

DATA SHEET

NEC

NPN SILICON RF TWIN TRANSISTOR μ PA802TC

NPN SILICON RF TRANSISTOR (WITH 2 ELEMENTS) IN A FLAT-LEAD 6-PIN THIN-TYPE ULTRA SUPER MINIMOLD

FEATURES

- Built-in low phase distortion, high-gain transistor
NF = 1.4 dB TYP., $|S_{21e}|^2 = 12.0$ dB TYP. @ $V_{CE} = 3$ V, $I_C = 7$ mA, $f = 1$ GHz
- Built-in 2 transistors ($2 \times 2SC5433$)
- Flat-lead 6-pin thin-type ultra super minimold package

BUILT-IN TRANSISTORS

	Q1, Q2
3-pin thin-type ultra super minimold part No.	2SC5433

ORDERING INFORMATION

Part Number	Quantity	Supplying Form
μ PA802TC	50 pcs (Non reel)	• 8 mm wide embossed taping • Pin 6 (Q1 Base), Pin 5 (Q2 Base), Pin 4 (Q2 Emitter) face the perforation side of the tape
μ PA802TC-T1	3 kpcs/reel	

Remark To order evaluation samples, contact your nearby sales office.
The unit sample quantity is 50 pcs.

Because this product uses high-frequency technology, avoid excessive static electricity, etc.

The information in this document is subject to change without notice. Before using this document, please confirm that this is the latest version.
Not all devices/types available in every country. Please check with local NEC Compound Semiconductor Devices representative for availability and additional information.

ABSOLUTE MAXIMUM RATINGS (T_A = +25°C)

Parameter	Symbol	Ratings	Unit
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	65	mA
Total Power Dissipation	P _{tot} ^{Note}	200 in 1 element	mW
		230 in 2 elements	
Junction Temperature	T _J	150	°C
Storage Temperature	T _{stg}	−65 to +150	°C

Note Mounted on 1.08 cm² × 1.0 mm (t) glass epoxy PCB

ELECTRICAL CHARACTERISTICS (T_A = +25°C)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Collector Cut-off Current	I _{CBO}	V _{CB} = 10 V, I _E = 0 mA	–	–	800	nA
Emitter Cut-off Current	I _{EBO}	V _{EB} = 1 V, I _C = 0 mA	–	–	800	nA
DC Current Gain	h _{FE} ^{Note 1}	V _{CE} = 3 V, I _C = 7 mA	70	–	150	–
Gain Bandwidth Product	f _T	V _{CE} = 3 V, I _C = 7 mA, f = 1 GHz	4.5	7.0	–	GHz
Insertion Power Gain	S _{21e} ²	V _{CE} = 3 V, I _C = 7 mA, f = 1 GHz	10.0	12.0	–	dB
Noise Figure	NF	V _{CE} = 3 V, I _C = 7 mA, f = 1 GHz, Z _S = Z _{opt}	–	1.4	2.7	dB
Reverse Transfer Capacitance	C _{re} ^{Note 2}	V _{CB} = 3 V, I _E = 0 mA, f = 1 MHz	–	–	0.9	pF

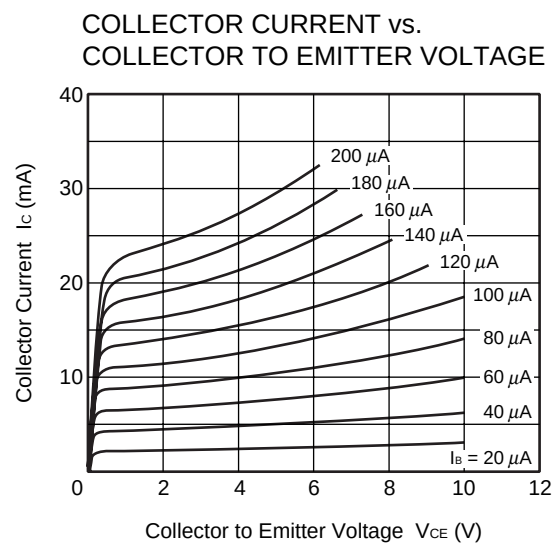
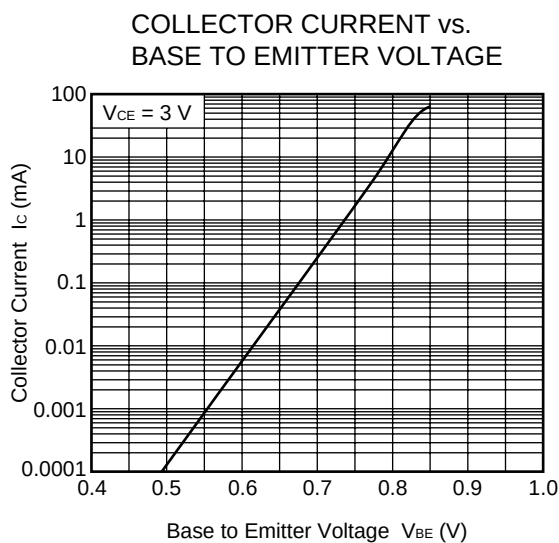
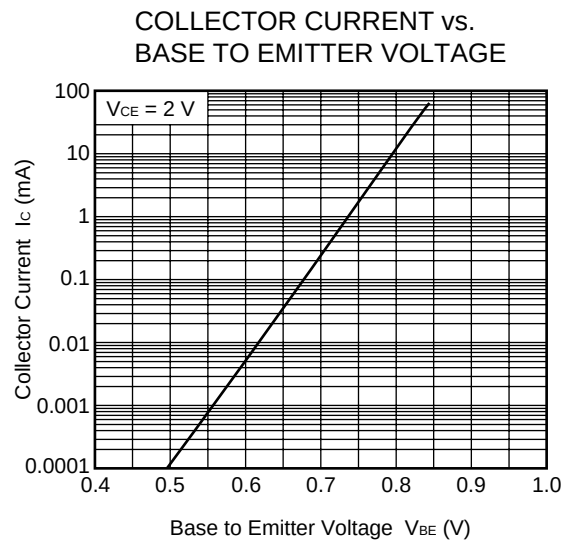
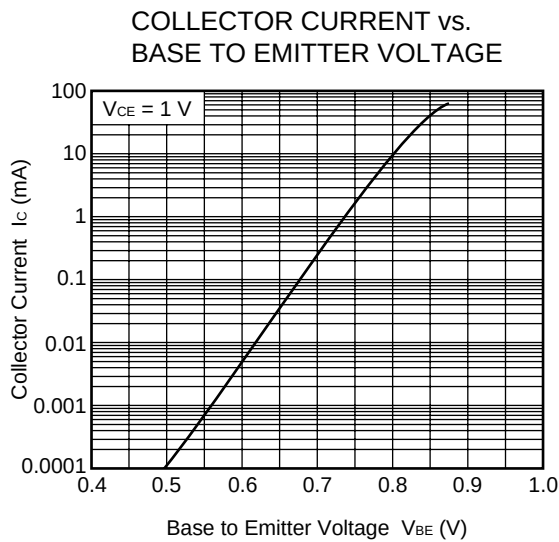
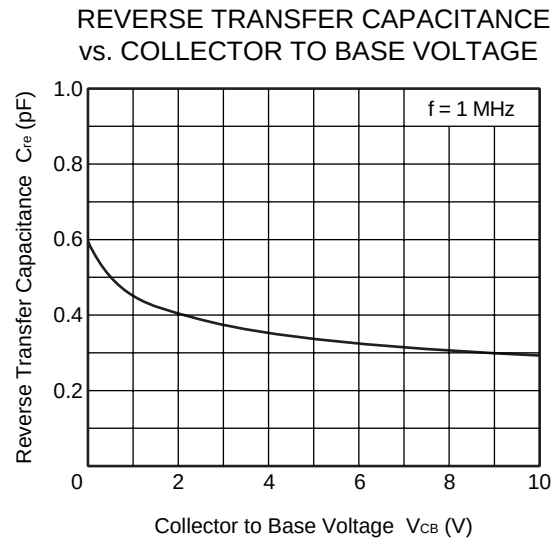
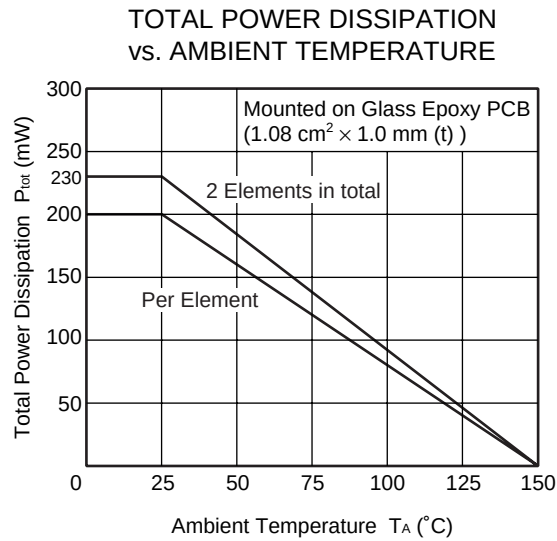
Notes 1. Pulse measurement: PW ≤ 350 μs, Duty Cycle ≤ 2%

2. Collector to base capacitance when the emitter grounded

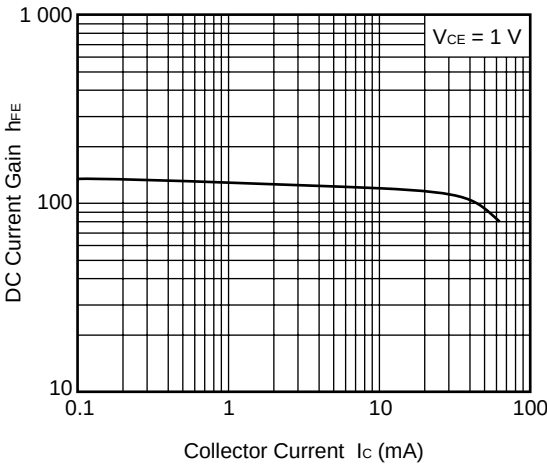
h_{FE} CLASSIFICATION

Rank	FB
Marking	3A
h _{FE} Value	70 to 150

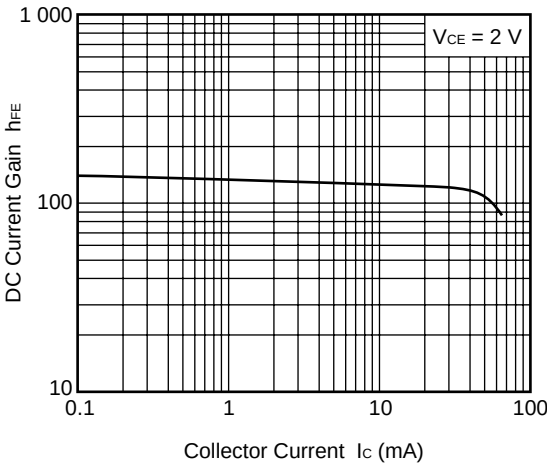
TYPICAL CHARACTERISTICS (Unless otherwise specified, $T_A = +25^\circ\text{C}$)



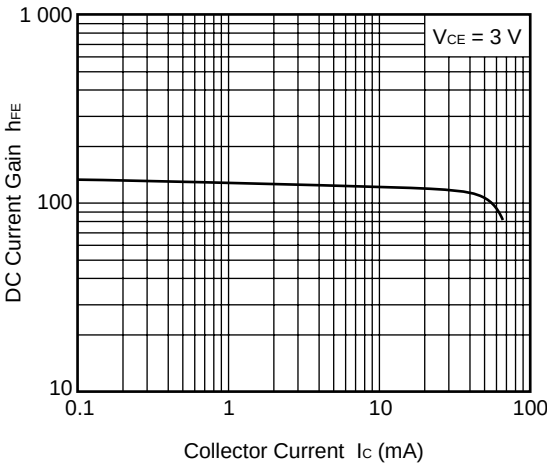
DC CURRENT GAIN vs.
COLLECTOR CURRENT



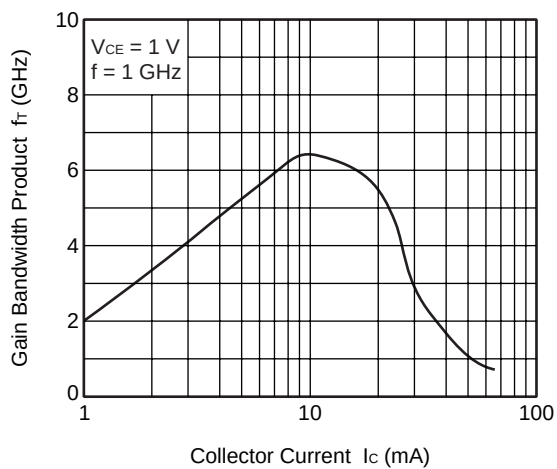
DC CURRENT GAIN vs.
COLLECTOR CURRENT



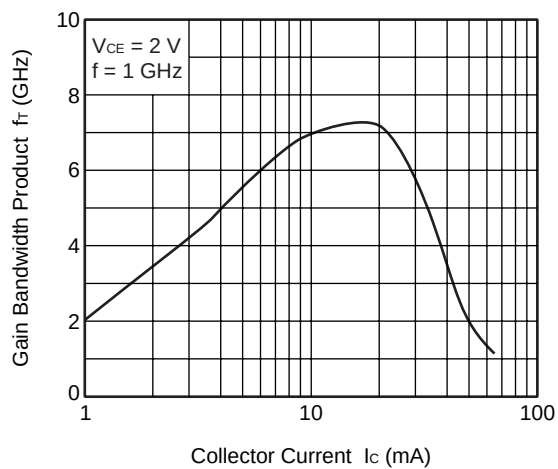
DC CURRENT GAIN vs.
COLLECTOR CURRENT



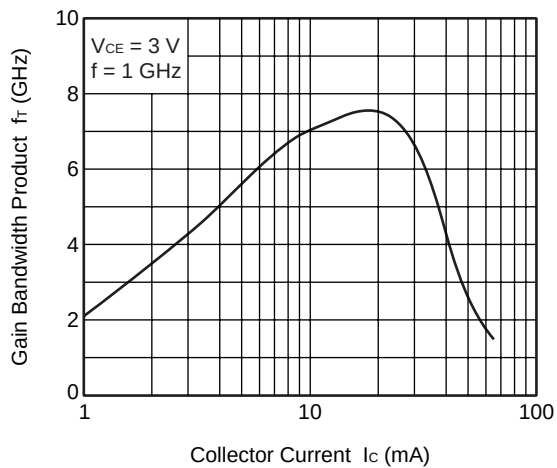
GAIN BANDWIDTH PRODUCT
vs. COLLECTOR CURRENT



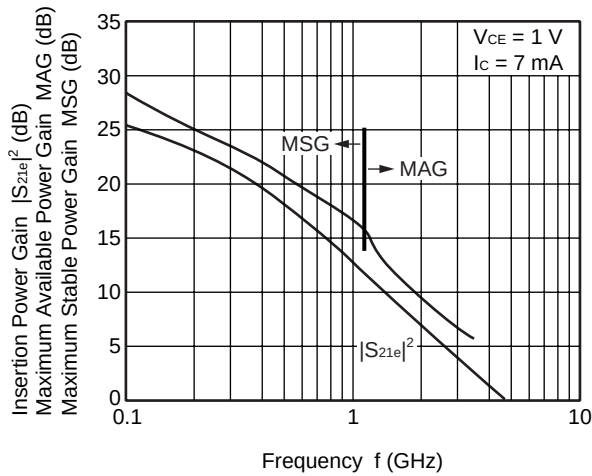
GAIN BANDWIDTH PRODUCT
vs. COLLECTOR CURRENT



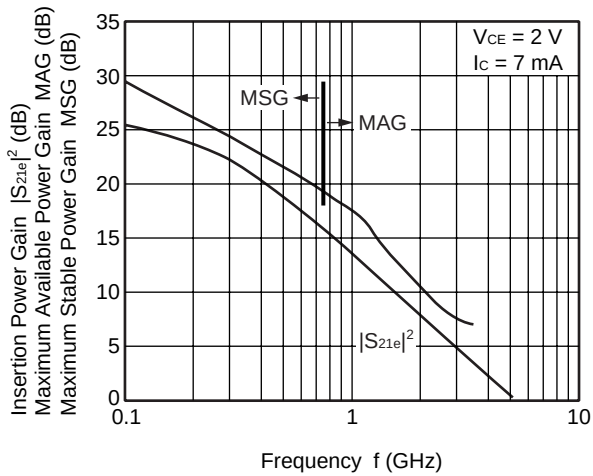
GAIN BANDWIDTH PRODUCT
vs. COLLECTOR CURRENT



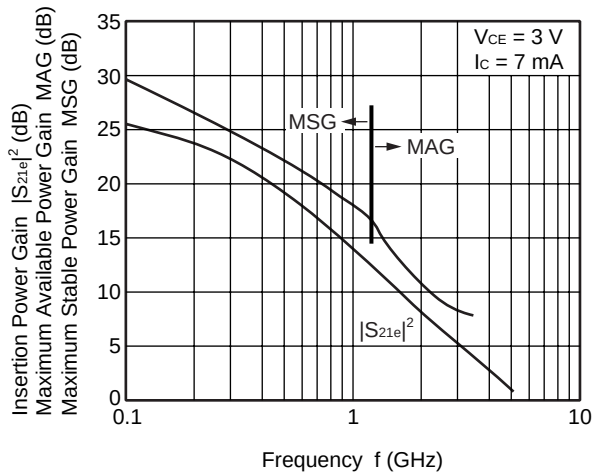
INSERTION POWER GAIN,
MAG, MSG vs. FREQUENCY



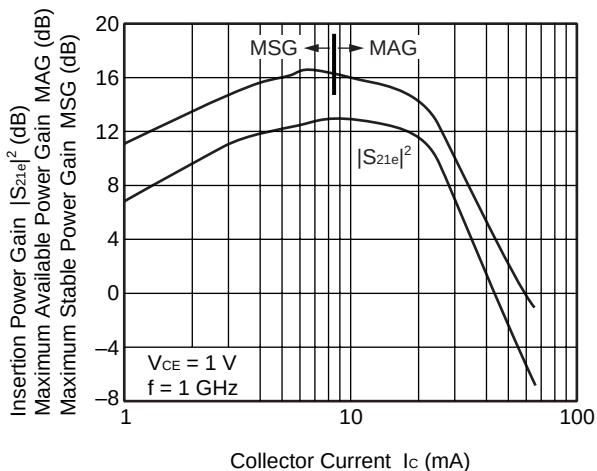
INSERTION POWER GAIN,
MAG, MSG vs. FREQUENCY



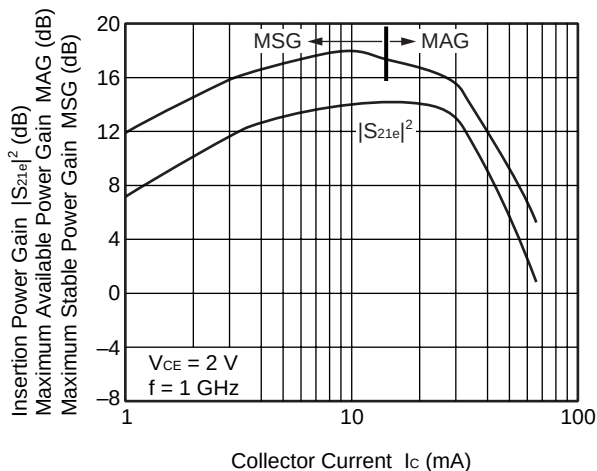
INSERTION POWER GAIN,
MAG, MSG vs. FREQUENCY



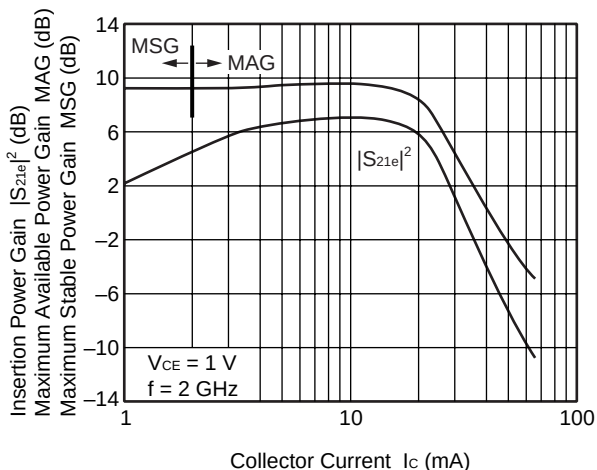
INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT



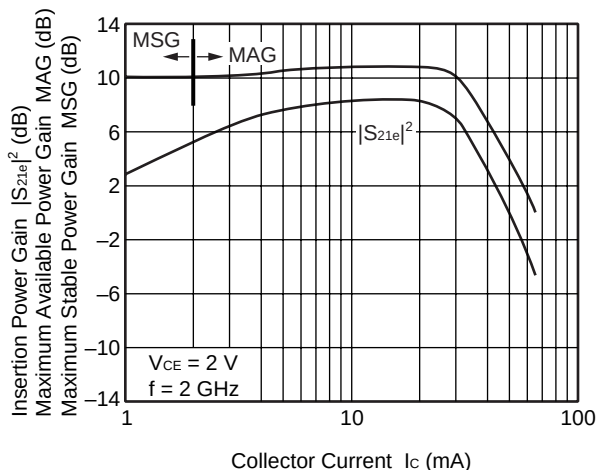
INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT



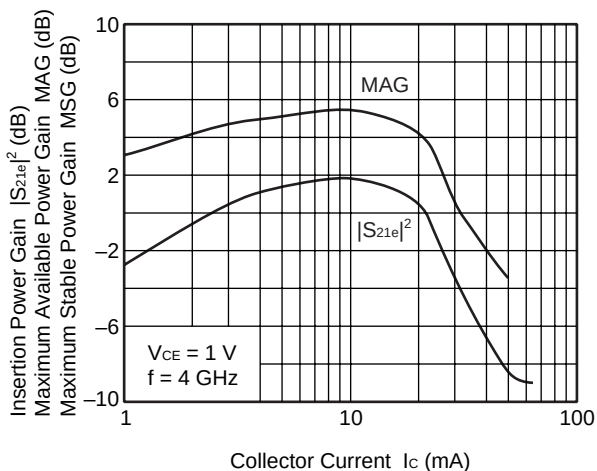
INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT



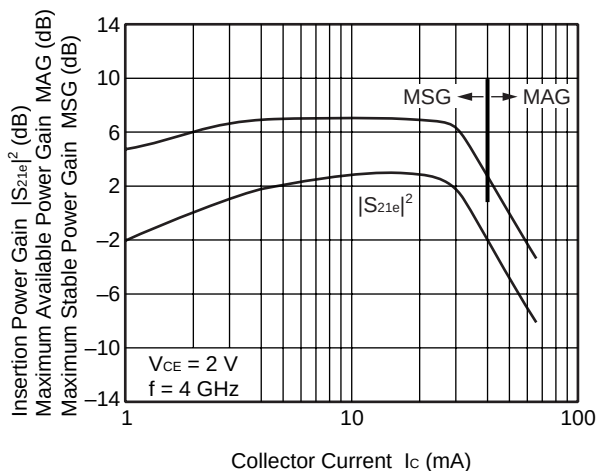
INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT



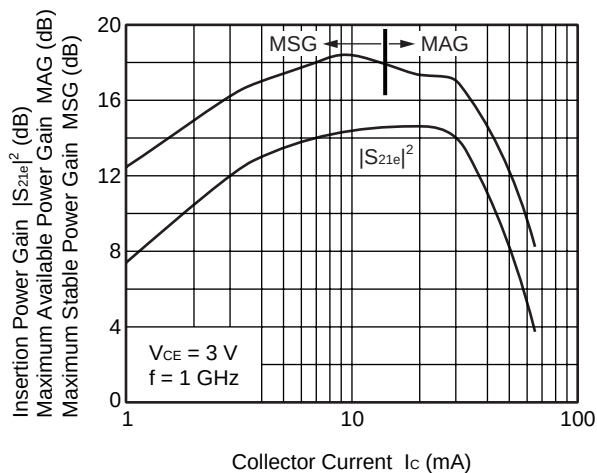
INSERTION POWER GAIN, MAG
vs. COLLECTOR CURRENT



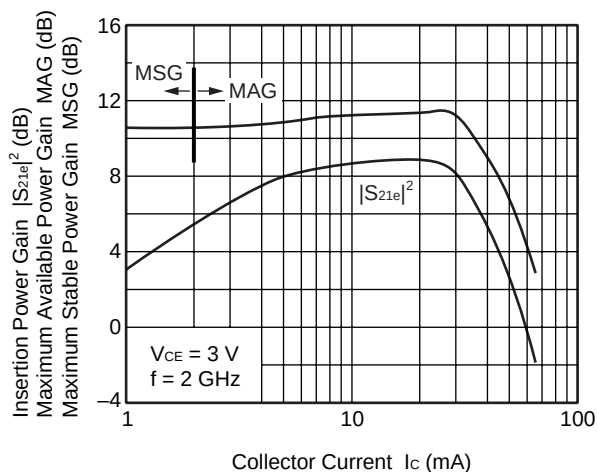
INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT



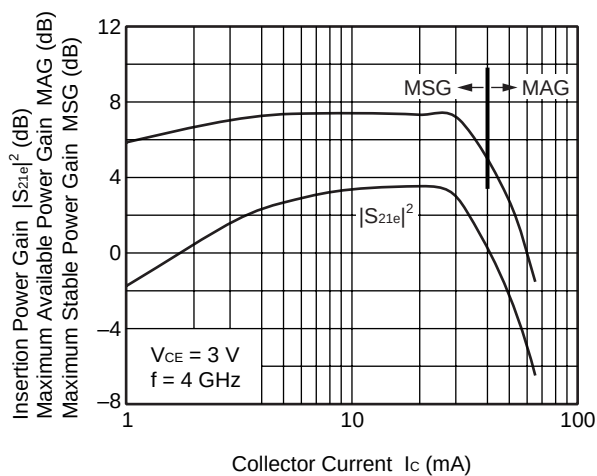
INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT



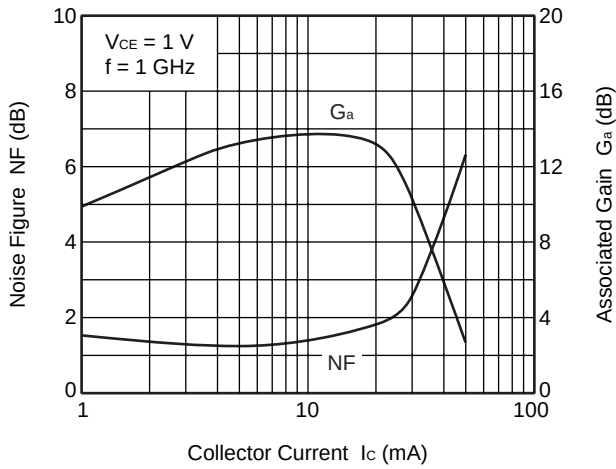
INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT



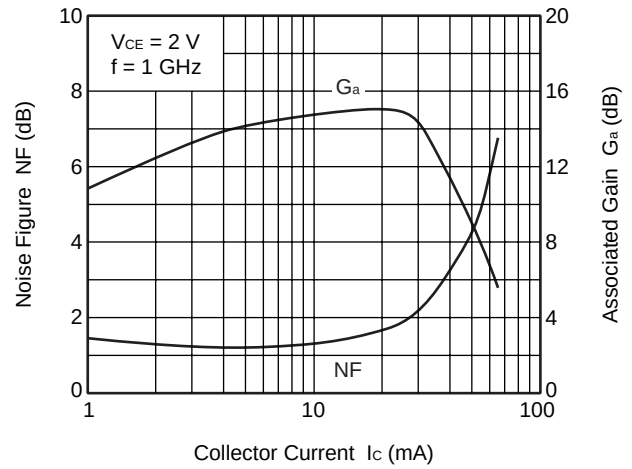
INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT



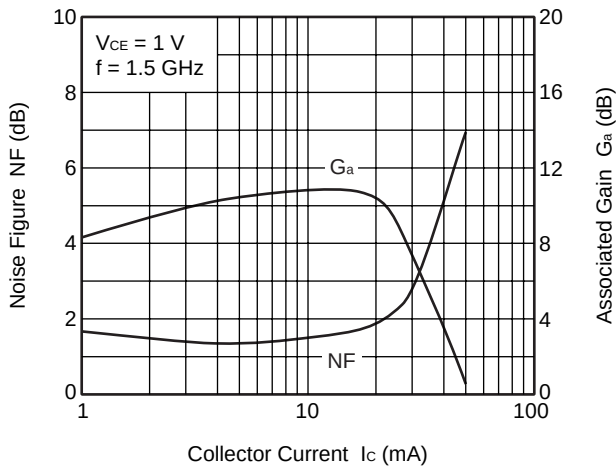
NOISE FIGURE, ASSOCIATED GAIN
vs. COLLECTOR CURRENT



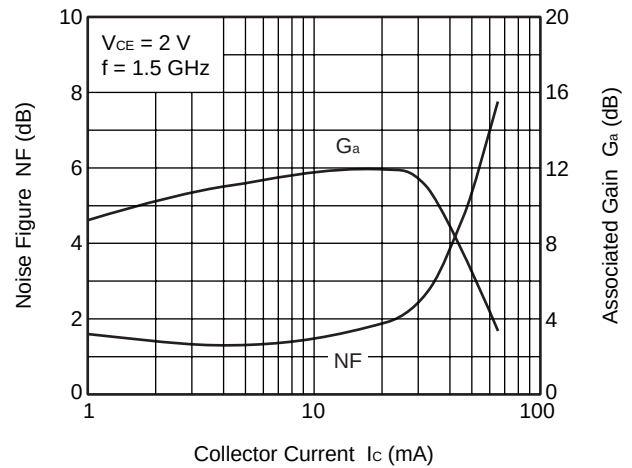
NOISE FIGURE, ASSOCIATED GAIN
vs. COLLECTOR CURRENT



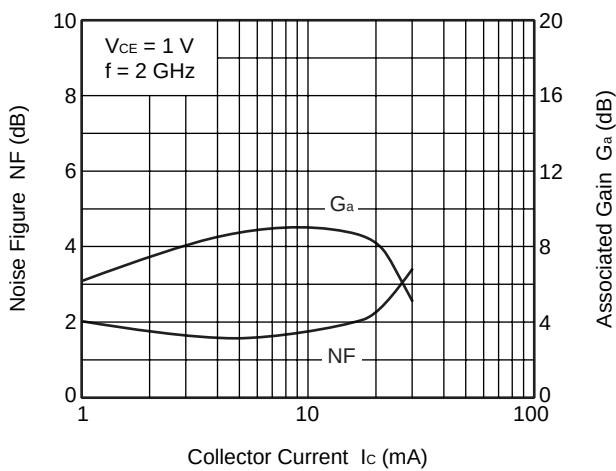
NOISE FIGURE, ASSOCIATED GAIN
vs. COLLECTOR CURRENT



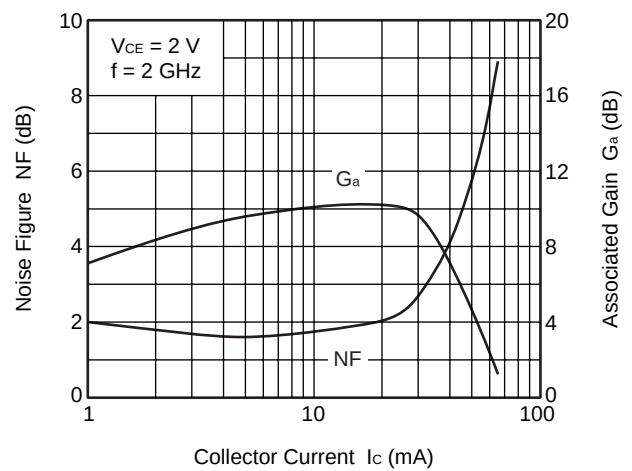
NOISE FIGURE, ASSOCIATED GAIN
vs. COLLECTOR CURRENT



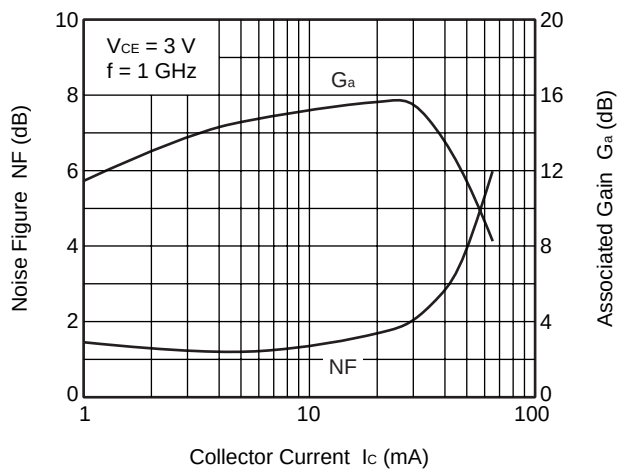
NOISE FIGURE, ASSOCIATED GAIN
vs. COLLECTOR CURRENT



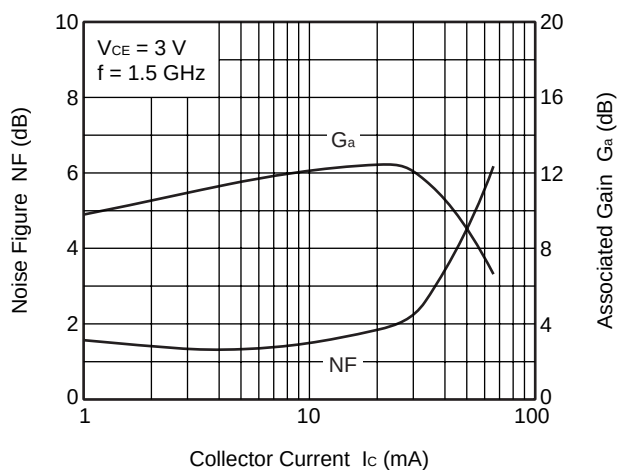
NOISE FIGURE, ASSOCIATED GAIN
vs. COLLECTOR CURRENT



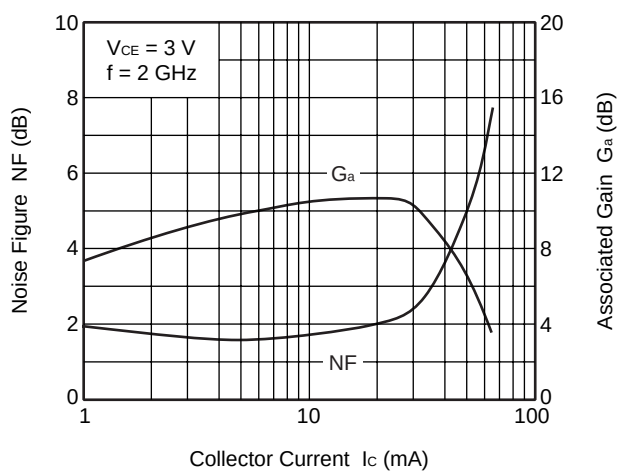
NOISE FIGURE, ASSOCIATED GAIN
vs. COLLECTOR CURRENT



NOISE FIGURE, ASSOCIATED GAIN
vs. COLLECTOR CURRENT



NOISE FIGURE, ASSOCIATED GAIN
vs. COLLECTOR CURRENT



Remark The graphs indicate nominal characteristics.

S-PARAMETERS

V_{CE} = 1 V, I_C = 1 mA, Z_o = 50 Ω

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.964	-15.2	3.699	169.0	0.033	80.3	0.992	-5.6
0.2	0.928	-29.2	3.467	158.0	0.061	72.8	0.970	-11.2
0.3	0.904	-42.9	3.350	148.5	0.087	64.8	0.934	-16.3
0.4	0.866	-56.3	3.161	139.0	0.109	57.6	0.894	-20.9
0.5	0.835	-68.7	2.974	130.4	0.127	51.2	0.854	-25.0
0.6	0.794	-80.3	2.795	122.2	0.142	45.3	0.812	-28.5
0.7	0.760	-91.0	2.618	115.2	0.153	40.2	0.773	-31.5
0.8	0.733	-100.7	2.453	108.6	0.161	35.7	0.737	-34.2
0.9	0.712	-110.2	2.298	102.4	0.167	31.9	0.704	-36.8
1.0	0.687	-119.0	2.164	96.4	0.171	28.5	0.676	-39.0
1.1	0.672	-127.4	2.032	91.2	0.173	25.3	0.649	-41.2
1.2	0.667	-135.0	1.924	86.3	0.173	22.7	0.626	-43.1
1.3	0.651	-142.4	1.808	81.2	0.173	20.2	0.605	-45.0
1.4	0.643	-148.7	1.712	76.7	0.173	18.2	0.588	-47.0
1.5	0.641	-154.8	1.628	72.7	0.171	16.6	0.573	-48.6
1.6	0.637	-160.7	1.547	68.6	0.169	15.2	0.558	-50.4
1.7	0.638	-166.3	1.471	64.6	0.166	14.2	0.546	-52.3
1.8	0.635	-171.4	1.403	60.6	0.163	13.6	0.534	-54.0
1.9	0.640	-176.2	1.344	57.7	0.159	13.2	0.523	-55.9
2.0	0.645	179.2	1.291	54.3	0.157	13.4	0.513	-57.8
2.1	0.647	175.2	1.247	50.8	0.153	14.0	0.502	-59.7
2.2	0.645	171.4	1.199	47.7	0.149	15.0	0.493	-61.8
2.3	0.647	167.6	1.157	44.9	0.145	15.7	0.482	-64.1
2.4	0.650	164.1	1.117	42.3	0.143	17.2	0.471	-66.2
2.5	0.656	160.6	1.081	39.2	0.141	18.5	0.460	-68.8
2.6	0.660	157.3	1.047	36.8	0.138	20.1	0.451	-71.7
2.7	0.665	154.0	1.012	34.1	0.137	22.3	0.442	-74.7
2.8	0.668	151.2	0.977	32.5	0.136	25.1	0.439	-77.2
2.9	0.673	148.9	0.951	29.7	0.138	27.8	0.435	-80.6
3.0	0.675	145.7	0.932	27.5	0.142	30.6	0.428	-85.2
4.0	0.732	121.7	0.726	8.1	0.217	41.7	0.434	-134.0
5.0	0.779	107.1	0.560	-3.0	0.323	33.2	0.474	-178.4

V_{CE} = 1 V, I_C = 3 mA, Z_o = 50 Ω

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.874	-25.7	9.824	162.9	0.030	78.6	0.964	-11.6
0.2	0.805	-47.8	8.706	147.0	0.055	65.3	0.889	-21.7
0.3	0.745	-67.1	7.795	134.6	0.073	56.1	0.798	-29.3
0.4	0.687	-84.8	6.840	123.9	0.086	49.8	0.712	-35.0
0.5	0.642	-99.1	6.007	115.2	0.095	45.1	0.635	-38.9
0.6	0.606	-111.8	5.330	107.5	0.101	41.5	0.575	-41.8
0.7	0.581	-122.9	4.787	101.6	0.106	39.2	0.524	-43.8
0.8	0.560	-132.4	4.310	96.1	0.110	37.4	0.484	-45.5
0.9	0.551	-141.0	3.917	91.3	0.114	36.5	0.451	-47.1
1.0	0.538	-149.0	3.596	86.6	0.117	35.8	0.423	-48.4
1.1	0.532	-155.8	3.304	82.6	0.119	35.3	0.400	-49.7
1.2	0.534	-161.9	3.079	78.7	0.121	35.2	0.380	-50.9
1.3	0.529	-168.0	2.849	74.9	0.124	35.2	0.362	-52.3
1.4	0.530	-172.9	2.668	71.5	0.127	35.4	0.347	-53.6
1.5	0.532	-177.5	2.509	68.3	0.129	35.7	0.334	-54.8
1.6	0.537	178.0	2.367	65.1	0.132	35.9	0.321	-56.1
1.7	0.538	173.8	2.230	61.9	0.135	36.5	0.310	-57.6
1.8	0.541	169.8	2.117	58.9	0.139	36.9	0.299	-58.9
1.9	0.550	166.7	2.014	56.6	0.142	37.5	0.289	-60.3
2.0	0.557	163.4	1.924	53.6	0.146	38.0	0.278	-61.9
2.1	0.562	160.4	1.843	50.9	0.149	38.7	0.266	-63.6
2.2	0.563	157.5	1.768	48.2	0.152	39.5	0.255	-65.2
2.3	0.569	154.9	1.696	45.9	0.156	39.8	0.243	-66.9
2.4	0.573	152.2	1.636	43.5	0.161	40.5	0.232	-68.7
2.5	0.582	149.4	1.575	41.1	0.166	40.8	0.221	-71.1
2.6	0.589	147.1	1.523	38.9	0.170	40.8	0.212	-73.7
2.7	0.595	144.4	1.468	36.5	0.175	41.1	0.200	-76.7
2.8	0.604	142.2	1.416	34.9	0.179	41.7	0.194	-79.0
2.9	0.607	140.3	1.375	32.6	0.185	42.1	0.191	-82.9
3.0	0.608	138.1	1.351	30.5	0.192	42.5	0.187	-89.0
4.0	0.678	118.7	1.058	10.9	0.262	37.4	0.218	-152.9
5.0	0.739	106.7	0.819	-4.2	0.335	27.9	0.296	164.9

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

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.794	-33.7	14.674	157.5	0.029	74.0	0.932	-16.5
0.2	0.707	-62.6	12.256	138.8	0.050	60.3	0.808	-29.2
0.3	0.633	-85.0	10.338	125.5	0.062	52.7	0.683	-37.3
0.4	0.583	-103.7	8.642	115.1	0.071	48.3	0.582	-42.4
0.5	0.547	-117.9	7.349	107.3	0.078	45.7	0.506	-45.5
0.6	0.523	-130.1	6.347	100.5	0.083	44.2	0.448	-47.4
0.7	0.511	-140.2	5.602	95.2	0.088	43.7	0.403	-48.7
0.8	0.499	-148.4	4.998	90.7	0.092	43.6	0.368	-49.6
0.9	0.497	-155.8	4.493	86.4	0.097	43.9	0.340	-50.8
1.0	0.491	-162.9	4.098	82.4	0.101	44.2	0.317	-51.6
1.1	0.492	-168.9	3.739	78.9	0.106	44.4	0.297	-52.7
1.2	0.494	-173.8	3.474	75.5	0.110	44.8	0.281	-53.4
1.3	0.498	-178.9	3.207	72.1	0.115	45.1	0.266	-54.8
1.4	0.499	176.9	2.997	69.1	0.120	45.5	0.254	-55.9
1.5	0.504	172.8	2.813	66.2	0.125	45.6	0.242	-57.1
1.6	0.508	169.0	2.647	63.3	0.130	45.8	0.231	-58.4
1.7	0.513	165.8	2.490	60.5	0.135	46.2	0.220	-59.8
1.8	0.518	162.7	2.355	57.8	0.141	46.2	0.210	-61.2
1.9	0.526	159.8	2.242	55.6	0.146	46.3	0.200	-62.7
2.0	0.535	157.1	2.139	52.9	0.152	46.4	0.190	-64.3
2.1	0.539	154.6	2.044	50.3	0.157	46.5	0.179	-66.1
2.2	0.540	152.1	1.960	47.9	0.162	46.6	0.167	-67.8
2.3	0.546	149.8	1.875	45.7	0.168	46.5	0.156	-69.6
2.4	0.554	147.6	1.808	43.5	0.174	46.5	0.144	-71.3
2.5	0.564	145.2	1.739	41.2	0.180	46.0	0.133	-73.9
2.6	0.570	143.0	1.675	39.2	0.186	45.7	0.124	-77.1
2.7	0.580	140.8	1.619	36.9	0.192	45.4	0.112	-80.5
2.8	0.588	138.5	1.559	35.3	0.196	45.3	0.106	-83.5
2.9	0.591	137.0	1.514	33.2	0.202	45.3	0.105	-88.9
3.0	0.592	135.2	1.489	31.3	0.211	45.1	0.103	-98.5
4.0	0.664	116.8	1.165	12.3	0.279	36.5	0.171	-175.2
5.0	0.728	106.1	0.910	-2.7	0.342	26.2	0.263	149.6

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

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.707	-42.6	18.487	153.0	0.027	71.3	0.900	-20.5
0.2	0.627	-74.9	14.621	132.8	0.045	58.3	0.737	-34.6
0.3	0.561	-98.7	11.775	119.5	0.055	51.8	0.598	-42.3
0.4	0.526	-116.9	9.576	109.6	0.062	49.2	0.497	-46.6
0.5	0.500	-130.8	7.985	102.5	0.068	48.2	0.426	-48.8
0.6	0.486	-141.8	6.820	96.6	0.074	47.9	0.373	-50.1
0.7	0.481	-151.4	5.965	91.7	0.079	48.3	0.333	-50.9
0.8	0.475	-158.5	5.304	87.5	0.084	49.0	0.303	-51.4
0.9	0.476	-165.0	4.753	83.6	0.090	49.4	0.279	-52.3
1.0	0.474	-171.2	4.316	79.9	0.095	50.0	0.260	-52.9
1.1	0.478	-176.3	3.936	76.7	0.101	50.4	0.243	-53.9
1.2	0.481	179.5	3.655	73.7	0.107	50.6	0.228	-54.6
1.3	0.484	175.0	3.361	70.5	0.113	50.8	0.215	-55.9
1.4	0.488	171.0	3.141	67.6	0.119	51.0	0.204	-57.2
1.5	0.494	167.7	2.943	65.0	0.125	51.0	0.194	-58.4
1.6	0.500	164.6	2.764	62.4	0.131	50.8	0.184	-59.8
1.7	0.505	161.4	2.602	59.6	0.137	50.9	0.174	-61.3
1.8	0.511	158.7	2.460	57.0	0.143	50.6	0.164	-62.8
1.9	0.519	155.9	2.343	54.7	0.149	50.5	0.155	-64.5
2.0	0.527	153.6	2.230	52.3	0.156	50.1	0.144	-66.1
2.1	0.532	151.4	2.132	49.8	0.162	50.1	0.134	-68.1
2.2	0.535	149.0	2.038	47.6	0.169	49.8	0.123	-70.0
2.3	0.542	147.2	1.954	45.4	0.175	49.4	0.112	-72.3
2.4	0.548	145.0	1.881	43.3	0.181	49.0	0.101	-74.6
2.5	0.557	143.0	1.811	40.9	0.188	48.4	0.090	-78.3
2.6	0.563	140.9	1.744	39.0	0.194	47.7	0.080	-82.6
2.7	0.573	138.9	1.687	36.9	0.200	47.2	0.069	-88.4
2.8	0.581	136.6	1.622	35.4	0.205	46.8	0.063	-92.9
2.9	0.586	135.3	1.575	33.3	0.212	46.6	0.062	-101.0
3.0	0.585	133.5	1.544	31.5	0.220	46.2	0.064	-115.1
4.0	0.660	116.0	1.209	13.0	0.287	36.1	0.165	169.6
5.0	0.726	105.7	0.946	-1.9	0.346	25.4	0.259	140.4

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

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.623	-55.0	22.578	147.4	0.025	68.3	0.853	-25.2
0.2	0.548	-90.2	16.658	126.3	0.039	57.8	0.653	-40.0
0.3	0.508	-114.2	12.865	113.5	0.047	52.8	0.509	-46.9
0.4	0.482	-131.8	10.207	104.7	0.054	51.6	0.414	-50.0
0.5	0.470	-143.3	8.403	98.3	0.060	52.0	0.351	-51.2
0.6	0.461	-153.7	7.120	92.9	0.067	52.9	0.305	-51.8
0.7	0.463	-161.7	6.195	88.4	0.073	53.7	0.272	-52.0
0.8	0.464	-167.8	5.471	84.7	0.079	54.4	0.247	-52.3
0.9	0.468	-173.1	4.898	81.2	0.086	55.1	0.226	-52.8
1.0	0.469	-178.5	4.436	77.8	0.092	55.6	0.211	-53.3
1.1	0.474	177.0	4.038	74.8	0.099	55.7	0.196	-54.3
1.2	0.478	173.6	3.744	72.0	0.106	55.7	0.184	-55.4
1.3	0.484	169.4	3.445	69.1	0.112	55.7	0.173	-56.7
1.4	0.486	166.3	3.213	66.3	0.120	55.6	0.163	-58.2
1.5	0.492	163.0	3.008	63.8	0.126	55.3	0.154	-59.5
1.6	0.500	160.3	2.825	61.2	0.133	54.8	0.144	-61.1
1.7	0.502	157.7	2.659	58.6	0.140	54.5	0.136	-62.9
1.8	0.510	154.8	2.513	56.1	0.147	54.0	0.126	-64.6
1.9	0.521	152.7	2.394	54.1	0.154	53.6	0.118	-66.6
2.0	0.528	150.3	2.276	51.6	0.161	52.9	0.108	-69.0
2.1	0.533	148.6	2.176	49.3	0.168	52.6	0.097	-71.5
2.2	0.535	146.5	2.079	47.0	0.174	52.1	0.086	-74.1
2.3	0.540	144.6	1.991	44.9	0.180	51.5	0.075	-76.9
2.4	0.544	142.5	1.915	42.8	0.187	50.9	0.064	-79.9
2.5	0.555	140.7	1.840	40.7	0.194	50.1	0.053	-85.9
2.6	0.562	139.2	1.775	38.7	0.201	49.3	0.045	-93.6
2.7	0.576	136.9	1.713	36.5	0.208	48.5	0.035	-106.3
2.8	0.581	135.0	1.647	35.2	0.212	48.1	0.030	-116.5
2.9	0.586	133.5	1.598	33.1	0.219	47.7	0.034	-128.4
3.0	0.588	131.8	1.572	31.3	0.227	47.1	0.043	-146.5
4.0	0.662	115.0	1.230	13.3	0.294	35.9	0.171	157.4
5.0	0.726	105.0	0.962	-1.5	0.350	24.8	0.266	133.0

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

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.492	-93.1	26.310	132.9	0.022	65.0	0.680	-36.6
0.2	0.497	-130.6	16.771	112.7	0.032	55.4	0.448	-49.0
0.3	0.496	-149.0	12.083	102.3	0.038	56.3	0.331	-51.9
0.4	0.500	-159.9	9.276	95.3	0.045	57.8	0.266	-51.8
0.5	0.500	-167.8	7.501	90.4	0.052	60.2	0.225	-51.0
0.6	0.502	-174.3	6.294	85.9	0.060	61.1	0.197	-50.1
0.7	0.508	-179.5	5.452	82.2	0.067	62.1	0.176	-49.4
0.8	0.513	176.6	4.796	78.9	0.075	62.4	0.161	-49.1
0.9	0.519	173.0	4.274	75.7	0.083	62.8	0.148	-49.6
1.0	0.523	168.9	3.871	72.7	0.091	62.8	0.138	-50.2
1.1	0.528	165.8	3.519	70.1	0.098	62.6	0.128	-51.5
1.2	0.534	163.0	3.255	67.3	0.106	62.1	0.120	-52.8
1.3	0.536	160.0	2.995	64.6	0.114	61.5	0.112	-55.0
1.4	0.541	157.5	2.794	61.9	0.122	61.1	0.105	-57.0
1.5	0.546	155.3	2.610	59.5	0.129	60.4	0.098	-59.3
1.6	0.555	152.8	2.452	57.1	0.137	59.6	0.090	-61.8
1.7	0.559	150.4	2.306	54.5	0.145	59.0	0.083	-64.8
1.8	0.563	148.4	2.178	52.1	0.152	58.1	0.075	-67.9
1.9	0.572	146.5	2.075	50.1	0.159	57.3	0.068	-71.7
2.0	0.578	144.5	1.976	47.8	0.167	56.4	0.059	-76.5
2.1	0.586	142.7	1.886	45.4	0.175	55.7	0.050	-82.5
2.2	0.586	140.9	1.800	43.2	0.181	55.0	0.041	-89.4
2.3	0.589	139.2	1.721	41.1	0.188	54.1	0.032	-100.5
2.4	0.596	137.6	1.662	39.2	0.196	53.3	0.025	-116.5
2.5	0.605	136.0	1.599	37.0	0.204	52.3	0.022	-144.4
2.6	0.614	134.0	1.541	34.9	0.211	51.2	0.025	-170.5
2.7	0.620	132.3	1.485	32.8	0.218	50.3	0.033	166.9
2.8	0.631	130.5	1.429	31.4	0.223	49.6	0.038	156.5
2.9	0.632	129.3	1.386	29.5	0.229	49.1	0.045	160.1
3.0	0.634	127.5	1.362	27.7	0.238	48.3	0.060	161.9
4.0	0.698	111.4	1.067	10.2	0.305	35.8	0.201	146.0
5.0	0.752	102.0	0.835	-3.0	0.359	24.1	0.296	126.2

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

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.962	-14.2	3.723	170.2	0.026	87.3	0.993	-4.6
0.2	0.939	-27.2	3.502	159.6	0.050	73.9	0.976	-9.4
0.3	0.910	-40.1	3.395	150.7	0.071	66.7	0.947	-13.6
0.4	0.875	-52.9	3.230	141.7	0.091	59.9	0.916	-17.6
0.5	0.841	-64.4	3.057	133.5	0.107	53.9	0.883	-21.1
0.6	0.807	-75.7	2.887	125.5	0.119	48.4	0.846	-24.1
0.7	0.773	-86.1	2.721	118.8	0.129	43.4	0.812	-26.9
0.8	0.744	-96.0	2.565	112.4	0.136	39.1	0.781	-29.3
0.9	0.721	-105.2	2.413	106.3	0.142	35.3	0.750	-31.6
1.0	0.695	-114.1	2.280	100.4	0.146	32.0	0.725	-33.7
1.1	0.678	-122.6	2.147	95.1	0.148	28.9	0.700	-35.5
1.2	0.667	-130.3	2.038	90.3	0.149	26.3	0.679	-37.1
1.3	0.652	-137.8	1.918	85.4	0.149	23.9	0.661	-39.0
1.4	0.643	-144.4	1.818	81.0	0.149	22.1	0.645	-40.6
1.5	0.640	-150.6	1.730	76.9	0.147	20.6	0.630	-42.2
1.6	0.635	-156.9	1.647	72.8	0.145	19.3	0.616	-43.8
1.7	0.634	-162.4	1.565	68.9	0.143	18.6	0.605	-45.4
1.8	0.631	-168.0	1.493	65.1	0.141	18.1	0.596	-46.9
1.9	0.633	-172.9	1.432	62.0	0.138	18.0	0.586	-48.4
2.0	0.636	-177.6	1.377	58.7	0.135	18.5	0.576	-50.1
2.1	0.637	178.1	1.326	55.4	0.132	19.4	0.566	-51.6
2.2	0.635	174.1	1.276	52.2	0.129	20.7	0.557	-53.4
2.3	0.638	170.1	1.232	49.5	0.126	21.9	0.547	-55.2
2.4	0.640	166.5	1.193	47.0	0.124	23.9	0.539	-57.0
2.5	0.646	163.1	1.152	44.0	0.123	25.8	0.530	-59.1
2.6	0.650	159.4	1.118	41.6	0.122	27.7	0.523	-61.8
2.7	0.654	156.0	1.083	38.7	0.122	30.0	0.512	-64.5
2.8	0.657	153.1	1.045	36.8	0.121	32.5	0.505	-66.7
2.9	0.661	150.5	1.010	34.4	0.122	35.7	0.497	-69.0
3.0	0.662	147.6	0.996	32.3	0.127	39.3	0.493	-72.9
4.0	0.721	122.9	0.782	12.3	0.211	49.9	0.473	-116.9
5.0	0.765	107.9	0.607	-0.4	0.325	39.7	0.482	-161.4

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

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.882	-23.1	9.881	164.5	0.025	78.8	0.973	-9.3
0.2	0.815	-43.4	8.864	149.6	0.045	67.7	0.912	-17.7
0.3	0.760	-61.0	8.053	137.7	0.061	59.5	0.835	-24.2
0.4	0.697	-77.7	7.164	127.2	0.073	53.0	0.760	-28.9
0.5	0.649	-91.8	6.358	118.5	0.081	48.5	0.694	-32.3
0.6	0.609	-104.3	5.687	111.1	0.087	44.8	0.637	-34.7
0.7	0.578	-115.4	5.111	104.9	0.092	42.4	0.590	-36.4
0.8	0.553	-125.2	4.647	99.5	0.096	40.8	0.553	-37.6
0.9	0.538	-134.0	4.229	94.6	0.099	39.7	0.521	-39.0
1.0	0.522	-142.3	3.899	90.0	0.102	39.2	0.496	-40.1
1.1	0.514	-149.7	3.590	85.9	0.104	38.7	0.473	-41.1
1.2	0.514	-156.1	3.347	82.1	0.107	38.6	0.454	-42.1
1.3	0.506	-162.4	3.104	78.2	0.109	38.6	0.437	-43.2
1.4	0.505	-167.9	2.910	74.8	0.112	38.9	0.423	-44.2
1.5	0.507	-172.8	2.736	71.7	0.114	39.2	0.410	-45.2
1.6	0.511	-177.8	2.581	68.5	0.117	39.7	0.400	-46.3
1.7	0.510	178.0	2.435	65.3	0.120	40.5	0.390	-47.4
1.8	0.515	173.7	2.308	62.3	0.123	41.0	0.380	-48.4
1.9	0.521	170.0	2.202	59.8	0.126	41.9	0.370	-49.5
2.0	0.529	166.5	2.102	57.0	0.130	42.5	0.360	-50.7
2.1	0.534	163.4	2.016	54.3	0.133	43.4	0.350	-51.8
2.2	0.533	160.8	1.930	51.6	0.137	44.3	0.340	-53.0
2.3	0.539	157.7	1.855	49.3	0.140	44.9	0.329	-54.3
2.4	0.544	154.9	1.791	47.1	0.144	45.7	0.319	-55.6
2.5	0.553	152.2	1.726	44.6	0.149	46.1	0.309	-57.4
2.6	0.560	149.6	1.669	42.5	0.154	46.2	0.299	-59.4
2.7	0.568	146.9	1.614	40.0	0.159	46.6	0.287	-61.6
2.8	0.576	144.4	1.550	38.3	0.163	47.0	0.279	-63.0
2.9	0.577	142.3	1.500	36.2	0.168	47.6	0.274	-65.0
3.0	0.579	140.3	1.476	34.2	0.176	48.3	0.268	-69.3
4.0	0.653	120.2	1.162	14.1	0.248	43.8	0.242	-122.3
5.0	0.722	108.4	0.903	-1.6	0.330	34.1	0.276	-170.6

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

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.800	-30.2	14.860	159.6	0.023	78.3	0.948	-13.3
0.2	0.719	-55.6	12.667	142.0	0.041	63.9	0.845	-23.7
0.3	0.646	-76.5	10.888	129.0	0.053	56.5	0.737	-30.5
0.4	0.585	-94.7	9.233	118.6	0.061	51.6	0.646	-34.6
0.5	0.540	-108.8	7.932	110.6	0.067	49.0	0.575	-37.1
0.6	0.508	-121.5	6.914	103.8	0.072	47.3	0.520	-38.4
0.7	0.489	-132.4	6.127	98.3	0.077	46.9	0.478	-39.2
0.8	0.474	-141.1	5.470	93.5	0.081	46.6	0.444	-39.9
0.9	0.467	-149.0	4.937	89.4	0.085	47.0	0.418	-40.7
1.0	0.460	-156.6	4.503	85.3	0.090	47.2	0.397	-41.2
1.1	0.458	-163.1	4.127	81.7	0.093	47.6	0.378	-41.8
1.2	0.461	-168.2	3.834	78.6	0.097	48.0	0.362	-42.3
1.3	0.460	-173.7	3.539	75.2	0.102	48.3	0.349	-43.3
1.4	0.461	-178.3	3.310	72.1	0.107	48.9	0.337	-44.1
1.5	0.465	177.5	3.105	69.3	0.111	49.3	0.327	-44.9
1.6	0.473	173.4	2.923	66.4	0.116	49.5	0.316	-45.9
1.7	0.476	169.8	2.750	63.6	0.121	49.9	0.307	-46.8
1.8	0.479	166.0	2.606	60.9	0.125	50.0	0.298	-47.7
1.9	0.487	163.0	2.481	58.7	0.130	50.3	0.289	-48.8
2.0	0.498	160.3	2.367	56.1	0.136	50.5	0.279	-49.8
2.1	0.500	157.6	2.267	53.6	0.141	50.8	0.269	-50.8
2.2	0.502	155.2	2.167	51.1	0.146	51.1	0.259	-51.8
2.3	0.509	152.6	2.079	49.0	0.151	50.9	0.249	-52.9
2.4	0.513	150.2	2.003	46.9	0.157	51.1	0.238	-53.8
2.5	0.525	148.0	1.930	44.6	0.163	50.9	0.227	-55.4
2.6	0.530	145.7	1.864	42.6	0.169	50.5	0.217	-57.1
2.7	0.542	143.4	1.799	40.3	0.175	50.2	0.204	-59.0
2.8	0.548	141.0	1.731	38.7	0.179	50.0	0.196	-59.9
2.9	0.553	139.1	1.673	36.7	0.185	50.2	0.192	-62.0
3.0	0.555	137.1	1.647	34.9	0.193	50.2	0.186	-67.3
4.0	0.633	119.2	1.298	15.6	0.263	42.3	0.163	-133.3
5.0	0.707	108.2	1.015	-0.2	0.334	32.0	0.215	175.8

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

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.737	-37.2	18.771	155.7	0.021	75.9	0.923	-16.3
0.2	0.636	-65.9	15.282	136.3	0.038	61.9	0.788	-27.9
0.3	0.566	-88.5	12.620	123.2	0.047	55.7	0.663	-34.2
0.4	0.514	-106.9	10.402	113.1	0.054	52.4	0.570	-37.5
0.5	0.478	-121.1	8.752	105.8	0.060	51.2	0.501	-39.0
0.6	0.457	-132.7	7.530	99.6	0.064	50.7	0.451	-39.6
0.7	0.444	-143.1	6.610	94.7	0.070	51.2	0.414	-39.9
0.8	0.436	-151.0	5.887	90.3	0.074	51.6	0.385	-40.0
0.9	0.436	-158.1	5.283	86.4	0.079	52.3	0.362	-40.4
1.0	0.433	-165.3	4.810	82.8	0.085	52.9	0.345	-40.8
1.1	0.436	-170.7	4.387	79.7	0.090	53.2	0.328	-41.3
1.2	0.440	-175.4	4.067	76.6	0.095	53.6	0.315	-41.7
1.3	0.441	179.8	3.751	73.4	0.100	53.8	0.303	-42.5
1.4	0.444	175.6	3.504	70.6	0.106	54.3	0.293	-43.4
1.5	0.448	171.9	3.285	68.0	0.111	54.3	0.284	-44.2
1.6	0.453	168.5	3.085	65.4	0.117	54.3	0.274	-45.0
1.7	0.459	165.1	2.903	62.7	0.122	54.4	0.265	-46.0
1.8	0.464	162.1	2.749	60.1	0.129	54.3	0.256	-46.9
1.9	0.474	159.2	2.614	58.1	0.134	54.2	0.248	-47.8
2.0	0.481	156.6	2.493	55.7	0.140	54.0	0.238	-48.8
2.1	0.483	154.5	2.384	53.3	0.146	54.0	0.228	-49.7
2.2	0.489	152.0	2.283	50.9	0.152	54.0	0.219	-50.6
2.3	0.496	149.8	2.187	48.8	0.158	53.7	0.208	-51.4
2.4	0.502	147.7	2.107	46.8	0.164	53.4	0.198	-52.2
2.5	0.512	145.8	2.029	44.5	0.170	52.9	0.186	-53.7
2.6	0.519	143.6	1.959	42.4	0.177	52.4	0.176	-55.1
2.7	0.529	141.4	1.891	40.3	0.183	51.8	0.163	-56.5
2.8	0.539	139.1	1.815	38.8	0.188	51.4	0.155	-57.3
2.9	0.541	137.4	1.757	36.9	0.193	51.3	0.152	-59.4
3.0	0.543	135.4	1.728	35.1	0.202	51.2	0.145	-65.5
4.0	0.622	118.1	1.357	16.1	0.271	41.8	0.130	-144.4
5.0	0.700	107.9	1.065	0.6	0.337	31.0	0.196	165.3

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

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.650	-46.0	23.297	150.8	0.021	71.7	0.887	-19.9
0.2	0.547	-78.8	17.877	130.2	0.034	60.3	0.717	-32.0
0.3	0.486	-102.8	14.123	117.3	0.041	56.0	0.584	-37.3
0.4	0.453	-120.8	11.343	108.0	0.048	54.7	0.494	-39.3
0.5	0.434	-134.1	9.390	101.4	0.053	55.2	0.434	-39.7
0.6	0.420	-144.5	8.003	95.8	0.059	55.5	0.390	-39.5
0.7	0.416	-153.8	6.986	91.4	0.064	56.4	0.358	-39.3
0.8	0.414	-160.8	6.182	87.5	0.070	57.0	0.335	-39.1
0.9	0.418	-166.8	5.541	84.0	0.076	57.7	0.316	-39.2
1.0	0.415	-173.0	5.021	80.7	0.082	58.2	0.301	-39.4
1.1	0.419	-178.0	4.574	77.7	0.088	58.4	0.288	-39.9
1.2	0.426	178.1	4.233	74.8	0.094	58.5	0.276	-40.2
1.3	0.428	173.5	3.905	71.9	0.100	58.6	0.265	-41.1
1.4	0.431	170.1	3.646	69.2	0.106	58.7	0.257	-41.9
1.5	0.436	166.8	3.413	66.8	0.112	58.6	0.248	-42.8
1.6	0.444	163.6	3.209	64.2	0.119	58.2	0.239	-43.6
1.7	0.450	161.0	3.016	61.8	0.125	58.1	0.231	-44.5
1.8	0.455	158.0	2.853	59.3	0.132	57.6	0.223	-45.3
1.9	0.464	155.4	2.713	57.4	0.137	57.3	0.214	-46.2
2.0	0.471	153.5	2.587	55.1	0.144	56.9	0.205	-47.2
2.1	0.477	151.7	2.470	52.7	0.150	56.6	0.196	-48.0
2.2	0.480	149.4	2.366	50.6	0.157	56.4	0.187	-48.8
2.3	0.489	147.6	2.266	48.6	0.163	55.7	0.176	-49.4
2.4	0.491	145.5	2.181	46.5	0.170	55.3	0.165	-49.8
2.5	0.506	143.7	2.101	44.4	0.177	54.5	0.154	-51.2
2.6	0.512	141.7	2.028	42.4	0.183	53.6	0.144	-52.4
2.7	0.523	139.6	1.954	40.3	0.190	53.1	0.131	-53.5
2.8	0.534	137.7	1.879	38.8	0.194	52.4	0.123	-53.4
2.9	0.535	135.8	1.814	36.9	0.200	52.2	0.119	-56.0
3.0	0.537	134.2	1.787	35.4	0.208	51.8	0.112	-63.1
4.0	0.619	117.6	1.405	16.7	0.277	41.4	0.111	-157.8
5.0	0.695	107.7	1.104	1.1	0.340	30.4	0.188	155.6

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

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.483	-73.0	30.821	140.3	0.016	68.2	0.790	-26.5
0.2	0.427	-110.7	20.881	119.0	0.026	60.1	0.577	-36.5
0.3	0.405	-132.9	15.398	107.6	0.032	60.4	0.456	-38.3
0.4	0.404	-146.7	11.950	100.1	0.039	61.9	0.387	-37.6
0.5	0.401	-157.0	9.728	94.7	0.045	63.4	0.345	-36.2
0.6	0.401	-164.9	8.188	90.1	0.052	64.4	0.316	-34.9
0.7	0.404	-171.4	7.102	86.4	0.058	65.2	0.296	-34.0
0.8	0.409	-175.9	6.255	83.2	0.065	65.8	0.280	-33.3
0.9	0.415	179.4	5.582	80.1	0.072	66.0	0.268	-33.4
1.0	0.420	174.6	5.059	77.1	0.079	65.9	0.258	-33.5
1.1	0.424	171.2	4.607	74.4	0.086	65.9	0.249	-34.1
1.2	0.432	168.3	4.249	72.0	0.093	65.5	0.240	-34.6
1.3	0.435	164.9	3.915	69.3	0.099	65.0	0.232	-35.7
1.4	0.441	162.0	3.648	66.8	0.107	64.7	0.225	-36.7
1.5	0.445	159.4	3.414	64.5	0.114	64.1	0.218	-37.6
1.6	0.454	157.0	3.208	62.1	0.120	63.3	0.211	-38.6
1.7	0.459	154.4	3.015	59.8	0.127	62.9	0.204	-39.7
1.8	0.465	152.4	2.851	57.4	0.134	62.1	0.196	-40.5
1.9	0.473	150.3	2.707	55.5	0.141	61.5	0.188	-41.5
2.0	0.482	148.4	2.579	53.3	0.148	60.7	0.179	-42.4
2.1	0.487	146.8	2.464	51.1	0.154	60.2	0.170	-43.2
2.2	0.489	145.2	2.358	48.9	0.161	59.7	0.161	-43.7
2.3	0.496	143.5	2.256	47.0	0.168	58.8	0.151	-44.0
2.4	0.502	141.5	2.171	45.1	0.175	58.2	0.141	-44.0
2.5	0.512	140.4	2.090	43.0	0.182	57.3	0.131	-44.8
2.6	0.521	138.6	2.018	41.2	0.189	56.3	0.120	-45.7
2.7	0.532	136.7	1.940	39.1	0.195	55.5	0.108	-46.0
2.8	0.541	134.8	1.869	37.7	0.200	54.7	0.101	-45.6
2.9	0.547	133.2	1.807	35.9	0.206	54.3	0.098	-48.0
3.0	0.545	131.8	1.778	34.3	0.215	53.9	0.090	-57.1
4.0	0.630	116.0	1.398	16.1	0.284	42.1	0.098	-170.6
5.0	0.703	106.7	1.096	0.7	0.345	30.5	0.185	147.9

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

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.958	-13.2	3.727	170.6	0.024	83.0	0.994	-4.2
0.2	0.938	-26.3	3.502	160.3	0.045	74.3	0.979	-8.5
0.3	0.912	-38.6	3.402	151.8	0.065	67.6	0.954	-12.4
0.4	0.881	-51.2	3.247	142.9	0.082	61.1	0.925	-16.0
0.5	0.849	-62.5	3.079	134.9	0.097	55.4	0.894	-19.2
0.6	0.812	-73.5	2.918	127.1	0.109	49.7	0.861	-22.0
0.7	0.779	-83.9	2.760	120.4	0.118	45.0	0.830	-24.6
0.8	0.747	-93.4	2.604	114.0	0.125	40.5	0.801	-26.8
0.9	0.724	-102.7	2.453	108.2	0.130	36.9	0.773	-29.1
1.0	0.698	-111.5	2.326	102.2	0.134	33.7	0.750	-31.0
1.1	0.680	-120.1	2.192	97.0	0.136	30.7	0.727	-32.8
1.2	0.670	-127.7	2.084	92.3	0.137	28.1	0.706	-34.3
1.3	0.651	-135.2	1.963	87.3	0.137	25.7	0.689	-36.0
1.4	0.642	-142.1	1.863	83.0	0.137	24.0	0.673	-37.7
1.5	0.637	-148.6	1.774	78.9	0.135	22.5	0.661	-39.2
1.6	0.633	-154.9	1.687	74.8	0.134	21.4	0.648	-40.7
1.7	0.631	-160.6	1.606	70.8	0.131	20.8	0.638	-42.1
1.8	0.625	-166.1	1.532	67.0	0.130	20.5	0.628	-43.5
1.9	0.630	-171.2	1.472	64.1	0.127	20.5	0.619	-45.0
2.0	0.632	-175.8	1.414	60.6	0.125	21.1	0.610	-46.5
2.1	0.633	179.6	1.359	57.3	0.121	22.1	0.598	-48.1
2.2	0.629	175.7	1.307	54.0	0.118	23.5	0.590	-49.7
2.3	0.632	171.5	1.260	51.5	0.115	24.8	0.578	-51.2
2.4	0.633	167.7	1.221	49.1	0.113	27.6	0.571	-52.5
2.5	0.640	164.0	1.185	46.3	0.113	29.8	0.565	-54.5
2.6	0.644	160.7	1.146	43.9	0.113	31.9	0.559	-56.8
2.7	0.647	157.2	1.111	41.1	0.114	34.3	0.548	-59.3
2.8	0.653	154.0	1.074	39.2	0.113	37.0	0.541	-61.5
2.9	0.652	151.3	1.035	36.8	0.114	40.7	0.535	-63.2
3.0	0.654	148.6	1.023	34.7	0.120	44.7	0.531	-67.0
4.0	0.715	123.6	0.809	14.5	0.206	54.4	0.501	-108.5
5.0	0.760	108.6	0.629	1.4	0.325	43.5	0.495	-151.9

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

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.877	-21.7	9.927	165.0	0.022	78.9	0.975	-8.4
0.2	0.821	-41.3	8.950	150.5	0.041	68.6	0.921	-16.0
0.3	0.765	-58.4	8.172	139.0	0.055	60.9	0.852	-21.9
0.4	0.702	-74.8	7.314	128.6	0.066	54.6	0.782	-26.2
0.5	0.653	-88.7	6.522	120.0	0.074	49.8	0.718	-29.3
0.6	0.607	-101.0	5.838	112.5	0.080	46.5	0.666	-31.4
0.7	0.575	-112.4	5.286	106.5	0.085	44.0	0.622	-33.0
0.8	0.550	-121.9	4.797	101.0	0.088	42.4	0.587	-34.3
0.9	0.533	-130.8	4.379	96.1	0.092	41.4	0.556	-35.4
1.0	0.515	-139.3	4.033	91.4	0.094	40.9	0.532	-36.4
1.1	0.505	-146.8	3.713	87.3	0.097	40.4	0.511	-37.3
1.2	0.502	-153.6	3.474	83.6	0.099	40.4	0.492	-38.2
1.3	0.495	-160.1	3.218	79.7	0.101	40.4	0.476	-39.3
1.4	0.494	-165.5	3.020	76.2	0.104	40.9	0.464	-40.2
1.5	0.497	-170.5	2.844	73.1	0.106	41.3	0.452	-41.1
1.6	0.496	-175.5	2.681	69.8	0.109	41.8	0.441	-42.2
1.7	0.500	-179.9	2.532	66.8	0.112	42.7	0.431	-43.1
1.8	0.501	175.4	2.401	63.8	0.115	43.2	0.423	-44.1
1.9	0.509	171.8	2.289	61.3	0.118	44.2	0.413	-45.1
2.0	0.515	168.0	2.184	58.6	0.121	45.0	0.404	-46.2
2.1	0.517	165.0	2.098	55.8	0.124	46.0	0.393	-47.4
2.2	0.519	162.1	2.007	53.2	0.127	46.8	0.383	-48.5
2.3	0.523	159.0	1.925	51.0	0.130	47.7	0.372	-49.3
2.4	0.527	156.2	1.855	48.9	0.135	48.7	0.364	-50.0
2.5	0.538	153.6	1.793	46.4	0.140	49.2	0.355	-51.6
2.6	0.545	151.0	1.739	44.2	0.145	49.5	0.346	-53.3
2.7	0.551	148.2	1.676	41.9	0.150	49.9	0.335	-55.1
2.8	0.561	145.5	1.612	40.2	0.154	50.2	0.327	-56.4
2.9	0.561	143.6	1.556	38.0	0.158	51.1	0.323	-57.7
3.0	0.564	141.1	1.536	36.1	0.167	52.0	0.319	-61.8
4.0	0.640	121.2	1.215	15.8	0.241	47.6	0.271	-108.5
5.0	0.712	109.1	0.948	-0.6	0.326	37.6	0.281	-156.2

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

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.800	-27.6	14.917	160.3	0.021	76.5	0.954	-11.8
0.2	0.721	-52.9	12.795	143.2	0.037	65.3	0.862	-21.3
0.3	0.648	-73.0	11.099	130.6	0.048	57.4	0.761	-27.4
0.4	0.586	-90.6	9.489	120.1	0.056	53.1	0.676	-31.1
0.5	0.540	-105.0	8.169	112.1	0.062	50.7	0.608	-33.3
0.6	0.505	-117.2	7.140	105.2	0.067	48.9	0.555	-34.6
0.7	0.481	-128.1	6.345	99.8	0.071	48.3	0.516	-35.1
0.8	0.463	-137.1	5.681	95.0	0.075	48.0	0.484	-35.6
0.9	0.457	-145.4	5.122	90.7	0.079	48.4	0.459	-36.3
1.0	0.446	-153.4	4.693	86.7	0.083	48.7	0.439	-36.8
1.1	0.443	-159.9	4.289	83.2	0.087	49.1	0.421	-37.4
1.2	0.446	-165.5	3.995	79.9	0.091	49.6	0.407	-37.9
1.3	0.443	-171.1	3.689	76.5	0.095	50.0	0.393	-38.7
1.4	0.444	-175.9	3.448	73.5	0.099	50.5	0.383	-39.5
1.5	0.448	179.6	3.237	70.8	0.103	51.0	0.373	-40.3
1.6	0.454	175.2	3.049	67.9	0.108	51.2	0.363	-41.1
1.7	0.456	171.8	2.866	65.1	0.113	51.8	0.354	-42.1
1.8	0.460	167.9	2.714	62.4	0.118	52.0	0.345	-43.0
1.9	0.470	164.8	2.587	60.2	0.122	52.3	0.337	-43.9
2.0	0.477	161.9	2.469	57.6	0.128	52.6	0.328	-45.0
2.1	0.482	159.1	2.364	55.1	0.132	52.9	0.318	-45.9
2.2	0.483	156.4	2.260	52.7	0.137	53.2	0.307	-46.8
2.3	0.489	153.8	2.164	50.6	0.142	53.4	0.296	-47.3
2.4	0.494	151.6	2.089	48.5	0.148	53.8	0.288	-47.8
2.5	0.505	149.4	2.014	46.4	0.154	53.5	0.278	-49.1
2.6	0.512	147.0	1.944	44.2	0.160	53.2	0.269	-50.5
2.7	0.523	144.7	1.882	41.9	0.165	53.0	0.257	-52.0
2.8	0.530	142.1	1.805	40.3	0.169	52.8	0.250	-52.7
2.9	0.533	140.6	1.746	38.4	0.175	53.1	0.247	-53.9
3.0	0.533	138.3	1.720	36.7	0.184	53.4	0.242	-58.8
4.0	0.616	120.1	1.360	17.1	0.255	45.7	0.189	-112.9
5.0	0.693	109.4	1.068	0.7	0.329	35.4	0.208	-165.8

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

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.730	-35.1	18.974	156.6	0.020	76.0	0.931	-14.6
0.2	0.643	-62.4	15.572	137.7	0.034	63.4	0.808	-25.0
0.3	0.567	-84.3	12.975	124.6	0.042	56.8	0.691	-30.7
0.4	0.514	-102.8	10.743	114.6	0.050	53.9	0.602	-33.5
0.5	0.473	-116.4	9.091	107.1	0.055	53.0	0.538	-34.7
0.6	0.448	-128.7	7.837	100.9	0.060	52.1	0.490	-35.2
0.7	0.434	-138.9	6.887	95.9	0.065	52.7	0.454	-35.3
0.8	0.421	-147.4	6.125	91.7	0.069	53.0	0.427	-35.4
0.9	0.420	-154.7	5.516	87.8	0.074	53.8	0.405	-35.7
1.0	0.413	-161.8	5.027	84.1	0.079	54.3	0.389	-36.0
1.1	0.415	-168.0	4.590	80.8	0.084	54.8	0.374	-36.4
1.2	0.419	-172.7	4.250	77.8	0.088	55.3	0.361	-36.8
1.3	0.419	-177.9	3.920	74.8	0.094	55.4	0.350	-37.6
1.4	0.422	177.8	3.662	71.8	0.099	55.8	0.340	-38.4
1.5	0.427	173.9	3.438	69.2	0.104	56.0	0.332	-39.1
1.6	0.431	170.0	3.228	66.6	0.110	56.1	0.322	-39.9
1.7	0.436	167.0	3.039	63.9	0.115	56.3	0.314	-40.9
1.8	0.444	163.6	2.879	61.4	0.120	56.3	0.306	-41.7
1.9	0.451	160.8	2.736	59.5	0.126	56.2	0.298	-42.6
2.0	0.458	158.3	2.612	57.0	0.132	56.2	0.289	-43.6
2.1	0.465	155.5	2.498	54.6	0.137	56.2	0.279	-44.4
2.2	0.466	153.3	2.389	52.3	0.143	56.2	0.269	-45.2
2.3	0.471	151.2	2.287	50.3	0.148	56.1	0.258	-45.5
2.4	0.476	148.9	2.203	48.4	0.154	56.0	0.249	-45.8
2.5	0.488	146.9	2.122	46.3	0.161	55.5	0.240	-47.0
2.6	0.497	144.9	2.050	44.3	0.167	55.0	0.231	-48.2
2.7	0.507	142.7	1.981	42.1	0.173	54.4	0.218	-49.4
2.8	0.517	140.3	1.903	40.4	0.178	54.0	0.211	-49.7
2.9	0.521	138.4	1.837	38.8	0.183	54.1	0.209	-51.0
3.0	0.520	136.7	1.813	37.0	0.192	54.2	0.203	-56.2
4.0	0.605	119.5	1.432	18.0	0.262	45.0	0.148	-117.8
5.0	0.684	109.3	1.126	1.5	0.332	34.3	0.178	-175.1

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

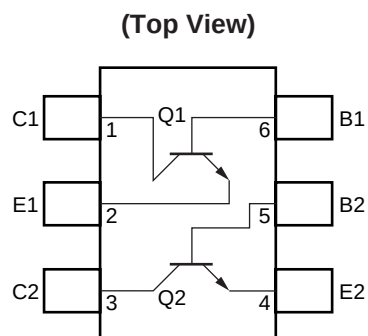
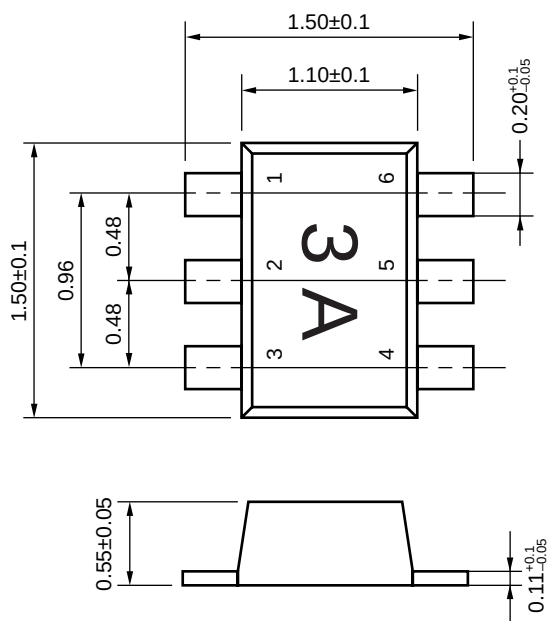
Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.666	-43.3	23.424	152.2	0.018	74.4	0.901	-17.7
0.2	0.557	-73.6	18.231	131.8	0.031	61.8	0.745	-28.4
0.3	0.490	-97.6	14.560	118.9	0.038	57.2	0.619	-33.2
0.4	0.448	-114.9	11.758	109.6	0.044	56.0	0.534	-34.8
0.5	0.421	-128.9	9.798	102.8	0.049	56.3	0.476	-35.1
0.6	0.405	-140.2	8.349	97.1	0.055	56.7	0.435	-34.8
0.7	0.398	-149.7	7.305	92.7	0.060	57.5	0.404	-34.4
0.8	0.393	-157.0	6.467	88.8	0.065	58.2	0.382	-34.1
0.9	0.394	-163.6	5.800	85.3	0.071	58.9	0.364	-34.3
1.0	0.394	-170.0	5.270	82.0	0.076	59.3	0.350	-34.4
1.1	0.397	-175.2	4.796	78.9	0.082	59.7	0.337	-34.8
1.2	0.402	-179.6	4.445	76.1	0.088	59.9	0.326	-35.3
1.3	0.403	-176.1	4.092	73.2	0.093	60.1	0.316	-36.1
1.4	0.407	-172.3	3.822	70.5	0.099	60.2	0.308	-36.8
1.5	0.413	-168.9	3.579	68.1	0.105	59.9	0.300	-37.6
1.6	0.418	-165.6	3.364	65.7	0.111	59.8	0.292	-38.4
1.7	0.424	-162.6	3.164	63.1	0.117	59.9	0.284	-39.3
1.8	0.430	-159.6	2.995	60.7	0.124	59.3	0.276	-40.2
1.9	0.443	-157.2	2.851	58.7	0.129	59.2	0.269	-41.0
2.0	0.447	-155.1	2.717	56.4	0.136	58.8	0.260	-41.9
2.1	0.451	-152.6	2.597	54.1	0.141	58.5	0.250	-42.6
2.2	0.454	-150.6	2.483	51.9	0.147	58.4	0.240	-43.4
2.3	0.462	-148.7	2.374	49.9	0.153	57.9	0.229	-43.4
2.4	0.467	-146.7	2.286	48.0	0.159	57.7	0.221	-43.5
2.5	0.479	-144.7	2.204	45.9	0.166	57.0	0.211	-44.5
2.6	0.486	-143.3	2.129	44.2	0.173	56.3	0.202	-45.6
2.7	0.500	-140.9	2.054	41.9	0.179	55.6	0.190	-46.4
2.8	0.509	-138.7	1.972	40.5	0.184	55.0	0.183	-46.4
2.9	0.512	-137.1	1.906	38.7	0.189	54.9	0.181	-47.8
3.0	0.511	-135.3	1.879	37.0	0.198	54.7	0.174	-53.4
4.0	0.597	-118.8	1.482	18.3	0.268	44.6	0.119	-123.7
5.0	0.679	-109.0	1.167	2.4	0.334	33.6	0.160	175.8

$V_{CE} = 3\text{ V}$, $I_C = 20\text{ mA}$, $Z_o = 50\ \Omega$

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.487	-65.5	31.757	142.0	0.016	70.7	0.816	-23.5
0.2	0.418	-102.6	21.845	120.8	0.025	62.0	0.617	-32.3
0.3	0.391	-126.1	16.273	109.2	0.030	61.6	0.501	-33.5
0.4	0.382	-141.3	12.682	101.5	0.036	62.9	0.435	-32.6
0.5	0.373	-151.6	10.339	96.0	0.042	64.2	0.395	-31.3
0.6	0.371	-160.8	8.714	91.4	0.048	65.2	0.368	-30.1
0.7	0.375	-168.1	7.572	87.6	0.054	66.1	0.348	-29.3
0.8	0.375	-173.4	6.671	84.3	0.060	66.7	0.334	-28.8
0.9	0.384	-177.8	5.957	81.3	0.067	67.0	0.322	-29.0
1.0	0.385	-177.2	5.400	78.4	0.074	67.0	0.313	-29.1
1.1	0.392	-173.5	4.906	75.6	0.080	66.9	0.303	-29.7
1.2	0.398	-170.3	4.529	73.2	0.086	66.7	0.295	-30.2
1.3	0.402	-166.6	4.182	70.6	0.093	66.3	0.288	-31.2
1.4	0.408	-163.9	3.894	68.1	0.100	66.1	0.281	-32.1
1.5	0.413	-161.0	3.648	65.9	0.106	65.6	0.275	-33.0
1.6	0.421	-158.3	3.426	63.6	0.112	65.1	0.268	-33.9
1.7	0.424	-156.0	3.223	61.2	0.119	64.5	0.261	-34.9
1.8	0.432	-153.7	3.048	58.9	0.126	63.8	0.254	-35.8
1.9	0.440	-151.5	2.897	57.1	0.132	63.4	0.247	-36.6
2.0	0.449	-149.7	2.760	54.9	0.139	62.7	0.239	-37.6
2.1	0.456	-147.9	2.641	52.7	0.145	62.1	0.229	-38.3
2.2	0.458	-146.2	2.523	50.5	0.151	61.7	0.220	-38.9
2.3	0.465	-144.6	2.410	48.7	0.157	61.0	0.210	-38.9
2.4	0.469	-142.9	2.320	46.9	0.164	60.6	0.202	-38.8
2.5	0.481	-141.5	2.238	44.9	0.171	59.6	0.193	-39.6
2.6	0.490	-140.1	2.157	43.2	0.179	58.5	0.184	-40.5
2.7	0.500	-138.1	2.083	41.2	0.185	57.7	0.171	-41.0
2.8	0.510	-136.1	1.999	39.8	0.189	57.0	0.165	-40.5
2.9	0.516	-134.5	1.933	38.0	0.195	56.7	0.163	-42.2
3.0	0.513	-133.0	1.907	36.4	0.204	56.3	0.154	-48.0
4.0	0.602	-117.6	1.504	18.1	0.273	45.0	0.096	-128.0
5.0	0.683	-108.1	1.184	2.0	0.337	33.9	0.146	168.3

PACKAGE DIMENSIONS

FLAT-LEAD 6-PIN THIN-TYPE ULTRA SUPER MINIMOLD (UNIT: mm)



PIN CONNECTIONS

1. Collector (Q1)
2. Emitter (Q1)
3. Collector (Q2)
4. Emitter (Q2)
5. Base (Q2)
6. Base (Q1)

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M8E 00.4-0110

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