NEC

NPN SILICON RF TWIN TRANSISTOR

μPA854TC

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

FEATURES

- Low voltage operation
- 2 different built-in transistors (2SC5435, 2SC5745)

  Q1: High gain transistor suited for buffer applications

  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 = 5.5 GHz TYP., $|S_{21e}|^2$ = 4.5 dB TYP. @ V_{CE} = 1 V, I_C = 10 mA, f = 2 GHz
- Flat-lead 6-pin thin-type ultra super minimold package

BUILT-IN TRANSISTORS

	Q1	Q2
3-pin thin-type ultra super minimold part No.	2SC5435	2SC5745

ORDERING INFORMATION

Part Number	Quantity	Supplying Form
μPA854TC	50 pcs (Non reel)	• 8 mm wide embossed taping • Pin 6 (Q1 Base), Pin 5 (Q2 Emitter), Pin 4 (Q2 Base) face the perforation side of the tape
μPA854TC-T1	3 kpcs/reel	

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.

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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	5.5	V
Emitter to Base Voltage	V_{EBO}	2	1.5	V
Collector Current	I_C	30	100	mA
Total Power Dissipation	P_{tot} Note	180	200	mW
		230 in 2 elements		
Junction Temperature	T_j	150		°C
Storage Temperature	T_{stg}	−65 to +150		°C

Note Mounted on 1.08 $cm^2 \times 1.0$ 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_{BE} = 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	$\lvert S_{21e} \rvert^2$	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_{BE} = 1 V, I_C = 0 mA	–	–	100	nA
DC Current Gain	h_{FE} Note 1	V_{CE} = 1 V, I_C = 10 mA	100	–	145	–
Gain Bandwidth Product	f_T	V_{CE} = 1 V, I_C = 10 mA, f = 2 GHz	4.0	5.5	–	GHz
Insertion Power Gain	$\lvert S_{21e} \rvert^2$	V_{CE} = 1 V, I_C = 10 mA, f = 2 GHz	3.0	4.5	–	dB
Noise Figure	NF	V_{CE} = 1 V, I_C = 10 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	0.7	0.8	0.9	pF

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

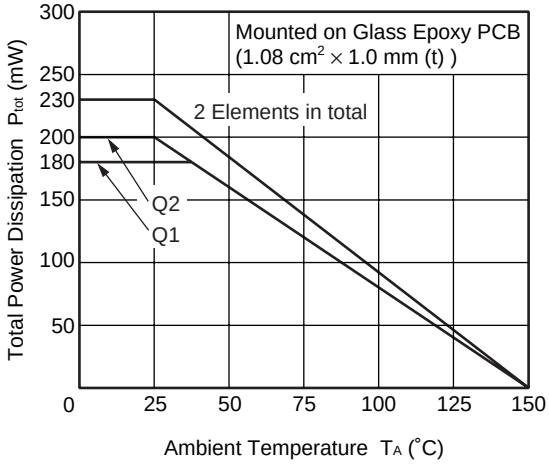
2. Collector to base capacitance when the emitter grounded

h_{FE} CLASSIFICATION

Rank	FB
Marking	2R
h_{FE} Value of Q1	75 to 150
h_{FE} Value of Q2	100 to 145

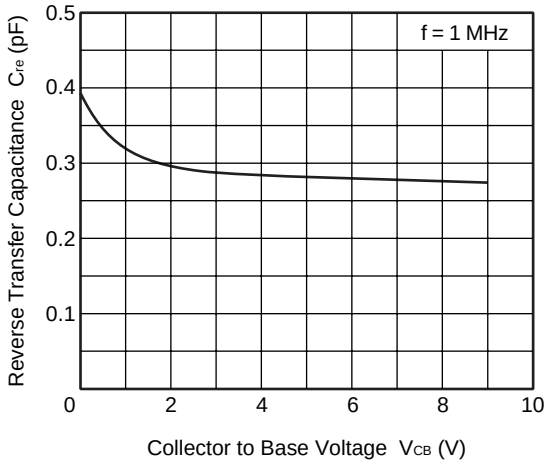
TYPICAL CHARACTERISTICS (Unless otherwise specified, T_A = +25°C)

TOTAL POWER DISSIPATION
vs. AMBIENT TEMPERATURE



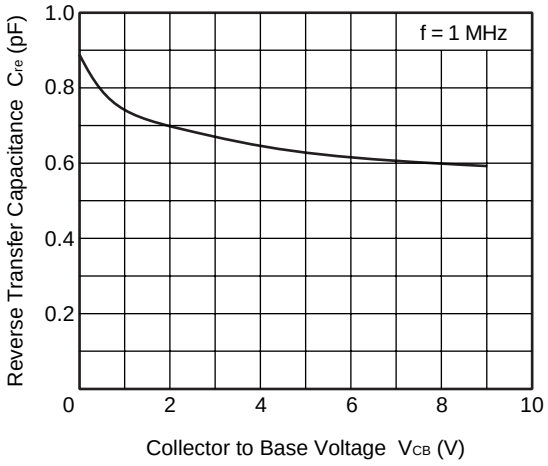
Q1

REVERSE TRANSFER CAPACITANCE
vs. COLLECTOR TO BASE VOLTAGE



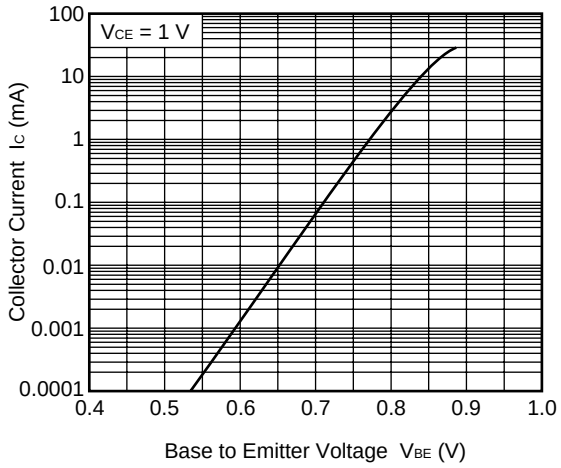
Q2

REVERSE TRANSFER CAPACITANCE
vs. COLLECTOR TO BASE VOLTAGE



Q1

COLLECTOR CURRENT vs.
BASE TO EMITTER VOLTAGE



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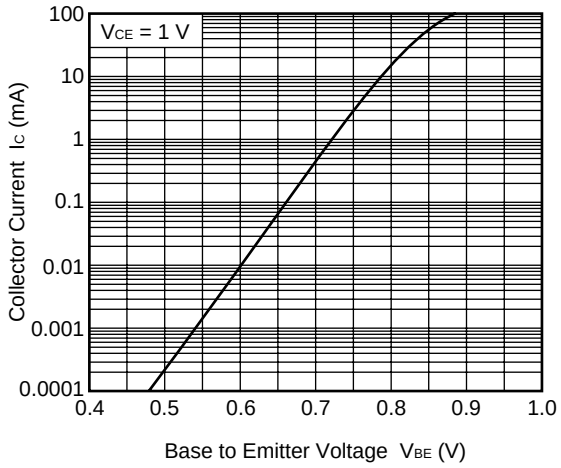
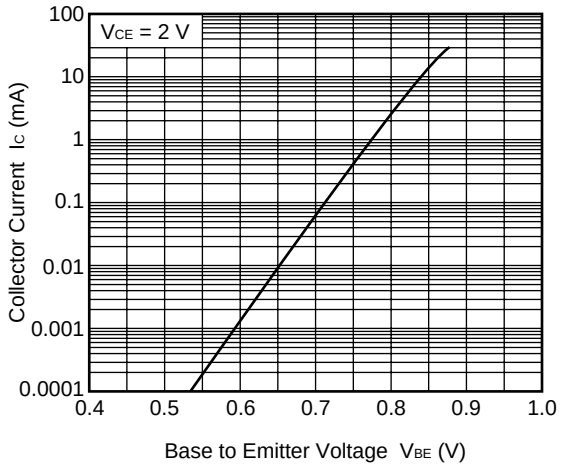
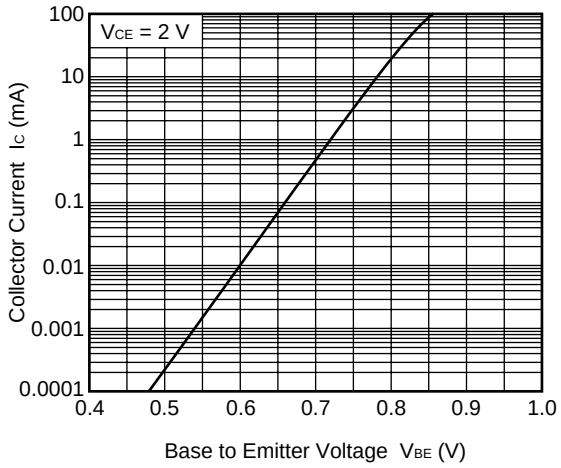
COLLECTOR CURRENT vs.
BASE TO EMITTER VOLTAGE



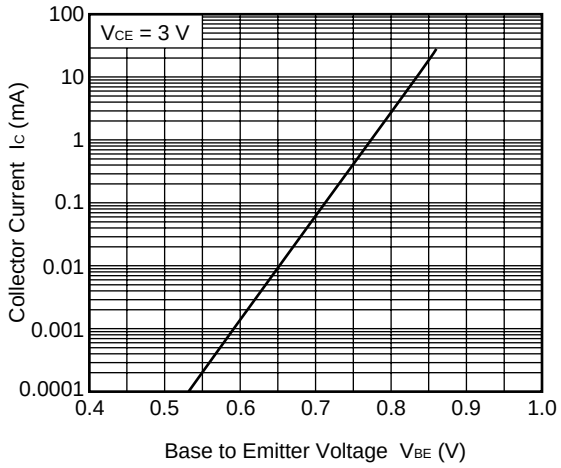
COLLECTOR CURRENT vs.
BASE TO EMITTER VOLTAGE



COLLECTOR CURRENT vs.
BASE TO EMITTER VOLTAGE

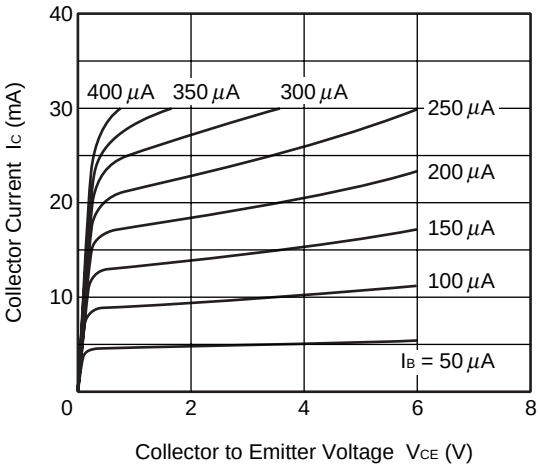


COLLECTOR CURRENT vs.
BASE TO EMITTER VOLTAGE



Q1

COLLECTOR CURRENT vs.
COLLECTOR TO EMITTER VOLTAGE



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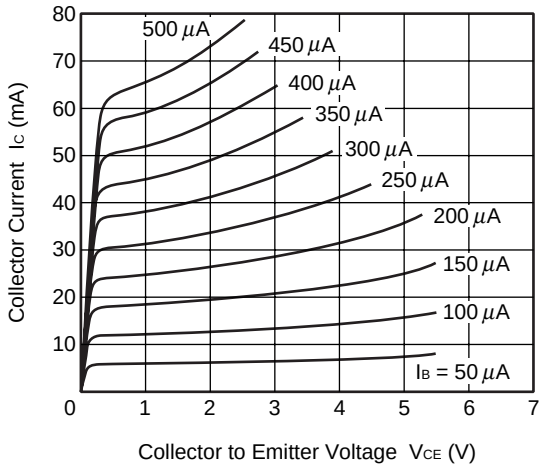
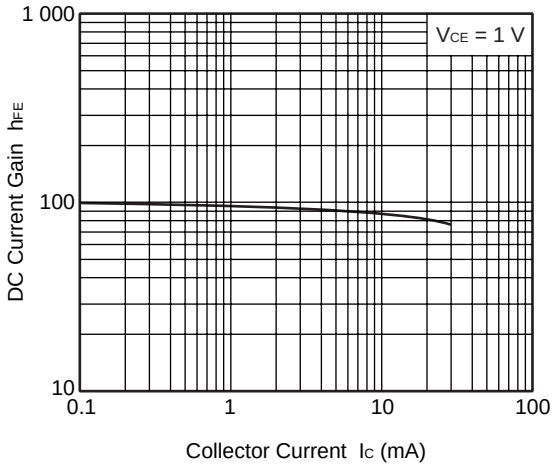
COLLECTOR CURRENT vs.
COLLECTOR TO EMITTER VOLTAGE



Q1

DC CURRENT GAIN vs.
COLLECTOR CURRENT



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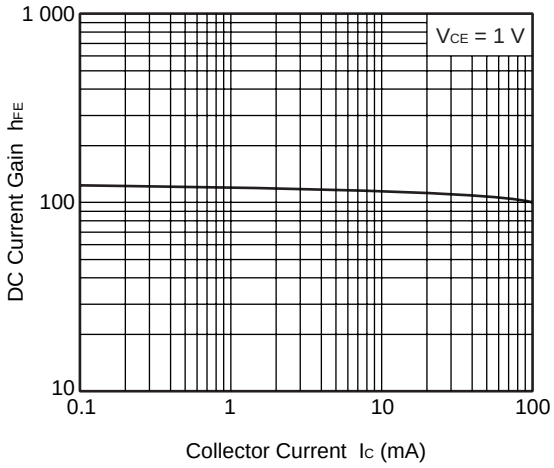
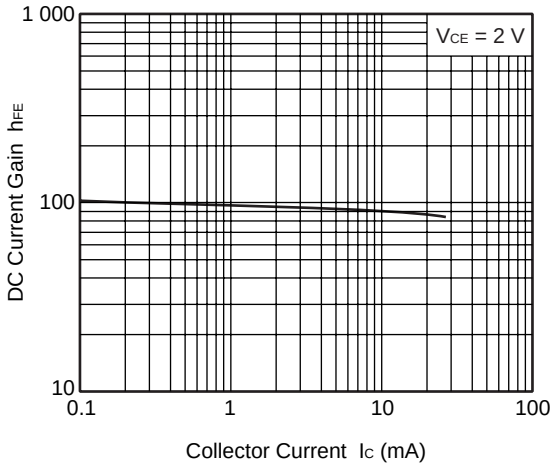
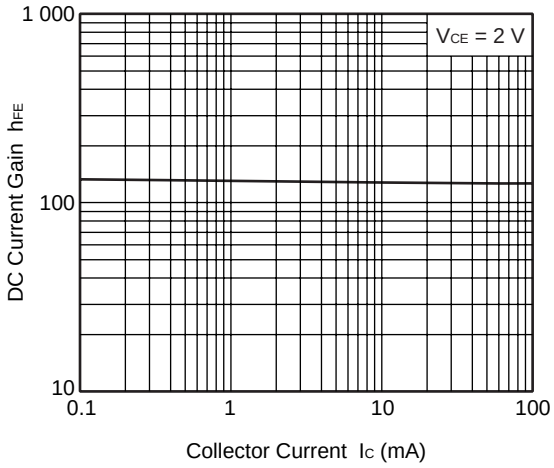
DC CURRENT GAIN vs.
COLLECTOR CURRENT



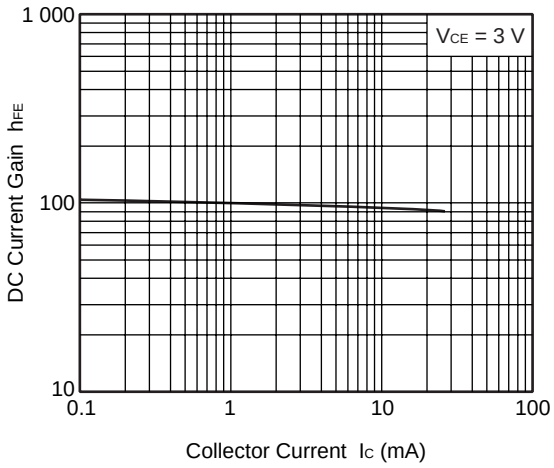
DC CURRENT GAIN vs.
COLLECTOR CURRENT



DC CURRENT GAIN vs.
COLLECTOR CURRENT

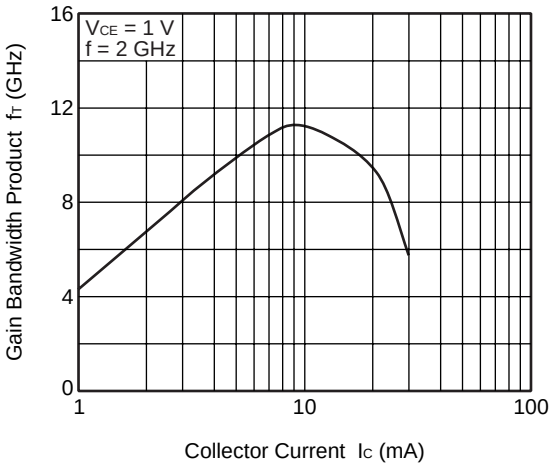


DC CURRENT GAIN vs.
COLLECTOR CURRENT



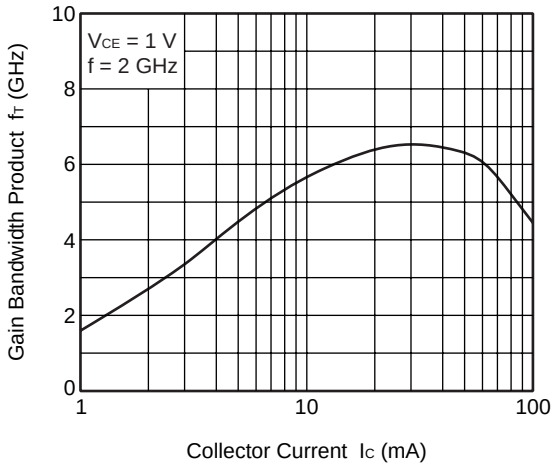
Q1

GAIN BANDWIDTH PRODUCT
vs. COLLECTOR CURRENT



Q2

GAIN BANDWIDTH PRODUCT
vs. COLLECTOR CURRENT



GAIN BANDWIDTH PRODUCT
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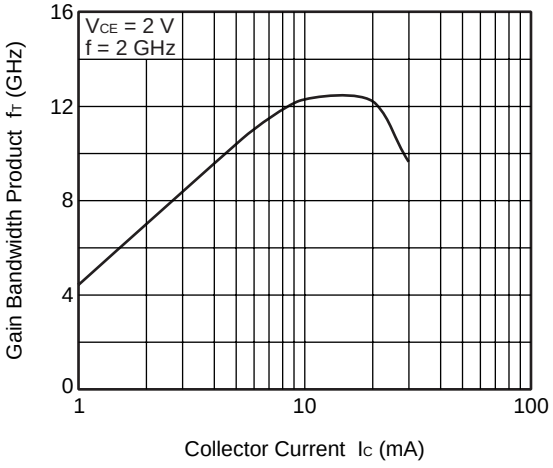
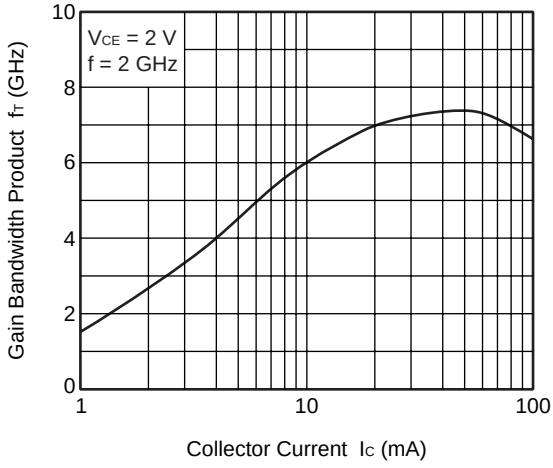
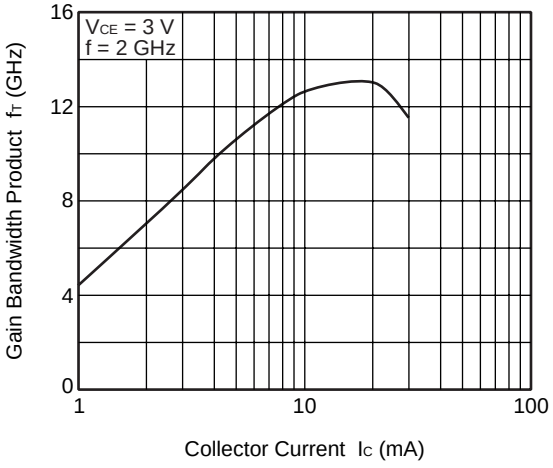


GAIN BANDWIDTH PRODUCT
vs. COLLECTOR CURRENT

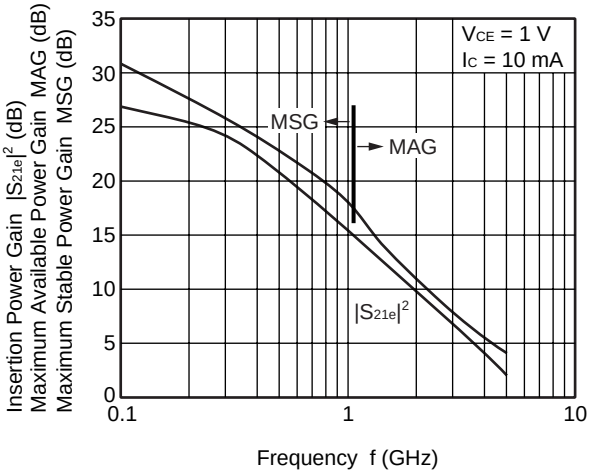


GAIN BANDWIDTH PRODUCT
vs. COLLECTOR CURRENT



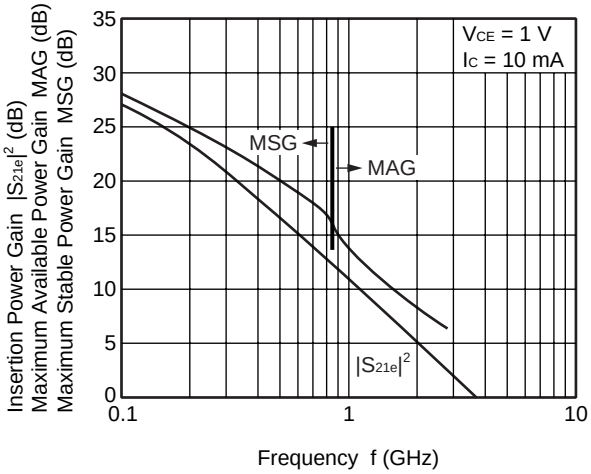
Q1

INSERTION POWER GAIN, MAG, MSG vs. FREQUENCY



Q2

INSERTION POWER GAIN, MAG, MSG vs. FREQUENCY



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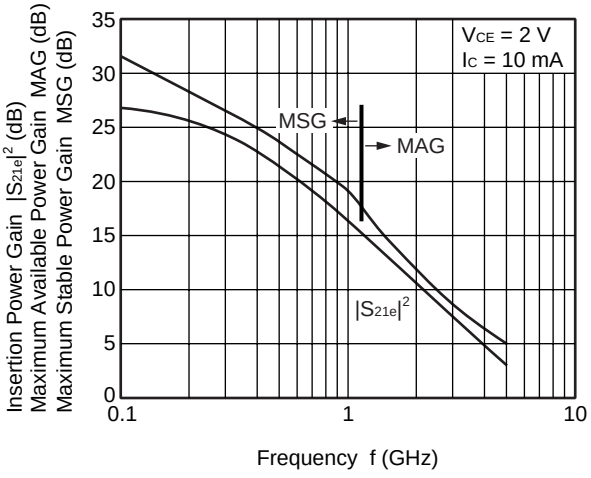

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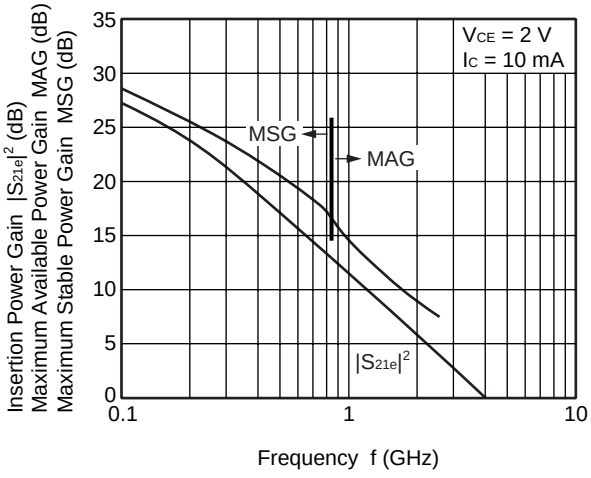

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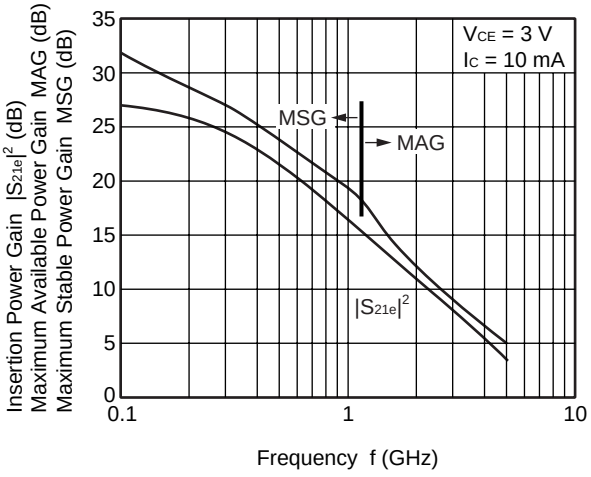

Q1

INSERTION POWER GAIN, MAG, MSG
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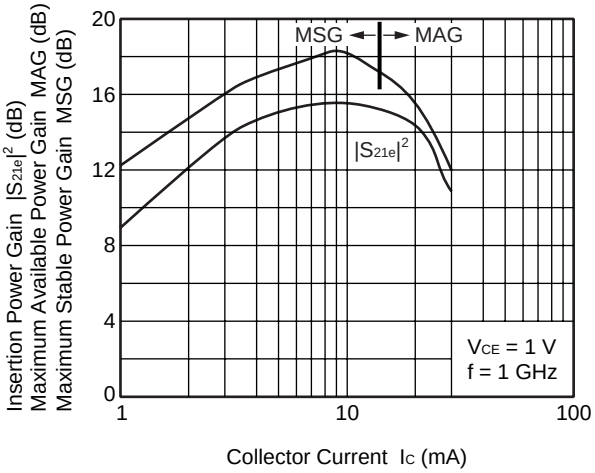
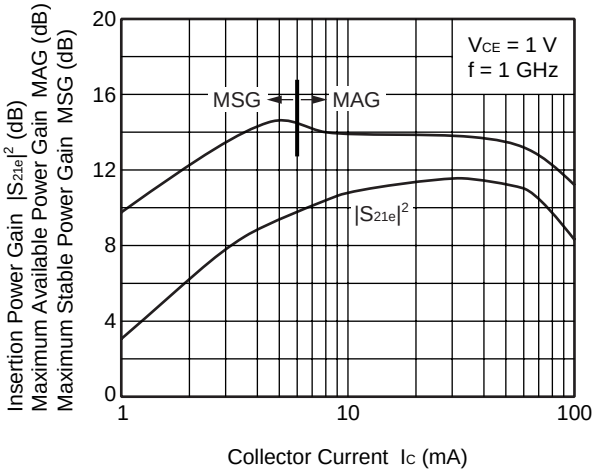


Q2

INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT



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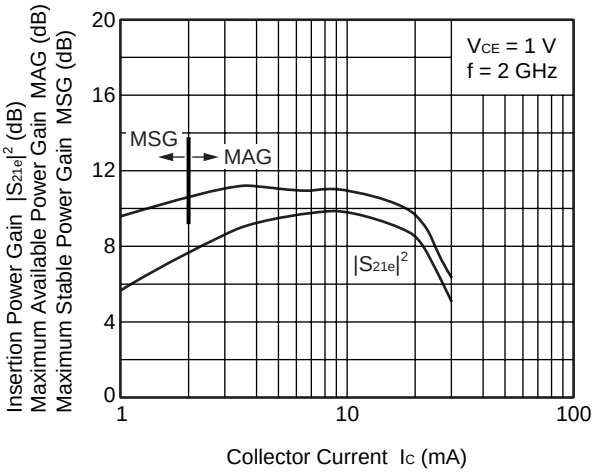

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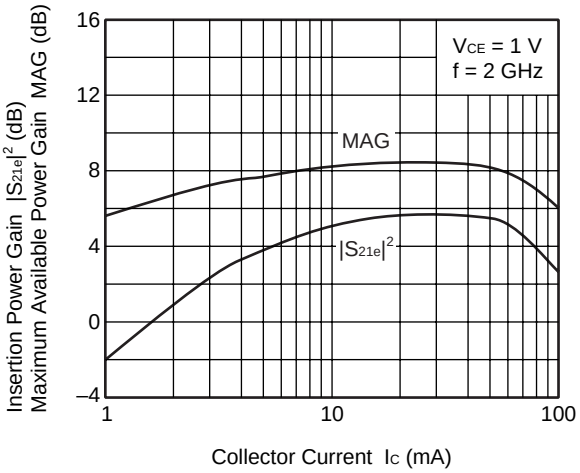
vs. COLLECTOR CURRENT



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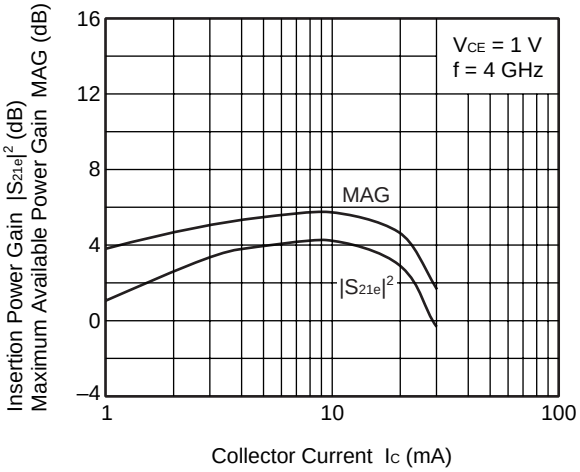
vs. COLLECTOR CURRENT



INSERTION POWER GAIN, MAG, MSG
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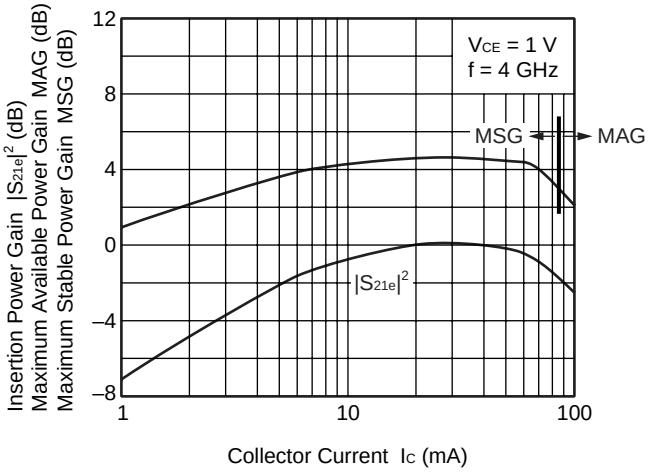
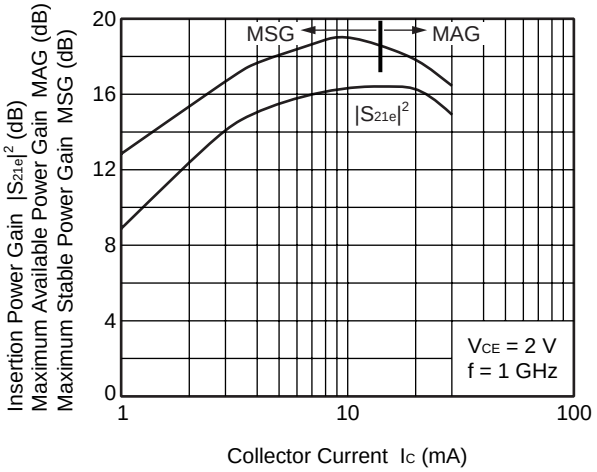


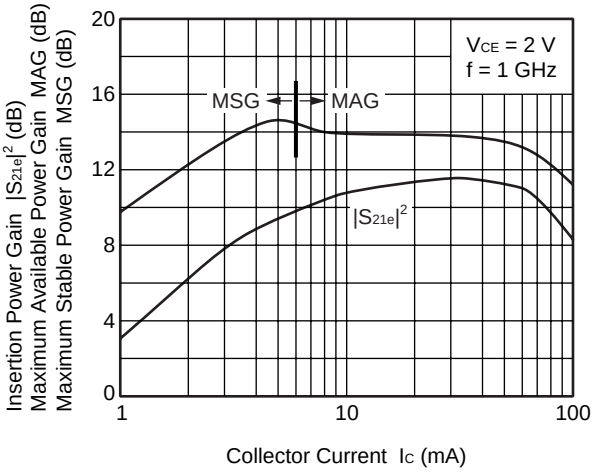
Q1

INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT



Q2

INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT



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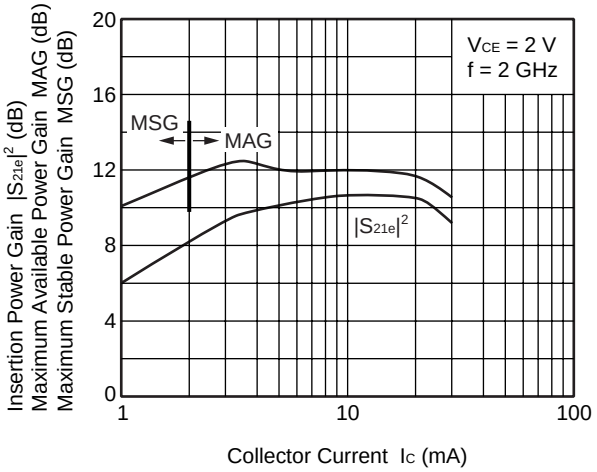
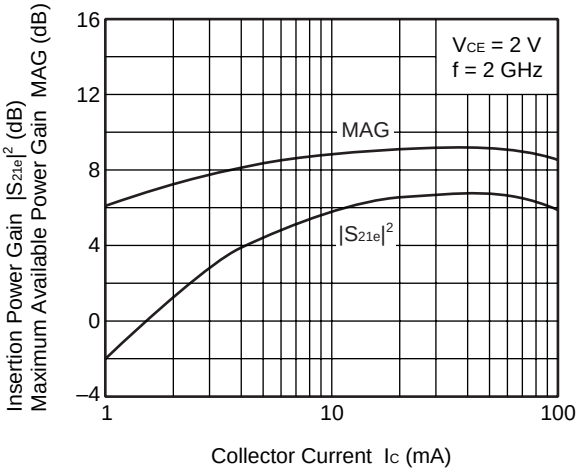
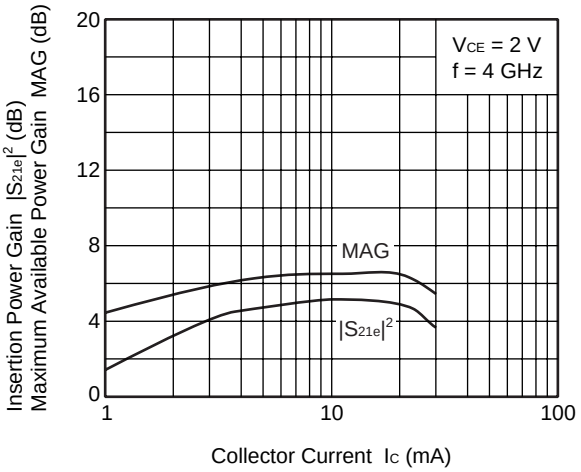
vs. COLLECTOR CURRENT



INSERTION POWER GAIN, MAG
vs. COLLECTOR CURRENT



INSERTION POWER GAIN, MAG
vs. COLLECTOR CURRENT



INSERTION POWER GAIN, MAG
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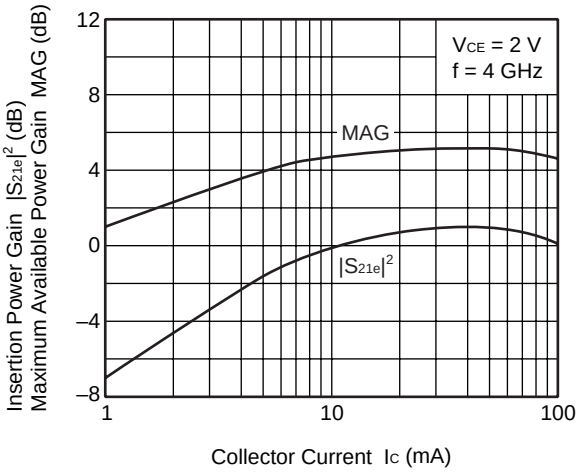
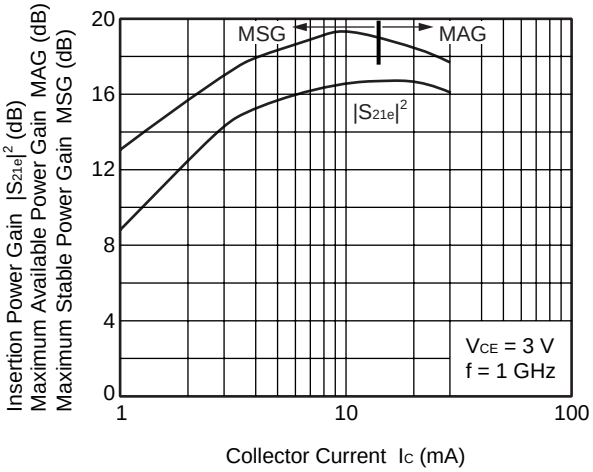
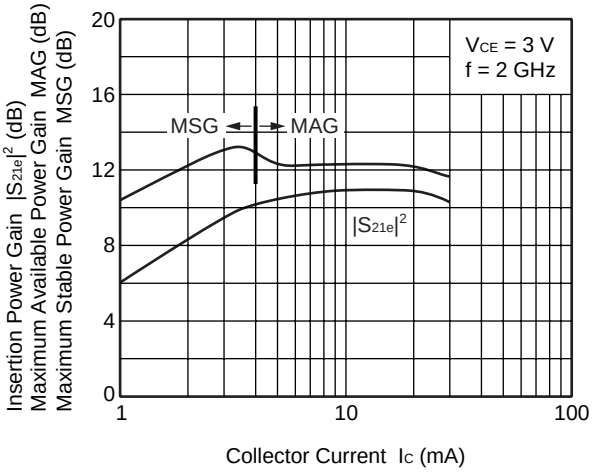


Q1

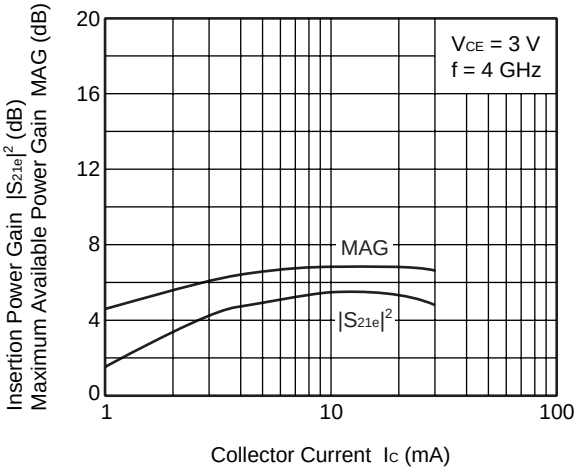
INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT



INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT

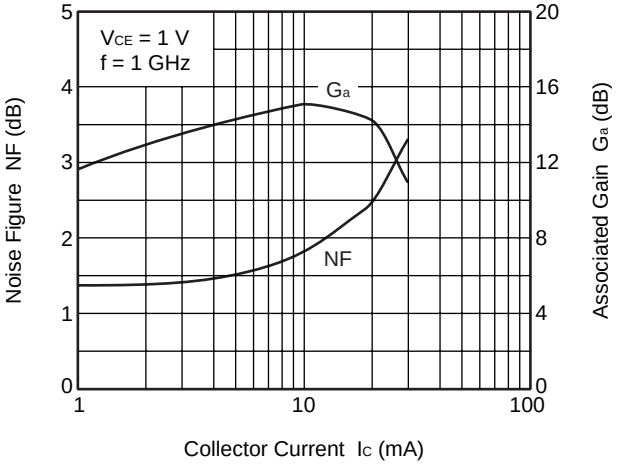


INSERTION POWER GAIN, MAG
vs. COLLECTOR CURRENT



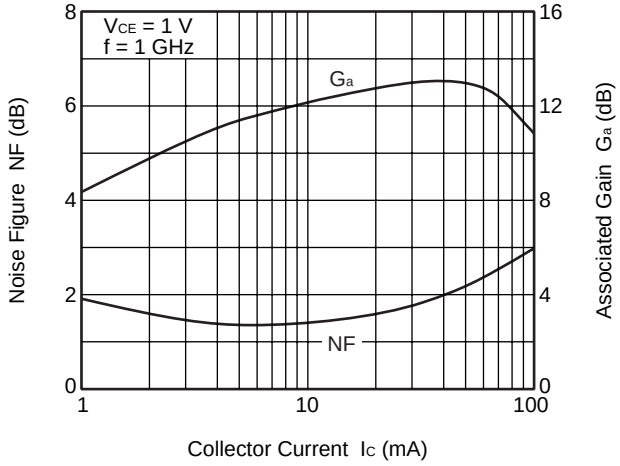
Q1

NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT

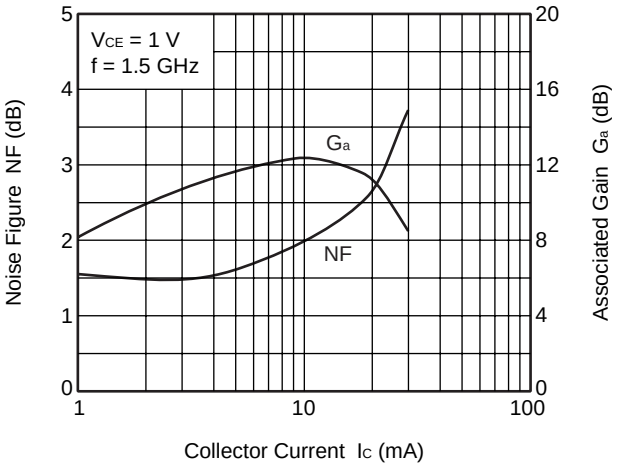


Q2

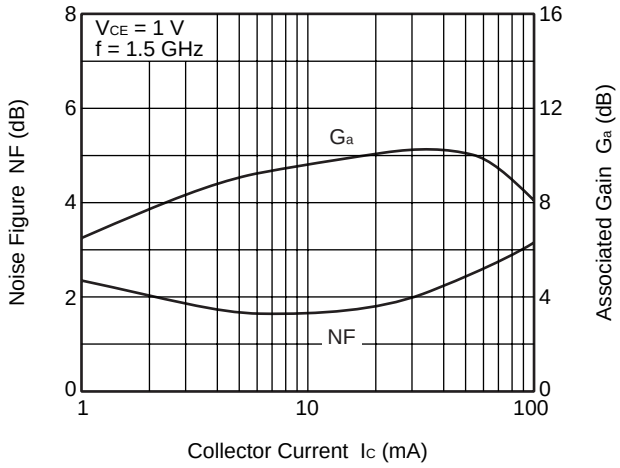
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



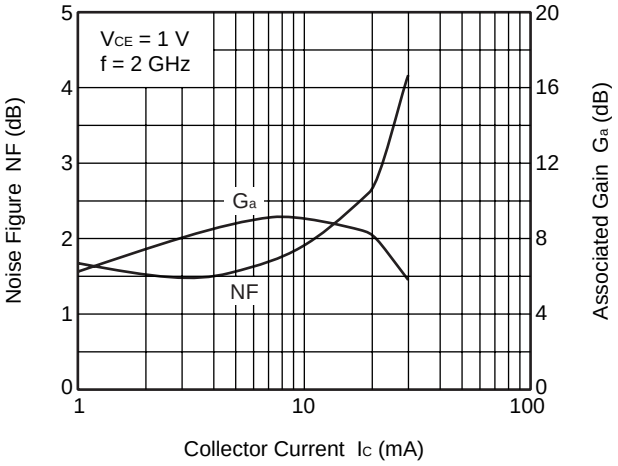
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



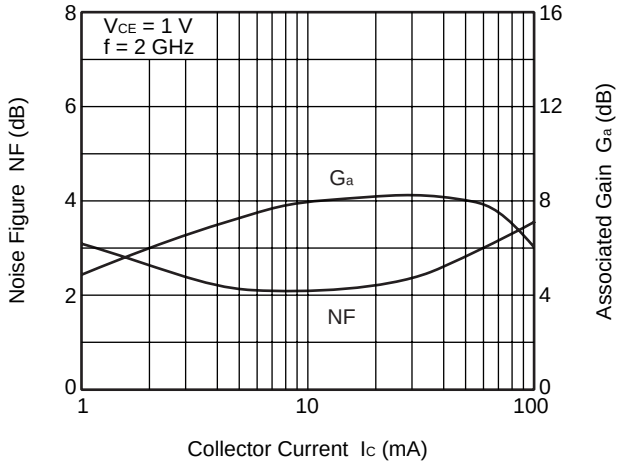
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT

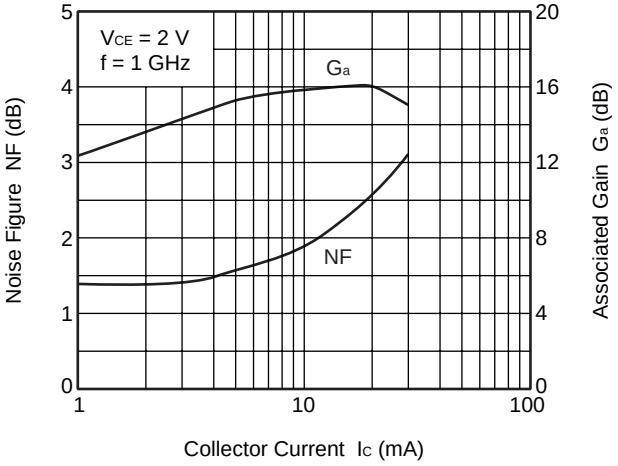


NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



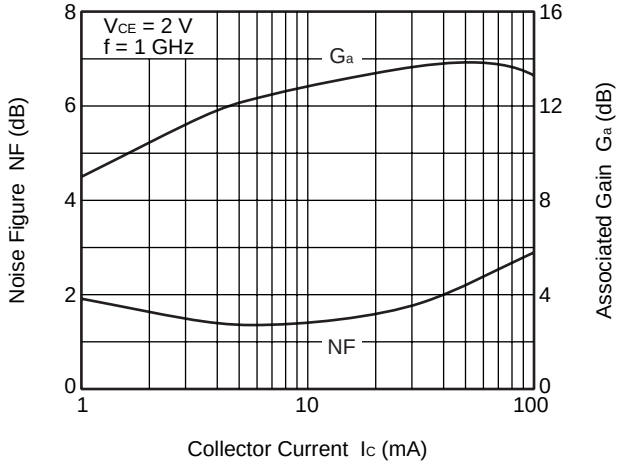
Q1

NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT

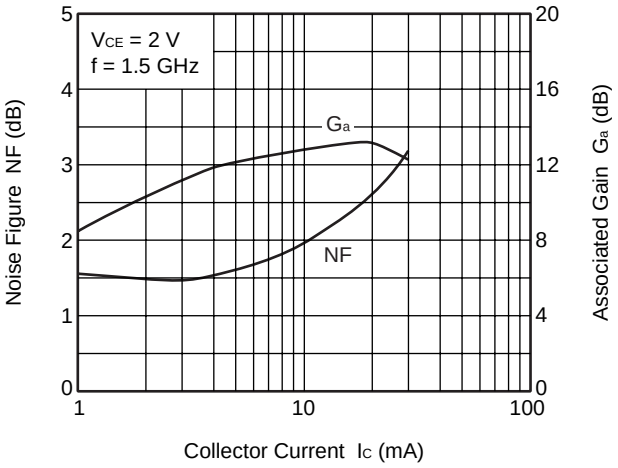


Q2

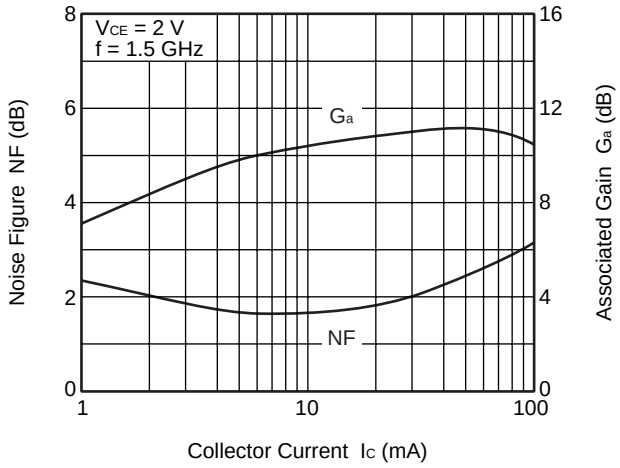
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



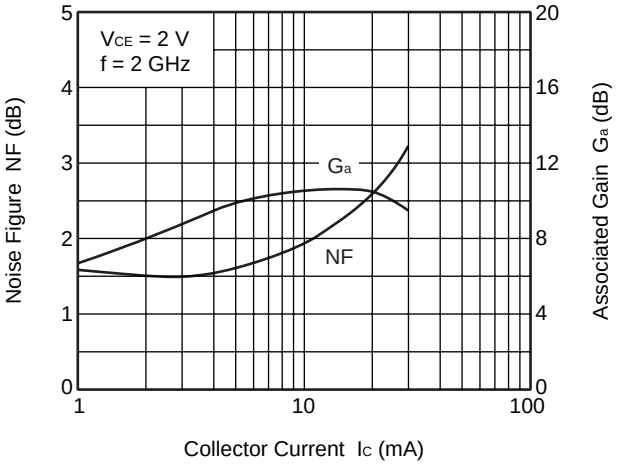
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



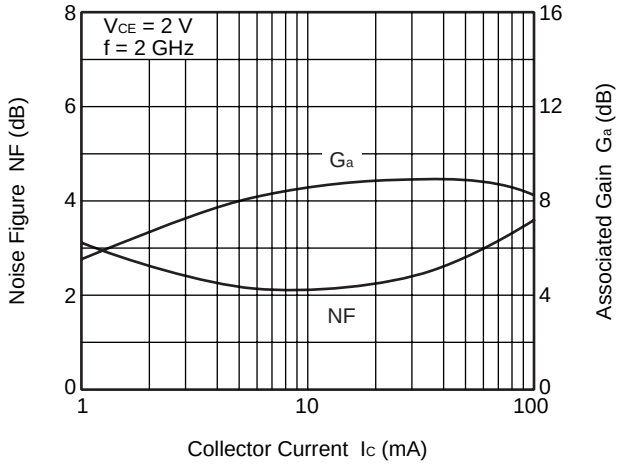
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT

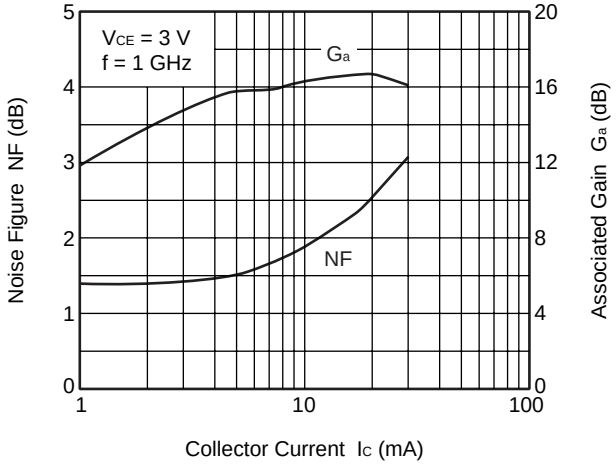


NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT

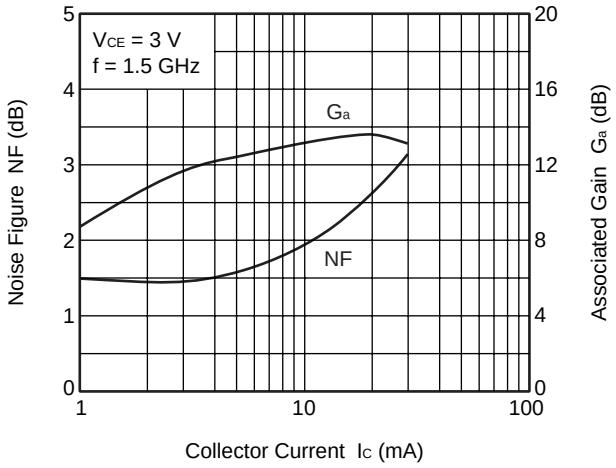


Q1

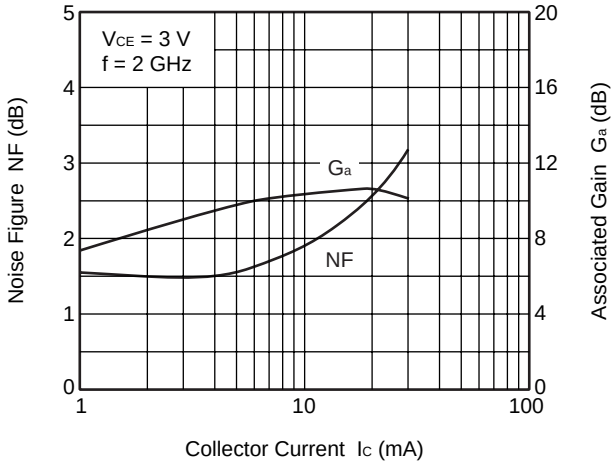
NOISE FIGURE, ASSOCIATED GAIN
vs. COLLECTOR CURRENT



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	0.942	–7.5	3.602	171.5	0.022	84.4	0.992	–4.4
0.2	0.947	–15.3	3.530	166.0	0.044	79.8	0.986	–8.6
0.3	0.923	–23.2	3.489	158.7	0.064	75.0	0.970	–12.8
0.4	0.896	–30.5	3.394	152.1	0.084	70.1	0.950	–16.9
0.5	0.864	–38.2	3.311	145.7	0.101	65.4	0.925	–20.7
0.6	0.831	–45.5	3.218	139.1	0.118	61.2	0.899	–24.4
0.7	0.795	–52.7	3.113	133.5	0.133	57.2	0.870	–27.9
0.8	0.757	–59.6	3.007	127.4	0.146	53.4	0.840	–31.2
0.9	0.719	–66.5	2.907	121.8	0.157	50.0	0.810	–34.4
1.0	0.681	–73.3	2.804	116.3	0.167	46.6	0.781	–37.3
1.1	0.644	–80.2	2.700	111.2	0.176	43.6	0.752	–40.1
1.2	0.610	–87.0	2.595	106.5	0.183	40.8	0.723	–42.5
1.3	0.574	–94.1	2.490	101.8	0.189	38.1	0.694	–44.9
1.4	0.548	–100.4	2.395	97.3	0.195	35.5	0.669	–47.3
1.5	0.523	–107.8	2.307	93.0	0.199	33.2	0.644	–49.5
1.6	0.497	–114.7	2.237	88.7	0.203	31.1	0.619	–51.6
1.7	0.476	–121.6	2.146	84.8	0.207	29.1	0.596	–53.7
1.8	0.459	–128.3	2.070	80.8	0.209	27.4	0.575	–55.5
1.9	0.441	–135.3	1.996	77.1	0.212	25.6	0.555	–57.4
2.0	0.431	–142.4	1.931	73.4	0.214	24.3	0.535	–59.1
2.1	0.420	–149.1	1.867	69.6	0.214	23.1	0.517	–61.0
2.2	0.411	–155.1	1.807	66.6	0.214	22.0	0.500	–62.8
2.3	0.405	–161.9	1.747	63.3	0.214	20.6	0.484	–64.6
2.4	0.400	–168.2	1.691	60.0	0.213	19.6	0.468	–66.4
2.5	0.395	–174.4	1.636	57.0	0.213	18.6	0.452	–68.3
2.6	0.394	179.9	1.581	54.4	0.211	17.5	0.440	–70.3
2.7	0.384	174.6	1.520	51.8	0.207	17.1	0.428	–71.7
2.8	0.383	171.0	1.486	49.9	0.205	17.8	0.424	–72.9
2.9	0.392	167.8	1.453	47.6	0.207	18.0	0.420	–74.8
3.0	0.398	163.3	1.432	45.1	0.210	18.1	0.409	–77.5
4.0	0.486	127.6	1.130	21.9	0.227	16.4	0.345	–105.7
5.0	0.566	106.2	0.897	3.4	0.254	16.1	0.355	–143.1

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	0.869	–13.8	9.468	167.2	0.021	81.8	0.977	–8.6
0.2	0.844	–27.0	9.026	156.9	0.041	75.0	0.942	–16.4
0.3	0.780	–39.1	8.497	146.5	0.057	68.0	0.889	–23.6
0.4	0.716	–50.4	7.860	137.5	0.072	62.5	0.828	–29.7
0.5	0.657	–60.9	7.272	129.5	0.083	58.1	0.767	–34.8
0.6	0.594	–70.9	6.668	122.0	0.093	54.6	0.708	–39.1
0.7	0.539	–80.0	6.150	116.0	0.101	51.7	0.655	–42.6
0.8	0.494	–88.5	5.668	109.9	0.108	49.4	0.610	–45.6
0.9	0.452	–97.4	5.247	104.8	0.114	47.6	0.567	–48.3
1.0	0.415	–105.5	4.872	99.9	0.120	46.3	0.531	–50.5
1.1	0.385	–113.8	4.546	95.6	0.125	45.1	0.499	–52.7
1.2	0.361	–122.2	4.234	91.7	0.130	44.1	0.471	–54.5
1.3	0.339	–130.1	3.961	87.8	0.135	43.2	0.445	–56.3
1.4	0.327	–137.7	3.729	84.4	0.140	42.3	0.420	–58.2
1.5	0.319	–145.9	3.513	81.1	0.144	41.7	0.399	–59.9
1.6	0.309	–153.5	3.341	77.8	0.148	41.1	0.381	–61.8
1.7	0.307	–160.9	3.163	74.7	0.153	40.6	0.362	–63.5
1.8	0.306	–167.8	3.010	71.8	0.158	40.1	0.345	–65.1
1.9	0.307	–174.3	2.863	69.0	0.162	39.7	0.329	–66.9
2.0	0.310	179.6	2.736	66.3	0.167	39.3	0.314	–68.6
2.1	0.313	173.8	2.622	63.4	0.171	39.0	0.299	–70.5
2.2	0.316	169.0	2.514	61.0	0.175	38.5	0.286	–72.6
2.3	0.325	163.1	2.410	58.3	0.179	38.0	0.274	–74.7
2.4	0.327	158.7	2.315	55.9	0.183	37.4	0.260	–77.0
2.5	0.334	153.8	2.232	53.5	0.186	37.0	0.247	–79.2
2.6	0.340	149.9	2.142	51.4	0.189	36.3	0.237	–81.4
2.7	0.338	145.3	2.055	49.4	0.191	36.3	0.226	–83.3
2.8	0.341	142.8	1.996	48.0	0.195	36.9	0.223	–84.2
2.9	0.349	141.6	1.950	45.9	0.202	36.7	0.222	–86.9
3.0	0.360	138.7	1.914	43.8	0.209	36.2	0.214	–90.7
4.0	0.464	114.6	1.472	24.2	0.256	28.5	0.181	–134.3
5.0	0.553	99.2	1.169	8.1	0.296	21.2	0.234	–176.7

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	0.804	–18.0	14.154	163.1	0.020	79.7	0.959	–12.0
0.2	0.743	–35.8	13.017	150.0	0.038	71.7	0.891	–22.4
0.3	0.656	–51.2	11.714	137.8	0.051	64.5	0.805	–30.8
0.4	0.578	–64.4	10.376	127.9	0.063	59.8	0.720	–37.2
0.5	0.510	–76.3	9.244	119.7	0.071	56.6	0.644	–41.9
0.6	0.451	–87.3	8.211	112.6	0.079	54.4	0.580	–45.7
0.7	0.404	–97.5	7.385	107.0	0.086	52.8	0.527	–48.5
0.8	0.367	–107.1	6.661	101.8	0.091	51.9	0.484	–50.7
0.9	0.333	–116.5	6.059	97.2	0.097	51.4	0.446	–52.7
1.0	0.310	–125.4	5.559	93.0	0.103	50.8	0.415	–54.5
1.1	0.292	–134.5	5.130	89.2	0.109	50.4	0.388	–56.0
1.2	0.281	–142.6	4.750	85.8	0.114	50.0	0.365	–57.5
1.3	0.269	–151.3	4.403	82.6	0.120	49.6	0.345	–59.0
1.4	0.267	–158.7	4.115	79.5	0.126	49.1	0.327	–60.6
1.5	0.269	–166.6	3.867	76.7	0.131	48.6	0.310	–62.3
1.6	0.270	–173.8	3.665	73.8	0.137	48.5	0.294	–64.2
1.7	0.272	179.8	3.457	71.1	0.143	48.0	0.278	–66.0
1.8	0.279	173.9	3.283	68.5	0.149	47.5	0.265	–67.8
1.9	0.283	168.5	3.117	66.0	0.155	47.0	0.252	–69.8
2.0	0.294	163.6	2.972	63.5	0.160	46.5	0.239	–71.9
2.1	0.299	159.2	2.838	60.9	0.166	46.1	0.226	–74.3
2.2	0.306	155.2	2.720	58.8	0.171	45.6	0.215	–76.8
2.3	0.315	150.4	2.599	56.5	0.177	44.8	0.204	–79.4
2.4	0.323	146.7	2.492	54.2	0.182	44.1	0.193	–82.3
2.5	0.331	142.6	2.401	52.0	0.186	43.4	0.182	–85.4
2.6	0.337	139.2	2.299	50.1	0.191	42.7	0.172	–88.3
2.7	0.339	135.2	2.206	48.3	0.194	42.5	0.162	–90.6
2.8	0.341	133.6	2.141	47.1	0.200	42.9	0.160	–91.8
2.9	0.349	133.0	2.092	45.1	0.208	42.3	0.161	–95.3
3.0	0.359	130.6	2.053	43.0	0.215	41.6	0.157	–100.1
4.0	0.466	110.4	1.572	24.8	0.267	31.7	0.153	–154.5
5.0	0.552	97.1	1.248	9.5	0.309	22.7	0.232	167.2

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	0.734	–22.2	17.839	159.8	0.019	79.6	0.940	–14.7
0.2	0.661	–43.6	15.818	144.7	0.036	69.6	0.844	–26.7
0.3	0.566	–60.4	13.713	131.7	0.047	63.1	0.736	–35.4
0.4	0.485	–75.5	11.756	121.9	0.056	59.1	0.641	–41.5
0.5	0.420	–88.1	10.221	113.8	0.064	57.3	0.563	–45.5
0.6	0.371	–99.5	8.926	107.3	0.071	55.9	0.502	–48.5
0.7	0.333	–110.6	7.932	102.2	0.077	55.2	0.452	–50.7
0.8	0.302	–120.1	7.085	97.3	0.083	55.0	0.413	–52.4
0.9	0.280	–130.6	6.405	93.1	0.090	54.7	0.381	–53.9
1.0	0.264	–139.9	5.841	89.3	0.096	54.7	0.354	–55.3
1.1	0.256	–148.9	5.358	85.9	0.102	54.4	0.332	–56.7
1.2	0.251	–157.2	4.946	82.7	0.108	54.1	0.312	–58.1
1.3	0.248	–165.4	4.576	79.7	0.115	53.9	0.295	–59.5
1.4	0.248	–171.6	4.279	76.8	0.121	53.2	0.279	–61.1
1.5	0.256	–178.5	4.000	74.2	0.127	52.8	0.265	–62.9
1.6	0.261	175.2	3.788	71.6	0.133	52.5	0.251	–64.8
1.7	0.266	169.0	3.567	69.2	0.140	52.0	0.238	–66.8
1.8	0.276	163.9	3.385	66.7	0.146	51.4	0.226	–68.8
1.9	0.282	159.4	3.214	64.5	0.153	50.8	0.214	–70.8
2.0	0.292	155.5	3.061	62.2	0.159	50.2	0.202	–73.1
2.1	0.301	151.3	2.922	59.6	0.165	49.7	0.192	–75.9
2.2	0.305	148.2	2.795	57.7	0.171	49.0	0.182	–78.8
2.3	0.317	144.2	2.671	55.5	0.177	48.2	0.172	–81.9
2.4	0.326	140.7	2.559	53.2	0.182	47.3	0.161	–85.4
2.5	0.335	137.5	2.463	51.2	0.188	46.5	0.152	–89.1
2.6	0.340	134.2	2.360	49.3	0.193	45.7	0.143	–92.6
2.7	0.344	131.0	2.264	47.7	0.197	45.4	0.133	–95.5
2.8	0.344	128.9	2.195	46.4	0.203	45.5	0.132	–97.0
2.9	0.352	128.5	2.143	44.5	0.211	44.8	0.134	–100.9
3.0	0.365	126.7	2.103	42.5	0.219	44.0	0.131	–106.8
4.0	0.470	108.7	1.608	24.7	0.272	32.9	0.148	–165.7
5.0	0.556	95.9	1.277	9.8	0.314	23.4	0.238	160.2

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	0.639	–30.0	21.992	155.9	0.018	74.1	0.911	–17.8
0.2	0.565	–52.4	18.566	138.6	0.033	67.0	0.783	–31.2
0.3	0.463	–71.9	15.405	125.1	0.042	62.6	0.657	–39.7
0.4	0.393	–88.1	12.789	115.7	0.051	59.7	0.558	–44.9
0.5	0.340	–101.9	10.885	108.3	0.057	59.3	0.484	–48.0
0.6	0.302	–114.3	9.379	102.3	0.064	58.9	0.429	–50.1
0.7	0.276	–126.0	8.244	97.6	0.071	58.8	0.385	–51.4
0.8	0.258	–136.4	7.308	93.2	0.077	58.9	0.353	–52.6
0.9	0.246	–146.9	6.588	89.5	0.084	58.8	0.325	–53.7
1.0	0.237	–155.7	5.973	85.9	0.091	58.7	0.304	–54.7
1.1	0.237	–164.1	5.477	82.8	0.098	58.5	0.285	–55.8
1.2	0.239	–171.3	5.037	80.0	0.104	58.2	0.269	–57.1
1.3	0.239	–178.7	4.653	77.3	0.111	57.7	0.254	–58.4
1.4	0.246	175.5	4.339	74.7	0.118	57.2	0.241	–60.1
1.5	0.256	170.5	4.057	72.3	0.125	56.6	0.229	–61.9
1.6	0.261	164.6	3.837	69.7	0.131	56.1	0.217	–64.0
1.7	0.271	160.0	3.612	67.4	0.138	55.5	0.206	–66.1
1.8	0.282	155.6	3.424	65.2	0.145	54.7	0.195	–68.3
1.9	0.287	151.8	3.243	62.9	0.152	53.9	0.185	–70.8
2.0	0.299	148.6	3.090	60.8	0.159	53.2	0.175	–73.4
2.1	0.307	145.3	2.952	58.4	0.166	52.5	0.165	–76.5
2.2	0.314	142.0	2.820	56.5	0.171	51.6	0.156	–79.6
2.3	0.325	139.1	2.694	54.4	0.178	50.8	0.147	–83.3
2.4	0.335	135.9	2.579	52.2	0.184	49.8	0.138	–87.4
2.5	0.343	133.1	2.486	50.2	0.189	48.9	0.128	–92.1
2.6	0.347	130.2	2.379	48.4	0.194	48.1	0.121	–96.0
2.7	0.355	127.0	2.282	46.8	0.199	47.7	0.113	–99.6
2.8	0.354	125.6	2.212	45.8	0.205	47.5	0.112	–101.7
2.9	0.361	125.3	2.160	43.7	0.214	46.7	0.114	–106.3
3.0	0.373	123.8	2.120	41.9	0.221	45.8	0.113	–112.6
4.0	0.478	106.9	1.619	24.4	0.276	34.2	0.147	–173.7
5.0	0.561	94.8	1.282	10.0	0.318	24.1	0.244	155.3

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	0.457	–51.4	27.029	145.4	0.016	67.4	0.799	–25.2
0.2	0.382	–84.9	20.070	125.3	0.027	64.3	0.611	–38.8
0.3	0.320	–109.1	15.319	112.8	0.035	62.3	0.482	–44.3
0.4	0.292	–128.1	12.104	104.7	0.043	62.8	0.400	–46.4
0.5	0.273	–142.3	10.018	98.6	0.049	63.5	0.347	–46.9
0.6	0.268	–153.4	8.485	93.6	0.057	64.1	0.310	–46.9
0.7	0.267	–163.1	7.355	89.9	0.064	64.7	0.283	–47.0
0.8	0.267	–171.2	6.486	86.3	0.071	64.7	0.263	–47.2
0.9	0.272	–178.6	5.806	83.0	0.078	64.6	0.246	–47.6
1.0	0.273	175.3	5.243	80.0	0.086	64.3	0.233	–48.1
1.1	0.280	169.9	4.785	77.2	0.093	63.9	0.221	–49.1
1.2	0.287	165.5	4.399	74.6	0.100	63.4	0.211	–50.0
1.3	0.295	160.6	4.053	72.1	0.108	62.7	0.202	–51.3
1.4	0.303	157.2	3.787	69.7	0.115	61.9	0.193	–53.1
1.5	0.315	153.6	3.536	67.4	0.122	61.1	0.184	–55.3
1.6	0.323	150.2	3.333	65.0	0.129	60.5	0.174	–57.5
1.7	0.329	146.5	3.135	62.9	0.136	59.7	0.166	–59.8
1.8	0.341	143.7	2.971	60.7	0.144	58.8	0.157	–62.2
1.9	0.349	140.9	2.815	58.6	0.151	57.8	0.149	–65.0
2.0	0.358	138.5	2.682	56.6	0.158	56.9	0.140	–68.0
2.1	0.367	135.7	2.553	54.2	0.165	56.0	0.132	–71.6
2.2	0.373	134.0	2.444	52.4	0.171	55.1	0.125	–75.5
2.3	0.383	131.4	2.334	50.3	0.178	54.0	0.117	–79.7
2.4	0.392	128.8	2.236	48.2	0.184	52.9	0.109	–84.9
2.5	0.402	126.4	2.152	46.2	0.190	52.0	0.101	–90.0
2.6	0.406	124.4	2.061	44.6	0.195	50.9	0.095	–95.5
2.7	0.410	121.6	1.975	43.2	0.200	50.5	0.087	–99.9
2.8	0.411	120.5	1.918	42.0	0.207	50.4	0.088	–101.9
2.9	0.418	120.2	1.876	40.0	0.216	49.4	0.093	–108.2
3.0	0.426	118.8	1.841	38.1	0.224	48.4	0.093	–116.3
4.0	0.523	103.7	1.406	21.1	0.279	35.9	0.143	–179.0
5.0	0.596	92.0	1.116	6.8	0.323	25.5	0.249	153.4

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	0.957	–7.3	3.472	172.2	0.018	83.4	0.995	–3.7
0.2	0.954	–14.0	3.430	167.1	0.036	81.3	0.989	–7.3
0.3	0.932	–21.1	3.400	160.4	0.055	76.3	0.976	–10.8
0.4	0.908	–28.0	3.320	154.2	0.071	71.8	0.959	–14.3
0.5	0.877	–34.7	3.254	148.1	0.087	67.7	0.941	–17.6
0.6	0.847	–41.5	3.173	141.9	0.101	63.7	0.919	–20.9
0.7	0.813	–48.3	3.086	136.5	0.115	60.0	0.895	–24.0
0.8	0.780	–54.8	2.996	130.7	0.126	56.4	0.872	–26.9
0.9	0.743	–61.3	2.908	125.3	0.137	53.1	0.845	–29.6
1.0	0.706	–67.7	2.818	120.0	0.146	50.0	0.820	–32.3
1.1	0.669	–74.3	2.729	115.0	0.155	47.0	0.793	–34.8
1.2	0.637	–80.6	2.635	110.5	0.162	44.2	0.768	–36.9
1.3	0.601	–87.0	2.531	105.8	0.168	41.6	0.744	–39.1
1.4	0.571	–93.4	2.443	101.5	0.174	39.1	0.720	–41.3
1.5	0.544	–100.3	2.360	97.1	0.178	36.8	0.696	–43.2
1.6	0.517	–106.7	2.300	92.9	0.182	34.7	0.673	–45.2
1.7	0.493	–113.6	2.210	88.8	0.186	32.8	0.651	–47.0
1.8	0.471	–120.3	2.136	84.9	0.189	31.1	0.633	–48.7
1.9	0.453	–127.2	2.065	81.2	0.191	29.4	0.615	–50.5
2.0	0.438	–133.8	2.000	77.6	0.193	28.1	0.596	–52.0
2.1	0.423	–140.3	1.939	73.8	0.194	27.0	0.578	–53.6
2.2	0.413	–146.6	1.880	70.6	0.194	25.8	0.562	–55.3
2.3	0.403	–153.7	1.823	67.2	0.194	24.5	0.546	–56.8
2.4	0.394	–160.2	1.763	64.1	0.194	23.4	0.531	–58.4
2.5	0.389	–166.6	1.709	61.1	0.193	22.4	0.514	–60.2
2.6	0.383	–172.6	1.650	58.2	0.191	21.4	0.502	–61.8
2.7	0.373	–178.4	1.591	55.8	0.188	21.0	0.490	–63.1
2.8	0.368	177.9	1.554	54.0	0.185	21.9	0.487	–64.1
2.9	0.376	174.3	1.520	51.6	0.188	22.3	0.483	–65.8
3.0	0.379	169.8	1.497	49.0	0.191	22.4	0.472	–68.4
4.0	0.464	131.1	1.186	25.4	0.211	21.7	0.403	–92.9
5.0	0.549	108.5	0.948	6.5	0.245	22.0	0.390	–127.8

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	0.883	–12.3	9.482	167.9	0.017	79.9	0.982	–7.2
0.2	0.845	–24.1	9.101	158.4	0.034	76.5	0.953	–13.9
0.3	0.794	–35.1	8.623	148.6	0.049	70.3	0.907	–19.9
0.4	0.734	–45.9	8.047	140.0	0.062	65.2	0.855	–25.2
0.5	0.674	–55.5	7.500	132.1	0.072	60.9	0.801	–29.5
0.6	0.616	–64.6	6.932	124.9	0.081	57.4	0.749	–33.1
0.7	0.560	–73.1	6.428	118.8	0.089	54.7	0.700	–36.4
0.8	0.508	–81.2	5.945	112.9	0.095	52.5	0.659	–38.9
0.9	0.463	–89.0	5.529	107.8	0.101	50.8	0.620	–41.0
1.0	0.424	–96.6	5.137	102.9	0.107	49.5	0.586	–43.1
1.1	0.392	–104.3	4.825	98.5	0.112	48.3	0.556	–44.8
1.2	0.363	–111.8	4.503	94.6	0.116	47.3	0.528	–46.3
1.3	0.337	–119.4	4.217	90.9	0.121	46.5	0.503	–47.7
1.4	0.319	–127.2	3.976	87.4	0.125	45.7	0.482	–49.2
1.5	0.308	–135.0	3.754	84.0	0.130	45.0	0.462	–50.6
1.6	0.293	–142.7	3.579	80.8	0.134	44.6	0.441	–51.9
1.7	0.283	–150.6	3.389	77.8	0.139	44.0	0.424	–53.4
1.8	0.280	–158.3	3.228	74.8	0.143	43.5	0.409	–54.5
1.9	0.279	–165.3	3.073	72.1	0.148	43.2	0.394	–55.9
2.0	0.278	–171.6	2.942	69.4	0.152	42.9	0.379	–57.1
2.1	0.279	–177.9	2.823	66.5	0.156	42.6	0.365	–58.6
2.2	0.281	176.2	2.709	64.1	0.160	42.1	0.352	–60.2
2.3	0.286	170.2	2.599	61.6	0.164	41.7	0.338	–61.7
2.4	0.292	164.7	2.499	59.1	0.167	41.2	0.325	–63.3
2.5	0.296	158.8	2.406	56.7	0.171	40.7	0.312	–64.9
2.6	0.300	154.3	2.309	54.4	0.174	40.1	0.301	–66.4
2.7	0.302	149.2	2.218	52.6	0.176	40.2	0.290	–67.5
2.8	0.301	146.9	2.156	51.2	0.180	40.9	0.288	–68.1
2.9	0.310	145.5	2.105	49.1	0.186	40.8	0.286	–70.2
3.0	0.319	142.4	2.066	47.0	0.193	40.4	0.277	–73.1
4.0	0.430	116.9	1.595	27.2	0.242	33.1	0.214	–106.7
5.0	0.525	100.8	1.278	10.6	0.286	25.8	0.224	–151.6

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	0.798	–16.1	14.241	164.4	0.016	77.7	0.967	–9.9
0.2	0.759	–32.2	13.202	152.1	0.032	73.3	0.911	–18.7
0.3	0.678	–45.7	12.011	140.4	0.044	67.2	0.837	–25.8
0.4	0.601	–57.9	10.754	130.8	0.054	62.4	0.761	–31.2
0.5	0.531	–68.5	9.663	122.7	0.063	59.4	0.694	–35.4
0.6	0.468	–78.4	8.647	115.6	0.070	57.2	0.635	–38.4
0.7	0.414	–87.8	7.815	110.0	0.076	55.7	0.584	–40.6
0.8	0.372	–96.3	7.086	104.6	0.082	54.8	0.543	–42.4
0.9	0.335	–105.1	6.475	99.9	0.087	54.0	0.508	–43.8
1.0	0.305	–113.2	5.944	95.6	0.092	53.6	0.478	–45.1
1.1	0.281	–121.7	5.494	92.0	0.098	53.1	0.452	–46.3
1.2	0.263	–130.2	5.102	88.7	0.103	52.8	0.430	–47.4
1.3	0.248	–138.9	4.739	85.3	0.108	52.5	0.410	–48.4
1.4	0.239	–146.8	4.439	82.3	0.114	52.2	0.392	–49.6
1.5	0.239	–155.3	4.167	79.5	0.119	51.7	0.377	–50.8
1.6	0.234	–163.6	3.958	76.6	0.124	51.5	0.361	–52.1
1.7	0.234	–170.7	3.734	74.0	0.130	51.1	0.346	–53.3
1.8	0.238	–177.2	3.548	71.4	0.136	50.7	0.333	–54.6
1.9	0.242	176.1	3.373	68.9	0.141	50.2	0.321	–56.0
2.0	0.251	170.7	3.220	66.4	0.147	49.7	0.308	–57.3
2.1	0.253	165.4	3.081	63.8	0.152	49.4	0.295	–58.8
2.2	0.262	160.6	2.949	61.8	0.157	49.0	0.283	–60.5
2.3	0.269	155.2	2.823	59.5	0.162	48.2	0.272	–62.2
2.4	0.277	150.7	2.705	57.2	0.167	47.5	0.260	–64.0
2.5	0.286	146.6	2.606	55.0	0.172	46.9	0.248	–65.8
2.6	0.289	142.7	2.502	53.0	0.176	46.3	0.238	–67.4
2.7	0.293	138.1	2.402	51.3	0.179	46.1	0.227	–68.4
2.8	0.294	136.2	2.328	50.1	0.184	46.4	0.226	–69.2
2.9	0.302	135.5	2.272	48.2	0.192	46.0	0.225	–71.6
3.0	0.314	133.1	2.231	46.2	0.200	45.5	0.217	–75.0
4.0	0.424	112.5	1.716	27.6	0.252	35.9	0.164	–117.4
5.0	0.520	98.9	1.371	12.0	0.297	27.0	0.197	–167.2

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	0.738	–19.7	17.973	161.3	0.016	81.6	0.952	–12.2
0.2	0.679	–38.0	16.180	147.0	0.030	72.4	0.872	–22.2
0.3	0.585	–53.6	14.255	134.4	0.041	66.2	0.777	–29.5
0.4	0.501	–66.6	12.357	124.7	0.049	62.1	0.691	–34.6
0.5	0.437	–78.2	10.826	116.8	0.057	59.7	0.618	–38.1
0.6	0.378	–88.4	9.532	110.0	0.063	58.6	0.560	–40.3
0.7	0.333	–98.2	8.481	104.9	0.069	58.3	0.514	–41.9
0.8	0.298	–107.6	7.618	99.9	0.075	57.8	0.477	–43.1
0.9	0.268	–116.9	6.915	95.8	0.081	57.5	0.446	–44.1
1.0	0.246	–125.5	6.306	91.9	0.086	57.5	0.421	–45.0
1.1	0.230	–135.3	5.803	88.5	0.092	57.0	0.400	–46.0
1.2	0.220	–144.5	5.372	85.4	0.098	56.8	0.381	–46.8
1.3	0.211	–152.6	4.975	82.5	0.104	56.5	0.364	–47.8
1.4	0.212	–160.8	4.649	79.6	0.110	56.1	0.350	–48.8
1.5	0.213	–168.6	4.350	77.1	0.116	55.7	0.336	–50.1
1.6	0.215	–176.3	4.122	74.5	0.121	55.4	0.322	–51.3
1.7	0.220	177.0	3.887	71.9	0.127	54.9	0.309	–52.6
1.8	0.226	170.6	3.690	69.5	0.134	54.3	0.297	–53.9
1.9	0.233	165.6	3.507	67.2	0.140	53.9	0.285	–55.2
2.0	0.241	160.9	3.339	64.9	0.146	53.3	0.273	–56.5
2.1	0.250	155.7	3.196	62.5	0.152	52.8	0.262	–58.3
2.2	0.254	151.9	3.057	60.6	0.157	52.2	0.251	–60.0
2.3	0.265	147.8	2.922	58.4	0.162	51.4	0.241	–61.9
2.4	0.276	143.7	2.804	56.1	0.168	50.6	0.229	–63.9
2.5	0.285	139.9	2.699	54.1	0.173	49.8	0.218	–65.8
2.6	0.291	136.9	2.586	52.4	0.178	49.0	0.208	–67.6
2.7	0.294	132.7	2.479	50.8	0.181	48.8	0.197	–68.5
2.8	0.294	131.4	2.405	49.7	0.187	49.0	0.197	–69.2
2.9	0.301	131.1	2.351	47.7	0.195	48.4	0.196	–72.1
3.0	0.313	129.0	2.306	45.9	0.203	47.7	0.189	–76.0
4.0	0.427	110.5	1.774	27.8	0.257	37.1	0.144	–124.7
5.0	0.521	97.7	1.411	12.5	0.303	27.6	0.191	–175.6

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	0.668	–24.3	22.264	157.9	0.016	76.4	0.932	–14.6
0.2	0.590	–45.9	19.222	141.5	0.028	70.3	0.823	–25.7
0.3	0.486	–62.4	16.245	128.4	0.037	65.2	0.711	–32.9
0.4	0.407	–76.7	13.671	118.7	0.044	62.8	0.619	–37.1
0.5	0.345	–88.8	11.735	111.2	0.051	61.7	0.549	–39.5
0.6	0.298	–100.2	10.178	105.1	0.057	61.3	0.496	–41.0
0.7	0.262	–110.7	8.949	100.4	0.064	61.2	0.454	–41.9
0.8	0.235	–120.6	7.982	95.9	0.070	61.1	0.423	–42.5
0.9	0.215	–131.2	7.200	92.1	0.076	61.1	0.397	–43.1
1.0	0.202	–140.9	6.546	88.6	0.082	61.1	0.376	–43.7
1.1	0.195	–150.3	6.005	85.5	0.088	60.9	0.358	–44.4
1.2	0.193	–158.7	5.531	82.7	0.094	60.5	0.342	–45.2
1.3	0.190	–167.6	5.118	79.9	0.101	60.2	0.329	–46.1
1.4	0.194	–174.1	4.770	77.4	0.107	59.7	0.316	–47.2
1.5	0.205	178.6	4.469	75.0	0.113	59.2	0.304	–48.6
1.6	0.207	171.4	4.230	72.6	0.120	58.8	0.291	–49.8
1.7	0.214	166.1	3.987	70.1	0.126	58.3	0.280	–51.0
1.8	0.222	160.9	3.782	68.0	0.133	57.6	0.269	–52.4
1.9	0.232	156.2	3.587	65.7	0.139	56.8	0.259	–53.9
2.0	0.243	152.4	3.420	63.7	0.146	56.2	0.248	–55.3
2.1	0.250	148.5	3.264	61.3	0.152	55.5	0.237	–57.3
2.2	0.259	145.3	3.126	59.4	0.157	54.8	0.227	–59.2
2.3	0.270	141.6	2.988	57.3	0.164	53.9	0.218	–61.1
2.4	0.279	138.7	2.865	55.2	0.169	52.9	0.206	–63.4
2.5	0.290	134.9	2.751	53.2	0.175	52.0	0.194	–65.6
2.6	0.297	131.7	2.635	51.4	0.179	50.9	0.183	–67.6
2.7	0.300	127.3	2.521	49.9	0.182	50.7	0.171	–67.8
2.8	0.294	126.7	2.447	49.1	0.188	51.2	0.174	–67.6
2.9	0.304	126.7	2.401	47.2	0.198	50.4	0.176	–71.6
3.0	0.319	125.3	2.355	45.3	0.206	49.5	0.169	–76.2
4.0	0.427	108.6	1.801	27.5	0.260	38.0	0.130	–130.8
5.0	0.521	96.8	1.439	12.8	0.306	28.2	0.190	178.1

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	0.503	–36.5	29.728	149.9	0.013	74.0	0.871	–19.4
0.2	0.396	–65.0	23.339	130.9	0.024	69.3	0.710	–31.0
0.3	0.316	–85.6	18.324	118.0	0.031	66.6	0.585	–36.0
0.4	0.263	–102.3	14.692	109.5	0.038	66.8	0.501	–37.9
0.5	0.226	–117.1	12.253	103.0	0.044	66.5	0.445	–38.3
0.6	0.203	–130.4	10.446	97.8	0.051	66.7	0.406	–38.3
0.7	0.193	–142.6	9.086	93.8	0.057	67.4	0.377	–38.1
0.8	0.188	–152.9	8.028	90.1	0.064	67.4	0.356	–38.1
0.9	0.183	–163.3	7.195	86.8	0.071	67.1	0.339	–38.3
1.0	0.184	–171.2	6.511	83.7	0.077	66.9	0.325	–38.6
1.1	0.187	–179.4	5.959	81.1	0.084	66.5	0.313	–39.1
1.2	0.192	175.2	5.473	78.5	0.091	65.9	0.302	–39.8
1.3	0.199	168.7	5.056	76.1	0.098	65.3	0.292	–40.7
1.4	0.205	164.0	4.701	73.9	0.104	64.6	0.283	–41.9
1.5	0.216	159.7	4.403	71.6	0.111	63.9	0.273	–43.3
1.6	0.228	154.6	4.153	69.3	0.118	63.3	0.263	–44.7
1.7	0.236	150.9	3.909	67.2	0.124	62.6	0.253	–46.1
1.8	0.246	147.3	3.708	65.1	0.131	61.7	0.244	–47.5
1.9	0.256	144.0	3.511	63.2	0.138	60.8	0.236	–49.1
2.0	0.266	141.8	3.350	61.2	0.145	59.9	0.226	–50.7
2.1	0.276	138.5	3.195	58.9	0.152	59.1	0.216	–52.8
2.2	0.280	136.5	3.059	57.2	0.157	58.2	0.207	–54.8
2.3	0.295	133.1	2.921	55.2	0.164	57.1	0.198	–56.9
2.4	0.303	130.8	2.799	53.1	0.170	56.1	0.187	–59.2
2.5	0.313	128.5	2.693	51.3	0.176	55.1	0.176	–61.5
2.6	0.320	125.7	2.578	49.6	0.180	54.1	0.166	–63.5
2.7	0.324	122.4	2.468	48.1	0.184	53.7	0.156	–63.7
2.8	0.321	121.4	2.396	47.4	0.190	53.9	0.159	–64.5
2.9	0.330	122.0	2.345	45.3	0.200	52.9	0.160	–68.7
3.0	0.340	120.9	2.302	43.6	0.208	52.0	0.153	–73.6
4.0	0.446	106.4	1.765	26.5	0.264	39.9	0.118	–133.8
5.0	0.539	95.2	1.404	11.9	0.310	29.3	0.187	174.7

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	0.959	–6.5	3.440	172.2	0.017	84.9	0.996	–3.4
0.2	0.952	–13.3	3.397	167.5	0.035	81.2	0.990	–6.8
0.3	0.934	–20.5	3.367	160.8	0.050	77.0	0.978	–10.1
0.4	0.908	–26.9	3.289	154.9	0.066	72.6	0.962	–13.5
0.5	0.886	–33.5	3.229	149.1	0.081	68.6	0.947	–16.5
0.6	0.851	–40.2	3.156	142.8	0.095	64.7	0.926	–19.5
0.7	0.818	–46.7	3.073	137.6	0.107	61.0	0.904	–22.4
0.8	0.786	–53.0	2.988	131.9	0.119	57.6	0.882	–25.2
0.9	0.751	–59.4	2.904	126.6	0.129	54.5	0.857	–27.8
1.0	0.715	–65.6	2.817	121.4	0.137	51.3	0.834	–30.4
1.1	0.679	–72.0	2.734	116.5	0.146	48.4	0.809	–32.7
1.2	0.646	–78.2	2.643	112.0	0.153	45.7	0.786	–34.8
1.3	0.610	–84.5	2.544	107.3	0.159	43.1	0.762	–36.8
1.4	0.581	–90.7	2.461	102.9	0.164	40.6	0.739	–38.9
1.5	0.553	–97.5	2.384	98.6	0.169	38.4	0.717	–40.8
1.6	0.523	–103.7	2.320	94.6	0.173	36.4	0.696	–42.7
1.7	0.499	–110.4	2.237	90.4	0.177	34.4	0.675	–44.5
1.8	0.475	–117.1	2.159	86.5	0.179	32.8	0.657	–46.1
1.9	0.458	–123.6	2.091	82.7	0.182	31.1	0.639	–47.6
2.0	0.440	–130.6	2.025	79.2	0.184	29.8	0.621	–49.2
2.1	0.425	–137.1	1.972	75.3	0.185	28.8	0.603	–50.8
2.2	0.412	–143.0	1.908	72.3	0.185	27.6	0.587	–52.3
2.3	0.400	–150.6	1.850	68.9	0.186	26.4	0.571	–53.8
2.4	0.391	–157.0	1.791	65.7	0.185	25.2	0.557	–55.4
2.5	0.384	–163.7	1.738	62.5	0.185	24.1	0.543	–56.9
2.6	0.375	–169.8	1.677	59.7	0.184	23.0	0.528	–58.5
2.7	0.361	–175.8	1.612	57.1	0.180	22.7	0.516	–59.6
2.8	0.357	–178.9	1.573	55.5	0.176	23.9	0.516	–60.6
2.9	0.365	177.6	1.542	53.0	0.180	24.4	0.512	–62.1
3.0	0.370	172.0	1.519	50.3	0.183	24.6	0.500	–64.6
4.0	0.446	132.0	1.203	26.9	0.205	24.1	0.431	–88.0
5.0	0.526	109.6	0.967	8.1	0.241	24.0	0.411	–121.8

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	0.873	–11.4	9.469	168.4	0.016	83.4	0.983	–6.6
0.2	0.855	–23.0	9.072	159.1	0.032	77.1	0.956	–12.9
0.3	0.801	–34.0	8.645	149.4	0.046	71.3	0.914	–18.5
0.4	0.742	–43.8	8.074	141.0	0.058	66.2	0.864	–23.4
0.5	0.683	–53.0	7.553	133.2	0.068	61.8	0.814	–27.6
0.6	0.624	–61.9	7.004	126.0	0.077	58.6	0.766	–31.1
0.7	0.569	–70.1	6.508	120.1	0.084	55.9	0.720	–33.9
0.8	0.519	–78.0	6.031	114.1	0.091	53.8	0.680	–36.4
0.9	0.472	–85.5	5.613	109.0	0.096	52.1	0.643	–38.4
1.0	0.431	–92.8	5.234	104.1	0.102	50.6	0.610	–40.3
1.1	0.396	–100.2	4.907	99.9	0.107	49.5	0.581	–41.8
1.2	0.366	–107.5	4.597	95.9	0.111	48.5	0.554	–43.2
1.3	0.337	–115.1	4.307	92.1	0.116	47.8	0.530	–44.6
1.4	0.319	–122.4	4.054	88.7	0.120	46.9	0.507	–45.8
1.5	0.302	–130.4	3.841	85.3	0.124	46.3	0.489	–47.1
1.6	0.286	–137.9	3.664	82.1	0.128	45.9	0.470	–48.5
1.7	0.279	–145.8	3.473	79.0	0.133	45.4	0.454	–49.8
1.8	0.270	–153.5	3.305	76.0	0.137	45.0	0.438	–50.8
1.9	0.266	–160.7	3.152	73.3	0.142	44.5	0.423	–52.0
2.0	0.266	–168.1	3.020	70.6	0.146	44.3	0.409	–53.2
2.1	0.264	–174.7	2.892	67.6	0.150	44.0	0.394	–54.5
2.2	0.268	179.9	2.779	65.3	0.154	43.6	0.382	–55.9
2.3	0.269	173.2	2.668	62.8	0.158	43.2	0.369	–57.3
2.4	0.275	167.1	2.564	60.2	0.161	42.6	0.356	–58.8
2.5	0.278	161.5	2.469	57.8	0.165	42.1	0.343	–60.2
2.6	0.281	156.0	2.370	55.5	0.168	41.7	0.332	–61.5
2.7	0.282	151.1	2.274	53.7	0.170	41.7	0.320	–62.1
2.8	0.279	148.4	2.209	52.5	0.173	42.6	0.320	–62.8
2.9	0.290	147.2	2.158	50.3	0.180	42.5	0.319	–64.6
3.0	0.300	144.0	2.118	48.2	0.187	42.2	0.310	–67.3
4.0	0.407	117.6	1.638	28.4	0.235	34.8	0.240	–97.5
5.0	0.496	102.2	1.312	12.1	0.280	27.5	0.231	–140.8

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	0.814	–16.1	14.203	164.8	0.015	81.6	0.970	–9.2
0.2	0.769	–30.5	13.198	152.8	0.030	74.7	0.918	–17.4
0.3	0.685	–43.5	12.084	141.3	0.042	68.3	0.849	–24.0
0.4	0.611	–55.3	10.862	131.9	0.051	63.7	0.778	–29.1
0.5	0.544	–65.4	9.785	123.8	0.059	60.7	0.712	–32.8
0.6	0.477	–74.8	8.798	116.8	0.066	58.3	0.655	–35.7
0.7	0.423	–83.8	7.960	111.1	0.072	56.8	0.607	–37.7
0.8	0.378	–91.8	7.237	105.8	0.078	55.9	0.568	–39.3
0.9	0.337	–100.3	6.628	101.2	0.083	55.2	0.533	–40.9
1.0	0.306	–108.2	6.085	96.9	0.088	54.7	0.504	–41.9
1.1	0.279	–116.3	5.645	93.1	0.094	54.3	0.480	–42.9
1.2	0.258	–124.6	5.231	89.6	0.099	53.9	0.458	–43.9
1.3	0.242	–132.9	4.861	86.4	0.104	53.6	0.439	–44.8
1.4	0.232	–140.9	4.564	83.4	0.109	53.3	0.421	–45.9
1.5	0.228	–149.6	4.282	80.5	0.114	52.9	0.405	–47.1
1.6	0.221	–157.6	4.071	77.7	0.120	52.6	0.391	–48.3
1.7	0.221	–166.2	3.842	75.0	0.125	52.3	0.376	–49.4
1.8	0.221	–173.7	3.653	72.4	0.131	51.8	0.363	–50.5
1.9	0.225	179.7	3.473	70.0	0.136	51.5	0.351	–51.6
2.0	0.229	173.8	3.316	67.5	0.141	51.0	0.338	–52.8
2.1	0.236	168.4	3.172	65.0	0.147	50.7	0.327	–54.2
2.2	0.240	163.0	3.040	62.9	0.151	50.2	0.315	–55.7
2.3	0.248	157.3	2.913	60.6	0.157	49.5	0.304	–57.2
2.4	0.258	152.5	2.793	58.3	0.162	48.8	0.292	–58.8
2.5	0.264	147.7	2.687	56.1	0.166	48.2	0.280	–60.3
2.6	0.269	143.7	2.580	54.2	0.170	47.4	0.269	–61.7
2.7	0.270	138.9	2.472	52.6	0.173	47.3	0.258	–62.5
2.8	0.270	137.4	2.401	51.4	0.178	47.6	0.258	–63.0
2.9	0.279	136.4	2.342	49.4	0.186	47.2	0.257	–65.5
3.0	0.293	134.2	2.302	47.5	0.194	46.6	0.248	–68.6
4.0	0.401	112.8	1.768	28.9	0.246	37.0	0.185	–105.2
5.0	0.494	99.8	1.413	13.4	0.291	28.2	0.194	–155.2

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	0.748	–19.7	17.954	161.9	0.015	80.1	0.956	–11.2
0.2	0.689	–36.3	16.223	148.0	0.028	73.1	0.883	–20.6
0.3	0.602	–50.6	14.364	135.6	0.039	66.9	0.795	–27.5
0.4	0.516	–62.8	12.538	125.9	0.047	62.9	0.711	–32.2
0.5	0.448	–74.0	11.028	118.0	0.054	60.8	0.640	–35.4
0.6	0.388	–83.9	9.737	111.3	0.060	59.6	0.585	–37.5
0.7	0.338	–93.2	8.687	106.1	0.066	59.1	0.540	–38.9
0.8	0.300	–101.6	7.815	101.2	0.072	58.7	0.503	–40.0
0.9	0.267	–110.5	7.097	96.9	0.077	58.5	0.474	–40.9
1.0	0.242	–119.1	6.487	93.1	0.083	58.1	0.449	–41.7
1.1	0.223	–128.4	5.973	89.6	0.089	58.1	0.428	–42.5
1.2	0.213	–137.0	5.528	86.3	0.094	57.7	0.409	–43.1
1.3	0.202	–146.1	5.117	83.5	0.100	57.5	0.394	–44.0
1.4	0.197	–154.4	4.780	80.8	0.106	57.1	0.379	–45.0
1.5	0.199	–163.3	4.483	78.1	0.111	56.7	0.365	–46.1
1.6	0.195	–171.6	4.244	75.5	0.117	56.5	0.352	–47.3
1.7	0.199	–179.1	4.011	73.0	0.123	56.0	0.339	–48.4
1.8	0.207	174.1	3.808	70.6	0.129	55.5	0.327	–49.5
1.9	0.211	167.8	3.617	68.2	0.135	54.9	0.317	–50.8
2.0	0.221	163.0	3.451	65.9	0.141	54.5	0.305	–51.9
2.1	0.227	157.8	3.296	63.5	0.146	54.0	0.293	–53.6
2.2	0.232	154.1	3.159	61.5	0.152	53.3	0.283	–55.2
2.3	0.244	149.2	3.025	59.4	0.157	52.4	0.273	–56.7
2.4	0.253	145.3	2.896	57.2	0.163	51.7	0.261	–58.4
2.5	0.261	141.1	2.790	55.1	0.167	51.0	0.249	–59.9
2.6	0.265	137.3	2.673	53.5	0.172	50.2	0.239	–61.4
2.7	0.270	132.8	2.564	51.8	0.176	49.8	0.229	–62.3
2.8	0.270	131.1	2.485	50.8	0.181	50.1	0.229	–62.9
2.9	0.279	131.1	2.427	48.8	0.189	49.5	0.228	–65.5
3.0	0.288	128.9	2.380	46.9	0.197	48.7	0.220	–68.9
4.0	0.399	110.9	1.828	29.1	0.251	38.3	0.161	–110.6
5.0	0.490	98.6	1.460	13.8	0.296	28.6	0.183	–163.8

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	0.688	–23.3	22.283	158.5	0.014	79.2	0.938	–13.5
0.2	0.597	–42.7	19.400	142.6	0.026	70.3	0.837	–23.9
0.3	0.505	–58.7	16.494	129.6	0.035	66.0	0.730	–30.6
0.4	0.418	–72.1	13.956	120.0	0.043	63.9	0.641	–34.6
0.5	0.354	–83.3	12.029	112.5	0.049	62.6	0.573	–36.8
0.6	0.303	–93.5	10.453	106.3	0.055	62.1	0.522	–38.1
0.7	0.263	–103.9	9.233	101.6	0.061	62.1	0.481	–38.9
0.8	0.235	–113.5	8.223	97.0	0.067	62.1	0.450	–39.6
0.9	0.211	–123.8	7.438	93.2	0.073	61.9	0.424	–40.1
1.0	0.195	–132.7	6.753	89.6	0.079	61.9	0.404	–40.6
1.1	0.181	–143.1	6.211	86.6	0.085	61.6	0.386	–41.2
1.2	0.177	–151.3	5.726	83.7	0.091	61.3	0.371	–41.8
1.3	0.173	–161.2	5.289	81.0	0.097	61.0	0.357	–42.7
1.4	0.174	–169.3	4.933	78.3	0.103	60.5	0.345	–43.6
1.5	0.183	–176.7	4.625	75.9	0.109	60.1	0.333	–44.7
1.6	0.184	175.2	4.376	73.6	0.116	59.6	0.321	–45.9
1.7	0.192	169.3	4.122	71.3	0.122	59.2	0.310	–47.1
1.8	0.200	163.8	3.915	69.0	0.128	58.4	0.300	–48.3
1.9	0.208	159.0	3.715	67.0	0.135	57.8	0.290	–49.6
2.0	0.217	154.5	3.542	64.8	0.141	57.1	0.279	–50.9
2.1	0.224	150.0	3.385	62.5	0.147	56.6	0.268	–52.4
2.2	0.232	146.0	3.237	60.7	0.153	55.8	0.259	–54.1
2.3	0.243	142.2	3.095	58.5	0.158	54.8	0.248	–55.8
2.4	0.255	139.0	2.968	56.5	0.164	54.0	0.237	–57.6
2.5	0.263	135.6	2.855	54.5	0.169	53.1	0.226	–59.4
2.6	0.269	132.4	2.739	52.9	0.174	52.2	0.216	–60.9
2.7	0.275	127.8	2.624	51.4	0.178	51.9	0.206	–61.6
2.8	0.274	127.1	2.543	50.3	0.184	51.9	0.206	–62.3
2.9	0.282	127.2	2.483	48.5	0.192	51.3	0.206	–65.2
3.0	0.290	125.6	2.434	46.6	0.200	50.4	0.197	–69.0
4.0	0.401	109.1	1.868	29.2	0.254	39.1	0.143	–115.7
5.0	0.493	97.7	1.490	14.4	0.299	29.2	0.178	–171.0

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	0.520	–33.1	30.236	151.1	0.013	79.6	0.885	–18.0
0.2	0.420	–59.2	24.043	132.4	0.022	69.4	0.733	–28.9
0.3	0.330	–77.6	19.027	119.6	0.030	68.5	0.612	–33.8
0.4	0.265	–92.4	15.371	110.8	0.036	67.2	0.528	–35.7
0.5	0.221	–106.8	12.856	104.4	0.043	67.6	0.473	–36.0
0.6	0.195	–119.6	10.974	99.1	0.049	67.5	0.434	–36.0
0.7	0.176	–131.4	9.567	95.1	0.055	68.0	0.405	–35.8
0.8	0.167	–142.4	8.457	91.4	0.062	68.0	0.383	–35.9
0.9	0.158	–153.7	7.585	88.1	0.068	68.0	0.366	–36.0
1.0	0.155	–163.2	6.875	85.0	0.075	67.6	0.352	–36.3
1.1	0.157	–172.6	6.291	82.3	0.081	67.0	0.340	–36.8
1.2	0.160	–179.8	5.782	79.9	0.088	66.7	0.329	–37.3
1.3	0.167	172.4	5.332	77.5	0.095	65.9	0.320	–38.2
1.4	0.174	167.6	4.965	75.3	0.101	65.2	0.310	–39.4
1.5	0.187	162.1	4.645	73.0	0.107	64.7	0.300	–40.8
1.6	0.194	157.3	4.383	70.8	0.114	64.1	0.290	–41.9
1.7	0.203	152.3	4.137	68.6	0.121	63.3	0.281	–43.1
1.8	0.212	148.6	3.925	66.6	0.128	62.5	0.271	–44.5
1.9	0.223	145.5	3.721	64.4	0.134	61.5	0.263	–46.0
2.0	0.233	142.3	3.546	62.4	0.141	60.6	0.254	–47.5
2.1	0.243	139.5	3.381	60.3	0.147	59.9	0.244	–49.2
2.2	0.248	136.7	3.243	58.5	0.153	58.9	0.235	–50.9
2.3	0.261	134.2	3.098	56.5	0.159	57.9	0.225	–52.9
2.4	0.272	131.5	2.969	54.6	0.165	56.8	0.214	–54.9
2.5	0.283	128.5	2.857	52.5	0.171	55.8	0.201	–57.1
2.6	0.289	125.3	2.722	50.8	0.175	54.5	0.189	–58.7
2.7	0.293	120.7	2.592	49.5	0.177	54.1	0.176	–57.4
2.8	0.282	120.7	2.529	49.4	0.184	55.2	0.187	–56.8
2.9	0.295	122.3	2.489	47.2	0.195	54.1	0.189	–62.1
3.0	0.308	120.7	2.437	45.2	0.203	52.9	0.179	–66.7
4.0	0.415	106.8	1.863	28.3	0.257	40.8	0.126	–118.7
5.0	0.505	96.3	1.488	13.7	0.304	30.2	0.173	–176.5

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	0.965	–27.0	3.736	162.2	0.048	72.8	0.976	–9.6
0.2	0.917	–51.4	3.351	145.0	0.091	59.9	0.923	–18.3
0.3	0.881	–73.6	3.000	131.0	0.119	48.1	0.860	–25.2
0.4	0.851	–91.6	2.650	118.4	0.139	38.6	0.801	–30.4
0.5	0.817	–106.7	2.334	108.4	0.150	30.8	0.750	–34.7
0.6	0.799	–119.2	2.081	99.7	0.156	24.4	0.709	–38.4
0.7	0.788	–130.2	1.868	92.1	0.158	19.4	0.678	–41.7
0.8	0.772	–139.3	1.692	85.2	0.157	15.3	0.654	–44.9
0.9	0.764	–147.4	1.536	78.9	0.154	11.8	0.634	–48.1
1.0	0.759	–154.5	1.415	73.3	0.150	9.2	0.619	–51.4
1.1	0.760	–161.1	1.309	68.0	0.144	7.2	0.607	–54.9
1.2	0.760	–166.9	1.221	63.3	0.137	5.9	0.597	–58.3
1.3	0.761	–171.9	1.141	58.5	0.130	5.3	0.590	–62.1
1.4	0.761	–177.0	1.075	54.4	0.122	5.6	0.585	–66.0
1.5	0.762	178.2	1.013	50.2	0.113	6.9	0.580	–70.2
1.6	0.768	174.0	0.958	46.7	0.106	9.1	0.578	–74.5
1.7	0.772	169.7	0.907	42.6	0.099	13.2	0.574	–79.1
1.8	0.774	166.0	0.865	39.6	0.094	18.4	0.573	–83.8
1.9	0.777	161.9	0.820	36.1	0.091	25.0	0.573	–88.7
2.0	0.782	158.4	0.782	32.9	0.091	32.4	0.574	–93.8
2.1	0.790	155.0	0.746	29.8	0.095	39.7	0.575	–99.1
2.2	0.790	151.5	0.714	27.2	0.101	46.2	0.577	–104.4
2.3	0.796	148.7	0.681	25.0	0.111	51.2	0.580	–109.9
2.4	0.801	145.7	0.650	22.8	0.123	55.0	0.585	–115.4
2.5	0.804	143.0	0.623	21.1	0.138	57.3	0.589	–120.8
2.6	0.807	140.6	0.599	19.6	0.154	58.8	0.595	–125.8
2.7	0.805	138.3	0.578	17.9	0.171	58.1	0.597	–131.1
2.8	0.799	136.5	0.561	16.3	0.184	55.2	0.599	–135.9
2.9	0.807	135.1	0.540	14.8	0.187	54.8	0.604	–140.7
3.0	0.819	132.5	0.518	14.7	0.199	56.5	0.615	–146.0
4.0	0.835	112.3	0.439	9.6	0.350	40.0	0.680	166.3
5.0	0.839	100.0	0.431	4.4	0.414	20.9	0.733	131.2

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	0.872	–42.1	9.948	153.6	0.047	67.2	0.920	–19.2
0.2	0.803	–74.2	8.068	133.6	0.076	51.9	0.782	–33.2
0.3	0.749	–99.3	6.555	118.8	0.092	41.3	0.657	–41.9
0.4	0.711	–117.6	5.397	107.6	0.101	34.9	0.563	–47.3
0.5	0.686	–131.4	4.530	99.4	0.105	30.8	0.496	–51.0
0.6	0.676	–142.1	3.904	92.4	0.108	28.1	0.448	–53.9
0.7	0.672	–150.9	3.423	86.5	0.109	26.9	0.414	–56.3
0.8	0.663	–158.6	3.037	81.2	0.110	26.5	0.388	–58.8
0.9	0.657	–164.6	2.723	76.4	0.110	26.5	0.368	–61.2
1.0	0.659	–170.3	2.479	72.0	0.110	27.2	0.352	–64.1
1.1	0.664	–175.3	2.276	67.8	0.110	28.4	0.339	–67.1
1.2	0.665	–179.7	2.107	64.1	0.111	29.9	0.329	–70.3
1.3	0.670	176.3	1.957	60.2	0.112	31.6	0.321	–73.8
1.4	0.673	172.4	1.834	56.7	0.114	33.6	0.316	–77.7
1.5	0.675	168.7	1.721	53.1	0.115	35.9	0.310	–81.8
1.6	0.683	165.5	1.628	50.0	0.119	38.1	0.307	–86.1
1.7	0.687	161.9	1.538	46.5	0.123	40.4	0.305	–90.7
1.8	0.691	158.9	1.462	43.5	0.127	42.5	0.305	–95.7
1.9	0.692	155.5	1.383	40.4	0.132	44.4	0.305	–100.7
2.0	0.700	152.9	1.319	37.1	0.139	46.3	0.307	–105.9
2.1	0.710	149.8	1.267	34.2	0.146	47.7	0.310	–111.2
2.2	0.713	147.6	1.212	31.4	0.155	49.1	0.315	–116.6
2.3	0.721	144.7	1.160	29.0	0.163	49.8	0.321	–122.1
2.4	0.726	142.6	1.111	26.5	0.172	50.3	0.329	–127.4
2.5	0.732	140.2	1.065	23.9	0.183	50.4	0.337	–132.6
2.6	0.734	138.3	1.021	21.7	0.195	50.5	0.349	–137.3
2.7	0.738	136.4	0.987	19.2	0.207	49.5	0.358	–142.1
2.8	0.738	135.1	0.949	17.2	0.215	47.2	0.368	–146.4
2.9	0.746	133.8	0.922	15.1	0.216	46.8	0.380	–151.3
3.0	0.761	131.5	0.888	13.7	0.223	47.9	0.391	–156.1
4.0	0.805	113.1	0.653	–2.1	0.339	36.0	0.514	161.5
5.0	0.832	100.8	0.524	–9.2	0.403	20.1	0.634	130.0

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	0.808	–54.5	14.785	147.1	0.042	63.2	0.862	–27.2
0.2	0.723	–90.2	11.072	125.7	0.065	48.0	0.668	–44.2
0.3	0.670	–115.4	8.482	111.6	0.075	39.9	0.525	–53.6
0.4	0.644	–132.7	6.752	101.7	0.081	36.6	0.430	–59.0
0.5	0.630	–144.8	5.565	94.6	0.086	35.3	0.367	–62.7
0.6	0.624	–153.8	4.739	88.7	0.089	35.0	0.323	–65.7
0.7	0.626	–161.2	4.123	83.6	0.092	35.6	0.292	–68.2
0.8	0.621	–167.5	3.637	79.0	0.095	36.8	0.268	–70.8
0.9	0.618	–172.7	3.250	74.9	0.098	37.7	0.250	–73.6
1.0	0.620	–177.6	2.951	70.9	0.102	39.2	0.236	–76.8
1.1	0.627	178.2	2.697	67.2	0.106	40.8	0.225	–80.2
1.2	0.630	174.2	2.497	63.8	0.111	42.2	0.217	–83.7
1.3	0.633	171.0	2.314	60.2	0.116	43.5	0.210	–87.9
1.4	0.638	167.5	2.164	57.1	0.121	44.8	0.206	–92.3
1.5	0.642	164.4	2.030	53.9	0.126	46.0	0.202	–97.0
1.6	0.648	161.4	1.913	50.9	0.133	46.9	0.201	–102.1
1.7	0.653	158.3	1.808	47.8	0.139	47.8	0.200	–107.2
1.8	0.658	155.6	1.718	44.9	0.146	48.5	0.202	–112.8
1.9	0.663	152.6	1.626	42.0	0.153	49.0	0.205	–118.3
2.0	0.668	150.1	1.550	38.9	0.161	49.5	0.209	–123.8
2.1	0.679	147.3	1.485	36.1	0.169	49.6	0.215	–129.3
2.2	0.684	145.0	1.423	33.5	0.177	49.9	0.222	–134.7
2.3	0.690	143.0	1.363	31.2	0.185	49.6	0.231	–140.0
2.4	0.696	141.0	1.305	28.7	0.194	49.3	0.241	–145.0
2.5	0.702	138.7	1.255	26.3	0.204	48.8	0.251	–149.7
2.6	0.706	137.0	1.204	24.1	0.214	48.3	0.264	–153.7
2.7	0.711	135.4	1.164	21.7	0.225	46.9	0.275	–157.8
2.8	0.712	134.6	1.120	19.5	0.231	44.7	0.288	–161.5
2.9	0.724	133.0	1.097	17.4	0.231	44.3	0.301	–165.7
3.0	0.734	130.9	1.057	15.8	0.238	44.9	0.313	–170.0
4.0	0.786	113.8	0.781	–2.0	0.337	33.5	0.444	154.1
5.0	0.828	101.5	0.607	–12.2	0.396	19.2	0.583	127.0

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	0.755	–64.8	18.527	142.0	0.039	60.2	0.810	–33.8
0.2	0.665	–103.0	12.986	120.2	0.057	47.1	0.583	–52.7
0.3	0.630	–126.4	9.602	107.2	0.065	40.9	0.440	–62.5
0.4	0.609	–142.1	7.511	98.2	0.071	40.0	0.351	–68.5
0.5	0.604	–152.9	6.153	91.9	0.076	40.4	0.293	–72.6
0.6	0.601	–161.1	5.211	86.4	0.080	40.9	0.254	–76.4
0.7	0.604	–167.1	4.510	81.9	0.085	42.5	0.226	–79.5
0.8	0.599	–172.8	3.967	77.6	0.090	43.9	0.205	–83.0
0.9	0.599	–177.6	3.541	73.8	0.095	45.2	0.190	–86.5
1.0	0.603	178.2	3.213	70.3	0.101	46.6	0.178	–90.7
1.1	0.609	174.4	2.932	66.7	0.107	47.8	0.169	–94.8
1.2	0.612	171.1	2.707	63.6	0.114	48.7	0.163	–99.3
1.3	0.616	167.9	2.507	60.2	0.120	49.3	0.158	–104.4
1.4	0.622	164.6	2.344	57.2	0.127	50.0	0.156	–109.5
1.5	0.624	161.9	2.198	54.2	0.134	50.5	0.155	–115.1
1.6	0.634	159.1	2.070	51.4	0.141	50.8	0.156	–120.6
1.7	0.637	156.2	1.958	48.3	0.149	51.0	0.158	–126.3
1.8	0.643	153.6	1.857	45.5	0.157	51.1	0.162	–132.1
1.9	0.648	151.1	1.759	43.0	0.164	50.9	0.168	–137.4
2.0	0.654	148.3	1.674	39.9	0.173	50.9	0.175	–142.4
2.1	0.666	145.9	1.606	37.2	0.181	50.6	0.183	–147.8
2.2	0.669	143.7	1.541	34.7	0.190	50.3	0.191	–152.4
2.3	0.677	141.7	1.475	32.4	0.198	49.7	0.202	–157.0
2.4	0.683	139.8	1.414	30.1	0.207	49.0	0.213	–161.2
2.5	0.686	137.8	1.359	27.7	0.216	48.2	0.225	–165.1
2.6	0.688	136.1	1.303	25.3	0.226	47.3	0.238	–168.5
2.7	0.696	134.7	1.259	23.0	0.235	45.7	0.249	–171.9
2.8	0.697	133.7	1.213	20.9	0.241	43.4	0.263	–174.6
2.9	0.709	132.3	1.187	18.8	0.240	43.0	0.277	–178.3
3.0	0.720	130.1	1.147	17.2	0.247	43.5	0.288	177.9
4.0	0.775	113.6	0.857	–1.2	0.337	31.9	0.417	147.2
5.0	0.821	101.9	0.659	–12.8	0.393	18.6	0.556	124.1

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	0.678	–78.4	22.639	135.8	0.035	56.2	0.739	–41.9
0.2	0.611	–115.5	14.824	114.8	0.049	46.1	0.495	–62.6
0.3	0.590	–137.9	10.608	102.9	0.056	44.2	0.360	–73.3
0.4	0.576	–151.7	8.185	94.9	0.062	44.9	0.282	–80.5
0.5	0.578	–160.9	6.653	89.4	0.068	46.5	0.233	–86.1
0.6	0.581	–167.5	5.608	84.6	0.074	48.2	0.200	–91.5
0.7	0.583	–172.9	4.852	80.4	0.081	49.7	0.177	–96.3
0.8	0.581	–178.0	4.258	76.5	0.088	51.1	0.160	–101.5
0.9	0.584	178.2	3.802	73.0	0.095	52.1	0.148	–106.6
1.0	0.588	174.4	3.439	69.7	0.102	52.9	0.140	–112.3
1.1	0.595	171.1	3.136	66.4	0.110	53.6	0.135	–117.8
1.2	0.599	167.9	2.895	63.5	0.118	54.0	0.132	–123.6
1.3	0.603	165.2	2.678	60.2	0.126	54.0	0.131	–129.4
1.4	0.608	162.2	2.505	57.4	0.134	54.0	0.133	–135.0
1.5	0.612	159.5	2.345	54.3	0.142	54.0	0.135	–140.8
1.6	0.619	157.0	2.209	51.8	0.150	53.8	0.139	–146.1
1.7	0.624	154.2	2.084	48.9	0.159	53.4	0.144	–151.3
1.8	0.630	151.8	1.979	46.3	0.167	53.0	0.151	–156.2
1.9	0.634	149.3	1.873	43.7	0.175	52.4	0.159	–160.9
2.0	0.640	147.0	1.784	40.7	0.184	51.8	0.168	–165.0
2.1	0.652	144.6	1.710	38.3	0.192	51.2	0.178	–168.9
2.2	0.658	142.5	1.638	35.8	0.201	50.5	0.188	–172.5
2.3	0.666	140.7	1.569	33.5	0.209	49.6	0.199	–176.0
2.4	0.671	138.8	1.506	31.2	0.218	48.7	0.211	–179.1
2.5	0.673	136.7	1.448	29.0	0.227	47.5	0.223	178.0
2.6	0.680	135.1	1.385	26.7	0.236	46.5	0.235	176.0
2.7	0.683	134.0	1.341	24.5	0.246	44.9	0.247	173.5
2.8	0.686	133.0	1.291	22.4	0.250	42.5	0.260	171.7
2.9	0.700	131.8	1.269	20.2	0.249	42.1	0.274	168.8
3.0	0.709	129.6	1.228	18.7	0.256	42.4	0.284	165.4
4.0	0.763	113.6	0.920	0.2	0.339	30.4	0.405	139.9
5.0	0.815	102.1	0.712	–12.4	0.390	17.7	0.538	120.3

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	0.566	–106.6	29.358	124.3	0.027	53.0	0.587	–59.7
0.2	0.555	–140.3	17.276	106.2	0.036	50.7	0.356	–84.1
0.3	0.552	–156.5	11.889	96.6	0.044	53.6	0.256	–98.5
0.4	0.555	–165.9	9.024	90.3	0.053	56.9	0.205	–110.1
0.5	0.559	–172.4	7.285	85.9	0.061	58.5	0.176	–119.7
0.6	0.563	–177.3	6.118	81.6	0.070	60.0	0.159	–128.8
0.7	0.566	178.5	5.264	78.0	0.079	60.8	0.149	–136.7
0.8	0.570	175.1	4.623	74.7	0.089	61.4	0.144	–143.8
0.9	0.569	171.7	4.111	71.7	0.098	61.4	0.142	–150.4
1.0	0.573	168.6	3.719	68.6	0.107	61.1	0.143	–156.3
1.1	0.581	166.0	3.391	65.7	0.117	60.9	0.145	–161.6
1.2	0.585	163.4	3.122	63.0	0.126	60.3	0.148	–166.2
1.3	0.589	160.9	2.886	60.0	0.136	59.5	0.153	–170.6
1.4	0.595	158.5	2.693	57.3	0.145	58.8	0.159	–174.5
1.5	0.600	156.1	2.525	54.7	0.154	58.0	0.166	–178.4
1.6	0.607	153.7	2.377	52.1	0.163	57.0	0.174	178.4
1.7	0.611	151.5	2.239	49.4	0.173	56.1	0.181	175.1
1.8	0.618	149.2	2.123	46.9	0.182	55.2	0.190	172.3
1.9	0.623	146.8	2.008	44.6	0.191	53.9	0.200	169.5
2.0	0.629	144.5	1.914	41.7	0.200	52.9	0.209	167.1
2.1	0.640	142.5	1.829	39.3	0.208	51.8	0.220	164.9
2.2	0.646	140.6	1.752	37.0	0.217	50.7	0.229	162.7
2.3	0.653	138.9	1.680	34.9	0.226	49.6	0.240	160.6
2.4	0.658	137.1	1.611	32.8	0.234	48.3	0.251	158.7
2.5	0.663	135.1	1.551	30.5	0.243	46.8	0.262	156.9
2.6	0.668	133.6	1.485	28.5	0.252	45.6	0.272	155.6
2.7	0.673	132.6	1.437	26.4	0.261	43.7	0.282	154.1
2.8	0.675	131.9	1.387	24.2	0.264	41.3	0.293	153.2
2.9	0.690	130.5	1.361	22.3	0.263	40.9	0.307	151.2
3.0	0.699	128.4	1.319	20.9	0.269	40.9	0.316	148.3
4.0	0.752	113.4	0.995	2.5	0.343	28.1	0.417	128.3
5.0	0.806	102.3	0.782	–11.0	0.387	16.1	0.530	113.4

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	0.968	–25.9	3.633	163.3	0.042	74.6	0.980	–8.6
0.2	0.926	–49.1	3.275	146.8	0.081	61.6	0.936	–16.2
0.3	0.892	–70.2	2.959	133.2	0.107	49.8	0.881	–22.5
0.4	0.858	–88.2	2.633	120.9	0.126	40.6	0.827	–27.4
0.5	0.829	–103.2	2.337	111.0	0.137	32.8	0.782	–31.4
0.6	0.806	–116.1	2.092	102.2	0.143	26.3	0.745	–34.9
0.7	0.793	–127.1	1.888	94.7	0.145	21.3	0.715	–37.9
0.8	0.780	–136.4	1.710	87.7	0.145	17.2	0.691	–41.0
0.9	0.767	–144.6	1.558	81.5	0.142	13.6	0.673	–44.0
1.0	0.765	–152.0	1.434	75.9	0.138	11.1	0.657	–47.0
1.1	0.763	–158.9	1.329	70.7	0.132	9.0	0.644	–50.4
1.2	0.764	–164.9	1.240	65.9	0.126	7.8	0.635	–53.7
1.3	0.765	–170.2	1.163	61.3	0.119	7.3	0.627	–57.2
1.4	0.764	–175.3	1.093	57.2	0.111	7.6	0.622	–60.8
1.5	0.766	179.8	1.031	53.0	0.103	9.2	0.617	–64.6
1.6	0.767	175.4	0.974	49.4	0.096	12.0	0.613	–68.7
1.7	0.771	170.9	0.927	45.5	0.090	16.5	0.610	–73.1
1.8	0.775	167.1	0.883	42.3	0.085	22.5	0.608	–77.5
1.9	0.774	163.2	0.835	39.0	0.083	29.8	0.607	–82.0
2.0	0.780	159.3	0.798	35.4	0.084	38.0	0.607	–86.8
2.1	0.788	155.8	0.764	32.4	0.088	45.6	0.606	–91.9
2.2	0.788	152.4	0.732	30.0	0.095	52.4	0.606	–96.9
2.3	0.793	149.5	0.698	27.7	0.106	57.4	0.607	–102.3
2.4	0.799	146.5	0.666	25.5	0.119	60.9	0.610	–107.6
2.5	0.801	143.6	0.639	23.7	0.134	62.9	0.612	–112.9
2.6	0.802	141.2	0.609	22.4	0.151	63.7	0.616	–118.2
2.7	0.802	138.8	0.593	20.6	0.169	62.8	0.616	–123.4
2.8	0.797	137.2	0.573	18.8	0.181	59.7	0.615	–128.2
2.9	0.803	135.5	0.556	17.3	0.185	59.5	0.619	–133.2
3.0	0.816	133.1	0.533	17.1	0.198	60.8	0.627	–138.5
4.0	0.832	112.4	0.449	11.2	0.354	43.0	0.680	172.5
5.0	0.835	100.1	0.439	5.5	0.420	23.0	0.729	135.5

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	0.894	–39.0	9.913	155.4	0.041	68.7	0.931	–16.9
0.2	0.812	–69.8	8.186	135.8	0.069	53.9	0.809	–29.4
0.3	0.754	–94.4	6.751	121.2	0.084	43.5	0.692	–37.3
0.4	0.711	–113.0	5.612	109.9	0.093	37.0	0.602	–42.2
0.5	0.688	–127.2	4.735	101.7	0.098	32.5	0.537	–45.5
0.6	0.672	–138.3	4.103	94.5	0.100	29.8	0.490	–48.1
0.7	0.664	–147.4	3.594	88.7	0.101	28.5	0.456	–50.0
0.8	0.656	–155.2	3.198	83.2	0.102	27.9	0.429	–52.3
0.9	0.651	–161.8	2.869	78.4	0.102	28.0	0.409	–54.4
1.0	0.653	–167.5	2.612	74.1	0.102	28.8	0.393	–56.8
1.1	0.654	–172.9	2.399	69.9	0.102	30.2	0.380	–59.4
1.2	0.656	–177.5	2.225	66.0	0.103	31.8	0.369	–62.3
1.3	0.659	178.1	2.070	62.2	0.104	33.7	0.361	–65.3
1.4	0.661	174.2	1.935	58.6	0.105	35.8	0.354	–68.7
1.5	0.665	170.6	1.820	55.2	0.107	38.4	0.347	–72.4
1.6	0.669	166.9	1.714	52.1	0.110	40.7	0.343	–76.3
1.7	0.673	163.5	1.625	48.7	0.114	43.3	0.339	–80.4
1.8	0.678	160.1	1.544	45.6	0.119	45.7	0.336	–84.9
1.9	0.683	157.1	1.468	42.6	0.124	47.7	0.335	–89.5
2.0	0.686	154.1	1.398	39.2	0.131	49.8	0.335	–94.3
2.1	0.699	151.0	1.339	36.1	0.138	51.4	0.335	–99.3
2.2	0.701	148.5	1.286	33.5	0.147	52.7	0.336	–104.6
2.3	0.709	146.1	1.229	31.1	0.156	53.4	0.340	–109.9
2.4	0.716	143.8	1.174	28.6	0.165	54.1	0.345	–115.2
2.5	0.720	141.4	1.126	26.1	0.176	54.2	0.351	–120.5
2.6	0.723	139.2	1.078	23.5	0.188	54.1	0.359	–125.6
2.7	0.728	137.4	1.040	21.3	0.200	53.1	0.365	–130.5
2.8	0.728	136.2	1.000	19.0	0.208	50.7	0.374	–135.3
2.9	0.739	134.6	0.976	17.0	0.209	50.5	0.382	–140.5
3.0	0.748	132.4	0.939	15.3	0.218	51.5	0.391	–145.5
4.0	0.799	114.0	0.691	–1.1	0.339	39.1	0.502	169.1
5.0	0.831	101.5	0.546	–8.8	0.406	22.4	0.624	134.9

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	0.814	–50.4	15.005	149.2	0.037	65.2	0.880	–24.0
0.2	0.723	–84.9	11.465	128.0	0.059	50.3	0.700	–39.2
0.3	0.671	–110.3	8.905	113.8	0.070	42.2	0.562	–47.5
0.4	0.640	–127.8	7.146	103.7	0.075	38.4	0.468	–52.1
0.5	0.617	–140.5	5.918	96.5	0.080	36.9	0.405	–54.9
0.6	0.612	–150.2	5.056	90.4	0.083	36.5	0.361	–57.0
0.7	0.610	–157.9	4.400	85.4	0.086	37.2	0.329	–58.8
0.8	0.605	–164.4	3.889	80.8	0.089	38.4	0.305	–60.8
0.9	0.602	–170.1	3.470	76.5	0.092	39.4	0.286	–62.8
1.0	0.606	–175.0	3.155	72.7	0.096	41.1	0.271	–65.3
1.1	0.610	–179.6	2.887	68.9	0.099	42.6	0.260	–67.8
1.2	0.612	176.6	2.668	65.5	0.104	44.1	0.250	–70.8
1.3	0.618	173.0	2.477	62.1	0.109	45.4	0.242	–74.2
1.4	0.620	169.3	2.314	58.9	0.113	46.8	0.236	–77.8
1.5	0.624	166.2	2.173	55.7	0.119	48.2	0.229	–81.9
1.6	0.630	162.9	2.049	52.8	0.125	49.3	0.226	–86.2
1.7	0.634	159.8	1.936	49.6	0.131	50.3	0.223	–90.8
1.8	0.640	157.1	1.839	46.8	0.137	51.1	0.221	–95.8
1.9	0.646	154.2	1.741	44.1	0.145	51.6	0.221	–101.0
2.0	0.650	151.6	1.660	40.9	0.152	52.3	0.221	–106.3
2.1	0.662	148.9	1.593	38.2	0.160	52.5	0.223	–111.9
2.2	0.665	146.6	1.528	35.5	0.169	52.9	0.227	–117.5
2.3	0.674	144.3	1.460	33.2	0.177	52.6	0.232	–123.2
2.4	0.682	142.1	1.402	30.7	0.186	52.3	0.239	–128.5
2.5	0.685	140.0	1.344	28.2	0.196	51.9	0.247	–133.9
2.6	0.690	138.4	1.287	25.9	0.206	51.6	0.257	–138.4
2.7	0.695	136.5	1.246	23.3	0.217	50.0	0.267	–143.1
2.8	0.697	135.7	1.201	21.2	0.224	47.7	0.279	–147.6
2.9	0.711	134.1	1.174	19.0	0.224	47.5	0.289	–152.5
3.0	0.722	131.9	1.131	17.5	0.232	48.2	0.298	–157.3
4.0	0.778	114.7	0.835	–1.2	0.335	36.6	0.421	162.4
5.0	0.823	102.2	0.637	–12.3	0.398	21.6	0.565	132.0

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	0.759	–60.0	18.982	144.2	0.034	62.1	0.832	–29.9
0.2	0.667	–96.4	13.649	122.7	0.052	48.5	0.618	–46.6
0.3	0.621	–121.1	10.215	109.1	0.060	43.1	0.476	–55.1
0.4	0.595	–137.3	8.032	100.0	0.066	41.6	0.385	–59.6
0.5	0.586	–149.0	6.596	93.7	0.070	41.7	0.327	–62.4
0.6	0.579	–157.3	5.598	88.1	0.075	42.5	0.286	–64.8
0.7	0.580	–164.1	4.854	83.5	0.080	43.9	0.257	–66.6
0.8	0.579	–169.7	4.279	79.4	0.085	45.5	0.235	–68.9
0.9	0.577	–174.7	3.815	75.5	0.090	46.7	0.218	–71.1
1.0	0.583	–179.4	3.461	71.9	0.095	48.2	0.205	–73.9
1.1	0.586	176.6	3.161	68.4	0.101	49.5	0.194	–77.1
1.2	0.591	173.0	2.921	65.1	0.107	50.5	0.185	–80.5
1.3	0.595	169.8	2.706	61.8	0.113	51.2	0.178	–84.4
1.4	0.600	166.4	2.528	58.9	0.120	52.0	0.173	–88.7
1.5	0.603	163.5	2.368	55.9	0.127	52.5	0.169	–93.4
1.6	0.610	160.9	2.235	53.2	0.134	52.9	0.166	–98.5
1.7	0.614	157.7	2.108	50.1	0.141	53.3	0.165	–103.8
1.8	0.622	155.1	2.004	47.3	0.149	53.4	0.164	–109.5
1.9	0.625	152.3	1.897	44.8	0.156	53.3	0.166	–115.4
2.0	0.630	150.0	1.809	41.8	0.164	53.3	0.169	–121.2
2.1	0.643	147.2	1.735	39.1	0.173	53.0	0.173	–127.1
2.2	0.648	145.3	1.660	36.5	0.181	52.7	0.179	–132.8
2.3	0.656	143.2	1.591	34.3	0.190	52.2	0.186	–138.4
2.4	0.661	141.1	1.525	32.0	0.198	51.6	0.195	–143.6
2.5	0.665	139.1	1.467	29.6	0.208	50.8	0.205	–148.6
2.6	0.673	137.4	1.405	27.1	0.218	50.2	0.216	–152.5
2.7	0.678	135.9	1.356	24.7	0.228	48.7	0.227	–156.4
2.8	0.680	135.0	1.307	22.7	0.233	46.4	0.240	–160.3
2.9	0.694	133.7	1.278	20.5	0.233	46.0	0.251	–165.0
3.0	0.703	131.4	1.238	18.8	0.240	46.5	0.261	–169.2
4.0	0.765	114.8	0.919	–0.4	0.334	35.0	0.386	155.4
5.0	0.818	102.8	0.701	–12.6	0.393	20.8	0.533	128.8

V_{CE} = 2 V, I_C = 10 mA, Z_O = 50 Ω

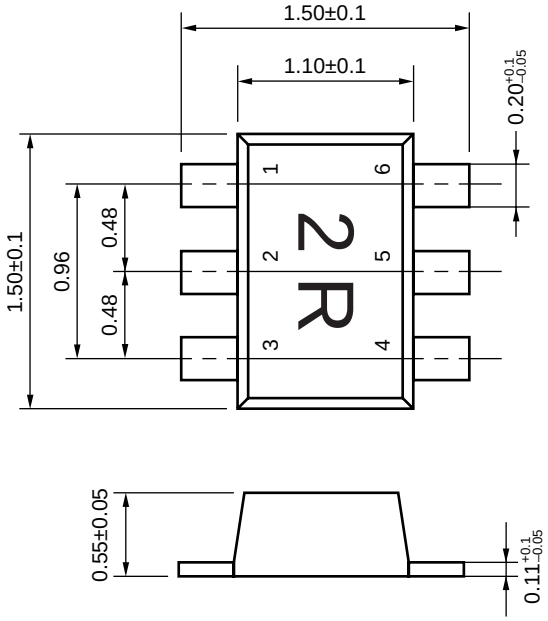
Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.694	–71.5	23.424	138.5	0.033	59.2	0.766	–36.7
0.2	0.604	–109.7	15.743	117.1	0.045	48.3	0.530	–55.1
0.3	0.575	–133.1	11.409	104.9	0.052	45.7	0.392	–63.7
0.4	0.561	–146.7	8.834	96.8	0.058	46.4	0.310	–68.6
0.5	0.556	–157.0	7.200	91.0	0.064	48.0	0.258	–72.0
0.6	0.555	–163.9	6.079	86.0	0.070	49.4	0.222	–75.1
0.7	0.557	–170.2	5.247	81.8	0.076	51.1	0.196	–77.8
0.8	0.558	–175.2	4.626	78.0	0.083	52.5	0.177	–80.9
0.9	0.556	–179.5	4.120	74.5	0.089	53.5	0.162	–84.0
1.0	0.561	176.7	3.731	71.1	0.097	54.5	0.151	–88.0
1.1	0.568	173.2	3.404	67.9	0.104	55.2	0.142	–92.1
1.2	0.570	170.0	3.140	65.0	0.111	55.5	0.135	–96.7
1.3	0.577	167.0	2.910	61.8	0.119	55.7	0.130	–101.7
1.4	0.581	163.9	2.718	59.0	0.127	55.8	0.128	–107.3
1.5	0.586	161.1	2.544	56.0	0.134	55.8	0.126	–113.2
1.6	0.592	158.5	2.396	53.5	0.142	55.5	0.126	–119.2
1.7	0.599	155.8	2.262	50.6	0.151	55.4	0.127	–125.4
1.8	0.604	153.4	2.148	48.0	0.158	55.1	0.130	–131.7
1.9	0.606	150.8	2.034	45.5	0.167	54.5	0.135	–137.5
2.0	0.616	148.4	1.938	42.6	0.175	54.1	0.141	–143.1
2.1	0.629	146.3	1.853	40.1	0.184	53.6	0.148	–148.6
2.2	0.632	143.9	1.779	37.6	0.193	52.8	0.156	–153.5
2.3	0.640	142.1	1.703	35.4	0.201	52.1	0.166	–158.4
2.4	0.647	140.2	1.633	33.1	0.209	51.2	0.176	–162.7
2.5	0.652	138.3	1.570	30.8	0.218	50.1	0.187	–166.6
2.6	0.657	136.6	1.507	28.4	0.228	48.9	0.199	–170.0
2.7	0.663	135.4	1.454	26.3	0.237	47.3	0.210	–173.3
2.8	0.666	134.6	1.401	24.1	0.242	45.0	0.223	–175.8
2.9	0.681	133.2	1.377	22.0	0.241	44.7	0.237	–179.8
3.0	0.691	131.0	1.331	20.4	0.248	44.9	0.246	176.2
4.0	0.754	115.1	0.992	1.2	0.334	33.1	0.367	146.8
5.0	0.811	103.0	0.763	–12.6	0.389	19.9	0.510	124.8

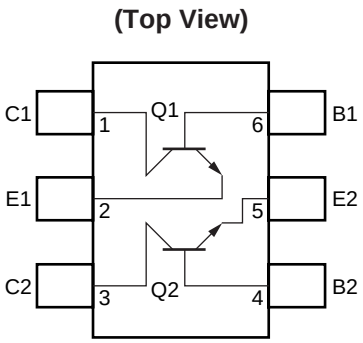
V_{CE} = 2 V, I_C = 20 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.561	–98.9	31.274	127.2	0.024	57.1	0.621	–52.1
0.2	0.523	–134.5	18.822	108.2	0.034	53.1	0.380	–72.6
0.3	0.520	–151.9	13.033	98.3	0.042	55.3	0.269	–83.1
0.4	0.517	–161.6	9.927	91.8	0.049	57.6	0.208	–90.9
0.5	0.519	–169.2	8.021	87.3	0.058	59.9	0.171	–97.7
0.6	0.523	–174.5	6.749	83.1	0.066	60.9	0.147	–104.4
0.7	0.531	–178.6	5.804	79.5	0.075	62.0	0.130	–110.7
0.8	0.529	177.0	5.084	76.2	0.084	62.6	0.119	–117.5
0.9	0.530	173.7	4.535	73.1	0.092	62.5	0.112	–124.1
1.0	0.536	170.9	4.099	70.1	0.102	62.5	0.108	–130.9
1.1	0.543	167.8	3.735	67.1	0.111	62.4	0.106	–137.8
1.2	0.549	165.3	3.441	64.4	0.120	61.6	0.107	–144.0
1.3	0.553	162.7	3.188	61.5	0.129	61.0	0.108	–150.2
1.4	0.559	160.2	2.972	59.0	0.138	60.3	0.112	–155.7
1.5	0.564	157.9	2.780	56.3	0.147	59.6	0.117	–161.3
1.6	0.569	155.5	2.617	53.9	0.156	58.7	0.123	–165.8
1.7	0.577	153.0	2.468	51.2	0.165	57.9	0.130	–170.5
1.8	0.583	150.9	2.339	48.7	0.173	56.9	0.138	–174.5
1.9	0.587	148.4	2.215	46.4	0.182	55.8	0.146	–178.3
2.0	0.595	146.3	2.109	43.7	0.191	54.8	0.156	178.6
2.1	0.607	144.2	2.018	41.3	0.200	53.8	0.166	175.5
2.2	0.614	142.2	1.934	38.9	0.208	52.8	0.176	172.7
2.3	0.620	140.5	1.852	36.7	0.216	51.6	0.186	170.1
2.4	0.628	138.6	1.777	34.6	0.225	50.3	0.197	167.7
2.5	0.633	137.1	1.711	32.4	0.234	49.0	0.208	165.6
2.6	0.638	135.4	1.636	30.2	0.243	47.8	0.219	164.1
2.7	0.643	134.4	1.581	28.0	0.251	45.9	0.229	162.6
2.8	0.649	133.5	1.527	26.2	0.255	43.5	0.243	161.3
2.9	0.660	132.1	1.498	24.2	0.255	43.2	0.256	158.6
3.0	0.672	130.1	1.452	22.5	0.261	43.2	0.265	155.4
4.0	0.733	115.0	1.092	3.4	0.338	30.6	0.370	133.7
5.0	0.795	103.6	0.848	–10.6	0.385	18.3	0.497	117.4

PACKAGE DIMENSIONS

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





PIN CONNECTIONS

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

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