U.H.F./V.H.F. POWER TRANSISTOR

N-P-N silicon transistor for use in class-B and C operated mobile, industrial and military transmitters with a supply voltage of 13,8 V.

It has a capstan envelope with a moulded cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

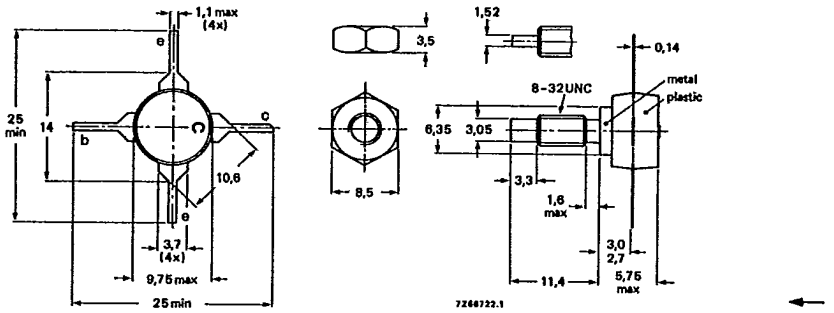
R.F. performance up to T_h = 25 °C in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_S W	P_L W	I_C A	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ mS
c.w.	13,8	470	typ. 0,15	1,5	typ. 0,17	typ. 10	typ. 65	–	–
c.w.	13,8	470	typ. 0,35	3,0	typ. 0,28	typ. 9,3	typ. 79	2,9 + j5,1	27 – j21
c.w.	12,5	470	< 0,35	2,5	< 0,31	> 8,5	> 65	–	–
c.w.	12,5	175	typ. 0,03	3,0	typ. 0,29	typ. 20	typ. 84	–	–

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-48/3



Torque on nut: min. 0,75 Nm (7,5 kg cm)
max. 0,85 Nm (8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

When locking is required an adhesive is preferred instead of a lock washer.

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.

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

Collector-base voltage (open emitter) peak value	V_{CBOM}	max.	36	V
Collector-emitter voltage (R_{BE} = 0) peak value	V_{CESM}	max.	36	V
Collector-emitter voltage (open base)	V_{CEO}	max.	18	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4	V
Collector current (average)	$I_{C(AV)}$	max.	0.7	A
Collector current (peak value) f > 1 MHz	I_{CM}	max.	2.0	A
Total power dissipation up to T_h = 90 °C f > 10 MHz	P_{tot}	max.	4.5	W
Storage temperature	T_{stg}	−65 to	+150	°C
Junction temperature	T_j	max.	150	°C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$ =	12	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$ =	0.6	K/W

V.H.F./U.H.F. power transistor

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CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Breakdown voltages				
Collector-base voltage open emitter, I_C = 10 mA	$V_{(BR)CBO}$	>	36	V
Collector-emitter voltage V_{BE} = 0; I_C = 10 mA	$V_{(BR)CES}$	>	36	V
Collector-emitter voltage open base, I_C = 25 mA	$V_{(BR)CEO}$	>	18	V
Emitter-base voltage open collector, I_E = 1,0 mA	$V_{(BR)EBO}$	>	4	V
Collector-emitter saturation voltage I_C = 100 mA; I_B = 20 mA	V_{CEsat}	typ.	0,1	V
D.C. current gain I_C = 100 mA; V_{CE} = 5 V	h_{FE}	> typ.	10 40	
Transition frequency I_C = 0,2 A; V_{CE} = 5 V; f = 500 MHz	f_T	typ.	1400	MHz
Collector capacitance at f = 1 MHz $I_E = I_e$ = 0; V_{CB} = 10 V	C_c	typ. <	6,5 9,0	pF pF
Feedback capacitance at f = 1 MHz I_C = 20 mA; V_{CE} = 10 V	C_{re}	typ.	4,8	pF
Collector-stud capacitance	C_{cs}	typ.	2	pF

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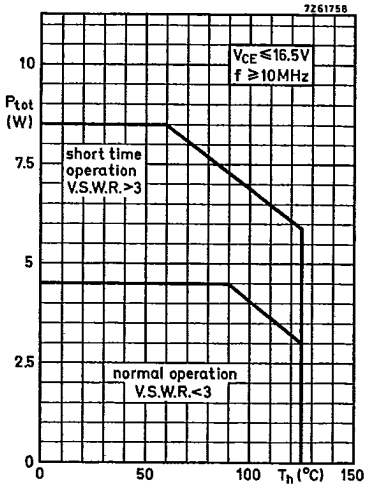

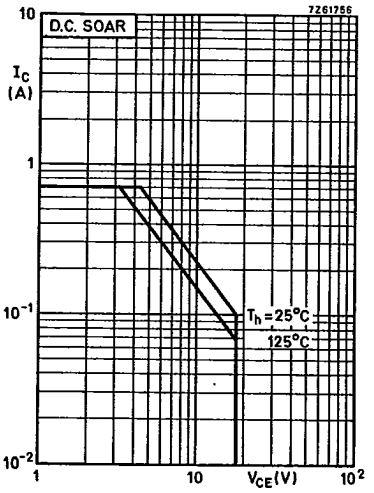

V.H.F./U.H.F. power transistor

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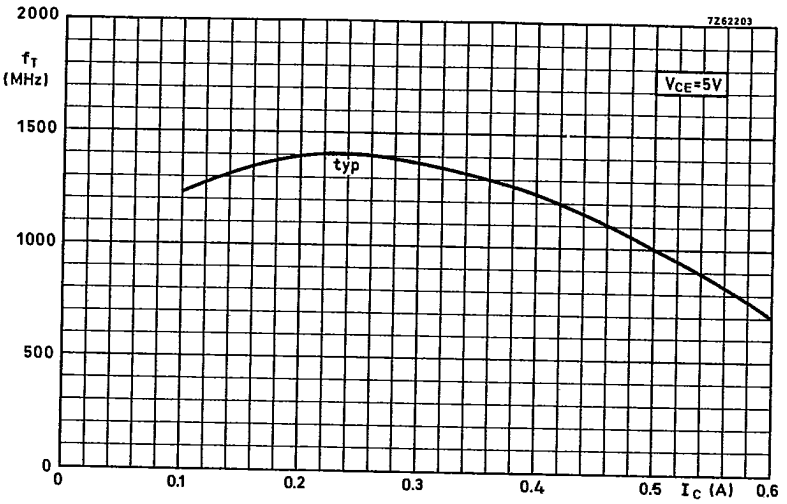
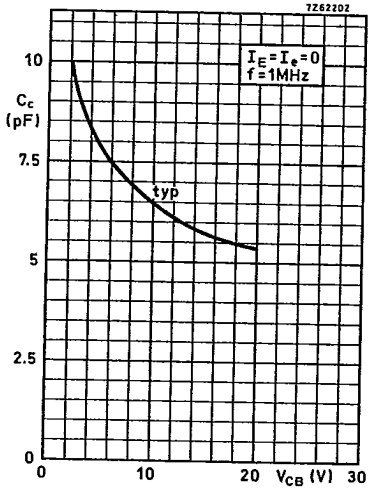




APPLICATION INFORMATION

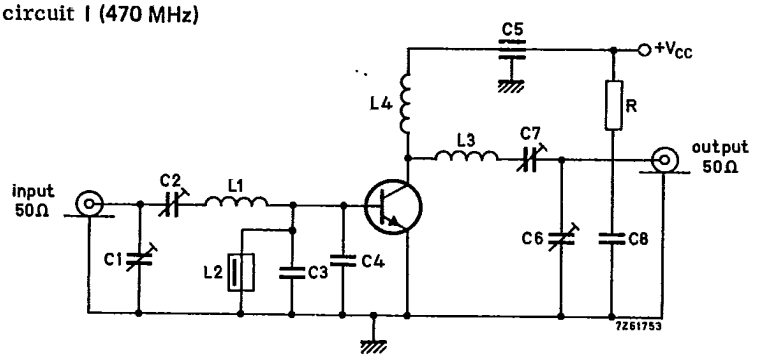
T_j = 25 °C unless otherwise specified

R.F. performance in c.w. operation (unneutralized common-emitter class B circuit)

T_h up to 25 °C

f (MHz)	V_{CC} (V)	P_S (W)	P_L (W)	I_C (A)	G_p (dB)	η (%)	$\bar{z}_i$ (Ω)	$\bar{Y}_L$ (mS)
470	13.8	typ. 0.15	1.5	typ. 0.17	typ. 10	typ. 65	-	-
470	13.8	typ. 0.35	3.0	typ. 0.28	typ. 9.3	typ. 79	2.9 + j5.1	27 − j21
470	12.5	< 0.35	2.5	< 0.31	> 8.5	> 65	-	-
175	12.5	typ. 0.03	3.0	typ. 0.29	typ. 20	typ. 84	-	-

Test circuit I (470 MHz)



C1 = C2 = C6 = C7 = 1.8 to 18 pF film dielectric trimmer
C3 = C4 = 18 pF disc ceramic capacitor
C5 = 4 nF feed-through capacitor
C8 = 0.1 µF polyester capacitor

L1 = 1 turn Cu wire (1.2 mm); int. diam. 6 mm; max. lead length 1 mm
L2 = 1 µH choke
L3 = 30 mm straight Cu wire (2 mm); height above print 2 mm
L4 = 2 turns closely wound Cu wire (0.5 mm); int. diam. 3 mm; max. lead length 8 mm

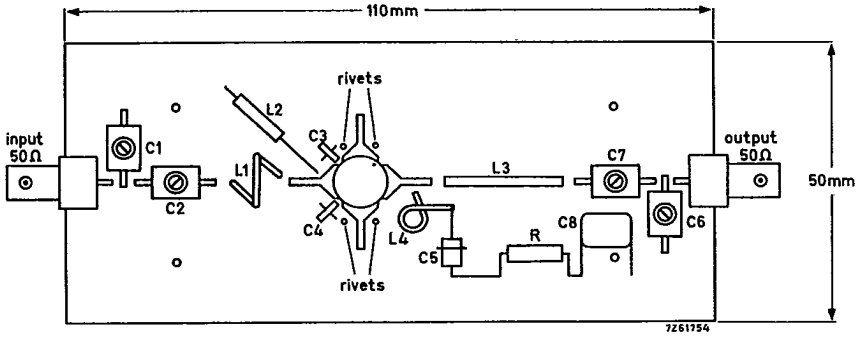
R = 10 Ω carbon

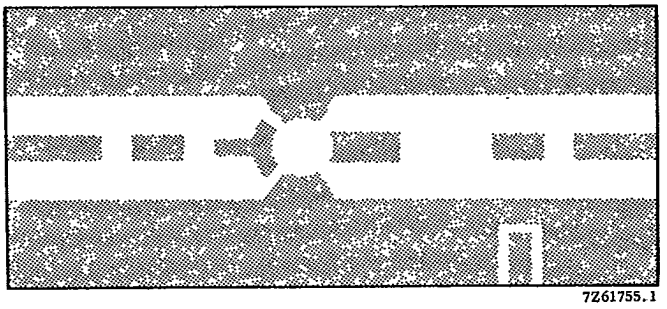
At P_L = 2.5 W and V_{CC} = 12.5 V, the output power at heatsink temperatures between 25 °C and 90 °C relative to that at 25 °C is diminished by typ. 5 mW/K

The transistor is designed to withstand full load mismatch in the test circuit under the following conditions: V_{CC} = 16.5 V; f = 470 MHz; T_h = 70 °C; V.S.W.R. = 50 : 1 through all phases; $P_S = P_{Snom} + 20\%$
where $P_{Snom} = P_S$ for 2.5 W transistor output into 50 Ω load and V_{CC} = 13.8 V

APPLICATION INFORMATION (continued)

Component lay-out and printed circuit board for 470 MHz test circuit.





Shaded area copper
Back area completely copper clad.
Material of printed circuit board: 1,5 mm epoxy fibre glass.

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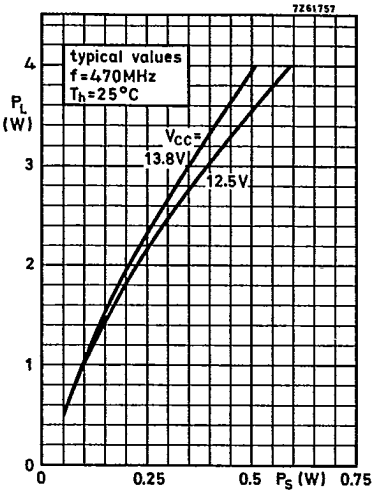
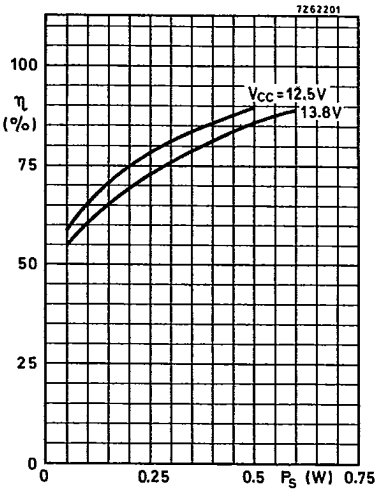
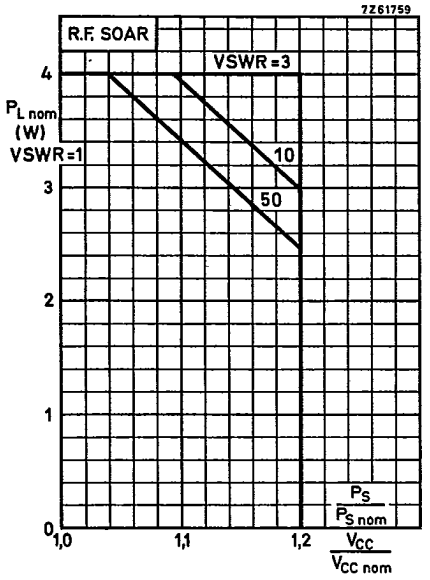






Conditions for R.F. SOAR

f = 470 MHz

T_h = 70 °C

V_{CCnom} = 13,8 V

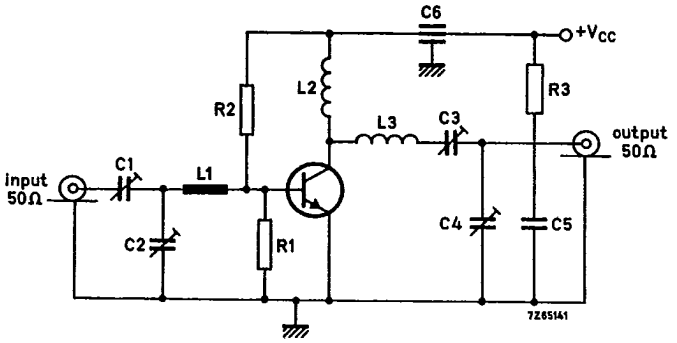
P_{Snom} = P_S at V_{CC} = V_{CCnom} and VSWR = 1

$R_{th\ mb\text{-}h}$ = 0,6 K/W

The transistor was developed for use with unstabilized supply voltage V_{CC}.
The above graph is based on its measured performance in test circuit I.
Supply voltage was varied from V_{CCnom} to 1,2 V_{CCnom}, and VSWR from 1 to 50.
It shows the max. permissible output power under nominal conditions in order not to exceed the max. permissible power dissipation under conditions of supply over-voltage ($V_{CC} > V_{CCnom}$) and load mismatch (VSWR > 1).
It is assumed that the drive power increases linearly with the supply voltage; i.e. $P_S/P_{Snom} = V_{CC}/V_{CCnom}$.

APPLICATION INFORMATION (continued)

Test circuit II (175 MHz)



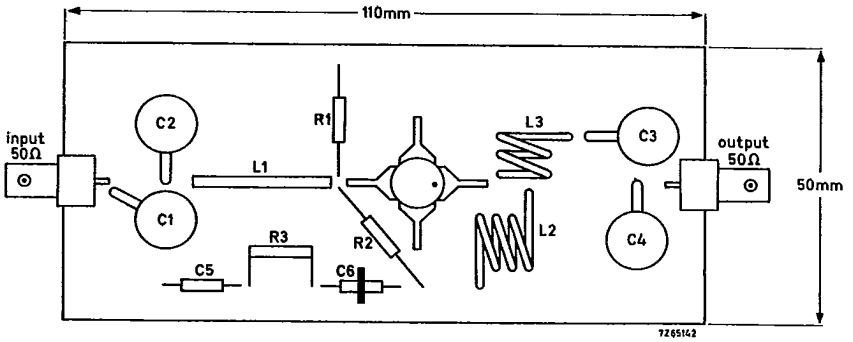
C1 = C3 = C4= 30 pF concentric air trimmer
C2 = 60 pF concentric air trimmer
C5 = 0.25 µF ceramic capacitor
C6 = 4 nF polyester capacitor

L1 = 25 mm straight Cu wire (1.2 mm); height above print max. 3 mm
L2 = 3 turns closely wound Cu wire (1.2 mm); int. diam. 10 mm; lead length 5 mm
L3 = 2 turns closely wound Cu wire (1.7 mm); int. diam. 12 mm; lead length 5 mm

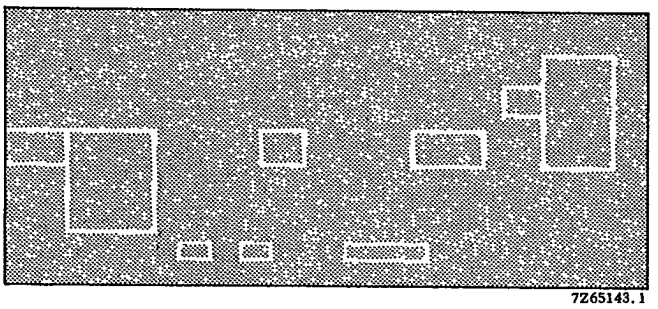
R1 = 50 Ω carbon
R2 = 1.2 kΩ carbon
R3 = 5 Ω carbon

APPLICATION INFORMATION (continued)

Component lay-out and printed circuit board for 175MHz test circuit.



Shaded area copper
Back area not metalized
Material of pcb : 1.5 mm epoxy fibre glass



OPERATING NOTE Below 200 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation. This resistor must be effective for both d.c. and r.f.