

# TBB1016

## Twin Built in Biasing Circuit MOS FET IC VHF/VHF RF Amplifier

REJ03G1327-0200

Rev.2.00

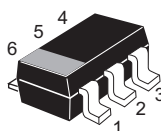
Aug 22, 2006

### Features

- Small SMD package CMTAK-6 built in twin BBFET; To reduce using parts cost & PC board space.
- Very useful for total tuner cost reduction.
- Suitable for World Standard Tuner RF amplifier.
- High gain; PG = 32 dB at 200 MHz
- Low noise; NF = 1.0 dB at 200 MHz
- Power supply voltage: 5 V

### Outline

RENESAS Package code: PTSP0006JA-A  
(Package name: CMTAK-6)



1. Drain(1)
2. Source
3. Drain(2)
4. Gate-1(2)
5. Gate-2
6. Gate-1(1)

- Notes:
1. Marking is "RM".
  2. TBB1016 is individual type number of RENESAS TBBFET.

### 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>	250	mW
Channel temperature	$T_{ch}$	150	°C
Storage temperature	$T_{stg}$	-55 to +150	°C

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

## Electrical Characteristics

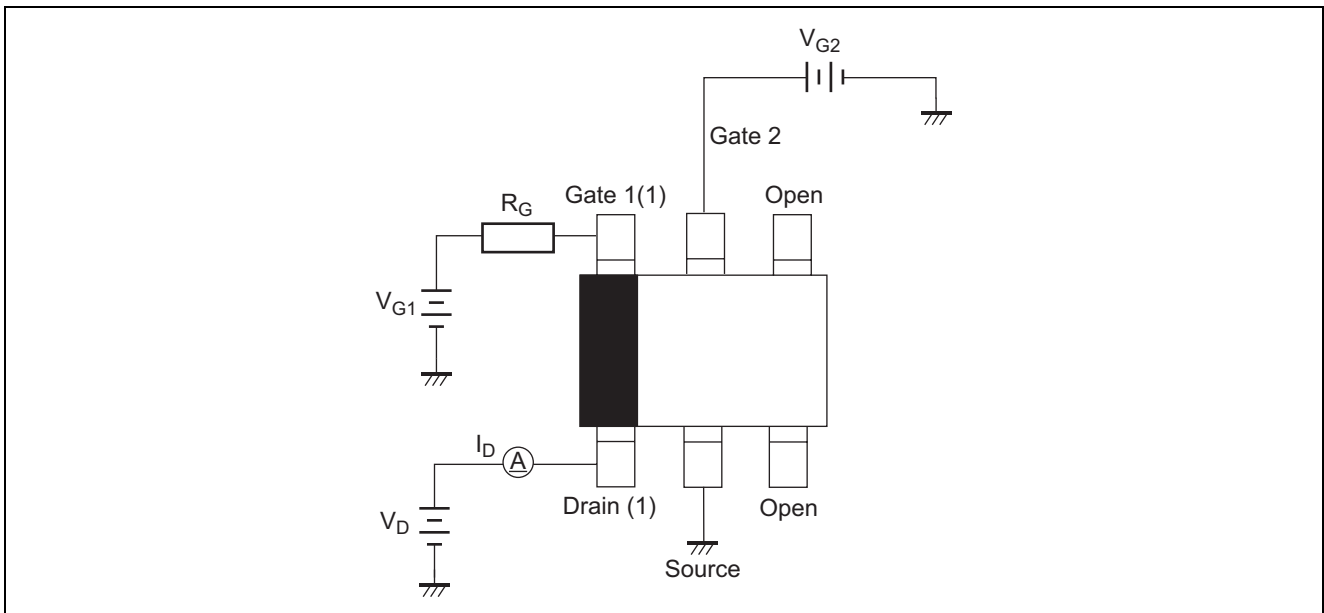
- The below specification are applicable for FET1 and FET2 unit

(Ta = 25°C)

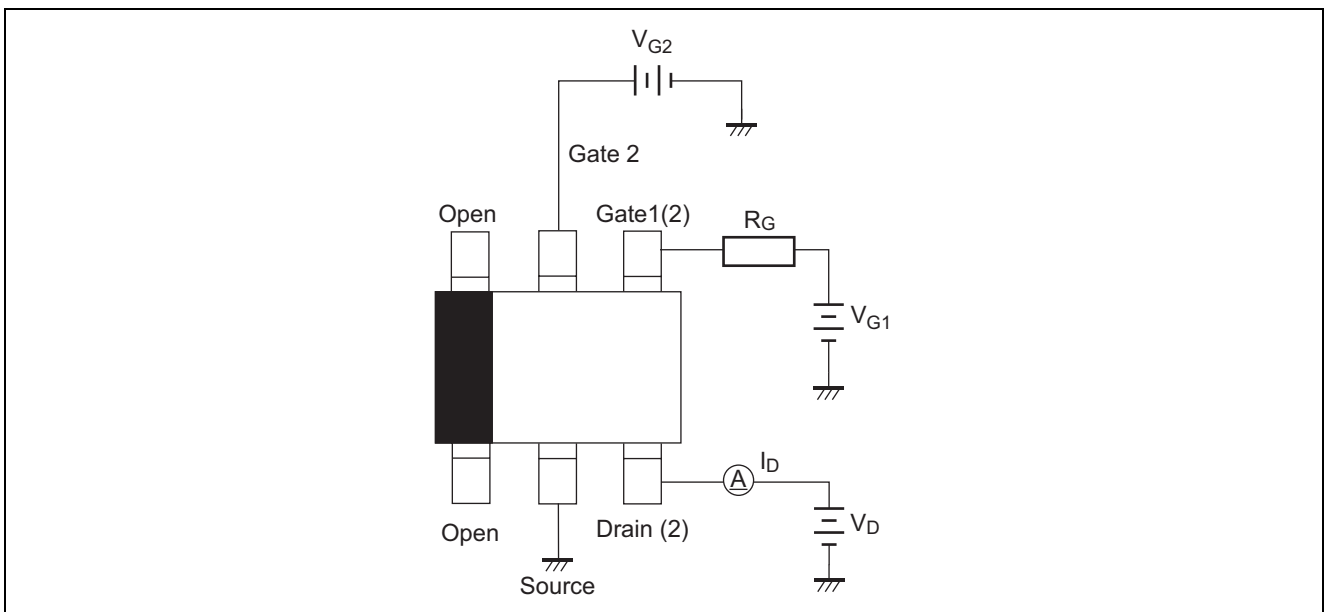
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain to source breakdown voltage	$V_{(BR)DSS}$	6	—	—	V	$I_D = 200 \mu A$ , $V_{G1S} = V_{G2S} = 0$
Gate1 to source breakdown voltage	$V_{(BR)G1SS}$	+6	—	—	V	$I_{G1} = +10 \mu A$ , $V_{G2S} = V_{DS} = 0$
Gate2 to source breakdown voltage	$V_{(BR)G2SS}$	+6	—	—	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	$I_{D(op)}$	11	15	19	mA	$V_{DS} = 5 V$ , $V_{G1} = 5 V$ $V_{G2S} = 4 V$ , $R_G = 120 k\Omega$
Forward transfer admittance	$ y_{fs} $	30	35	42	mS	$V_{DS} = 5 V$ , $V_{G1} = 5 V$ , $V_{G2S} = 4 V$ , $f = 1 kHz$ , $R_G = 120 k\Omega$
Input capacitance	$C_{iss}$	1.8	2.2	2.6	pF	$V_{DS} = 5 V$ , $V_{G1} = 5 V$ , $V_{G2S} = 4 V$ , $f = 1 MHz$ , $R_G = 120 k\Omega$
Output capacitance	$C_{oss}$	0.9	1.3	1.7	pF	$f = 1 MHz$ , $R_G = 120 k\Omega$
Power gain	PG	27	32	37	dB	$V_{DS} = 5 V$ , $V_{G1} = 5 V$ , $V_{G2S} = 4 V$ , $R_G = 120 k\Omega$ , $f = 200 MHz$
Noise figure	NF	—	1.0	1.7	dB	

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

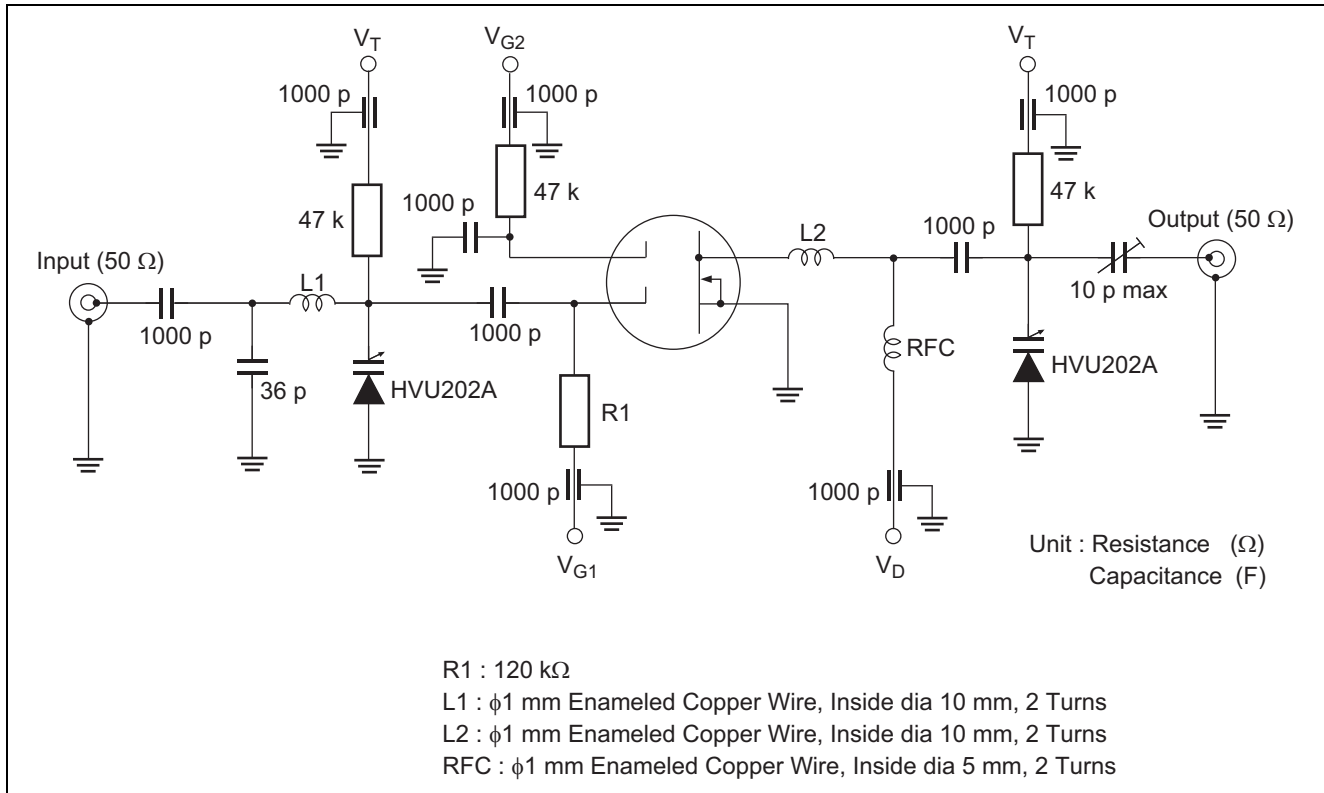
### • Measurement of FET1



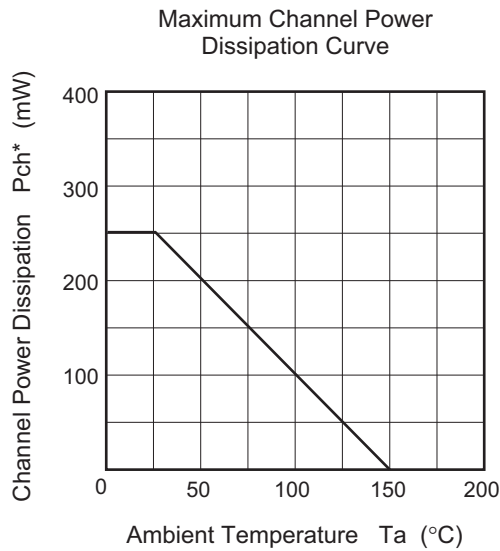
### • Measurement of FET2



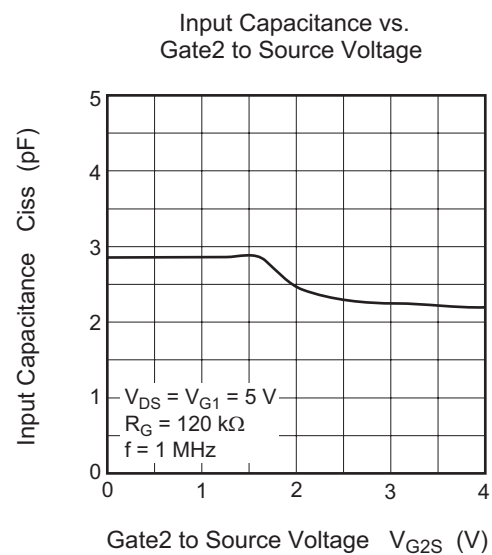
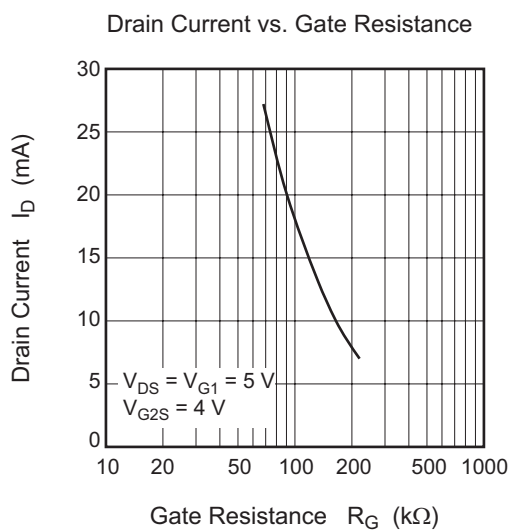
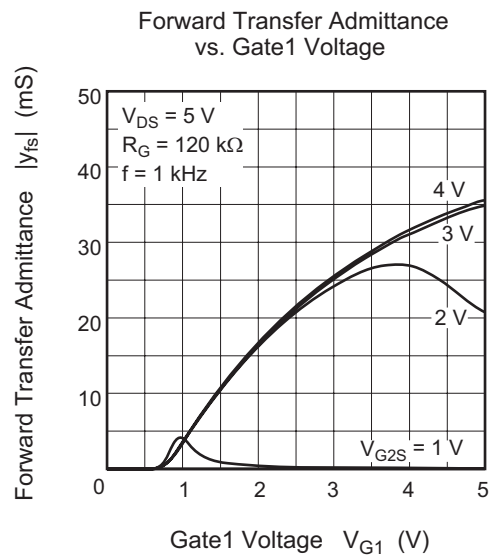
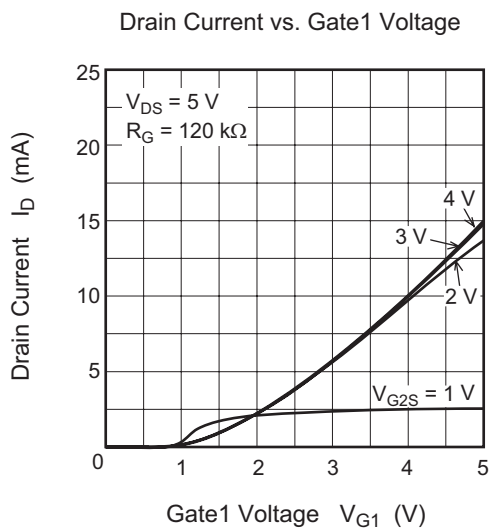
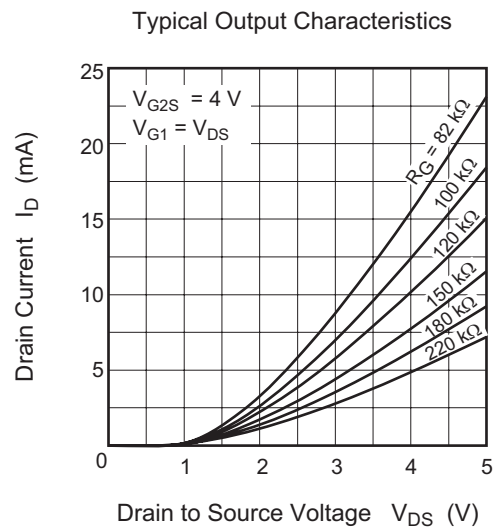
## 200 MHz Power Gain, Noise Figure Test Circuit

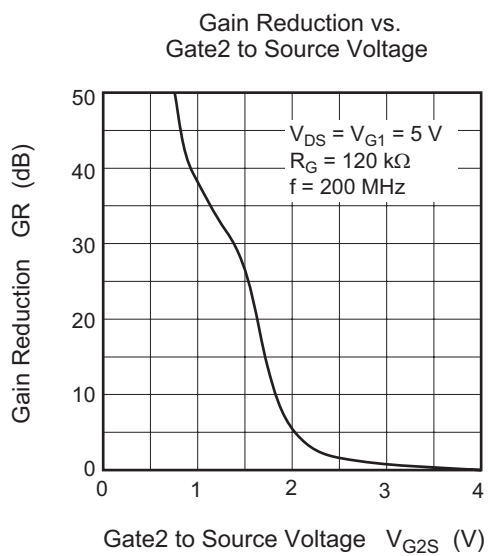
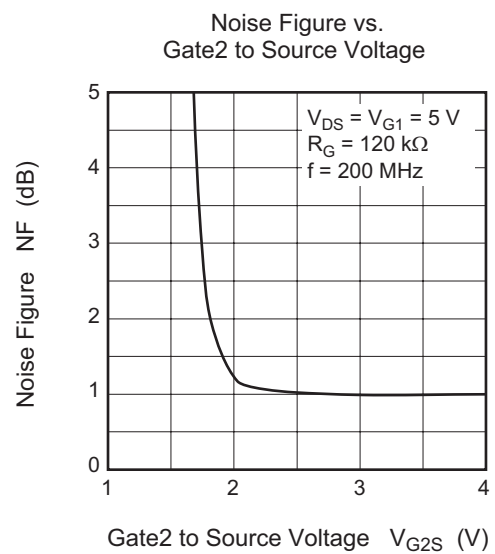
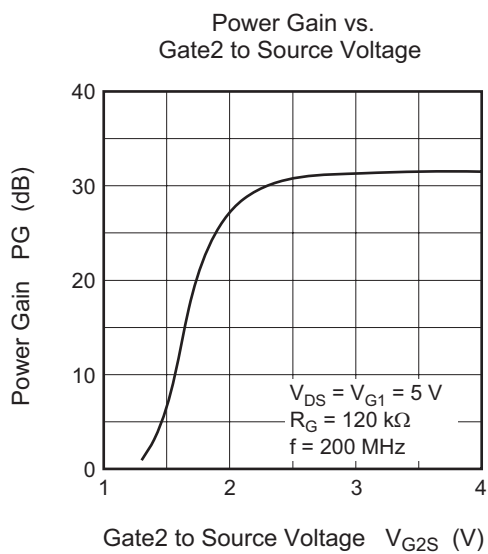
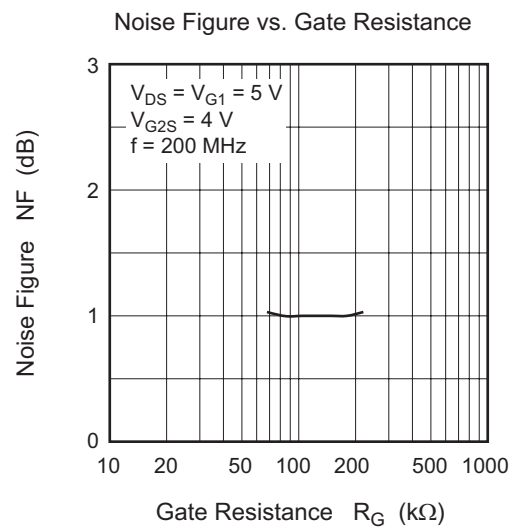
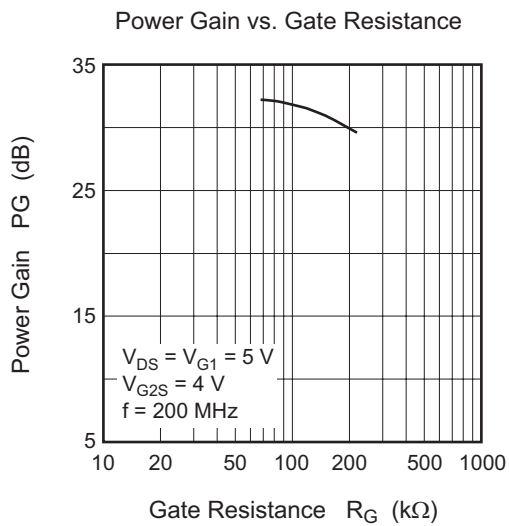


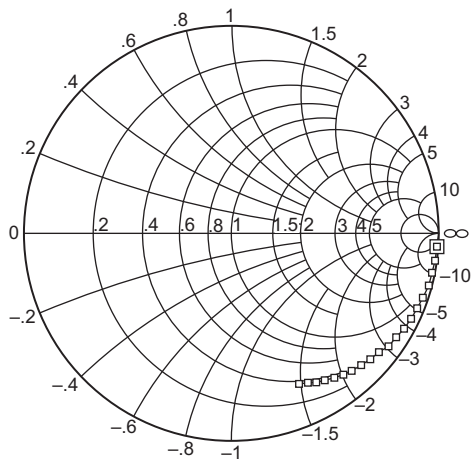
## Main Characteristics



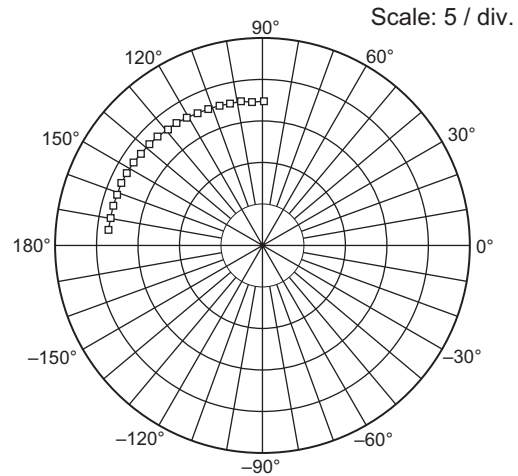
\* Value on the glass epoxy board (50 mm × 40 mm × 1 mm)



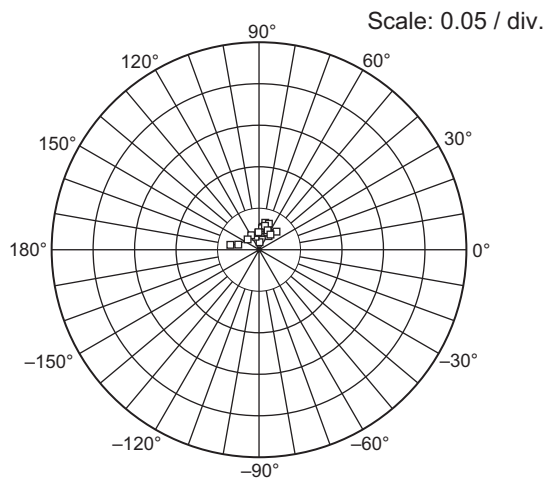


S<sub>11</sub> Parameter vs. Frequency

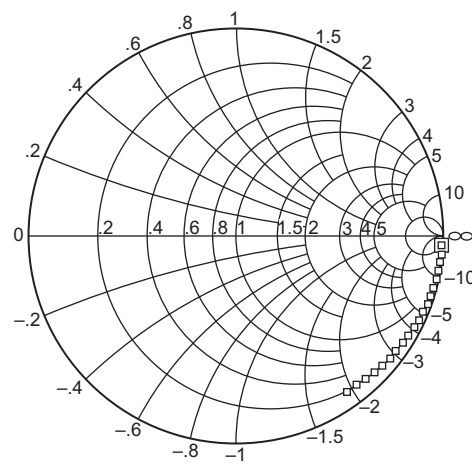
Test condition:  $V_{DS} = 5\text{ V}$ ,  $V_{G1} = 5\text{ V}$ ,  
 $V_{G2S} = 4\text{ V}$ ,  $R_G = 120\text{ k}\Omega$   
 0.05 to 1.0 GHz (0.05 GHz step)

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

Test condition:  $V_{DS} = 5\text{ V}$ ,  $V_{G1} = 5\text{ V}$ ,  
 $V_{G2S} = 4\text{ V}$ ,  $R_G = 120\text{ k}\Omega$   
 0.05 to 1.0 GHz (0.05 GHz step)

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

Test condition:  $V_{DS} = 5\text{ V}$ ,  $V_{G1} = 5\text{ V}$ ,  
 $V_{G2S} = 4\text{ V}$ ,  $R_G = 120\text{ k}\Omega$   
 0.05 to 1.0 GHz (0.05 GHz step)

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

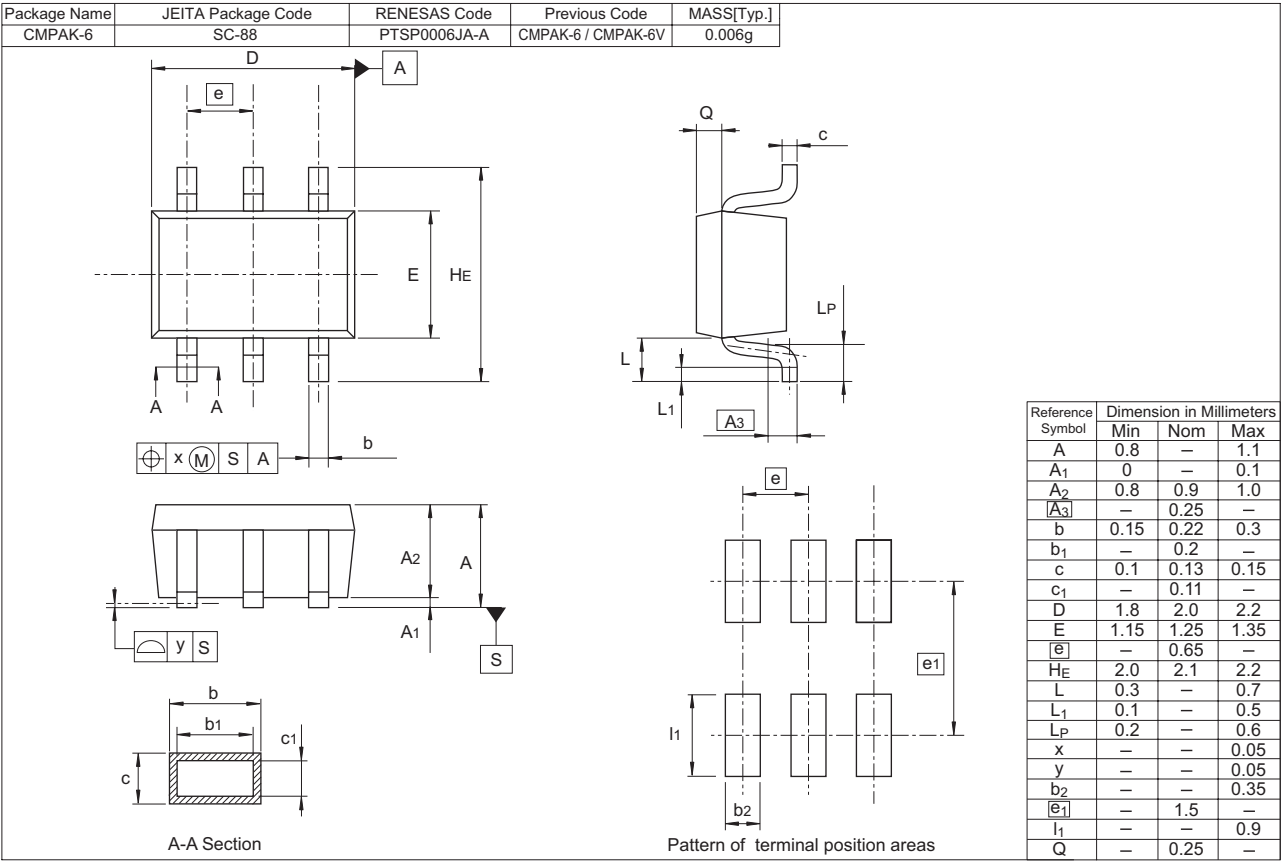
Test condition:  $V_{DS} = 5\text{ V}$ ,  $V_{G1} = 5\text{ V}$ ,  
 $V_{G2S} = 4\text{ V}$ ,  $R_G = 120\text{ k}\Omega$   
 0.05 to 1.0 GHz (0.05 GHz step)

**S parameter**(V<sub>DS</sub> = 5 V, V<sub>GI</sub> = 5 V, V<sub>G2S</sub> = 4 V, R<sub>G</sub> = 120 kΩ, Z<sub>O</sub> = 50 Ω)

Freq. (MHz)	S11		S21		S12		S22	
	Mag	Deg	Mag	Deg	Mag	Deg	Mag	Deg
50	0.994	-3.7	3.73	175.3	0.002	88.4	0.992	-2.4
100	0.992	-7.6	3.72	170.7	0.003	107.7	0.996	-5.1
150	0.987	-11.1	3.72	166.1	0.004	54.7	0.992	-7.2
200	0.985	-14.8	3.70	161.7	0.004	62.4	0.990	-9.6
250	0.975	-18.6	3.71	157.0	0.005	81.1	0.990	-12.0
300	0.967	-21.9	3.69	152.9	0.005	83.3	0.984	-14.6
350	0.960	-25.4	3.68	148.1	0.004	65.3	0.982	-17.1
400	0.952	-28.9	3.65	143.8	0.006	68.8	0.982	-19.4
450	0.940	-32.2	3.64	138.9	0.006	77.6	0.972	-21.9
500	0.934	-35.7	3.62	134.7	0.006	69.3	0.971	-24.6
550	0.914	-38.8	3.58	130.0	0.006	77.0	0.965	-26.9
600	0.904	-42.1	3.58	125.9	0.006	45.7	0.959	-29.9
650	0.892	-45.4	3.55	121.4	0.005	66.8	0.955	-32.5
700	0.881	-48.8	3.52	116.9	0.004	52.5	0.948	-35.6
750	0.870	-51.5	3.51	112.5	0.004	93.5	0.949	-38.3
800	0.855	-54.4	3.49	107.9	0.004	92.7	0.941	-41.4
850	0.839	-57.5	3.47	103.7	0.004	121.0	0.936	-44.4
900	0.827	-60.3	3.48	99.3	0.004	140.2	0.929	-47.7
950	0.809	-62.8	3.43	95.0	0.005	167.7	0.921	-50.9
1000	0.796	-65.7	3.43	90.3	0.007	171.4	0.921	-54.5



# Package Dimensions



# Ordering Information

Part Name	Quantity	Shipping Container
TBB1016RMTL-E	3000 pcs	φ178mm reel, 8mm 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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