

TBB1004

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

REJ03G0842-1100

Rev.11.00

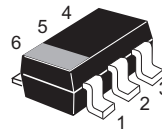
Aug 22, 2006

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 200V at C=200pF, 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. Gate-1(1)
4. Gate-1(2)
5. Gate-2
6. Drain(2)

- Notes:
1. Marking is "DM".
 2. TBB1004 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

Note: 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	0.7	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	0.7	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	$Z_i = S11^*$, $Z_o = S22^* (:PG)$ $Z_i = S11_{opt} (:NF)$

Electrical Characteristics (cont.)

(Ta = 25°C)

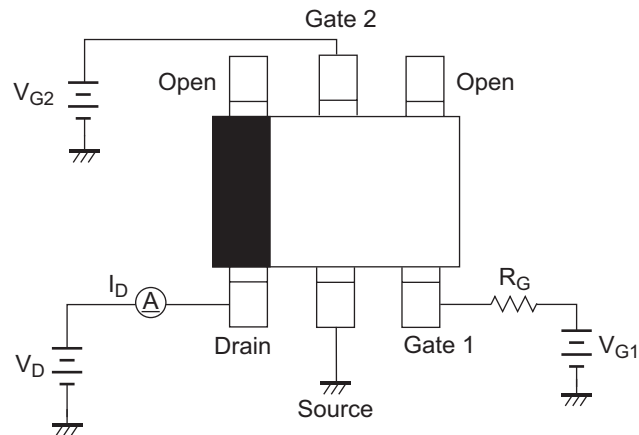
The below specification are applicable for VHF unit (FET2)

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	$I_{D(op)}$	16	20	24	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	37	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}	2.3	2.7	3.1	pF	$V_{DS} = 5\ V$, $V_{G1} = 5\ V$ $V_{G2S} = 4\ V$, $R_G = 100\ k\Omega$ $f = 1\ MHz$
Output capacitance	C_{oss}	1.4	1.8	2.2	pF	
Reverse transfer capacitance	C_{rss}	—	0.03	0.05	pF	
Power gain	PG	24	29	—	dB	$V_{DS} = V_{G1} = 5\ V$, $V_{G2S} = 4\ V$
Noise figure	NF	—	1.2	1.7	dB	$R_G = 100\ k\Omega$, $f = 200\ MHz$

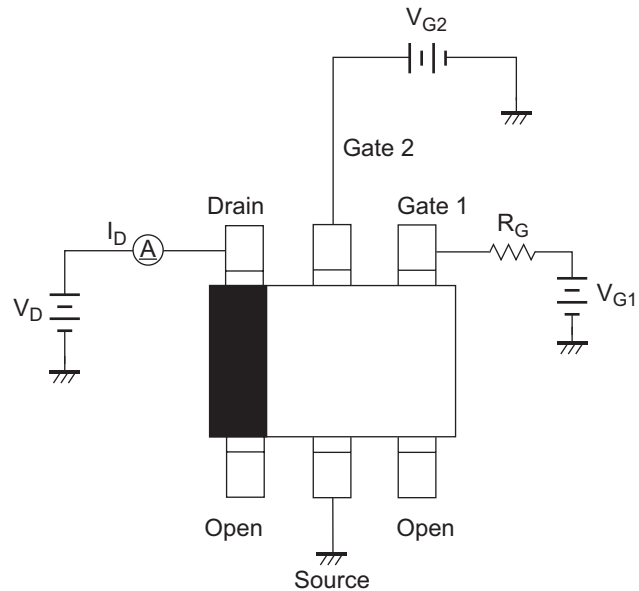
Test Circuits

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

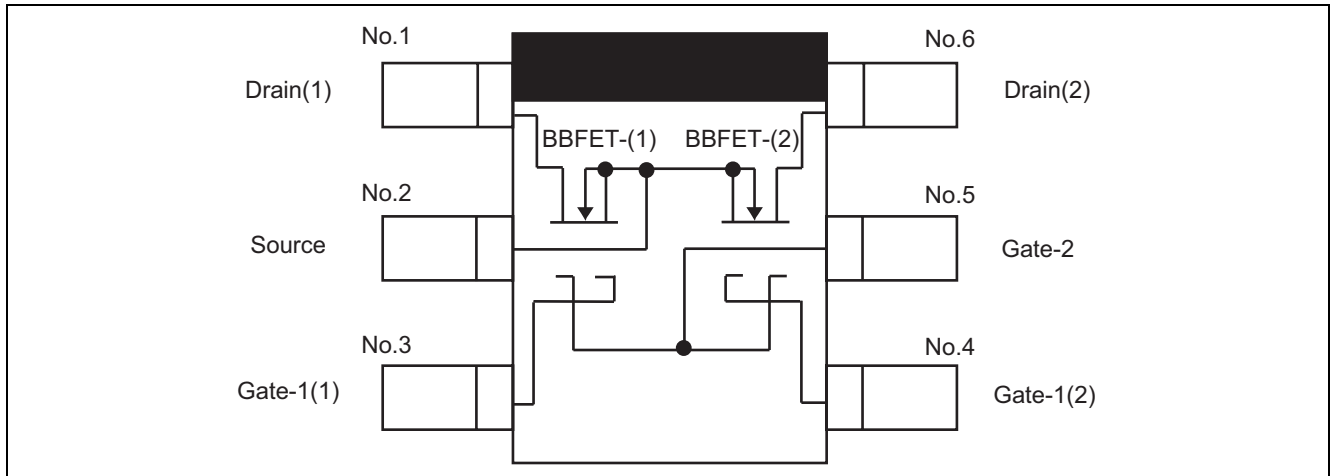
Measurement of FET1



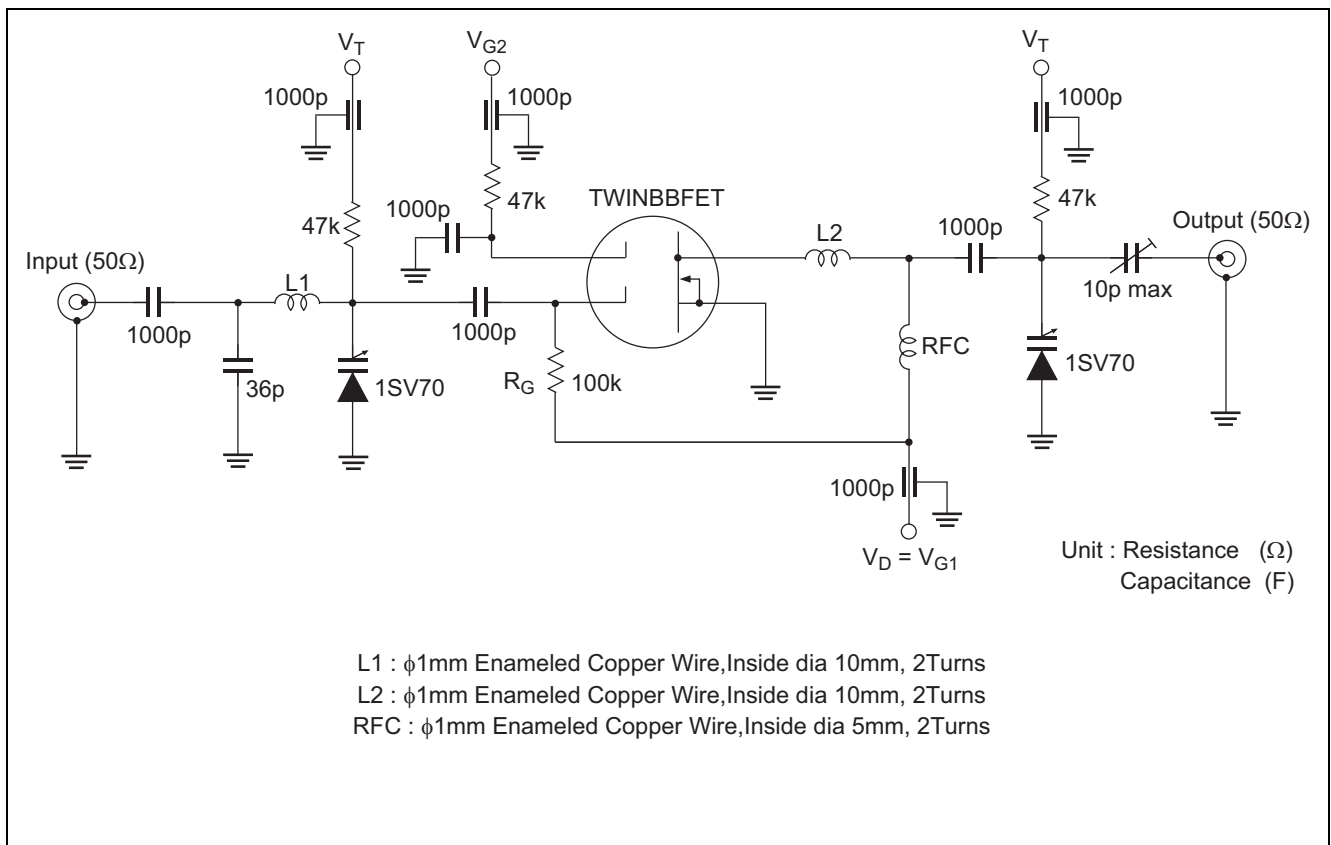
Measurement of FET2



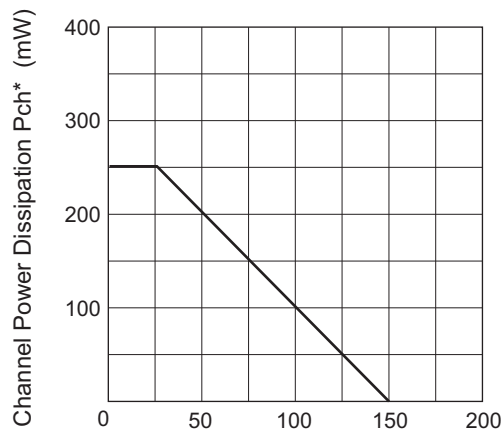
- **Equivalent Circuit**



- **200 MHz Power Gain, Noise Figure Test Circuit**



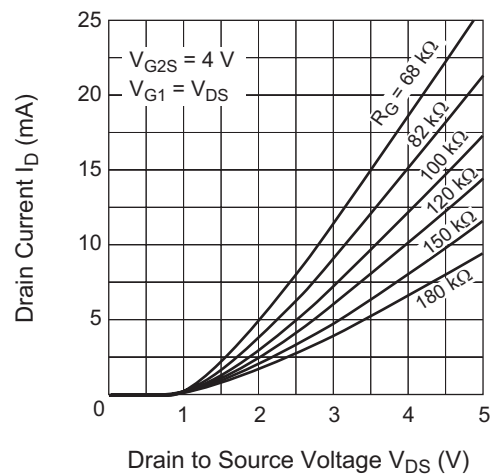
Maximum Channel Power
Dissipation Curve



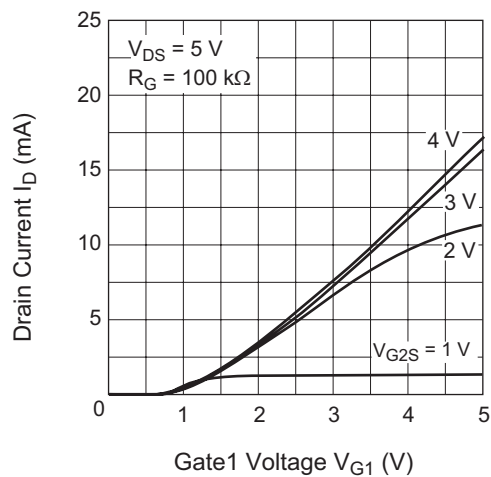
Ambient Temperature T_a (°C)

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

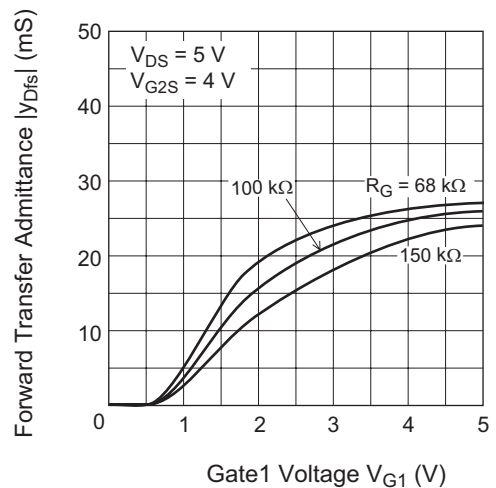
Typical Output Characteristics (FET1)



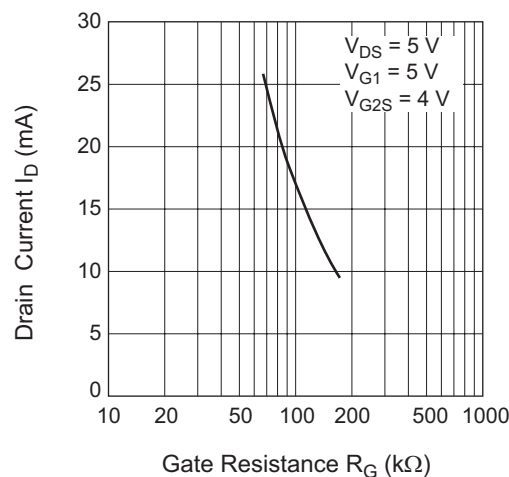
Drain Current vs.
Gate1 Voltage (FET1)



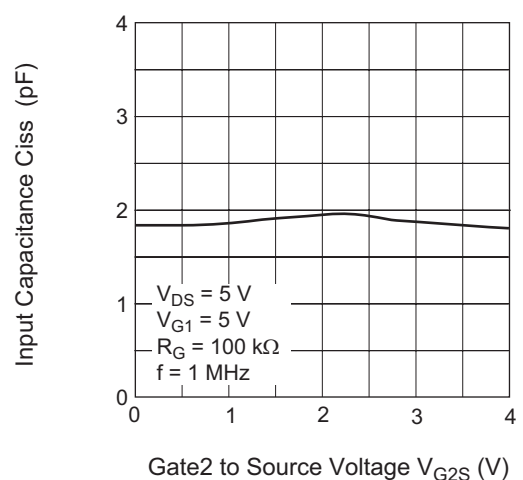
Forward Transfer Admittance
vs. Gate1 Voltage (FET1)



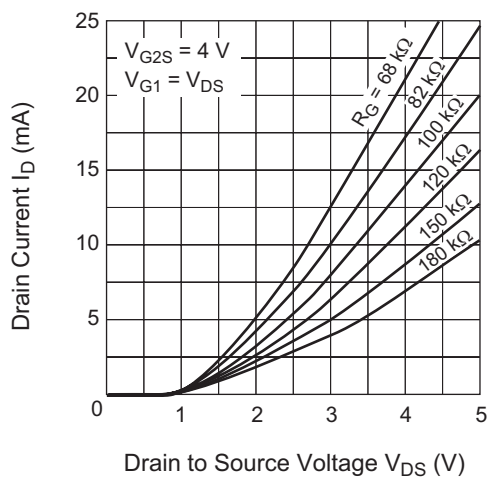
Drain Current vs.
Gate Resistance (FET1)



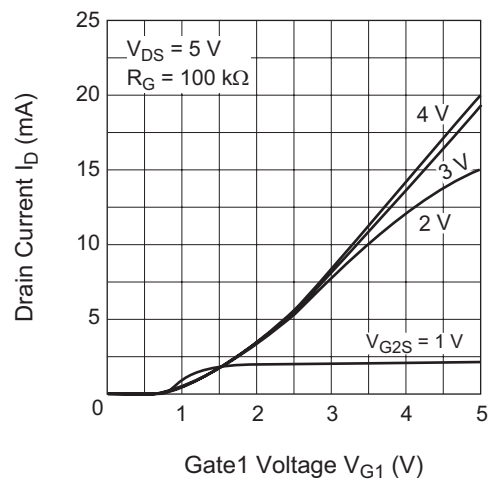
Input Capacitance vs.
Gate2 to Source Voltage (FET1)



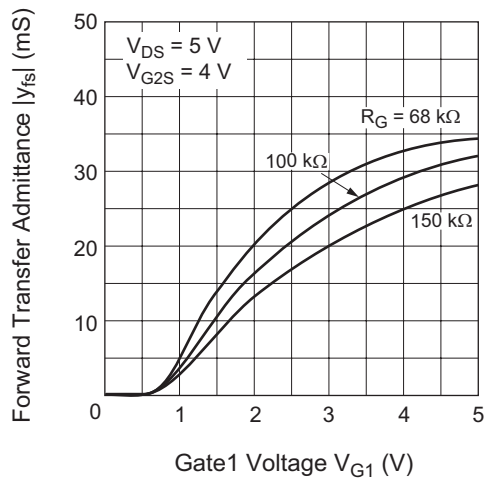
Typical Output Characteristics (FET2)



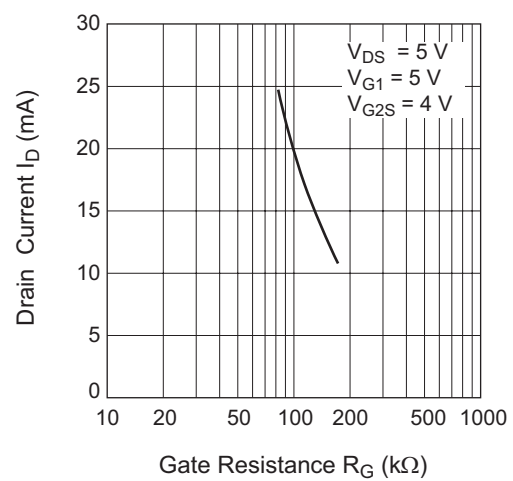
Drain Current vs. Gate1 Voltage (FET2)



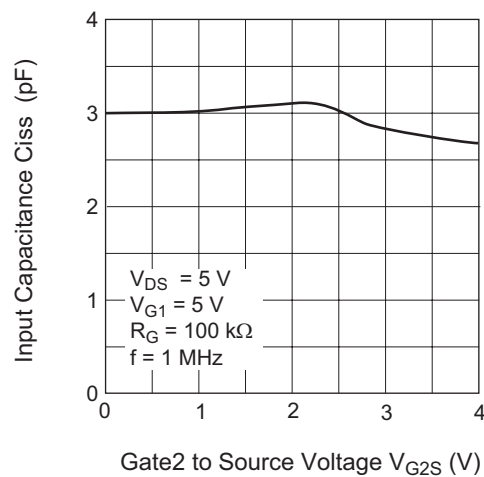
Forward Transfer Admittance vs. Gate1 Voltage (FET2)



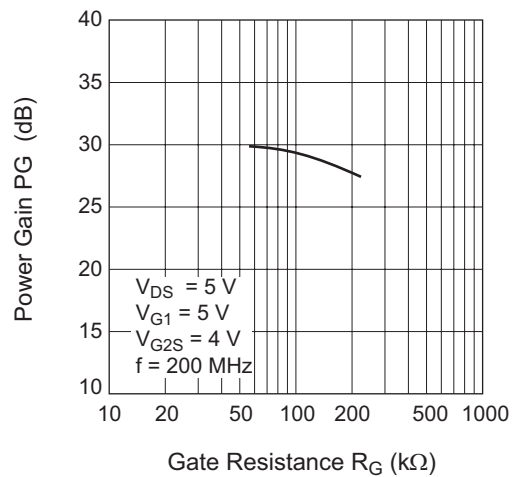
Drain Current vs. Gate Resistance (FET2)

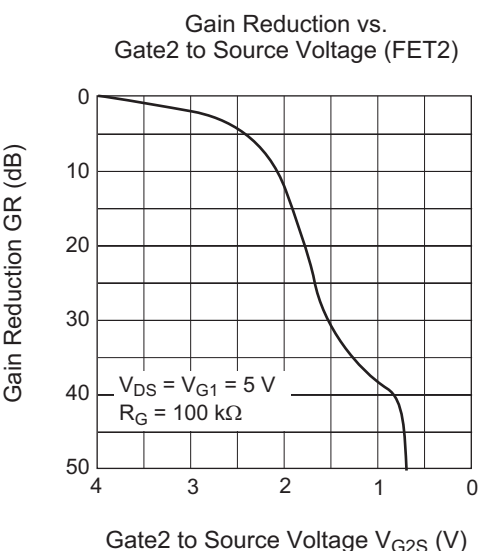
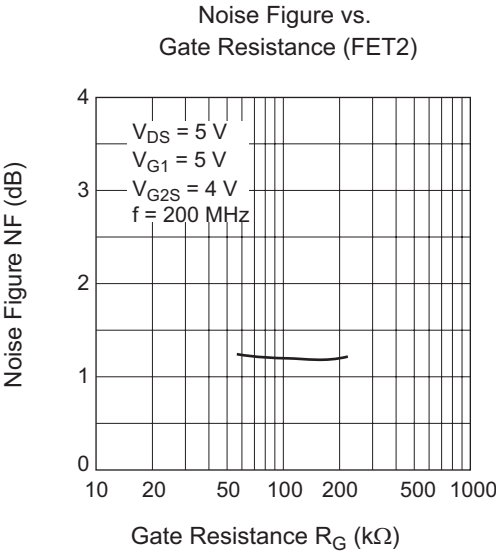


Input Capacitance vs. Gate2 to Source Voltage (FET2)

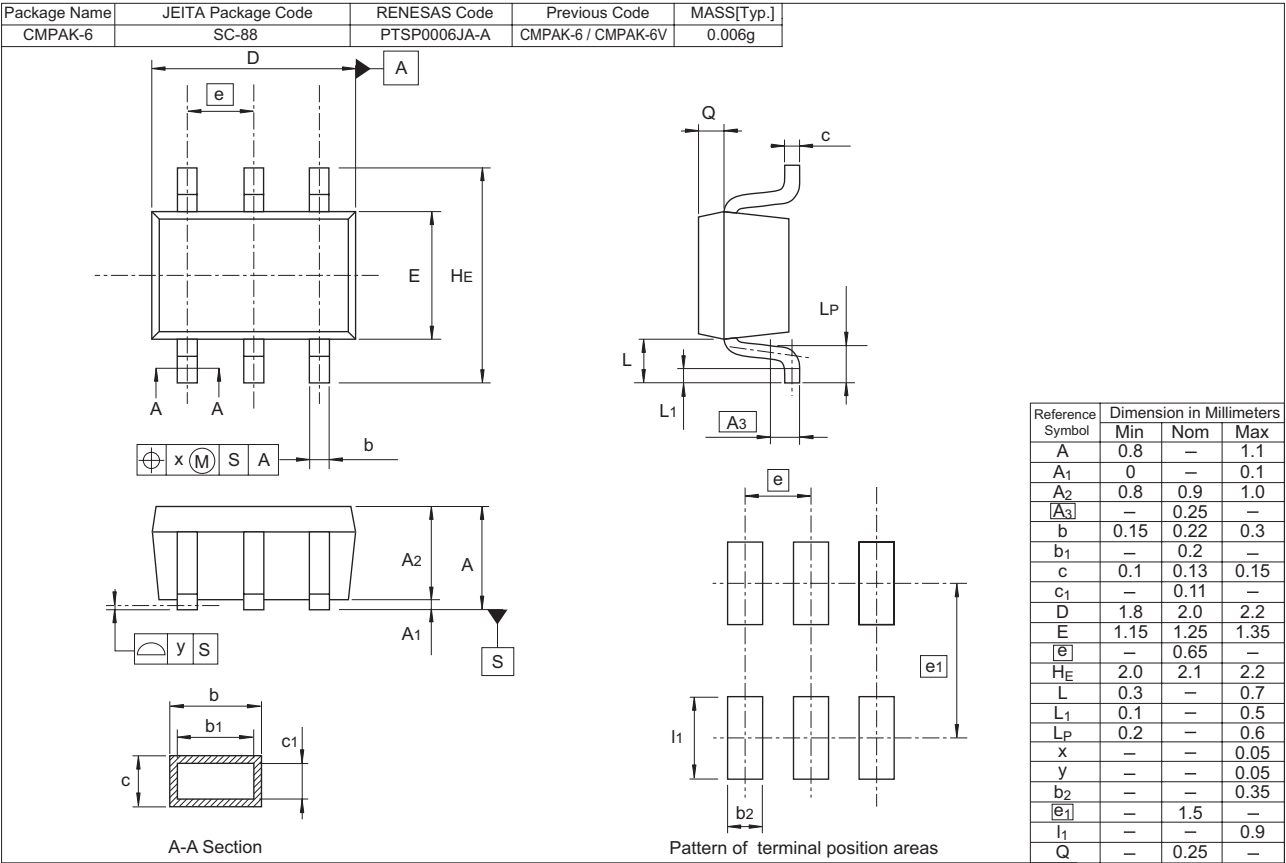


Power Gain vs. Gate Resistance (FET2)





Package Dimensions



Ordering Information

Part Name	Quantity	Shipping Container
TBB1004DMTL-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.

Renesas Technology Corp. Sales Strategic Planning Div. Nippon Bldg., 2-6-2, Ohte-machi, Chiyoda-ku, Tokyo 100-0004, Japan

Keep safety first in your circuit designs!

1. Renesas Technology Corp. puts the maximum effort into making semiconductor products better and more reliable, but there is always the possibility that trouble may occur with them. Trouble with semiconductors may lead to personal injury, fire or property damage. Remember to give due consideration to safety when making your circuit designs, with appropriate measures such as (i) placement of substitutive, auxiliary circuits, (ii) use of nonflammable material or (iii) prevention against any malfunction or mishap.

Notes regarding these materials

1. These materials are intended as a reference to assist our customers in the selection of the Renesas Technology Corp. product best suited to the customer's application; they do not convey any license under any intellectual property rights, or any other rights, belonging to Renesas Technology Corp. or a third party.
2. Renesas Technology Corp. assumes no responsibility for any damage, or infringement of any third-party's rights, originating in the use of any product data, diagrams, charts, programs, algorithms, or circuit application examples contained in these materials.
3. All information contained in these materials, including product data, diagrams, charts, programs and algorithms represents information on products at the time of publication of these materials, and are subject to change by Renesas Technology Corp. without notice due to product improvements or other reasons. It is therefore recommended that customers contact Renesas Technology Corp. or an authorized Renesas Technology Corp. product distributor for the latest product information before purchasing a product listed herein.
The information described here may contain technical inaccuracies or typographical errors.
Renesas Technology Corp. assumes no responsibility for any damage, liability, or other loss rising from these inaccuracies or errors.
Please also pay attention to information published by Renesas Technology Corp. by various means, including the Renesas Technology Corp. Semiconductor home page (<http://www.renesas.com>).
4. When using any or all of the information contained in these materials, including product data, diagrams, charts, programs, and algorithms, please be sure to evaluate all information as a total system before making a final decision on the applicability of the information and products. Renesas Technology Corp. assumes no responsibility for any damage, liability or other loss resulting from the information contained herein.
5. Renesas Technology Corp. semiconductors are not designed or manufactured for use in a device or system that is used under circumstances in which human life is potentially at stake. Please contact Renesas Technology Corp. or an authorized Renesas Technology Corp. product distributor when considering the use of a product contained herein for any specific purposes, such as apparatus or systems for transportation, vehicular, medical, aerospace, nuclear, or undersea repeater use.
6. The prior written approval of Renesas Technology Corp. is necessary to reprint or reproduce in whole or in part these materials.
7. If these products or technologies are subject to the Japanese export control restrictions, they must be exported under a license from the Japanese government and cannot be imported into a country other than the approved destination.
Any diversion or reexport contrary to the export control laws and regulations of Japan and/or the country of destination is prohibited.
8. Please contact Renesas Technology Corp. for export details on these materials or the products contained therein.



RENESAS SALES OFFICES

<http://www.renesas.com>

Refer to "<http://www.renesas.com/en/network>" for the latest and detailed information.

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, AZIA Center, 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