NEC

NPN SILICON RF TRANSISTOR
2SC5736

NPN SILICON RF TRANSISTOR FOR HIGH-FREQUENCY LOW NOISE FLAT-LEAD 3-PIN THIN-TYPE ULTRA SUPER MINIMOLD

FEATURES

- Low voltage operation, low phase distortion
- Ideal for OSC applications
- Flat-lead 3-pin thin-type ultra super minimold package

ORDERING INFORMATION

Part Number	Quantity	Supplying Form
2SC5736	50 pcs (Non reel)	• 8 mm wide embossed taping
2SC5736-T1	3 kpcs/reel	• Pin 3 (collector) face the perforation side of the tape

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

ABSOLUTE MAXIMUM RATINGS (T_A = +25°C)

Parameter	Symbol	Ratings	Unit
Collector to Base Voltage	V_{CBO}	15	V
Collector to Emitter Voltage	V_{CEO}	5	V
Emitter to Base Voltage	V_{EBO}	3	V
Collector Current	I_C	100	mA
Total Power Dissipation	P_{tot} Note	200	mW
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

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

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ELECTRICAL CHARACTERISTICS (T_A = +25°C)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
DC Characteristics						
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	–
RF Characteristics						
Gain Bandwidth Product (1)	f_T	V_{CE} = 1 V, I_C = 5 mA, f = 2 GHz	4.5	5.0	–	GHz
Gain Bandwidth Product (2)	f_T	V_{CE} = 1 V, I_C = 15 mA, f = 2 GHz	5.5	6.5	–	GHz
Insertion Power Gain (1)	$\lvert S_{21e} \rvert^2$	V_{CE} = 1 V, I_C = 5 mA, f = 2 GHz	3.5	4.5	–	dB
Insertion Power Gain (2)	$\lvert S_{21e} \rvert^2$	V_{CE} = 1 V, I_C = 15 mA, f = 2 GHz	4.5	6.0	–	dB
Noise Figure	NF	V_{CE} = 1 V, I_C = 5 mA, f = 2 GHz, $Z_S = Z_{opt}$	–	2.0	3.0	dB
Reverse Transfer Capacitance	C_{re} Note 2	V_{CB} = 0.5 V, I_E = 0 mA, f = 1 MHz	0.55	0.68	0.8	pF

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

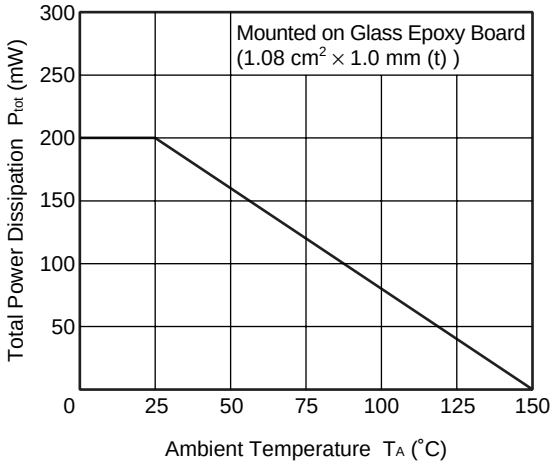
2. Collector to base capacitance measured using capacitance meter (self-balancing bridge method) when the emitter is connected to the guard pin

h_{FE} CLASSIFICATION

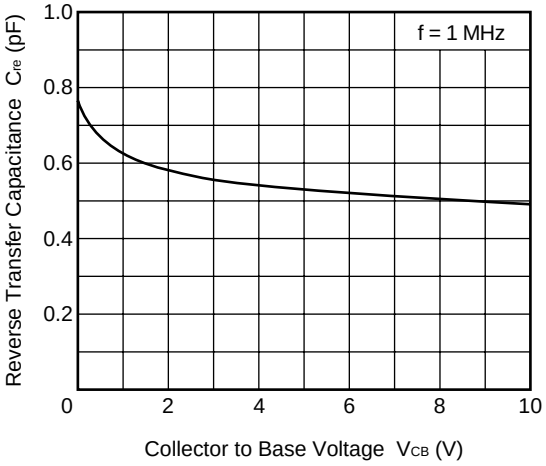
Rank	FB
Marking	TX
h_{FE} Value	100 to 145

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

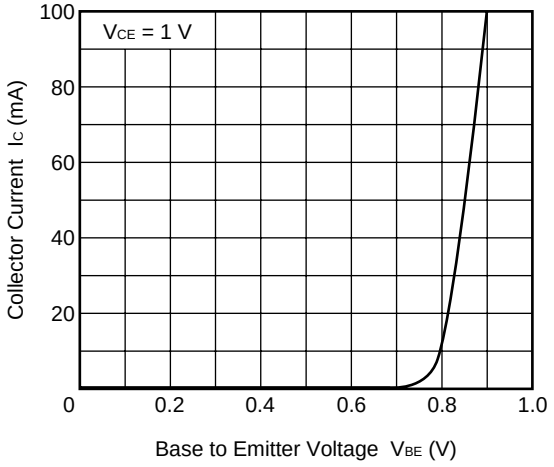
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



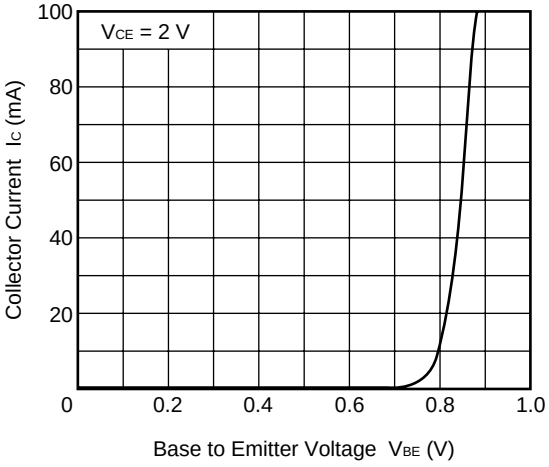
REVERSE TRANSFER CAPACITANCE vs. COLLECTOR TO BASE VOLTAGE



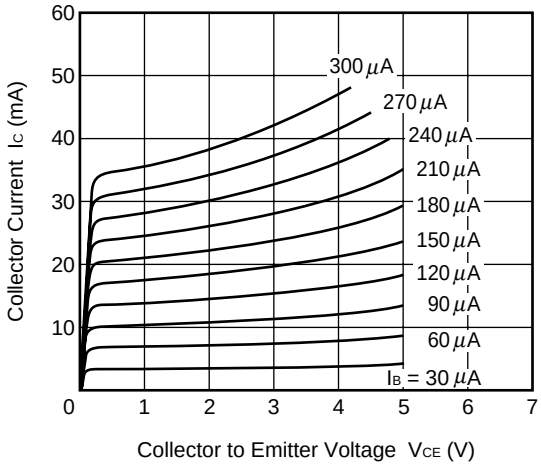
COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE



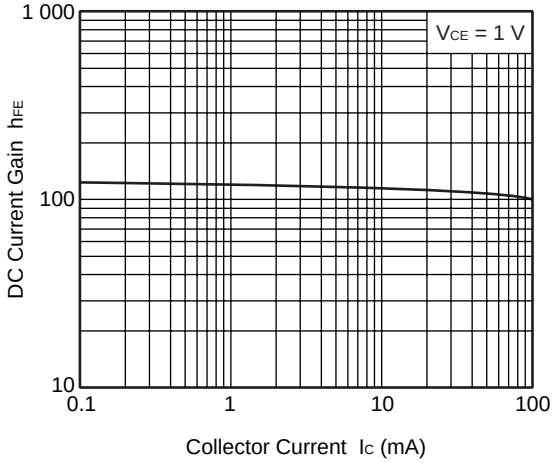
COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE



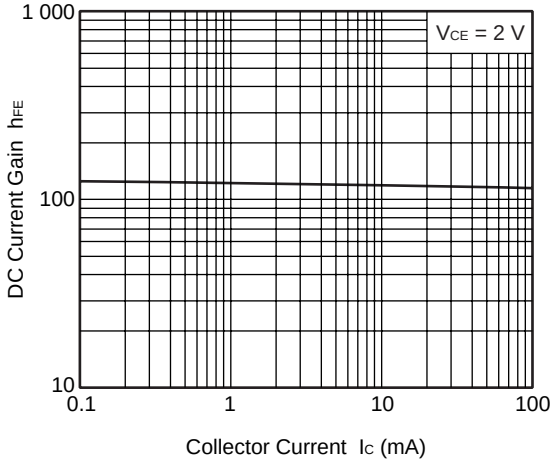
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



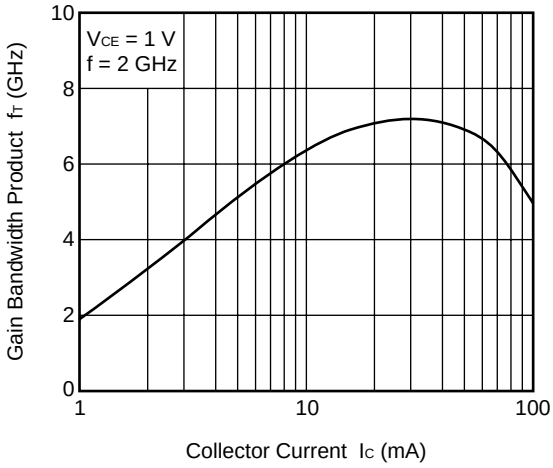
DC CURRENT GAIN vs.
COLLECTOR CURRENT



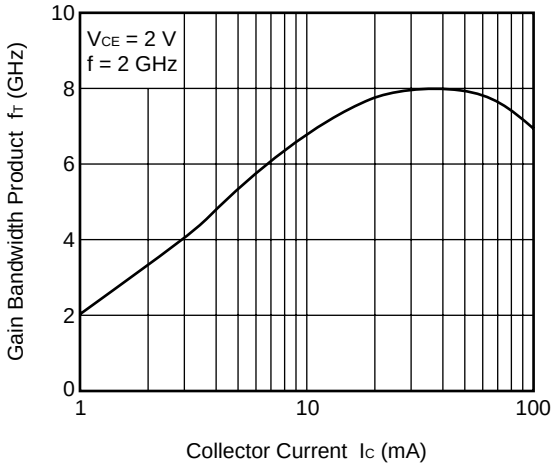
DC CURRENT GAIN vs.
COLLECTOR CURRENT



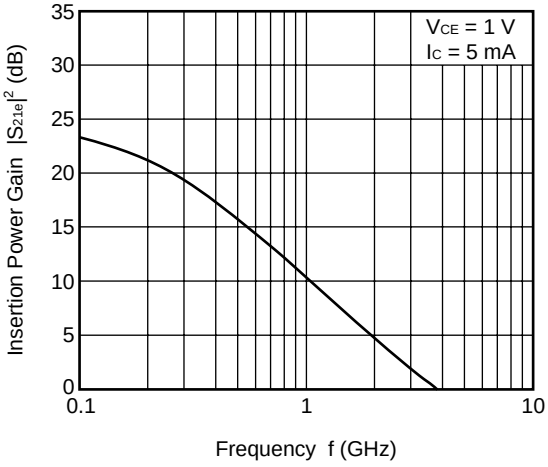
GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT



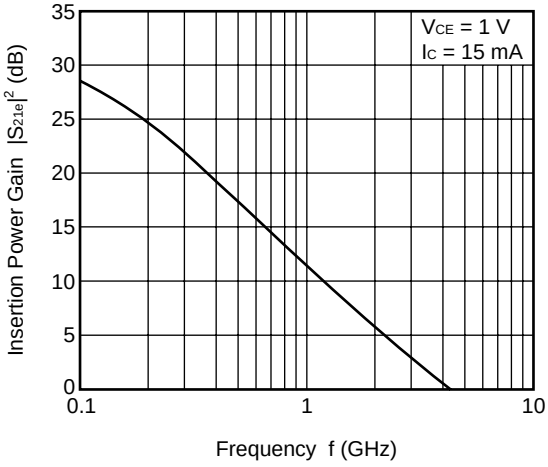
GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT



INSERTION POWER GAIN vs. FREQUENCY



INSERTION POWER GAIN vs. FREQUENCY



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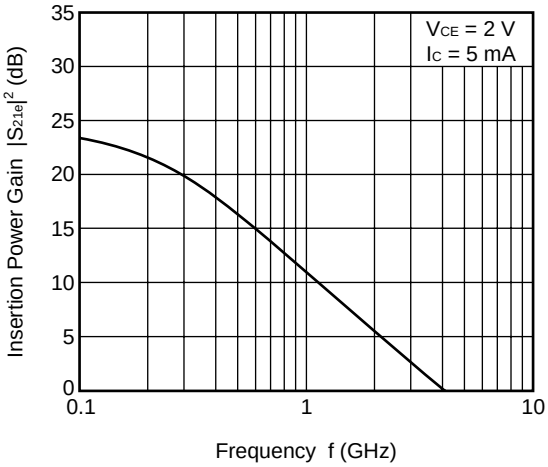
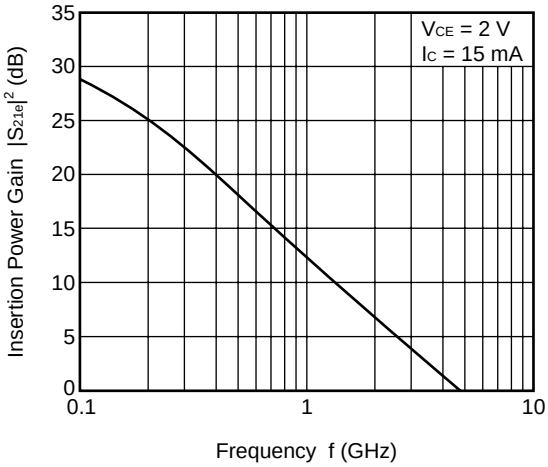
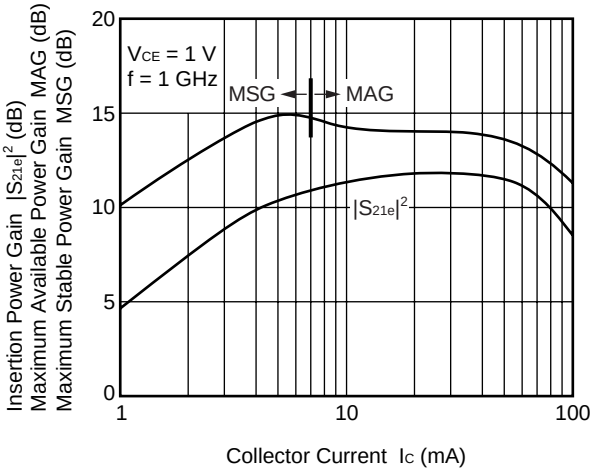


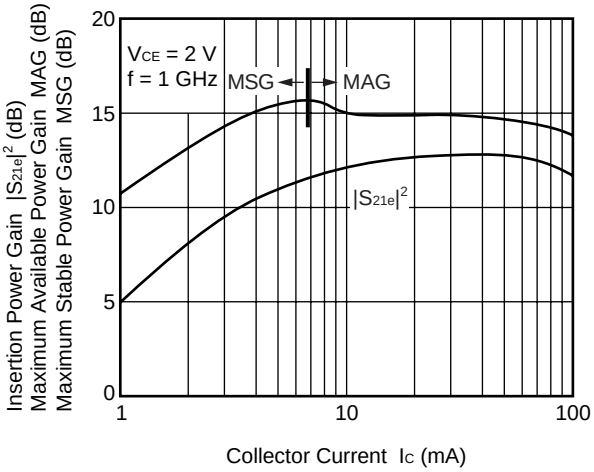
INSERTION POWER GAIN vs. FREQUENCY



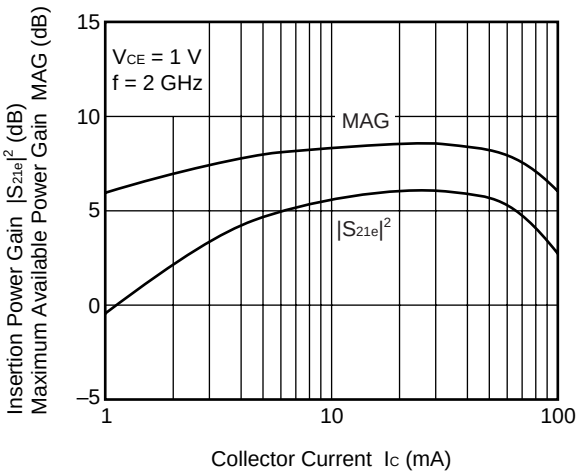
INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT



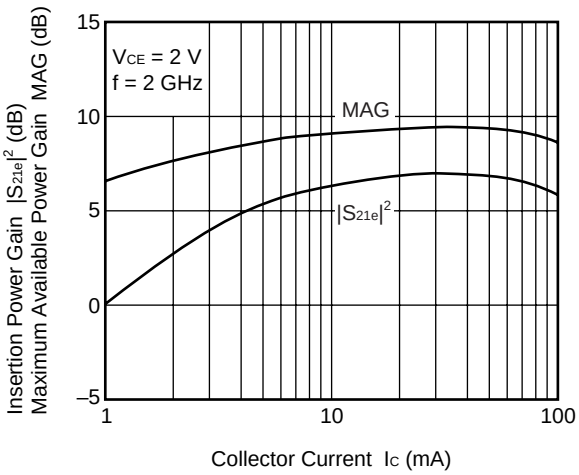
INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT



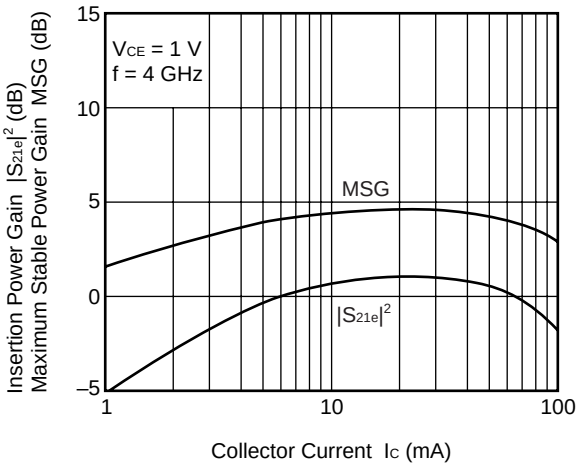
INSERTION POWER GAIN, MAG
vs. COLLECTOR CURRENT



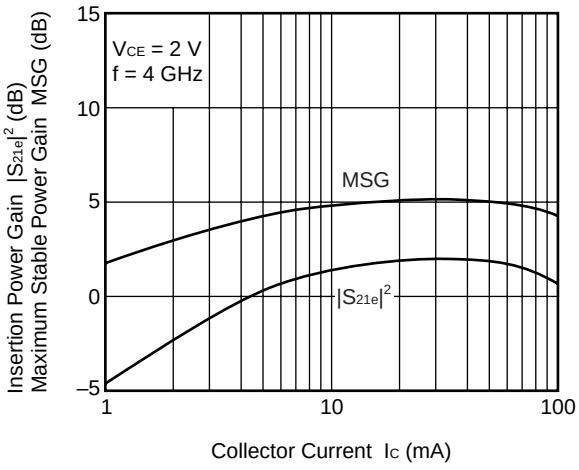
INSERTION POWER GAIN, MAG
vs. COLLECTOR CURRENT



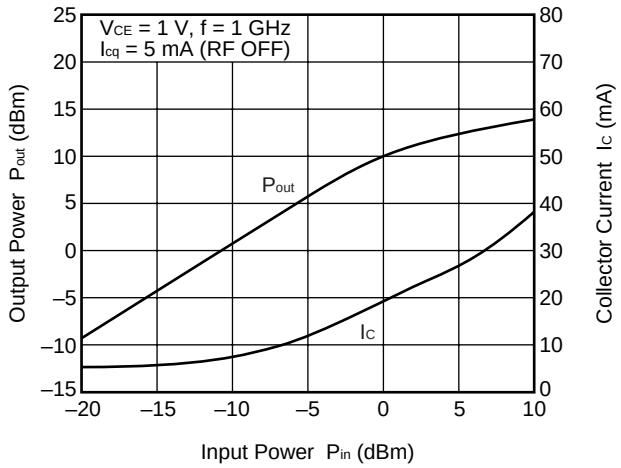
INSERTION POWER GAIN, MSG
vs. COLLECTOR CURRENT



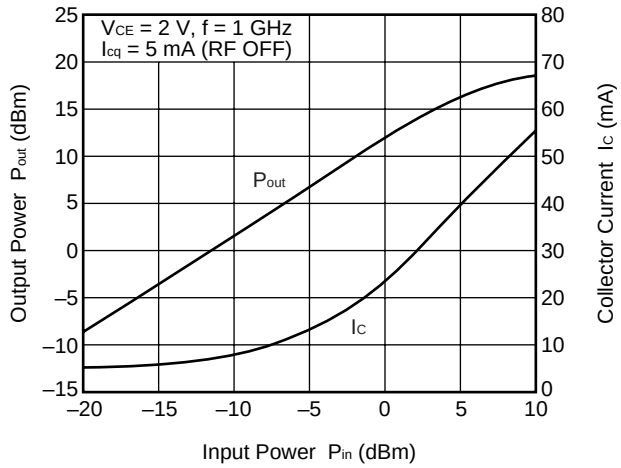
INSERTION POWER GAIN, MSG
vs. COLLECTOR CURRENT



OUTPUT POWER, COLLECTOR CURRENT vs. INPUT POWER



OUTPUT POWER, COLLECTOR CURRENT vs. INPUT POWER



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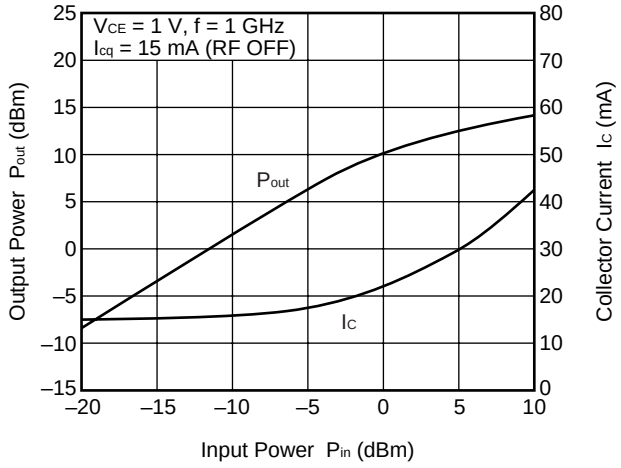

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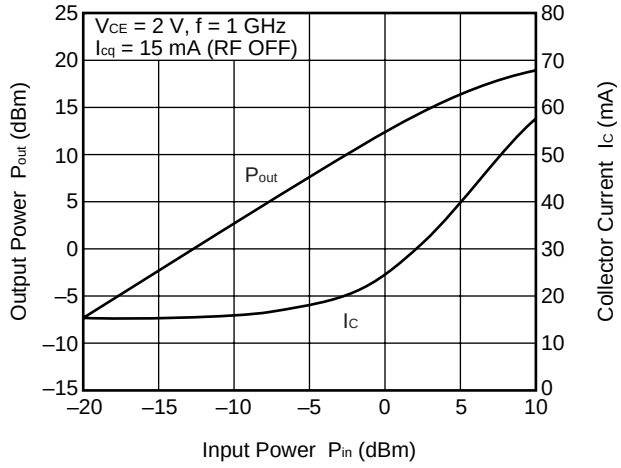

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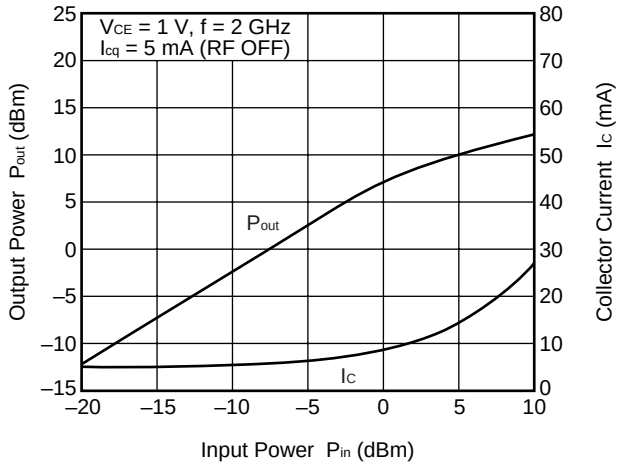

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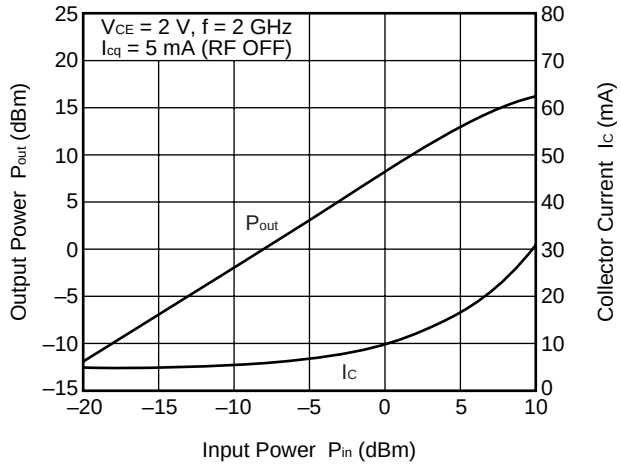

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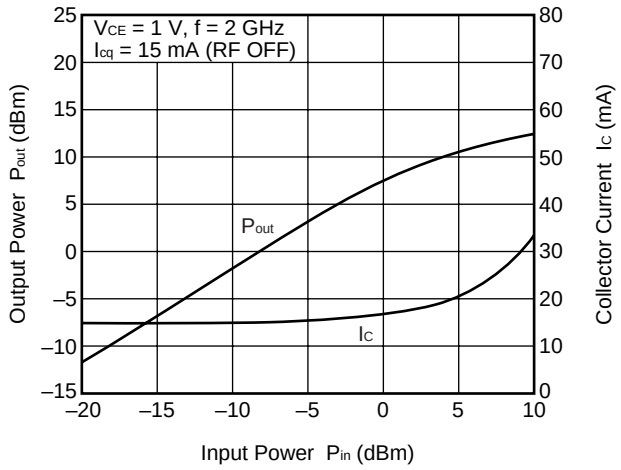
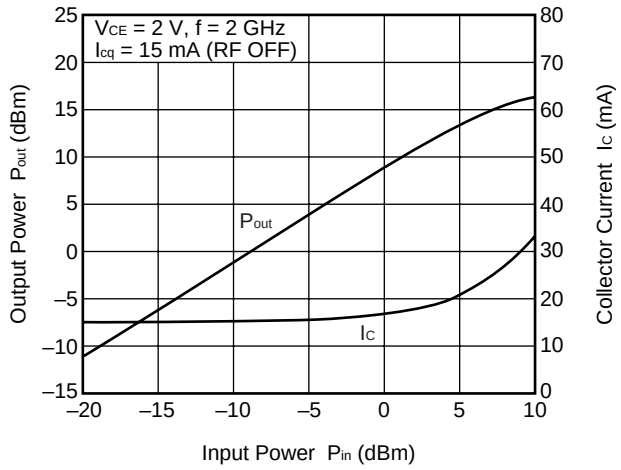
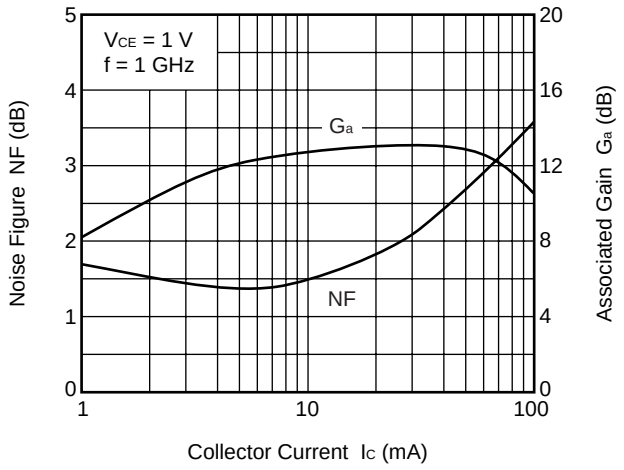


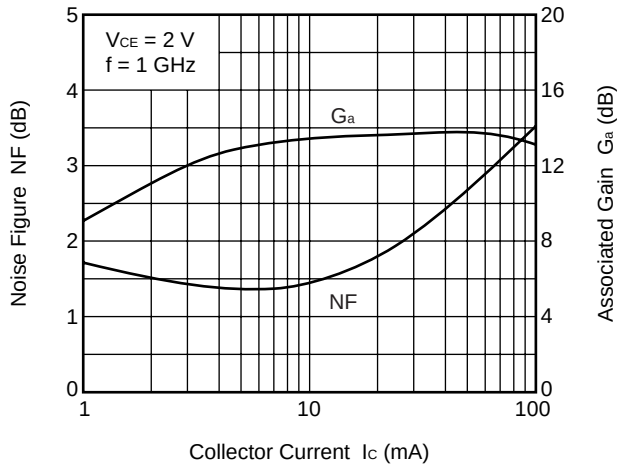
OUTPUT POWER, COLLECTOR CURRENT vs. INPUT POWER



NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



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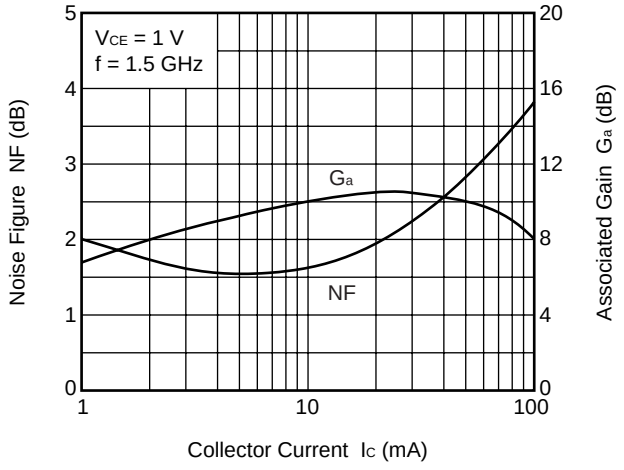

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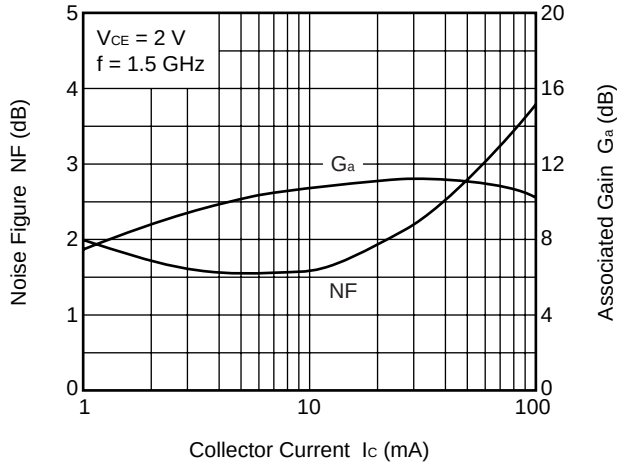

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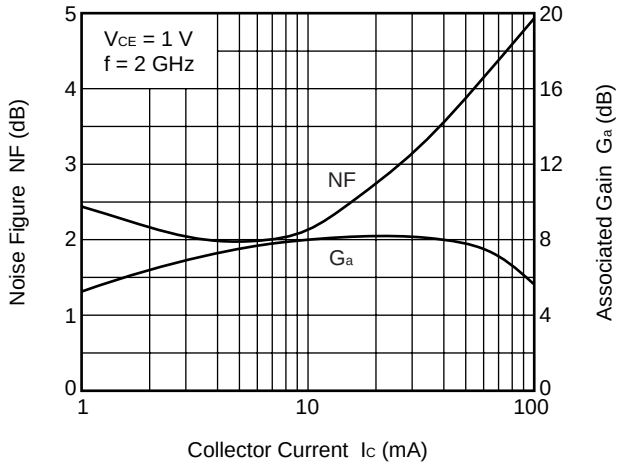
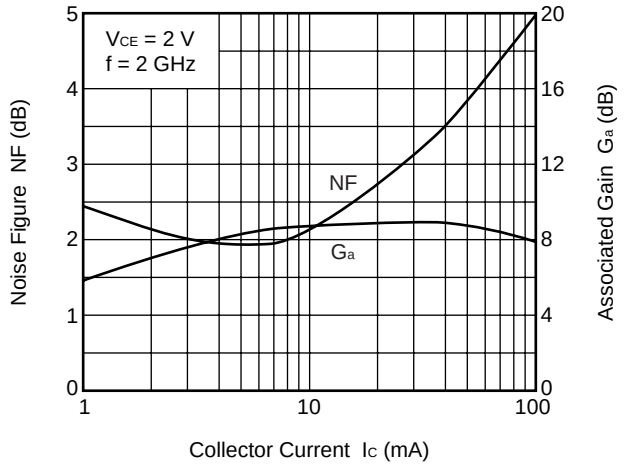


NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



Remark The graphs indicate nominal characteristics.

S-PARAMETERS

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	0.961	–20.3	3.616	165.2	0.045	77.6	0.984	–8.4	0.064	19.03
0.2	0.931	–40.8	3.430	151.3	0.084	65.9	0.948	–16.5	0.099	16.12
0.3	0.893	–58.7	3.172	138.8	0.114	56.0	0.892	–23.0	0.149	14.43
0.4	0.855	–74.3	2.878	127.7	0.138	47.3	0.835	–28.8	0.202	13.20
0.5	0.814	–88.7	2.610	117.6	0.153	40.1	0.781	–33.3	0.258	12.32
0.6	0.782	–101.1	2.374	109.0	0.162	34.0	0.733	–37.3	0.313	11.66
0.7	0.759	–111.7	2.176	102.0	0.167	29.1	0.695	–40.5	0.361	11.14
0.8	0.741	–121.6	1.983	95.1	0.169	25.1	0.660	–43.7	0.417	10.69
0.9	0.726	–129.8	1.825	89.1	0.169	21.7	0.637	–46.8	0.472	10.34
1.0	0.719	–137.5	1.693	83.4	0.166	19.1	0.613	–50.0	0.526	10.08
1.1	0.710	–144.4	1.579	78.4	0.162	17.1	0.598	–53.1	0.585	9.89
1.2	0.708	–150.5	1.470	74.3	0.157	15.9	0.582	–56.1	0.646	9.72
1.3	0.706	–156.5	1.384	69.5	0.150	15.3	0.573	–59.3	0.708	9.64
1.4	0.706	–161.5	1.304	65.4	0.144	15.2	0.564	–62.7	0.779	9.58
1.5	0.704	–166.4	1.232	61.1	0.137	16.1	0.560	–66.4	0.854	9.53
1.6	0.704	–170.7	1.165	57.5	0.130	17.4	0.549	–70.0	0.960	9.52
1.7	0.709	–175.1	1.107	53.9	0.123	19.9	0.545	–74.0	1.043	8.27
1.8	0.710	–178.9	1.048	50.4	0.118	23.6	0.539	–77.9	1.155	7.11
1.9	0.715	178.1	0.993	47.7	0.113	28.5	0.538	–82.1	1.236	6.50
2.0	0.721	173.9	0.945	44.7	0.112	34.2	0.531	–86.5	1.304	5.97
2.1	0.723	171.3	0.907	41.5	0.112	40.5	0.537	–91.1	1.334	5.62
2.2	0.730	167.6	0.870	38.8	0.116	46.5	0.532	–96.0	1.330	5.31
2.3	0.738	165.3	0.845	36.2	0.123	52.0	0.543	–100.3	1.228	5.50
2.4	0.747	162.2	0.814	34.1	0.132	56.8	0.543	–105.4	1.164	5.44
2.5	0.745	159.8	0.783	32.1	0.144	60.7	0.549	–109.7	1.139	5.10
2.6	0.756	157.8	0.752	30.6	0.157	63.6	0.557	–114.9	1.046	5.49
2.7	0.755	154.9	0.726	28.7	0.172	65.5	0.559	–119.4	1.027	5.25
2.8	0.763	152.9	0.707	27.0	0.188	66.8	0.573	–124.0	0.939	5.76
2.9	0.764	150.3	0.694	25.8	0.206	67.1	0.574	–128.2	0.907	5.29
3.0	0.766	148.5	0.676	26.0	0.223	67.8	0.573	–132.7	0.903	4.82
4.0	0.798	130.8	0.551	22.1	0.384	54.7	0.644	–177.4	0.891	1.57
5.0	0.779	117.8	0.500	20.3	0.477	39.0	0.698	153.5	1.002	–0.09

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	0.868	–33.6	9.763	157.3	0.041	72.7	0.937	–17.1	0.089	23.72
0.2	0.806	–64.0	8.495	138.3	0.072	57.5	0.819	–30.6	0.169	20.73
0.3	0.732	–86.8	7.113	124.3	0.089	48.0	0.698	–39.2	0.263	19.01
0.4	0.685	–104.3	5.966	113.7	0.100	41.9	0.600	–45.3	0.346	17.77
0.5	0.645	–118.3	5.056	105.2	0.106	38.2	0.528	–49.0	0.439	16.79
0.6	0.620	–130.2	4.395	98.3	0.109	36.0	0.470	–52.1	0.528	16.04
0.7	0.609	–139.2	3.888	92.8	0.112	35.1	0.429	–54.2	0.602	15.40
0.8	0.598	–147.3	3.453	87.6	0.114	35.0	0.396	–56.7	0.687	14.81
0.9	0.595	–153.8	3.116	83.2	0.116	35.2	0.373	–59.0	0.757	14.30
1.0	0.593	–159.8	2.841	79.0	0.117	36.2	0.351	–61.8	0.828	13.83
1.1	0.596	–164.8	2.618	75.1	0.119	37.6	0.338	–64.3	0.881	13.42
1.2	0.596	–169.2	2.414	72.0	0.121	39.3	0.323	–67.3	0.943	12.99
1.3	0.598	–173.7	2.247	68.3	0.124	41.0	0.315	–70.2	0.991	12.59
1.4	0.603	–177.5	2.104	65.1	0.127	42.9	0.307	–73.7	1.028	11.17
1.5	0.604	179.0	1.977	61.9	0.131	44.8	0.302	–77.3	1.063	10.26
1.6	0.608	175.9	1.865	58.8	0.135	46.7	0.294	–81.1	1.095	9.53
1.7	0.613	172.7	1.760	56.0	0.140	48.6	0.290	–85.2	1.115	8.94
1.8	0.617	169.8	1.666	53.0	0.145	50.5	0.285	–89.2	1.136	8.36
1.9	0.621	167.6	1.577	50.8	0.151	52.3	0.286	–93.7	1.146	7.87
2.0	0.632	164.5	1.506	48.2	0.158	53.9	0.281	–98.5	1.133	7.56
2.1	0.634	162.9	1.442	45.5	0.166	55.4	0.288	–103.1	1.129	7.21
2.2	0.643	159.9	1.383	42.7	0.174	56.6	0.287	–108.3	1.116	6.94
2.3	0.646	158.4	1.340	40.4	0.183	57.4	0.297	–112.3	1.084	6.87
2.4	0.662	156.0	1.294	37.8	0.193	58.2	0.300	–117.6	1.042	7.00
2.5	0.661	154.2	1.247	35.8	0.203	58.8	0.305	–121.3	1.039	6.68
2.6	0.672	152.7	1.200	33.8	0.214	59.4	0.314	–126.5	1.009	6.92
2.7	0.672	150.5	1.160	31.7	0.225	59.5	0.320	–130.7	1.006	6.66
2.8	0.682	149.1	1.125	29.7	0.236	59.5	0.333	–135.2	0.971	6.78
2.9	0.685	147.2	1.108	27.5	0.249	59.2	0.339	–138.9	0.941	6.48
3.0	0.686	145.7	1.081	26.8	0.261	59.4	0.344	–142.8	0.940	6.17
4.0	0.747	130.8	0.829	14.5	0.382	49.9	0.469	178.1	0.853	3.37
5.0	0.760	118.7	0.643	8.4	0.464	37.5	0.582	152.4	0.929	1.42

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	0.792	–45.2	14.588	150.9	0.039	68.0	0.884	–24.2	0.139	25.70
0.2	0.711	–80.6	11.659	129.6	0.062	52.9	0.707	–40.5	0.254	22.76
0.3	0.639	–105.2	9.139	115.8	0.073	46.3	0.564	–49.1	0.375	20.96
0.4	0.602	–121.6	7.364	106.4	0.081	43.0	0.465	–54.7	0.486	19.61
0.5	0.577	–134.5	6.097	99.1	0.086	42.2	0.397	–57.6	0.595	18.52
0.6	0.561	–144.8	5.199	93.2	0.090	42.6	0.346	–60.3	0.696	17.63
0.7	0.555	–152.6	4.559	88.5	0.094	43.4	0.311	–62.2	0.773	16.84
0.8	0.554	–159.3	4.021	84.1	0.099	44.8	0.283	–64.8	0.845	16.09
0.9	0.552	–164.3	3.610	80.4	0.104	46.1	0.263	–67.0	0.906	15.42
1.0	0.555	–169.5	3.280	76.8	0.109	47.7	0.246	–70.1	0.953	14.79
1.1	0.559	–173.6	3.012	73.3	0.114	49.3	0.235	–72.9	0.987	14.22
1.2	0.562	–177.1	2.770	70.7	0.120	50.9	0.223	–76.4	1.023	12.70
1.3	0.567	179.4	2.573	67.4	0.126	52.2	0.217	–79.7	1.042	11.84
1.4	0.569	176.1	2.407	64.5	0.133	53.4	0.210	–83.9	1.061	11.07
1.5	0.574	172.8	2.258	61.6	0.140	54.4	0.207	–87.9	1.071	10.45
1.6	0.577	170.5	2.128	58.9	0.147	55.3	0.201	–92.6	1.088	9.80
1.7	0.583	167.7	2.004	56.3	0.154	56.2	0.199	–97.2	1.094	9.27
1.8	0.588	165.2	1.900	53.8	0.162	56.9	0.195	–102.2	1.097	8.79
1.9	0.593	163.4	1.797	51.6	0.170	57.6	0.199	–107.2	1.100	8.31
2.0	0.602	160.6	1.715	49.1	0.179	58.0	0.196	–112.9	1.093	7.96
2.1	0.608	159.3	1.640	46.5	0.187	58.5	0.206	–117.5	1.080	7.70
2.2	0.618	156.7	1.572	44.1	0.196	58.6	0.207	–123.3	1.069	7.44
2.3	0.622	155.2	1.521	41.8	0.206	58.6	0.217	–126.7	1.048	7.34
2.4	0.633	153.0	1.471	39.3	0.216	58.6	0.222	–132.3	1.026	7.34
2.5	0.635	151.5	1.415	37.6	0.225	58.6	0.228	–135.6	1.023	7.06
2.6	0.647	150.4	1.366	35.9	0.235	58.5	0.239	–140.8	0.999	7.64
2.7	0.646	148.5	1.316	33.7	0.246	58.1	0.245	–144.7	1.004	6.91
2.8	0.656	147.3	1.283	31.5	0.256	57.8	0.258	–148.7	0.976	7.01
2.9	0.659	145.6	1.261	29.3	0.268	57.1	0.267	–152.1	0.956	6.73
3.0	0.658	144.4	1.237	28.7	0.279	57.1	0.272	–155.5	0.954	6.47
4.0	0.730	131.1	0.957	15.5	0.384	47.6	0.406	171.2	0.867	3.97
5.0	0.751	119.0	0.735	6.4	0.459	36.5	0.530	149.2	0.913	2.04

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	0.714	–55.7	18.356	145.6	0.035	65.5	0.831	–30.0	0.173	27.17
0.2	0.641	–94.1	13.659	123.4	0.055	51.2	0.621	–47.6	0.328	23.97
0.3	0.583	–117.4	10.273	110.6	0.063	46.9	0.476	–55.9	0.476	22.12
0.4	0.557	–133.1	8.118	102.1	0.070	46.2	0.382	–61.0	0.599	20.64
0.5	0.540	–144.7	6.632	95.6	0.076	47.0	0.321	–63.8	0.711	19.41
0.6	0.533	–153.7	5.631	90.3	0.082	48.4	0.276	–66.5	0.802	18.39
0.7	0.533	–160.2	4.904	86.2	0.087	50.1	0.246	–68.4	0.868	17.49
0.8	0.533	–166.3	4.319	82.2	0.094	51.7	0.221	–71.3	0.927	16.63
0.9	0.532	–170.8	3.871	78.8	0.100	53.1	0.205	–73.8	0.974	15.86
1.0	0.537	–175.0	3.511	75.5	0.107	54.5	0.190	–77.6	1.004	14.75
1.1	0.541	–178.5	3.214	72.4	0.115	55.8	0.181	–80.7	1.026	13.49
1.2	0.547	178.4	2.953	69.8	0.122	56.9	0.172	–85.3	1.042	12.56
1.3	0.552	175.2	2.741	66.7	0.130	57.7	0.167	–89.2	1.055	11.81
1.4	0.555	172.3	2.559	64.0	0.138	58.3	0.163	–94.1	1.063	11.13
1.5	0.559	169.5	2.400	61.2	0.147	58.8	0.161	–98.9	1.069	10.53
1.6	0.563	167.1	2.264	58.7	0.155	59.2	0.157	–104.4	1.076	9.98
1.7	0.573	164.7	2.132	56.4	0.163	59.4	0.157	–109.6	1.071	9.53
1.8	0.579	162.3	2.019	53.9	0.172	59.6	0.155	–115.6	1.072	9.05
1.9	0.581	161.0	1.910	52.1	0.181	59.7	0.161	–120.8	1.078	8.54
2.0	0.589	158.4	1.820	49.7	0.190	59.7	0.162	–127.0	1.073	8.16
2.1	0.595	157.3	1.746	47.2	0.199	59.7	0.172	–131.3	1.061	7.92
2.2	0.603	154.6	1.667	44.9	0.208	59.5	0.176	–137.2	1.058	7.57
2.3	0.610	153.5	1.614	42.6	0.218	59.2	0.186	–139.9	1.033	7.58
2.4	0.622	151.7	1.559	40.2	0.228	58.8	0.194	–145.4	1.014	7.62
2.5	0.623	150.4	1.502	38.5	0.237	58.5	0.199	–148.3	1.013	7.31
2.6	0.635	149.1	1.451	36.7	0.247	58.1	0.211	–153.1	0.996	7.69
2.7	0.631	147.2	1.404	34.7	0.257	57.6	0.218	–156.6	1.003	7.03
2.8	0.644	146.0	1.362	32.5	0.266	57.0	0.233	–159.9	0.979	7.09
2.9	0.649	144.2	1.339	30.3	0.278	56.2	0.241	–162.8	0.958	6.83
3.0	0.647	143.4	1.313	29.6	0.288	56.1	0.246	–165.6	0.960	6.58
4.0	0.717	130.7	1.022	16.2	0.386	46.5	0.380	165.6	0.887	4.23
5.0	0.743	119.2	0.788	6.7	0.457	35.9	0.504	146.5	0.917	2.36

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	0.645	–67.5	22.475	139.6	0.033	61.6	0.762	–37.0	0.250	28.31
0.2	0.580	–108.3	15.461	117.2	0.047	51.3	0.527	–55.2	0.423	25.21
0.3	0.538	–130.5	11.251	105.8	0.055	49.5	0.389	–63.2	0.593	23.14
0.4	0.526	–144.0	8.732	98.1	0.062	50.9	0.306	–68.2	0.716	21.51
0.5	0.516	–154.1	7.086	92.6	0.069	53.0	0.253	–71.1	0.821	20.14
0.6	0.512	–161.4	5.969	87.8	0.076	54.9	0.215	–74.2	0.900	18.96
0.7	0.517	–167.2	5.179	84.2	0.084	56.7	0.190	–76.6	0.942	17.91
0.8	0.517	–172.4	4.550	80.5	0.092	58.3	0.170	–80.4	0.988	16.96
0.9	0.520	–176.2	4.078	77.4	0.100	59.3	0.156	–83.6	1.013	15.42
1.0	0.524	–180.0	3.696	74.3	0.108	60.4	0.144	–88.7	1.034	14.21
1.1	0.530	177.1	3.386	71.5	0.117	61.0	0.138	–92.8	1.041	13.37
1.2	0.535	174.6	3.107	69.2	0.126	61.7	0.132	–98.6	1.052	12.53
1.3	0.540	171.8	2.882	66.3	0.135	61.9	0.130	–103.4	1.055	11.87
1.4	0.545	169.1	2.690	63.8	0.144	62.0	0.128	–109.3	1.058	11.25
1.5	0.551	166.6	2.521	61.2	0.153	62.1	0.128	–114.7	1.057	10.70
1.6	0.556	164.5	2.372	58.7	0.162	62.0	0.128	–121.2	1.061	10.14
1.7	0.562	162.5	2.233	56.6	0.171	61.8	0.131	–126.9	1.061	9.64
1.8	0.568	160.3	2.117	54.1	0.181	61.6	0.132	–133.4	1.060	9.19
1.9	0.572	158.8	2.005	52.3	0.190	61.4	0.141	–138.3	1.061	8.72
2.0	0.580	156.4	1.913	50.0	0.200	61.0	0.145	–144.8	1.054	8.39
2.1	0.585	155.3	1.825	47.7	0.209	60.7	0.156	–147.8	1.050	8.05
2.2	0.598	153.0	1.751	45.4	0.218	60.1	0.163	–153.3	1.037	7.88
2.3	0.602	152.0	1.692	43.3	0.228	59.4	0.172	–155.1	1.023	7.78
2.4	0.613	150.2	1.631	40.9	0.237	59.0	0.182	–159.9	1.010	7.75
2.5	0.614	148.8	1.573	39.3	0.247	58.5	0.187	–162.3	1.010	7.42
2.6	0.625	147.9	1.516	37.5	0.256	57.9	0.201	–166.4	0.998	7.72
2.7	0.626	146.0	1.467	35.4	0.266	57.1	0.207	–169.4	0.997	7.41
2.8	0.635	145.0	1.424	33.4	0.276	56.4	0.222	–172.2	0.982	7.13
2.9	0.638	143.5	1.400	31.2	0.287	55.5	0.230	–174.4	0.967	6.88
3.0	0.640	142.4	1.375	30.4	0.298	55.1	0.235	–176.8	0.961	6.65
4.0	0.707	130.2	1.076	17.0	0.389	45.4	0.366	159.5	0.902	4.42
5.0	0.737	119.2	0.834	7.0	0.456	35.1	0.487	143.0	0.923	2.62

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	0.521	–99.6	29.267	128.1	0.024	57.2	0.606	–51.2	0.391	30.92
0.2	0.508	–135.0	17.671	107.9	0.036	55.7	0.369	–69.9	0.638	26.95
0.3	0.496	–151.6	12.312	98.9	0.044	58.7	0.260	–78.2	0.808	24.51
0.4	0.494	–161.1	9.401	92.7	0.053	62.0	0.200	–84.4	0.900	22.48
0.5	0.497	–168.2	7.551	88.3	0.063	64.4	0.163	–89.1	0.960	20.82
0.6	0.498	–173.3	6.348	84.4	0.072	65.8	0.137	–95.0	0.999	19.45
0.7	0.501	–177.2	5.500	81.4	0.082	66.6	0.121	–100.0	1.015	17.49
0.8	0.506	178.8	4.810	78.1	0.092	67.2	0.109	–107.2	1.034	16.04
0.9	0.511	176.1	4.304	75.4	0.102	67.5	0.102	–113.1	1.043	14.98
1.0	0.516	173.3	3.892	72.7	0.113	67.6	0.099	–121.3	1.047	14.06
1.1	0.525	171.0	3.563	70.1	0.123	67.4	0.098	–127.0	1.042	13.37
1.2	0.529	169.3	3.264	68.1	0.133	67.3	0.100	–134.3	1.047	12.57
1.3	0.535	166.9	3.025	65.5	0.144	66.8	0.103	–139.1	1.044	11.95
1.4	0.541	164.8	2.828	63.1	0.154	66.3	0.108	–145.3	1.041	11.40
1.5	0.545	162.6	2.644	60.6	0.164	65.7	0.113	–150.0	1.043	10.81
1.6	0.550	160.9	2.488	58.5	0.174	65.0	0.119	–155.9	1.043	10.29
1.7	0.558	159.0	2.340	56.3	0.184	64.3	0.126	–160.3	1.040	9.82
1.8	0.563	157.0	2.219	54.2	0.194	63.7	0.133	–165.5	1.039	9.37
1.9	0.566	156.0	2.098	52.4	0.204	63.0	0.144	–168.0	1.041	8.89
2.0	0.576	153.7	2.002	50.2	0.214	62.2	0.153	–172.9	1.034	8.58
2.1	0.581	152.8	1.908	48.1	0.223	61.6	0.164	–173.8	1.032	8.22
2.2	0.592	150.8	1.829	45.9	0.232	60.7	0.173	–177.8	1.025	8.00
2.3	0.596	149.7	1.766	43.8	0.243	59.7	0.181	–178.4	1.015	7.87
2.4	0.608	148.3	1.703	41.5	0.252	58.9	0.192	178.2	1.003	7.95
2.5	0.611	147.0	1.642	39.8	0.261	58.2	0.197	176.4	1.001	7.75
2.6	0.620	146.1	1.583	38.4	0.271	57.4	0.211	173.6	0.995	7.66
2.7	0.621	144.4	1.530	36.3	0.280	56.5	0.218	171.3	0.997	7.37
2.8	0.633	143.6	1.488	34.2	0.289	55.6	0.232	169.8	0.981	7.11
2.9	0.635	142.0	1.468	32.0	0.300	54.5	0.240	168.4	0.968	6.89
3.0	0.633	141.3	1.439	31.4	0.309	54.0	0.244	166.1	0.971	6.67
4.0	0.704	129.6	1.131	18.3	0.395	43.6	0.366	149.8	0.917	4.57
5.0	0.732	119.0	0.888	7.7	0.455	34.0	0.476	137.3	0.934	2.90

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	0.953	–18.4	3.508	166.1	0.039	79.3	0.988	–7.3	0.059	19.51
0.2	0.946	–38.6	3.366	152.9	0.074	67.4	0.958	–14.6	0.088	16.58
0.3	0.903	–55.5	3.133	140.9	0.102	57.8	0.909	–20.4	0.144	14.87
0.4	0.864	–70.8	2.876	130.2	0.124	49.5	0.858	–25.8	0.191	13.67
0.5	0.828	–84.9	2.625	120.3	0.138	42.3	0.811	–29.9	0.243	12.78
0.6	0.792	–97.0	2.401	111.9	0.148	36.2	0.765	–33.7	0.303	12.11
0.7	0.770	–107.7	2.206	104.8	0.153	31.2	0.730	–36.7	0.348	11.59
0.8	0.748	–117.7	2.023	97.9	0.155	27.2	0.696	–39.8	0.404	11.16
0.9	0.733	–126.3	1.864	92.1	0.155	23.7	0.674	–42.7	0.458	10.81
1.0	0.721	–134.1	1.734	86.4	0.152	21.2	0.650	–45.7	0.516	10.56
1.1	0.716	–141.3	1.620	81.3	0.148	19.2	0.637	–48.5	0.564	10.38
1.2	0.711	–147.6	1.512	77.1	0.144	18.0	0.621	–51.5	0.628	10.22
1.3	0.709	–153.9	1.424	72.3	0.137	17.3	0.612	–54.5	0.689	10.15
1.4	0.706	–159.0	1.341	68.1	0.131	17.5	0.601	–57.7	0.773	10.11
1.5	0.704	–164.2	1.267	64.0	0.125	18.6	0.596	–61.2	0.850	10.07
1.6	0.704	–168.5	1.202	60.2	0.118	20.4	0.586	–64.5	0.952	10.07
1.7	0.706	–173.0	1.139	56.8	0.112	23.2	0.581	–68.2	1.050	8.72
1.8	0.712	–176.9	1.079	53.2	0.107	27.5	0.574	–72.0	1.143	7.76
1.9	0.713	179.6	1.021	50.6	0.103	33.1	0.570	–75.7	1.247	6.98
2.0	0.717	175.6	0.977	47.6	0.102	39.5	0.564	–79.8	1.312	6.46
2.1	0.721	173.0	0.935	44.5	0.104	46.4	0.567	–84.4	1.320	6.17
2.2	0.726	169.0	0.898	41.5	0.108	52.9	0.563	–88.9	1.313	5.84
2.3	0.732	166.6	0.871	39.2	0.116	58.3	0.573	–93.3	1.211	5.97
2.4	0.743	163.5	0.845	36.7	0.127	63.2	0.571	–97.9	1.107	6.24
2.5	0.741	161.0	0.811	34.9	0.139	66.8	0.576	–102.3	1.076	5.97
2.6	0.751	158.8	0.778	33.3	0.154	69.5	0.581	–107.3	0.995	7.05
2.7	0.749	155.9	0.753	31.4	0.169	71.1	0.583	–111.9	0.971	6.48
2.8	0.759	154.0	0.730	29.8	0.186	72.0	0.592	–116.3	0.889	5.95
2.9	0.759	151.1	0.719	28.5	0.204	72.2	0.589	–120.4	0.865	5.47
3.0	0.762	149.4	0.699	28.4	0.222	72.5	0.587	–125.0	0.862	4.99
4.0	0.794	131.4	0.569	23.7	0.390	57.9	0.646	–170.9	0.862	1.64
5.0	0.774	118.0	0.512	21.2	0.485	41.3	0.695	158.3	0.989	0.24

V_{CE} = 2 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	0.874	–30.9	9.759	158.7	0.037	74.4	0.946	–14.9	0.086	24.23
0.2	0.821	–59.3	8.620	140.6	0.064	59.6	0.843	–27.0	0.164	21.29
0.3	0.747	–81.6	7.329	126.8	0.081	50.0	0.731	–34.8	0.254	19.56
0.4	0.691	–98.9	6.216	116.2	0.092	44.1	0.639	–40.3	0.339	18.32
0.5	0.646	–113.3	5.309	107.5	0.098	40.2	0.569	–43.6	0.430	17.35
0.6	0.620	–125.0	4.618	100.5	0.101	38.0	0.512	–46.3	0.516	16.59
0.7	0.603	–134.5	4.100	95.2	0.104	37.1	0.472	–48.2	0.591	15.95
0.8	0.591	–142.7	3.654	89.8	0.106	36.8	0.438	–50.3	0.676	15.38
0.9	0.586	–149.7	3.302	85.5	0.107	37.1	0.415	–52.3	0.747	14.88
1.0	0.583	–156.1	3.017	81.3	0.109	38.3	0.393	–54.6	0.814	14.42
1.1	0.582	–161.3	2.779	77.4	0.110	39.6	0.379	–56.8	0.875	14.01
1.2	0.585	–166.2	2.561	74.2	0.113	41.5	0.365	–59.1	0.932	13.57
1.3	0.585	–170.6	2.388	70.6	0.115	43.4	0.356	–61.8	0.982	13.17
1.4	0.587	–174.7	2.237	67.3	0.118	45.4	0.346	–64.8	1.024	11.83
1.5	0.589	–178.4	2.101	64.0	0.122	47.5	0.340	–67.9	1.055	10.94
1.6	0.591	178.1	1.982	61.1	0.126	49.5	0.331	–71.2	1.090	10.13
1.7	0.598	174.9	1.872	58.2	0.130	51.6	0.326	–74.8	1.107	9.58
1.8	0.603	171.9	1.773	55.2	0.136	53.7	0.319	–78.4	1.121	9.03
1.9	0.605	169.8	1.677	52.9	0.142	55.6	0.317	–82.4	1.135	8.49
2.0	0.613	166.5	1.603	50.1	0.149	57.4	0.310	–86.7	1.130	8.12
2.1	0.619	164.7	1.535	47.5	0.157	59.0	0.315	–91.3	1.112	7.87
2.2	0.628	161.6	1.469	44.8	0.165	60.2	0.312	–96.0	1.099	7.58
2.3	0.631	160.1	1.425	42.4	0.175	61.2	0.319	–100.0	1.061	7.59
2.4	0.644	157.9	1.380	39.9	0.185	62.0	0.319	–105.1	1.025	7.76
2.5	0.644	155.8	1.326	38.0	0.195	62.7	0.323	–108.8	1.021	7.44
2.6	0.659	154.4	1.279	36.1	0.206	63.2	0.329	–114.0	0.978	7.93
2.7	0.657	152.1	1.237	33.8	0.217	63.3	0.333	–118.1	0.978	7.56
2.8	0.669	150.8	1.202	31.7	0.229	63.4	0.343	–122.8	0.935	7.21
2.9	0.669	148.6	1.180	29.6	0.242	63.0	0.346	–126.6	0.917	6.88
3.0	0.673	147.4	1.151	29.0	0.254	63.2	0.348	–130.7	0.909	6.55
4.0	0.741	132.6	0.882	16.1	0.381	53.2	0.460	–173.5	0.816	3.65
5.0	0.755	119.6	0.678	8.4	0.469	40.1	0.572	157.9	0.897	1.61

V_{CE} = 2 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	0.808	–41.4	14.766	152.7	0.035	70.0	0.899	–21.2	0.129	26.28
0.2	0.718	–75.1	12.065	132.0	0.055	55.1	0.740	–35.7	0.249	23.38
0.3	0.644	–98.7	9.602	118.5	0.067	48.5	0.603	–43.5	0.367	21.54
0.4	0.596	–116.1	7.804	108.5	0.075	45.1	0.505	–48.2	0.480	20.20
0.5	0.565	–129.1	6.495	101.2	0.079	44.1	0.438	–50.5	0.589	19.13
0.6	0.548	–140.0	5.568	95.2	0.084	44.3	0.387	–52.5	0.685	18.24
0.7	0.538	–147.9	4.875	90.5	0.088	45.2	0.352	–53.8	0.765	17.44
0.8	0.533	–155.2	4.312	86.0	0.092	46.6	0.323	–55.5	0.841	16.71
0.9	0.532	–160.8	3.875	82.2	0.097	48.1	0.303	–57.1	0.899	16.03
1.0	0.532	–166.3	3.520	78.6	0.101	49.6	0.284	–59.5	0.951	15.40
1.1	0.535	–170.5	3.230	75.2	0.107	51.4	0.273	–61.6	0.985	14.81
1.2	0.540	–174.1	2.976	72.8	0.112	53.1	0.260	–64.2	1.016	13.45
1.3	0.544	–177.9	2.766	69.5	0.118	54.5	0.253	–66.9	1.036	12.52
1.4	0.547	178.9	2.585	66.6	0.125	55.8	0.245	–70.1	1.054	11.75
1.5	0.550	175.4	2.426	63.6	0.131	56.9	0.240	–73.6	1.067	11.08
1.6	0.554	172.8	2.283	61.0	0.138	57.9	0.232	–77.3	1.080	10.46
1.7	0.561	170.0	2.154	58.5	0.145	58.8	0.227	–81.4	1.082	9.97
1.8	0.565	167.0	2.037	55.8	0.153	59.7	0.220	–85.5	1.090	9.41
1.9	0.570	165.4	1.930	53.7	0.161	60.3	0.221	–90.4	1.091	8.95
2.0	0.579	162.4	1.845	51.1	0.170	60.8	0.216	–95.3	1.079	8.64
2.1	0.585	161.1	1.763	48.6	0.178	61.3	0.221	–100.2	1.068	8.36
2.2	0.593	158.5	1.691	46.1	0.187	61.7	0.219	–105.5	1.059	8.08
2.3	0.598	157.0	1.636	43.8	0.197	61.6	0.227	–109.6	1.035	8.05
2.4	0.613	155.0	1.583	41.4	0.207	61.7	0.228	–115.1	1.006	8.39
2.5	0.613	153.5	1.524	39.6	0.216	61.8	0.233	–118.8	1.005	8.06
2.6	0.624	152.4	1.468	37.7	0.226	61.8	0.240	–124.3	0.984	8.12
2.7	0.625	150.2	1.420	35.7	0.237	61.5	0.243	–128.4	0.982	7.78
2.8	0.636	148.8	1.379	33.4	0.247	61.1	0.255	–133.0	0.956	7.47
2.9	0.640	147.3	1.354	31.3	0.259	60.5	0.260	–136.8	0.935	7.18
3.0	0.640	145.9	1.324	30.5	0.271	60.4	0.263	–140.5	0.933	6.89
4.0	0.713	132.5	1.025	16.5	0.380	50.9	0.387	–179.6	0.845	4.31
5.0	0.743	120.3	0.781	6.6	0.462	39.3	0.514	155.3	0.883	2.28

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	0.725	–50.5	18.782	147.7	0.032	67.9	0.853	–26.3	0.171	27.73
0.2	0.643	–87.5	14.308	125.9	0.050	53.8	0.656	–41.9	0.323	24.60
0.3	0.578	–111.4	10.931	113.0	0.058	49.0	0.515	–49.1	0.466	22.73
0.4	0.541	–127.3	8.687	104.0	0.065	47.9	0.422	–53.1	0.596	21.27
0.5	0.523	–139.1	7.130	97.6	0.071	48.6	0.360	–54.8	0.703	20.05
0.6	0.510	–148.9	6.067	92.1	0.076	50.1	0.315	–56.5	0.797	19.03
0.7	0.508	–155.7	5.279	88.2	0.082	51.7	0.284	–57.4	0.864	18.10
0.8	0.507	–162.4	4.653	83.9	0.088	53.5	0.259	–59.1	0.922	17.25
0.9	0.506	–167.3	4.169	80.5	0.094	54.9	0.242	–60.7	0.968	16.47
1.0	0.509	–171.7	3.788	77.2	0.101	56.4	0.225	–63.3	1.000	15.65
1.1	0.513	–175.5	3.473	74.2	0.107	57.5	0.215	–65.5	1.020	14.23
1.2	0.519	–178.8	3.192	71.7	0.115	58.8	0.204	–68.7	1.038	13.25
1.3	0.523	177.7	2.966	68.7	0.122	59.8	0.198	–71.7	1.048	12.51
1.4	0.527	174.9	2.773	66.0	0.130	60.4	0.191	–75.5	1.056	11.84
1.5	0.532	171.9	2.596	63.2	0.138	61.0	0.186	–79.4	1.060	11.25
1.6	0.535	169.4	2.444	60.7	0.147	61.5	0.180	–83.9	1.067	10.64
1.7	0.542	167.0	2.303	58.4	0.154	61.7	0.176	–88.3	1.069	10.13
1.8	0.549	164.4	2.182	55.9	0.163	62.1	0.171	–93.2	1.068	9.68
1.9	0.554	163.1	2.065	53.9	0.171	62.3	0.172	–98.7	1.068	9.22
2.0	0.563	160.1	1.973	51.6	0.181	62.3	0.168	–104.4	1.058	8.90
2.1	0.567	159.3	1.885	49.2	0.189	62.4	0.175	–109.6	1.053	8.57
2.2	0.578	156.5	1.809	46.8	0.198	62.2	0.175	–115.6	1.041	8.36
2.3	0.583	155.3	1.745	44.6	0.208	61.9	0.183	–119.3	1.023	8.30
2.4	0.596	153.5	1.690	42.3	0.218	61.7	0.187	–125.2	1.001	8.70
2.5	0.596	152.3	1.631	40.5	0.227	61.4	0.191	–128.7	0.999	8.56
2.6	0.609	151.0	1.566	38.7	0.237	61.2	0.199	–134.6	0.985	8.20
2.7	0.606	148.9	1.516	36.6	0.247	60.6	0.204	–138.4	0.989	7.88
2.8	0.622	148.0	1.474	34.4	0.257	60.1	0.217	–142.8	0.959	7.58
2.9	0.624	146.4	1.450	32.2	0.269	59.3	0.222	–146.2	0.943	7.32
3.0	0.625	145.2	1.416	31.5	0.280	59.2	0.227	–149.7	0.940	7.04
4.0	0.700	132.3	1.102	17.4	0.381	49.6	0.354	174.9	0.864	4.61
5.0	0.732	120.7	0.843	6.8	0.458	38.4	0.484	152.5	0.891	2.65

V_{CE} = 2 V, I_C = 10 mA, Z_O = 50 Ω

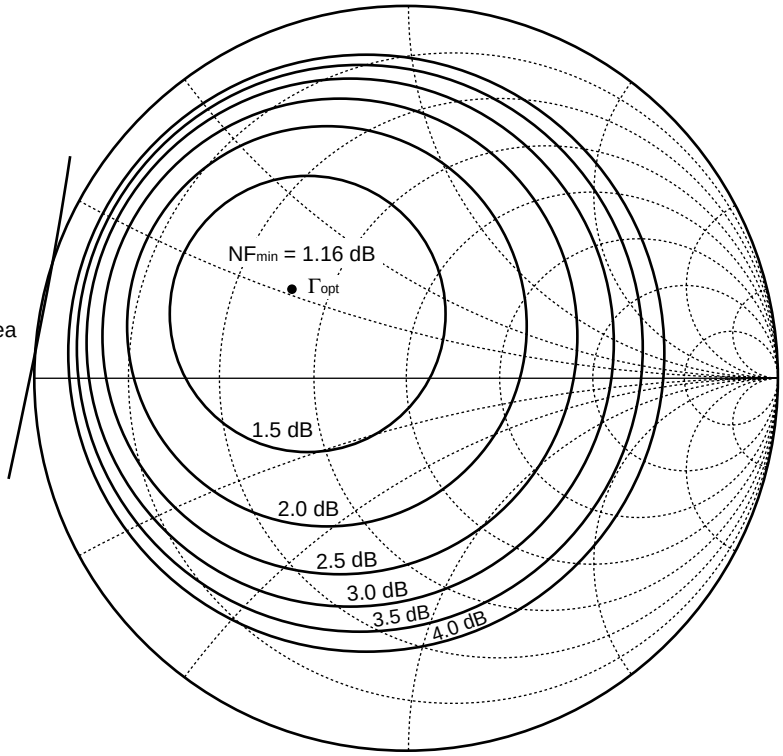
Frequency	S_{11}		S_{21}		S_{12}		S_{22}		K	MAG/MSG
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		(dB)
0.1	0.668	–60.8	23.136	142.1	0.029	64.6	0.790	–32.2	0.231	28.99
0.2	0.572	–101.0	16.396	119.9	0.043	53.0	0.566	–48.3	0.420	25.84
0.3	0.524	–123.5	12.059	108.0	0.051	51.5	0.428	–54.7	0.583	23.77
0.4	0.499	–138.3	9.425	100.0	0.058	52.6	0.344	–58.0	0.713	22.14
0.5	0.486	–148.9	7.659	94.4	0.064	54.4	0.290	–59.2	0.816	20.77
0.6	0.484	–157.3	6.482	89.6	0.071	56.4	0.251	–60.6	0.888	19.60
0.7	0.481	–163.1	5.629	85.9	0.078	58.1	0.225	–61.4	0.942	18.56
0.8	0.484	–168.9	4.947	82.2	0.086	59.9	0.203	–63.4	0.983	17.61
0.9	0.487	–172.8	4.416	79.1	0.093	60.9	0.188	–65.2	1.011	16.11
1.0	0.491	–177.0	4.010	76.1	0.102	62.0	0.174	–68.1	1.029	14.91
1.1	0.497	180.0	3.678	73.3	0.110	62.7	0.166	–70.9	1.034	14.12
1.2	0.502	177.1	3.374	71.1	0.119	63.5	0.156	–74.8	1.046	13.23
1.3	0.508	174.4	3.134	68.2	0.127	63.9	0.151	–78.3	1.048	12.59
1.4	0.514	171.7	2.924	65.8	0.136	64.0	0.146	–82.9	1.049	11.97
1.5	0.519	169.2	2.740	63.1	0.145	64.1	0.143	–87.6	1.048	11.43
1.6	0.523	166.6	2.579	60.7	0.154	64.0	0.138	–93.1	1.053	10.85
1.7	0.528	164.6	2.430	58.5	0.162	64.0	0.136	–98.5	1.055	10.32
1.8	0.536	161.9	2.300	56.2	0.171	63.9	0.132	–104.7	1.053	9.86
1.9	0.539	160.7	2.179	54.1	0.181	63.7	0.136	–110.9	1.055	9.39
2.0	0.549	158.1	2.076	51.9	0.190	63.4	0.134	–117.7	1.048	9.05
2.1	0.555	157.4	1.985	49.6	0.199	63.1	0.143	–122.6	1.040	8.77
2.2	0.566	154.9	1.901	47.4	0.208	62.7	0.145	–129.2	1.031	8.53
2.3	0.571	154.0	1.840	45.2	0.218	62.1	0.155	–132.4	1.014	8.54
2.4	0.582	152.4	1.773	42.9	0.228	61.6	0.160	–138.5	1.001	8.75
2.5	0.585	151.0	1.712	41.2	0.237	61.1	0.164	–141.5	0.997	8.59
2.6	0.596	149.8	1.650	39.6	0.246	60.7	0.174	–147.2	0.986	8.26
2.7	0.599	147.9	1.598	37.4	0.256	59.9	0.180	–151.0	0.982	7.95
2.8	0.608	147.0	1.549	35.5	0.266	59.2	0.193	–154.9	0.969	7.65
2.9	0.610	145.0	1.523	33.1	0.277	58.4	0.200	–157.9	0.956	7.40
3.0	0.611	144.2	1.492	32.4	0.288	58.1	0.204	–161.0	0.951	7.15
4.0	0.689	132.2	1.164	18.3	0.383	48.3	0.333	168.6	0.881	4.82
5.0	0.726	121.0	0.897	7.3	0.455	37.7	0.462	149.3	0.896	2.94

V_{CE} = 2 V, I_C = 20 mA, Z_O = 50 Ω

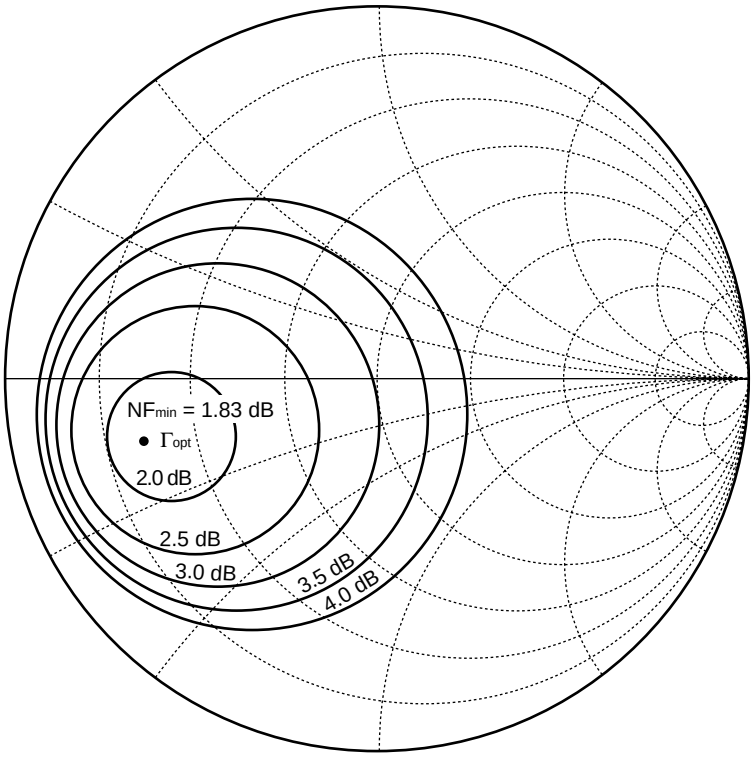
Frequency	S_{11}		S_{21}		S_{12}		S_{22}		K	MAG/MSG
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		(dB)
0.1	0.504	–88.9	30.979	130.7	0.024	63.6	0.643	–44.3	0.392	31.19
0.2	0.473	–127.5	19.256	110.0	0.033	57.5	0.407	–59.5	0.635	27.66
0.3	0.460	–146.0	13.484	100.6	0.041	60.6	0.292	–64.3	0.796	25.16
0.4	0.454	–156.7	10.338	94.2	0.050	63.3	0.229	–67.0	0.892	23.18
0.5	0.455	–164.0	8.318	89.8	0.059	65.2	0.189	–68.0	0.953	21.52
0.6	0.455	–170.0	6.993	85.9	0.068	66.8	0.160	–70.1	0.992	20.14
0.7	0.458	–174.1	6.051	82.9	0.077	67.9	0.141	–71.4	1.012	18.29
0.8	0.462	–178.6	5.310	79.7	0.087	68.5	0.125	–74.7	1.028	16.85
0.9	0.468	178.6	4.733	76.8	0.096	68.7	0.115	–77.6	1.037	15.75
1.0	0.473	175.5	4.290	74.3	0.106	69.0	0.105	–83.0	1.042	14.83
1.1	0.480	173.4	3.919	71.7	0.115	69.0	0.100	–87.5	1.041	14.08
1.2	0.486	171.4	3.598	69.8	0.125	68.8	0.095	–94.1	1.043	13.31
1.3	0.492	169.1	3.335	67.2	0.135	68.4	0.094	–99.6	1.041	12.69
1.4	0.498	167.0	3.113	64.8	0.145	68.0	0.093	–106.7	1.038	12.12
1.5	0.502	164.6	2.917	62.4	0.155	67.5	0.093	–113.2	1.037	11.57
1.6	0.510	162.8	2.741	60.3	0.165	66.8	0.093	–121.2	1.035	11.08
1.7	0.515	160.8	2.581	58.3	0.174	66.3	0.096	–128.1	1.036	10.54
1.8	0.524	158.9	2.444	56.0	0.184	65.8	0.097	–136.1	1.033	10.13
1.9	0.525	158.0	2.312	54.4	0.193	65.1	0.106	–141.4	1.037	9.60
2.0	0.538	155.8	2.207	52.2	0.203	64.4	0.111	–149.1	1.027	9.35
2.1	0.541	154.8	2.107	50.0	0.212	63.8	0.122	–151.7	1.026	8.98
2.2	0.554	152.5	2.018	47.9	0.221	63.0	0.129	–157.7	1.018	8.78
2.3	0.558	151.9	1.951	45.8	0.231	62.1	0.137	–159.0	1.006	8.78
2.4	0.571	150.3	1.882	43.6	0.241	61.4	0.146	–164.0	0.994	8.93
2.5	0.573	149.2	1.809	42.0	0.250	60.7	0.151	–166.4	0.994	8.59
2.6	0.586	148.1	1.748	40.3	0.260	59.9	0.164	–170.6	0.982	8.28
2.7	0.587	146.4	1.689	38.3	0.269	59.0	0.170	–173.6	0.984	7.98
2.8	0.596	145.5	1.639	36.3	0.278	58.2	0.183	–176.0	0.973	7.70
2.9	0.598	144.4	1.613	34.2	0.289	57.2	0.190	–177.8	0.961	7.46
3.0	0.600	143.1	1.581	33.3	0.299	56.7	0.195	179.4	0.958	7.23
4.0	0.677	131.7	1.240	19.7	0.387	46.5	0.320	158.0	0.904	5.05
5.0	0.718	121.0	0.967	8.2	0.453	36.5	0.441	143.0	0.909	3.29

EQUAL NF CIRCLE

V_{CE} = 1 V
I_C = 5 mA
f = 1 GHz



V_{CE} = 1 V
I_C = 5 mA
f = 2 GHz



NOISE PARAMETERS

V_{CE} = 1 V, I_C = 3 mA

f	NF_{min}	G_a	Γ_{opt}		Rn/50
(GHz)	(dB)	(dB)	MAG.	ANG.	
0.8	0.99	12.9	0.38	111.7	0.11
0.9	1.07	12.0	0.40	122.2	0.11
1.0	1.14	11.3	0.42	131.8	0.11
1.5	1.52	8.9	0.52	168.2	0.07
1.8	1.74	7.9	0.59	–177.2	0.06
1.9	1.82	7.5	0.60	–173.2	0.06
2.0	1.89	7.2	0.62	–169.5	0.06
2.5	2.27	6.0	0.69	–153.8	0.12

V_{CE} = 2 V, I_C = 3 mA

f	NF_{min}	G_a	Γ_{opt}		Rn/50
(GHz)	(dB)	(dB)	MAG.	ANG.	
0.8	0.94	13.5	0.38	108.6	0.12
0.9	1.02	12.7	0.40	119.4	0.11
1.0	1.10	12.0	0.42	129.2	0.11
1.5	1.48	9.5	0.52	166.5	0.07
1.8	1.71	8.4	0.58	–178.5	0.06
1.9	1.79	8.1	0.60	–174.4	0.06
2.0	1.87	7.8	0.61	–170.6	0.06
2.5	2.25	6.6	0.68	–154.3	0.11

V_{CE} = 1 V, I_C = 5 mA

f	NF_{min}	G_a	Γ_{opt}		Rn/50
(GHz)	(dB)	(dB)	MAG.	ANG.	
0.8	1.03	13.7	0.32	125.6	0.09
0.9	1.09	12.9	0.34	135.6	0.09
1.0	1.16	12.1	0.37	144.5	0.09
1.5	1.49	9.5	0.49	176.8	0.07
1.8	1.69	8.3	0.56	–170.9	0.06
1.9	1.76	8.0	0.58	–167.5	0.07
2.0	1.83	7.7	0.60	–164.3	0.07
2.5	2.16	6.4	0.67	–148.8	0.13

V_{CE} = 2 V, I_C = 5 mA

f	NF_{min}	G_a	Γ_{opt}		Rn/50
(GHz)	(dB)	(dB)	MAG.	ANG.	
0.8	0.98	14.4	0.31	120.9	0.10
0.9	1.05	13.5	0.34	131.3	0.09
1.0	1.12	12.7	0.36	140.7	0.09
1.5	1.47	10.1	0.48	174.6	0.07
1.8	1.67	9.0	0.55	–172.5	0.07
1.9	1.74	8.6	0.57	–168.9	0.07
2.0	1.81	8.3	0.59	–165.5	0.07
2.5	2.16	7.0	0.66	–149.7	0.13

V_{CE} = 1 V, I_C = 7 mA

f	NF_{min}	G_a	Γ_{opt}		Rn/50
(GHz)	(dB)	(dB)	MAG.	ANG.	
0.8	1.08	14.2	0.29	139.6	0.08
0.9	1.14	13.3	0.33	147.8	0.08
1.0	1.21	12.5	0.36	155.3	0.08
1.5	1.54	9.8	0.49	–177.1	0.07
1.8	1.74	8.6	0.56	–166.0	0.07
1.9	1.81	8.3	0.58	–162.9	0.08
2.0	1.87	8.0	0.60	–160.0	0.08
2.5	2.20	6.5	0.67	–145.7	0.15

V_{CE} = 2 V, I_C = 7 mA

f	NF_{min}	G_a	Γ_{opt}		Rn/50
(GHz)	(dB)	(dB)	MAG.	ANG.	
0.8	1.06	14.9	0.28	137.2	0.08
0.9	1.12	14.0	0.31	145.9	0.08
1.0	1.19	13.3	0.34	153.7	0.08
1.5	1.52	10.5	0.48	–177.8	0.07
1.8	1.72	9.3	0.55	–166.6	0.07
1.9	1.78	9.0	0.57	–163.5	0.08
2.0	1.85	8.6	0.58	–160.5	0.08
2.5	2.18	7.2	0.66	–146.0	0.15

V_{CE} = 1 V, I_C = 10 mA

f	NF_{min}	G_a	Γ_{opt}		Rn/50
(GHz)	(dB)	(dB)	MAG.	ANG.	
0.8	1.16	14.6	0.30	156.0	0.08
0.9	1.23	13.7	0.34	161.8	0.08
1.0	1.30	12.9	0.37	167.3	0.07
1.5	1.63	10.1	0.51	–170.8	0.07
1.8	1.83	8.8	0.57	–161.0	0.08
1.9	1.89	8.5	0.59	–158.1	0.09
2.0	1.96	8.1	0.60	–155.4	0.10
2.5	2.29	6.7	0.67	–143.1	0.18

V_{CE} = 2 V, I_C = 10 mA

f	NF_{min}	G_a	Γ_{opt}		Rn/50
(GHz)	(dB)	(dB)	MAG.	ANG.	
0.8	1.12	15.3	0.29	149.9	0.08
0.9	1.19	14.4	0.32	156.7	0.08
1.0	1.25	13.6	0.35	162.9	0.08
1.5	1.59	10.7	0.49	–173.0	0.07
1.8	1.80	9.5	0.56	–162.7	0.08
1.9	1.86	9.1	0.57	–159.8	0.09
2.0	1.93	8.8	0.59	–156.9	0.10
2.5	2.27	7.3	0.66	–143.6	0.17

V_{CE} = 1 V, I_C = 20 mA

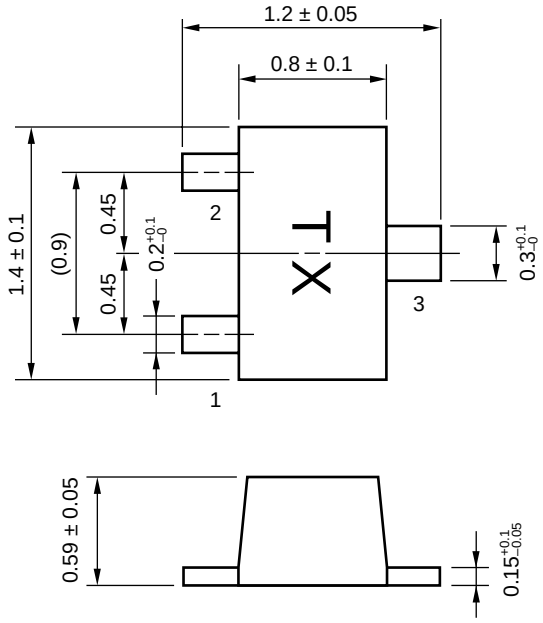
f (GHz)	NF_{min} (dB)	G_a (dB)	Γ_{opt} MAG.	Γ_{opt} ANG.	Rn/50
0.8	1.41	15.1	0.39	177.8	0.07
0.9	1.48	14.2	0.42	–179.2	0.07
1.0	1.56	13.4	0.45	–176.2	0.07
1.5	1.94	10.4	0.57	–161.3	0.09
1.8	2.17	9.1	0.62	–153.0	0.12
1.9	2.24	8.7	0.64	–150.4	0.14
2.0	2.32	8.3	0.65	–147.9	0.16
2.5	2.70	6.8	0.71	–138.2	0.28

V_{CE} = 2 V, I_C = 20 mA

f (GHz)	NF_{min} (dB)	G_a (dB)	Γ_{opt} MAG.	Γ_{opt} ANG.	Rn/50
0.8	1.39	15.9	0.37	175.0	0.07
0.9	1.46	15.0	0.40	178.4	0.07
1.0	1.54	14.2	0.43	–178.2	0.08
1.5	1.92	11.1	0.55	–162.4	0.09
1.8	2.14	9.8	0.61	–154.0	0.12
1.9	2.22	9.4	0.63	–151.4	0.13
2.0	2.30	9.0	0.64	–149.0	0.15
2.5	2.68	7.5	0.71	–138.5	0.27

PACKAGE DIMENSIONS

FLAT-LEAD 3-PIN THIN-TYPE ULTRA SUPER MINIMOLD (UNIT: mm)



PIN CONNECTIONS

1. Emitter
2. Base
3. Collector

[MEMO]

[MEMO]

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