INTEGRATED CIRCUITS

DATA SHEET

TDA8575A
Ground noise isolation amplifier

Preliminary specification
1996 Jul 29

File under Integrated Circuits, IC01

Philips Semiconductors

PHILIPS

FEATURES

- High common mode rejection up to high frequencies
- Reduced dependency of common mode rejection on source resistance
- Low distortion
- Low noise
- AC and DC short-circuit safe
- Few external components
- ESD protected on all pins.

GENERAL DESCRIPTION

The TDA8575AT is a two channel amplifier with differential input and single ended output for use in car audio applications. The differential amplifier has a gain of 0 dB, a low distortion and a high common mode rejection. The TDA8575AT comes in a 8 pin SO package.

The TDA8575AT is developed for those car audio applications where long connections between signal sources and amplifiers (or boosters) are necessary and ground noise has to be eliminated.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{CC}	supply voltage		5	8.5	18	V
I_{CC}	supply current	V_{CC} = 8.5 V	–	12.6	15	mA
G_v	voltage gain		–0.5	0	+0.5	dB
$V_{o(rms)(max)}$	maximum output voltage (RMS value)	THD = 0.1%	–	1.7	–	V
SVRR	supply voltage ripple rejection		55	60	–	dB
CMRR	common mode rejection ratio	R_s = 0 Ω	–	80	–	dB
THD	total harmonic distortion	$V_{o(rms)}$ = 1 V; f = 1 kHz	–	0.005	–	%
V_{no}	noise output voltage		–	3.7	5	μV
$\|Z_i\|$	input impedance		–	108	–	kΩ
$\|Z_o\|$	output impedance		–	–	10	Ω

ORDERING INFORMATION

TYPE NUMBER	PACKAGE		
	NAME	DESCRIPTION	VERSION
TDA8575AT	SO8	plastic small outline package; 8 leads; body width 3.9 mm	SOT96-1

BLOCK DIAGRAM

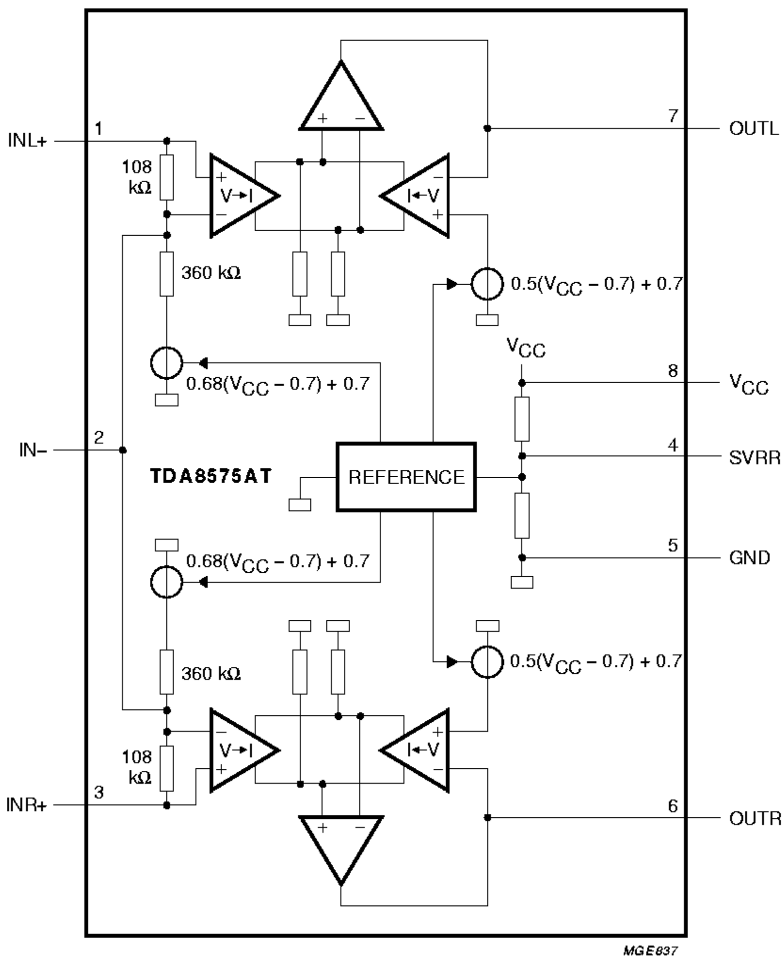


Fig.1 Block diagram.

PINNING

SYMBOL	PIN	DESCRIPTION
INL+	1	positive input left
IN−	2	common negative input
INR+	3	positive input right
SVRR	4	supply voltage ripple rejection
GND	5	ground
OUTR	6	output right
OUTL	7	output left
V_{CC}	8	supply voltage

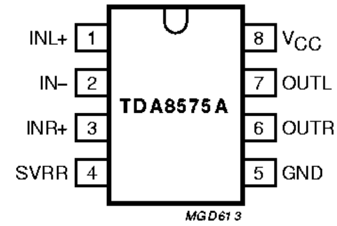


Fig.2 Pin configuration.

FUNCTIONAL DESCRIPTION

System description

To enable a high common mode rejection a new system setup is used. The voltage to current converter, referred to as V → I in the block diagram of Fig.1, replaces the resistors that can be seen in the conventional system solution.

Both systems are shown in Figs 3 and 4. In the conventional system the common mode rejection is limited by the matching properties of the resistors resulting in a CMRR of 60 dB maximum. Using the new system setup a CMRR of 80 dB is achieved

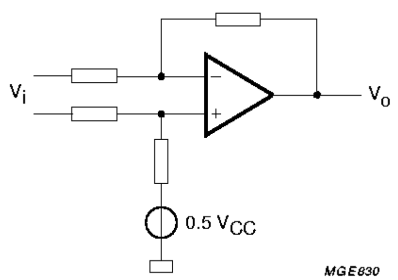


Fig.3 Conventional system.

Power on

In Fig.4 the preferred input capacitor values are shown. If the capacitor C2 = 22 µF connected to the IN- inputs had to be charged by the $0.5V_{CC}$ voltage source a charge time

$5\tau = 5 \times \frac{360\ k\Omega}{2} \times 22\ \mu F = 20$ seconds would be required.

This is inconvenient for most applications and therefore the TDA8575AT is equipped with a quick charge circuit. On power-on the quick charge circuit charges the capacitor C2 connected to the IN- pins. The quick charge circuit consists of a voltage buffer and a control circuit (referred to as ‘reference and powercheck’ in Fig.4) that monitors the supply voltage V_{CC}. If the supply voltage rises more than ≈ 2 V the voltage buffer is switched on.
After charging C2 the voltage buffer is switched off. The charge time of C2 will equal the charge time of C4, the SVRR capacitor.

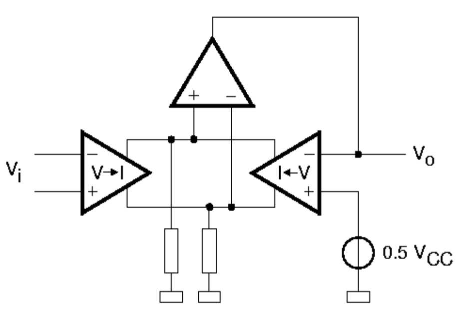


Fig.4 New system using V → I converters.

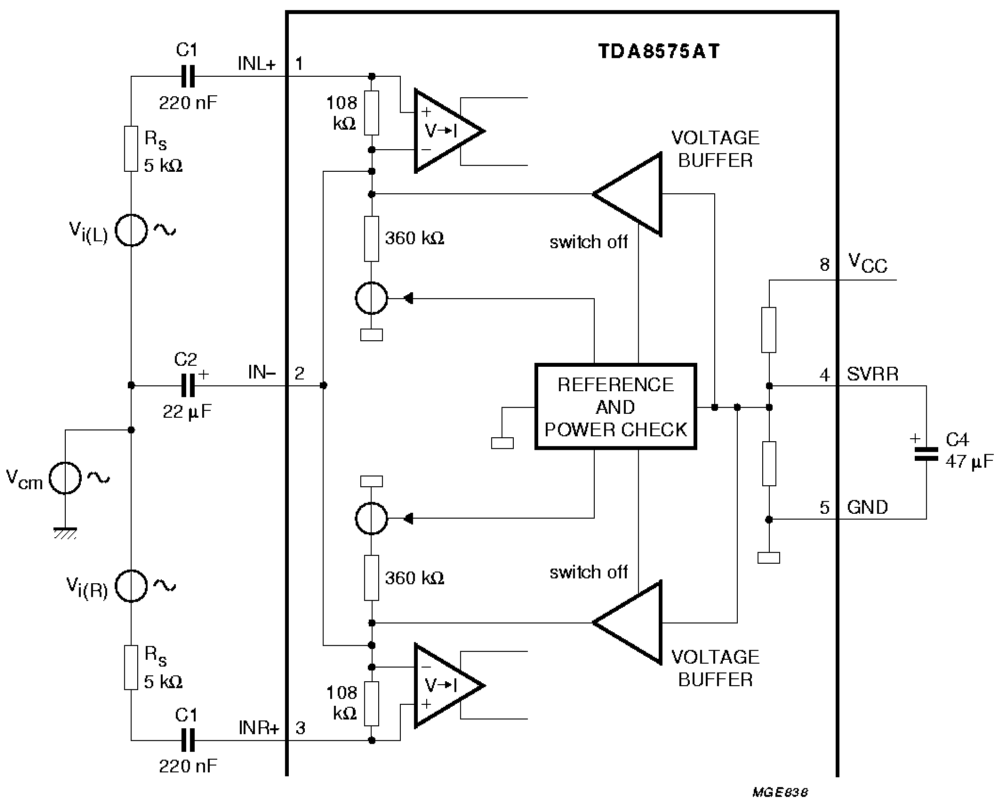


Fig.5 Quick charge circuit.

LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CC}	supply voltage	operating	–	18	V
I_{ORM}	repetitive peak output current		–	40	mA
V_{sc}	AC and DC short-circuit safe voltage		–	18	V
T_{stg}	storage temperature		–55	+150	°C
T_{amb}	operating ambient temperature		–40	+85	°C
T_j	junction temperature		–	+150	°C

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	VALUE	UNIT
$R_{th\ j\text{-}a}$	thermal resistance from junction to ambient in free air TDA8575AT (SO8)	160	K/W

QUALITY SPECIFICATION

Quality according to ***UZW-BO/FQ-0601***, if this type is used as an audio amplifier.

DC CHARACTERISTICS

V_{CC} = 8.5 V; T_{amb} = 25 °C; R_L = 10 kΩ; in accordance with application circuit (see Fig.8).

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{CC}	supply voltage	V_i = 0 V	5	8.5	18	V
I_{CC}	supply current		–	12.6	15	mA
V_O	output voltage	note 1	–	4.7	–	V

Note

1. The DC output voltage with respect to ground is approximately $0.5V_{CC}$.

AC CHARACTERISTICS

V_{CC} = 8.5 V; f = 1 kHz; R_s = 0 kΩ; R_L = 10 kΩ; T_{amb} = 25 °C; in accordance with application circuit (see Fig.8).

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
G_v	voltage gain		−0.5	0	+0.5	dB
α_{cs}	channel separation	R_s = 5 kΩ; note 1	70	80	−	dB
$\|\Delta G_v\|$	channel unbalance		−	−	0.5	dB
$f_{ro(l)}$	low frequency roll-off	−1 dB; note 2	−	−	20	Hz
$f_{ro(h)}$	high frequency roll-off	−1 dB	20	−	−	kHz
$\|Z_i\|$	input impedance		80	108	123	kΩ
$\|Z_o\|$	output impedance		−	−	10	Ω
$V_{i(rms)(max)}$	maximum input voltage (RMS value)	THD = 1%	−	1.7	−	V
V_{no}	noise output voltage	unweighted; note 3	−	3.7	5	μV
THD	total harmonic distortion	$V_{i(rms)}$ = 1 V	−	0.005	0.01	%
		$V_{i(rms)}$ = 1 V; f = 20 Hz to 20 kHz	−	0.01	−	%
THD_{max}	total harmonic distortion at maximum output current	$V_{i(rms)}$ = 1 V; R_L = 150 Ω	−	−	1	%
$V_{i(cm)(rms)}$	common-mode input voltage (RMS value)		−	−	1	V
CMRR	common-mode rejection ratio	R_s = 5 kΩ	66	80	−	dB
		R_s = 0 Ω; note 4 f = 100 Hz to 20 kHz	−	80	−	dB
SVRR	supply voltage ripple rejection	R_s = 2 kΩ; note 5	55	−	−	dB
		R_s = 2 kΩ; note 5 f = 20 Hz to 20 kHz	−	60	−	dB

Notes

1. The channel separation is dependent on the capacitor C2 connected to the IN- pin. The channel separation for low frequencies (<1 kHz) can be increased by using a larger capacitance for C2.
2. The frequency response is externally fixed by the input and output coupling capacitors.
3. The noise output voltage is measured in a bandwidth of 20 Hz up to 20 kHz, unweighted.
4. The common mode rejection ratio is measured at the output with a voltage source $V_{cm(rms)}$ = 1 V and both $V_{i(L)}$ and $V_{i(R)}$ short-circuited according to Fig.8. The common mode rejection is dependent on the capacitor C2 connected to the IN- input. The common mode rejection for low frequencies (<1 kHz) can be increased by using a larger capacitance for C2.
5. Supply voltage ripple rejection is measured at the output using a ripple amplitude of 2 V (p-p). The source resistance R_s = 2 kΩ

APPLICATION INFORMATION

General

The TDA8575AT is a two channel amplifier with differential input and single-ended output for use in car audio applications. The differential amplifier has a gain of 0 dB, a low distortion and a high common mode rejection.

Due to wiring resistance and noise coming from various electric devices in the automobile, performance loss will appear in those car audio applications where long connections between signal sources and amplifiers (or boosters) are necessary. To solve these problems the TDA8575AT is developed (see Figs 6 and 7).

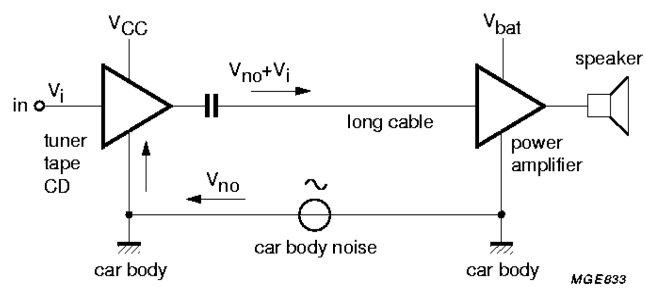


Fig.6 A typical noise problem in car audio systems.

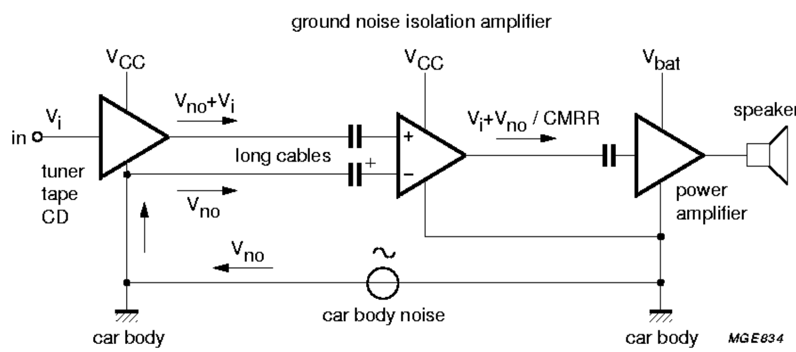


Fig.7 The TDA8575AT eliminates noise problems in car audio systems.

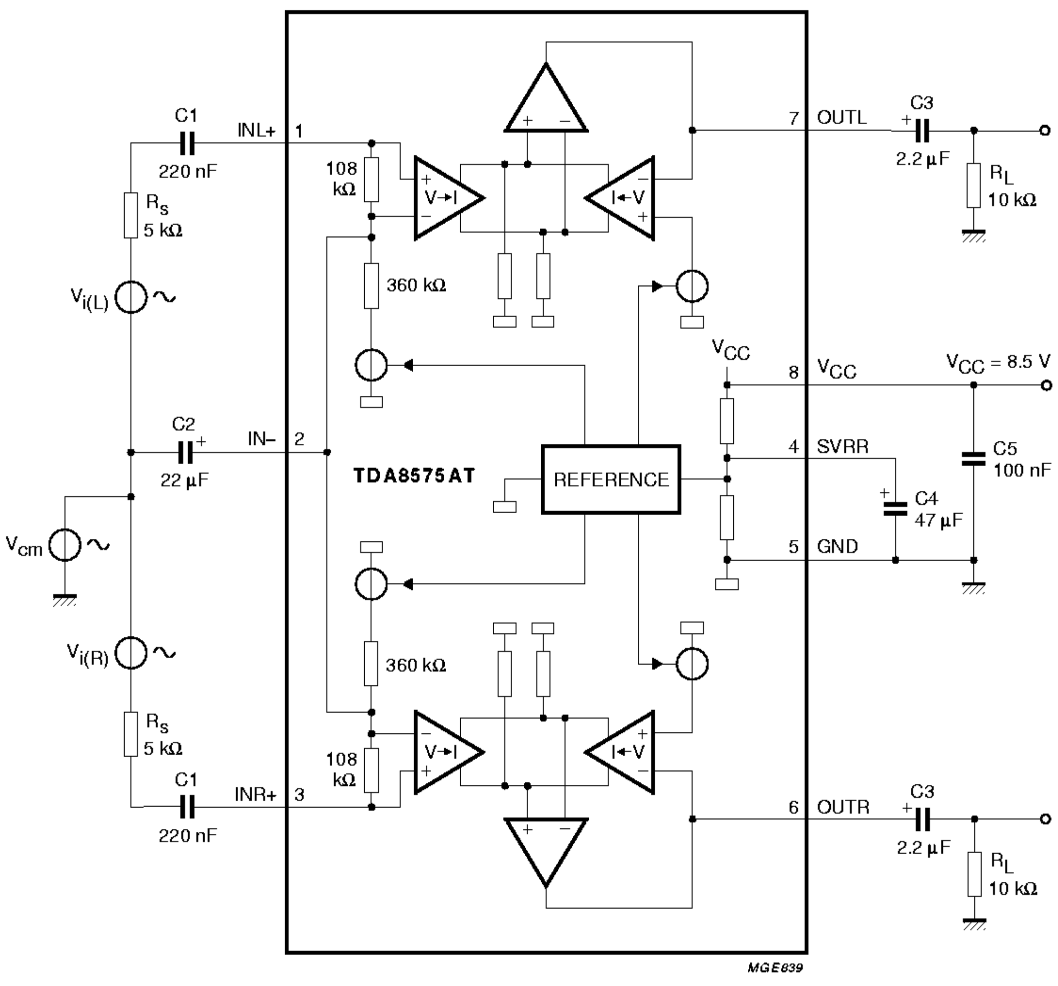
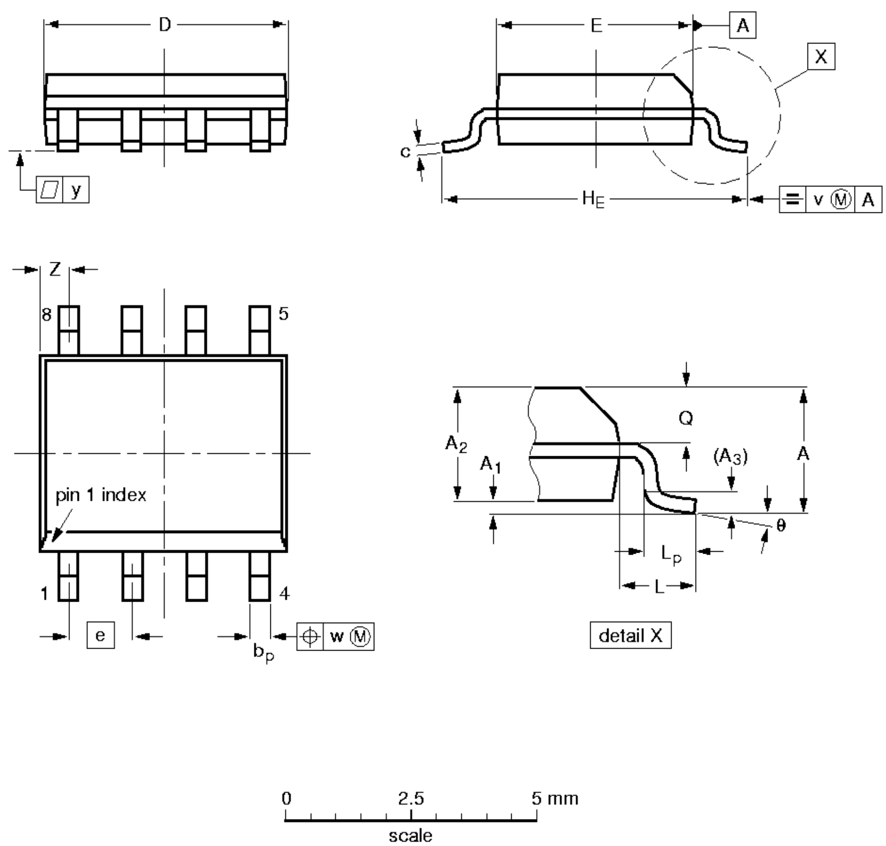


Fig.8 Application circuit TDA8575AT.

PACKAGE OUTLINES

SO8: plastic small outline package; 8 leads; body width 3.9 mm **SOT96-1**



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

UNIT	A max.	A_1	A_2	A_3	b_p	c	$D^{(1)}$	$E^{(2)}$	e	H_E	L	L_p	Q	v	w	y	$Z^{(1)}$	θ
mm	1.75	0.25 0.10	1.45 1.25	0.25	0.49 0.36	0.25 0.19	5.0 4.8	4.0 3.8	1.27	6.2 5.8	1.05	1.0 0.4	0.7 0.6	0.25	0.25	0.1	0.7 0.3	8° 0°
inches	0.069	0.0098 0.0039	0.057 0.049	0.01	0.019 0.014	0.0098 0.0075	0.20 0.19	0.16 0.15	0.050	0.24 0.23	0.041	0.039 0.016	0.028 0.024	0.01	0.01	0.004	0.028 0.012	

Notes

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
2. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT96-1	076E03S	MS-012AA				~~92-11-17~~ 95-02-04

SOLDERING

Introduction

There is no soldering method that is ideal for all IC packages. Wave soldering is often preferred when through-hole and surface mounted components are mixed on one printed-circuit board. However, wave soldering is not always suitable for surface mounted ICs, or for printed-circuits with high population densities. In these situations reflow soldering is often used.

This text gives a very brief insight to a complex technology. A more in-depth account of soldering ICs can be found in our "*IC Package Databook*" (order code 9398 652 90011).

Reflow soldering

Reflow soldering techniques are suitable for all SO packages.

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 techniques exist for reflowing; for example, thermal conduction by heated belt. Dwell times vary between 50 and 300 seconds depending on heating method. Typical reflow temperatures range from 215 to 250 °C.

Preheating is necessary to dry the paste and evaporate the binding agent. Preheating duration: 45 minutes at 45 °C.

Wave soldering

Wave soldering techniques can be used for all SO packages if the following conditions are observed:

- A double-wave (a turbulent wave with high upward pressure followed by a smooth laminar wave) soldering technique should be used.
- The longitudinal axis of the package footprint must be parallel to the solder flow.
- The package 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.

Maximum permissible solder temperature is 260 °C, and maximum duration of package immersion in solder is 10 seconds, if cooled to less than 150 °C within 6 seconds. 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.

Repairing soldered joints

Fix the component by first soldering two diagonally-opposite end leads. Use only a low voltage soldering iron (less than 24 V) 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.

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

NOTES

Philips Semiconductors – a worldwide company

Argentina: see South America

Australia: 34 Waterloo Road, NORTH RYDE, NSW 2113, Tel. +61 2 9805 4455, Fax. +61 2 9805 4466

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

Belarus: Hotel Minsk Business Center, Bld. 3, r. 1211, Volodarski Str. 6, 220050 MINSK, Tel. +375 172 200 733, Fax. +375 172 200 773

Belgium: see The Netherlands

Brazil: see South America

Bulgaria: Philips Bulgaria Ltd., Energoproject, 15th floor, 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

Czech Republic: see Austria

Denmark: Prags Boulevard 80, PB 1919, DK-2300 COPENHAGEN S, Tel. +45 32 88 2636, Fax. +45 31 57 1949

Finland: Sinikalliontie 3, FIN-02630 ESPOO, Tel. +358 615 800, Fax. +358 615 80920

France: 4 Rue du Port-aux-Vins, 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, Tel. +30 1 4894 339/911, Fax. +30 1 4814 240

Hungary: see Austria

India: Philips INDIA Ltd, Shivsagar Estate, A Block, Dr. Annie Besant Rd. Worli, MUMBAI 400 018, Tel. +91 22 4938 541, Fax. +91 22 4938 722

Indonesia: see Singapore

Ireland: Newstead, Clonskeagh, DUBLIN 14, Tel. +353 1 7640 000, Fax. +353 1 7640 200

Israel: RAPAC Electronics, 7 Kehilat Saloniki St, 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, 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

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

Romania: see Italy

Russia: Philips Russia, Ul. Usatcheva 35A, 119048 MOSCOW, Tel. +7 095 926 5361, Fax. +7 095 564 8323

Singapore: Lorong 1, Toa Payoh, SINGAPORE 1231, 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 7430 Johannesburg 2000, Tel. +27 11 470 5911, Fax. +27 11 470 5494

South America: Rua do Rocio 220, 5th floor, Suite 51, 04552-903 São Paulo, SÃO PAULO - SP, Brazil, Tel. +55 11 821 2333, Fax. +55 11 829 1849

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 1 481 7730

Taiwan: PHILIPS TAIWAN Ltd., 23-30F, 66, Chung Hsiao West Road, Sec. 1, P.O. Box 22978, TAIPEI 100, Tel. +886 2 382 4443, Fax. +886 2 382 4444

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

Uruguay: see South America

Vietnam: see Singapore

Yugoslavia: PHILIPS, Trg N. Pasica 5/v, 11000 BEOGRAD, Tel. +381 11 825 344, Fax.+381 11 635 777

For all other countries apply to: Philips Semiconductors, 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

SCA51

Printed in The Netherlands 517021/10/01/pp16 Date of release: 1996 Jul 29 Document order number: 9397 750 00986

Let's make things better.

Philips Semiconductors

PHILIPS