

BB305M

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

HITACHI

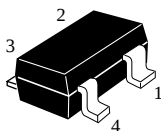
ADE-208-607D (Z)
5th. Edition
Mar. 2001

Features

- Build in Biasing Circuit; To reduce using parts cost & PC board space.
- Superior cross modulation characteristics.
- High gain; (PG = 28 dB typ. at $f = 200$ MHz)
- Wide supply voltage range;
Applicable with 5V to 9V supply voltage.
- Withstanding to ESD;
Build in ESD absorbing diode. Withstand up to 200V at $C=200\text{pF}$, $R_s=0$ conditions.
- Provide mini mold packages; MPAK-4(SOT-143Rmod)

Outline

MPAK-4



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

- Notes:
1. Marking is "EW —".
 2. BB305M is individual type number of HITACHI BBFET.

Absolute Maximum Ratings (Ta = 25°C)

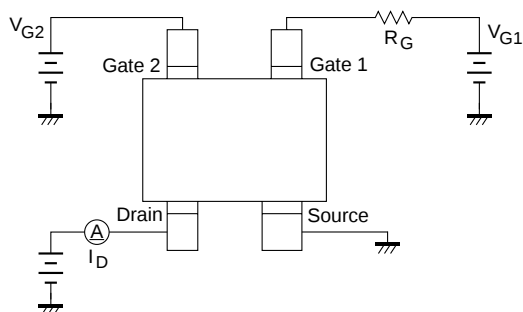
Item	Symbol	Ratings	Unit
Drain to source voltage	V_{DS}	12	V
Gate1 to source voltage	V_{G1S}	+10 −0	V
Gate2 to source voltage	V_{G2S}	±10	V
Drain current	I_D	25	mA
Channel power dissipation	Pch	150	mW
Channel temperature	Tch	150	°C
Storage temperature	Tstg	−55 to +150	°C

Electrical Characteristics (Ta = 25°C)

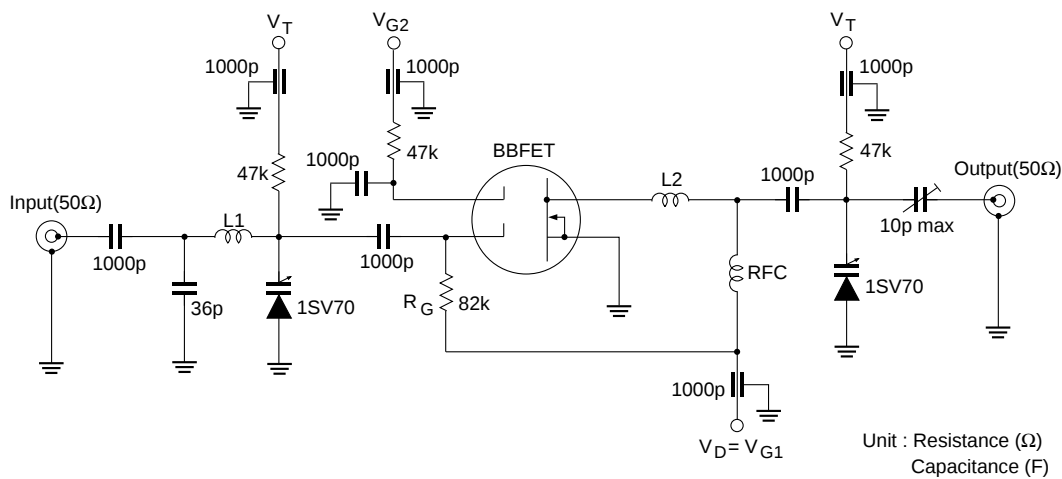
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain to source breakdown voltage	$V_{(BR)DSS}$	12	—	—	V	$I_D = 200\mu A$, $V_{G1S} = V_{G2S} = 0$
Gate1 to source breakdown voltage	$V_{(BR)G1SS}$	+10	—	—	V	$I_{G1} = +10\mu A$, $V_{G2S} = V_{DS} = 0$
Gate2 to source breakdown voltage	$V_{(BR)G2SS}$	± 10	—	—	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	$V_{G1S(off)}$	0.4	—	1.0	V	$V_{DS} = 5V$, $V_{G2S} = 4V$, $I_D = 100\mu A$
Gate2 to source cutoff voltage	$V_{G2S(off)}$	0.4	—	1.0	V	$V_{DS} = 5V$, $V_{G1S} = 5V$, $I_D = 100\mu A$
Input capacitance	C_{iss}	2.3	2.8	3.5	pF	$V_{DS} = 5V$, $V_{G1} = 5V$
Output capacitance	C_{oss}	1.1	1.5	1.9	pF	$V_{G2S} = 4V$, $R_G = 82k\Omega$
Reverse transfer capacitance	C_{rss}	—	0.017	0.04	pF	$f = 1MHz$
Drain current	$I_{D(op)1}$	10	15	20	mA	$V_{DS} = 5V$, $V_{G1} = 5V$, $V_{G2S} = 4V$ $R_G = 82k\Omega$
	$I_{D(op)2}$	—	13	—	mA	$V_{DS} = 9V$, $V_{G1} = 9V$, $V_{G2S} = 6V$ $R_G = 220k\Omega$
Forward transfer admittance	$ y_{fs} 1$	23	28	—	mS	$V_{DS} = 5V$, $V_{G1} = 5V$, $V_{G2S} = 4V$ $R_G = 82k\Omega$, $f = 1kHz$
	$ y_{fs} 2$	—	28	—	mS	$V_{DS} = 9V$, $V_{G1} = 9V$, $V_{G2S} = 6V$ $R_G = 220k\Omega$, $f = 1kHz$
Power gain	PG1	24	28	—	dB	$V_{DS} = 5V$, $V_{G1} = 5V$, $V_{G2S} = 4V$ $R_G = 82k\Omega$, $f = 200MHz$
	PG2	—	28	—	dB	$V_{DS} = 9V$, $V_{G1} = 9V$, $V_{G2S} = 6V$ $R_G = 220k\Omega$, $f = 200MHz$
Noise figure	NF1	—	1.4	1.9	dB	$V_{DS} = 5V$, $V_{G1} = 5V$, $V_{G2S} = 4V$ $R_G = 82k\Omega$, $f = 200MHz$
	NF2	—	1.4	—	dB	$V_{DS} = 9V$, $V_{G1} = 9V$, $V_{G2S} = 6V$ $R_G = 220k\Omega$, $f = 200MHz$

Main Characteristics

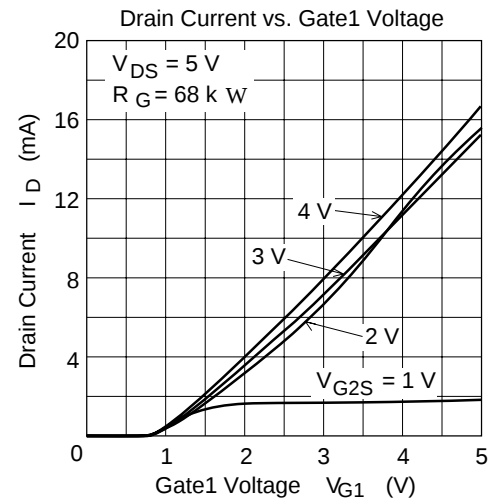
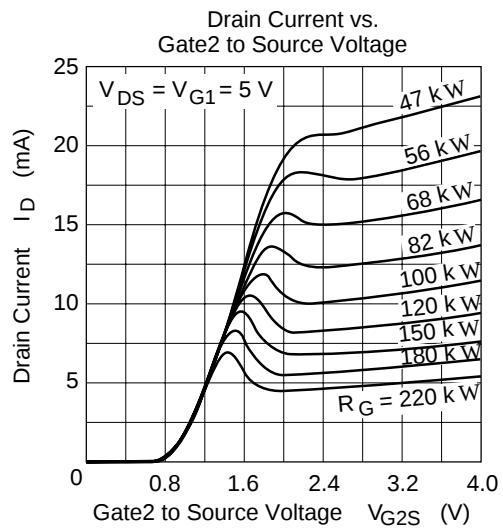
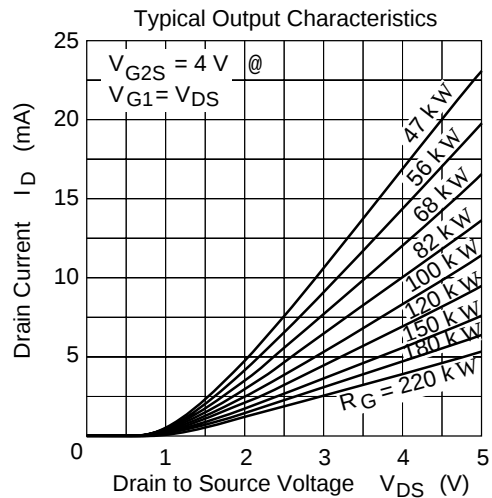
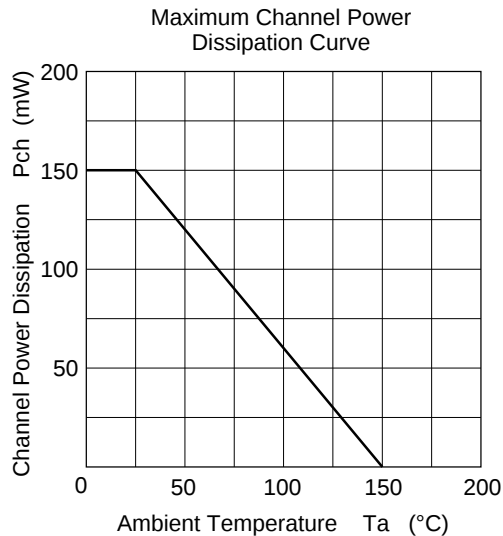
Test Circuit for Operating Items ($I_{D(op)}$, $|y_{fs}|$, C_{iss} , C_{oss} , C_{rss} , NF, PG)



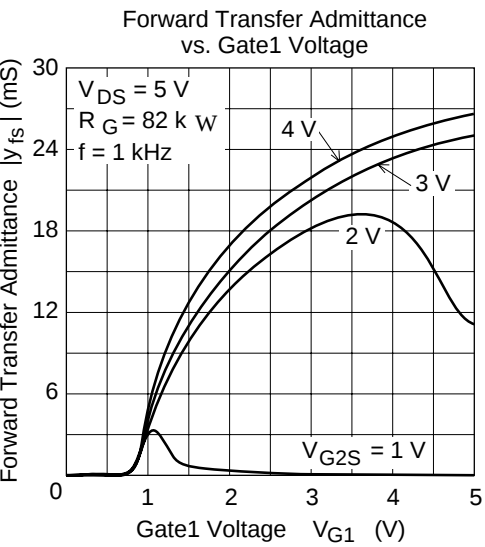
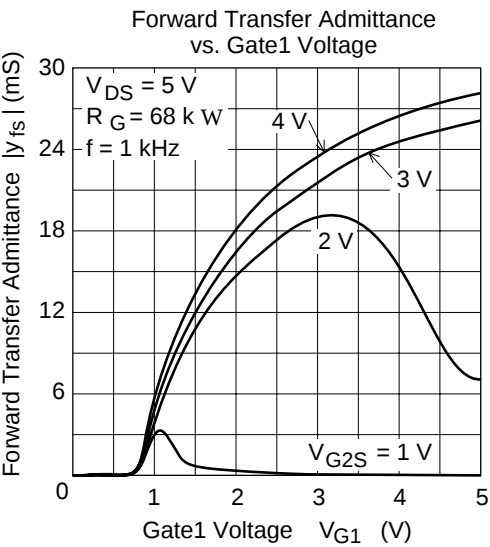
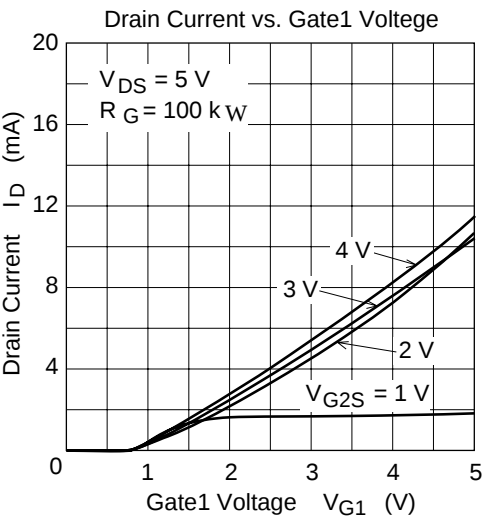
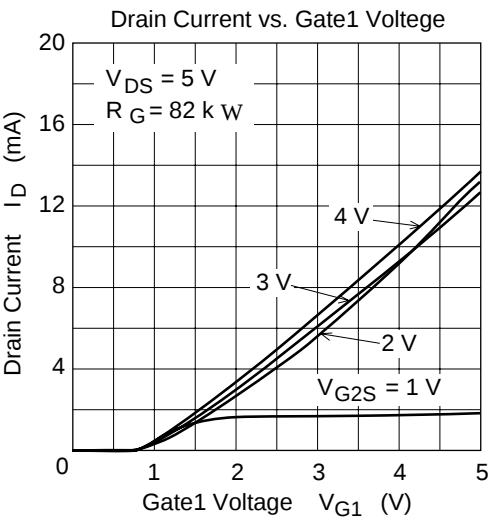
200MHz Power Gain, Noise Figure Test Circuit

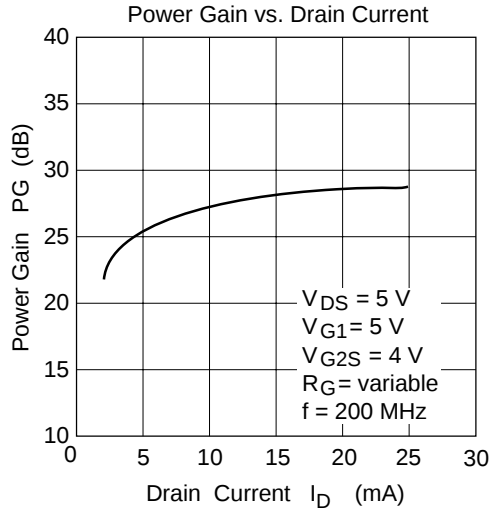
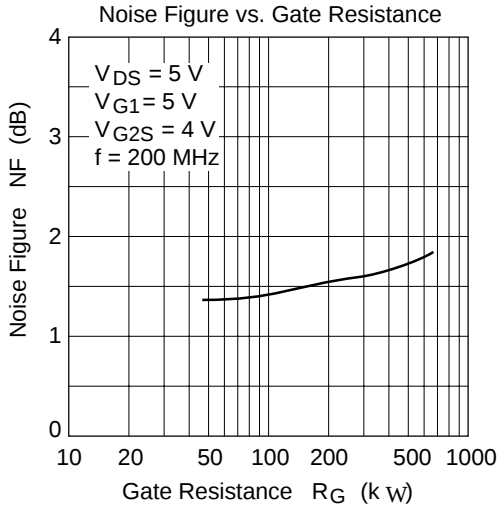
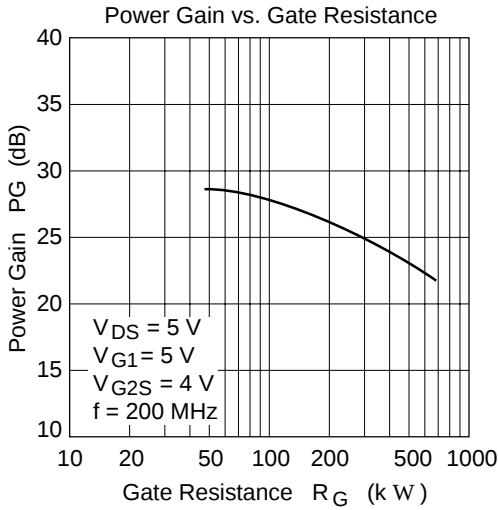
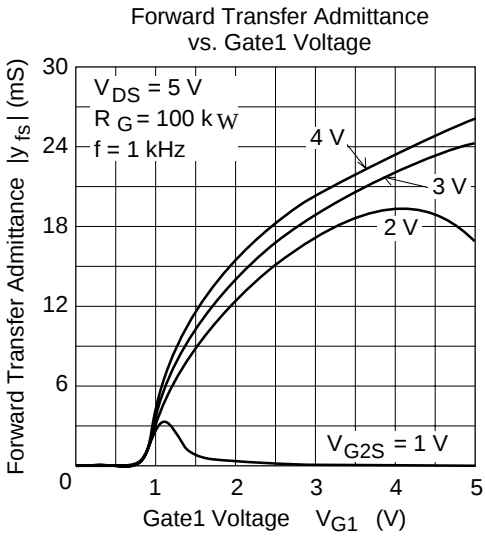


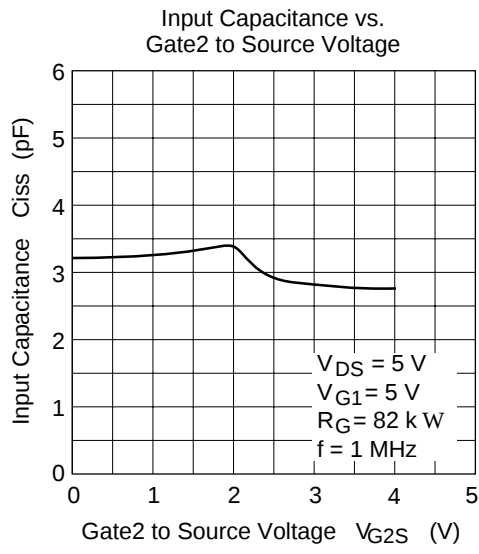
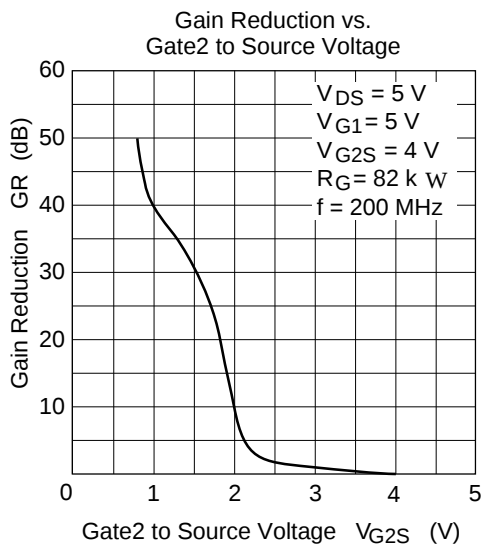
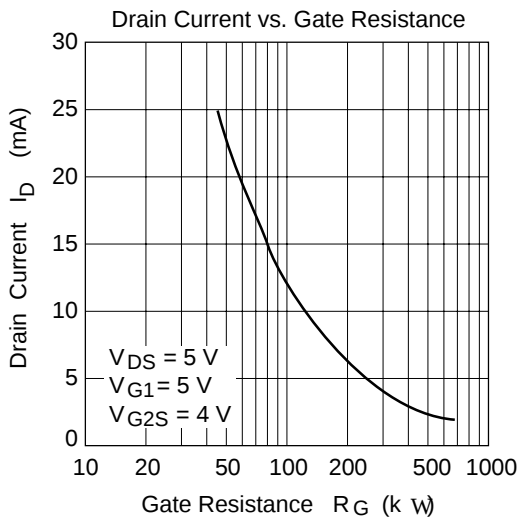
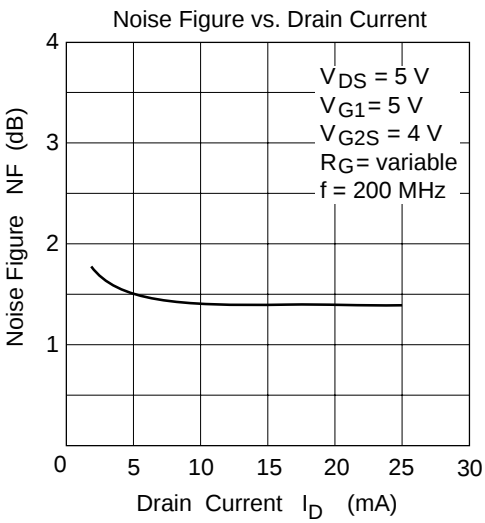
L1 : $\phi 1\text{mm}$ Enameled Copper Wire, Inside dia 10mm, 2Turns
L2 : $\phi 1\text{mm}$ Enameled Copper Wire, Inside dia 10mm, 2Turns
RFC : $\phi 1\text{mm}$ Enameled Copper Wire, Inside dia 5mm, 2Turns



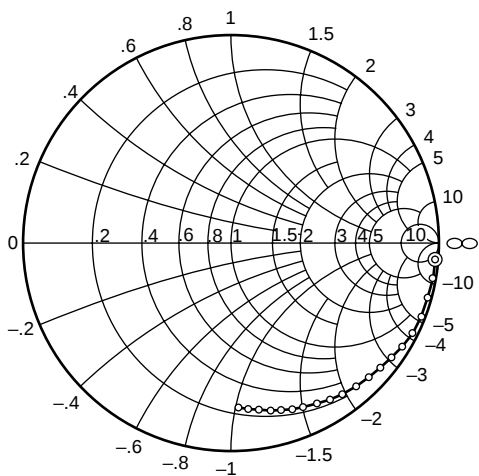
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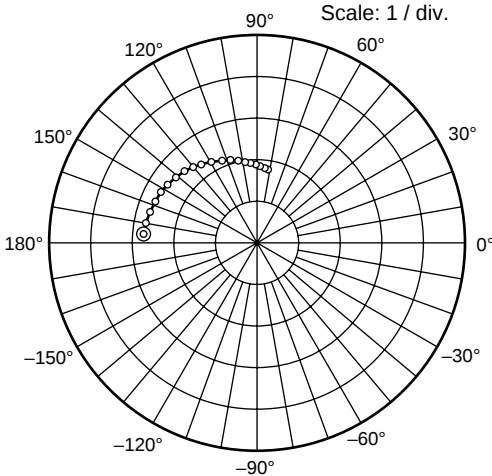


S11 Parameter vs. Frequency



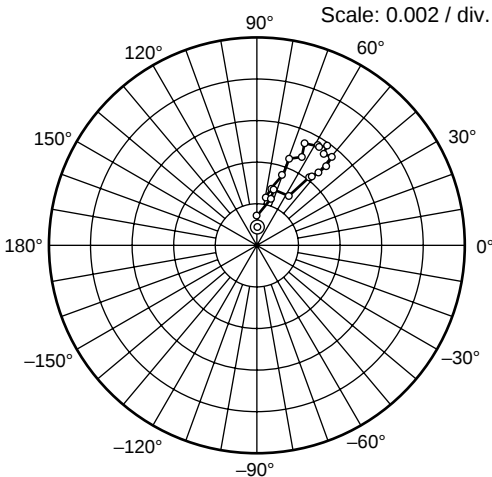
Test Condition : $V_{DS}=5\text{ V}$, $V_{G1}=5\text{ V}$
 $V_{G2S}=4\text{ V}$, $R_G=82\text{ k}\Omega$
50 ' 1000 MHz (50 MHz step)

S21 Parameter vs. Frequency



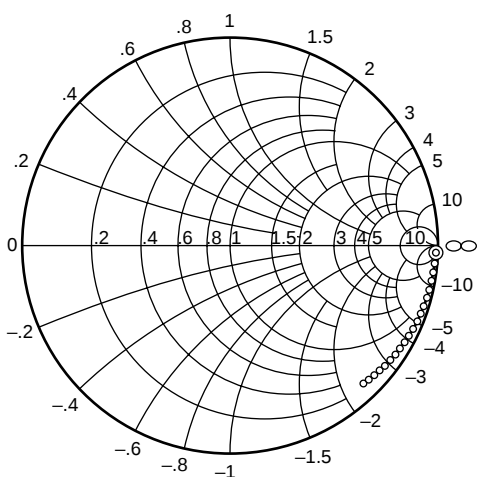
Test Condition : $V_{DS}=5\text{ V}$, $V_{G1}=5\text{ V}$
 $V_{G2S}=4\text{ V}$, $R_G=82\text{ k}\Omega$
50 ' 1000 MHz (50 MHz step)

S12 Parameter vs. Frequency



Test Condition : $V_{DS}=5\text{ V}$, $V_{G1}=5\text{ V}$
 $V_{G2S}=4\text{ V}$, $R_G=82\text{ k}\Omega$
50 ' 1000 MHz (50 MHz step)

S22 Parameter vs. Frequency

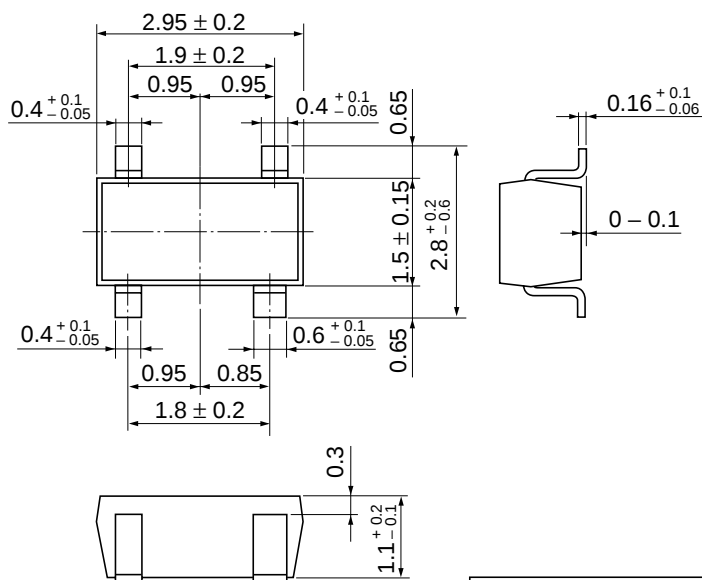


Test Condition : $V_{DS}=5\text{ V}$, $V_{G1}=5\text{ V}$
 $V_{G2S}=4\text{ V}$, $R_G=82\text{ k}\Omega$
50 ' 1000 MHz (50 MHz step)

Sparameter ($V_{DS} = V_{G1} = 5V$, $V_{G2S} = 4V$, $R_G = 82k\Omega$, $Z_o = 50\Omega$)

f (MHz)	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
50	0.991	−4.8	2.69	174.9	0.00090	91.4	0.991	−2.2
100	0.991	−9.9	2.68	169.3	0.00153	90.5	0.992	−4.8
150	0.982	−15.4	2.66	163.4	0.00243	73.8	0.991	−7.5
200	0.975	−20.7	2.62	157.5	0.00293	74.9	0.989	−9.9
250	0.972	−25.6	2.60	152.0	0.00370	70.1	0.985	−12.6
300	0.956	−30.6	2.54	146.3	0.00444	69.0	0.981	−15.0
350	0.942	−35.5	2.47	140.9	0.00478	63.7	0.977	−17.3
400	0.928	−40.1	2.42	135.7	0.00535	64.8	0.973	−19.7
450	0.920	−44.9	2.38	130.5	0.00551	56.8	0.967	−22.0
500	0.906	−49.2	2.32	125.7	0.00549	58.6	0.962	−24.5
550	0.894	−53.6	2.25	120.8	0.00584	54.4	0.957	−26.9
600	0.880	−57.8	2.18	116.2	0.00542	53.3	0.952	−29.2
650	0.868	−62.1	2.12	111.5	0.00562	49.5	0.944	−31.5
700	0.854	−66.2	2.06	106.8	0.00509	48.6	0.939	−33.8
750	0.842	−70.3	2.00	102.5	0.00465	49.7	0.933	−36.1
800	0.835	−73.9	1.94	98.4	0.00427	51.6	0.927	−38.3
850	0.820	−77.7	1.89	94.0	0.00416	53.3	0.921	−40.5
900	0.802	−81.5	1.83	89.6	0.00289	57.9	0.915	−42.7
950	0.801	−84.7	1.78	85.6	0.00288	72.9	0.909	−44.9
1000	0.789	−87.9	1.73	82.1	0.00241	78.9	0.904	−47.1

Unit: mm



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

Cautions

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