
2SC4899

Silicon NPN Epitaxial

HITACHI

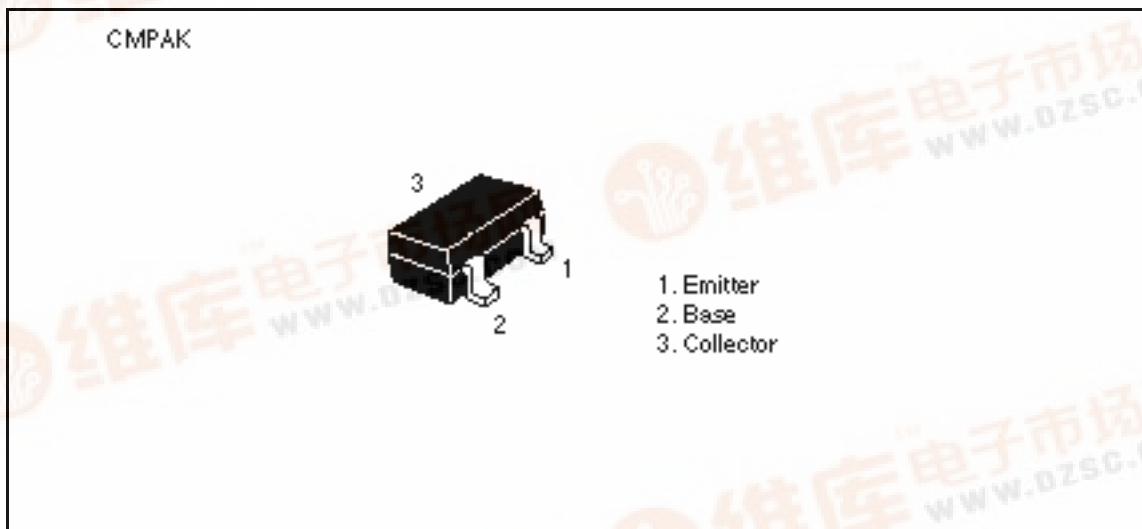
Application

VHF / UHF wide band amplifier

Features

- Σ High gain bandwidth product
 $f_T = 9 \text{ GHz Typ}$
- Σ High gain, low noise figure
 $PG = 14.0 \text{ dB Typ}$, $NF = 1.2 \text{ dB Typ}$ at $f = 900 \text{ MHz}$

Outline



2SC4899

Absolute Maximum Ratings (Ta = 25°C)

Item	Symbol	Ratings	Unit
Collector to base voltage	V_{CBO}	15	V
Collector to emitter voltage	V_{CEO}	9	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	T_j	150	°C
Storage temperature	T_{stg}	–55 to +150	°C

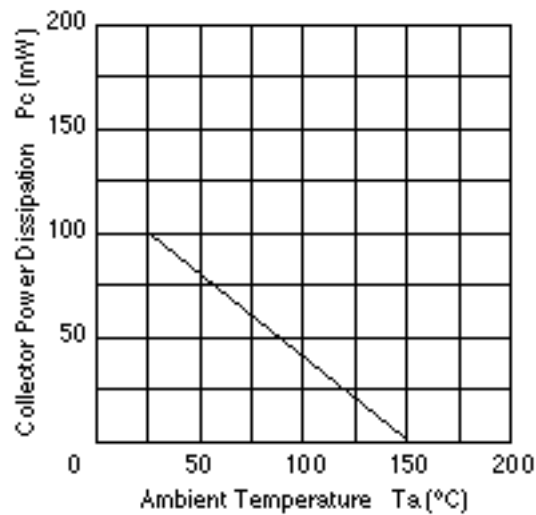
Electrical Characteristics (Ta = 25°C)

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	$V_{CE} = 9\text{ V}, R_{BE} = \bullet$
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}	—	0.5	0.85	pF	$V_{CB} = 5\text{ V}, I_E = 0, f = 1\text{ MHz}$
Gain bandwidth product	f_T	6.0	9.0	—	GHz	$V_{CE} = 5\text{ V}, I_C = 10\text{ mA}$
Power gain	PG	11.0	14.0	—	dB	$V_{CE} = 5\text{ V}, I_C = 10\text{ mA},$ $f = 900\text{ MHz}$
Noise figure	NF	—	1.2	2.5	dB	$V_{CE} = 5\text{ V}, I_C = 5\text{ mA},$ $f = 900\text{ MHz}$

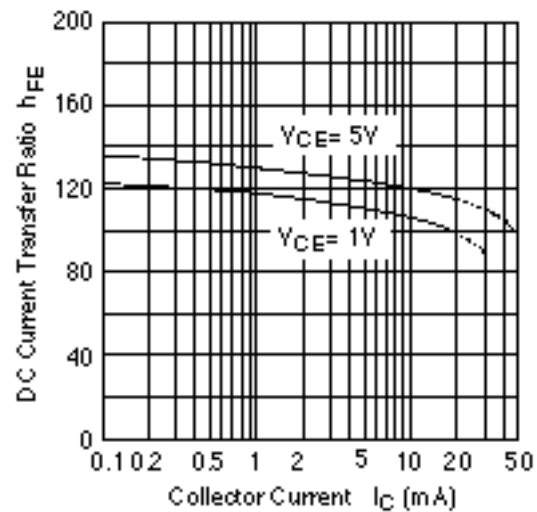
Note: Marking is “YH—”.

Attention: This is electrostatic sensitive device.

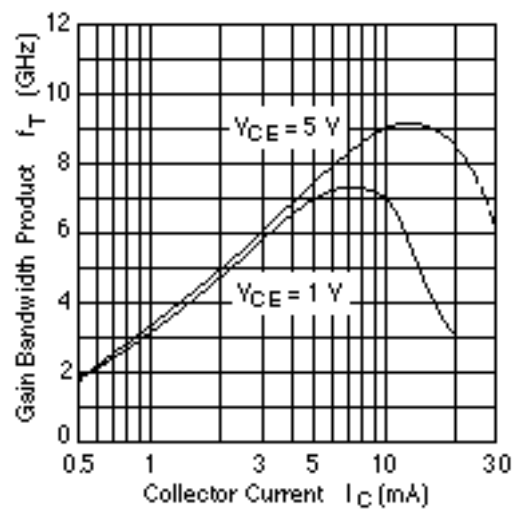
Maximum Collector Dissipation Curve



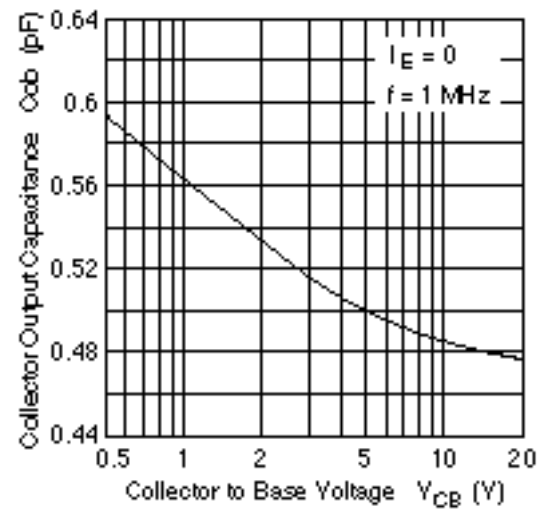
DC Current Transfer Ratio vs. Collector Current

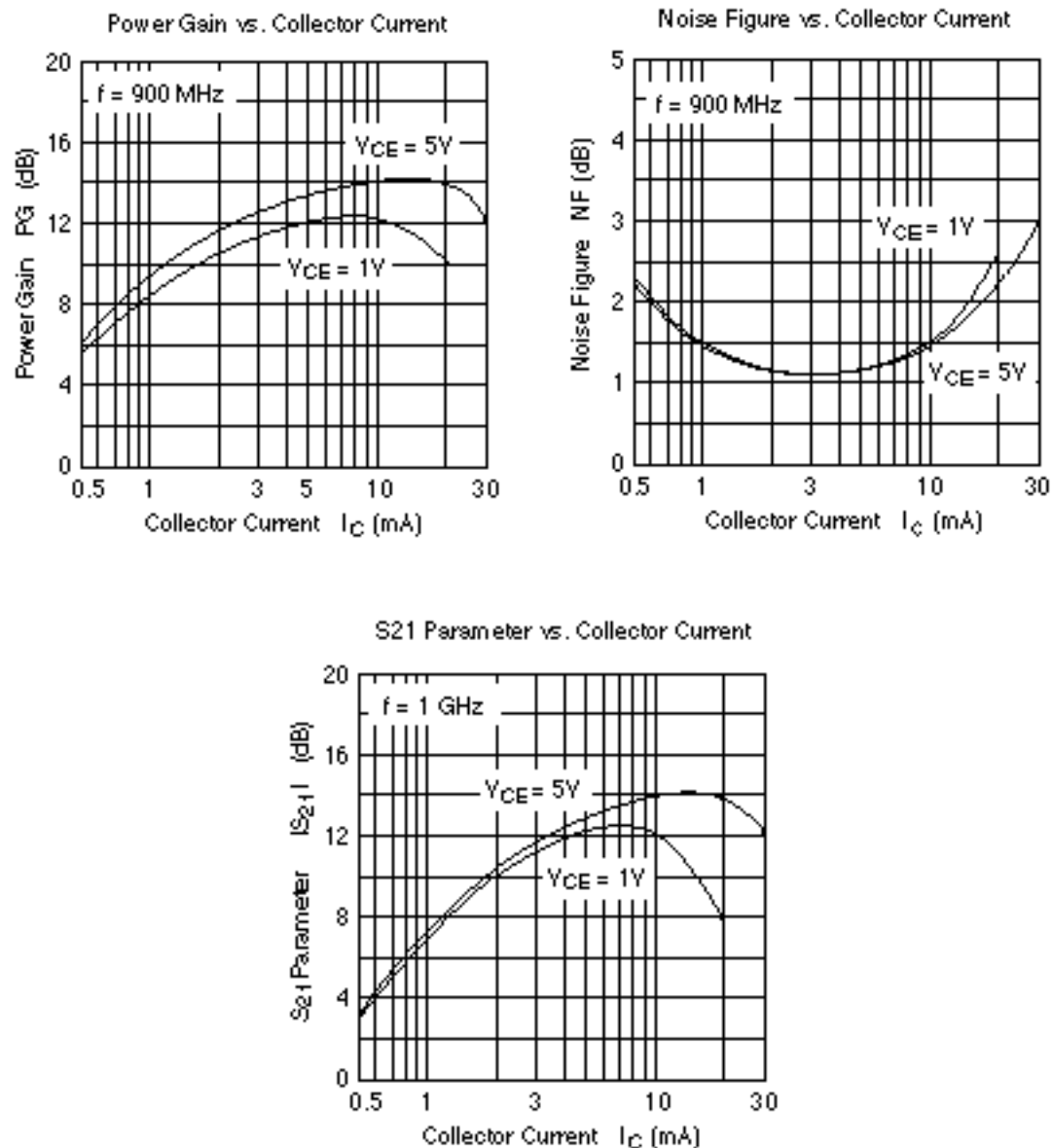


Gain Bandwidth Product vs. Collector Current

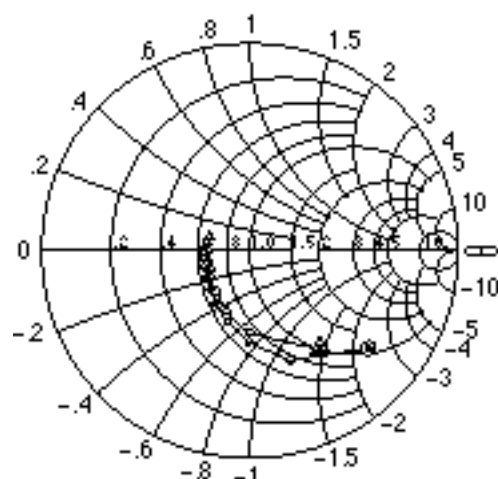


Collector Output Capacitance vs. Collector to Base Voltage





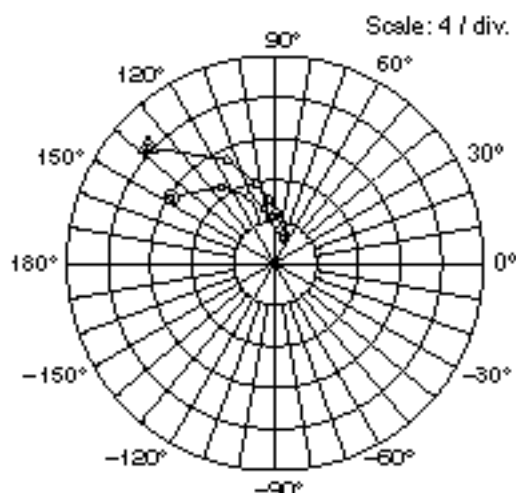
S11 Parameter vs. Frequency



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

○ — ○ ($I_C = 5 \text{ mA}$)
△ — △ ($I_C = 10 \text{ mA}$)

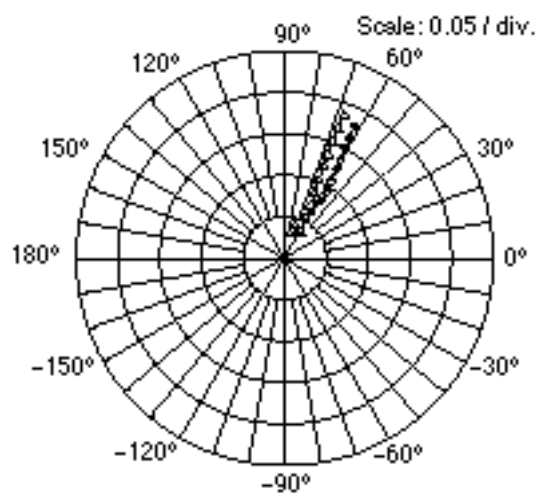
S21 Parameter vs. Frequency



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

○ — ○ ($I_C = 5 \text{ mA}$)
△ — △ ($I_C = 10 \text{ mA}$)

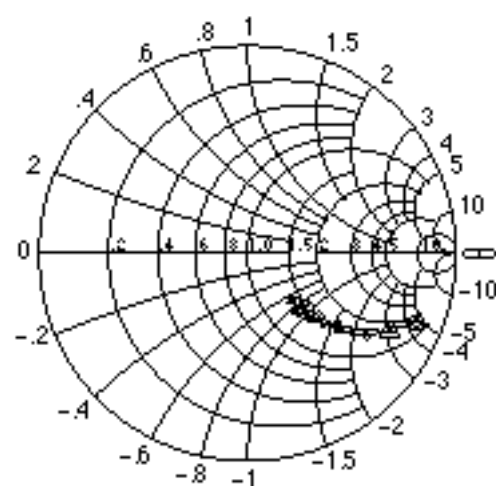
S12 Parameter vs. Frequency



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

○ — ○ ($I_C = 5 \text{ mA}$)
△ — △ ($I_C = 10 \text{ mA}$)

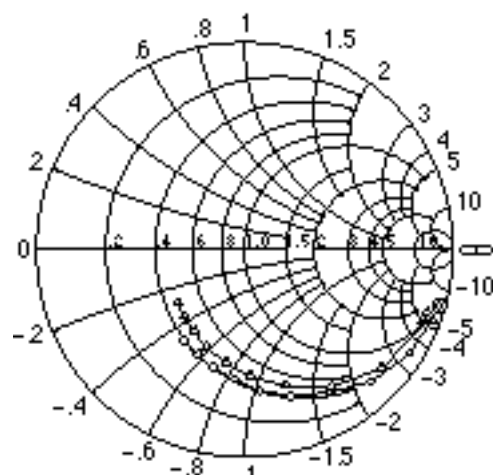
S22 Parameter vs. Frequency



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

○ — ○ ($I_C = 5 \text{ mA}$)
△ — △ ($I_C = 10 \text{ mA}$)

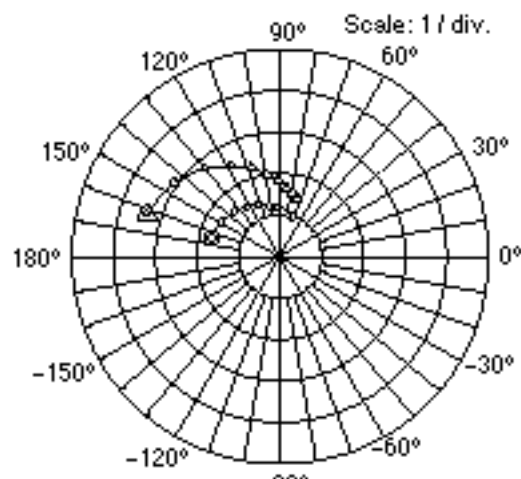
S11 Parameter vs. Frequency



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

○ — ○ ($I_C = 0.5 \text{ mA}$)
 △ — △ ($I_C = 1 \text{ mA}$)

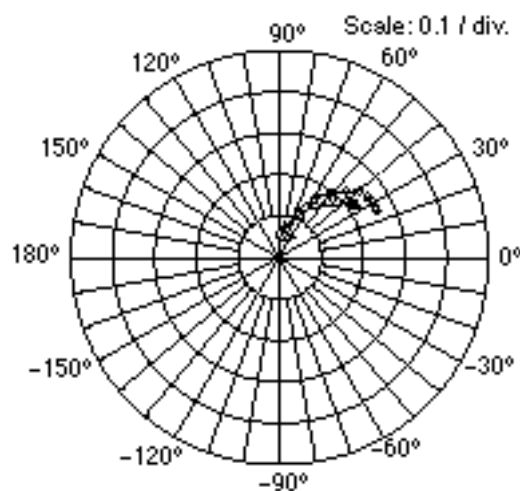
S21 Parameter vs. Frequency



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

○ — ○ ($I_C = 0.5 \text{ mA}$)
 △ — △ ($I_C = 1 \text{ mA}$)

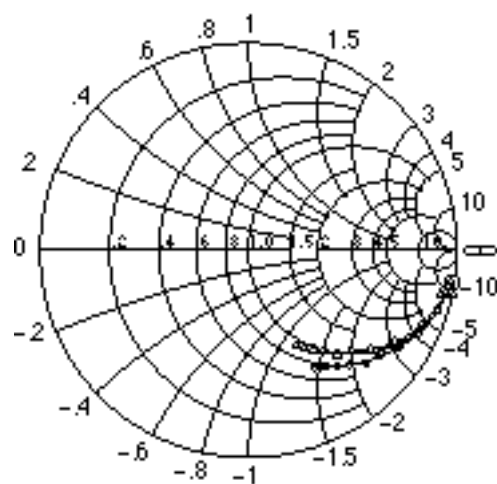
S12 Parameter vs. Frequency



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

○ — ○ ($I_C = 0.5 \text{ mA}$)
 △ — △ ($I_C = 1 \text{ mA}$)

S22 Parameter vs. Frequency



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

○ — ○ ($I_C = 0.5 \text{ mA}$)
 △ — △ ($I_C = 1 \text{ mA}$)

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

Freq. (MHz)	S11		S21		S12		S22	
	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.
100	0.814	-20.5	13.23	163.0	0.0214	79.4	0.961	-11.8
200	0.740	-39.5	11.84	147.6	0.0403	70.6	0.878	-22.3
300	0.648	-56.3	10.34	134.9	0.0550	64.1	0.780	-29.7
400	0.563	-69.7	8.99	125.2	0.0653	60.6	0.694	-34.9
500	0.499	-80.8	7.81	117.6	0.0744	58.4	0.626	-38.1
600	0.439	-90.8	6.81	111.1	0.0821	57.9	0.571	-40.3
700	0.393	-99.1	6.11	106.0	0.0888	57.8	0.528	-41.8
800	0.356	-107.0	5.44	101.6	0.0956	58.1	0.497	-42.6
900	0.322	-115.5	4.93	97.7	0.102	58.3	0.469	-43.0
1000	0.303	-123.2	4.51	94.6	0.109	59.2	0.452	-43.7
1100	0.275	-129.7	4.17	91.6	0.116	60.3	0.442	-43.8
1200	0.263	-135.1	3.86	88.7	0.125	59.8	0.435	-46.3
1300	0.253	-141.7	3.61	85.9	0.130	60.2	0.414	-47.3
1400	0.242	-148.6	3.37	83.5	0.137	60.6	0.399	-47.4
1500	0.237	-154.2	3.17	81.1	0.144	61.2	0.360	-47.8
1600	0.232	-160.0	3.00	78.7	0.151	61.5	0.383	-48.1
1700	0.224	-166.4	2.83	77.0	0.158	61.8	0.376	-48.8
1800	0.225	-171.0	2.70	74.9	0.165	62.0	0.370	-49.5
1900	0.228	-176.5	2.59	73.0	0.172	62.2	0.363	-50.2
2000	0.223	-179.7	2.47	71.3	0.180	62.3	0.359	-51.4

2SC4899

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

Freq. (MHz)	S11		S21		S12		S22	
	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.
100	0.688	-29.6	20.06	156.3	0.0201	76.3	0.921	-16.8
200	0.582	-54.7	16.54	137.5	0.0349	67.8	0.780	-28.9
300	0.479	-74.0	13.31	124.0	0.0459	64.0	0.653	-35.6
400	0.399	-89.5	10.97	114.9	0.0544	63.0	0.564	-39.0
500	0.345	-101.3	9.20	108.4	0.0624	62.6	0.501	-40.4
600	0.309	-111.2	7.87	103.1	0.0702	63.7	0.456	-41.0
700	0.280	-120.4	6.90	98.7	0.0782	64.3	0.424	-41.1
800	0.257	-128.5	6.09	95.2	0.0857	65.2	0.402	-41.2
900	0.243	-137.6	5.45	92.0	0.0936	66.0	0.384	-41.0
1000	0.227	-145.3	4.97	89.3	0.102	66.6	0.375	-40.8
1100	0.216	-153.0	4.56	86.8	0.111	67.3	0.373	-40.8
1200	0.207	-156.5	4.22	84.2	0.120	66.9	0.369	-43.5
1300	0.206	-163.1	3.93	82.2	0.126	67.1	0.350	-44.4
1400	0.209	-168.6	3.65	80.0	0.135	67.6	0.339	-44.5
1500	0.204	-176.8	3.43	77.9	0.143	67.5	0.334	-44.4
1600	0.203	180.0	3.24	75.9	0.151	67.7	0.330	-44.6
1700	0.207	173.7	3.06	74.2	0.160	67.6	0.325	-45.5
1800	0.211	169.8	2.91	72.5	0.168	67.5	0.322	-46.1
1900	0.215	164.6	2.78	71.1	0.177	67.4	0.317	-47.2
2000	0.204	161.2	2.66	69.2	0.185	67.2	0.314	-48.2

S Parameter ($V_{CE} = 1\text{ V}$, $I_C = 0.5\text{ mA}$, $Z_O = 50\text{ }\Omega$, Emitter Common)

Freq. (MHz)	S11		S21		S12		S22	
	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.
100	0.983	-7.8	1.76	172.6	0.0295	85.3	0.996	-4.5
200	0.974	-16.2	1.71	165.0	0.0604	79.3	0.987	-9.1
300	0.958	-24.3	1.69	157.1	0.0910	73.8	0.972	-13.7
400	0.936	-32.1	1.65	149.9	0.118	68.9	0.954	-17.9
500	0.904	-39.4	1.59	142.8	0.143	64.1	0.933	-22.0
600	0.877	-46.3	1.55	135.7	0.165	59.6	0.909	-26.0
700	0.845	-53.1	1.48	129.3	0.184	55.5	0.886	-29.3
800	0.799	-59.4	1.44	123.2	0.199	51.9	0.861	-32.9
900	0.781	-66.6	1.39	117.4	0.214	48.3	0.835	-35.9
1000	0.738	-72.6	1.36	112.3	0.225	45.3	0.810	-38.5
1100	0.714	-78.0	1.32	107.2	0.235	43.5	0.791	-40.9
1200	0.683	-83.8	1.25	102.6	0.249	40.2	0.783	-44.0
1300	0.657	-89.0	1.21	98.3	0.253	37.0	0.758	-46.7
1400	0.626	-94.6	1.18	93.8	0.256	34.8	0.734	-48.7
1500	0.603	-99.6	1.14	89.8	0.259	32.9	0.717	-50.9
1600	0.585	-104.8	1.09	85.9	0.260	31.1	0.702	-52.7
1700	0.567	-109.5	1.06	82.5	0.261	29.6	0.687	-54.7
1800	0.553	-114.2	1.04	79.1	0.261	28.0	0.674	-56.6
1900	0.538	-119.8	1.02	76.5	0.260	27.1	0.659	-58.7
2000	0.524	-123.9	0.994	73.7	0.258	25.6	0.647	-60.5

2SC4899

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

Freq. (MHz)	S11		S21		S12		S22	
	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.
100	0.956	-10.5	3.49	171.1	0.0298	83.7	0.991	-6.1
200	0.938	-20.8	3.37	162.3	0.0596	77.0	0.972	-12.0
300	0.912	-31.1	3.26	153.2	0.0874	70.7	0.945	-18.1
400	0.871	-40.9	3.12	145.1	0.112	65.1	0.910	-23.4
500	0.830	-50.1	2.94	137.9	0.133	60.0	0.871	-28.1
600	0.782	-57.6	2.80	130.6	0.151	56.0	0.831	-32.5
700	0.740	-65.8	2.63	124.0	0.164	51.9	0.795	-36.1
800	0.686	-73.0	2.48	118.2	0.175	48.8	0.759	-39.4
900	0.656	-80.7	2.35	112.5	0.185	45.9	0.725	-42.4
1000	0.613	-87.2	2.24	107.9	0.192	43.8	0.694	-44.8
1100	0.582	-93.3	2.13	103.8	0.200	42.8	0.672	-47.0
1200	0.551	-99.1	2.00	99.3	0.210	40.3	0.662	-49.8
1300	0.532	-104.7	1.91	95.3	0.210	38.1	0.631	-52.4
1400	0.505	-111.4	1.82	91.6	0.213	37.2	0.606	-53.8
1500	0.483	-116.3	1.74	88.1	0.215	36.3	0.587	-55.6
1600	0.461	-121.2	1.66	84.9	0.216	35.6	0.573	-57.3
1700	0.445	-127.2	1.59	81.9	0.217	34.9	0.558	-58.6
1800	0.435	-132.0	1.54	78.9	0.219	35.0	0.545	-60.3
1900	0.425	-137.6	1.49	76.7	0.221	34.7	0.531	-61.8
2000	0.413	-141.4	1.45	73.9	0.221	34.6	0.519	-63.5

When using this document, keep the following in mind:

1. This document may, wholly or partially, be subject to change without notice.
2. All rights are reserved: No one is permitted to reproduce or duplicate, in any form, the whole or part of this document without Hitachi's permission.
3. Hitachi will not be held responsible for any damage to the user that may result from accidents or any other reasons during operation of the user's unit according to this document.
4. Circuitry and other examples described herein are meant merely to indicate the characteristics and performance of Hitachi's semiconductor products. Hitachi assumes no responsibility for any intellectual property claims or other problems that may result from applications based on the examples described herein.
5. No license is granted by implication or otherwise under any patents or other rights of any third party or Hitachi, Ltd.
6. **MEDICAL APPLICATIONS:** Hitachi's products are not authorized for use in MEDICAL APPLICATIONS without the written consent of the appropriate officer of Hitachi's sales company. Such use includes, but is not limited to, use in life support systems. Buyers of Hitachi's products are requested to notify the relevant Hitachi sales offices when planning to use the products in MEDICAL APPLICATIONS.

HITACHI

Hitachi, Ltd.

Semiconductor & IC Div.

Nippon Bldg., 2-6-2, Ohite-machi, Chiyoda-ku, Tokyo 100, Japan

Tel Tokyo (03) 3270-2111

Fax (03) 3270-5109

For further information write to:

Hitachi America, Ltd.

Semiconductor & IC Div.

2000 Sierra Point Parkway

Berkeley, CA 94705-4835

U.S.A.

Tel 415-589-8300

Fax 415-589-4207

Hitachi Europe GmbH

Electronic Components Group

Continental Europe

Danrecher Straße 3

D-85622 Feldkirchen

München

Tel 089-9 91 80-0

Fax 089-9 29 30 00

Hitachi Europe Ltd.

Electronic Components Div.

Northern Europe Headquarters

Whitbrook Park

Lower Cookham Road

Maidenhead

Berkshire SL6 8YA

United Kingdom

Tel 0628-585000

Fax 0628-778322

Hitachi Asia Pte. Ltd.

45 Collyer Quay #20-00

Hitachi Tower

Singapore 0404

Tel 535-2100

Fax 535-1533

Hitachi Asia (Hong Kong) Ltd.

Unit 705, North Tower,

World Finance Centre

Harbour City, Canton Road

Tsim Sha Tsui, Kowloon

Hong Kong

Tel 27359218

Fax 27308074