

# DATA SHEET

## **BLT50** UHF power transistor

Product specification

April 1991

# UHF power transistor

# BLT50

### FEATURES

- SMD encapsulation
- Gold metallization ensures excellent reliability.

### DESCRIPTION

NPN silicon planar epitaxial transistor encapsulated in a SOT223 surface mounted envelope and designed primarily for use in hand-held radio equipment in the 470 MHz communications band.

### PINNING - SOT223

PIN	DESCRIPTION
1	emitter
2	base
3	emitter
4	collector

### QUICK REFERENCE DATA

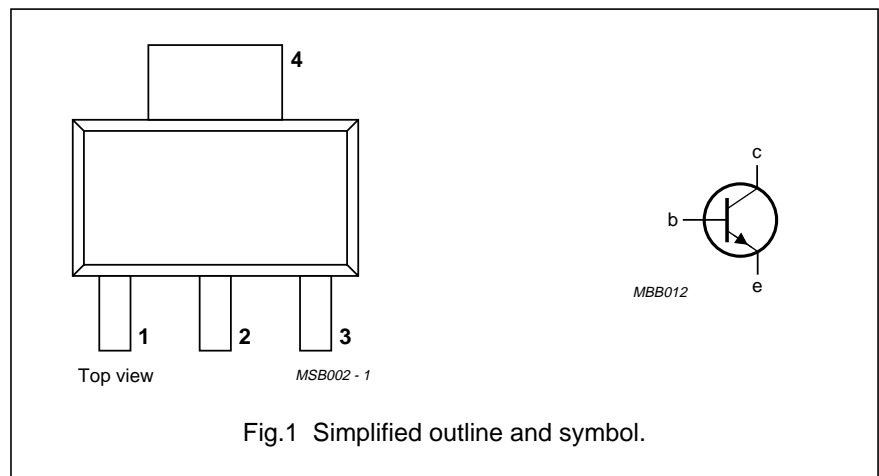
RF performance at  $T_s \leq 60$  °C in a common emitter class-B test circuit (note 1).

MODE OF OPERATION	f (MHz)	V <sub>CE</sub> (V)	P <sub>L</sub> (W)	G <sub>p</sub> (dB)	$\eta_c$ (%)
c.w. narrow band	470	7.5	1.2	> 10	> 55

### Note

1.  $T_s$  = temperature at soldering point of collector tab.

### PIN CONFIGURATION



# UHF power transistor

# BLT50

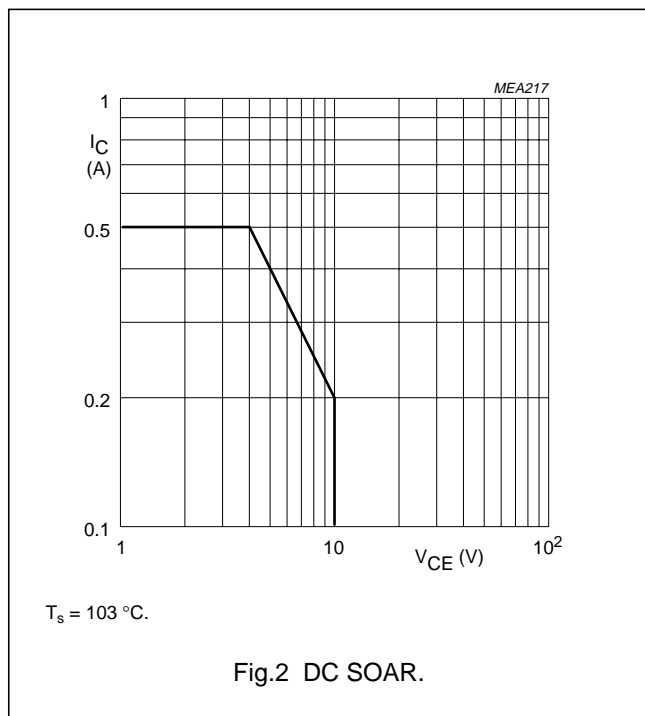
## LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$V_{CBO}$	collector-base voltage	open emitter	–	20	V
$V_{CEO}$	collector-emitter voltage	open base	–	10	V
$V_{EBO}$	emitter-base voltage	open collector	–	3	V
$I_C, I_{C(AV)}$	collector current	DC or average value	–	500	mA
$I_{CM}$	collector current	peak value $f > 1$ MHz	–	1.5	A
$P_{tot}$	total power dissipation	$f > 1$ MHz; $T_s = 103$ °C (note 1)	–	2	W
$T_{stg}$	storage temperature range		–65	150	°C
$T_j$	operating junction temperature		–	175	°C

### Note

- $T_s$  = temperature at soldering point of collector tab.



## THERMAL RESISTANCE

SYMBOL	PARAMETER	CONDITIONS	MAX.	UNIT
$R_{th\ j-s(DC)}$	from junction to soldering point	$P_{tot} = 2$ W; $T_s = 103$ °C	36	K/W

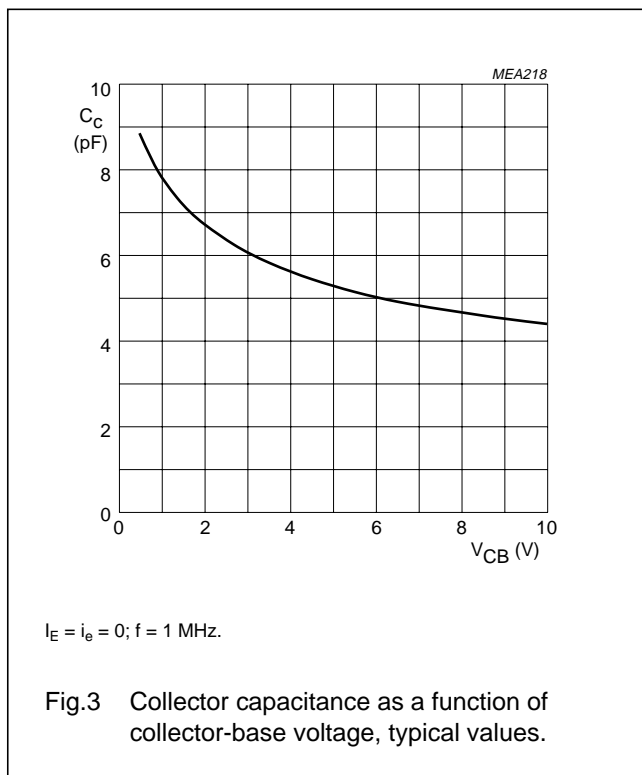
UHF power transistor

BLT50

**CHARACTERISTICS**

$T_j = 25\text{ }^\circ\text{C}$ .

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)CBO}$	collector-base breakdown voltage	open emitter; $I_C = 5\text{ mA}$	20	–	–	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	open base; $I_C = 10\text{ mA}$	10	–	–	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	open collector; $I_E = 1\text{ mA}$	3	–	–	V
$I_{CES}$	collector-emitter leakage current	$V_{BE} = 0$ ; $V_{CE} = 10\text{ V}$	–	–	250	$\mu\text{A}$
$h_{FE}$	DC current gain	$V_{CE} = 5\text{ V}$ ; $I_C = 300\text{ mA}$	25	–	–	
$E_{SBR}$	second breakdown energy	$L = 25\text{ mH}$ ; $R_{BE} = 10\text{ }\Omega$ ; $f = 50\text{ Hz}$	0.55	–	–	mJ
$C_c$	collector capacitance	$V_{CB} = 7.5\text{ V}$ ; $I_E = I_e = 0$ ; $f = 1\text{ MHz}$	–	4.7	6	pF
$C_{re}$	feedback capacitance	$V_{CE} = 7.5\text{ V}$ ; $I_C = 0$ ; $f = 1\text{ MHz}$	–	2.9	4.5	pF



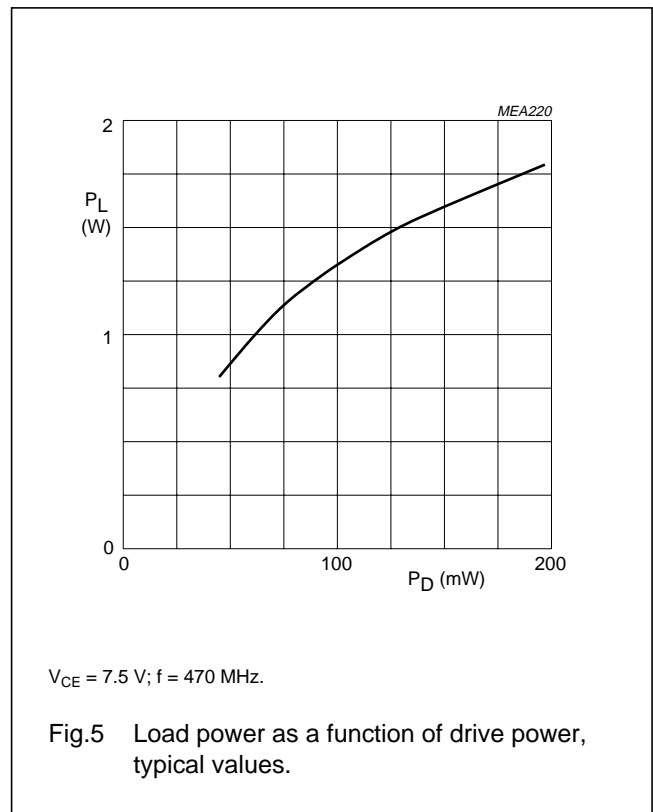
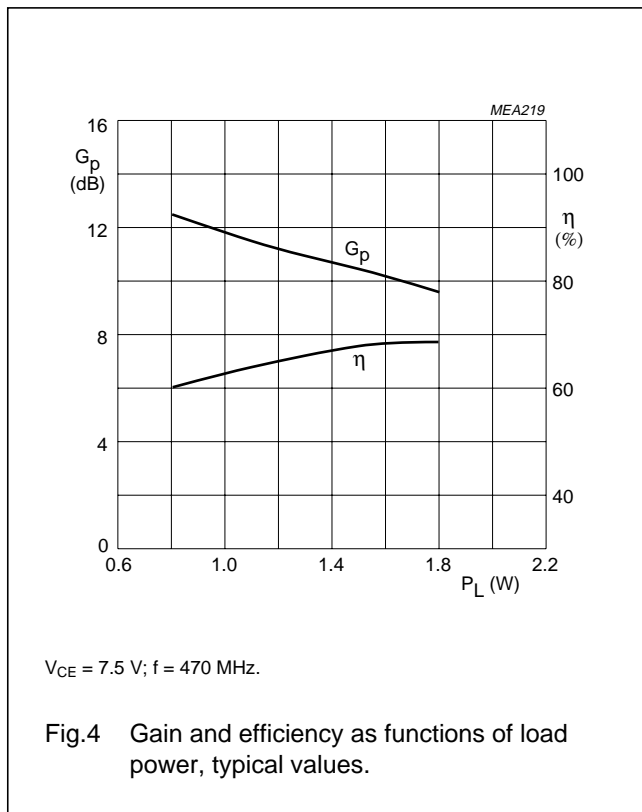
UHF power transistor

BLT50

**APPLICATION INFORMATION**

RF performance at  $T_s \leq 60\text{ }^\circ\text{C}$  in a common emitter class-B test circuit.

MODE OF OPERATION	f (MHz)	$V_{CE}$ (V)	$P_L$ (W)	$G_p$ (dB)	$\eta_c$ (%)
c.w. narrow band	470	7.5	1.2	> 10 typ. 11.2	> 55 typ. 65

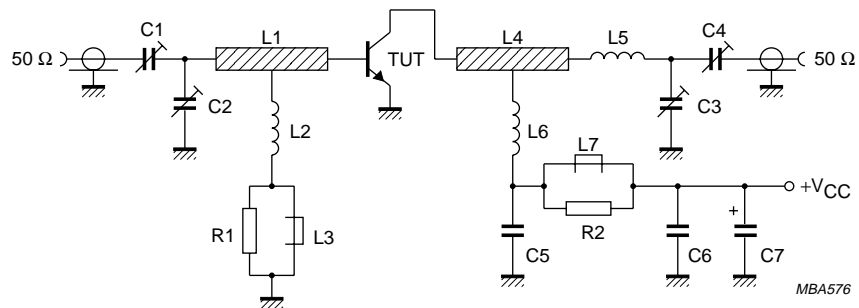


**Ruggedness in class-B operation**

The BLT50 is capable of withstanding a load mismatch corresponding to  $V_{SWR} = 50:1$  through all phases at rated output power, up to a supply voltage of 9 V,  $f = 470\text{ MHz}$  and  $T_s \leq 60\text{ }^\circ\text{C}$ , where  $T_s$  is the temperature at the soldering point of the collector tab.

## UHF power transistor

## BLT50

Fig.6 Class-B test circuit at  $f = 470$  MHz.

## List of components (see test circuit)

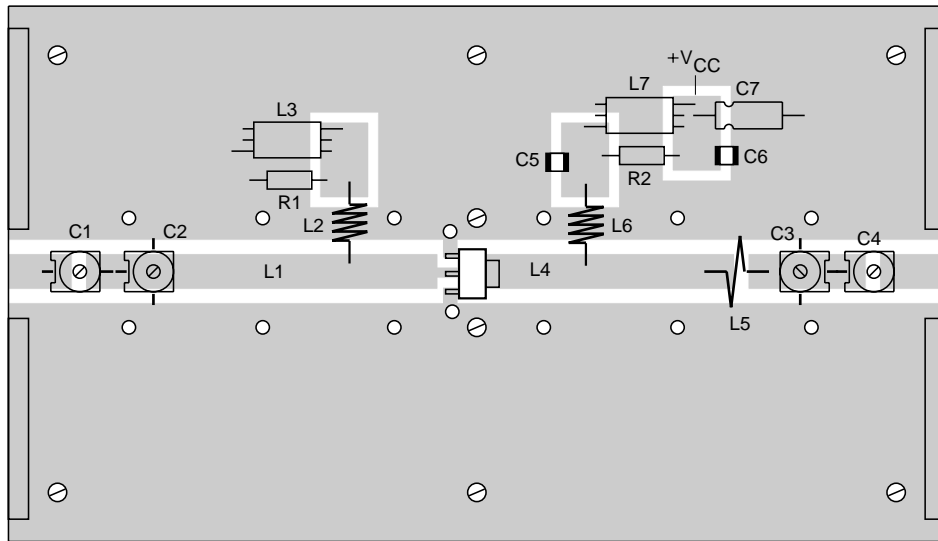
COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
C1	film dielectric trimmer	1.4 to 5.5 pF		2222 809 09004
C2	film dielectric trimmer	1.4 to 5.5 pF		2222 809 09001
C3	film dielectric trimmer	2 to 9 pF		2222 809 09002
C4	film dielectric trimmer	2 to 9 pF		2222 809 09005
C5	multilayer ceramic chip capacitor (note 1)	100 pF		
C6	multilayer ceramic chip capacitor (note 1)	1 nF		
C7	63 V electrolytic capacitor	2.2 $\mu$ F		
L1	stripline (note 2)	50 $\Omega$	54 mm $\times$ 4.7 mm	
L2	5 turns enamelled 0.4 mm copper wire		int. dia. 3 mm	
L3, L7	grade 3B1 Ferroxcube wideband RF choke			4312 020 36640
L4	stripline (note 2)	50 $\Omega$	36 mm $\times$ 4.7 mm	
L5	1 turn enamelled 1.4 mm copper wire	5 nH	int. dia. 4 mm	
L6	3 turns enamelled 0.4 mm copper wire		int. dia. 3 mm	
R1, R2	0.25 W metal film resistor	10 $\Omega$ , 5%		

## Notes

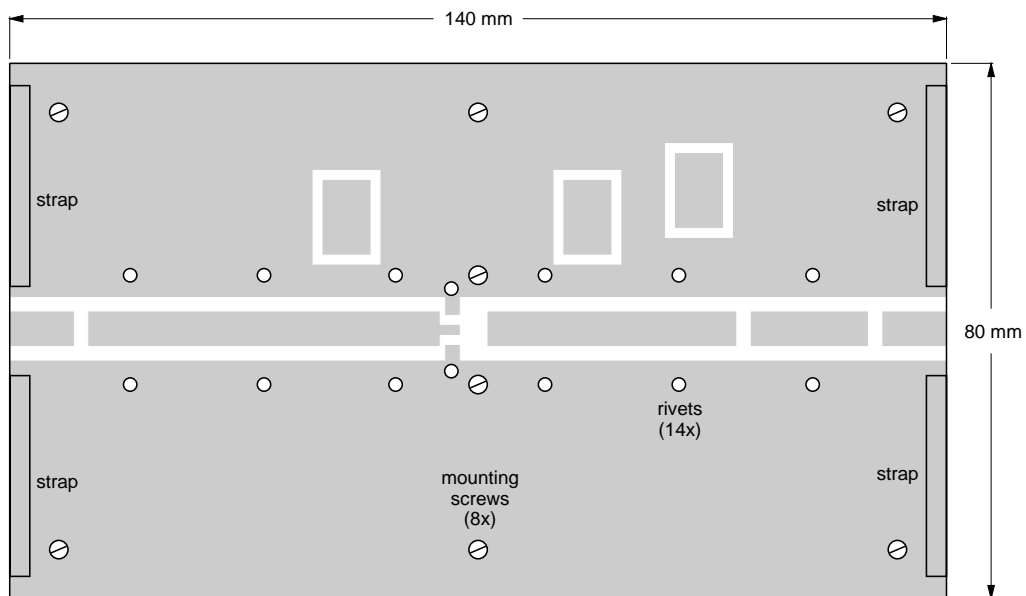
- American Technical Ceramics (ATC) capacitor, type 100B or other capacitor of the same quality.
- The striplines are mounted on a double copper-clad printed circuit board, with PTFE fibre-glass dielectric ( $\epsilon_r = 2.2$ ); thickness  $\frac{1}{16}$  inch.

UHF power transistor

BLT50



MBA575



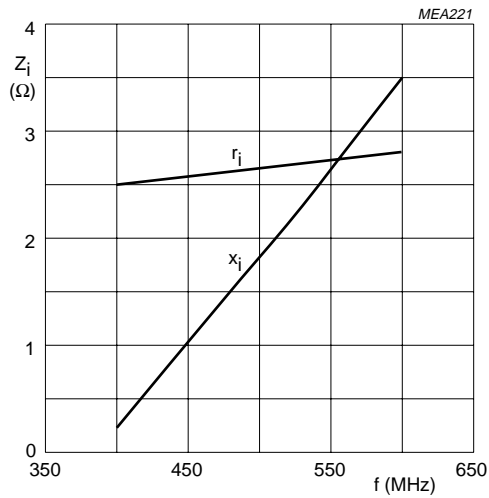
MBA574

The circuit and components are situated on one side of a copper-clad PTFE fibre-glass board; the other side is unetched and serves as a ground plane. Earth connections from the component side to the ground plane are made by means of fixing screws, hollow rivets and copper foil straps, as shown.

Fig.7 Component layout for 470 MHz class-B test circuit.

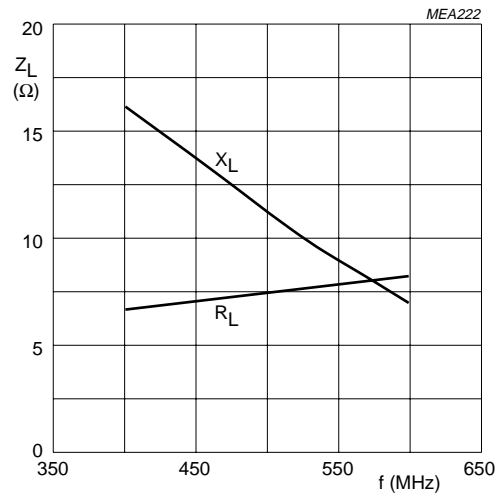
UHF power transistor

BLT50



Class-B operation;  $V_{CE} = 7.5$  V;  $P_L = 1.2$  W.

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



Class-B operation;  $V_{CE} = 7.5$  V;  $P_L = 1.2$  W.

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

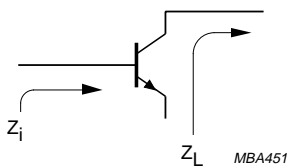
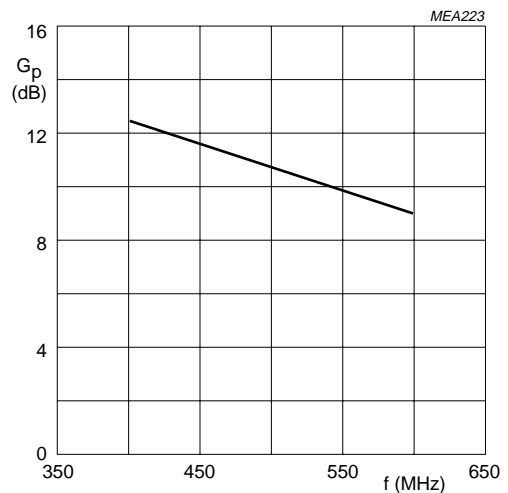


Fig. 10 Definition of transistor impedance.



Class-B operation;  $V_{CE} = 7.5$  V;  $P_L = 1.2$  W.

Fig. 11 Power gain as a function of frequency, typical values.



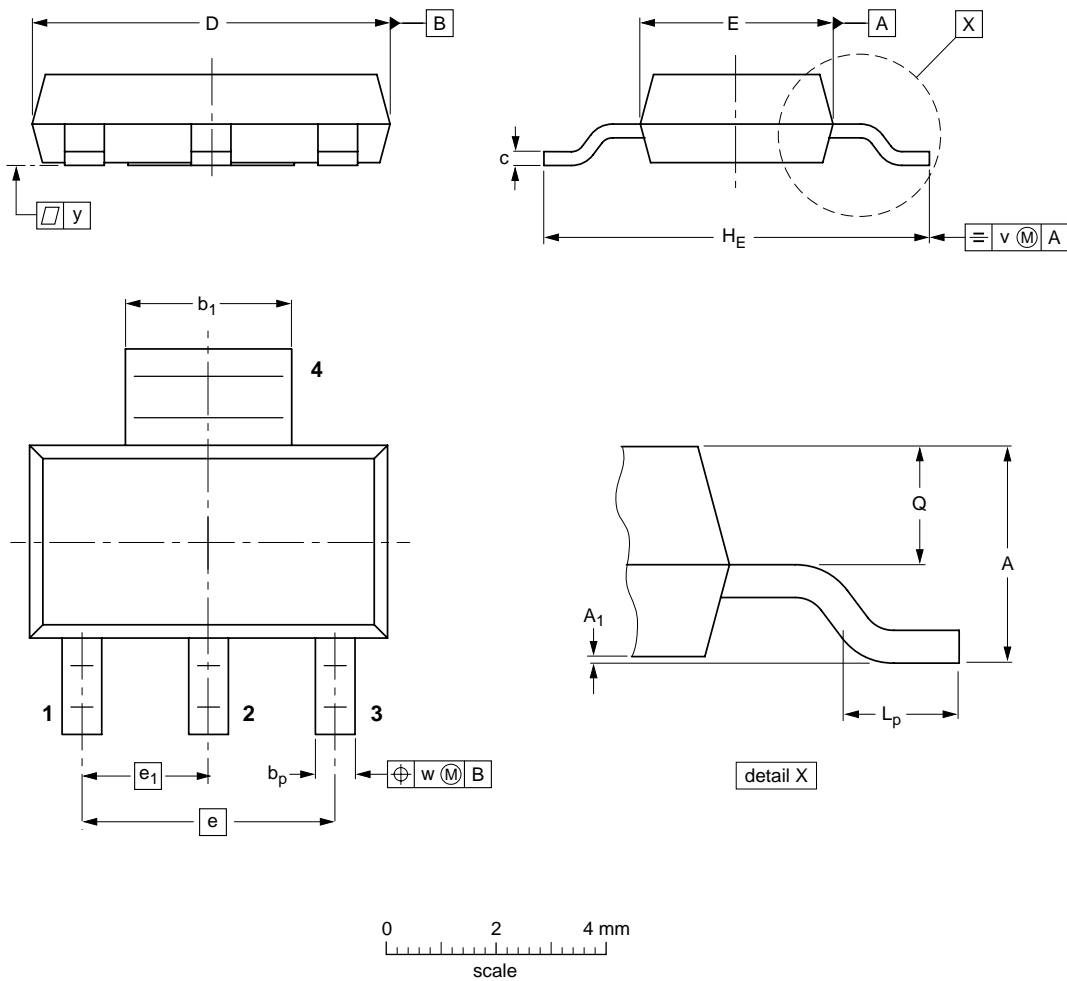
# UHF power transistor

# BLT50

## PACKAGE OUTLINE

Plastic surface mounted package; collector pad for good heat transfer; 4 leads

SOT223



**DIMENSIONS (mm are the original dimensions)**

UNIT	A	A <sub>1</sub>	b <sub>p</sub>	b <sub>1</sub>	c	D	E	e	e <sub>1</sub>	H <sub>E</sub>	L <sub>p</sub>	Q	v	w	y
mm	1.8 1.5	0.10 0.01	0.80 0.60	3.1 2.9	0.32 0.22	6.7 6.3	3.7 3.3	4.6	2.3	7.3 6.7	1.1 0.7	0.95 0.85	0.2	0.1	0.1

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT223						96-11-11 97-02-28

# UHF power transistor

# BLT50

## 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.