

# DATA SHEET

**MX1011B200Y**

**Microwave power transistor**

Product specification  
Supersedes data of January 1995

1997 Feb 18

# Microwave power transistor

# MX1011B200Y

### FEATURES

- Suitable for short and medium pulse applications up to 100  $\mu$ s pulse width, 10% duty factor
- Diffused emitter ballasting resistors improve ruggedness
- Interdigitated emitter-base structure provides high emitter efficiency
- Gold metallization with barrier realizes very stable characteristics and excellent lifetime
- Multicell geometry improves power sharing reduces thermal resistance
- Internal input and output prematching networks allow an easier design of circuits.

### APPLICATIONS

Intended for use in common base class C broadband pulsed power amplifiers for IFF, TCAS and Mode S applications in the 1030 MHz to 1090 MHz bandwidth. Also suitable for medium pulse, heavy duty operation within the 1030 MHz to 1150 MHz bandwidth.

### DESCRIPTION

NPN silicon planar epitaxial microwave power transistor in a SOT439A metal ceramic flange package, with base connected to flange.

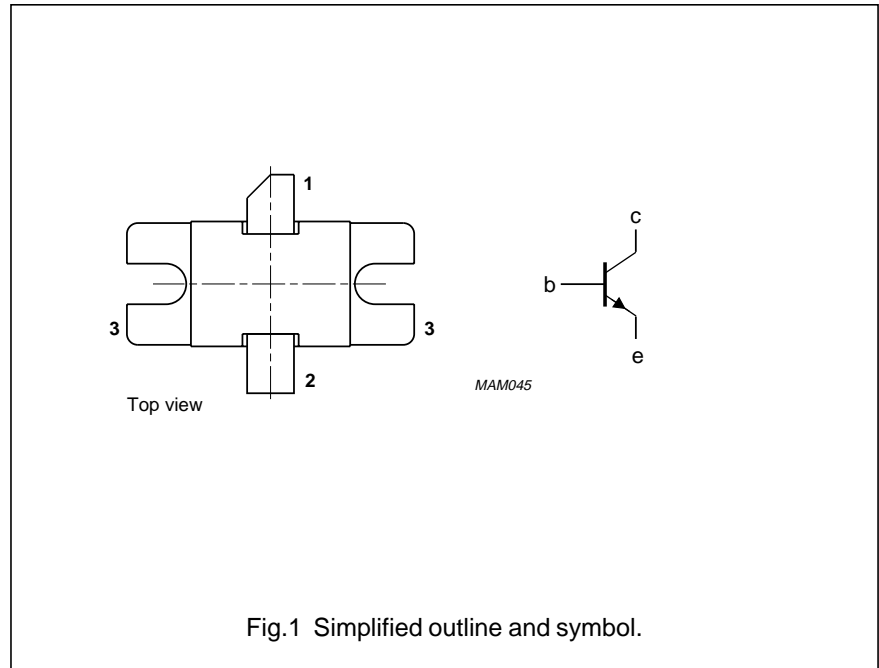
### QUICK REFERENCE DATA

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

| MODE OF OPERATION | CONDITIONS                                  | f (GHz) | V <sub>CC</sub> (V) | P <sub>L</sub> (W) | G <sub>p</sub> (dB) | $\eta_c$ (%) |
|-------------------|---|---------|---------------------|--------------------|---------------------|--------------|
| Class C           | $t_p = 10\text{ }\mu\text{s}; \delta = 1\%$ | 1.09    | 50                  | 200                | $\geq 7.5$          | $\geq 45$    |

### PINNING - SOT439A

| PIN | DESCRIPTION              |
|-----|--------------------------|
| 1   | collector                |
| 2   | emitter                  |
| 3   | base connected to flange |



### 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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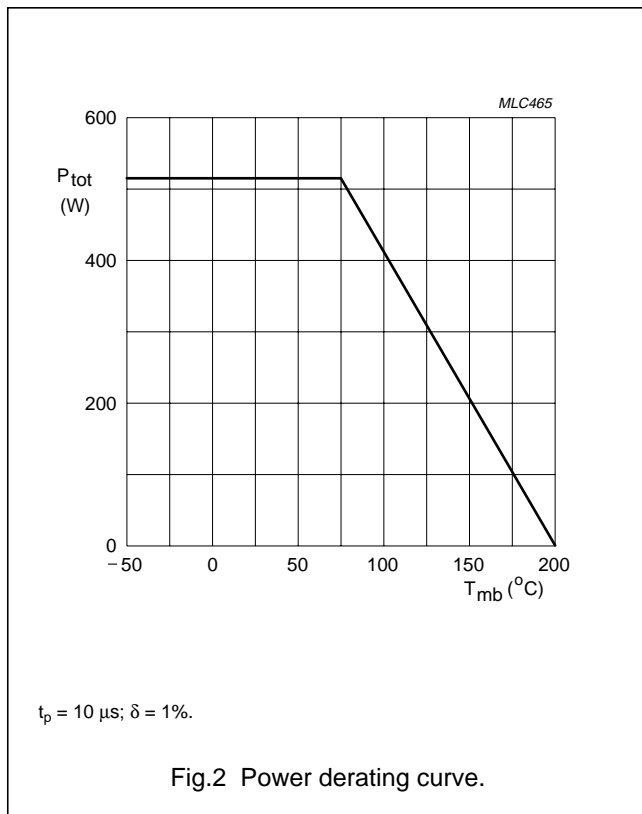
**LIMITING VALUES**

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

| SYMBOL    | PARAMETER                 | CONDITIONS   | MIN. | MAX. | UNIT             |
|-----------|---------------------------|--|------|------|------------------|
| $V_{CBO}$ | collector-base voltage    | open emitter   | –    | 65   | V                |
| $V_{CES}$ | collector-emitter voltage | $R_{BE} = 0$   | –    | 65   | V                |
| $V_{CEO}$ | collector-emitter voltage | open base  | –    | 15   | V                |
| $V_{EBO}$ | emitter-base voltage      | open collector   | –    | 3    | V                |
| $I_{CM}$  | peak collector current    | $t_p = 10 \mu s; \delta = 1\%$   | –    | 11.5 | A                |
| $P_{tot}$ | total power dissipation   | $T_{mb} < 75 \text{ }^\circ\text{C}; t_p \leq 10 \mu s; \delta \leq 1\%$ | –    | 515  | W                |
| $T_{stg}$ | storage temperature       |  | –65  | +200 | $^\circ\text{C}$ |
| $T_j$     | junction temperature      |  | –    | 200  | $^\circ\text{C}$ |
| $T_{sld}$ | soldering temperature     | $t \leq 10 \text{ s}; \text{note 1}$                                     | –    | 235  | $^\circ\text{C}$ |

**Note**

- Up to 0.2 mm from ceramic.



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## THERMAL CHARACTERISTICS

| SYMBOL         | PARAMETER   | CONDITIONS   | MAX. | UNIT |
|----------------|---|--|------|------|
| $R_{th\ j-mb}$ | thermal resistance from junction to mounting base | $T_j = 120\text{ °C}$                                    | 2.5  | K/W  |
| $R_{th\ mb-h}$ | thermal resistance from mounting base to heatsink | note 1   | 0.2  | K/W  |
| $Z_{th}$       | thermal impedance from junction to heatsink       | $t_p = 10\ \mu\text{s}; \delta = 1\%$ ;<br>notes 1 and 2 | 0.16 | K/W  |

## Notes

1. See "Mounting recommendations in the General part of handbook SC19a".
2. Equivalent thermal impedance under pulsed microwave operating conditions.

## CHARACTERISTICS

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

| SYMBOL        | PARAMETER                           | CONDITIONS                         | MAX. | UNIT |
|---------------|-------------------------------------|------------------------------------|------|------|
| $I_{CBO}$     | collector cut-off current           | $I_E = 0; V_{CB} = 50\text{ V}$    | 6    | mA   |
| $I_{CES}$     | collector cut-off current           | $V_{BE} = 0; V_{CE} = 50\text{ V}$ | 6    | mA   |
| $I_{EBO}$     | emitter cut-off current             | $I_C = 0; V_{EB} = 1.5\text{ V}$   | 1.5  | mA   |
| $V_{(BR)CBO}$ | collector-base breakdown voltage    | $I_C = 40\text{ mA}$               | 65   | V    |
| $V_{(BR)CES}$ | collector-emitter breakdown voltage | $I_C = 40\text{ mA}; V_{BE} = 0$   | 65   | V    |

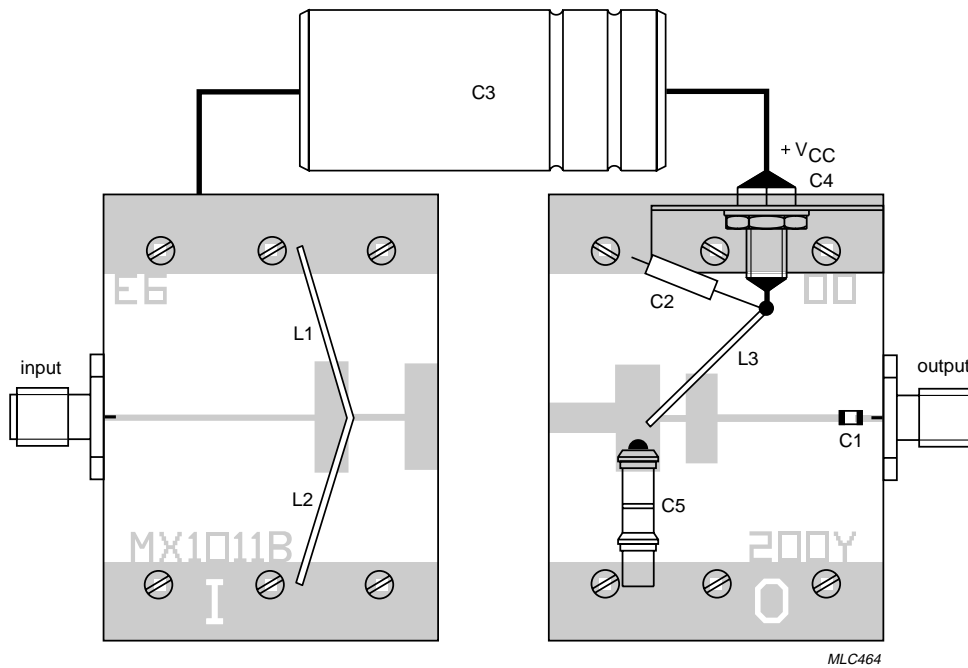
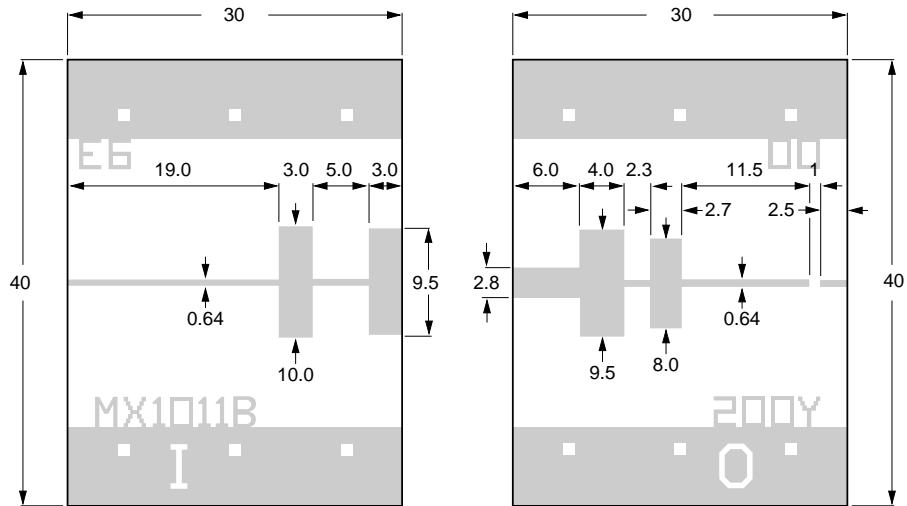
## APPLICATION INFORMATION

Microwave performance up to  $T_{mb} = 25\text{ °C}$  in a common-base test circuit as shown in Fig.3.

| MODE OF OPERATION | CONDITIONS                              | f (GHz)      | $V_{CC}$ (V) | $P_L$ (W)              | $G_p$ (dB)             | $\eta_c$ (%)         |
|-------------------|---|--------------|--------------|------------------------|------------------------|----------------------|
| Class C           | $t_p = 10\ \mu\text{s}; \delta = 1\%$   | 1.09         | 50           | $\geq 200$<br>typ. 220 | $\geq 7.5$<br>typ. 8.3 | $\geq 45$<br>typ. 52 |
|                   | $t_p = 0.5\ \mu\text{s}; \delta = 50\%$ | 1.03 to 1.09 | 50           | typ. 220               | typ. 7.5               | typ. 50              |
|                   | $t_p = 112\ \mu\text{s}; \delta = 1\%$  |              |              |                        |                        |                      |
|                   | $t_p = 6.6\ \mu\text{s}; \delta = 51\%$ | 1.03 to 1.15 | 50           | typ. 100               | typ. 6                 | typ. 35              |
|                   | $t_p = 3.3\ \mu\text{s}; \delta = 43\%$ |              |              |                        |                        |                      |
|                   | $t_p = 32\ \mu\text{s}; \delta = 1\%$   | 1.09         | 50           | typ. 210               | typ. 7.5               | typ. 47              |

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

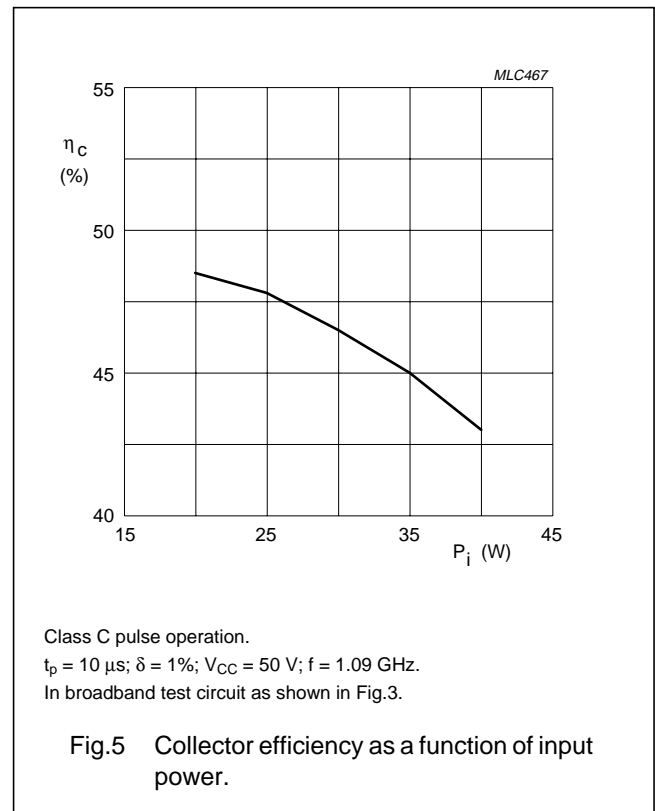
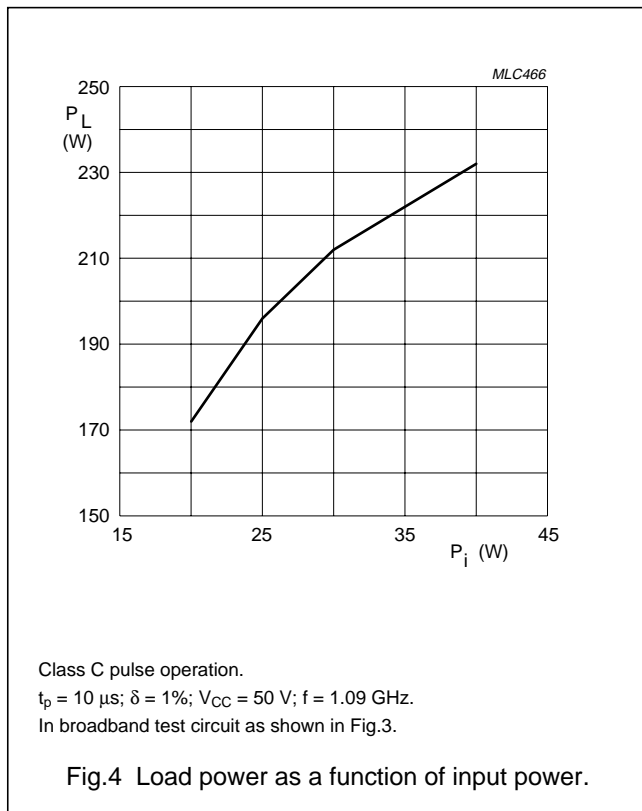
Fig.3 Broadband test circuit.

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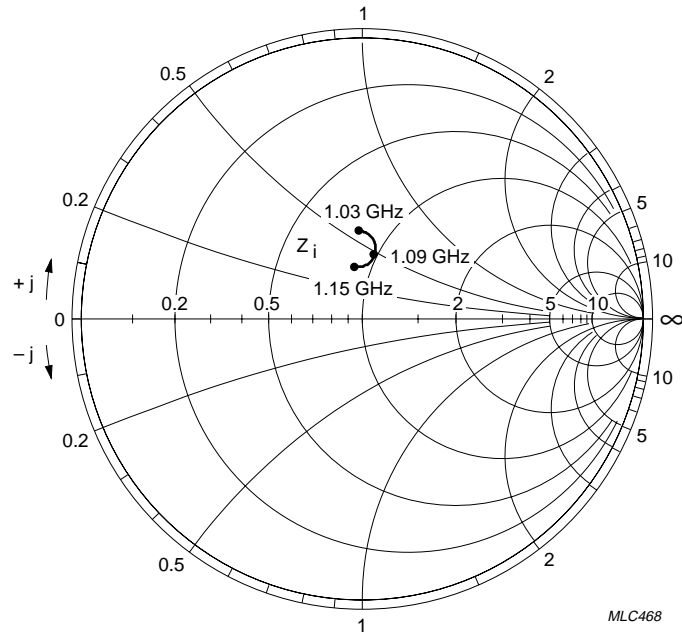
List of components (see Fig.3)

| COMPONENT | DESCRIPTION  | VALUE              | ORDERING INFORMATION |
|-----------|--|--------------------|----------------------|
| C1        | capacitor  | 100 pF             | ATC 100A101kp50x     |
| C2        | tantalum capacitor   | 10 $\mu$ F; 50 V   | –                    |
| C3        | electrolytic capacitor   | 63 V; 1000 $\mu$ F | –                    |
| C4        | feedthrough bypass capacitor   | –                  | Erie1250-003         |
| C5        | variable gigatrim capacitor  | 0.8 to 8 pF        | Tekelec 729-1        |
| L1, L2    | 0.65 mm copper wire; total length = 26 mm;<br>height of loop = 10 mm | –                  | –                    |
| L3        | 0.85 mm silver wire; total length = 30 mm;<br>height of loop = 15 mm | –                  | –                    |



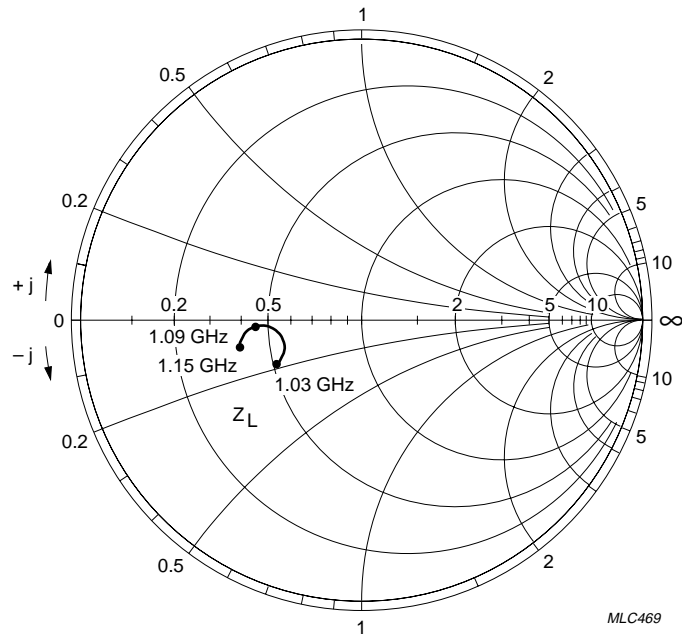
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$V_{CC} = 50 \text{ V}; Z_o = 10 \Omega; P_o = 240 \text{ W}.$

Fig.6 Input impedance as a function of frequency.



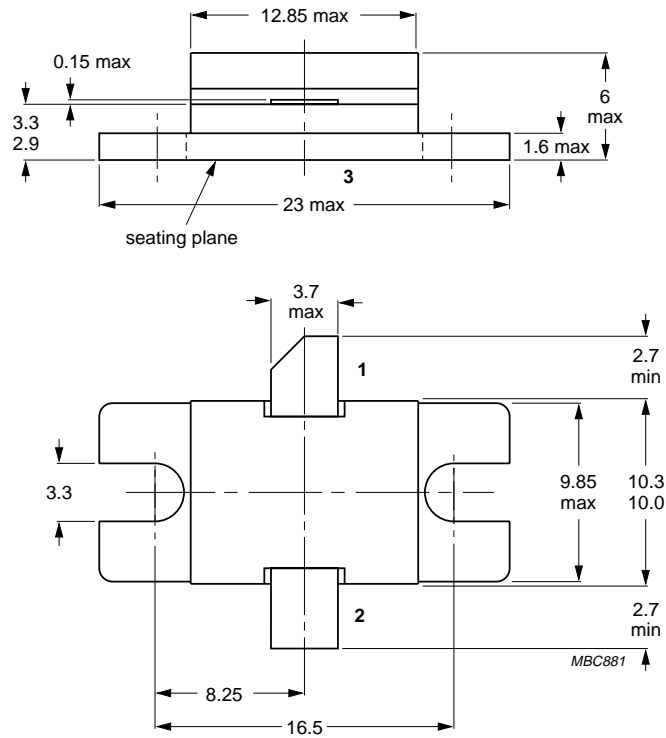
$V_{CC} = 50 \text{ V}; Z_o = 50 \Omega; P_o = 240 \text{ W}.$

Fig.7 Optimum load impedance as a function of frequency.

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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.8 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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**NOTES**

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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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**Czech Republic:** see Austria

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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,  
Tel. +48 22 612 2831, Fax. +48 22 612 2327

**Portugal:** see Spain

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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

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TAIPEI, Taiwan Tel. +886 2 2134 2870, Fax. +886 2 2134 2874

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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

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**Yugoslavia:** PHILIPS, Trg N. Pasica 5/v, 11000 BEOGRAD,  
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