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

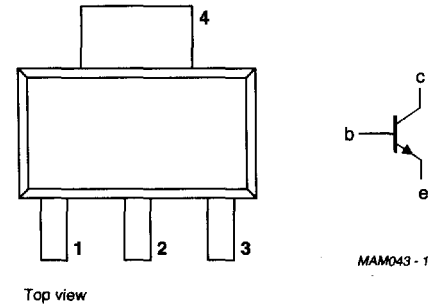


Fig.1 Simplified outline and symbol.

QUICK REFERENCE DATA

RF performance at $T_s \leq 60$ °C in a common emitter test circuit (see Fig.7).

MODE OF OPERATION	f (MHz)	V_{CE} (V)	P_L (W)	G_p (dB)	η_C (%)
CW, class-B narrow band	900	7.5	1.2	≥6	≥60
		6	1.2	typ. 6.5	typ. 77

LIMITING VALUES

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

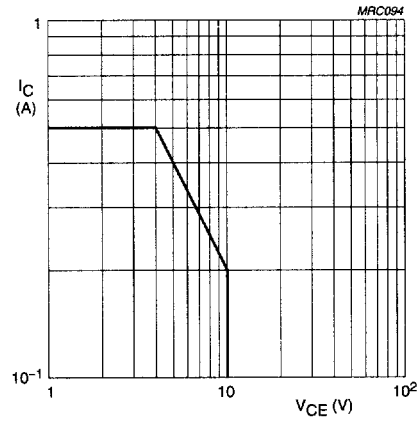
SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	–	20	V
V_{CEO}	collector-emitter voltage	open base	–	9.5	V
V_{EBO}	emitter-base voltage	open collector	–	2.5	V
I_C	collector current (DC)		–	500	mA
$I_{C(AV)}$	average collector current		–	500	mA
P_{tot}	total power dissipation	T_s = 110 °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
$R_{th\ j\text{-}s}$	thermal resistance from junction to soldering point	P_{tot} = 2 W; T_s = 110 °C; note 1	32	K/W

Note to the "Limiting values" and "Thermal characteristics"

1. T_s is the temperature at the soldering point of the collector pin.



T_s = 110 °C.

Fig.2 DC SOAR.

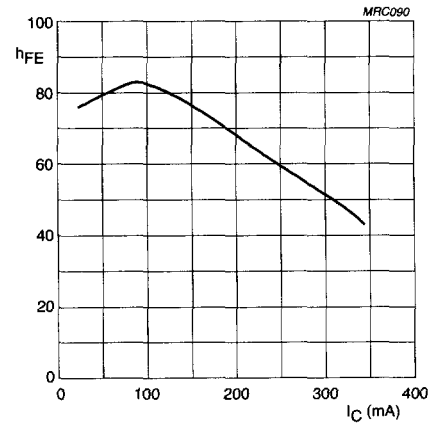
CHARACTERISTICS

T_j = 25 °C unless otherwise specified.

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

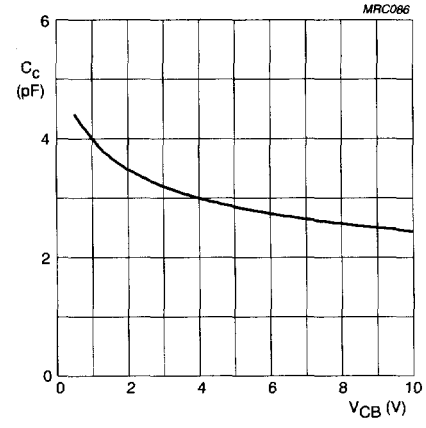
Note

1. Measured under pulsed conditions: $t_p \leq 200$ μs; $\delta \leq 0.02$.



V_{CE} = 7.5 V; $t_p \leq 200$ μs; $\delta \leq 0.02$; T_j = 25 °C.

Fig.3 DC current gain as a function of collector current; typical values.



$I_E = i_e$ = 0; f = 1 MHz; T_j = 25 °C.

Fig.4 Collector capacitance as a function of collector-base voltage; typical values.

APPLICATION INFORMATION

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

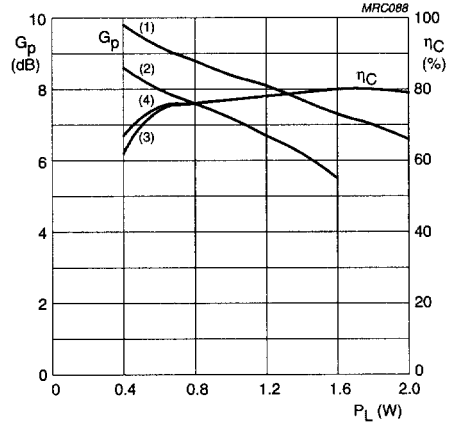
MODE OF OPERATION	f (MHz)	V_{CE} (V)	P_L (W)	G_p (dB)	η_C (%)
CW, class-B narrow band	900	7.5	1.2	≥6 typ. 8	≥60 typ. 77
		6	1.2	typ. 6.5	typ. 77

Note

1. T_s is the temperature at the soldering point of the collector pin.

Ruggedness in class-AB operation

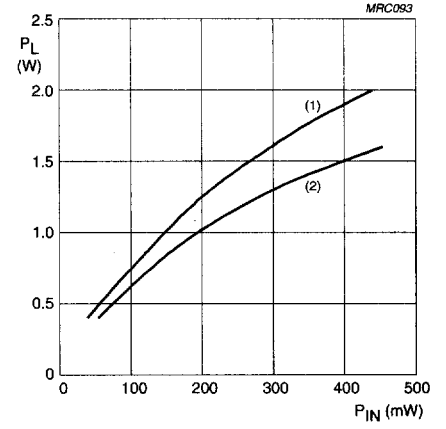
The BLT81 is capable of withstanding a load mismatch corresponding to VSWR = 50 : 1 through all phases under the following conditions: f = 900 MHz; V_{CE} = 9 V; P_L = 1.2 W; $T_s \leq 60$ °C.



Class-B; f = 900 MHz; $T_s \leq 60$ °C.

(1) V_{CE} = 7.5 V. (3) V_{CE} = 7.5 V.
(2) V_{CE} = 6 V. (4) V_{CE} = 6 V.

Fig.5 Power gain and collector efficiency as functions of load power; typical values.



Class-B; f = 900 MHz; $T_s \leq 60$ °C.

(1) V_{CE} = 7.5 V. (2) V_{CE} = 6 V.

Fig.6 Load power as a function of input power; typical values.

Test circuit information

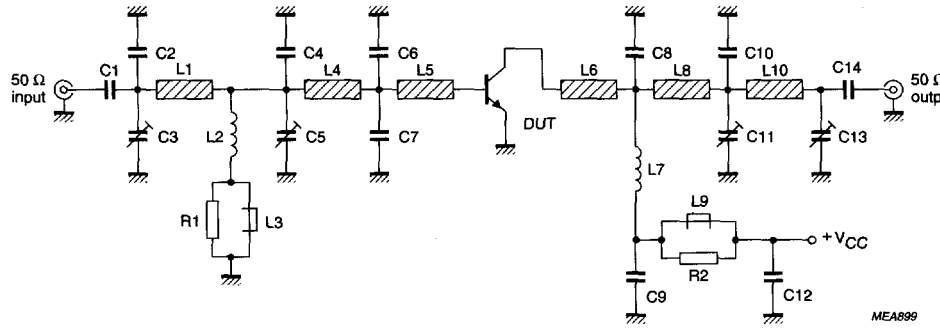


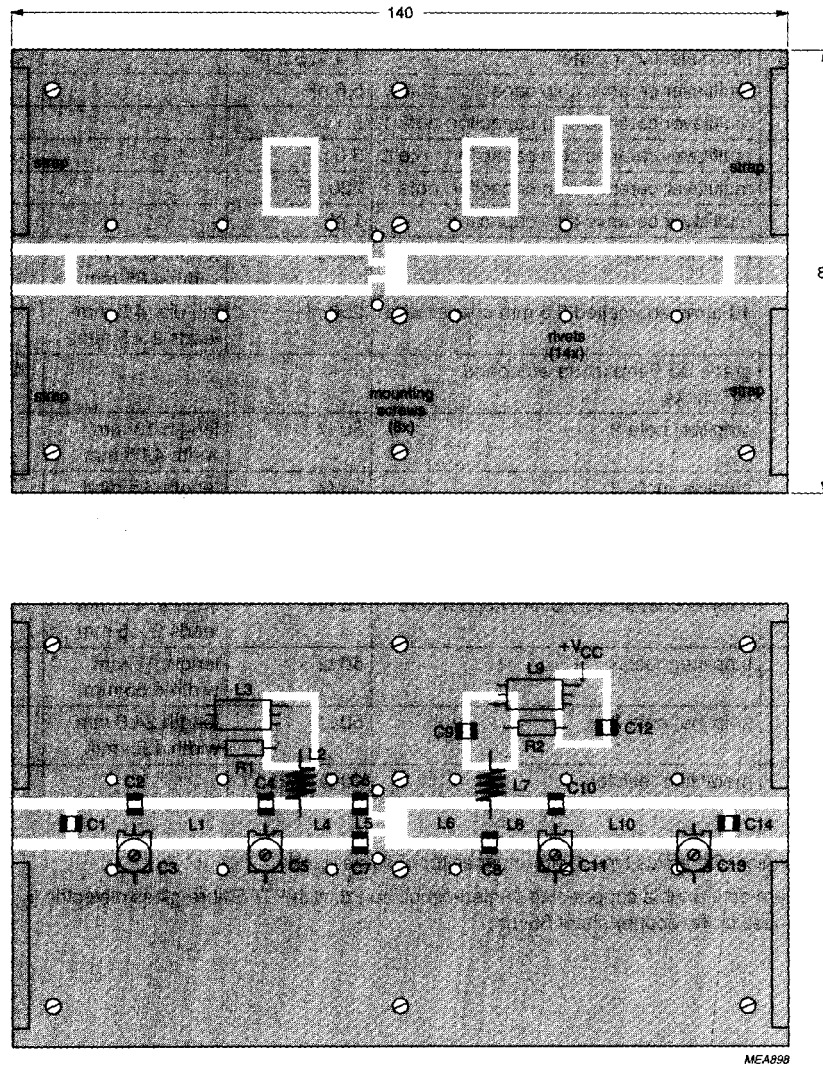
Fig.7 Common emitter test circuit for class-B operation at 900 MHz.

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 Ω	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 × 5 mm	
L3, L9	grade 3B Ferroxcube wideband HF choke			4312 020 36640
L4	stripline; note 2	50 Ω	length 18 mm width 4.85 mm	
L5	stripline; note 2	75 Ω	length 3.5 mm width 2.5 mm	
L6	stripline; note 2	50 Ω	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 × 5 mm	
L8	stripline; note 2	50 Ω	length 15 mm width 4.85 mm	
L10	stripline; note 2	50 Ω	length 24.6 mm width 4.85 mm	
R1, R2	metal film resistor	10 Ω, 0.25 W		

Notes

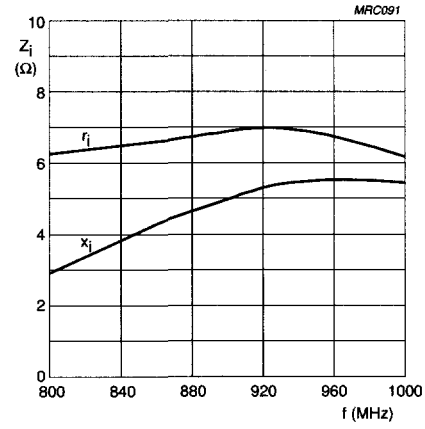
1. American Technical Ceramics type 100B or capacitor of same quality.
2. The striplines are on a double copper-clad printed-circuit board, with PTFE fibre-glass dielectric ($\varepsilon_r = 2.2$); thickness $1/16$ inch; thickness of the copper sheet 35 μm.



Dimensions in mm.

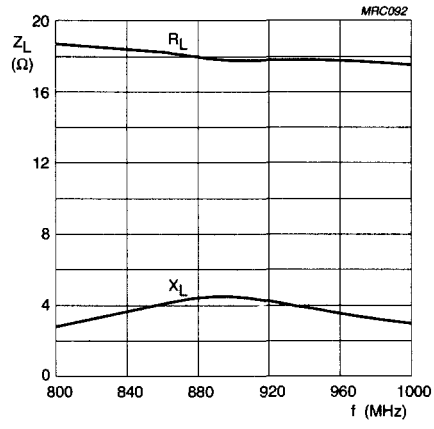
The components are situated on one side of the copper-clad PTFE fibre-glass board, the other side is unetched and serves as a ground plane. Earth connections from the component side to the ground plane are made by means of fixing screws and copper foil straps under the emitter leads.

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



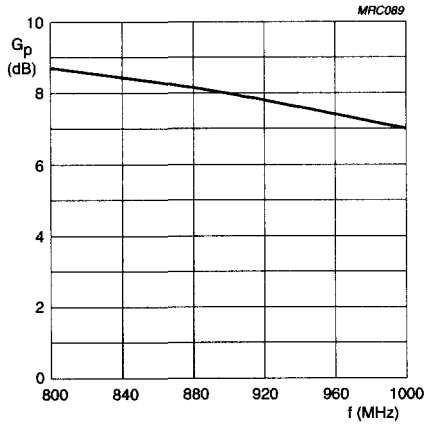
Class-B; V_{CE} = 7.5 V; P_L = 1.2 W; $T_s \leq 60$ °C.

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.

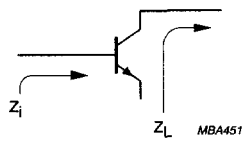


Fig.12 Definition of transistor impedance.