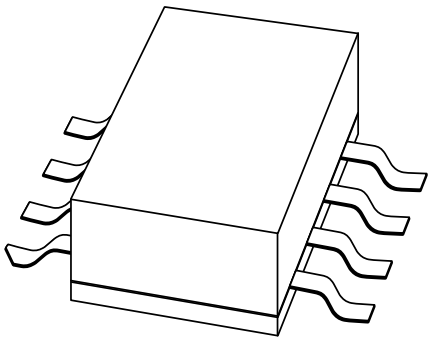
DATA SHEET



BLT94
UHF power transistor

Product specification
Supersedes data of 1997 Nov 04

1998 Jan 28

Philips
Semiconductors

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UHF power transistor BLT94

FEATURES

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

APPLICATIONS

- Common emitter class-AB and B operation in portable radio transmitters in the 900 MHz communication band.

DESCRIPTION

NPN silicon planar epitaxial power transistor encapsulated in a ceramic SOT409A package.

PINNING

PIN	DESCRIPTION
1, 4, 5, 8	emitter
2, 3	base
6, 7	collector

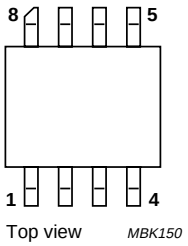


Fig.1 Simplified outline SOT409A.

QUICK REFERENCE DATA

RF performance at $T_{mb} \leq 60$ °C in a common emitter test circuit.

MODE OF OPERATION	f (MHz)	V_{CE} (V)	P_L (W)	G_p (dB)	η_C (%)
CW, class-AB	900	7.5	6	≥8 typ. 10	≥50 typ. 60

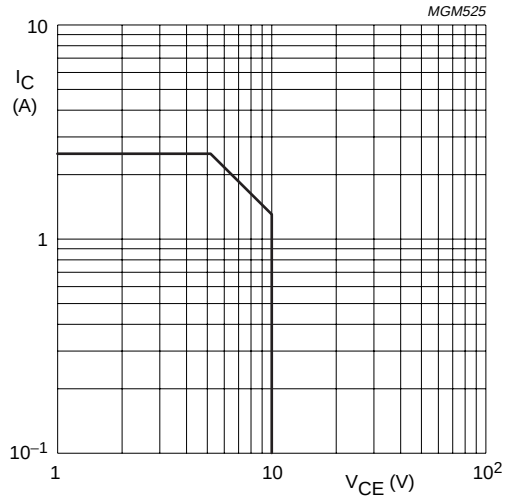
LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	–	20	V
V_{CEO}	collector-emitter voltage	open base	–	10	V
V_{EBO}	emitter-base voltage	open collector	–	3	V
I_C	collector current (DC)		–	2.5	A
P_{tot}	total power dissipation	$T_{mb} \leq 60$ °C	–	13	W
T_{stg}	storage temperature		–65	+150	°C
T_j	operating junction temperature		–	200	°C

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j\text{-}mb}$	thermal resistance from junction to mounting base	$T_{mb} \leq 60$ °C; P_{tot} = 13 W	8	K/W



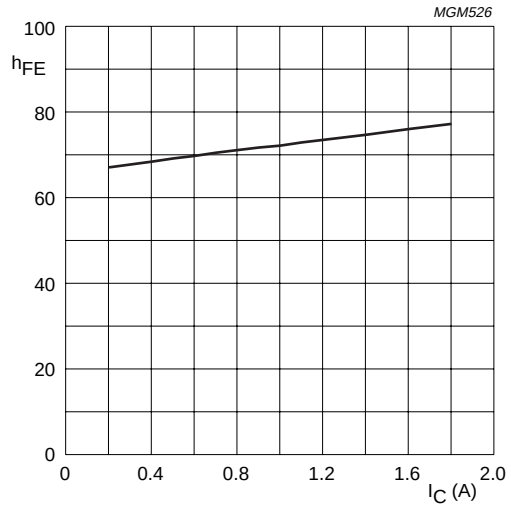
T_{mb} = 60 °C.

Fig.2 DC SOAR.

CHARACTERISTICS

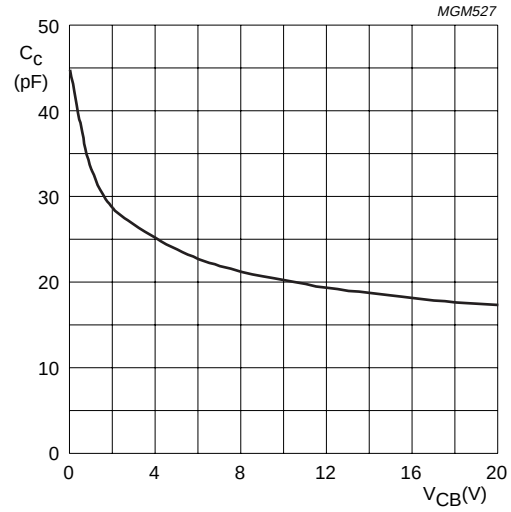
T_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)CBO}$	collector-base breakdown voltage	open emitter; I_C = 20 mA	20	–	–	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	open base; I_C = 40 mA	10	–	–	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	open collector; I_E = 4 mA	3	–	–	V
I_{CES}	collector leakage current	V_{BE} = 0; V_{CE} = 7.5 V	–	–	1	mA
h_{FE}	DC current gain	I_C = 1.2 A; V_{CE} = 5 V	25	–	–	
C_c	collector capacitance	$I_E = i_e$ = 0; V_{CB} = 7.5 V; f = 1 MHz	–	24	–	pF
C_{re}	feedback capacitance	I_C = 0; V_{CE} = 7.5 V; f = 1 MHz	–	17	–	pF



V_{CE} = 5 V; T_j = 25 °C.
Measured under pulse conditions: $t_p \leq 300$ µs; $\delta \leq 0.001$.

Fig.3 DC current gain as a function of collector current; typical values.



$I_E = i_e$ = 0; f = 1 MHz; T_j = 25 °C.

Fig.4 Collector capacitance as a function of collector-base voltage; typical values.

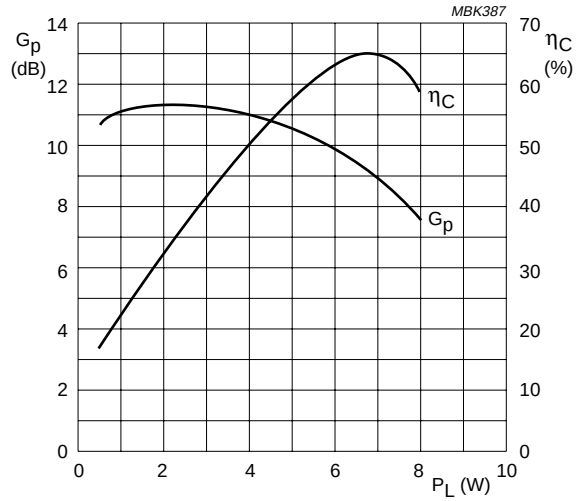
APPLICATION INFORMATION

RF performance at $T_{mb} \leq 60$ °C in a common emitter test circuit (see Fig.7).

MODE OF OPERATION	f (MHz)	V_{CE} (V)	I_{CQ} (mA)	P_L (W)	G_p (dB)	η_C (%)
CW, class-AB	900	7.5	50	6	≥8 typ. 10	≥50 typ. 55

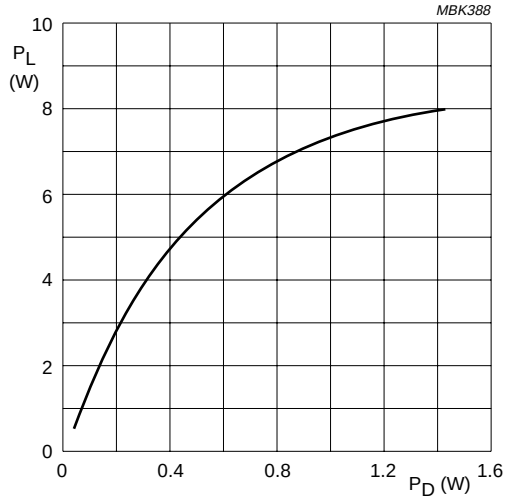
Ruggedness in class-AB operation

The BLT94 is capable of withstanding a load mismatch corresponding to VSWR = 10 : 1 through all phases under the following conditions: CW, class-AB operation; V_{CE} = 9 V; P_L = 6 W and f = 900 MHz; $T_{mb} \leq 60$ °C.



CW, class-AB operation; V_{CE} = 7.5 V; I_{CQ} = 50 mA; f = 900 MHz; $T_{mb} \leq 60$ °C.

Fig.5 Power gain and collector efficiency as functions of load power; typical values.



CW, class-AB operation; V_{CE} = 7.5 V; I_{CQ} = 50 mA; f = 900 MHz; $T_{mb} \leq 60$ °C.

Fig.6 Load power as a function of drive power; typical values.

Test circuit information

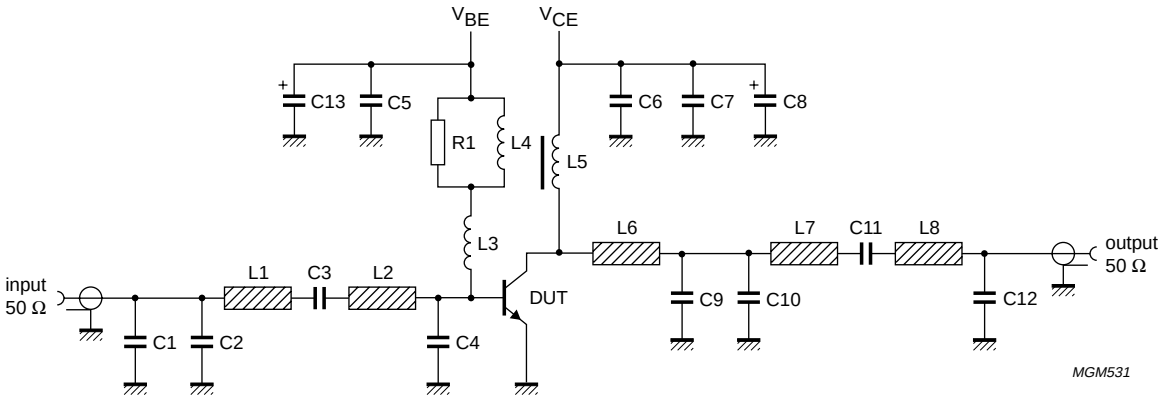


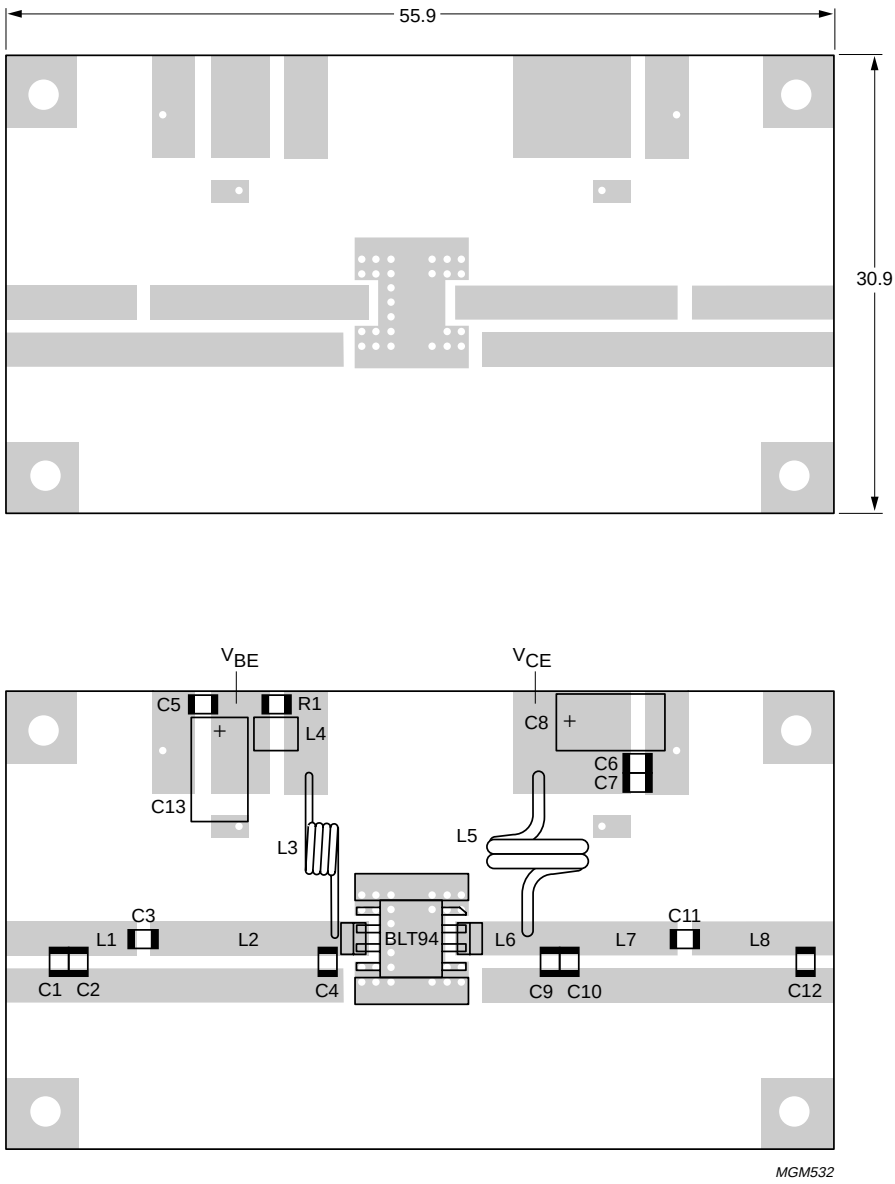
Fig.7 Common emitter test circuit for class-AB operation at f = 900 MHz.

List of components used in test circuit (see Figs 7 and 8).

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE No.
C1, C2	multilayer ceramic chip capacitor; note 1	2.7 pF		
C3	multilayer ceramic chip capacitor; note 1	82 pF		
C4	multilayer ceramic chip capacitor; note 1	15 pF		
C5	multilayer ceramic chip capacitor	1 nF		
C6	multilayer ceramic chip capacitor; note 1	100 pF		
C7	multilayer ceramic chip capacitor	39 nF		
C8	electrolytic capacitor	4.7 μF, 10 V		
C9, C10	multilayer ceramic chip capacitor; note 1	6.8 pF		
C11	multilayer ceramic chip capacitor; note 1	4.3 pF		
C12	multilayer ceramic chip capacitor; note 1	0.7 pF		
C13	electrolytic capacitor	10 μF, 10 V		
L1	stripline; note 2	50 Ω	3.17 x 2.28 mm	
L2	stripline; note 2	50 Ω	11 x 2.28 mm	
L3	5 turns 0.5 mm enamelled copper wire		int. dia. = 3 mm leads = 2 x 7.5 mm	
L4	chipbead	1μH		
L5	2 turns 1 mm enamelled copper wire		int. dia. = 6 mm; leads = 2 x 7.5 mm	
L6	stripline; note 2	50 Ω	3.82 x 2.28 mm	
L7	stripline; note 2	50 Ω	6.18 x 2.28 mm	
L8	stripline; note 2	50 Ω	5.62 x 2.28 mm	
R1	SMD resistor	27 Ω		

Notes

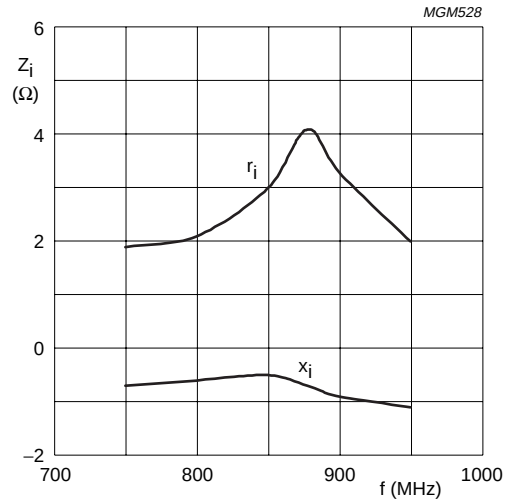
1. American Technical Ceramics type 100A or capacitor of same quality.
2. The striplines are on a double copper-clad printed circuit board, with DUROID dielectric (ε_r = 2.2); thickness 0.79 mm, thickness of the copper sheet 2 x 35 μm.



Dimensions in mm.

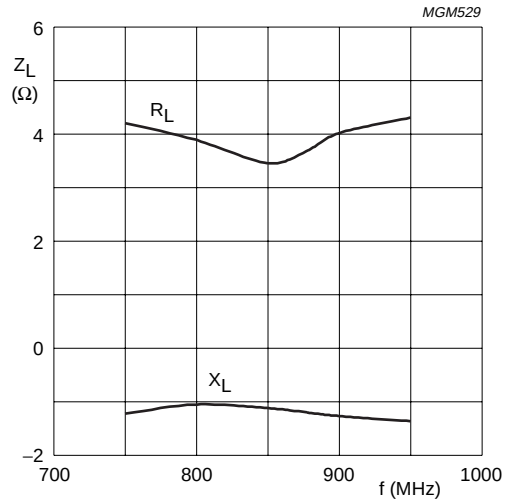
The components are situated on one side of the copper-clad printed-circuit board, the other side is unetched and serves as a ground plane. Earth connections from the component side to the ground plane are made by through metallization.

Fig.8 Printed-circuit board and component layout for 900 MHz class-AB test circuit in Fig.7.



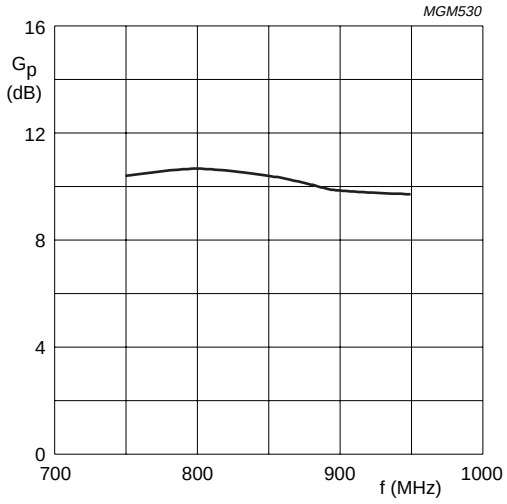
CW, class-AB operation; V_{CE} = 7.58 V; I_{CQ} = 50 mA;
P_L = 6 W; $T_{mb} \leq 60$ °C.

Fig.9 Input impedance as a function of frequency (series components); typical values.



CW, class-AB operation; V_{CE} = 7.5 V; I_{CQ} = 50 mA;
P_L = 6 W; $T_{mb} \leq 60$ °C.

Fig.10 Load impedance as a function of frequency (series components); typical values.



CW, class-AB operation; V_{CE} = 7.5 V; I_{CQ} = 50 mA;
P_L = 6 W; $T_{mb} \leq 60$ °C.

Fig.11 Power gain as a function of frequency (series components); typical values.

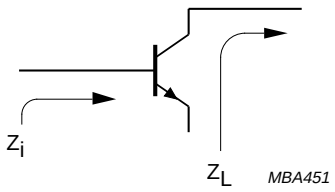
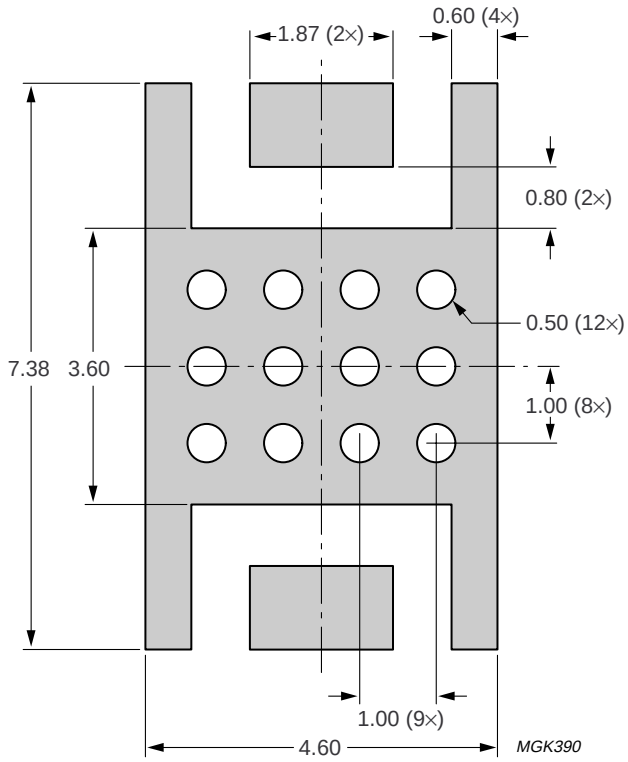


Fig.12 Definition of transistor impedance.

MOUNTING RECOMMENDATIONS

Both the metallized groundplate and leads contribute to the heatflow. It is recommended that the transistor is mounted on a grounded metallized area of a maximum thickness of 0.8 mm on the printed-circuit board, equipped with at least 12 (0.5 mm 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.

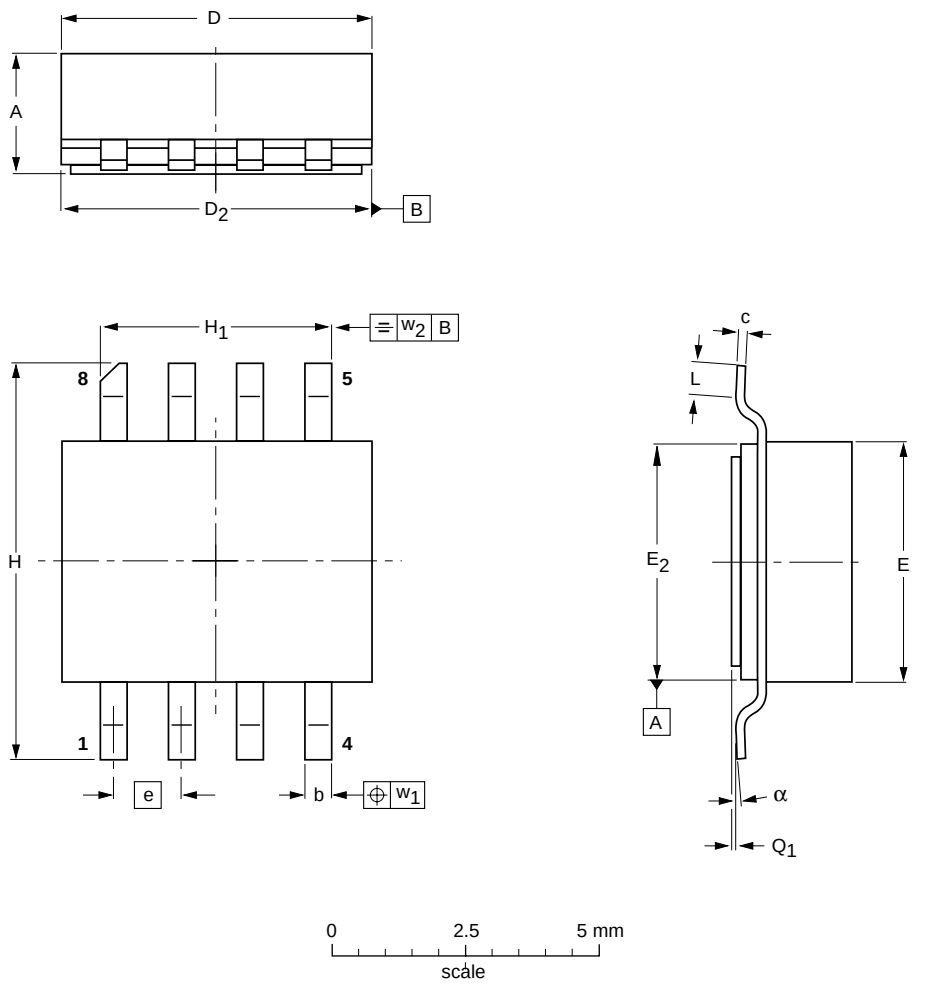


Dimensions in mm.

Fig.13 Reflow soldering footprint for SOT409A.

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

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.	

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Argentina: see South America

Australia: 34 Waterloo Road, NORTH RYDE, NSW 2113,
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Austria: Computerstr. 6, A-1101 WIEN, P.O. Box 213, Tel. +43 160 1010,
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Belarus: Hotel Minsk Business Center, Bld. 3, r. 1211, Volodarski Str. 6,
220050 MINSK, Tel. +375 172 200 733, Fax. +375 172 200 773

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51 James Bourchier Blvd., 1407 SOFIA,
Tel. +359 2 689 211, Fax. +359 2 689 102

Canada: PHILIPS SEMICONDUCTORS/COMPONENTS,
Tel. +1 800 234 7381

China/Hong Kong: 501 Hong Kong Industrial Technology Centre,
72 Tat Chee Avenue, Kowloon Tong, HONG KONG,
Tel. +852 2319 7888, Fax. +852 2319 7700

Colombia: see South America

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Denmark: Prags Boulevard 80, PB 1919, DK-2300 COPENHAGEN S,
Tel. +45 32 88 2636, Fax. +45 31 57 0044

Finland: Sinikalliontie 3, FIN-02630 ESPOO,
Tel. +358 9 615800, Fax. +358 9 61580920

France: 51 Rue Carnot, BP317, 92156 SURESNES Cedex,
Tel. +33 1 40 99 6161, Fax. +33 1 40 99 6427

Germany: Hammerbrookstraße 69, D-20097 HAMBURG,
Tel. +49 40 23 53 60, Fax. +49 40 23 536 300

Greece: No. 15, 25th March Street, GR 17778 TAVROS/ATHENS,
Tel. +30 1 4894 339/239, Fax. +30 1 4814 240

Hungary: see Austria

India: Philips INDIA Ltd, Band Box Building, 2nd floor,
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Ireland: Newstead, Clonskeagh, DUBLIN 14,
Tel. +353 1 7640 000, Fax. +353 1 7640 200

Israel: RAPAC Electronics, 7 Kehilat Saloniki St, PO Box 18053,
TEL AVIV 61180, Tel. +972 3 645 0444, Fax. +972 3 649 1007

Italy: PHILIPS SEMICONDUCTORS, Piazza IV Novembre 3,
20124 MILANO, Tel. +39 2 6752 2531, Fax. +39 2 6752 2557

Japan: Philips Bldg 13-37, Kohnan 2-chome, Minato-ku, TOKYO 108,
Tel. +81 3 3740 5130, Fax. +81 3 3740 5077

Korea: Philips House, 260-199 Itaewon-dong, Yongsan-ku, SEOUL,
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Malaysia: No. 76 Jalan Universiti, 46200 PETALING JAYA, SELANGOR,
Tel. +60 3 750 5214, Fax. +60 3 757 4880

Mexico: 5900 Gateway East, Suite 200, EL PASO, TEXAS 79905,
Tel. +9-5 800 234 7381

Middle East: see Italy

Netherlands: Postbus 90050, 5600 PB EINDHOVEN, Bldg. VB,
Tel. +31 40 27 82785, Fax. +31 40 27 88399

New Zealand: 2 Wagener Place, C.P.O. Box 1041, AUCKLAND,
Tel. +64 9 849 4160, Fax. +64 9 849 7811

Norway: Box 1, Manglerud 0612, OSLO,
Tel. +47 22 74 8000, Fax. +47 22 74 8341

Philippines: Philips Semiconductors Philippines Inc.,
106 Valero St. Salcedo Village, P.O. Box 2108 MCC, MAKATI,
Metro MANILA, Tel. +63 2 816 6380, Fax. +63 2 817 3474

Poland: Ul. Lukiska 10, PL 04-123 WARSZAWA,
Tel. +48 22 612 2831, Fax. +48 22 612 2327

Portugal: see Spain

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Russia: Philips Russia, Ul. Usatcheva 35A, 119048 MOSCOW,
Tel. +7 095 755 6918, Fax. +7 095 755 6919

Singapore: Lorong 1, Toa Payoh, SINGAPORE 1231,
Tel. +65 350 2538, Fax. +65 251 6500

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South Africa: S.A. PHILIPS Pty Ltd., 195-215 Main Road Martindale,
2092 JOHANNESBURG, P.O. Box 7430 Johannesburg 2000,
Tel. +27 11 470 5911, Fax. +27 11 470 5494

South America: Al. Vicente Pinzon, 173, 6th floor,
04547-130 SÃO PAULO, SP, Brazil,
Tel. +55 11 821 2333, Fax. +55 11 821 2382

Spain: Balmes 22, 08007 BARCELONA,
Tel. +34 3 301 6312, Fax. +34 3 301 4107

Sweden: Kottbygatan 7, Akalla, S-16485 STOCKHOLM,
Tel. +46 8 632 2000, Fax. +46 8 632 2745

Switzerland: Allmendstrasse 140, CH-8027 ZÜRICH,
Tel. +41 1 488 2686, Fax. +41 1 488 3263

Taiwan: Philips Semiconductors, 6F, No. 96, Chien Kuo N. Rd., Sec. 1,
TAIPEI, Taiwan Tel. +886 2 2134 2865, Fax. +886 2 2134 2874

Thailand: PHILIPS ELECTRONICS (THAILAND) Ltd.,
209/2 Sanpavuth-Bangna Road Prakanong, BANGKOK 10260,
Tel. +66 2 745 4090, Fax. +66 2 398 0793

Turkey: Talatpasa Cad. No. 5, 80640 GÜLTEPE/ISTANBUL,
Tel. +90 212 279 2770, Fax. +90 212 282 6707

Ukraine: PHILIPS UKRAINE, 4 Patrice Lumumba str., Building B, Floor 7,
252042 KIEV, Tel. +380 44 264 2776, Fax. +380 44 268 0461

United Kingdom: Philips Semiconductors Ltd., 276 Bath Road, Hayes,
MIDDLESEX UB3 5BX, Tel. +44 181 730 5000, Fax. +44 181 754 8421

United States: 811 East Arques Avenue, SUNNYVALE, CA 94088-3409,
Tel. +1 800 234 7381

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Tel. +381 11 625 344, Fax.+381 11 635 777

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International Marketing & Sales Communications, Building BE-p, P.O. Box 218,
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Printed in The Netherlands 125108/00/03/pp16 Date of release: 1998 Jan 28 Document order number: 9397 750 03235

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