DATA SHEET

BLW90
UHF power transistor

Product specification

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Philips
Semiconductors

PHILIPS

UHF power transistor BLW90

DESCRIPTION

N-P-N silicon planar epitaxial transistor suitable for transmitting applications in class-A, B or C in the u.h.f. and v.h.f. range for a nominal supply voltage of 28 V. The transistor is resistance stabilized and is guaranteed to withstand infinite VSWR at rated output power. High reliability is ensured by a **gold sandwich metallization.**

The transistor is housed in a ¼" capstan envelope with a ceramic cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

R.F. performance up to T_h = 25 °C in an unneutralized common-emitter class-B circuit

MODE OF OPERATION	V_{CE} V	f MHz	P_L W	G_p dB	η %
c.w.	28	470	4	> 11	> 55

PIN CONFIGURATION

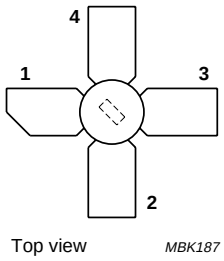


Fig.1 Simplified outline. SOT122A.

PINNING - SOT122A.

PIN	DESCRIPTION
1	collector
2	emitter
3	base
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-emitter voltage				
(peak value); V_{BE} = 0	V_{CESM}	max.	60	V
open base	V_{CEO}	max.	30	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4	V
Collector current				
d.c. or average	I_C; $I_{C(AV)}$	max.	0,62	A
(peak value); f > 1 MHz	I_{CM}	max.	2,0	A
Total power dissipation (d.c. and r.f.) up to T_{mb} = 25 °C	P_{tot}	max.	18,6	W
Storage temperature	T_{stg}		−65 to + 150	°C
Operating junction temperature	T_j	max.	200	°C

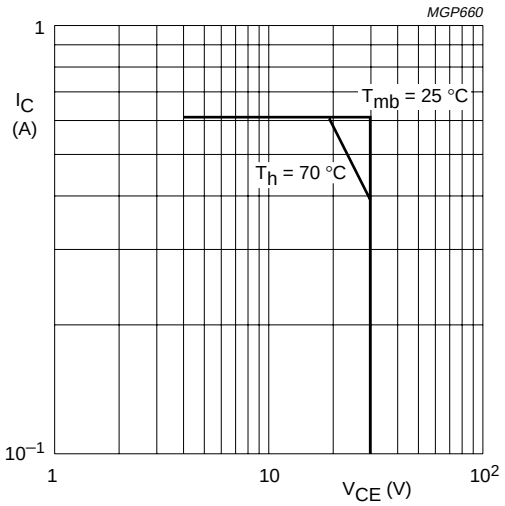
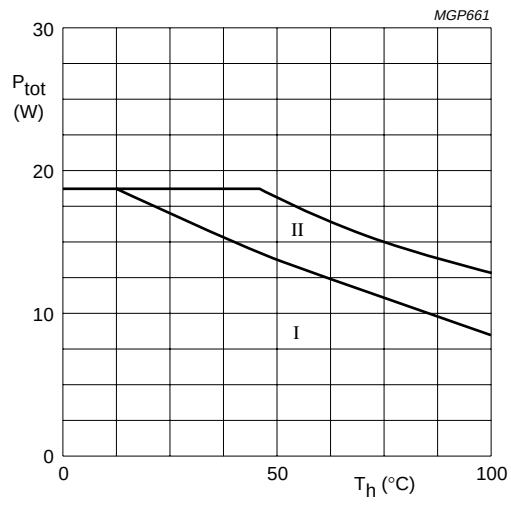


Fig.2 D.C. SOAR.



I Continuous d.c. and r.f. operation
II Short-time operation during mismatch

Fig.3 Power derating curves vs. temperature.

THERMAL RESISTANCE

(dissipation = 6 W; T_{mb} = 73,6 °C, i.e. T_h = 70 °C)

From junction to mounting base				
(d.c. and r.f. dissipation)	$R_{th\ j\text{-}mb}$	=	9,0	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,6	K/W

CHARACTERISTICS

T_j = 25 °C

Collector-emitter breakdown voltage				
V_{BE} = 0; I_C = 4 mA	$V_{(BR)CES}$	>	60	V
Collector-emitter breakdown voltage				
open base; I_C = 20 mA	$V_{(BR)CEO}$	>	30	V
Emitter-base breakdown voltage				
open collector; I_E = 2 mA	$V_{(BR)EBO}$	>	4	V
Collector cut-off current				
V_{BE} = 0; V_{CE} = 30 V	I_{CES}	<	2	mA
Second breakdown energy; L = 25 mH; f = 50 Hz				
open base	E_{SBO}	>	1	mJ
R_{BE} = 10 Ω	E_{SBR}	>	1	mJ
D.C. current gain (1)	h_{FE}	typ.	40	
I_C = 0,3 A; V_{CE} = 5 V		10 to 100		
Collector-emitter saturation voltage (1)				
I_C = 1,0 A; I_B = 0,2 A	V_{CEsat}	typ.	0,9	V
Transition frequency at f = 500 MHz (1)				
$-I_E$ = 0,3 A; V_{CB} = 28 V	f_T	typ.	1,2	GHz
$-I_E$ = 1,0 A; V_{CB} = 28 V	f_T	typ.	0,9	GHz
Collector capacitance at f = 1 MHz				
$I_E = I_e$ = 0; V_{CB} = 28 V	C_c	typ.	8,4	pF
Feedback capacitance at f = 1 MHz				
I_C = 20 mA; V_{CE} = 28 V	C_{re}	typ.	3,6	pF
Collector-stud capacitance	C_{cs}	typ.	1,2	pF

Note

1. Measured under pulse conditions: $t_p \leq 200$ μs; $\delta \leq 0{,}02$.

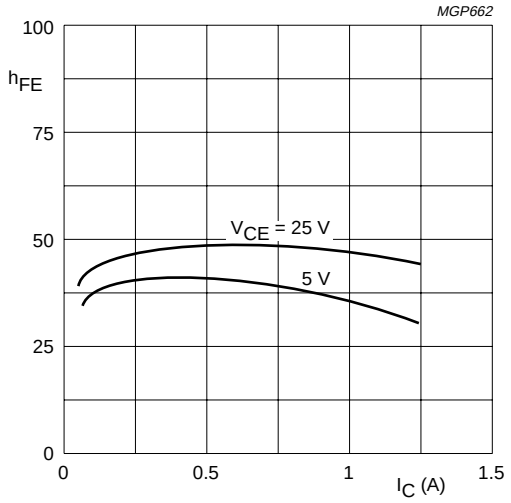


Fig.4 Typical values; T_j = 25 °C.

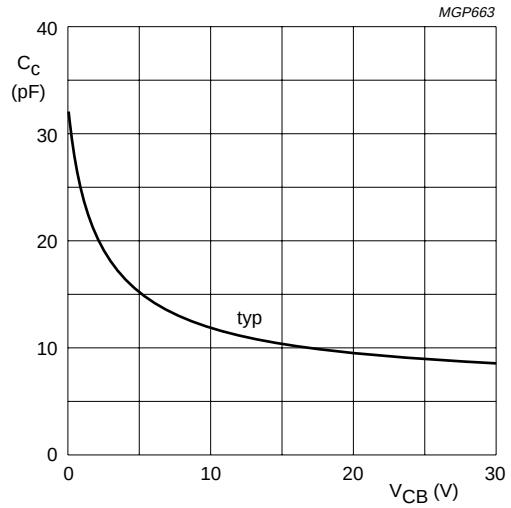


Fig.5 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

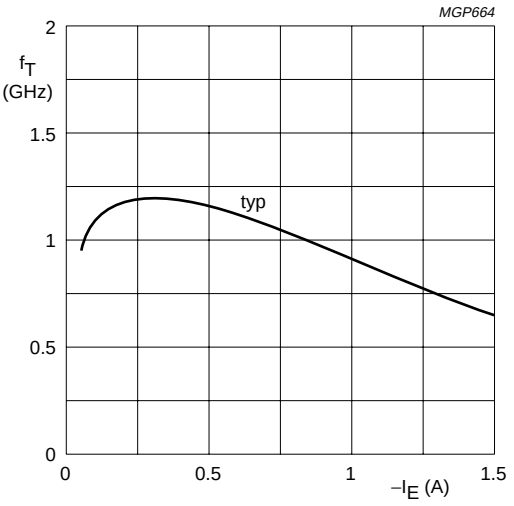


Fig.6 V_{CB} = 28 V; f = 500 MHz; T_j = 25 °C.

APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit); T_h = 25 °C

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	$\bar{z}_i$ (Ω)	$\bar{Z}_L$ (Ω)
470	**28**	**4**	< **0,32**	> **11**	< **0,26**	> **55**	**1,7 + j1,8**	**8 + j26**
470	28	4	typ. 0,23	typ. 12,5	typ. 0,25	typ. 58	–	–

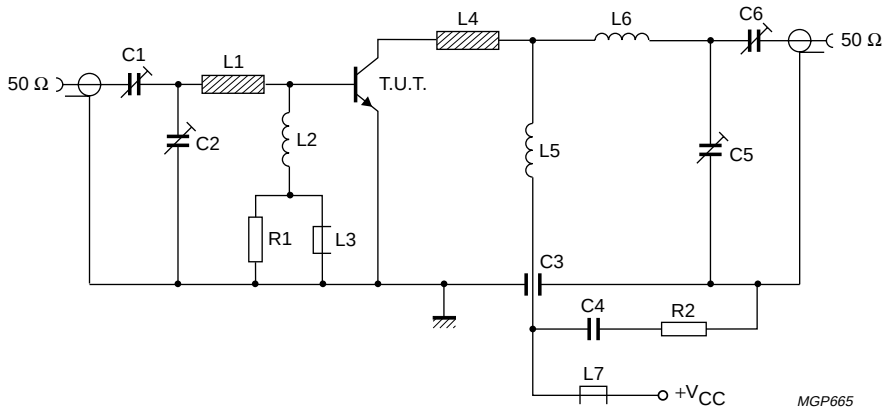


Fig.7 Test circuit; c.w. class-B.

List of components:

C1 = C5 = C6 = 1,4 to 5,5 pF film dielectric trimmer (cat. no. 2222 809 09001)

C2 = 2 to 9 pF film dielectric trimmer (cat. no. 2222 809 09002)

C3 = 100 pF feed-through capacitor

C4 = 100 nF polyester capacitor

L1 = stripline (34,8 mm × 6,0 mm)

L2 = 320 nH; 13 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 4 mm; leads 2 × 4 mm

L3 = L7 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)

L4 = stripline (12,0 mm × 6,0 mm)

L5 = 265 nH; 13 turns closely wound enamelled Cu wire (0,35 mm); int. dia. 3,5 mm; leads 2 × 4 mm

L6 = 29 nH; 3 turns closely wound enamelled Cu wire (1 mm); int. dia. 3,5 mm; leads 2 × 4 mm

L1 and L4 are striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric (ε_r = 2,74); thickness 1/16".

R1 = 100 Ω carbon resistor

R2 = 10 Ω carbon resistor

Component layout and printed-circuit board for 470 MHz test circuit are shown in Fig.8.

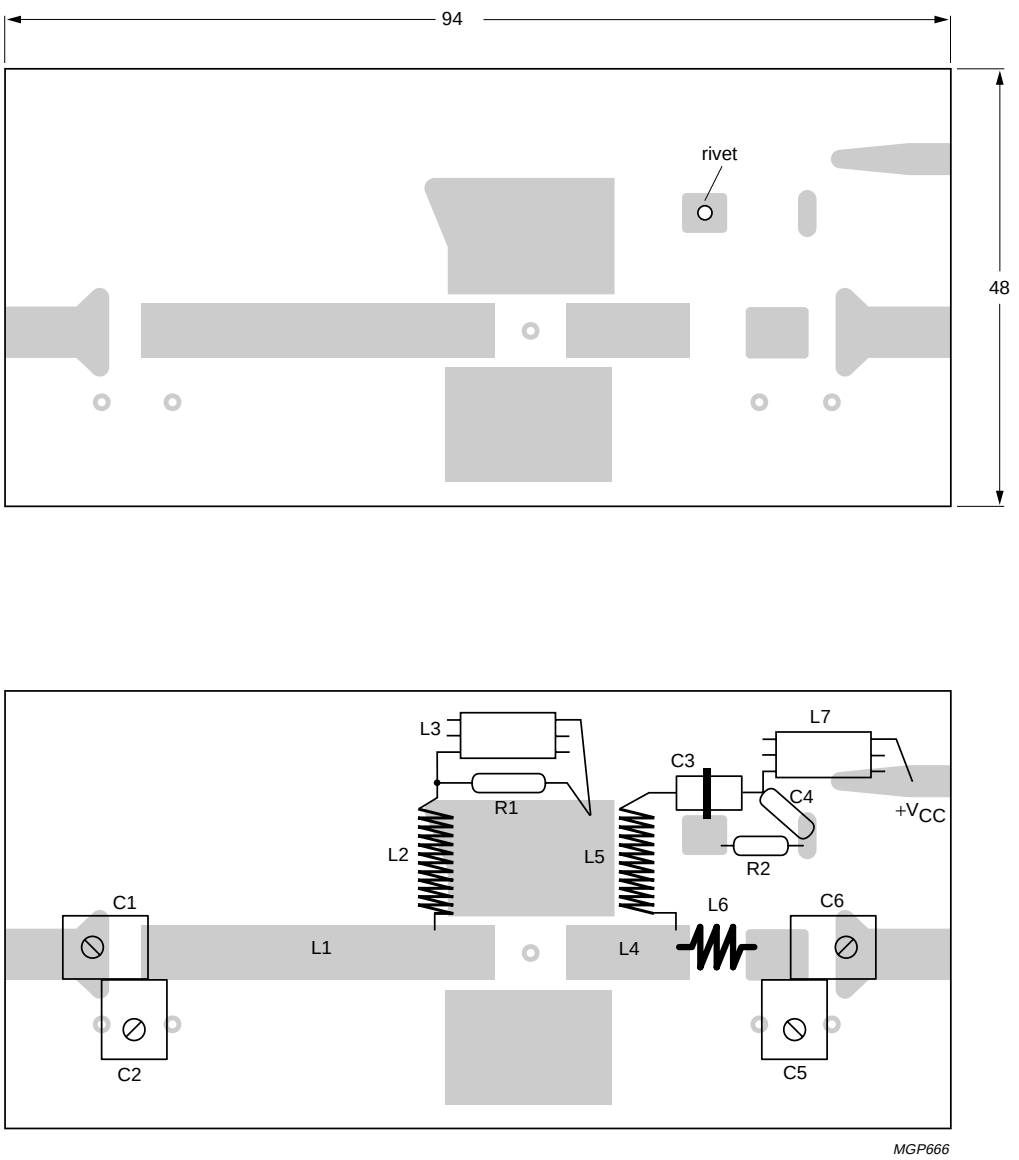


Fig.8 Component layout and printed-circuit board for 470 MHz test circuit.

The circuit and the components are situated on one side of the PTFE fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets, whilst under the emitter leads Cu straps are used for a direct contact between upper and lower sheets.

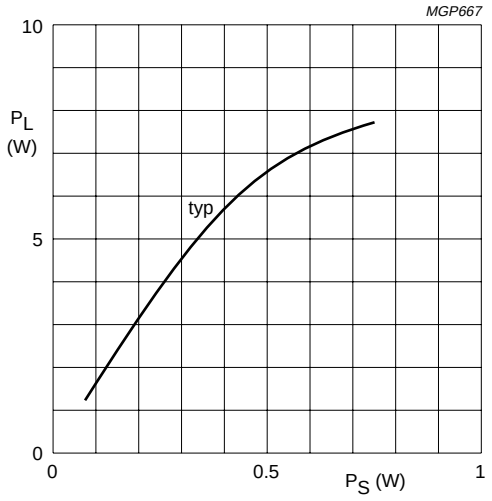


Fig.9 V_{CE} = 28 V; f = 470 MHz; T_h = 25 °C.

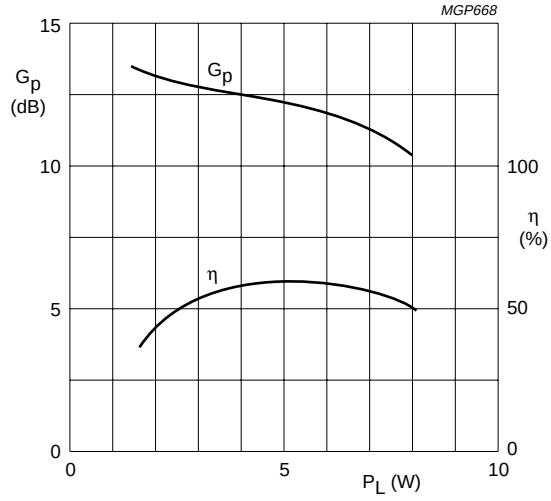
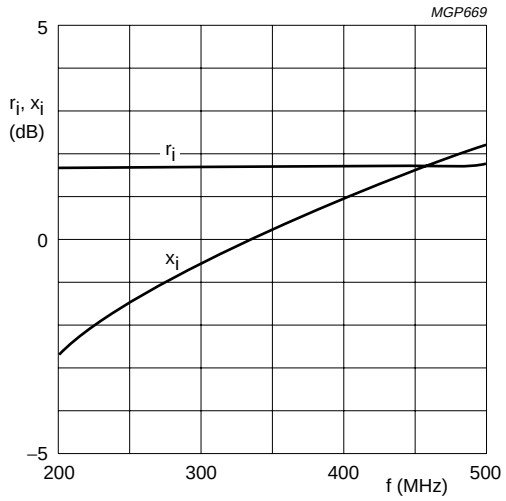
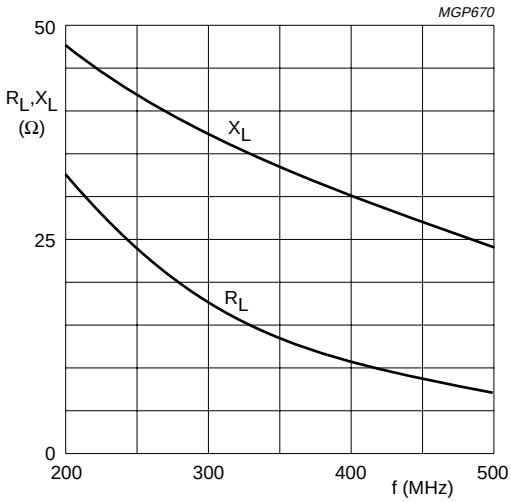


Fig.10 Typical values; V_{CE} = 28 V; f = 470 MHz; T_h = 25 °C.



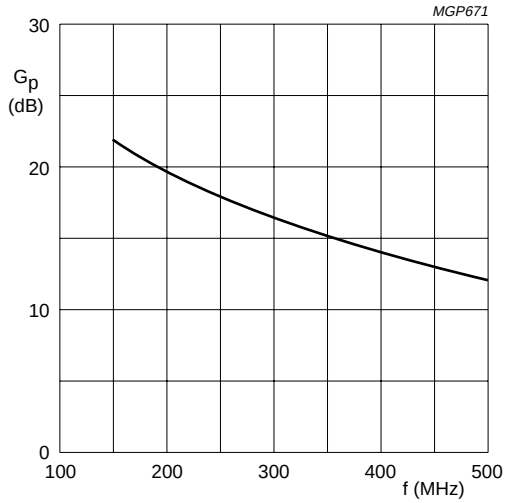
Typical values; V_{CE} = 28 V; P_L = 4 W; T_h = 25 °C.

Fig.11 Input impedance (series components).



Typical values; V_{CE} = 28 V; P_L = 4 W; T_h = 25 °C.

Fig.12 Load impedance (series components).



Typical values; V_{CE} = 28 V; P_L = 4 W; T_h = 25 °C.

Fig.13

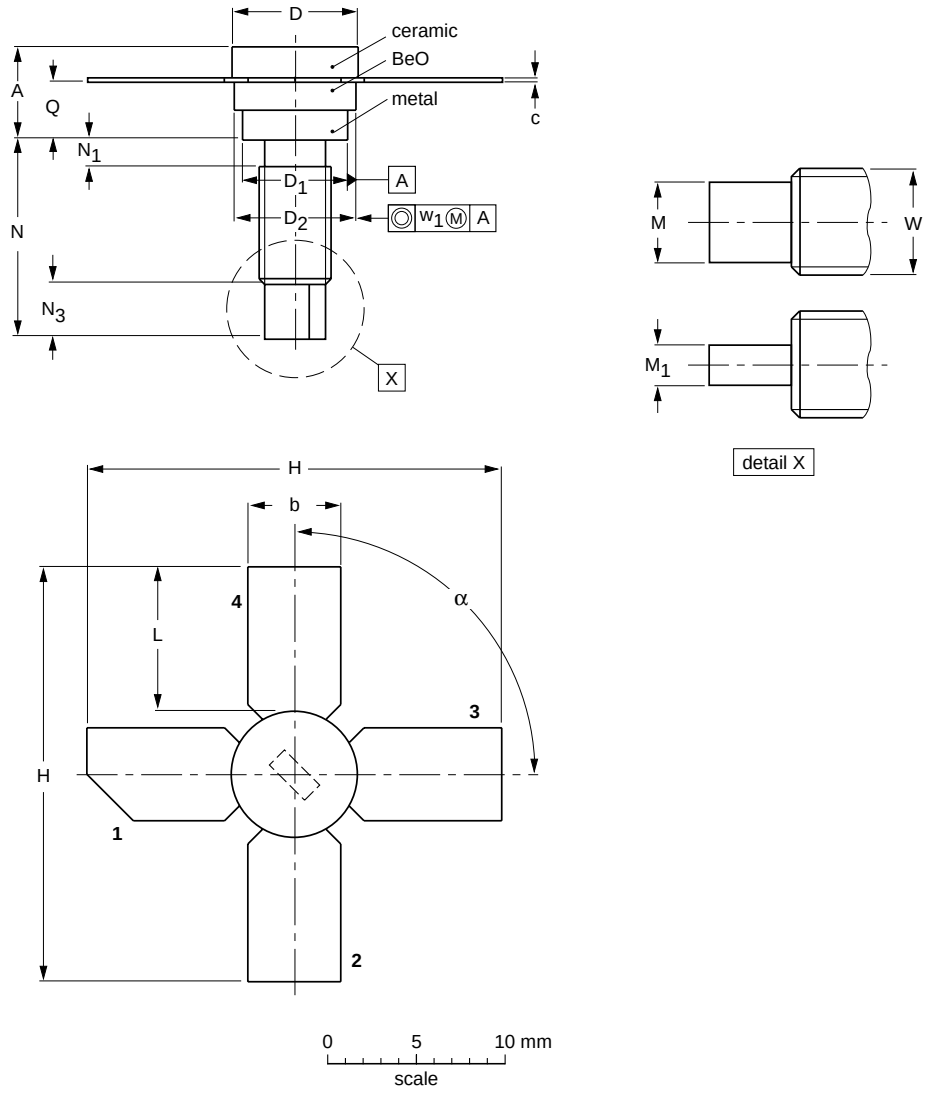
Ruggedness

The BLW90 is capable of withstanding full load mismatch (VSWR = 50 through all phases) up to 4 W under the following conditions:

V_{CE} = 28 V; f = 470 MHz; T_h = 70 °C; $R_{th\ mb\text{-}h}$ = 0,6 K/W.

PACKAGE OUTLINE

Studded ceramic package; 4 leads **SOT122A**



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

UNIT	A	b	c	D	D_1	D_2	H	L	M_1	M	N	N_1 max.	N_3	Q	W	w_1	α
mm	5.97 4.74	5.85 5.58	0.18 0.14	7.50 7.23	6.48 6.22	7.24 6.93	27.56 25.78	9.91 9.14	3.18 2.66	1.66 1.39	11.82 11.04	1.02	3.86 2.92	3.38 2.74	8-32 UNC	0.381	90°

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT122A						97-04-18

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.	

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