



BB502M

Built in Biasing Circuit MOS FET IC UHF RF Amplifier

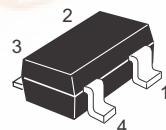
REJ03G0833-0500
(Previous ADE-208-809C)
Rev.5.00
Aug.10.2005

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)

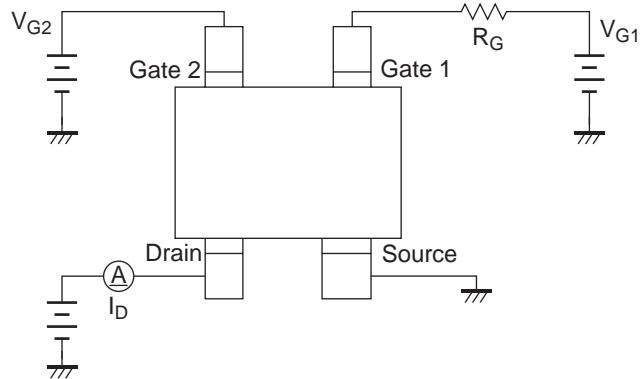
Item	Symbol	Ratings	Unit
Drain to source voltage	V _{DS}	6	V
Gate1 to source voltage	V _{G1S}	+6 -0	V
Gate2 to source voltage	V _{G2S}	+6 -0	V
Drain current	I _D	20	mA
Channel power dissipation	P _{ch}	150	mW
Channel temperature	T _{ch}	150	°C
Storage temperature	T _{stg}	-55 to +150	°C

Electrical Characteristics

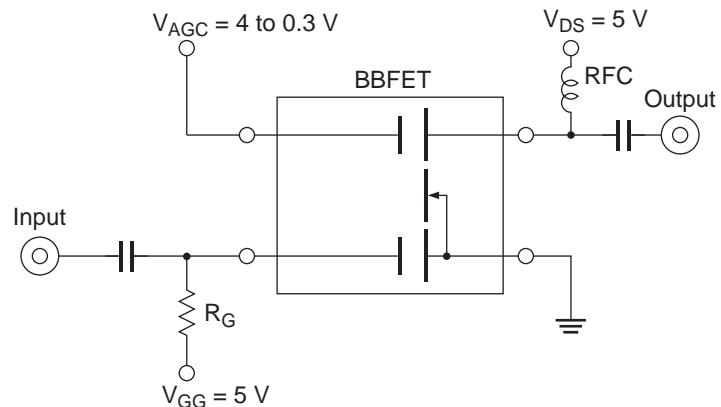
(Ta = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test conditions
Drain to source breakdown voltage	V _{(BR)DSS}	6	—	—	V	I _D = 200 μA, V _{G1S} = V _{G2S} = 0
Gate1 to source breakdown voltage	V _{(BR)G1SS}	+6	—	—	V	I _{G1} = +10 μA, V _{G2S} = V _{DS} = 0
Gate2 to source breakdown voltage	V _{(BR)G2SS}	+6	—	—	V	I _{G2} = +10 μA, 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 μA
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 μA
Drain current	I _{D(op)}	8	11	14	mA	V _{DS} = 5 V, V _{G1} = 5 V V _{G2S} = 4 V, R _G = 180 kΩ
Forward transfer admittance	y _{fs}	20	25	30	mS	V _{DS} = 5 V, V _{G1} = 5 V, V _{G2S} = 4 V R _G = 180 kΩ, f = 1 kHz
Input capacitance	C _{iss}	1.4	1.7	2.0	pF	V _{DS} = 5 V, V _{G1} = 5 V
Output capacitance	C _{oss}	0.7	1.1	1.5	pF	V _{G2S} = 4 V, R _G = 180 kΩ
Reverse transfer capacitance	C _{rss}	—	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 kΩ f = 900 MHz

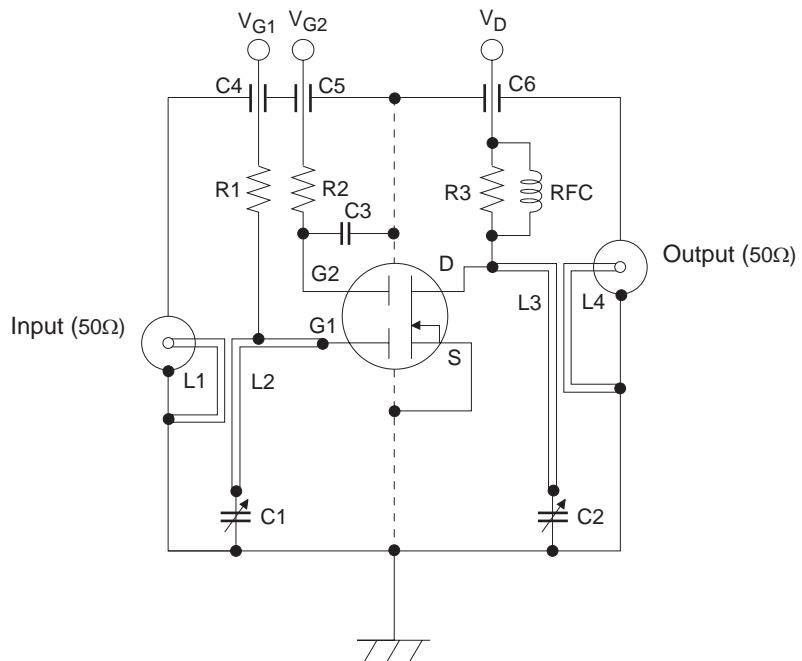
Main Characteristics

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

Application Circuit



900MHz Power Gain, Noise Figure Test Circuit



C1, C2: Variable Capacitor (10pF MAX)

C3: Disk Capacitor (1000pF)

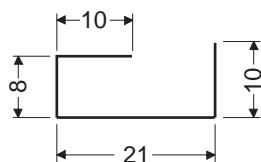
C4 to C6: Air Capacitor (1000pF)

R1: 180 kΩ

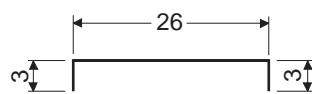
R2: 47 kΩ

R3: 4.7 kΩ

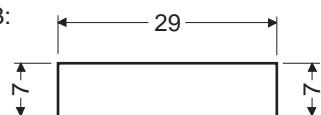
L1:



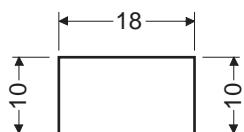
L2:

(φ1mm Copper wire)
Unit: mm

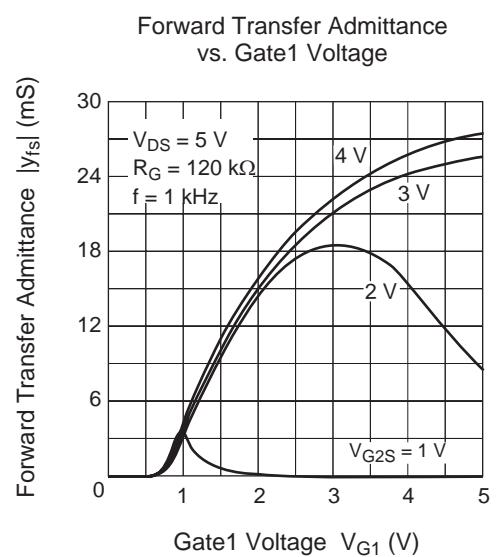
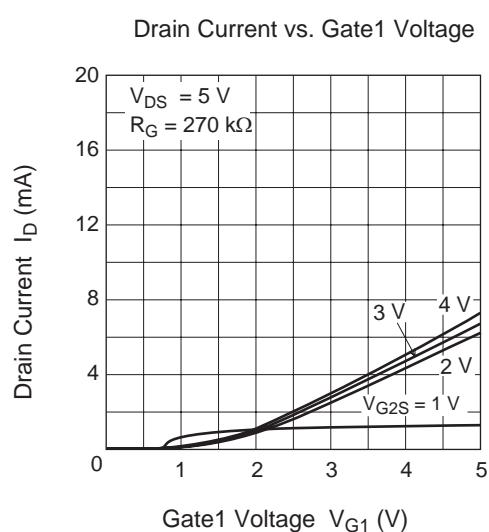
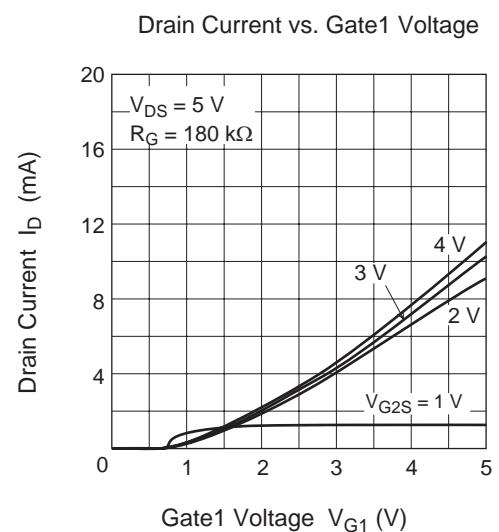
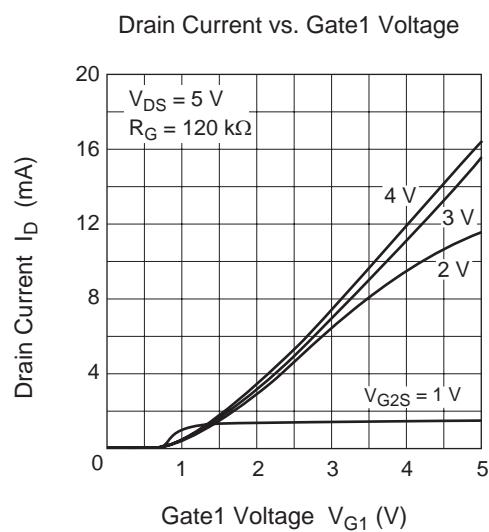
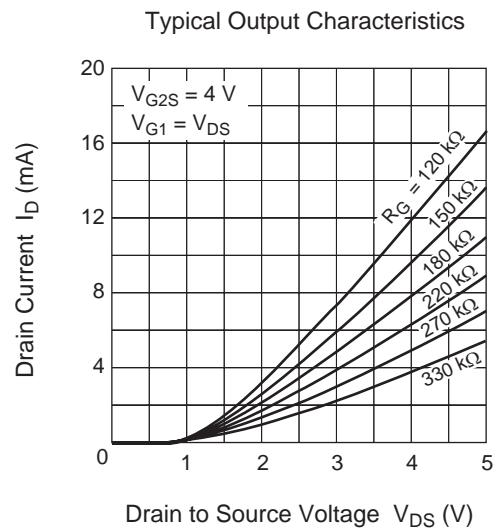
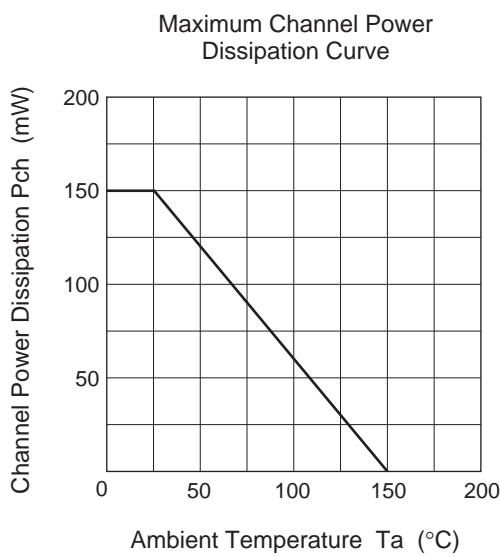
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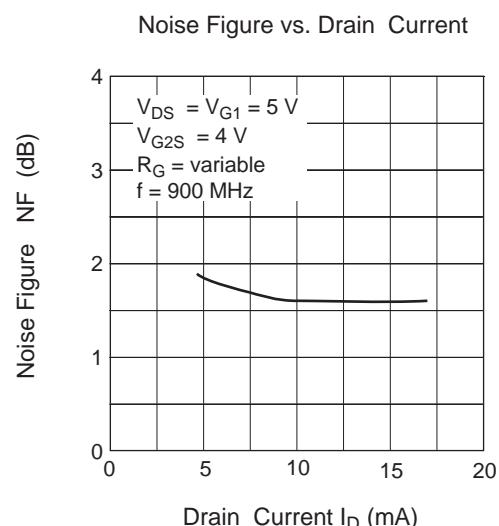
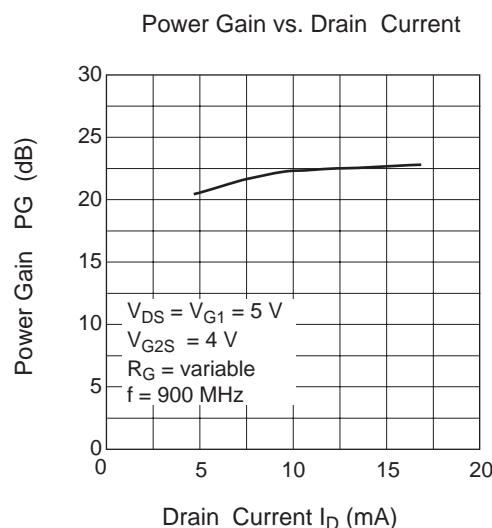
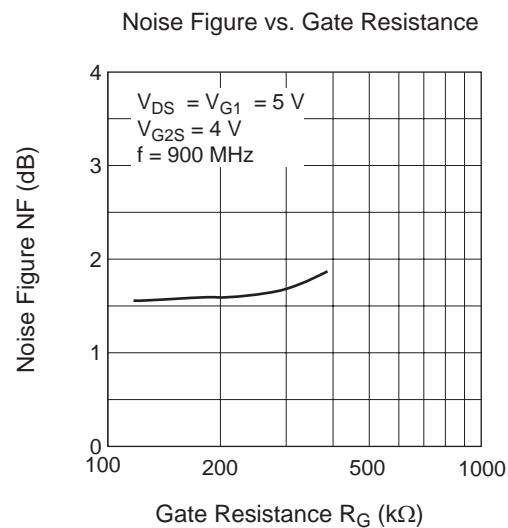
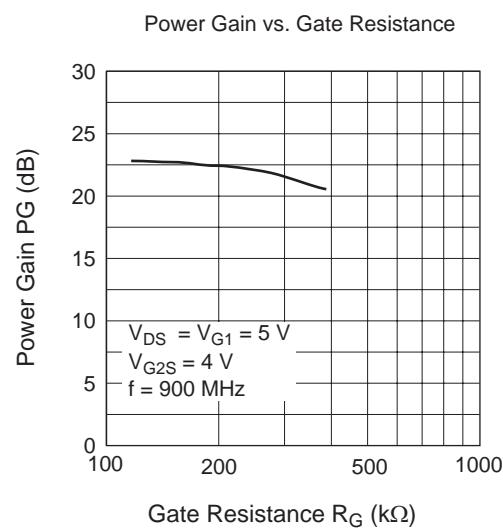
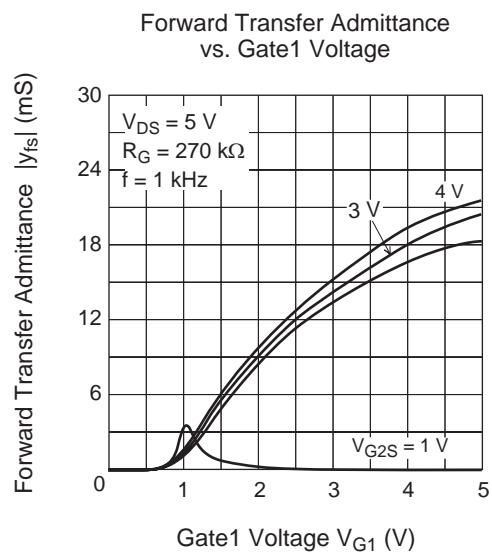
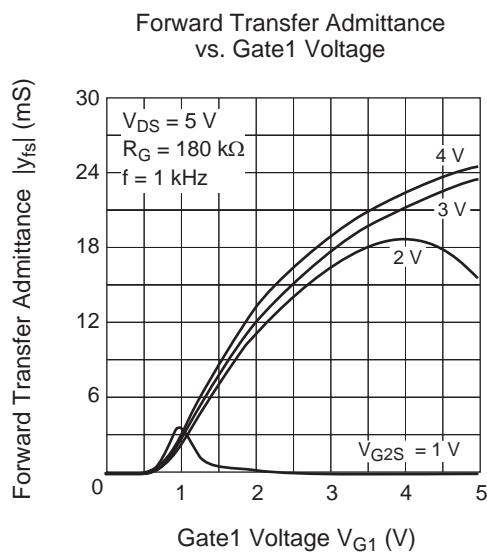


L4:

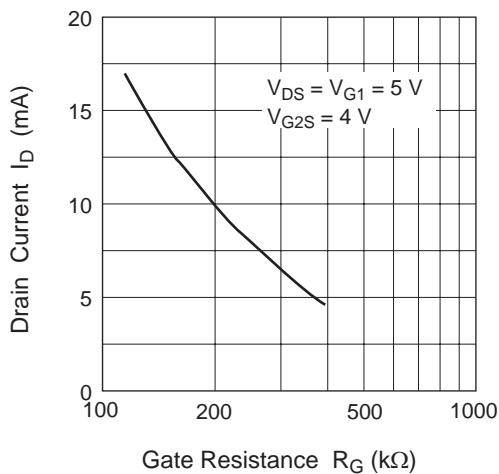


RFC: φ1mm Copper wire with enamel 4turns inside dia 6mm

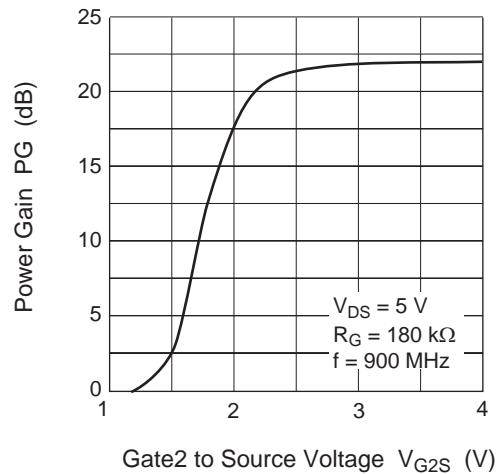




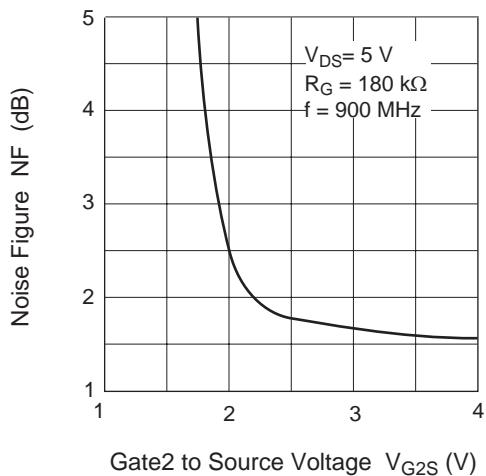
Drain Current vs. Gate Resistance



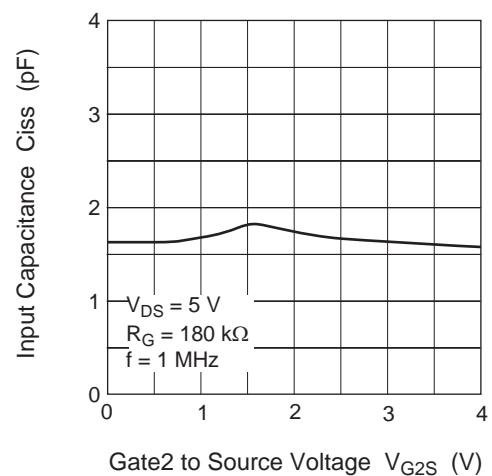
Power Gain vs. Gate2 to Source Voltage



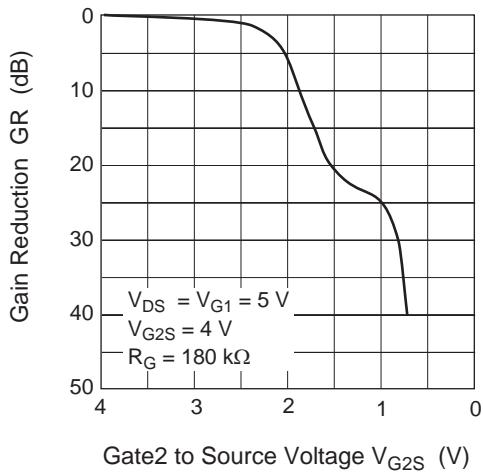
Noise Figure vs. Gate2 to Source Voltage

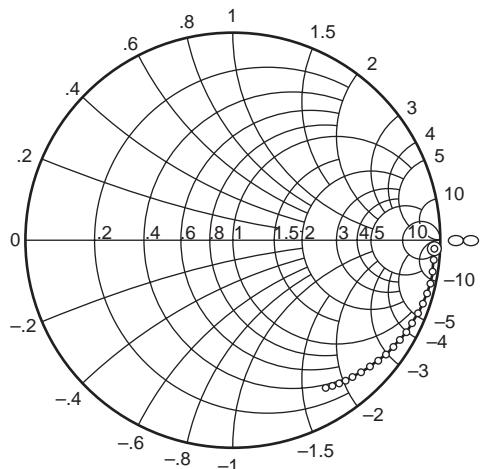


Input Capacitance vs. Gate2 to Source Voltage

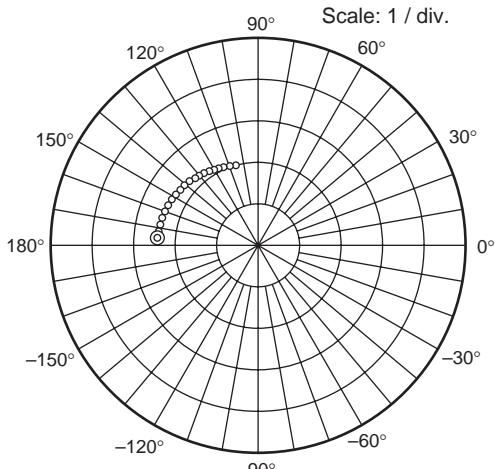


Gain Reduction vs. Gate2 to Source Voltage

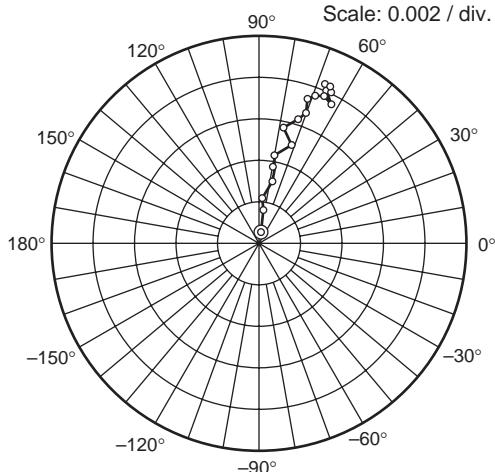


S11 Parameter vs. Frequency

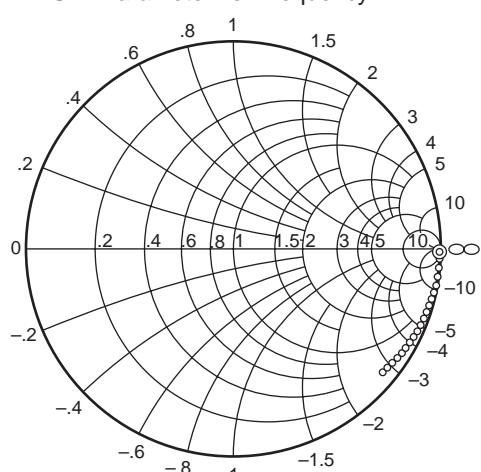
Test Condition: $V_{DS} = 5 \text{ V}$, $V_{G1} = 5 \text{ V}$
 $V_{G2S} = 4 \text{ V}$, $R_G = 180 \text{ k}\Omega$,
 $Z_0 = 50\Omega$
50 to 1000 MHz (50 MHz step)
◎—○

S21 Parameter vs. Frequency

Test Condition: $V_{DS} = 5 \text{ V}$, $V_{G1} = 5 \text{ V}$
 $V_{G2S} = 4 \text{ V}$, $R_G = 180 \text{ k}\Omega$,
 $Z_0 = 50\Omega$
50 to 1000 MHz (50 MHz step)
◎—○

S12 Parameter vs. Frequency

Test Condition: $V_{DS} = 5 \text{ V}$, $V_{G1} = 5 \text{ V}$
 $V_{G2S} = 4 \text{ V}$, $R_G = 180 \text{ k}\Omega$,
 $Z_0 = 50\Omega$
50 to 1000 MHz (50 MHz step)
◎—○

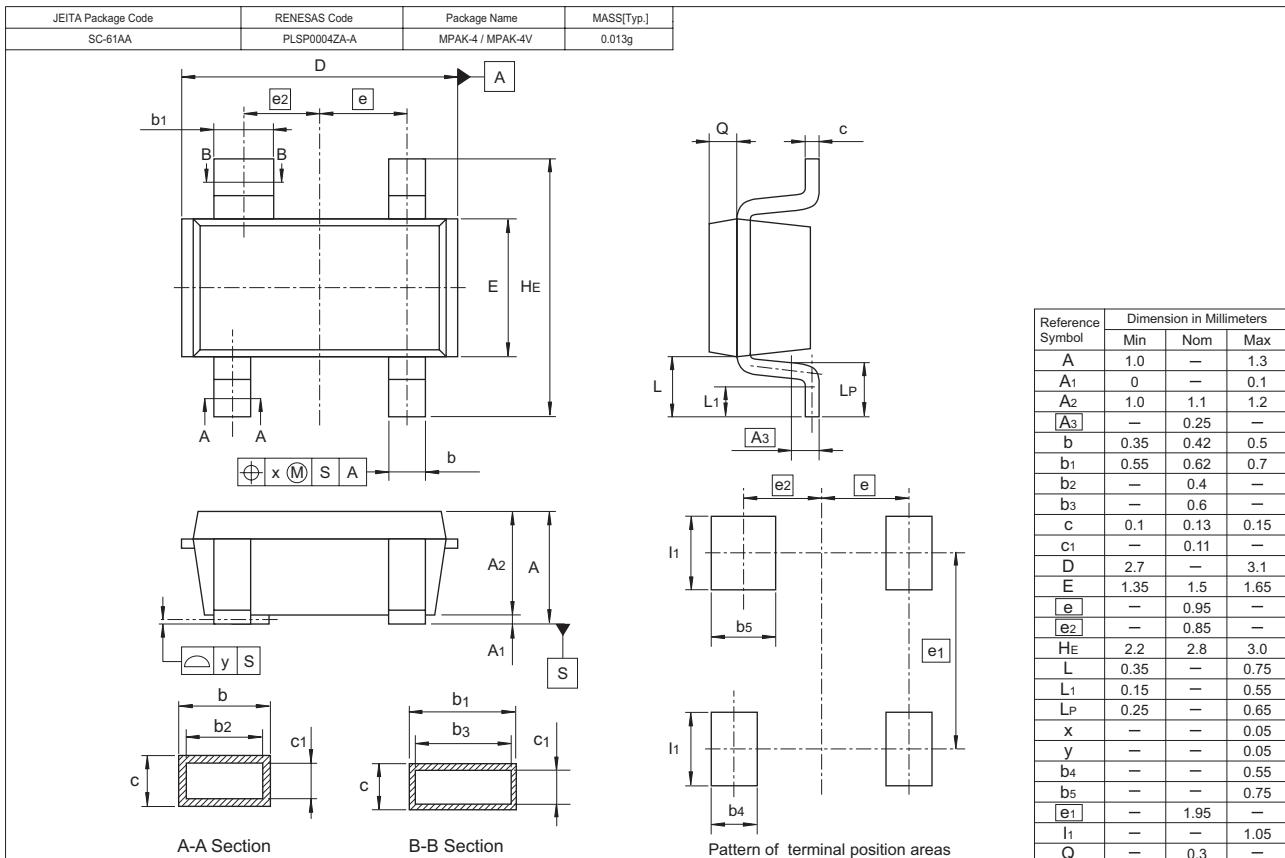
S22 Parameter vs. Frequency

Test Condition: $V_{DS} = 5 \text{ V}$, $V_{G1} = 5 \text{ V}$
 $V_{G2S} = 4 \text{ V}$, $R_G = 180 \text{ k}\Omega$,
 $Z_0 = 50\Omega$
50 to 1000 MHz (50 MHz step)
◎—○

S Parameter(V_{DS} = V_{G1} = 5V, V_{G2S} = 4V, R_G = 180kΩ, Z₀ = 50Ω)

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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