

NPN EPITAXIAL SILICON TRANSISTOR IN SMALL MINI-MOLD PACKAGE  
FOR LOW-NOISE MICROWAVE AMPLIFICATION

FEATURES

- Low current consumption and high gain  
 $|S_{21e}|^2 = 9 \text{ dB TYP. @ } V_{CE} = 2 \text{ V, } I_c = 7 \text{ mA, } f = 2 \text{ GHz}$   
 $|S_{21e}|^2 = 8.5 \text{ dB TYP. @ } V_{CE} = 1 \text{ V, } I_c = 5 \text{ mA, } f = 2 \text{ GHz}$
- Small Mini-Mold package  
 EIAJ: SC-70

ORDERING INFORMATION

PART NUMBER	QUANTITY	ARRANGEMENT
2SC5179-T1	3000 units/reel	Embossed tape, 8 mm wide, pin No. 3 (Collector) facing the perforations
2SC5179-T2		Embossed tape, 8 mm wide, pins No. 1 (Emitter) and No. 2 (Base) facing the perforations

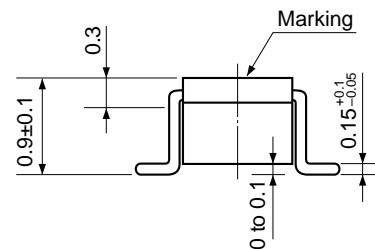
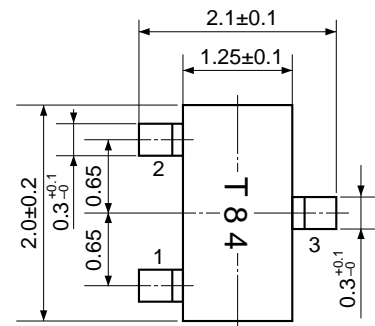
\* Contact your NEC sales representatives to order samples for evaluation (available in batches of 50).

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

Collector to Base Voltage	$V_{CBO}$	5	V
Collector to Emitter Voltage	$V_{CEO}$	3	V
Emitter to Base Voltage	$V_{EBO}$	2	V
Collector Current	$I_c$	10	mA
Total Power Dissipation	$P_T$	30	mW
Junction Temperature	$T_j$	150	$^\circ\text{C}$
Storage Temperature	$T_{stg}$	-65 to +150	$^\circ\text{C}$

PACKAGE DIMENSIONS

(Units: mm)



PIN CONNECTIONS

1. Emitter
2. Base
3. Collector

**CAUTION;** This transistor uses high-frequency technology. Be careful not to allow excessive current to flow through the transistor, including static electricity.

**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25 °C)**

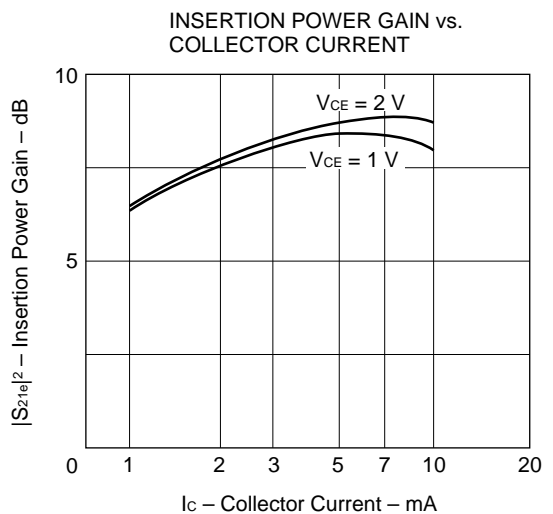
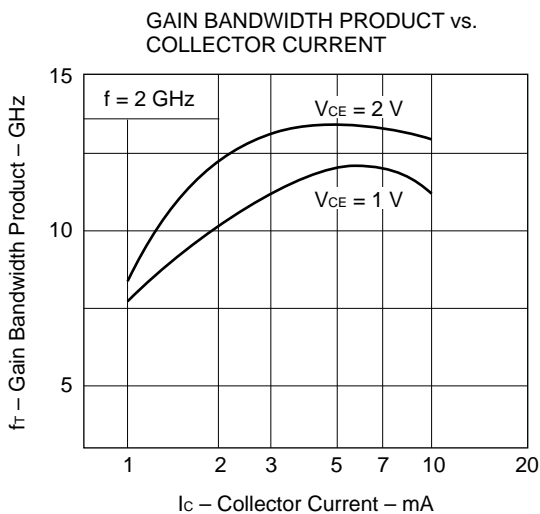
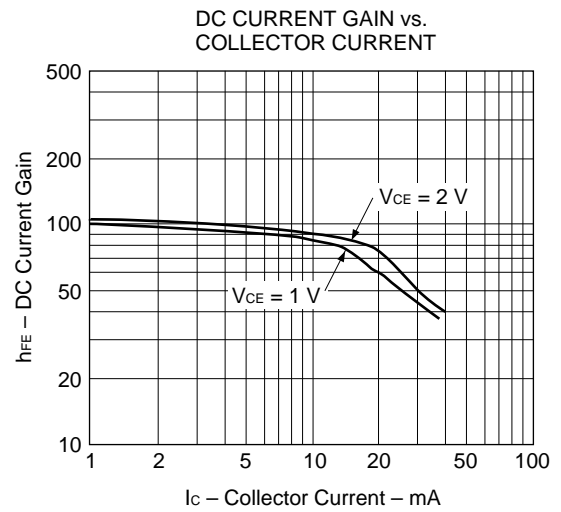
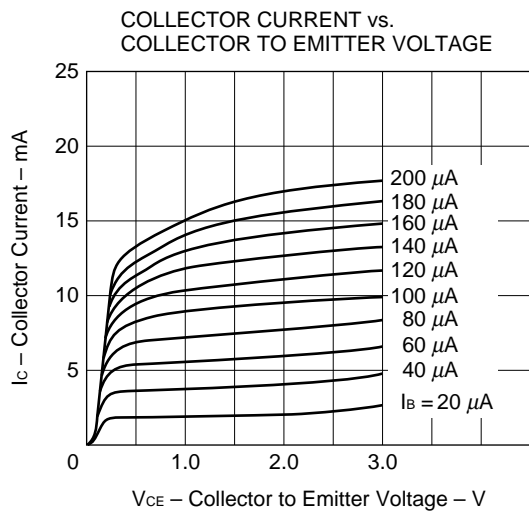
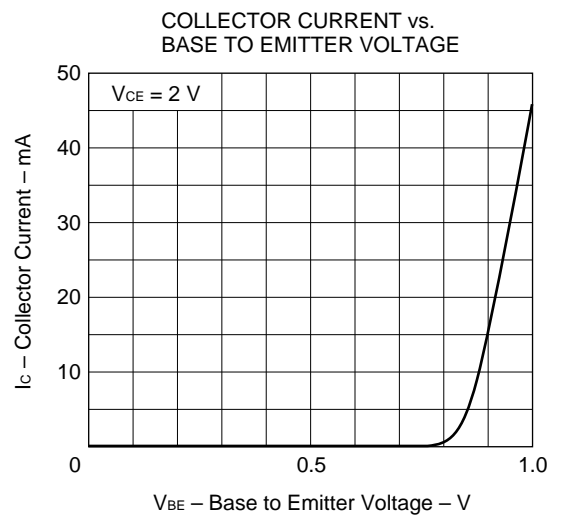
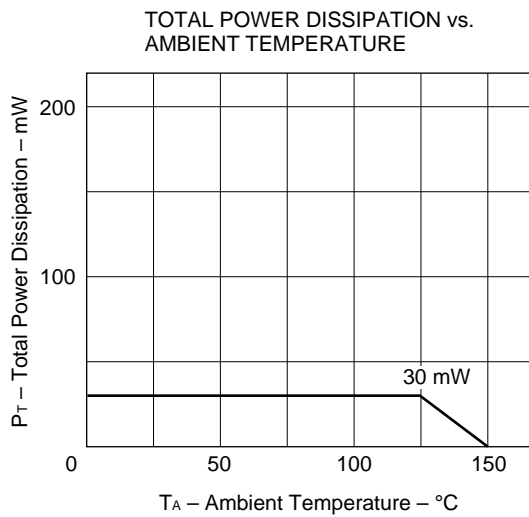
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS
Collector Cutoff Current	I <sub>CBO</sub>			100	nA	V <sub>CB</sub> = 5 V, I <sub>E</sub> = 0
Emitter Cutoff Current	I <sub>EBO</sub>			100	nA	V <sub>EB</sub> = 1 V, I <sub>C</sub> = 0
DC Current Gain	h <sub>FE</sub>	70		140		V <sub>CE</sub> = 2 V, I <sub>C</sub> = 7 mA* <sup>1</sup>
Insertion Power Gain (1)	S <sub>21e</sub>   <sup>2</sup>	7.5	9		dB	V <sub>CE</sub> = 2 V, I <sub>C</sub> = 7 mA, f = 2 GHz
Insertion Power Gain (2)	S <sub>21e</sub>   <sup>2</sup>	7	8.5		dB	V <sub>CE</sub> = 1 V, I <sub>C</sub> = 5 mA, f = 2 GHz
Noise Figure (1)	NF		1.5	2.0	dB	V <sub>CE</sub> = 2 V, I <sub>C</sub> = 3 mA, f = 2 GHz
Noise Figure (2)	NF		1.5	2.0	dB	V <sub>CE</sub> = 1 V, I <sub>C</sub> = 3 mA, f = 2 GHz
Gain Bandwidth Product (1)	f <sub>T</sub>	10	13		GHz	V <sub>CE</sub> = 2 V, I <sub>C</sub> = 7 mA, f = 2 GHz
Gain Bandwidth Product (2)	f <sub>T</sub>	8.5	12		GHz	V <sub>CE</sub> = 1 V, I <sub>C</sub> = 5 mA, f = 2 GHz
Feedback Capacitance	C <sub>re</sub>		0.4	0.6	pF	V <sub>CB</sub> = 2 V, I <sub>E</sub> = 0 mA, f = 1 MHz* <sup>2</sup>

- \*1. Measured with pulses: Pulse width ≤ 350 μs, duty cycle ≤ 2 %, pulsed
- \*2. Measured with a three-terminal bridge. The emitter and case terminal are connected to the guard terminal of the bridge.

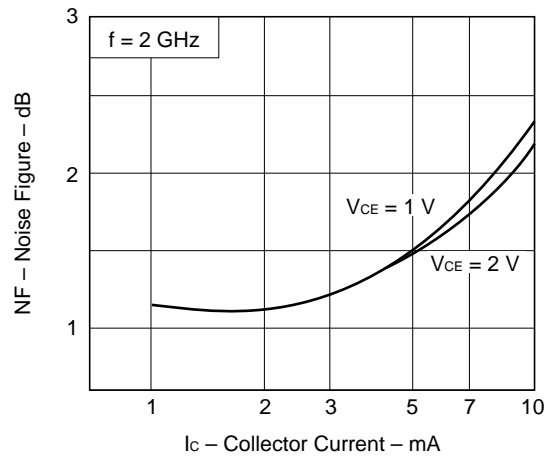
**h<sub>FE</sub> Class**

Class	FB
Marking	T84
h <sub>FE</sub>	70 to 140

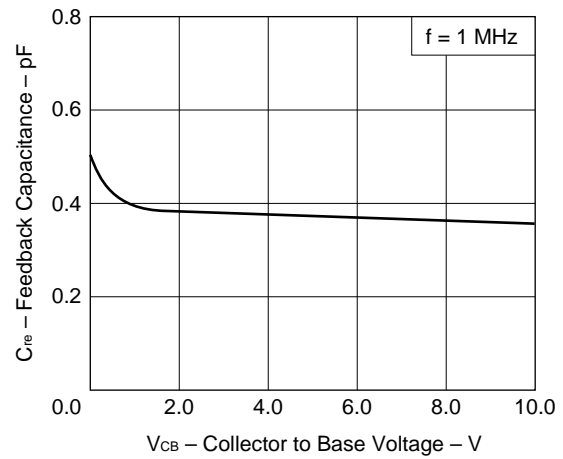
CHARACTERISTICS CURVES (T<sub>A</sub> = 25 °C)



NOISE FIGURE vs.  
COLLECTOR CURRENT



FEED-BACK CAPACITANCE vs.  
COLLECTOR TO BASE VOLTAGE



**S-PARAMETER**

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

FREQUENCY		S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG	
100.0000	0.982	-3.7	1.968	174.3	0.020	83.4	0.994	-4.0	
200.0000	0.983	-7.5	1.939	167.5	0.038	82.6	0.992	-8.1	
300.0000	0.973	-10.6	1.930	161.8	0.058	79.2	0.980	-11.5	
400.0000	0.955	-14.9	2.014	156.4	0.075	75.4	0.959	-15.5	
500.0000	0.946	-17.9	1.934	150.9	0.091	72.8	0.949	-18.8	
600.0000	0.918	-22.1	1.988	146.3	0.107	69.9	0.923	-22.1	
700.0000	0.900	-25.8	1.951	141.7	0.122	66.8	0.901	-25.6	
800.0000	0.873	-29.1	1.931	137.1	0.136	64.2	0.875	-28.4	
900.0000	0.845	-33.3	1.996	133.2	0.148	61.7	0.851	-31.2	
1000.0000	0.827	-35.8	1.900	129.5	0.158	59.8	0.832	-34.1	
1100.0000	0.799	-40.3	1.963	125.6	0.170	57.6	0.806	-36.4	
1200.0000	0.776	-43.4	1.944	121.7	0.179	55.7	0.781	-38.8	
1300.0000	0.753	-46.8	1.909	118.0	0.189	54.3	0.761	-41.1	
1400.0000	0.718	-50.7	1.936	114.1	0.196	52.7	0.736	-43.1	
1500.0000	0.695	-53.4	1.870	110.7	0.205	50.9	0.719	-45.4	
1600.0000	0.663	-57.1	1.878	107.2	0.211	49.7	0.698	-47.0	
1700.0000	0.634	-60.0	1.849	104.0	0.215	48.5	0.677	-48.9	
1800.0000	0.609	-62.8	1.810	100.6	0.222	47.3	0.658	-50.3	
1900.0000	0.581	-65.7	1.786	97.9	0.227	46.4	0.642	-51.9	
2000.0000	0.554	-69.0	1.773	94.7	0.231	45.8	0.622	-53.4	

$V_{CE} = 1\text{ V}$ ,  $I_c = 3\text{ mA}$ ,  $Z_o = 50\ \Omega$

FREQUENCY		S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG	
100.0000	0.932	-6.3	5.517	168.9	0.019	83.2	0.975	-7.0	
200.0000	0.914	-12.8	5.308	160.7	0.037	79.3	0.951	-13.6	
300.0000	0.881	-18.1	5.147	152.7	0.054	74.7	0.913	-19.1	
400.0000	0.833	-25.4	5.209	145.3	0.067	70.9	0.857	-24.5	
500.0000	0.797	-29.6	4.893	139.4	0.080	67.7	0.819	-28.7	
600.0000	0.737	-35.8	4.844	133.4	0.092	65.8	0.765	-32.1	
700.0000	0.687	-41.6	4.709	127.6	0.101	63.4	0.720	-35.6	
800.0000	0.636	-46.0	4.495	122.5	0.111	62.2	0.680	-37.8	
900.0000	0.583	-51.0	4.406	117.5	0.118	61.4	0.645	-40.0	
1000.0000	0.541	-54.6	4.184	113.4	0.127	60.5	0.616	-41.8	
1100.0000	0.495	-59.2	4.048	108.6	0.135	59.5	0.587	-43.4	
1200.0000	0.452	-61.8	3.894	104.4	0.143	59.0	0.561	-44.6	
1300.0000	0.420	-65.0	3.693	101.0	0.150	58.2	0.538	-46.0	
1400.0000	0.381	-67.5	3.545	97.1	0.158	58.2	0.517	-47.1	
1500.0000	0.354	-70.0	3.369	94.2	0.165	57.4	0.502	-48.3	
1600.0000	0.325	-71.8	3.227	91.2	0.173	57.5	0.483	-48.9	
1700.0000	0.299	-73.7	3.089	88.6	0.180	57.2	0.469	-49.9	
1800.0000	0.276	-75.3	2.965	85.9	0.187	56.9	0.457	-50.5	
1900.0000	0.254	-77.3	2.842	83.7	0.194	56.8	0.446	-51.3	
2000.0000	0.234	-79.0	2.744	81.2	0.201	56.7	0.434	-52.2	

V<sub>CE</sub> = 1 V, I<sub>c</sub> = 5 mA, Z<sub>o</sub> = 50 Ω

FREQUENCY		S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG	
100.0000	0.867	-9.9	8.234	165.2	0.018	83.2	0.957	-9.0	
200.0000	0.834	-19.0	7.897	155.1	0.035	77.1	0.911	-17.3	
300.0000	0.782	-25.7	7.518	145.9	0.050	72.5	0.847	-23.7	
400.0000	0.713	-34.0	7.443	137.5	0.062	69.7	0.776	-28.9	
500.0000	0.655	-39.7	6.901	130.7	0.073	66.9	0.723	-32.6	
600.0000	0.576	-46.5	6.572	123.6	0.083	66.2	0.664	-35.4	
700.0000	0.514	-52.3	6.182	117.3	0.092	64.6	0.618	-37.9	
800.0000	0.458	-56.2	5.737	112.1	0.100	64.0	0.579	-39.3	
900.0000	0.410	-59.9	5.382	107.5	0.109	63.2	0.547	-40.8	
1000.0000	0.369	-62.7	5.014	103.5	0.116	63.5	0.522	-41.8	
1100.0000	0.335	-65.8	4.692	99.8	0.125	62.8	0.499	-42.8	
1200.0000	0.303	-67.2	4.411	96.3	0.134	63.2	0.479	-43.5	
1300.0000	0.276	-69.6	4.134	93.3	0.141	62.4	0.459	-44.4	
1400.0000	0.251	-71.0	3.902	90.4	0.149	62.7	0.444	-45.1	
1500.0000	0.229	-72.5	3.681	87.9	0.159	62.1	0.431	-45.9	
1600.0000	0.210	-73.7	3.493	85.3	0.167	62.0	0.420	-46.2	
1700.0000	0.191	-74.4	3.326	83.0	0.174	61.6	0.409	-46.8	
1800.0000	0.174	-75.1	3.175	80.8	0.182	61.3	0.399	-47.5	
1900.0000	0.159	-76.8	3.035	78.7	0.190	61.0	0.392	-48.0	
2000.0000	0.144	-78.3	2.915	76.7	0.198	60.7	0.384	-48.7	

V<sub>CE</sub> = 1 V, I<sub>c</sub> = 7 mA, Z<sub>o</sub> = 50 Ω

FREQUENCY		S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG	
100.0000	0.793	-15.0	10.022	161.8	0.018	80.9	0.938	-10.4	
200.0000	0.737	-27.5	9.509	149.4	0.034	76.0	0.875	-19.6	
300.0000	0.661	-36.5	8.774	139.2	0.047	71.5	0.796	-26.1	
400.0000	0.574	-44.7	8.493	130.0	0.058	68.7	0.716	-31.0	
500.0000	0.517	-50.7	7.755	122.7	0.069	67.4	0.660	-33.9	
600.0000	0.446	-56.1	7.177	116.0	0.077	66.5	0.601	-36.0	
700.0000	0.395	-60.3	6.636	110.4	0.086	65.8	0.559	-37.8	
800.0000	0.348	-63.2	6.072	105.9	0.095	65.9	0.524	-38.7	
900.0000	0.311	-66.1	5.617	102.0	0.104	65.7	0.497	-39.7	
1000.0000	0.278	-68.0	5.189	98.4	0.112	66.0	0.476	-40.1	
1100.0000	0.251	-70.3	4.824	95.1	0.121	65.3	0.457	-40.9	
1200.0000	0.227	-71.3	4.499	92.0	0.129	65.4	0.442	-41.1	
1300.0000	0.204	-73.4	4.203	89.4	0.138	65.3	0.426	-42.0	
1400.0000	0.185	-74.0	3.963	86.7	0.146	64.8	0.413	-42.7	
1500.0000	0.167	-75.7	3.722	84.3	0.155	64.6	0.404	-43.1	
1600.0000	0.151	-76.3	3.525	82.1	0.163	64.5	0.395	-43.7	
1700.0000	0.135	-77.1	3.345	80.1	0.172	64.0	0.385	-44.0	
1800.0000	0.122	-77.5	3.191	77.8	0.180	63.6	0.377	-44.6	
1900.0000	0.108	-78.9	3.042	76.0	0.190	63.2	0.371	-45.2	
2000.0000	0.097	-81.0	2.913	74.1	0.197	62.9	0.365	-46.1	

V<sub>CE</sub> = 2 V, I<sub>c</sub> = 1 mA, Z<sub>o</sub> = 50 Ω

FREQUENCY	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.0000	0.982	-3.3	2.003	173.6	0.018	84.7	0.996	-3.6
200.0000	0.985	-6.8	1.935	168.2	0.036	83.0	0.993	-7.4
300.0000	0.977	-9.8	1.940	162.7	0.052	80.2	0.983	-10.5
400.0000	0.960	-13.9	2.017	157.1	0.069	76.3	0.964	-14.4
500.0000	0.952	-16.7	1.946	152.1	0.085	73.9	0.955	-17.4
600.0000	0.925	-20.7	1.993	147.7	0.099	71.0	0.932	-20.4
700.0000	0.908	-24.1	1.957	143.2	0.113	68.0	0.913	-23.8
800.0000	0.884	-27.3	1.942	138.8	0.126	65.9	0.888	-26.5
900.0000	0.859	-31.1	2.004	135.0	0.137	63.8	0.865	-29.2
1000.0000	0.840	-33.5	1.911	131.4	0.147	61.6	0.847	-32.0
1100.0000	0.815	-37.8	1.973	127.7	0.159	59.3	0.822	-34.1
1200.0000	0.795	-40.5	1.951	124.0	0.168	57.8	0.803	-36.4
1300.0000	0.772	-44.0	1.928	120.4	0.177	56.1	0.782	-38.4
1400.0000	0.741	-47.4	1.956	116.7	0.184	54.6	0.758	-40.4
1500.0000	0.716	-50.2	1.889	113.2	0.193	53.0	0.743	-42.6
1600.0000	0.689	-53.5	1.896	109.8	0.198	51.6	0.719	-44.1
1700.0000	0.659	-56.4	1.873	106.7	0.204	50.5	0.699	-45.9
1800.0000	0.635	-59.0	1.835	103.4	0.210	49.6	0.681	-47.4
1900.0000	0.606	-61.6	1.815	100.7	0.215	48.8	0.666	-48.8
2000.0000	0.581	-64.7	1.801	97.6	0.220	48.0	0.647	-50.4

V<sub>CE</sub> = 2 V, I<sub>c</sub> = 3 mA, Z<sub>o</sub> = 50 Ω

FREQUENCY	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.0000	0.933	-5.7	5.575	170.0	0.017	84.9	0.979	-6.3
200.0000	0.922	-11.6	5.330	161.5	0.033	79.6	0.959	-12.5
300.0000	0.893	-16.6	5.178	154.0	0.049	75.2	0.924	-17.5
400.0000	0.851	-23.1	5.267	146.8	0.062	72.2	0.874	-22.6
500.0000	0.815	-27.0	4.943	141.1	0.074	69.1	0.838	-26.4
600.0000	0.759	-32.9	4.915	135.2	0.086	67.6	0.787	-29.6
700.0000	0.713	-38.0	4.769	129.6	0.095	65.0	0.745	-33.0
800.0000	0.664	-42.0	4.578	124.5	0.104	63.8	0.706	-35.0
900.0000	0.612	-46.6	4.507	119.7	0.112	63.0	0.673	-37.0
1000.0000	0.572	-49.9	4.285	115.6	0.120	61.9	0.645	-38.9
1100.0000	0.525	-54.0	4.163	111.0	0.128	61.1	0.617	-40.3
1200.0000	0.485	-56.5	4.009	106.8	0.136	60.8	0.593	-41.4
1300.0000	0.452	-59.2	3.814	103.4	0.143	60.2	0.569	-43.0
1400.0000	0.413	-61.5	3.672	99.6	0.150	59.9	0.548	-43.9
1500.0000	0.385	-63.5	3.499	96.7	0.157	59.5	0.532	-44.9
1600.0000	0.356	-64.9	3.349	93.6	0.164	59.1	0.517	-45.6
1700.0000	0.330	-66.4	3.213	90.9	0.172	58.7	0.501	-46.4
1800.0000	0.307	-67.7	3.079	88.2	0.178	58.6	0.488	-47.2
1900.0000	0.286	-69.2	2.959	85.9	0.185	58.4	0.478	-47.8
2000.0000	0.265	-70.4	2.863	83.5	1.193	58.2	0.464	-48.6

V<sub>CE</sub> = 2 V, I<sub>c</sub> = 5 mA, Z<sub>o</sub> = 50 Ω

FREQUENCY		S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG	
100.0000	0.885	-8.3	8.518	167.7	0.017	82.5	0.964	-8.1	
200.0000	0.859	-15.7	8.125	157.0	0.032	78.3	0.926	-15.6	
300.0000	0.811	-22.2	7.721	148.0	0.046	73.6	0.868	-21.4	
400.0000	0.742	-30.3	7.619	139.7	0.057	71.7	0.801	-26.5	
500.0000	0.689	-35.3	7.082	132.9	0.068	68.6	0.752	-30.0	
600.0000	0.612	-41.5	6.779	125.8	0.077	67.5	0.696	-32.3	
700.0000	0.550	-46.7	6.401	119.7	0.086	66.1	0.650	-34.9	
800.0000	0.495	-50.2	5.962	114.6	0.094	65.7	0.612	-36.2	
900.0000	0.446	-53.7	5.613	109.9	0.102	65.0	0.581	-37.6	
1000.0000	0.406	-55.9	5.244	105.8	0.111	64.6	0.557	-38.5	
1100.0000	0.369	-58.4	4.918	101.9	0.118	64.6	0.534	-39.7	
1200.0000	0.337	-59.5	4.631	98.5	0.127	64.6	0.515	-40.2	
1300.0000	0.310	-61.3	4.346	95.5	0.134	64.1	0.495	-41.0	
1400.0000	0.285	-61.9	4.103	92.6	0.142	64.0	0.481	-41.6	
1500.0000	0.263	-63.2	3.875	90.0	0.150	63.7	0.467	-42.3	
1600.0000	0.244	-63.4	3.680	87.4	0.157	63.4	0.456	-42.6	
1700.0000	0.225	-63.7	3.502	85.1	0.165	63.3	0.446	-43.3	
1800.0000	0.210	-63.8	3.338	83.0	0.172	62.7	0.435	-43.7	
1900.0000	0.193	-64.7	3.193	80.9	0.181	62.5	0.427	-44.2	
2000.0000	0.178	-64.8	3.064	78.9	0.188	62.3	0.419	-45.0	

V<sub>CE</sub> = 2 V, I<sub>c</sub> = 7 mA, Z<sub>o</sub> = 50 Ω

FREQUENCY		S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG	
100.0000	0.836	-10.5	11.040	165.5	0.016	82.0	0.952	-9.4	
200.0000	0.794	-19.7	10.358	153.3	0.031	77.4	0.897	-17.6	
300.0000	0.731	-27.4	9.657	143.3	0.043	73.3	0.825	-23.4	
400.0000	0.645	-36.2	9.225	133.7	0.053	71.2	0.751	-28.2	
500.0000	0.579	-41.6	8.418	126.3	0.063	69.1	0.696	-31.0	
600.0000	0.500	-47.0	7.759	119.3	0.073	68.1	0.640	-32.9	
700.0000	0.440	-51.4	7.124	113.3	0.081	67.5	0.598	-34.6	
800.0000	0.393	-54.0	6.499	108.6	0.089	67.2	0.564	-35.3	
900.0000	0.352	-56.3	6.003	104.4	0.097	67.0	0.537	-36.4	
1000.0000	0.319	-57.7	5.536	100.8	0.105	67.1	0.517	-36.8	
1100.0000	0.290	-59.5	5.135	97.3	0.114	67.0	0.496	-37.7	
1200.0000	0.265	-59.6	4.801	94.4	0.122	67.0	0.482	-37.8	
1300.0000	0.242	-61.1	4.484	91.6	0.130	66.5	0.465	-38.6	
1400.0000	0.223	-61.2	4.221	89.0	0.138	66.8	0.456	-39.0	
1500.0000	0.204	-62.1	3.974	86.5	0.147	66.1	0.443	-39.7	
1600.0000	0.189	-61.7	3.760	84.3	0.154	65.7	0.435	-40.1	
1700.0000	0.175	-61.5	3.565	82.3	0.163	65.4	0.426	-40.5	
1800.0000	0.162	-60.6	3.393	80.2	0.171	65.1	0.418	-41.0	
1900.0000	0.148	-60.8	3.248	78.3	0.179	64.7	0.411	-41.4	
2000.0000	0.137	-60.9	3.106	76.6	0.187	64.5	0.406	-42.1	



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