BB502M

Built in Biasing Circuit MOS FET IC
UHF RF Amplifier

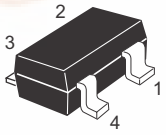
REJ03G0833-0500
(Previous ADE-208-809C)
Rev.5.00
Aug.10.2005

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

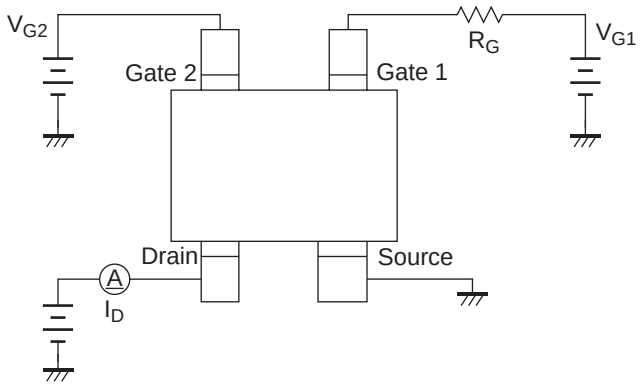
Electrical Characteristics

(Ta = 25°C)

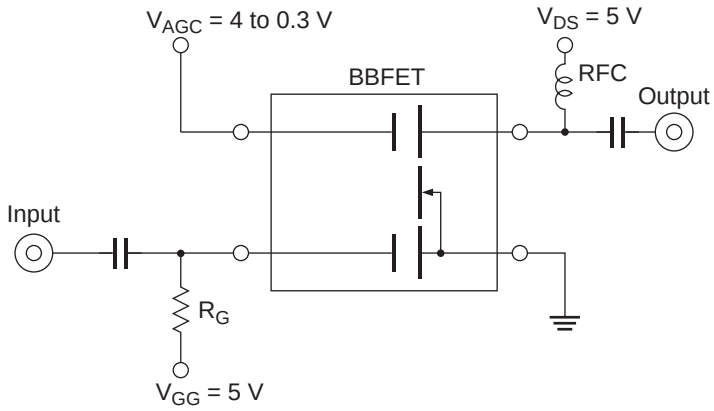
Item	Symbol	Min	Typ	Max	Unit	Test conditions
Drain to source breakdown voltage	$V_{(BR)DSS}$	6	—	—	V	I_D = 200 µA, V_{G1S} = V_{G2S} = 0
Gate1 to source breakdown voltage	$V_{(BR)G1SS}$	+6	—	—	V	I_{G1} = +10 µA, V_{G2S} = V_{DS} = 0
Gate2 to source breakdown voltage	$V_{(BR)G2SS}$	+6	—	—	V	I_{G2} = +10 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	Ciss	1.4	1.7	2.0	pF	V_{DS} = 5 V, V_{G1} = 5 V V_{G2S} =4 V, R_G = 180 kΩ f = 1 MHz
Output capacitance	Coss	0.7	1.1	1.5	pF	
Reverse transfer capacitance	Crss	—	0.02	0.05	pF	
Power gain	PG	17	22	—	dB	V_{DS} = 5 V, V_{G1} = 5 V V_{G2S} =4 V, R_G = 180 kΩ f = 900 MHz
Noise figure	NF	—	1.6	2.2	dB	

Main Characteristics

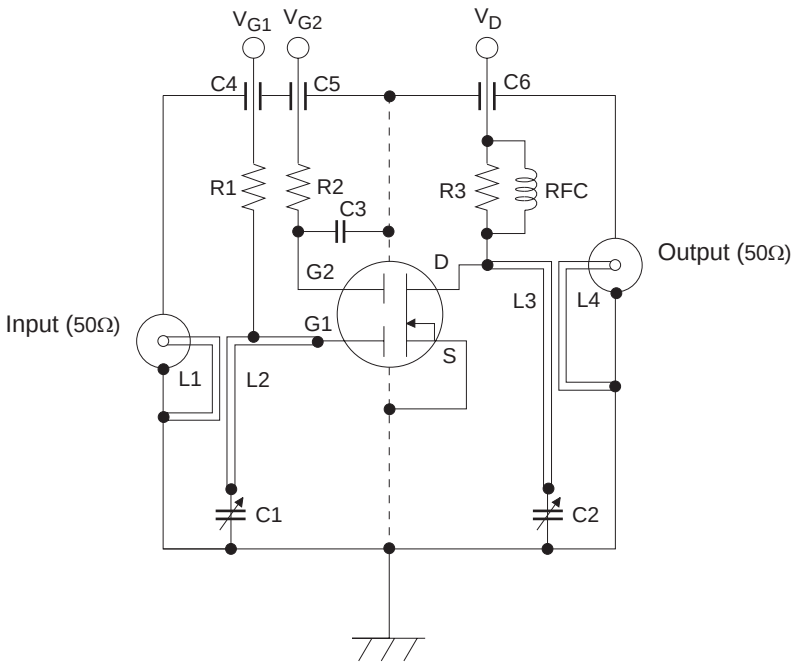
Test Circuit for Operating Items ($I_{D(op)}$, |yfs|, Ciss, Coss, Crss, NF, PG)



Application Circuit

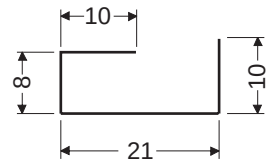


900MHz Power Gain, Noise Figure Test Circuit



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:



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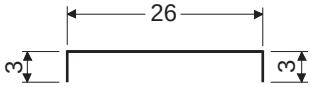
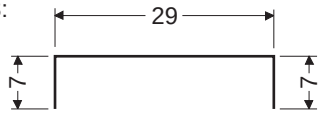
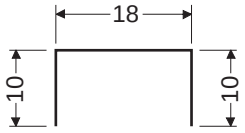


(ϕ1mm Copper wire)
Unit: mm

L3:

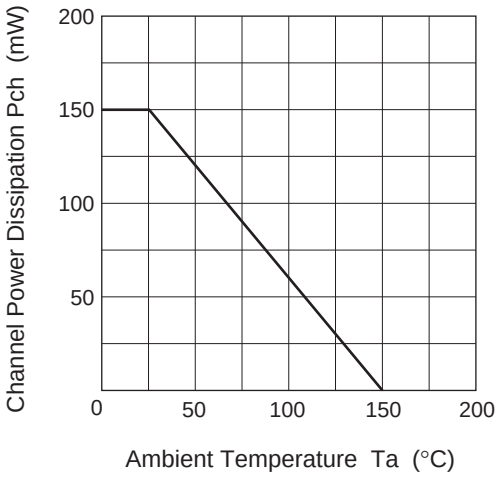


L4:

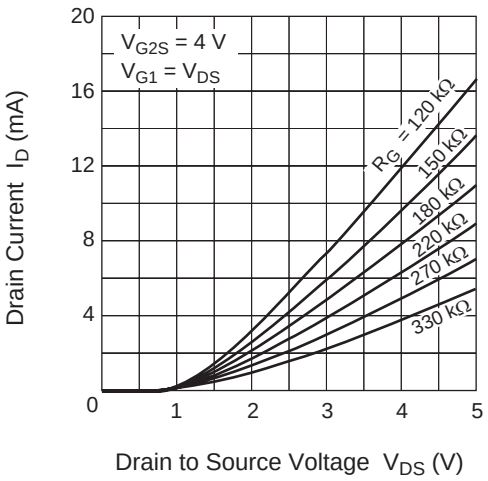


RFC: ϕ1mm Copper wire with enamel 4turns inside dia 6mm

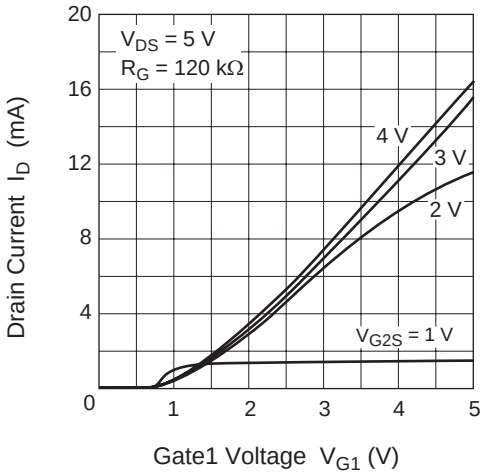
Maximum Channel Power Dissipation Curve



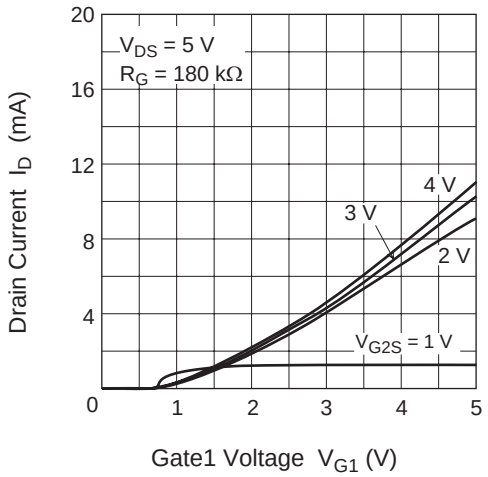
Typical Output Characteristics



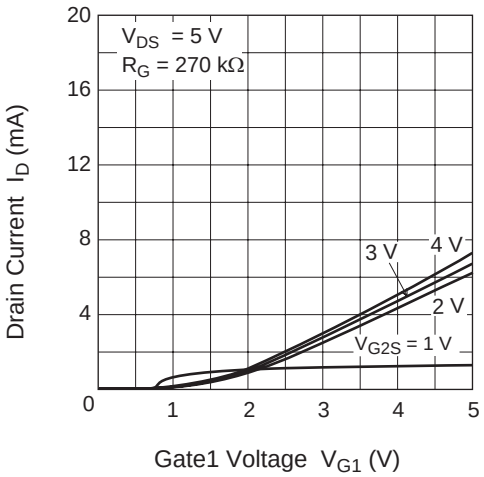
Drain Current vs. Gate1 Voltage



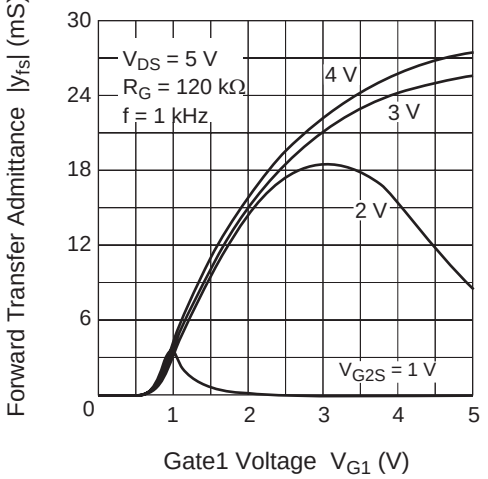
Drain Current vs. Gate1 Voltage



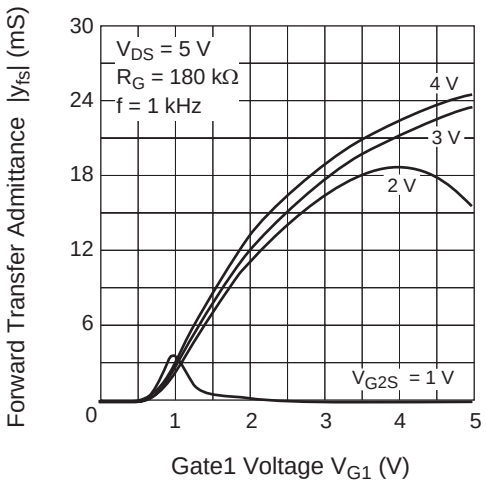
Drain Current vs. Gate1 Voltage



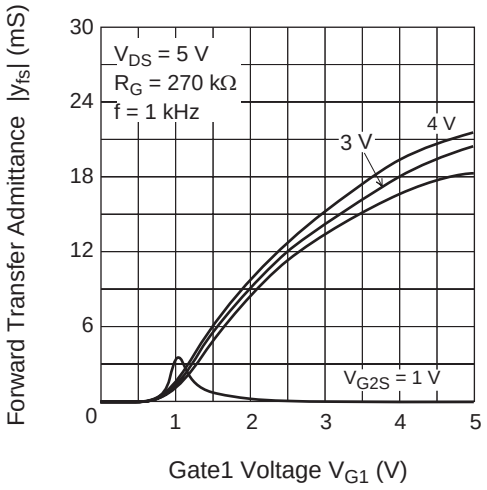
Forward Transfer Admittance vs. Gate1 Voltage



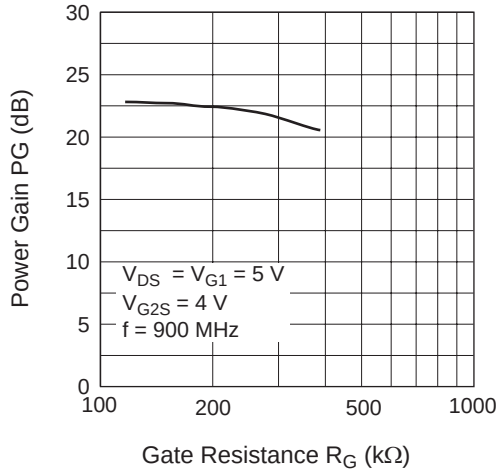
Forward Transfer Admittance vs. Gate1 Voltage



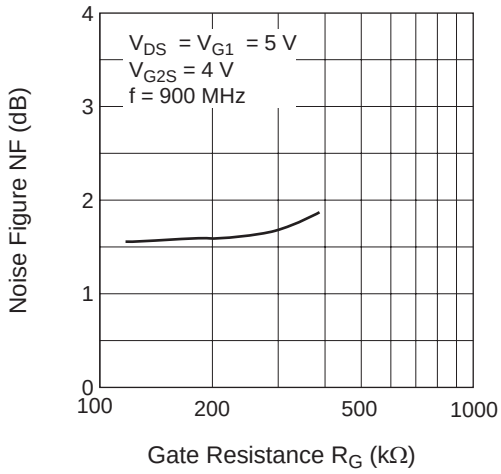
Forward Transfer Admittance vs. Gate1 Voltage



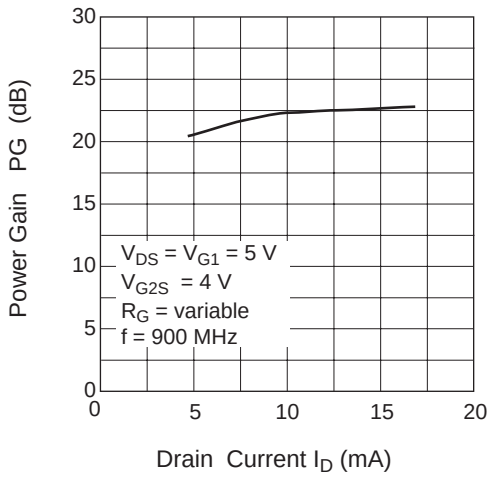
Power Gain vs. Gate Resistance



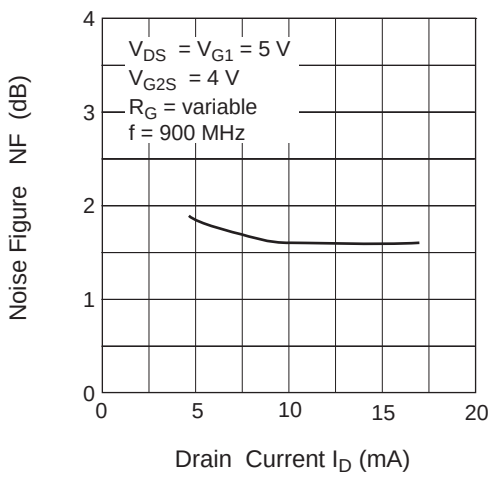
Noise Figure vs. Gate Resistance



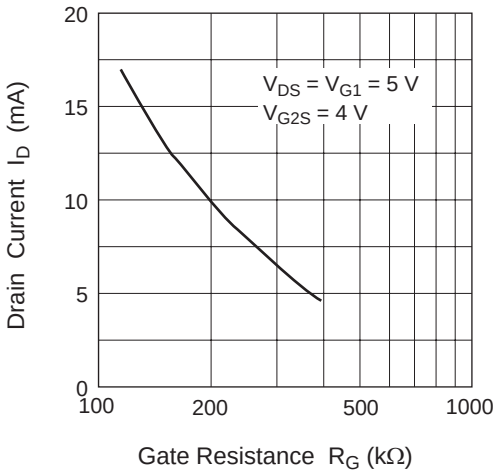
Power Gain vs. Drain Current



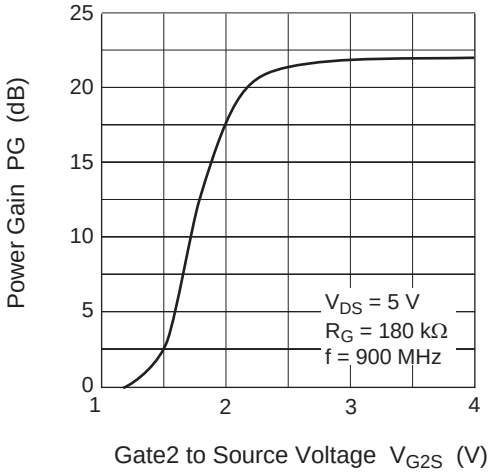
Noise Figure vs. Drain Current



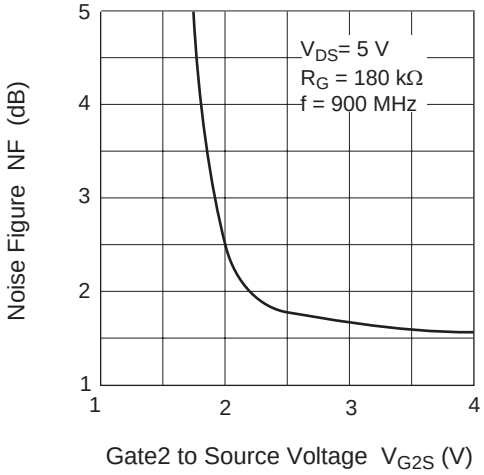
Drain Current vs. Gate Resistance



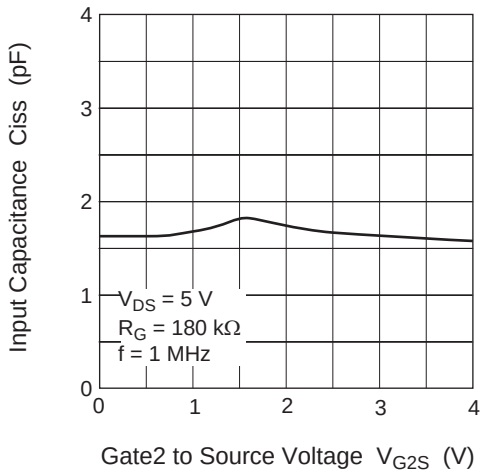
Power Gain vs.
Gate2 to Source Voltage



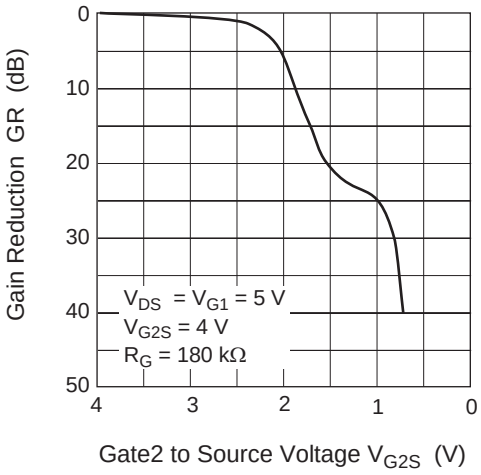
Noise Figure vs.
Gate2 to Source Voltage



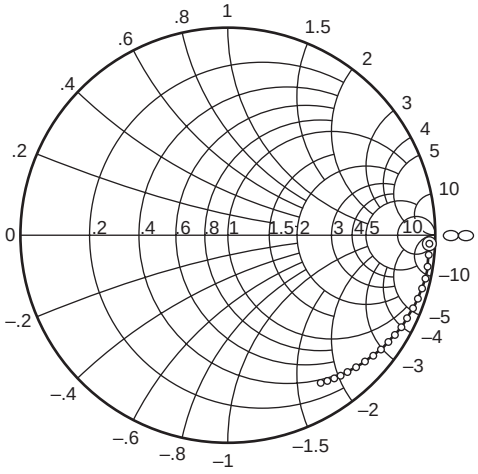
Input Capacitance vs.
Gate2 to Source Voltage



Gain Reduction vs.
Gate2 to Source Voltage



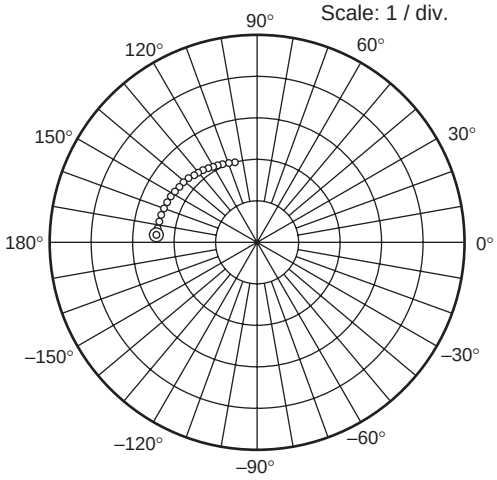
S11 Parameter vs. Frequency



Test Condition; V_{DS} = 5 V , V_{G1} = 5 V
V_{G2S} = 4 V , R_G = 180 kΩ ,
Zo = 50Ω

50 to 1000 MHz (50 MHz step)

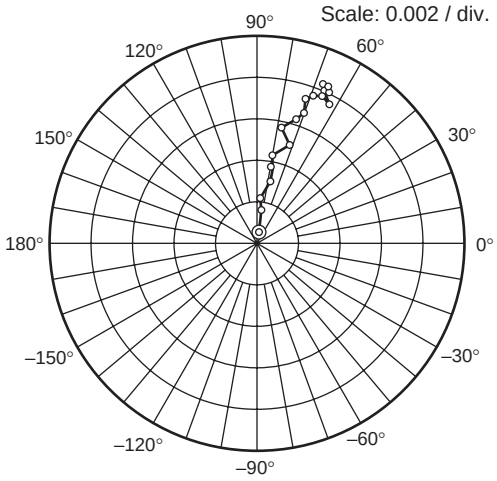
S21 Parameter vs. Frequency



Test Condition: V_{DS} = 5 V , V_{G1} = 5 V
V_{G2S} = 4 V , R_G = 180 kΩ ,
Zo = 50Ω

50 to 1000 MHz (50 MHz step)

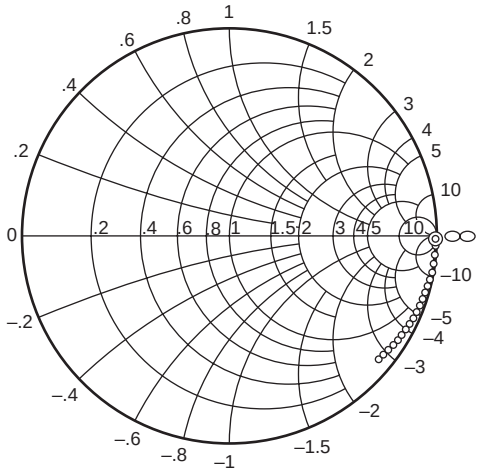
S12 Parameter vs. Frequency



Test Condition: V_{DS} = 5 V , V_{G1} = 5 V
V_{G2S} = 4 V , R_G = 180 kΩ ,
Zo = 50Ω

50 to 1000 MHz (50 MHz step)

S22 Parameter vs. Frequency



Test Condition: V_{DS} = 5 V , V_{G1} = 5 V
V_{G2S} = 4 V , R_G = 180 kΩ ,
Zo = 50Ω

50 to 1000 MHz (50 MHz step)

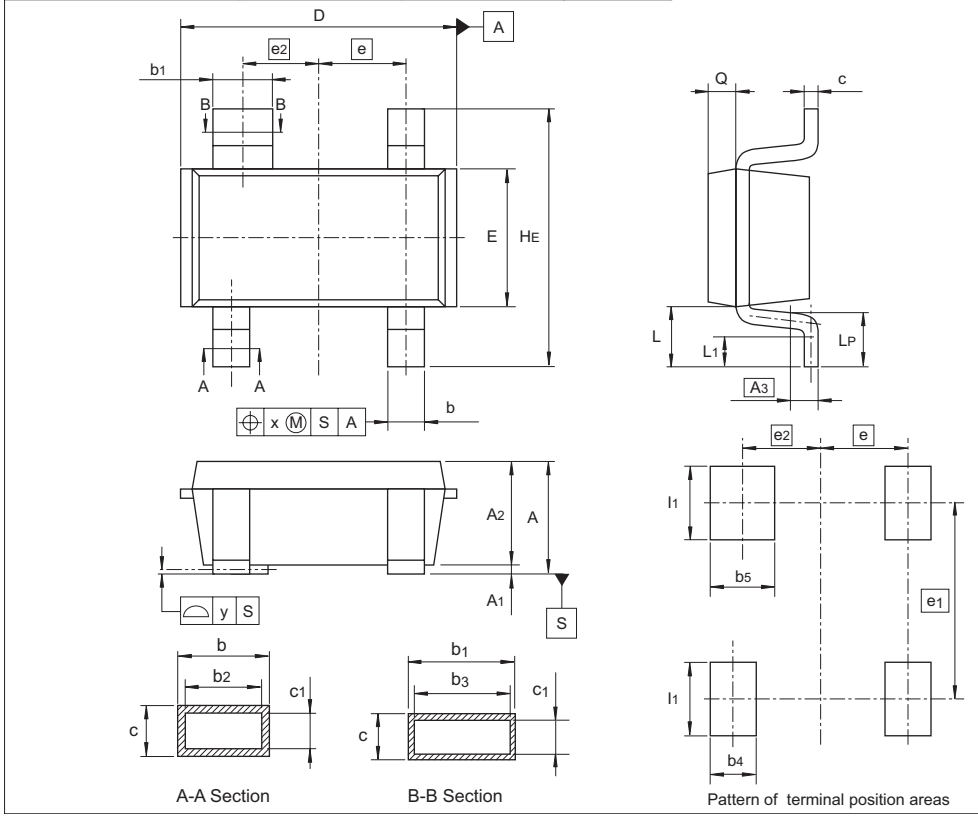
S Parameter

(V_{DS} = V_{G1} = 5V, V_{G2S} = 4V, R_G = 180kΩ, Zo = 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

JEITA Package Code	RENESAS Code	Package Name	MASS[Typ.]
SC-61AA	PLSP0004ZA-A	MPAK-4 / MPAK-4V	0.013g



Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
A	1.0	–	1.3
A_1	0	–	0.1
A_2	1.0	1.1	1.2
A_3	–	0.25	–
b	0.35	0.42	0.5
b_1	0.55	0.62	0.7
b_2	–	0.4	–
b_3	–	0.6	–
c	0.1	0.13	0.15
c_1	–	0.11	–
D	2.7	–	3.1
E	1.35	1.5	1.65
e	–	0.95	–
e_2	–	0.85	–
H_E	2.2	2.8	3.0
L	0.35	–	0.75
L_1	0.15	–	0.55
L_P	0.25	–	0.65
x	–	–	0.05
y	–	–	0.05
b_4	–	–	0.55
b_5	–	–	0.75
e_1	–	1.95	–
I_1	–	–	1.05
Q	–	0.3	–

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.

Renesas Technology Corp. Sales Strategic Planning Div. Nippon Bldg., 2-6-2, Ohte-machi, Chiyoda-ku, Tokyo 100-0004, Japan

RENESAS SALES OFFICES

http://www.renesas.com

Refer to "**http://www.renesas.com/en/network**" for the latest and detailed information.

Renesas Technology America, Inc.
450 Holger Way, San Jose, CA 95134-1368, U.S.A
Tel: <1> (408) 382-7500, Fax: <1> (408) 382-7501

Renesas Technology Europe Limited
Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K.
Tel: <44> (1628) 585-100, Fax: <44> (1628) 585-900

Renesas Technology Hong Kong Ltd.
7th Floor, North Tower, World Finance Centre, Harbour City, 1 Canton Road, Tsimshatsui, Kowloon, Hong Kong
Tel: <852> 2265-6688, Fax: <852> 2730-6071

Renesas Technology Taiwan Co., Ltd.
10th Floor, No.99, Fushing North Road, Taipei, Taiwan
Tel: <886> (2) 2715-2888, Fax: <886> (2) 2713-2999

Renesas Technology (Shanghai) Co., Ltd.
Unit2607 Ruijing Building, No.205 Maoming Road (S), Shanghai 200020, China
Tel: <86> (21) 6472-1001, Fax: <86> (21) 6415-2952

Renesas Technology Singapore Pte. Ltd.
1 Harbour Front Avenue, #06-10, Keppel Bay Tower, Singapore 098632
Tel: <65> 6213-0200, Fax: <65> 6278-8001

Renesas Technology Korea Co., Ltd.
Kukje Center Bldg. 18th Fl., 191, 2-ka, Hangang-ro, Yongsan-ku, Seoul 140-702, Korea
Tel: <82> 2-796-3115, Fax: <82> 2-796-2145

Renesas Technology Malaysia Sdn. Bhd.
Unit 906, Block B, Menara Amcorp, Amcorp Trade Centre, No.18, Jalan Persiaran Barat, 46050 Petaling Jaya, Selangor Darul Ehsan, Malaysia
Tel: <603> 7955-9390, Fax: <603> 7955-9510

Colophon .3.0