

BIC703C

Bias Controlled Monolithic IC VHF/UHF RF Amplifier

HITACHI

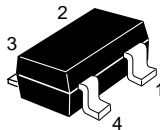
ADE-208-985D (Z)
5th. Edition
Mar. 2001

Features

- Bias Controlled Monolithic IC (No external DC biasing voltage on gate1.);
To reduce using parts cost & PC board space.
- High $|y_{fs}|$;
 $|y_{fs}| = 29 \text{ mS typ. (} f = 1\text{kHz)}$
- Low noise;
 $NF = 1.0 \text{ dB typ. (at } f = 200 \text{ MHz), } NF = 1.8 \text{ dB typ. (at } f = 900 \text{ MHz)}$
- Withstanding to ESD;
Build in ESD absorbing diode. Withstand up to 200V at $C = 200\text{pF}$, $R_s = 0$ 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)

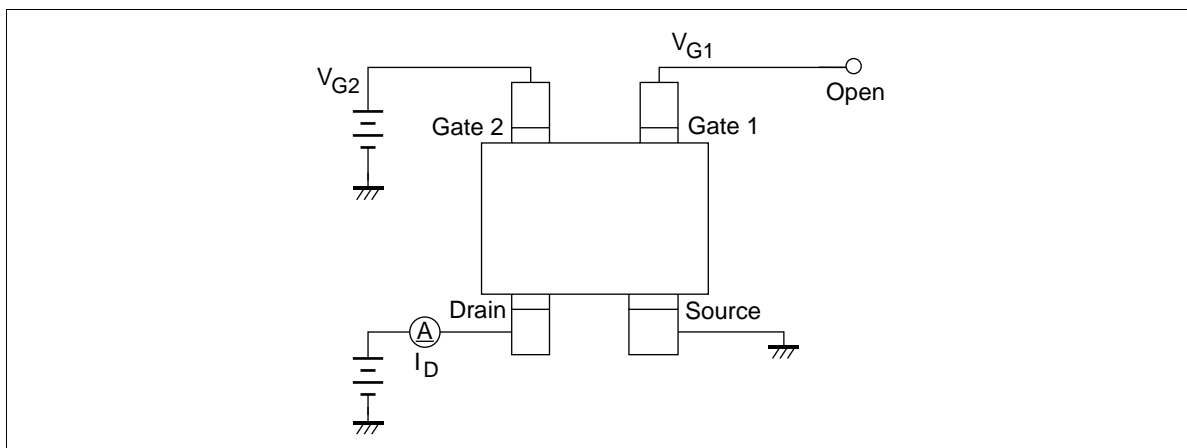
| Item | Symbol | Ratings | Unit |
|---------------------------|-----------|-------------|------|
| Drain to source voltage | V_{DS} | 6 | V |
| Gate1 to source voltage | V_{G1S} | +6 -0 | V |
| Gate2 to source voltage | V_{G2S} | +6 -0 | V |
| Drain current | I_D | 30 | mA |
| Channel power dissipation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

Electrical Characteristics (Ta = 25°C)

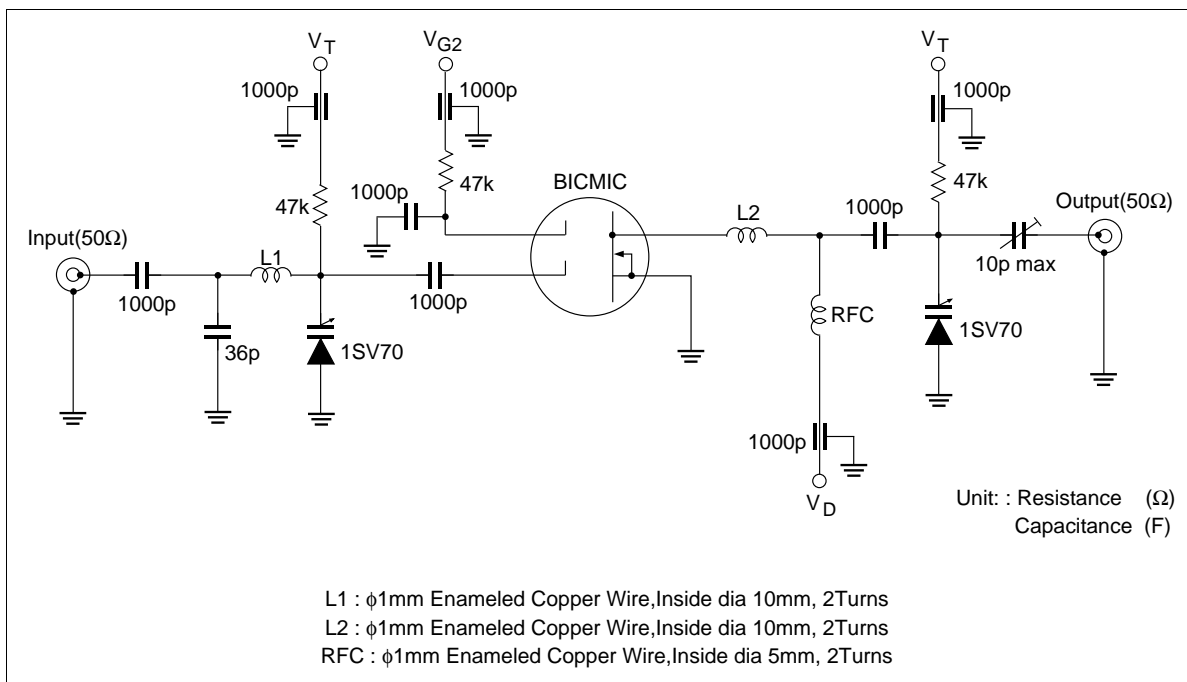
| Item | Symbol | Min | Typ | Max | Unit | Test Conditions |
|-----------------------------------|----------------|-----|-------|------|------|---|
| Drain to source breakdown voltage | $V_{(BR)DSS}$ | 6 | — | — | V | $I_D = 200\mu A$ $V_{G2S} = 0, V_{G1} = \text{open}$ |
| Gate1 to source breakdown voltage | $V_{(BR)G1SS}$ | +6 | — | — | V | $I_{G1} = +1mA, V_{G2S} = V_{DS} = 0$ |
| Gate2 to source breakdown voltage | $V_{(BR)G2SS}$ | +6 | — | — | V | $I_{G2} = +10\mu A, V_{G1S} = V_{DS} = 0$ |
| 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 | $V_{DS} = 5V, I_D = 100\mu A$ $V_{G1} = \text{open}$ |
| Drain current | $I_{D(op)}$ | 12 | 15 | 18 | mA | $V_{DS} = 5V, V_{G2S} = 4V$ $V_{G1} = \text{open}$ |
| 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 | $V_{G1} = \text{open}$ |
| Reverse transfer capacitance | C_{rss} | — | 0.022 | 0.05 | pF | $f = 1MHz$ |
| Power gain | PG1 | 23 | 28 | — | dB | $V_{DS} = 5V, V_{G2S} = 4V$ $V_{G1} = \text{open}$ |
| Noise figure | NF1 | — | 1.0 | 1.8 | dB | $f = 200MHz$ |
| Power gain | PG2 | 17 | 22 | — | dB | $V_{DS} = 5V, V_{G2S} = 4V$ $V_{G1} = \text{open}$ |
| Noise figure | NF2 | — | 1.8 | 2.4 | dB | $f = 900MHz$ |

Test Circuits

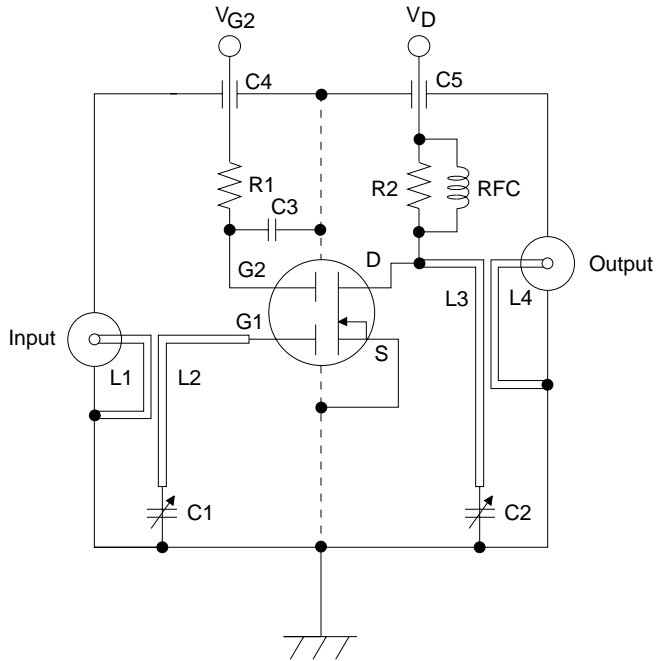
- DC Biasing Circuit for Operating Characteristic Items ($I_{D(op)}$, $|y_{fs}|$, C_{iss} , C_{oss} , C_{rss} , NF , PG)



- 200 MHz Power Gain, Noise Figure Test Circuit

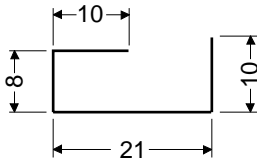


• 900 MHz Power Gain, Noise Figure Test Circuit

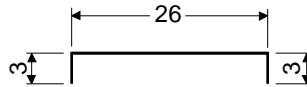


- C1, C2 : Variable Capacitor (10pF MAX)
- C3 : Disk Capacitor (1000pF)
- C4, C5 : Air Capacitor (1000pF)
- R1 : 47 k Ω
- R2 : 4.7 k Ω

L1:

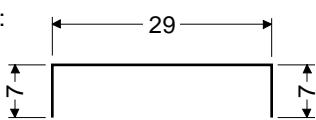


L2:

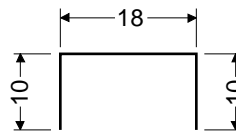


(ϕ 1mm Copper wire)
Unit : mm

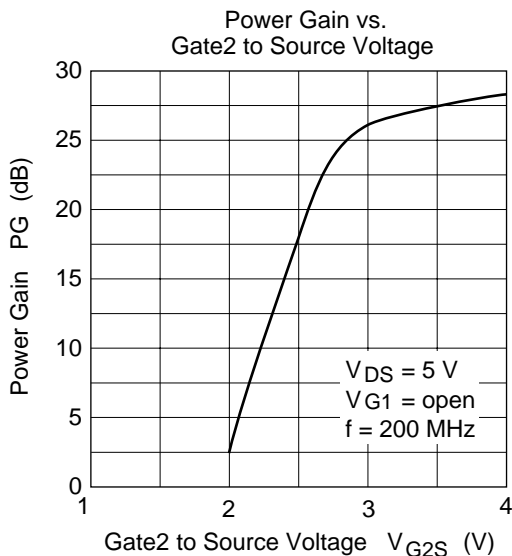
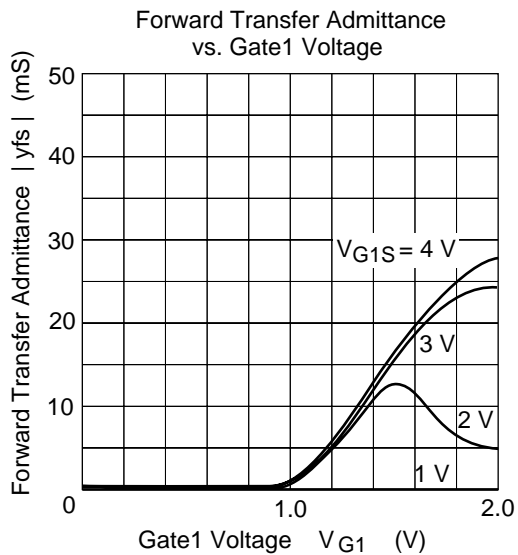
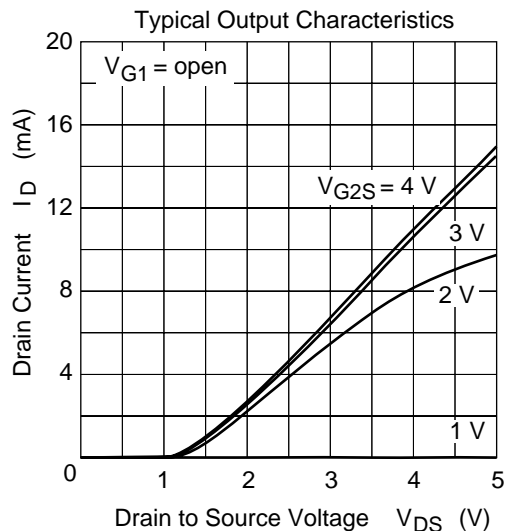
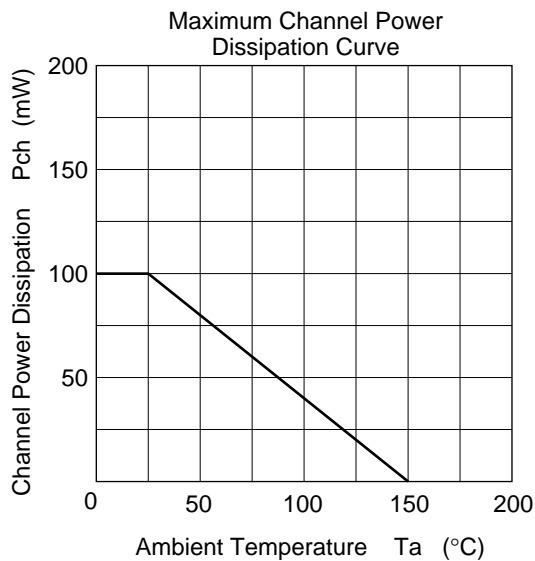
L3:

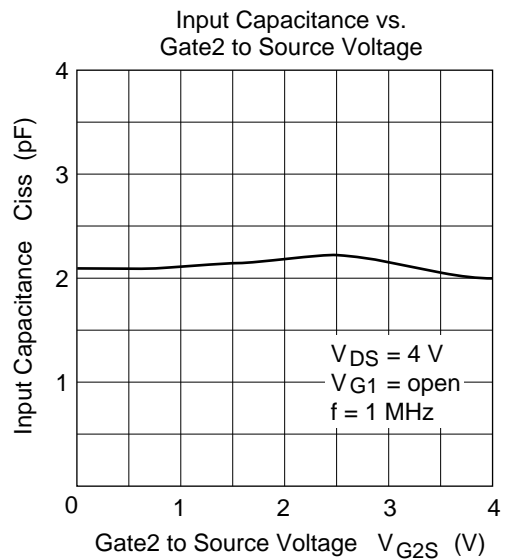
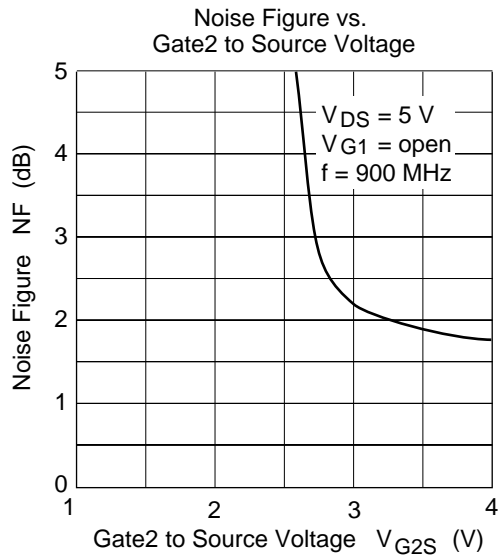
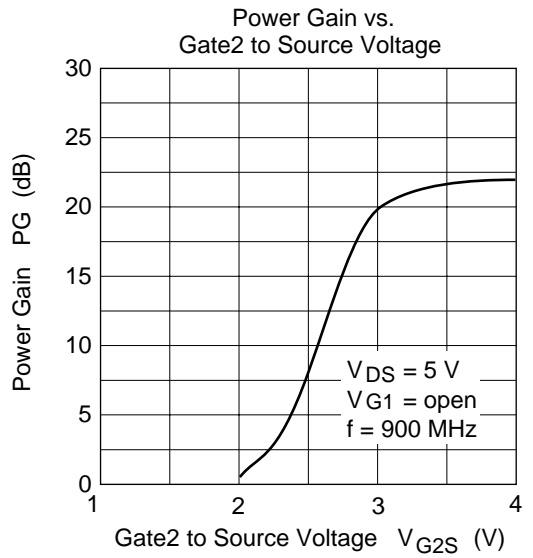
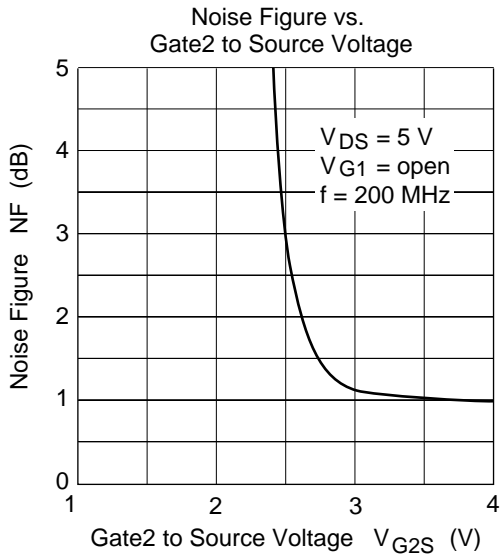


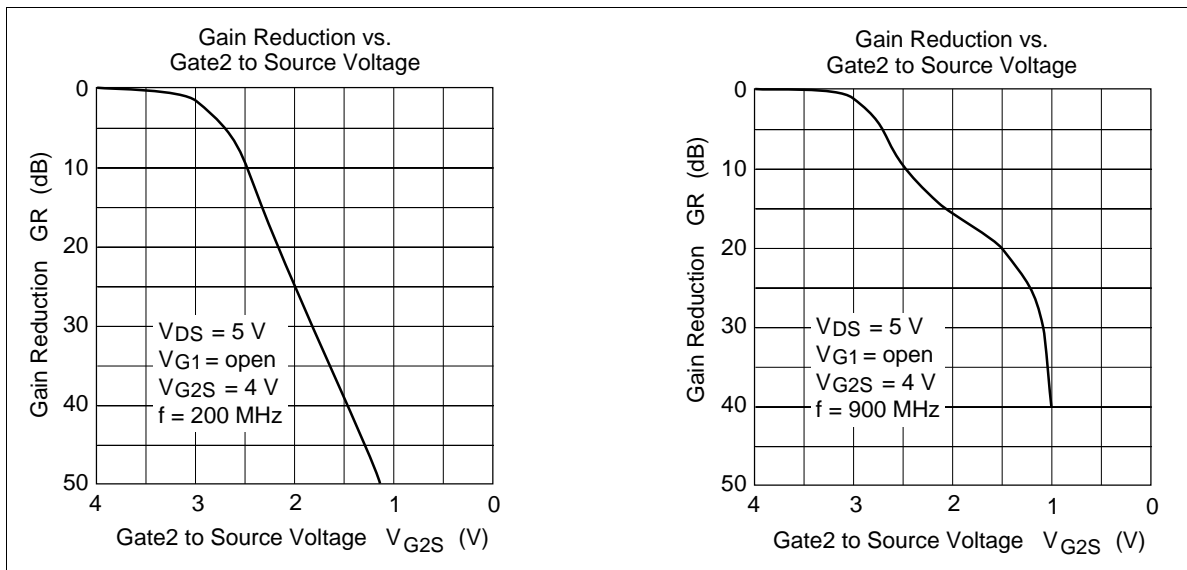
L4:



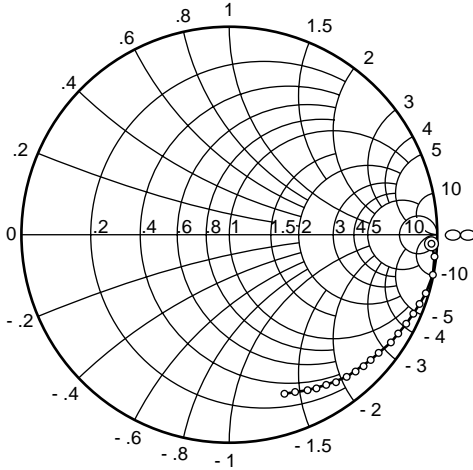
RFC : ϕ 1mm Copper wire with enamel 4turns inside dia 6mm







S11 Parameter vs. Frequency

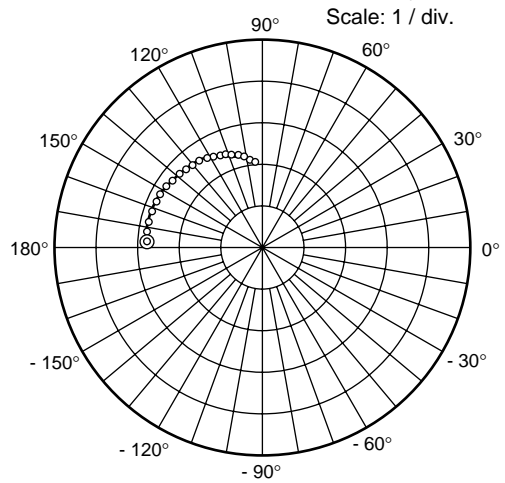


Test Condition: $V_{DS} = 5\text{ V}$, $V_{G1} = \text{open}$
 $V_{G2S} = 4\text{ V}$,
 $Z_0 = 50\ \Omega$

50 to 1000 MHz (50 MHz step)



S21 Parameter vs. Frequency

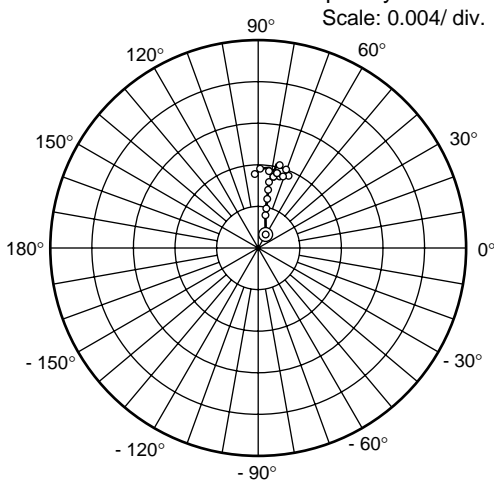


Test Condition: $V_{DS} = 5\text{ V}$, $V_{G1} = \text{open}$
 $V_{G2S} = 4\text{ V}$,
 $Z_0 = 50\ \Omega$

50 to 1000 MHz (50 MHz step)



S12 Parameter vs. Frequency

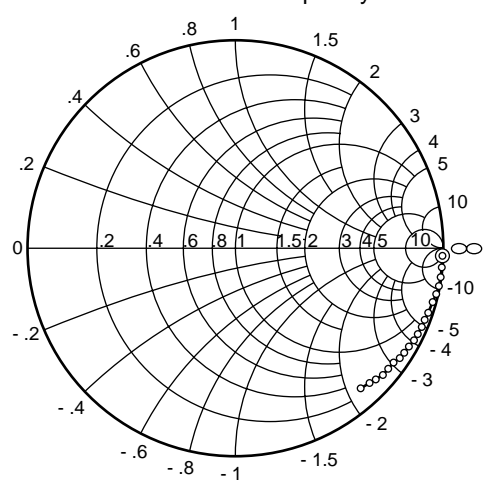


Test Condition: $V_{DS} = 5\text{ V}$, $V_{G1} = \text{open}$
 $V_{G2S} = 4\text{ V}$,
 $Z_0 = 50\ \Omega$

50 to 1000 MHz (50 MHz step)



S22 Parameter vs. Frequency



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

50 to 1000 MHz (50 MHz step)



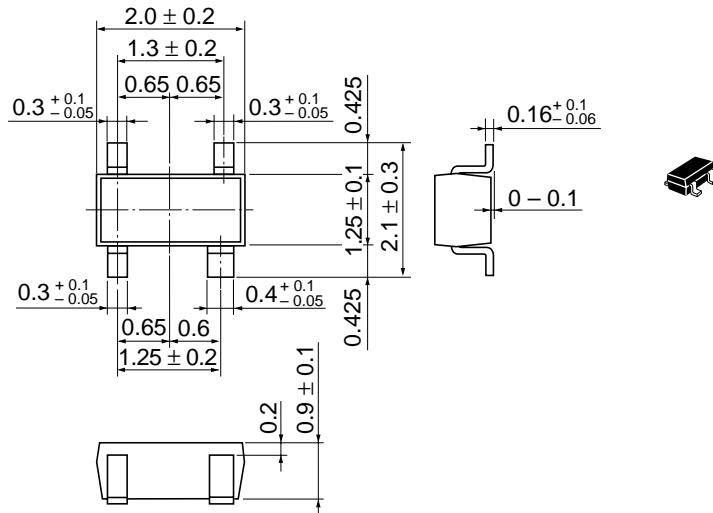
Sparameter ($V_{DS} = 5 \text{ V}$, $V_{G2S} = 4 \text{ V}$, $V_{G1} = \text{open}$, $Z_0 = 50 \Omega$)

| f (MHz) | S11 | | S21 | | S12 | | S22 | |
|---------|-------|-------|------|-------|---------|------|-------|-------|
| | 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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