2SC4784

Silicon NPN Epitaxial

HITACHI

Application

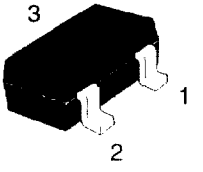
VHF / UHF wide band amplifier

Features

- High gain bandwidth product
  f_T = 10 GHz Typ.
- High gain, low noise figure
  PG = 15.0 dB Typ, NF = 1.2 dB Typ at f = 900 MHz

Outline

CMPAK



1. Emitter
2. Base
3. Collector

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	100	mW
Junction temperature	Tj	150	°C
Storage temperature	Tstg	–55 to +150	°C

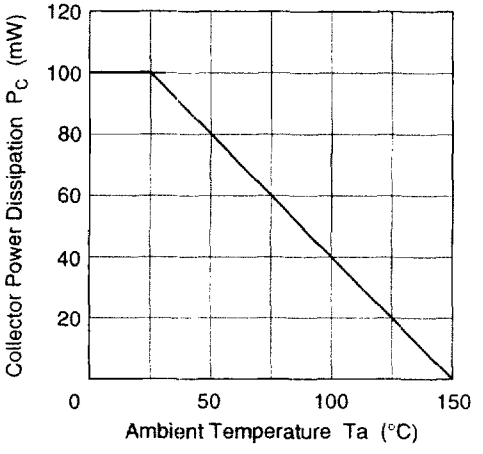
Electrical Characteristics (Ta = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test conditions
Collector cutoff current	I_{CBO}	—	—	10	µA	V_{CB} = 15 V, I_E = 0
	I_{CEO}	—	—	1	mA	V_{CE} = 8 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 = 10 mA
Collector output capacitance	Cob	—	0.45	0.8	pF	V_{CB} = 5 V, I_E = 0, f = 1 MHz
Gain bandwidth product	f_T	7.0	10.0	—	GHz	V_{CE} = 5 V, I_C = 10 mA
Power gain	PG	12.0	15.0	—	dB	V_{CE} = 5 V, I_C = 10 mA, f = 900 MHz
Noise figure	NF	—	1.2	2.5	dB	V_{CE} = 5 V, I_C = 5 mA, f = 900 MHz

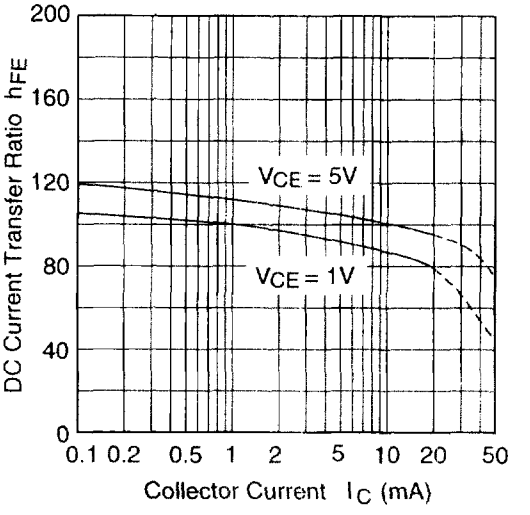
Note: Marking is "YA–".

Attention: This is electrostatic sensitve device.

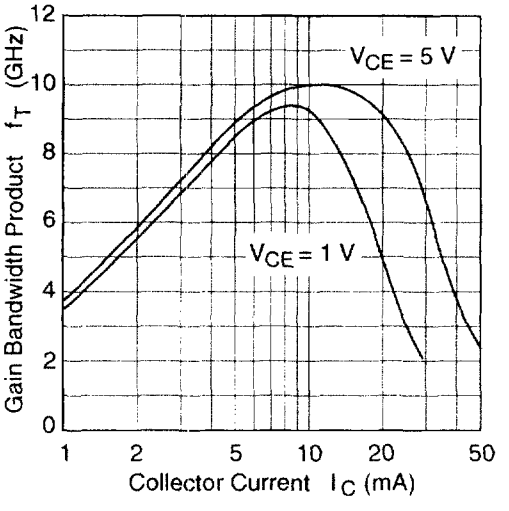
Maximum Collector Dissipation Curve



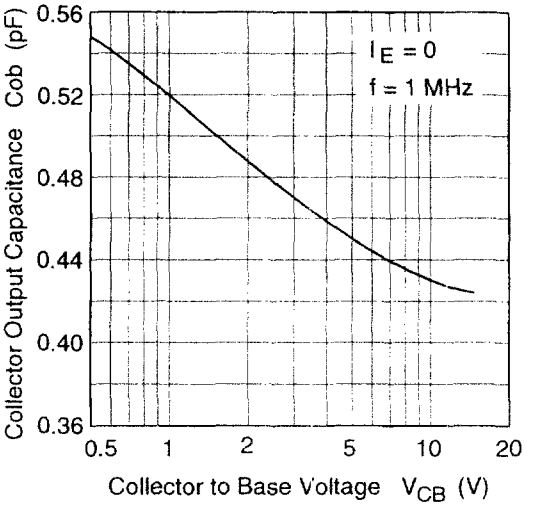
DC Current Transfer Ratio vs. Collector Current



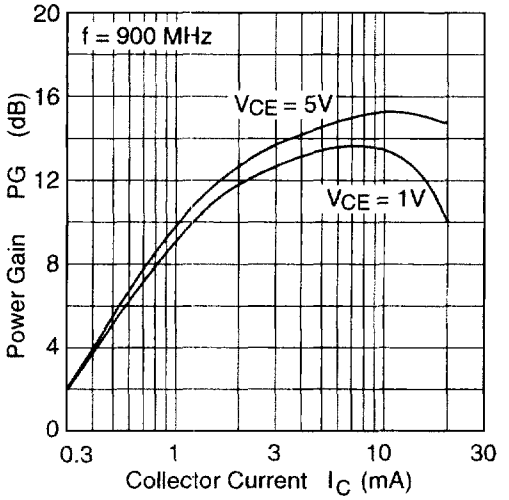
Gain Bandwidth Product vs. Collector Current



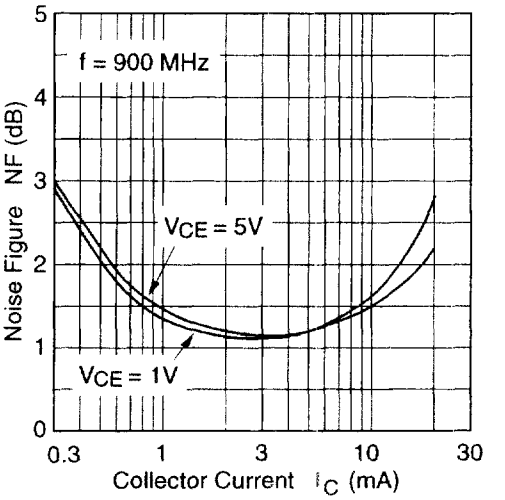
Collector Output Capacitance vs. Collector to Base Voltage



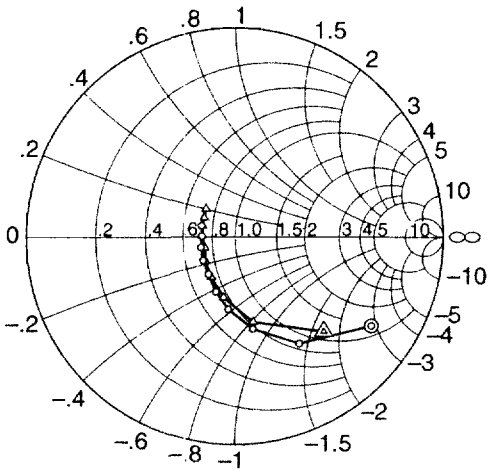
Power Gain vs. Collector Current



Noise Figure vs. Collector Current

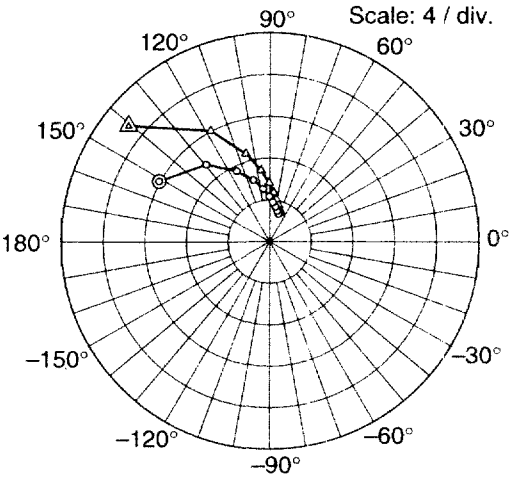


S11 Parameter vs. Frequency



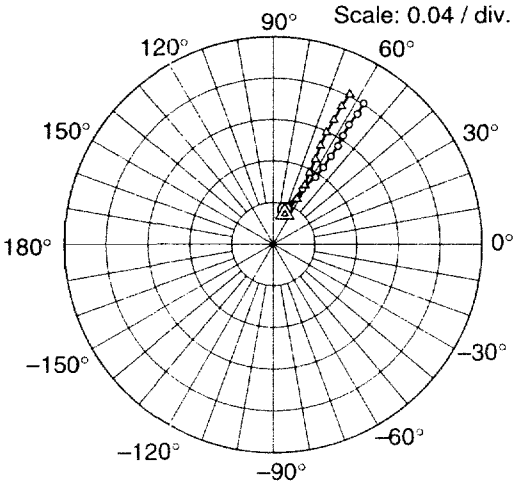
Condition: V_{CE} = 5 V , Zo = 50 Ω
200 to 2000 MHz (200 MHz step)
◎——◎ (I_C = 5 mA)
△——△ (I_C = 10 mA)

S21 Parameter vs. Frequency



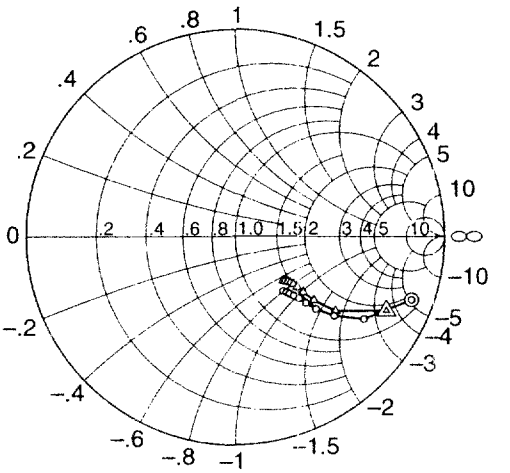
Condition: V_{CE} = 5 V , Zo = 50 Ω
200 to 2000 MHz (200 MHz step)
◎——◎ (I_C = 5 mA)
△——△ (I_C = 10 mA)

S12 Parameter vs. Frequency



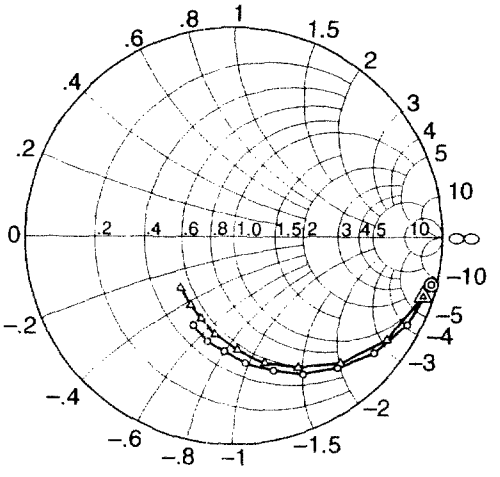
Condition: V_{CE} = 5 V , Zo = 50 Ω
200 to 2000 MHz (200 MHz step)
◎——◎ (I_C = 5 mA)
△——△ (I_C = 10 mA)

S22 Parameter vs. Frequency



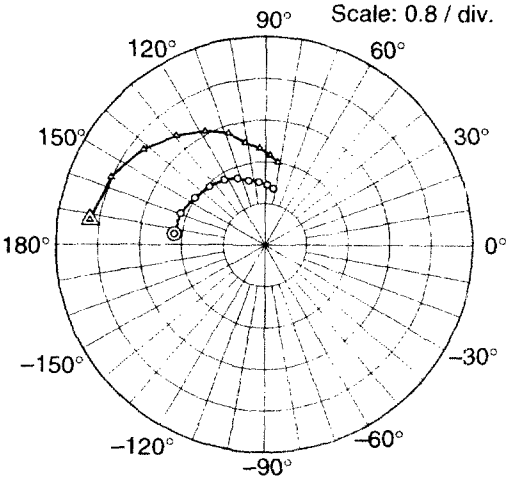
Condition: V_{CE} = 5 V , Zo = 50 Ω
200 to 2000 MHz (200 MHz step)
◎——◎ (I_C = 5 mA)
△——△ (I_C = 10 mA)

S11 Parameter vs. Frequency



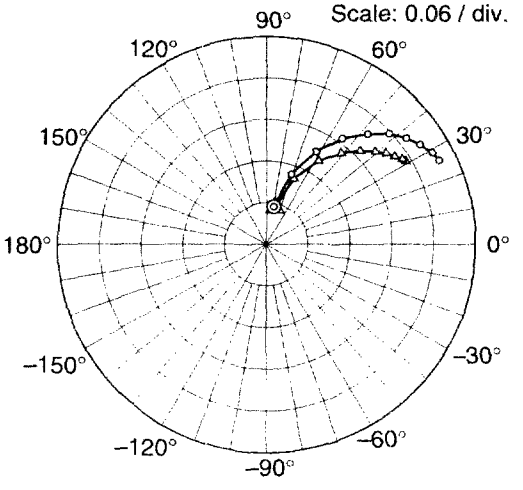
Condition: V_{CE} = 1 V , Zo = 50 Ω
200 to 2000 MHz (200 MHz step)
◎——◎ (I_C = 0.5 mA)
△——△ (I_C = 1 mA)

S21 Parameter vs. Frequency



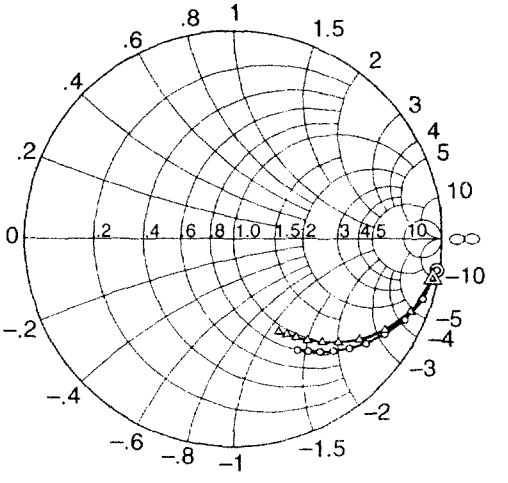
Condition: V_{CE} = 1 V , Zo = 50 Ω
200 to 2000 MHz (200 MHz step)
◎——◎ (I_C = 0.5 mA)
△——△ (I_C = 1 mA)

S12 Parameter vs. Frequency



Condition: V_{CE} = 1 V , Zo = 50 Ω
200 to 2000 MHz (200 MHz step)
◎——◎ (I_C = 0.5 mA)
△——△ (I_C = 1 mA)

S22 Parameter vs. Frequency



Condition: V_{CE} = 1 V , Zo = 50 Ω
200 to 2000 MHz (200 MHz step)
◎——◎ (I_C = 0.5 mA)
△——△ (I_C = 1 mA)

S Parameter (V_{CE} = 5 V, I_C = 5 mA, Z_O = 50 Ω, Emitter Common)

Freq.	S11		S21		S12		S22	
(MHz)	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.
100	0.850	–17.1	13.203	164.8	0.018	80.4	0.965	–10.5
200	0.781	–33.0	12.116	151.3	0.035	72.0	0.898	–19.9
300	0.689	–47.5	10.894	139.0	0.049	65.9	0.815	–27.5
400	0.598	–58.8	9.620	129.5	0.060	62.2	0.735	–32.8
500	0.523	–69.4	8.489	121.6	0.069	59.5	0.667	–36.4
600	0.450	–78.8	7.534	115.1	0.076	57.9	0.610	–38.9
700	0.394	–87.1	6.760	109.9	0.083	57.1	0.563	–40.6
800	0.348	–95.3	6.129	105.1	0.088	57.0	0.523	–42.1
900	0.306	–102.7	5.550	100.7	0.095	56.6	0.493	–42.7
1000	0.278	–109.3	5.113	97.4	0.101	56.8	0.467	–43.5
1100	0.243	–117.8	4.716	94.0	0.107	57.0	0.445	–44.2
1200	0.219	–125.4	4.342	91.0	0.113	56.8	0.428	–44.3
1300	0.203	–132.4	4.057	88.5	0.118	57.1	0.416	–45.1
1400	0.190	–143.7	3.804	85.9	0.124	57.4	0.401	–45.5
1500	0.167	–153.7	3.580	83.8	0.130	57.5	0.390	–45.9
1600	0.171	–163.2	3.391	81.1	0.136	57.8	0.380	–46.6
1700	0.161	–172.5	3.207	79.2	0.143	57.7	0.371	–47.0
1800	0.160	178.6	3.051	77.1	0.149	57.3	0.364	–47.6
1900	0.167	169.4	2.921	75.0	0.155	57.6	0.356	–48.3
2000	0.170	161.4	2.788	73.1	0.161	57.5	0.349	–48.9

S Parameter (V_{CE} = 5 V, I_C = 10 mA, Z_O = 50 Ω, Emitter Common)

Freq.	S11		S21		S12		S22	
(MHz)	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.
100	0.730	–25.1	20.636	158.3	0.017	77.3	0.929	–15.0
200	0.622	–46.7	17.551	140.7	0.031	69.3	0.808	–26.3
300	0.508	–64.4	14.512	127.1	0.041	64.0	0.689	–33.0
400	0.417	–77.8	12.064	118.0	0.049	62.8	0.600	–36.8
500	0.349	–89.5	10.223	111.0	0.057	62.1	0.534	–38.7
600	0.295	–100.6	8.803	105.3	0.064	62.1	0.487	–39.2
700	0.256	–110.7	7.735	101.0	0.070	62.9	0.451	–39.3
800	0.223	–120.6	6.899	97.1	0.077	63.4	0.423	–39.6
900	0.195	–129.7	6.178	93.5	0.084	63.6	0.403	–39.4
1000	0.183	–140.7	5.644	90.7	0.091	63.8	0.385	–39.5
1100	0.173	–151.8	5.167	88.0	0.098	64.3	0.372	–39.6
1200	0.154	–160.4	4.743	85.5	0.105	64.6	0.361	–39.6
1300	0.158	–171.4	4.423	83.5	0.112	64.5	0.353	–40.0
1400	0.158	177.6	4.121	81.4	0.119	64.8	0.345	–40.3
1500	0.157	165.9	3.866	79.1	0.126	64.7	0.338	–40.6
1600	0.165	160.7	3.648	77.0	0.133	64.2	0.332	–41.0
1700	0.172	154.4	3.460	75.1	0.141	64.1	0.327	–41.8
1800	0.176	147.9	3.277	73.7	0.148	63.9	0.321	–42.3
1900	0.187	140.9	3.129	71.6	0.155	63.7	0.317	–42.8
2000	0.194	136.0	2.982	69.8	0.162	63.2	0.312	–43.5

S Parameter (V_{CE} = 1 V, I_C = 0.5 mA, Z_O = 50 Ω, Emitter Common)

Freq.	S11		S21		S12		S22	
(MHz)	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.
100	0.983	–6.8	1.755	173.2	0.027	84.6	0.995	–4.5
200	0.975	–13.4	1.721	166.6	0.055	79.9	0.987	–8.8
300	0.957	–20.2	1.722	159.4	0.082	75.0	0.974	–13.3
400	0.933	–26.9	1.706	152.9	0.107	70.6	0.956	–17.7
500	0.910	–33.2	1.629	146.3	0.130	66.2	0.937	–21.4
600	0.879	–39.5	1.597	139.8	0.151	61.9	0.913	–25.4
700	0.845	–45.8	1.553	134.0	0.170	58.1	0.890	–28.9
800	0.804	–51.4	1.528	128.1	0.187	54.4	0.862	–32.4
900	0.778	–57.3	1.475	122.6	0.203	51.1	0.838	–35.2
1000	0.739	–62.9	1.432	117.8	0.215	47.6	0.813	–38.4
1100	0.706	–68.6	1.392	112.7	0.227	44.9	0.790	–41.1
1200	0.671	–73.0	1.317	107.8	0.237	42.1	0.767	–43.5
1300	0.643	–78.5	1.286	104.8	0.245	39.7	0.745	–46.1
1400	0.609	–84.4	1.261	100.0	0.252	37.3	0.723	–48.5
1500	0.573	–88.6	1.215	96.4	0.258	35.3	0.702	–50.4
1600	0.553	–94.4	1.186	92.6	0.263	33.1	0.683	–52.6
1700	0.531	–100.1	1.158	88.8	0.267	31.1	0.667	–54.5
1800	0.516	–103.8	1.128	85.7	0.272	29.1	0.650	–56.5
1900	0.485	–109.6	1.098	82.5	0.273	27.7	0.634	–58.4
2000	0.466	–114.5	1.070	78.9	0.275	26.1	0.619	–60.3

S Parameter (V_{CE} = 1 V, I_C = 1 mA, Z_O = 50 Ω, Emitter Common)

Freq.	S11		S21		S12		S22	
(MHz)	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.
100	0.962	–8.8	3.376	172.0	0.027	83.7	0.991	–5.9
200	0.950	–17.5	3.268	164.5	0.054	78.2	0.975	–11.4
300	0.919	–26.2	3.223	156.2	0.080	72.6	0.951	–17.2
400	0.885	–33.8	3.139	148.7	0.102	67.2	0.920	–22.4
500	0.839	–41.8	2.969	141.8	0.123	62.2	0.887	–26.8
600	0.797	–49.5	2.833	135.1	0.141	58.1	0.851	–31.2
700	0.748	–56.3	2.699	129.2	0.157	54.5	0.815	–35.1
800	0.701	–63.3	2.611	123.2	0.169	51.1	0.776	–38.7
900	0.664	–69.9	2.473	117.9	0.181	47.9	0.743	–41.8
1000	0.625	–75.7	2.363	113.1	0.190	45.2	0.710	–44.7
1100	0.577	–82.3	2.254	108.3	0.198	43.0	0.680	–47.3
1200	0.545	–87.7	2.109	104.2	0.205	40.7	0.655	–49.3
1300	0.515	–93.8	2.011	101.3	0.210	39.1	0.633	–51.8
1400	0.475	–100.5	1.946	97.0	0.215	37.5	0.606	–54.0
1500	0.446	–105.5	1.863	93.7	0.219	36.2	0.584	–55.7
1600	0.421	–111.6	1.800	90.1	0.222	34.6	0.563	–57.7
1700	0.403	–117.9	1.732	87.2	0.225	33.7	0.545	–59.2
1800	0.387	–122.1	1.663	84.4	0.229	32.2	0.528	–60.9
1900	0.366	–129.0	1.614	81.6	0.230	31.7	0.512	–62.7
2000	0.354	–135.7	1.554	78.6	0.232	31.0	0.498	–64.1