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Renesas Technology Corp.
Customer Support Dept.
April 1, 2003

Cautions

Keep safety first in your circuit designs!

1. Renesas Technology Corporation puts the maximum effort into making semiconductor products better and more reliable, but there is always the possibility that trouble may occur with them. Trouble with semiconductors may lead to personal injury, fire or property damage.

Remember to give due consideration to safety when making your circuit designs, with appropriate measures such as (i) placement of substitutive, auxiliary circuits, (ii) use of nonflammable material or (iii) prevention against any malfunction or mishap.

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2SC4988

Silicon NPN Epitaxial

RENESAS

ADE-208-004A (Z)
2nd. Edition
Mar. 2001

Application

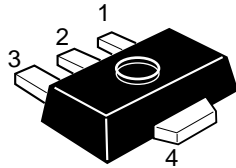
VHF / UHF wide band amplifier

Features

- High gain bandwidth product
 $f_T = 8.5$ GHz Typ
- High gain, low noise figure
PG = 10.5 dB Typ, NF = 1.3 dB Typ at $f = 900$ MHz

Outline

UPAK



1. Base
2. Collector
3. Emitter
4. Collector (Flange)

Note: Marking is "FR".

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

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

Absolute Maximum Ratings (Ta = 25°C)

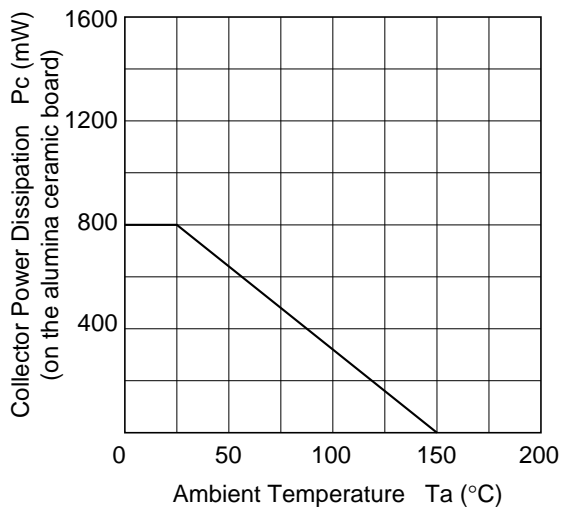
Item	Symbol	Ratings	Unit
Collector to base voltage	V_{CBO}	15	V
Collector to emitter voltage	V_{CEO}	9	V
Emitter to base voltage	V_{EBO}	1.5	V
Collector current	I_C	100	mA
Collector power dissipation	P_C	800* ¹	mW
Junction temperature	T_j	150	°C
Storage temperature	T_{stg}	-55 to +150	°C

Note: 1. This value is allowed when using the alumina ceramics board (12.5 x 20 x 0.7 mm)

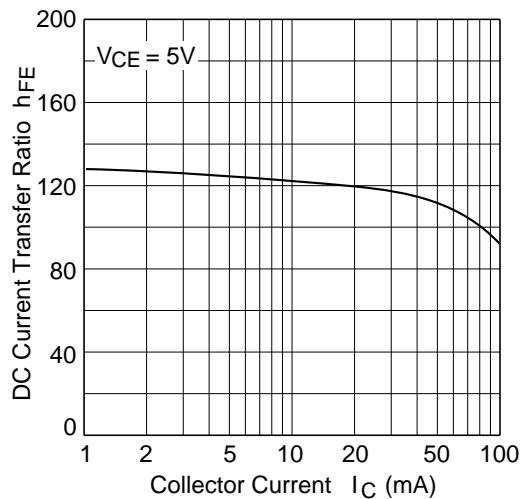
Electrical Characteristics (Ta = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test conditions
Collector to base breakdown voltage	$V_{(BR)CBO}$	15	—	—	V	$I_C = 10 \mu A, I_E = 0$
Collector cutoff current	I_{CBO}	—	—	1	μA	$V_{CB} = 12 V, I_E = 0$
	I_{CEO}	—	—	1	mA	$V_{CE} = 9 V, R_{BE} =$
Emitter cutoff current	I_{EBO}	—	—	10	μA	$V_{EB} = 1.5 V, I_C = 0$
DC current transfer ratio	h_{FE}	50	120	250		$V_{CE} = 5 V, I_C = 20 mA$
Collector output capacitance	C_{ob}	—	1.1	1.6	pF	$V_{CB} = 5 V, I_E = 0, f = 1 MHz$
Gain bandwidth product	f_T	5.5	8.5	—	GHz	$V_{CE} = 5 V, I_C = 20 mA$
Power gain	PG	7.5	10.5	—	dB	$V_{CE} = 5 V, I_C = 20 mA, f = 900 MHz$
Noise figure	NF	—	1.3	2.5	dB	$V_{CE} = 5 V, I_C = 5 mA, f = 900 MHz$

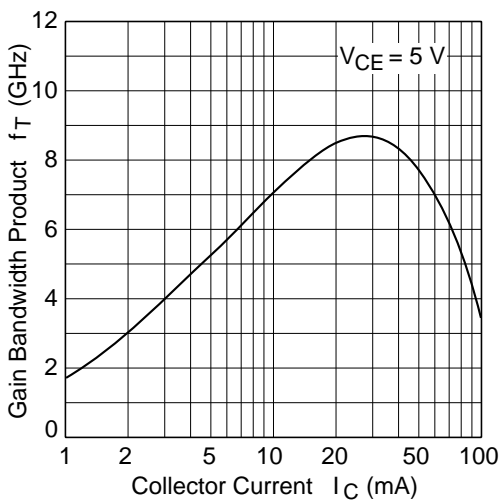
Collector Power Dissipation Curve



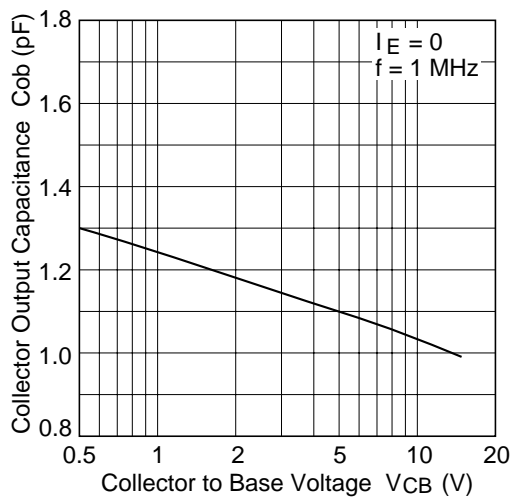
DC Current Transfer Ratio vs. Collector Current



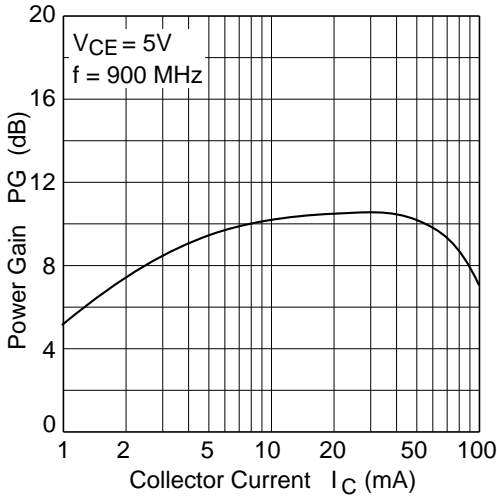
Gain Bandwidth Product vs. Collector Current



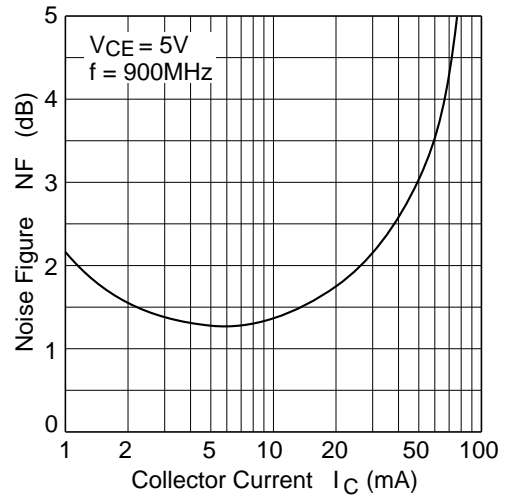
Collector Output Capacitance vs. Collector to Base Voltage



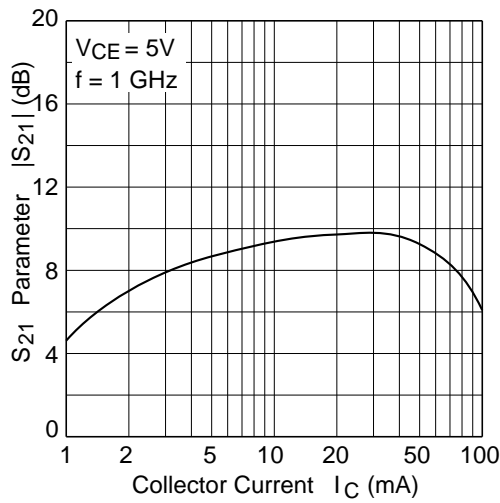
Power Gain vs. Collector Current



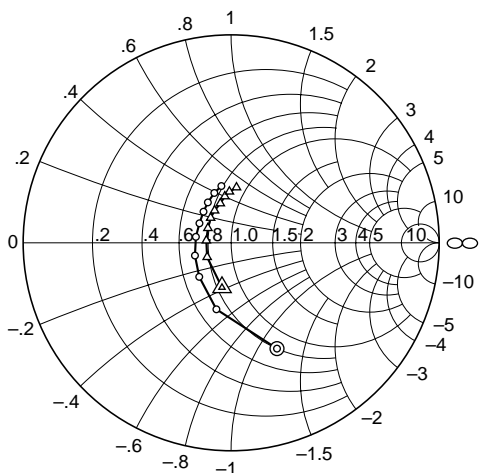
Noise Figure vs. Collector Current



S21 Parameter vs. Collector Current

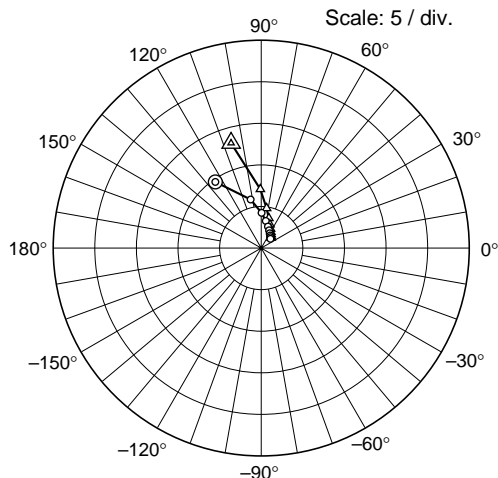


S11 Parameter vs. Frequency



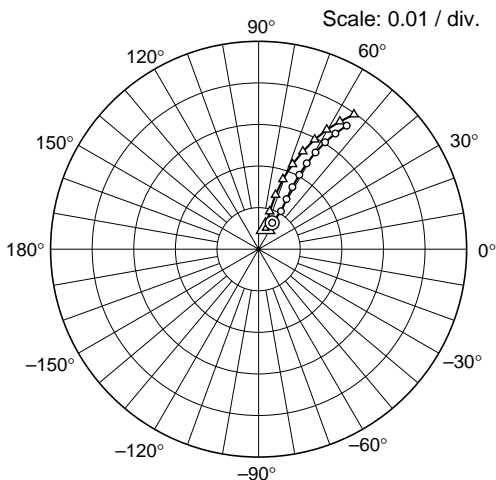
Condition: $V_{CE} = 5\text{ V}$, $Z_o = 50\ \Omega$
 200 to 2000 MHz (200 MHz step)
 ○ (IC = 5 mA)
 △ (IC = 20 mA)

S21 Parameter vs. Frequency



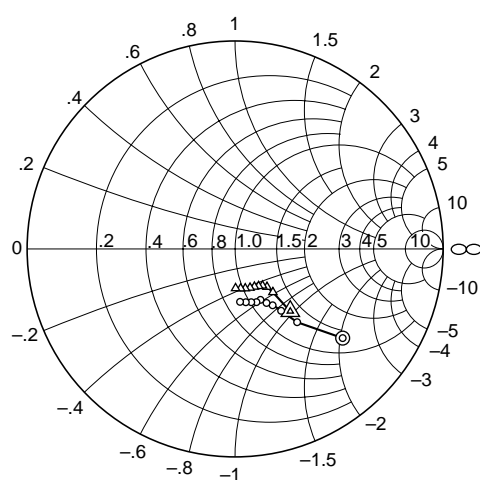
Condition: $V_{CE} = 5\text{ V}$, $Z_o = 50\ \Omega$
 200 to 2000 MHz (200 MHz step)
 ○ (IC = 5 mA)
 △ (IC = 20 mA)

S12 Parameter vs. Frequency



Condition: $V_{CE} = 5\text{ V}$, $Z_o = 50\ \Omega$
 200 to 2000 MHz (200 MHz step)
 ○ (IC = 5 mA)
 △ (IC = 20 mA)

S22 Parameter vs. Frequency



Condition: $V_{CE} = 5\text{ V}$, $Z_o = 50\ \Omega$
 200 to 2000 MHz (200 MHz step)
 ○ (IC = 5 mA)
 △ (IC = 20 mA)

S Parameter ($V_{CE} = 5\text{ V}$, $I_C = 5\text{ mA}$, $Z_0 = 50\ \Omega$)

Freq. (MHz)	S11		S21		S12		S22	
	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.
200	0.555	-66.6	9.68	124.7	0.0717	62.3	0.672	-39.7
400	0.328	-102.5	5.98	102.2	0.106	59.4	0.462	-49.8
600	0.225	-133.1	4.24	89.3	0.138	60.8	0.371	-53.4
800	0.185	-160.5	3.31	80.3	0.170	61.4	0.326	-56.4
1000	0.172	170.5	2.71	72.4	0.204	61.3	0.301	-59.9
1200	0.179	148.5	2.34	65.8	0.237	60.7	0.285	-63.6
1400	0.200	131.7	2.06	59.9	0.270	59.5	0.276	-68.2
1600	0.224	120.0	1.86	54.4	0.303	58.1	0.268	-73.2
1800	0.253	108.7	1.71	49.6	0.334	56.4	0.262	-78.7
2000	0.277	99.8	1.58	44.9	0.365	54.5	0.256	-84.7

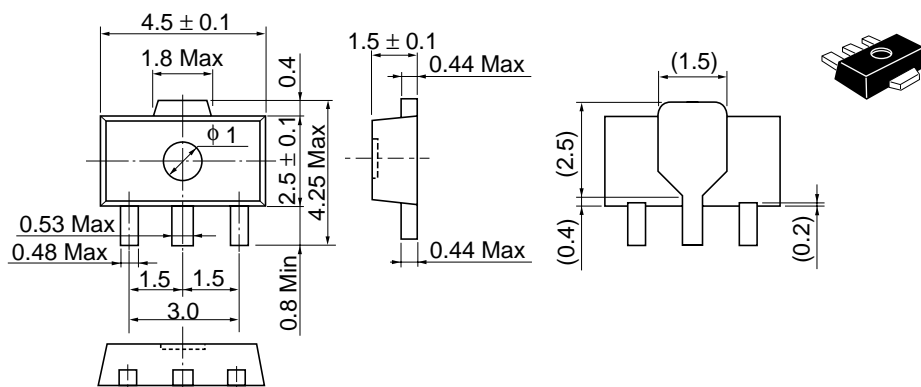
S Parameter ($V_{CE} = 5\text{ V}$, $I_C = 20\text{ mA}$, $Z_0 = 50\ \Omega$)

Freq. (MHz)	S11		S21		S12		S22	
	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.
200	0.220	-101.8	13.13	106.0	0.0532	71.5	0.401	-48.6
400	0.135	-149.0	7.08	90.8	0.0946	73.6	0.277	-49.0
600	0.120	175.1	4.83	82.2	0.137	72.6	0.239	-50.1
800	0.132	148.0	3.70	75.5	0.178	70.8	0.221	-53.4
1000	0.155	129.6	3.02	69.5	0.220	68.2	0.212	-57.9
1200	0.174	117.3	2.58	63.9	0.258	65.6	0.205	-63.1
1400	0.196	105.5	2.26	58.8	0.296	62.9	0.201	-69.1
1600	0.225	97.8	2.04	54.1	0.331	60.3	0.197	-75.7
1800	0.246	92.0	1.86	50.0	0.364	57.5	0.193	-82.1
2000	0.267	84.5	1.72	45.7	0.397	54.7	0.190	-89.4

Package Dimensions

As of January, 2001

Unit: mm



Hitachi Code	UPAK
JEDEC	—
EIAJ	Conforms
Mass (reference value)	0.050 g

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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>
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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) 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>

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