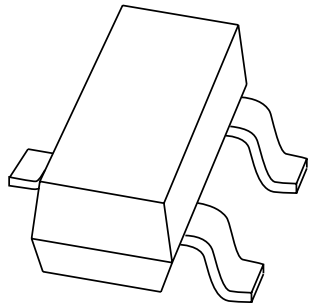


DATA SHEET



BSR12 PNP switching transistor

Product specification

1999 Jul 23

PNP switching transistor

BSR12

FEATURES

- Low current (max. 100 mA)
- Low voltage (max. 15 V).

APPLICATIONS

- High-speed, saturated switching applications for industrial service in thick and thin-film circuits.

DESCRIPTION

PNP switching transistor in a SOT23 plastic package.

PINNING

PIN	DESCRIPTION
1	base
2	emitter
3	collector

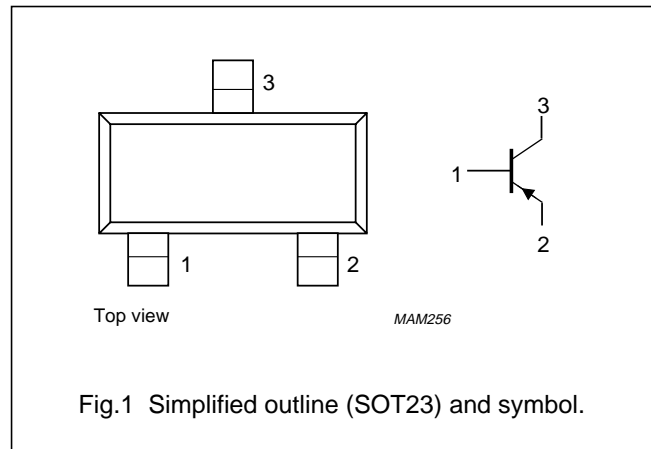


Fig.1 Simplified outline (SOT23) and symbol.

MARKING

TYPE NUMBER	MARKING CODE
BSR12	B5p

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	–	–15	V
V_{CEO}	collector-emitter voltage	open base	–	–15	V
I_{CM}	peak collector current		–	–200	mA
P_{tot}	total power dissipation	$T_{amb} \leq 25\text{ }^{\circ}\text{C}$	–	250	mW
T_j	junction temperature		–	150	$^{\circ}\text{C}$
h_{FE}	DC current gain	$I_C = -10\text{ mA}; V_{CE} = -1\text{ V}$	30	–	
		$I_C = -50\text{ mA}; V_{CE} = -1\text{ V}$	30	120	
f_T	transition frequency	$f = 500\text{ MHz}; I_C = -50\text{ mA}; V_{CE} = -10\text{ V}$	1.5	–	GHz
t_{off}	turn-off time	$I_{Con} = -30\text{ mA}; I_{Bon} = -3\text{ mA}; I_{Boff} = 3\text{ mA}$	–	30	ns

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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	–	–15	V
V_{CEO}	collector-emitter voltage	open base	–	–15	V
V_{EBO}	emitter-base voltage	open collector	–	–3	V
I_C	collector current (DC)		–	–100	mA
I_{CM}	peak collector current		–	–200	mA
P_{tot}	total power dissipation	$T_{amb} \leq 25\text{ °C}$	–	250	mW
T_{stg}	storage temperature		–65	+150	°C
T_j	junction temperature		–	150	°C

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j-a}$	thermal resistance from junction to ambient	note 1	500	K/W

Note

1. Transistor mounted on a ceramic substrate $8 \times 10 \times 0.7$ mm.

PNP switching transistor

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CHARACTERISTICS

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

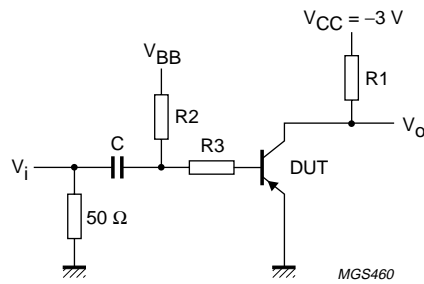
SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{CBO}	collector cut-off current	$I_E = 0; V_{CB} = -10\text{ V}$	–	–	–50	nA
		$I_E = 0; V_{CB} = -10\text{ V}; T_{amb} = 125\text{ °C}$	–	–	–5	μA
I_{CES}	collector cut-off current	$V_{BE} = 0; V_{CE} = -10\text{ V}$	–	–	–50	nA
$V_{(BR)CBO}$	breakdown voltage	$I_E = 0; I_C = -10\text{ }\mu\text{A}$	–15	–	–	V
$V_{(BR)CES}$	breakdown voltage	$V_{BE} = 0; I_C = -10\text{ }\mu\text{A}$	–15	–	–	V
$V_{(BR)EBO}$	breakdown voltage	$I_C = 0; I_E = -100\text{ }\mu\text{A}$	–3	–	–	V
$V_{CEOsust}$	collector-emitter sustaining voltage	$I_B = 0; I_C = -10\text{ mA}$	–15	–	–	V
V_{CEsat}	collector-emitter saturation voltage	$I_C = -10\text{ mA}; I_B = -1\text{ mA}; \text{note 1}$	–	–	–130	mV
		$I_C = -50\text{ mA}; I_B = -5\text{ mA}; \text{note 1}$	–	–180	–270	mV
		$I_C = -100\text{ mA}; I_B = -10\text{ mA}; \text{note 1}$	–	–	–450	mV
V_{BEsat}	base-emitter saturation voltage	$I_C = -10\text{ mA}; I_B = -1\text{ mA}; \text{note 1}$	–725	–	–920	mV
		$I_C = -50\text{ mA}; I_B = -5\text{ mA}; \text{note 1}$	–800	–	–1150	mV
		$I_C = -100\text{ mA}; I_B = -10\text{ mA}; \text{note 1}$	–900	–	–1500	mV
h_{FE}	DC current gain	$I_C = -1\text{ mA}; V_{CE} = -1\text{ V}; \text{note 1}$	30	–	–	
		$I_C = -10\text{ mA}; V_{CE} = -1\text{ V}; \text{note 1}$	30	–	–	
		$I_C = -50\text{ mA}; V_{CE} = -1\text{ V}; \text{note 1}$	30	–	120	
		$I_C = -50\text{ mA}; V_{CE} = -1\text{ V}; T_{amb} = 55\text{ °C}; \text{note 1}$	30	–	–	
		$I_C = -100\text{ mA}; V_{CE} = -1\text{ V}; \text{note 1}$	20	–	–	
f_T	transition frequency	$I_C = -50\text{ mA}; V_{CE} = -10\text{ V}; f = 500\text{ MHz}$	1.5	–	–	GHz
C_c	collector capacitance	$I_E = I_e = 0; V_{CB} = -5\text{ V}$	–	–	4.5	pF
C_e	emitter capacitance	$I_C = I_c = 0; V_{EB} = -0.5\text{ V}$	–	–	6	pF
Switching time (see Fig.2)						
t_{on}	turn-on time	$V_i = -6.85\text{ V}; V_{BB} = 0\text{ V}; I_{Con} = -30\text{ mA}; I_{Bon} = -3.0\text{ mA}$	–	–	20	ns
t_{off}	turn-off time	$V_i = 11.7\text{ V}; V_{BB} = -9.85\text{ V}; I_{Con} = -30\text{ mA}; I_{Bon} = -3\text{ mA}; I_{Boff} = 3\text{ mA}$	–	–	30	ns

Note

1. Pulse test: $t_p = 300\text{ }\mu\text{s}; \delta = 0.01$.

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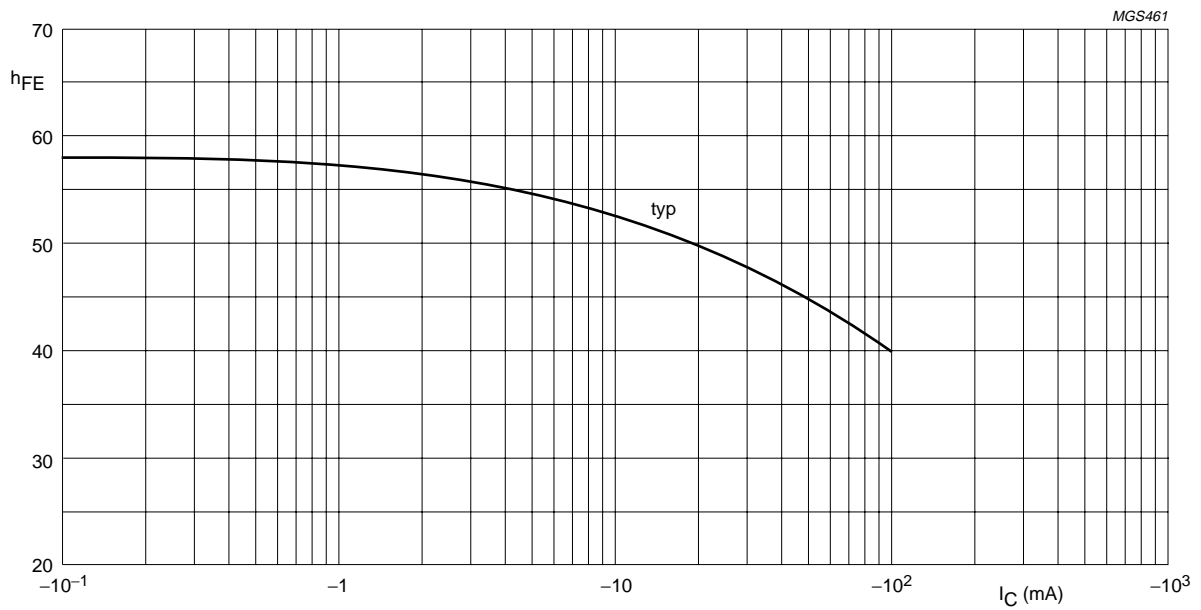


$R1 = 94 \Omega$; $R2 = 1 \text{ k}\Omega$; $R3 = 2 \text{ k}\Omega$; $C = 0.1 \mu\text{F}$.

Pulse generator: Pulse duration $t_p = 400 \text{ ns}$. Rise time $t_r < 1 \text{ ns}$. Output impedance $Z_o = 50 \Omega$.

Sampling scope: Rise time $t_r < 1 \text{ ns}$. Input impedance $Z_i = 100 \text{ k}\Omega$.

Fig.2 Test circuit for switching times.

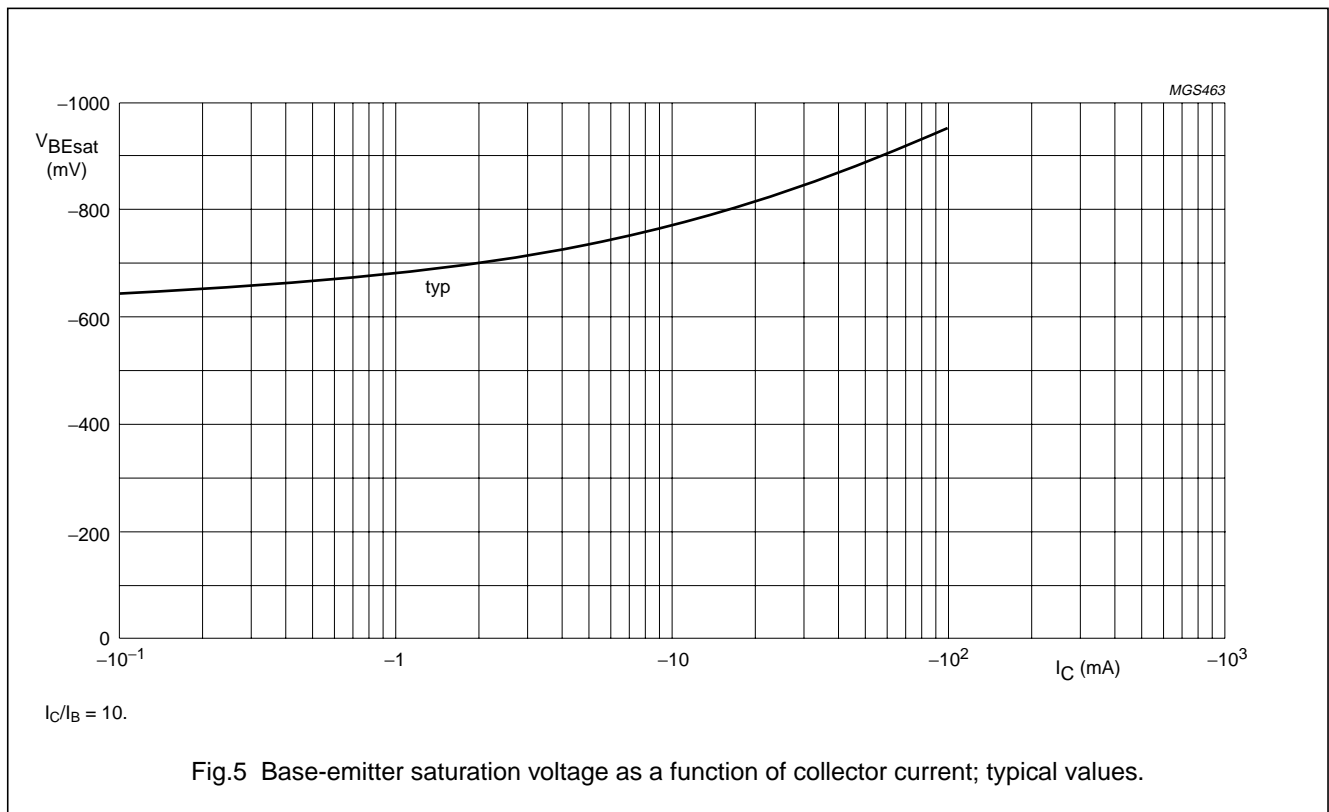
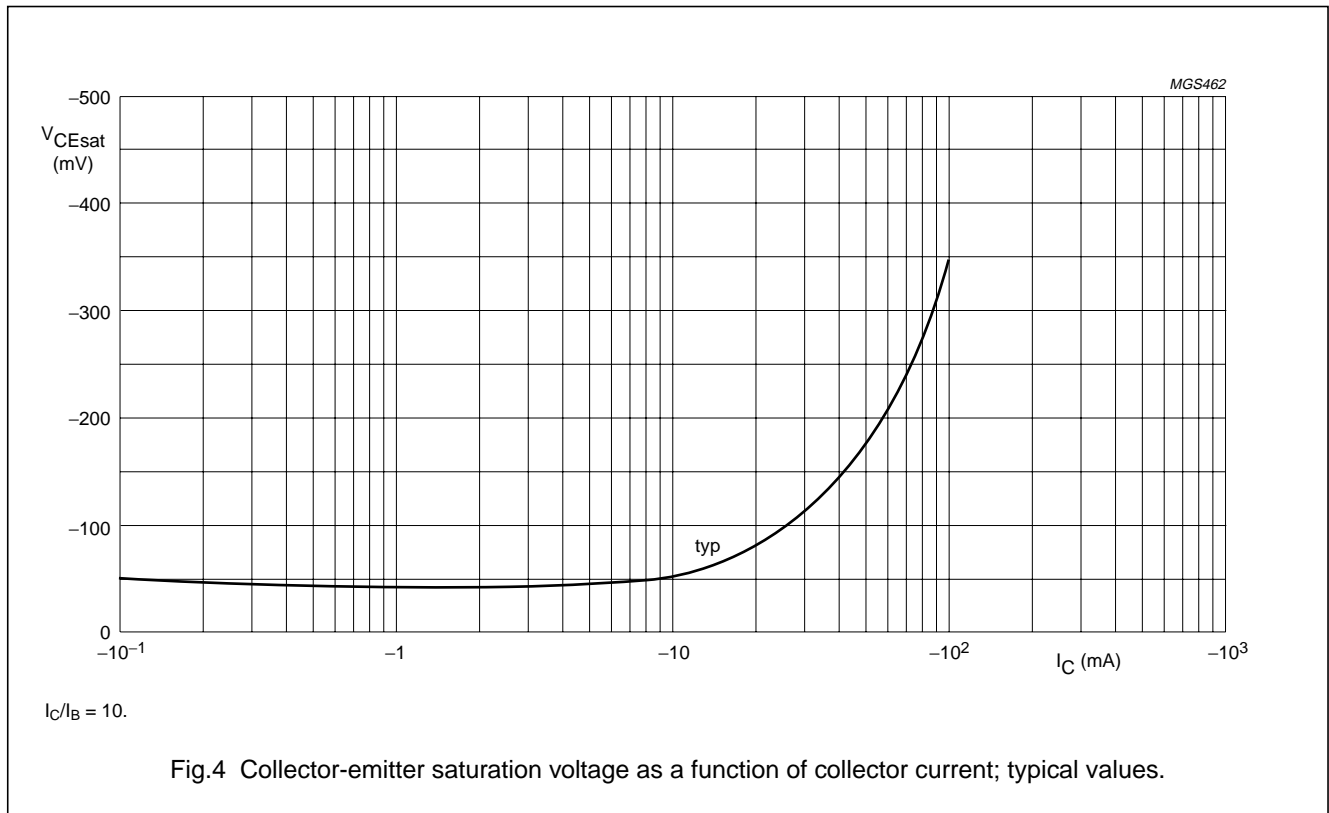


$V_{CE} = -1 \text{ V}$; $T_{amb} = 25^\circ\text{C}$.

Fig.3 DC current gain; typical values.

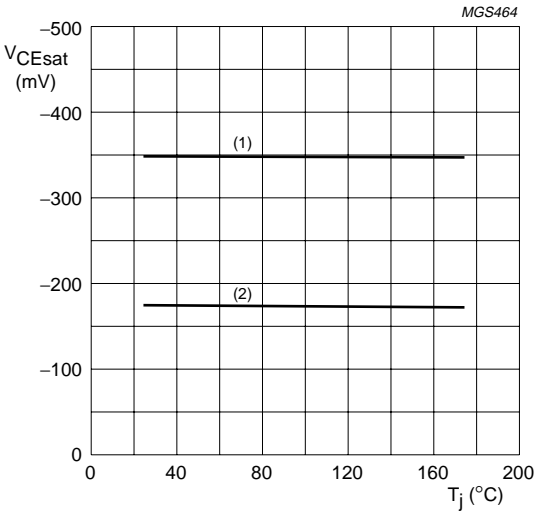
PNP switching transistor

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PNP switching transistor

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- (1) I_C = 100 mA; I_B = 10 mA
- (2) I_C = 50 mA and I_B = 5 mA.

Fig.6 Collector-emitter saturation voltage as a function of junction temperature; typical values.

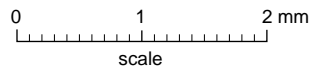
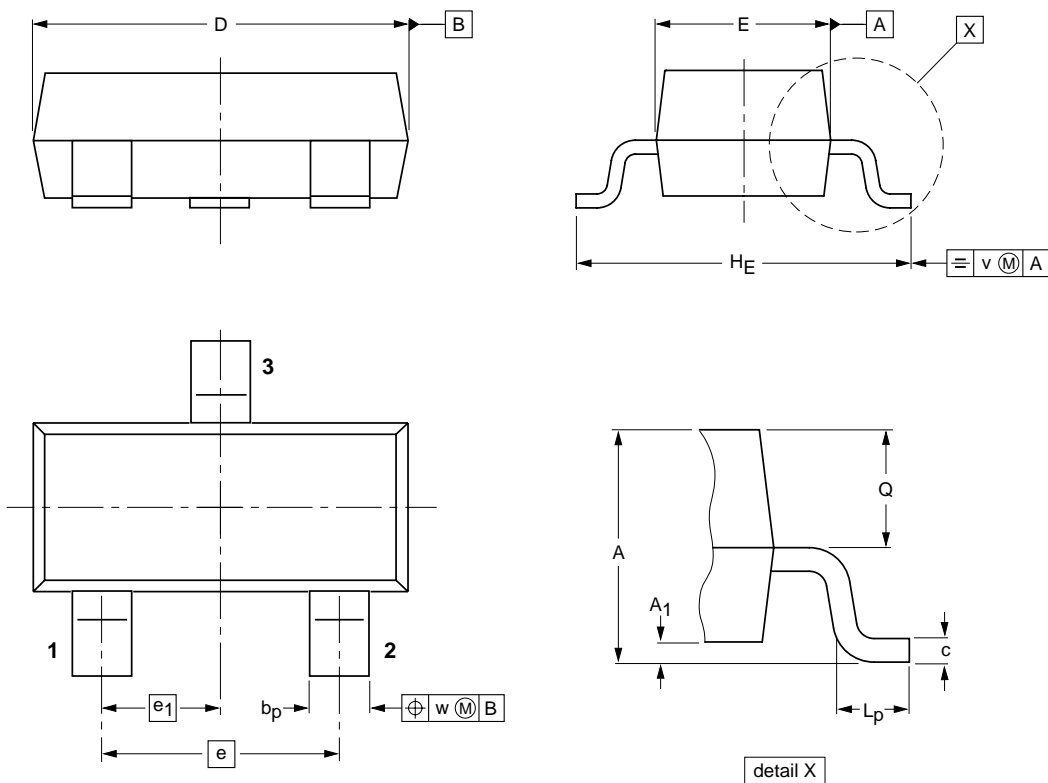
PNP switching transistor

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PACKAGE OUTLINE

Plastic surface mounted package; 3 leads

SOT23



DIMENSIONS (mm are the original dimensions)

UNIT	A	A ₁ max.	b _p	c	D	E	e	e ₁	H _E	L _p	Q	v	w
mm	1.1 0.9	0.1	0.48 0.38	0.15 0.09	3.0 2.8	1.4 1.2	1.9	0.95	2.5 2.1	0.45 0.15	0.55 0.45	0.2	0.1

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT23						97-02-28

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DEFINITIONS

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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	
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NOTES

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Argentina: see South America

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Austria: Computerstr. 6, A-1101 WIEN, P.O. Box 213,
Tel. +43 1 60 101 1248, Fax. +43 1 60 101 1210

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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,
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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,
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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,
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Middle East: see Italy

Netherlands: Postbus 90050, 5600 PB EINDHOVEN, Bldg. VB,
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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,
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Philippines: Philips Semiconductors Philippines Inc.,
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04547-130 SÃO PAULO, SP, Brazil,
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