

VHF power transistor

BLW40

FEATURES

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

DESCRIPTION

NPN silicon planar epitaxial transistor encapsulated in a 4-lead SOT120 stud envelope with a ceramic cap. It is designed for common emitter, class-B operation in mobile VHF transmitters with a supply voltage of 12.5 V. All leads are isolated from the mounting flange.

PINNING - SOT120

PIN	DESCRIPTION
1	collector
2	emitter
3	base
4	emitter

QUICK REFERENCE DATA

RF performance at $T_{mb} = 25\text{ }^\circ\text{C}$ in a common emitter test circuit.

MODE OF OPERATION	f (MHz)	V _{CE} (V)	P _L (W)	G _p (dB)	η_c (%)
c.w. class-B	175	12.5	40	> 10	> 55

WARNING

<p>Product and environmental safety - toxic materials</p> <p>This product contains beryllium oxide. The product is entirely safe provided that the BeO disc is not damaged. All persons who handle, use or dispose of this product should be aware of its nature and of the necessary safety precautions. After use, dispose of as chemical or special waste according to the regulations applying at the location of the user. It must never be thrown out with the general or domestic waste.</p>
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PIN CONFIGURATION

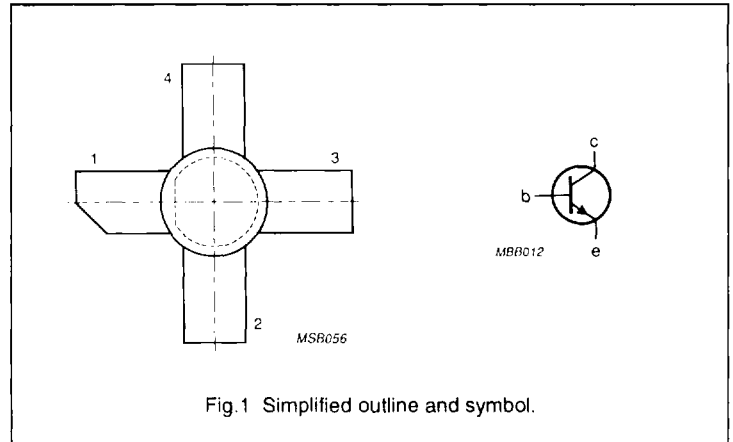


Fig.1 Simplified outline and symbol.

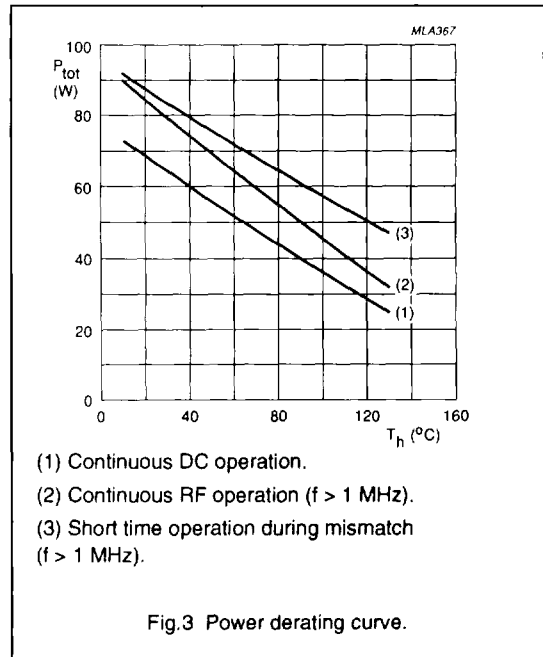
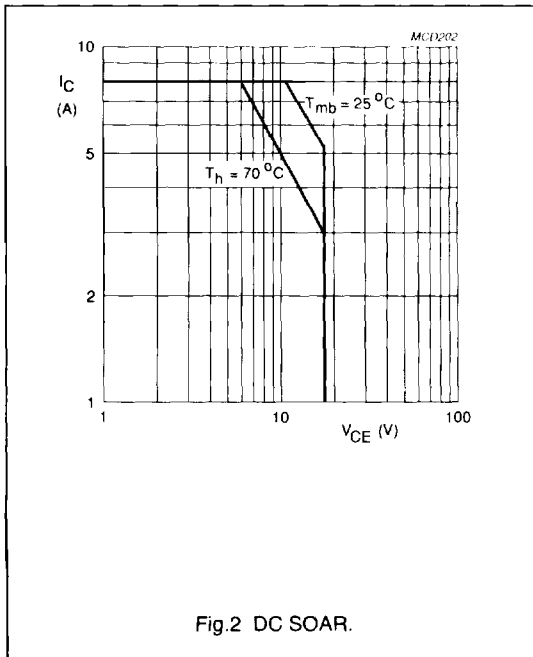
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LIMITING VALUES

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	-	16.5	V
V_{EBO}	emitter-base voltage	open collector	-	4	V
$I_C, I_{C(AV)}$	collector current	DC or average value	-	8	A
I_{CM}	collector current	peak value $f > 1$ MHz	-	25	A
P_{tot}	total power dissipation	RF operation; $f > 1$ MHz; $T_{mb} = 25$ °C	-	106	W
T_{stg}	storage temperature range		-65	150	°C
T_j	junction operating temperature		-	200	°C



THERMAL RESISTANCE

SYMBOL	PARAMETER	MAX.	UNIT
$R_{th\ j-mb(RF)}$	from junction to mounting base	1.65	K/W
$R_{th\ mb-h}$	from mounting base to heatsink	0.45	K/W

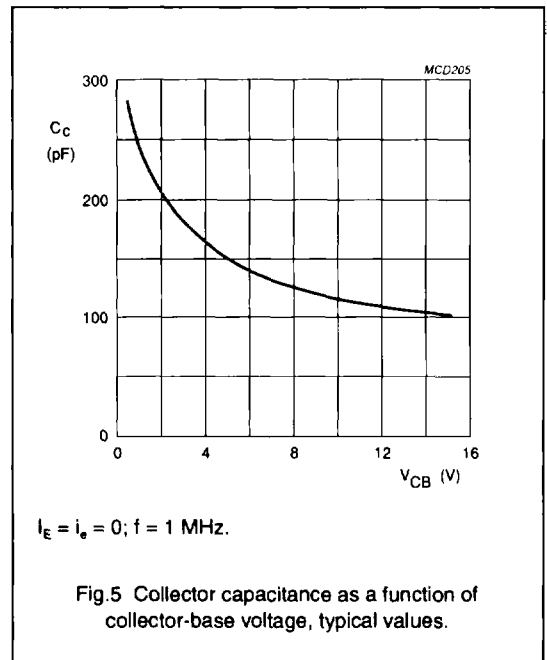
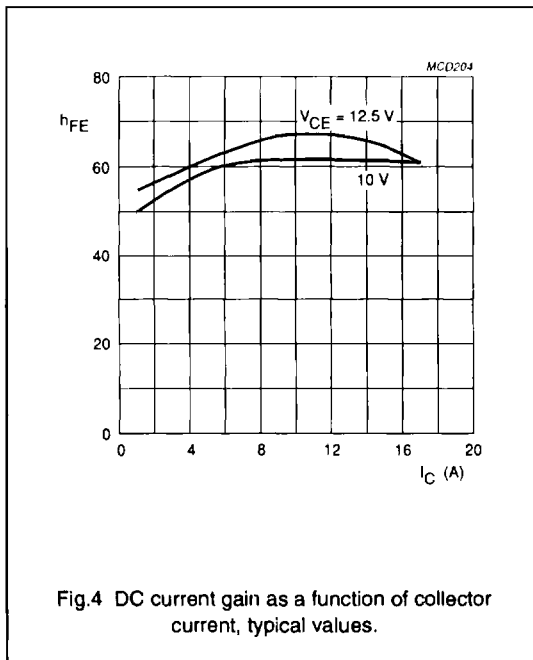
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CHARACTERISTICS

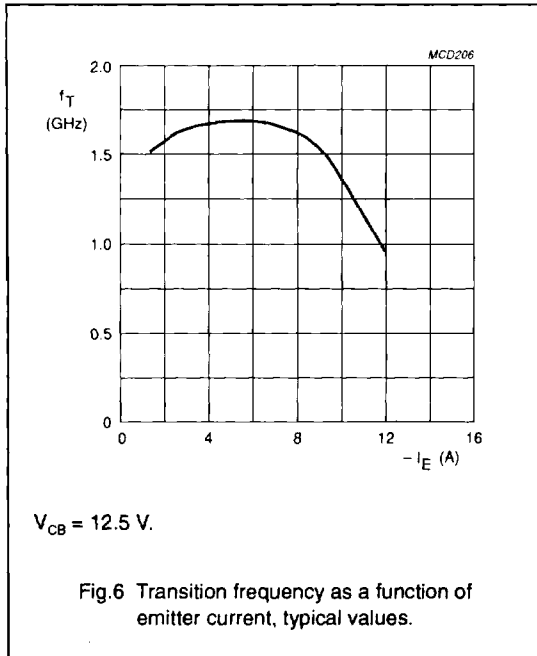
$T_j = 25\text{ }^\circ\text{C}$.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)CBO}$	collector-base breakdown voltage	open emitter; $I_C = 50\text{ mA}$	36	-	-	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	open base; $I_C = 100\text{ mA}$	16.5	-	-	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	open collector; $I_E = 10\text{ mA}$	4	-	-	V
I_{CES}	collector-emitter leakage current	$V_{BE} = 0$; $V_{CE} = 20\text{ V}$	-	-	25	mA
h_{FE}	DC current gain	$V_{CE} = 10\text{ V}$; $I_C = 5.4\text{ A}$	15	60	-	
f_T	transition frequency	$V_{CE} = 12.5\text{ V}$; $I_E = 5\text{ A}$	-	1.65	-	GHz
C_c	collector capacitance	$V_{CB} = 12.5\text{ V}$; $I_E = I_\sigma = 0$; $f = 1\text{ MHz}$	-	105	-	pF
C_{re}	feedback capacitance	$V_{CE} = 12.5\text{ V}$; $I_C = 0$; $f = 1\text{ MHz}$	-	65	-	pF
C_{c-s}	collector-stud capacitance	$f = 1\text{ MHz}$	-	2	-	pF



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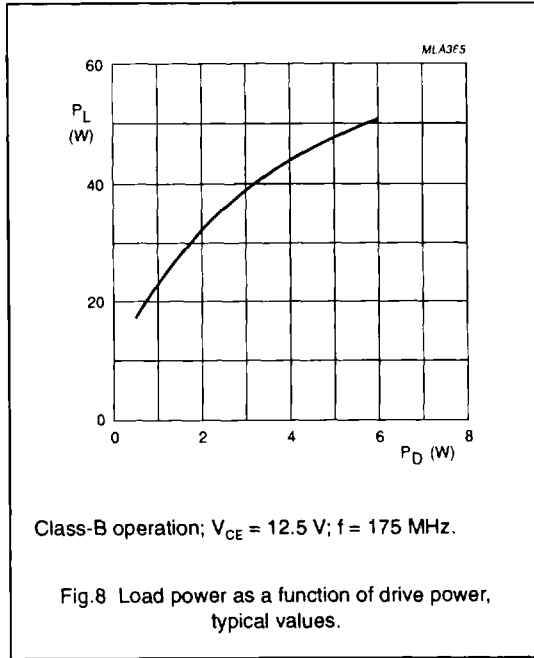
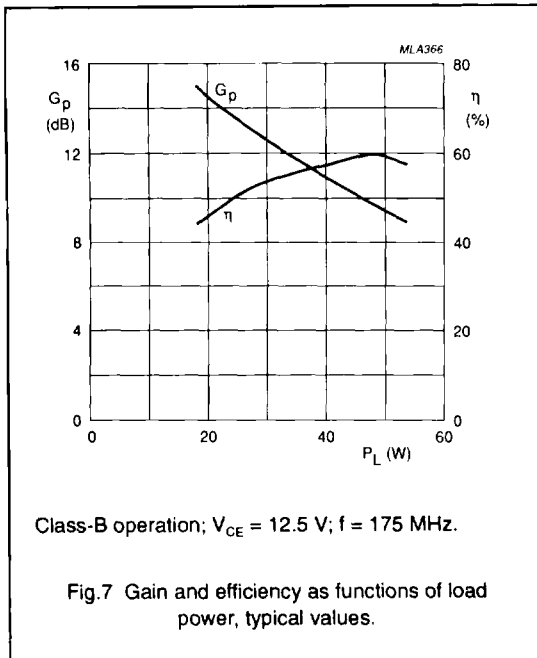
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APPLICATION INFORMATION

RF performance at $T_{mb} = 25\text{ }^\circ\text{C}$ in a common emitter test circuit.

MODE OF OPERATION	f (MHz)	V_{CE} (V)	P_L (W)	G_p (dB)	η_c (%)
c.w. class-B	175	12.5	40	> 10 typ. 11	> 55 typ. 57

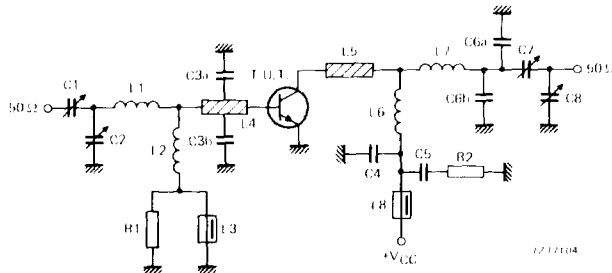


Ruggedness in class-B operation

The BLW40 is capable of withstanding a load mismatch corresponding to $V_{SWR} = 10:1$ through all phases at rated output power, up to a supply voltage of 15.5 V, and $f = 175\text{ MHz}$.

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Fig.9 Class-B test circuit at $f = 175$ MHz.

List of components (see test circuit)

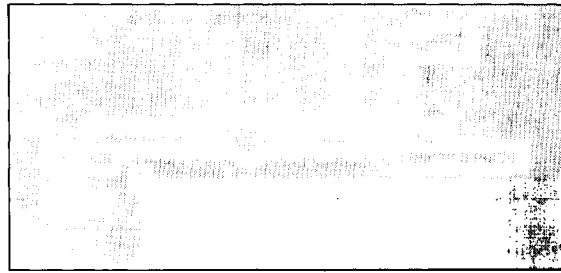
COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
C1	film dielectric trimmer	2.5 to 20 pF		2222 809 07004
C2, C8	film dielectric trimmer	4 to 40 pF		2222 809 07008
C3a, C3b	500 V ceramic capacitor	47 pF		
C4	500 V ceramic capacitor	120 pF		
C5	polyester capacitor	100 nF		
C6a, C6b	500 V ceramic capacitor	8.2 pF		
C7	film dielectric trimmer	5 to 60 pF		2222 809 07011
L1	1 turn enamelled 1.6 mm copper wire		int. dia. 9 mm; leads 2 x 5 mm	
L2	7 turns closely wound enamelled 0.5 mm copper wire	100 nH	int. dia. 3 mm; leads 2 x 5 mm	
L3, L8	grade 3B Ferroxcube wideband HF choke			4312 020 36640
L4, L5	stripline (note 1)		12 mm x 6 mm; note 2	
L6	2 turns enamelled 1.6 mm copper wire		int. dia. 5 mm; length 6 mm; leads 2 x 5 mm	
L7	2 turns enamelled 1.6 mm copper wire		int. dia. 4.5 mm; length 6 mm; leads 2 x 5 mm	
R1	0.25 W carbon resistor	10 Ω , 5%		
R2	0.25 W carbon resistor	4.7 Ω , 5%		

Notes

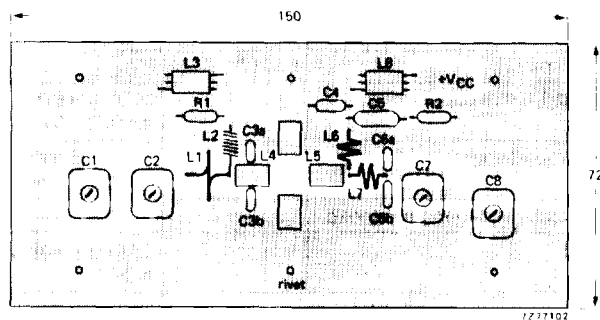
1. The striplines are mounted on a double copper-clad printed circuit board, with PTFE fibre-glass dielectric, thickness $\frac{1}{16}$ inch.
2. Taps for capacitors C3a and C3b are situated 5 mm from the transistor.

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The circuit and components are situated on one side of an epoxy 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 hollow rivets and copper straps under the emitters.

Fig.10 Component layout for 175 MHz class-B test circuit.

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