BB505M

Build in Biasing Circuit MOS FET IC
UHF RF Amplifier

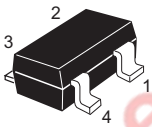
REJ03G0365-0100Z
Rev.1.00
Jun.14.2004

Features

- Build in Biasing Circuit; To reduce using parts cost & PC board space.
- Low noise; NF = 1.5 dB typ. at f = 900 MHz
- High gain; PG = 24 dB typ. at f = 900 MHz
- Withstanding to ESD;
  Build in ESD absorbing diode. Withstand up to 190 V at C = 200 pF, Rs = 0 conditions.
- Provide mini mold packages; MPAK-4 (SOT-143mod)

Outline

MPAK-4



1. Source
2. Gate1
3. Gate2
4. Drain

Notes: 1. Marking is “ES-”.
2. BB505M is individual type number of RENESAS 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	20	mA
Channel power dissipation	Pch[note3]	300	mW
Channel temperature	Tch	150	°C
Storage temperature	Tstg	–55 to +150	°C

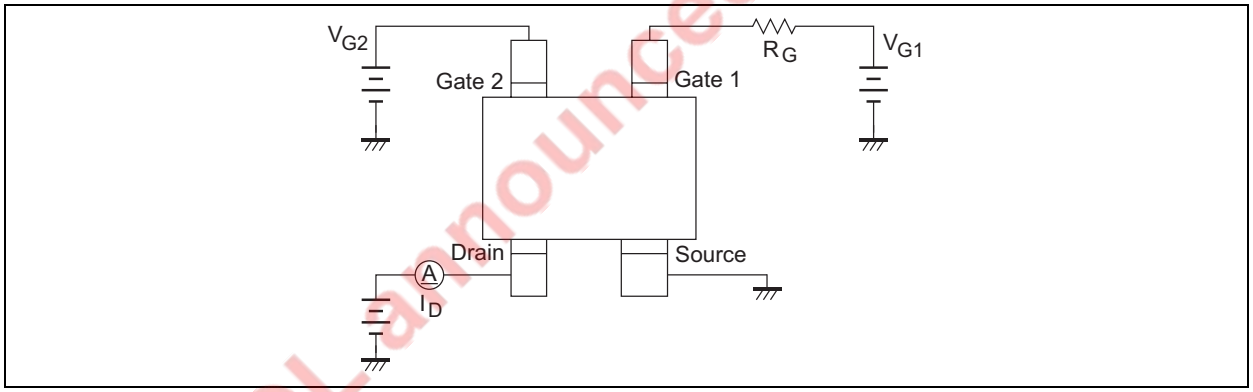
Notes: 3. Value on the glass epoxy board (50 mm × 40 mm × 1 mm).

Electrical Characteristics

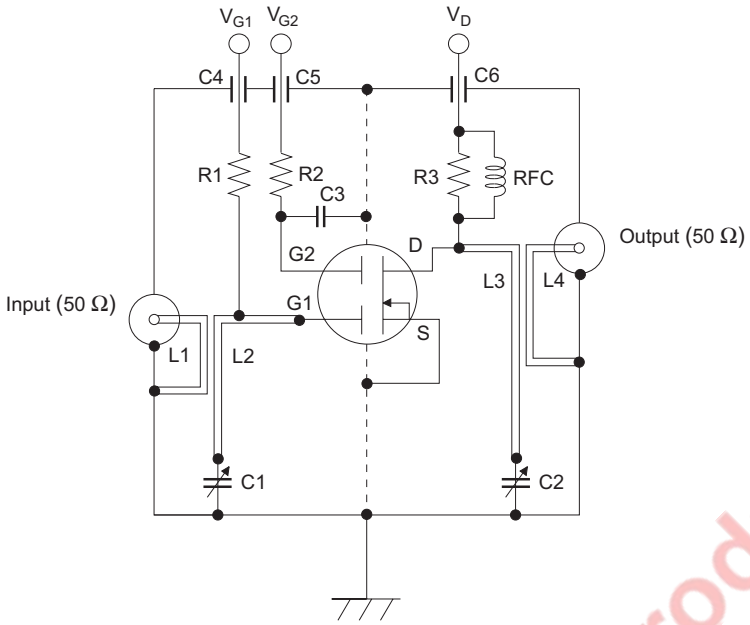
(Ta = 25°C)

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	$V_{G1S(off)}$	0.5	0.7	1.0	V	V_{DS} = 5 V, V_{G2S} = 4 V, I_D = 100 µA
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 µA
Drain current	$I_{D(op)}$	7	11	15	mA	V_{DS} = 5 V, V_{G1} = 5 V, V_{G2S} = 4 V R_G = 220 kΩ
Forward transfer admittance	$\|y_{fs}\|$	28	33	38	mS	V_{DS} = 5 V, V_{G1} = 5 V, V_{G2S} = 4 V R_G = 220 kΩ, f = 1 kHz
Input capacitance	C_{iss}	1.4	1.75	2.1	pF	V_{DS} = 5 V, V_{G1} = 5 V, V_{G2S} = 4 V R_G = 220 kΩ, f = 1 MHz
Output capacitance	C_{oss}	1.0	1.4	1.8	pF	
Reverse transfer capacitance	C_{rss}	—	0.03	0.05	pF	
Power gain	PG	19	24	29	dB	V_{DS} = 5 V, V_{G1} = 5 V, V_{G2S} = 4 V R_G = 220 kΩ, f = 900 MHz
Noise figure	NF	—	1.5	2.2	dB	

Bias Circuit for Operating Items ($I_{D(op)}$, $|y_{fs}|$, Ciss, Coss, Crss, NF, PG)

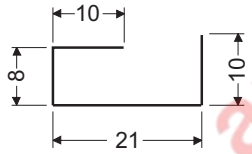


900 MHz Power Gain, Noise Figure Test Circuit

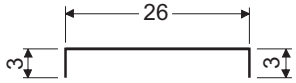


C1, C2 : Variable Capacitor (10 pF MAX)
C3 : Disk Capacitor (1000 pF)
C4 to C6 : Air Capacitor (1000 pF)
R1 : 220 kΩ
R2 : 47 kΩ
R3 : 4.7 kΩ

L1:

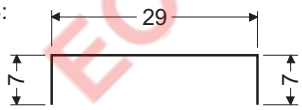


L2:

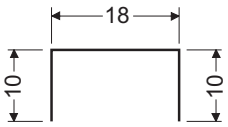


(ϕ1mm Copper wire)
Unit : mm

L3:



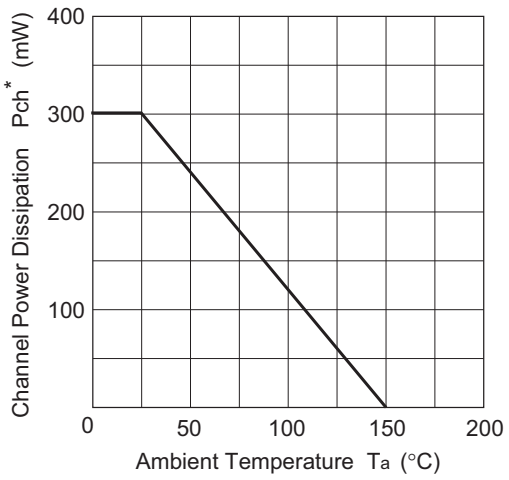
L4:



RFC : ϕ1mm Copper wire with enamel 4 turns inside dia 6 mm

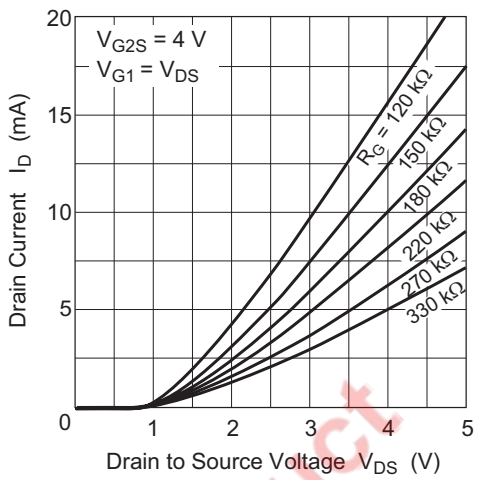
Main Characteristics

Maximum Channel Power Dissipation Curve

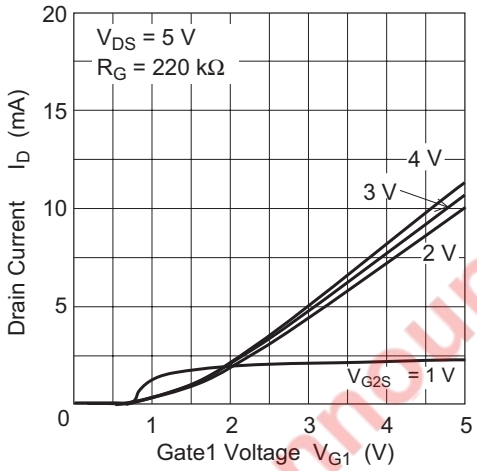


* Value on the glass epoxy board (50mm × 40mm × 1mm)

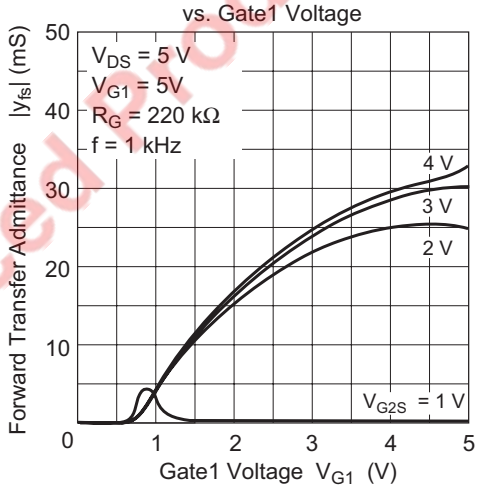
Typical Output Characteristics



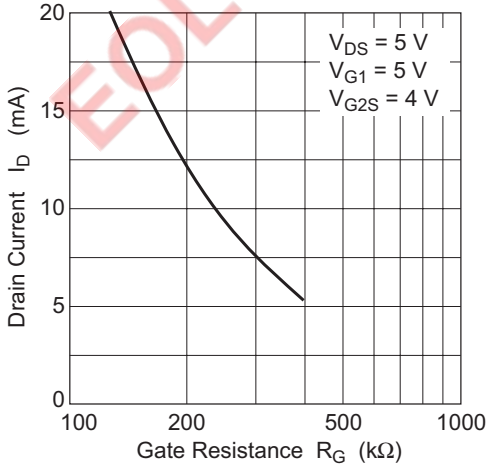
Drain Current vs. Gate1 Voltage



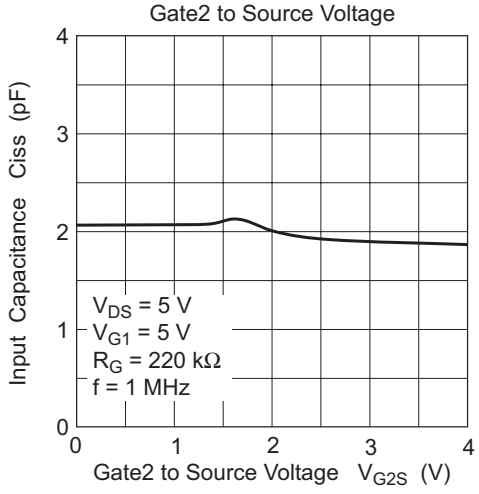
Forward Transfer Admittance vs. Gate1 Voltage



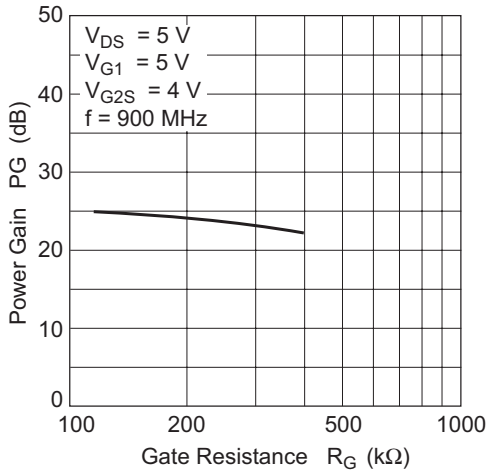
Drain Current vs. Gate Resistance



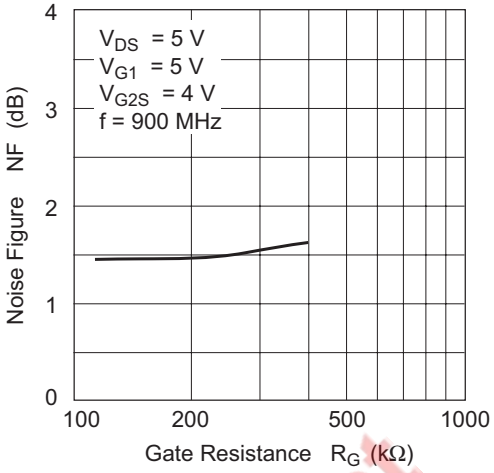
Input Capacitance vs. Gate2 to Source Voltage



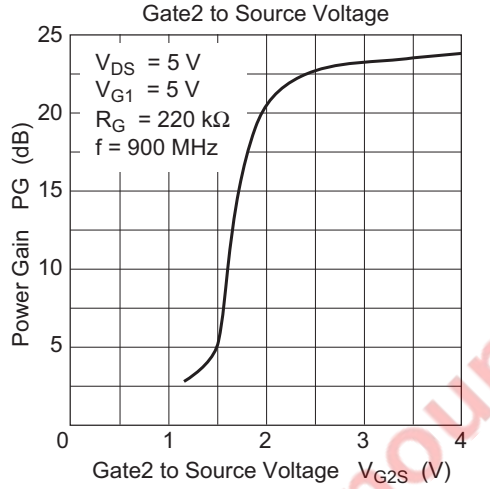
Power Gain vs. Gate Resistance



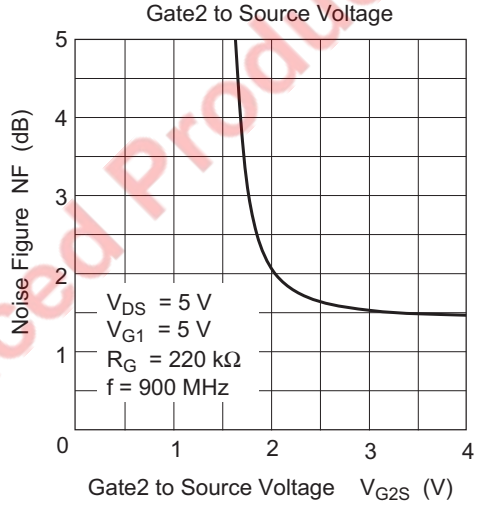
Noise Figure vs. Gate Resistance



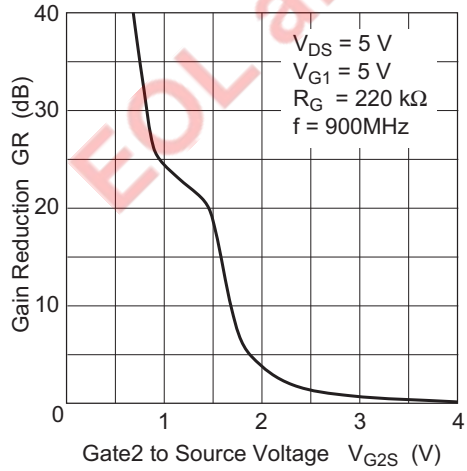
Power Gain vs.
Gate2 to Source Voltage



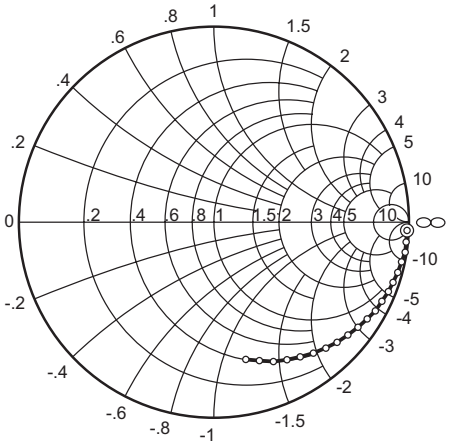
Noise Figure vs.
Gate2 to Source Voltage



Gain Reduction vs.
Gate2 to Source Voltage

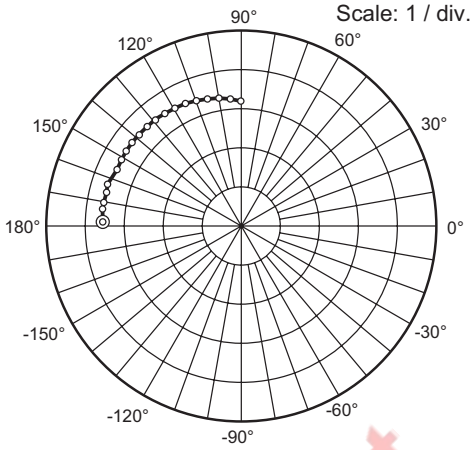


S_{11} Parameter vs. Frequency



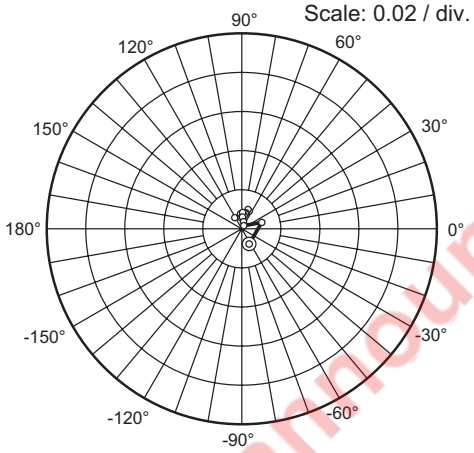
Condition: V_{DS} = 5 V, V_{G1} = 5 V, V_{G2S} = 4 V
R_G = 220 kΩ, Zo = 50 Ω
50 to 1000 MHz (50 MHz Step)

S_{21} Parameter vs. Frequency



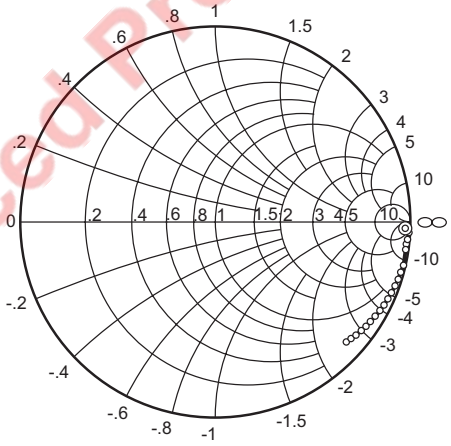
Condition: V_{DS} = 5 V, V_{G1} = 5 V, V_{G2S} = 4 V
R_G = 220 kΩ, Zo = 50 Ω
50 to 1000 MHz (50 MHz Step)

S_{12} Parameter vs. Frequency



Condition: V_{DS} = 5 V, V_{G1} = 5 V, V_{G2S} = 4 V
R_G = 220 kΩ, Zo = 50 Ω
50 to 1000 MHz (50 MHz Step)

S_{22} Parameter vs. Frequency



Condition: V_{DS} = 5 V, V_{G1} = 5 V, V_{G2S} = 4 V
R_G = 220 kΩ, Zo = 50 Ω
50 to 1000 MHz (50 MHz Step)

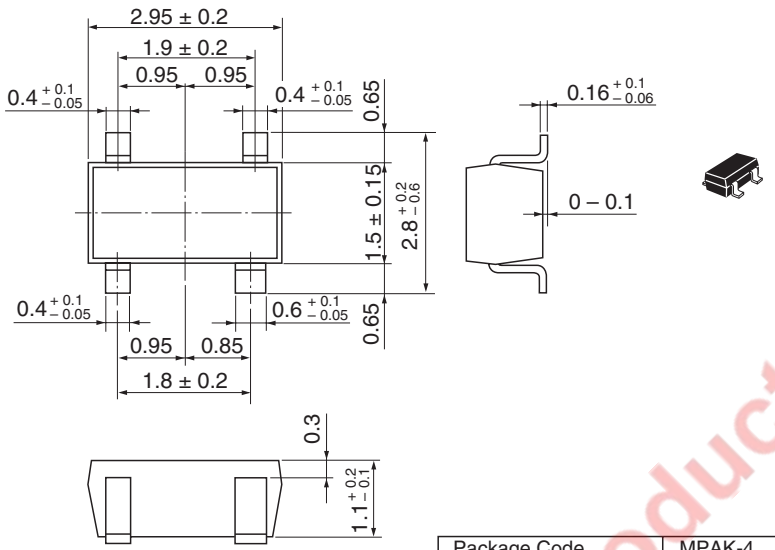
S parameter

(V_{DS} = 5 V, V_{G1} = 5 V, V_{G2S} = 4 V, R_G = 200 kΩ, Z_O = 50 Ω)

	S11		S21		S12		S22	
f (MHz)	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
50	0.991	-2.4	3.55	178.2	0.009	-64.5	0.976	-1.8
100	0.991	-5.9	3.58	172.9	0.011	18.0	0.995	-3.1
150	0.993	-8.9	3.58	170.2	0.002	61.4	0.990	-5.2
200	0.983	-11.9	3.56	165.9	0.004	77.7	0.986	-6.5
250	0.977	-15.3	3.59	162.6	0.006	87.6	0.986	-8.2
300	0.969	-18.5	3.50	155.5	0.008	87.8	0.990	-12.9
350	0.962	-21.6	3.51	151.0	0.006	94.6	0.984	-15.1
400	0.952	-25.2	3.52	146.9	0.007	80.9	0.982	-17.3
450	0.944	-28.7	3.52	142.6	0.008	87.1	0.977	-19.5
500	0.929	-32.2	3.51	138.2	0.008	78.1	0.973	-21.8
550	0.914	-36.0	3.51	133.4	0.008	74.7	0.968	-24.0
600	0.897	-40.0	3.50	129.0	0.008	84.8	0.963	-26.1
650	0.881	-44.2	3.49	124.2	0.010	72.6	0.957	-28.2
700	0.863	-48.3	3.47	119.4	0.010	67.5	0.950	-30.4
750	0.842	-52.7	3.45	114.5	0.008	78.7	0.943	-32.6
800	0.819	-57.3	3.41	109.7	0.008	82.1	0.939	-34.6
850	0.797	-62.0	3.37	104.9	0.008	85.3	0.931	-36.6
900	0.775	-66.8	3.33	99.9	0.008	95.6	0.924	-38.7
950	0.746	-71.8	3.27	94.9	0.007	97.4	0.916	-40.6
1000	0.721	-76.9	3.20	90.2	0.007	122.8	0.909	-42.4

Package Dimensions

As of January, 2003
Unit: mm



Package Code	MPAK-4
JEDEC	—
JEITA	Conforms
Mass (reference value)	0.013 g

Ordering Information

Part Name	Quantity	Shipping Container
BB505MES-	3000	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.

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Colophon .1.0