DATA SHEET

BLW98
UHF linear power transistor

Product specification

August 1986

Philips
Semiconductors

PHILIPS

UHF linear power transistor BLW98

DESCRIPTION

N-P-N silicon planar epitaxial transistor primarily intended for use in linear u.h.f. amplifiers of TV transposers and transmitters in band IV-V, as well as for driver stages in tube systems.

FEATURES:

- diffused emitter ballasting resistors for an optimum temperature profile;
- gold sandwich metallization ensures excellent reliability.

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

QUICK REFERENCE DATA

R.F. performance in linear amplifier

MODE OF OPERATION	f_{vision} MHz	V_{CE} V	I_C mA	T_h °C	d_{im} (1) dB	$P_{o\ sync}$ (1) W	G_p dB
class-A	860	25	850	70	–60	> 3,5	> 6,5
class-A	860	25	850	25	–60	typ. 4,4	typ. 7,0

Note

1. Three-tone test method (vision carrier –8 dB, sound carrier –7 dB, sideband signal –16 dB), zero dB corresponds to peak sync level.

PIN CONFIGURATION

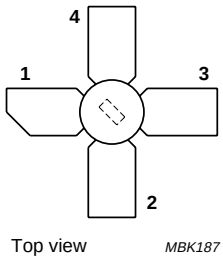


Fig.1 Simplified outline. SOT122A.

PINNING - SOT122A.

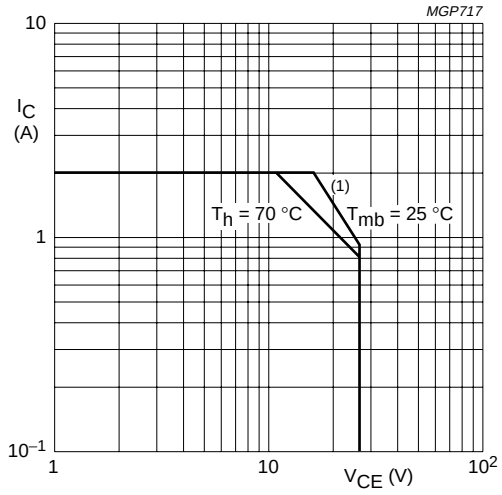
PIN	DESCRIPTION
1	collector
2	emitter
3	base
4	emitter

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.	50	V
open base	V_{CEO}	max.	27	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5	V
Collector current				
d.c.	I_C	max.	2	A
(peak value); f > 1 MHz	I_{CM}	max.	4	A
Total power dissipation at T_h = 70 °C	P_{tot}	max.	21,5	W
Storage temperature	T_{stg}		−65 to +150	°C
Operating junction temperature	T_j	max.	200	°C



(1) Second breakdown limit (independent of temperature).

Fig.2 D.C. SOAR.

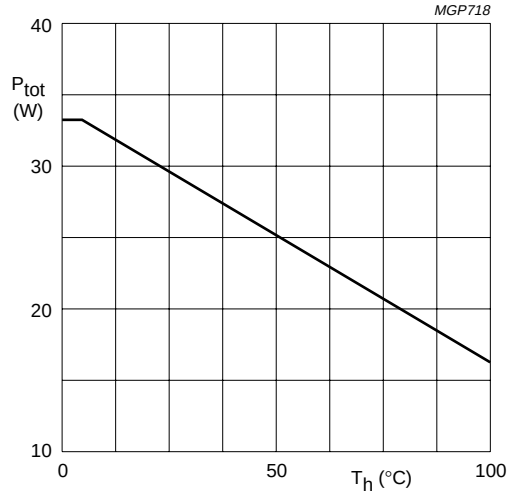


Fig.3 Power derating curve vs. temperature.

THERMAL RESISTANCE

(dissipation = 21,25 W; T_{mb} = 82,75 °C, T_h = 70 °C)

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	5,45	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,6	K/W

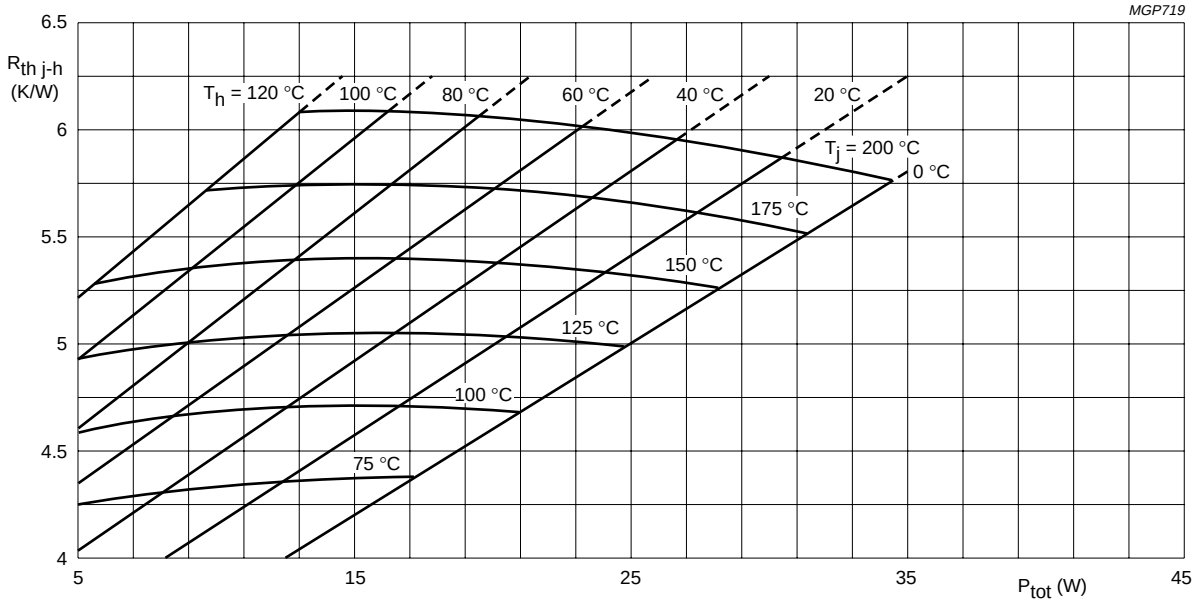


Fig.4 Maximum thermal resistance from junction to heatsink as a function of power dissipation, with heatsink and junction temperature as parameters. ($R_{th\ mb\text{-}h}$ = 0,6 K/W.)

Example

Nominal class-A operation (without r.f. signal): V_{CE} = 25 V; I_C = 850 mA; T_h = 70 °C.

Fig.4 shows:	$R_{th\ j\text{-}h}$	max.	6,05	K/W
	T_j	max.	200	°C
Typical device:	$R_{th\ j\text{-}h}$	typ.	5,35	K/W
	T_j	typ.	183	°C

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-emitter breakdown voltage				
V_{BE} = 0; I_C = 10 mA	$V_{(BR)CES}$	>	50	V
open base, I_C = 25 mA	$V_{(BR)CEO}$	>	27	V
Emitter-base breakdown voltage				
open collector, I_E = 5 mA	$V_{(BR)EBO}$	>	3,5	V
D.C. current gain(1)				
I_C = 850 mA; V_{CE} = 25 V	h_{FE}	>	15	
		typ.	40	
Collector-emitter saturation voltage(1)				
I_C = 500 mA; I_B = 100 mA	V_{CEsat}	typ.	0,25	V
Transition frequency at f = 500 MHz(2)				
$-I_E$ = 850 mA; V_{CB} = 25 V	f_T	typ.	2,5	GHz
Collector capacitance at f = 1 MHz				
$I_E = I_e$ = 0; V_{CB} = 25 V	C_c	typ.	24	pF
		<	30	pF
Feedback capacitance at f = 1 MHz				
I_C = 50 mA; V_{CE} = 25 V	C_{re}	typ.	15	pF
Collector-stud capacitance	C_{cs}	typ.	1,2	pF

Notes

1. Measured under pulse conditions: $t_p \leq 300$ μs; $\delta \leq 0{,}02$.
2. Measured under pulse conditions: $t_p \leq 50$ μs; $\delta \leq 0{,}01$.

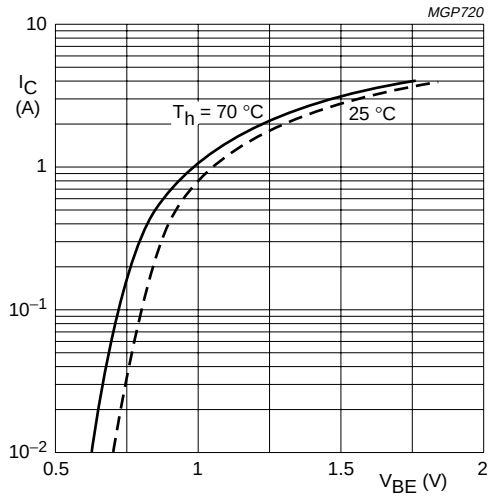


Fig.5 Typical values; V_{CE} = 25 V.

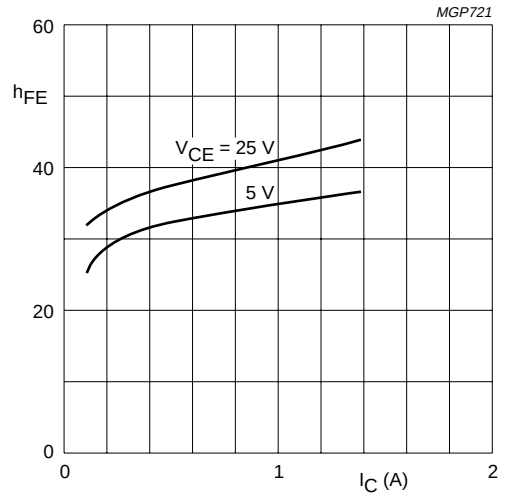


Fig.6 Typical values; T_j = 25 °C.

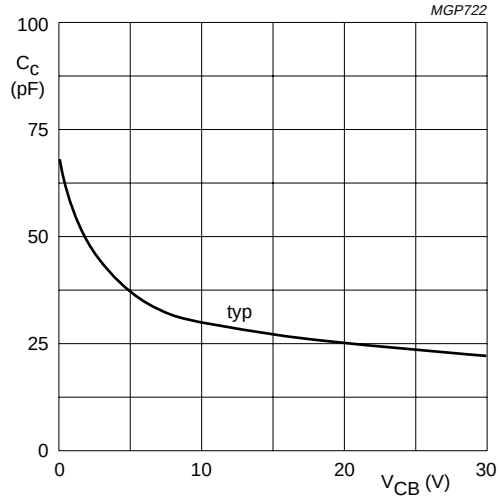


Fig.7 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

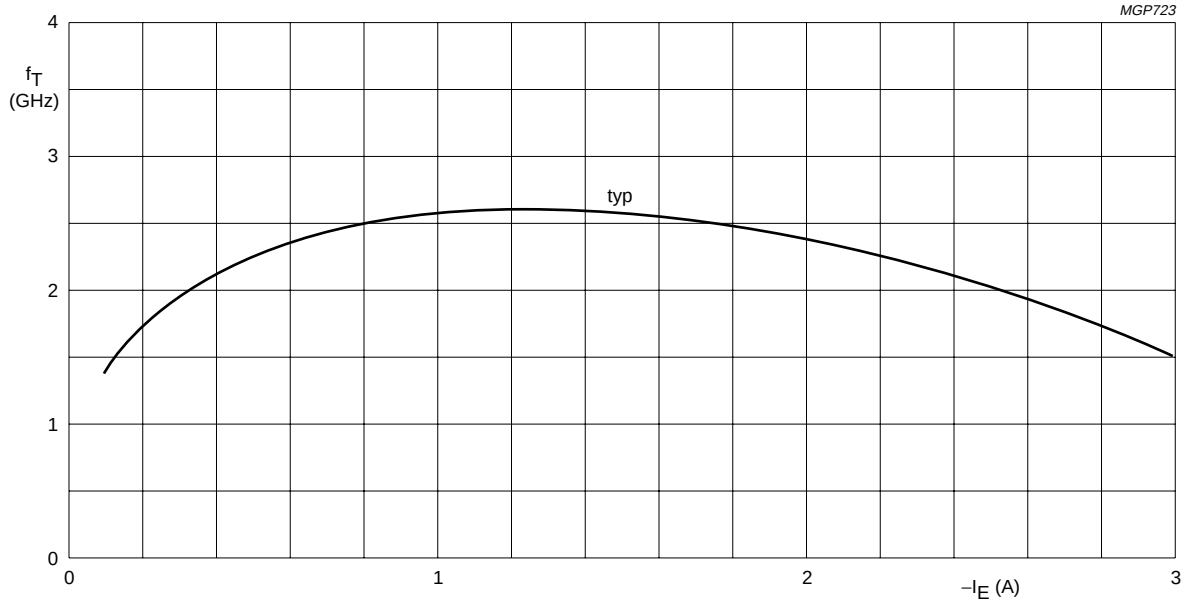


Fig.8 V_{CB} = 25 V; f = 500 MHz; T_j = 25 °C.

APPLICATION INFORMATION

R.F. performance in u.h.f. class-A operation (linear power amplifier)

f_{vision} (MHz)	V_{CE} (V)	I_C (mA)	T_h (°C)	d_{im}(dB)(1)	$P_{o\ sync}$ (W)(1)	G_P (dB)
860	25	850	70	–60	> 3,5	> 6,5
860	25	850	70	–60	typ. 3,8	typ. 7,0
860	25	850	25	–60	typ. 4,4	typ. 7,0

Note

1. Three-tone test method (vision carrier –8 dB, sound carrier –7 dB, sideband signal –16 dB), zero dB corresponds to peak sync level.

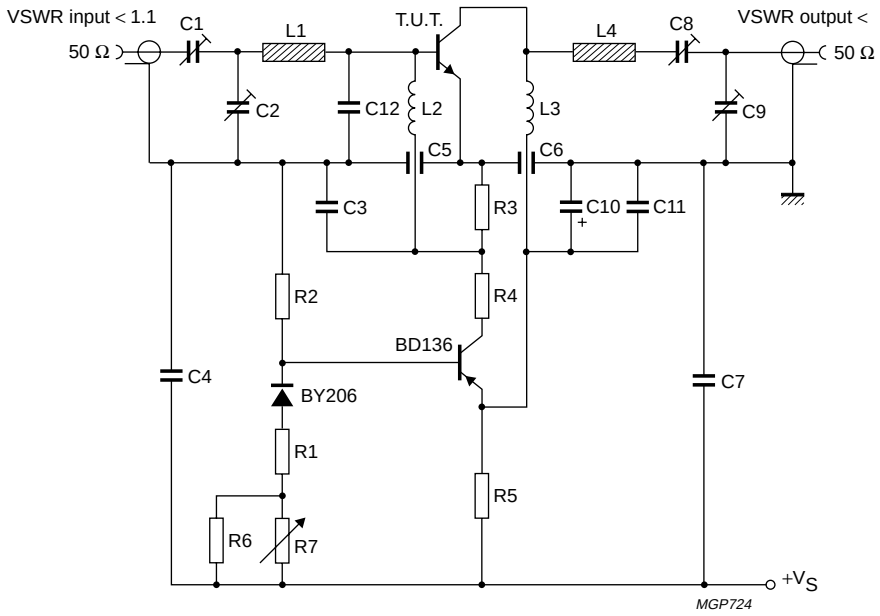
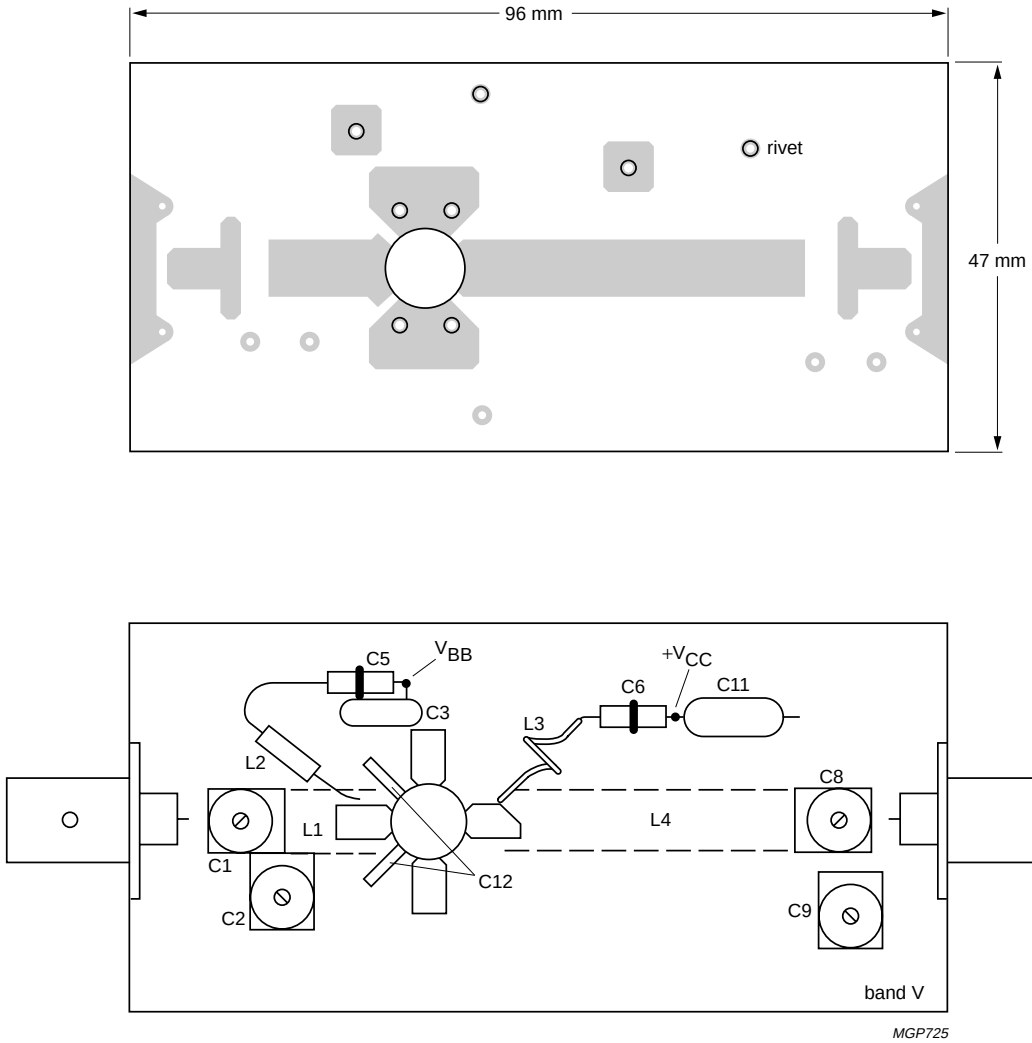


Fig.9 Class-A test circuit at f_{vision} = 860 MHz.

List of components:

C1 = C2 = 1,4 to 5,5 pF film dielectric trimmer (cat. no. 2222 809 09001)
C3 = C4 = 100 nF polyester capacitor
C5 = C6 = 1 nF feed-through capacitor
C7 = 5,6 pF ceramic capacitor
C8 = 2 to 18 pF film dielectric trimmer (cat. no. 2222 809 09003)
C9 = 2 to 9 pF film dielectric trimmer (cat. no. 2222 809 09002)
C10 = 10 μF/40 V solid aluminium electrolytic capacitor
C11 = 470 nF polyester capacitor
C12 = 2 × 3,3 pF chip capacitors (in parallel)
R1 = 150 Ω carbon resistor (0,25 W)
R2 = 1,8 kΩ carbon resistor (0,5 W)
R3 = 33 Ω carbon resistor (0,5 W)
R4 = 220 Ω carbon resistor (1 W)
R5 = 4 × 12 Ω carbon resistors in parallel (1 W each)
R6 = 1 kΩ carbon resistor (0,25 W)
R7 = 220 Ω carbon potentiometer (0,25 W)
L1 = stripline (13,6 mm × 6,9 mm)
L2 = microchoke 0,47 μH (cat. no. 4322 057 04770)
L3 = 1 turn Cu wire (1 mm); internal diameter 5,5 mm; leads 2 × 5 mm
L4 = stripline (40,8 mm × 6,9 mm)

L1 and L4 are striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric (ε_r = 2,74); thickness 1,5 mm.



Note
Hole in printed-circuit board: Ø 9,7 mm.

Fig.10 Component layout and printed circuit board for 860 MHz class-A test circuit.

The circuit and the components are on one side of the PTFE fibre-glass board, the other side is unetched copper to serve as a ground-plane. Earth connections are made by hollow rivets. Additionally copper straps are used under the emitters and at the input and output to provide direct contact between the copper on the component side and the ground-plane.

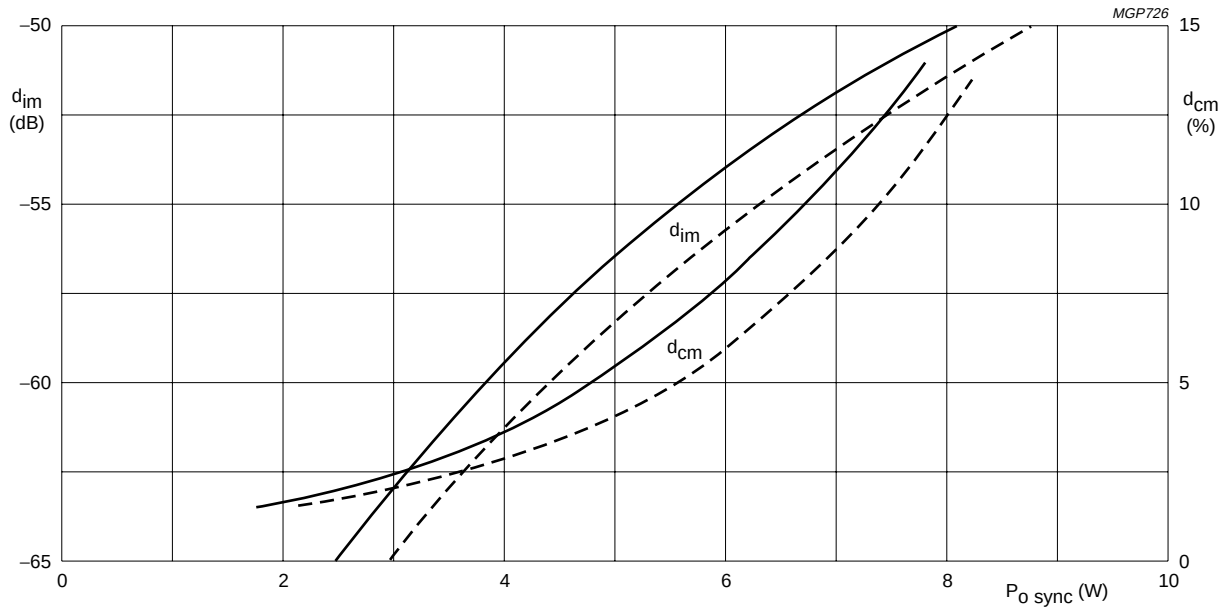
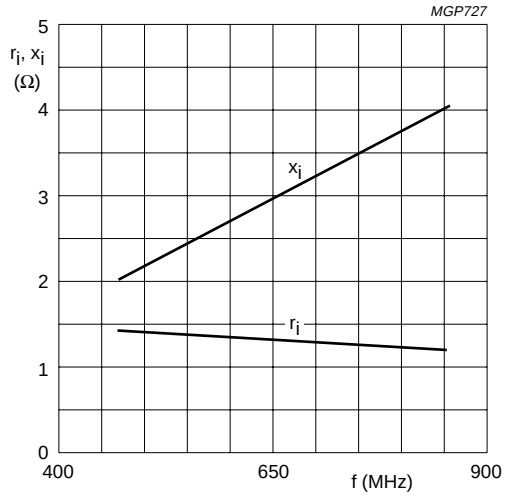


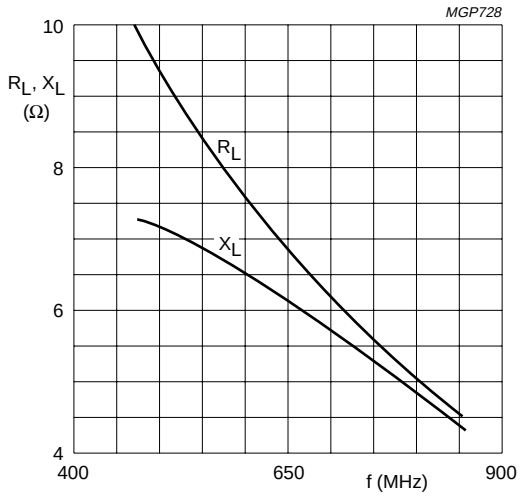
Fig.11 Intermodulation distortion (d_{im})(1.) and cross-modulation distortion (d_{cm})(2.) as a function of $P_{o\ sync}$. Typical values; V_{CE} = 25 V; I_C = 850 mA;– – –T_h = 25 °C;——T_h = 70 °C; f_{vision} = 860 MHz.

1. Three-tone test method (vision carrier −8 dB, sound carrier −7 dB, sideband signal −16 dB), zero dB corresponds to peak sync level.
   Intermodulation distortion of input signal ≤ −75 dB.
2. Two-tone test method (vision carrier 0 dB, sound carrier −7 dB), zero dB corresponds to peak sync level.
   Cross-modulation distortion (d_{cm}) is the voltage variation (%) of sound carrier when vision carrier is switched from 0 dB to −20 dB.



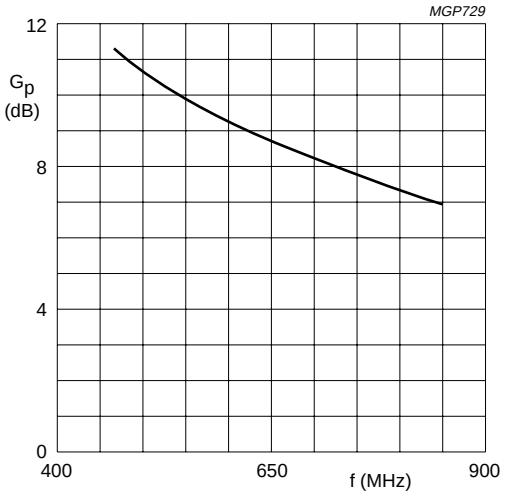
Typical values; V_{CE} = 25 V; I_C = 850 mA;
class-A operation; T_h = 70 °C.

Fig.12 Input impedance (series components).



Typical values; V_{CE} = 25 V; I_C = 850 mA;
class-A operation; T_h = 70 °C.

Fig.13 Load impedance (series components).

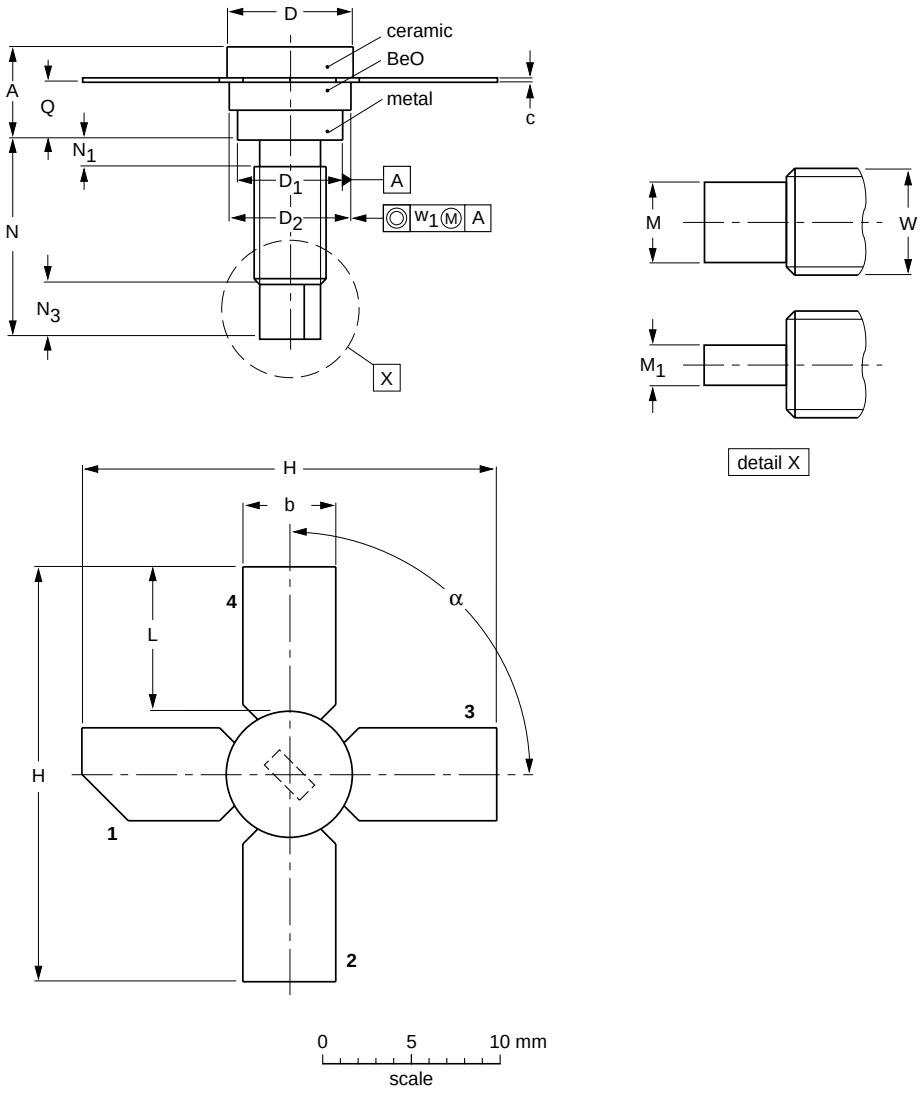


Typical values; V_{CE} = 25 V; I_C = 850 mA;
class-A operation; T_h = 70 °C.

Fig.14

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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