

BB502C

Build in Biasing Circuit MOS FET IC
UHF RF Amplifier

HITACHI

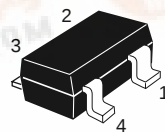
ADE-208-810B(Z)
3rd. Edition
Jun. 1999

Features

- Build in Biasing Circuit; To reduce using parts cost & PC board space.
- Low noise; NF = 1.6 dB typ. at f = 900 MHz
- High gain; PG = 22 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; CMPAK-4(SOT-343mod)

Outline

CMPAK-4



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

- Note:
1. Marking is "BS-".
 2. BB502C is individual type number of HITACHI BBFET.

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Absolute Maximum Ratings (Ta = 25°C)

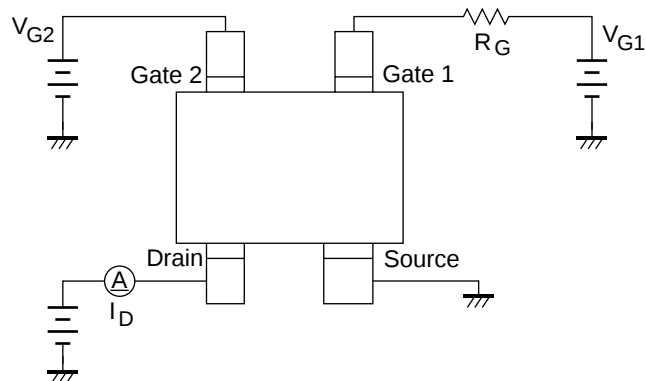
Item	Symbol	Ratings	Unit
Drain to source voltage	V_{DS}	6	V
Gate1 to source voltage	V_{G1S}	+6 -0	V
Gate2 to source voltage	V_{G2S}	+6 -0	V
Drain current	I_D	20	mA
Channel power dissipation	Pch	100	mW
Channel temperature	Tch	150	°C
Storage temperature	Tstg	-55 to +150	°C

Electrical Characteristics (Ta = 25°C)

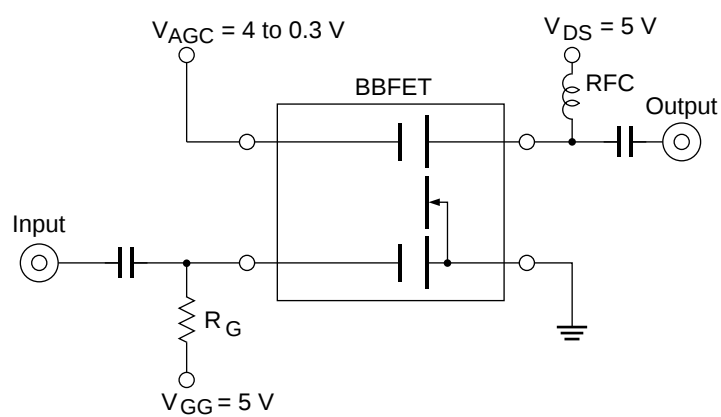
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain to source breakdown voltage	$V_{(BR)DSS}$	6	—	—	V	$I_D = 200\mu A$ $V_{G1S} = V_{G2S} = 0$
Gate1 to source breakdown voltage	$V_{(BR)G1SS}$	+6	—	—	V	$I_{G1} = +10\mu A$ $V_{G2S} = V_{DS} = 0$
Gate2 to source breakdown voltage	$V_{(BR)G2SS}$	+6	—	—	V	$I_{G2} = +10\mu A$ $V_{G1S} = V_{DS} = 0$
Gate1 to source cutoff current	I_{G1SS}	—	—	+100	nA	$V_{G1S} = +5V$ $V_{G2S} = V_{DS} = 0$
Gate2 to source cutoff current	I_{G2SS}	—	—	+100	nA	$V_{G2S} = +5V$ $V_{G1S} = V_{DS} = 0$
Gate1 to source cutoff voltage	$V_{G1S(off)}$	0.5	0.7	1.0	V	$V_{DS} = 5V$, $V_{G2S} = 4V$ $I_D = 100\mu A$
Gate2 to source cutoff voltage	$V_{G2S(off)}$	0.5	0.7	1.0	V	$V_{DS} = 5V$, $V_{G1S} = 5V$ $I_D = 100\mu A$
Drain current	$I_{D(op)}$	8	11	14	mA	$V_{DS} = 5V$, $V_{G1} = 5V$ $V_{G2S} = 4V$, $R_G = 180k\Omega$
Forward transfer admittance	$ y_{fs} $	20	25	30	mS	$V_{DS} = 5V$, $V_{G1} = 5V$ $V_{G2S} = 4V$ $R_G = 180k\Omega$, $f = 1kHz$
Input capacitance	C_{iss}	1.4	1.7	2.0	pF	$V_{DS} = 5V$, $V_{G1} = 5V$
Output capacitance	C_{oss}	0.7	1.1	1.5	pF	$V_{G2S} = 4V$, $R_G = 180k\Omega$
Reverse transfer capacitance	C_{rss}	—	0.02	0.05	pF	$f = 1MHz$
Power gain	PG	17	22	—	dB	$V_{DS} = 5V$, $V_{G1} = 5V$ $V_{G2S} = 4V$, $R_G = 180k\Omega$
Noise figure	NF	—	1.6	2.2	dB	$f = 900MHz$

Main Characteristics

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

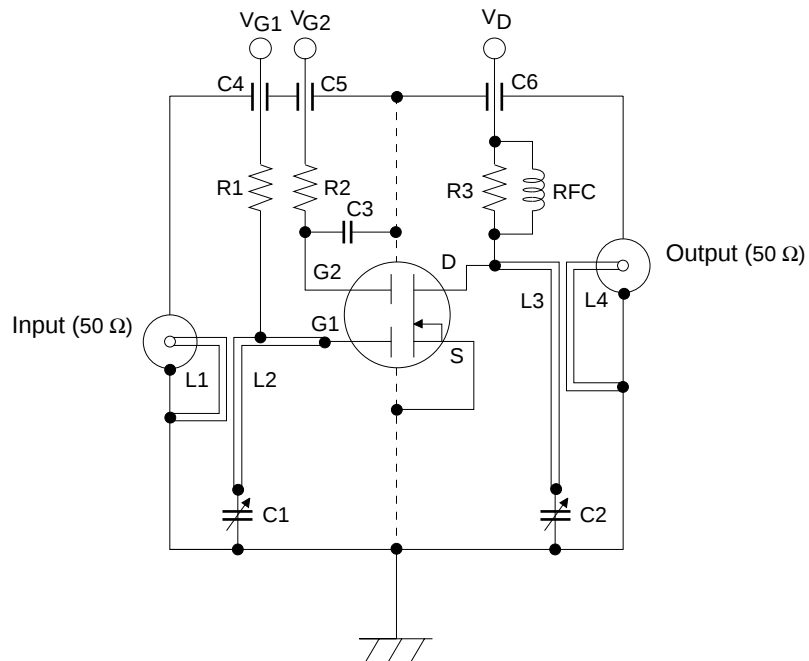


Application Circuit



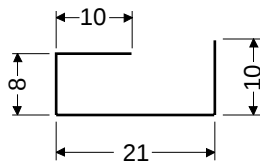
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900MHz Power Gain, Noise Test Circuit

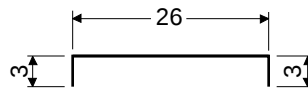


- C1, C2: Variable Capacitor (10pF MAX)
 C3: Disk Capacitor (1000pF)
 C4 to C6: Air Capacitor (1000pF)
 R1: 180 k Ω
 R2: 47 k Ω
 R3: 4.7 k Ω

L1:

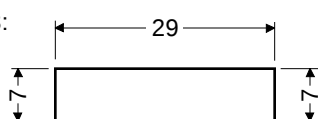


L2:

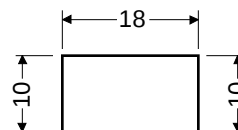


(ϕ 1mm Copper wire)
Unit: mm

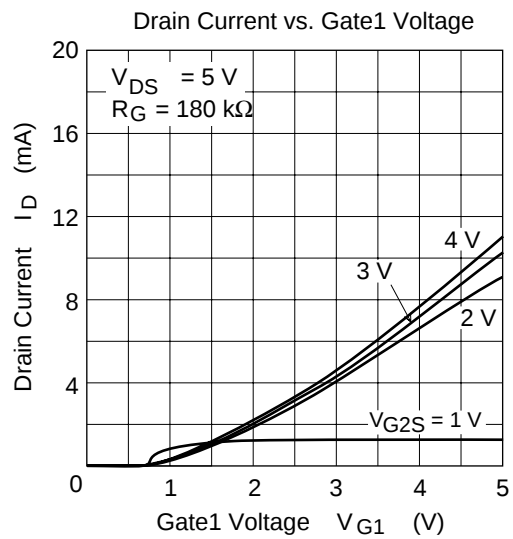
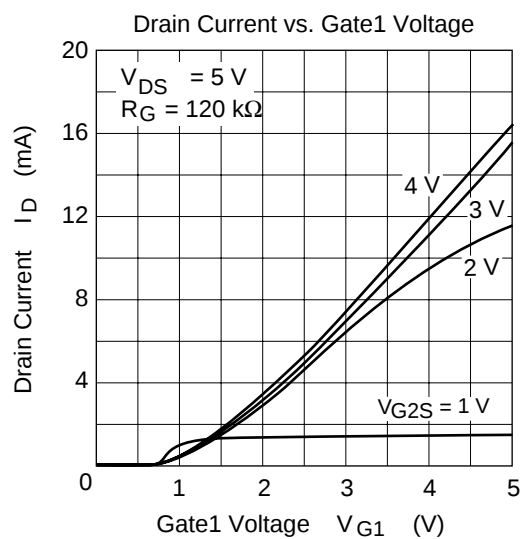
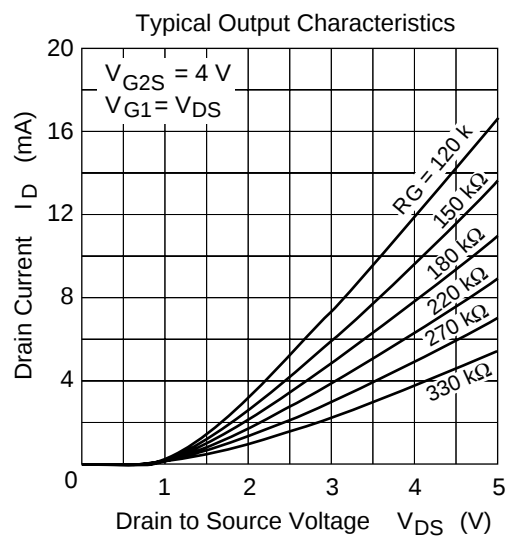
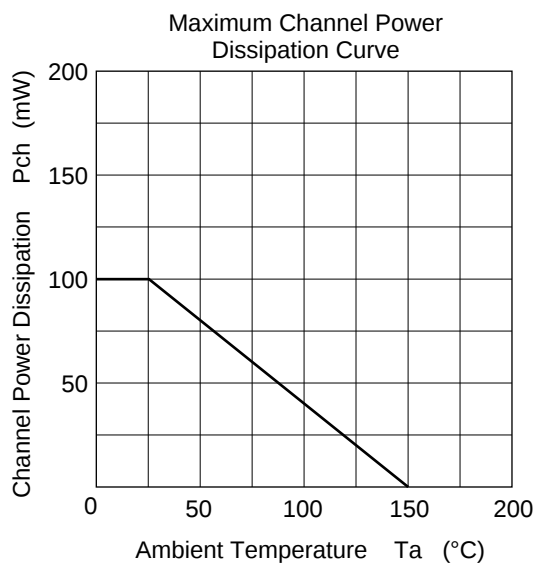
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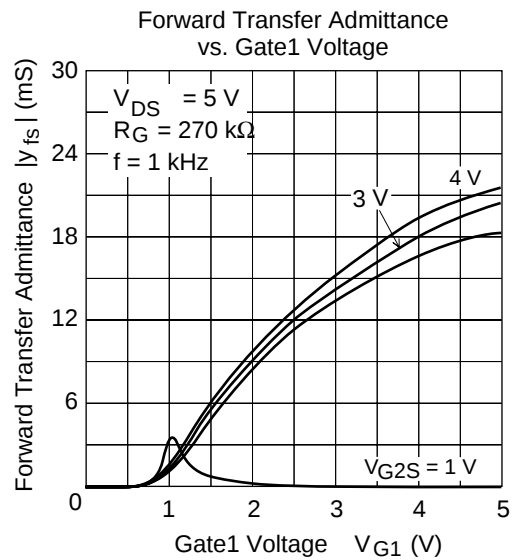
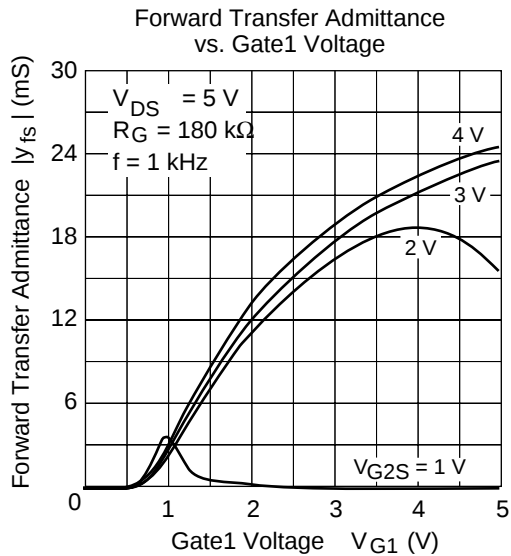
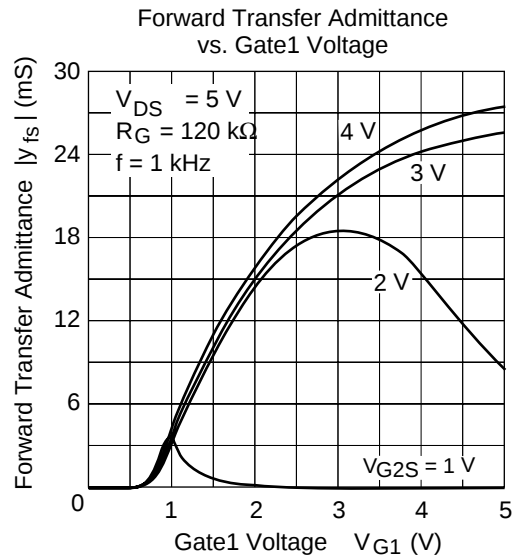
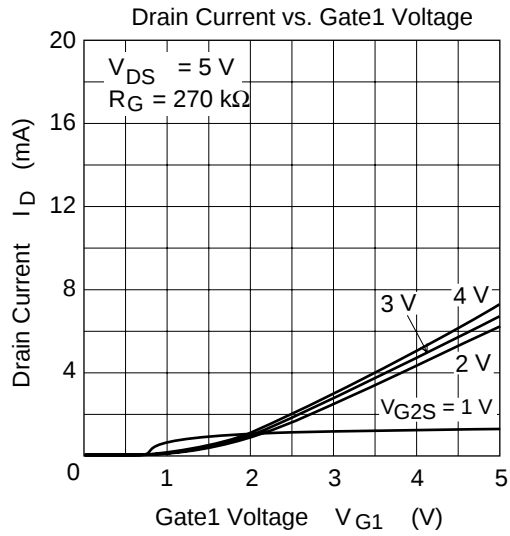


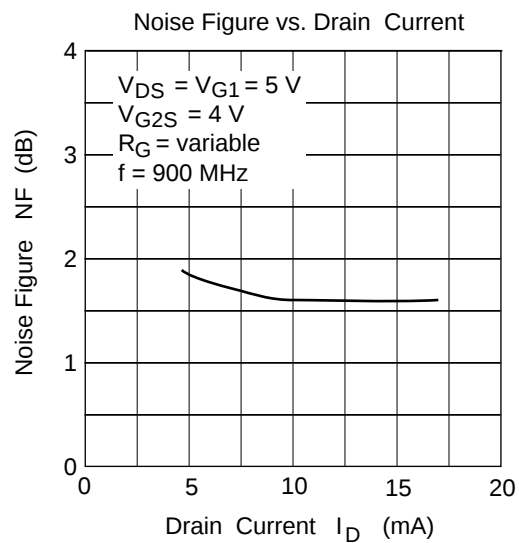
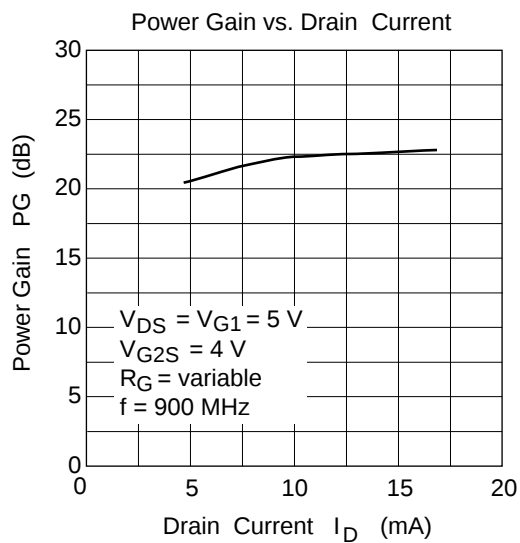
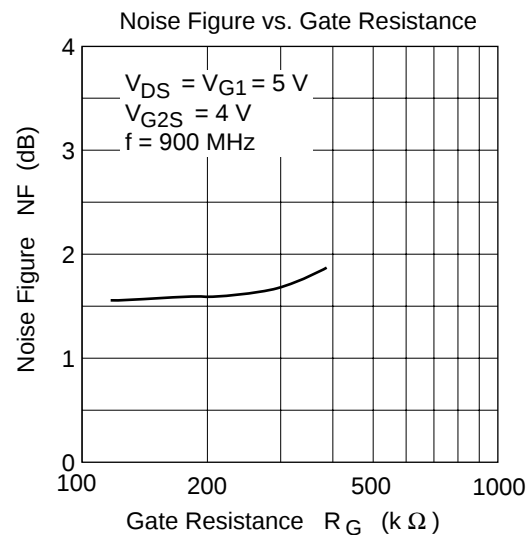
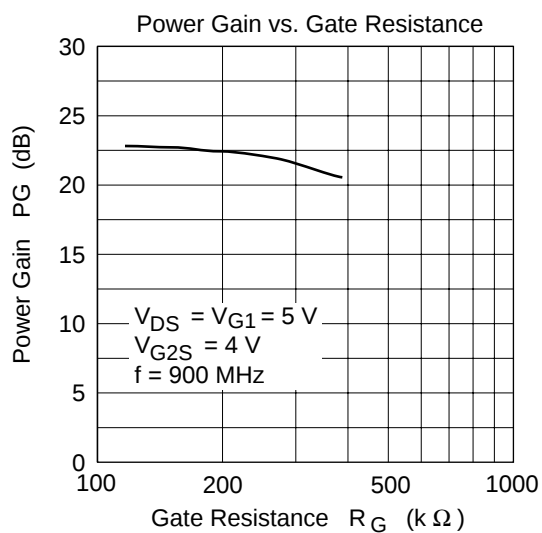
L4:



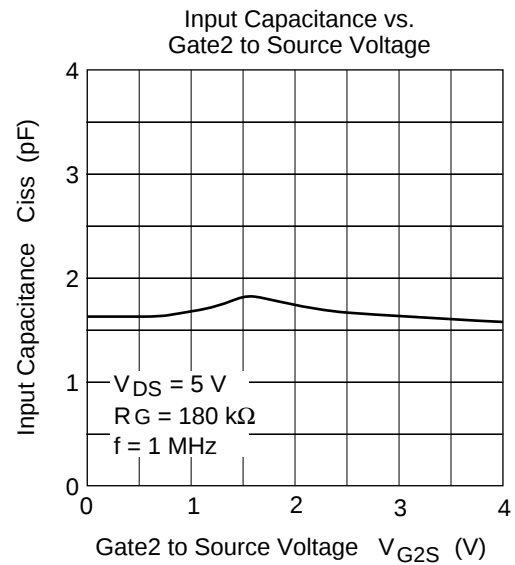
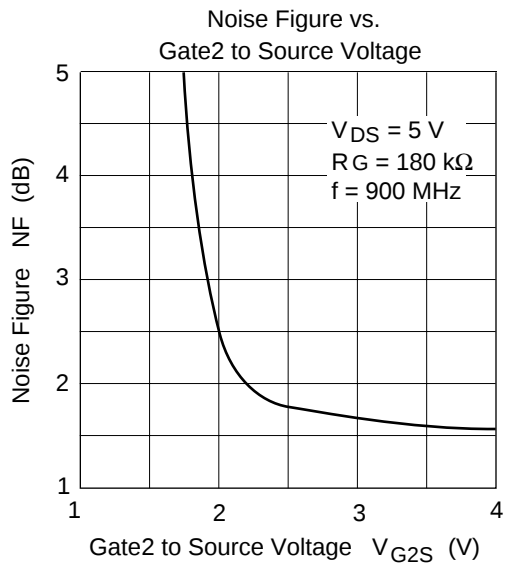
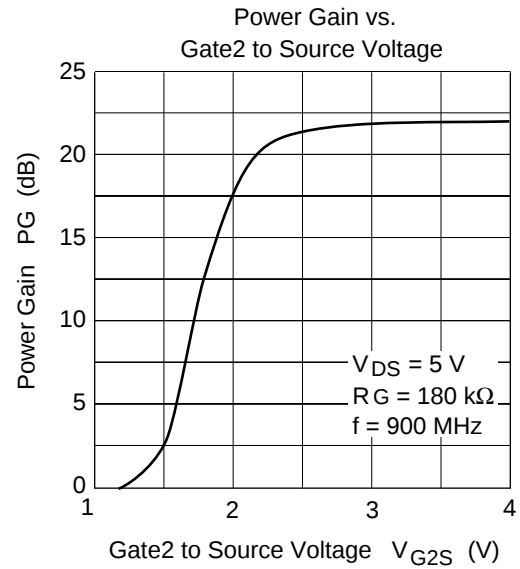
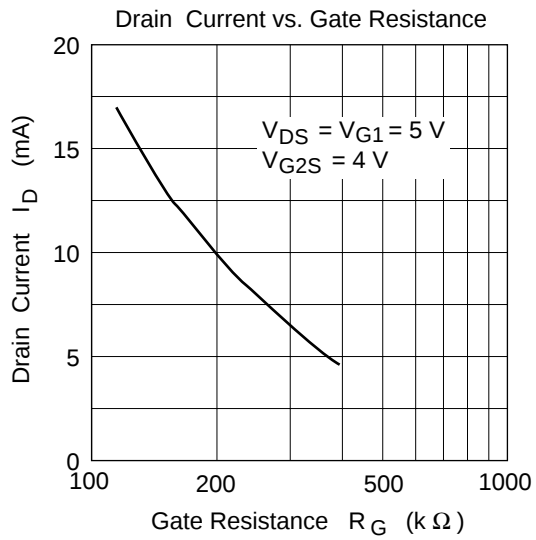
RFC: ϕ 1mm Copper wire with enamel 4turns inside dia 6mm

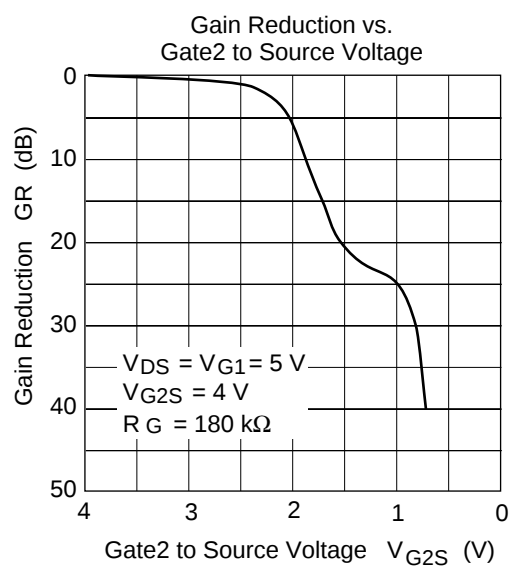






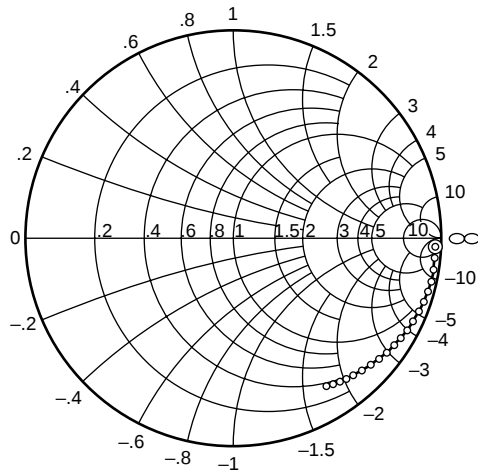
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S11 Parameter vs. Frequency

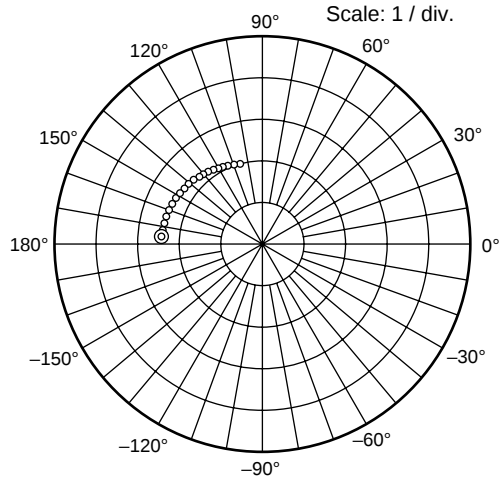


Test Condition: $V_{DS} = 5\text{ V}$, $V_{G1} = 5\text{ V}$
 $V_{G2S} = 4\text{ V}$, $R_G = 180\text{ k}\Omega$,
 $Z_0 = 50\text{ }\Omega$

50 to 1000 MHz (50 MHz step)



S21 Parameter vs. Frequency

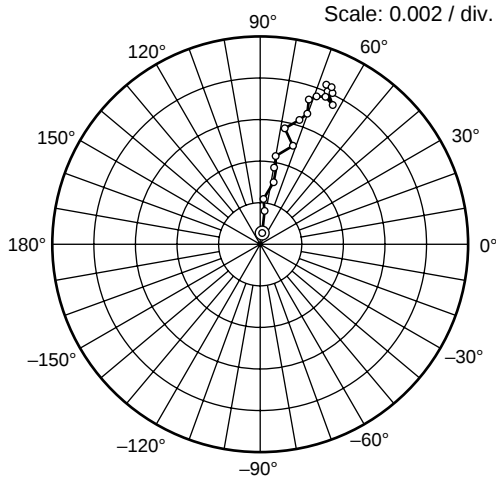


Test Condition: $V_{DS} = 5\text{ V}$, $V_{G1} = 5\text{ V}$
 $V_{G2S} = 4\text{ V}$, $R_G = 180\text{ k}\Omega$,
 $Z_0 = 50\text{ }\Omega$

50 to 1000 MHz (50 MHz step)



S12 Parameter vs. Frequency

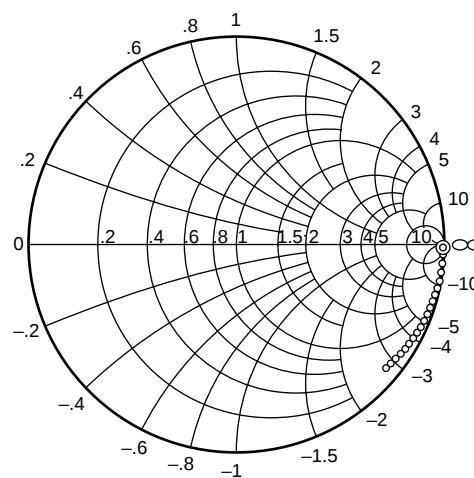


Test Condition: $V_{DS} = 5\text{ V}$, $V_{G1} = 5\text{ V}$
 $V_{G2S} = 4\text{ V}$, $R_G = 180\text{ k}\Omega$,
 $Z_0 = 50\text{ }\Omega$

50 to 1000 MHz (50 MHz step)



S22 Parameter vs. Frequency



Test Condition: $V_{DS} = 5\text{ V}$, $V_{G1} = 5\text{ V}$
 $V_{G2S} = 4\text{ V}$, $R_G = 180\text{ k}\Omega$,
 $Z_0 = 50\text{ }\Omega$

50 to 1000 MHz (50 MHz step)



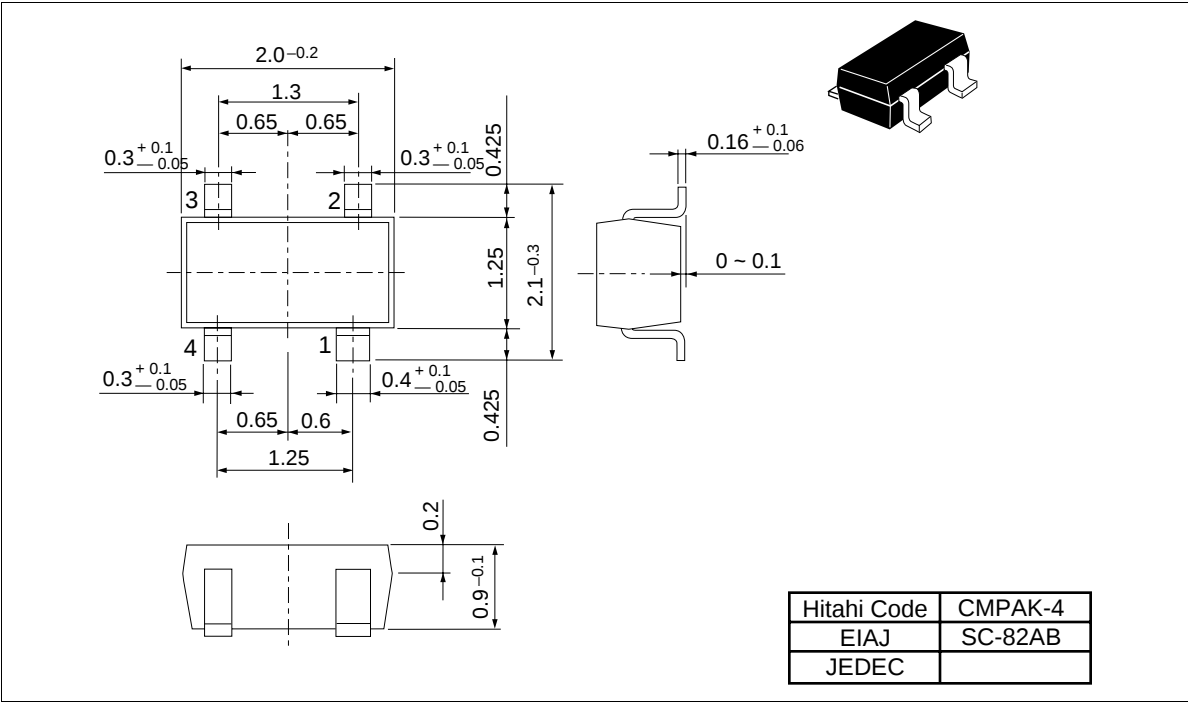
Sparameter ($V_{DS} = V_{G1} = 5V$, $V_{G2S} = 4V$, $R_G = 180k\Omega$, $Z_o = 50\Omega$)

f (MHz)	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
50	0.994	-2.8	2.52	176.2	0.00072	88.6	0.995	-2.2
100	0.994	-5.7	2.51	172.4	0.00161	80.9	0.998	-4.0
150	0.991	-9.2	2.50	168.1	0.00230	86.6	0.997	-6.2
200	0.985	-12.5	2.47	164.1	0.00297	78.0	0.996	-8.2
250	0.985	-15.5	2.46	160.0	0.00374	78.9	0.994	-10.2
300	0.975	-18.7	2.43	156.4	0.00436	80.6	0.992	-12.2
350	0.969	-22.0	2.40	152.3	0.00507	70.9	0.990	-14.2
400	0.962	-24.9	2.38	148.6	0.00557	77.3	0.989	-16.3
450	0.954	-27.7	2.35	144.6	0.00625	72.4	0.987	-18.5
500	0.945	-30.8	2.31	141.0	0.00663	70.0	0.984	-20.4
550	0.935	-33.8	2.28	136.7	0.00721	70.5	0.981	-22.4
600	0.925	-36.6	2.25	133.4	0.00747	68.4	0.978	-24.3
650	0.918	-39.5	2.21	130.3	0.00761	65.6	0.975	-26.4
700	0.909	-42.5	2.18	126.1	0.00807	65.6	0.972	-28.3
750	0.898	-45.0	2.14	122.9	0.00828	67.6	0.969	-30.2
800	0.887	-47.8	2.09	119.5	0.00801	65.1	0.965	-32.2
850	0.874	-50.6	2.07	116.0	0.00815	63.6	0.961	-34.2
900	0.862	-53.0	2.03	112.7	0.00832	65.1	0.958	-36.1
950	0.855	-55.5	1.99	109.4	0.00738	61.8	0.954	-37.9
1000	0.845	-58.1	1.95	108.1	0.00802	65.8	0.951	-39.8

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Package Dimensions

Unit: mm



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