

# TBB1005

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

REJ03G0843-0900

Rev.9.00

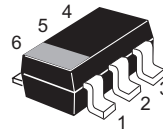
Aug 22, 2006

### Features

- Small SMD package CMPAK-6 built in twin BBFET; To reduce using parts cost & PC board space.
- Suitable for World Standard Tuner RF amplifier.
- Very useful for total tuner cost reduction.
- Withstanding to ESD; Built in ESD absorbing diode. Withstand up to 200 V at C = 200 pF, Rs = 0 conditions.
- Provide mini mold packages; CMPAK-6

### Outline

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



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

- Notes:
1. Marking is "EM".
  2. TBB1005 is individual type number of RENESAS TWIN 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	$P_{ch}^{*3}$	250	mW
Channel temperature	$T_{ch}$	150	°C
Storage temperature	$T_{stg}$	-55 to +150	°C

Notes: 3. Value on the glass epoxy board (49mm × 38mm × 1mm).

## Electrical Characteristics

(Ta = 25°C)

The below specification are applicable for UHF unit (FET1)

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	0.75	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	0.75	1.0	V	$V_{DS} = 5 V, V_{G1S} = 5 V$ $I_D = 100 \mu A$
Drain current	$I_{D(op)}$	13	17	21	mA	$V_{DS} = 5 V, V_{G1} = 5 V$ $V_{G2S} = 4 V, R_G = 100 k\Omega$
Forward transfer admittance	$ y_{fs} $	21	26	31	mS	$V_{DS} = 5 V, V_{G1} = 5 V, V_{G2S} = 4 V$ $R_G = 100 k\Omega, f = 1 kHz$
Input capacitance	$C_{iss}$	1.4	1.8	2.2	pF	$V_{DS} = 5 V, V_{G1} = 5 V$
Output capacitance	$C_{oss}$	1.0	1.4	1.8	pF	$V_{G2S} = 4 V, R_G = 100 k\Omega$
Reverse transfer capacitance	$C_{rss}$	—	0.02	0.04	pF	$f = 1 MHz$
Power gain	PG	16	21	—	dB	$V_{DS} = V_{G1} = 5 V, V_{G2S} = 4 V$ $R_G = 100 k\Omega, f = 900 MHz$
Noise figure	NF	—	1.7	2.5	dB	$Z_i = S11^*, Z_o = S22^*(:PG)$ $Z_i = S11opt (:NF)$

## Electrical Characteristics (cont.)

(Ta = 25°C)

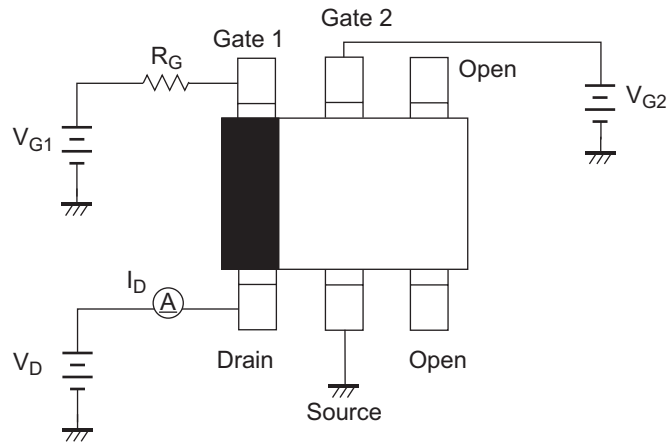
The below specification are applicable for VHF unit (FET2)

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	0.75	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	0.75	1.0	V	$V_{DS} = 5 V, V_{G1S} = 5 V$ $I_D = 100 \mu A$
Drain current	$I_{D(op)}$	14	18	22	mA	$V_{DS} = 5 V, V_{G1} = 5 V, V_{G2S} = 4 V, R_G = 82 k\Omega$
Forward transfer admittance	$ y_{fs} $	20	25	30	mS	$V_{DS} = 5 V, V_{G1} = 5 V, V_{G2S} = 4 V, R_G = 82 k\Omega, f = 1 kHz$
Input capacitance	$C_{iss}$	2.2	2.6	3.0	pF	$V_{DS} = 5 V, V_{G1} = 5 V$
Output capacitance	$C_{oss}$	1.2	1.6	2.0	pF	$V_{G2S} = 4 V, R_G = 82 k\Omega$
Reverse transfer capacitance	$C_{rss}$	—	0.03	0.05	pF	$f = 1 MHz$
Power gain	PG	22	27	—	dB	$V_{DS} = V_{G1} = 5 V, V_{G2S} = 4 V$
Noise figure	NF	—	1.2	1.7	dB	$R_G = 82 k\Omega, f = 200 MHz$

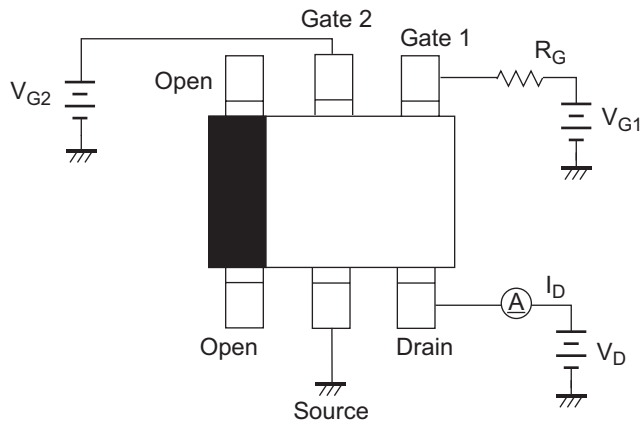
Test Circuits

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

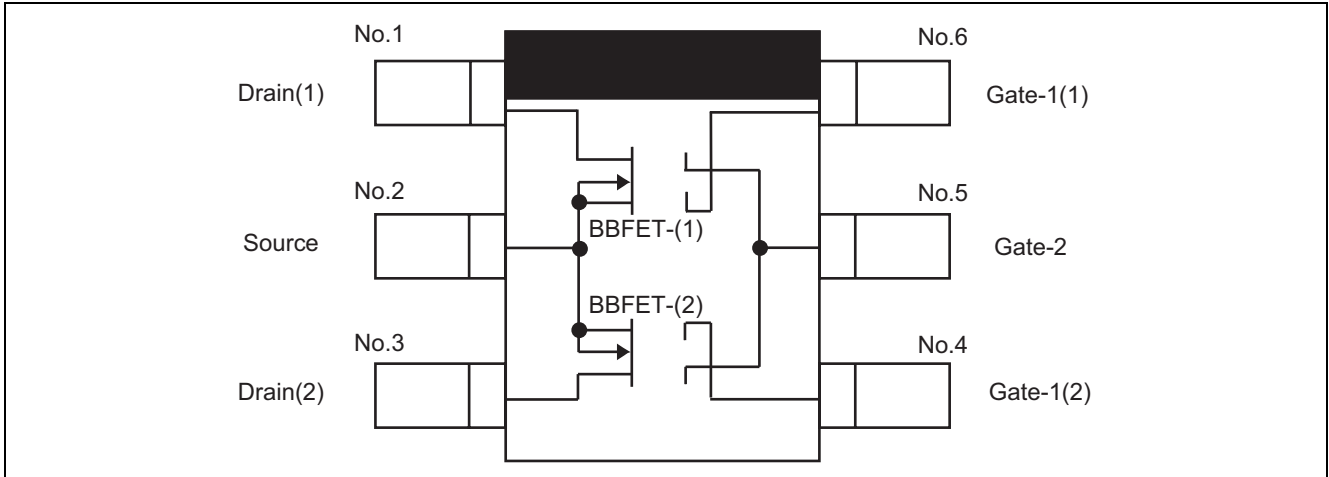
Measurement of FET1



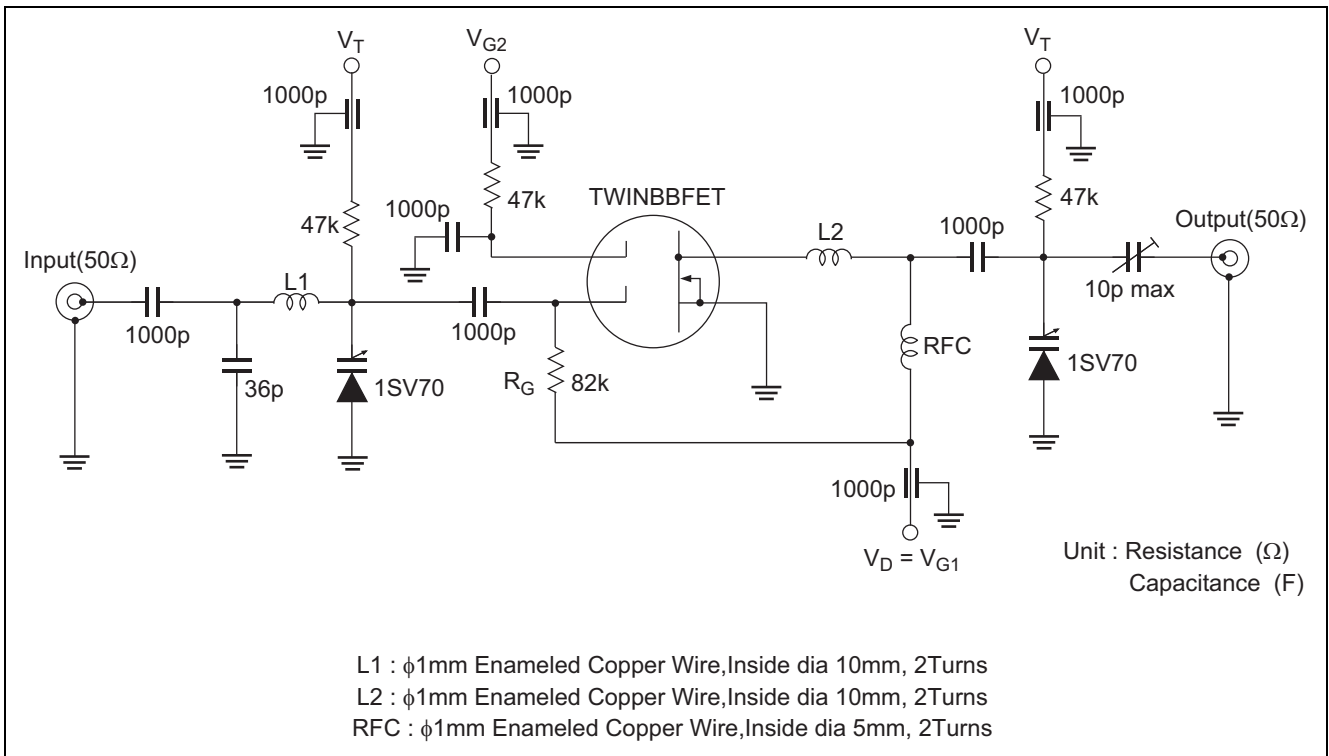
Measurement of FET2



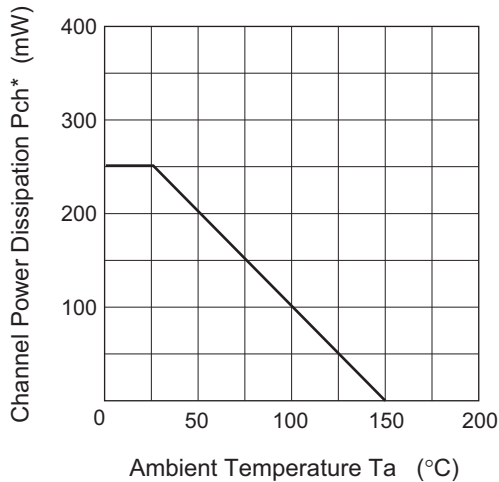
• Equivalent Circuit



• 200 MHz Power Gain, Noise Figure Test Circuit

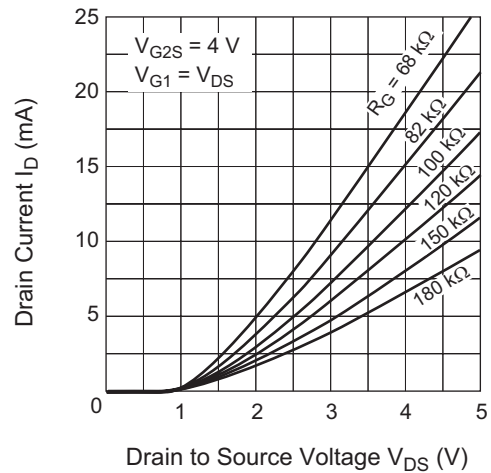


Maximum Channel Power Dissipation Curve

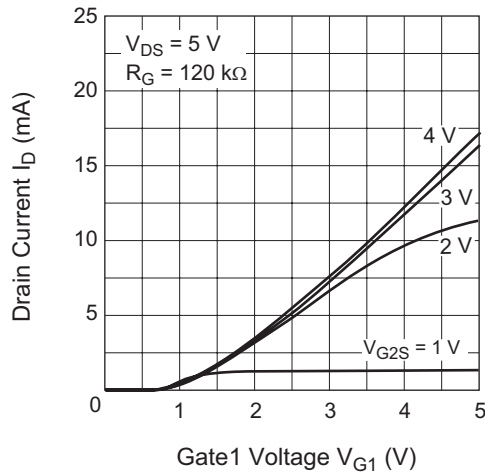


\* Value on the glass epoxy board (49mm × 38mm × 1mm)

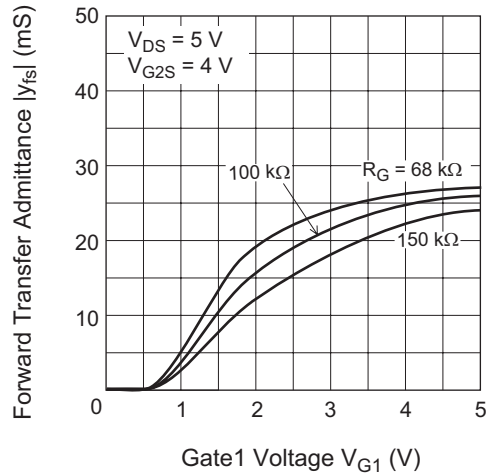
Typical Output Characteristics (FET1)



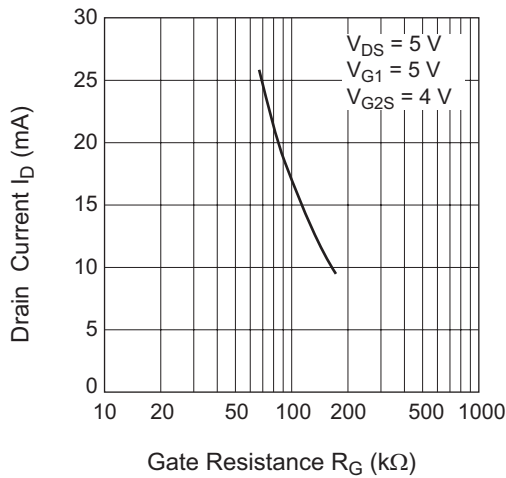
Drain Current vs. Gate1 Voltage (FET1)



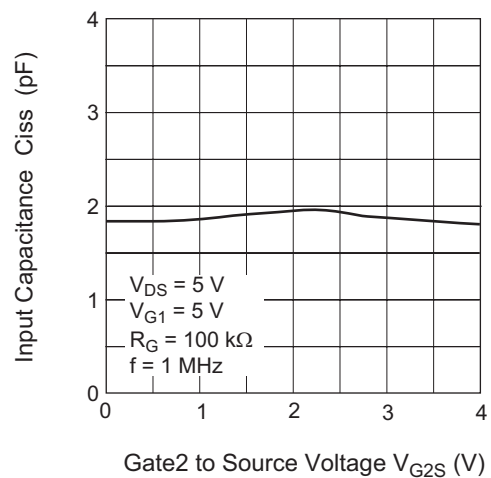
Forward Transfer Admittance vs. Gate1 Voltage (FET1)



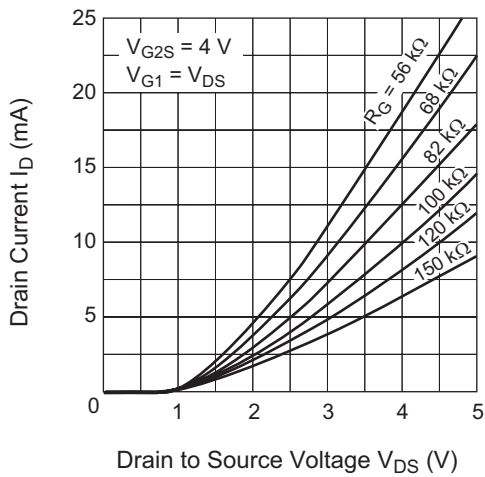
Drain Current vs. Gate Resistance (FET1)



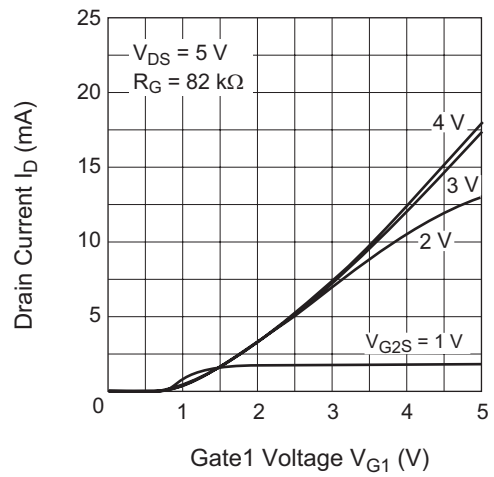
Input Capacitance vs. Gate2 to Source Voltage (FET1)



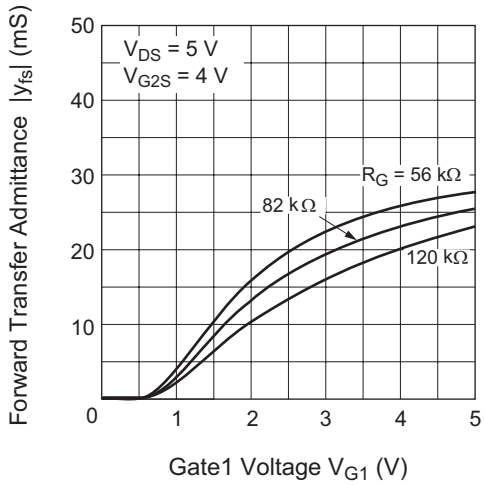
Typical Output Characteristics (FET2)



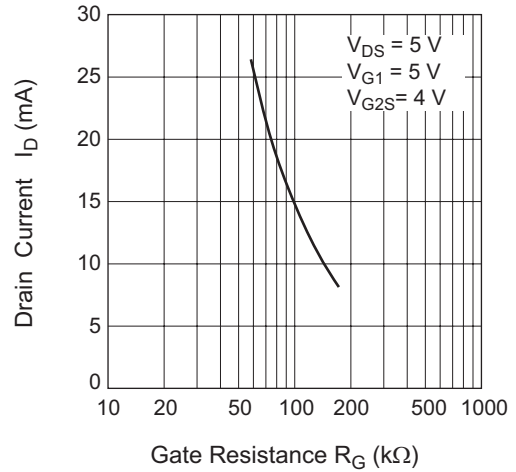
Drain Current vs. Gate1 Voltage (FET2)



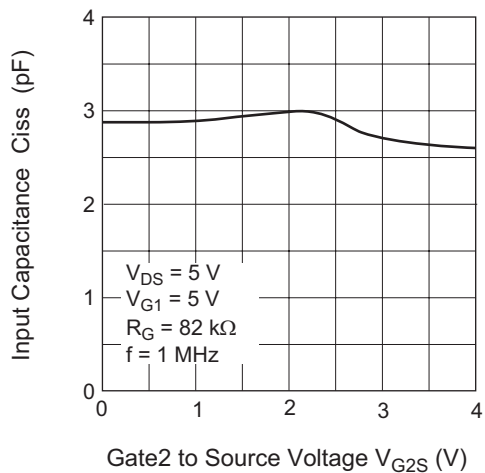
Forward Transfer Admittance vs. Gate1 Voltage (FET2)



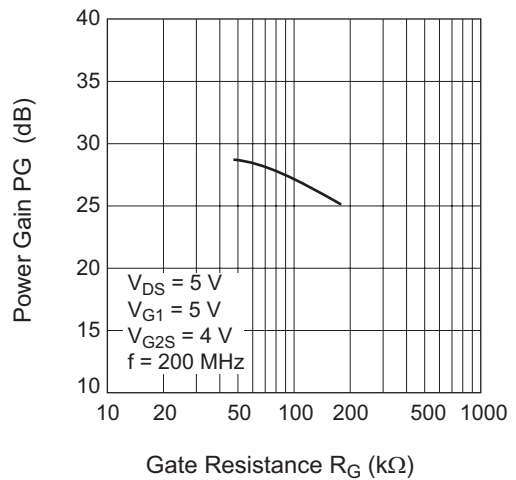
Drain Current vs. Gate Resistance (FET2)

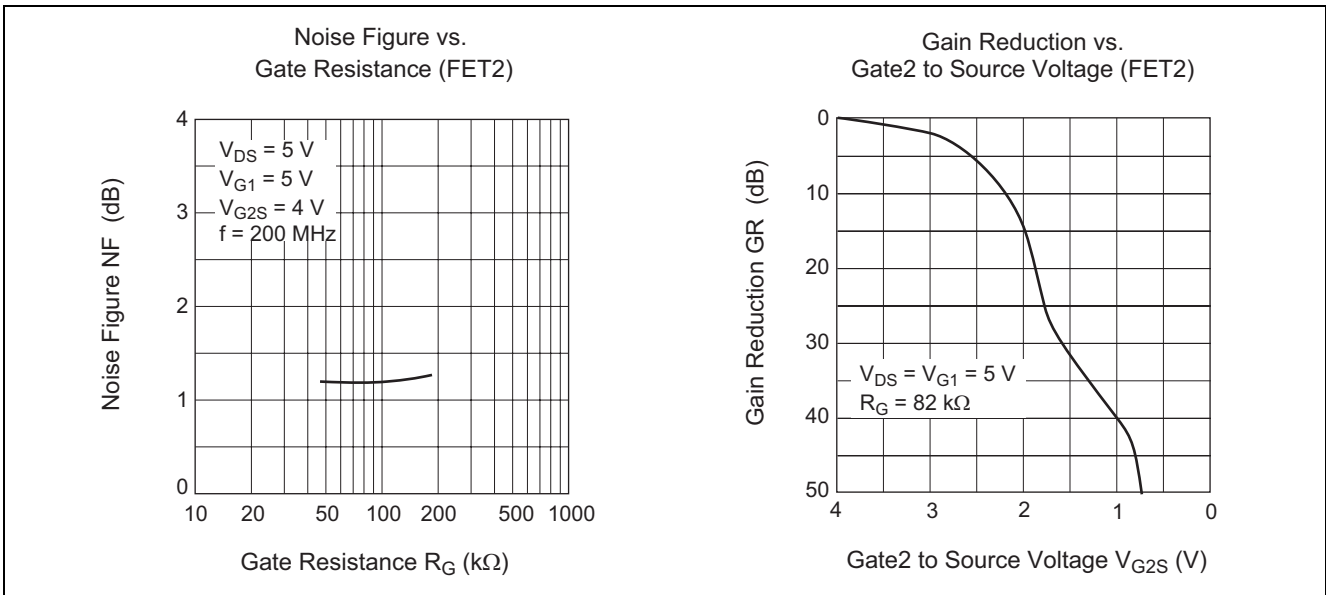


Input Capacitance vs. Gate2 to Source Voltage (FET2)



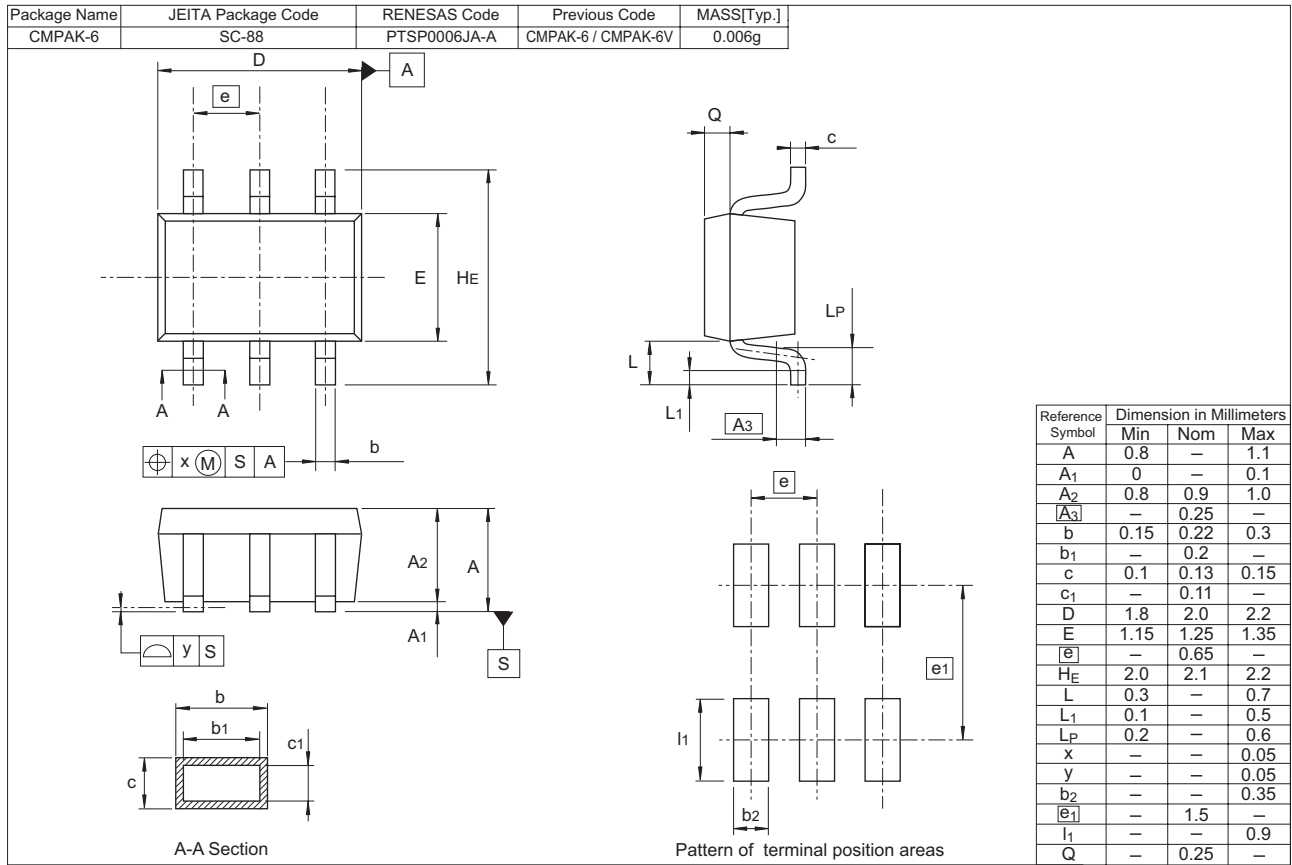
Power Gain vs. Gate Resistance (FET2)







### Package Dimensions



### Ordering Information

Part Name	Quantity	Shipping Container
TBB1005EMTL-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.

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