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# 2SC4791

Silicon NPN Epitaxial

# HITACHI

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## Application

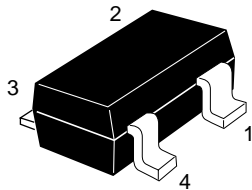
VHF / UHF wide band amplifier

## Features

- High gain bandwidth product  
 $f_T = 10 \text{ GHz Typ.}$
- High gain, low noise figure  
 $PG = 15.5 \text{ dB Typ, NF} = 1.2 \text{ dB Typ at } f = 900 \text{ MHz}$

## Outline

MPAK-4



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

**Absolute Maximum Ratings** (Ta = 25°C)

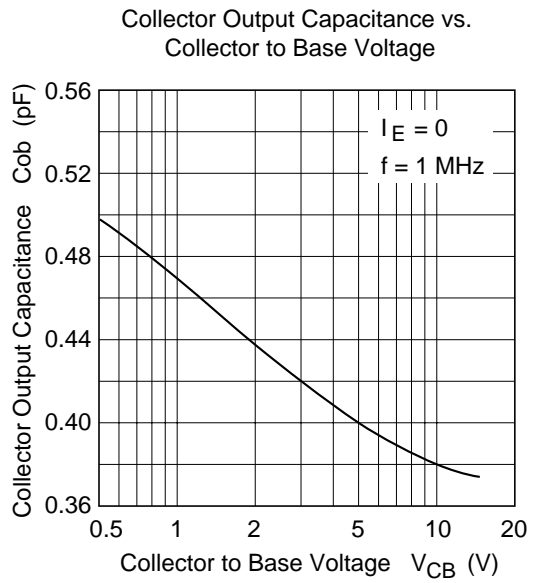
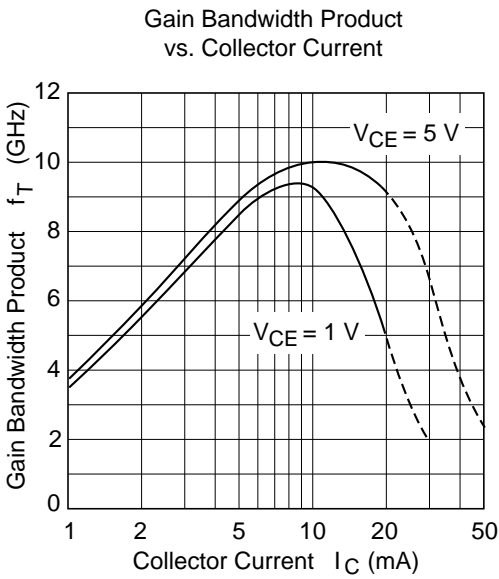
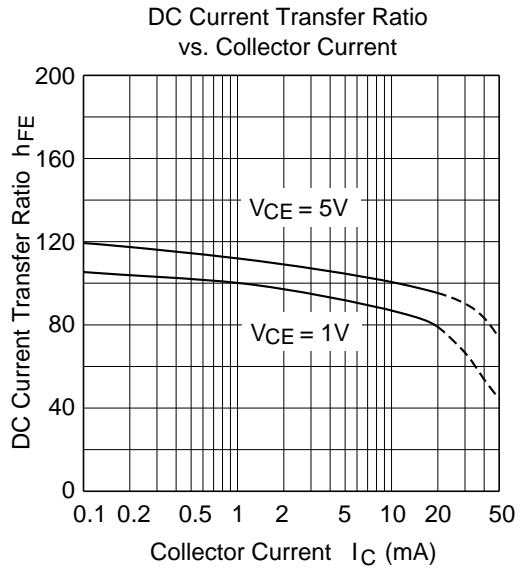
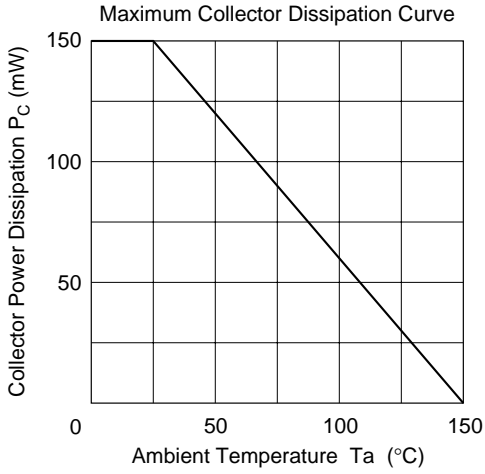
Item	Symbol	Ratings	Unit
Collector to base voltage	$V_{CBO}$	15	V
Collector to emitter voltage	$V_{CEO}$	8	V
Emitter to base voltage	$V_{EBO}$	1.5	V
Collector current	$I_C$	20	mA
Collector power dissipation	$P_C$	150	mW
Junction temperature	$T_j$	150	°C
Storage temperature	$T_{stg}$	-55 to +150	°C

**Electrical Characteristics** (Ta = 25°C)

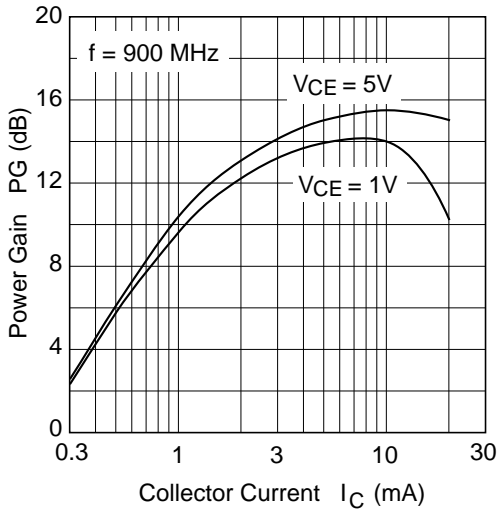
Item	Symbol	Min	Typ	Max	Unit	Test conditions
Collector cutoff current	$I_{CBO}$	—	—	10	μA	$V_{CB} = 15\text{ V}, I_E = 0$
	$I_{CEO}$	—	—	1	mA	$V_{CE} = 8\text{ V}, R_{BE} = \infty$
Emitter cutoff current	$I_{EBO}$	—	—	10	μA	$V_{EB} = 1.5\text{ V}, I_C = 0$
DC current transfer ratio	$h_{FE}$	50	120	250		$V_{CE} = 5\text{ V}, I_C = 10\text{ mA}$
Collector output capacitance	$C_{ob}$	—	0.4	0.75	pF	$V_{CB} = 5\text{ V}, I_E = 0, f = 1\text{ MHz}$
Gain bandwidth product	$f_T$	7.0	10.0	—	GHz	$V_{CE} = 5\text{ V}, I_C = 10\text{ mA}$
Power gain	PG	12.5	15.5	—	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 "YA-".

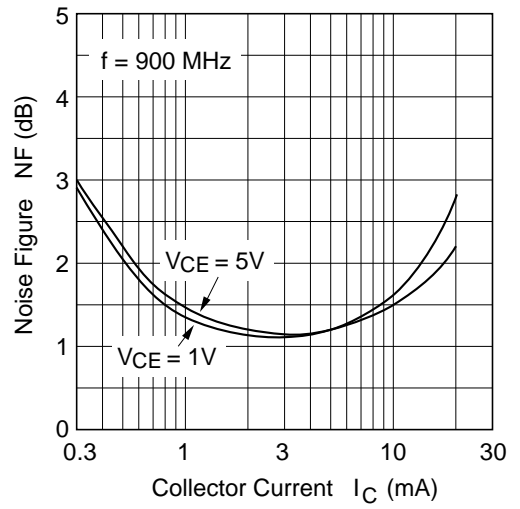
Attention: This is electrostatic sensitive device.



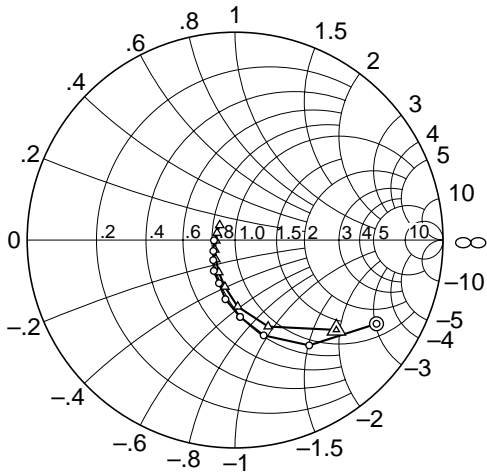
Power Gain vs. Collector Current



Noise Figure vs. Collector Current

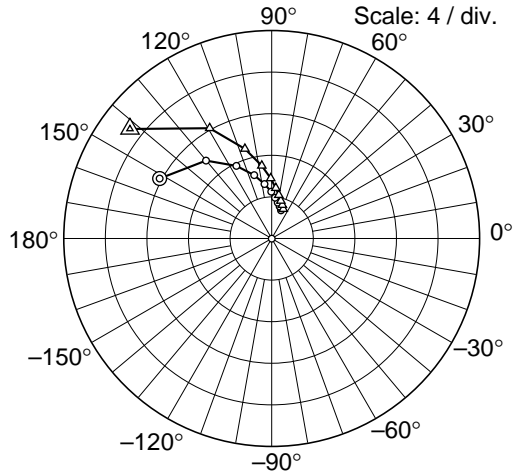


S11 Parameter vs. Frequency



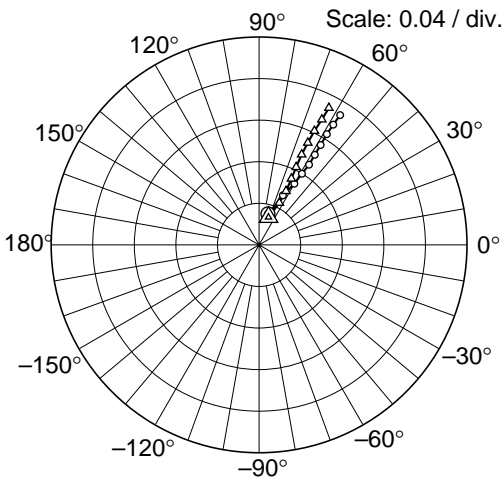
Condition:  $V_{CE} = 5\text{ V}$ ,  $Z_o = 50\ \Omega$   
 200 to 2000 MHz (200 MHz step)  
 ○ — ○ ( $I_C = 5\text{ mA}$ )  
 △ — △ ( $I_C = 10\text{ mA}$ )

S21 Parameter vs. Frequency



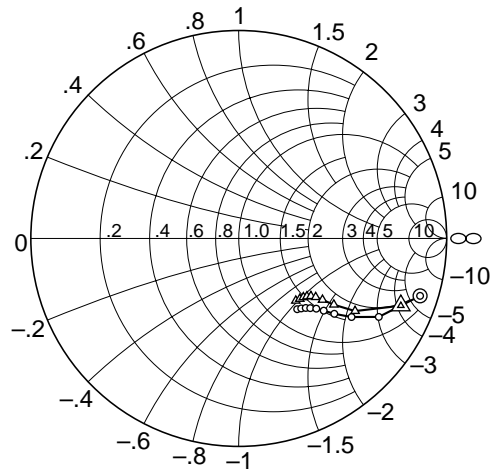
Condition:  $V_{CE} = 5\text{ V}$ ,  $Z_o = 50\ \Omega$   
 200 to 2000 MHz (200 MHz step)  
 ○ — ○ ( $I_C = 5\text{ mA}$ )  
 △ — △ ( $I_C = 10\text{ mA}$ )

S12 Parameter vs. Frequency



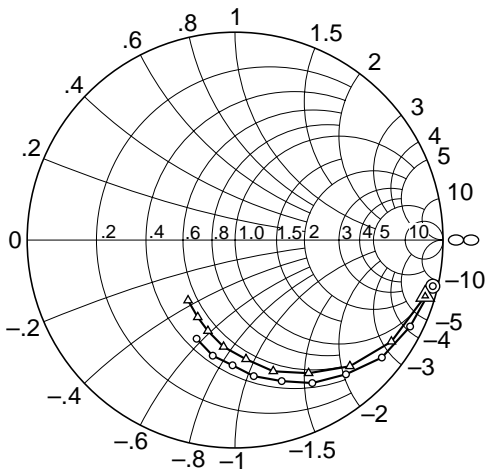
Condition:  $V_{CE} = 5\text{ V}$ ,  $Z_o = 50\ \Omega$   
 200 to 2000 MHz (200 MHz step)  
 ○ — ○ ( $I_C = 5\text{ mA}$ )  
 △ — △ ( $I_C = 10\text{ mA}$ )

S22 Parameter vs. Frequency



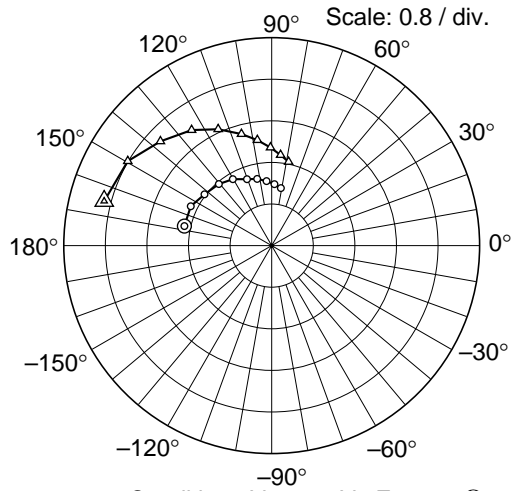
Condition:  $V_{CE} = 5\text{ V}$ ,  $Z_o = 50\ \Omega$   
 200 to 2000 MHz (200 MHz step)  
 ○ — ○ ( $I_C = 5\text{ mA}$ )  
 △ — △ ( $I_C = 10\text{ mA}$ )

S11 Parameter vs. Frequency



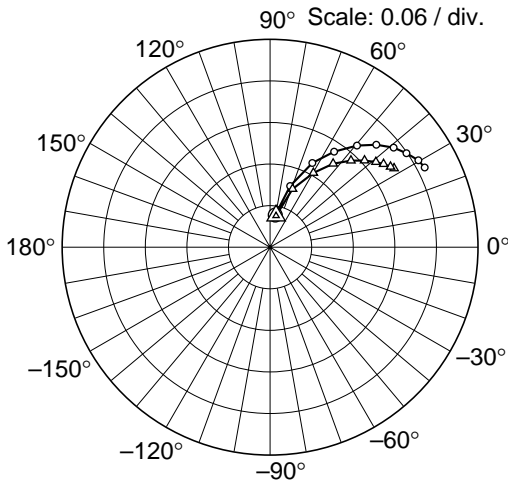
Condition:  $V_{CE} = 1\text{ V}$ ,  $Z_o = 50\ \Omega$   
 200 to 2000 MHz (200 MHz step)  
 ○ (  $I_C = 0.5\text{ mA}$  )  
 △ (  $I_C = 1\text{ mA}$  )

S21 Parameter vs. Frequency



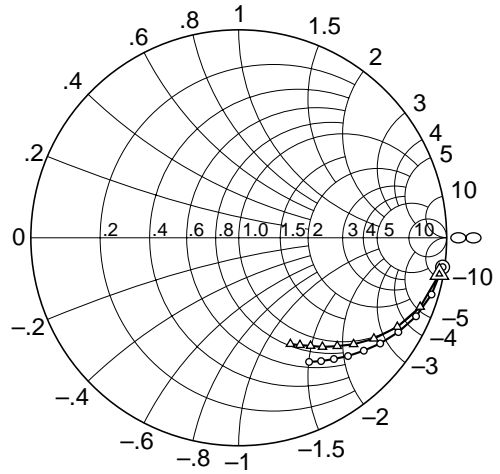
Condition:  $V_{CE} = 1\text{ V}$ ,  $Z_o = 50\ \Omega$   
 200 to 2000 MHz (200 MHz step)  
 ○ (  $I_C = 0.5\text{ mA}$  )  
 △ (  $I_C = 1\text{ mA}$  )

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

Freq. (MHz)	S11		S21		S12		S22	
	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.
100	0.859	-15.9	13.192	165.5	0.016	82.3	0.974	-9.3
200	0.790	-30.6	12.225	151.9	0.031	73.9	0.914	-17.5
300	0.700	-44.0	10.967	139.9	0.043	68.2	0.841	-24.2
400	0.618	-54.8	9.802	130.2	0.053	64.0	0.771	-29.2
500	0.543	-64.7	8.686	122.4	0.061	61.4	0.710	-32.5
600	0.477	-73.3	7.761	116.0	0.068	59.8	0.660	-34.8
700	0.421	-80.1	6.955	110.2	0.074	58.9	0.619	-36.7
800	0.369	-86.3	6.316	105.5	0.080	58.7	0.584	-38.2
900	0.331	-92.8	5.748	101.0	0.086	58.1	0.557	-39.3
1000	0.287	-99.4	5.275	97.6	0.091	57.9	0.535	-40.3
1100	0.226	-104.8	4.869	94.1	0.097	57.9	0.517	-41.2
1200	0.220	-110.7	4.498	90.6	0.102	58.1	0.502	-42.1
1300	0.200	-110.7	4.169	88.2	0.107	58.4	0.492	-43.1
1400	0.179	-125.0	3.926	85.4	0.113	58.2	0.479	-44.2
1500	0.159	-131.7	3.698	83.0	0.119	58.2	0.471	-44.9
1600	0.142	-138.0	3.493	80.5	0.125	58.4	0.463	-46.0
1700	0.126	-147.6	3.311	78.1	0.130	58.5	0.456	-47.2
1800	0.117	-154.1	3.143	76.1	0.136	58.2	0.450	-48.2
1900	0.109	-166.9	3.008	74.0	0.142	58.0	0.445	-49.3
2000	0.102	179.8	2.864	71.9	0.147	57.9	0.440	-50.4

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

Freq. (MHz)	S11		S21		S12		S22	
	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.
100	0.758	-22.4	19.871	159.8	0.015	78.6	0.942	-12.6
200	0.650	-41.5	17.252	142.4	0.028	71.0	0.842	-22.5
300	0.538	-57.1	14.423	129.0	0.037	66.8	0.739	-28.5
400	0.445	-69.1	12.168	119.4	0.045	64.3	0.659	-32.0
500	0.383	-79.6	10.376	112.2	0.052	63.3	0.600	-33.7
600	0.320	-87.8	8.995	106.7	0.058	63.4	0.577	-34.9
700	0.274	-95.4	7.914	101.8	0.065	63.7	0.524	-35.4
800	0.230	-102.4	7.057	97.8	0.071	64.0	0.499	-36.3
900	0.205	-109.8	6.332	93.9	0.076	64.4	0.480	-36.7
1000	0.174	-116.9	5.778	91.0	0.083	64.5	0.466	-37.4
1100	0.154	-125.9	5.291	88.1	0.089	64.6	0.454	-38.0
1200	0.131	-135.1	4.862	85.4	0.096	64.7	0.444	-38.7
1300	0.118	-142.7	4.508	82.9	0.102	64.6	0.438	-39.4
1400	0.108	-154.7	4.226	80.8	0.109	64.5	0.431	-40.4
1500	0.104	-165.2	3.961	78.7	0.116	64.3	0.426	-41.4
1600	0.093	-178.6	3.718	76.4	0.122	64.1	0.420	-42.4
1700	0.095	169.4	3.532	74.3	0.129	64.0	0.417	-43.6
1800	0.094	158.4	3.347	72.4	0.135	63.4	0.413	-44.8
1900	0.094	148.2	3.190	70.5	0.142	63.2	0.409	-46.0
2000	0.101	136.0	3.036	68.6	0.148	63.0	0.406	-47.3



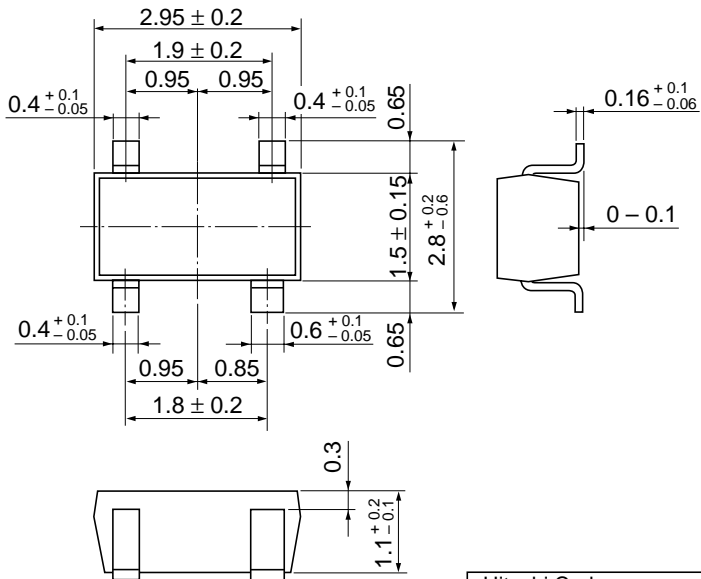
**S Parameter** ( $V_{CE} = 1 \text{ V}$ ,  $I_C = 0.5 \text{ mA}$ ,  $Z_O = 50 \Omega$ , Emitter Common)

Freq. (MHz)	S11		S21		S12		S22	
	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.
100	0.983	-6.6	1.757	174.0	0.023	85.8	0.995	-4.1
200	0.976	-13.1	1.723	167.3	0.047	80.7	0.990	-8.2
300	0.961	-19.6	1.741	160.2	0.071	76.4	0.980	-12.3
400	0.938	-26.2	1.734	154.0	0.093	71.9	0.966	-16.4
500	0.920	-32.5	1.666	147.6	0.093	67.6	0.950	-20.1
600	0.903	-38.6	1.629	142.6	0.133	63.4	0.932	-23.9
700	0.868	-44.6	1.584	136.2	0.151	59.9	0.913	-27.3
800	0.836	-50.4	1.564	130.6	0.166	56.2	0.891	-30.6
900	0.819	-56.1	1.520	125.3	0.180	52.8	0.869	-33.8
1000	0.780	-61.6	1.484	120.3	0.193	49.5	0.849	-36.8
1100	0.749	-66.9	1.434	115.3	0.204	46.7	0.828	-39.6
1200	0.713	-71.7	1.369	110.4	0.213	44.0	0.810	-42.1
1300	0.687	-77.0	1.322	107.2	0.221	41.4	0.794	-44.8
1400	0.659	-82.2	1.317	102.3	0.229	38.9	0.774	-47.3
1500	0.629	-86.9	1.282	98.5	0.234	36.7	0.757	-49.7
1600	0.601	-91.2	1.248	94.6	0.239	34.6	0.741	-51.9
1700	0.578	-96.7	1.215	91.0	0.243	32.4	0.726	-54.2
1800	0.656	-101.0	1.187	87.5	0.248	30.4	0.713	-56.3
1900	0.532	-106.3	1.155	84.4	0.249	28.9	0.699	-58.4
2000	0.508	-111.4	1.124	81.0	0.251	27.3	0.686	-60.5

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

Freq. (MHz)	S11		S21		S12		S22	
	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.
100	0.969	-8.3	3.406	172.8	0.023	84.7	0.992	-5.3
200	0.953	-16.4	3.337	165.1	0.046	79.1	0.980	-10.3
300	0.927	-25.1	3.270	157.0	0.070	73.7	0.960	-15.8
400	0.896	-33.0	3.218	149.3	0.090	68.8	0.933	-20.8
500	0.860	-40.5	3.068	143.0	0.108	64.2	0.905	-25.1
600	0.820	-47.7	2.950	136.9	0.124	59.7	0.874	-29.3
700	0.778	-54.5	2.816	130.7	0.139	56.3	0.844	-33.2
800	0.731	-61.1	2.711	124.8	0.151	52.9	0.810	-36.7
900	0.703	-67.5	2.580	119.7	0.162	49.8	0.780	-39.9
1000	0.657	-73.8	2.470	114.8	0.171	46.9	0.752	-42.8
1100	0.617	-79.8	2.363	110.2	0.178	44.7	0.725	-45.5
1200	0.575	-84.8	2.229	105.3	0.185	42.5	0.703	-47.7
1300	0.549	-89.8	2.104	102.4	0.191	40.8	0.686	-50.1
1400	0.516	-96.2	2.053	97.9	0.196	38.8	0.660	-52.5
1500	0.485	-101.5	1.975	94.3	0.199	37.6	0.641	-54.5
1600	0.456	-106.7	1.891	90.9	0.203	36.2	0.623	-56.4
1700	0.429	-111.9	1.827	87.8	0.206	34.9	0.607	-58.3
1800	0.412	-115.9	1.751	84.6	0.209	33.7	0.593	-60.3
1900	0.389	-122.6	1.700	81.7	0.211	33.2	0.580	-62.1
2000	0.368	-128.0	1.645	78.8	0.212	32.4	0.567	-64.1



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

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## 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

URL      North America      : <http://semiconductor.hitachi.com/>  
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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

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