

To all our customers

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Renesas Technology Corp.  
Customer Support Dept.  
April 1, 2003

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Keep safety first in your circuit designs!

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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.

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# TBB1010

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

# RENESAS

ADE-208-1607B (Z)

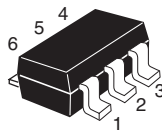
3rd. Edition  
Feb. 2003

### Features

- Small SMD package CMPAK-6 built in twin BBFET; To reduce using parts cost & PC board space.
- High  $|y_{fs}|=29\text{mS} \times 2$
- Suitable for World Standard Tuner RF amplifier.
- Very useful for total tuner cost reduction.
- Withstanding to ESD; Build in ESD absorbing diode. Withstand up to 200 V at  $C = 200 \text{ pF}$ ,  $R_s = 0$  conditions.
- Provide mini mold packages; CMPAK-6

### Outline

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 "KM".
  2. TBB1010 is individual type number of HITACHI TWIN BBFET.

## Absolute Maximum Ratings

( $T_a = 25^\circ\text{C}$ )

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	$^\circ\text{C}$
Storage temperature	$T_{stg}$	-55 to +150	$^\circ\text{C}$

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

## Electrical Characteristics

( $T_a = 25^\circ\text{C}$ )

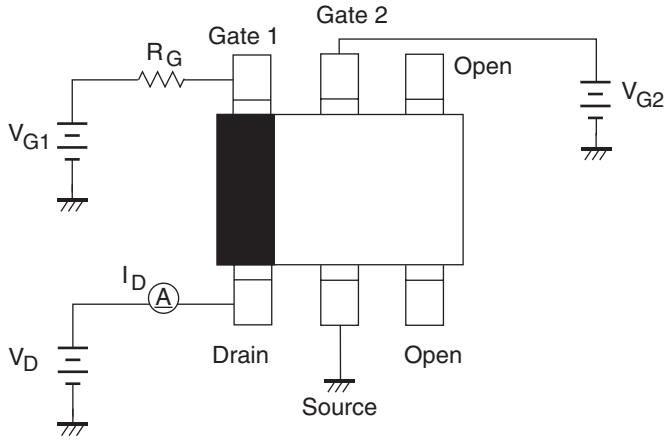
The below specification are applicable for FET1 and FET2 unit

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain to source breakdown voltage	$V_{(BR)DSS}$	6	—	—	V	$I_D = 200 \mu\text{A}$ , $V_{G1S} = V_{G2S} = 0$
Gate1 to source breakdown voltage	$V_{(BR)G1SS}$	+6	—	—	V	$I_{G1} = +10 \mu\text{A}$ , $V_{G2S} = V_{DS} = 0$
Gate2 to source breakdown voltage	$V_{(BR)G2SS}$	+6	—	—	V	$I_{G2} = +10 \mu\text{A}$ , $V_{G1S} = V_{DS} = 0$
Gate1 to source cutoff current	$I_{G1SS}$	—	—	+100	nA	$V_{G1S} = +5 \text{ V}$ , $V_{G2S} = V_{DS} = 0$
Gate2 to source cutoff current	$I_{G2SS}$	—	—	+100	nA	$V_{G2S} = +5 \text{ V}$ , $V_{G1S} = V_{DS} = 0$
Gate1 to source cutoff voltage	$V_{G1S(off)}$	0.6	—	1.1	V	$V_{DS} = 5 \text{ V}$ , $V_{G2S} = 4 \text{ V}$ , $I_D = 100 \mu\text{A}$
Gate2 to source cutoff voltage	$V_{G2S(off)}$	0.6	—	1.1	V	$V_{DS} = 5 \text{ V}$ , $V_{G1S} = 5 \text{ V}$ , $I_D = 100 \mu\text{A}$
Drain current	$I_{D(op)}$	12	16	20	mA	$V_{DS} = 5 \text{ V}$ , $V_{G1} = 5 \text{ V}$ $V_{G2S} = 4 \text{ V}$ , $R_G = 120 \text{ k}\Omega$
Forward transfer admittance	$ y_{fs} $	24	29	—	mS	$V_{DS} = 5 \text{ V}$ , $V_{G1} = 5 \text{ V}$ , $V_{G2S} = 4 \text{ V}$ $R_G = 120 \text{ k}\Omega$ , $f = 1 \text{ kHz}$
Input capacitance	$C_{iss}$	1.7	2.1	2.5	pF	$V_{DS} = 5 \text{ V}$ , $V_{G1} = 5 \text{ V}$
Output capacitance	$C_{oss}$	1.0	1.4	1.8	pF	$V_{G2S} = 4 \text{ V}$ , $R_G = 120 \text{ k}\Omega$
Reverse transfer capacitance	$C_{rss}$	—	0.03	0.05	pF	$f = 1 \text{ MHz}$
Power gain	PG	25	30	—	dB	$V_{DS} = V_{G1} = 5 \text{ V}$ , $V_{G2S} = 4 \text{ V}$
Noise figure	NF	—	1.1	1.8	dB	$R_G = 120 \text{ k}\Omega$ , $f = 200 \text{ MHz}$

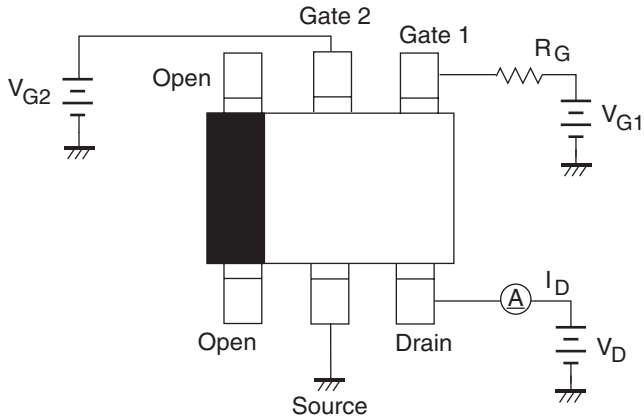
## Test Circuits

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

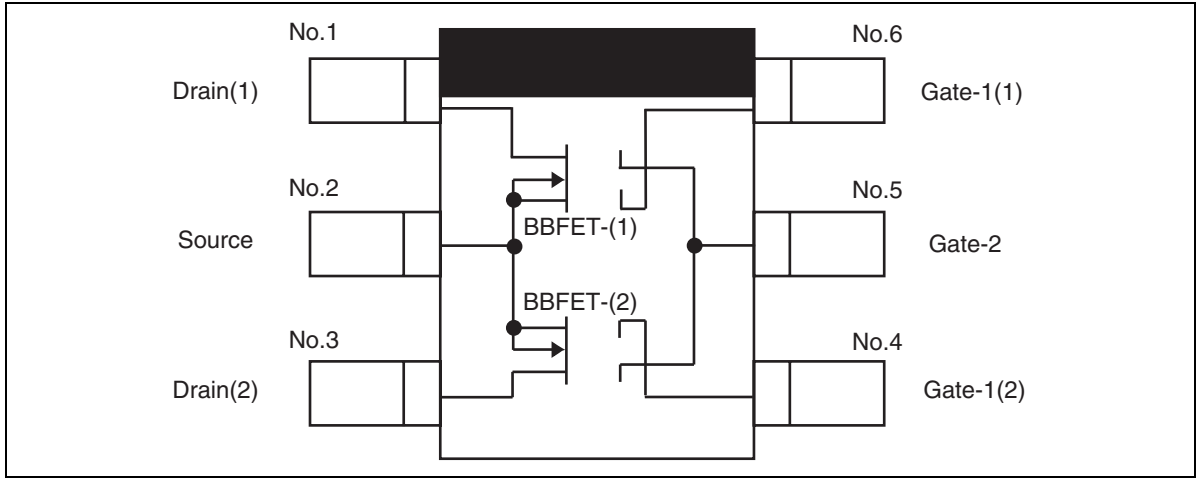
Measurement of FET1



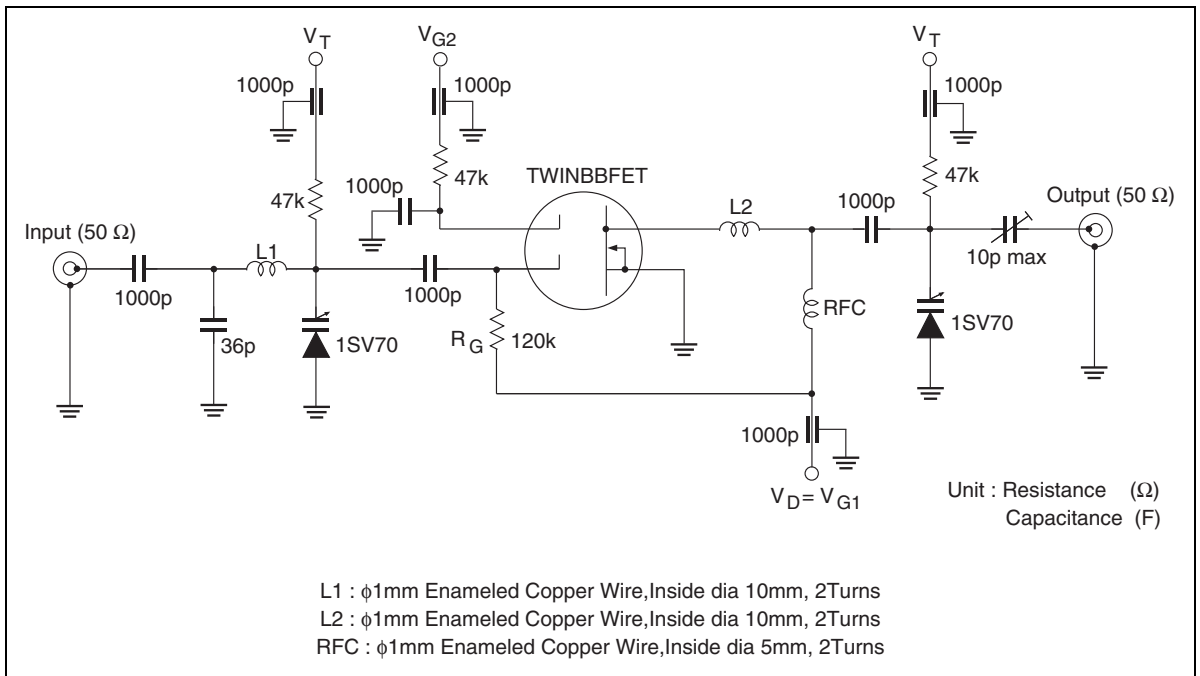
Measurement of FET2



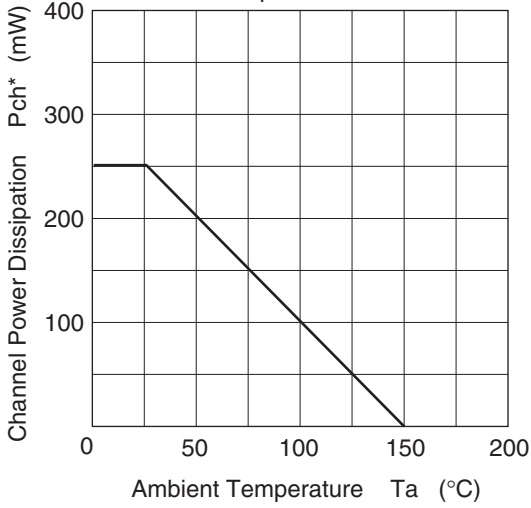
• Equivalent Circuit



• 200 MHz Power Gain, Noise Figure Test Circuit

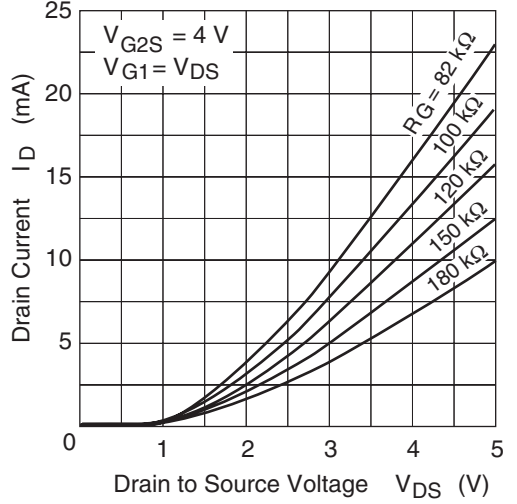


Maximum Channel Power Dissipation Curve

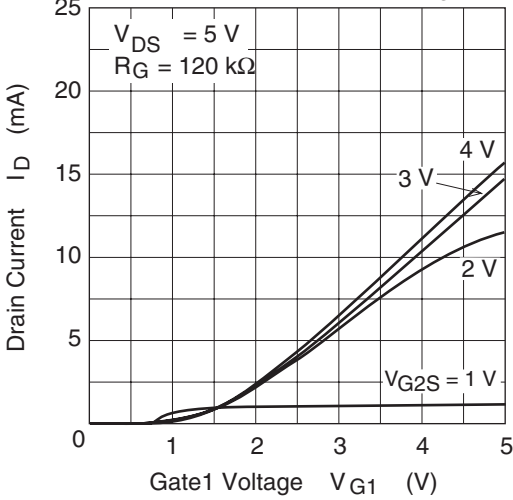


\* Value on the glass epoxy board (50mm × 40mm × 1mm)

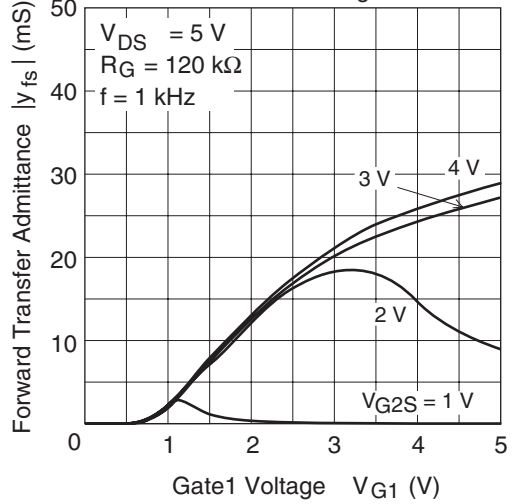
Typical Output Characteristics



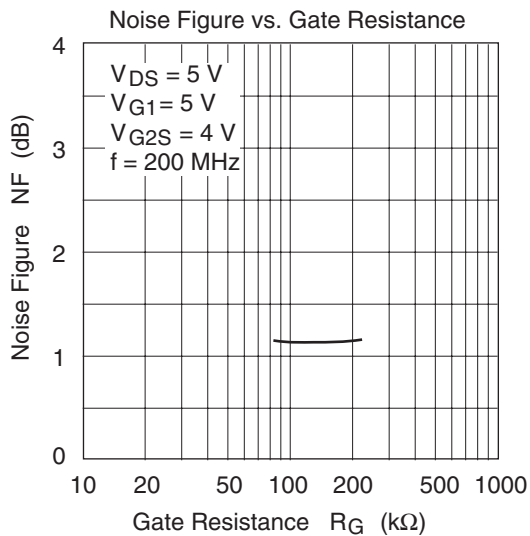
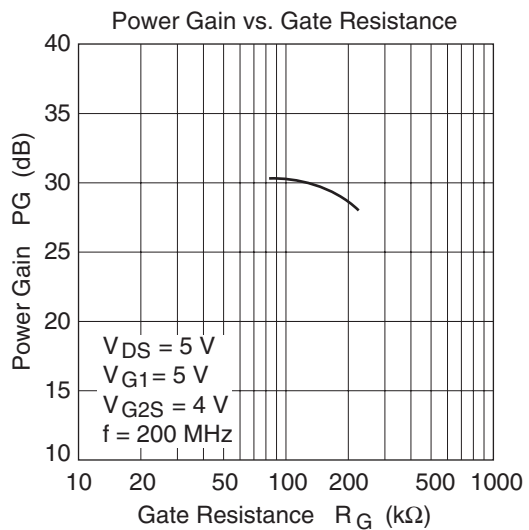
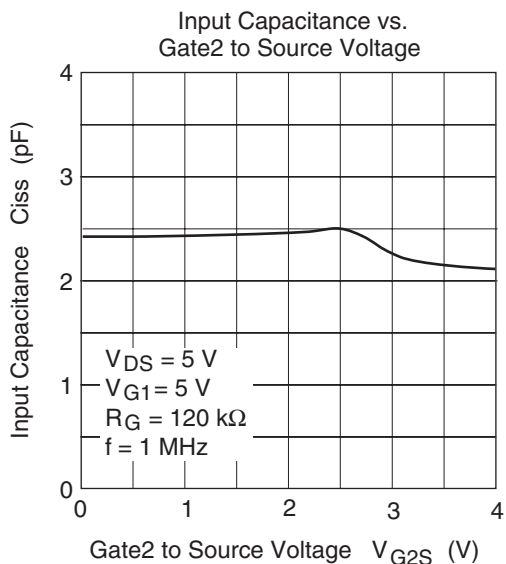
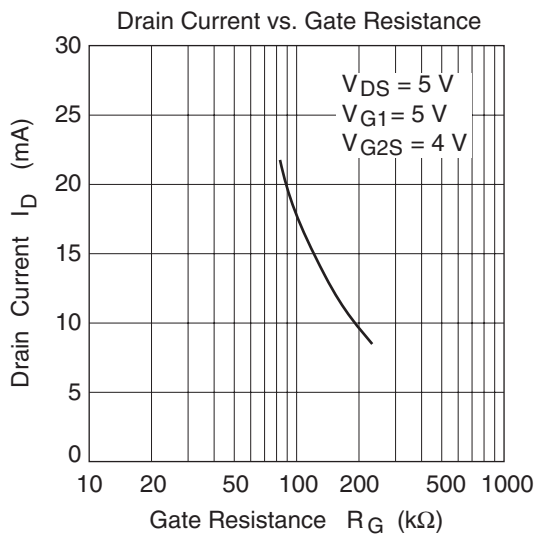
Drain Current vs. Gate1 Voltage

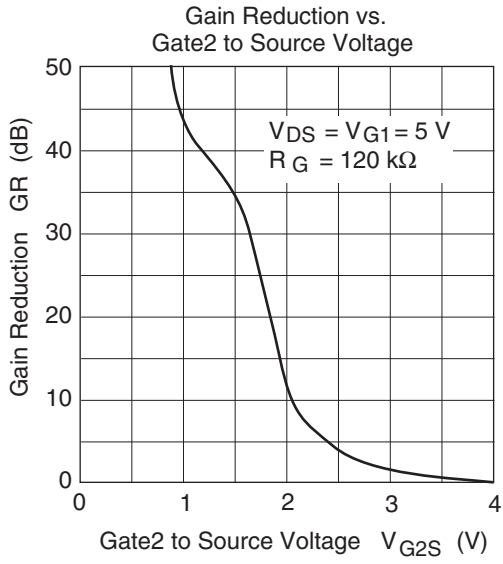


Forward Transfer Admittance vs. Gate1 Voltage





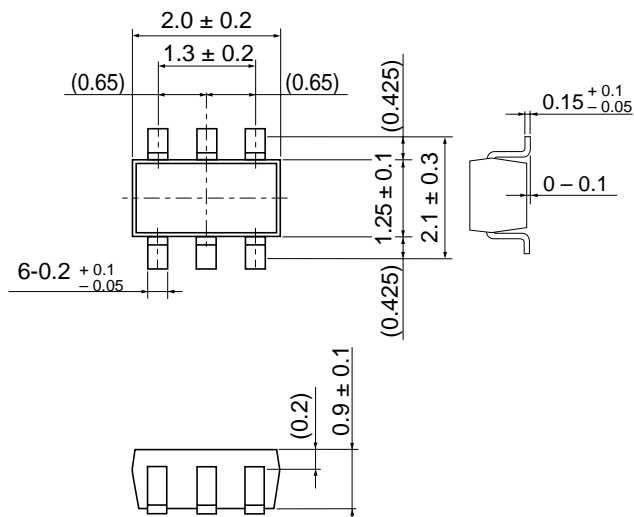




## Package Dimensions

As of July, 2002

Unit: mm



Hitachi Code	CMPAK-6
JEDEC	—
JEITA	Conforms
Mass (reference value)	0.006 g

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**Sales Offices****HITACHI****Hitachi, Ltd.**

Semiconductor & Integrated Circuits  
 Nippon Bldg., 2-6-2, Ohte-machi, Chiyoda-ku, Tokyo 100-0004, Japan  
 Tel: (03) 3270-2111 Fax: (03) 3270-5109

URL <http://www.hitachisemiconductor.com/>

**For further information write to:**

Hitachi Semiconductor (America) Inc.  
 179 East Tasman Drive  
 San Jose, CA 95134  
 Tel: <1>(408) 433-1990  
 Fax: <1>(408) 433-0223

Hitachi Europe Ltd.  
 Electronic Components Group  
 Whitebrook Park  
 Lower Cookham Road  
 Maidenhead  
 Berkshire SL6 8YA, United Kingdom  
 Tel: <44> (1628) 585000  
 Fax: <44> (1628) 778322

Hitachi Asia Ltd.  
 Hitachi Tower  
 16 Collyer Quay #20-00  
 Singapore 049318  
 Tel: <65>-6538-6533/6538-8577  
 Fax: <65>-6538-6933/6538-3877  
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Hitachi Asia (Hong Kong) Ltd.  
 Group III (Electronic Components)  
 7/F., North Tower  
 World Finance Centre,  
 Harbour City, Canton Road  
 Tsim Sha Tsui, Kowloon Hong Kong  
 Tel: <852>-2735-9218  
 Fax: <852>-2730-0281  
 URL: <http://semiconductor.hitachi.com.hk>

Hitachi Europe GmbH  
 Electronic Components Group  
 Dornacher Str 3  
 D-85622 Feldkirchen  
 Postfach 201, D-85619 Feldkirchen  
 Germany  
 Tel: <49> (89) 9 9180-0  
 Fax: <49> (89) 9 29 30 00

Hitachi Asia Ltd.  
 (Taipei Branch Office)  
 4/F, No. 167, Tun Hwa North Road  
 Hung-Kuo Building  
 Taipei (105), Taiwan  
 Tel: <886>-(2)-2718-3666  
 Fax: <886>-(2)-2718-8180  
 Telex: 23222 HAS-TP  
 URL: <http://semiconductor.hitachi.com.tw>

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