

# DATA SHEET

# NEC

## NPN SILICON RF TWIN TRANSISTOR $\mu$ PA862TD

### NPN SILICON RF TRANSISTOR (WITH 2 DIFFERENT ELEMENTS) IN A 6-PIN LEAD-LESS MINIMOLD

#### FEATURES

- Low voltage operation
- 2 different built-in transistors (2SC5435, 2SC5800)
  - Q1: Built-in high gain transistor  
 $f_T = 12.0 \text{ GHz TYP.}$ ,  $|S_{21e}|^2 = 8.5 \text{ dB TYP. @ } V_{CE} = 3 \text{ V, } I_c = 10 \text{ mA, } f = 2 \text{ GHz}$
  - Q2: Built-in low phase distortion transistor suited for OSC operation  
 $f_T = 4.5 \text{ GHz TYP.}$ ,  $|S_{21e}|^2 = 4.0 \text{ dB TYP. @ } V_{CE} = 1 \text{ V, } I_c = 5 \text{ mA, } f = 2 \text{ GHz}$
- 6-pin lead-less minimold package

#### BUILT-IN TRANSISTORS

	Q1	Q2
3-pin thin-type ultra super minimold part No.	2SC5435	2SC5800

#### ORDERING INFORMATION

Part Number	Quantity	Supplying Form
$\mu$ PA862TD	50 pcs (Non reel)	• 8 mm wide embossed taping
$\mu$ PA862TD-T3	10 kpcs/reel	• Pin 1 (Q1 Collector), Pin 6 (Q1 Base) face the perforation side of the tape

**Remark** To order evaluation samples, consult your NEC sales representative.  
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 representative for availability and additional information.

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

Parameter	Symbol	Ratings		Unit
		Q1	Q2	
Collector to Base Voltage	V <sub>CBO</sub>	9	9	V
Collector to Emitter Voltage	V <sub>CEO</sub>	6	5.5	V
Emitter to Base Voltage	V <sub>EBO</sub>	2	1.5	V
Collector Current	I <sub>C</sub>	30	100	mA
Total Power Dissipation	P <sub>tot</sub> <sup>Note</sup>	180	190	mW
		210 in 2 elements		
Junction Temperature	T <sub>j</sub>	150		°C
Storage Temperature	T <sub>stg</sub>	-65 to +150		°C

**Note** Mounted on 1.08 cm<sup>2</sup> × 1.0 mm (t) glass epoxy PCB

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

**(1) Q1**

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Collector Cut-off Current	I <sub>CBO</sub>	V <sub>CB</sub> = 5 V, I <sub>E</sub> = 0 mA	–	–	100	nA
Emitter Cut-off Current	I <sub>EBO</sub>	V <sub>BE</sub> = 1 V, I <sub>C</sub> = 0 mA	–	–	100	nA
DC Current Gain	h <sub>FE</sub> <sup>Note 1</sup>	V <sub>CE</sub> = 3 V, I <sub>C</sub> = 10 mA	75	110	150	–
Gain Bandwidth Product	f <sub>T</sub>	V <sub>CE</sub> = 3 V, I <sub>C</sub> = 10 mA, f = 2 GHz	10.0	12.0	–	GHz
Insertion Power Gain	S <sub>21e</sub>   <sup>2</sup>	V <sub>CE</sub> = 3 V, I <sub>C</sub> = 10 mA, f = 2 GHz	7.0	8.5	–	dB
Noise Figure	NF	V <sub>CE</sub> = 3 V, I <sub>C</sub> = 3 mA, f = 2 GHz, Z <sub>S</sub> = Z <sub>opt</sub>	–	1.5	2.5	dB
Reverse Transfer Capacitance	C <sub>re</sub> <sup>Note 2</sup>	V <sub>CB</sub> = 3 V, I <sub>E</sub> = 0 mA, f = 1 MHz	–	0.4	0.7	pF

**(2) Q2**

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Collector Cut-off Current	I <sub>CBO</sub>	V <sub>CB</sub> = 5 V, I <sub>E</sub> = 0 mA	–	–	600	nA
Emitter Cut-off Current	I <sub>EBO</sub>	V <sub>BE</sub> = 1 V, I <sub>C</sub> = 0 mA	–	–	600	nA
DC Current Gain	h <sub>FE</sub> <sup>Note 1</sup>	V <sub>CE</sub> = 1 V, I <sub>C</sub> = 5 mA	100	120	145	–
Gain Bandwidth Product (1)	f <sub>T</sub>	V <sub>CE</sub> = 1 V, I <sub>C</sub> = 5 mA, f = 2 GHz	3.0	4.5	–	GHz
Gain Bandwidth Product (2)	f <sub>T</sub>	V <sub>CE</sub> = 1 V, I <sub>C</sub> = 15 mA, f = 2 GHz	5.0	6.5	–	GHz
Insertion Power Gain (1)	S <sub>21e</sub>   <sup>2</sup>	V <sub>CE</sub> = 1 V, I <sub>C</sub> = 5 mA, f = 2 GHz	3.0	4.0	–	dB
Insertion Power Gain (2)	S <sub>21e</sub>   <sup>2</sup>	V <sub>CE</sub> = 1 V, I <sub>C</sub> = 15 mA, f = 2 GHz	4.5	5.5	–	dB
Noise Figure	NF	V <sub>CE</sub> = 1 V, I <sub>C</sub> = 10 mA, f = 2 GHz, Z <sub>S</sub> = Z <sub>opt</sub>	–	1.9	2.5	dB
Reverse Transfer Capacitance	C <sub>re</sub> <sup>Note 2</sup>	V <sub>CB</sub> = 0.5 V, I <sub>E</sub> = 0 mA, f = 1 MHz	–	0.6	0.8	pF

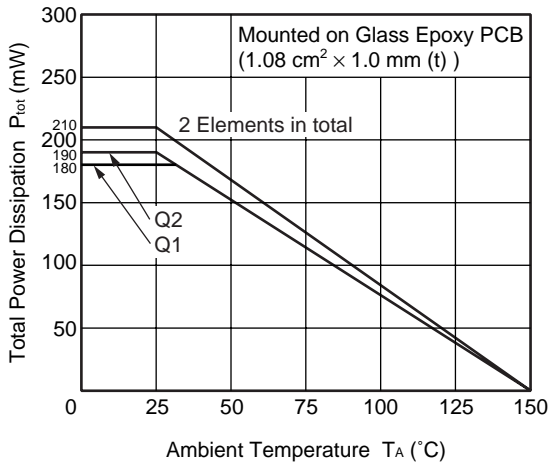
- Notes 1.** Pulse measurement: PW ≤ 350 μs, Duty Cycle ≤ 2%  
**2.** Collector to base capacitance when the emitter grounded

**h<sub>FE</sub> CLASSIFICATION**

Rank	FB
Marking	vY
h <sub>FE</sub> Value of Q1	75 to 150
h <sub>FE</sub> Value of Q2	100 to 145

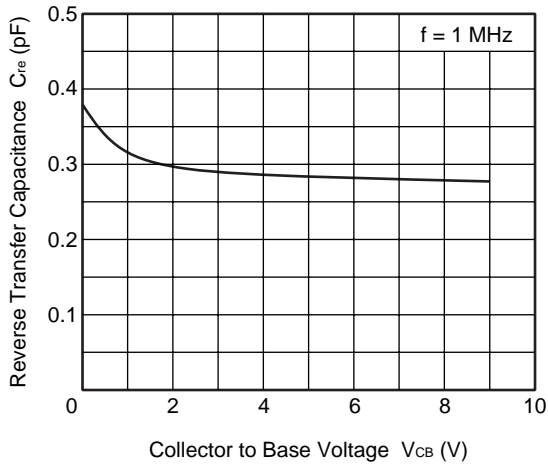
**TYPICAL CHARACTERISTICS (Unless otherwise specified,  $T_A = +25^\circ\text{C}$ )**

**TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE**



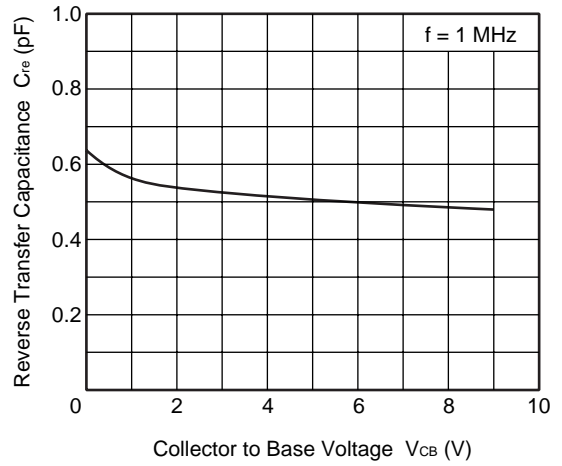
**Q1**

**REVERSE TRANSFER CAPACITANCE vs. COLLECTOR TO BASE VOLTAGE**



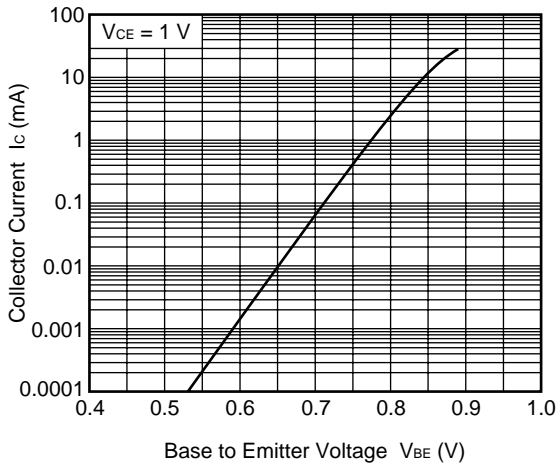
**Q2**

**REVERSE TRANSFER CAPACITANCE vs. COLLECTOR TO BASE VOLTAGE**



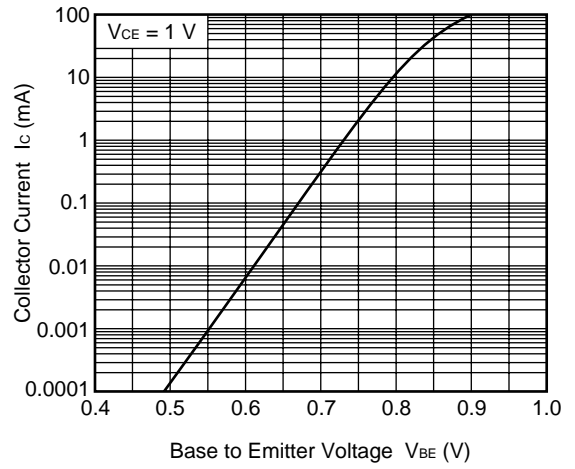
Q1

COLLECTOR CURRENT vs.  
BASE TO EMITTER VOLTAGE

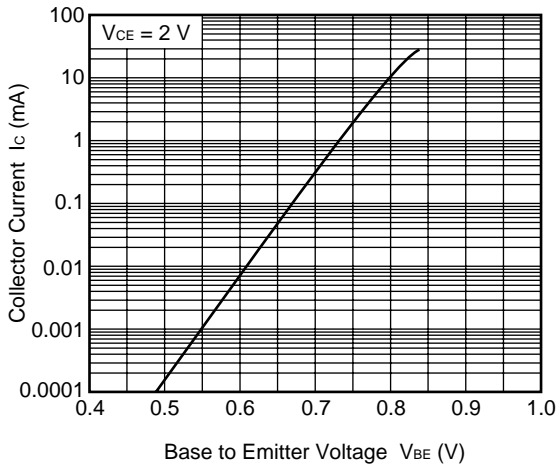


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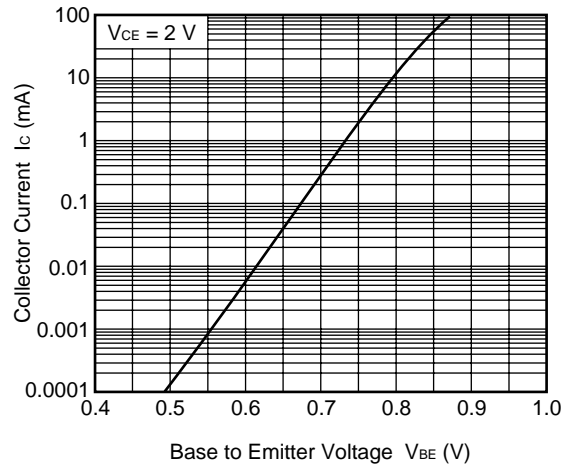
COLLECTOR CURRENT vs.  
BASE TO EMITTER VOLTAGE



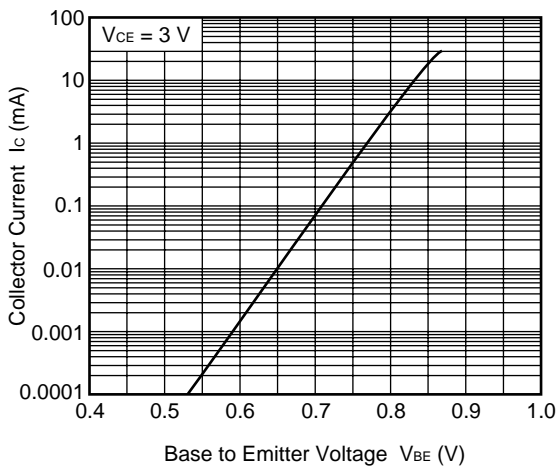
COLLECTOR CURRENT vs.  
BASE TO EMITTER VOLTAGE



COLLECTOR CURRENT vs.  
BASE TO EMITTER VOLTAGE

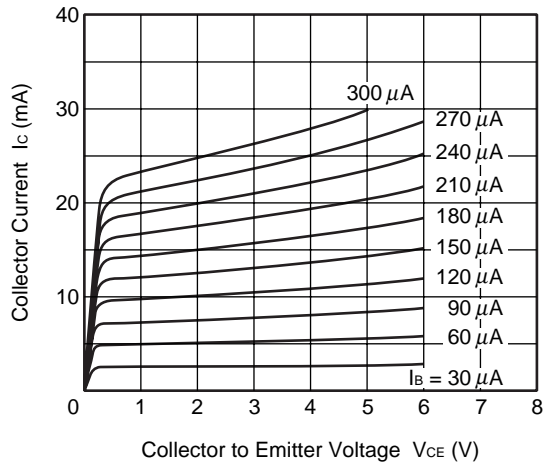


COLLECTOR CURRENT vs.  
BASE TO EMITTER VOLTAGE



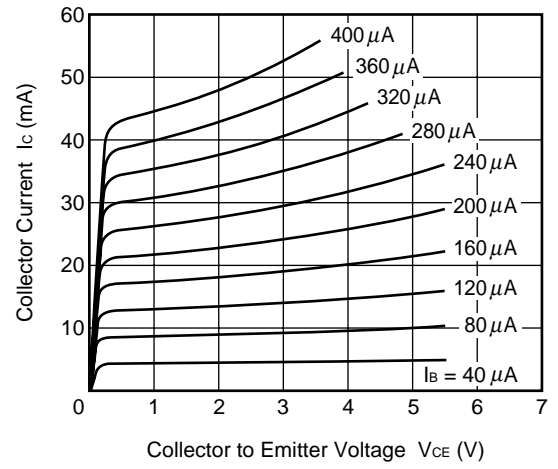
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COLLECTOR CURRENT vs.  
COLLECTOR TO EMITTER VOLTAGE



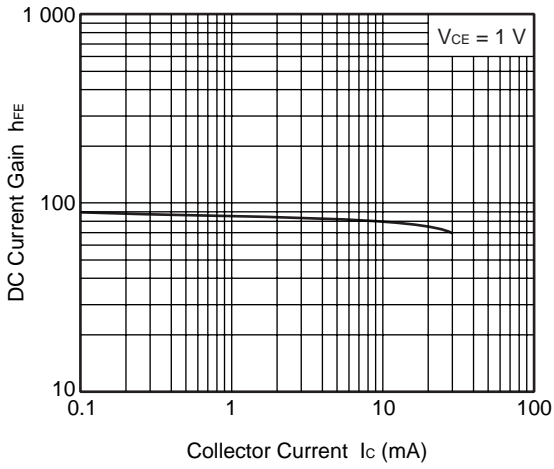
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COLLECTOR CURRENT vs.  
COLLECTOR TO EMITTER VOLTAGE



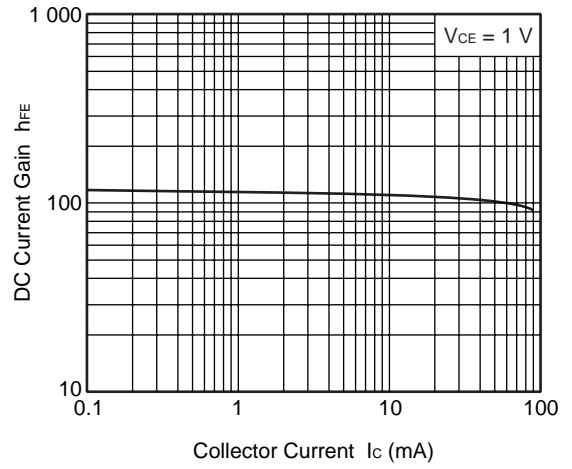
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DC CURRENT GAIN vs.  
COLLECTOR CURRENT

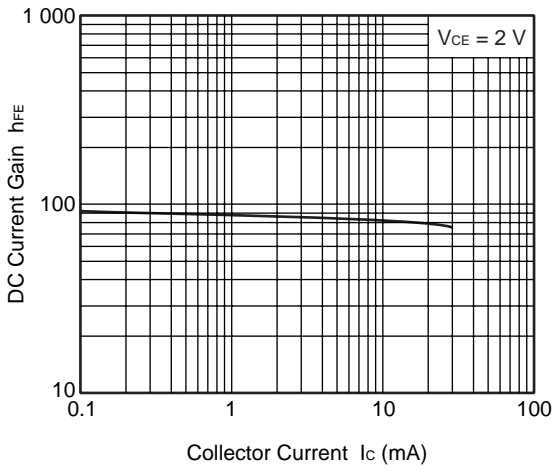


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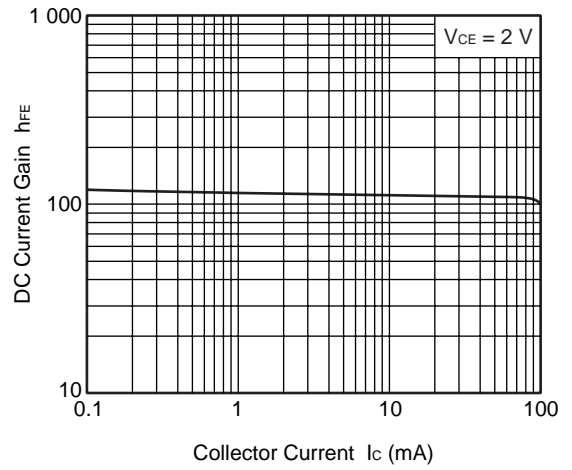
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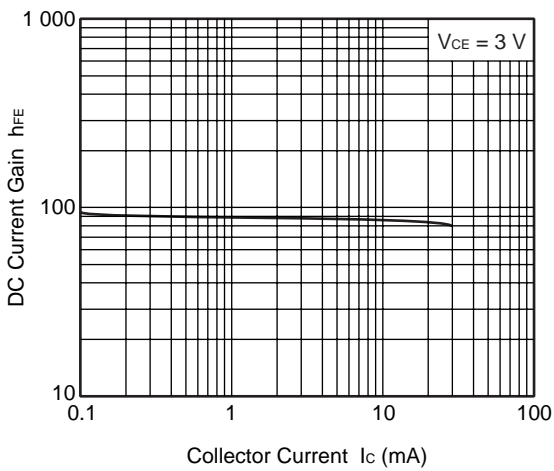
DC CURRENT GAIN vs.  
COLLECTOR CURRENT



DC CURRENT GAIN vs.  
COLLECTOR CURRENT

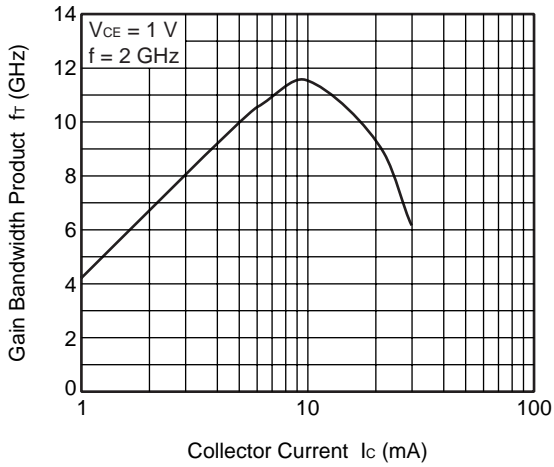


DC CURRENT GAIN vs.  
COLLECTOR CURRENT



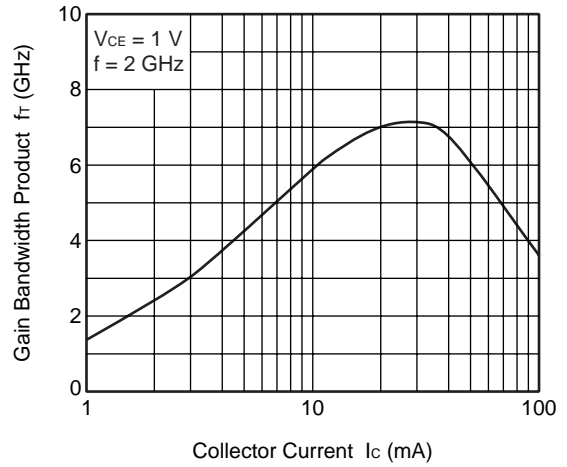
Q1

GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT

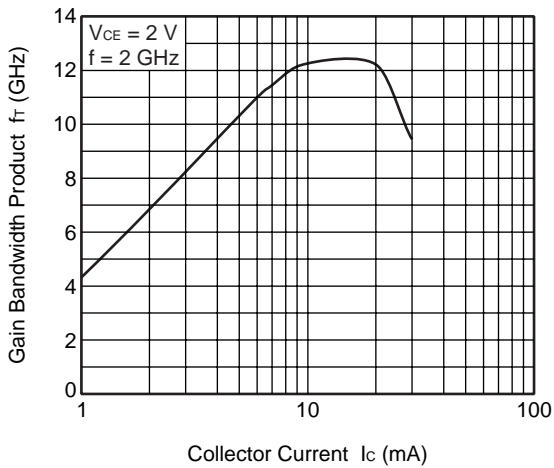


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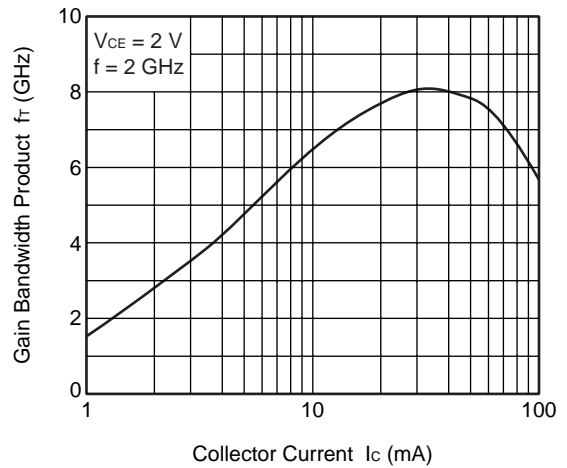
GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT



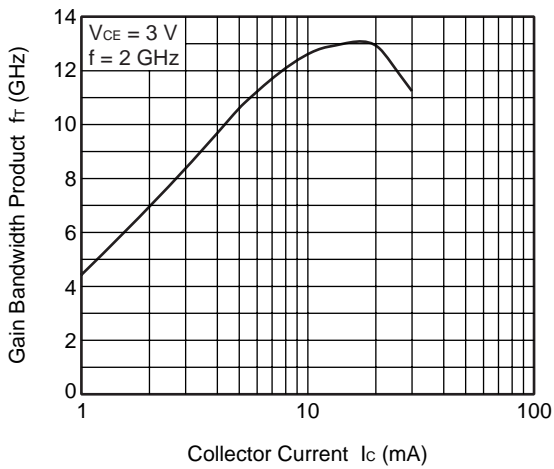
GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT



GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT



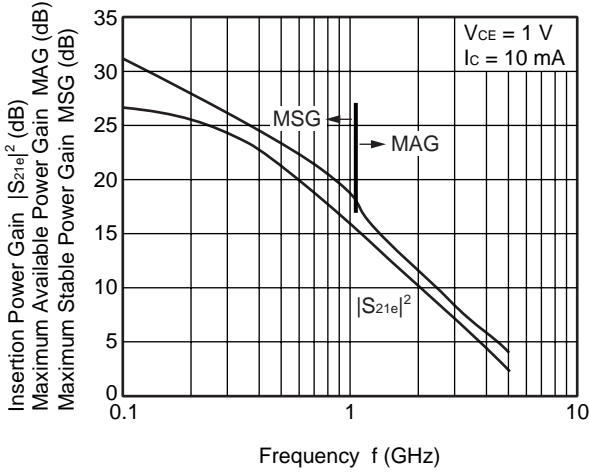
GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT





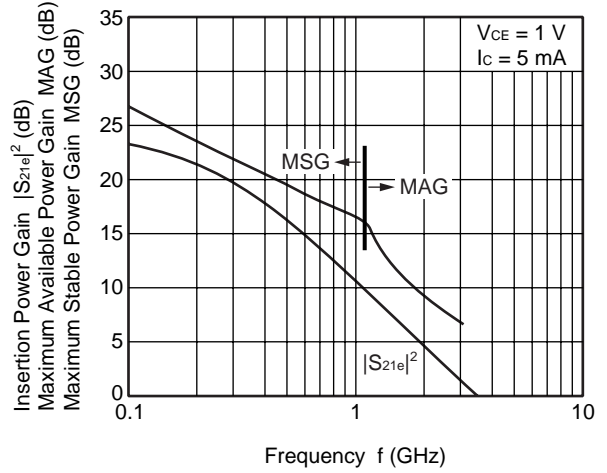
Q1

INSERTION POWER GAIN, MAG, MSG vs. FREQUENCY

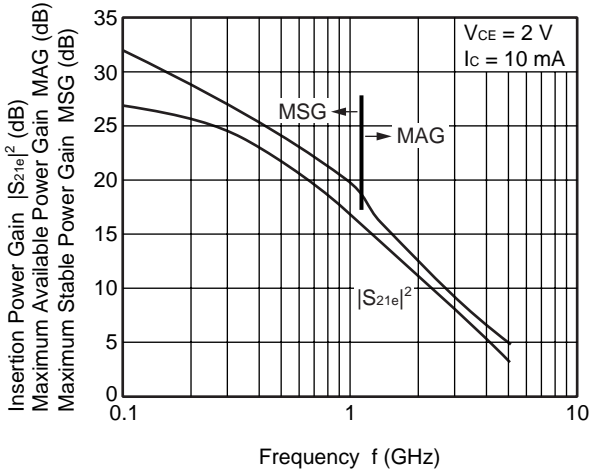


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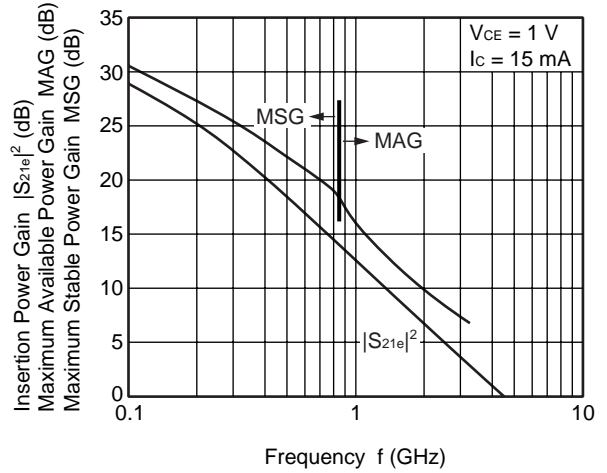
INSERTION POWER GAIN, MAG, MSG vs. FREQUENCY



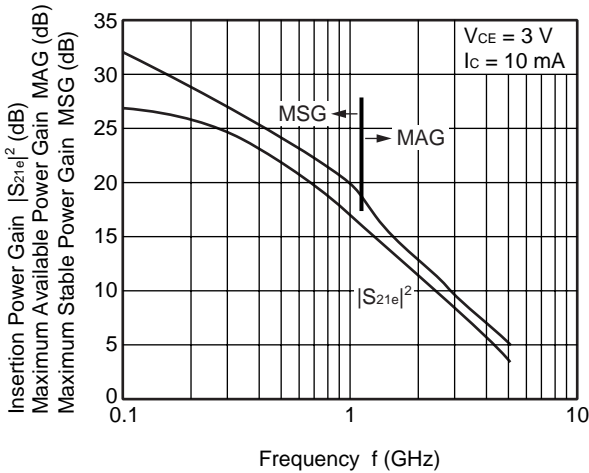
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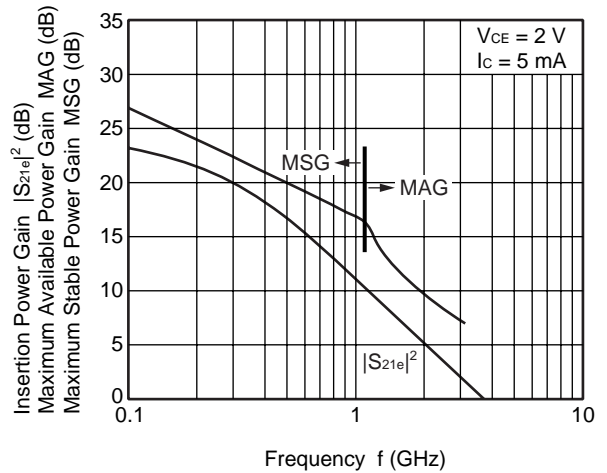
INSERTION POWER GAIN, MAG, MSG vs. FREQUENCY



INSERTION POWER GAIN, MAG, MSG vs. FREQUENCY

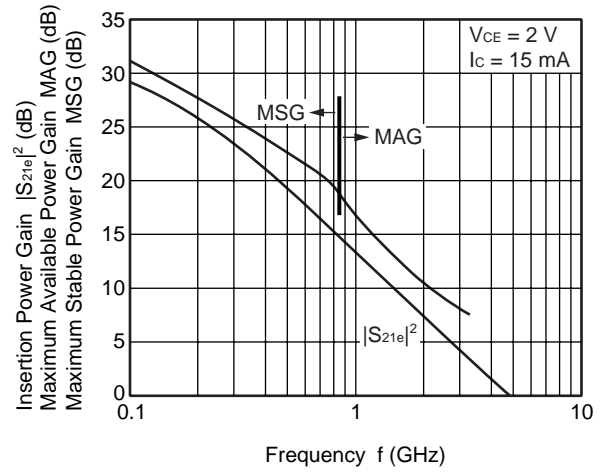


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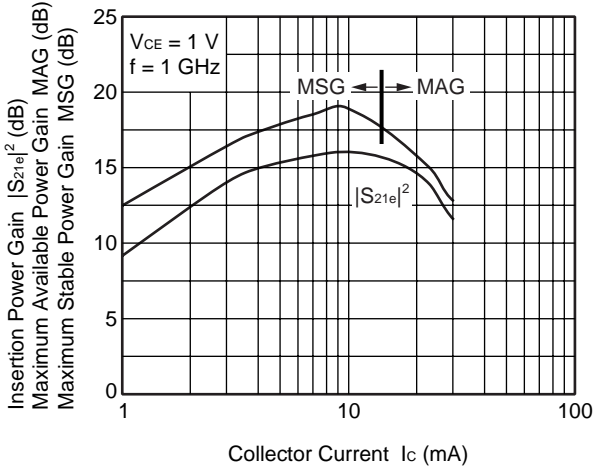
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INSERTION POWER GAIN,  
MAG, MSG vs. FREQUENCY



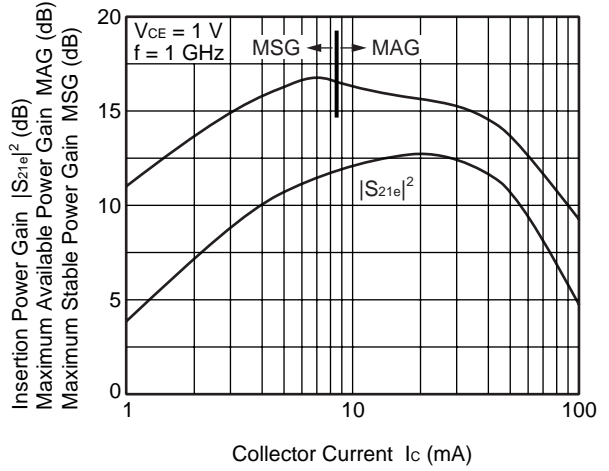
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INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT

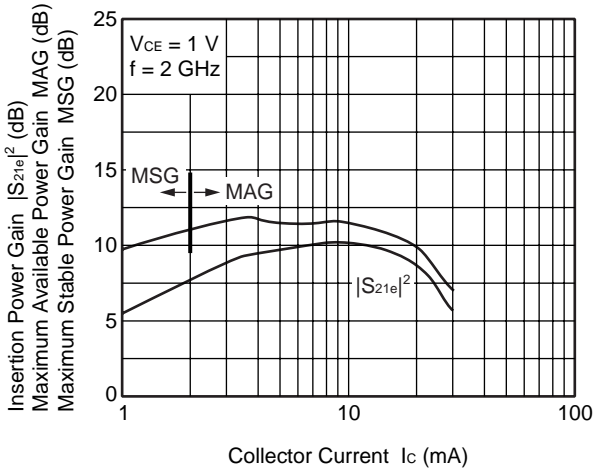


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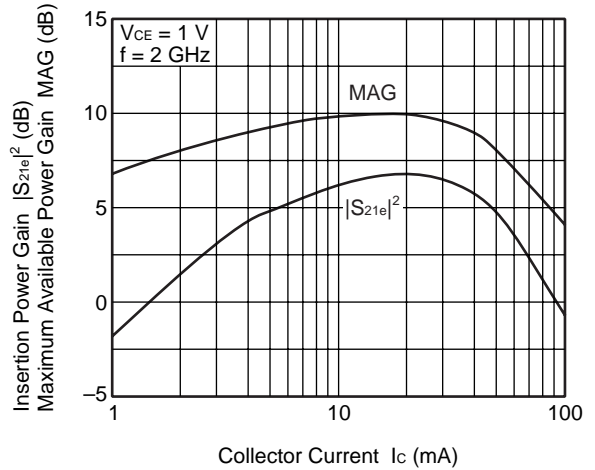
INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT



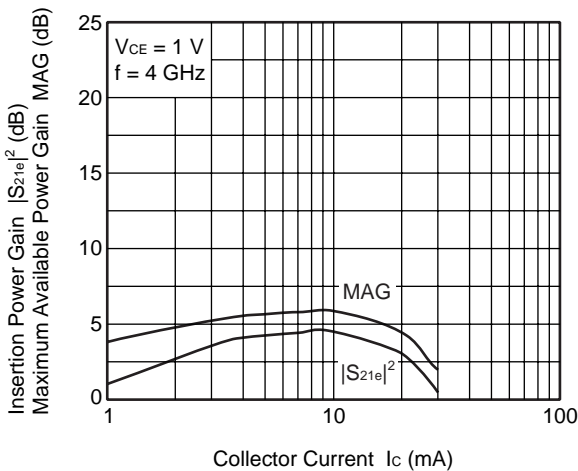
INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT



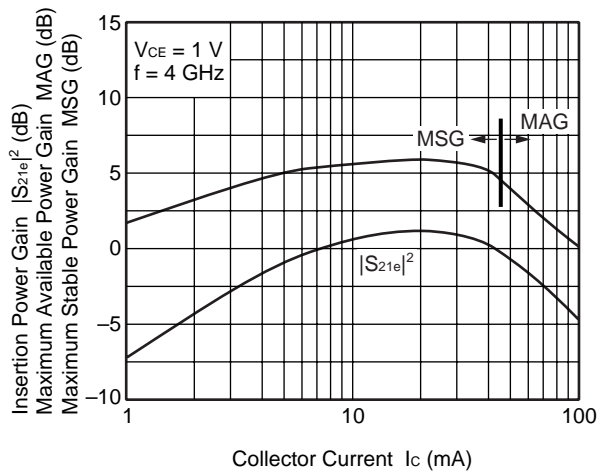
INSERTION POWER GAIN, MAG vs. COLLECTOR CURRENT



INSERTION POWER GAIN, MAG vs. COLLECTOR CURRENT

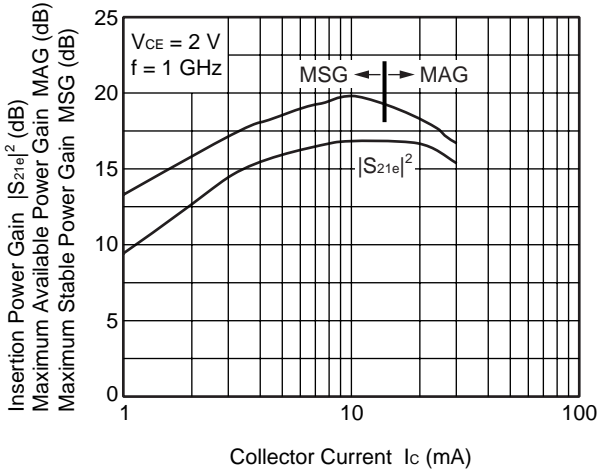


INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT



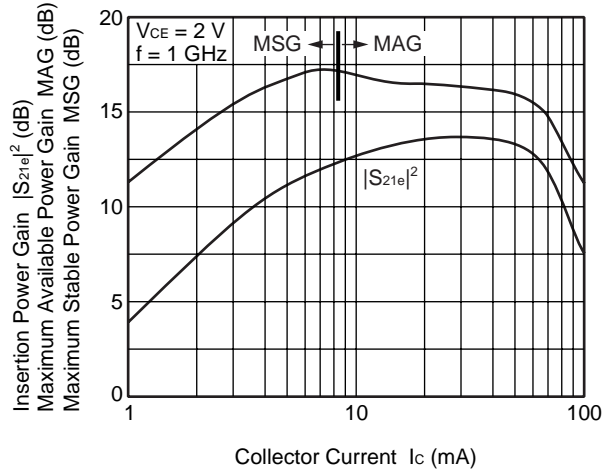
Q1

INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT

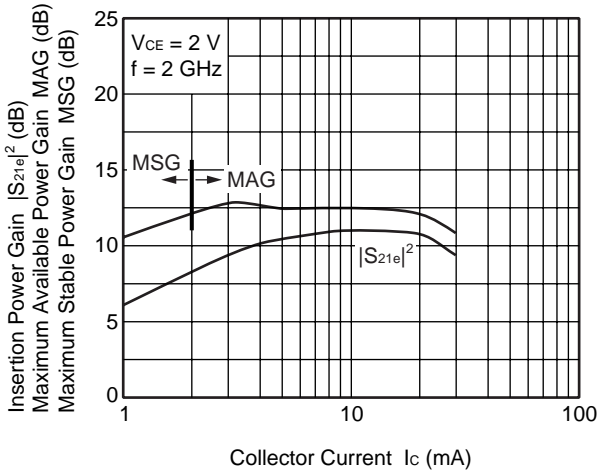


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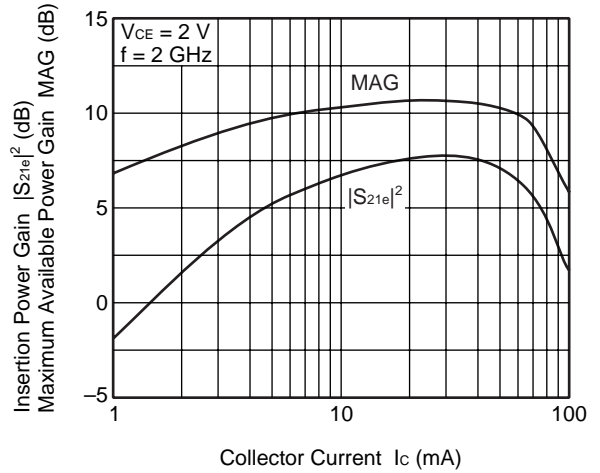
INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT



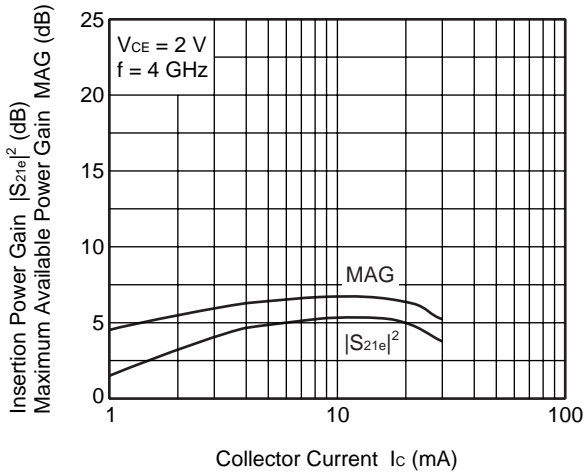
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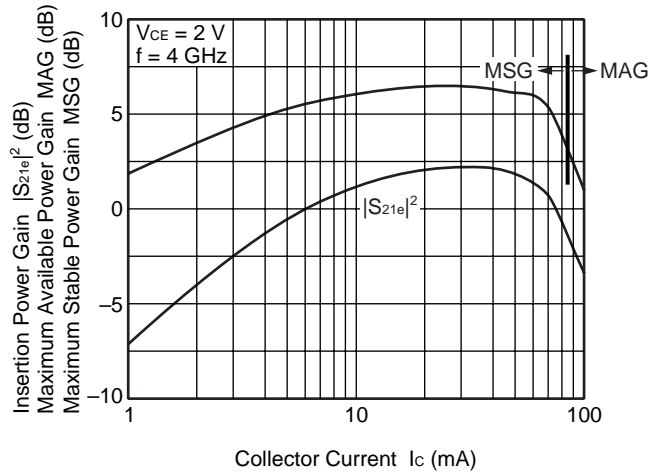
INSERTION POWER GAIN, MAG vs. COLLECTOR CURRENT



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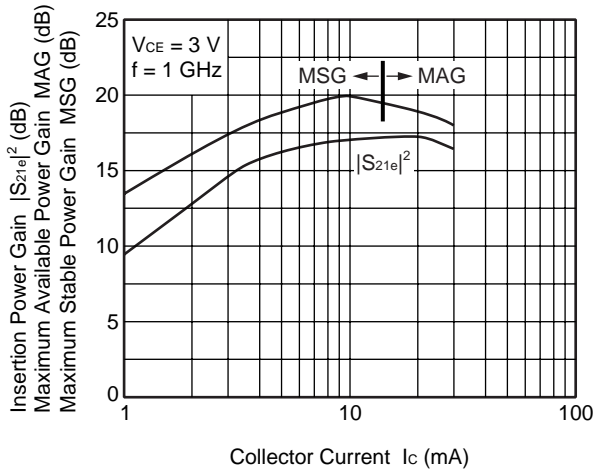


INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT

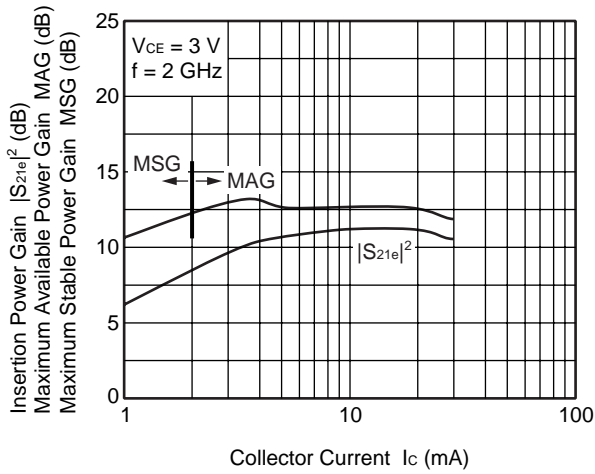


Q1

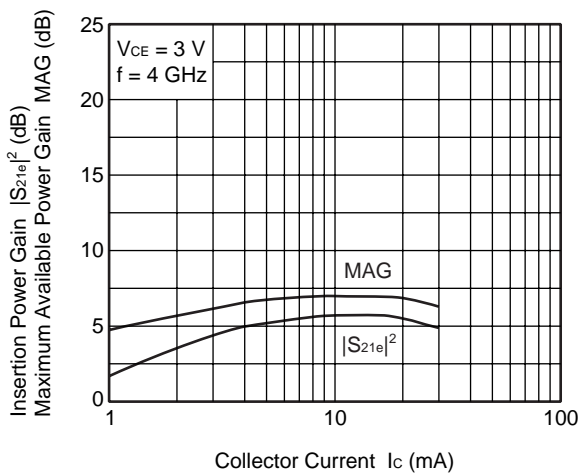
INSERTION POWER GAIN, MAG, MSG  
vs. COLLECTOR CURRENT



INSERTION POWER GAIN, MAG, MSG  
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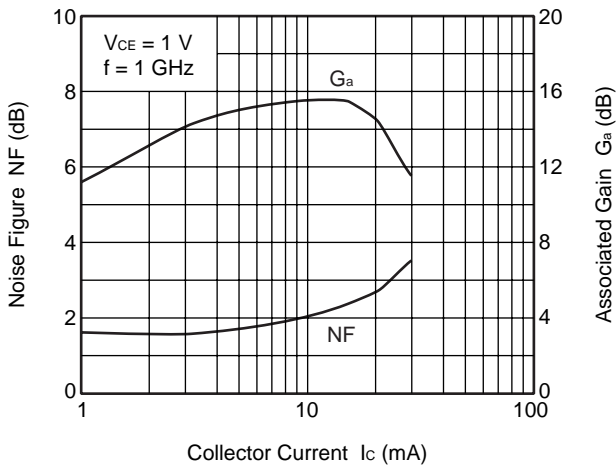


INSERTION POWER GAIN, MAG  
vs. COLLECTOR CURRENT



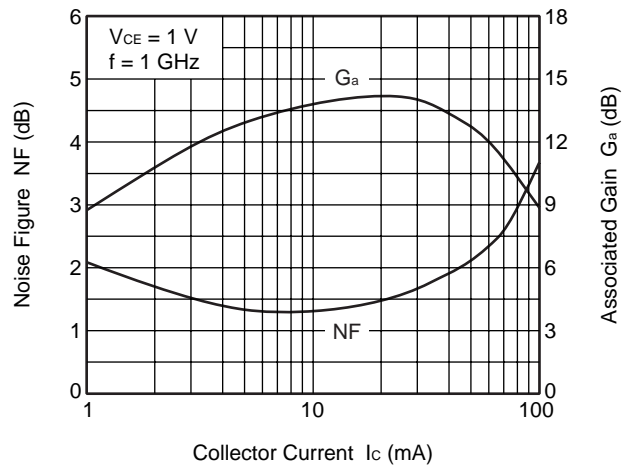
Q1

NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT

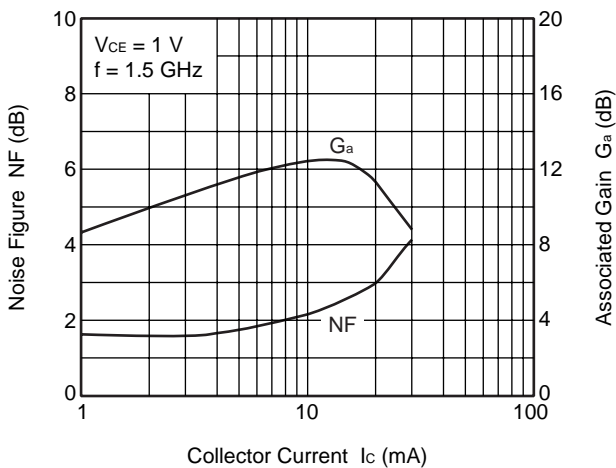


Q2

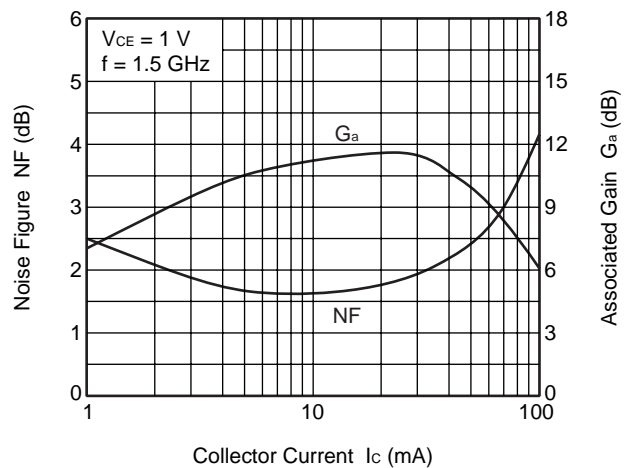
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



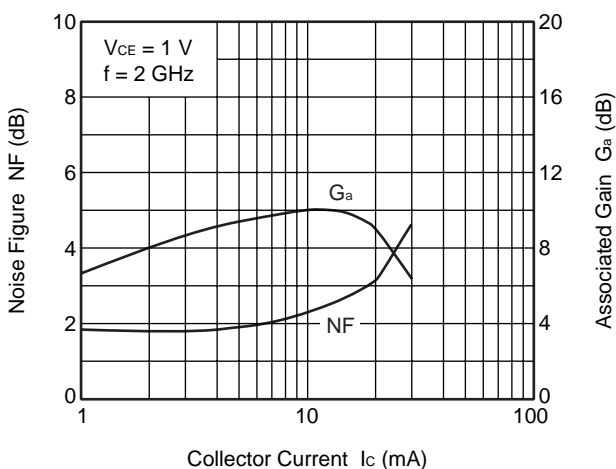
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



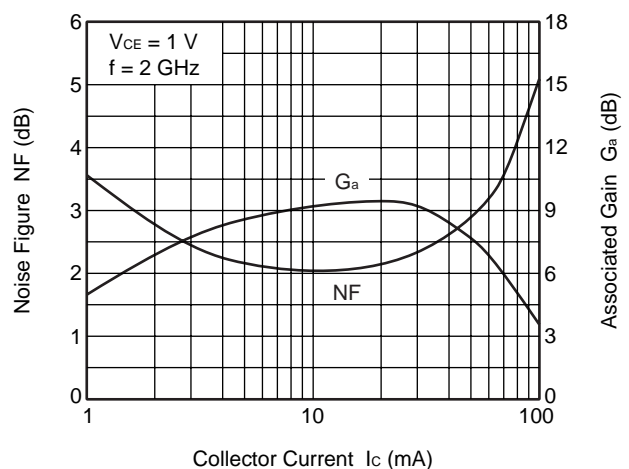
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT

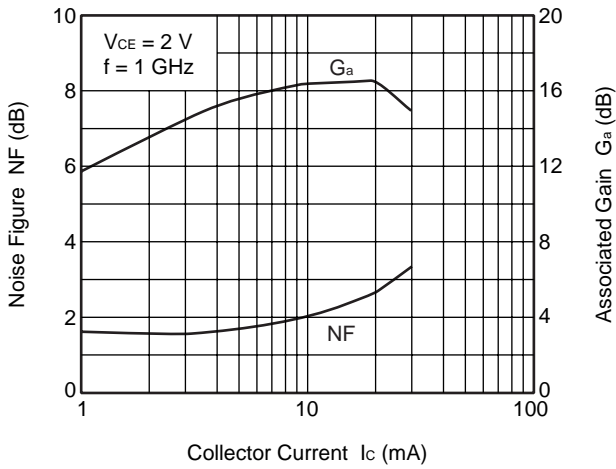


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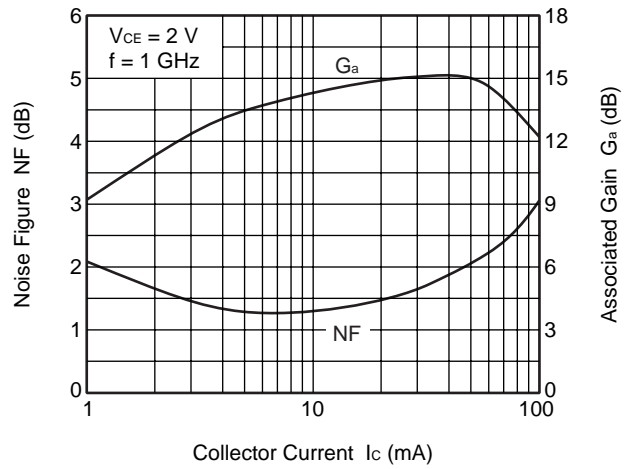
Q1

NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT

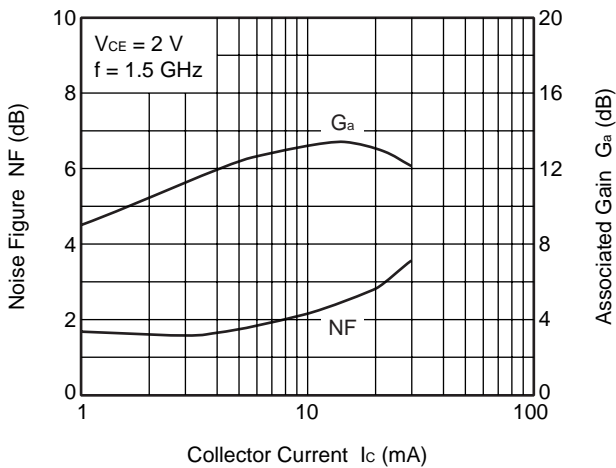


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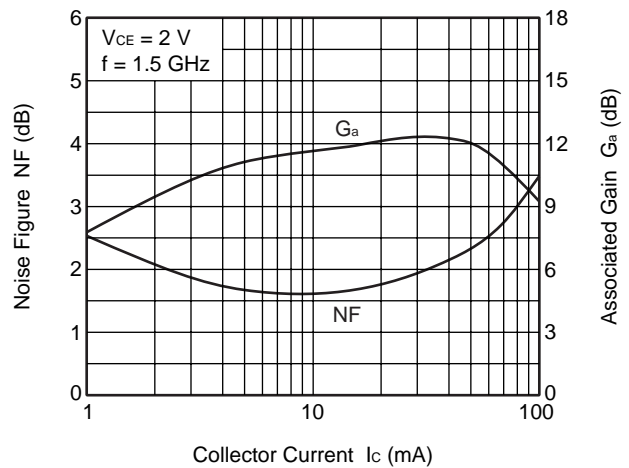
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



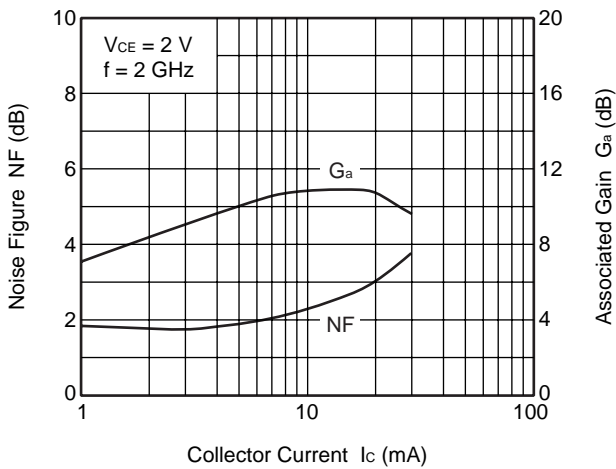
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



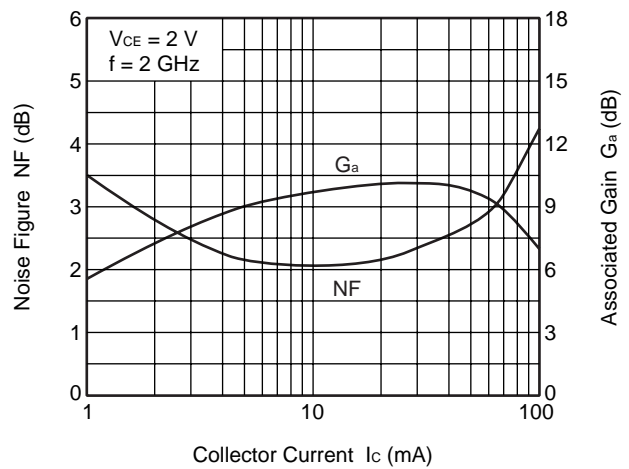
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT

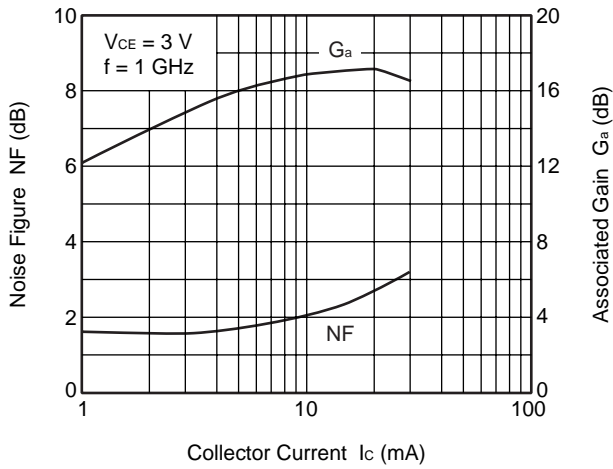


NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT

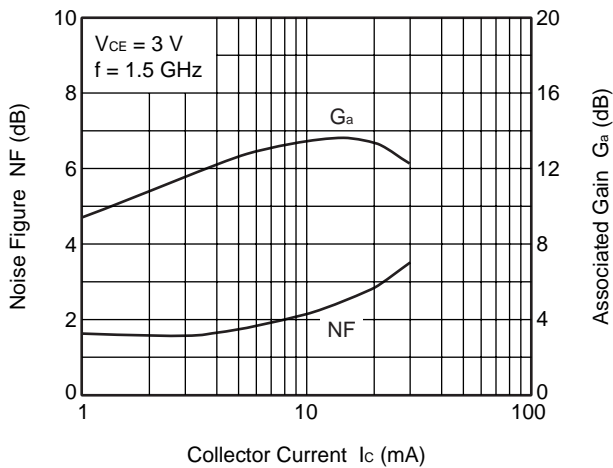


Q1

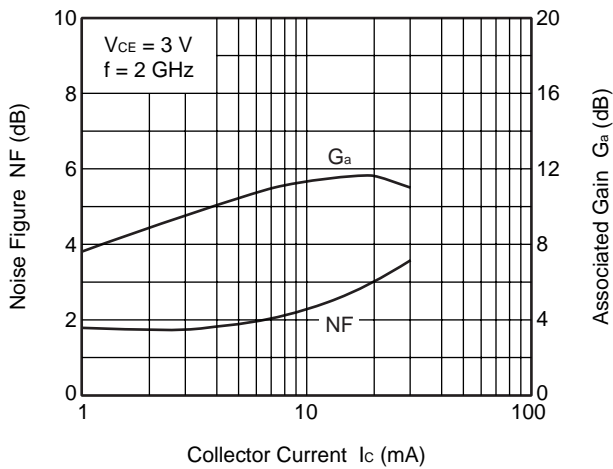
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



**Remark** The graphs indicate nominal characteristics.



**S-PARAMETERS Q1**

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

Frequency (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.952	-7.1	3.547	172.9	0.020	86.6	0.992	-3.7
0.2	0.943	-14.4	3.539	167.2	0.040	80.9	0.989	-7.3
0.3	0.931	-21.5	3.494	161.1	0.060	76.6	0.971	-10.6
0.4	0.905	-28.3	3.407	154.8	0.079	72.0	0.951	-14.3
0.5	0.880	-35.8	3.352	148.4	0.096	67.8	0.929	-17.9
0.6	0.845	-43.0	3.274	142.1	0.112	63.4	0.900	-21.6
0.7	0.809	-50.3	3.172	136.6	0.127	59.1	0.870	-25.0
0.8	0.770	-57.2	3.067	130.7	0.140	55.3	0.837	-28.4
0.9	0.731	-64.5	2.965	125.0	0.152	51.5	0.807	-31.9
1.0	0.692	-71.4	2.864	119.5	0.161	48.1	0.775	-34.9
1.1	0.658	-78.5	2.756	114.6	0.169	44.8	0.746	-37.8
1.2	0.626	-85.5	2.640	110.0	0.177	42.1	0.717	-40.4
1.3	0.596	-92.3	2.536	105.5	0.182	39.4	0.693	-42.8
1.4	0.571	-98.7	2.420	101.1	0.186	36.9	0.669	-45.3
1.5	0.549	-104.8	2.325	96.9	0.190	34.8	0.648	-47.3
1.6	0.530	-110.8	2.237	93.2	0.193	32.8	0.628	-49.2
1.7	0.513	-116.9	2.141	89.7	0.195	31.1	0.609	-50.9
1.8	0.498	-122.2	2.059	86.1	0.196	29.5	0.592	-52.3
1.9	0.487	-127.6	1.976	83.4	0.197	28.2	0.577	-53.6
2.0	0.472	-132.0	1.907	80.2	0.198	27.0	0.562	-54.7
2.1	0.468	-137.5	1.844	77.5	0.198	26.1	0.552	-56.3
2.2	0.456	-141.5	1.769	74.8	0.198	25.3	0.538	-57.2
2.3	0.455	-147.0	1.721	72.3	0.199	24.5	0.533	-58.3
2.4	0.447	-150.7	1.663	69.8	0.200	23.9	0.518	-59.2
2.5	0.445	-155.3	1.611	67.5	0.200	23.5	0.512	-60.4
2.6	0.437	-158.8	1.570	65.5	0.200	22.7	0.505	-62.0
2.7	0.437	-162.3	1.517	63.2	0.200	22.3	0.499	-62.7
2.8	0.433	-166.1	1.469	61.3	0.199	22.1	0.491	-64.2
2.9	0.426	-169.4	1.409	58.1	0.200	21.3	0.472	-65.2
3.0	0.419	-173.8	1.381	55.7	0.200	21.3	0.465	-68.0
4.0	0.436	149.3	1.136	34.9	0.208	23.7	0.424	-88.2
5.0	0.503	118.2	0.905	16.8	0.232	24.5	0.397	-112.6

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

Frequency (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.853	-13.4	9.491	169.0	0.019	83.5	0.980	-7.6
0.2	0.839	-25.7	9.175	158.6	0.038	75.3	0.952	-14.8
0.3	0.791	-37.4	8.690	149.4	0.054	69.5	0.897	-21.0
0.4	0.735	-48.4	8.100	140.7	0.068	64.1	0.841	-27.0
0.5	0.673	-59.7	7.538	132.5	0.080	59.6	0.778	-32.1
0.6	0.617	-69.9	6.973	125.3	0.089	55.5	0.717	-36.6
0.7	0.565	-79.4	6.435	119.2	0.097	52.3	0.660	-40.3
0.8	0.516	-88.6	5.919	113.5	0.103	49.9	0.608	-43.7
0.9	0.475	-97.9	5.470	108.4	0.109	47.9	0.564	-46.8
1.0	0.440	-106.4	5.081	103.7	0.113	46.2	0.525	-49.7
1.1	0.417	-114.8	4.728	99.6	0.118	44.9	0.493	-52.1
1.2	0.397	-122.6	4.398	95.9	0.122	44.2	0.463	-54.3
1.3	0.384	-130.3	4.113	92.2	0.125	43.4	0.441	-56.2
1.4	0.371	-137.5	3.859	89.0	0.129	42.8	0.421	-58.2
1.5	0.364	-143.4	3.637	85.8	0.132	42.3	0.404	-59.7
1.6	0.357	-149.6	3.441	83.0	0.135	42.1	0.389	-61.0
1.7	0.355	-155.0	3.252	80.4	0.138	41.9	0.375	-62.3
1.8	0.352	-159.9	3.090	77.7	0.141	41.8	0.362	-63.2
1.9	0.352	-164.5	2.940	75.6	0.145	41.9	0.353	-64.2
2.0	0.345	-168.5	2.810	73.2	0.148	41.7	0.340	-64.8
2.1	0.355	-172.8	2.697	71.1	0.151	41.8	0.334	-66.0
2.2	0.349	-176.2	2.578	69.3	0.154	41.9	0.321	-66.3
2.3	0.360	179.9	2.488	67.3	0.158	41.9	0.317	-67.1
2.4	0.357	177.4	2.396	65.4	0.162	41.9	0.304	-68.2
2.5	0.362	174.0	2.305	63.6	0.166	42.0	0.300	-69.1
2.6	0.359	171.4	2.235	62.4	0.169	42.0	0.294	-70.9
2.7	0.367	169.1	2.155	60.6	0.173	42.0	0.287	-70.9
2.8	0.366	165.8	2.079	59.2	0.177	41.8	0.282	-73.1
2.9	0.359	164.2	1.983	56.7	0.181	41.2	0.267	-74.4
3.0	0.358	159.3	1.937	54.8	0.185	41.3	0.267	-77.6
4.0	0.403	131.3	1.524	36.4	0.230	39.4	0.251	-102.6
5.0	0.486	107.7	1.201	21.1	0.275	32.1	0.242	-133.9

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

Frequency (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.783	-18.8	14.076	165.6	0.018	80.3	0.964	-10.8
0.2	0.747	-34.7	13.183	152.2	0.036	72.3	0.907	-20.3
0.3	0.673	-49.8	12.003	141.1	0.049	65.6	0.823	-27.8
0.4	0.607	-62.9	10.741	131.5	0.060	61.0	0.742	-34.4
0.5	0.537	-76.1	9.603	123.1	0.068	57.1	0.663	-39.4
0.6	0.481	-87.4	8.612	116.2	0.075	54.3	0.594	-43.5
0.7	0.437	-98.0	7.754	110.7	0.081	52.7	0.535	-46.7
0.8	0.398	-108.0	6.998	105.4	0.086	51.5	0.486	-49.5
0.9	0.372	-118.1	6.348	100.9	0.091	50.6	0.444	-52.1
1.0	0.351	-127.1	5.824	96.9	0.095	50.1	0.410	-54.6
1.1	0.338	-135.6	5.367	93.4	0.100	49.8	0.383	-56.7
1.2	0.332	-143.4	4.940	90.4	0.104	49.8	0.359	-58.8
1.3	0.326	-151.0	4.598	87.4	0.109	49.7	0.342	-60.4
1.4	0.325	-156.9	4.286	84.5	0.113	49.6	0.326	-62.2
1.5	0.322	-162.3	4.028	81.7	0.117	49.5	0.313	-63.7
1.6	0.324	-167.9	3.798	79.3	0.122	49.6	0.303	-64.9
1.7	0.327	-172.4	3.582	77.0	0.126	49.6	0.291	-66.2
1.8	0.326	-176.7	3.393	74.6	0.131	49.6	0.282	-67.0
1.9	0.330	179.2	3.224	72.8	0.135	49.6	0.275	-68.1
2.0	0.326	176.0	3.078	70.5	0.140	49.6	0.264	-68.5
2.1	0.338	172.5	2.946	68.7	0.144	49.6	0.260	-69.7
2.2	0.336	170.4	2.817	67.1	0.148	49.7	0.248	-70.0
2.3	0.347	167.5	2.713	65.3	0.153	49.5	0.245	-70.8
2.4	0.345	165.2	2.609	63.6	0.159	49.4	0.234	-72.1
2.5	0.352	162.6	2.509	62.1	0.163	49.3	0.231	-72.9
2.6	0.351	160.3	2.432	60.8	0.168	49.3	0.224	-75.0
2.7	0.358	158.5	2.340	59.2	0.173	49.0	0.219	-74.9
2.8	0.359	155.9	2.260	57.8	0.178	48.6	0.215	-77.6
2.9	0.352	154.4	2.158	55.6	0.183	47.8	0.202	-79.5
3.0	0.353	150.0	2.104	53.8	0.188	47.8	0.205	-83.1
4.0	0.402	125.3	1.631	36.5	0.239	43.3	0.203	-111.7
5.0	0.486	104.8	1.283	22.1	0.288	33.9	0.212	-147.2

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

Frequency (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.731	-22.4	17.662	162.6	0.018	78.1	0.946	-13.2
0.2	0.666	-42.3	16.079	147.1	0.033	70.1	0.866	-24.3
0.3	0.585	-59.7	14.117	135.1	0.045	63.9	0.761	-32.4
0.4	0.515	-74.0	12.267	125.3	0.054	59.6	0.666	-38.8
0.5	0.451	-88.1	10.693	117.2	0.061	57.0	0.584	-43.3
0.6	0.402	-100.5	9.403	110.6	0.067	55.3	0.515	-46.9
0.7	0.369	-111.7	8.357	105.7	0.072	54.5	0.460	-49.5
0.8	0.341	-122.4	7.466	100.9	0.077	54.0	0.414	-52.0
0.9	0.326	-132.1	6.722	96.9	0.082	53.8	0.378	-54.2
1.0	0.313	-141.7	6.135	93.3	0.087	54.0	0.348	-56.6
1.1	0.309	-149.3	5.624	90.1	0.092	53.9	0.325	-58.5
1.2	0.309	-156.8	5.163	87.3	0.097	54.2	0.304	-60.5
1.3	0.309	-163.3	4.802	84.6	0.102	54.2	0.290	-62.1
1.4	0.311	-168.8	4.464	82.0	0.107	54.2	0.278	-63.8
1.5	0.312	-173.7	4.191	79.4	0.112	54.3	0.267	-65.3
1.6	0.316	-178.2	3.945	77.1	0.117	54.2	0.259	-66.6
1.7	0.320	178.1	3.712	75.0	0.122	54.2	0.249	-67.9
1.8	0.320	174.4	3.516	72.8	0.127	54.2	0.241	-68.7
1.9	0.327	170.6	3.333	71.1	0.132	54.1	0.236	-69.8
2.0	0.324	168.0	3.181	69.1	0.137	53.9	0.227	-70.2
2.1	0.338	165.7	3.047	67.3	0.142	53.9	0.224	-71.4
2.2	0.334	162.9	2.914	65.8	0.147	53.8	0.212	-71.5
2.3	0.348	160.7	2.803	64.2	0.153	53.6	0.210	-72.5
2.4	0.345	159.0	2.694	62.5	0.158	53.3	0.199	-73.9
2.5	0.353	156.7	2.591	61.0	0.163	53.0	0.197	-74.8
2.6	0.353	154.3	2.509	59.9	0.169	52.8	0.192	-77.4
2.7	0.359	153.2	2.414	58.3	0.174	52.4	0.186	-77.2
2.8	0.361	150.8	2.330	57.2	0.179	51.8	0.183	-80.3
2.9	0.354	149.1	2.223	55.0	0.185	50.9	0.171	-82.7
3.0	0.355	145.1	2.167	53.2	0.191	50.7	0.175	-86.6
4.0	0.404	122.9	1.674	36.3	0.244	45.0	0.183	-117.4
5.0	0.490	103.1	1.316	22.5	0.294	34.8	0.204	-154.4

V<sub>CE</sub> = 1 V, I<sub>c</sub> = 10 mA, Z<sub>o</sub> = 50 Ω

Frequency (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.648	-29.0	21.750	159.0	0.017	76.3	0.924	-16.1
0.2	0.574	-52.1	18.960	141.4	0.030	67.2	0.810	-28.7
0.3	0.489	-71.7	15.944	128.7	0.040	62.5	0.686	-36.9
0.4	0.426	-88.0	13.412	119.2	0.048	59.7	0.584	-42.6
0.5	0.373	-103.3	11.427	111.5	0.054	58.2	0.504	-46.3
0.6	0.340	-116.3	9.904	105.5	0.060	57.8	0.440	-49.0
0.7	0.319	-127.6	8.699	101.1	0.065	57.4	0.391	-51.0
0.8	0.302	-138.3	7.716	96.8	0.071	57.6	0.351	-52.9
0.9	0.297	-147.7	6.924	93.2	0.076	57.8	0.320	-54.9
1.0	0.294	-156.2	6.289	90.0	0.081	58.1	0.294	-57.0
1.1	0.298	-163.2	5.752	87.1	0.086	58.3	0.275	-58.8
1.2	0.302	-168.7	5.272	84.8	0.092	58.6	0.258	-60.8
1.3	0.306	-175.1	4.878	82.1	0.097	58.6	0.247	-62.4
1.4	0.310	-179.3	4.535	79.7	0.103	58.6	0.238	-64.3
1.5	0.313	176.2	4.245	77.4	0.109	58.5	0.229	-65.8
1.6	0.320	172.7	4.002	75.3	0.114	58.4	0.223	-67.1
1.7	0.324	169.6	3.760	73.3	0.120	58.4	0.215	-68.4
1.8	0.327	166.6	3.562	71.2	0.125	58.1	0.209	-69.4
1.9	0.333	163.7	3.377	69.6	0.131	57.9	0.205	-70.6
2.0	0.332	161.1	3.223	67.6	0.136	57.7	0.197	-70.8
2.1	0.343	158.8	3.086	66.0	0.142	57.4	0.195	-72.2
2.2	0.340	156.9	2.947	64.5	0.147	57.1	0.184	-72.3
2.3	0.356	155.6	2.839	62.9	0.153	56.8	0.183	-73.4
2.4	0.353	153.7	2.728	61.4	0.159	56.3	0.173	-75.0
2.5	0.360	151.8	2.621	60.0	0.164	56.0	0.172	-76.1
2.6	0.360	149.9	2.540	58.9	0.170	55.6	0.166	-79.0
2.7	0.367	148.7	2.445	57.5	0.175	55.0	0.161	-79.1
2.8	0.368	146.5	2.360	56.3	0.181	54.3	0.159	-82.4
2.9	0.360	145.3	2.250	54.3	0.187	53.3	0.149	-85.4
3.0	0.361	141.2	2.191	52.6	0.193	53.0	0.154	-89.3
4.0	0.411	120.5	1.687	35.9	0.248	46.5	0.169	-122.4
5.0	0.496	101.9	1.322	22.3	0.298	35.7	0.200	-159.8

V<sub>CE</sub> = 1 V, I<sub>c</sub> = 20 mA, Z<sub>o</sub> = 50 Ω

Frequency (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.465	-48.9	26.851	149.0	0.016	74.9	0.815	-23.4
0.2	0.402	-84.3	20.632	128.1	0.026	63.2	0.639	-37.0
0.3	0.351	-109.5	15.878	115.8	0.033	60.8	0.504	-42.6
0.4	0.330	-127.2	12.668	107.4	0.040	61.1	0.415	-45.5
0.5	0.320	-142.0	10.429	101.3	0.045	61.7	0.354	-46.6
0.6	0.313	-152.8	8.867	96.4	0.051	62.6	0.309	-47.3
0.7	0.315	-161.6	7.698	92.8	0.057	63.4	0.276	-47.9
0.8	0.318	-169.6	6.765	89.3	0.063	63.8	0.249	-48.8
0.9	0.324	-175.5	6.024	86.4	0.069	64.1	0.230	-50.1
1.0	0.330	179.0	5.444	83.8	0.075	64.4	0.213	-52.0
1.1	0.339	174.7	4.967	81.3	0.081	64.5	0.202	-53.8
1.2	0.348	171.3	4.529	79.1	0.087	64.5	0.192	-56.2
1.3	0.356	167.3	4.195	76.9	0.093	64.5	0.186	-58.0
1.4	0.361	164.9	3.897	74.8	0.099	64.3	0.181	-60.2
1.5	0.367	161.8	3.642	72.6	0.105	64.1	0.177	-62.0
1.6	0.373	159.5	3.426	70.6	0.111	63.7	0.174	-63.6
1.7	0.376	157.3	3.218	68.8	0.117	63.4	0.171	-65.3
1.8	0.380	155.1	3.046	66.8	0.123	63.0	0.167	-66.4
1.9	0.385	153.2	2.890	65.3	0.129	62.7	0.166	-68.1
2.0	0.385	151.0	2.757	63.5	0.135	62.2	0.160	-68.5
2.1	0.398	149.9	2.640	61.9	0.141	61.7	0.161	-70.4
2.2	0.395	148.0	2.528	60.4	0.147	61.4	0.152	-70.7
2.3	0.406	147.1	2.432	59.0	0.153	60.8	0.152	-72.1
2.4	0.404	145.6	2.339	57.5	0.159	60.3	0.144	-74.4
2.5	0.410	144.5	2.250	56.2	0.165	59.7	0.145	-75.8
2.6	0.411	142.5	2.179	55.1	0.171	59.3	0.141	-79.3
2.7	0.416	141.9	2.100	53.8	0.177	58.6	0.136	-79.2
2.8	0.419	139.9	2.025	52.6	0.183	57.8	0.136	-83.7
2.9	0.408	138.8	1.931	50.7	0.189	56.7	0.127	-87.2
3.0	0.411	135.4	1.881	49.0	0.196	56.3	0.133	-91.9
4.0	0.459	116.0	1.452	32.2	0.253	48.5	0.160	-127.9
5.0	0.536	99.1	1.141	19.5	0.304	36.9	0.204	-164.6

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

Frequency (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.965	-7.3	3.547	173.5	0.018	87.6	0.993	-3.2
0.2	0.946	-13.5	3.554	168.1	0.035	82.3	0.992	-6.3
0.3	0.930	-19.9	3.510	162.4	0.051	77.9	0.976	-9.0
0.4	0.911	-26.3	3.439	156.4	0.068	73.6	0.960	-12.3
0.5	0.887	-33.4	3.397	150.3	0.083	69.7	0.941	-15.4
0.6	0.855	-40.2	3.321	144.3	0.097	65.6	0.917	-18.7
0.7	0.821	-46.7	3.230	139.1	0.110	61.5	0.890	-21.8
0.8	0.786	-53.4	3.137	133.3	0.122	57.8	0.860	-24.8
0.9	0.746	-60.4	3.039	127.8	0.132	54.1	0.835	-27.8
1.0	0.708	-67.1	2.949	122.5	0.141	50.9	0.805	-30.7
1.1	0.672	-73.9	2.848	117.7	0.149	47.8	0.779	-33.2
1.2	0.642	-80.6	2.738	113.1	0.156	45.1	0.753	-35.5
1.3	0.611	-87.1	2.639	108.8	0.161	42.5	0.731	-37.8
1.4	0.585	-93.2	2.524	104.4	0.166	40.1	0.708	-40.0
1.5	0.562	-99.3	2.430	100.2	0.169	38.0	0.689	-41.9
1.6	0.540	-105.3	2.344	96.5	0.172	36.0	0.669	-43.7
1.7	0.523	-111.0	2.250	92.9	0.174	34.3	0.650	-45.3
1.8	0.506	-116.6	2.161	89.4	0.175	32.8	0.634	-46.6
1.9	0.493	-121.8	2.076	86.6	0.177	31.5	0.620	-47.9
2.0	0.476	-126.5	2.007	83.4	0.178	30.4	0.606	-49.0
2.1	0.468	-132.1	1.939	80.7	0.178	29.5	0.596	-50.4
2.2	0.455	-136.0	1.864	78.1	0.178	28.7	0.582	-51.1
2.3	0.452	-141.5	1.811	75.5	0.179	28.1	0.579	-52.0
2.4	0.446	-145.2	1.753	73.1	0.180	27.5	0.564	-53.0
2.5	0.442	-150.1	1.699	70.7	0.180	27.2	0.558	-54.0
2.6	0.432	-153.3	1.655	69.0	0.181	26.6	0.551	-55.4
2.7	0.432	-157.3	1.598	66.7	0.181	26.2	0.545	-56.1
2.8	0.425	-161.2	1.548	64.7	0.181	25.9	0.536	-57.5
2.9	0.419	-164.3	1.485	61.5	0.181	25.2	0.518	-58.5
3.0	0.410	-169.1	1.455	59.1	0.182	25.3	0.509	-61.0
4.0	0.421	152.7	1.199	38.3	0.193	28.8	0.466	-79.4
5.0	0.485	119.8	0.957	19.6	0.221	29.8	0.430	-101.8

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

Frequency (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.875	-11.4	9.429	169.8	0.018	86.2	0.984	-6.3
0.2	0.845	-23.2	9.182	160.1	0.032	77.3	0.961	-12.4
0.3	0.804	-34.0	8.752	151.4	0.046	71.7	0.914	-17.7
0.4	0.751	-44.0	8.224	143.1	0.059	66.4	0.864	-22.7
0.5	0.693	-54.3	7.717	135.3	0.070	62.2	0.811	-27.2
0.6	0.636	-63.9	7.192	128.2	0.078	58.4	0.756	-31.1
0.7	0.585	-72.7	6.672	122.2	0.086	55.1	0.704	-34.4
0.8	0.531	-81.2	6.180	116.4	0.092	52.7	0.656	-37.3
0.9	0.490	-90.1	5.735	111.2	0.097	50.6	0.616	-40.0
1.0	0.449	-98.2	5.358	106.5	0.102	49.0	0.576	-42.4
1.1	0.422	-106.3	5.003	102.4	0.106	47.8	0.545	-44.4
1.2	0.398	-114.0	4.659	98.7	0.110	46.9	0.516	-46.2
1.3	0.380	-121.6	4.379	95.1	0.114	46.1	0.495	-47.8
1.4	0.365	-128.6	4.100	91.7	0.117	45.5	0.475	-49.5
1.5	0.353	-135.1	3.879	88.5	0.120	45.1	0.457	-50.8
1.6	0.345	-141.3	3.676	85.6	0.123	44.8	0.442	-51.9
1.7	0.339	-147.0	3.478	83.0	0.126	44.6	0.428	-53.0
1.8	0.333	-152.0	3.303	80.3	0.129	44.5	0.417	-53.8
1.9	0.331	-157.7	3.144	78.2	0.132	44.5	0.407	-54.6
2.0	0.325	-161.6	3.010	75.7	0.135	44.4	0.395	-55.1
2.1	0.332	-166.5	2.886	73.7	0.138	44.5	0.388	-56.2
2.2	0.324	-169.5	2.761	71.7	0.142	44.6	0.376	-56.4
2.3	0.334	-173.8	2.663	69.8	0.145	44.7	0.373	-57.0
2.4	0.330	-176.8	2.564	67.9	0.149	44.7	0.361	-57.7
2.5	0.336	179.5	2.468	66.2	0.153	44.9	0.357	-58.5
2.6	0.332	176.4	2.394	64.8	0.156	44.9	0.349	-59.8
2.7	0.340	174.1	2.306	63.0	0.160	44.9	0.344	-59.8
2.8	0.338	170.6	2.227	61.6	0.163	44.9	0.339	-61.4
2.9	0.332	168.5	2.123	59.0	0.167	44.4	0.323	-62.4
3.0	0.329	163.7	2.071	57.1	0.171	44.4	0.321	-65.2
4.0	0.371	133.9	1.630	39.0	0.215	43.1	0.293	-86.6
5.0	0.459	109.6	1.290	23.4	0.262	35.9	0.264	-114.5

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

Frequency (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.812	-16.7	14.092	166.6	0.016	84.9	0.970	-8.9
0.2	0.760	-31.0	13.350	154.1	0.030	73.8	0.924	-17.1
0.3	0.690	-44.5	12.274	143.6	0.042	68.2	0.851	-23.4
0.4	0.623	-56.5	11.100	134.3	0.052	63.6	0.779	-29.0
0.5	0.554	-68.7	10.037	125.9	0.060	59.9	0.708	-33.3
0.6	0.494	-79.0	9.066	119.0	0.067	57.2	0.643	-36.8
0.7	0.445	-89.0	8.205	113.4	0.072	55.5	0.588	-39.5
0.8	0.401	-98.6	7.428	108.2	0.078	54.2	0.539	-41.7
0.9	0.370	-108.4	6.770	103.5	0.082	53.2	0.500	-43.8
1.0	0.342	-117.2	6.233	99.5	0.087	52.8	0.466	-45.7
1.1	0.324	-125.9	5.760	95.8	0.091	52.3	0.439	-47.3
1.2	0.316	-133.7	5.318	92.9	0.095	52.3	0.415	-48.9
1.3	0.305	-141.5	4.958	89.7	0.099	52.1	0.397	-50.1
1.4	0.299	-148.1	4.628	86.8	0.103	52.0	0.382	-51.5
1.5	0.296	-154.5	4.343	84.1	0.107	52.0	0.369	-52.6
1.6	0.296	-160.2	4.107	81.6	0.112	52.1	0.357	-53.6
1.7	0.294	-165.2	3.873	79.3	0.116	52.0	0.346	-54.5
1.8	0.295	-169.9	3.673	76.9	0.120	52.1	0.337	-55.1
1.9	0.297	-174.4	3.484	75.1	0.124	52.1	0.330	-55.9
2.0	0.291	-178.1	3.328	72.9	0.128	52.1	0.320	-56.2
2.1	0.304	177.7	3.185	71.1	0.132	52.2	0.315	-57.2
2.2	0.301	175.1	3.050	69.4	0.137	52.2	0.304	-57.1
2.3	0.314	172.1	2.938	67.7	0.141	52.2	0.302	-57.8
2.4	0.310	170.1	2.825	66.0	0.146	52.0	0.291	-58.5
2.5	0.319	167.1	2.717	64.5	0.151	52.0	0.288	-59.3
2.6	0.316	164.4	2.630	63.2	0.155	52.0	0.281	-60.7
2.7	0.324	162.5	2.533	61.7	0.160	51.7	0.277	-60.4
2.8	0.324	159.5	2.442	60.4	0.164	51.4	0.271	-62.3
2.9	0.317	158.0	2.333	58.0	0.169	50.6	0.257	-63.6
3.0	0.316	153.6	2.272	56.2	0.175	50.6	0.257	-66.7
4.0	0.366	127.8	1.762	39.2	0.225	46.8	0.239	-91.2
5.0	0.456	106.2	1.391	24.5	0.274	37.5	0.219	-123.8

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

Frequency (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.725	-19.1	17.802	163.8	0.015	80.7	0.958	-11.0
0.2	0.685	-37.4	16.382	149.5	0.029	72.5	0.890	-20.4
0.3	0.607	-53.1	14.584	138.0	0.039	66.6	0.798	-27.3
0.4	0.533	-66.2	12.825	128.3	0.048	62.2	0.712	-32.7
0.5	0.464	-79.3	11.315	120.1	0.054	59.8	0.635	-36.4
0.6	0.410	-90.2	10.021	113.5	0.060	58.2	0.569	-39.2
0.7	0.370	-101.1	8.952	108.4	0.065	56.9	0.517	-41.4
0.8	0.333	-111.3	8.035	103.5	0.070	56.7	0.472	-43.1
0.9	0.310	-121.5	7.261	99.4	0.075	56.3	0.436	-44.8
1.0	0.292	-130.5	6.641	95.7	0.079	56.3	0.405	-46.4
1.1	0.285	-139.2	6.104	92.5	0.084	56.3	0.382	-47.8
1.2	0.279	-146.9	5.613	89.7	0.089	56.3	0.362	-49.3
1.3	0.277	-154.8	5.219	86.9	0.094	56.4	0.348	-50.4
1.4	0.277	-160.9	4.862	84.2	0.098	56.4	0.335	-51.8
1.5	0.277	-166.2	4.553	81.8	0.103	56.3	0.324	-52.8
1.6	0.279	-171.3	4.297	79.4	0.108	56.5	0.315	-53.8
1.7	0.282	-175.9	4.045	77.3	0.112	56.4	0.305	-54.7
1.8	0.284	-179.7	3.836	75.1	0.117	56.4	0.298	-55.3
1.9	0.288	176.4	3.635	73.4	0.122	56.4	0.292	-56.0
2.0	0.286	172.6	3.469	71.3	0.127	56.2	0.283	-56.2
2.1	0.297	169.8	3.321	69.6	0.131	56.1	0.280	-57.3
2.2	0.294	166.9	3.171	68.0	0.136	56.1	0.270	-57.0
2.3	0.307	164.9	3.059	66.4	0.141	55.9	0.268	-57.7
2.4	0.306	162.7	2.941	64.8	0.146	55.7	0.257	-58.4
2.5	0.313	160.6	2.825	63.3	0.151	55.5	0.255	-59.3
2.6	0.313	157.8	2.737	62.1	0.156	55.3	0.248	-60.8
2.7	0.318	156.6	2.635	60.6	0.161	54.9	0.244	-60.6
2.8	0.319	153.8	2.536	59.4	0.166	54.4	0.239	-62.8
2.9	0.312	152.3	2.423	57.2	0.172	53.6	0.226	-64.1
3.0	0.315	148.1	2.362	55.5	0.177	53.5	0.227	-67.5
4.0	0.367	124.5	1.825	39.0	0.230	48.3	0.214	-94.0
5.0	0.455	104.3	1.438	24.9	0.280	38.3	0.202	-129.6

V<sub>CE</sub> = 2 V, I<sub>c</sub> = 10 mA, Z<sub>o</sub> = 50 Ω

Frequency (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.670	-23.0	22.008	160.6	0.014	77.1	0.939	-13.3
0.2	0.595	-45.4	19.593	144.3	0.027	71.1	0.845	-23.9
0.3	0.510	-62.4	16.792	132.0	0.035	64.8	0.734	-30.8
0.4	0.439	-77.2	14.296	122.3	0.043	62.3	0.640	-35.7
0.5	0.380	-91.1	12.312	114.7	0.048	61.0	0.563	-38.7
0.6	0.336	-103.6	10.745	108.5	0.054	60.2	0.501	-40.8
0.7	0.306	-115.0	9.495	103.8	0.059	59.9	0.452	-42.2
0.8	0.281	-125.5	8.443	99.4	0.064	60.0	0.412	-43.5
0.9	0.269	-135.7	7.598	95.8	0.069	60.0	0.382	-44.7
1.0	0.258	-145.3	6.916	92.4	0.074	60.3	0.355	-46.2
1.1	0.259	-152.9	6.330	89.5	0.079	60.3	0.336	-47.3
1.2	0.260	-160.4	5.811	87.0	0.085	60.5	0.318	-48.7
1.3	0.262	-166.8	5.394	84.4	0.090	60.6	0.307	-49.8
1.4	0.267	-172.3	5.015	82.0	0.095	60.5	0.296	-51.2
1.5	0.269	-177.0	4.702	79.5	0.100	60.4	0.287	-52.2
1.6	0.274	178.4	4.422	77.5	0.105	60.4	0.280	-53.2
1.7	0.277	174.7	4.161	75.5	0.110	60.3	0.272	-54.1
1.8	0.280	171.1	3.940	73.5	0.115	60.0	0.266	-54.8
1.9	0.287	168.2	3.736	71.9	0.121	59.9	0.262	-55.6
2.0	0.284	165.3	3.564	70.0	0.126	59.6	0.254	-55.7
2.1	0.296	162.6	3.410	68.3	0.131	59.5	0.252	-56.8
2.2	0.294	160.5	3.258	66.8	0.136	59.3	0.242	-56.5
2.3	0.308	158.9	3.140	65.3	0.141	58.9	0.240	-57.3
2.4	0.304	156.9	3.017	63.8	0.147	58.5	0.230	-57.9
2.5	0.314	154.9	2.897	62.5	0.152	58.2	0.229	-59.0
2.6	0.313	152.8	2.804	61.2	0.157	57.9	0.222	-60.7
2.7	0.321	151.4	2.699	59.7	0.163	57.3	0.218	-60.5
2.8	0.321	148.9	2.602	58.5	0.168	56.8	0.214	-62.7
2.9	0.315	147.6	2.484	56.5	0.173	55.9	0.202	-64.3
3.0	0.317	143.3	2.421	54.9	0.179	55.6	0.204	-67.9
4.0	0.367	121.7	1.856	38.6	0.233	49.6	0.195	-96.6
5.0	0.457	103.0	1.462	24.9	0.284	39.0	0.190	-134.7

V<sub>CE</sub> = 2 V, I<sub>c</sub> = 20 mA, Z<sub>o</sub> = 50 Ω

Frequency (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.486	-36.9	29.425	153.6	0.013	79.1	0.883	-18.0
0.2	0.419	-65.2	23.883	133.9	0.023	68.4	0.737	-29.6
0.3	0.345	-87.4	19.002	121.4	0.029	65.7	0.608	-35.0
0.4	0.300	-104.1	15.432	112.6	0.035	64.8	0.516	-37.7
0.5	0.272	-120.6	12.867	106.0	0.041	65.2	0.451	-38.7
0.6	0.254	-133.4	11.011	100.8	0.046	65.3	0.402	-39.2
0.7	0.250	-145.0	9.606	97.0	0.052	65.7	0.365	-39.4
0.8	0.243	-155.2	8.466	93.4	0.058	66.4	0.336	-39.9
0.9	0.247	-163.0	7.570	90.3	0.063	66.5	0.314	-40.6
1.0	0.251	-170.3	6.858	87.5	0.069	66.7	0.294	-41.7
1.1	0.257	-176.3	6.251	85.0	0.074	66.7	0.281	-42.7
1.2	0.268	179.4	5.716	83.0	0.080	66.7	0.268	-44.2
1.3	0.273	174.3	5.300	80.7	0.086	66.5	0.261	-45.3
1.4	0.280	171.0	4.916	78.5	0.092	66.3	0.253	-46.8
1.5	0.284	167.4	4.605	76.4	0.097	66.1	0.248	-48.0
1.6	0.292	164.5	4.327	74.4	0.103	65.7	0.244	-49.2
1.7	0.295	161.9	4.068	72.6	0.108	65.4	0.238	-50.3
1.8	0.299	159.5	3.851	70.7	0.114	65.0	0.234	-51.0
1.9	0.307	156.5	3.650	69.2	0.119	64.6	0.231	-52.1
2.0	0.306	154.9	3.481	67.3	0.125	64.1	0.225	-52.1
2.1	0.319	152.8	3.334	65.8	0.130	63.8	0.224	-53.6
2.2	0.315	151.1	3.185	64.4	0.136	63.4	0.216	-53.2
2.3	0.329	150.6	3.067	63.0	0.142	62.9	0.216	-54.2
2.4	0.325	148.9	2.944	61.6	0.148	62.3	0.206	-55.0
2.5	0.335	147.6	2.832	60.3	0.153	61.9	0.206	-56.1
2.6	0.335	145.5	2.741	59.3	0.159	61.4	0.200	-58.1
2.7	0.340	144.9	2.639	58.0	0.164	60.7	0.197	-58.0
2.8	0.342	142.7	2.544	56.8	0.169	60.1	0.193	-60.5
2.9	0.333	141.9	2.424	54.9	0.175	58.9	0.182	-62.2
3.0	0.337	138.0	2.363	53.2	0.182	58.5	0.184	-66.3
4.0	0.387	118.4	1.811	37.2	0.237	51.5	0.179	-97.7
5.0	0.476	101.3	1.424	23.9	0.289	40.1	0.182	-138.2

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

Frequency (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.951	-6.6	3.571	173.3	0.017	87.1	0.996	-2.9
0.2	0.948	-13.1	3.558	168.3	0.033	82.6	0.993	-5.9
0.3	0.935	-19.4	3.515	162.8	0.048	78.4	0.975	-8.6
0.4	0.911	-25.8	3.442	156.8	0.064	74.1	0.962	-11.7
0.5	0.890	-32.5	3.406	150.9	0.079	70.1	0.944	-14.6
0.6	0.858	-39.1	3.337	145.0	0.092	66.2	0.920	-17.8
0.7	0.825	-45.5	3.248	139.8	0.105	62.3	0.895	-20.6
0.8	0.789	-52.2	3.160	134.1	0.116	58.6	0.867	-23.6
0.9	0.752	-59.0	3.066	128.7	0.126	55.1	0.842	-26.6
1.0	0.714	-65.4	2.974	123.4	0.135	51.8	0.815	-29.3
1.1	0.680	-72.1	2.876	118.7	0.142	48.8	0.789	-31.8
1.2	0.646	-78.7	2.769	114.2	0.149	46.2	0.765	-34.1
1.3	0.615	-85.0	2.668	109.8	0.155	43.5	0.743	-36.2
1.4	0.591	-91.5	2.557	105.4	0.159	41.2	0.719	-38.4
1.5	0.566	-97.4	2.463	101.2	0.163	39.1	0.701	-40.3
1.6	0.546	-103.3	2.378	97.6	0.165	37.2	0.682	-42.0
1.7	0.525	-109.1	2.282	94.0	0.168	35.5	0.663	-43.5
1.8	0.507	-114.2	2.195	90.5	0.169	34.0	0.647	-44.8
1.9	0.494	-119.7	2.110	87.7	0.170	32.7	0.634	-46.2
2.0	0.477	-124.1	2.041	84.4	0.172	31.5	0.618	-47.2
2.1	0.467	-129.8	1.973	81.8	0.172	30.6	0.609	-48.6
2.2	0.453	-133.9	1.895	79.1	0.172	30.0	0.596	-49.3
2.3	0.451	-139.2	1.841	76.7	0.173	29.3	0.593	-50.2
2.4	0.442	-143.2	1.782	74.2	0.174	28.8	0.578	-51.1
2.5	0.438	-148.1	1.728	71.9	0.174	28.5	0.573	-52.1
2.6	0.429	-151.4	1.679	70.0	0.175	28.0	0.565	-53.2
2.7	0.429	-155.5	1.627	67.6	0.175	27.7	0.560	-53.8
2.8	0.422	-159.5	1.573	65.8	0.175	27.5	0.551	-55.0
2.9	0.414	-162.7	1.509	62.4	0.175	26.8	0.531	-56.0
3.0	0.405	-167.3	1.480	60.1	0.176	26.9	0.523	-58.6
4.0	0.413	153.8	1.219	39.3	0.189	30.5	0.479	-76.4
5.0	0.479	120.3	0.974	20.6	0.218	31.4	0.441	-98.5

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

Frequency (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.875	-11.6	9.462	170.0	0.016	80.1	0.985	-6.1
0.2	0.851	-22.5	9.220	160.5	0.031	77.7	0.963	-11.8
0.3	0.810	-32.9	8.796	152.0	0.044	72.2	0.918	-16.7
0.4	0.758	-42.6	8.287	143.8	0.056	67.3	0.872	-21.7
0.5	0.699	-52.5	7.800	136.0	0.066	63.1	0.820	-25.7
0.6	0.641	-61.9	7.283	129.0	0.075	59.2	0.767	-29.6
0.7	0.590	-70.5	6.773	123.1	0.083	56.1	0.718	-32.7
0.8	0.538	-78.8	6.291	117.4	0.088	53.7	0.670	-35.5
0.9	0.491	-87.3	5.841	112.1	0.094	51.6	0.629	-38.1
1.0	0.453	-95.1	5.459	107.4	0.099	50.1	0.592	-40.3
1.1	0.424	-103.3	5.101	103.3	0.103	48.8	0.561	-42.3
1.2	0.398	-111.0	4.754	99.7	0.106	48.0	0.532	-44.1
1.3	0.377	-118.4	4.479	96.0	0.110	47.2	0.511	-45.5
1.4	0.362	-125.3	4.192	92.7	0.113	46.5	0.491	-47.1
1.5	0.349	-131.7	3.968	89.4	0.116	46.1	0.474	-48.4
1.6	0.341	-138.1	3.758	86.5	0.120	45.8	0.459	-49.5
1.7	0.333	-144.2	3.555	83.9	0.123	45.6	0.445	-50.5
1.8	0.327	-149.3	3.383	81.1	0.126	45.4	0.433	-51.2
1.9	0.323	-154.9	3.217	79.0	0.129	45.4	0.423	-52.0
2.0	0.317	-158.8	3.078	76.5	0.132	45.5	0.412	-52.3
2.1	0.322	-163.8	2.952	74.5	0.135	45.5	0.405	-53.4
2.2	0.315	-167.3	2.826	72.5	0.138	45.6	0.394	-53.5
2.3	0.323	-171.9	2.729	70.6	0.141	45.6	0.391	-54.2
2.4	0.321	-174.5	2.623	68.7	0.145	45.8	0.378	-54.8
2.5	0.326	-178.5	2.528	67.0	0.149	45.9	0.375	-55.5
2.6	0.323	178.3	2.453	65.7	0.152	45.9	0.367	-56.8
2.7	0.329	175.8	2.363	63.9	0.155	45.8	0.362	-56.8
2.8	0.327	172.6	2.277	62.4	0.159	45.8	0.356	-58.3
2.9	0.322	170.4	2.176	59.9	0.163	45.2	0.340	-59.2
3.0	0.318	165.6	2.124	58.0	0.167	45.4	0.338	-61.9
4.0	0.360	135.1	1.668	40.0	0.211	44.3	0.306	-82.3
5.0	0.449	110.0	1.323	24.2	0.258	37.1	0.272	-109.0

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

Frequency (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.800	-14.8	14.185	166.6	0.016	81.3	0.972	-8.5
0.2	0.762	-29.9	13.456	154.6	0.029	74.6	0.928	-16.1
0.3	0.699	-43.3	12.386	144.2	0.040	68.8	0.859	-22.2
0.4	0.632	-54.5	11.241	135.0	0.050	64.4	0.790	-27.6
0.5	0.560	-66.3	10.196	126.7	0.058	60.6	0.721	-31.6
0.6	0.500	-76.5	9.233	119.8	0.064	58.2	0.657	-35.0
0.7	0.451	-86.0	8.357	114.2	0.070	56.2	0.602	-37.4
0.8	0.404	-95.3	7.591	108.9	0.075	55.0	0.554	-39.6
0.9	0.369	-104.6	6.941	104.4	0.079	54.2	0.516	-41.6
1.0	0.339	-113.4	6.384	100.2	0.084	53.6	0.482	-43.4
1.1	0.321	-122.2	5.896	96.7	0.088	53.2	0.454	-44.8
1.2	0.309	-130.1	5.456	93.6	0.092	53.1	0.431	-46.3
1.3	0.298	-137.9	5.089	90.4	0.096	53.0	0.414	-47.5
1.4	0.292	-144.9	4.753	87.5	0.101	52.9	0.399	-48.8
1.5	0.285	-150.8	4.461	84.7	0.105	52.9	0.386	-49.8
1.6	0.284	-157.1	4.214	82.2	0.109	52.9	0.375	-50.8
1.7	0.283	-162.3	3.973	79.9	0.113	52.9	0.363	-51.6
1.8	0.282	-167.1	3.771	77.6	0.117	53.0	0.354	-52.2
1.9	0.283	-171.9	3.576	75.8	0.121	53.0	0.347	-52.9
2.0	0.280	-175.6	3.416	73.6	0.125	52.9	0.337	-53.1
2.1	0.290	-179.7	3.275	71.7	0.129	53.0	0.333	-54.1
2.2	0.289	177.4	3.131	70.0	0.133	53.0	0.322	-53.9
2.3	0.298	173.9	3.016	68.4	0.138	53.0	0.320	-54.6
2.4	0.297	171.5	2.900	66.7	0.143	52.8	0.308	-55.2
2.5	0.304	168.7	2.789	65.2	0.147	52.8	0.306	-56.0
2.6	0.302	165.9	2.700	64.0	0.152	52.7	0.299	-57.3
2.7	0.309	164.1	2.600	62.4	0.156	52.4	0.294	-57.3
2.8	0.310	161.1	2.507	61.1	0.160	52.1	0.289	-58.9
2.9	0.303	159.6	2.393	58.8	0.166	51.3	0.275	-60.0
3.0	0.304	154.7	2.335	56.9	0.171	51.3	0.274	-63.0
4.0	0.353	128.4	1.811	40.1	0.221	47.7	0.251	-85.9
5.0	0.441	106.4	1.435	25.2	0.270	38.6	0.224	-117.1

V<sub>CE</sub> = 3 V, I<sub>c</sub> = 7 mA, Z<sub>o</sub> = 50 Ω

Frequency (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.736	-18.2	17.762	164.3	0.014	81.1	0.961	-10.3
0.2	0.696	-35.5	16.431	150.3	0.028	71.8	0.898	-19.2
0.3	0.619	-50.5	14.686	138.8	0.038	67.4	0.810	-25.7
0.4	0.544	-63.0	12.978	129.3	0.046	63.4	0.727	-31.0
0.5	0.473	-75.5	11.479	121.2	0.052	60.7	0.652	-34.6
0.6	0.418	-86.5	10.202	114.6	0.058	59.0	0.588	-37.3
0.7	0.373	-96.5	9.131	109.4	0.063	57.7	0.535	-39.3
0.8	0.334	-106.4	8.216	104.5	0.068	57.3	0.491	-41.0
0.9	0.310	-116.3	7.430	100.4	0.073	57.0	0.456	-42.5
1.0	0.288	-125.7	6.799	96.6	0.077	57.0	0.425	-44.0
1.1	0.277	-134.5	6.255	93.3	0.082	56.7	0.402	-45.2
1.2	0.271	-142.6	5.762	90.5	0.087	56.9	0.381	-46.6
1.3	0.266	-150.7	5.365	87.7	0.091	56.8	0.366	-47.6
1.4	0.265	-156.6	4.988	85.1	0.096	56.9	0.353	-48.9
1.5	0.262	-162.8	4.679	82.5	0.101	57.0	0.342	-49.9
1.6	0.266	-168.0	4.408	80.2	0.105	57.1	0.333	-50.8
1.7	0.268	-172.8	4.153	78.0	0.110	56.9	0.324	-51.6
1.8	0.270	-177.0	3.940	75.8	0.114	57.0	0.316	-52.1
1.9	0.272	178.7	3.734	74.1	0.119	56.9	0.310	-52.9
2.0	0.272	175.5	3.565	72.1	0.124	56.8	0.301	-53.0
2.1	0.282	171.9	3.415	70.4	0.128	56.7	0.298	-54.0
2.2	0.275	169.3	3.262	68.8	0.133	56.6	0.288	-53.8
2.3	0.292	166.7	3.145	67.2	0.138	56.4	0.286	-54.4
2.4	0.290	164.8	3.021	65.6	0.143	56.2	0.275	-55.0
2.5	0.298	162.1	2.906	64.1	0.148	56.1	0.273	-55.8
2.6	0.297	159.4	2.812	63.0	0.153	55.9	0.267	-57.1
2.7	0.302	158.0	2.709	61.5	0.158	55.6	0.263	-56.8
2.8	0.304	155.1	2.610	60.3	0.162	55.2	0.257	-58.7
2.9	0.298	154.0	2.490	58.1	0.168	54.2	0.244	-59.9
3.0	0.299	149.4	2.429	56.4	0.173	54.1	0.244	-63.2
4.0	0.352	125.5	1.873	39.9	0.225	49.2	0.226	-88.1
5.0	0.443	104.8	1.478	25.7	0.275	39.2	0.204	-122.3



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

Frequency (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.676	-22.3	22.003	161.3	0.014	82.7	0.944	-12.5
0.2	0.612	-42.9	19.679	145.3	0.025	71.9	0.855	-22.6
0.3	0.526	-59.1	16.963	133.1	0.034	66.5	0.749	-29.2
0.4	0.451	-73.0	14.543	123.5	0.042	63.2	0.658	-33.9
0.5	0.386	-86.6	12.577	115.7	0.047	61.7	0.583	-36.7
0.6	0.340	-98.4	10.996	109.6	0.053	60.8	0.521	-38.8
0.7	0.306	-109.1	9.727	104.9	0.058	60.4	0.473	-40.0
0.8	0.278	-119.8	8.676	100.4	0.063	60.5	0.433	-41.2
0.9	0.263	-130.2	7.819	96.7	0.068	60.4	0.402	-42.4
1.0	0.250	-139.7	7.112	93.3	0.073	60.8	0.375	-43.6
1.1	0.246	-148.1	6.522	90.4	0.078	60.8	0.356	-44.7
1.2	0.246	-155.8	5.980	87.9	0.083	61.0	0.337	-46.0
1.3	0.247	-163.1	5.562	85.3	0.088	61.0	0.326	-47.0
1.4	0.250	-168.6	5.172	82.9	0.093	61.0	0.315	-48.3
1.5	0.252	-173.7	4.838	80.5	0.098	60.8	0.306	-49.2
1.6	0.256	-178.4	4.560	78.3	0.103	60.8	0.298	-50.1
1.7	0.259	-177.6	4.292	76.4	0.108	60.6	0.291	-51.0
1.8	0.264	-173.8	4.069	74.3	0.113	60.4	0.284	-51.6
1.9	0.268	-169.8	3.851	72.7	0.118	60.3	0.279	-52.3
2.0	0.267	-167.1	3.675	70.8	0.123	60.1	0.272	-52.4
2.1	0.280	-164.5	3.517	69.1	0.128	59.9	0.269	-53.4
2.2	0.277	-161.9	3.364	67.6	0.133	59.7	0.260	-53.0
2.3	0.289	-160.6	3.234	66.2	0.138	59.4	0.259	-53.8
2.4	0.288	-158.7	3.110	64.7	0.144	59.0	0.248	-54.3
2.5	0.295	-156.7	2.991	63.3	0.149	58.7	0.247	-55.2
2.6	0.296	-154.1	2.893	62.1	0.154	58.5	0.240	-56.7
2.7	0.302	-152.9	2.786	60.6	0.159	57.9	0.237	-56.3
2.8	0.303	-150.5	2.686	59.5	0.164	57.5	0.231	-58.4
2.9	0.297	-149.2	2.563	57.4	0.170	56.4	0.219	-59.7
3.0	0.299	-144.6	2.496	55.7	0.176	56.1	0.220	-63.4
4.0	0.350	-122.8	1.917	39.7	0.229	50.4	0.205	-90.2
5.0	0.444	-103.5	1.513	25.9	0.280	39.6	0.190	-127.2

V<sub>CE</sub> = 3 V, I<sub>c</sub> = 20 mA, Z<sub>o</sub> = 50 Ω

Frequency (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.524	-31.2	29.776	154.7	0.013	79.3	0.896	-16.9
0.2	0.445	-59.6	24.547	135.5	0.022	69.8	0.758	-28.0
0.3	0.363	-80.1	19.730	122.9	0.029	66.8	0.631	-33.4
0.4	0.308	-95.6	16.104	113.9	0.035	65.3	0.540	-36.1
0.5	0.269	-112.0	13.477	107.4	0.040	65.7	0.475	-37.1
0.6	0.247	-124.7	11.550	102.1	0.046	65.9	0.424	-37.7
0.7	0.233	-136.9	10.103	98.2	0.051	66.0	0.387	-37.9
0.8	0.225	-147.7	8.906	94.4	0.057	66.7	0.357	-38.3
0.9	0.226	-156.8	7.971	91.4	0.062	66.8	0.334	-38.9
1.0	0.226	-164.9	7.224	88.5	0.068	67.0	0.314	-39.9
1.1	0.232	-172.0	6.593	86.0	0.073	67.0	0.300	-40.9
1.2	0.239	-176.8	6.038	84.0	0.079	67.0	0.287	-42.1
1.3	0.245	-177.6	5.595	81.6	0.084	66.9	0.279	-43.1
1.4	0.253	-174.0	5.198	79.5	0.090	66.6	0.271	-44.5
1.5	0.258	-170.1	4.867	77.4	0.095	66.3	0.265	-45.6
1.6	0.265	-166.8	4.569	75.4	0.101	65.9	0.261	-46.6
1.7	0.270	-163.8	4.302	73.6	0.106	65.5	0.255	-47.6
1.8	0.273	-161.0	4.071	71.7	0.112	65.3	0.250	-48.3
1.9	0.280	-158.5	3.855	70.3	0.117	64.8	0.247	-49.3
2.0	0.279	-156.3	3.676	68.4	0.122	64.4	0.241	-49.3
2.1	0.291	-154.3	3.521	66.9	0.128	64.0	0.240	-50.6
2.2	0.289	-152.4	3.365	65.5	0.134	63.6	0.232	-50.1
2.3	0.302	-151.6	3.239	64.2	0.139	63.2	0.231	-51.1
2.4	0.299	-150.2	3.110	62.8	0.145	62.6	0.222	-51.7
2.5	0.309	-148.8	2.989	61.4	0.150	62.1	0.221	-52.7
2.6	0.308	-146.5	2.894	60.4	0.156	61.7	0.215	-54.3
2.7	0.313	-146.2	2.788	59.1	0.161	61.1	0.212	-53.8
2.8	0.314	-143.9	2.685	58.0	0.166	60.4	0.207	-56.2
2.9	0.309	-142.6	2.562	55.9	0.172	59.3	0.195	-57.7
3.0	0.311	-138.8	2.494	54.4	0.178	59.0	0.197	-61.8
4.0	0.364	-119.3	1.908	38.6	0.233	52.0	0.186	-91.3
5.0	0.454	-101.8	1.502	25.3	0.284	40.8	0.178	-131.4

**S-PARAMETERS Q2**

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

Frequency (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.965	-24.1	3.654	164.3	0.035	77.0	0.985	-6.8
0.2	0.935	-46.4	3.467	149.7	0.068	63.9	0.947	-13.4
0.3	0.904	-66.0	3.152	137.5	0.091	52.8	0.901	-18.9
0.4	0.876	-83.9	2.849	125.4	0.109	43.5	0.850	-23.4
0.5	0.848	-99.0	2.549	115.8	0.120	35.6	0.807	-27.0
0.6	0.826	-111.8	2.286	107.5	0.126	29.4	0.768	-30.3
0.7	0.812	-122.4	2.062	100.2	0.128	24.0	0.740	-33.3
0.8	0.801	-131.7	1.875	93.3	0.128	19.7	0.715	-36.3
0.9	0.793	-139.5	1.703	87.5	0.126	16.0	0.696	-39.3
1.0	0.789	-146.6	1.561	82.0	0.123	13.1	0.679	-42.7
1.1	0.786	-152.5	1.434	77.0	0.117	10.9	0.669	-45.9
1.2	0.780	-157.9	1.323	72.2	0.112	9.3	0.662	-49.2
1.3	0.784	-162.3	1.227	68.4	0.105	8.3	0.656	-52.7
1.4	0.784	-166.8	1.147	64.2	0.099	8.1	0.650	-56.2
1.5	0.791	-170.3	1.077	60.7	0.092	9.0	0.649	-59.8
1.6	0.792	-173.4	1.006	57.4	0.085	10.6	0.646	-63.3
1.7	0.795	-176.4	0.951	54.2	0.079	13.6	0.648	-66.9
1.8	0.795	-179.4	0.895	51.1	0.072	18.2	0.647	-70.5
1.9	0.798	178.0	0.850	48.8	0.067	24.7	0.647	-74.0
2.0	0.802	175.4	0.809	45.9	0.065	32.5	0.648	-77.6
2.1	0.805	173.3	0.768	43.8	0.063	41.4	0.648	-81.2
2.2	0.810	171.1	0.735	41.2	0.065	50.5	0.649	-84.9
2.3	0.809	169.0	0.708	39.7	0.070	58.7	0.648	-88.6
2.4	0.810	167.0	0.677	38.1	0.077	65.6	0.648	-92.5
2.5	0.810	164.8	0.650	36.5	0.086	71.0	0.651	-96.5
2.6	0.810	162.9	0.630	35.5	0.096	74.9	0.654	-100.6
2.7	0.813	160.6	0.607	34.2	0.108	77.3	0.654	-104.5
2.8	0.817	158.7	0.583	33.0	0.120	78.7	0.660	-108.2
2.9	0.811	157.0	0.558	32.5	0.134	79.1	0.661	-111.8
3.0	0.812	154.7	0.536	31.5	0.148	79.1	0.655	-115.8
4.0	0.816	133.9	0.435	25.9	0.294	67.7	0.679	-153.2
5.0	0.808	121.8	0.434	22.1	0.396	42.5	0.634	166.5

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

Frequency (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.885	-35.2	9.632	157.9	0.035	72.0	0.949	-13.6
0.2	0.835	-65.4	8.466	139.8	0.060	56.9	0.843	-24.6
0.3	0.786	-88.2	7.146	126.3	0.075	45.9	0.738	-31.8
0.4	0.753	-107.2	6.038	114.9	0.083	38.6	0.649	-36.5
0.5	0.722	-121.5	5.142	106.5	0.088	33.6	0.584	-39.5
0.6	0.706	-133.1	4.463	99.6	0.090	30.4	0.535	-41.9
0.7	0.698	-142.0	3.918	93.8	0.091	28.3	0.499	-44.1
0.8	0.693	-149.6	3.488	88.4	0.091	27.3	0.470	-46.3
0.9	0.692	-155.9	3.124	84.1	0.090	26.7	0.449	-48.6
1.0	0.688	-161.5	2.836	79.7	0.090	27.1	0.432	-51.3
1.1	0.689	-165.9	2.585	76.0	0.088	28.1	0.421	-54.1
1.2	0.688	-170.1	2.374	72.2	0.087	29.5	0.413	-56.8
1.3	0.694	-173.5	2.197	69.1	0.086	31.3	0.408	-59.9
1.4	0.694	-177.0	2.044	66.0	0.085	33.7	0.404	-63.0
1.5	0.703	-179.4	1.912	63.0	0.086	36.8	0.403	-66.2
1.6	0.705	178.2	1.794	60.0	0.086	39.6	0.402	-69.4
1.7	0.708	176.0	1.692	57.3	0.087	43.0	0.403	-72.6
1.8	0.710	173.8	1.597	54.6	0.089	46.6	0.403	-75.8
1.9	0.713	171.8	1.515	52.3	0.091	50.1	0.404	-78.9
2.0	0.717	169.9	1.441	49.8	0.095	53.4	0.405	-82.3
2.1	0.723	168.4	1.375	47.6	0.099	56.6	0.407	-85.7
2.2	0.725	166.8	1.318	45.0	0.105	59.3	0.409	-89.1
2.3	0.725	165.0	1.274	43.2	0.110	61.8	0.412	-92.5
2.4	0.729	163.4	1.219	41.5	0.118	63.8	0.414	-96.1
2.5	0.731	161.7	1.175	39.4	0.125	65.6	0.418	-99.8
2.6	0.733	160.2	1.136	37.8	0.133	67.1	0.421	-103.6
2.7	0.736	158.4	1.100	36.0	0.142	68.0	0.427	-107.4
2.8	0.741	156.9	1.057	34.3	0.151	68.6	0.433	-110.9
2.9	0.737	155.5	1.020	32.9	0.161	68.6	0.438	-114.5
3.0	0.738	153.3	0.975	31.0	0.172	68.7	0.440	-118.2
4.0	0.769	135.3	0.730	15.3	0.286	62.1	0.509	-153.5
5.0	0.796	123.5	0.577	7.2	0.381	41.4	0.526	167.1

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

Frequency (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.830	-44.6	14.560	152.7	0.032	68.1	0.908	-19.6
0.2	0.756	-79.1	11.937	132.3	0.053	52.8	0.749	-33.2
0.3	0.711	-103.5	9.559	119.1	0.063	43.4	0.617	-40.9
0.4	0.680	-121.8	7.781	108.6	0.069	38.4	0.520	-45.1
0.5	0.660	-134.7	6.481	101.2	0.072	36.0	0.454	-47.8
0.6	0.651	-144.9	5.542	95.2	0.074	35.1	0.406	-49.8
0.7	0.647	-152.5	4.815	90.3	0.076	34.8	0.372	-51.6
0.8	0.647	-159.1	4.262	85.6	0.077	35.6	0.345	-53.7
0.9	0.648	-164.5	3.801	81.9	0.079	36.8	0.326	-56.0
1.0	0.648	-169.0	3.439	78.1	0.080	38.3	0.311	-58.6
1.1	0.648	-172.8	3.130	74.9	0.081	40.2	0.302	-61.3
1.2	0.650	-176.4	2.865	71.7	0.083	42.1	0.294	-64.3
1.3	0.656	-179.0	2.653	68.8	0.085	44.2	0.290	-67.3
1.4	0.659	178.1	2.466	66.0	0.088	46.6	0.287	-70.4
1.5	0.667	175.8	2.308	63.4	0.091	48.8	0.286	-73.6
1.6	0.668	173.8	2.164	60.8	0.094	50.9	0.286	-76.8
1.7	0.673	172.1	2.038	58.3	0.098	52.9	0.288	-79.9
1.8	0.674	170.3	1.925	55.8	0.102	55.2	0.288	-83.0
1.9	0.678	168.7	1.828	53.7	0.107	57.1	0.290	-86.1
2.0	0.682	166.9	1.741	51.3	0.112	58.7	0.291	-89.5
2.1	0.685	165.5	1.660	49.3	0.118	60.2	0.294	-92.7
2.2	0.689	164.2	1.594	46.9	0.123	61.6	0.297	-96.1
2.3	0.691	162.6	1.540	45.2	0.130	62.7	0.299	-99.4
2.4	0.694	161.3	1.477	43.4	0.137	63.5	0.302	-102.9
2.5	0.696	159.9	1.423	41.4	0.144	64.3	0.307	-106.6
2.6	0.699	158.5	1.379	39.8	0.151	65.0	0.312	-110.2
2.7	0.701	156.9	1.334	38.0	0.160	65.0	0.317	-113.8
2.8	0.706	155.5	1.286	36.2	0.168	65.2	0.324	-117.3
2.9	0.703	154.4	1.240	34.9	0.177	64.9	0.330	-120.7
3.0	0.703	152.4	1.191	32.9	0.186	64.8	0.335	-124.3
4.0	0.743	135.5	0.893	15.4	0.286	58.7	0.418	-157.4
5.0	0.783	124.6	0.691	4.4	0.373	40.2	0.462	164.9

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

Frequency (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.776	-53.0	18.356	148.5	0.031	67.4	0.869	-24.3
0.2	0.701	-90.0	14.204	127.3	0.048	50.5	0.676	-39.5
0.3	0.661	-114.1	10.997	114.4	0.055	43.0	0.535	-47.1
0.4	0.643	-131.0	8.762	104.8	0.060	40.1	0.439	-51.3
0.5	0.627	-143.1	7.220	98.1	0.064	39.0	0.376	-53.7
0.6	0.623	-151.8	6.127	92.7	0.066	39.7	0.331	-55.7
0.7	0.623	-158.8	5.301	88.3	0.069	40.5	0.300	-57.6
0.8	0.624	-164.8	4.674	84.1	0.071	42.1	0.275	-59.8
0.9	0.627	-169.2	4.154	80.7	0.074	43.6	0.258	-62.4
1.0	0.629	-173.3	3.752	77.2	0.077	45.5	0.245	-65.3
1.1	0.630	-176.6	3.418	74.2	0.080	47.4	0.236	-68.4
1.2	0.631	-179.9	3.132	71.3	0.084	49.3	0.230	-71.5
1.3	0.639	177.9	2.893	68.7	0.087	51.0	0.227	-74.8
1.4	0.640	175.2	2.691	66.1	0.091	52.8	0.225	-78.1
1.5	0.649	173.3	2.520	63.6	0.096	54.5	0.225	-81.3
1.6	0.652	171.4	2.362	61.2	0.100	56.0	0.225	-84.7
1.7	0.655	169.8	2.224	58.8	0.105	57.3	0.227	-87.7
1.8	0.657	168.3	2.103	56.4	0.110	58.9	0.228	-90.9
1.9	0.660	166.6	1.996	54.6	0.116	60.0	0.230	-93.9
2.0	0.664	165.0	1.900	52.2	0.122	61.0	0.232	-97.3
2.1	0.667	163.9	1.814	50.2	0.128	61.8	0.235	-100.5
2.2	0.673	162.6	1.740	47.9	0.134	62.5	0.238	-103.9
2.3	0.675	161.2	1.684	46.3	0.141	63.0	0.241	-107.1
2.4	0.675	160.0	1.616	44.4	0.148	63.4	0.244	-110.7
2.5	0.680	158.6	1.554	42.6	0.155	63.8	0.250	-114.2
2.6	0.679	157.3	1.506	41.1	0.162	64.1	0.255	-117.5
2.7	0.686	155.9	1.461	39.3	0.170	63.9	0.262	-121.3
2.8	0.687	154.5	1.409	37.5	0.178	63.8	0.269	-124.5
2.9	0.685	153.5	1.360	36.1	0.187	63.3	0.276	-127.8
3.0	0.685	151.8	1.308	34.1	0.195	62.9	0.281	-131.1
4.0	0.726	135.7	0.987	16.4	0.287	56.6	0.371	-162.0
5.0	0.774	125.2	0.762	4.0	0.369	39.2	0.425	162.1

V<sub>CE</sub> = 1 V, I<sub>c</sub> = 10 mA, Z<sub>o</sub> = 50 Ω

Frequency (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.708	-63.2	22.952	143.0	0.028	63.3	0.812	-30.6
0.2	0.647	-104.2	16.597	121.5	0.042	49.2	0.587	-47.2
0.3	0.617	-126.0	12.376	109.5	0.048	44.0	0.444	-54.7
0.4	0.605	-141.2	9.676	100.9	0.052	43.3	0.355	-59.0
0.5	0.600	-151.8	7.899	95.0	0.056	44.1	0.298	-61.6
0.6	0.600	-159.5	6.665	90.2	0.060	46.1	0.258	-64.1
0.7	0.601	-165.4	5.746	86.2	0.064	47.5	0.230	-66.4
0.8	0.604	-170.5	5.055	82.4	0.068	49.6	0.209	-69.4
0.9	0.610	-174.3	4.489	79.4	0.072	51.2	0.194	-72.6
1.0	0.612	-177.8	4.048	76.2	0.077	52.9	0.183	-76.3
1.1	0.615	179.3	3.674	73.5	0.081	54.4	0.177	-80.1
1.2	0.615	176.5	3.369	70.9	0.086	55.8	0.172	-83.9
1.3	0.625	174.4	3.114	68.4	0.091	57.2	0.171	-87.7
1.4	0.628	172.0	2.897	66.1	0.096	58.4	0.170	-91.3
1.5	0.634	170.5	2.709	63.7	0.102	59.3	0.171	-94.7
1.6	0.638	169.1	2.540	61.3	0.107	60.3	0.172	-98.2
1.7	0.640	167.4	2.398	59.1	0.113	61.0	0.175	-101.3
1.8	0.642	166.0	2.264	56.9	0.119	61.9	0.177	-104.5
1.9	0.647	164.5	2.149	55.1	0.125	62.4	0.180	-107.4
2.0	0.650	163.2	2.046	53.0	0.131	62.8	0.182	-110.7
2.1	0.653	162.0	1.955	51.1	0.138	63.2	0.186	-113.8
2.2	0.658	161.0	1.875	48.8	0.145	63.4	0.189	-117.2
2.3	0.657	159.7	1.811	47.3	0.151	63.5	0.194	-120.2
2.4	0.660	158.5	1.740	45.5	0.159	63.4	0.197	-123.5
2.5	0.662	157.2	1.678	43.6	0.166	63.4	0.204	-126.8
2.6	0.665	156.0	1.626	42.3	0.173	63.4	0.210	-130.0
2.7	0.669	154.7	1.574	40.5	0.181	62.9	0.216	-133.3
2.8	0.671	153.6	1.516	38.7	0.188	62.6	0.224	-136.2
2.9	0.668	152.6	1.468	37.3	0.197	61.9	0.231	-139.2
3.0	0.670	150.6	1.413	35.5	0.205	61.4	0.238	-142.0
4.0	0.711	135.4	1.073	17.5	0.291	54.4	0.332	-169.0
5.0	0.765	125.5	0.831	4.3	0.366	38.1	0.393	157.6

V<sub>CE</sub> = 1 V, I<sub>c</sub> = 20 mA, Z<sub>o</sub> = 50 Ω

Frequency (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.595	-90.1	30.614	132.0	0.023	57.3	0.670	-44.6
0.2	0.578	-129.8	19.508	111.8	0.032	50.6	0.424	-63.1
0.3	0.571	-147.1	13.843	101.9	0.037	49.8	0.301	-71.5
0.4	0.576	-158.0	10.586	95.1	0.043	52.9	0.232	-77.7
0.5	0.577	-165.5	8.543	90.4	0.048	55.1	0.189	-82.6
0.6	0.582	-170.9	7.163	86.4	0.055	57.3	0.161	-88.1
0.7	0.587	-174.9	6.145	83.1	0.060	59.2	0.143	-93.6
0.8	0.594	-178.7	5.390	79.8	0.067	60.7	0.130	-100.1
0.9	0.599	178.4	4.783	77.4	0.073	61.4	0.123	-106.2
1.0	0.601	175.5	4.308	74.6	0.079	62.6	0.120	-112.5
1.1	0.606	173.3	3.913	72.3	0.085	63.4	0.120	-118.0
1.2	0.608	171.2	3.584	69.9	0.092	63.8	0.121	-122.9
1.3	0.616	169.5	3.312	67.7	0.098	64.3	0.124	-126.9
1.4	0.620	167.6	3.075	65.6	0.105	64.6	0.127	-130.5
1.5	0.626	166.2	2.876	63.4	0.112	64.8	0.131	-133.3
1.6	0.628	165.0	2.698	61.3	0.118	65.0	0.135	-136.3
1.7	0.631	163.7	2.545	59.2	0.125	64.9	0.139	-138.6
1.8	0.636	162.5	2.404	57.1	0.132	65.1	0.143	-141.2
1.9	0.637	161.1	2.282	55.4	0.139	65.0	0.146	-143.2
2.0	0.643	160.0	2.174	53.5	0.146	64.7	0.151	-145.7
2.1	0.644	159.2	2.075	51.8	0.153	64.6	0.155	-148.1
2.2	0.649	158.1	1.994	49.6	0.160	64.2	0.160	-150.4
2.3	0.648	157.0	1.927	48.1	0.167	63.9	0.165	-152.6
2.4	0.649	156.0	1.850	46.5	0.175	63.4	0.170	-155.0
2.5	0.653	154.8	1.783	44.6	0.182	62.9	0.177	-157.2
2.6	0.655	153.7	1.730	43.3	0.189	62.6	0.183	-159.2
2.7	0.657	152.5	1.674	41.6	0.197	61.8	0.190	-161.3
2.8	0.660	151.4	1.619	39.9	0.205	61.1	0.198	-163.2
2.9	0.656	150.5	1.564	38.6	0.212	60.2	0.206	-164.9
3.0	0.657	148.8	1.507	36.9	0.220	59.5	0.212	-166.6
4.0	0.700	134.7	1.150	19.2	0.299	51.3	0.303	-175.3
5.0	0.754	125.6	0.900	5.7	0.363	35.7	0.368	147.2

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

Frequency (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.963	-22.6	3.694	164.6	0.032	77.4	0.986	-6.3
0.2	0.934	-45.4	3.525	150.4	0.062	64.8	0.951	-12.5
0.3	0.911	-64.6	3.208	138.6	0.085	53.5	0.909	-17.7
0.4	0.878	-82.4	2.915	126.7	0.101	44.5	0.861	-22.0
0.5	0.847	-97.3	2.615	117.2	0.111	36.9	0.818	-25.4
0.6	0.826	-110.3	2.350	108.9	0.117	30.6	0.782	-28.6
0.7	0.812	-121.0	2.120	101.6	0.119	25.2	0.754	-31.5
0.8	0.802	-130.4	1.931	94.8	0.120	21.0	0.730	-34.4
0.9	0.795	-138.3	1.757	88.9	0.117	17.2	0.711	-37.3
1.0	0.789	-145.4	1.613	83.5	0.114	14.5	0.694	-40.4
1.1	0.784	-151.4	1.483	78.7	0.109	12.3	0.684	-43.6
1.2	0.779	-156.8	1.370	74.0	0.104	10.8	0.676	-46.8
1.3	0.783	-161.5	1.269	70.1	0.098	10.0	0.670	-50.1
1.4	0.783	-165.9	1.185	66.0	0.091	9.9	0.665	-53.5
1.5	0.788	-169.6	1.112	62.6	0.085	11.0	0.663	-56.9
1.6	0.791	-172.7	1.042	59.2	0.078	13.0	0.659	-60.5
1.7	0.793	-175.9	0.983	56.1	0.072	16.4	0.660	-63.8
1.8	0.795	-179.0	0.928	53.0	0.067	21.7	0.658	-67.3
1.9	0.796	178.5	0.878	50.6	0.063	28.7	0.658	-70.7
2.0	0.798	175.9	0.833	47.8	0.061	37.0	0.656	-74.3
2.1	0.802	173.9	0.798	45.5	0.060	46.4	0.656	-77.8
2.2	0.806	171.6	0.761	43.0	0.063	55.4	0.657	-81.3
2.3	0.805	169.4	0.735	41.3	0.068	63.5	0.657	-84.9
2.4	0.805	167.3	0.703	40.1	0.076	69.9	0.655	-88.8
2.5	0.805	165.2	0.673	38.2	0.085	74.8	0.657	-92.6
2.6	0.810	163.1	0.651	37.2	0.096	78.6	0.657	-96.5
2.7	0.811	161.1	0.629	35.9	0.108	80.5	0.658	-100.4
2.8	0.813	159.2	0.604	34.7	0.120	81.7	0.662	-104.1
2.9	0.809	157.4	0.581	34.1	0.133	81.8	0.662	-107.8
3.0	0.807	155.0	0.556	32.9	0.148	81.8	0.656	-111.7
4.0	0.813	134.2	0.451	26.7	0.293	69.6	0.671	-149.1
5.0	0.806	121.8	0.441	22.5	0.397	44.1	0.623	170.1

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

Frequency (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.888	-33.6	9.650	158.8	0.030	72.3	0.954	-12.4
0.2	0.850	-62.4	8.552	141.1	0.055	58.2	0.857	-22.7
0.3	0.794	-85.2	7.287	127.9	0.070	47.1	0.759	-29.5
0.4	0.754	-104.1	6.206	116.5	0.078	39.9	0.674	-33.8
0.5	0.723	-118.6	5.302	108.0	0.083	35.0	0.609	-36.8
0.6	0.705	-130.2	4.613	101.0	0.086	31.5	0.560	-39.1
0.7	0.695	-139.7	4.061	95.2	0.086	29.4	0.525	-41.0
0.8	0.688	-147.6	3.619	89.9	0.086	28.5	0.496	-43.1
0.9	0.688	-153.9	3.244	85.5	0.086	27.8	0.475	-45.2
1.0	0.686	-159.6	2.948	81.1	0.085	28.3	0.458	-47.7
1.1	0.682	-164.3	2.689	77.3	0.083	29.3	0.447	-50.4
1.2	0.682	-168.7	2.470	73.6	0.082	30.6	0.437	-53.0
1.3	0.687	-172.0	2.282	70.5	0.082	32.7	0.431	-55.8
1.4	0.690	-175.5	2.127	67.2	0.081	35.2	0.427	-58.9
1.5	0.696	-178.3	1.991	64.2	0.081	38.2	0.425	-61.9
1.6	0.699	179.2	1.865	61.4	0.081	41.4	0.423	-65.1
1.7	0.701	177.0	1.760	58.7	0.083	45.0	0.424	-68.0
1.8	0.705	174.8	1.661	55.9	0.084	48.7	0.423	-71.1
1.9	0.707	172.7	1.576	53.8	0.087	52.2	0.424	-74.1
2.0	0.709	170.6	1.498	51.1	0.091	55.7	0.423	-77.4
2.1	0.715	169.1	1.429	49.0	0.095	59.0	0.424	-80.7
2.2	0.720	167.6	1.370	46.5	0.100	61.8	0.426	-84.0
2.3	0.721	165.7	1.327	44.7	0.106	64.4	0.427	-87.3
2.4	0.722	164.1	1.268	42.8	0.113	66.3	0.427	-90.9
2.5	0.725	162.3	1.221	40.8	0.121	68.1	0.430	-94.5
2.6	0.727	160.9	1.181	39.3	0.129	69.6	0.434	-98.0
2.7	0.730	159.0	1.141	37.5	0.138	70.3	0.437	-101.8
2.8	0.734	157.5	1.101	35.8	0.147	71.0	0.442	-105.3
2.9	0.730	156.0	1.058	34.3	0.157	70.9	0.445	-108.8
3.0	0.733	154.1	1.011	32.5	0.167	71.1	0.446	-112.6
4.0	0.764	135.9	0.757	16.4	0.283	64.2	0.505	-148.4
5.0	0.791	124.1	0.597	7.6	0.381	43.1	0.516	171.3

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

Frequency (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.847	-42.1	14.583	153.9	0.029	71.4	0.918	-17.8
0.2	0.767	-75.3	12.130	134.1	0.050	54.8	0.772	-30.4
0.3	0.712	-99.6	9.834	120.9	0.059	45.2	0.645	-37.6
0.4	0.676	-117.9	8.066	110.2	0.065	39.6	0.550	-41.6
0.5	0.657	-131.3	6.744	102.7	0.069	37.2	0.484	-43.9
0.6	0.644	-141.8	5.777	96.8	0.071	36.3	0.436	-45.7
0.7	0.641	-150.0	5.041	91.7	0.072	36.0	0.402	-47.3
0.8	0.638	-156.6	4.452	87.0	0.074	36.6	0.375	-49.1
0.9	0.636	-162.2	3.979	83.2	0.075	37.7	0.355	-51.1
1.0	0.639	-167.0	3.604	79.4	0.076	39.4	0.339	-53.4
1.1	0.638	-170.9	3.276	76.2	0.078	41.2	0.329	-55.9
1.2	0.639	-174.7	3.006	73.0	0.079	43.1	0.321	-58.6
1.3	0.645	-177.5	2.783	70.2	0.081	45.4	0.315	-61.5
1.4	0.648	179.5	2.588	67.3	0.084	47.6	0.311	-64.3
1.5	0.656	177.2	2.418	64.7	0.087	49.9	0.310	-67.3
1.6	0.659	175.3	2.266	62.1	0.090	52.1	0.308	-70.3
1.7	0.662	173.3	2.139	59.6	0.094	54.3	0.309	-73.2
1.8	0.664	171.3	2.021	57.2	0.098	56.7	0.308	-76.2
1.9	0.668	169.6	1.914	55.0	0.102	58.6	0.309	-79.2
2.0	0.670	167.9	1.824	52.7	0.107	60.4	0.310	-82.4
2.1	0.674	166.5	1.737	50.6	0.112	61.9	0.311	-85.5
2.2	0.677	165.1	1.667	48.3	0.118	63.3	0.312	-88.9
2.3	0.680	163.6	1.616	46.4	0.125	64.6	0.314	-92.1
2.4	0.682	162.3	1.547	44.7	0.132	65.4	0.315	-95.6
2.5	0.686	160.8	1.491	42.8	0.139	66.3	0.319	-99.1
2.6	0.687	159.4	1.443	41.2	0.146	67.0	0.323	-102.7
2.7	0.692	157.9	1.393	39.5	0.154	67.1	0.326	-106.4
2.8	0.696	156.2	1.345	37.5	0.162	67.2	0.332	-109.8
2.9	0.691	155.2	1.296	36.1	0.171	67.0	0.336	-113.3
3.0	0.693	153.3	1.246	34.3	0.181	66.8	0.340	-117.0
4.0	0.734	136.4	0.933	16.6	0.281	60.7	0.413	-151.4
5.0	0.777	125.2	0.721	4.9	0.371	42.0	0.450	169.7

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

Frequency (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.777	-49.4	18.629	149.9	0.028	69.2	0.882	-22.1
0.2	0.703	-85.8	14.683	129.2	0.045	51.8	0.701	-36.3
0.3	0.660	-109.4	11.476	116.2	0.052	44.3	0.563	-43.4
0.4	0.630	-127.4	9.203	106.4	0.057	41.4	0.469	-47.1
0.5	0.617	-139.8	7.609	99.5	0.060	40.4	0.405	-49.2
0.6	0.612	-148.8	6.468	94.1	0.063	40.8	0.359	-50.7
0.7	0.608	-156.4	5.599	89.7	0.066	41.7	0.327	-52.2
0.8	0.610	-162.3	4.946	85.3	0.068	43.2	0.302	-54.0
0.9	0.612	-167.2	4.401	81.9	0.071	44.7	0.284	-56.1
1.0	0.614	-171.4	3.977	78.5	0.074	46.6	0.270	-58.5
1.1	0.614	-174.9	3.619	75.5	0.077	48.5	0.260	-61.1
1.2	0.616	-178.4	3.321	72.5	0.080	50.4	0.253	-64.0
1.3	0.624	179.1	3.069	70.0	0.084	52.2	0.248	-67.0
1.4	0.627	176.4	2.855	67.3	0.088	54.1	0.244	-69.9
1.5	0.636	174.5	2.668	64.9	0.092	55.7	0.244	-73.0
1.6	0.636	172.9	2.500	62.4	0.096	57.2	0.242	-76.1
1.7	0.639	170.9	2.358	60.1	0.101	58.7	0.243	-79.1
1.8	0.644	169.4	2.229	57.8	0.106	60.4	0.243	-82.0
1.9	0.647	167.6	2.113	55.8	0.111	61.3	0.244	-85.0
2.0	0.650	166.0	2.014	53.6	0.117	62.3	0.245	-88.2
2.1	0.655	164.8	1.922	51.6	0.123	63.3	0.246	-91.5
2.2	0.658	163.5	1.843	49.3	0.129	64.2	0.248	-94.7
2.3	0.658	162.2	1.782	47.6	0.136	64.8	0.250	-97.9
2.4	0.660	161.0	1.710	46.0	0.143	65.0	0.252	-101.5
2.5	0.663	159.6	1.643	44.0	0.150	65.4	0.256	-105.1
2.6	0.665	158.4	1.591	42.4	0.157	65.8	0.260	-108.6
2.7	0.668	156.9	1.540	40.7	0.165	65.6	0.265	-112.3
2.8	0.674	155.5	1.486	38.8	0.172	65.5	0.270	-115.5
2.9	0.669	154.4	1.436	37.5	0.181	65.0	0.276	-119.1
3.0	0.673	152.6	1.380	35.6	0.190	64.7	0.281	-122.6
4.0	0.716	136.7	1.040	17.5	0.282	58.5	0.361	-155.4
5.0	0.768	126.0	0.803	4.7	0.366	41.0	0.409	167.0

V<sub>CE</sub> = 2 V, I<sub>c</sub> = 10 mA, Z<sub>o</sub> = 50 Ω

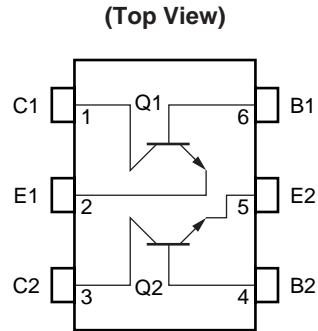
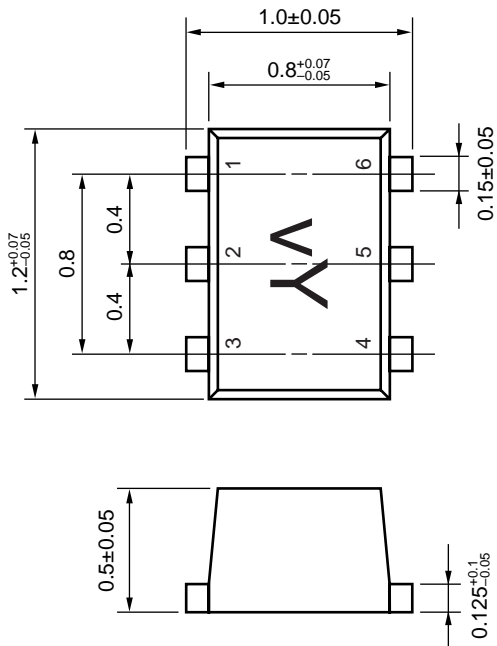
Frequency (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.717	-59.4	23.348	145.1	0.025	63.5	0.833	-27.6
0.2	0.644	-97.6	17.228	123.6	0.039	51.0	0.619	-42.9
0.3	0.611	-120.6	13.025	111.4	0.045	45.3	0.478	-49.8
0.4	0.594	-137.0	10.243	102.6	0.050	44.5	0.388	-53.2
0.5	0.585	-148.1	8.383	96.5	0.054	45.3	0.329	-55.2
0.6	0.583	-156.2	7.082	91.6	0.058	46.7	0.287	-56.9
0.7	0.584	-162.4	6.107	87.6	0.061	48.2	0.259	-58.4
0.8	0.586	-167.8	5.385	83.7	0.065	50.1	0.236	-60.5
0.9	0.590	-171.9	4.775	80.8	0.069	51.8	0.220	-63.0
1.0	0.593	-175.8	4.316	77.6	0.074	53.5	0.207	-65.9
1.1	0.595	-178.8	3.919	74.9	0.078	55.3	0.198	-69.0
1.2	0.596	178.0	3.600	72.2	0.082	56.7	0.192	-72.3
1.3	0.602	176.1	3.326	69.7	0.087	58.1	0.189	-75.7
1.4	0.608	173.6	3.093	67.3	0.092	59.2	0.186	-78.9
1.5	0.617	171.9	2.888	65.0	0.097	60.4	0.186	-82.1
1.6	0.619	170.4	2.708	62.7	0.103	61.1	0.186	-85.4
1.7	0.622	168.8	2.554	60.5	0.108	62.0	0.187	-88.5
1.8	0.626	167.3	2.413	58.3	0.114	63.0	0.187	-91.7
1.9	0.627	166.0	2.289	56.5	0.120	63.5	0.189	-94.6
2.0	0.634	164.2	2.180	54.3	0.126	64.0	0.190	-98.0
2.1	0.634	163.2	2.080	52.4	0.132	64.4	0.192	-101.1
2.2	0.640	162.2	1.998	50.3	0.139	64.7	0.194	-104.5
2.3	0.640	160.9	1.931	48.7	0.146	64.9	0.197	-107.7
2.4	0.641	159.7	1.851	47.0	0.153	64.9	0.199	-111.1
2.5	0.644	158.5	1.786	45.1	0.160	64.9	0.204	-114.7
2.6	0.647	157.2	1.728	43.6	0.167	64.9	0.208	-118.0
2.7	0.649	155.8	1.670	41.9	0.175	64.5	0.213	-121.7
2.8	0.655	154.5	1.616	40.1	0.182	64.1	0.220	-124.8
2.9	0.651	153.5	1.561	38.7	0.190	63.5	0.226	-128.3
3.0	0.654	151.8	1.500	36.9	0.198	63.1	0.231	-131.3
4.0	0.698	136.6	1.138	18.9	0.284	56.3	0.317	-161.6
5.0	0.756	126.6	0.880	5.3	0.362	39.9	0.374	162.9

V<sub>CE</sub> = 2 V, I<sub>c</sub> = 20 mA, Z<sub>o</sub> = 50 Ω

Frequency (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.585	-81.0	32.144	134.9	0.021	62.1	0.711	-39.3
0.2	0.555	-121.9	21.060	114.2	0.030	52.7	0.465	-55.9
0.3	0.546	-140.8	15.111	104.0	0.036	51.9	0.336	-62.6
0.4	0.546	-153.5	11.601	96.9	0.041	53.5	0.262	-66.4
0.5	0.544	-161.5	9.389	92.0	0.046	56.0	0.216	-69.1
0.6	0.552	-167.6	7.891	88.1	0.052	58.0	0.183	-72.2
0.7	0.553	-172.1	6.777	84.7	0.058	59.7	0.161	-75.4
0.8	0.559	-176.3	5.942	81.4	0.063	61.3	0.144	-79.7
0.9	0.564	-179.4	5.269	78.9	0.070	62.1	0.133	-84.3
1.0	0.571	177.7	4.754	76.0	0.076	63.1	0.125	-89.5
1.1	0.571	175.3	4.322	73.8	0.082	64.2	0.121	-94.4
1.2	0.576	172.9	3.953	71.4	0.088	64.6	0.119	-99.4
1.3	0.584	171.2	3.650	69.3	0.094	65.0	0.119	-103.9
1.4	0.586	169.1	3.392	67.1	0.100	65.5	0.119	-108.1
1.5	0.596	167.8	3.172	65.0	0.107	65.7	0.122	-111.6
1.6	0.599	166.6	2.975	62.9	0.113	65.9	0.123	-115.2
1.7	0.603	165.1	2.808	60.9	0.120	65.9	0.126	-118.2
1.8	0.604	164.0	2.648	58.9	0.126	66.1	0.128	-121.5
1.9	0.608	162.8	2.514	57.2	0.133	66.1	0.131	-124.2
2.0	0.614	161.6	2.397	55.2	0.140	65.9	0.133	-127.4
2.1	0.616	160.7	2.287	53.6	0.146	65.7	0.137	-130.2
2.2	0.618	159.8	2.193	51.4	0.153	65.4	0.140	-133.3
2.3	0.621	158.5	2.120	49.9	0.161	65.1	0.144	-136.0
2.4	0.620	157.3	2.035	48.3	0.168	64.6	0.148	-139.1
2.5	0.623	156.4	1.960	46.5	0.175	64.2	0.153	-142.0
2.6	0.625	155.3	1.902	45.0	0.182	63.9	0.159	-144.5
2.7	0.628	154.0	1.840	43.6	0.190	63.1	0.165	-147.4
2.8	0.632	152.8	1.775	41.9	0.197	62.5	0.172	-149.7
2.9	0.628	152.0	1.720	40.5	0.205	61.7	0.180	-152.2
3.0	0.631	150.4	1.655	38.8	0.212	61.0	0.186	-154.4
4.0	0.675	136.1	1.262	21.0	0.290	53.3	0.274	-176.3
5.0	0.738	127.1	0.985	7.0	0.358	37.7	0.338	152.9

PACKAGE DIMENSIONS

6-PIN LEAD-LESS MINIMOLD (UNIT: mm)



PIN CONNECTIONS

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



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