

DATA SHEET

BLW50F HF/VHF power transistor

Product specification

August 1986

HF/VHF power transistor

BLW50F

DESCRIPTION

N-P-N silicon planar epitaxial transistor primarily intended for use in class-A, AB and B operated, industrial and military transmitters in the h.f. and v.h.f. band. Resistance stabilization provides protection against device damage at severe load mismatch conditions. Matched h_{FE} groups are available on request.

It has a 3/8" flange envelope with a ceramic cap. All leads are isolated from the flange.

QUICK REFERENCE DATA

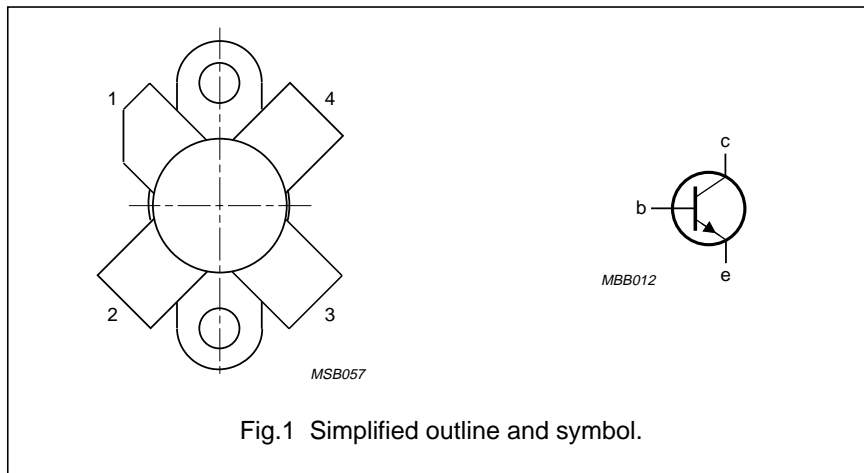
R.F. performance

MODE OF OPERATION	V_{CE} V	f MHz	P_L W	G_p dB	η_{dt} %	I_C A	$I_{C(zs)}$ mA	d_3 dB	T_h °C
s.s.b. (class-A)	45	1,6 - 28	0 - 16 (P.E.P.)	> 19,5	—	1,2	—	< -40	70
s.s.b. (class-AB)	50	1,6 - 28	10 - 65 (P.E.P.)	typ. 18	typ. 45 ⁽¹⁾	1,45	50	typ. -30	25

Note

- At 65W P.E.P.

PIN CONFIGURATION



PINNING - SOT123

PIN	DESCRIPTION
1	collector
2	emitter
3	base
4	emitter

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

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RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage ($V_{BE} = 0$)

peak value

V_{CESM} max. 110 V

Collector-emitter voltage (open base)

V_{CEO} max. 55 V

Emitter-base voltage (open collector)

V_{EBO} max. 4 V

Collector current (average)

$I_{C(AV)}$ max. 2,5 A

Collector current (peak value); $f > 1$ MHz

I_{CM} max. 7,5 A

D.C. and r.f. ($f > 1$ MHz) power dissipation; $T_{mb} = 25$ °C

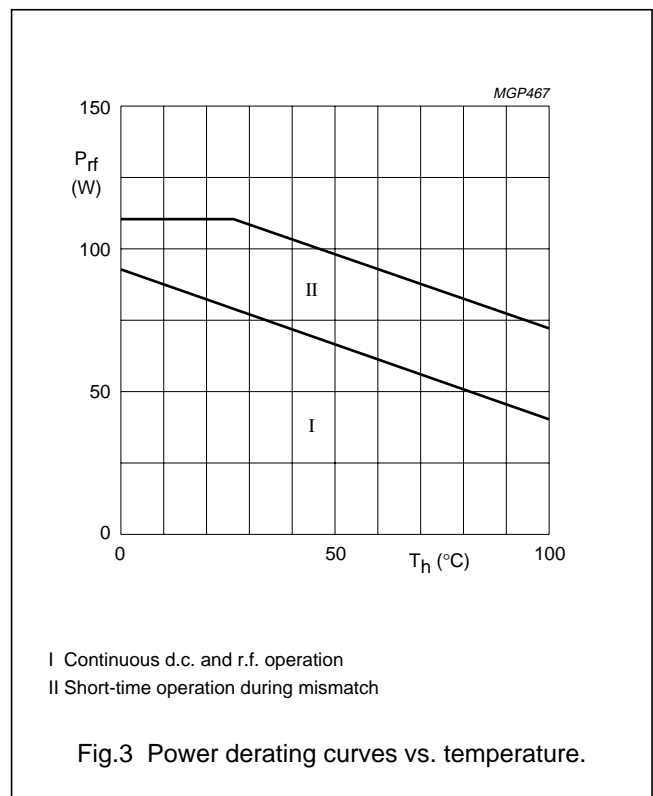
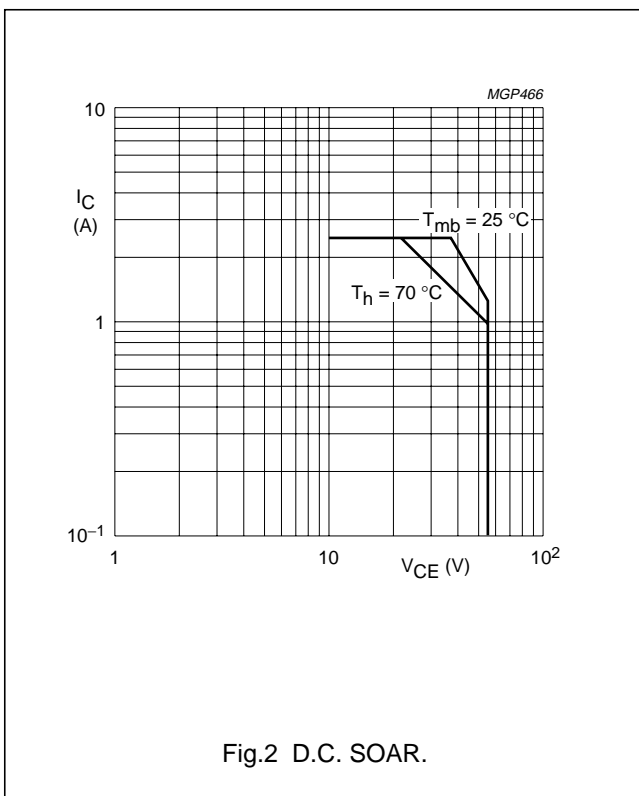
$P_{tot}; P_{rf}$ max. 94 W

Storage temperature

T_{stg} -65 to + 150 °C

Operating junction temperature

T_j max. 200 °C



THERMAL RESISTANCE

(dissipation = 54 W; $T_{mb} = 86$ °C, i.e. $T_h = 70$ °C)

From junction to mounting base

(d.c. and r.f. dissipation)

$R_{th\ j-mb}$ = 2,1 K/W

From mounting base to heatsink

$R_{th\ mb-h}$ = 0,3 K/W

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

Collector-emitter breakdown voltage

 $V_{BE} = 0; I_C = 25\text{ mA}$ $V_{(BR)CES} > 110\text{ V}$

Collector-emitter breakdown voltage

open base; $I_C = 100\text{ mA}$ $V_{(BR)CEO} > 55\text{ V}$

Emitter-base breakdown voltage

open collector; $I_E = 10\text{ mA}$ $V_{(BR)EBO} > 4\text{ V}$

Collector cut-off current

 $V_{BE} = 0; V_{CE} = 55\text{ V}$ $I_{CES} < 10\text{ mA}$ Second breakdown energy; $L = 25\text{ mH}; f = 50\text{ Hz}$

open base

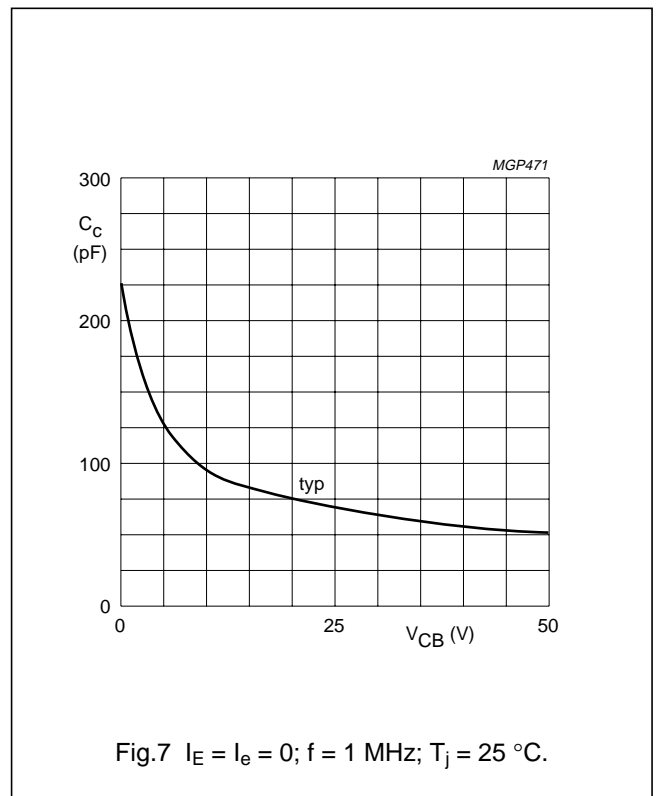
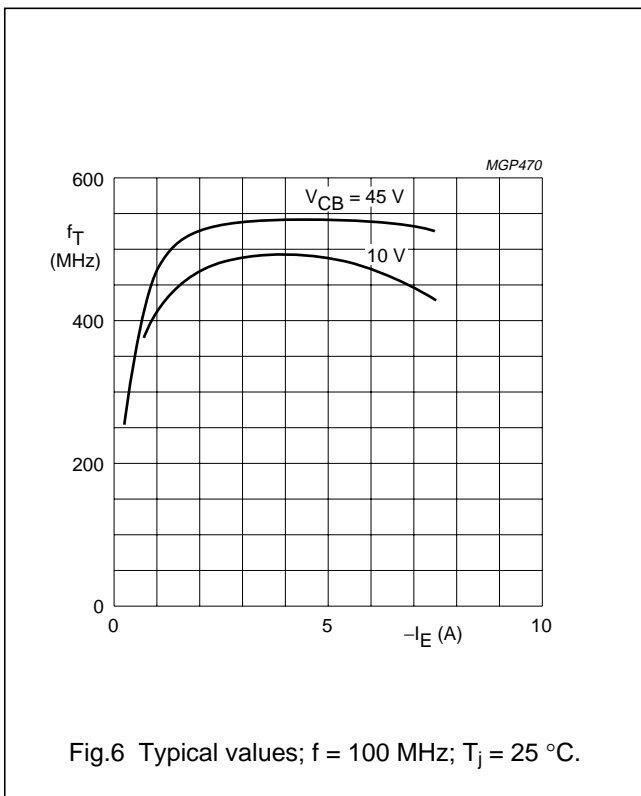
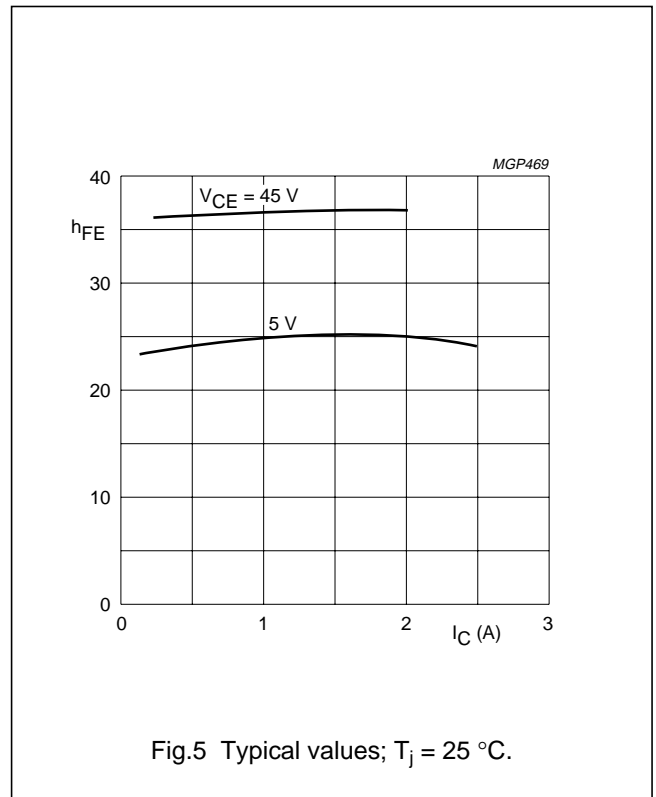
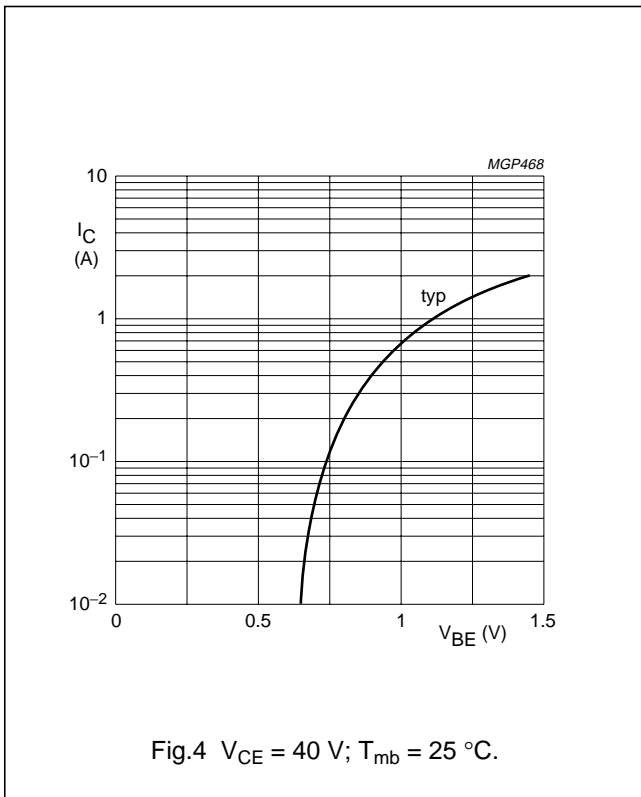
 $E_{SBO} > 8\text{ mJ}$ $R_{BE} = 10\ \Omega$ $E_{SBR} > 8\text{ mJ}$ D.C. current gain⁽¹⁾ $I_C = 1,2\text{ A}; V_{CE} = 5\text{ V}$ h_{FE} typ. 25
15 to 100D.C. current gain ratio of matched devices⁽¹⁾ $I_C = 1,2\text{ A}; V_{CE} = 5\text{ V}$ $h_{FE1}/h_{FE2} < 1,2$ Collector-emitter saturation voltage⁽¹⁾ $I_C = 3,0\text{ A}; I_B = 0,6\text{ A}$ V_{CEsat} typ. 1,2 VTransition frequency at $f = 100\text{ MHz}$ ⁽¹⁾ $-I_E = 1,2\text{ A}; V_{CB} = 45\text{ V}$ f_T typ. 490 MHz $-I_E = 4,0\text{ A}; V_{CB} = 45\text{ V}$ f_T typ. 540 MHzCollector capacitance at $f = 1\text{ MHz}$ $I_E = I_e = 0; V_{CB} = 45\text{ V}$ C_c typ. 53 pFFeedback capacitance at $f = 1\text{ MHz}$ $I_C = 50\text{ mA}; V_{CE} = 45\text{ V}$ C_{re} typ. 35 pF

Collector-flange capacitance

 C_{cf} typ. 2 pF**Note**1. Measured under pulse conditions: $t_p \leq 200\ \mu\text{s}; \delta \leq 0,02$.

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APPLICATION INFORMATION

R.F. performance in s.s.b. class-A operation (linear power amplifier)

 $V_{CE} = 45 \text{ V}$; $f_1 = 28,000 \text{ MHz}$; $f_2 = 28,001 \text{ MHz}$

OUTPUT POWER W	G_p dB	I_C A	$d_3^{(1)}$ dB	$d_5^{(1)}$ dB	T_h °C
> 16 (P.E.P.)	> 19,5	1,2	-40	< -40	70
typ. 17 (P.E.P.)	typ. 20,5	1,2	-40	< -40	70

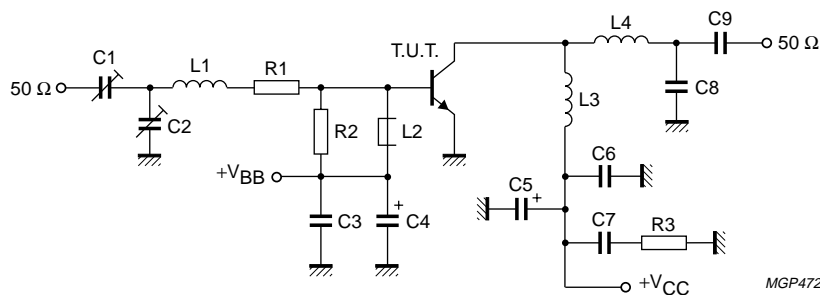


Fig.8 Test circuit; s.s.b. class-A.

List of components in Fig.8:

- C1 = C2 = 10 to 780 pF film dielectric trimmer
- C3 = 22 nF ceramic capacitor (63 V)
- C4 = 4,7 μ F/16 V electrolytic capacitor
- C5 = 1 μ F/75 V solid tantalum capacitor
- C6 = C7 = 47 nF polyester capacitor (100 V)
- C8 = 68 pF ceramic capacitor (500 V)
- C9 = 3,9 nF ceramic capacitor
- L1 = 3 turns closely wound enamelled Cu wire (1,0 mm); int. dia 9,0 mm; leads $2 \times 5 \text{ mm}$
- L2 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
- L3 = 1,05 μ H; 15 turns enamelled Cu wire (1,0 mm); int. dia. 10 mm; length 17,4 mm; leads $2 \times 5 \text{ mm}$
- L4 = 162 nH; 6 turns enamelled Cu wire (1,0 mm); int. dia. 7,0 mm; length 11,6 mm; leads $2 \times 5 \text{ mm}$
- R1 = 1,6 Ω ; parallel connection of $3 \times 4,7 \Omega$ carbon resistors ($\pm 5\%$; 0,125 W)
- R2 = 47 Ω carbon resistor ($\pm 5\%$; 0,25 W)
- R3 = 4,7 Ω carbon resistor ($\pm 5\%$; 0,25 W)

Note

1. Stated intermodulation distortion figures are referred to the according level of either of the equal amplified tones. Relative to the according peak envelope powers these figures should be increased by 6 dB.

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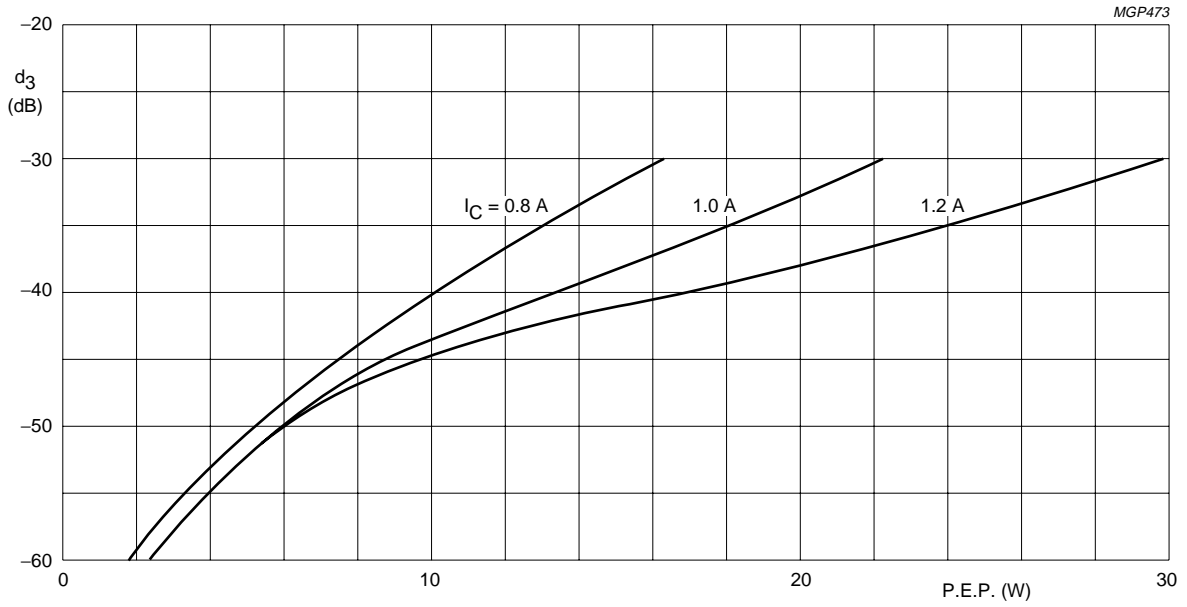


Fig.9 Intermodulation distortion (see note on previous page) as a function of output power. Typical values; $V_{CE} = 45\text{ V}$; $f_1 = 28,000\text{ MHz}$; $f_2 = 28,001\text{ MHz}$; $T_h = 70\text{ }^\circ\text{C}$.

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R.F. performance in s.s.b. class-AB operation (linear power amplifier)

$V_{CE} = 50 \text{ V}$; $f_1 = 28,000 \text{ MHz}$; $f_2 = 28,001 \text{ MHz}$

OUTPUT POWER W	G_p dB	$\eta_{dt}(\%)$ AT 65 W P.E.P.	I_C (A) typ. 1,45	$d_3^{(1)}$ dB	$d_5^{(1)}$ dB	$I_{C(zs)}$ mA	T_h $^{\circ}\text{C}$
10 to 65 (P.E.P.)	typ. 18	typ. 45		typ. -30	< -30	50	25

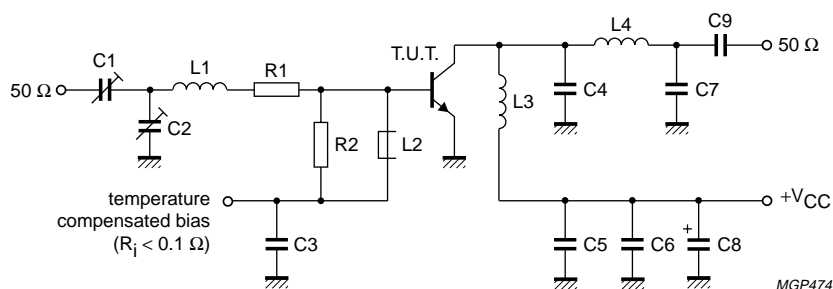


Fig.10 Test circuit; s.s.b. class-AB.

List of components:

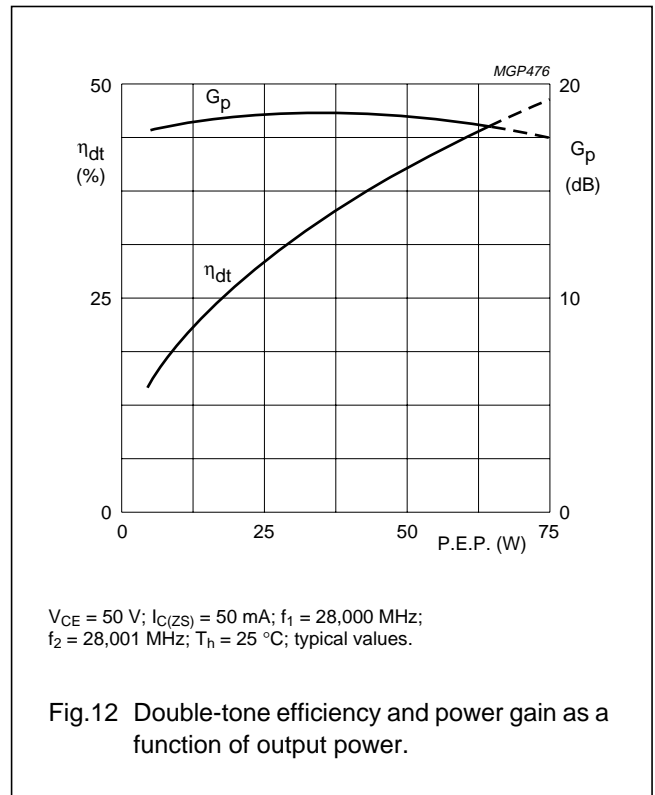
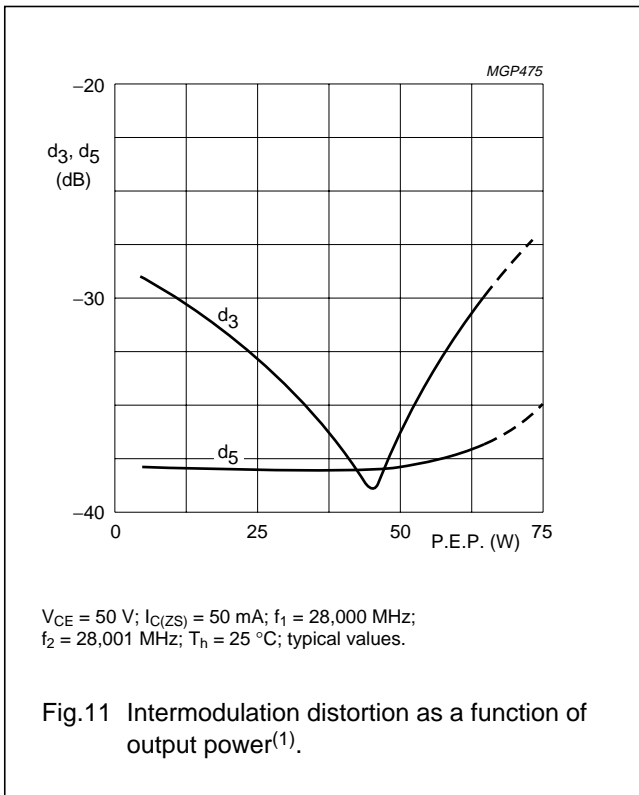
- C1 = C2 = 10 to 780 pF film dielectric trimmer
- C3 = C5 = C6 = 220 nF polyester capacitor
- C4 = 120 pF ceramic capacitor (500 V)
- C7 = 150 pF ceramic capacitor (500 V)
- C8 = 47 μ F/63 V electrolytic capacitor
- C9 = 3,9 nF ceramic capacitor
- L1 = 4 turns closely wound enamelled Cu wire (1,6 mm); int. dia 7,0 mm; leads 2 \times 5 mm
- L2 = Ferroxcube wide-band h.f. choke, grade 3B (cat.no. 4312 020 36640)
- L3 = 9 turns enamelled Cu wire (1,0 mm); int. dia. 10 mm; length 14,5 mm; leads 2 \times 5 mm
- L4 = 6 turns enamelled Cu wire (1,0 mm); int. dia. 6,5 mm; length 11,0 mm; leads 2 \times 5 mm
- R1 = 2,4 Ω ; parallel connection of 2 \times 4,7 Ω carbon resistors
- R2 = 39 Ω carbon resistor

Note

1. Stated intermodulation distortion figures are referred to the according level of either of the equal amplified tones. Relative to the according peak envelope powers these figures should be increased by 6 dB.

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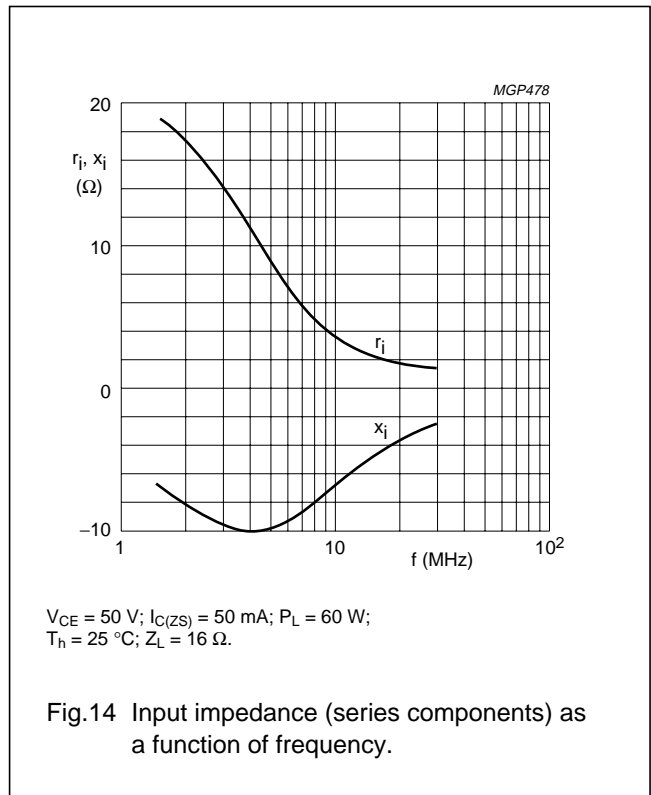
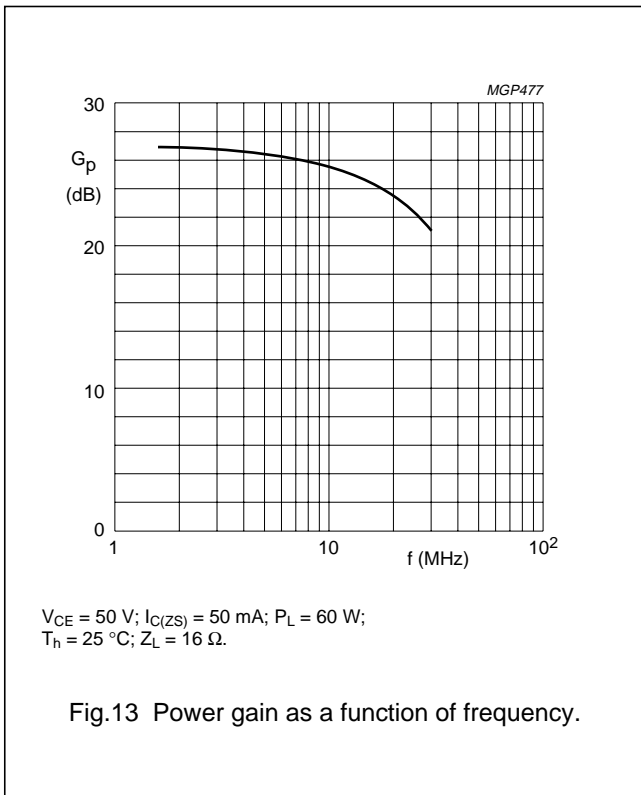
Ruggedness in s.s.b. operation

The BLW50F is capable of withstanding full load mismatch (VSWR = 50 through all phases) up to 45 W (P.E.P.) under the following conditions:

$V_{CE} = 50 \text{ V}; f_1 = 28,000 \text{ MHz}; f_2 = 28,001 \text{ MHz}; T_h = 70 \text{ }^\circ\text{C}; R_{th\text{ mb-h}} = 0,3 \text{ K/W}.$

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Figs 13 and 14 are typical curves and hold for an unneutralized amplifier in s.s.b. class-AB operation.

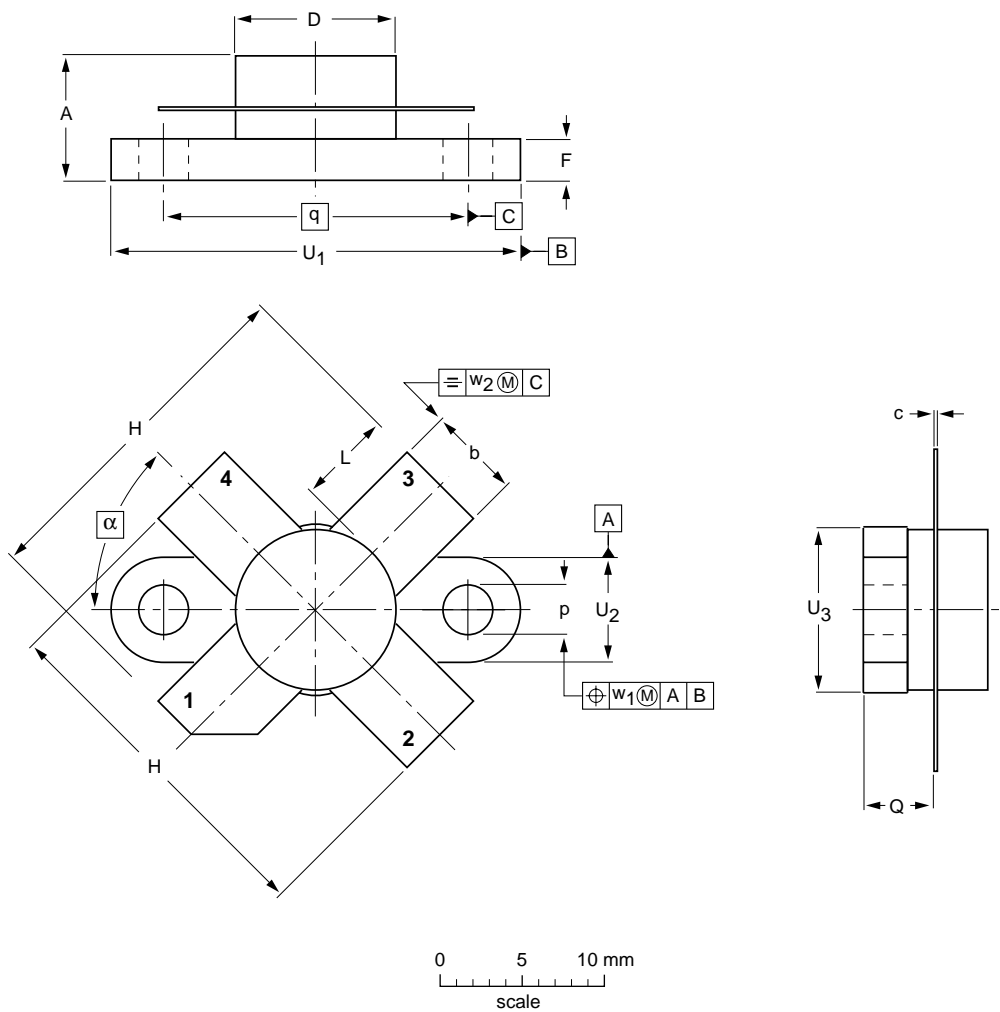
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PACKAGE OUTLINE

Flanged ceramic package; 2 mounting holes; 4 leads

SOT123A



DIMENSIONS (millimetre dimensions are derived from the original inch dimensions)

UNIT	A	b	c	D	D ₁	F	H	L	p	Q	q	U ₁	U ₂	U ₃	w ₁	w ₂	α
mm	7.47 6.37	5.82 5.56	0.18 0.10	9.73 9.47	9.63 9.42	2.72 2.31	20.71 19.93	5.61 5.16	3.33 3.04	4.63 4.11	18.42	25.15 24.38	6.61 6.09	9.78 9.39	0.51	1.02	45°
inches	0.294 0.251	0.229 0.219	0.007 0.004	0.383 0.373	0.397 0.371	0.107 0.091	0.815 0.785	0.221 0.203	0.131 0.120	0.182 0.162	0.725	0.99 0.96	0.26 0.24	0.385 0.370	0.02	0.04	

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT123A						97-06-28

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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.	

LIFE SUPPORT APPLICATIONS

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