



**NE68019 / 2SC5008** JEITA Part No.

**NPN SILICON EPITAXIAL TRANSISTOR  
3 PINS ULTRA SUPER MINI MOLD**

**DESCRIPTION**

The NE68019 / 2SC5008 is an NPN epitaxial silicon transistor designed for use in low noise and small signal amplifiers from VHF band to L band. Low noise figure, high gain, and high current capability achieve a very wide dynamic range and excellent linearity. This is achieved by direct nitride passivated base surface, process (NEST2 process) which is a proprietary fabrication technique.

**FEATURES**

- Low Voltage Use.
- High  $f_t$ : 8.0 GHz TYP. (@  $V_{CE} = 3\text{ V}$ ,  $I_c = 5\text{ mA}$ ,  $f = 2\text{ GHz}$ )
- Low  $C_{re}$ : 0.3 pF TYP. (@  $V_{CE} = 3\text{ V}$ ,  $I_E = 0$ ,  $f = 1\text{ MHz}$ )
- Low NF: 1.9 dB TYP. (@  $V_{CE} = 3\text{ V}$ ,  $I_c = 5\text{ mA}$ ,  $f = 2\text{ GHz}$ )
- High  $|S_{21e}|^2$ : 7.5 dB TYP. (@  $V_{CE} = 3\text{ V}$ ,  $I_c = 5\text{ mA}$ ,  $f = 2\text{ GHz}$ )
- Ultra Super Mini Mold Package.

**ORDERING INFORMATION**

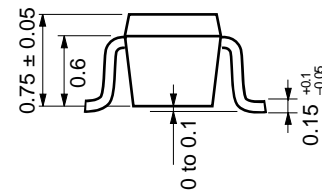
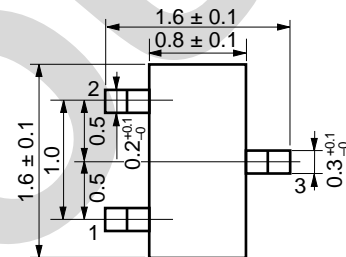
PART NUMBER	QUANTITY	PACKING STYLE
NE68019-A 2SC5008-A	50 pcs./Unit	Embossed tape 8 mm wide. Pin3 (Collector) face to perforation side of the tape.
NE68019-T-A 2SC5008-T-A	3 kpcs./Reel	

\* To order evaluation samples, please contact your nearby sales office.  
Unit sample quantity shall be 50 pcs.

**ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = 25 °C)**

Collector to Base Voltage	$V_{CBO}$	20	V
Collector to Emitter Voltage	$V_{CEO}$	10	V
Emitter to Base Voltage	$V_{EBO}$	1.5	V
Collector Current	$I_c$	35	mA
Total Power Dissipation	$P_T$	125	mW
Junction Temperature	$T_j$	150	°C
Storage Temperature	$T_{stg}$	-65 to + 150	°C

**PACKAGE DIMENSIONS**  
in millimeters



1. Emitter
2. Base
3. Collector

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

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Collector Cutoff Current	I <sub>CB0</sub>			1.0	μA	V <sub>CB</sub> = 10 V, I <sub>E</sub> = 0
Emitter Cutoff Current	I <sub>EB0</sub>			1.0	μA	V <sub>EB</sub> = 1 V, I <sub>C</sub> = 0
DC Current Gain	h <sub>FE</sub>	80		160		V <sub>CE</sub> = 3 V, I <sub>C</sub> = 5 mA <sup>*1</sup>
Gain Bandwidth Product	f <sub>T</sub>	5.5	8.0		GHz	V <sub>CE</sub> = 3 V, I <sub>C</sub> = 5 mA
Feed-back Capacitance	C <sub>re</sub>		0.3	0.7	pF	V <sub>CB</sub> = 3 V, I <sub>E</sub> = 0, f = 1 MHz <sup>*2</sup>
Insertion Power Gain	IS <sub>21el</sub> <sup>2</sup>	5.5	7.5		dB	V <sub>CE</sub> = 3 V, I <sub>C</sub> = 5 mA, f = 2 GHz
Noise Figure	NF		1.9	3.2	dB	V <sub>CE</sub> = 3 V, I <sub>C</sub> = 5 mA, f = 2 GHz

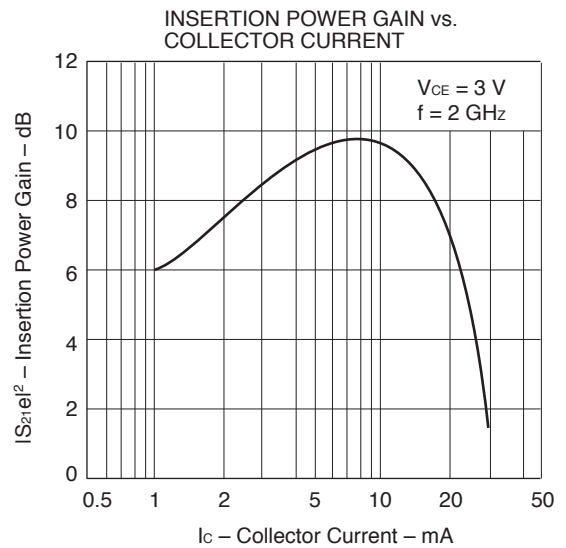
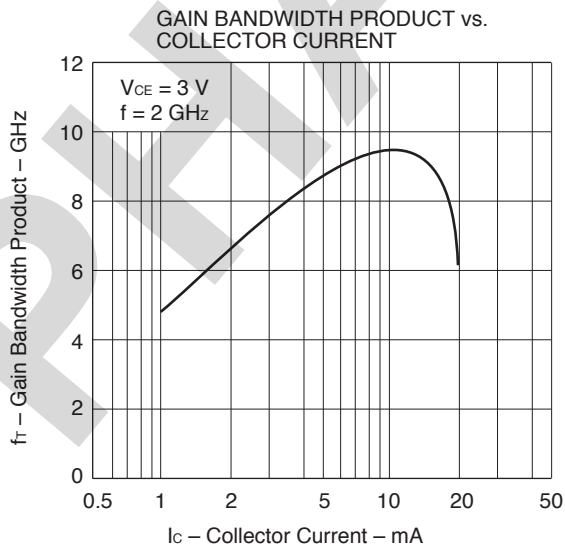
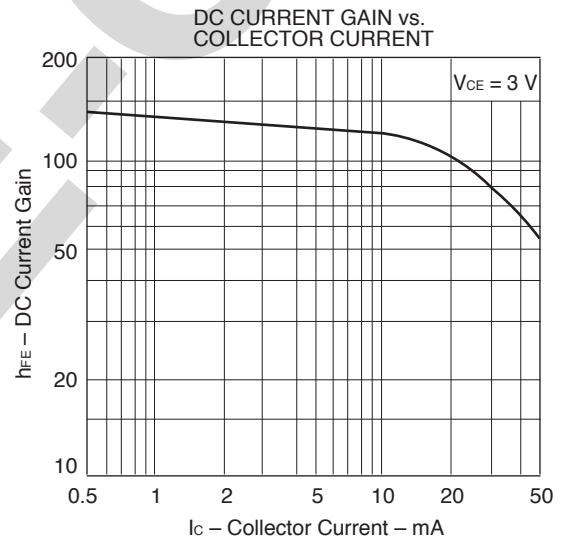
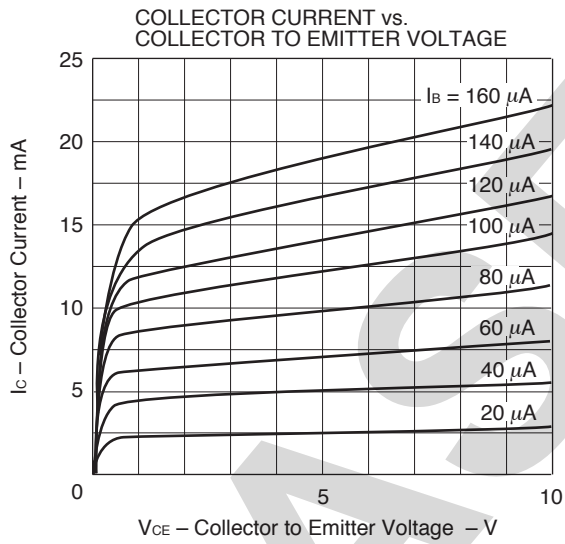
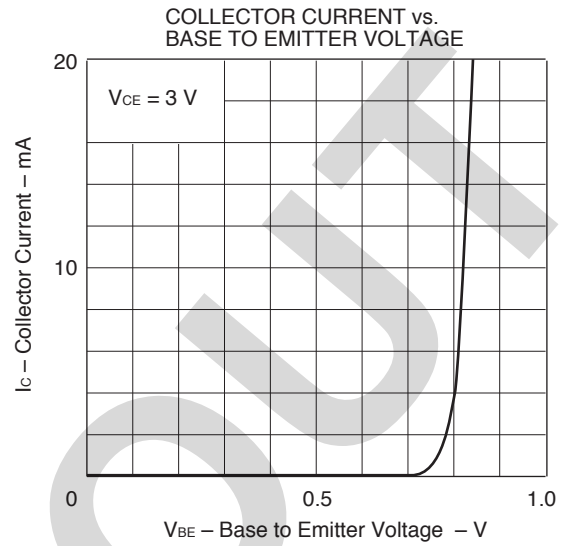
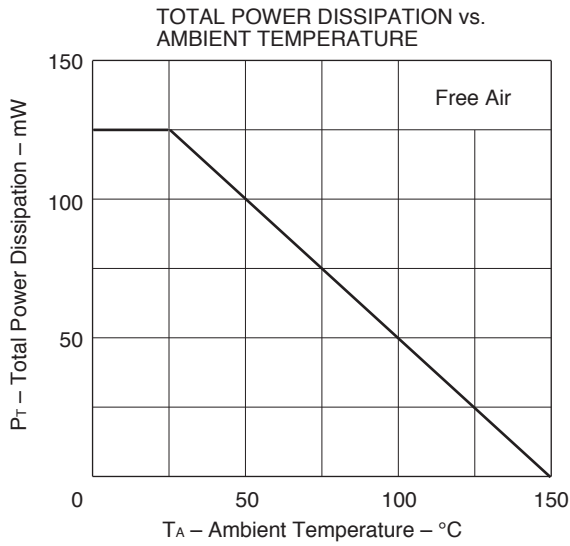
\*1 Pulse Measurement PW ≤ 350 μs, Duty Cycle ≤ 2 %

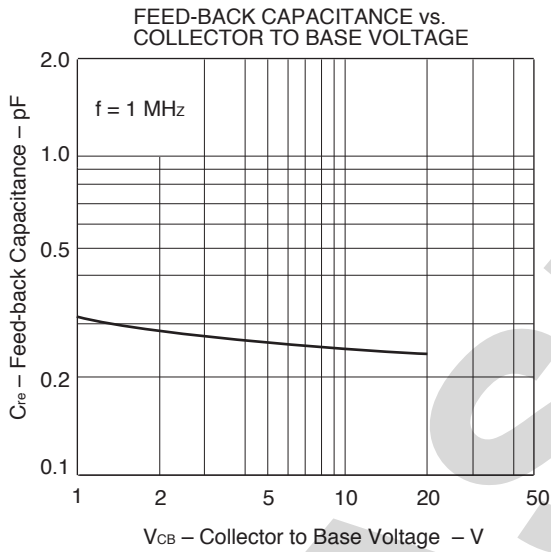
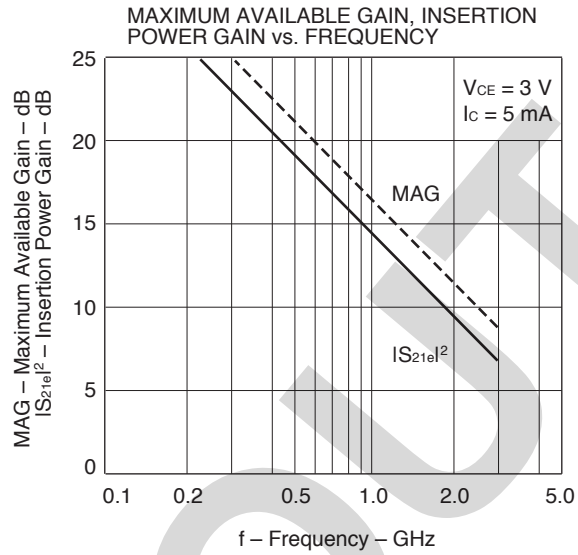
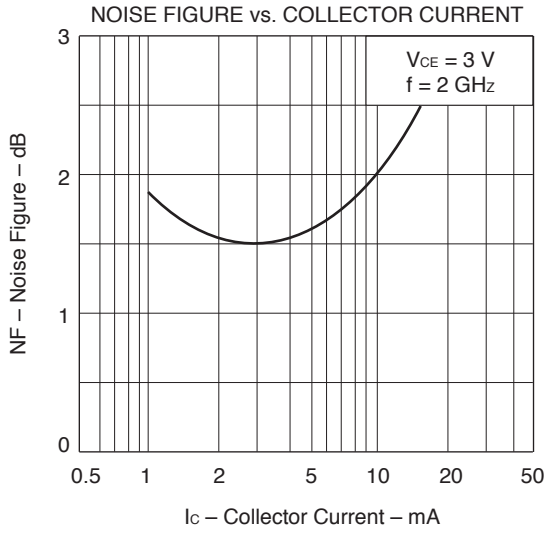
\*2 The emitter terminal and the case shall be connected to the guard terminal of the three-terminal capacitance bridge.

**h<sub>FE</sub> Classification**

RANK	FB
Marking	44
h <sub>FE</sub>	80 to 160

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





**S-PARAMETER**

V<sub>CE</sub> = 3 V, I<sub>c</sub> = 10 mA, Z<sub>O</sub> = 50 Ω

FREQUENCY		S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG	
100.00	.739	-23.1	15.190	151.5	.016	74.9	.922	-13.6	
200.00	.617	-45.5	13.966	131.9	.027	63.0	.804	-22.2	
300.00	.507	-64.6	12.474	115.9	.035	57.3	.699	-25.8	
400.00	.414	-81.0	10.826	102.7	.042	51.8	.632	-27.3	
500.00	.344	-94.7	9.421	91.8	.049	49.7	.583	-28.1	
600.00	.296	-105.9	8.147	82.9	.055	47.0	.550	-28.1	
700.00	.260	-116.6	7.211	74.9	.062	44.4	.525	-28.3	
800.00	.236	-126.3	6.434	67.7	.068	41.8	.506	-28.7	
900.00	.218	-136.2	5.806	60.9	.075	39.1	.490	-28.9	
1000.00	.205	-144.8	5.288	54.6	.083	36.4	.477	-29.6	
1100.00	.199	-153.1	4.864	48.6	.089	33.4	.466	-29.9	
1200.00	.194	-161.6	4.500	42.7	.096	30.2	.457	-31.0	
1300.00	.193	-168.9	4.191	37.0	.102	27.7	.449	-31.7	
1400.00	.194	-175.6	3.908	31.4	.111	24.2	.441	-32.8	
1500.00	.196	-178.7	3.680	26.2	.118	21.0	.435	-33.9	
1600.00	.202	-173.5	3.489	20.7	.125	17.6	.429	-35.5	
1700.00	.214	-167.9	3.317	15.0	.133	12.6	.417	-37.2	
1800.00	.222	-161.7	3.154	9.6	.139	9.4	.406	-38.2	
1900.00	.229	-156.3	2.994	4.2	.145	6.0	.397	-39.4	
2000.00	.237	-151.7	2.857	-1.0	.152	2.6	.390	-40.5	
2100.00	.246	-147.5	2.748	-6.1	.159	-0.9	.381	-42.1	
2200.00	.253	-144.6	2.626	-11.1	.167	-4.6	.374	-43.6	
2300.00	.263	-140.9	2.539	-16.2	.174	-8.0	.366	-45.2	
2400.00	.271	-137.9	2.445	-21.3	.182	-11.6	.357	-46.8	
2500.00	.283	-134.8	2.363	-26.3	.190	-15.2	.347	-48.4	
2600.00	.292	-132.0	2.288	-31.4	.197	-19.2	.338	-50.6	
2700.00	.303	-129.7	2.218	-36.4	.204	-22.9	.328	-52.5	
2800.00	.315	-127.4	2.147	-41.4	.211	-26.7	.318	-54.8	
2900.00	.326	-125.0	2.085	-46.3	.220	-30.8	.309	-56.9	
3000.00	.339	-122.7	2.032	-51.2	.227	-34.2	.299	-59.5	

V<sub>CE</sub> = 3 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	
100.00	.815	-17.7	11.972	155.6	.016	77.0	.947	-11.5	
200.00	.732	-34.0	11.228	138.4	.029	63.4	.855	-20.4	
300.00	.634	-50.1	10.480	123.5	.039	56.1	.757	-25.1	
400.00	.539	-64.9	9.549	110.7	.047	51.8	.687	-27.9	
500.00	.455	-78.9	8.722	99.0	.054	47.4	.630	-29.6	
600.00	.392	-89.6	7.703	89.1	.060	44.0	.589	-30.5	
700.00	.336	-100.4	6.951	80.3	.066	41.4	.557	-30.9	
800.00	.297	-110.0	6.265	72.2	.073	38.5	.532	-31.5	
900.00	.268	-119.5	5.700	64.9	.079	35.8	.511	-31.9	
1000.00	.244	-128.0	5.221	58.3	.086	32.7	.494	-32.5	
1100.00	.228	-136.6	4.802	51.8	.092	29.7	.480	-32.9	
1200.00	.216	-145.2	4.479	45.5	.098	27.4	.468	-33.8	
1300.00	.208	-153.4	4.169	39.6	.106	24.0	.459	-34.4	
1400.00	.203	-160.8	3.900	33.9	.113	21.1	.449	-35.6	
1500.00	.202	-167.7	3.674	28.2	.121	17.5	.440	-36.6	
1600.00	.205	-173.8	3.478	22.7	.128	14.3	.433	-37.8	
1700.00	.214	-179.6	3.316	17.3	.135	10.2	.421	-39.7	
1800.00	.219	-172.5	3.153	11.6	.141	6.4	.409	-40.7	
1900.00	.223	-165.7	3.001	6.0	.146	3.5	.399	-41.7	
2000.00	.230	-160.0	2.874	.7	.153	0.0	.391	-43.0	
2100.00	.236	-155.4	2.753	-4.6	.160	-3.2	.382	-44.4	
2200.00	.244	-151.6	2.631	-9.6	.167	-6.9	.374	-45.7	
2300.00	.254	-147.1	2.548	-14.9	.174	-10.4	.365	-47.2	
2400.00	.262	-143.5	2.453	-20.0	.181	-13.8	.356	-49.0	
2500.00	.273	-140.2	2.370	-25.0	.189	-17.4	.346	-50.5	
2600.00	.281	-137.1	2.295	-30.2	.196	-21.0	.337	-52.7	
2700.00	.293	-134.1	2.228	-35.2	.203	-24.9	.328	-54.6	
2800.00	.303	-131.4	2.156	-40.2	.211	-28.3	.317	-56.7	
2900.00	.315	-128.6	2.092	-45.2	.218	-32.3	.307	-58.8	
3000.00	.326	-126.2	2.040	-50.1	.227	-36.1	.298	-61.4	

**S-PARAMETER**

V<sub>CE</sub> = 3 V, I<sub>c</sub> = 5 mA, Z<sub>0</sub> = 50 Ω

FREQUENCY	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.00	.870	-13.9	9.067	158.8	.017	76.2	.964	-9.7
200.00	.809	-27.3	8.687	143.1	.031	65.8	.897	-17.8
300.00	.733	-40.3	8.368	129.3	.042	58.0	.814	-23.3
400.00	.661	-53.0	7.864	117.5	.052	51.2	.748	-27.0
500.00	.575	-66.1	7.479	106.3	.059	45.9	.687	-29.5
600.00	.510	-76.2	6.765	96.3	.066	41.4	.643	-31.2
700.00	.440	-87.2	6.297	86.6	.072	38.2	.604	-32.3
800.00	.387	-96.8	5.812	77.7	.078	34.7	.574	-33.3
900.00	.345	-106.1	5.365	69.7	.083	32.7	.547	-33.9
1000.00	.309	-114.9	4.964	62.4	.090	29.2	.527	-34.7
1100.00	.283	-123.3	4.616	55.4	.096	25.9	.509	-35.2
1200.00	.261	-131.9	4.298	49.0	.101	23.0	.493	-36.1
1300.00	.246	-139.7	4.032	42.4	.107	20.4	.481	-36.7
1400.00	.234	-147.4	3.784	36.7	.115	17.1	.471	-37.8
1500.00	.227	-154.7	3.568	30.8	.122	14.2	.460	-38.9
1600.00	.227	-161.3	3.385	25.0	.129	11.2	.450	-40.2
1700.00	.231	-168.9	3.230	19.1	.137	7.1	.438	-41.9
1800.00	.231	-176.7	3.069	13.5	.141	3.4	.425	-42.8
1900.00	.233	176.3	2.929	7.8	.148	.7	.413	-44.0
2000.00	.237	169.5	2.802	2.3	.153	-2.4	.405	-45.2
2100.00	.242	163.9	2.690	-3.0	.159	-6.1	.396	-46.5
2200.00	.247	159.4	2.583	-8.3	.166	-9.3	.387	-48.0
2300.00	.256	154.3	2.495	-13.6	.173	-12.8	.377	-49.5
2400.00	.264	150.1	2.404	-18.8	.179	-16.2	.367	-51.1
2500.00	.274	146.2	2.324	-23.9	.187	-19.3	.358	-52.7
2600.00	.282	142.3	2.251	-29.2	.194	-23.3	.348	-54.8
2700.00	.292	139.2	2.188	-34.3	.200	-26.9	.339	-56.8
2800.00	.303	135.9	2.117	-39.4	.207	-30.2	.328	-59.0
2900.00	.313	132.9	2.056	-44.5	.215	-34.1	.319	-60.9
3000.00	.325	130.0	2.003	-49.5	.223	-37.5	.309	-63.5

V<sub>CE</sub> = 3 V, I<sub>c</sub> = 3 mA, Z<sub>0</sub> = 50 Ω

FREQUENCY	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.00	.936	-10.5	5.612	163.6	.017	79.6	.981	-7.1
200.00	.892	-20.4	5.628	148.9	.034	69.7	.944	-14.0
300.00	.842	-30.5	5.602	136.8	.048	60.6	.887	-19.3
400.00	.785	-41.2	5.393	126.0	.060	53.2	.837	-23.7
500.00	.732	-50.8	5.328	116.2	.069	46.4	.782	-27.2
600.00	.681	-59.2	4.924	106.6	.077	40.6	.740	-29.9
700.00	.618	-68.7	4.767	97.2	.084	35.8	.698	-32.0
800.00	.564	-77.9	4.575	88.0	.090	31.0	.663	-33.9
900.00	.510	-86.9	4.365	79.4	.094	27.0	.627	-35.2
1000.00	.459	-96.0	4.191	70.9	.100	23.5	.599	-36.5
1100.00	.413	-104.8	3.991	62.9	.106	19.8	.577	-37.5
1200.00	.375	-113.0	3.790	55.7	.110	17.1	.558	-38.5
1300.00	.350	-120.8	3.588	48.7	.116	14.2	.542	-39.6
1400.00	.325	-128.3	3.410	42.0	.121	11.1	.525	-40.8
1500.00	.307	-135.8	3.234	35.7	.126	7.8	.513	-41.8
1600.00	.295	-142.9	3.086	29.5	.134	4.9	.499	-43.2
1700.00	.289	-150.9	2.960	23.3	.140	1.0	.486	-44.8
1800.00	.283	-158.6	2.830	17.0	.143	-2.7	.471	-46.0
1900.00	.276	-166.4	2.707	11.2	.148	-5.6	.457	-47.1
2000.00	.273	-174.1	2.597	5.4	.153	-8.5	.448	-48.4
2100.00	.273	179.6	2.504	-3	.159	-11.6	.435	-49.8
2200.00	.275	174.0	2.405	-5.9	.164	-14.4	.428	-51.3
2300.00	.280	167.8	2.332	-11.5	.170	-17.9	.417	-52.7
2400.00	.284	162.6	2.248	-16.9	.176	-20.9	.406	-54.2
2500.00	.292	157.7	2.177	-22.2	.182	-23.8	.396	-55.9
2600.00	.298	152.8	2.109	-27.6	.187	-27.3	.386	-57.9
2700.00	.307	148.7	2.051	-32.9	.194	-30.7	.376	-59.9
2800.00	.316	144.7	1.988	-38.1	.200	-33.8	.366	-61.8
2900.00	.326	140.9	1.934	-43.4	.207	-37.3	.356	-64.0
3000.00	.337	137.3	1.885	-48.6	.214	-40.5	.346	-66.6

**S-PARAMETER**

V<sub>CE</sub> = 3 V, I<sub>c</sub> = 1 mA, Z<sub>o</sub> = 50 Ω

FREQUENCY		S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG	
100.00	.986	-6.4	1.963	167.5	.019	82.2	.996	-4.0	
200.00	.971	-13.0	2.022	157.2	.036	73.4	.987	-8.1	
300.00	.958	-19.5	2.075	147.4	.053	66.7	.966	-11.8	
400.00	.936	-26.5	2.082	137.6	.070	58.7	.953	-15.4	
500.00	.914	-32.8	2.114	129.5	.084	52.1	.929	-18.7	
600.00	.890	-39.0	2.011	120.8	.098	45.0	.909	-22.0	
700.00	.859	-45.3	1.993	112.4	.109	38.5	.883	-24.9	
800.00	.833	-51.7	1.967	103.7	.120	32.1	.859	-27.7	
900.00	.801	-58.0	1.916	95.7	.127	25.8	.830	-30.5	
1000.00	.769	-65.2	1.952	88.0	.137	20.2	.803	-33.0	
1100.00	.732	-72.5	1.972	79.8	.143	14.4	.776	-35.0	
1200.00	.693	-80.0	1.987	72.4	.148	9.7	.754	-37.1	
1300.00	.663	-86.7	1.945	64.6	.154	4.5	.734	-39.0	
1400.00	.626	-93.9	1.936	57.2	.157	-1.1	.712	-41.1	
1500.00	.596	-100.5	1.893	49.6	.162	-4.4	.693	-42.9	
1600.00	.570	-107.2	1.852	42.8	.165	-8.3	.676	-44.6	
1700.00	.542	-114.9	1.845	35.3	.170	-12.9	.660	-46.5	
1800.00	.523	-121.5	1.786	28.6	.172	-17.5	.640	-48.3	
1900.00	.497	-129.1	1.766	21.5	.174	-21.5	.622	-49.9	
2000.00	.471	-137.3	1.746	14.6	.174	-25.3	.610	-51.7	
2100.00	.456	-144.2	1.707	8.2	.174	-28.5	.595	-53.3	
2200.00	.443	-151.0	1.661	1.6	.176	-31.9	.583	-55.0	
2300.00	.430	-158.3	1.648	-4.8	.177	-35.1	.567	-56.8	
2400.00	.424	-164.8	1.598	-10.9	.178	-38.1	.557	-58.6	
2500.00	.419	-171.3	1.565	-17.0	.180	-40.5	.545	-60.5	
2600.00	.414	-177.8	1.534	-23.1	.182	-43.6	.534	-62.6	
2700.00	.412	176.4	1.504	-29.1	.183	-46.5	.523	-64.6	
2800.00	.413	170.5	1.466	-34.9	.186	-48.7	.515	-66.9	
2900.00	.414	164.7	1.442	-40.6	.189	-51.4	.504	-69.2	
3000.00	.419	159.5	1.413	-46.3	.191	-53.5	.495	-71.7	

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	
100.00	.849	-19.1	8.397	156.6	.021	75.5	.949	-11.9	
200.00	.764	-34.1	8.259	139.2	.037	63.8	.866	-21.8	
300.00	.681	-49.1	7.901	125.1	.051	54.8	.767	-28.2	
400.00	.612	-63.6	7.397	113.1	.060	48.4	.689	-32.3	
500.00	.534	-78.0	7.006	101.8	.068	42.2	.623	-35.2	
600.00	.473	-89.5	6.297	91.7	.076	38.7	.573	-37.0	
700.00	.414	-101.5	5.833	82.2	.082	35.3	.531	-38.1	
800.00	.371	-112.1	5.352	73.6	.089	31.9	.499	-39.2	
900.00	.339	-122.2	4.924	65.7	.095	28.7	.472	-39.9	
1000.00	.314	-131.4	4.557	58.5	.103	25.6	.448	-40.9	
1100.00	.295	-140.2	4.219	51.6	.109	22.8	.429	-41.2	
1200.00	.283	-148.3	3.935	45.2	.115	20.1	.414	-42.2	
1300.00	.275	-156.2	3.672	38.8	.122	16.9	.398	-42.8	
1400.00	.270	-163.3	3.448	32.9	.129	13.8	.385	-44.0	
1500.00	.267	-170.3	3.242	26.9	.136	10.7	.374	-45.0	
1600.00	.268	-176.4	3.081	21.1	.143	7.5	.362	-46.4	
1700.00	.273	177.8	2.927	15.4	.153	3.9	.353	-47.9	
1800.00	.280	172.2	2.783	9.6	.160	-1.1	.340	-49.5	
1900.00	.288	165.8	2.663	3.9	.165	-3.8	.326	-51.1	
2000.00	.294	160.1	2.540	-1.7	.171	-6.8	.316	-52.2	
2100.00	.301	155.4	2.445	-7.0	.177	-10.1	.304	-53.7	
2200.00	.307	151.6	2.347	-12.4	.186	-13.8	.293	-55.4	
2300.00	.317	147.3	2.260	-17.8	.192	-17.2	.284	-57.0	
2400.00	.324	143.6	2.177	-23.0	.199	-20.8	.272	-58.9	
2500.00	.334	140.2	2.105	-28.2	.207	-23.9	.261	-60.8	
2600.00	.345	137.0	2.037	-33.5	.214	-27.8	.251	-63.7	
2700.00	.354	134.0	1.977	-38.6	.221	-31.4	.241	-65.9	
2800.00	.365	131.0	1.913	-43.8	.228	-35.3	.230	-68.6	
2900.00	.377	128.2	1.856	-48.9	.235	-39.0	.220	-71.2	
3000.00	.387	125.5	1.808	-53.8	.244	-42.9	.210	-74.5	

**S-PARAMETER**

V<sub>CE</sub> = 1 V, I<sub>c</sub> = 3 mA, Z<sub>0</sub> = 50 Ω

FREQUENCY	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.00	.928	-11.2	5.570	160.2	.022	78.7	.974	-8.7
200.00	.876	-22.9	5.562	146.9	.040	67.5	.928	-16.9
300.00	.821	-34.2	5.509	134.3	.057	57.4	.859	-23.0
400.00	.758	-45.7	5.289	123.2	.070	49.7	.798	-28.0
500.00	.705	-56.7	5.198	113.1	.081	43.3	.738	-32.0
600.00	.652	-66.1	4.787	103.2	.089	37.0	.689	-35.2
700.00	.588	-76.8	4.617	93.6	.097	31.9	.640	-37.5
800.00	.535	-87.1	4.406	84.1	.103	27.6	.601	-39.4
900.00	.484	-97.1	4.187	75.5	.108	23.9	.565	-41.0
1000.00	.438	-107.0	3.986	67.1	.115	20.3	.533	-42.6
1100.00	.401	-116.3	3.771	59.1	.120	16.5	.508	-43.6
1200.00	.371	-125.4	3.566	51.8	.125	13.4	.486	-44.7
1300.00	.350	-133.4	3.362	44.8	.131	10.3	.468	-45.7
1400.00	.333	-141.3	3.177	38.3	.137	7.0	.449	-47.2
1500.00	.320	-148.7	3.015	31.8	.143	4.1	.436	-48.3
1600.00	.312	-156.1	2.872	25.8	.149	1.1	.421	-49.7
1700.00	.310	-162.9	2.745	19.5	.157	-2.5	.408	-51.4
1800.00	.310	-170.2	2.623	13.4	.162	-6.5	.391	-52.9
1900.00	.309	-177.5	2.514	7.3	.165	-9.7	.377	-54.2
2000.00	.310	175.4	2.407	1.4	.171	-12.7	.366	-55.5
2100.00	.313	169.8	2.318	-4.2	.177	-16.1	.351	-57.2
2200.00	.317	164.9	2.227	-9.8	.182	-19.1	.343	-58.5
2300.00	.324	159.5	2.157	-15.4	.188	-22.3	.330	-60.4
2400.00	.331	155.0	2.076	-20.8	.194	-25.6	.319	-62.2
2500.00	.338	150.6	2.012	-26.2	.200	-28.8	.307	-64.1
2600.00	.346	146.5	1.947	-31.7	.207	-32.4	.296	-66.8
2700.00	.356	142.6	1.894	-36.9	.213	-35.6	.285	-69.0
2800.00	.365	139.0	1.833	-42.3	.220	-39.1	.274	-71.8
2900.00	.375	135.7	1.782	-47.5	.226	-42.7	.265	-74.3
3000.00	.386	132.4	1.737	-52.7	.234	-46.1	.254	-77.2

V<sub>CE</sub> = 1 V, I<sub>c</sub> = 1 mA, Z<sub>0</sub> = 50 Ω

FREQUENCY	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.00	.983	-6.8	1.986	166.5	.022	83.1	.993	-4.6
200.00	.968	-14.0	2.016	156.0	.044	73.1	.983	-9.3
300.00	.952	-21.0	2.067	145.7	.064	65.2	.959	-13.6
400.00	.925	-28.5	2.064	135.9	.083	56.7	.942	-17.7
500.00	.904	-35.3	2.096	127.1	.100	49.8	.913	-21.6
600.00	.878	-41.8	1.992	118.1	.116	42.7	.889	-25.2
700.00	.844	-48.6	1.971	109.4	.129	35.5	.859	-28.5
800.00	.816	-55.6	1.945	100.6	.141	28.7	.829	-31.7
900.00	.782	-62.3	1.900	92.3	.151	22.5	.795	-34.8
1000.00	.749	-69.9	1.926	84.3	.159	16.3	.765	-37.4
1100.00	.709	-77.8	1.940	76.0	.166	11.1	.736	-39.7
1200.00	.673	-85.8	1.952	68.2	.172	5.8	.709	-42.0
1300.00	.639	-92.8	1.904	60.4	.178	.8	.686	-44.2
1400.00	.606	-100.6	1.889	52.8	.182	-3.9	.661	-46.3
1500.00	.578	-107.5	1.837	45.2	.185	-8.9	.641	-48.2
1600.00	.551	-114.6	1.801	38.0	.189	-12.8	.621	-50.2
1700.00	.526	-122.6	1.782	30.7	.195	-17.6	.603	-52.2
1800.00	.509	-129.5	1.727	23.8	.196	-22.3	.582	-54.4
1900.00	.487	-137.3	1.702	16.9	.196	-26.3	.562	-56.1
2000.00	.466	-145.4	1.674	9.8	.198	-30.1	.548	-57.9
2100.00	.454	-152.5	1.637	3.4	.198	-33.7	.530	-59.6
2200.00	.446	-159.2	1.590	-3.1	.199	-36.9	.519	-61.7
2300.00	.437	-166.3	1.571	-9.5	.200	-40.5	.502	-63.5
2400.00	.433	-172.8	1.520	-15.7	.201	-43.8	.490	-65.7
2500.00	.430	-179.0	1.488	-21.7	.201	-46.5	.477	-67.7
2600.00	.429	174.8	1.459	-27.8	.203	-49.3	.466	-70.0
2700.00	.429	169.2	1.425	-33.7	.204	-52.3	.453	-72.4
2800.00	.433	163.8	1.390	-39.5	.206	-55.1	.443	-75.1
2900.00	.437	158.6	1.363	-45.3	.208	-57.9	.431	-77.5
3000.00	.443	153.5	1.336	-50.9	.211	-60.2	.421	-80.5

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