

# DATA SHEET

## **BLV45/12** VHF power transistor

Product specification

August 1986

# VHF power transistor

# BLV45/12

### DESCRIPTION

N-P-N silicon planar epitaxial transistor primarily intended for use in mobile radio transmitters in the 175 MHz communications band.

### FEATURES

- multi-base structure and emitter-ballasting resistors for an optimum temperature profile
- gold metallization ensures excellent reliability
- internal matching to achieve an optimum wideband capability and high power gain

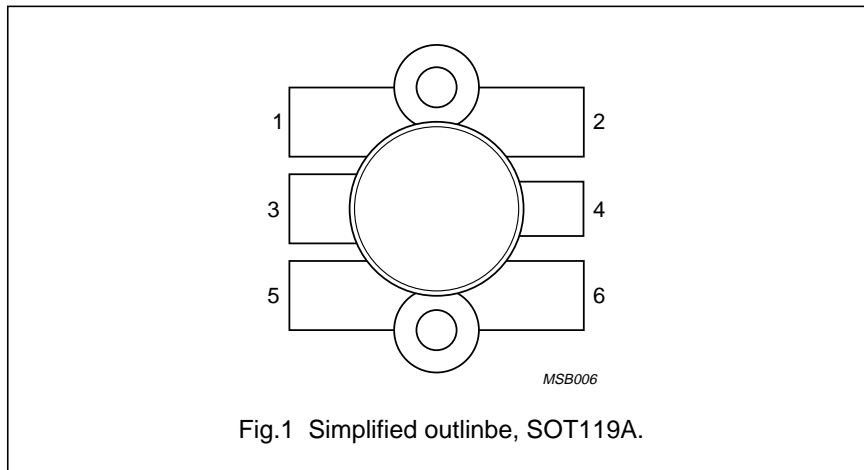
The transistor has a 6-lead flange envelope with a ceramic cap (SOT-119). All leads are isolated from the flange.

### QUICK REFERENCE DATA

R.F. performance up to  $T_h = 25\text{ }^\circ\text{C}$  in a common-emitter class-B circuit

MODE OF OPERATION	$V_{CE}$ V	f MHz	$P_L$ W	$G_p$ dB	$\eta_c$ %
narrow band; c.w.	12,5	175	45	> 6,5	> 55

### PIN CONFIGURATION



### PINNING

PIN	DESCRIPTION
1	emitter
2	emitter
3	base
4	collector
5	emitter
6	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.

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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 (open base)

$V_{CEO}$  max. 16,5 V

Emitter-base voltage (open collector)

$V_{EBO}$  max. 4 V

Collector current

d.c. or average

$I_C$  max. 9 A

peak value;  $f > 1$  MHz

$I_{CM}$  max. 27 A

Total power dissipation

at  $T_{mb} = 25$  °C;  $f > 1$  MHz

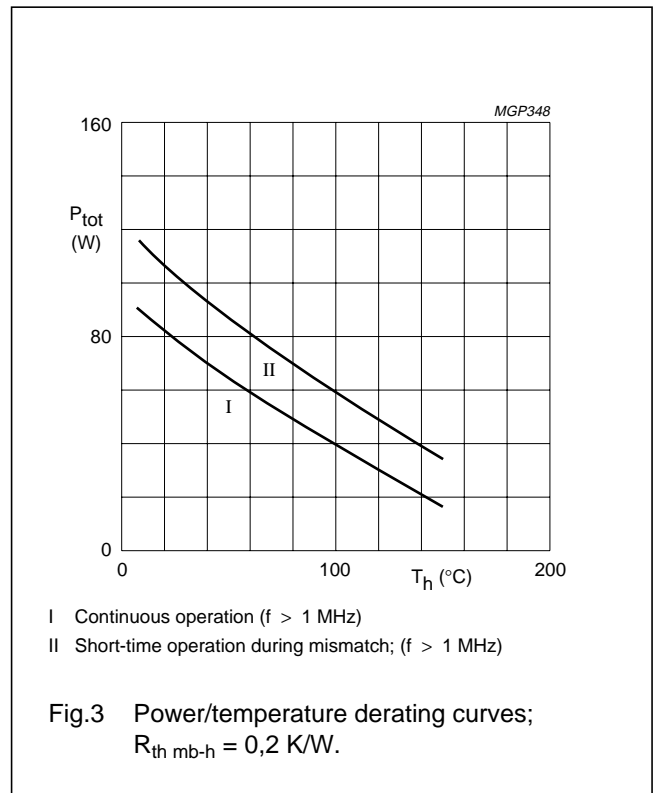
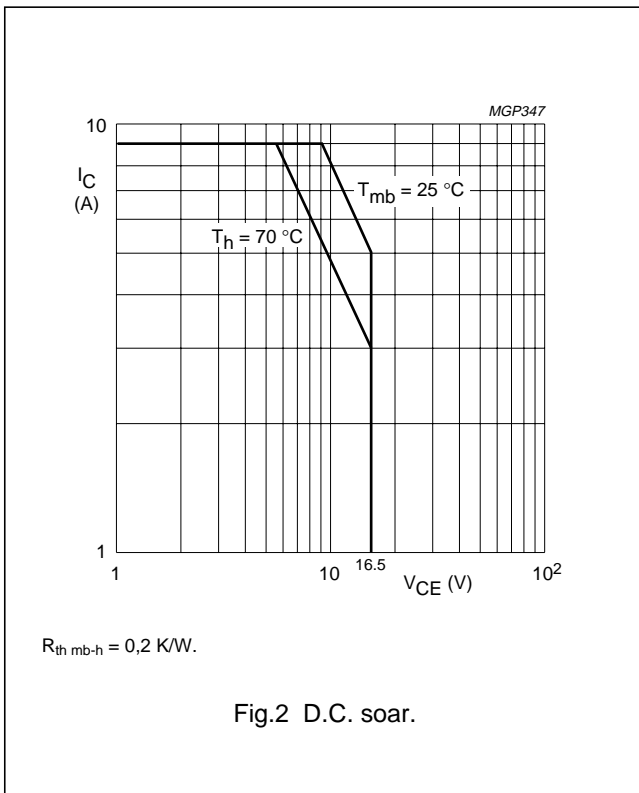
$P_{tot}$  max. 90 W

Storage temperature

$T_{stg}$  -65 to + 150 °C

Operating junction temperature

$T_j$  max. 200 °C



**THERMAL RESISTANCE**

Dissipation = 68 W;  $T_{mb} = 25$  °C

From junction to mounting base

(r.f. dissipation)

$R_{th\ j-mb} = 1,58$  K/W

From mounting base to heatsink

$R_{th\ mb-h} = 0,2$  K/W

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**CHARACTERISTICS**

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

Collector-base breakdown voltage

open emitter;  $I_C = 50\text{ mA}$

$$V_{(BR)CBO} > 36\text{ V}$$

Collector-emitter breakdown voltage

open base;  $I_C = 100\text{ mA}$

$$V_{(BR)CEO} > 16,5\text{ V}$$

Emitter-base breakdown voltage

open collector;  $I_E = 10\text{ mA}$

$$V_{(BR)EBO} > 4\text{ V}$$

Collector cut-off current

$V_{BE} = 0$ ;  $V_{CE} = 16\text{ V}$

$$I_{CES} < 22\text{ mA}$$

Second breakdown energy

$L = 25\text{ mH}$ ;  $f = 50\text{ Hz}$ ;  $R_{BE} = 10\text{ }\Omega$

$$E_{SBR} > 12,5\text{ mJ}$$

D.C. current gain

$V_{CE} = 10\text{ V}$ ;  $I_C = 6\text{ A}$

$$h_{FE} > \text{typ. } 55$$

Collector capacitance at  $f = 1\text{ MHz}$

$I_E = i_e = 0$ ;  $V_{CB} = 12,5\text{ V}$

$$C_c \text{ typ. } 130\text{ pF}$$

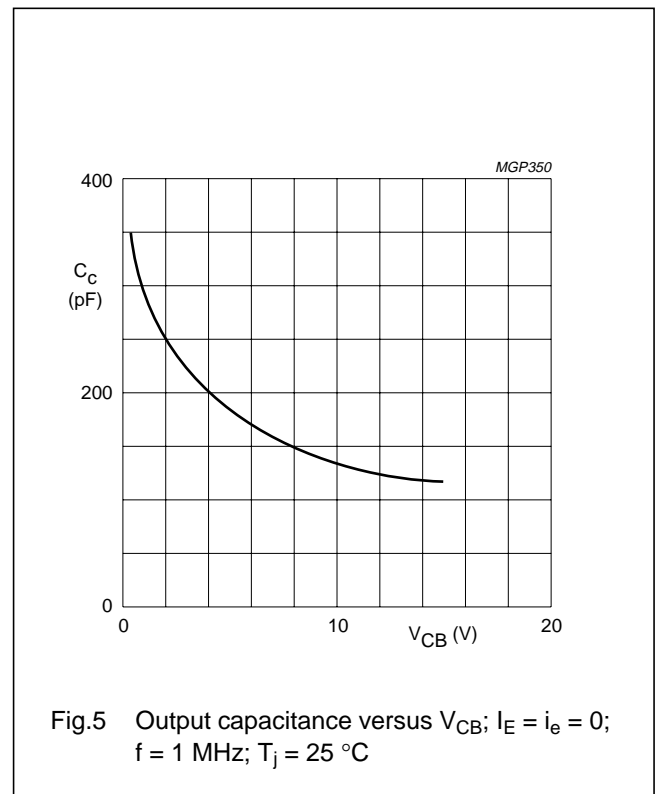
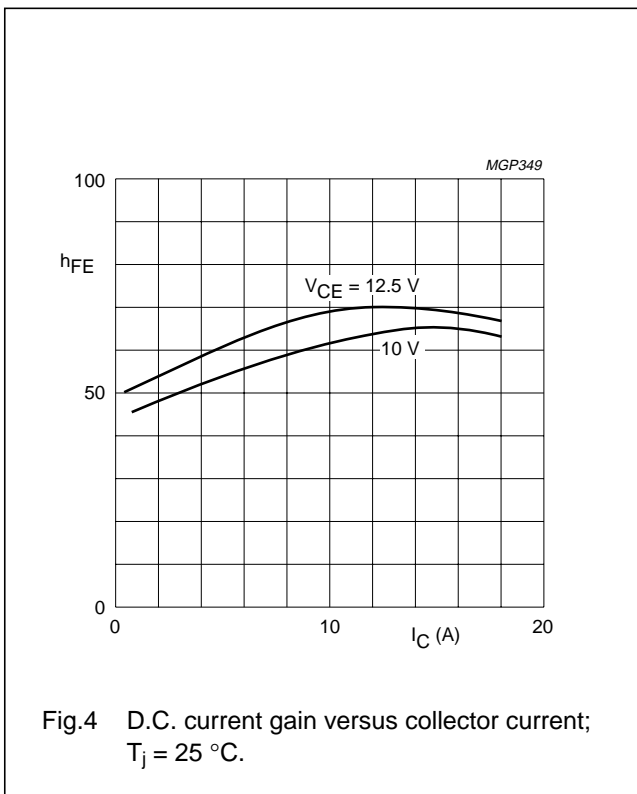
Collector-flange capacitance

$$C_{cf} \text{ typ. } 3\text{ pF}$$

Feedback capacitance at  $f = 1\text{ MHz}$

$I_C = 0$ ;  $V_{CE} = 12,5\text{ V}$

$$C_{re} \text{ typ. } 80\text{ pF}$$



## VHF power transistor

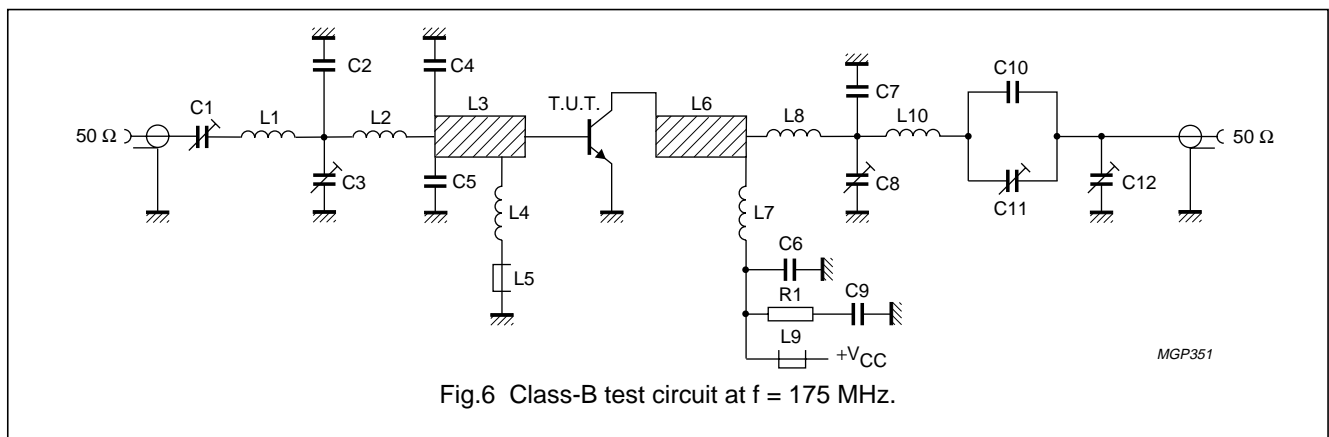
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## APPLICATION INFORMATION

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

 $f = 175 \text{ MHz}$ ;  $T_h = 25 \text{ }^\circ\text{C}$ ;  $R_{th \text{ mb-h}} = 0,2 \text{ K/W}$ 

MODE OF OPERATION	$V_{CE}$ V	$P_L$ W	$G_p$ dB	$\eta_c$ %
narrow band; c.w.	12,5	45	> 6,5 typ. 8,0	> 55 typ. 67

Fig.6 Class-B test circuit at  $f = 175 \text{ MHz}$ .

## List of components:

C1 = C11 = C12 = 4 to 40 pF film dielectric trimmer (cat.no. 2222 809 07008)

C2 = C10 = 10 pF multilayer ceramic chip capacitor <sup>(1)</sup>

C3 = 2,5 to 20 pF film dielectric trimmer (cat. no. 2222 809 07004)

C4 = C5 = 91 pF multilayer ceramic chip capacitor <sup>(1)</sup>C6 = 820 pF multilayer ceramic chip capacitor <sup>(1)</sup>C7 = C8 =  $2 \times 4,7 \text{ pF}$  multilayer ceramic chip capacitors<sup>(1)</sup> in parallel

C9 = 100 nF polyester capacitor

L1 = strip, 28 mm  $\times$  4 mmL2 = 4 turns Cu wire (1,0 mm); int.dia. 4,0 mm; length 7,5 mm; leads  $2 \times 3,5 \text{ mm}$ L3 = strip, 22 mm  $\times$  6 mmL4 = 1 turn Cu wire (0,8 mm); int.dia. 3,0 mm; leads  $2 \times 9 \text{ mm}$ 

L5 = L9 = Ferroxcube wideband h.f. choke, grade 3B (cat. no. 4312 020 36640)

L6 = strip, 12 mm  $\times$  6 mmL7 = 2 turns enamelled Cu wire (1,6 mm); int.dia. 5,0 mm; length 7,0 mm; leads  $2 \times 5 \text{ mm}$ L8 = 2 turns enamelled Cu wire (1,6 mm); int.dia. 5,0 mm; length 7,0 mm; leads  $2 \times 3 \text{ mm}$ L10 = strip, 18 mm  $\times$  4 mm

L1, L3, L6 and L10 are strips on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric, thickness 1/16 inch.

R1 =  $4,7 \text{ } \Omega \pm 10\%$ , carbon resistor

## Note

1. American Technical Ceramics capacitor type 100B or capacitor of same quality.

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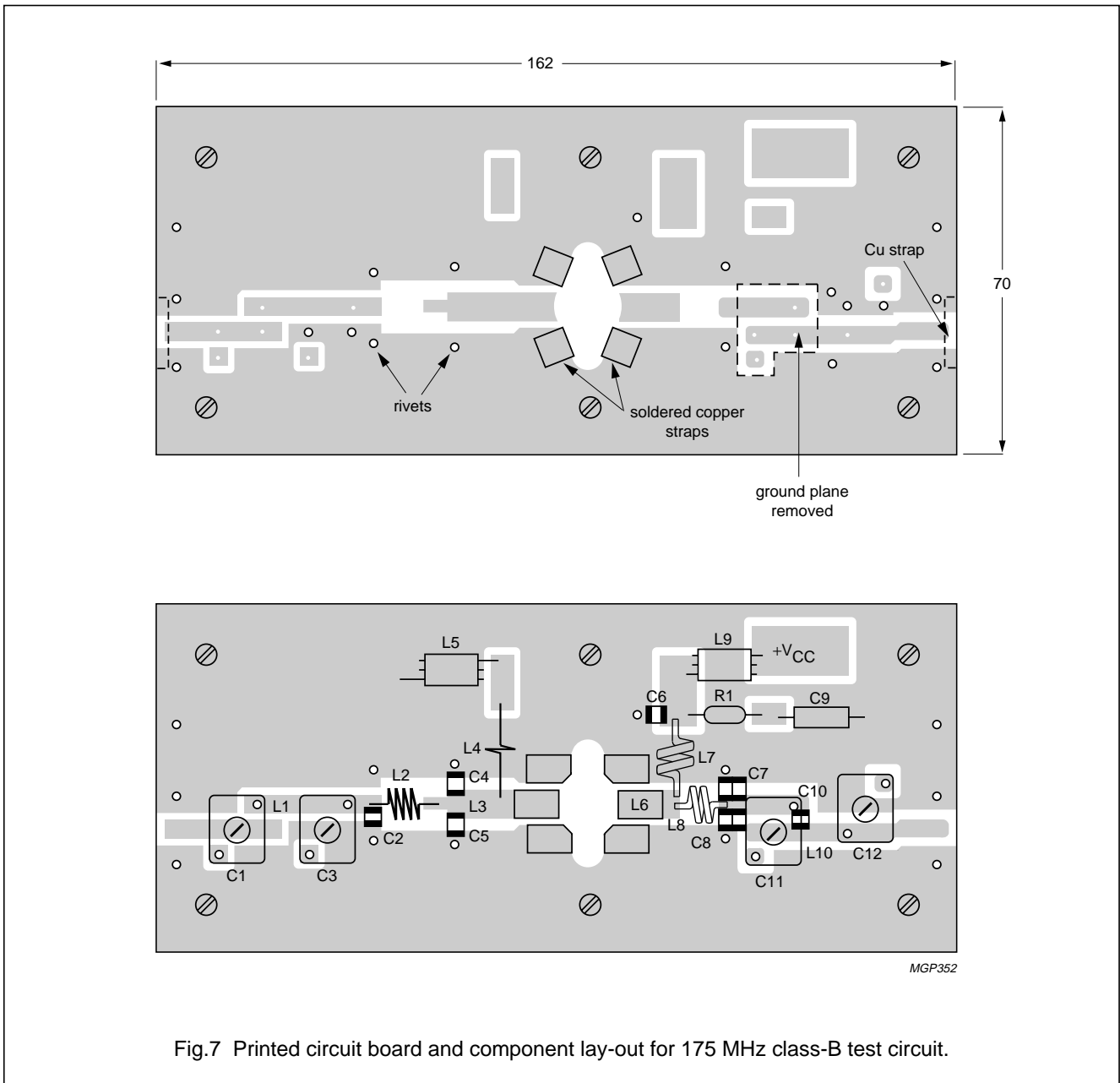


Fig.7 Printed circuit board and component lay-out for 175 MHz class-B test circuit.

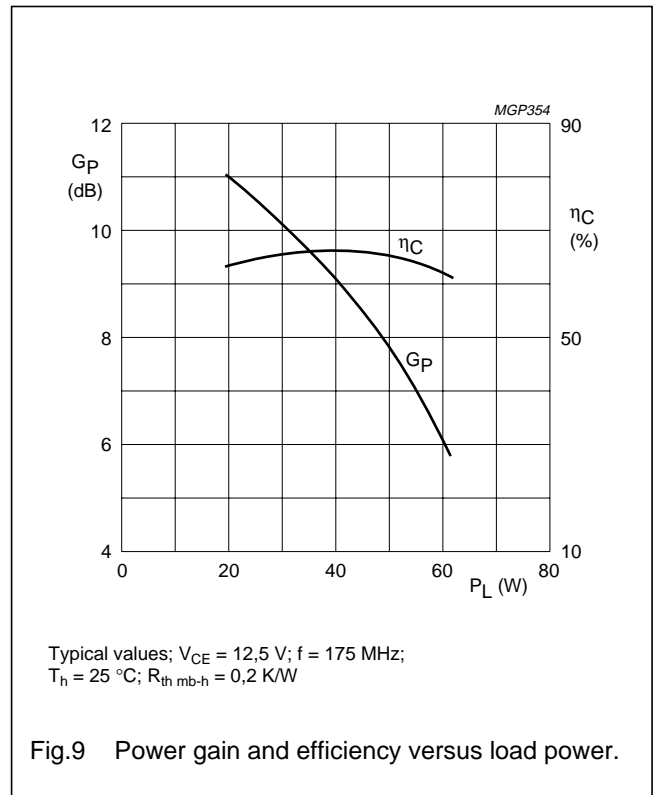
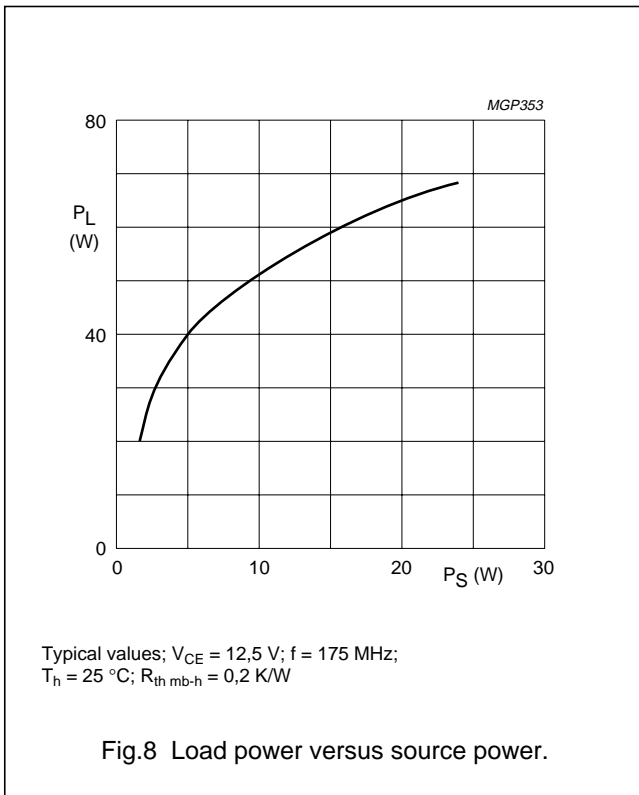
The circuit and components are on one side of the epoxy fibre-glass board. The other side, except for the area indicated by the dotted line, is unetched copper serving as a ground plane.

If the p.c.b. is in direct contact with the heatsink, the heatsink area within the dotted line has to be raised at least 0,5 mm to minimize the dielectric losses.

Earth connections are made by hollow rivets and additionally by fixing screws and copper straps under the emitters to provide a direct contact between the copper of the component side and the ground plane.

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**Ruggedness in class-B operation**

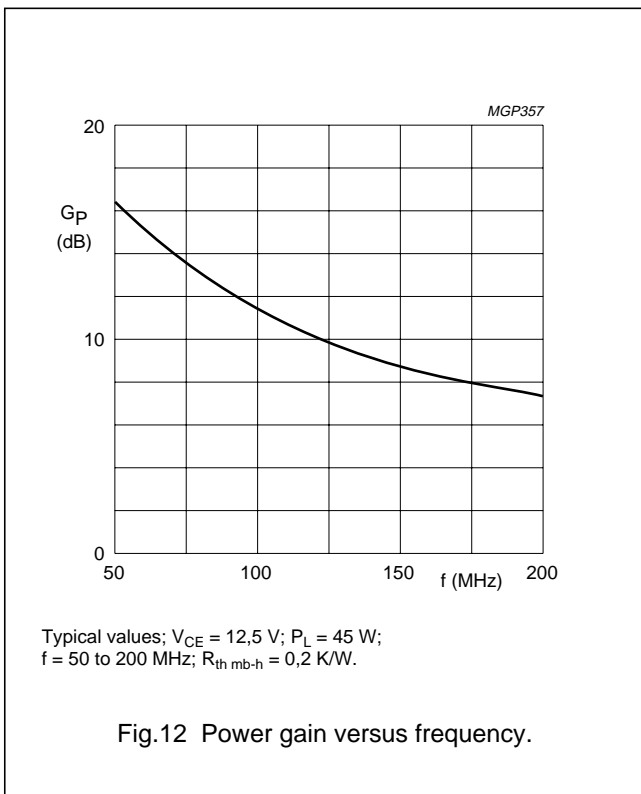
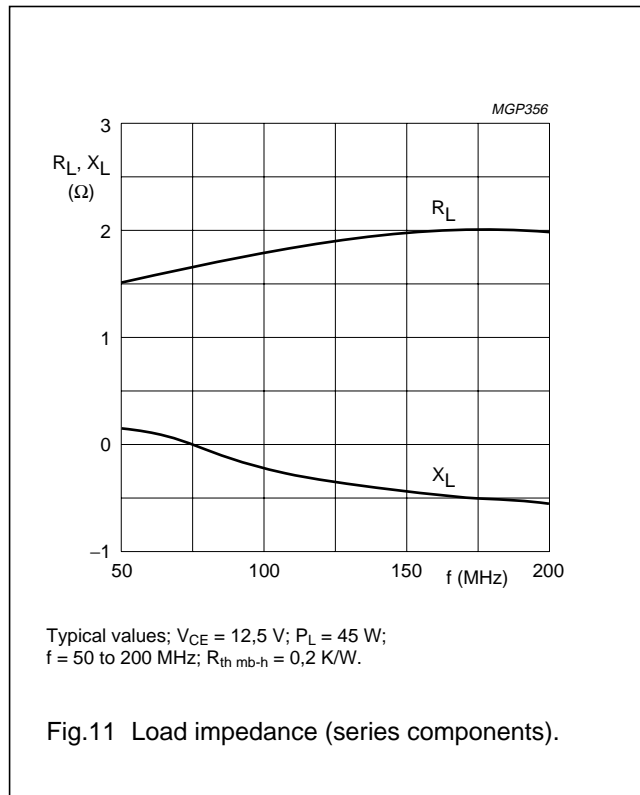
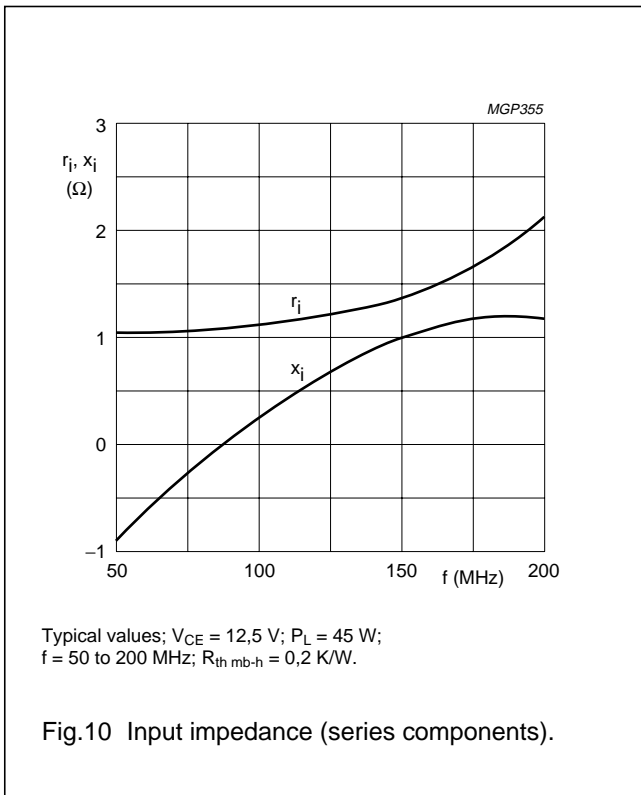
The BLV45/12 is capable of withstanding a load mismatch (VSWR = 20 through all phases) at rated load power up to a supply voltage of 15,5 V;  $T_h = 25 \text{ }^\circ\text{C}$ ;  $R_{th\ mb-h} = 0,2 \text{ K/W}$ .

**Power slump**

If  $T_h$  is increased from 25 °C to 70 °C the output power slump for constant  $P_S$  amounts to typ. 7 % ( $V_{CE} = 12,5 \text{ V}$ ;  $f = 175 \text{ MHz}$ ;  $R_{th\ mb-h} = 0,2 \text{ K/W}$ ).

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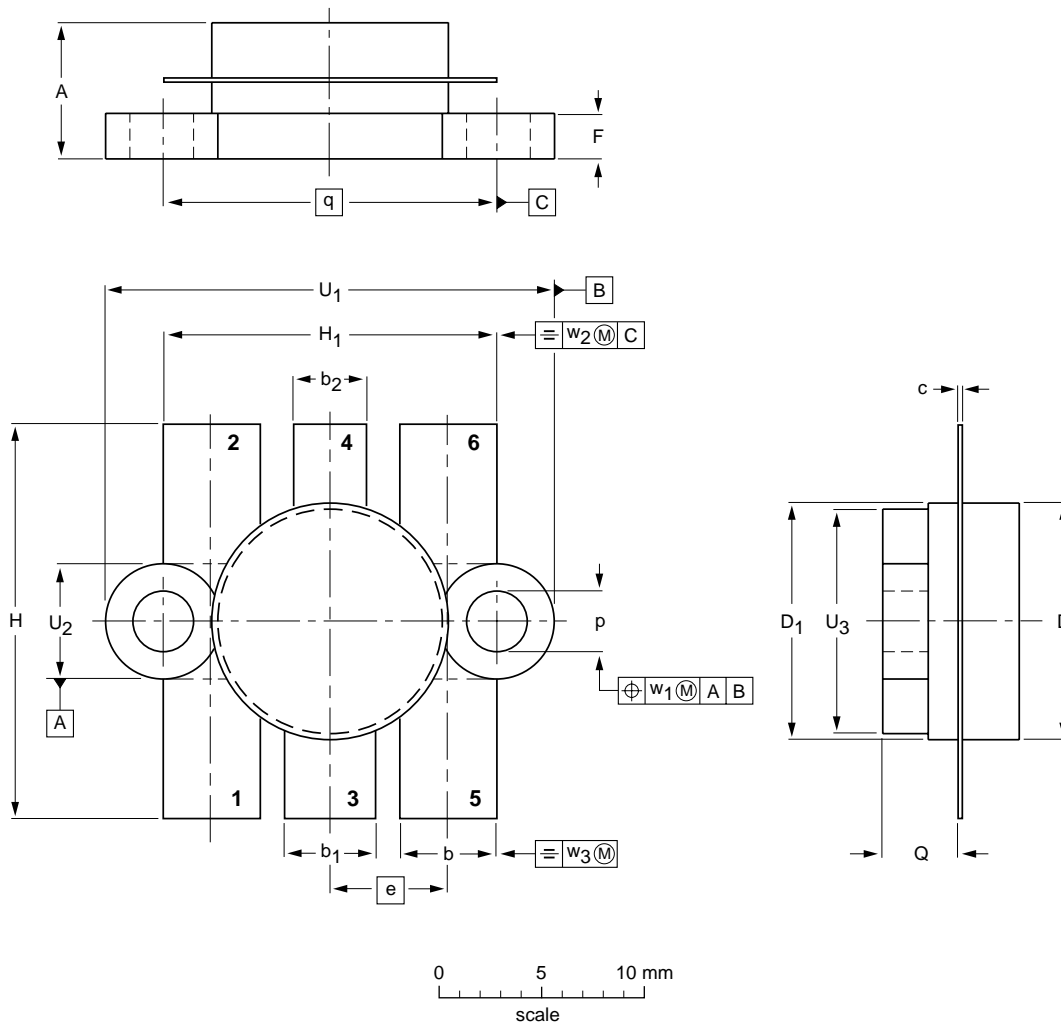
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PACKAGE OUTLINE

Flanged ceramic package; 2 mounting holes; 6 leads

SOT119A



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

UNIT	A	b	b <sub>1</sub>	b <sub>2</sub>	c	D	D <sub>1</sub>	e	F	H	H <sub>1</sub>	p	Q	q	U <sub>1</sub>	U <sub>2</sub>	U <sub>3</sub>	w <sub>1</sub>	w <sub>2</sub>	w <sub>3</sub>
mm	7.39 6.32	5.59 5.33	5.34 5.08	4.07 3.81	0.18 0.07	12.86 12.59	12.83 12.57	6.48	2.54 2.28	22.10 21.08	18.55 18.28	3.31 2.97	4.58 3.98	18.42	25.23 23.95	6.48 6.07	12.76 12.06	0.51	1.02	0.26
inches	0.291 0.249	0.220 0.210	0.210 0.200	0.160 0.150	0.007 0.003	0.505 0.496	0.505 0.495	0.255	0.100 0.090	0.870 0.830	0.730 0.720	0.130 0.117	0.180 0.157	0.725	0.993 0.943	0.255 0.239	0.502 0.475	0.02	0.04	0.01

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT119A						97-06-28

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**DEFINITIONS**

<b>Data Sheet Status</b>	
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.
<b>Limiting values</b>	
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.	
<b>Application information</b>	
Where application information is given, it is advisory and does not form part of the specification.	

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