2SC4993

Silicon NPN Epitaxial

HITACHI

ADE-208-011
1st. Edition

Application

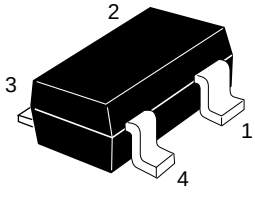
VHF / UHF wide band amplifier

Features

- High gain bandwidth product
  f_T = 10.5 GHz Typ
- High gain, low noise figure
  PG = 16.5 dB Typ, NF = 1.2 dB Typ at f = 900 MHz

Outline

MPAK-4



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

Hitachi semiconductor

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	Tj	150	°C
Storage temperature	Tstg	–55 to +150	°C

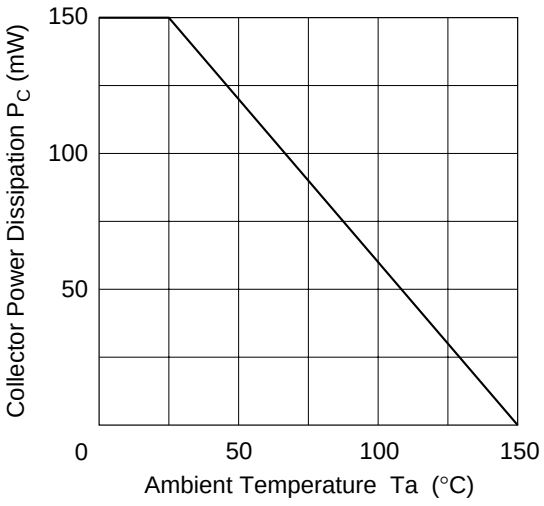
Electrical Characteristics (Ta = 25°C)

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	7.5	10.5	—	GHz	V_{CE} = 5 V, I_C = 10 mA
Power gain	PG	13.5	16.5	—	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

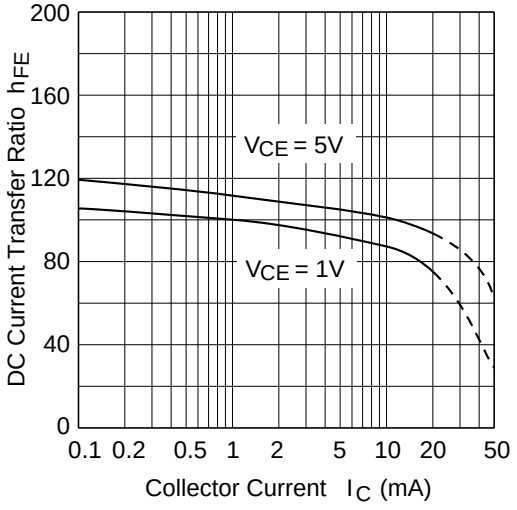
Note: Marking is “YS–”.

Attention: This device is very sensitive to electro static discharge.
It is recommended to adopt appropriate cautions when handling this transistor.

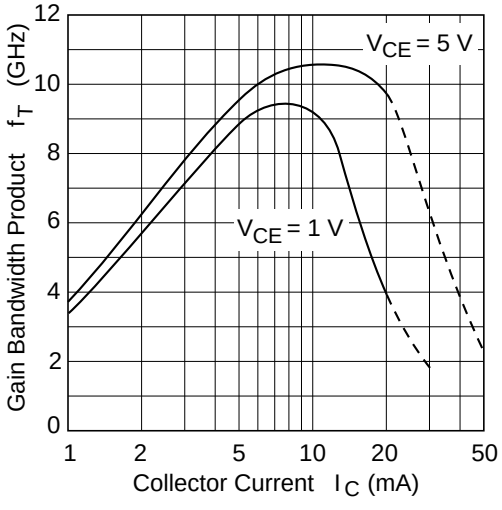
Maximum Collector Dissipation Curve



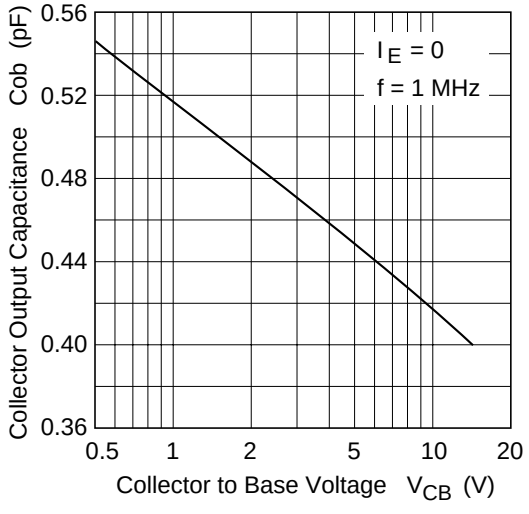
DC Current Transfer Ratio vs. Collector Current



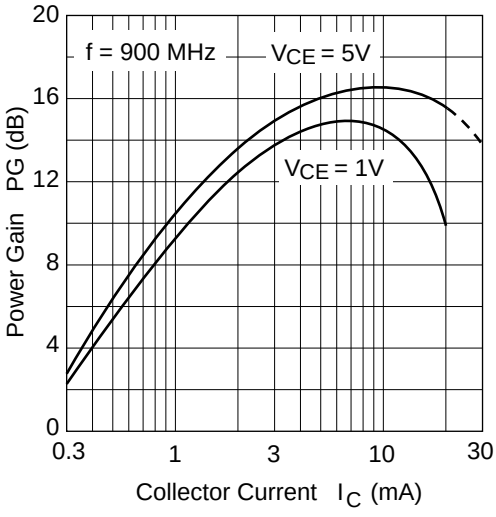
Gain Bandwidth Product vs. Collector Current



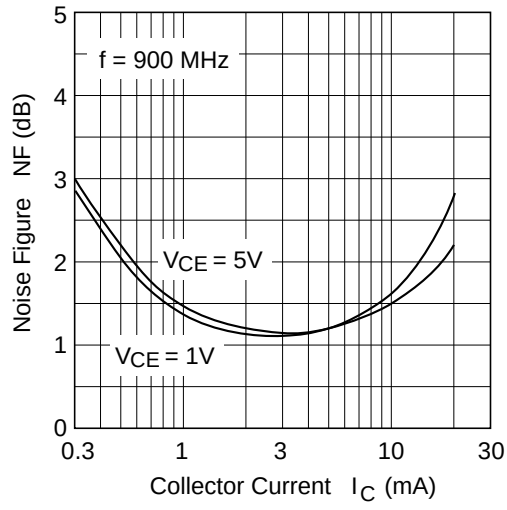
Collector Output Capacitance vs. Collector to Base Voltage



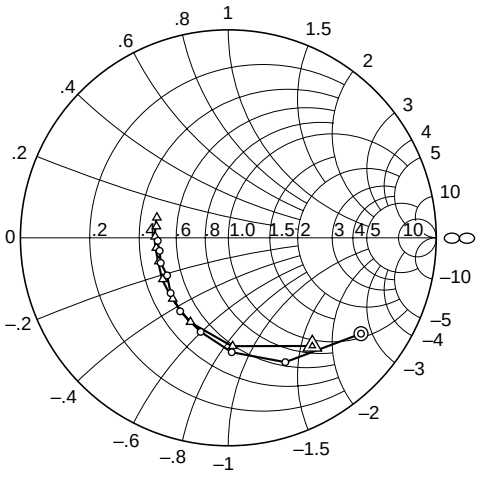
Power Gain vs. Collector Current



Noise Figure vs. Collector Current

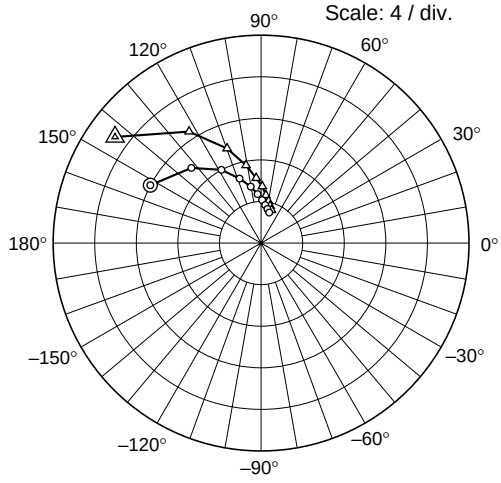


S11 Parameter vs. Frequency



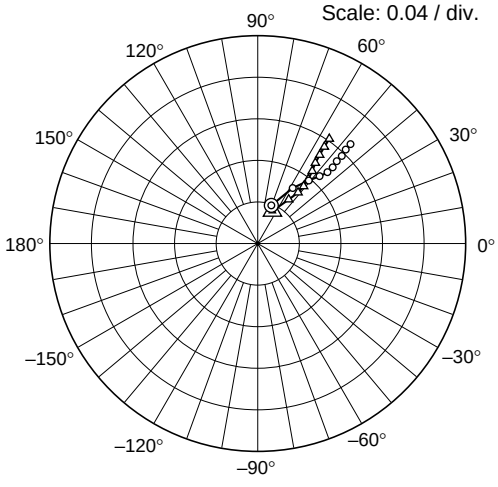
Condition: V_{CE} = 5 V , Zo = 50 Ω
200 to 2000 MHz (200 MHz step)
(I_C = 5 mA)
(I_C = 10 mA)

S21 Parameter vs. Frequency



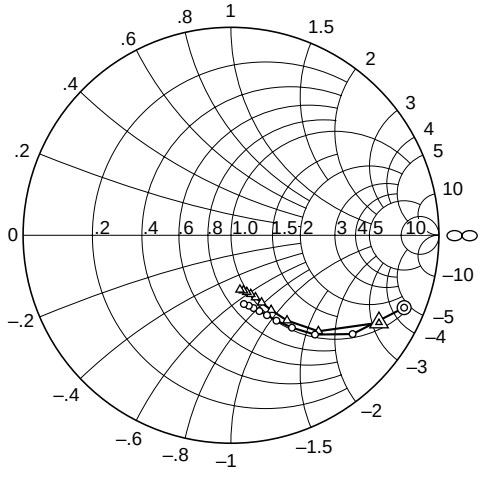
Condition: V_{CE} = 5 V , Zo = 50 Ω
200 to 2000 MHz (200 MHz step)
(I_C = 5 mA)
(I_C = 10 mA)

S12 Parameter vs. Frequency



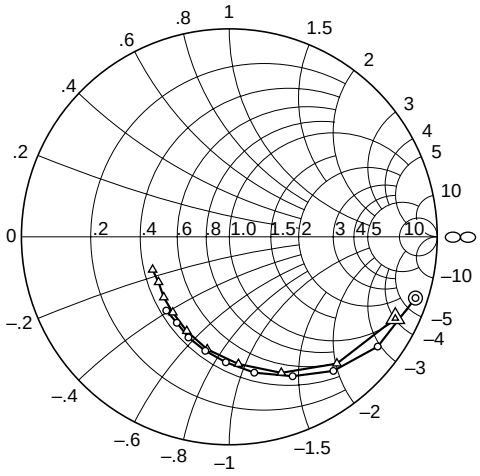
Condition: V_{CE} = 5 V , Zo = 50 Ω
200 to 2000 MHz (200 MHz step)
(I_C = 5 mA)
(I_C = 10 mA)

S22 Parameter vs. Frequency



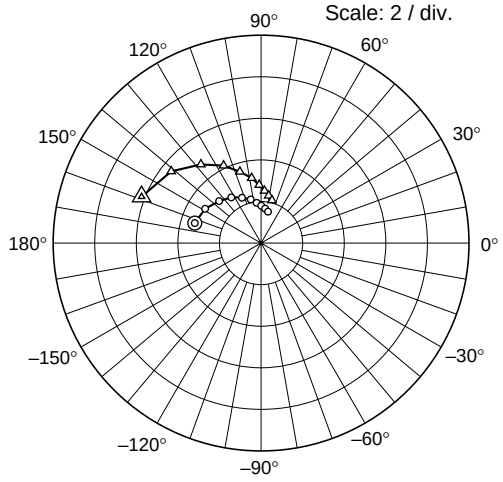
Condition: V_{CE} = 5 V , Zo = 50 Ω
200 to 2000 MHz (200 MHz step)
(I_C = 5 mA)
(I_C = 10 mA)

S11 Parameter vs. Frequency



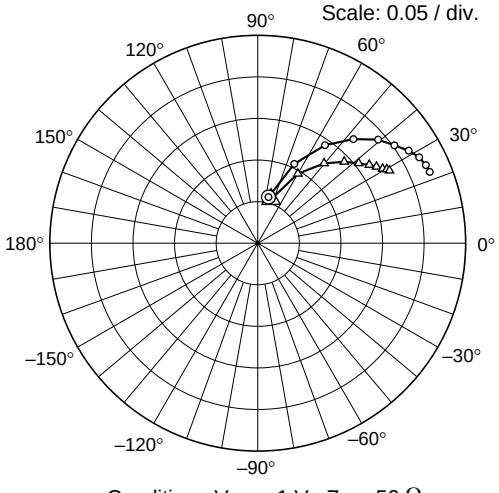
Condition: V_{CE} = 1 V , Zo = 50 Ω
200 to 2000 MHz (200 MHz step)
(I_C = 1 mA)
(I_C = 2 mA)

S21 Parameter vs. Frequency



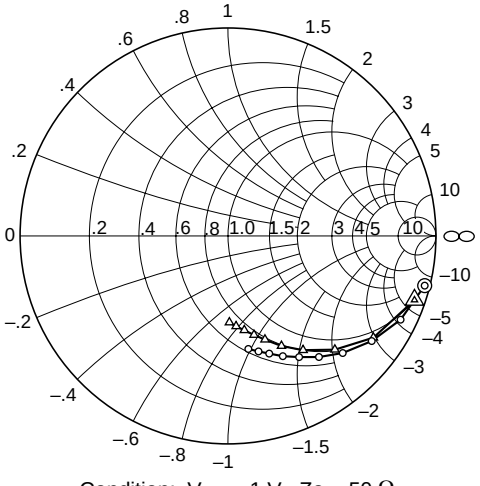
Condition: V_{CE} = 1 V , Zo = 50 Ω
200 to 2000 MHz (200 MHz step)
(I_C = 1 mA)
(I_C = 2 mA)

S12 Parameter vs. Frequency



Condition: V_{CE} = 1 V , Zo = 50 Ω
200 to 2000 MHz (200 MHz step)
(I_C = 1 mA)
(I_C = 2 mA)

S22 Parameter vs. Frequency



Condition: V_{CE} = 1 V , Zo = 50 Ω
200 to 2000 MHz (200 MHz step)
(I_C = 1 mA)
(I_C = 2 mA)

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

Freq.	S11		S21		S12		S22	
(MHz)	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 V, I_C = 10 mA, Z_O = 50 Ω)

Freq.	S11		S21		S12		S22	
(MHz)	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

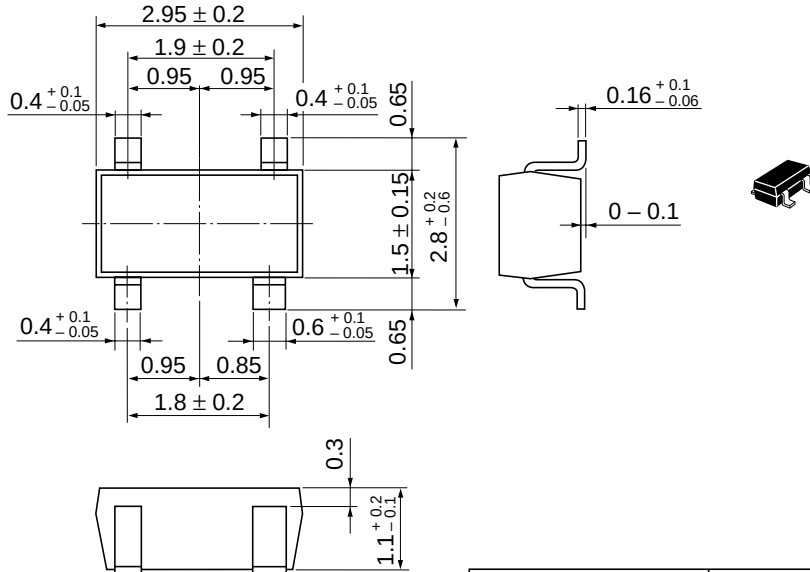
S Parameters (V_{CE} = 1 V, I_C = 1 mA, Z_O = 50 Ω)

Freq.	S11		S21		S12		S22	
(MHz)	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 V, I_C = 2 mA, Z_O = 50 Ω)

Freq.	S11		S21		S12		S22	
(MHz)	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	95.2	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

Unit: mm



Hitachi Code	MPAK-4
JEDEC	—
EIAJ	Conforms
Weight (reference value)	0.013 g

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HITACHI

Hitachi, Ltd.
Semiconductor & Integrated Circuits.
Nippon Bldg., 2-6-2, Ohte-machi, Chiyoda-ku, Tokyo 100-0004, Japan
Tel: Tokyo (03) 3270-2111 Fax: (03) 3270-5109

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For further information write to:

Hitachi Semiconductor
(America) Inc.
179 East Tasman Drive,
San Jose,CA 95134
Tel: <1> (408) 433-1990
Fax: <1>(408) 433-0223

Hitachi Europe GmbH
Electronic components Group
Dornacher Straße 3
D-85622 Feldkirchen, Munich
Germany
Tel: <49> (89) 9 9180-0
Fax: <49> (89) 9 29 30 00

Hitachi Europe Ltd.
Electronic Components Group.
Whitebrook Park
Lower Cookham Road
Maidenhead
Berkshire SL6 8YA, United Kingdom
Tel: <44> (1628) 585000
Fax: <44> (1628) 778322

Hitachi Asia Pte. Ltd.
16 Collyer Quay #20-00
Hitachi Tower
Singapore 049318
Tel: 535-2100
Fax: 535-1533

Hitachi Asia Ltd.
Taipei Branch Office
3F, Hung Kuo Building. No.167,
Tun-Hwa North Road, Taipei (105)
Tel: <886> (2) 2718-3666
Fax: <886> (2) 2718-8180

Hitachi Asia (Hong Kong) Ltd.
Group III (Electronic Components)
7/F., North Tower, World Finance Centre,
Harbour City, Canton Road, Tsim Sha Tsui,
Kowloon, Hong Kong
Tel: <852> (2) 735 9218
Fax: <852> (2) 730 0281
Telex: 40815 HITEC HX