DATA SHEET

NEC

NPN SILICON RF TWIN TRANSISTOR

μPA850TD

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, 2SC5736)

  Q1: High gain transistor

  f_T = 12.0 GHz TYP., $|S_{21e}|^2$ = 8.5 dB TYP. @ V_{CE} = 3 V, I_C = 10 mA, f = 2 GHz

  Q2: Low phase distortion transistor suited for OSC applications

  f_T = 5.0 GHz TYP., $|S_{21e}|^2$ = 4.5 dB TYP. @ V_{CE} = 1 V, I_C = 5 mA, f = 2 GHz
- 6-pin lead-less minimold package

BUILT-IN TRANSISTORS

	Q1	Q2
3-pin thin-type ultra super minimold part No.	2SC5435	2SC5736

ORDERING INFORMATION

Part Number	Quantity	Supplying Form
μPA850TD	50 pcs (Non reel)	• 8 mm wide embossed taping
μPA850TD-T3	10 kpcs/reel	• Pin 1 (Q1 Collector), Pin 6 (Q1 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.

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ABSOLUTE MAXIMUM RATINGS (T_A = +25°C)

Parameter	Symbol	Ratings		Unit
		Q1	Q2	
Collector to Base Voltage	V_{CBO}	9	15	V
Collector to Emitter Voltage	V_{CEO}	6	5	V
Emitter to Base Voltage	V_{EBO}	2	3	V
Collector Current	I_C	30	100	mA
Total Power Dissipation	P_{tot} Note	180	190	mW
		210 in 2 elements		
Junction Temperature	T_j	150		°C
Storage Temperature	T_{stg}	−65 to +150		°C

Note Mounted on 1.08 $cm^2 \times$ 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_{EB} = 1 V, I_C = 0 mA	–	–	100	nA
DC Current Gain	h_{FE} Note 1	V_{CE} = 3 V, I_C = 10 mA	75	110	150	–
Gain Bandwidth Product	f_T	V_{CE} = 3 V, I_C = 10 mA, f = 2 GHz	10.0	12.0	–	GHz
Insertion Power Gain	$\|S_{21e}\|^2$	V_{CE} = 3 V, I_C = 10 mA, f = 2 GHz	7.0	8.5	–	dB
Noise Figure	NF	V_{CE} = 3 V, I_C = 3 mA, f = 2 GHz, $Z_S = Z_{opt}$	–	1.5	2.5	dB
Reverse Transfer Capacitance	C_{re} Note 2	V_{CB} = 3 V, I_E = 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_{CBO}	V_{CB} = 5 V, I_E = 0 mA	–	–	100	nA
Emitter Cut-off Current	I_{EBO}	V_{EB} = 1 V, I_C = 0 mA	–	–	100	nA
DC Current Gain	h_{FE} Note 1	V_{CE} = 1 V, I_C = 5 mA	100	–	145	–
Gain Bandwidth Product (1)	f_T	V_{CE} = 1 V, I_C = 5 mA, f = 2 GHz	4.5	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	4.5	–	dB
Insertion Power Gain (2)	$\|S_{21e}\|^2$	V_{CE} = 1 V, I_C = 15 mA, f = 2 GHz	4.5	6.0	–	dB
Noise Figure	NF	V_{CE} = 1 V, I_C = 5 mA, f = 2 GHz, $Z_S = Z_{opt}$	–	2.0	3.0	dB
Reverse Transfer Capacitance	C_{re} Note 2	V_{CB} = 0.5 V, I_E = 0 mA, f = 1 MHz	0.45	0.56	0.70	pF

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

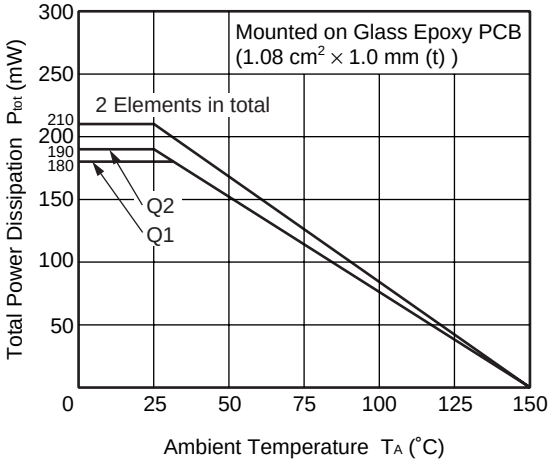
2. Collector to base capacitance when the emitter grounded

h_{FE} CLASSIFICATION

Rank	FB
Marking	vF
h_{FE} Value of Q1	75 to 150
h_{FE} Value of Q2	100 to 145

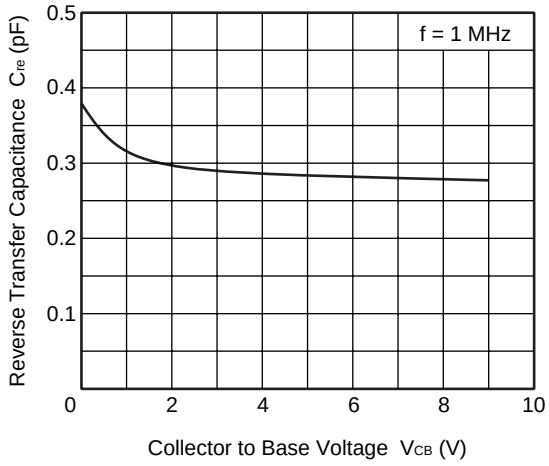
TYPICAL CHARACTERISTICS (Unless otherwise specified, T_A = +25°C)

TOTAL POWER DISSIPATION
vs. AMBIENT TEMPERATURE



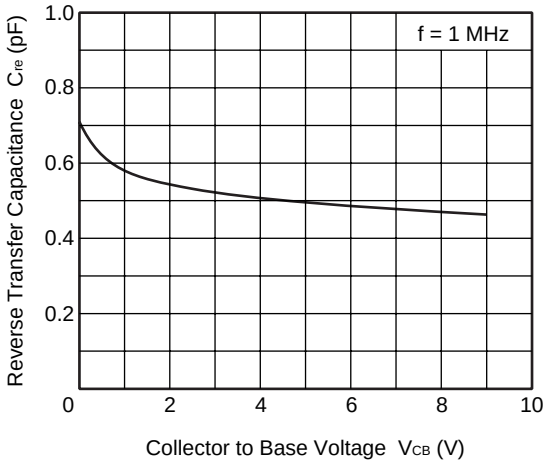
Q1

REVERSE TRANSFER CAPACITANCE
vs. COLLECTOR TO BASE VOLTAGE



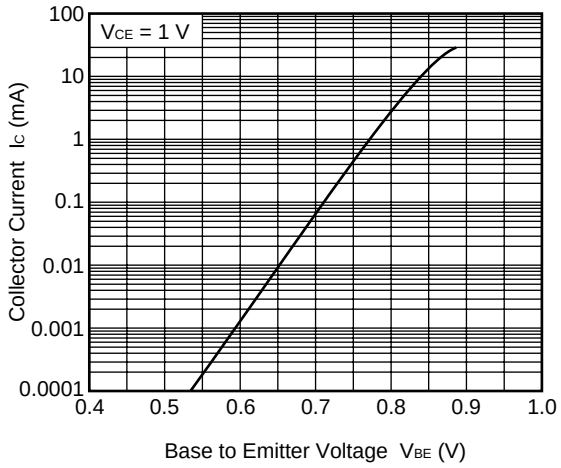
Q2

REVERSE TRANSFER CAPACITANCE
vs. COLLECTOR TO BASE VOLTAGE



Q1

COLLECTOR CURRENT vs.
BASE TO EMITTER VOLTAGE



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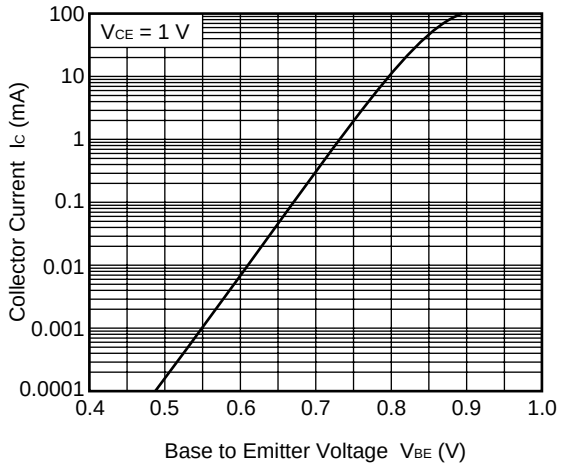
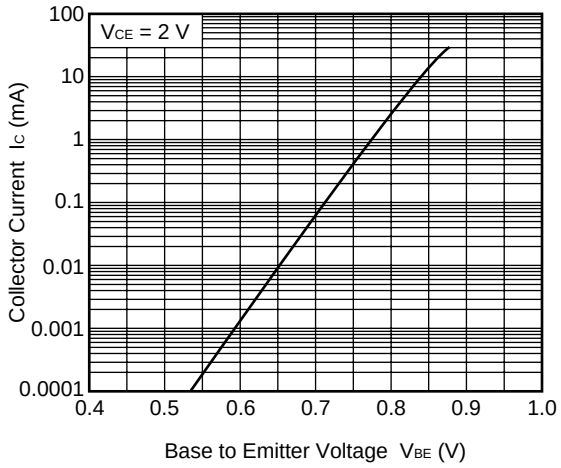
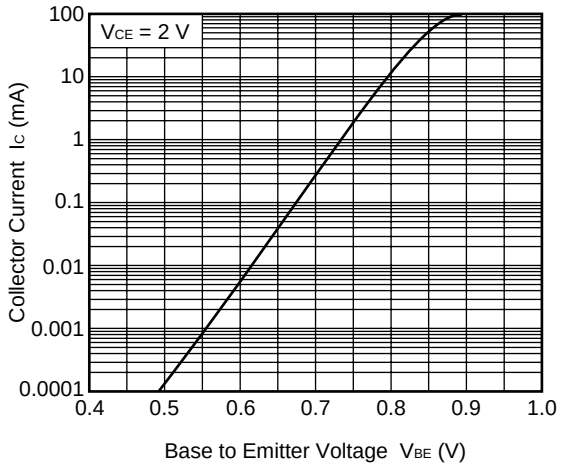
COLLECTOR CURRENT vs.
BASE TO EMITTER VOLTAGE



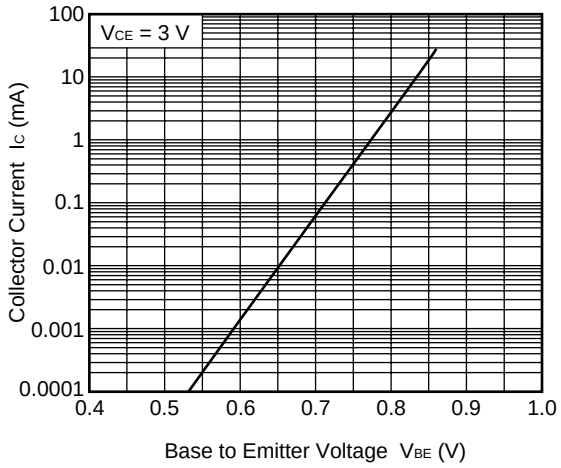
COLLECTOR CURRENT vs.
BASE TO EMITTER VOLTAGE



COLLECTOR CURRENT vs.
BASE TO EMITTER VOLTAGE

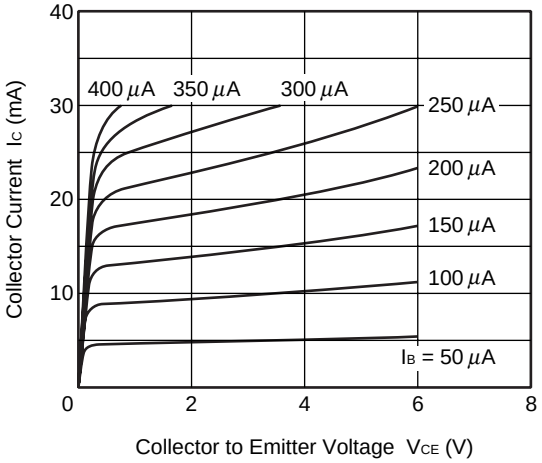


COLLECTOR CURRENT vs.
BASE TO EMITTER VOLTAGE



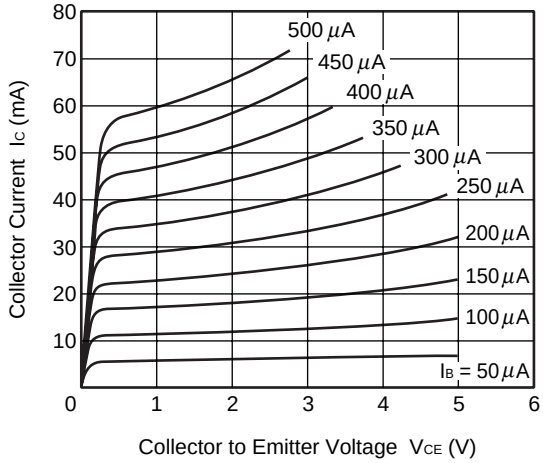
Q1

COLLECTOR CURRENT vs.
COLLECTOR TO EMITTER VOLTAGE



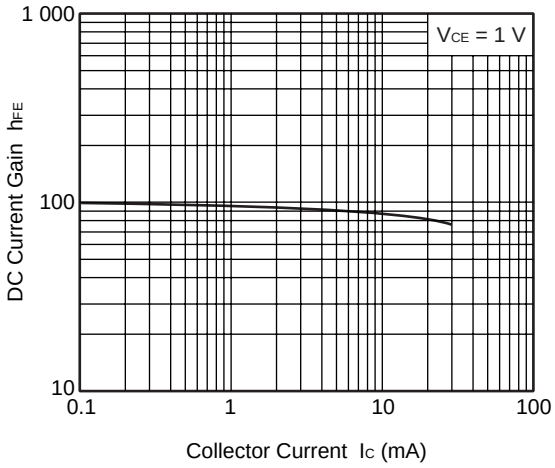
Q2

COLLECTOR CURRENT vs.
COLLECTOR TO EMITTER VOLTAGE



Q1

DC CURRENT GAIN vs.
COLLECTOR CURRENT



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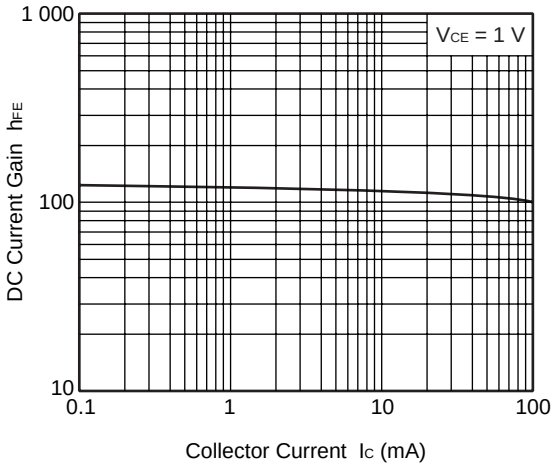
DC CURRENT GAIN vs.
COLLECTOR CURRENT



DC CURRENT GAIN vs.
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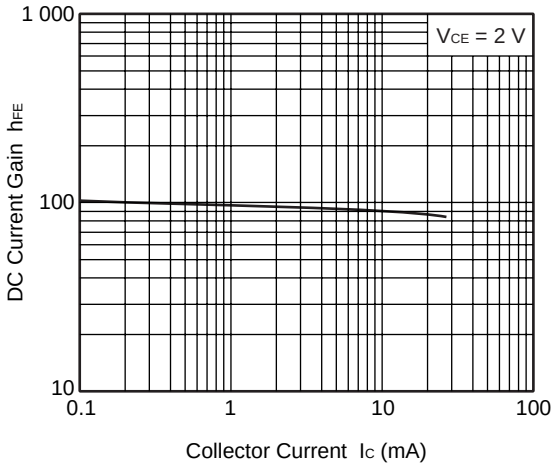

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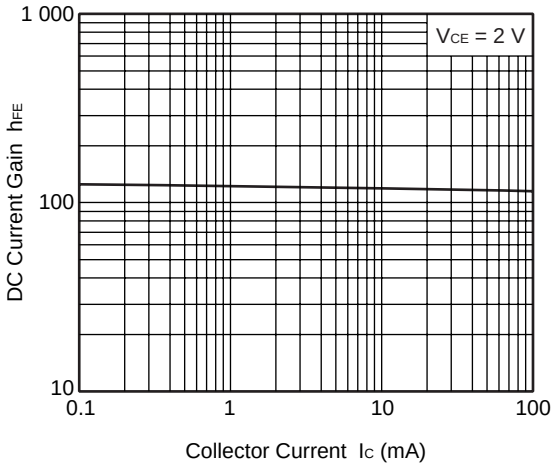

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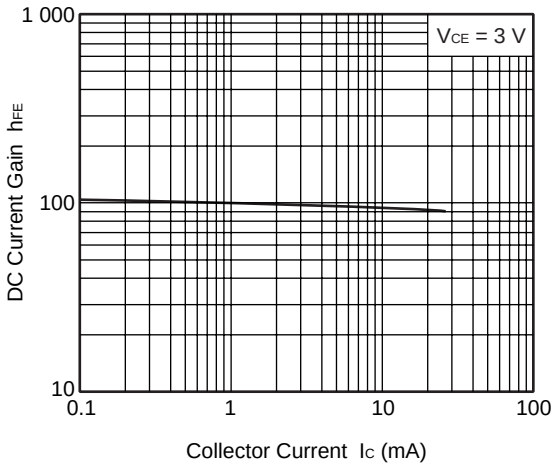
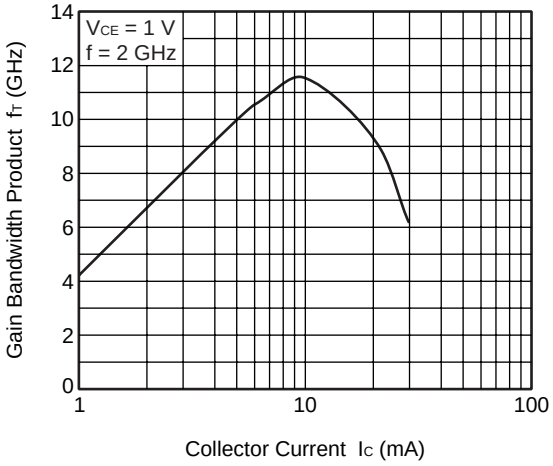


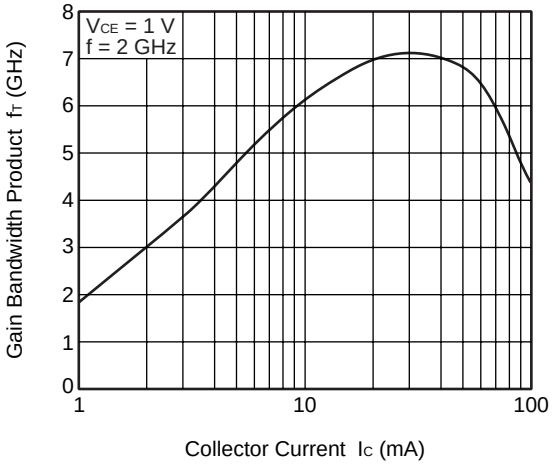
Q1

GAIN BANDWIDTH PRODUCT
vs. COLLECTOR CURRENT



Q2

GAIN BANDWIDTH PRODUCT
vs. COLLECTOR CURRENT



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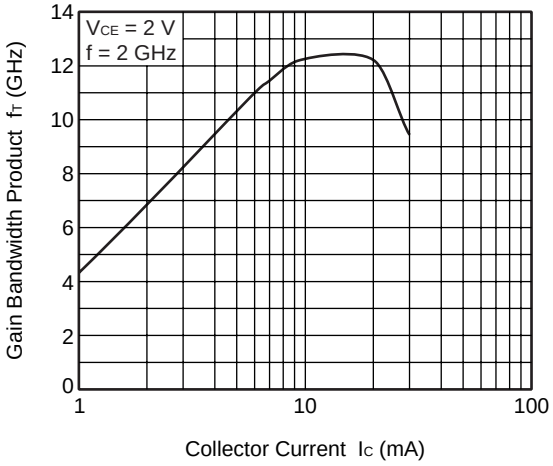

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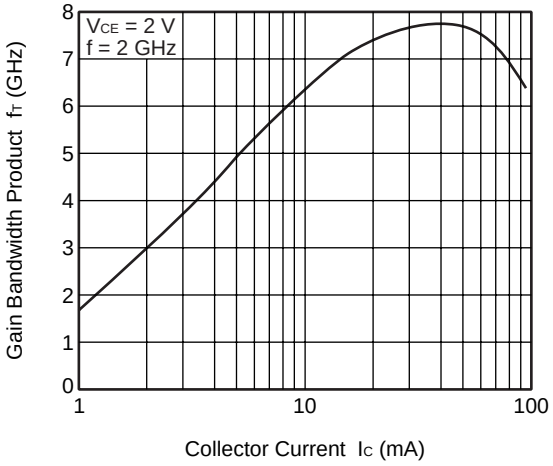

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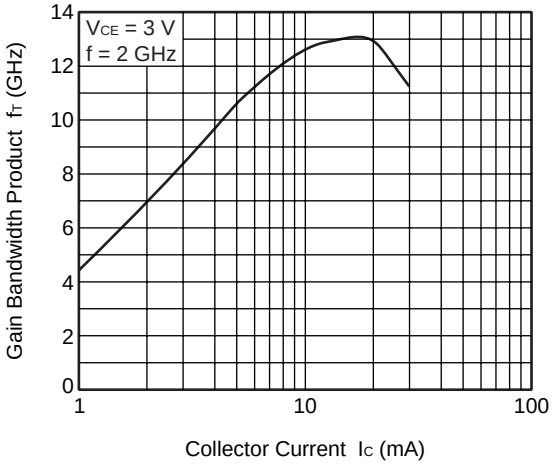
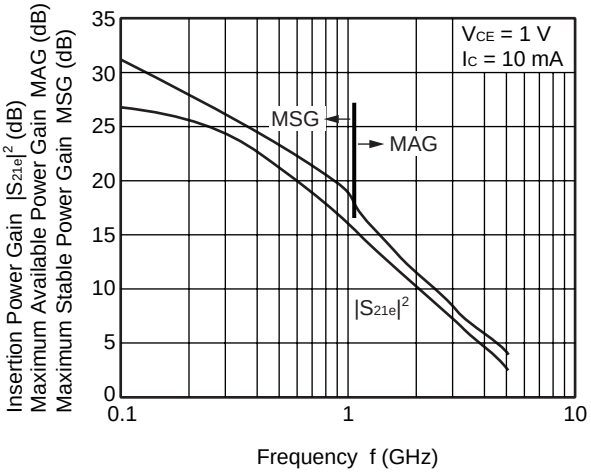


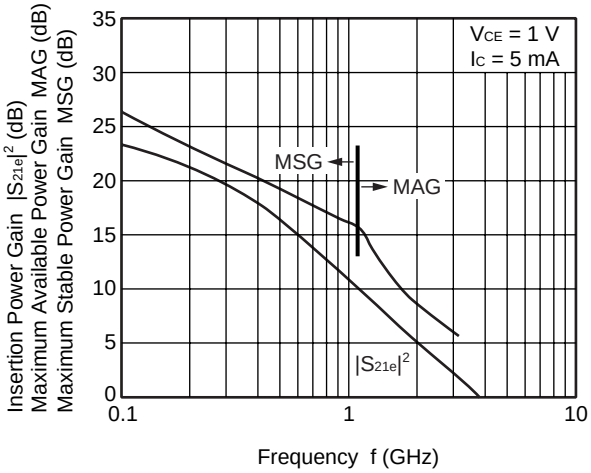
Q1

INSERTION POWER GAIN, MAG, MSG vs. FREQUENCY



Q2

INSERTION POWER GAIN, MAG, MSG vs. FREQUENCY



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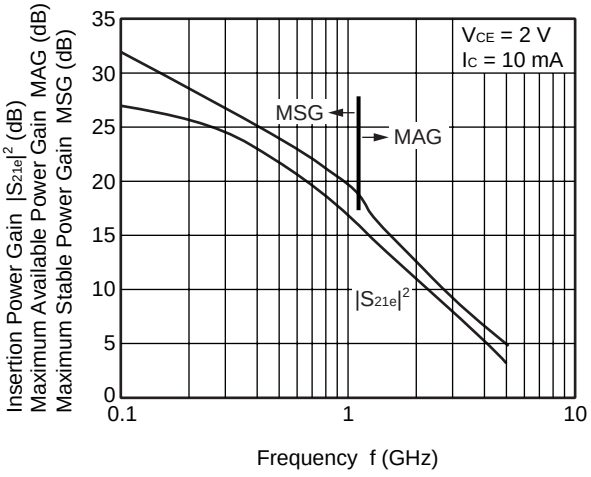

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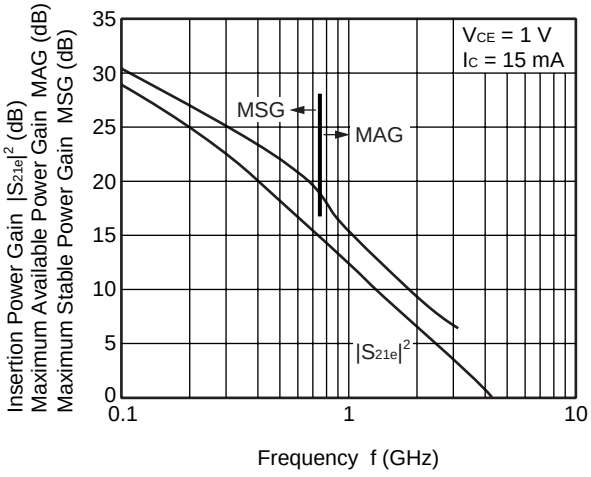

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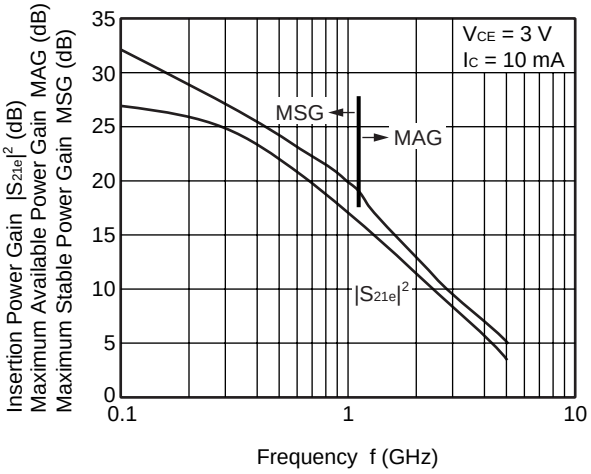

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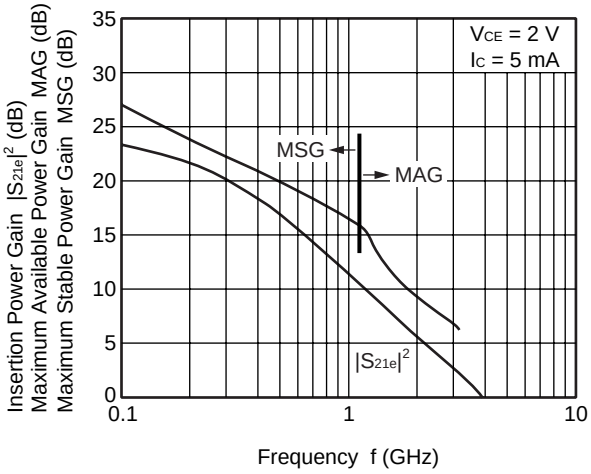
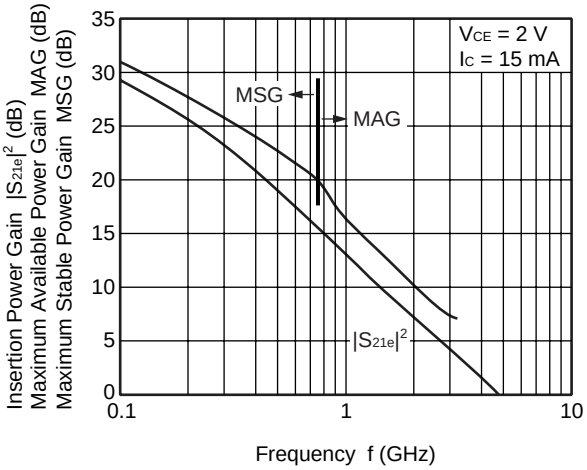


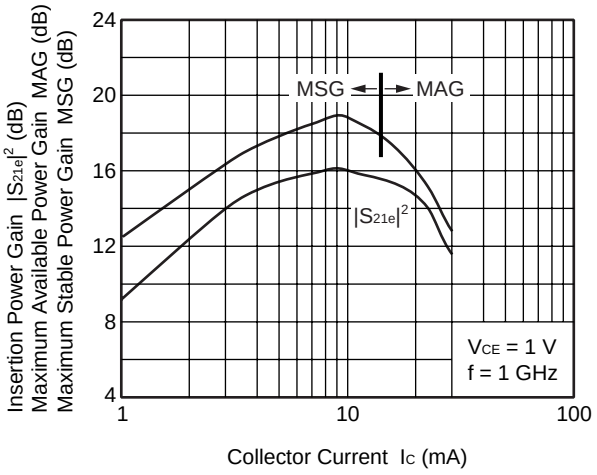
Q2

INSERTION POWER GAIN,
MAG, MSG vs. FREQUENCY



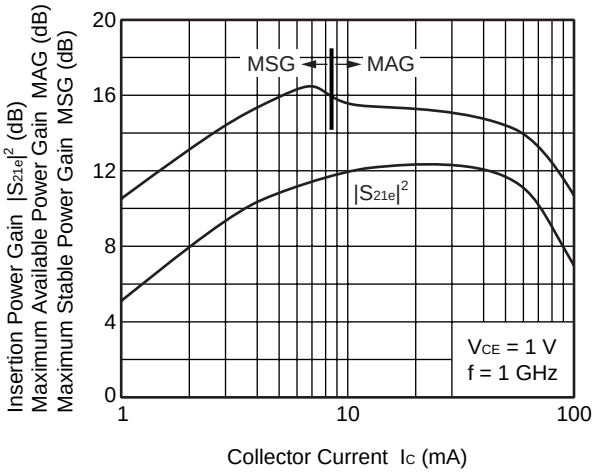
Q1

INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT



Q2

INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT



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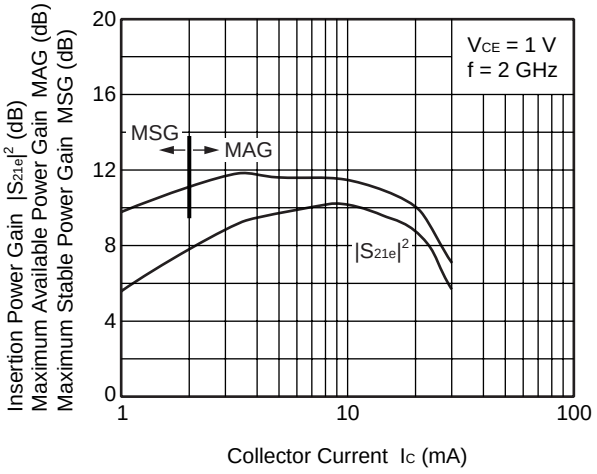

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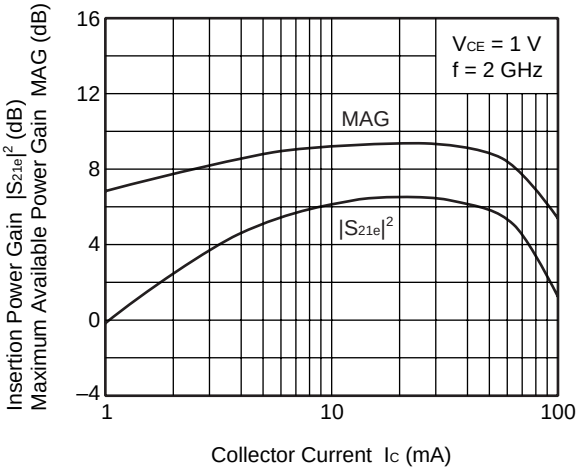

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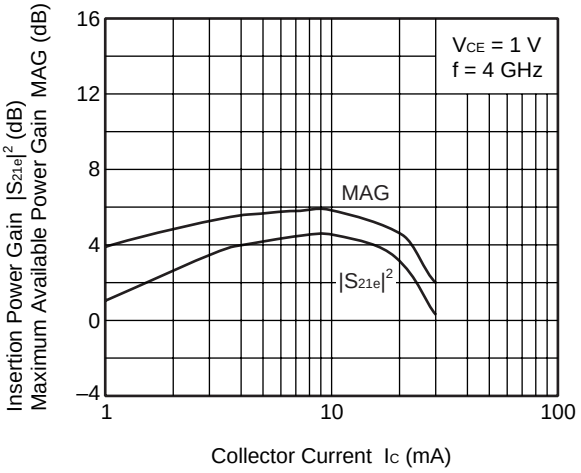

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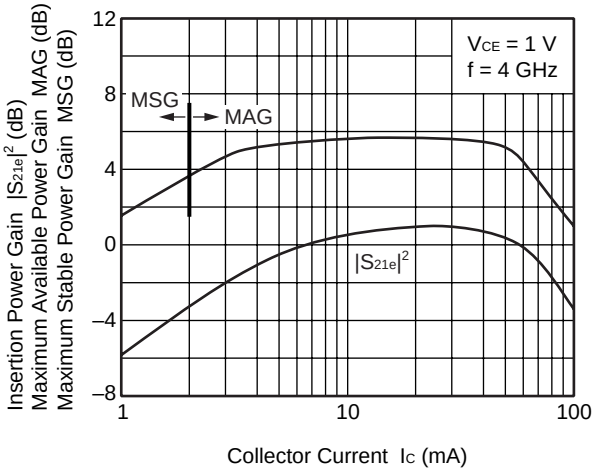

Q1

INSERTION POWER GAIN, MAG, MSG
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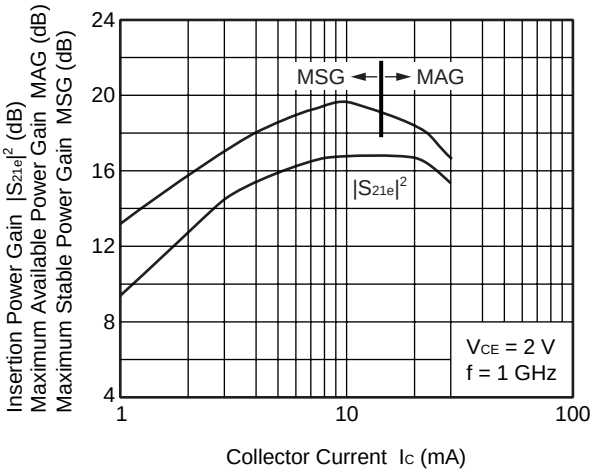
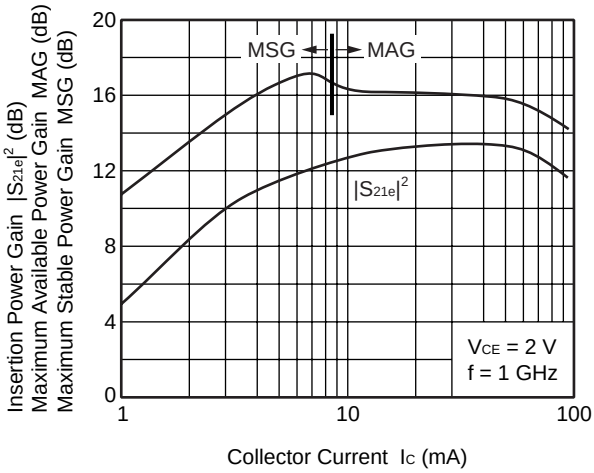


Q2

INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT



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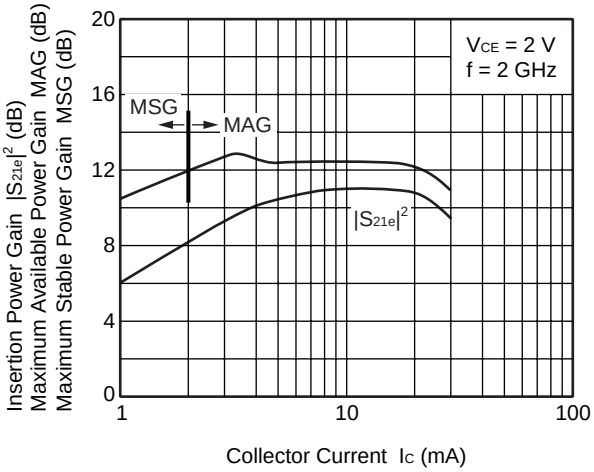

INSERTION POWER GAIN, MAG
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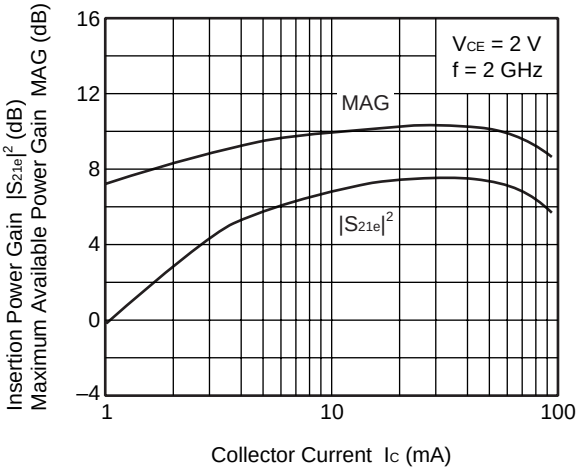
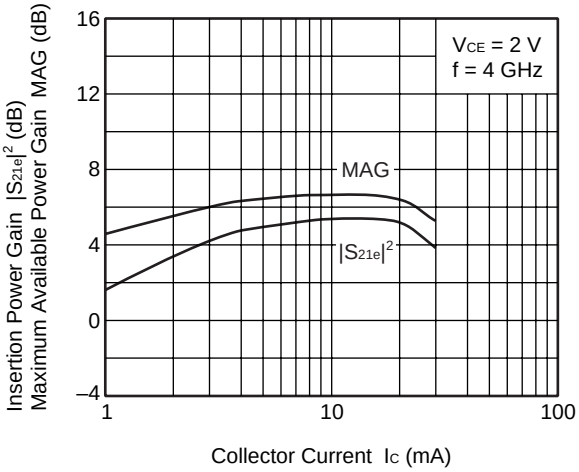
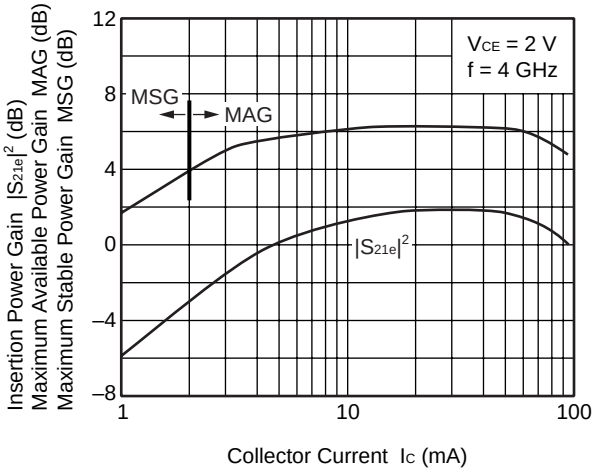


INSERTION POWER GAIN, MAG
vs. COLLECTOR CURRENT

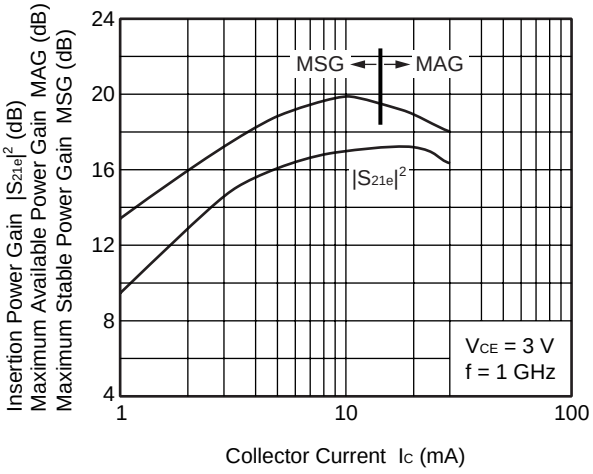


INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT



Q1

INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT



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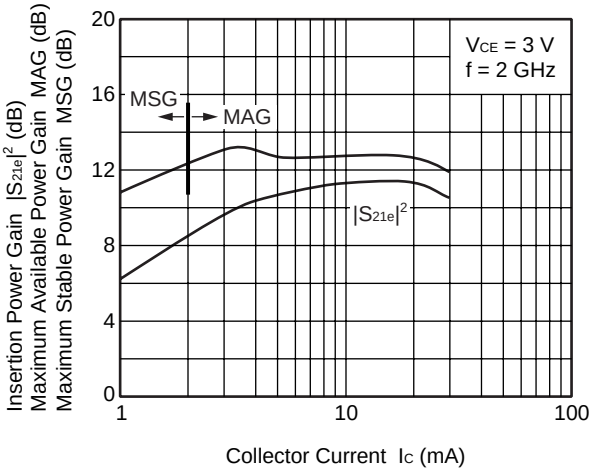
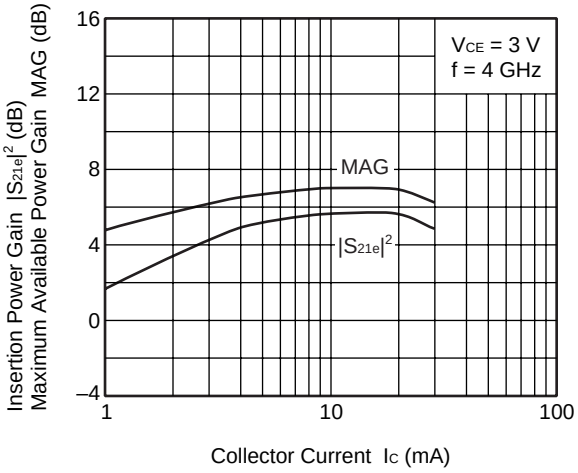
vs. COLLECTOR CURRENT

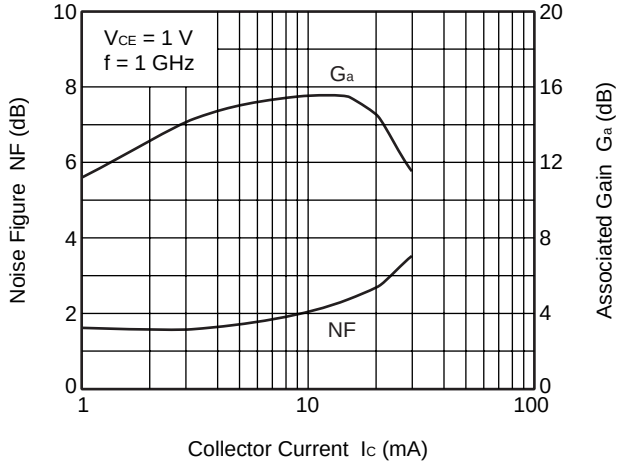


INSERTION POWER GAIN, MAG
vs. COLLECTOR CURRENT



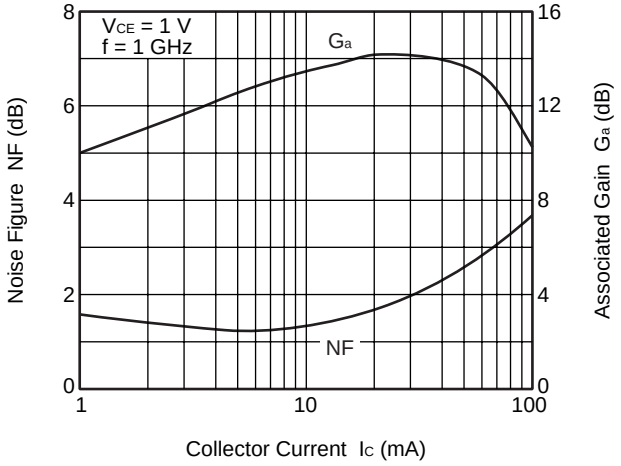
Q1

NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT

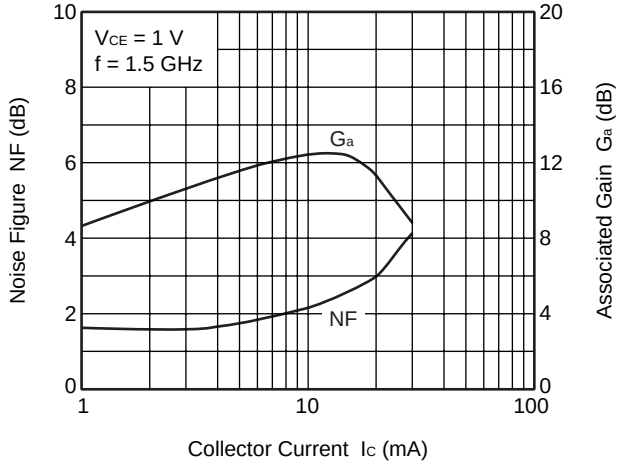


Q2

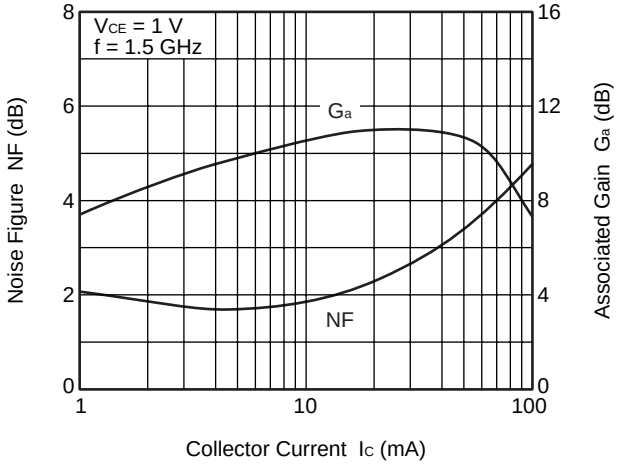
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



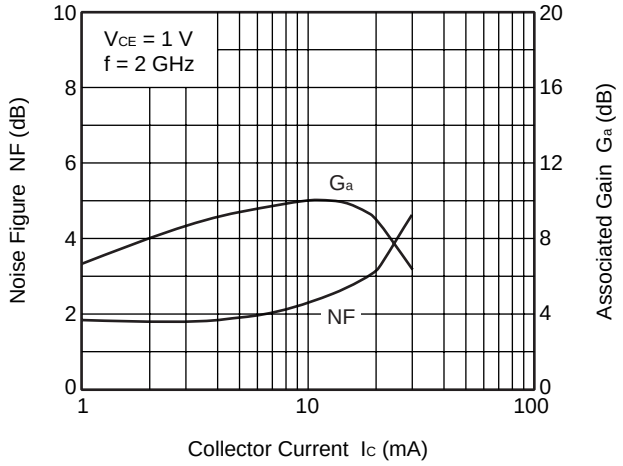
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



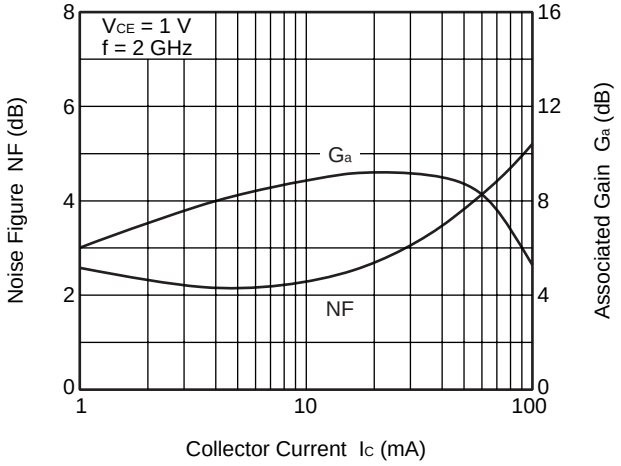
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT

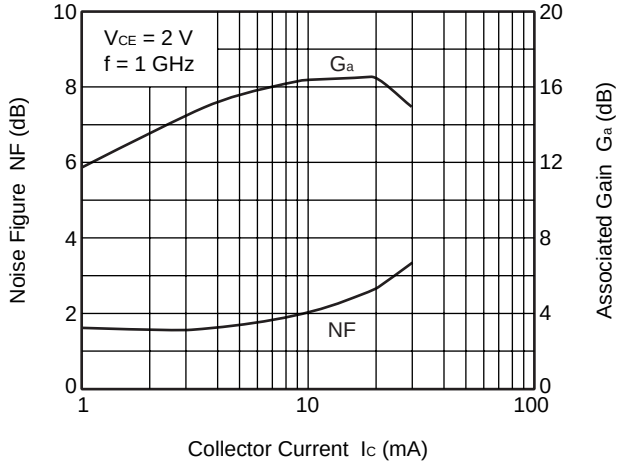


NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



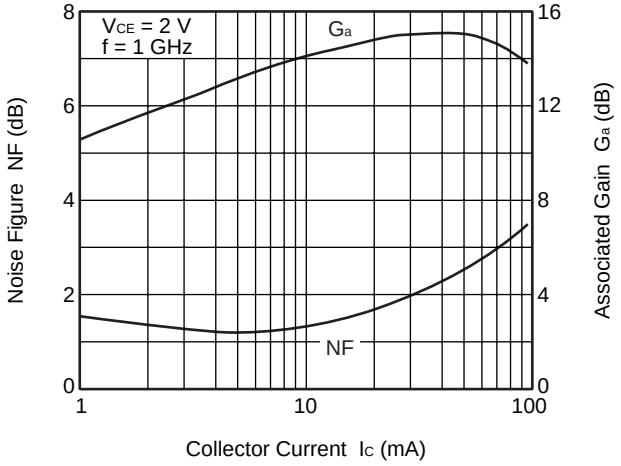
Q1

NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT

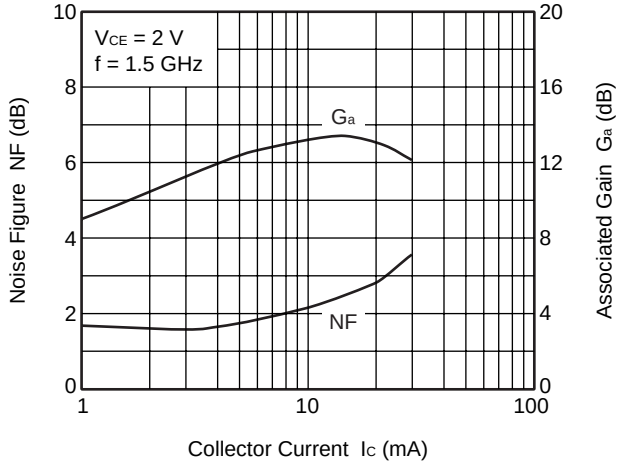


Q2

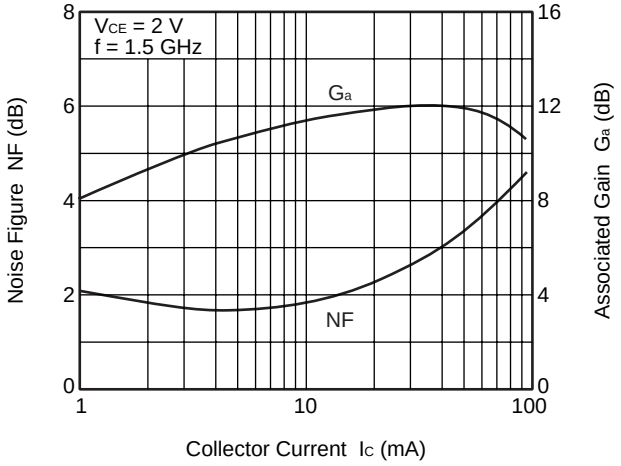
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



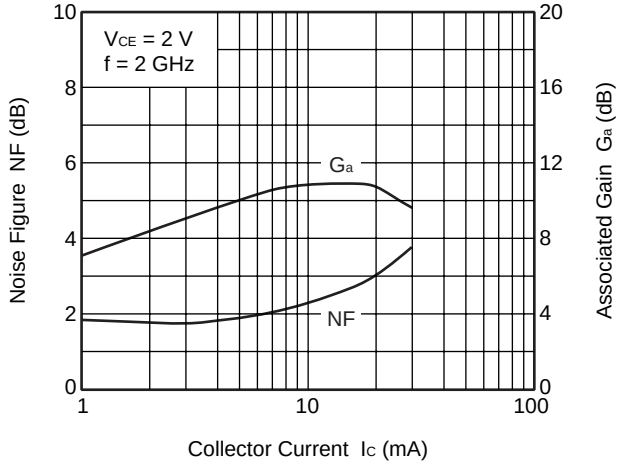
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



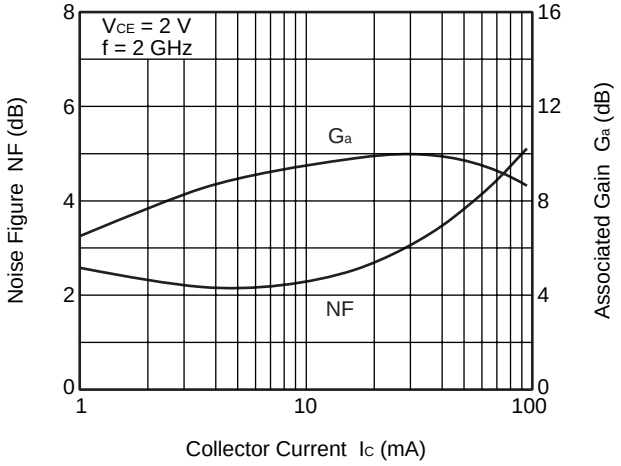
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT

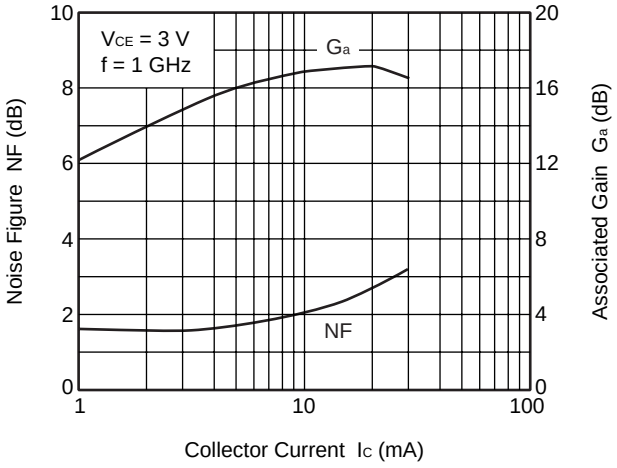


NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT

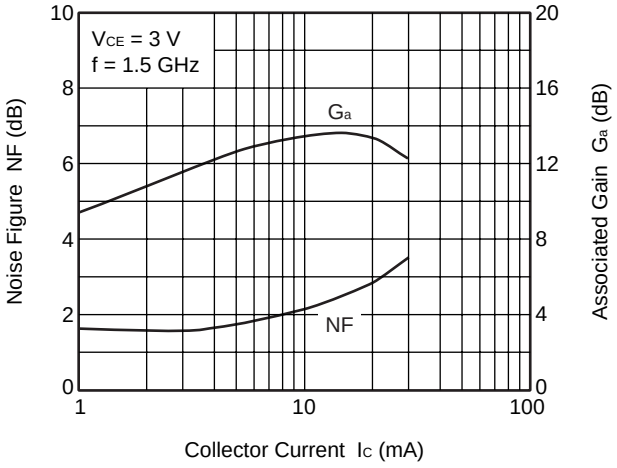


Q1

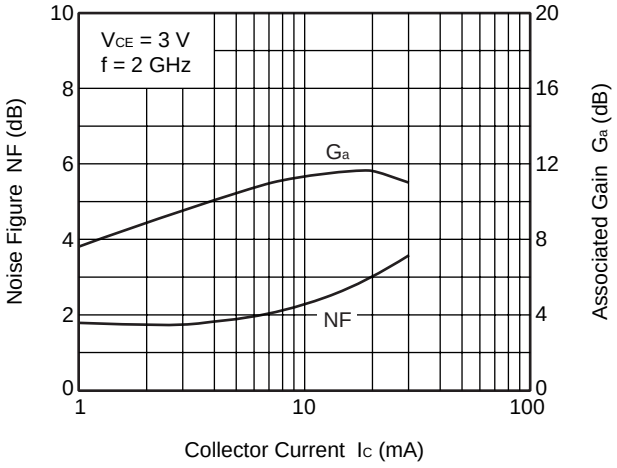
NOISE FIGURE, ASSOCIATED GAIN
vs. COLLECTOR CURRENT



NOISE FIGURE, ASSOCIATED GAIN
vs. COLLECTOR CURRENT



NOISE FIGURE, ASSOCIATED GAIN
vs. COLLECTOR CURRENT



Remark The graphs indicate nominal characteristics.

S-PARAMETERS Q1

V_{CE} = 1 V, I_C = 1 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	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_{CE} = 1 V, I_C = 3 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	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_{CE} = 1 V, I_C = 5 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	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_{CE} = 1 V, I_C = 7 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	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_{CE} = 1 V, I_C = 10 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	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_{CE} = 1 V, I_C = 20 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	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_{CE} = 2 V, I_C = 1 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	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_{CE} = 2 V, I_C = 3 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	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_{CE} = 2 V, I_C = 5 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	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_{CE} = 2 V, I_C = 7 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	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_{CE} = 2 V, I_C = 10 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	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_{CE} = 2 V, I_C = 20 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	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_{CE} = 3 V, I_C = 1 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	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_{CE} = 3 V, I_C = 3 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	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_{CE} = 3 V, I_C = 5 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	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_{CE} = 3 V, I_C = 7 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	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_{CE} = 3 V, I_C = 10 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	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_{CE} = 3 V, I_C = 20 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	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_{CE} = 1 V, I_C = 1 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.958	–18.6	3.742	165.9	0.039	77.6	0.986	–7.5
0.2	0.926	–38.0	3.515	153.0	0.073	67.5	0.952	–14.9
0.3	0.893	–55.7	3.311	141.8	0.102	57.2	0.903	–21.1
0.4	0.866	–71.9	3.080	130.4	0.124	48.6	0.849	–26.6
0.5	0.826	–86.5	2.803	120.8	0.139	41.0	0.797	–31.0
0.6	0.800	–99.0	2.559	112.4	0.150	34.6	0.750	–34.9
0.7	0.777	–110.6	2.326	104.6	0.157	29.2	0.710	–38.2
0.8	0.760	–120.5	2.139	97.7	0.159	24.5	0.678	–41.3
0.9	0.750	–129.0	1.962	91.8	0.160	20.5	0.651	–44.3
1.0	0.743	–136.3	1.807	86.2	0.159	17.2	0.627	–47.2
1.1	0.738	–142.7	1.677	81.2	0.157	14.4	0.609	–50.2
1.2	0.736	–148.4	1.556	76.9	0.153	12.1	0.595	–53.2
1.3	0.731	–153.0	1.457	72.4	0.149	10.4	0.583	–56.4
1.4	0.732	–157.3	1.363	68.3	0.144	9.0	0.574	–59.7
1.5	0.732	–161.3	1.284	64.6	0.139	8.1	0.568	–63.2
1.6	0.732	–164.9	1.213	60.7	0.133	7.8	0.563	–66.7
1.7	0.730	–168.0	1.147	57.3	0.127	8.0	0.560	–70.5
1.8	0.731	–171.2	1.086	54.1	0.121	8.7	0.559	–74.0
1.9	0.732	–174.0	1.032	51.2	0.115	10.3	0.558	–77.6
2.0	0.736	–176.7	0.988	48.3	0.109	12.4	0.558	–81.3
2.1	0.736	–179.6	0.944	45.6	0.104	15.2	0.559	–84.8
2.2	0.738	177.8	0.909	42.7	0.099	19.0	0.562	–88.6
2.3	0.737	175.1	0.869	40.2	0.096	23.2	0.566	–92.1
2.4	0.739	172.3	0.839	37.6	0.094	28.2	0.569	–95.6
2.5	0.744	169.6	0.807	35.7	0.094	33.6	0.571	–99.2
2.6	0.747	167.1	0.768	33.5	0.096	39.0	0.574	–102.7
2.7	0.747	164.3	0.737	31.4	0.100	44.4	0.578	–105.9
2.8	0.752	161.9	0.717	29.1	0.106	49.3	0.584	–109.6
2.9	0.755	159.7	0.699	27.2	0.114	54.2	0.585	–112.4
3.0	0.757	157.2	0.674	25.7	0.122	57.6	0.587	–116.1
4.0	0.785	139.3	0.513	18.1	0.253	59.2	0.589	–155.9
5.0	0.765	125.8	0.458	8.6	0.365	33.2	0.500	160.0

V_{CE} = 1 V, I_C = 3 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.886	–31.6	9.729	158.8	0.037	72.9	0.950	–15.0
0.2	0.820	–59.4	8.474	141.6	0.064	58.8	0.847	–27.2
0.3	0.762	–82.6	7.325	128.3	0.082	48.1	0.735	–35.9
0.4	0.724	–101.4	6.289	116.7	0.093	40.7	0.640	–41.9
0.5	0.691	–116.7	5.390	108.2	0.099	35.7	0.565	–46.0
0.6	0.673	–128.5	4.686	101.1	0.102	32.2	0.508	–49.1
0.7	0.663	–138.3	4.114	95.2	0.105	29.9	0.463	–51.4
0.8	0.655	–146.1	3.673	89.9	0.105	28.6	0.429	–53.8
0.9	0.651	–152.6	3.305	85.4	0.105	27.7	0.402	–56.1
1.0	0.652	–158.4	2.994	81.3	0.105	27.5	0.380	–58.5
1.1	0.655	–163.1	2.748	77.6	0.105	27.9	0.364	–61.1
1.2	0.655	–167.2	2.529	74.2	0.105	28.5	0.351	–63.8
1.3	0.654	–170.6	2.346	70.8	0.105	29.8	0.341	–66.8
1.4	0.656	–173.5	2.184	67.7	0.105	30.9	0.334	–70.0
1.5	0.659	–176.3	2.048	64.7	0.106	32.7	0.330	–73.4
1.6	0.660	–179.0	1.926	61.8	0.107	34.4	0.327	–76.9
1.7	0.661	178.7	1.815	59.0	0.108	36.5	0.326	–80.5
1.8	0.661	176.5	1.720	56.5	0.110	38.5	0.326	–84.0
1.9	0.662	174.5	1.633	54.1	0.112	40.6	0.329	–87.6
2.0	0.666	172.5	1.557	51.5	0.114	43.0	0.330	–91.0
2.1	0.666	170.1	1.490	49.2	0.118	45.0	0.334	–94.4
2.2	0.667	168.1	1.433	46.5	0.122	47.2	0.338	–98.0
2.3	0.667	165.9	1.376	44.2	0.126	49.0	0.344	–101.1
2.4	0.669	163.7	1.328	41.9	0.131	50.5	0.349	–104.6
2.5	0.673	161.6	1.276	40.0	0.136	52.0	0.353	–107.7
2.6	0.678	159.5	1.226	37.8	0.142	53.3	0.360	–111.0
2.7	0.680	157.4	1.174	35.5	0.149	54.5	0.365	–113.9
2.8	0.685	155.5	1.143	33.4	0.157	55.4	0.372	–117.1
2.9	0.686	153.9	1.114	31.2	0.164	56.8	0.375	–119.8
3.0	0.690	151.7	1.079	29.4	0.172	57.3	0.379	–123.0
4.0	0.736	137.7	0.808	15.3	0.272	53.0	0.411	–161.4
5.0	0.751	125.9	0.630	1.1	0.364	31.4	0.397	157.5

V_{CE} = 1 V, I_C = 5 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.816	–42.6	14.761	152.7	0.034	69.3	0.904	–21.3
0.2	0.734	–76.6	11.896	133.0	0.056	53.4	0.745	–36.6
0.3	0.677	–101.7	9.670	119.7	0.067	44.4	0.606	–45.6
0.4	0.652	–120.1	7.910	108.8	0.074	39.4	0.505	–51.2
0.5	0.632	–133.7	6.596	101.6	0.078	36.9	0.432	–54.7
0.6	0.622	–144.0	5.625	95.5	0.081	35.7	0.380	–57.4
0.7	0.620	–152.1	4.883	90.5	0.083	35.7	0.340	–59.5
0.8	0.620	–158.5	4.330	86.0	0.085	36.3	0.311	–61.7
0.9	0.620	–164.1	3.869	82.2	0.087	37.0	0.288	–64.1
1.0	0.624	–168.3	3.488	78.7	0.089	38.2	0.270	–66.7
1.1	0.627	–172.2	3.190	75.4	0.092	39.5	0.257	–69.5
1.2	0.630	–175.4	2.930	72.6	0.094	41.0	0.246	–72.5
1.3	0.631	–178.1	2.715	69.6	0.097	42.7	0.239	–76.0
1.4	0.635	179.3	2.525	66.9	0.100	44.2	0.234	–79.4
1.5	0.637	177.1	2.364	64.4	0.103	45.9	0.231	–83.2
1.6	0.640	174.8	2.221	61.7	0.107	47.3	0.230	–87.0
1.7	0.640	173.1	2.097	59.3	0.111	48.9	0.230	–90.9
1.8	0.642	171.1	1.986	57.0	0.116	50.1	0.232	–94.6
1.9	0.642	169.2	1.881	54.7	0.121	51.6	0.236	–98.1
2.0	0.646	167.8	1.798	52.3	0.126	52.7	0.240	–101.5
2.1	0.644	165.5	1.716	50.1	0.132	53.9	0.245	–104.8
2.2	0.647	163.5	1.653	47.8	0.137	54.7	0.250	–108.3
2.3	0.647	161.6	1.587	45.4	0.143	55.5	0.257	–111.4
2.4	0.648	159.6	1.527	43.3	0.149	56.0	0.263	–114.6
2.5	0.653	157.7	1.472	41.3	0.156	56.3	0.269	–117.5
2.6	0.653	156.1	1.413	39.5	0.163	56.6	0.276	–120.6
2.7	0.661	154.0	1.359	37.3	0.170	56.9	0.281	–123.3
2.8	0.663	152.4	1.323	35.2	0.178	57.0	0.289	–126.2
2.9	0.667	151.0	1.288	33.1	0.185	57.5	0.292	–128.7
3.0	0.668	149.0	1.247	31.3	0.192	57.3	0.297	–131.6
4.0	0.716	136.8	0.940	16.5	0.282	50.7	0.341	–169.3
5.0	0.743	125.9	0.721	0.8	0.364	30.4	0.352	152.8

V_{CE} = 1 V, I_C = 7 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.757	–51.9	18.689	147.7	0.033	66.1	0.861	–26.5
0.2	0.675	–90.0	14.141	127.0	0.050	50.9	0.663	–43.2
0.3	0.637	–115.0	11.007	114.2	0.058	43.6	0.518	–52.1
0.4	0.616	–131.9	8.780	104.3	0.063	40.9	0.420	–57.3
0.5	0.603	–144.0	7.230	97.8	0.067	40.1	0.354	–60.5
0.6	0.598	–153.1	6.114	92.4	0.070	40.2	0.307	–63.2
0.7	0.599	–159.8	5.272	87.9	0.074	41.4	0.273	–65.5
0.8	0.603	–165.5	4.643	84.0	0.077	42.7	0.247	–67.9
0.9	0.605	–170.1	4.155	80.5	0.080	44.0	0.227	–70.6
1.0	0.610	–173.8	3.742	77.2	0.083	45.7	0.212	–73.7
1.1	0.617	–177.1	3.419	74.4	0.087	47.2	0.201	–77.1
1.2	0.621	–179.7	3.140	71.8	0.091	48.7	0.192	–80.6
1.3	0.622	177.7	2.907	69.0	0.096	50.2	0.186	–84.5
1.4	0.622	175.7	2.697	66.6	0.100	51.4	0.183	–88.5
1.5	0.627	173.9	2.527	64.1	0.105	52.6	0.182	–92.7
1.6	0.630	171.5	2.373	61.6	0.110	53.7	0.183	–96.8
1.7	0.629	170.0	2.239	59.2	0.116	54.7	0.185	–100.8
1.8	0.634	168.0	2.119	57.2	0.121	55.5	0.188	–104.6
1.9	0.632	166.5	2.011	55.1	0.128	56.3	0.193	–108.2
2.0	0.639	165.1	1.914	52.9	0.134	56.9	0.198	–111.5
2.1	0.636	163.2	1.831	50.8	0.140	57.6	0.203	–114.6
2.2	0.638	161.5	1.761	48.5	0.146	58.0	0.210	–118.0
2.3	0.639	159.5	1.693	46.2	0.153	58.2	0.217	–120.7
2.4	0.639	157.8	1.629	44.1	0.159	58.2	0.224	–123.7
2.5	0.643	155.9	1.571	42.3	0.166	58.1	0.230	–126.3
2.6	0.646	154.2	1.508	40.4	0.173	58.2	0.237	–129.1
2.7	0.650	152.2	1.456	38.4	0.181	58.0	0.243	–131.4
2.8	0.654	150.6	1.413	36.1	0.189	57.8	0.251	–134.3
2.9	0.654	149.4	1.377	34.1	0.196	57.9	0.255	–136.5
3.0	0.657	147.4	1.331	32.4	0.203	57.5	0.259	–139.3
4.0	0.705	136.2	1.010	17.5	0.288	49.7	0.311	–175.7
5.0	0.736	126.0	0.770	1.5	0.364	29.7	0.331	148.7

V_{CE} = 1 V, I_C = 10 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.696	–65.1	23.163	141.8	0.029	62.2	0.801	–32.9
0.2	0.615	–105.2	16.266	120.6	0.043	49.1	0.571	–50.7
0.3	0.598	–128.5	12.161	108.9	0.049	44.7	0.429	–59.1
0.4	0.590	–143.7	9.506	100.1	0.054	44.0	0.340	–64.1
0.5	0.582	–153.8	7.734	94.4	0.058	45.1	0.282	–67.5
0.6	0.585	–161.5	6.512	89.6	0.062	46.4	0.242	–70.4
0.7	0.589	–166.9	5.592	85.7	0.067	48.2	0.213	–73.2
0.8	0.595	–171.8	4.925	82.0	0.071	49.9	0.192	–76.5
0.9	0.596	–175.5	4.393	79.0	0.076	51.4	0.175	–79.9
1.0	0.603	–178.7	3.951	76.1	0.081	52.9	0.163	–83.8
1.1	0.609	178.6	3.606	73.2	0.086	54.3	0.154	–88.2
1.2	0.613	176.3	3.310	70.9	0.091	55.4	0.148	–92.5
1.3	0.614	174.1	3.060	68.3	0.097	56.5	0.145	–97.2
1.4	0.618	172.3	2.845	66.0	0.102	57.4	0.144	–102.0
1.5	0.623	170.6	2.662	63.7	0.108	58.2	0.145	–106.5
1.6	0.625	168.8	2.495	61.5	0.114	58.8	0.148	–110.9
1.7	0.625	167.3	2.355	59.2	0.121	59.3	0.151	–114.9
1.8	0.629	165.6	2.228	57.3	0.127	59.6	0.156	–118.6
1.9	0.629	164.2	2.111	55.2	0.134	60.0	0.162	–121.8
2.0	0.633	162.7	2.013	53.1	0.141	60.1	0.168	–124.8
2.1	0.630	160.9	1.924	51.1	0.148	60.3	0.175	–127.4
2.2	0.635	159.4	1.849	48.7	0.155	60.4	0.182	–130.4
2.3	0.630	157.5	1.782	46.7	0.161	60.2	0.189	–132.7
2.4	0.634	155.8	1.714	44.6	0.168	59.9	0.197	–135.2
2.5	0.637	154.1	1.652	42.9	0.175	59.6	0.203	–137.4
2.6	0.641	152.4	1.589	41.0	0.183	59.1	0.211	–139.9
2.7	0.644	150.8	1.530	39.0	0.191	58.7	0.216	–142.0
2.8	0.648	149.2	1.491	36.9	0.199	58.1	0.224	–144.3
2.9	0.648	147.9	1.449	34.9	0.206	58.1	0.228	–146.5
3.0	0.651	146.1	1.403	33.3	0.213	57.4	0.233	–148.8
4.0	0.699	135.7	1.064	18.4	0.294	48.5	0.292	176.6
5.0	0.731	126.0	0.816	2.4	0.365	29.0	0.316	144.0

V_{CE} = 1 V, I_C = 15 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.602	–81.5	27.947	134.6	0.025	57.3	0.717	–40.7
0.2	0.576	–121.8	18.068	114.5	0.036	48.6	0.472	–58.9
0.3	0.569	–141.8	13.057	104.1	0.041	48.0	0.342	–67.2
0.4	0.572	–154.8	10.041	96.2	0.047	49.4	0.266	–72.4
0.5	0.576	–163.0	8.113	91.4	0.052	51.7	0.219	–76.3
0.6	0.576	–169.1	6.806	87.0	0.057	53.6	0.186	–80.2
0.7	0.583	–173.3	5.842	83.7	0.063	55.4	0.162	–84.2
0.8	0.591	–177.1	5.128	80.4	0.068	57.2	0.145	–89.0
0.9	0.594	179.7	4.564	77.5	0.074	58.3	0.133	–94.0
1.0	0.600	177.1	4.098	74.8	0.080	59.6	0.125	–99.5
1.1	0.607	174.8	3.740	72.3	0.086	60.5	0.120	–105.3
1.2	0.611	172.7	3.436	70.1	0.092	61.1	0.118	–111.0
1.3	0.612	171.1	3.172	67.6	0.099	61.8	0.118	–116.4
1.4	0.616	169.4	2.947	65.4	0.105	62.1	0.120	–121.3
1.5	0.621	167.8	2.759	63.3	0.112	62.7	0.124	–125.9
1.6	0.623	166.1	2.582	61.1	0.119	62.7	0.128	–129.9
1.7	0.623	164.7	2.439	59.1	0.126	62.8	0.134	–133.4
1.8	0.625	163.6	2.312	57.2	0.133	62.7	0.140	–136.3
1.9	0.626	162.0	2.190	55.3	0.141	62.6	0.147	–138.8
2.0	0.629	160.9	2.086	53.2	0.148	62.4	0.153	–141.0
2.1	0.628	159.2	1.994	51.3	0.155	62.3	0.160	–142.9
2.2	0.629	157.5	1.919	49.1	0.162	62.1	0.168	–145.1
2.3	0.629	155.9	1.844	47.0	0.169	61.8	0.175	–146.7
2.4	0.633	154.1	1.776	44.9	0.177	61.1	0.183	–148.6
2.5	0.634	152.5	1.714	43.3	0.184	60.6	0.189	–150.3
2.6	0.637	150.8	1.646	41.5	0.191	59.9	0.196	–152.2
2.7	0.640	149.1	1.588	39.4	0.200	59.4	0.202	–153.9
2.8	0.644	147.9	1.543	37.4	0.207	58.6	0.210	–155.7
2.9	0.645	146.9	1.503	35.6	0.215	58.2	0.214	–157.5
3.0	0.648	144.8	1.454	33.8	0.222	57.4	0.219	–159.5
4.0	0.695	135.1	1.104	19.0	0.300	47.7	0.282	168.7
5.0	0.731	125.6	0.847	2.8	0.366	28.4	0.310	139.0

V_{CE} = 1 V, I_C = 20 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.559	–95.3	30.733	129.9	0.024	56.8	0.654	–46.5
0.2	0.556	–132.9	18.918	110.7	0.031	49.6	0.409	–64.8
0.3	0.561	–150.1	13.456	101.0	0.037	51.1	0.290	–73.2
0.4	0.567	–161.0	10.257	94.0	0.043	53.8	0.224	–79.3
0.5	0.573	–168.0	8.266	89.5	0.049	56.9	0.183	–84.1
0.6	0.575	–173.1	6.907	85.6	0.055	58.3	0.156	–89.3
0.7	0.583	–177.0	5.925	82.4	0.061	60.1	0.136	–94.7
0.8	0.590	179.7	5.190	79.2	0.067	61.5	0.124	–100.9
0.9	0.594	176.9	4.627	76.5	0.074	62.3	0.115	–107.2
1.0	0.601	174.5	4.146	74.1	0.080	63.2	0.110	–113.9
1.1	0.606	172.5	3.779	71.7	0.087	63.7	0.108	–120.4
1.2	0.611	170.8	3.478	69.4	0.094	64.1	0.109	–126.3
1.3	0.615	169.1	3.213	67.1	0.101	64.6	0.111	–131.6
1.4	0.616	167.7	2.985	65.0	0.108	64.7	0.115	–136.1
1.5	0.621	166.4	2.792	62.9	0.115	64.8	0.120	–140.0
1.6	0.623	164.8	2.619	60.9	0.122	64.6	0.126	–143.5
1.7	0.625	163.5	2.469	58.8	0.129	64.6	0.132	–146.4
1.8	0.627	162.2	2.340	56.9	0.136	64.3	0.139	–148.6
1.9	0.628	161.0	2.214	55.1	0.144	63.9	0.146	–150.5
2.0	0.630	159.9	2.111	53.2	0.152	63.6	0.153	–151.9
2.1	0.629	158.0	2.017	51.2	0.159	63.3	0.160	–153.4
2.2	0.631	156.5	1.941	49.1	0.167	62.9	0.167	–154.9
2.3	0.631	154.9	1.867	46.9	0.174	62.4	0.174	–156.1
2.4	0.633	153.2	1.800	44.9	0.181	61.8	0.181	–157.5
2.5	0.637	151.6	1.735	43.2	0.189	61.0	0.187	–158.9
2.6	0.639	150.0	1.668	41.5	0.197	60.3	0.195	–160.3
2.7	0.641	148.3	1.607	39.6	0.205	59.6	0.201	–161.7
2.8	0.645	147.1	1.559	37.6	0.213	58.7	0.208	–163.3
2.9	0.645	145.7	1.523	35.7	0.219	58.3	0.211	–164.7
3.0	0.649	144.1	1.471	33.9	0.227	57.3	0.216	–166.6
4.0	0.696	134.6	1.122	19.2	0.303	47.2	0.283	163.7
5.0	0.732	125.4	0.857	3.1	0.367	27.9	0.309	135.6

V_{CE} = 2 V, I_C = 1 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.962	–17.3	3.376	166.8	0.034	79.0	0.990	–6.3
0.2	0.941	–35.0	3.205	155.3	0.064	69.5	0.964	–12.5
0.3	0.909	–51.3	3.047	144.6	0.090	59.8	0.926	–17.9
0.4	0.882	–66.7	2.879	133.7	0.112	51.2	0.883	–22.8
0.5	0.845	–80.9	2.649	124.3	0.127	43.8	0.839	–26.9
0.6	0.818	–93.3	2.437	115.9	0.137	37.2	0.798	–30.4
0.7	0.795	–104.8	2.238	108.2	0.144	31.8	0.761	–33.7
0.8	0.779	–115.0	2.072	101.3	0.148	26.9	0.731	–36.6
0.9	0.766	–123.8	1.911	95.1	0.149	22.6	0.705	–39.4
1.0	0.756	–131.4	1.766	89.4	0.148	19.1	0.684	–42.3
1.1	0.751	–138.2	1.644	84.3	0.146	16.0	0.665	–45.1
1.2	0.747	–144.1	1.529	79.8	0.143	13.4	0.651	–48.0
1.3	0.743	–149.1	1.433	75.2	0.139	11.5	0.639	–51.0
1.4	0.742	–153.8	1.339	71.1	0.135	10.0	0.629	–54.3
1.5	0.741	–158.0	1.263	67.2	0.129	9.0	0.622	–57.5
1.6	0.742	–161.9	1.199	63.3	0.123	8.4	0.616	–60.9
1.7	0.738	–165.3	1.132	59.9	0.117	8.5	0.611	–64.5
1.8	0.739	–168.4	1.074	56.7	0.111	9.3	0.610	–68.0
1.9	0.737	–171.3	1.022	53.6	0.105	10.7	0.608	–71.6
2.0	0.745	–174.3	0.981	50.8	0.099	13.1	0.605	–75.3
2.1	0.743	–177.2	0.934	47.9	0.093	16.4	0.605	–78.6
2.2	0.744	179.9	0.901	45.0	0.088	20.4	0.604	–82.6
2.3	0.743	177.0	0.863	42.5	0.084	25.4	0.607	–86.0
2.4	0.746	174.1	0.832	40.0	0.083	31.0	0.609	–89.7
2.5	0.748	171.4	0.797	37.9	0.083	37.2	0.610	–93.0
2.6	0.751	168.6	0.762	35.6	0.085	44.0	0.612	–96.0
2.7	0.753	166.0	0.731	33.5	0.090	50.2	0.614	–99.2
2.8	0.758	163.4	0.707	31.4	0.097	55.3	0.619	–102.9
2.9	0.758	161.3	0.691	29.5	0.105	60.6	0.620	–105.7
3.0	0.762	158.6	0.666	27.9	0.114	64.1	0.617	–109.4
4.0	0.784	139.8	0.509	20.2	0.251	63.6	0.603	–149.2
5.0	0.768	125.9	0.455	10.3	0.365	35.7	0.494	165.1

V_{CE} = 2 V, I_C = 3 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.893	–28.9	9.692	160.3	0.032	74.8	0.958	–12.8
0.2	0.825	–55.2	8.579	143.9	0.057	60.4	0.869	–23.7
0.3	0.774	–77.5	7.524	131.0	0.073	50.4	0.770	–31.4
0.4	0.733	–96.2	6.543	119.5	0.084	43.1	0.681	–36.9
0.5	0.696	–111.1	5.640	111.0	0.090	38.0	0.610	–40.5
0.6	0.672	–123.3	4.944	103.7	0.094	34.4	0.553	–43.2
0.7	0.660	–133.4	4.358	97.7	0.096	31.9	0.509	–45.4
0.8	0.652	–142.1	3.903	92.3	0.097	30.4	0.474	–47.4
0.9	0.646	–149.0	3.518	87.7	0.097	29.4	0.448	–49.3
1.0	0.644	–154.7	3.191	83.5	0.097	29.4	0.426	–51.5
1.1	0.647	–159.9	2.927	79.7	0.097	29.7	0.409	–53.7
1.2	0.646	–164.0	2.700	76.4	0.097	30.3	0.394	–56.1
1.3	0.644	–167.9	2.505	72.8	0.097	31.6	0.384	–58.7
1.4	0.649	–170.9	2.331	69.8	0.097	32.8	0.376	–61.5
1.5	0.650	–173.9	2.188	66.8	0.097	34.6	0.369	–64.6
1.6	0.653	–176.8	2.057	63.9	0.098	36.6	0.364	–67.8
1.7	0.651	–179.2	1.942	61.0	0.099	38.8	0.362	–71.2
1.8	0.654	178.5	1.841	58.5	0.101	40.9	0.361	–74.4
1.9	0.654	176.2	1.744	56.0	0.103	43.5	0.361	–77.7
2.0	0.656	174.4	1.664	53.6	0.106	45.8	0.361	–81.1
2.1	0.655	171.9	1.592	51.1	0.109	48.2	0.363	–84.4
2.2	0.659	169.8	1.533	48.5	0.113	50.4	0.365	–87.9
2.3	0.658	167.6	1.470	46.2	0.117	52.4	0.369	–91.1
2.4	0.661	165.3	1.414	43.8	0.122	54.1	0.372	–94.4
2.5	0.665	163.1	1.361	41.7	0.127	55.5	0.375	–97.6
2.6	0.664	160.9	1.306	39.8	0.133	57.0	0.380	–100.9
2.7	0.669	158.8	1.258	37.4	0.141	58.3	0.383	–103.8
2.8	0.674	157.0	1.220	35.2	0.149	59.4	0.389	–107.1
2.9	0.678	155.2	1.189	33.1	0.156	60.6	0.390	–109.7
3.0	0.680	153.1	1.149	31.2	0.163	61.3	0.393	–113.1
4.0	0.727	138.9	0.859	16.5	0.266	56.6	0.406	–152.1
5.0	0.745	126.7	0.659	1.2	0.360	33.9	0.381	164.3

V_{CE} = 2 V, I_C = 5 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.826	–38.4	14.897	154.6	0.029	71.0	0.919	–18.3
0.2	0.740	–70.7	12.288	135.7	0.050	55.7	0.778	–31.8
0.3	0.684	–95.3	10.137	122.4	0.061	46.7	0.648	–39.8
0.4	0.648	–114.2	8.401	111.5	0.068	41.6	0.549	–44.7
0.5	0.623	–128.3	7.045	104.0	0.072	38.8	0.478	–47.6
0.6	0.610	–138.9	6.036	97.7	0.074	37.7	0.425	–49.6
0.7	0.606	–147.8	5.250	92.7	0.077	37.6	0.385	–51.2
0.8	0.603	–154.9	4.646	88.0	0.079	38.1	0.355	–52.8
0.9	0.604	–160.4	4.169	84.3	0.081	38.5	0.332	–54.5
1.0	0.606	–165.1	3.764	80.6	0.082	39.9	0.313	–56.5
1.1	0.610	–169.3	3.450	77.4	0.085	41.2	0.298	–58.7
1.2	0.613	–172.7	3.171	74.4	0.087	42.7	0.286	–61.1
1.3	0.613	–175.8	2.937	71.4	0.090	44.4	0.277	–63.8
1.4	0.618	–178.1	2.729	68.7	0.093	46.1	0.270	–66.8
1.5	0.617	179.1	2.556	66.1	0.096	47.9	0.266	–70.0
1.6	0.623	177.0	2.402	63.5	0.099	49.5	0.262	–73.5
1.7	0.624	175.0	2.268	61.0	0.103	51.0	0.260	–77.0
1.8	0.623	173.0	2.146	58.7	0.108	52.4	0.261	–80.4
1.9	0.625	171.3	2.036	56.6	0.113	54.0	0.262	–83.9
2.0	0.631	169.6	1.942	54.2	0.117	55.3	0.263	–87.4
2.1	0.627	167.5	1.854	52.0	0.122	56.5	0.266	–90.6
2.2	0.632	165.5	1.785	49.6	0.128	57.4	0.269	–94.3
2.3	0.630	163.6	1.712	47.3	0.134	58.3	0.274	–97.5
2.4	0.634	161.4	1.649	45.0	0.140	58.8	0.278	–100.8
2.5	0.636	159.5	1.590	43.1	0.146	59.3	0.282	–103.9
2.6	0.637	157.5	1.523	41.1	0.153	59.7	0.287	–107.1
2.7	0.644	155.6	1.465	38.9	0.161	59.9	0.292	–110.0
2.8	0.647	154.0	1.423	36.7	0.168	60.1	0.298	–113.1
2.9	0.649	152.5	1.388	34.7	0.176	60.7	0.299	–115.7
3.0	0.653	150.4	1.344	32.8	0.183	60.6	0.303	–119.0
4.0	0.703	138.2	1.010	17.4	0.274	53.9	0.327	–158.5
5.0	0.736	127.3	0.767	1.2	0.359	32.7	0.330	160.0

V_{CE} = 2 V, I_C = 7 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.773	–45.9	18.641	150.4	0.028	69.5	0.887	–22.4
0.2	0.684	–82.3	14.568	130.3	0.045	53.9	0.710	–37.1
0.3	0.633	–106.8	11.562	117.3	0.053	45.6	0.571	–44.8
0.4	0.606	–124.9	9.349	107.0	0.059	42.7	0.472	–49.1
0.5	0.592	–137.8	7.732	100.2	0.063	41.7	0.406	–51.5
0.6	0.583	–147.7	6.571	94.7	0.066	41.6	0.357	–53.1
0.7	0.582	–155.2	5.677	90.1	0.069	42.4	0.322	–54.5
0.8	0.584	–161.4	5.019	86.0	0.072	43.7	0.295	–56.0
0.9	0.587	–166.5	4.485	82.3	0.075	44.9	0.274	–57.7
1.0	0.590	–170.5	4.039	79.1	0.078	46.5	0.257	–59.7
1.1	0.595	–174.0	3.690	76.1	0.081	48.2	0.244	–62.1
1.2	0.599	–176.9	3.397	73.5	0.085	49.5	0.233	–64.6
1.3	0.599	–179.5	3.151	70.7	0.089	51.1	0.225	–67.6
1.4	0.604	178.2	2.923	68.3	0.093	52.6	0.219	–70.9
1.5	0.607	176.2	2.733	65.8	0.098	54.0	0.215	–74.3
1.6	0.610	174.1	2.570	63.3	0.102	55.2	0.213	–78.1
1.7	0.611	171.9	2.423	60.9	0.107	56.3	0.212	–81.8
1.8	0.612	170.3	2.296	58.7	0.113	57.3	0.213	–85.5
1.9	0.613	168.8	2.177	56.6	0.118	58.1	0.214	–89.2
2.0	0.618	167.3	2.075	54.4	0.124	58.9	0.217	–92.6
2.1	0.616	164.9	1.983	52.3	0.130	59.6	0.220	–96.2
2.2	0.618	163.3	1.906	49.9	0.136	60.1	0.225	–99.8
2.3	0.619	161.3	1.830	47.8	0.142	60.5	0.230	–102.9
2.4	0.621	159.5	1.764	45.6	0.149	60.6	0.235	–106.1
2.5	0.626	157.7	1.697	43.7	0.156	60.7	0.239	–109.2
2.6	0.625	155.8	1.628	41.8	0.163	60.7	0.245	–112.5
2.7	0.630	154.1	1.566	39.8	0.170	60.6	0.249	–115.2
2.8	0.636	152.4	1.527	37.6	0.178	60.4	0.256	–118.3
2.9	0.639	150.9	1.484	35.6	0.185	60.6	0.258	–120.8
3.0	0.640	149.1	1.437	33.8	0.192	60.3	0.262	–123.9
4.0	0.693	137.7	1.084	18.3	0.279	52.7	0.293	–163.7
5.0	0.730	127.3	0.819	1.6	0.358	32.1	0.308	156.6

V_{CE} = 2 V, I_C = 10 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.692	–59.2	23.828	144.5	0.025	63.4	0.830	–28.3
0.2	0.614	–97.0	17.217	123.6	0.038	51.3	0.617	–43.7
0.3	0.578	–121.7	13.057	111.4	0.045	46.4	0.475	–50.7
0.4	0.568	–137.9	10.306	102.3	0.050	45.8	0.385	–54.2
0.5	0.561	–148.5	8.410	96.3	0.054	46.7	0.326	–56.0
0.6	0.560	–157.0	7.104	91.5	0.058	47.6	0.284	–57.5
0.7	0.566	–163.4	6.121	87.4	0.062	49.5	0.254	–58.7
0.8	0.569	–168.4	5.386	83.7	0.066	51.2	0.231	–60.3
0.9	0.570	–172.7	4.806	80.5	0.070	52.6	0.213	–62.2
1.0	0.576	–176.0	4.324	77.6	0.075	54.3	0.198	–64.7
1.1	0.583	–178.9	3.944	74.9	0.080	55.7	0.187	–67.4
1.2	0.586	178.6	3.631	72.5	0.085	56.8	0.178	–70.5
1.3	0.588	176.4	3.357	69.9	0.090	58.0	0.171	–74.1
1.4	0.593	174.5	3.118	67.6	0.095	58.9	0.167	–77.8
1.5	0.597	172.4	2.919	65.3	0.101	59.8	0.165	–81.9
1.6	0.600	170.7	2.737	63.1	0.107	60.5	0.163	–86.0
1.7	0.599	169.1	2.580	60.8	0.112	61.0	0.164	–90.2
1.8	0.601	167.6	2.443	58.8	0.119	61.5	0.165	–94.2
1.9	0.601	166.1	2.315	56.8	0.126	61.8	0.169	–98.0
2.0	0.608	164.6	2.210	54.7	0.132	62.1	0.172	–101.6
2.1	0.604	162.7	2.108	52.7	0.138	62.4	0.177	–104.8
2.2	0.607	161.1	2.028	50.4	0.145	62.5	0.182	–108.6
2.3	0.608	159.3	1.947	48.3	0.151	62.4	0.188	–111.6
2.4	0.611	157.4	1.876	46.2	0.158	62.1	0.193	–114.9
2.5	0.612	155.9	1.807	44.5	0.165	61.9	0.198	–117.7
2.6	0.615	154.0	1.732	42.6	0.172	61.5	0.205	–120.7
2.7	0.619	152.4	1.667	40.5	0.180	61.3	0.209	–123.3
2.8	0.624	150.7	1.621	38.5	0.188	60.8	0.216	–126.2
2.9	0.625	149.5	1.581	36.4	0.195	60.8	0.218	–128.7
3.0	0.630	147.8	1.527	34.7	0.202	60.1	0.223	–131.4
4.0	0.680	137.1	1.153	19.5	0.284	51.5	0.262	–170.9
5.0	0.724	127.6	0.875	2.9	0.358	31.6	0.286	152.3

V_{CE} = 2 V, I_C = 15 mA, Z_O = 50 Ω

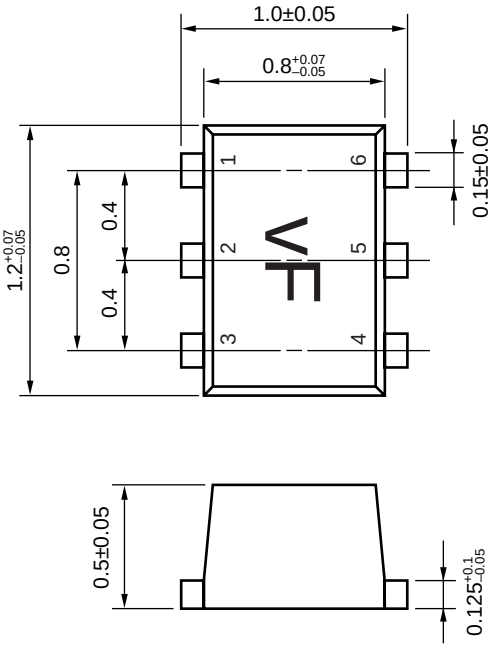
Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.611	–73.3	29.151	137.7	0.023	63.5	0.755	–34.8
0.2	0.552	–113.9	19.480	117.1	0.032	51.5	0.519	–50.2
0.3	0.543	–135.1	14.247	106.3	0.038	49.6	0.385	–56.2
0.4	0.542	–149.1	11.025	98.3	0.043	50.9	0.307	–59.2
0.5	0.545	–158.4	8.948	93.1	0.048	53.2	0.256	–60.7
0.6	0.543	–164.9	7.513	88.8	0.053	54.7	0.222	–62.1
0.7	0.553	–170.0	6.447	85.2	0.058	56.7	0.196	–63.7
0.8	0.556	–174.4	5.668	81.8	0.063	58.3	0.177	–65.8
0.9	0.562	–177.7	5.042	79.0	0.069	59.6	0.161	–68.1
1.0	0.568	179.6	4.533	76.3	0.075	60.7	0.149	–71.3
1.1	0.575	177.1	4.138	73.8	0.080	61.8	0.140	–75.0
1.2	0.578	174.8	3.797	71.5	0.086	62.5	0.133	–79.1
1.3	0.581	172.8	3.509	69.0	0.092	63.2	0.128	–83.6
1.4	0.584	171.4	3.258	66.9	0.098	63.5	0.126	–88.4
1.5	0.589	169.9	3.051	64.7	0.105	64.0	0.125	–93.2
1.6	0.594	168.0	2.864	62.6	0.111	64.2	0.125	–98.1
1.7	0.594	166.6	2.699	60.5	0.118	64.3	0.128	–102.7
1.8	0.596	165.2	2.559	58.6	0.124	64.4	0.131	–106.8
1.9	0.598	163.8	2.421	56.7	0.131	64.4	0.136	–110.6
2.0	0.599	162.5	2.308	54.8	0.138	64.3	0.140	–114.1
2.1	0.599	160.8	2.204	52.8	0.145	64.2	0.145	–117.2
2.2	0.602	159.0	2.121	50.6	0.153	64.0	0.151	–120.7
2.3	0.601	157.6	2.036	48.5	0.159	63.7	0.158	–123.4
2.4	0.604	155.9	1.961	46.5	0.166	63.1	0.164	–126.3
2.5	0.608	154.4	1.892	44.8	0.173	62.6	0.170	–128.9
2.6	0.611	152.6	1.814	42.9	0.181	62.0	0.176	–131.6
2.7	0.612	150.8	1.748	40.9	0.188	61.6	0.182	–133.8
2.8	0.618	149.3	1.698	38.9	0.196	60.9	0.189	–136.5
2.9	0.619	148.5	1.653	37.1	0.203	60.6	0.192	–138.6
3.0	0.622	146.5	1.602	35.2	0.210	59.9	0.196	–141.3
4.0	0.674	136.7	1.208	20.1	0.289	50.5	0.245	–179.6
5.0	0.722	127.5	0.917	3.2	0.358	30.6	0.277	146.1

V_{CE} = 2 V, I_C = 20 mA, Z_O = 50 Ω

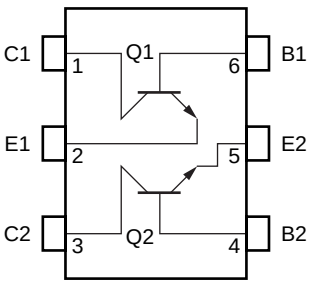
Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.558	–85.5	32.559	133.1	0.021	60.1	0.696	–39.5
0.2	0.529	–125.0	20.682	113.2	0.029	51.9	0.454	–54.4
0.3	0.525	–144.2	14.836	103.3	0.035	52.5	0.332	–59.8
0.4	0.531	–155.7	11.364	95.9	0.040	55.4	0.261	–62.5
0.5	0.537	–163.8	9.183	91.3	0.045	57.3	0.217	–64.1
0.6	0.539	–169.7	7.683	87.3	0.051	59.3	0.186	–65.7
0.7	0.548	–173.9	6.607	84.0	0.057	60.9	0.163	–67.6
0.8	0.553	–177.5	5.796	80.9	0.063	62.6	0.146	–70.5
0.9	0.558	179.5	5.156	78.1	0.069	63.5	0.133	–73.6
1.0	0.565	177.1	4.629	75.7	0.075	64.3	0.123	–77.6
1.1	0.573	174.8	4.222	73.1	0.081	64.8	0.115	–82.2
1.2	0.577	172.9	3.881	71.0	0.087	65.4	0.109	–87.0
1.3	0.580	171.2	3.586	68.6	0.094	65.7	0.106	–92.4
1.4	0.584	169.6	3.331	66.5	0.100	66.0	0.105	–98.0
1.5	0.587	168.0	3.116	64.4	0.107	66.1	0.105	–103.2
1.6	0.592	166.5	2.922	62.4	0.114	66.2	0.108	–108.5
1.7	0.592	165.3	2.755	60.3	0.121	66.1	0.111	–113.2
1.8	0.594	164.0	2.609	58.5	0.128	65.9	0.115	–117.2
1.9	0.595	162.4	2.470	56.6	0.135	65.6	0.120	–121.0
2.0	0.599	161.4	2.356	54.6	0.142	65.3	0.126	–124.0
2.1	0.596	159.6	2.251	52.6	0.149	65.1	0.132	–127.0
2.2	0.602	158.2	2.163	50.5	0.157	64.8	0.139	–129.9
2.3	0.599	156.6	2.077	48.5	0.163	64.3	0.146	–132.3
2.4	0.601	154.9	2.001	46.5	0.170	63.7	0.153	–134.6
2.5	0.605	153.3	1.927	44.9	0.178	63.0	0.158	–136.9
2.6	0.609	151.8	1.852	43.1	0.185	62.3	0.165	–139.4
2.7	0.613	150.0	1.787	41.0	0.193	61.7	0.170	–141.4
2.8	0.616	148.7	1.734	39.0	0.201	60.8	0.177	–143.8
2.9	0.617	147.5	1.690	37.0	0.208	60.6	0.180	–145.9
3.0	0.619	145.8	1.632	35.4	0.214	59.6	0.185	–148.3
4.0	0.672	136.4	1.234	20.3	0.292	49.8	0.240	174.8
5.0	0.723	127.3	0.936	3.3	0.358	30.1	0.273	142.7

PACKAGE DIMENSIONS

6-PIN LEAD-LESS 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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