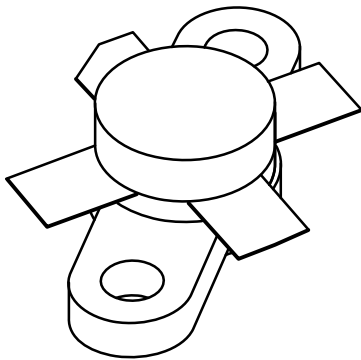


DATA SHEET



BLF242 HF-VHF power MOS transistor

Product specification
Supersedes data of 1997 Dec 17

2003 Oct 13

HF-VHF power MOS transistor

BLF242

FEATURES

- High power gain
- Low noise
- Easy power control
- Good thermal stability
- Withstands full load mismatch
- Gold metallization ensures excellent reliability.

DESCRIPTION

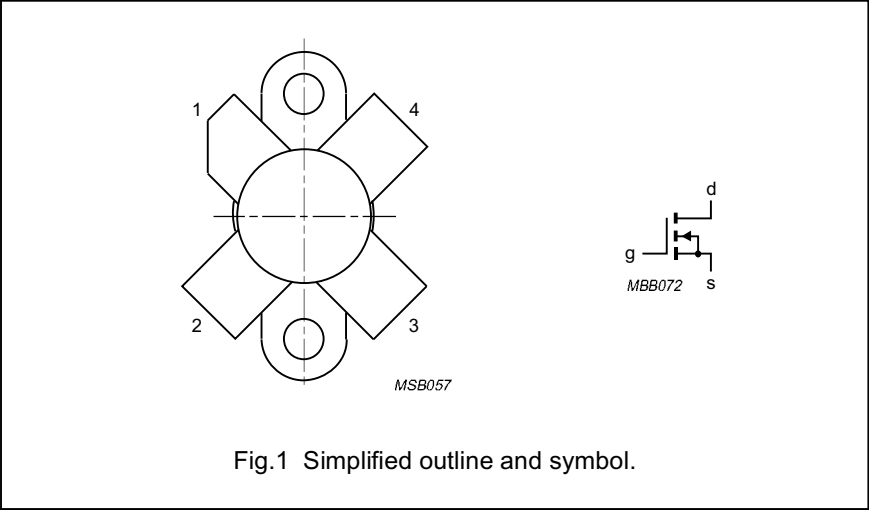
Silicon N-channel enhancement mode vertical D-MOS transistor designed for professional transmitter applications in the HF/VHF frequency range.

The transistor is encapsulated in a 4-lead, SOT123A flange package, with a ceramic cap. All leads are isolated from the flange.

PINNING - SOT123A

PIN	DESCRIPTION
1	drain
2	source
3	gate
4	source

PIN CONFIGURATION



CAUTION

This product is supplied in anti-static packing to prevent damage caused by electrostatic discharge during transport and handling. For further information, refer to Philips specs.: SNW-EQ-608, SNW-FQ-302A, and SNW-FQ-302B.

WARNING

Product and environmental safety - toxic materials

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.

QUICK REFERENCE DATA

RF performance at $T_h = 25\text{ }^{\circ}\text{C}$ in a common source test circuit.

MODE OF OPERATION	f (MHz)	V _{DS} (V)	P _L (W)	G _p (dB)	η _D (%)
CW, class-B	175	28	5	>13 typ. 16	>50 typ. 60

HF-VHF power MOS transistor

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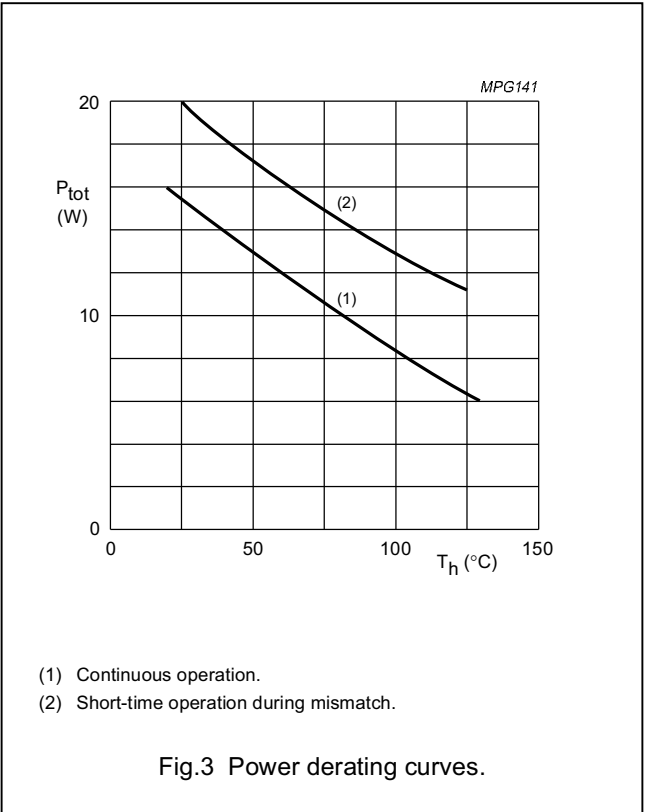
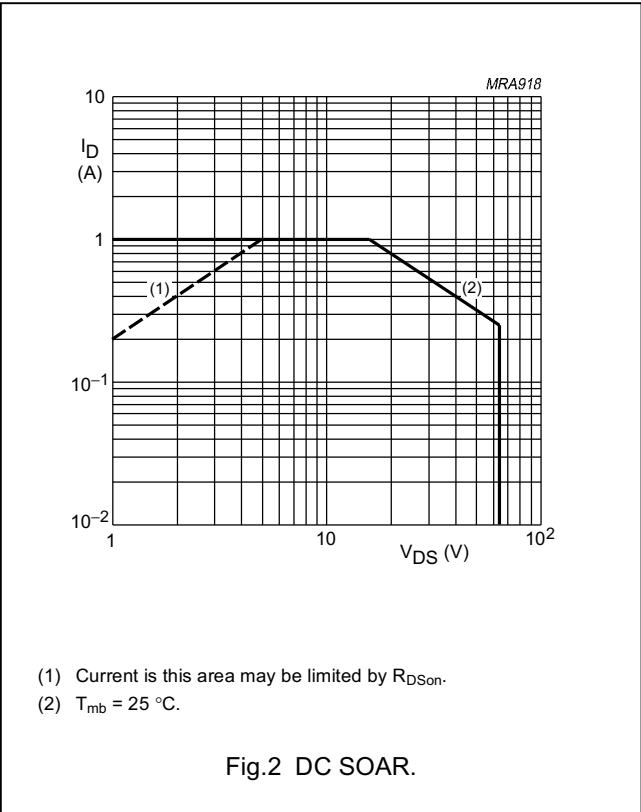
LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 60134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V _{DS}	drain-source voltage		–	65	V
V _{GS}	gate-source voltage		–	±20	V
I _D	drain current (DC)		–	1	A
P _{tot}	total power dissipation	T _{mb} ≤ 25 °C	–	16	W
T _{stg}	storage temperature		–65	150	°C
T _j	junction temperature		–	200	°C

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
R _{th j-mb}	thermal resistance from junction to mounting base	T _{mb} = 25 °C; P _{tot} = 16 W	11	K/W
R _{th mb-h}	thermal resistance from mounting base to heatsink	T _{mb} = 25 °C; P _{tot} = 16 W	0.3	K/W



HF-VHF power MOS transistor

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CHARACTERISTICS

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

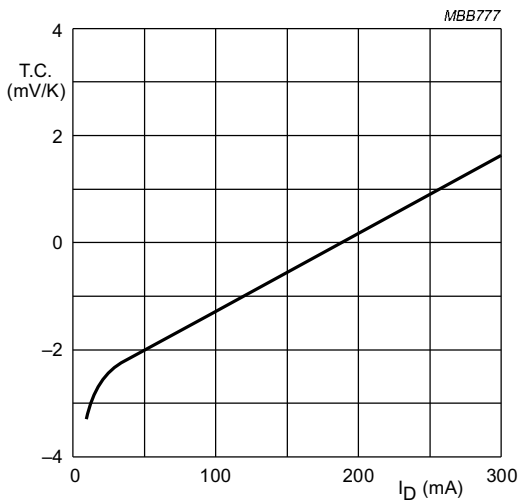
SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	drain-source breakdown voltage	$V_{GS} = 0$; $I_D = 0.1\text{ mA}$	65	–	–	V
I_{DSS}	drain-source leakage current	$V_{GS} = 0$; $V_{DS} = 28\text{ V}$	–	–	10	μA
I_{GSS}	gate-source leakage current	$V_{GS} = \pm 20\text{ V}$; $V_{DS} = 0$	–	–	1	μA
V_{GSth}	gate-source threshold voltage	$I_D = 3\text{ mA}$; $V_{DS} = 10\text{ V}$	2	–	4.5	V
g_{fs}	forward transconductance	$I_D = 0.3\text{ A}$; $V_{DS} = 10\text{ V}$	0.16	0.24	–	S
R_{DSon}	drain-source on-state resistance	$I_D = 0.3\text{ A}$; $V_{GS} = 1\text{ V}$	–	3.3	5	Ω
I_{DSX}	on-state drain current	$V_{GS} = 10\text{ V}$; $V_{GS} = 10\text{ V}$	–	1.2	–	A
C_{is}	input capacitance	$V_{GS} = 0$; $V_{DS} = 28\text{ V}$; $f = 1\text{ MHz}$	–	13	–	pF
C_{os}	output capacitance	$V_{GS} = 0$; $V_{DS} = 28\text{ V}$; $f = 1\text{ MHz}$	–	9.4	–	pF
C_{rs}	feedback capacitance	$V_{GS} = 0$; $V_{DS} = 28\text{ V}$; $f = 1\text{ MHz}$	–	1.7	–	pF

 V_{GS} group indicator

GROUP	LIMITS (V)		GROUP	LIMITS (V)	
	MIN.	MAX.		MIN.	MAX.
A	2.0	2.1	O	3.3	3.4
B	2.1	2.2	P	3.4	3.5
C	2.2	2.3	Q	3.5	3.6
D	2.3	2.4	R	3.6	3.7
E	2.4	2.5	S	3.7	3.8
F	2.5	2.6	T	3.8	3.9
G	2.6	2.7	U	3.9	4.0
H	2.7	2.8	V	4.0	4.1
J	2.8	2.9	W	4.1	4.2
K	2.9	3.0	X	4.2	4.3
L	3.0	3.1	Y	4.3	4.4
M	3.1	3.2	Z	4.4	4.5
N	3.2	3.3			

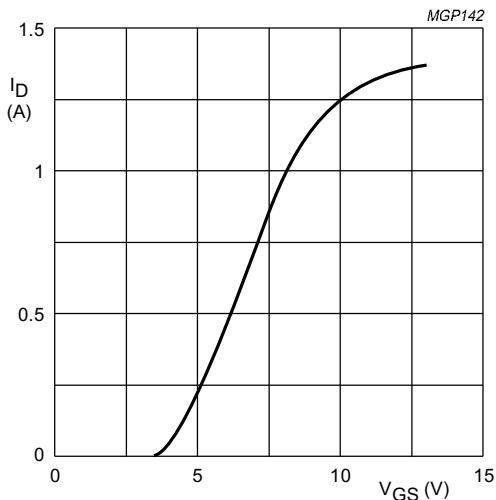
HF-VHF power MOS transistor

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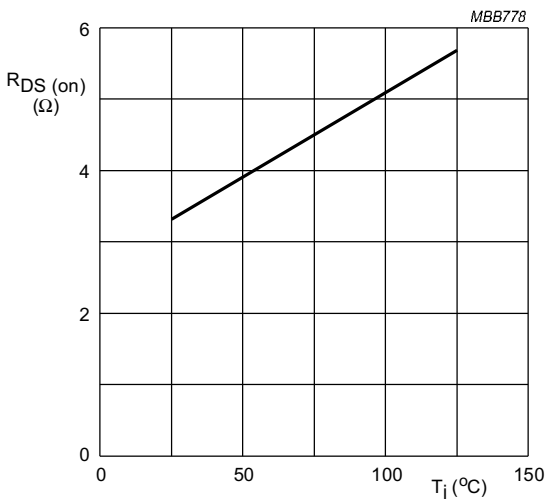
$V_{DS} = 10\text{ V}$.

Fig.4 Temperature coefficient of gate-source voltage as a function of drain current, typical values.



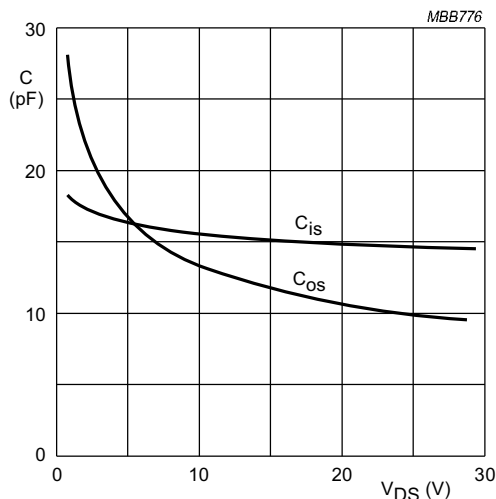
$V_{DS} = 10\text{ V}$; $T_j = 25\text{ }^{\circ}\text{C}$.

Fig.5 Drain current as a function of gate-source voltage, typical values.



$I_D = 0.3\text{ A}$; $V_{GS} = 10\text{ V}$.

Fig.6 Drain-source on-state resistance as a function of junction temperature, typical values.

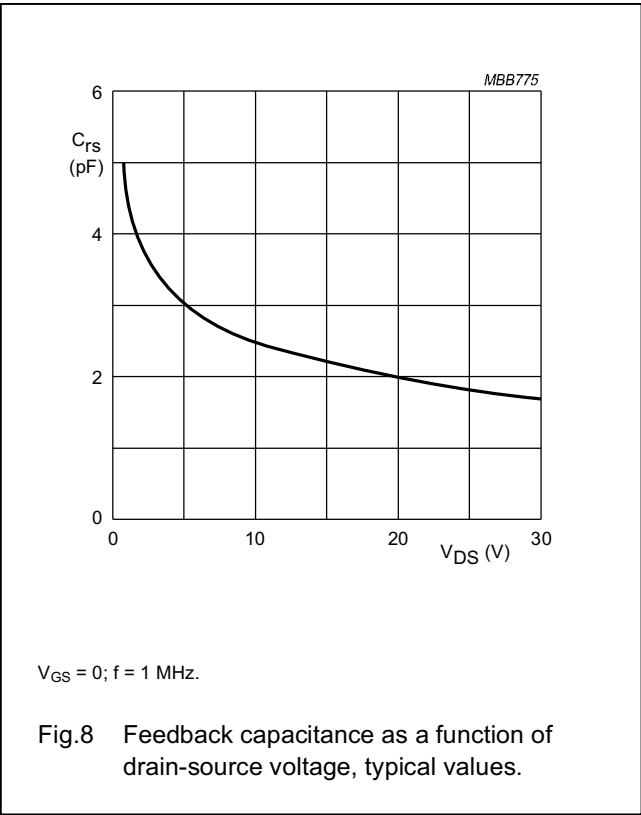


$V_{GS} = 0$; $f = 1\text{ MHz}$.

Fig.7 Input and output capacitance as functions of drain-source voltage, typical values.

HF-VHF power MOS transistor

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APPLICATION INFORMATION FOR CLASS-B OPERATION

$T_h = 25\text{ }^{\circ}\text{C}$; $R_{th\text{ }mb-h} = 0.3\text{ K/W}$; unless otherwise specified.
RF performance in CW operation in a common source class-B test circuit.

MODE OF OPERATION	f (MHz)	V_{DS} (V)	I_{DQ} (mA)	P_L (W)	G_p (dB)	η_D (%)	R_{GS} (Ω)
CW, class-B	175	28	10	5	>13 typ. 16	>50 typ. 60	47

Ruggedness in class-B operation

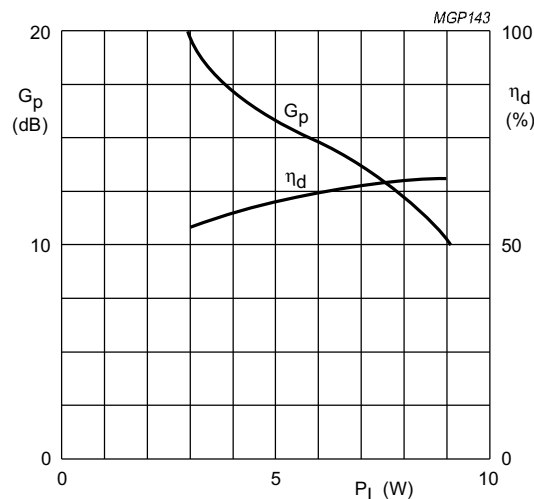
The BLF242 is capable of withstanding a load mismatch corresponding to $V_{SWR} = 50$ through all phases under the following conditions: $V_{DS} = 28\text{ V}$; $f = 175\text{ MHz}$ at rated output power.

Noise figure (see Fig.11)

$V_{DS} = 28\text{ V}$; $I_D = 0.2\text{ A}$; $f = 175\text{ MHz}$; $R_{GS} = 47\text{ }\Omega$; $T_h = 25\text{ }^{\circ}\text{C}$. Input and output power matched for $P_L = 5\text{ W}$; $F = \text{typ. } 5.5\text{ dB}$.

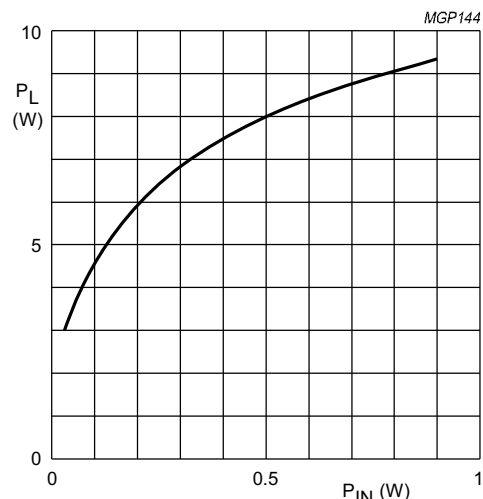
HF-VHF power MOS transistor

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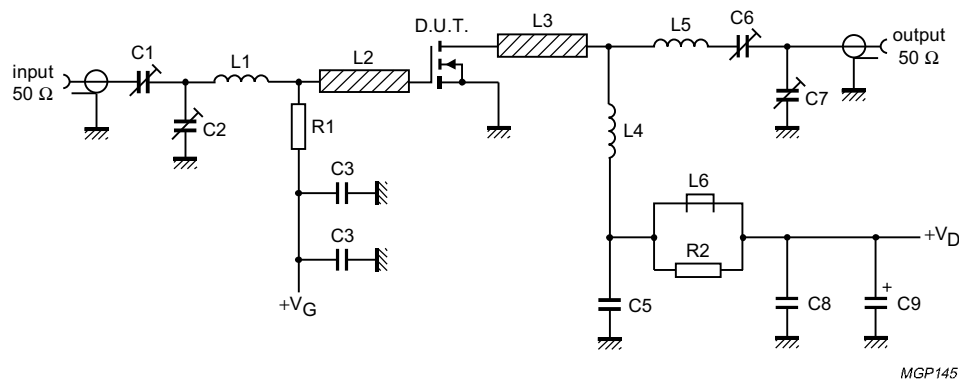
Class-B operation; $V_{DS} = 28$ V; $I_{DQ} = 10$ mA;
 $R_{GS} = 47$ Ω ; $f = 175$ MHz.

Fig.9 Power gain and efficiency as functions of load power, typical values.



Class-B operation; $V_{DS} = 28$ V; $I_{DQ} = 10$ mA;
 $R_{GS} = 47$ Ω ; $f = 175$ MHz.

Fig.10 Load power as a function of input power, typical values.



$f = 175$ MHz.

Fig.11 Test circuit for class-B operation.

HF-VHF power MOS transistor

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List of components (see Fig.11)

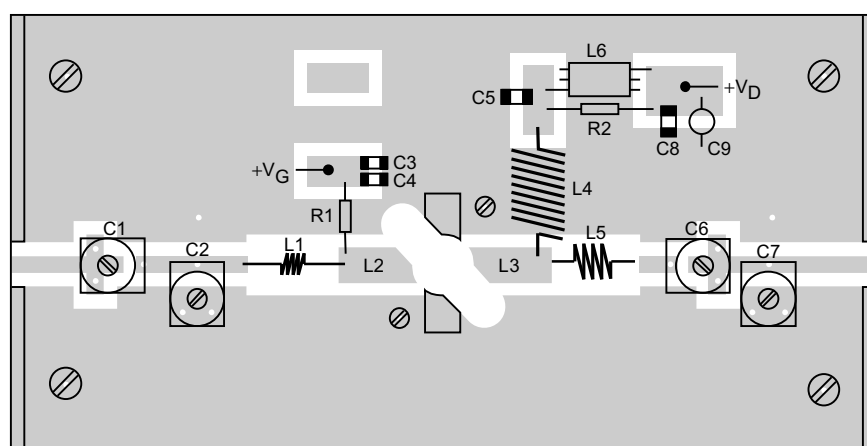
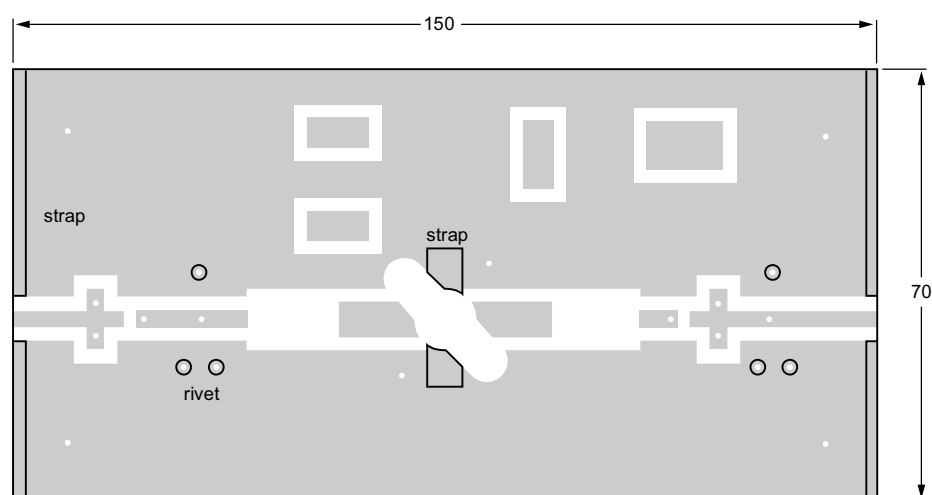
COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
C1, C2, C7	film dielectric trimmer	4 to 40 pF		2222 809 08002
C3	multilayer ceramic chip capacitor; note 1	100 pF		
C4, C8	ceramic chip capacitor	100 nF		2222 852 47104
C6	film dielectric trimmer	5 to 60 pF		2222 809 08003
C9	electrolytic capacitor	2.2 μ F, 40 V		
L1	5 turns enamelled 0.7 mm copper wire	53 nH	length 5.4 mm int. dia. 3 mm leads 2 $\times$ 5 mm	
L2, L3	stripline; note 2	30 Ω	10 $\times$ 6 mm	
L4	11 turns enamelled 1 mm copper wire	500 nH	length 15.5 mm int. dia. 8 mm leads 2 $\times$ 5 mm	
L5	5 turns enamelled 1 mm copper wire	79 nH	length 9.1 mm int. dia. 5 mm leads 2 $\times$ 5 mm	
L6	grade 3B Ferroxcube RF choke			4312 020 36640
R1	0.5 W metal film resistor	47 Ω		
R2	0.5 W metal film resistor	10 Ω		

Notes

1. American Technical Ceramics (ATC) capacitor, type 100B or other capacitor of the same quality.
2. The striplines are on a double copper-clad printed circuit board, with epoxy fibre-glass dielectric ($\epsilon_r = 4.5$), thickness $\frac{1}{16}$ inch.

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MGP146

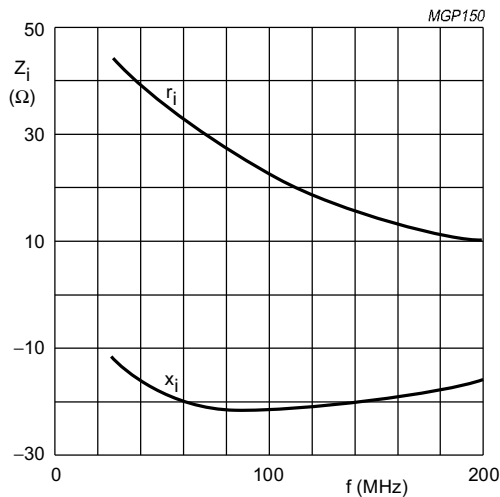
Dimensions in mm.

The circuit and components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by fixing screws, copper straps and hollow rivets at the edges of the board and under the source.

Fig.12 Component layout for 175 MHz class-B test circuit.

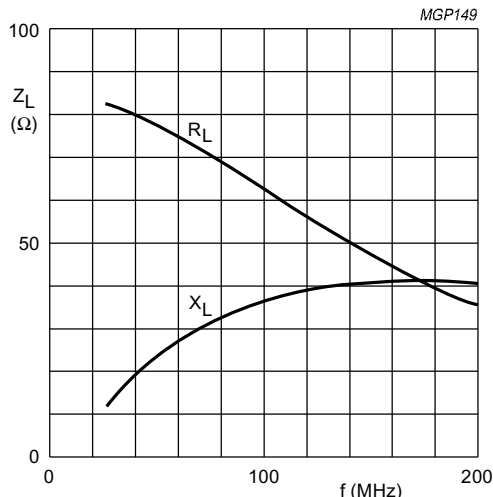
HF-VHF power MOS transistor

BLF242



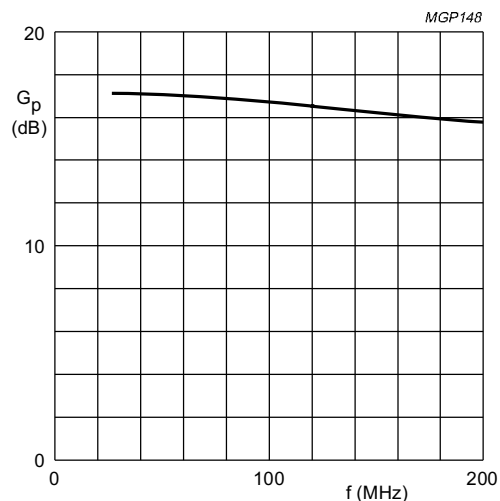
Class-B operation; $V_{DS} = 28\text{ V}$; $P_L = 30\text{ W}$;
 $R_{GS} = 47\text{ }\Omega$; $T_h = 25\text{ }^\circ\text{C}$.

Fig.13 Input impedance as a function of frequency
(series components), typical values.



Class-B operation; $V_{DS} = 28\text{ V}$; $P_L = 30\text{ W}$;
 $R_{GS} = 47\text{ }\Omega$; $T_h = 25\text{ }^\circ\text{C}$.

Fig.14 Load impedance as a function of frequency
(series components), typical values.



Class-B operation; $V_{DS} = 28\text{ V}$; $P_L = 30\text{ W}$;
 $R_{GS} = 47\text{ }\Omega$; $T_h = 25\text{ }^\circ\text{C}$.

Fig.15 Power gain as a function of frequency,
typical values.

HF-VHF power MOS transistor

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BLF242 scattering parameters $V_{DS} = 28\text{ V}$; $I_D = 10\text{ mA}$; note 1

f (MHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	S ₁₁	∠ Φ	S ₂₁	∠ Φ	S ₁₂	∠ Φ	S ₂₂	∠ Φ
5	0.99	-3.40	5.57	177.10	0.01	87.60	1.00	-2.60
10	0.98	-5.80	5.52	175.10	0.01	85.50	1.00	-5.30
20	0.99	-12.40	5.53	169.40	0.02	80.70	0.99	-10.70
30	0.98	-17.90	5.46	164.90	0.03	76.50	0.99	-16.10
40	0.97	-24.10	5.40	159.80	0.04	71.80	0.98	-21.30
50	0.96	-30.10	5.30	154.80	0.05	67.2	0.97	-26.30
60	0.95	-36.10	5.17	149.80	0.06	62.90	0.95	-31.20
70	0.93	-41.60	5.01	145.10	0.06	58.70	0.94	-35.80
80	0.92	-46.40	4.83	141.00	0.07	55.10	0.93	-40.20
90	0.91	-50.90	4.68	137.30	0.08	51.80	0.92	-44.50
100	0.90	-55.20	4.55	133.60	0.08	48.50	0.90	-48.70
125	0.87	-66.60	4.23	124.20	0.09	40.10	0.87	-58.40
150	0.84	-76.70	3.85	115.60	0.10	32.70	0.84	-66.60
175	0.82	-85.00	3.51	108.60	0.10	27.20	0.82	-74.00
200	0.81	-92.70	3.23	102.10	0.11	22.00	0.81	-80.90
250	0.78	-106.30	2.72	89.90	0.10	12.50	0.78	-92.10
300	0.78	-117.30	2.33	80.30	0.10	6.10	0.78	-101.80
350	0.77	-126.90	2.00	71.40	0.09	1.00	0.78	-109.70
400	0.78	-135.60	1.74	63.90	0.08	-1.50	0.79	-116.80
450	0.79	-143.20	1.53	56.80	0.06	-1.80	0.80	-123.00
500	0.79	-150.30	1.36	51.00	0.05	2.10	0.81	-128.80
600	0.81	-163.30	1.09	40.80	0.03	33.70	0.84	-139.00
700	0.82	-175.10	0.89	32.70	0.05	74.30	0.86	-147.90
800	0.83	173.80	0.74	26.80	0.08	87.20	0.87	-155.90
900	0.83	163.20	0.63	23.00	0.11	86.30	0.89	-162.90
1000	0.83	152.90	0.54	21.70	0.28	144.80	0.65	175.60

Note

- For more extensive s-parameters see internet:
<http://www.semiconductors.philips.com/markets/communications/wirelesscommunication/broadcast>.

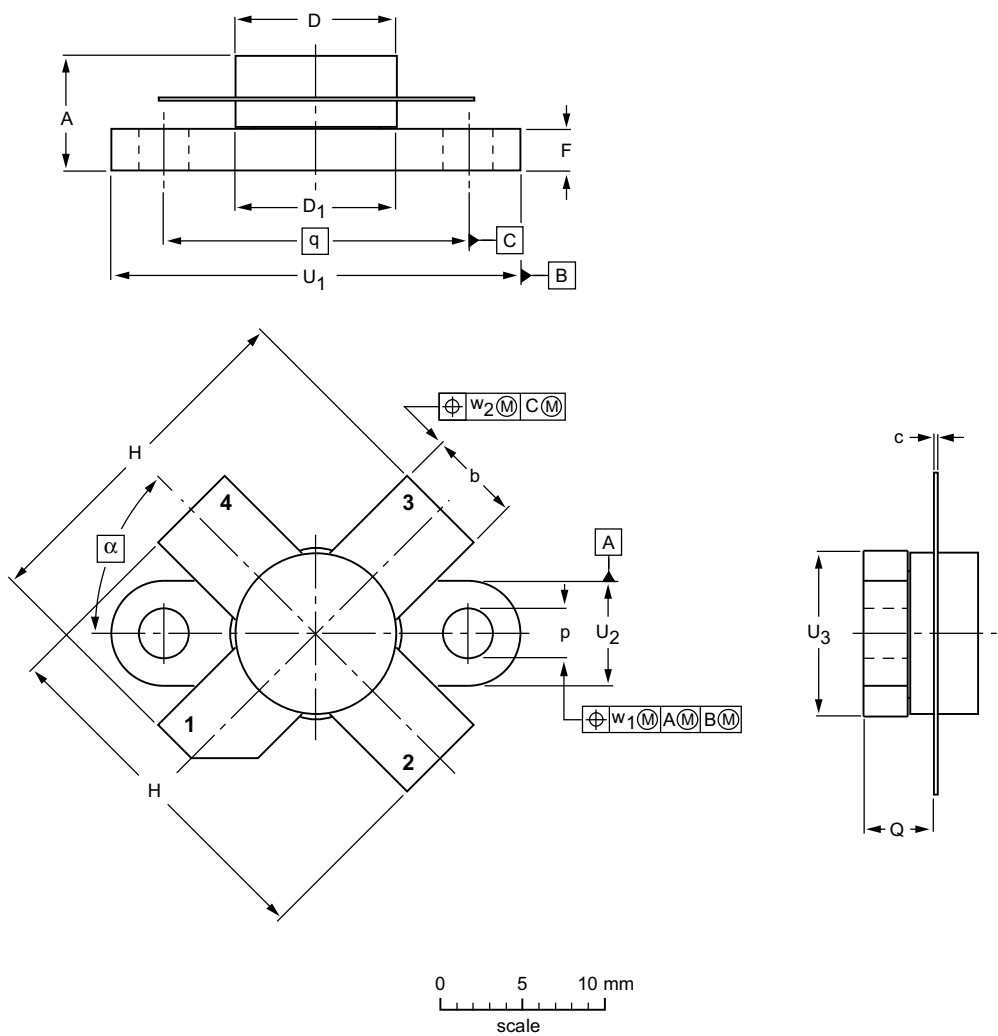
HF-VHF power MOS transistor

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PACKAGE OUTLINE

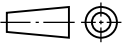
Flanged ceramic package; 2 mounting holes; 4 leads

SOT123A



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

UNIT	A	b	c	D	D ₁	F	H	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	9.78 9.42	2.72 2.31	20.71 19.93	3.33 3.04	4.63 4.11	18.42	24.87 24.64	6.48 6.22	9.78 9.39	0.25	0.51	45°
inches	0.294 0.251	0.229 0.219	0.007 0.004	0.383 0.373	0.385 0.371	0.107 0.091	0.815 0.785	0.131 0.120	0.182 0.162	0.725	0.980 0.970	0.255 0.245	0.385 0.370	0.010	0.020	

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT123A						99-03-29

HF-VHF power MOS transistor

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DATA SHEET STATUS

LEVEL	DATA SHEET STATUS ⁽¹⁾	PRODUCT STATUS ⁽²⁾⁽³⁾	DEFINITION
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III	Product data	Production	This data sheet contains data from the product specification. Philips Semiconductors reserves the right to make changes at any time in order to improve the design, manufacturing and supply. Relevant changes will be communicated via a Customer Product/Process Change Notification (CPCN).

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Short-form specification — The data in a short-form specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.

Limiting values definition — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). 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.

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