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DATA SHEET

BLT70
UHF power transistor

Product specification

1996 Feb 06

Philips
Semiconductors

PHILIPS

UHF power transistor BLT70

FEATURES

- Very high efficiency
- Low supply voltage.

APPLICATIONS

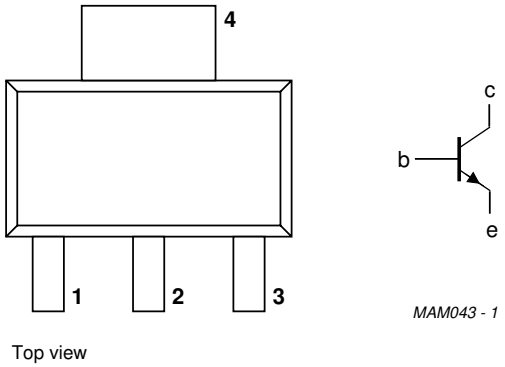
- Hand-held radio equipment in common emitter class-AB operation in the 900 MHz communication band.

DESCRIPTION

NPN silicon planar epitaxial transistor encapsulated in a plastic SOT223H SMD package.

PINNING - SOT223H

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



Top view

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 (mW)	G_p (dB)	η_C (%)
CW, class-AB	900	4.8	600	≥6	≥60

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)		–	250	mA
P_{tot}	total power dissipation	T_s = 60 °C; note 1	–	2.1	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} = 2.1 W; T_s = 60 °C; note 1	55	K/W

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

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

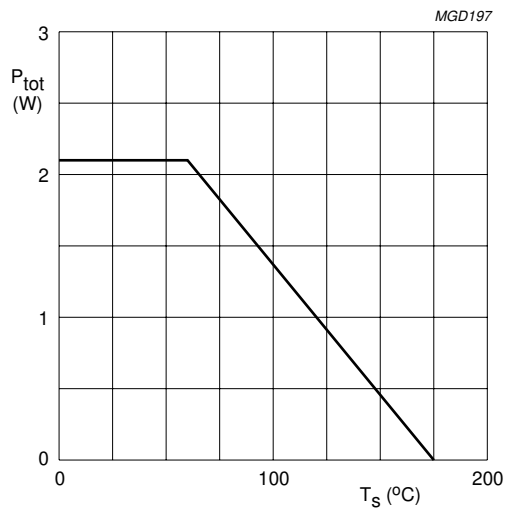
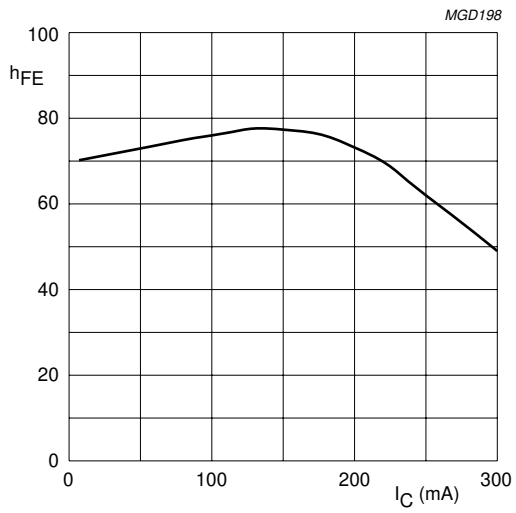


Fig.2 DC SOAR.

CHARACTERISTICS

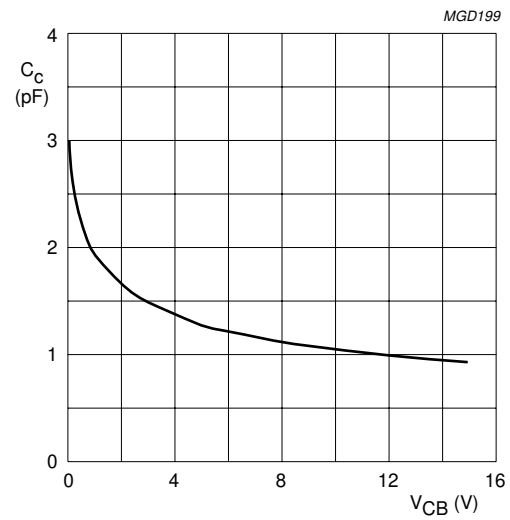
T_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$V_{(BR)CBO}$	collector-base breakdown voltage	open emitter; I_C = 0.5 mA	16	–	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	open base; I_C = 5 mA	8	–	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	open collector; I_E = 0.2 mA	2.5	–	V
I_{CES}	collector leakage current	V_{CE} = 7 V; V_{BE} = 0	–	0.1	mA
h_{FE}	DC current gain	V_{CE} = 4.8 V; I_C = 100 mA	25	–	
C_c	collector capacitance	V_{CB} = 4.8 V; $I_E = i_e$ = 0; f = 1 MHz	–	3.5	pF
C_{re}	feedback capacitance	V_{CE} = 4.8 V; I_C = 0; f = 1 MHz	–	2.5	pF



V_{CE} = 4.8 V; 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).

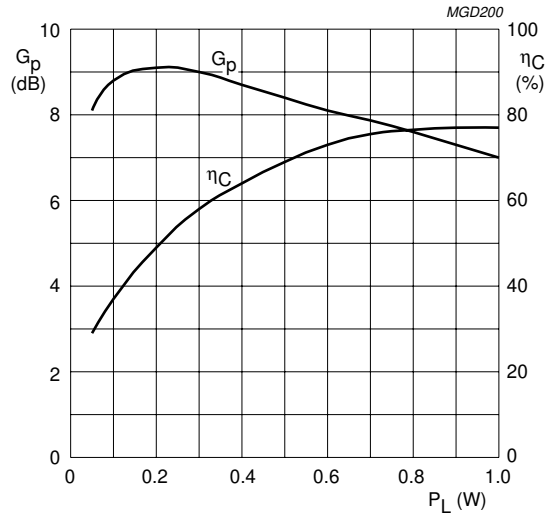
MODE OF OPERATION	f (MHz)	V_{CE} (V)	I_{CQ} (mA)	P_L (W)	G_p (dB)	η_C (%)
CW, class-AB	900	4.8	0.01	0.6	≥6 typ. 8.1	≥60 typ. 73

Note

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

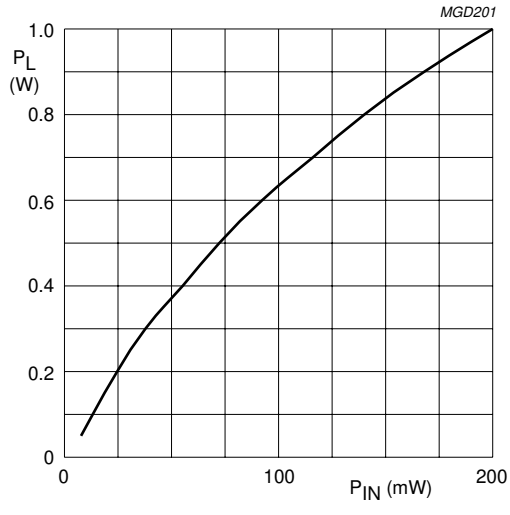
Ruggedness in class-AB operation

The BLT70 is capable of withstanding a load mismatch corresponding to VSWR = 6 : 1 through all phases under the following conditions: f = 900 MHz; V_{CE} = 6.5 V; P_L = 0.5 W; $T_s \leq 60$ °C.



f = 900 MHz; V_{CE} = 4.8 V; I_{CQ} = 0.01 mA; $T_s \leq 60$ °C.

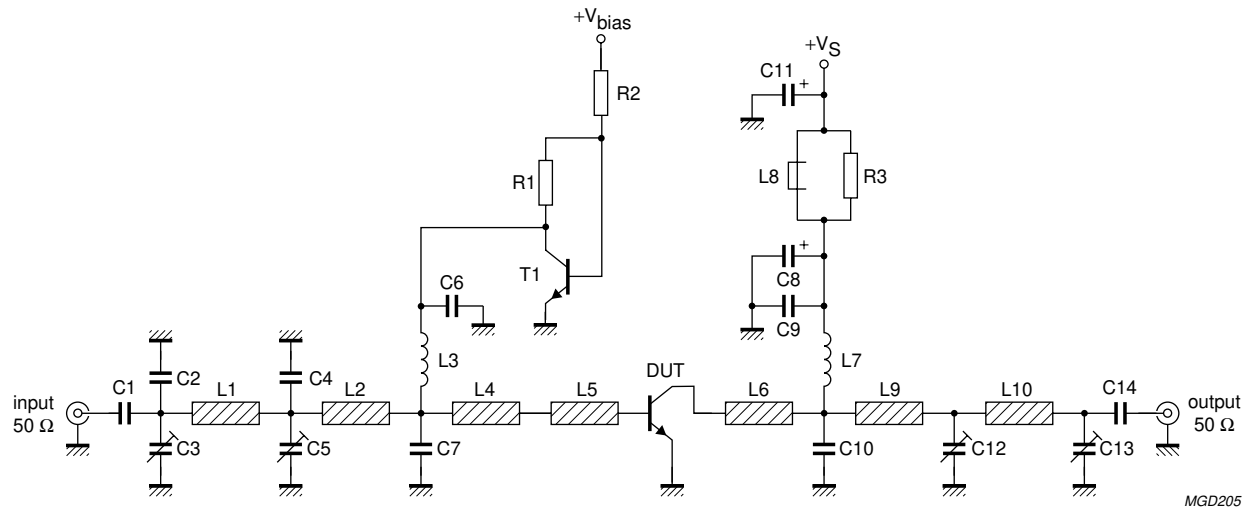
Fig.5 Power gain and collector efficiency as functions of load power; typical values.



f = 900 MHz; V_{CE} = 4.8 V; I_{CQ} = 0.01 mA; $T_s \leq 60$ °C.

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

Test circuit information



$V_S = V_{bias}$ = typ. 4.8 V.

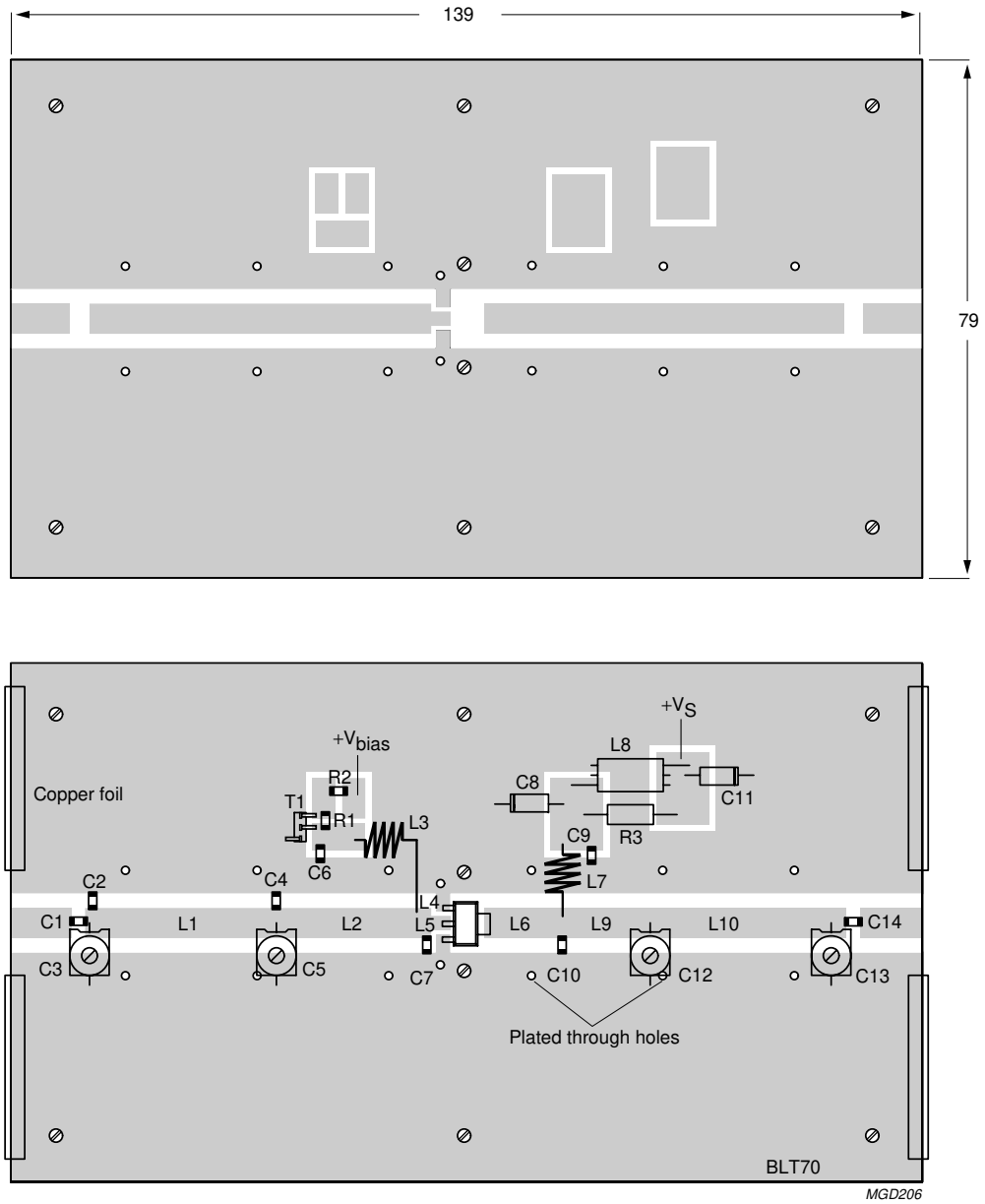
Fig.7 Common emitter test circuit for class-AB operation at 900 MHz.

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

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE No.
C1, C6, C9, C14	multilayer ceramic chip capacitor; note 1	100 pF		
C2	multilayer ceramic chip capacitor; note 1	1 pF		
C4	multilayer ceramic chip capacitor; note 1	2.4 pF		
C3, C5, C12, C13	film dielectric trimmer	1.4 to 5.5 pF		2222 809 09004
C7	multilayer ceramic chip capacitor; note 1	5.1 pF		
C8	tantalum capacitor	1 μF, 35 V		
C10	multilayer ceramic chip capacitor; note 1	2.7 pF		
C11	tantalum capacitor	100 μF, 20 V		
L1	stripline; note 2	50 Ω	length 29.1 mm width 5 mm	
L2	stripline; note 2	50 Ω	length 21 mm width 5 mm	
L3	8 turns enamelled 0.8 mm copper wire	216 nH	length 7 mm internal dia. 4.5 mm	
L4	stripline; note 2	50 Ω	length 1 mm width 5 mm	
L5	stripline; note 2	50 Ω	length 3 mm width 2.5 mm	
L6	stripline; note 2	50 Ω	length 12 mm width 5 mm	
L7	8 turns enamelled 0.8 mm copper wire	105 nH	length 7 mm internal dia. 3.4 mm	
L8	grade 3B Ferroxcube wideband HF choke			4132 020 36640
L9	stripline; note 2	50 Ω	length 12 mm width 5 mm	
L10	stripline; note 2	50 Ω	length 28 mm width 5 mm	
R1	metal film resistor	0.1 W, 15 Ω		
R2	metal film resistor	0.1 W, 390 Ω		
R3	metal film resistor	0.6 W, 10 Ω		
T1	NPN transistor	BD139		

Notes

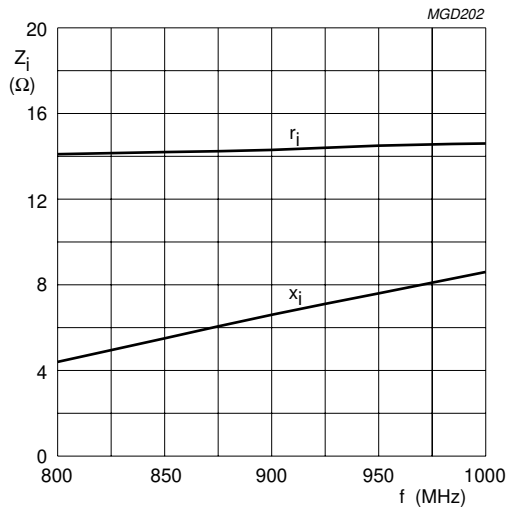
1. American Technical Ceramics type 100A or capacitor of same quality.
2. The striplines are on a double copper-clad printed-circuit board, with DUROID dielectric (ε_r = 2.2); thickness $^1/_{16}$"; thickness of the copper sheet 2 × 35 μm.



Dimensions in mm.

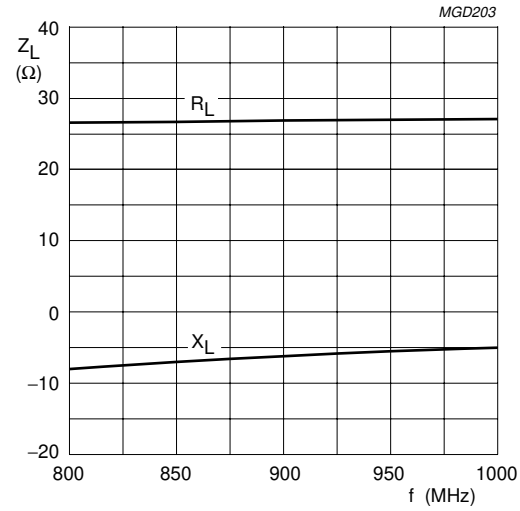
The components are situated on one side of the copper-clad PCB, the other side is unetched and serves as a ground plane. Earth connections from the component side to the ground plane are made by through metallization.

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



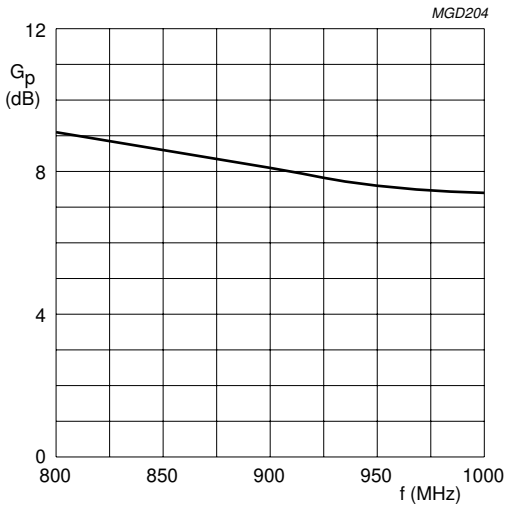
V_{CE} = 4.8 V; I_{CQ} = 0.01 mA; P_L = 0.6 W; $T_s \leq 60$ °C.

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



V_{CE} = 4.8 V; I_{CQ} = 0.01 mA; P_L = 0.6 W; $T_s \leq 60$ °C.

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



V_{CE} = 4.8 V; I_{CQ} = 0.01 mA; P_L = 0.6 W; $T_s \leq 60$ °C.

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

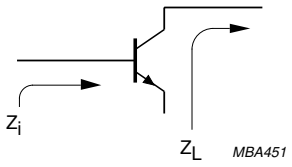
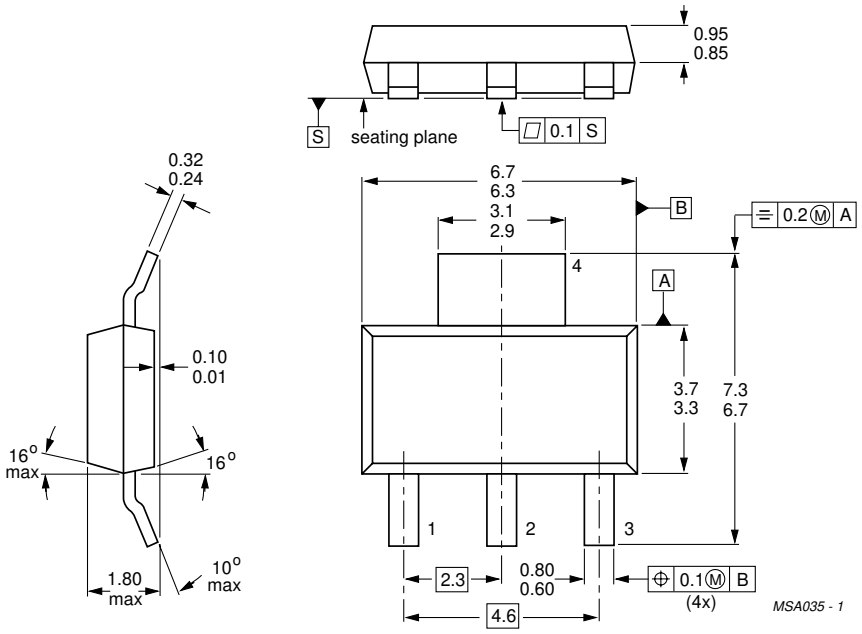


Fig.12 Definition of transistor impedance.

PACKAGE OUTLINE



Dimensions in mm.

Fig.13 SOT223H.

DEFINITIONS

Data Sheet Status	
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.
Limiting values	
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.	
Application information	
Where application information is given, it is advisory and does not form part of the specification.	

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