
2SC5247

Silicon NPN Epitaxial

HITACHI

ADE-208-281
1st. Edition

Application

VHF / UHF wide band amplifier

Features

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

Outline

SMPAK



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

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

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	T_{j}	150	$^\circ\text{C}$
Storage temperature	T_{stg}	-55 to +150	$^\circ\text{C}$

Note: Marking is "ZD-".

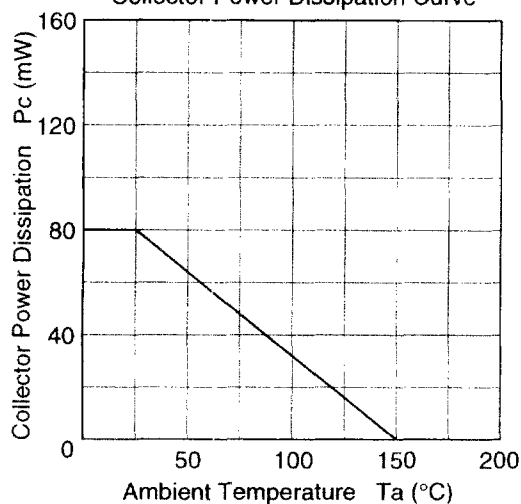
Attention: This device is very sensitive to electro static discharge.

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

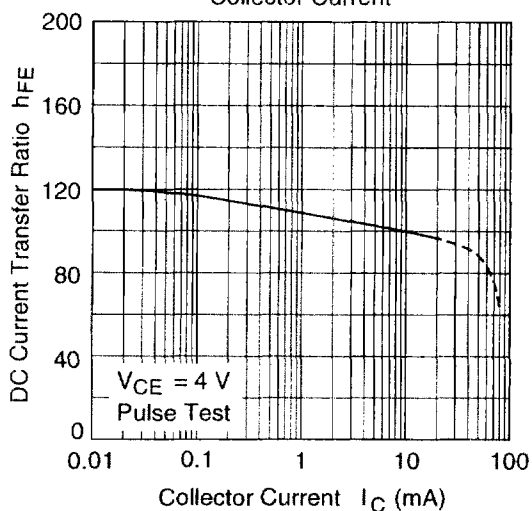
Electrical Characteristics ($T_a = 25^\circ\text{C}$)

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

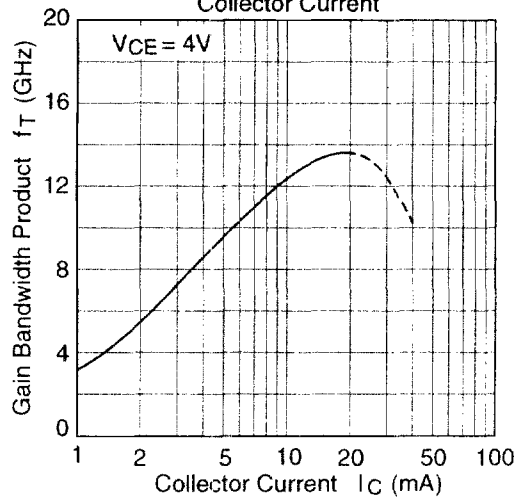
Collector Power Dissipation Curve



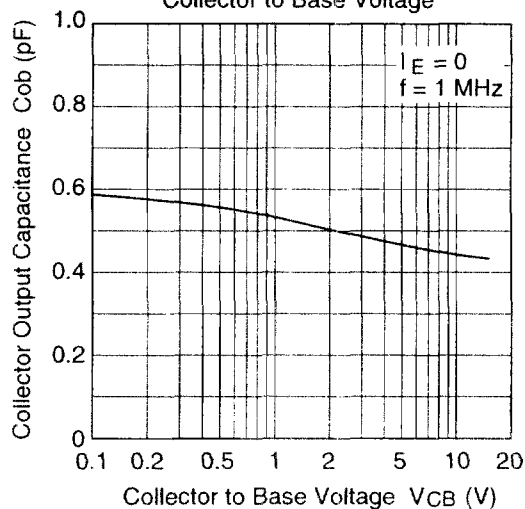
DC Current Transfer Ratio vs. Collector Current

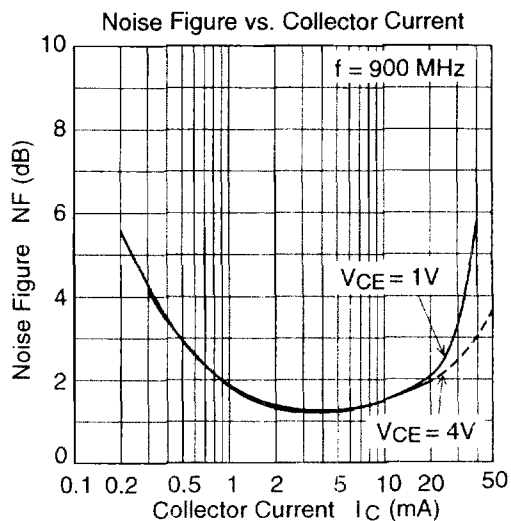
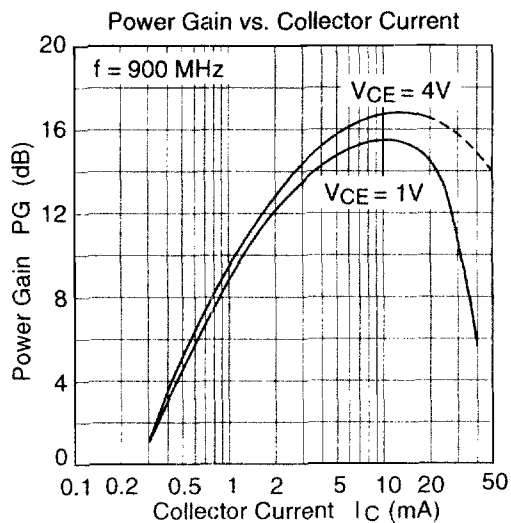


Gain Bandwidth Product vs. Collector Current

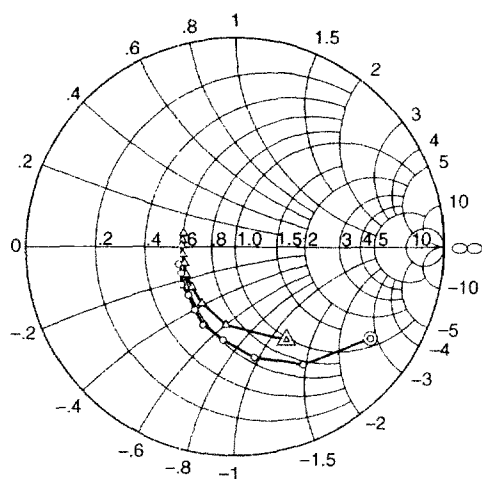


Collector Output Capacitance vs. Collector to Base Voltage





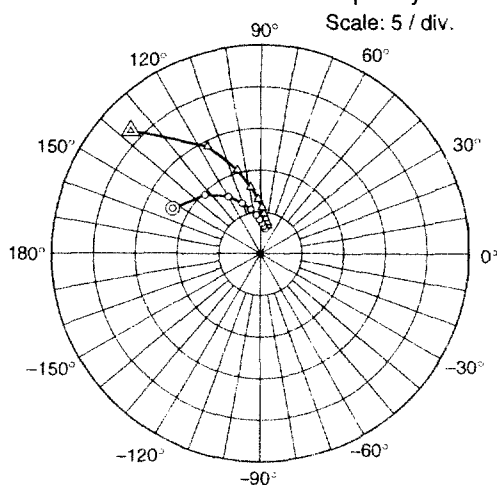
S11 Parameter vs. Frequency



Condition: $V_{CE} = 4\text{ V}$, $Z_o = 50\ \Omega$
200 to 2000 MHz (200 MHz step)

○ — ○ ($I_C = 5\text{ mA}$)
△ — △ ($I_C = 20\text{ mA}$)

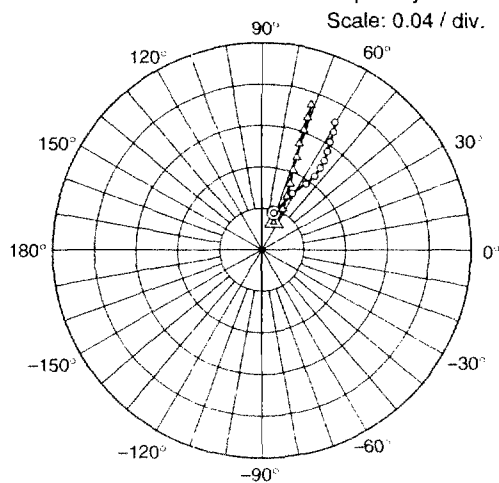
S21 Parameter vs. Frequency



Condition: $V_{CE} = 4\text{ V}$, $Z_o = 50\ \Omega$
200 to 2000 MHz (200 MHz step)

○ — ○ ($I_C = 5\text{ mA}$)
△ — △ ($I_C = 20\text{ mA}$)

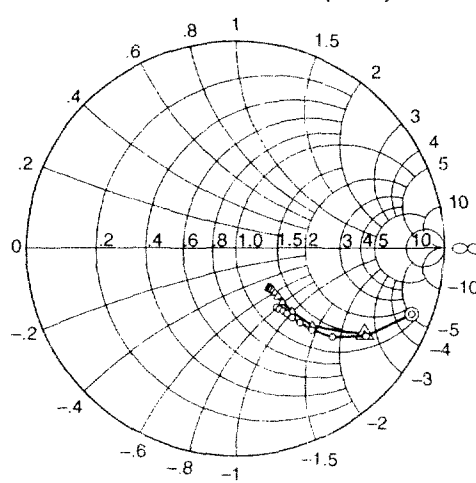
S12 Parameter vs. Frequency



Condition: $V_{CE} = 4\text{ V}$, $Z_o = 50\ \Omega$
200 to 2000 MHz (200 MHz step)

○ — ○ ($I_C = 5\text{ mA}$)
△ — △ ($I_C = 20\text{ mA}$)

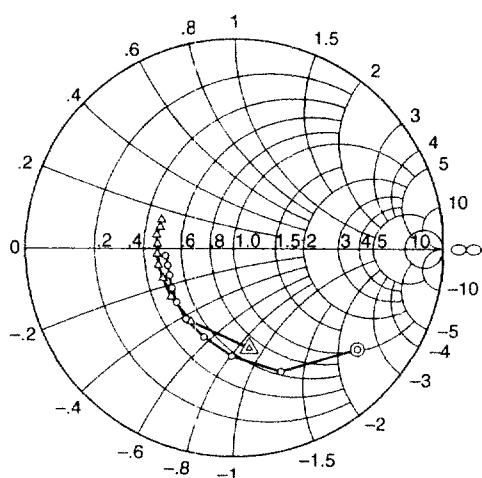
S22 Parameter vs. Frequency



Condition: $V_{CE} = 4\text{ V}$, $Z_o = 50\ \Omega$
200 to 2000 MHz (200 MHz step)

○ — ○ ($I_C = 5\text{ mA}$)
△ — △ ($I_C = 20\text{ mA}$)

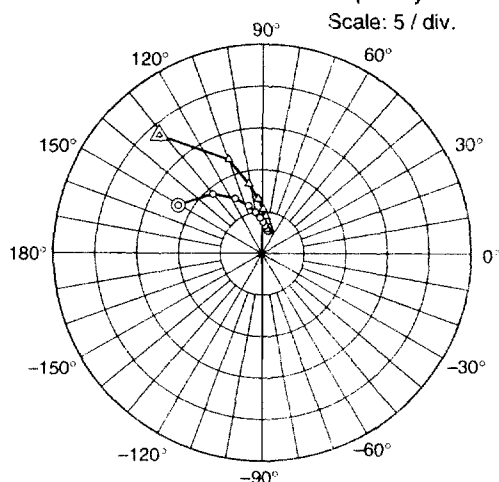
S11 Parameter vs. Frequency



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

○ — ○ ($I_C = 5\text{ mA}$)
△ — △ ($I_C = 20\text{ mA}$)

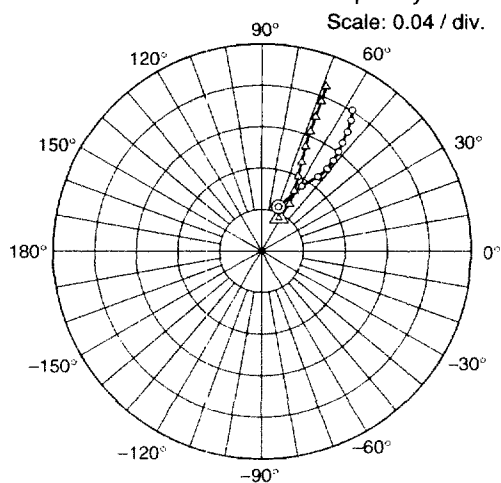
S21 Parameter vs. Frequency



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

○ — ○ ($I_C = 5\text{ mA}$)
△ — △ ($I_C = 20\text{ mA}$)

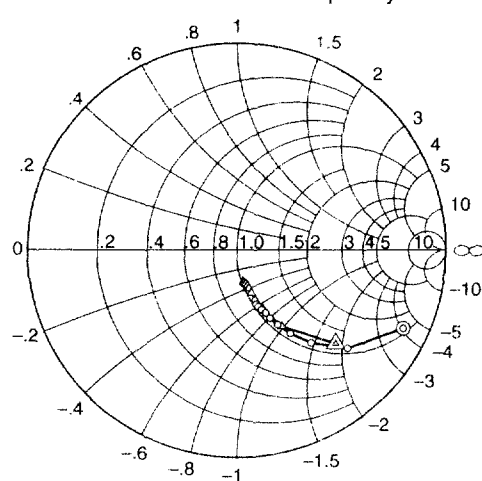
S12 Parameter vs. Frequency



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

○ — ○ ($I_C = 5\text{ mA}$)
△ — △ ($I_C = 20\text{ mA}$)

S22 Parameter vs. Frequency



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

○ — ○ ($I_C = 5\text{ mA}$)
△ — △ ($I_C = 20\text{ mA}$)

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S Parameter ($V_{CE} = 4\text{ V}$, $I_C = 5\text{ mA}$, $Z_O = 50\ \Omega$)

Freq. (MHz)	S11		S21		S12		S22	
	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.
200	0.785	-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 ($V_{CE} = 4\text{ V}$, $I_C = 20\text{ mA}$, $Z_O = 50\ \Omega$)

Freq. (MHz)	S11		S21		S12		S22	
	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.
200	0.510	-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 ($V_{CE} = 1\text{ V}$, $I_C = 5\text{ mA}$, $Z_0 = 50\ \Omega$)

Freq. (MHz)	S11		S21		S12		S22	
	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.
200	0.763	-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 ($V_{CE} = 1\text{ V}$, $I_C = 10\text{ mA}$, $Z_0 = 50\ \Omega$)

Freq. (MHz)	S11		S21		S12		S22	
	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