

# DATA SHEET

## **BLT92/SL** UHF power transistor

Product specification

May 1989

# UHF power transistor

# BLT92/SL

### DESCRIPTION

NPN silicon planar epitaxial transistor primarily intended for use in handheld radio stations in the 900 MHz communications band.

This device has been designed specifically for class-B operation.

### FEATURES

- internal input matching capacitor for a high power gain
- gold metallization ensures excellent reliability

The transistor has a 4-lead studless envelope with a ceramic cap (SOT122D). All leads are isolated from the mounting base.

### PINNING

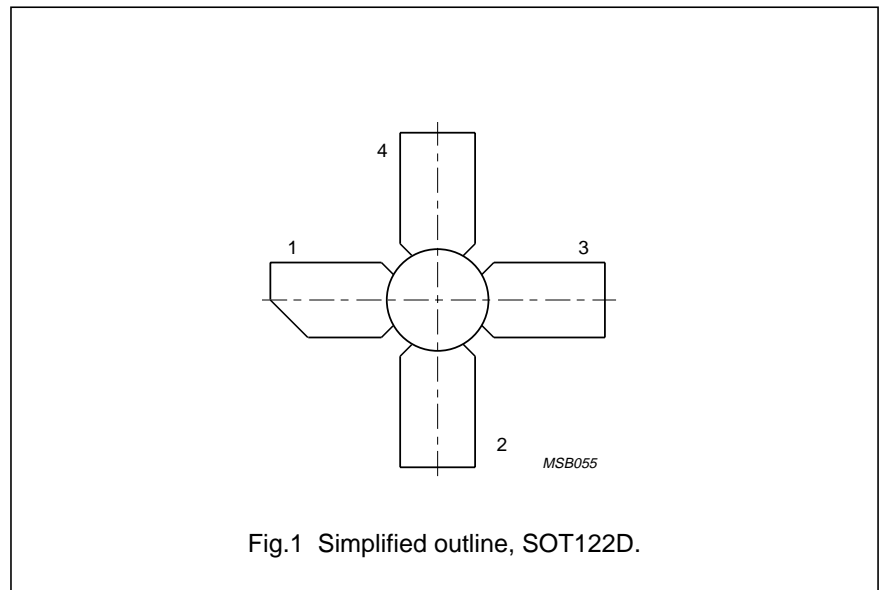
- 1 = collector
- 2 = emitter
- 3 = base
- 4 = emitter

### QUICK REFERENCE DATA

RF performance at  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in a common-emitter class-B circuit

MODE OF OPERATION	$V_{CE}$ (V)	f (MHz)	$P_L$ (W)	$G_p$ (dB)	$\eta_c$ (%)
CW (class-B)	7.5	900	3.0	> 7.0	> 50

### PIN CONFIGURATION



**PRODUCT SAFETY** This device incorporates beryllium oxide (BeO), the dust of which is toxic. The device is entirely safe provided that the internal BeO disc is not damaged.

UHF power transistor

BLT92/SL

**RATINGS**

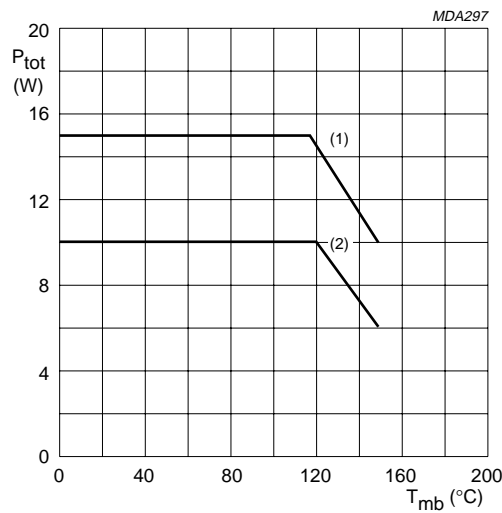
Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	$V_{CBO}$	max.	20 V
Collector-emitter voltage (open base)	$V_{CEO}$	max.	10 V
Emitter-base voltage (open collector)	$V_{EBO}$	max.	3.0 V
Collector current			
DC or average	$I_C; I_{C(AV)}$	max.	1.2 A
(peak value); $f > 800$ MHz	$I_{CM}$	max.	3.6 A
Total power dissipation			
at $T_{amb} < 120$ °C; $f > 800$ MHz	$P_{tot}$	max.	10 W
Storage temperature range	$T_{stg}$		-65 to +150 °C
Operating junction temperature	$T_j$	max.	200 °C

**THERMAL RESISTANCE**

Dissipation = 10 W;  $T_{mb} = 25$  °C

From junction to mounting base ( $f > 800$ MHz)	$R_{th\ j-mb(RF)}$	max.	6.0 K/W
---	--------------------	------	---------



- (1) Short-time RF operation during mismatch ( $f > 800$  MHz).
- (2) Continuous RF operation ( $f > 800$  MHz).

Fig.2 Total power dissipation as a function of temperature.

UHF power transistor

BLT92/SL

**CHARACTERISTICS**

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

Collector-base breakdown voltage

open emitter;  $I_C = 10\text{ mA}$

$V_{(BR)CBO} > 20\text{ V}$

Collector-emitter breakdown voltage

open base;  $I_C = 20\text{ mA}$

$V_{(BR)CEO} > 10\text{ V}$

Emitter-base breakdown voltage

open collector;  $I_E = 2\text{ mA}$

$V_{(BR)EBO} > 3.0\text{ V}$

Collector cut-off current

$V_{BE} = 0; V_{CE} = 10\text{ V}$

$I_{CES} < 5.0\text{ mA}$

Second breakdown energy

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

$E_{SBR} > 1.0\text{ mJ}$

DC current gain

$I_C = 600\text{ mA}; V_{CE} = 5\text{ V}$

$h_{FE} > 25$

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

$I_E = i_e = 0; V_{CB} = 7.5\text{ V}$

$C_c$  typ.  $11\text{ pF}$

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

$I_C = 0; V_{CE} = 7.5\text{ V}$

$C_{re}$  typ.  $6.0\text{ pF}$

Collector-mounting base capacitance

$C_{c-mb}$  typ.  $1.2\text{ pF}$

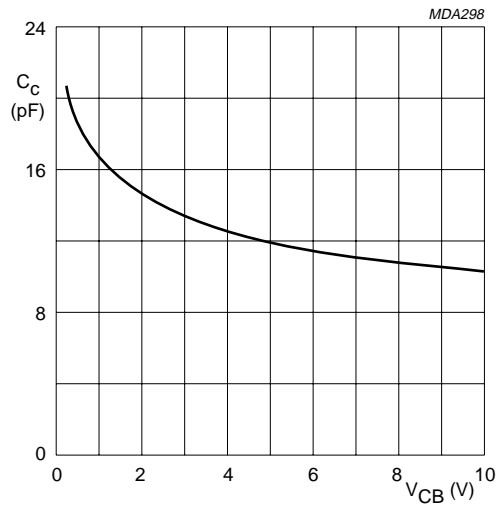


Fig.3 Collector capacitance as a function of collector-base voltage;  $f = 1\text{ MHz}; I_E = i_e = 0$ ; typical values.

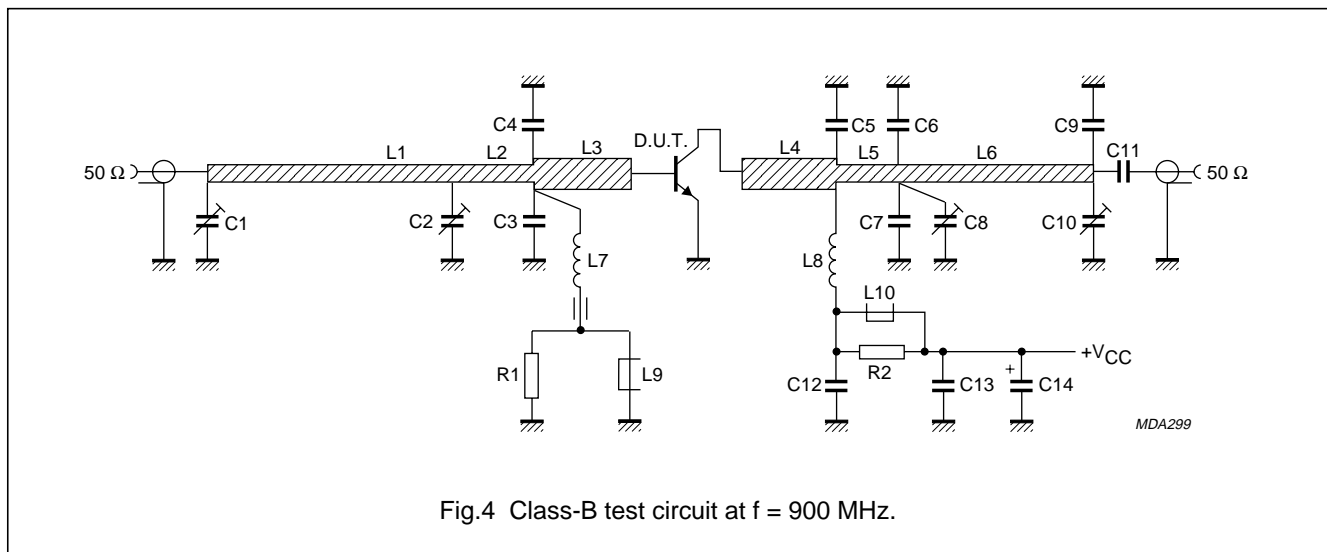
## UHF power transistor

## BLT92/SL

## APPLICATION INFORMATION

RF performance in CW operation (common-emitter circuit; class-B);  $f = 900 \text{ MHz}$ ;  $T_{mb} = 25 \text{ }^\circ\text{C}$ 

MODE OF OPERATION	$V_{CE}$ (V)	$P_L$ (W)	$G_p$ (dB)	$\eta_c$ (%)
Class-B; CW	7.5	3.0	> 7.0 typ. 8.5	> 50 typ. 57

Fig.4 Class-B test circuit at  $f = 900 \text{ MHz}$ .

## List of components:

- C1 = C2 = C8 = C10 = 1.4 to 5.5 pF film dielectric trimmer (cat. no. 2222 809 09001)
- C3 = C6 = C7 = 3.3 pF multilayer ceramic chip capacitor<sup>(1)</sup>
- C4 = C5 = C9 = 5.6 pF multilayer ceramic chip capacitor<sup>(1)</sup>
- C11 = C12 = C13 = 180 pF multilayer ceramic chip capacitor
- C14 = 1  $\mu\text{F}$  (35 V) tantalum capacitor
- L1 = 50  $\Omega$  stripline (25 mm  $\times$  2.4 mm)
- L2 = 50  $\Omega$  stripline (11 mm  $\times$  2.4 mm)
- L3 = L4 = 25  $\Omega$  stripline (11.5 mm  $\times$  6.0 mm)
- L5 = 50  $\Omega$  stripline (7.0 mm  $\times$  2.4 mm)
- L6 = 50  $\Omega$  stripline (27.0 mm  $\times$  2.4 mm)
- L7 = 4 turns closely wound enamelled Cu wire (0.4 mm), int. dia.: 3 mm, with ferrite bead (cat. no. 4330 830 32221) over the coldside lead
- L8 = 1 turn Cu wire (1.0 mm); int. dia. 5.5 mm; length 2 mm; leads 2  $\times$  5 mm
- L9 = L10 = Ferroxcube wideband HF choke, grade 3B (cat. no. 4312 020 36642)
- R1 = R2 = 10  $\Omega \pm 5\%$ ; 0.25 W metal film resistor

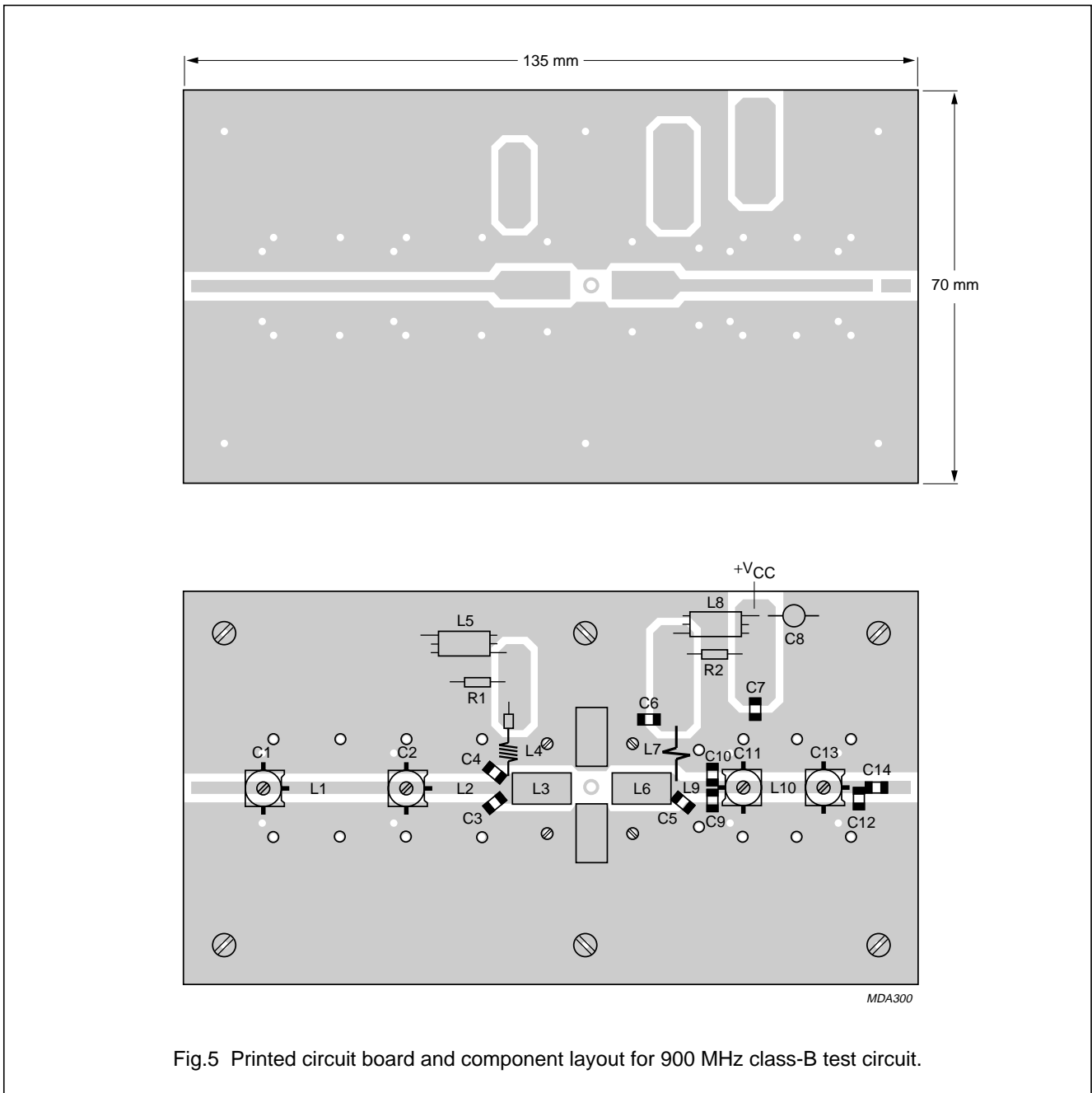
The striplines on a double Cu-clad printed circuit board with PTFE fibreglass dielectric ( $\epsilon_r = 2.2$ ); thickness 1/32 inch; thickness of copper-sheet 2  $\times$  35  $\mu\text{m}$ .

## Note

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

UHF power transistor

BLT92/SL

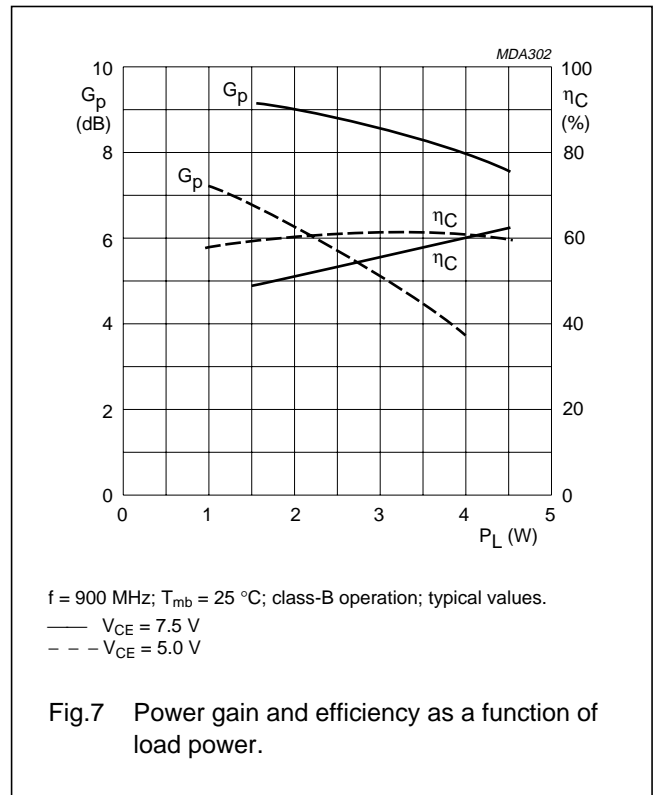
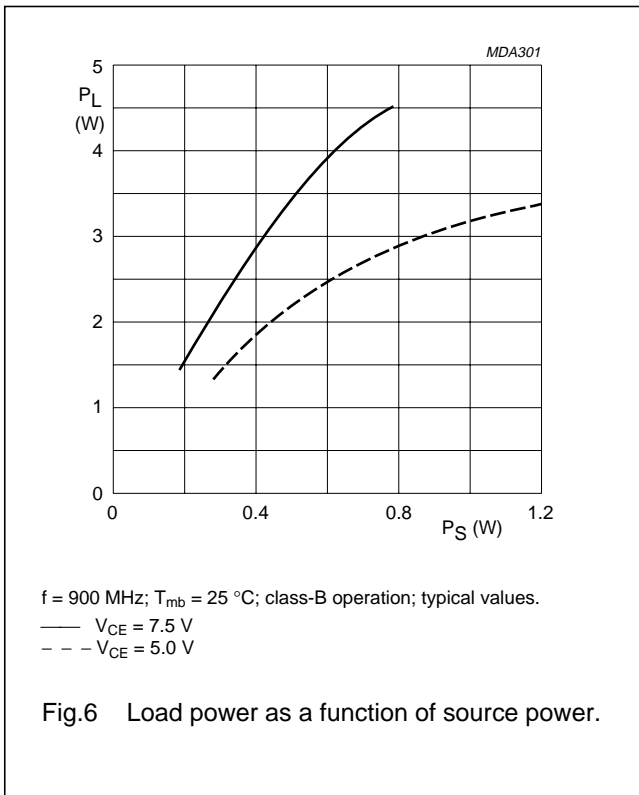


**Note:**

The circuit and the components are on one side of the PTFE fibreglass board; the other side is un-etched copper serving as groundplane. Earth connections are made by hollow rivets and also by fixing-screws and copper straps around the board and under the emitters to provide a direct contact between the copper on the component side and the groundplane.

UHF power transistor

BLT92/SL

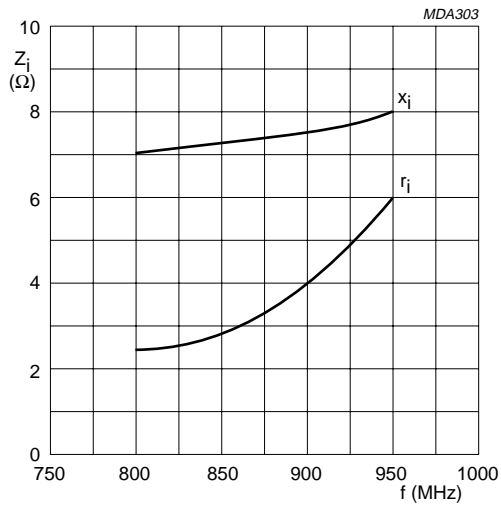


**RUGGEDNESS**

The device is capable of withstanding a full load mismatch (VSWR = 50; all phases) at rated load power up to a supply voltage of 9.0 V at  $T_{mb} = 25\text{ }^\circ\text{C}$ .

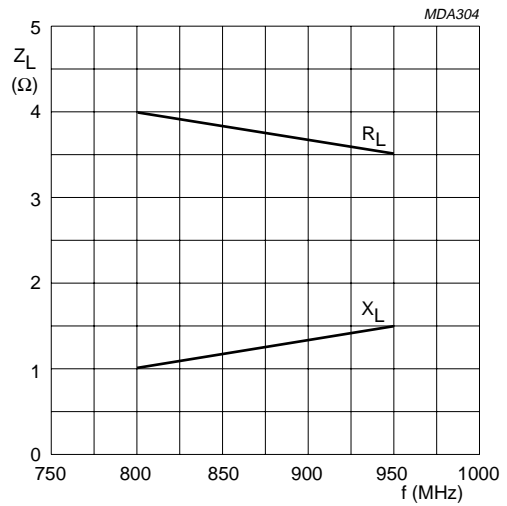
UHF power transistor

BLT92/SL



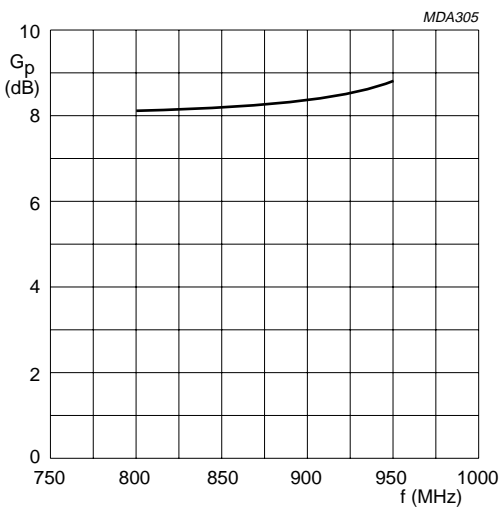
$V_{CE} = 7,5 \text{ V}$ ;  $P_L = 3 \text{ W}$ ;  $f = 800 - 960 \text{ MHz}$ ;  $T_{mb} = 25 \text{ }^\circ\text{C}$ ;  
class-B operation; typical values.

Fig. 8 Input impedance as a function of frequency (series components).



$V_{CE} = 7,5 \text{ V}$ ;  $P_L = 3 \text{ W}$ ;  $f = 800 - 960 \text{ MHz}$ ;  $T_{mb} = 25 \text{ }^\circ\text{C}$ ;  
class-B operation; typical values.

Fig. 9 Load impedance as a function of frequency (series components).



$V_{CE} = 7,5 \text{ V}$ ;  $P_L = 3 \text{ W}$ ;  $f = 800 - 960 \text{ MHz}$ ;  $T_{mb} = 25 \text{ }^\circ\text{C}$ ;  
class-B operation; typical values.

Fig. 10 Power gain as a function of frequency.



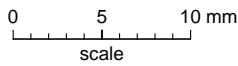
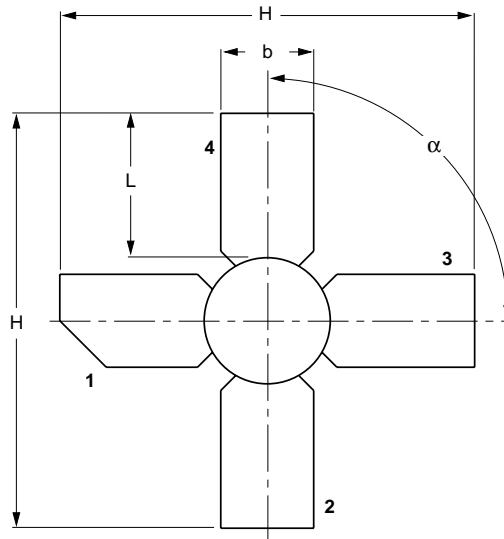
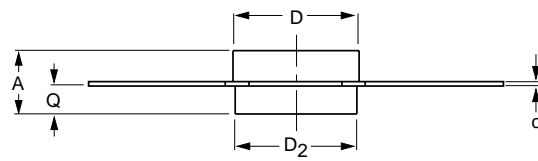
UHF power transistor

BLT92/SL

PACKAGE OUTLINE

Studless ceramic package; 4 leads

SOT122D



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

UNIT	A	b	c	D	$D_2$	H	L	Q	$\alpha$
mm	4.17 3.27	5.85 5.58	0.18 0.14	7.50 7.23	7.24 6.98	27.56 25.78	9.91 9.14	1.58 1.27	90°

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT122D						97-04-18

## UHF power transistor

BLT92/SL

**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.	

**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.