2SC5247

Silicon NPN Bipolar Transistor

HITACHI

ADE-208-281 (Z)
1st. Edition
Oct. 1994

Application

VHF / UHF wide band amplifier

Features

- High gain bandwidth product
  f_T = 13.5 GHz typ
- High gain, low noise figure
  PG = 17 dB typ, NF = 1.2 dB typ at f = 900 MHz

Outline

SMPAK

1. Emitter
2. Base
3. Collector

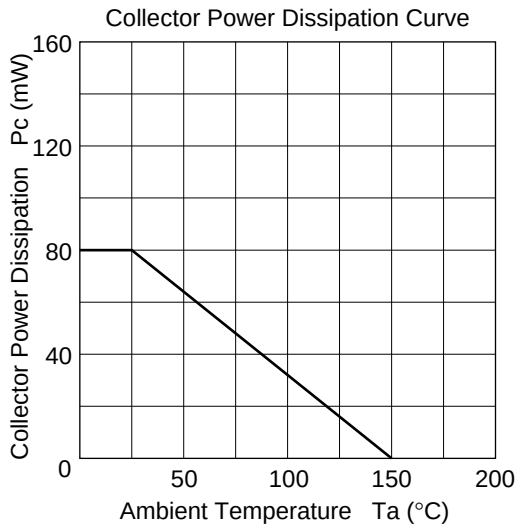
Note: 1. Marking is “ZD–”.

Attention This device is very sensitive to electro static discharge.
It is recommended to adopt appropriate cautions when handling this transistor.

Hitachi semiconductor

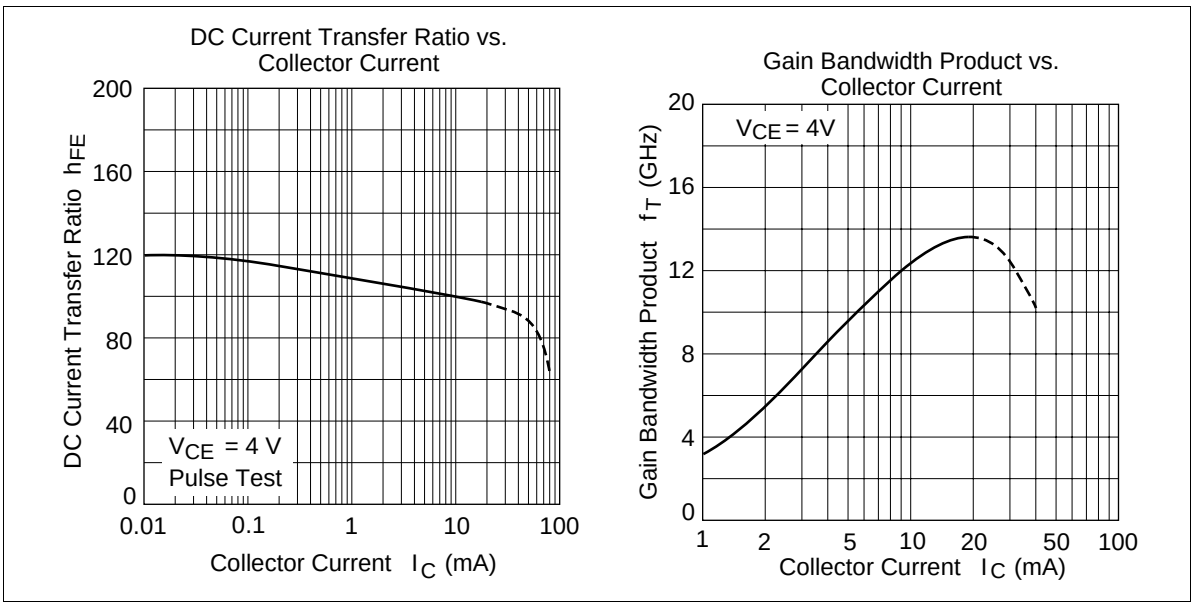
Absolute Maximum Ratings (Ta = 25°C)

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	50	mA
Collector power dissipation	P_C	80	mW
Junction temperature	Tj	150	°C
Storage temperature	Tstg	–55 to +150	°C

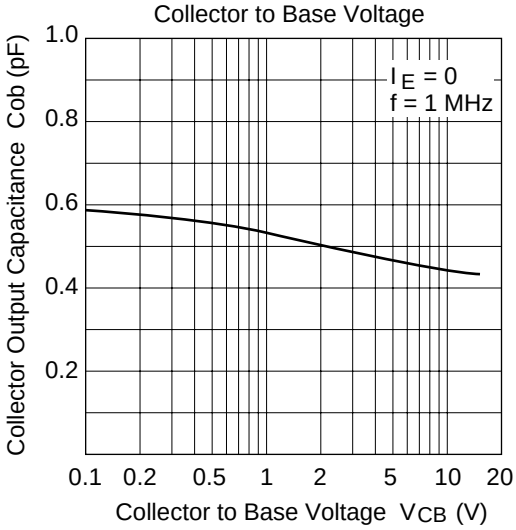


Electrical Characteristics (Ta = 25°C)

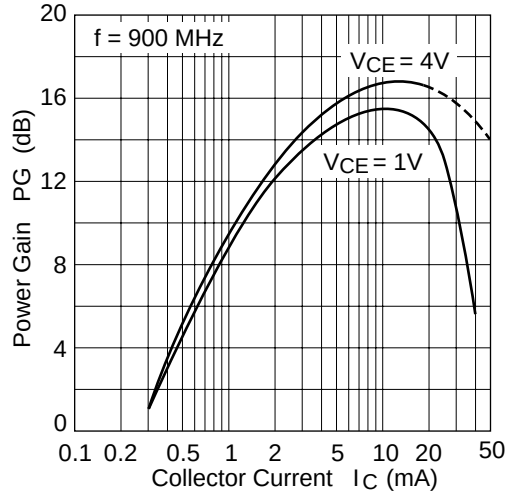
Item	Symbol	Min	Typ	Max	Unit	Test conditions
Collector to base breakdown voltage	$V_{(BR)CBO}$	15	—	—	V	I_C = 10 µA, I_E = 0
Collector cutoff current	I_{CBO}	—	—	1	µA	V_{CB} = 12 V, I_E = 0
	I_{CEO}	—	—	1	mA	V_{CE} = 8 V, R_{BE} = ∞
Emitter cutoff current	I_{EBO}	—	—	10	µA	V_{EB} = 1.5 V, I_C = 0
DC current transfer ratio	h_{FE}	50	100	160		V_{CE} = 4 V, I_C = 20 mA
Output capacitance	Cob	—	0.47	0.75	pF	V_{CB} = 5 V, I_E = 0, f = 1 MHz
Gain bandwidth product	f_T	10.5	13.5	—	GHz	V_{CE} = 4 V, I_C = 20 mA
Power gain	PG	14	17	—	dB	V_{CE} = 4 V, I_C = 20 mA, f = 900 MHz
Noise figure	NF	—	1.2	2.5	dB	V_{CE} = 4 V, I_C = 5 mA, f = 900 MHz



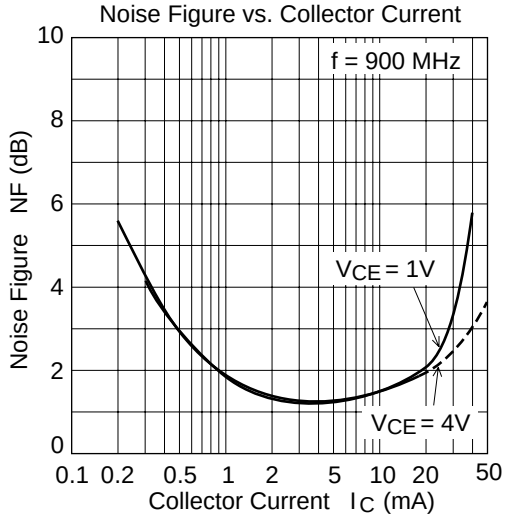
Collector Output Capacitance vs. Collector to Base Voltage



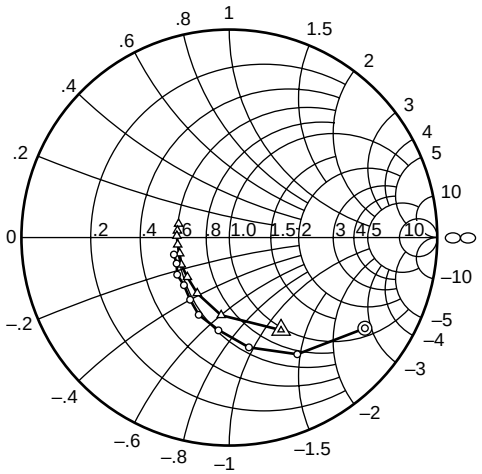
Power Gain vs. Collector Current



Noise Figure vs. Collector Current

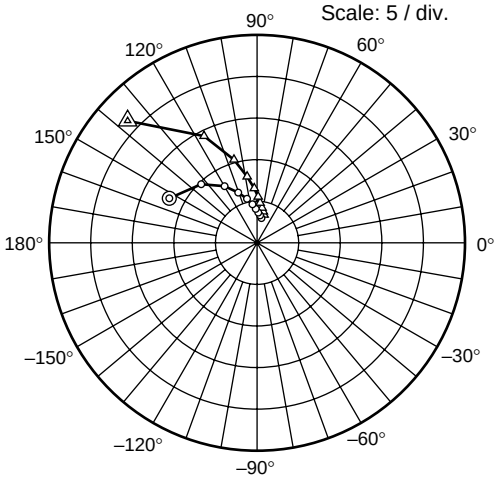


S11 Parameter vs. Frequency



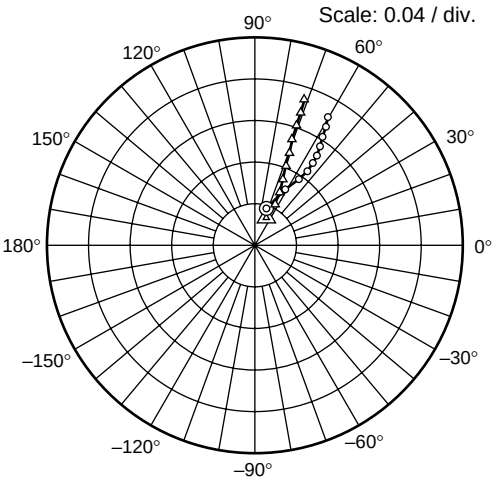
Condition: V_{CE} = 4 V , Zo = 50 Ω
200 to 2000 MHz (200 MHz step)
(I_C = 5 mA)
(I_C = 20 mA)

S21 Parameter vs. Frequency



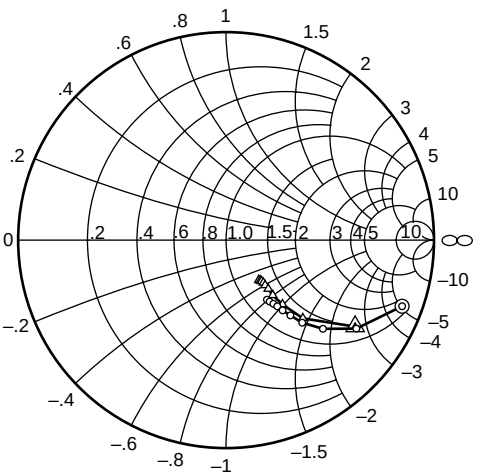
Condition: V_{CE} = 4 V , Zo = 50 Ω
200 to 2000 MHz (200 MHz step)
(I_C = 5 mA)
(I_C = 20 mA)

S12 Parameter vs. Frequency



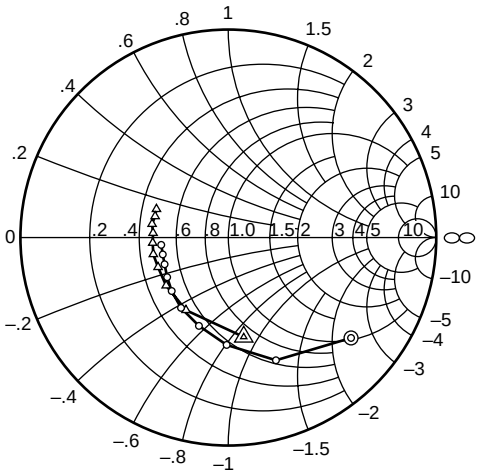
Condition: V_{CE} = 4 V , Zo = 50 Ω
200 to 2000 MHz (200 MHz step)
(I_C = 5 mA)
(I_C = 20 mA)

S22 Parameter vs. Frequency



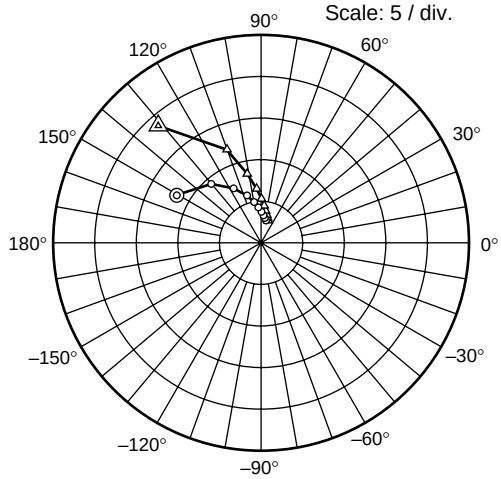
Condition: V_{CE} = 4 V , Zo = 50 Ω
200 to 2000 MHz (200 MHz step)
(I_C = 5 mA)
(I_C = 20 mA)

S11 Parameter vs. Frequency



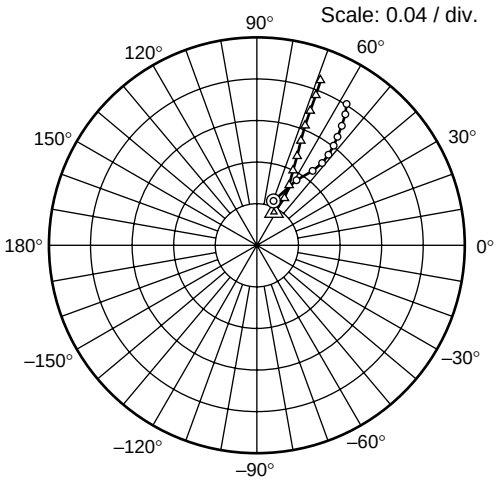
Condition: V_{CE} = 1 V , Zo = 50 Ω
200 to 2000 MHz (200 MHz step)
(I_C = 5 mA)
(I_C = 20 mA)

S21 Parameter vs. Frequency



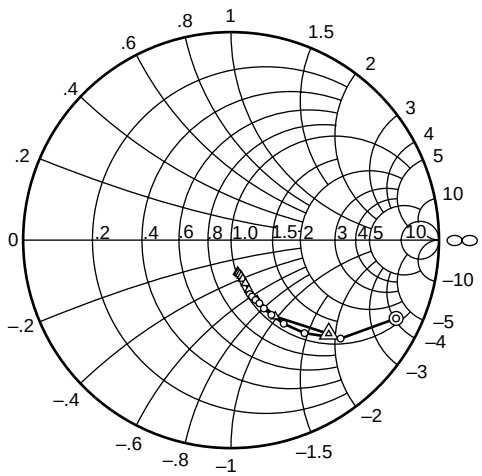
Condition: V_{CE} = 1 V , Zo = 50 Ω
200 to 2000 MHz (200 MHz step)
(I_C = 5 mA)
(I_C = 20 mA)

S12 Parameter vs. Frequency



Condition: V_{CE} = 1 V , Zo = 50 Ω
200 to 2000 MHz (200 MHz step)
(I_C = 5 mA)
(I_C = 20 mA)

S22 Parameter vs. Frequency



Condition: V_{CE} = 1 V , Zo = 50 Ω
200 to 2000 MHz (200 MHz step)
(I_C = 5 mA)
(I_C = 20 mA)

S Parameter (V_{CE} = 4 V, I_C = 5 mA, Z_O = 50 Ω)

Freq.	S11		S21		S12		S22	
(MHz)	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.
200	0.785	–33.8	11.8	153	0.037	72.5	0.905	–20.6
400	0.650	–59.8	9.73	134	0.061	61.4	0.758	–34.2
600	0.537	–79.7	7.85	120	0.077	56.3	0.632	–42.5
800	0.450	–96.7	6.54	111	0.087	54.6	0.540	–47.4
1000	0.400	–112	5.43	103	0.097	54.8	0.477	–49.5
1200	0.354	–122	4.67	96.7	0.105	55.3	0.434	–51.2
1400	0.317	–134	4.09	92.1	0.114	56.6	0.403	–52.3
1600	0.308	–145	3.64	87.6	0.123	58.0	0.382	–53.4
1800	0.283	–154	3.32	83.6	0.133	59.0	0.363	–54.7
2000	0.279	–163	3.02	79.8	0.142	60.3	0.348	–55.6

S Parameter (V_{CE} = 4 V, I_C = 20 mA, Z_O = 50 Ω)

Freq.	S11		S21		S12		S22	
(MHz)	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.
200	0.510	–60.9	21.4	137	0.029	67.3	0.747	–33.8
400	0.376	–96.0	14.3	116	0.044	63.5	0.527	–45.5
600	0.310	–120	10.4	106	0.056	64.8	0.411	–48.7
800	0.278	–137	8.05	98.5	0.069	66.9	0.347	–49.7
1000	0.266	–151	6.56	92.9	0.082	68.5	0.310	–49.1
1200	0.251	–162	5.54	88.6	0.095	69.4	0.287	–49.1
1400	0.252	–172	4.81	85.3	0.108	70.7	0.272	–48.8
1600	0.253	178	4.25	81.8	0.122	70.8	0.261	–49.2
1800	0.252	173	3.83	78.6	0.135	70.9	0.255	–49.8
2000	0.253	165	3.48	75.8	0.148	71.3	0.248	–50.6

S Parameter (V_{CE} = 1 V, I_C = 5 mA, Z_O = 50 Ω)

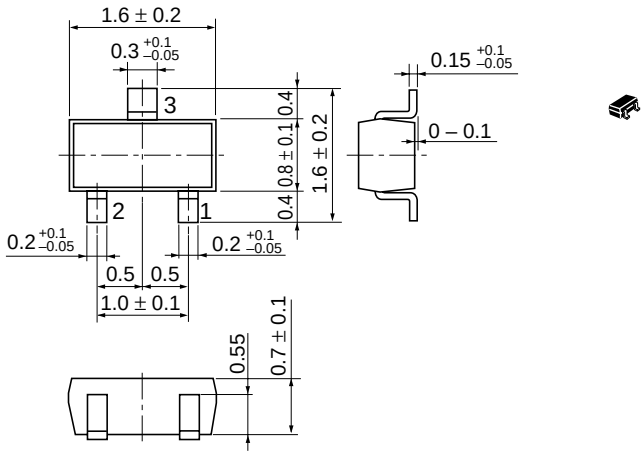
Freq.	S11		S21		S12		S22	
(MHz)	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.
200	0.763	–39.3	11.6	151	0.046	69.6	0.879	–25.4
400	0.627	–68.8	9.27	130	0.073	58.4	0.708	–42.0
600	0.517	–90.9	7.33	117	0.089	53.2	0.570	–51.8
800	0.448	–108	5.94	107	0.101	51.6	0.475	–57.9
1000	0.408	–124	4.98	99.6	0.111	51.7	0.409	–61.7
1200	0.375	–137	4.28	94.3	0.121	52.4	0.365	–64.5
1400	0.351	–147	3.73	89.2	0.130	53.4	0.333	–66.0
1600	0.333	–157	3.32	84.9	0.141	54.6	0.311	–67.9
1800	0.326	–166	3.02	81.3	0.152	56.0	0.290	–69.8
2000	0.325	–174	2.76	77.3	0.161	57.6	0.275	–71.1

S Parameter (V_{CE} = 1 V, I_C = 20 mA, Z_O = 50 Ω)

Freq.	S11		S21		S12		S22	
(MHz)	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.
200	0.484	–81.3	18.7	131	0.036	62.6	0.651	–43.8
400	0.404	–120	12.0	111	0.052	59.5	0.425	–60.0
600	0.378	–142	8.49	101	0.066	61.6	0.315	–66.5
800	0.367	–157	6.54	94.6	0.080	64.1	0.254	–70.3
1000	0.370	–168	5.31	89.4	0.094	65.6	0.219	–71.6
1200	0.365	–176	4.50	85.2	0.109	67.1	0.195	–73.3
1400	0.363	177	3.92	81.8	0.124	68.0	0.180	–74.1
1600	0.373	170	3.46	78.3	0.139	68.3	0.170	–75.9
1800	0.367	164	3.13	75.4	0.155	68.5	0.162	–77.6
2000	0.372	158	2.84	72.2	0.170	68.9	0.156	–78.4

Package Dimensions

As of January, 2001
Unit: mm



Hitachi Code	SMPAK
JEDEC	—
EIAJ	Conforms
Mass (reference value)	0.003 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
NorthAmerica : http://semiconductor.hitachi.com/
Europe : http://www.hitachi-eu.com/hel/ecg
Asia : http://sicapac.hitachi-asia.com
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 Straβe 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) 585160

Hitachi Asia Ltd.
Hitachi Tower
16 Collyer Quay #20-00,
Singapore 049318
Tel : <65>-538-6533/538-8577
Fax : <65>-538-6933/538-3877
URL : http://www.hitachi.com.sg

Hitachi Asia Ltd.
(Taipei Branch Office)
4/F, No. 167, Tun Hwa North Road,
Hung-Kuo Building,
Taipei (105), Taiwan
Tel : <886>-(2)-2718-3666
Fax : <886>-(2)-2718-8180
Telex : 23222 HAS-TP
URL : http://www.hitachi.com.tw

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
URL : http://www.hitachi.com.hk

Colophon 2.0