

MICROWAVE LOW NOISE AMPLIFIER
NPN SILICON EPITAXIAL TRANSISTOR
(WITH BUILT-IN 2 ELEMENTS) SUPER MINI MOLD

FEATURES

- Low Noise
NF = 1.3 dB TYP. @ $V_{CE} = 2$ V, $I_C = 3$ mA, $f = 2$ GHz
NF = 1.3 dB TYP. @ $V_{CE} = 1$ V, $I_C = 3$ mA, $f = 2$ GHz
- A Super Mini Mold Package Adopted
- Built-in 2 Transistors ($2 \times 2SC5184$)

ORDERING INFORMATION

PART NUMBER	QUANTITY	PACKING STYLE
μ PA808T	Loose products (50 PCS)	Embossed tape 8 mm wide. Pin 6 (Q1 Base), Pin 5 (Q2 Base), Pin 4 (Q2 Emitter) face to perforation side of the tape.
μ PA808T-T1	Taping products (3 KPCS/Reel)	

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

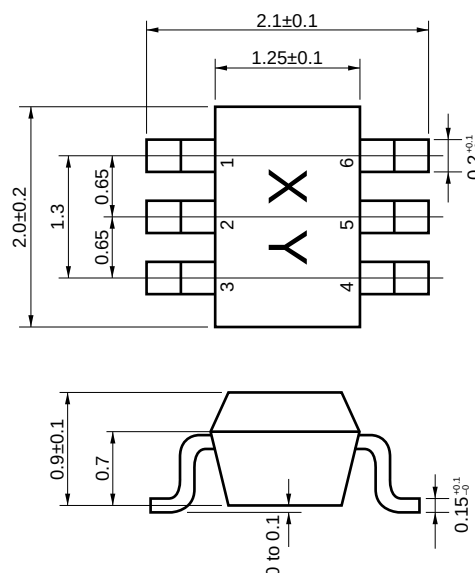
ABSOLUTE MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$)

PARAMETER	SYMBOL	RATING	UNIT
Collector to Base Voltage	V_{CBO}	5	V
Collector to Emitter Voltage	V_{CEO}	3	V
Emitter to Base Voltage	V_{EBO}	2	V
Collector Current	I_C	30	mA
Total Power Dissipation	P_T	90 in 1 element 180 in 2 elements ^{Note}	mW
Junction Temperature	T_j	150	$^\circ\text{C}$
Storage Temperature	T_{stg}	-65 to +150	$^\circ\text{C}$

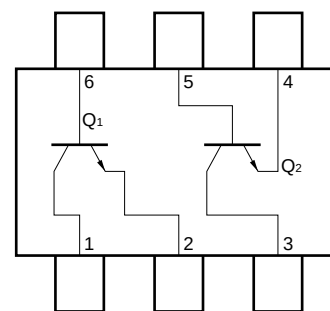
Note 110 mW must not be exceeded in 1 element.

PACKAGE DRAWINGS

(Unit: mm)



PIN CONFIGURATION (Top View)



PIN CONNECTIONS

- Collector (Q1)
- Emitter (Q1)
- Collector (Q2)
- Emitter (Q2)
- Base (Q2)
- Base (Q1)

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

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

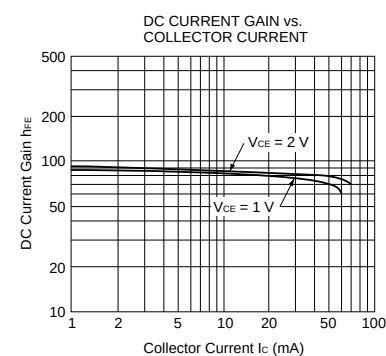
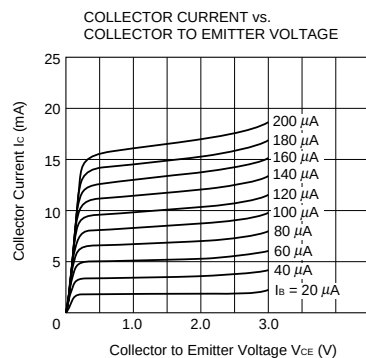
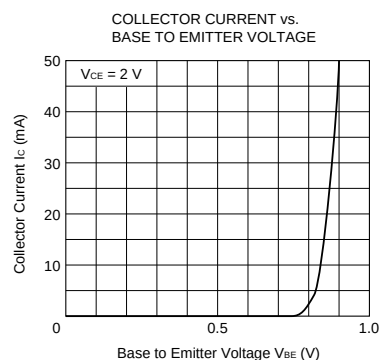
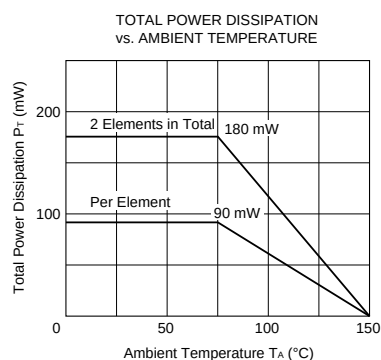
PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Collector Cutoff Current	I_{CBO}	$V_{CB} = 5\text{ V}, I_E = 0$			0.1	μA
Emitter Cutoff Current	I_{EBO}	$V_{EB} = 1\text{ V}, I_C = 0$			0.1	μA
DC Current Gain	h_{FE}	$V_{CE} = 2\text{ V}, I_C = 20\text{ mA}$ Note 1	70		140	
Gain Bandwidth Product (1)	f_T	$V_{CE} = 2\text{ V}, I_C = 20\text{ mA}, f = 2\text{ GHz}$	9	11		GHz
Gain Bandwidth Product (2)	f_T	$V_{CE} = 1\text{ V}, I_C = 10\text{ mA}, f = 2\text{ GHz}$	7	9		GHz
Feed-back Capacitance	C_{re}	$V_{CB} = 2\text{ V}, I_E = 0, f = 1\text{ MHz}$ Note 2		0.4	0.8	pF
Insertion Power Gain (1)	$ S_{21e} ^2$	$V_{CE} = 2\text{ V}, I_C = 20\text{ mA}, f = 2\text{ GHz}$	7	8.5		dB
Insertion Power Gain (2)	$ S_{21e} ^2$	$V_{CE} = 1\text{ V}, I_C = 10\text{ mA}, f = 2\text{ GHz}$	6	7.5		dB
Noise Figure (1)	NF	$V_{CE} = 2\text{ V}, I_C = 3\text{ mA}, f = 2\text{ GHz}$		1.3	2	dB
Noise Figure (2)	NF	$V_{CE} = 1\text{ V}, I_C = 3\text{ mA}, f = 2\text{ GHz}$		1.3	2	dB
h_{FE} Ratio	h_{FE1}/h_{FE2}	$V_{CE} = 2\text{ V}, I_C = 20\text{ mA}$ A smaller value among h_{FE} of $h_{FE1} = Q1, Q2$ A larger value among h_{FE} of $h_{FE2} = Q1, Q2$	0.85			

Notes 1. Pulse Measurement: $P_w \leq 350\text{ }\mu\text{s}$, Duty cycle $\leq 2\%$

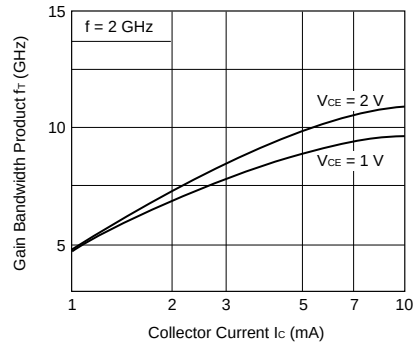
2. Measured with 3-pin bridge, emitter and case should be connected to guard pin of bridge.

 h_{FE} CLASSIFICATION

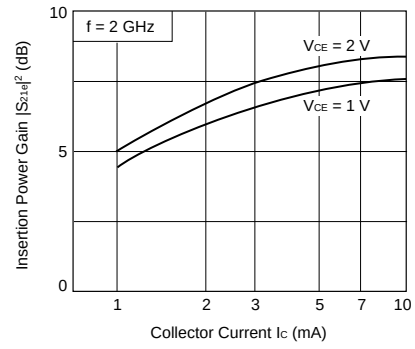
Rank	KB
Marking	T86
h_{FE} Value	70 to 140

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

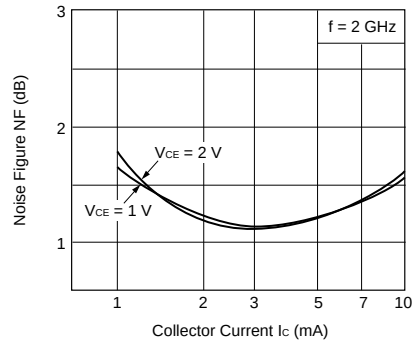
GAIN BANDWIDTH PRODUCT
vs. COLLECTOR CURRENT



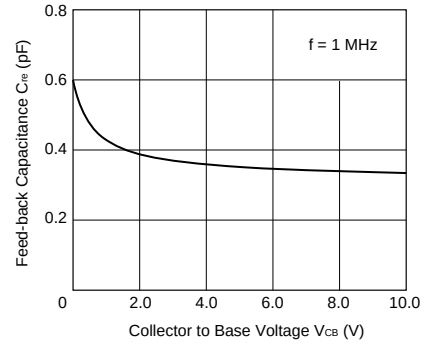
INSERTION GAIN vs.
COLLECTOR CURRENT



NOISE FIGURE vs.
COLLECTOR CURRENT



FEED-BACK CAPACITANCE vs.
COLLECTOR TO BASE VOLTAGE



S-PARAMETERS

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

FREQUENCY		S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG	
100.0000	0.974	−6.9	2.031	170.7	0.029	84.1	0.993	−5.5	
200.0000	0.971	−14.0	1.953	162.5	0.057	78.0	0.982	−10.9	
300.0000	0.956	−20.5	1.928	154.8	0.083	72.3	0.960	−15.5	
400.0000	0.926	−28.4	2.021	147.6	0.105	67.5	0.925	−20.7	
500.0000	0.902	−34.5	1.911	141.1	0.126	62.9	0.902	−24.9	
600.0000	0.861	−42.2	1.941	135.2	0.144	58.6	0.861	−28.6	
700.0000	0.829	−49.5	1.930	129.2	0.158	54.4	0.826	−32.6	
800.0000	0.793	−55.6	1.864	123.6	0.172	51.1	0.791	−35.6	
900.0000	0.753	−63.1	1.917	118.6	0.182	48.2	0.758	−38.5	
1000.0000	0.723	−68.8	1.839	114.1	0.191	45.7	0.731	−41.3	
1100.0000	0.691	−76.3	1.838	109.3	0.200	43.4	0.703	−43.4	
1200.0000	0.652	−82.9	1.833	104.4	0.204	41.6	0.675	−45.6	
1300.0000	0.628	−88.7	1.742	100.1	0.209	39.4	0.652	−47.9	
1400.0000	0.587	−95.8	1.756	95.7	0.213	38.4	0.629	−49.5	
1500.0000	0.565	−101.4	1.686	92.0	0.215	37.0	0.610	−51.6	
1600.0000	0.535	−107.4	1.654	88.1	0.217	36.0	0.591	−53.0	
1700.0000	0.508	−113.5	1.624	84.7	0.218	35.3	0.574	−54.6	
1800.0000	0.489	−118.6	1.565	81.2	0.220	35.0	0.559	−56.0	
1900.0000	0.471	−124.6	1.530	78.4	0.221	34.5	0.545	−57.4	
2000.0000	0.449	−130.5	1.509	75.2	0.222	34.6	0.532	−59.0	

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

FREQUENCY		S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG	
100.0000	0.917	-11.2	5.682	164.5	0.027	81.0	0.966	-10.7	
200.0000	0.879	-22.2	5.447	154.3	0.052	72.7	0.914	-20.4	
300.0000	0.830	-31.8	5.165	144.7	0.072	66.6	0.845	-28.1	
400.0000	0.755	-44.2	5.205	136.0	0.087	61.7	0.764	-34.6	
500.0000	0.703	-52.5	4.838	129.3	0.101	58.1	0.705	-39.7	
600.0000	0.625	-63.5	4.684	122.1	0.111	55.8	0.639	-43.1	
700.0000	0.560	-73.9	4.522	115.3	0.121	54.2	0.587	-46.8	
800.0000	0.506	-81.8	4.219	109.8	0.129	53.3	0.543	-49.0	
900.0000	0.456	-90.8	4.031	104.7	0.137	52.9	0.508	-51.3	
1000.0000	0.411	-98.6	3.796	100.0	0.143	52.3	0.478	-52.9	
1100.0000	0.384	-105.7	3.574	95.9	0.152	51.9	0.451	-54.4	
1200.0000	0.346	-113.0	3.377	91.7	0.158	51.7	0.428	-55.6	
1300.0000	0.327	-119.7	3.166	88.4	0.165	51.6	0.408	-57.2	
1400.0000	0.303	-126.4	3.011	85.2	0.171	51.8	0.390	-58.2	
1500.0000	0.289	-132.4	2.850	82.4	0.179	51.9	0.375	-59.6	
1600.0000	0.273	-138.2	2.707	79.6	0.185	51.9	0.361	-60.2	
1700.0000	0.261	-144.4	2.588	77.1	0.193	51.9	0.348	-61.3	
1800.0000	0.252	-150.1	2.468	74.4	0.200	52.1	0.338	-62.4	
1900.0000	0.247	-156.0	2.364	72.2	0.207	52.4	0.329	-63.4	
2000.0000	0.242	-161.8	2.274	69.8	0.214	52.4	0.319	-64.8	

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

FREQUENCY		S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG	
100.0000	0.784	-18.0	11.844	157.9	0.026	77.0	0.906	-18.0	
200.0000	0.700	-36.7	10.881	143.4	0.045	68.8	0.784	-32.0	
300.0000	0.606	-51.4	9.746	131.7	0.060	64.3	0.664	-40.8	
400.0000	0.490	-68.6	9.052	121.0	0.070	62.4	0.563	-46.7	
500.0000	0.412	-80.3	8.022	113.0	0.081	61.4	0.496	-50.2	
600.0000	0.343	-92.6	7.101	106.5	0.091	61.2	0.436	-52.6	
700.0000	0.299	-103.1	6.348	101.0	0.100	62.0	0.393	-54.8	
800.0000	0.265	-111.9	5.687	96.8	0.110	62.1	0.359	-55.8	
900.0000	0.243	-120.0	5.170	93.2	0.119	62.3	0.336	-57.4	
1000.0000	0.222	-127.7	4.735	89.7	0.130	62.2	0.317	-58.1	
1100.0000	0.213	-135.2	4.360	86.9	0.140	62.3	0.298	-59.3	
1200.0000	0.198	-142.5	4.033	83.9	0.150	62.7	0.283	-59.8	
1300.0000	0.193	-149.8	3.756	81.5	0.159	62.2	0.268	-61.4	
1400.0000	0.184	-156.2	3.508	79.0	0.169	61.9	0.257	-62.2	
1500.0000	0.183	-162.3	3.310	76.8	0.179	61.8	0.248	-63.3	
1600.0000	0.178	-168.3	3.127	74.6	0.189	61.4	0.239	-63.8	
1700.0000	0.177	-173.9	2.963	72.7	0.199	61.0	0.231	-65.1	
1800.0000	0.176	-179.6	2.814	70.6	0.208	60.9	0.224	-66.2	
1900.0000	0.180	175.3	2.686	68.6	0.217	60.3	0.218	-67.3	
2000.0000	0.182	170.6	2.573	66.9	0.228	60.0	0.211	-68.8	

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

FREQUENCY		S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG	
100.0000	0.689	-24.5	14.893	153.4	0.024	76.0	0.865	-22.1	
200.0000	0.583	-47.9	13.678	137.1	0.041	68.5	0.710	-37.1	
300.0000	0.476	-65.2	11.837	124.5	0.054	65.2	0.579	-45.5	
400.0000	0.372	-82.3	10.296	114.1	0.065	63.8	0.483	-50.8	
500.0000	0.306	-94.2	8.800	106.9	0.076	65.2	0.421	-53.5	
600.0000	0.259	-106.7	7.604	101.4	0.087	65.2	0.367	-55.4	
700.0000	0.232	-117.0	6.695	96.9	0.098	65.5	0.331	-57.2	
800.0000	0.211	-126.3	5.965	93.1	0.108	65.5	0.301	-58.0	
900.0000	0.198	-134.5	5.386	90.1	0.118	65.6	0.282	-59.2	
1000.0000	0.184	-142.3	4.901	87.1	0.128	66.0	0.265	-59.5	
1100.0000	0.180	-149.3	4.500	84.5	0.140	65.8	0.251	-60.8	
1200.0000	0.172	-156.7	4.155	82.0	0.151	65.5	0.239	-61.5	
1300.0000	0.172	-163.4	3.851	79.5	0.161	65.1	0.226	-63.1	
1400.0000	0.169	-169.2	3.602	77.3	0.170	64.6	0.218	-63.8	
1500.0000	0.169	-175.2	3.400	75.4	0.183	64.2	0.210	-65.4	
1600.0000	0.168	179.9	3.189	73.1	0.193	63.8	0.203	-66.0	
1700.0000	0.168	174.6	3.032	71.4	0.203	63.2	0.195	-67.1	
1800.0000	0.170	169.3	2.880	69.4	0.213	62.6	0.188	-68.3	
1900.0000	0.175	165.1	2.748	67.6	0.224	62.0	0.184	-69.4	
2000.0000	0.179	161.1	2.629	66.0	0.234	61.4	0.179	-71.4	

$V_{CE} = 1 \text{ V}$, $I_C = 20 \text{ mA}$, $Z_O = 50 \Omega$

FREQUENCY		S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG	
100.0000	0.441	−76.4	18.515	138.3	0.021	73.8	0.753	−30.4	
200.0000	0.358	−97.6	15.403	121.3	0.037	69.2	0.556	−46.5	
300.0000	0.290	−111.1	12.655	110.9	0.049	69.0	0.429	−53.6	
400.0000	0.242	−120.8	10.657	104.2	0.061	69.6	0.349	−58.2	
500.0000	0.208	−129.8	9.000	99.0	0.073	70.4	0.301	−59.6	
600.0000	0.196	−142.5	7.688	94.9	0.084	70.5	0.259	−61.2	
700.0000	0.190	−150.3	6.712	91.3	0.096	70.5	0.234	−62.7	
800.0000	0.185	−158.8	5.955	88.1	0.108	70.5	0.212	−63.2	
900.0000	0.184	−164.7	5.338	85.6	0.120	69.9	0.200	−64.9	
1000.0000	0.182	−171.1	4.863	82.9	0.132	69.7	0.189	−65.0	
1100.0000	0.183	−176.2	4.468	80.7	0.144	69.3	0.179	−67.1	
1200.0000	0.183	178.4	4.106	78.5	0.156	68.5	0.169	−68.2	
1300.0000	0.187	173.6	3.806	76.3	0.168	68.2	0.160	−69.9	
1400.0000	0.187	169.5	3.540	74.3	0.179	67.5	0.154	−71.5	
1500.0000	0.193	165.5	3.337	72.1	0.190	66.9	0.149	−73.3	
1600.0000	0.193	161.7	3.154	70.4	0.202	65.8	0.144	−74.4	
1700.0000	0.196	158.0	2.980	68.7	0.214	65.3	0.138	−76.3	
1800.0000	0.199	153.9	2.843	67.0	0.224	64.3	0.134	−78.3	
1900.0000	0.205	151.4	2.699	65.2	0.235	63.7	0.130	−79.8	
2000.0000	0.211	148.9	2.579	63.6	0.247	62.9	0.127	−82.4	

$V_{CE} = 2 \text{ V}$, $I_C = 1 \text{ mA}$, $Z_O = 50 \Omega$

FREQUENCY		S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG	
100.0000	0.978	−6.8	2.018	171.8	0.025	83.3	0.995	−4.9	
200.0000	0.975	−13.1	1.958	163.5	0.049	78.9	0.987	−9.7	
300.0000	0.964	−19.1	1.937	156.3	0.071	74.1	0.970	−13.9	
400.0000	0.932	−26.5	2.026	149.7	0.091	68.8	0.938	−18.4	
500.0000	0.915	−32.1	1.917	143.3	0.110	64.8	0.920	−22.1	
600.0000	0.876	−39.3	1.959	137.6	0.127	60.6	0.884	−25.5	
700.0000	0.846	−46.0	1.945	132.0	0.140	57.0	0.852	−29.1	
800.0000	0.812	−51.8	1.888	126.6	0.152	53.7	0.822	−31.8	
900.0000	0.776	−58.9	1.940	121.9	0.162	50.9	0.791	−34.6	
1000.0000	0.746	−64.1	1.862	117.6	0.170	48.7	0.766	−37.1	
1100.0000	0.717	−71.2	1.875	112.8	0.177	46.4	0.740	−39.1	
1200.0000	0.676	−77.5	1.874	108.0	0.184	44.3	0.714	−41.1	
1300.0000	0.652	−83.0	1.785	103.9	0.189	42.2	0.693	−43.1	
1400.0000	0.610	−89.8	1.802	99.6	0.192	41.0	0.669	−44.7	
1500.0000	0.586	−95.2	1.731	96.0	0.195	39.6	0.653	−46.7	
1600.0000	0.554	−101.0	1.709	92.0	0.197	39.0	0.634	−47.8	
1700.0000	0.526	−106.7	1.681	88.6	0.198	38.3	0.616	−49.4	
1800.0000	0.503	−111.9	1.624	85.1	0.200	37.8	0.602	−50.7	
1900.0000	0.482	−117.8	1.594	82.1	0.201	37.5	0.591	−52.0	
2000.0000	0.457	−123.4	1.572	79.0	0.202	37.6	0.575	−53.3	

$V_{CE} = 2 \text{ V}, I_C = 3 \text{ mA}, Z_o = 50 \Omega$

FREQUENCY		S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG	
100.0000	0.916	−10.2	5.805	166.0	0.023	82.8	0.973	−9.3	
200.0000	0.893	−20.0	5.495	155.8	0.045	74.6	0.931	−17.8	
300.0000	0.850	−28.6	5.238	146.7	0.062	68.0	0.870	−24.4	
400.0000	0.777	−39.7	5.292	138.5	0.077	64.1	0.798	−30.4	
500.0000	0.731	−47.1	4.938	131.9	0.090	60.3	0.745	−34.8	
600.0000	0.656	−57.0	4.818	125.0	0.101	58.5	0.684	−37.8	
700.0000	0.592	−66.2	4.673	118.4	0.109	56.7	0.633	−41.0	
800.0000	0.536	−73.3	4.389	113.0	0.117	55.5	0.591	−42.9	
900.0000	0.481	−81.4	4.223	107.8	0.123	55.0	0.557	−44.8	
1000.0000	0.435	−88.0	3.993	103.3	0.131	54.5	0.528	−46.2	
1100.0000	0.400	−95.1	3.781	99.0	0.137	54.5	0.504	−47.6	
1200.0000	0.357	−101.3	3.589	94.9	0.144	54.2	0.479	−48.5	
1300.0000	0.333	−107.4	3.374	91.5	0.151	54.0	0.459	−49.8	
1400.0000	0.302	−113.4	3.210	88.0	0.157	54.1	0.441	−50.5	
1500.0000	0.284	−119.4	3.047	85.2	0.164	54.4	0.427	−51.7	
1600.0000	0.264	−124.8	2.896	82.3	0.170	54.4	0.414	−52.3	
1700.0000	0.247	−130.7	2.766	79.9	0.177	54.7	0.401	−53.2	
1800.0000	0.233	−136.2	2.641	77.2	0.183	54.7	0.392	−54.0	
1900.0000	0.225	−142.5	2.528	75.0	0.191	55.1	0.383	−54.8	
2000.0000	0.215	−148.4	2.436	72.9	0.198	54.9	0.373	−55.8	

 $V_{CE} = 2 \text{ V}, I_C = 5 \text{ mA}, Z_o = 50 \Omega$

FREQUENCY		S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG	
100.0000	0.857	−13.2	9.113	162.6	0.023	78.8	0.948	−12.7	
200.0000	0.811	−25.8	8.527	150.3	0.041	72.1	0.870	−23.3	
300.0000	0.743	−36.6	7.907	139.9	0.057	66.2	0.781	−30.9	
400.0000	0.642	−50.1	7.737	130.5	0.069	63.9	0.690	−36.6	
500.0000	0.571	−59.3	7.109	123.0	0.079	61.7	0.627	−40.3	
600.0000	0.483	−69.9	6.609	115.5	0.088	61.2	0.564	−42.6	
700.0000	0.415	−79.3	6.140	109.1	0.096	60.5	0.517	−44.8	
800.0000	0.363	−86.7	5.613	104.2	0.105	60.2	0.479	−45.9	
900.0000	0.321	−93.7	5.182	99.9	0.113	60.2	0.451	−47.4	
1000.0000	0.284	−100.3	4.803	95.9	0.121	60.5	0.427	−47.9	
1100.0000	0.260	−106.6	4.448	92.6	0.130	60.6	0.406	−48.9	
1200.0000	0.231	−112.8	4.149	89.2	0.137	60.4	0.388	−49.5	
1300.0000	0.215	−119.2	3.875	86.4	0.146	60.7	0.372	−50.4	
1400.0000	0.196	−125.0	3.635	83.8	0.155	60.7	0.359	−51.0	
1500.0000	1.185	−131.8	3.428	81.3	0.163	60.7	0.348	−52.1	
1600.0000	0.172	−137.4	3.244	78.9	0.171	60.7	0.337	−52.3	
1700.0000	0.163	−144.2	3.090	76.6	0.180	60.5	0.327	−53.0	
1800.0000	0.155	−150.5	2.938	74.6	0.188	60.3	0.319	−53.7	
1900.0000	0.152	−157.2	2.810	72.6	0.196	60.3	0.313	−54.5	
2000.0000	0.149	−164.1	2.692	70.7	0.205	60.0	0.305	−55.4	

$V_{CE} = 2 \text{ V}$, $I_C = 7 \text{ mA}$, $Z_O = 50 \Omega$

FREQUENCY		S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG	
100.0000	0.805	−16.8	12.051	160.5	0.021	76.4	0.923	−15.4	
200.0000	0.733	−31.1	11.136	145.9	0.039	71.1	0.818	−27.3	
300.0000	0.645	−43.8	10.084	134.6	0.052	66.7	0.711	−34.9	
400.0000	0.531	−58.4	9.504	124.1	0.063	64.9	0.615	−39.8	
500.0000	0.445	−68.3	8.484	116.3	0.073	64.6	0.550	−42.8	
600.0000	0.366	−78.6	7.598	109.4	0.083	64.2	0.492	−44.5	
700.0000	0.311	−87.2	6.839	103.8	0.092	63.5	0.451	−46.1	
800.0000	0.269	−94.4	6.153	99.5	0.100	63.8	0.416	−46.7	
900.0000	0.240	−101.0	5.628	95.7	0.110	63.6	0.393	−47.7	
1000.0000	0.212	−107.4	5.139	92.4	0.119	64.0	0.374	−48.1	
1100.0000	0.194	−113.9	4.750	89.4	0.128	63.9	0.355	−48.9	
1200.0000	0.174	−120.4	4.399	86.5	0.137	64.1	0.341	−49.3	
1300.0000	0.161	−127.7	4.097	84.0	0.146	63.5	0.326	−50.1	
1400.0000	0.148	−134.2	3.836	81.6	0.155	64.4	0.316	−50.6	
1500.0000	0.141	−141.3	3.613	79.2	0.164	64.2	0.307	−51.6	
1600.0000	0.132	−147.6	3.403	77.2	0.174	63.5	0.298	−51.8	
1700.0000	0.127	−154.8	3.231	75.1	0.182	63.3	0.290	−52.4	
1800.0000	0.122	−161.7	3.069	73.1	0.192	63.0	0.283	−53.1	
1900.0000	0.123	−169.0	2.919	71.1	0.201	62.6	0.277	−54.1	
2000.0000	0.123	−175.7	2.802	69.5	0.210	62.2	0.271	−55.0	

$V_{CE} = 2 \text{ V}$, $I_C = 10 \text{ mA}$, $Z_O = 50 \Omega$

FREQUENCY		S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG	
100.0000	0.723	−20.3	15.896	156.6	0.021	78.2	0.890	−18.6	
200.0000	0.629	−38.3	14.304	140.5	0.036	71.0	0.755	−31.2	
300.0000	0.520	−53.2	12.506	128.1	0.048	67.3	0.633	−38.5	
400.0000	0.403	−67.5	11.061	117.4	0.059	67.5	0.541	−42.4	
500.0000	0.327	−76.9	9.540	110.0	0.069	66.7	0.480	−44.5	
600.0000	0.266	−86.7	8.285	104.2	0.079	67.1	0.427	−45.6	
700.0000	0.228	−95.0	7.319	99.5	0.088	67.3	0.393	−46.6	
800.0000	0.196	−102.2	6.522	95.8	0.098	67.3	0.363	−46.7	
900.0000	0.175	−109.0	5.905	92.5	0.107	67.2	0.343	−47.5	
1000.0000	0.155	−116.2	5.381	89.5	0.117	67.0	0.329	−47.6	
1100.0000	0.143	−123.2	4.958	86.8	0.128	67.2	0.313	−48.2	
1200.0000	0.129	−130.1	4.574	84.3	0.137	67.2	0.301	−48.6	
1300.0000	0.121	−138.7	4.251	81.9	0.147	66.8	0.289	−49.3	
1400.0000	0.114	−145.5	3.961	79.8	0.157	66.7	0.281	−49.7	
1500.0000	0.109	−153.5	3.732	77.7	0.166	66.5	0.273	−50.7	
1600.0000	0.105	−160.3	3.520	75.7	0.176	65.7	0.266	−51.0	
1700.0000	0.102	−168.2	3.341	74.0	0.186	65.3	0.259	−51.7	
1800.0000	0.101	−176.1	3.172	72.0	0.196	64.8	0.253	−52.8	
1900.0000	0.105	177.1	3.013	70.3	0.205	64.3	0.248	−53.5	
2000.0000	0.108	171.3	2.886	68.6	0.215	64.0	0.242	−54.2	

$V_{CE} = 2 \text{ V}$, $I_C = 20 \text{ mA}$, $Z_O = 50 \Omega$

FREQUENCY	S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100.0000	0.474	-33.9	27.070	147.2	0.018	76.5	0.805	-24.1
200.0000	0.354	57.5	20.499	127.1	0.031	74.3	0.624	-36.4
300.0000	0.270	-73.3	15.719	115.1	0.043	72.8	0.501	-42.1
400.0000	0.213	-85.2	12.575	107.5	0.054	71.2	0.424	-44.2
500.0000	0.173	-94.8	10.387	101.9	0.064	72.6	0.376	-44.6
600.0000	0.146	-105.1	8.873	97.6	0.074	73.1	0.337	-44.9
700.0000	0.129	-115.0	7.714	93.9	0.084	72.7	0.312	-45.2
800.0000	0.116	-124.7	6.794	91.0	0.095	72.0	0.294	-44.9
900.0000	0.104	-133.8	6.117	88.4	0.106	72.5	0.279	-45.8
1000.0000	0.097	-143.0	5.522	85.2	0.116	72.4	0.266	-44.9
1100.0000	0.093	-151.3	5.083	83.4	0.128	71.7	0.257	-45.7
1200.0000	0.091	-159.0	4.649	81.0	0.137	71.1	0.250	-46.1
1300.0000	0.090	-169.5	4.346	79.0	0.148	70.9	0.241	-46.9
1400.0000	0.089	-176.4	4.044	77.1	0.159	70.5	0.234	-47.2
1500.0000	0.091	177.3	3.797	75.6	0.169	69.5	0.229	-48.7
1600.0000	0.094	170.6	3.565	73.8	0.179	68.9	0.224	-49.5
1700.0000	0.095	165.4	3.378	71.8	0.190	68.2	0.218	-50.2
1800.0000	0.100	160.1	3.222	70.2	0.200	67.6	0.216	-50.7
1900.0000	0.106	156.6	3.080	68.4	0.210	66.9	0.210	-52.1
2000.0000	0.106	150.5	2.922	67.1	0.219	66.3	0.204	-52.9

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