

U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor for use in class-A, B and C operated mobile, industrial and military transmitters with a supply voltage of 13,5 V. The transistor is resistance stabilized and is guaranteed to withstand severe load mismatch conditions with a supply over-voltage to 16,5 V. Gold metallization ensures extremely high reliability.

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

QUICK REFERENCE DATA

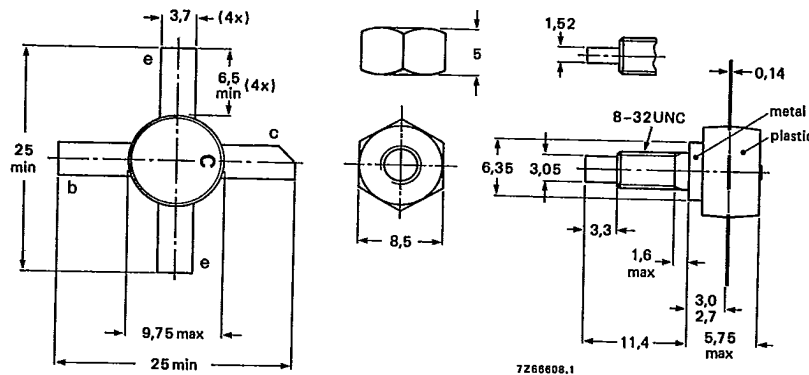
R.F. performance up to $T_{mb} = 25^{\circ}\text{C}$ in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_S W	P_L W	I_C A	G_p dB	η %	Z_i Ω	$\bar{Y}_L$ mS
c.w.	13,5	470	< 8,0	20	< 2,28	> 4	> 65	$1,2 + j4,5$	$163 - j35$
c.w.	12,5	470	< 6,8	17	< 2,09	> 4	> 65	—	—

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-48/2.



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)

Voltages

Collector-base voltage (open emitter)
peak value

V_{CBOM} max. 36 V

Collector-emitter voltage (open base)

V_{CEO} max. 18 V

Emitter-base voltage (open collector)

V_{EBO} max. 4 V

Currents

Collector current (average)

$I_{C(AV)}$ max. 3,5 A

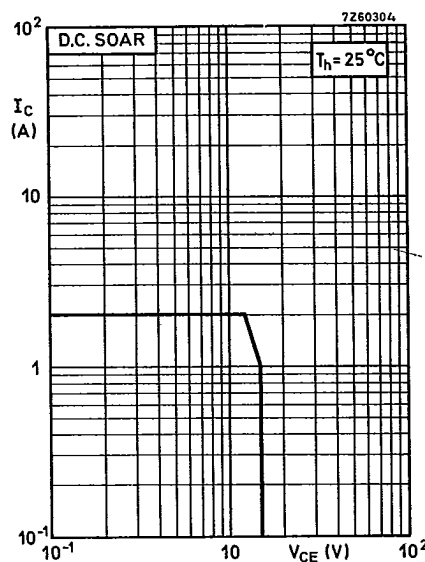
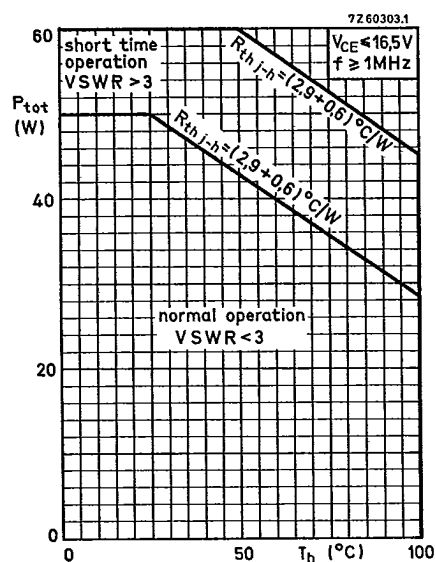
Collector current (peak value) $f > 1$ MHz

I_{CM} max. 10 A

Power dissipation

Total power dissipation up to $T_h = 25^\circ\text{C}$
 $f \geq 1$ MHz

P_{tot} max. 50 W



Temperatures

Storage temperature

T_{stg} -65 to +200 $^\circ\text{C}$

Junction temperature

T_j max. 200 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to mounting base

$R_{th j-mb}$ = 2,9 K/W

From mounting base to heatsink

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

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CHARACTERISTICS

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

Breakdown voltages

Collector-base voltage

open emitter ; $I_C = 25\text{ mA}$ $V_{(BR)CBO} > 36\text{ V}$

Collector-emitter voltage

open base ; $I_C = 25\text{ mA}$ $V_{(BR)CEO} > 18\text{ V}$

Emitter-base voltage

open collector ; $I_E = 10\text{ mA}$ $V_{(BR)EBO} > 4\text{ V}$

Transient energy

 $L = 25\text{ mH}$; $f = 50\text{ Hz}$

open base

 $-V_{BE} = 1,5\text{ V}$; $R_{BE} = 33\ \Omega$ $E > 3,1\text{ mWs}$ $E > 3,1\text{ mWs}$

D. C. current gain

 $I_C = 1\text{ A}$; $V_{CE} = 5\text{ V}$ $h_{FE} > 10$
typ. 30

Transition frequency

 $I_C = 2\text{ A}$; $V_{CE} = 10\text{ V}$ f_T typ. 1,0 GHzCollector capacitance at $f = 1\text{ MHz}$ $I_E = I_e = 0$; $V_{CB} = 15\text{ V}$ C_c typ. 55 pF
< 70 pF

Feedback capacitance

 $I_C = 100\text{ mA}$; $V_{CE} = 15\text{ V}$ C_{re} typ. 32 pF

Collector-stud capacitance

 C_{cs} typ. 2 pF

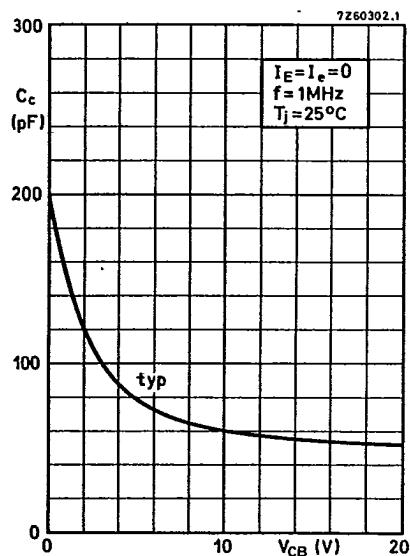
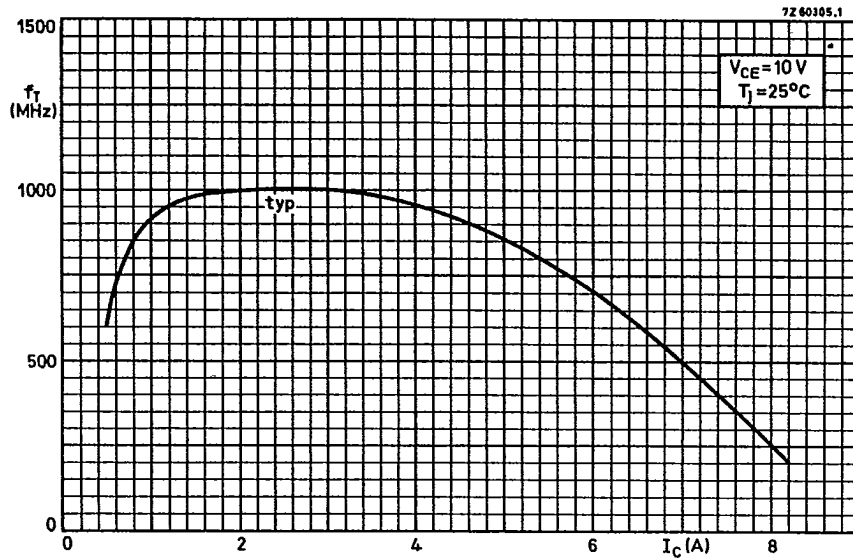
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February 1975

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3592 E-03

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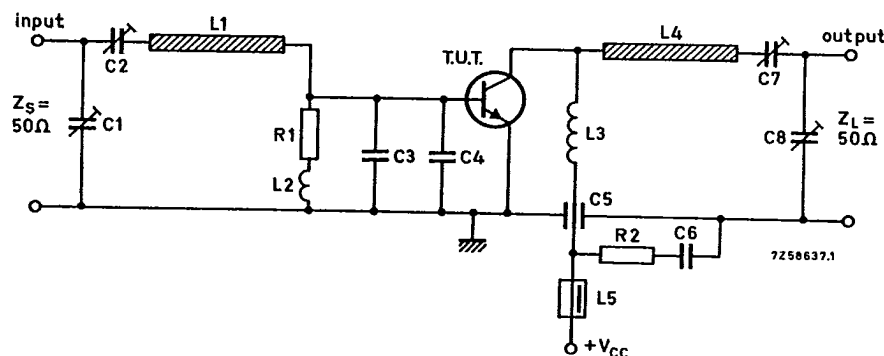
APPLICATION INFORMATION

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

 T_{mb} up to 25 °C

f (MHz)	V _{CE} (V)	P _S (W)	P _L (W)	I _C (A)	G _p (dB)	η (%)	$\bar{z}_i$ (Ω)	$\bar{V}_L$ (mS)
470	13,5	< 8,00	20	< 2,28	> 4	> 65	1,2 + j4,5	163 - j35
470	12,5	< 6,80	17	< 2,09	> 4	> 65	—	—
175	12,5	typ. 1,35	17	typ. 2,30	typ. 11	typ. 60	—	—

Test circuit: 470 MHz; c.w. class-B.



List of components:

C1 = C2 = C7 = C8 = 2,0 to 9,0 pF film dielectric trimmer (cat. no. 2222 809 09002)

C3 = C4 = 15 pF chip capacitor

C5 = 100 pF feed-through capacitor

C6 = 33 nF polyester capacitor

R1 = 1 Ω carbon resistorR2 = 10 Ω carbon resistor

L1 = stripline (41,1 mm x 5,0 mm)

L2 = 13 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 4,0 mm (0,32 μ H)

L3 = 2 turns Cu wire (1 mm); winding pitch 1,5 mm; int. dia. 4 mm; leads 2 x 5 mm

L4 = stripline (52,7 mm x 5,0 mm)

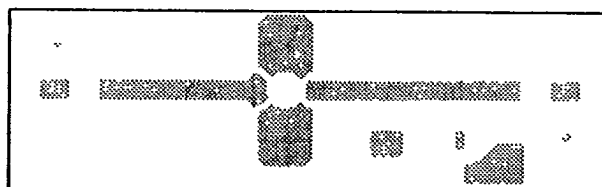
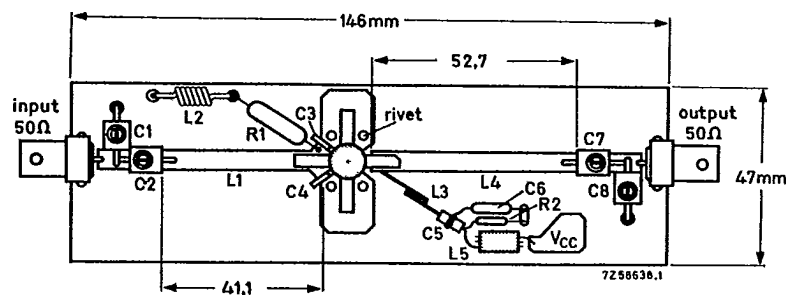
L5 = Ferroxcube choke coil. Z (at f = 50 MHz) = 750 $\Omega \pm 20\%$ (cat. no. 4312 020 36640)L1 and L4 are striplines on a double Cu-clad print plate with PTFE fibre-glass dielectric. ($\epsilon_r = 2,74$); thickness 1,45 mm.

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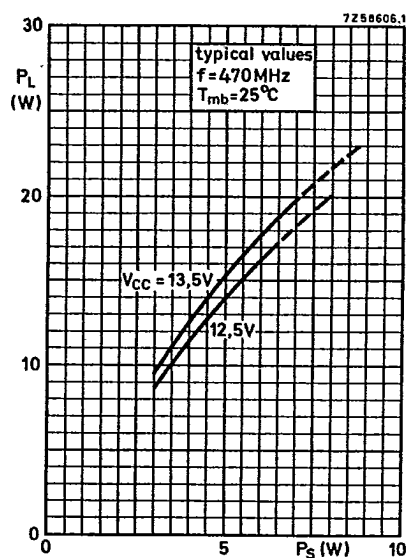
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APPLICATION INFORMATION (continued)

Component layout and printed-circuit board for 470 MHz test circuit.



The circuit and the components are situated on one side of the PTFE fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets.



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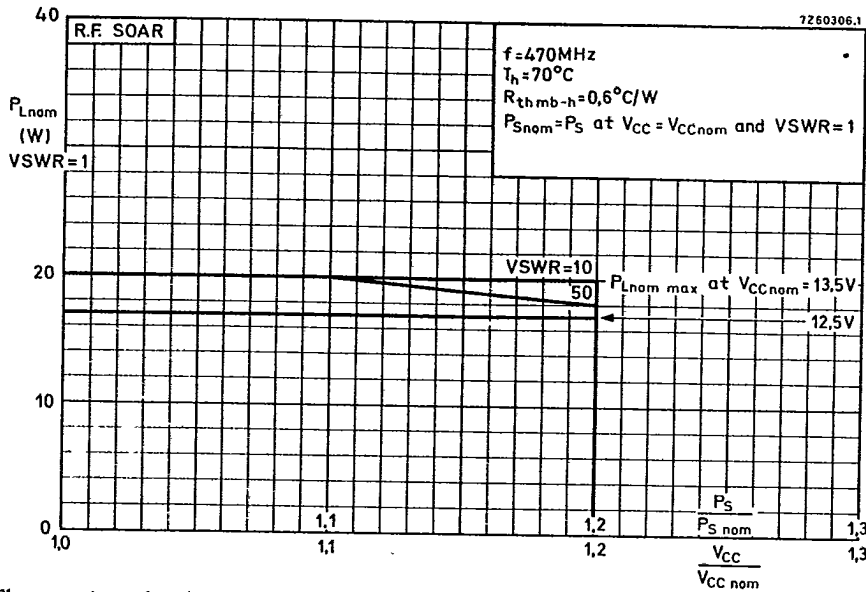
U.H.F. power transistor

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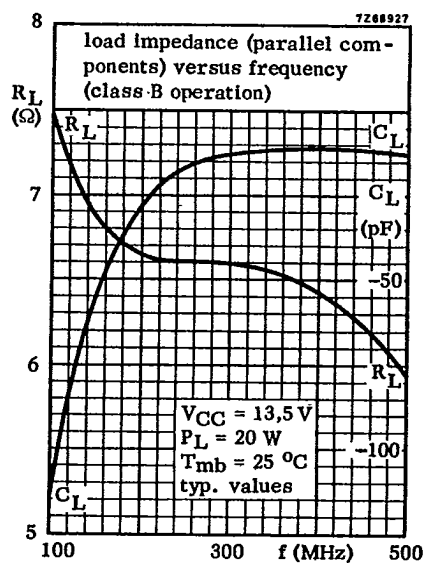
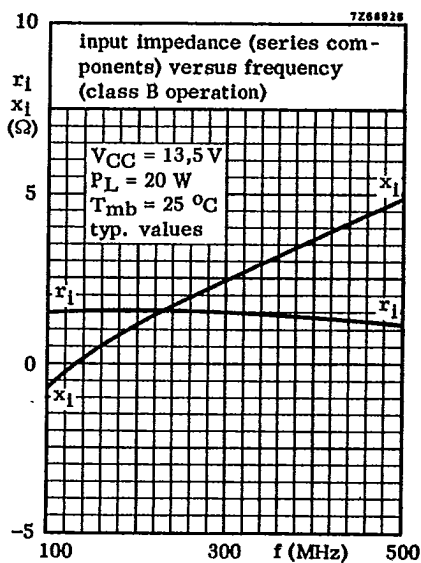
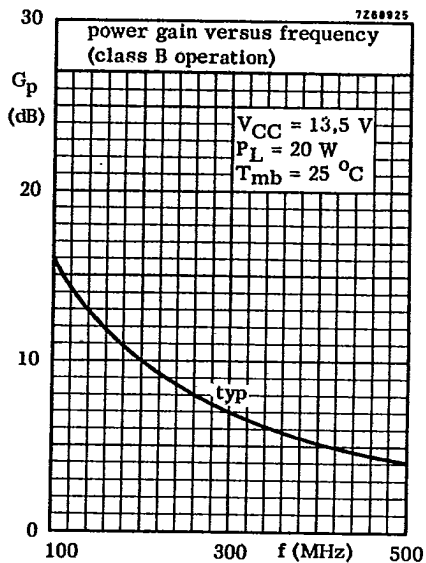
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The transistor has been developed for use with unstabilized supply voltages. As the output power and drive power increase with the supply voltage, the nominal output power must be derated in accordance with the graph above for safe operation at supply voltages other than the nominal. The graph shows the allowable output power, under nominal conditions, as a function of the supply overvoltage ratio, with VSWR as parameter. The graph applies to the situation in which the drive (P_S/P_{Snom}) increases linearly with the supply overvoltage ratio.

The horizontal line at 20 W applies at $V_{CCnom} = 13.5 \text{ V}$.
For $V_{CCnom} = 12.5 \text{ V}$, P_L should be derated to 17 W.



3596 E-07

886 February 1975