Philips Semiconductors

Data sheet	
status	Product specification
date of issue	January 1991

BLU56
UHF power transistor

FEATURES

- SMD encapsulation
- Emitter-ballasting resistors for optimum temperature profile
- Gold metallization ensures excellent reliability.

DESCRIPTION

NPN silicon planar epitaxial transistor encapsulated in a SOT223 surface mounted envelope and designed primarily for use in mobile 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 (see note 1.)

MODE OF OPERATION	f (MHz)	V_{CE} (V)	P_L (W)	G_p (dB)	η_c (%)
c.w. narrow band	470	12.5	1	> 12	> 50

Note

1. T_S = temperature at soldering point of collector tab.

PIN CONFIGURATION

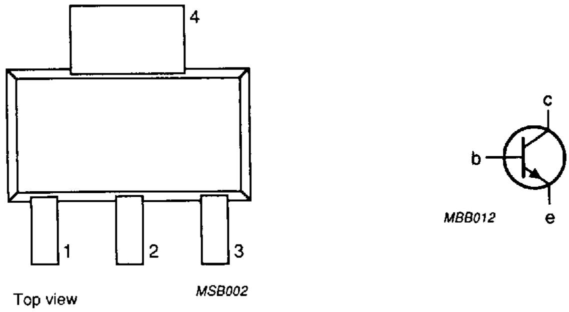


Fig.1 Simplified outline and symbol.

LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	–	36	V
V_{CEO}	collector-emitter voltage	open base	–	16	V
V_{EBO}	emitter-base voltage	open collector	–	3	V
I_C, $I_{C(AV)}$	collector current	DC or average value	–	200	mA
I_{CM}	collector current	peak value f > 1 MHz	–	600	mA
P_{tot}	total power dissipation	f > 1 MHz T_S = 105 °C (note 1)	–	2	W
T_{stg}	storage temperature range		–65	150	°C
T_j	operating junction temperature		–	175	°C

Note

1. T_S = temperature at soldering point of collector tab.

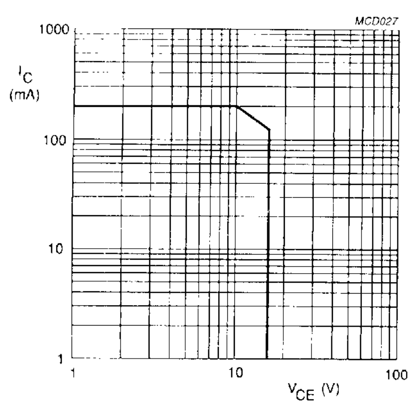


Fig.2 DC SOAR; T_S = 105 °C.

THERMAL RESISTANCE

SYMBOL	PARAMETER	MAX.	UNIT
$R_{th\ j\text{-}s(DC)}$	from junction to soldering point	35	K/W

CHARACTERISTICS

T_j = 25 °C.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)CBO}$	collector-base breakdown voltage	open emitter I_C = 2.5 mA	36	–	–	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	open base I_C = 10 mA	16	–	–	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	open collector I_E = 0.5 mA	3	–	–	V
I_{CES}	collector-emitter leakage current	V_{BE} = 0 V_{CE} = 16 V	–	–	1	mA
h_{FE}	DC current gain	V_{CE} = 10 V I_C = 150 mA	25	–	–	
E_{SBR}	second breakdown energy	L = 25 mH R_{BE} = 10 Ω f = 50 Hz	0.3	–	–	mJ
C_c	collector capacitance	V_{CB} = 12.5 V $I_E = I_e$ = 0 f = 1 MHz	–	2.2	3	pF
C_{re}	feedback capacitance	V_{CE} = 12.5 V I_C = 0 f = 1 MHz	–	1.2	2	pF

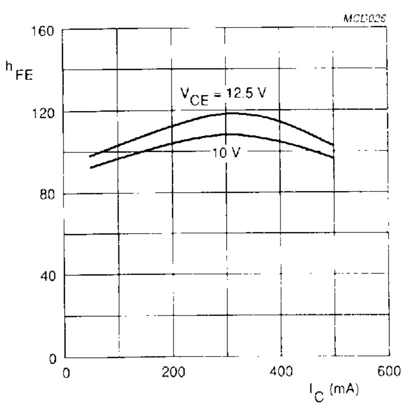


Fig.3 DC current gain as a function of drain current; typical values.

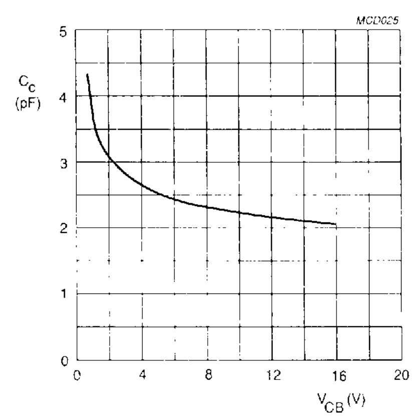


Fig.4 Collector capacitance as a function of collector-base voltage; $I_E = I_e$ = 0; f = 1 MHz; typical values.

APPLICATION INFORMATION

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

MODE OF OPERATION	f (MHz)	V_{CE} (V)	P_L (W)	G_p (dB)	η_c (%)
c.w. narrow band	470	12.5	1	> 12 typ. 14	> 50 typ. 58

Ruggedness in class-B operation

The BLU56 is capable of withstanding a load mismatch corresponding to VSWR = 50:1 through all phases at rated output power, up to a supply voltage of 15.5 V, f = 470 MHz and $T_s \leq 60$ °C.

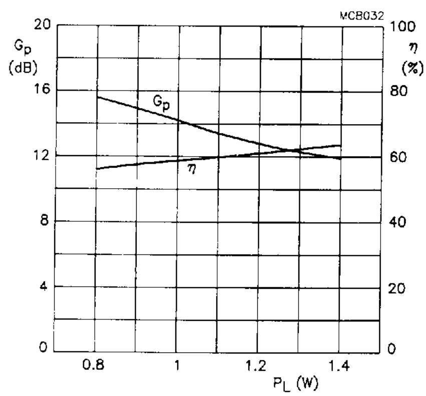


Fig.5 Gain and efficiency as functions of load power; typical values.

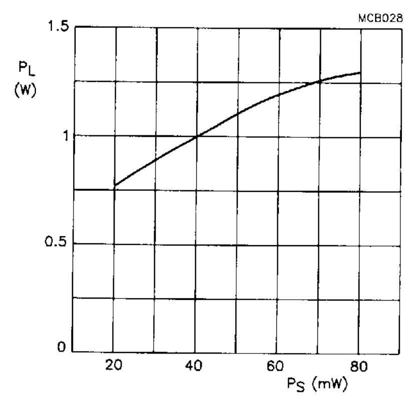


Fig.6 Load power as a function of drive power; typical values.

UHF power transistor BLU56

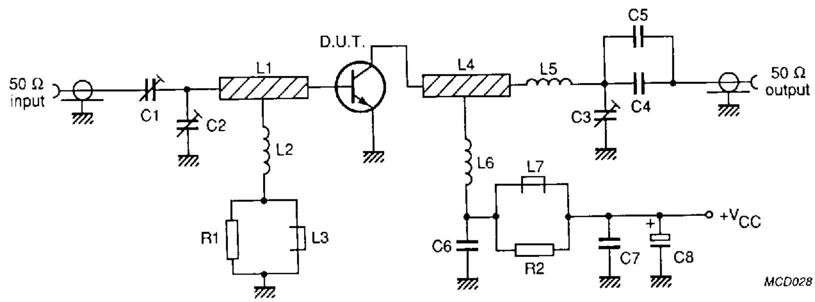


Fig.7 Class-B test circuit at f = 470 MHz.

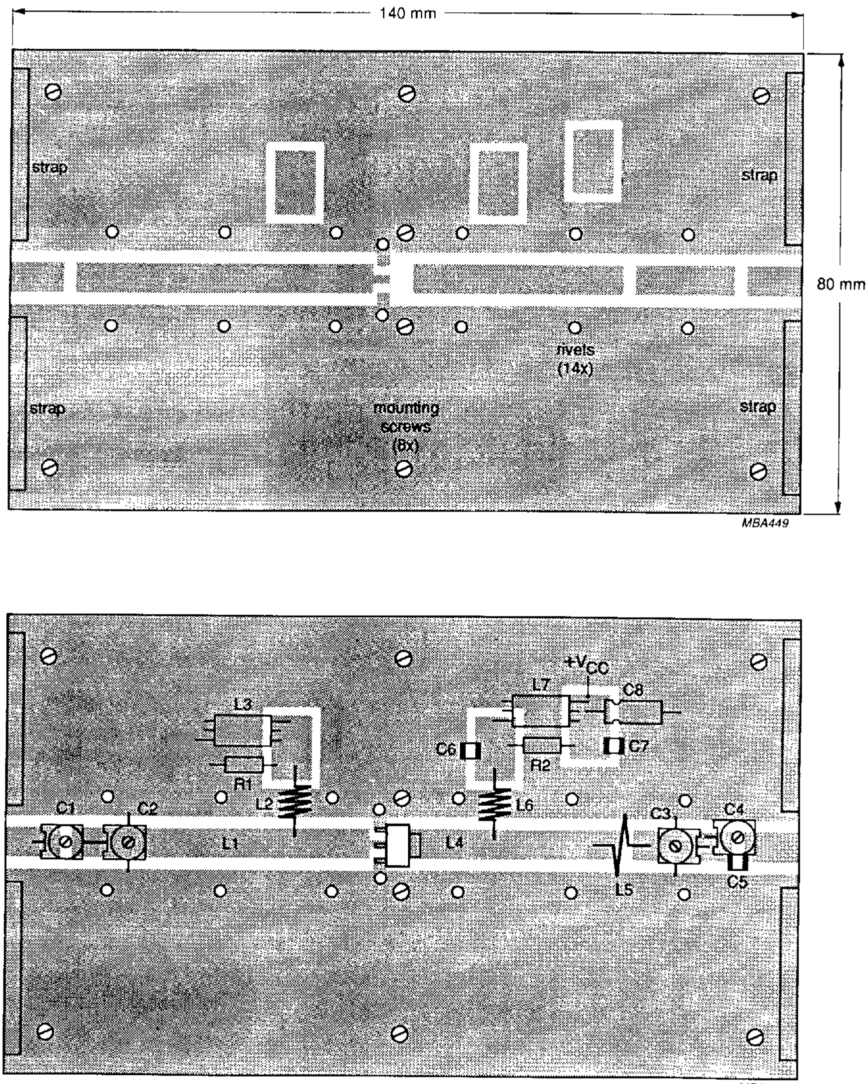
List of components (see test circuit)

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
C1, C4	film dielectric trimmer	2 to 18 pF		2222 809 05217
C2, C3	film dielectric trimmer	2 to 9 pF		2222 809 09002
C5	multilayer ceramic chip capacitor (note 1)	10 pF		
C6	multilayer ceramic chip capacitor (note 1)	100 pF		
C7	multilayer ceramic chip capacitor (note 1)	1 nF		
C8	63 V electrolytic capacitor	2.2 µF		
L1	stripline (note 2)	50 Ω	54 mm x 4.7 mm	
L2, L6	4 turns enamelled 0.4 mm copper wire	50 nH	int. dia. 3 mm	
L3, L7	grade 3B1 Ferroxcube wideband RF choke			4312 020 36640
L4	stripline (note 2)	50 Ω	36 mm x 4.7 mm	
L5	1 turn enamelled 2.2 mm copper wire	20 nH	int. dia. 8 mm	
R1, R2	0.25 W metal film resistor	10 Ω, 5%		

Notes

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

UHF power transistor BLU56



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.8 Component layout for 470 MHz class-B test circuit.

UHF power transistor BLU56

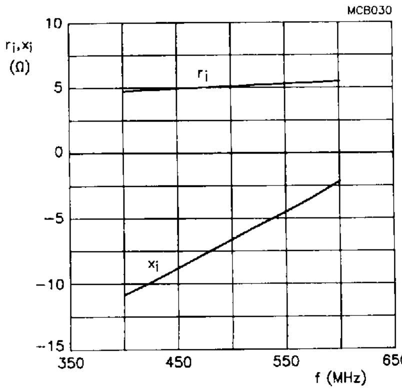


Fig.9 Input impedance (series components) as a function of frequency; class-B operation; V_{CE} = 12.5 V; P_L = 1 W; typical values.

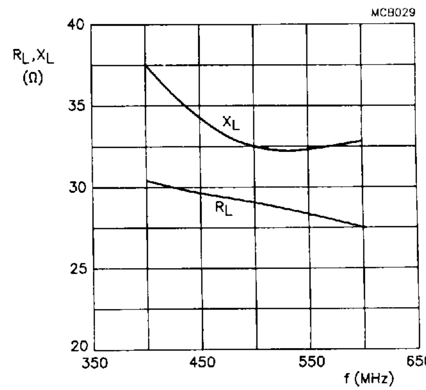


Fig.10 Load impedance (series components) as a function of frequency; class-B operation; V_{DS} = 12.5 V; P_L = 1 W; typical values.

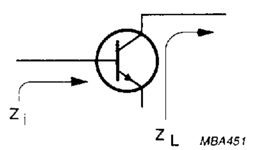


Fig.11 Definition of transistor impedance.

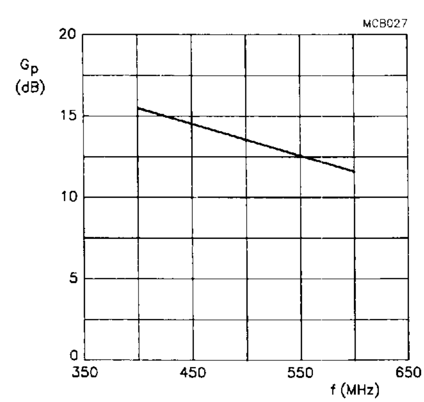


Fig.12 Power gain as a function of frequency; class-B operation; V_{DS} = 12.5 V; P_L = 1 W; typical values.