

# BB506M

## Build in Biasing Circuit MOS FET IC UHF RF Amplifier

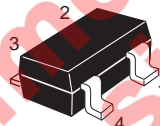
R07DS0289EJ0200  
(Previous: REJ03G1604-0100)  
Rev.2.00  
Mar 28, 2011

### Features

- Build in Biasing Circuit; To reduce using parts cost & PC board space.
- High gain  
PG = 24 dB typ. (f = 900 MHz)
- Low noise  
NF = 1.4 dB typ. (f = 900 MHz)
- Low output capacitance  
Coss = 1.1 pF typ. (f = 1 MHz)
- Provide mini mold packages: MPAK-4 (SOT-143mod)

### Outline

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



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

- Notes:
1. Marking is "FS-".
  2. BB506M 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	$I_D$	30	mA
Channel power dissipation	$P_{ch}$ <sup>Note3</sup>	300	mW
Channel temperature	Tch	150	°C
Storage temperature	Tstg	-55 to +150	°C

Notes: 3. Value on the glass epoxy board (50 mm × 40 mm × 1 mm).

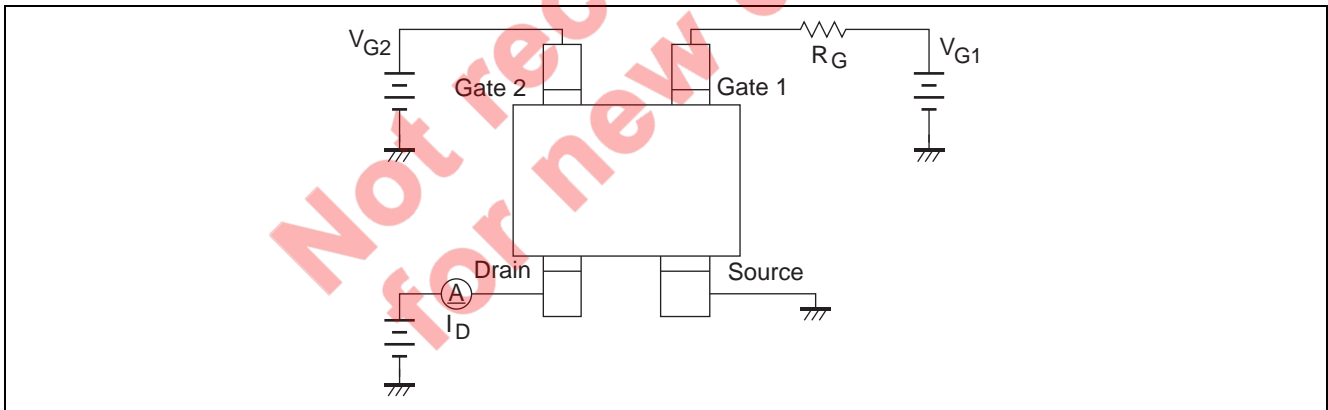
This device is sensitive to electro static discharge. An adequate careful handling procedure is requested.

Electrical Characteristics

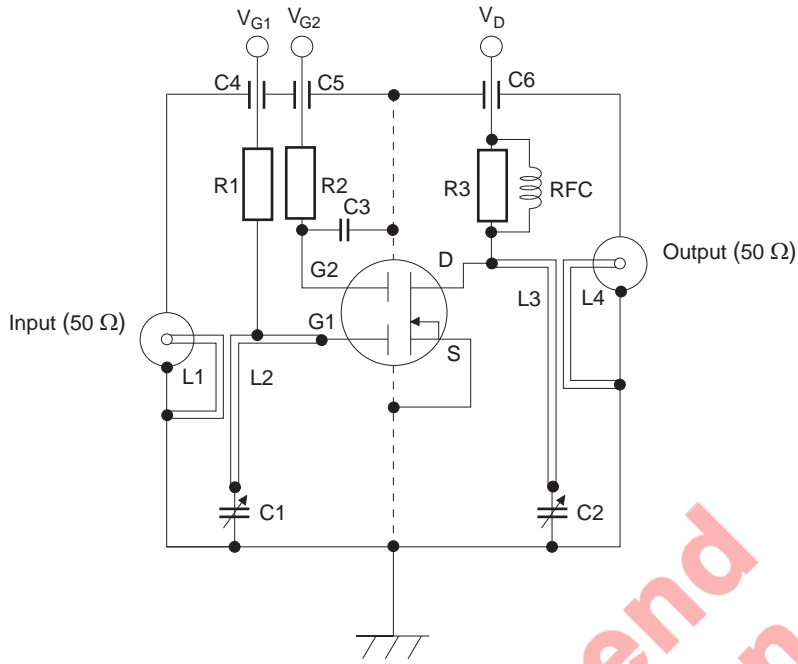
(Ta = 25°C)

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	0.8	1.1	V	$V_{DS} = 5 V, V_{G2S} = 4 V, I_D = 100 \mu A$
Gate2 to source cutoff voltage	$V_{G2S(off)}$	0.4	0.7	1.0	V	$V_{DS} = 5 V, V_{G1S} = 5 V, I_D = 100 \mu A$
Drain current	$I_{D(op)}$	12	16	20	mA	$V_{DS} = 5 V, V_{G1} = 5 V, V_{G2S} = 4 V$ $R_G = 100 k\Omega$
Forward transfer admittance	$ y_{fs} $	27	32	38	mS	$V_{DS} = 5 V, V_{G1} = 5 V, V_{G2S} = 4 V$ $R_G = 100 k\Omega, f = 1 kHz$
Input capacitance	$C_{iss}$	1.2	1.6	2.0	pF	$V_{DS} = 5 V, V_{G1} = 5 V, V_{G2S} = 4 V$
Output capacitance	$C_{oss}$	0.7	1.1	1.5	pF	$R_G = 100 k\Omega, f = 1 MHz$
Power gain	PG	19	24	29	dB	$V_{DS} = 5 V, V_{G1} = 5 V, V_{G2S} = 4 V$
Noise figure	NF	—	1.4	2.1	dB	$R_G = 100 k\Omega, f = 900 MHz$

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

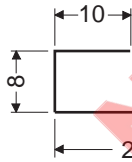


900 MHz Power Gain, Noise Figure Test Circuit

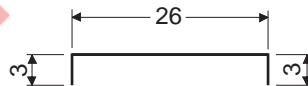


- C1, C2 : Variable Capacitor (10 pF MAX)
- C3 : Disk Capacitor (1000 pF)
- C4 to C6 : Air Capacitor (1000 pF)
- R1 : 100 kΩ
- R2 : 47 kΩ
- R3 : 4.7 kΩ

L1:

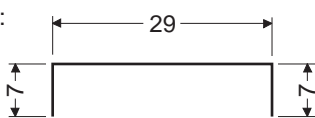


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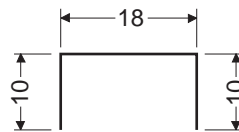


(φ1 mm Copper wire)  
Unit : mm

L3:

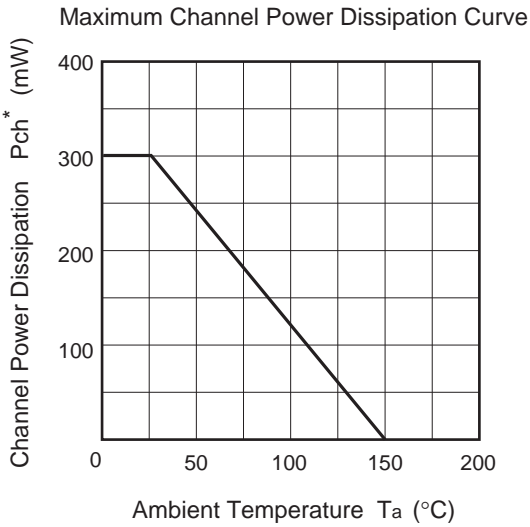


L4:

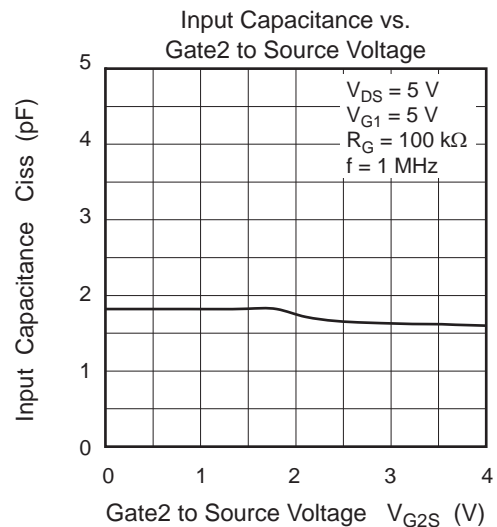
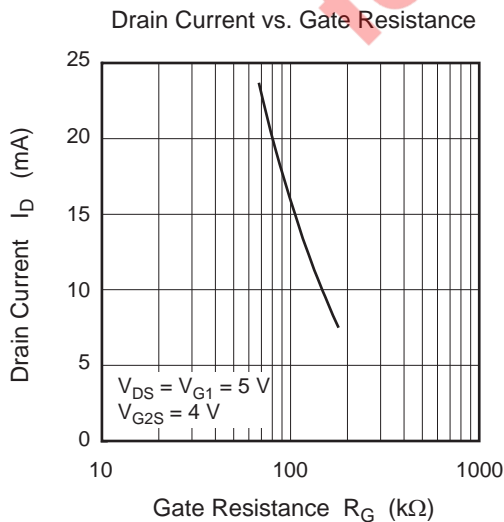
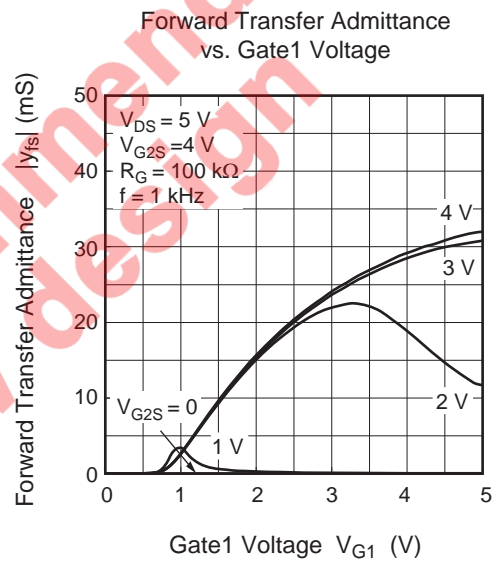
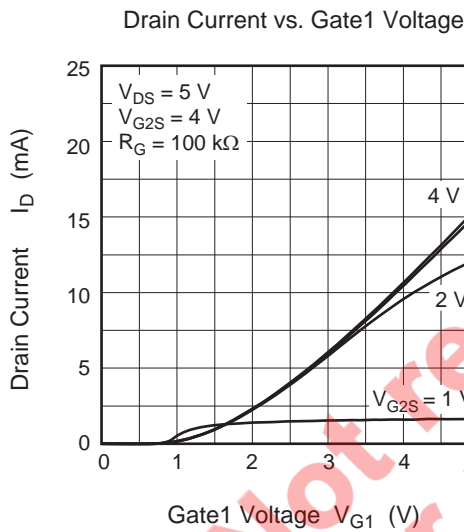
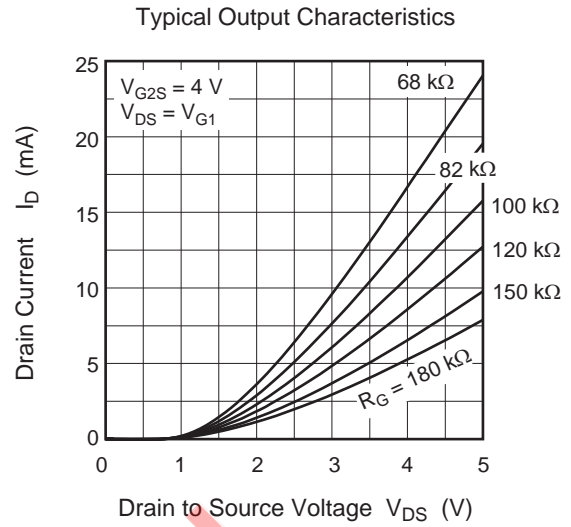


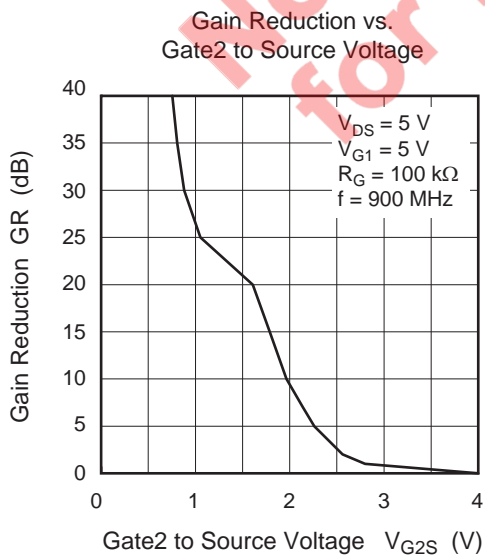
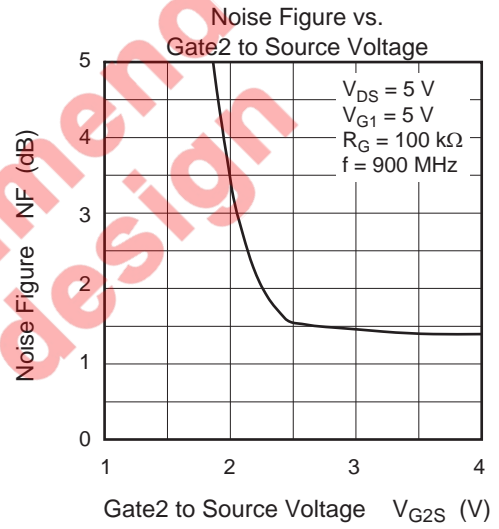
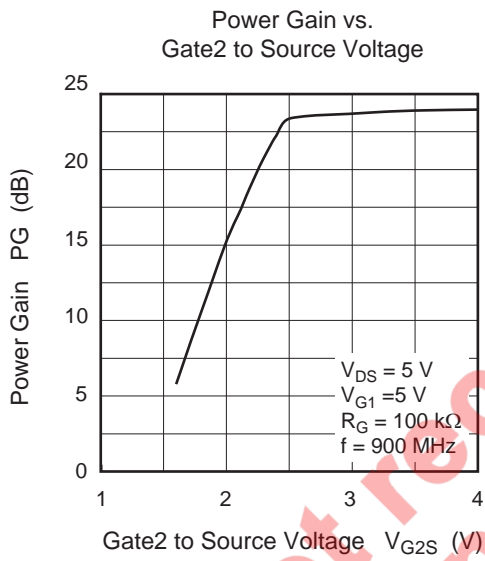
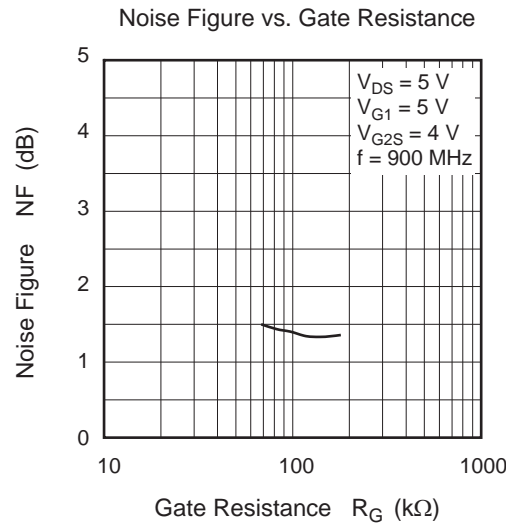
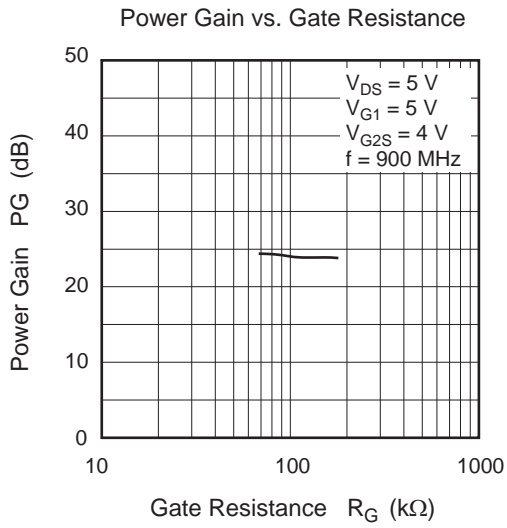
RFC : φ1 mm Copper wire with enamel 4 turns inside dia 6 mm

Main Characteristics

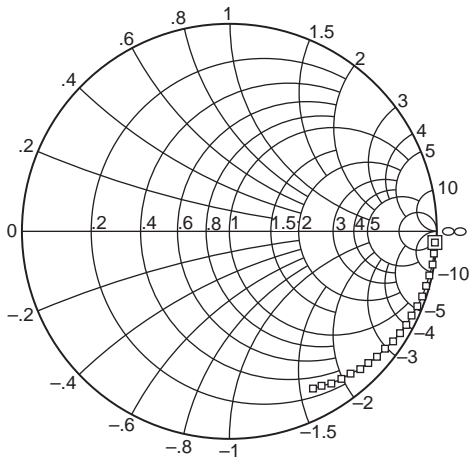


\* Value on the glass epoxy board (50 mm × 40 mm × 1 mm)



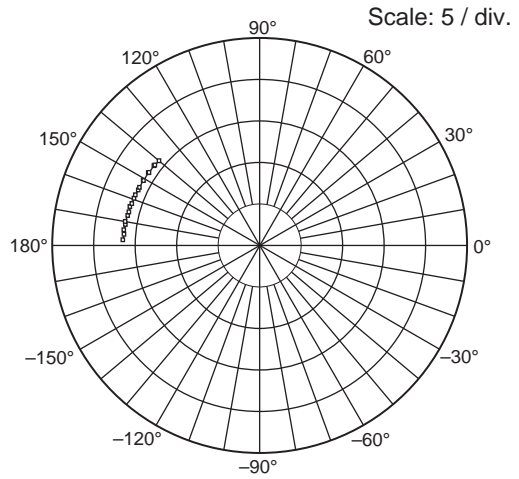


S<sub>11</sub> Parameter vs. Frequency



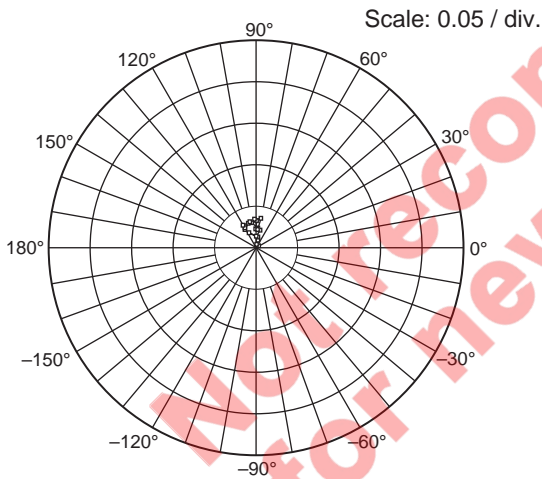
Test condition:  $V_{DS} = 5\text{ V}$ ,  $V_{G1} = 5\text{ V}$ ,  
 $V_{GS2} = 4\text{ V}$ ,  $R_G = 100\text{ k}\Omega$   
 0.05 to 1.05 GHz (0.05 GHz step)

S<sub>21</sub> Parameter vs. Frequency



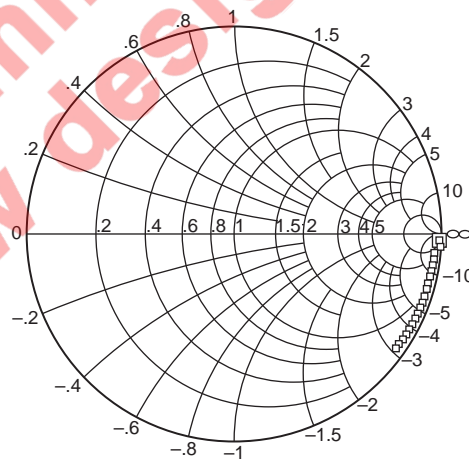
Test condition:  $V_{DS} = 5\text{ V}$ ,  $V_{G1} = 5\text{ V}$ ,  
 $V_{GS2} = 4\text{ V}$ ,  $R_G = 100\text{ k}\Omega$   
 0.05 to 1.05 GHz (0.05 GHz step)

S<sub>12</sub> Parameter vs. Frequency



Test condition:  $V_{DS} = 5\text{ V}$ ,  $V_{G1} = 5\text{ V}$ ,  
 $V_{GS2} = 4\text{ V}$ ,  $R_G = 100\text{ k}\Omega$   
 0.05 to 1.05 GHz (0.05 GHz step)

S<sub>22</sub> Parameter vs. Frequency



Test condition:  $V_{DS} = 5\text{ V}$ ,  $V_{G1} = 5\text{ V}$ ,  
 $V_{GS2} = 4\text{ V}$ ,  $R_G = 100\text{ k}\Omega$   
 0.05 to 1.05 GHz (0.05 GHz step)

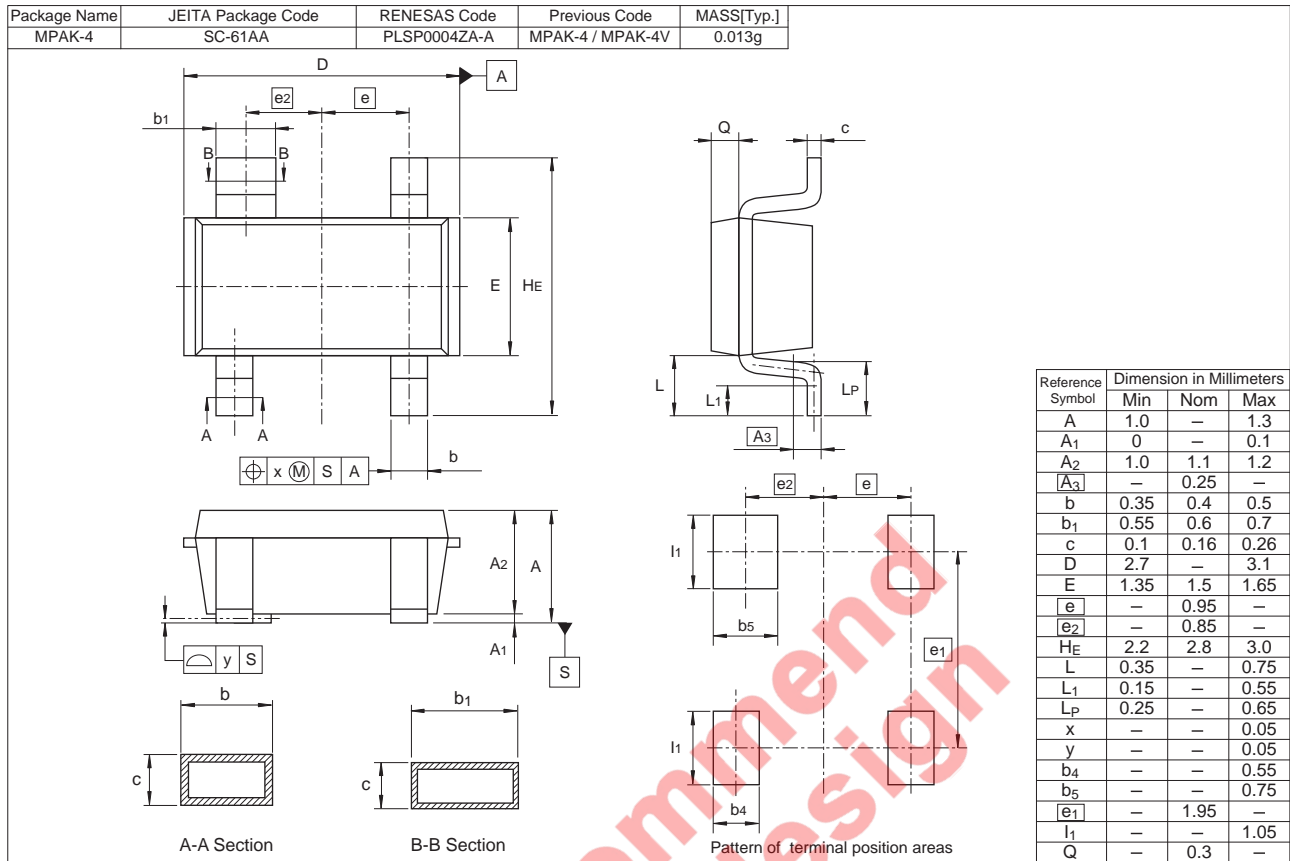
## S parameter

 $(V_{DS} = 5\text{ V}, V_{G1} = 5\text{ V}, V_{G2S} = 4\text{ V}, R_G = 100\text{ k}\Omega, Z_0 = 50\ \Omega)$ 

Freq (MHz)	S11		S21		S12		S22	
	Mag	Deg	Mag	Deg	Mag	Deg	Mag	Deg
50	0.995	-3.3	3.28	177.9	0.001	17.6	0.991	-1.8
100	0.991	-6.2	3.26	175.5	0.001	75.6	0.996	-3.6
150	0.992	-9.3	3.28	173.7	0.002	73.8	0.995	-5.2
200	0.987	-12.4	3.26	171.3	0.002	79.5	0.997	-7.0
250	0.984	-15.5	3.27	170.0	0.004	116.5	0.995	-8.6
300	0.981	-18.6	3.24	167.3	0.003	89.6	0.993	-10.3
350	0.975	-21.7	3.23	165.8	0.004	76.3	0.992	-11.8
400	0.967	-24.8	3.24	163.3	0.004	87.0	0.989	-13.9
450	0.964	-27.9	3.22	161.9	0.004	91.9	0.991	-15.5
500	0.958	-30.8	3.22	159.4	0.006	89.0	0.987	-17.0
550	0.951	-33.9	3.22	157.9	0.006	100.4	0.988	-18.9
600	0.939	-37.0	3.20	155.4	0.004	84.2	0.985	-20.4
650	0.933	-40.3	3.20	154.1	0.004	85.4	0.984	-22.2
700	0.922	-43.5	3.20	150.7	0.007	80.4	0.983	-23.7
750	0.916	-46.5	3.19	150.7	0.007	93.5	0.981	-25.5
800	0.900	-49.6	3.19	146.7	0.006	108.8	0.979	-27.2
850	0.892	-52.8	3.18	146.4	0.005	122.9	0.978	-28.9
900	0.883	-56.2	3.18	142.8	0.005	120.3	0.975	-30.6
950	0.866	-59.2	3.17	142.3	0.006	104.0	0.970	-32.3
1000	0.858	-62.0	3.16	139.8	0.006	121.3	0.970	-33.8

Not recommended for new designs

### Package Dimensions



### Ordering Information

Orderable Part Number	Quantity	Shipping Container
BB506MFS-TL-E BB506MFS-TL-H	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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