TBB1010

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

ADE-208-1607B (Z)

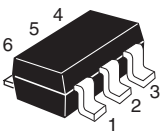
3rd. Edition
Feb. 2003

Features

- Small SMD package CMPAK-6 built in twin BBFET; To reduce using parts cost & PC board space.
- High |yfs|=29mS ×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 pF, Rs = 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

(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	Pch[*3]	250	mW
Channel temperature	Tch	150	°C
Storage temperature	Tstg	–55 to +150	°C

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

Electrical Characteristics

(Ta = 25°C)

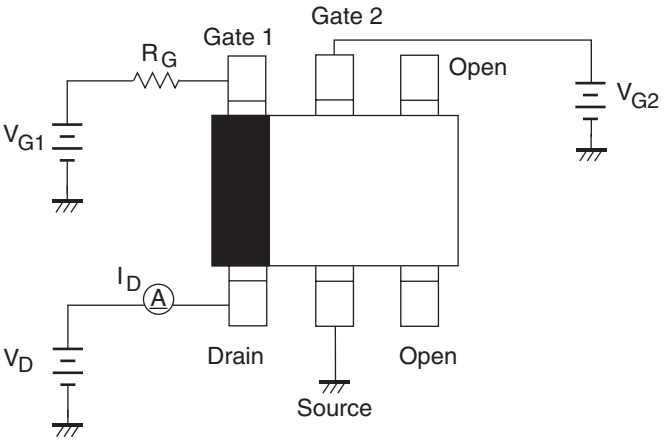
The below specification are applicable for FET1 and FET2 unit

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

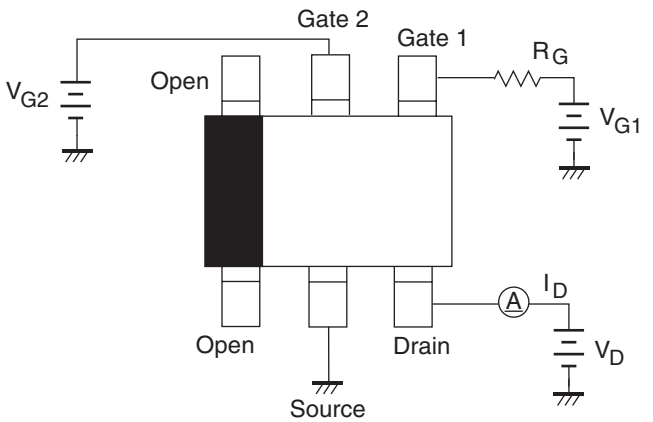
Test Circuits

- **DC Biasing Circuit for Operating Characteristic Items** ($I_{D(op)}$, |yfs|, Ciss, Coss, Crss, NF, PG)

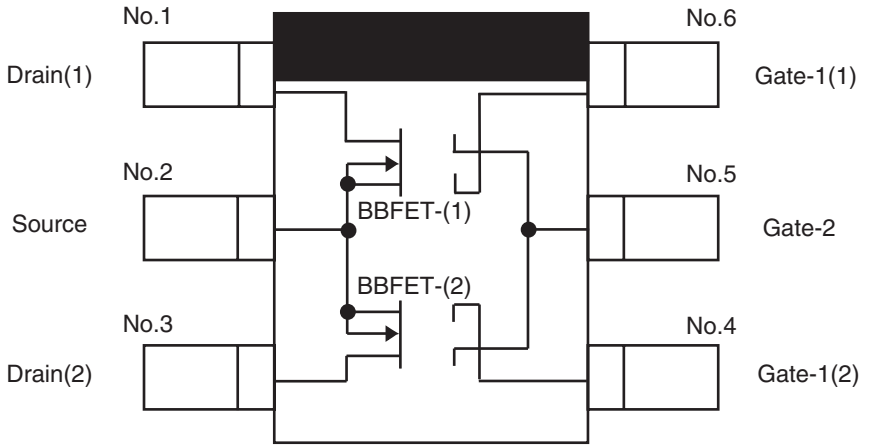
Measurment of FET1



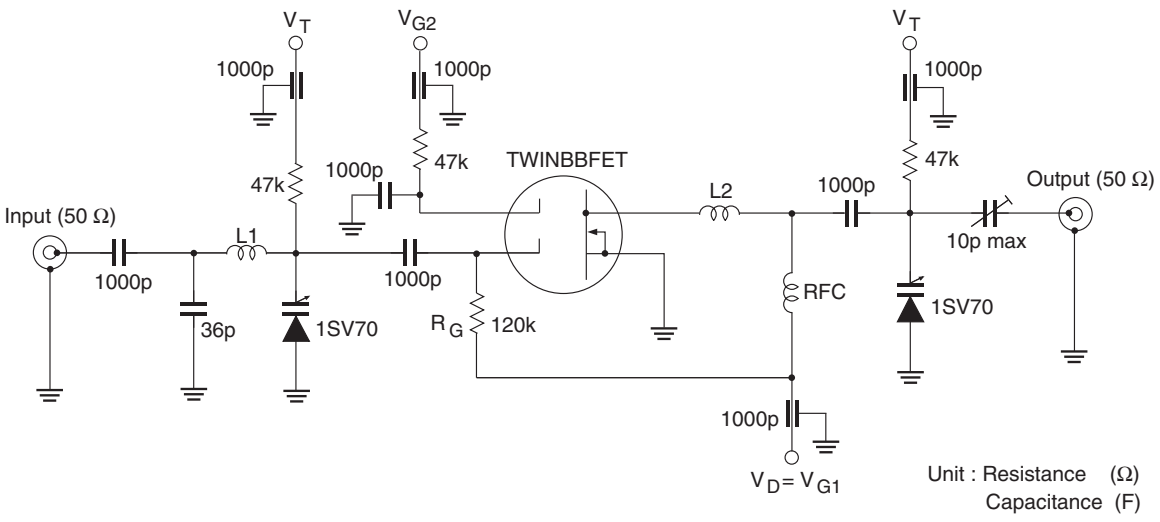
Measurment of FET2



- **Equivalent Circuit**

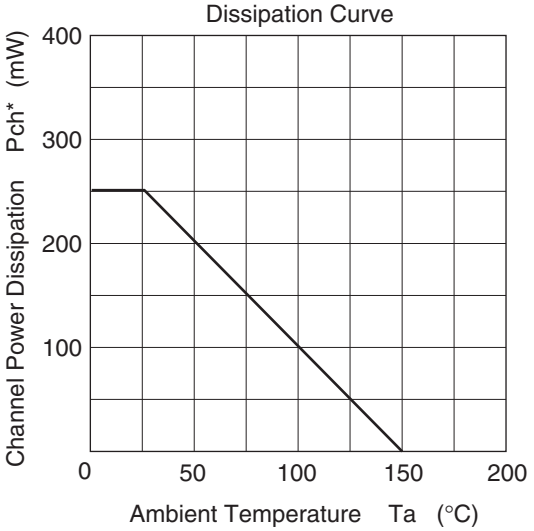


- **200 MHz Power Gain, Noise Figure Test Circuit**



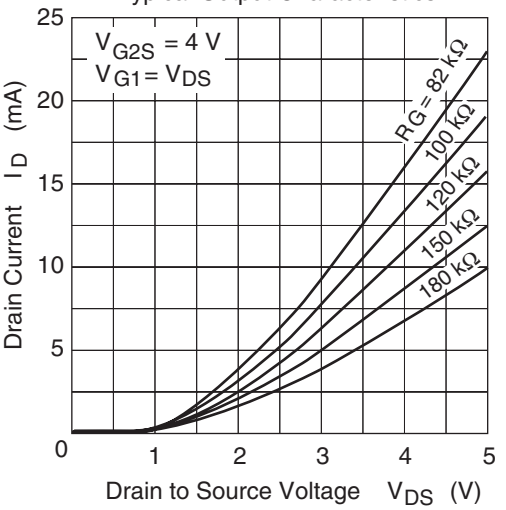
L1 : ϕ1mm Enameled Copper Wire,Inside dia 10mm, 2Turns
L2 : ϕ1mm Enameled Copper Wire,Inside dia 10mm, 2Turns
RFC : ϕ1mm Enameled Copper Wire,Inside dia 5mm, 2Turns

Maximum Channel Power Dissipation Curve

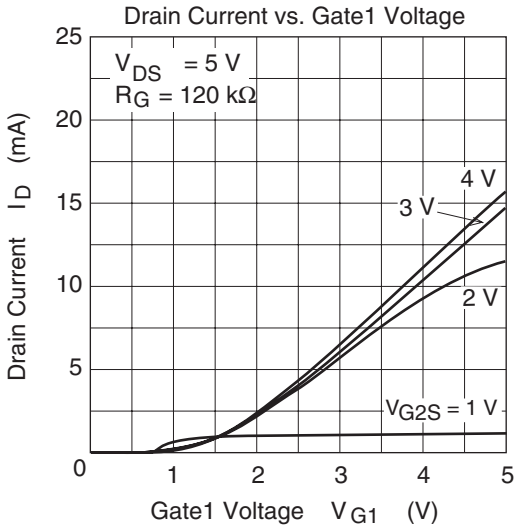


* Value on the glass epoxy board (50mm × 40mm × 1mm)

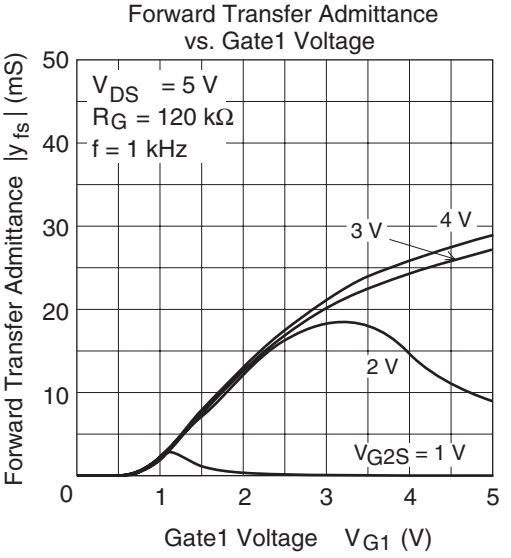
Typical Output Characteristics



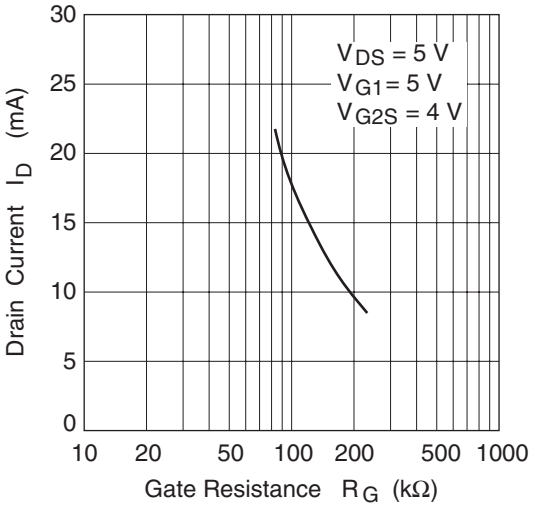
Drain Current vs. Gate1 Voltage



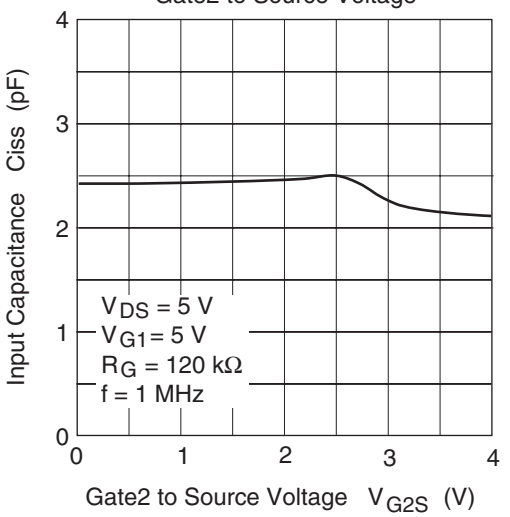
Forward Transfer Admittance vs. Gate1 Voltage



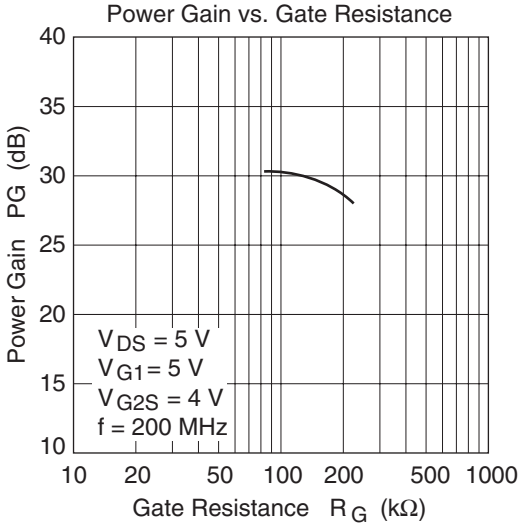
Drain Current vs. Gate Resistance



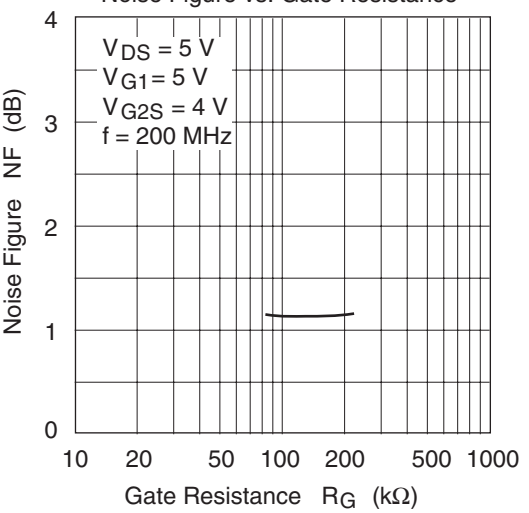
Input Capacitance vs. Gate2 to Source Voltage

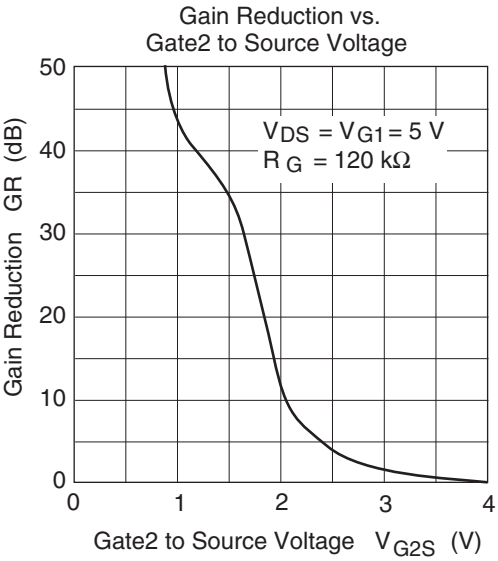


Power Gain vs. Gate Resistance



Noise Figure vs. Gate Resistance

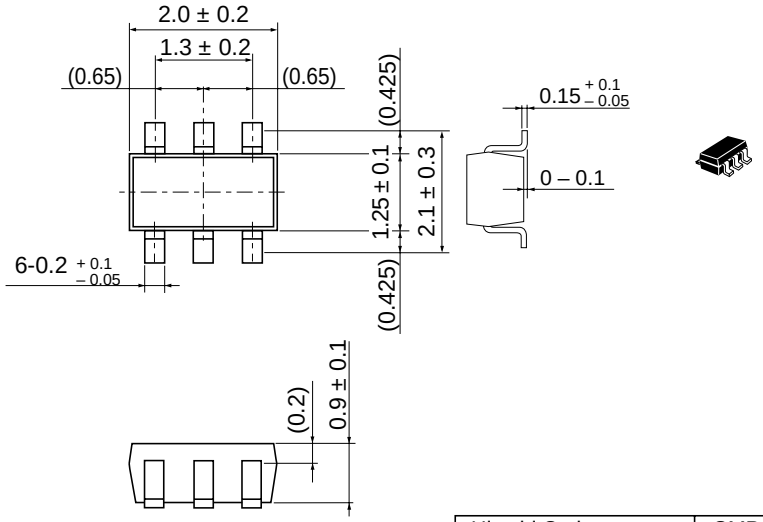



Gain Reduction vs.
Gate2 to Source Voltage
V_{DS} = V_{G1} = 5 V
R_G = 120 kΩ
Gain Reduction GR (dB)
50
40
30
20
10
0
0
1
2
3
4
Gate2 to Source Voltage V_{G2S} (V)

Package Dimensions

As of July, 2002

Unit: mm



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

Disclaimer

1. Hitachi neither warrants nor grants licenses of any rights of Hitachi's or any third party's patent, copyright, trademark, or other intellectual property rights for information contained in this document. Hitachi bears no responsibility for problems that may arise with third party's rights, including intellectual property rights, in connection with use of the information contained in this document.
2. Products and product specifications may be subject to change without notice. Confirm that you have received the latest product standards or specifications before final design, purchase or use.
3. Hitachi makes every attempt to ensure that its products are of high quality and reliability. However, contact Hitachi's sales office before using the product in an application that demands especially high quality and reliability or where its failure or malfunction may directly threaten human life or cause risk of bodily injury, such as aerospace, aeronautics, nuclear power, combustion control, transportation, traffic, safety equipment or medical equipment for life support.
4. Design your application so that the product is used within the ranges guaranteed by Hitachi particularly for maximum rating, operating supply voltage range, heat radiation characteristics, installation conditions and other characteristics. Hitachi bears no responsibility for failure or damage when used beyond the guaranteed ranges. Even within the guaranteed ranges, consider normally foreseeable failure rates or failure modes in semiconductor devices and employ systemic measures such as fail-safes, so that the equipment incorporating Hitachi product does not cause bodily injury, fire or other consequential damage due to operation of the Hitachi product.
5. This product is not designed to be radiation resistant.
6. No one is permitted to reproduce or duplicate, in any form, the whole or part of this document without written approval from Hitachi.
7. Contact Hitachi's sales office for any questions regarding this document or Hitachi semiconductor products.

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 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.
Hitachi Tower
16 Collyer Quay #20-00
Singapore 049318
Tel : <65>-6538-6533/6538-8577
Fax : <65>-6538-6933/6538-3877
URL : http://semiconductor.hitachi.com.sg

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

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

Colophon 7.0

RENESAS