



TBB1005

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

REJ03G0843-0900

Rev.9.00

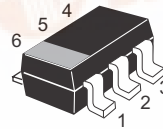
Aug 22, 2006

Features

- Small SMD package CMTAK-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; CMTAK-6

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

Electrical Characteristics (cont.)

(Ta = 25°C)

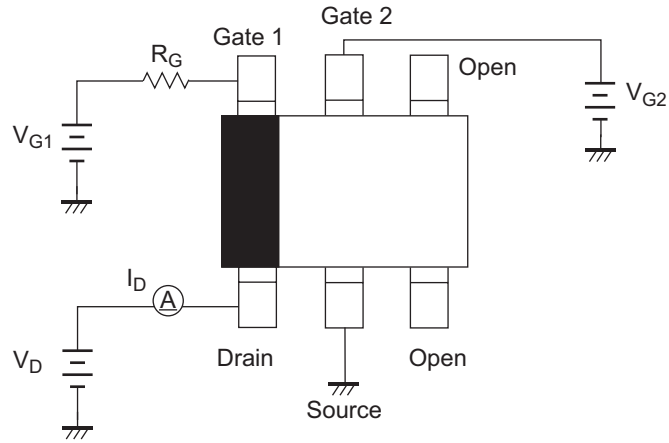
The below specification are applicable for VHF unit (FET2)

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	$V_{DS} = 5V, V_{G1} = 5 V$
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	$R_G = 82 k\Omega, f = 200 MHz$

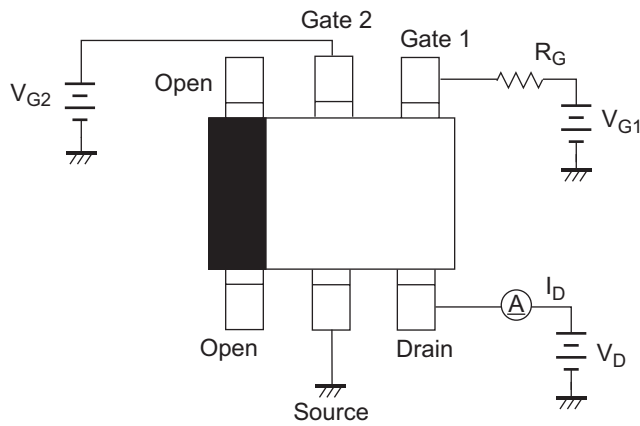
Test Circuits

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

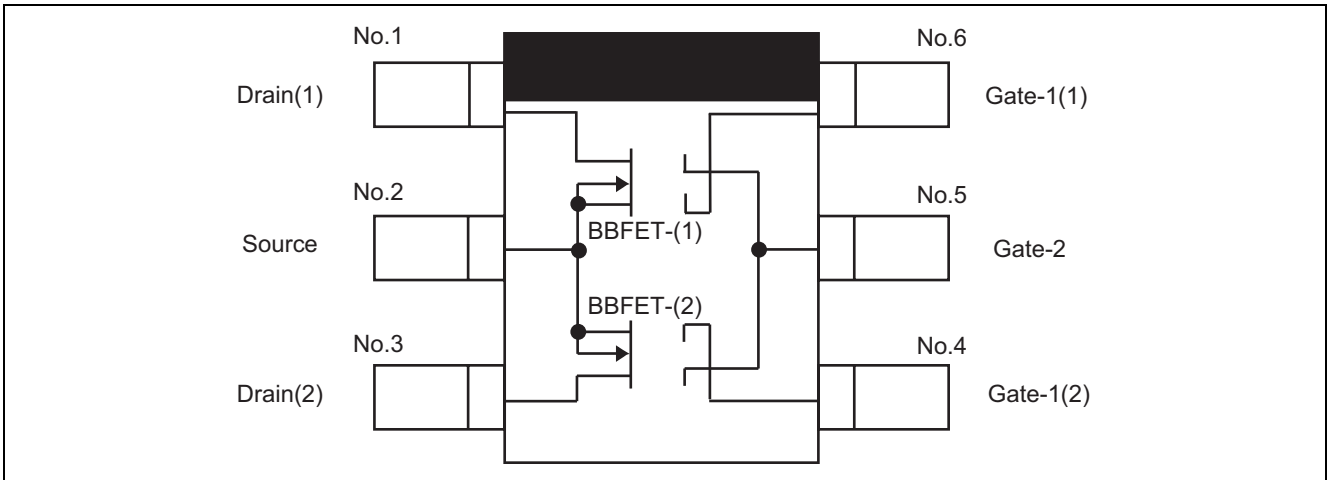
Measurement of FET1



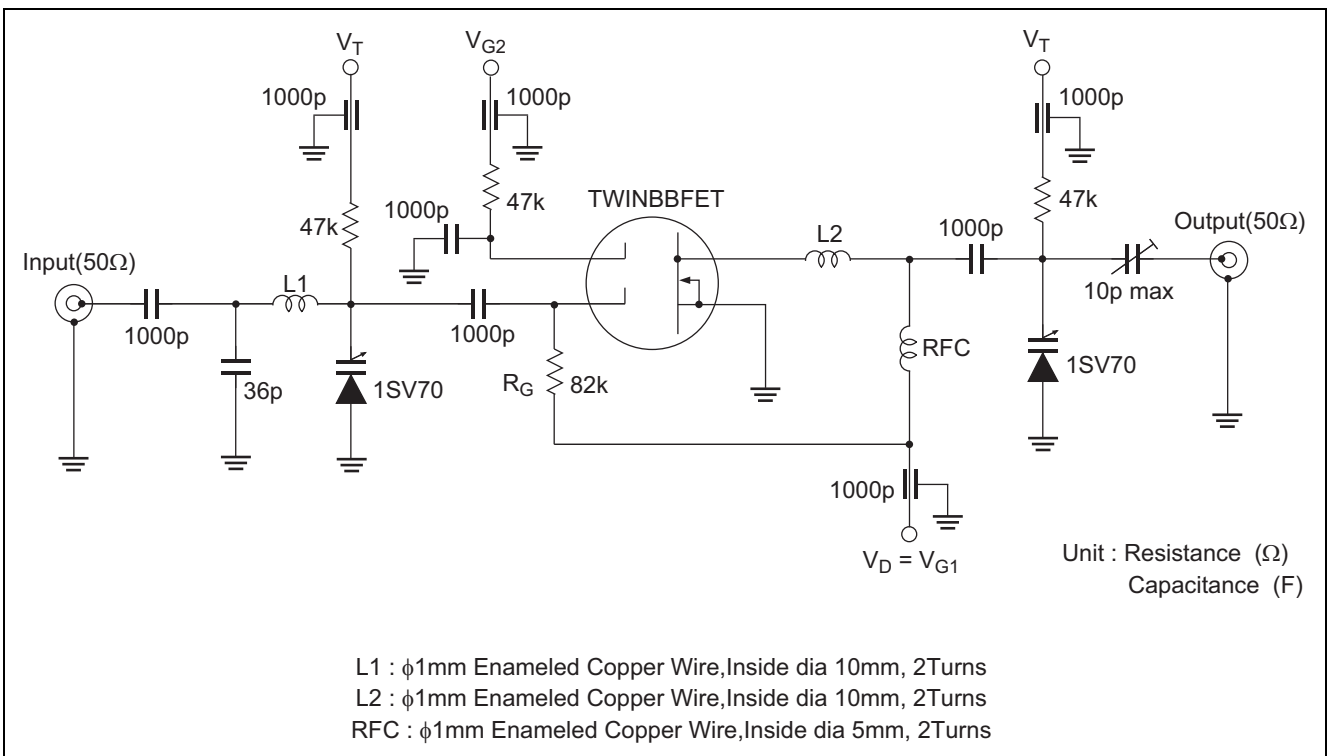
Measurement of FET2



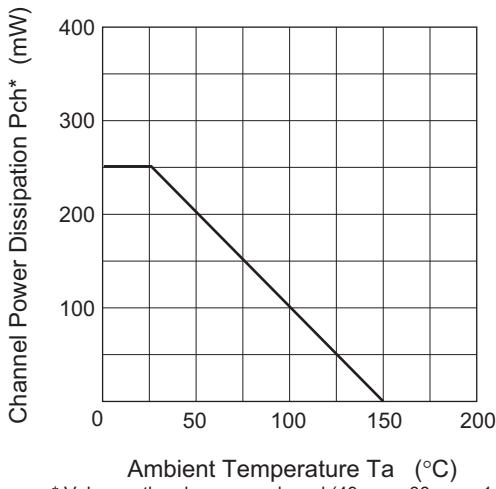
• Equivalent Circuit



• 200 MHz Power Gain, Noise Figure Test Circuit

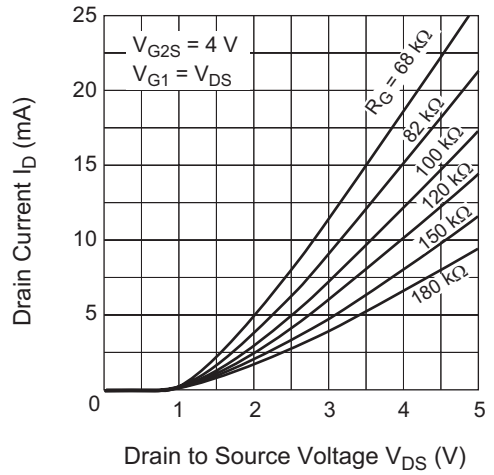


Maximum Channel Power Dissipation Curve

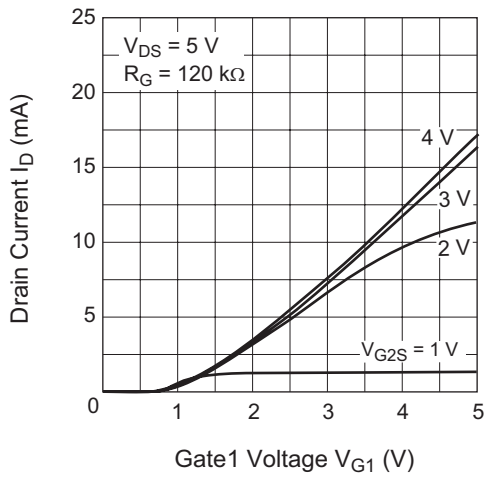


* Value on the glass epoxy board (49mm × 38mm × 1mm)

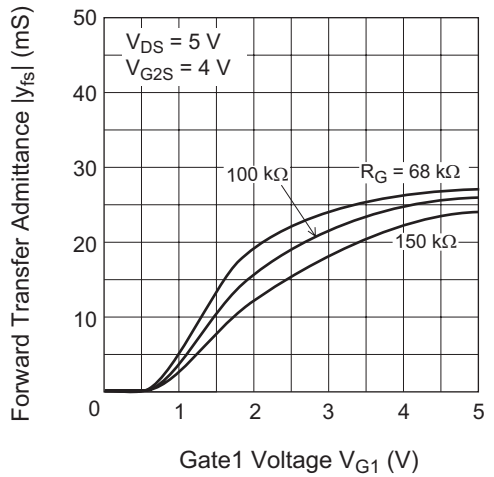
Typical Output Characteristics (FET1)



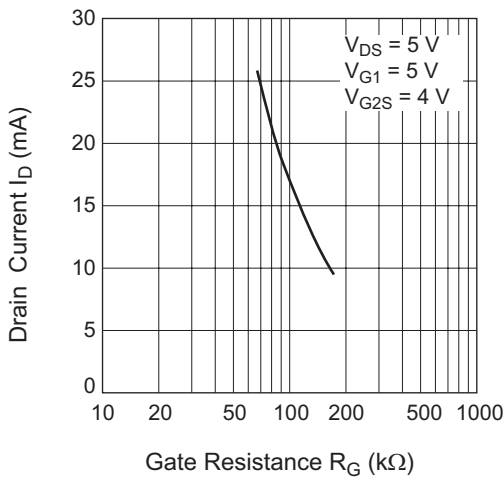
Drain Current vs. Gate1 Voltage (FET1)



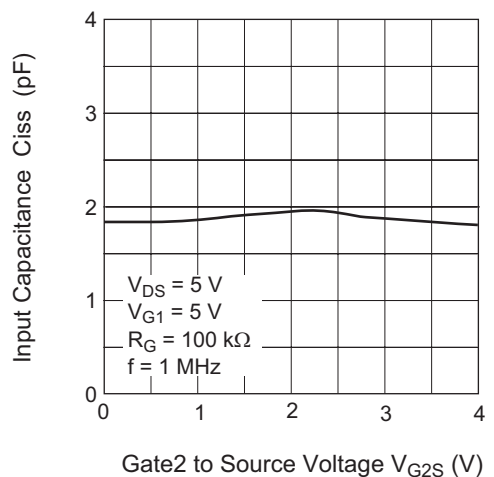
Forward Transfer Admittance vs. Gate1 Voltage (FET1)



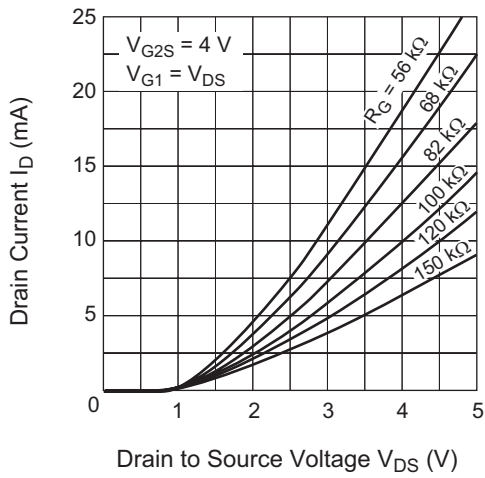
Drain Current vs. Gate Resistance (FET1)



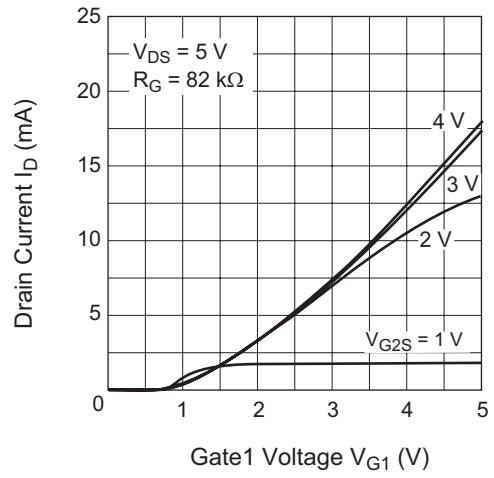
Input Capacitance vs. Gate2 to Source Voltage (FET1)



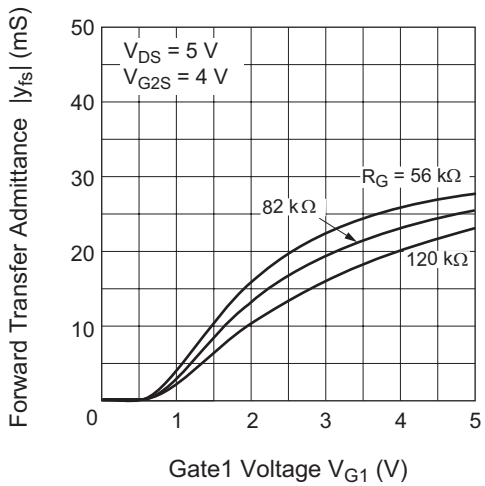
Typical Output Characteristics (FET2)



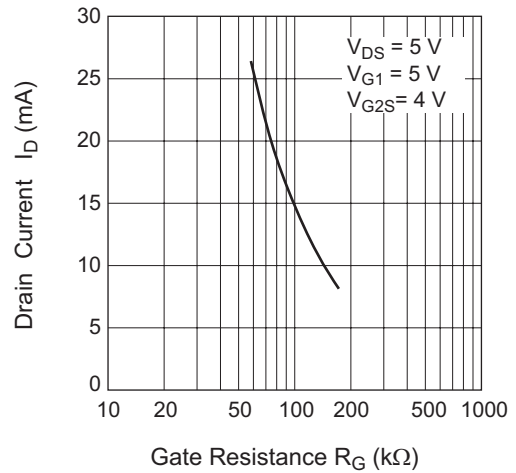
Drain Current vs. Gate1 Voltage (FET2)



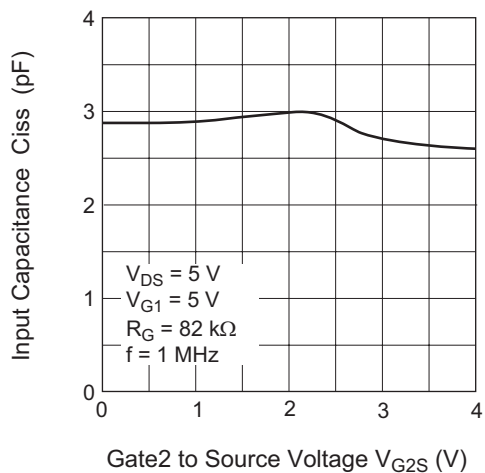
Forward Transfer Admittance vs. Gate1 Voltage (FET2)



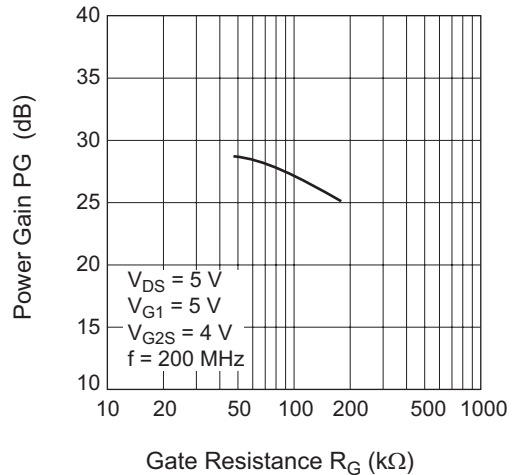
Drain Current vs. Gate Resistance (FET2)

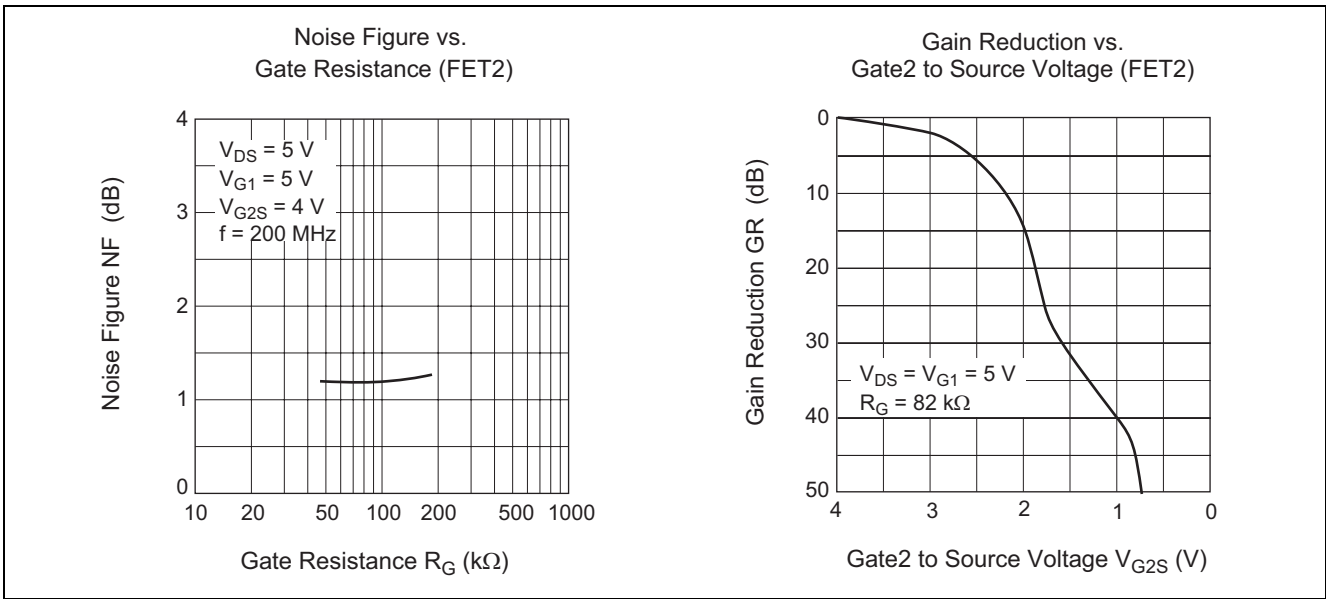


Input Capacitance vs. Gate2 to Source Voltage (FET2)

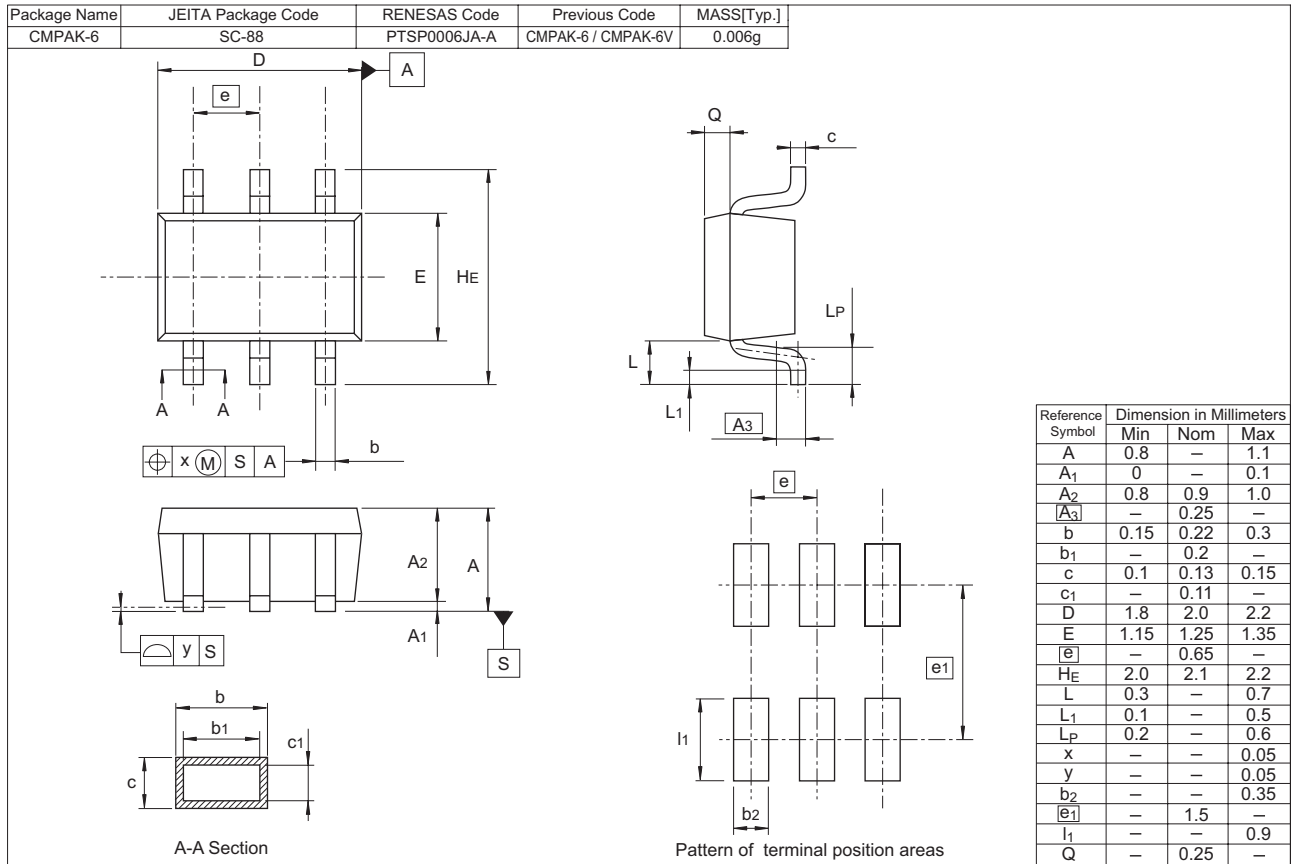


Power Gain vs. Gate Resistance (FET2)





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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Renesas Technology America, Inc.

450 Holger Way, San Jose, CA 95134-1368, U.S.A
Tel: <1> (408) 382-7500, Fax: <1> (408) 382-7501

Renesas Technology Europe Limited

Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K.
Tel: <44> (1628) 585-100, Fax: <44> (1628) 585-900

Renesas Technology (Shanghai) Co., Ltd.

Unit 204, 205, AZIACenter, No.1233 Lujiazui Ring Rd, Pudong District, Shanghai, China 200120
Tel: <86> (21) 5877-1818, Fax: <86> (21) 6887-7898

Renesas Technology Hong Kong Ltd.

7th Floor, North Tower, World Finance Centre, Harbour City, 1 Canton Road, Tsimshatsui, Kowloon, Hong Kong
Tel: <852> 2265-6688, Fax: <852> 2730-6071

Renesas Technology Taiwan Co., Ltd.

10th Floor, No.99, Fushing North Road, Taipei, Taiwan
Tel: <886> (2) 2715-2888, Fax: <886> (2) 2713-2999

Renesas Technology Singapore Pte. Ltd.

1 Harbour Front Avenue, #06-10, Keppel Bay Tower, Singapore 098632
Tel: <65> 6213-0200, Fax: <65> 6278-8001

Renesas Technology Korea Co., Ltd.

Kukje Center Bldg. 18th Fl., 191, 2-ka, Hangang-ro, Yongsan-ku, Seoul 140-702, Korea
Tel: <82> (2) 796-3115, Fax: <82> (2) 796-2145

Renesas Technology Malaysia Sdn. Bhd

Unit 906, Block B, Menara Amcorp, Amcorp Trade Centre, No.18, Jalan Persiaran Barat, 46050 Petaling Jaya, Selangor Darul Ehsan, Malaysia
Tel: <603> 7955-9390, Fax: <603> 7955-9510