

To all our customers

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Renesas Technology Corp.
Customer Support Dept.
April 1, 2003

Cautions

Keep safety first in your circuit designs!

1. Renesas Technology Corporation puts the maximum effort into making semiconductor products better and more reliable, but there is always the possibility that trouble may occur with them. Trouble with semiconductors may lead to personal injury, fire or property damage.

Remember to give due consideration to safety when making your circuit designs, with appropriate measures such as (i) placement of substitutive, auxiliary circuits, (ii) use of nonflammable material or (iii) prevention against any malfunction or mishap.

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BB501C

Build in Biasing Circuit MOS FET IC UHF RF Amplifier

RENESAS

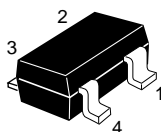
ADE-208-701D (Z)
5th. Edition
Mar. 2001

Features

- Build in Biasing Circuit; To reduce using parts cost & PC board space.
- High gain;
PG = 21.5 dB typ. at f = 900 MHz
- Low noise;
NF = 1.85 dB typ. at f = 900 MHz
- Withstanding to ESD;
Build in ESD absorbing diode. Withstand up to 200V at C=200pF, Rs=0 conditions.
- Provide mini mold packages; CMPAK-4(SOT-343mod)

Outline

CMPAK-4



1. Source
2. Gate1
3. Gate2
4. Drain

- Notes:
1. Marking is "AS -".
 2. BB501C is individual type number of HITACHI BBFET.

Absolute Maximum Ratings (Ta = 25°C)

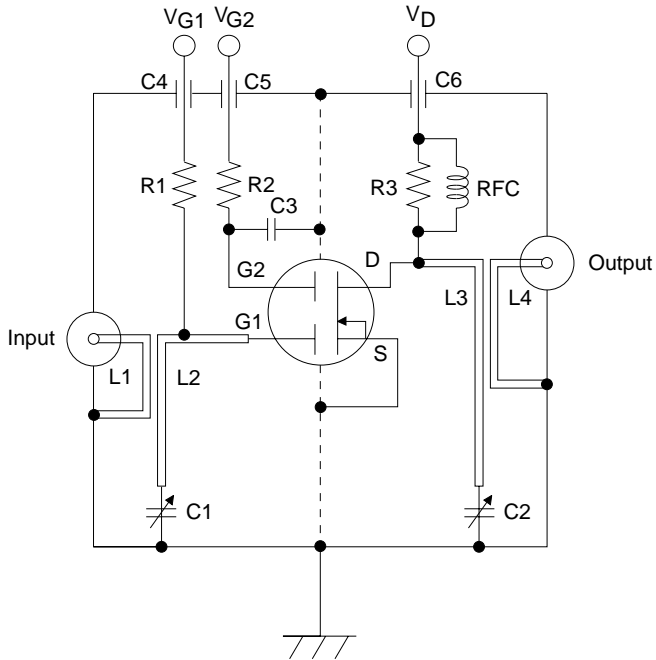
Item	Symbol	Ratings	Unit
Drain to source voltage	V_{DS}	6	V
Gate1 to source voltage	V_{G1S}	+6 - 0	V
Gate2 to source voltage	V_{G2S}	+6 - 0	V
Drain current	I_D	20	mA
Channel power dissipation	Pch	100	mW
Channel temperature	Tch	150	°C
Storage temperature	Tstg	-55 to +150	°C

Electrical Characteristics (Ta = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain to source breakdown voltage	$V_{(BR)DSS}$	6	—	—	V	$I_D = 200\mu A$ $V_{G1S} = V_{G2S} = 0$
Gate1 to source breakdown voltage	$V_{(BR)G1SS}$	+6	—	—	V	$I_{G1} = +10\mu A$ $V_{G2S} = V_{DS} = 0$
Gate2 to source breakdown voltage	$V_{(BR)G2SS}$	+6	—	—	V	$I_{G2} = +10\mu A$ $V_{G1S} = V_{DS} = 0$
Gate1 to source cutoff current	I_{G1SS}	—	—	+100	nA	$V_{G1S} = +5V$ $V_{G2S} = V_{DS} = 0$
Gate2 to source cutoff current	I_{G2SS}	—	—	+100	nA	$V_{G2S} = +5V$ $V_{G1S} = V_{DS} = 0$
Gate1 to source cutoff voltage	$V_{G1S(off)}$	0.5	0.7	1.0	V	$V_{DS} = 5V, V_{G2S} = 4V$ $I_D = 100\mu A$
Gate2 to source cutoff voltage	$V_{G2S(off)}$	0.5	0.7	1.0	V	$V_{DS} = 5V, V_{G1S} = 5V$ $I_D = 100\mu A$
Drain current	$I_{D(op)}$	7	10	13	mA	$V_{DS} = 5V, V_{G1} = 5V$ $V_{G2S} = 4V, R_G = 47k\Omega$
Forward transfer admittance	$ y_{fs} $	19	24	29	mS	$V_{DS} = 5V, V_{G1} = 5V$ $V_{G2S} = 4V$ $R_G = 47k\Omega, f = 1kHz$
Input capacitance	C_{iss}	1.4	1.7	2.0	pF	$V_{DS} = 5V, V_{G1} = 5V$
Output capacitance	C_{oss}	0.7	1.1	1.5	pF	$V_{G2S} = 4V, R_G = 47k\Omega$
Reverse transfer capacitance	C_{rss}	—	0.019	0.04	pF	$f = 1MHz$
Power gain	PG	17	21.5	—	dB	$V_{DS} = 5V, V_{G1} = 5V$ $V_{G2S} = 4V, R_G = 47k\Omega$
Noise figure	NF	—	1.85	2.4	dB	$f = 900MHz$

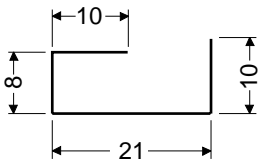
Main Characteristics

900MHz Power Gain, Noise Figure Test Circuit

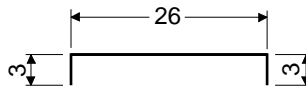


- C1, C2 : Variable Capacitor (10pF MAX)
- C3 : Disk Capacitor (1000pF)
- C4 to C6 : Air Capacitor (1000pF)
- R1 : 47 k Ω
- R2 : 47 k Ω
- R3 : 4.7 k Ω

L1 :

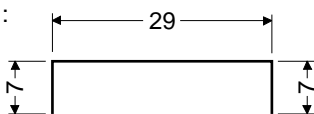


L2 :

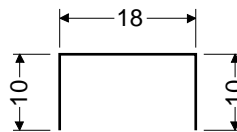


(ϕ 1mm Copper wire)
Unit : mm

L3 :

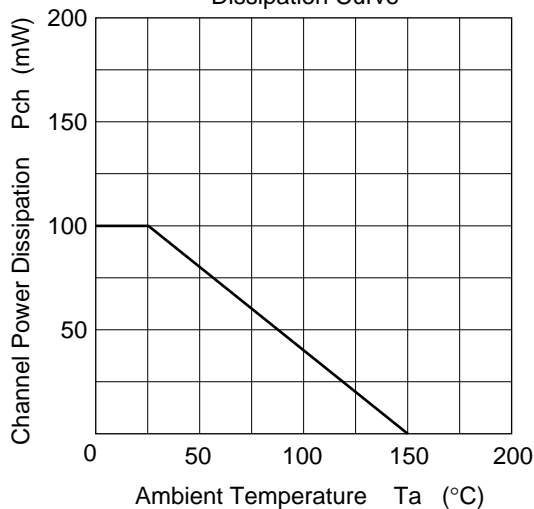


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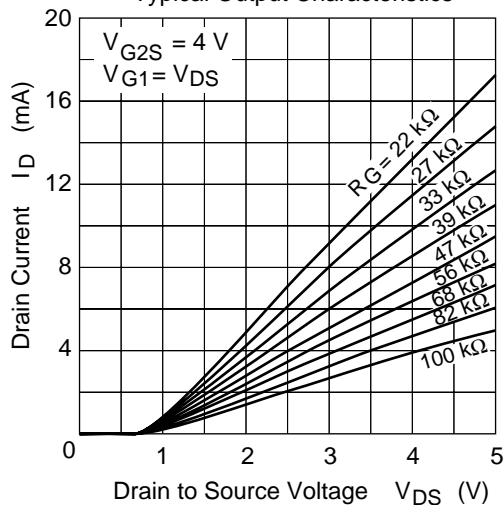


RFC : ϕ 1mm Copper wire with enamel 4turns inside dia 6mm

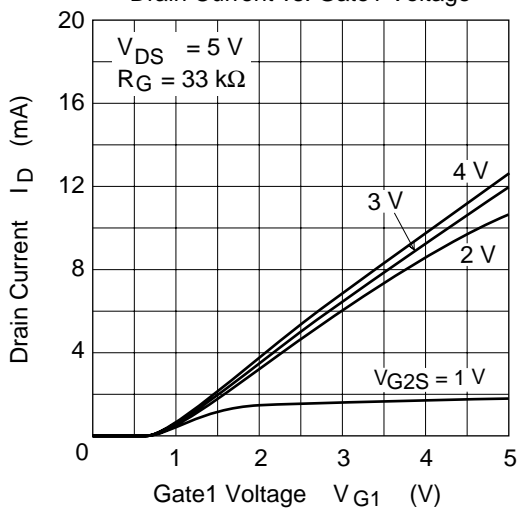
Maximum Channel Power Dissipation Curve



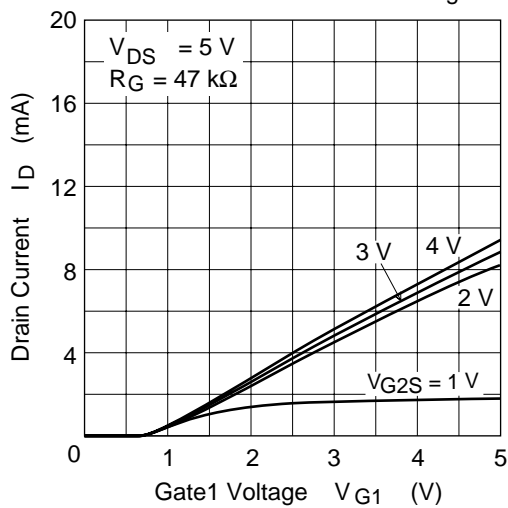
Typical Output Characteristics

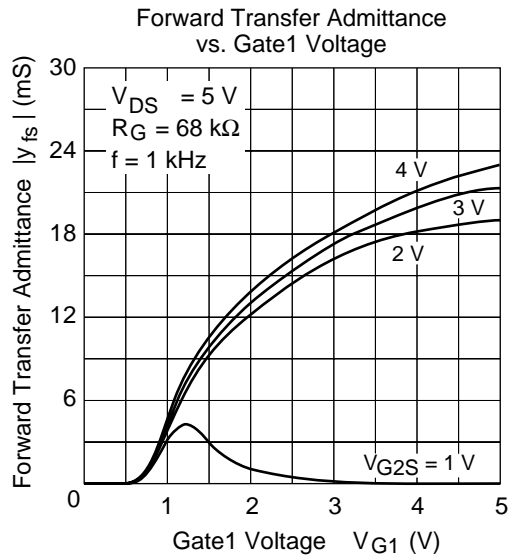
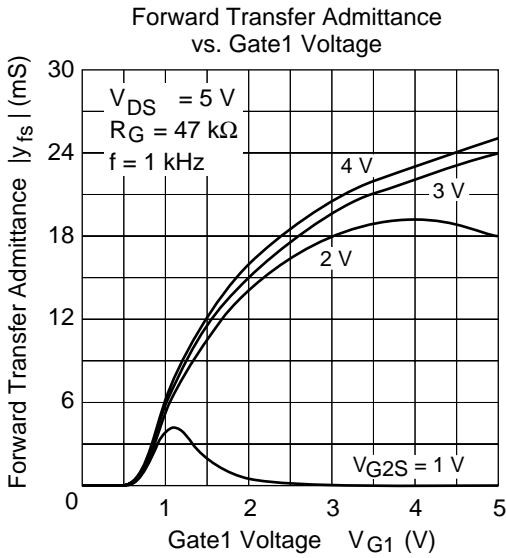
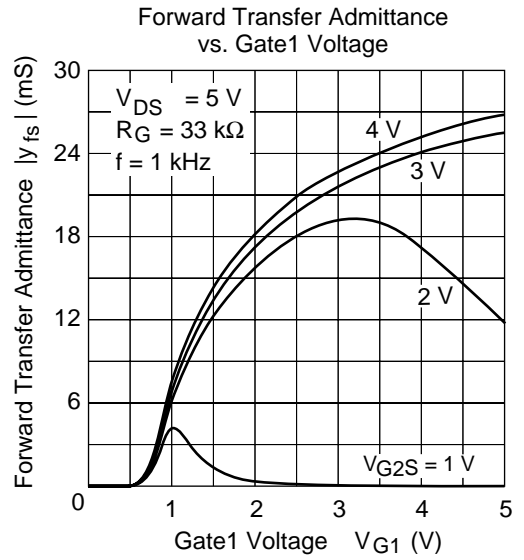
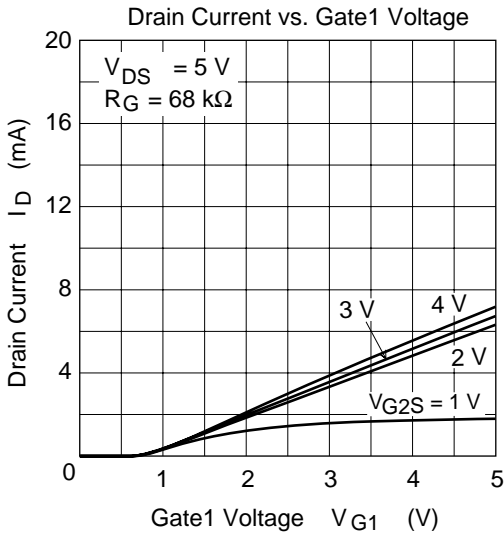


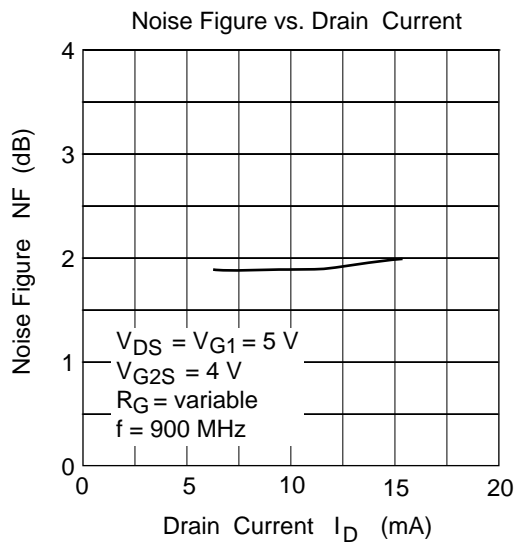
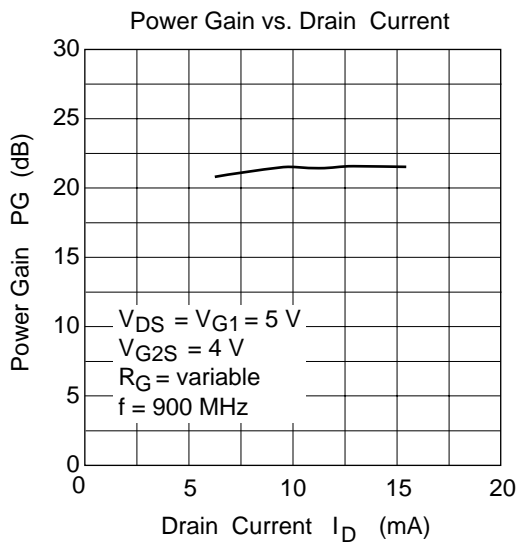
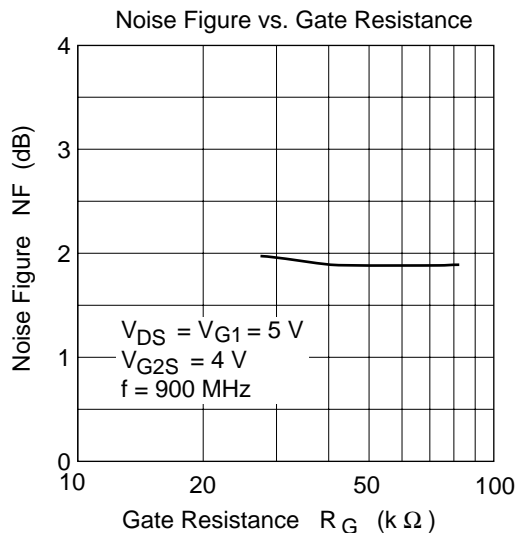
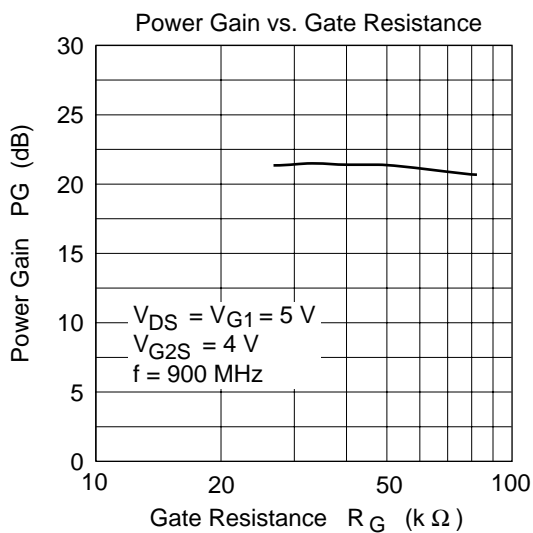
Drain Current vs. Gate1 Voltage



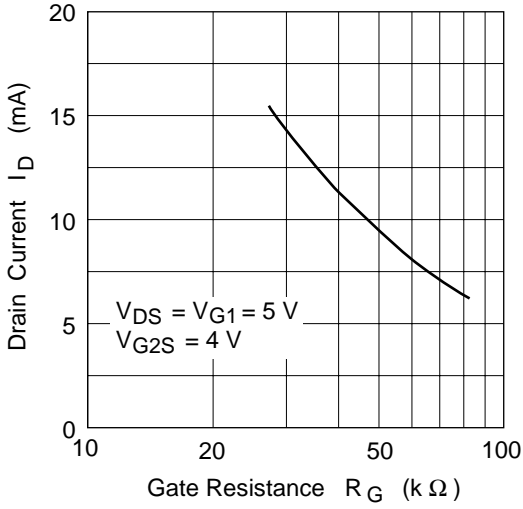
Drain Current vs. Gate1 Voltage



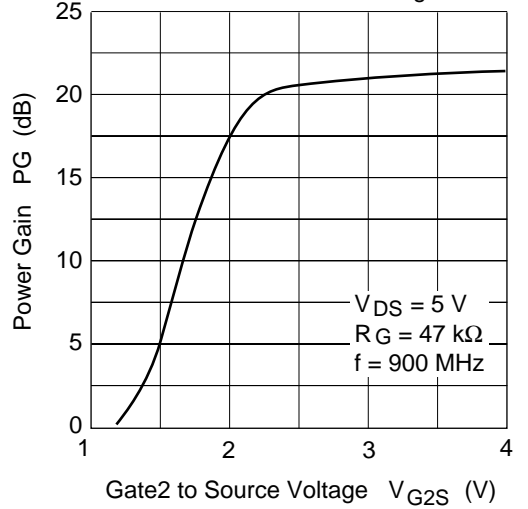




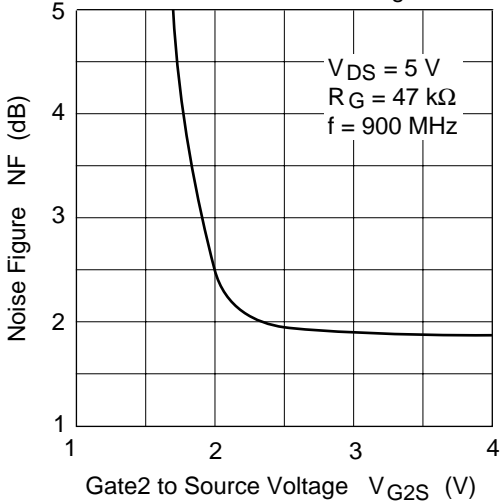
Drain Current vs. Gate Resistance



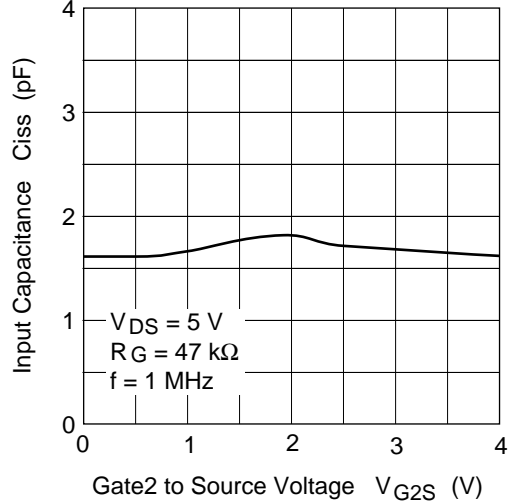
Power Gain vs. Gate2 to Source Voltage



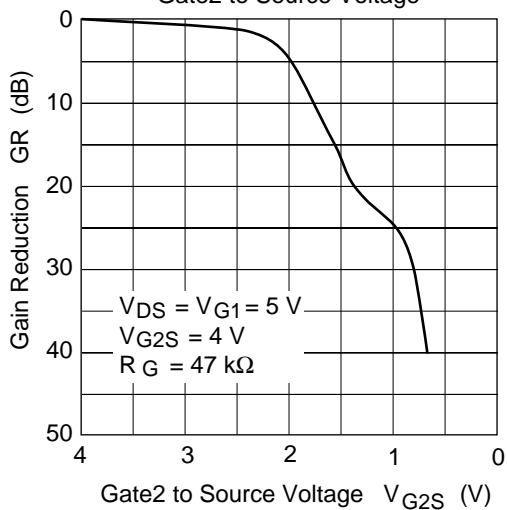
Noise Figure vs. Gate2 to Source Voltage



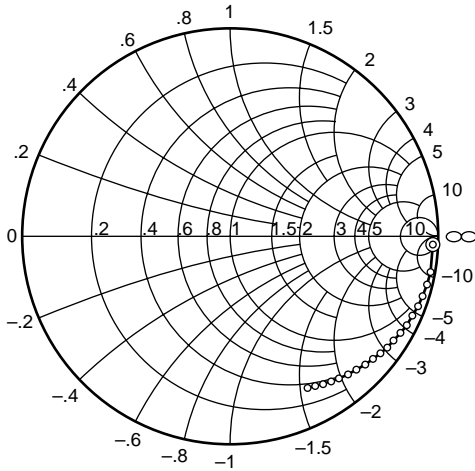
Input Capacitance vs. Gate2 to Source Voltage



Gain Reduction vs.
Gate2 to Source Voltage



S11 Parameter vs. Frequency

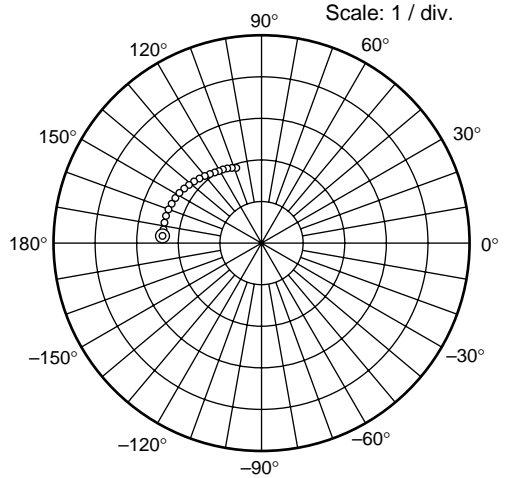


Test Condition: $V_{DS} = 5\text{ V}$, $V_{G1} = 5\text{ V}$
 $V_{G2S} = 4\text{ V}$, $R_G = 47\text{ k}\Omega$,
 $Z_0 = 50\ \Omega$

50 to 1000 MHz (50 MHz step)



S21 Parameter vs. Frequency

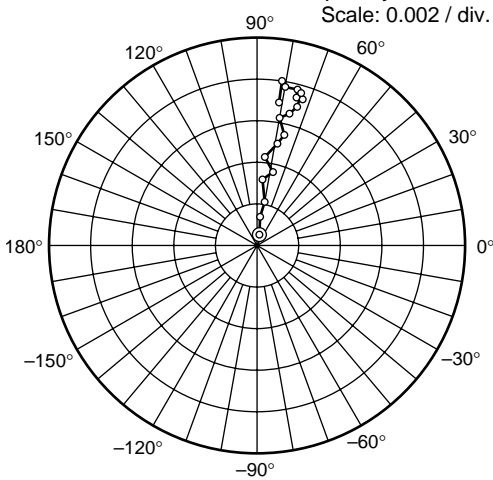


Test Condition: $V_{DS} = 5\text{ V}$, $V_{G1} = 5\text{ V}$
 $V_{G2S} = 4\text{ V}$, $R_G = 47\text{ k}\Omega$,
 $Z_0 = 50\ \Omega$

50 to 1000 MHz (50 MHz step)



S12 Parameter vs. Frequency

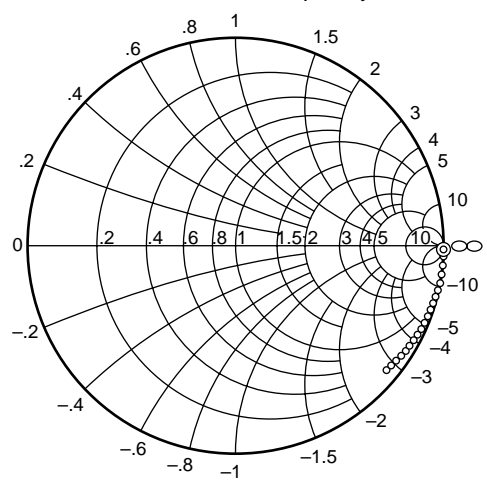


Test Condition: $V_{DS} = 5\text{ V}$, $V_{G1} = 5\text{ V}$
 $V_{G2S} = 4\text{ V}$, $R_G = 47\text{ k}\Omega$,
 $Z_0 = 50\ \Omega$

50 to 1000 MHz (50 MHz step)



S22 Parameter vs. Frequency



Test Condition: $V_{DS} = 5\text{ V}$, $V_{G1} = 5\text{ V}$
 $V_{G2S} = 4\text{ V}$, $R_G = 47\text{ k}\Omega$,
 $Z_0 = 50\ \Omega$

50 to 1000 MHz (50 MHz step)



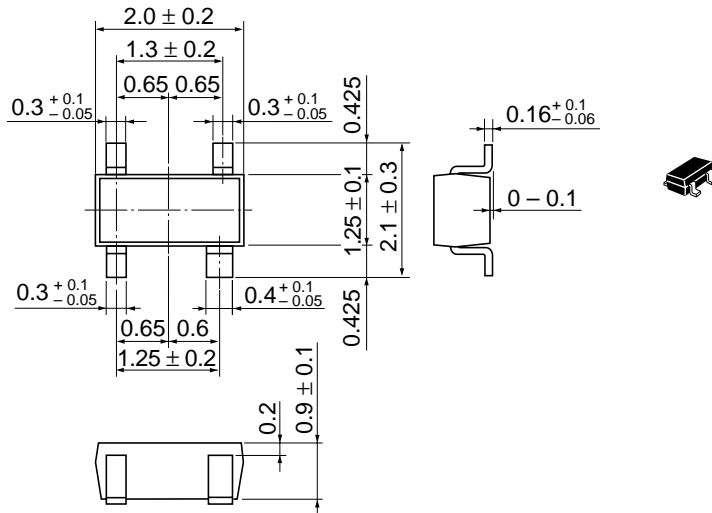
Sparameter ($V_{DS} = V_{G1} = 5V$, $V_{G2S} = 4V$, $R_G = 47k\Omega$, $Z_0 = 50\Omega$)

f (MHz)	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
50	0.974	-2.8	2.40	176.4	0.00057	78.1	0.997	-2.0
100	0.974	-10.0	2.38	172.2	0.00144	82.4	0.998	-4.2
150	0.974	-13.6	2.38	168.4	0.00211	78.7	0.997	-6.0
200	0.965	-16.5	2.37	164.1	0.00316	84.8	0.995	-8.1
250	0.963	-20.0	2.35	160.4	0.00358	76.3	0.994	-10.2
300	0.953	-23.7	2.32	156.8	0.00431	84.0	0.992	-12.2
350	0.947	-26.8	2.30	152.9	0.00503	79.0	0.990	-14.2
400	0.942	-29.6	2.28	148.6	0.00545	76.6	0.987	-16.2
450	0.929	-32.8	2.26	144.9	0.00630	80.3	0.984	-18.1
500	0.923	-35.4	2.21	141.2	0.00646	76.1	0.981	-20.2
550	0.912	-38.5	2.19	137.6	0.00693	73.7	0.977	-22.1
600	0.903	-41.2	2.15	134.2	0.00732	72.9	0.974	-24.1
650	0.886	-44.2	2.12	130.6	0.00729	74.6	0.971	-26.0
700	0.879	-46.8	2.08	127.4	0.00733	72.0	0.967	-27.8
750	0.873	-49.2	2.06	124.3	0.00762	74.5	0.962	-29.7
800	0.859	-52.4	2.03	120.8	0.00756	73.7	0.959	-31.7
850	0.846	-55.4	2.00	117.3	0.00772	75.5	0.955	-33.6
900	0.836	-58.0	1.96	114.3	0.00775	79.6	0.951	-35.5
950	0.827	-60.4	1.93	111.0	0.00801	81.7	0.946	-37.3
1000	0.815	-62.8	1.89	108.0	0.00704	81.0	0.942	-39.4

Package Dimensions

As of January, 2001

Unit: mm



Hitachi Code	CMPAK-4(T)
JEDEC	—
EIAJ	Conforms
Mass (reference value)	0.006 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

URL	NorthAmerica	: 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) 585160

Hitachi Asia Ltd.
Hitachi Tower
16 Collyer Quay #20-00,
Singapore 049318
Tel : <65>-538-6533/538-8577
Fax : <65>-538-6933/538-3877
URL : <http://www.hitachi.com.sg>

Hitachi Asia Ltd.
(Taipei Branch Office)
4/F, No. 167, Tun Hwa North Road,
Hung-Kuo Building,
Taipei (105), Taiwan
Tel : <886>-(2)-2718-3666
Fax : <886>-(2)-2718-8180
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Hitachi Asia (Hong Kong) Ltd.
Group III (Electronic Components)
7/F., North Tower,
World Finance Centre,
Harbour City, Canton Road
Tsim Sha Tsui, Kowloon,
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