
2SC5246

Silicon NPN Epitaxial

HITACHI

ADE-208-264
1st. Edition

Application

VHF / UHF wide band amplifier

Features

- High gain bandwidth product
 $f_T = 12 \text{ GHz typ}$
- High gain, low noise figure
 $PG = 16.5 \text{ dB typ, NF} = 1.6 \text{ dB typ at } f = 900 \text{ MHz}$

Outline

SMPAK



1. Emitter
2. Base
3. Collector

2SC5246

Absolute Maximum Ratings (Ta = 25°C)

Item	Symbol	Ratings	Unit
Collector to base voltage	V_{CBO}	15	V
Collector to emitter voltage	V_{CEO}	8	V
Emitter to base voltage	V_{EBO}	1.5	V
Collector current	I_C	20	mA
Collector power dissipation	P_C	80	mW
Junction temperature	T_j	150	°C
Storage temperature	T_{stg}	-55 to +150	°C

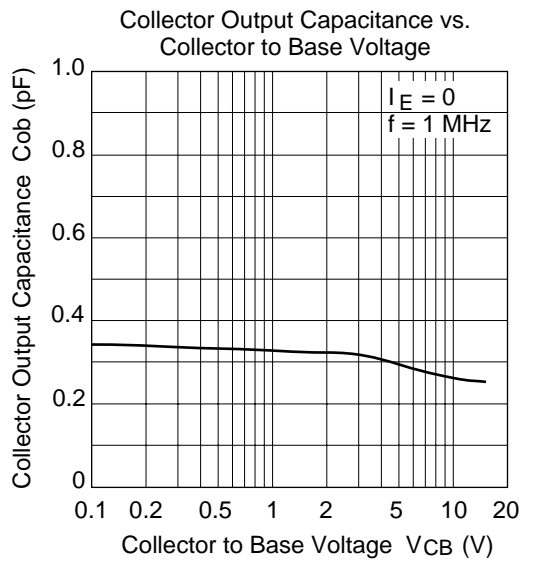
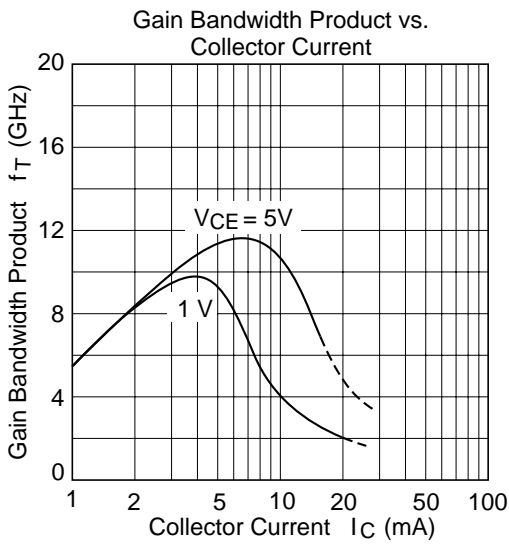
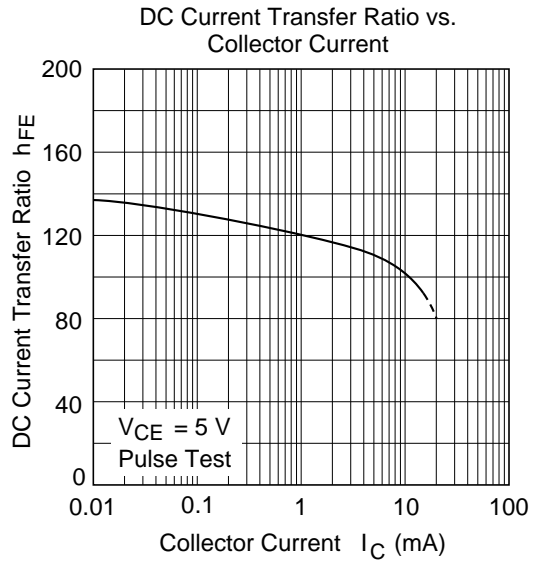
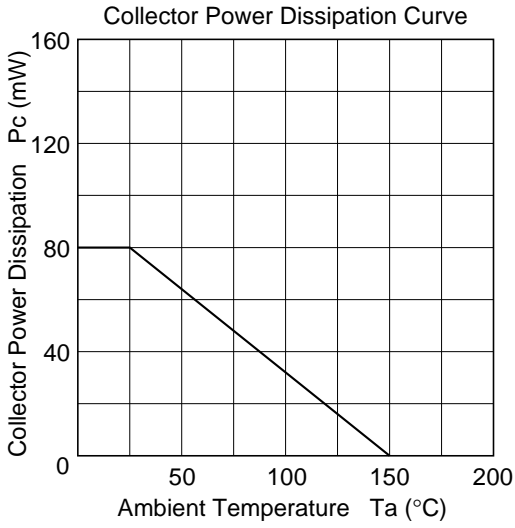
Note: Marking is "ZC-".

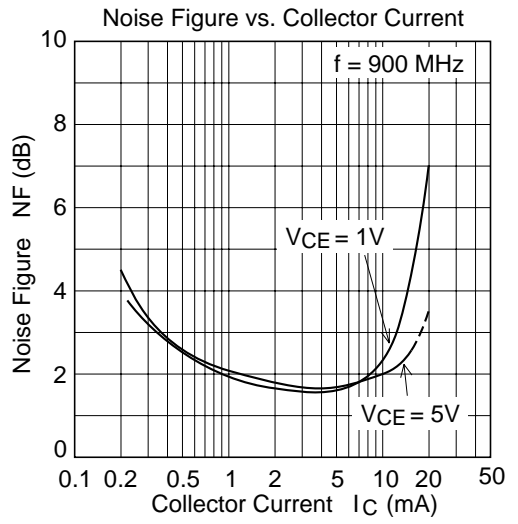
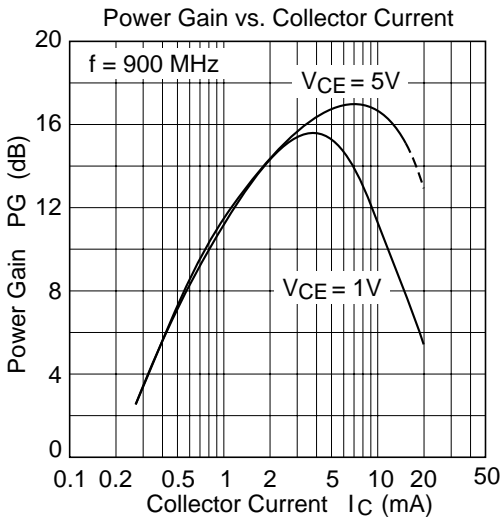
Attention: This device is very sensitive to electro static discharge.

It is recommended to adopt appropriate cautions when handling this transistor.

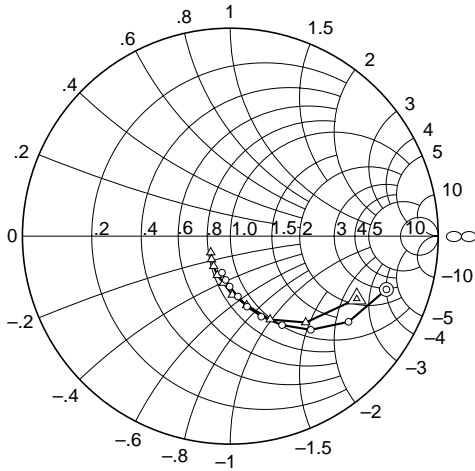
Electrical Characteristics (Ta = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test conditions
Collector cutoff current	I_{CBO}	—	—	10	μ A	$V_{CB} = 15$ V, $I_E = 0$
	I_{CEO}	—	—	1	mA	$V_{CE} = 8$ V, $R_{BE} = \infty$
Emitter cutoff current	I_{EBO}	—	—	10	μ A	$V_{EB} = 1.5$ V, $I_C = 0$
DC current transfer ratio	h_{FE}	50	100	160		$V_{CE} = 5$ V, $I_C = 10$ mA
Collector output capacitance	C_{ob}	—	0.3	0.8	pF	$V_{CB} = 5$ V, $I_E = 0$, $f = 1$ MHz
Gain bandwidth product	f_T	9	12	—	GHz	$V_{CE} = 5$ V, $I_C = 5$ mA
Power gain	PG	14	16.5	—	dB	$V_{CE} = 5$ V, $I_C = 10$ mA, $f = 900$ MHz
Noise figure	NF	—	1.6	2.5	dB	$V_{CE} = 5$ V, $I_C = 5$ mA, $f = 900$ MHz



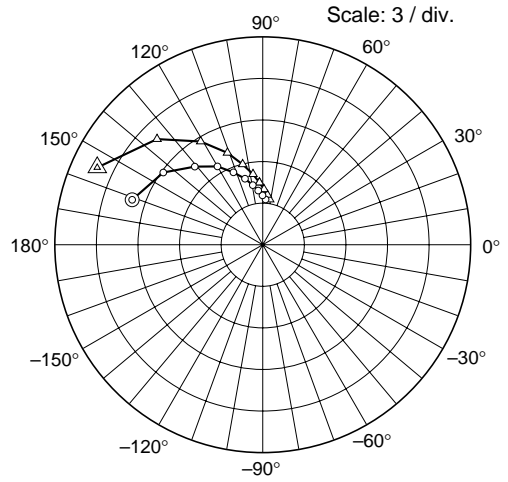


S11 Parameter vs. Frequency



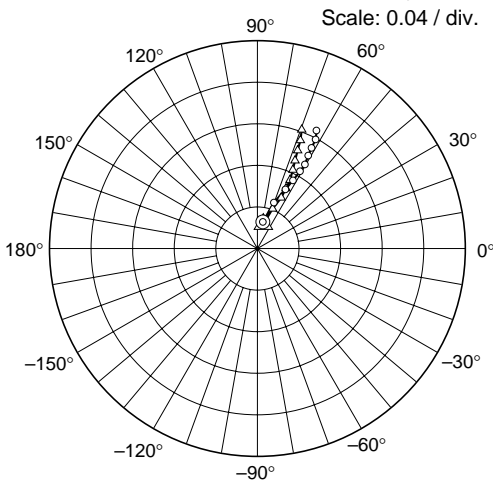
Condition: $V_{CE} = 5\text{ V}$, $Z_o = 50\ \Omega$
 200 to 2000 MHz (200 MHz step)
 ○ — ○ ($I_C = 5\text{ mA}$)
 △ — △ ($I_C = 10\text{ mA}$)

S21 Parameter vs. Frequency



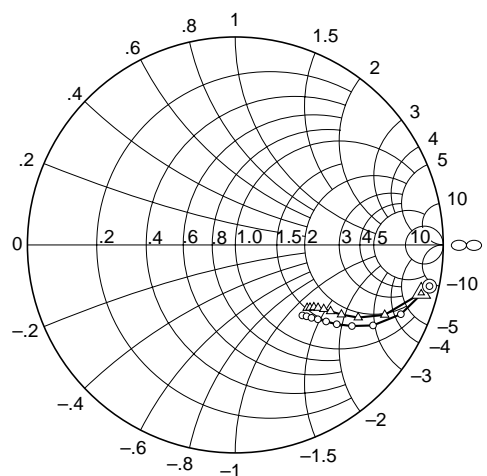
Condition: $V_{CE} = 5\text{ V}$, $Z_o = 50\ \Omega$
 200 to 2000 MHz (200 MHz step)
 ○ — ○ ($I_C = 5\text{ mA}$)
 △ — △ ($I_C = 10\text{ mA}$)

S12 Parameter vs. Frequency



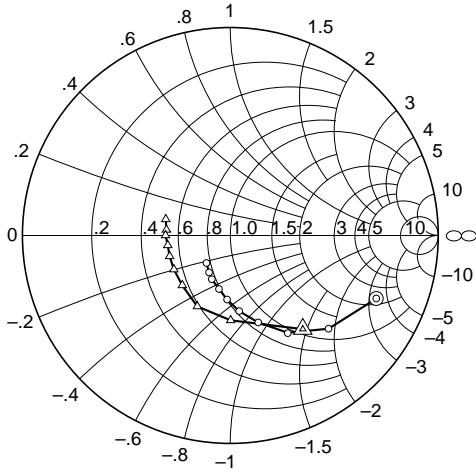
Condition: $V_{CE} = 5\text{ V}$, $Z_o = 50\ \Omega$
 200 to 2000 MHz (200 MHz step)
 ○ — ○ ($I_C = 5\text{ mA}$)
 △ — △ ($I_C = 10\text{ mA}$)

S22 Parameter vs. Frequency



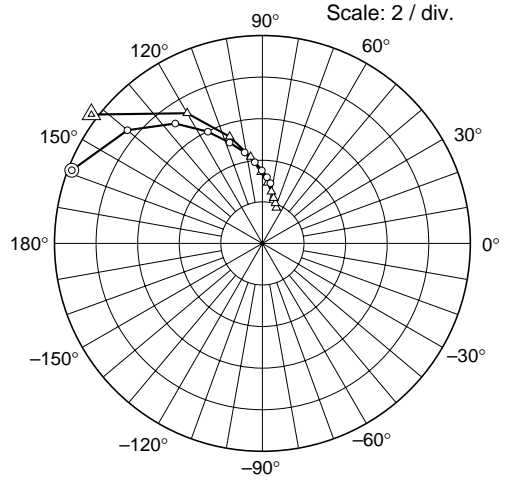
Condition: $V_{CE} = 5\text{ V}$, $Z_o = 50\ \Omega$
 200 to 2000 MHz (200 MHz step)
 ○ — ○ ($I_C = 5\text{ mA}$)
 △ — △ ($I_C = 10\text{ mA}$)

S11 Parameter vs. Frequency



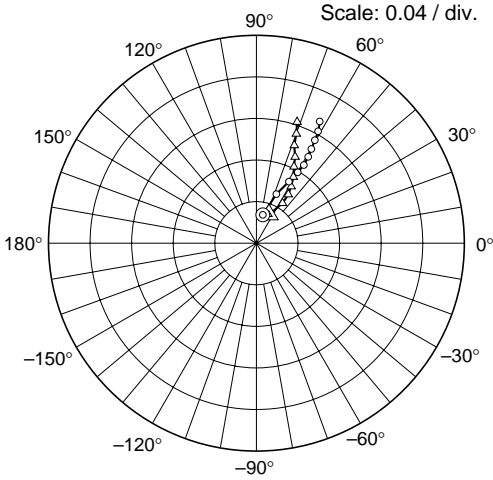
Condition: $V_{CE} = 1\text{ V}$, $Z_o = 50\ \Omega$
 200 to 2000 MHz (200 MHz step)
 ○ (IC = 5 mA)
 △ (IC = 10 mA)

S21 Parameter vs. Frequency



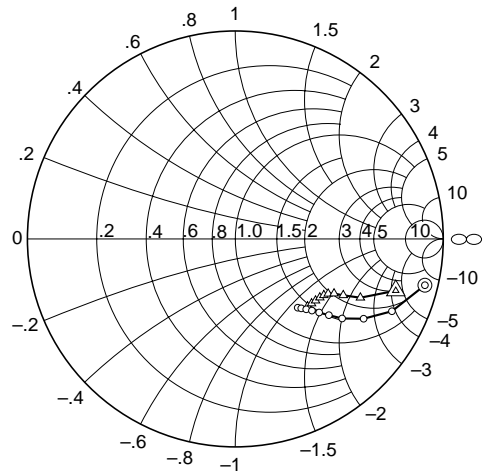
Condition: $V_{CE} = 1\text{ V}$, $Z_o = 50\ \Omega$
 200 to 2000 MHz (200 MHz step)
 ○ (IC = 5 mA)
 △ (IC = 10 mA)

S12 Parameter vs. Frequency



Condition: $V_{CE} = 1\text{ V}$, $Z_o = 50\ \Omega$
 200 to 2000 MHz (200 MHz step)
 ○ (IC = 5 mA)
 △ (IC = 10 mA)

S22 Parameter vs. Frequency



Condition: $V_{CE} = 1\text{ V}$, $Z_o = 50\ \Omega$
 200 to 2000 MHz (200 MHz step)
 ○ (IC = 5 mA)
 △ (IC = 10 mA)

S Parameter ($V_{CE} = 5 \text{ V}$, $I_C = 5 \text{ mA}$, $Z_O = 50 \Omega$)

Freq. (MHz)	S11		S21		S12		S22	
	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.
200	0.793	-18.9	9.98	161	0.026	78.6	0.955	-12.0
400	0.702	-36.0	8.88	144	0.047	70.2	0.864	-22.7
600	0.594	-49.4	7.63	131	0.063	64.6	0.768	-30.3
800	0.495	-59.9	6.54	120	0.074	62.4	0.684	-34.8
1000	0.415	-69.1	5.65	112	0.085	61.1	0.620	-38.0
1200	0.349	-76.8	4.94	105	0.093	60.5	0.572	-40.1
1400	0.293	-83.0	4.37	99.4	0.102	61.3	0.535	-42.0
1600	0.241	-90.2	3.93	94.7	0.110	61.7	0.508	-43.7
1800	0.214	-93.9	3.57	90.2	0.119	61.9	0.486	-45.0
2000	0.181	-103	3.28	89.3	0.127	63.4	0.469	-46.4

S Parameter ($V_{CE} = 5 \text{ V}$, $I_C = 10 \text{ mA}$, $Z_O = 50 \Omega$)

Freq. (MHz)	S11		S21		S12		S22	
	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.
200	0.679	-26.4	13.2	155	0.024	76.2	0.924	-14.6
400	0.552	-48.9	10.8	135	0.041	69.0	0.794	-25.1
600	0.445	-64.5	8.71	121	0.054	64.8	0.687	-30.6
800	0.342	-76.7	7.12	111	0.064	64.5	0.611	-33.3
1000	0.283	-88.1	5.99	104	0.073	64.5	0.559	-34.9
1200	0.228	-98.3	5.15	97.8	0.083	65.7	0.526	-36.0
1400	0.191	-105	4.50	93.0	0.092	66.8	0.501	-37.3
1600	0.166	-119	4.01	88.6	0.102	67.9	0.483	-38.5
1800	0.136	-124	3.62	84.6	0.112	68.3	0.470	-40.1
2000	0.123	-140	3.31	81.1	0.122	69.5	0.460	-41.3

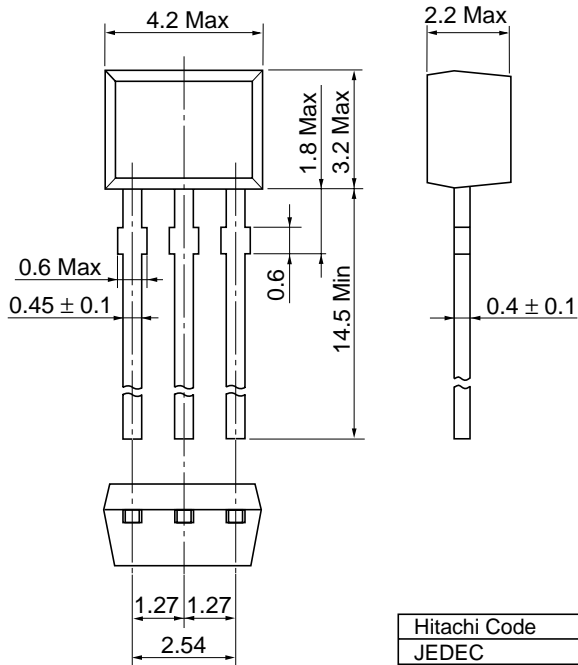
S Parameter ($V_{CE} = 1 \text{ V}$, $I_C = 5 \text{ mA}$, $Z_O = 50 \Omega$)

Freq. (MHz)	S11		S21		S12		S22	
	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.
200	0.764	-23.4	9.82	159	0.028	77.1	0.938	-13.7
400	0.651	-43.6	8.47	140	0.051	67.8	0.830	-24.8
600	0.545	-59.5	7.13	126	0.067	62.1	0.727	-31.9
800	0.439	-72.2	5.98	116	0.079	59.7	0.641	-36.7
1000	0.366	-83.3	5.10	108	0.088	58.7	0.581	-39.2
1200	0.308	-92.9	4.46	101	0.097	59.0	0.537	-41.3
1400	0.263	-102	3.92	95.3	0.105	59.7	0.505	-43.1
1600	0.228	-113	3.51	90.4	0.114	60.4	0.481	-44.8
1800	0.205	-120	3.19	86.0	0.123	61.1	0.461	-46.5
2000	0.175	-131	2.92	82.3	0.132	62.5	0.447	-47.8

S Parameter ($V_{CE} = 1 \text{ V}$, $I_C = 10 \text{ mA}$, $Z_O = 50 \Omega$)

Freq. (MHz)	S11		S21		S12		S22	
	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.
200	0.570	-52.3	10.3	143	0.030	66.1	0.811	-17.9
400	0.443	-89.8	7.23	120	0.046	56.8	0.665	-25.2
600	0.376	-115	5.37	107	0.056	56.7	0.586	-27.6
800	0.333	-134	4.20	97.7	0.064	58.4	0.534	-29.0
1000	0.317	-149	3.43	91.0	0.073	60.8	0.519	-30.6
1200	0.309	-161	2.93	85.0	0.082	63.8	0.505	-32.5
1400	0.305	-171	2.53	80.1	0.091	65.8	0.495	-34.8
1600	0.312	-180	2.25	76.1	0.101	68.1	0.487	-37.6
1800	0.309	175	2.03	72.0	0.112	69.9	0.481	-40.3
2000	0.320	166	1.84	68.6	0.123	71.4	0.476	-43.1

Unit: mm



Hitachi Code	SPAK
JEDEC	—
EIAJ	—
Weight (reference value)	0.10 g

Cautions

1. Hitachi neither warrants nor grants licenses of any rights of Hitachi's or any third party's patent, copyright, trademark, or other intellectual property rights for information contained in this document. Hitachi bears no responsibility for problems that may arise with third party's rights, including intellectual property rights, in connection with use of the information contained in this document.
2. Products and product specifications may be subject to change without notice. Confirm that you have received the latest product standards or specifications before final design, purchase or use.
3. Hitachi makes every attempt to ensure that its products are of high quality and reliability. However, contact Hitachi's sales office before using the product in an application that demands especially high quality and reliability or where its failure or malfunction may directly threaten human life or cause risk of bodily injury, such as aerospace, aeronautics, nuclear power, combustion control, transportation, traffic, safety equipment or medical equipment for life support.
4. Design your application so that the product is used within the ranges guaranteed by Hitachi particularly for maximum rating, operating supply voltage range, heat radiation characteristics, installation conditions and other characteristics. Hitachi bears no responsibility for failure or damage when used beyond the guaranteed ranges. Even within the guaranteed ranges, consider normally foreseeable failure rates or failure modes in semiconductor devices and employ systemic measures such as fail-safes, so that the equipment incorporating Hitachi product does not cause bodily injury, fire or other consequential damage due to operation of the Hitachi product.
5. This product is not designed to be radiation resistant.
6. No one is permitted to reproduce or duplicate, in any form, the whole or part of this document without written approval from Hitachi.
7. Contact Hitachi's sales office for any questions regarding this document or Hitachi semiconductor products.

HITACHI

Hitachi, Ltd.

Semiconductor & Integrated Circuits.
Nippon Bldg., 2-6-2, Ohte-machi, Chiyoda-ku, Tokyo 100-0004, Japan
Tel: Tokyo (03) 3270-2111 Fax: (03) 3270-5109

URL North America : <http://semiconductor.hitachi.com/>
 Europe : <http://www.hitachi-eu.com/hel/ecg>
 Asia (Singapore) : <http://www.has.hitachi.com.sg/grp3/sicd/index.htm>
 Asia (Taiwan) : http://www.hitachi.com.tw/E/Product/SICD_Frame.htm
 Asia (HongKong) : <http://www.hitachi.com.hk/eng/bo/grp3/index.htm>
 Japan : <http://www.hitachi.co.jp/Sicd/indx.htm>

For further information write to:

Hitachi Semiconductor
(America) Inc.
179 East Tasman Drive,
San Jose, CA 95134
Tel: <1> (408) 433-1990
Fax: <1> (408) 433-0223

Hitachi Europe GmbH
Electronic components Group
Dornacher Straße 3
D-85622 Feldkirchen, Munich
Germany
Tel: <49> (89) 9 9180-0
Fax: <49> (89) 9 29 30 00

Hitachi Europe Ltd.
Electronic Components Group.
Whitebrook Park
Lower Cookham Road
Maidenhead
Berkshire SL6 8YA, United Kingdom
Tel: <44> (1628) 585000
Fax: <44> (1628) 778322

Hitachi Asia Pte. Ltd.
16 Collyer Quay #20-00
Hitachi Tower
Singapore 049318
Tel: 535-2100
Fax: 535-1533

Hitachi Asia Ltd.
Taipei Branch Office
3F, Hung Kuo Building, No.167,
Tun-Hwa North Road, Taipei (105)
Tel: <886> (2) 2718-3666
Fax: <886> (2) 2718-8180

Hitachi Asia (Hong Kong) Ltd.
Group III (Electronic Components)
7/F., North Tower, World Finance Centre,
Harbour City, Canton Road, Tsim Sha Tsui,
Kowloon, Hong Kong
Tel: <852> (2) 735 9218
Fax: <852> (2) 730 0281
Telex: 40815 HITEC HX

Copyright ' Hitachi, Ltd., 1999. All rights reserved. Printed in Japan.

HITACHI