

DATA SHEET

NEC

NPN SILICON RF TWIN TRANSISTOR μ PA842TC

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

FEATURES

- 2 different built-in transistors (2SC5436, 2SC5600)
 - Q1: Low noise transistor
 $NF = 1.3 \text{ dB TYP. @ } V_{CE} = 1 \text{ V, } I_C = 3 \text{ mA, } f = 2 \text{ GHz}$
 - Q2: Low phase distortion transistor suited for OSC applications
 $f_T = 5.0 \text{ GHz TYP., } |S_{21e}|^2 = 4.0 \text{ dB TYP. @ } V_{CE} = 1 \text{ V, } I_C = 5 \text{ mA, } f = 2 \text{ GHz}$
- Flat-lead 6-pin thin-type ultra super minimold package

BUILT-IN TRANSISTORS

	Q1	Q2
3-pin thin-type ultra super minimold part No.	2SC5436	2SC5600

ORDERING INFORMATION

Part Number	Quantity	Supplying Form
μ PA842TC	50 pcs (Non reel)	• 8 mm wide embossed taping
μ PA842TC-T1	3 kpcs/reel	• Pin 6 (Q1 Base), Pin 5 (Q2 Emitter), Pin 4 (Q2 Base) face the perforation side of the tape

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
		Q1	Q2	
Collector to Base Voltage	V _{CBO}	5	9	V
Collector to Emitter Voltage	V _{CEO}	3	5.5	V
Emitter to Base Voltage	V _{EBO}	2	1.5	V
Collector Current	I _C	30	100	mA
Total Power Dissipation	P _{tot} ^{Note}	90	200	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)

(1) Q1

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Collector Cut-off Current	I _{CBO}	V _{CB} = 5 V, I _E = 0 mA	–	–	100	nA
Emitter Cut-off Current	I _{EBO}	V _{BE} = 1 V, I _C = 0 mA	–	–	100	nA
DC Current Gain	h _{FE} ^{Note 1}	V _{CE} = 2 V, I _C = 20 mA	70	–	140	–
Gain Bandwidth Product (1)	f _T	V _{CE} = 1 V, I _C = 10 mA, f = 2 GHz	7.0	9.0	–	GHz
Gain Bandwidth Product (2)	f _T	V _{CE} = 2 V, I _C = 20 mA, f = 2 GHz	9.0	11	–	GHz
Insertion Power Gain (1)	S _{21e} ²	V _{CE} = 1 V, I _C = 10 mA, f = 2 GHz	6.0	7.5	–	dB
Insertion Power Gain (2)	S _{21e} ²	V _{CE} = 2 V, I _C = 20 mA, f = 2 GHz	7.0	8.5	–	dB
Noise Figure (1)	NF	V _{CE} = 1 V, I _C = 3 mA, f = 2 GHz, Z _S = Z _{opt}	–	1.3	2.0	dB
Noise Figure (2)	NF	V _{CE} = 2 V, I _C = 3 mA, f = 2 GHz, Z _S = Z _{opt}	–	1.3	2.0	dB
Reverse Transfer Capacitance	C _{re} ^{Note 2}	V _{CB} = 2 V, I _E = 0 mA, f = 1 MHz	–	0.4	0.8	pF

(2) Q2

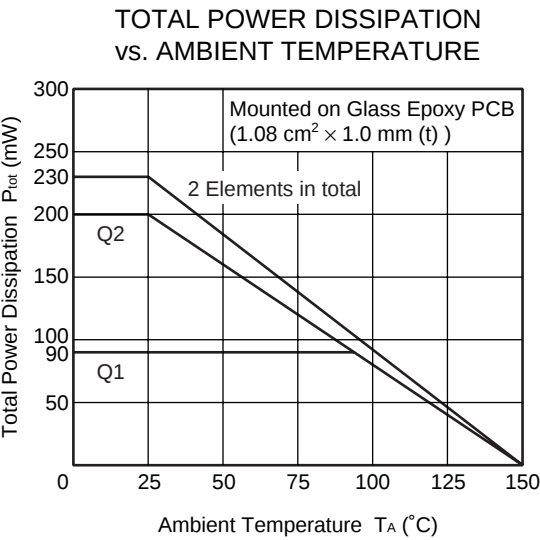
Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Collector Cut-off Current	I _{CBO}	V _{CB} = 5 V, I _E = 0 mA	–	–	600	nA
Emitter Cut-off Current	I _{EBO}	V _{BE} = 1 V, I _C = 0 mA	–	–	600	nA
DC Current Gain	h _{FE} ^{Note 1}	V _{CE} = 1 V, I _C = 5 mA	100	–	160	–
Gain Bandwidth Product (1)	f _T	V _{CE} = 1 V, I _C = 5 mA, f = 2 GHz	3.5	5.0	–	GHz
Gain Bandwidth Product (2)	f _T	V _{CE} = 1 V, I _C = 15 mA, f = 2 GHz	5.5	6.5	–	GHz
Insertion Power Gain (1)	S _{21e} ²	V _{CE} = 1 V, I _C = 5 mA, f = 2 GHz	3.5	4.0	–	dB
Insertion Power Gain (2)	S _{21e} ²	V _{CE} = 1 V, I _C = 15 mA, f = 2 GHz	4.5	5.5	–	dB
Noise Figure	NF	V _{CE} = 1 V, I _C = 5 mA, f = 2 GHz, Z _S = Z _{opt}	–	1.5	2.5	dB
Reverse Transfer Capacitance	C _{re} ^{Note 2}	V _{CB} = 0.5 V, I _E = 0 mA, f = 1 MHz	–	0.8	1.0	pF

- Notes 1.** Pulse measurement: PW ≤ 350 μs, Duty Cycle ≤ 2%
- 2.** Collector to base capacitance when the emitter grounded

h_{FE} CLASSIFICATION

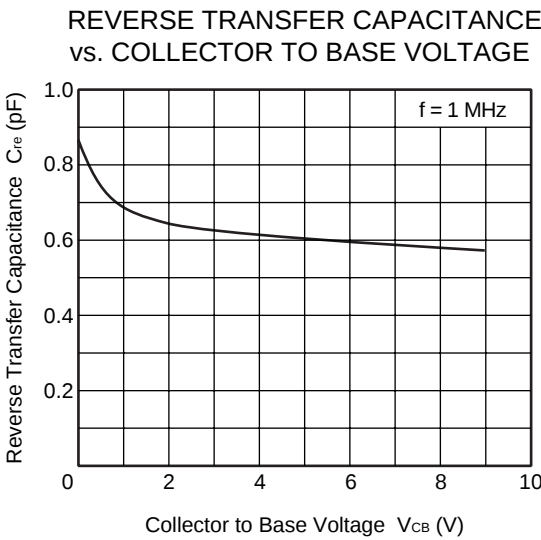
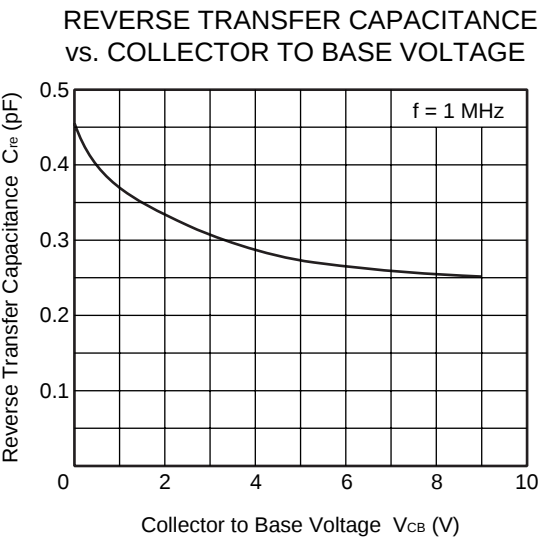
Rank	FB
Marking	2B
h _{FE} Value of Q1	70 to 140
h _{FE} Value of Q2	100 to 160

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



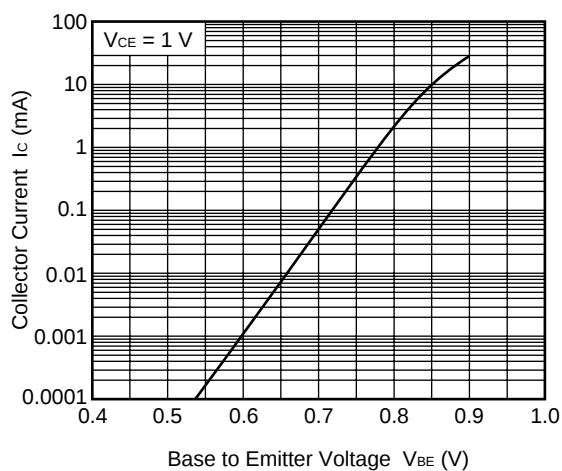
Q1

Q2



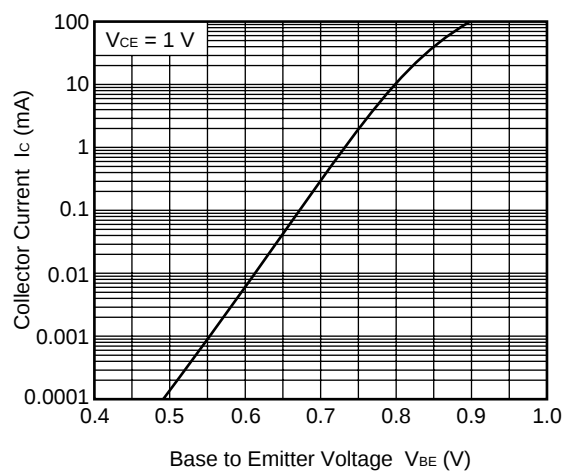
Q1

COLLECTOR CURRENT vs.
BASE TO EMITTER VOLTAGE

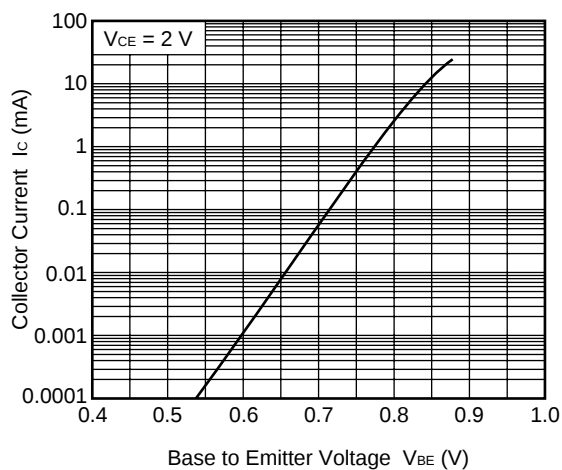


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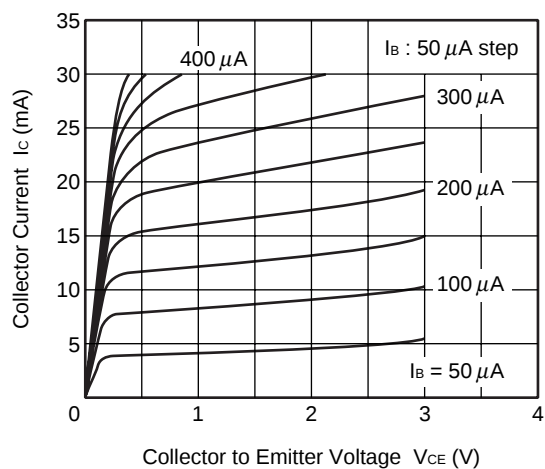
COLLECTOR CURRENT vs.
BASE TO EMITTER VOLTAGE



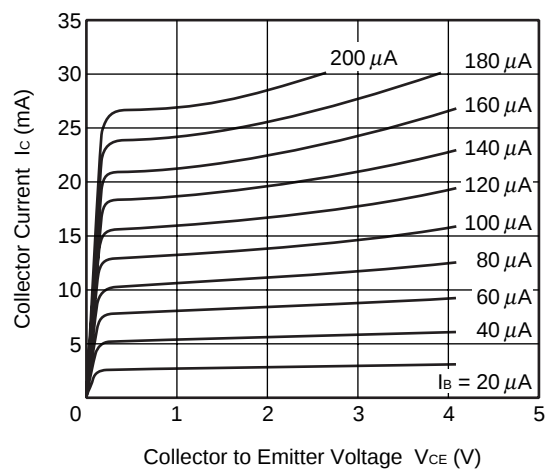
COLLECTOR CURRENT vs.
BASE TO EMITTER VOLTAGE



COLLECTOR CURRENT vs.
COLLECTOR TO EMITTER VOLTAGE

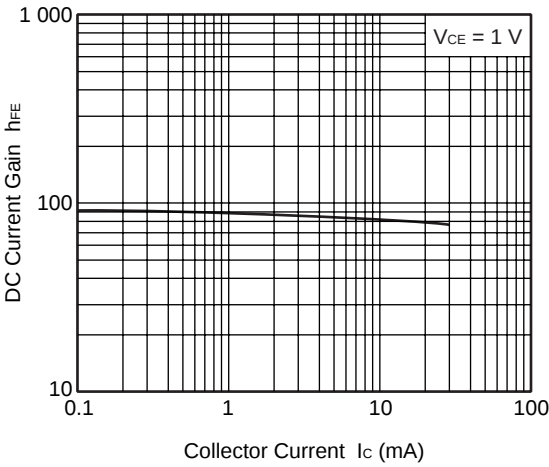


COLLECTOR CURRENT vs.
COLLECTOR TO EMITTER VOLTAGE



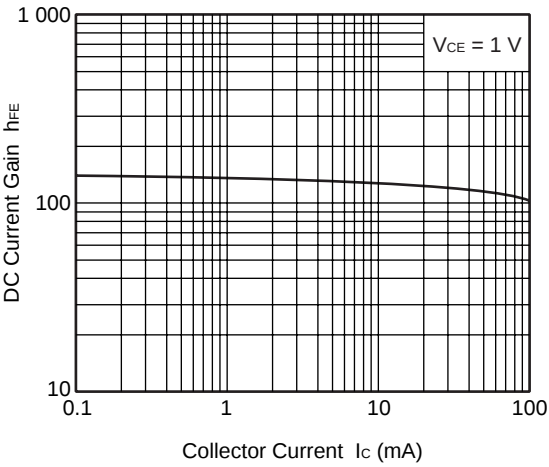
Q1

DC CURRENT GAIN vs.
COLLECTOR CURRENT

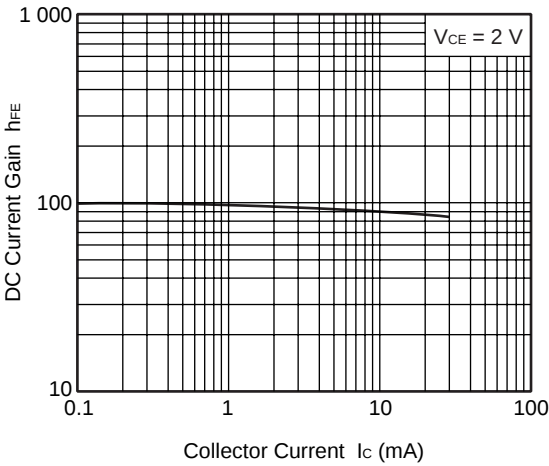


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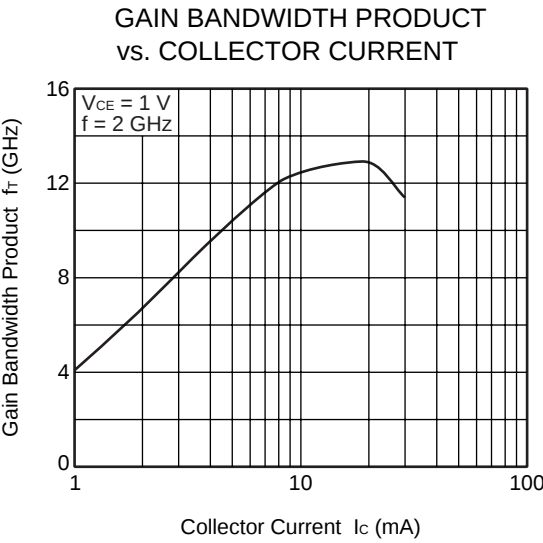
DC CURRENT GAIN vs.
COLLECTOR CURRENT



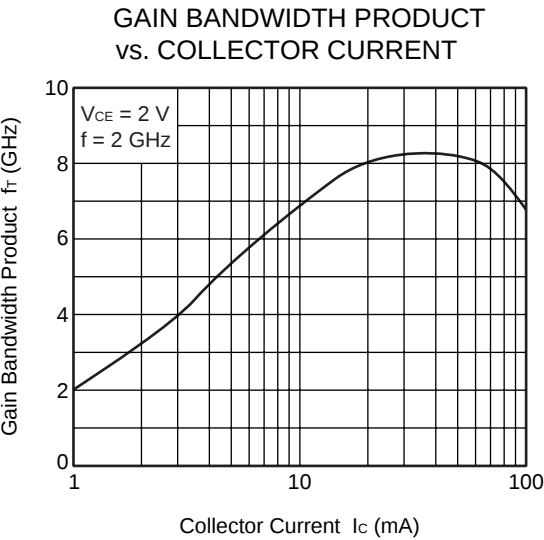
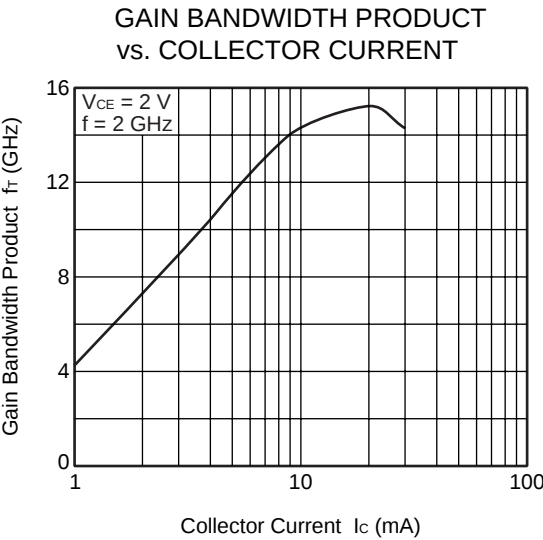
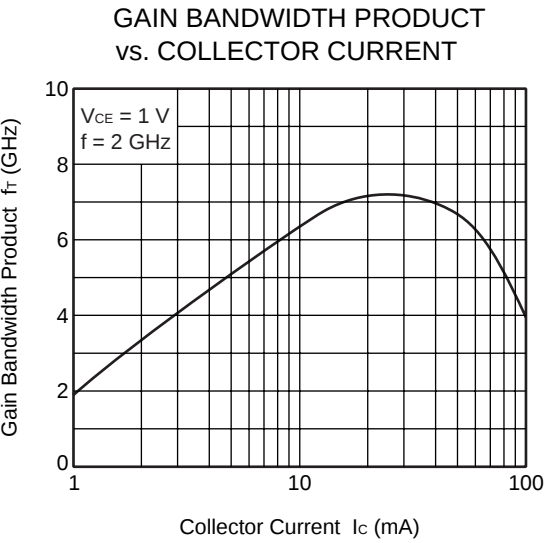
DC CURRENT GAIN vs.
COLLECTOR CURRENT



Q1

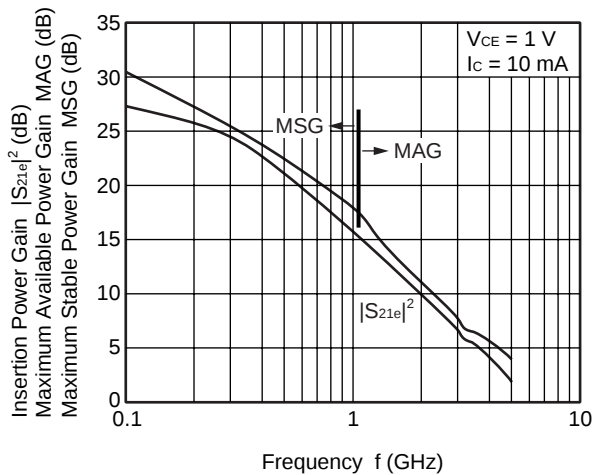


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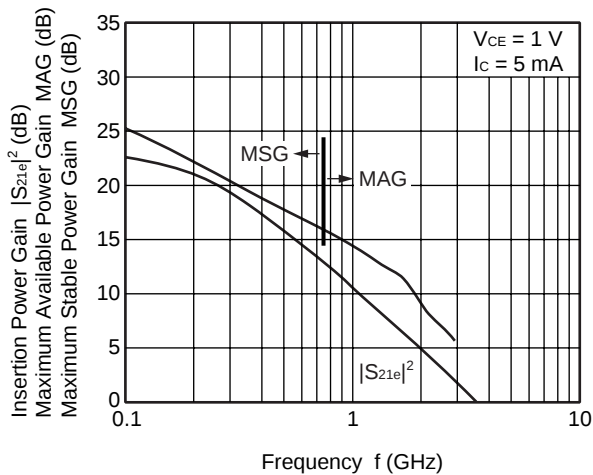
Q1

INSERTION POWER GAIN,
MAG, MSG vs. FREQUENCY

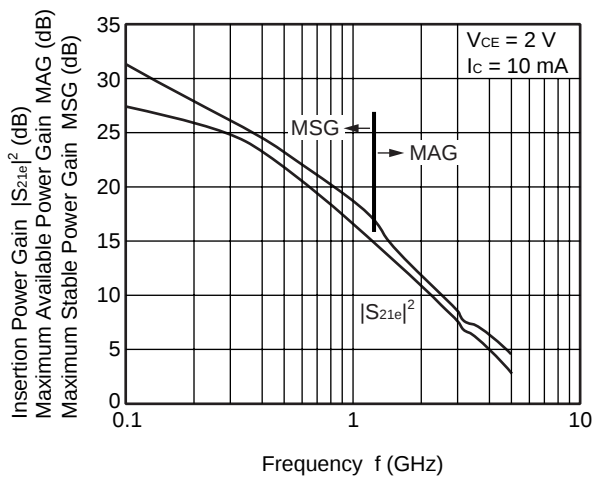


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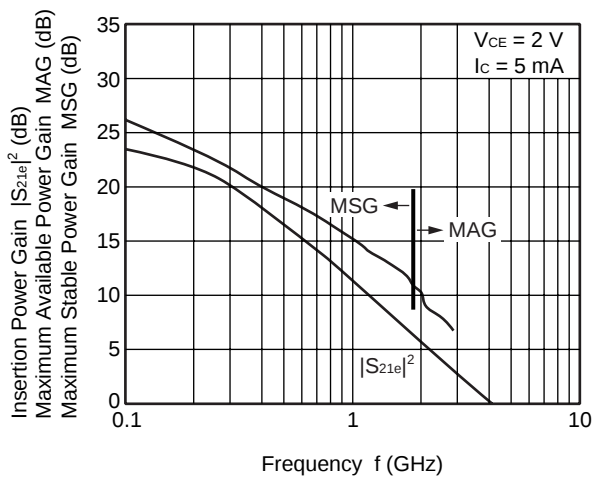
INSERTION POWER GAIN,
MAG, MSG vs. FREQUENCY



INSERTION POWER GAIN,
MAG, MSG vs. FREQUENCY

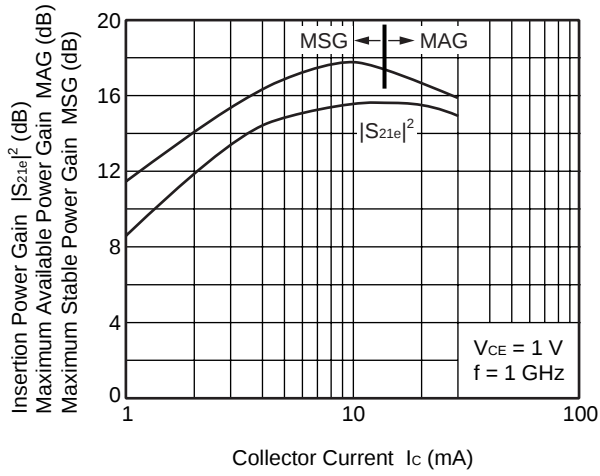


INSERTION POWER GAIN,
MAG, MSG vs. FREQUENCY



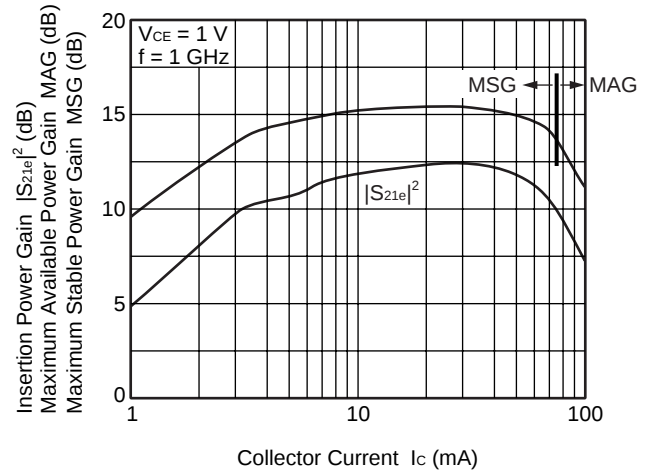
Q1

INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT

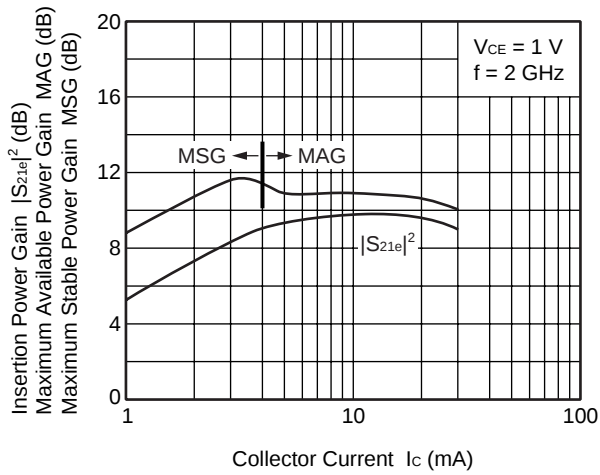


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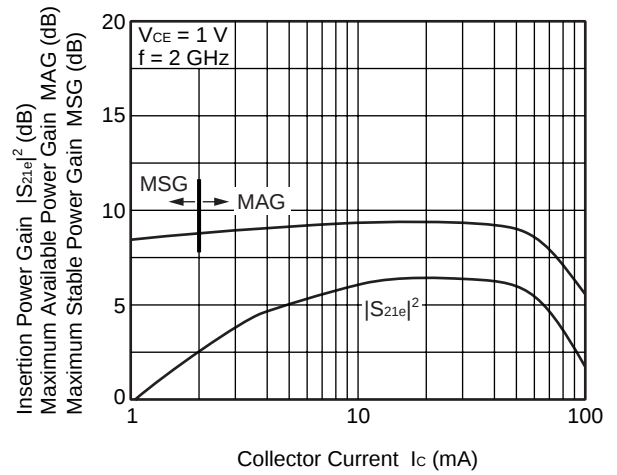
INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT



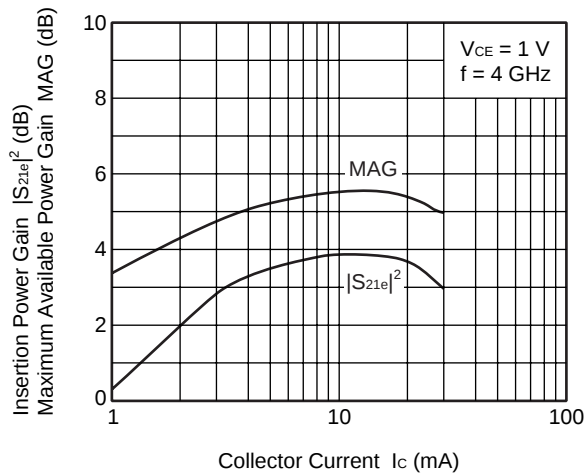
INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT



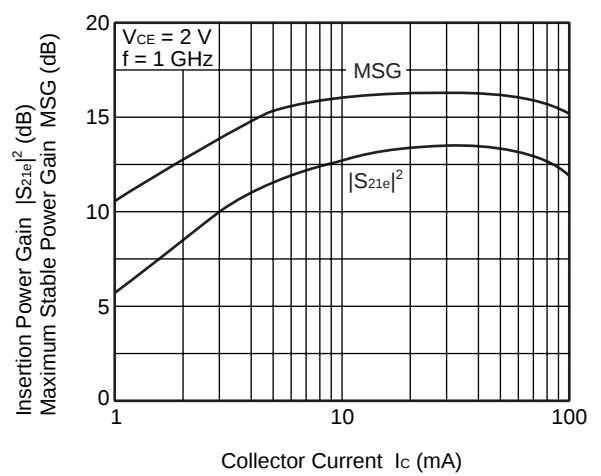
INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT



INSERTION POWER GAIN, MAG
vs. COLLECTOR CURRENT

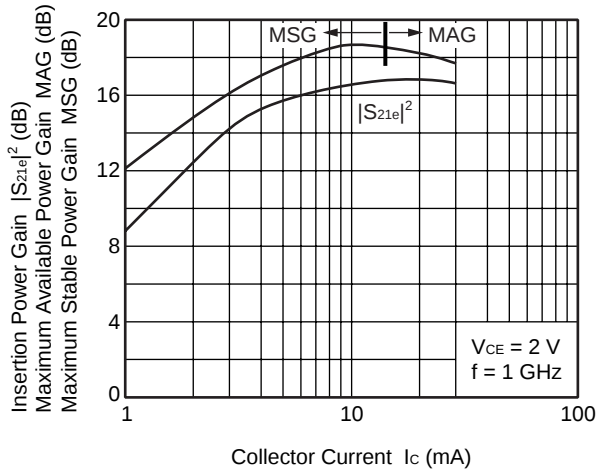


INSERTION POWER GAIN, MSG
vs. COLLECTOR CURRENT



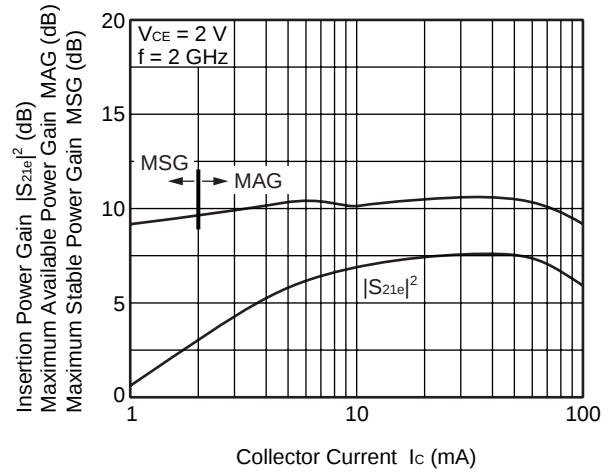
Q1

INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT

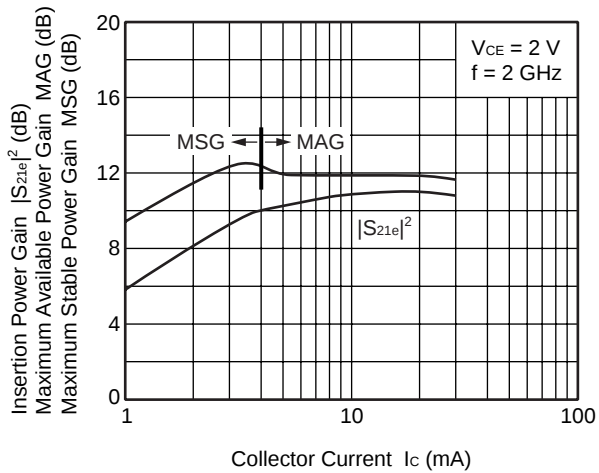


Q2

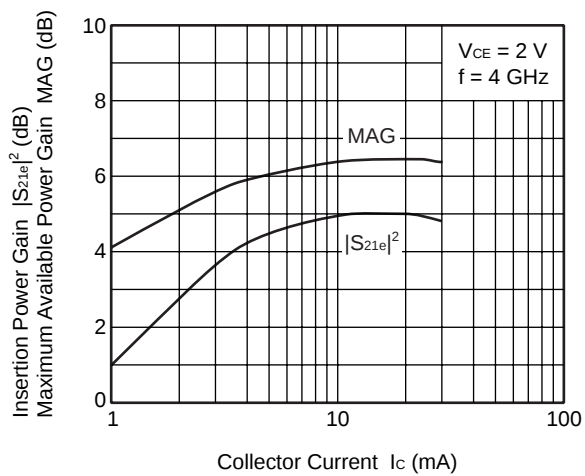
INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT



INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT

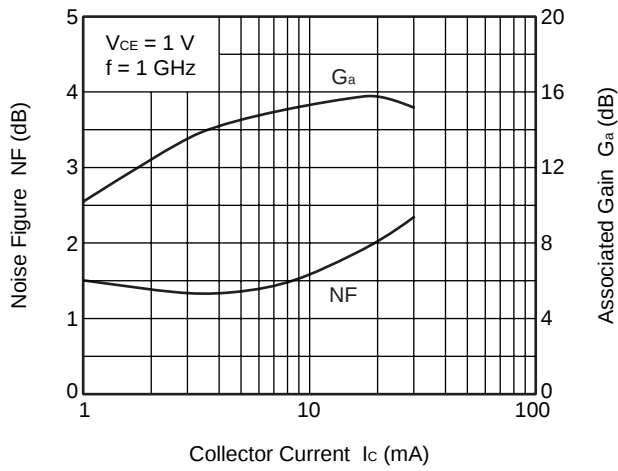


INSERTION POWER GAIN, MAG
vs. COLLECTOR CURRENT



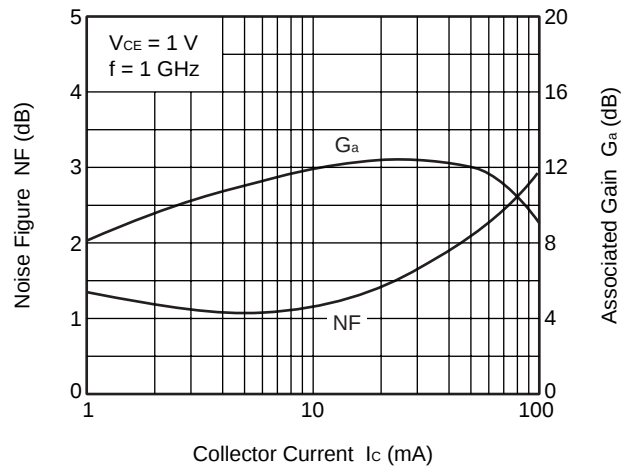
Q1

NOISE FIGURE, ASSOCIATED GAIN
vs. COLLECTOR CURRENT

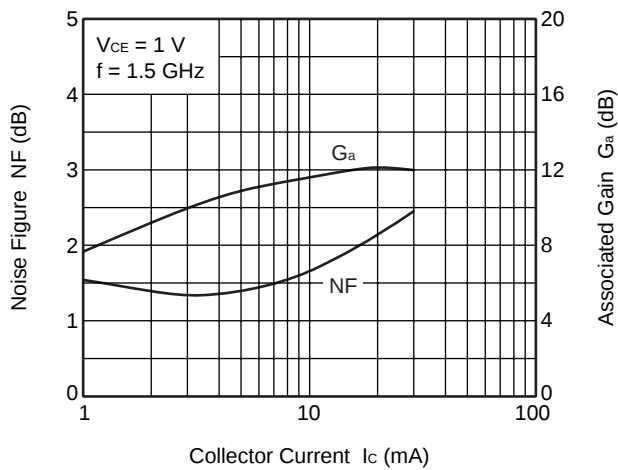


Q2

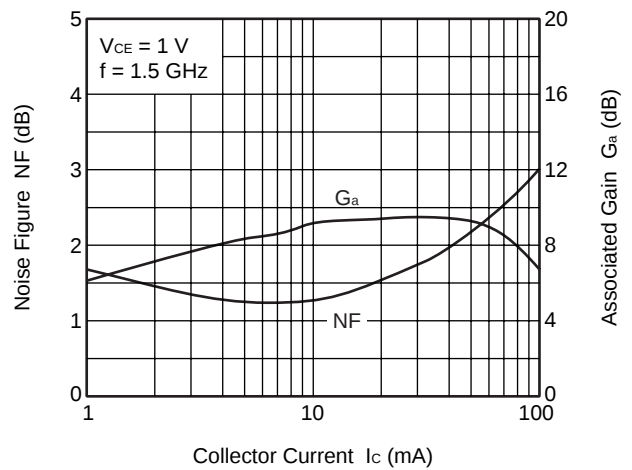
NOISE FIGURE, ASSOCIATED GAIN
vs. COLLECTOR CURRENT



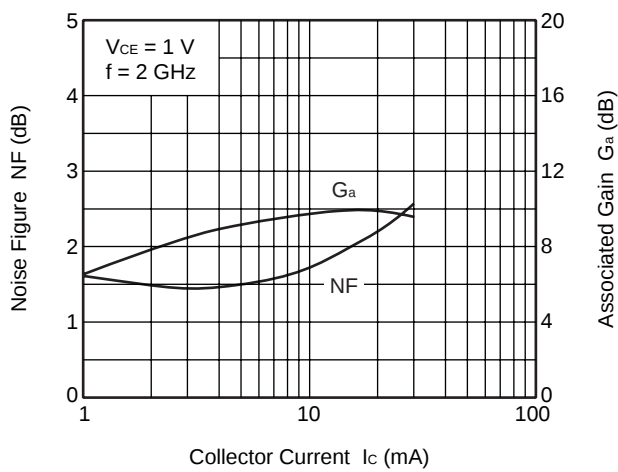
NOISE FIGURE, ASSOCIATED GAIN
vs. COLLECTOR CURRENT



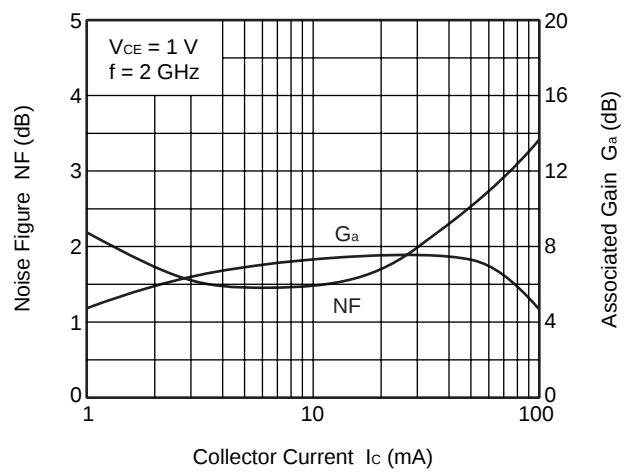
NOISE FIGURE, ASSOCIATED GAIN
vs. COLLECTOR CURRENT



NOISE FIGURE, ASSOCIATED GAIN
vs. COLLECTOR CURRENT

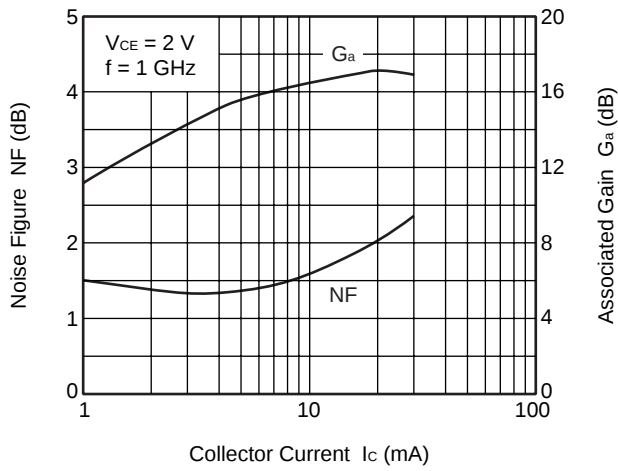


NOISE FIGURE, ASSOCIATED GAIN
vs. COLLECTOR CURRENT



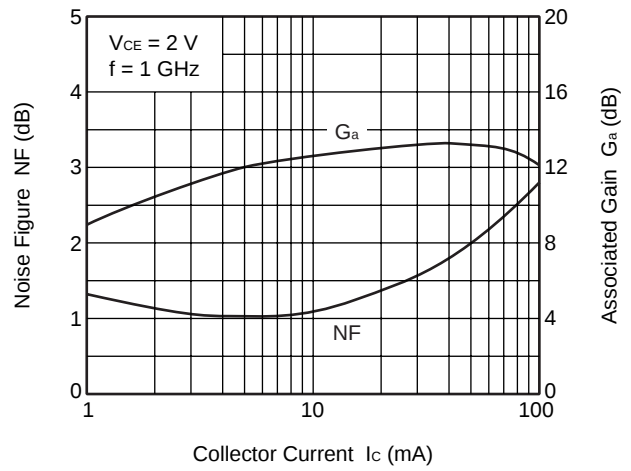
Q1

NOISE FIGURE, ASSOCIATED GAIN
vs. COLLECTOR CURRENT

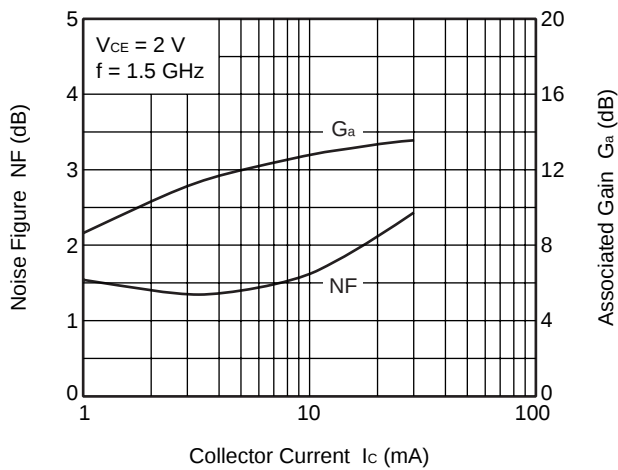


Q2

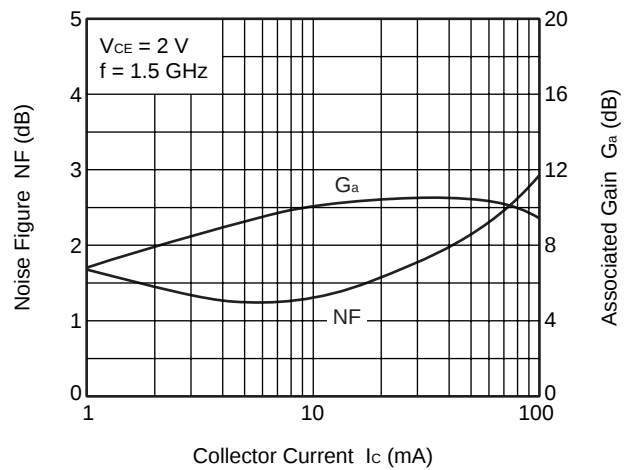
NOISE FIGURE, ASSOCIATED GAIN
vs. COLLECTOR CURRENT



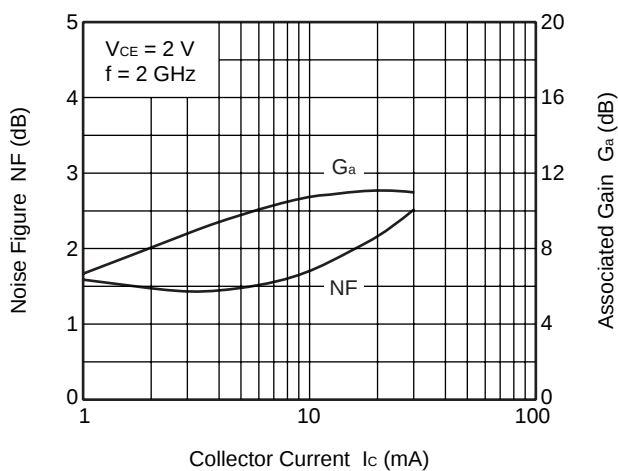
NOISE FIGURE, ASSOCIATED GAIN
vs. COLLECTOR CURRENT



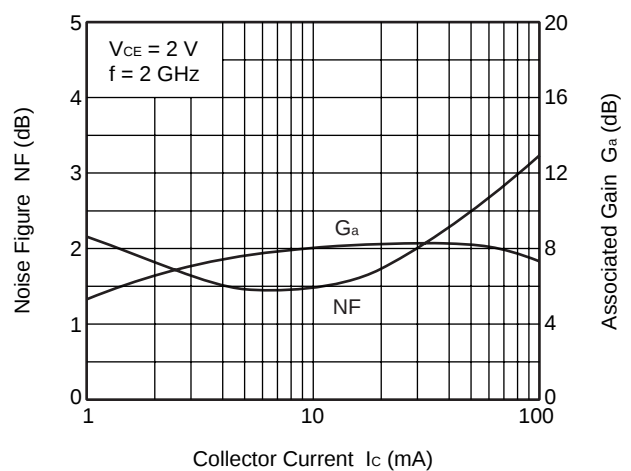
NOISE FIGURE, ASSOCIATED GAIN
vs. COLLECTOR CURRENT



NOISE FIGURE, ASSOCIATED GAIN
vs. COLLECTOR CURRENT



NOISE FIGURE, ASSOCIATED GAIN
vs. COLLECTOR CURRENT



Remark The graphs indicate nominal characteristics.

S-PARAMETERS Q1

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	0.961	-9.2	3.473	171.0	0.025	81.9	0.988	-5.0
0.2	0.960	-16.7	3.379	165.6	0.051	79.4	0.977	-9.6
0.3	0.938	-24.8	3.391	158.3	0.076	73.7	0.958	-14.4
0.4	0.921	-32.8	3.303	150.9	0.100	68.6	0.938	-19.1
0.5	0.885	-40.6	3.206	144.4	0.120	63.7	0.912	-23.5
0.6	0.850	-48.4	3.116	138.0	0.140	59.1	0.880	-27.7
0.7	0.814	-56.2	2.996	131.3	0.156	54.8	0.847	-31.6
0.8	0.773	-63.5	2.908	125.5	0.171	50.7	0.815	-35.4
0.9	0.734	-70.9	2.794	119.8	0.184	47.0	0.782	-38.9
1.0	0.697	-78.2	2.693	114.3	0.195	43.4	0.750	-42.2
1.1	0.666	-85.3	2.580	109.4	0.205	40.1	0.718	-45.3
1.2	0.631	-92.5	2.480	104.4	0.212	36.9	0.687	-48.2
1.3	0.609	-99.8	2.396	99.7	0.219	33.9	0.660	-51.1
1.4	0.576	-106.8	2.300	95.1	0.225	31.2	0.630	-53.9
1.5	0.555	-114.2	2.217	90.6	0.230	28.6	0.605	-56.3
1.6	0.532	-120.8	2.124	86.4	0.234	26.3	0.579	-58.7
1.7	0.512	-128.0	2.041	82.1	0.237	24.0	0.556	-60.7
1.8	0.498	-135.4	1.979	78.9	0.238	21.9	0.531	-63.7
1.9	0.480	-142.2	1.899	74.6	0.241	19.9	0.511	-65.6
2.0	0.474	-148.4	1.833	71.0	0.242	18.2	0.492	-67.5
2.1	0.466	-155.5	1.763	67.3	0.242	16.8	0.473	-69.5
2.2	0.465	-161.1	1.718	64.2	0.240	15.6	0.455	-71.7
2.3	0.460	-166.4	1.651	61.1	0.240	14.4	0.441	-73.7
2.4	0.456	-171.6	1.593	57.9	0.239	13.3	0.428	-75.6
2.5	0.453	-177.2	1.551	54.9	0.237	12.2	0.412	-78.0
2.6	0.450	177.6	1.499	51.6	0.236	10.8	0.405	-80.6
2.7	0.449	172.0	1.459	49.2	0.235	9.8	0.396	-82.9
2.8	0.445	166.8	1.414	46.3	0.232	9.0	0.384	-85.4
2.9	0.442	161.5	1.363	43.8	0.230	8.0	0.372	-87.2
3.0	0.421	155.7	1.290	40.6	0.224	7.0	0.356	-90.6
4.0	0.553	125.3	1.038	19.6	0.226	9.6	0.312	-119.4
5.0	0.612	101.9	0.822	1.9	0.250	12.5	0.351	-156.4

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	0.902	-16.5	9.450	166.1	0.025	79.1	0.959	-10.0
0.2	0.865	-28.5	8.890	156.9	0.048	73.6	0.919	-19.2
0.3	0.812	-41.8	8.515	146.0	0.068	66.3	0.858	-27.9
0.4	0.752	-54.3	7.853	136.2	0.085	60.3	0.796	-35.3
0.5	0.686	-65.4	7.186	128.1	0.098	55.5	0.731	-41.6
0.6	0.626	-76.2	6.625	121.0	0.109	51.6	0.668	-47.1
0.7	0.571	-85.8	6.019	114.2	0.118	48.4	0.611	-51.8
0.8	0.523	-95.2	5.572	108.6	0.126	45.9	0.562	-55.9
0.9	0.485	-103.9	5.141	103.2	0.132	43.9	0.517	-59.4
1.0	0.451	-113.1	4.776	98.8	0.138	42.1	0.479	-62.9
1.1	0.425	-120.9	4.426	94.6	0.143	40.8	0.444	-66.0
1.2	0.406	-129.3	4.130	90.4	0.147	39.5	0.414	-68.8
1.3	0.392	-136.8	3.884	86.7	0.152	38.7	0.387	-71.9
1.4	0.376	-144.8	3.641	83.2	0.157	37.8	0.362	-74.8
1.5	0.369	-152.0	3.444	79.7	0.160	37.0	0.341	-77.6
1.6	0.362	-158.8	3.246	76.6	0.165	36.4	0.320	-80.3
1.7	0.361	-165.7	3.072	73.4	0.169	35.7	0.302	-82.6
1.8	0.363	-172.3	2.923	70.9	0.173	35.1	0.285	-86.2
1.9	0.362	-178.9	2.784	67.7	0.177	34.5	0.270	-88.8
2.0	0.365	176.5	2.660	65.0	0.181	33.9	0.255	-91.5
2.1	0.370	170.7	2.534	62.3	0.185	33.6	0.242	-94.6
2.2	0.380	166.8	2.442	59.8	0.189	33.3	0.230	-97.8
2.3	0.384	162.4	2.327	57.4	0.193	32.9	0.220	-101.1
2.4	0.385	158.7	2.233	54.9	0.198	32.4	0.213	-104.2
2.5	0.392	154.4	2.157	52.7	0.201	32.0	0.204	-108.2
2.6	0.393	150.1	2.071	50.0	0.206	31.2	0.200	-111.9
2.7	0.397	146.1	2.007	48.0	0.209	30.6	0.195	-116.0
2.8	0.399	141.7	1.939	45.8	0.213	30.0	0.192	-120.8
2.9	0.403	137.7	1.865	43.5	0.215	29.2	0.188	-125.2
3.0	0.390	132.7	1.759	41.4	0.215	28.3	0.183	-131.6
4.0	0.533	113.7	1.385	23.5	0.263	24.3	0.199	-171.3
5.0	0.589	95.2	1.091	7.6	0.304	17.2	0.286	162.4

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

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.834	-22.3	14.387	162.3	0.023	75.6	0.929	-14.4
0.2	0.777	-38.1	13.010	149.8	0.045	70.2	0.854	-26.8
0.3	0.695	-55.0	11.901	136.9	0.061	62.3	0.762	-37.5
0.4	0.620	-69.6	10.442	126.6	0.074	57.2	0.674	-45.9
0.5	0.549	-82.3	9.203	118.4	0.083	53.4	0.596	-52.5
0.6	0.491	-93.7	8.199	111.6	0.091	51.2	0.526	-58.2
0.7	0.443	-104.0	7.272	105.5	0.098	49.4	0.470	-62.7
0.8	0.407	-115.2	6.583	100.5	0.104	48.3	0.424	-66.8
0.9	0.381	-123.9	6.000	96.0	0.110	47.4	0.385	-70.3
1.0	0.357	-133.3	5.487	91.9	0.116	46.8	0.352	-73.8
1.1	0.344	-140.8	5.049	88.4	0.122	46.3	0.324	-76.9
1.2	0.334	-149.9	4.656	84.8	0.128	45.9	0.301	-80.1
1.3	0.329	-156.5	4.359	81.6	0.133	45.6	0.280	-83.3
1.4	0.325	-164.3	4.061	78.6	0.139	45.1	0.261	-86.9
1.5	0.327	-170.8	3.826	75.5	0.145	44.8	0.245	-90.2
1.6	0.327	-176.9	3.590	72.7	0.150	44.3	0.230	-93.7
1.7	0.330	177.2	3.391	70.0	0.156	43.8	0.217	-97.0
1.8	0.339	171.8	3.209	67.8	0.162	43.4	0.205	-101.4
1.9	0.343	165.8	3.053	65.0	0.168	42.7	0.195	-105.3
2.0	0.349	162.3	2.913	62.6	0.173	42.1	0.185	-109.2
2.1	0.360	158.0	2.769	60.2	0.179	41.7	0.177	-113.7
2.2	0.368	154.7	2.660	58.0	0.185	41.3	0.170	-118.1
2.3	0.376	151.1	2.536	55.9	0.190	40.7	0.166	-122.9
2.4	0.378	147.8	2.430	53.5	0.196	40.0	0.162	-127.1
2.5	0.384	144.3	2.341	51.6	0.201	39.4	0.159	-132.2
2.6	0.389	141.1	2.247	49.0	0.207	38.4	0.159	-136.5
2.7	0.394	137.6	2.176	47.1	0.212	37.6	0.160	-141.8
2.8	0.395	133.5	2.096	45.2	0.217	36.7	0.163	-147.1
2.9	0.402	129.9	2.015	43.2	0.220	35.8	0.167	-152.0
3.0	0.391	125.2	1.903	41.1	0.221	34.7	0.170	-158.7
4.0	0.532	110.1	1.487	24.5	0.277	27.6	0.222	167.2
5.0	0.586	92.9	1.169	9.4	0.320	18.3	0.315	148.7

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

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.762	-25.9	18.345	158.9	0.023	74.8	0.899	-17.8
0.2	0.699	-46.6	16.059	144.3	0.042	67.0	0.795	-32.7
0.3	0.606	-65.4	14.035	130.7	0.055	60.6	0.682	-44.5
0.4	0.529	-81.1	11.913	120.2	0.066	56.4	0.584	-53.1
0.5	0.463	-94.2	10.228	112.5	0.074	53.9	0.504	-59.7
0.6	0.413	-106.9	8.957	106.2	0.081	52.7	0.439	-65.1
0.7	0.374	-117.4	7.862	100.7	0.088	51.9	0.387	-69.6
0.8	0.350	-128.1	7.058	96.1	0.094	51.4	0.347	-73.7
0.9	0.331	-137.3	6.377	92.0	0.101	51.3	0.313	-77.4
1.0	0.317	-146.9	5.805	88.4	0.107	51.0	0.286	-81.0
1.1	0.312	-154.3	5.325	85.1	0.113	50.8	0.262	-84.5
1.2	0.307	-162.1	4.903	81.9	0.120	50.6	0.243	-88.0
1.3	0.310	-168.8	4.563	78.9	0.127	50.3	0.226	-91.6
1.4	0.308	-175.3	4.241	76.1	0.133	49.9	0.212	-95.9
1.5	0.315	178.6	3.989	73.3	0.140	49.5	0.200	-99.8
1.6	0.318	173.2	3.743	70.7	0.146	49.0	0.189	-104.1
1.7	0.326	168.3	3.536	68.2	0.153	48.5	0.180	-108.1
1.8	0.334	163.4	3.338	66.2	0.159	47.9	0.171	-113.3
1.9	0.342	158.3	3.174	63.6	0.166	47.1	0.165	-118.1
2.0	0.348	155.5	3.027	61.3	0.172	46.3	0.159	-123.0
2.1	0.359	151.3	2.872	59.1	0.179	45.8	0.154	-128.2
2.2	0.367	148.8	2.760	57.1	0.185	45.2	0.151	-133.4
2.3	0.376	146.0	2.625	55.0	0.191	44.4	0.150	-138.5
2.4	0.379	142.9	2.516	52.8	0.198	43.5	0.150	-143.1
2.5	0.386	139.6	2.424	50.9	0.204	42.7	0.150	-148.3
2.6	0.390	136.1	2.324	48.5	0.210	41.6	0.153	-152.4
2.7	0.398	133.2	2.251	46.7	0.215	40.8	0.157	-157.5
2.8	0.398	129.7	2.164	44.7	0.220	39.7	0.165	-162.1
2.9	0.402	126.4	2.078	42.9	0.224	38.6	0.171	-166.2
3.0	0.393	121.7	1.966	41.1	0.225	37.4	0.179	-172.2
4.0	0.533	108.3	1.533	24.9	0.284	28.9	0.244	158.6
5.0	0.588	91.9	1.199	10.3	0.327	18.9	0.338	143.1

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

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.702	-32.6	22.894	155.1	0.021	71.0	0.858	-22.2
0.2	0.606	-55.8	19.053	138.1	0.038	65.1	0.721	-39.3
0.3	0.509	-77.7	15.901	124.2	0.049	59.8	0.592	-51.7
0.4	0.441	-94.4	13.087	114.2	0.058	57.2	0.493	-60.4
0.5	0.387	-108.2	11.029	107.2	0.066	55.9	0.416	-66.7
0.6	0.351	-121.1	9.515	101.5	0.073	55.8	0.358	-72.1
0.7	0.326	-132.2	8.272	96.5	0.080	55.6	0.313	-76.7
0.8	0.312	-142.8	7.381	92.2	0.087	55.8	0.279	-80.9
0.9	0.301	-151.2	6.627	88.7	0.094	55.8	0.252	-84.8
1.0	0.295	-160.4	6.012	85.3	0.101	55.5	0.230	-88.9
1.1	0.294	-166.8	5.510	82.3	0.108	55.5	0.212	-92.8
1.2	0.296	-174.1	5.054	79.5	0.116	54.9	0.197	-96.9
1.3	0.302	-179.2	4.693	76.7	0.123	54.7	0.185	-101.3
1.4	0.304	174.4	4.362	74.1	0.130	54.2	0.174	-106.2
1.5	0.313	169.8	4.099	71.4	0.137	53.6	0.167	-110.9
1.6	0.318	164.7	3.835	69.1	0.144	52.9	0.160	-116.0
1.7	0.325	160.5	3.622	66.7	0.152	52.3	0.154	-120.9
1.8	0.335	156.7	3.415	64.8	0.159	51.6	0.150	-126.7
1.9	0.347	152.0	3.243	62.4	0.166	50.7	0.147	-132.1
2.0	0.353	149.6	3.094	60.3	0.173	49.7	0.145	-137.5
2.1	0.364	145.9	2.939	58.2	0.179	48.9	0.144	-142.9
2.2	0.372	144.0	2.823	56.2	0.186	48.2	0.144	-148.2
2.3	0.380	141.5	2.683	54.2	0.193	47.3	0.146	-153.2
2.4	0.384	138.7	2.568	52.1	0.200	46.3	0.148	-157.6
2.5	0.390	135.9	2.470	50.3	0.206	45.3	0.152	-162.2
2.6	0.394	132.4	2.369	47.9	0.213	44.1	0.157	-165.8
2.7	0.402	129.8	2.293	46.2	0.219	43.1	0.163	-170.3
2.8	0.404	126.5	2.207	44.3	0.224	41.9	0.173	-174.0
2.9	0.409	123.4	2.124	42.4	0.228	40.7	0.182	-177.2
3.0	0.400	119.0	2.003	40.7	0.229	39.4	0.193	177.8
4.0	0.541	107.0	1.558	25.0	0.290	29.9	0.265	152.7
5.0	0.594	91.0	1.216	10.7	0.333	19.3	0.359	139.2

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

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.513	-48.1	30.789	146.4	0.019	68.0	0.744	-31.2
0.2	0.426	-82.2	23.059	127.0	0.032	64.1	0.558	-51.5
0.3	0.366	-107.0	17.787	113.8	0.040	62.1	0.427	-64.1
0.4	0.329	-124.4	14.003	105.2	0.048	61.7	0.342	-72.5
0.5	0.309	-138.5	11.482	99.4	0.056	62.2	0.282	-78.6
0.6	0.301	-149.9	9.771	94.8	0.064	62.7	0.240	-84.3
0.7	0.292	-158.8	8.405	90.6	0.072	63.1	0.210	-89.4
0.8	0.295	-167.9	7.435	87.0	0.080	63.1	0.187	-94.5
0.9	0.297	-174.4	6.676	84.0	0.088	62.8	0.170	-99.3
1.0	0.302	178.8	6.017	81.0	0.096	62.3	0.157	-104.4
1.1	0.304	174.2	5.496	78.5	0.104	62.1	0.147	-109.4
1.2	0.312	169.0	5.037	75.9	0.112	61.3	0.140	-114.8
1.3	0.319	165.1	4.669	73.4	0.120	60.6	0.135	-120.2
1.4	0.326	160.6	4.333	71.0	0.129	59.8	0.131	-126.2
1.5	0.334	157.2	4.064	68.5	0.136	58.9	0.130	-131.7
1.6	0.341	153.6	3.801	66.4	0.144	58.0	0.129	-137.5
1.7	0.349	150.4	3.587	64.2	0.152	57.1	0.129	-143.0
1.8	0.360	147.4	3.380	62.4	0.159	56.1	0.131	-148.9
1.9	0.373	144.1	3.209	60.2	0.167	54.9	0.134	-154.3
2.0	0.379	141.8	3.058	58.2	0.175	53.8	0.136	-159.3
2.1	0.391	139.4	2.901	56.2	0.182	52.7	0.140	-164.1
2.2	0.399	137.4	2.781	54.4	0.189	51.8	0.144	-168.6
2.3	0.406	135.3	2.645	52.5	0.196	50.6	0.151	-172.7
2.4	0.410	133.2	2.531	50.4	0.204	49.4	0.156	-176.1
2.5	0.415	130.6	2.436	48.8	0.210	48.3	0.162	-179.4
2.6	0.419	127.7	2.335	46.4	0.218	46.8	0.169	178.0
2.7	0.427	125.4	2.262	44.7	0.224	45.7	0.178	174.6
2.8	0.429	122.3	2.173	42.9	0.229	44.5	0.189	172.2
2.9	0.433	119.6	2.089	41.2	0.233	43.1	0.200	170.1
3.0	0.423	115.4	1.972	39.6	0.235	41.7	0.213	166.4
4.0	0.559	105.1	1.533	24.3	0.297	31.0	0.292	146.1
5.0	0.611	89.6	1.194	10.6	0.339	19.8	0.384	134.6

$V_{CE} = 2\text{ V}$, $I_C = 1\text{ mA}$, $Z_0 = 50\ \Omega$

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.968	-9.2	3.396	171.9	0.022	81.3	0.991	-4.2
0.2	0.963	-14.8	3.331	166.7	0.043	80.2	0.982	-8.2
0.3	0.946	-22.1	3.344	160.1	0.064	75.1	0.968	-12.2
0.4	0.931	-29.8	3.265	153.3	0.084	70.7	0.949	-16.2
0.5	0.904	-36.5	3.184	147.3	0.102	66.4	0.928	-19.9
0.6	0.870	-43.8	3.114	141.4	0.119	62.2	0.904	-23.6
0.7	0.838	-50.6	3.016	134.9	0.134	58.1	0.875	-27.0
0.8	0.801	-57.3	2.943	129.6	0.148	54.3	0.848	-30.3
0.9	0.760	-64.2	2.844	124.0	0.160	50.8	0.820	-33.5
1.0	0.724	-70.9	2.756	118.9	0.170	47.3	0.793	-36.4
1.1	0.694	-77.5	2.652	114.1	0.180	44.1	0.764	-39.3
1.2	0.657	-84.3	2.565	109.0	0.188	41.0	0.737	-41.8
1.3	0.631	-91.2	2.485	104.6	0.195	38.3	0.710	-44.3
1.4	0.600	-97.9	2.397	100.1	0.201	35.5	0.684	-47.0
1.5	0.573	-104.7	2.321	95.5	0.206	33.0	0.659	-49.3
1.6	0.548	-111.2	2.231	91.4	0.210	30.7	0.634	-51.4
1.7	0.526	-118.0	2.145	87.1	0.214	28.5	0.614	-53.1
1.8	0.507	-125.4	2.095	83.9	0.216	26.3	0.588	-55.7
1.9	0.486	-132.3	2.012	79.8	0.219	24.4	0.569	-57.5
2.0	0.474	-138.5	1.947	76.0	0.220	22.6	0.551	-59.2
2.1	0.463	-145.4	1.878	72.3	0.221	21.3	0.533	-61.1
2.2	0.459	-151.4	1.828	69.1	0.221	20.1	0.514	-62.7
2.3	0.450	-157.1	1.759	66.0	0.220	19.0	0.500	-64.5
2.4	0.444	-162.5	1.698	62.7	0.220	17.8	0.488	-66.2
2.5	0.439	-168.4	1.660	59.7	0.219	16.7	0.470	-68.3
2.6	0.432	-174.0	1.599	56.3	0.218	15.4	0.462	-70.6
2.7	0.429	-179.6	1.560	54.0	0.217	14.4	0.453	-72.4
2.8	0.421	174.7	1.517	51.1	0.216	13.6	0.440	-74.7
2.9	0.418	169.2	1.459	48.4	0.213	12.4	0.426	-76.2
3.0	0.395	163.0	1.383	45.3	0.208	11.6	0.409	-79.3
4.0	0.525	128.9	1.121	23.7	0.214	14.6	0.352	-103.9
5.0	0.588	104.0	0.886	5.1	0.243	17.2	0.362	-140.6

$V_{CE} = 2\text{ V}$, $I_C = 3\text{ mA}$, $Z_0 = 50\ \Omega$

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.908	-14.9	9.530	166.9	0.020	78.6	0.966	-8.4
0.2	0.881	-24.5	9.004	158.8	0.041	75.6	0.932	-16.2
0.3	0.830	-36.6	8.712	148.8	0.058	69.0	0.882	-23.6
0.4	0.777	-47.9	8.116	139.5	0.073	63.5	0.825	-29.9
0.5	0.710	-57.7	7.526	131.7	0.085	58.8	0.769	-35.3
0.6	0.654	-67.5	6.984	124.7	0.096	55.2	0.711	-40.2
0.7	0.598	-76.0	6.421	118.0	0.104	52.2	0.658	-44.2
0.8	0.545	-84.7	5.984	112.4	0.112	49.6	0.612	-47.8
0.9	0.499	-92.8	5.563	107.1	0.118	47.6	0.570	-50.9
1.0	0.457	-100.9	5.161	102.3	0.124	46.0	0.531	-53.6
1.1	0.429	-108.5	4.819	98.3	0.129	44.5	0.496	-56.2
1.2	0.400	-116.6	4.501	94.1	0.134	43.4	0.466	-58.5
1.3	0.383	-124.1	4.242	90.5	0.138	42.3	0.440	-60.6
1.4	0.361	-131.5	3.988	86.9	0.143	41.5	0.414	-63.1
1.5	0.349	-139.6	3.786	83.3	0.147	40.6	0.392	-65.2
1.6	0.335	-146.5	3.568	80.3	0.152	40.0	0.371	-67.2
1.7	0.330	-153.6	3.386	77.1	0.156	39.4	0.352	-68.9
1.8	0.325	-161.2	3.225	74.5	0.160	38.8	0.333	-71.5
1.9	0.324	-168.2	3.074	71.4	0.165	38.1	0.317	-73.3
2.0	0.325	-173.5	2.942	68.7	0.169	37.6	0.301	-75.2
2.1	0.328	179.8	2.805	66.0	0.173	37.3	0.287	-77.2
2.2	0.333	175.4	2.702	63.5	0.176	37.0	0.273	-79.5
2.3	0.337	170.3	2.580	61.1	0.181	36.7	0.261	-81.8
2.4	0.339	165.9	2.479	58.5	0.184	36.1	0.251	-83.9
2.5	0.341	161.4	2.394	56.4	0.188	35.6	0.240	-86.8
2.6	0.345	156.4	2.300	53.6	0.193	34.9	0.234	-89.7
2.7	0.349	151.9	2.231	51.6	0.196	34.3	0.226	-92.7
2.8	0.349	147.5	2.149	49.5	0.200	33.6	0.219	-96.6
2.9	0.351	142.9	2.064	47.3	0.202	32.9	0.211	-100.0
3.0	0.341	137.4	1.954	45.0	0.202	32.0	0.200	-105.5
4.0	0.488	116.3	1.543	26.9	0.252	28.1	0.177	-145.1
5.0	0.552	97.1	1.214	10.3	0.296	20.6	0.244	178.1

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

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.852	-18.7	14.464	163.6	0.020	77.0	0.940	-11.8
0.2	0.800	-32.7	13.295	152.5	0.038	72.7	0.878	-22.3
0.3	0.727	-47.8	12.353	140.4	0.053	65.5	0.799	-31.4
0.4	0.648	-60.5	11.011	130.3	0.065	60.5	0.719	-38.6
0.5	0.572	-71.5	9.808	122.2	0.073	57.0	0.645	-44.2
0.6	0.513	-82.0	8.824	115.4	0.082	54.4	0.579	-48.8
0.7	0.456	-91.5	7.881	109.1	0.088	52.7	0.524	-52.6
0.8	0.411	-100.7	7.194	104.1	0.095	51.5	0.477	-55.8
0.9	0.376	-109.2	6.575	99.5	0.100	50.7	0.438	-58.5
1.0	0.345	-118.1	6.037	95.3	0.106	50.0	0.405	-61.0
1.1	0.325	-126.0	5.565	91.8	0.112	49.4	0.376	-63.2
1.2	0.307	-134.6	5.154	88.2	0.117	49.0	0.350	-65.3
1.3	0.297	-142.2	4.809	85.1	0.123	48.5	0.328	-67.5
1.4	0.285	-150.1	4.499	82.0	0.129	48.2	0.307	-69.9
1.5	0.283	-157.9	4.245	78.7	0.134	47.7	0.290	-72.3
1.6	0.279	-165.1	3.990	76.1	0.139	47.3	0.273	-74.4
1.7	0.280	-171.8	3.775	73.3	0.145	46.9	0.258	-76.5
1.8	0.283	-178.2	3.576	71.1	0.150	46.4	0.243	-79.4
1.9	0.289	175.2	3.404	68.5	0.157	45.8	0.230	-81.9
2.0	0.292	170.9	3.254	65.9	0.162	45.2	0.218	-84.3
2.1	0.301	165.3	3.094	63.6	0.167	44.8	0.206	-87.2
2.2	0.310	161.4	2.977	61.4	0.173	44.3	0.195	-90.3
2.3	0.316	157.6	2.835	59.2	0.178	43.7	0.187	-93.6
2.4	0.318	154.4	2.722	56.9	0.184	43.1	0.179	-96.7
2.5	0.325	149.9	2.625	55.0	0.189	42.5	0.172	-100.6
2.6	0.329	146.1	2.513	52.5	0.195	41.6	0.168	-104.3
2.7	0.334	142.2	2.437	50.7	0.199	40.8	0.163	-109.0
2.8	0.335	137.8	2.349	48.6	0.204	39.9	0.160	-114.3
2.9	0.341	134.0	2.255	46.7	0.208	38.9	0.158	-119.5
3.0	0.335	128.9	2.135	44.6	0.209	37.9	0.153	-127.3
4.0	0.480	112.5	1.670	27.8	0.266	31.1	0.171	-171.7
5.0	0.545	94.7	1.310	12.1	0.311	21.7	0.260	160.9

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

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.788	-21.2	18.584	160.6	0.019	73.9	0.915	-14.7
0.2	0.728	-39.3	16.528	147.2	0.036	70.2	0.827	-27.1
0.3	0.633	-55.8	14.772	134.2	0.048	63.7	0.726	-37.0
0.4	0.554	-69.8	12.776	123.9	0.058	59.8	0.635	-44.4
0.5	0.480	-81.4	11.099	116.1	0.066	57.1	0.557	-49.7
0.6	0.420	-92.6	9.789	109.7	0.073	55.8	0.492	-54.0
0.7	0.373	-102.4	8.647	104.0	0.080	54.9	0.440	-57.4
0.8	0.338	-112.0	7.795	99.4	0.086	54.5	0.398	-60.3
0.9	0.310	-121.0	7.076	95.2	0.092	54.2	0.362	-62.6
1.0	0.288	-130.9	6.448	91.5	0.098	53.9	0.333	-65.0
1.1	0.273	-138.8	5.923	88.3	0.104	53.6	0.308	-67.1
1.2	0.264	-147.6	5.477	84.9	0.110	53.3	0.287	-69.3
1.3	0.261	-154.7	5.093	82.2	0.117	53.0	0.269	-71.5
1.4	0.255	-162.5	4.751	79.3	0.123	52.6	0.251	-74.1
1.5	0.256	-169.8	4.467	76.4	0.129	52.2	0.237	-76.6
1.6	0.256	-176.5	4.197	73.9	0.136	51.7	0.223	-79.2
1.7	0.264	177.6	3.963	71.4	0.142	51.2	0.210	-81.8
1.8	0.269	171.9	3.747	69.3	0.148	50.6	0.198	-85.1
1.9	0.275	165.7	3.562	66.8	0.155	49.9	0.188	-88.3
2.0	0.283	162.3	3.394	64.6	0.161	49.2	0.177	-91.4
2.1	0.293	157.4	3.231	62.3	0.167	48.6	0.168	-95.1
2.2	0.303	154.1	3.108	60.3	0.173	48.1	0.159	-98.8
2.3	0.310	151.0	2.960	58.2	0.179	47.3	0.153	-103.1
2.4	0.313	147.8	2.835	56.1	0.185	46.5	0.147	-107.0
2.5	0.321	144.0	2.735	54.2	0.191	45.7	0.142	-111.9
2.6	0.325	140.5	2.617	51.8	0.197	44.7	0.141	-116.4
2.7	0.332	136.8	2.535	50.0	0.202	43.7	0.138	-122.1
2.8	0.335	132.9	2.443	48.2	0.208	42.8	0.139	-128.0
2.9	0.339	129.5	2.347	46.2	0.212	41.6	0.141	-133.8
3.0	0.333	124.4	2.218	44.4	0.213	40.4	0.142	-142.4
4.0	0.479	110.7	1.733	28.1	0.273	32.4	0.182	175.8
5.0	0.546	93.7	1.351	13.1	0.318	22.1	0.278	153.5

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

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.721	-26.0	23.344	157.1	0.018	71.0	0.880	-18.1
0.2	0.642	-47.0	19.960	141.5	0.033	68.8	0.762	-32.3
0.3	0.536	-65.5	17.100	127.9	0.044	62.8	0.644	-42.7
0.4	0.454	-80.1	14.274	117.9	0.052	60.5	0.547	-49.8
0.5	0.391	-92.5	12.140	110.7	0.059	58.8	0.470	-54.6
0.6	0.342	-104.4	10.565	104.8	0.066	58.5	0.410	-58.3
0.7	0.305	-114.8	9.214	99.6	0.073	58.3	0.363	-61.3
0.8	0.277	-125.2	8.252	95.4	0.079	58.3	0.327	-63.9
0.9	0.259	-134.5	7.432	91.6	0.086	58.2	0.297	-66.1
1.0	0.247	-144.4	6.759	88.2	0.093	58.1	0.273	-68.3
1.1	0.240	-152.3	6.194	85.3	0.100	57.8	0.252	-70.4
1.2	0.236	-160.8	5.700	82.3	0.106	57.4	0.235	-72.7
1.3	0.239	-167.1	5.299	79.9	0.113	57.2	0.219	-75.1
1.4	0.237	-174.9	4.927	77.1	0.120	56.7	0.205	-78.0
1.5	0.243	178.7	4.622	74.5	0.127	56.1	0.194	-81.0
1.6	0.248	173.0	4.339	72.1	0.134	55.5	0.182	-84.1
1.7	0.254	168.1	4.100	69.8	0.141	54.8	0.172	-87.3
1.8	0.265	163.0	3.869	67.9	0.148	54.1	0.162	-91.2
1.9	0.273	157.3	3.679	65.5	0.155	53.4	0.154	-95.2
2.0	0.279	154.9	3.511	63.4	0.161	52.4	0.145	-99.2
2.1	0.293	150.7	3.335	61.4	0.168	51.7	0.138	-103.8
2.2	0.302	148.4	3.199	59.4	0.174	51.0	0.132	-108.5
2.3	0.309	145.6	3.046	57.4	0.181	50.1	0.128	-113.7
2.4	0.315	142.5	2.921	55.3	0.187	49.1	0.125	-118.4
2.5	0.322	139.3	2.812	53.6	0.193	48.2	0.123	-123.9
2.6	0.326	135.8	2.696	51.2	0.200	47.0	0.123	-129.1
2.7	0.333	132.8	2.608	49.6	0.206	46.1	0.124	-135.4
2.8	0.337	129.2	2.514	47.6	0.211	44.9	0.129	-141.5
2.9	0.341	125.9	2.412	45.7	0.215	43.7	0.134	-147.4
3.0	0.335	120.9	2.280	44.0	0.217	42.5	0.139	-155.8
4.0	0.481	109.1	1.776	28.3	0.279	33.4	0.197	167.0
5.0	0.547	93.1	1.382	13.6	0.324	22.5	0.295	148.4

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

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.553	-38.3	32.555	149.3	0.015	70.7	0.792	-25.0
0.2	0.449	-65.8	25.226	130.9	0.028	68.1	0.623	-41.0
0.3	0.367	-87.5	19.898	117.5	0.036	64.9	0.492	-50.6
0.4	0.306	-104.4	15.851	108.6	0.044	64.7	0.403	-56.1
0.5	0.270	-118.4	13.132	102.5	0.051	64.6	0.339	-59.3
0.6	0.247	-131.4	11.207	97.6	0.058	64.7	0.293	-61.9
0.7	0.231	-142.5	9.657	93.4	0.065	65.0	0.258	-63.9
0.8	0.224	-152.4	8.577	89.9	0.073	65.1	0.232	-65.9
0.9	0.220	-161.1	7.689	86.8	0.080	65.0	0.211	-67.6
1.0	0.223	-169.9	6.966	83.8	0.088	64.6	0.194	-69.6
1.1	0.222	-176.0	6.341	81.3	0.095	64.2	0.179	-71.8
1.2	0.227	177.6	5.834	78.7	0.102	63.6	0.168	-74.3
1.3	0.234	172.6	5.411	76.2	0.110	63.0	0.157	-77.0
1.4	0.240	167.1	5.026	74.0	0.118	62.3	0.147	-80.6
1.5	0.250	162.6	4.713	71.6	0.125	61.4	0.139	-84.1
1.6	0.257	158.4	4.414	69.5	0.132	60.5	0.131	-88.2
1.7	0.265	154.4	4.159	67.3	0.140	59.7	0.125	-92.5
1.8	0.276	151.5	3.928	65.6	0.147	58.7	0.117	-97.5
1.9	0.289	147.2	3.737	63.5	0.155	57.6	0.113	-102.9
2.0	0.294	145.1	3.561	61.4	0.161	56.5	0.107	-108.5
2.1	0.307	142.0	3.383	59.4	0.169	55.6	0.104	-114.4
2.2	0.316	140.3	3.247	57.7	0.175	54.7	0.101	-120.6
2.3	0.324	138.1	3.088	55.8	0.182	53.6	0.100	-127.3
2.4	0.329	135.7	2.958	53.9	0.189	52.4	0.100	-132.8
2.5	0.338	133.0	2.847	52.1	0.196	51.4	0.101	-139.2
2.6	0.340	130.1	2.726	49.9	0.203	50.0	0.105	-144.5
2.7	0.350	127.6	2.638	48.2	0.208	48.9	0.110	-151.0
2.8	0.351	124.2	2.544	46.5	0.214	47.6	0.117	-156.6
2.9	0.356	121.1	2.440	44.7	0.219	46.4	0.126	-161.8
3.0	0.351	117.2	2.307	43.0	0.220	45.0	0.136	-169.7
4.0	0.494	107.1	1.787	27.9	0.284	34.8	0.208	159.0
5.0	0.558	91.8	1.393	13.6	0.329	23.2	0.310	143.6

S-PARAMETERS Q2

V_{CE} = 1 V, I_C = 1 mA, Z₀ = 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	0.991	-19.4	3.621	166.8	0.048	87.1	0.999	-8.5
0.2	0.984	-39.3	3.495	152.7	0.088	63.3	0.962	-15.4
0.3	0.946	-58.5	3.218	139.1	0.122	56.7	0.924	-22.5
0.4	0.896	-76.2	2.924	126.8	0.152	46.4	0.872	-28.3
0.5	0.851	-91.2	2.618	116.8	0.175	38.8	0.818	-33.2
0.6	0.816	-103.4	2.358	108.8	0.183	33.1	0.766	-37.2
0.7	0.790	-114.1	2.147	101.5	0.193	27.5	0.724	-40.7
0.8	0.787	-123.4	1.993	95.4	0.195	22.7	0.682	-43.6
0.9	0.774	-132.4	1.841	88.8	0.197	19.1	0.652	-46.3
1.0	0.771	-140.6	1.724	82.5	0.196	15.9	0.626	-48.9
1.1	0.760	-147.8	1.599	77.3	0.192	13.5	0.606	-51.4
1.2	0.751	-154.4	1.493	72.3	0.189	10.8	0.589	-53.9
1.3	0.744	-160.5	1.387	67.4	0.184	9.6	0.573	-56.6
1.4	0.738	-165.7	1.311	63.5	0.179	8.3	0.557	-59.7
1.5	0.737	-170.7	1.236	59.5	0.171	7.0	0.549	-62.8
1.6	0.737	-175.7	1.171	55.6	0.166	7.1	0.538	-65.6
1.7	0.741	179.8	1.123	52.3	0.159	6.3	0.531	-69.4
1.8	0.750	175.0	1.074	48.4	0.151	7.1	0.526	-72.6
1.9	0.750	170.2	1.021	44.5	0.144	8.9	0.522	-76.2
2.0	0.752	166.5	0.970	41.1	0.140	10.8	0.520	-80.3
2.1	0.752	162.8	0.920	38.0	0.135	13.5	0.513	-84.5
2.2	0.756	159.4	0.887	35.2	0.129	17.9	0.515	-88.9
2.3	0.757	156.5	0.849	32.6	0.127	21.9	0.511	-93.0
2.4	0.767	153.8	0.815	30.2	0.126	25.9	0.509	-98.0
2.5	0.772	151.1	0.790	28.1	0.130	31.0	0.505	-102.7
2.6	0.771	148.2	0.755	26.0	0.132	35.1	0.507	-107.2
2.7	0.782	145.1	0.728	23.8	0.137	39.7	0.507	-111.8
2.8	0.782	143.2	0.701	22.1	0.146	42.4	0.511	-116.4
2.9	0.781	140.7	0.673	20.0	0.157	46.5	0.511	-120.8
3.0	0.785	137.9	0.652	17.9	0.170	48.1	0.519	-125.6
4.0	0.824	119.0	0.517	9.4	0.299	46.5	0.598	-173.1
5.0	0.820	104.5	0.470	6.6	0.415	29.6	0.679	153.2

V_{CE} = 1 V, I_C = 3 mA, Z₀ = 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	0.905	-33.5	10.568	158.4	0.046	75.5	0.939	-19.2
0.2	0.856	-64.3	9.334	138.9	0.072	54.9	0.817	-32.8
0.3	0.777	-88.9	7.733	123.8	0.095	45.6	0.697	-43.2
0.4	0.715	-108.7	6.456	112.2	0.108	39.4	0.592	-50.5
0.5	0.674	-123.2	5.436	103.7	0.118	35.9	0.512	-55.3
0.6	0.654	-134.4	4.702	97.4	0.119	33.8	0.447	-58.9
0.7	0.641	-143.6	4.126	91.9	0.124	32.5	0.400	-61.7
0.8	0.642	-150.9	3.714	87.1	0.128	31.5	0.363	-64.3
0.9	0.636	-158.3	3.350	82.2	0.130	31.9	0.331	-66.2
1.0	0.636	-164.4	3.059	77.6	0.133	31.7	0.309	-69.0
1.1	0.631	-169.8	2.808	73.8	0.135	32.6	0.292	-70.7
1.2	0.626	-174.9	2.601	70.1	0.136	32.8	0.277	-73.5
1.3	0.627	-179.2	2.395	66.3	0.142	33.7	0.264	-76.5
1.4	0.625	177.0	2.234	63.3	0.146	34.9	0.251	-79.8
1.5	0.628	173.1	2.100	60.2	0.146	35.8	0.242	-83.4
1.6	0.633	169.2	1.983	57.0	0.151	36.1	0.233	-87.3
1.7	0.638	165.9	1.883	54.5	0.154	36.4	0.227	-91.5
1.8	0.647	162.2	1.790	51.2	0.156	37.9	0.221	-95.2
1.9	0.651	158.5	1.696	48.4	0.163	39.2	0.216	-99.6
2.0	0.657	155.7	1.611	45.2	0.169	39.7	0.212	-104.5
2.1	0.659	152.9	1.531	42.6	0.173	39.9	0.210	-110.1
2.2	0.663	150.6	1.464	40.1	0.179	40.9	0.212	-115.0
2.3	0.669	148.4	1.399	37.7	0.186	41.8	0.209	-119.4
2.4	0.678	146.3	1.353	35.6	0.192	42.4	0.213	-125.6
2.5	0.682	144.1	1.307	33.2	0.200	42.5	0.215	-130.9
2.6	0.684	142.1	1.250	31.1	0.204	42.8	0.220	-135.4
2.7	0.695	139.7	1.209	28.7	0.212	43.4	0.223	-140.7
2.8	0.695	138.2	1.161	26.7	0.219	42.9	0.232	-144.9
2.9	0.696	136.1	1.126	24.4	0.229	43.4	0.237	-149.6
3.0	0.704	133.7	1.097	22.1	0.238	43.2	0.250	-153.8
4.0	0.762	118.6	0.845	6.2	0.317	37.7	0.383	168.8
5.0	0.787	105.6	0.673	-3.7	0.404	25.2	0.507	145.0

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

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.857	-40.6	14.145	154.1	0.043	71.9	0.902	-24.7
0.2	0.790	-76.0	11.832	132.6	0.065	51.7	0.735	-41.3
0.3	0.706	-102.1	9.354	117.7	0.082	44.1	0.597	-52.2
0.4	0.656	-121.4	7.570	107.1	0.091	39.6	0.488	-59.9
0.5	0.624	-134.9	6.276	99.4	0.099	38.4	0.411	-64.4
0.6	0.612	-144.9	5.368	93.7	0.103	38.2	0.352	-68.6
0.7	0.605	-153.2	4.679	88.8	0.111	37.9	0.308	-71.1
0.8	0.607	-159.8	4.194	84.5	0.113	37.9	0.277	-74.4
0.9	0.604	-166.3	3.768	80.0	0.119	39.0	0.250	-76.9
1.0	0.608	-171.8	3.427	75.9	0.123	39.4	0.229	-80.0
1.1	0.602	-176.4	3.125	72.3	0.128	40.5	0.213	-81.9
1.2	0.603	179.2	2.887	68.9	0.133	40.8	0.202	-85.8
1.3	0.599	175.1	2.656	65.5	0.139	41.9	0.190	-89.9
1.4	0.603	171.6	2.477	62.7	0.145	42.1	0.179	-93.9
1.5	0.607	168.5	2.321	59.8	0.150	42.4	0.172	-99.2
1.6	0.614	164.6	2.192	57.0	0.157	42.9	0.164	-104.1
1.7	0.619	161.4	2.080	54.4	0.163	42.5	0.160	-109.2
1.8	0.628	158.0	1.973	51.4	0.167	43.5	0.156	-114.1
1.9	0.629	154.6	1.870	48.5	0.174	44.3	0.155	-120.5
2.0	0.637	152.1	1.777	45.7	0.181	43.6	0.154	-125.6
2.1	0.641	149.4	1.682	43.3	0.188	43.8	0.155	-132.6
2.2	0.646	147.7	1.609	40.8	0.193	43.7	0.161	-137.6
2.3	0.650	145.1	1.535	38.5	0.200	43.7	0.160	-142.9
2.4	0.657	143.2	1.480	36.3	0.207	43.7	0.167	-148.9
2.5	0.666	141.1	1.427	34.2	0.215	43.3	0.170	-154.2
2.6	0.662	138.8	1.363	32.2	0.220	43.6	0.178	-158.1
2.7	0.669	137.2	1.317	30.3	0.226	44.0	0.183	-162.8
2.8	0.672	136.3	1.279	28.5	0.236	43.3	0.194	-165.2
2.9	0.675	134.2	1.242	26.1	0.247	43.4	0.204	-169.8
3.0	0.685	132.1	1.213	23.8	0.255	42.5	0.217	-173.0
4.0	0.749	117.2	0.930	6.9	0.322	35.2	0.351	156.9
5.0	0.779	105.0	0.744	-3.7	0.400	23.3	0.468	138.0

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

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.793	-52.5	18.676	148.3	0.036	75.5	0.849	-32.7
0.2	0.705	-91.2	14.443	125.2	0.055	47.4	0.631	-51.5
0.3	0.632	-116.9	10.828	111.4	0.068	44.5	0.490	-63.1
0.4	0.601	-134.5	8.561	101.8	0.078	42.2	0.386	-71.2
0.5	0.581	-146.5	6.991	95.3	0.085	43.9	0.319	-76.8
0.6	0.576	-155.0	5.919	90.4	0.090	44.9	0.268	-81.6
0.7	0.573	-162.1	5.127	86.0	0.098	44.8	0.232	-85.3
0.8	0.576	-167.8	4.573	82.0	0.104	45.6	0.206	-89.8
0.9	0.578	-173.2	4.096	78.0	0.112	46.9	0.183	-94.2
1.0	0.584	-177.7	3.709	74.4	0.118	47.6	0.169	-98.9
1.1	0.579	178.1	3.394	71.0	0.126	48.5	0.156	-102.0
1.2	0.579	174.0	3.123	68.0	0.132	48.8	0.147	-107.7
1.3	0.581	170.8	2.868	64.9	0.142	49.4	0.143	-113.0
1.4	0.581	167.7	2.675	62.4	0.150	49.2	0.135	-118.4
1.5	0.588	164.9	2.510	59.8	0.154	48.8	0.134	-125.1
1.6	0.593	161.4	2.353	57.0	0.165	49.0	0.131	-131.4
1.7	0.600	158.6	2.240	54.6	0.171	48.2	0.135	-137.9
1.8	0.609	155.5	2.125	51.7	0.177	48.7	0.134	-143.8
1.9	0.613	152.5	2.012	49.1	0.186	48.3	0.136	-149.7
2.0	0.621	150.3	1.915	46.4	0.193	47.6	0.139	-154.8
2.1	0.624	147.8	1.810	44.2	0.200	46.8	0.147	-161.6
2.2	0.631	146.1	1.729	41.9	0.208	47.1	0.155	-165.1
2.3	0.635	143.8	1.648	39.6	0.216	46.5	0.157	-169.7
2.4	0.642	142.4	1.591	37.6	0.224	45.8	0.170	-174.5
2.5	0.650	140.5	1.540	35.6	0.233	45.4	0.175	-178.7
2.6	0.651	138.4	1.476	33.5	0.237	44.8	0.185	178.9
2.7	0.664	136.6	1.422	31.2	0.244	44.2	0.193	174.3
2.8	0.662	135.3	1.368	29.3	0.252	43.8	0.202	172.7
2.9	0.663	133.1	1.327	27.2	0.263	43.4	0.212	169.6
3.0	0.671	131.1	1.297	25.1	0.270	42.4	0.222	167.6
4.0	0.733	117.7	1.008	8.8	0.335	34.3	0.353	146.8
5.0	0.768	105.6	0.811	-2.8	0.404	22.0	0.456	132.1

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

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.732	-63.5	22.710	143.1	0.039	53.8	0.785	-39.4
0.2	0.643	-104.7	16.341	119.4	0.049	45.4	0.550	-60.5
0.3	0.586	-128.8	11.832	106.8	0.057	45.6	0.413	-72.6
0.4	0.571	-144.3	9.170	98.5	0.067	45.5	0.319	-81.7
0.5	0.557	-155.0	7.454	92.6	0.076	48.1	0.261	-88.2
0.6	0.558	-162.1	6.290	88.1	0.083	50.2	0.219	-94.3
0.7	0.557	-168.5	5.434	84.0	0.093	50.7	0.189	-99.9
0.8	0.564	-173.4	4.821	80.5	0.100	52.0	0.168	-106.1
0.9	0.565	-178.1	4.311	76.8	0.109	52.4	0.151	-111.7
1.0	0.570	177.9	3.906	73.2	0.118	52.9	0.142	-118.2
1.1	0.566	174.0	3.558	70.2	0.126	53.6	0.132	-122.8
1.2	0.568	170.6	3.282	67.4	0.135	53.2	0.129	-130.1
1.3	0.568	167.6	3.008	64.4	0.144	53.4	0.127	-136.0
1.4	0.570	164.7	2.811	62.0	0.154	53.2	0.125	-142.4
1.5	0.579	162.0	2.626	59.5	0.160	53.1	0.128	-148.7
1.6	0.584	158.9	2.467	56.9	0.170	52.0	0.132	-154.8
1.7	0.592	156.1	2.335	54.6	0.177	51.2	0.138	-160.0
1.8	0.600	153.5	2.219	51.7	0.184	51.1	0.141	-165.6
1.9	0.604	150.5	2.103	49.4	0.194	50.9	0.146	-171.0
2.0	0.611	148.4	1.992	46.7	0.202	49.7	0.154	-174.7
2.1	0.616	146.2	1.892	44.6	0.209	48.4	0.163	-179.9
2.2	0.623	144.4	1.804	42.3	0.218	48.5	0.171	-177.5
2.3	0.629	142.5	1.728	40.1	0.227	48.0	0.175	-173.2
2.4	0.636	141.0	1.662	38.2	0.234	46.9	0.188	-170.0
2.5	0.644	139.2	1.607	36.1	0.243	45.9	0.195	-166.8
2.6	0.646	137.4	1.537	34.2	0.247	45.5	0.205	-165.1
2.7	0.654	135.4	1.483	32.1	0.256	44.8	0.214	-161.6
2.8	0.655	134.1	1.427	30.2	0.263	43.5	0.222	-160.0
2.9	0.654	132.4	1.381	28.1	0.272	43.3	0.232	-157.4
3.0	0.664	130.2	1.355	26.0	0.280	42.3	0.243	-155.8
4.0	0.726	117.2	1.050	10.0	0.343	33.4	0.362	-139.8
5.0	0.757	105.5	0.850	-1.8	0.406	20.9	0.453	-127.1

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

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.581	-93.3	30.515	130.3	0.025	59.7	0.642	-56.5
0.2	0.551	-131.2	18.907	109.2	0.036	45.6	0.399	-80.4
0.3	0.535	-150.6	13.075	99.3	0.043	56.4	0.293	-95.0
0.4	0.535	-161.8	9.967	92.8	0.057	56.0	0.229	-107.7
0.5	0.535	-169.3	8.020	88.1	0.069	58.7	0.192	-117.4
0.6	0.537	-174.2	6.742	84.4	0.078	62.2	0.171	-127.6
0.7	0.540	-178.7	5.797	81.0	0.088	61.4	0.155	-135.9
0.8	0.549	177.6	5.132	77.8	0.099	61.0	0.148	-143.1
0.9	0.551	174.1	4.565	74.8	0.109	61.5	0.145	-151.1
1.0	0.558	170.8	4.128	71.5	0.119	61.1	0.145	-156.9
1.1	0.555	167.8	3.762	68.7	0.130	61.2	0.143	-161.8
1.2	0.557	165.0	3.470	66.2	0.139	60.0	0.148	-167.5
1.3	0.559	162.3	3.178	63.4	0.151	59.8	0.152	-171.6
1.4	0.563	160.1	2.966	61.4	0.162	58.2	0.157	-176.9
1.5	0.568	157.5	2.769	58.8	0.170	57.5	0.164	-179.8
1.6	0.576	154.9	2.607	56.5	0.182	56.7	0.172	-176.0
1.7	0.583	152.4	2.461	54.3	0.188	54.7	0.180	-172.5
1.8	0.591	150.1	2.329	51.5	0.197	54.5	0.187	-168.9
1.9	0.598	147.3	2.213	49.3	0.209	53.3	0.195	-166.1
2.0	0.604	145.4	2.097	46.8	0.216	52.1	0.203	-163.3
2.1	0.609	143.4	1.983	44.9	0.223	50.9	0.215	-160.1
2.2	0.617	142.1	1.894	42.8	0.232	50.2	0.225	-158.9
2.3	0.620	140.3	1.806	40.7	0.241	49.1	0.231	-155.3
2.4	0.629	138.9	1.745	38.7	0.249	47.7	0.242	-153.1
2.5	0.638	137.2	1.683	36.9	0.259	47.1	0.249	-150.8
2.6	0.638	135.5	1.610	35.0	0.265	46.1	0.258	-149.4
2.7	0.649	133.8	1.552	32.8	0.271	45.0	0.267	-146.8
2.8	0.649	132.5	1.493	31.0	0.278	43.8	0.274	-145.6
2.9	0.648	130.5	1.450	29.1	0.289	43.4	0.284	-143.9
3.0	0.660	128.8	1.417	27.1	0.295	42.0	0.293	-142.7
4.0	0.720	116.3	1.102	11.5	0.354	31.9	0.400	-130.1
5.0	0.753	105.2	0.896	-0.1	0.411	19.3	0.470	-119.4

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

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.984	-19.1	3.923	167.5	0.040	78.7	0.998	-7.6
0.2	0.989	-38.3	3.801	153.9	0.074	65.8	0.969	-13.9
0.3	0.942	-56.7	3.506	140.8	0.103	58.0	0.934	-20.3
0.4	0.898	-74.0	3.202	128.8	0.132	48.9	0.884	-25.7
0.5	0.853	-88.8	2.883	119.0	0.152	40.7	0.835	-30.3
0.6	0.816	-101.2	2.597	111.1	0.159	35.2	0.785	-33.9
0.7	0.791	-111.8	2.363	104.4	0.168	30.0	0.746	-37.1
0.8	0.781	-121.2	2.199	98.2	0.170	25.5	0.706	-39.8
0.9	0.768	-130.3	2.033	91.9	0.173	22.0	0.675	-42.1
1.0	0.766	-138.7	1.903	85.9	0.172	19.0	0.649	-44.4
1.1	0.754	-145.9	1.762	80.6	0.168	16.9	0.629	-46.6
1.2	0.745	-152.8	1.650	75.8	0.165	14.7	0.611	-48.8
1.3	0.735	-158.9	1.534	71.1	0.162	13.5	0.595	-51.2
1.4	0.727	-164.2	1.446	67.2	0.157	12.5	0.581	-53.9
1.5	0.727	-169.4	1.367	63.3	0.151	11.7	0.571	-56.7
1.6	0.729	-174.5	1.294	59.5	0.147	11.8	0.559	-59.2
1.7	0.731	-179.0	1.240	56.2	0.142	11.3	0.553	-62.4
1.8	0.739	176.0	1.184	52.1	0.135	13.7	0.547	-65.1
1.9	0.737	171.3	1.126	48.6	0.131	15.4	0.541	-68.4
2.0	0.743	167.4	1.072	45.0	0.127	18.0	0.537	-72.2
2.1	0.742	163.5	1.019	42.1	0.123	20.1	0.529	-75.8
2.2	0.746	160.3	0.977	39.0	0.120	25.3	0.529	-80.0
2.3	0.745	157.1	0.937	36.7	0.121	29.3	0.527	-83.5
2.4	0.754	154.5	0.903	34.3	0.121	33.6	0.520	-88.2
2.5	0.758	151.6	0.873	32.0	0.125	38.1	0.516	-92.4
2.6	0.758	148.7	0.837	29.7	0.128	42.5	0.514	-96.8
2.7	0.768	145.7	0.806	27.7	0.134	46.2	0.513	-101.2
2.8	0.769	143.8	0.777	25.6	0.143	48.5	0.515	-105.4
2.9	0.765	141.3	0.747	23.6	0.156	51.5	0.513	-109.5
3.0	0.774	138.4	0.725	21.3	0.168	52.9	0.518	-114.4
4.0	0.813	119.4	0.569	10.4	0.297	50.4	0.576	-162.6
5.0	0.816	105.0	0.498	6.5	0.419	33.1	0.654	161.3

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

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.939	-28.4	9.630	161.3	0.036	84.0	0.964	-14.7
0.2	0.887	-55.9	8.779	143.3	0.066	56.2	0.866	-26.0
0.3	0.805	-79.1	7.497	128.6	0.086	49.6	0.767	-35.0
0.4	0.742	-98.6	6.405	116.9	0.100	42.7	0.673	-41.2
0.5	0.693	-113.8	5.459	108.0	0.111	38.7	0.595	-45.4
0.6	0.667	-125.5	4.762	101.3	0.114	35.8	0.532	-48.4
0.7	0.647	-135.2	4.207	95.5	0.120	33.2	0.484	-50.7
0.8	0.644	-143.4	3.803	90.6	0.120	32.3	0.445	-52.6
0.9	0.635	-151.3	3.446	85.7	0.124	31.8	0.415	-54.0
1.0	0.635	-158.0	3.157	80.8	0.126	31.6	0.390	-55.7
1.1	0.628	-163.9	2.903	76.6	0.126	32.3	0.373	-57.2
1.2	0.624	-169.4	2.694	72.9	0.128	32.3	0.355	-59.3
1.3	0.620	-174.1	2.470	69.4	0.130	33.5	0.341	-61.4
1.4	0.618	-178.2	2.313	66.2	0.133	34.3	0.327	-63.8
1.5	0.620	177.4	2.176	62.9	0.134	35.0	0.316	-66.6
1.6	0.624	173.3	2.053	59.8	0.138	36.7	0.304	-69.0
1.7	0.629	169.5	1.954	57.1	0.140	36.7	0.296	-72.4
1.8	0.637	165.7	1.854	53.7	0.142	38.7	0.289	-75.2
1.9	0.639	162.0	1.761	50.7	0.148	40.5	0.281	-78.0
2.0	0.645	159.0	1.676	47.4	0.153	41.1	0.276	-82.4
2.1	0.647	155.7	1.589	45.0	0.157	41.9	0.265	-86.6
2.2	0.655	153.4	1.526	42.4	0.162	43.4	0.266	-90.9
2.3	0.656	150.7	1.458	39.9	0.168	44.4	0.262	-94.1
2.4	0.665	148.8	1.406	37.6	0.174	44.6	0.258	-100.1
2.5	0.672	146.4	1.359	35.4	0.182	45.7	0.255	-104.3
2.6	0.673	144.2	1.300	33.3	0.186	46.3	0.255	-108.9
2.7	0.685	142.0	1.256	30.8	0.194	47.0	0.253	-114.2
2.8	0.687	140.1	1.210	28.8	0.202	47.0	0.259	-118.6
2.9	0.684	137.8	1.165	26.5	0.212	47.5	0.259	-123.2
3.0	0.695	135.6	1.139	24.1	0.221	47.7	0.268	-128.1
4.0	0.755	119.7	0.873	7.3	0.307	42.7	0.369	-174.8
5.0	0.786	106.5	0.695	-3.1	0.403	29.5	0.492	156.0

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

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.851	-39.0	15.112	155.3	0.035	66.6	0.912	-21.9
0.2	0.782	-71.7	12.744	134.3	0.057	53.4	0.758	-36.6
0.3	0.693	-97.3	10.222	119.5	0.070	49.0	0.624	-46.3
0.4	0.638	-116.7	8.302	108.8	0.082	42.9	0.516	-52.4
0.5	0.601	-130.4	6.897	101.1	0.089	41.6	0.441	-56.1
0.6	0.587	-141.0	5.911	95.5	0.092	40.7	0.383	-58.9
0.7	0.576	-149.5	5.156	90.5	0.099	40.9	0.342	-60.5
0.8	0.577	-156.5	4.615	86.4	0.102	41.6	0.306	-62.2
0.9	0.573	-163.0	4.155	82.1	0.109	42.4	0.282	-63.9
1.0	0.576	-168.7	3.779	77.8	0.113	42.6	0.260	-65.5
1.1	0.571	-173.5	3.453	74.4	0.117	44.4	0.246	-66.9
1.2	0.570	-178.0	3.187	71.1	0.122	44.3	0.231	-69.3
1.3	0.569	177.9	2.929	67.8	0.129	45.1	0.218	-71.6
1.4	0.569	174.3	2.740	64.9	0.135	46.0	0.206	-74.6
1.5	0.575	170.6	2.566	62.2	0.139	46.6	0.197	-78.2
1.6	0.580	167.0	2.418	59.5	0.147	47.0	0.188	-81.7
1.7	0.585	163.7	2.295	56.9	0.151	46.2	0.181	-86.1
1.8	0.597	160.5	2.181	53.8	0.158	47.7	0.172	-89.9
1.9	0.600	157.0	2.065	51.2	0.165	48.0	0.165	-93.8
2.0	0.605	154.4	1.961	48.3	0.174	47.4	0.164	-99.0
2.1	0.609	151.8	1.860	46.0	0.177	47.6	0.155	-105.4
2.2	0.615	149.7	1.777	43.6	0.185	48.1	0.158	-110.6
2.3	0.621	147.8	1.702	41.3	0.192	47.9	0.154	-115.2
2.4	0.630	145.8	1.639	39.2	0.199	47.6	0.157	-122.8
2.5	0.636	143.7	1.586	37.0	0.208	47.8	0.155	-128.5
2.6	0.639	141.4	1.520	34.9	0.213	47.2	0.159	-133.1
2.7	0.650	139.5	1.463	32.8	0.220	47.0	0.160	-139.4
2.8	0.651	138.0	1.412	30.7	0.227	46.6	0.166	-143.8
2.9	0.650	136.1	1.363	28.5	0.238	46.8	0.171	-149.3
3.0	0.660	133.6	1.335	26.2	0.246	45.9	0.182	-153.2
4.0	0.727	119.4	1.027	9.1	0.319	39.2	0.305	168.2
5.0	0.766	106.9	0.821	-3.0	0.398	26.9	0.425	146.9

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

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.802	-45.9	18.711	151.1	0.032	69.2	0.878	-27.4
0.2	0.723	-81.9	15.009	129.1	0.051	50.4	0.681	-43.1
0.3	0.629	-107.3	11.524	114.8	0.061	48.0	0.546	-52.9
0.4	0.588	-126.5	9.192	104.9	0.072	44.9	0.436	-59.0
0.5	0.562	-139.3	7.548	97.9	0.080	44.8	0.368	-62.6
0.6	0.551	-148.8	6.424	92.8	0.083	46.6	0.313	-65.1
0.7	0.547	-156.7	5.569	88.2	0.091	45.3	0.275	-66.9
0.8	0.550	-162.5	4.976	84.5	0.097	47.0	0.247	-69.1
0.9	0.550	-168.4	4.460	80.4	0.104	47.8	0.223	-70.6
1.0	0.554	-173.6	4.045	76.6	0.110	48.7	0.203	-72.9
1.1	0.549	-178.1	3.698	73.3	0.117	50.0	0.191	-74.4
1.2	0.549	177.8	3.404	70.2	0.122	50.2	0.177	-77.8
1.3	0.548	174.2	3.128	67.1	0.131	50.5	0.169	-80.9
1.4	0.549	170.9	2.924	64.6	0.138	50.1	0.156	-84.2
1.5	0.556	167.6	2.740	62.0	0.144	50.9	0.148	-89.3
1.6	0.562	164.1	2.574	59.3	0.153	51.0	0.141	-94.4
1.7	0.567	161.3	2.441	56.7	0.158	50.3	0.136	-99.2
1.8	0.577	158.1	2.314	53.9	0.164	51.0	0.129	-104.2
1.9	0.582	154.9	2.194	51.2	0.174	50.7	0.125	-109.7
2.0	0.591	152.4	2.087	48.5	0.181	50.0	0.125	-115.5
2.1	0.595	150.2	1.973	46.4	0.188	49.5	0.121	-124.0
2.2	0.602	148.0	1.887	44.1	0.195	49.7	0.127	-130.2
2.3	0.606	146.0	1.804	41.9	0.202	49.2	0.123	-135.3
2.4	0.613	144.4	1.738	39.9	0.211	48.7	0.130	-143.2
2.5	0.621	142.3	1.682	37.7	0.219	48.2	0.132	-148.7
2.6	0.624	140.6	1.608	35.7	0.223	48.0	0.137	-153.3
2.7	0.636	138.5	1.550	33.5	0.231	47.4	0.142	-160.2
2.8	0.635	137.1	1.495	31.7	0.239	46.4	0.149	-163.6
2.9	0.637	135.1	1.446	29.3	0.249	46.5	0.158	-168.3
3.0	0.646	133.0	1.415	27.2	0.256	45.6	0.168	-171.3
4.0	0.714	119.1	1.091	10.4	0.325	37.7	0.296	158.1
5.0	0.753	106.9	0.872	-2.2	0.399	25.6	0.407	140.8

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

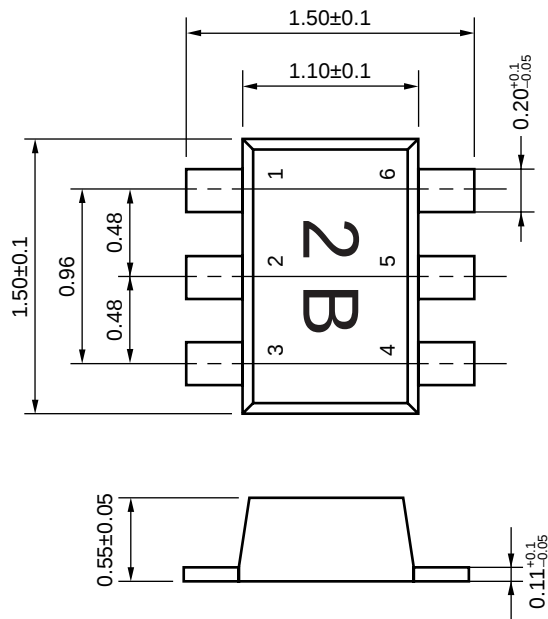
Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.750	-56.5	23.514	146.0	0.027	64.8	0.823	-33.9
0.2	0.644	-95.7	17.490	122.6	0.045	47.2	0.593	-51.3
0.3	0.572	-120.7	12.917	109.5	0.054	46.3	0.456	-60.9
0.4	0.541	-137.5	10.084	100.7	0.063	48.6	0.356	-67.2
0.5	0.526	-149.2	8.204	94.5	0.073	49.9	0.292	-70.9
0.6	0.523	-157.4	6.928	89.9	0.077	52.7	0.245	-74.0
0.7	0.521	-163.9	5.995	85.9	0.086	52.5	0.212	-76.3
0.8	0.523	-169.3	5.321	82.3	0.093	53.4	0.187	-79.3
0.9	0.527	-174.6	4.765	78.7	0.102	54.0	0.166	-81.7
1.0	0.531	-178.7	4.312	75.1	0.108	54.9	0.153	-85.3
1.1	0.526	177.4	3.932	72.2	0.117	55.8	0.139	-87.4
1.2	0.528	173.5	3.628	69.5	0.125	55.4	0.128	-92.4
1.3	0.529	170.1	3.328	66.6	0.135	55.2	0.122	-96.6
1.4	0.534	167.5	3.108	63.9	0.143	55.3	0.112	-101.6
1.5	0.537	164.5	2.906	61.5	0.149	55.0	0.110	-108.4
1.6	0.543	161.3	2.723	58.8	0.160	54.0	0.107	-115.8
1.7	0.551	158.6	2.583	56.8	0.165	53.3	0.104	-122.9
1.8	0.562	155.9	2.448	54.1	0.172	53.6	0.101	-129.8
1.9	0.567	152.4	2.323	51.5	0.181	53.0	0.100	-136.5
2.0	0.574	150.6	2.204	48.8	0.190	51.8	0.104	-143.6
2.1	0.578	148.1	2.090	46.8	0.197	51.6	0.109	-152.9
2.2	0.586	146.6	1.996	44.7	0.205	51.1	0.117	-156.8
2.3	0.591	144.5	1.905	42.4	0.214	50.1	0.117	-163.6
2.4	0.600	142.7	1.836	40.4	0.222	49.4	0.126	-169.5
2.5	0.607	141.2	1.774	38.5	0.230	48.7	0.132	-174.4
2.6	0.610	139.5	1.698	36.6	0.236	48.2	0.141	-177.7
2.7	0.622	137.2	1.636	34.4	0.242	47.6	0.147	177.2
2.8	0.624	136.0	1.578	32.5	0.250	46.6	0.156	175.1
2.9	0.624	134.2	1.527	30.4	0.261	46.2	0.167	171.3
3.0	0.636	132.0	1.493	28.4	0.267	45.3	0.176	169.7
4.0	0.702	119.0	1.156	11.7	0.333	36.2	0.301	147.8
5.0	0.744	106.9	0.927	-0.8	0.400	24.1	0.401	134.1

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

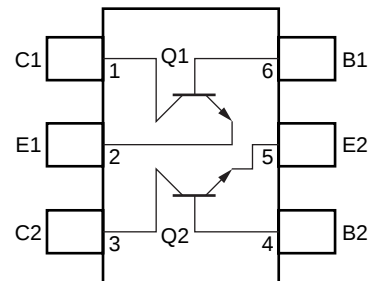
Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.576	-82.7	32.751	133.7	0.019	74.7	0.684	-47.8
0.2	0.516	-122.3	20.941	111.9	0.033	49.5	0.430	-67.0
0.3	0.491	-143.9	14.639	101.4	0.039	56.1	0.309	-77.0
0.4	0.490	-156.1	11.171	94.7	0.051	59.8	0.235	-85.3
0.5	0.484	-164.6	9.005	89.8	0.065	60.6	0.188	-90.6
0.6	0.489	-170.0	7.567	86.3	0.072	63.7	0.157	-97.0
0.7	0.489	-175.5	6.505	82.5	0.082	62.6	0.134	-102.3
0.8	0.496	-179.0	5.770	79.5	0.090	62.8	0.119	-108.6
0.9	0.499	176.8	5.143	76.4	0.102	63.4	0.107	-115.2
1.0	0.506	173.6	4.652	73.3	0.112	62.7	0.101	-122.0
1.1	0.504	170.4	4.245	70.5	0.121	62.9	0.094	-127.8
1.2	0.507	167.5	3.891	67.9	0.130	61.6	0.092	-135.7
1.3	0.510	164.8	3.578	65.4	0.141	61.2	0.093	-142.2
1.4	0.514	162.2	3.339	63.2	0.151	60.2	0.091	-150.6
1.5	0.521	160.0	3.125	61.0	0.159	59.8	0.097	-157.2
1.6	0.527	157.0	2.931	58.4	0.171	58.4	0.102	-163.1
1.7	0.534	154.7	2.767	56.5	0.177	57.0	0.110	-168.7
1.8	0.545	152.2	2.633	53.7	0.184	56.7	0.115	-174.5
1.9	0.548	149.4	2.488	51.5	0.195	56.0	0.120	-179.7
2.0	0.560	147.7	2.358	49.3	0.205	54.3	0.129	176.7
2.1	0.565	145.5	2.233	47.1	0.210	53.3	0.139	171.2
2.2	0.571	143.9	2.132	45.1	0.221	52.6	0.149	169.6
2.3	0.575	142.3	2.034	42.9	0.229	51.4	0.156	165.1
2.4	0.586	140.8	1.960	41.0	0.237	50.5	0.167	162.2
2.5	0.594	139.3	1.892	39.1	0.246	49.5	0.174	158.6
2.6	0.595	137.6	1.809	37.3	0.252	48.6	0.183	156.7
2.7	0.610	135.7	1.743	35.2	0.258	47.4	0.192	153.6
2.8	0.609	134.4	1.678	33.5	0.265	46.5	0.198	152.8
2.9	0.610	132.5	1.627	31.3	0.276	46.0	0.210	150.2
3.0	0.620	130.6	1.588	29.4	0.283	44.7	0.218	149.4
4.0	0.689	118.1	1.231	13.3	0.343	34.7	0.334	135.3
5.0	0.733	106.8	0.996	0.9	0.403	22.3	0.412	124.5

PACKAGE DIMENSIONS

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



(Top View)



PIN CONNECTIONS

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

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M8E 00.4-0110

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► **Technical issue**

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