DATA SHEET

BLV91/SL
UHF power transistor

Product specification

September 1988

Philips
Semiconductors

PHILIPS

UHF power transistor BLV91/SL

DESCRIPTION

NPN silicon planar epitaxial transistor designed for use in mobile radio transmitters in the 900 MHz band.

FEATURES

- diffused emitter-ballasting resistors for an optimum temperature profile.
- gold metallization ensures excellent reliability.
- the device can be applied at rated load power, without an external heatsink, when it is mounted on a printed-circuit board (see Fig.6).

The transistor has a 4-lead envelope with a ceramic cap (SOT-172D). All leads are isolated from the mounting base.

QUICK REFERENCE DATA

RF performance in a common-emitter class-B circuit

MODE OF OPERATION	T °C	V_{CE} V	f MHz	P_L W	G_p dB	η_C %
narrow band; CW	T_{mb} = 25	12.5	900	2	> 6.5	> 50
	T_a = 25(1)	12.5	900	1.5	> 6.5	> 50
	T_a = 25(1)	9.6	900	1.5	typ. 6.6	typ. 60

Note

1. Device mounted on a printed-circuit board (see Fig.6).

PIN CONFIGURATION

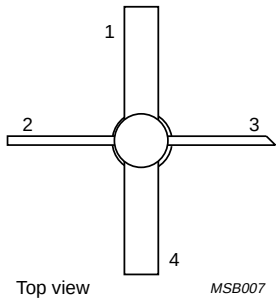


Fig.1 Simplified outline. SOT172D.

PINNING - SOT172D.

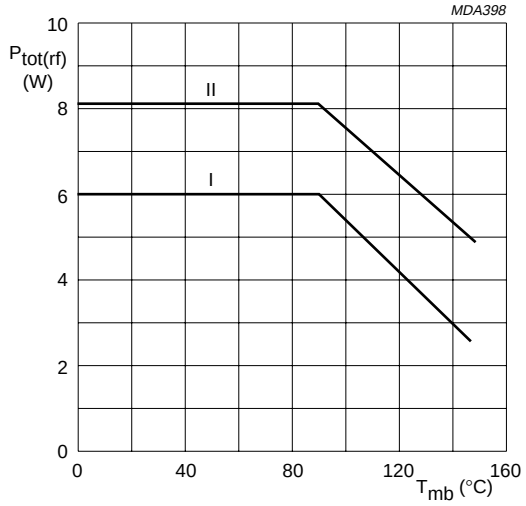
PIN	DESCRIPTION
1	emitter
2	base
3	collector
4	emitter

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.	36	V
Collector-emitter voltage (open base)	V_{CEO}	max.	16	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3	V
Collector current				
DC or average	I_C; $I_{C(AV)}$	max.	0.4	A
(peak value); f > 1 MHz	I_{CM}	max.	1.2	A
Total power dissipation				
f > 1 MHz; $T_{mb} \leq 90$ °C	$P_{tot(RF)}$	max.	6	W
Storage temperature	T_{stg}		−65 to + 150	°C
Operating junction temperature	T_j	max.	200	°C



I Continuous RF operation (f > 1 MHz)
II Short-time RF operation during mismatch (f > 1 MHz)

Fig.2 Power/temperature curve.

THERMAL RESISTANCE

Dissipation = 4.5 W

From junction to ambient[1] (f > 1 MHz)				
T_a = 25 °C	$R_{th\ j\text{-}a\ (RF)}$	max.	55	K/W
From junction to mounting base				
T_{mb} = 25 °C (f > 1 MHz)	$R_{th\ j\text{-}mb\ (RF)}$	max.	15	K/W

Note

1. Device mounted on a printed-circuit board (see Fig.6).

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-base breakdown voltage				
open emitter; I_C = 5 mA	$V_{(BR)CBO}$	>	36	V
Collector-emitter breakdown voltage				
open base; I_C = 10 mA	$V_{(BR)CEO}$	>	16	V
Emitter-base breakdown voltage				
open collector; I_E = 0.5 mA	$V_{(BR)EBO}$	>	3	V
Collector cut-off current				
V_{BE} = 0; V_{CE} = 16 V	I_{CES}	<	2.5	mA
Second breakdown energy				
L = 25 mH; f = 50 Hz; R_{BE} = 10 Ω	E_{SBR}	>	0.55	mJ
D.C. current gain				
I_C = 0.3 A; V_{CE} = 10 V	h_{FE}	>	25	
Collector capacitance at f = 1 MHz				
$I_E = i_e$ = 0; V_{CB} = 12.5 V	C_C	typ.	3.5	pF
Feedback capacitance at f = 1 MHz				
I_C = 0; V_{CE} = 12.5 V	C_{re}	typ.	2.0	pF
Collector-mounting base capacitance	$C_{c\text{-}mb}$	typ.	0.5	pF

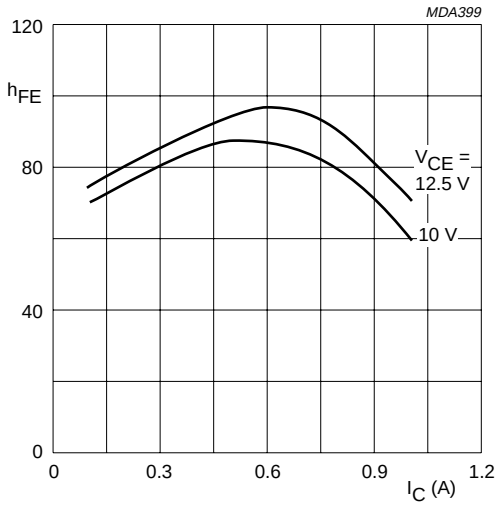


Fig.3 T_j = 25 °C; typical values.

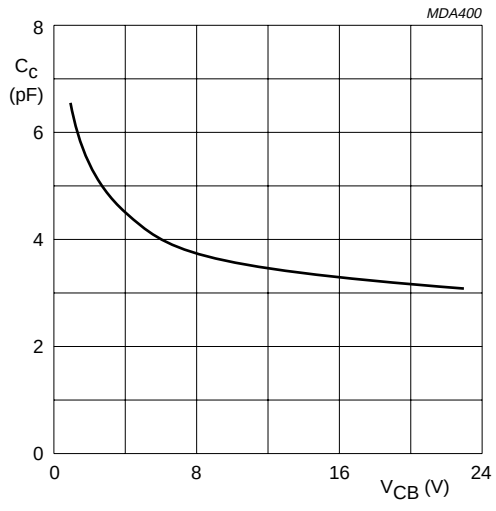


Fig.4 $I_E = i_e$ = 0; f = 1 MHz; typical values.

APPLICATION INFORMATION

RF performance in CW operation (common-emitter circuit; class-B): f = 900 MHz

MODE OF OPERATION	V_{CE} V	P_L W	G_p dB	η_C %	T °C
narrow band; CW	12.5	2	> 6.5	> 50	T_{mb} = 25
	12.5	2	typ. 7.8	typ. 60	T_{mb} = 25
	12.5	1.5	> 6.5	> 50	T_a = 25(2)
	9.6	1.5	typ. 6.6	typ. 60	T_a = 25(2)

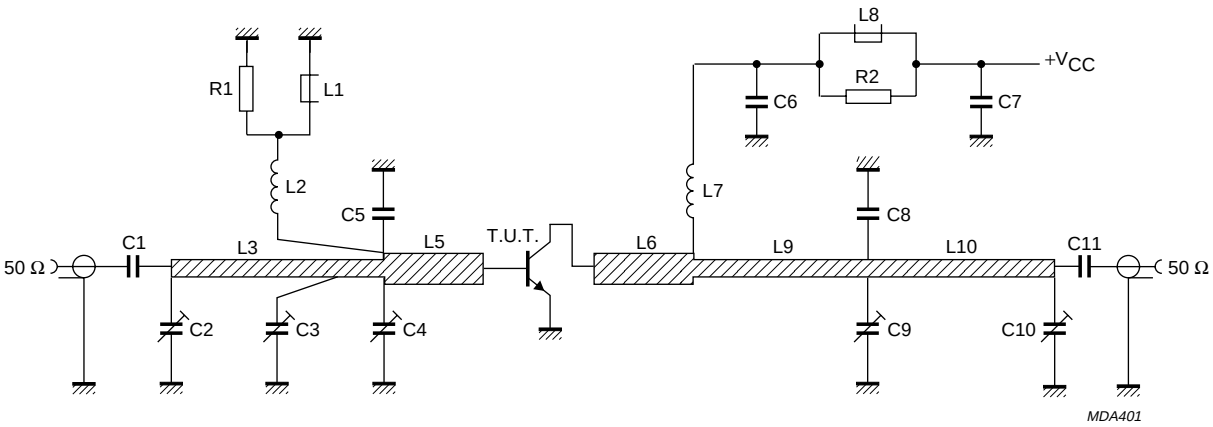


Fig.5 Class-B test circuit at f = 900 MHz.

List of components:

C1 = C11 = 33 pF multilayer ceramic chip capacitor

C2 = C3 = C10 = 1.4 to 5.5 pF film dielectric trimmer (cat. no. 2222 809 09001)

C4 = C5 = 5.6 pF multilayer ceramic chip capacitor (1)

C6 = 10 pF multilayer ceramic chip capacitor

C7 = 330 pF multilayer ceramic chip capacitor

C8 = 3.9 pF multilayer ceramic chip capacitor(1)

C9 = 1.2 to 3.5 pF film dielectric trimmer (cat. no. 2222 809 05001)

L1 = L8 = Ferroxcube wideband HF choke, grade 3B (cat. no. 4312 020 36642)

L2 = 60 nH; 4 turns closely wound enamelled Cu wire (0.4 mm); int. dia. 3 mm; leads 2×5 mm

L3 = 50 Ω stripline (25.4 mm $\times$ 2.4 mm)

L4 = 50 Ω stripline (4.4 mm $\times$ 2.4 mm)

L5 = L6 = 34 Ω stripline (14.0 mm $\times$ 4.0 mm)

L7 = 280 nH; 15 turns closely wound enamelled Cu wire (0.4 mm); int. dia. 3 mm; leads 2×5 mm

L9 = 50 Ω stripline (24.8 mm $\times$ 2.4 mm)

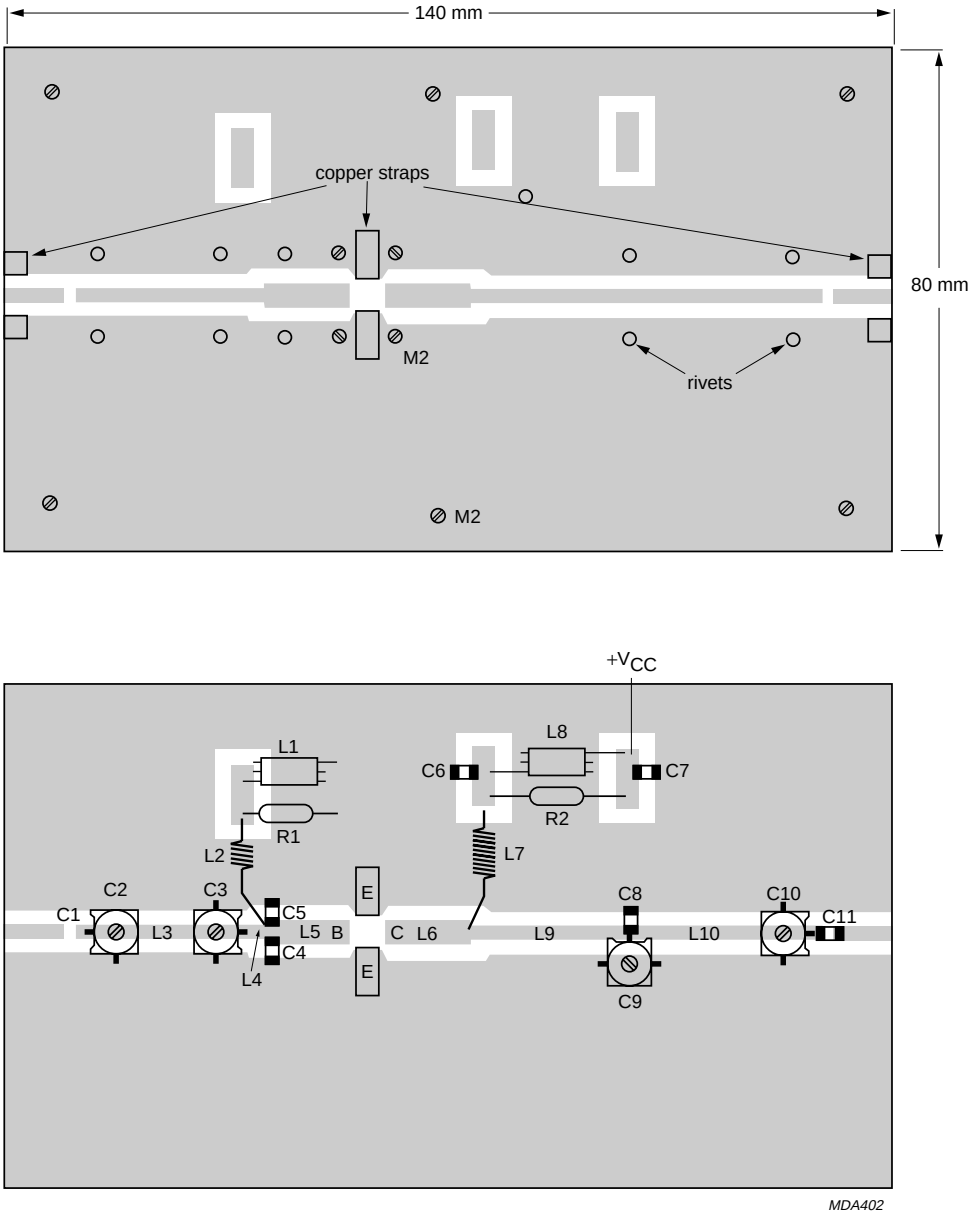
L10 = 50 Ω stripline (30.5 mm $\times$ 2.4 mm)

R1 = R2 = 10 $\Omega \pm 5\%$; 0.25 W metal film resistor

L3, L4, L5, L6, L9 and L10 are striplines on a double Cu-clad printed-circuit board with P.T.F.E. fibre-glass dielectric (ε_r = 2.2); thickness $^1/_{32}$ inch; thickness of copper-sheet 2×35 μm.

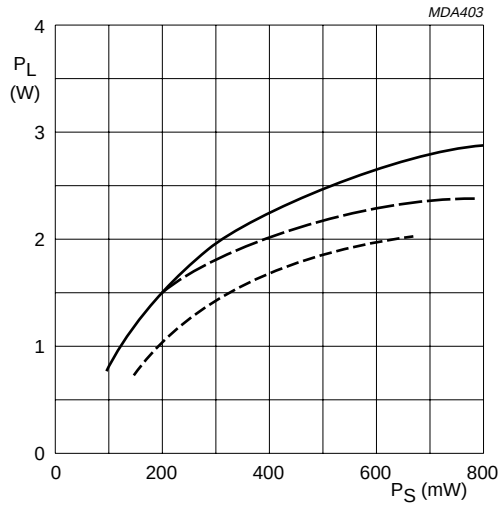
Notes

1. American Technical Ceramics capacitor type 100A or capacitor of same quality.
2. Device mounted on a printed-circuit board (see Fig.6).



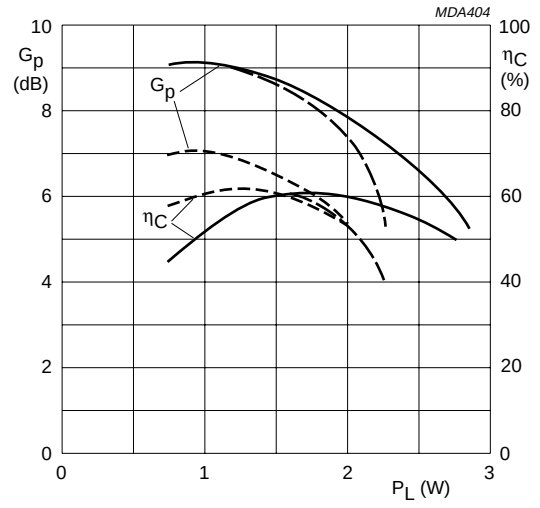
The circuit and the components are on one side of the P.T.F.E. fibre-glass board; the other side is unetched copper serving as groundplane. Earth connections are made by hollow rivets and also by fixing-screws and copper straps around the board and under the emitters to provide a direct contact between the copper on the component side and the groundplane.

Fig.6 Printed-circuit board and component lay-out for 900 MHz class-B test circuit.



f = 900 MHz; class-B operation; typical values.
—— T_{mb} = 25 °C; V_{CE} = 12.5 V;
– – – – T_a = 25 °C; V_{CE} = 12.5 V;
- - - - T_a = 25 °C; V_{CE} = 9.6 V

Fig.7 Load power as a function of source power.

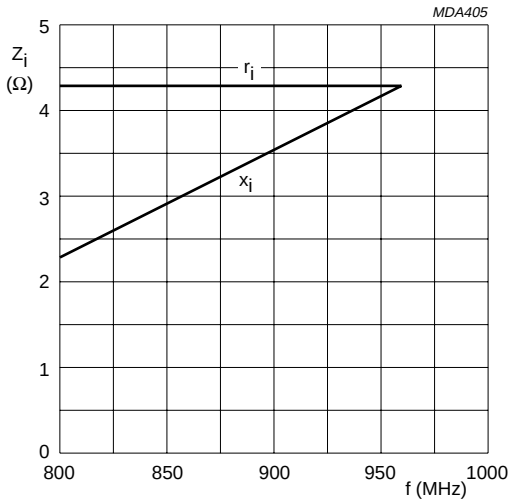


f = 900 MHz; class-B operation; typical values.
—— T_{mb} = 25 °C; V_{CE} = 12.5 V;
– – – – T_a = 25 °C; V_{CE} = 12.5 V;
- - - - T_a = 25 °C; V_{CE} = 9.6 V

Fig.8 Power gain and efficiency as a function of load power.

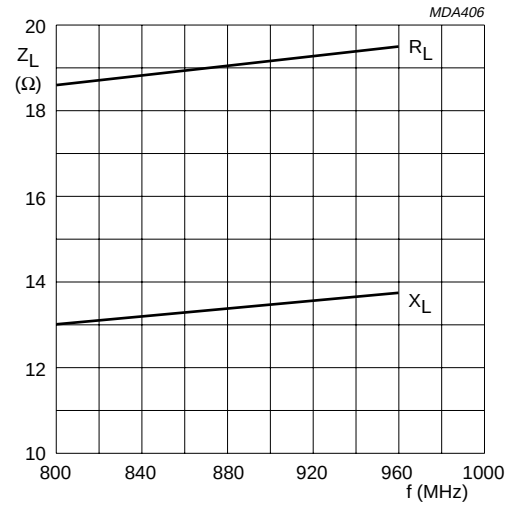
RUGGEDNESS

The device is capable to withstand a full load mismatch (VSWR = 50; all phases) at P_L = 1.5 W up to a supply voltage of 15.5 V at T_a = 25 °C. Device mounted on a printed-circuit board (see Fig.6).



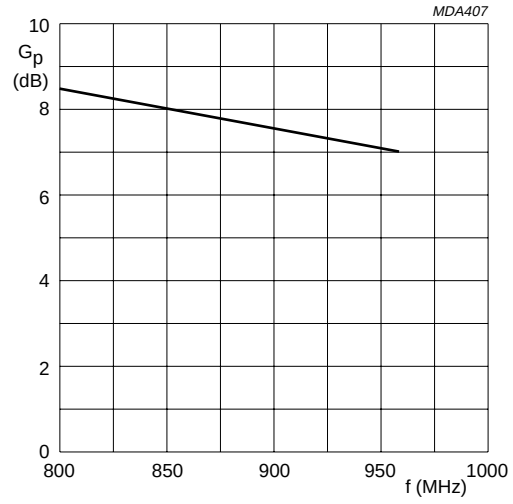
V_{CE} = 12.5 V; P_L = 2 W; f = 800 - 960 MHz; T_{mb} = 25 °C; class-B operation; typical values.

Fig.9 Input impedance (series components).



V_{CE} = 12.5 V; P_L = 2 W; f = 800 - 960 MHz; T_{mb} = 25 °C; class-B operation; typical values.

Fig.10 Load impedance (series components).

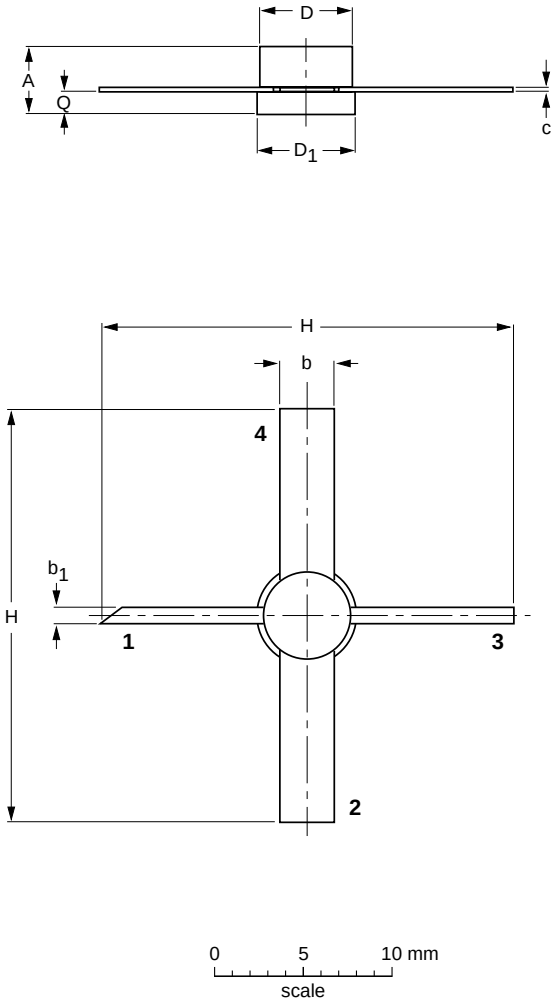


V_{CE} = 12.5 V; P_L = 2 W; f = 800 - 960 MHz; T_{mb} = 25 °C; class-B operation; typical values.

Fig.11 Power gain as a function of frequency.

PACKAGE OUTLINE

Studless ceramic package; 4 leads **SOT172D**



DIMENSIONS (millimetre dimensions are derived from the original inch dimensions)

UNIT	A	b	b_1	c	D	D_1	H	Q
mm	3.71 2.89	3.31 3.04	0.89 0.63	0.16 0.10	5.20 4.95	5.33 5.08	26.17 24.63	1.15 0.88
inches	0.146 0.114	0.13 0.12	0.035 0.025	0.006 0.004	0.205 0.195	0.210 0.200	1.03 0.97	0.045 0.035

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT172D						97-06-28

DEFINITIONS

Data Sheet Status	
Objective specification	This data sheet contains target or goal specifications for product development.
Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.
Limiting values	
Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.	
Application information	
Where application information is given, it is advisory and does not form part of the specification.	

LIFE SUPPORT APPLICATIONS

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