

# DATA SHEET

## **CGY2032TS** **DECT 500 mW power amplifier**

Product specification  
Supersedes data of 1998 Nov 23  
File under Integrated Circuits, IC17

1999 Jul 21

# DECT 500 mW power amplifier

# CGY2032TS

### FEATURES

- Power Amplifier (PA) overall efficiency 55%
- 27.5 dBm saturated output power at 3.2 V
- 0 dBm input power
- 40 dB linear gain
- Operation without negative supply
- Wide operating temperature range -30 to +85 °C
- SSOP16 package.

### APPLICATIONS

- 1.88 to 1.9 GHz transceivers for DECT applications
- 2 GHz transceivers [Personal Handy phone System (PHS), Digital Cellular System (DCS) and Personal Communication Services (PCS)].

### GENERAL DESCRIPTION

The CGY2032TS is a GaAs Monolithic Microwave Integrated Circuit (MMIC) power amplifier specifically designed to operate from 3.6 V battery supply. No negative supply voltage is required for operation.

### QUICK REFERENCE DATA

SYMBOL	PARAMETER <sup>(1)</sup>	MIN.	TYP.	MAX.	UNIT
V <sub>DD</sub>	positive supply voltage	-	3.2	-	V
I <sub>DD</sub>	positive peak supply current	-	350	-	mA
P <sub>o</sub>	output power	-	27.5	-	dBm
T <sub>amb</sub>	ambient temperature	-30	-	+85	°C

### Note

1. For conditions, see Chapters "AC characteristics" and "DC characteristics".

### ORDERING INFORMATION

TYPE NUMBER	PACKAGE		
	NAME	DESCRIPTION	VERSION
CGY2032TS	SSOP16	plastic shrink small outline package; 16 leads; body width 4.4 mm	SOT369-1

### BLOCK DIAGRAM

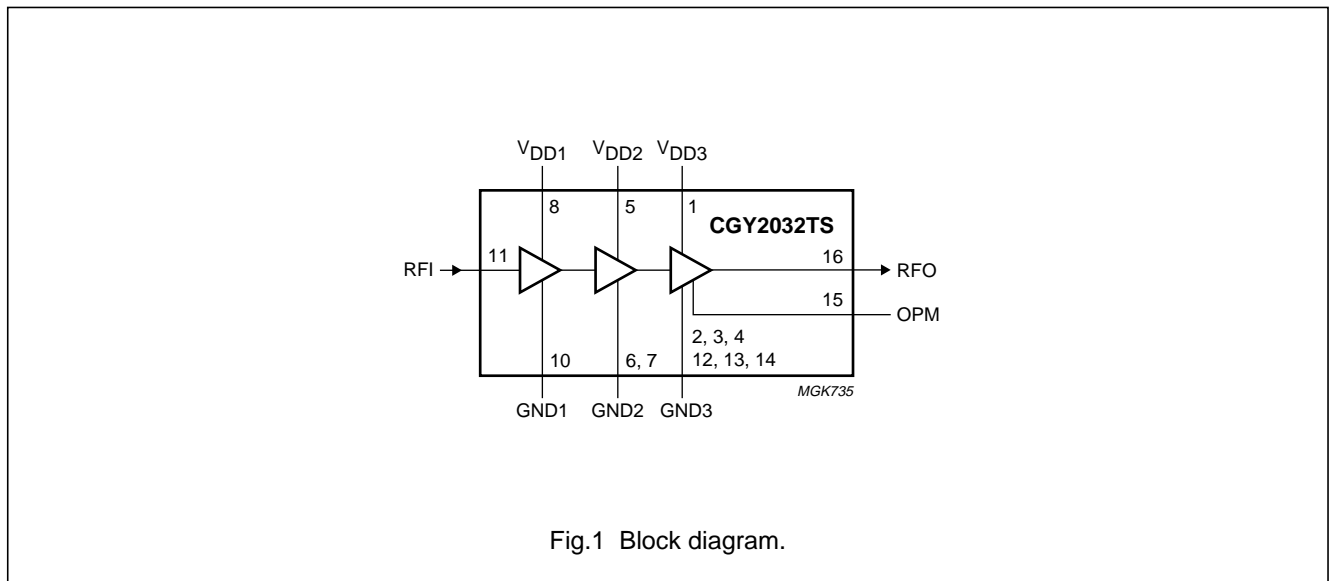


Fig.1 Block diagram.

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**PINNING**

SYMBOL	PIN	DESCRIPTION
V <sub>DD3</sub>	1	third stage supply voltage
GND3	2	third stage ground supply
GND3	3	third stage ground supply
GND3	4	third stage ground supply
V <sub>DD2</sub>	5	second stage supply voltage
GND2	6	second stage ground supply
GND2	7	second stage ground supply
V <sub>DD1</sub>	8	first stage supply voltage
n.c.	9	not connected
GND1	10	first stage ground supply
RFI	11	PA input
GND3	12	third stage ground supply
GND3	13	third stage ground supply
GND3	14	third stage ground supply
OPM	15	output pre-matching
RFO	16	PA output

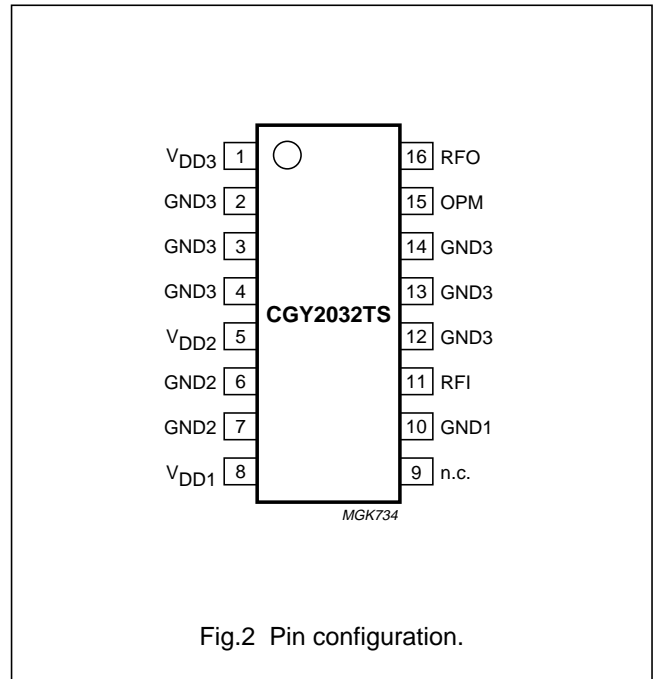


Fig.2 Pin configuration.

**FUNCTIONAL DESCRIPTION**

**Amplifier**

The CGY2032TS is a 3-stage GaAs power amplifier capable of delivering 500 mW (typ.) at 1.9 GHz into a 50 Ω load. Each amplifier stage has an open-drain configuration. The drains have to be loaded externally by adequate reactive circuits which must also provide a DC path to the supply.

The amplifier can be switched off by means of a single external PNP or PMOS series switch connected between the battery and the amplifier drains.

This switch can also be used to vary the actual supply voltage applied to the amplifier and hence, control the output power.

This device is specifically designed to work with a duty factor of 50% and can work up to 100% with good thermal performance printed-circuit boards.

**Biasing**

Internal biasing is provided inside the amplifier for class AB operation.

**LIMITING VALUES**

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V <sub>DD</sub>	operating supply voltage	note 1	–	5.2	V
T <sub>j(max)</sub>	maximum operating junction temperature		–	150	°C
P <sub>tot</sub>	total power dissipation	note 2	–	450	mW
P <sub>i</sub>	input power		–	15	dBm
T <sub>stg</sub>	storage temperature		–55	+125	°C

**Notes**

1. On Philips evaluation board.
2. On Philips evaluation board, P<sub>tot</sub> maximum value is 800 mW.

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**HANDLING**

Do not operate or store near strong electrostatic fields. Meets class 1 ESD test requirements [Human Body Model (HBM)], in accordance with "MIL STD 883C - method 3015".

**THERMAL CHARACTERISTICS**

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air; note 1	145	K/W

**Note**

1. On Philips evaluation board,  $R_{th(j-a)}$  value is typically 80 K/W.

**DC CHARACTERISTICS**

$T_{amb} = 25\text{ }^{\circ}\text{C}$ ; unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
<b>Pins <math>V_{DD1}</math>, <math>V_{DD2}</math> and <math>V_{DD3}</math></b>						
$V_{DD}$	positive supply voltage		1.8	3.2	4.2	V
$I_{DD}$	positive peak supply current	$V_{DD} = 3.2\text{ V}$	–	–	800	mA

**AC CHARACTERISTICS**

$V_{DD} = 3.2\text{ V}$ ;  $f_{RF} = 1900\text{ MHz}$ ;  $P_i = 0\text{ dBm}$ ;  $T_{amb} = 25\text{ }^{\circ}\text{C}$ ; duty factor  $\delta = 50\%$ ;  $50\text{ }\Omega$  impedance system; measured and guaranteed on the CGY2032TS evaluation board; the circuit diagram is shown in Fig.5.

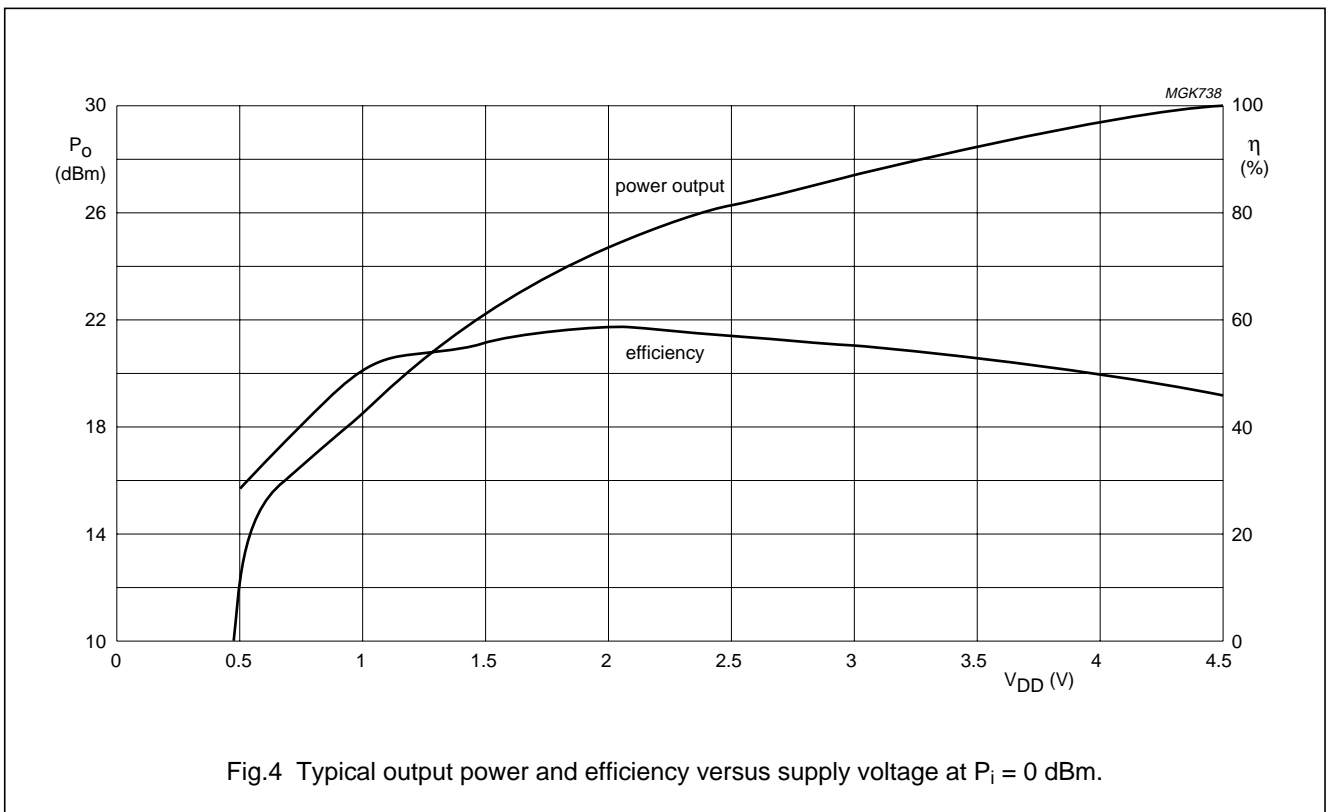
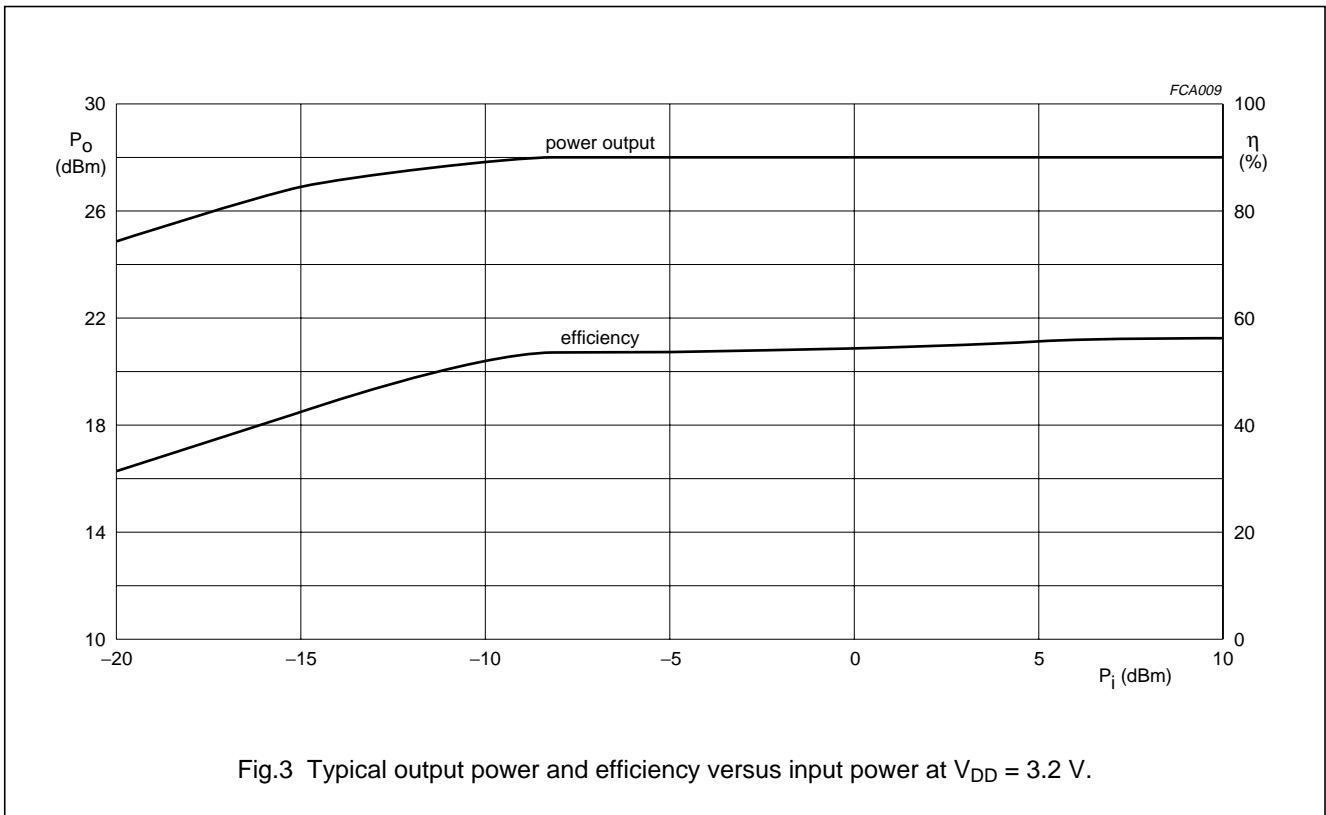
SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$P_i$	input power		–5	0	+5	dBm
$\delta$	duty factor		–	50	100	%
$P_o$	output power		26.5	27.5	29	dBm
$I_{DD}$	total drain current		–	–	500	mA
$\eta$	efficiency		–	55	–	%
$P_{leak}$	RF leakage to output in power off state	$V_{DD} = 0\text{ V}$	–	–40	–35	dBm
H2	second harmonic level		–	–	–30	dBc
H3	third harmonic level		–	–	–35	dBc
Stab	stability (spurious levels)	note 1	–	–60	–	dBc

**Note**

1. The device is adjusted to provide nominal value of load power into a  $50\text{ }\Omega$  load. The device is switched off and a 6 : 1 load replaces the  $50\text{ }\Omega$  load. The device is switched on and the phase of the 6 : 1 load is varied 360 electrical degrees during a 60 seconds test period.

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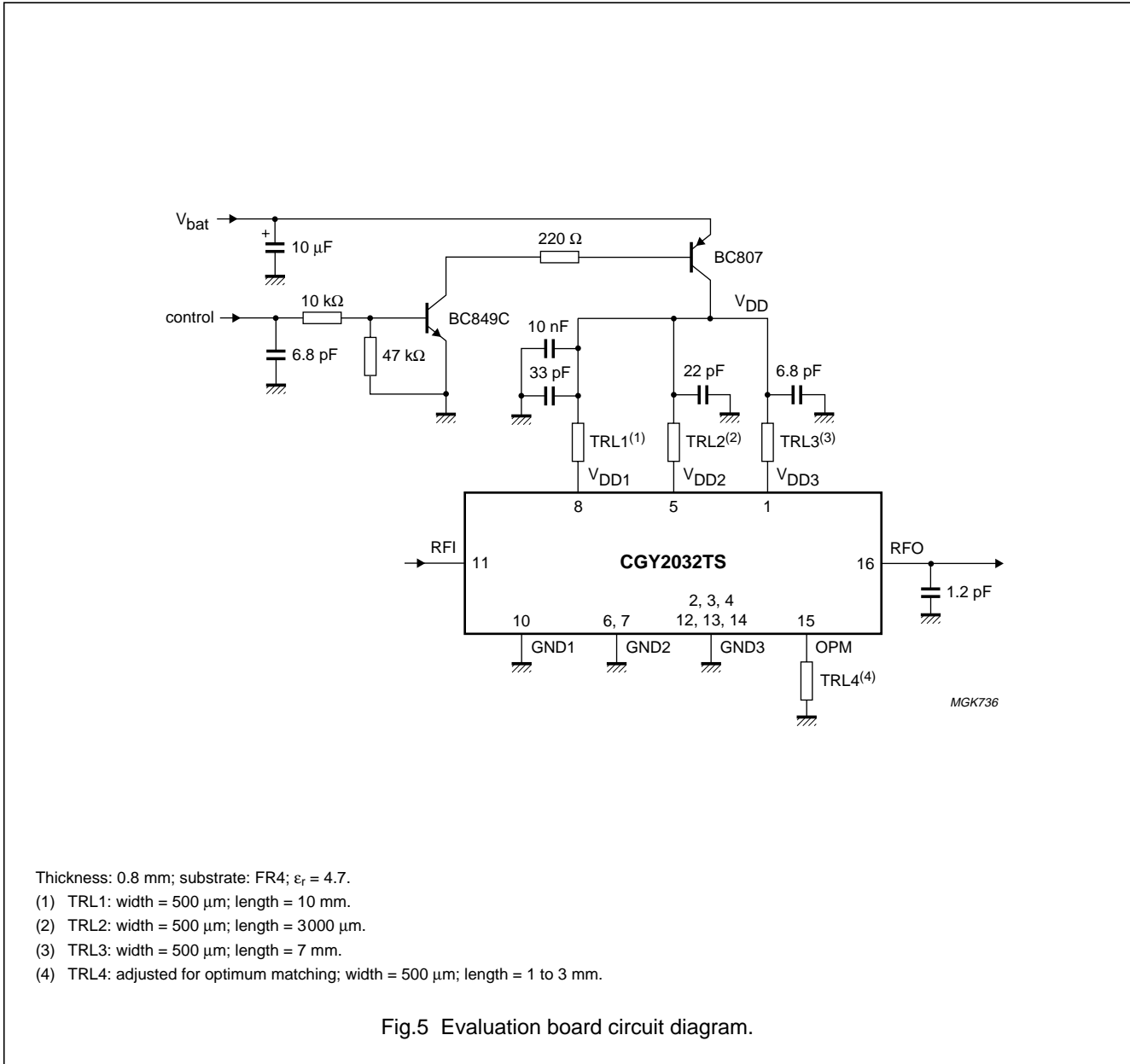


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APPLICATION INFORMATION

The CGY2032TS is operated and tested in accordance with the circuit diagram shown in Fig.5. Supply voltage switching is achieved by a single bipolar PNP transistor.



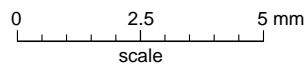
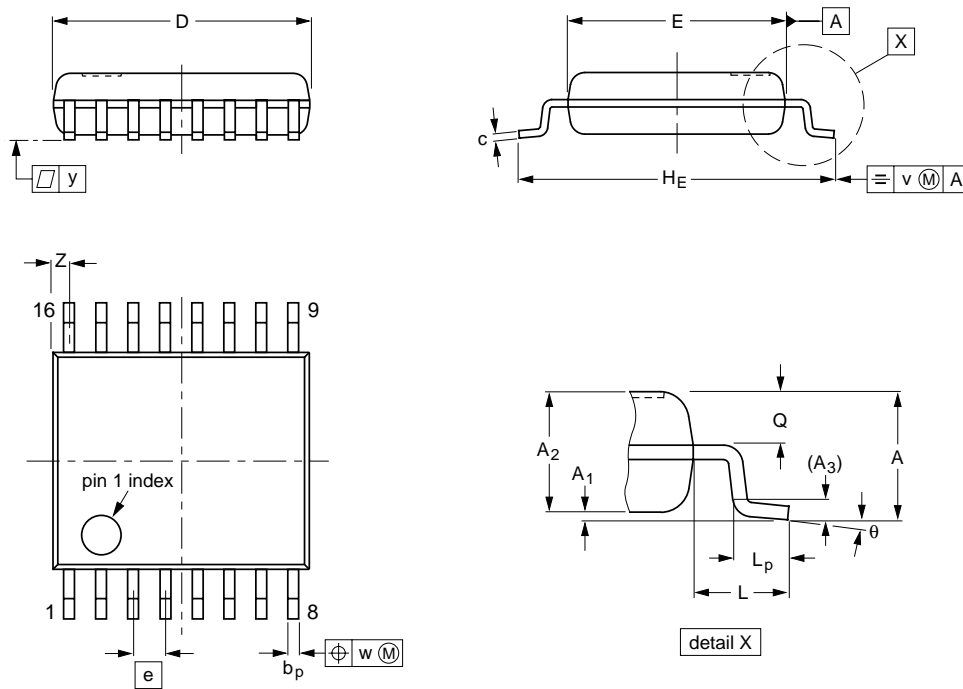
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PACKAGE OUTLINE

SSOP16: plastic shrink small outline package; 16 leads; body width 4.4 mm

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DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	b <sub>p</sub>	c	D <sup>(1)</sup>	E <sup>(1)</sup>	e	H <sub>E</sub>	L	L <sub>p</sub>	Q	v	w	y	z <sup>(1)</sup>	θ
mm	1.5	0.15 0.00	1.4 1.2	0.25	0.32 0.20	0.25 0.13	5.30 5.10	4.5 4.3	0.65	6.6 6.2	1.0	0.75 0.45	0.65 0.45	0.2	0.13	0.1	0.48 0.18	10° 0°

Note

1. Plastic or metal protrusions of 0.20 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT369-1						94-04-20 95-02-04

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### SOLDERING

#### Introduction to soldering surface mount packages

This text gives a very brief insight to a complex technology. A more in-depth account of soldering ICs can be found in our *"Data Handbook IC26; Integrated Circuit Packages"* (document order number 9398 652 90011).

There is no soldering method that is ideal for all surface mount IC packages. Wave soldering is not always suitable for surface mount ICs, or for printed-circuit boards with high population densities. In these situations reflow soldering is often used.

#### Reflow soldering

Reflow soldering requires solder paste (a suspension of fine solder particles, flux and binding agent) to be applied to the printed-circuit board by screen printing, stencilling or pressure-syringe dispensing before package placement.

Several methods exist for reflowing; for example, infrared/convection heating in a conveyor type oven. Throughput times (preheating, soldering and cooling) vary between 100 and 200 seconds depending on heating method.

Typical reflow peak temperatures range from 215 to 250 °C. The top-surface temperature of the packages should preferably be kept below 230 °C.

#### Wave soldering

Conventional single wave soldering is not recommended for surface mount devices (SMDs) or printed-circuit boards with a high component density, as solder bridging and non-wetting can present major problems.

To overcome these problems the double-wave soldering method was specifically developed.

If wave soldering is used the following conditions must be observed for optimal results:

- Use a double-wave soldering method comprising a turbulent wave with high upward pressure followed by a smooth laminar wave.
- For packages with leads on two sides and a pitch (e):
  - larger than or equal to 1.27 mm, the footprint longitudinal axis is **preferred** to be parallel to the transport direction of the printed-circuit board;
  - smaller than 1.27 mm, the footprint longitudinal axis **must** be parallel to the transport direction of the printed-circuit board.

The footprint must incorporate solder thieves at the downstream end.

- For packages with leads on four sides, the footprint must be placed at a 45° angle to the transport direction of the printed-circuit board. The footprint must incorporate solder thieves downstream and at the side corners.

During placement and before soldering, the package must be fixed with a droplet of adhesive. The adhesive can be applied by screen printing, pin transfer or syringe dispensing. The package can be soldered after the adhesive is cured.

Typical dwell time is 4 seconds at 250 °C.

A mildly-activated flux will eliminate the need for removal of corrosive residues in most applications.

#### Manual soldering

Fix the component by first soldering two diagonally-opposite end leads. Use a low voltage (24 V or less) soldering iron applied to the flat part of the lead. Contact time must be limited to 10 seconds at up to 300 °C.

When using a dedicated tool, all other leads can be soldered in one operation within 2 to 5 seconds between 270 and 320 °C.



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## Suitability of surface mount IC packages for wave and reflow soldering methods

PACKAGE	SOLDERING METHOD	
	WAVE	REFLOW <sup>(1)</sup>
BGA, SQFP	not suitable	suitable
HLQFP, HSQFP, HSOP, SMS	not suitable <sup>(2)</sup>	suitable
PLCC <sup>(3)</sup> , SO, SOJ	suitable	suitable
LQFP, QFP, TQFP	not recommended <sup>(3)(4)</sup>	suitable
SSOP, TSSOP, VSO	not recommended <sup>(5)</sup>	suitable

## Notes

- All surface mount (SMD) packages are moisture sensitive. Depending upon the moisture content, the maximum temperature (with respect to time) and body size of the package, there is a risk that internal or external package cracks may occur due to vaporization of the moisture in them (the so called popcorn effect). For details, refer to the Drypack information in the "Data Handbook IC26; Integrated Circuit Packages; Section: Packing Methods".
- These packages are not suitable for wave soldering as a solder joint between the printed-circuit board and heatsink (at bottom version) can not be achieved, and as solder may stick to the heatsink (on top version).
- If wave soldering is considered, then the package must be placed at a 45° angle to the solder wave direction. The package footprint must incorporate solder thieves downstream and at the side corners.
- Wave soldering is only suitable for LQFP, TQFP and QFP packages with a pitch (e) equal to or larger than 0.8 mm; it is definitely not suitable for packages with a pitch (e) equal to or smaller than 0.65 mm.
- Wave soldering is only suitable for SSOP and TSSOP packages with a pitch (e) equal to or larger than 0.65 mm; it is definitely not suitable for packages with a pitch (e) equal to or smaller than 0.5 mm.

## 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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These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips for any damages resulting from such improper use or sale.

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**NOTES**

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# Philips Semiconductors – a worldwide company

**Argentina:** see South America

**Australia:** 3 Figtree Drive, HOMEBUSH, NSW 2140,  
Tel. +61 2 9704 8141, Fax. +61 2 9704 8139

**Austria:** Computerstr. 6, A-1101 WIEN, P.O. Box 213,  
Tel. +43 1 60 101 1248, Fax. +43 1 60 101 1210

**Belarus:** Hotel Minsk Business Center, Bld. 3, r. 1211, Volodarski Str. 6,  
220050 MINSK, Tel. +375 172 20 0733, Fax. +375 172 20 0773

**Belgium:** see The Netherlands

**Brazil:** see South America

**Bulgaria:** Philips Bulgaria Ltd., Energoproject, 15th floor,  
51 James Bourchier Blvd., 1407 SOFIA,  
Tel. +359 2 68 9211, Fax. +359 2 68 9102

**Canada:** PHILIPS SEMICONDUCTORS/COMPONENTS,  
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**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

**Czech Republic:** see Austria

**Denmark:** Sydhavnsgade 23, 1780 COPENHAGEN V,  
Tel. +45 33 29 3333, Fax. +45 33 29 3905

**Finland:** Sinikalliontie 3, FIN-02630 ESPOO,  
Tel. +358 9 615 800, Fax. +358 9 6158 0920

**France:** 51 Rue Carnot, BP317, 92156 SURESNES Cedex,  
Tel. +33 1 4099 6161, Fax. +33 1 4099 6427

**Germany:** Hammerbrookstraße 69, D-20097 HAMBURG,  
Tel. +49 40 2353 60, Fax. +49 40 2353 6300

**Hungary:** see Austria

**India:** Philips INDIA Ltd, Band Box Building, 2nd floor,  
254-D, Dr. Annie Besant Road, Worli, MUMBAI 400 025,  
Tel. +91 22 493 8541, Fax. +91 22 493 0966

**Indonesia:** PT Philips Development Corporation, Semiconductors Division,  
Gedung Philips, Jl. Buncit Raya Kav.99-100, JAKARTA 12510,  
Tel. +62 21 794 0040 ext. 2501, Fax. +62 21 794 0080

**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, Via Casati, 23 - 20052 MONZA (MI),  
Tel. +39 039 203 6838, Fax +39 039 203 6800

**Japan:** Philips Bldg 13-37, Kohnan 2-chome, Minato-ku,  
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**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

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Tel. +9-5 800 234 7381, Fax +9-5 800 943 0087

**Middle East:** see Italy

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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

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Metro MANILA, Tel. +63 2 816 6380, Fax. +63 2 817 3474

**Poland:** Ul. Lukiska 10, PL 04-123 WARSZAWA,  
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**Portugal:** see Spain

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Tel. +27 11 471 5401, Fax. +27 11 471 5398

**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 93 301 6312, Fax. +34 93 301 4107

**Sweden:** Kottbygatan 7, Akalla, S-16485 STOCKHOLM,  
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**Switzerland:** Allmendstrasse 140, CH-8027 ZÜRICH,  
Tel. +41 1 488 2741 Fax. +41 1 488 3263

**Taiwan:** Philips Semiconductors, 6F, No. 96, Chien Kuo N. Rd., Sec. 1,  
TAIPEI, Taiwan Tel. +886 2 2134 2886, Fax. +886 2 2134 2874

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Tel. +66 2 745 4090, Fax. +66 2 398 0793

**Turkey:** Yukari Dudullu, Org. San. Blg., 2.Cad. Nr. 28 81260 Umraniye,  
ISTANBUL, Tel. +90 216 522 1500, Fax. +90 216 522 1813

**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. +44 208 730 5000, Fax. +44 208 754 8421

**United States:** 811 East Arques Avenue, SUNNYVALE, CA 94088-3409,  
Tel. +1 800 234 7381, Fax. +1 800 943 0087

**Uruguay:** see South America

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