

# DATA SHEET

**MX0912B251Y**

**NPN microwave power transistor**

Product specification  
Supersedes data of November 1994

1997 Feb 19

# NPN microwave power transistor

# MX0912B251Y

### FEATURES

- Interdigitated structure; high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high VSWR
- Gold metallization realizes very stable characteristics and excellent lifetime
- Multicell geometry gives good balance of dissipated power and low thermal resistance
- Input and output matching cell allows an easier design of circuits.

### APPLICATIONS

Intended for use in common base class C broadband pulse power amplifier from 960 to 1215 MHz for TACAN application.

### DESCRIPTION

NPN silicon planar epitaxial microwave power transistor in a SOT439A metal ceramic flange package, with base connected to flange. It is mounted in common base configuration, and specified in class C.

### PINNING - SOT439A

PIN	DESCRIPTION
1	collector
2	emitter
3	base connected to flange

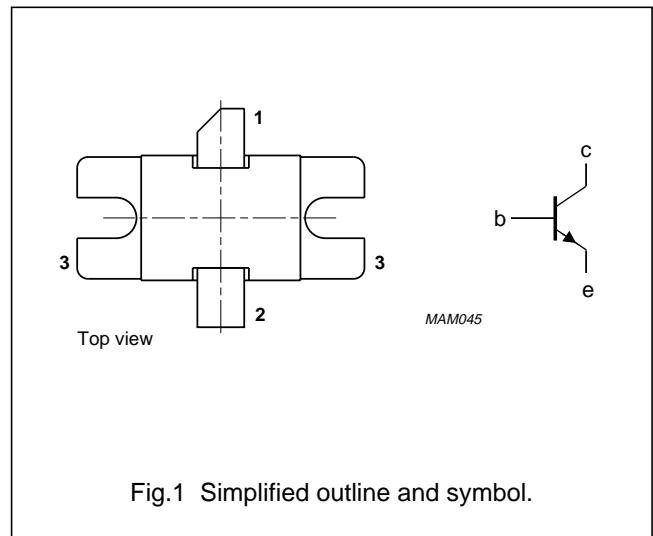


Fig.1 Simplified outline and symbol.

### QUICK REFERENCE DATA

Microwave performance up to  $T_{mb} = 25\text{ }^\circ\text{C}$  in a common base class C broadband amplifier.

MODE OF OPERATION	f (GHz)	V <sub>CC</sub> (V)	P <sub>L</sub> (W)	G <sub>po</sub> (dB)	η <sub>C</sub> (%)	Z <sub>i</sub> /Z <sub>L</sub> (Ω)
Class C t <sub>p</sub> = 10 μs; δ = 10%	0.960 to 1.215	50	>235	>7	>42	see Figs 7 and 8

### WARNING

#### Product and environmental safety - toxic materials

This product contains beryllium oxide. The product is entirely safe provided that the BeO slab is not damaged. All persons who handle, use or dispose of this product should be aware of its nature and of the necessary safety precautions. After use, dispose of as chemical or special waste according to the regulations applying at the location of the user. It must never be thrown out with the general or domestic waste.

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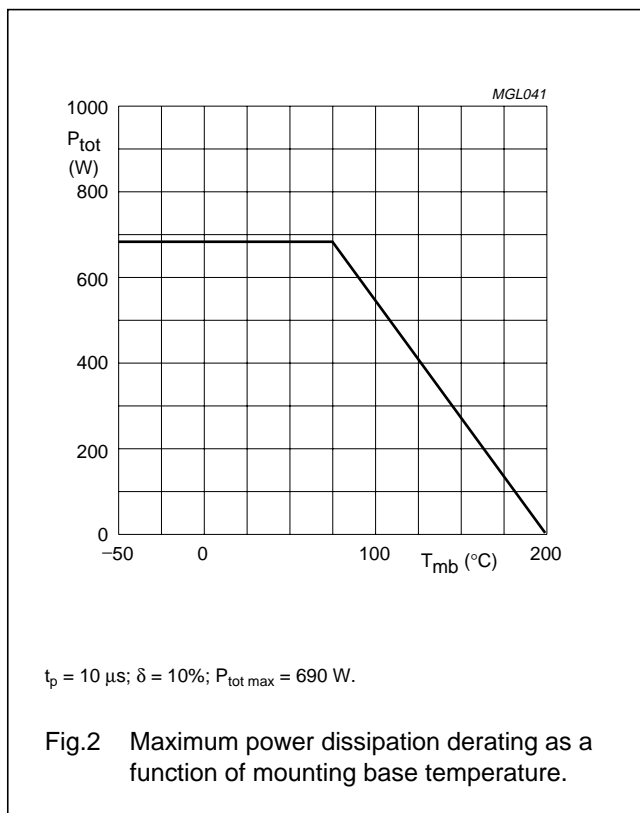
**LIMITING VALUES**

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V <sub>CBO</sub>	collector-base voltage	open emitter	–	65	V
V <sub>CES</sub>	collector-emitter voltage	R <sub>BE</sub> = 0 Ω	–	60	V
V <sub>CEO</sub>	collector-emitter voltage	open base	–	20	V
V <sub>EBO</sub>	emitter-base voltage	open collector	–	3	V
I <sub>C</sub>	collector current	t <sub>p</sub> ≤ 10 μs; δ ≤ 10%	–	15	A
P <sub>tot</sub>	total power dissipation (peak power)	T <sub>mb</sub> = 75 °C; t <sub>p</sub> ≤ 10 μs; δ ≤ 10%	–	690	W
T <sub>stg</sub>	storage temperature		–65	+200	°C
T <sub>j</sub>	operating junction temperature		–	200	°C
T <sub>slid</sub>	soldering temperature	t ≤ 10 s; note 1	–	235	°C

**Note**

- Up to 0.2 mm from ceramic.



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**THERMAL CHARACTERISTICS** $T_j = 125\text{ °C}$  unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MAX.	UNIT
$R_{th\ j-mb}$	thermal resistance from junction to mounting base	CW	1.9	K/W
$R_{th\ mb-h}$	thermal resistance from mounting base to heatsink	CW; note 1	0.2	K/W
$Z_{th\ j-h}$	thermal impedance from junction to heatsink	$t_p = 10\ \mu\text{s}$ ; $\delta = 10\%$ notes 1 and 2	0.28	K/W

**Notes**

- See "Mounting recommendations in the General part of handbook SC19a".
- Equivalent thermal impedance under nominal pulse microwave operating conditions.

**CHARACTERISTICS** $T_{mb} = 25\text{ °C}$  unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MAX.	UNIT
$I_{CBO}$	collector cut-off current	$V_{CB} = 65\text{ V}$ ; $I_E = 0$	100	mA
		$V_{CB} = 50\text{ V}$ ; $I_E = 0$	10	mA
$I_{CES}$	collector cut-off current	$V_{CE} = 60\text{ V}$ ; $R_{BE} = 0$	100	mA
$I_{EBO}$	emitter cut-off current	$V_{EB} = 1.5\text{ V}$ ; $I_C = 0$	1	mA

**APPLICATION INFORMATION**

Microwave performance up to  $T_{mb} = 25\text{ °C}$  measured in the test jig as shown in Fig.6 and working in class C broadband mode in pulse; note 1.

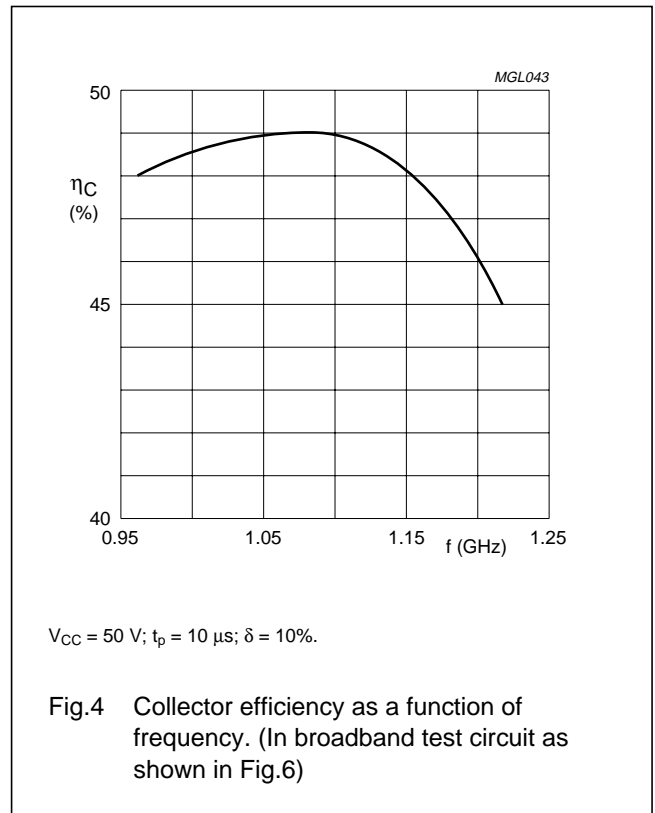
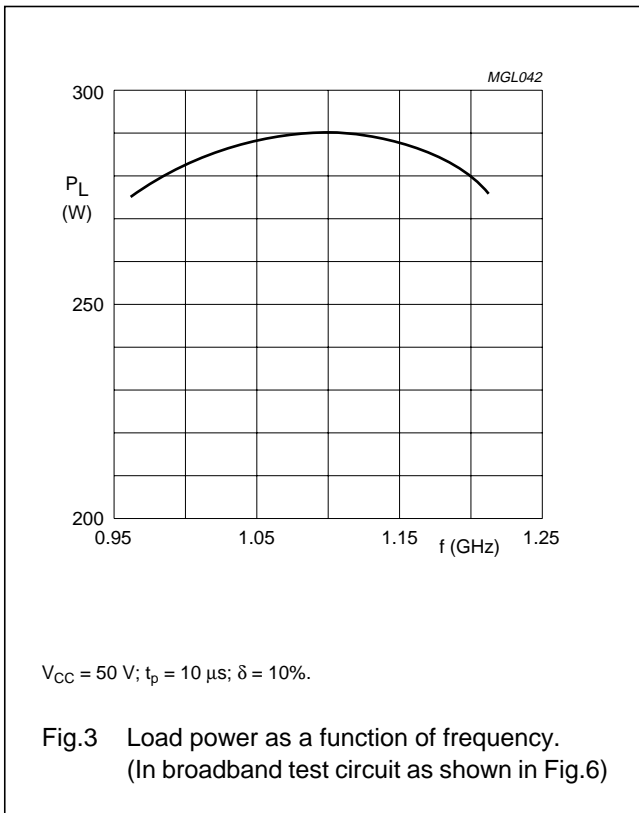
MODE OF OPERATION	f (GHz)	$V_{CC}$ (V) <sup>(2)</sup>	$P_L$ (W)	$G_{po}$ (dB)	$\eta_c$ (%)	$Z_i/Z_L$ ( $\Omega$ )
Class C; $t_p = 10\ \mu\text{s}$ ; $\delta = 10\%$	0.960 to 1.215	50	>235 typ. 275	>7 typ. 7.4	>42 typ. 47	see Figs 7 and 8
$t_p = 300\ \mu\text{s}$ ; $\delta = 10\%$ ; see Fig.5	1.03 to 1.09	50	typ. 280	typ. 8	typ. 48	

**Notes**

- Operating conditions and performance for other pulse formats can be made available on request.
- $V_{CC}$  during pulse.

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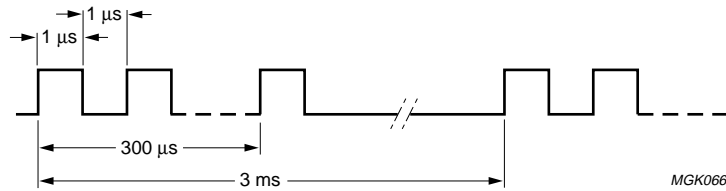


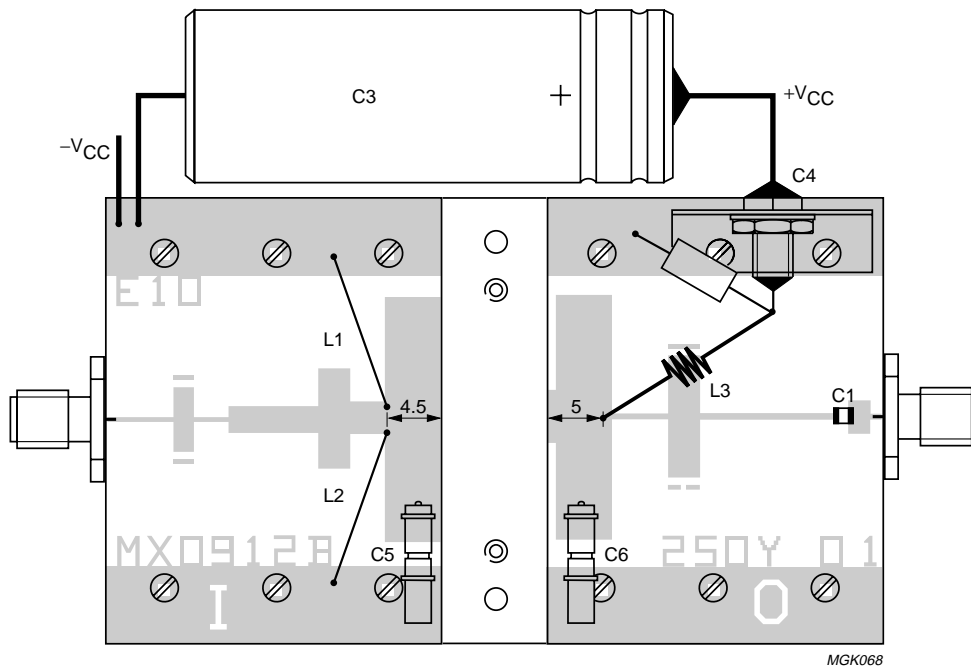
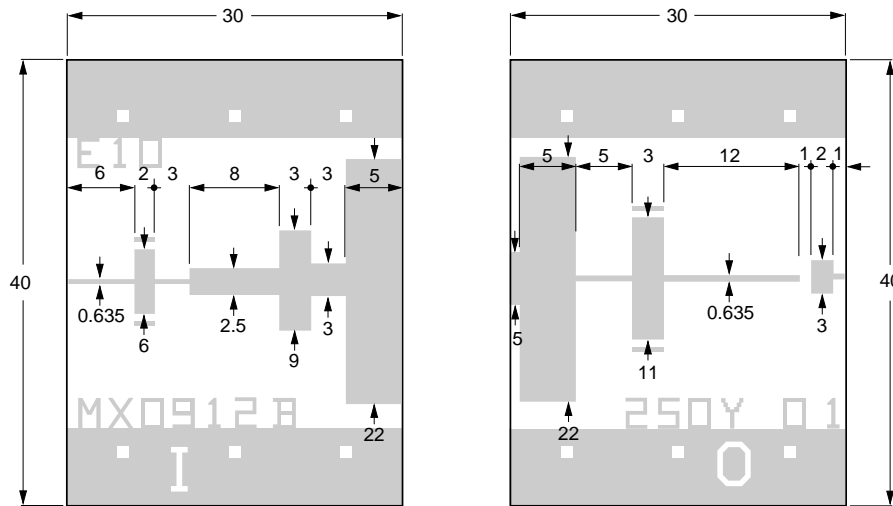
Fig.5 Pulse definition.

List of components

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
L1, L2	0.65 mm diameter copper wire	–	total length = 12 mm; height of loop = 9 mm	–
L3	4 turns 0.65 mm diameter copper wire	–	int. diameter 3 mm; L = 5 mm	–
C1	DC block	100 pF		ATC, ref. 100A101KP50X
C2	tantalum capacitor	10 μF; 50 V		
C3	electrolytic capacitor	470 μF; 63 V		
C4	feedthrough bypass capacitor			Erie, ref. 1250-003
C5, C6	variable gigatrim capacitor	0.8 to 8 pF		Tekelec, ref. 729.1

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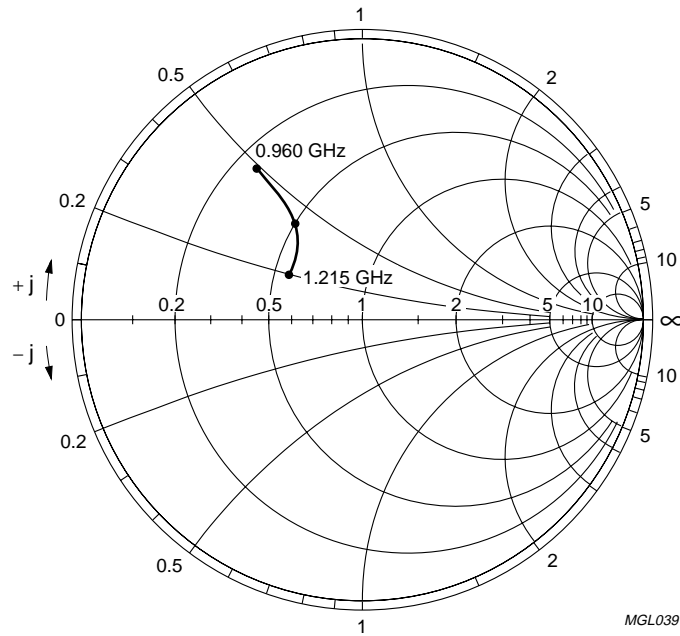


Dimensions in mm.  
 Substrate: Epsilam 10.  
 Thickness: 0.635 mm.  
 Permittivity:  $\epsilon_r = 10$ .

Fig.6 Broadband test circuit.

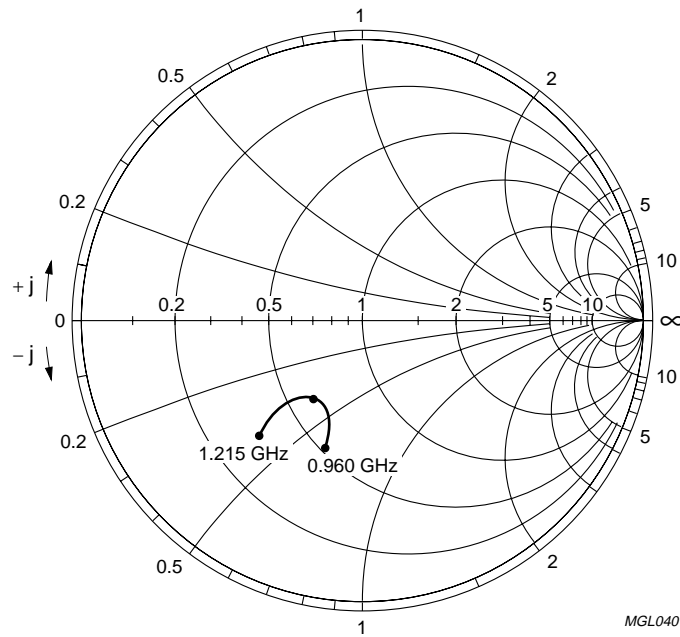
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$V_{CC} = 50\text{ V}; Z_o = 5\ \Omega; P_L = 235\text{ W}.$

Fig.7 Input impedance as a function of frequency associated with optimum load impedance.



$V_{CC} = 50\text{ V}; Z_o = 5\ \Omega; P_L = 235\text{ W}.$

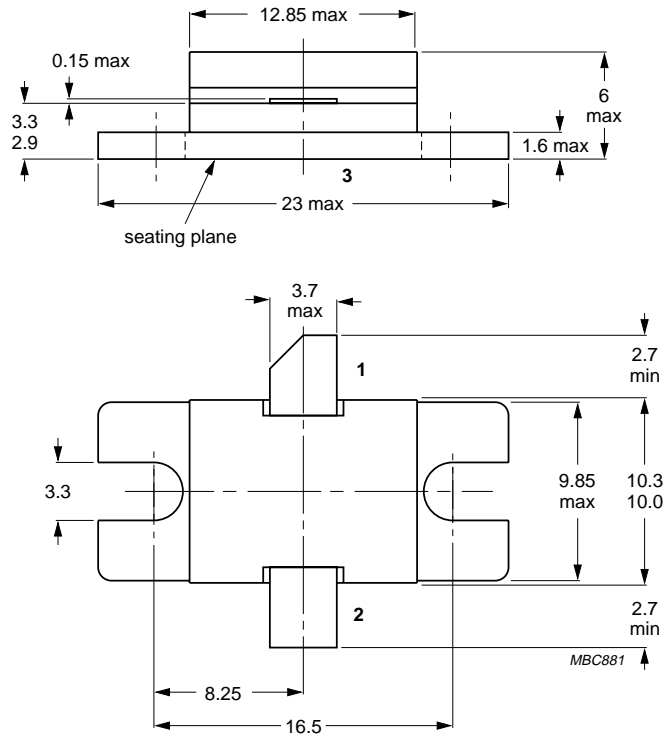
Fig.8 Optimum load impedance as a function of frequency associated with input impedance.



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PACKAGE OUTLINE



Dimensions in mm.  
 Torque on screws: max. 0.4 Nm.  
 Recommended screw: M3.  
 Recommended pitch for mounting screws: 19 mm.

Fig.9 SOT439A.

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**DEFINITIONS**

<b>Data sheet status</b>	
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.
<b>Limiting values</b>	
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.	
<b>Application information</b>	
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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**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

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Tel. +359 2 689 211, Fax. +359 2 689 102

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Tel. +1 800 234 7381

**China/Hong Kong:** 501 Hong Kong Industrial Technology Centre,  
72 Tat Chee Avenue, Kowloon Tong, HONG KONG,  
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**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 9 615800, Fax. +358 9 61580/xxx

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

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Tel. +65 350 2538, Fax. +65 251 6500

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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,  
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**Taiwan:** Philips Semiconductors, 6F, No. 96, Chien Kuo N. Rd., Sec. 1,  
TAIPEI, Taiwan Tel. +886 2 2134 2870, Fax. +886 2 2134 2874

**Thailand:** PHILIPS ELECTRONICS (THAILAND) Ltd.,  
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Tel. +66 2 745 4090, Fax. +66 2 398 0793

**Turkey:** Talatpasa Cad. No. 5, 80640 GÜLTEPE/ISTANBUL,  
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**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

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Tel. +381 11 625 344, Fax. +381 11 635 777

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