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

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BB302M

Build in Biasing Circuit MOS FET IC VHF RF Amplifier



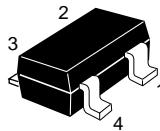
ADE-208-572B(Z)
3rd. Edition
Mar. 2001

Features

- Build in Biasing Circuit; To reduce using parts cost & PC board space.
- Low noise characteristics;
($NF = 1.7$ dB typ. at $f = 200$ MHz)
- Withstanding to ESD;
Build in ESD absorbing diode. Withstand up to 240V at $C=200pF$, $Rs=0$ conditions.
- Provide mini mold packages; MPAK-4(SOT-143Rmod)

Outline

MPAK-4



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

Notes: 1. Marking is "BW -".
2. BB302M is individual type number of HITACHI BBFET.

Absolute Maximum Ratings (Ta = 25°C)

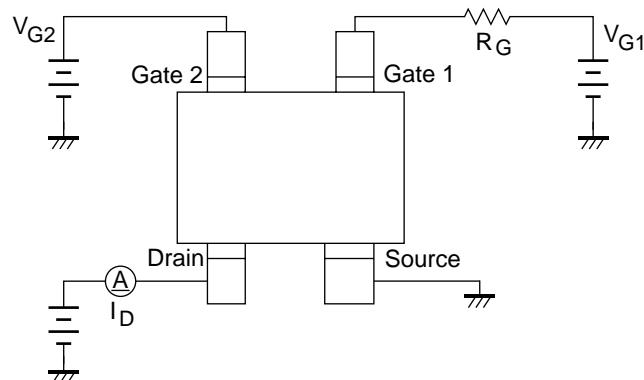
Item	Symbol	Ratings	Unit
Drain to source voltage	V _{DS}	12	V
Gate1 to source voltage	V _{G1S}	+10 - 0	V
Gate2 to source voltage	V _{G2S}	±10	V
Drain current	I _D	25	mA
Channel power dissipation	Pch	150	mW
Channel temperature	Tch	150	°C
Storage temperature	Tstg	-55 to +150	°C

Electrical Characteristics (Ta = 25°C)

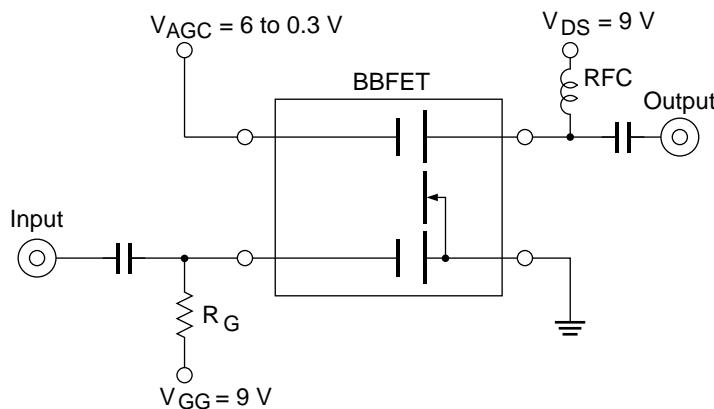
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain to source breakdown voltage	V _{(BR)DSS}	12	—	—	V	I _D = 200μA V _{G1S} = V _{G2S} = 0
Gate1 to source breakdown voltage	V _{(BR)G1SS}	+10	—	—	V	I _{G1} = +10μA V _{G2S} = V _{DS} = 0
Gate2 to source breakdown voltage	V _{(BR)G2SS}	±10	—	—	V	I _{G2} = ±10μA V _{G1S} = V _{DS} = 0
Gate1 to source cutoff current	I _{G1SS}	—	—	+100	nA	V _{G1S} = +9V V _{G2S} = V _{DS} = 0
Gate2 to source cutoff current	I _{G2SS}	—	—	±100	nA	V _{G2S} = ±9V V _{G1S} = V _{DS} = 0
Gate1 to source cutoff voltage	V _{G1S(off)}	0.4	—	1.0	V	V _{DS} = 9V, V _{G2S} = 6V I _D = 100μA
Gate2 to source cutoff voltage	V _{G2S(off)}	0.4	—	1.0	V	V _{DS} = 9V, V _{G1S} = 9V I _D = 100μA
Drain current	I _{D(op)}	9	13	18	mA	V _{DS} = 9V, V _{G1} = 9V V _{G2S} = 6V, R _G = 120kΩ
Forward transfer admittance	y _{fs}	15	20	—	mS	V _{DS} = 9V, V _{G1} = 9V V _{G2S} = 6V R _G = 120kΩ, f = 1kHz
Input capacitance	C _{iss}	2.2	3.0	4.0	pF	V _{DS} = 9V, V _{G1} = 9V
Output capacitance	C _{oss}	0.8	1.1	1.5	pF	V _{G2S} = 6V, R _G = 120kΩ
Reverse transfer capacitance	C _{rss}	—	0.017	0.04	pF	f = 1MHz
Power gain	PG	22	26	—	dB	V _{DS} = 9V, V _{G1} = 9V V _{G2S} = 6V
Noise figure	NF	—	1.7	2.2	dB	R _G = 120kΩ f = 200MHz

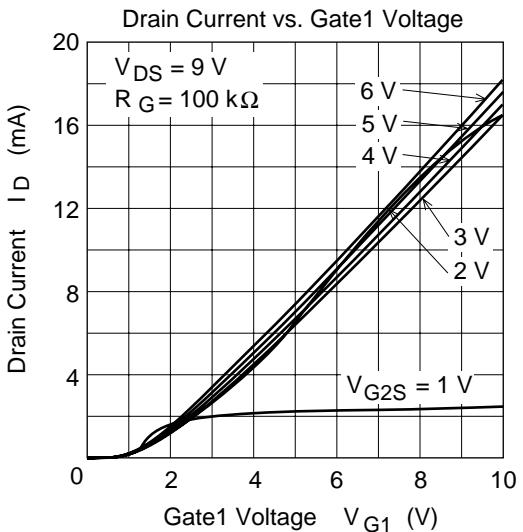
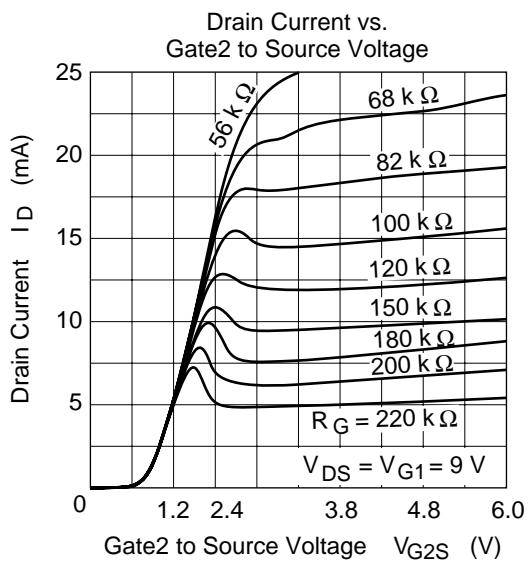
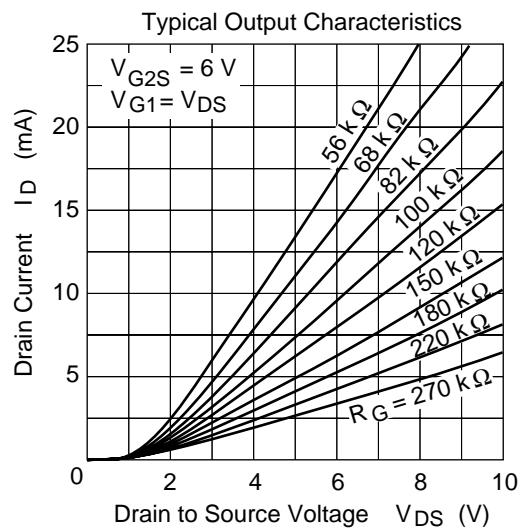
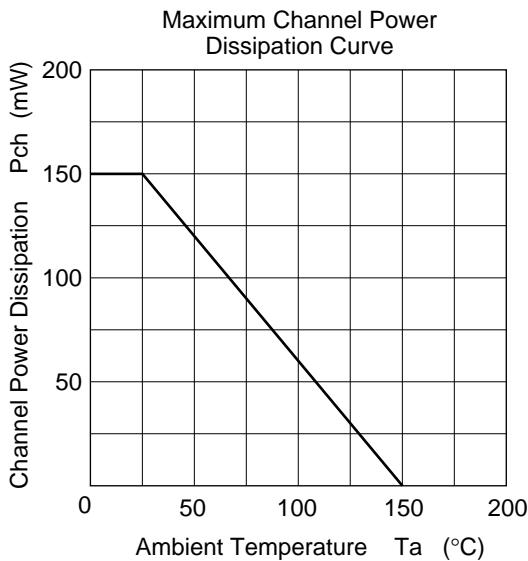
Main Characteristics

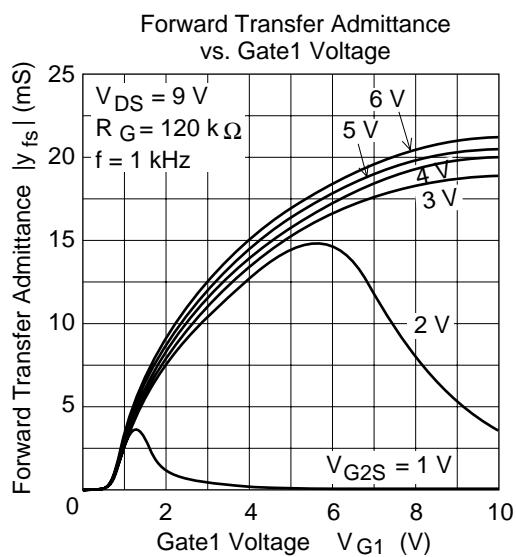
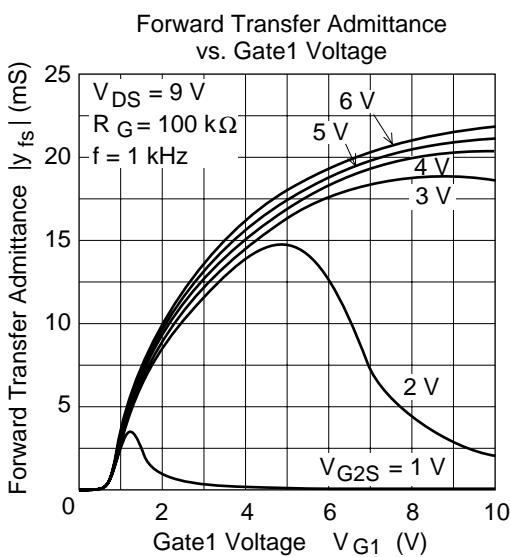
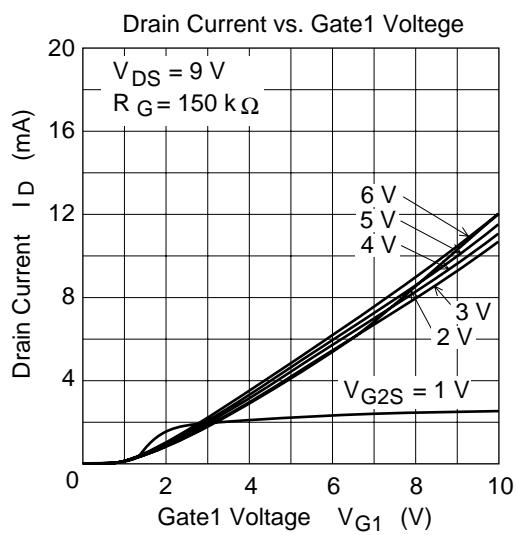
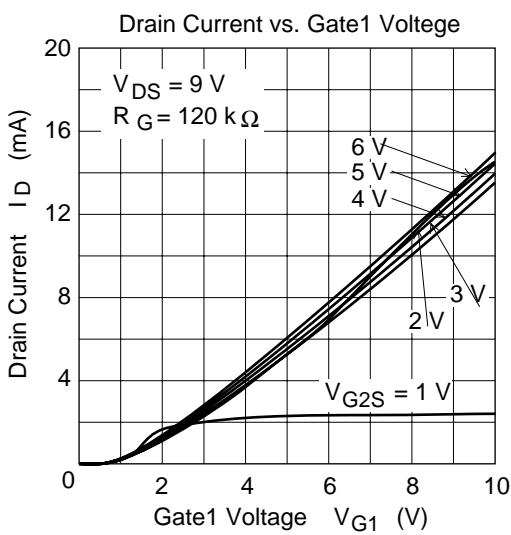
Test Circuit for Operating Items ($I_{D(\text{op})}$, $|y_{fs}|$, C_{iss} , C_{oss} , C_{rss} , NF, PG)

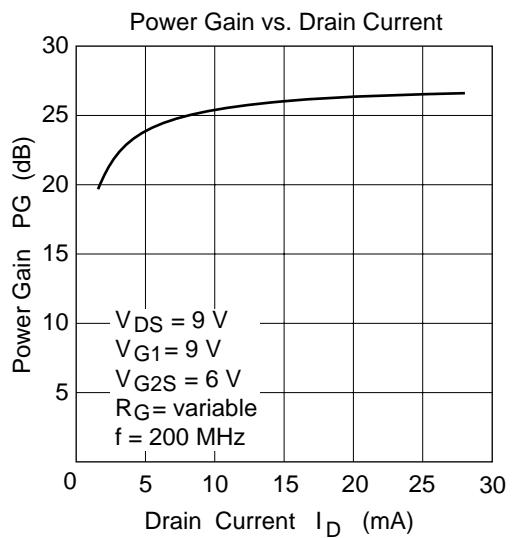
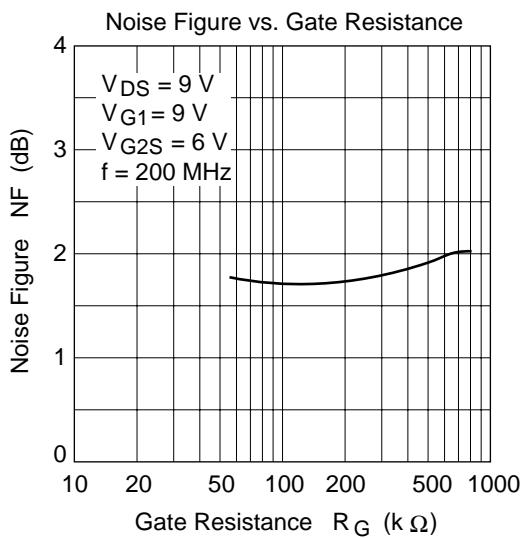
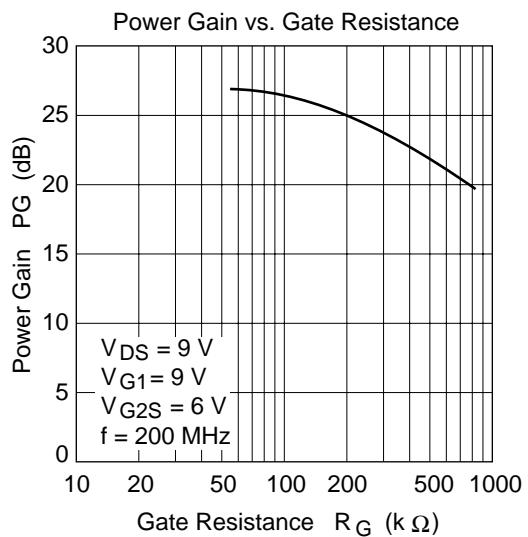
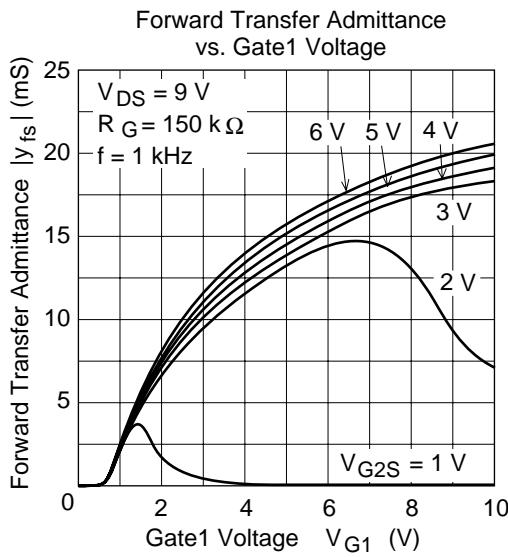


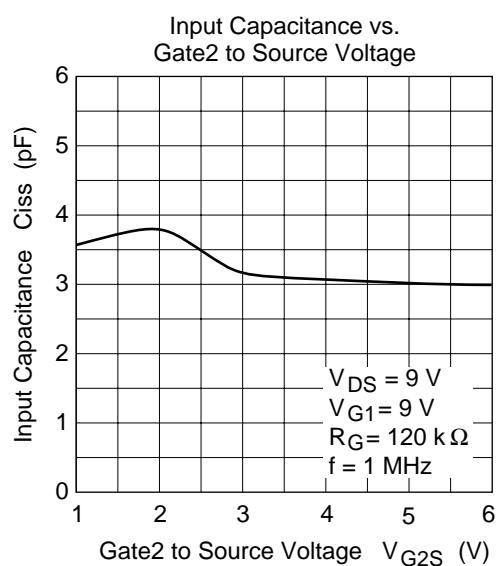
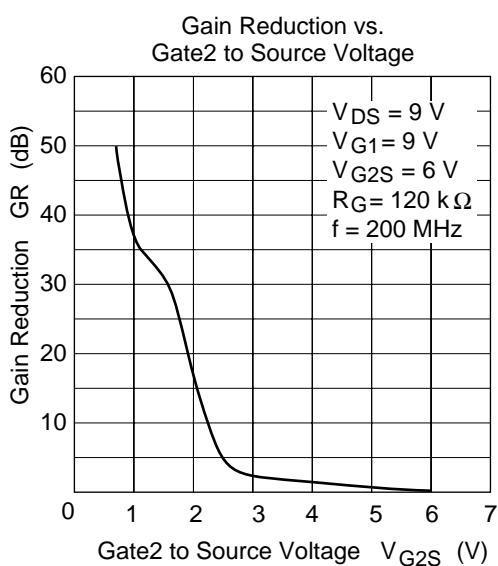
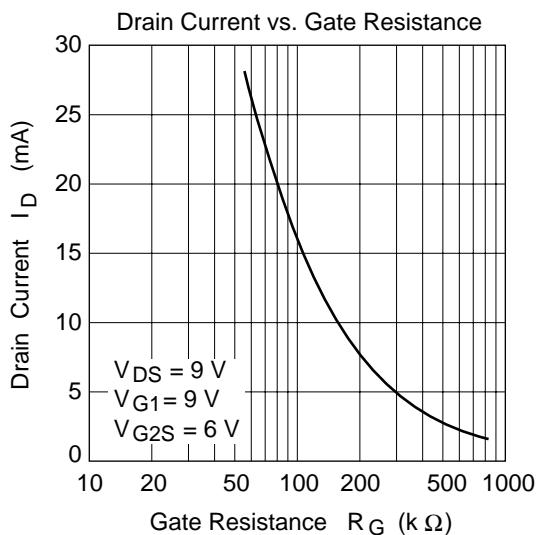
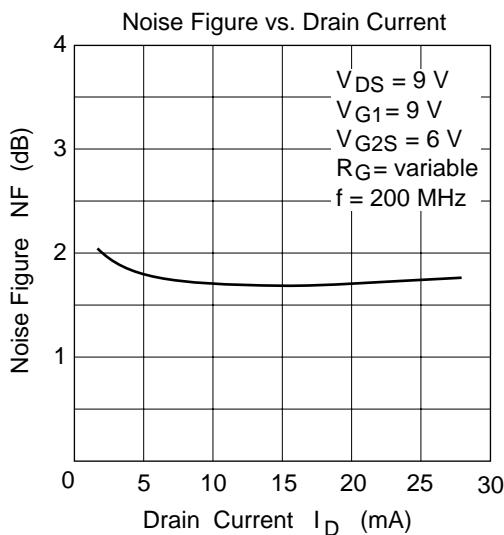
Application Circuit

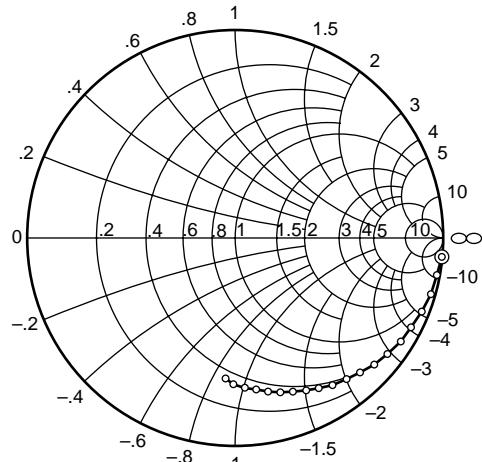




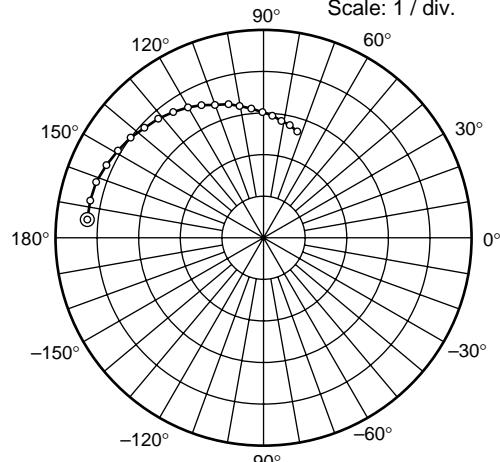




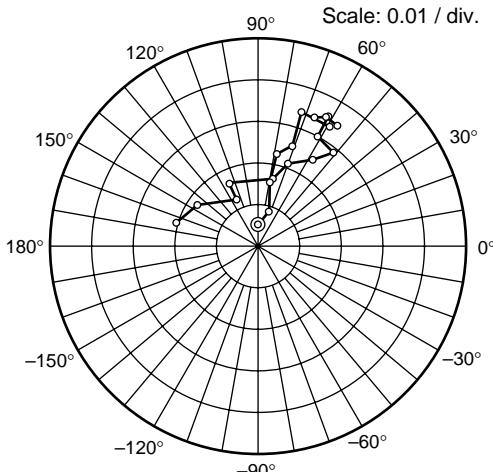


S11 Parameter vs. Frequency

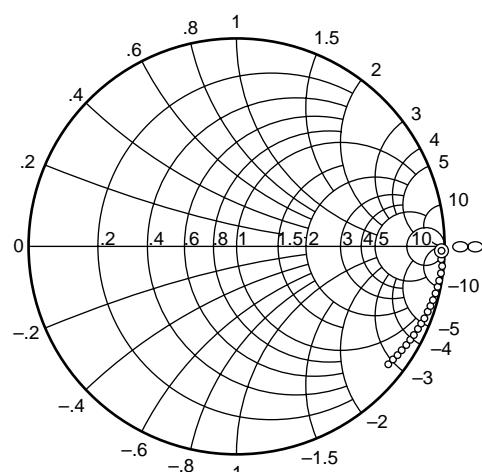
Test Condition : $V_{DS} = 9 \text{ V}$, $V_{G1} = 9 \text{ V}$
 $V_{G2S} = 6 \text{ V}$, $R_G = 120 \text{ k}\Omega$
50 to 1000 MHz (50 MHz step)

**S21 Parameter vs. Frequency**

Test Condition : $V_{DS} = 9 \text{ V}$, $V_{G1} = 9 \text{ V}$
 $V_{G2S} = 6 \text{ V}$, $R_G = 120 \text{ k}\Omega$
50 to 1000 MHz (50 MHz step)

**S12 Parameter vs. Frequency**

Test Condition : $V_{DS} = 9 \text{ V}$, $V_{G1} = 9 \text{ V}$
 $V_{G2S} = 6 \text{ V}$, $R_G = 120 \text{ k}\Omega$
50 to 1000 MHz (50 MHz step)

**S22 Parameter vs. Frequency**

Test Condition : $V_{DS} = 9 \text{ V}$, $V_{G1} = 9 \text{ V}$
 $V_{G2S} = 6 \text{ V}$, $R_G = 120 \text{ k}\Omega$
50 to 1000 MHz (50 MHz step)



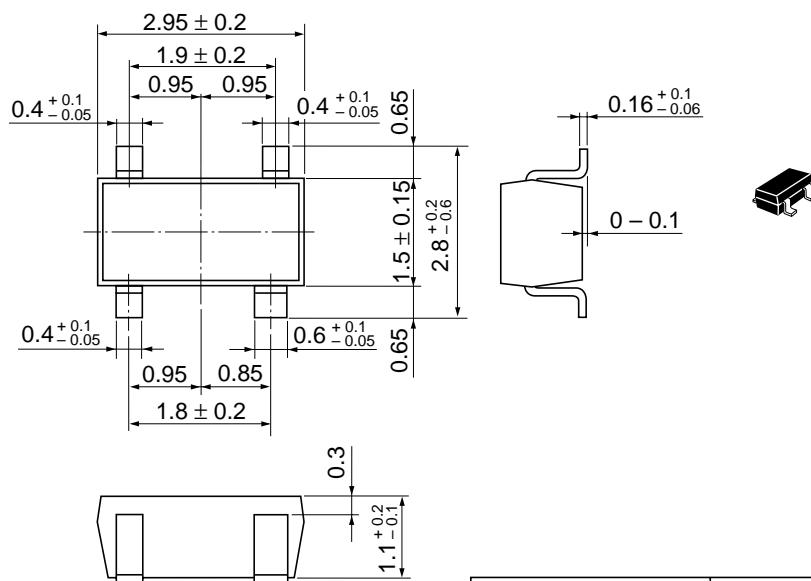
Sparameter ($V_{DS} = V_{G1} = 9V$, $V_{G2S} = 6V$, $R_G = 120k\Omega$, $Z_0 = 50\Omega$)

f (MHz)	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
50	0.988	-5.2	2.13	174.1	0.00052	90.0	0.985	-1.3
100	0.986	-10.4	2.13	167.9	0.00087	72.5	0.993	-3.6
150	0.979	-16.0	2.12	161.6	0.00156	79.4	0.992	-5.5
200	0.964	-21.5	2.08	155.2	0.00226	78.4	0.990	-7.5
250	0.948	-26.9	2.04	149.1	0.00254	71.0	0.987	-9.6
300	0.939	-32.0	2.00	143.0	0.00339	72.0	0.985	-11.4
350	0.920	-37.3	1.95	137.3	0.00335	59.0	0.982	-13.3
400	0.904	-42.3	1.91	131.5	0.00338	66.3	0.978	-15.3
450	0.885	-47.1	1.86	125.7	0.00351	62.2	0.974	-17.1
500	0.864	-51.7	1.81	120.1	0.00347	56.6	0.970	-18.9
550	0.848	-56.5	1.76	115.1	0.00355	61.5	0.966	-21.0
600	0.826	-60.9	1.70	110.1	0.00300	61.4	0.961	-22.7
650	0.808	-65.0	1.66	104.7	0.00289	51.1	0.957	-24.5
700	0.789	-69.4	1.61	100.3	0.00246	57.6	0.952	-26.6
750	0.773	-73.7	1.56	95.4	0.00211	70.0	0.947	-28.3
800	0.755	-77.9	1.51	90.5	0.00166	77.5	0.943	-30.2
850	0.735	-82.1	1.47	85.9	0.00165	114.5	0.937	-32.2
900	0.721	-86.3	1.42	81.3	0.00123	114.5	0.933	-34.1
950	0.703	-90.7	1.39	76.9	0.00176	145.8	0.927	-35.9
1000	0.677	-93.9	1.34	72.4	0.00204	164.0	0.923	-37.9

Package Dimensions

As of January, 2001

Unit: mm



Hitachi Code	MPAK-4
JEDEC	—
EIAJ	Conforms
Mass (reference value)	0.013 g

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Colophon 2.0