DATA SHEET

TZA1027
Analog current buffer for CD-R and CD-RW systems

Preliminary specification
File under Integrated Circuits, IC01

1999 Sep 17

Philips Semiconductors

PHILIPS

FEATURES

- Eight amplifiers for servo and power calibration functions
- Gain selector for CD-R and CD-RW discs
- Separate data amplifier for read speed up to thirty times nominal data speed.

GENERAL DESCRIPTION

The TZA1027 is an analog current buffer IC for CD-R and CD-RW systems with a 3-spot push-pull tracking system. The IC interfaces directly to the photo diodes and TZA1020. A HF current amplifier is implemented to detect the actual HF data signal.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{DD}	supply voltage		4.5	5.0	5.5	V
$I_{i(cd)}$	central diode input current	WRON = 1	0	–	3400	μA
$I_{i(sd)}$	satellite diode input current	WRON = 1	0	–	520	μA
B_{CAHF}	bandwidth	C_i = 5 pF	72	–	–	MHz
$t_{d(f)}$	flatness delay	C_i = 5 pF; f = 0.1 to 32 MHz	–	30	200	ps
G_{SS}	servo satellite detector gain	HG = 1	–	32	–	
		HG = 0	–	8	–	
T_{amb}	ambient temperature		0	–	70	°C

ORDERING INFORMATION

TYPE NUMBER	PACKAGE		
	NAME	DESCRIPTION	VERSION
TZA1027HL	LQFP32	plastic low profile quad flat package; 32 leads; body 5 × 5 × 1.4 mm	SOT401-1

BLOCK DIAGRAM

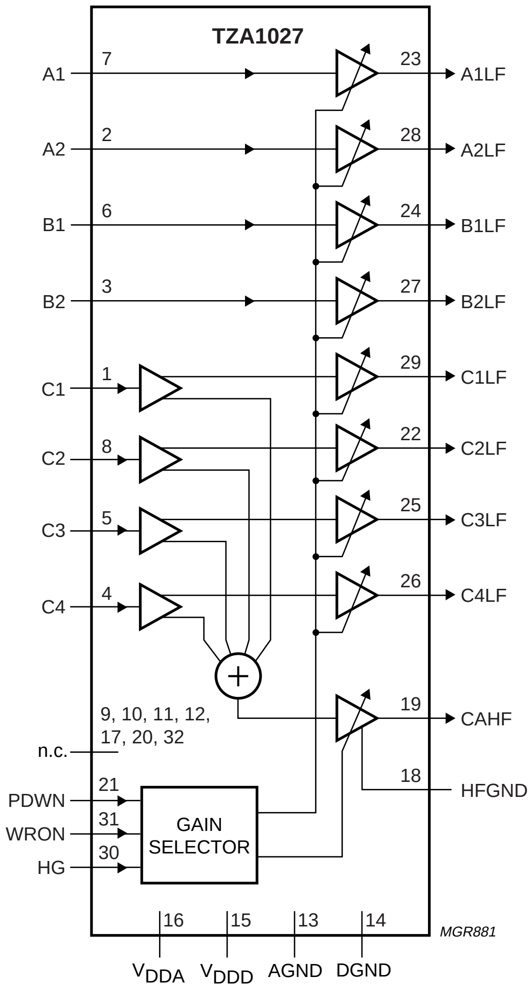


Fig.1 Block diagram.

PINNING

SYMBOL	PIN	DESCRIPTION
C1	1	central photo diode current input
A2	2	satellite diode current input
B2	3	satellite diode current input
C4	4	central photo diode current input
C3	5	central photo diode current input
B1	6	satellite diode current input
A1	7	satellite diode current input
C2	8	central photo diode current input
n.c.	9	not connected
n.c.	10	not connected
n.c.	11	not connected
n.c.	12	not connected
AGND	13	analog ground
DGND	14	digital ground
V_{DDD}	15	digital power supply
V_{DDA}	16	analog power supply
n.c.	17	not connected
HFGND	18	ground connection of CAHF output stage
CAHF	19	central aperture high-frequency output
n.c.	20	not connected
PDWN	21	digital input power-down
C2LF	22	C2 central detector signal output
A1LF	23	A1 satellite detector signal output
B1LF	24	B1 satellite detector signal output
C3LF	25	C3 central detector signal output
C4LF	26	C4 central detector signal output
B2LF	27	B2 satellite detector signal output
A2LF	28	A2 satellite detector signal output
C1LF	29	C1 central detector signal output
HG	30	digital input high gain selection
WRON	31	digital input write on gain selection
n.c.	32	not connected

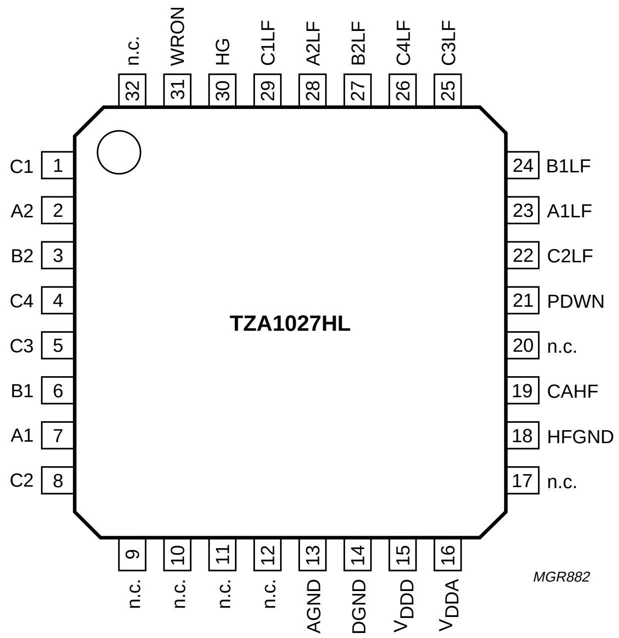


Fig.2 Pin configuration.

FUNCTIONAL DESCRIPTION

All detector signals are applied to wide-band amplifiers for servo and laser power calibration functions of the TZA1020. Signals from the central detector are added and amplified to suitable levels for the decoder circuit. Current gain can be selected for CD-R and CD-RW discs.

LIMITING VALUES

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

SYMBOL	PARAMETERS	MIN.	MAX.	UNIT
V_{DD}	supply voltage	0	5.5	V
T_{stg}	storage temperature	–6.5	+150	°C
T_{amb}	ambient temperature	0	70	°C
V_{es}	electrostatic handling:			
	Machine model	–100	+100	V
	Human body model	–500	+500	V

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITION	VALUE	UNIT
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	95	K/W

LOGIC FUNCTIONS

PDWN	WRON	HG	MODE
1	X; note 1	X; note 1	power-down
0	0	0	CD-R read
0	0	1	CD-RW read
0	1	0	CD-R write
0	1	1	CD-RW write

Note

1. X = don’t care.

CHARACTERISTICS

V_{DDA} = V_{DDD} = 5 V; T_{amb} = 25 °C; $I_{i(cd)}$ = 25 μA with x = 1LF to 4LF; $I_{i(sd)}$ = 4 μA with y = A or B and z = 1LF or 2LF; PDWN = 0; WRON = 0; HG = 0 and C_{cd} = C_{sd} = 5 pF; the given maximum and minimum values are 4σ values; unless otherwise specified. Signals available on the IC pins are upper case. Signals not visible on the IC pins are lower case.

SYMBOL	PARAMETERS	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Supplies						
V_{DDA}	analog supply voltage		4.5	5.0	5.5	V
V_{DDD}	digital supply voltage		4.5	5.0	5.5	V
ΔV_{DD}	difference between V_{DDA} and V_{DDD}		–0.3	–	+0.3	V
I_{DDA}	analog supply current	PDWN = 1	–	0.1	–	mA
			–	13	–	mA
I_{DDD}	digital supply current	PDWN = 1	–	0	–	mA
			–	14	–	mA
Detector inputs						
INPUT CURRENT RANGE						
$I_{i(cd)}$	central diode input current		1.0	–	75	μA
		WRON = 1	0	–	3400	μA
$I_{i(sd)}$	satellite diode input current		0.6	–	9	μA
		WRON = 1	0	–	520	μA
INPUT VOLTAGE LEVEL						
$V_{i(cd)}$	central diode input voltage level		2.5	2.9	3.3	V
		WRON = 1	2.6	3.0	3.4	V
$V_{i(sd)}$	satellite diode input voltage level		1.6	1.9	2.2	V
		WRON = 1	1.7	2.0	2.3	V
INPUT RESISTANCE						
$R_{i(cd)}$	central diode input resistance		–	420	–	Ω
		WRON = 1; $I_{i(cd)}$ = 1 mA	–	220	–	Ω
$R_{i(sd)}$	satellite diode input resistance		–	620	–	Ω
		WRON = 1; $I_{i(cd)}$ = 200 μA	–	370	–	Ω
Transfer functions						
SERVO OUTPUTS CD						
G_{cd}	servo central detector gain		–0.93	–1	–1.07	
		HG = 1	–2.8	–3	–3.2	
		WRON = 1	–0.94	–1	–1.06	
		WRON = 1; HG = 1	–0.93	–1	–1.07	
G_{mm}	gain mismatch	3σ	–	–	3	%
B_{cd}	bandwidth		33	44	–	MHz
		HG = 1; $I_{i(cd)}$ = 6 μA	18	22	–	MHz
		WRON = 1; $I_{i(cd)}$ = 1000 μA	150	230	–	MHz
		WRON = 1; HG = 1; $I_{i(cd)}$ = 250 μA	100	130	–	MHz

SYMBOL	PARAMETERS	CONDITIONS	MIN.	TYP.	MAX.	UNIT
t_r	rise time	WRON = 1; 30 μA < $I_{i(cd)}$ < 520 μA	–	2	–	ns
t_d	delay time	WRON = 1; 30 μA < $I_{i(cd)}$ < 520 μA	–	2.5	–	ns
SERVO OUTPUTS SD						
G_{SS}	servo satellite detector gain	HG = 1	–2.85	–3.05	–3.25	
		WRON = 0; HG = 0	–0.96	–1.02	–1.08	
		WRON = 1; HG = 0	–0.88	–0.95	–1.02	
		WRON = 1; HG = 1	–0.88	–0.95	–1.02	
B_S	bandwidth	HG = 1; $I_{i(cd)}$ = 1 μA	24	–	–	MHz
		WRON = X; note 1; HG = X; note 1	46	–	–	MHz
t_r	rise time	WRON = 1; 4 μA < $I_{i(cd)}$ < 65 μA	–	3.6	–	ns
t_d	delay time	WRON = 1; 4 μA < $I_{i(cd)}$ < 65 μA	–	4.5	–	ns
DATA OUTPUT; PIN CAHF						
G_{SS}	servo satellite detector gain		7.5	8.1	8.7	
		HG = 1	29	32	35	
		WRON = 1; HG = X; note 1	–	0	–	
B_{CAHF}	bandwidth		80	–	–	MHz
		HG = 1; $I_{i(cd)}$ = 6 μA	72	–	–	MHz
$t_{d(f)}$	flatness delay		–	30	200	ps
		HG = 1; $I_{i(cd)}$ = 6 μA	–	170	–	ps
I_n	noise current		–	1.4	–	μA
		HG = 1; $I_{i(cd)}$ = 6 μA	–	2	–	μA
Output pins						
$V_{o(cd)}$	central diode output voltage		–0.2	–	V_{DDD} – 1	V
$V_{o(sd)}$	satellite diode output voltage		–0.2	–	V_{DDD} – 1	V
$V_{o(CAHF)}$	data output voltage		1	–	V_{DDD} + 0.2	V
$R_{o(cd)}$	central diode output resistance		–	1	–	MΩ
$R_{o(sd)}$	satellite diode output resistance		–	5	–	MΩ
R_{CAHF}	data output resistance		–	40	–	kΩ
Digital control signals						
INPUT VOLTAGE LEVELS; PINS PDWN, WRON AND HG						
V_{IL}	LOW-level input voltage		–0.2	–	+1.2	V
V_{IH}	HIGH-level input voltage		1.8	–	V_{DDD} + 0.2	V
INPUT CURRENT						
I_{LI}	input leakage current		–1	–	+1	μA
DELAY TIME						
t_d	delay time		–	0.3	–	μs

Note

1. X = don't care.

TEST AND APPLICATION INFORMATION

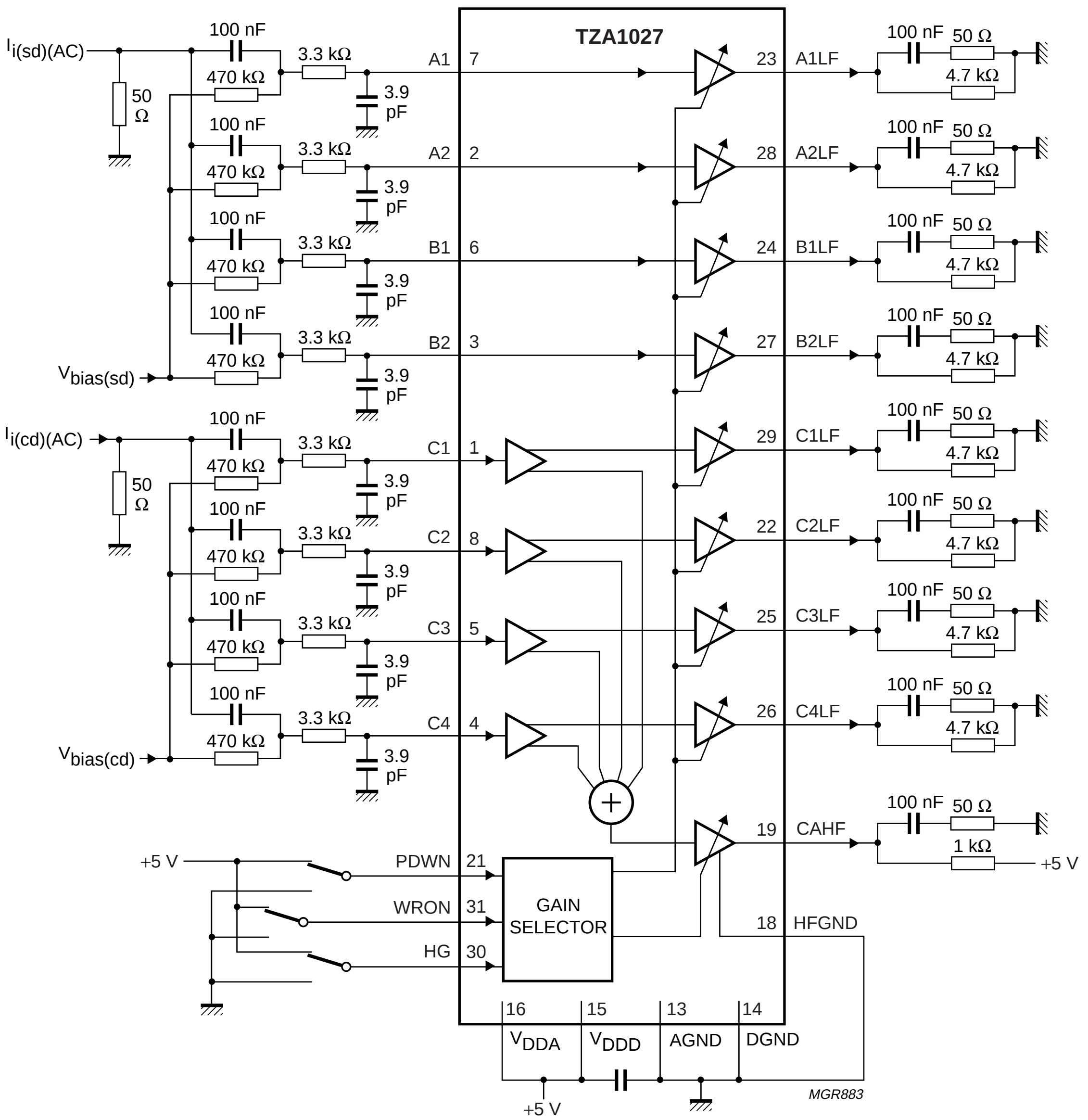


Fig.3 Test diagram.

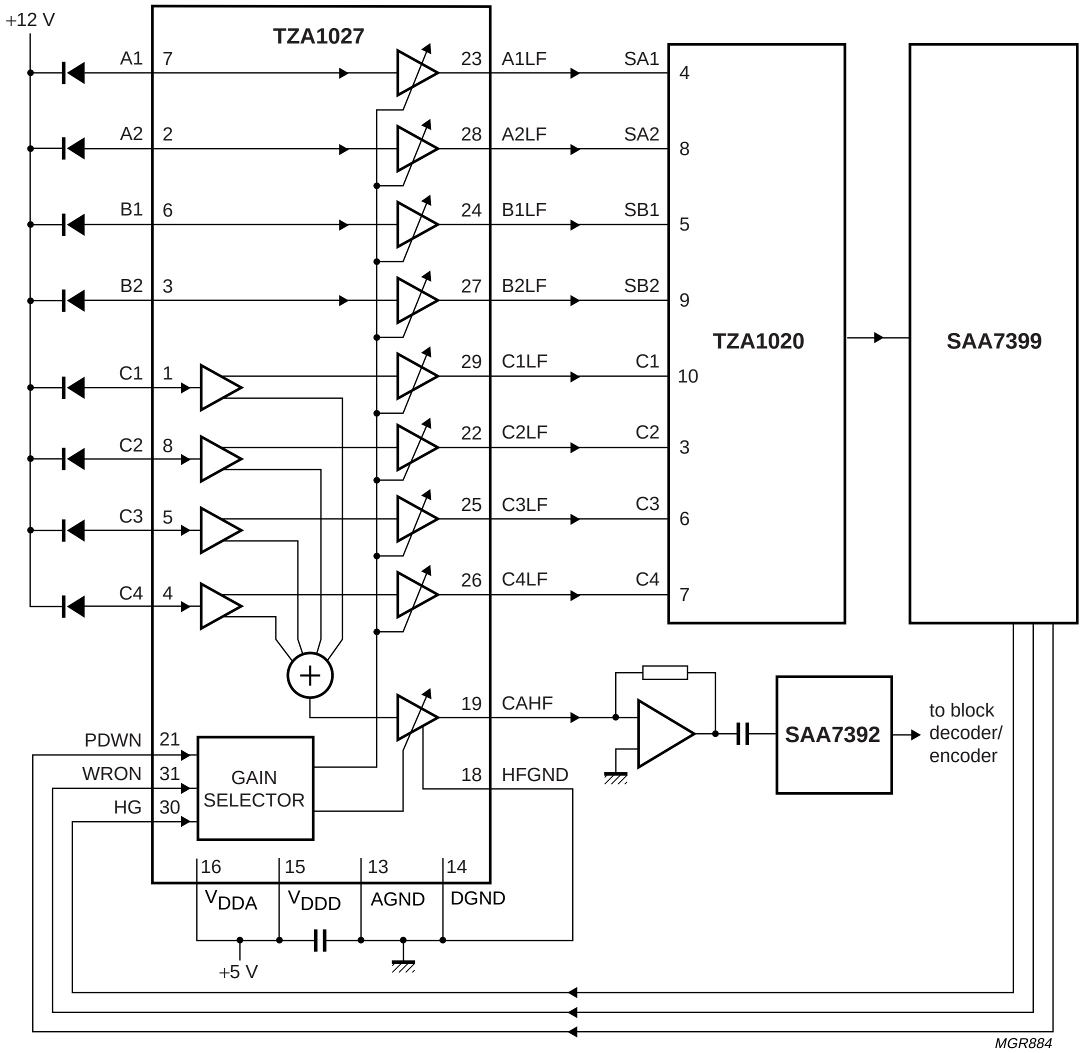
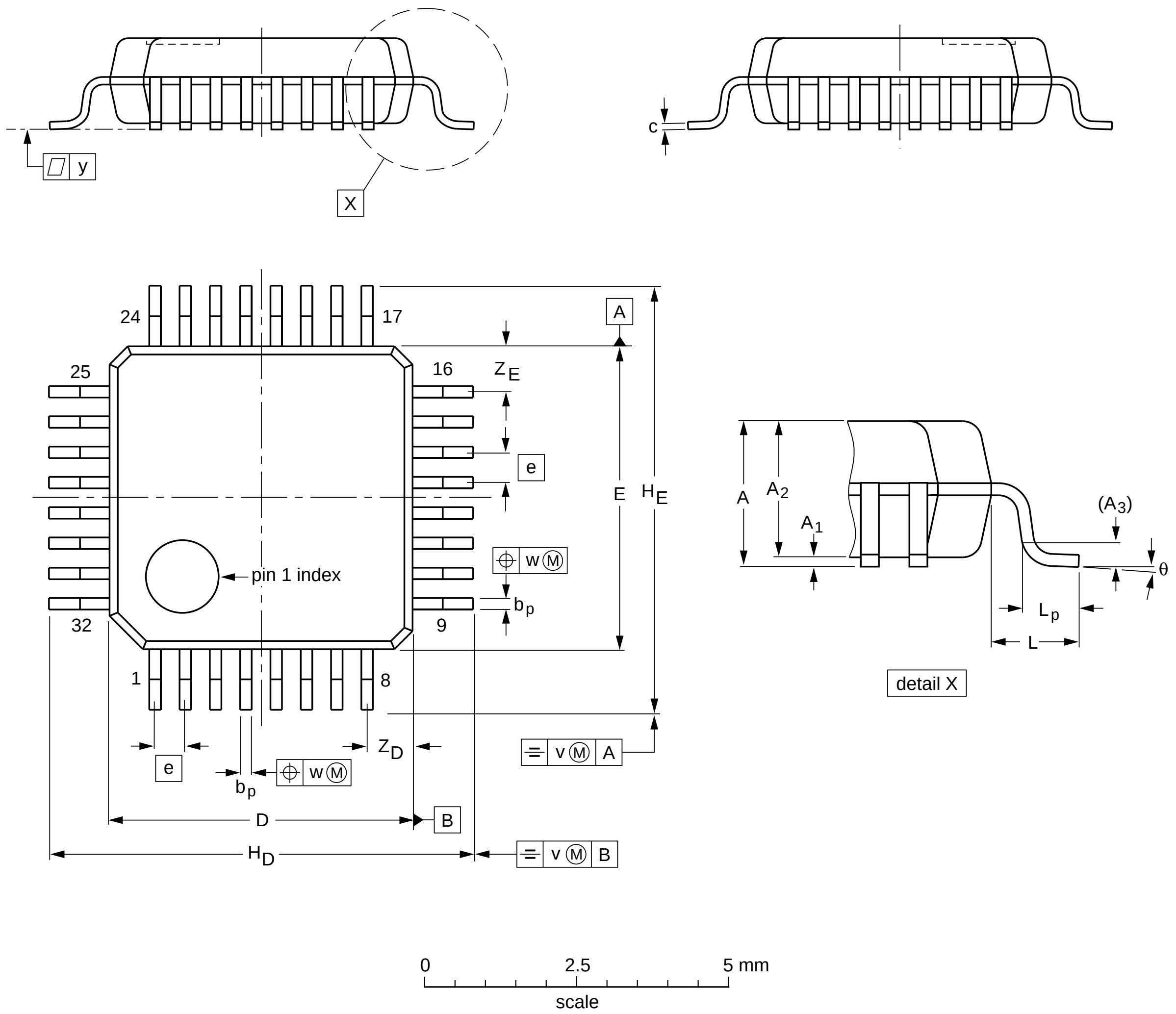


Fig.4 Application diagram.

PACKAGE OUTLINE

LQFP32: plastic low profile quad flat package; 32 leads; body 5 x 5 x 1.4 mm **SOT401-1**



DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A_1	A_2	A_3	b_p	c	D(1)	E(1)	e	H_D	H_E	L	L_p	v	w	y	Z_D(1)	Z_E(1)	θ
mm	1.60	0.15 0.05	1.5 1.3	0.25	0.27 0.17	0.18 0.12	5.1 4.9	5.1 4.9	0.5	7.15 6.85	7.15 6.85	1.0	0.75 0.45	0.2	0.12	0.1	0.95 0.55	0.95 0.55	7° 0°

Note

1. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT401-1						~~95-12-19~~ 97-08-04

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 preferable 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 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.
- 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.

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.

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

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

Notes

1. 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”*.
2. 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).
3. 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.
4. 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.
5. 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.	

LIFE SUPPORT APPLICATIONS

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.

NOTES

NOTES

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, Tel. +1 800 234 7381, Fax. +1 800 943 0087

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, TOKYO 108-8507, Tel. +81 3 3740 5130, Fax. +81 3 3740 5057

Korea: Philips House, 260-199 Itaewon-dong, Yongsan-ku, SEOUL, Tel. +82 2 709 1412, Fax. +82 2 709 1415

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, Fax +9-5 800 943 0087

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

Pakistan: see Singapore

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: Al.Jerozolimskie 195 B, 02-222 WARSAW, Tel. +48 22 5710 000, Fax. +48 22 5710 001

Portugal: see Spain

Romania: see Italy

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

Singapore: Lorong 1, Toa Payoh, SINGAPORE 319762, Tel. +65 350 2538, Fax. +65 251 6500

Slovakia: see Austria

Slovenia: see Italy

South Africa: S.A. PHILIPS Pty Ltd., 195-215 Main Road Martindale, 2092 JOHANNESBURG, P.O. Box 58088 Newville 2114, 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, Tel. +46 8 5985 2000, Fax. +46 8 5985 2745

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

Thailand: PHILIPS ELECTRONICS (THAILAND) Ltd., 209/2 Sanpavuth-Bangna Road Prakanong, BANGKOK 10260, 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

Vietnam: see Singapore

Yugoslavia: PHILIPS, Trg N. Pasica 5/v, 11000 BEOGRAD, Tel. +381 11 62 5344, Fax.+381 11 63 5777

For all other countries apply to: Philips Semiconductors, International Marketing & Sales Communications, Building BE-p, P.O. Box 218, 5600 MD EINDHOVEN, The Netherlands, Fax. +31 40 27 24825

Internet: http://www.semiconductors.philips.com

Printed in The Netherlands 545002/01/pp16 Date of release: 1999 Sep 17 Document order number: 9397 750 04724