To all our customers

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

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Keep safety first in your circuit designs!

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   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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BIC703C

Bias Controlled Monolithic IC
VHF/UHF RF Amplifier

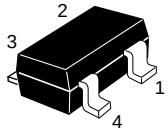
ADE-208-985D (Z)
5th. Edition
Mar. 2001

Features

- Bias Controlled Monolithic IC (No external DC biasing voltage on gate1.);
  To reduce using parts cost & PC board space.
- High |yfs| ;
  |yfs| = 29 mS typ. (f = 1kHz)
- Low noise;
  NF = 1.0 dB typ. (at f = 200 MHz), NF = 1.8 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 package; CMPAK-4 (SOT-343mod)

Outline

CMPAK-4



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

Notes: 1. Marking is “CZ–”.
2. BIC703C is individual type number of HITACHI BICMIC.

Absolute Maximum Ratings (Ta = 25°C)

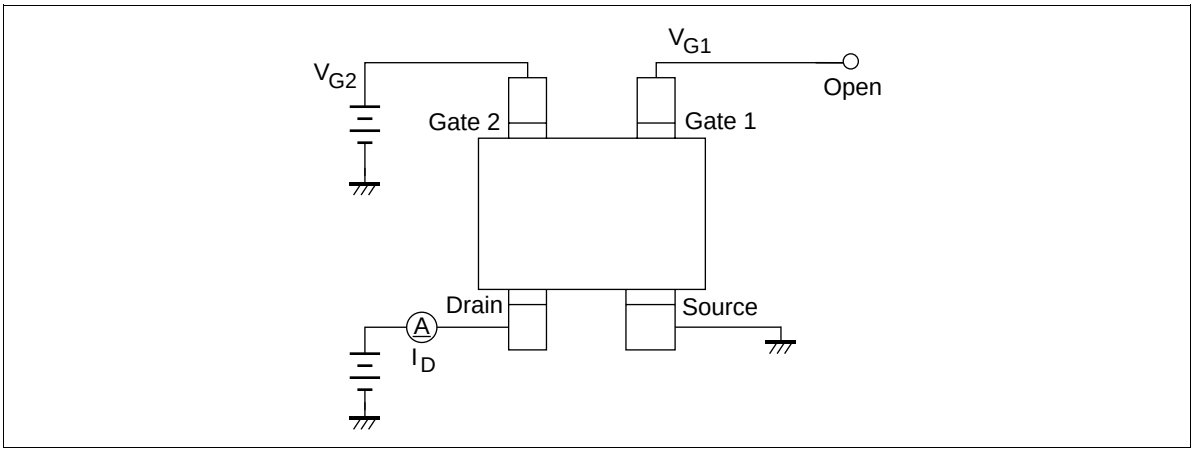
Item	Symbol	Ratings	Unit
Drain to source voltage	V_{DS}	6	V
Gate1 to source voltage	V_{G1S}	+6 –0	V
Gate2 to source voltage	V_{G2S}	+6 –0	V
Drain current	I_D	30	mA
Channel power dissipation	Pch	100	mW
Channel temperature	Tch	150	°C
Storage temperature	Tstg	–55 to +150	°C

Electrical Characteristics (Ta = 25°C)

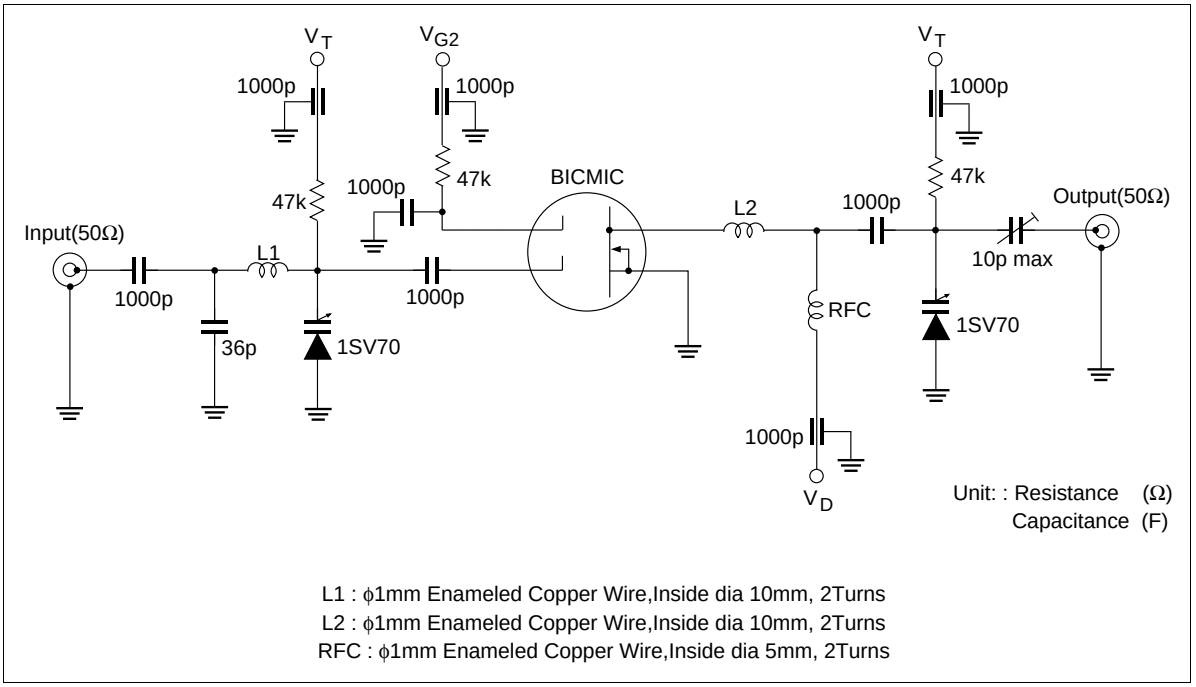
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain to source breakdown voltage	$V_{(BR)DSS}$	6	—	—	V	I_D = 200µA V_{G2S} = 0,V_{G1} = open
Gate1 to source breakdown voltage	$V_{(BR)G1SS}$	+6	—	—	V	I_{G1} = +1mA, V_{G2S} = V_{DS} = 0
Gate2 to source breakdown voltage	$V_{(BR)G2SS}$	+6	—	—	V	I_{G2} = +10µA, V_{G1S} = V_{DS} = 0
Gate2 to source cutoff current	I_{G2SS}	—	—	+100	nA	V_{G2S} = +5V, V_{G1S} = V_{DS} = 0
Gate2 to source cutoff voltage	$V_{G2S(off)}$	0.8	1.1	1.5	V	V_{DS} = 5V, I_D = 100µA V_{G1} = open
Drain current	$I_{D(op)}$	12	15	18	mA	V_{DS} = 5V , V_{G2S} = 4V V_{G1} = open
Forward transfer admittance	$\|y_{fs}\|$	24	29	34	mS	V_{DS} = 5V, I_D = 15mA V_{G2S} =4V, f = 1kHz
Input capacitance	c_{iss}	1.6	2.0	2.4	pF	V_{DS} = 5V, V_{G2S} =4V
Output capacitance	c_{oss}	0.6	1.0	1.4	pF	V_{G1} = open
Reverse transfer capacitance	c_{rss}	—	0.022	0.05	pF	f = 1MHz
Power gain	PG1	23	28	—	dB	V_{DS} = 5V, V_{G2S} =4V V_{G1} = open
Noise figure	NF1	—	1.0	1.8	dB	f = 200MHz
Power gain	PG2	17	22	—	dB	V_{DS} = 5V, V_{G2S} =4V V_{G1} = open
Noise figure	NF2	—	1.8	2.4	dB	f = 900MHz

Test Circuits

- **DC Biasing Circuit for Operating Characteristic Items** ($I_{D(op)}$, |yfs|, Ciss, Coss, Crss, NF, PG)

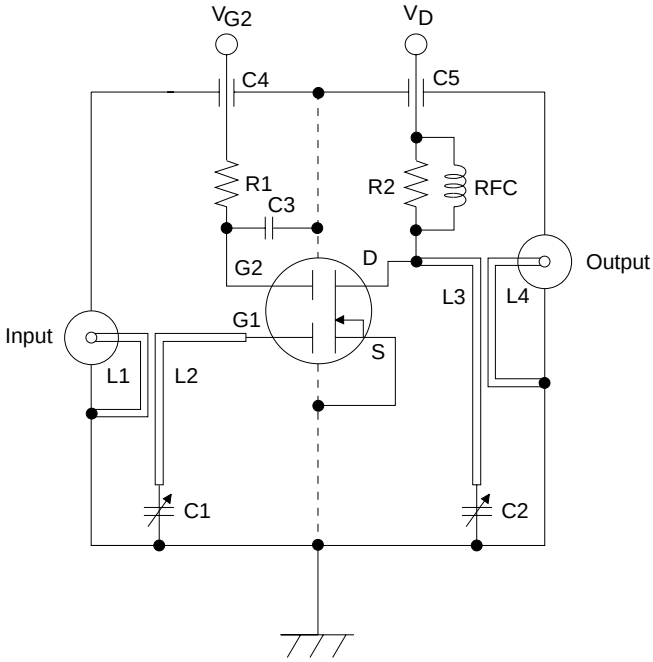


- **200 MHz Power Gain, Noise Figure Test Circuit**



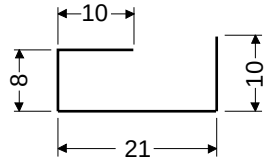
L1 : ϕ1mm Enameled Copper Wire,Inside dia 10mm, 2Turns
L2 : ϕ1mm Enameled Copper Wire,Inside dia 10mm, 2Turns
RFC : ϕ1mm Enameled Copper Wire,Inside dia 5mm, 2Turns

- **900 MHz Power Gain, Noise Figure Test Circuit**

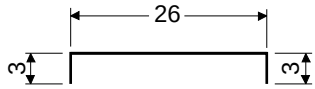


C1, C2 : Variable Capacitor (10pF MAX)
C3 : Disk Capacitor (1000pF)
C4, C5 : Air Capacitor (1000pF)
R1 : 47 kΩ
R2 : 4.7 kΩ

L1:

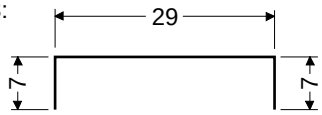


L2:

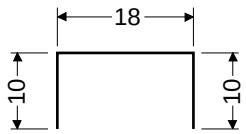


(ϕ1mm Copper wire)
Unit : mm

L3:

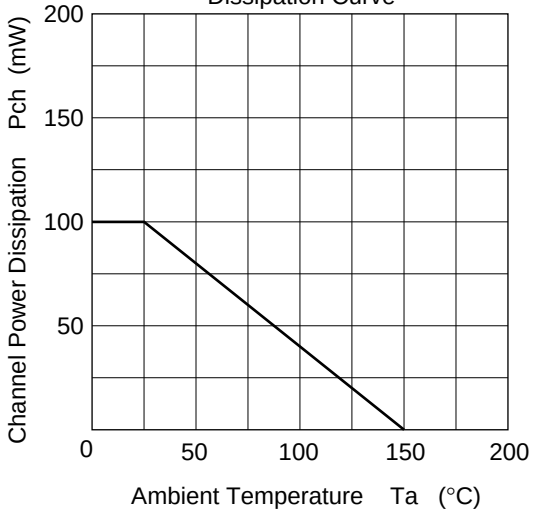


L4:

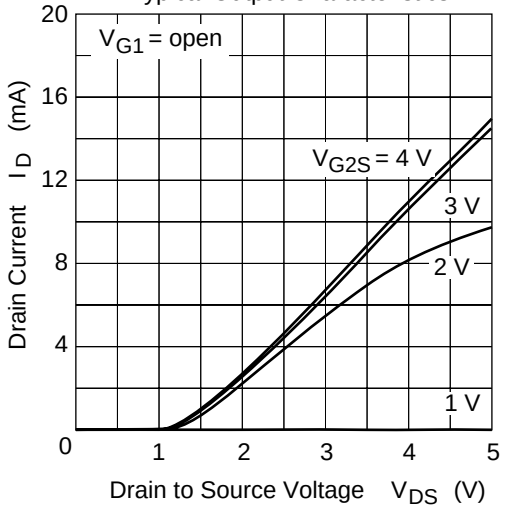


RFC : ϕ1mm Copper wire with enamel 4turns inside dia 6mm

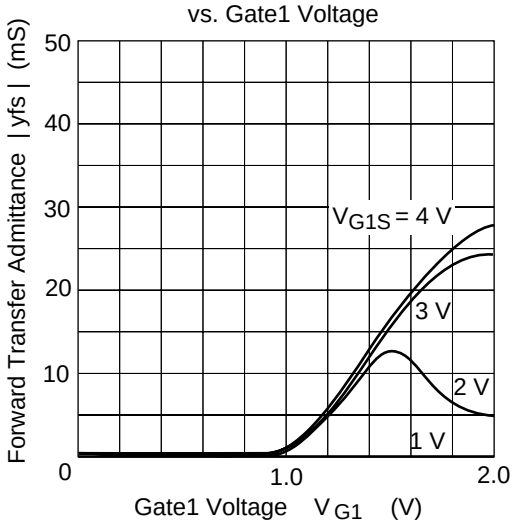
Maximum Channel Power Dissipation Curve



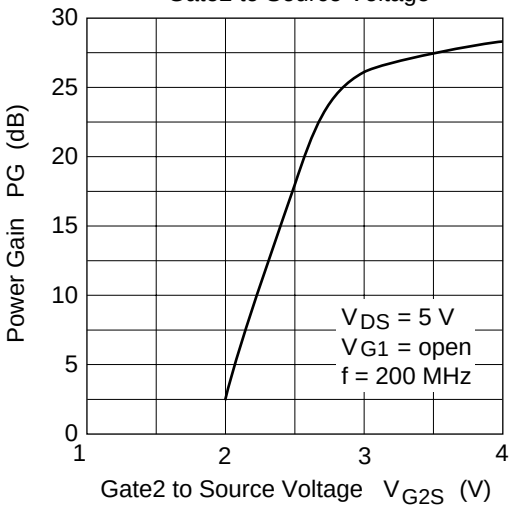
Typical Output Characteristics



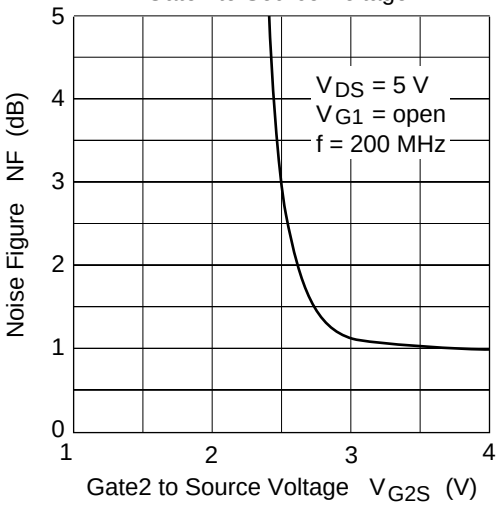
Forward Transfer Admittance vs. Gate1 Voltage



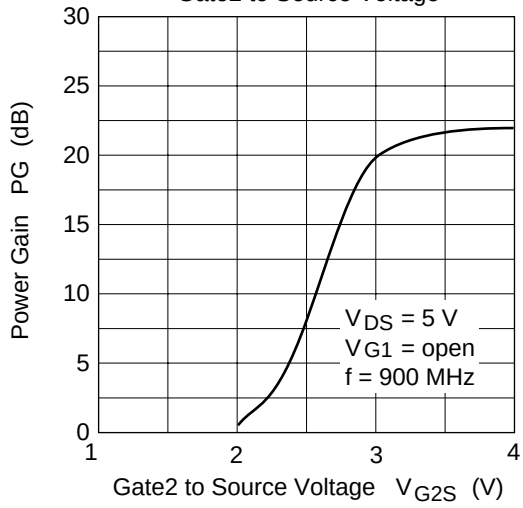
Power Gain vs. Gate2 to Source Voltage



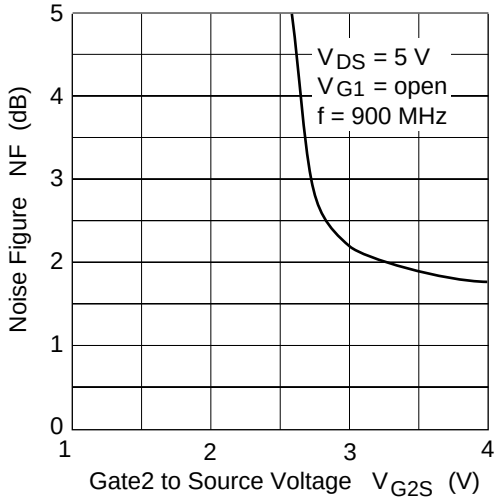
Noise Figure vs.
Gate2 to Source Voltage



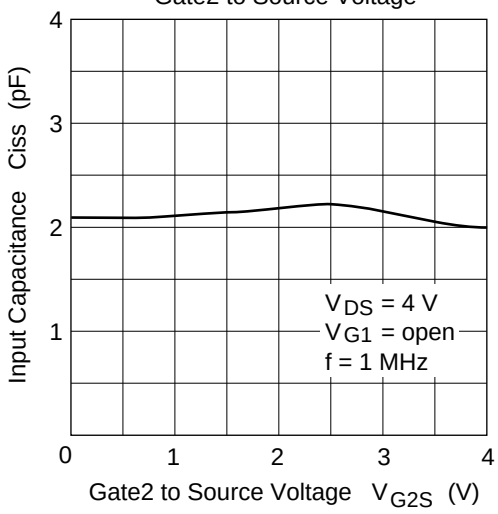
Power Gain vs.
Gate2 to Source Voltage

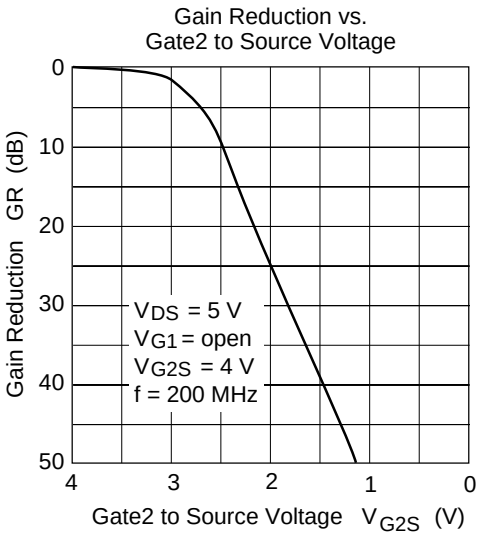


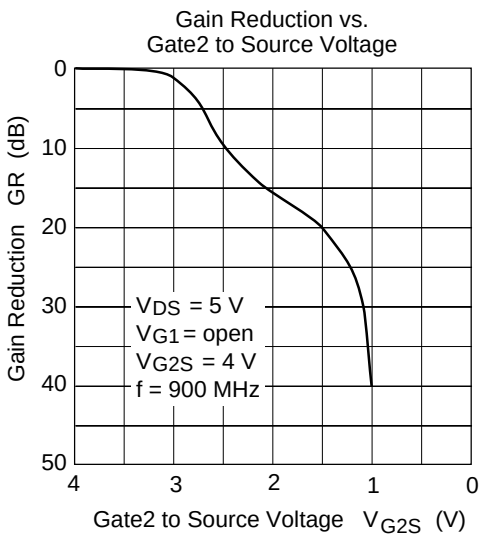
Noise Figure vs.
Gate2 to Source Voltage



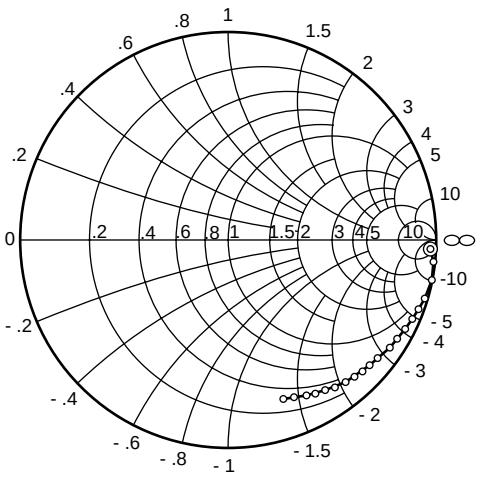
Input Capacitance vs.
Gate2 to Source Voltage




Gain Reduction vs.
Gate2 to Source Voltage
Gain Reduction GR (dB)
0
10
20
30
40
50
4
3
2
1
0
VDS = 5 V
VG1 = open
VG2S = 4 V
f = 200 MHz
Gate2 to Source Voltage VG2S (V)


Gain Reduction vs.
Gate2 to Source Voltage
Gain Reduction GR (dB)
0
10
20
30
40
50
4
3
2
1
0
VDS = 5 V
VG1 = open
VG2S = 4 V
f = 900 MHz
Gate2 to Source Voltage VG2S (V)

S11 Parameter vs. Frequency

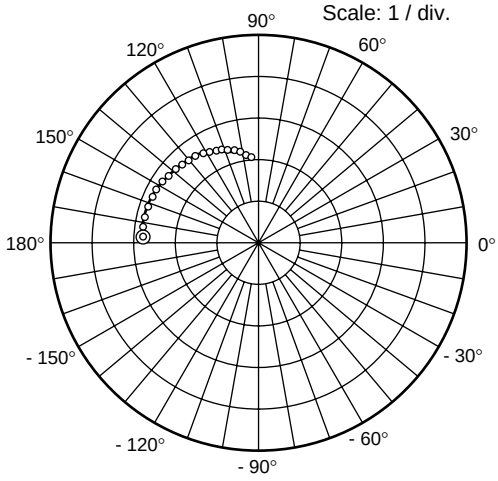


Test Condition: V_{DS} = 5 V , V_{G1} = open
V_{G2S} = 4 V ,
Zo = 50 Ω

50 to 1000 MHz (50 MHz step)

S21 Parameter vs. Frequency

Scale: 1 / div.

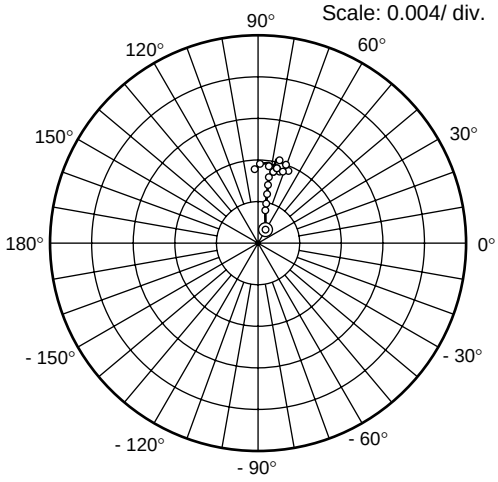


Test Condition: V_{DS} = 5 V , V_{G1} = open
V_{G2S} = 4 V ,
Zo = 50 Ω

50 to 1000 MHz (50 MHz step)

S12 Parameter vs. Frequency

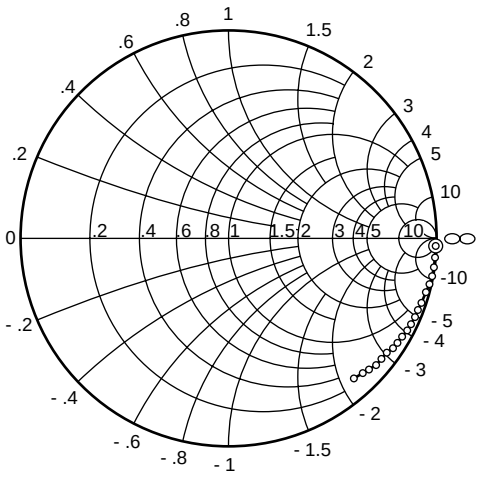
Scale: 0.004/ div.



Test Condition: V_{DS} = 5 V , V_{G1} = open
V_{G2S} = 4 V ,
Zo = 50 Ω

50 to 1000 MHz (50 MHz step)

S22 Parameter vs. Frequency



Test Condition: V_{DS} = 5 V , V_{G1} = open
V_{G2S} = 4 V ,
Zo = 50 Ω

50 to 1000 MHz (50 MHz step)

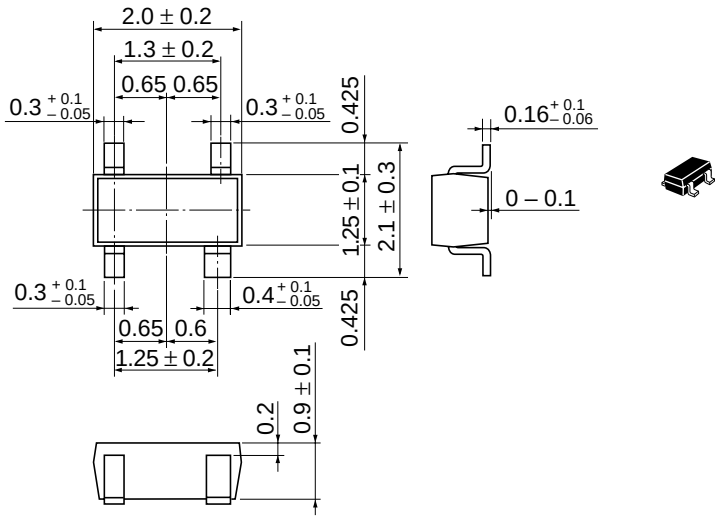
Sparameter (V_{DS} = 5 V, V_{G2S} = 4 V, V_{G1} = open, Zo = 50 Ω)

	S11		S21		S12		S22	
f (MHz)	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
50	1.000	-3.3	2.80	175.9	0.00106	58.8	0.990	-2.4
100	0.993	-7.2	2.78	170.9	0.00171	75.7	0.992	-4.7
150	0.991	-10.9	2.77	166.1	0.00253	75.1	0.991	-7.2
200	0.984	-15.0	2.74	161.2	0.00356	77.4	0.987	-9.6
250	0.978	-19.0	2.72	156.5	0.00442	78.2	0.985	-12.2
300	0.970	-22.8	2.68	151.8	0.00485	80.0	0.982	-14.7
350	0.958	-26.7	2.64	147.2	0.00576	74.7	0.978	-17.1
400	0.954	-30.3	2.60	142.7	0.00642	71.7	0.973	-19.6
450	0.945	-33.8	2.56	138.6	0.00689	73.3	0.968	-22.0
500	0.932	-37.5	2.50	134.1	0.00712	71.8	0.963	-24.2
550	0.920	-40.6	2.46	129.8	0.00765	70.7	0.958	-26.7
600	0.910	-44.3	2.41	125.7	0.00804	69.9	0.952	-28.9
650	0.900	-47.5	2.37	121.6	0.00798	69.1	0.947	-31.3
700	0.887	-50.9	2.31	117.8	0.00787	67.8	0.942	-33.4
750	0.870	-54.4	2.27	113.6	0.00785	70.8	0.936	-35.8
800	0.863	-57.6	2.22	110.0	0.00758	73.3	0.929	-37.9
850	0.853	-60.9	2.18	105.8	0.00721	75.2	0.924	-40.3
900	0.839	-63.6	2.12	102.2	0.00694	75.8	0.917	-42.5
950	0.827	-66.5	2.07	98.6	0.00716	88.1	0.912	-44.5
1000	0.819	-70.1	2.04	94.9	0.00667	92.7	0.906	-46.7

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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Colophon 2.0