DATA SHEET

BLV12

VHF power transistor

Product specification

September 1991

Philips
Semiconductors

PHILIPS

FEATURES

- Emitter-ballasting resistors for an optimum temperature profile
- Excellent reliability
- Withstands full load mismatch.

DESCRIPTION

NPN silicon planar epitaxial transistor encapsulated in a 4-lead SOT123 flange envelope with a ceramic cap. It is designed for common emitter, class-B operation in mobile VHF transmitters with a supply voltage of 12.5 V. All leads are isolated from the mounting flange.

PINNING - SOT123

PIN	DESCRIPTION
1	collector
2	emitter
3	base
4	emitter

QUICK REFERENCE DATA

RF performance at T_{mb} = 25 °C in a common emitter test circuit.

MODE OF OPERATION	f (MHz)	V_{CE} (V)	P_L (W)	G_P (dB)	η_C (%)
c.w. class-B	175	12.5	30	> 9	> 60

WARNING

Product and environmental safety - toxic materials

This product contains beryllium oxide. The product is entirely safe provided that the BeO disc is not damaged. All persons who handle, use or dispose of this product should be aware of its nature and of the necessary safety precautions. After use, dispose of as chemical or special waste according to the regulations applying at the location of the user. It must never be thrown out with the general or domestic waste.

PIN CONFIGURATION

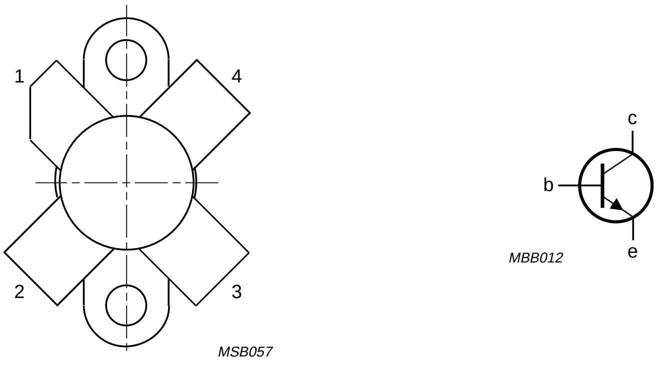
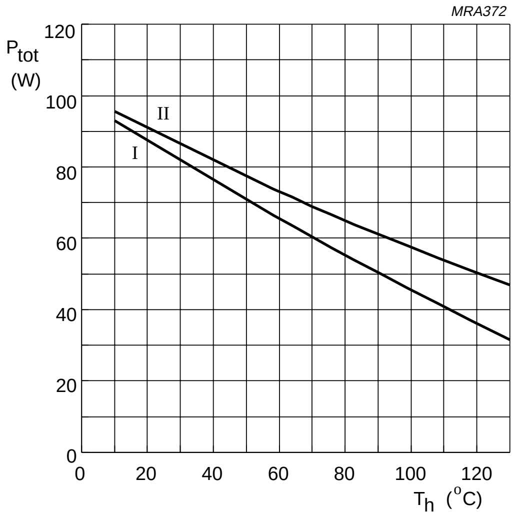


Fig.1 Simplified outline and symbol.

LIMITING VALUES

In accordance with the Absolute Maximum System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	–	36	V
V_{CEO}	collector-emitter voltage	open base	–	16	V
V_{EBO}	emitter-base voltage	open collector	–	3	V
I_C, $I_{C(AV)}$	collector current	DC or average value	–	6	A
I_{CM}	collector current	peak value f > 1 MHz	–	18	A
P_{tot}	total power dissipation	RF operation; f > 1 MHz; T_{mb} = 25 °C	–	100	W
T_{stg}	storage temperature range		–65	150	°C
T_j	junction operating temperature		–	200	°C



(I) Continuous DC operation.

(II) Short time operation during mismatch (f > 1 MHz)

Fig.2 Power/temperature derating curve.

THERMAL RESISTANCE

SYMBOL	PARAMETER	CONDITIONS	MAX.	UNIT
$R_{th\ j\text{-}mb(RF)}$	from junction to mounting base	P_{tot} = 100 W; T_{mb} = 25 °C	1.75	K/W
$R_{th\ mb\text{-}h}$	from mounting base to heatsink		0.3	K/W

CHARACTERISTICS

$T_j = 25$ °C.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)CBO}$	collector-base breakdown voltage	open emitter; $I_c = 10$ mA	36	–	–	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	open base; $I_c = 25$ mA	16	–	–	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	open collector; $I_E = 2$ mA	3	–	–	V
I_{CES}	collector-emitter leakage current	$V_{BE} = 0$; $V_{CE} = 16$ V	–	–	10	mA
h_{FE}	DC current gain	$V_{CE} = 5$ V; $I_C = 4$ A	25	35	–	
f_T	transition frequency	$V_{CE} = 12.5$ V; $I_E = 4$ A; f = 500 MHz	–	1.6	–	GHz
C_c	collector capacitance	$V_{CB} = 12.5$ V; $I_E = I_e = 0$; f = 1 MHz	–	90	100	pF
C_{re}	feedback capacitance	$V_{CE} = 12.5$ V; $I_C = 0$; f = 1 MHz	–	60	70	pF
$C_{c\text{-}f}$	collector-flange capacitance	f = 1 MHz	–	2	–	pF

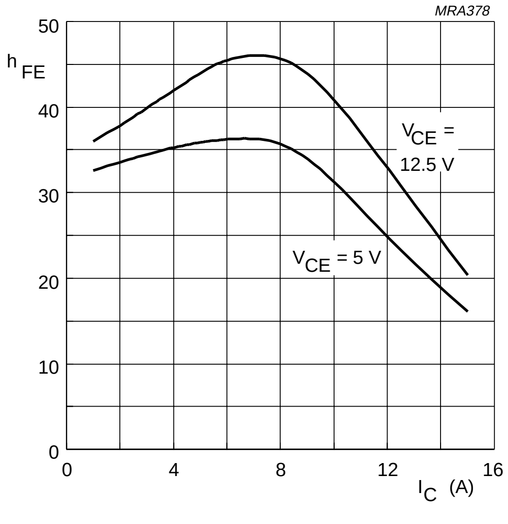
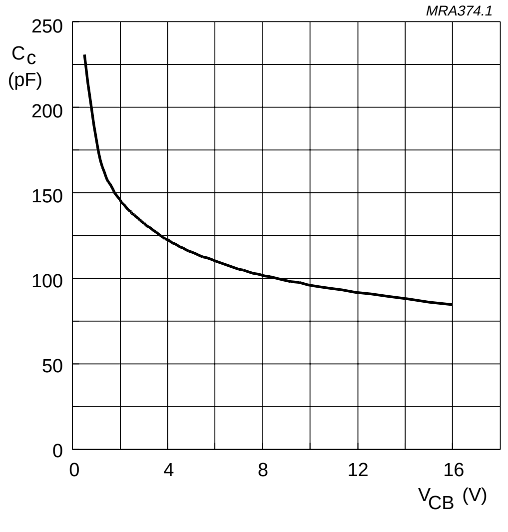
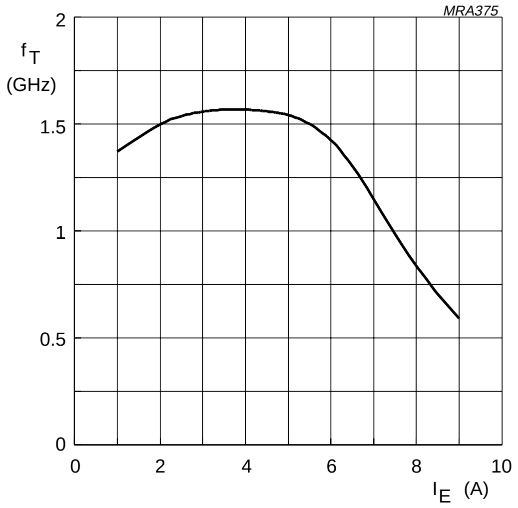


Fig.3 DC current gain as a function of collector current, typical values.



$I_E = i_e = 0$; f = 1 MHz.

Fig.4 Collector capacitance as a function of collector-base voltage, typical values.



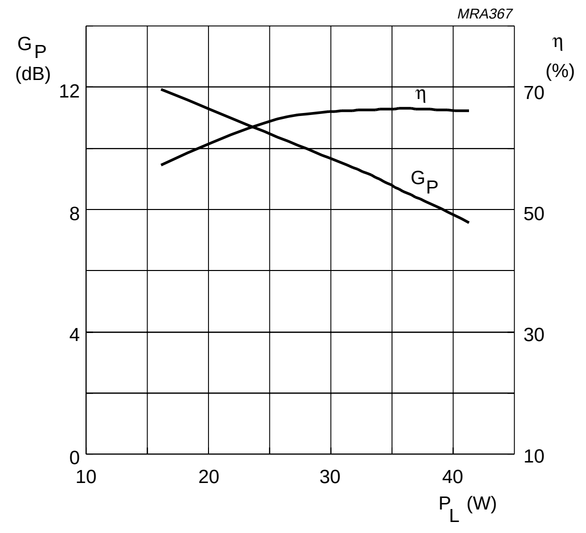
V_{CB} = 12.5 V.

Fig.5 Transition frequency as a function of emitter current, typical values.

APPLICATION INFORMATION

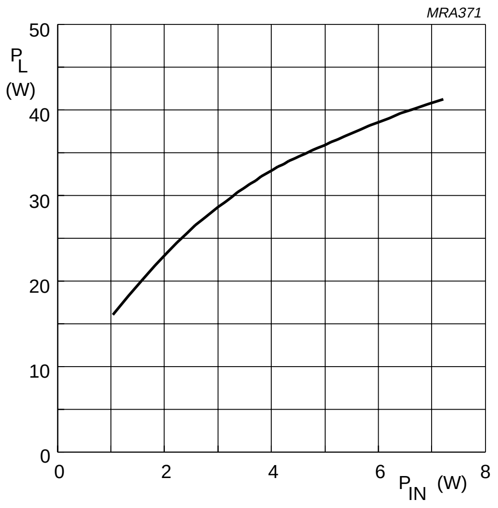
RF performance at T_{mb} = 25 °C in a common emitter test circuit.

MODE OF OPERATION	f (MHz)	V_{CE} (V)	P_L (W)	G_P (dB)	η_C (%)
c.w. class-B	175	12.5	30	> 9 typ. 9.8	> 60 typ. 66



Class-B operation; V_{CE} = 12.5 V; f = 175 MHz.

Fig.6 Gain and efficiency as functions of load power, typical values.



Class-B operation; V_{CE} = 12.5 V; f = 175 MHz.

Fig.7 Load power as a function of drive power, typical values.

Ruggedness in class-B operation

The BLV12 is capable of withstanding a full load mismatch corresponding to VSWR = 50:1 through all phases at rated output power, up to a supply voltage of 15.5 V, and f = 175 MHz.

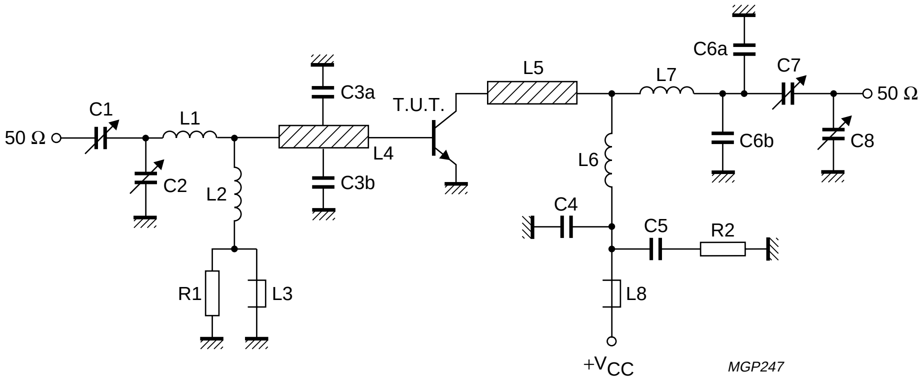


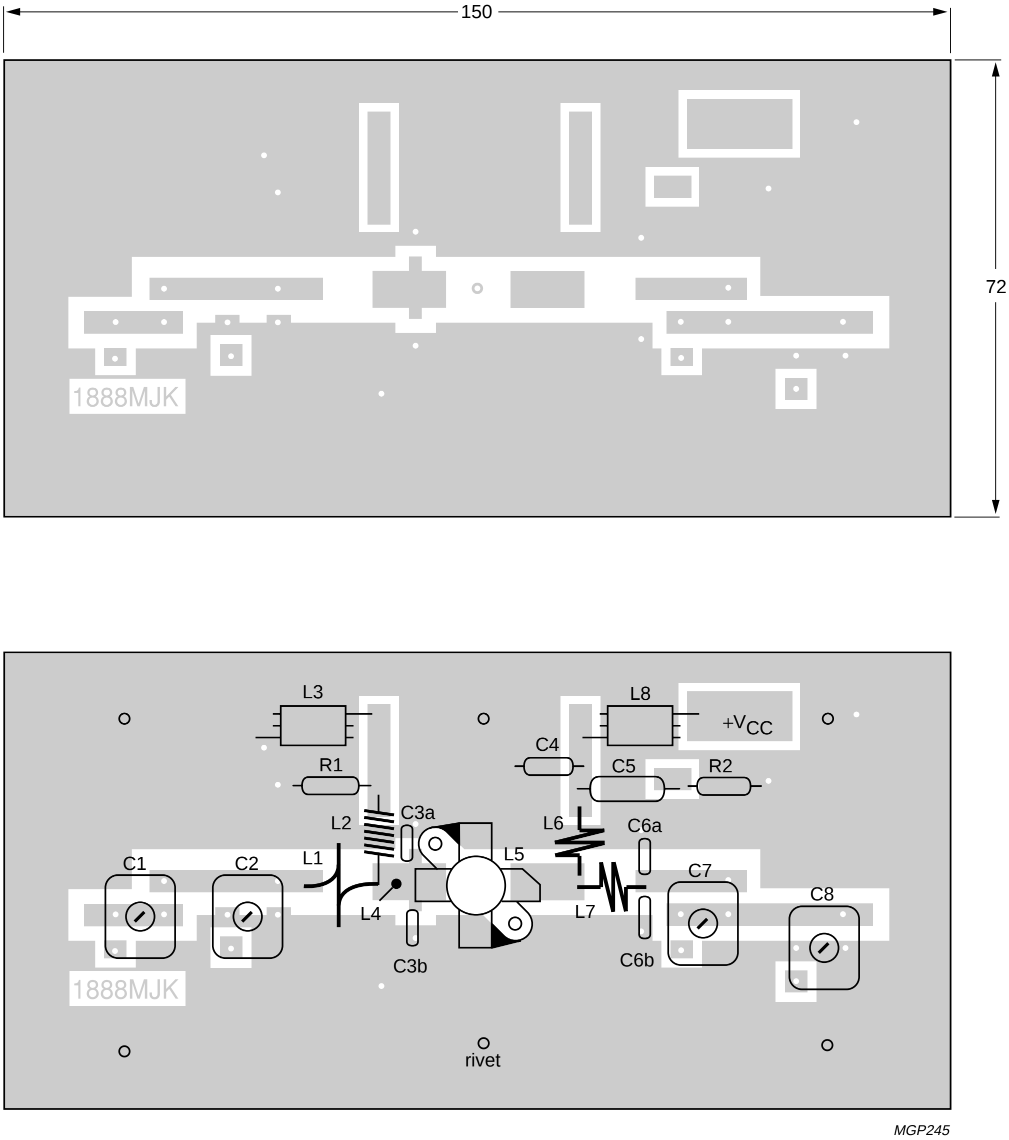
Fig.8 Class-B test circuit at f = 175 MHz.

List of components (see test circuit)

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
C1	film dielectric trimmer	2.5 to 20 pF		2222 809 07004
C2, C8	film dielectric trimmer	4 to 40 pF		2222 809 07008
C3a, C3b	500 V ceramic capacitor	47 pF		
C4	500 V ceramic capacitor	120 pF		
C5	polyester capacitor	100 nF		
C6a, C6b	500 V ceramic capacitor	8.2 pF		
C7	film dielectric trimmer	5 to 60 pF		2222 809 07011
L1	1 turn enamelled 1.6 mm copper wire		int. dia. 9 mm; leads 2 × 5 mm	
L2	7 turns closely wound enamelled 0.5 mm copper wire	100 nH	int. dia. 3 mm; leads 2 × 5 mm	
L3, L8	grade 3B Ferroxcube wideband HF choke			4312 020 36640
L4, L5	stripline (note 1)		12 mm × 6 mm; note 2	
L6	2 turns enamelled 1.6 mm copper wire		int. dia. 5 mm; length 6 mm; leads 2 × 5 mm	
L7	2 turns enamelled 1.6 mm copper wire		int. dia. 4.5 mm; length 6 mm; leads 2 × 5 mm	
R1	0.25 W carbon resistor	10 Ω, 5%		
R2	0.25 W carbon resistor	4.7 Ω, 5%		

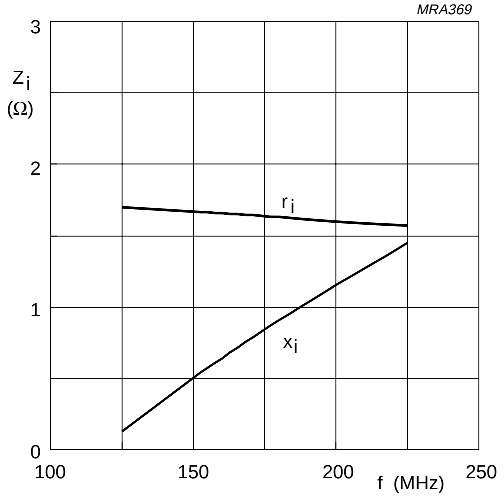
Notes

1. The striplines are on a double copper-clad printed circuit board, with epoxy fibre-glass dielectric, thickness $^{1}/_{16}$ inch.
2. Taps for capacitors C3a and C3b are situated 5 mm from the transistor.



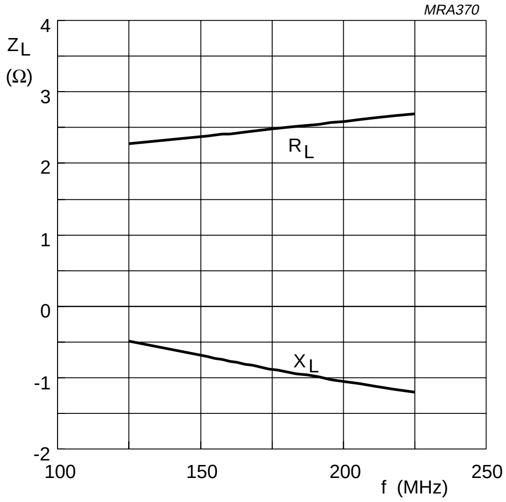
The circuit and components are situated on one side of an epoxy fibre-glass board; the other side is unetched and serves as a ground plane. Earth connections are made by means of hollow rivets and copper straps under the emitters, to provide a direct contact between the component side and the ground plane.

Fig.9 Component layout for 175 MHz class-B test circuit.



Class-B operation; V_{CE} = 12.5 V; P_L = 30 W.

Fig.10 Input impedance (series components) as a function of frequency, typical values.



Class-B operation; V_{CE} = 12.5 V; P_L = 30 W.

Fig.11 Load impedance (series components) as a function of frequency, typical values.

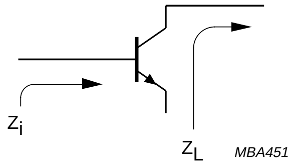
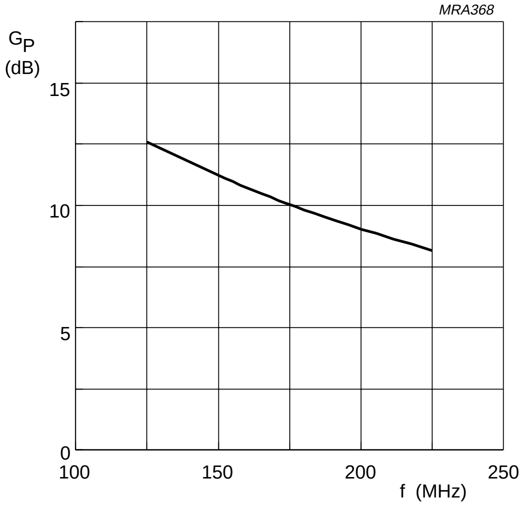


Fig.12 Definition of transistor impedance.

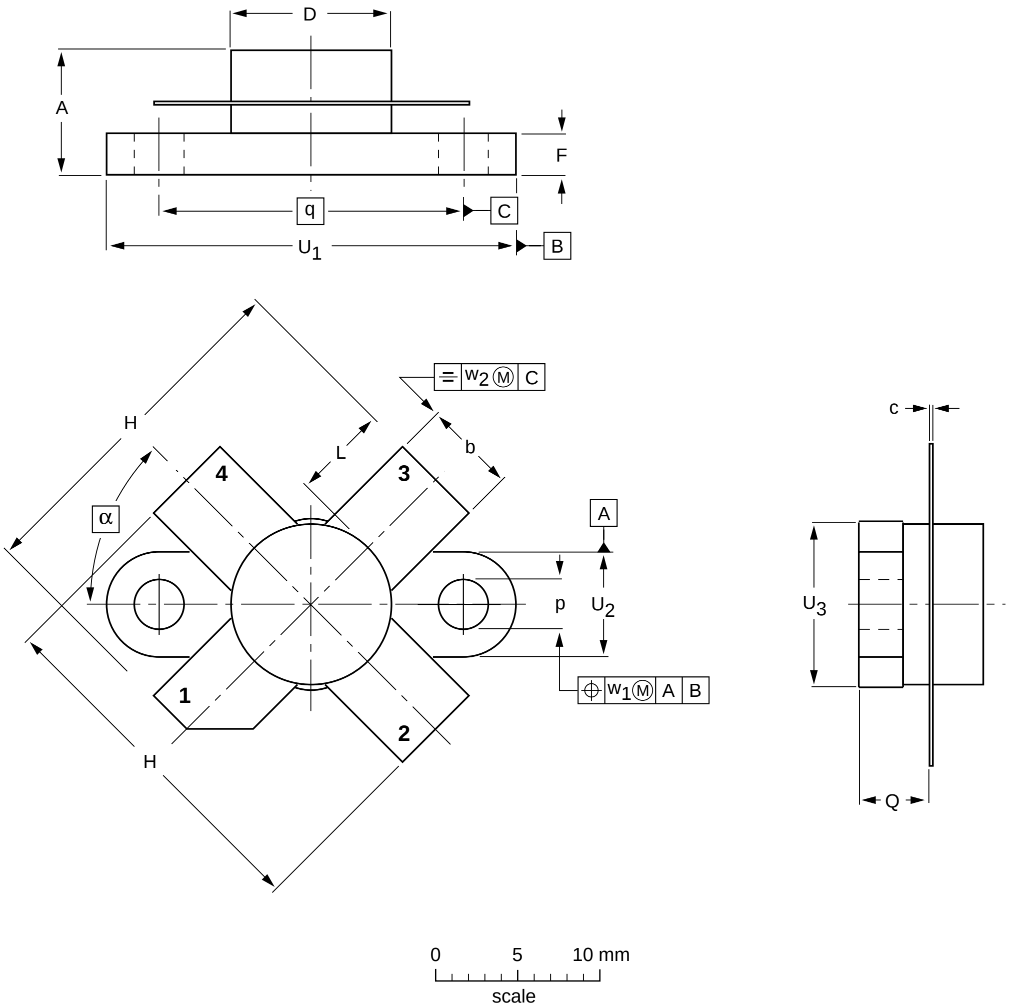


Class-B operation; V_{CE} = 12.5 V; P_L = 30 W.

Fig.13 Power gain as a function of frequency, typical values.

PACKAGE OUTLINE

Flanged ceramic package; 2 mounting holes; 4 leads **SOT123A**



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

UNIT	A	b	c	D	D_1	F	H	L	p	Q	q	U_1	U_2	U_3	w_1	w_2	α
mm	7.47 6.37	5.82 5.56	0.18 0.10	9.73 9.47	9.63 9.42	2.72 2.31	20.71 19.93	5.61 5.16	3.33 3.04	4.63 4.11	18.42	25.15 24.38	6.61 6.09	9.78 9.39	0.51	1.02	45°
inches	0.294 0.251	0.229 0.219	0.007 0.004	0.383 0.373	0.397 0.371	0.107 0.091	0.815 0.785	0.221 0.203	0.131 0.120	0.182 0.162	0.725	0.99 0.96	0.26 0.24	0.385 0.370	0.02	0.04	

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT123A						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