

# Silicon NPN Transistor

## **BLT71**

UHF Power Transistor

16V / 500mA

# DATASHEET

OEM – Philips

Source: Philips Data Handbook SC09

RF Power Modules and Transistors for Mobile Phones 1996

**UHF power transistor****BLT71****FEATURES**

- Very high efficiency
- Low supply voltage.

**APPLICATIONS**

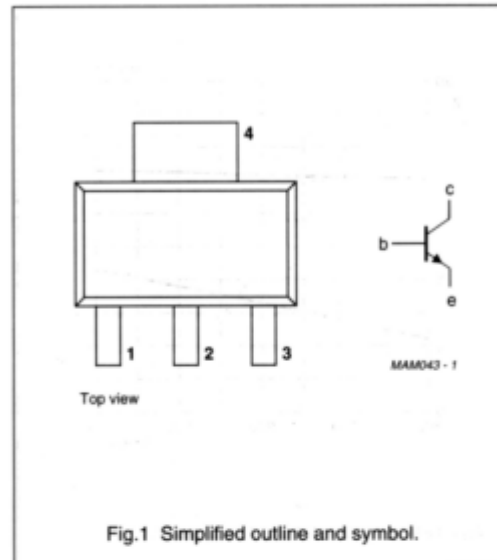
- Hand-held radio equipment in common emitter class-AB operation in the 900 MHz communications band.

**DESCRIPTION**

NPN silicon planar epitaxial transistor encapsulated in a SOT223 envelope.

**PINNING - SOT223**

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

**QUICK REFERENCE DATA**

RF performance at  $T_s \leq 60$  °C in a common emitter test circuit.

MODE OF OPERATION	f (MHz)	$V_{CE}$ (V)	$P_L$ (W)	$G_p$ (dB)	$\eta_c$ (%)
CW, class-AB	900	4.8	1.2	$\geq 6$	$\geq 60$

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**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	–	16	V
$V_{CEO}$	collector-emitter voltage	open base	–	8	V
$V_{EBO}$	emitter-base voltage	open collector	–	2.5	V
$I_C$	collector current (DC)		–	500	mA
$P_{tot}$	total power dissipation	up to $T_s = 90\text{ °C}$	–	3.5	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	$P_{tot} = 3.5\text{ W}$ ; up to $T_s = 90\text{ °C}$ ; note 1	24	K/W

**Note**

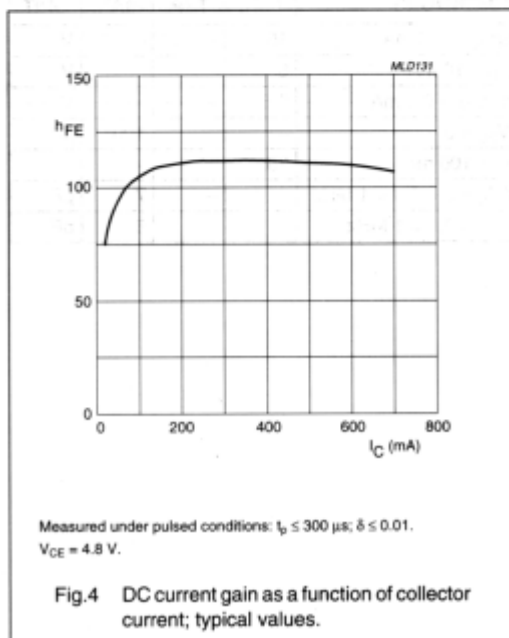
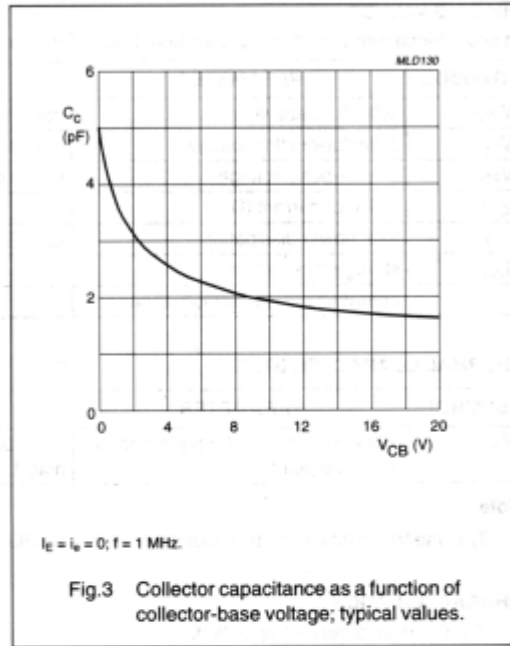
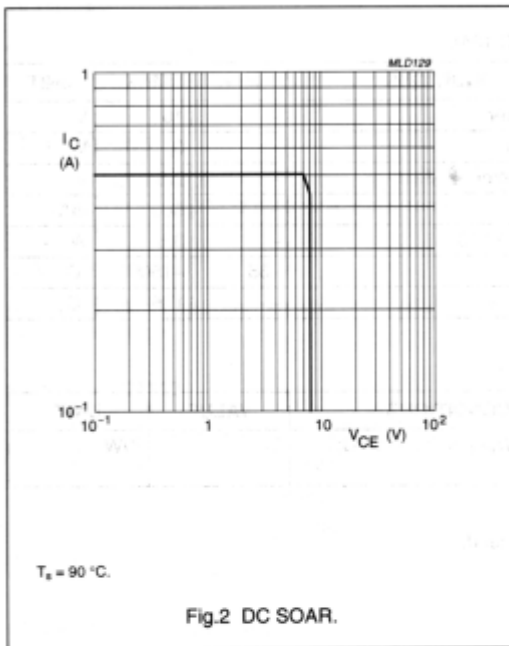
- $T_s$  is the temperature at the soldering point of the collector lead.

**CHARACTERISTICS** $T_j = 25\text{ °C}$  unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)CBO}$	collector-base breakdown voltage	open emitter; $I_C = 0.5\text{ mA}$	16	–	–	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	open base; $I_C = 10\text{ mA}$	8	–	–	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	open collector; $I_E = 0.1\text{ mA}$	2.5	–	–	V
$I_{CES}$	collector leakage current	$V_{CE} = 8\text{ V}$ ; $V_{BE} = 0$	–	–	100	$\mu\text{A}$
$h_{FE}$	DC current gain	$V_{CE} = 5\text{ V}$ ; $I_C = 100\text{ mA}$	25	–	–	
$C_c$	collector capacitance	$V_{CB} = 4.8\text{ V}$ ; $I_E = I_b = 0$ ; $f = 1\text{ MHz}$	–	–	7	pF
$C_{fb}$	feedback capacitance	$V_{CE} = 4.8\text{ V}$ ; $I_C = 0$ ; $f = 1\text{ MHz}$	–	–	5	pF

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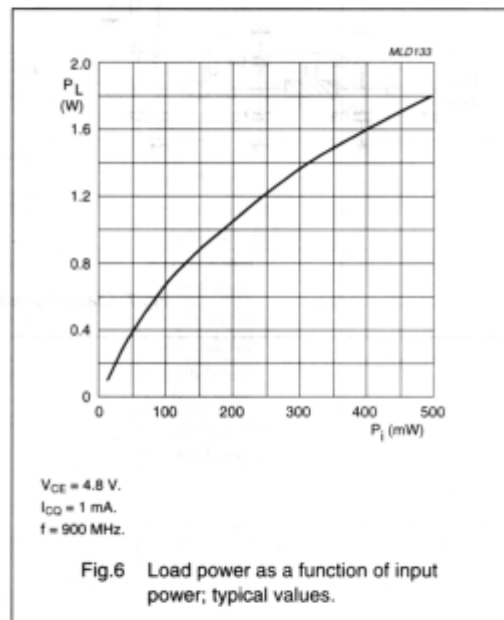
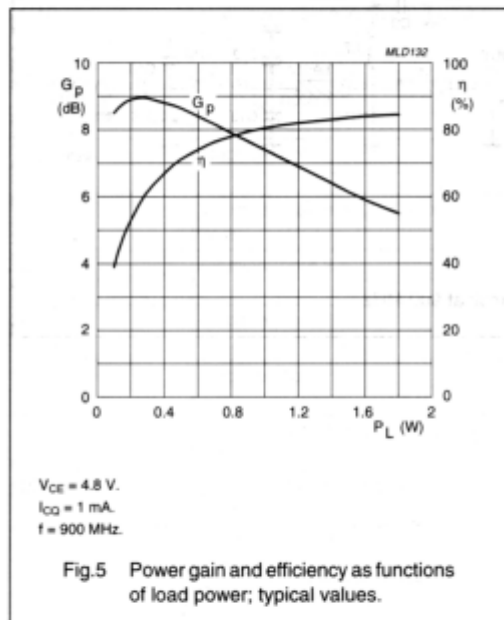
APPLICATION INFORMATION

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

MODE OF OPERATION	f (MHz)	V <sub>CE</sub> (V)	I <sub>CO</sub> (mA)	P <sub>L</sub> (W)	G <sub>p</sub> (dB)	$\eta_c$ (%)
CW, class-AB	900	4.8	1	1.2	$\geq 6$	$\geq 60$

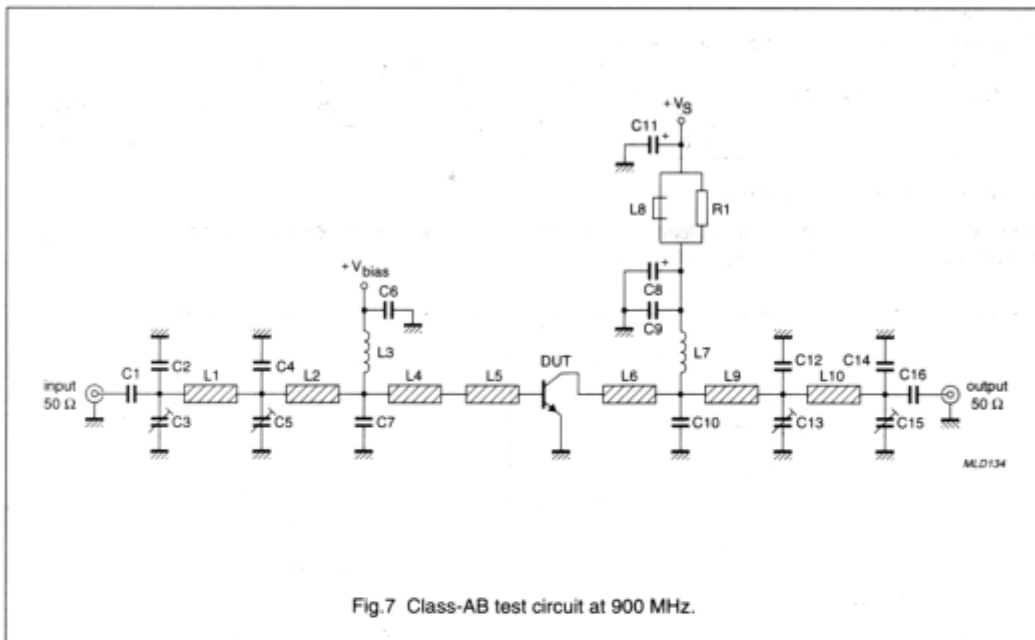
Ruggedness in class-AB operation

The BLT71 is capable of withstanding a load mismatch corresponding to VSWR = 6 : 1 through all phases under the following conditions: P<sub>L</sub> = 1.2 W; V<sub>CE</sub> = 6.5 V; f = 900 MHz.



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## List of components (see Figs 7 and 8)

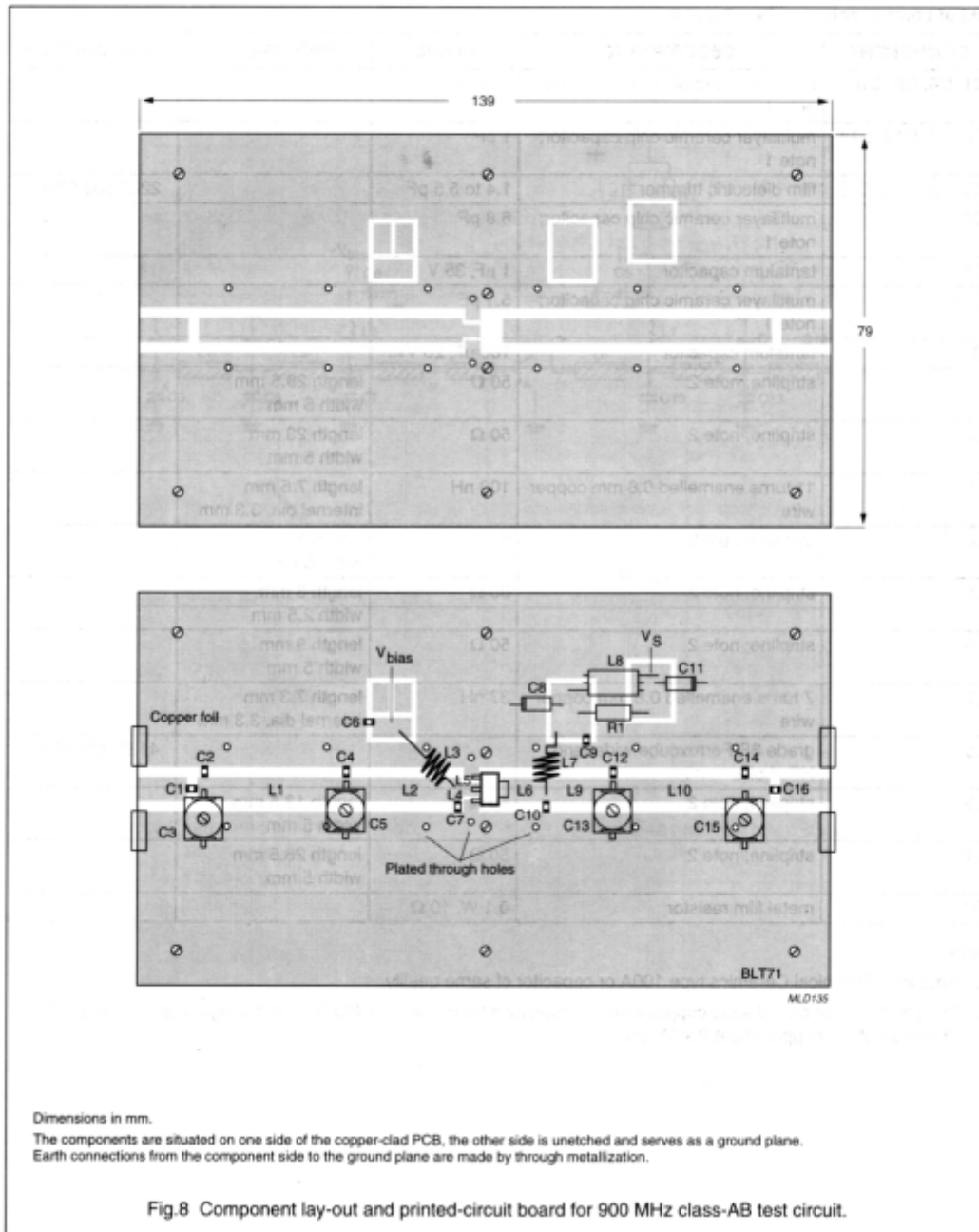
COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE No.
C1, C6, C9, C16	multilayer ceramic chip capacitor; note 1	100 pF		
C2, C4, C12, C14	multilayer ceramic chip capacitor; note 1	1 pF		
C3, C5, C13, C15	film dielectric trimmer	1.4 to 5.5 pF		2222 809 09004
C7	multilayer ceramic chip capacitor; note 1	6.8 pF		
C8	tantalum capacitor	1 $\mu$ F, 35 V		
C10	multilayer ceramic chip capacitor; note 1	5.1 pF		
C11	tantalum capacitor	100 $\mu$ F, 20 V		
L1	stripline; note 2	50 $\Omega$	length 28.5 mm width 5 mm	
L2	stripline; note 2	50 $\Omega$	length 23 mm width 5 mm	
L3	11 turns enamelled 0.6 mm copper wire	100 nH	length 7.5 mm internal dia. 3.3 mm	
L4	stripline; note 2	50 $\Omega$	length 1 mm width 5 mm	
L5	stripline; note 2	50 $\Omega$	length 3 mm width 2.5 mm	
L6	stripline; note 2	50 $\Omega$	length 9 mm width 5 mm	
L7	7 turns enamelled 0.6 mm copper wire	37 nH	length 7.3 mm internal dia. 3.3 mm	
L8	grade 3B Ferroxcube wideband HF choke			4132 020 36640
L9	stripline; note 2	50 $\Omega$	length 13.5 mm width 5 mm	
L10	stripline; note 2	50 $\Omega$	length 26.5 mm width 5 mm	
R1	metal film resistor	0.1 W, 10 $\Omega$		

## Notes

- American Technical Ceramics type 100A or capacitor of same quality.
- The striplines are on a double copper-clad printed-circuit board, with DUROID dielectric ( $\epsilon_r = 2.2$ ); thickness  $\frac{1}{16}$ "\*; thickness of the copper sheet  $2 \times 35 \mu\text{m}$ .

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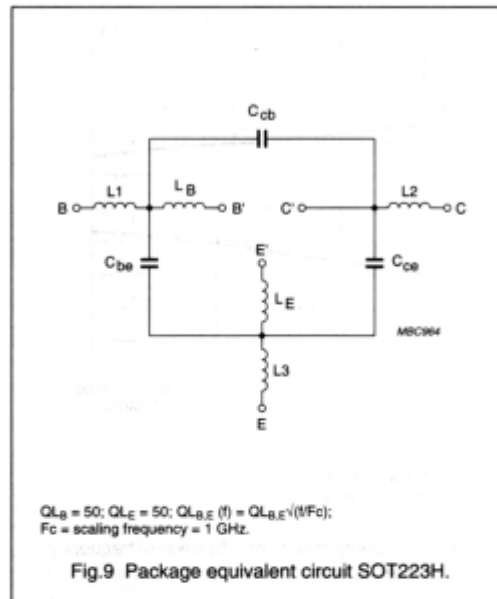
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## SPICE parameters for the BLT71 crystal

SEQUENCE No.	PARAMETER	VALUE	UNIT
1	IS	3.503	fA
2	BF	190.5	–
3	NF	0.981	–
4	VAF	35.45	V
5	IKF	24.52	A
6	ISE	184.9	fA
7	NE	1.475	–
8	BR	12.61	–
9	NR	1.042	–
10	VAR	1.476	V
11	IKR	2.206	A
12	ISC	866.5	aA
13	NC	1.025	–
14	RB	2.000	$\Omega$
15	IRB	1.000	$\mu$ A
16	RBM	2.000	$\Omega$
17	RE	373.8	m $\Omega$
18	RC	330.6	m $\Omega$
19 <sup>(1)</sup>	XTB	0.000	–
20 <sup>(1)</sup>	EG	1.110	eV
21 <sup>(1)</sup>	XTI	3.000	–
22	CJE	9.746	pF
23	VJE	0.600	V
24	MJE	0.288	–
25	TF	11.99	ps
26	XTF	0.979	–
27	VTF	19.52	mV
28	ITF	0.137	A
29	PTF	0.000	deg
30	CJC	5.028	pF
31	VJC	0.609	V
32	MJC	0.368	–
33	XCJC	0.150	–
34	TR	3.841	ns
35 <sup>(1)</sup>	CJS	0.000	F
36 <sup>(1)</sup>	VJS	750.0	mV
37 <sup>(1)</sup>	MJS	0.000	–
38	FC	0.813	–

## Note

- These parameters have not been extracted, the default values are shown.



## List of components (see Fig.9)

DESIGNATION	VALUE	UNIT
$C_{be}$	182	fF
$C_{cb}$	16	fF
$C_{ce}$	249	fF
L1	0.025	nH
L2	1.19	nH
L3	0.6	nH
$L_B$	1.85	nH
$L_E$	1.22	nH

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