DATA SHEET

BLV75/12
VHF power transistor

Product specification

August 1986

Philips
Semiconductors

PHILIPS

VHF power transistor BLV75/12

DESCRIPTION

N-P-N silicon planar epitaxial transistor primarily intended for use in mobile radio transmitters in the 175 MHz commmunications 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 °C in a common-emitter class-B circuit

MODE OF OPERATION	V_{CE} V	f MHz	P_L W	G_p dB	η_C %
narrow band; c.w.	12,5	175	75	> 6,5	> 55

PIN CONFIGURATION

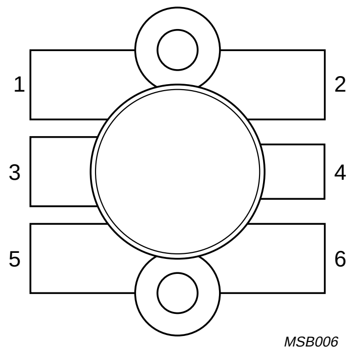


Fig.1 Simplified outlinbe, SOT119A.

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.

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.	15	A
peak value; f > 1 MHz	I_{CM}	max.	45	A
Total power dissipation				
at T_{mb} = 25 °C; f > 1 MHz	P_{tot}	max.	150	W
Storage temperature	T_{stg}	–65 to + 150		°C
Operating junction temperature	T_j	max.	200	°C

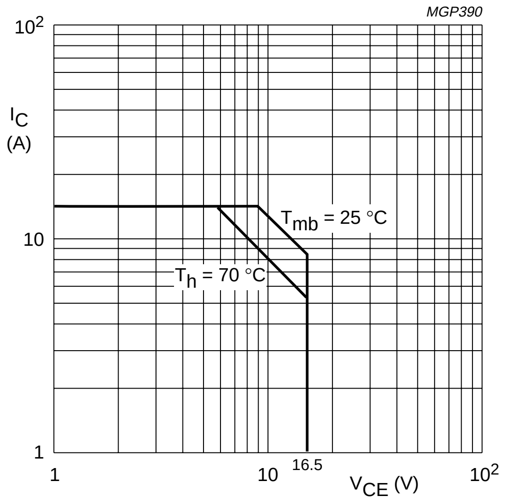
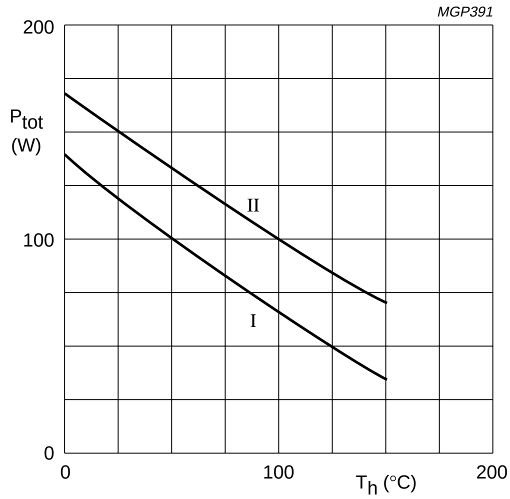


Fig.2 D.C. soar. $R_{th\ mb-h}$ = 0,2 K/W.



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

Fig.3 Power/temperature derating curves; $R_{th\ mb-h}$ = 0,2 K/W.

THERMAL RESISTANCE

Dissipation = 96 W; T_{mb} = 25 °C

From junction to mounting base (r.f. operation)	$R_{th\ j-mb}$	=	1,05	K/W
From mounting base to heatsink	$R_{th\ mb-h}$	=	0,2	K/W

CHARACTERISTICS

T_j = 25°C unless otherwise specified

Collector-base breakdown voltage				
open emitter; I_C = 100 mA	$V_{(BR)CBO}$	min.	36	V
Collector-emitter breakdown voltage				
open base; I_C = 200 mA	$V_{(BR)CEO}$	min.	16,5	V
Emitter-base breakdown voltage				
open collector; I_E = 20 mA	$V_{(BR)EBO}$	min.	4	V
Collector cut-off current				
V_{BE} = 0; V_{CE} = 16 V	I_{CES}	max.	44	mA
Second breakdown energy				
L = 25 mH; f = 50 Hz; R_{BE} = 10 Ω	E_{SBR}	min.	20	mJ
D.C. current gain				
V_{CE} = 10 V; I_C = 10 A	h_{FE}	min. typ.	15 55	
Collector capacitance at f = 1 MHz				
$I_E = i_e$ = 0; V_{CB} = 12,5 V	C_c	typ.	240	pF
Feedback capacitance at f = 1 MHz				
I_C = 0; V_{CE} = 12,5 V	C_{re}	typ.	150	pF
Collector-flange capacitance	C_{cf}	typ.	3	pF

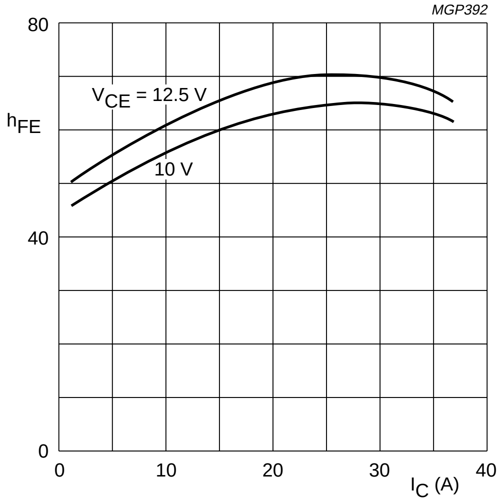


Fig.4 D.C. current gain versus collector current; T_j = 25 °C.

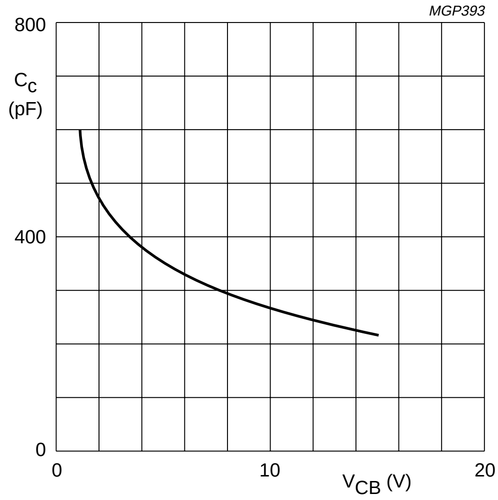


Fig.5 Output capacitance versus V_{CB}; $I_E = i_e = 0$; f = 1 MHz; T_j = 25 °C.

APPLICATION

R. F. performance in c.w. operation (common-emitter circuit; class-B)
f = 175 MHz; T_h = 25 °C; $R_{th\ mb-h}$ = 0,2 K/W

MODE OF OPERATION	V_{CE} V	P_L W	G_p dB	η_C %
narrow band; c.w.	12,5	75	> 6,5 typ. 7,5	> 55 typ. 63

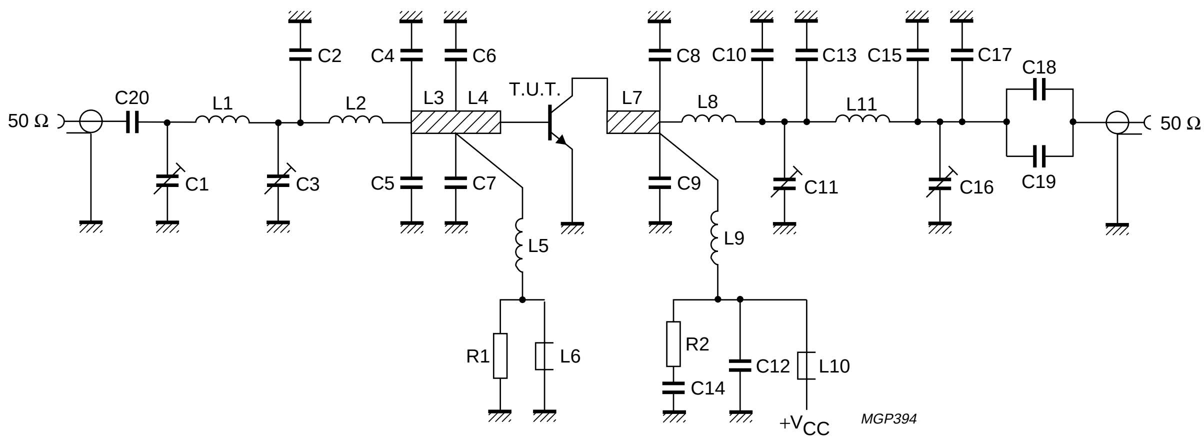


Fig.6 Class-B test circuit at f = 175 MHz.

List of components:

C1	=	5 to 60 pF film dielectric trimmer (cat. no. 2222 809 07011)
C2	=	10 pF multilayer ceramic chip capacitor(1)
C3	=	C16 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 07008)
C4	=	C5 = 75 pF multilayer ceramic chip capacitor
C6	=	C7 = 100 pF multilayer ceramic chip capacitor(1)
C8	=	C9 = 2 × 75 pF multilayer ceramic chip capacitors(1) in parallel
C10	=	C13 = 39 pF multilayer ceramic chip capacitor(1)
C11	=	2,5 to 20 pF film dielectric trimmer (cat. no. 2222 809 07004)
C12	=	2 × 820 pF multilayer ceramic chip capacitors in parallel(1)
C14	=	100 nF polyester capacitor
C15	=	C17 = 12 pF multilayer ceramic chip capacitor(1)
C18	=	C19 = 470 pF multilayer ceramic chip capacitor(1)
C20	=	820 pF multilayer ceramic chip capacitor(1)
L1	=	1 turn silver-plated Cu-wire (2,0 mm); int. dia. 10 mm; leads 2 × 4 mm
L2	=	1 turn silver-plated Cu-wire (2,0 mm); int. dia. 1 mm; leads 2 × 6 mm
L3	=	strip (14 mm × 6 mm)
L4	=	strip (8 mm × 6 mm)
L5	=	100 nH, 7 turns closely wound enamelled Cu-wire (0,5 mm); int. dia. 3 mm; leads 2 × 7 mm
L6	=	Ferroxcube wideband h.f. choke, grade 3B (cat. no. 4312 020 36640)
L7	=	strip (12 mm × 6 mm)
L8	=	silver-plated copper U-shaped inductance (7 + 15 + 7) mm × 4 mm × 0,5 mm
L9	=	silver-plated copper U-shaped inductance (8 + 8,5 + 6) mm × 4 mm × 0,5 mm
L10	=	modified Ferroxcube wideband h.f. choke, grade 3B (cat. no. 4312 020 36640) with 3 parallel connected Cu wires (0,8 mm)
L11	=	2 turns silver-plated Cu-wire (2,0 mm); int. dia. 9 mm; length 7,5 mm; leads 2 × 3,5 mm

L3, L4 and L7 are strips on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric (ε_r = 4,5), thickness 1/16 inch).

R1	=	10 Ω ± 10%, carbon resistor
R2	=	4,7 Ω ± 10%, carbon resistor

Note

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

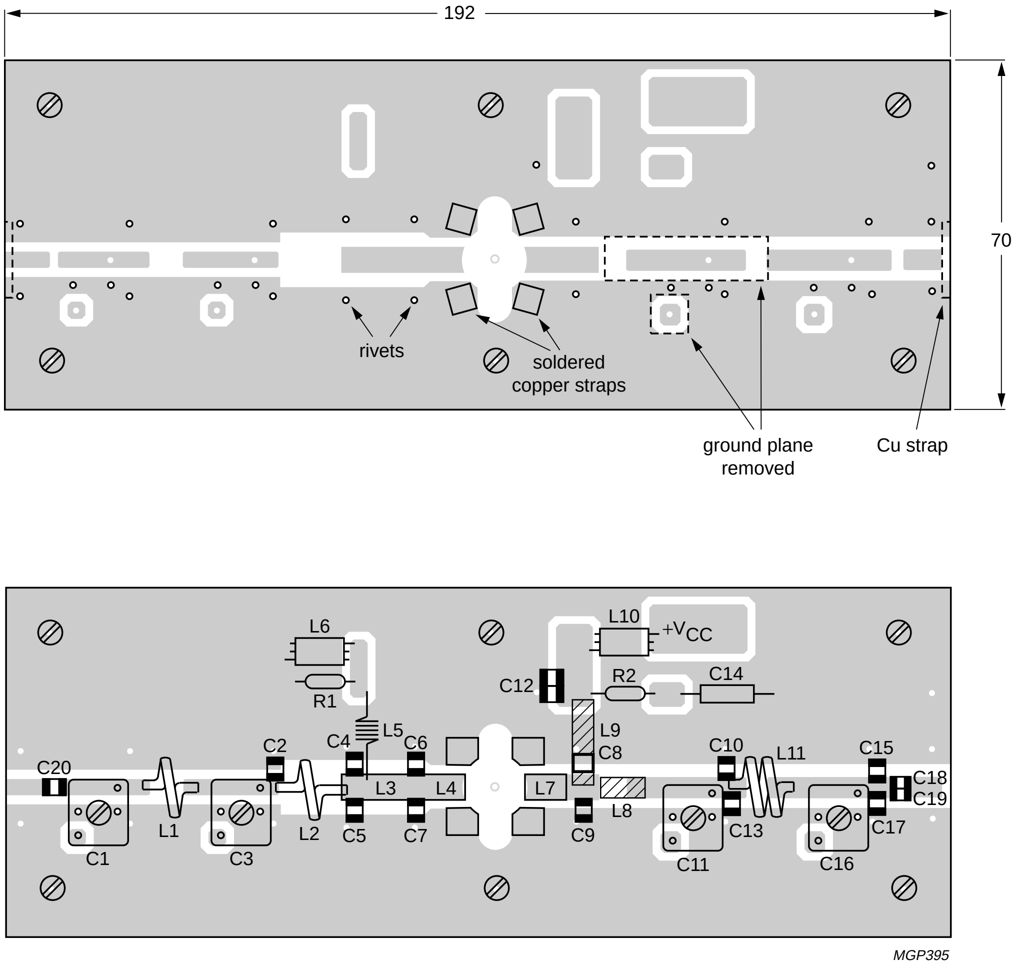
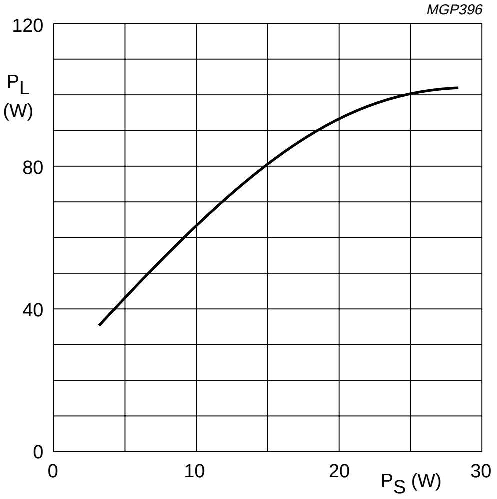


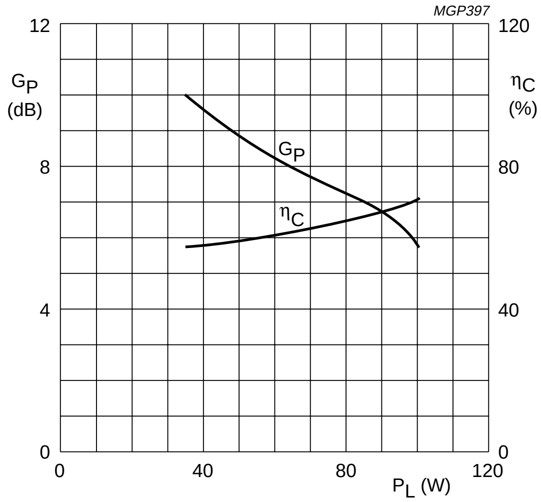
Fig.7 Printed circuit board and component lay-out for 175 MHz class-B test circuit.

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 al 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.



Typical values; V_{CE} = 12,5 V; f = 175 MHz;
T_h = 25 °C; $R_{th\ mb\text{-}h}$ = 0,2 K/W

Fig.8 Load power versus source power.



Typical values; V_{CE} = 12,5 V; f = 175 MHz;
T_h = 25 °C; $R_{th\ mb\text{-}h}$ = 0,2 K/W

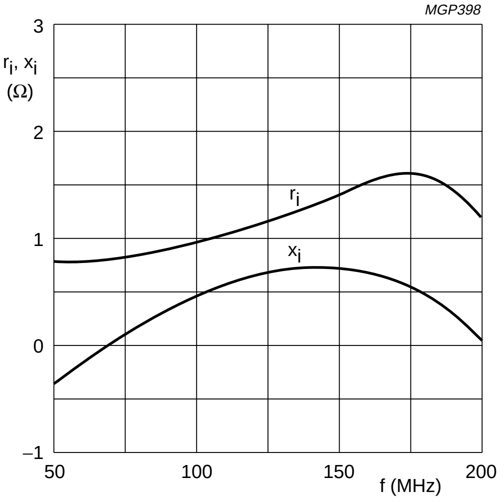
Fig.9 Power gain and efficiency versus load power.

Ruggedness in class-B operation

The BLV75/12 is capable of withstanding a load mismatch (VSWR = 20 through all phases) at rated load power up to a supply voltage of 12,5 V; T_h = 25 °C; $R_{th\ mb\text{-}h}$ = 0,2 K/W.

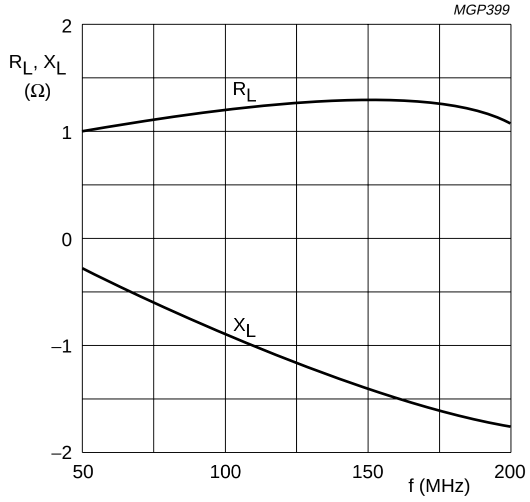
Power slump

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; f = 175 MHz; $R_{th\ mb\text{-}h}$ = 0,2 K/W).



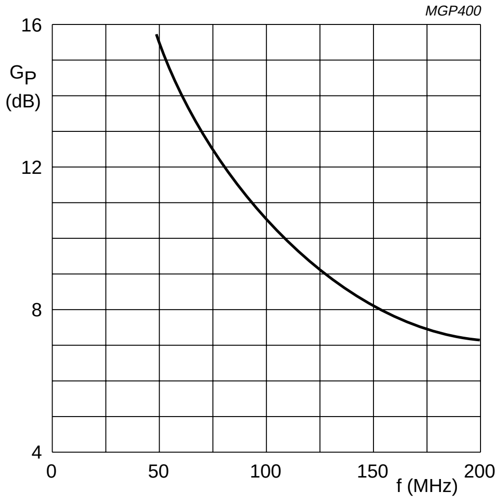
Typical values; V_{CE} = 12,5 V; P_L = 75 W; f = 50 to 200 MHz; class-B operation; $R_{th\ mb\text{-}h}$ = 0,2 K/W

Fig.10 Input impedance (series components).



Typical values; V_{CE} = 12,5 V; P_L = 75 W; f = 50 to 200 MHz; class-B operation; $R_{th\ mb\text{-}h}$ = 0,2 K/W

Fig.11 Load impedance (series components).

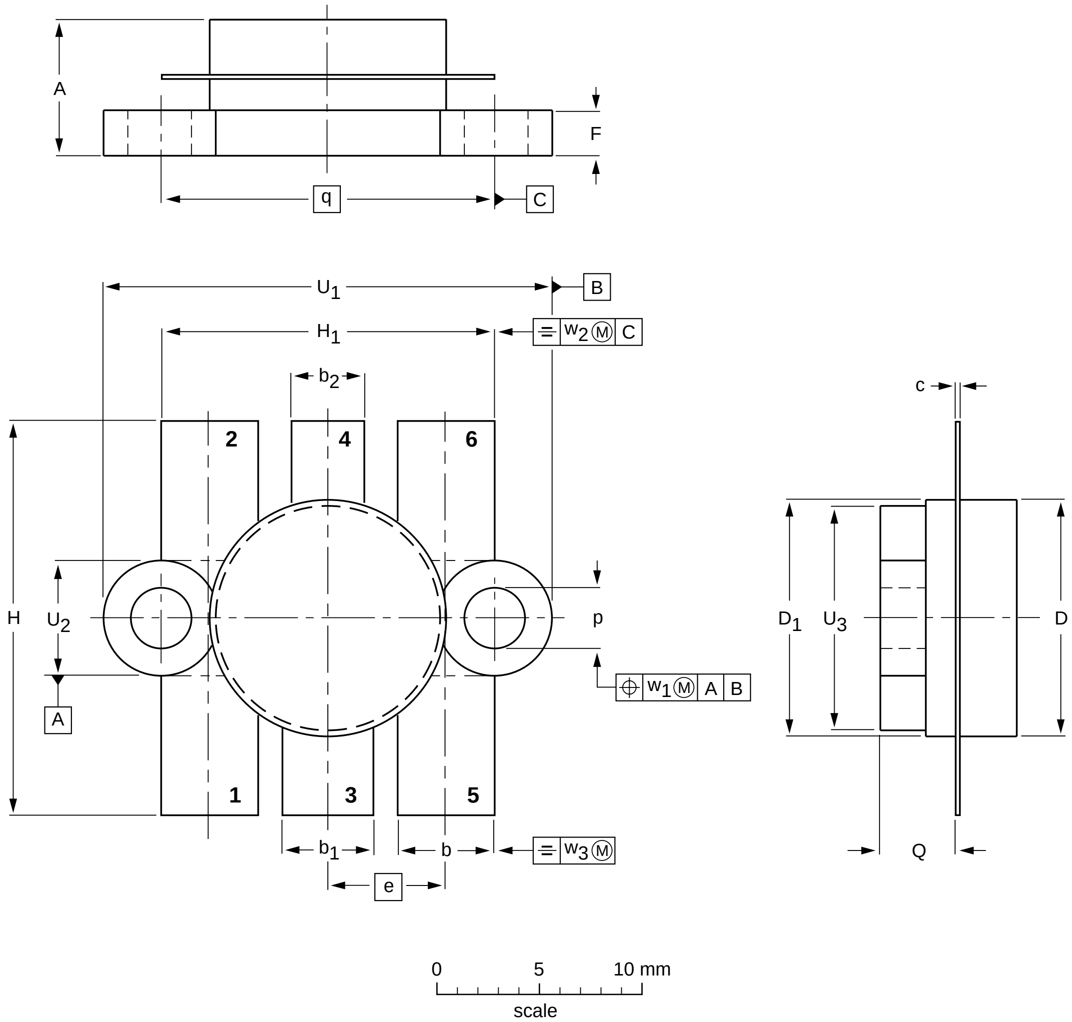


Typical values; V_{CE} = 12,5 V; P_L = 75 W; f = 50 to 200 MHz; class-B operation; $R_{th\ mb\text{-}h}$ = 0,2 K/W

Fig.12 Power gain versus frequency.

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_1	b_2	c	D	D_1	e	F	H	H_1	p	Q	q	U_1	U_2	U_3	w_1	w_2	w_3
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

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

These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips for any damages resulting from such improper use or sale.