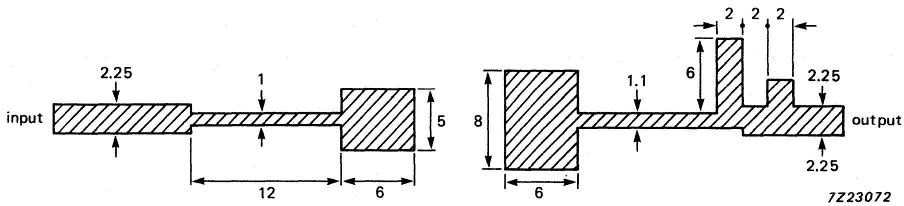


Fig. 4 Premathing test circuit board for c.w.; class-A application (dimensions in mm).

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

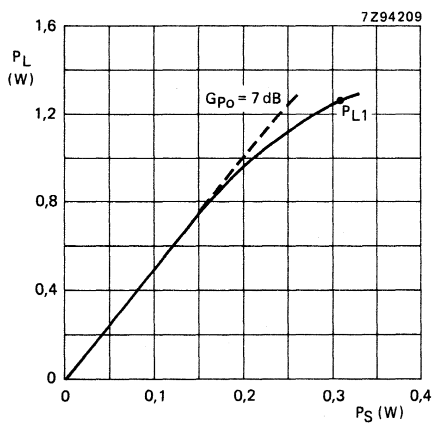


Fig. 5 Load power as a function of input power; f = 4,2 GHz; V_{CE} = 16 V; I_C = 400 mA regulated.

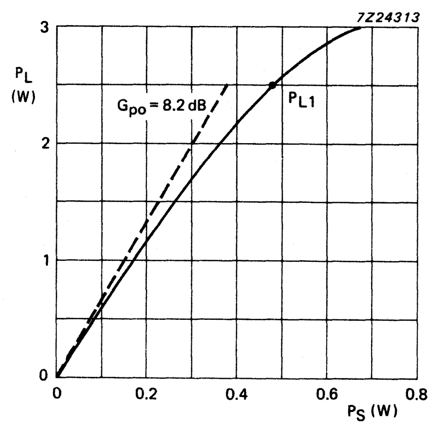


Fig. 6 Load power as a function of input power; f = 2 GHz; V_{CE} = 16 V; I_C = 400 mA regulated.

* 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 °C in an unneutralized common-emitter class-A circuit

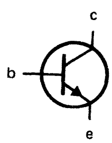
type number	mode of operation	f GHz	V_{CC} V	I_C mA	P_{L1} mW	G_{po} dB
LUE2003S	c.w. class-A	2,0	18	30	typ. 250	typ. 11
LUE2009S	c.w. class-A	2,0	18	110	typ. 900	typ. 9,8

MECHANICAL DATA

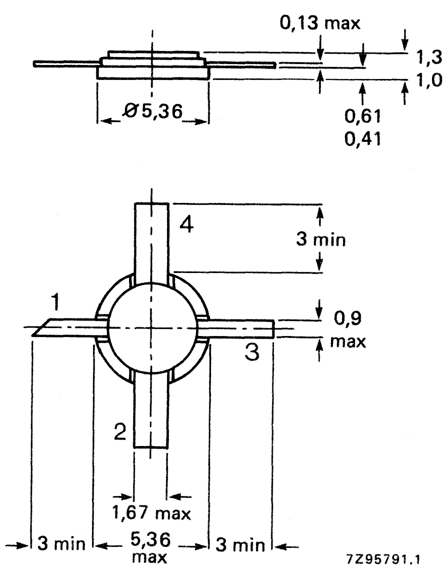
Dimensions in mm

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_{CBO}	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; $t_{std} \leqslant 10$ s	T_{sld}	max.	235		°C

LUE2003S

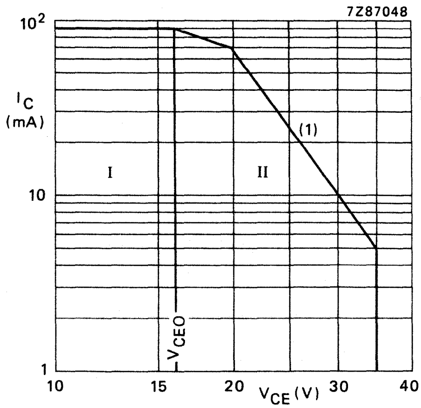


Fig. 2 DC SOAR at $T_{mb} \leqslant 75$ °C.

(1) Second breakdown limit (independent of temperature)

I Region of permissible DC operation.

II Permissible extention provided $R_{BE} \leqslant 220\ \Omega$.

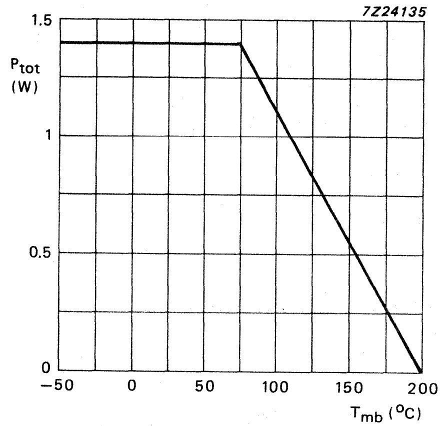


Fig. 3 Power derating curve as a function of base temperature.

LUE2009S

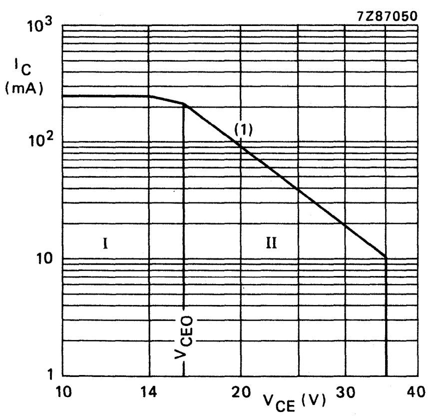


Fig. 4 DC SOAR at $T_{mb} \leqslant 75$ °C.

(1) Second breakdown limit (independent of temperature)

I Region of permissible DC operation.

II Permissible extention provided $R_{BE} \leqslant 100\ \Omega$.

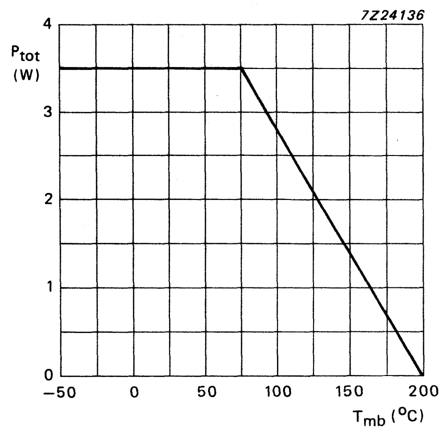


Fig. 5 Power derating curve as a function of base temperature.

THERMAL RESISTANCE (at T_j = 75 °C)

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

CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

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

LUE2003S

s-parameters (common-emitter)

V_{CE} = 18 V; I_C = 30 mA; T_{mb} = 25 °C; Z_O = 50 Ω; 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 V; I_C = 110 mA; T_{mb} = 25 °C; Z_O = 50 Ω; 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 °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	$\overline{z_i}$ Ω	$\overline{Z_l}$ Ω
c.w.; class-A	1,7 to 2,1	16	1,1	typ. 5,5	typ. 8	see Fig. 6	

MECHANICAL DATA

Dimensions in mm

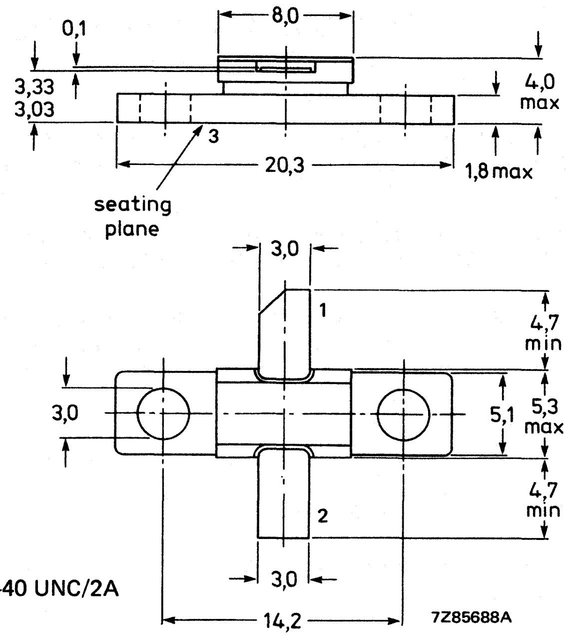
FO-83 (see Fig. 1).

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

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	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.	2 A
Total power dissipation			
up to T_{mb} = 75 °C	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; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235 °C

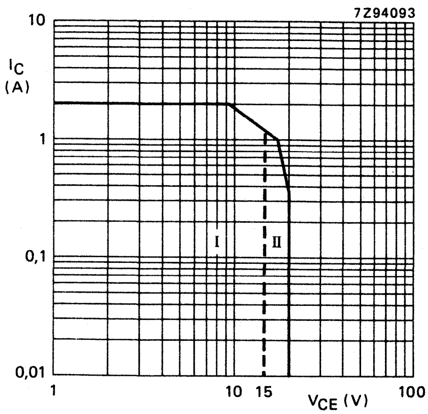


Fig. 2 D.C. SOAR; $T_{mb} \leqslant 75$ °C.
I Region of permissible d.c. operation
II Permissible extension provided
$R_{BE} \leqslant 47\ \Omega$.

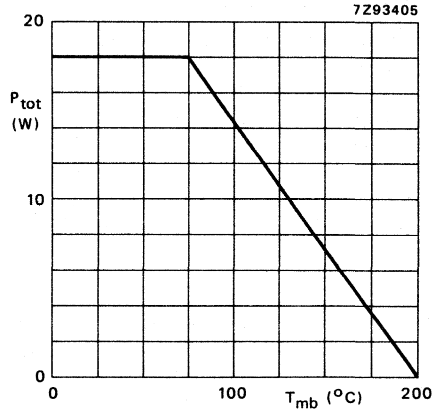


Fig. 3 Power derating curve versus mounting base temperature.

THERMAL RESISTANCE (at $T_j = 75$ °C)

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

CHARACTERISTICS

$T_{mb} = 25$ °C unless otherwise specified

Collector cut-off currents			
$I_E = 0$; $V_{CB} = 20$ V	I_{CBO}	≤	0,5 mA
$I_E = 0$; $V_{CB} = 40$ V	I_{CBO}	≤	2,5 mA
$V_{CE} = 20$ V; $R_{BE} = 47\ \Omega$	I_{CER}	≤	25 mA
$V_{CE} = 15$ V; $I_B = 0$	I_{CEO}	≤	2 mA
Emitter cut-off current			
$I_C = 0$; $V_{EB} = 1,5$ V	I_{EBO}	≤	100 µA
$I_C = 0$; $V_{EB} = 3,5$ V	I_{EBO}	≤	500 µA
D.C. current gain			
$I_C = 1$ A; $V_{CE} = 3$ V	h_{FE}		15 to 100

APPLICATION INFORMATION

Microwave performance up to T_{mb} = 25 °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	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω
c.w.; class-A	1,7 to 2,1	16	1,1	⩾ 5	⩾ 7	see Fig. 6	

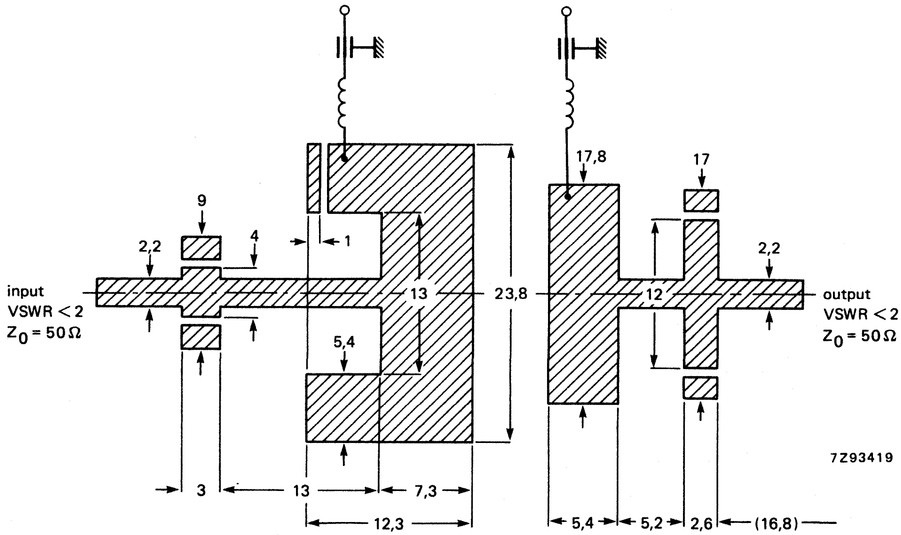


Fig. 4 Wideband test circuit board for 1,7 to 2,1 GHz, c.w., class-A application (Dimensions in mm).

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

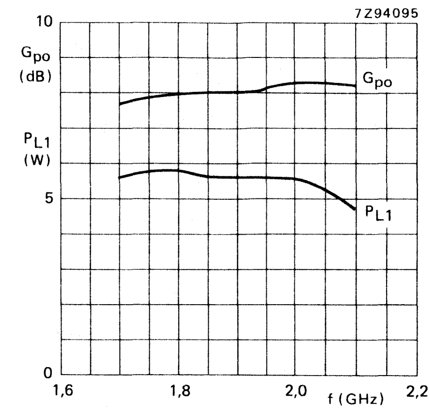


Fig. 5 Load power and power gain versus frequency; V_{CE} = 16 V; I_C = 1,1 A; V_{CE} and I_C regulated.

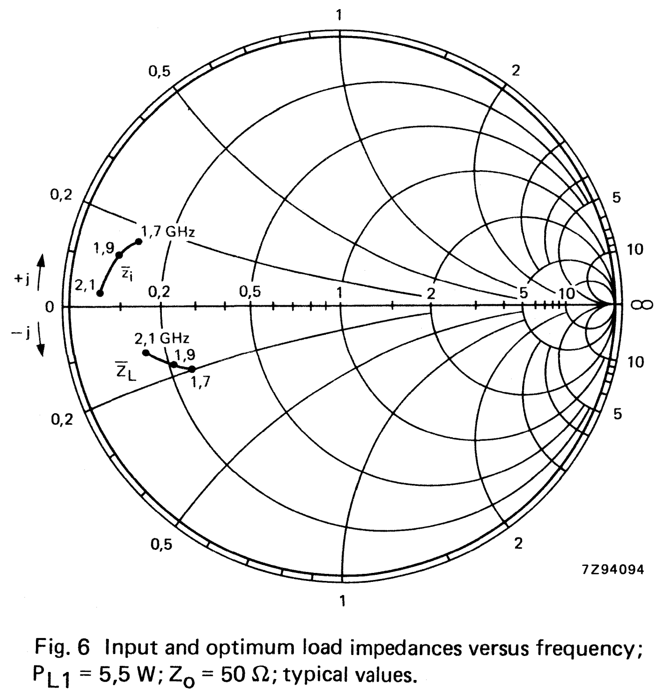


Fig. 6 Input and optimum load impedances versus frequency; P_{L1} = 5,5 W; Z_o = 50 Ω; typical values.

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 °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	$\overline{z_i}$ Ω	$\overline{Z_L}$ 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

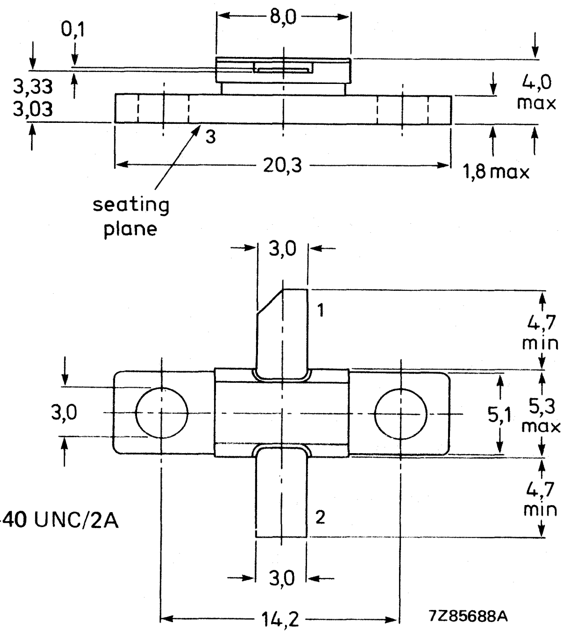
FO-83 (see Fig. 1).

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			
open base	V_{CEO}	max.	15 V
$R_{BE} = 47\ \Omega$	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 $T_{mb} = 75\ ^oC$	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; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235 °C

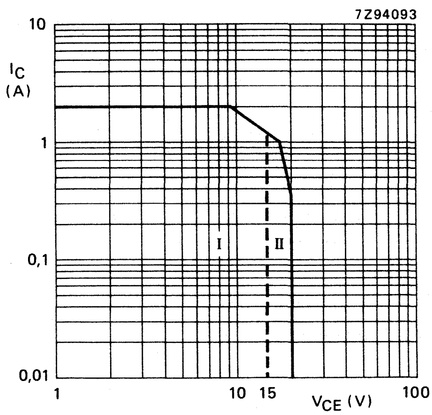


Fig. 2 D.C. SOAR; $T_{mb} \leqslant 75\ ^oC$.

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

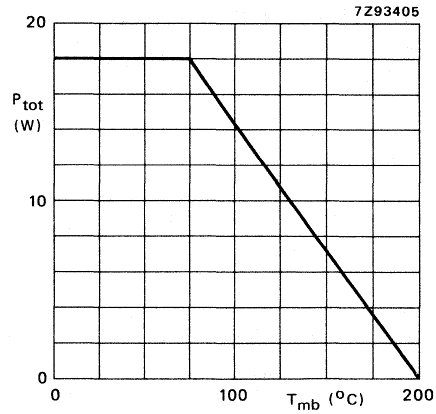


Fig. 3 Power derating curve versus mounting base temperature.

THERMAL RESISTANCE (at $T_j = 75\ ^oC$)

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

CHARACTERISTICS

$T_{mb} = 25\ ^oC$ unless otherwise specified

Collector cut-off currents			
$I_E = 0$; $V_{CB} = 20$ V	I_{CBO}	$\leqslant$	0,5 mA
$I_E = 0$; $V_{CB} = 40$ V	I_{CBO}	$\leqslant$	2,5 mA
$V_{CE} = 20$ V; $R_{BE} = 47\ \Omega$	I_{CER}	$\leqslant$	25 mA
$V_{CE} = 15$ V; $I_B = 0$	I_{CEO}	$\leqslant$	2 mA
Emitter cut-off current			
$I_C = 0$; $V_{EB} = 1,5$ V	I_{EBO}	$\leqslant$	100 μA
$I_C = 0$; $V_{EB} = 3,5$ V	I_{EBO}	$\leqslant$	500 μA
D.C. current gain			
$I_C = 1$ A; $V_{CE} = 3$ V	h_{FE}		15 to 100

APPLICATION INFORMATION

Microwave performance up to T_{mb} = 25 °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	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω
c.w.; class-A	2,0 to 2,4	16	1,1	≥ 4	≥ 6	see Fig. 6	

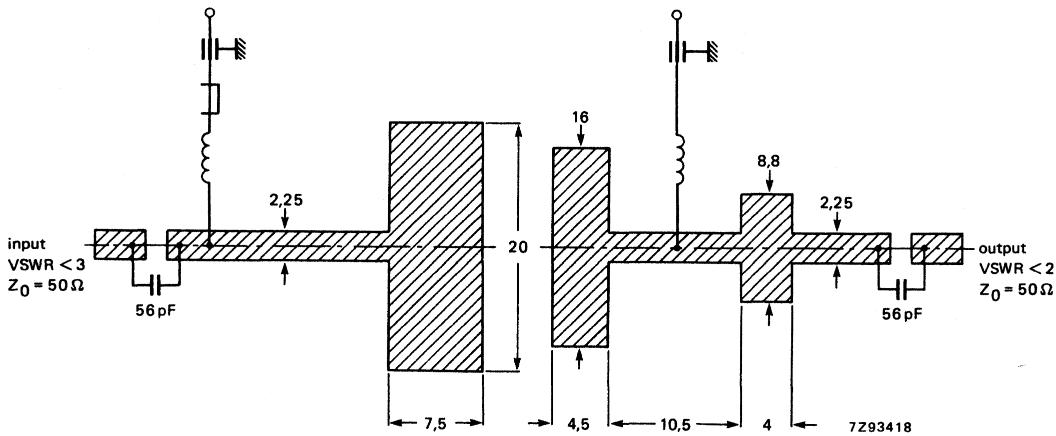


Fig. 4 Wideband test circuit board, class-A application. (Dimensions in mm).

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

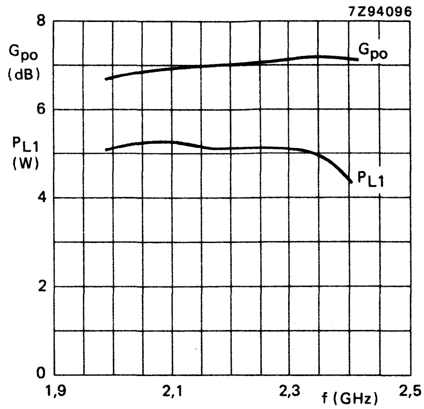


Fig. 5 Load power and power gain versus frequency; V_{CE} = 16 V; I_C = 1,1 A; V_{CE} and I_C regulated.

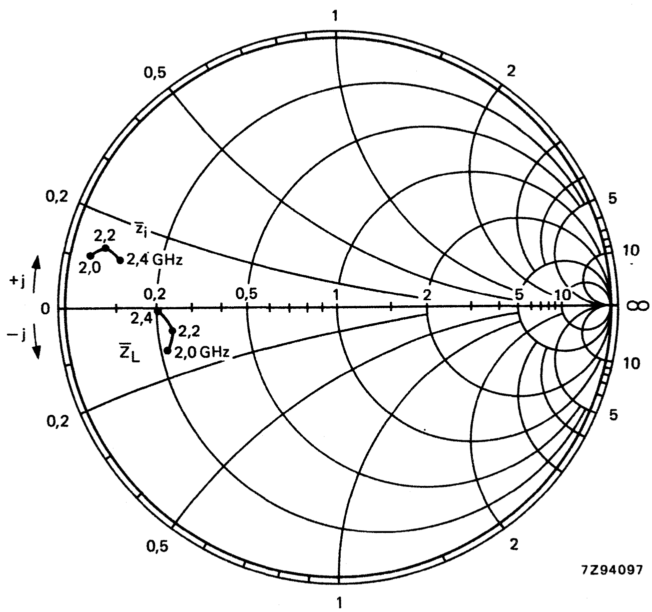


Fig. 6 Input and optimum load impedance versus frequency; Z_o = 50 Ω; typical values.

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_{case} = 25 °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	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω
c.w.; linear amplifier	2,3 to 2,7	16	1	typ. 5	typ. 8	11 + j3	7,5–j9

MECHANICAL DATA

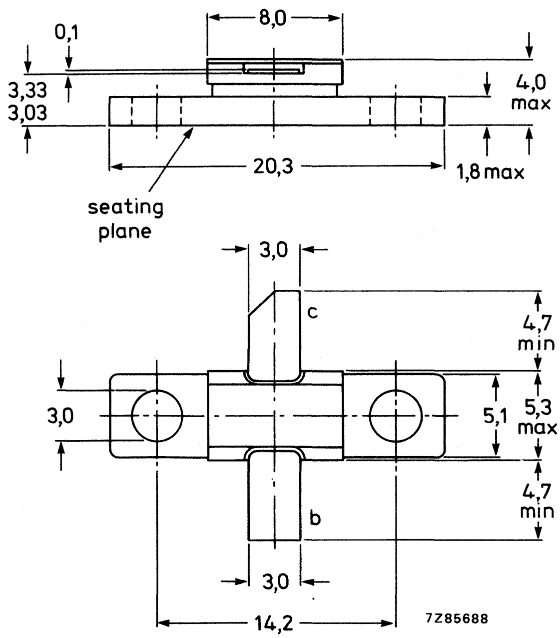
Dimensions in mm

Fig. 1 FO-83.

Metallic cap is connected to the flange

Torque on nut: max. 0,4 Nm

Recommended screw: M2,5



Marking code

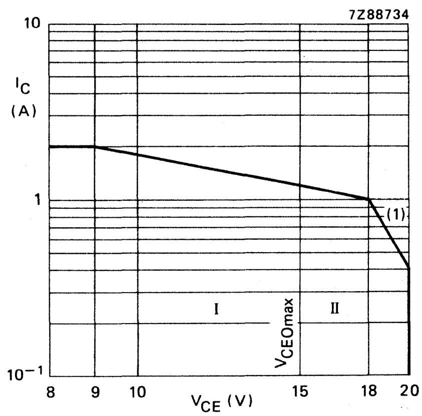
RTC2327E40R = LV2327E40R

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			
R_{BE} = 47 Ω	V_{CER}	max.	20 V
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 °C	P_{tot}	max.	18 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; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235 °C



(1) Second breakdown limit
(independent of temperature)

Fig. 2 D.C. SOAR at $T_{mb} \leqslant 75$ °C.

I Region of permissible d.c. operation.
II Permissible extension provided $R_{BE} \leqslant 47$ Ω.

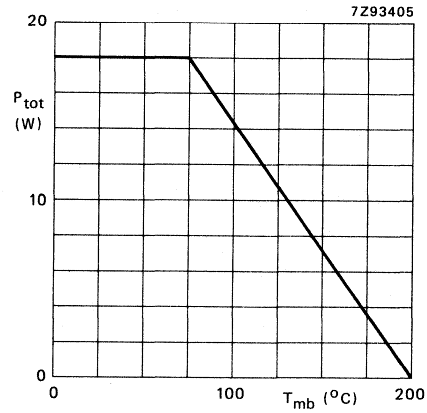


Fig. 3 Power derating curve versus mounting base temperature.

THERMAL RESISTANCE (at T_j = 75 °C)

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

CHARACTERISTICS

T_{case} = 25 °C unless otherwise specified

Collector cut-off currents			
V_{CB} = 20 V; I_E = 0	I_{CBO}	⩽	0,5 mA
V_{CB} = 40 V; I_E = 0	I_{CBO}	⩽	2,5 mA
V_{CE} = 20 V; R_{BE} = 47 Ω	I_{CER}	⩽	25 mA ←
V_{CE} = 15 V; I_B = 0	I_{CEO}	⩽	2 mA
Emitter cut-off current			
V_{EB} = 1,5 V; I_C = 0	I_{EBO}	⩽	100 μA
V_{EB} = 3,5 V; I_C = 0	I_{EBO}	⩽	500 μA
D.C. current gain			
V_{CE} = 3 V; I_C = 1 A	h_{FE}	⩾ ⩽	15 100

APPLICATION INFORMATION

R.F. performance in c.w. operation up to T_{case} = 25 °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	$\overline{z_i}$ Ω	$\overline{Z_L}$ 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}.

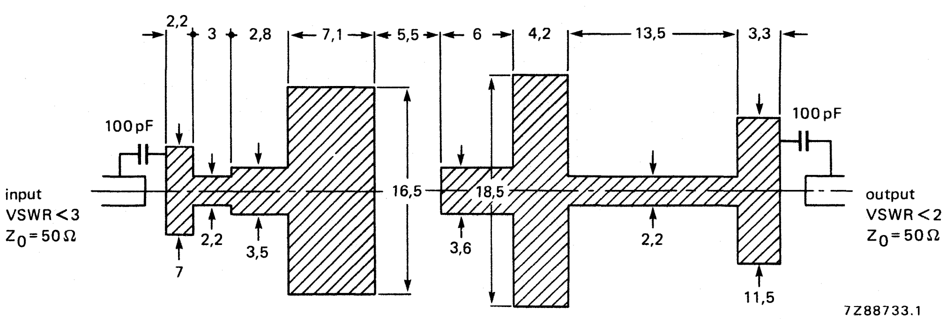


Fig. 4 Wideband test circuit board for 2,3 to 2,7 GHz. (Dimensions in mm). ←

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

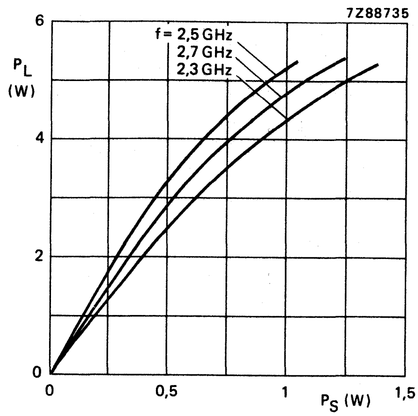


Fig. 5 Load power as a function of source power.

Conditions for Fig. 5:

V_{CE} = 16 V
I_C = 1 A
} regulated; typical values; T_{case} = 25 °C.

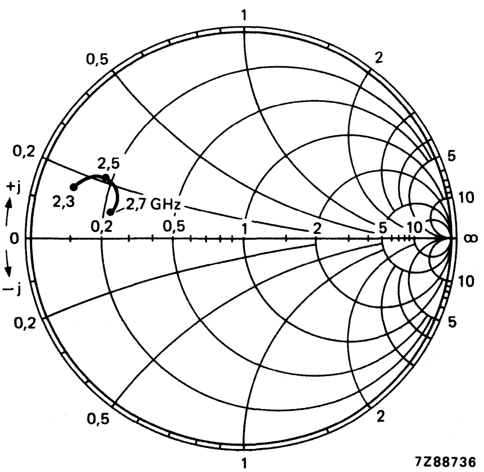


Fig. 6 Input impedance as a function of frequency for P_{L1}.

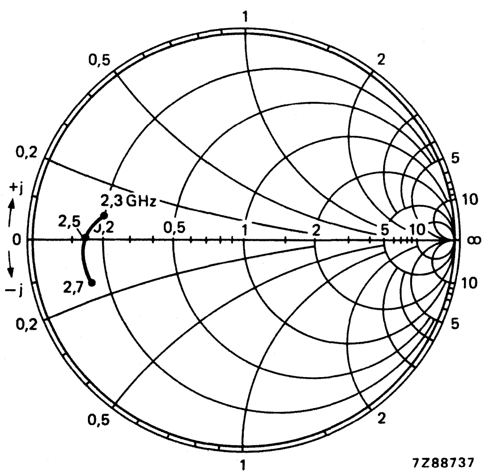


Fig. 7 Optimum load impedance as a function of frequency for P_{L1}.

Conditions for Figs 6 and 7:

V_{CE} = 16 V
I_C = 1 A
} regulated; typical values; Z_o = 50 Ω; T_{case} = 25 °C.

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 °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	$\overline{z_i}$; $\overline{Z_L}$
class-A CW	2.9 to 3.1	18	1.0	typ. 5	typ. 6.5	see Fig. 6

MECHANICAL DATA

Dimensions in mm

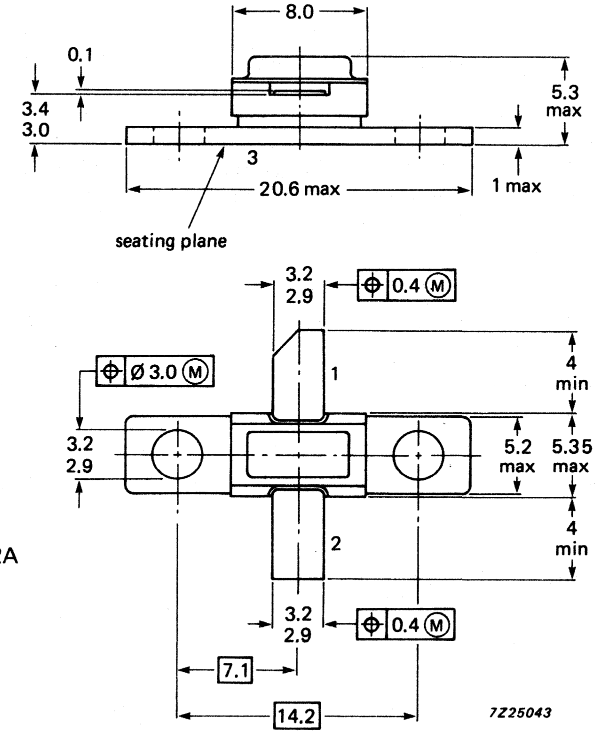
FO-83B (see Fig. 1)

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.

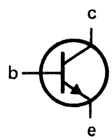
MECHANICAL DATA

Dimensions in mm

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

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} = 100 Ω	V_{CER}	max.	20 V
open base	V_{CEO}	max.	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 °C	P_{tot}	max.	20 W
Storage temperature range	T_{stg}		−65 to +200 °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 °C)

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

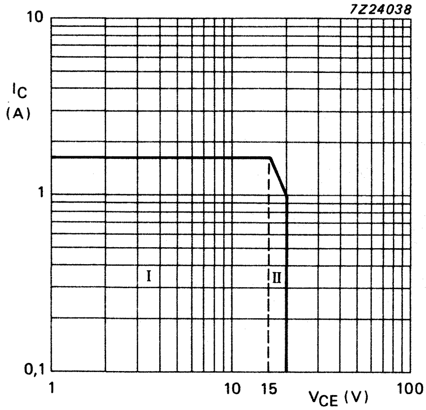


Fig. 2 DC SOAR at T_{mb} = 75 °C

I Region of permissible DC operation

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

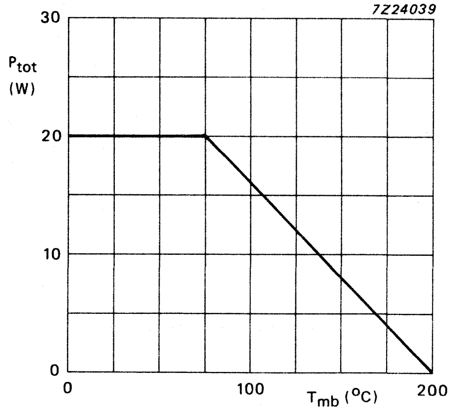


Fig. 3 Power derating curve.

DEVELOPMENT DATA

CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Collector cut-off currents			
V_{CB} = 40 V; I_E = 0	I_{CBO}	$\leqslant$	6.0 mA
V_{CB} = 30 V; I_E = 0	I_{CBO}	$\leqslant$	60 μA
V_{CE} = 20 V; R_{BE} = 100 Ω	I_{CER}	$\leqslant$	100 μA
V_{CE} = 15 V; I_B = 0	I_{CEO}	$\leqslant$	600 μA
Emitter cut-off currents			
V_{EB} = 1.5 V; I_C = 0	I_{EBO}	$\leqslant$	6 μA
V_{EB} = 3.5 V; I_C = 0	I_{EBO}	$\leqslant$	60 μA
DC current gain			
V_{CE} = 5 V; I_C = 1 A	h_{FE}	$\geqslant$	15
		$\leqslant$	150

APPLICATION INFORMATION

Microwave performance up to T_{mb} = 25 °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	$\geqslant$4.5	$\geqslant$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)

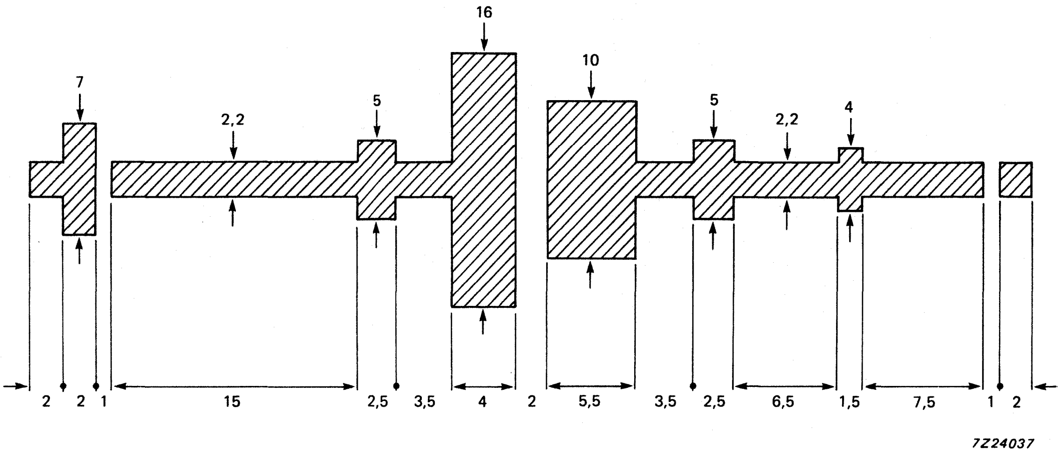


Fig. 4 Broadband test circuit for 2.9 to 3.1 GHz (dimensions in mm).
Double Cu clad p.c. board with PTFE fibreglass dielectric,
thickness 0.8 mm, ϵ_r = 2.54.

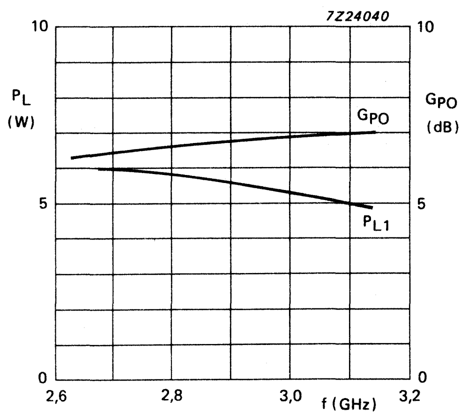


Fig. 5 Load power and power gain as a function of frequency.

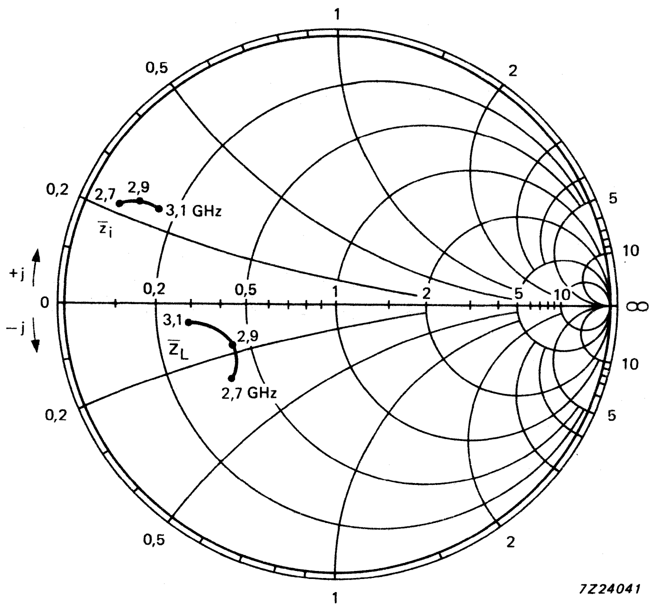


Fig. 6 Input and optimum load impedances as a function of frequency; P_{L1} = 5 W; Z_O = 50 Ω.

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 °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	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω
c.w.; class-A	3,7 to 4,2	16	500	typ. 2	typ. 5,5	see Fig. 6	

MECHANICAL DATA

Dimensions in mm

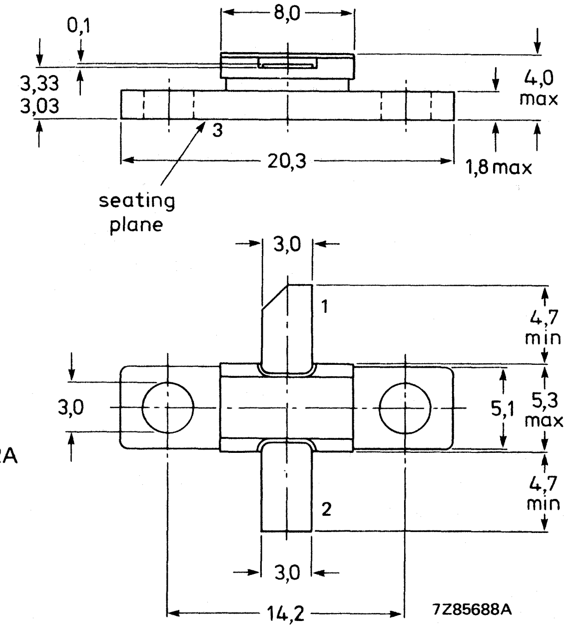
FO-83 (see Fig. 1).

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 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.	16 V
$R_{BE} = 10\ \Omega$	V_{CER}	max.	20 V
Emitter-base voltage, open collector	V_{EBO}	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; $t_{sld} \leqslant 10$ 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	$\overline{z_i}$ Ω	$\overline{Z_L}$ 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

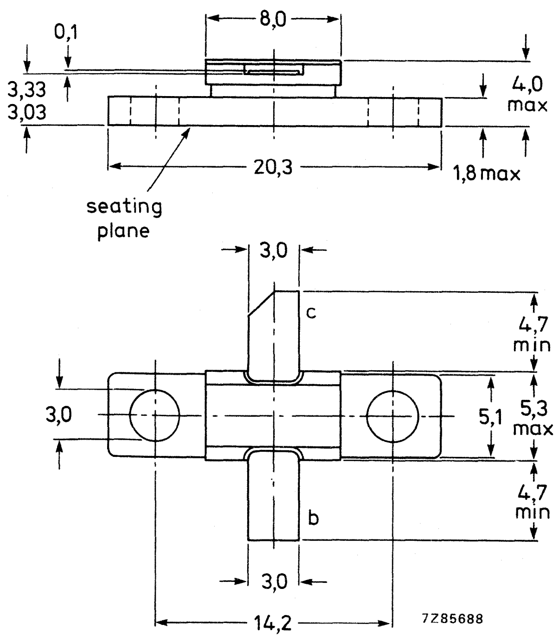
Dimensions in mm

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

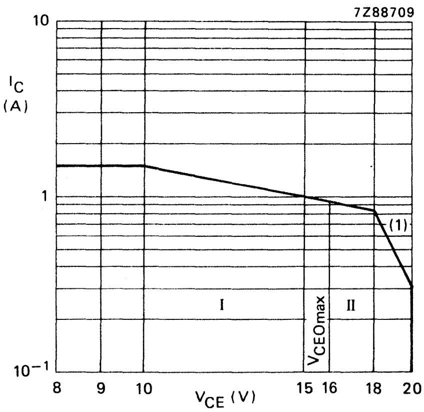
PRODUCT SAFETY

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 Ω	V_{CER}	max.	20 V
open base	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 °C	P_{tot}	max.	15 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; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235 °C



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

Fig. 2 D.C. SOAR at $T_{mb} \leqslant 75$ °C.

I Region of permissible d.c. operation.
II Permissible extension provided $R_{BE} \leqslant 47$ Ω.

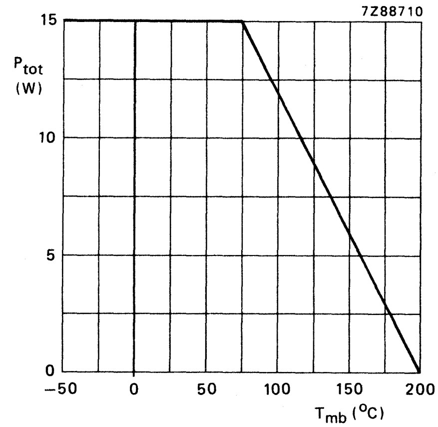


Fig. 3 Power derating curve vs. mounting base temperature.

→ **THERMAL RESISTANCE** (at T_j = 75 °C)

From junction to mounting base	$R_{th\ j\text{-}mb}$ =	5 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$ =	0,7 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 °C in an unneutralized common-emitter class-A circuit.

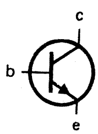
Mode of operation	f GHz	V_{CC} V	I_C A	P_{L1} W	G_{po} dB
c.w. class-A	2,1	16	1,1	typ. 5,5	typ. 8,0

MECHANICAL DATA

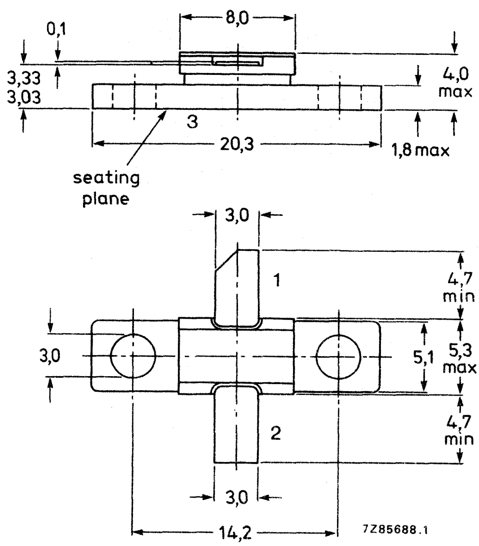
Dimensions in mm

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 Ω	V_{CER}	max.	20 V
open base	V_{CEO}	max.	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 °C	P_{tot}	max.	18 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; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235 °C

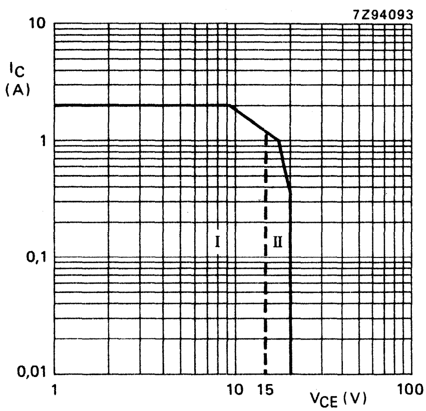


Fig. 2 D.C. SOAR at $T_{mb} \leqslant 75$ °C.

I Region of permissible d.c. operation.

II Permissible extention provided $R_{BE} \leqslant 47\ \Omega$.

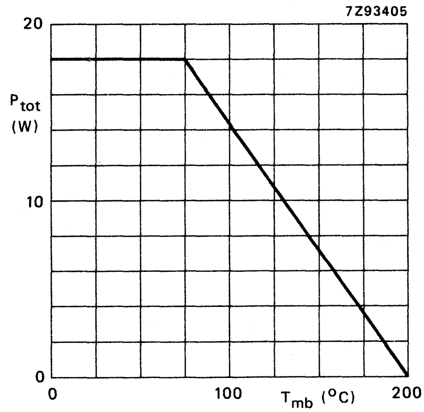


Fig. 3 Power derating curve.

THERMAL RESISTANCE (T_j = 75 °C)

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

CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Collector cut-off current		
I_E = 0; V_{CB} = 20 V	I_{CBO}	max. 500 μA
I_E = 0; V_{CB} = 40 V	I_{CBO}	max. 3 mA
Emitter cut-off current		
I_C = 0; V_{EB} = 1,5 V	I_{EBO}	max. 10 μA
I_C = 0; V_{EB} = 3,5 V	I_{EBO}	max. 0,5 mA
D.C. current gain		
I_C = 1100 mA; V_{CE} = 5 V	h_{FE}	15 to 100

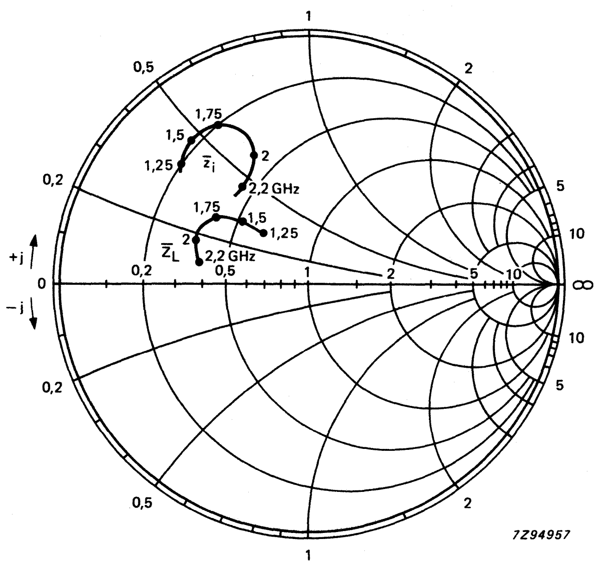


Fig. 4 Input and optimum load impedance as a function of frequency; Z_0 = 10 Ω; typical values.

DEVELOPMENT DATA

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 °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	$\overline{z_i}$ Ω	$\overline{Z_L}$ 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

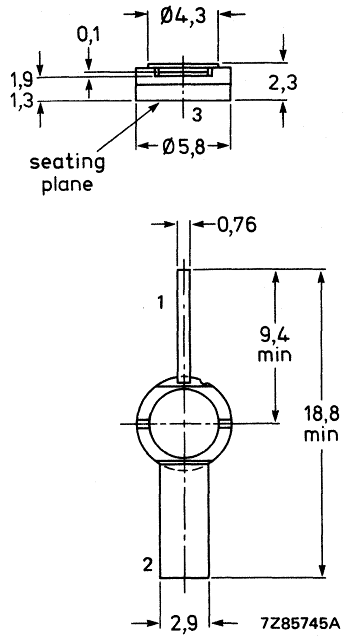
FO-93 (see Fig. 1).

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

Dimensions in mm

Fig. 1 FO-93.



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 Ω	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 °C	P_{tot}	max.	6	W
Storage temperature	T_{stg}	−65 to + 200		°C
Junction temperature	T_j	max.	200	°C
Soldering temperature at 0,1 mm from case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	°C

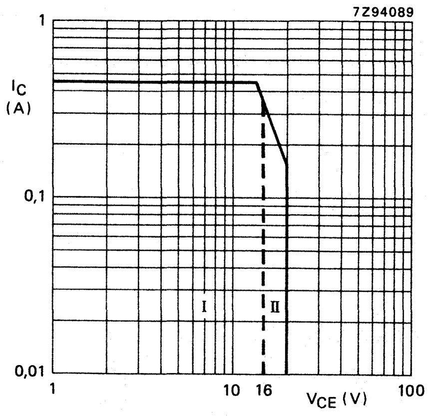


Fig. 2 D.C. SOAR; $T_{mb} \leqslant 75\ ^{o}C$.

I Region of permissible d.c. operation

II Permissible extension at $R_{BE} \leqslant 70\ \Omega$.

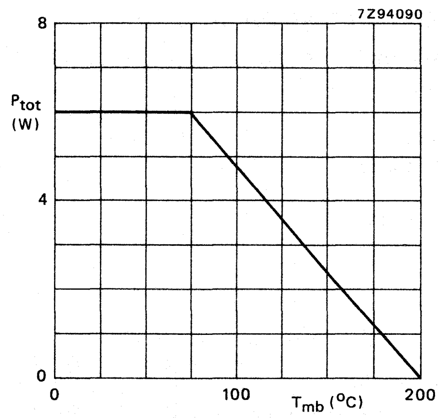


Fig. 3 Power derating curve versus mounting base temperature.

THERMAL RESISTANCE (at Tj=75 ^{o}C)

From junction to mounting base $R_{th\ j\text{-}mb}$ = 12 K/W

CHARACTERISTICS

T_{mb} = 25 ^{o}C unless otherwise specified

Collector cut-off current			
$I_E = 0$; $V_{CB} = 25$ V	I_{CBO}	$\leqslant$	10 μA
$I_E = 0$; $V_{CB} = 35$ V		$\leqslant$	500 μA
Emitter cut-off current			
$I_C = 0$; $V_{EB} = 1,5$ V	I_{EBO}	$\leqslant$	10 μA
$I_C = 0$; $V_{EB} = 3,5$ V		$\leqslant$	100 μA
D.C. current gain			
$I_C = 230$ mA; $V_{CE} = 5$ V	h_{FE}	typ.	40
Collector-base capacitance			
$I_E = I_C = 0$; $V_{CB} = 16$ V; $V_{EB} = 1,5$ V	C_{cb}	typ.	2 pF
Collector-emitter capacitance			
$I_E = I_C = 0$; $V_{CE} = 16$ V; $V_{EB} = 1,5$ V	C_{ce}	typ.	2 pF
Emitter-base capacitance			
$I_E = I_C = 0$; $V_{CB} = 10$ V; $V_{EB} = 1$ V	C_{eb}	typ.	15 pF

APPLICATION INFORMATION

Microwave performance up to T_{mb} = 25 °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	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω
c.w.; class-A	2,3	16	250	≥ 1,2	≥ 7,5	3,5 + j11	6,4 + j2

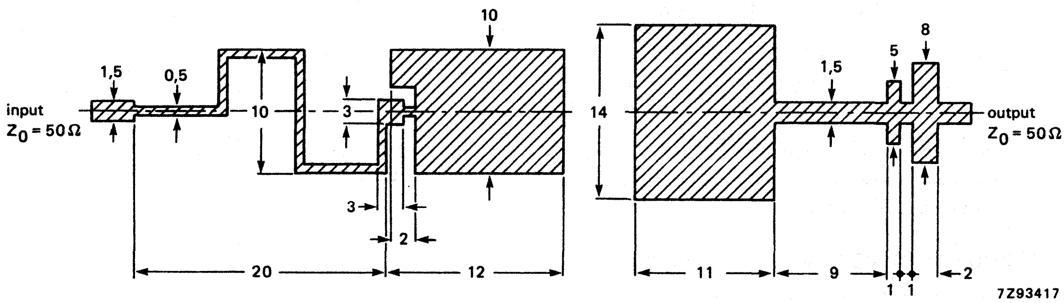


Fig. 4 Prematching test circuit board with PTFE fibre-glass dielectric (ϵ_r = 2,54), thickness 0,8 mm.

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

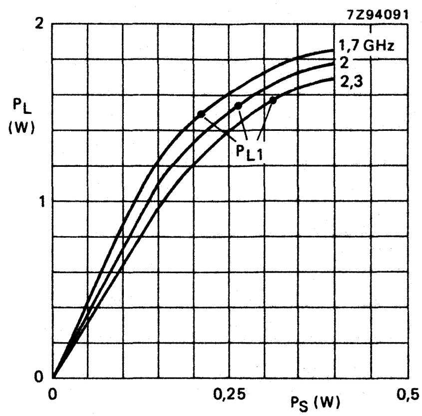


Fig. 5 Output power versus source power.

Conditions for Figs 5 and 6:

V_{CE} = 16 V
I_C = 250 mA } regulated; typical values.

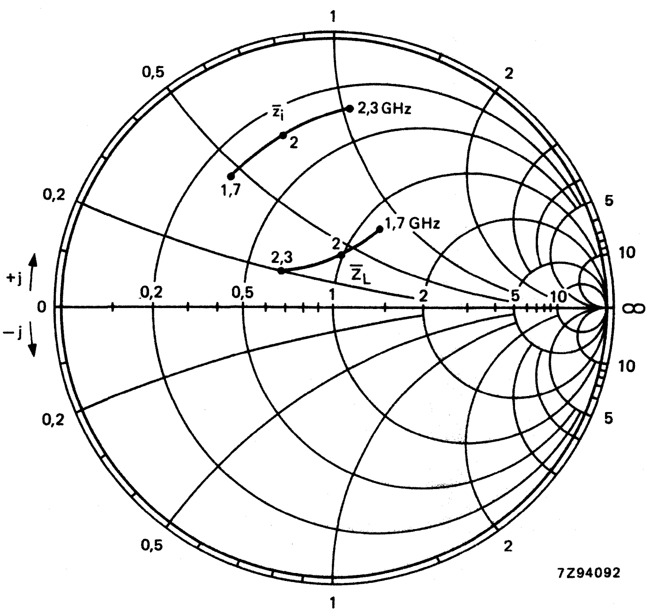


Fig. 6 Input and optimum load impedances versus frequency; Z_o = 10 Ω; P_{L1} = 1,6 W; T_{mb} = 25 °C.

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 °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	$\overline{z_i}$ Ω	$\overline{Z_L}$ 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

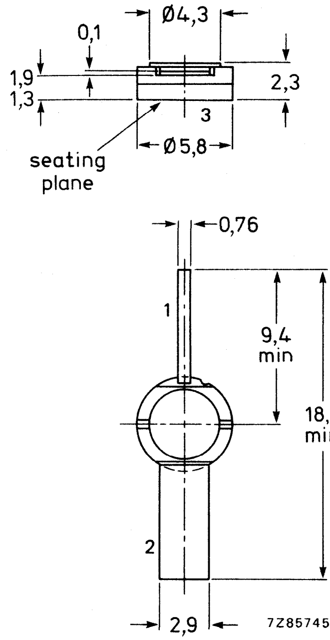
FO-93 (see Fig. 1).

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

Dimensions in mm

Fig. 1 FO-93.



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 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 case; $t_{sld} \leq$ 10 s	T_{sld}	max.	235	°C

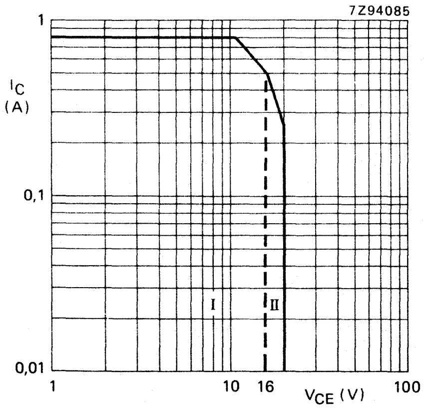


Fig. 2 D.C. SOAR; $T_{mb} \leqslant 75$ °C.
I Region of permissible d.c. operation
II Permissible extension provided $R_{BE} \leqslant 70\ \Omega$.

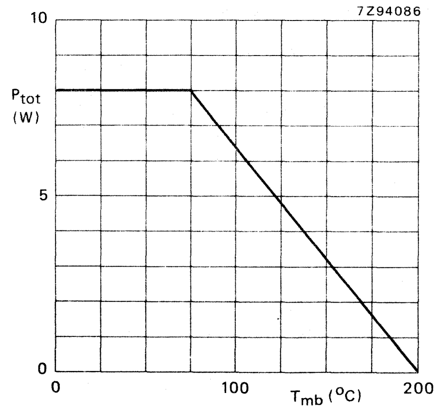


Fig. 3 Power derating curve versus mounting base temperature.

THERMAL RESISTANCE (at Tj=75 °C)

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	8 K/W

CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Collector cut-off current			
$I_E = 0$; $V_{CB} = 25$ V	I_{CBO}	$\leqslant$	15 μA
$I_E = 0$; $V_{CB} = 35$ V	I_{CBO}	$\leqslant$	700 μA
Emitter cut-off current			
$I_C = 0$; $V_{EB} = 1{,}5$ V	I_{EBO}	$\leqslant$	15 μA
$I_C = 0$; $V_{EB} = 3{,}5$ V	I_{EBO}	$\leqslant$	150 μA
D.C. current gain			
$I_C = 400$ mA; $V_{CE} = 5$ V	h_{FE}	typ.	40
Collector-base capacitance			
$I_E = I_C = 0$; $V_{CB} = 16$ V; $V_{EB} = 1{,}5$ V	C_{cb}	typ.	3 pF
Collector-emitter capacitance			
$I_E = I_C = 0$; $V_{CE} = 16$ V; $V_{EB} = 1{,}5$ V	C_{ce}	typ.	2,2 pF
Emitter-base capacitance			
$I_E = I_C = 0$; $V_{CB} = 10$ V; $V_{EB} = 1$ V	C_{eb}	typ.	83 pF

APPLICATION INFORMATION

Microwave performance up to T_{mb} = 25 °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	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω
c.w.; class-A	2,3	16	400	⩾ 2	⩾ 7	2 + j8	5,5 – j1,8

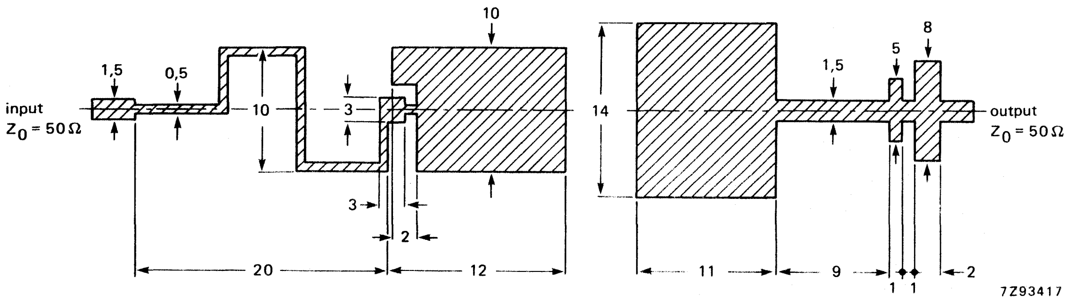


Fig. 4 Prematching test circuit board with PTFE fibre-glass dielectric (ϵ_r = 2,54), thickness 0,8 mm.

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

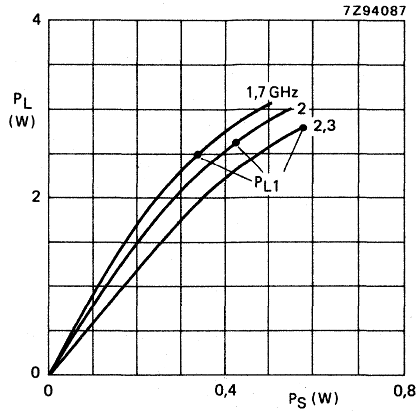


Fig. 5 Output power versus source power.

Conditions for Figs 5 and 6:

V_{CE} = 16 V
I_C = 400 mA } regulated; typical values.

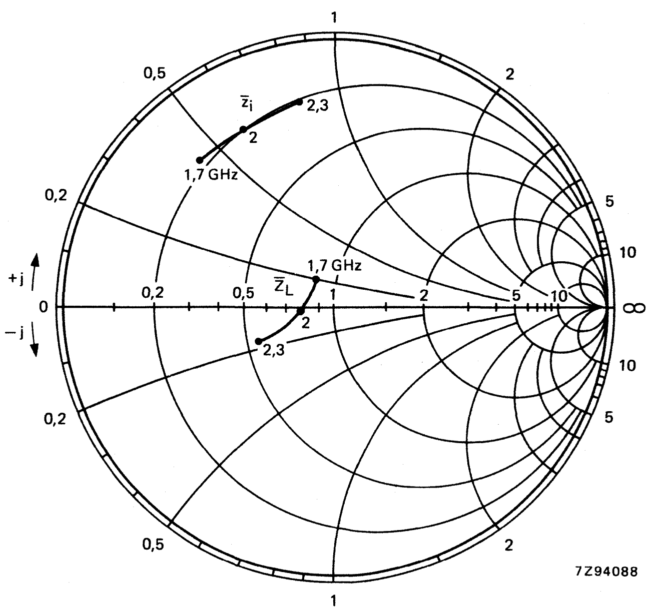


Fig. 6 Input and optimum load impedance versus frequency;
Z_o = 10 Ω; T_{mb} = 25 °C.

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 °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	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω
c.w.; class-A	1,4 to 1,8	16	11	11	2	see Fig. 7	

MECHANICAL DATA

FO-57C (see Fig. 1).

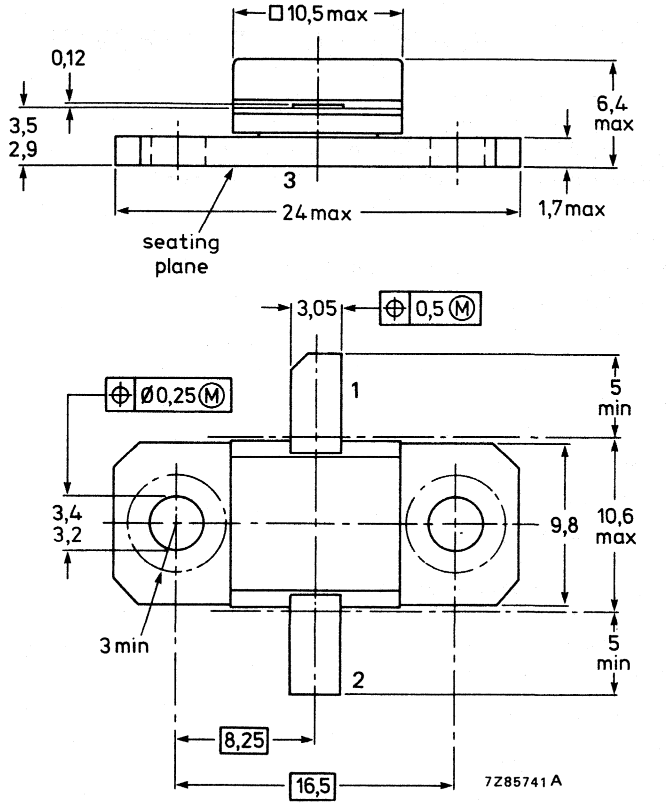
PRODUCT SAFETY

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

Dimensions in mm

Fig. 1 FO-57C.



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; $t_{sld} \leq 10$ s	T_{sld}	max.	235 °C

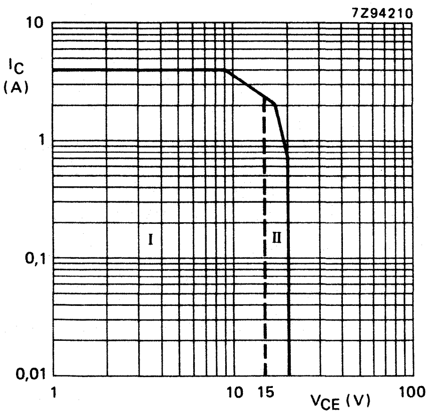


Fig. 2 D.C. SOAR; $T_{mb} \leqslant 75$ °C.
I Region of permissible D.C. operation
II Permissible extension provided $R_{BE} \leqslant 47\ \Omega$

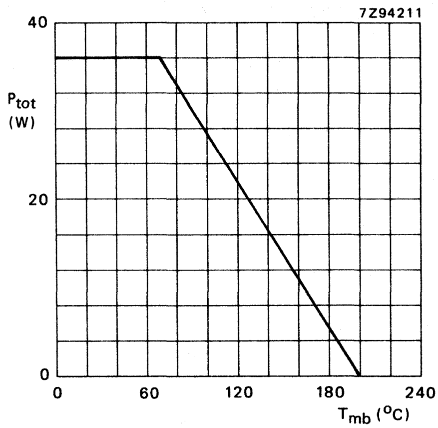


Fig. 3 Power derating curve versus mounting base temperature.

THERMAL RESISTANCE (at T_j = 75 °C)

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	2,2 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,5 K/W

CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Collector cut-off current			
$I_E = 0$; V_{CB} = 20 V	I_{CBO}	≤	1 mA
$I_E = 0$; V_{CB} = 40 V	I_{CBO}	≤	5 mA
V_{CE} = 20 V; R_{BE} = 47 Ω	I_{CER}	≤	50 mA
V_{CE} = 15 V; $I_B = 0$	I_{CEO}	≤	4 mA
Emitter cut-off current			
$I_C = 0$; V_{EB} = 1,5 V	I_{EBO}	≤	200 μA
$I_C = 0$; V_{EB} = 3,5 V	I_{EBO}	≤	1 mA
D.C. current gain			
I_C = 2 A; V_{CE} = 3 V	h_{FE}		15 to 100

APPLICATION INFORMATION

Microwave performance up to T_{mb} = 25 °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	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω
c.w.; class-A	1,4 to 1,8	16	⩾ 9	⩾ 10	2	see Fig. 7	

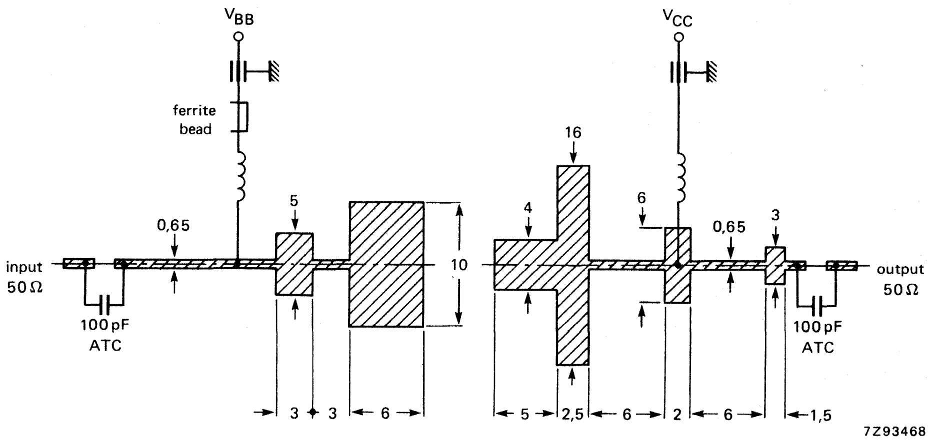


Fig. 4 Wideband test circuit board for 1,4 to 1,8 GHz, c.w., class-A application (dimensions in mm). Epsilam p.c. board, thickness 0,635 mm, ϵ_r = 10.

* Amplifier consists of test circuit board without any additional tuning.

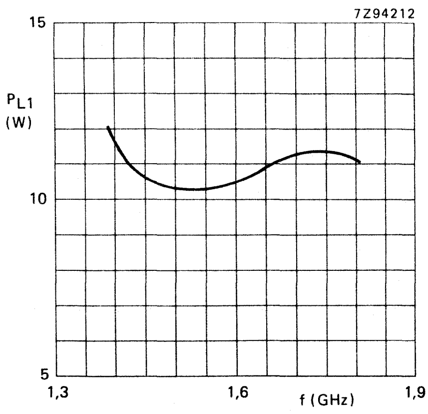


Fig. 5 Load power versus frequency.

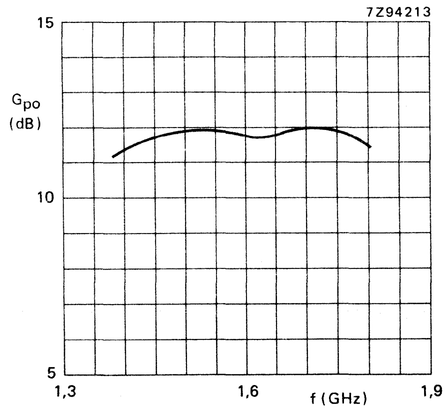


Fig. 6 Linear power gain versus frequency.

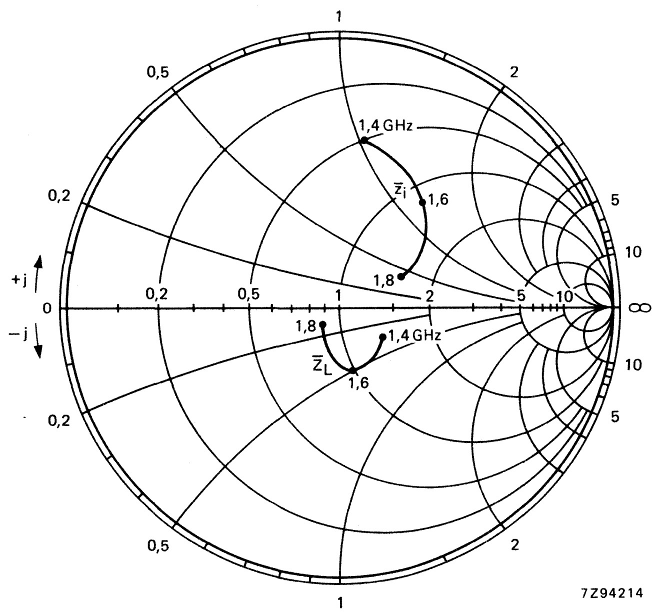


Fig. 7 Input and load impedances versus frequency; Z_O = 5 Ω; typical values.

Conditions for Figs 5 to 7:

V_{CE} = 16 V
I_C = 2 A } regulated; T_{mb} = 25 °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 ^oC 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 μs δ = 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.

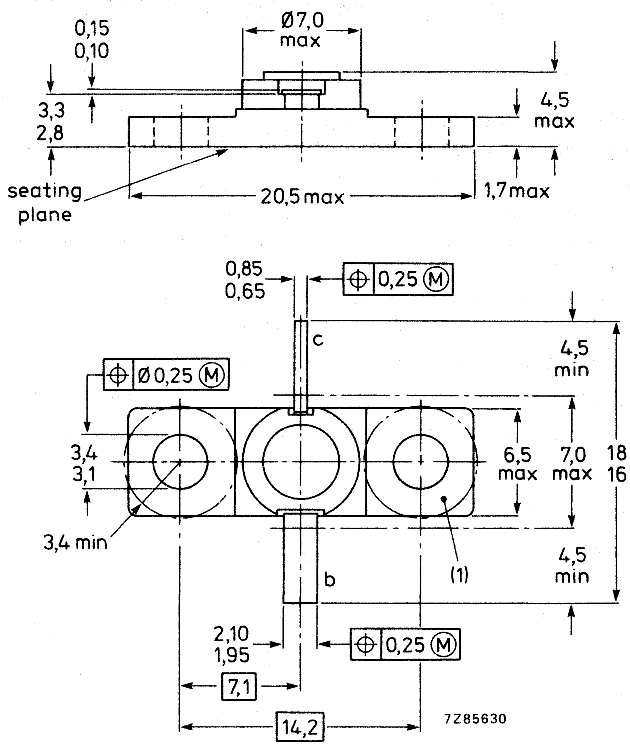
MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-53.

Marking code:

RTC 1040 S



RATINGS

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

Collector-base voltage (open emitter)	V_{CBO}	max.	55	V
Collector-emitter voltage (R_{BE} = 10 Ω)	V_{CER}	max.	50	V
(open base)	V_{CEO}	max.	35	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3	V
Collector current (t_p $\leqslant$ 10 μs, $\delta \leqslant$ 1%)	I_C	max.	3	A
Total power dissipation (t_p $\leqslant$ 10 μs, $\delta \leqslant$ 1%, $T_{mb} \leqslant$ 75 °C)	P_{tot}	max.	60	W
Storage temperature	T_{stg}		−65 to 200	°C
Junction temperature	T_j	max.	200	°C
Soldering temperature at 0,1 mm from case; $t_{sld} \leqslant$ 10 s	T_{sld}	max.	235	°C

THERMAL RESISTANCE

From junction to mounting base under pulsed conditions; t_p = 10 μs, δ = 1%	$R_{th\ j\text{-}mb}$	8	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 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 °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 µs δ = 1%	1,09	45	72	7,6	40	2,2 + j4	4,3 – j1

MECHANICAL DATA

FO-53 (see Fig. 1)

PRODUCT SAFETY

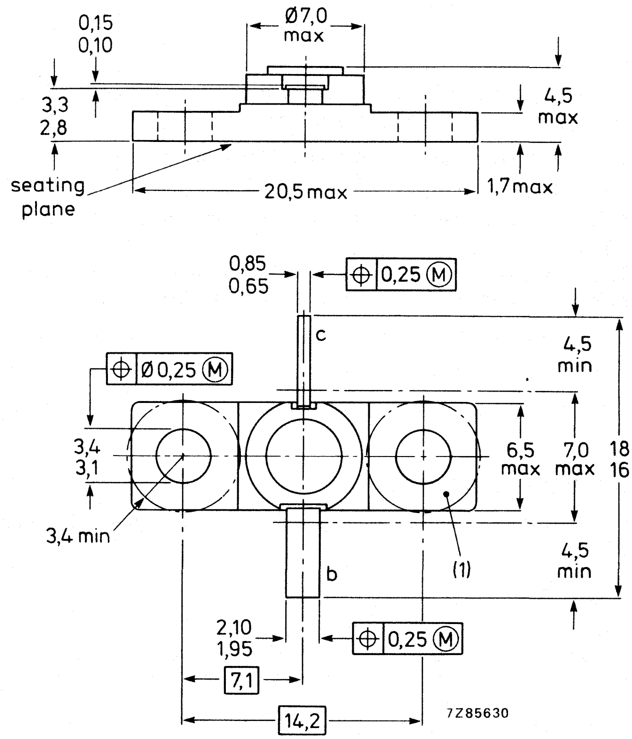
These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.

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_{CBO}	max.	50	V
Collector-emitter voltage (R_{BE} = 10 Ω)	V_{CER}	max.	45	V
(open base)	V_{CEO}	max.	35	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5	V
Collector current ($t_p \leqslant 10\ \mu s$, $\delta \leqslant 1\%$)	I_C	max.	6	A
Total power dissipation ($t_p \leqslant 10\ \mu s$, $\delta \leqslant 1\%$, $T_{mb} \leqslant 75\ ^oC$)	P_{tot}	max.	140	W
Storage temperature	T_{stg}		−65 to 200	^oC
Junction temperature	T_j	max.	200	^oC
Soldering temperature at 0,1 mm from case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	^oC

THERMAL RESISTANCE

From junction to mounting base under pulsed conditions; t_p = 10 μs, δ = 1%	$R_{th\ j\text{-}mb}$	3,5	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 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 °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 μs δ = 1%	1,09	45	120	9,8	49	1,4 + j5	3 – j4

MECHANICAL DATA

FO-53 (see Fig. 1)

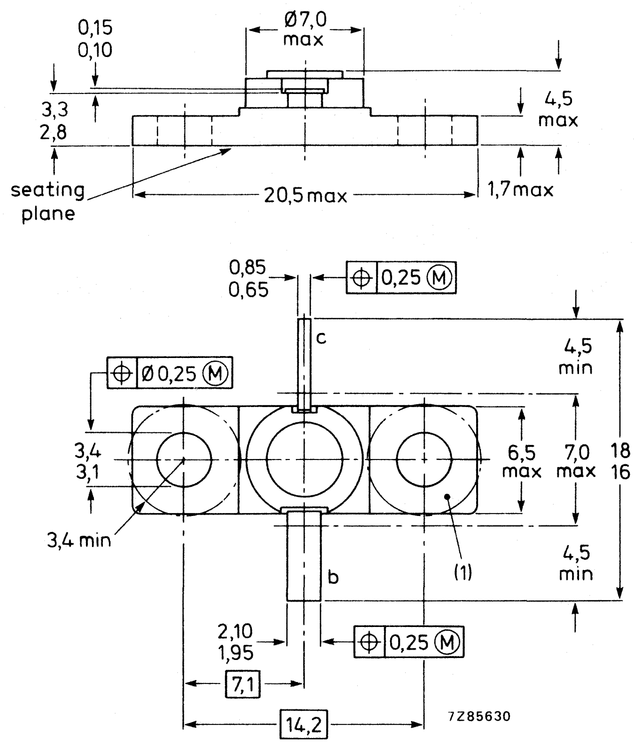
PRODUCT SAFETY

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_{CBO}	max.	55 V
Collector-emitter voltage (R_{BE} = 10 Ω)	V_{CER}	max.	50 V
(open base)	V_{CEO}	max.	35 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5 V
Collector current (t_p ⩽ 10 μs, δ ⩽ 1%)	I_C	max.	8 A
Total power dissipation (t_p ⩽ 10 μs, δ ⩽ 1%, T_{mb} ⩽ 75 °C)	P_{tot}	max.	190 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} ⩽ 10 s	T_{sld}	max.	235 °C

THERMAL RESISTANCE

From junction to mounting base under pulsed conditions; t_p = 10 μs, δ = 1%	$R_{th\ j\text{-}mb}$	2,5 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 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 °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 μs δ = 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.

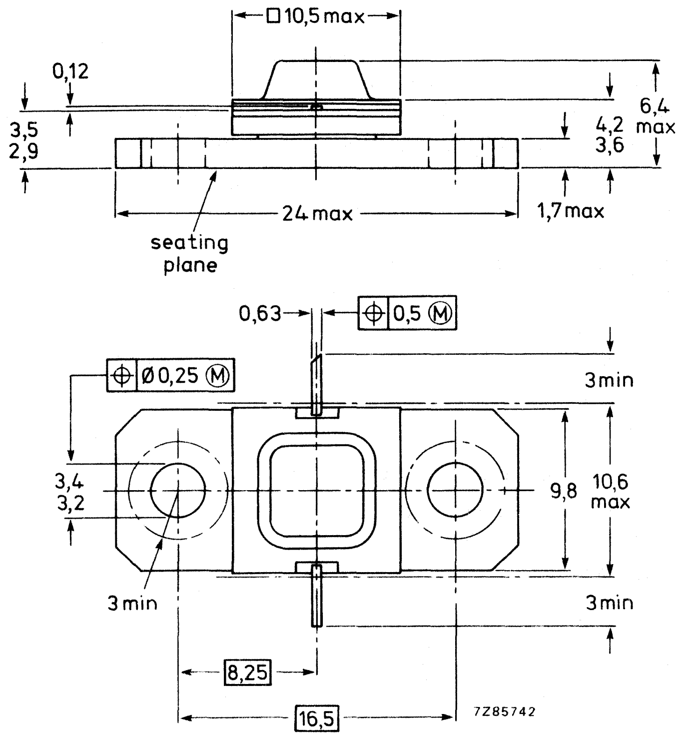
MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-57B.

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_{CBO}	max.	65 V
Collector-emitter voltage (R_{BE} = 10 Ω)	C_{CER}	max.	65 V
(open base)	V_{CEO}	max.	35 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5 V
Collector current (t_p ≤ 10 μs, δ ≤ 1%)	I_C	max.	10 A
Total power dissipation (t_p ≤ 10 μs, δ ≤ 1%, T_{mb} ≤ 75 °C)	P_{tot}	max.	500 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} ≤ 10 s	T_{sld}	max.	235 °C

THERMAL RESISTANCE

From junction to mounting base under pulsed conditions; t_p = 10 μs, δ = 1%	$R_{th\ j\text{-}mb}$	0,075 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 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 ^{o}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 µs δ = 1%	0,6 to 0,75	48	420	7,2	40

MECHANICAL DATA

FO-57B (see Fig. 1)

PRODUCT SAFETY

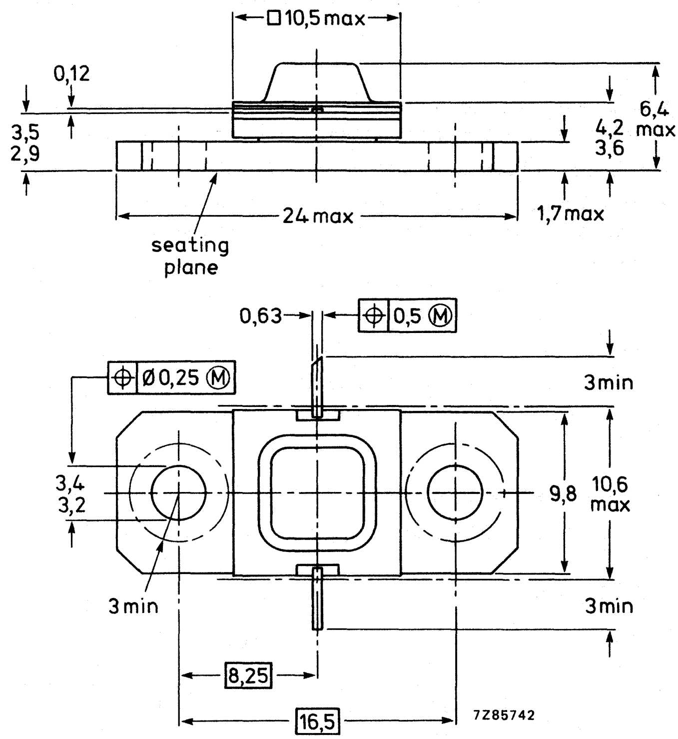
These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.

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_{CBO}	max.	65 V
Collector-emitter voltage (R_{BE} = 10 Ω)	V_{CER}	max.	65 V
(open base)	V_{CEO}	max.	35 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5 V
Collector current (t_p ⩽ 10 μs, δ ⩽ 1%)	I_C	max.	32 A
Total power dissipation (t_p ⩽ 10 μs, δ ⩽ 1%, T_{mb} = 75 °C)	P_{tot}	max.	1200 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} ⩽ 10 s	T_{sld}	max.	235 °C

THERMAL RESISTANCE

From junction to mounting base under pulsed conditions; t_p = 10 μs, δ = 1%	$R_{th\ j\text{-}mb}$	0,04 K/W

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 °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 μs δ = 1%	1,09	50	100	8,5	40	10 + j22	1,75 − j5

MECHANICAL DATA

FO-67 (see Fig. 1).

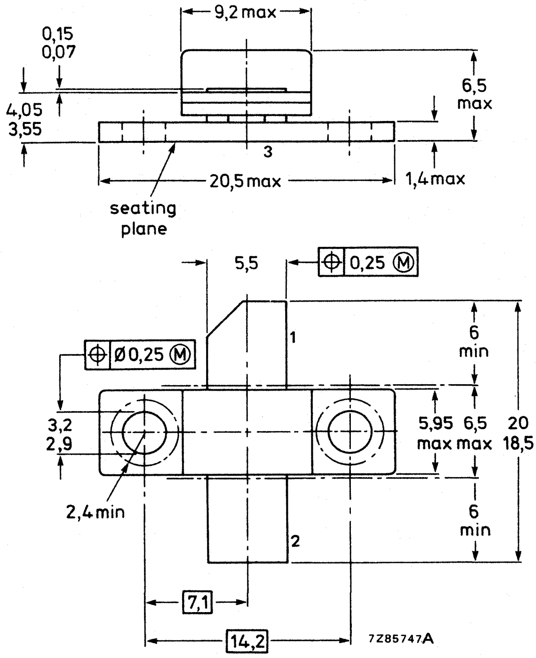
PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

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				
$R_{BE} \leqslant 10\ \Omega$	V_{CER}	max.	65	V
open base	V_{CEO}	max.	25	V
Emitter-base voltage, open collector	V_{EBO}	max.	3,5	V
Collector current				
$t_p \leqslant 10\ \mu s$, $\delta \leqslant 1\%$	I_C	max.	7	A
Total power dissipation				
$t_p \leqslant 10\ \mu s$, $\delta \leqslant 1\%$; $T_{mb} \leqslant 75\ ^oC$	P_{tot}	max.	250	W
Storage temperature	T_{stg}		−65 to 150	^oC
Junction temperature	T_j	max.	200	^oC
Soldering temperature				
at 0,1 mm from case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	^oC

THERMAL RESISTANCE (at Tj=75 ^oC)

From junction to mounting base under pulsed conditions:

$t_p \leqslant 10\ \mu s$, $\delta \leqslant 1\%$ $R_{th\ j\text{-}mb}$ = 0,16 K/W

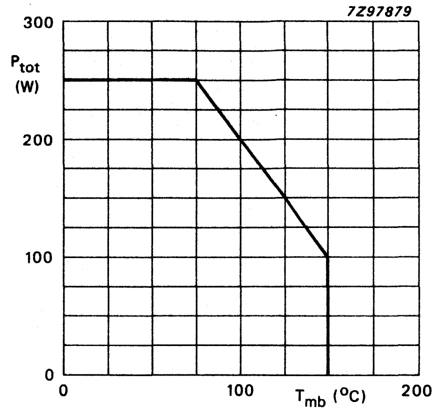


Fig. 2 Power derating curve versus mounting base temperature in pulsed condition.

DEVELOPMENT DATA

CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Breakdown voltages				
I_C = 20 mA; I_E = 0	$V_{(BR)CBO}$	⩾	65	V
I_C = 20 mA; R_{BE} = 10 Ω	$V_{(BR)CER}$	⩾	65	V
I_C = 0; I_E = 2,5 mA	$V_{(BR)EBO}$	⩾	3,5	V
Collector cut-off current				
I_E = 0; V_{CB} = 50 V	I_{CBO}	⩽	2,5	mA
Emitter cut-off current				
I_C = 0; V_{EB} = 1,5 V	I_{EBO}	⩽	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 °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 μs δ = 1%	1,09	50	200	8,5	40	see Fig. 3 and 4	

MECHANICAL DATA

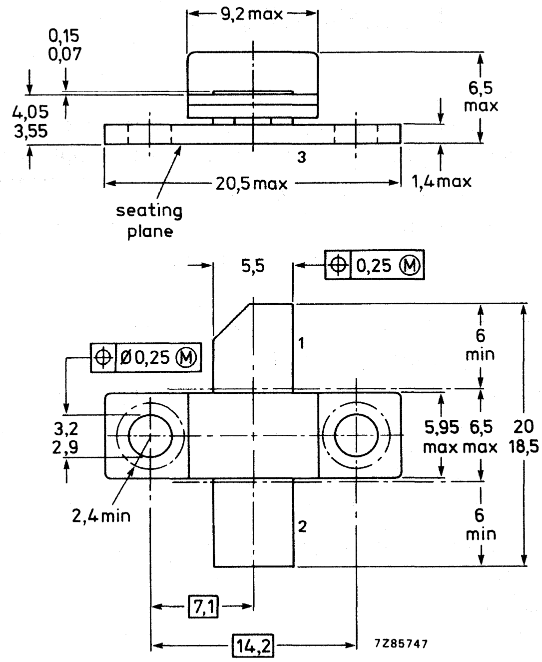
FO-67 (see Fig. 1)

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.

MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-67.



Pinning:

1 = collector
2 = emitter
3 = base

Marking code:

RTC11175Y

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				
$R_{BE} \leq 10\ \Omega$	V_{CER}	max.	65	V
open base	V_{CEO}	max.	25	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				
$t_p \leq 10\ \mu s$, $\delta \leq 1\%$; $T_{mb} \leq 75\ ^oC$	P_{tot}	max.	500	W
Storage temperature	T_{stg}		−65 to 150	^oC
Junction temperature	T_j	max.	200	^oC
Soldering temperature				
at 0,1 mm from case; $t_{sld} \leq 10$ s	T_{sld}	max.	235	^oC

THERMAL RESISTANCE (at Tj=75 ^oC)

From junction to mounting base under pulsed conditions:

$t_p \leq 10\ \mu s$, $\delta \leq 1\%$	$R_{th\ j\text{-}mb}$	=	0,08	K/W

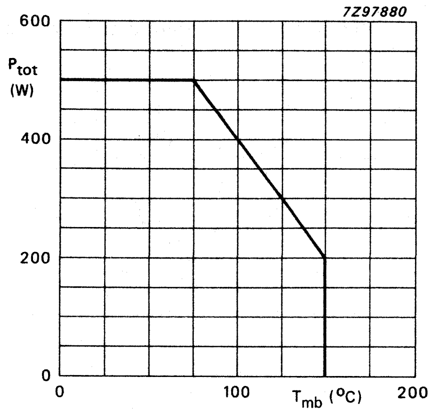


Fig. 2 Power derating curve versus mounting base temperature in pulsed condition.

CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Breakdown voltages			
I_C = 40 mA; I_E = 0	$V_{(BR)CBO}$	⩾	65 V
I_C = 40 mA; R_{BE} = 10 Ω	$V_{(BR)CER}$	⩾	65 V
I_C = 0; I_E = 5 mA	$V_{(BR)EBO}$	⩾	3,5 V
Collector cut-off current			
I_E = 0; V_{CB} = 50 V	I_{CBO}	⩽	5 mA
Emitter cut-off current			
I_C = 0; V_{EB} = 1,5 V	I_{EBO}	⩽	0,5 mA
Collector-base capacitance			
I_E = I_C = 0; V_{CB} = 50 V	C_{cb}	typ.	45 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	⩾ 175	⩾ 7,5	⩾ 35	see Fig. 3 and 4	

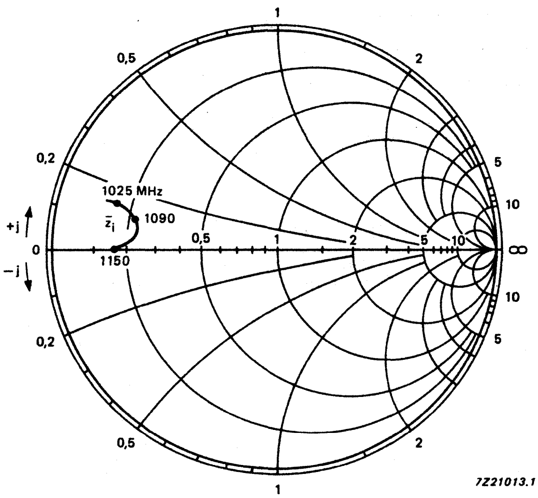


Fig. 3 Input impedance versus frequency; Z_o = 50 Ω; typical values.

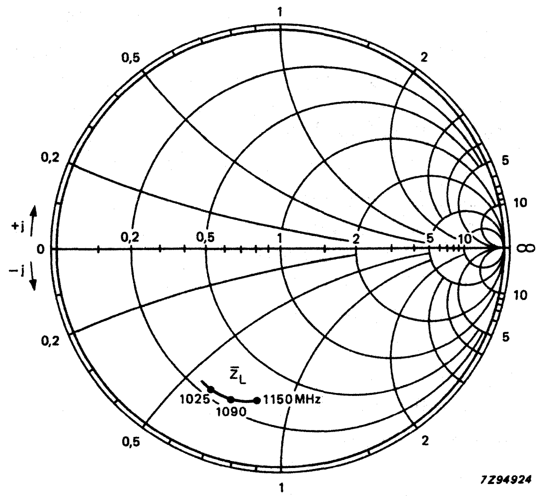


Fig. 4 Optimum load impedance versus frequency; Z_o = 5 Ω; typical values.

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 ^oC 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 μs, δ = 1%	1,09	50	400	8	35	see Fig. 3	

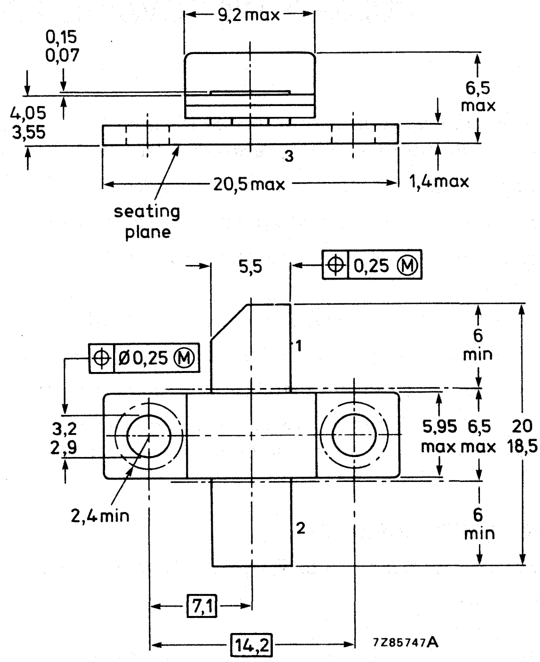
MECHANICAL DATA

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.

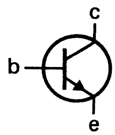
MECHANICAL DATA Dimensions in mm

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			
$R_{BE} \leqslant 10\,\Omega$	V_{CER}	max.	65 V
open base	V_{CEO}	max.	25 V
Emitter-base voltage, open collector	V_{EBO}	max.	3,5 V
Collector current			
$t_p \leqslant 10\,\mu s$, $\delta \leqslant 1\%$	I_C	max.	25 A
Total power dissipation			
$t_p \leqslant 10\,\mu s$, $\delta \leqslant 1\%$; $T_{mb} \leqslant 75\,^oC$	P_{tot}	max.	1000 W
Storage temperature	T_{stg}		−65 to 150 °C
Junction temperature	T_j	max.	200 °C
Soldering temperature			
at 0,1 mm from case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235 °C

THERMAL RESISTANCE (at Tj=75 °C)

From junction to mounting base under pulsed conditions:

$t_p \leqslant 10\,\mu s$, $\delta \leqslant 1\%$	$R_{th\ j\text{-}mb}$	=	0,04 K/W

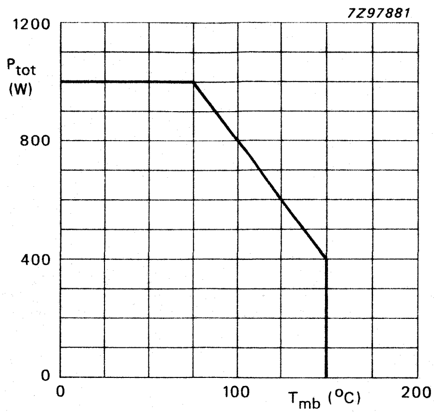


Fig. 2 Power derating curve versus mounting base temperature; pulsed condition.

CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Breakdown voltages			
I_C = 80 mA; I_E = 0	$V_{(BR)CBO}$	⩾	65 V
I_C = 80 mA; R_{BE} = 10 Ω	$V_{(BR)CER}$	⩾	65 V
I_C = 0; I_E = 10 mA	$V_{(BR)EBO}$	⩾	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.	90 pF

APPLICATION INFORMATION

Microwave performance up to T_{mb} = 25 °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 μs δ = 1%	1,09	50	⩾ 350	⩾ 7	⩾ 30	see Fig. 3	

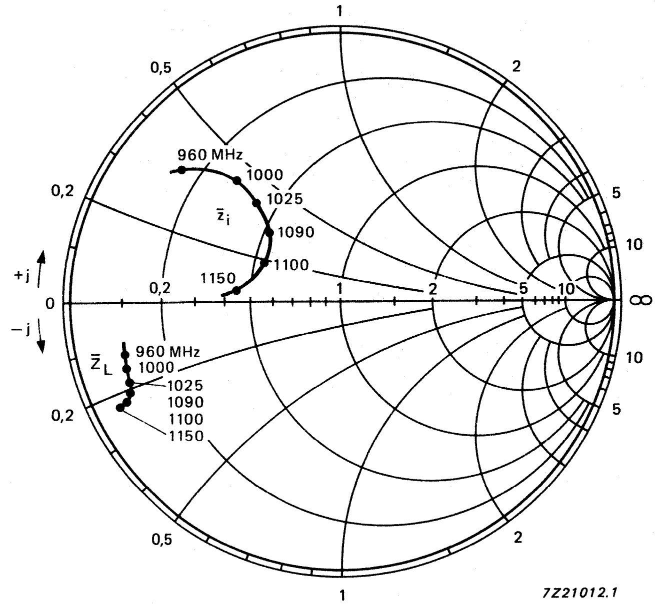


Fig. 3 Optimal load impedance and input impedance in large signal conditions; Z_O = 10 Ω; typical values.

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 °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 μs δ = 1%	1,09	50	200	9	50	3,5 + j9	1,5 – j2

MECHANICAL DATA

FO-67A (see Fig. 1)

PRODUCT SAFETY

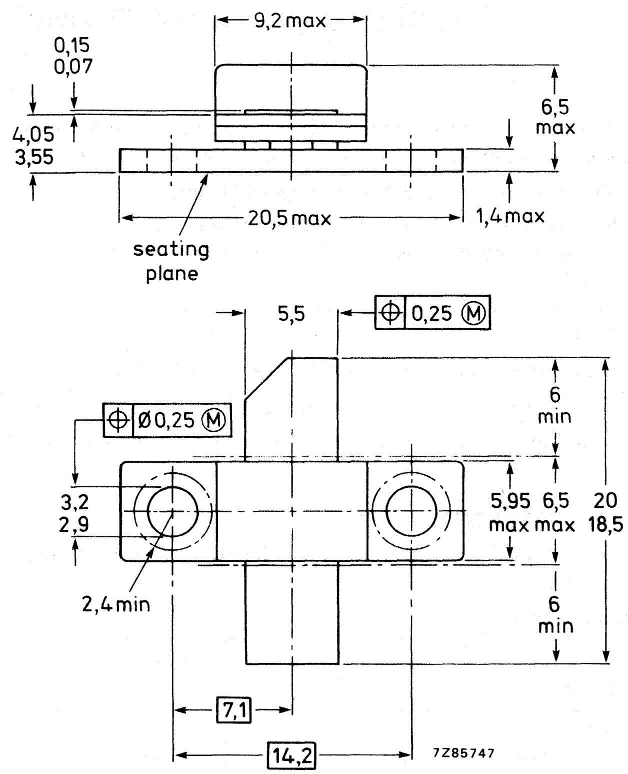
These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the B_eO disc is not damaged.

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 Ω)	V_{CER}	max.	65	V
(open base)	V_{CEO}	max.	35	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5	V
Collector current ($t_p \leqslant 10\ \mu s$, $\delta \leqslant 1\%$)	I_C	max.	12,5	A
Total power dissipation ($t_p \leqslant 10\ \mu s$, $\delta \leqslant 1\%$, $T_{mb} \leqslant 75\ ^oC$)	P_{tot}	max.	500	W
Storage temperature	T_{stg}		−65 to 200	^oC
Junction temperature	T_j	max.	200	^oC
Soldering temperature at 0,1 mm from case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	^oC

THERMAL RESISTANCE

From junction to mounting base under pulsed conditions; $t_p = 10\ \mu s$, $\delta = 1\%$	$R_{th\ j\text{-}mb}$	0,08	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 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 ^oC 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 μs δ = 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.

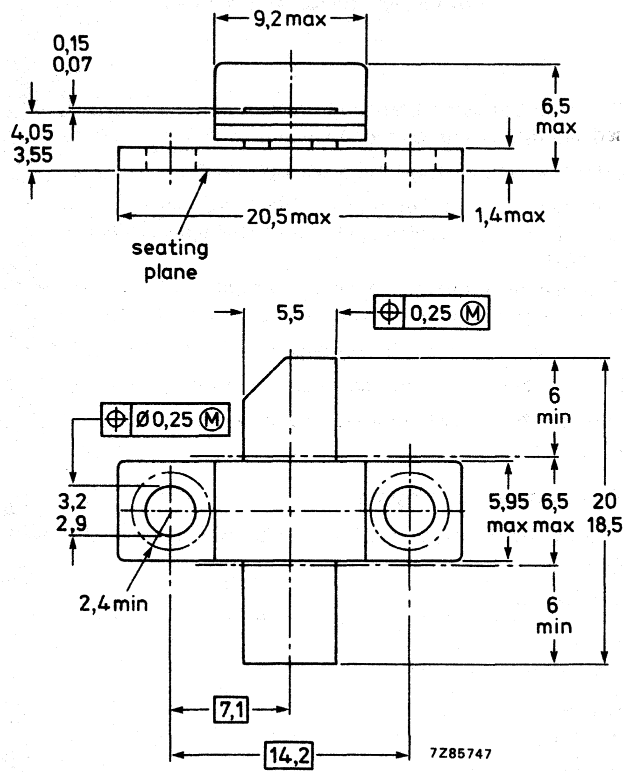
MECHANICAL DATA

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 Ω)	V_{CER}	max.	65	V
(open base)	V_{CEO}	max.	35	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5	V
Collector current ($t_p \leqslant 10\ \mu s$, $\delta \leqslant 1\%$)	I_C	max.	25	A
Total power dissipation ($t_p \leqslant 10\ \mu s$, $\delta \leqslant 1\%$, $T_{mb} \leqslant 75\ ^oC$)	P_{tot}	max.	1000	W
Storage temperature	T_{stg}		−65 to 200	^oC
Junction temperature	T_j	max.	200	^oC
Soldering temperature at 0,1 mm from case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	^oC

THERMAL RESISTANCE

From junction to mounting base under pulsed conditions; t_p = 10 μs, δ = 1%	$R_{th\ j\text{-}mb}$	0,04	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 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 °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 μs δ = 1%	1,025 to 1,150	50	700	6,7	35

MECHANICAL DATA

FO-96 (see Fig. 1)

PRODUCT SAFETY

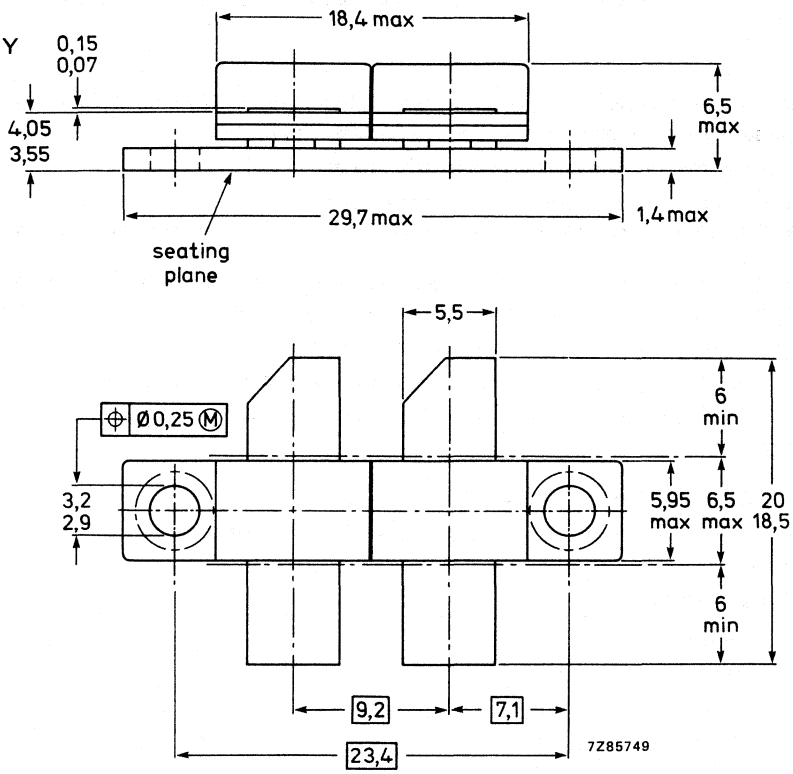
These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.

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_{CBO}	max.	65	V
Collector-emitter voltage (R_{BE} = 10 Ω)	V_{CER}	max.	65	V
(open base)	V_{CEO}	max.	35	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5	V
Collector current ($t_p \leqslant 10\ \mu s$, $\delta \leqslant 1\%$)	I_C	max.	50	A
Total power dissipation ($t_p \leqslant 10\ \mu s$, $\delta \leqslant 1\%$, $T_{mb} \leqslant 75\ ^oC$)	P_{tot}	max.	2000	W
Storage temperature	T_{stg}		−65 to 200	^oC
Junction temperature	T_j	max.	200	^oC
Soldering temperature at 0,1 mm from case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	^oC

THERMAL RESISTANCE

From junction to mounting base under pulsed conditions; $t_p = 10\ \mu s$, $\delta = 1\%$	$R_{th\ j\text{-}mb}$	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 °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 μs δ = 1%	0,6 to 0,75	48	850	7,5	35

MECHANICAL DATA

FO-96 (see Fig. 1)

PRODUCT SAFETY

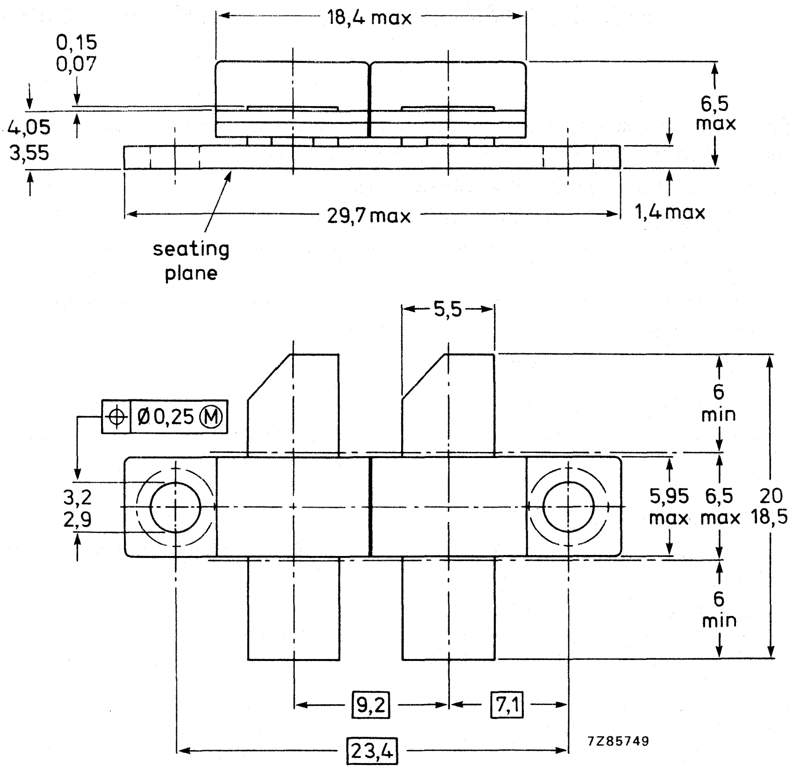
These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-96.

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 Ω)	V_{CER}	max.	65 V
(open base)	V_{CEO}	max.	35 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5 V
Collector current ($t_p \leqslant 10\ \mu s$, $\delta \leqslant 1\%$)	I_C	max.	50 A
Total power dissipation ($t_p \leqslant 10\ \mu s$, $\delta \leqslant 1\%$, $T_{mb} \leqslant 75\ ^oC$)	P_{tot}	max.	1800 W
Storage temperature	T_{stg}		−65 to 200 °C
Junction temperature	T_j	max.	200 °C
Soldering temperature at 0,1 mm from case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235 °C

THERMAL RESISTANCE

From junction to mounting base under pulsed conditions; $t_p = 10\ \mu s$, $\delta = 1\%$	$R_{th\ j\text{-}mb}$	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 °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_i Ω	Z_L Ω
pulsed: t_p = 10 μs δ = 1%	1,09	50	850	7,5	35	see Fig. 3	

MECHANICAL DATA

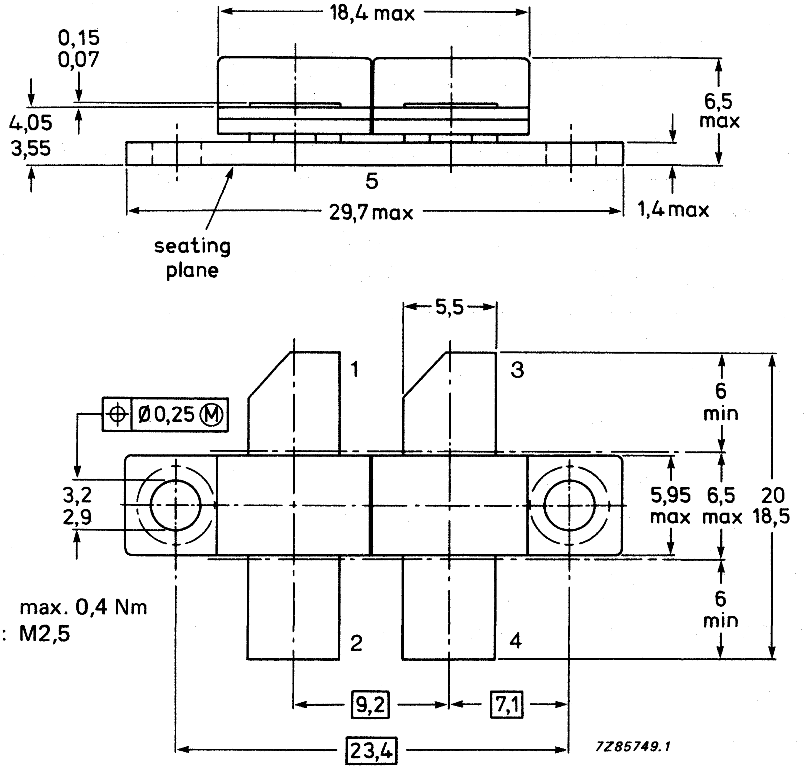
FO-96 (see Fig. 1).

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)

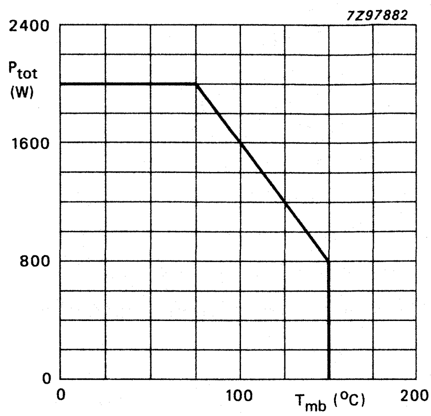
Collector-base voltage, open emitter	V_{CBO}	max.	65	V
Collector-emitter voltage				
$R_{BE} \leqslant 10\ \Omega$	V_{CER}	max.	65	V
open base	V_{CEO}	max.	25	V
Emitter-base voltage, open collector	V_{EBO}	max.	3,5	V
Collector current, per transistor section				
$t_p \leqslant 10\ \mu s$, $\delta \leqslant 1\%$	I_C	max.	50	A
Total power dissipation				
$t_p \leqslant 10\ \mu s$, $\delta \leqslant 1\%$; $T_{mb} \leqslant 75\ ^oC$	P_{tot}	max.	2x1000	W
Storage temperature	T_{stg}		−65 to 150	^oC
Junction temperature	T_j	max.	200	^oC
Soldering temperature				
at 0,1 mm from case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	^oC

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

From junction to mounting base under pulsed conditions:

$t_p \leqslant 10\ \mu s$, $\delta \leqslant 1\%$ — $R_{th\ j\text{-}mb}$ = 0,02 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	$V_{(BR)CBO}$	⩾	65 V
I_C = 80 mA; R_{BE} = 10 Ω	$V_{(BR)CER}$	⩾	65 V
I_C = 0; I_E = 5 mA	$V_{(BR)EBO}$	⩾	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	

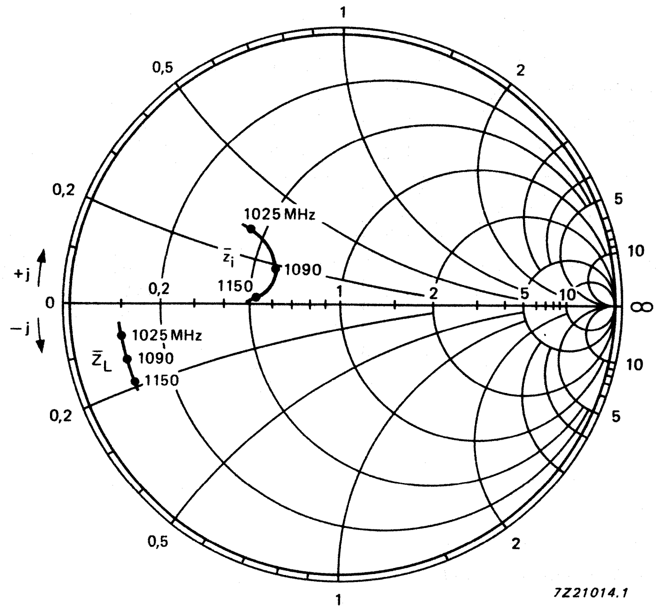


Fig. 3 Input and optimum load impedance in large signal conditions; Z_o = 10 Ω; typical values.

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 ^{o}C in a 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 μs δ = 1%	1,09	50	900	7,8	35	2,5 + j4	10 – j11

MECHANICAL DATA

FO-96 (see Fig. 1)

PRODUCT SAFETY

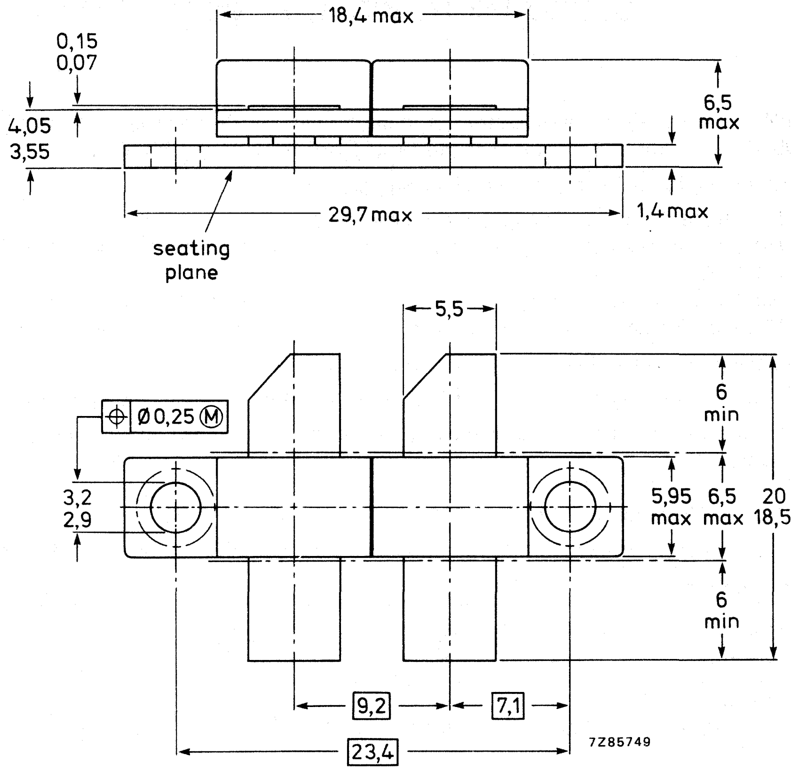
These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.

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_{CBO}	max.	65 V
Collector-emitter voltage (R_{BE} = 10 Ω)	V_{CER}	max.	65 V
(open base)	V_{CEO}	max.	35 V
Emitter-base voltage (open collector)	V_{EBO}	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_{sld} ⩽ 10 s	T_{sld}	max.	235 °C

THERMAL RESISTANCE

From junction to mounting base
under pulsed conditions; t_p = 10 μs, δ = 1% $R_{th\ j\text{-}mb}$ 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 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 ^{o}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 μs δ = 10%	0,960 to 1,215	50	90	8,6	34

MECHANICAL DATA

FO-57C (see Fig. 1)

PRODUCT SAFETY

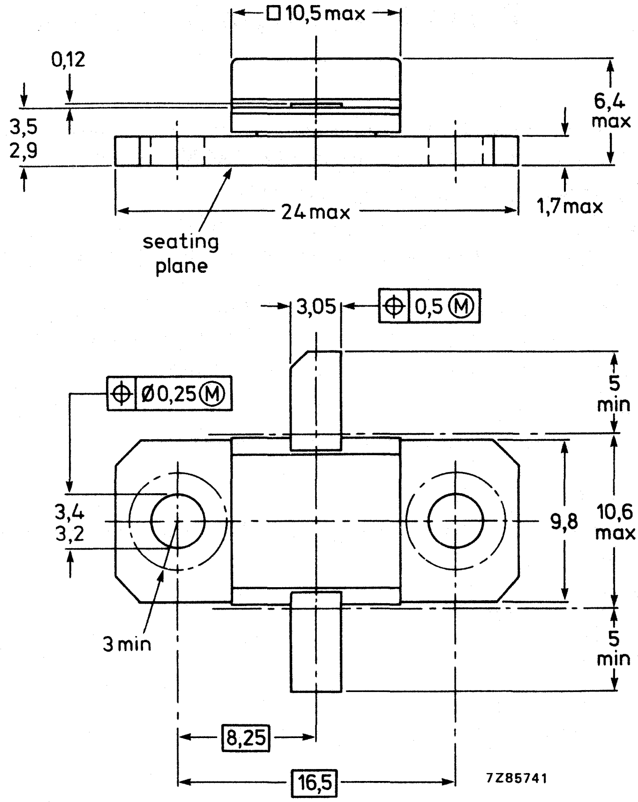
These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-57C.

Marking code:
RTC MZ 0912 B 75 Y



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 Ω)	V_{CER}	max.	65	V
(open base)	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_{sld} ⩽ 10 s	T_{sld}	max.	235	°C

THERMAL RESISTANCE

From junction to mounting base under pulsed conditions; t_p = 10 μs, δ = 10%	$R_{th\ j\text{-}mb}$	0,2 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 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 °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 μs δ = 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.

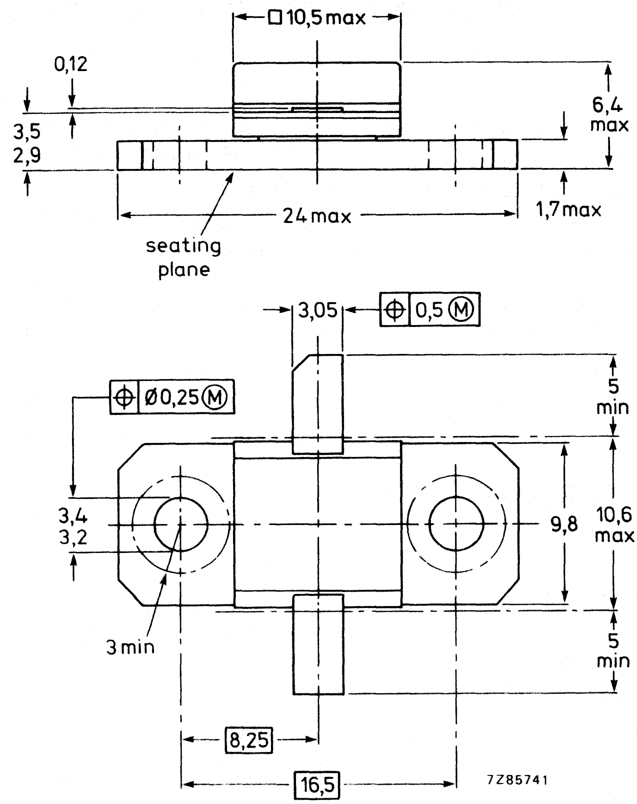
MECHANICAL DATA

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_{CBO}	max.	65	V
Collector-emitter voltage (R_{BE} = 10 Ω)	V_{CER}	max.	65	V
(open base)	V_{CEO}	max.	35	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5	V
Collector current ($t_p \leqslant 10\ \mu s$, $\delta \leqslant 10\%$)	I_C	max.	14	A
Total power dissipation ($t_p \leqslant 10\ \mu s$, $\delta \leqslant 10\%$, $T_{mb} \leqslant 75\ ^oC$)	P_{tot}	max.	600	W
Storage temperature	T_{stg}		−65 to 200	^oC
Junction temperature	T_j	max.	200	^oC
Soldering temperature at 0,1 mm from case, $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	^oC

THERMAL RESISTANCE

From junction to mounting base under pulsed conditions; t_p = 10 μs, δ = 10%	$R_{th\ j\text{-}mb}$	0,1	K/W

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 °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

Dimensions in mm

FO-38

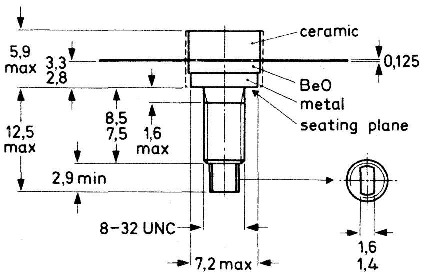
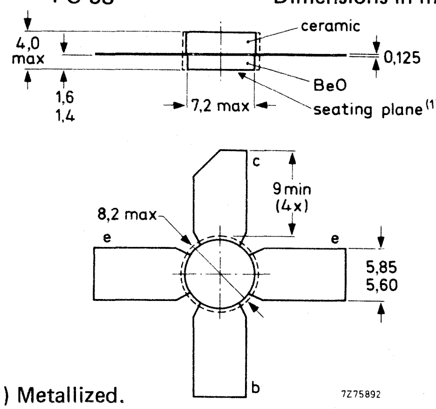


Fig. 1a For top view see Fig. 1b.

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

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

FO-58



(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_{CBO}	max.	39	39	39	45	V
Collector-emitter voltage $R_{BE} = 10\ \Omega$	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 $T_{mb} = 25\ ^oC$	P_{tot}	max.	5	7	12,5	20	W
Storage temperature	T_{stg}		−65 to +150				^oC
Operating junction temperature	T_j	max.	200				^oC
Lead soldering temperature at 0,7 mm from ceramic; $t_{sld} \leq 10$ s	T_{sld}	max.	235				^oC

THERMAL RESISTANCE

			PEE/PDE1001U	1003U	1005U	1010U	
From junction to mounting base	$R_{th\ j\text{-}mb}$	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 °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)

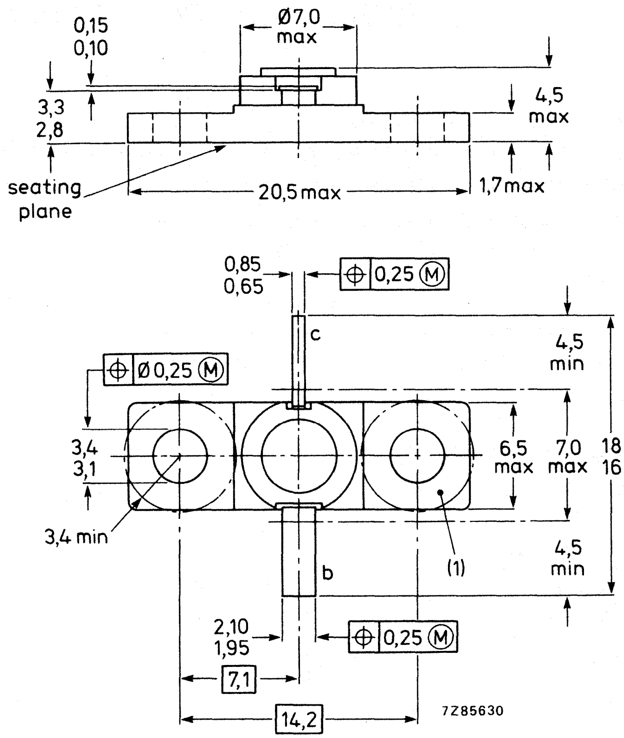
PRODUCT SAFETY

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 °C	P_{tot}	max.	4,5	W
Storage temperature	T_{stg}		−65 to 200	°C
Junction temperature	T_j	max.	200	°C
Soldering temperature at 0,1 mm from case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	°C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	22	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 °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)

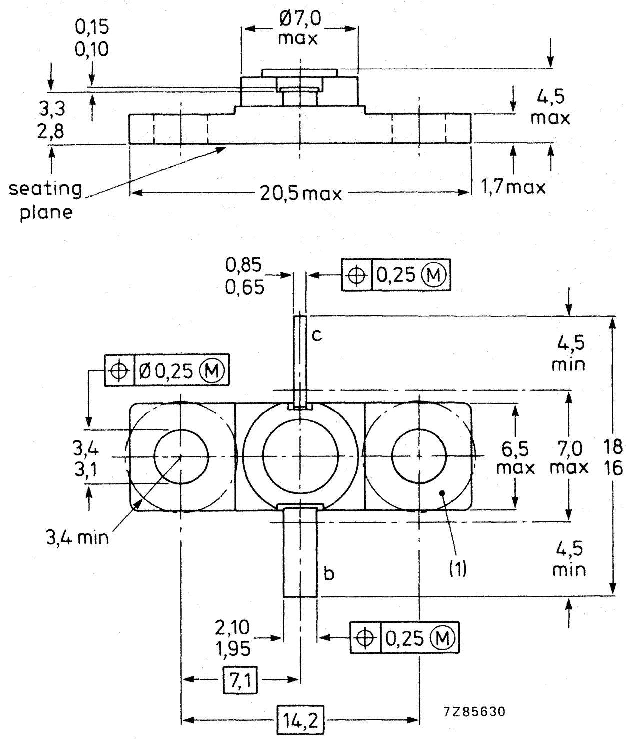
PRODUCT SAFETY

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_{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.	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	$R_{th\ j\text{-}mb}$	11 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 °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)

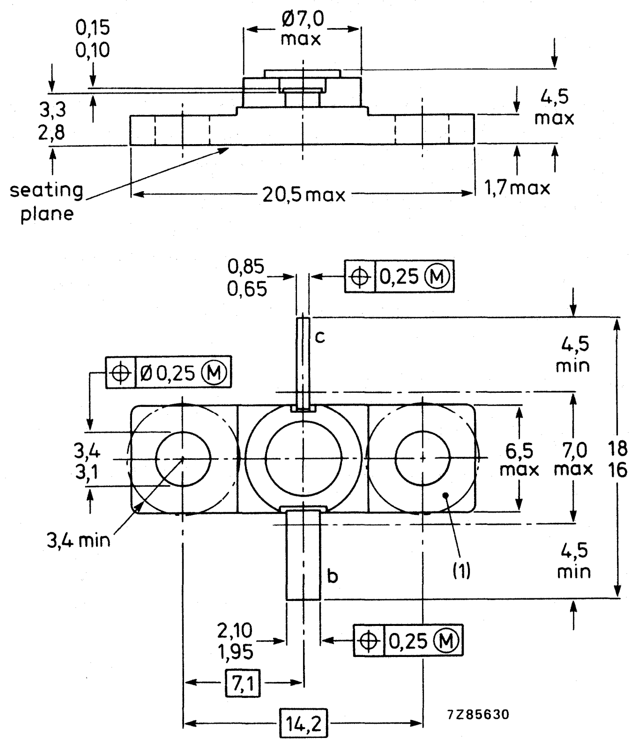
PRODUCT SAFETY

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 Ω)	V_{CER}	max.	45	V
(open base)	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; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	°C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	7	K/W

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 ^{o}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 μs δ = 10%	0,960 to 1,215	28	5	9	45	7 + 5,5 (at f = 1,09 GHz)	8 + j13 (at f = 1,09 GHz)
c.w.	1,2	28	6,5	10,5	45	—	—

MECHANICAL DATA

FO-53 (see Fig. 1)

PRODUCT SAFETY

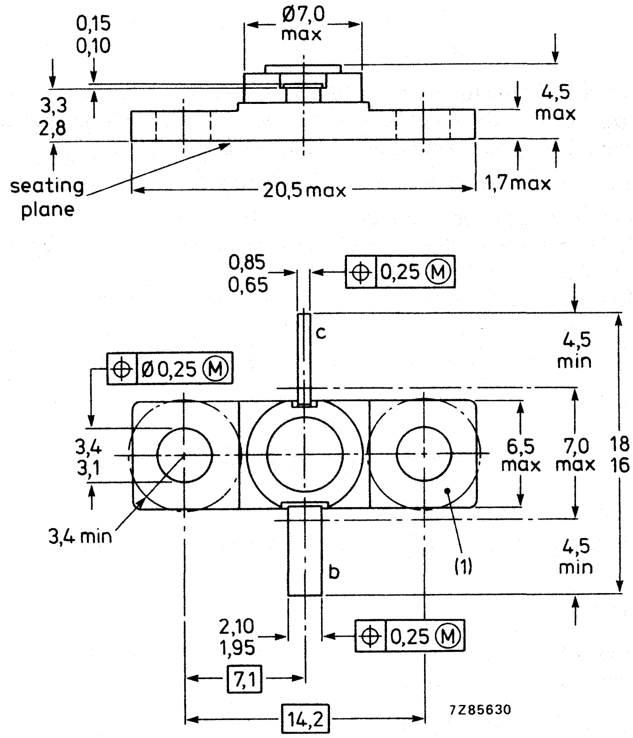
This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

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_{CBO}	max.	40	V
Collector-emitter voltage (R_{BE} = 10 Ω)	V_{CER}	max.	40	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3	V
Collector current ($t_p \leqslant 10\ \mu s$, $\delta \leqslant 10\%$)	I_C	max.	1,2	A
Total power dissipation ($t_p \leqslant 10\ \mu s$, $\delta \leqslant 10\%$, $T_{mb} \leqslant 75\ ^oC$)	P_{tot}	max.	17,5	W
Storage temperature	T_{stg}		−65 to 200	^oC
Junction temperature	T_j	max.	200	^oC
Soldering temperature at 0.1 mm from case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	^oC

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	7,5	K/W

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 °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 %	$\overline{z_i}$ Ω	$\overline{Z_L}$ 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

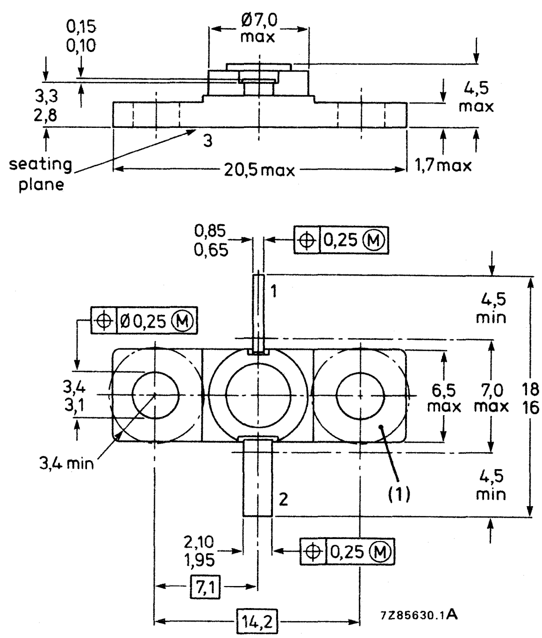
Fig. 1 FO-53.

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				
$R_{BE} \leq 10\ \Omega$	V_{CER}	max.	40	V
open base	V_{CEO}	max.	22	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 °C	P_{tot}	max.	25	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; $t_{sld} \leq 10$ s	T_{sld}	max.	235	°C

THERMAL RESISTANCE

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

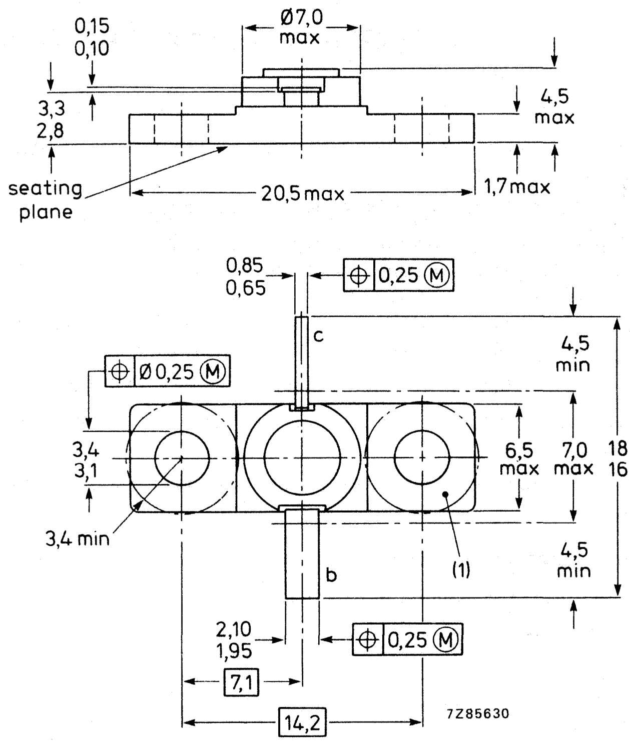
MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-53.

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 Ω)	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; $T_{mb} \leqslant 75$ °C	P_{tot}	max.	4	7,5	18	W
Junction temperature	T_j	max.	200	200	200	°C
Storage temperature	T_{stg}	min.	–65	–65	–65	°C
		max.	200	200	200	°C
Soldering temperature (d = 0,7 mm; t_{sld} = 10 s	T_{sld}	max.	235	235	235	°C
THERMAL RESISTANCE						
Junction-mounting base	$R_{th\ j\text{-}mb}$		30	18	7	K/W
From mounting base to heatsink (torque on nut: 0,5 Nm with M3 screw)	$R_{th\ mb\text{-}h}$		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, interdigited 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

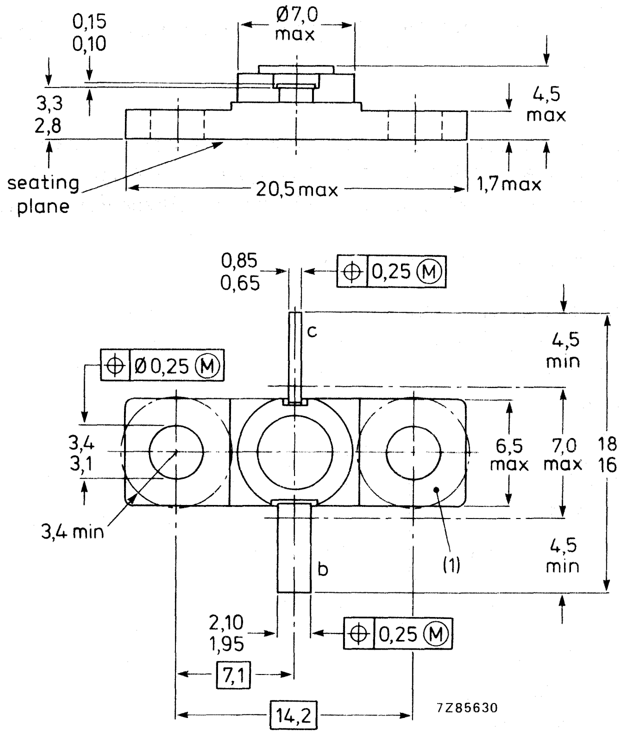
FO-53 (see Fig. 1).

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_{CBO}	max.	35	V
Collector-emitter voltage (R_{BE} = 10 Ω)	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 ($T_{mb} \leqslant 75$ °C)	P_{tot}	max.	16,5	W
Storage temperature	T_{stg}	min.	−65	°C
		max.	200	°C
Operating junction temperature	T_j	max.	200	°C
Soldering temperature at 0,7 mm from case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	230	°C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	6	K/W
From mounting base to heatsink (torque on nut: 0,5 Nm with M3 screw)	$R_{th\ mb\text{-}h}$	=	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 °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	$\overline{Z_L}$ 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

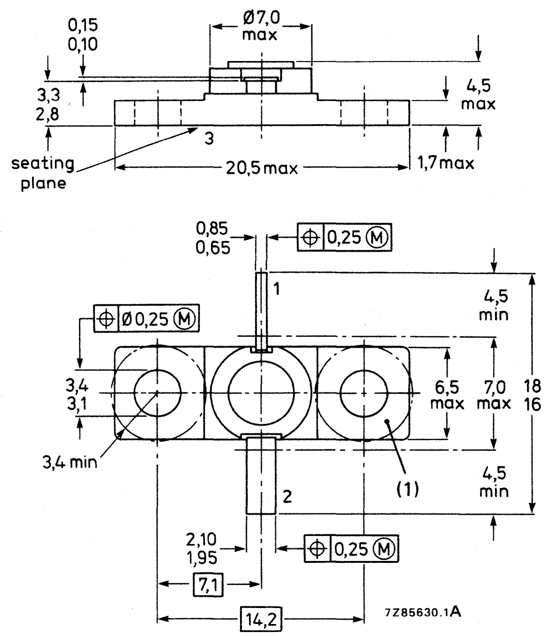
Fig. 1 FO-53.

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 $T_{mb} = 75\ ^oC$	P_{rf}	max.	4,5	9	15	W
Storage temperature	T_{stg}	max.	−65 to + 200			^oC
Junction temperature	T_j	max.	200			^oC
Lead soldering temperature at 0,3 mm from ceramic; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235			^oC

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	max.	22	11	6,6	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	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 ^oC 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).

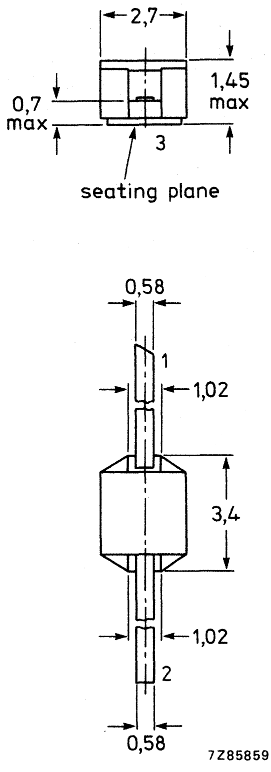
PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Dimensions in mm

Fig. 1a FO-102.

PPC5001T

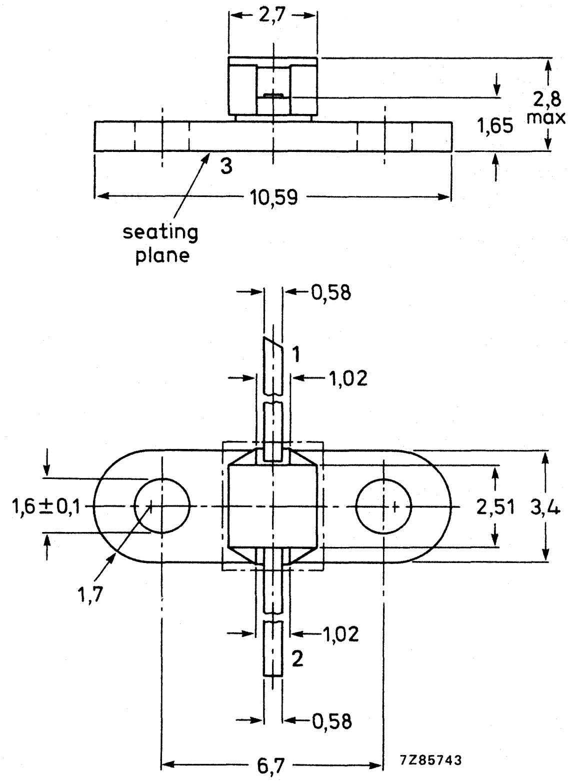


Pinning:

1 = base
2 = emitter
3 = collector

Fig. 1b FO-85.

PQC5001T



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,				
$R_{BE} = 70\,\Omega$	V_{CER}	max.	35	V
open emitter	V_{CEO}	max.	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 $T_{amb} = 75\ ^oC$	P_{tot}	max.	4	W
Storage temperature	T_{stg}		−65 to +200	^oC
Junction temperature	T_j	max.	200	^oC
Soldering temperature				
at 0,1 mm from the case, $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	^oC

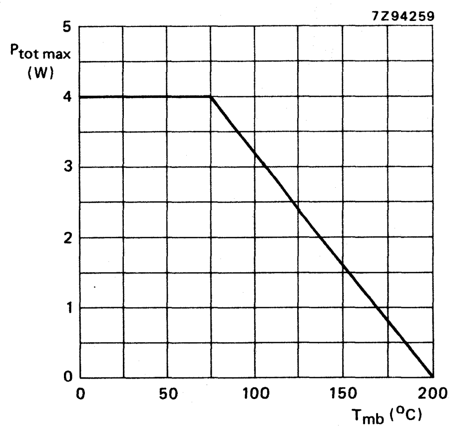


Fig. 2 Power derating curve versus mounting base temperature.

THERMAL RESISTANCE (at Tj=75 ^oC)

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	24	K/W

CHARACTERISTICS

$T_{mb} = 25\ ^oC$ unless otherwise specified

Breakdown voltages				
$I_C = 500\ \mu A$; $I_E = 0$	$V_{(BR)CBO}$	$\geqslant$	40	V
$I_C = 2{,}5$ mA; $R_{BE} = 70\,\Omega$	$V_{(BR)CER}$	$\geqslant$	35	V
$I_C = 0$; $I_E = 100\ \mu A$	$V_{(BR)EBO}$	$\geqslant$	3,5	V
Collector cut-off current				
$I_E = 0$; $V_{CB} = 24$ V	I_{CBO}	$\leqslant$	100	μA
Emitter cut-off current				
$I_C = 0$; $V_{EB} = 1{,}5$ V	I_{EBO}	$\leqslant$	0,2	μA
Collector-base capacitance at f = 1 MHz				
$I_E = I_C = 0$; $V_{CB} = 18$ V; $V_{EB} = 1{,}5$ V	C_{cb}	typ.	1,4	pF

Emitter-base capacitance at f = 1 MHz $I_E = I_C = 0$; $V_{EB} = 1$ V; $V_{CB} = 10$ V	C_{eb}	typ.	5,5 pF
Collector-emitter capacitance at f = 1 MHz $I_E = I_C = 0$; $V_{CE} = 18$ V; $V_{EB} = 1,5$ V	C_{ce}	typ.	0,9 pF

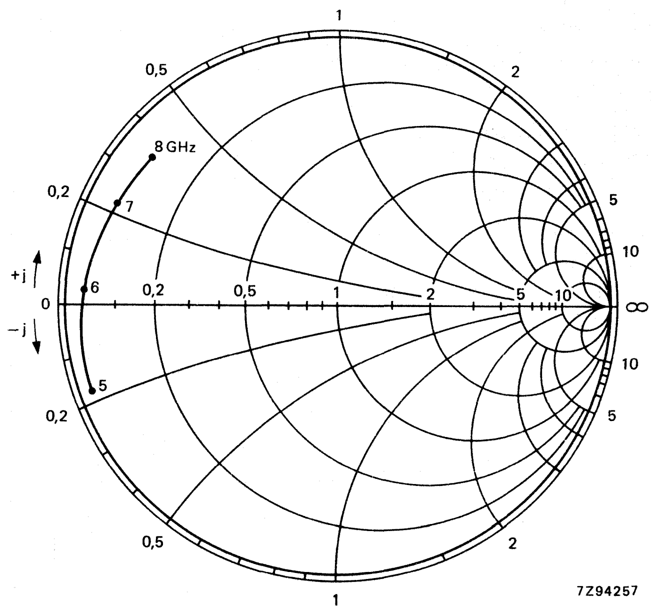


Fig. 3 Emitter reflection coefficient.

Conditions for Figs 3 and 4:
$V_{CE} = 20$ V; $I_C = 200$ mA;
$Z_0 = 50\ \Omega$

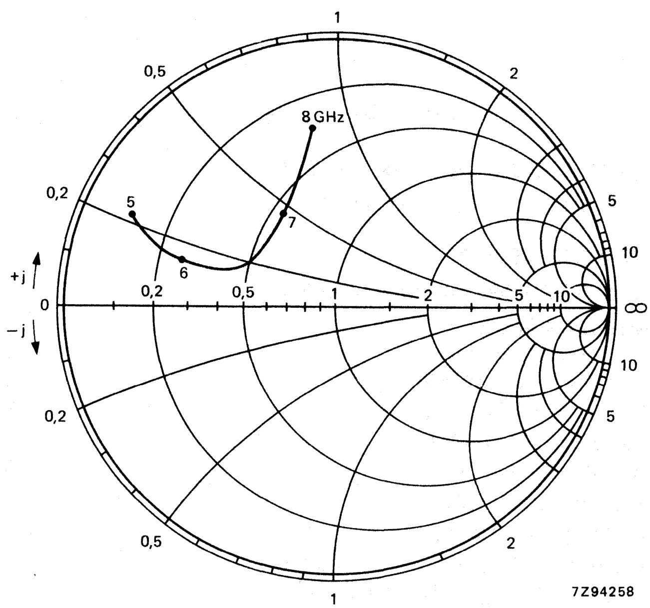


Fig. 4 Base reflection coefficient.

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 °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

Dimensions in mm

Fig. 1 FO-41B.

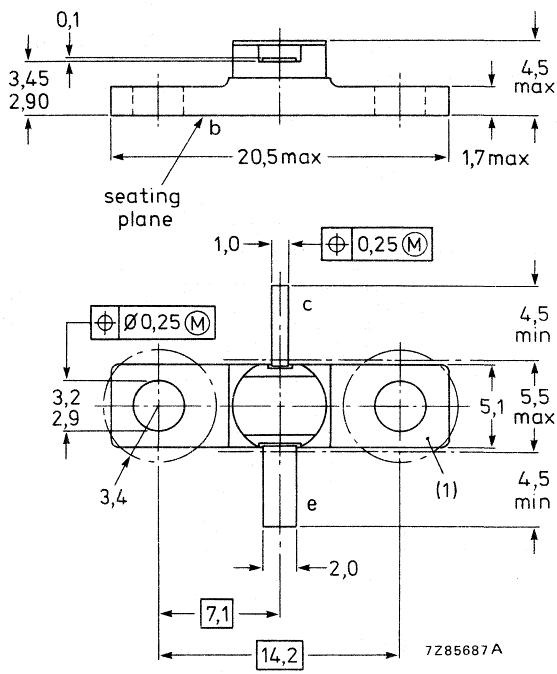
Base and metallic cap connected to flange.

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						
$R_{BE} = 10\ \Omega$	V_{CER}	max.	40	40	40	V
open base	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 °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; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235			°C

THERMAL RESISTANCE (at T_j = 75 °C)

			PTB23001X	23003X	23005X	
From junction to mounting base	$R_{th\ j\text{-}mb}$	max.	22	12	8,5	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	max.	0,7	0,7	0,7	K/W

PTB23001X

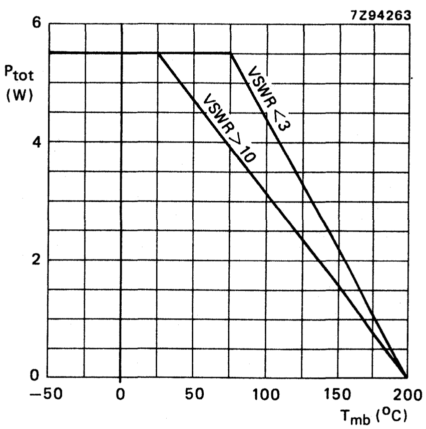


Fig. 2 Maximum permissible R.F. power dissipation as a function of mounting base temperature. f > 1 MHz.

PTB23003X

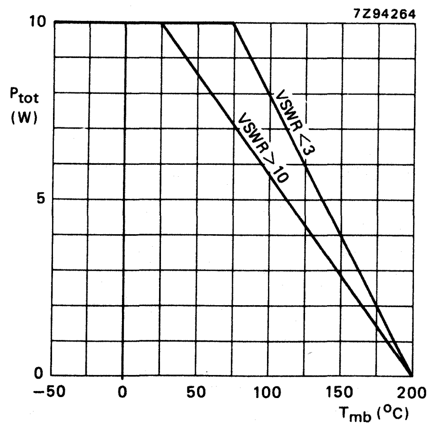
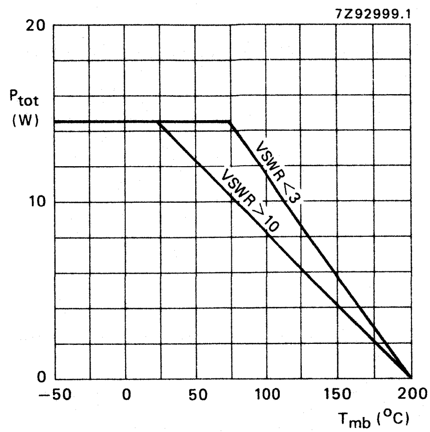


Fig. 3 Maximum permissible R.F. power dissipation as a function of mounting base temperature. f > 1 MHz.



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		⩾	40	–	–	V
open emitter; I_C = 2 mA	$V_{(BR)CBO}$	⩾	–	40	–	V
open emitter; I_C = 3 mA		⩾	–	–	40	V
Collector-emitter breakdown voltage						
R_{BE} = 10 Ω; I_C = 10 mA	$V_{(BR)CER}$	⩾	40	40	40	V
Emitter-base breakdown voltage						
open collector; I_E = 0,5 mA		⩾	3,5	–	–	V
open collector; I_E = 1,0 mA	$V_{(BR)EBO}$	⩾	–	3,5	–	V
open collector; I_E = 1,5 mA		⩾	–	–	3,5	V
Collector cut-off current						
I_E = 0; V_{CB} = 24 V	I_{CBO}	⩽	10	20	30	μA
Emitter cut-off current						
I_C = 0; V_{EB} = 1,5 V	I_{EBO}	⩽	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

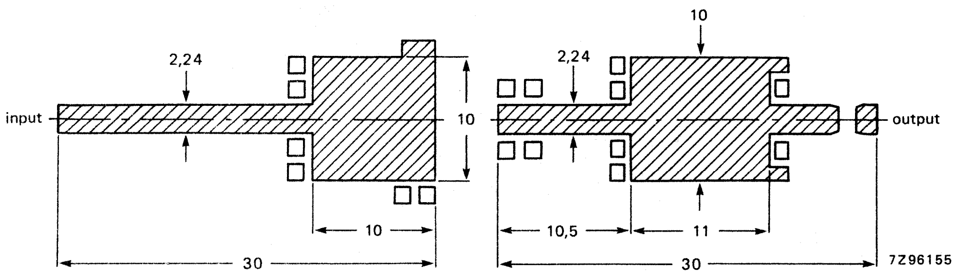


Fig. 5 Prematching test circuit board for PTB23001X.

Circuit on a double Cu-clad printed-circuit board Teflon fibre-glass dielectric (ϵ_r = 2,55); thickness 0,8 mm.

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

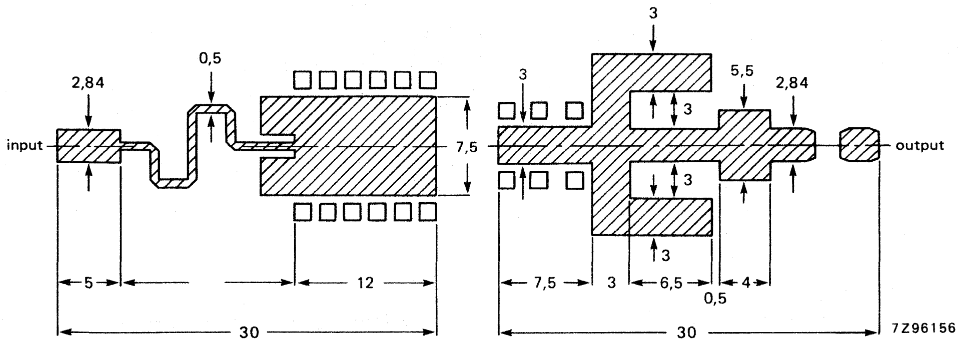


Fig. 6 Prematching test circuit board for PTB23003X.

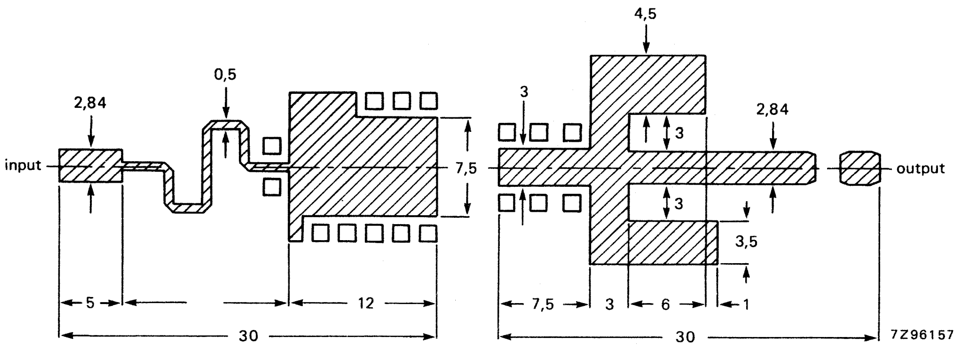


Fig. 7 Prematching test circuit board for PTB23005X.

Circuits on a double Cu-clad printed-circuit board Teflon fibre-glass dielectric (ϵ_r = 2,55 for PTB23003X; ϵ_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 °C in an unneutralized common-base class-B circuit

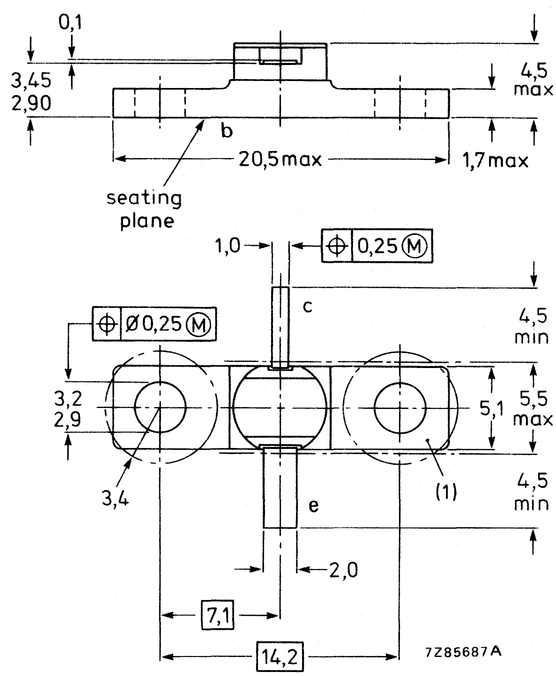
type number	mode of operation	f GHz	V_{CE} V	P_L W	G_p dB	η %	$\bar{z}_i$ Ω	$\bar{Z}_L$ Ω
PTB32001X	c.w.	3	24	typ. 1,8	typ. 9,5	typ. 45	15 + j31	5,5 + j10
PTB32003X	c.w.	3	24	typ. 3,0	typ. 9,5	typ. 40	5,5 + j29	5 – j2,2
PTB32005X	c.w.	3	24	typ. 5,5	typ. 9,5	typ. 40	2,8 + j20	4 – j7

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 Ω	V_{CER}	max.	40	40	40	V
open base	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 °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} ≤ 10 s	T_{sld}	max.	235			°C

THERMAL RESISTANCE (at T_j = 75 °C)

			PTB32001X	32003X	32005X	
From junction to mounting base	$R_{th\ j\text{-}mb}$	max.	22	12	8,5	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	max.	0,7	0,7	0,7	K/W

PTB32001X

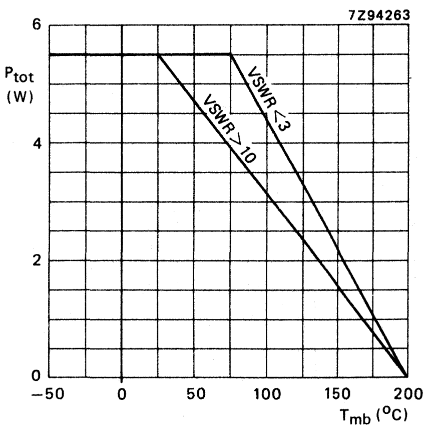


Fig. 2 Maximum permissible R.F. power dissipation as a function of mounting base temperature. f > 1 MHz.

PTB32003X

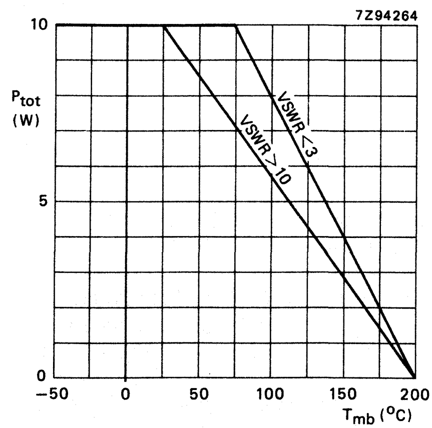


Fig. 3 Maximum permissible R.F. power dissipation as a function of mounting base temperature. f > 1 MHz.

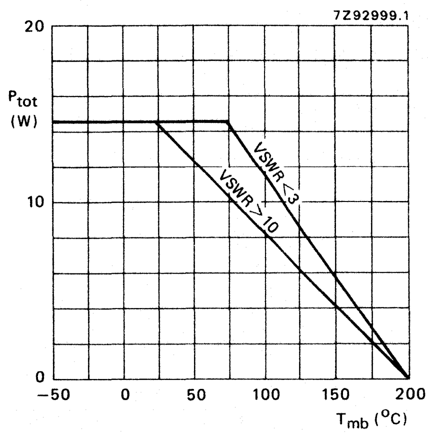


Fig. 4 Maximum permissible R.F. power dissipation as a function of mounting base temperature. f > 1 MHz.

PTB23005X

CHARACTERISTICS

			PTB32001X	32003X	32005X	
Collector-base breakdown voltage						
open emitter; I_C = 1 mA		≥	40	–	–	V
open emitter; I_C = 2 mA	$V_{(BR)CBO}$	≥	–	40	–	V
open emitter; I_C = 3 mA		≥	–	–	40	V
Collector-emitter breakdown voltage						
R_{BE} = 10 Ω; I_C = 10 mA	$V_{(BR)CER}$	≥	40	40	40	V
Emitter-base breakdown voltage						
open collector; I_E = 0,5 mA		≥	3,5	–	–	V
open collector; I_E = 1,0 mA	$V_{(BR)EBO}$	≥	–	3,5	–	V
open collector; I_E = 1,5 mA		≥	–	–	3,5	V
Collector cut-off current						
I_E = 0; V_{CB} = 24 V	I_{CBO}	≤	10	20	30	μA
Emitter cut-off current						
I_C = 0; V_{EB} = 1,5 V	I_{EBO}	≤	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

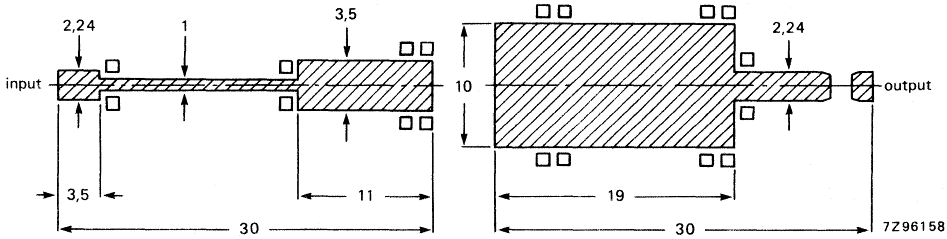


Fig. 5 Prematching test circuit board for PTB32001X.

Circuit on a double Cu-clad printed-circuit board Teflon fibre-glass dielectric (ϵ_r = 2,55); thickness 0,8 mm.

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

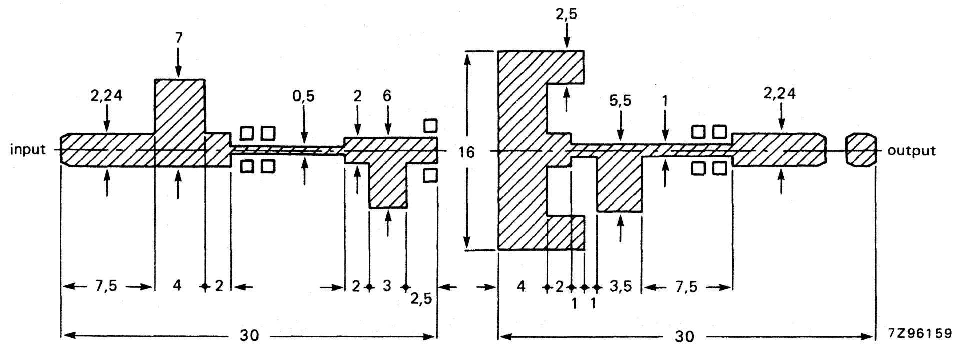


Fig. 6 Prematching test circuit board for PTB32003X.

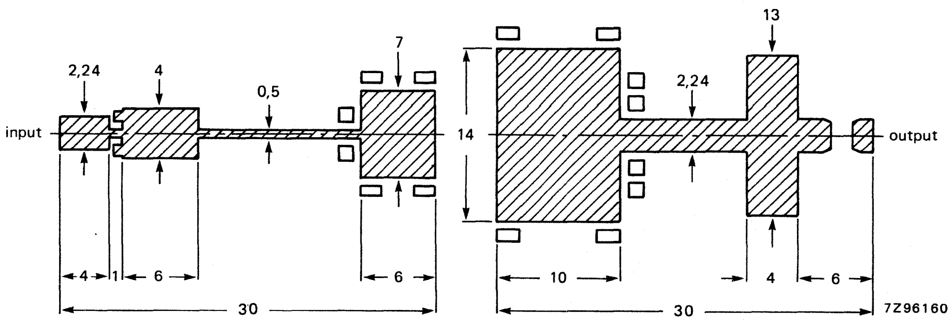


Fig. 7 Prematching test circuit board for PTB32005X.

Circuits on a double Cu-clad printed-circuit board Teflon fibre-glass dielectric (ϵ_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 °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 %	$\overline{z_i}$ Ω	$\overline{Z_L}$ 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 ;

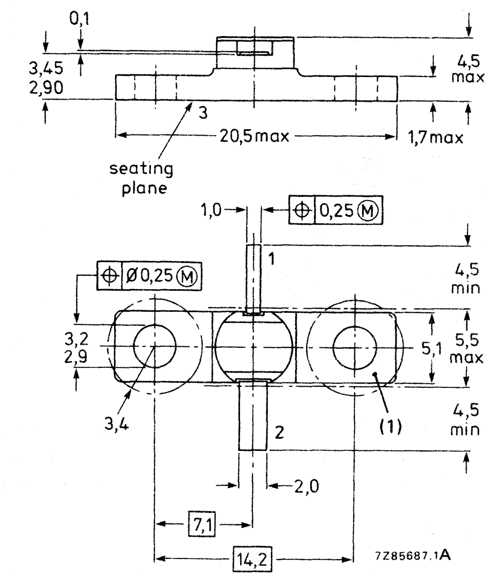
1 = collector
2 = emitter
3 = base

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	V_{CER}	max.	40	40	V
Collector-emitter voltage, open base	V_{CEO}	max.	15	15	V
Emitter-base voltage, open collector	V_{EBO}	max.	3,5	3,5	V
Collector current (d.c.)	I_C	max.	0,25	0,5	A
R.F. power dissipation (f > 1 MHz) up to T_{mb} = 75 °C	P_{tot}	max.	5,5	10	W
Storage temperature	T_{stg}		−65 to + 200		°C
Junction temperature	T_j	max.	200		°C
Lead soldering temperature at 0,3 mm from ceramic; $t_{sld} \leqslant$ 10 s	T_{sld}	max.	235		°C

PTB42001X

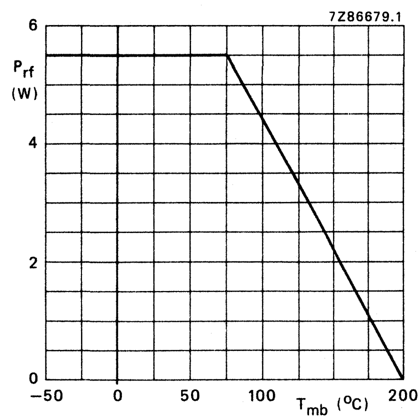


Fig. 2 Maximum permissible R.F. power dissipation as a function of mounting base temperature. f > 1 MHz.

PTB42002X

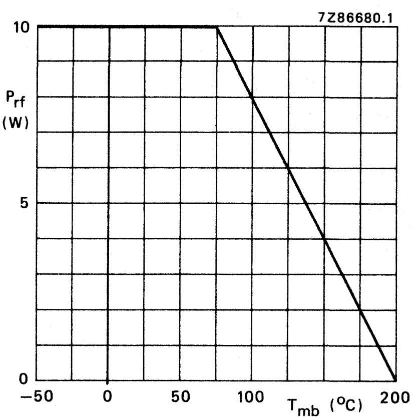


Fig. 3 Maximum permissible R.F. power dissipation as a function of mounting base temperature. f > 1 MHz.

→ **THERMAL RESISTANCE** (at T_j = 75 °C)

			PTB42001X	42002X	
From junction to mounting base	$R_{th\ j\text{-}mb}$	max.	22	12	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	max.	0,7	0,7	K/W

CHARACTERISTICS

			PTB42001X	42002X	
Collector-base breakdown voltage					
open emitter; I_C = 1 mA	$V_{(BR)CBO}$	⩾	40	–	V
open emitter; I_C = 2 mA	$V_{(BR)CBO}$	⩾	–	40	V
Collector-emitter breakdown voltage					
R_{BE} = 10 Ω; I_C = 10 mA	$V_{(BR)CER}$	⩾	40	40	V
Emitter-base breakdown voltage					
open collector; I_E = 0,5 mA	$V_{(BR)EBO}$	⩾	3,5	–	V
open collector; I_E = 1,0 mA	$V_{(BR)EBO}$	⩾	–	3,5	V
Collector cut-off current					
I_E = 0; V_{CB} = 24 V	I_{CBO}	⩽	10	20	μA
Emitter cut-off current					
I_C = 0; V_{EB} = 1,5 V	I_{EBO}	⩽	0,2	0,4	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	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	pF

APPLICATION INFORMATION (see also next page)

PTB42001X

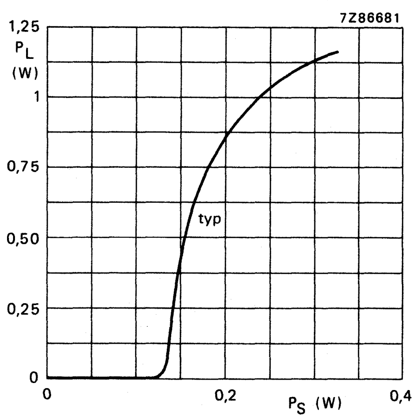


Fig. 4 Load power as a function of source power.

PTB42002X

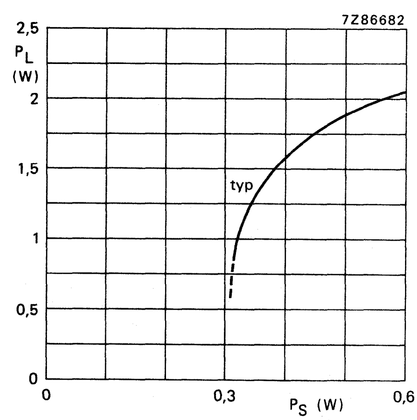


Fig. 5 Load power as a function of source power.

Conditions for Figs 4 and 5:
Class-B operation; V_{CE} = 24 V; f = 4,2 GHz; T_{mb} = 25 °C.

APPLICATION INFORMATION (see also previous page)

R.F. performance up to T_{mb} = 25 °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 %	$\overline{z_i}$ Ω	$\overline{Z_L}$ 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

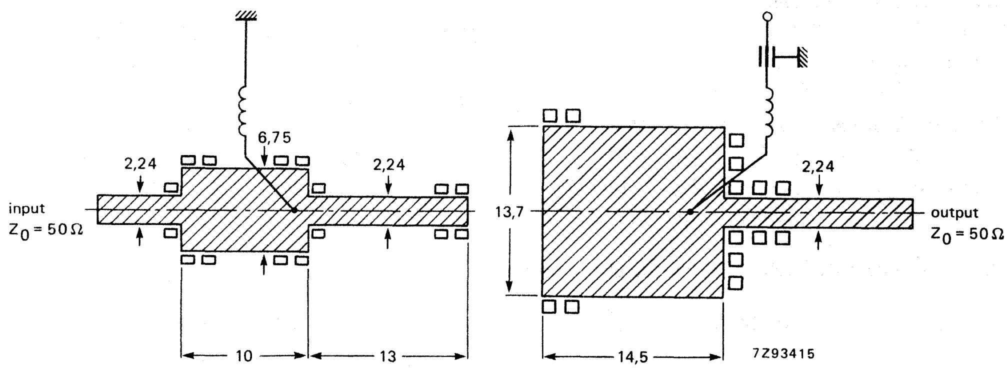


Fig. 6 Prematching test circuit boards for the **PTB42001X** at 4,2 GHz (Dimensions in mm.)

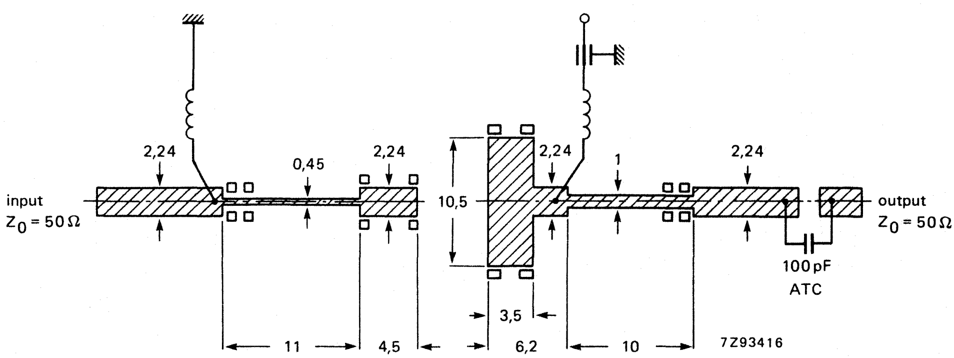


Fig. 7 Prematching test circuit boards for the **PTB42002X** at 4,2 GHz. (Dimensions in mm.)

Circuits on a double Cu-clad printed-circuit board PTFE fibre-glass dielectric (ϵ_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 °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 %	$\overline{z_i}$ Ω	$\overline{Z_L}$ 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

Dimensions in mm

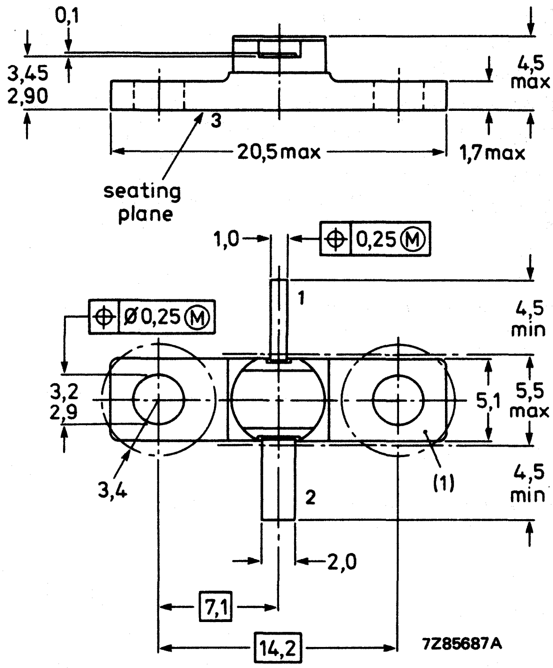
Fig. 1 FO-41B.

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

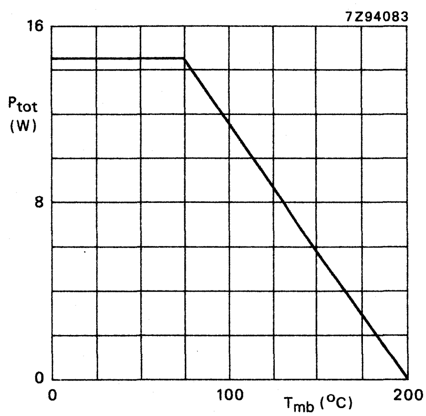


Fig. 2 Power derating curve versus mounting base temperature.

THERMAL RESISTANCE (at T_j = 75 °C) ←

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	8,5 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,7 K/W

CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Breakdown voltages			
I_C = 3 mA; I_E = 0	$V_{(BR)CBO}$	≥	40 V
I_C = 10 mA; R_{BE} = 10 Ω	$V_{(BR)CER}$	≥	40 V
I_C = 0; I_E = 1 mA	$V_{(BR)EBO}$	≥	3,5 V
Collector cut-off current			
I_E = 0; V_{CB} = 24 V	I_{CBO}	≤	30 μA
Emitter cut-off current			
I_C = 0; V_{EB} = 1,5 V	I_{EBO}	≤	0,6 μA
Collector-base capacitance			
$I_E = I_C = 0$; V_{CB} = 24 V	C_{cb}	typ.	3,8 pF

APPLICATION INFORMATION

Microwave performance up to T_{mb} = 25 °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 %	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω
c.w.; class-C	4,2	24	⩾ 2,5	⩾ 5	⩾ 28	12 + j35	2,5 − j10

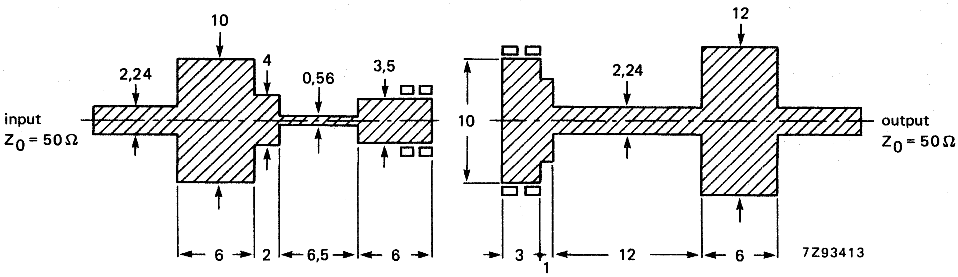


Fig. 3 Prematching test circuit board for 4,2 GHz. (Dimensions in mm).

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

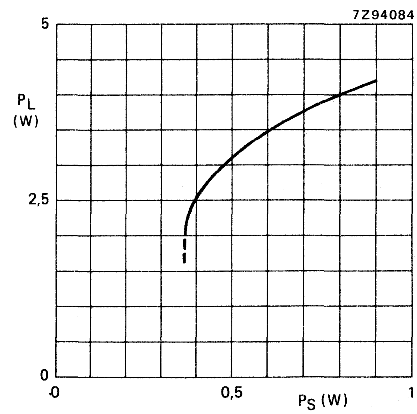


Fig. 4 Load power versus source power.

* 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

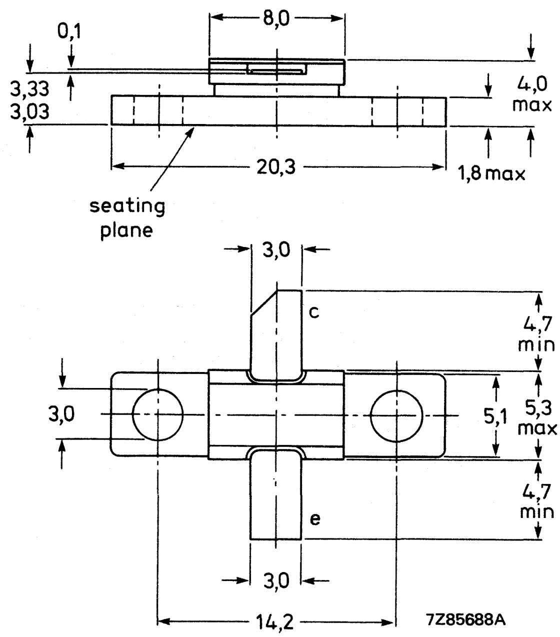
R.F. performance up to T_{mb} = 25 °C in an unneutralized common-base class-B circuit

mode of operation	f GHz	V_{CC} V	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Z_L}$ 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				
($R_{BE} \leqslant 10\ \Omega$)	V_{CER}	max.	40	V
(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	A
Total r.f. power dissipation up to T_{mb} = 75 °C	P_{rf}	max.	18	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; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	°C

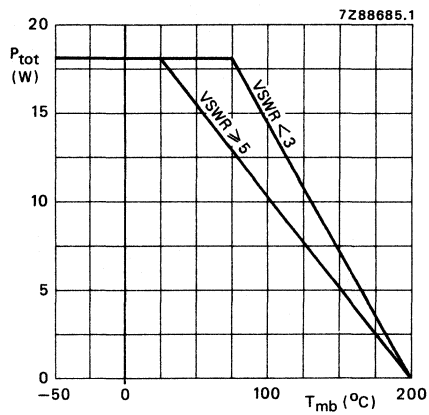


Fig. 2 Maximum permissible r.f. power dissipation as a function of mounting base temperature.
f > 3,6 GHz; V_{CE} = 24 V.

→ **THERMAL RESISTANCE** (at T_j = 75 °C)

From junction to mounting base	$R_{th\ j\text{-}mb}$ =	6,5 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$ =	0,7 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 °C in an unneutralized common-base class-B circuit, P_S = 1 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

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 the BeO disc is not damaged.

MECHANICAL DATA

Dimensions in mm

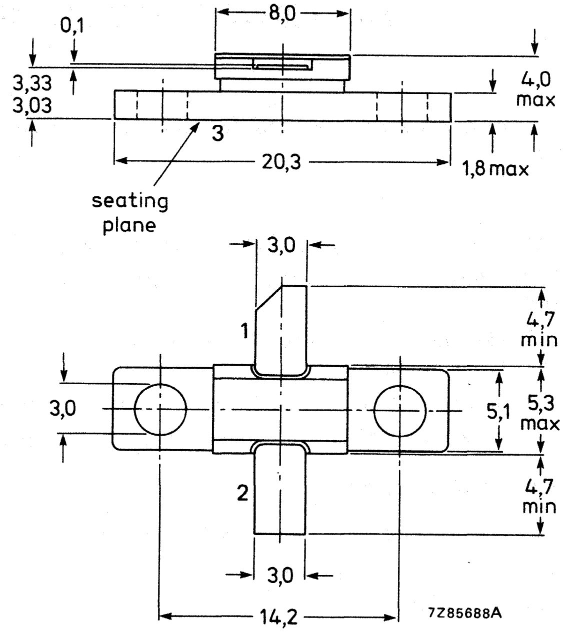
Fig. 1 FO-83.

Base connected to flange.

Pinning:

1 = collector
2 = emitter
3 = base

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



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.	1	A
Total power dissipation up to $T_{mb} = 75\ ^oC$	P_{tot}	max.	18	W
Storage temperature	T_{stg}		−65 to 200	^oC
Junction temperature	T_j	max.	200	^oC
Lead soldering temperature at 0,1 mm from the case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	^oC

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

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	6,5	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,7	K/W

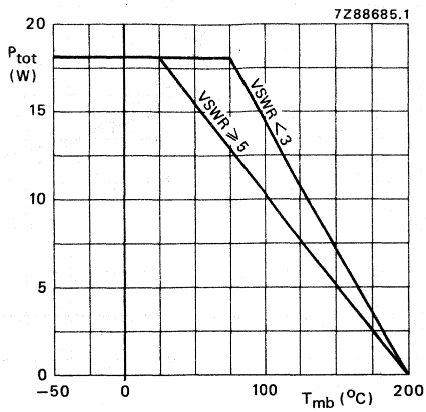


Fig. 2 Power derating curve versus mounting base temperature; V_{CE} = 24 V; f > 1 MHz.

CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Collector-emitter breakdown voltage I_C = 30 mA; R_{BE} = 10 Ω	$V_{(BR)CER}$	≥	40 V
Emitter-base breakdown voltage I_C = 0; I_E = 0,5 mA	$V_{(BR)EBO}$	≥	3,5 V
Collector cut-off current I_E = 0; V_{CB} = 24 V	I_{CBO}	≤	50 mA
Emitter cut-off current I_C = 0; V_{EB} = 1,5 V	I_{EBO}	≤	1,5 mA
Collector-base capacitance at f = 1 MHz I_E = I_C = 0; V_{CB} = 24 V; V_{EB} = 1,5 V	C_{cb}	typ.	50 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.	1,2 pF
Emitter-base capacitance at f = 1 MHz I_E = I_C = 0; V_{CB} = 24 V; V_{EB} = 1 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

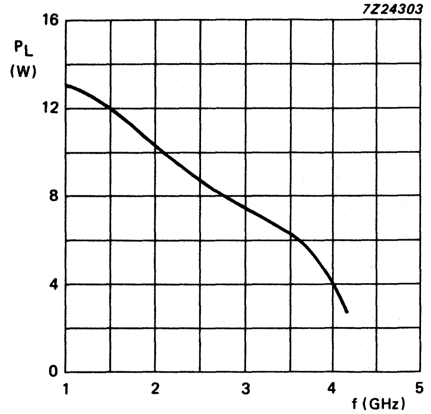


Fig. 3 Load power as a function of frequency. V_{CC} = 24 V; P_S = 1 W.

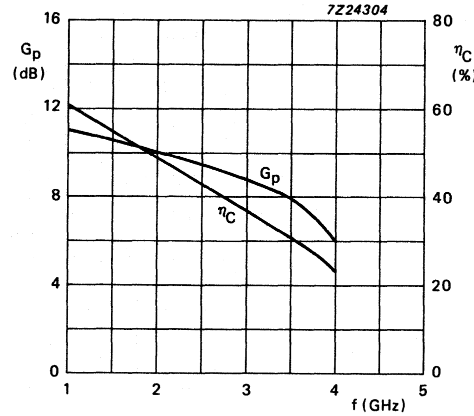


Fig. 4 Power gain and efficiency as a function of frequency. V_{CC} = 24 V; P_S = 1 W.

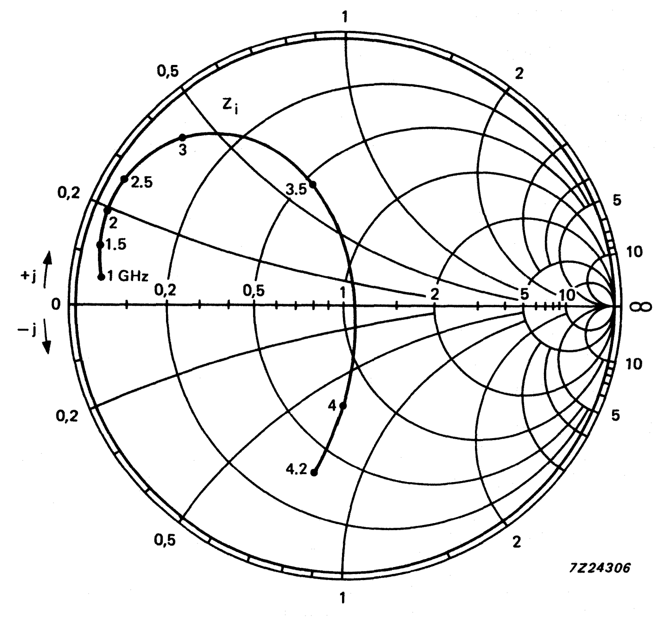


Fig. 5 Input impedance as a function of frequency. V_{CC} = 24 V; P_S = 1 W.

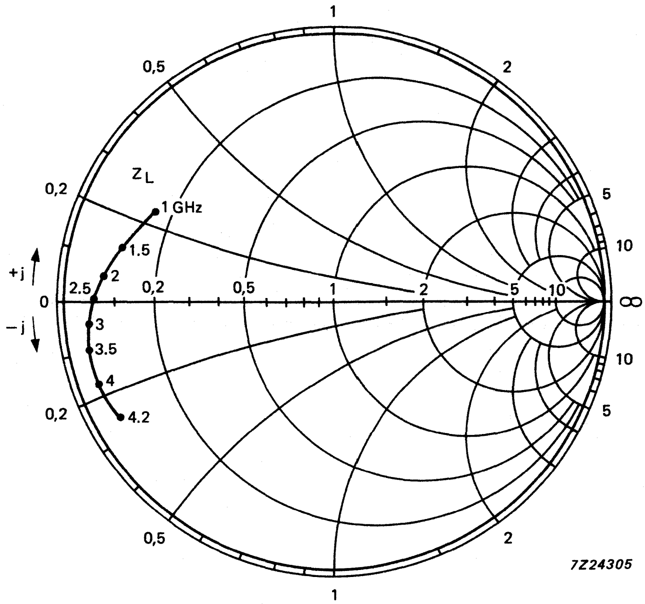


Fig. 6 Output impedance as a function of frequency.
V_{CC} = 24 V; P_S = 1 W.

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 °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

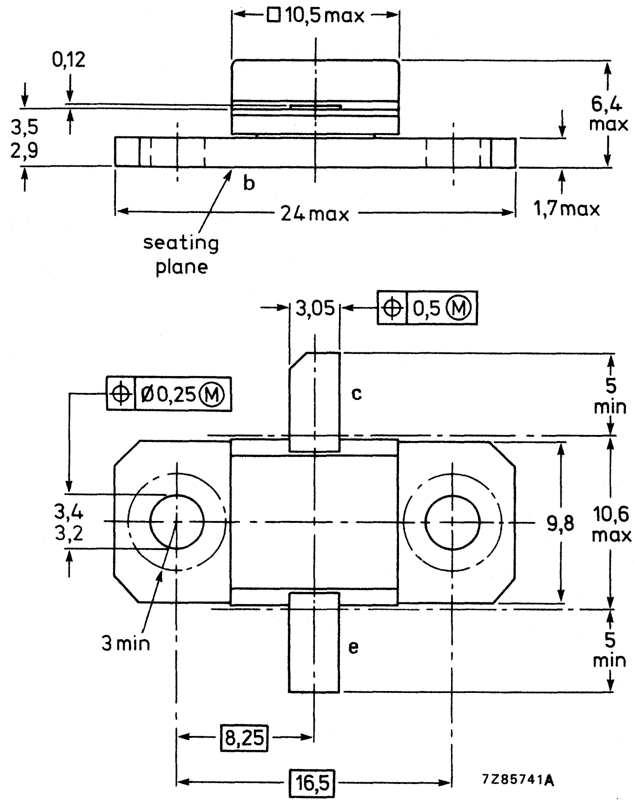
Dimensions in mm

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			
$R_{BE} = 10\ \Omega$	V_{CER}	max.	35 V
open base	V_{CEO}	max.	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 $T_{mb} = 75\ ^oC$	P_{tot}	max.	27 W
Storage temperature	T_{stg}	−65 to	+ 200 °C
Junction temperature	T_j	max.	+ 200 °C
Lead soldering temperature	T_{sld}	max.	+ 235 °C

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

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

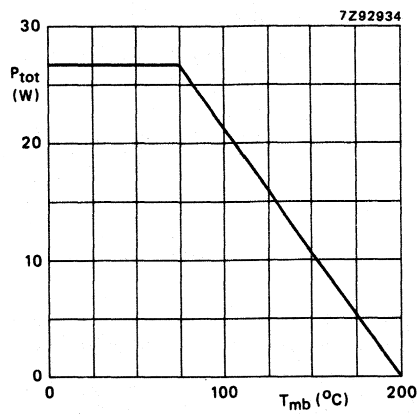


Fig. 2 Power derating curve versus mounting base temperature.

CHARACTERISTICS

T_{mb} = 25 °C

Collector cut-off current

$I_E = 0$; $V_{CB} = 30$ V	I_{CBO}	<	2,5 mA
$I_E = 0$; $V_{CB} = 40$ V	I_{CBO}	<	5 mA
$R_{BE} = 10\ \Omega$; $V_{CE} = 35$ V	I_{CER}	<	25 mA

Emitter cut-off current

$I_C = 0$; $V_{EB} = 1{,}5$ V	I_{EBO}	<	100 μA
$I_C = 0$; $V_{EB} = 3$ V	I_{EBO}	<	0,5 mA

APPLICATION INFORMATION (type PZ1418B15U)

Microwave performance up to T_{mb} = 25 °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
PZ1418B15U	1,4 to 1,8	28	> 12,5	> 7	> 38	see Fig. 6	see Fig. 7

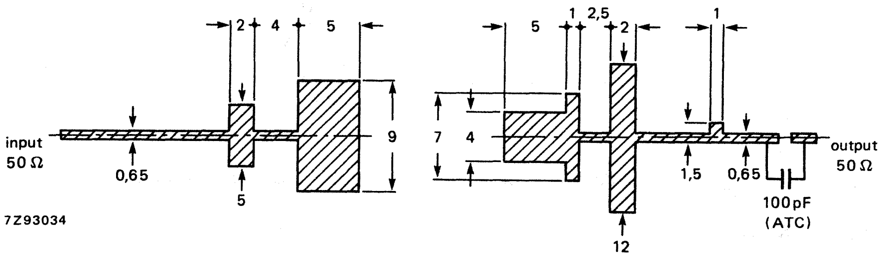


Fig. 3 Wideband test circuit boards for 1,4 to 1,8 GHz (dimensions in mm); Epsilam p.c. board; thickness 0,635 mm; ϵ_r = 10.

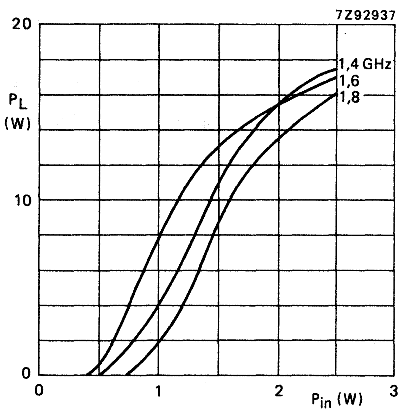


Fig. 4 Load power vs. input power; typical values.

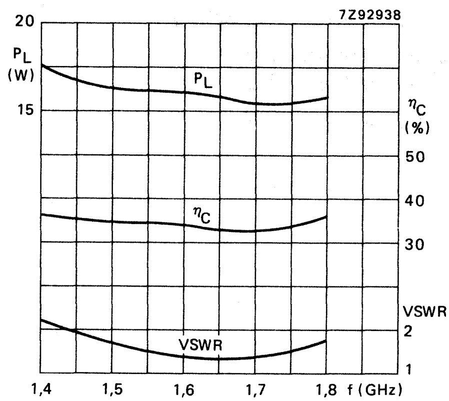


Fig. 5 Load power, efficiency and VSWR vs. frequency; typical values; P_{in} = 2,5 W.

Conditions for Figs 4 and 5:

V_{CC} = 28 V; class-B operation; T_{mb} = 25 °C.

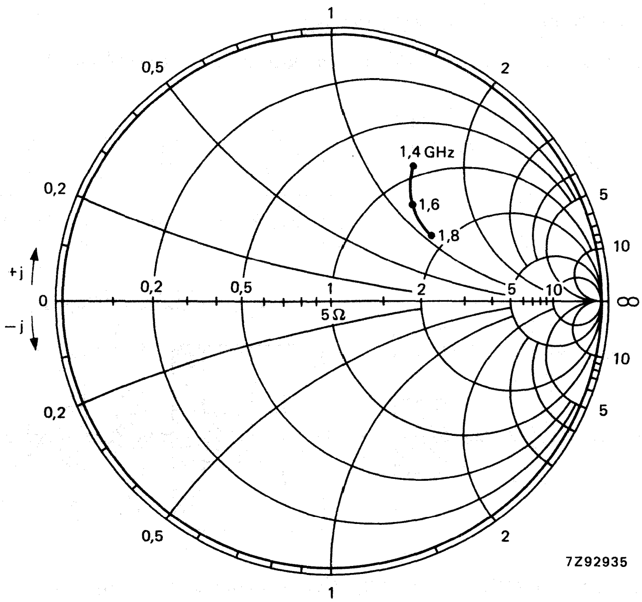


Fig. 6 Input impedance vs. frequency; typical values; Z_O = 5 Ω.

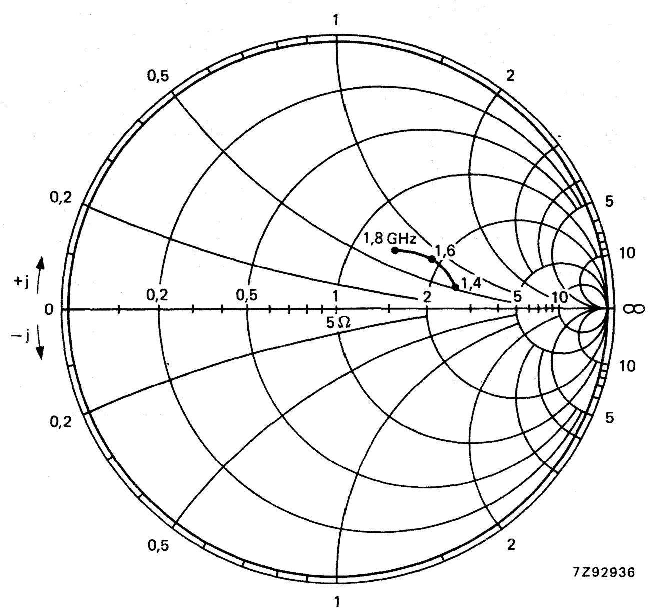
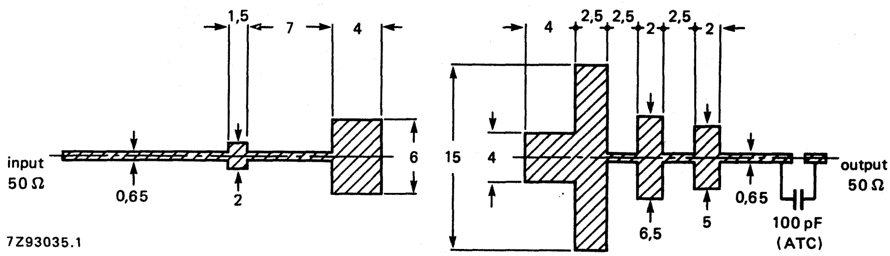


Fig. 7 Optimum load impedance vs. frequency; typical values; Z_O = 5 Ω.

APPLICATION INFORMATION (type PZ1721B12U)

Microwave performance up to T_{mb} = 25 °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; ϵ_r = 10.

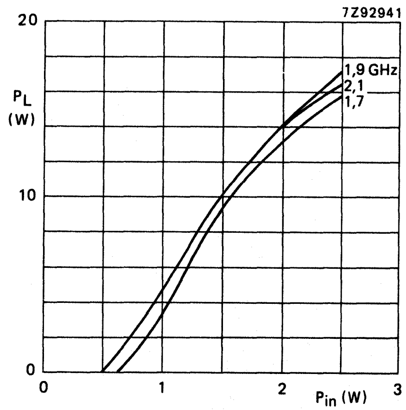


Fig. 9 Load power vs. input power; typical values.

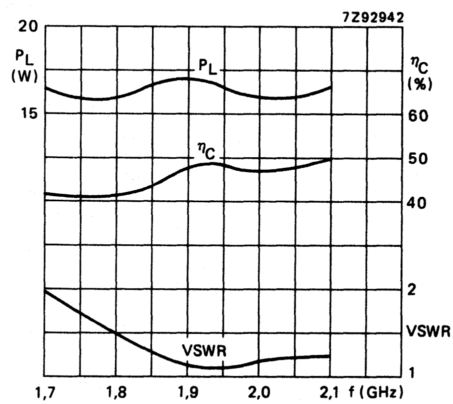


Fig. 10 Load power, efficiency and VSWR vs. frequency; typical values; P_{in} = 2,5 W.

Conditions for Figs 9 and 10:

V_{CC} = 28 V; class-B operation; T_{mb} = 25 °C.

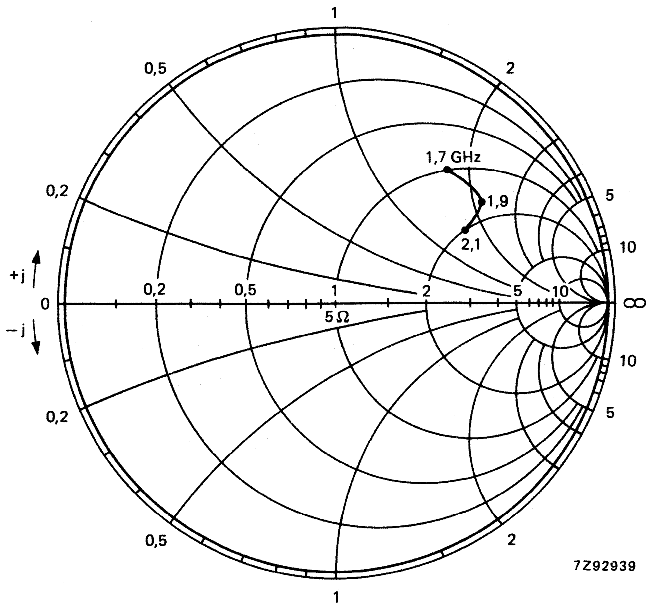


Fig. 11 Input impedance vs. frequency;
typical values; Z_O = 5 Ω.

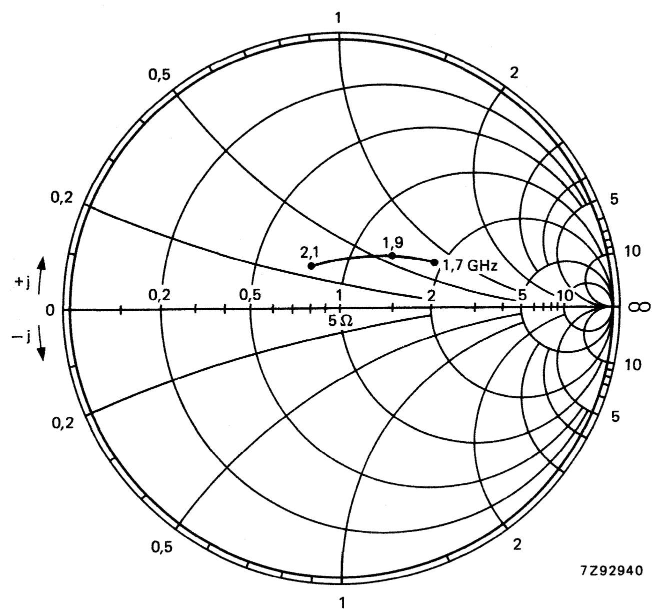


Fig. 12 Optimum load impedance vs. frequency;
typical values; Z_O = 5 Ω.

APPLICATION INFORMATION (type PZ2024B10U)

Microwave performance up to T_{mb} = 25 °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

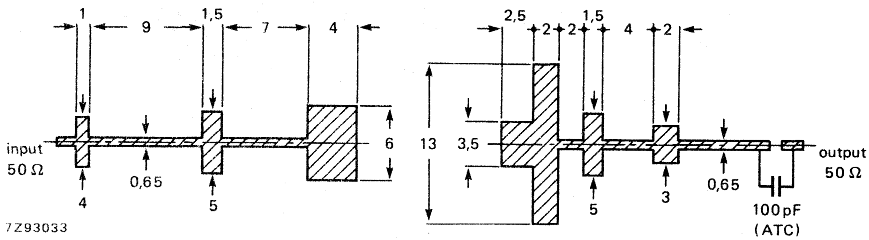


Fig. 13 Wideband test circuit boards for 2,0 to 2,4 GHz (dimensions in mm); Epsilam p.c. board; thickness 0,635 mm; ϵ_r = 10.

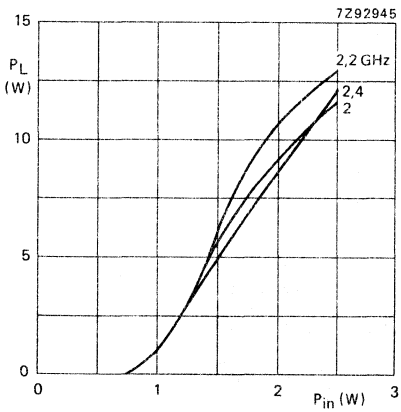


Fig. 14 Load power vs. input power. typical values.

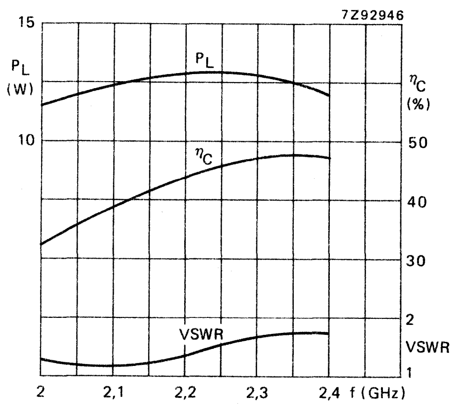


Fig. 15 Load power, efficiency and VSWR vs. frequency; typical values; P_{in} = 2,5 W.

Conditions for Figs 14 and 15:

V_{CC} = 28 V; class-B operation; T_{mb} = 25 °C.

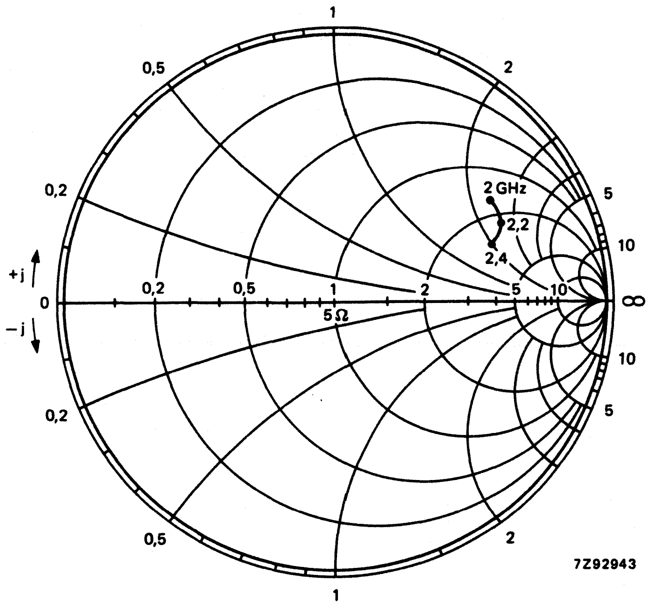


Fig. 16 Input impedance vs. frequency; typical values; $Z_O = 5\ \Omega$.

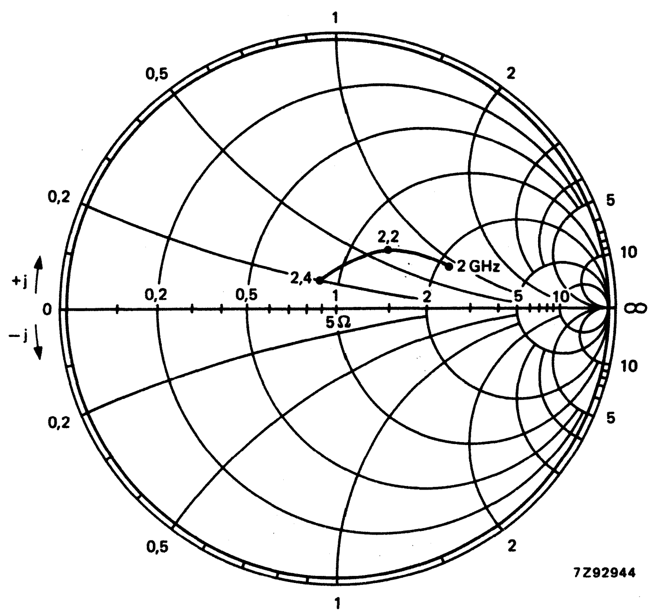


Fig. 17 Optimum load impedance vs. frequency; typical values; $Z_O = 5\ \Omega$.

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 °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

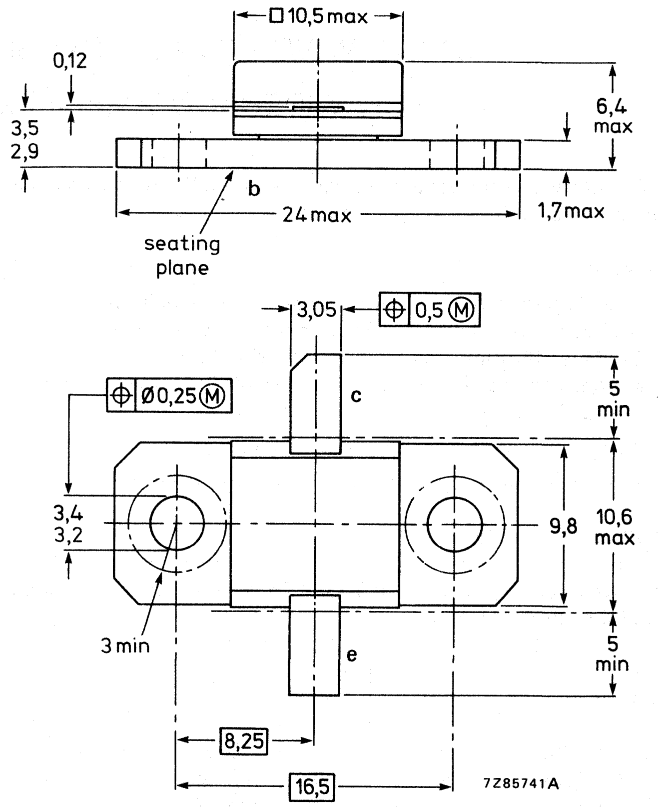
Dimensions in mm

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 Ω	V_{CER}	max.	35 V
open base	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 °C	P_{tot}	max.	45 W
Storage temperature	T_{stg}	−65 to	+ 200 °C
Junction temperature	T_j	max.	+ 200 °C
Lead soldering temperature	T_{sld}	max.	+ 235 °C

→ **THERMAL RESISTANCE** (at T_j = 75 °C)

From junction to mounting base $R_{th\ j\text{-}mb}$ = 2,2 K/W

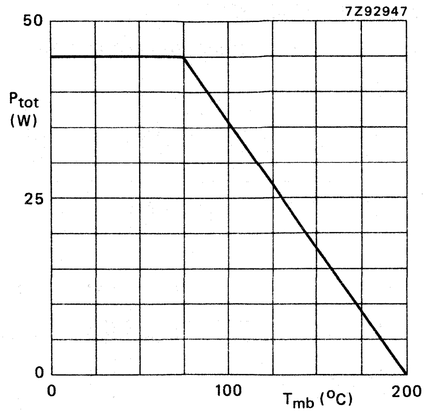


Fig. 2 Power derating curve versus mounting base temperature.

CHARACTERISTICS

$T_{mb} = 25\ ^{o}C$

Collector cut-off current

$I_E = 0$; $V_{CB} = 30$ V	I_{CBO}	<	5 mA
$I_E = 0$; $V_{CB} = 40$ V	I_{CBO}	<	10 mA
$R_{BE} = 10\ \Omega$; $V_{CE} = 35$ V	I_{CER}	<	50 mA

Emitter cut-off current

$I_C = 0$; $V_{EB} = 1{,}5$ V	I_{EBO}	<	200 μA
$I_C = 0$; $V_{EB} = 3$ V	I_{EBO}	<	1 mA

APPLICATION INFORMATION (type PZ1418B30U)

Microwave performance up to T_{mb} = 25 °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

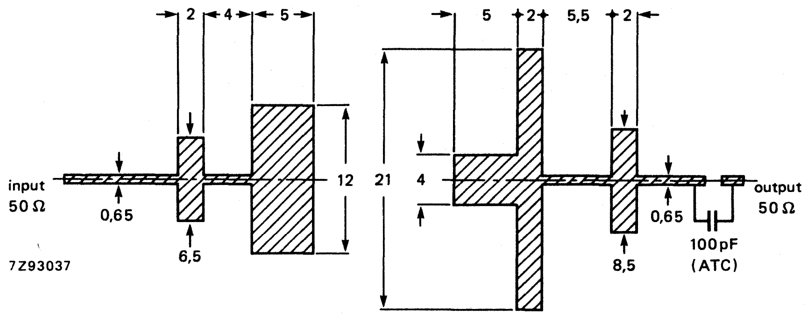


Fig. 3 Wideband test circuit boards for 1,4 to 1,8 GHz (dimensions in mm); Epsilam p.c. board; thickness 0,635 mm; ϵ_r = 10.

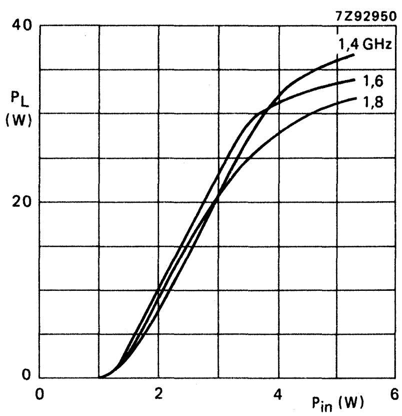


Fig. 4 Load power versus input power; typical values.

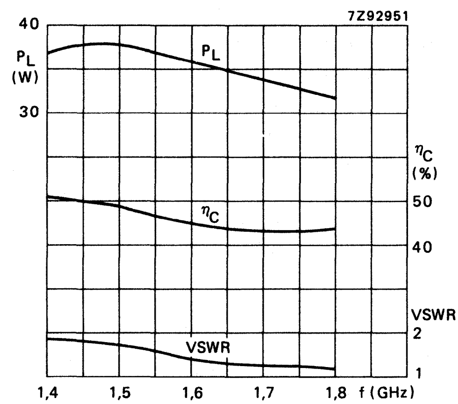


Fig. 5 Load power, efficiency and VSWR versus frequency; typical values; P_{in} = 5 W.

Conditions for Figs 4 and 5:

V_{CC} = 28 V; class-B operation; T_{mb} = 25 °C.

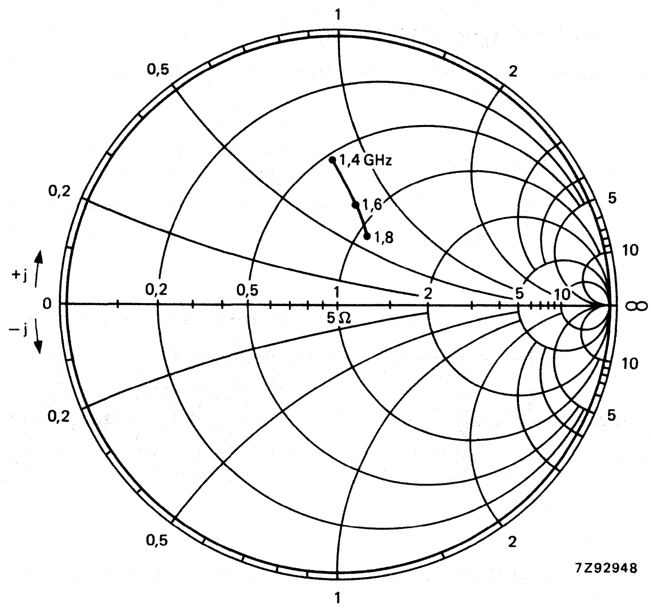


Fig. 6 Input impedance vs. frequency; typical values; $Z_O = 5\ \Omega$.

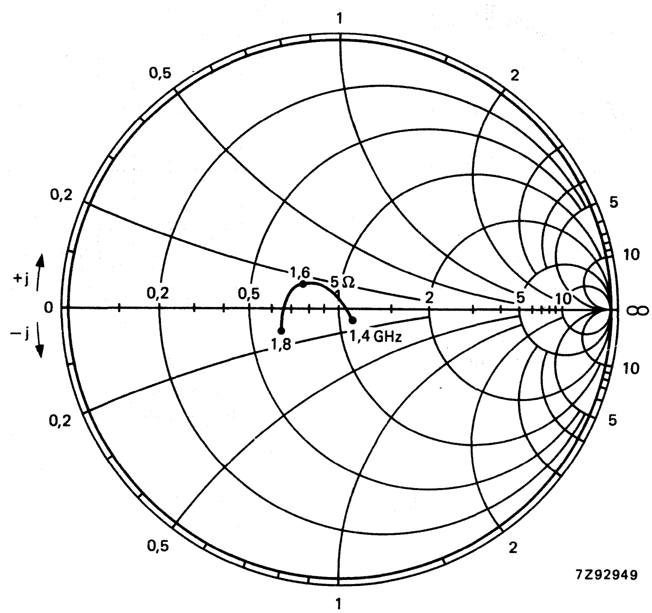


Fig. 7 Optimum load impedance vs. frequency; typical values; $Z_O = 5\ \Omega$.

APPLICATION INFORMATION (type PZ1721B25U)

Microwave performance up to T_{mb} = 25 °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

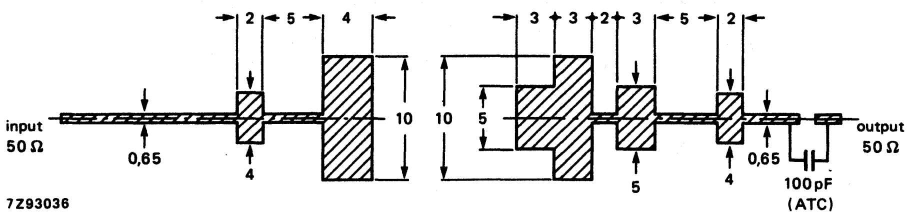


Fig. 8 Wideband test circuit boards for 1,7 to 2,1 GHz (dimensions in mm); Epsilam p.c. board; thickness 0,635 mm; ϵ_r = 10.

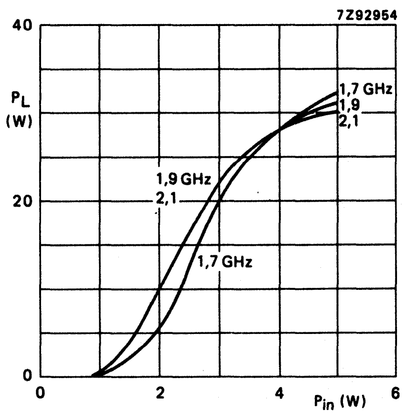


Fig. 9 Load power vs. input power; typical values.

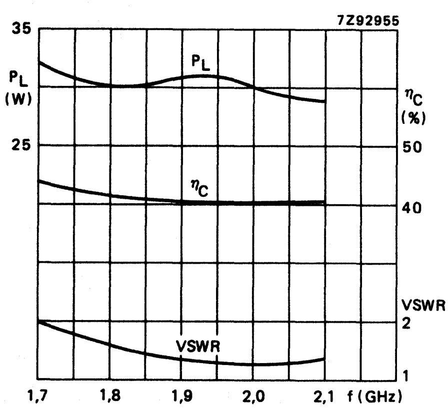


Fig. 10 Load power, efficiency and VSWR vs. frequency; typical values; P_{in} = 5 W.

Conditions for Figs 9 and 10:

V_{CC} = 28 V; class-B operation; T_{mb} = 25 °C.

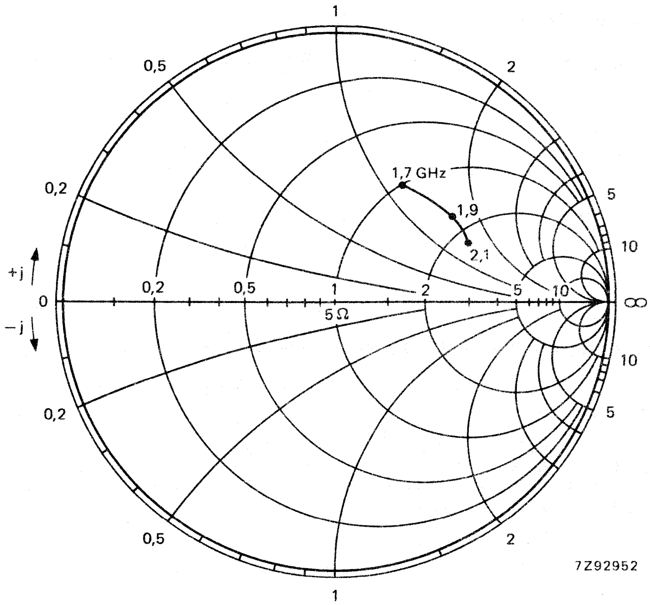


Fig. 11 Input impedance vs. frequency; typical values; $Z_O = 5\ \Omega$.

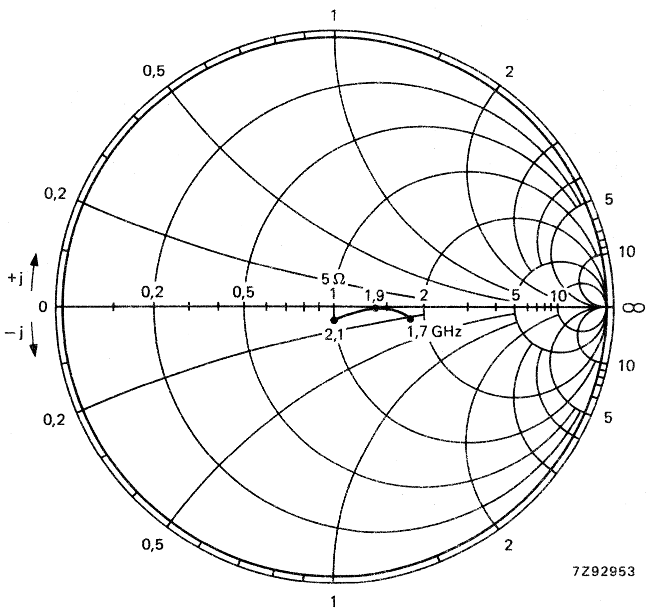


Fig. 12 Optimum load impedance vs. frequency; typical values; $Z_O = 5\ \Omega$.

APPLICATION INFORMATION (type PZ2024B20U)

Microwave performance up to T_{mb} = 25 °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

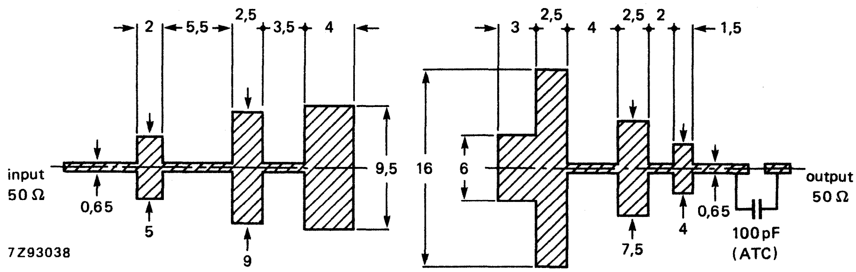


Fig. 13 Wideband test circuit boards for 2,0 to 2,4 GHz (dimensions in mm); Epsilam p.c. board; thickness 0,635 mm; ϵ_r = 10.

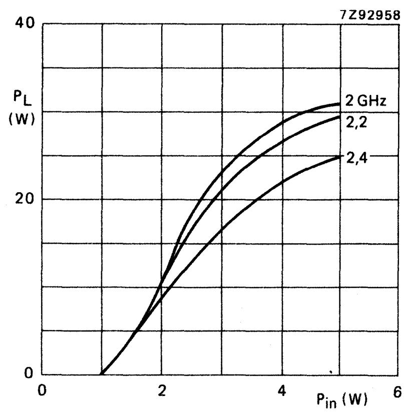


Fig. 14 Load power versus input power; typical values.

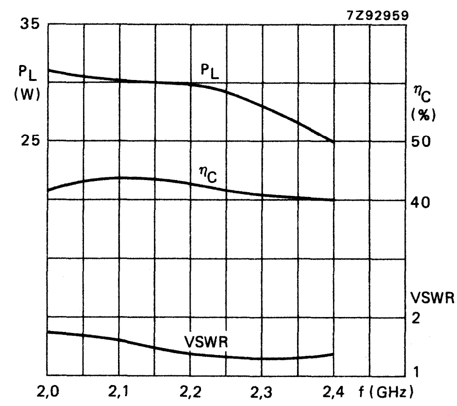


Fig. 15 Load power, efficiency and VSWR versus frequency; typical values; P_{in} = 5 W.

Conditions for Figs 14 and 15:

V_{CC} = 28 V; class-B operation; T_{mb} = 25 °C.

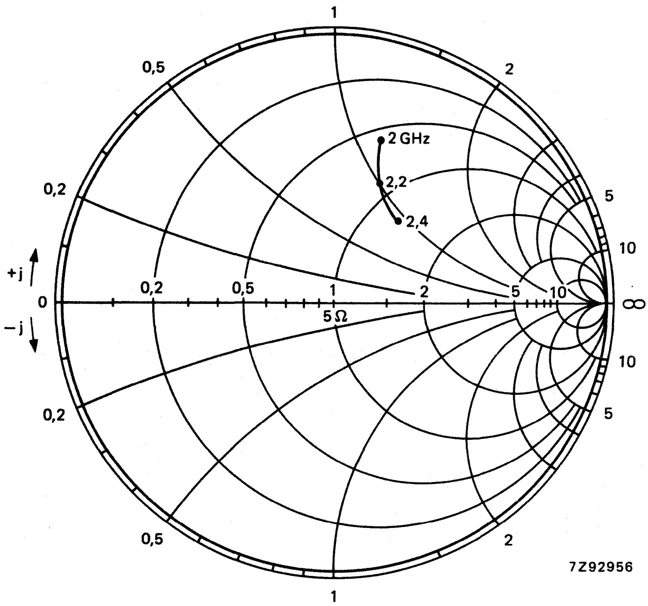


Fig. 16 Input impedance vs. frequency; typical values; $Z_O = 5\ \Omega$.

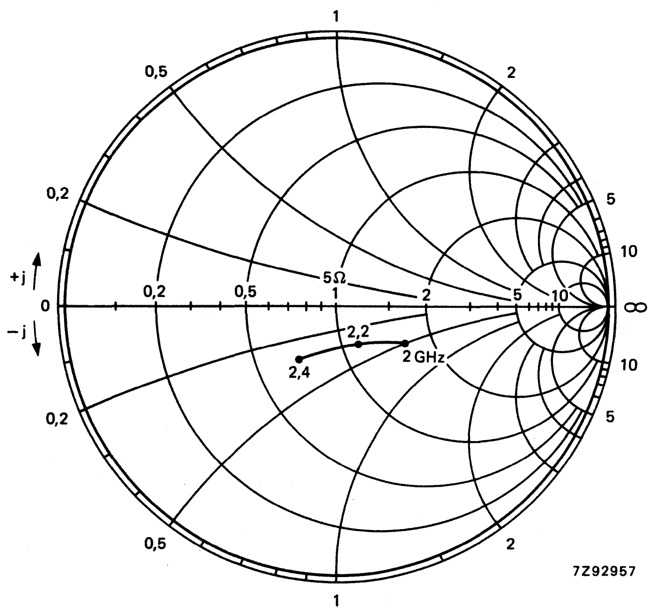


Fig. 17 Optimum load impedance vs. frequency; typical values; $Z_O = 5\ \Omega$.

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 °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 %	$\overline{z}_i$; $\overline{Z}_L$ Ω
class-C; CW	2.3 to 2.7	28	16	8	45	see Figs 6 and 7

MECHANICAL DATA

Dimensions in mm

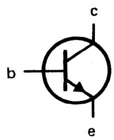
FO-57D (see Fig. 1).

MECHANICAL DATA

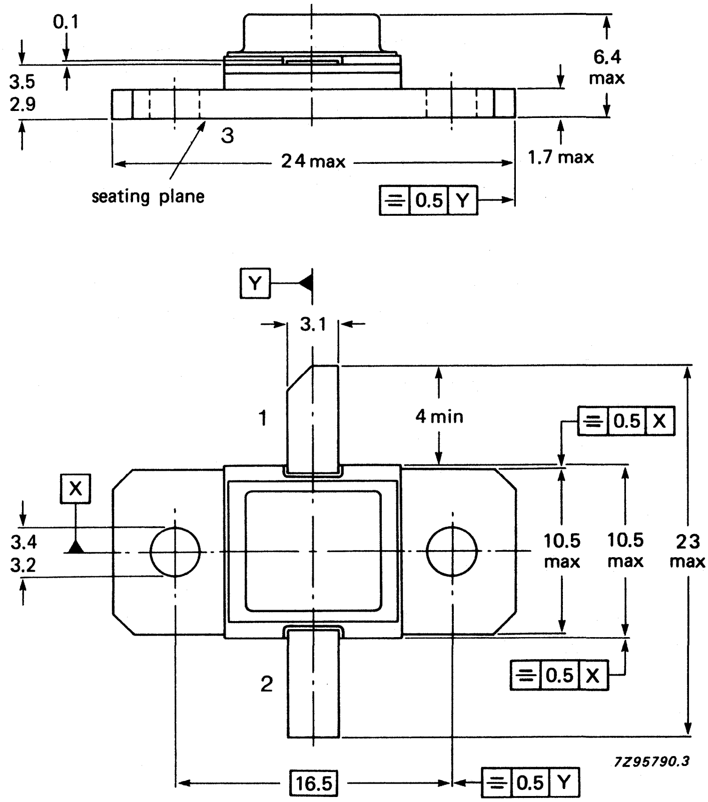
Dimensions in mm

Fig. 1 FO-57D.

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 Ω	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 $T_{mb} \leq 75$ °C	P_{tot}	max.	32 W
Storage temperature range	T_{stg}	−65 to + 200 °C	
Operating 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 °C)

From junction to mounting base	$R_{th\,j\text{-}mb}$	max.	4 K/W
From mounting base to heatsink	$R_{th\,mb\text{-}h}$	typ.	0.5 K/W

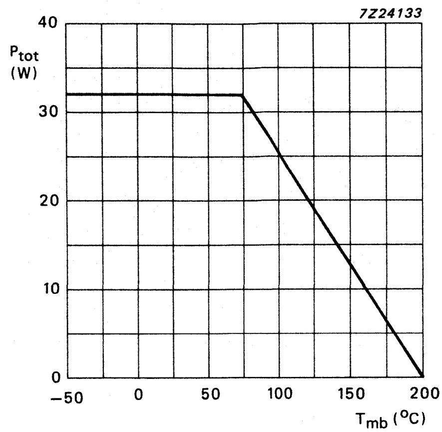


Fig. 2 Power derating curve.

CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Collector cut-off current			
V_{CB} = 40 V; I_E = 0	I_{CBO}	≤	8 mA
V_{CB} = 30 V; I_E = 0	I_{CBO}	≤	80 μA
V_{CE} = 30 V; R_{BE} = 10 Ω	I_{CER}	≤	130 μA
V_{CE} = 40 V; I_B = 0	I_{CEO}	≤	1 mA
Emitter cut-off current			
V_{EB} = 1.5 V; I_C = 0	I_{EBO}	≤	100 μA
V_{EB} = 3.5 V; I_C = 0	I_{EBO}	≤	1 mA

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 %	$\overline{z_i}$; $\overline{Z_L}$ Ω
class-C; CW	2.3 to 2.7	28	≥ 15	≥ 7	≥ 40	see Figs 6 and 7

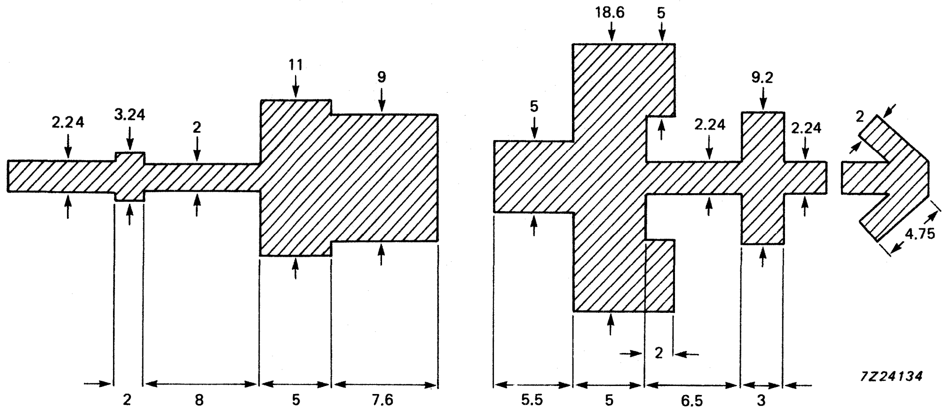


Fig. 3 Broadband test circuit for 2.3 to 2.7 GHz; class-C; CW application
Teflon fibreglass; ϵ_r = 2.55; thickness 0.8 mm (dimensions in mm).

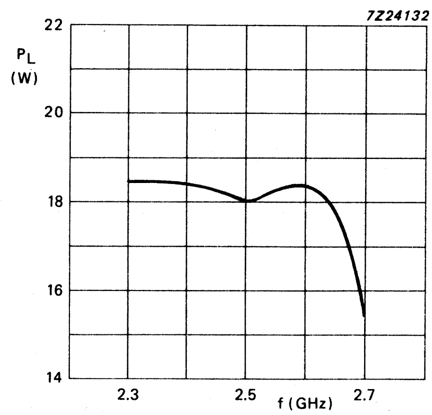


Fig. 4 Load power as a function of frequency;
P_{in} = 2.5 W; typical values.

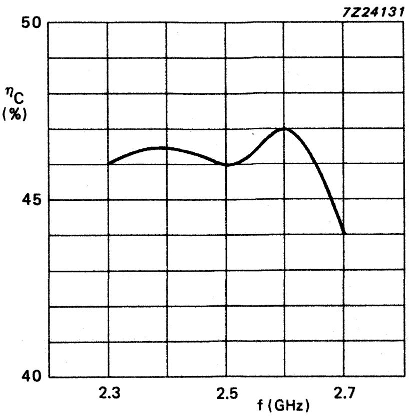


Fig. 5 Power gain as a function of frequency; typical values.

DEVELOPMENT DATA

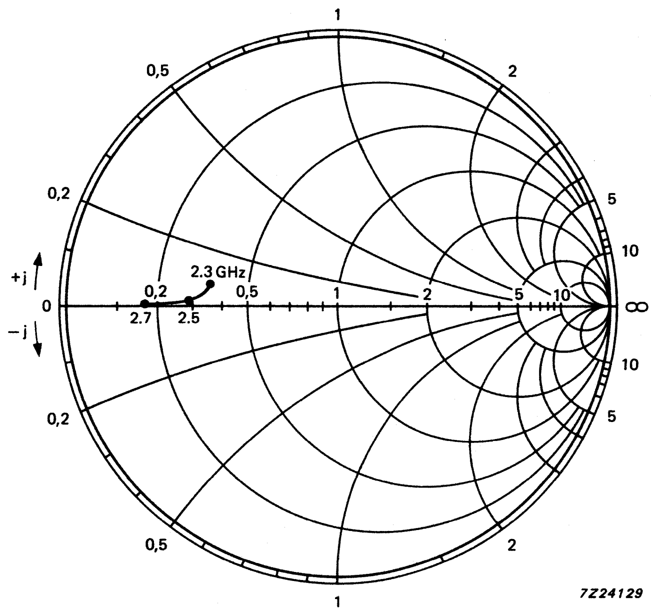


Fig. 6 Input impedance as a function of frequency; V_{CC} = 28 V; P_L = 16 W; Z_O = 50 Ω.

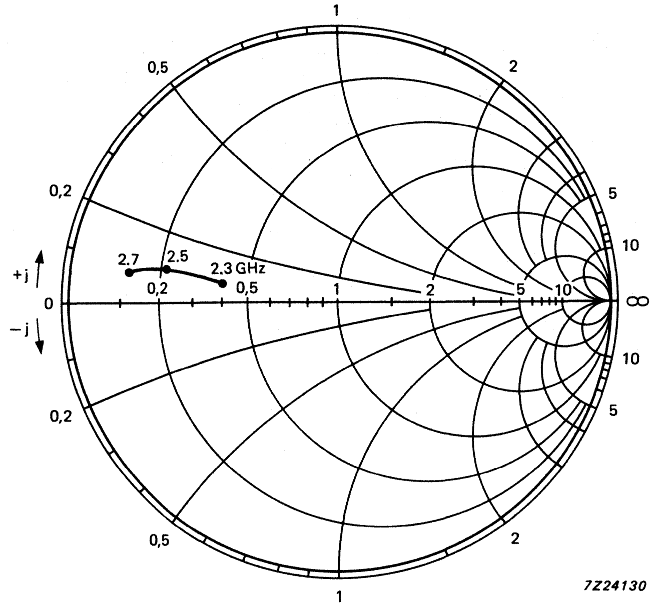


Fig. 7 Optimum load impedance as a function of frequency; V_{CC} = 28 V; P_L = 16 W; Z_O = 50 Ω.

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 °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

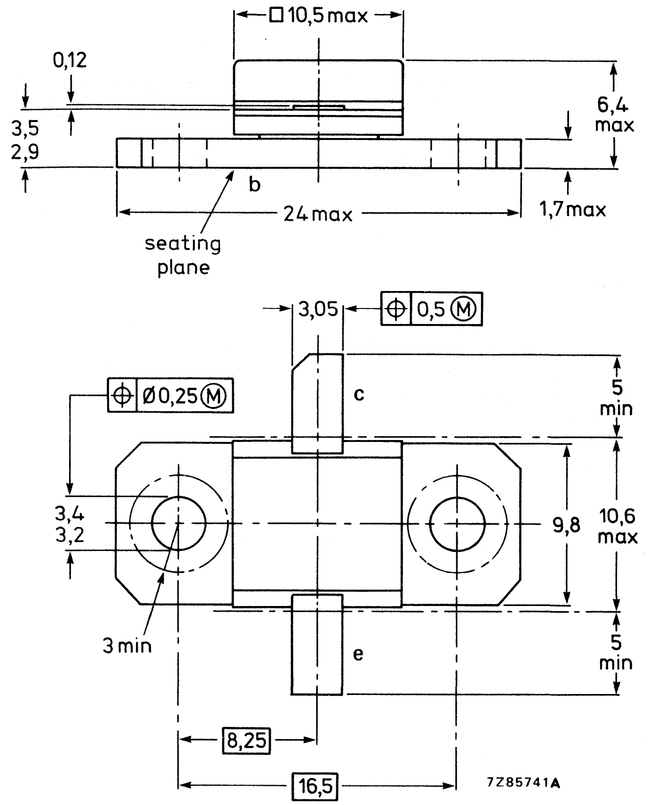
FO-57C (see Fig. 1)

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				
$R_{BE} = 10\ \Omega$	V_{CER}	max.	35	V
open base	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 $T_{mb} = 75\ ^oC$	P_{tot}	max.	45	W
Storage temperature	T_{stg}	−65 to	+ 200	^oC
Junction temperature	T_j	max.	+ 200	^oC
Lead soldering temperature				
$>$ 0,1 mm from flange; $t_{sld} < 10$ s	T_{sld}	max.	+ 235	^oC

THERMAL RESISTANCE (at $T_j = 75\ ^oC$)

From junction to mounting base	$R_{th\ j\text{-}mb}$	max.	2,2	K/W

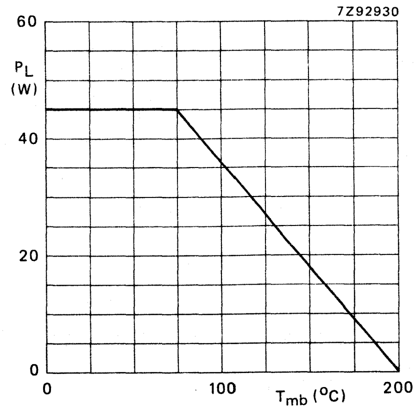


Fig. 2 Power derating curve versus mounting base temperature.

CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Collector cut-off currents				
V_{CB} = 40 V; I_E = 0	I_{CBO}	$\leqslant$	10	mA
V_{CB} = 30 V; I_E = 0	I_{CBO}	$\leqslant$	5	mA
V_{CER} = 35 V; R_{BE} = 10 Ω	I_{CER}	$\leqslant$	50	mA
Emitter cut-off currents				
V_{EB} = 3 V; I_C = 0	I_{EBO}	$\leqslant$	1	mA
V_{EB} = 1,5 V; I_C = 0	I_{EBO}	$\leqslant$	200	μA
Collector-base capacitance				
I_E = I_C = 0; V_{CB} = 28 V	C_{cb}	typ.	17	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
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.

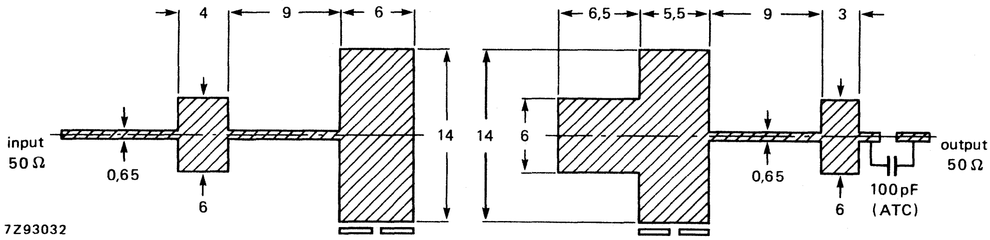


Fig. 3 Prematching test circuit boards, c.w., class-B at 1,55 GHz (dimensions in mm); Epsilam p.c. board; thickness 0,65 mm; ϵ_r = 10.

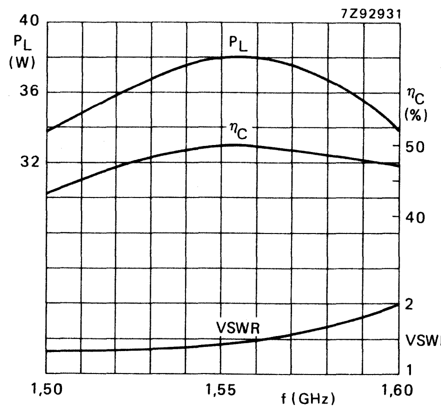


Fig. 4 Load power, efficiency and VSWR versus frequency; V_{CE} = 28 V; T_{mb} = 25 °C; class-B operation; typical values.

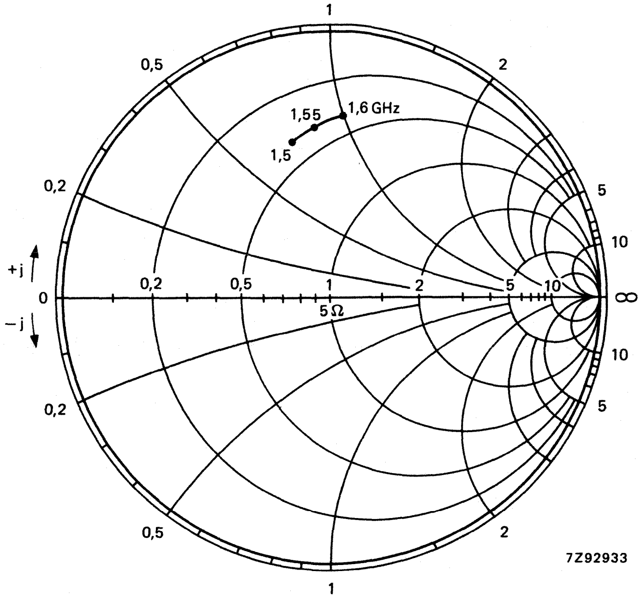


Fig. 5 Input impedance versus frequency;
P_L = 38 W; Z_O = 5 Ω; typical values.

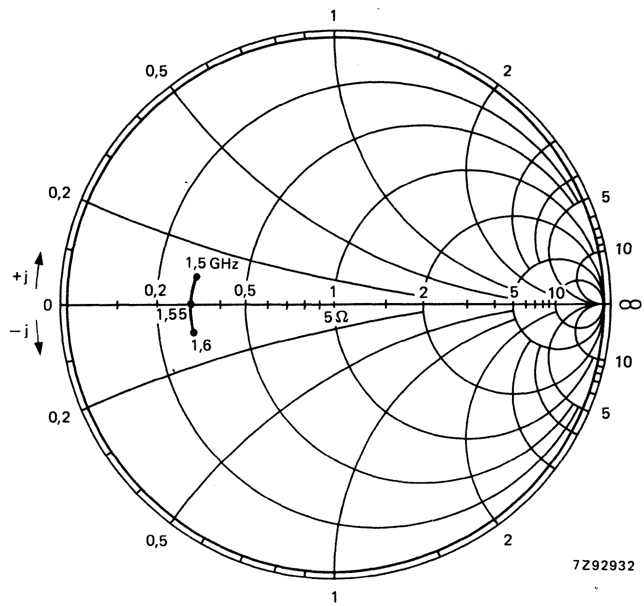


Fig. 6 Optimum load impedance versus frequency;
P_L = 38 W; Z_O = 5 Ω; typical values.

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 °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

Dimensions in mm

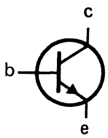
FO-57D (see Fig. 1).

MECHANICAL DATA

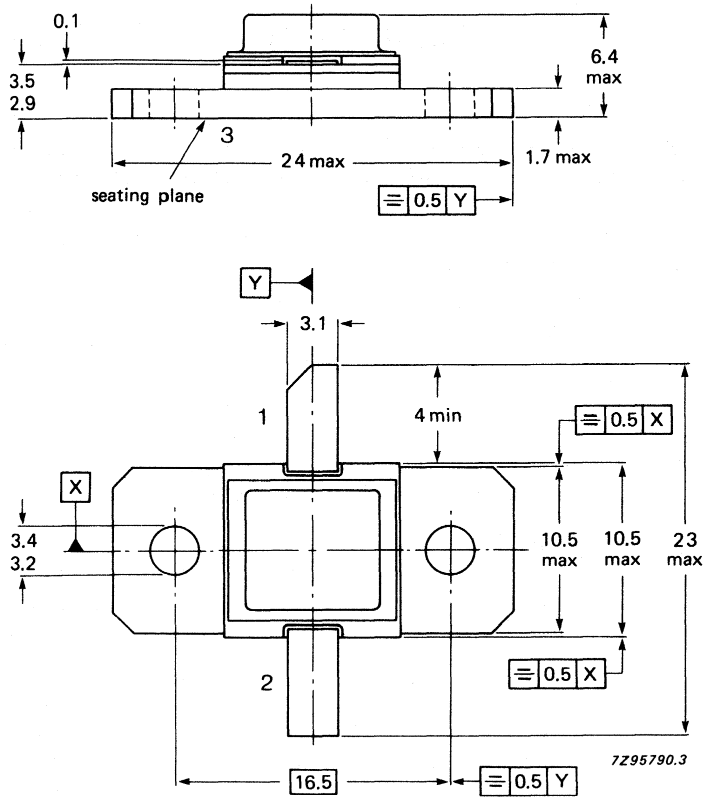
Dimensions in mm

Fig. 1 FO-57D

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 Ω	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 $T_{mb} \leq 75$ °C	P_{tot}	max.	67.5 W
Storage temperature range	T_{stg}		−65 to 200 °C
Operating 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 = 200 °C)

From junction to mounting base	$R_{th\ j\text{-}mb}$	max.	2.5 K/W

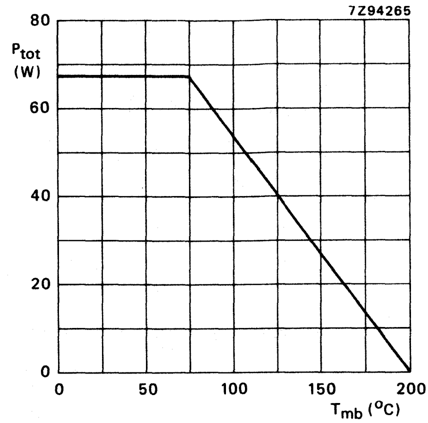


Fig. 2 Power derating curve versus mounting base temperature.

CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Collector cut-off current			
V_{CB} = 40 V; I_E = 0	I_{CBO}	≤	20 mA
V_{CB} = 30 V; I_E = 0	I_{CBO}	≤	10 mA
V_{CE} = 35 V; R_{BE} = 10 Ω	I_{CER}	≤	100 mA
Emitter cut-off current			
V_{EB} = 1.5 V; I_C = 0	I_{EBO}	≤	400 μA
V_{EB} = 3 V; I_C = 0	I_{EBO}	≤	2 mA

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 %	$\overline{z_i}$; $\overline{Z_L}$ Ω
class-C; CW	1.64	28	≥ 40	≥ 8.6	≥ 43	see Fig. 5

DEVELOPMENT DATA

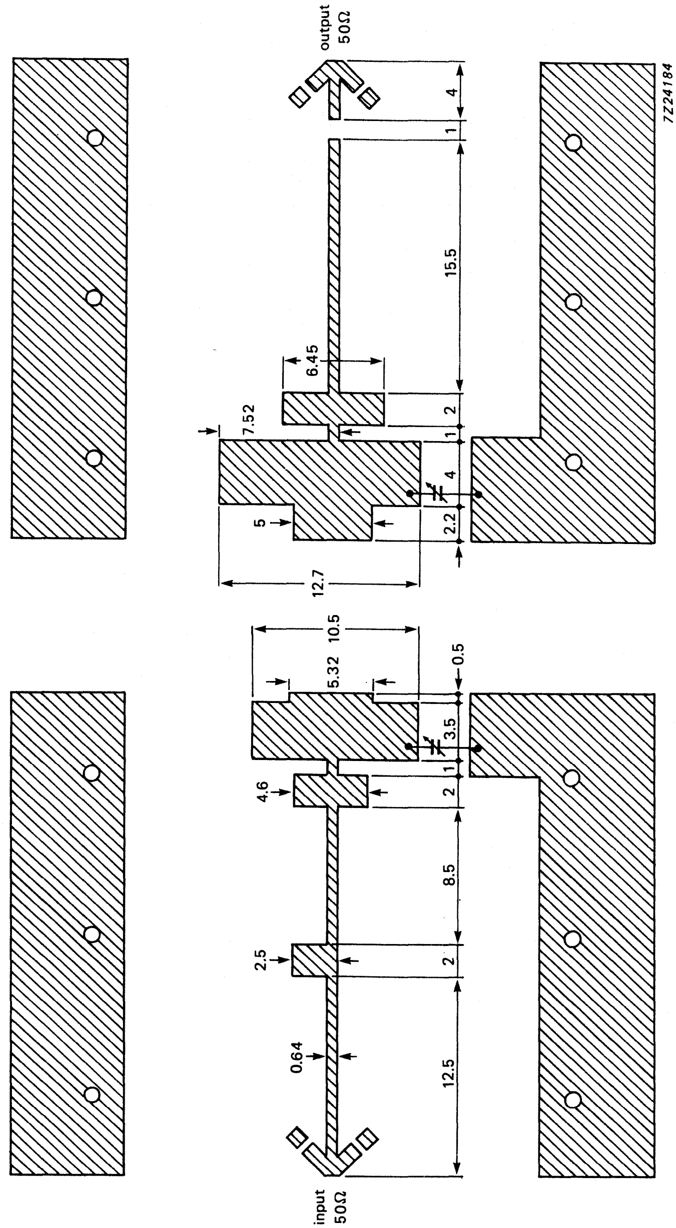


Fig. 3 Narrowband test circuit for 1.64 GHz; class-C; pulsed application;
Epsilam printed circuit board; thickness 0.635 mm; ϵ_r = 10; dimensions in mm.

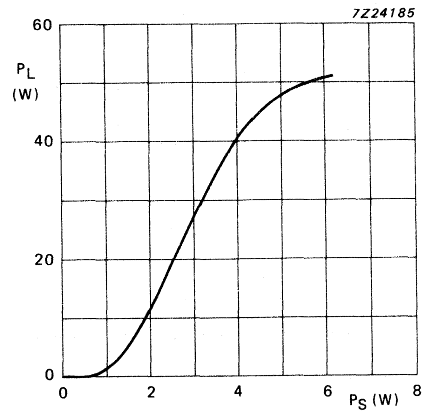


Fig. 4 Load power as a function of input power; V_{CC} = 28 V; f = 1.64 MHz; T_{mb} = 25 °C; typical values.

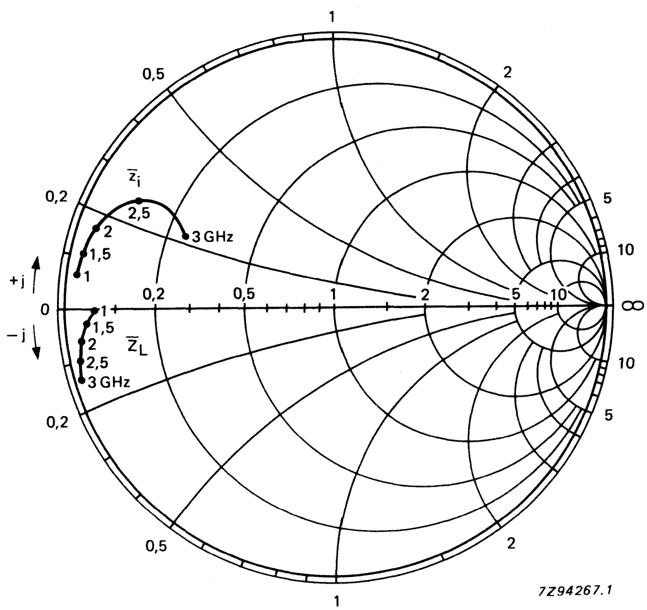


Fig. 5 Input and optimum load impedance as a function of frequency; V_{CC} = 28 V; Z_O = 50 Ω.

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 °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 %	$\overline{z}_i$; $\overline{Z}_L$ 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

Dimensions in mm

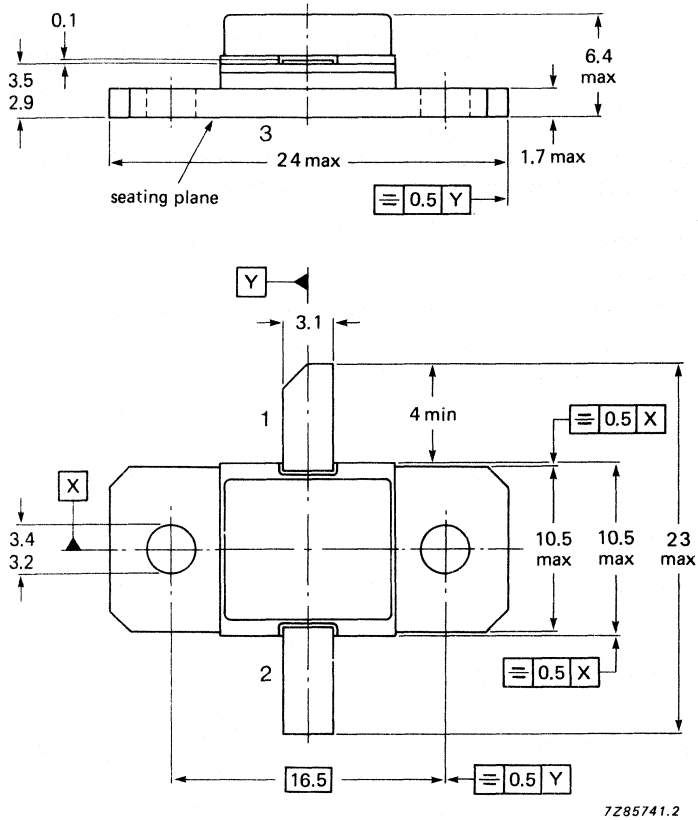
FO-57C (see Fig. 1)

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

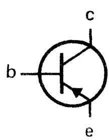
Dimensions in mm

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.	40 V
Collector-emitter voltage			
open base	V_{CEO}	max.	15 V
R_{BE} = 10 Ω	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 °C	P_{tot}	max.	67,5 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

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 °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 μs δ = 10%	2.8 to 3.3	24	5.6	5.7	47

MECHANICAL DATA

Dimensions in mm

FO-83 (see Fig. 1).

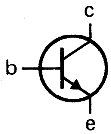
MECHANICAL DATA

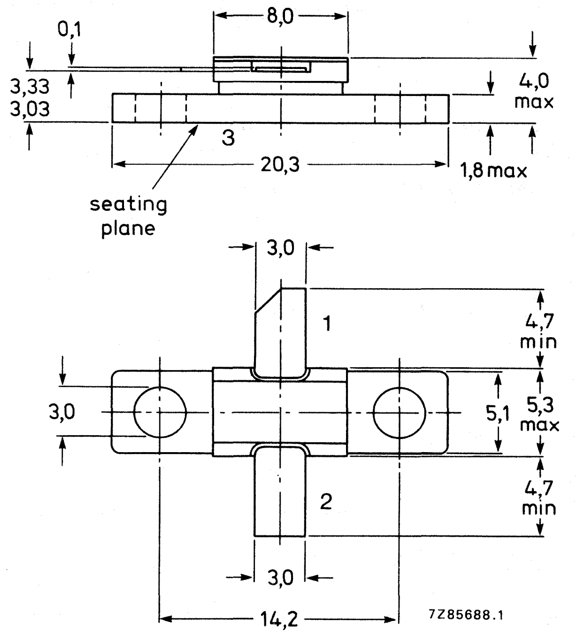
Dimensions in mm

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 Ω	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 $T_{mb} \leqslant 75\ ^oC$*	P_{tot}	max.	45 W
Storage temperature range	T_{stg}		−65 to +200 °C
Operating junction temperature	T_j	max.	200 °C
Soldering temperature at 0.3 mm from the case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235 °C

THERMAL RESISTANCE (at T_j = 75 °C)

From junction to mounting base (CW)	$R_{th\ j\text{-}mb}$	max.	6.5 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	typ.	0.5 K/W
Equivalent thermal impedance under pulsed microwave conditions t_p = 100 μs; δ = 10%	$Z_{th\ j\text{-}mb}$	typ.	2 K/W

* Maximum values under nominal pulse microwave operating conditions.

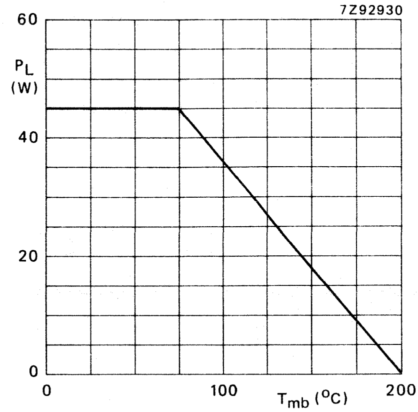


Fig. 2 Power derating curve; t_p = 100 μs; δ = 10%.

CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Collector cut-off current			
V_{CB} = 35 V; I_E = 0	I_{CBO}	$\leqslant$	3 mA
V_{CB} = 24 V; I_E = 0	I_{CBO}	$\leqslant$	0.1 mA
V_{CE} = 35 V; R_{BE} = 10 Ω	I_{CER}	$\leqslant$	3 mA
Emitter cut-off current			
V_{EB} = 1.5 V; I_C = 0	I_{EBO}	$\leqslant$	10 μA
V_{EB} = 3 V; I_C = 0	I_{EBO}	$\leqslant$	0.5 mA

APPLICATION INFORMATION

Microwave performance at T_{mb} = 25 °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 μs δ = 10%	2.8 to 3.3	24	$\geqslant$ 4	$\geqslant$ 4.3	$\geqslant$ 30

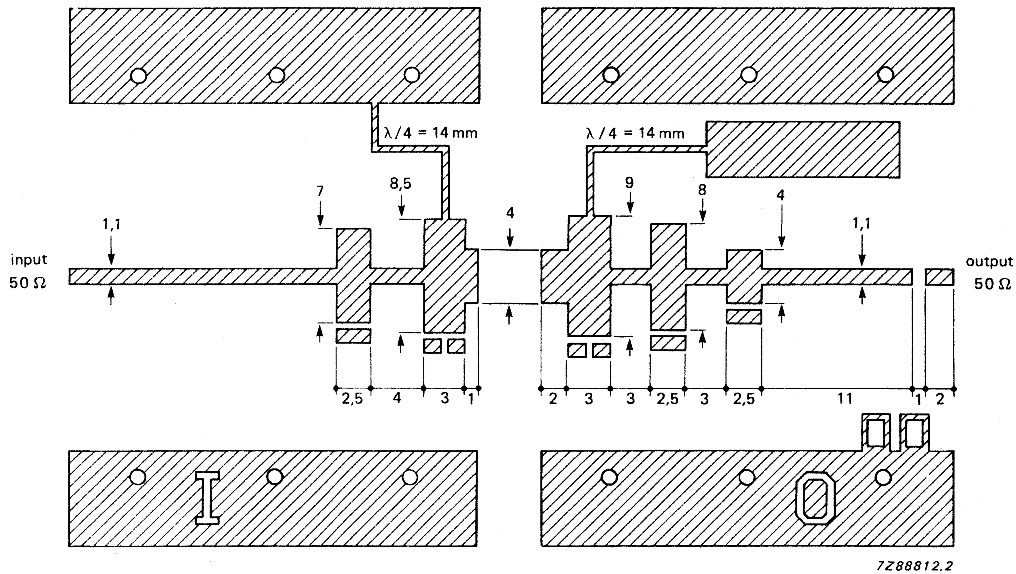


Fig. 3 Broadband test circuit for 2.8 to 3.3 GHz; class-C; pulse application. Cu-clad printed circuit board with PTFE fibreglass dielectric (ϵ_r = 2.54); thickness = 0.4 mm.

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 °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

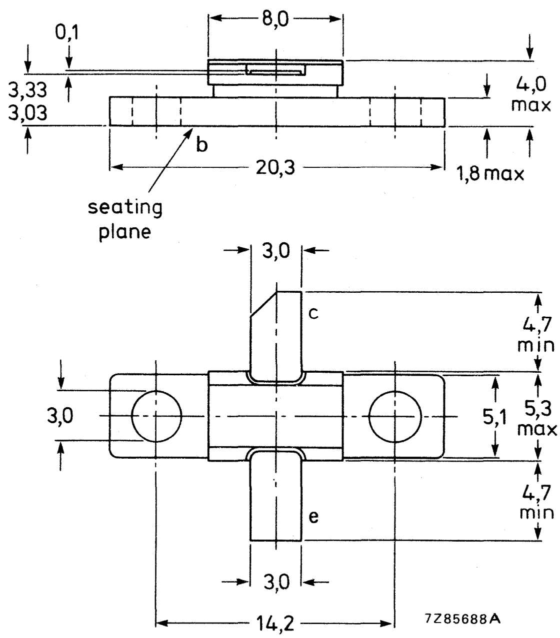
Dimensions in mm

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 Ω)	V_{CER}	max.	35	V
(open base)	V_{CEO}	max.	15	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3	V
Collector current (d.c.) (t_p = 100 μs; δ = 10%)	I_C	max.	1	A
Total power dissipation up to T_{mb} = 75 °C (t_p = 100 μs; δ = 10%)	P_{tot}	max.	25	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_{sld} ⩽ 10 s	T_{sld}	max.	235	°C

→ THERMAL RESISTANCE (at T_j = 75 °C)

From junction to mounting base	$R_{th\ j\text{-}mb}$	max.	6,5	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	max.	0,6	K/W

CHARACTERISTICS

T_{mb} = 25 °C

Collector-base breakdown voltage I_C = 3 mA; open emitter	$V_{(BR)CBO}$	⩾	35	V
Collector-emitter breakdown voltage R_{BE} = 10 Ω; I_C = 3 mA	$V_{(BR)CER}$	⩾	35	V
Emitter-base breakdown voltage I_E = 0,5 mA; open collector	$V_{(BR)EBO}$	⩾	3	V
Collector cut-off current I_E = 0; V_{CB} = 24 V	I_{CBO}	⩽	0,1	mA
Emitter cut-off current I_C = 0; V_{EB} = 1,5 V	I_{EBO}	⩽	10	μA

APPLICATION INFORMATION

R.F. performance up to T_{mb} = 25 °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 %
RV3135B5X	3,1 to 3,5	24	100	10	> 4 typ. 5,6	> 4,3 typ. 5,7	> 30 typ. 47

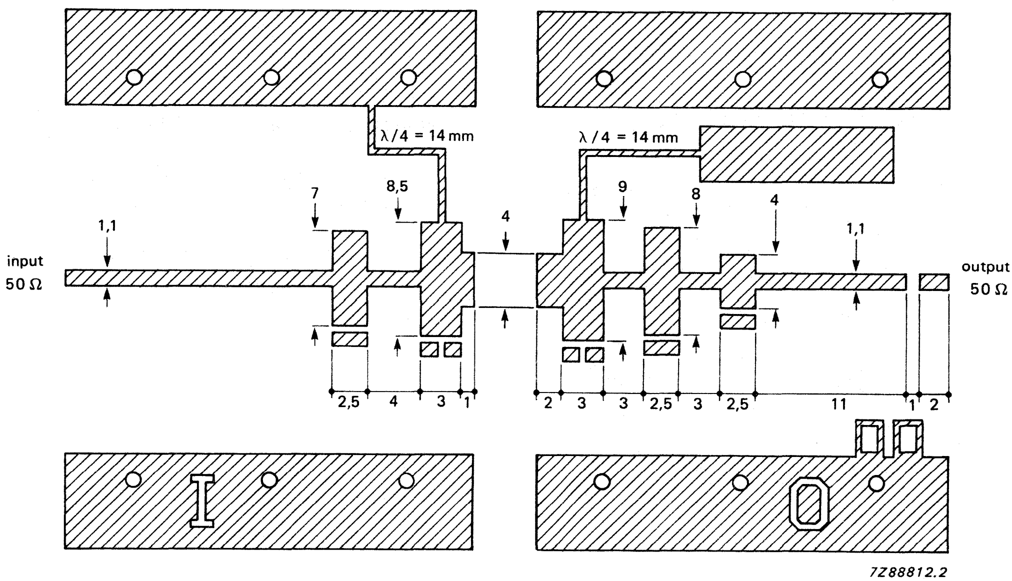


Fig. 2 Wideband test circuit boards for 3,1 to 3,5 GHz (dimensions in mm); striplines on a double CU-clad p.c. board with PTFE fibre-glass dielelctric (ϵ_r = 2,54); thickness 0,4 mm.

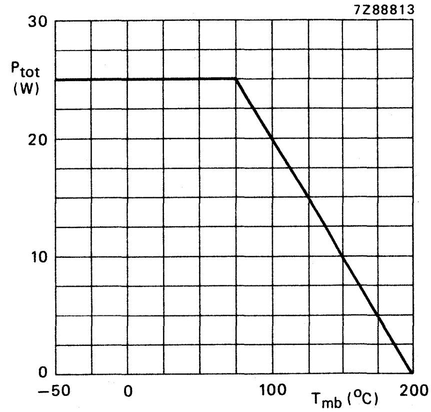


Fig. 3

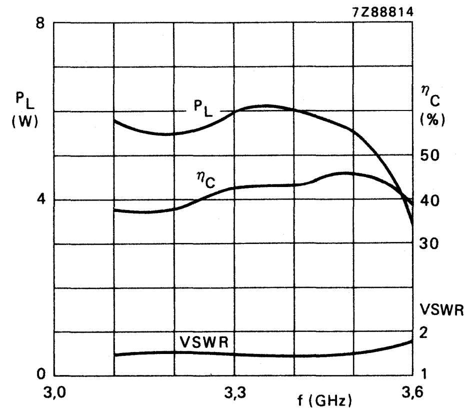


Fig. 4.

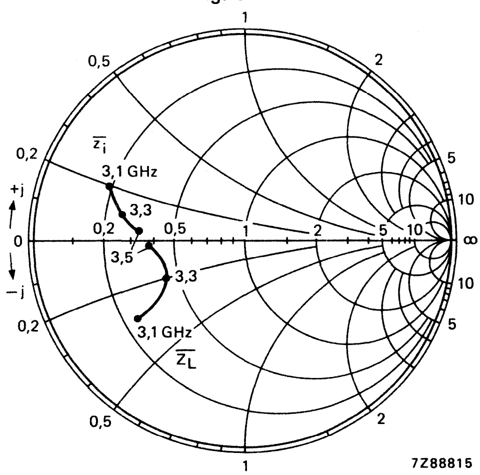


Fig. 5.

Fig. 3 Power derating curve vs. mounting base temperature; t_p = 100 μs; δ = 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_o = 50 Ω; T_{mb} = 25 °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 frequence 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 °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 μs; δ = 10% (see Fig. 2)	1.03 to 1.09	50	typ. 250	typ. 7.5	typ. 40

MECHANICAL DATA

Dimensions in mm

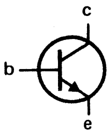
FO-91 (see Fig. 1).

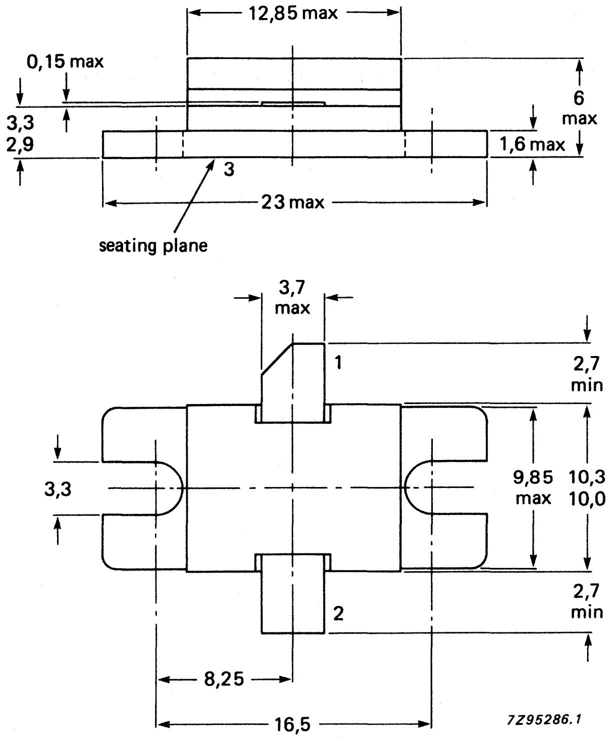
MECHANICAL DATA

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 Ω	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 $T_{mb} \leqslant 75$ °C*	P_{tot}	max.	650	W
Storage temperature range	T_{stg}		−65 to + 200	°C
Operating junction temperature	T_j	max.	200	°C
Soldering temperature at 0.3 mm from the case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	°C

THERMAL RESISTANCE (at T_j = 100 °C)

From junction to mounting base in CW	$R_{th\ j\text{-}mb}$	max.	1.2	K/W
From mounting base to heatsink in CW	$R_{th\ mb\text{-}h}$	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).

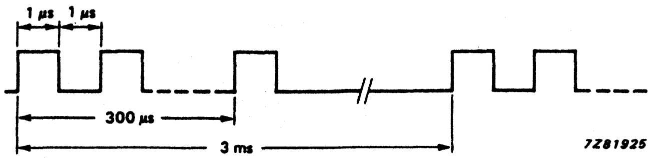


Fig. 2 Pulse definition.

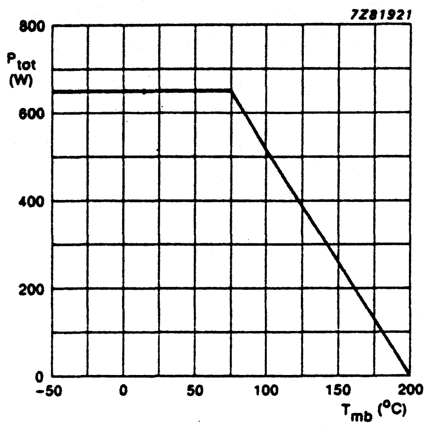


Fig. 3 Power derating curve.
t_p = 300 µs; δ = 10% (see Fig. 2).

CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Collector cut-off current			
V_{CB} = 50 V; I_E = 0	I_{CBO}	≤	10 mA
V_{CB} = 60 V; I_E = 0	I_{CBO}	≤	50 mA
V_{CE} = 50 V; R_{BE} = 10 Ω	I_{CER}	≤	50 mA
V_{CE} = 20 V; I_B = 0	I_{CEO}	≤	50 mA
Emitter cut-off current			
V_{EB} = 1.5 V; I_B = 0	I_{EBO}	≤	500 µA
V_{EB} = 3.5 V; I_B = 0	I_{EBO}	≤	5 mA

APPLICATION INFORMATION

Microwave performance up to T_{mb} = 25 °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 μs δ = 10% (see Fig. 2)	1.03 to 1.09	50	≥ 210	≥ 7	≥ 38

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 °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 μs δ = 10% (see Fig. 2)	1.03 to 1.09	50	typ. 350	typ. 7.5	typ. 40

MECHANICAL DATA

Dimensions in mm

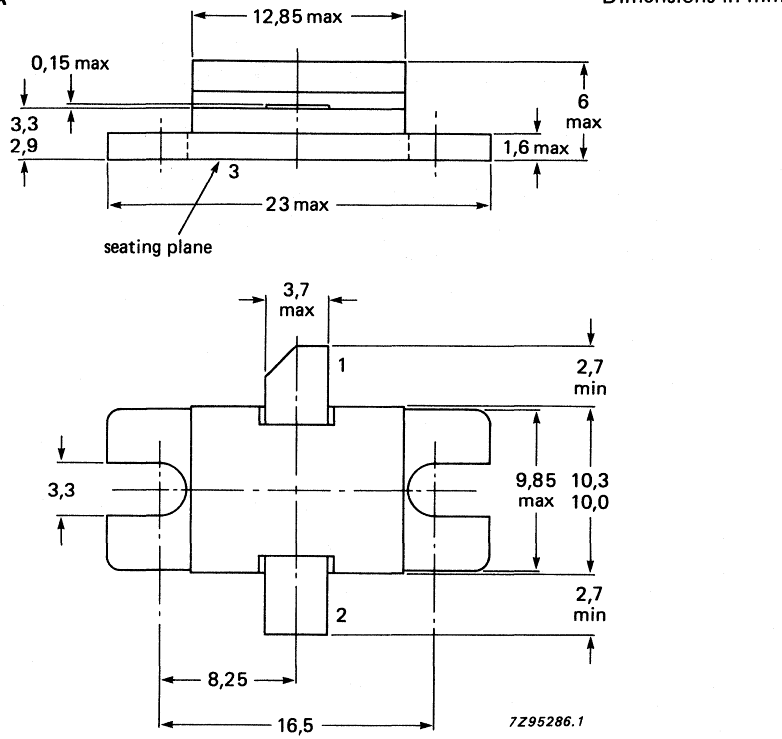
FO-91 (see Fig. 1).

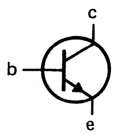
MECHANICAL DATA

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 Ω	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 $T_{mb} \leqslant 75\ ^oC$*	P_{tot}	max.	880	W
Storage temperature range	T_{stg}		−65 to 200	°C
Operating junction temperature	T_j	max.	200	°C
Soldering temperature at 0.3 mm from the case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	°C

THERMAL RESISTANCE (at T_j = 100 °C)

From junction to mounting base in CW	$R_{th\ j\text{-}mb}$	max.	0.8	K/W
From mounting base to heatsink in CW	$R_{th\ mb\text{-}h}$	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).

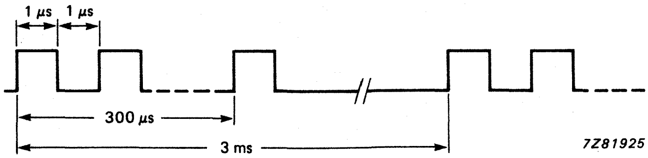


Fig. 2 Pulse definition.

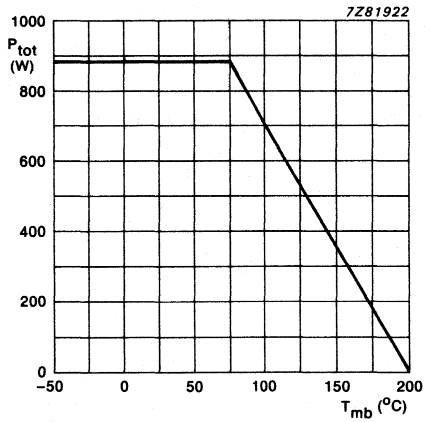


Fig. 3 Power derating curve.
t_p = 300 μs; δ = 10% (see Fig. 2).

CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Collector cut-off current			
V_{CB} = 50 V; I_E = 0	I_{CBO}	≤	10 mA
V_{CB} = 60 V; I_E = 0	I_{CBO}	≤	50 mA
V_{CE} = 50 V; R_{BE} = 10 Ω	I_{CER}	≤	50 mA
V_{CE} = 20 V; I_B = 0	I_{CEO}	≤	50 mA
Emitter cut-off current			
V_{EB} = 1.5 V; I_B = 0	I_{EBO}	≤	500 μA
V_{EB} = 3.5 V; I_B = 0	I_{EBO}	≤	5 mA

APPLICATION INFORMATION

Microwave performance up to T_{mb} = 25 ^{o}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 μs δ = 10% (see Fig. 2)	1.03 to 1.09	50	⩾ 300	⩾ 7	⩾ 38

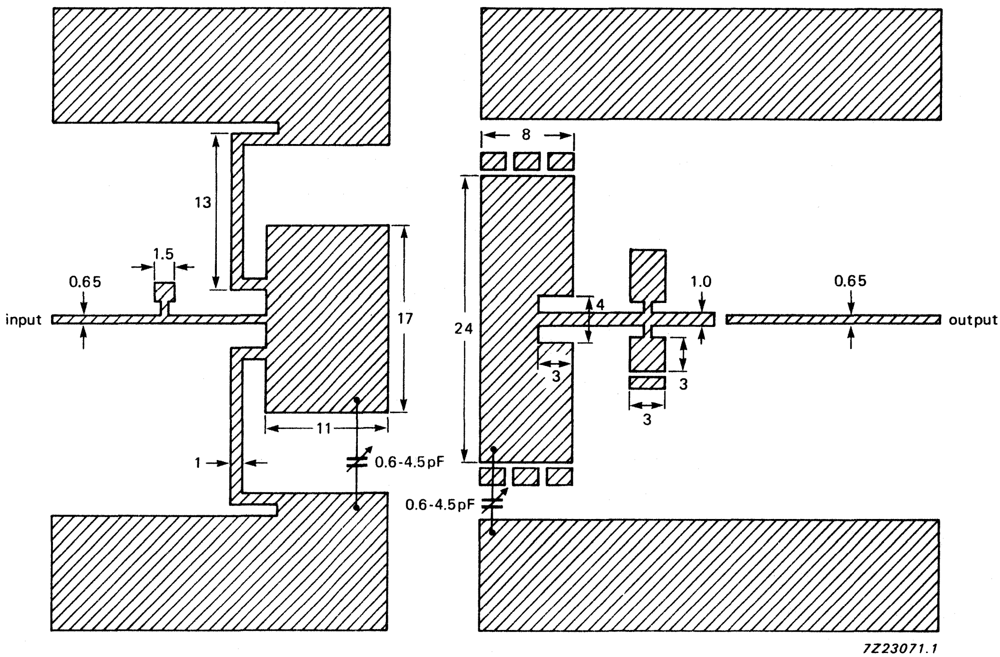


Fig. 4 Broadband test circuit for 1.03 to 1.09 GHz; class-C; pulse application. Epsilam printed circuit board thickness 0.635 mm; ϵ_r = 10 (dimensions in mm).

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 °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 %	$\overline{z_i}; \overline{Z_L}$ Ω
t_p = 1 ms; δ = 10%	1.2 to 1.4	40	150	7	42	see Fig. 6
t_p = 150 μs δ = 5%	1.2 to 1.4	50	240	9	45	see Fig. 6

MECHANICAL DATA

Dimensions in mm

FO-91 (see Fig. 1).

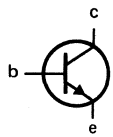
MECHANICAL DATA

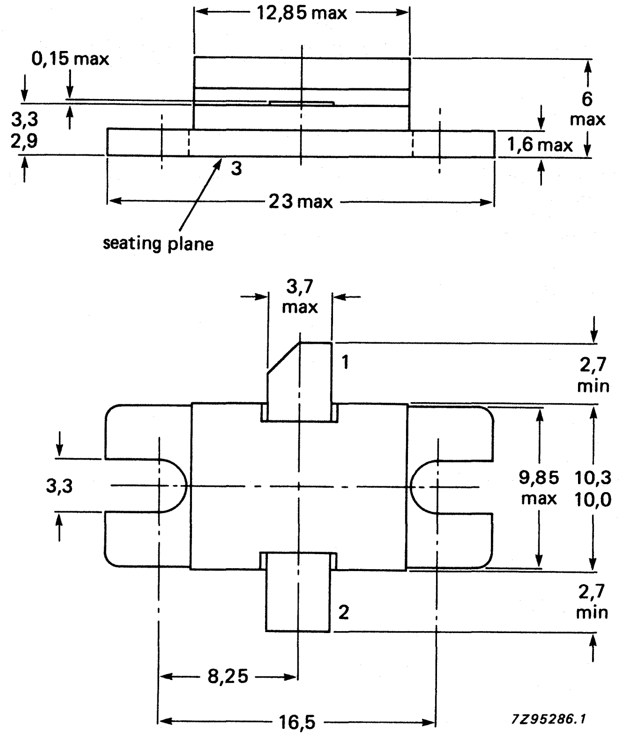
Dimensions in mm

Fig. 1 FO-91.

Pinning:
1 = collector
2 = emitter
3 = base

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 Ω	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 $T_{mb} \leqslant 75$ °C*	P_{tot}	max.	300	W
Storage temperature range	T_{stg}	–65 to + 200		°C
Operating junction temperature	T_j	max.	200	°C
Soldering temperature at 0.3 mm from the case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	°C

THERMAL RESISTANCE (at T_j = 75 °C)

From junction to mounting base (CW)	$R_{th\,j\text{-}mb}$	max.	1	K/W
From junction to mounting base**	$Z_{th\,j\text{-}mb}$	typ.	0.3	K/W
From mounting base to heatsink (CW)	$R_{th\,mb\text{-}h}$	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 ms; δ = 10%).

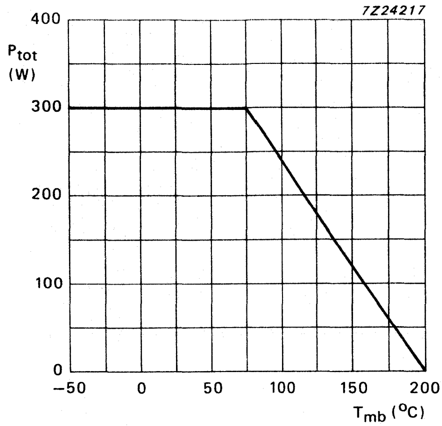


Fig. 2 Power derating curve t_p = 1 ms; δ = 10%.

CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Breakdown voltages			
I_C = 35 mA; I_E = 0	$V_{(BR)CBO}$	$\geqslant$	60 V
I_C = 35 mA; I_B = 0	$V_{(BR)CEO}$	$\geqslant$	20 V
I_C = 35 mA; R_{BE} = 10 Ω	$V_{(BR)CER}$	$\geqslant$	50 V
I_C = 0; I_E = 10 mA	$V_{(BR)EBO}$	$\geqslant$	3 V
Collector cut-off current			
I_E = 0; V_{CB} = 50 V	I_{CBO}	$\leqslant$	7 mA

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 %	$\overline{z}_i$; $\overline{Z}_L$
class-C; t_p = 1 ms; δ = 10%	1.2 to 1.4	40	$\geqslant$ 135	$\geqslant$ 6.5	$\geqslant$ 35	see Fig. 6

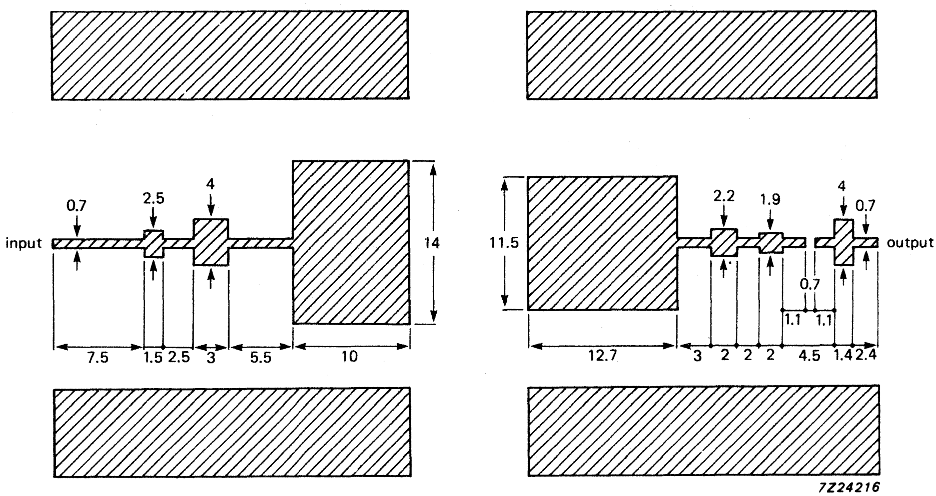


Fig. 3 Broadband test circuit for 1.2 to 1.4 GHz; class-C; pulse applications (dimensions in mm). Epsilam printed circuit board; thickness 0.635 mm; ϵ_r = 10.

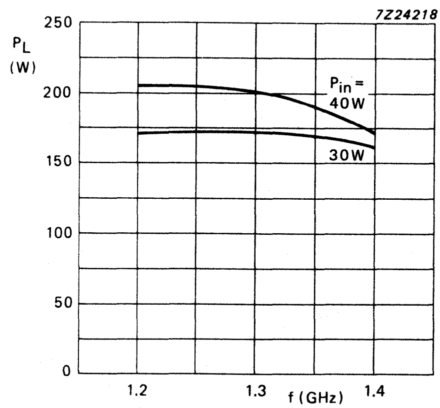


Fig. 4 Load power as a function of frequency; V_{CC} = 40 V; t_p = 1 ms; δ = 10%; typical values.

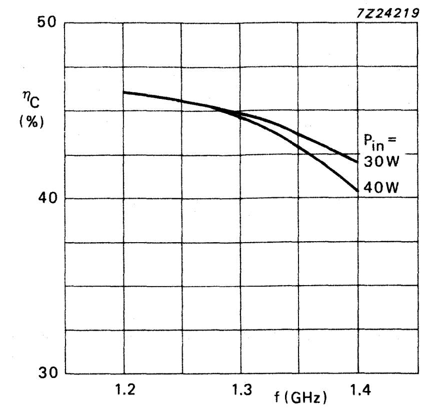


Fig. 5 Power gain as a function of frequency;
t_p = 1 ms; δ = 10%; typical values.

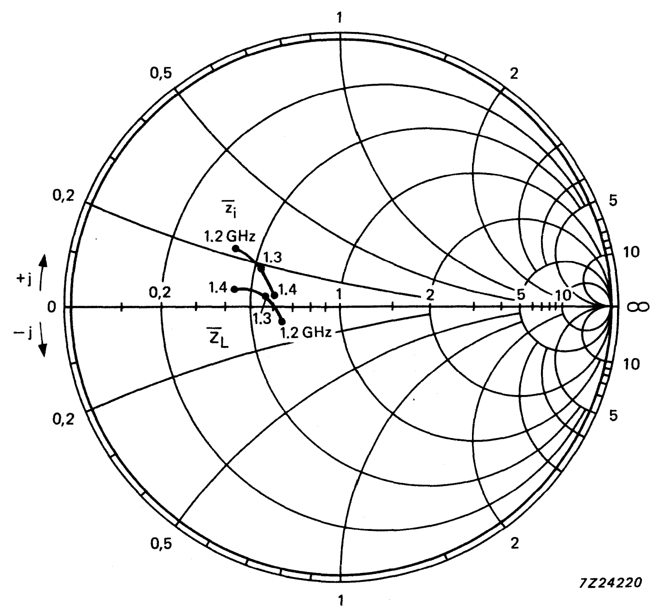


Fig. 6 Input and optimum load impedance as a function of frequency;
V_{CC} = 40 V; Z_O = 5 Ω.

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 °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 μs; δ = 5%	1.2 to 1.4	50	typ. 320	typ. 8	typ. 38	see Fig. 6
class-C; t_p = 300 μs; δ = 5%	1.2 to 1.4	50	typ. 300	typ. 7.5	typ. 35	see Fig. 6

MECHANICAL DATA

Dimensions in mm

FO-91 (see Fig. 1).

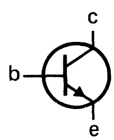
MECHANICAL DATA

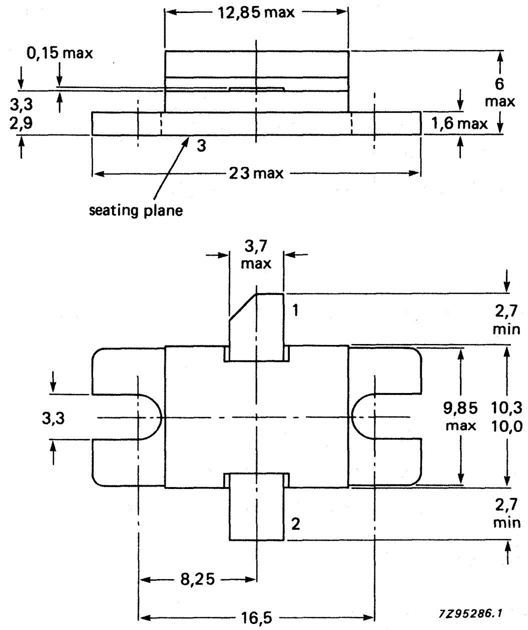
Dimensions in mm

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, $R_{BE} \leqslant 10\ \Omega$	V_{CER}	max.	60 V
Emitter-base voltage, open collector	V_{EBO}	max.	3 V
Collector current (DC) $t_p \leqslant 150\ \mu s$; $\delta \leqslant 5\%$	I_C	max.	21 A
Total power dissipation up to T_{mb} = 75 °C $t_p \leqslant 150\ \mu s$; $\delta \leqslant 5\%$	P_{tot}	max.	630 W
Storage temperature range	T_{stg}		−65 to 200 °C
Junction temperature	T_j	max.	200 °C
Lead soldering temperature at 0.1 mm from the case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235 °C

THERMAL RESISTANCE (at T_j = 100 °C)

From junction to mounting base	$R_{th\ j\text{-}mb}$	max.	0.8 K/W
Equivalent thermal impedance under pulsed microwave conditions; t_p = 150 μs; δ = 5%	Z_{th}	typ.	0.19 K/W

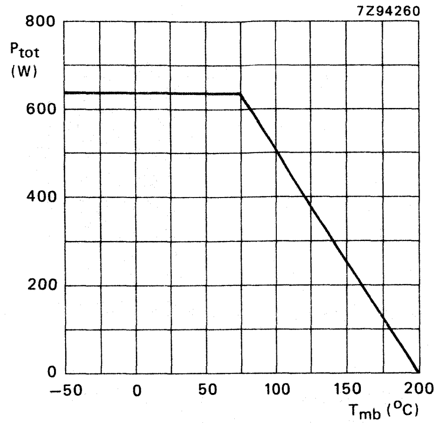


Fig. 2 Power derating curve; pulsed conditions; t_p = 150 μs; δ = 5%.

CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Collector-base breakdown voltage				
I_C = 50 mA; I_E = 0	$V_{(BR)CBO}$	min.	60	V
Collector-emitter breakdown voltage				
I_C = 50 mA; R_{BE} = 10 Ω	$V_{(BR)CER}$	min.	50	V
Emitter-base breakdown voltage				
I_C = 0; I_E = 5 mA	$V_{(BR)EBO}$	min.	3	V
Collector cut-off current				
I_E = 0; V_{CB} = 50 V	I_{CBO}	max.	10	mA
Emitter cut-off current				
I_C = 0; V_{EB} = 1.5 V	I_{EBO}	max.	0.5	mA

APPLICATION INFORMATION

Microwave performance up to T_{mb} = 25 °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 μs; δ = 5%	1.2 to 1.4	50	≥ 250	≥ 7	≥ 35	see Fig. 6

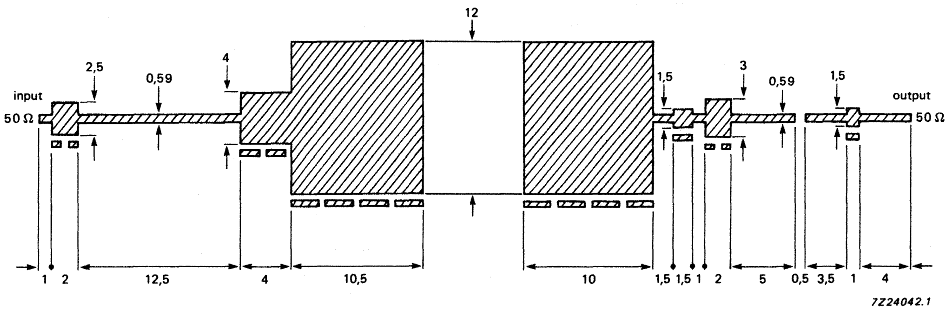


Fig. 3 Wideband test circuit for 1.2 to 1.4 GHz (dimensions in mm).
Epsilam printed circuit board; thickness 0.635 mm; ϵ_r = 10.

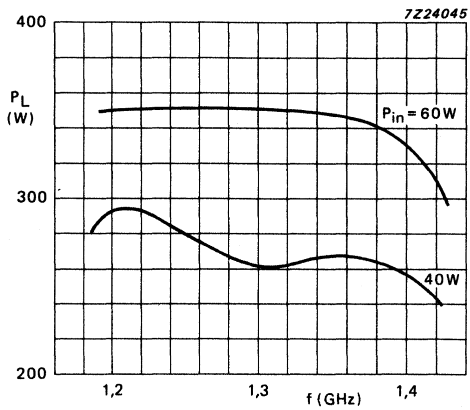


Fig. 4 Load power as a function of frequency; typical values;
t_p = 150 μs; δ = 5%.

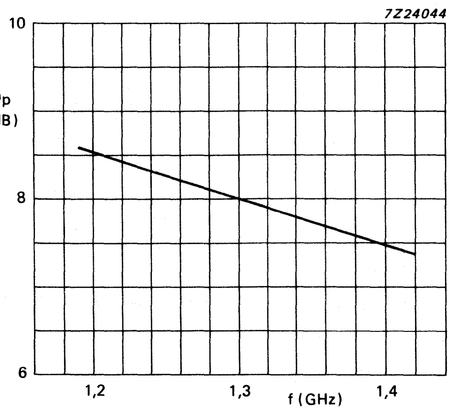


Fig. 5 Power gain as a function of frequency; t_p = 150 μs; δ = 5%.

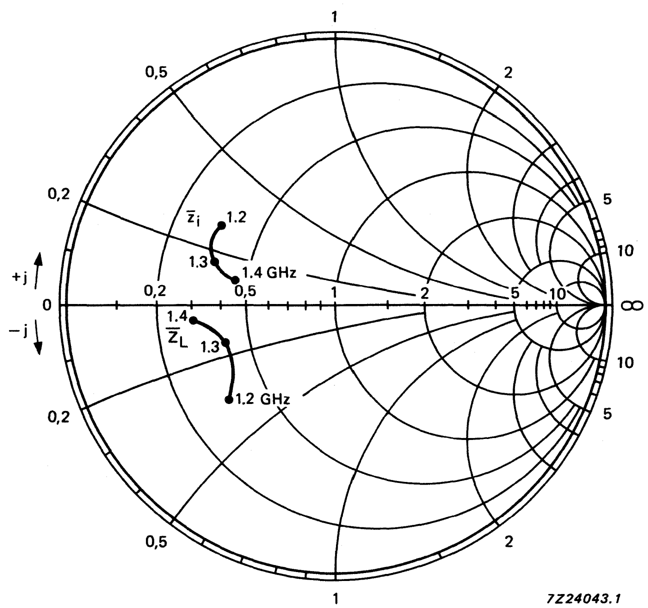


Fig. 6 Input and optimum load impedance as a function of frequency; V_{CC} = 50 V; P_L = 250 W; t_p = 150 μs; δ = 5%; class-C operation; Z_O = 5 Ω; typical values.

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 °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 μs; δ = 10%	2.7 to 3.1	40	100	6.5	40	see Fig. 5

MECHANICAL DATA

Dimensions in mm

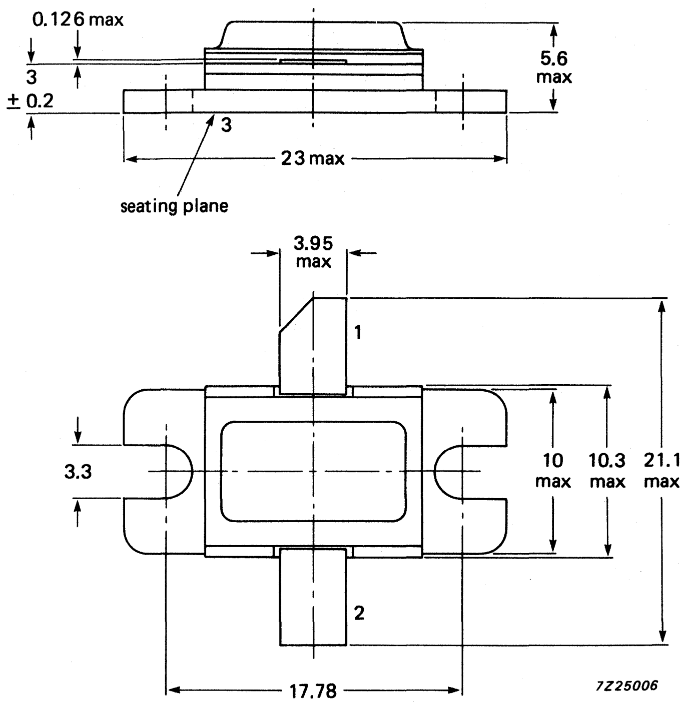
FO-125A (see Fig. 1).

MECHANICAL DATA

Dimensions in mm

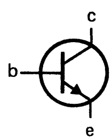
Fig. 1 FO-125A.

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,				
$R_{BE} = 10\ \Omega$	V_{CER}	max.	50	V
open base	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 $T_{mb} = 75\ ^oC$ *	P_{tot}	max.	185	W
Storage temperature range	T_{stg}		−65 to +200	^oC
Junction temperature	T_j	max.	200	^oC
Soldering temperature up to 0.3 mm from the case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	^oC

THERMAL RESISTANCE (at $T_j = 100\ ^oC$)

From junction to mounting base	$R_{th\ j\text{-}mb}$	max.	1.7	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	typ.	0.3	K/W
Equivalent thermal impedance under pulse microwave conditions $t_p = 100\ \mu s$; $\delta = 10\%$	$Z_{th\ j\text{-}mb}$	typ.	0.55	K/W

* Maximum value under normal pulsed microwave operating conditions.

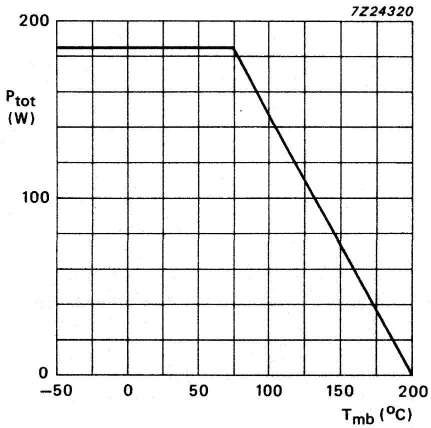


Fig. 2 Power derating curve; t_p = 100 μs; δ = 10%.

DEVELOPMENT DATA

CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Collector cut-off current

V_{CB} = 50 V; I_E = 0	I_{CBO}	max.	30 mA
V_{CB} = 30 V; I_E = 0	I_{CBO}	max.	150 μA
V_{CB} = 50 V; R_{BE} = 10 Ω	I_{CER}	max.	150 mA

Emitter cut-off current

V_{EB} = 1.5 V; I_C = 0	I_{EBO}	max.	150 μA
V_{EB} = 3.5 V; I_C = 0	I_{EBO}	max.	7 mA

APPLICATION INFORMATION

Microwave performance up to T_{mb} = 25 °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 %	$\overline{z_i}$; $\overline{Z_L}$ Ω
class-C t_p = 100 μs; δ = 10%	2.7 to 3.1	40	⩾ 90	⩾ 6	⩾ 35	see Fig. 5

* During pulse.

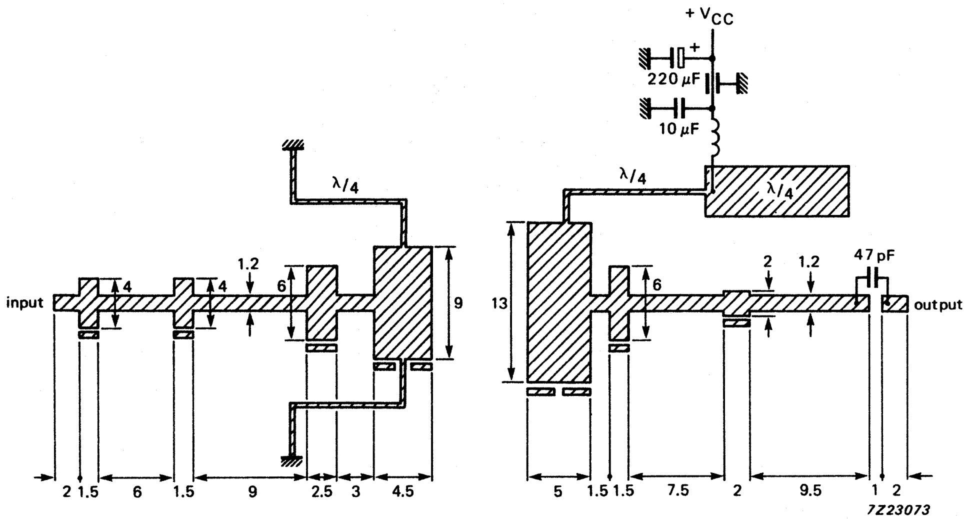


Fig. 3 Broadband test circuit for 3.0 to 3.4 GHz. (dimensions in mm).
PTFE fibreglass printed circuit board; ϵ_r = 2.55; thickness 0.4 mm.

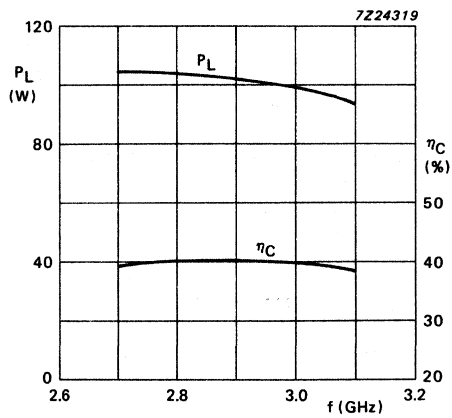


Fig. 4 Load power and collector efficiency as a function of frequency*;
V_{CC} = 40 V; t_p = 100 μs; δ = 10%; typical values.

* In a broadband test circuit as shown in Fig. 3.

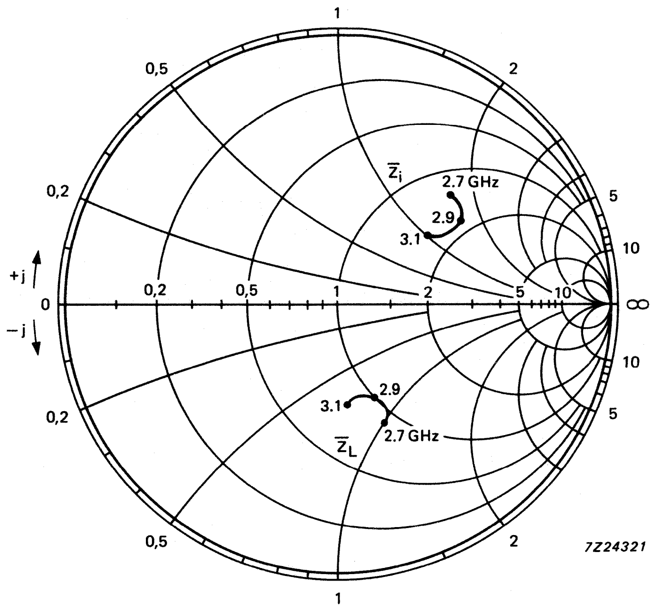


Fig. 5 Input and optimum load impedance as a function of frequency; $Z_O = 5\ \Omega$; $V_{CC} = 40$ V; typical values.

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 °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 %	$\overline{z_i}$; $\overline{Z_L}$ Ω
class-C t_p = 100 μs; δ = 10%	3.0 to 3.4	40	80	6	35	see Fig. 5

MECHANICAL DATA

Dimensions in mm

FO-125A (see Fig. 1).

MECHANICAL DATA

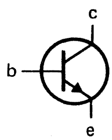
Dimensions in mm

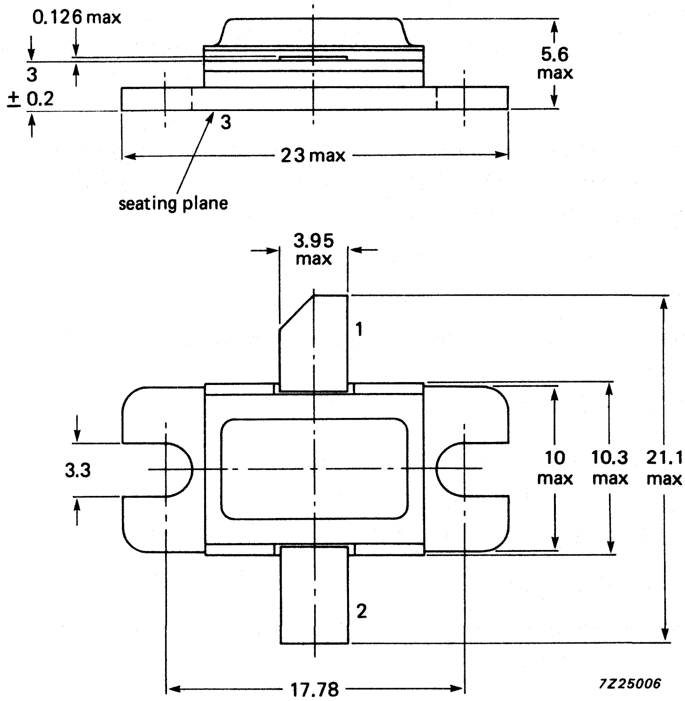
Fig. 1 FO-125A.

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,				
$R_{BE} = 10\ \Omega$	V_{CER}	max.	50	V
open base	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 °C*	P_{tot}	max.	185	W
Storage temperature range	T_{stg}		−65 to +200	°C
Junction temperature	T_j	max.	200	°C
Soldering temperature up to 0.3 mm from the case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	°C

THERMAL RESISTANCE (at T_j = 100 °C)

From junction to mounting base	$R_{th\ j\text{-}mb}$	max.	1.7	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	typ.	0.3	K/W
Equivalent thermal impedance under pulse microwave conditions $t_p = 100\ \mu s$; $\delta = 10\%$	$Z_{th\ j\text{-}mb}$	typ.	0.55	K/W

* Maximum value under normal pulsed microwave operating conditions.

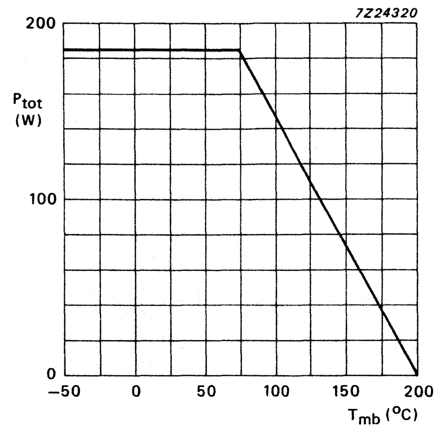


Fig. 2 Power derating curve; t_p = 100 μs; δ = 10%.

DEVELOPMENT DATA

CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Collector cut-off current			
V_{CB} = 50 V; I_E = 0	I_{CBO}	max.	30 mA
V_{CB} = 30 V; I_E = 0	I_{CBO}	max.	150 μA
V_{CB} = 50 V; R_{BE} = 10 Ω	I_{CER}	max.	150 mA
Emitter cut-off current			
V_{EB} = 1.5 V; I_C = 0	I_{EBO}	max.	150 μA
V_{EB} = 3.5 V; I_C = 0	I_{EBO}	max.	7 mA

APPLICATION INFORMATION

Microwave performance up to T_{mb} = 25 °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 μs; δ = 10%	3.0 to 3.4	40	≥ 70	≥ 5.4	≥ 30	see Fig. 5

* During pulse.

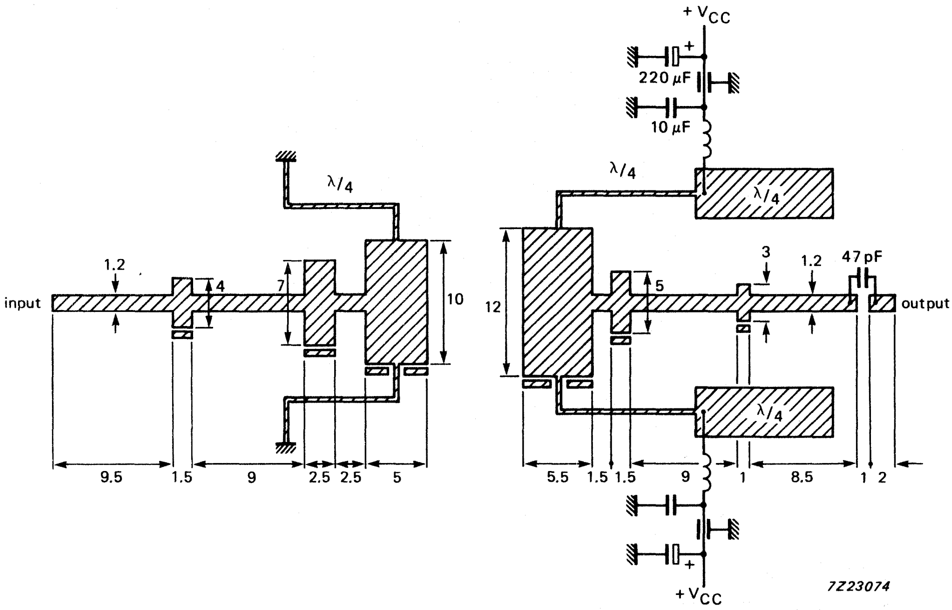


Fig. 3 Broadband test circuit for 3.0 to 3.4 GHz. (dimensions in mm).
PTFE fibreglass printed circuit board; ϵ_r = 2.55; thickness 0.4 mm.

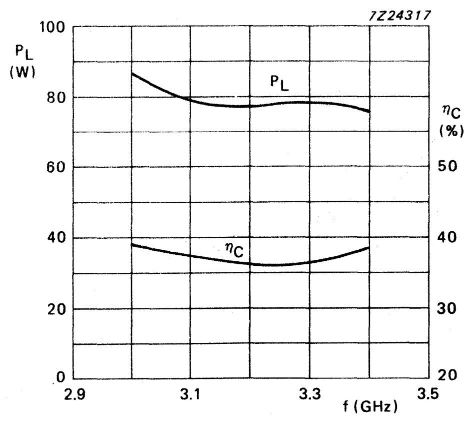


Fig. 4 Load power and collector efficiency as a function of frequency*;
V_{CC} = 40 V, t_p = 100 μs; δ = 10%; typical values.

* In a broadband test circuit as shown in Fig. 3.

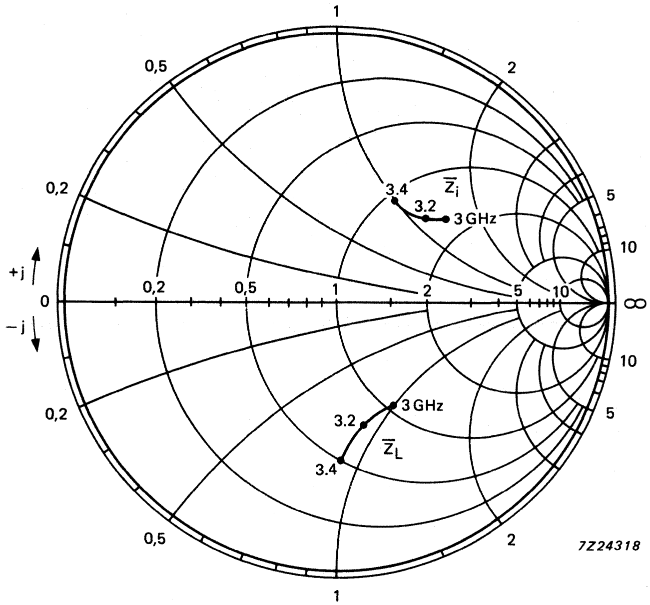


Fig. 5 Input and optimum load impedance as a function of frequency; Z_O = 5 Ω; V_{CC} = 40 V; typical values.

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 °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 %	$\bar{z}_i$ $\bar{Z}_L$ Ω
class-B						see table
t_p = 100 μs, δ = 10%	1,09	50	typ. 350	typ. 7,8	typ. 38	
t_p = 300 μs, δ = 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

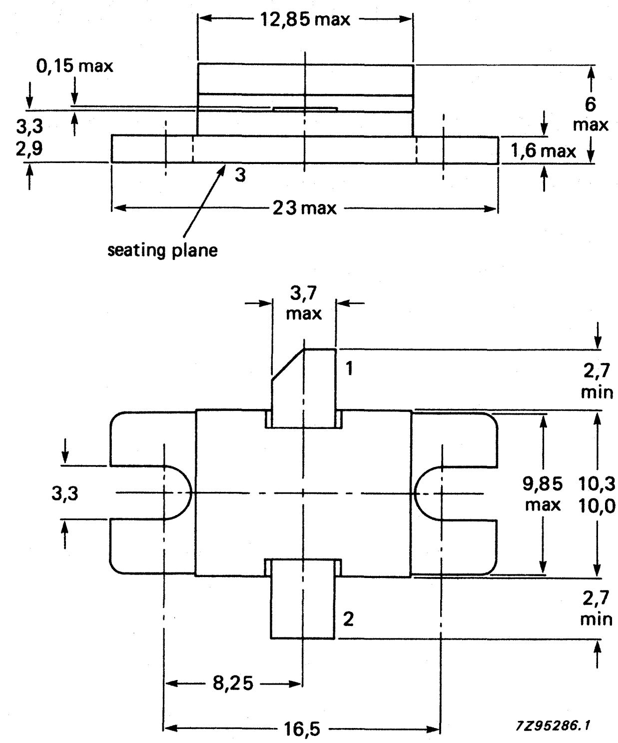
FO-91 (see Fig. 1)

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

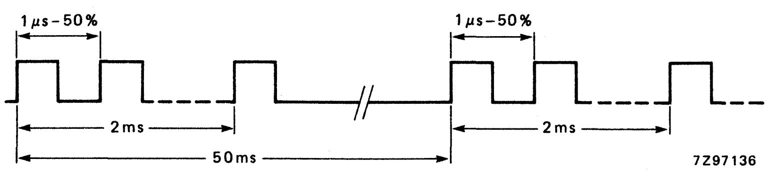


Fig. 2 DABS pulse definition.

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 μs, δ ⩽ 10%	I_C	max.	21 A
Total power dissipation up to T_{mb} = 75 °C			
t_p = 100 μs, δ ⩽ 10%	P_{tot}	max.	630 W
Storage temperature	T_{stg}		−65 to +200 °C
Junction temperature	T_j	max.	200 °C
Soldering temperature			
at 0,1 mm from the case, t_{sld} ⩽ 10 s	T_{sld}	max.	235 °C

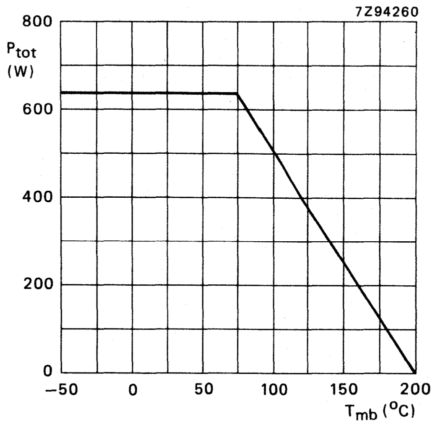


Fig. 3 Power derating curve versus mounting base temperature; t_p = 100 μs, δ = 10%.

THERMAL RESISTANCE (at T_j = 100 °C)

From junction to mounting base	$R_{th\ j\text{-}mb}$	max.	0,8 K/W
Equivalent thermal impedance; t_p = 100 μs; δ = 10%	Z_{th}	typ.	0,2 K/W

CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Breakdown voltages			
I_C = 50 mA; I_E = 0	$V_{(BR)CBO}$	⩾	60 V
I_C = 50 mA; R_{BE} = 10 Ω	$V_{(BR)CER}$	⩾	60 V
I_C = 0; I_E = 5 mA	$V_{(BR)EBO}$	⩾	3 V
Collector cut-off current			
I_E = 0; V_{CB} = 50 V	I_{CBO}	⩽	10 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 °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 μs; δ = 10%	1,09	50	⩾ 300	⩾ 7	⩾ 30

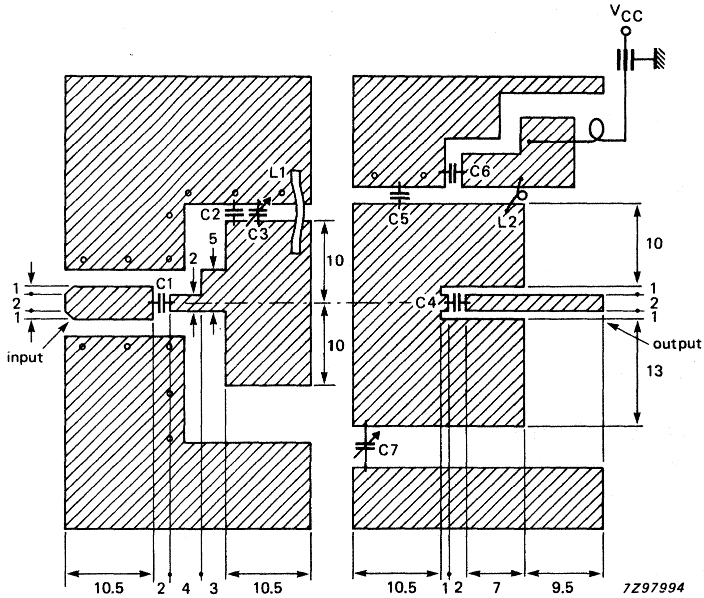


Fig. 4 Narrowband test circuit for 1,09 GHz (dimensions in mm).
PTFE printed circuit board; thickness 0,8 mm; ϵ_r = 2,55.

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 °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 μs; δ = 10 %	1,2 to 1,4	42	typ. 40	typ. 7,8	typ. 40	see Fig. 6	
class-C; t_p = 300 μs; δ = 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

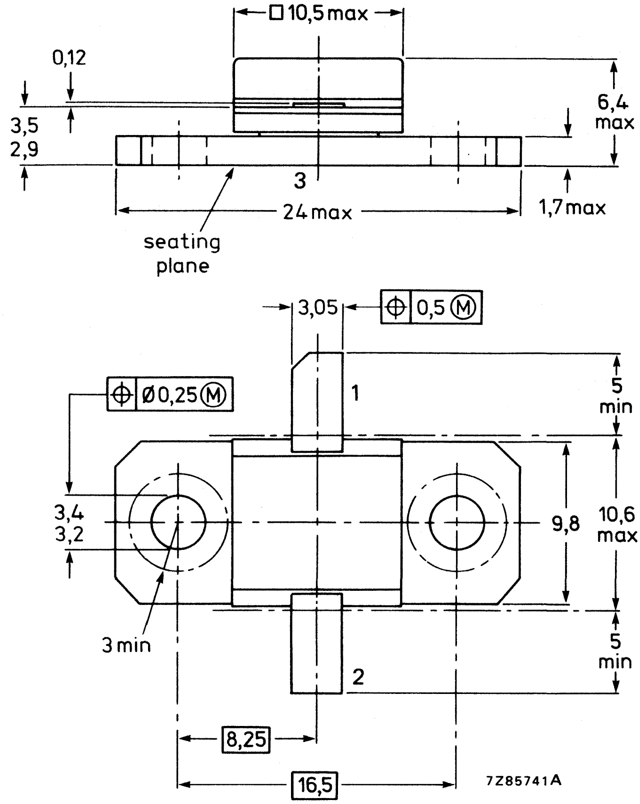
Dimensions in mm

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, $R_{BE} \leqslant 10\ \Omega$	V_{CER}	max.	60 V
Emitter-base voltage, open collector	V_{EBO}	max.	3 V
Collector current (d.c.) $t_p \leqslant 50\ \mu s$; $\delta \leqslant 10$ %	I_C	max.	3 A
Total power dissipation up to T_{mb} = 75 °C $t_p \leqslant 50\ \mu s$; $\delta \leqslant 10$ %	P_{tot}	max.	90 W
Storage temperature	T_{stg}		−65 to 200 °C
Junction temperature	T_j	max.	200 °C
Lead soldering temperature at 0,1 mm from the case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235 °C

THERMAL RESISTANCE (at T_j = 75 °C) ←

From junction to mounting base	$R_{th\ j\text{-}mb}$	max.	5,0 K/W
Transient thermal impedance; t_p = 50 μs, single pulse	Z_{th}	typ.	0,6 K/W

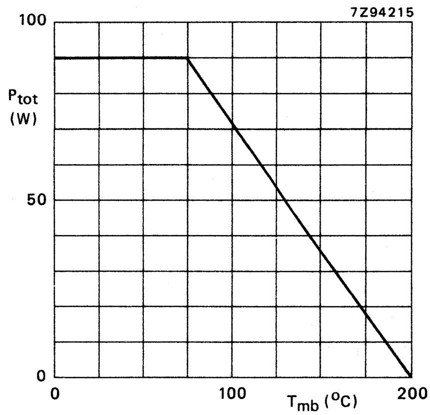


Fig. 2 Power derating curve versus mounting base temperature (under pulsed conditions: t_p = 50 μs, δ = 10 %).

CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Collector-base breakdown voltage I_C = 2 mA; I_E = 0	$V_{(BR)CBO}$	$\geqslant$	60 V
Collector-emitter breakdown voltage I_C = 2 mA; R_{BE} = 10 Ω	$V_{(BR)CER}$	$\geqslant$	60 V
Emitter-base breakdown voltage I_C = 0; I_E = 0,2 mA	$V_{(BR)EBO}$	$\geqslant$	3 V
Collector cut-off current I_E = 0; V_{CB} = 50 V	I_{CBO}	$\leqslant$	1 mA
Emitter cut-off current I_C = 0; V_{EB} = 1,5 V	I_{EBO}	$\leqslant$	50 μA

PRODUCT TEST

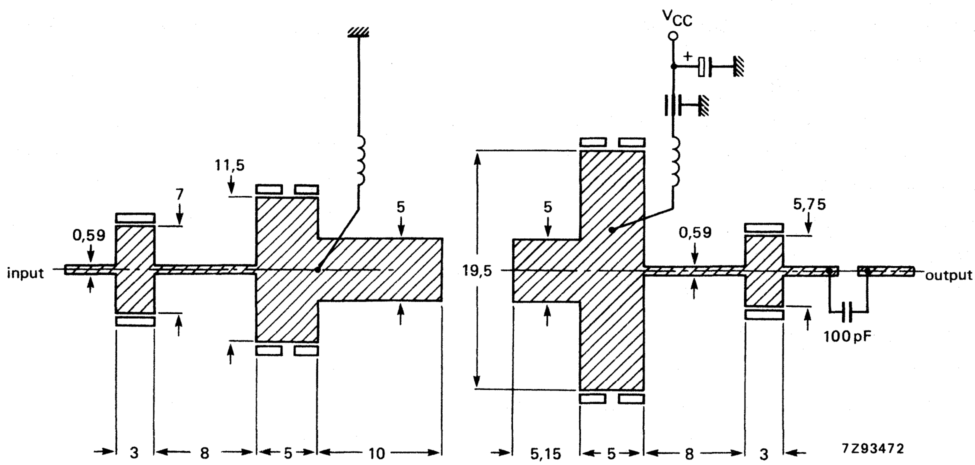


Fig. 3 Wideband test circuit for 1,2 to 1,4 GHz (dimensions in mm).
Epsilam p.c. board, thickness 0,635 mm, ϵ_r = 10.

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 μs; δ = 10 %	1,2 to 1,4	42	> 35	> 7	> 35	see Fig. 6	

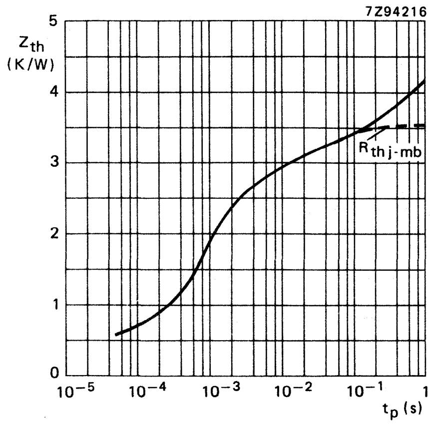


Fig. 4 Transient thermal impedance.

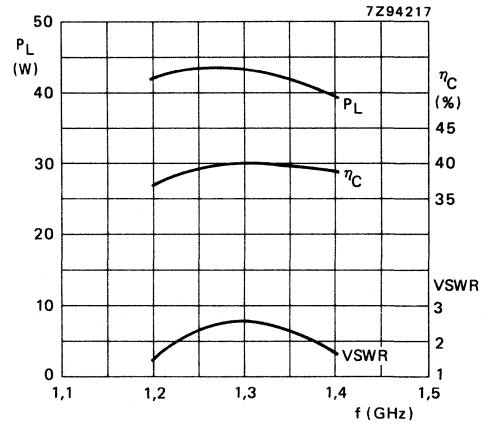


Fig. 5 Load power, collector efficiency and VSWR versus frequency; V_{CE} = 42 V; P_S = 7 W.

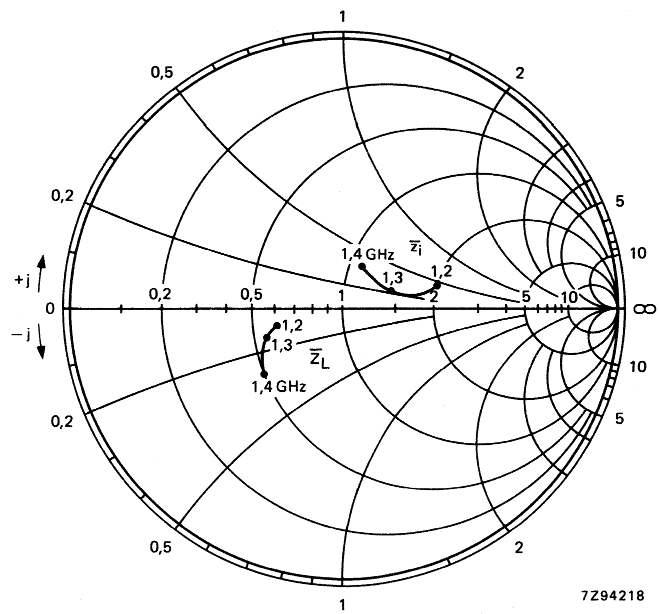


Fig. 6 Input and optimum load impedances versus frequency; Z_O = 5 Ω.

Conditions for Fig. 6:

V_{CE} = 42 V; P_L = 35 W; t_p = 50 μs; δ = 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 °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 μs; δ = 10 %	1,2 to 1,4	42	typ. 80	typ. 7	typ. 38	see Fig. 6	
class-B; t_p = 300 μs; δ = 10 %	1,2 to 1,4	50	typ. 80	typ. 7	typ. 30	see Fig. 6	

MECHANICAL DATA

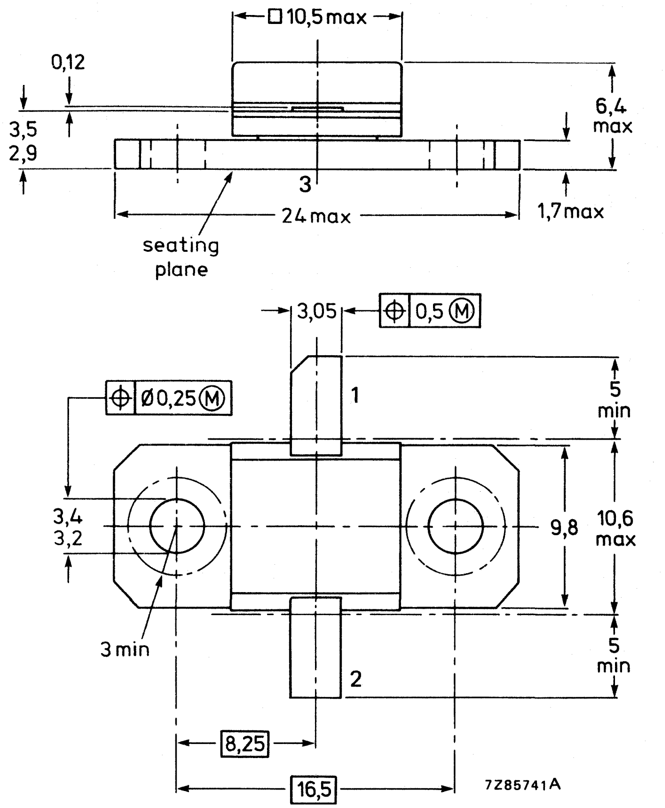
FO-57C (see Fig. 1).

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

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, $R_{BE} \leqslant 10\ \Omega$	V_{CER}	max.	60	V
Emitter-base voltage, open collector	V_{EBO}	max.	3	V
Collector current (d.c.) $t_p \leqslant 50\ \mu s$; $\delta \leqslant 10\ \%$	I_C	max.	6	A
Total power dissipation up to T_{mb} = 75 °C $t_p \leqslant 50\ \mu s$; $\delta \leqslant 10\ \%$	P_{tot}	max.	180	W
Storage temperature	T_{stg}		−65 to 200	°C
Junction temperature	T_j	max.	200	°C
Lead soldering temperature at 0,1 mm from the case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	°C

THERMAL RESISTANCE (at T_j = 75 °C)

From junction to mounting base	$R_{th\ j\text{-}mb}$	max.	2,5	K/W
Transient thermal impedance, t_p = 50 μs, (single pulse)	Z_{th}	typ.	0,3	K/W

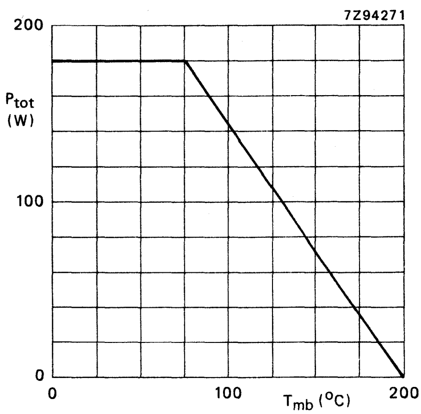


Fig. 2 Power derating curve versus mounting base temperature (under pulsed conditions: t_p = 50 μs, δ = 10 %).

CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Collector-base breakdown voltage I_C = 4 mA; I_E = 0	$V_{(BR)CBO}$	⩾	60	V
Collector-emitter breakdown voltage I_C = 4 mA; R_{BE} = 10 Ω	$V_{(BR)CER}$	⩾	60	V
Emitter-base breakdown voltage I_C = 0; I_E = 0,4 mA	$V_{(BR)EBO}$	⩾	3	V
Collector cut-off current I_E = 0; V_{CB} = 50 V	I_{CBO}	⩽	2	mA
Emitter cut-off current I_C = 0; V_{EB} = 1,5 V	I_{EBO}	⩽	100	μA

PRODUCT TEST

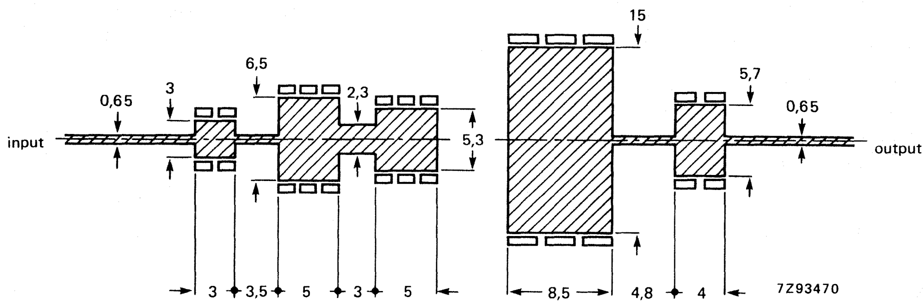


Fig. 3 Wideband test circuit for 1,2 to 1,4 GHz (dimensions in mm).
Epsilam p.c. board, thickness 0,635 mm, ϵ_r = 10.

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 μs; δ = 10 %	1,2 to 1,4	42	> 65	> 6	> 32	see Fig. 6	

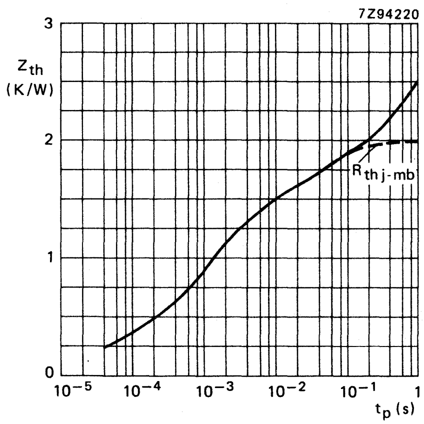


Fig. 4 Transient thermal impedance.

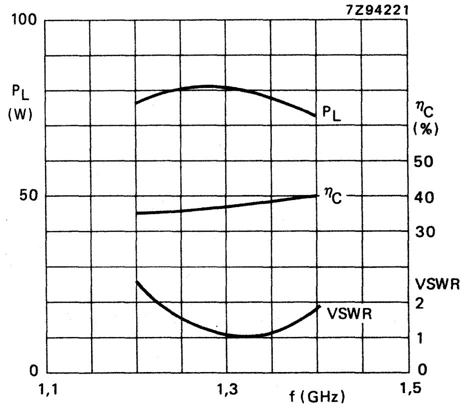


Fig. 5 Load power (at P_S = 16 W), and collector efficiency and VSWR (at P_L = 65 W) versus frequency; V_{CE} = 42 V.

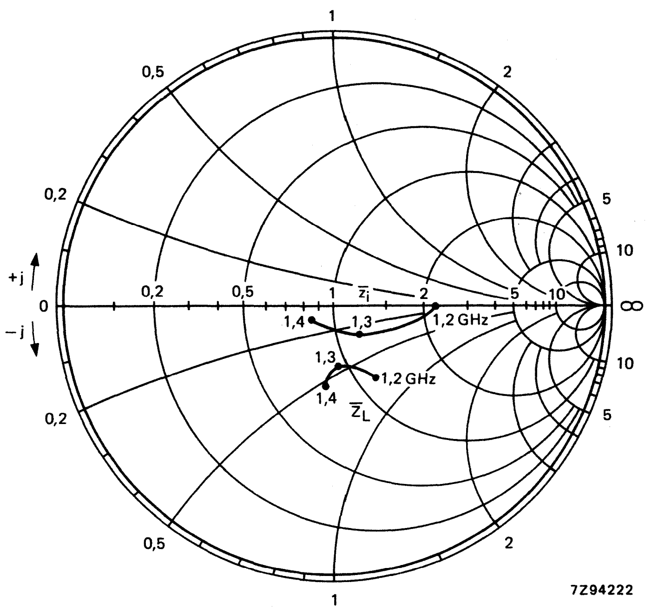


Fig. 6 Input and optimum load impedance versus frequency; Z_O = 5 Ω.

Conditions for Fig. 6:

V_{CE} = 42 V; P_L = 65 W; t_p = 50 μs; δ = 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 °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 µs; δ = 10 %	1,2 to 1,4	42	typ. 150	typ. 7	typ. 38	see Fig. 7	
class-C; t_p = 300 µs; δ = 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

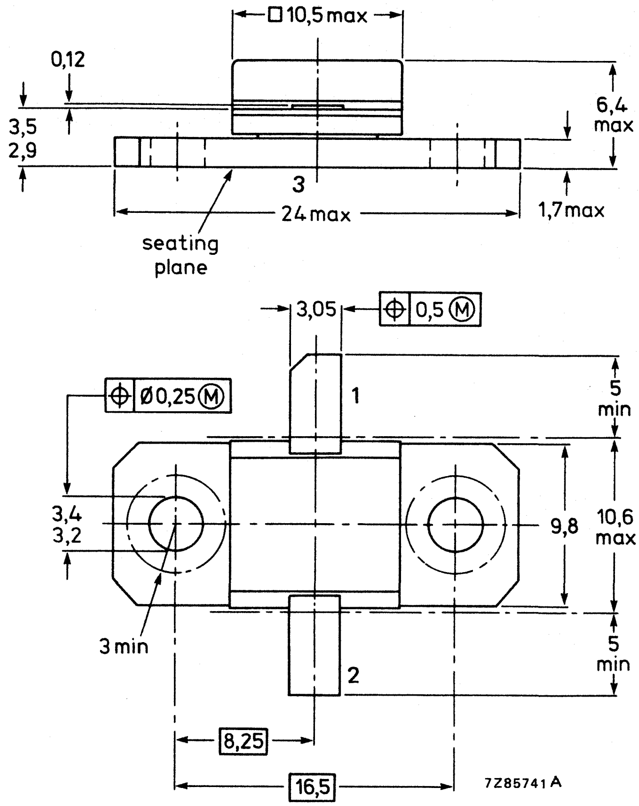
Dimensions in mm

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, $R_{BE} \leqslant 10\ \Omega$	V_{CER}	max.	60 V
Emitter-base voltage, open collector	V_{EBO}	max.	3 V
Collector current (d.c.) $t_p \leqslant 50\ \mu s$; $\delta \leqslant 10\ \%$	I_C	max.	12 A
Total power dissipation up to $T_{mb} = 75\ ^oC$ $t_p \leqslant 50\ \mu s$; $\delta \leqslant 10\ \%$	P_{tot}	max.	360 W
Storage temperature	T_{stg}		−65 to 200 °C
Junction temperature	T_j	max.	200 °C
Lead soldering temperature at 0,1 mm from the case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235 °C

THERMAL RESISTANCE (at $T_j = 75\ ^oC$)

From junction to mounting base	$R_{th\ j\text{-}mb}$	max.	1,25 K/W
Transient thermal impedance, $t_p = 50\ \mu s$ single pulse	Z_{th}	typ.	0,15 K/W

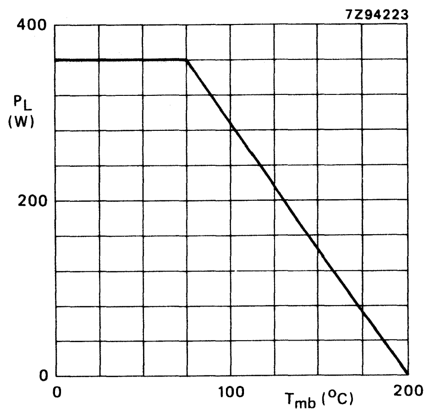


Fig. 2 Power derating curve versus mounting base temperature; pulsed conditions, $t_p = 50\ \mu s$, $\delta = 10\ \%$.

CHARACTERISTICS

$T_{mb} = 25\ ^oC$ unless otherwise specified

Collector-base breakdown voltage $I_C = 8$ mA; $I_E = 0$	$V_{(BR)CBO}$	$\geqslant$	60 V
Collector-emitter breakdown voltage $I_C = 8$ mA; $R_{BE} = 10\ \Omega$	$V_{(BR)CER}$	$\geqslant$	60 V
Emitter-base breakdown voltage $I_C = 0$; $I_E = 0{,}8$ mA	$V_{(BR)EBO}$	$\geqslant$	3 V
Collector cut-off current $I_E = 0$; $V_{CB} = 50$ V	I_{CBO}	$\leqslant$	4 mA
Emitter cut-off current $I_C = 0$; $V_{EB} = 1{,}5$ V	I_{EBO}	$\leqslant$	200 μA

PRODUCT TEST

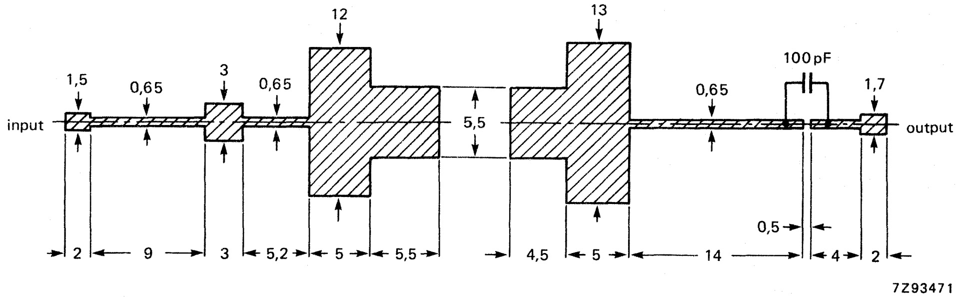


Fig. 3 Wideband test circuit for 1,2 to 1,4 GHz (dimensions in mm).
Epsilam p.c. board, thickness 0,635 mm, ϵ_r = 10.

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 %	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω
class-C; t_p = 50 μs; δ = 10 %	1,2 to 1,4	42	> 125	> 6	38	see Fig. 7	

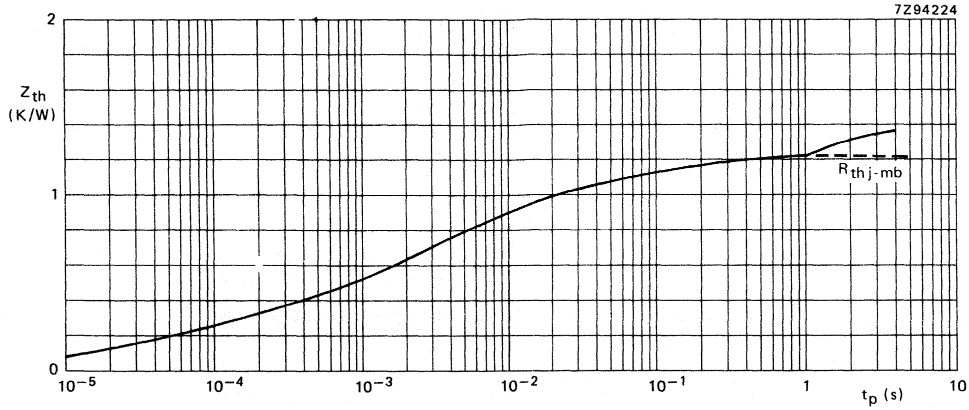


Fig. 4 Transient thermal impedance.

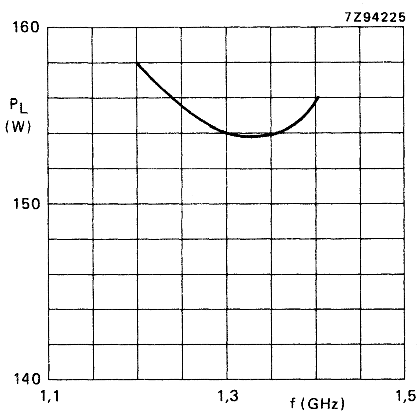


Fig. 5 Load power versus frequency; P_S = 30 W.

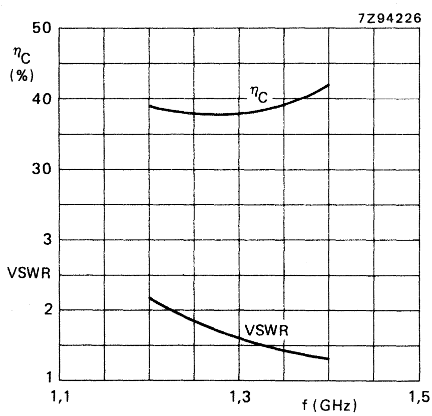


Fig. 6 Collector efficiency and VSWR versus frequency; P_L = 125 W.

Conditions for Figs 5 and 6:

V_{CE} = 42 V; t_p = 50 μs, δ = 10 %.

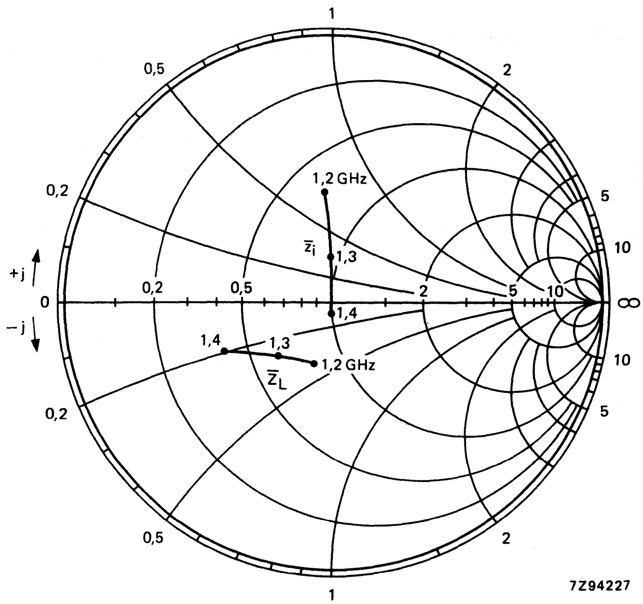


Fig. 7 Input and optimum load impedance versus frequency; Z_O = 5 Ω.

Conditions for Fig. 7:

V_{CE} = 42 V; P_L = 125 W; t_p = 50 μs, δ = 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 °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 μs; δ = 10 %	1,2 to 1,4	42	typ. 200	typ. 7	typ. 38	see Fig. 6	see Fig. 6
class-C; t_p = 300 μs; δ = 10 %	1,2 to 1,4	50	typ. 200	typ. 7	typ. 35	see Fig. 6	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

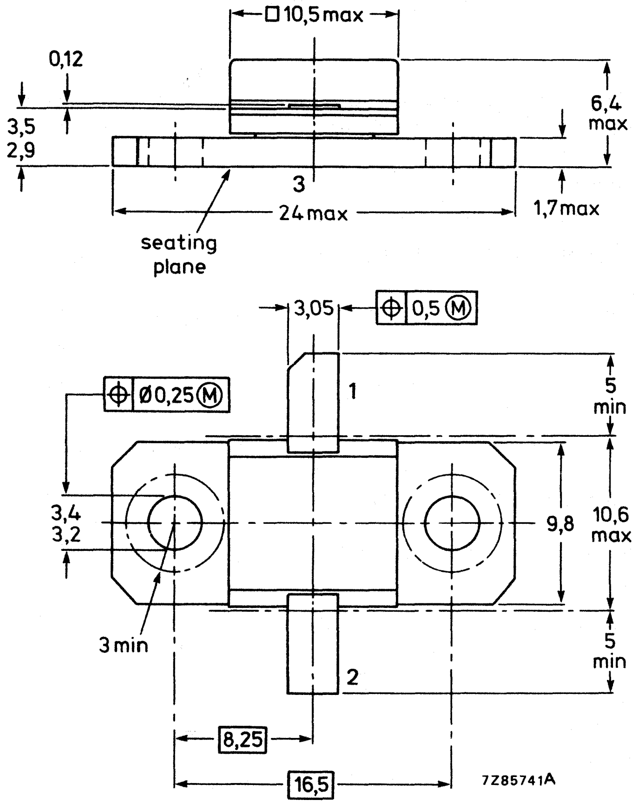
Dimensions in mm

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 °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 %	$\overline{z}_i$; $\overline{Z}_L$ Ω
class-C t_p = 100 μs δ = 10%	2,7 to 3,1	40	typ. 45	typ. 7	typ. 40	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.

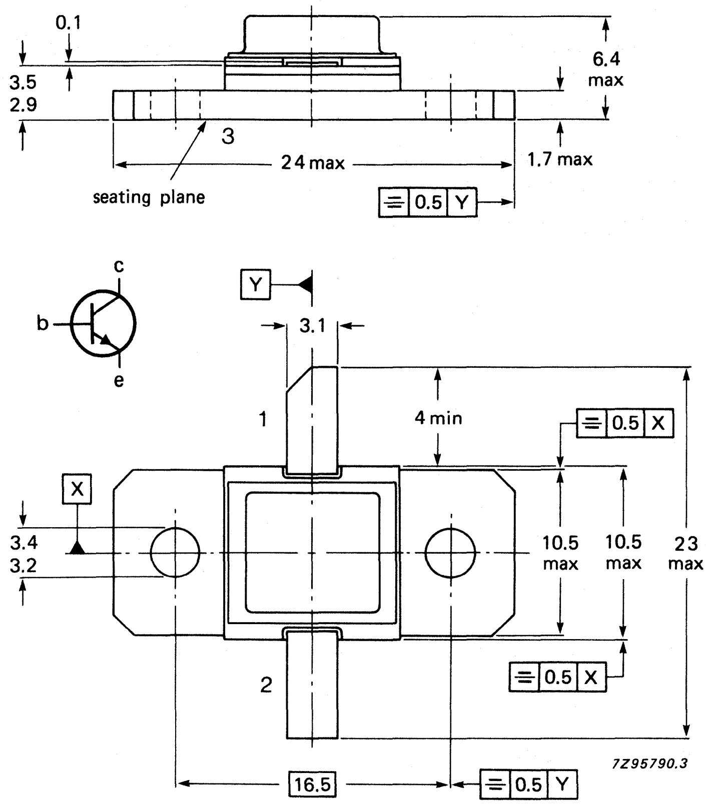
MECHANICAL DATA

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			
R_{BE} = 10 Ω	V_{CER}	max.	50 V
open base	V_{CEO}	max.	15 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5 V
Collector current (peak)*	I_C	max.	4,4 A
Total power dissipation up to T_{mb} = 75 °C*	P_{tot}	max.	90 W
Storage temperature range	T_{stg}		−65 to + 200 °C
Junction temperature	T_j	max.	200 °C
Soldering temperature up to 0,3 mm from the case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235 °C

* Maximum value under normal pulsed microwave operating conditions.

THERMAL RESISTANCE (at T_j = 100 °C)

From junction to mounting base	$R_{th\ j\text{-}mb}$	max.	3,3 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	typ.	0,3 K/W
Equivalent thermal impedance under pulsed microwave conditions t_p = 100 μs; δ = 10%	$Z_{th\ j\text{-}mb}$	typ.	1,07 K/W

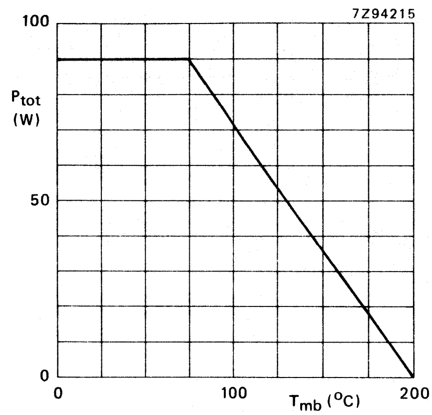


Fig. 2 Power derating curve; t_p = 100 μs; δ = 10%.

CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Collector cut-off current			
V_{CB} = 50 V; I_E = 0	I_{CBO}	⩽	16 mA
V_{CB} = 30 V; I_E = 0	I_{CBO}	⩽	0,16 mA
V_{CB} = 50 V; R_{BE} = 10 Ω	I_{CBO}	⩽	160 mA
Emitter cut-off current			
V_{EB} = 3,5 V; I_C = 0	I_{EBO}	⩽	1 mA

APPLICATION INFORMATION

Microwave performance up to T_{mb} = 25 °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 %	$\overline{z}_i$; $\overline{Z}_L$ Ω
class-C t_p = 100 μs δ = 10%	2,7 to 3,1	40	⩾ 40	⩾ 6,4	⩾ 35	see Fig. 6

* During pulse.

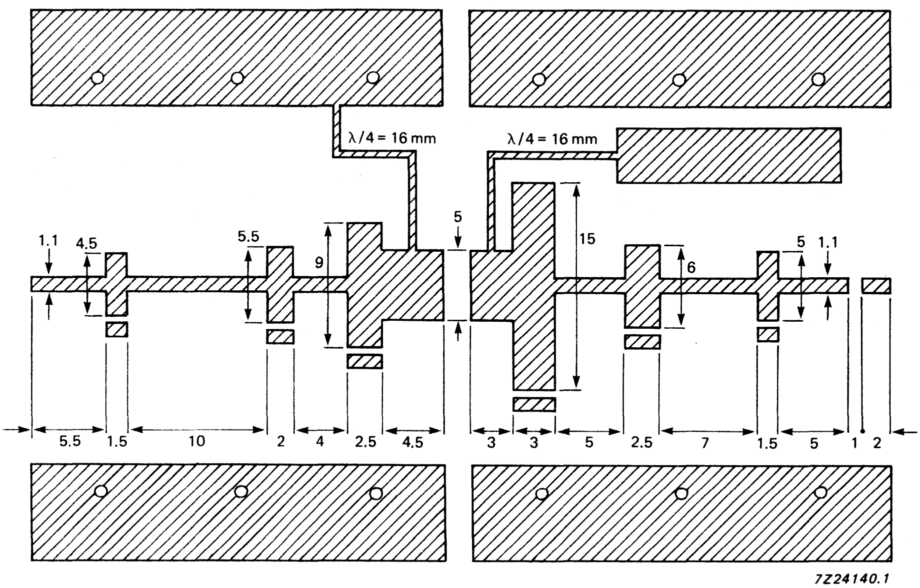


Fig. 3 Broadband test circuit for 2,7 to 3,1 GHz. (dimensions in mm).
PTFE fibreglass printed circuit board, thickness 0,4 mm; ϵ_r = 2,54.

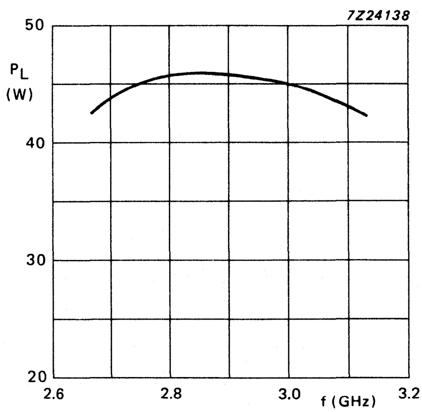


Fig. 4 Load power as a function of frequency*; V_{CC} = 40 V;
P_{in} = 9 W; t_p = 100 μs; δ = 10%; typical values.

* In a broadband test circuit as shown in Fig. 3.

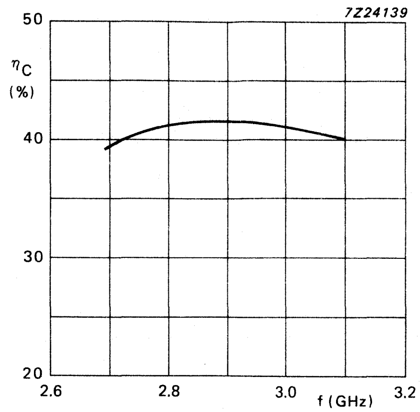


Fig. 5 Collector efficiency as a function of frequency*;
V_{CC} = 40 V; t_p = 100 μs; δ = 10%; typical values.

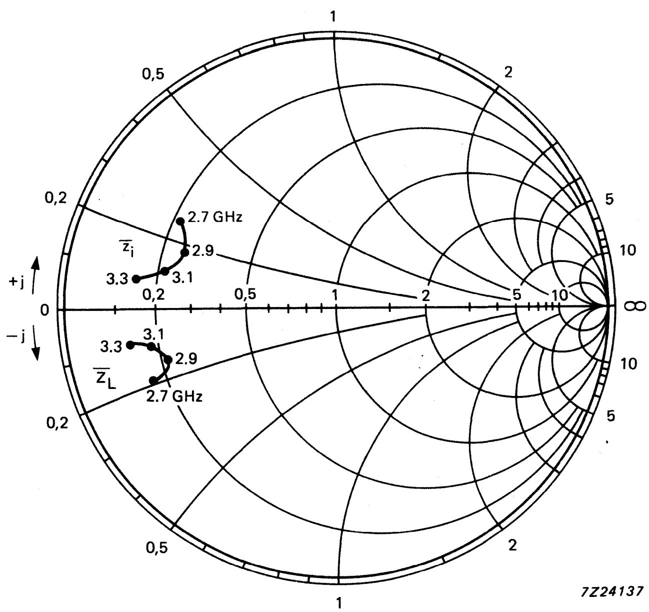


Fig. 6 Input and optimum load impedance as a function of frequency;
Z_O = 50 Ω; V_{CC} = 40 V; typical values.

* 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 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 ^{o}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 μs δ = 10%	2,7 to 3,1	40	typ. 65	typ. 6,3	typ. 40	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.

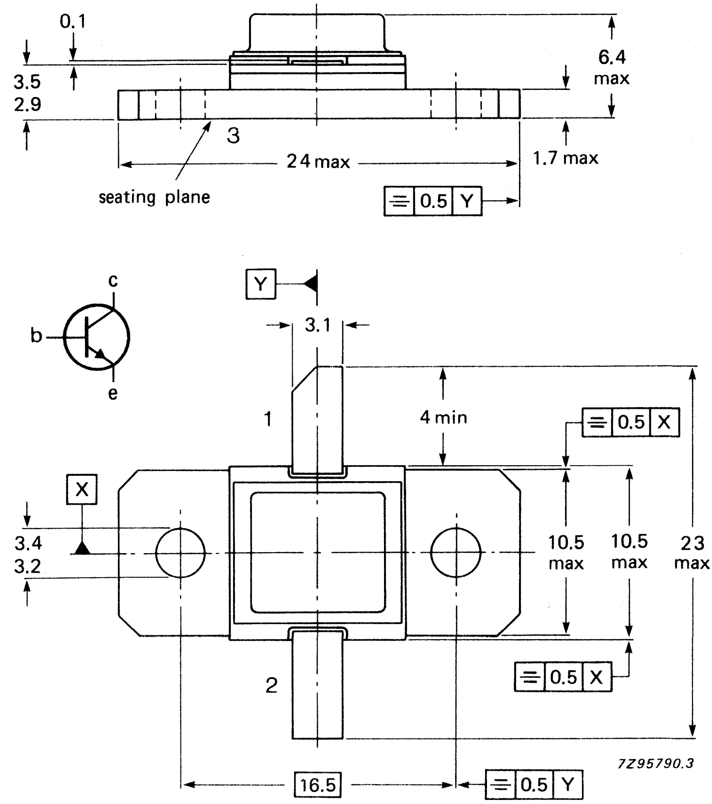
MECHANICAL DATA

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			
R_{BE} = 10 Ω	V_{CER}	max.	50 V
open base	V_{CEO}	max.	15 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5 V
Collector current (peak)*	I_C	max.	5,7 A
Total power dissipation at $T_{mb} \leqslant 75$ °C*	P_{tot}	max.	125 W
Storage temperature range	T_{stg}		−65 to + 200 °C
Junction temperature	T_j	max.	200 °C
Soldering temperature up to 0,3 mm from the case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235 °C

* Maximum value under normal pulsed microwave operating conditions.

THERMAL RESISTANCE (at T_j = 100 °C)

From junction to mounting base (CW)	$R_{th\ j\text{-}mb}$	max.	2,5 K/W
Equivalent thermal impedance under pulsed microwave conditions t_p = 100 μs; δ = 10%	$Z_{th\ j\text{-}mb}$	typ.	0,8 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	typ.	0,3 K/W

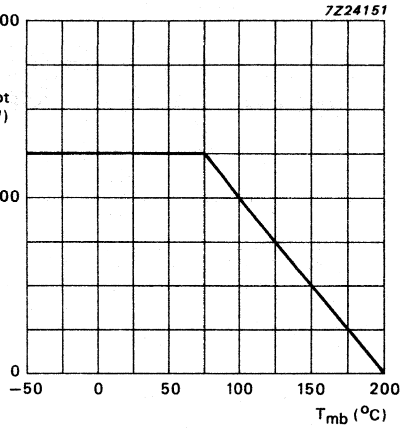


Fig. 2 Power derating curve; t_p = 100 μs; δ = 10%.

CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Collector cut-off current			
V_{CB} = 50 mA; I_E = 0	I_{CBO}	⩽	24 mA
V_{CB} = 30 mA; I_E = 0	I_{CBO}	⩽	80 μA
V_{CB} = 50 mA; R_{BE} = 10 Ω	I_{CBO}	⩽	240 mA
Emitter cut-off current			
V_{EB} = 3,5 V; I_C = 0	I_{EBO}	⩽	5 mA

APPLICATION INFORMATION

Microwave performance up to T_{mb} = 25 °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 %	$\overline{z_i}$; $\overline{Z_L}$ Ω
class-C t_p = 100 μs δ = 10%	2,7 to 3,1	40	⩾ 60	⩾ 6,0	⩾ 35	see Fig. 6

* During pulse.

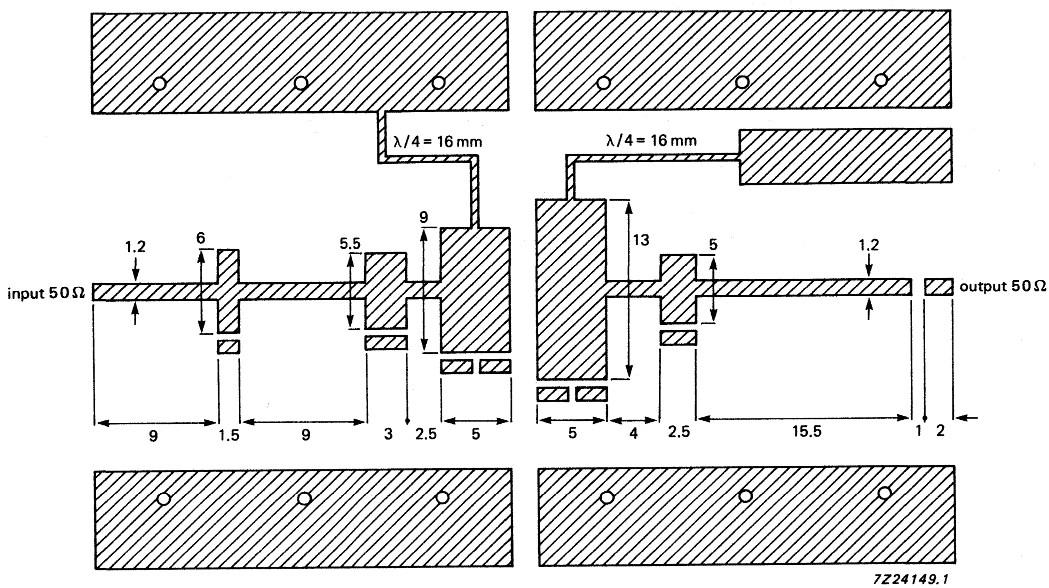


Fig. 3 Broadband test circuit for 2,7 to 3,1 GHz. (dimensions in mm).
PTFE fibreglass printed circuit board, thickness 0,4 mm; ϵ_r = 2,54.

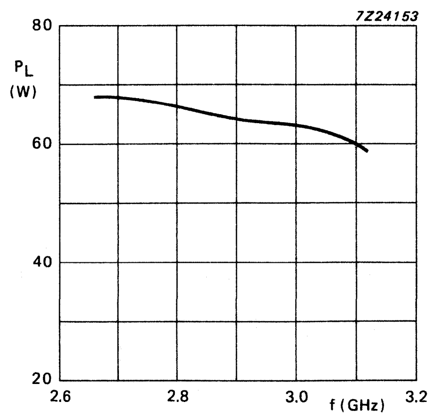


Fig. 4 Load power as a function of frequency*; V_{CC} = 40 V;
P_{in} = 15 W; t_p = 100 μs; δ = 10%; typical values.

* In a broadband test circuit as shown in Fig. 3.

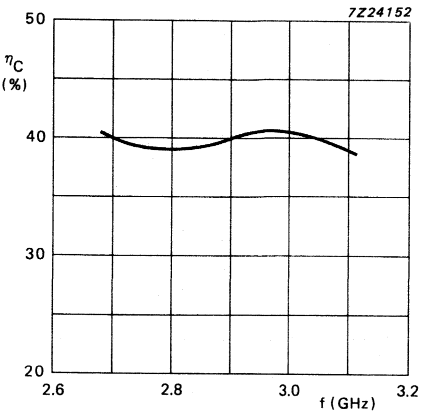


Fig. 5 Collector efficiency as a function of frequency*; V_{CC} = 40 V; P_{in} = 15 W; t_p = 100 μs; δ = 10%; typical values.

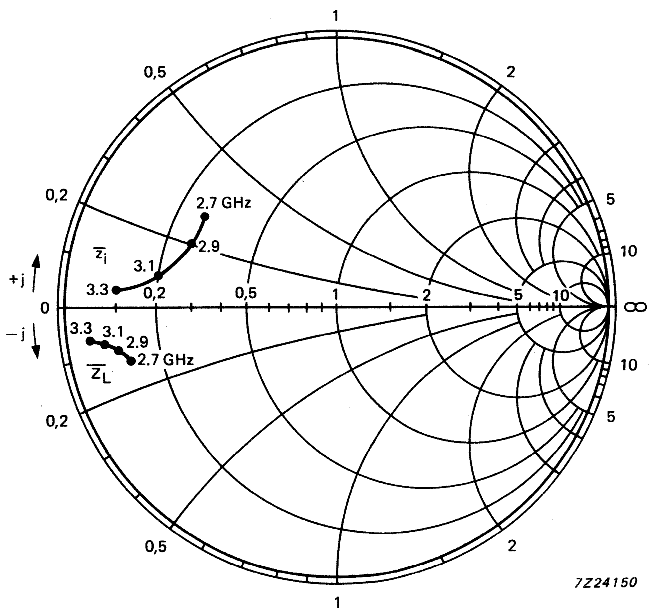


Fig. 6 Input and optimum load impedance as a function of frequency; Z_O = 50 Ω; V_{CC} = 40 V; typical values.

* 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 °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 μs δ = 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.

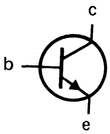
MECHANICAL DATA

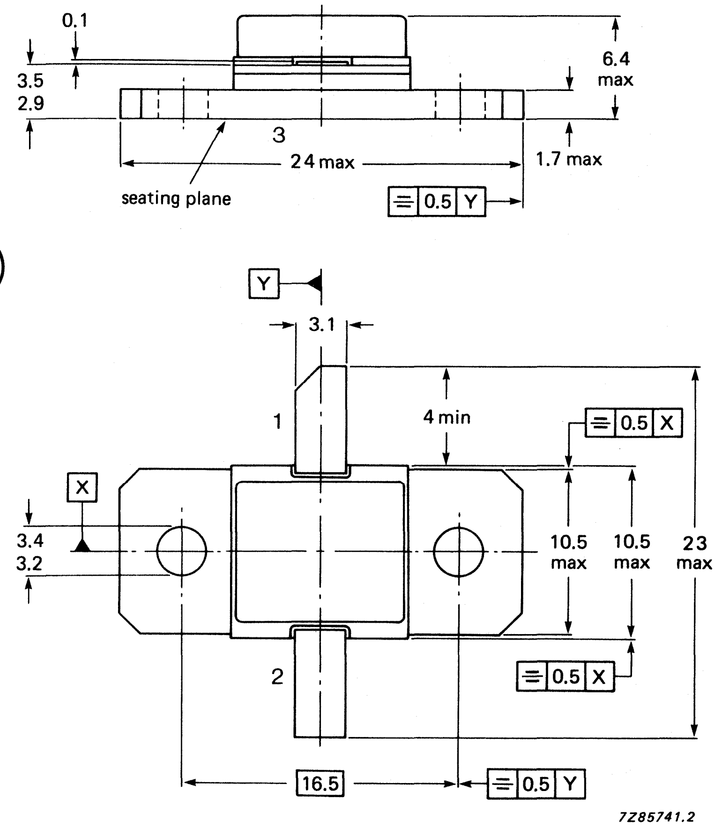
Dimensions in mm

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

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 Ω	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.	A
Total power dissipation at $T_{mb} \leq 75$ °C*	P_{tot}	max.	75 W
Storage temperature range	T_{stg}		−65 to + 200 °C
Operating 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

* Maximum values under nominal pulse microwave operating conditions.

THERMAL RESISTANCE (at T_j = 75 °C)

From junction to mounting base (CW)	$R_{th\ j\text{-}mb}$	max.	3.5 K/W
Equivalent thermal impedance under pulsed microwave conditions t_p = 100 µs; δ = 10%	$Z_{th\ j\text{-}mb}$	typ.	1.2 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	typ.	0.3 K/W

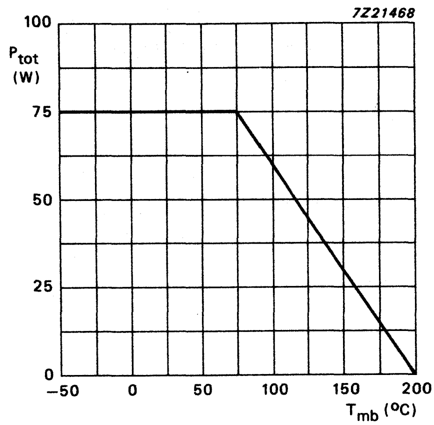


Fig. 2 Power derating curve versus mounting base temperature; t_p = 100 µs; δ = 10%.

CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Collector cut-off current			
V_{CB} = 50 V; I_E = 0	I_{CBO}	⩽	10 mA
V_{CB} = 30 V; I_E = 0	I_{CBO}	⩽	0.1 mA
V_{CE} = 50 V; R_{BE} = 10 Ω	I_{CER}	⩽	50 mA
Emitter cut-off current			
V_{EB} = 1.5 V; I_C = 0	I_{EBO}	⩽	10 µA
V_{EB} = 3.5 V; I_C = 0	I_{EBO}	⩽	0.1 mA

APPLICATION INFORMATION

Microwave performance at T_{mb} = 25 °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 µs δ = 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 ^{o}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 μs; δ = 10%	2.8 to 3.3	40	34	5.5	33

MECHANICAL DATA

Dimensions in mm

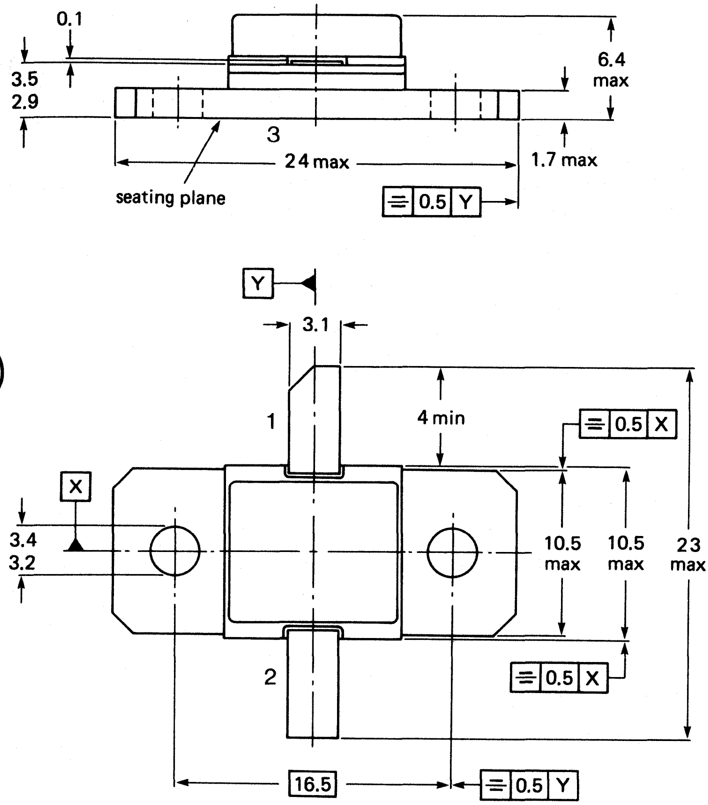
FO-57C (see Fig. 1)

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

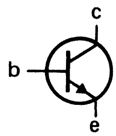
Dimensions in mm

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

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 Ω	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 $T_{mb} \leq 75$ °C *	P_{tot}	max.	150 W
Storage temperature range	T_{stg}		−65 to + 200 °C
Operating 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 °C)

From junction to mounting base (CW)	$R_{th\ j\text{-}mb}$	max.	1.75 K/W
From junction to mounting base *	$R_{th\ j\text{-}mb}$	typ.	0.6 K/W

* Maximum values under nominal pulse microwave operating conditions.

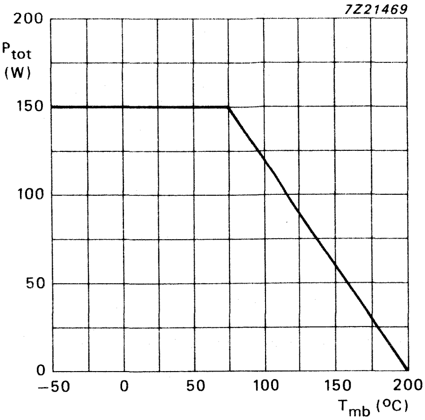


Fig. 2 Power derating curve; t_p = 100 μs; δ = 10%.

CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Collector cut-off current

V_{CB} = 50 V; I_E = 0	I_{CBO}	≤	20 mA
V_{CB} = 30 V; I_E = 0	I_{CBO}	≤	200 mA
V_{CE} = 50 V; R_{BE} = 10 Ω	I_{CER}	≤	100 mA

Emitter cut-off current

V_{EB} = 1.5 V; I_C = 0	I_{EBO}	≤	20 μA
V_{EB} = 3.5 V; I_C = 0	I_{EBO}	≤	0.2 mA

APPLICATION INFORMATION

Microwave performance at T_{mb} = 25 °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 μs; δ = 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 °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 %	$\overline{z_i}; \overline{Z_L}$ Ω
class-C t_p = 100 μs δ = 10%	2,8 to 3,3	40	typ. 45	typ. 7	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.

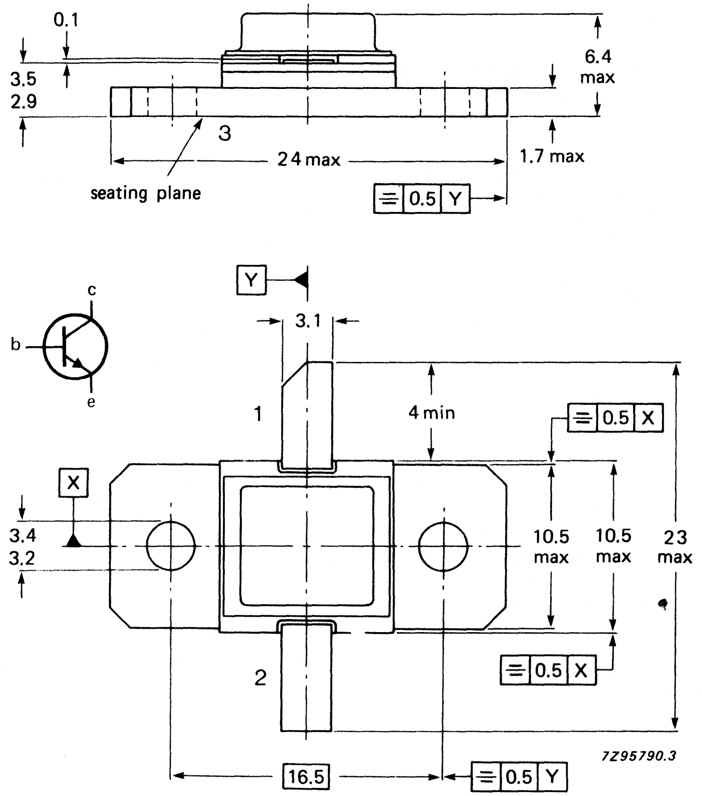
MECHANICAL DATA

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			
R_{BE} = 10 Ω	V_{CER}	max.	50 V
open base	V_{CEO}	max.	15 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5 V
Collector current (peak)*	I_C	max.	4,4 A
Total power dissipation at $T_{mb} \leq 75$ °C*	P_{tot}	max.	90 W
Storage temperature range	T_{stg}	−65 to + 200 °C	
Junction temperature	T_j	max.	200 °C
Soldering temperature up to 0,3 mm from the case; $t_{sld} \leq 10$ s	T_{sld}	max.	235 °C

* Maximum value under normal pulsed microwave operating conditions.

THERMAL RESISTANCE (at T_j = 100 °C)

From junction to mounting base	$R_{th\ j\text{-}mb}$	max.	3,3	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	typ.	0,3	K/W
Equivalent thermal impedance under pulse microwave conditions; t_p = 100 μs; δ = 10%	$Z_{th\ j\text{-}mb}$	typ.	1,07	K/W

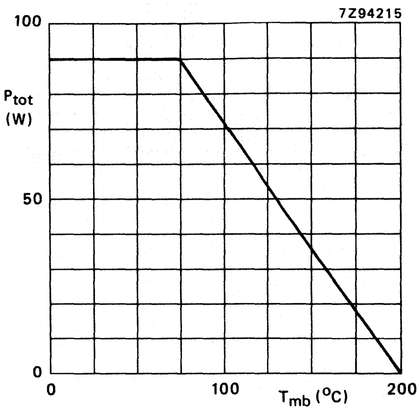


Fig. 2 Power derating curve; t_p = 100 μs; δ = 10%.

CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Collector cut-off current				
V_{CB} = 50 V; I_E = 0	I_{CBO}	⩽	16	mA
V_{CB} = 30 V; I_E = 0	I_{CBO}	⩽	0,16	mA
V_{CB} = 50 V; R_{BE} = 10 Ω	I_{CBO}	⩽	160	mA
Emitter cut-off current				
V_{EB} = 3,5 V; I_C = 0	I_{EBO}	⩽	1	mA

APPLICATION INFORMATION

Microwave performance up to T_{mb} = 25 °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 %	$\overline{z_i}$; $\overline{Z_L}$ Ω
class-C t_p = 100 μs δ = 10%	2,8 to 3,3	40	⩾ 37	⩾ 6	⩾ 33	see Fig. 6

* During pulse.

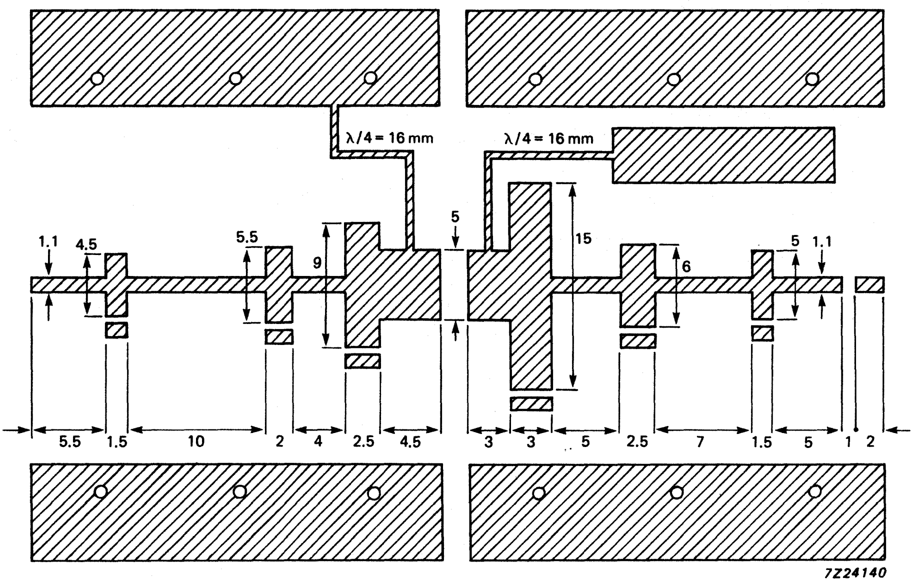


Fig. 3 Broadband test circuit for 2,8 to 3,3 GHz. (dimensions in mm).
PTFE fibreglass printed circuit board; thickness 0,4 mm; ϵ_r = 2,54.

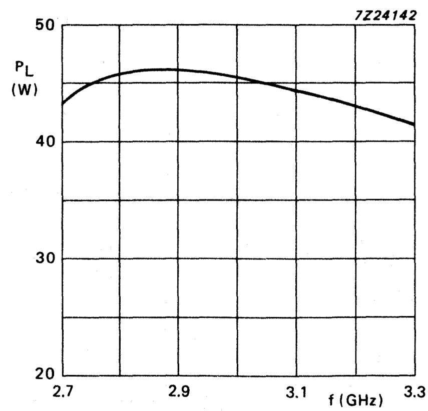


Fig. 4 Load power as a function of frequency*; V_{CC} = 40 V;
P_{in} = 9 W; t_p = 100 μs; δ = 10%; typical values.

* In a broadband test circuit as shown in Fig. 3.

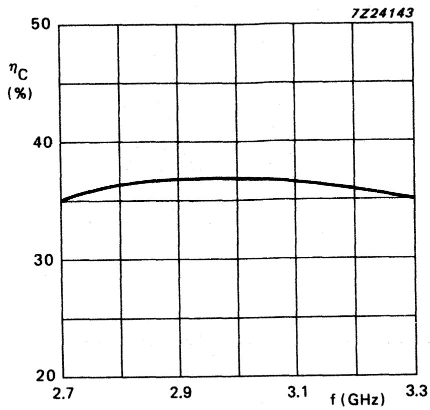


Fig. 5 Collector efficiency as a function of frequency*; V_{CC} = 40 V; t_p = 100 μs; δ = 10%; typical values.

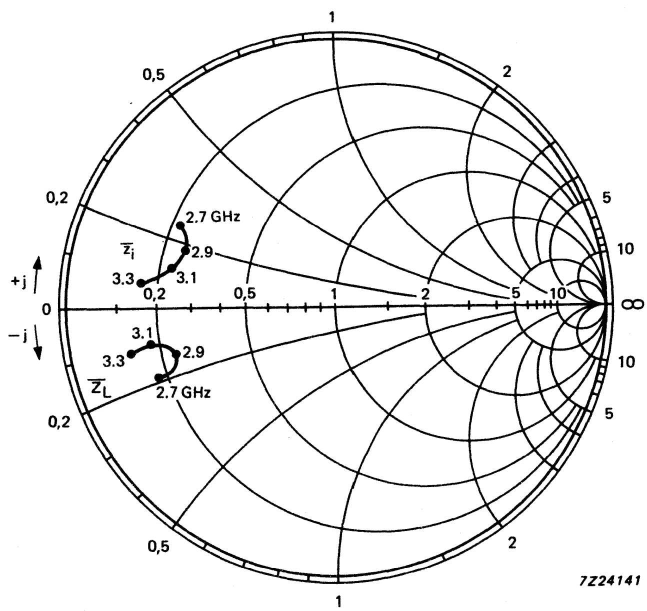


Fig. 6 Input and optimum load impedance as a function of frequency; Z_O = 50 Ω; V_{CC} = 40 V; typical values.

* 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 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; 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 °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 %	$\overline{z}_i$; $\overline{Z}_L$ Ω
class-C t_p = 100 μs δ = 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.

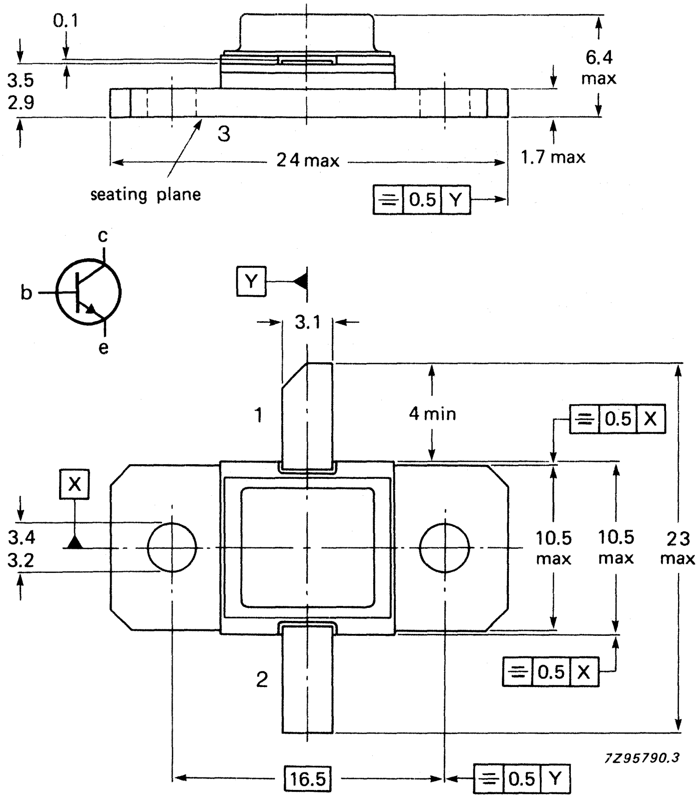
MECHANICAL DATA

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			
R_{BE} = 10 Ω	V_{CER}	max.	50 V
open base	V_{CEO}	max.	15 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 °C*	P_{tot}	max.	125 W
Storage temperature range	T_{stg}	−65 to + 200	°C
Junction temperature	T_j	max.	200 °C
Soldering temperature up to 0,3 mm from the case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235 °C

* Maximum value under normal pulsed microwave operating conditions.

THERMAL RESISTANCE (at T_j = 100 °C)

From junction to mounting base (CW)	$R_{th\,j\text{-}mb}$	max.	2,5 K/W
Equivalent thermal impedance under pulsed microwave conditions t_p = 100 μs; δ = 10%	$Z_{th\,j\text{-}mb}$	typ.	0,8 K/W
From mounting base to heatsink	$R_{th\,mb\text{-}h}$	typ.	0,3 K/W

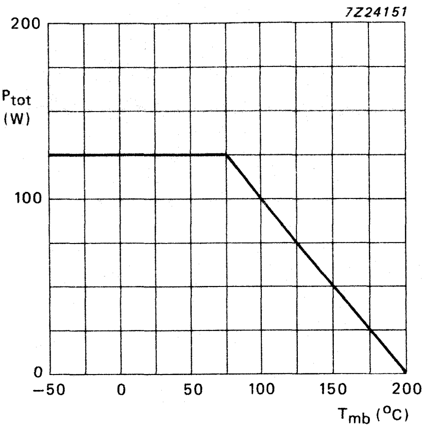


Fig. 2 Power derating curve; t_p = 100 μs; δ = 10 %.

CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Collector cut-off current			
V_{CB} = 50 V; I_E = 0	I_{CBO}	⩽	24 mA
V_{CB} = 30 V; I_E = 0	I_{CBO}	⩽	80 μA
V_{CB} = 50 V; R_{BE} = 10 Ω	I_{CBO}	⩽	240 mA
Emitter cut-off current			
V_{EB} = 3,5 V; I_C = 0	I_{EBO}	⩽	5 mA

APPLICATION INFORMATION

Microwave performance up to T_{mb} = 25 °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 %	$\overline{z_i}$; $\overline{Z_L}$ Ω
class-C t_p = 100 μs δ = 10%	2,8 to 3,3	40	⩾ 55	⩾ 5,6	⩾ 33	see Fig. 6

* During pulse.

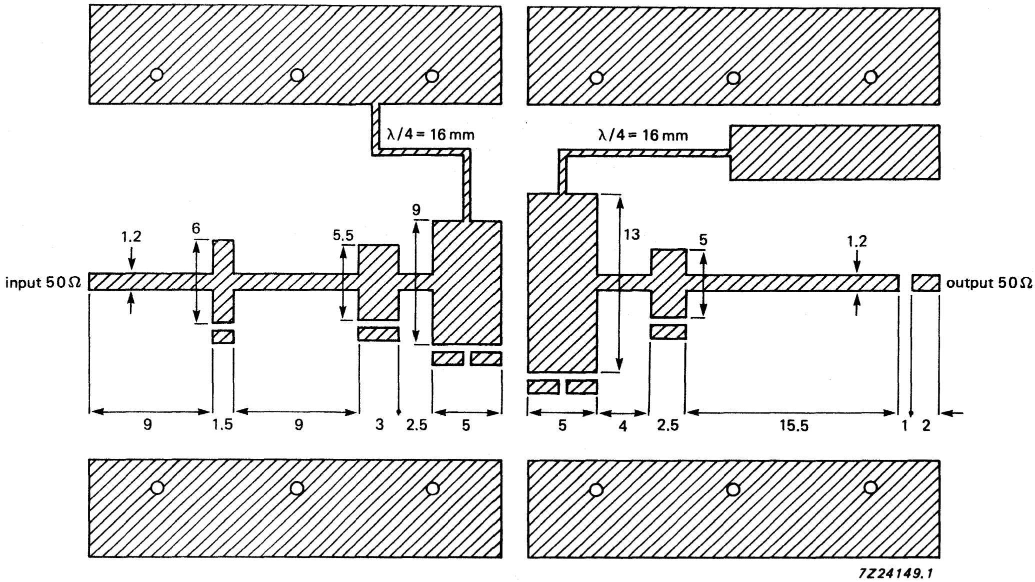


Fig. 3 Broadband test circuit for 2,8 to 3,3 GHz. (dimensions in mm).
PTFE fibreglass printed circuit board, thickness 0,4 mm.

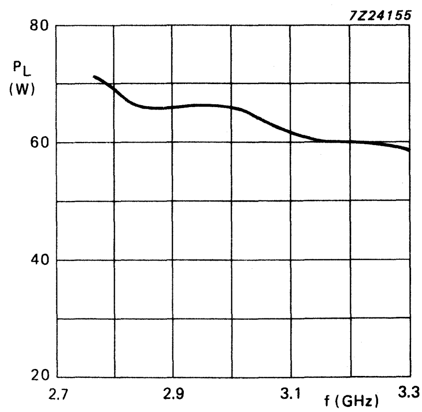


Fig. 4 Load power as a function of frequency*; V_{CC} = 40 V;
P_{in} = 15 W; t_p = 100 μs; δ = 10%; typical values.

*In a broadband test circuit as shown in Fig. 3.

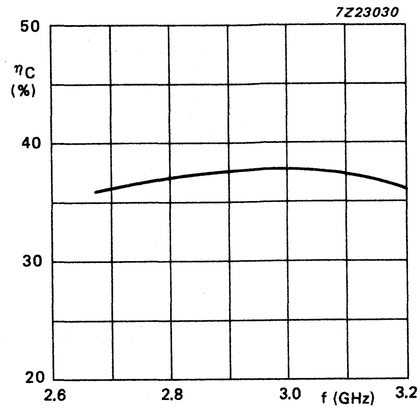


Fig. 5 Collector efficiency as a function of frequency*; V_{CC} = 40 V; t_p = 100 μs; δ = 10%; typical values.

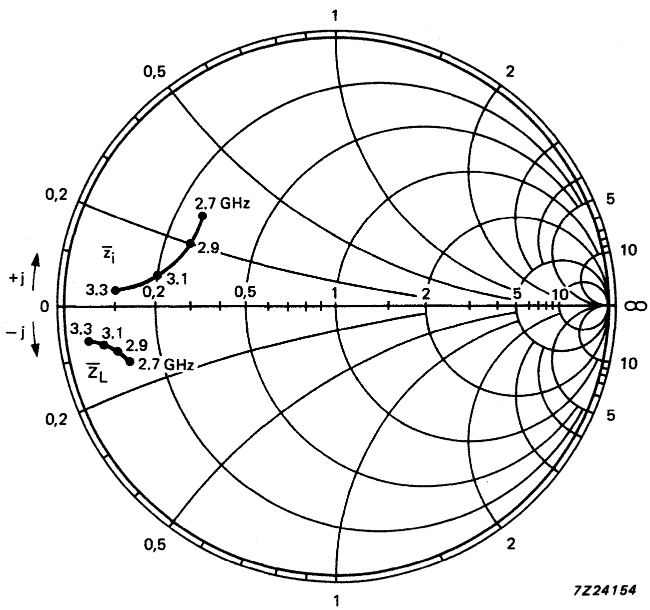


Fig. 6 Input and optimum load impedance as a function of frequency; Z_O = 50 Ω; V_{CC} = 40 V; typical values.

* 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 °C in an unneutralized wideband common-base class-B circuit under pulse conditions

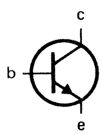
type number	f GHz	V_{CC} V	t_p µs	δ %	P_L W	G_p dB	η_C %
RZ3135B15W	3,1 to 3,5	40	100	10	typ. 18	typ. 5,5	typ. 33
RZ3135B30W	3,1 to 3,5	40	100	10	typ. 34	typ. 5,5	typ. 33

MECHANICAL DATA

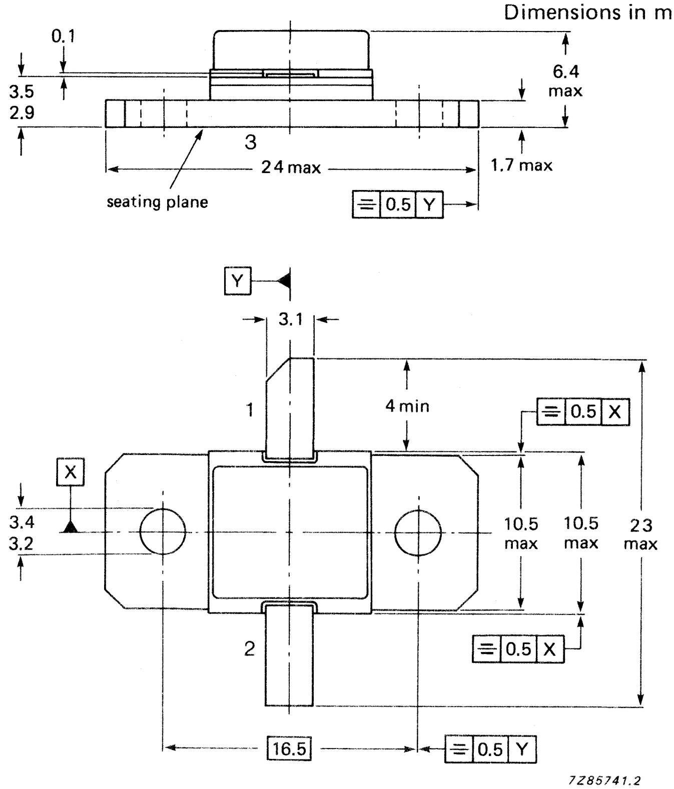
Dimensions in mm

Fig. 1 FO-57C.

Pinning:
1 = collector
2 = emitter
3 = base



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



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 Ω	V_{CER}	max.	50	50	V
open base	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 °C	P_{tot}	max.	75	150	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 $t_{sld} \leqslant 10$ s	T_{sld}	max.	235		°C

THERMAL RESISTANCE (T_j = 75 °C)

			RZ3135B15W	RZ3135B30W	
From junction to mounting base in (CW)	$R_{th\ j\text{-}mb}$	max.	3,5	1,75	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	max.	0,3	0,3	K/W
From junction to mounting base	$R_{th\text{-}peak}$	typ.	1,2	0,6	K/W

CHARACTERISTICS

			RZ3135B15W	RZ3135B30W	
T_{mb} = 25 °C					
Collector-base breakdown voltage open emitter; I_C = 10 mA	$V_{(BR)CBO}$	≥	50		V
open emitter; I_C = 20 mA	$V_{(BR)CBO}$	≥		50	V
Collector-emitter breakdown voltage R_{BE} = 10 Ω; I_C = 50 mA	$V_{(BR)CER}$	≥	50		V
R_{BE} = 10 Ω; I_C = 100 mA	$V_{(BR)CER}$	≥		50	V
Emitter-base breakdown voltage open collector; I_E = 0,1 mA	$V_{(BR)EBO}$	≥	3,5		V
open collector; I_E = 0,2 mA	$V_{(BR)EBO}$	≥		3,5	V
Collector cut-off current I_E = 0; V_{CB} = 30 V	I_{CBO}	≤	0,1	0,2	mA
Emitter cut-off current I_C = 0; V_{EB} = 1,5 V	I_{EBO}	≤	10	20	μA

* In normal pulse conditions; t_{on} = 100 μs; δ = 10%.

APPLICATION INFORMATION (type RZ3135B15W)

R.F. performance up to T_{mb} = 25 °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

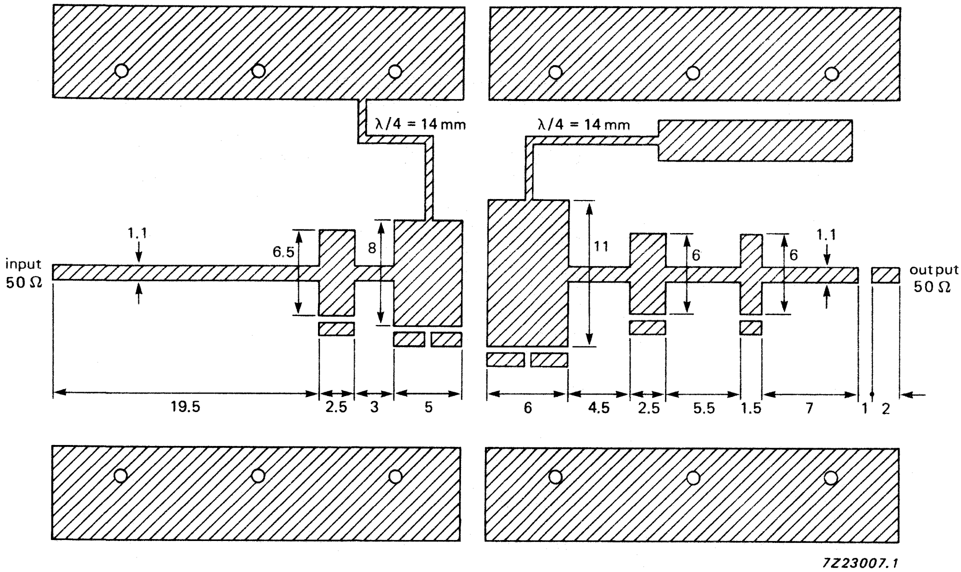
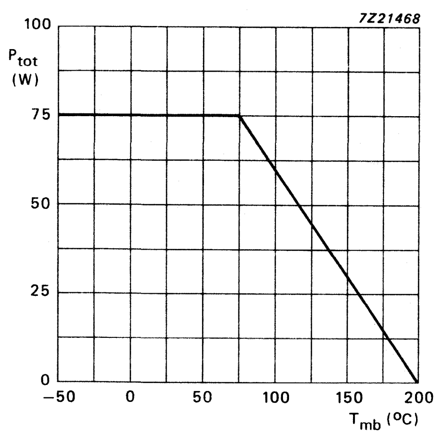


Fig. 2 Test circuit boards for 3,1 to 3,5 GHz (dimensions in mm); striplines on a double Cu-clad p.c. board with PTFE fibre-glass dielectric (ϵ_r = 2,54); thickness 0,8 mm.



base temperature; t_p = 100 µs; δ = 10%.

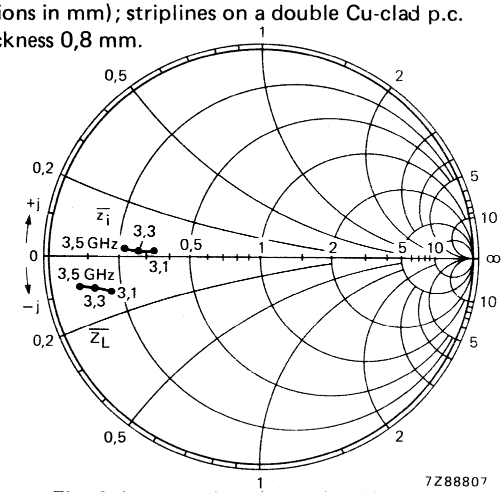


Fig. 4 Input and optimum load impedance vs. frequency; typical values; Z_o = 50 Ω; T_{mb} = 25 °C.

APPLICATION INFORMATION (type RZ3135B30W)

R.F. performance up to T_{mb} = 25 °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

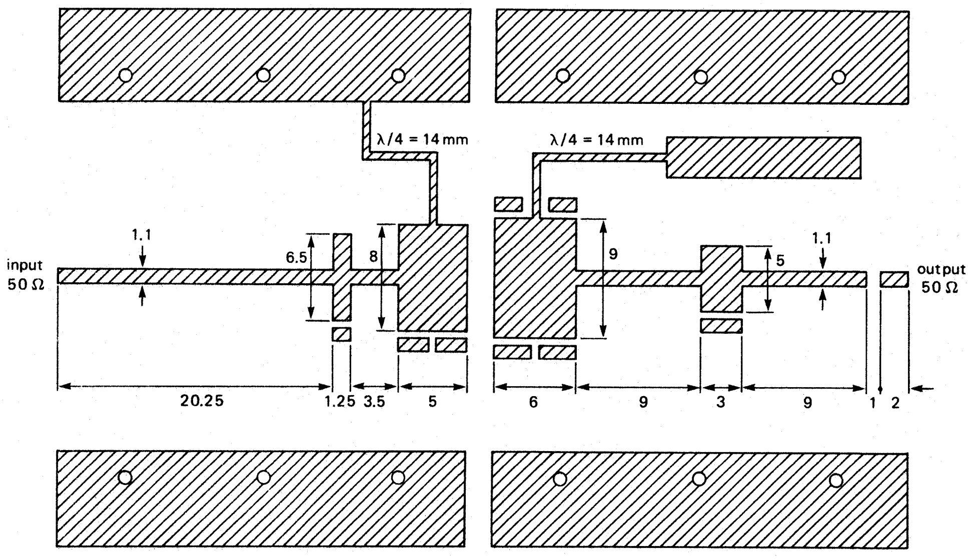


Fig. 5 Test circuit boards for 3,1 to 3,5 GHz (dimensions in mm); striplines on a double Cu-clad p.c board with PTFE fibre-glass dielectric (ϵ_r = 2,54); thickness 0,8 mm.

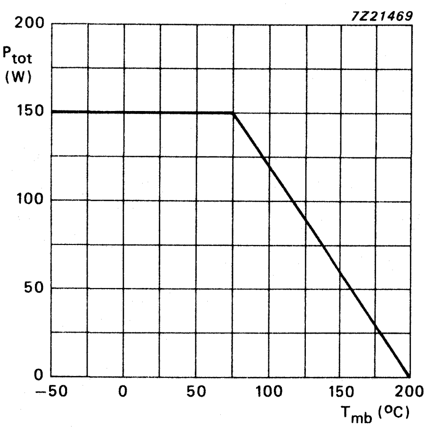


Fig. 6 Power derating curve vs. mounting base temperature; t_p = 100 μs; δ = 10%.

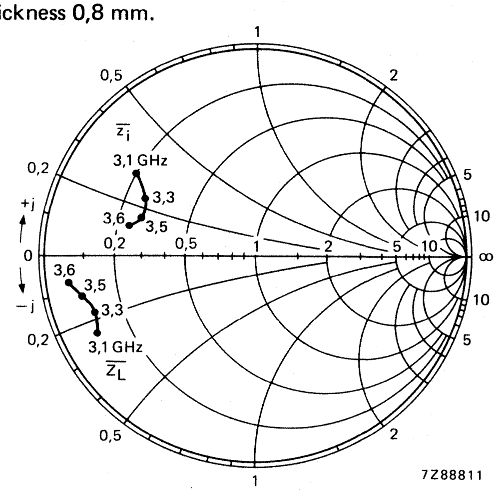


Fig. 7 Input and optimum load impedance vs. frequency; typical values; Z_o = 50 Ω; T_{mb} = 25 °C.

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 °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 μs; δ = 10%	3.1 to 3.5	40	typ. 40	typ. 6.4	typ. 35	see Fig. 6

MECHANICAL DATA

Dimensions in mm

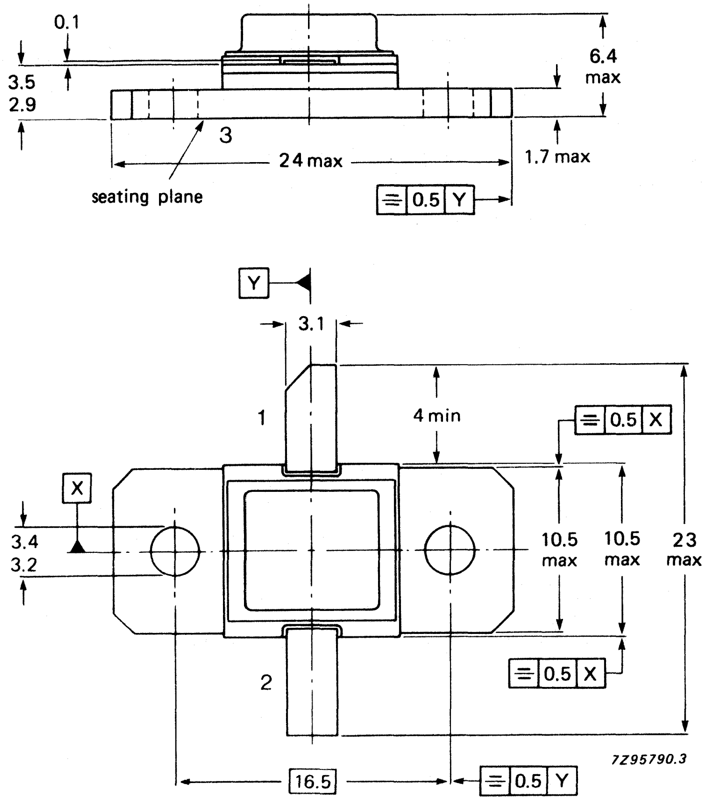
FO-57D (see Fig. 1).

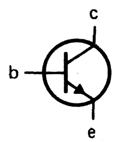
PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

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			
$R_{BE} = 10\,\Omega$	V_{CER}	max.	50 V
open base	V_{CEO}	max.	15 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3.5 V
Collector current (peak) *	I_C	max.	4.4 A
Total power dissipation at $T_{mb} \leqslant 75\ ^{o}C$ *	P_{tot}	max.	90 W
Storage temperature range	T_{stg}		−65 to + 200 ^{o}C
Junction temperature	T_j	max.	200 ^{o}C
Soldering temperature up to 0.3 mm from the case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235 ^{o}C

* Maximum value under pulsed microwave operating conditions; t_p = 100 μs, δ = 10%.

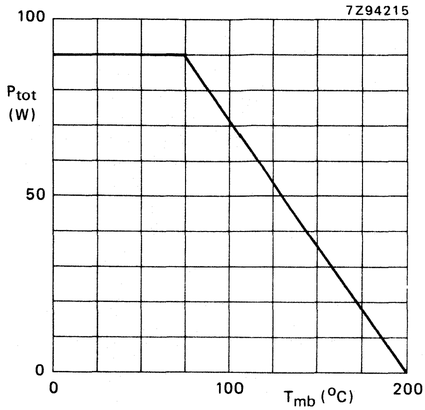


Fig. 2 Power derating curve; t_p = 100 μs; δ = 10%.

THERMAL RESISTANCE (at T_j = 100 °C)

From junction to mounting base	$R_{th\ j\text{-}mb}$	max.	3.3 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	typ.	0.3 K/W
Equivalent thermal impedance under pulse microwave conditions; t_p = 100 μs; δ = 10%.	$Z_{th\ j\text{-}mb}$	typ.	1.07 K/W

CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Collector cut-off current			
V_{CB} = 50 V; I_E = 0	I_{CBO}	⩽	16 mA
V_{CB} = 30 V; I_E = 0	I_{CBO}	⩽	0.16 mA
V_{CB} = 50 V; R_{BE} = 10 Ω	I_{CBO}	⩽	160 mA
Emitter cut-off current			
V_{EB} = 3.5 V; I_C = 0	I_{EBO}	⩽	1 mA

APPLICATION INFORMATION

Microwave performance up to T_{mb} = 25 °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 μs; δ = 10%	3.1 to 3.5	40	⩾ 35	⩾ 5.9	⩾ 30	see Fig. 6

* During pulsed conditions.

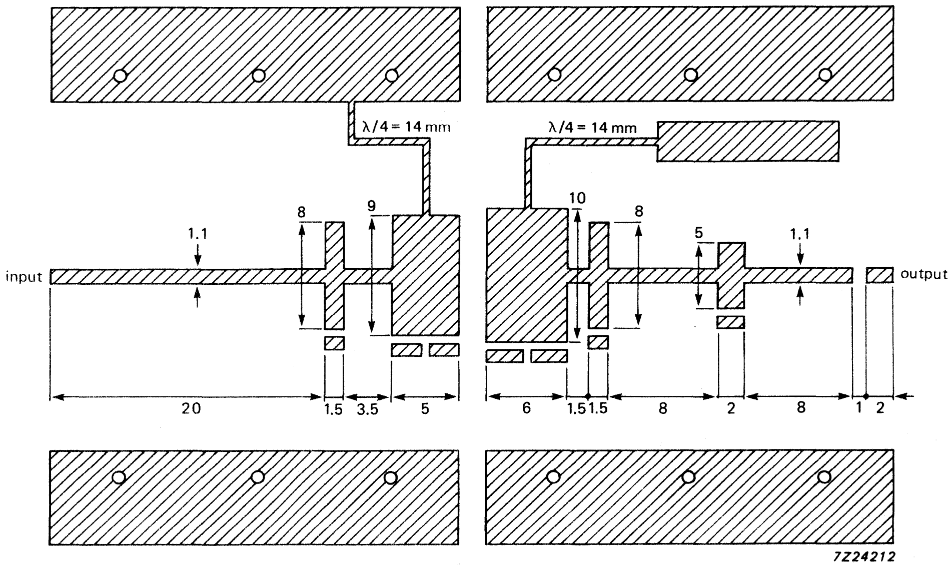


Fig. 3 Broadband test circuit for 3.1 to 3.5 GHz. (dimensions in mm). PTFE fibreglass printed circuit board; thickness 0.4 mm; ϵ_r = 2.54.

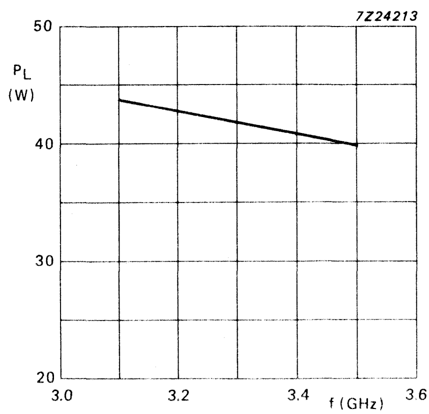


Fig. 4 Load power as a function of frequency*; V_{CC} = 40 V; P_{in} = 9 W; t_p = 100 μs; δ = 10%; typical values.

* In a broadband test circuit as shown in Fig. 3.

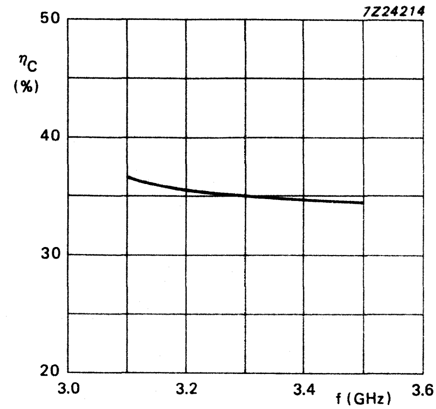


Fig. 5 Collector efficiency as a function of frequency*; V_{CC} = 40 V; t_p = 100 μs; δ = 10%; typical values.

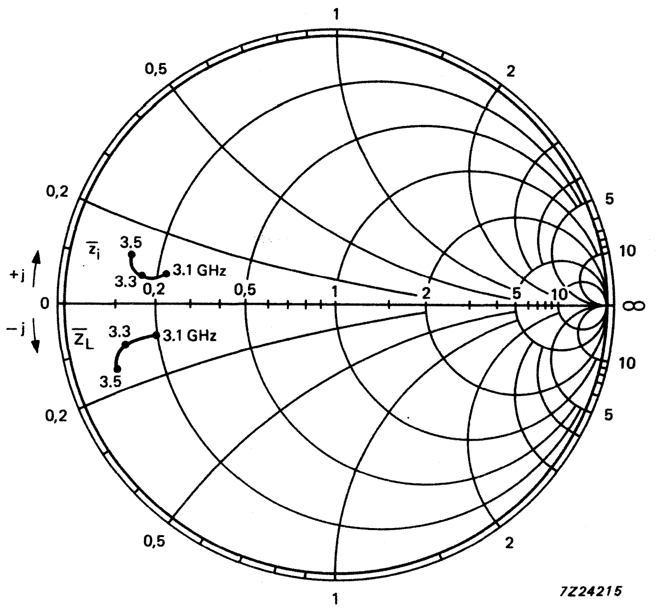


Fig. 6 Input and optimum load impedance as a function of frequency; Z_O = 50 Ω; V_{CC} = 40 V; typical values.

* 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 °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 μs δ = 10%	3,1 to 3,5	40	typ. 55	typ. 5,6	typ. 35	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.

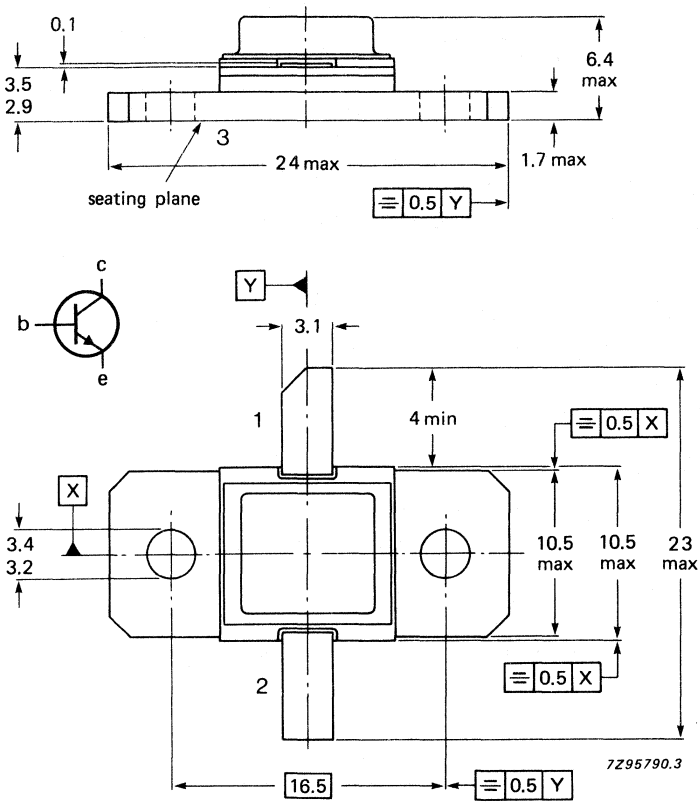
MECHANICAL DATA

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				
R_{BE} = 10 Ω	V_{CER}	max.	50	V
open base	V_{CEO}	max.	15	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5	V
Collector current (peak)*	I_C	max.	5,7	A
Total power dissipation at $T_{mb} \leqslant 75$ °C*	P_{tot}	max.	125	W
Storage temperature range	T_{stg}		−65 to + 200	°C
Junction temperature	T_j	max.	200	°C
Soldering temperature up to 0,3 mm from the case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235	°C

* Maximum value under normal pulsed microwave operating conditions.

THERMAL RESISTANCE (at T_j = 100 °C)

From junction to mounting base (CW)	$R_{th\ j\text{-}mb}$	max.	2,5 K/W
Equivalent thermal impedance under pulsed microwave conditions t_p = 100 μs; δ = 10%	$Z_{th\ j\text{-}mb}$	typ.	0,8 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	typ.	0,3 K/W

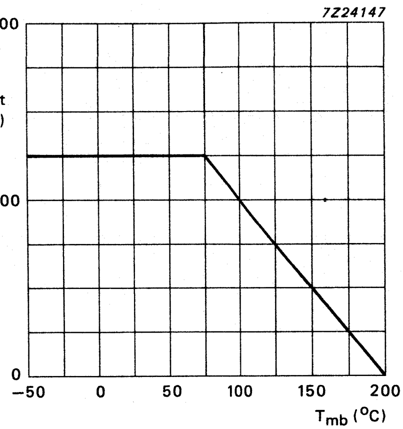


Fig. 2 Power derating curve; t_p = 100 μs; δ = 10%.

CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Collector cut-off current			
V_{CB} = 50 V; I_E = 0	I_{CBO}	⩽	24 mA
V_{CB} = 30 V; I_E = 0	I_{CBO}	⩽	80 μA
V_{CB} = 50 V; R_{BE} = 10 Ω	I_{CBO}	⩽	240 mA
Emitter cut-off current			
V_{EB} = 3,5 V; I_C = 0	I_{EBO}	⩽	5 mA

APPLICATION INFORMATION

Microwave performance up to T_{mb} = 25 °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 %	$\overline{z_i}$; $\overline{Z_L}$ Ω
class-C t_p = 100 μs δ = 10%	3,1 to 3,5	40	⩾ 50	⩾ 5,2	⩾ 30	see Fig. 6

* During pulse.

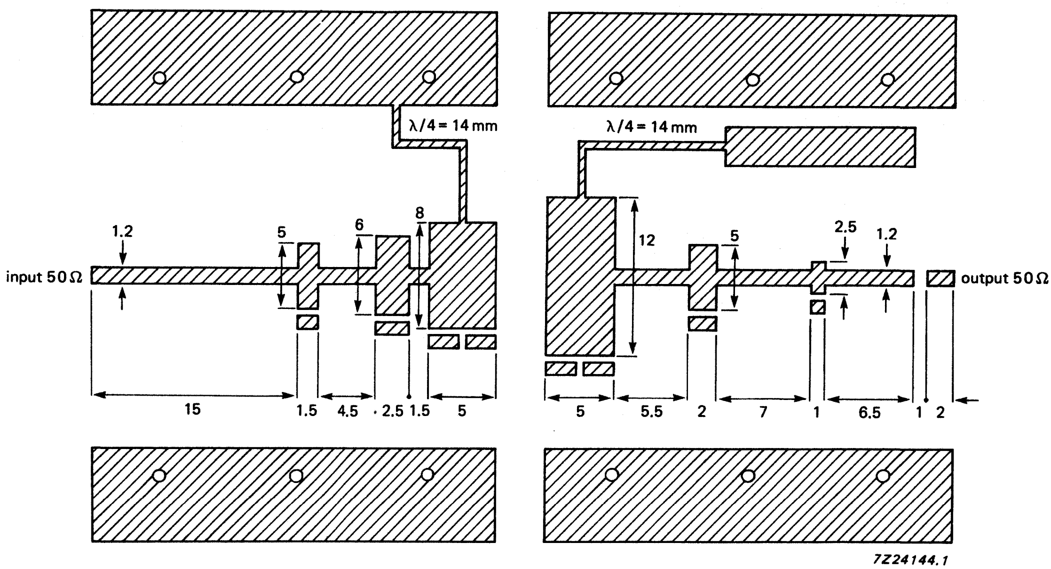


Fig. 3 Broadband test circuit for 3,1 to 3,5 GHz. (dimensions in mm).
PTFE fibreglass printed circuit board, thickness 0,4 mm; ϵ_r = 2,54.

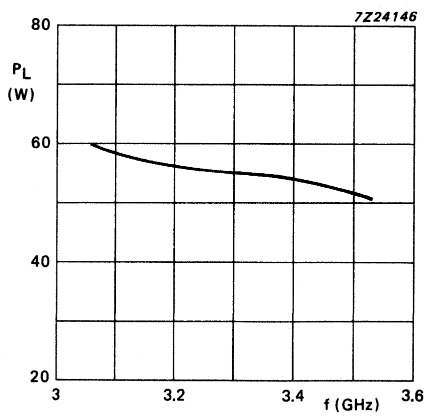


Fig. 4 Load power as a function of frequency*; V_{CC} = 40 V;
P_{in} = 15 W; t_p = 100 μs; δ = 10%; typical values.

* In a broadband test circuit as shown in Fig. 3.

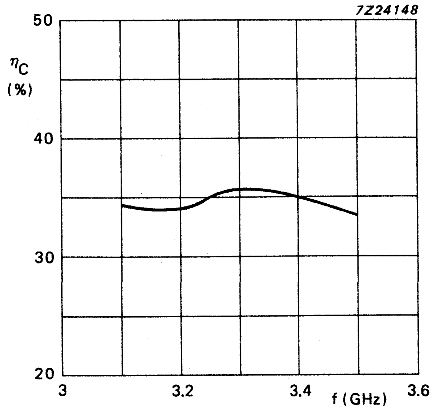


Fig. 5 Collector efficiency as a function of frequency*;
V_{CC} = 40 V; t_p = 100 μs; δ = 10%; typical values.

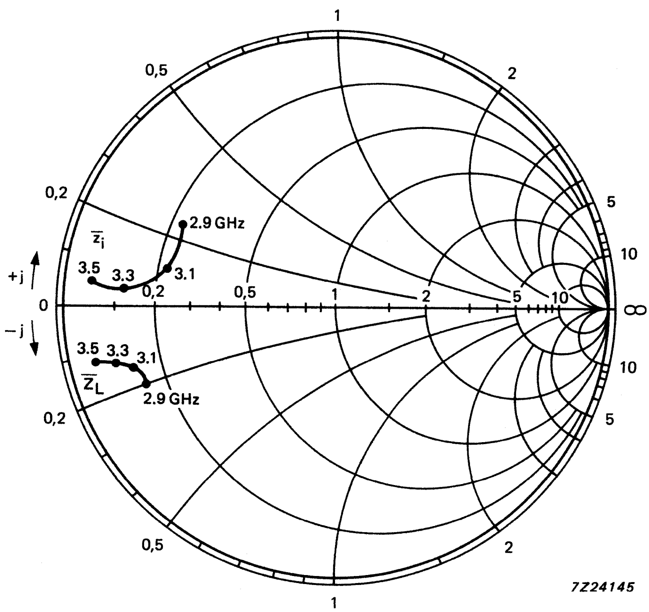


Fig. 6 Input and optimum load impedance as a function of frequency;
Z_O = 50 Ω; V_{CC} = 40 V; typical values.

* 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 ^{o}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 μs; δ = 10%	1.09	50	typ. 50	typ. 10	typ. 45
t_p = 300 μs; δ = 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

Dimensions in mm

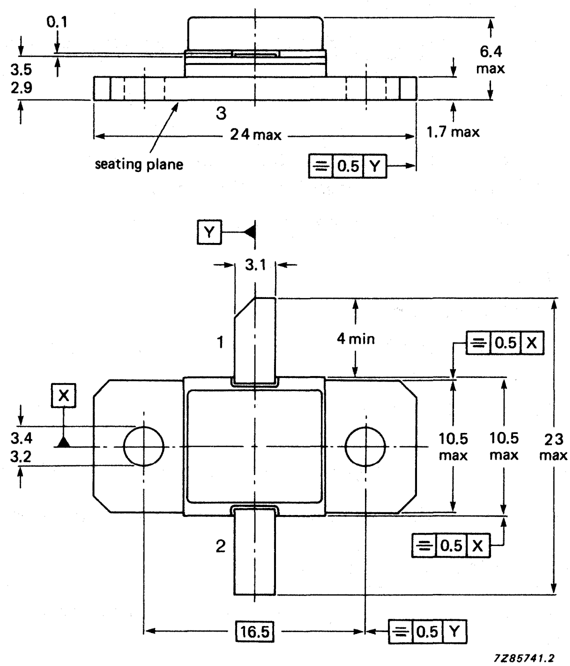
FO-57C (see Fig. 1)

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

Dimensions in mm

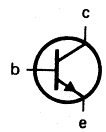
Fig. 1 FO-57C



Base is connected to the seating plane

Pinning;

1 = collector
2 = emitter
3 = base



Torque on screw: max. 0.5 Nm
Recommended screw: M3

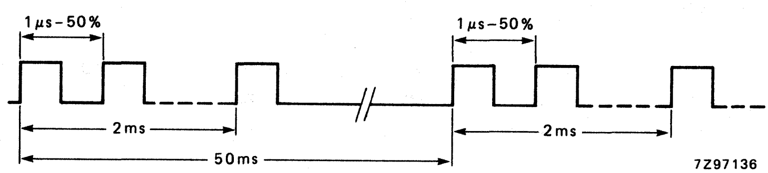


Fig. 2 DABS pulse difinition.

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, $R_{BE} \leqslant 10\ \Omega$	V_{CER}	max.	60 V
Emitter-base voltage, open collector	V_{EBO}	max.	3 V
Collector current (DC) $t_p = 100\ \mu s$; $\delta \leqslant 10\%$	I_C	max.	3 V
Total power dissipation up to $T_{mb} = 75\ ^oC$; $t_p = 100\ \mu s$; $\delta \leqslant 10\%$	P_{tot}	max.	90 W
Storage temperature range	T_{stg}		–65 to +200 ^oC
Junction temperature	T_j	max.	200 ^oC
Soldering temperature up to 0.1 mm from the case; $t_{sld} \leqslant 10$ s	T_{sld}	max.	235 ^oC

THERMAL RESISTANCE (at T_j = 75 °C)

From junction to mounting base	$R_{th\ j\text{-}mb}$	max.	5.0 K/W
Equivalent thermal impedance; t_p = 100 μs; δ = 10%	Z_{th}	max.	1.9 K/W

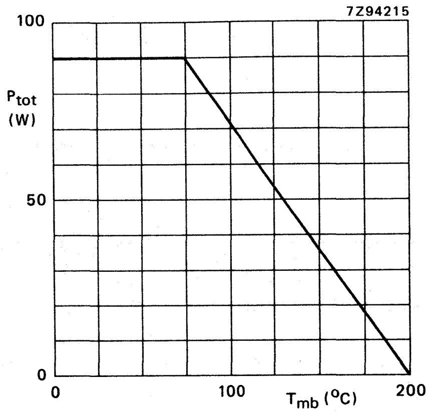


Fig. 3 Power derating curve as a function of base temperature; t_p = 100 μs; δ = 10%; pulsed conditions.

CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Collector-base breakdown voltage I_C = 7 mA; I_E = 0	$V_{(BR)CBO}$	min.	60 V
Collector-emitter breakdown voltage I_C = 7 mA; R_{BE} = 10 Ω	$V_{(BR)CER}$	min.	60 V
Emitter-base breakdown voltage I_C = 0; I_E = 0.5 mA	$V_{(BR)EBO}$	min.	3 V
Collector cut-off current I_E = 0; V_{CB} = 50 V	I_{CBO}	max.	1.5 mA

APPLICATION INFORMATION

Microwave performance up to T_{mb} = 25 °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 μs; δ = 10%	1.09	50	⩾ 35	⩾ 7	⩾ 30

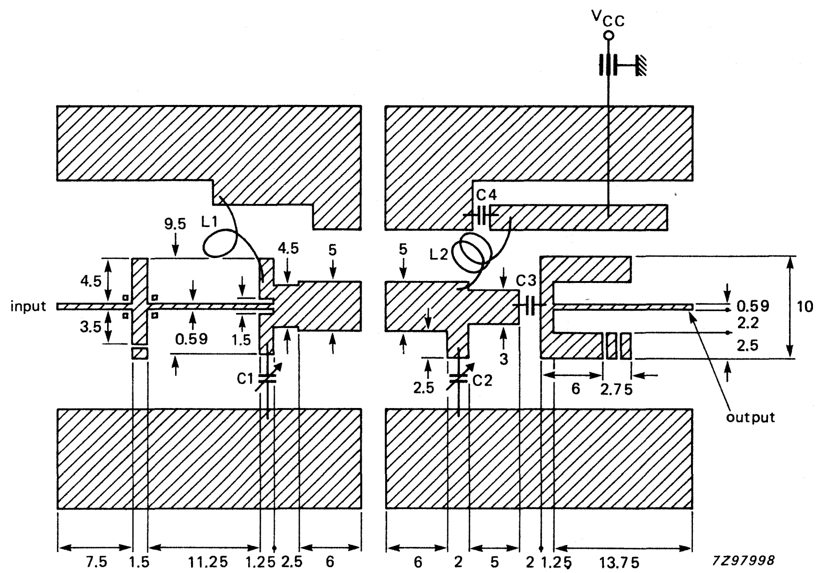


Fig. 4 Narrowband test circuit for 1.09 GHz. (dimensions in mm).
Epsilam printed circuit board; thickness = 0.635 mm; ϵ_r = 10.

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 °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 %	$\overline{z_i}$ $\overline{Z_L}$ Ω
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

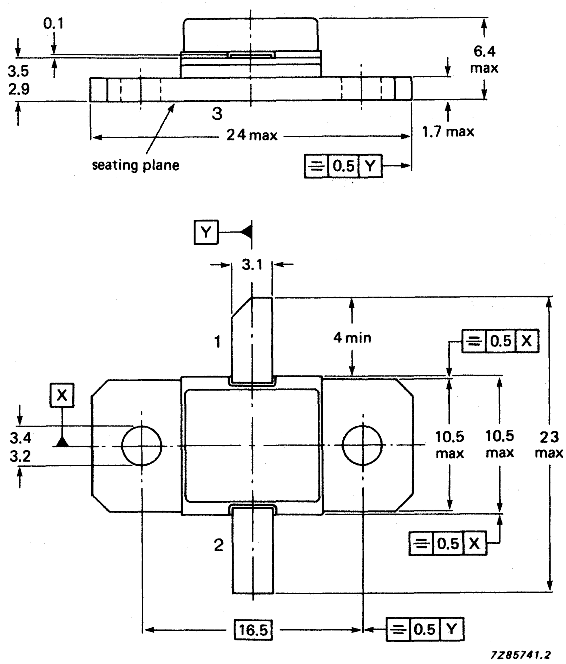
Dimensions in mm

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 Dimensions in mm

Fig. 1 FO-57C.



Pinning:

1 = collector
2 = emitter
3 = base

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

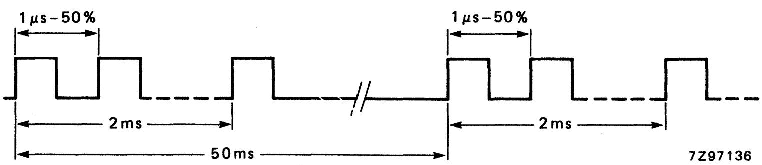


Fig. 2 DABS pulse definition.

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.) $t_p = 100\ \mu s$; $\delta \leqslant 10\%$	I_C	max.	6 A
Total power dissipation up to $T_{mb} = 75\ ^oC$ $t_p = 100\ \mu s$, $\delta \leqslant 10\%$	P_{tot}	max.	180 W
Storage temperature	T_{stg}		−65 to +200 °C
Junction temperature	T_j	max.	200 °C
Soldering temperature at 0,1 mm from the case, $t_{sld} \leqslant 10$ s	T_{sld}	max.	235 °C

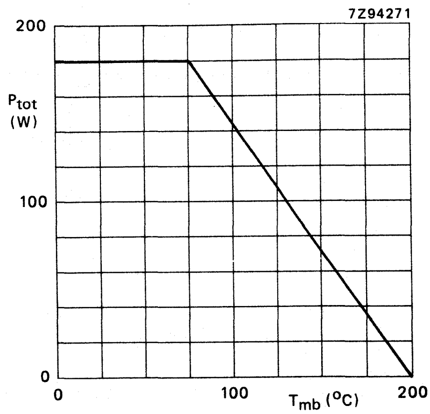


Fig. 3 Power derating curve versus mounting base temperature; $t_p = 100\ \mu s$, $\delta = 10\%$.

THERMAL RESISTANCE (at $T_j = 75\ ^oC$)

From junction to mounting base	$R_{th\ j\text{-}mb}$	max.	2,5 K/W
Equivalent thermal impedance; $t_p = 100\ \mu s$; $\delta = 10\%$	Z_{th}	typ.	0,9 K/W

CHARACTERISTICS

$T_{mb} = 25\ ^oC$ unless otherwise specified

Breakdown voltages			
$I_C = 15$ mA; $I_E = 0$	$V_{(BR)CBO}$	min.	60 V
$I_C = 15$ mA; $R_{BE} = 10\ \Omega$	$V_{(BR)CER}$	min.	60 V
$I_C = 0$; $I_E = 1$ mA	$V_{(BR)EBO}$	min.	3 V
Collector cut-off current $I_E = 0$; $V_{CB} = 60$ 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

APPLICATION INFORMATION

Microwave performance up to T_{mb} = 25 °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 μs; δ = 10%	1,09	50	≥ 80	≥ 7	≥ 30

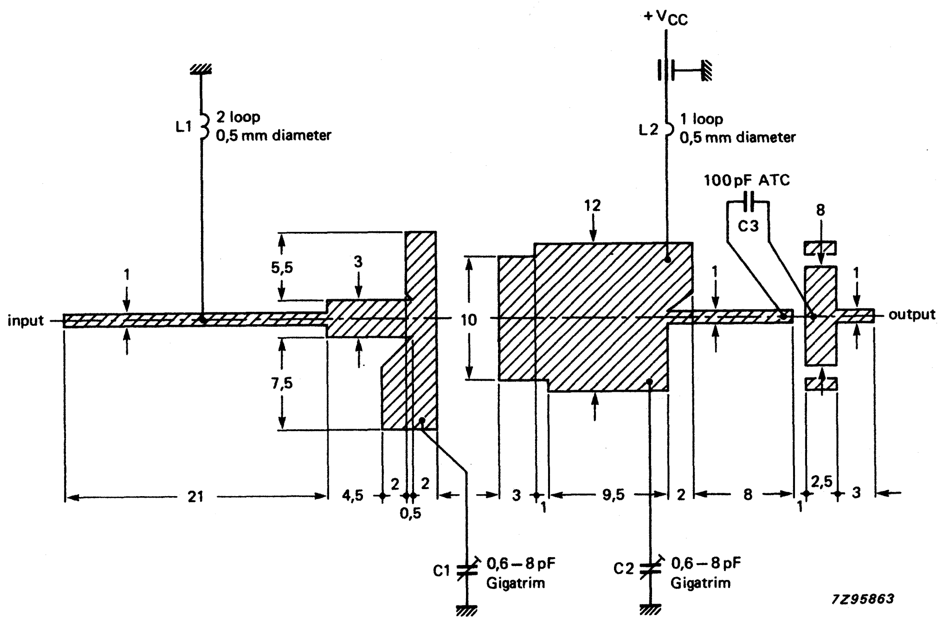


Fig. 4 Narrowband test circuit for 1,09 GHz (dimensions in mm). Epsilam printed circuit board; thickness 0,635 mm; ϵ_r = 10.

List of components

C1 = C2 0,6 to 8 pF Gigatrim capacitor
C3 = 100 pF ATC capacitor (small size)

L1 = Two open turns; wire diameter 0,5 mm
L2 = One turn diameter 4 mm; wire diameter 0,5 mm

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 ^oC 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 μs, δ = 10%	1,09	50	typ. 250	typ. 7,5	typ. 25	
t_p = 300 μs, δ = 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

Dimensions in mm

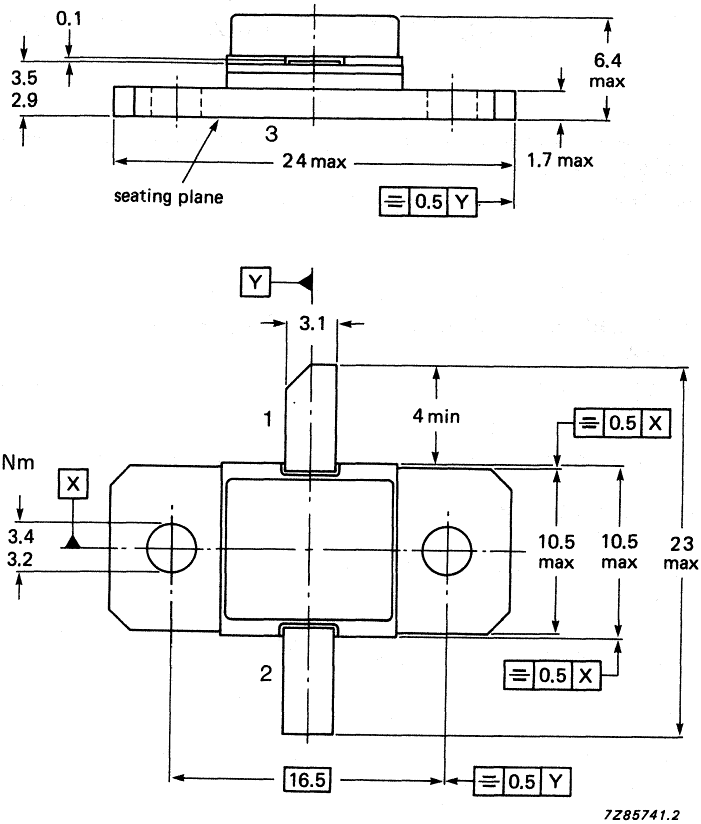
FO-57C (see Fig. 1)

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

Dimensions in mm

Fig. 1 FO-57C.



Pinning:

1 = collector
2 = emitter
3 = base

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

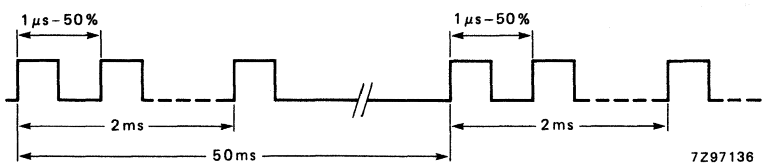


Fig. 2 DABS pulse definition.

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.)			
$t_p = 100\ \mu s$, $\delta \leqslant 10\%$	I_C	max.	15 A
Total power dissipation up to $T_{mb} = 75\ ^oC$			
$t_p = 100\ \mu s$, $\delta \leqslant 10\%$	P_{tot}	max.	450 W
Storage temperature	T_{stg}		−65 to +200 °C
Junction temperature	T_j	max.	200 °C
Soldering temperature			
at 0,1 mm from the case. $t_{sld} \leqslant 10$ s	T_{sld}	max.	235 °C

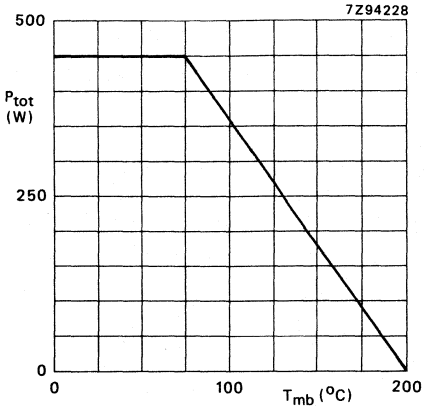


Fig. 3 Power derating curve versus mounting base temperature; $t_p = 100\ \mu s$, $\delta = 10\%$.

THERMAL RESISTANCE (at $T_j = 75\ ^oC$)

From junction to mounting base	$R_{th\ j\text{-}mb}$	max.	1,1 K/W
Equivalent thermal impedance; $t_p = 100\ \mu s$; $\delta = 10\%$	Z_{th}	typ.	0,35 K/W

CHARACTERISTICS

$T_{mb} = 25\ ^oC$ unless otherwise specified

Breakdown voltages			
$I_C = 35$ mA; $I_E = 0$	$V_{(BR)CBO}$	$\geqslant$	60 V
$I_C = 35$ mA; $R_{BE} = 10\ \Omega$	$V_{(BR)CER}$	$\geqslant$	60 V
$I_C = 0$; $I_E = 3,5$ mA.	$V_{(BR)EBO}$	$\geqslant$	3 V
Collector cut-off current			
$I_E = 0$; $V_{CB} = 50$ V	I_{CBO}	$\leqslant$	7 mA

IMPEDANCES

frequency GHz	input ($\overline{z_i}$) Ω	load ($\overline{Z}_L$) 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 °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 μs; δ = 10%	1,09	50	≥ 200	≥ 7	≥ 30

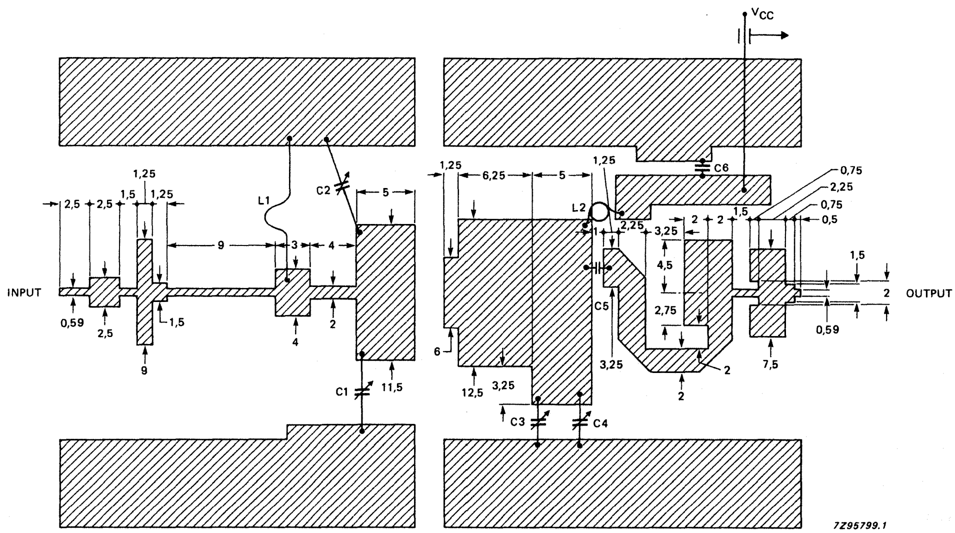


Fig. 4 Narrowband test cicuit for 1,09 GHz (dimensions in mm).
Epsilam printed circuit board; thickness 0.635 mm; ϵ_r = 10.

List of components:

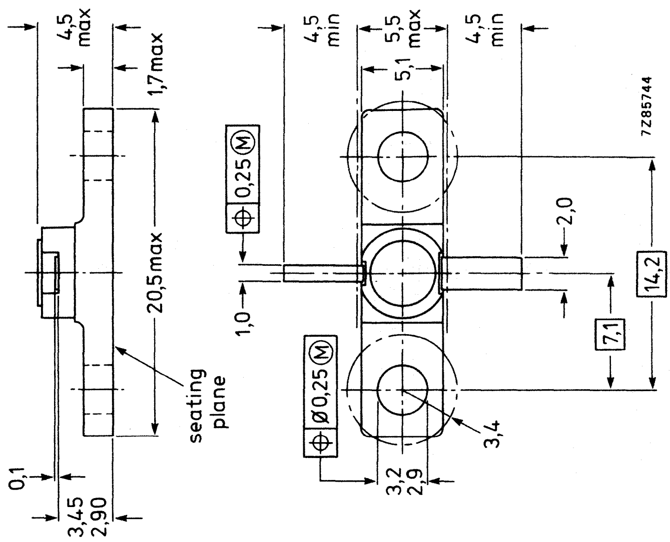
C1 = C3 0,6 - 8 pF Gigatrim capacitor
C2 0,8 - 12,3 pF Gigatrim capacitor
C4 10 pF capacitor
C5 100 pF ATC capacitor
C6 1000 pF decoupling capacitor
L1 Square loop 6 x 6 mm; wire diameter 0,8 mm
L2 One turn diameter 5 mm; wire diameter 0,5 mm

ENVELOPES

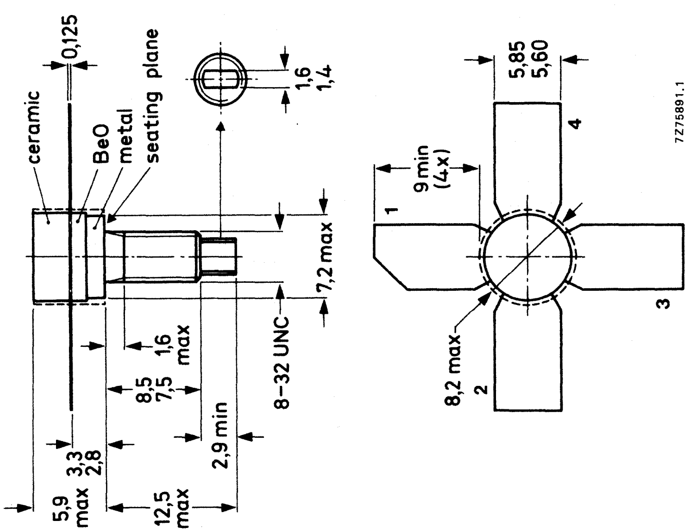
MECHANICAL DATA

Dimensions in mm

FO-41A.

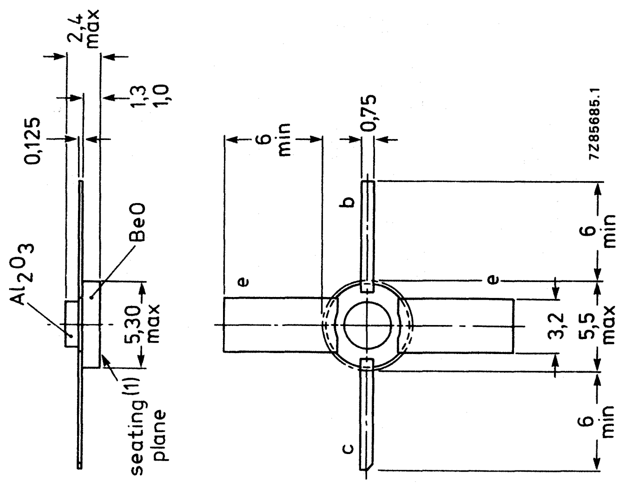


FO-38.

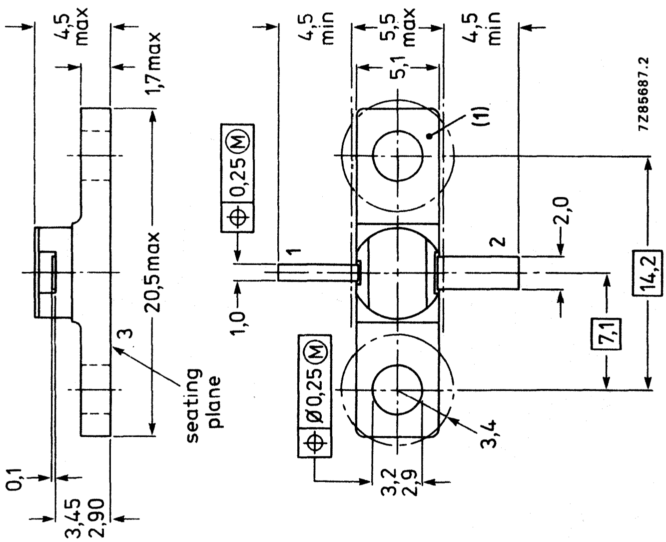


MECHANICAL DATA Dimensions in mm

FO-45.



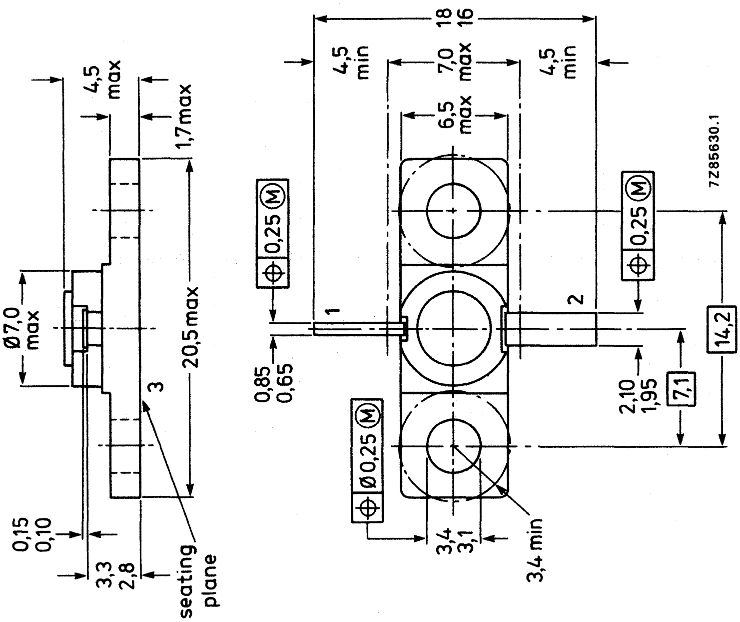
FO-41B.



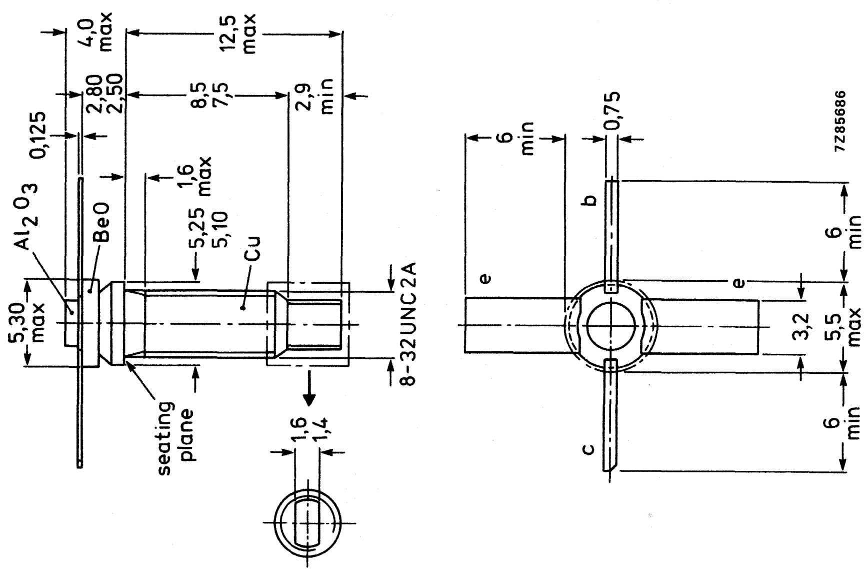
MECHANICAL DATA

Dimensions in mm

FO-53.

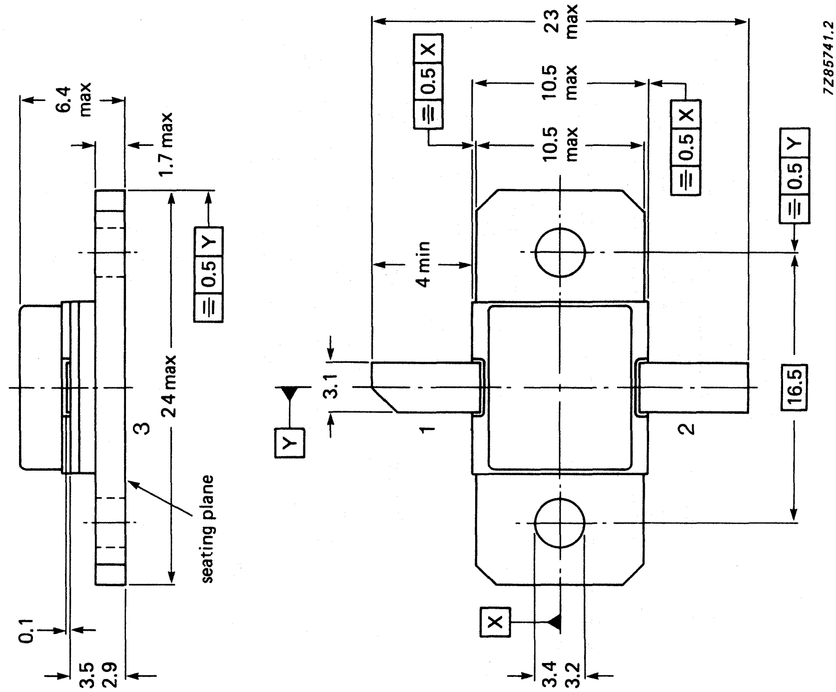


FO-46.

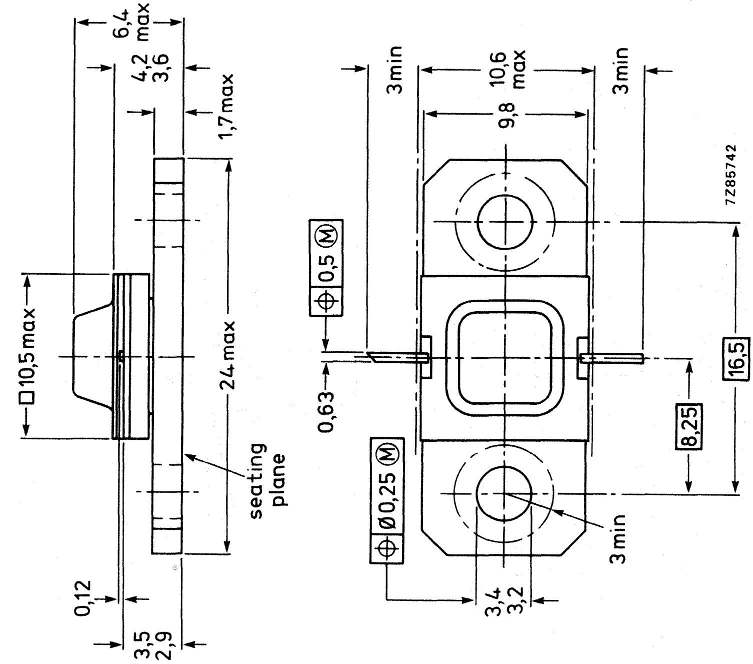


MECHANICAL DATA Dimensions in mm

FO-57C.



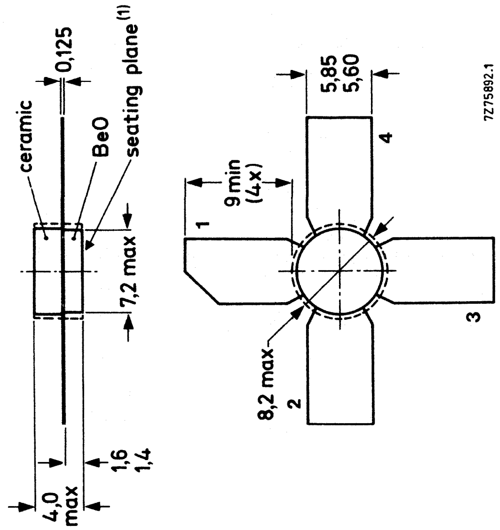
FO-57B.



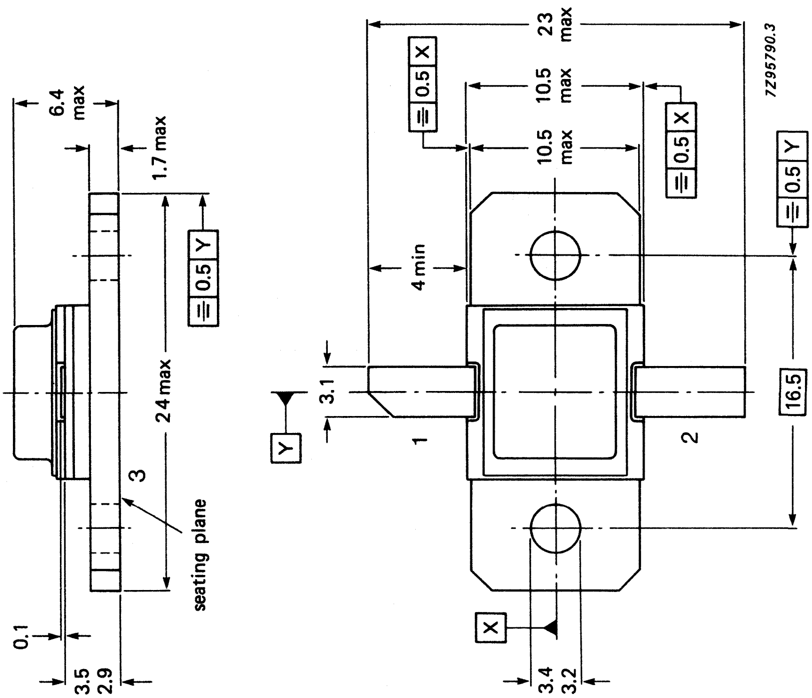
MECHANICAL DATA

Dimensions in mm

FO-58.



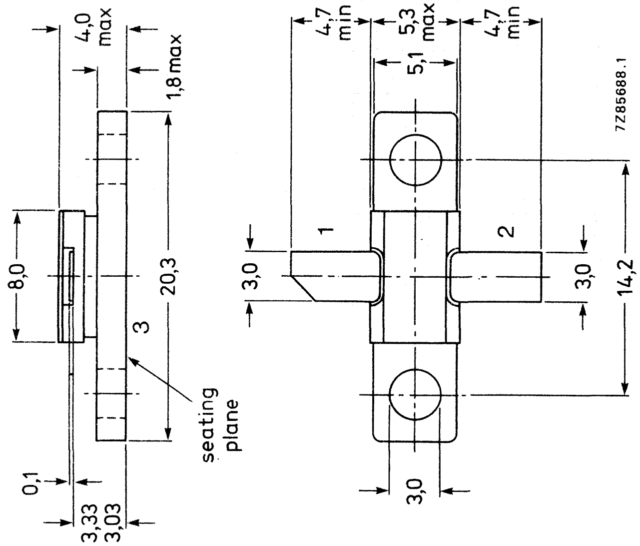
FO-57D.



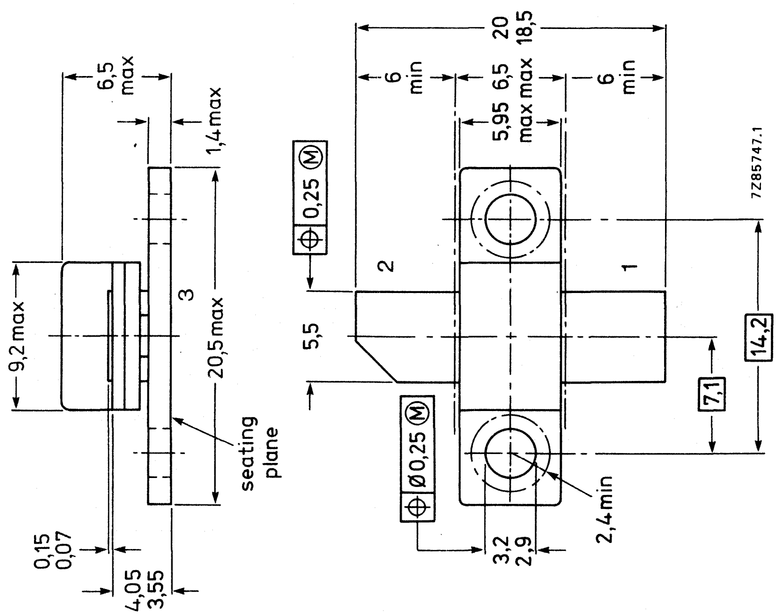
MECHANICAL DATA

Dimensions in mm

FO-83.



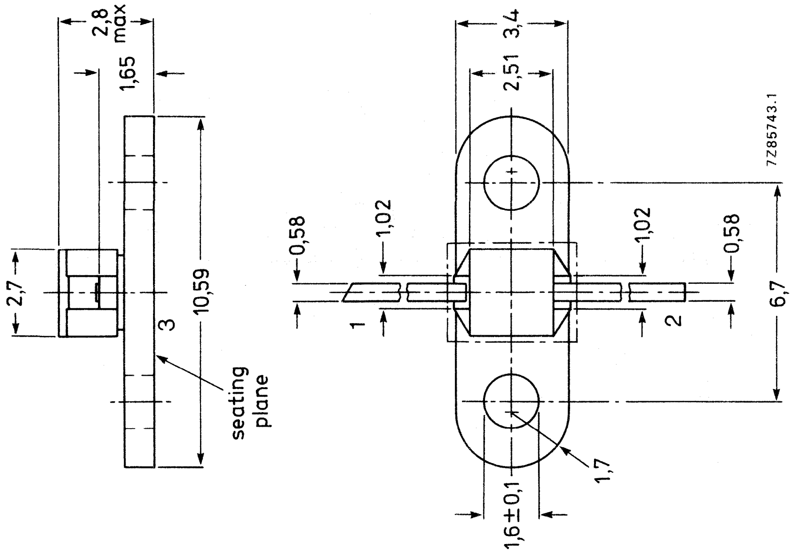
FO-67.



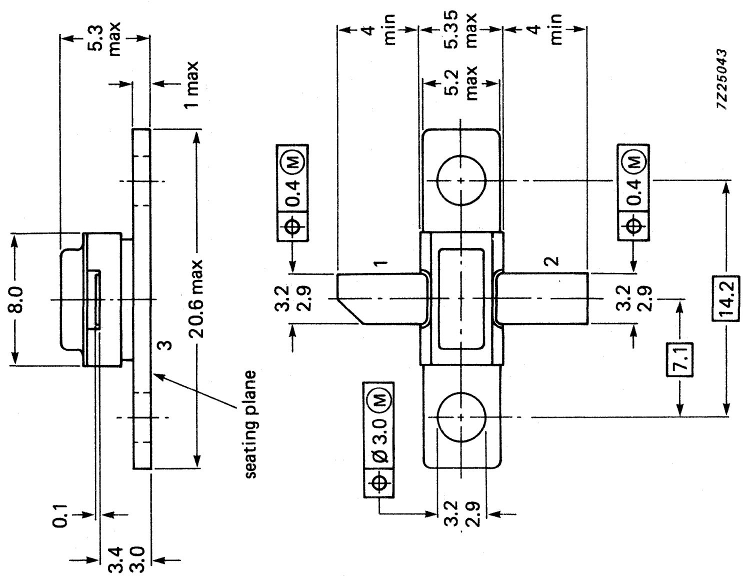
MECHANICAL DATA

Dimensions in mm

FO-85.

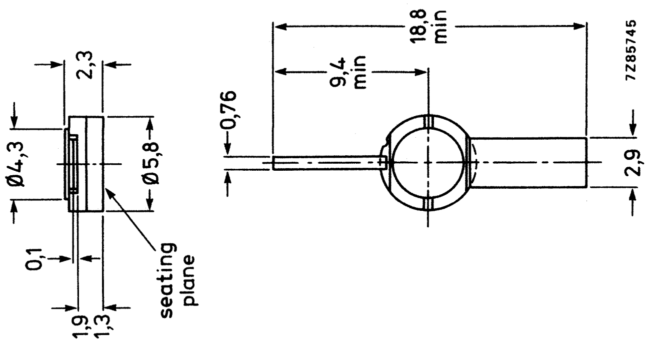


FO-83B.

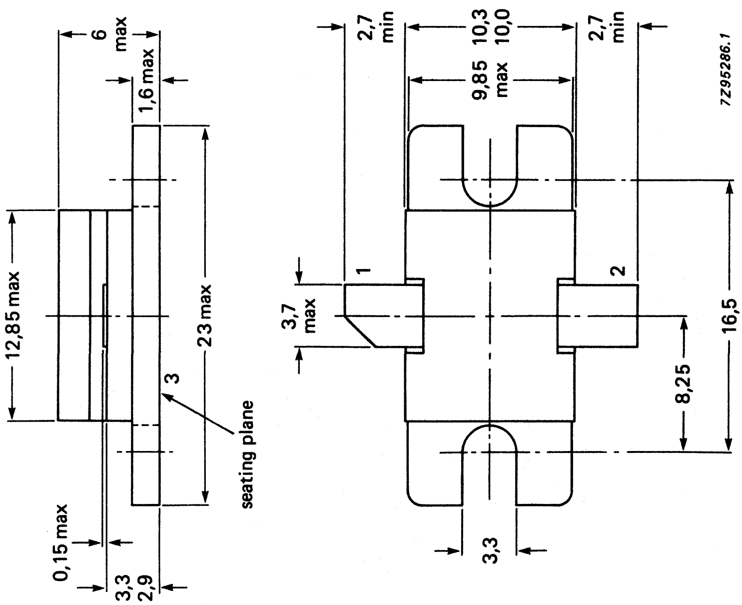


MECHANICAL DATA Dimensions in mm

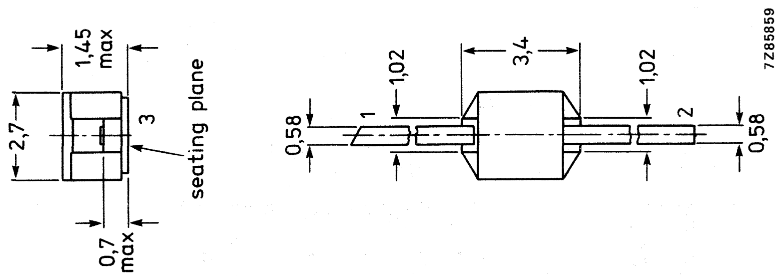
FO-93.



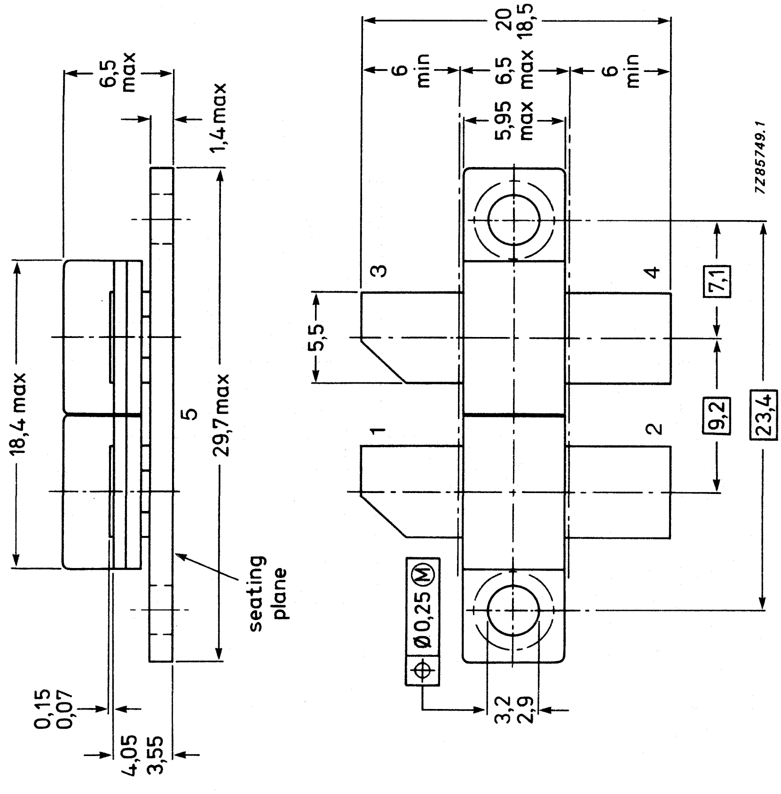
FO-91.



FO-102.

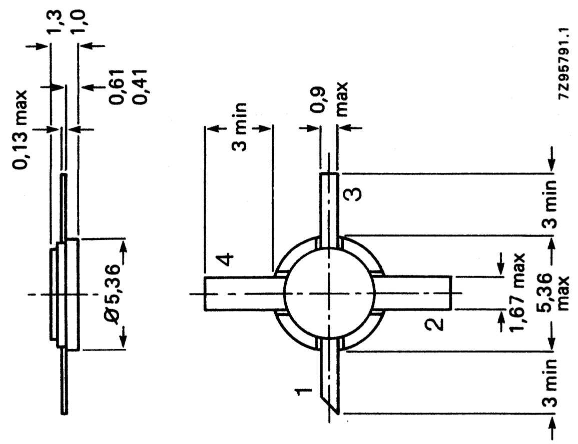

1,45
max
2,7
3
seating plane
0,7
max
1,02
3,4
1,02
0,58
1
2
0,58
7Z85859

FO-96.

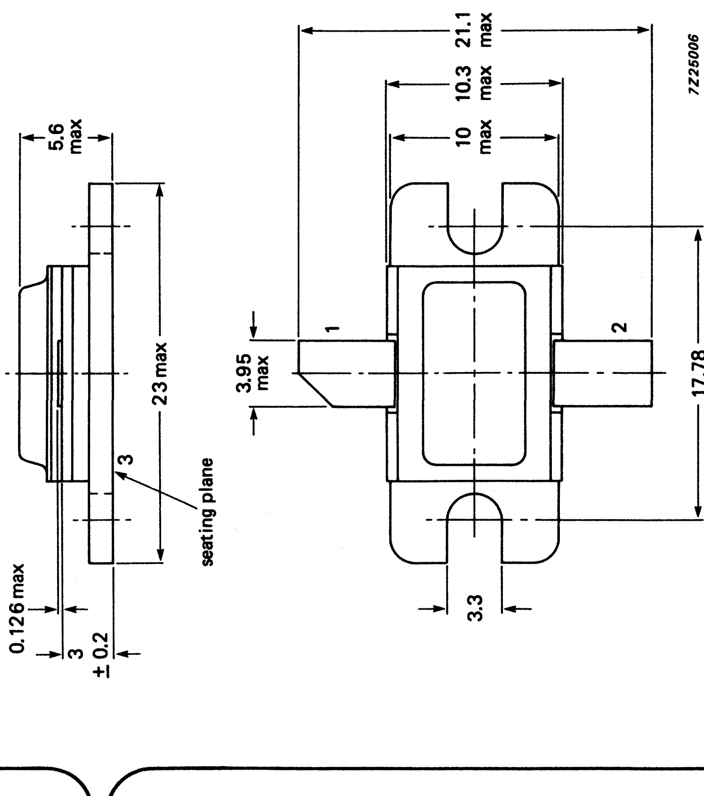

6,5
max
1,4 max
18,4 max
5
29,7 max
seating
plane
0,15
0,07
4,05
3,55
20
18,5
6
min
6,5
max
6
min
5,95
max
7Z85749.1
3
4
5,5
7,1
1
2
9,2
23,4
Ø0,25 Ⓜ
3,2
2,9

MECHANICAL DATA

FO-163.



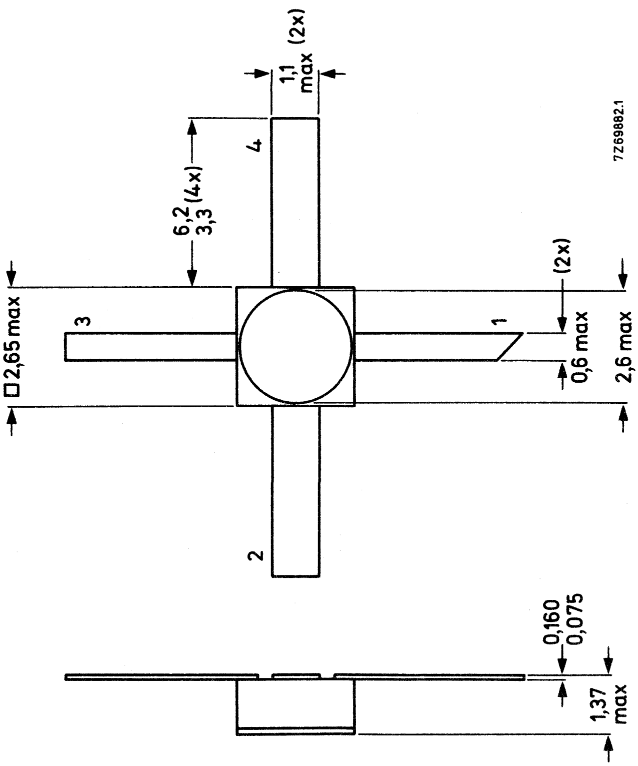
FO-125A.



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.

Mm = Microminiature semiconductors for hybrid circuits
SD = Small-signal diodes
Sp = Special diodes
T = Tuner diodes
Vrg = Voltage regulator diodes
Sm = Small-signal transistors

* = series
FET = Field-effect transistors
Mm = Microminiature semicondcutors for hybrid circuits
P = Low-frequency power transistors
Sm = Small-signal transistors

P = Low-frequency power transistors

P = Low-frequency power transistors

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

* = 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

* = series
RFP = R.F. power transistors and modules
WBM = Wideband hybrid IC modules

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

* = series
PM = Power MOS transistors
SP = Low-frequency switching power transistors
Sm = Small-signal transistors
Th = Thyristors
Tri = Triacs

* = series
R = Rectifier diodes
PM = Power MOS transistors

* = 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

* = 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

* = 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

A = Accessories
FET = Field-effect transistors
I = Infrared devices
Ph = Photoconductive devices
R = Rectified diodes
RFP = R.F. power transistors and modules
SD = Small-signal diodes
Sm = Small-signal transistors
Vrf = Voltage reference diodes
WBT = Wideband transistors

A = Accessories
FET = Field-effect transistors
I = Infrared devices
Ph = Photoconductive devices
R = Rectified diodes
RFP = R.F. power transistors and modules
SD = Small-signal diodes
Sm = Small-signal transistors
Vrf = Voltage reference diodes
WBT = Wideband transistors

A = Accessories
FET = Field-effect transistors
I = Infrared devices
Ph = Photoconductive devices
R = Rectified diodes
RFP = R.F. power transistors and modules
SD = Small-signal diodes
Sm = Small-signal transistors
Vrf = Voltage reference diodes
WBT = Wideband transistors

A = Accessories

DATA HANDBOOK SYSTEM

DATA HANDBOOK SYSTEM

Our Data Handbook System comprises more than 70 books with specifications on electronic components, subassemblies and materials. It is made up of six series of handbooks:

PROFESSIONAL COMPONENTS*

DISCRETE SEMICONDUCTORS

INTEGRATED CIRCUITS

PASSIVE COMPONENTS**

MATERIALS**

DISPLAY COMPONENTS

The contents of each series are listed on pages iii to viii.

The data handbooks contain all pertinent data available at the time of publication, and each is revised and reissued periodically.

When ratings or specifications differ from those published in the preceding edition they are indicated with arrows in the page margin. Where application information is given it is advisory and does not form part of the product specification.

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Product specialists are at your service and enquiries will be answered promptly.

* Will replace the Electron tubes (blue) series of handbooks.
** Will replace the Components and materials (green) series of handbooks.

PROFESSIONAL COMPONENTS

This series of data handbooks comprises:

T1	**Power tubes for RF heating and communications**
T2a	**Transmitting tubes for communications, glass types**
T2b	**Transmitting tubes for communications, ceramic types**
T3	**Klystrons**
T4	**Magnetrons for microwave heating**
T5	**Cathode-ray tubes** Instrument tubes, monitor and display tubes, C.R. tubes for special applications
T6	**Geiger-Müller tubes**
T8*	**Colour display systems** Colour TV picture tubes, colour data graphic display tube assemblies, deflection units
T9	**Photo and electron multipliers**
T10	**Plumbicon camera tubes and accessories**
T11	**Microwave semiconductors and components**
T12	**Vidicon and Newvicon camera tubes**
T13	**Image intensifiers and infrared detectors**
T15	**Dry reed switched**
T16**	**Monochrome tubes and deflection units** Black and white TV picture tubes, monochrome data graphic display tubes, deflection units

* Handbook T8 will be issued in a new series of handbooks (Display Components) and will have the new handbook code DC01.

** Handbook T16 will be re-issued in the future in the new series of handbooks (Display Components).

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This series of data handbooks comprises:

S1 **Diodes**
Small-signal silicon diodes, voltage regulator diodes (< 1.5 W), voltage reference diodes, tuner diodes, rectifier diodes

S2a **Power diodes**

S2b **Thyristors and triacs**

S3 **Small-signal transistors**

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**

S7 **Surface mounted semiconductors**

S8a **Light-emitting diodes**

S8b **Devices for optoelectronics**
Optoelectronics, photosensitive diodes and transistors, infrared light-emitting diodes and infrared sensitive devices, laser and fibre-optic components

S9 **PowerMos transistors**

S10 **Wideband transistors and wideband hybrid IC modules**

S11 **Microwave transistors**

S13 **Semiconductor sensors**

S14 **Liquid Crystal Displays**

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This series of handbooks comprises:

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IC02a/b	**Video and associated systems** Bipolar, MOS
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IC05N	**HE4000B logic family — uncased ICs** CMOS
IC06	**High-speed CMOS; PC74HC/HCT/HCU** Logic family
IC08	**ECL 10K and 100K logic families**
IC09N	**TTL logic series**
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IC11	**Linear Products**
Supplement to IC11	**Linear Products**
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IC13	**Semi-custom** Programmable Logic Devices (PLD)
IC14	**Microcontrollers and peripherals** Bipolar, MOS
IC15	**FAST TTL logic series**
IC16	**CMOS integrated circuits for clocks and watches**
IC17	**ICs for Telecom** Bipolar, MOS Radio pagers Mobile telephones ISDN
IC18	**Microprocessors and peripherals**
IC19	**Data communication products**

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This series of handbooks comprises:

current code		new handbook code
C2	**Television tuners, coaxial aerial input assemblies**	**DC01***
C3	**Loudspeakers**	**DC04***
C4	**Ferroxcube potcores, square cores and cross cores**	**MA01****
C5	**Ferroxcube for power, audio/video and accelerators**	
C7	**Variable capacitors**	**PA04**△
C8	**Variable mains transformers**	**PC10**△△
C9	**Piezoelectric quartz devices**	**PA07**△
C11	**Varistors, thermistors and sensors**	**PA02**△
C12	**Potentiometers, encoders and switches**	**PA03**△
C13	**Fixed resistors**	**PA08**△
C14	**Electrolytic capacitors; solid and non-solid**	**PA01**
C15	**Ceramic capacitors**	**PA06**△
C16	**Permanent magnet materials**	**MA02****
C19	**Piezoelectric ceramics**	**MA03****
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).

** These handbooks will be re-issued in the future in the new series of handbooks (Materials).

△ These handbooks will be re-issued in the future in the new series of handbooks (Passive Components).

△△ These handbooks will be re-issued in the future in the new series of handbooks (Professional Components).

MATERIALS

This series of handbooks comprises:

MA01* **Ferrites (the current issue are handbooks C4 and C5)**

MA02* **Permanent magnet materials**

MA03* **Piezoelectric ceramics**

* Not yet issued in the Materials series of handbooks.

DISPLAY COMPONENTS

This series of handbooks comprises:

DC01 **Colour display systems**

DC02* **Monochrome tubes and deflection units**

DC03* **Television tuners, coaxial aerial input assemblies**

DC04* **Loudspeakers**

DC05* **Wire-wound components for TVs and monitors**

* Not yet issued in the Display Components series of handbooks.

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