
2SC4993

Silicon NPN Epitaxial

HITACHI

ADE-208-011
1st. Edition

Application

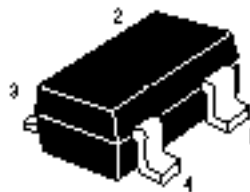
VHF / UHF wide band amplifier

Features

- Σ High gain bandwidth product
 $f_T = 10.5 \text{ GHz Typ}$
- Σ High gain, low noise figure
 $PG = 16.5 \text{ dB Typ}$, $NF = 1.2 \text{ dB Typ}$ at $f = 900 \text{ MHz}$

Outline

MPAK-4



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

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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	150	mW
Junction temperature	T_j	150	°C
Storage temperature	T_{stg}	-55 to +150	°C

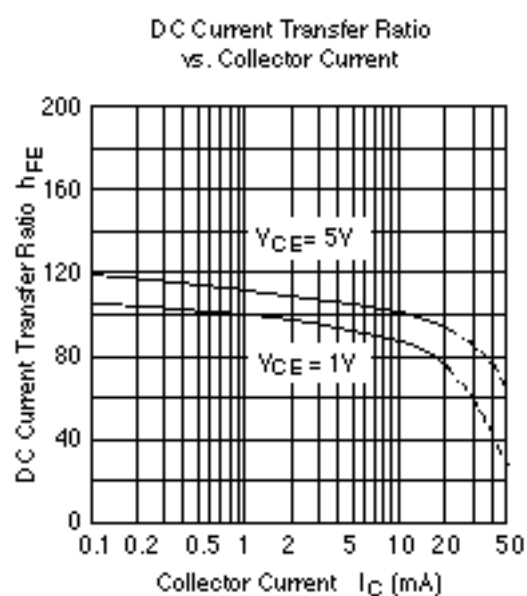
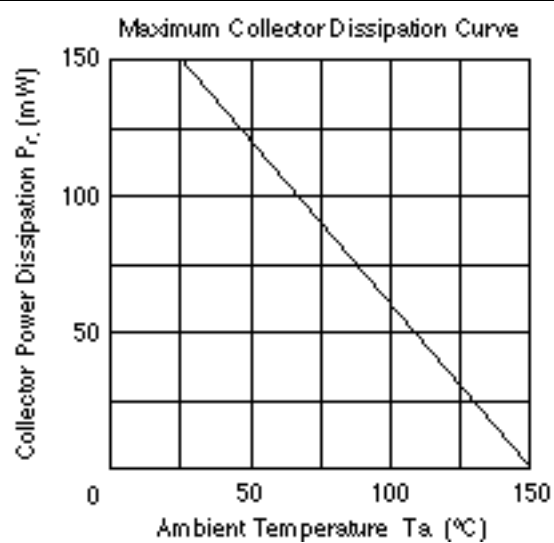
Electrical Characteristics (Ta = 25°C)

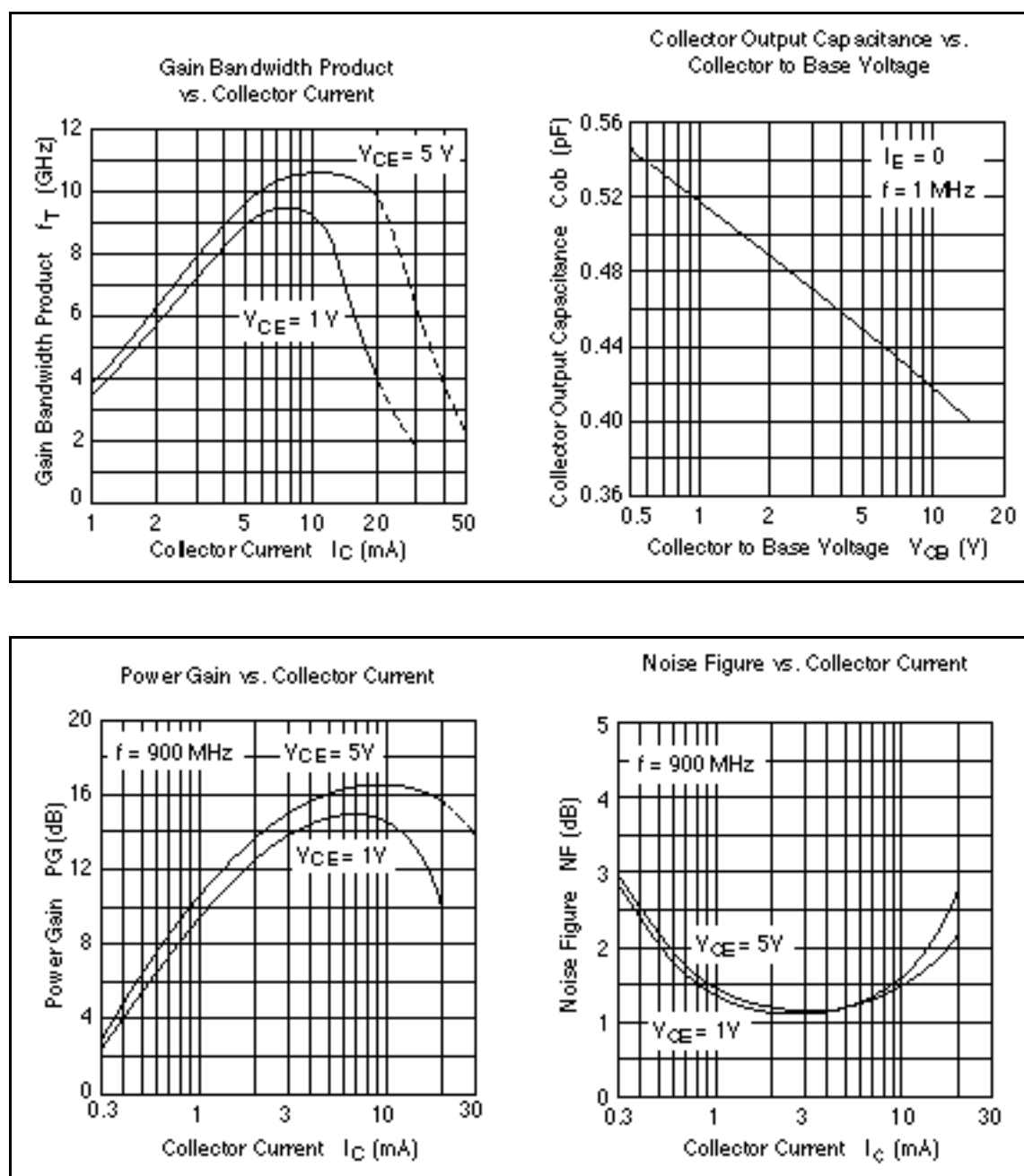
Item	Symbol	Min	Typ	Max	Unit	Test conditions
Collector cutoff current	I_{CBO}	—	—	10	μA	$V_{CB} = 15\text{ V}, I_E = 0$
	I_{CEO}	—	—	1	mA	$V_{CE} = 8\text{ V}, R_{BE} = \bullet$
Emitter cutoff current	I_{EBO}	—	—	10	μA	$V_{EB} = 1.5\text{ V}, I_C = 0$
DC current transfer ratio	h_{FE}	50	120	250		$V_{CE} = 5\text{ V}, I_C = 10\text{ mA}$
Collector output capacitance	C_{ob}	—	0.45	0.8	pF	$V_{CB} = 5\text{ V}, I_E = 0, f = 1\text{ MHz}$
Gain bandwidth product	f_T	7.5	10.5	—	GHz	$V_{CE} = 5\text{ V}, I_C = 10\text{ mA}$
Power gain	PG	13.5	16.5	—	dB	$V_{CE} = 5\text{ V}, I_C = 10\text{ mA}, f = 900\text{ MHz}$
Noise figure	NF	—	1.2	2.5	dB	$V_{CE} = 5\text{ V}, I_C = 5\text{ mA}, f = 900\text{ MHz}$

Note: Marking is "YS—".

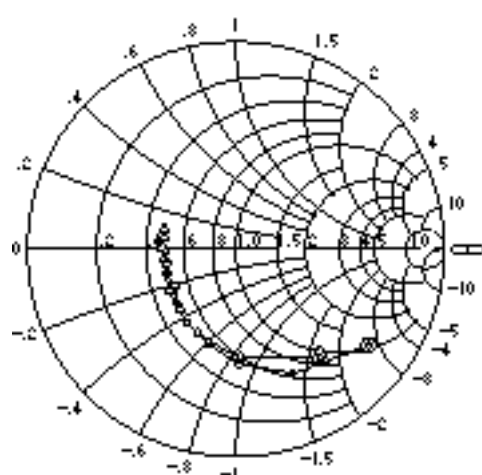
Attention: This device is very sensitive to electro static discharge.

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



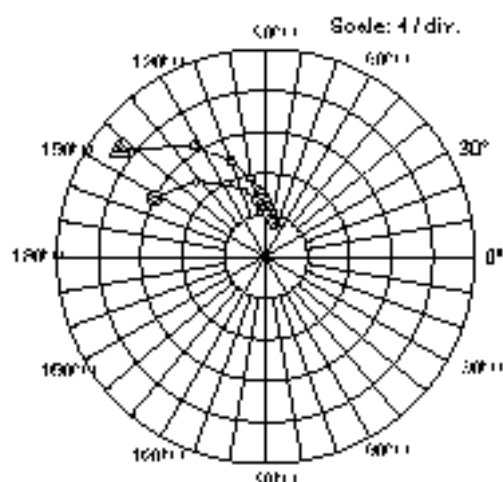


S11 Parameter vs. Frequency



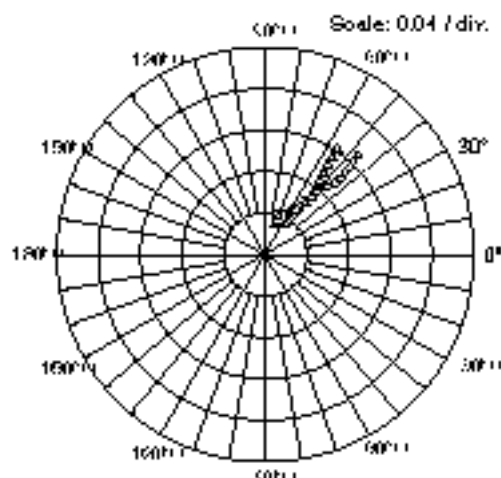
Condition: $V_{CE} = 5 \text{ V}$, $Z_0 = 50 \Omega$
 200 to 2000 MHz (200 MHz step)
 ○ — ($I_C = 5 \text{ mA}$)
 △ — ($I_C = 10 \text{ mA}$)

S21 Parameter vs. Frequency



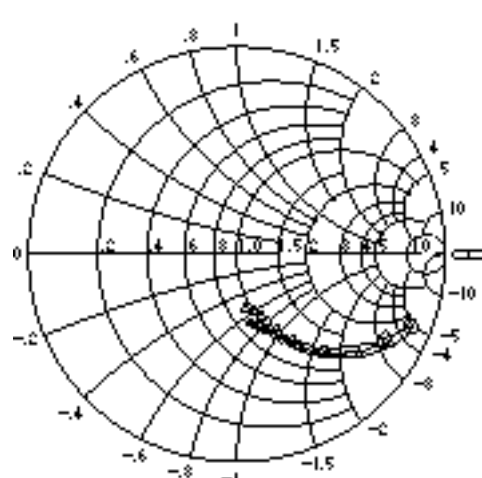
Condition: $V_{CE} = 5 \text{ V}$, $Z_0 = 50 \Omega$
 200 to 2000 MHz (200 MHz step)
 ○ — ($I_C = 5 \text{ mA}$)
 △ — ($I_C = 10 \text{ mA}$)

S12 Parameter vs. Frequency



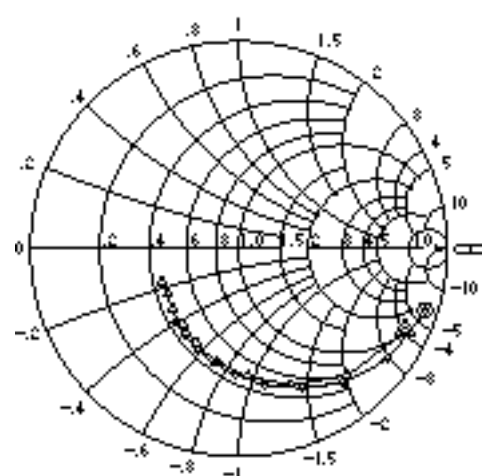
Condition: $V_{CE} = 5 \text{ V}$, $Z_0 = 50 \Omega$
 200 to 2000 MHz (200 MHz step)
 ○ — ($I_C = 5 \text{ mA}$)
 △ — ($I_C = 10 \text{ mA}$)

S22 Parameter vs. Frequency



Condition: $V_{CE} = 5 \text{ V}$, $Z_0 = 50 \Omega$
 200 to 2000 MHz (200 MHz step)
 ○ — ($I_C = 5 \text{ mA}$)
 △ — ($I_C = 10 \text{ mA}$)

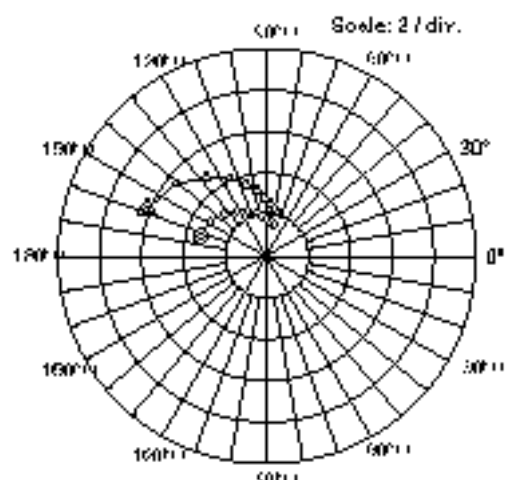
S11 Parameter vs. Frequency



Condition: $V_{CE} = 1\text{ V}$, $Z_0 = 50\ \Omega$
200 to 2000 MHz (200 MHz step)

● (IC = 1 mA)
▲ (IC = 2 mA)

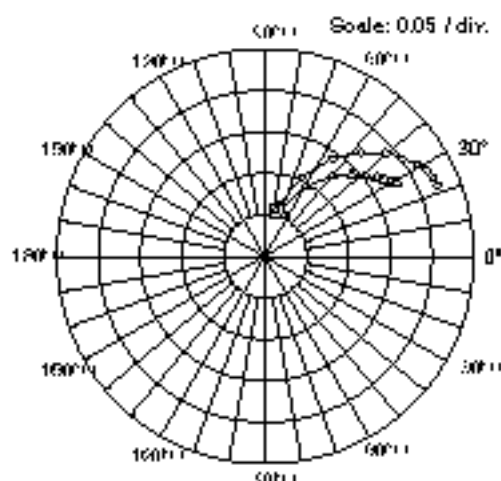
S21 Parameter vs. Frequency



Condition: $V_{CE} = 1\text{ V}$, $Z_0 = 50\ \Omega$
200 to 2000 MHz (200 MHz step)

● (IC = 1 mA)
▲ (IC = 2 mA)

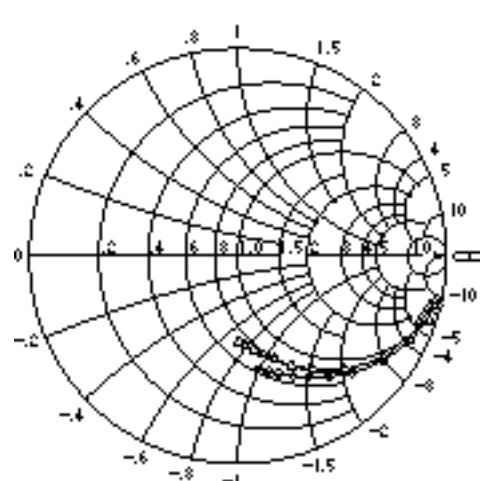
S12 Parameter vs. Frequency



Condition: $V_{CE} = 1\text{ V}$, $Z_0 = 50\ \Omega$
200 to 2000 MHz (200 MHz step)

● (IC = 1 mA)
▲ (IC = 2 mA)

S22 Parameter vs. Frequency



Condition: $V_{CE} = 1\text{ V}$, $Z_0 = 50\ \Omega$
200 to 2000 MHz (200 MHz step)

● (IC = 1 mA)
▲ (IC = 2 mA)

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

Freq. (MHz)	S11		S21		S12		S22	
	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.
200	0.787	-35.9	12.02	152.4	0.0390	70.3	0.903	-22.7
400	0.655	-65.4	9.86	132.8	0.0633	51.0	0.754	-39.1
600	0.551	-88.3	8.01	118.4	0.0782	51.0	0.626	-49.8
800	0.472	-106.4	6.54	108.4	0.0882	47.5	0.533	-56.6
1000	0.423	-123.2	5.52	100.3	0.0962	45.7	0.466	-62.0
1200	0.385	-136.2	4.72	94.0	0.103	45.5	0.422	-65.8
1400	0.357	-148.4	4.14	88.5	0.110	46.2	0.390	-69.5
1600	0.347	-159.6	3.68	83.6	0.117	46.2	0.367	-72.8
1800	0.338	-169.2	3.35	79.3	0.124	46.9	0.350	-75.8
2000	0.340	-177.5	3.04	74.9	0.131	47.1	0.337	-79.4

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

Freq. (MHz)	S11		S21		S12		S22	
	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.
200	0.659	-52.2	17.36	144.0	0.0343	65.6	0.827	-30.6
400	0.522	-87.8	12.78	122.8	0.0518	54.8	0.625	-47.7
600	0.445	-114.3	9.68	109.7	0.0626	51.6	0.491	-56.7
800	0.398	-132.4	7.64	100.9	0.0706	51.2	0.409	-61.8
1000	0.374	-147.7	6.29	94.2	0.0789	51.8	0.356	-65.6
1200	0.354	-161.2	5.33	88.7	0.0872	53.0	0.322	-68.5
1400	0.351	-172.0	4.64	84.2	0.0953	54.4	0.299	-71.5
1600	0.353	179.2	4.10	79.9	0.104	55.0	0.284	-74.5
1800	0.351	171.1	3.70	76.3	0.113	55.4	0.273	-77.4
2000	0.358	164.3	3.34	72.5	0.122	55.6	0.266	-80.7

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

Freq. (MHz)	S11		S21		S12		S22	
	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.
200	0.942	-18.2	3.33	163.2	0.0570	76.8	0.976	-14.2
400	0.888	-36.5	3.16	148.5	0.105	65.2	0.923	-25.9
600	0.817	-52.2	2.86	135.0	0.143	55.5	0.857	-36.2
800	0.737	-65.6	2.62	123.3	0.170	47.4	0.789	-45.6
1000	0.665	-79.6	2.36	113.0	0.191	40.7	0.729	-53.1
1200	0.604	-91.6	2.15	103.5	0.204	35.6	0.676	-59.6
1400	0.561	-101.9	1.94	96.4	0.213	31.5	0.636	-65.5
1600	0.523	-112.1	1.79	89.9	0.220	28.0	0.600	-70.7
1800	0.485	-121.4	1.66	83.4	0.223	24.9	0.575	-75.2
2000	0.467	-130.5	1.54	77.6	0.224	22.5	0.553	-79.8

S Parameters ($V_{CE} = 1\text{ V}$, $I_C = 2\text{ mA}$, $Z_O = 50\text{ }\Omega$)

Freq. (MHz)	S11		S21		S12		S22	
	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.
200	0.890	-26.2	6.17	158.9	0.0552	73.0	0.949	-19.0
400	0.800	-49.7	5.53	141.4	0.0967	60.0	0.854	-35.0
600	0.701	-69.1	4.76	127.4	0.125	50.3	0.751	-46.8
800	0.614	-85.9	4.14	115.8	0.143	43.3	0.658	-56.7
1000	0.552	-101.1	3.58	106.5	0.155	38.4	0.589	-64.1
1200	0.498	-114.3	3.16	98.2	0.164	35.1	0.530	-70.4
1400	0.455	-126.7	2.80	91.8	0.170	32.8	0.493	-75.3
1600	0.430	-137.2	2.52	85.2	0.175	30.8	0.461	-80.2
1800	0.405	-147.3	2.31	80.8	0.179	29.8	0.437	-84.9
2000	0.402	-156.7	2.12	75.6	0.181	28.9	0.417	-89.1

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