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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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TBB1008

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

RENESAS

ADE-208-1599 (Z)

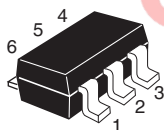
Rev.0
Jun. 2002

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; Build in ESD absorbing diode. Withstand up to 200 V at C = 200 pF, R_s = 0 conditions.
- Provide mini mold packages; CMPAK-6

Outline

CMPAK-6



1. Gate-1(1)
2. Source
3. Drain(1)
4. Drain(2)
5. Gate-2
6. Gate-1(2)

- Notes:
1. Marking is "HM".
 2. TBB1008 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	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 (50 mm × 40 mm × 1 mm).

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	0.7	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	32	mS	$V_{DS} = 5 V, V_{G1} = 5 V, V_{G2S} = 4 V$ $R_G = 100 k\Omega, f = 1 kHz$
Input capacitance	Ciss	1.4	1.8	2.2	pF	$V_{DS} = 5 V, V_{G1} = 5 V$
Output capacitance	Coss	1.0	1.4	1.8	pF	$V_{G2S} = 4 V, R_G = 100 k\Omega$
Reverse transfer capacitance	Crss	—	0.02	0.04	pF	$f = 1 MHz$
Power gain	PG	16	21	—	dB	$V_{DS} = V_{G1} = 5 V, V_{G2S} = 4 V$ $R_G = 100 k\Omega, f = 900 MHz$ $Z_i = S11^*, Z_o = S22^* (:PG)$
Noise figure	NF	—	1.7	2.5	dB	$Z_i = S11opt (:NF)$

TBB1008

The below specification are applicable for VHF unit (FET2)

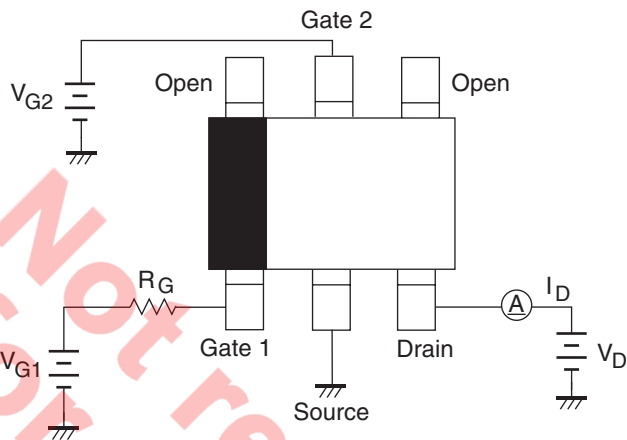
(Ta = 25°C)

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	$I_{D(op)}$	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	38	mS	$V_{DS} = 5 V, V_{G1} = 5 V, V_{G2S} = 4 V$ $R_G = 100 k\Omega, f = 1 kHz$
Input capacitance	Ciss	2.3	2.7	3.1	pF	$V_{DS} = 5 V, V_{G1} = 5 V$
Output capacitance	Coss	1.4	1.8	2.2	pF	$V_{G2S} = 4 V, R_G = 100 k\Omega$
Reverse transfer capacitance	Crss	—	0.03	0.05	pF	$f = 1 MHz$
Power gain	PG	24	29	—	dB	$V_{DS} = V_{G1} = 5 V, V_{G2S} = 4 V$
Noise figure	NF	—	1.2	1.7	dB	$R_G = 100 k\Omega, f = 200 MHz$

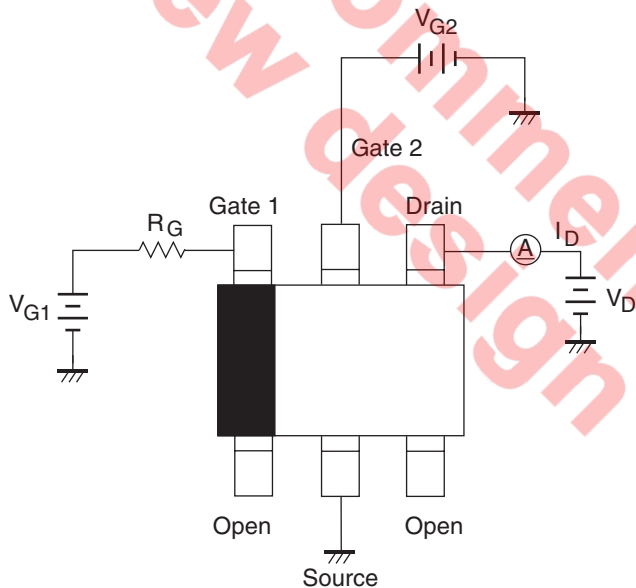
Test Circuits

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

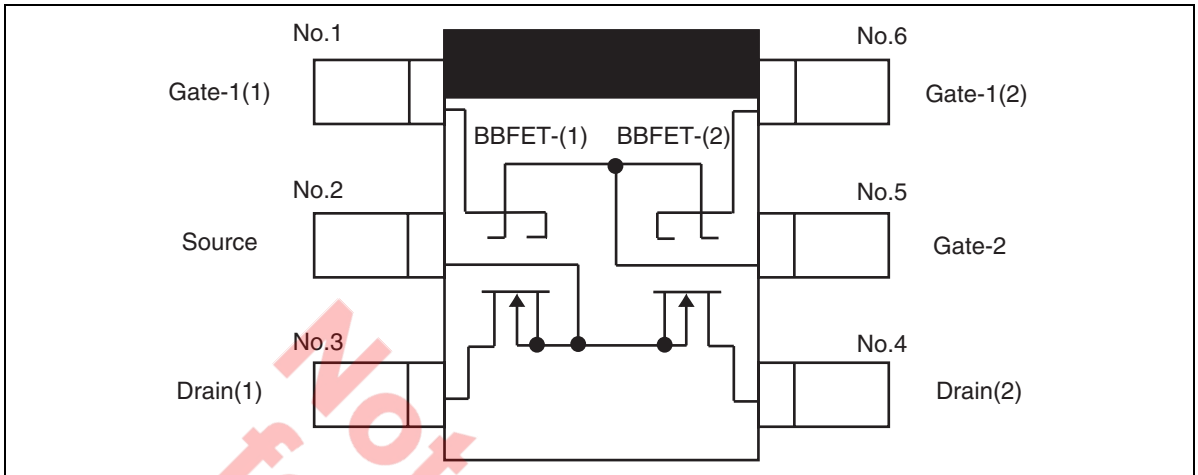
• Measurement of FET1



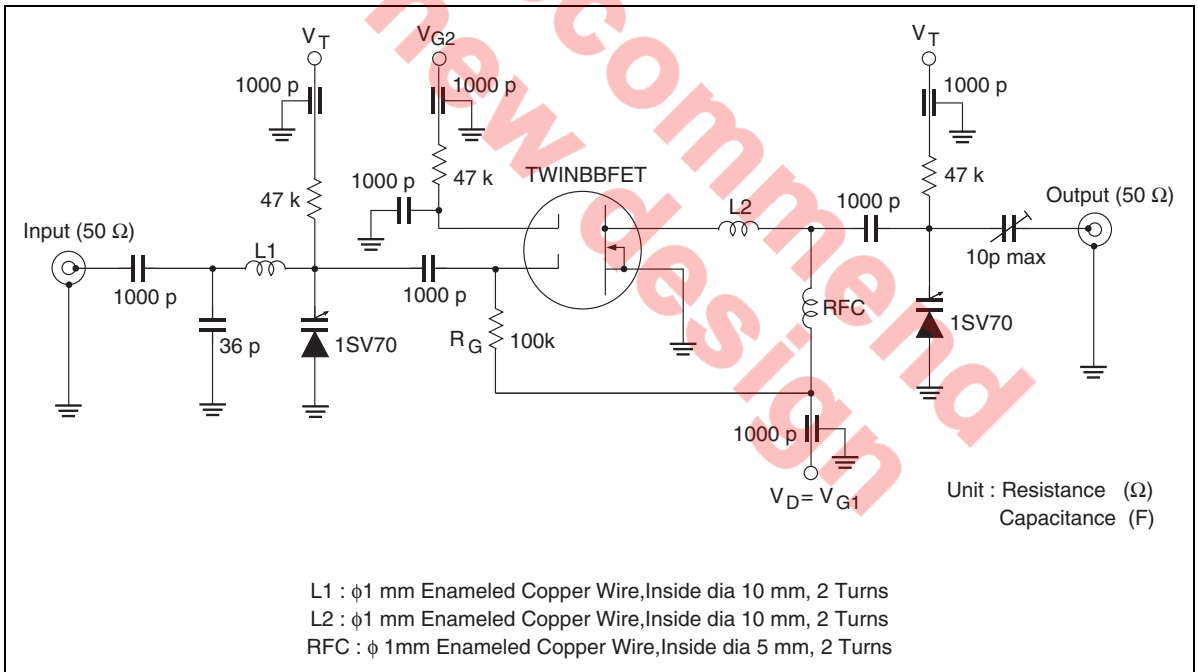
• Measurement of FET2



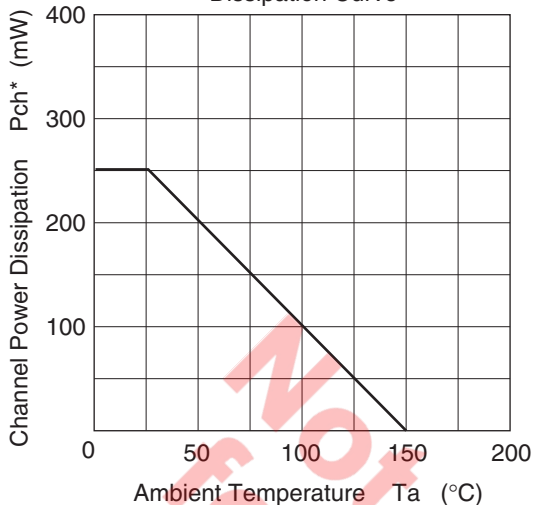
• Equivalent Circuit



• 200 MHz Power Gain, Noise Figure Test Circuit

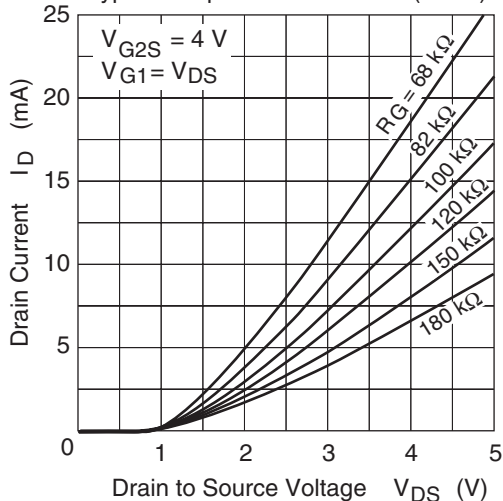


Maximum Channel Power Dissipation Curve

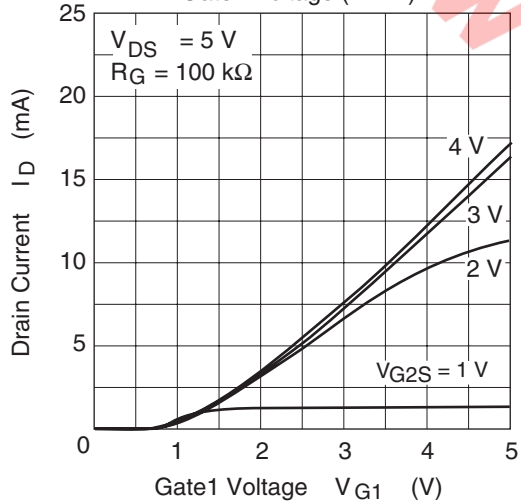


* Value on the glass epoxy board (50mm × 40mm × 1mm)

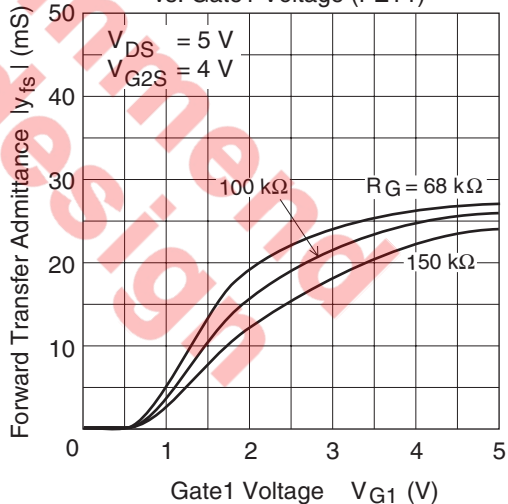
Typical Output Characteristics (FET1)

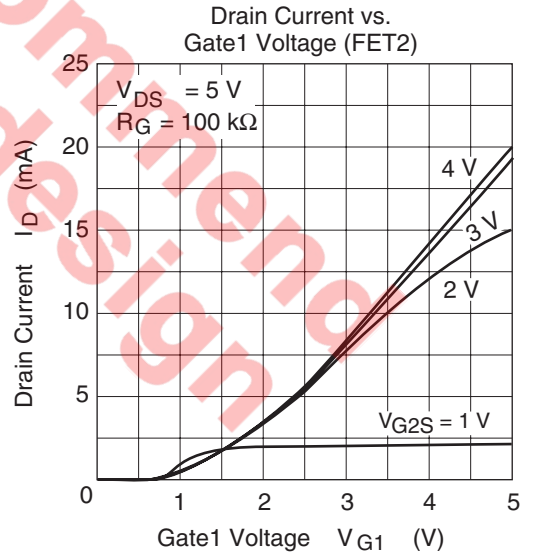
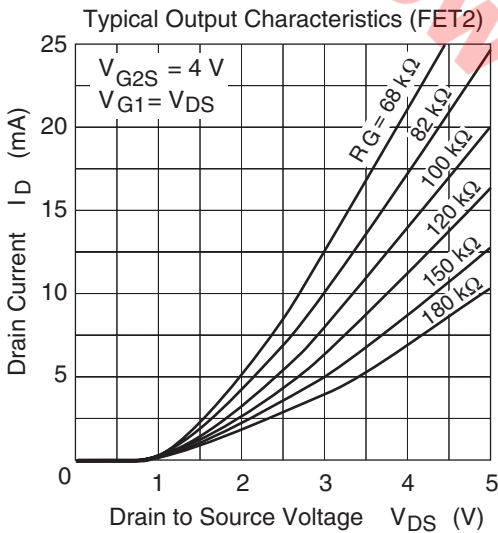
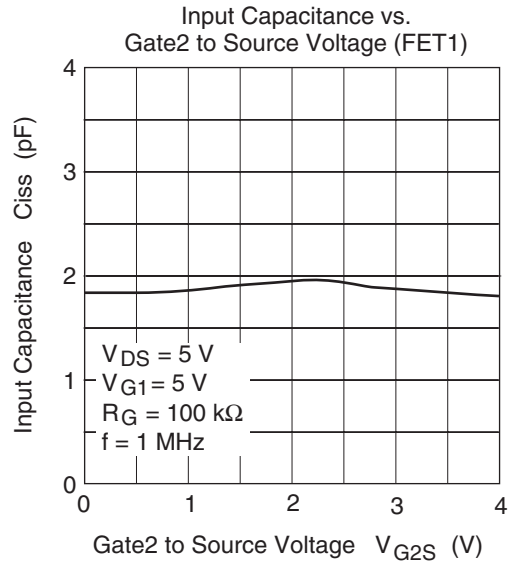
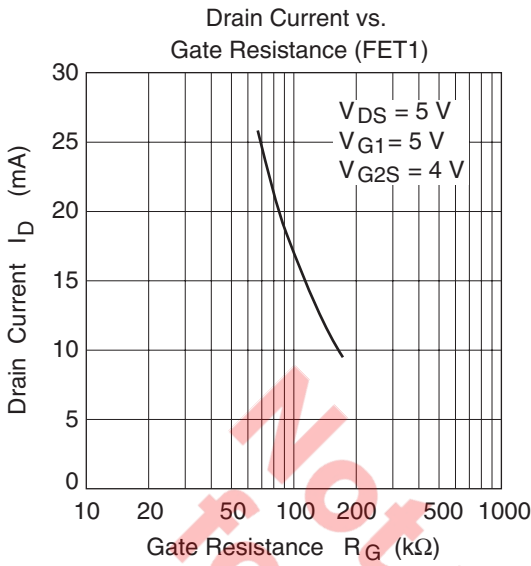


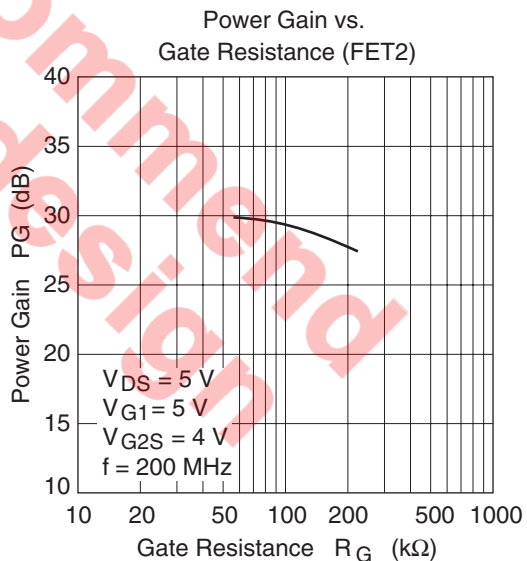
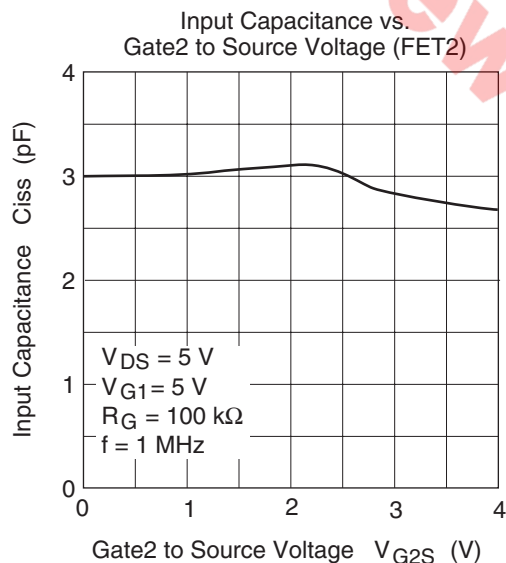
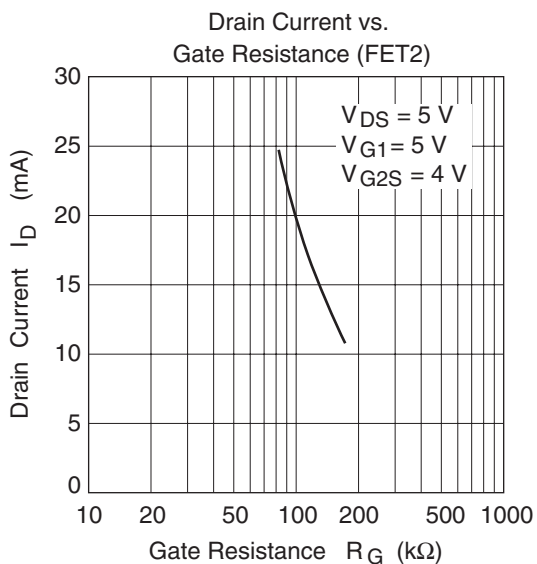
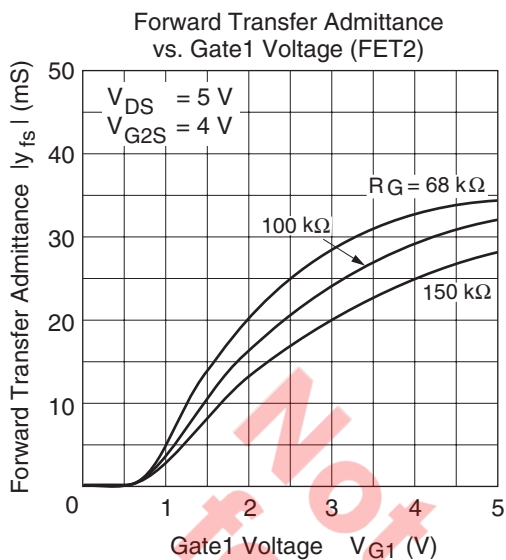
Drain Current vs. Gate1 Voltage (FET1)

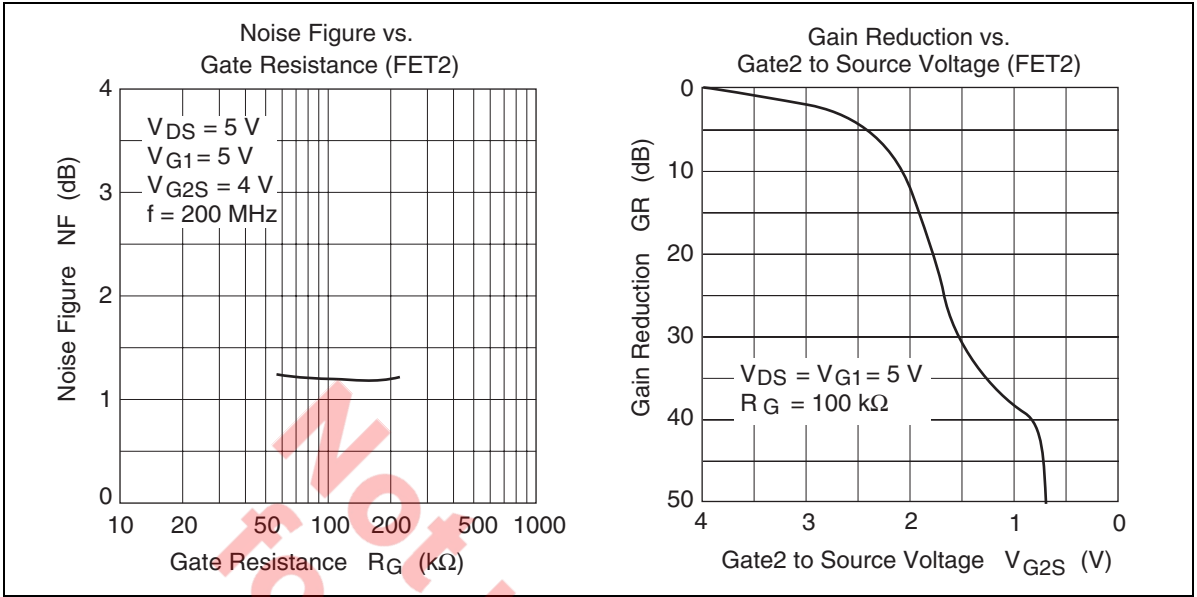


Forward Transfer Admittance vs. Gate1 Voltage (FET1)





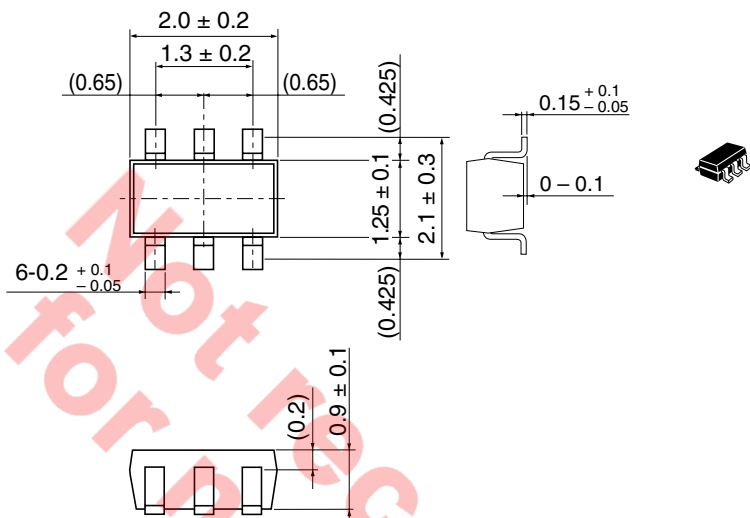




Not recommend for new design

Package Dimensions

As of January, 2002
Unit: mm



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

Not for new recommend design

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