

# DATA SHEET

## **TDA7056B**

**5 W mono BTL audio amplifier with  
DC volume control**

Product specification  
Supersedes data of 1996 May 28  
File under Integrated Circuits, IC01

1997 Aug 15

## 5 W mono BTL audio amplifier with DC volume control

### TDA7056B

#### FEATURES

- DC volume control
- Few external components
- Mute mode
- Thermal protection
- Short-circuit proof
- No switch-on and switch-off clicks
- Good overall stability
- Low power consumption
- Low HF radiation
- ESD protected on all pins.

#### GENERAL DESCRIPTION

The TDA7056B is a mono Bridge-Tied Load (BTL) output amplifier with DC volume control.

It is designed for use in TV and monitors, but is also suitable for battery-fed portable recorders and radios. The device is contained in a 9-pin medium power package.

A Missing Current Limiter (MCL) is built in. The MCL circuit is activated when the difference in current between the output terminal of each amplifier exceeds 100 mA (300 mA typ.). This level of 100 mA allows for headphone applications (single-ended).

#### QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_P$	supply voltage		4.5	–	18	V
$P_O$	output power	$V_P = 12\text{ V}$ $R_L = 16\ \Omega$ $R_L = 8\ \Omega$	3 5	3.5 5.5	– –	W W
$G_{V(\max)}$	maximum total voltage gain		39.5	40.5	41.5	dB
$\phi$	gain control		68	73.5	–	dB
$I_{q(\text{tot})}$	total quiescent current	$V_P = 12\text{ V}; R_L = \infty$	–	9.2	13	mA
THD	total harmonic distortion	$P_O = 0.5\text{ W}$	–	0.3	1	%

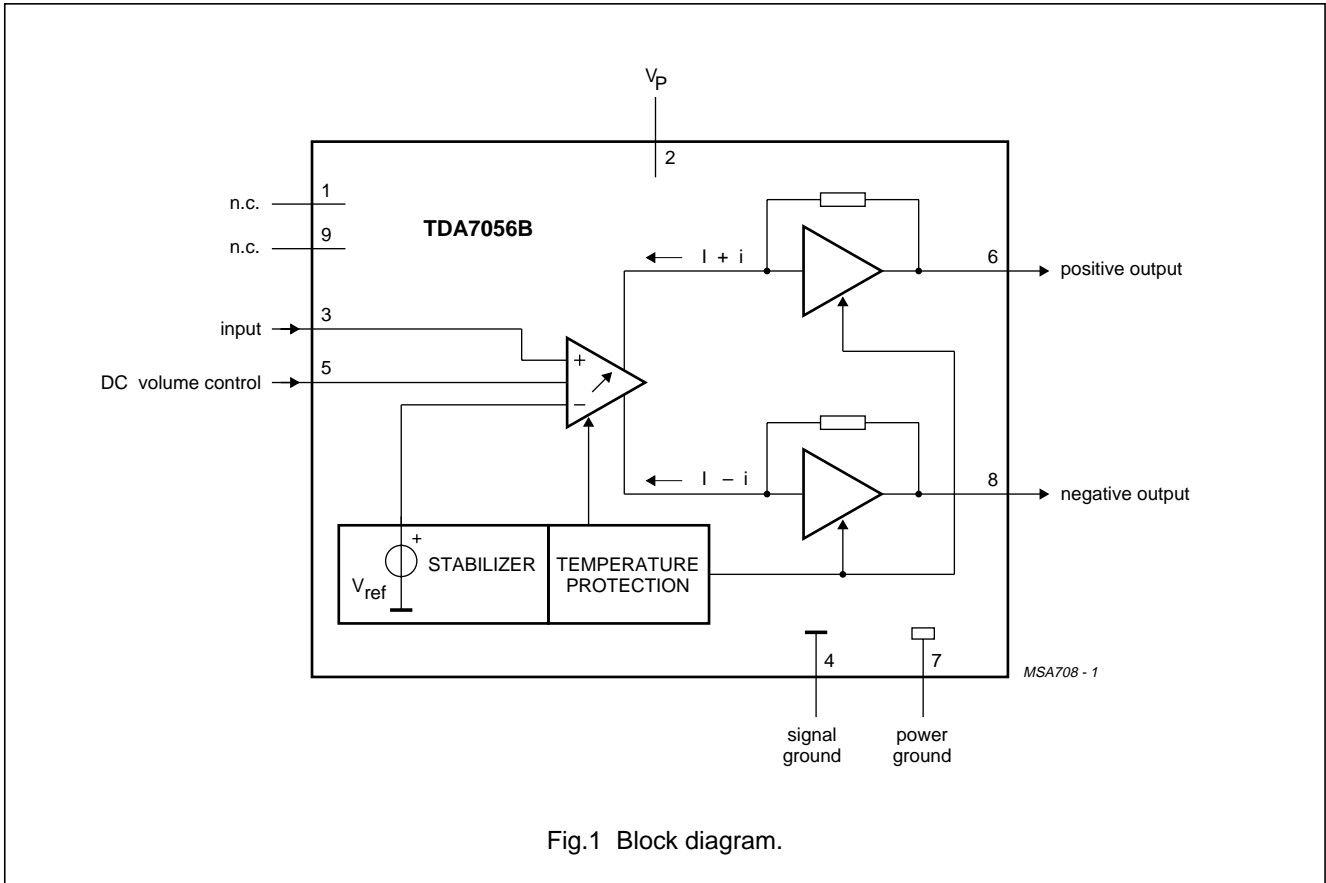
#### ORDERING INFORMATION

TYPE NUMBER	PACKAGE		
	NAME	DESCRIPTION	VERSION
TDA7056B	SIL9MPF	plastic single in-line medium power package with fin; 9 leads	SOT110-1

# 5 W mono BTL audio amplifier with DC volume control

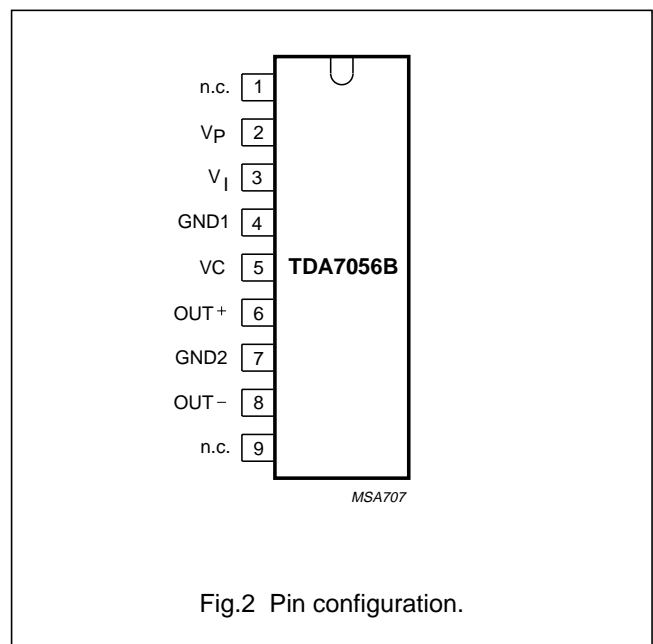
TDA7056B

## BLOCK DIAGRAM



## PINNING

SYMBOL	PIN	DESCRIPTION
n.c.	1	not connected
V <sub>P</sub>	2	positive supply voltage
V <sub>I</sub>	3	voltage input
GND1	4	signal ground
VC	5	DC volume control
OUT+	6	positive output
GND2	7	power ground
OUT-	8	negative output
n.c.	9	not connected



## 5 W mono BTL audio amplifier with DC volume control

TDA7056B

### FUNCTIONAL DESCRIPTION

The TDA7056B is a mono BTL output amplifier with DC volume control, designed for use in TV and monitor but is also suitable for battery-fed portable recorders and radios.

In conventional DC volume circuits the control or input stage is AC coupled to the output stage via external capacitors to keep the offset voltage low. In the TDA7056B the DC volume control stage is integrated into the input stage so that no coupling capacitors are required. With this configuration, a low offset voltage is still maintained and the minimum supply voltage remains low.

The BTL principle offers the following advantages:

- Lower peak value of the supply current
- The frequency of the ripple on the supply voltage is twice the signal frequency.

Consequently, a reduced power supply with smaller capacitors can be used which results in cost reductions. For portable applications there is a trend to decrease the supply voltage, resulting in a reduction of output power at conventional output stages. Using the BTL principle increases the output power.

The maximum gain of the amplifier is fixed at 40.5 dB. The DC volume control stage has a logarithmic control characteristic. Therefore, the total gain can be controlled from 40.5 dB to -33 dB. If the DC volume control voltage falls below 0.4 V, the device will switch to the mute mode.

The amplifier is short-circuit proof to ground,  $V_P$  and across the load. Also a thermal protection circuit is implemented. If the crystal temperature rises above +150 °C the gain will be reduced, thereby reducing the output power. Special attention is given to switch-on and switch-off clicks, low HF radiation and a good overall stability.

### Power dissipation

Assume  $V_P = 12$  V;  $R_L = 16$  Ω.

The maximum sine wave dissipation is = 1.8 W.

The  $R_{th\ vj-a}$  of the package is 55 K/W.

Therefore  $T_{amb\ (max)} = 150 - 55 \times 1.8 = 51$  °C.

### LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$V_P$	supply voltage		-	18	V
$V_{3,5}$	input voltage pins 3 and 5		-	5	V
$I_{ORM}$	repetitive peak output current		-	1.25	A
$I_{OSM}$	non-repetitive peak output current		-	1.5	A
$P_{tot}$	total power dissipation	$T_{case} < 60$ °C	-	9	W
$T_{amb}$	operating ambient temperature		-40	+85	°C
$T_{stg}$	storage temperature		-55	+150	°C
$T_{vj}$	virtual junction temperature		-	+150	°C
$T_{sc}$	short-circuit time		-	1	h

### THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	VALUE	UNIT
$R_{th\ j-a}$	thermal resistance from junction to ambient in free air	55	K/W
$R_{th\ j-c}$	thermal resistance from junction to case	10	K/W

## 5 W mono BTL audio amplifier with DC volume control

TDA7056B

### CHARACTERISTICS

$V_P = 12\text{ V}$ ;  $V_{DC} = 1.4\text{ V}$ ;  $f = 1\text{ kHz}$ ;  $R_L = 16\ \Omega$ ;  $T_{amb} = 25\text{ }^\circ\text{C}$ ; unless otherwise specified (see Fig.13).

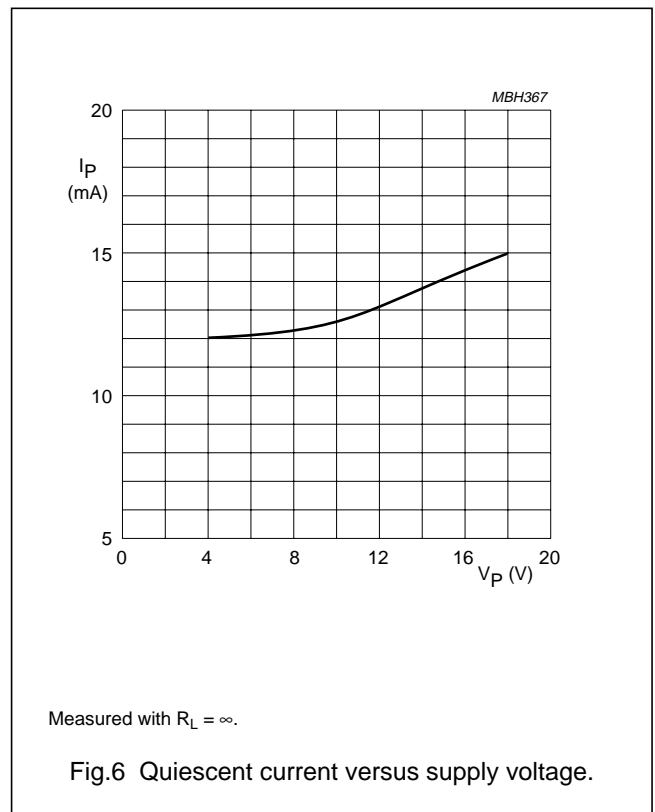
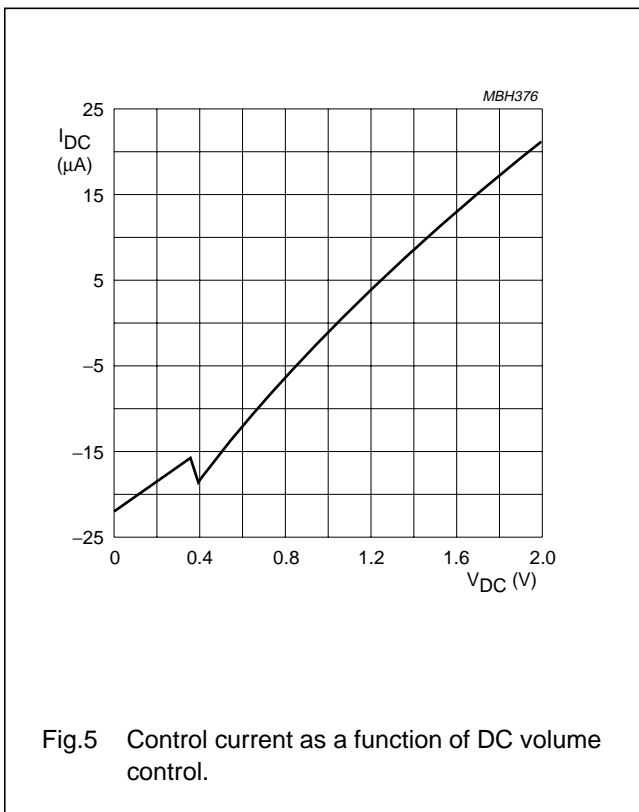
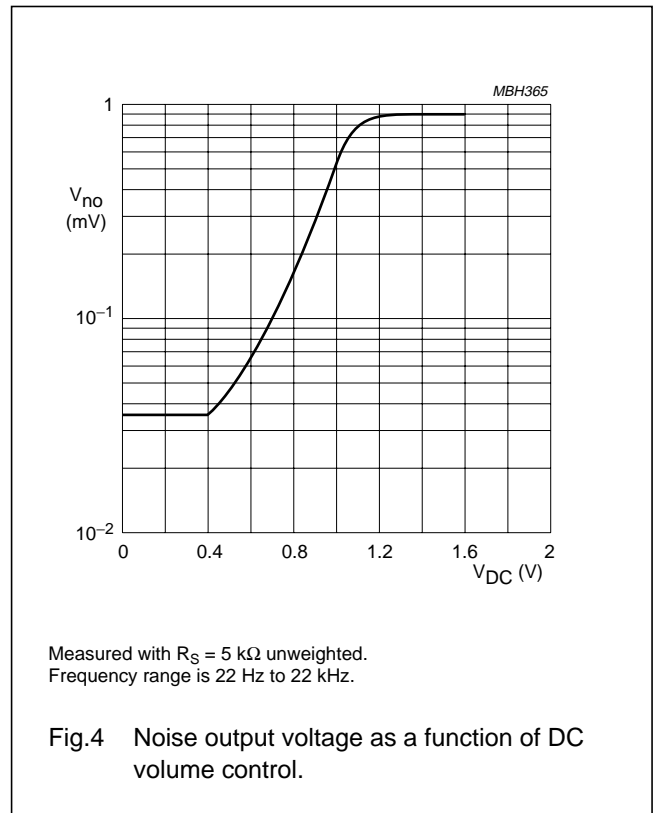
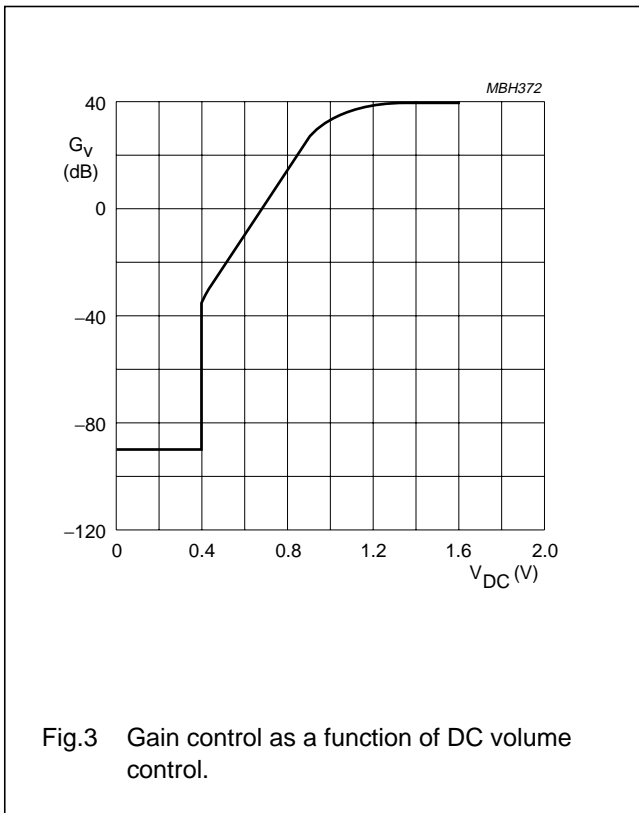
SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
<b>Supply</b>						
$V_P$	positive supply voltage		4.5	–	18	V
$I_{q(\text{tot})}$	total quiescent current	note 1; $R_L = \infty$	–	9.2	13	mA
<b>Maximum gain (<math>V_5 = 1.4\text{ V}</math>)</b>						
$P_O$	output power	THD = 10%; $R_L = 16\ \Omega$	3	3.5	–	W
		THD = 10%; $R_L = 8\ \Omega$	5	5.5	–	W
THD	total harmonic distortion	$P_O = 0.5\text{ W}$	–	0.3	1	%
$G_{V(\text{max})}$	maximum total voltage gain		39.5	40.5	41.5	dB
$V_I$	input signal handling (RMS value)	$G_{V(\text{max})} = 0\text{ dB}$ ; THD < 1%	1.0	–	–	V
$V_{no}$	noise output voltage (RMS value)	note 2; $f = 500\text{ kHz}$	–	210	–	$\mu\text{V}$
B	bandwidth	at –1 dB	–	0.02 to 300	–	kHz
SVRR	supply voltage ripple rejection	note 3	34	38	–	dB
$ \Delta V_O $	DC output offset voltage	$ V_8 - v_6 $	–	0	200	mV
$Z_I$	input impedance (pin 3)		15	20	25	$\text{k}\Omega$
<b>Mute position</b>						
$V_O$	output voltage in mute position	note 4; $V_5 \leq 0.4\text{ V}$ ; $V_I = 1.0\text{ V}$	–	35	45	$\mu\text{V}$
<b>DC volume control; note 5</b>						
$\phi$	gain control		68	73.5	–	dB
$I_5$	control current	$V_5 = 0\text{ V}$	–20	–25	–30	$\mu\text{A}$

### Notes

1. With a load connected to the outputs the quiescent current will increase, the maximum value of this increase being equal to the DC output offset voltage divided by  $R_L$ .
2. The noise output voltage (RMS value) at  $f = 500\text{ kHz}$  is measured with  $R_S = 0\ \Omega$  and  $B = 5\text{ kHz}$ .
3. The ripple rejection is measured with  $R_S = 0\ \Omega$  and  $f = 100\text{ Hz}$  to  $10\text{ kHz}$ . The ripple voltage  $V_R$  of  $200\text{ mV}$  (RMS value) is applied to the positive supply rail.
4. The noise output voltage (RMS value) is measured with  $R_S = 5\text{ k}\Omega$  unweighted.
5. The DC volume control can be configured in several ways. Two possible circuits are shown in Figs 14 and 15. The circuits at the volume control pin will influence the switch-on and switch-off behaviour and the maximum voltage gain.

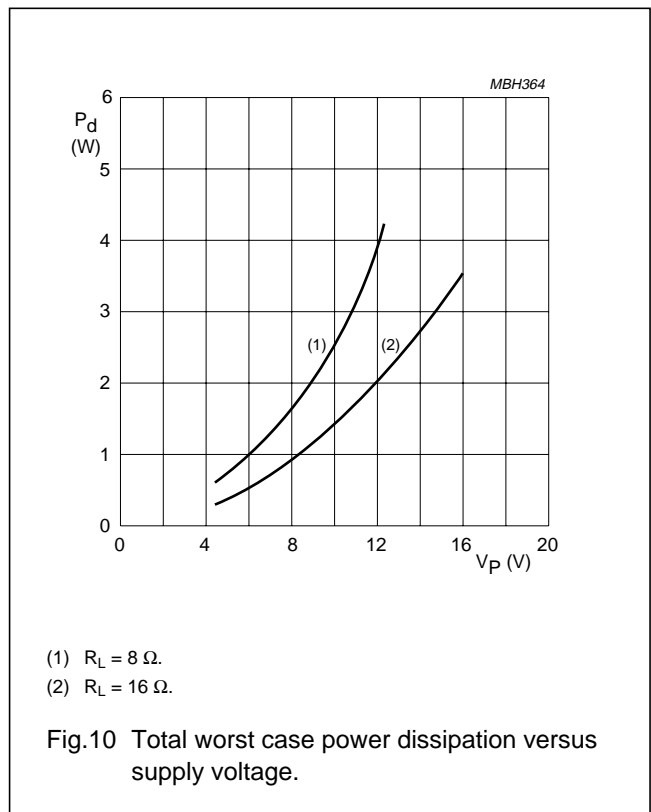
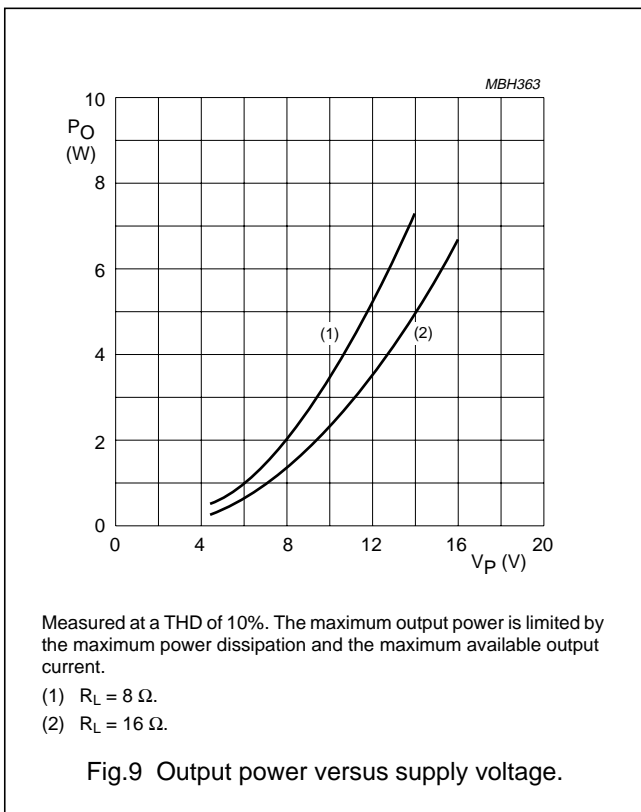
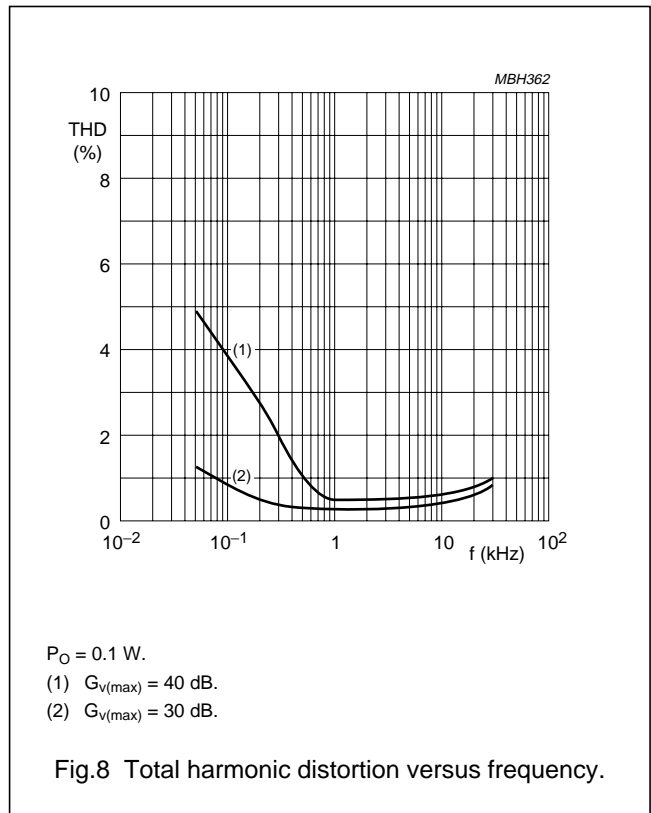
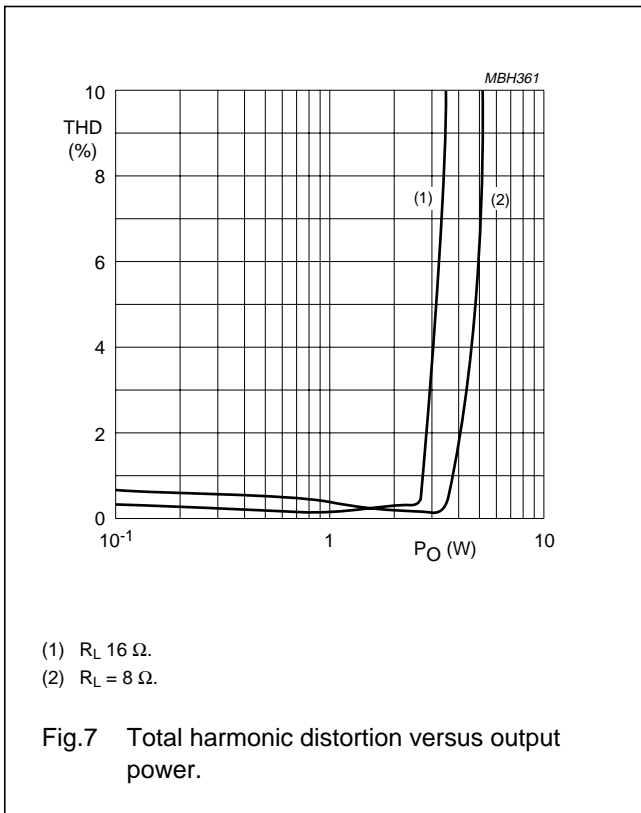
5 W mono BTL audio amplifier with DC volume control

TDA7056B



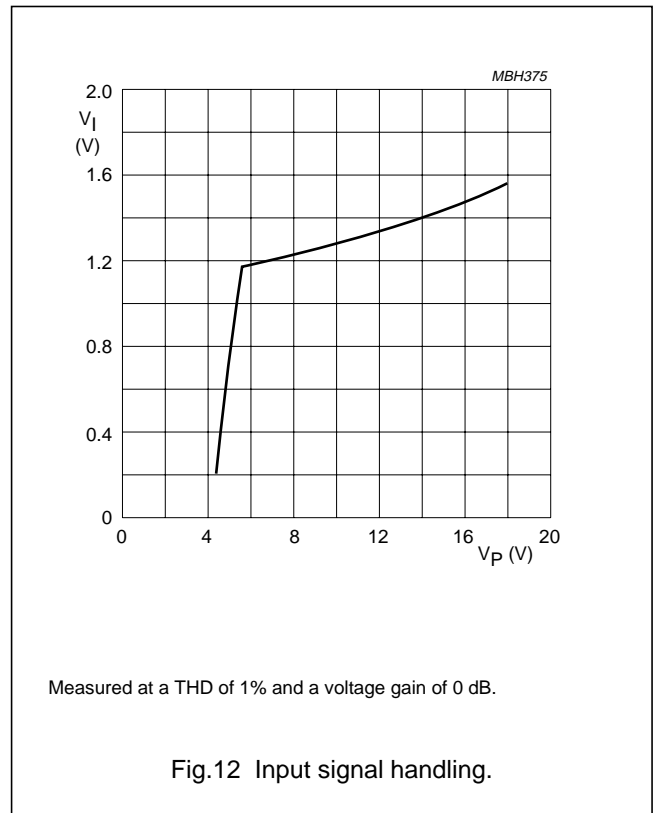
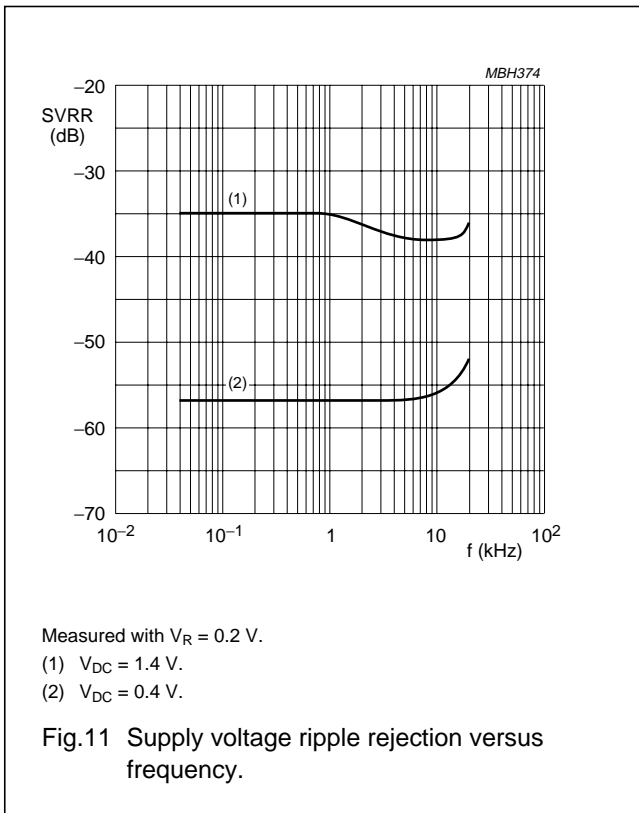
# 5 W mono BTL audio amplifier with DC volume control

TDA7056B



5 W mono BTL audio amplifier with DC volume control

TDA7056B

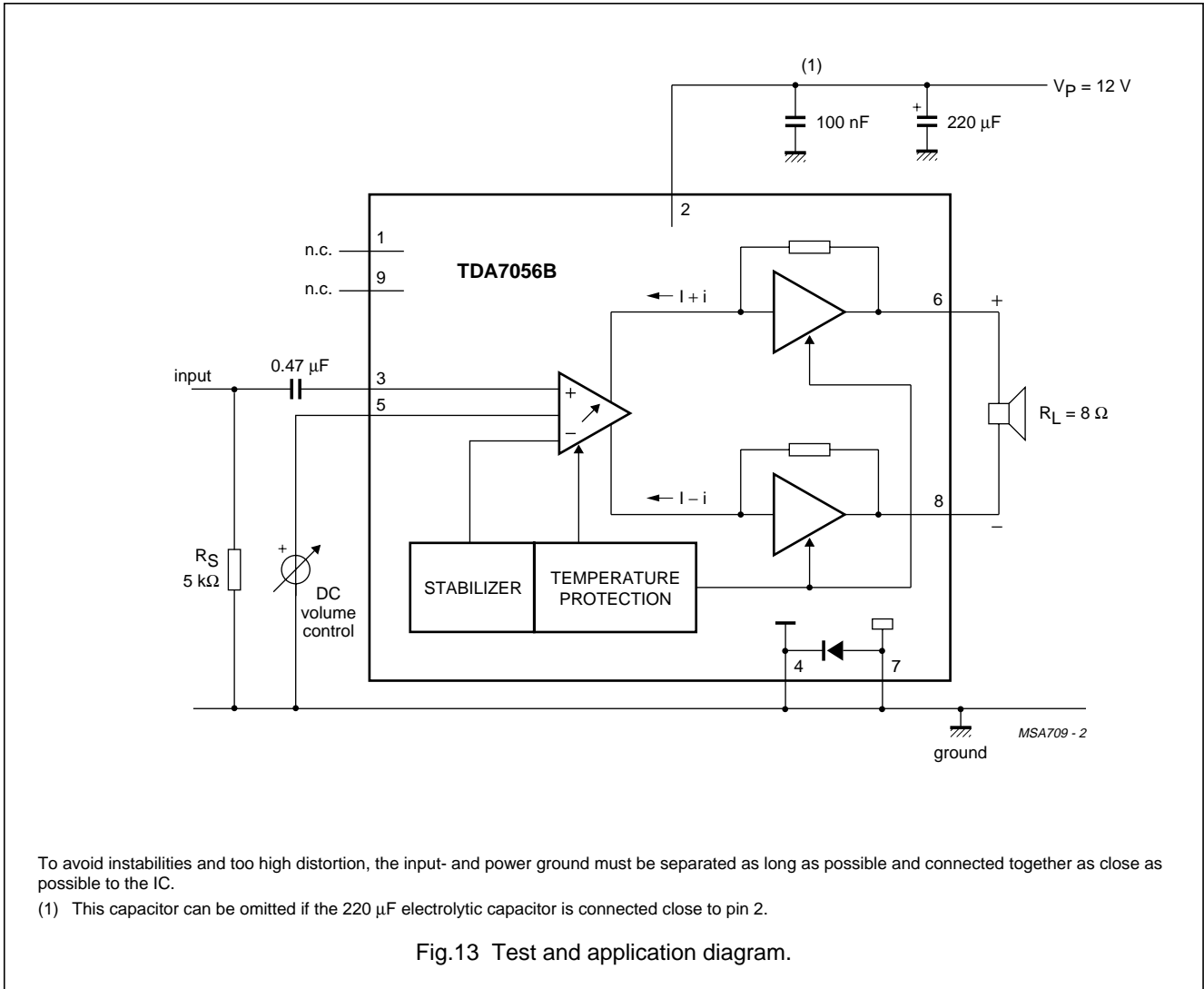




5 W mono BTL audio amplifier with DC volume control

TDA7056B

TEST AND APPLICATION INFORMATION



For single-end application the output peak current may not exceed 100 mA; at higher output currents the short circuit protection (MLC) will be activated.

# 5 W mono BTL audio amplifier with DC volume control

TDA7056B

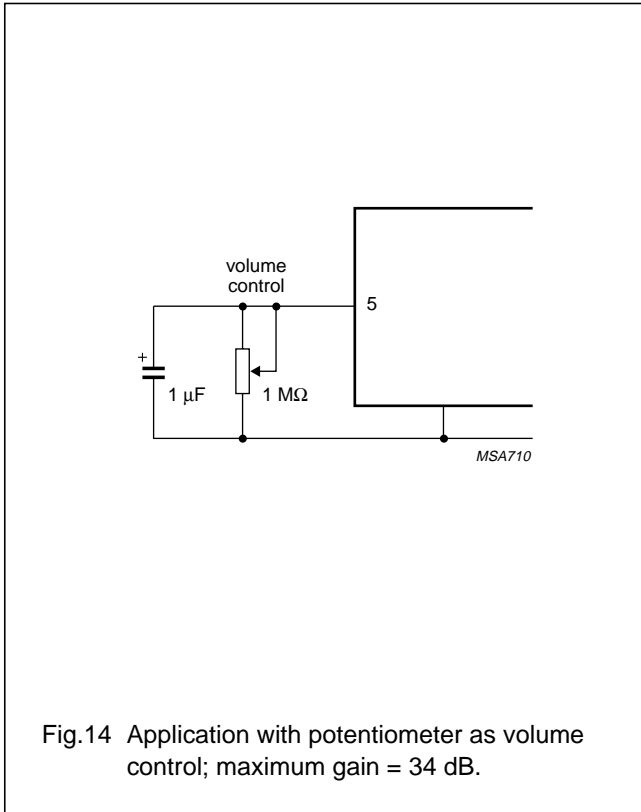


Fig.14 Application with potentiometer as volume control; maximum gain = 34 dB.

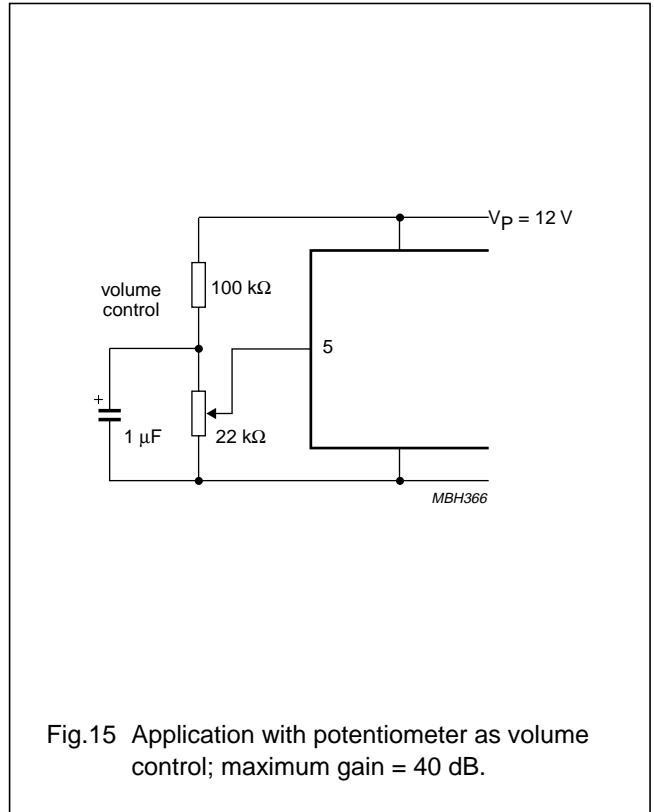


Fig.15 Application with potentiometer as volume control; maximum gain = 40 dB.

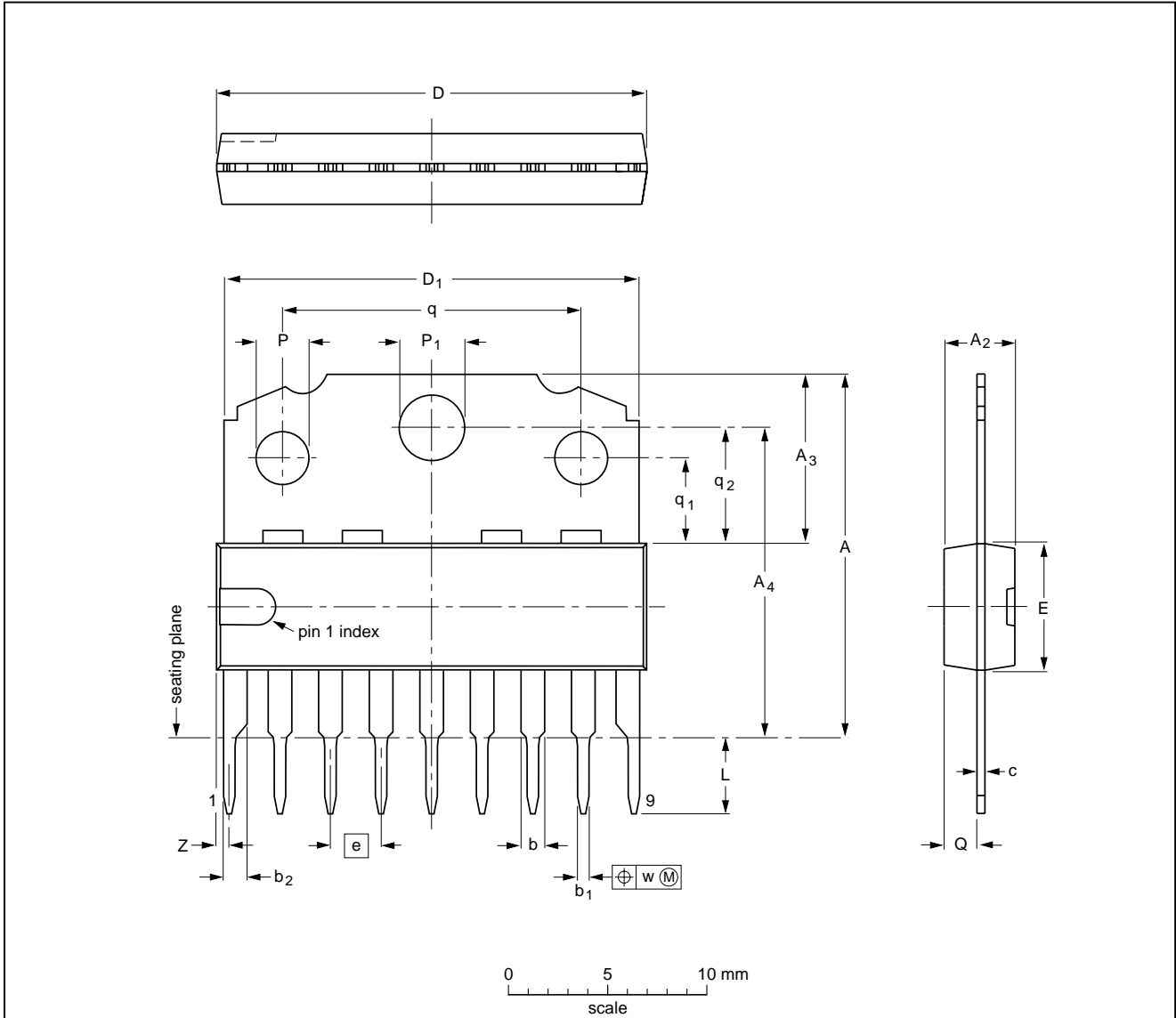
5 W mono BTL audio amplifier with DC volume control

TDA7056B

PACKAGE OUTLINE

SIL9MPF: plastic single in-line medium power package with fin; 9 leads

SOT110-1



DIMENSIONS (mm are the original dimensions)

UNIT	A	A <sub>2</sub> max.	A <sub>3</sub>	A <sub>4</sub>	b	b <sub>1</sub>	b <sub>2</sub>	c	D <sup>(1)</sup>	D <sub>1</sub>	E <sup>(1)</sup>	e	L	P	P <sub>1</sub>	Q	q	q <sub>1</sub>	q <sub>2</sub>	w	Z <sup>(1)</sup> max.
mm	18.5 17.8	3.7	8.7 8.0	15.8 15.4	1.40 1.14	0.67 0.50	1.40 1.14	0.48 0.38	21.8 21.4	21.4 20.7	6.48 6.20	2.54	3.9 3.4	2.75 2.50	3.4 3.2	1.75 1.55	15.1 14.9	4.4 4.2	5.9 5.7	0.25	1.0

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			
SOT110-1						92-11-17 95-02-25

## 5 W mono BTL audio amplifier with DC volume control

TDA7056B

### 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).

#### Soldering by dipping or by wave

The maximum permissible temperature of the solder is 260 °C; solder at this temperature must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds.

The device may be mounted up to the seating plane, but the temperature of the plastic body must not exceed the specified maximum storage temperature ( $T_{stg\ max}$ ). If the printed-circuit board has been pre-heated, forced cooling may be necessary immediately after soldering to keep the temperature within the permissible limit.

#### Repairing soldered joints

Apply a low voltage soldering iron (less than 24 V) to the lead(s) of the package, below the seating plane or not more than 2 mm above it. If the temperature of the soldering iron bit is less than 300 °C it may remain in contact for up to 10 seconds. If the bit temperature is between 300 and 400 °C, contact may be up to 5 seconds.

### 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.

---

5 W mono BTL audio amplifier with DC  
volume control

---

TDA7056B

**NOTES**

---

5 W mono BTL audio amplifier with DC  
volume control

---

TDA7056B

**NOTES**

---

5 W mono BTL audio amplifier with DC  
volume control

---

TDA7056B

**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. +43 160 1010,  
Fax. +43 160 101 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 0044

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

**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/ATHENS,  
Tel. +30 1 4894 339/239, Fax. +30 1 4814 240

**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:** see Singapore

**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,  
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. +7 095 755 6918, Fax. +7 095 755 6919

**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 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

**Uruguay:** see South America

**Vietnam:** see Singapore

**Yugoslavia:** PHILIPS, Trg N. Pasica 5/v, 11000 BEOGRAD,  
Tel. +381 11 625 344, 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>

© Philips Electronics N.V. 1997

SCA55

All rights are reserved. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner.

The information presented in this document does not form part of any quotation or contract, is believed to be accurate and reliable and may be changed without notice. No liability will be accepted by the publisher for any consequence of its use. Publication thereof does not convey nor imply any license under patent- or other industrial or intellectual property rights.

Printed in The Netherlands

547027/1200/03/pp16

Date of release: 1997 Aug 15

Document order number: 9397 750 02728

*Let's make things better.*

**Philips**  
Semiconductors



**PHILIPS**