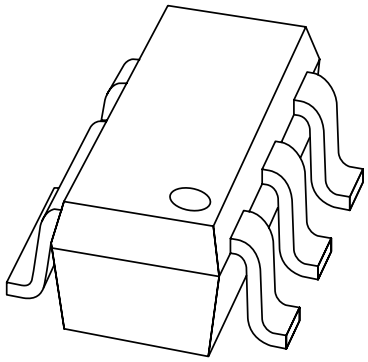
DATA SHEET



BGA2031
MMIC variable gain amplifier

Preliminary specification
Supersedes data of 1999 Feb 26

1999 Jul 23

Philips
Semiconductors

PHILIPS

MMIC variable gain amplifier BGA2031

FEATURES

- High gain
- Excellent adjacent channel power rejection
- Small SMD package
- Low dissipation.

APPLICATIONS

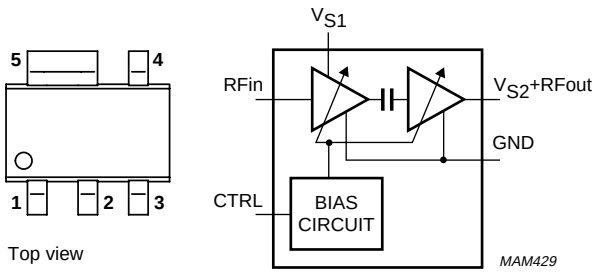
- General purpose variable gain amplifier for low voltage and medium power
- Driver for power amplifiers in systems that require good linearity, such as CDMA, both cellular band (850 MHz) and PCS (1.9 GHz). This is because of the high output power and good linearity.

DESCRIPTION

Silicon Monolitic Microwave Integrated Circuit (MMIC) 2 stage variable gain amplifier in double polysilicon technology in a 5-pin SOT551A plastic SMD package for low voltage medium power applications.

PINNING

PIN	DESCRIPTION
1	RF in
2	CTRL
3	V_{S1}
4	V_{S2} + RF out
5	GND



Marking code: G1.

Fig.1 Simplified outline (SOT551A) and symbol.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	TYP.	MAX.	UNIT
V_{S1}, V_{S2}	supply voltages		3.6	4.1	V
I_S	supply current into pin 3 + pin 4	V_{CTRL} = 0	0	–	µA
		V_{CTRL} = 2.7 V; V_S = 3.6 V	51	63	mA
		V_{CTRL} = 2.4 V; V_S = 3 V	30	37	mA
P_L	load power	at 1 dB gain compression point; f = 1.9 GHz	13.5	–	dBm
ACPR	adjacent channel power rejection	f = 1.9 GHz; P_L = 12 dBm	48	–	dBc
		f = 836 MHz; P_L = 8 dBm	55	–	dBc
G_p	power gain	f = 1.9 GHz; P_L = 12 dBm	26	–	dB
		f = 836 MHz; P_L = 8 dBm	27	–	dB
ΔG	gain control range	f = 836 MHz; P_L = 8 dBm	70	–	dB

LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_S	DC supply voltage		–	4.2	V
I_{CTRL}	control current	V_{CTRL} = 2.7 V; V_{S1} = 4.2 V; V_{S2} = 4.2 V	–	1.2	mA
I_{S1}	current into pin 3	V_{S1} = 4.2 V	–	27	mA
I_{S2}	current into pin 4	V_{S2} = 4.2 V	–	50	mA
P_D	drive power		–	tbf	dBm
P_{tot}	total power dissipation	$T_s \leq 90$ °C	–	280	mW
T_{stg}	storage temperature		–65	+150	°C
T_j	operating junction temperature		–	150	°C

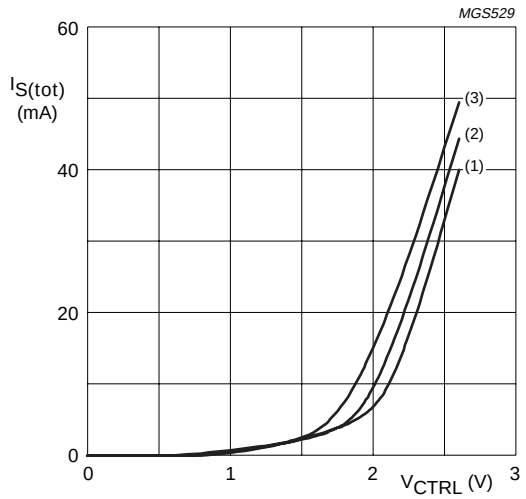
THERMAL RESISTANCE

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j\text{-}s}$	thermal resistance from junction to solder point	P_{tot} = 280 mW; $T_s \leq 90$ °C	215	K/W

CHARACTERISTICS

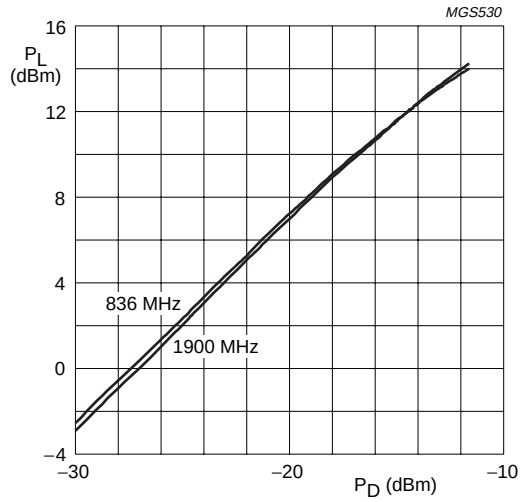
T_j = 25 °C; Z_S = Z_L = 50 Ω; V_S = 3.6 V; unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
f	frequency range		800	–	2500	MHz
V_{S1}, V_{S2}	supply voltages		2.7	3.6	4.1	V
I_S	supply current (in pin 3 + pin 4)	V_{CTRL} = 0	–	0	10	μA
		V_{CTRL} = 2.7 V; V_S = 3.6 V	39	51	63	mA
		V_{CTRL} = 2.4 V; V_S = 3 V	23	30	37	mA
I_{CTRL}	control current	V_{CTRL} = 2.7 V	0.7	0.92	1.1	mA
f = 1900 MHz						
f	frequency range		1850	–	1950	MHz
G_P	power gain	V_{CTRL} = 2.7 V; P_L = 12 dBm	–	26	–	dB
ΔG	gain control range	0 < V_{CTRL} < 2.7 V	–	61	–	dB
G_{CS}	gain control slope	middle of ΔG	–	38	–	dB/V
ACPR	adjacent channel power rejection	±1.23 MHz offset; BW_{ACP} = 30 kHz; $BW_{carrier}$ = 1.23 MHz; P_L = 10 dBm	–	48	–	dBc
		±1.98 MHz offset; BW_{ACP} = 30 kHz; $BW_{carrier}$ = 1.23 MHz; P_L = 10 dBm	–	67	–	dBc
P_L	load power	at 1 dB gain compression point	–	13.5	–	dBm
P_N	noise power	in CDMA receive band (1895 – 1955 MHz)	–	tbf	–	dBm/Hz
$VSWR_{IN}$	input VSWR	V_{CTRL} = 2.7 V	–	1:3.5	–	
$VSWR_{OUT}$	output VSWR	V_{CTRL} = 2.7 V	–	1:1.6	–	
f = 836 MHz						
f	frequency range		824	–	849	MHz
G_P	power gain	V_{CTRL} = 2.7 V; P_L = 8 dBm	–	27	–	dB
ΔG	gain control range	0 < V_{CTRL} < 2.7 V	–	70	–	dB
G_{CS}	gain control slope	middle of ΔG	–	40	–	dB/V
ACPR	adjacent channel power rejection	±885 kHz offset; BW_{ACP} = 30 kHz; $BW_{carrier}$ = 1.23 MHz; P_L = 8 dBm	–	55	–	dBc
		±1.98 MHz offset; BW_{ACP} = 30 kHz; $BW_{carrier}$ = 1.23 MHz; P_L = 8 dBm	–	69	–	dBc
P_L	load power	at 1 dB gain compression point	–	12	–	dBm
P_N	noise power	in CDMA receive band (869 to 894 MHz)	–	tbf	–	dBm/Hz
$VSWR_{IN}$	input VSWR	V_{CTRL} = 2.7 V	–	1:2	–	
$VSWR_{OUT}$	output VSWR	V_{CTRL} = 2.7 V	–	1:1.7	–	



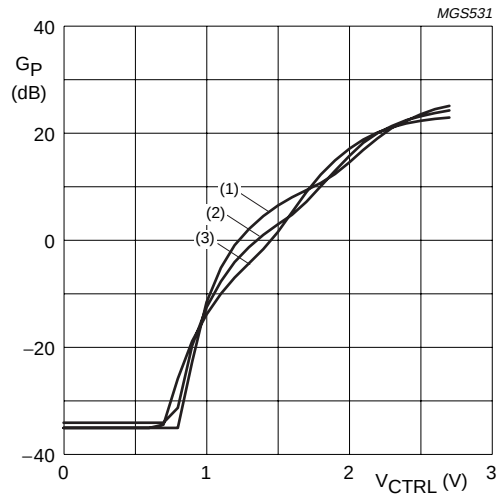
V_S = 3.6 V.
(1) T_{amb} = –30 °C.
(2) T_{amb} = 25 °C.
(3) T_{amb} = 85 °C.

Fig.2 Total supply current as a function of control voltage; typical values.



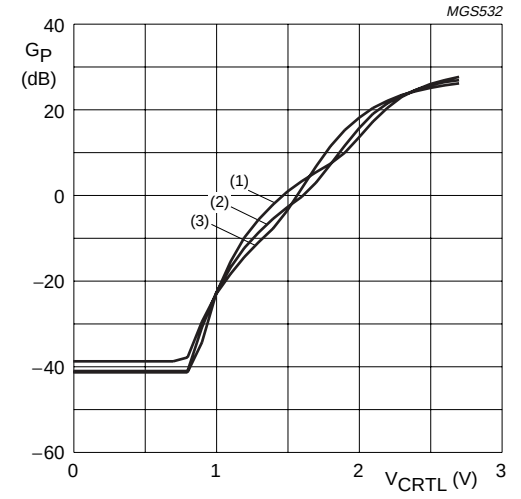
V_S = 3.6 V; V_C = 2.7 V.

Fig.3 Load power as a function of the drive power; typical values.



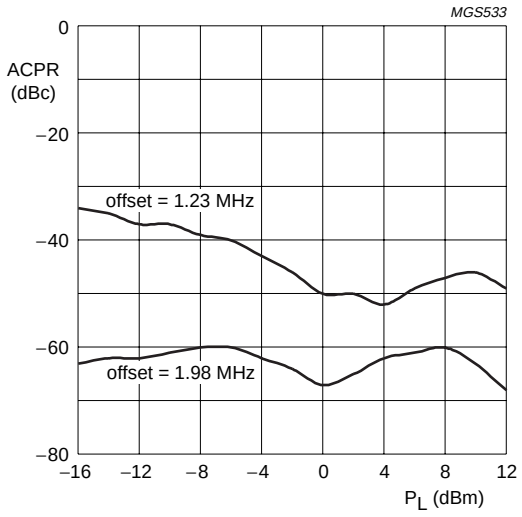
V_S = 3.6 V; f = 1.9 GHz.
(1) T_{amb} = –30 °C.
(2) T_{amb} = 25 °C.
(3) T_{amb} = 85 °C.

Fig.4 Power gain as a function of control voltage; typical values.



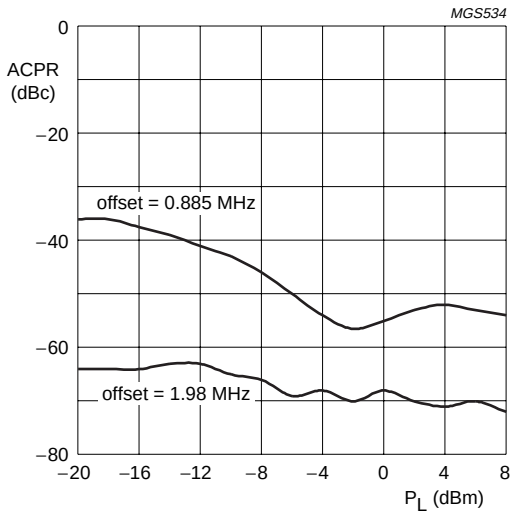
V_S = 3.6 V; f = 836 MHz.
(1) T_{amb} = –30 °C.
(2) T_{amb} = 25 °C.
(3) T_{amb} = 85 °C.

Fig.5 Power gain as a function of control voltage; typical values.



V_S = 3.6 V; f = 1.9 GHz; P_D = –13.5 dBm.

Fig.6 Adjacent channel power rejection as a function of the load power; typical values.



V_S = 3.6 V; f = 836 MHz; P_D = –19 dBm.

Fig.7 Adjacent channel power rejection as a function of the load power; typical values.

ELECTRICAL BLOCK DIAGRAM

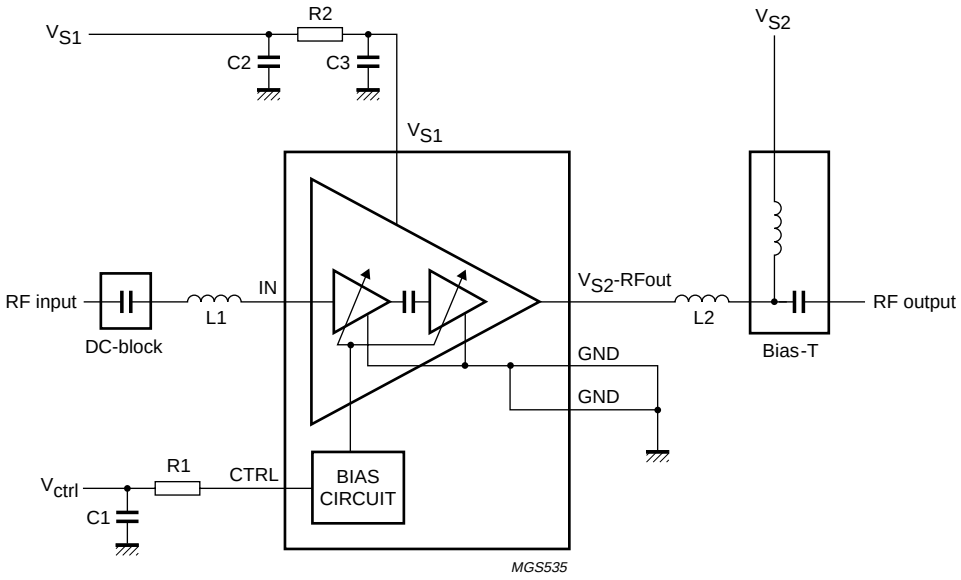


Fig.8 Test diagram.

List of components (see Fig.8)

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
C1	multilayer ceramic chip capacitor	10 nF	0603	tbf
C2	multilayer ceramic chip capacitor	22 nF	0603	tbf
C3	multilayer ceramic chip capacitor	1.5 nF	0603	tbf
L1, L2	stripline; note 1	50 Ω		tbf
R1	SMD resistor	22 Ω; 0.16 W	0603	tbf
R2	SMD resistor	2.4 Ω; 0.16 W	0603	tbf

Note

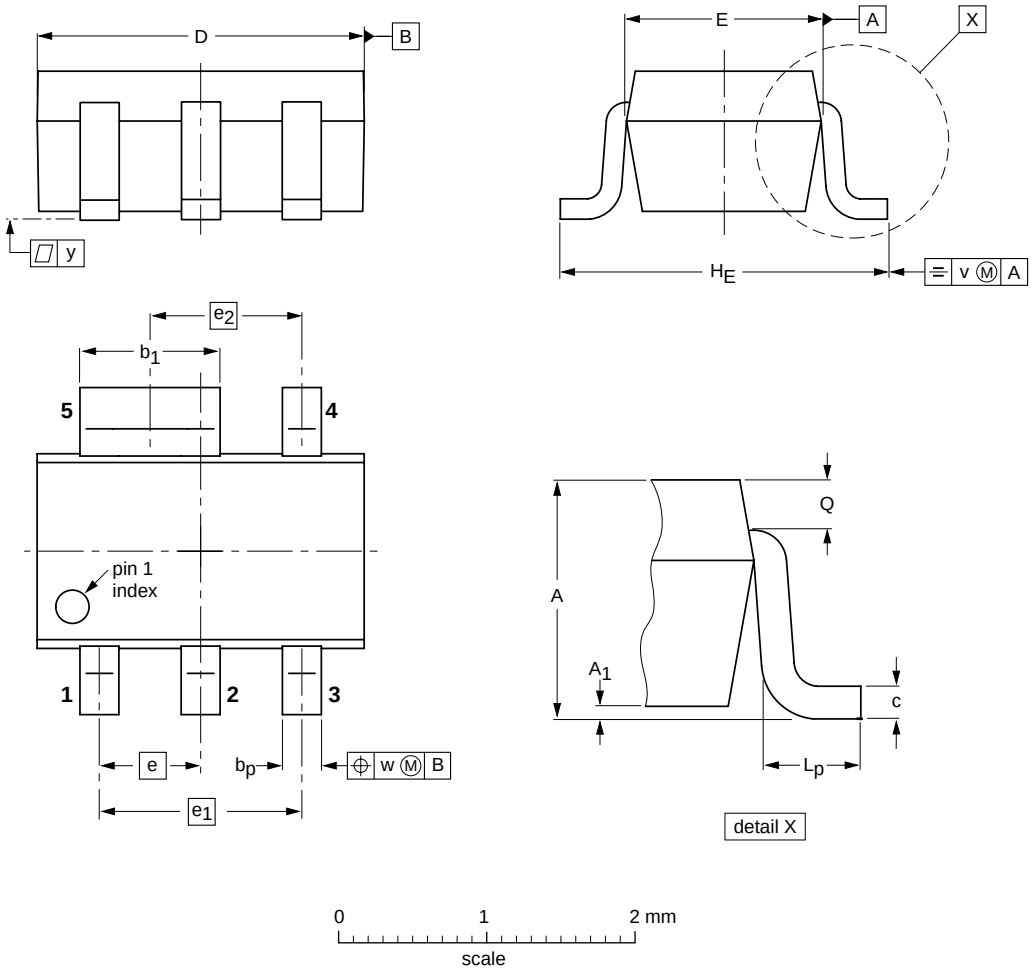
1. The striplines are on a gold plated double copper-clad printed-circuit board (ε_r = 6.15), board thickness = 0.64 mm, copper thickness = 35 μm, gold thickness = 5 μm.

PACKAGE OUTLINE

Plastic surface mounted package; 5 leads **SOT551A**

Package under development

Philips Semiconductors reserves the right to make changes without notice.



DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1 max	b_p	b_1	c	D	E	e	e_1	e_2	H_E	L_p	Q	v	w	y
mm	1.1 0.9	0.1	0.3 0.2	0.8 1.0	0.25 0.10	2.2 1.8	1.35 1.15	0.65	1.3	0.975	2.2 2.0	0.45 0.15	0.25 0.15	0.2	0.2	0.1

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT551A						1999-05-07

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: 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 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 125006/03/pp12 Date of release: 1999 Jul 23 Document order number: 9397 750 06072

Let's make things better.

Philips Semiconductors

PHILIPS