DATA SHEET

NEC

NPN SILICON RF TWIN TRANSISTOR

μPA848TD

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

FEATURES

- 2 different built-in transistors (2SC5668, 2SC5676)
  Q1: 21.0 GHz f_T high-gain transistor, ideal for 3.6 to 4.2 GHz oscillation application
  f_T = 21.0 GHz TYP., $|S_{21e}|^2$ = 11.5 dB TYP. @ V_{CE} = 2 V, I_C = 20 mA, f = 2 GHz
  Q2: Built-in low voltage operation, low phase distortion transistor suited for OSC operation
  f_T = 5.5 GHz TYP., $|S_{21e}|^2$ = 4.0 dB TYP. @ V_{CE} = 1 V, I_C = 10 mA, f = 2 GHz
- 6-pin lead-less minimold package

BUILT-IN TRANSISTORS

	Q1	Q2
3-pin thin-type ultra super minimold part No.	2SC5668	2SC5676

ORDERING INFORMATION

Part Number	Quantity	Supplying Form
μPA848TD	50 pcs (Non reel)	• 8 mm wide embossed taping
μPA848TD-T3	10 kpcs/reel	• Pin 1 (Q1 Collector), Pin 6 (Q1 Base) face the perforation side of the tape

Remark To order evaluation samples, consult your NEC sales representative.
Unit sample quantity is 50 pcs.

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

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ABSOLUTE MAXIMUM RATINGS (T_A = +25°C)

Parameter	Symbol	Ratings		Unit
		Q1	Q2	
Collector to Base Voltage	V_{CBO}	15	9	V
Collector to Emitter Voltage	V_{CEO}	3.3	5.5	V
Emitter to Base Voltage	V_{EBO}	1.5	1.5	V
Collector Current	I_C	35	100	mA
Total Power Dissipation	P_{tot} Note	115	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 substrate

ELECTRICAL CHARACTERISTICS (T_A = +25°C)

(1) Q1

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Collector Cut-off Current	I_{CBO}	V_{CB} = 5 V, I_E = 0 mA	–	–	100	nA
Emitter Cut-off Current	I_{EBO}	V_{BE} = 1 V, I_C = 0 mA	–	–	100	nA
DC Current Gain	h_{FE} Note 1	V_{CE} = 2 V, I_C = 5 mA	50	70	100	–
Gain Bandwidth Product	f_T	V_{CE} = 2 V, I_C = 20 mA, f = 2 GHz	18.0	21.0	–	GHz
Insertion Power Gain (1)	$\lvert S_{21e} \rvert^2$	V_{CE} = 1 V, I_C = 10 mA, f = 2 GHz	9.0	11.0	–	dB
Insertion Power Gain (2)	$\lvert S_{21e} \rvert^2$	V_{CE} = 2 V, I_C = 20 mA, f = 2 GHz	9.5	11.5	–	dB
Noise Figure	NF	V_{CE} = 2 V, I_C = 5 mA, f = 2 GHz, $Z_S = Z_{opt}$	–	1.1	1.5	dB
Reverse Transfer Capacitance	C_{re} Note 2	V_{CB} = 2 V, I_E = 0 mA, f = 1 MHz	–	0.24	0.3	pF
Maximum Available Power Gain	MAG Note 3	V_{CE} = 2 V, I_C = 20 mA, f = 2 GHz	–	12.5	–	dB
Maximum Stable Power Gain	MSG Note 4	V_{CE} = 2 V, I_C = 20 mA, f = 2 GHz	–	13.5	–	dB

(2) Q2

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Collector Cut-off Current	I_{CBO}	V_{CB} = 5 V, I_E = 0 mA	–	–	200	nA
Emitter Cut-off Current	I_{EBO}	V_{BE} = 1 V, I_C = 0 mA	–	–	200	nA
DC Current Gain	h_{FE} Note 1	V_{CE} = 1 V, I_C = 10 mA	100	–	160	–
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	2.5	4.0	–	dB
Noise Figure	NF	V_{CE} = 1 V, I_C = 10 mA, f = 2 GHz, $Z_S = Z_{opt}$	–	1.8	3.0	dB
Reverse Transfer Capacitance	C_{re} Note 2	V_{CB} = 0.5 V, I_E = 0 mA, f = 1 MHz	–	0.9	1.2	pF

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

2. Collector to base capacitance when the emitter grounded

3. $MAG = \left| \frac{S_{21}}{S_{12}} \right| (K - \sqrt{(K^2 - 1)})$

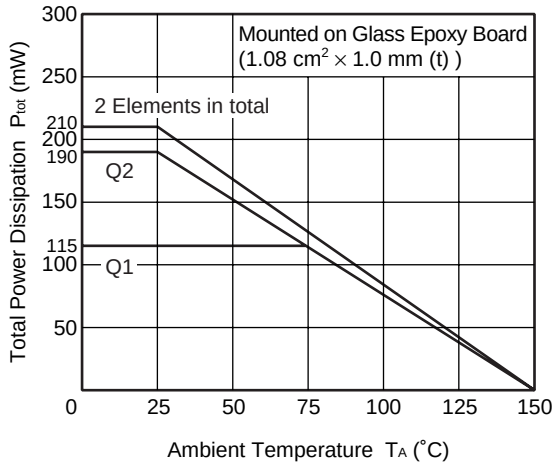
4. $MSG = \left| \frac{S_{21}}{S_{12}} \right|$

h_{FE} CLASSIFICATION

Rank	FB
Marking	vD
h_{FE} Value of Q1	50 to 100
h_{FE} Value of Q2	100 to 160

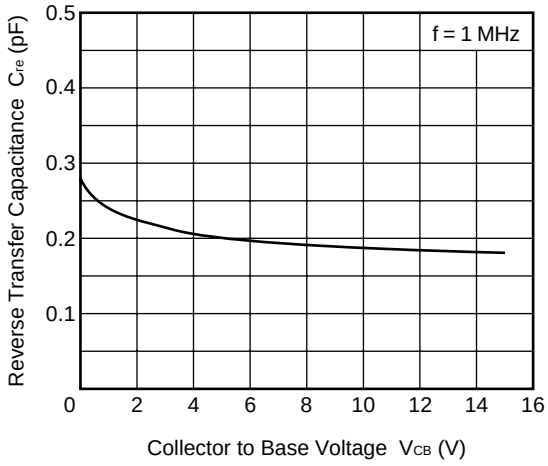
TYPICAL CHARACTERISTICS (Unless otherwise specified, T_A = +25°C)

TOTAL POWER DISSIPATION
vs. AMBIENT TEMPERATURE



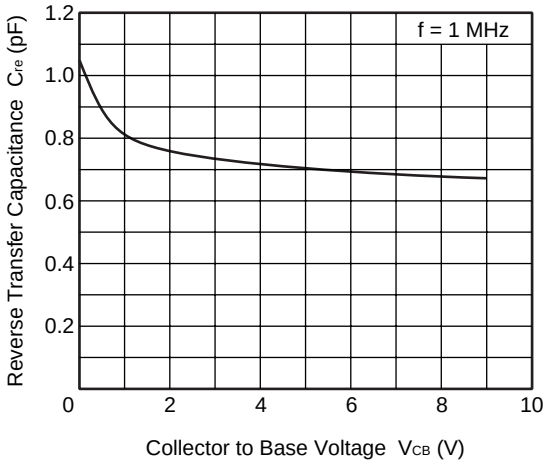
Q1

REVERSE TRANSFER CAPACITANCE
vs. COLLECTOR TO BASE VOLTAGE



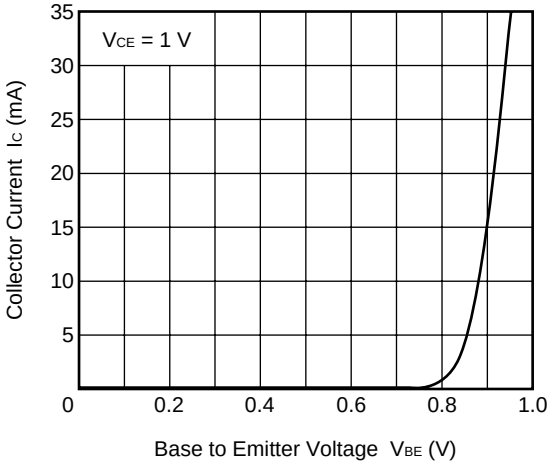
Q2

REVERSE TRANSFER CAPACITANCE
vs. COLLECTOR TO BASE VOLTAGE



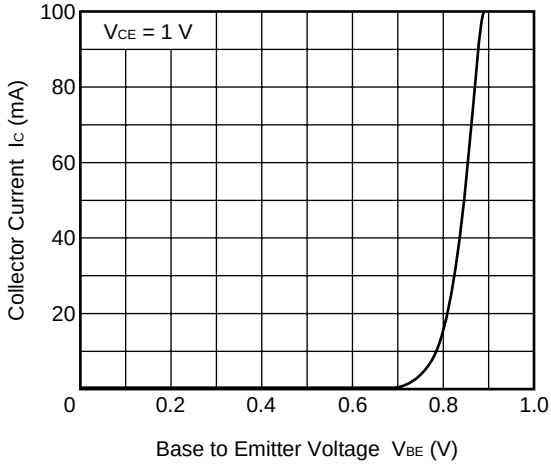
Q1

COLLECTOR CURRENT vs.
BASE TO EMITTER VOLTAGE

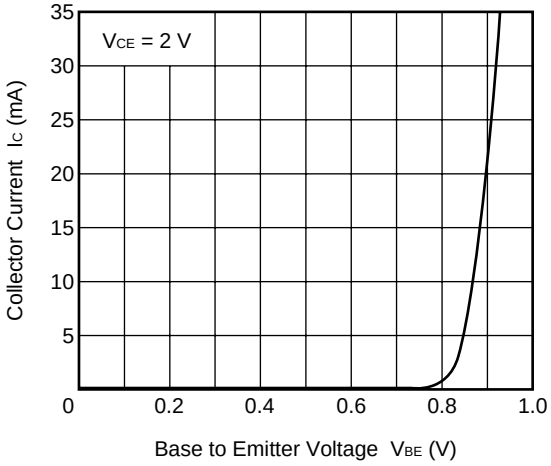


Q2

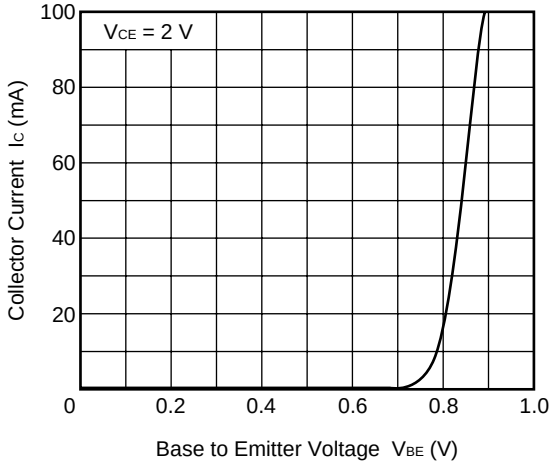
COLLECTOR CURRENT vs.
BASE TO EMITTER VOLTAGE



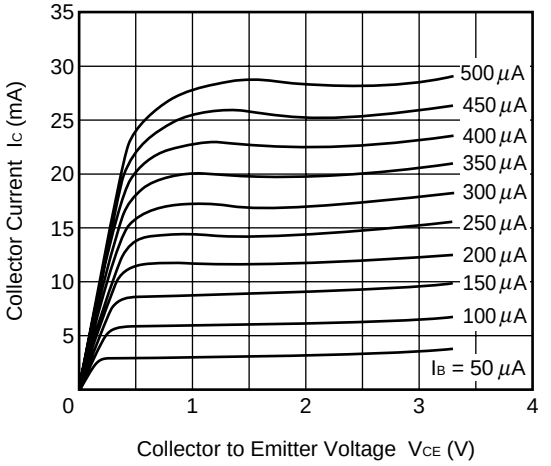
COLLECTOR CURRENT vs.
BASE TO EMITTER VOLTAGE



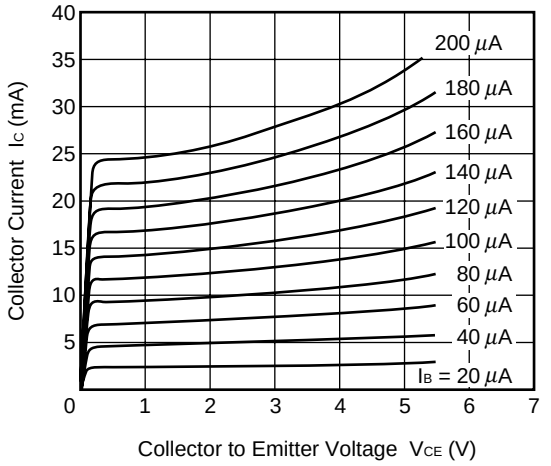
COLLECTOR CURRENT vs.
BASE TO EMITTER VOLTAGE



COLLECTOR CURRENT vs.
COLLECTOR TO EMITTER VOLTAGE

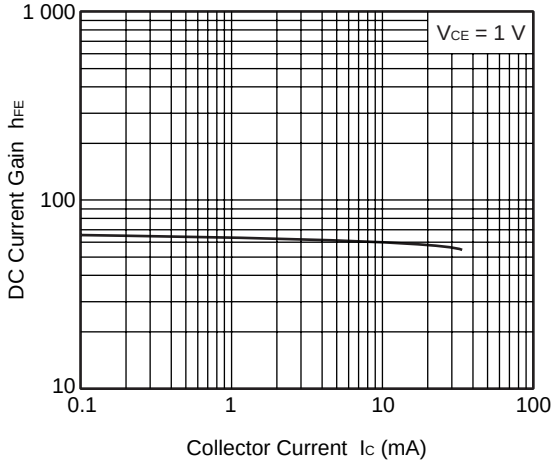


COLLECTOR CURRENT vs.
COLLECTOR TO EMITTER VOLTAGE



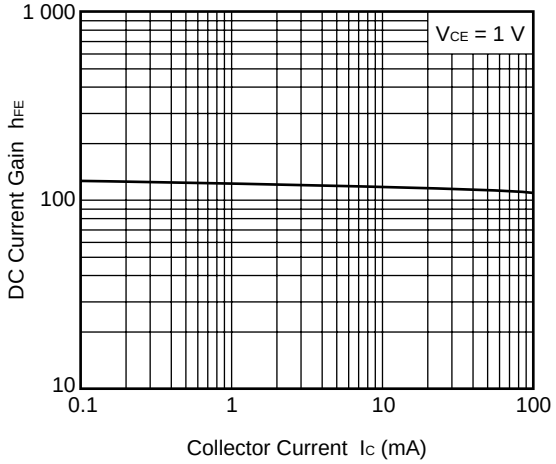
Q1

DC CURRENT GAIN vs.
COLLECTOR CURRENT

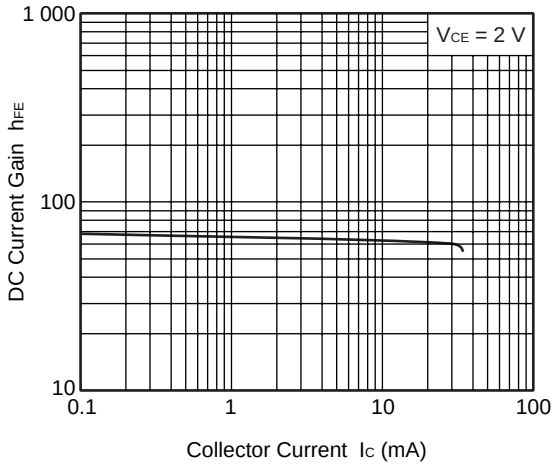


Q2

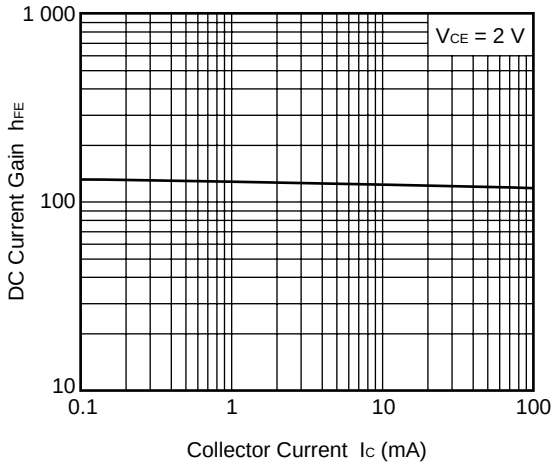
DC CURRENT GAIN vs.
COLLECTOR CURRENT



DC CURRENT GAIN vs.
COLLECTOR CURRENT

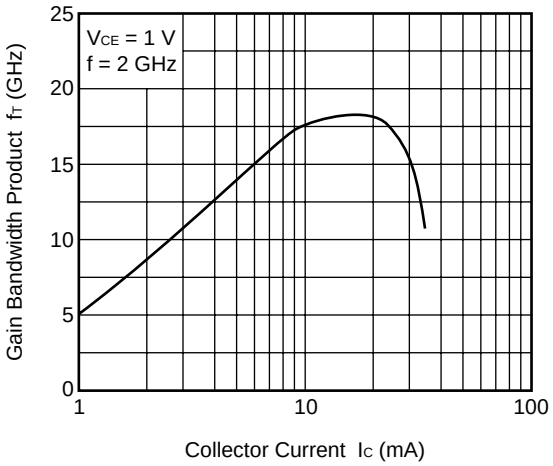


DC CURRENT GAIN vs.
COLLECTOR CURRENT



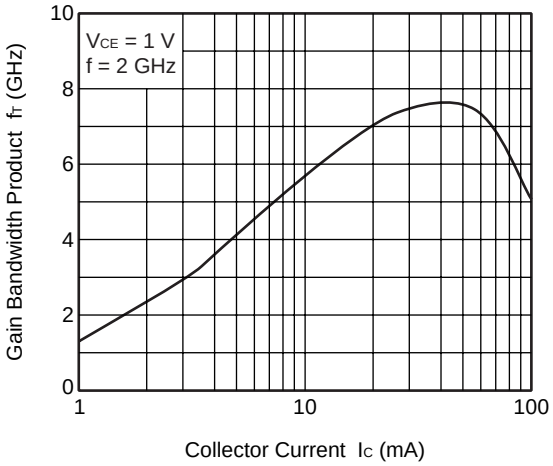
Q1

GAIN BANDWIDTH PRODUCT
vs. COLLECTOR CURRENT



Q2

GAIN BANDWIDTH PRODUCT
vs. COLLECTOR CURRENT



GAIN BANDWIDTH PRODUCT
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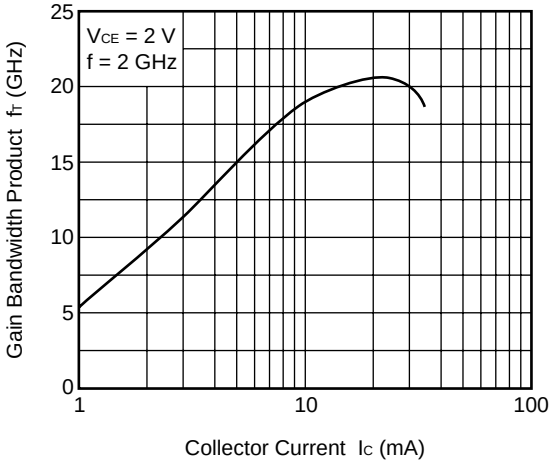
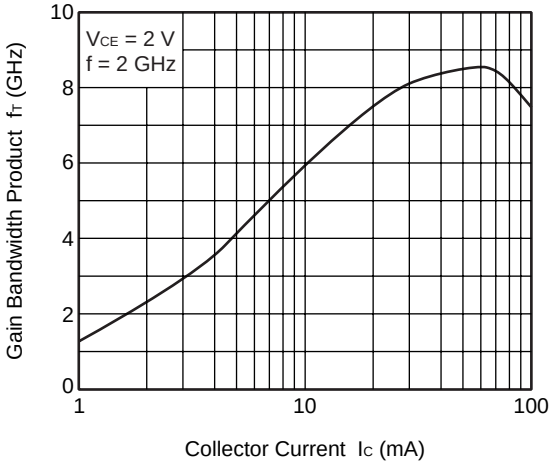
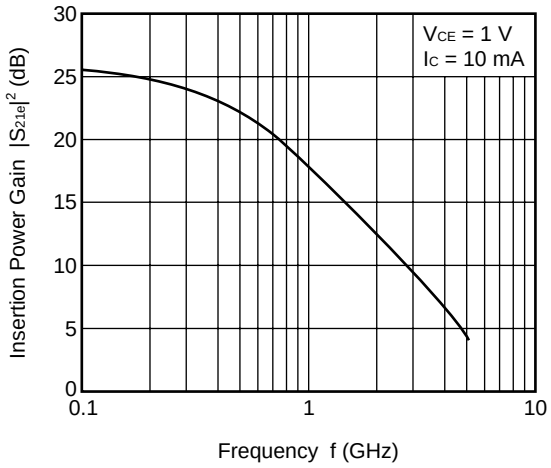


GAIN BANDWIDTH PRODUCT
vs. COLLECTOR CURRENT



Q1

INSERTION POWER GAIN vs. FREQUENCY



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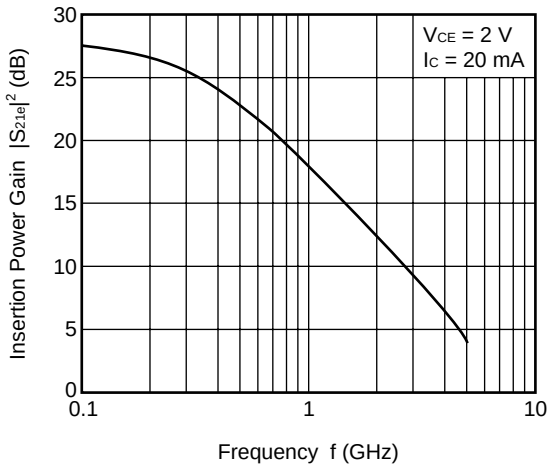
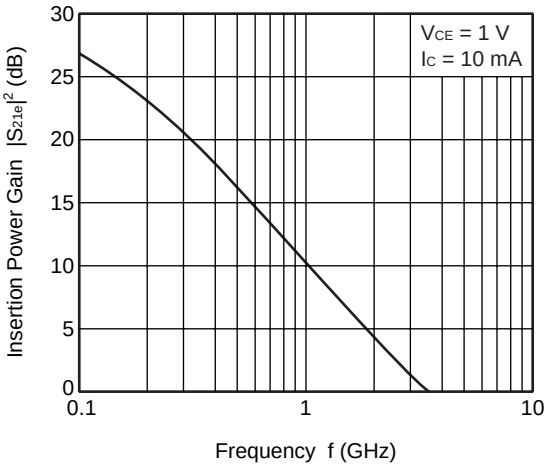


Q2

INSERTION POWER GAIN vs. FREQUENCY



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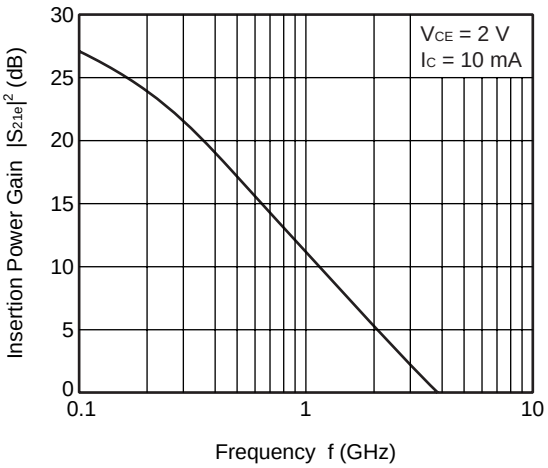
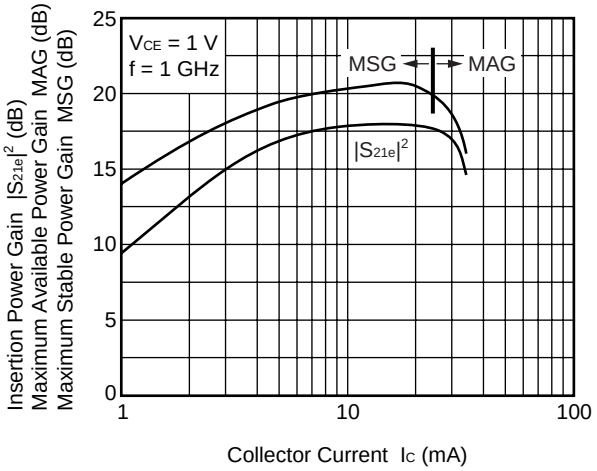


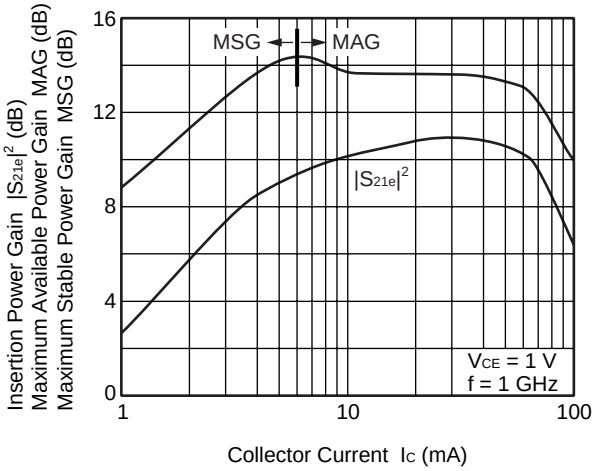
Q1

INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT

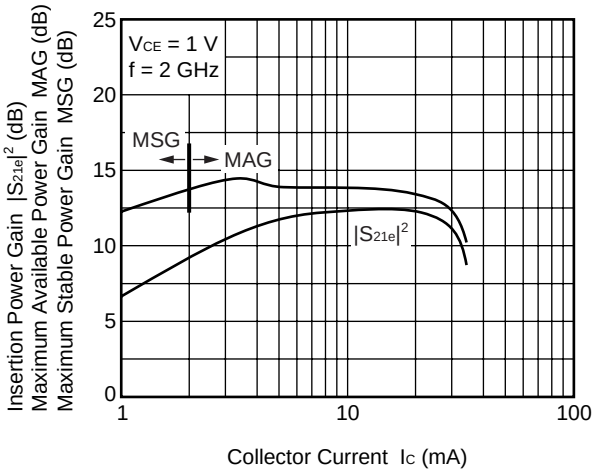


Q2

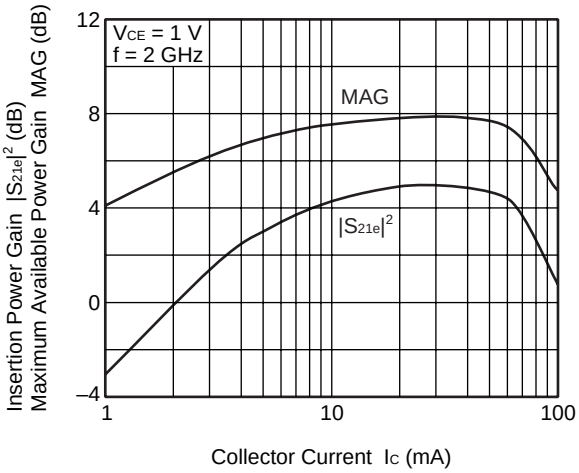
INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT



INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT



INSERTION POWER GAIN, MAG vs. COLLECTOR CURRENT



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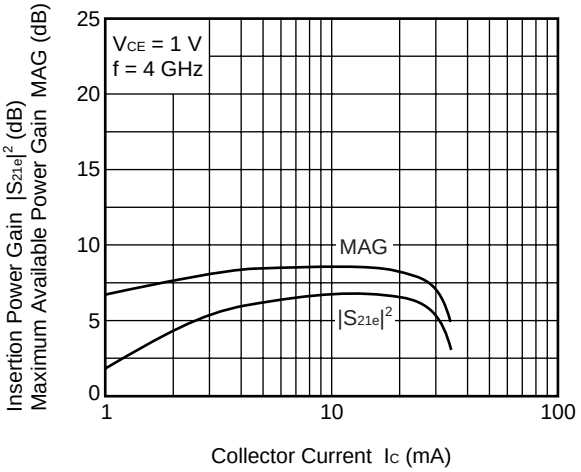
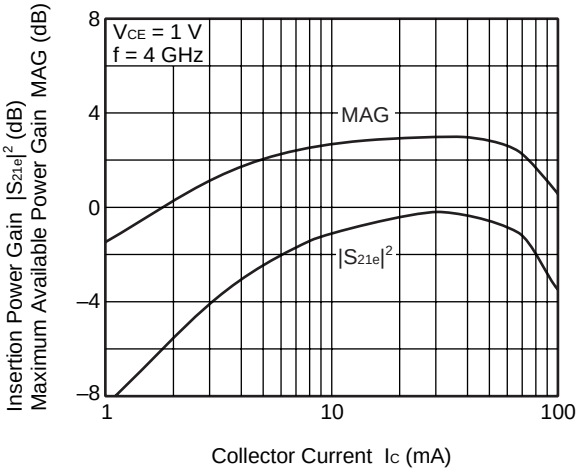


INSERTION POWER GAIN, MAG vs. COLLECTOR CURRENT



Q1

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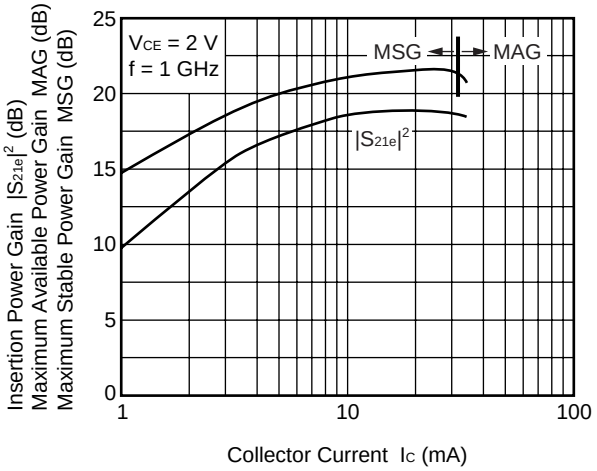
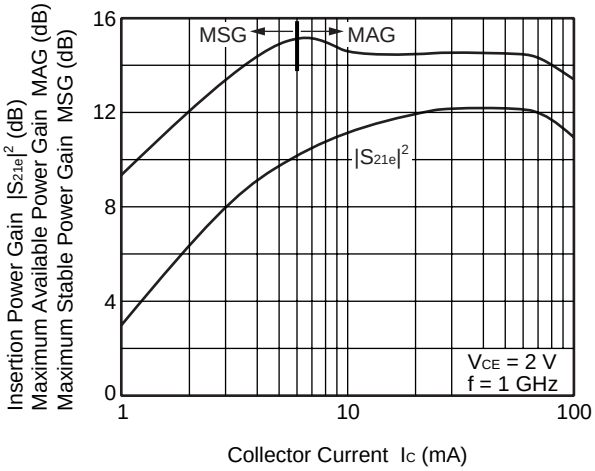
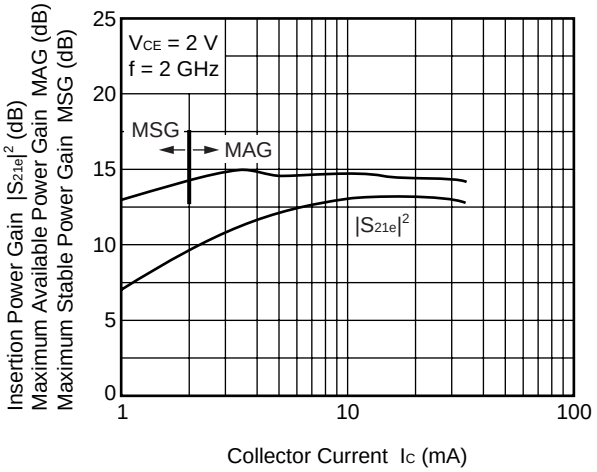


Q2

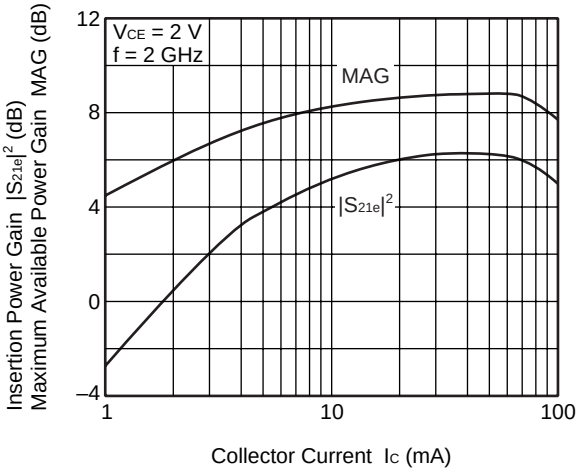
INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT



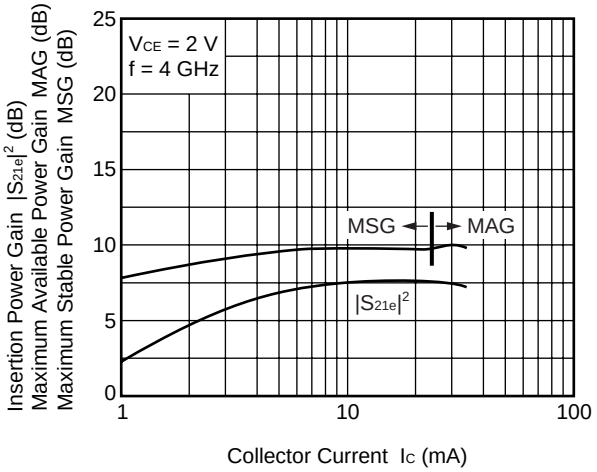
INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT



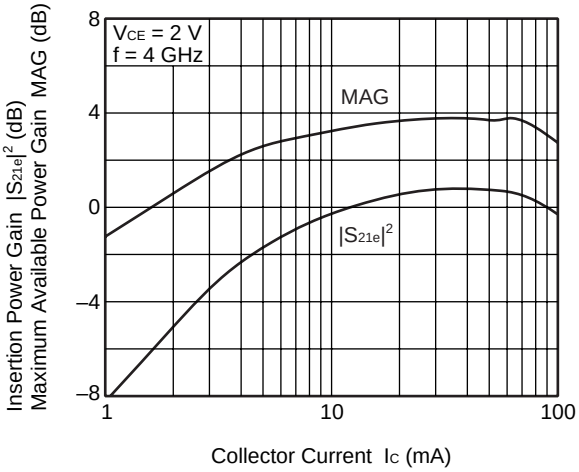
INSERTION POWER GAIN, MAG vs. COLLECTOR CURRENT



INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT

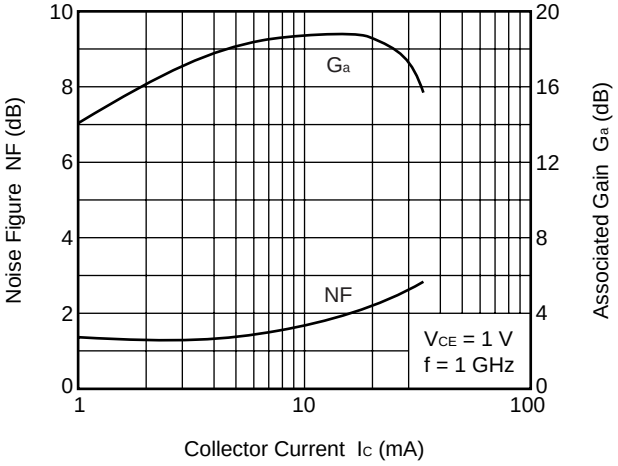


INSERTION POWER GAIN, MAG vs. COLLECTOR CURRENT



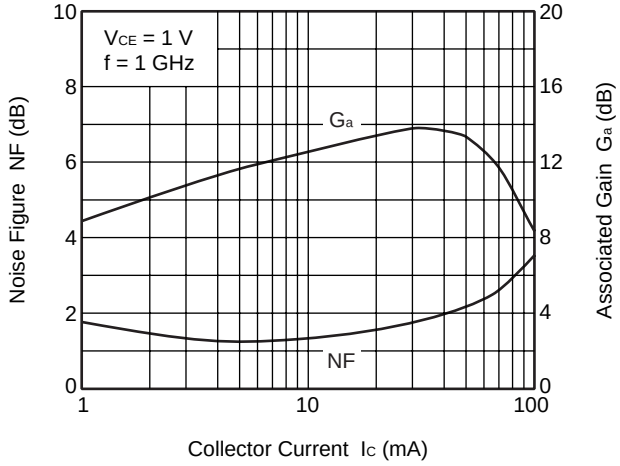
Q1

NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT

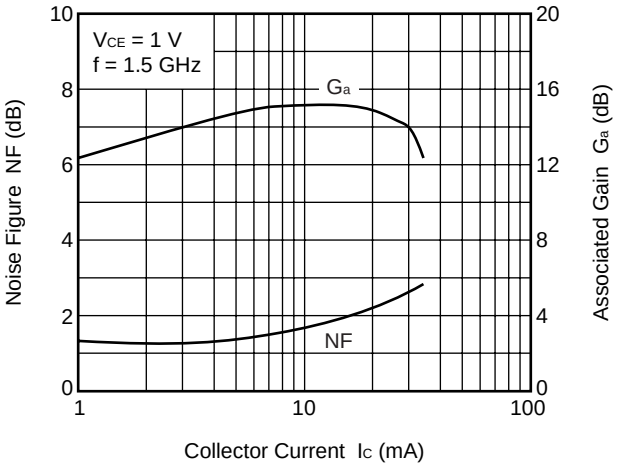


Q2

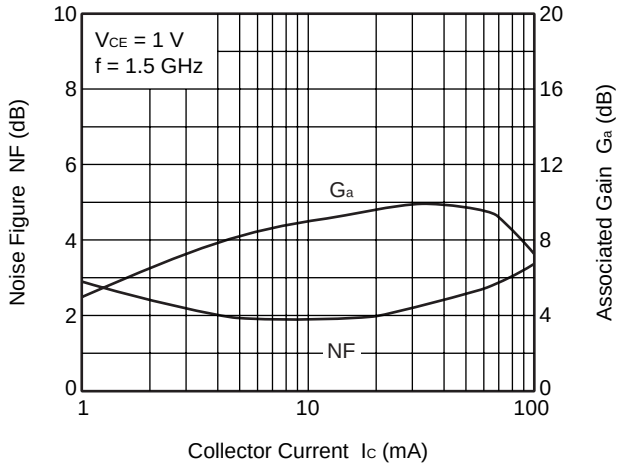
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



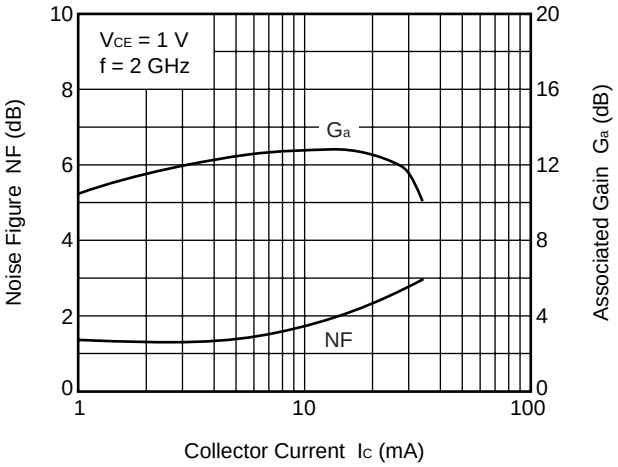
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



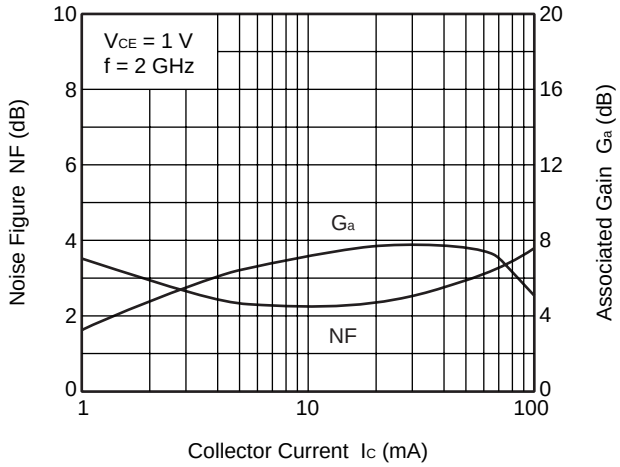
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT

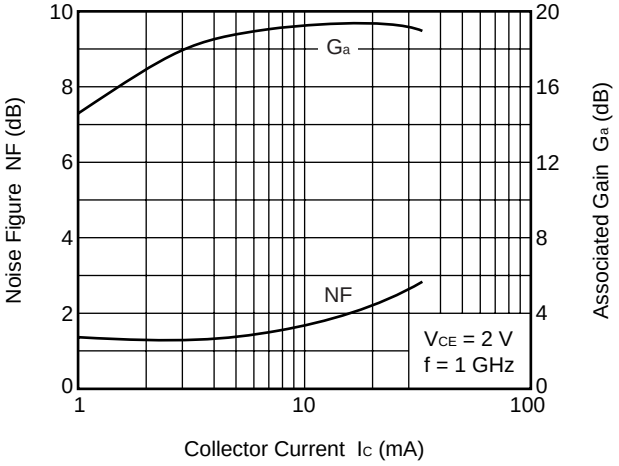


NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



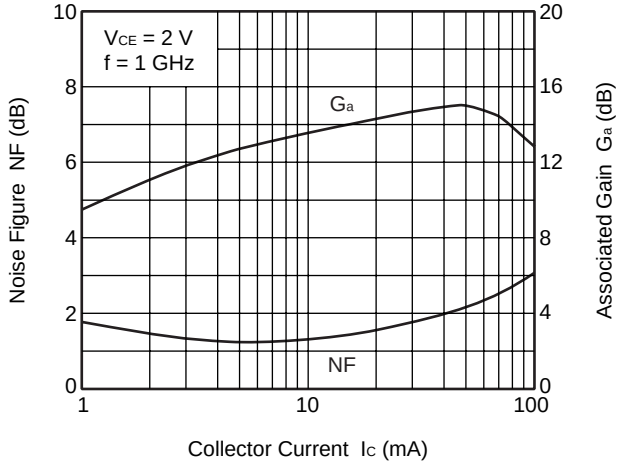
Q1

NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT

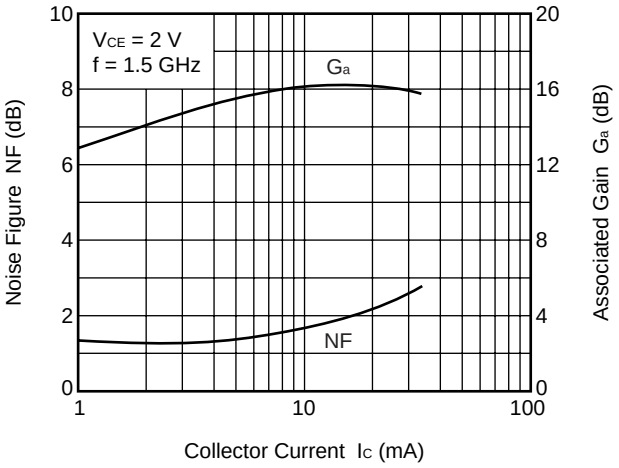


Q2

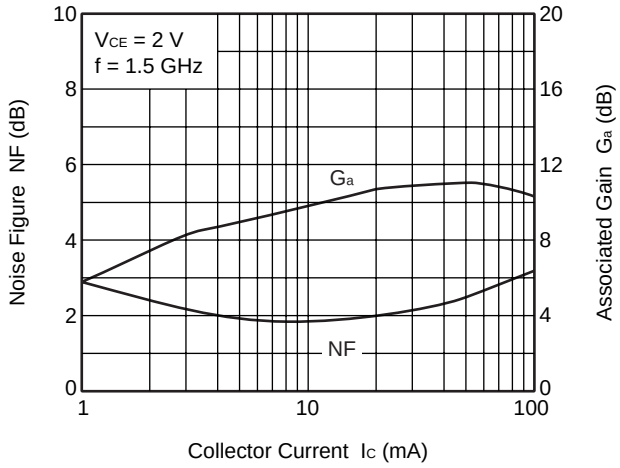
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



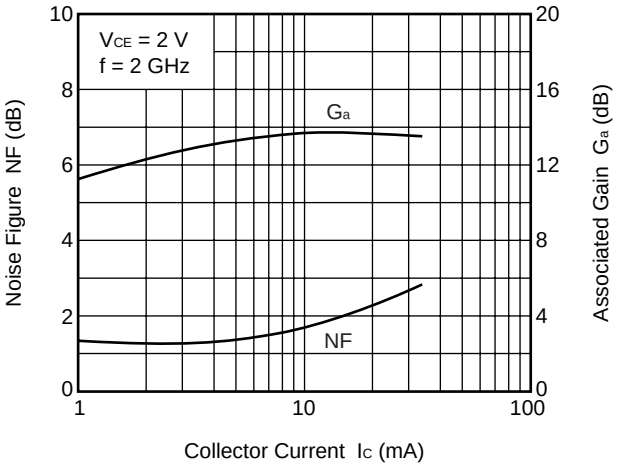
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



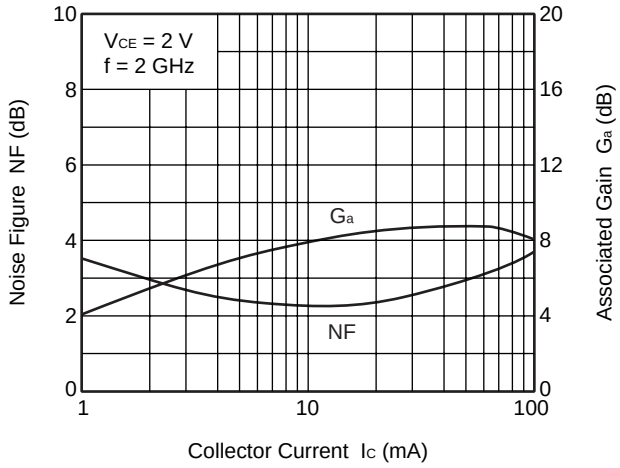
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



Remark The graphs indicate nominal characteristics.

S-PARAMETERS Q1

Note When K ≥ 1, the MAG (Maximum Available Power Gain) is used. $MAG = \left|\frac{S_{21}}{S_{12}}\right| (K - \sqrt{(K^2 - 1)})$

When K < 1, the MSG (Maximum Stable Power Gain) is used. $MSG = \left|\frac{S_{21}}{S_{12}}\right|$

V_{CE} = 1 V, I_C = 1 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}		K	MAG/MSG Note
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		(dB)
0.1	0.953	–5.4	3.383	174.6	0.015	82.4	1.001	–3.5	0.090	23.64
0.2	0.941	–10.7	3.363	170.1	0.029	82.2	0.991	–7.7	0.047	20.70
0.3	0.933	–16.5	3.345	164.0	0.043	77.3	0.984	–11.7	0.094	18.93
0.4	0.916	–22.3	3.315	157.8	0.057	73.2	0.969	–15.8	0.133	17.67
0.5	0.901	–27.5	3.304	152.8	0.070	69.1	0.956	–20.1	0.158	16.74
0.6	0.879	–33.9	3.262	146.7	0.082	65.0	0.932	–24.4	0.189	16.02
0.7	0.853	–39.4	3.204	141.4	0.093	60.8	0.910	–28.7	0.224	15.39
0.8	0.824	–45.3	3.134	135.9	0.102	56.8	0.883	–33.2	0.256	14.87
0.9	0.794	–51.2	3.062	130.4	0.111	53.0	0.860	–37.4	0.288	14.42
1.0	0.761	–56.8	2.991	125.2	0.117	49.2	0.831	–41.7	0.329	14.07
1.1	0.731	–62.7	2.916	120.1	0.123	45.6	0.808	–45.9	0.361	13.75
1.2	0.702	–68.5	2.817	115.2	0.127	42.3	0.783	–49.7	0.399	13.47
1.3	0.674	–74.4	2.735	110.6	0.130	39.1	0.762	–53.6	0.429	13.22
1.4	0.651	–80.1	2.638	106.0	0.133	36.5	0.741	–57.2	0.465	12.99
1.5	0.628	–85.6	2.552	101.7	0.133	34.0	0.725	–60.5	0.499	12.82
1.6	0.609	–91.0	2.469	97.5	0.134	31.6	0.705	–63.8	0.540	12.66
1.7	0.591	–96.4	2.373	93.7	0.133	29.6	0.693	–66.7	0.578	12.51
1.8	0.576	–101.4	2.282	89.9	0.131	28.0	0.676	–69.4	0.630	12.39
1.9	0.560	–106.4	2.205	86.6	0.130	26.6	0.668	–71.9	0.671	12.30
2.0	0.551	–111.0	2.128	82.8	0.127	25.8	0.652	–74.2	0.731	12.24
2.1	0.541	–115.6	2.066	79.9	0.124	25.5	0.645	–76.6	0.770	12.20
2.2	0.529	–120.1	1.989	76.7	0.121	25.3	0.632	–78.9	0.844	12.15
2.3	0.521	–124.6	1.927	73.8	0.118	25.7	0.628	–81.1	0.895	12.13
2.4	0.517	–128.6	1.871	70.6	0.115	26.2	0.617	–83.3	0.966	12.12
2.5	0.510	–133.1	1.821	67.8	0.111	27.5	0.612	–85.6	1.025	11.17
2.6	0.507	–137.1	1.761	65.3	0.108	28.7	0.604	–88.0	1.108	10.13
2.7	0.504	–140.9	1.712	62.6	0.105	30.7	0.599	–90.5	1.173	9.60
2.8	0.500	–144.7	1.657	60.1	0.103	32.9	0.594	–92.6	1.251	9.05
2.9	0.497	–148.1	1.609	56.8	0.102	35.3	0.585	–95.1	1.325	8.56
3.0	0.492	–152.5	1.567	54.2	0.101	38.7	0.577	–98.2	1.400	8.13
4.0	0.505	167.7	1.242	30.0	0.163	64.8	0.593	–127.0	1.118	6.74
5.0	0.536	124.0	0.896	9.2	0.293	51.7	0.660	–155.1	0.910	4.85

V_{CE} = 1 V, I_C = 3 mA, Z_O = 50 Ω

Frequency (GHz)	S_{11} MAG.	S_{11} ANG. (deg.)	S_{21} MAG.	S_{21} ANG. (deg.)	S_{12} MAG.	S_{12} ANG. (deg.)	S_{22} MAG.	S_{22} ANG. (deg.)	K	MAG/MSG (dB)
0.1	0.857	–9.2	8.768	172.2	0.013	79.0	0.989	–5.9	0.138	28.41
0.2	0.838	–17.5	8.546	164.3	0.027	79.0	0.966	–12.4	0.113	24.96
0.3	0.802	–26.4	8.303	156.0	0.040	73.5	0.937	–18.4	0.175	23.22
0.4	0.761	–34.7	7.969	147.8	0.051	68.7	0.897	–24.5	0.236	21.92
0.5	0.727	–42.5	7.672	141.1	0.061	64.3	0.858	–30.1	0.280	21.01
0.6	0.678	–50.7	7.286	133.8	0.069	60.3	0.807	–35.5	0.341	20.21
0.7	0.629	–57.9	6.893	127.8	0.076	56.7	0.762	–40.4	0.398	19.55
0.8	0.583	–65.4	6.487	121.9	0.082	53.8	0.715	–45.0	0.453	18.99
0.9	0.542	–72.4	6.110	116.3	0.087	51.3	0.675	–49.4	0.506	18.47
1.0	0.501	–79.3	5.766	111.4	0.090	49.4	0.635	–53.5	0.562	18.07
1.1	0.467	–86.2	5.442	106.8	0.093	47.6	0.604	–57.4	0.611	17.66
1.2	0.437	–92.9	5.110	102.4	0.096	46.3	0.572	–60.7	0.667	17.28
1.3	0.413	–99.7	4.838	98.6	0.098	45.5	0.548	–64.1	0.710	16.95
1.4	0.394	–106.1	4.565	94.8	0.100	44.8	0.526	–67.3	0.757	16.61
1.5	0.377	–111.9	4.330	91.3	0.101	44.5	0.509	–70.0	0.803	16.32
1.6	0.363	–117.9	4.124	88.0	0.103	44.1	0.492	–72.8	0.847	16.04
1.7	0.353	–123.3	3.911	85.0	0.104	44.4	0.480	–75.1	0.887	15.75
1.8	0.344	–128.7	3.717	81.9	0.105	44.8	0.466	–77.2	0.934	15.48
1.9	0.339	–133.6	3.551	79.3	0.107	45.1	0.459	–79.2	0.965	15.21
2.0	0.335	–137.9	3.392	76.3	0.109	46.0	0.446	–80.9	1.007	14.42
2.1	0.331	–142.3	3.271	74.1	0.110	47.1	0.441	–82.7	1.033	13.61
2.2	0.328	–146.4	3.130	71.7	0.113	47.8	0.430	–84.4	1.070	12.83
2.3	0.327	–150.7	3.012	69.4	0.115	48.8	0.427	–86.1	1.090	12.36
2.4	0.326	–153.8	2.907	66.9	0.117	49.8	0.418	–87.7	1.116	11.87
2.5	0.326	–158.0	2.810	64.7	0.120	50.8	0.414	–89.5	1.132	11.49
2.6	0.328	–161.1	2.713	62.8	0.122	51.7	0.407	–91.5	1.156	11.07
2.7	0.329	–164.5	2.624	60.5	0.125	52.7	0.404	–93.6	1.167	10.73
2.8	0.329	–168.0	2.529	58.6	0.129	53.4	0.400	–95.4	1.185	10.32
2.9	0.328	–170.9	2.449	56.0	0.134	53.8	0.395	–97.9	1.190	9.98
3.0	0.330	–174.6	2.381	53.7	0.139	54.9	0.390	–100.4	1.192	9.70
4.0	0.377	151.8	1.849	32.8	0.204	58.2	0.427	–127.8	1.055	8.14
5.0	0.443	117.2	1.375	12.7	0.296	45.6	0.522	–153.3	0.940	6.67

V_{CE} = 1 V, I_C = 5 mA, Z_O = 50 Ω

Frequency (GHz)	S_{11} MAG.	S_{11} ANG. (deg.)	S_{21} MAG.	S_{21} ANG. (deg.)	S_{12} MAG.	S_{12} ANG. (deg.)	S_{22} MAG.	S_{22} ANG. (deg.)	K	MAG/MSG (dB)
0.1	0.774	–11.0	12.726	169.9	0.013	81.9	0.975	–7.8	0.132	29.94
0.2	0.749	–22.4	12.171	160.1	0.025	77.4	0.940	–15.9	0.166	26.81
0.3	0.702	–33.3	11.561	150.2	0.037	71.7	0.893	–23.1	0.244	24.93
0.4	0.648	–43.3	10.804	141.2	0.047	66.8	0.836	–29.9	0.322	23.64
0.5	0.602	–52.2	10.143	133.7	0.055	62.9	0.780	–35.9	0.384	22.66
0.6	0.545	–61.2	9.378	126.3	0.062	59.8	0.717	–41.3	0.459	21.82
0.7	0.498	–69.5	8.672	120.2	0.067	57.1	0.665	–46.1	0.522	21.11
0.8	0.450	–77.5	8.011	114.7	0.072	55.3	0.611	–50.7	0.592	20.48
0.9	0.410	–85.3	7.390	109.4	0.076	53.8	0.572	–54.5	0.652	19.88
1.0	0.378	–92.8	6.878	104.9	0.079	53.0	0.532	–58.4	0.710	19.38
1.1	0.348	–100.5	6.419	100.8	0.083	52.1	0.502	–62.0	0.760	18.91
1.2	0.325	–108.0	5.966	96.9	0.085	51.8	0.473	–65.0	0.815	18.44
1.3	0.310	–115.1	5.603	93.5	0.089	51.8	0.453	–68.3	0.852	18.01
1.4	0.296	–122.4	5.256	90.1	0.092	51.9	0.434	–71.1	0.893	17.59
1.5	0.287	–128.4	4.952	87.1	0.094	52.1	0.420	–73.6	0.929	17.21
1.6	0.280	–134.7	4.689	84.2	0.097	52.3	0.404	–76.1	0.963	16.83
1.7	0.281	–140.3	4.433	81.4	0.100	52.8	0.397	–78.2	0.984	16.45
1.8	0.276	–145.1	4.202	78.8	0.103	53.3	0.385	–80.3	1.018	15.27
1.9	0.273	–149.9	4.009	76.5	0.106	53.7	0.380	–81.9	1.038	14.56
2.0	0.273	–153.9	3.820	74.0	0.110	54.3	0.369	–83.6	1.062	13.89
2.1	0.274	–157.8	3.671	71.9	0.114	55.0	0.365	–85.3	1.071	13.46
2.2	0.272	–161.7	3.512	69.7	0.117	55.6	0.356	–86.9	1.095	12.89
2.3	0.278	–165.6	3.376	67.8	0.121	56.1	0.354	–88.5	1.099	12.54
2.4	0.279	–168.6	3.257	65.5	0.125	56.5	0.346	–89.8	1.109	12.15
2.5	0.278	–171.9	3.144	63.4	0.129	57.0	0.343	–91.7	1.116	11.78
2.6	0.282	–174.6	3.029	61.8	0.133	57.3	0.338	–93.4	1.127	11.40
2.7	0.286	–177.5	2.928	59.7	0.138	57.7	0.334	–95.5	1.131	11.08
2.8	0.288	179.4	2.818	58.0	0.142	57.8	0.331	–97.2	1.141	10.70
2.9	0.287	176.8	2.723	55.6	0.148	57.5	0.328	–99.8	1.142	10.36
3.0	0.292	173.4	2.647	53.5	0.154	57.9	0.325	–102.3	1.138	10.11
4.0	0.350	143.1	2.041	34.1	0.219	56.7	0.371	–130.1	1.042	8.44
5.0	0.419	113.0	1.536	15.4	0.300	43.3	0.470	–154.8	0.963	7.09

V_{CE} = 1 V, I_C = 7 mA, Z_O = 50 Ω

Frequency (GHz)	S_{11} MAG.	S_{11} ANG. (deg.)	S_{21} MAG.	S_{21} ANG. (deg.)	S_{12} MAG.	S_{12} ANG. (deg.)	S_{22} MAG.	S_{22} ANG. (deg.)	K	MAG/MSG (dB)
0.1	0.727	–13.3	15.582	168.3	0.013	78.0	0.965	–9.1	0.197	30.95
0.2	0.684	–26.3	14.748	157.0	0.025	75.3	0.918	–18.3	0.222	27.75
0.3	0.630	–38.5	13.750	146.3	0.035	70.5	0.859	–26.3	0.297	25.92
0.4	0.566	–49.2	12.586	136.7	0.044	65.7	0.788	–33.4	0.394	24.55
0.5	0.520	–59.0	11.588	129.0	0.051	62.8	0.721	–39.4	0.462	23.54
0.6	0.461	–68.9	10.535	121.7	0.057	60.4	0.655	–44.8	0.543	22.65
0.7	0.416	–77.7	9.605	115.7	0.062	58.2	0.600	–49.3	0.613	21.88
0.8	0.372	–86.0	8.778	110.5	0.067	57.3	0.548	–53.6	0.684	21.19
0.9	0.337	–94.6	8.033	105.5	0.071	56.4	0.509	–57.3	0.743	20.55
1.0	0.311	–102.8	7.425	101.4	0.074	56.3	0.473	–60.9	0.797	20.00
1.1	0.288	–111.0	6.886	97.6	0.078	55.9	0.445	–64.3	0.843	19.45
1.2	0.272	–119.2	6.374	93.9	0.082	55.7	0.420	–67.3	0.888	18.92
1.3	0.262	–126.8	5.958	90.8	0.085	55.9	0.402	–70.4	0.922	18.45
1.4	0.256	–134.1	5.578	87.7	0.089	56.2	0.385	–73.0	0.953	17.97
1.5	0.252	–140.6	5.245	84.9	0.092	56.6	0.373	–75.6	0.980	17.54
1.6	0.248	–146.7	4.953	82.1	0.097	56.8	0.360	–78.0	1.004	16.70
1.7	0.250	–151.8	4.667	79.7	0.100	57.2	0.353	–80.1	1.024	15.73
1.8	0.247	–156.2	4.424	77.2	0.104	57.7	0.343	–82.1	1.049	14.94
1.9	0.249	–160.2	4.211	75.0	0.108	57.8	0.339	–83.7	1.059	14.42
2.0	0.253	–164.9	4.011	72.6	0.112	58.4	0.329	–85.3	1.075	13.86
2.1	0.252	–168.0	3.851	70.8	0.116	58.7	0.326	–87.0	1.082	13.44
2.2	0.255	–171.1	3.686	68.8	0.121	58.9	0.318	–88.5	1.093	12.98
2.3	0.259	–174.5	3.542	66.9	0.126	59.2	0.317	–90.0	1.095	12.62
2.4	0.259	–178.3	3.415	64.6	0.130	59.3	0.310	–91.4	1.104	12.23
2.5	0.264	179.4	3.294	62.8	0.135	59.6	0.307	–93.1	1.104	11.91
2.6	0.269	176.9	3.173	61.1	0.139	59.6	0.302	–94.9	1.110	11.55
2.7	0.272	174.8	3.065	59.3	0.144	59.7	0.299	–97.0	1.114	11.22
2.8	0.274	171.4	2.956	57.7	0.149	59.5	0.297	–98.8	1.120	10.87
2.9	0.274	169.3	2.850	55.3	0.155	58.9	0.294	–101.4	1.120	10.53
3.0	0.279	166.3	2.769	53.4	0.161	59.2	0.292	–103.8	1.116	10.28
4.0	0.342	138.7	2.125	34.7	0.227	56.0	0.343	–132.0	1.037	8.54
5.0	0.412	110.6	1.607	16.8	0.304	42.2	0.445	–156.3	0.973	7.24

V_{CE} = 1 V, I_C = 10 mA, Z_O = 50 Ω

Frequency (GHz)	S_{11} MAG.	S_{11} ANG. (deg.)	S_{21} MAG.	S_{21} ANG. (deg.)	S_{12} MAG.	S_{12} ANG. (deg.)	S_{22} MAG.	S_{22} ANG. (deg.)	K	MAG/MSG (dB)
0.1	0.646	–16.0	18.824	166.4	0.012	76.8	0.951	–10.6	0.239	32.05
0.2	0.606	–30.7	17.451	153.6	0.024	75.2	0.889	–21.0	0.270	28.59
0.3	0.544	–44.8	15.874	142.0	0.034	69.3	0.814	–29.7	0.369	26.73
0.4	0.478	–56.4	14.222	132.1	0.041	65.7	0.733	–36.9	0.471	25.40
0.5	0.431	–67.2	12.822	124.3	0.048	62.9	0.660	–42.8	0.551	24.30
0.6	0.377	–77.6	11.486	117.2	0.053	61.8	0.591	–47.9	0.635	23.34
0.7	0.337	–87.0	10.362	111.6	0.058	60.3	0.537	–52.3	0.706	22.52
0.8	0.302	–96.6	9.372	106.6	0.063	59.9	0.487	–56.1	0.773	21.76
0.9	0.276	–106.0	8.524	102.0	0.067	59.4	0.451	–59.9	0.826	21.05
1.0	0.255	–115.1	7.812	98.2	0.071	59.7	0.417	–63.2	0.876	20.41
1.1	0.242	–123.9	7.220	94.6	0.075	59.6	0.393	–66.3	0.912	19.81
1.2	0.231	–132.7	6.654	91.4	0.079	59.8	0.371	–69.3	0.952	19.23
1.3	0.231	–140.9	6.207	88.4	0.084	60.0	0.355	–72.3	0.974	18.70
1.4	0.227	–147.4	5.809	85.6	0.088	60.2	0.341	–75.1	0.999	18.20
1.5	0.230	–153.4	5.436	82.9	0.092	60.6	0.331	–77.4	1.018	16.89
1.6	0.232	–159.0	5.132	80.4	0.097	60.7	0.320	–80.0	1.035	16.12
1.7	0.235	–163.8	4.838	78.1	0.101	60.8	0.315	–81.9	1.047	15.47
1.8	0.235	–168.1	4.581	75.7	0.106	61.1	0.306	–84.0	1.065	14.82
1.9	0.238	–171.7	4.355	73.7	0.110	61.2	0.303	–85.5	1.071	14.34
2.0	0.243	–175.6	4.149	71.4	0.115	61.3	0.294	–87.2	1.082	13.83
2.1	0.246	178.7	3.807	67.7	0.125	61.4	0.286	–90.3	1.093	12.99
2.2	0.252	176.2	3.656	66.0	0.130	61.7	0.285	–91.8	1.091	12.65
2.3	0.254	173.3	3.520	63.9	0.135	61.5	0.279	–93.2	1.096	12.28
2.4	0.257	170.8	3.396	62.0	0.140	61.5	0.277	–95.0	1.095	11.96
2.5	0.265	168.6	3.275	60.5	0.145	61.4	0.272	–96.7	1.099	11.63
2.6	0.267	166.7	3.161	58.7	0.150	61.2	0.270	–98.9	1.101	11.30
2.7	0.269	164.2	3.042	57.2	0.155	60.8	0.267	–100.7	1.106	10.94
2.8	0.272	162.1	2.930	54.9	0.162	60.0	0.266	–103.5	1.104	10.61
2.9	0.276	159.4	2.850	53.1	0.168	59.9	0.264	–105.9	1.099	10.37
3.0	0.342	134.3	2.180	35.1	0.234	55.3	0.321	–134.4	1.034	8.57
4.0	0.412	108.3	1.649	17.7	0.306	41.2	0.424	–158.3	0.984	7.32
5.0										

V_{CE} = 1 V, I_C = 20 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}		K	MAG/MSG
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		(dB)
0.1	0.506	–23.6	23.959	162.4	0.012	74.9	0.905	–13.8	0.342	33.06
0.2	0.450	–42.2	21.326	146.8	0.023	72.7	0.815	–26.3	0.405	29.75
0.3	0.385	–60.6	18.512	134.2	0.030	68.3	0.716	–35.7	0.518	27.87
0.4	0.336	–75.8	15.934	124.0	0.037	65.8	0.622	–43.0	0.624	26.32
0.5	0.301	–89.1	13.930	116.5	0.043	64.8	0.547	–48.4	0.708	25.10
0.6	0.266	–102.2	12.194	109.9	0.049	64.4	0.481	–52.9	0.789	24.00
0.7	0.245	–114.0	10.795	104.9	0.054	64.1	0.432	–56.6	0.850	23.03
0.8	0.229	–125.1	9.658	100.4	0.058	64.2	0.389	–60.2	0.907	22.18
0.9	0.222	–135.3	8.698	96.5	0.064	64.4	0.358	–63.5	0.946	21.36
1.0	0.218	–145.3	7.928	93.0	0.068	64.8	0.331	–66.8	0.983	20.65
1.1	0.218	–153.8	7.277	89.9	0.073	64.8	0.313	–70.0	1.006	19.47
1.2	0.223	–161.4	6.685	87.0	0.078	65.0	0.296	–73.0	1.030	18.25
1.3	0.230	–167.1	6.210	84.3	0.083	65.1	0.285	–76.1	1.043	17.45
1.4	0.236	–173.1	5.793	81.8	0.089	65.1	0.275	–78.9	1.056	16.71
1.5	0.241	–177.0	5.423	79.3	0.094	65.3	0.269	–81.4	1.066	16.06
1.6	0.247	178.9	5.101	77.0	0.099	65.1	0.262	–84.0	1.075	15.45
1.7	0.255	176.0	4.805	75.0	0.104	65.0	0.260	–86.1	1.080	14.92
1.8	0.257	172.7	4.532	72.9	0.109	65.1	0.253	–88.3	1.092	14.33
1.9	0.262	170.4	4.313	71.0	0.115	64.8	0.253	–89.8	1.090	13.92
2.0	0.266	167.9	4.107	68.8	0.120	64.8	0.246	–91.7	1.096	13.45
2.1	0.272	166.2	3.939	67.1	0.126	64.8	0.245	–93.2	1.092	13.11
2.2	0.273	163.4	3.762	65.4	0.131	64.3	0.240	–94.9	1.099	12.66
2.3	0.279	162.1	3.614	63.7	0.137	64.0	0.240	–96.4	1.094	12.35
2.4	0.285	159.9	3.478	61.8	0.143	63.7	0.236	–97.9	1.092	12.02
2.5	0.289	158.2	3.355	60.1	0.148	63.3	0.235	–99.7	1.090	11.71
2.6	0.291	156.5	3.230	58.6	0.154	62.9	0.231	–101.7	1.094	11.36
2.7	0.296	155.0	3.117	56.8	0.160	62.5	0.230	–104.0	1.092	11.06
2.8	0.300	152.8	3.004	55.5	0.165	61.9	0.229	–106.0	1.095	10.72
2.9	0.301	151.4	2.893	53.3	0.172	60.9	0.229	–109.1	1.093	10.39
3.0	0.307	148.7	2.808	51.5	0.179	60.6	0.228	–111.6	1.088	10.15
4.0	0.375	127.5	2.139	34.1	0.244	54.3	0.297	–140.5	1.034	8.30
5.0	0.439	103.8	1.610	17.6	0.313	39.4	0.403	–163.3	1.002	6.86

V_{CE} = 2 V, I_C = 1 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}		K	MAG/MSG
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		(dB)
0.1	0.952	–5.9	3.448	175.1	0.013	81.8	1.001	–3.3	0.085	24.24
0.2	0.947	–10.0	3.410	170.6	0.025	83.1	0.993	–7.1	0.040	21.38
0.3	0.936	–15.5	3.399	164.7	0.037	78.0	0.985	–10.8	0.093	19.59
0.4	0.920	–20.8	3.369	158.7	0.049	74.3	0.972	–14.7	0.132	18.37
0.5	0.909	–25.9	3.360	154.1	0.061	70.4	0.960	–18.7	0.149	17.44
0.6	0.885	–31.7	3.322	148.1	0.071	66.5	0.938	–22.7	0.188	16.70
0.7	0.860	–36.7	3.273	143.0	0.081	62.5	0.920	–26.7	0.222	16.07
0.8	0.833	–42.4	3.207	137.7	0.089	58.5	0.894	–30.9	0.257	15.55
0.9	0.803	–48.0	3.140	132.3	0.097	55.0	0.873	–34.9	0.289	15.11
1.0	0.772	–53.4	3.074	127.2	0.102	51.2	0.845	–39.0	0.331	14.78
1.1	0.743	–59.0	3.007	122.3	0.108	47.9	0.823	–43.0	0.361	14.46
1.2	0.714	–64.7	2.913	117.4	0.111	44.8	0.799	–46.6	0.401	14.19
1.3	0.685	–70.2	2.829	112.9	0.114	41.8	0.780	–50.3	0.434	13.94
1.4	0.662	–75.7	2.738	108.4	0.116	39.2	0.759	–53.7	0.471	13.71
1.5	0.640	–81.1	2.653	104.1	0.117	36.8	0.744	–57.0	0.506	13.55
1.6	0.619	–86.2	2.571	100.1	0.117	34.5	0.724	–60.2	0.552	13.40
1.7	0.599	–91.3	2.477	96.2	0.116	32.8	0.713	–63.1	0.592	13.28
1.8	0.582	–96.3	2.385	92.4	0.115	31.5	0.695	–65.7	0.649	13.16
1.9	0.566	–101.4	2.306	89.1	0.114	30.3	0.688	–68.2	0.689	13.08
2.0	0.554	–106.0	2.225	85.4	0.111	29.9	0.672	–70.5	0.757	13.02
2.1	0.542	–110.2	2.166	82.4	0.109	29.8	0.665	–72.8	0.803	13.00
2.2	0.528	–114.7	2.083	79.3	0.106	30.2	0.654	–74.9	0.880	12.95
2.3	0.520	–119.1	2.023	76.3	0.103	31.0	0.648	–77.1	0.933	12.94
2.4	0.515	–123.5	1.964	73.1	0.100	32.1	0.636	–79.1	1.010	12.31
2.5	0.506	–127.5	1.913	70.3	0.097	33.8	0.632	–81.4	1.074	11.27
2.6	0.503	–131.8	1.850	67.9	0.094	35.6	0.624	–83.8	1.158	10.52
2.7	0.499	–135.5	1.802	64.9	0.093	38.4	0.619	–86.2	1.219	10.07
2.8	0.493	–139.4	1.741	62.4	0.091	41.3	0.613	–88.2	1.297	9.53
2.9	0.489	–143.0	1.694	59.3	0.092	44.5	0.604	–90.7	1.362	9.08
3.0	0.484	–147.1	1.654	56.5	0.092	48.3	0.596	–93.7	1.415	8.70
4.0	0.486	171.8	1.320	32.2	0.167	71.6	0.607	–122.2	1.032	7.88
5.0	0.514	126.9	0.950	10.5	0.301	55.4	0.673	–151.1	0.846	4.99

V_{CE} = 2 V, I_C = 3 mA, Z_O = 50 Ω

Frequency (GHz)	S_{11} MAG.	S_{11} ANG. (deg.)	S_{21} MAG.	S_{21} ANG. (deg.)	S_{12} MAG.	S_{12} ANG. (deg.)	S_{22} MAG.	S_{22} ANG. (deg.)	K	MAG/MSG (dB)
0.1	0.849	–8.1	8.766	172.7	0.013	81.5	0.991	–5.2	0.115	28.45
0.2	0.848	–15.9	8.544	165.2	0.024	79.7	0.971	–11.1	0.113	25.55
0.3	0.813	–23.7	8.340	157.3	0.034	75.3	0.947	–16.5	0.168	23.83
0.4	0.776	–31.4	8.038	149.5	0.045	70.3	0.911	–21.9	0.236	22.56
0.5	0.747	–38.3	7.789	143.1	0.053	66.3	0.875	–27.1	0.277	21.63
0.6	0.696	–45.9	7.422	136.0	0.061	62.5	0.829	–32.0	0.339	20.84
0.7	0.654	–52.6	7.059	130.1	0.068	59.1	0.787	–36.4	0.394	20.18
0.8	0.606	–59.1	6.676	124.4	0.073	56.3	0.743	–40.9	0.451	19.63
0.9	0.563	–65.6	6.326	118.9	0.077	54.0	0.706	–44.9	0.504	19.12
1.0	0.523	–71.8	5.997	113.9	0.081	52.1	0.667	–48.7	0.560	18.72
1.1	0.484	–78.5	5.680	109.4	0.084	50.3	0.635	–52.3	0.610	18.32
1.2	0.450	–84.4	5.350	104.9	0.086	49.2	0.605	–55.4	0.669	17.94
1.3	0.424	–90.6	5.074	101.0	0.088	48.4	0.581	–58.8	0.713	17.61
1.4	0.401	–96.5	4.800	97.3	0.090	47.9	0.559	–61.6	0.762	17.28
1.5	0.384	–102.1	4.564	93.8	0.091	47.6	0.542	–64.2	0.803	16.98
1.6	0.365	–108.0	4.348	90.3	0.093	47.4	0.523	–66.8	0.851	16.70
1.7	0.353	–113.0	4.131	87.3	0.094	47.8	0.513	–68.9	0.891	16.42
1.8	0.344	–117.9	3.933	84.3	0.096	48.2	0.497	–70.9	0.937	16.14
1.9	0.332	–123.2	3.763	81.6	0.097	48.7	0.490	–72.8	0.971	15.87
2.0	0.325	–127.6	3.597	78.7	0.099	49.7	0.477	–74.5	1.016	14.85
2.1	0.321	–131.8	3.464	76.5	0.101	51.0	0.472	–76.2	1.038	14.18
2.2	0.317	–136.1	3.324	73.9	0.103	51.8	0.462	–77.9	1.071	13.48
2.3	0.312	–140.2	3.202	71.7	0.105	53.1	0.458	–79.3	1.091	13.00
2.4	0.309	–144.0	3.094	69.1	0.108	54.1	0.449	–80.9	1.116	12.52
2.5	0.308	–148.2	2.989	66.9	0.110	55.4	0.445	–82.6	1.132	12.13
2.6	0.308	–151.4	2.886	64.9	0.113	56.4	0.437	–84.5	1.152	11.71
2.7	0.309	–155.2	2.795	62.7	0.116	57.5	0.433	–86.3	1.162	11.38
2.8	0.307	–158.8	2.695	60.8	0.120	58.5	0.429	–88.1	1.174	10.99
2.9	0.302	–161.8	2.607	58.1	0.125	58.9	0.423	–90.4	1.184	10.61
3.0	0.306	–165.4	2.540	55.8	0.129	60.0	0.419	–92.8	1.177	10.38
4.0	0.345	158.2	1.983	35.0	0.199	63.4	0.447	–119.8	1.013	9.27
5.0	0.411	121.8	1.483	14.2	0.296	50.0	0.544	–146.7	0.882	7.00

V_{CE} = 2 V, I_C = 5 mA, Z_O = 50 Ω

Frequency (GHz)	S_{11} MAG.	S_{11} ANG. (deg.)	S_{21} MAG.	S_{21} ANG. (deg.)	S_{12} MAG.	S_{12} ANG. (deg.)	S_{22} MAG.	S_{22} ANG. (deg.)	K	MAG/MSG (dB)
0.1	0.793	–9.6	12.650	170.5	0.011	79.8	0.981	–6.7	0.164	30.67
0.2	0.766	–19.3	12.156	161.4	0.022	79.4	0.950	–13.9	0.159	27.36
0.3	0.721	–29.4	11.624	152.1	0.032	72.6	0.910	–20.3	0.248	25.54
0.4	0.671	–38.1	10.959	143.3	0.041	69.0	0.859	–26.4	0.317	24.26
0.5	0.627	–46.2	10.354	136.2	0.049	65.0	0.807	–31.7	0.382	23.29
0.6	0.572	–54.3	9.653	128.9	0.055	62.3	0.749	–36.7	0.453	22.44
0.7	0.523	–61.3	8.978	122.9	0.060	59.6	0.699	–41.1	0.519	21.73
0.8	0.474	–68.5	8.329	117.3	0.065	57.9	0.649	–45.3	0.585	21.10
0.9	0.431	–75.4	7.741	112.2	0.069	56.4	0.609	–48.9	0.645	20.53
1.0	0.394	–82.0	7.228	107.6	0.072	55.8	0.570	–52.4	0.704	20.02
1.1	0.361	–88.6	6.768	103.4	0.075	54.9	0.541	–55.6	0.756	19.56
1.2	0.332	–95.5	6.313	99.6	0.078	54.6	0.512	–58.5	0.809	19.09
1.3	0.311	–102.2	5.929	96.0	0.081	54.6	0.491	–61.4	0.850	18.67
1.4	0.296	–108.6	5.585	92.7	0.084	54.7	0.472	–63.9	0.887	18.25
1.5	0.283	–115.0	5.284	89.4	0.086	55.0	0.457	–66.2	0.922	17.88
1.6	0.271	–120.7	4.996	86.5	0.089	55.1	0.440	–68.5	0.958	17.50
1.7	0.265	–126.1	4.727	83.9	0.092	55.8	0.432	–70.5	0.985	17.12
1.8	0.257	–131.4	4.482	81.2	0.095	56.2	0.420	–72.3	1.017	15.95
1.9	0.253	–136.5	4.279	78.8	0.098	56.8	0.414	–73.9	1.034	15.28
2.0	0.250	–141.1	4.082	76.1	0.101	57.7	0.403	–75.4	1.060	14.57
2.1	0.248	–145.3	3.927	74.1	0.104	58.4	0.399	–77.0	1.070	14.14
2.2	0.245	–149.4	3.759	71.9	0.108	58.9	0.390	–78.4	1.089	13.60
2.3	0.246	–153.4	3.615	69.9	0.112	59.7	0.388	–79.8	1.096	13.21
2.4	0.245	–156.6	3.490	67.6	0.116	60.1	0.380	–81.1	1.106	12.81
2.5	0.246	–160.7	3.369	65.7	0.120	60.7	0.376	–82.7	1.110	12.47
2.6	0.248	–163.8	3.248	63.9	0.123	61.2	0.370	–84.3	1.122	12.08
2.7	0.252	–166.3	3.139	61.9	0.128	61.7	0.367	–86.1	1.121	11.78
2.8	0.253	–170.0	3.024	60.2	0.132	61.8	0.364	–87.7	1.129	11.41
2.9	0.252	–173.2	2.926	57.7	0.138	61.7	0.359	–90.1	1.129	11.09
3.0	0.255	–176.5	2.849	55.5	0.144	62.2	0.356	–92.4	1.121	10.86
4.0	0.307	150.1	2.206	36.5	0.212	61.4	0.390	–119.9	1.010	9.56
5.0	0.380	117.6	1.674	17.1	0.297	47.7	0.490	–146.3	0.913	7.50

V_{CE} = 2 V, I_C = 7 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}		K	MAG/MSG
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		(dB)
0.1	0.738	–11.4	15.535	169.0	0.012	79.1	0.972	–7.8	0.195	31.23
0.2	0.703	–22.4	14.745	158.5	0.021	77.8	0.932	–15.8	0.211	28.37
0.3	0.653	–33.3	13.867	148.5	0.031	72.3	0.881	–22.9	0.295	26.48
0.4	0.597	–42.8	12.835	139.1	0.039	68.3	0.818	–29.3	0.382	25.19
0.5	0.547	–51.3	11.917	131.7	0.046	65.1	0.757	–34.7	0.454	24.18
0.6	0.489	–59.8	10.929	124.4	0.051	62.9	0.695	–39.6	0.533	23.29
0.7	0.441	–67.4	10.045	118.5	0.056	60.7	0.642	–43.6	0.604	22.53
0.8	0.393	–74.4	9.212	113.2	0.060	59.8	0.591	–47.5	0.677	21.86
0.9	0.355	–81.6	8.480	108.3	0.064	59.0	0.552	–50.8	0.733	21.20
1.0	0.322	–88.7	7.861	104.1	0.068	58.7	0.514	–53.9	0.791	20.66
1.1	0.293	–96.0	7.320	100.2	0.071	58.3	0.487	–57.0	0.836	20.12
1.2	0.268	–103.3	6.790	96.5	0.075	58.5	0.460	–59.7	0.884	19.60
1.3	0.253	–110.7	6.360	93.3	0.078	58.6	0.441	–62.3	0.918	19.13
1.4	0.241	–117.7	5.971	90.1	0.082	59.0	0.424	–64.8	0.947	18.64
1.5	0.232	–124.4	5.621	87.3	0.085	59.3	0.411	–67.0	0.976	18.23
1.6	0.225	–130.9	5.316	84.6	0.088	59.6	0.398	–69.2	0.999	17.79
1.7	0.224	–136.4	5.019	82.1	0.092	60.1	0.391	–71.0	1.017	16.57
1.8	0.218	–141.5	4.759	79.4	0.095	60.5	0.379	–72.8	1.043	15.71
1.9	0.215	–146.3	4.532	77.3	0.100	60.7	0.375	–74.3	1.053	15.17
2.0	0.216	–150.8	4.321	74.8	0.103	61.4	0.364	–75.7	1.070	14.59
2.1	0.218	–155.1	4.150	73.0	0.107	61.9	0.361	–77.2	1.074	14.21
2.2	0.216	–158.7	3.975	70.9	0.111	62.1	0.354	–78.6	1.087	13.72
2.3	0.217	–162.6	3.822	69.0	0.116	62.6	0.352	–79.9	1.090	13.35
2.4	0.218	–165.3	3.679	66.9	0.121	62.7	0.344	–81.0	1.096	12.95
2.5	0.222	–169.1	3.551	65.0	0.125	63.1	0.342	–82.7	1.097	12.64
2.6	0.224	–172.1	3.422	63.3	0.129	63.1	0.336	–84.2	1.104	12.26
2.7	0.228	–174.8	3.303	61.4	0.134	63.3	0.333	–86.0	1.106	11.94
2.8	0.228	–177.7	3.188	59.8	0.139	63.2	0.330	–87.6	1.109	11.60
2.9	0.231	179.4	3.077	57.4	0.145	62.7	0.326	–90.0	1.107	11.28
3.0	0.232	176.0	2.996	55.4	0.151	63.0	0.323	–92.2	1.102	11.03
4.0	0.293	145.1	2.313	37.1	0.218	60.3	0.361	–120.4	1.009	9.68
5.0	0.367	115.1	1.758	18.5	0.299	46.6	0.464	–146.6	0.928	7.69

V_{CE} = 2 V, I_C = 10 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}		K	MAG/MSG
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		(dB)
0.1	0.669	–13.1	18.827	167.3	0.011	81.6	0.960	–9.1	0.196	32.37
0.2	0.633	–25.9	17.591	155.4	0.020	76.2	0.908	–18.0	0.271	29.37
0.3	0.570	–37.8	16.209	144.5	0.029	71.9	0.844	–25.6	0.361	27.44
0.4	0.511	–48.0	14.664	134.8	0.036	67.7	0.771	–32.1	0.462	26.05
0.5	0.463	–57.3	13.369	127.2	0.043	65.6	0.702	–37.4	0.537	24.96
0.6	0.404	–65.9	12.067	120.1	0.048	64.3	0.637	–41.9	0.623	24.05
0.7	0.358	–73.7	10.941	114.4	0.052	62.9	0.584	–45.6	0.694	23.19
0.8	0.316	–81.4	9.951	109.3	0.057	62.3	0.534	–49.1	0.763	22.45
0.9	0.283	–89.2	9.095	104.8	0.061	62.1	0.497	–52.0	0.816	21.76
1.0	0.256	–97.3	8.375	100.8	0.065	62.2	0.463	–55.0	0.865	21.13
1.1	0.235	–105.2	7.752	97.2	0.068	62.1	0.438	–57.8	0.904	20.54
1.2	0.214	–113.4	7.173	93.8	0.072	62.2	0.415	–60.3	0.944	19.96
1.3	0.207	–121.0	6.696	90.8	0.076	62.5	0.398	–62.9	0.967	19.43
1.4	0.198	–129.3	6.274	88.0	0.081	62.9	0.383	–65.2	0.991	18.92
1.5	0.195	–136.2	5.898	85.2	0.084	63.3	0.372	–67.3	1.009	17.84
1.6	0.193	–142.4	5.561	82.7	0.089	63.2	0.360	–69.4	1.027	16.97
1.7	0.192	–148.7	5.241	80.4	0.093	63.5	0.354	–71.2	1.042	16.27
1.8	0.193	–153.1	4.965	78.1	0.097	64.0	0.344	–73.0	1.058	15.63
1.9	0.194	–158.0	4.727	76.0	0.102	63.9	0.341	–74.5	1.059	15.18
2.0	0.194	–161.8	4.502	73.6	0.106	64.3	0.331	–75.8	1.074	14.62
2.1	0.196	–165.4	4.326	71.9	0.111	64.7	0.329	–77.3	1.075	14.26
2.2	0.197	–168.8	4.135	69.9	0.115	64.6	0.322	–78.5	1.083	13.79
2.3	0.201	–172.0	3.977	68.1	0.120	64.8	0.321	–79.8	1.080	13.46
2.4	0.202	–174.9	3.828	66.0	0.125	64.7	0.315	–81.0	1.087	13.08
2.5	0.205	–178.1	3.694	64.3	0.130	64.8	0.313	–82.6	1.085	12.76
2.6	0.210	179.6	3.557	62.7	0.135	64.7	0.307	–84.0	1.088	12.41
2.7	0.214	177.2	3.436	61.0	0.139	64.7	0.304	–85.8	1.089	12.09
2.8	0.215	173.8	3.313	59.5	0.145	64.3	0.302	–87.4	1.093	11.74
2.9	0.216	171.6	3.194	57.2	0.151	63.7	0.299	–90.0	1.091	11.41
3.0	0.222	168.4	3.109	55.2	0.157	63.7	0.296	–92.1	1.083	11.21
4.0	0.287	140.5	2.392	37.6	0.224	59.7	0.337	–121.1	1.007	9.77
5.0	0.361	112.4	1.824	19.9	0.301	45.7	0.440	–147.2	0.942	7.83

V_{CE} = 2 V, I_C = 20 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}		K	MAG/MSG
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		(dB)
0.1	0.542	–17.9	24.232	164.1	0.010	66.6	0.934	–11.1	0.399	33.96
0.2	0.493	–33.0	21.939	149.7	0.019	75.1	0.858	–21.6	0.380	30.72
0.3	0.431	–47.4	19.388	137.6	0.026	71.9	0.770	–29.7	0.484	28.64
0.4	0.367	–58.9	16.973	127.6	0.033	69.1	0.684	–35.9	0.601	27.17
0.5	0.322	–69.1	14.992	120.1	0.038	68.0	0.611	–40.5	0.686	25.96
0.6	0.277	–79.2	13.250	113.5	0.043	67.4	0.547	–44.3	0.766	24.87
0.7	0.243	–88.4	11.802	108.2	0.048	66.8	0.498	–47.2	0.832	23.94
0.8	0.212	–98.5	10.616	103.7	0.052	67.0	0.453	–50.1	0.888	23.08
0.9	0.193	–108.5	9.591	99.6	0.057	67.0	0.422	–52.6	0.929	22.27
1.0	0.175	–117.8	8.791	96.1	0.061	67.4	0.393	–55.0	0.967	21.56
1.1	0.167	–127.8	8.092	92.9	0.066	67.4	0.372	–57.5	0.991	20.89
1.2	0.160	–137.7	7.439	89.9	0.070	67.7	0.353	–59.7	1.020	19.38
1.3	0.163	–146.3	6.932	87.3	0.075	67.8	0.341	–62.1	1.030	18.58
1.4	0.164	–154.2	6.475	84.6	0.080	67.8	0.329	–64.4	1.043	17.81
1.5	0.166	–160.4	6.067	82.1	0.085	68.1	0.321	–66.5	1.055	17.12
1.6	0.169	–166.1	5.723	79.9	0.090	67.9	0.312	–68.6	1.061	16.53
1.7	0.177	–170.1	5.378	77.9	0.094	68.1	0.308	–70.3	1.069	15.96
1.8	0.176	–174.4	5.085	75.7	0.099	68.1	0.300	–72.1	1.081	15.36
1.9	0.182	–177.9	4.839	73.7	0.104	67.9	0.299	–73.5	1.079	14.95
2.0	0.186	178.7	4.607	71.4	0.109	68.0	0.292	–74.9	1.084	14.48
2.1	0.191	176.1	4.421	69.9	0.115	68.1	0.291	–76.3	1.081	14.13
2.2	0.193	174.1	4.231	68.0	0.120	67.7	0.285	–77.7	1.084	13.72
2.3	0.198	171.5	4.058	66.4	0.125	67.6	0.285	–79.0	1.082	13.37
2.4	0.202	169.2	3.910	64.5	0.130	67.3	0.280	–80.1	1.081	13.04
2.5	0.206	167.6	3.768	62.7	0.135	67.1	0.279	–81.8	1.079	12.73
2.6	0.211	165.4	3.629	61.4	0.141	66.7	0.274	–83.1	1.080	12.39
2.7	0.214	164.0	3.510	59.5	0.146	66.4	0.272	–85.1	1.077	12.11
2.8	0.219	160.9	3.380	58.2	0.151	65.8	0.270	–86.7	1.080	11.76
2.9	0.219	159.3	3.258	56.1	0.158	64.9	0.268	–89.5	1.079	11.43
3.0	0.225	156.6	3.168	54.3	0.165	64.7	0.267	–91.7	1.071	11.22
4.0	0.295	133.2	2.424	37.3	0.232	59.2	0.313	–122.2	1.007	9.68
5.0	0.367	108.4	1.848	20.3	0.305	44.6	0.417	–148.7	0.956	7.82

S-PARAMETERS Q2

V_{CE} = 1 V, I_C = 1 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}		K	MAG/MSG
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		(dB)
0.1	0.973	–26.9	3.619	162.3	0.055	73.9	0.980	–9.6	0.059	18.14
0.2	0.936	–51.7	3.311	146.1	0.104	60.7	0.917	–18.4	0.099	15.03
0.3	0.883	–74.2	2.950	131.4	0.139	48.2	0.847	–25.1	0.164	13.28
0.4	0.835	–92.8	2.602	118.8	0.161	38.4	0.777	–30.6	0.234	12.08
0.5	0.809	–108.3	2.317	108.8	0.175	30.5	0.719	–34.7	0.285	11.22
0.6	0.781	–121.3	2.046	99.7	0.182	24.1	0.669	–38.2	0.354	10.50
0.7	0.766	–132.5	1.829	92.3	0.186	18.7	0.635	–41.3	0.409	9.93
0.8	0.754	–141.9	1.644	85.7	0.185	14.4	0.605	–44.5	0.472	9.48
0.9	0.746	–149.9	1.482	79.5	0.184	10.7	0.584	–47.6	0.539	9.06
1.0	0.743	–156.8	1.357	73.9	0.180	7.8	0.568	–50.8	0.604	8.77
1.1	0.741	–163.2	1.249	68.9	0.175	5.0	0.559	–54.3	0.667	8.53
1.2	0.745	–168.8	1.145	64.1	0.169	3.1	0.551	–57.5	0.733	8.30
1.3	0.747	–173.2	1.066	60.0	0.163	1.3	0.549	–61.1	0.799	8.16
1.4	0.753	–177.7	0.995	55.9	0.156	0.1	0.547	–64.6	0.859	8.03
1.5	0.753	178.8	0.933	52.0	0.149	–0.6	0.551	–68.0	0.944	7.98
1.6	0.759	175.2	0.874	48.7	0.141	–0.9	0.549	–71.3	1.027	6.90
1.7	0.764	172.2	0.821	45.4	0.134	–0.6	0.556	–74.6	1.104	5.91
1.8	0.765	169.2	0.774	42.4	0.126	0.6	0.558	–77.8	1.228	5.00
1.9	0.767	166.2	0.733	39.7	0.119	2.1	0.564	–80.9	1.332	4.45
2.0	0.772	163.6	0.700	36.6	0.113	4.7	0.566	–84.0	1.436	4.00
2.1	0.773	161.1	0.675	35.0	0.107	8.1	0.573	–87.2	1.523	3.73
2.2	0.776	158.7	0.641	33.0	0.102	12.2	0.576	–90.3	1.653	3.24
2.3	0.776	156.0	0.614	31.4	0.100	17.0	0.584	–93.2	1.737	2.91
2.4	0.777	153.5	0.592	29.5	0.098	22.0	0.582	–96.4	1.837	2.52
2.5	0.781	151.0	0.568	27.9	0.099	27.7	0.588	–99.8	1.844	2.29
2.6	0.779	148.5	0.545	26.7	0.101	33.2	0.591	–103.1	1.905	1.85
2.7	0.776	145.9	0.526	25.4	0.106	37.9	0.596	–106.7	1.905	1.47
2.8	0.765	143.6	0.502	24.6	0.113	41.4	0.599	–109.8	1.982	0.80
2.9	0.737	141.5	0.478	23.3	0.123	42.9	0.599	–113.2	2.176	–0.22
3.0	0.722	140.5	0.463	22.0	0.130	44.1	0.596	–117.1	2.283	–0.84
4.0	0.793	118.9	0.379	17.8	0.230	53.2	0.655	–150.7	1.372	–1.47
5.0	0.752	96.1	0.380	17.2	0.338	34.4	0.687	–177.9	1.313	–2.85

V_{CE} = 1 V, I_C = 3 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}		K	MAG/MSG
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		(dB)
0.1	0.900	–42.3	9.612	154.4	0.052	67.8	0.921	–20.6	0.066	22.63
0.2	0.828	–75.6	7.960	134.2	0.087	51.1	0.767	–36.3	0.150	19.61
0.3	0.758	–101.6	6.434	119.4	0.106	40.0	0.631	–46.1	0.240	17.84
0.4	0.722	–120.4	5.271	108.5	0.116	32.8	0.527	–53.0	0.321	16.59
0.5	0.702	–134.5	4.452	100.0	0.121	28.3	0.453	–57.5	0.399	15.66
0.6	0.685	–145.7	3.801	93.4	0.123	25.2	0.397	–61.5	0.488	14.90
0.7	0.678	–154.7	3.310	87.7	0.124	23.0	0.359	–64.6	0.566	14.25
0.8	0.674	–162.1	2.919	83.0	0.125	21.9	0.330	–68.1	0.648	13.70
0.9	0.675	–168.1	2.605	78.5	0.125	21.0	0.311	–71.5	0.725	13.20
1.0	0.677	–173.6	2.359	74.4	0.124	21.1	0.297	–75.0	0.797	12.79
1.1	0.677	–178.3	2.149	70.8	0.124	21.2	0.290	–78.4	0.874	12.41
1.2	0.684	177.5	1.968	67.2	0.123	21.8	0.284	–81.9	0.937	12.04
1.3	0.688	174.0	1.820	64.1	0.123	22.6	0.285	–85.0	1.000	11.72
1.4	0.692	170.8	1.694	60.9	0.122	23.6	0.285	–88.3	1.062	9.89
1.5	0.695	168.0	1.583	57.7	0.122	25.0	0.289	–91.0	1.122	9.00
1.6	0.701	165.4	1.488	55.0	0.123	26.3	0.291	–94.0	1.166	8.37
1.7	0.704	163.0	1.397	52.4	0.123	27.9	0.298	–96.4	1.218	7.73
1.8	0.705	160.9	1.322	49.8	0.124	29.7	0.301	–99.1	1.273	7.14
1.9	0.706	158.6	1.255	47.4	0.126	31.5	0.309	–101.3	1.315	6.64
2.0	0.709	156.5	1.194	44.7	0.128	33.6	0.311	–103.7	1.351	6.18
2.1	0.713	154.3	1.150	42.9	0.130	35.5	0.319	–106.0	1.355	5.90
2.2	0.712	152.6	1.100	41.0	0.133	37.2	0.322	–108.6	1.389	5.44
2.3	0.716	150.3	1.059	39.1	0.137	38.9	0.330	–110.8	1.379	5.20
2.4	0.717	148.3	1.019	36.7	0.142	40.3	0.332	–113.3	1.387	4.85
2.5	0.721	146.1	0.983	35.1	0.148	41.8	0.339	–116.0	1.371	4.60
2.6	0.719	144.2	0.946	33.4	0.152	42.9	0.344	–118.7	1.392	4.20
2.7	0.716	142.0	0.911	31.5	0.159	43.7	0.351	–121.8	1.408	3.79
2.8	0.707	139.8	0.876	30.1	0.165	43.8	0.356	–124.5	1.453	3.26
2.9	0.682	138.2	0.831	28.1	0.172	43.0	0.362	–127.6	1.571	2.38
3.0	0.670	137.7	0.804	26.7	0.177	43.0	0.366	–131.2	1.637	1.90
4.0	0.750	118.5	0.630	11.9	0.250	45.5	0.466	–159.4	1.217	1.21
5.0	0.729	96.8	0.507	4.9	0.334	30.8	0.551	178.1	1.252	–1.21

V_{CE} = 1 V, I_C = 5 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}		K	MAG/MSG
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		(dB)
0.1	0.833	–54.3	14.362	147.8	0.049	62.3	0.861	–30.0	0.112	24.67
0.2	0.757	–92.6	10.885	126.0	0.074	46.4	0.652	–49.9	0.208	21.66
0.3	0.693	–118.9	8.290	112.2	0.086	37.7	0.502	–61.9	0.325	19.85
0.4	0.670	–135.7	6.567	102.6	0.092	33.1	0.401	–70.3	0.430	18.54
0.5	0.661	–148.0	5.432	95.5	0.096	30.9	0.334	–76.4	0.523	17.55
0.6	0.651	–157.5	4.591	89.9	0.098	30.0	0.287	–82.4	0.625	16.69
0.7	0.649	–165.1	3.964	85.2	0.101	29.7	0.256	–87.3	0.713	15.95
0.8	0.650	–171.3	3.486	81.2	0.103	30.3	0.233	–92.9	0.796	15.31
0.9	0.652	–176.4	3.095	77.4	0.105	30.9	0.220	–97.5	0.868	14.68
1.0	0.656	179.1	2.793	73.8	0.107	32.0	0.212	–102.5	0.937	14.16
1.1	0.659	174.9	2.544	70.7	0.110	32.9	0.209	–106.5	0.997	13.65
1.2	0.665	171.5	2.321	67.7	0.113	34.0	0.208	–110.3	1.047	11.82
1.3	0.671	168.3	2.148	64.7	0.115	35.2	0.211	–113.3	1.088	10.91
1.4	0.673	165.6	1.999	62.0	0.118	36.4	0.213	–116.5	1.129	10.10
1.5	0.678	163.2	1.864	59.3	0.121	37.7	0.218	–118.6	1.159	9.45
1.6	0.683	161.0	1.756	56.8	0.125	38.7	0.221	–121.1	1.181	8.90
1.7	0.687	158.9	1.648	54.5	0.129	39.8	0.228	–122.5	1.206	8.34
1.8	0.686	157.0	1.561	52.2	0.132	41.0	0.231	–124.7	1.240	7.76
1.9	0.688	154.7	1.481	49.9	0.137	41.9	0.238	–125.7	1.255	7.31
2.0	0.690	153.1	1.412	47.5	0.141	43.0	0.240	–127.8	1.268	6.88
2.1	0.694	151.2	1.358	45.7	0.146	43.9	0.246	–129.1	1.260	6.61
2.2	0.692	149.5	1.300	43.9	0.151	44.5	0.249	–131.1	1.281	6.16
2.3	0.695	147.4	1.251	41.9	0.157	45.0	0.255	–132.6	1.272	5.87
2.4	0.697	145.7	1.210	39.9	0.163	45.4	0.258	–134.7	1.268	5.59
2.5	0.698	143.6	1.165	38.1	0.170	45.8	0.264	–136.6	1.263	5.27
2.6	0.698	141.7	1.121	36.4	0.175	45.9	0.268	–138.7	1.275	4.91
2.7	0.694	139.8	1.080	34.6	0.182	45.8	0.275	–141.1	1.290	4.50
2.8	0.684	137.8	1.039	33.1	0.188	45.2	0.282	–143.4	1.331	3.98
2.9	0.661	136.3	0.988	31.2	0.195	43.8	0.290	–146.0	1.418	3.20
3.0	0.649	135.8	0.956	29.7	0.199	43.5	0.295	–149.1	1.475	2.74
4.0	0.730	117.8	0.753	13.6	0.264	42.5	0.399	–170.4	1.181	1.98
5.0	0.716	96.9	0.598	3.4	0.336	28.5	0.491	171.9	1.213	–0.28

V_{CE} = 1 V, I_C = 7 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}		K	MAG/MSG
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		(dB)
0.1	0.782	–65.3	18.038	142.5	0.045	59.1	0.806	–37.9	0.130	26.03
0.2	0.705	–105.6	12.752	120.4	0.065	44.4	0.571	–60.8	0.266	22.95
0.3	0.661	–130.4	9.386	107.8	0.073	37.4	0.425	–74.6	0.402	21.08
0.4	0.645	–145.6	7.303	99.2	0.079	35.1	0.336	–85.0	0.522	19.69
0.5	0.640	–156.4	5.973	92.7	0.083	34.8	0.280	–93.1	0.627	18.60
0.6	0.637	–164.5	5.020	87.9	0.086	35.2	0.243	–101.4	0.728	17.67
0.7	0.639	–171.2	4.330	83.6	0.089	35.9	0.220	–108.0	0.811	16.85
0.8	0.639	–176.7	3.799	80.0	0.093	37.1	0.206	–115.1	0.893	16.12
0.9	0.643	178.7	3.367	76.6	0.097	38.3	0.199	–120.7	0.953	15.39
1.0	0.648	174.8	3.036	73.4	0.101	39.7	0.197	–126.0	1.007	14.28
1.1	0.651	171.0	2.761	70.6	0.105	40.7	0.197	–129.9	1.053	12.78
1.2	0.657	167.9	2.519	67.8	0.110	41.7	0.200	–133.6	1.089	11.78
1.3	0.663	165.3	2.329	65.2	0.114	42.8	0.204	–135.9	1.116	11.03
1.4	0.667	162.7	2.168	62.7	0.119	43.7	0.208	–138.5	1.141	10.33
1.5	0.671	160.5	2.023	60.2	0.124	44.6	0.213	–139.9	1.161	9.70
1.6	0.673	158.3	1.903	57.8	0.129	45.2	0.217	–142.1	1.177	9.14
1.7	0.675	156.6	1.787	55.6	0.134	46.1	0.221	–142.8	1.197	8.58
1.8	0.680	154.6	1.692	53.4	0.139	46.6	0.225	–144.7	1.206	8.12
1.9	0.680	152.7	1.607	51.2	0.145	47.0	0.229	–145.1	1.213	7.67
2.0	0.683	150.9	1.533	48.9	0.150	47.7	0.231	–146.7	1.219	7.27
2.1	0.683	149.4	1.474	47.3	0.156	47.8	0.236	–147.6	1.220	6.92
2.2	0.684	147.7	1.413	45.6	0.162	47.9	0.238	–149.4	1.223	6.55
2.3	0.687	145.6	1.356	43.7	0.169	48.0	0.243	–150.3	1.219	6.22
2.4	0.687	144.0	1.314	41.6	0.175	47.9	0.244	–152.0	1.214	5.96
2.5	0.689	142.1	1.266	39.9	0.183	47.8	0.250	–153.4	1.208	5.65
2.6	0.686	140.2	1.217	38.3	0.189	47.6	0.253	–155.2	1.227	5.23
2.7	0.682	138.4	1.174	36.3	0.196	47.0	0.260	–157.1	1.238	4.84
2.8	0.675	136.6	1.132	34.9	0.201	46.0	0.266	–159.0	1.265	4.41
2.9	0.652	135.2	1.076	33.1	0.208	44.4	0.275	–160.9	1.342	3.64
3.0	0.639	134.7	1.041	31.6	0.211	43.9	0.280	–163.5	1.395	3.19
4.0	0.718	117.2	0.829	15.2	0.273	41.1	0.378	–179.5	1.159	2.40
5.0	0.708	96.9	0.651	3.9	0.338	27.2	0.465	166.3	1.201	0.13

V_{CE} = 1 V, I_C = 10 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}		K	MAG/MSG
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		(dB)
0.1	0.711	–79.1	21.972	136.6	0.040	54.1	0.740	–47.1	0.186	27.35
0.2	0.658	–118.6	14.391	115.0	0.055	42.8	0.494	–73.3	0.346	24.19
0.3	0.634	–140.8	10.281	103.6	0.062	39.4	0.364	–89.2	0.500	22.20
0.4	0.626	–154.5	7.903	96.2	0.067	39.0	0.294	–101.9	0.632	20.71
0.5	0.625	–163.6	6.414	90.5	0.072	40.1	0.252	–111.9	0.740	19.51
0.6	0.626	–170.7	5.384	86.1	0.077	41.4	0.228	–121.7	0.834	18.47
0.7	0.629	–176.4	4.630	82.3	0.082	42.8	0.215	–129.3	0.907	17.54
0.8	0.633	178.5	4.058	79.1	0.087	44.3	0.210	–136.6	0.971	16.70
0.9	0.636	174.6	3.595	76.0	0.092	45.4	0.209	–141.8	1.019	15.05
1.0	0.643	171.0	3.234	73.1	0.098	46.8	0.211	–146.4	1.056	13.75
1.1	0.646	167.9	2.942	70.5	0.104	47.6	0.215	–149.6	1.089	12.72
1.2	0.653	165.0	2.683	67.9	0.110	48.4	0.219	–152.4	1.110	11.87
1.3	0.657	162.6	2.481	65.4	0.115	49.0	0.224	–154.3	1.128	11.16
1.4	0.662	160.1	2.308	63.2	0.121	49.7	0.229	–156.2	1.140	10.53
1.5	0.666	158.3	2.153	60.7	0.127	50.2	0.233	–157.2	1.152	9.93
1.6	0.670	156.1	2.024	58.5	0.133	50.4	0.237	–158.9	1.159	9.41
1.7	0.674	154.4	1.904	56.4	0.139	50.7	0.241	–159.3	1.163	8.91
1.8	0.671	152.7	1.802	54.4	0.145	51.0	0.243	–161.0	1.185	8.34
1.9	0.673	150.8	1.712	52.4	0.152	51.0	0.246	–161.2	1.184	7.92
2.0	0.676	149.2	1.634	50.2	0.158	51.0	0.247	–162.7	1.185	7.54
2.1	0.679	147.6	1.571	48.5	0.165	50.9	0.250	–163.3	1.177	7.25
2.2	0.676	145.9	1.507	46.8	0.171	50.6	0.252	–164.9	1.191	6.80
2.3	0.680	144.2	1.445	45.0	0.179	50.3	0.255	–165.6	1.179	6.51
2.4	0.682	142.5	1.399	43.1	0.186	49.8	0.256	–167.2	1.170	6.26
2.5	0.679	140.9	1.347	41.4	0.193	49.4	0.260	–168.3	1.177	5.88
2.6	0.680	138.9	1.299	39.6	0.200	48.9	0.263	–170.0	1.183	5.54
2.7	0.676	137.3	1.254	37.8	0.207	48.0	0.269	–171.4	1.191	5.19
2.8	0.668	135.6	1.205	36.6	0.213	46.8	0.276	–172.9	1.220	4.70
2.9	0.644	134.1	1.147	34.6	0.219	45.0	0.283	–174.1	1.289	3.97
3.0	0.632	133.8	1.112	33.4	0.222	44.4	0.289	–176.5	1.333	3.55
4.0	0.710	116.6	0.887	16.8	0.283	40.0	0.376	171.6	1.142	2.68
5.0	0.700	96.7	0.699	4.8	0.341	25.9	0.454	160.3	1.187	0.50

V_{CE} = 1 V, I_C = 20 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}		K	MAG/MSG
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		(dB)
0.1	0.628	–107.7	28.511	125.0	0.030	50.6	0.596	–68.5	0.287	29.76
0.2	0.613	–142.3	16.654	106.2	0.040	45.0	0.387	–100.4	0.535	26.24
0.3	0.613	–158.5	11.440	97.5	0.047	47.4	0.308	–119.5	0.711	23.90
0.4	0.614	–168.2	8.692	91.6	0.053	49.6	0.276	–133.8	0.832	22.12
0.5	0.614	–174.5	6.982	86.9	0.060	52.0	0.260	–143.8	0.920	20.64
0.6	0.621	–179.9	5.841	83.5	0.067	54.1	0.258	–152.2	0.981	19.38
0.7	0.624	175.6	4.989	80.3	0.075	55.1	0.257	–157.9	1.026	17.26
0.8	0.632	171.9	4.368	77.5	0.082	56.3	0.262	–162.9	1.057	15.82
0.9	0.636	168.8	3.870	74.9	0.090	56.8	0.266	–166.2	1.078	14.65
1.0	0.641	165.8	3.483	72.4	0.097	57.5	0.273	–169.1	1.095	13.67
1.1	0.645	163.0	3.164	70.1	0.105	57.6	0.279	–171.0	1.107	12.81
1.2	0.652	160.4	2.887	67.9	0.113	57.6	0.285	–172.8	1.114	12.04
1.3	0.657	158.6	2.666	65.7	0.119	57.8	0.289	–173.9	1.120	11.38
1.4	0.662	156.4	2.480	63.6	0.127	57.6	0.295	–175.2	1.121	10.79
1.5	0.664	154.6	2.314	61.4	0.134	57.4	0.298	–175.9	1.127	10.19
1.6	0.667	152.9	2.175	59.5	0.142	57.0	0.301	–177.3	1.129	9.68
1.7	0.672	151.4	2.046	57.5	0.149	56.8	0.303	–177.7	1.128	9.21
1.8	0.673	149.7	1.938	55.6	0.156	56.4	0.306	–179.1	1.132	8.73
1.9	0.671	148.0	1.843	53.8	0.163	55.9	0.307	–179.4	1.138	8.27
2.0	0.672	146.6	1.758	51.8	0.171	55.4	0.307	179.3	1.138	7.87
2.1	0.675	145.4	1.689	50.3	0.178	54.8	0.308	178.5	1.131	7.57
2.2	0.673	143.6	1.623	48.7	0.186	53.9	0.308	176.9	1.136	7.17
2.3	0.676	142.0	1.556	47.0	0.194	53.2	0.310	176.2	1.130	6.86
2.4	0.674	140.3	1.508	45.1	0.202	52.3	0.310	174.8	1.129	6.55
2.5	0.675	138.7	1.451	43.4	0.210	51.6	0.313	173.8	1.127	6.23
2.6	0.673	137.0	1.401	41.9	0.216	50.6	0.315	172.2	1.135	5.88
2.7	0.667	135.3	1.351	40.1	0.224	49.4	0.320	171.0	1.147	5.49
2.8	0.659	133.6	1.298	38.9	0.229	48.0	0.326	170.0	1.171	5.03
2.9	0.636	132.5	1.235	36.9	0.235	45.9	0.331	169.2	1.223	4.36
3.0	0.626	132.0	1.197	35.7	0.237	45.1	0.337	167.1	1.257	3.98
4.0	0.701	115.4	0.959	19.4	0.297	38.9	0.405	158.9	1.118	3.00
5.0	0.690	96.4	0.760	7.3	0.349	24.2	0.465	150.5	1.168	0.90

V_{CE} = 2 V, I_C = 1 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}		K	MAG/MSG
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		(dB)
0.1	0.974	–25.0	3.575	163.7	0.047	76.0	0.983	–7.9	0.046	18.78
0.2	0.941	–48.8	3.301	148.2	0.089	62.4	0.933	–15.5	0.097	15.69
0.3	0.887	–70.6	2.978	134.1	0.120	50.6	0.874	–21.4	0.159	13.94
0.4	0.847	–88.6	2.648	121.9	0.141	41.0	0.812	–26.3	0.223	12.75
0.5	0.820	–104.0	2.380	112.0	0.155	33.1	0.759	–29.8	0.275	11.87
0.6	0.789	–117.4	2.117	103.0	0.162	26.7	0.712	–33.0	0.345	11.17
0.7	0.770	–128.7	1.893	95.6	0.166	21.3	0.680	–35.8	0.402	10.58
0.8	0.755	–138.6	1.710	89.0	0.166	16.9	0.650	–38.7	0.468	10.14
0.9	0.749	–146.7	1.546	82.9	0.165	13.3	0.630	–41.4	0.529	9.72
1.0	0.744	–154.1	1.416	77.4	0.162	10.3	0.613	–44.3	0.597	9.42
1.1	0.741	–160.6	1.306	72.3	0.158	7.6	0.603	–47.5	0.662	9.19
1.2	0.745	–166.5	1.198	67.7	0.153	5.7	0.593	–50.4	0.727	8.95
1.3	0.746	–171.4	1.115	63.7	0.146	3.9	0.590	–53.7	0.799	8.81
1.4	0.751	–175.9	1.039	59.4	0.140	2.8	0.586	–56.8	0.865	8.69
1.5	0.752	–179.8	0.973	55.5	0.134	2.3	0.588	–60.0	0.952	8.61
1.6	0.755	176.8	0.916	52.1	0.127	2.2	0.585	–63.2	1.047	7.24
1.7	0.760	173.4	0.860	48.9	0.121	2.6	0.591	–66.3	1.123	6.40
1.8	0.762	170.5	0.813	45.9	0.114	4.0	0.590	–69.3	1.247	5.55
1.9	0.764	167.4	0.768	43.3	0.107	5.8	0.596	–72.4	1.352	5.00
2.0	0.767	164.6	0.731	40.4	0.102	8.8	0.596	–75.2	1.477	4.48
2.1	0.771	162.1	0.702	38.4	0.096	12.6	0.601	–78.1	1.554	4.24
2.2	0.771	159.6	0.669	36.6	0.093	16.7	0.601	–81.1	1.706	3.70
2.3	0.772	156.9	0.643	34.6	0.090	21.9	0.607	–84.0	1.783	3.41
2.4	0.775	154.3	0.618	32.7	0.089	27.4	0.605	–86.9	1.857	3.05
2.5	0.774	151.7	0.593	31.1	0.091	33.3	0.608	–90.0	1.896	2.70
2.6	0.774	149.1	0.570	29.8	0.094	38.8	0.610	–93.4	1.928	2.31
2.7	0.767	146.5	0.549	28.4	0.099	43.7	0.614	–96.6	1.942	1.86
2.8	0.758	144.1	0.525	27.6	0.107	47.0	0.615	–99.7	1.986	1.23
2.9	0.730	142.0	0.500	26.1	0.116	48.3	0.612	–103.0	2.178	0.20
3.0	0.715	140.9	0.483	25.0	0.123	49.5	0.608	–107.0	2.285	–0.44
4.0	0.787	119.2	0.390	19.3	0.226	57.5	0.650	–141.2	1.370	–1.25
5.0	0.742	96.3	0.383	18.4	0.336	37.8	0.679	–170.1	1.329	–2.85

V_{CE} = 2 V, I_C = 3 mA, Z_O = 50 Ω

Frequency (GHz)	S_{11} MAG.	S_{11} ANG. (deg.)	S_{21} MAG.	S_{21} ANG. (deg.)	S_{12} MAG.	S_{12} ANG. (deg.)	S_{22} MAG.	S_{22} ANG. (deg.)	K	MAG/MSG (dB)
0.1	0.907	–37.9	9.712	156.4	0.044	68.0	0.936	–17.2	0.102	23.41
0.2	0.834	–70.3	8.220	137.1	0.075	54.0	0.800	–30.7	0.146	20.37
0.3	0.764	–95.9	6.772	122.4	0.094	42.9	0.675	–39.2	0.235	18.60
0.4	0.720	–114.8	5.611	111.3	0.104	35.7	0.574	–44.9	0.321	17.33
0.5	0.698	–129.3	4.779	102.9	0.109	30.7	0.502	–48.4	0.398	16.42
0.6	0.679	–141.0	4.095	96.0	0.112	27.6	0.445	–51.3	0.485	15.65
0.7	0.670	–150.3	3.576	90.3	0.113	25.4	0.406	–53.6	0.564	15.00
0.8	0.663	–158.5	3.164	85.4	0.113	24.2	0.374	–56.1	0.650	14.46
0.9	0.663	–164.9	2.824	81.0	0.114	23.5	0.354	–58.6	0.725	13.95
1.0	0.665	–170.5	2.557	76.9	0.113	23.4	0.337	–61.4	0.801	13.53
1.1	0.665	–175.6	2.336	73.1	0.113	23.4	0.327	–64.2	0.874	13.14
1.2	0.669	179.8	2.136	69.6	0.113	24.1	0.319	–67.1	0.947	12.77
1.3	0.674	176.3	1.977	66.4	0.112	24.9	0.317	–70.1	1.011	11.83
1.4	0.679	172.8	1.838	63.3	0.112	26.0	0.314	–73.0	1.069	10.53
1.5	0.682	169.8	1.718	60.2	0.112	27.4	0.317	–75.7	1.127	9.68
1.6	0.687	167.1	1.614	57.4	0.113	28.9	0.316	–78.6	1.182	8.98
1.7	0.691	164.8	1.515	54.8	0.113	30.5	0.322	–81.1	1.228	8.38
1.8	0.692	162.3	1.429	52.1	0.114	32.5	0.322	–83.7	1.292	7.73
1.9	0.692	159.8	1.358	49.8	0.116	34.3	0.329	–86.0	1.331	7.24
2.0	0.696	157.8	1.293	47.1	0.118	36.5	0.329	–88.4	1.359	6.82
2.1	0.700	155.7	1.241	45.2	0.120	38.6	0.336	–90.8	1.370	6.51
2.2	0.700	153.6	1.192	43.2	0.124	40.3	0.337	–93.3	1.393	6.11
2.3	0.702	151.4	1.142	41.4	0.128	42.1	0.343	–95.7	1.398	5.76
2.4	0.705	149.4	1.102	39.1	0.132	43.6	0.344	–98.2	1.385	5.50
2.5	0.707	147.2	1.059	37.3	0.137	45.2	0.349	–100.9	1.381	5.19
2.6	0.707	145.0	1.020	35.5	0.142	46.5	0.351	–103.7	1.397	4.81
2.7	0.702	142.9	0.983	33.7	0.149	47.1	0.356	–106.7	1.411	4.39
2.8	0.693	141.0	0.940	32.2	0.155	47.4	0.359	–109.5	1.463	3.80
2.9	0.670	139.1	0.892	30.3	0.162	46.6	0.363	–112.9	1.572	2.95
3.0	0.659	138.6	0.863	28.7	0.167	46.7	0.364	–116.6	1.631	2.48
4.0	0.738	119.1	0.672	13.4	0.241	49.2	0.446	–147.8	1.213	1.67
5.0	0.721	97.4	0.532	5.2	0.327	34.1	0.530	–173.0	1.241	–0.85

V_{CE} = 2 V, I_C = 5 mA, Z_O = 50 Ω

Frequency (GHz)	S_{11} MAG.	S_{11} ANG. (deg.)	S_{21} MAG.	S_{21} ANG. (deg.)	S_{12} MAG.	S_{12} ANG. (deg.)	S_{22} MAG.	S_{22} ANG. (deg.)	K	MAG/MSG (dB)
0.1	0.839	–49.3	14.693	150.4	0.042	64.2	0.885	–25.2	0.120	25.42
0.2	0.757	–85.8	11.472	129.2	0.065	49.6	0.693	–42.2	0.209	22.44
0.3	0.693	–112.1	8.902	115.3	0.077	40.4	0.546	–52.1	0.320	20.62
0.4	0.660	–129.8	7.140	105.2	0.083	35.6	0.442	–58.5	0.428	19.32
0.5	0.647	–142.7	5.913	98.0	0.088	33.3	0.373	–62.7	0.521	18.29
0.6	0.635	–153.2	5.021	92.3	0.090	32.3	0.320	–66.5	0.622	17.45
0.7	0.628	–161.1	4.354	87.4	0.093	32.0	0.285	–69.6	0.714	16.71
0.8	0.631	–167.8	3.829	83.3	0.095	32.4	0.257	–73.1	0.794	16.07
0.9	0.633	–173.4	3.406	79.4	0.097	32.9	0.240	–76.5	0.866	15.45
1.0	0.636	–178.1	3.072	75.9	0.099	34.0	0.227	–80.3	0.938	14.91
1.1	0.638	177.5	2.802	72.7	0.102	34.9	0.220	–83.8	0.997	14.41
1.2	0.644	173.5	2.557	69.7	0.104	36.0	0.214	–87.3	1.051	12.52
1.3	0.649	170.5	2.368	66.7	0.107	37.3	0.214	–90.4	1.094	11.61
1.4	0.653	167.6	2.200	64.0	0.110	38.4	0.214	–93.5	1.130	10.82
1.5	0.657	165.1	2.054	61.3	0.113	39.8	0.217	–96.0	1.166	10.14
1.6	0.661	162.7	1.932	58.8	0.116	40.8	0.217	–98.9	1.192	9.57
1.7	0.666	160.5	1.813	56.5	0.120	42.0	0.223	–100.9	1.212	9.03
1.8	0.665	158.5	1.712	54.1	0.123	43.3	0.224	–103.3	1.254	8.41
1.9	0.669	156.5	1.627	51.9	0.127	44.2	0.230	–104.9	1.257	8.01
2.0	0.671	154.5	1.551	49.4	0.132	45.4	0.231	–107.0	1.271	7.58
2.1	0.676	152.7	1.490	47.7	0.136	46.4	0.237	–108.9	1.259	7.32
2.2	0.673	150.8	1.424	45.7	0.141	46.9	0.238	–111.0	1.286	6.82
2.3	0.677	148.7	1.368	43.9	0.147	47.6	0.244	–112.8	1.274	6.55
2.4	0.679	146.7	1.319	41.9	0.153	48.0	0.245	–115.1	1.274	6.22
2.5	0.680	144.9	1.270	40.0	0.159	48.5	0.250	–117.3	1.267	5.91
2.6	0.680	142.9	1.223	38.4	0.164	48.7	0.252	–119.7	1.279	5.54
2.7	0.676	141.0	1.177	36.4	0.171	48.6	0.258	–122.6	1.291	5.14
2.8	0.667	138.9	1.130	35.0	0.177	48.1	0.262	–125.2	1.333	4.61
2.9	0.645	137.5	1.077	32.9	0.184	46.7	0.268	–128.4	1.411	3.87
3.0	0.632	137.1	1.039	31.5	0.187	46.4	0.272	–131.9	1.474	3.36
4.0	0.719	118.7	0.819	14.8	0.253	45.8	0.364	–158.3	1.162	2.66
5.0	0.706	97.8	0.630	3.7	0.326	31.6	0.459	–179.0	1.210	0.09

V_{CE} = 2 V, I_C = 7 mA, Z_O = 50 Ω

Frequency (GHz)	S_{11} MAG.	S_{11} ANG. (deg.)	S_{21} MAG.	S_{21} ANG. (deg.)	S_{12} MAG.	S_{12} ANG. (deg.)	S_{22} MAG.	S_{22} ANG. (deg.)	K	MAG/MSG (dB)
0.1	0.792	–58.7	18.513	145.7	0.039	62.2	0.837	–31.5	0.125	26.78
0.2	0.705	–97.3	13.582	123.9	0.058	47.3	0.614	–51.0	0.264	23.69
0.3	0.651	–122.9	10.160	110.6	0.067	40.3	0.465	–61.9	0.396	21.81
0.4	0.628	–139.5	7.999	101.8	0.072	37.5	0.367	–69.5	0.517	20.44
0.5	0.617	–150.9	6.578	95.1	0.076	36.8	0.303	–74.7	0.625	19.36
0.6	0.613	–160.0	5.548	90.1	0.080	37.0	0.257	–80.2	0.723	18.41
0.7	0.612	–167.1	4.775	85.7	0.083	37.7	0.227	–84.6	0.811	17.59
0.8	0.615	–173.4	4.203	82.0	0.086	38.9	0.205	–90.0	0.887	16.87
0.9	0.619	–178.3	3.730	78.5	0.090	39.8	0.192	–94.5	0.950	16.16
1.0	0.624	177.6	3.361	75.4	0.094	41.2	0.183	–99.6	1.003	15.19
1.1	0.626	173.7	3.058	72.4	0.098	42.1	0.179	–103.7	1.052	13.55
1.2	0.630	169.9	2.793	69.6	0.102	43.2	0.177	–107.7	1.094	12.49
1.3	0.637	167.3	2.582	66.9	0.106	44.3	0.178	–110.9	1.121	11.74
1.4	0.640	164.6	2.400	64.4	0.111	45.2	0.180	–114.2	1.147	11.03
1.5	0.646	162.2	2.239	61.9	0.115	46.3	0.183	–116.2	1.164	10.42
1.6	0.650	159.9	2.105	59.5	0.120	46.9	0.185	–119.0	1.182	9.87
1.7	0.655	158.2	1.977	57.4	0.125	47.6	0.190	–120.3	1.192	9.35
1.8	0.656	156.3	1.870	55.1	0.130	48.5	0.192	–122.5	1.211	8.82
1.9	0.658	154.1	1.774	52.9	0.135	48.9	0.197	–123.5	1.215	8.39
2.0	0.658	152.4	1.692	50.6	0.140	49.6	0.198	–125.4	1.229	7.93
2.1	0.664	150.8	1.622	49.0	0.146	49.9	0.203	–126.6	1.217	7.65
2.2	0.660	148.9	1.556	47.2	0.152	50.1	0.204	–128.6	1.235	7.20
2.3	0.665	147.1	1.494	45.4	0.158	50.2	0.209	–129.8	1.221	6.92
2.4	0.666	145.2	1.441	43.2	0.164	50.1	0.210	–131.8	1.218	6.61
2.5	0.666	143.1	1.389	41.5	0.171	50.1	0.215	–133.5	1.216	6.29
2.6	0.664	141.4	1.335	39.8	0.177	50.0	0.217	–135.7	1.231	5.87
2.7	0.660	139.7	1.288	38.0	0.183	49.4	0.223	–138.2	1.241	5.51
2.8	0.653	137.9	1.236	36.6	0.189	48.4	0.228	–140.5	1.275	5.01
2.9	0.630	136.6	1.177	34.8	0.196	46.8	0.235	–143.4	1.348	4.26
3.0	0.621	136.0	1.137	33.3	0.199	46.5	0.239	–146.6	1.393	3.83
4.0	0.702	118.3	0.897	16.5	0.262	44.1	0.333	–167.8	1.158	2.94
5.0	0.696	97.9	0.695	4.1	0.328	30.1	0.427	175.2	1.192	0.61

V_{CE} = 2 V, I_C = 10 mA, Z_O = 50 Ω

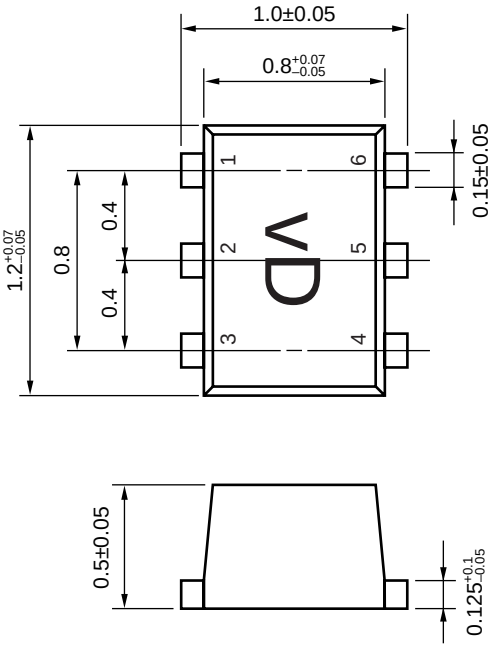
Frequency (GHz)	S_{11} MAG.	S_{11} ANG. (deg.)	S_{21} MAG.	S_{21} ANG. (deg.)	S_{12} MAG.	S_{12} ANG. (deg.)	S_{22} MAG.	S_{22} ANG. (deg.)	K	MAG/MSG (dB)
0.1	0.717	–69.5	22.966	139.9	0.035	56.5	0.774	–39.5	0.205	28.12
0.2	0.656	–110.4	15.675	118.4	0.050	46.1	0.530	–61.4	0.335	24.96
0.3	0.612	–134.4	11.341	106.3	0.057	41.8	0.388	–74.0	0.496	22.96
0.4	0.600	–148.9	8.789	98.4	0.062	40.9	0.303	–83.4	0.627	21.51
0.5	0.598	–158.6	7.159	92.6	0.067	41.6	0.250	–90.8	0.732	20.31
0.6	0.598	–166.9	6.019	88.1	0.071	43.1	0.214	–98.6	0.826	19.25
0.7	0.599	–173.0	5.167	84.1	0.076	44.4	0.191	–105.2	0.904	18.32
0.8	0.603	–178.3	4.533	80.9	0.081	45.9	0.177	–112.4	0.967	17.48
0.9	0.607	177.3	4.021	77.7	0.086	46.9	0.170	–118.3	1.014	15.96
1.0	0.612	173.6	3.623	74.8	0.091	48.2	0.167	–124.0	1.055	14.56
1.1	0.616	169.9	3.295	72.1	0.097	49.1	0.168	–128.3	1.087	13.53
1.2	0.623	166.7	3.007	69.6	0.102	49.9	0.169	–132.2	1.111	12.65
1.3	0.629	164.4	2.780	67.0	0.108	50.6	0.173	–134.8	1.126	11.97
1.4	0.632	161.7	2.583	64.7	0.113	51.2	0.176	–137.7	1.143	11.28
1.5	0.637	159.8	2.407	62.4	0.119	51.7	0.180	–139.1	1.153	10.68
1.6	0.640	157.7	2.265	60.1	0.125	52.0	0.183	–141.5	1.163	10.14
1.7	0.644	155.9	2.128	58.1	0.131	52.4	0.187	–142.1	1.168	9.63
1.8	0.645	154.2	2.012	56.0	0.136	52.6	0.189	–144.1	1.181	9.11
1.9	0.647	152.2	1.911	54.0	0.142	52.7	0.193	–144.4	1.185	8.68
2.0	0.648	150.7	1.822	51.8	0.149	52.8	0.194	–146.2	1.190	8.26
2.1	0.652	148.9	1.749	50.1	0.155	52.8	0.197	–146.9	1.182	7.95
2.2	0.651	147.3	1.675	48.5	0.161	52.5	0.198	–148.6	1.189	7.54
2.3	0.654	145.6	1.607	46.8	0.168	52.2	0.202	–149.5	1.183	7.22
2.4	0.653	143.6	1.554	44.6	0.175	51.8	0.202	–151.2	1.180	6.92
2.5	0.656	141.9	1.494	43.0	0.182	51.5	0.206	–152.6	1.174	6.61
2.6	0.651	140.1	1.439	41.2	0.188	50.9	0.208	–154.5	1.191	6.19
2.7	0.650	138.4	1.386	39.6	0.195	50.2	0.214	–156.4	1.197	5.84
2.8	0.641	136.7	1.332	38.3	0.200	49.0	0.220	–158.3	1.228	5.35
2.9	0.620	135.4	1.271	36.3	0.207	47.2	0.227	–160.4	1.289	4.66
3.0	0.610	135.1	1.227	34.9	0.210	46.7	0.233	–163.2	1.329	4.23
4.0	0.692	117.7	0.971	18.0	0.270	42.8	0.322	–178.6	1.138	3.30
5.0	0.686	97.8	0.755	5.3	0.331	28.6	0.408	168.2	1.180	1.01

V_{CE} = 2 V, I_C = 20 mA, Z_O = 50 Ω

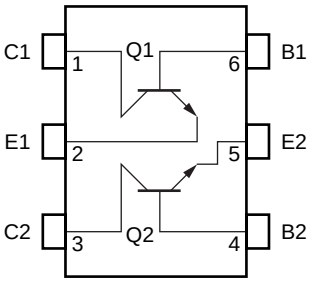
Frequency	S_{11}		S_{21}		S_{12}		S_{22}		K	MAG/MSG
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		(dB)
0.1	0.608	–95.8	30.772	128.9	0.029	50.8	0.637	–56.7	0.314	30.26
0.2	0.579	–133.1	18.610	109.3	0.037	48.6	0.398	–83.5	0.526	26.97
0.3	0.572	–152.2	12.924	99.9	0.043	48.6	0.293	–99.9	0.702	24.73
0.4	0.572	–163.4	9.847	93.5	0.050	50.9	0.240	–113.4	0.823	22.94
0.5	0.573	–170.4	7.946	88.8	0.056	53.0	0.211	–124.0	0.910	21.48
0.6	0.581	–176.7	6.645	85.2	0.063	55.1	0.199	–134.2	0.969	20.21
0.7	0.581	178.6	5.690	81.9	0.070	56.2	0.192	–141.6	1.021	18.21
0.8	0.590	174.4	4.978	79.0	0.077	57.2	0.192	–148.6	1.051	16.72
0.9	0.595	170.9	4.415	76.4	0.084	57.7	0.195	–153.1	1.075	15.54
1.0	0.601	167.8	3.962	74.0	0.091	58.3	0.201	–157.4	1.094	14.52
1.1	0.606	164.8	3.596	71.7	0.098	58.5	0.205	–160.0	1.108	13.64
1.2	0.612	162.3	3.289	69.3	0.106	58.6	0.211	–162.5	1.114	12.88
1.3	0.620	160.2	3.042	67.1	0.112	58.8	0.215	–163.9	1.117	12.26
1.4	0.622	157.9	2.825	65.0	0.119	58.6	0.220	–165.7	1.125	11.60
1.5	0.627	156.2	2.638	62.9	0.126	58.5	0.224	–166.6	1.125	11.05
1.6	0.631	154.5	2.479	60.9	0.133	58.2	0.228	–168.0	1.126	10.54
1.7	0.635	152.8	2.325	59.1	0.140	58.0	0.230	–168.5	1.130	10.01
1.8	0.634	150.8	2.201	57.1	0.147	57.7	0.233	–170.1	1.139	9.49
1.9	0.637	149.5	2.088	55.2	0.154	57.1	0.234	–170.2	1.138	9.07
2.0	0.635	147.9	1.990	53.3	0.161	56.8	0.235	–171.9	1.145	8.61
2.1	0.640	146.2	1.912	51.7	0.168	56.3	0.236	–172.4	1.135	8.34
2.2	0.638	144.8	1.833	50.1	0.175	55.5	0.236	–174.2	1.140	7.93
2.3	0.641	143.3	1.759	48.5	0.183	54.7	0.238	–174.8	1.133	7.62
2.4	0.641	141.6	1.698	46.5	0.190	53.9	0.239	–176.4	1.130	7.32
2.5	0.642	140.0	1.634	44.9	0.197	53.2	0.241	–177.4	1.129	6.99
2.6	0.641	138.3	1.574	43.4	0.204	52.3	0.243	–179.0	1.136	6.63
2.7	0.638	136.7	1.515	41.6	0.211	51.2	0.248	179.7	1.145	6.25
2.8	0.630	135.0	1.458	40.3	0.216	49.7	0.253	178.3	1.169	5.80
2.9	0.606	133.8	1.390	38.5	0.222	47.8	0.261	177.4	1.221	5.13
3.0	0.599	133.6	1.345	37.3	0.225	47.1	0.266	175.0	1.249	4.76
4.0	0.677	116.9	1.067	20.8	0.285	41.2	0.340	165.7	1.116	3.66
5.0	0.673	97.5	0.832	7.7	0.338	26.5	0.411	156.7	1.162	1.47

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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