

To all our customers

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

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# BB102C

## Build in Biasing Circuit MOS FET IC UHF RF Amplifier

**RENESAS**

ADE-208-588 (Z)  
1st. Edition  
November 1997

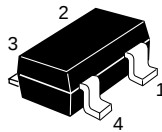
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### Features

- Build in Biasing Circuit; To reduce using parts cost & PC board space.
- Low noise characteristics;  
(NF = 2.1 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

- Note 1 Marking is “BW-”.
- Note 2 BB302C is individual type number of HITACHI BBFET.

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

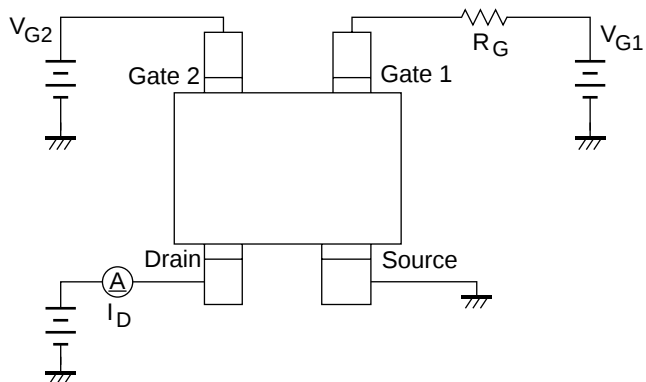
| Item                      | Symbol    | Ratings     | Unit |
|---------------------------|-----------|-------------|------|
| Drain to source voltage   | $V_{DS}$  | 12          | V    |
| Gate1 to source voltage   | $V_{G1S}$ | +10<br>-0   | V    |
| Gate2 to source voltage   | $V_{G2S}$ | ±10         | V    |
| Drain current             | $I_D$     | 25          | mA   |
| Channel power dissipation | Pch       | 100         | mW   |
| Channel temperature       | Tch       | 150         | °C   |
| Storage temperature       | Tstg      | -55 to +150 | °C   |

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

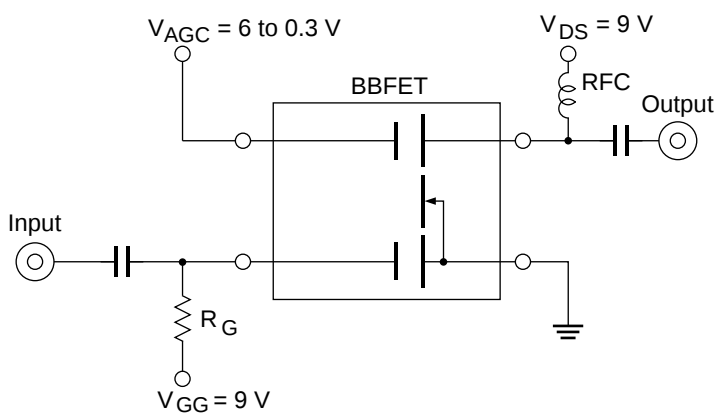
| Item                              | Symbol         | Min | Typ   | Max  | Unit | Test Conditions                                                                   |
|-----------------------------------|----------------|-----|-------|------|------|-----------------------------------------------------------------------------------|
| Drain to source breakdown voltage | $V_{(BR)DSS}$  | 12  | —     | —    | V    | $I_D = 200\mu A$ , $V_{G1S} = V_{G2S} = 0$                                        |
| Gate1 to source breakdown voltage | $V_{(BR)G1SS}$ | +10 | —     | —    | V    | $I_{G1} = +10\mu A$ , $V_{G2S} = V_{DS} = 0$                                      |
| Gate2 to source breakdown voltage | $V_{(BR)G2SS}$ | ±10 | —     | —    | V    | $I_{G2} = \pm 10\mu A$ , $V_{G1S} = V_{DS} = 0$                                   |
| Gate1 to source cutoff current    | $I_{G1SS}$     | —   | —     | +100 | nA   | $V_{G1S} = +9V$ , $V_{G2S} = V_{DS} = 0$                                          |
| Gate2 to source cutoff current    | $I_{G2SS}$     | —   | —     | ±100 | nA   | $V_{G2S} = \pm 9V$ , $V_{G1S} = V_{DS} = 0$                                       |
| Gate1 to source cutoff voltage    | $V_{G1S(off)}$ | 0.1 | —     | 0.8  | V    | $V_{DS} = 9V$ , $V_{G2S} = 6V$ , $I_D = 100\mu A$                                 |
| Gate2 to source cutoff voltage    | $V_{G2S(off)}$ | 0.5 | —     | 1.1  | V    | $V_{DS} = 9V$ , $V_{G1S} = 9V$ , $I_D = 100\mu A$                                 |
| Drain current                     | $I_{D(op)}$    | 10  | 15    | 20   | mA   | $V_{DS} = 9V$ , $V_{G1} = 9V$ , $V_{G2S} = 6V$<br>$R_G = 560k\Omega$              |
| Forward transfer admittance       | $ y_{fs} $     | 16  | 21    | —    | mS   | $V_{DS} = 9V$ , $V_{G1} = 9V$ , $V_{G2S} = 6V$<br>$R_G = 560k\Omega$ , $f = 1kHz$ |
| Input capacitance                 | $C_{iss}$      | 1.2 | 1.6   | 2.2  | pF   | $V_{DS} = 9V$ , $V_{G1} = 9V$                                                     |
| Output capacitance                | $C_{oss}$      | 0.7 | 1.1   | 1.5  | pF   | $V_{G2S} = 6V$ , $R_G = 560k\Omega$                                               |
| Reverse transfer capacitance      | $C_{rss}$      | —   | 0.011 | 0.03 | pF   | $f = 1MHz$                                                                        |
| Power gain                        | PG             | 16  | 20    | —    | dB   | $V_{DS} = 9V$ , $V_{G1} = 9V$ , $V_{G2S} = 6V$                                    |
| Noise figure                      | NF             | —   | 2.1   | 3.1  | dB   | $R_G = 120k\Omega$ , $f = 900MHz$                                                 |

## Main Characteristics

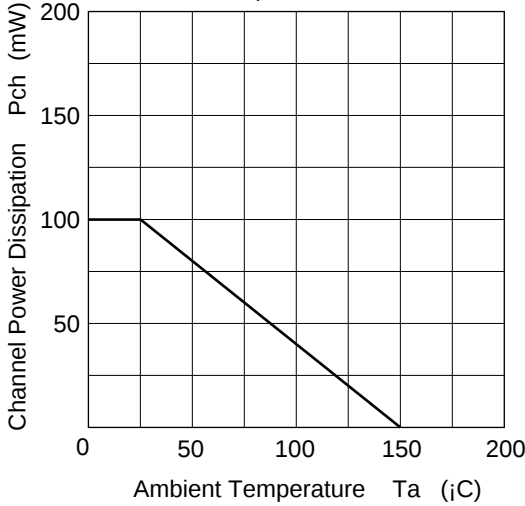
Test Circuit for Operating Items ( $I_{D(op)}$ ,  $|y_{fs}|$ ,  $C_{iss}$ ,  $C_{oss}$ ,  $C_{rss}$ , NF, PG)



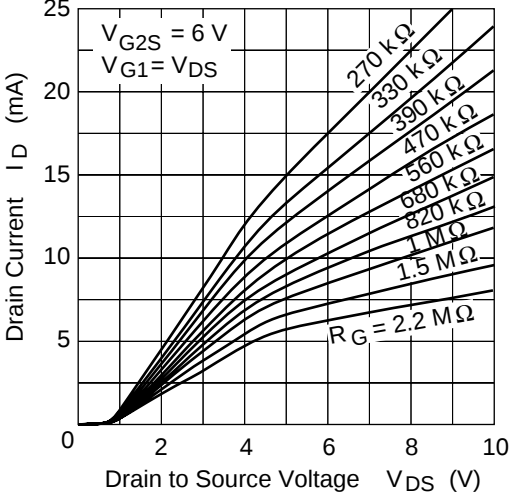
Application Circuit



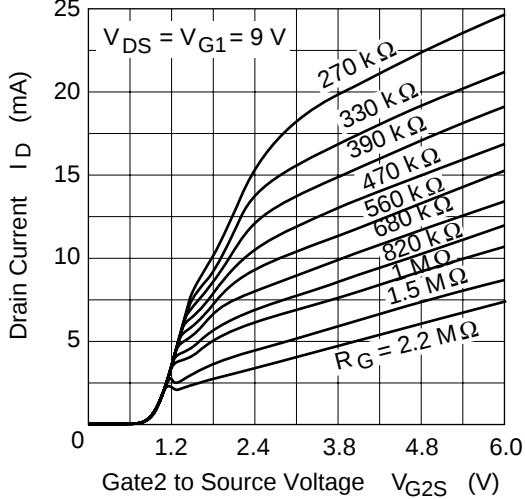
Maximum Channel Power  
Dissipation Curve



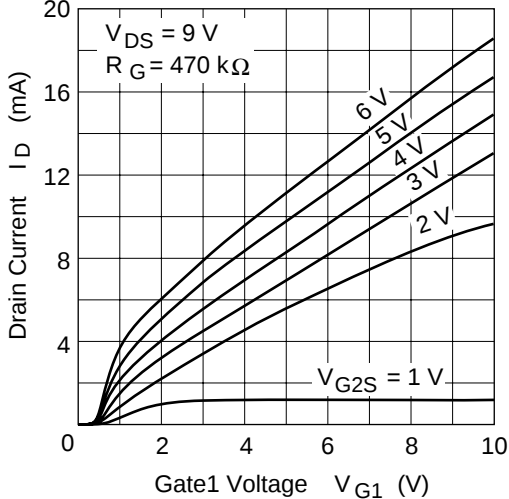
Typical Output Characteristics

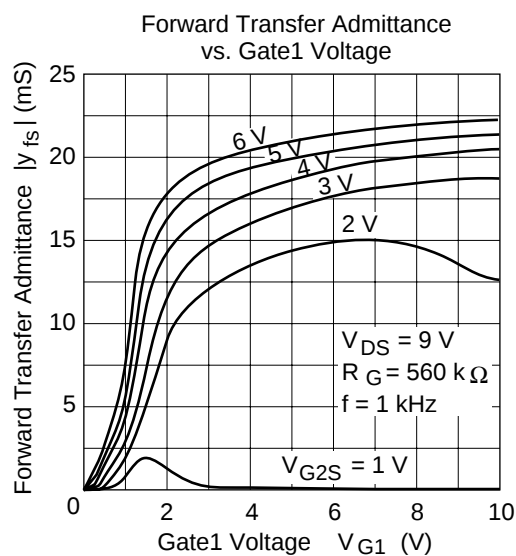
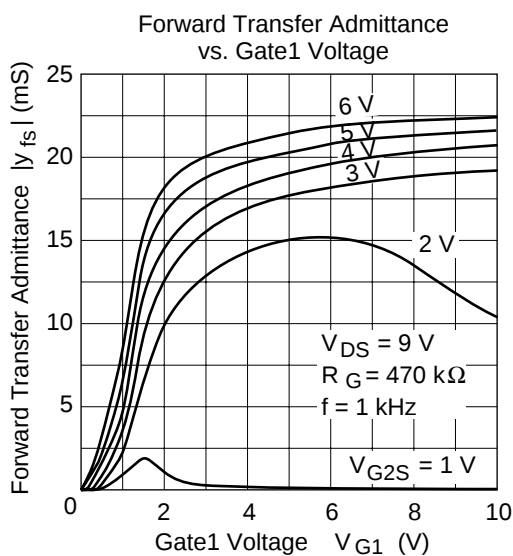
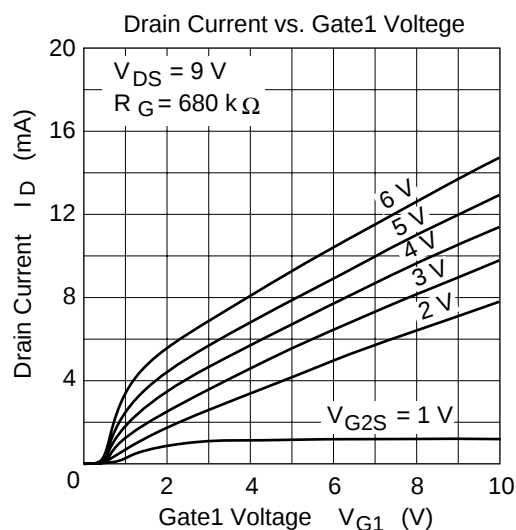
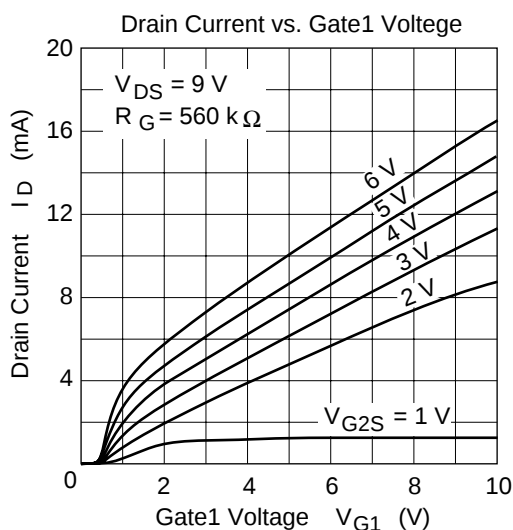


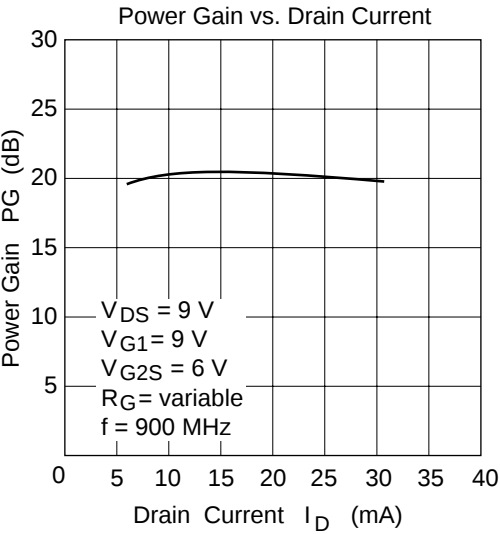
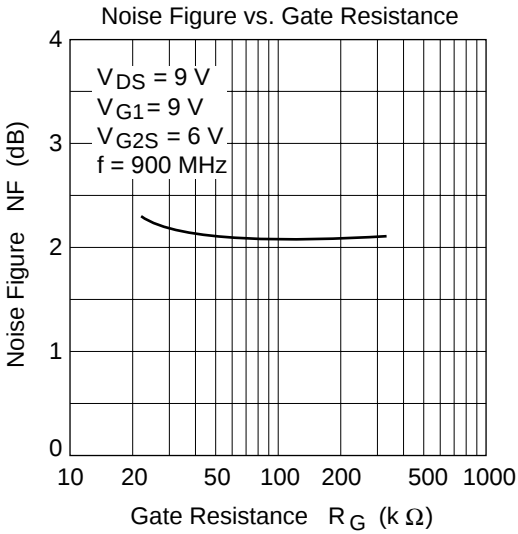
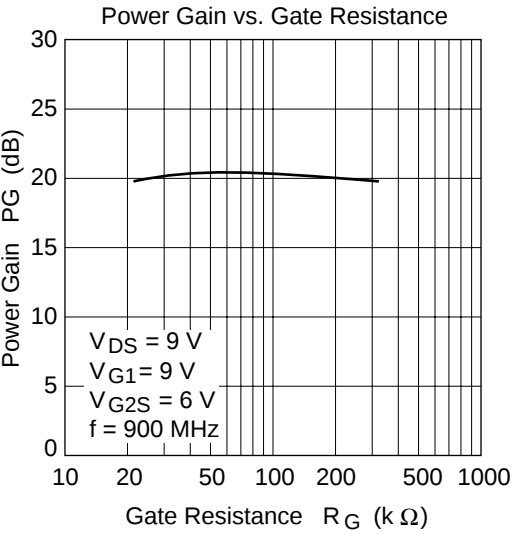
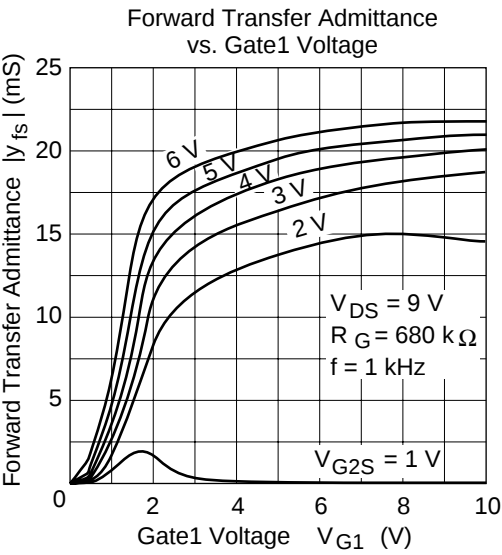
Drain Current vs.  
Gate2 to Source Voltage

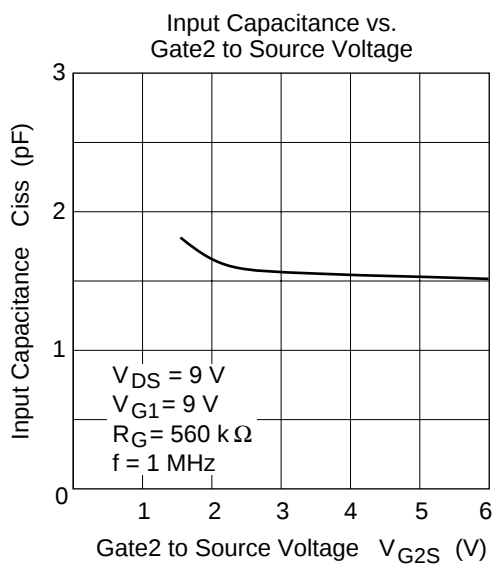
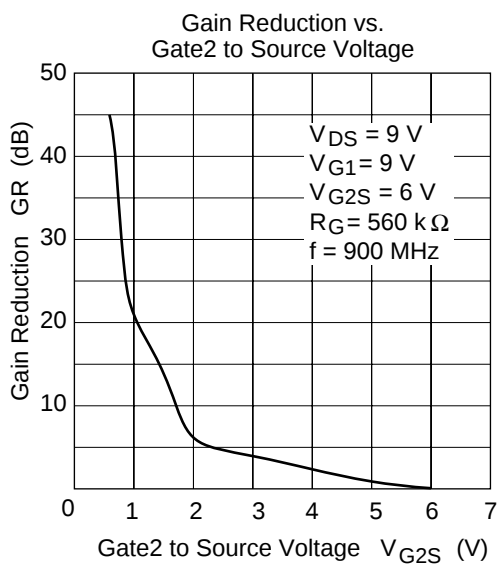
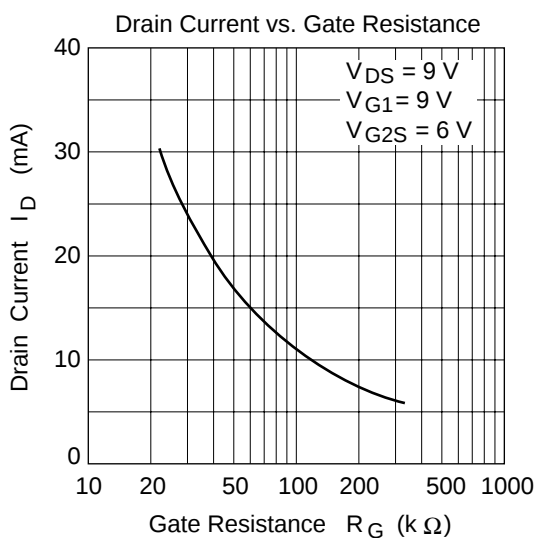
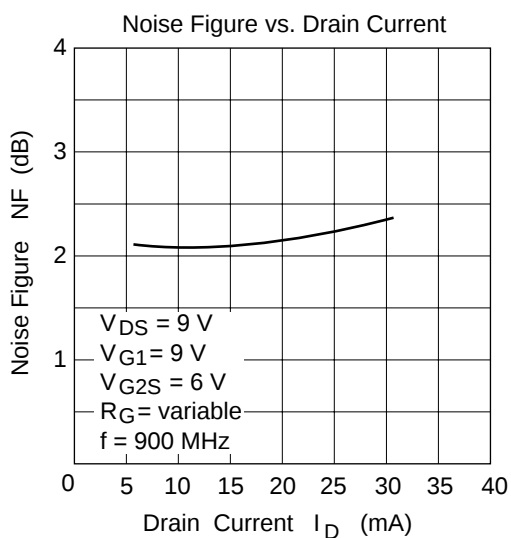


Drain Current vs. Gate1 Voltage

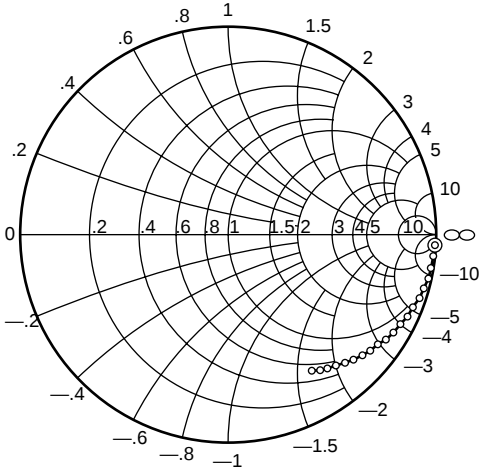






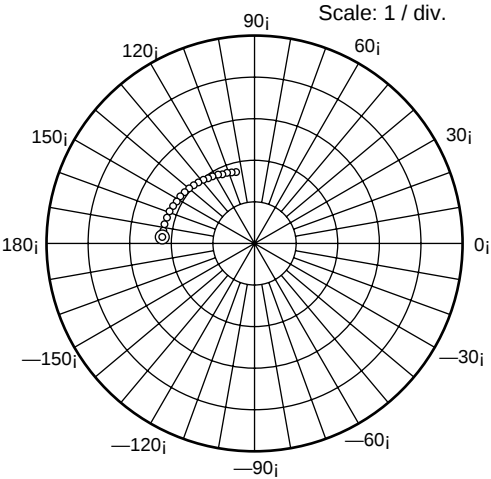


S11 Parameter vs. Frequency



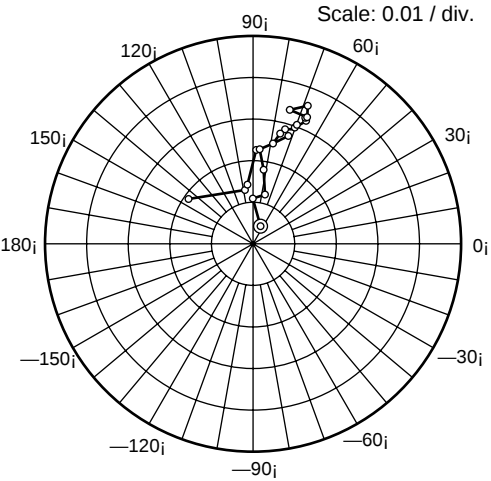
Test Condition :  $V_{DS} = 9\text{ V}$ ,  $V_{G1} = 9\text{ V}$   
 $V_{G2S} = 6\text{ V}$ ,  $R_G = 560\text{ k}\Omega$   
50 1000 MHz (50 MHz step)  
⊙—○

S21 Parameter vs. Frequency



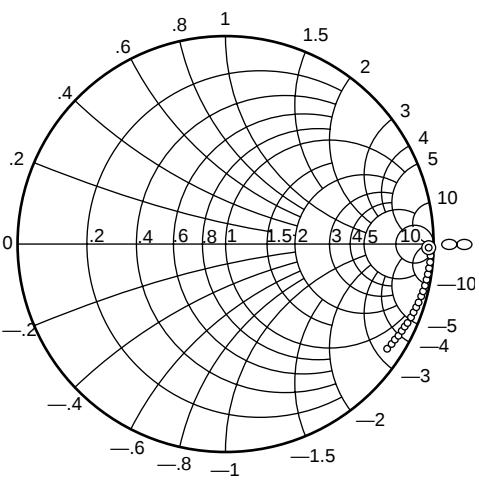
Test Condition :  $V_{DS} = 9\text{ V}$ ,  $V_{G1} = 9\text{ V}$   
 $V_{G2S} = 6\text{ V}$ ,  $R_G = 560\text{ k}\Omega$   
50 1000 MHz (50 MHz step)  
⊙—○

S12 Parameter vs. Frequency



Test Condition :  $V_{DS} = 9\text{ V}$ ,  $V_{G1} = 9\text{ V}$   
 $V_{G2S} = 6\text{ V}$ ,  $R_G = 560\text{ k}\Omega$   
50 1000 MHz (50 MHz step)  
⊙—○

S22 Parameter vs. Frequency



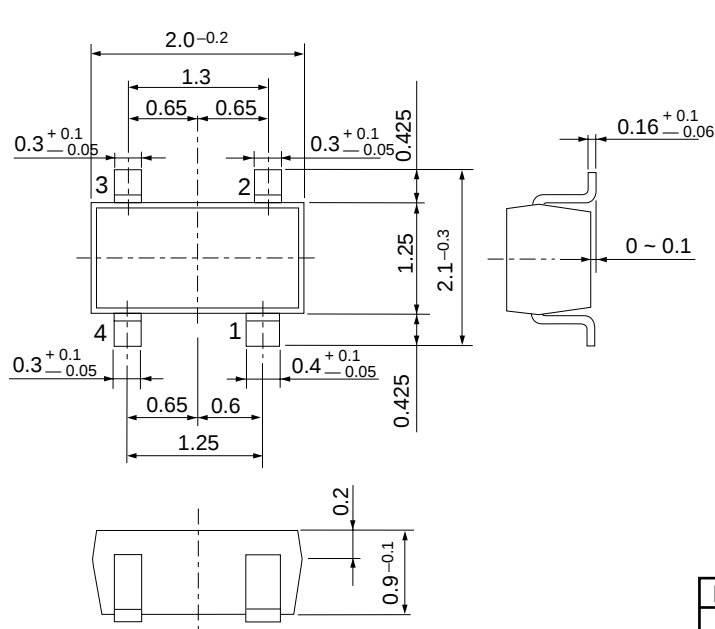
Test Condition :  $V_{DS} = 9\text{ V}$ ,  $V_{G1} = 9\text{ V}$   
 $V_{G2S} = 6\text{ V}$ ,  $R_G = 560\text{ k}\Omega$   
50 1000 MHz (50 MHz step)  
⊙—○

**Sparameter** ( $V_{DS} = V_{G1} = 9V$ ,  $V_{G2S} = 6V$ ,  $R_G = 560k\Omega$ ,  $Z_0 = 50\Omega$ )

| f (MHz) | S11   |       | S21  |       | S12     |       | S22   |       |
|---------|-------|-------|------|-------|---------|-------|-------|-------|
|         | MAG   | ANG   | MAG  | ANG   | MAG     | ANG   | MAG   | ANG   |
| 50      | 0.995 | -2.9  | 2.22 | 176.0 | 0.00046 | 66.9  | 0.977 | -1.0  |
| 100     | 0.991 | -6.0  | 2.21 | 172.0 | 0.00109 | 90.4  | 0.987 | -3.2  |
| 150     | 0.987 | -9.4  | 2.21 | 168.0 | 0.00122 | 76.5  | 0.987 | -5.0  |
| 200     | 0.985 | -12.4 | 2.19 | 163.6 | 0.00180 | 81.9  | 0.985 | -6.7  |
| 250     | 0.975 | -15.4 | 2.18 | 159.3 | 0.00228 | 86.0  | 0.983 | -8.4  |
| 300     | 0.969 | -18.4 | 2.15 | 155.3 | 0.00246 | 78.8  | 0.981 | -10.0 |
| 350     | 0.954 | -21.5 | 2.12 | 151.7 | 0.00273 | 76.2  | 0.979 | -11.7 |
| 400     | 0.948 | -24.6 | 2.11 | 147.6 | 0.00331 | 66.9  | 0.976 | -13.4 |
| 450     | 0.933 | -27.5 | 2.08 | 143.7 | 0.00334 | 74.7  | 0.973 | -14.9 |
| 500     | 0.923 | -30.7 | 2.05 | 139.9 | 0.00357 | 68.4  | 0.969 | -16.8 |
| 550     | 0.912 | -33.6 | 2.02 | 136.2 | 0.00328 | 67.5  | 0.965 | -18.3 |
| 600     | 0.892 | -36.3 | 1.99 | 123.9 | 0.00305 | 69.8  | 0.961 | -19.9 |
| 650     | 0.882 | -39.3 | 1.96 | 128.7 | 0.00322 | 66.7  | 0.958 | -21.5 |
| 700     | 0.868 | -42.0 | 1.92 | 125.4 | 0.00297 | 70.3  | 0.953 | -23.4 |
| 750     | 0.851 | -45.0 | 1.90 | 122.0 | 0.00286 | 74.4  | 0.948 | -24.7 |
| 800     | 0.834 | -47.7 | 1.87 | 117.9 | 0.00273 | 71.9  | 0.944 | -26.2 |
| 850     | 0.815 | -50.6 | 1.83 | 114.9 | 0.00226 | 88.1  | 0.940 | -27.9 |
| 900     | 0.801 | -53.5 | 1.82 | 111.2 | 0.00143 | 95.5  | 0.934 | -29.4 |
| 950     | 0.788 | -55.9 | 1.79 | 107.8 | 0.00131 | 98.6  | 0.931 | -31.0 |
| 1000    | 0.768 | -58.5 | 1.77 | 104.4 | 0.00189 | 145.2 | 0.925 | -32.9 |

Package Dimensions

Unit: mm



|              |         |
|--------------|---------|
| Hitachi Code | CMPAK-4 |
| EIAJ         | SC-82AB |
| JEDEC        |         |

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