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

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TBB1008

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

RENESAS

ADE-208-1599 (Z)

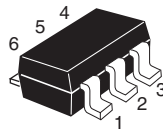
Rev.0
Jun. 2002

Features

- Small SMD package CMLPAK-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; CMLPAK-6

Outline

CMLPAK-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	Tch	150	°C
Storage temperature	Tstg	-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	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	$V_{DS} = V_{G1} = 5 V$, $V_{G2S} = 4 V$ $R_G = 100 k\Omega$, $f = 900 MHz$ $Z_i = S11^*$, $Z_o = S22^*$ (:PG)
Noise figure	NF	—	1.7	2.5	dB	$Z_i = S11_{opt}$ (:NF)

The below specification are applicable for VHF unit (FET2)

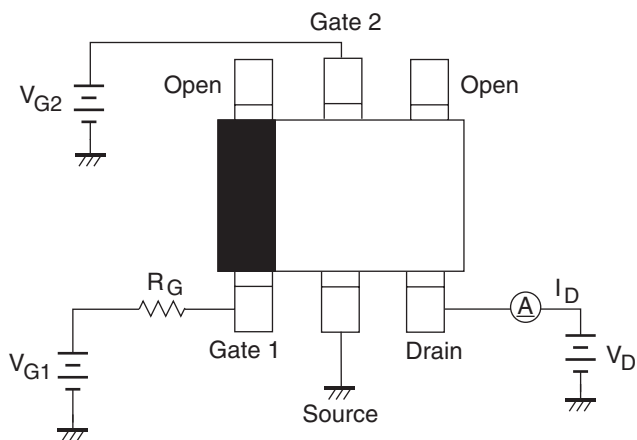
(Ta = 25°C)

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	C_{iss}	2.3	2.7	3.1	pF	$V_{DS} = 5\ V, V_{G1} = 5\ V$
Output capacitance	C_{oss}	1.4	1.8	2.2	pF	$V_{G2S} = 4\ V, R_G = 100\ k\Omega$
Reverse transfer capacitance	C_{rss}	—	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	$R_G = 100\ k\Omega, f = 200\ MHz$

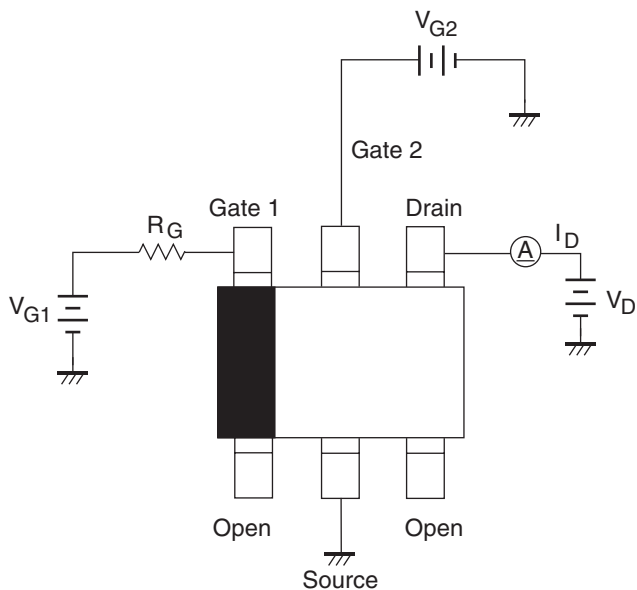
Test Circuits

• DC Biasing Circuit for Operating Characteristic Items ($I_{D(op)}$, $lyfsl$, C_{iss} , C_{oss} , Cr_{ss} , NF , PG)

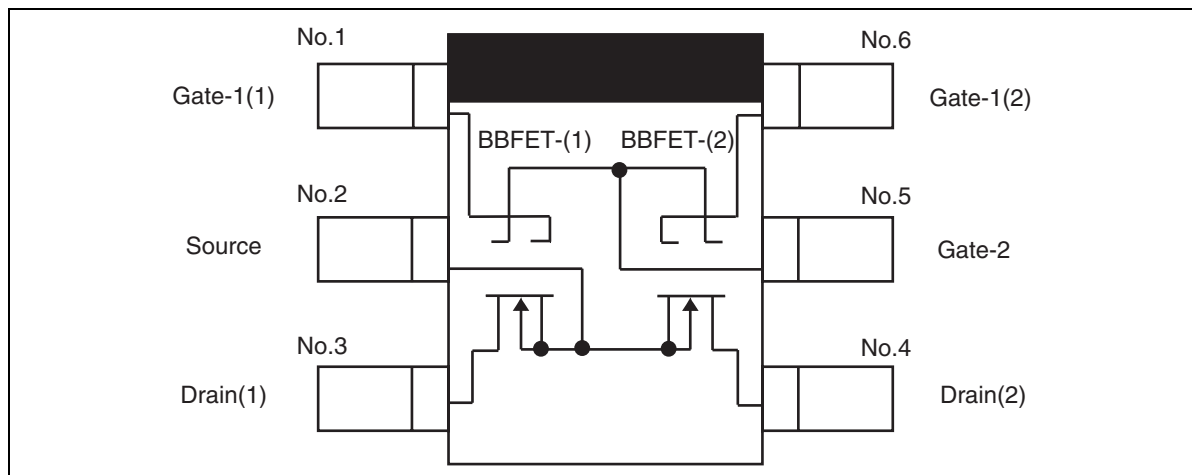
• Measurement of FET1



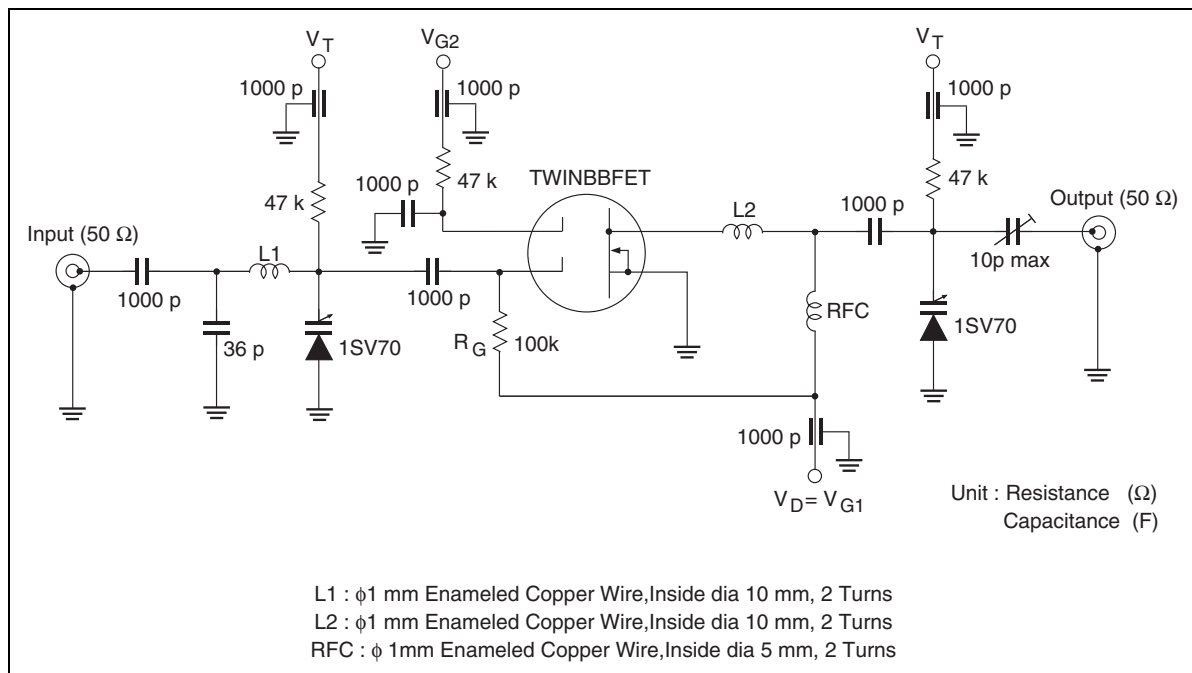
• Measurement of FET2



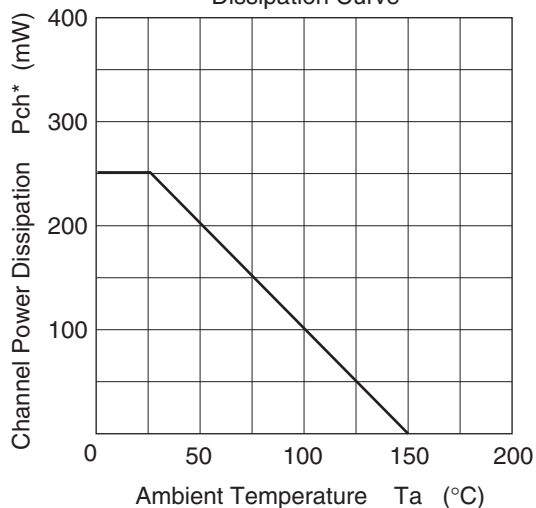
• Equivalent Circuit



• 200 MHz Power Gain, Noise Figure Test Circuit

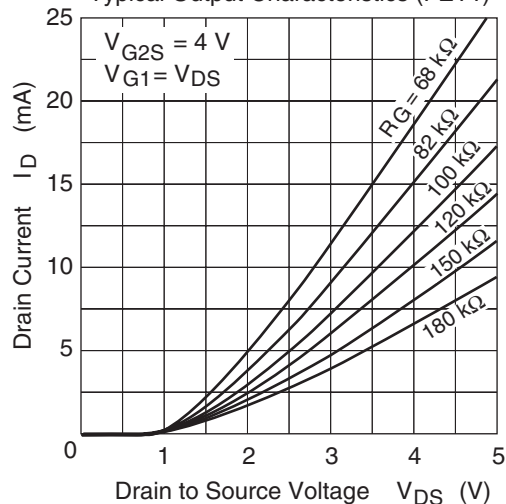


Maximum Channel Power
Dissipation Curve

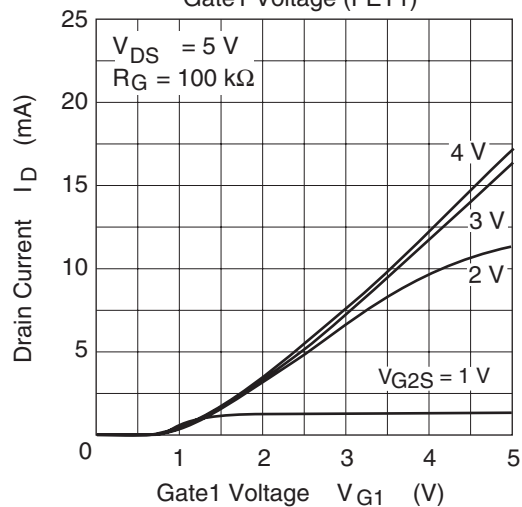


* Value on the glass epoxy board (50mm $\times$ 40mm $\times$ 1mm)

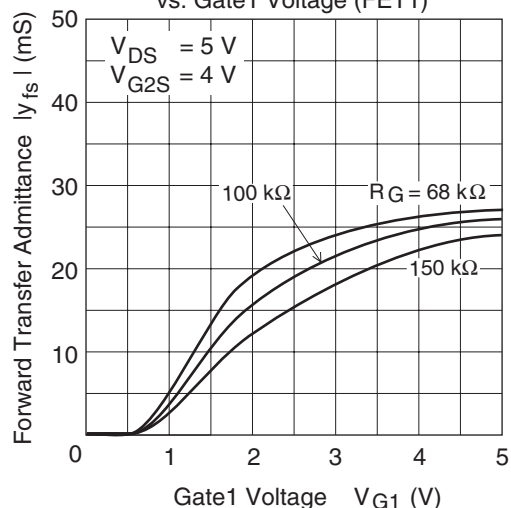
Typical Output Characteristics (FET1)

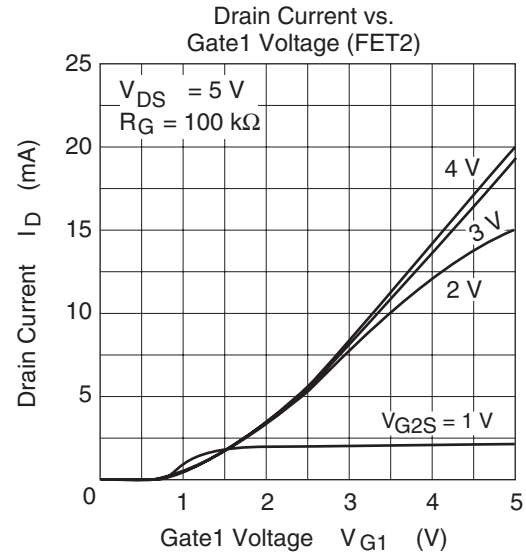
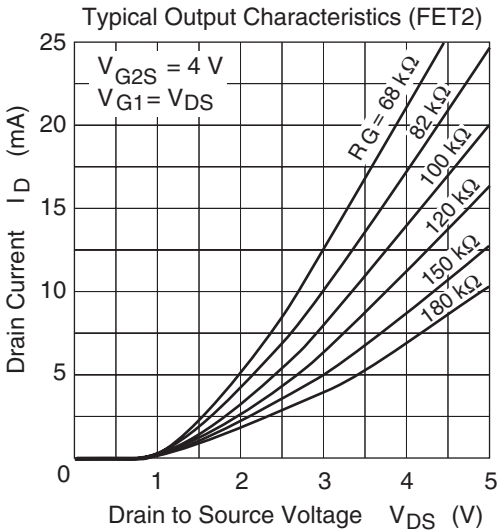
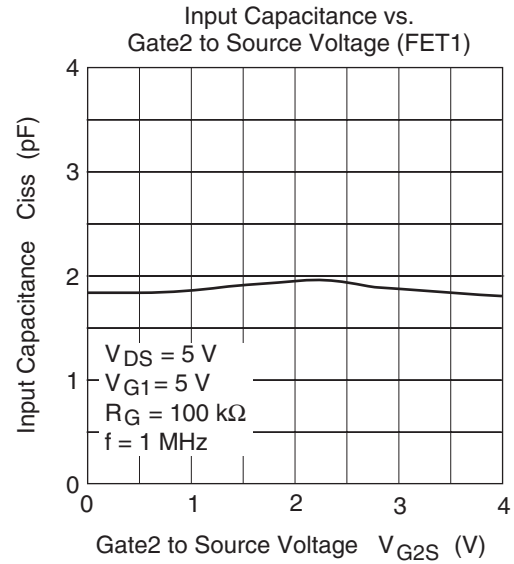
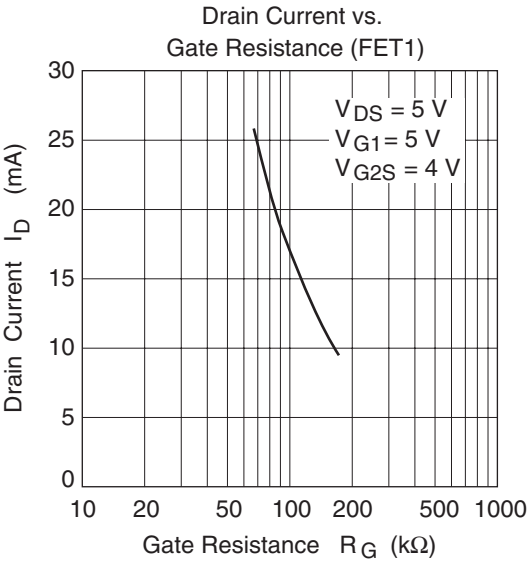


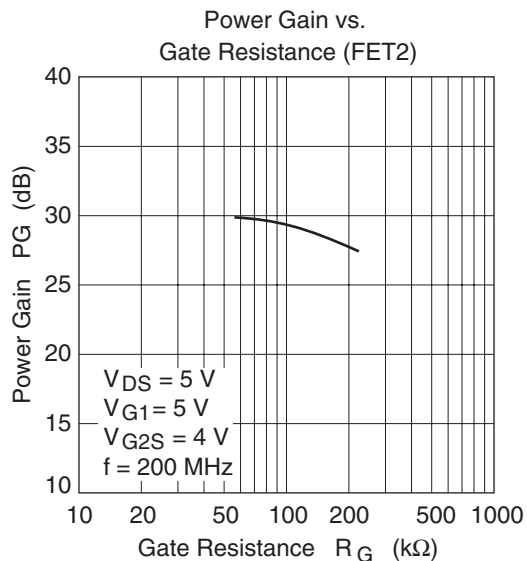
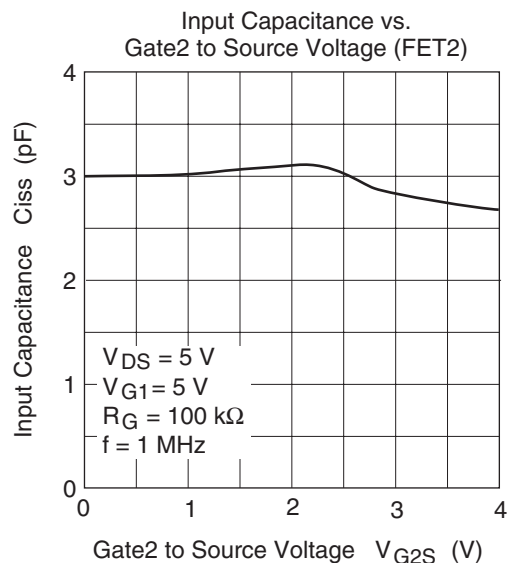
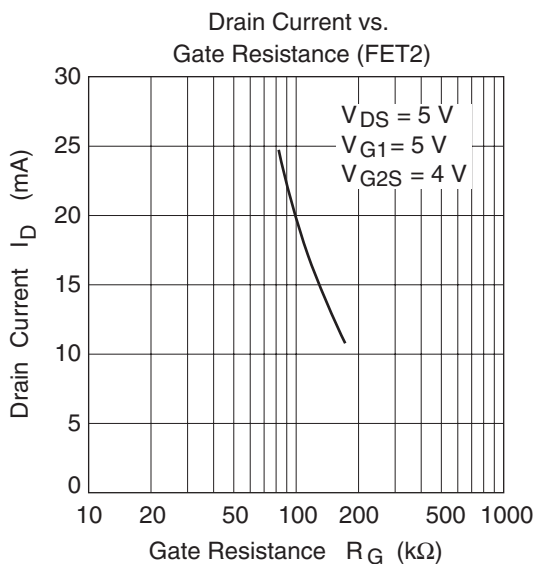
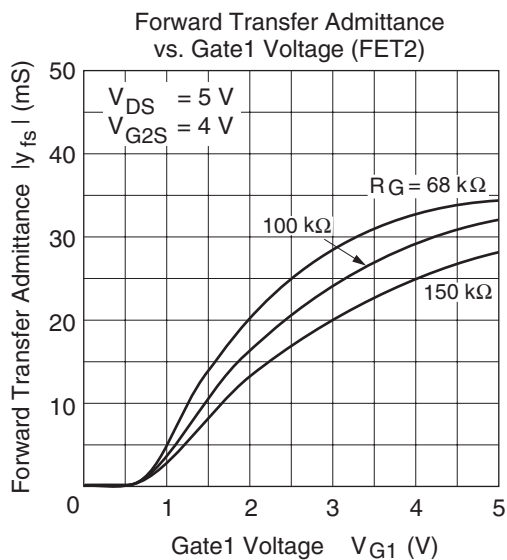
Drain Current vs.
Gate1 Voltage (FET1)

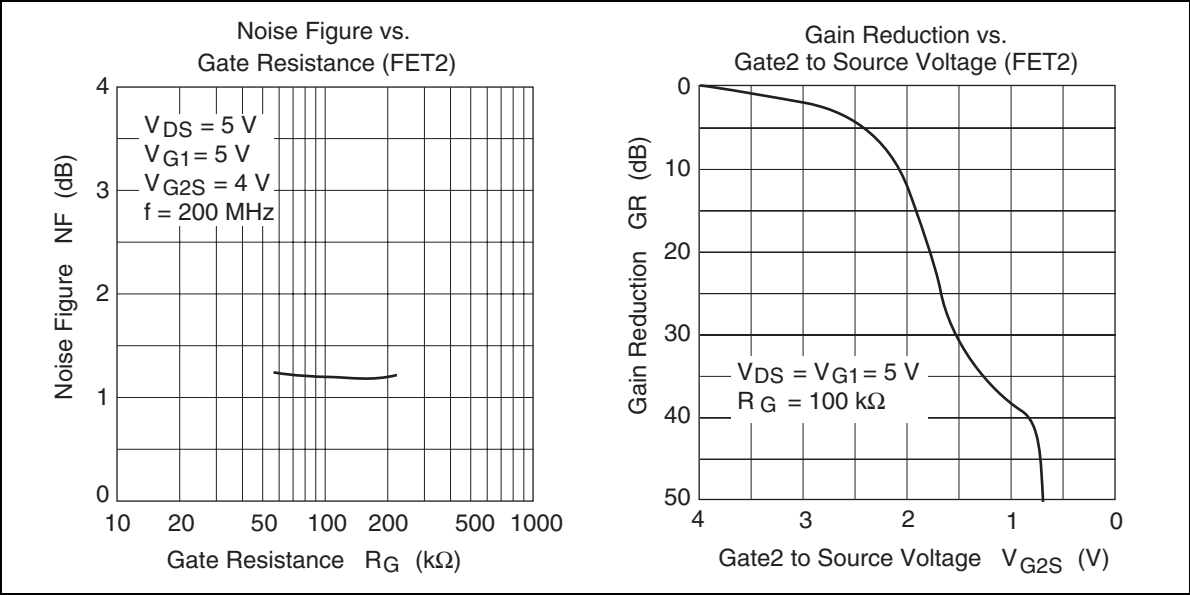


Forward Transfer Admittance
vs. Gate1 Voltage (FET1)









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