BLF242

HF-VHF power MOS transistor

Rev. 4 — 1 September 2015

AMPLEON

Product data sheet

IMPORTANT NOTICE

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As of December 7th, 2015 BL RF Power of NXP Semiconductors will operate as an independent company under the new trade name Ampleon, which will be used in future data sheets together with new contact details.

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Thank you for your cooperation and understanding,

Ampleon

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.

PIN CONFIGURATION

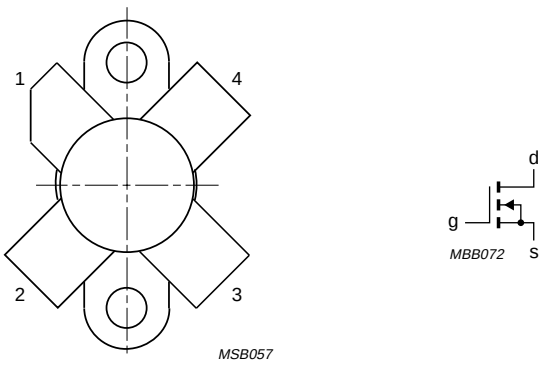


Fig.1 Simplified outline and symbol.

PINNING - SOT123A

PIN	DESCRIPTION
1	drain
2	source
3	gate
4	source

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 °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

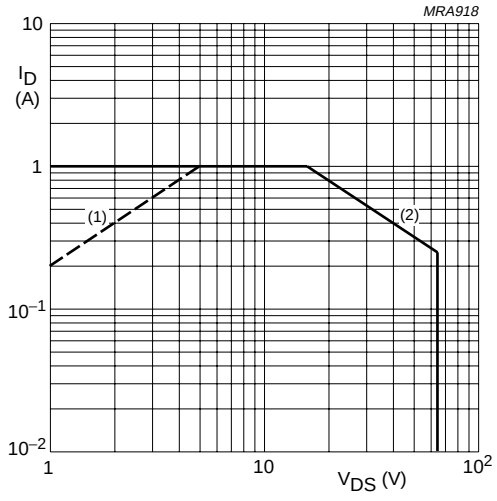
LIMITING VALUES

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	$T_{mb} \leq 25$ °C	–	16	W
T_{stg}	storage temperature		–65	150	°C
T_j	junction temperature		–	200	°C

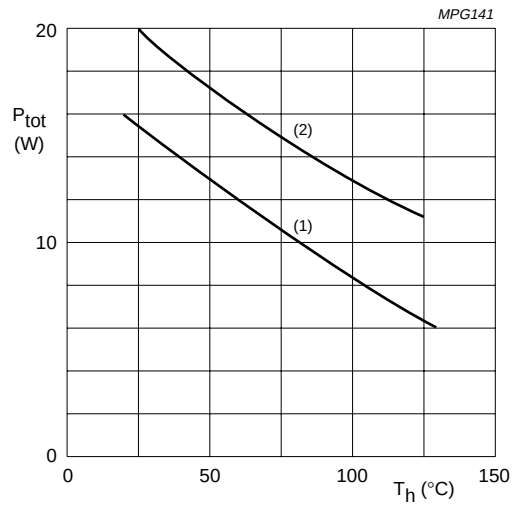
THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j\text{-}mb}$	thermal resistance from junction to mounting base	T_{mb} = 25 °C; P_{tot} = 16 W	11	K/W
$R_{th\ mb\text{-}h}$	thermal resistance from mounting base to heatsink	T_{mb} = 25 °C; P_{tot} = 16 W	0.3	K/W



(1) Current is this area may be limited by R_{DSon}.
(2) T_{mb} = 25 °C.

Fig.2 DC SOAR.



(1) Continuous operation.
(2) Short-time operation during mismatch.

Fig.3 Power derating curves.

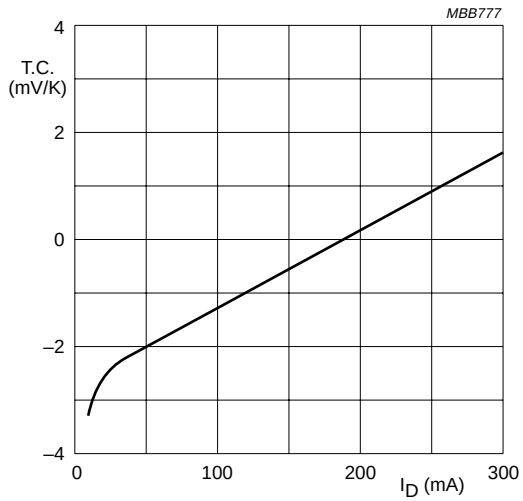
CHARACTERISTICS

T_j = 25 °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 mA	65	–	–	V
I_{DSS}	drain-source leakage current	V_{GS} = 0; V_{DS} = 28 V	–	–	10	μA
I_{GSS}	gate-source leakage current	V_{GS} = ±20 V; V_{DS} = 0	–	–	1	μA
V_{GSth}	gate-source threshold voltage	I_D = 3 mA; V_{DS} = 10 V	2	–	4.5	V
g_{fs}	forward transconductance	I_D = 0.3 A; V_{DS} = 10 V	0.16	0.24	–	S
R_{DSon}	drain-source on-state resistance	I_D = 0.3 A; V_{GS} = 1 V	–	3.3	5	Ω
I_{DSX}	on-state drain current	V_{GS} = 10 V; V_{GS} = 10 V	–	1.2	–	A
C_{is}	input capacitance	V_{GS} = 0; V_{DS} = 28 V; f = 1 MHz	–	13	–	pF
C_{os}	output capacitance	V_{GS} = 0; V_{DS} = 28 V; f = 1 MHz	–	9.4	–	pF
C_{rs}	feedback capacitance	V_{GS} = 0; V_{DS} = 28 V; f = 1 MHz	–	1.7	–	pF

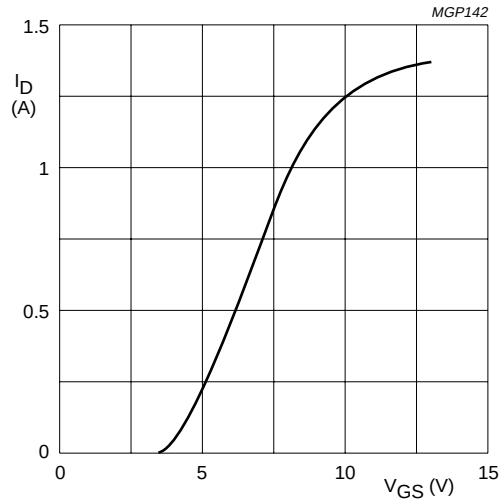
V_{GS} group indicator

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			



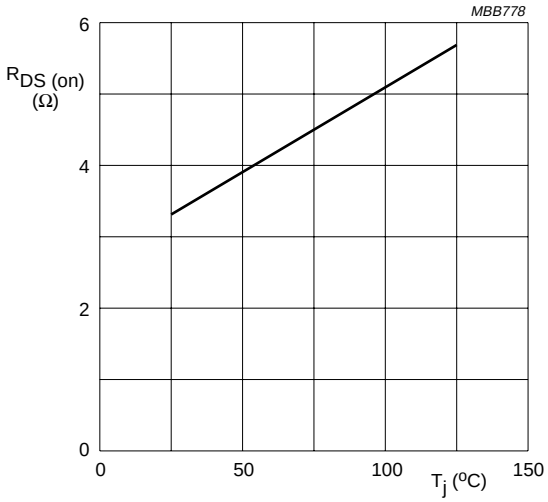
V_{DS} = 10 V.

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



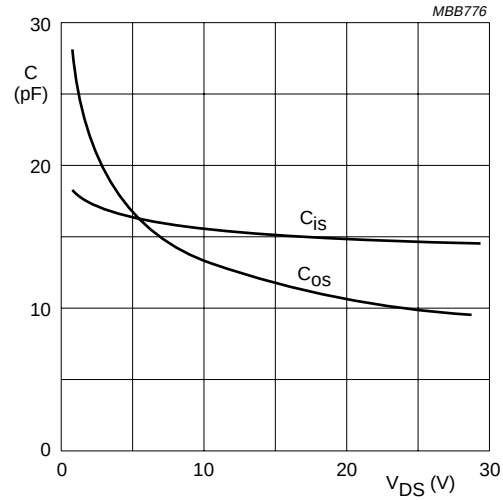
V_{DS} = 10 V; T_j = 25 °C.

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



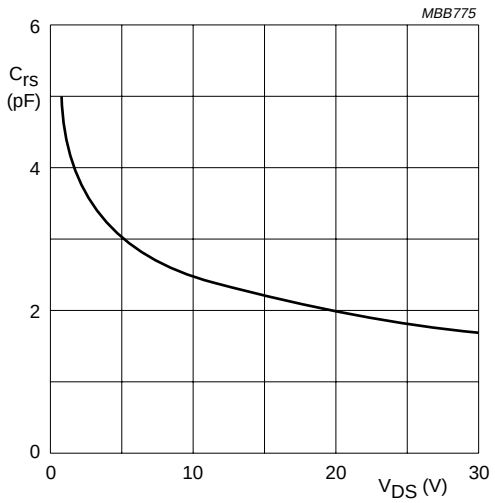
I_D = 0.3 A; V_{GS} = 10 V.

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



V_{GS} = 0; f = 1 MHz.

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



V_{GS} = 0; f = 1 MHz.

Fig.8 Feedback capacitance as a function of drain-source voltage, typical values.

APPLICATION INFORMATION FOR CLASS-B OPERATION

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

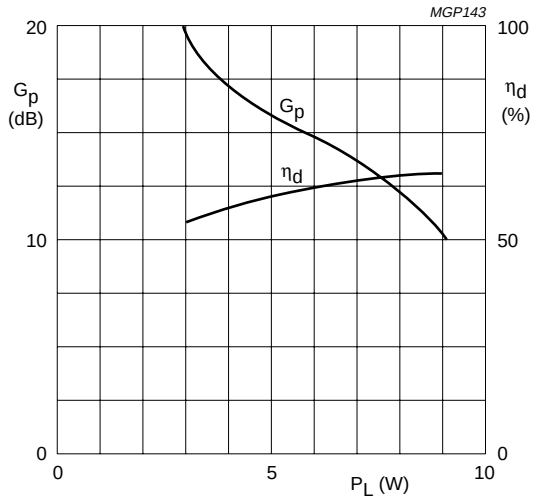
MODE OF OPERATION	f (MHz)	V_{DS} (V)	I_{DQ} (mA)	P_L (W)	G_P (dB)	η_D (%)	R_{GS} (Ω)
CW, class-B	175	28	10	5	>13 typ. 16	>50 typ. 60	47

Ruggedness in class-B operation

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

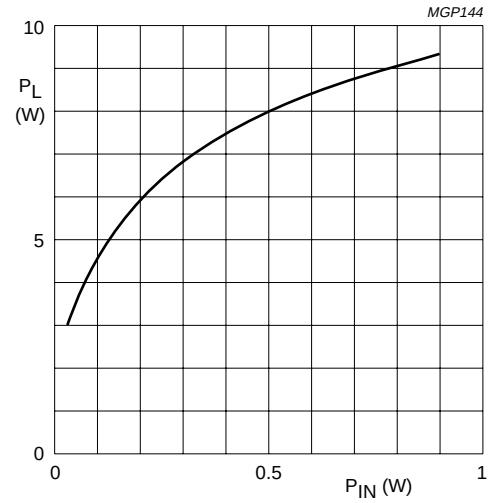
Noise figure (see Fig.11)

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



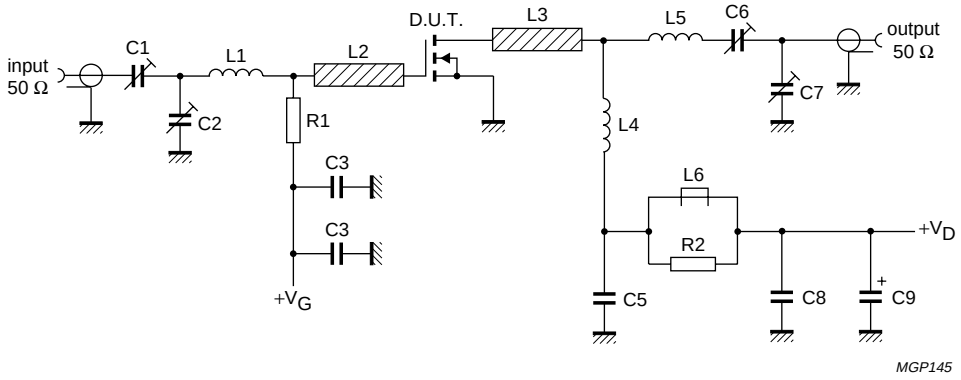
Class-B operation; V_{DS} = 28 V; I_{DQ} = 10 mA; R_{GS} = 47 Ω; f = 175 MHz.

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.

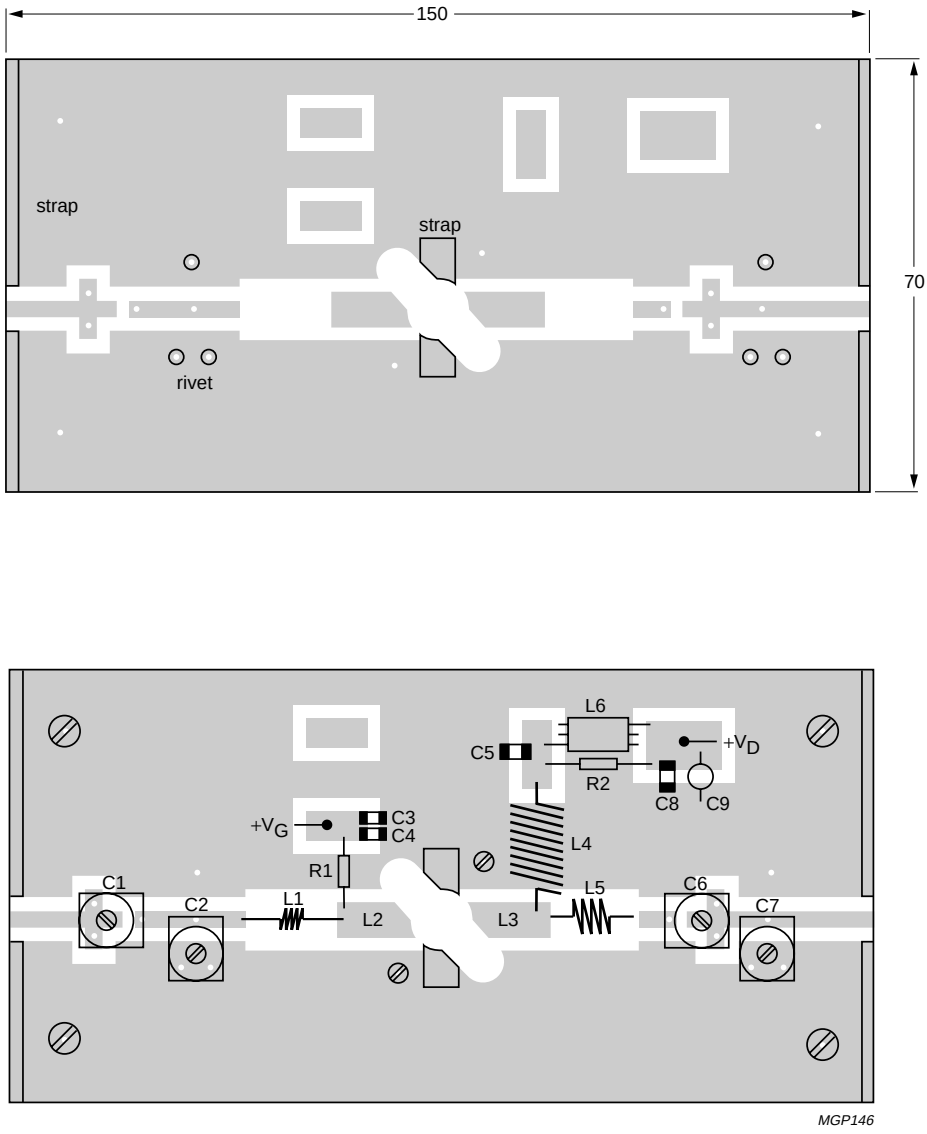
Fig.11 Test circuit for class-B operation.

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 μF, 40 V		
L1	5 turns enamelled 0.7 mm copper wire	53 nH	length 5.4 mm int. dia. 3 mm leads 2 × 5 mm	
L2, L3	stripline; note 2	30 Ω	10 × 6 mm	
L4	11 turns enamelled 1 mm copper wire	500 nH	length 15.5 mm int. dia. 8 mm leads 2 × 5 mm	
L5	5 turns enamelled 1 mm copper wire	79 nH	length 9.1 mm int. dia. 5 mm leads 2 × 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

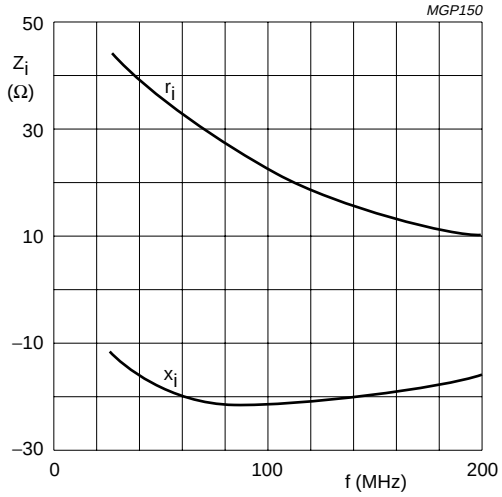
1. American Technical Ceramics (ATC) capacitor, type 100B or other capacitor of the same quality.
2. The striplines are on a double copper-clad printed circuit board, with epoxy fibre-glass dielectric (ε_r = 4.5), thickness $\frac{1}{16}$ inch.



Dimensions in mm.

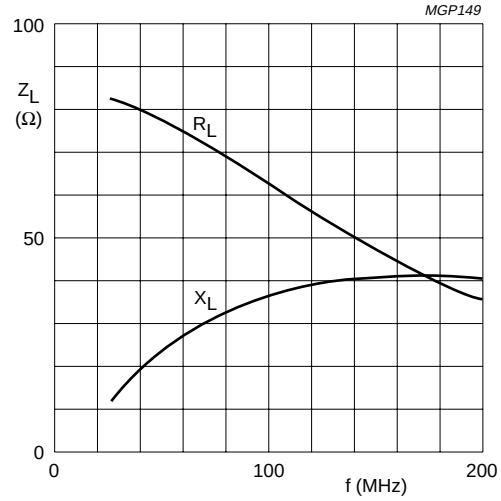
The circuit and components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by fixing screws, copper straps and hollow rivets at the edges of the board and under the source.

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



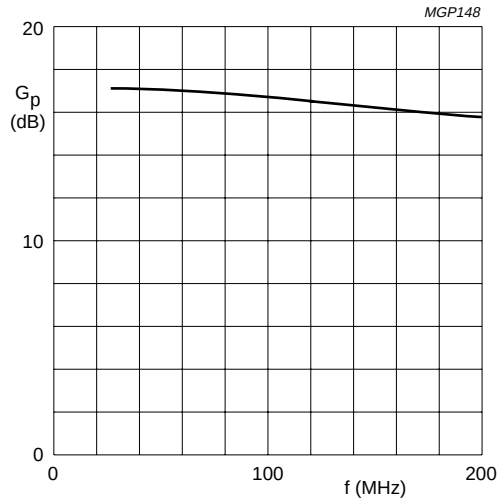
Class-B operation; V_{DS} = 28 V; P_L = 30 W;
R_{GS} = 47 Ω; T_h = 25 °C.

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



Class-B operation; V_{DS} = 28 V; P_L = 30 W;
R_{GS} = 47 Ω; T_h = 25 °C.

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



Class-B operation; V_{DS} = 28 V; P_L = 30 W;
R_{GS} = 47 Ω; T_h = 25 °C.

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

BLF242 scattering parameters

V_{DS} = 28 V; I_D = 10 mA; note 1

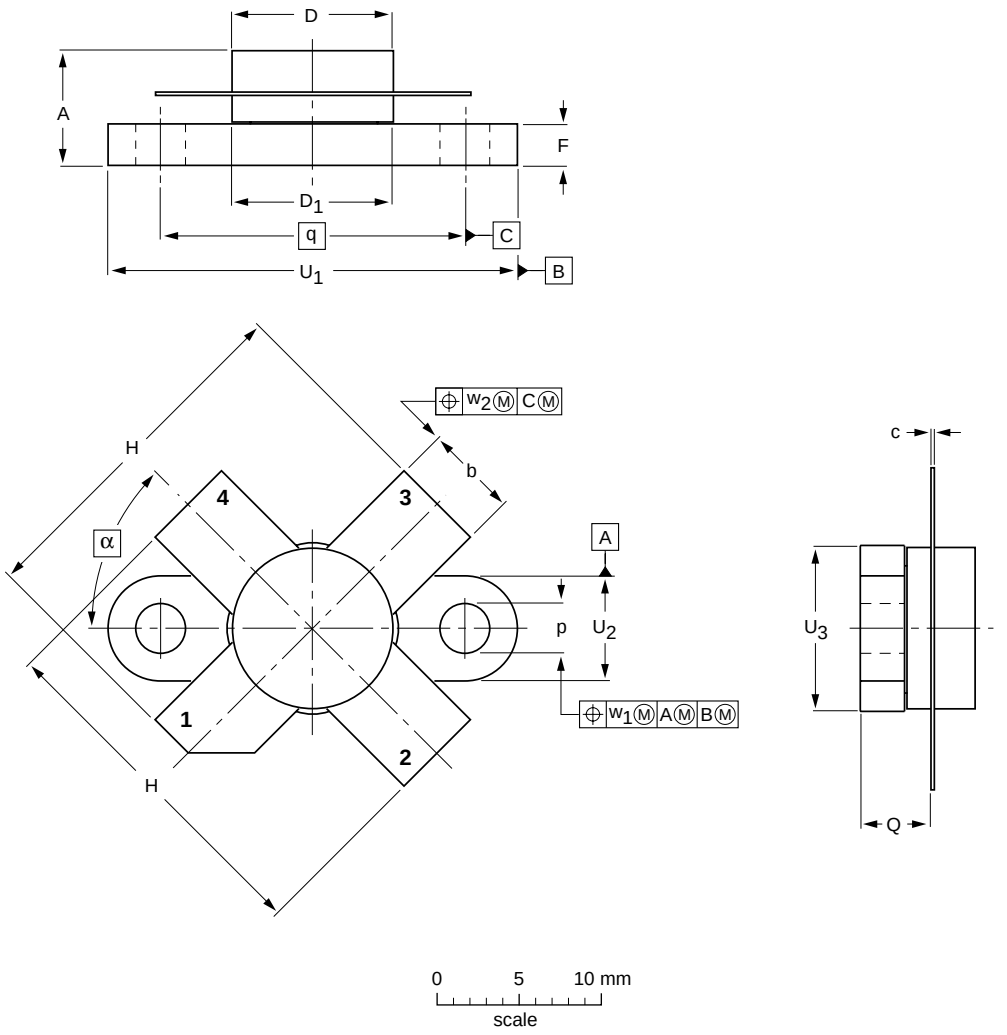
f (MHz)	s_{11}		s_{21}		s_{12}		s_{22}	
	$\|s_{11}\|$	$\angle\Phi$	$\|s_{21}\|$	$\angle\Phi$	$\|s_{12}\|$	$\angle\Phi$	$\|s_{22}\|$	$\angle\Phi$
5	0.99	–3.40	5.57	177.10	0.01	87.60	1.00	–2.60
10	0.98	–5.80	5.52	175.10	0.01	85.50	1.00	–5.30
20	0.99	–12.40	5.53	169.40	0.02	80.70	0.99	–10.70
30	0.98	–17.90	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

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

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

DATA SHEET STATUS

LEVEL	DATA SHEET STATUS(1)	PRODUCT STATUS(2)(3)	DEFINITION
I	Objective data	Development	This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.
II	Preliminary data	Qualification	This data sheet contains data from the preliminary specification. Supplementary data will be published at a later date. Philips Semiconductors reserves the right to change the specification without notice, in order to improve the design and supply the best possible product.
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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2. The product status of the device(s) described in this data sheet may have changed since this data sheet was published. The latest information is available on the Internet at URL http://www.semiconductors.philips.com.
3. For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

DEFINITIONS

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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