U.H.F./V.H.F. TRANSMITTING TRANSISTOR

N-P-N transistor intended 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

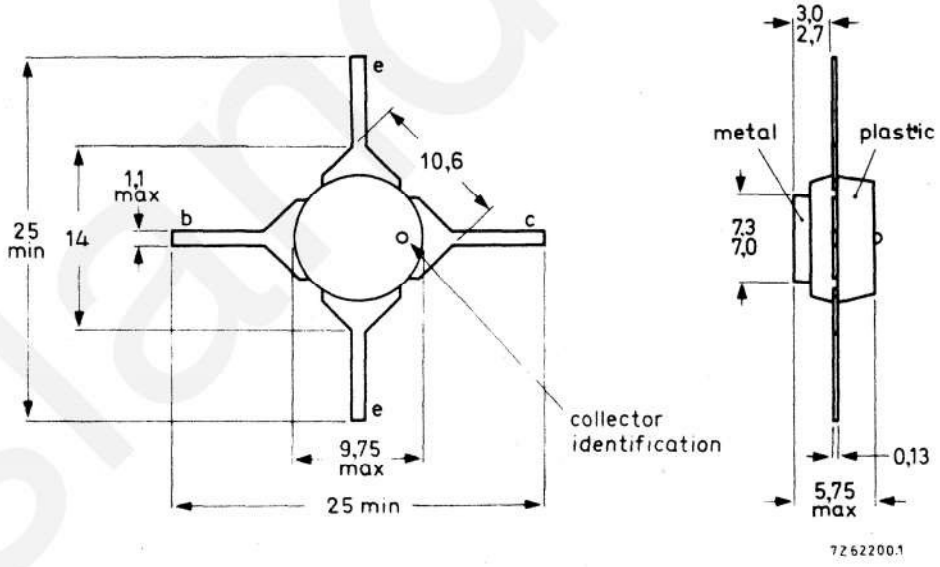
R.F. performance up to T_{mb} = 25 °C in an unneutralized common-emitter class-B circuit

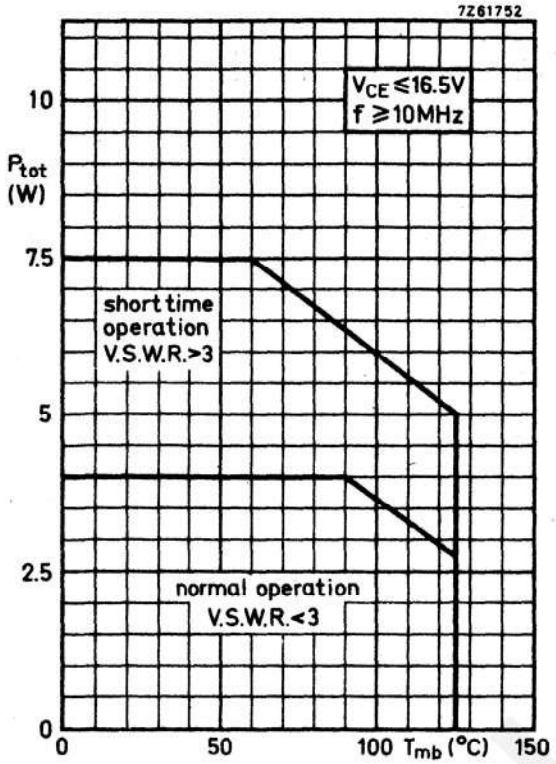
mode of operation	V_{CE} V	f MHz	P_S W	P_L W	I_C A	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ mA/V
c.w.	13,8	470	typ. 0,15	1,5	typ. 0,17	typ. 10	typ. 65	–	–
c.w.	13,8	470	typ. 0,28	2,5	typ. 0,24	typ. 9,5	typ. 75	2,6 + j4,8	23 – j23
c.w.	12,5	470	< 0,35	2,5	< 0,31	> 8,5	> 65	–	–
c.w.	12,5	175	typ. 0,03	3,0	typ. 0,29	typ. 20	typ. 84	–	–

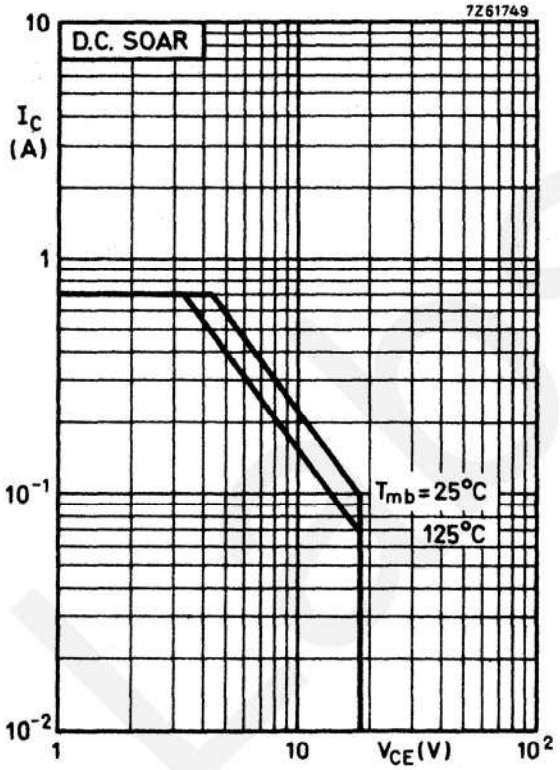
MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-48 (without stud).




7Z61752
$V_{CE} \leq 16.5V$
$f \geq 10MHz$
P_{tot} (W)
10
7.5
5
2.5
0
short time operation V.S.W.R.>3
normal operation V.S.W.R.<3
0
50
100
T_{mb} (°C)
150


7Z61749
D.C. SOAR
I_C (A)
10
1
10^{-1}
10^{-2}
T_{mb}=25°C
125°C
1
10
V_{CE}(V)
10^2

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 (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
Currents				
Collector current (average)	$I_{C(AV)}$	max.	0.7	A
Collector current (peak value) f > 1 MHz	I_{CM}	max.	2.0	A
Power dissipation				
Total power dissipation up to T_{mb} = 90 °C f > 10 MHz	P_{tot}	max.	4.0	W
Temperatures				
Storage temperature	T_{stg}	−65 to +150		°C
Junction temperature	T_j	max.	150	°C

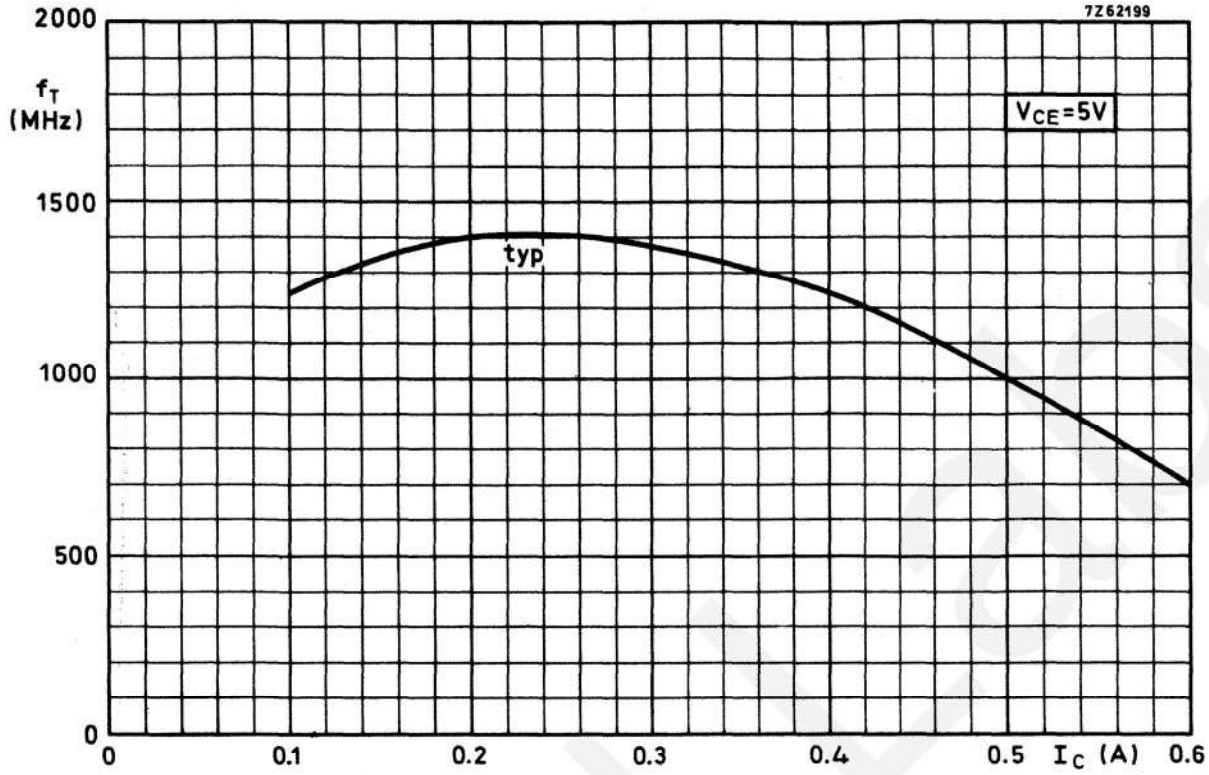
THERMAL RESISTANCE

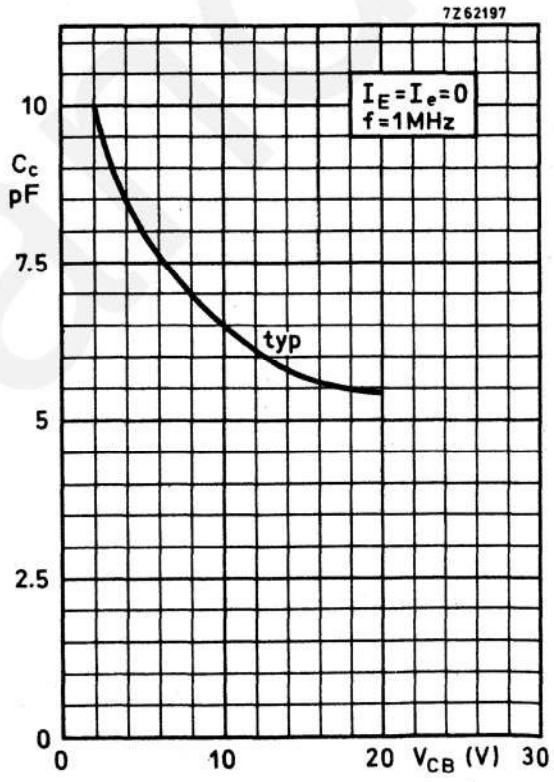
From junction to mounting base	$R_{th\ j\text{-}mb}$	=	12	°C/W

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 = 200 mA; 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


7Z62199
2000
f_T (MHz)
1500
1000
500
0
V_{CE}=5V
typ
0
0.1
0.2
0.3
0.4
0.5
I_C (A)
0.6


7Z62197
10
C_c pF
7.5
5
2.5
0
I_E=I_e=0
f=1MHz
typ
0
10
20
V_{CB} (V)
30

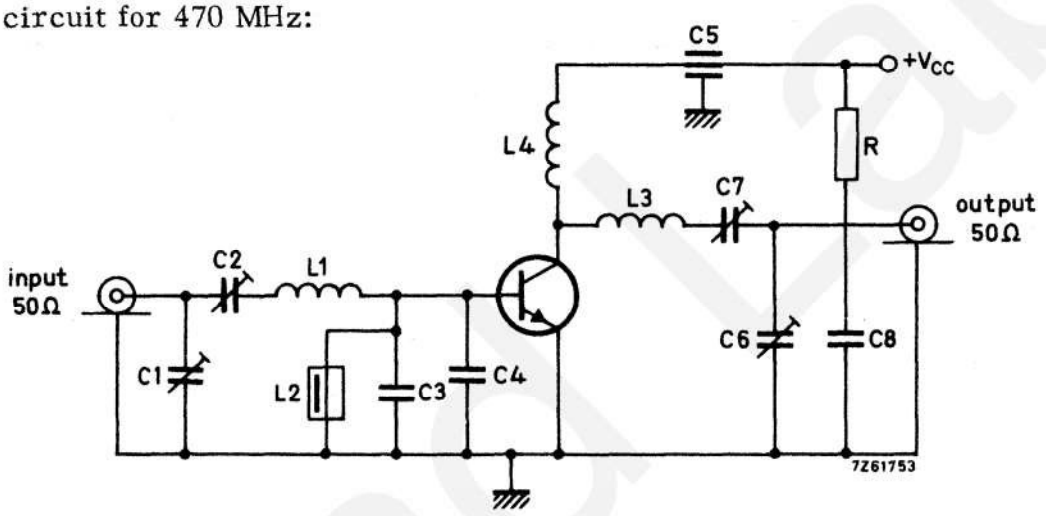
APPLICATION INFORMATION

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

T_{mb} = 25 °C

f (MHz)	V_{CC} (V)	P_S (W)	P_L (W)	I_C (A)	G_p (dB)	η (%)	$\bar{z}_i$ (Ω)	$\bar{Y}_L$ (mA/V)
470	13.8	typ. 0.15	1.5	typ. 0.17	typ. 10	typ. 65	-	-
470	13.8	typ. 0.28	2.5	typ. 0.24	typ. 9.5	typ. 75	2.6+j4.8	23 − j23
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 for 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

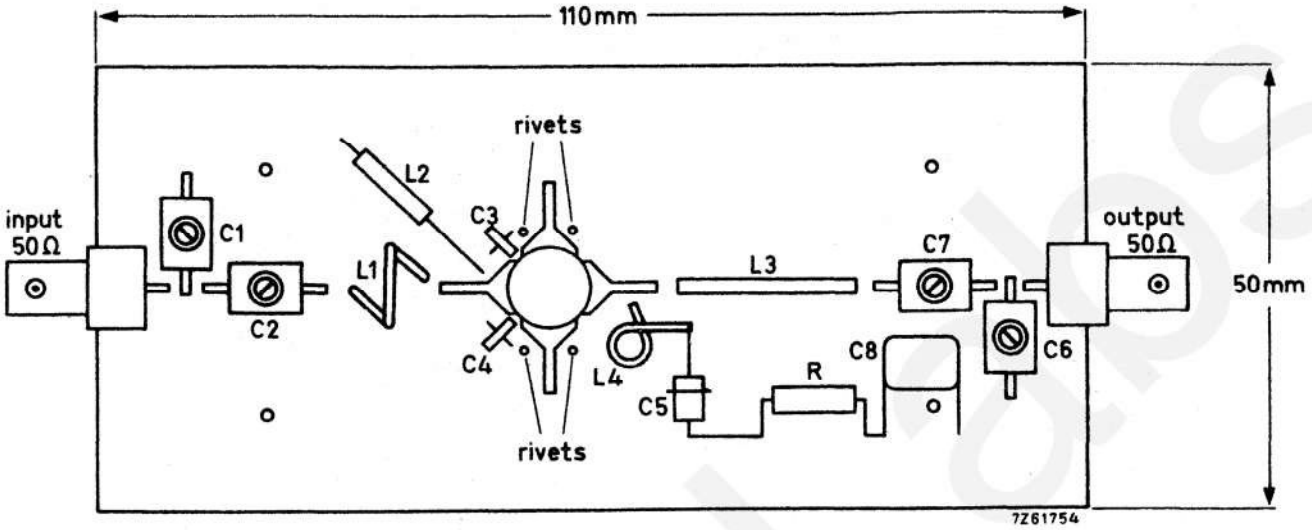
At P_L = 2.5 W and V_{CC} = 12.5 V the output power at mounting-base temperatures between 25 °C and 90 °C relative to that at 25 °C is diminished by typ. 5 mW/°C

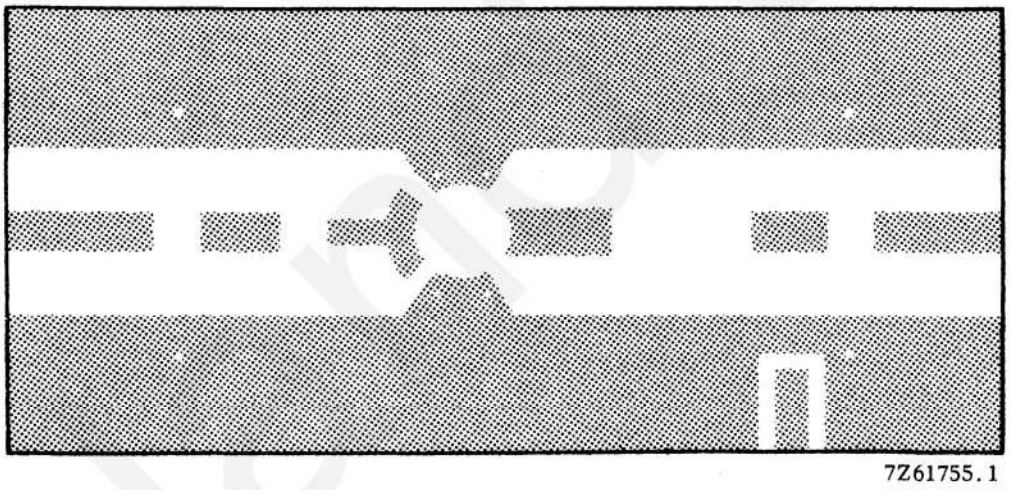
The transistor is designed to withstand full load mismatch in the test circuit under the following conditions: V_{CC} = 16.5 V; f = 470 MHz; T_{mb} = 70 °C; V.S.W.R. = 50 : 1 through all phases; $P_S = P_{Snom}$ + 20 %
where $P_{Snom} = P_S$ for 2.5 W transistor output into 50 Ω load at V_{CC} = 13.8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

Component lay-out for 470 MHz see page 7

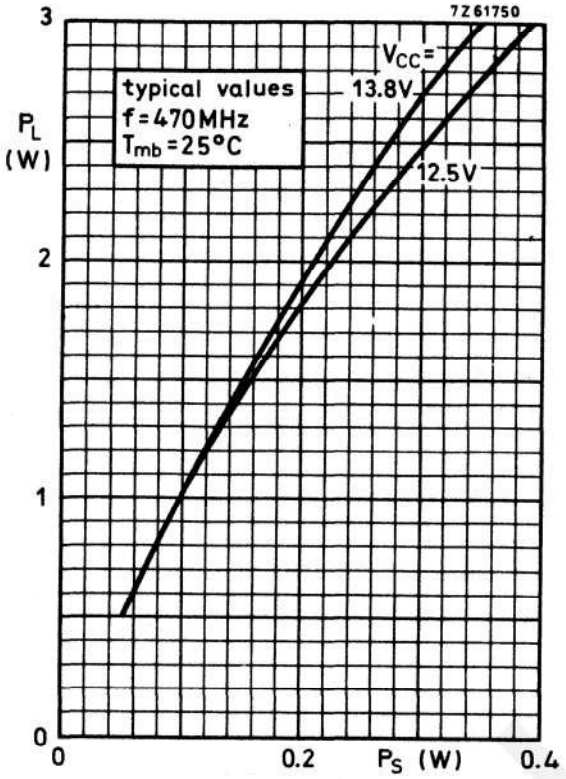
APPLICATION INFORMATION (continued)

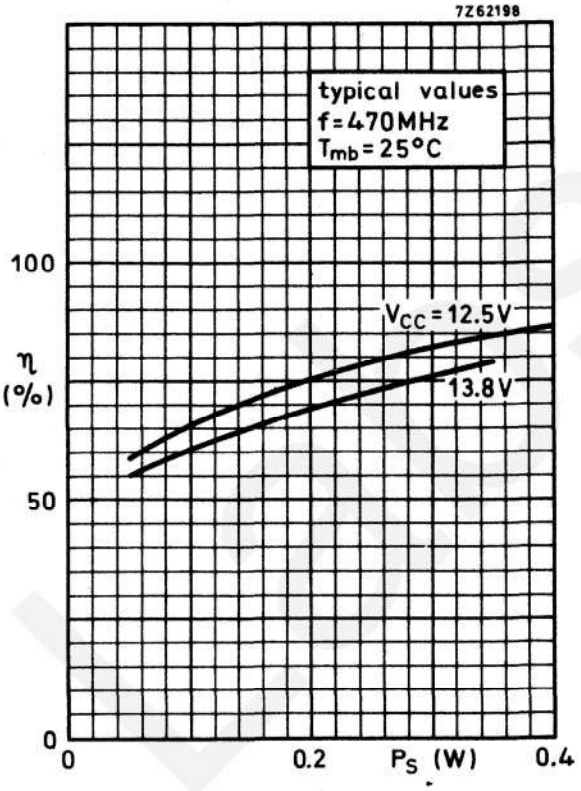
Component lay-out and printed circuit board for 470 MHz test circuit.

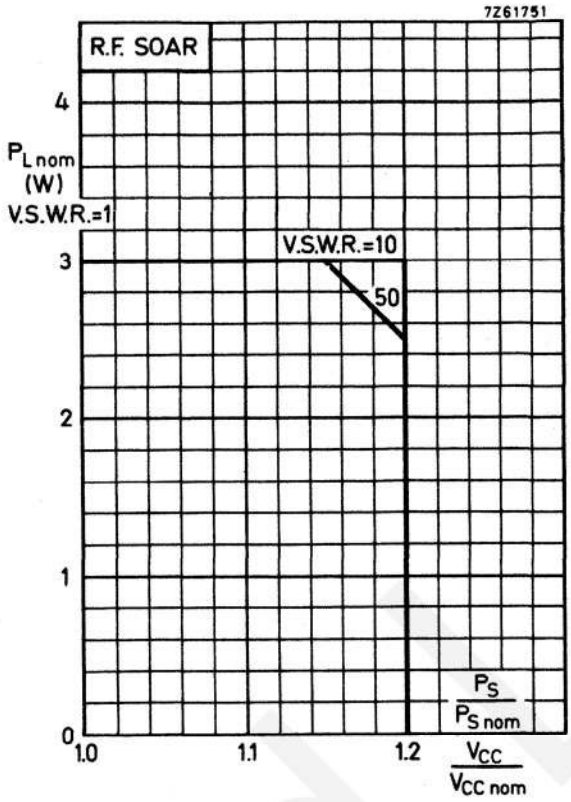




Shaded area copper
Back area completely copper clad
Material of printed circuit board: 1.5 mm epoxy fibre glass


7Z61750
typical values
f = 470MHz
T_{mb} = 25°C
V_{CC} = 13.8V
12.5V
P_L (W)
3
2
1
0
0
0.2
P_S (W)
0.4


7Z62198
typical values
f = 470MHz
T_{mb} = 25°C
V_{CC} = 12.5V
13.8V
η (%)
100
50
0
0
0.2
P_S (W)
0.4



Conditions for R.F. SOAR

f = 470 MHz

T_{mb} = 70 °C

V_{CCnom} = 13.8 V

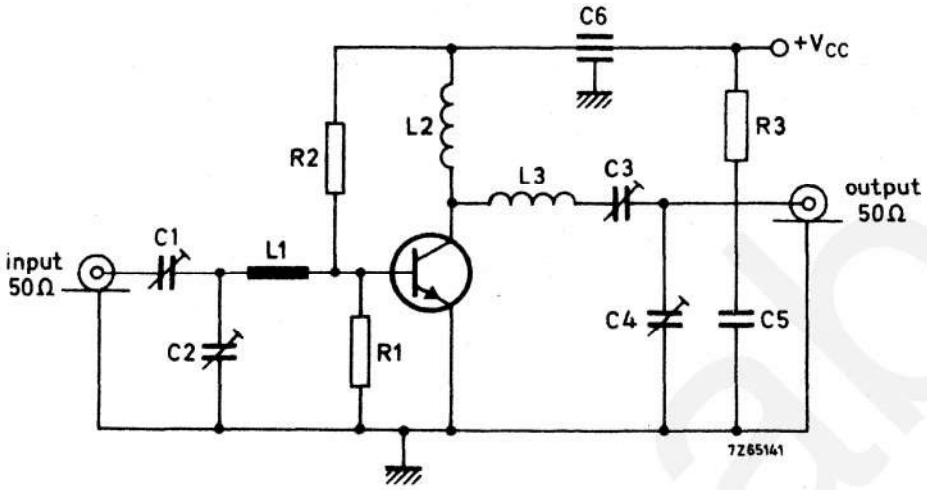
$P_{Snom} = P_S$ at $V_{CC} = V_{CCnom}$ and V.S.W.R. = 1

see also page 6

The transistor was developed for use with unstabilized supply voltage V_{CC}.
The above graph is based on its measured performance in the circuit given on page 6. Supply voltage was varied from V_{CCnom} to 1.2 V_{CCnom}, and V.S.W.R. from 1 to 50. It shows the max. allowable output power under nominal conditions in order not to exceed the max. allowable power dissipation under conditions of supply overvoltage ($V_{CC} > V_{CCnom}$) and load mismatch (V.S.W.R. > 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 for 175 MHz:



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

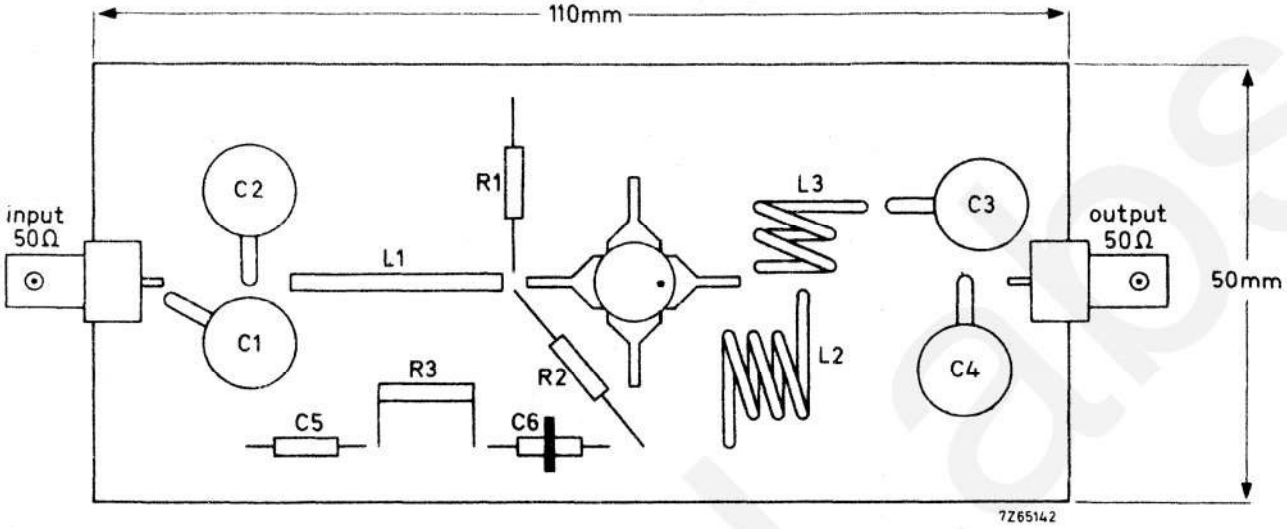
L1 = 25 mm straight Cu wire (1.2 mm); height above print max. 3 mm
L2 = 3 turns closely wound Cu wire (1.2 mm); int. diam. 10 mm; max. lead lenght 5 mm
L3 = 2 turns closely wound Cu wire (1.7 mm); int. diam. 12 mm; max. lead lenght 5 mm

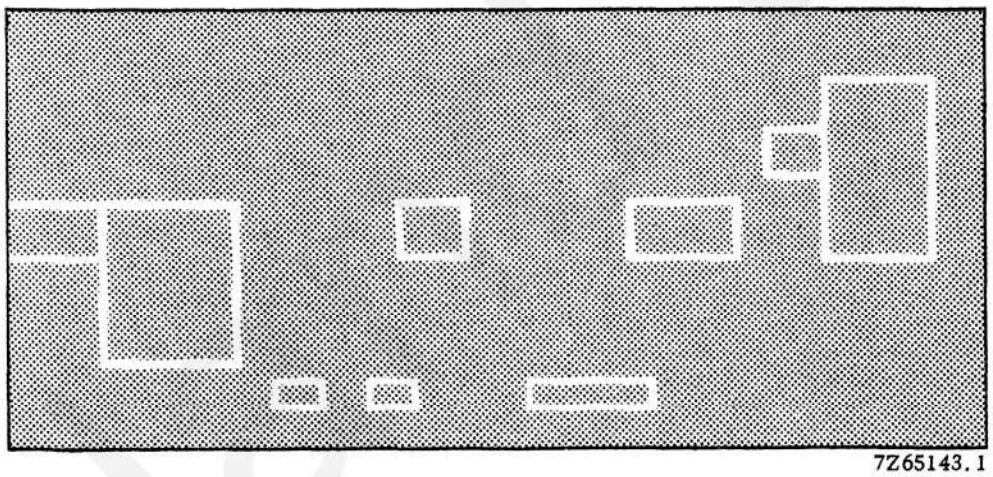
R1 = 50 Ω carbon
R2 = 1.2 kΩ carbon
R3 = 5 Ω carbon

Component lay-out for 175 MHz see page 11.

APPLICATION INFORMATION (continued)

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





Shaded area copper
Back area not metallized
Material of printed circuit board: 1.5 mm epoxy fibre glass

OPERATING NOTE Below 280 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.