

# DATA SHEET

## **BLT81** UHF power transistor

Product specification  
Supersedes data of November 1992

1996 May 09

# UHF power transistor

# BLT81

### FEATURES

- SMD encapsulation
- Gold metallization ensures excellent reliability.

### APPLICATIONS

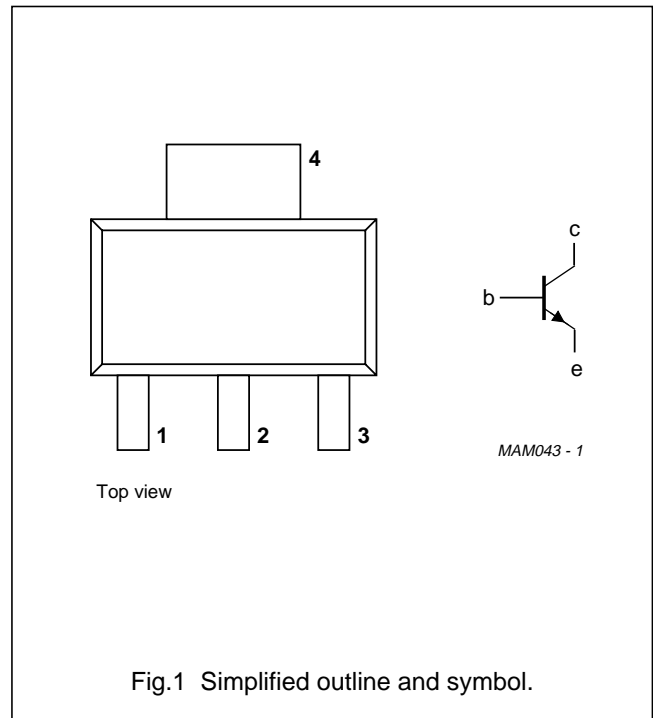
- Hand-held radio equipment in the 900 MHz communication band.

### DESCRIPTION

NPN silicon planar epitaxial transistor encapsulated in a plastic SOT223 SMD package.

### PINNING - SOT223

PIN	SYMBOL	DESCRIPTION
1	e	emitter
2	b	base
3	e	emitter
4	c	collector



### QUICK REFERENCE DATA

RF performance at  $T_s \leq 60\text{ }^\circ\text{C}$  in a common emitter test circuit (see Fig.7).

MODE OF OPERATION	f (MHz)	V <sub>CE</sub> (V)	P <sub>L</sub> (W)	G <sub>p</sub> (dB)	$\eta_c$ (%)
CW, class-B narrow band	900	7.5	1.2	$\geq 6$	$\geq 60$
		6	1.2	typ. 6.5	typ. 77

UHF power transistor

BLT81

**LIMITING VALUES**

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

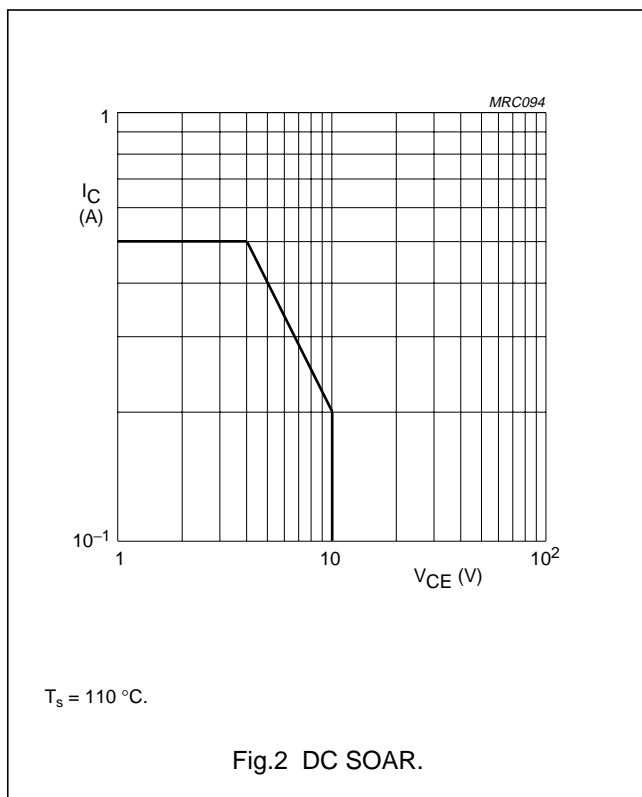
SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$V_{CBO}$	collector-base voltage	open emitter	–	20	V
$V_{CEO}$	collector-emitter voltage	open base	–	9.5	V
$V_{EBO}$	emitter-base voltage	open collector	–	2.5	V
$I_C$	collector current (DC)		–	500	mA
$I_{C(AV)}$	average collector current		–	500	mA
$P_{tot}$	total power dissipation	$T_s = 110\text{ °C}$ ; note 1	–	2	W
$T_{stg}$	storage temperature		–65	+150	°C
$T_j$	operating junction temperature		–	175	°C

**THERMAL CHARACTERISTICS**

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j-s}$	thermal resistance from junction to soldering point	$P_{tot} = 2\text{ W}$ ; $T_s = 110\text{ °C}$ ; note 1	32	K/W

**Note to the “Limiting values” and “Thermal characteristics”**

- $T_s$  is the temperature at the soldering point of the collector pin.



UHF power transistor

BLT81

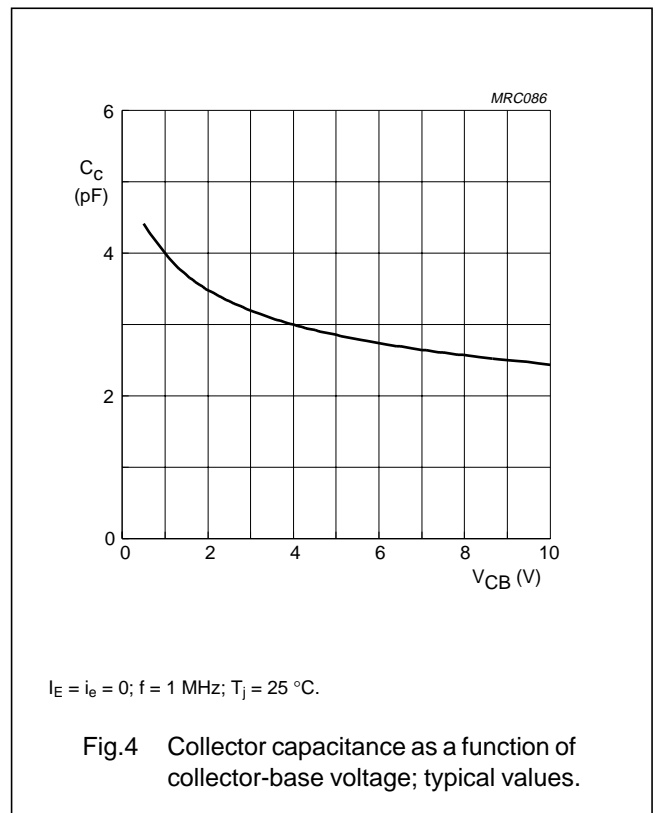
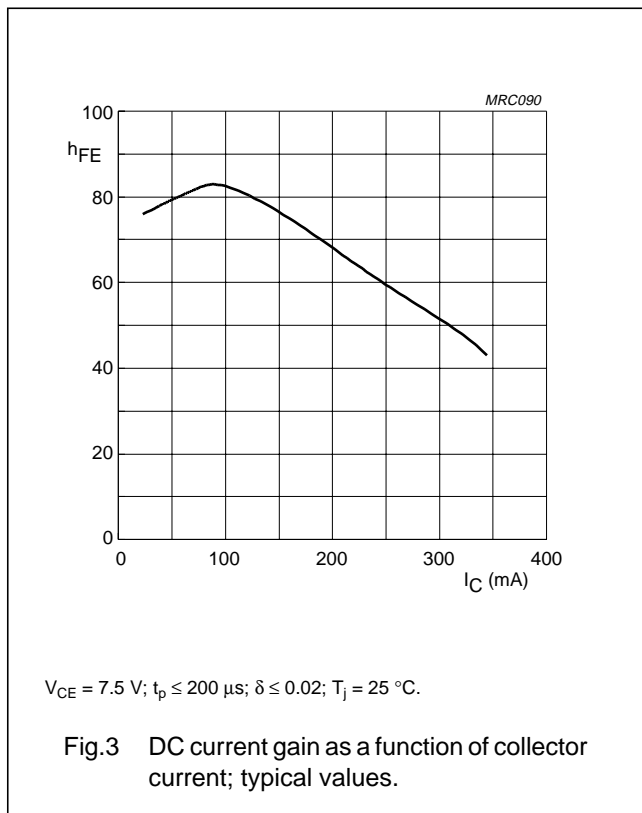
**CHARACTERISTICS**

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)CBO}$	collector-base breakdown voltage	open emitter; $I_C = 1\text{ mA}$	20	–	–	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	open base; $I_C = 10\text{ mA}$	9.5	–	–	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	open collector; $I_E = 0.1\text{ mA}$	2.5	–	–	V
$I_{CES}$	collector leakage current	$V_{CE} = 10\text{ V}$ ; $V_{BE} = 0$	–	–	0.1	mA
$h_{FE}$	DC current gain	$V_{CE} = 5\text{ V}$ ; $I_C = 300\text{ mA}$ ; note 1;	25	–	–	
$C_c$	collector capacitance	$V_{CB} = 7.5\text{ V}$ ; $I_E = i_e = 0$ ; $f = 1\text{ MHz}$ ;	–	2.7	4	pF
$C_{re}$	feedback capacitance	$V_{CE} = 7.5\text{ V}$ ; $I_C = 0$ ; $f = 1\text{ MHz}$	–	1.7	3	pF

**Note**

1. Measured under pulsed conditions:  $t_p \leq 200\text{ }\mu\text{s}$ ;  $\delta \leq 0.02$ .



# UHF power transistor

# BLT81

## APPLICATION INFORMATION

RF performance at  $T_s \leq 60^\circ\text{C}$  in a common emitter test circuit (see note 1 and Fig.7).

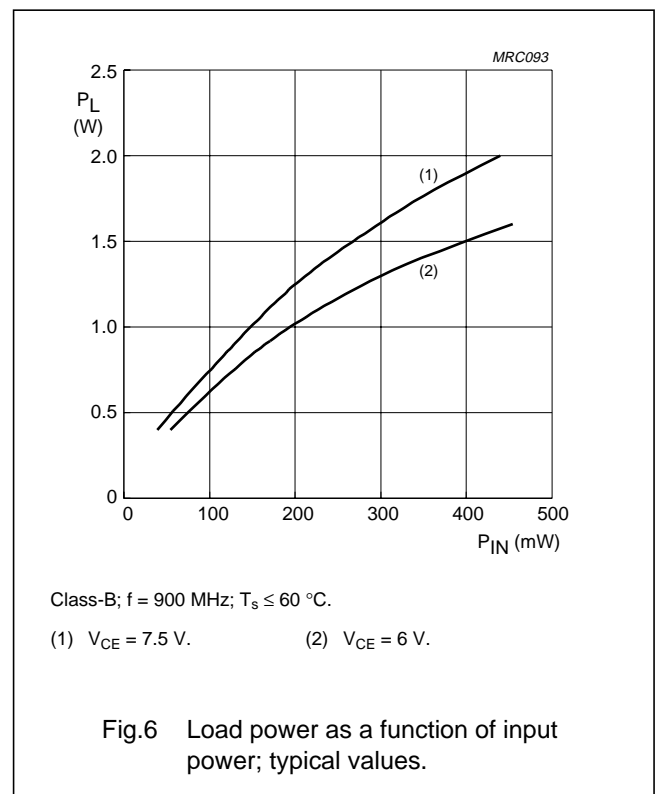
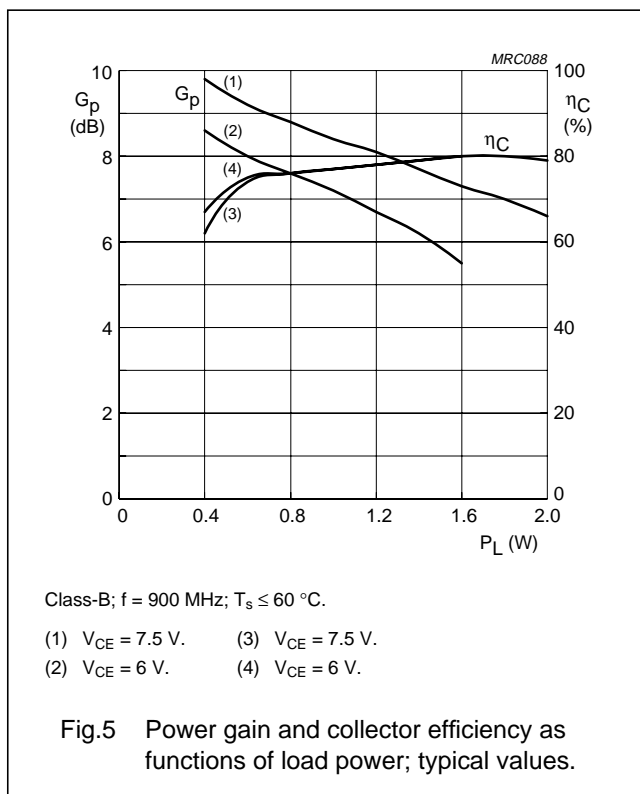
MODE OF OPERATION	f (MHz)	V <sub>CE</sub> (V)	P <sub>L</sub> (W)	G <sub>p</sub> (dB)	$\eta_c$ (%)
CW, class-B narrow band	900	7.5	1.2	$\geq 6$ typ. 8	$\geq 60$ typ. 77
		6	1.2	typ. 6.5	typ. 77

### Note

- $T_s$  is the temperature at the soldering point of the collector pin.

### Ruggedness in class-AB operation

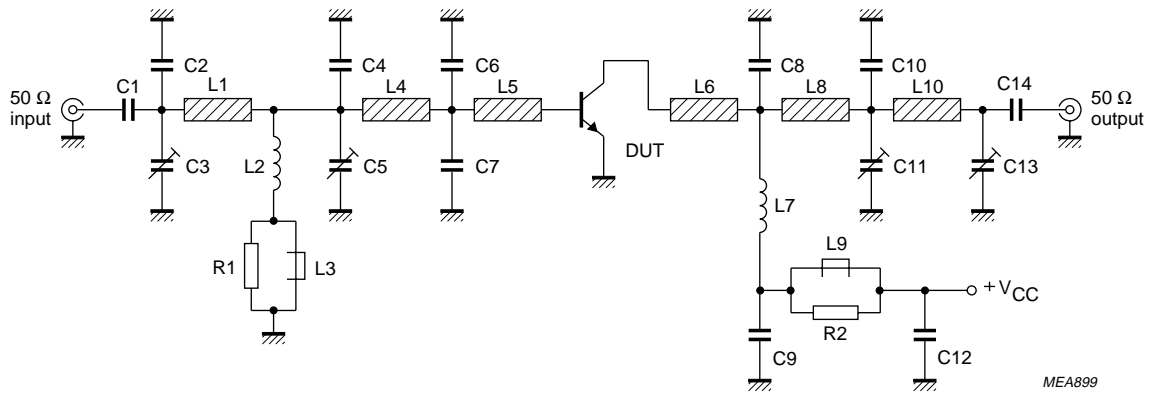
The BLT81 is capable of withstanding a load mismatch corresponding to VSWR = 50 : 1 through all phases under the following conditions: f = 900 MHz; V<sub>CE</sub> = 9 V; P<sub>L</sub> = 1.2 W; T<sub>s</sub> ≤ 60 °C.



# UHF power transistor

# BLT81

## Test circuit information



MEA899

Fig.7 Common emitter test circuit for class-B operation at 900 MHz.

## UHF power transistor

BLT81

## List of components used in test circuit (see Figs 7 and 8)

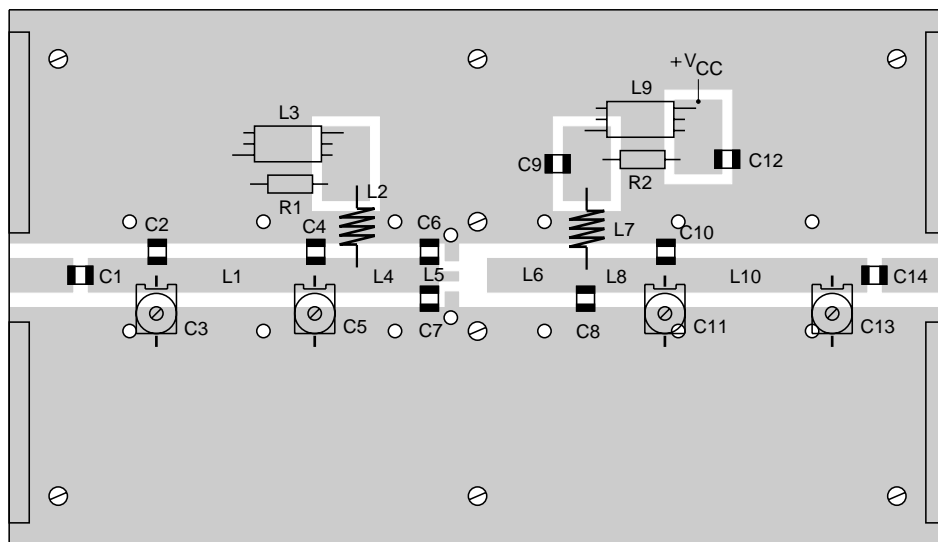
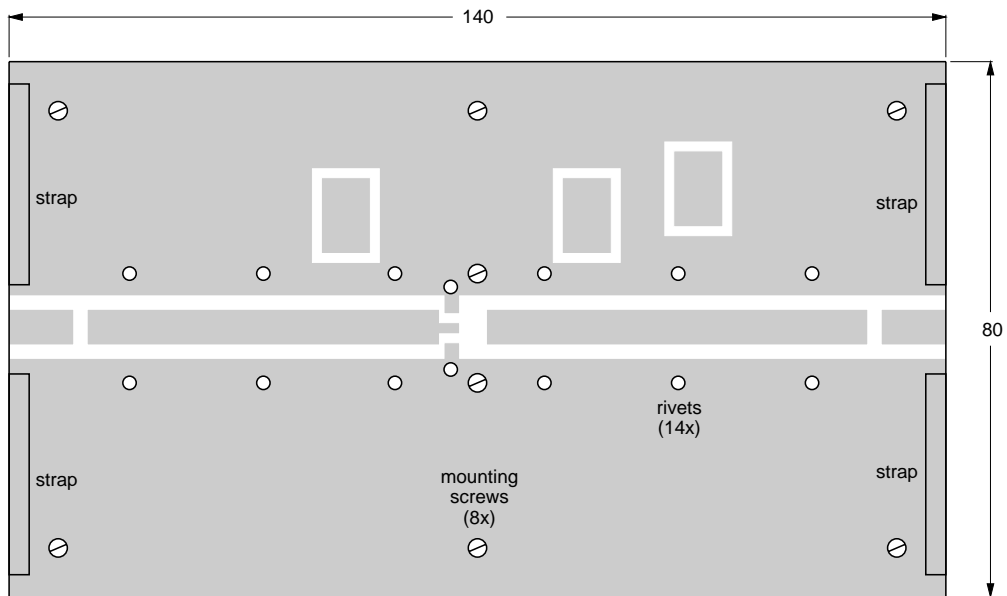
COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE No.
C1, C14	multilayer ceramic chip capacitor; note 1	100 pF		
C2	multilayer ceramic chip capacitor; note 1	3 pF		
C3, C5, C11, C13	film dielectric trimmer	1.4 to 5.5 pF		2222 809 09004
C4	multilayer ceramic chip capacitor; note 1	5.6 pF		
C6, C7, C10	multilayer ceramic chip capacitor; note 1	5.1 pF		
C8	multilayer ceramic chip capacitor; note 1	3.6 pF		
C9	multilayer ceramic chip capacitor; note 1	220 pF		
C12	multilayer ceramic chip capacitor;	1 nF		
L1	stripline; note 2	50 $\Omega$	length 26.6 mm width 4.85 mm	
L2	10 turns enamelled 0.6 mm copper wire	250 nH	int. dia. 4.5 mm leads 2 $\times$ 5 mm	
L3, L9	grade 3B Ferroxcube wideband HF choke			4312 020 36640
L4	stripline; note 2	50 $\Omega$	length 18 mm width 4.85 mm	
L5	stripline; note 2	75 $\Omega$	length 3.5 mm width 2.5 mm	
L6	stripline; note 2	50 $\Omega$	length 10 mm width 4.85 mm	
L7	4 turns enamelled 0.6 mm copper wire	65 nH	int. dia. 4.5 mm leads 2 $\times$ 5 mm	
L8	stripline; note 2	50 $\Omega$	length 15 mm width 4.85 mm	
L10	stripline; note 2	50 $\Omega$	length 24.6 mm width 4.85 mm	
R1, R2	metal film resistor	10 $\Omega$ , 0.25 W		

## Notes

- American Technical Ceramics type 100B or capacitor of same quality.
- The striplines are on a double copper-clad printed-circuit board, with PTFE fibre-glass dielectric ( $\epsilon_r = 2.2$ ); thickness  $\frac{1}{16}$ " ; thickness of the copper sheet 35  $\mu\text{m}$ .

UHF power transistor

BLT81



MEA898

Dimensions in mm.

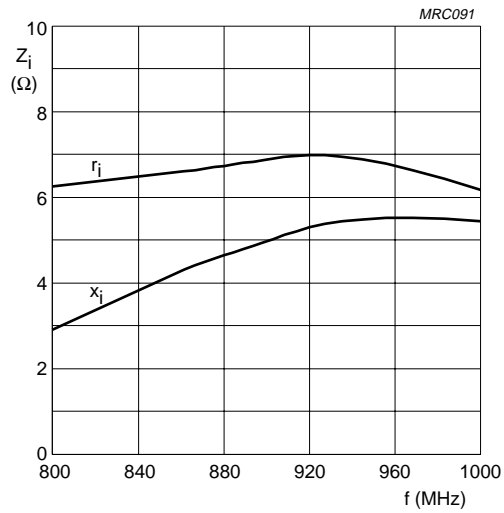
The components are situated on one side of the copper-clad PTFE fibre-glass board, the other side is unetched and serves as a ground plane. Earth connections from the component side to the ground plane are made by means of fixing screws and copper foil straps under the emitter leads.

Fig.8 Printed-circuit board and component lay-out for 900 MHz class-B test circuit in Fig.7.



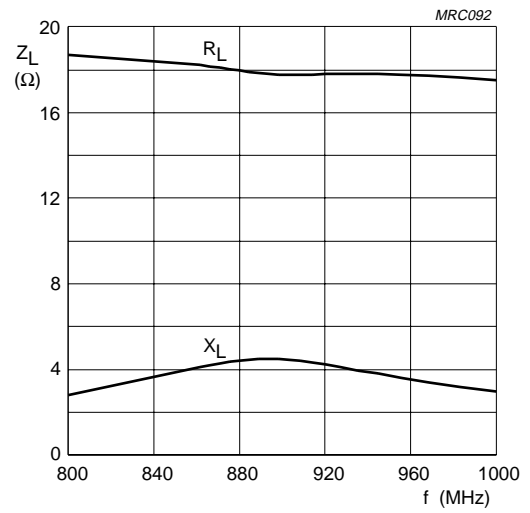
UHF power transistor

BLT81



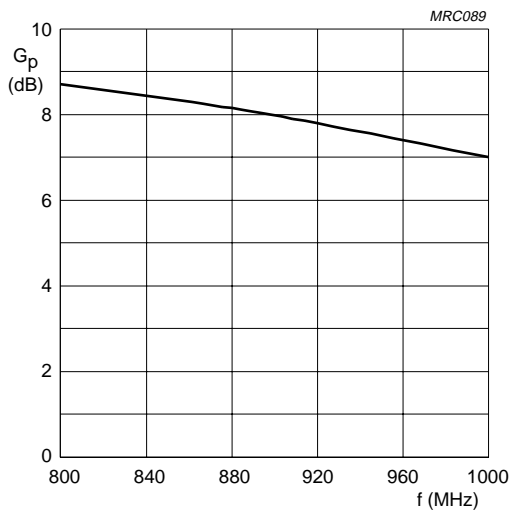
Class-B;  $V_{CE} = 7.5$  V;  $P_L = 1.2$  W;  $T_s \leq 60$  °C.

Fig. 9 Input impedance as a function of frequency (series components); typical values.



Class-B;  $V_{CE} = 7.5$  V;  $P_L = 1.2$  W;  $T_s \leq 60$  °C.

Fig. 10 Load impedance as a function of frequency (series components); typical values.



Class-B;  $V_{CE} = 7.5$  V;  $P_L = 1.2$  W;  $T_s \leq 60$  °C.

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

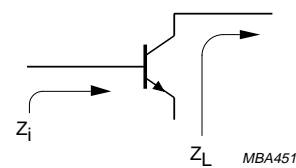
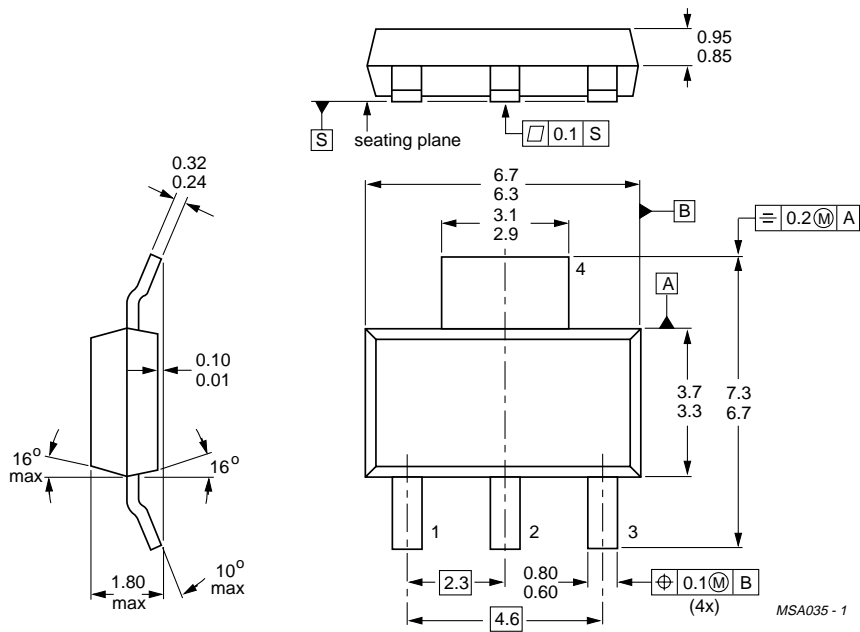


Fig. 12 Definition of transistor impedance.

UHF power transistor

BLT81

PACKAGE OUTLINE



Dimensions in mm.

Fig.13 SOT223.

## UHF power transistor

BLT81

**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.

## Philips Semiconductors – a worldwide company

**Argentina:** see South America

**Australia:** 34 Waterloo Road, NORTH RYDE, NSW 2113,  
Tel. (02) 805 4455, Fax. (02) 805 4466

**Austria:** Computerstr. 6, A-1101 WIEN, P.O. Box 213,  
Tel. (01) 60 101-1256, Fax. (01) 60 101-1250

**Belarus:** Hotel Minsk Business Center, Bld. 3, r. 1211,  
Volodarski Str. 6, 220050 MINSK,  
Tel. (172) 200 733, Fax. (172) 200 773

**Belgium:** see The Netherlands

**Brazil:** see South America

**Bulgaria:** Philips Bulgaria Ltd., Energoproject, 15th floor,  
51 James Bourchier Blvd., 1407 SOFIA,  
Tel. (359) 2 689 211, Fax. (359) 2 689 102

**Canada:** PHILIPS SEMICONDUCTORS/COMPONENTS:  
Tel. (800) 234-7381, Fax. (708) 296-8556

**Chile:** see South America

**China/Hong Kong:** 501 Hong Kong Industrial Technology Centre,  
72 Tat Chee Avenue, Kowloon Tong, HONG KONG,  
Tel. (852) 2319 7888, Fax. (852) 2319 7700

**Colombia:** see South America

**Czech Republic:** see Austria

**Denmark:** Prags Boulevard 80, PB 1919, DK-2300  
COPENHAGEN S, Tel. (032) 88 2636, Fax. (031) 57 1949

**Finland:** Sinikalliontie 3, FIN-02630 ESPOO,  
Tel. (358) 0-615 800, Fax. (358) 0-61580 920

**France:** 4 Rue du Port-aux-Vins, BP317,  
92156 SURESNES Cedex,  
Tel. (01) 4099 6161, Fax. (01) 4099 6427

**Germany:** P.O. Box 10 51 40, 20035 HAMBURG,  
Tel. (040) 23 53 60, Fax. (040) 23 53 63 00

**Greece:** No. 15, 25th March Street, GR 17778 TAVROS,  
Tel. (01) 4894 339/4894 911, Fax. (01) 4814 240

**Hungary:** see Austria

**India:** Philips INDIA Ltd, Shivsagar Estate, A Block,  
Dr. Annie Besant Rd. Worli, BOMBAY 400 018  
Tel. (022) 4938 541, Fax. (022) 4938 722

**Indonesia:** see Singapore

**Ireland:** Newstead, Clonskeagh, DUBLIN 14,  
Tel. (01) 7640 000, Fax. (01) 7640 200

**Israel:** RAPAC Electronics, 7 Kehilat Saloniki St, TEL AVIV 61180,  
Tel. (03) 645 04 44, Fax. (03) 648 10 07

**Italy:** PHILIPS SEMICONDUCTORS,  
Piazza IV Novembre 3, 20124 MILANO,  
Tel. (0039) 2 6752 2531, Fax. (0039) 2 6752 2557

**Japan:** Philips Bldg 13-37, Kohnan 2-chome, Minato-ku,  
TOKYO 108, Tel. (03) 3740 5130, Fax. (03) 3740 5077

**Korea:** Philips House, 260-199 Itaewon-dong,  
Yongsan-ku, SEOUL, Tel. (02) 709-1412, Fax. (02) 709-1415

**Malaysia:** No. 76 Jalan Universiti, 46200 PETALING JAYA,  
SELANGOR, Tel. (03) 750 5214, Fax. (03) 757 4880

**Mexico:** 5900 Gateway East, Suite 200, EL PASO,  
TEXAS 79905, Tel. 9-5(800) 234-7831, Fax. (708) 296-8556

**Middle East:** see Italy

**Netherlands:** Postbus 90050, 5600 PB EINDHOVEN, Bldg. VB,  
Tel. (040) 2783749, Fax. (040) 2788399

**New Zealand:** 2 Wagener Place, C.P.O. Box 1041, AUCKLAND,  
Tel. (09) 849-4160, Fax. (09) 849-7811

**Norway:** Box 1, Manglerud 0612, OSLO,  
Tel. (022) 74 8000, Fax. (022) 74 8341

**Philippines:** PHILIPS SEMICONDUCTORS PHILIPPINES Inc.,  
106 Valero St. Salcedo Village, P.O. Box 2108 MCC,  
MAKATI, Metro MANILA,  
Tel. (63) 2 816 6380, Fax. (63) 2 817 3474

**Poland:** Ul. Lukiska 10, PL 04-123 WARSZAWA,  
Tel. (022) 612 2831, Fax. (022) 612 2327

**Portugal:** see Spain

**Romania:** see Italy

**Singapore:** Lorong 1, Toa Payoh, SINGAPORE 1231,  
Tel. (65) 350 2000, Fax. (65) 251 6500

**Slovakia:** see Austria

**Slovenia:** see Italy

**South Africa:** S.A. PHILIPS Pty Ltd.,  
195-215 Main Road Martindale, 2092 JOHANNESBURG,  
P.O. Box 7430 Johannesburg 2000,  
Tel. (011) 470-5911, Fax. (011) 470-5494

**South America:** Rua do Rocio 220 - 5th floor, Suite 51,  
CEP: 04552-903-SÃO PAULO-SP, Brazil,  
P.O. Box 7383 (01064-970),  
Tel. (011) 821-2333, Fax. (011) 829-1849

**Spain:** Balmes 22, 08007 BARCELONA,  
Tel. (03) 301 6312, Fax. (03) 301 4107

**Sweden:** Kottbygatan 7, Akalla. S-16485 STOCKHOLM,  
Tel. (0) 8-632 2000, Fax. (0) 8-632 2745

**Switzerland:** Allmendstrasse 140, CH-8027 ZÜRICH,  
Tel. (01) 488 2211, Fax. (01) 481 77 30

**Taiwan:** PHILIPS TAIWAN Ltd., 23-30F, 66,  
Chung Hsiao West Road, Sec. 1, P.O. Box 22978,  
TAIPEI 100, Tel. (886) 2 382 4443, Fax. (886) 2 382 4444

**Thailand:** PHILIPS ELECTRONICS (THAILAND) Ltd.,  
209/2 Sanpavuth-Bangna Road Prakanong, BANGKOK 10260,  
Tel. (66) 2 745-4090, Fax. (66) 2 398-0793

**Turkey:** Talatpasa Cad. No. 5, 80640 GÜLTEPE/ISTANBUL,  
Tel. (0212) 279 2770, Fax. (0212) 282 6707

**Ukraine:** PHILIPS UKRAINE,  
2A Akademika Koroleva str., Office 165, 252148 KIEV,  
Tel. 380-44-4760297, Fax. 380-44-4766991

**United Kingdom:** Philips Semiconductors LTD.,  
276 Bath Road, Hayes, MIDDLESEX UB3 5BX,  
Tel. (0181) 730-5000, Fax. (0181) 754-8421

**United States:** 811 East Arques Avenue, SUNNYVALE,  
CA 94088-3409, Tel. (800) 234-7381, Fax. (708) 296-8556

**Uruguay:** see South America

**Vietnam:** see Singapore

**Yugoslavia:** PHILIPS, Trg N. Pasica 5/v, 11000 BEOGRAD,  
Tel. (381) 11 825 344, Fax. (359) 211 635 777

**Internet:** <http://www.semiconductors.philips.com/ps/>

**For all other countries apply to:** Philips Semiconductors,  
Marketing & Sales Communications, Building BE-p,  
P.O. Box 218, 5600 MD EINDHOVEN, The Netherlands,  
Fax. +31-40-2724825

SCDS48

© Philips Electronics N.V. 1996

All rights are reserved. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner.

The information presented in this document does not form part of any quotation or contract, is believed to be accurate and reliable and may be changed without notice. No liability will be accepted by the publisher for any consequence of its use. Publication thereof does not convey nor imply any license under patent- or other industrial or intellectual property rights.

Printed in The Netherlands

127061/1200/02/pp12  
Document order number:

Date of release: 1996 May 09  
9397 750 00835