

MICROWAVE LOW NOISE AMPLIFIER
NPN SILICON EPITAXIAL TRANSISTOR
COMPACT MINI MOLD

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
 $I_c = 100 \text{ mA}$
- Compact Mini Mold Package
 EIAJ: SC-70

ORDERING INFORMATION

PART NUMBER	QUANTITY	PACKING STYLE
2SC5193-T1	3 Kpcs/Reel	Embossed tape 8 mm wide. Pin 3 (collector) face to perforation side of the tape.
2SC5193-T2	3 Kpcs/Reel	Embossed tape 8 mm wide. Pin 1 (Emitter), Pin 2 (Base) face to perforation side of the tape.

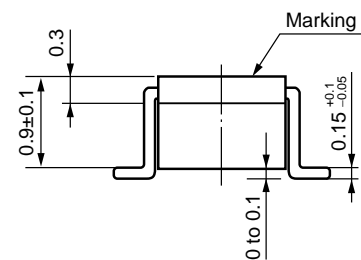
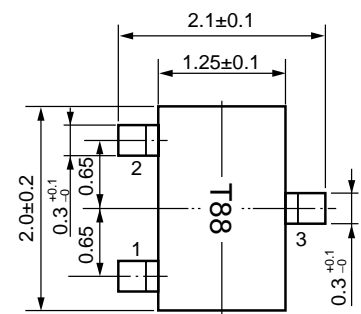
Remark If you require an evaluation sample, please contact an NEC Sales Representative. (Unit sample quantity is 50 pcs.)

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

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	150	mW
Junction Temperature	T_j	150	$^\circ\text{C}$
Storage Temperature	T_{stg}	-65 to +150	$^\circ\text{C}$

PACKAGE DRAWING

(Units: mm)



PIN CONNECTIONS

1. Emitter
2. Base
3. Collector

This device uses radio frequency technology. Take due precautions to protect it from excessive input levels such as static electricity.

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		9		GHz
Collector Capacitance	C _{re}	V _{CB} = 1 V, I _E = 0, f = 1.0 MHz ^{Note 2}		0.75	0.85	pF

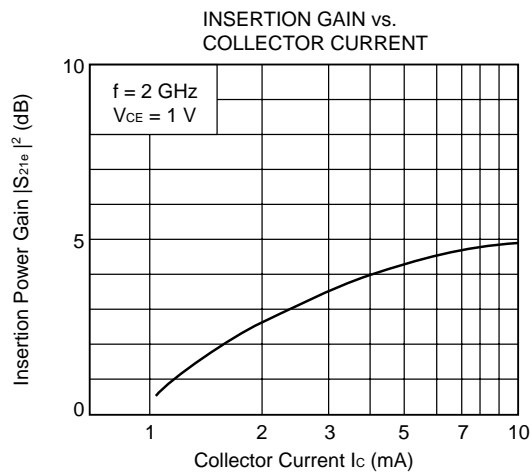
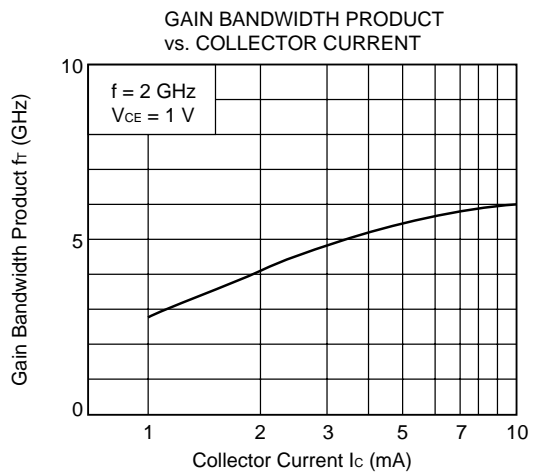
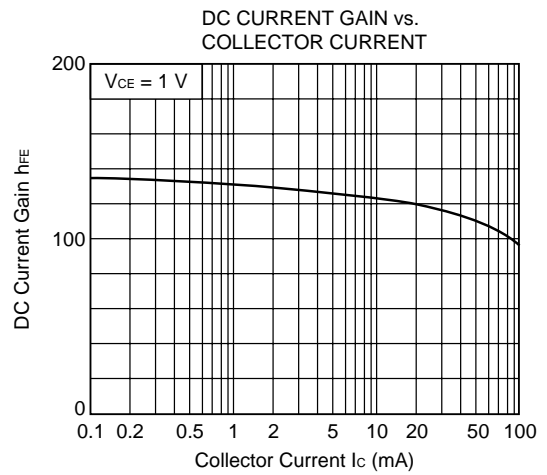
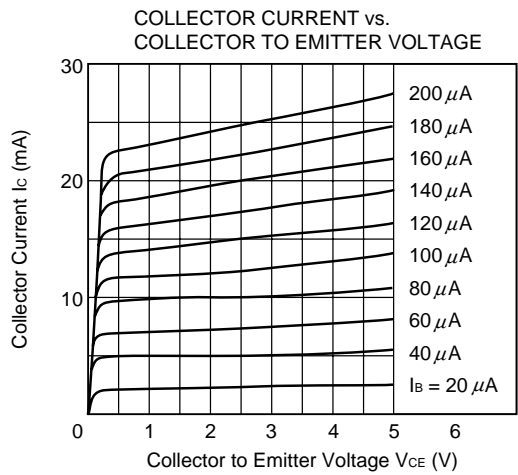
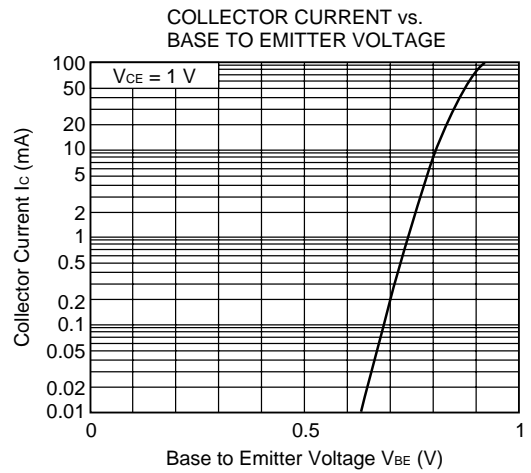
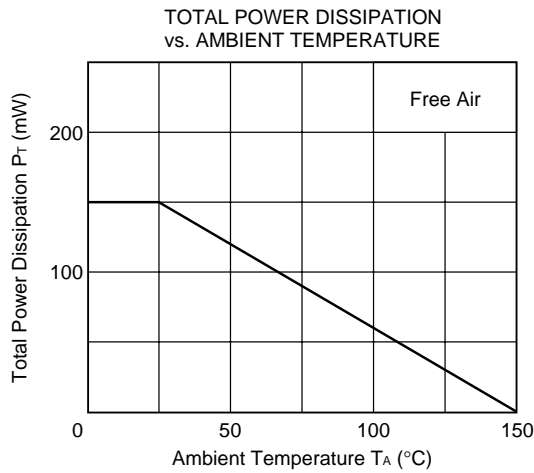
Notes 1. Pulse Measurement: PW ≤ 350 μs, Duty cycle ≤ 2 %, Pulsed

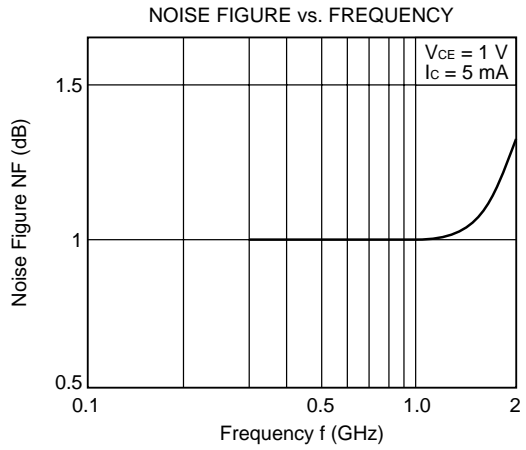
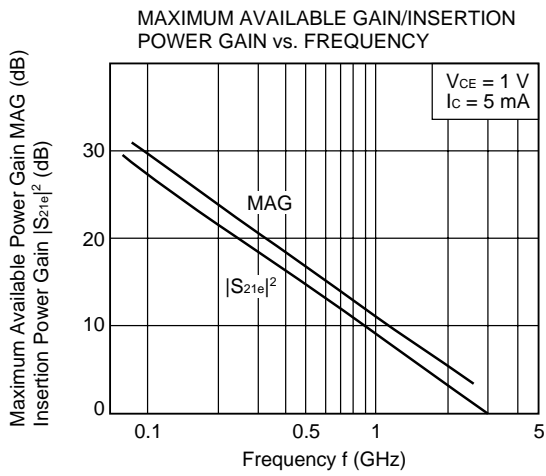
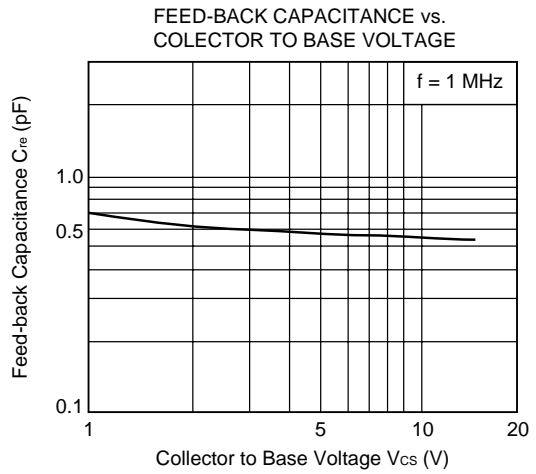
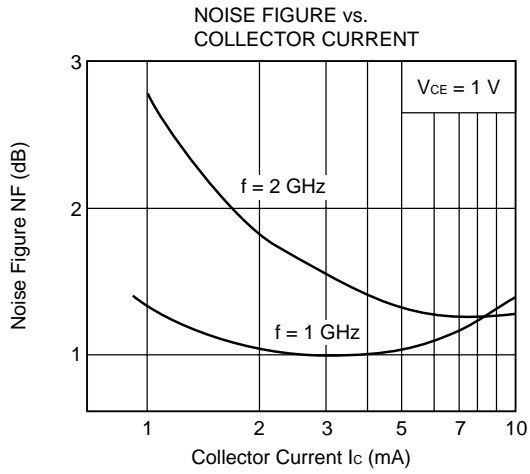
2. Measured with 3-pin bridge, emitter and case should be connected to guard pin of bridge.

h_{FE} Classification

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

TYPICAL CHARACTERISTICS (T_A = 25 °C)





S-PARAMETER

V_{CE} = 1 V, I_c = 1 mA, Z_o = 50 Ω

FREQUENCY (MHz)	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.00	0.952	-18.2	3.497	166.0	0.050	74.0	0.979	-8.3
200.00	0.913	-37.9	3.208	150.4	0.101	64.5	0.927	-18.9
300.00	0.871	-55.6	3.048	135.4	0.141	56.5	0.855	-28.2
400.00	0.817	-68.8	2.825	124.1	0.169	49.8	0.803	-33.7
500.00	0.737	-82.6	2.332	114.8	0.184	42.1	0.746	-39.1
600.00	0.657	-93.4	2.236	107.2	0.196	37.7	0.691	-41.0
700.00	0.624	-103.9	2.043	99.0	0.206	33.0	0.639	-45.4
800.00	0.594	-117.9	1.864	91.9	0.208	30.5	0.573	-46.2
900.00	0.560	-127.1	1.715	85.0	0.208	29.0	0.538	-49.5
1000.00	0.544	-137.1	1.593	80.3	0.203	27.8	0.494	-51.7
1100.00	0.527	-145.1	1.458	75.3	0.200	25.6	0.478	-55.7
1200.00	0.534	-154.5	1.391	70.9	0.195	24.4	0.450	-60.1
1300.00	0.554	-163.9	1.258	66.7	0.195	24.1	0.426	-62.4
1400.00	0.566	-169.0	1.200	63.5	0.194	25.6	0.409	-66.3
1500.00	0.547	-175.2	1.185	55.1	0.199	26.0	0.406	-67.7
1600.00	0.523	179.3	1.176	51.3	0.201	29.6	0.392	-72.4
1700.00	0.540	172.6	1.129	48.8	0.198	33.0	0.375	-76.0
1800.00	0.530	165.2	1.109	47.4	0.199	37.3	0.370	-80.9
1900.00	0.559	160.8	1.028	45.2	0.200	40.0	0.365	-87.1
2000.00	0.571	156.2	0.981	43.6	0.203	43.2	0.364	-91.0

V_{CE} = 1 V, I_c = 3 mA, Z_o = 50 Ω

FREQUENCY (MHz)	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.00	0.864	-29.3	8.784	157.7	0.050	64.3	0.927	-16.5
200.00	0.768	-37.8	7.364	136.9	0.088	56.8	0.797	-34.0
300.00	0.675	-79.1	6.372	139.7	0.115	51.1	0.667	-46.3
400.00	0.584	-94.9	5.374	110.1	0.130	47.2	0.568	-52.1
500.00	0.504	-110.1	4.501	102.3	0.138	44.1	0.485	-55.8
600.00	0.455	-123.0	3.906	96.2	0.148	43.4	0.430	-57.0
700.00	0.428	-134.7	3.298	89.7	0.156	42.3	0.380	-61.3
800.00	0.405	-145.9	2.938	84.1	0.163	42.8	0.321	-63.1
900.00	0.381	-154.2	2.915	79.4	0.171	43.7	0.286	-64.8
1000.00	0.379	-163.1	2.397	75.8	0.178	44.6	0.239	-66.7
1100.00	0.374	-171.9	2.196	72.0	0.184	44.7	0.246	-70.8
1200.00	0.389	-178.5	2.061	68.3	0.190	44.6	0.226	-76.4
1300.00	0.404	174.9	1.916	64.3	0.198	44.2	0.201	-79.4
1400.00	0.414	172.1	1.829	60.6	0.210	44.4	0.184	-83.7
1500.00	0.411	165.7	1.759	55.5	0.225	44.2	0.176	-85.9
1600.00	0.402	161.8	1.680	52.5	0.241	45.3	0.167	-92.5
1700.00	0.417	156.7	1.606	50.1	0.249	48.9	0.159	-97.7
1800.00	0.428	151.2	1.537	49.4	0.259	48.8	0.151	-107.2
1900.00	0.446	148.4	1.458	47.4	0.265	48.7	0.130	-114.4
2000.00	0.457	144.8	1.394	43.8	0.272	48.6	0.155	-120.7

V_{CE} = 1 V, I_c = 5 mA, Z_o = 50 Ω

FREQUENCY (MHz)	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.00	0.790	-37.9	12.042	152.3	0.043	67.5	0.886	-23.5
200.00	0.672	-69.2	9.515	129.2	0.079	54.7	0.708	-42.2
300.00	0.564	-91.9	7.780	113.6	0.101	51.0	0.562	-55.7
400.00	0.475	-108.5	3.993	103.8	0.115	49.2	0.456	-61.2
500.00	0.415	-123.8	4.959	97.3	0.124	48.6	0.374	-63.8
600.00	0.383	-137.1	4.268	92.1	0.135	49.0	0.329	-64.4
700.00	0.366	-147.8	3.741	86.2	0.146	48.6	0.289	-69.8
800.00	0.331	-138.3	3.313	81.3	0.156	47.4	0.235	-73.5
900.00	0.332	-166.3	2.927	77.3	0.168	50.2	0.202	-75.2
1000.00	0.335	-174.3	2.677	74.1	0.179	51.1	0.181	-76.6
1100.00	0.337	177.3	2.431	70.7	0.188	50.8	0.175	-81.8
1200.00	0.333	172.0	2.282	67.4	0.197	50.3	0.158	-90.1
1300.00	0.365	166.3	2.124	63.6	0.208	49.5	0.134	-95.4
1400.00	0.375	164.2	2.027	59.9	0.222	48.9	0.120	-101.8
1500.00	0.378	158.6	1.944	55.4	0.240	48.1	0.114	-106.3
1600.00	0.373	155.0	1.850	52.7	0.258	48.4	0.112	-116.2
1700.00	0.387	150.8	1.764	50.6	0.269	49.5	0.107	-128.3
1800.00	0.401	146.1	1.679	50.0	0.279	50.2	0.109	-137.3
1900.00	0.418	143.8	1.603	48.2	0.286	50.1	0.114	-144.5
2000.00	0.429	140.6	1.526	46.7	0.294	49.5	0.125	-150.2

V_{CE} = 1 V, I_c = 7 mA, Z_o = 50 Ω

FREQUENCY (MHz)	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.00	0.736	-44.1	14.388	148.1	0.041	61.2	0.833	-28.2
200.00	0.603	-77.3	10.890	124.2	0.074	53.6	0.642	-48.4
300.00	0.494	-100.6	8.181	109.3	0.094	51.9	0.497	-62.1
400.00	0.415	-117.8	6.500	100.3	0.108	51.7	0.389	-68.0
500.00	0.369	-133.0	5.307	94.7	0.118	52.1	0.310	-70.2
600.00	0.350	-145.9	4.558	89.8	0.132	52.9	0.271	-70.5
700.00	0.336	-155.9	3.974	84.3	0.144	52.7	0.240	-77.0
800.00	0.324	-166.0	3.500	79.9	0.156	53.1	0.191	-83.3
900.00	0.309	-173.7	3.096	76.3	0.169	53.8	0.158	-85.9
1000.00	0.314	178.7	2.819	73.3	0.183	54.2	0.141	-87.1
1100.00	0.319	171.0	2.583	70.1	0.193	53.7	0.139	-93.2
1200.00	0.335	166.5	2.407	66.9	0.204	52.9	0.128	-104.6
1300.00	0.347	161.6	2.235	63.3	0.215	51.8	0.106	-113.9
1400.00	0.336	159.6	2.137	59.8	0.231	50.8	0.093	-123.2
1500.00	0.362	154.5	2.032	55.5	0.250	49.7	0.093	-129.3
1600.00	0.359	151.2	1.932	52.9	0.268	49.5	0.098	-140.1
1700.00	0.373	147.4	1.845	50.9	0.280	50.4	0.102	-133.9
1800.00	0.388	143.2	1.756	50.5	0.291	50.7	0.110	-161.6
1900.00	0.404	141.0	1.676	48.7	0.299	50.5	0.116	-167.2
2000.00	0.415	138.1	1.597	47.5	0.307	49.6	0.130	-170.3

V_{CE} = 1 V, I_c = 10 mA, Z_o = 50 Ω

FREQUENCY (MHz)	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.00	0.676	-49.5	16.485	144.1	0.041	59.8	0.808	-31.3
200.00	0.545	-83.0	11.960	120.0	0.071	53.3	0.588	-53.4
300.00	0.442	-108.8	8.726	105.9	0.090	53.3	0.433	-67.7
400.00	0.372	-126.4	6.820	97.6	0.103	54.1	0.339	-73.9
500.00	0.339	-141.2	5.333	92.6	0.116	54.9	0.263	-76.2
600.00	0.328	-153.6	4.754	88.1	0.130	33.9	0.229	-76.4
700.00	0.318	-162.8	4.124	82.9	0.143	55.4	0.205	-84.2
800.00	0.309	-172.4	3.626	78.7	0.157	55.7	0.162	-93.2
900.00	0.295	-179.8	3.201	75.3	0.171	56.3	0.131	-97.4
1000.00	0.303	173.2	2.922	72.6	0.186	56.4	0.115	-99.3
1100.00	0.310	166.1	2.674	69.6	0.198	55.7	0.118	-105.7
1200.00	0.326	162.2	2.480	66.5	0.209	54.5	0.113	-119.6
1300.00	0.336	157.7	2.312	63.1	0.221	53.1	0.096	-132.9
1400.00	0.345	156.0	2.205	39.5	0.237	51.9	0.089	-144.2
1500.00	0.333	151.3	2.100	55.5	0.257	50.6	0.091	-151.0
1600.00	0.351	148.1	1.989	55.0	0.276	50.2	0.101	-159.3
1700.00	0.360	144.8	1.904	51.0	0.230	50.9	0.111	-171.4
1800.00	0.380	140.9	1.804	50.7	0.300	51.0	0.122	-177.0
1900.00	0.396	139.0	1.724	49.0	0.307	50.7	0.129	178.5
2000.00	0.407	136.0	1.642	47.6	0.315	49.7	0.143	177.0

V_{CE} = 3 V, I_c = 1 mA, Z_o = 50 Ω

FREQUENCY (MHz)	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.00	1.003	-16.7	3.418	166.9	0.029	74.7	0.989	-3.6
200.00	0.956	-32.7	3.121	154.7	0.078	64.7	0.951	-14.1
300.00	0.938	-48.4	3.082	141.4	0.113	60.2	0.897	-21.7
400.00	0.895	-61.8	2.931	129.6	0.138	53.4	0.857	-26.1
500.00	0.793	-75.1	2.631	120.5	0.130	46.1	0.811	-30.5
600.00	0.700	-83.7	2.365	114.3	0.160	42.9	0.774	-31.5
700.00	0.671	-96.0	2.189	106.3	0.171	38.2	0.735	-35.8
800.00	0.629	-108.8	1.997	98.9	0.172	34.9	0.665	-35.9
900.00	0.581	-117.9	1.837	92.0	0.172	33.9	0.636	-38.4
1000.00	0.554	-127.4	1.706	87.7	0.170	33.3	0.590	-39.3
1100.00	0.535	-135.4	1.570	82.7	0.167	31.4	0.579	-43.2
1200.00	0.531	-145.8	1.510	78.0	0.162	30.6	0.541	-47.1
1300.00	0.540	-156.4	1.359	74.3	0.162	30.5	0.522	-48.3
1400.00	0.542	-161.9	1.299	71.7	0.162	32.5	0.510	-51.5
1500.00	0.527	-168.3	1.278	62.8	0.166	33.5	0.509	-52.6
1600.00	0.497	-174.3	1.272	58.3	0.169	37.6	0.493	-56.2
1700.00	0.512	178.3	1.216	55.8	0.169	41.3	0.476	-58.1
1800.00	0.492	170.4	1.209	54.2	0.171	46.9	0.469	-62.0
1900.00	0.524	165.5	1.119	52.2	0.176	49.9	0.454	-66.3
2000.00	0.534	159.9	1.069	50.4	0.180	33.4	0.454	-69.3

V_{CE} = 3 V, I_c = 3 mA, Z_o = 50 Ω

FREQUENCY (MHz)	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.00	0.924	-23.0	8.393	160.8	0.031	54.9	0.965	-10.7
200.00	0.830	-46.1	7.259	143.7	0.070	59.2	0.964	-24.0
300.00	0.750	-65.0	6.624	128.1	0.096	55.7	0.760	-34.3
400.00	0.653	-79.4	3.805	116.8	0.111	51.5	0.671	-38.9
500.00	0.548	-93.1	4.720	108.8	0.119	48.5	0.599	-41.3
600.00	0.471	-104.2	4.121	103.1	0.127	47.9	0.555	-41.1
700.00	0.433	-116.2	3.695	96.4	0.136	46.5	0.509	-44.9
800.00	0.397	-128.3	3.302	90.5	0.141	46.3	0.441	-44.6
900.00	0.361	-136.7	2.944	85.5	0.147	47.4	0.409	-43.0
1000.00	0.345	-146.1	2.696	82.0	0.153	48.6	0.378	-44.9
1100.00	0.332	-155.5	2.479	77.9	0.158	48.6	0.368	-48.3
1200.00	0.336	-164.1	2.328	74.3	0.163	48.8	0.338	-52.4
1300.00	0.346	-172.7	2.158	70.3	0.170	48.7	0.314	-52.7
1400.00	0.332	-177.1	2.063	67.1	0.180	49.3	0.300	54.5
1500.00	0.347	176.5	1.997	61.8	0.194	49.2	0.294	-55.3
1600.00	0.338	171.8	1.906	58.4	0.207	50.6	0.282	-58.8
1700.00	0.349	165.6	1.818	56.0	0.216	52.3	0.262	-60.8
1800.00	0.355	139.2	1.740	55.1	0.225	54.4	0.251	-64.3
1900.00	0.373	155.6	1.650	53.2	0.233	53.1	0.241	-68.3
2000.00	0.387	131.2	1.376	31.6	0.240	55.5	0.239	-72.5

V_{CE} = 3 V, I_c = 5 mA, Z_o = 50 Ω

FREQUENCY (MHz)	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.00	0.865	-27.8	11.588	156.9	0.036	49.9	0.938	-13.2
200.00	0.742	-53.4	9.364	137.4	0.066	58.5	0.805	-29.3
300.00	0.637	-73.2	8.312	121.7	0.086	53.0	0.675	-40.3
400.00	0.531	-87.6	6.607	110.7	0.100	53.2	0.576	-44.3
500.00	0.438	-101.3	5.519	103.7	0.109	52.0	0.500	-45.6
600.00	0.376	-113.3	4.799	98.6	0.118	52.5	0.461	-44.5
700.00	0.343	-125.0	4.262	92.5	0.128	52.0	0.418	-48.1
800.00	0.315	-136.9	3.784	87.3	0.135	52.5	0.357	-47.9
900.00	0.286	-145.5	3.354	83.0	0.143	53.5	0.325	-47.4
1000.00	0.276	-154.9	3.048	79.8	0.154	54.4	0.301	-46.6
1100.00	0.268	-164.6	2.812	76.3	0.163	54.4	0.294	-50.1
1200.00	0.276	-172.4	2.613	73.0	0.170	54.2	0.267	-54.7
1300.00	0.286	179.9	2.441	69.4	0.180	53.6	0.243	-54.8
1400.00	0.293	173.9	2.321	63.9	0.192	53.4	0.228	-56.1
1500.00	0.294	169.9	2.232	61.4	0.207	52.8	0.222	-57.0
1600.00	0.290	165.5	2.123	58.3	0.223	53.4	0.211	-61.0
1700.00	0.303	160.1	2.030	56.3	0.234	54.4	0.191	-63.5
1800.00	0.313	154.3	1.932	53.6	0.244	55.8	0.179	-67.5
1900.00	0.330	151.2	1.836	53.8	0.252	56.0	0.171	-71.9
2000.00	0.341	147.2	1.757	52.4	0.259	55.8	0.168	-77.4

V_{CE} = 3 V, I_c = 7 mA, Z_o = 50 Ω

FREQUENCY (MHz)	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.00	0.811	-32.6	14.032	153.7	0.027	57.0	0.922	-18.2
200.00	0.668	-59.1	11.239	132.2	0.063	56.7	0.752	-33.9
300.00	0.553	-79.0	8.969	116.7	0.081	55.4	0.611	-44.6
400.00	0.449	-93.3	7.293	106.9	0.094	55.4	0.510	-47.9
500.00	0.370	-107.1	6.039	100.6	0.103	55.3	0.435	-48.1
600.00	0.318	-119.6	5.212	93.8	0.114	56.2	0.400	-46.5
700.00	0.290	-131.1	4.581	90.2	0.125	55.8	0.364	-50.1
800.00	0.268	-142.9	4.057	85.5	0.134	56.2	0.305	-50.1
900.00	0.244	-151.8	3.587	81.6	0.145	57.1	0.275	-49.0
1000.00	0.237	-161.2	3.266	78.6	0.157	57.6	0.255	-47.7
1100.00	0.233	-170.9	3.003	75.4	0.167	57.5	0.249	-51.5
1200.00	0.243	-178.1	2.794	72.3	0.173	57.0	0.225	-56.7
1300.00	0.253	174.8	2.596	68.9	0.186	56.1	0.199	-56.7
1400.00	0.261	171.0	2.474	65.4	0.199	55.4	0.185	-37.7
1500.00	0.265	165.4	2.365	61.3	0.216	54.6	0.179	-38.7
1600.00	0.265	161.2	2.253	58.4	0.232	54.7	0.169	-63.3
1700.00	0.277	156.4	2.153	56.5	0.245	55.5	0.149	-66.8
1800.00	0.290	151.1	2.046	56.9	0.233	56.4	0.137	-71.3
1900.00	0.306	148.3	1.943	54.2	0.264	56.4	0.130	-76.7
2000.00	0.318	144.6	1.856	52.8	0.271	53.9	0.128	-83.6

V_{CE} = 3 V, I_c = 10 mA, Z_o = 50 Ω

FREQUENCY (MHz)	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.00	0.775	-34.3	16.213	130.4	0.031	42.4	0.916	-18.1
200.00	0.609	-63.8	12.257	128.4	0.037	55.3	0.712	-37.2
300.00	0.488	-83.7	9.683	115.4	0.077	56.3	0.569	-47.6
400.00	0.390	-98.0	7.790	104.3	0.091	56.6	0.467	-30.5
500.00	0.321	-111.7	6.396	98.4	0.101	57.6	0.394	-50.4
600.00	0.277	-124.8	5.493	93.8	0.113	58.5	0.362	-48.1
700.00	0.253	-136.0	4.808	88.6	0.125	58.4	0.329	-51.9
800.00	0.236	-147.8	4.252	84.3	0.135	58.4	0.273	-52.2
900.00	0.216	-157.0	3.752	80.7	0.147	59.1	0.242	-50.9
1000.00	0.212	-166.4	3.408	77.8	0.160	59.6	0.224	-49.1
1100.00	0.221	-176.0	3.131	74.8	0.171	59.2	0.220	-53.1
1200.00	0.221	177.3	2.909	71.9	0.180	58.5	0.197	-59.1
1300.00	0.232	170.6	2.711	68.6	0.191	57.3	0.171	-59.2
1400.00	0.240	167.1	2.581	65.2	0.205	56.3	0.157	-60.1
1500.00	0.247	161.8	2.457	61.2	0.222	55.2	0.150	-61.2
1600.00	0.248	158.0	2.335	58.5	0.239	55.2	0.141	-66.8
1700.00	0.261	153.6	2.236	56.6	0.252	53.8	0.121	-71.4
1800.00	0.275	148.5	2.120	56.2	0.263	56.5	0.101	-77.2
1900.00	0.291	146.1	2.019	54.6	0.272	56.4	0.104	-83.3
2000.00	0.302	142.6	1.923	53.2	0.279	56.8	0.104	-91.6

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