

BB502M

Built in Biasing Circuit MOS FET IC UHF RF Amplifier

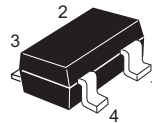
REJ03G0833-0500
(Previous ADE-208-809C)
Rev.5.00
Aug.10.2005

Features

- Built in Biasing Circuit; To reduce using parts cost & PC board space.
- Low noise; NF = 1.6 dB typ. at f = 900 MHz
- High gain; PG = 22 dB typ. at f = 900 MHz
- Withstanding to ESD;
Built in ESD absorbing diode. Withstand up to 200V at C=200pF, Rs=0 conditions.
- Provide mini mold packages; MPAK-4(SOT-143Rmod)

Outline

RENESAS Package code: PLSP0004ZA-A
(Package name: MPAK-4)



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

- Notes:
1. Marking is "BS-".
 2. BB502M is individual type number of RENESAS BBFET.

Absolute Maximum Ratings

(Ta = 25°C)

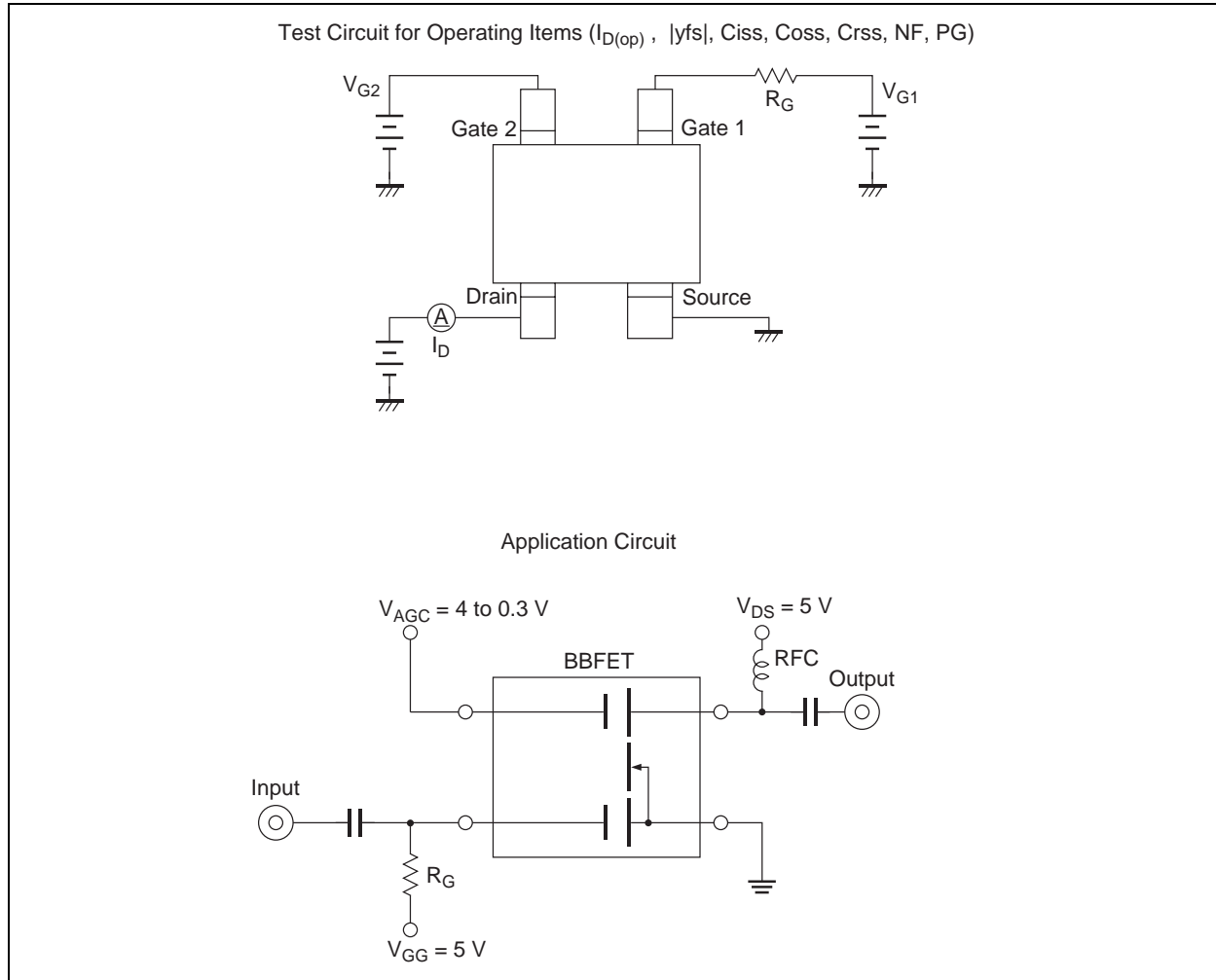
| Item | Symbol | Ratings | Unit |
|---------------------------|-----------|-------------|------|
| Drain to source voltage | V_{DS} | 6 | V |
| Gate1 to source voltage | V_{G1S} | +6 -0 | V |
| Gate2 to source voltage | V_{G2S} | +6 -0 | V |
| Drain current | I_D | 20 | mA |
| Channel power dissipation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

Electrical Characteristics

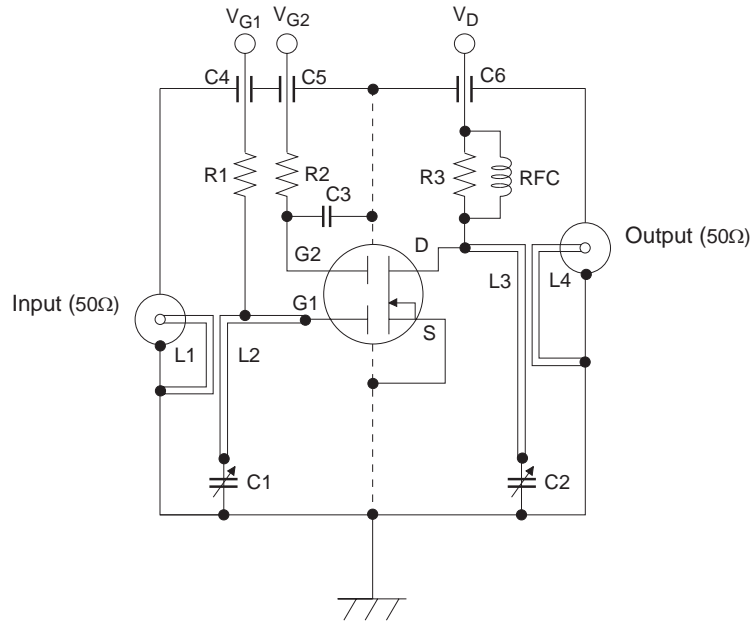
(Ta = 25°C)

| 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 | $V_{G1S} = +5 V, V_{G2S} = V_{DS} = 0$ |
| Gate2 to source cutoff current | I_{G2SS} | — | — | +100 | nA | $V_{G2S} = +5 V, V_{G1S} = V_{DS} = 0$ |
| Gate1 to source cutoff voltage | $V_{G1S(off)}$ | 0.5 | 0.7 | 1.0 | V | $V_{DS} = 5 V, V_{G2S} = 4 V$ $I_D = 100 \mu A$ |
| Gate2 to source cutoff voltage | $V_{G2S(off)}$ | 0.5 | 0.7 | 1.0 | V | $V_{DS} = 5 V, V_{G1S} = 5 V$ $I_D = 100 \mu A$ |
| Drain current | $I_{D(op)}$ | 8 | 11 | 14 | mA | $V_{DS} = 5 V, V_{G1} = 5 V$ $V_{G2S} = 4 V, R_G = 180 k\Omega$ |
| Forward transfer admittance | $ y_{fs} $ | 20 | 25 | 30 | mS | $V_{DS} = 5 V, V_{G1} = 5 V, V_{G2S} = 4 V$ $R_G = 180 k\Omega, f = 1 kHz$ |
| Input capacitance | Ciss | 1.4 | 1.7 | 2.0 | pF | $V_{DS} = 5 V, V_{G1} = 5 V$ |
| Output capacitance | Coss | 0.7 | 1.1 | 1.5 | pF | $V_{G2S} = 4 V, R_G = 180 k\Omega$ |
| Reverse transfer capacitance | Crss | — | 0.02 | 0.05 | pF | $f = 1 MHz$ |
| Power gain | PG | 17 | 22 | — | dB | $V_{DS} = 5 V, V_{G1} = 5 V$ |
| Noise figure | NF | — | 1.6 | 2.2 | dB | $V_{G2S} = 4 V, R_G = 180 k\Omega$ $f = 900 MHz$ |

Main Characteristics

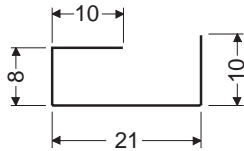


900MHz Power Gain, Noise Figure Test Circuit

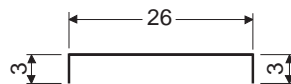


- C1, C2: Variable Capacitor (10pF MAX)
- C3: Disk Capacitor (1000pF)
- C4 to C6: Air Capacitor (1000pF)
- R1: 180 kΩ
- R2: 47 kΩ
- R3: 4.7 kΩ

L1:

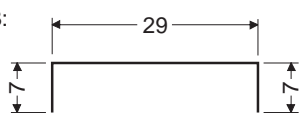


L2:

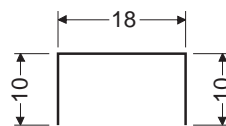


(φ1mm Copper wire)
Unit: mm

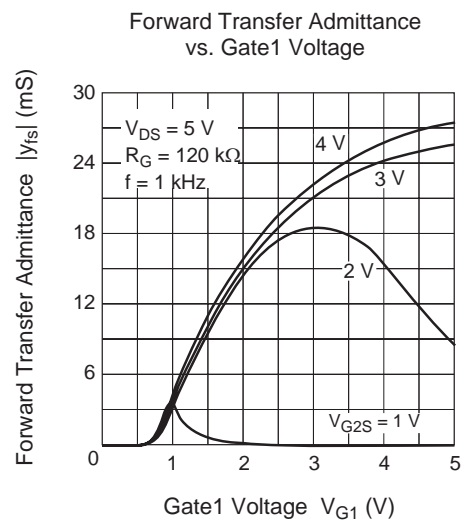
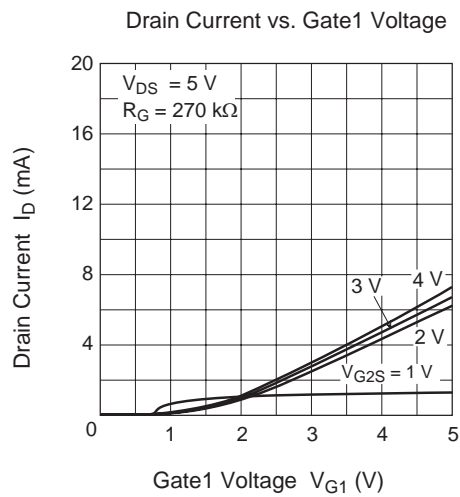
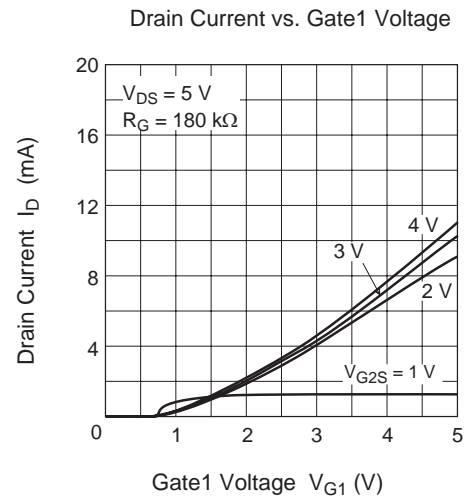
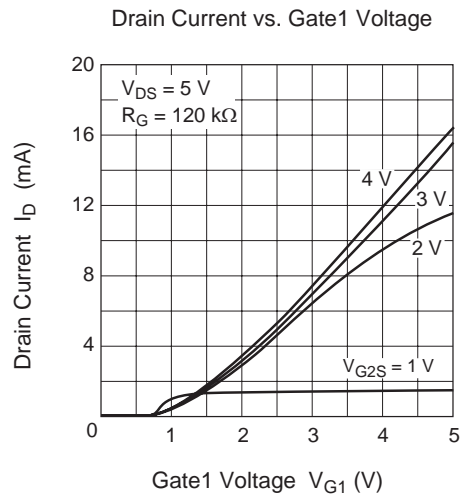
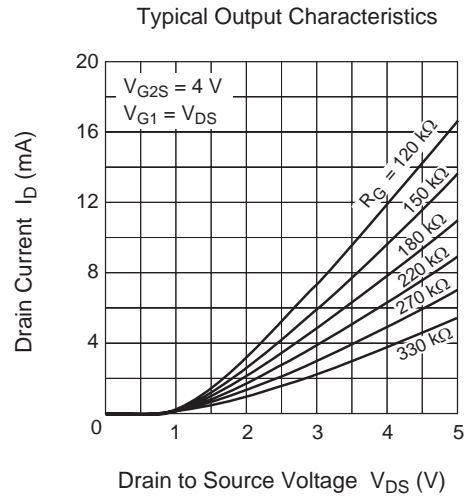
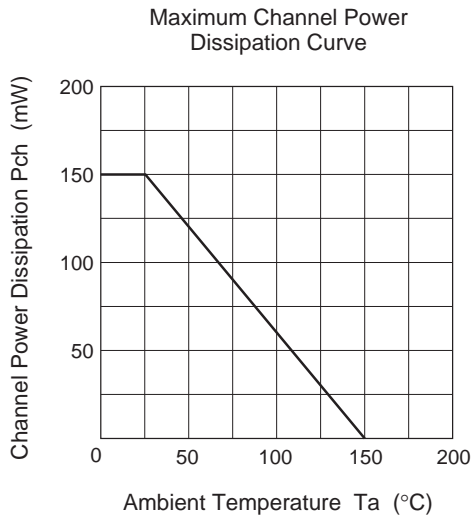
L3:

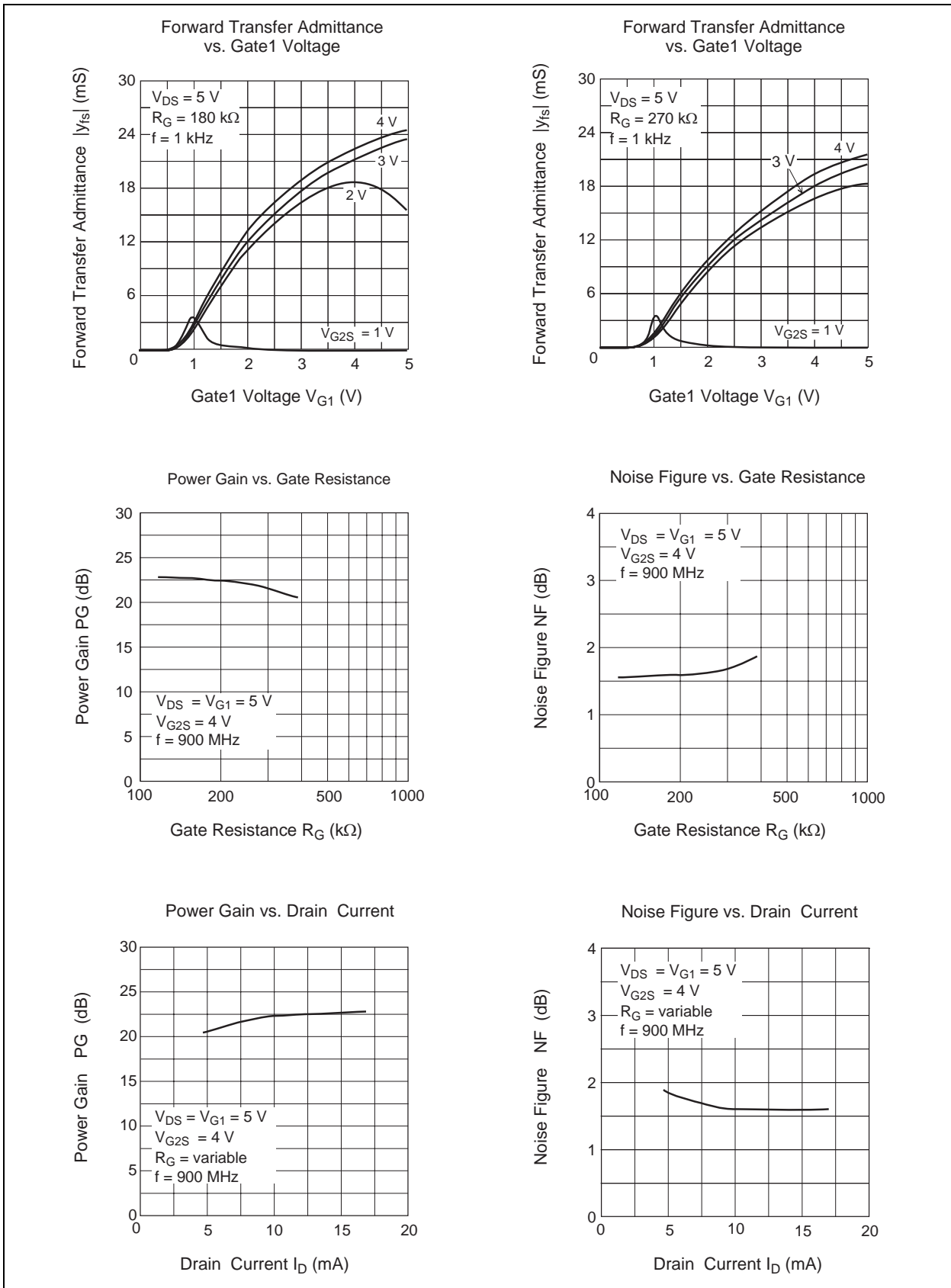


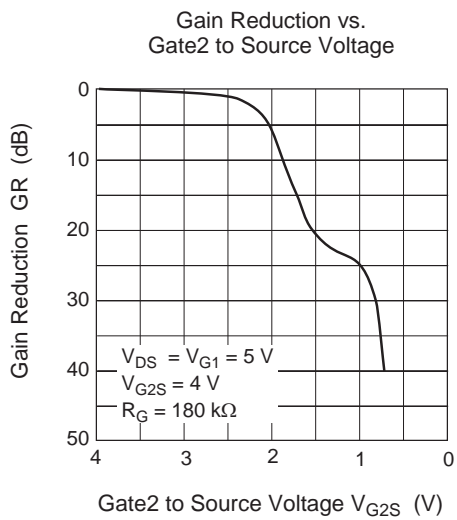
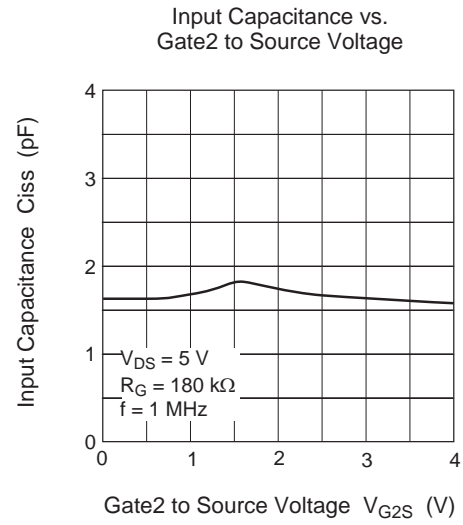
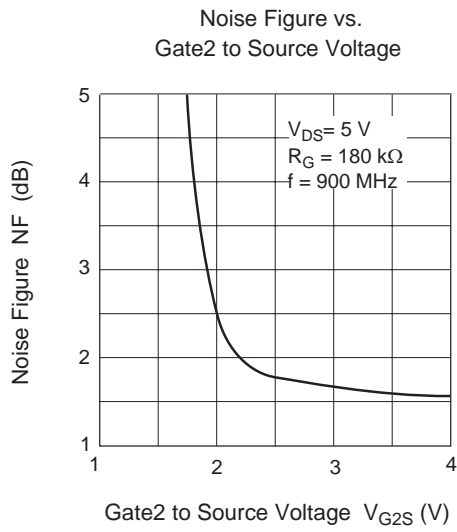
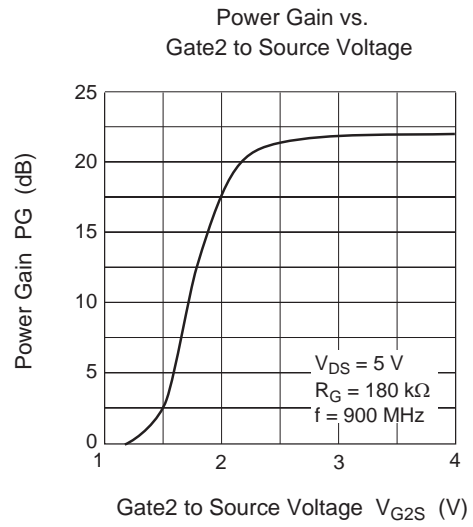
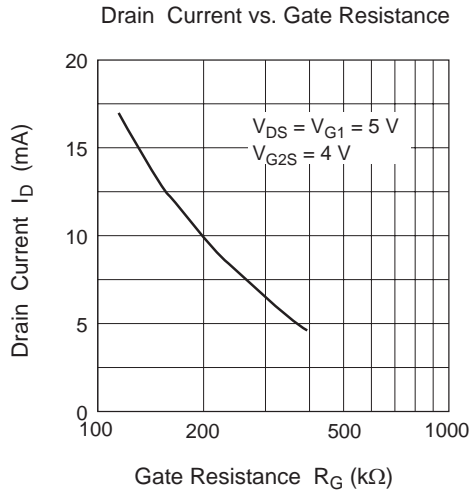
L4:



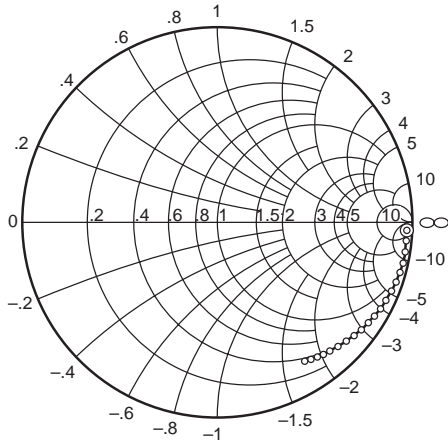
RFC: φ1mm Copper wire with enamel 4turns inside dia 6mm







S11 Parameter vs. Frequency

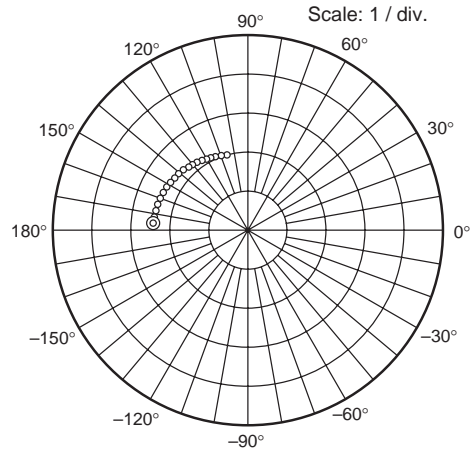


Test Condition; $V_{DS} = 5\text{ V}$, $V_{G1} = 5\text{ V}$
 $V_{G2S} = 4\text{ V}$, $R_G = 180\text{ k}\Omega$,
 $Z_o = 50\Omega$

50 to 1000 MHz (50 MHz step)



S21 Parameter vs. Frequency

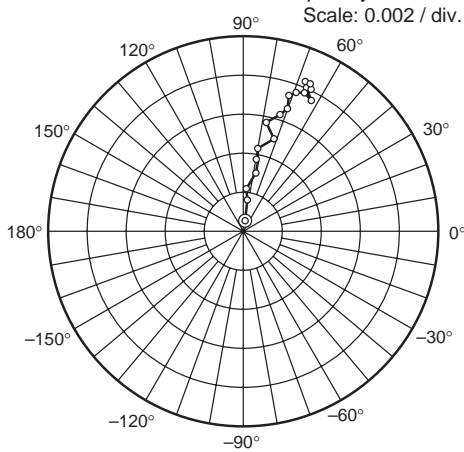


Test Condition: $V_{DS} = 5\text{ V}$, $V_{G1} = 5\text{ V}$
 $V_{G2S} = 4\text{ V}$, $R_G = 180\text{ k}\Omega$,
 $Z_o = 50\Omega$

50 to 1000 MHz (50 MHz step)



S12 Parameter vs. Frequency

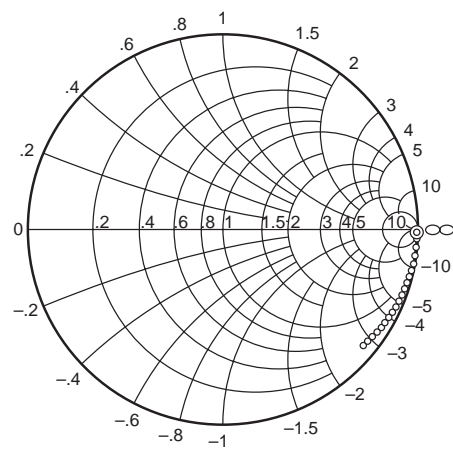


Test Condition: $V_{DS} = 5\text{ V}$, $V_{G1} = 5\text{ V}$
 $V_{G2S} = 4\text{ V}$, $R_G = 180\text{ k}\Omega$,
 $Z_o = 50\Omega$

50 to 1000 MHz (50 MHz step)



S22 Parameter vs. Frequency



Test Condition: $V_{DS} = 5\text{ V}$, $V_{G1} = 5\text{ V}$
 $V_{G2S} = 4\text{ V}$, $R_G = 180\text{ k}\Omega$,
 $Z_o = 50\Omega$

50 to 1000 MHz (50 MHz step)

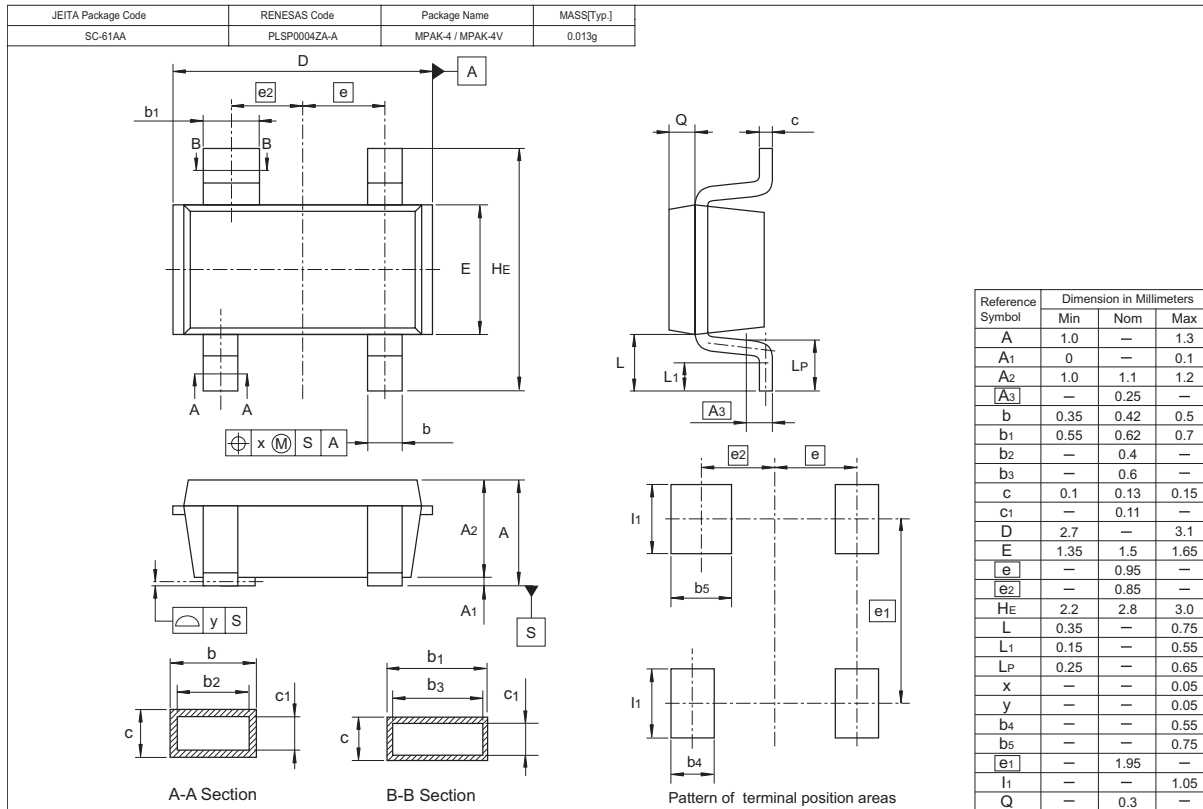


S Parameter

 $(V_{DS} = V_{G1} = 5V, V_{G2S} = 4V, R_G = 180k\Omega, Z_0 = 50\Omega)$

| f(MHz) | S11 | | S21 | | S12 | | S22 | |
|--------|-------|-------|------|-------|---------|------|-------|-------|
| | MAG. | ANG. | MAG. | ANG. | MAG. | ANG. | MAG. | ANG. |
| 50 | 0.994 | -2.8 | 2.52 | 176.2 | 0.00072 | 88.6 | 0.995 | -2.2 |
| 100 | 0.994 | -5.7 | 2.51 | 172.4 | 0.00161 | 80.9 | 0.998 | -4.0 |
| 150 | 0.991 | -9.2 | 2.50 | 168.1 | 0.00230 | 86.6 | 0.997 | -6.2 |
| 200 | 0.985 | -12.5 | 2.47 | 164.1 | 0.00297 | 78.0 | 0.996 | -8.2 |
| 250 | 0.985 | -15.5 | 2.46 | 160.0 | 0.00374 | 78.9 | 0.994 | -10.2 |
| 300 | 0.975 | -18.7 | 2.43 | 156.4 | 0.00436 | 80.6 | 0.992 | -12.2 |
| 350 | 0.969 | -22.0 | 2.40 | 152.3 | 0.00507 | 70.9 | 0.990 | -14.2 |
| 400 | 0.962 | -24.9 | 2.38 | 148.6 | 0.00557 | 77.3 | 0.989 | -16.3 |
| 450 | 0.954 | -27.7 | 2.35 | 144.6 | 0.00625 | 72.4 | 0.987 | -18.5 |
| 500 | 0.945 | -30.8 | 2.31 | 141.0 | 0.00663 | 70.0 | 0.984 | -20.4 |
| 550 | 0.935 | -33.8 | 2.28 | 136.7 | 0.00721 | 70.5 | 0.981 | -22.4 |
| 600 | 0.925 | -36.6 | 2.25 | 133.4 | 0.00747 | 68.4 | 0.978 | -24.3 |
| 650 | 0.918 | -39.5 | 2.21 | 130.3 | 0.00761 | 65.6 | 0.975 | -26.4 |
| 700 | 0.909 | -42.5 | 2.18 | 126.1 | 0.00807 | 65.6 | 0.972 | -28.3 |
| 750 | 0.898 | -45.0 | 2.14 | 122.9 | 0.00828 | 67.6 | 0.969 | -30.2 |
| 800 | 0.887 | -47.8 | 2.09 | 119.5 | 0.00801 | 65.1 | 0.965 | -32.2 |
| 850 | 0.874 | -50.6 | 2.07 | 116.0 | 0.00815 | 63.6 | 0.961 | -34.2 |
| 900 | 0.862 | -53.0 | 2.03 | 112.7 | 0.00832 | 65.1 | 0.958 | -36.1 |
| 950 | 0.855 | -55.5 | 1.99 | 109.4 | 0.00738 | 61.8 | 0.954 | -37.9 |
| 1000 | 0.845 | -58.1 | 1.95 | 106.1 | 0.00802 | 65.8 | 0.951 | -39.8 |

Package Dimensions



Ordering Information

| Part Name | Quantity | Shipping Container |
|---------------|----------|-----------------------------------|
| BB502MBS-TL-E | 3000 | φ 178 mm Reel, 8 mm Emboss Taping |

Note: For some grades, production may be terminated. Please contact the Renesas sales office to check the state of production before ordering the product.

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