

# BB102M

Build in Biasing Circuit MOS FET IC  
UHF RF Amplifier

# HITACHI

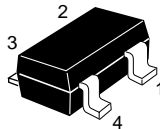
ADE-208-587A (Z)  
2nd. Edition  
Mar. 2001

## Features

- Build in Biasing Circuit; To reduce using parts cost & PC board space.
- Low noise characteristics;  
(NF = 2.1 dB typ. at f = 900 MHz)
- Withstanding to ESD;  
Build in ESD absorbing diode. Withstand up to 200V 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)

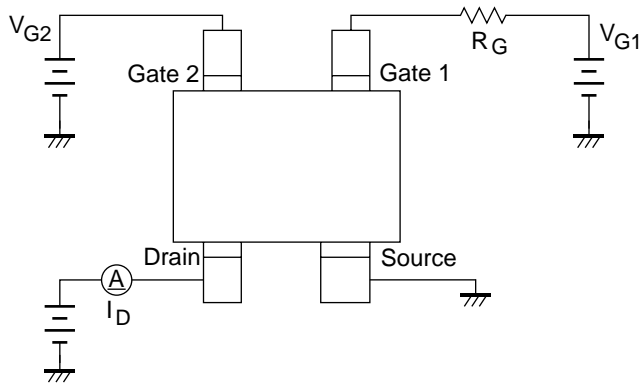
Item	Symbol	Ratings	Unit
Drain to source voltage	$V_{DS}$	12	V
Gate1 to source voltage	$V_{G1S}$	+10 -0	V
Gate2 to source voltage	$V_{G2S}$	±10	V
Drain current	$I_D$	25	mA
Channel power dissipation	Pch	150	mW
Channel temperature	Tch	150	°C
Storage temperature	Tstg	-55 to +150	°C

## Electrical Characteristics (Ta = 25°C)

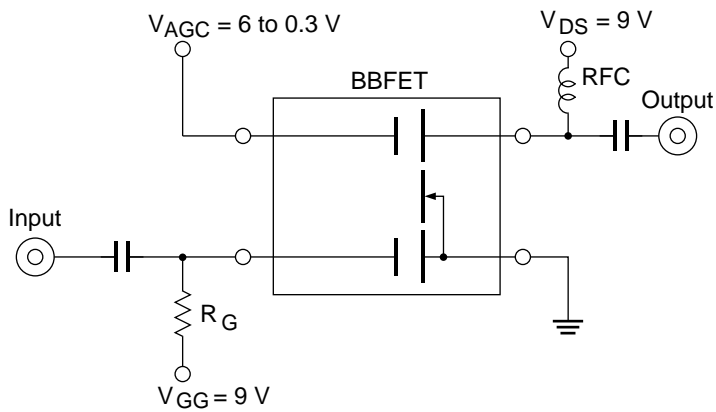
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain to source breakdown voltage	$V_{(BR)DSS}$	12	—	—	V	$I_D = 200\mu A, V_{G1S} = V_{G2S} = 0$
Gate1 to source breakdown voltage	$V_{(BR)G1SS}$	+10	—	—	V	$I_{G1} = +10\mu A, V_{G2S} = V_{DS} = 0$
Gate2 to source breakdown voltage	$V_{(BR)G2SS}$	±10	—	—	V	$I_{G2} = \pm 10\mu A, V_{G1S} = V_{DS} = 0$
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	$V_{G2S} = \pm 9V, V_{G1S} = V_{DS} = 0$
Gate1 to source cutoff voltage	$V_{G1S(off)}$	0.1	—	0.8	V	$V_{DS} = 9V, V_{G2S} = 6V, I_D = 100\mu A$
Gate2 to source cutoff voltage	$V_{G2S(off)}$	0.5	—	1.1	V	$V_{DS} = 9V, V_{G1S} = 9V, I_D = 100\mu A$
Drain current	$I_{D(op)}$	10	15	20	mA	$V_{DS} = 9V, V_{G1} = 9V, V_{G2S} = 6V$ $R_G = 560k\Omega$
Forward transfer admittance	$ y_{fs} $	16	21	—	mS	$V_{DS} = 9V, V_{G1} = 9V, V_{G2S} = 6V$ $R_G = 560k\Omega, f = 1kHz$
Input capacitance	$C_{iss}$	1.2	1.6	2.2	pF	$V_{DS} = 9V, V_{G1} = 9V$
Output capacitance	$C_{oss}$	0.7	1.1	1.5	pF	$V_{G2S} = 6V, R_G = 560k\Omega$
Reverse transfer capacitance	$C_{rss}$	—	0.011	0.03	pF	$f = 1MHz$
Power gain	PG	16	20	—	dB	$V_{DS} = 9V, V_{G1} = 9V, V_{G2S} = 6V$
Noise figure	NF	—	2.1	3.1	dB	$R_G = 120k\Omega, f = 900MHz$

Main Characteristics

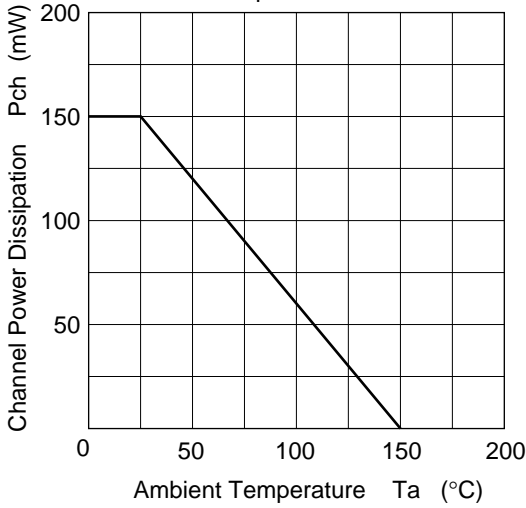
Test Circuit for Operating Items ( $I_{D(op)}$ ,  $|y_{fs}|$ ,  $C_{iss}$ ,  $C_{oss}$ ,  $C_{rss}$ , NF, PG)



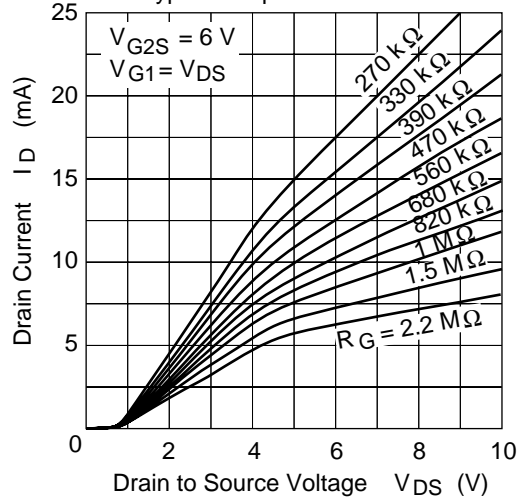
Application Circuit



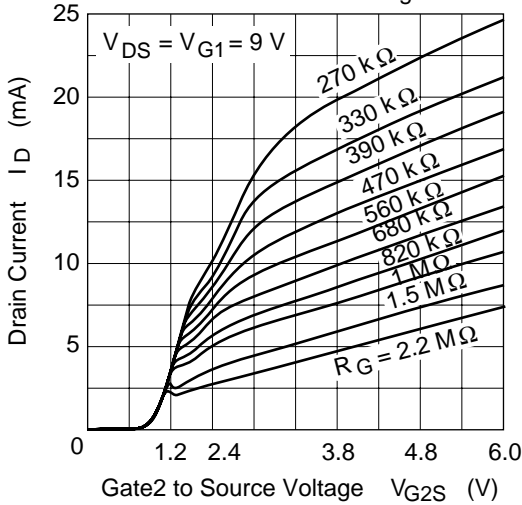
Maximum Channel Power Dissipation Curve



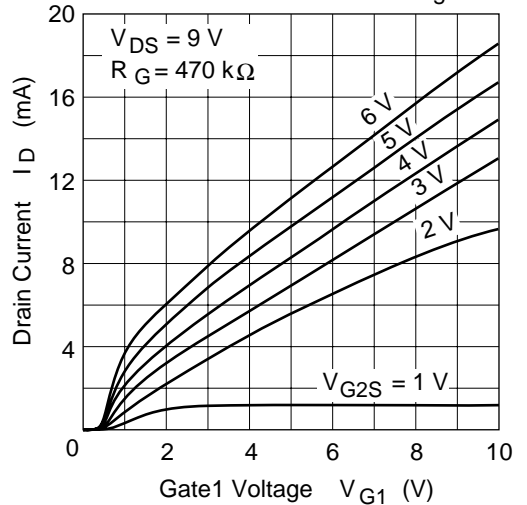
Typical Output Characteristics

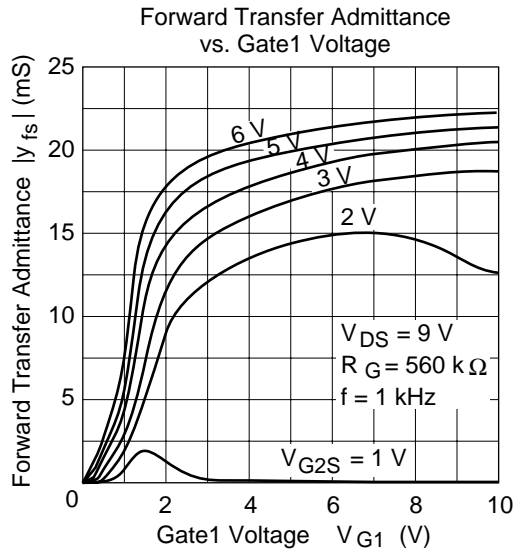
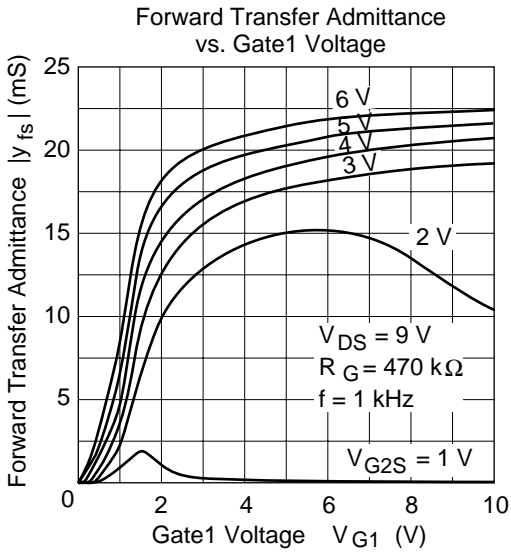
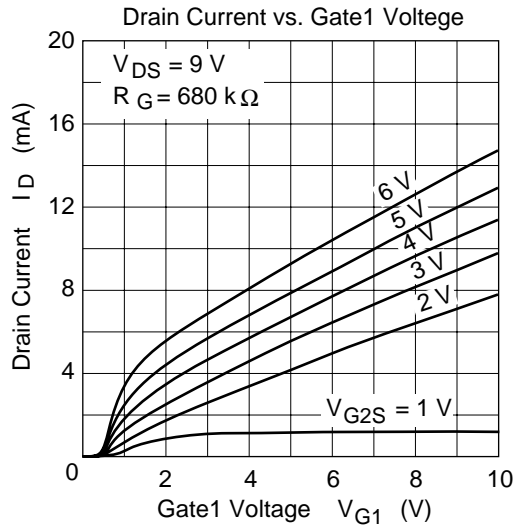
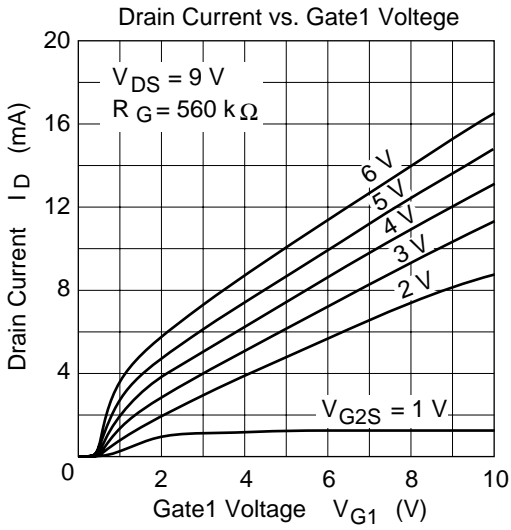


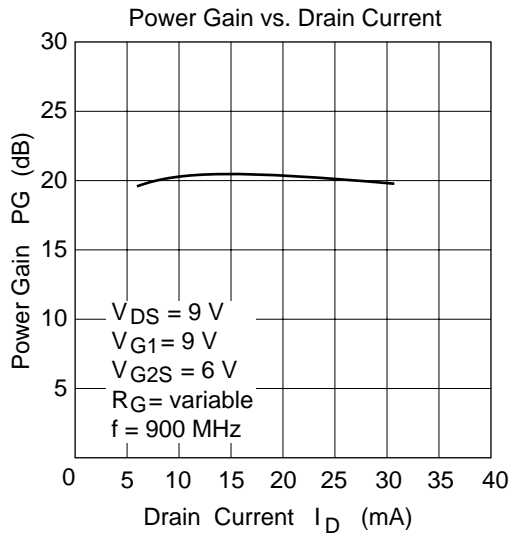
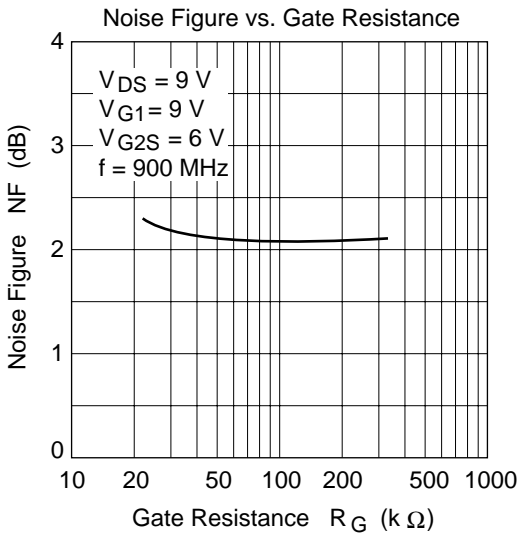
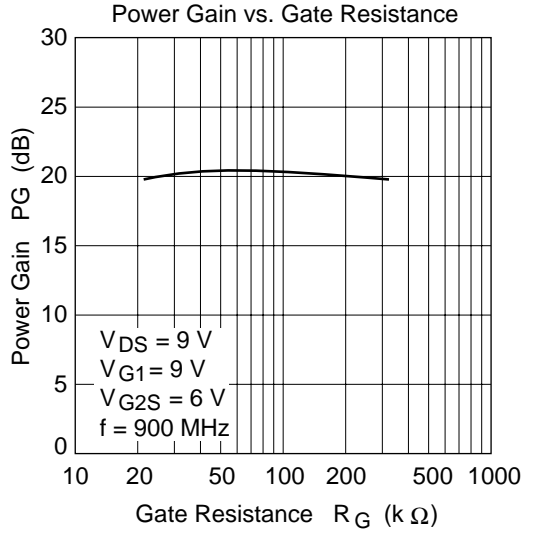
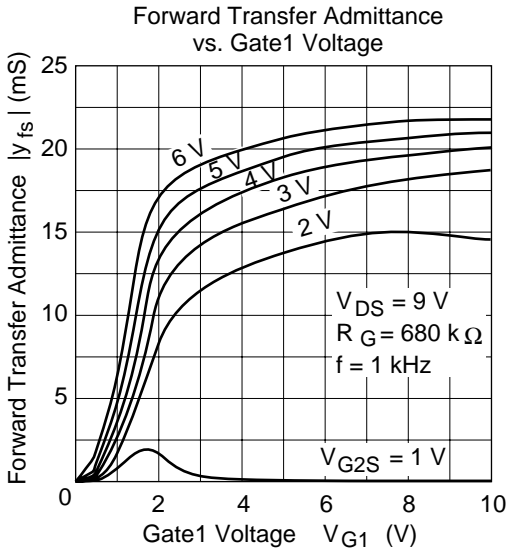
Drain Current vs. Gate2 to Source Voltage

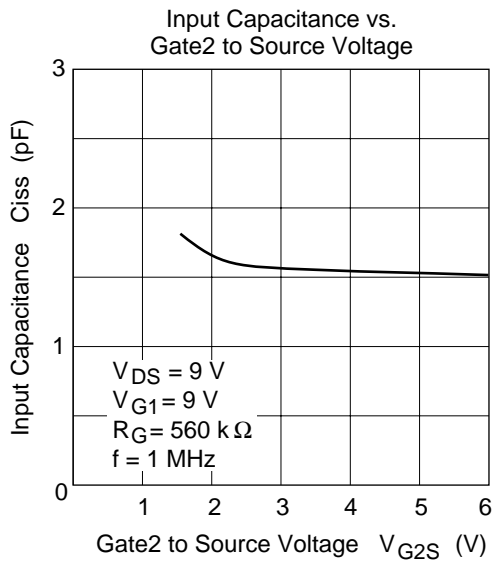
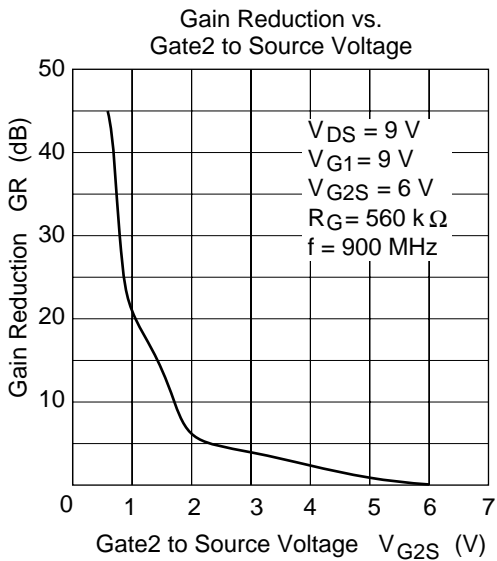
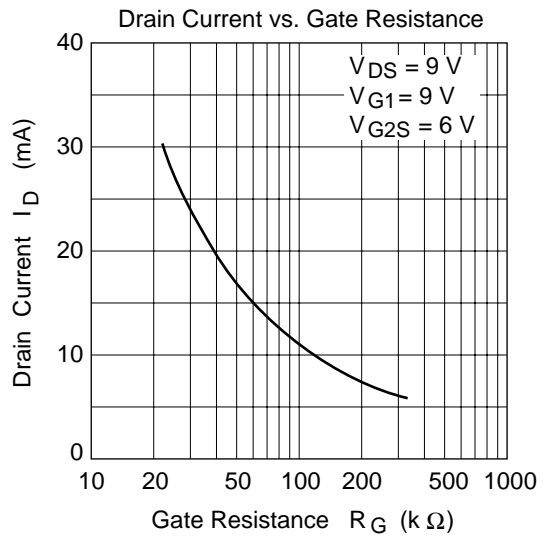
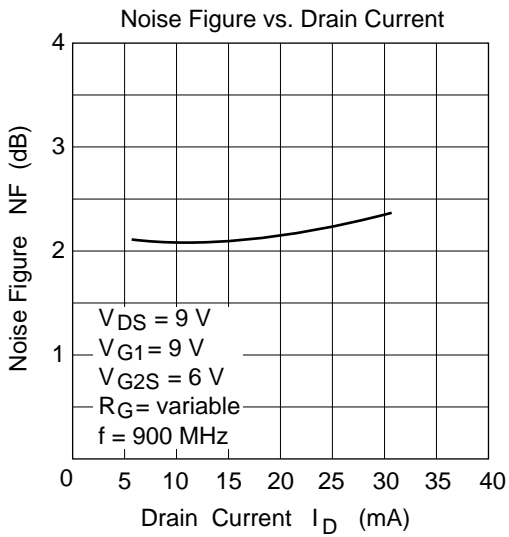


Drain Current vs. Gate1 Voltage

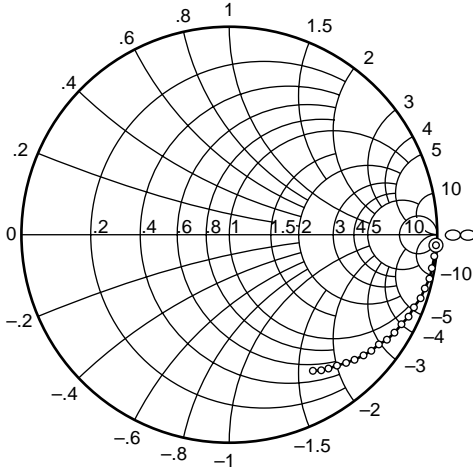








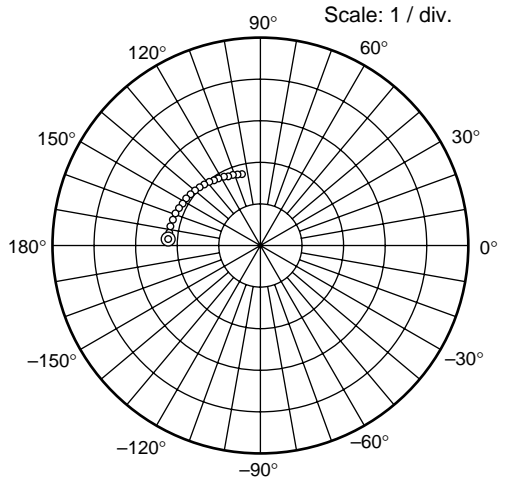
**S11 Parameter vs. Frequency**



Test Condition :  $V_{DS} = 9\text{ V}$ ,  $V_{G1} = 9\text{ V}$   
 $V_{G2S} = 6\text{ V}$ ,  $R_G = 560\text{ k}\Omega$   
 50 to 1000 MHz (50 MHz step)



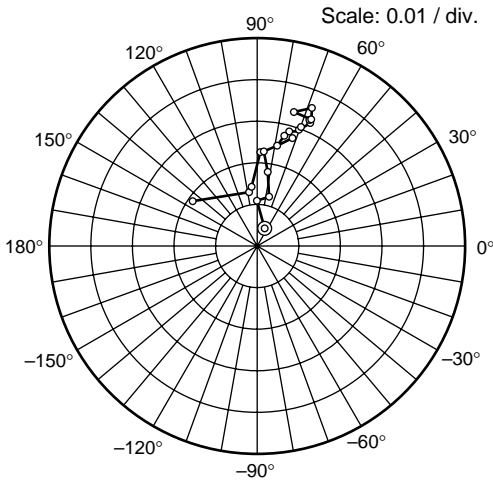
**S21 Parameter vs. Frequency**



Test Condition :  $V_{DS} = 9\text{ V}$ ,  $V_{G1} = 9\text{ V}$   
 $V_{G2S} = 6\text{ V}$ ,  $R_G = 560\text{ k}\Omega$   
 50 to 1000 MHz (50 MHz step)



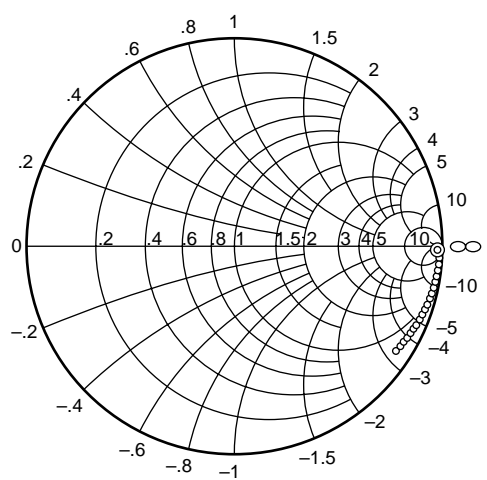
**S12 Parameter vs. Frequency**



Test Condition :  $V_{DS} = 9\text{ V}$ ,  $V_{G1} = 9\text{ V}$   
 $V_{G2S} = 6\text{ V}$ ,  $R_G = 560\text{ k}\Omega$   
 50 to 1000 MHz (50 MHz step)



**S22 Parameter vs. Frequency**



Test Condition :  $V_{DS} = 9\text{ V}$ ,  $V_{G1} = 9\text{ V}$   
 $V_{G2S} = 6\text{ V}$ ,  $R_G = 560\text{ k}\Omega$   
 50 to 1000 MHz (50 MHz step)



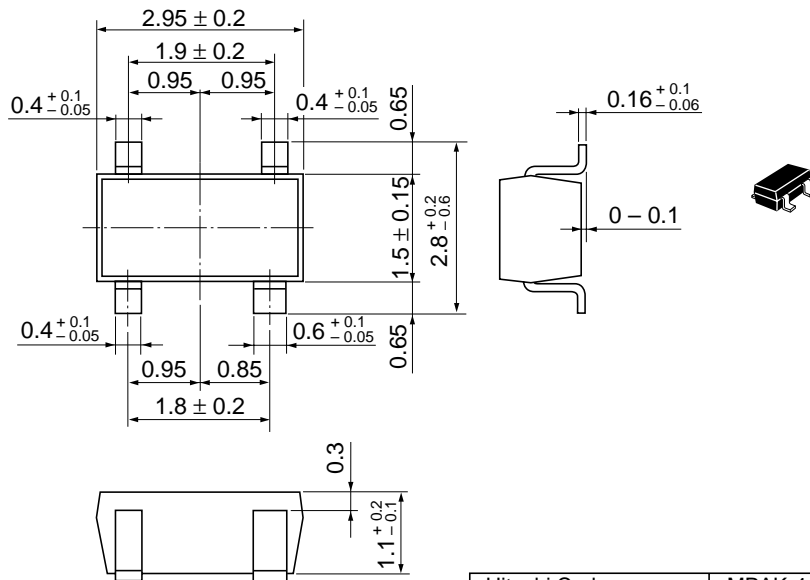
**Sparameter** ( $V_{DS} = V_{G1} = 9V$ ,  $V_{G2S} = 6V$ ,  $R_G = 560k\Omega$ ,  $Z_O = 50\Omega$ )

f (MHz)	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
50	0.995	-2.9	2.22	176.0	0.00046	66.9	0.977	-1.0
100	0.991	-6.0	2.21	172.0	0.00109	90.4	0.987	-3.2
150	0.987	-9.4	2.21	168.0	0.00122	76.5	0.987	-5.0
200	0.985	-12.4	2.19	163.6	0.00180	81.9	0.985	-6.7
250	0.975	-15.4	2.18	159.3	0.00228	86.0	0.983	-8.4
300	0.969	-18.4	2.15	155.3	0.00246	78.8	0.981	-10.0
350	0.954	-21.5	2.12	151.7	0.00273	76.2	0.979	-11.7
400	0.948	-24.6	2.11	147.6	0.00331	66.9	0.976	-13.4
450	0.933	-27.5	2.08	143.7	0.00334	74.7	0.973	-14.9
500	0.923	-30.7	2.05	139.9	0.00357	68.4	0.969	-16.8
550	0.912	-33.6	2.02	136.2	0.00328	67.5	0.965	-18.3
600	0.892	-36.3	1.99	123.9	0.00305	69.8	0.961	-19.9
650	0.882	-39.3	1.96	128.7	0.00322	66.7	0.958	-21.5
700	0.868	-42.0	1.92	125.4	0.00297	70.3	0.953	-23.4
750	0.851	-45.0	1.90	122.0	0.00286	74.4	0.948	-24.7
800	0.834	-47.7	1.87	117.9	0.00273	71.9	0.944	-26.2
850	0.815	-50.6	1.83	114.9	0.00226	88.1	0.940	-27.9
900	0.801	-53.5	1.82	111.2	0.00143	95.5	0.934	-29.4
950	0.788	-55.9	1.79	107.8	0.00131	98.6	0.931	-31.0
1000	0.768	-58.5	1.77	104.4	0.00189	145.2	0.925	-32.9

## Package Dimensions

As of January, 2001

Unit: mm



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

## Cautions

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