

To all our customers

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

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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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# 2SC5080

Silicon NPN Epitaxial

# RENESAS

ADE-208-1132A (Z)  
2nd. Edition  
Mar. 2001

## Application

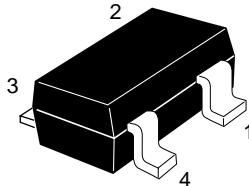
VHF / UHF wide band amplifier

## Features

- High gain bandwidth product  
 $f_T = 13.5$  GHz Typ
- High gain, low noise figure  
PG = 18 dB Typ, NF = 1.1 dB Typ at  $f = 900$  MHz

## Outline

MPAK-4



1. Collector
2. Emitter
3. Base
4. Emitter

Note: Marking is "ZD-".

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

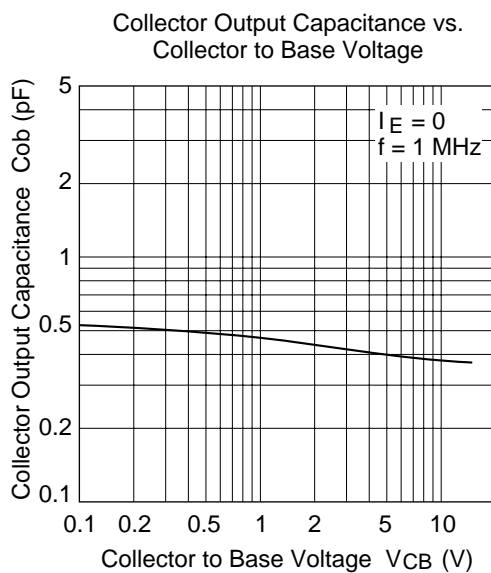
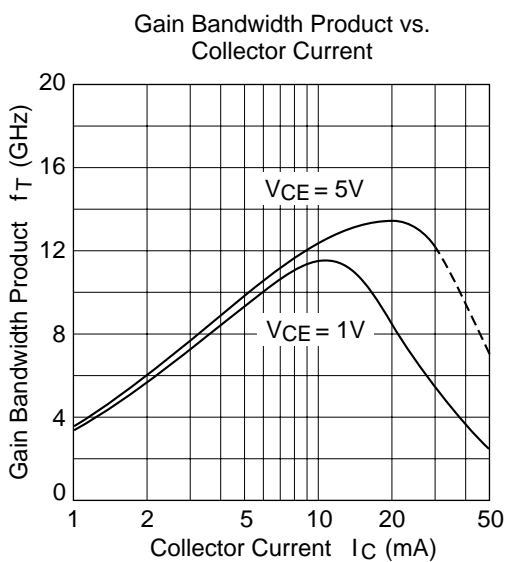
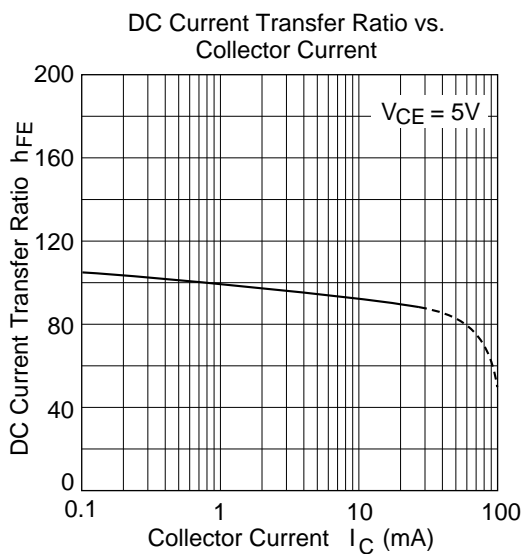
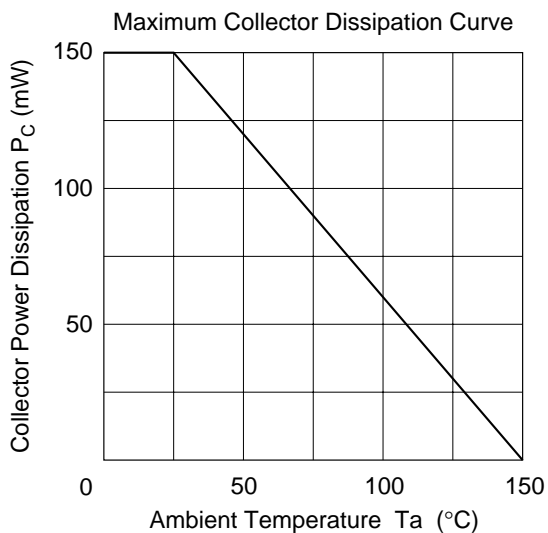
It is recommended to adopt appropriate cautions when handling this transistor.

## Absolute Maximum Ratings (Ta = 25°C)

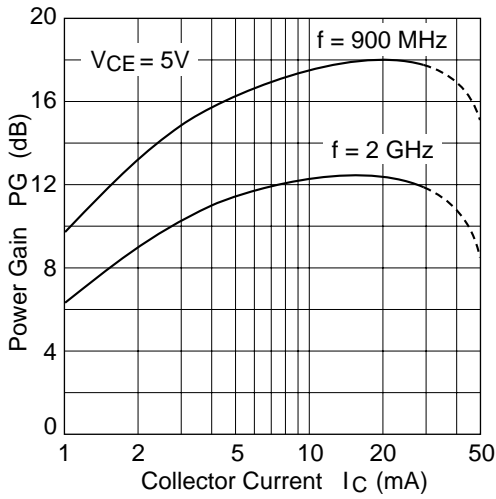
Item	Symbol	Ratings	Unit
Collector to base voltage	$V_{CBO}$	15	V
Collector to emitter voltage	$V_{CEO}$	8	V
Emitter to base voltage	$V_{EBO}$	1.5	V
Collector current	$I_C$	50	mA
Collector power dissipation	$P_C$	150	mW
Junction temperature	$T_j$	150	°C
Storage temperature	$T_{stg}$	-55 to +150	°C

## Electrical Characteristics (Ta = 25°C)

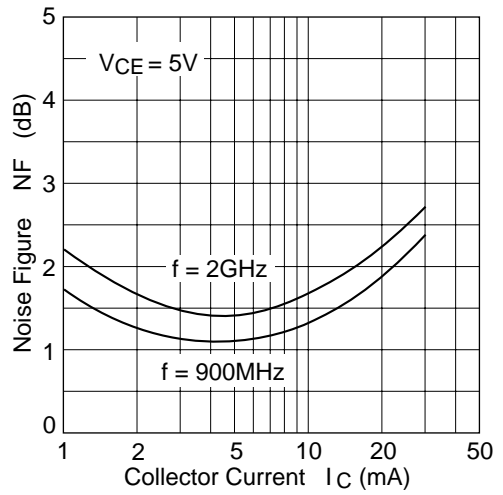
Item	Symbol	Min	Typ	Max	Unit	Test conditions
Collector to base breakdown voltage	$V_{(BR)CBO}$	15	—	—	V	$I_C = 10 \mu A, I_E = 0$
Collector cutoff current	$I_{CBO}$	—	—	1	$\mu A$	$V_{CB} = 12 V, I_E = 0$
	$I_{CEO}$	—	—	1	mA	$V_{CE} = 8 V, R_{BE} =$
Emitter cutoff current	$I_{EBO}$	—	—	10	$\mu A$	$V_{EB} = 1.5 V, I_C = 0$
DC current transfer ratio	$h_{FE}$	50	90	160		$V_{CE} = 5 V, I_C = 20 mA$
Collector output capacitance	$C_{ob}$	—	0.4	0.75	pF	$V_{CB} = 5 V, I_E = 0, f = 1 MHz$
Gain bandwidth product	$f_T$	10.5	13.5	—	GHz	$V_{CE} = 5 V, I_C = 20 mA$
Power gain	PG	15	18	—	dB	$V_{CE} = 5 V, I_C = 20 mA, f = 900 MHz$
Noise figure	NF	—	1.1	2.0	dB	$V_{CE} = 5 V, I_C = 5 mA, f = 900 MHz$



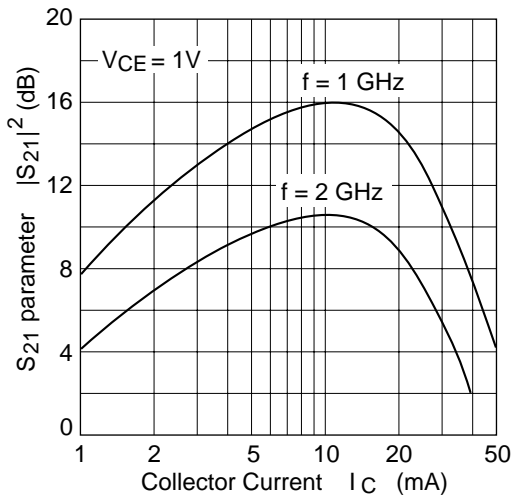
Power Gain vs. Collector Current



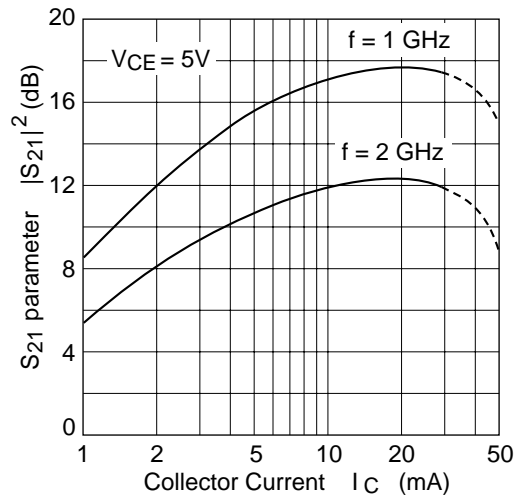
Noise Figure vs. Collector Current



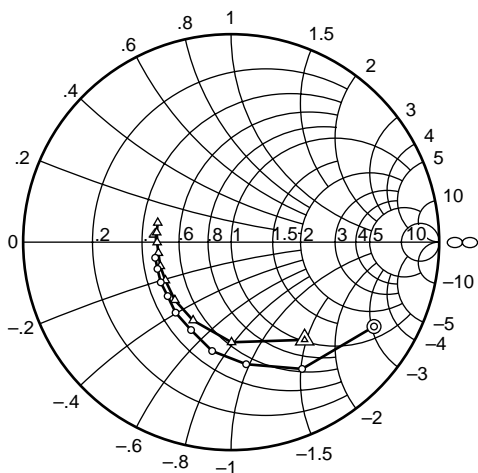
S21 Parameter vs. Collector Current



S21 Parameter vs. Collector Current

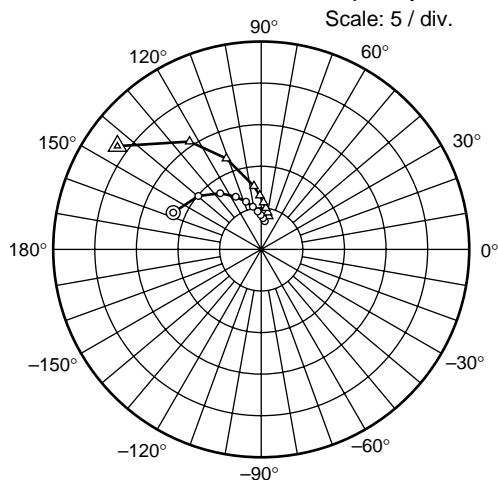


S11 Parameter vs. Frequency



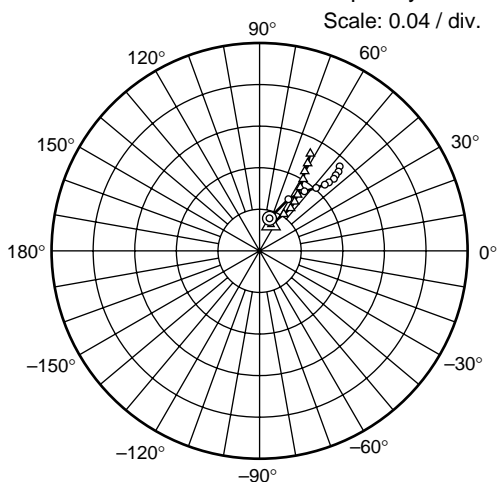
Condition:  $V_{CE} = 5\text{ V}$ ,  $Z_o = 50\ \Omega$   
 200 to 2000 MHz (200 MHz step)  
 ○ (IC = 5 mA)  
 △ (IC = 20 mA)

S21 Parameter vs. Frequency



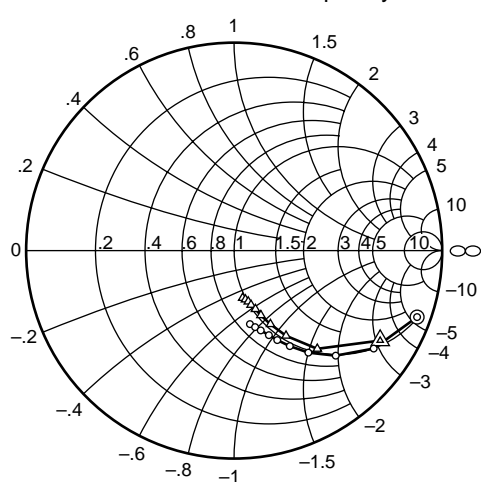
Condition:  $V_{CE} = 5\text{ V}$ ,  $Z_o = 50\ \Omega$   
 200 to 2000 MHz (200 MHz step)  
 ○ (IC = 5 mA)  
 △ (IC = 20 mA)

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

Freq. (MHz)	S11		S21		S12		S22	
	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.
200	0.798	-30.8	11.47	157.3	0.0329	73.0	0.936	-20.0
400	0.699	-60.8	9.88	139.6	0.0570	60.8	0.820	-35.1
600	0.592	-83.0	8.35	126.1	0.0718	53.0	0.703	-46.0
800	0.532	-99.9	7.03	115.7	0.0817	48.0	0.607	-54.0
1000	0.465	-114.5	6.02	107.6	0.0891	45.4	0.532	-59.8
1200	0.432	-128.2	5.23	101.0	0.0939	44.6	0.478	-64.3
1400	0.401	-139.6	4.58	95.2	0.0993	44.1	0.440	-67.7
1600	0.390	-150.2	4.14	90.7	0.103	44.8	0.405	-71.6
1800	0.373	-160.5	3.76	86.4	0.108	45.1	0.382	-74.7
2000	0.373	-168.3	3.42	82.6	0.112	46.5	0.362	-77.9

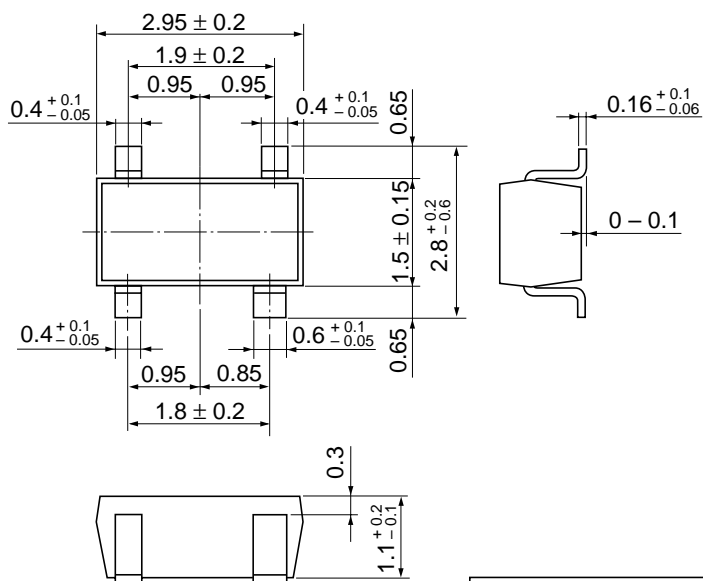
## S Parameters ( $V_{CE} = 5\text{ V}$ , $I_C = 20\text{ mA}$ , $Z_O = 50\ \Omega$ )

Freq. (MHz)	S11		S21		S12		S22	
	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.
200	0.588	-53.1	21.24	144.3	0.0275	66.3	0.826	-31.8
400	0.482	-89.8	15.59	123.6	0.0423	56.6	0.619	-49.8
600	0.419	-115.9	11.75	111.0	0.0507	53.9	0.480	-58.7
800	0.389	-134.1	9.29	102.4	0.0581	54.5	0.395	-63.8
1000	0.366	-149.7	7.64	96.5	0.0652	55.8	0.337	-67.6
1200	0.365	-161.9	6.47	91.4	0.0726	57.3	0.300	-70.1
1400	0.354	-171.4	5.63	97.1	0.0806	58.7	0.274	-72.8
1600	0.356	-179.7	4.98	83.5	0.0877	60.4	0.255	-74.6
1800	0.361	172.7	4.48	79.9	0.0959	61.2	0.242	-77.1
2000	0.365	165.3	4.06	77.0	0.105	62.4	0.232	-79.9

## Package Dimensions

As of January, 2001

Unit: mm



Hitachi Code	MPAK-4
JEDEC	—
EIAJ	Conforms
Mass (reference value)	0.013 g

## Cautions

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