

NEC

SILICON TRANSISTOR
2SC5191MICROWAVE LOW NOISE AMPLIFIER
NPN SILICON EPITAXIAL TRANSISTOR

FEATURES

- Low Voltage Operation, Low Phase Distortion
- Low Noise
 $NF = 1.5 \text{ dB TYP. @ } V_{CE} = 3 \text{ V, } I_c = 7 \text{ mA, } f = 2 \text{ GHz}$
 $NF = 1.7 \text{ dB TYP. @ } V_{CE} = 1 \text{ V, } I_c = 3 \text{ mA, } f = 2 \text{ GHz}$
- Large Absolute Maximum Collector Current
 $I_c = 100 \text{ mA}$
- Mini Mold Package
EIAJ: SC-59

ORDERING INFORMATION

PART NUMBER	QUANTITY	PACKING STYLE
2SC5191-T1	3 Kpcs/Reel	Embossed tape 8 mm wide. Pin 3 (collector) face to perforation side of the tape.
2SC5191-T2	3 Kpcs/Reel	Embossed tape 8 mm wide. Pin 1 (Emitter), Pin 2 (Base) face to perforation side of the tape.

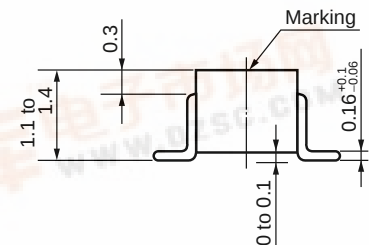
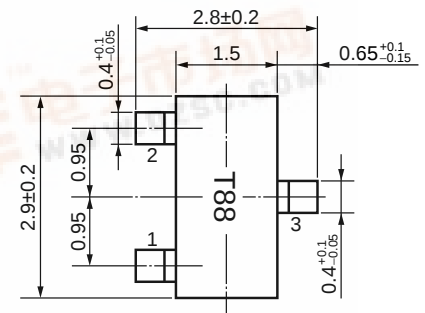
Remark If you require an evaluation sample, please contact an NEC Sales Representative. (Unit sample quantity is 50 pcs.)

ABSOLUTE MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$)

PARAMETER	SYMBOL	RATING	UNIT
Collector to Base Voltage	V_{CBO}	9	V
Collector to Emitter Voltage	V_{CEO}	6	V
Emitter to Base Voltage	V_{EBO}	2	V
Collector Current	I_c	100	mA
Total Power Dissipation	P_T	200	mW
Junction Temperature	T_j	150	$^\circ\text{C}$
Storage Temperature	T_{stg}	-65 to +150	$^\circ\text{C}$

PACKAGE DRAWINGS

(Unit: mm)



PIN CONNECTIONS

1. Emitter
2. Base
3. Collector

ELECTRICAL CHARACTERISTICS (T_A = 25 °C)

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Collector Cutoff Current	I _{CBO}	V _{CB} = 5 V, I _E = 0			100	nA
Emitter Cutoff Current	I _{EBO}	V _{EB} = 1 V, I _C = 0			100	nA
DC Current Gain	h _{FE}	V _{CE} = 1 V, I _C = 3 mA ^{Note 1}	80		160	
Insertion Power Gain (1)	S _{21e} ²	V _{CE} = 1 V, I _C = 3 mA, f = 2.0 GHz	2.5	3.5		dB
Insertion Power Gain (2)	S _{21e} ²	V _{CE} = 3 V, I _C = 20 mA, f = 2.0 GHz		6.5		dB
Noise Figure (1)	NF	V _{CE} = 1 V, I _C = 3 mA, f = 2.0 GHz		1.7	2.5	dB
Noise Figure (2)	NF	V _{CE} = 3 V, I _C = 7 mA, f = 2.0 GHz		1.5		dB
Gain Bandwidth Product (1)	f _T	V _{CE} = 1 V, I _C = 3 mA, f = 2.0 GHz	4	4.5		GHz
Gain Bandwidth Product (2)	f _T	V _{CE} = 3 V, I _C = 20 mA, f = 2.0 GHz		8.5		GHz
Collector Capacitance	C _{re}	V _{CB} = 1 V, I _E = 0, f = 1.0 MHz ^{Note 2}		0.75	0.85	pF

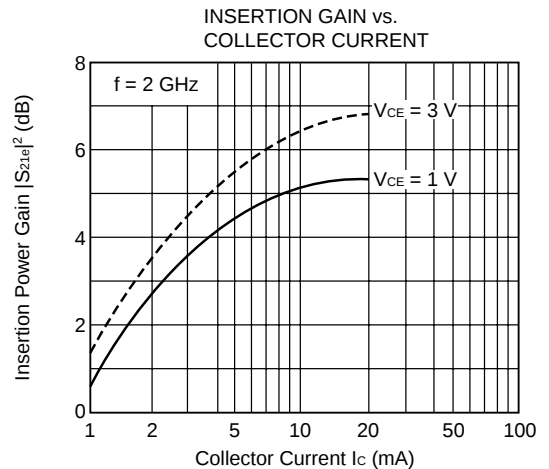
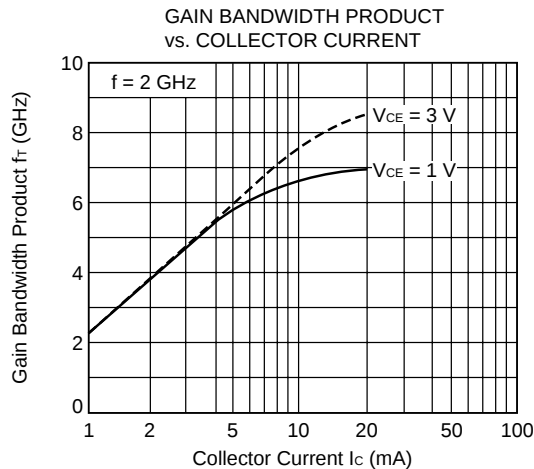
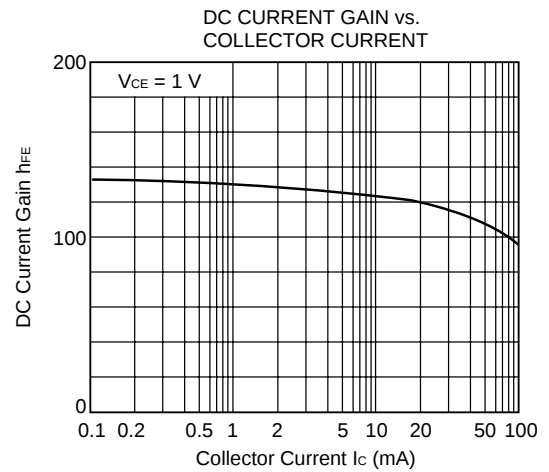
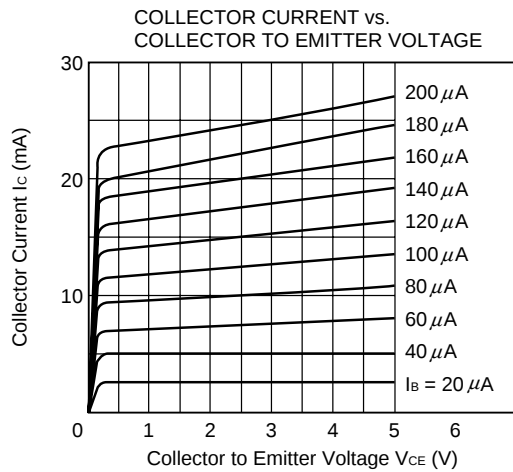
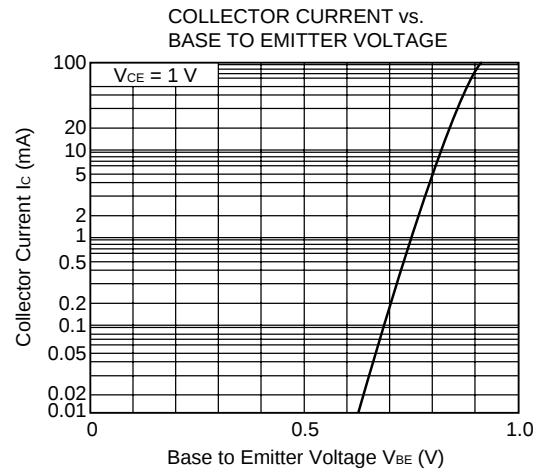
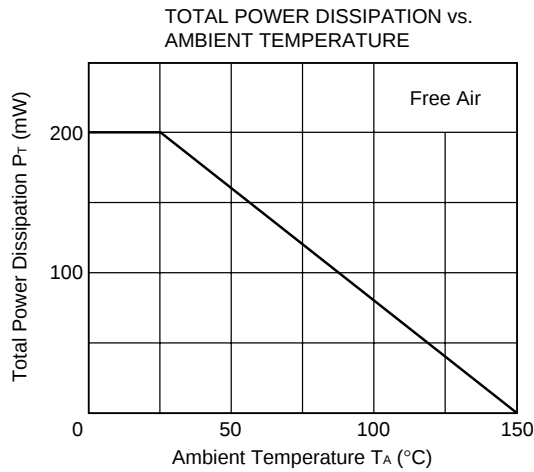
Notes 1. Pulse Measurement: PW ≤ 350 μs, Duty cycle ≤ 2 %, Pulsed

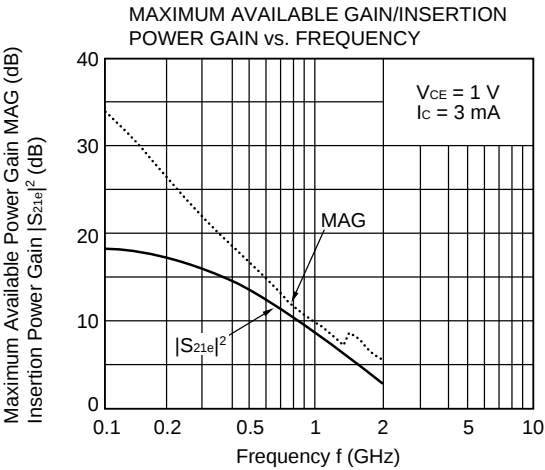
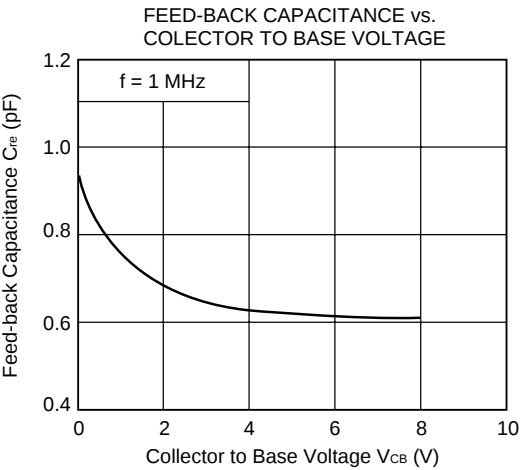
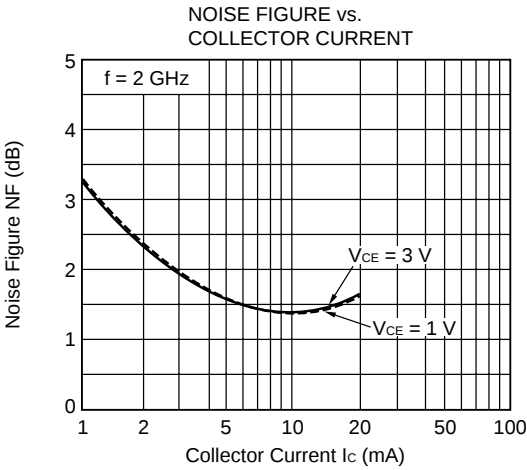
2. Measured with 3-pin bridge, emitter and case should be connected to guard pin of bridge.

h_{FE} Classification

Rank	FB
Marking	T88
h _{FE}	80 to 160

TYPICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$)





S-PARAMETERS

$V_{CE} = 1\text{ V}$, $I_C = 1\text{ mA}$, $Z_0 = 50\ \Omega$

FREQUENCY (MHz)	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.00	0.969	-17.1	3.342	165.9	0.058	80.2	0.990	-9.6
200.00	0.923	-34.8	3.220	152.2	0.099	71.6	0.948	-17.9
300.00	0.868	-51.0	3.032	139.4	0.141	61.0	0.877	-26.0
400.00	0.831	-65.4	2.785	128.8	0.167	49.6	0.821	-33.3
500.00	0.762	-79.3	2.592	118.8	0.186	45.7	0.766	-38.6
600.00	0.715	-91.0	2.355	109.3	0.202	37.4	0.710	-42.5
700.00	0.678	-103.8	2.190	100.6	0.210	34.9	0.664	-46.5
800.00	0.645	-113.9	2.020	94.1	0.219	30.8	0.629	-50.1
900.00	0.617	-124.9	1.849	86.6	0.216	26.8	0.599	-54.8
1000.00	0.600	-134.1	1.759	80.4	0.226	23.6	0.573	-56.2
1100.00	0.586	-141.8	1.638	75.2	0.220	25.1	0.546	-60.1
1200.00	0.559	-150.3	1.530	70.0	0.223	23.0	0.514	-60.4
1300.00	0.556	-158.1	1.459	65.1	0.213	24.1	0.513	-64.9
1400.00	0.551	-166.4	1.379	61.2	0.216	26.2	0.495	-66.4
1500.00	0.532	-171.2	1.288	56.1	0.207	24.3	0.481	-69.4
1600.00	0.553	-177.8	1.237	53.3	0.209	25.5	0.477	-72.0
1700.00	0.552	176.8	1.206	50.2	0.214	26.9	0.468	-75.2
1800.00	0.548	170.0	1.145	46.7	0.204	29.2	0.470	-78.4
1900.00	0.537	164.3	1.058	43.5	0.199	30.8	0.470	-80.9
2000.00	0.552	160.5	1.051	41.2	0.209	31.8	0.442	-84.6

$V_{CE} = 1\text{ V}$, $I_C = 3\text{ mA}$, $Z_0 = 50\ \Omega$

FREQUENCY (MHz)	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.00	0.878	-27.3	8.524	158.6	0.042	70.2	0.931	-17.4
200.00	0.795	-52.6	7.536	140.5	0.086	63.9	0.840	-32.4
300.00	0.692	-73.3	6.465	125.8	0.113	52.7	0.708	-43.3
400.00	0.612	-90.3	5.488	115.3	0.123	47.8	0.602	-51.1
500.00	0.553	-105.9	4.763	106.3	0.143	44.7	0.535	-56.7
600.00	0.511	-117.9	4.142	98.5	0.153	43.8	0.479	-61.1
700.00	0.477	-130.1	3.673	92.1	0.156	42.1	0.422	-64.5
800.00	0.449	-139.3	3.273	86.6	0.164	40.8	0.386	-67.9
900.00	0.443	-149.3	2.951	81.4	0.166	42.2	0.362	-70.5
1000.00	0.427	-158.0	2.727	76.5	0.185	41.3	0.337	-73.2
1100.00	0.430	-165.7	2.524	72.4	0.183	40.8	0.318	-75.0
1200.00	0.414	-171.7	2.338	68.5	0.196	42.5	0.287	-79.0
1300.00	0.409	-178.9	2.194	64.4	0.205	42.9	0.295	-81.7
1400.00	0.421	177.0	2.072	61.3	0.211	42.6	0.277	-83.9
1500.00	0.397	170.0	1.924	57.3	0.221	41.8	0.264	-86.1
1600.00	0.430	165.1	1.823	55.2	0.228	41.2	0.258	-87.3
1700.00	0.415	161.5	1.753	52.2	0.242	43.4	0.257	-94.1
1800.00	0.446	155.0	1.641	48.9	0.252	44.0	0.242	-96.0
1900.00	0.414	150.3	1.561	46.7	0.261	42.6	0.239	-95.3
2000.00	0.432	147.2	1.523	44.6	0.268	42.8	0.227	-103.4

$V_{CE} = 1\text{ V}$, $I_C = 5\text{ mA}$, $Z_o = 50\ \Omega$

FREQUENCY (MHz)	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.00	0.828	-34.9	12.029	153.2	0.047	72.5	0.896	-23.8
200.00	0.698	-64.4	9.922	133.0	0.076	59.6	0.750	-41.2
300.00	0.586	-86.5	8.024	118.3	0.100	52.5	0.602	-53.1
400.00	0.513	-103.4	6.568	108.6	0.111	49.5	0.488	-61.1
500.00	0.461	-118.7	5.561	100.5	0.121	48.7	0.428	-66.7
600.00	0.423	-132.0	4.754	93.8	0.129	46.9	0.363	-71.2
700.00	0.409	-143.3	4.178	88.3	0.147	49.8	0.330	-74.3
800.00	0.379	-152.0	3.699	83.5	0.156	47.9	0.299	-77.4
900.00	0.396	-160.6	3.317	78.8	0.162	47.2	0.275	-82.9
1000.00	0.380	-169.2	3.040	74.6	0.178	48.4	0.260	-84.9
1100.00	0.386	-175.8	2.810	70.8	0.185	49.2	0.237	-87.8
1200.00	0.379	177.9	2.596	67.4	0.200	48.0	0.222	-90.4
1300.00	0.374	172.3	2.412	63.9	0.208	48.2	0.224	-95.8
1400.00	0.385	167.2	2.269	60.9	0.216	47.4	0.203	-97.8
1500.00	0.366	162.1	2.136	57.4	0.233	46.8	0.197	-101.8
1600.00	0.394	157.6	1.994	55.6	0.247	47.5	0.189	-105.4
1700.00	0.387	154.4	1.940	52.4	0.253	48.2	0.200	-107.6
1800.00	0.401	149.9	1.822	50.2	0.265	46.1	0.186	-112.3
1900.00	0.394	143.8	1.705	47.1	0.276	47.1	0.181	-108.8
2000.00	0.413	142.2	1.661	45.5	0.294	46.2	0.183	-122.0

$V_{CE} = 1\text{ V}$, $I_C = 7\text{ mA}$, $Z_o = 50\ \Omega$

FREQUENCY (MHz)	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.00	0.765	-41.7	14.938	148.5	0.047	67.6	0.856	-29.5
200.00	0.621	-74.7	11.624	127.4	0.069	57.3	0.675	-49.1
300.00	0.514	-97.4	8.988	113.0	0.089	52.6	0.516	-61.4
400.00	0.450	-114.0	7.200	104.2	0.105	48.1	0.417	-69.3
500.00	0.417	-129.8	6.002	96.8	0.119	51.6	0.358	-75.2
600.00	0.382	-141.2	5.090	90.7	0.132	50.0	0.312	-77.7
700.00	0.370	-153.0	4.437	85.7	0.138	54.3	0.274	-81.5
800.00	0.352	-161.1	3.924	81.5	0.152	52.4	0.248	-88.8
900.00	0.368	-168.9	3.502	77.3	0.158	53.2	0.231	-92.2
1000.00	0.358	-177.0	3.198	73.1	0.176	53.7	0.211	-93.2
1100.00	0.360	177.8	2.961	70.1	0.191	52.3	0.191	-100.3
1200.00	0.360	171.7	2.726	66.8	0.206	53.1	0.185	-101.6
1300.00	0.365	165.9	2.534	63.2	0.217	52.1	0.187	-105.6
1400.00	0.369	160.9	2.380	60.3	0.235	51.6	0.171	-111.0
1500.00	0.351	155.9	2.225	57.4	0.240	50.3	0.165	-119.0
1600.00	0.382	153.0	2.099	55.6	0.258	50.4	0.157	-119.3
1700.00	0.374	150.9	2.035	52.8	0.267	50.3	0.166	-125.9
1800.00	0.395	145.3	1.909	50.1	0.276	47.7	0.166	-132.7
1900.00	0.389	140.7	1.796	48.2	0.279	48.1	0.156	-130.1
2000.00	0.394	137.7	1.732	46.0	0.307	45.0	0.158	-138.8

$V_{CE} = 1 \text{ V}$, $I_C = 10 \text{ mA}$, $Z_0 = 50 \Omega$

FREQUENCY (MHz)	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.00	0.709	-49.2	17.593	143.9	0.046	65.1	0.813	-35.5
200.00	0.559	-84.3	12.812	122.2	0.062	62.1	0.599	-55.4
300.00	0.453	-107.2	9.641	108.9	0.078	52.2	0.458	-68.8
400.00	0.402	-124.4	7.603	100.7	0.099	55.9	0.354	-78.2
500.00	0.380	-139.0	6.276	93.8	0.108	52.3	0.308	-84.6
600.00	0.354	-149.7	5.297	88.3	0.122	55.0	0.254	-88.0
700.00	0.346	-160.7	4.604	83.8	0.140	56.0	0.232	-93.3
800.00	0.334	-168.4	4.044	79.8	0.145	57.5	0.208	-98.3
900.00	0.356	-175.4	3.614	75.9	0.163	55.1	0.202	-102.5
1000.00	0.346	176.7	3.290	72.1	0.173	54.1	0.177	-107.7
1100.00	0.353	171.9	3.049	69.0	0.191	53.3	0.167	-110.5
1200.00	0.360	166.4	2.806	65.7	0.201	54.7	0.157	-116.5
1300.00	0.351	161.2	2.610	62.6	0.218	53.0	0.161	-120.6
1400.00	0.361	156.0	2.434	60.1	0.240	53.4	0.150	-128.5
1500.00	0.351	150.0	2.296	57.6	0.255	50.8	0.140	-131.4
1600.00	0.378	149.4	2.154	55.4	0.269	52.3	0.160	-137.6
1700.00	0.356	146.5	2.090	52.4	0.279	50.8	0.166	-136.0
1800.00	0.386	141.6	1.942	50.7	0.295	49.8	0.139	-138.1
1900.00	0.379	139.0	1.844	47.8	0.297	48.5	0.143	-138.2
2000.00	0.404	135.6	1.787	45.7	0.309	47.5	0.148	-148.3

$V_{CE} = 3 \text{ V}$, $I_C = 1 \text{ mA}$, $Z_0 = 50 \Omega$

FREQUENCY (MHz)	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.00	0.963	-15.6	3.352	167.4	0.039	69.0	0.987	-7.2
200.00	0.935	-31.4	3.268	155.2	0.077	70.7	0.966	-14.3
300.00	0.889	-45.5	3.121	143.4	0.110	63.1	0.912	-20.7
400.00	0.846	-59.2	2.893	133.6	0.133	52.8	0.872	-26.2
500.00	0.791	-71.9	2.735	124.1	0.152	50.6	0.824	-30.9
600.00	0.734	-83.7	2.517	115.0	0.163	43.2	0.782	-34.5
700.00	0.694	-96.2	2.371	106.7	0.156	39.1	0.737	-38.5
800.00	0.668	-105.7	2.182	99.9	0.184	35.4	0.689	-40.8
900.00	0.633	-117.2	2.022	92.6	0.183	33.0	0.660	-45.4
1000.00	0.611	-127.2	1.927	86.7	0.181	32.4	0.648	-46.8
1100.00	0.597	-135.2	1.796	81.0	0.183	30.1	0.610	-48.9
1200.00	0.564	-143.3	1.681	76.1	0.171	29.2	0.590	-50.7
1300.00	0.544	-151.2	1.601	71.1	0.180	29.4	0.587	-53.7
1400.00	0.543	-159.7	1.510	66.8	0.169	29.2	0.581	-55.6
1500.00	0.531	-165.5	1.410	61.6	0.173	30.4	0.565	-58.4
1600.00	0.542	-173.1	1.336	58.9	0.172	32.6	0.552	-60.9
1700.00	0.535	-178.3	1.314	56.0	0.178	34.3	0.541	-63.7
1800.00	0.529	174.4	1.244	52.3	0.161	36.6	0.545	-66.0
1900.00	0.515	169.5	1.163	48.4	0.171	38.1	0.548	-68.1
2000.00	0.531	164.3	1.136	46.0	0.183	40.1	0.530	-71.4

$V_{CE} = 3\text{ V}$, $I_C = 3\text{ mA}$, $Z_o = 50\ \Omega$

FREQUENCY (MHz)	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.00	0.896	-23.6	8.711	160.8	0.040	74.9	0.949	-13.8
200.00	0.812	-45.2	7.884	144.2	0.071	66.3	0.877	-24.9
300.00	0.715	-63.9	6.914	130.2	0.092	59.1	0.757	-34.5
400.00	0.636	-79.4	5.959	119.9	0.103	51.9	0.673	-40.1
500.00	0.566	-92.8	5.241	111.0	0.116	48.4	0.609	-44.6
600.00	0.516	-104.7	4.591	103.1	0.124	45.4	0.546	-47.4
700.00	0.464	-117.5	4.116	96.5	0.131	42.4	0.499	-50.0
800.00	0.428	-127.4	3.676	91.1	0.149	44.5	0.465	-52.8
900.00	0.427	-138.6	3.330	85.4	0.144	44.9	0.433	-55.1
1000.00	0.389	-147.0	3.073	81.1	0.155	45.7	0.420	-55.8
1100.00	0.384	-154.9	2.843	76.8	0.162	45.7	0.389	-57.5
1200.00	0.380	-162.2	2.638	72.7	0.168	46.5	0.363	-57.4
1300.00	0.364	-170.0	2.470	68.8	0.176	47.0	0.367	-60.1
1400.00	0.378	-177.8	2.325	65.7	0.191	49.7	0.360	-62.3
1500.00	0.361	178.3	2.162	61.6	0.190	46.6	0.333	-64.2
1600.00	0.382	172.1	2.045	59.6	0.203	47.2	0.320	-65.9
1700.00	0.371	169.0	1.973	56.6	0.210	49.3	0.328	-70.4
1800.00	0.386	162.2	1.854	53.8	0.217	48.5	0.311	-72.5
1900.00	0.373	156.8	1.749	50.6	0.230	50.1	0.321	-73.1
2000.00	0.387	153.1	1.703	48.6	0.236	50.1	0.299	-75.8

$V_{CE} = 3\text{ V}$, $I_C = 5\text{ mA}$, $Z_o = 50\ \Omega$

FREQUENCY (MHz)	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.00	0.847	-29.5	12.405	156.1	0.040	66.7	0.922	-18.5
200.00	0.718	-54.0	10.551	137.2	0.064	65.1	0.805	-31.9
300.00	0.607	-74.5	8.790	122.8	0.083	59.2	0.662	-41.3
400.00	0.525	-89.4	7.304	113.1	0.097	53.0	0.566	-47.1
500.00	0.454	-103.9	6.251	104.8	0.102	51.9	0.494	-50.6
600.00	0.402	-115.9	5.383	97.9	0.115	51.6	0.445	-52.2
700.00	0.379	-127.6	4.744	92.2	0.124	53.4	0.401	-55.5
800.00	0.349	-137.8	4.216	87.5	0.127	51.1	0.377	-56.2
900.00	0.347	-148.2	3.784	82.7	0.145	52.8	0.348	-59.2
1000.00	0.318	-155.9	3.477	78.6	0.157	53.3	0.326	-59.1
1100.00	0.323	-163.8	3.202	75.0	0.162	52.3	0.293	-63.5
1200.00	0.320	-171.7	2.963	71.4	0.175	52.8	0.288	-63.2
1300.00	0.313	-177.4	2.751	67.9	0.191	53.5	0.294	-66.9
1400.00	0.320	175.0	2.589	65.1	0.192	50.9	0.281	-68.0
1500.00	0.305	169.8	2.421	61.2	0.195	51.4	0.263	-68.7
1600.00	0.327	163.6	2.276	59.4	0.210	53.1	0.245	-71.4
1700.00	0.308	162.5	2.203	56.8	0.226	51.8	0.248	-75.4
1800.00	0.341	156.8	2.069	53.9	0.230	51.2	0.236	-76.9
1900.00	0.327	148.3	1.951	51.1	0.239	51.3	0.241	-78.1
2000.00	0.333	147.6	1.891	49.4	0.254	50.4	0.226	-83.2

$V_{CE} = 3\text{ V}$, $I_C = 7\text{ mA}$, $Z_O = 50\ \Omega$

FREQUENCY (MHz)	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.00	0.780	-33.5	15.604	151.8	0.034	75.0	0.889	-22.4
200.00	0.639	-61.9	12.605	131.6	0.059	62.9	0.738	-37.1
300.00	0.520	-82.6	10.059	117.5	0.080	59.3	0.580	-46.6
400.00	0.442	-97.6	8.162	108.4	0.085	56.6	0.494	-52.5
500.00	0.382	-112.6	6.855	100.9	0.098	55.7	0.427	-54.4
600.00	0.346	-124.7	5.848	94.6	0.108	56.5	0.373	-55.5
700.00	0.318	-136.6	5.125	89.5	0.118	57.5	0.344	-58.1
800.00	0.295	-144.5	4.525	85.3	0.131	57.5	0.314	-60.2
900.00	0.297	-156.6	4.059	80.8	0.134	55.0	0.290	-63.1
1000.00	0.282	-164.9	3.730	77.0	0.153	56.6	0.284	-62.8
1100.00	0.285	-170.0	3.414	73.7	0.164	58.3	0.269	-64.7
1200.00	0.279	-177.0	3.152	70.5	0.178	56.0	0.247	-67.7
1300.00	0.269	176.0	2.945	67.1	0.188	55.8	0.234	-70.3
1400.00	0.295	169.7	2.762	64.6	0.204	57.0	0.224	-70.8
1500.00	0.278	163.5	2.572	61.2	0.213	54.7	0.222	-73.1
1600.00	0.297	161.3	2.427	59.6	0.225	53.1	0.225	-74.4
1700.00	0.281	156.8	2.331	56.8	0.240	53.9	0.212	-82.0
1800.00	0.318	151.6	2.194	54.5	0.247	52.9	0.198	82.6
1900.00	0.293	144.1	2.073	51.3	0.263	52.6	0.210	-82.6
2000.00	0.307	144.2	2.009	49.7	0.266	51.3	0.183	-89.8

$V_{CE} = 3\text{ V}$, $I_C = 10\text{ mA}$, $Z_O = 50\ \Omega$

FREQUENCY (MHz)	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.00	0.731	-39.7	18.468	148.0	0.036	64.3	0.857	-27.2
200.00	0.570	-68.3	14.160	127.2	0.055	62.0	0.676	-41.8
300.00	0.453	-88.8	10.931	113.5	0.070	57.7	0.530	-50.0
400.00	0.381	-104.3	8.738	105.0	0.085	59.4	0.432	-56.4
500.00	0.334	-119.4	7.284	98.1	0.093	58.9	0.380	-57.7
600.00	0.297	-131.4	6.170	92.4	0.103	60.7	0.332	-60.1
700.00	0.285	-145.7	5.377	87.6	0.121	57.6	0.297	-61.5
800.00	0.254	-151.0	4.738	83.8	0.133	61.4	0.278	-62.8
900.00	0.274	-161.8	4.232	79.8	0.142	62.0	0.248	-65.8
1000.00	0.250	-169.5	3.882	76.2	0.158	60.6	0.237	-65.0
1100.00	0.263	-176.4	3.572	72.8	0.164	58.0	0.228	-68.8
1200.00	0.260	176.4	3.289	70.0	0.182	58.9	0.198	-70.3
1300.00	0.251	170.1	3.069	66.6	0.192	56.8	0.211	-71.3
1400.00	0.259	166.9	2.885	64.3	0.201	56.1	0.202	-75.4
1500.00	0.253	161.3	2.685	60.9	0.214	54.6	0.186	-80.0
1600.00	0.283	155.7	2.519	59.4	0.230	55.9	0.180	-80.6
1700.00	0.270	152.5	2.427	56.9	0.243	56.3	0.171	-81.9
1800.00	0.310	146.5	2.278	54.8	0.256	52.8	0.175	-86.6
1900.00	0.281	141.1	2.145	51.8	0.268	54.0	0.169	-86.4
2000.00	0.306	139.5	2.088	50.1	0.281	51.6	0.160	-98.9

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