

TBB1005

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

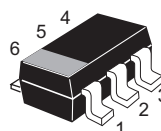
R07DS0315EJ1000
(Previous: REJ03G0843-0900)
Rev.10.00
Mar 28, 2011

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 | Tch | 150 | °C |
| Storage temperature | Tstg | -55 to +150 | °C |

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

Electrical Characteristics

The below specification are applicable for UHF unit (FET1)

(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 | 0.75 | 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 | $V_{DS} = V_{G1} = 5 V, V_{G2S} = 4 V$ |
| Noise figure | NF | — | 1.7 | 2.5 | dB | $R_G = 100 k\Omega, f = 900 MHz$ $Z_i = S11^*, Z_o = S22^* (:PG)$ $Z_i = S11opt (:NF)$ |

The below specification are applicable for VHF unit (FET2)

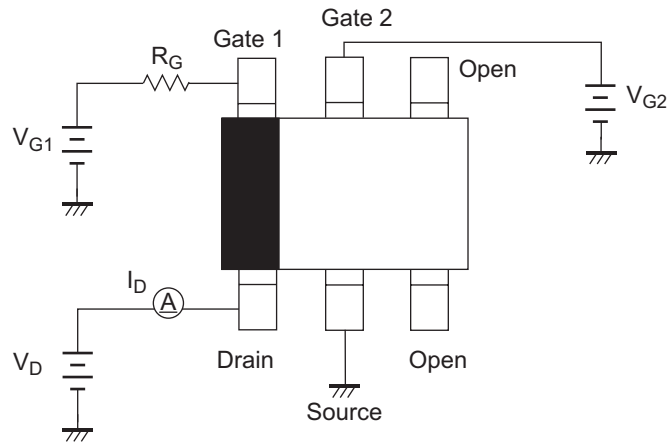
(Ta = 25°C)

| 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 | 0.75 | 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 | $R_G = 82 k\Omega, f = 200 MHz$ |

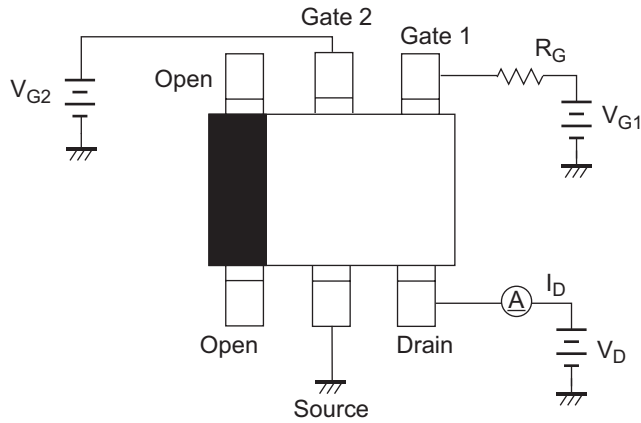
Test Circuits

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

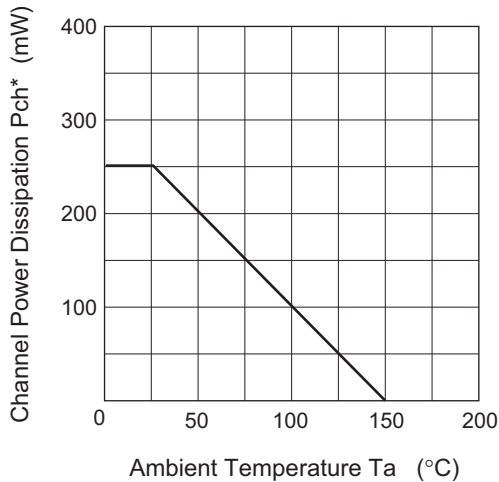
Measurement of FET1



Measurement of FET2

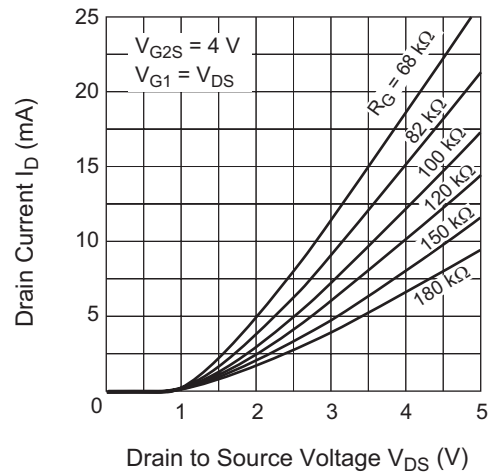


Maximum Channel Power Dissipation Curve

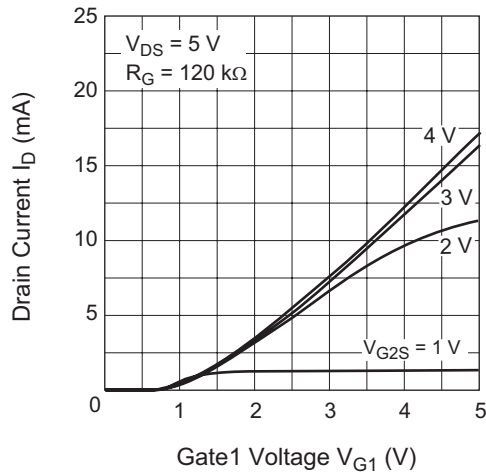


* Value on the glass epoxy board (49mm × 38mm × 1mm)

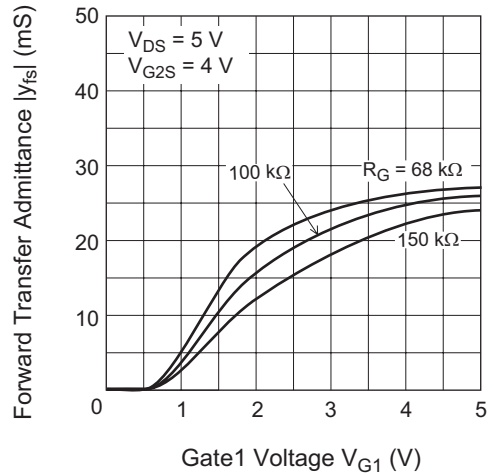
Typical Output Characteristics (FET1)



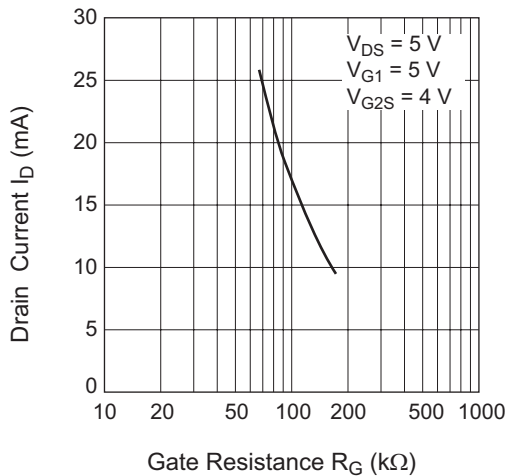
Drain Current vs. Gate1 Voltage (FET1)



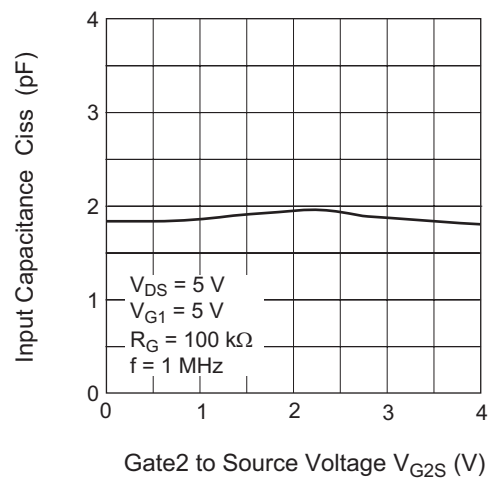
Forward Transfer Admittance vs. Gate1 Voltage (FET1)



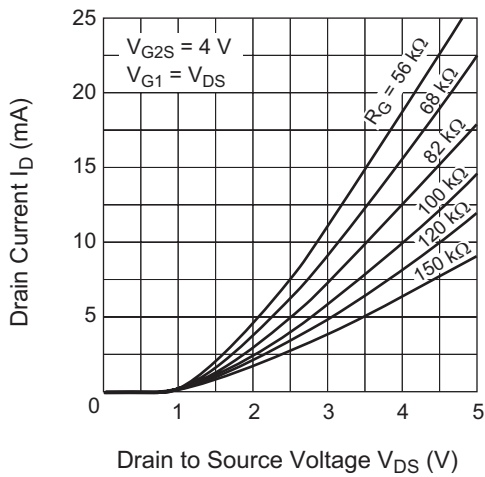
Drain Current vs. Gate Resistance (FET1)



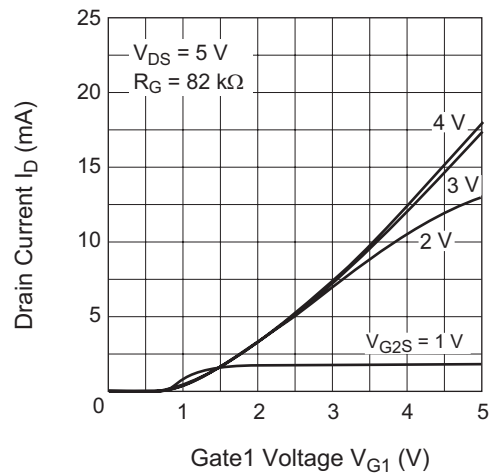
Input Capacitance vs. Gate2 to Source Voltage (FET1)



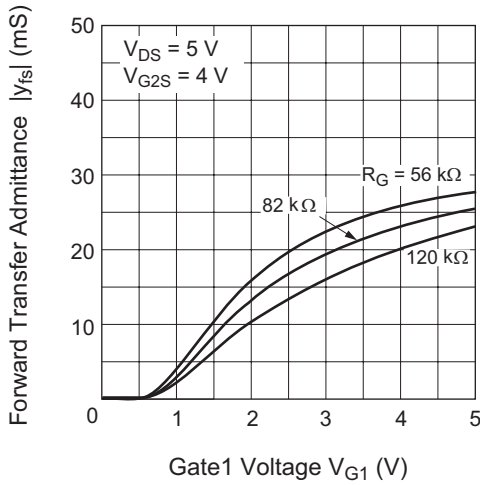
Typical Output Characteristics (FET2)



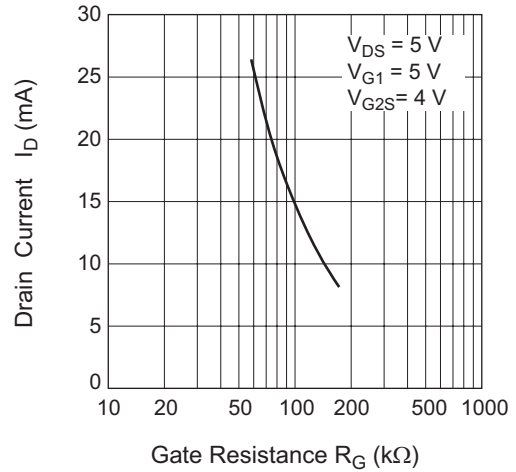
Drain Current vs. Gate1 Voltage (FET2)



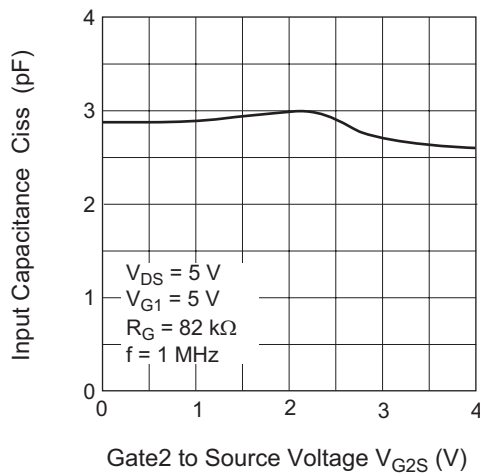
Forward Transfer Admittance vs. Gate1 Voltage (FET2)



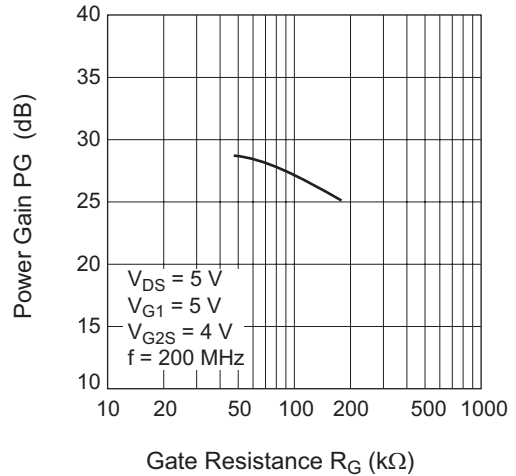
Drain Current vs. Gate Resistance (FET2)

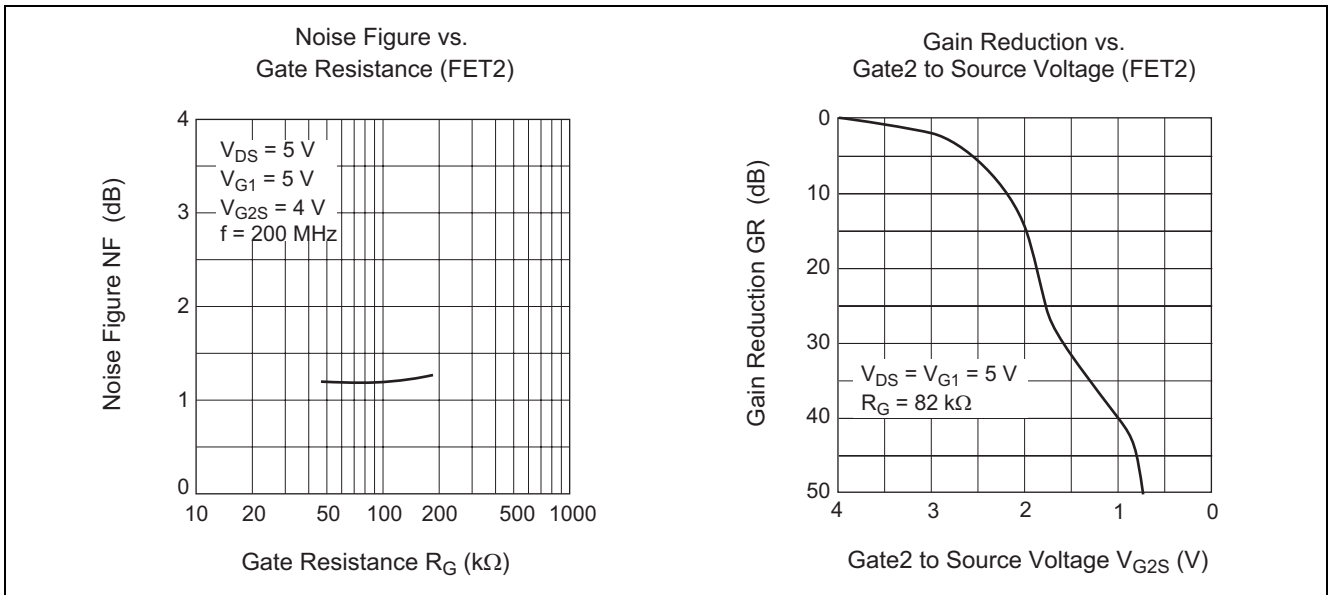


Input Capacitance vs. Gate2 to Source Voltage (FET2)

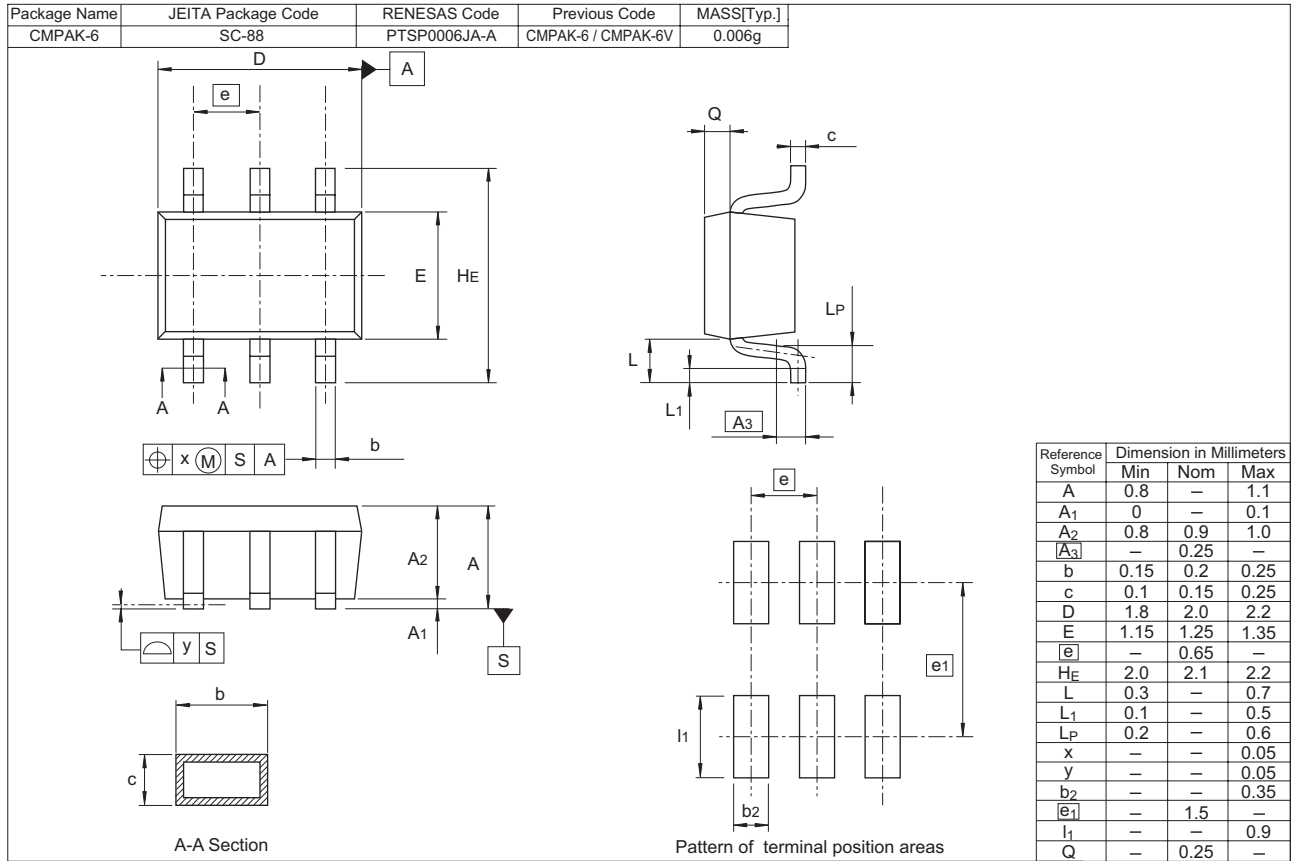


Power Gain vs. Gate Resistance (FET2)





Package Dimensions



Ordering Information

| Part Name | Quantity | Shipping Container |
|---------------|----------|-----------------------------------|
| TBB1005EMTL-E | 3000 | φ 178 mm Reel, 8 mm Emboss Taping |
| TBB1005EMTL-H | | |

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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