BLF202

HF/VHF power MOS transistor

Rev. 3 — 1 September 2015

Product data sheet

IMPORTANT NOTICE

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Thank you for your cooperation and understanding,

Ampleon

HF/VHF power MOS transistor BLF202

FEATURES

- High power gain
- Easy power control
- Gold metallization
- Good thermal stability
- Withstands full load mismatch.

APPLICATIONS

- Communications transmitters in the HF/VHF range with a nominal supply voltage of 12.5 V.

DESCRIPTION

Silicon N-channel enhancement mode vertical D-MOS transistor in an 8-lead SOT409A SMD package with a ceramic cap.

PINNING - SOT409A

PIN	DESCRIPTION
1, 8	source
2, 3	gate
4, 5	source
6, 7	drain

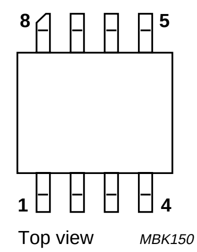


Fig.1 Simplified outline.

QUICK REFERENCE DATA

RF performance at T_{mb} = 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	12.5	2	>10	>50

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.

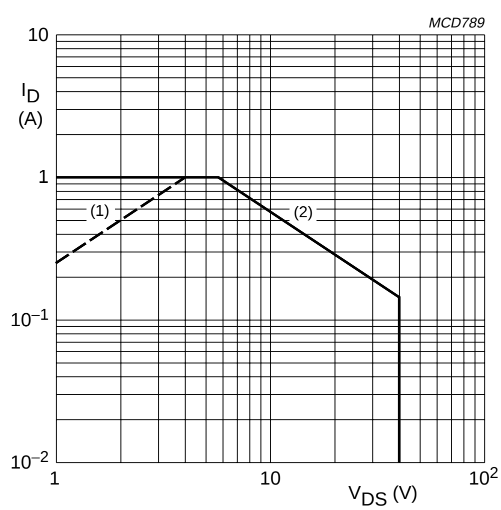
LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{DS}	drain-source voltage		–	40	V
V_{GS}	gate-source voltage		–	±20	V
I_D	drain current (DC)		–	1	A
P_{tot}	total power dissipation	$T_{mb} \leq 85$ °C	–	5.7	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	$T_{mb} \leq 85$ °C; P_{tot} = 5.7 W	20.5	K/W



(1) Current is this area may be limited by R_{DSon}.
(2) T_{mb} = 85 °C.

Fig.2 DC SOAR.

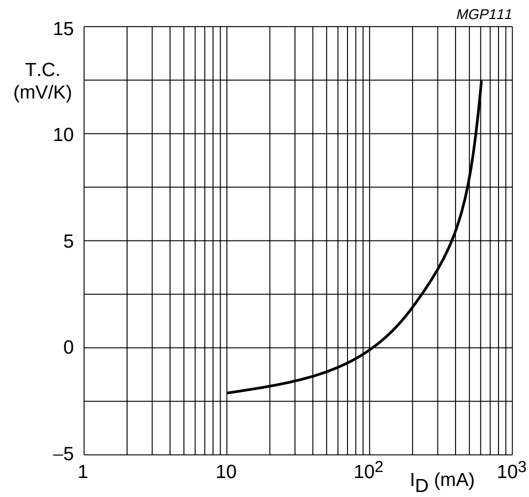
CHARACTERISTICS

T_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	drain-source breakdown voltage	I_D = 3 mA; V_{GS} = 0	40	–	–	V
V_{GSth}	gate-source threshold voltage	I_D = 3 mA; V_{DS} = 10 V	2	–	4.5	V
I_{DSS}	drain-source leakage current	V_{GS} = 0; V_{DS} = 12.5 V	–	–	10	μA
I_{GSS}	gate-source leakage current	V_{GS} = ±20 V; V_{DS} = 0	–	–	1	μA
I_{DSX}	on-state drain current	V_{GS} = 15 V; V_{DS} = 10 V	–	1.3	–	A
R_{DSon}	drain-source on-state resistance	I_D = 0.3 A; V_{GS} = 15 V	–	3.5	4	Ω
g_{fs}	forward transconductance	I_D = 0.3 A; V_{DS} = 10 V	80	135	–	mS
C_{is}	input capacitance	V_{GS} = 0; V_{DS} = 12.5 V; f = 1 MHz	–	5.3	–	pF
C_{os}	output capacitance	V_{GS} = 0; V_{DS} = 12.5 V; f = 1 MHz	–	7.8	–	pF
C_{rs}	feedback capacitance	V_{GS} = 0; V_{DS} = 12.5 V; f = 1 MHz	–	1.8	–	pF

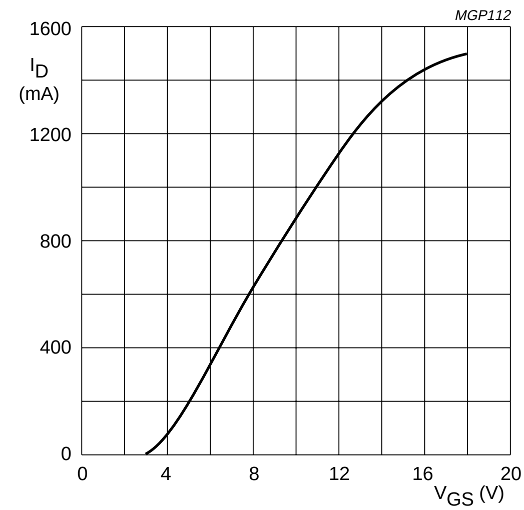
V_{GS} group indicator

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			



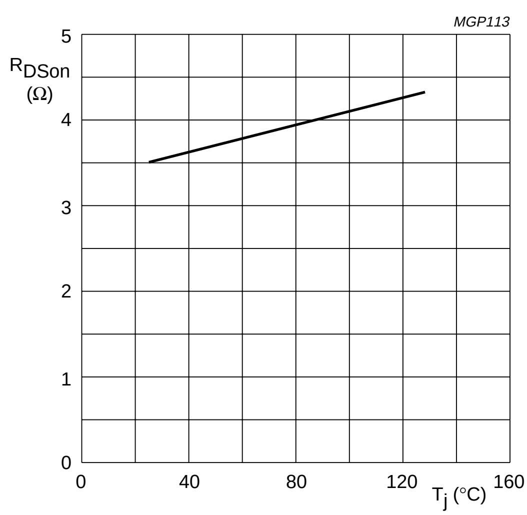
V_{DS} = 10 V.

Fig.3 Temperature coefficient of gate-source voltage as a function of drain current; typical values.



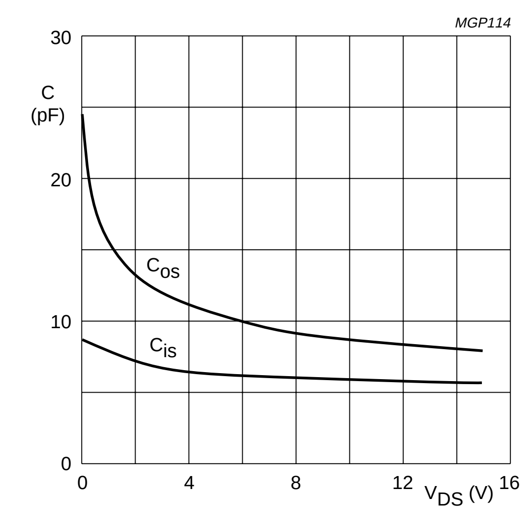
V_{DS} = 10 V; T_j = 25 °C.

Fig.4 Drain current as a function of gate-source voltage; typical values.



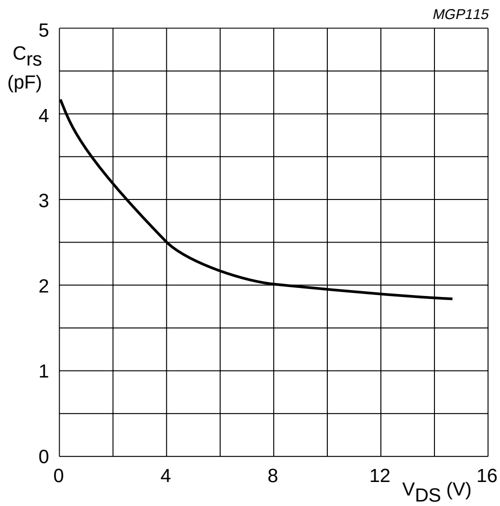
V_{GS} = 15 V; I_D = 0.3 A.

Fig.5 Drain-source on-state resistance as a function of junction temperature; typical values.



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

Fig.6 Input and output capacitance as functions of drain-source voltage; typical values.



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

Fig.7 Feedback capacitance as a function of drain-source voltage; typical values.

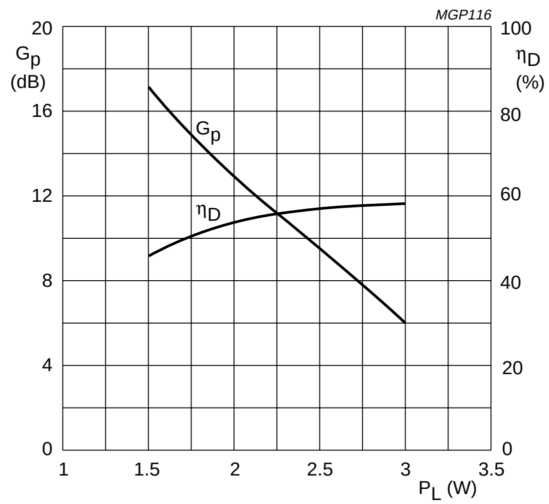
APPLICATION INFORMATION FOR CLASS-B OPERATION

T_{mb} = 25 °C; R_{GS} = 237 Ω; 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 (%)
CW, class-B	175	12.5	20	2	>10 typ. 13	>50 typ. 55

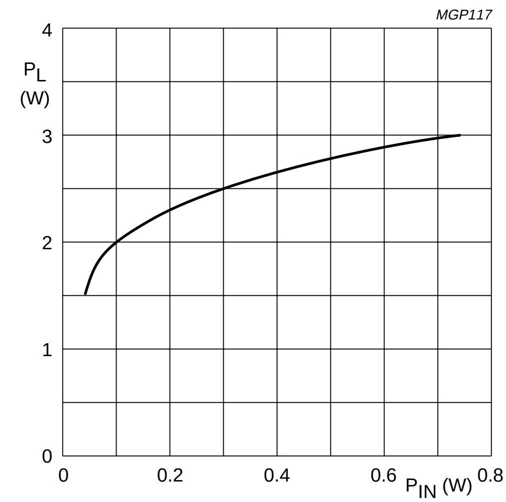
Ruggedness in class-B operation

The BLF202 is capable of withstanding a load mismatch corresponding to VSWR = 50:1 through all phases under the following conditions: V_{DS} = 15.5 V; f = 175 MHz at rated load power.



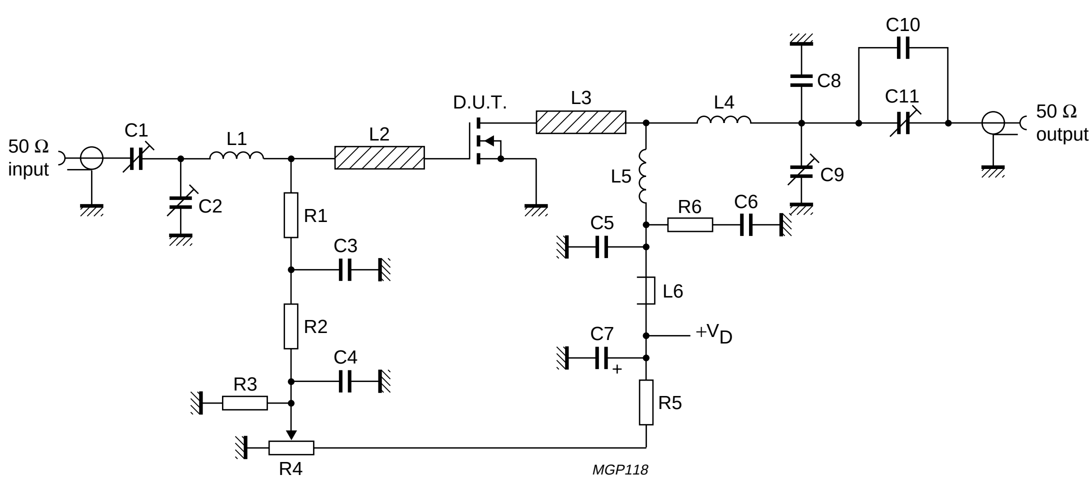
Class-B operation; V_{DS} = 12.5 V; I_{DQ} = 20mA; f = 175 MHz.

Fig.8 Power gain and efficiency as a functions of load power; typical values.



Class-B operation; V_{DS} = 12.5 V; I_{DQ} = 20 mA; f = 175 MHz.

Fig.9 Load power as a function of input power; typical values.



f = 175 MHz.

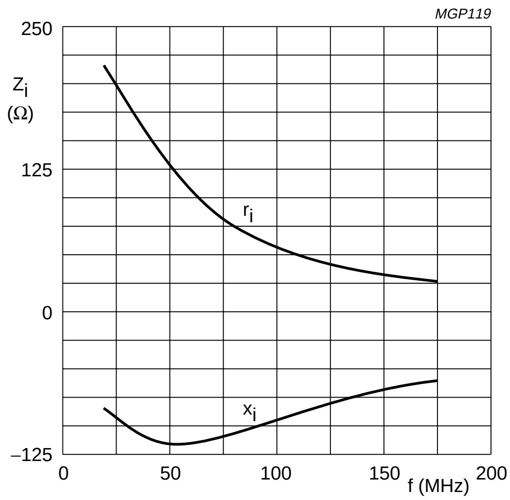
Fig.10 Test circuit for class-B operation.

List of components (see Fig.10)

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
C1, C11	film dielectric trimmer	2 to 9 pF		2222 809 09005
C2, C9	film dielectric trimmer	2 to 9 pF		2222 809 09002
C3, C5	multilayer ceramic chip capacitor; note 1	1 nF; 500 V		
C4, C6	multilayer ceramic chip capacitor	2 × 100 nF in parallel, 50 V		2222 852 47104
C7	Sprague electrolytic tantalum capacitor	2.2 µF; 35 V		
C8	multilayer ceramic chip capacitor; note 1	5.1 pF; 500 V		
C10	multilayer ceramic chip capacitor; note 1	9.1 pF; 500 V		
L1	8 turns enamelled 0.8 mm copper wire	137 nH	length 5.1 mm; int. dia. 4 mm; leads 2 × 5 mm	
L2, L3	stripline; note 2	81 Ω	8 mm × 2 mm	
L4	3 turns enamelled 1 mm copper wire	57 nH	length 5 mm; int. dia. 6 mm; leads 2 × 5 mm	
L5	9 turns enamelled 1 mm copper wire	355 nH	length 11 mm; int. dia. 7 mm; leads 2 × 5 mm	
L6	grade 3B Ferroxcube RF choke			4312 020 36642
R1	0.4 W metal film resistor	237 Ω		2322 151 72371
R2	0.4 W metal film resistor	1 kΩ		2322 151 71002
R3	0.4 W metal film resistor	1 MΩ		2322 151 71005
R4	10 turns cermet potentiometer	5 kΩ		
R5	0.4 W metal film resistor	7.5 kΩ		2322 151 77502
R6	1 W metal film resistor	10 Ω		2322 153 51009

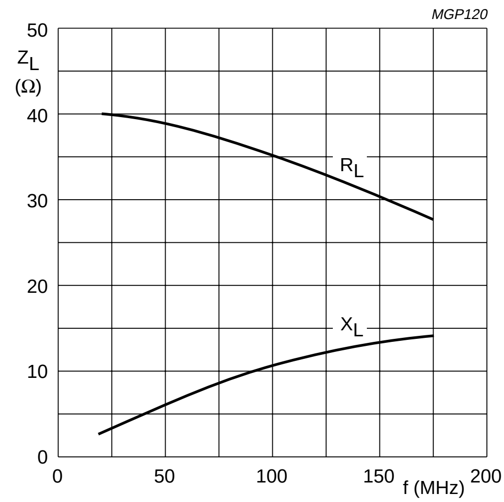
Notes

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 PTFE fibre-glass dielectric (ε_r = 2.2), thickness 1.6 mm.



Class B-operation; V_{DS} = 12.5 V; I_{DQ} = 20 mA;
R_{GS} = 237 Ω; P_L = 2 W.

Fig.11 Input impedance as a function of frequency (series of components); typical values.



Class B-operation; V_{DS} = 12.5 V; I_{DQ} = 20 mA;
R_{GS} = 237 Ω; P_L = 2 W.

Fig.12 Load impedance as a function of frequency (series components); typical values.

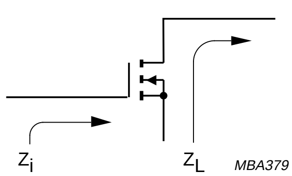
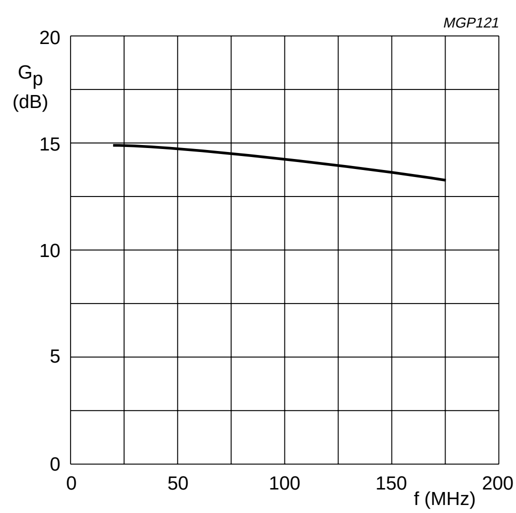


Fig.13 Definition of MOS impedance.



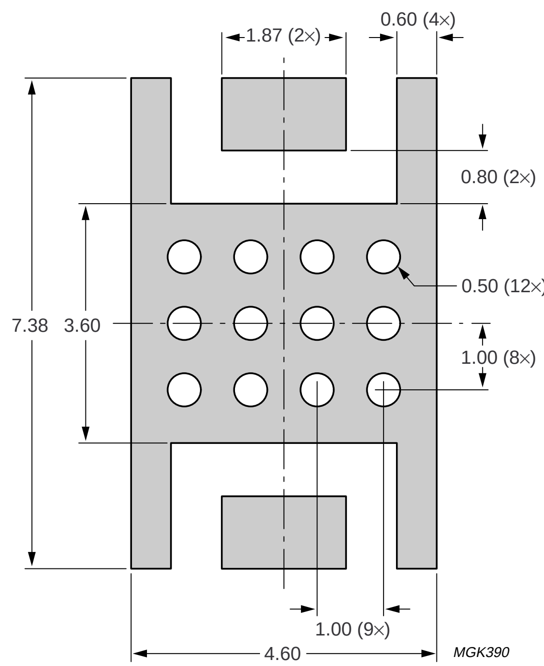
Class B-operation; V_{DS} = 12.5 V; I_{DQ} = 20 mA;
R_{GS} = 237 Ω; P_L = 2 W.

Fig.14 Power gain as a function of frequency; typical values.

MOUNTING RECOMMENDATIONS

Both the metallized ground plate and the device leads contribute to the heat flow. It is recommended that the transistor be mounted on a grounded metallized area of the printed-circuit board. This area should be of maximum 0.8 mm thickness and include at least 12 x 0.5 diameter through metallized holes filled with solder.

A thermal resistance $R_{th(mb-h)}$ of 5 K/W can be achieved if heatsink compound is applied when the transistor is mounted on the printed-circuit board.



Dimensions in mm.

Fig.15 Footprint SOT409A.

BLF202 scattering parameters

V_{DS} = 12.5 V; I_D = 20 mA; note 1

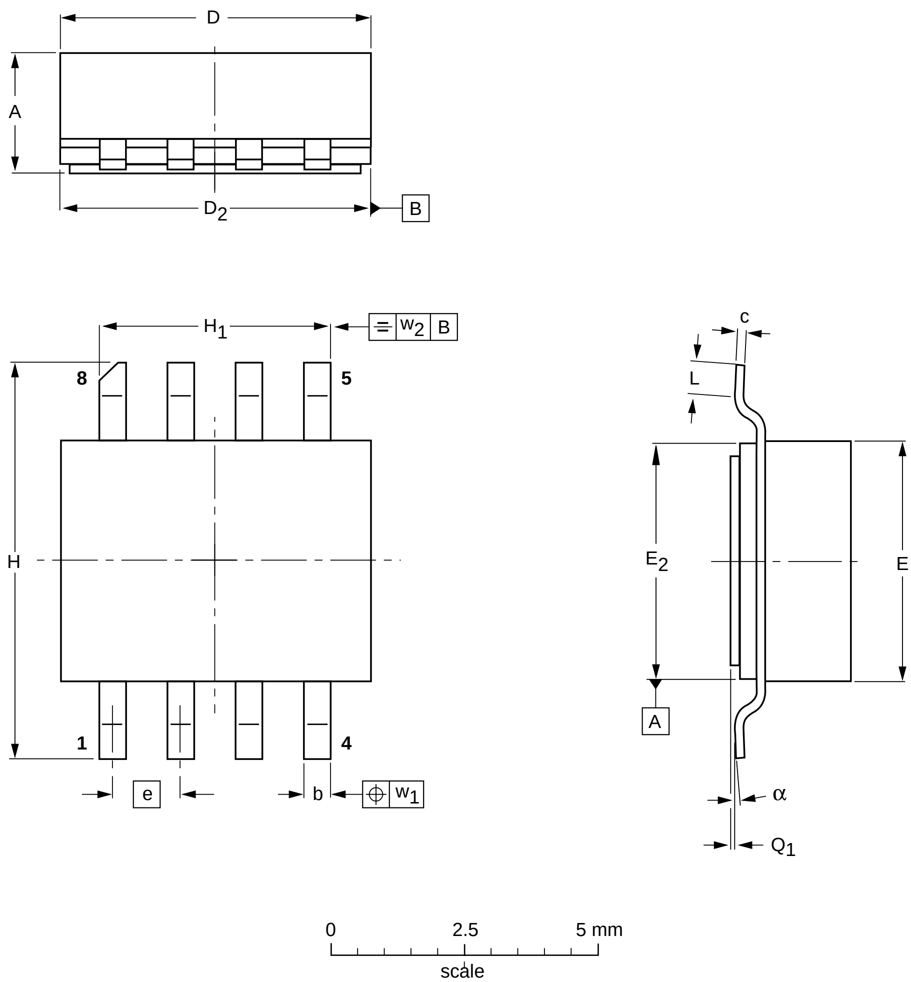
f (MHz)	s_{11}		s_{21}		s_{12}		s_{22}	
	$\|s_{11}\|$	∠ Φ	$\|s_{21}\|$	∠ Φ	$\|s_{12}\|$	∠ Φ	$\|s_{22}\|$	∠ Φ
5	1.00	–2.00	5.76	178.30	0.01	88.30	0.97	–2.40
10	1.00	–4.00	5.75	176.50	0.01	86.70	0.97	–4.90
20	1.00	–7.90	5.72	172.90	0.02	83.40	0.97	–9.70
30	0.99	–11.90	5.69	169.40	0.03	80.20	0.97	–14.50
40	0.99	–15.80	5.65	165.90	0.04	77.00	0.96	–19.30
50	0.98	–19.60	5.58	162.40	0.05	73.80	0.96	–23.90
60	0.97	–23.40	5.51	159.00	0.06	70.70	0.95	–28.50
70	0.96	–27.00	5.42	–155.70	0.07	67.70	0.94	–33.00
80	0.94	–30.70	5.33	152.40	0.08	64.80	0.93	–37.40
90	0.93	–34.10	5.23	149.30	0.09	62.00	0.92	–41.60
100	0.92	–37.50	5.12	146.40	0.10	59.40	0.92	–45.60
125	0.89	–45.60	4.86	139.30	0.12	53.10	0.89	–55.30
150	0.85	–53.00	4.58	132.60	0.13	47.20	0.87	–64.10
175	0.82	–59.80	4.29	126.60	0.14	42.00	0.85	–72.00
200	0.79	–66.00	4.03	121.20	0.15	37.70	0.83	–79.20
250	0.74	–77.00	3.55	111.30	0.17	29.30	0.79	–91.70
300	0.70	–86.30	3.15	103.30	0.17	23.10	0.77	–101.90
350	0.68	–94.30	2.80	96.00	0.18	17.30	0.76	–110.30
400	0.66	–101.40	2.52	89.80	0.18	12.90	0.75	–117.20
450	0.64	–107.80	2.27	83.80	0.18	8.60	0.74	–123.20
500	0.64	–113.50	2.07	78.80	0.18	5.20	0.74	–128.30
600	0.63	–123.80	1.75	69.60	0.17	–0.70	0.74	–136.60
700	0.64	–132.60	1.51	61.40	0.15	–5.30	0.75	–143.20
800	0.65	–140.60	1.32	54.40	0.14	–8.20	0.76	–148.60
900	0.67	–148.10	1.16	48.20	0.12	–9.70	0.77	–153.30
1000	0.68	–155.00	1.04	42.90	0.11	–9.20	0.78	–157.40

Note

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

PACKAGE OUTLINE

Ceramic surface mounted package; 8 leads **SOT409A**



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

UNIT	A	b	c	D	D_2	E	E_2	e	H	H_1	L	Q_1	w_1	w_2	α
mm	2.36 2.06	0.58 0.43	0.23 0.18	5.94 5.03	5.16 5.00	4.93 4.01	4.14 3.99	1.27	7.47 7.26	4.39 4.24	1.02 0.51	0.10 0.00	0.25	0.25	7° 0°
inches	0.093 0.081	0.023 0.017	0.009 0.007	0.234 0.198	0.203 0.197	0.194 0.158	0.163 0.157	0.050	0.294 0.286	0.173 0.167	0.040 0.020	0.004 0.000	0.010	0.010	7° 0°

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT409A						98-01-27

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.
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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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