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

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2SC5593

Silicon NPN Epitaxial High Frequency Low Noise Amplifier

RENESAS

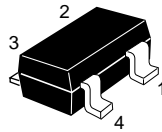
ADE-208-797 (Z)
1st. Edition
Nov. 2000

Features

- High gain bandwidth product
 $f_T = 23 \text{ GHz typ.}$
- High power gain and low noise figure ;
 $PG = 18 \text{ dB typ. , } NF = 1.8 \text{ dB typ. at } f = 1.8 \text{ GHz}$

Outline

CMPAK-4



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

Note: Marking is "XH-".

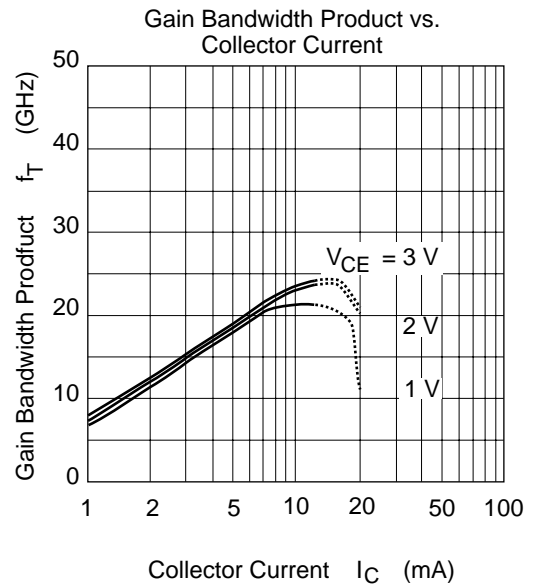
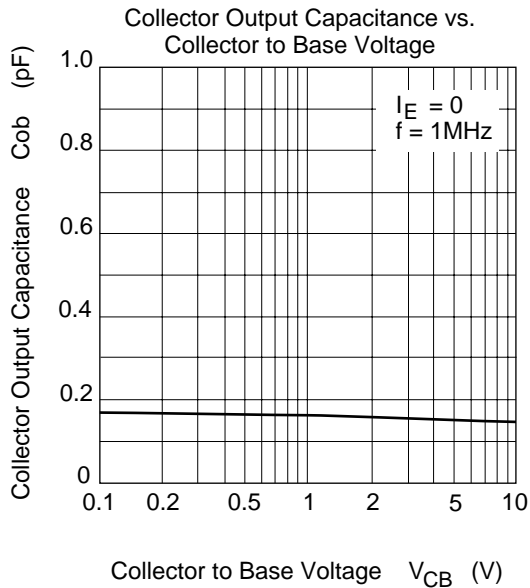
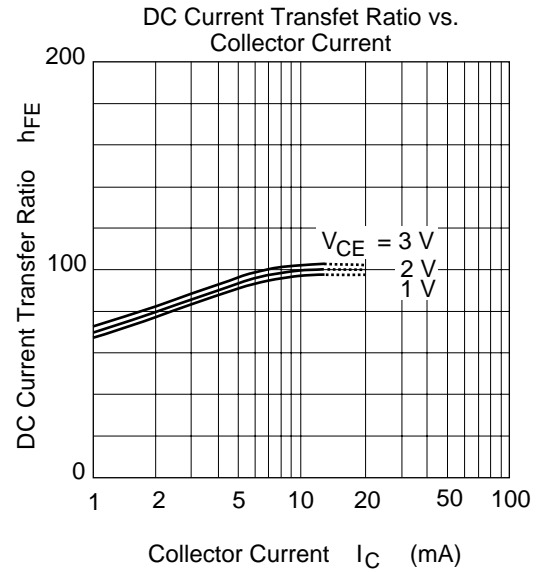
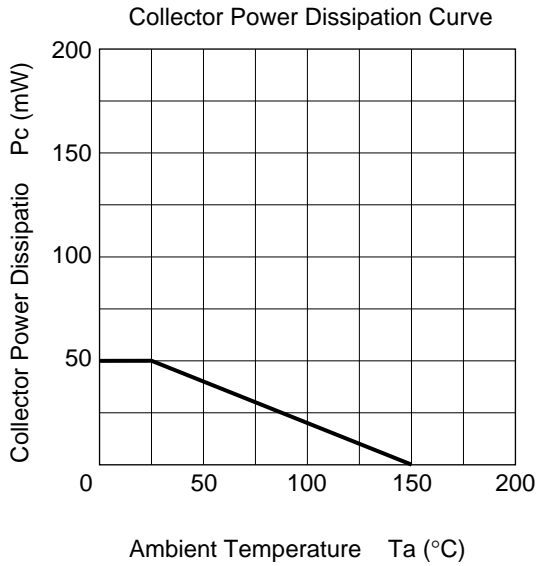
Absolute Maximum Ratings ($T_a = 25^\circ\text{C}$)

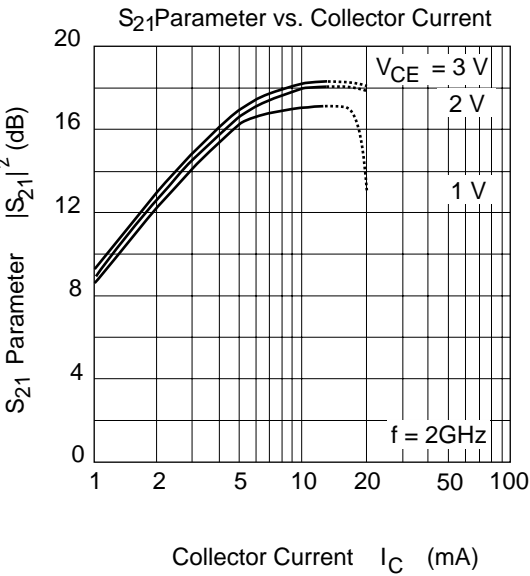
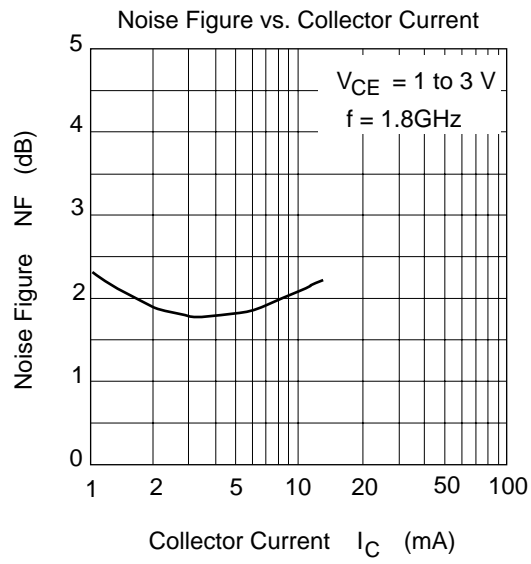
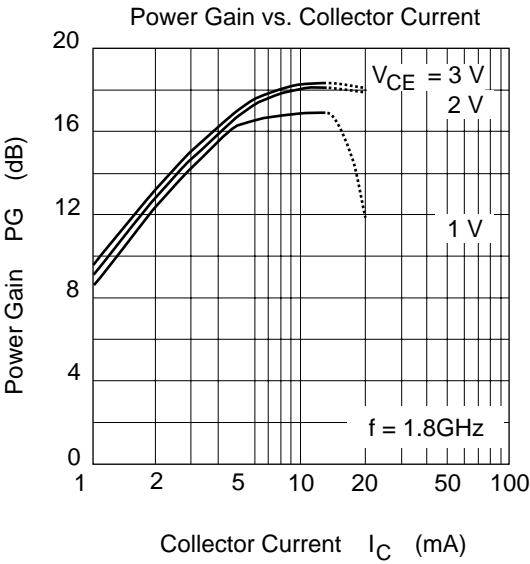
Item	Symbol	Ratings	Unit
Collector to base voltage	V_{CBO}	12	V
Collector to emitter voltage	V_{CEO}	4.5	V
Emitter to base voltage	V_{EBO}	1	V
Collector current	I_{C}	12	mA
Collector power dissipation	P_{c}	50	mW
Junction temperature	T_{j}	150	$^\circ\text{C}$
Storage temperature	T_{stg}	-55 to +150	$^\circ\text{C}$

Electrical Characteristics ($T_a = 25^\circ\text{C}$)

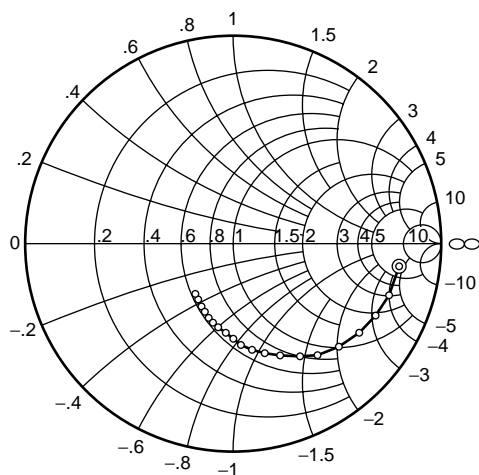
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Collector to base breakdown voltage	$V_{(\text{BR})\text{CBO}}$	12	—	—	V	$I_{\text{C}} = 10\text{ }\mu\text{A}$, $I_{\text{E}} = 0$
Collector cutoff current	I_{CBO}	—	—	1	μA	$V_{\text{CB}} = 10\text{ V}$, $I_{\text{E}} = 0$
Collector cutoff current	I_{CEO}	—	—	1	μA	$V_{\text{CE}} = 4\text{ V}$, $R_{\text{BE}} = \infty$
Emitter cutoff current	I_{EBO}	—	—	12	μA	$V_{\text{EB}} = 1\text{ V}$, $I_{\text{C}} = 0$
DC current transfer ratio	h_{FE}	60	100	140	V	$V_{\text{CE}} = 2\text{ V}$, $I_{\text{C}} = 10\text{ mA}$
Collector output capacitance	C_{ob}	—	0.16	0.4	pF	$V_{\text{CB}} = 2\text{ V}$, $I_{\text{E}} = 0$ $f = 1\text{ MHz}$
Gain bandwidth product	f_{T}	20	23	—	GHz	$V_{\text{CE}} = 2\text{ V}$, $I_{\text{C}} = 10\text{ mA}$ $f = 2\text{ GHz}$
Power gain	PG	14	18	—	dB	$V_{\text{CE}} = 2\text{ V}$, $I_{\text{C}} = 10\text{ mA}$ $f = 1.8\text{ GHz}$
Noise figure	NF	—	1.8	2.3	dB	$V_{\text{CE}} = 2\text{ V}$, $I_{\text{C}} = 3\text{ mA}$ $f = 1.8\text{ GHz}$

Main Characteristics





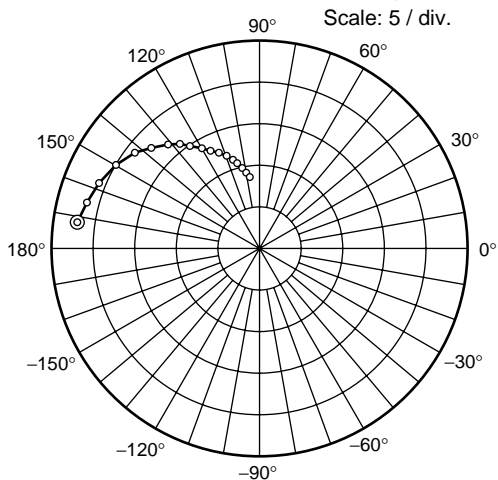
S11 Parameter vs. Frequency

Condition : $V_{CE} = 2\text{ V}$, $I_C = 10\text{ mA}$

100 to 2000 MHz (100 MHz step)

⊙—○

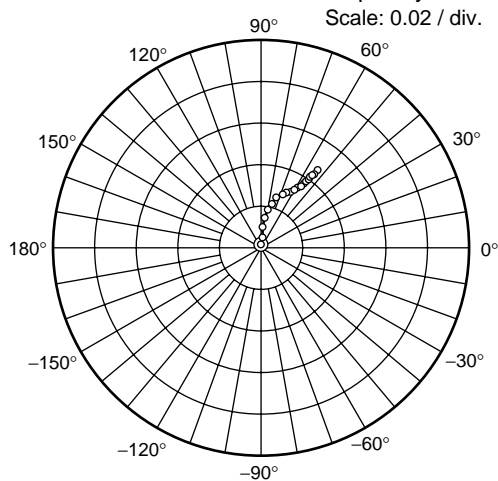
S21 Paramter vs. Frequency

Condition : $V_{CE} = 2\text{ V}$, $I_C = 10\text{ mA}$

100 to 2000 MHz (100 MHz step)

⊙—○

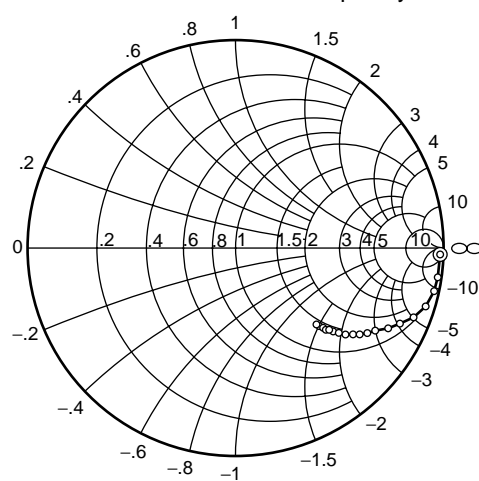
S12 Parameter vs. Frequency

Condition : $V_{CE} = 2\text{ V}$, $I_C = 10\text{ mA}$

100 to 2000 MHz (100 MHz step)

⊙—○

S22 Parameter vs. Frequency

Condition : $V_{CE} = 2\text{ V}$, $I_C = 10\text{ mA}$

100 to 2000 MHz (100 MHz step)

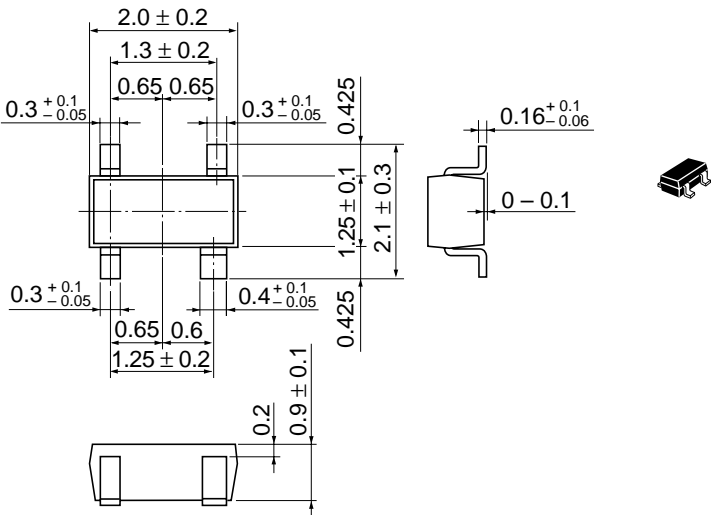
⊙—○

S-parameter ($V_{CE} = 2\text{ V}$, $I_C = 10\text{ mA}$, $Z_o = 50\ \Omega$)

f (MHz)	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100	0.804	−8.2	22.02	172.5	0.00305	94.6	0.993	−3.4
200	0.795	−17.8	21.55	165.0	0.0067	86.8	0.986	−8.1
300	0.776	−27.4	20.88	157.5	0.0107	85.4	0.972	−12.7
400	0.746	−35.8	20.05	150.2	0.0146	82.5	0.947	−17.2
500	0.714	−44.5	18.93	143.7	0.0182	78.4	0.917	−21.2
600	0.673	−53.2	17.84	137.9	0.0215	74.8	0.881	−25.1
700	0.632	−59.9	16.60	132.5	0.0249	71.8	0.842	−28.3
800	0.595	−67.1	15.69	127.9	0.0274	67.9	0.808	−31.2
900	0.557	−74.6	14.64	123.5	0.0296	65.1	0.763	−33.7
1000	0.519	−79.1	13.68	119.5	0.0319	63.6	0.729	−35.6
1100	0.488	−86.0	12.88	116.0	0.0337	61.6	0.696	−37.2
1200	0.454	−91.1	12.03	112.8	0.0350	60.4	0.666	−38.6
1300	0.430	−95.9	11.26	110.6	0.0366	58.8	0.644	−39.5
1400	0.403	−101.8	10.69	107.8	0.0382	57.4	0.619	−40.6
1500	0.377	−106.3	10.16	105.4	0.0401	56.6	0.598	−41.2
1600	0.364	−111.0	9.66	103.6	0.0410	56.3	0.581	−42.0
1700	0.346	−116.6	9.19	101.4	0.0422	55.6	0.564	−42.6
1800	0.327	−120.0	8.79	99.3	0.0435	55.2	0.550	−43.2
1900	0.313	−124.9	8.40	97.5	0.0447	55.2	0.537	−43.9
2000	0.296	−130.8	7.99	95.5	0.0457	54.8	0.525	−44.0

Package Dimensions

Unit: mm



Hitachi Code	CMPAK-4(T)
JEDEC	—
EIAJ	Conforms
Mass (reference value)	0.006 g

Cautions

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