

To our customers,

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## Old Company Name in Catalogs and Other Documents

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On April 1<sup>st</sup>, 2010, NEC Electronics Corporation merged with Renesas Technology Corporation, and Renesas Electronics Corporation took over all the business of both companies. Therefore, although the old company name remains in this document, it is a valid Renesas Electronics document. We appreciate your understanding.

Renesas Electronics website: <http://www.renesas.com>

April 1<sup>st</sup>, 2010  
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

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EOL product

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## BB501M

Built in Biasing Circuit MOS FET IC  
UHF RF Amplifier

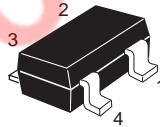
REJ03G0831-0600  
(Previous ADE-208-700D)  
Rev.6.00  
Aug.10.2005

### Features

- Built in Biasing Circuit; To reduce using parts cost & PC board space.
- High gain;  
PG = 21.5 dB typ. at f = 900 MHz
- Low noise;  
NF = 1.85 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 "AS -".
  2. BB501M is individual type number of RENESAS BBFET.

## Absolute Maximum Ratings

(Ta = 25°C)

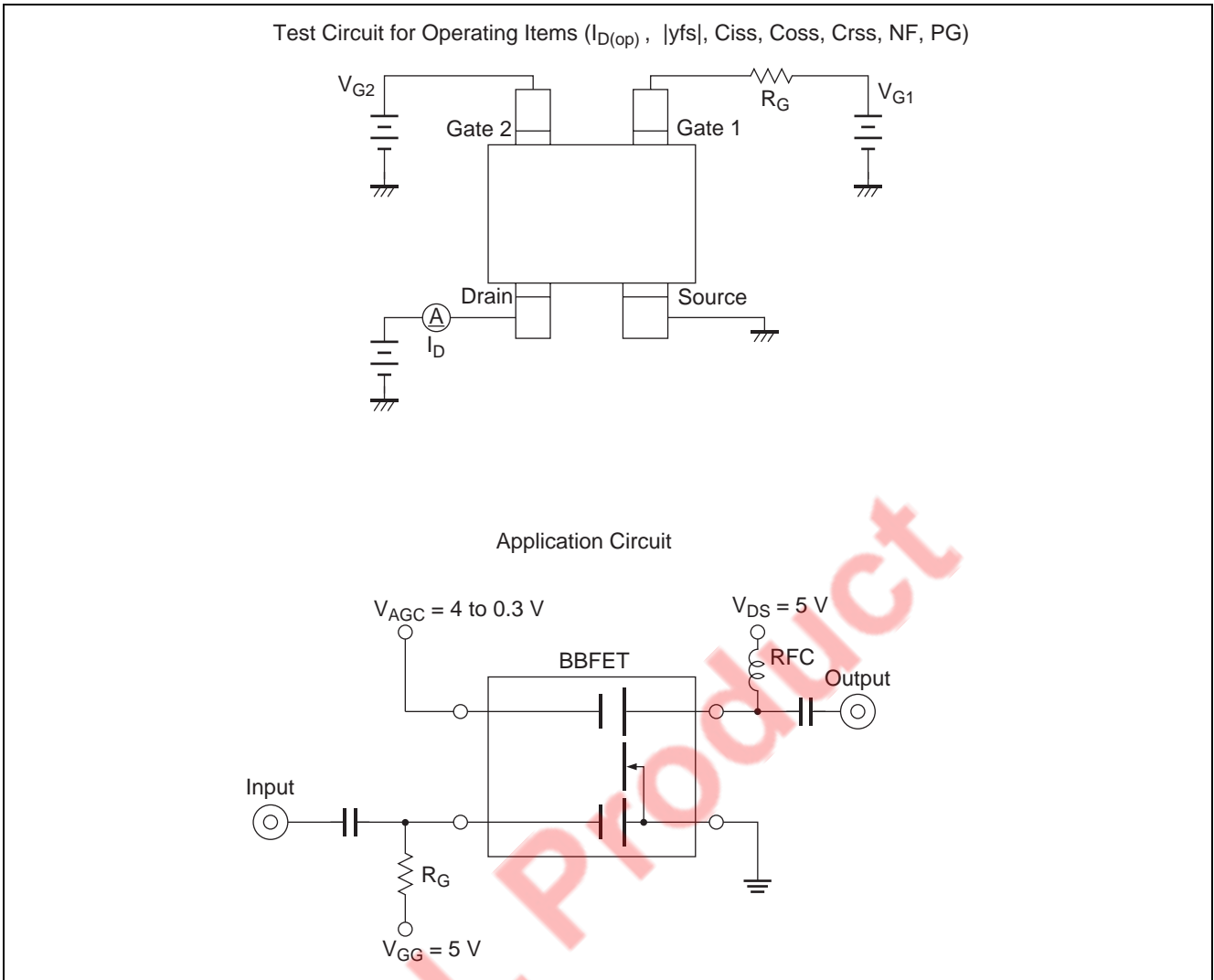
Item	Symbol	Ratings	Unit
Drain to source voltage	$V_{DS}$	6	V
Gate1 to source voltage	$V_{G1S}$	+6 – 0	V
Gate2 to source voltage	$V_{G2S}$	+6 – 0	V
Drain current	$I_D$	20	mA
Channel power dissipation	Pch	150	mW
Channel temperature	Tch	150	°C
Storage temperature	Tstg	–55 to +150	°C

## Electrical Characteristics

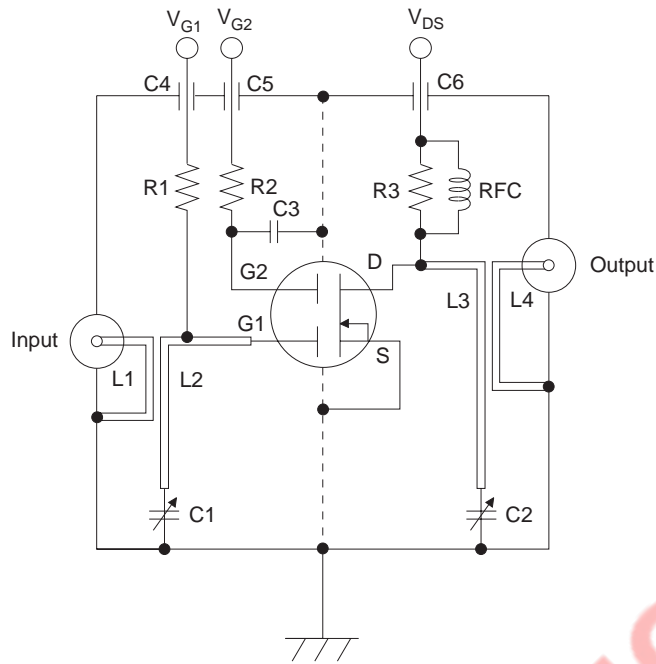
(Ta = 25°C)

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	$I_{D(op)}$	7	10	13	mA	$V_{DS} = 5 V, V_{G1} = 5 V$ $V_{G2S} = 4 V, R_G = 47 k\Omega$
Forward transfer admittance	$ y_{fs} $	19	24	29	mS	$V_{DS} = 5 V, V_{G1} = 5 V, V_{G2S} = 4 V$ $R_G = 47 k\Omega, f = 1 kHz$
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	$V_{G2S} = 4 V, R_G = 47 k\Omega$
Reverse transfer capacitance	$C_{rss}$	—	0.019	0.04	pF	$f = 1 MHz$
Power gain	PG	17	21.5	—	dB	$V_{DS} = 5 V, V_{G1} = 5 V$
Noise figure	NF	—	1.85	2.4	dB	$V_{G2S} = 4 V, R_G = 47 k\Omega$ $f = 900 MHz$

Main Characteristics

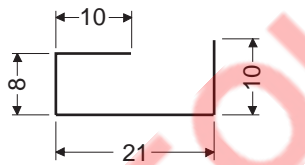


900MHz Power Gain, Noise Figure Test Circuit

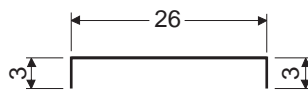


- C1, C2 : Variable Capacitor (10pF MAX)
- C3 : Disk Capacitor (1000pF)
- C4 to C6 : Air Capacitor (1000pF)
- R1 : 47 k $\Omega$
- R2 : 47 k $\Omega$
- R3 : 4.7 k $\Omega$

L1 :

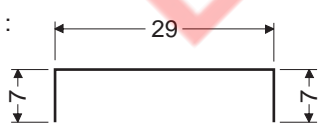


L2 :

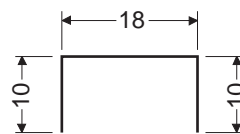


( $\phi$ 1mm Copper wire)  
Unit : mm

L3 :

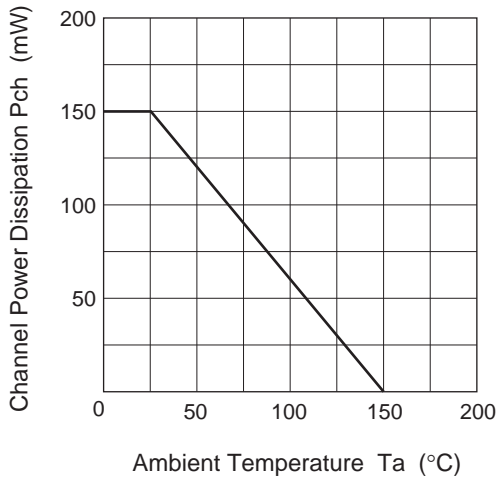


L4 :

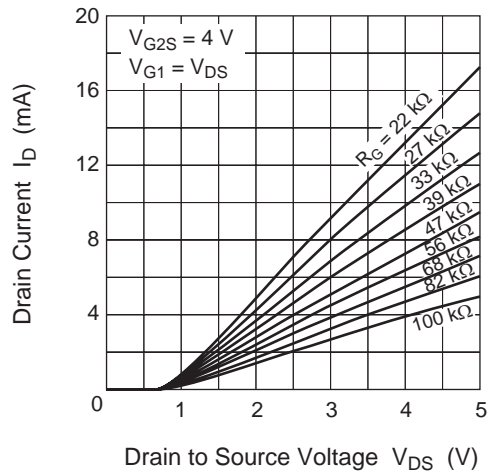


RFC :  $\phi$ 1mm Copper wire with enamel 4turns inside dia 6mm

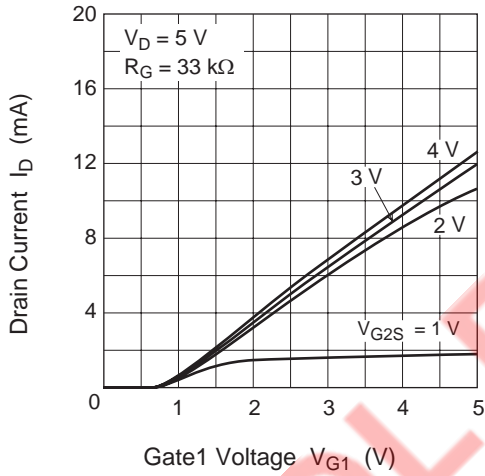
Maximum Channel Power Dissipation Curve



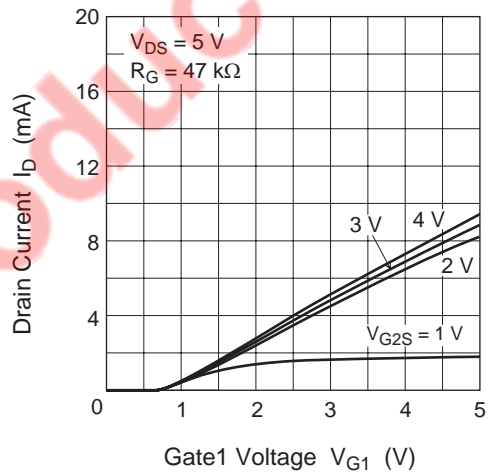
Typical Output Characteristics



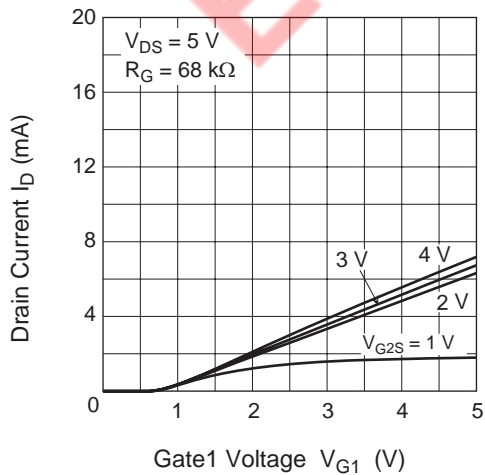
Drain Current vs. Gate1 Voltage



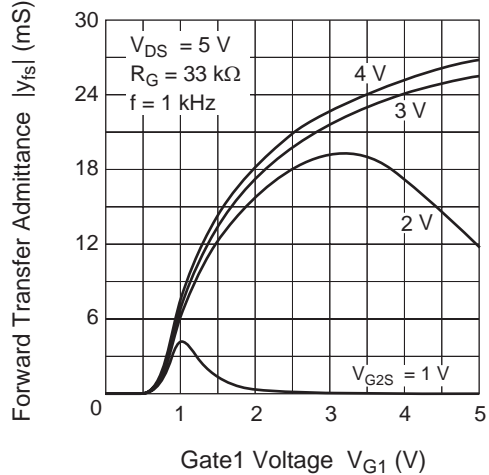
Drain Current vs. Gate1 Voltage

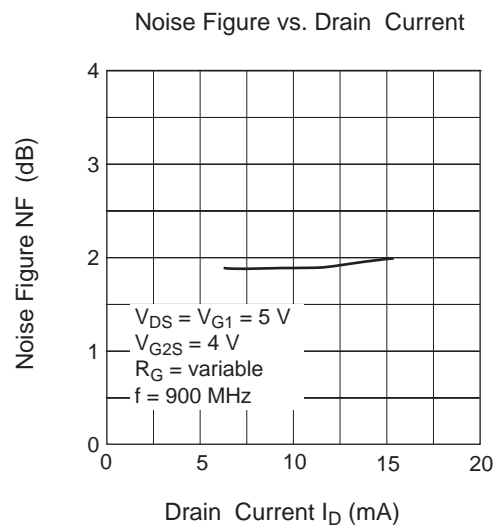
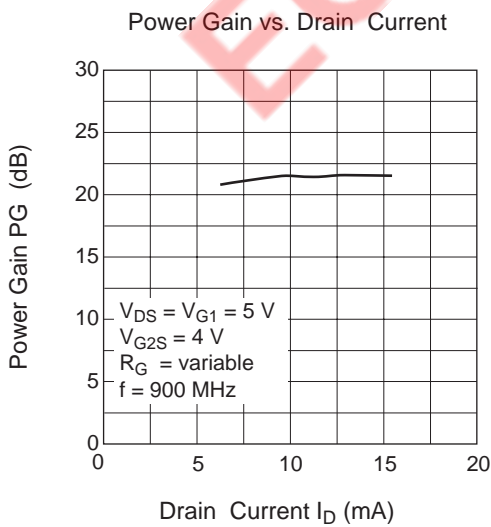
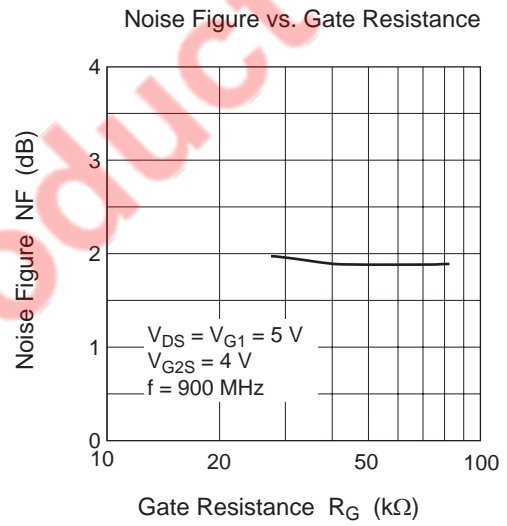
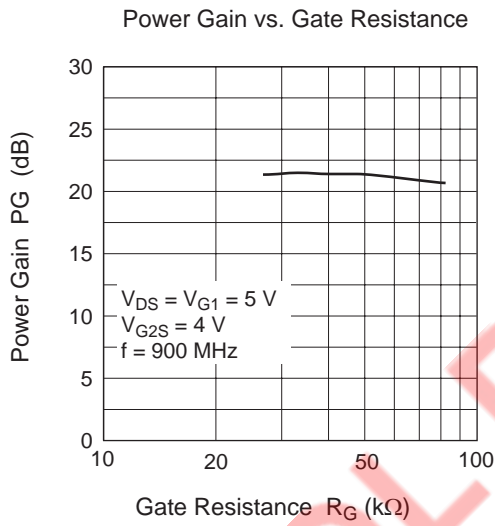
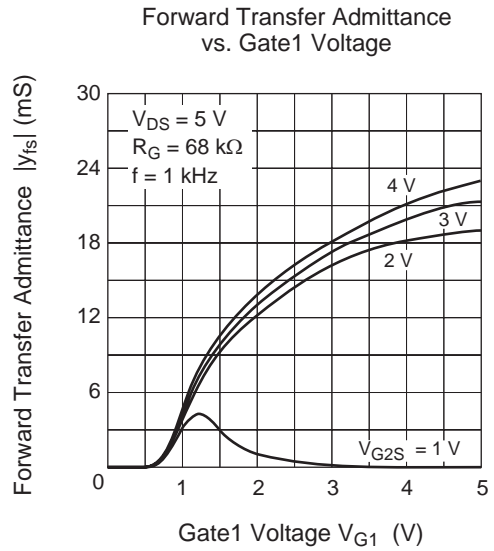
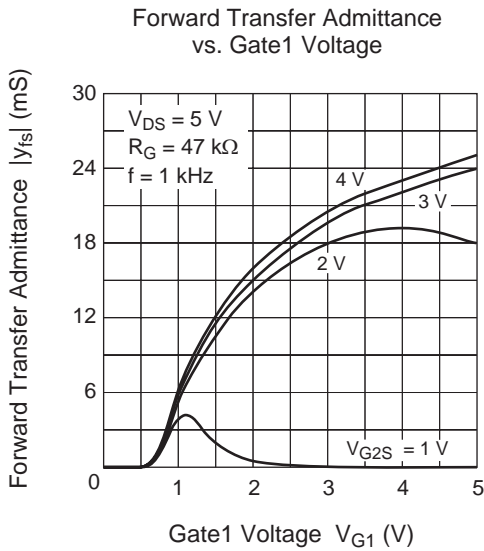


Drain Current vs. Gate1 Voltage

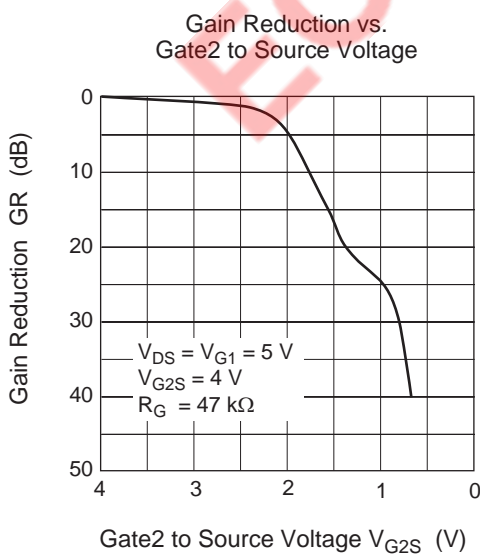
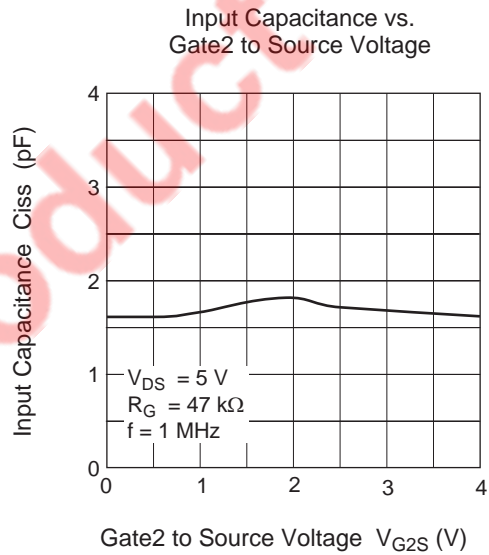
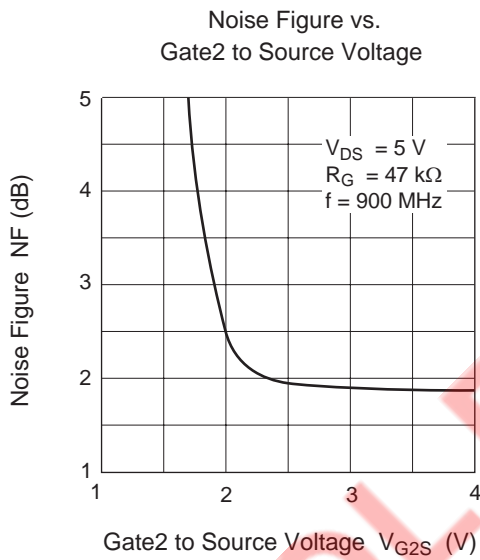
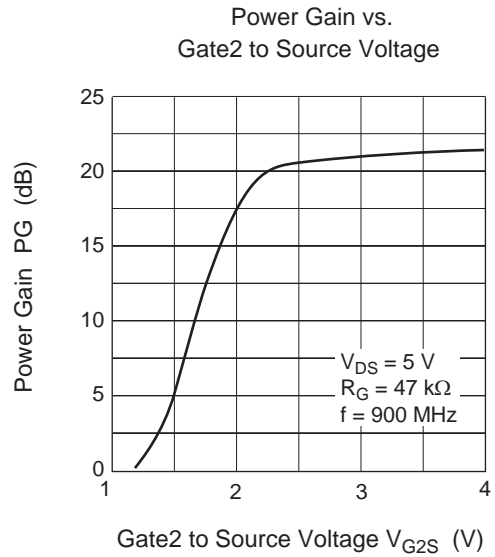
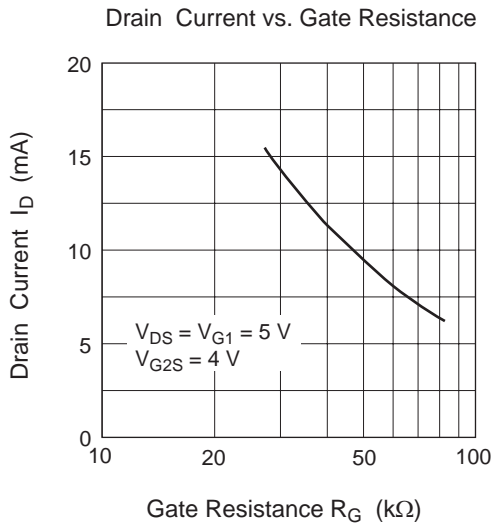


Forward Transfer Admittance vs. Gate1 Voltage

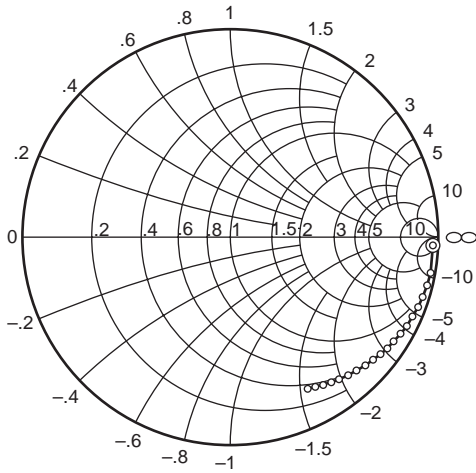








S11 Parameter vs. Frequency

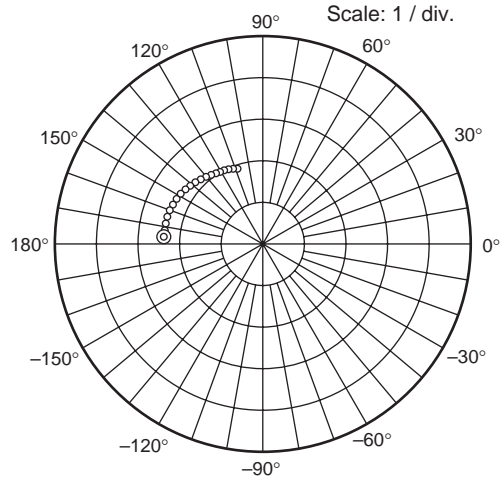


Test Condition:  $V_{DS} = 5\text{ V}$ ,  $V_{G1} = 5\text{ V}$   
 $V_{G2S} = 4\text{ V}$ ,  $R_G = 47\text{ k}\Omega$ ,  
 $Z_0 = 50\Omega$

50 to 1000 MHz (50 MHz step)

⊙—○

S21 Parameter vs. Frequency

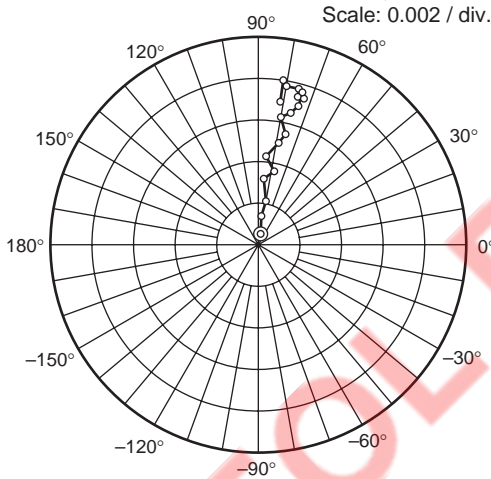


Test Condition:  $V_{DS} = 5\text{ V}$ ,  $V_{G1} = 5\text{ V}$   
 $V_{G2S} = 4\text{ V}$ ,  $R_G = 47\text{ k}\Omega$ ,  
 $Z_0 = 50\Omega$

50 to 1000 MHz (50 MHz step)

⊙—○

S12 Parameter vs. Frequency

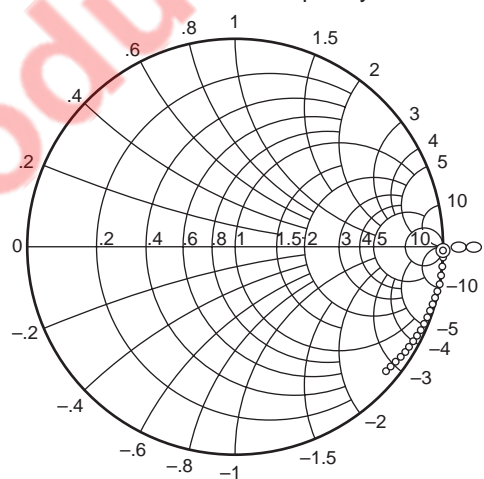


Test Condition:  $V_{DS} = 5\text{ V}$ ,  $V_{G1} = 5\text{ V}$   
 $V_{G2S} = 4\text{ V}$ ,  $R_G = 47\text{ k}\Omega$ ,  
 $Z_0 = 50\Omega$

50 to 1000 MHz (50 MHz step)

⊙—○

S22 Parameter vs. Frequency



Test Condition:  $V_{DS} = 5\text{ V}$ ,  $V_{G1} = 5\text{ V}$   
 $V_{G2S} = 4\text{ V}$ ,  $R_G = 47\text{ k}\Omega$ ,  
 $Z_0 = 50\Omega$

50 to 1000 MHz (50 MHz step)

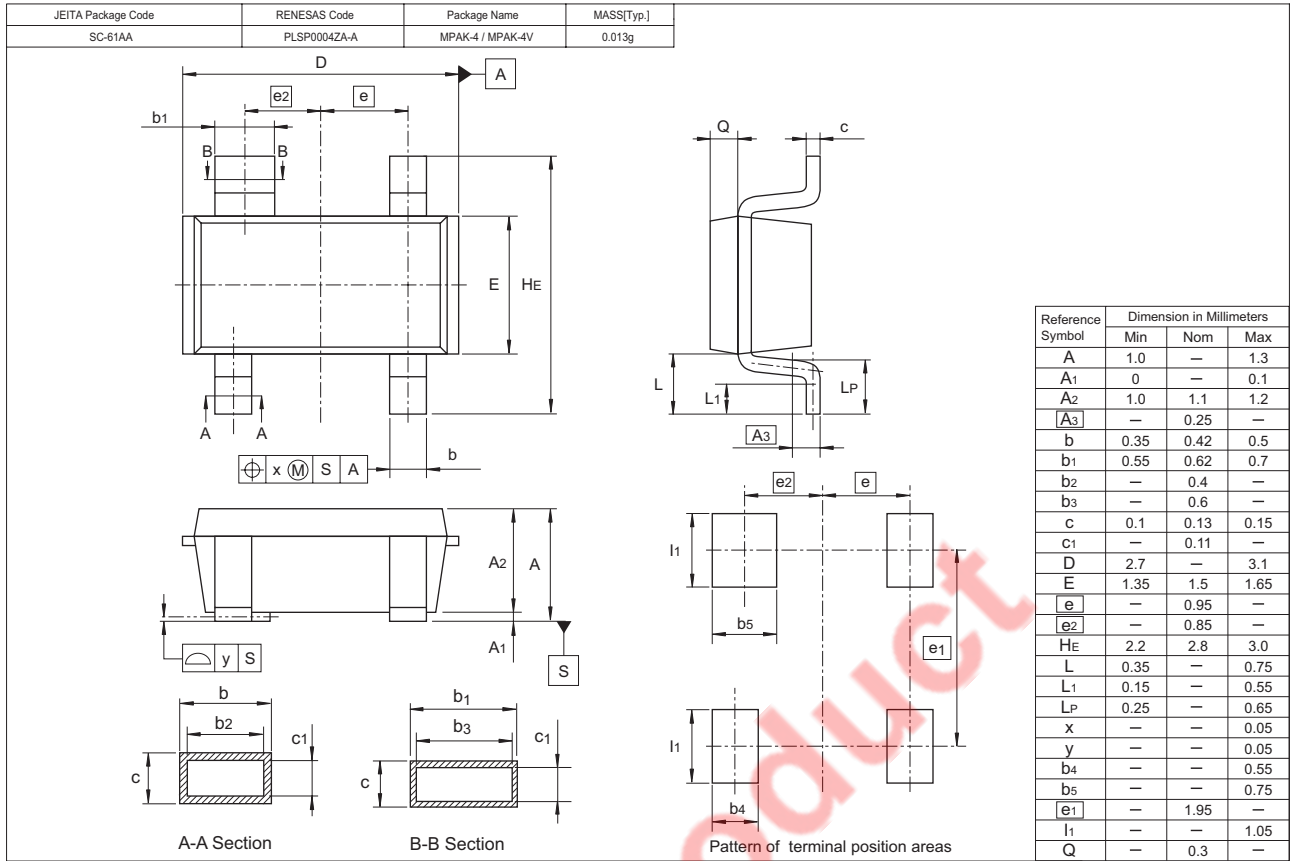
⊙—○

## S Parameter

 $(V_{DS} = V_{G1} = 5V, V_{G2S} = 4V, R_G = 47k\Omega, Z_0 = 50\Omega)$ 

f(MHz)	S11		S21		S12		S22	
	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.
50	0.974	-2.8	2.40	176.4	0.00057	78.1	0.997	-2.0
100	0.974	-10.0	2.38	172.2	0.00144	82.4	0.998	-4.2
150	0.974	-13.6	2.38	168.4	0.00211	78.7	0.997	-6.0
200	0.965	-16.5	2.37	164.1	0.00316	84.8	0.995	-8.1
250	0.963	-20.0	2.35	160.4	0.00358	76.3	0.994	-10.2
300	0.953	-23.7	2.32	156.8	0.00431	84.0	0.992	-12.2
350	0.947	-26.8	2.30	152.9	0.00503	79.0	0.990	-14.2
400	0.942	-29.6	2.28	148.6	0.00545	76.6	0.987	-16.2
450	0.929	-32.8	2.26	144.9	0.00630	80.3	0.984	-18.1
500	0.923	-35.4	2.21	141.2	0.00646	76.1	0.981	-20.2
550	0.912	-38.5	2.19	137.6	0.00693	73.7	0.977	-22.1
600	0.903	-41.2	2.15	134.2	0.00732	72.9	0.974	-24.1
650	0.886	-44.2	2.12	130.6	0.00729	74.6	0.971	-26.0
700	0.879	-46.8	2.08	127.4	0.00733	72.0	0.967	-27.8
750	0.873	-49.2	2.06	124.3	0.00762	74.5	0.962	-29.7
800	0.859	-52.4	2.03	120.8	0.00756	73.7	0.959	-31.7
850	0.846	-55.4	2.00	117.3	0.00772	75.5	0.955	-33.6
900	0.836	-58.0	1.96	114.3	0.00775	79.6	0.951	-35.5
950	0.827	-60.4	1.93	111.0	0.00801	81.7	0.946	-37.3
1000	0.815	-62.8	1.89	108.0	0.00704	81.0	0.942	-39.4

### Package Dimensions



### Ordering Information

Part Name	Quantity	Shipping Container
BB501MAS-TL-E	3000	φ 178 mm Reel, 8 mm Emboss Taping

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