

SILICON TRANSISTOR

2SC5013

HIGH FREQUENCY LOW NOISE AMPLIFIER NPN SILICON EPITAXIAL TRANSISTOR 4 PINS SUPER MINI MOLD

FEATURES

- · Small Package
- High Gain Bandwidth Product (f_T = 10 GHz TYP.)
- · Low Noise, High Gain
- Low Voltage Operation

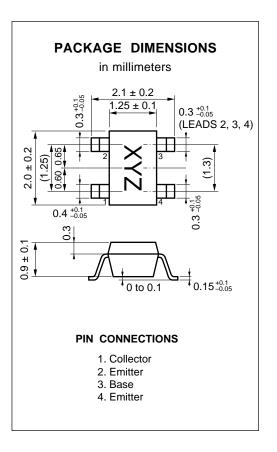
ORDERING INFORMATION

PART NUMBER	QUANTITY	PACKING STYLE
2SC5013-T1	3 Kpcs/Reel.	Embossed tape 8 mm wide. Pin3 (Base), Pin4 (Emitter) face to perforation side of the tape.
2SC5013-T2	3 Kpcs/Reel.	Embossed tape 8 mm wide. Pin1 (Collector), Pin2 (Emitter) face to perforation side of the tape.

* Please contact with responsible NEC person, If you require evaluation sample. Unit sample quantity shall be 50 pcs. (Part No.: 2SC5013)

ABSOLUTE MAXIMUM RATINGS $(T_A = 25 \degree C)$

Collector to Base Voltage	Vсво	20	V
Collector to Emitter Voltage	Vceo	10	V
Emitter to Base Voltage	Vево	1.5	V
Collector Current	lc	35	mΑ
Total Power Dissipation	Рт	150	mW
Junction Temperature	T_j	150	°C
Storage Temperature	T_{stg}	-65 to +150	°C



Caution; Electrostatic Sensitive Device.



ELECTRICAL CHARACTERISTICS (TA = 25 °C)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Collector Cutoff Current	Ісво			1.0	μΑ	Vcb = 10 V, IE = 0
Emitter Cutoff Current	ІЕВО			1.0	μΑ	VEB = 1 V, Ic = 0
DC Current Gain	hfe	50	100	250		VcE = 6 V, Ic = 10 mA*1
Gain Bandwidth Product	f⊤		10		GHz	VcE = 6 V, Ic = 10 mA
Feed back Capacitance	Cre		0.25	0.8	pF	VcB = 10 V, IE = 0, f = 1 MHz*2
Insertion Power Gain	S _{21e} ²	7.5	9.5		dB	VcE = 6 V, Ic = 10 mA, f = 2.0 GHz
Noise Figure	NF		1.8	3.0	dB	VcE = 6 V, Ic = 5 mA, f = 2.0 GHz

^{*1} Pulse Measurement; PW \leq 350 μ s, Duty Cycle \leq 2 % Pulsed.

hfe Classification

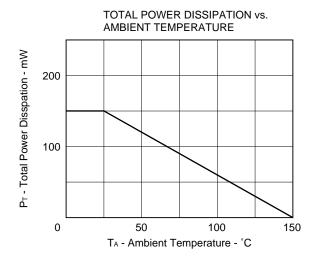
Rank	EB	FB	GB
Marking	R46	R47	R48
hfe	50 to 100	80 to 160	125 to 250

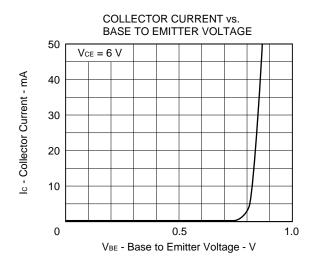
2

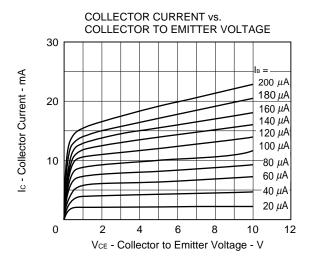
^{*2} Measured with 3 terminals bridge, Emitter and Case should be grounded.

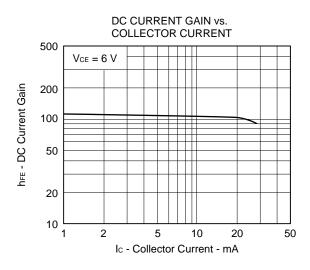


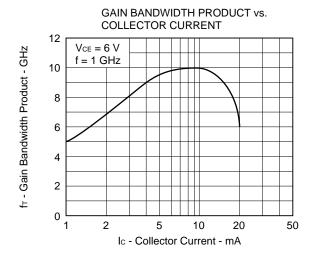
TYPICAL CHARACTERISTICS (TA = 25 °C)

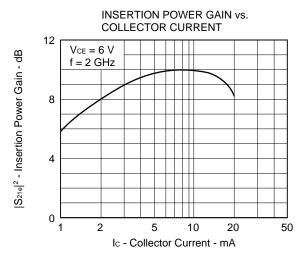




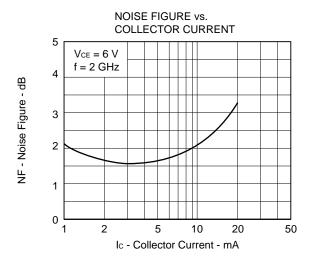


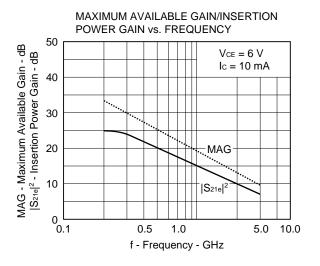


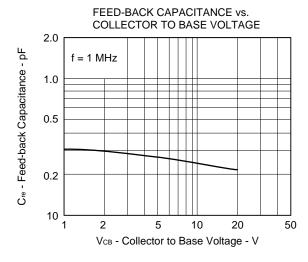












S-PARAMETER

Vce = 6 V, Ic = 10 mA

VCE = 6 V, IC = 10 MA	4							
FREQUENCY	5	S ₁₁	S	1	S	12	S	22
f (MHz)	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.00	.728	-26.9	21.563	157.7	.013	86.3	.946	-11.0
200.00	.616	-50.1	18.401	139.3	.023	69.9	.851	-18.5
300.00	.522	-68.0	15.357	126.0	.029	57.4	.766	-23.2
400.00 500.00	.441 .376	-83.2 -96.2	12.718 10.893	116.3 108.2	.037 .039	58.4 62.0	.694 .637	-24.8 -26.0
600.00	.341	-107.8	9.466	102.5	.047	63.0	.602	-27.0
700.00	.310	-118.1	8.396	97.2	.049	60.6	.579	-27.3
800.00	.286	-127.0	7.434	92.5	.054	60.1	.556	-28.3
900.00 1000.00	.266 .261	–138.1 –146.1	6.707 6.128	88.7 84.7	.056 .065	58.1 59.9	.541 .529	-28.3 -29.2
1100.00	.252	-154.5	5.578	81.6	.067	63.0	.516	-29.5
1200.00	.249	-160.1	5.111	78.4	.073	60.2	.506	-31.0
1300.00 1400.00	.243 .241	-168.7 -173.0	4.769 4.467	75.6 72.5	.073 .082	57.3 56.5	.494 .488	-31.7 -33.7
1500.00	.253	-179.5	4.183	69.6	.085	59.6	.474	-34.3
1600.00	.251	174.3	3.932	67.1	.094	56.7	.471	-36.3
1700.00 1800.00	.269 .266	170.9 164.5	3.731 3.536	64.7 62.0	.093 .098	58.2 59.3	.464 .466	-36.5 -38.0
1900.00	.269	161.6	3.372	60.0	.100	56.7	.457	-40.0
2000.00	.285	158.2	3.233	57.1	.116	56.2	.451	-42.0
2100.00 2200.00	.289 .300	154.8 150.6	3.071 2.935	55.4 52.3	.117 .120	57.0 58.5	.449 .445	-44.3 -46.0
2300.00	.298	149.3	2.812	50.8	.128	57.4	.440	-47.1
2400.00	.293	144.6	2.720	48.4	.127	57.1	.432	-47.0 50.0
2500.00 2600.00	.315 .326	143.0 138.8	2.623 2.542	45.8 43.9	.137 .144	55.1 54.7	.425 .419	-52.2 -50.4
2700.00	.327	137.8	2.435	42.4	.151	50.4	.419	-54.7
2800.00	.320	136.4	2.376	39.4	.158	53.9	.427	-57.6
2900.00 3000.00	.327 .337	135.1 129.1	2.285 2.218	37.9 34.6	.161 .160	48.7 50.1	.425 .419	-60.2 -61.9
VcE = 3 V, Ic = 5 mA								
Vce = 3 V, Ic = 5 mA FREQUENCY	5	S11	Sz	1	S	12	S	22
	S MAG	S ₁₁ ANG	S2 MAG	1 ANG	S MAG	12 ANG	S MAG	222 ANG
FREQUENCY f (MHz) 100.00	MAG .836	ANG -17.9	MAG 13.996	ANG 164.7	MAG .015	ANG 73.5	MAG .971	ANG -8.3
FREQUENCY f (MHz) 100.00 200.00	MAG .836 .768	ANG -17.9 -34.4	MAG 13.996 12.918	ANG 164.7 150.7	MAG .015 .025	ANG 73.5 72.7	MAG .971 .918	ANG -8.3 -15.1
FREQUENCY f (MHz) 100.00 200.00 300.00	.836 .768 .692	ANG -17.9 -34.4 -48.4	MAG 13.996 12.918 11.709	ANG 164.7 150.7 138.9	.015 .025 .038	73.5 72.7 66.8	.971 .918 .862	-8.3 -15.1 -20.5
FREQUENCY f (MHz) 100.00 200.00	MAG .836 .768 .692 .614 .535	ANG -17.9 -34.4 -48.4 -61.2 -72.4	MAG 13.996 12.918 11.709 10.317 9.260	ANG 164.7 150.7 138.9 129.2 120.2	MAG .015 .025	73.5 72.7 66.8 60.2 55.8	MAG .971 .918 .862 .793 .731	-8.3 -15.1 -20.5 -23.9 -27.1
FREQUENCY f (MHz) 100.00 200.00 300.00 400.00 500.00 600.00	MAG .836 .768 .692 .614 .535 .490	ANG -17.9 -34.4 -48.4 -61.2 -72.4 -82.3	MAG 13.996 12.918 11.709 10.317 9.260 8.326	ANG 164.7 150.7 138.9 129.2 120.2 113.8	MAG .015 .025 .038 .044 .051 .056	73.5 72.7 66.8 60.2 55.8 55.6	MAG .971 .918 .862 .793 .731 .684	-8.3 -15.1 -20.5 -23.9 -27.1 -29.1
FREQUENCY f (MHz) 100.00 200.00 300.00 400.00 500.00 600.00 700.00	MAG .836 .768 .692 .614 .535 .490	ANG -17.9 -34.4 -48.4 -61.2 -72.4 -82.3 -92.9	MAG 13.996 12.918 11.709 10.317 9.260 8.326 7.553	ANG 164.7 150.7 138.9 129.2 120.2 113.8 107.6	MAG .015 .025 .038 .044 .051 .056 .063	73.5 72.7 66.8 60.2 55.8 55.6 55.6	MAG .971 .918 .862 .793 .731 .684	-8.3 -15.1 -20.5 -23.9 -27.1 -29.1 -30.6
FREQUENCY f (MHz) 100.00 200.00 300.00 400.00 500.00 600.00 700.00 800.00 900.00	MAG .836 .768 .692 .614 .535 .490 .435 .398 .362	ANG -17.9 -34.4 -48.4 -61.2 -72.4 -82.3 -92.9 -100.8 -110.0	MAG 13.996 12.918 11.709 10.317 9.260 8.326 7.553 6.791 6.194	ANG 164.7 150.7 138.9 129.2 120.2 113.8 107.6 102.1 97.7	MAG .015 .025 .038 .044 .051 .056 .063 .065 .070	73.5 72.7 66.8 60.2 55.8 55.6 55.6 58.1 54.7	MAG .971 .918 .862 .793 .731 .684 .658 .614 .591	-8.3 -15.1 -20.5 -23.9 -27.1 -29.1 -30.6 -32.6
FREQUENCY f (MHz) 100.00 200.00 300.00 400.00 500.00 600.00 700.00 800.00 900.00 1000.00	MAG .836 .768 .692 .614 .535 .490 .435 .398 .362 .333	ANG -17.9 -34.4 -48.4 -61.2 -72.4 -82.3 -92.9 -100.8 -110.0 -118.3	MAG 13.996 12.918 11.709 10.317 9.260 8.326 7.553 6.791 6.194 5.724	ANG 164.7 150.7 138.9 129.2 120.2 113.8 107.6 102.1 97.7 93.2	MAG .015 .025 .038 .044 .051 .056 .063 .063 .065 .070	73.5 72.7 66.8 60.2 55.8 55.6 55.6 58.1 54.7 54.2	MAG .971 .918 .862 .793 .731 .684 .658 .614 .591	ANG -8.3 -15.1 -20.5 -23.9 -27.1 -29.1 -30.6 -32.6 -32.8 -33.4
FREQUENCY f (MHz) 100.00 200.00 300.00 400.00 500.00 600.00 700.00 800.00 900.00 1000.00 1100.00	MAG .836 .768 .692 .614 .535 .490 .435 .398 .362 .333 .318	ANG -17.9 -34.4 -48.4 -61.2 -72.4 -82.3 -92.9 -100.8 -110.0 -118.3 -126.0	MAG 13.996 12.918 11.709 10.317 9.260 8.326 7.553 6.791 6.194 5.724 5.263	ANG 164.7 150.7 138.9 129.2 120.2 113.8 107.6 102.1 97.7 93.2 89.6	MAG .015 .025 .038 .044 .051 .056 .063 .065 .070 .074	73.5 72.7 66.8 60.2 55.8 55.6 55.6 54.7 54.2 55.3	MAG .971 .918 .862 .793 .731 .684 .658 .614 .591 .567	ANG -8.3 -15.1 -20.5 -23.9 -27.1 -29.1 -30.6 -32.6 -32.8 -33.4 -34.7
FREQUENCY f (MHz) 100.00 200.00 300.00 400.00 500.00 600.00 700.00 800.00 900.00 1100.00 1200.00 1300.00	MAG .836 .768 .692 .614 .535 .490 .435 .398 .362 .333 .318 .297 .281	ANG -17.9 -34.4 -48.4 -61.2 -72.4 -82.3 -92.9 -100.8 -110.0 -118.3 -126.0 -133.4 -141.4	MAG 13.996 12.918 11.709 10.317 9.260 8.326 7.553 6.791 6.194 5.724 5.263 4.837 4.538	ANG 164.7 150.7 138.9 129.2 120.2 113.8 107.6 102.1 97.7 93.2 89.6 85.7 82.5	MAG .015 .025 .038 .044 .051 .056 .063 .065 .070 .074 .079 .084 .085	73.5 72.7 66.8 60.2 55.8 55.6 55.6 54.7 54.7 54.2 55.3 53.9 53.3	MAG .971 .918 .862 .793 .731 .684 .658 .614 .591 .567 .548 .542	ANG -8.3 -15.1 -20.5 -23.9 -27.1 -29.1 -30.6 -32.6 -32.8 -33.4 -34.7 -35.6 -36.7
FREQUENCY f (MHz) 100.00 200.00 300.00 400.00 500.00 600.00 700.00 800.00 1000.00 1100.00 1200.00 1300.00 1400.00	MAG .836 .768 .692 .614 .535 .490 .435 .398 .362 .333 .318 .297 .281	ANG -17.9 -34.4 -48.4 -61.2 -72.4 -82.3 -92.9 -100.8 -110.0 -118.3 -126.0 -133.4 -141.4 -147.5	MAG 13.996 12.918 11.709 10.317 9.260 8.326 7.553 6.791 6.194 5.724 5.263 4.837 4.538 4.256	ANG 164.7 150.7 138.9 129.2 120.2 113.8 107.6 102.1 97.7 93.2 89.6 85.7 82.5 79.4	MAG .015 .025 .038 .044 .051 .056 .063 .065 .070 .074 .079 .084 .085	73.5 72.7 66.8 60.2 55.8 55.6 55.6 54.7 54.2 55.3 53.9 53.3 52.0	MAG .971 .918 .862 .793 .731 .684 .658 .614 .591 .567 .548 .542 .516 .509	ANG -8.3 -15.1 -20.5 -23.9 -27.1 -29.1 -30.6 -32.6 -32.8 -33.4 -34.7 -35.6 -36.7 -37.9
FREQUENCY f (MHz) 100.00 200.00 300.00 400.00 500.00 600.00 700.00 800.00 1000.00 1100.00 1200.00 1300.00 1400.00 1500.00	MAG .836 .768 .692 .614 .535 .490 .435 .398 .362 .333 .318 .297 .281 .275 .263	ANG -17.9 -34.4 -48.4 -61.2 -72.4 -82.3 -92.9 -100.8 -110.0 -118.3 -126.0 -133.4 -141.4 -147.5 -155.9	MAG 13.996 12.918 11.709 10.317 9.260 8.326 7.553 6.791 6.194 5.724 5.263 4.837 4.538 4.256 4.004	ANG 164.7 150.7 138.9 129.2 120.2 113.8 107.6 102.1 97.7 93.2 89.6 85.7 82.5 79.4 76.0	MAG .015 .025 .038 .044 .051 .056 .063 .065 .070 .074 .079 .084 .085 .090 .099	73.5 72.7 66.8 60.2 55.8 55.6 58.1 54.7 54.2 55.3 53.9 53.3 52.0 50.6	MAG .971 .918 .862 .793 .731 .684 .658 .614 .591 .567 .548 .542 .516 .509	-8.3 -15.1 -20.5 -23.9 -27.1 -29.1 -30.6 -32.6 -32.8 -33.4 -34.7 -35.6 -36.7 -37.9 -38.2
FREQUENCY f (MHz) 100.00 200.00 300.00 400.00 500.00 600.00 700.00 800.00 1000.00 1100.00 1200.00 1300.00 1400.00 1500.00 1600.00 1700.00	MAG .836 .768 .692 .614 .535 .490 .435 .398 .362 .333 .318 .297 .281 .275 .263 .268	ANG -17.9 -34.4 -48.4 -61.2 -72.4 -82.3 -92.9 -100.8 -110.0 -118.3 -126.0 -133.4 -141.4 -147.5 -155.9 -162.3 -169.6	MAG 13.996 12.918 11.709 10.317 9.260 8.326 7.553 6.791 6.194 5.724 5.263 4.837 4.538 4.256 4.004 3.770 3.597	ANG 164.7 150.7 138.9 129.2 120.2 113.8 107.6 102.1 97.7 93.2 89.6 85.7 82.5 79.4 76.0 73.3 70.7	MAG .015 .025 .038 .044 .051 .056 .063 .065 .070 .074 .079 .084 .085 .090 .099 .099	73.5 72.7 66.8 60.2 55.8 55.6 55.6 58.1 54.7 54.2 55.3 53.9 53.3 52.0 50.6 49.4 49.9	MAG .971 .918 .862 .793 .731 .684 .658 .614 .591 .567 .548 .542 .516 .509 .488 .491 .484	-8.3 -15.1 -20.5 -23.9 -27.1 -29.1 -30.6 -32.8 -33.4 -34.7 -35.6 -36.7 -37.9 -38.2 -39.3 -40.0
FREQUENCY f (MHz) 100.00 200.00 300.00 400.00 500.00 600.00 700.00 800.00 1000.00 1100.00 1200.00 1300.00 1400.00 1500.00 1600.00 1700.00 1800.00	MAG .836 .768 .692 .614 .535 .490 .435 .398 .362 .333 .318 .297 .281 .275 .263 .268 .277	ANG -17.9 -34.4 -48.4 -61.2 -72.4 -82.3 -92.9 -100.8 -110.0 -118.3 -126.0 -133.4 -141.4 -147.5 -155.9 -162.3 -169.6 -174.9	MAG 13.996 12.918 11.709 10.317 9.260 8.326 7.553 6.791 6.194 5.724 5.263 4.837 4.538 4.256 4.004 3.770 3.597 3.407	ANG 164.7 150.7 138.9 129.2 120.2 113.8 107.6 102.1 97.7 93.2 89.6 85.7 82.5 79.4 76.0 73.3 70.7 67.7	MAG .015 .025 .038 .044 .051 .056 .063 .065 .070 .074 .079 .084 .085 .090 .099 .099 .105 .109	73.5 72.7 66.8 60.2 55.8 55.6 55.6 58.1 54.7 54.2 55.3 53.9 53.3 52.0 50.6 49.4 49.9 51.2	MAG .971 .918 .862 .793 .731 .684 .658 .614 .591 .567 .548 .542 .516 .509 .488 .491 .484	ANG -8.3 -15.1 -20.5 -23.9 -27.1 -29.1 -30.6 -32.6 -32.8 -33.4 -34.7 -35.6 -36.7 -37.9 -38.2 -39.3 -40.0 -41.7
FREQUENCY f (MHz) 100.00 200.00 300.00 400.00 500.00 600.00 700.00 800.00 1000.00 1100.00 1200.00 1300.00 1400.00 1500.00 1600.00 1700.00	MAG .836 .768 .692 .614 .535 .490 .435 .398 .362 .333 .318 .297 .281 .275 .263 .268	ANG -17.9 -34.4 -48.4 -61.2 -72.4 -82.3 -92.9 -100.8 -110.0 -118.3 -126.0 -133.4 -141.4 -147.5 -155.9 -162.3 -169.6	MAG 13.996 12.918 11.709 10.317 9.260 8.326 7.553 6.791 6.194 5.724 5.263 4.837 4.538 4.256 4.004 3.770 3.597	ANG 164.7 150.7 138.9 129.2 120.2 113.8 107.6 102.1 97.7 93.2 89.6 85.7 82.5 79.4 76.0 73.3 70.7	MAG .015 .025 .038 .044 .051 .056 .063 .065 .070 .074 .079 .084 .085 .090 .099 .099	73.5 72.7 66.8 60.2 55.8 55.6 55.6 58.1 54.7 54.2 55.3 53.9 53.3 52.0 50.6 49.4 49.9	MAG .971 .918 .862 .793 .731 .684 .658 .614 .591 .567 .548 .542 .516 .509 .488 .491 .484	-8.3 -15.1 -20.5 -23.9 -27.1 -29.1 -30.6 -32.8 -33.4 -34.7 -35.6 -36.7 -37.9 -38.2 -39.3 -40.0
FREQUENCY f (MHz) 100.00 200.00 300.00 400.00 500.00 600.00 700.00 800.00 1000.00 1100.00 1200.00 1300.00 1400.00 1500.00 1600.00 1700.00 1800.00 1900.00 2000.00 2100.00	MAG .836 .768 .692 .614 .535 .490 .435 .398 .362 .333 .318 .297 .281 .275 .263 .268 .277 .267 .262 .276	ANG -17.9 -34.4 -48.4 -61.2 -72.4 -82.3 -92.9 -100.8 -110.0 -118.3 -126.0 -133.4 -141.4 -147.5 -155.9 -162.3 -169.6 -174.9 -179.5 175.7 169.3	MAG 13.996 12.918 11.709 10.317 9.260 8.326 7.553 6.791 6.194 5.724 5.263 4.837 4.538 4.256 4.004 3.770 3.597 3.407 3.244 3.118 2.967	ANG 164.7 150.7 138.9 129.2 120.2 113.8 107.6 102.1 97.7 93.2 89.6 85.7 82.5 79.4 76.0 73.3 70.7 67.7 65.6 62.3 59.5	MAG .015 .025 .038 .044 .051 .056 .063 .065 .070 .074 .079 .084 .085 .090 .099 .105 .109 .112 .119 .120	73.5 72.7 66.8 60.2 55.8 55.6 55.6 58.1 54.7 54.2 55.3 53.9 53.3 52.0 50.6 49.4 49.9 51.2 50.2 51.9 50.4	MAG .971 .918 .862 .793 .731 .684 .658 .614 .591 .567 .548 .542 .516 .509 .488 .491 .484 .475 .468 .460 .453	ANG -8.3 -15.1 -20.5 -23.9 -27.1 -29.1 -30.6 -32.6 -32.8 -33.4 -34.7 -35.6 -36.7 -37.9 -38.2 -39.3 -40.0 -41.7 -43.4 -46.6 -47.4
FREQUENCY f (MHz) 100.00 200.00 300.00 400.00 500.00 600.00 700.00 800.00 1100.00 1200.00 1300.00 1400.00 1500.00 1600.00 1700.00 1800.00 1900.00 2000.00 2100.00 2200.00	MAG .836 .768 .692 .614 .535 .490 .435 .398 .362 .333 .318 .297 .281 .275 .263 .268 .277 .267 .262 .276 .273 .283	ANG -17.9 -34.4 -48.4 -61.2 -72.4 -82.3 -92.9 -100.8 -110.0 -118.3 -126.0 -133.4 -141.4 -147.5 -155.9 -162.3 -169.6 -174.9 -179.5 175.7 169.3 164.4	MAG 13.996 12.918 11.709 10.317 9.260 8.326 7.553 6.791 6.194 5.724 5.263 4.837 4.538 4.256 4.004 3.770 3.597 3.407 3.244 3.118 2.967 2.837	ANG 164.7 150.7 138.9 129.2 120.2 113.8 107.6 102.1 97.7 93.2 89.6 85.7 82.5 79.4 76.0 73.3 70.7 67.7 65.6 62.3 59.5 56.5	MAG .015 .025 .038 .044 .051 .056 .063 .065 .070 .074 .079 .084 .085 .090 .099 .105 .109 .112 .119 .120 .127	73.5 72.7 66.8 60.2 55.8 55.6 55.6 58.1 54.7 54.2 55.3 53.9 53.3 52.0 50.6 49.4 49.9 51.2 50.2 51.9 50.4 47.6	MAG .971 .918 .862 .793 .731 .684 .658 .614 .591 .567 .548 .542 .516 .509 .488 .491 .484 .475 .468 .460 .453 .446	ANG -8.3 -15.1 -20.5 -23.9 -27.1 -29.1 -30.6 -32.8 -33.4 -34.7 -35.6 -36.7 -37.9 -38.2 -39.3 -40.0 -41.7 -43.4 -46.6 -47.4 -49.3
FREQUENCY f (MHz) 100.00 200.00 300.00 400.00 500.00 600.00 700.00 800.00 1000.00 1100.00 1200.00 1300.00 1400.00 1500.00 1600.00 1700.00 1800.00 1900.00 2000.00 2100.00	MAG .836 .768 .692 .614 .535 .490 .435 .398 .362 .333 .318 .297 .281 .275 .263 .268 .277 .267 .262 .276	ANG -17.9 -34.4 -48.4 -61.2 -72.4 -82.3 -92.9 -100.8 -110.0 -118.3 -126.0 -133.4 -141.4 -147.5 -155.9 -162.3 -169.6 -174.9 -179.5 175.7 169.3	MAG 13.996 12.918 11.709 10.317 9.260 8.326 7.553 6.791 6.194 5.724 5.263 4.837 4.538 4.256 4.004 3.770 3.597 3.407 3.244 3.118 2.967	ANG 164.7 150.7 138.9 129.2 120.2 113.8 107.6 102.1 97.7 93.2 89.6 85.7 82.5 79.4 76.0 73.3 70.7 67.7 65.6 62.3 59.5	MAG .015 .025 .038 .044 .051 .056 .063 .065 .070 .074 .079 .084 .085 .090 .099 .105 .109 .112 .119 .120	73.5 72.7 66.8 60.2 55.8 55.6 55.6 58.1 54.7 54.2 55.3 53.9 53.3 52.0 50.6 49.4 49.9 51.2 50.2 51.9 50.4	MAG .971 .918 .862 .793 .731 .684 .658 .614 .591 .567 .548 .542 .516 .509 .488 .491 .484 .475 .468 .460 .453	ANG -8.3 -15.1 -20.5 -23.9 -27.1 -29.1 -30.6 -32.6 -32.8 -33.4 -34.7 -35.6 -36.7 -37.9 -38.2 -39.3 -40.0 -41.7 -43.4 -46.6 -47.4
FREQUENCY f (MHz) 100.00 200.00 300.00 400.00 500.00 600.00 700.00 800.00 1000.00 1100.00 1200.00 1300.00 1400.00 1500.00 1600.00 1700.00 1800.00 1900.00 2000.00 2200.00 2300.00 2400.00 2500.00	MAG .836 .768 .692 .614 .535 .490 .435 .398 .362 .333 .318 .297 .281 .275 .263 .268 .277 .267 .262 .276 .273 .283 .291 .283 .302	ANG -17.9 -34.4 -48.4 -61.2 -72.4 -82.3 -92.9 -100.8 -110.0 -118.3 -126.0 -133.4 -141.4 -147.5 -155.9 -162.3 -169.6 -174.9 -179.5 175.7 169.3 164.4 161.1 155.3 153.1	MAG 13.996 12.918 11.709 10.317 9.260 8.326 7.553 6.791 6.194 5.724 5.263 4.837 4.538 4.256 4.004 3.770 3.597 3.407 3.244 3.118 2.967 2.837 2.726 2.635 2.538	ANG 164.7 150.7 138.9 129.2 120.2 113.8 107.6 102.1 97.7 93.2 89.6 85.7 82.5 79.4 76.0 73.3 70.7 67.7 65.6 62.3 59.5 56.5 54.5 52.3 49.3	MAG .015 .025 .038 .044 .051 .056 .063 .065 .070 .074 .079 .084 .085 .090 .099 .105 .109 .112 .119 .120 .127 .129 .135 .138	73.5 72.7 66.8 60.2 55.8 55.6 55.6 58.1 54.7 54.2 55.3 53.9 53.3 52.0 50.6 49.4 49.9 51.2 50.2 51.9 50.4 47.6 49.7 50.6 50.0	MAG .971 .918 .862 .793 .731 .684 .658 .614 .591 .567 .548 .542 .516 .509 .488 .491 .484 .475 .468 .460 .453 .446 .441 .431 .429	ANG -8.3 -15.1 -20.5 -23.9 -27.1 -30.6 -32.6 -32.8 -33.4 -34.7 -35.6 -36.7 -37.9 -38.2 -39.3 -40.0 -41.7 -43.4 -46.6 -47.4 -49.3 -50.5 -51.1 -53.9
FREQUENCY f (MHz) 100.00 200.00 300.00 400.00 500.00 600.00 700.00 800.00 1000.00 1100.00 1200.00 1300.00 1400.00 1500.00 1600.00 1700.00 1800.00 1900.00 2100.00 2200.00 2300.00 2400.00 2500.00 2600.00	MAG .836 .768 .692 .614 .535 .490 .435 .398 .362 .333 .318 .297 .281 .275 .263 .268 .277 .267 .262 .276 .273 .283 .291 .283 .302 .304	ANG -17.9 -34.4 -48.4 -61.2 -72.4 -82.3 -92.9 -100.8 -110.0 -118.3 -126.0 -133.4 -141.4 -147.5 -155.9 -162.3 -169.6 -174.9 -179.5 175.7 169.3 164.4 161.1 155.3 153.1 148.2	MAG 13.996 12.918 11.709 10.317 9.260 8.326 7.553 6.791 6.194 5.724 5.263 4.837 4.538 4.256 4.004 3.770 3.597 3.407 3.244 3.118 2.967 2.837 2.726 2.635 2.538 2.458	ANG 164.7 150.7 138.9 129.2 120.2 113.8 107.6 102.1 97.7 93.2 89.6 85.7 82.5 79.4 76.0 73.3 70.7 67.7 65.6 62.3 59.5 56.5 54.5 55.3 49.3 47.3	MAG .015 .025 .038 .044 .051 .056 .063 .065 .070 .074 .079 .084 .085 .090 .099 .105 .109 .112 .119 .120 .127 .129 .135 .138 .143	73.5 72.7 66.8 60.2 55.8 55.6 55.6 58.1 54.7 54.2 55.3 53.9 53.3 52.0 50.6 49.4 49.9 51.2 50.2 51.9 50.4 47.6 49.7 50.6 50.0 49.1	MAG .971 .918 .862 .793 .731 .684 .658 .614 .591 .567 .548 .542 .516 .509 .488 .491 .484 .475 .468 .460 .453 .446 .441 .431 .429 .426	ANG -8.3 -15.1 -20.5 -23.9 -27.1 -30.6 -32.6 -32.8 -33.4 -34.7 -35.6 -36.7 -37.9 -38.2 -39.3 -40.0 -41.7 -43.4 -46.6 -47.4 -49.3 -50.5 -51.1 -53.9 -53.3
FREQUENCY f (MHz) 100.00 200.00 300.00 400.00 500.00 600.00 700.00 800.00 1000.00 1100.00 1200.00 1300.00 1400.00 1500.00 1600.00 1700.00 1800.00 1900.00 2000.00 2200.00 2300.00 2400.00 2500.00	MAG .836 .768 .692 .614 .535 .490 .435 .398 .362 .333 .318 .297 .281 .275 .263 .268 .277 .267 .262 .276 .273 .283 .291 .283 .302	ANG -17.9 -34.4 -48.4 -61.2 -72.4 -82.3 -92.9 -100.8 -110.0 -118.3 -126.0 -133.4 -141.4 -147.5 -155.9 -162.3 -169.6 -174.9 -179.5 175.7 169.3 164.4 161.1 155.3 153.1	MAG 13.996 12.918 11.709 10.317 9.260 8.326 7.553 6.791 6.194 5.724 5.263 4.837 4.538 4.256 4.004 3.770 3.597 3.407 3.244 3.118 2.967 2.837 2.726 2.635 2.538	ANG 164.7 150.7 138.9 129.2 120.2 113.8 107.6 102.1 97.7 93.2 89.6 85.7 82.5 79.4 76.0 73.3 70.7 67.7 65.6 62.3 59.5 56.5 54.5 52.3 49.3	MAG .015 .025 .038 .044 .051 .056 .063 .065 .070 .074 .079 .084 .085 .090 .099 .105 .109 .112 .119 .120 .127 .129 .135 .138	73.5 72.7 66.8 60.2 55.8 55.6 55.6 58.1 54.7 54.2 55.3 53.9 53.3 52.0 50.6 49.4 49.9 51.2 50.2 51.9 50.4 47.6 49.7 50.6 50.0	MAG .971 .918 .862 .793 .731 .684 .658 .614 .591 .567 .548 .542 .516 .509 .488 .491 .484 .475 .468 .460 .453 .446 .441 .431 .429	ANG -8.3 -15.1 -20.5 -23.9 -27.1 -30.6 -32.6 -32.8 -33.4 -34.7 -35.6 -36.7 -37.9 -38.2 -39.3 -40.0 -41.7 -43.4 -46.6 -47.4 -49.3 -50.5 -51.1 -53.9
FREQUENCY f (MHz) 100.00 200.00 300.00 400.00 500.00 600.00 700.00 800.00 1000.00 1100.00 1200.00 1300.00 1400.00 1500.00 1600.00 1700.00 1800.00 1900.00 2000.00 2100.00 2200.00 2300.00 2400.00 2500.00 2600.00 2700.00	MAG .836 .768 .692 .614 .535 .490 .435 .398 .362 .333 .318 .297 .281 .275 .263 .268 .277 .267 .262 .276 .273 .283 .291 .283 .302 .304 .313	ANG -17.9 -34.4 -48.4 -61.2 -72.4 -82.3 -92.9 -100.8 -110.0 -118.3 -126.0 -133.4 -141.4 -147.5 -155.9 -162.3 -169.6 -174.9 -179.5 175.7 169.3 164.4 161.1 155.3 153.1 148.2 145.8	MAG 13.996 12.918 11.709 10.317 9.260 8.326 7.553 6.791 6.194 5.724 5.263 4.837 4.538 4.256 4.004 3.770 3.597 3.407 3.244 3.118 2.967 2.837 2.726 2.635 2.538 2.458 2.365	ANG 164.7 150.7 138.9 129.2 120.2 113.8 107.6 102.1 97.7 93.2 89.6 85.7 82.5 79.4 76.0 73.3 70.7 65.6 62.3 59.5 56.5 54.5 52.3 49.3 47.3 45.9	MAG .015 .025 .038 .044 .051 .056 .063 .065 .070 .074 .079 .084 .085 .090 .099 .105 .109 .112 .119 .120 .127 .129 .135 .138 .143 .147	73.5 72.7 66.8 60.2 55.8 55.6 55.6 58.1 54.7 54.2 55.3 53.9 53.3 52.0 50.6 49.4 49.9 51.2 50.2 51.9 50.4 47.6 49.7 50.6 50.0 49.1 47.8	MAG .971 .918 .862 .793 .731 .684 .658 .614 .591 .567 .548 .542 .516 .509 .488 .491 .484 .475 .468 .460 .453 .446 .441 .431 .429 .426 .418	ANG -8.3 -15.1 -20.5 -23.9 -27.1 -30.6 -32.6 -32.8 -33.4 -34.7 -35.6 -36.7 -37.9 -38.2 -39.3 -40.0 -41.7 -43.4 -46.6 -47.4 -49.3 -50.5 -51.1 -53.9 -53.3 -57.4



S-PARAMETER

VcE = 3 V, Ic = 3 mA									
FREQUENCY	S	11	S	21	S	12	S	22	
f (MHz)	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG	
100.00	.902	-13.0	9.558	168.7	.014	84.4	.979	-6.1	
200.00	.851	-26.2	9.143	157.3	.028	74.3	.954	-11.7	
300.00	.802	-37.4	8.623	147.3	.039	69.7	.919	-16.7	
400.00 500.00	.740 .673	-48.4 -58.7	7.924 7.396	138.3 129.6	.047 .059	62.4 58.6	.870 .820	-20.8 -24.6	
600.00	.628	-58.7 -68.1	6.856	123.0	.064	56.0	.820 .777	-24.0 -27.4	
700.00	.570	-77.1	6.376	116.2	.069	53.7	.771 .741	-27.4 -29.3	
800.00	.525	-85.5	5.838	110.2	.075	52.2	.698	-32.1	
900.00	.476	-94.0	5.406	105.2	.079	51.0	.671	-33.0	
1000.00	.444	-101.0	5.065	100.2	.086	48.3	.650	-34.5	
1100.00	.414	-108.1	4.698	96.0	.088	48.0	.621	-35.7	
1200.00	.382	-115.4	4.347	91.6	.095	47.4	.606	-37.3	
1300.00	.362	-123.1	4.108	88.0	.097	47.5	.584	-38.4	
1400.00	.347	-129.7	3.874	84.3	.098	45.7	.570	-39.5	
1500.00	.331	-136.8	3.663	80.7	.100	45.9	.543	-40.5	
1600.00	.323	-144.1	3.457	77.5	.103	44.4	.540	-41.8	
1700.00	.325	-151.0	3.312	74.7	.107	46.4	.525	-42.7	
1800.00	.311	-156.6 -161.8	3.143	71.5	.113	44.2	.523	-44.8 -46.4	
1900.00 2000.00	.299 .316	-161.8 -169.4	3.009 2.883	68.8 65.2	.114 .118	46.4 44.7	.515 .504	-46.4 -47.9	
2100.00	.303	-109.4 -176.8	2.746	62.4	.113	44.7 45.6	.492	-47.9 -50.0	
2200.00	.311	179.4	2.636	59.0	.125	43.0	.488	-51.8	
2300.00	.308	173.8	2.539	57.0	.128	44.0	.486	-52.1	
2400.00	.298	169.7	2.446	54.5	.137	45.1	.470	-53.4	
2500.00	.319	164.0	2.371	51.4	.141	42.7	.468	-55.8	
2600.00	.323	161.0	2.291	49.2	.139	43.4	.463	-56.2	
2700.00	.320	158.3	2.203	47.5	.143	42.6	.462	-58.9	
2800.00	.318	155.2	2.146	44.2	.149	42.2	.469	-62.4	
2900.00	.339	152.9	2.066	42.5	.150	42.5	.457	-63.6	
3000.00	.322	146.3	1.987	39.1	.162	41.3	.458	-66.6	
VcE = 3 V, Ic = 1 mA									
FREQUENCY	S	11	S	S ₂₁		S ₁₂		S ₂₂	
f (MHz)	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG	
100.00	.971	-7.4	3.546	173.5	.019	84.5	.998	-3.3	
200.00	.950	-15.4	3.498	166.3	.031	75.8	.986	-6.9	
300.00	.937	-22.4	3.464	159.7	.045	76.2	.983	-9.9	
400.00	.910	-29.7	3.348	153.4	.058	67.5	.962	-13.2	
500.00	.877	-36.9	3.321	146.0	.071	67.2	.946	-16.6	
600.00	.858	-44.0	3.232	140.7	.082	62.3	.928	-19.3	

FREQUENCY	S	S ₁₁	S	21	S	12	S	22
f (MHz)	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.00	.971	-7.4	3.546	173.5	.019	84.5	.998	-3.3
200.00	.950	-15.4	3.498	166.3	.031	75.8	.986	-6.9
300.00	.937	-22.4	3.464	159.7	.045	76.2	.983	-9.9
400.00	.910	-29.7	3.348	153.4	.058	67.5	.962	-13.2
500.00	.877	-36.9	3.321	146.0	.071	67.2	.946	-16.6
600.00	.858	-44.0	3.232	140.7	.082	62.3	.928	-19.3
700.00	.822	-51.3	3.187	134.4	.090	58.1	.909	-21.9
800.00	.792	-58.1	3.054	128.3	.102	56.1	.884	-25.5
900.00	.751	-65.0	2.949	122.9	.110	50.7	.852	-27.2
1000.00	.718	-71.4	2.867	117.5	.116	48.6	.845	-29.7
1100.00	.686	-78.2	2.750	112.7	.122	45.0	.813	-32.3
1200.00	.649	-84.4	2.620	107.1	.131	42.7	.793	-34.2
1300.00	.623	-91.2	2.543	102.7	.128	42.4	.767	-36.0
1400.00	.592	-97.1	2.449	98.2	.137	37.2	.758	-38.7
1500.00	.565	-104.0	2.362	93.5	.136	33.7	.729	-40.0
1600.00	.542	-110.2	2.259	89.2	.140	32.8	.715	-41.5
1700.00	.524	-117.6	2.219	85.9	.147	29.5	.703	-43.2
1800.00	.508	-122.9	2.117	81.6	.148	28.3	.692	-45.5
1900.00	.483	-127.9	2.043	78.3	.140	30.1	.674	-47.2
2000.00	.481	-135.3	1.989	74.0	.147	28.4	.667	-49.0
2100.00	.453	-141.6	1.901	70.1	.145	25.9	.652	-51.0
2200.00	.445	-147.4	1.850	65.9	.145	25.6	.642	-52.6
2300.00	.445	-152.3	1.791	63.4	.154	24.4	.636	-54.4
2400.00	.425	-157.1	1.722	60.3	.145	25.6	.630	-56.3
2500.00	.436	-163.5	1.691	56.6	.148	25.9	.619	-58.8
2600.00	.419	-169.2	1.642	53.7	.148	22.1	.609	-58.5
2700.00	.430	-172.0	1.577	51.8	.143	22.3	.610	-61.9
2800.00	.416	-176.9	1.552	47.7	.146	22.6	.606	-64.8
2900.00	.433	178.9	1.488	45.5	.145	23.0	.596	-64.8
3000.00	.408	173.9	1.450	42.1	.155	22.8	.597	-67.4

[MEMO]

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