

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

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Not recommended  
for new design

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## BB503C

Built in Biasing Circuit MOS FET IC  
UHF RF Amplifier

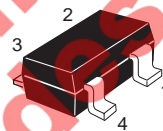
REJ03G0834-0500  
(Previous ADE-208-812C)  
Rev.5.00  
Aug.10.2005

### Features

- Built in Biasing Circuit; To reduce using parts cost & PC board space.
- Low noise; NF = 1.8 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; CMPAK-4(SOT-343mod)

### Outline

RENESAS Package code: PTSP0004ZA-A  
(Package name: CMPAK-4)



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

- Notes:
1. Marking is "CS-".
  2. BB503C is individual type number of RENESAS BBFET.

Not recommended for new design

## Absolute Maximum Ratings

(Ta = 25°C)

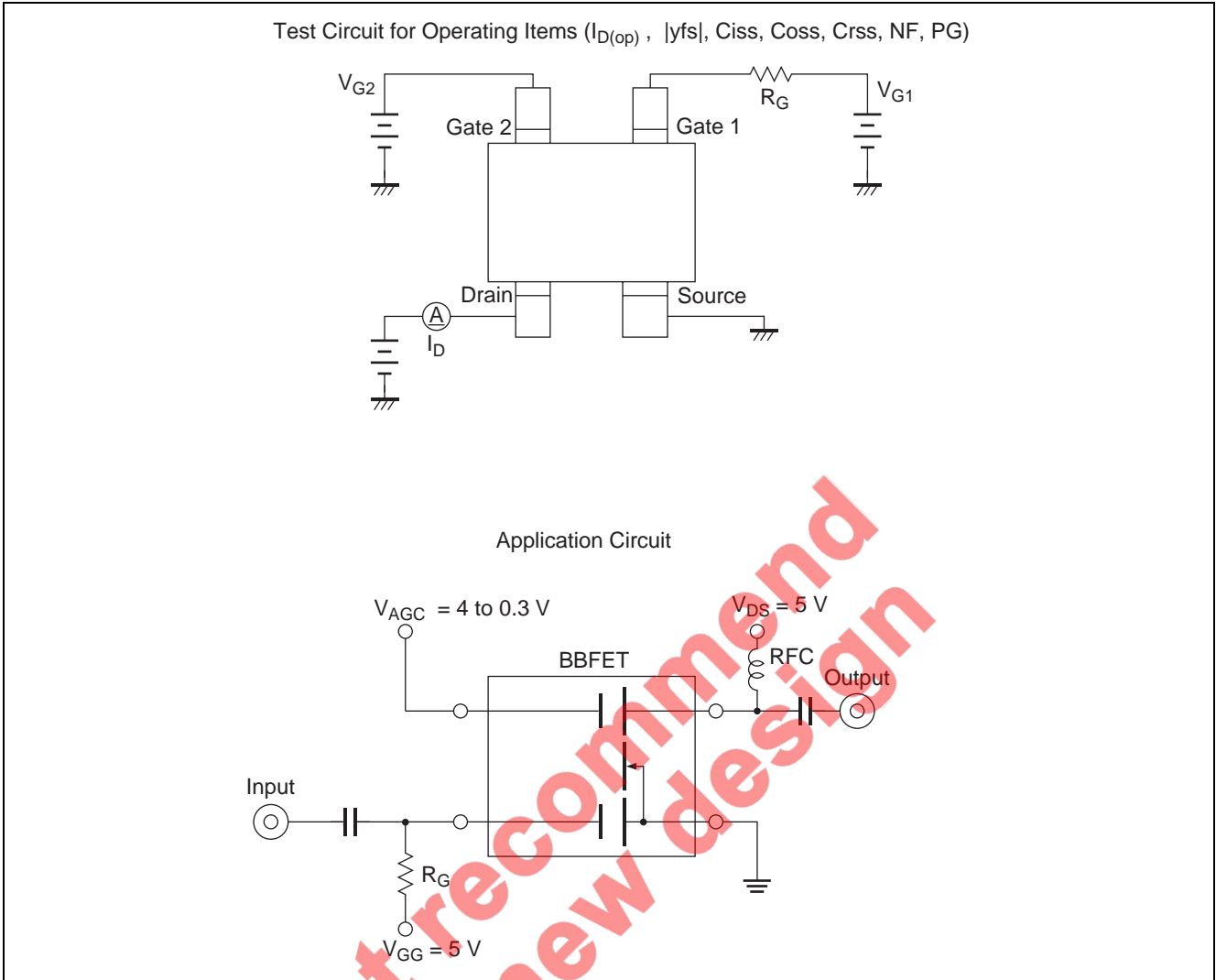
Item	Symbol	Ratings	Unit
Drain to source voltage	$V_{DS}$	6	V
Gate1 to source voltage	$V_{G1S}$	+6 -0	V
Gate2 to source voltage	$V_{G2S}$	+6 -0	V
Drain current	$I_D$	20	mA
Channel power dissipation	Pch	100	mW
Channel temperature	Tch	150	°C
Storage temperature	Tstg	-55 to +150	°C

## Electrical Characteristics

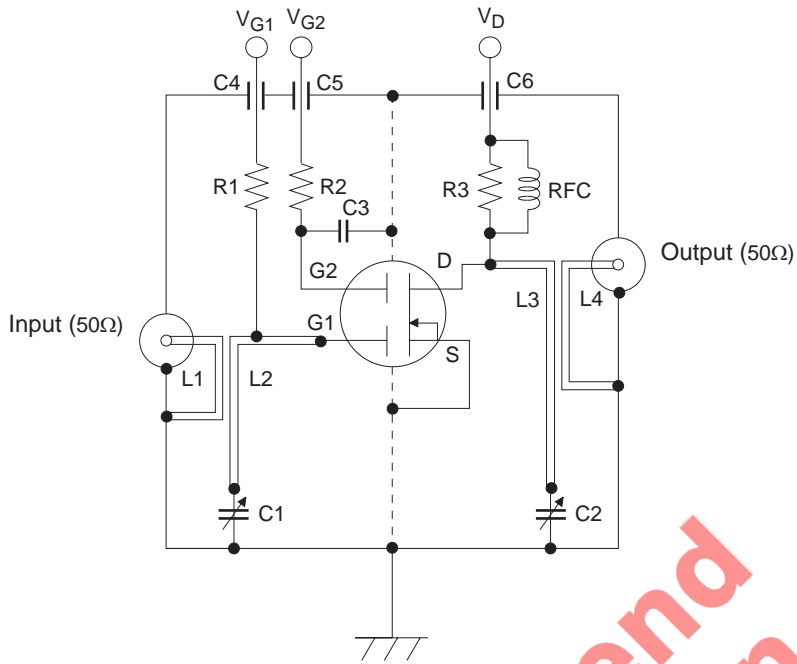
(Ta = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test conditions
Drain to source breakdown voltage	$V_{(BR)DSS}$	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	$C_{rss}$	—	0.025	0.05	pF	$f = 1 MHz$
Power gain	PG	17	22	—	dB	$V_{DS} = 5 V, V_{G1} = 5 V$
Noise figure	NF	—	1.8	2.4	dB	$V_{G2S} = 4 V, R_G = 47 k\Omega$ $f = 900 MHz$

Main Characteristics

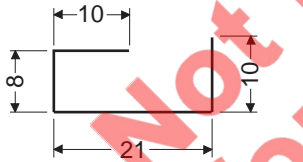


900MHz Power Gain, Noise Figure Test Circuit

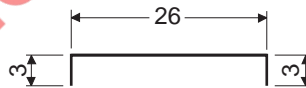


- C1, C2: Variable Capacitor (10pF MAX)
- C3: Disk Capacitor (1000pF)
- C4 to C6: Air Capacitor (1000pF)
- R1: 47 kΩ
- R2: 47 kΩ
- R3: 4.7 kΩ

L1:

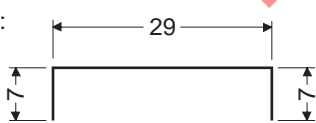


L2:

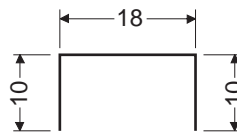


(φ1mm Copper wire)  
Unit: mm

L3:

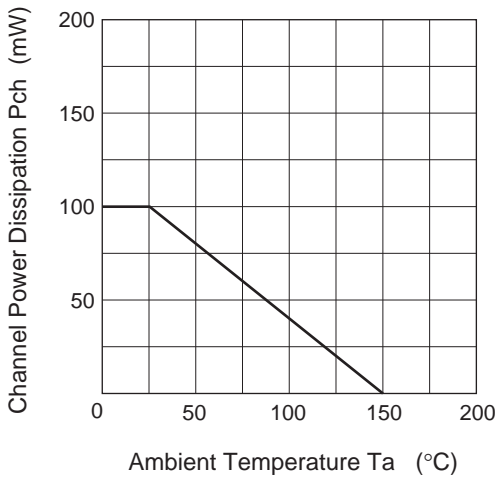


L4:

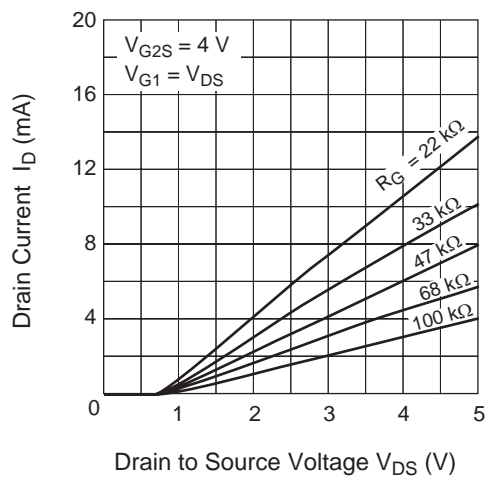


RFC: φ1mm Copper wire with enamel 4turns inside dia 6mm

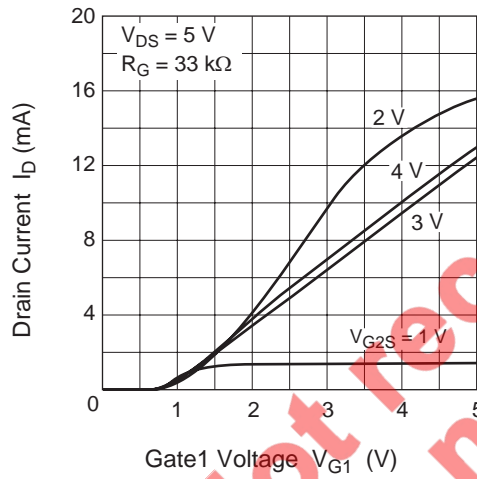
Maximum Channel Power Dissipation Curve



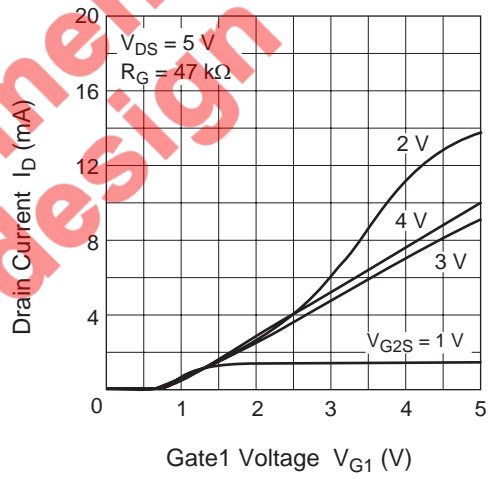
Typical Output Characteristics



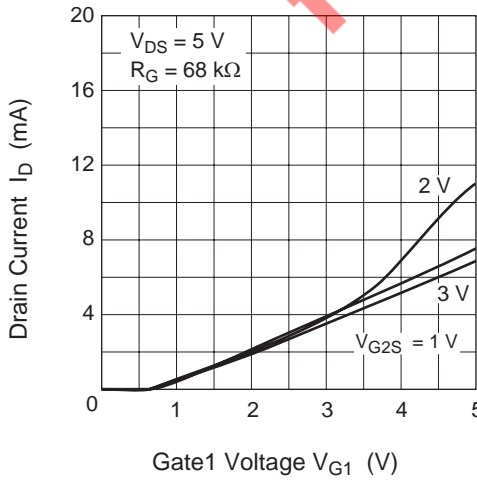
Drain Current vs. Gate1 Voltage



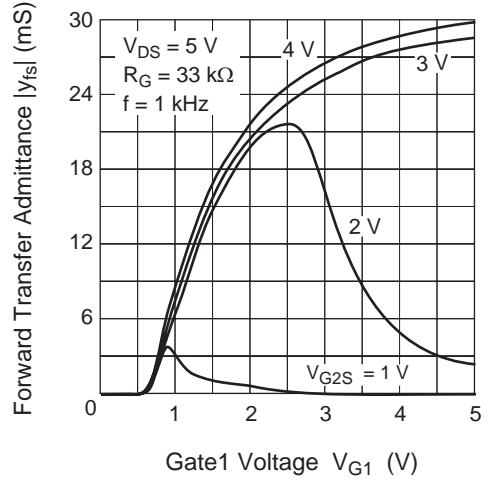
Drain Current vs. Gate1 Voltage

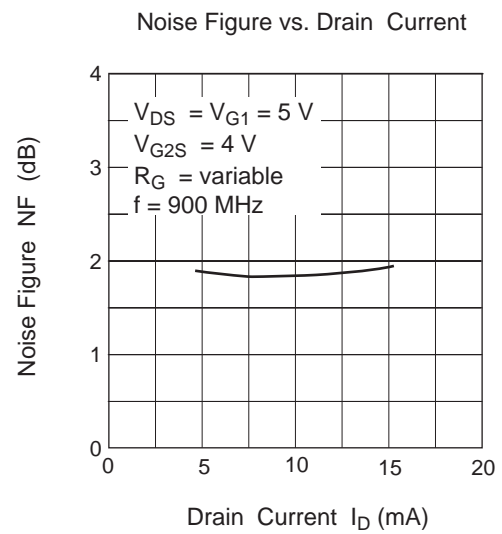
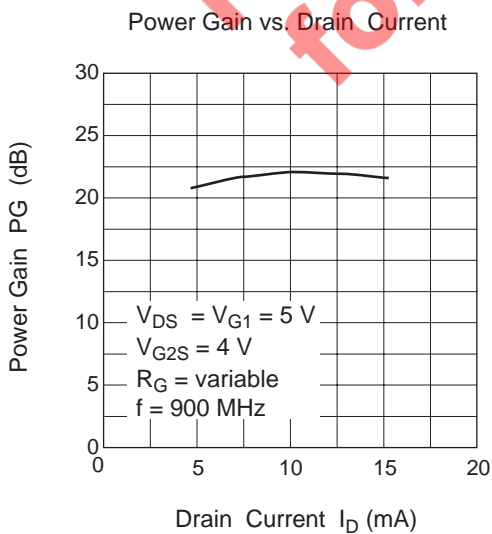
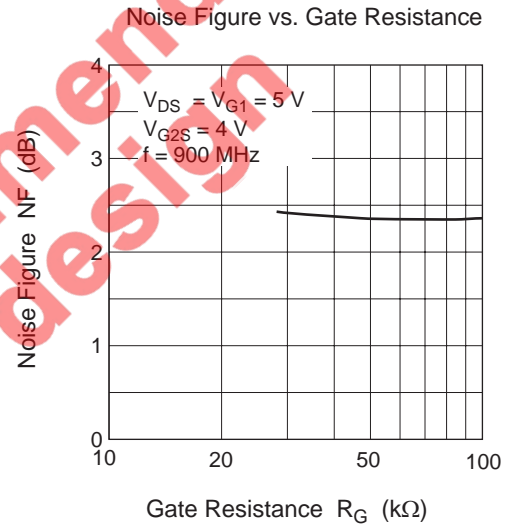
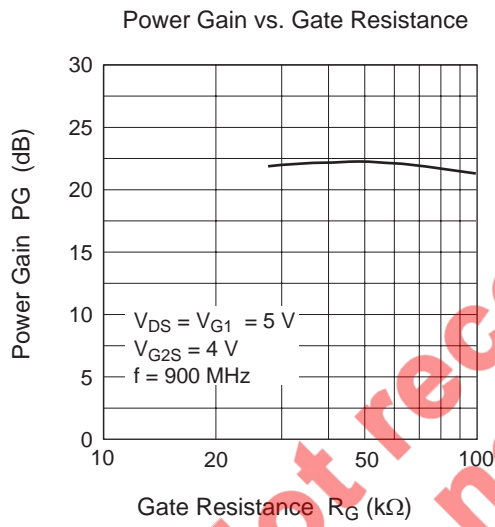
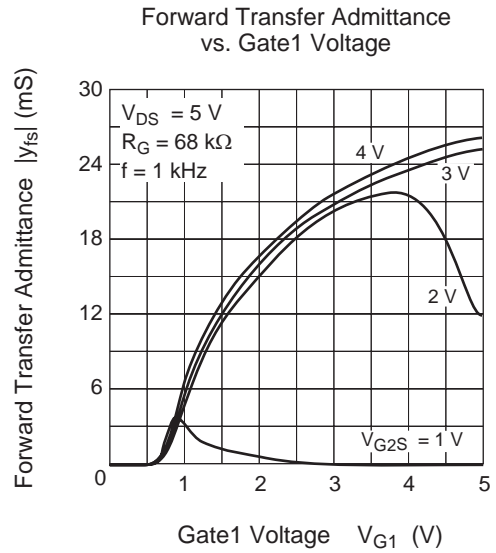
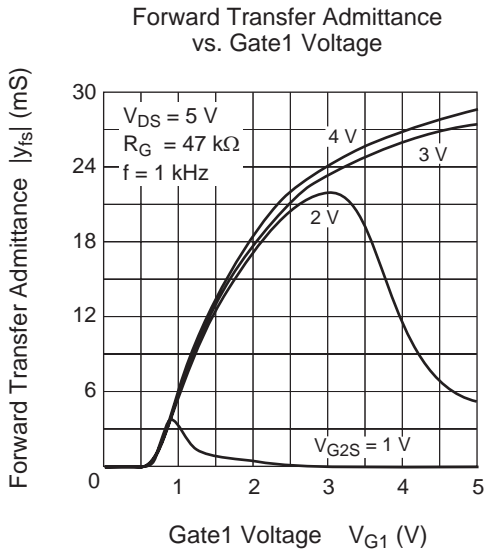


Drain Current vs. Gate1 Voltage

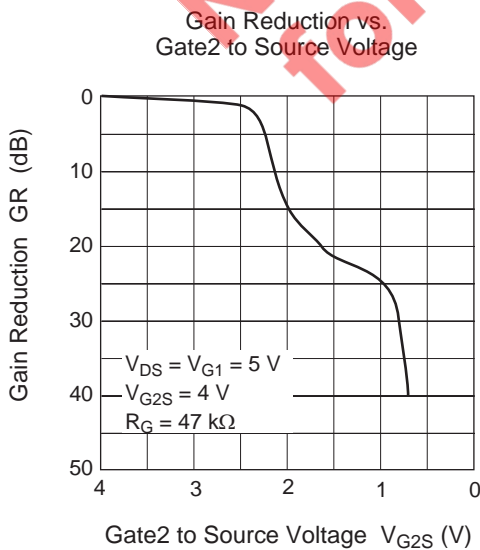
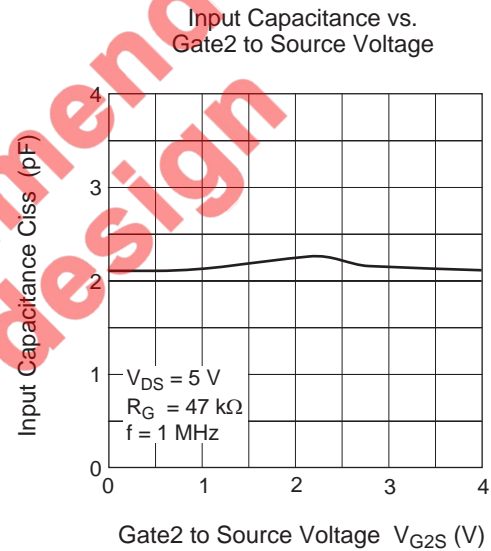
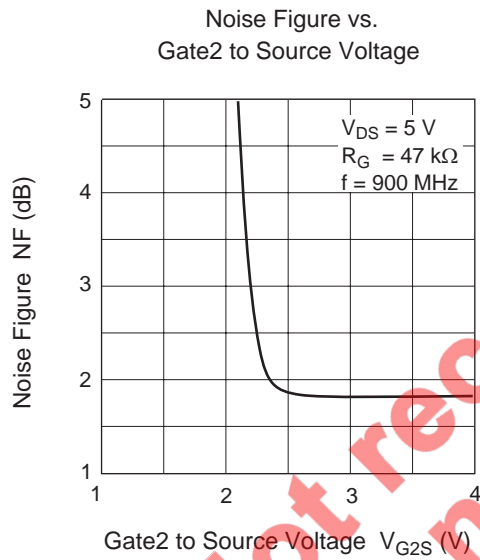
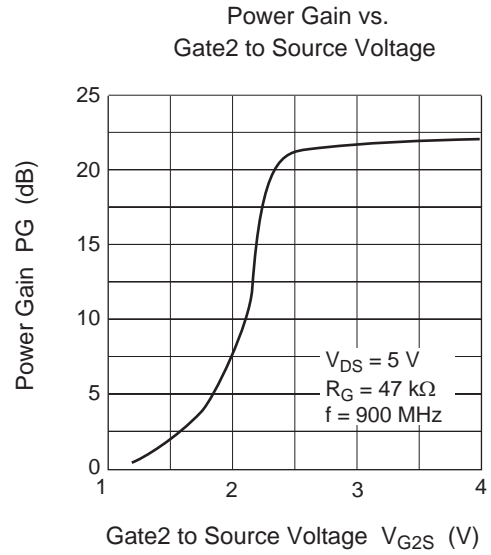
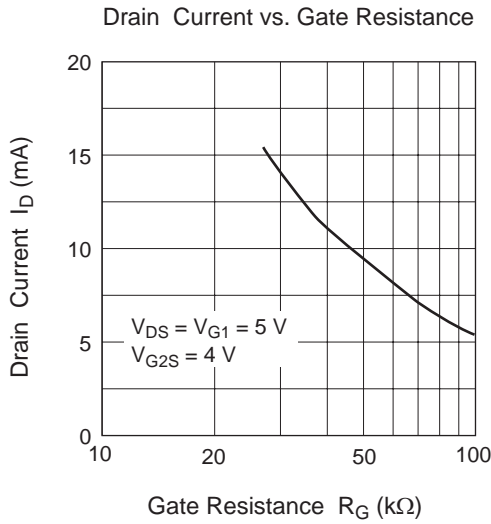


Forward Transfer Admittance vs. Gate1 Voltage

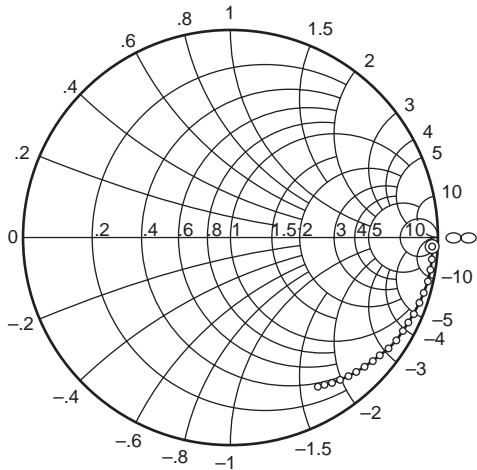








S11 Parameter vs. Frequency

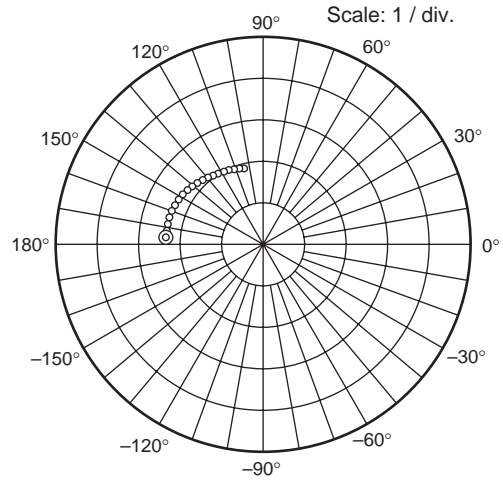


Test Condition:  $V_{DS} = 5\text{ V}$ ,  $V_{G1} = 5\text{ V}$   
 $V_{G2S} = 4\text{ V}$ ,  $R_G = 47\text{ k}\Omega$ ,  
 $Z_0 = 50\Omega$

50 to 1000 MHz (50 MHz step)

⊙—○

S21 Parameter vs. Frequency

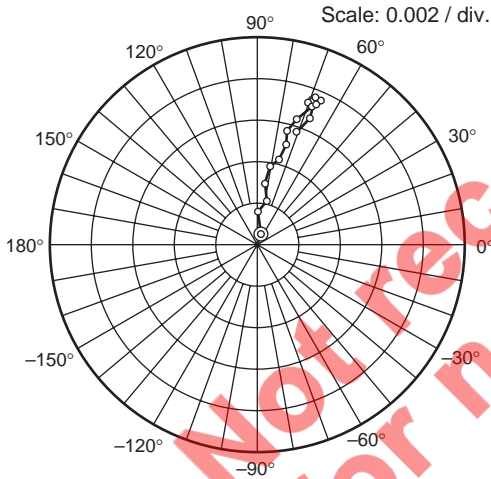


Test Condition:  $V_{DS} = 5\text{ V}$ ,  $V_{G1} = 5\text{ V}$   
 $V_{G2S} = 4\text{ V}$ ,  $R_G = 47\text{ k}\Omega$ ,  
 $Z_0 = 50\Omega$

50 to 1000 MHz (50 MHz step)

⊙—○

S12 Parameter vs. Frequency

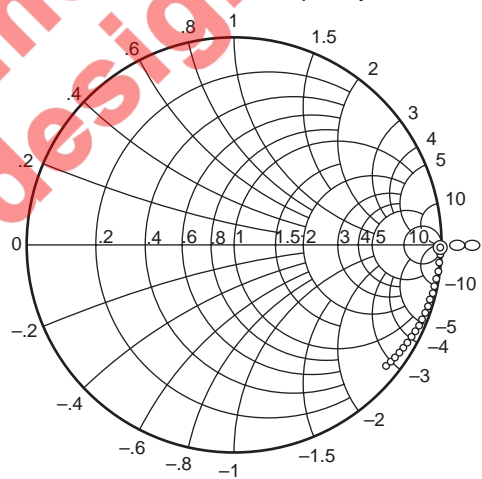


Test Condition:  $V_{DS} = 5\text{ V}$ ,  $V_{G1} = 5\text{ V}$   
 $V_{G2S} = 4\text{ V}$ ,  $R_G = 47\text{ k}\Omega$ ,  
 $Z_0 = 50\Omega$

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)

⊙—○

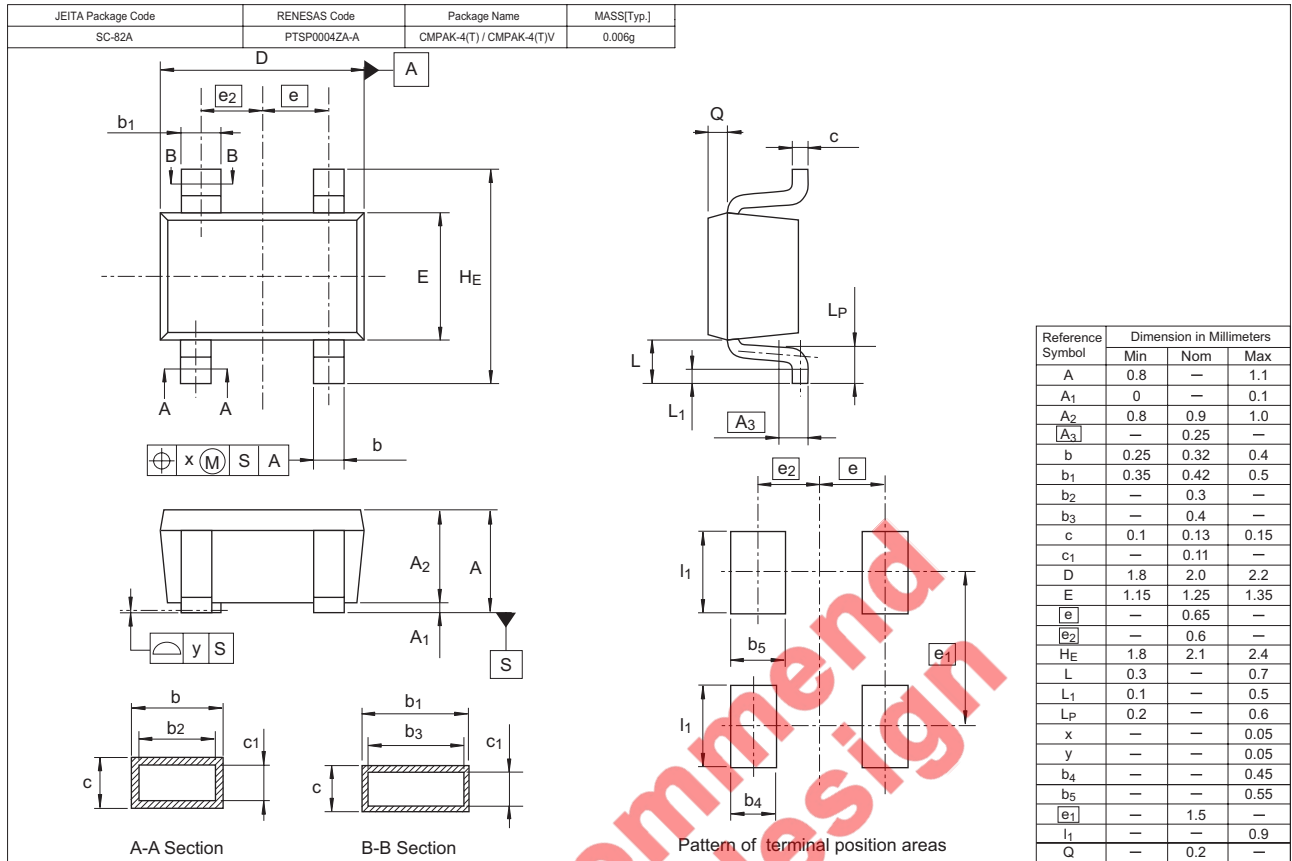
## S Parameter

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

f(MHz)	S11		S21		S12		S22	
	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.
50	0.975	-2.6	2.37	176.1	0.00097	74.4	0.995	-1.9
100	0.977	-6.5	2.37	172.1	0.00162	89.8	0.998	-3.9
150	0.975	-9.1	2.36	168.0	0.00222	78.2	0.997	-5.8
200	0.972	-12.4	2.33	163.8	0.00282	83.8	0.996	-8.0
250	0.968	-15.6	2.32	159.9	0.00388	81.1	0.994	-10.0
300	0.963	-18.9	2.30	156.0	0.00437	76.0	0.993	-11.8
350	0.954	-22.2	2.28	151.8	0.00518	73.6	0.991	-13.9
400	0.946	-25.3	2.25	148.2	0.00567	75.6	0.989	-15.8
450	0.937	-28.2	2.22	144.1	0.00631	72.5	0.986	-17.8
500	0.930	-31.5	2.19	140.2	0.00637	72.7	0.984	-19.6
550	0.920	-34.7	2.16	136.3	0.00720	70.3	0.981	-21.6
600	0.914	-37.4	2.13	132.7	0.00747	67.0	0.978	-23.4
650	0.902	-40.4	2.09	129.3	0.00738	69.2	0.975	-25.4
700	0.886	-43.5	2.07	125.4	0.00758	68.6	0.972	-27.3
750	0.879	-46.1	2.03	122.0	0.00757	66.0	0.968	-29.0
800	0.873	-48.9	1.99	118.3	0.00729	67.5	0.966	-31.0
850	0.857	-52.0	1.96	114.9	0.00723	68.8	0.962	-32.9
900	0.845	-54.5	1.93	111.4	0.00706	68.3	0.959	-34.8
950	0.838	-57.2	1.90	108.1	0.00659	67.5	0.954	-36.6
1000	0.824	-59.6	1.86	104.9	0.00574	71.0	0.952	-38.5

Not recommended for new design

### Package Dimensions



### Ordering Information

Part Name	Quantity	Shipping Container
BB503CCS-TL-E	3000	φ 178 mm Reel, 8 mm Emboss Taping

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