

To our customers,

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## Old Company Name in Catalogs and Other Documents

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On April 1<sup>st</sup>, 2010, NEC Electronics Corporation merged with Renesas Technology Corporation, and Renesas Electronics Corporation took over all the business of both companies. Therefore, although the old company name remains in this document, it is a valid Renesas Electronics document. We appreciate your understanding.

Renesas Electronics website: <http://www.renesas.com>

April 1<sup>st</sup>, 2010  
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

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NPN SILICON RF TRANSISTOR

**2SC5745**

**Phase-out/Discontinued**

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
2SC5745	50 pcs (Non reel)	• 8 mm wide embossed taping
2SC5745-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<sub>A</sub> = +25°C)**

Parameter	Symbol	Ratings	Unit
Collector to Base Voltage	V <sub>CBO</sub>	15	V
Collector to Emitter Voltage	V <sub>CEO</sub>	5.5	V
Emitter to Base Voltage	V <sub>EBO</sub>	1.5	V
Collector Current	I <sub>c</sub>	100	mA
Total Power Dissipation	P <sub>tot</sub> <sup>Note</sup>	200	mW
Junction Temperature	T <sub>j</sub>	150	°C
Storage Temperature	T <sub>stg</sub>	-65 to +150	°C

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

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

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Not all devices/types available in every country. Please check with local NEC representative for availability and additional information.

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

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
DC Characteristics						
Collector Cut-off Current	I <sub>CBO</sub>	V <sub>CB</sub> = 5 V, I <sub>E</sub> = 0 mA	–	–	100	nA
Emitter Cut-off Current	I <sub>EBO</sub>	V <sub>BE</sub> = 1 V, I <sub>C</sub> = 0 mA	–	–	100	nA
DC Current Gain	h <sub>FE</sub> <sup>Note 1</sup>	V <sub>CE</sub> = 1 V, I <sub>C</sub> = 10 mA	100	–	145	–
RF Characteristics						
Gain Bandwidth Product	f <sub>T</sub>	V <sub>CE</sub> = 1 V, I <sub>C</sub> = 10 mA, f = 2 GHz	4.0	5.5	–	GHz
Insertion Power Gain	S <sub>21e</sub>   <sup>2</sup>	V <sub>CE</sub> = 1 V, I <sub>C</sub> = 10 mA, f = 2 GHz	3.0	4.5	–	dB
Noise Figure	NF	V <sub>CE</sub> = 1 V, I <sub>C</sub> = 10 mA, f = 2 GHz, Z <sub>S</sub> = Z <sub>opt</sub>	–	2.0	3.0	dB
Reverse Transfer Capacitance	C <sub>re</sub> <sup>Note 2</sup>	V <sub>CB</sub> = 0.5 V, I <sub>E</sub> = 0 mA, f = 1 MHz	0.7	0.8	0.9	pF

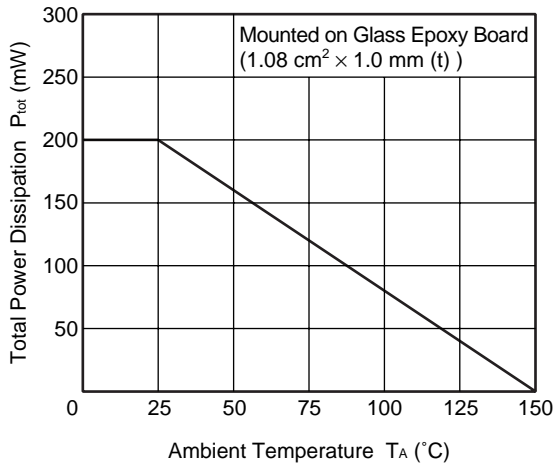
- Notes** 1. Pulse measurement: PW ≤ 350 μs, Duty Cycle ≤ 2%  
 2. Collector to base capacitance when the emitter grounded

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

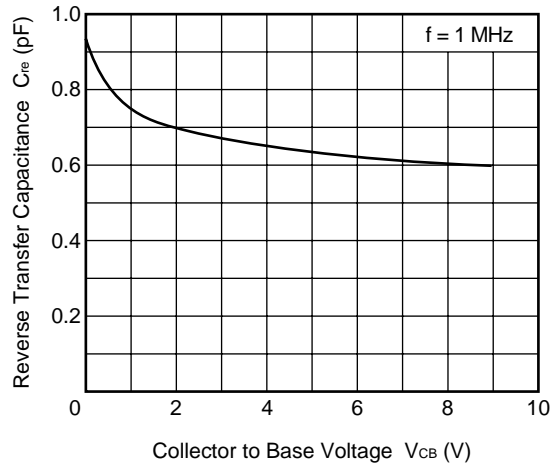
Rank	FB
Marking	TY
h <sub>FE</sub> Value	100 to 145

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

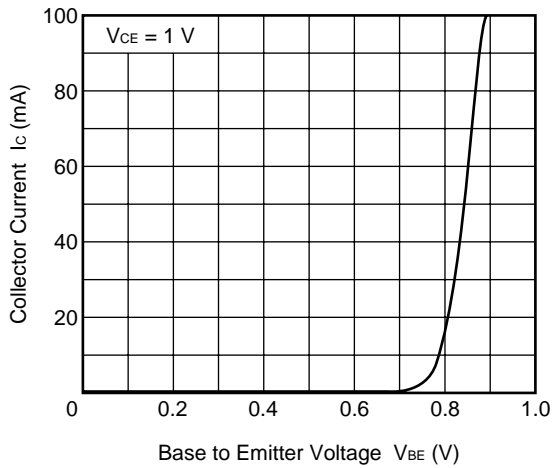
**TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE**



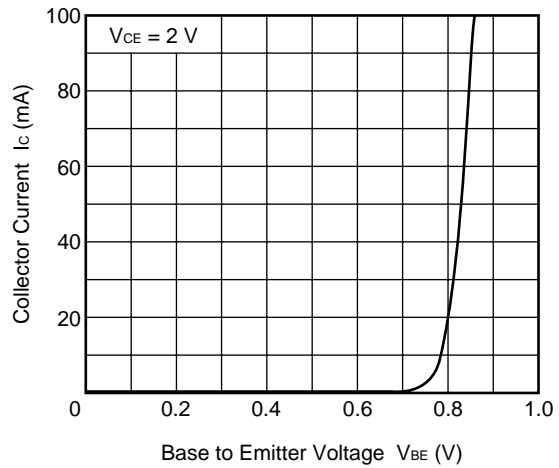
**REVERSE TRANSFER CAPACITANCE vs. COLLECTOR TO BASE VOLTAGE**



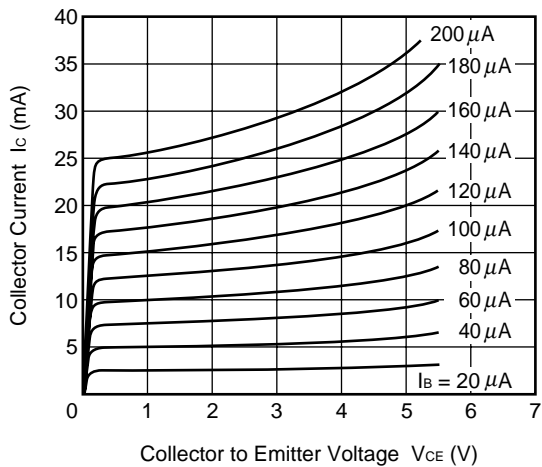
**COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE**



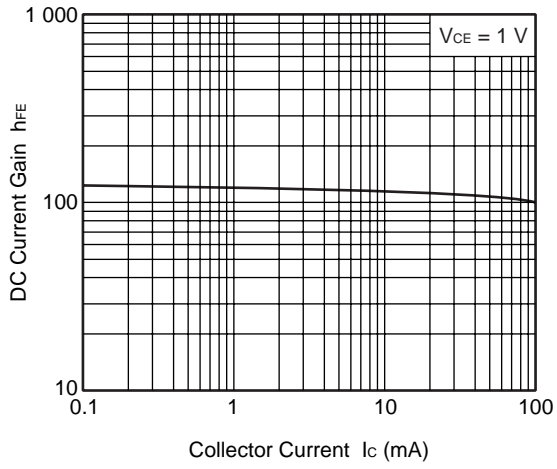
**COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE**



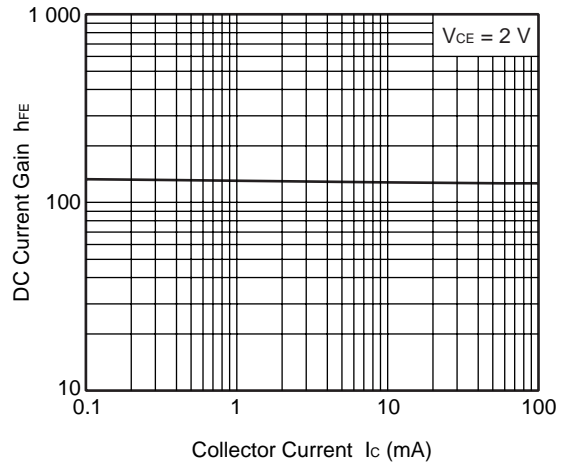
**COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE**



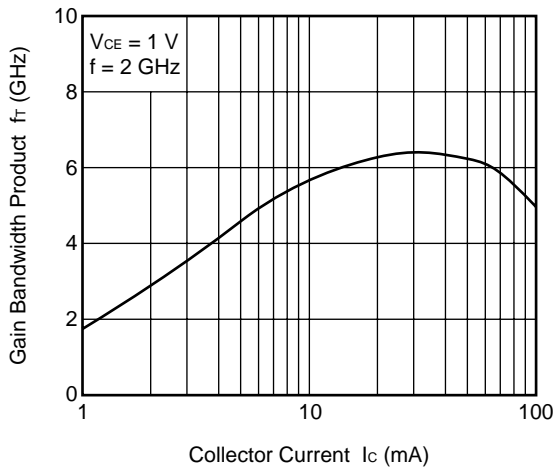
DC CURRENT GAIN vs.  
COLLECTOR CURRENT



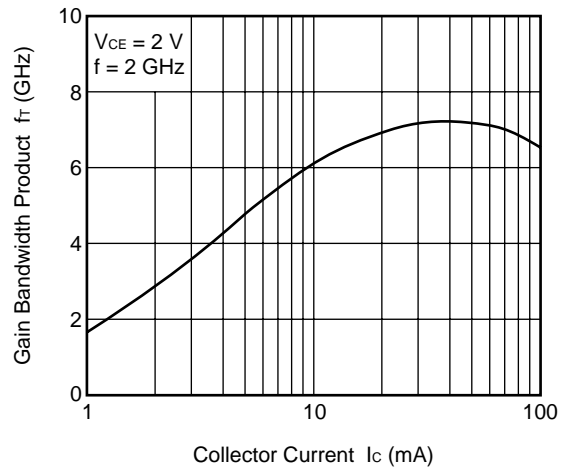
DC CURRENT GAIN vs.  
COLLECTOR CURRENT



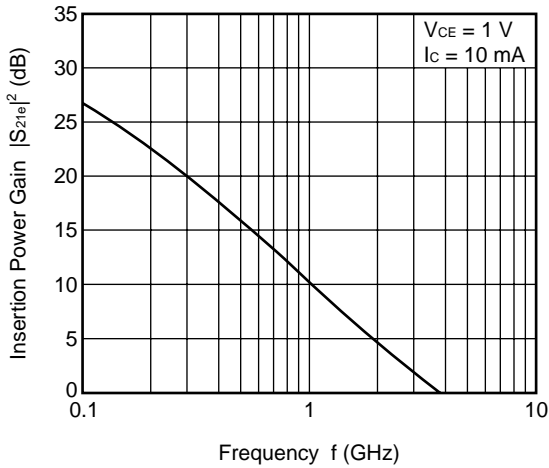
**GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT**



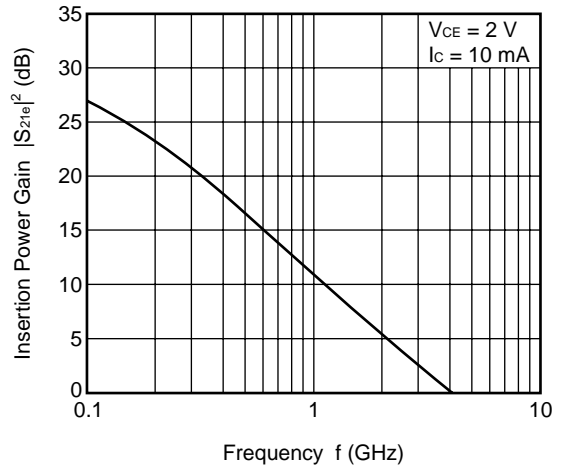
**GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT**



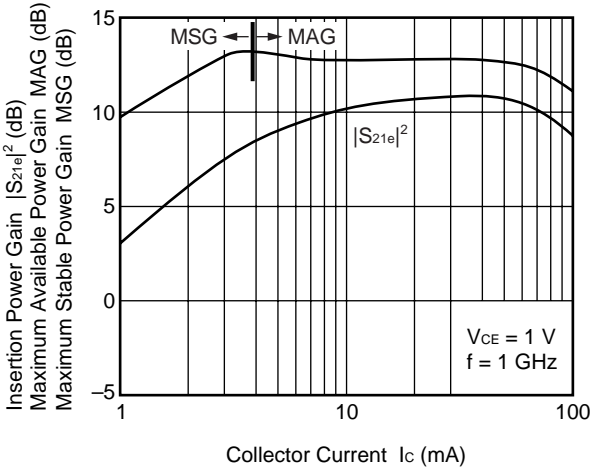
**INSERTION POWER GAIN vs. FREQUENCY**



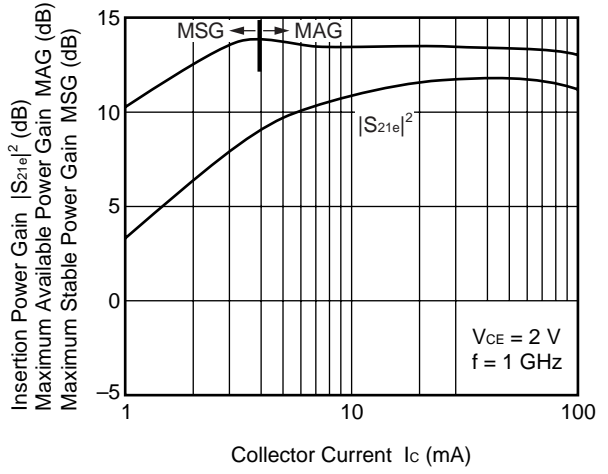
**INSERTION POWER GAIN vs. FREQUENCY**



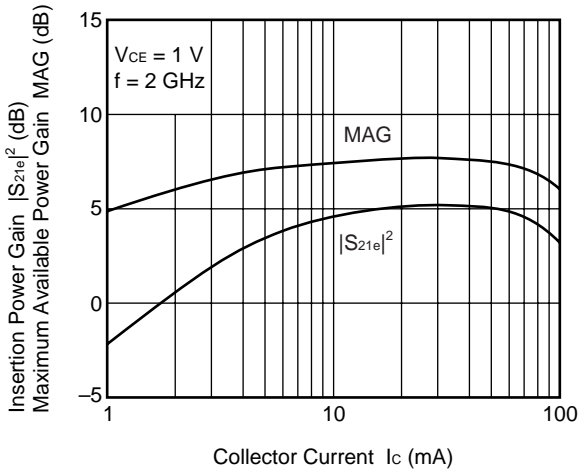
INSERTION POWER GAIN, MAG, MSG  
vs. COLLECTOR CURRENT



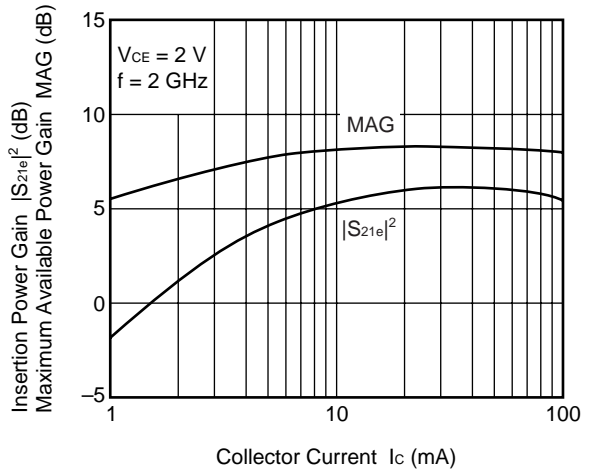
INSERTION POWER GAIN, MAG, MSG  
vs. COLLECTOR CURRENT



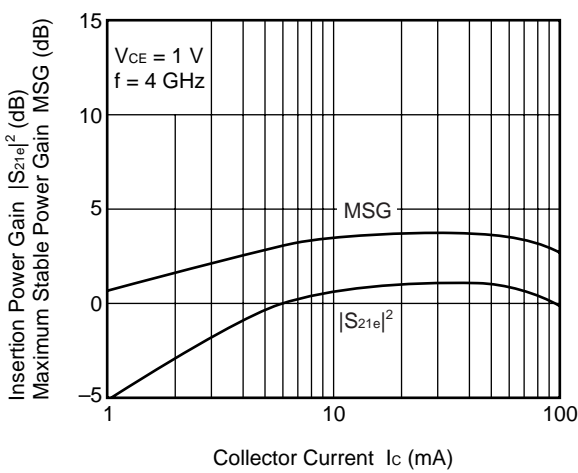
INSERTION POWER GAIN, MAG  
vs. COLLECTOR CURRENT



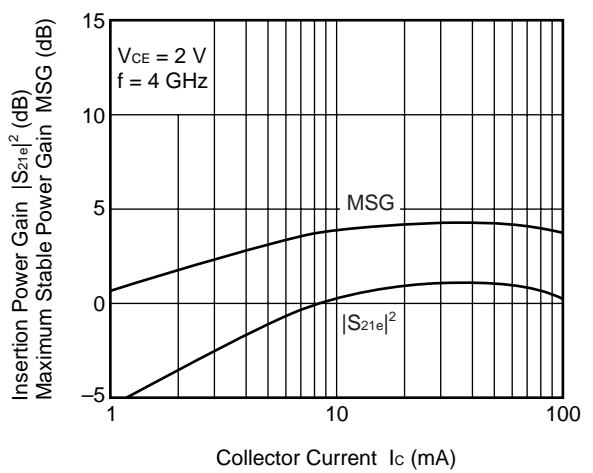
INSERTION POWER GAIN, MAG  
vs. COLLECTOR CURRENT



INSERTION POWER GAIN, MSG  
vs. COLLECTOR CURRENT

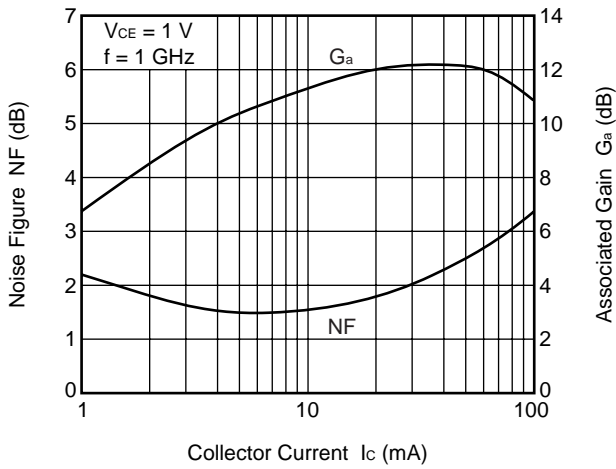


INSERTION POWER GAIN, MSG  
vs. COLLECTOR CURRENT

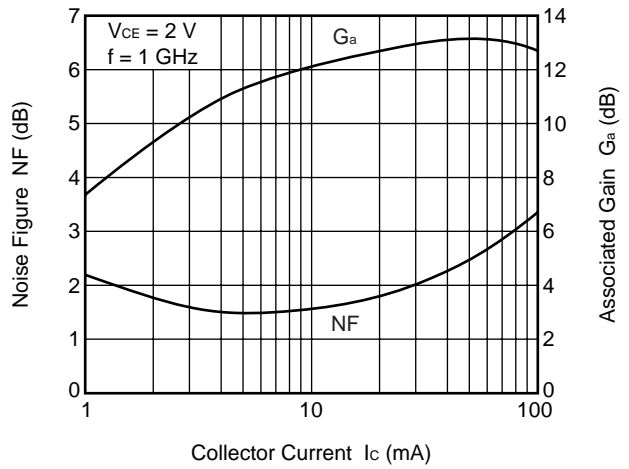




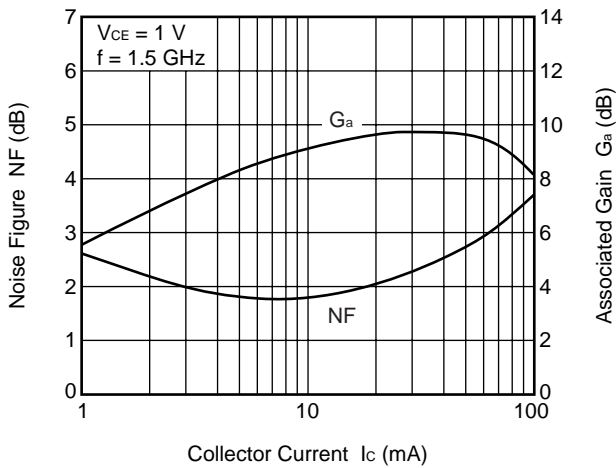
**NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT**



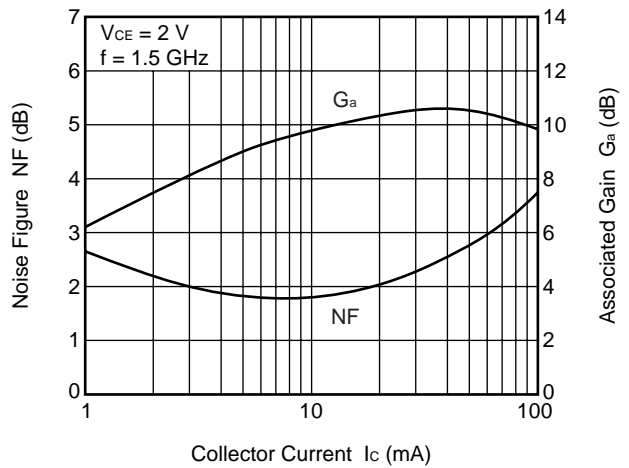
**NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT**



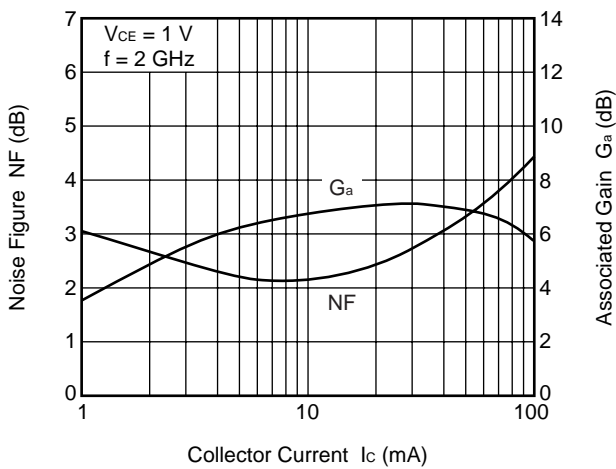
**NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT**



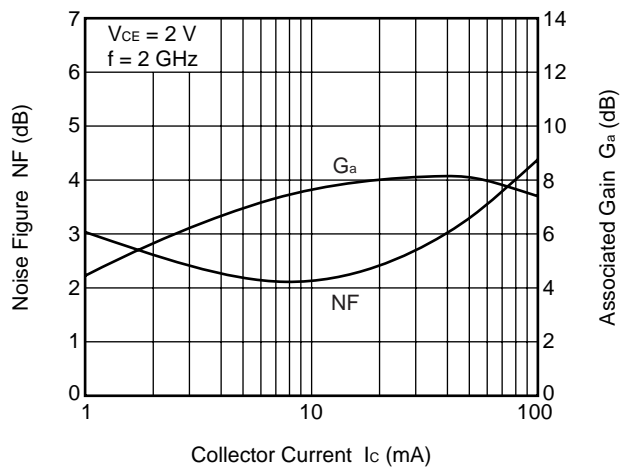
**NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT**



**NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT**



**NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT**



**Remark** The graphs indicate nominal characteristics.

**S-PARAMETERS**

**Note** When  $K \geq 1$ , 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.  $MSG = \left| \frac{S_{21}}{S_{12}} \right|$

$V_{CE} = 1\text{ V}$ ,  $I_C = 1\text{ mA}$ ,  $Z_O = 50\ \Omega$

Frequency (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>		K	MAG/MSG (dB)
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		
0.1	0.966	-26.0	3.599	162.4	0.054	75.9	0.978	-10.0	0.035	18.24
0.2	0.917	-51.2	3.281	145.0	0.096	60.5	0.918	-19.0	0.114	15.34
0.3	0.869	-72.4	2.966	130.2	0.127	48.9	0.857	-25.9	0.179	13.68
0.4	0.823	-89.9	2.590	118.4	0.146	40.0	0.789	-31.2	0.243	12.49
0.5	0.791	-105.0	2.313	108.0	0.157	32.5	0.739	-35.3	0.305	11.68
0.6	0.764	-117.3	2.046	99.5	0.162	26.9	0.694	-39.2	0.373	11.03
0.7	0.748	-127.9	1.841	92.1	0.163	22.6	0.665	-42.4	0.430	10.53
0.8	0.735	-137.0	1.665	85.6	0.159	19.4	0.635	-45.8	0.506	10.19
0.9	0.727	-144.7	1.522	79.5	0.156	17.3	0.620	-49.0	0.571	9.89
1.0	0.723	-151.3	1.398	74.4	0.151	15.6	0.599	-52.5	0.656	9.67
1.1	0.723	-157.3	1.299	69.6	0.144	14.6	0.594	-56.1	0.723	9.56
1.2	0.727	-162.9	1.209	65.3	0.135	14.9	0.578	-59.9	0.813	9.51
1.3	0.726	-167.8	1.136	61.0	0.127	16.0	0.577	-64.0	0.905	9.52
1.4	0.729	-172.3	1.068	57.0	0.119	18.6	0.568	-68.1	1.014	8.81
1.5	0.728	-176.5	1.008	53.1	0.112	22.5	0.568	-72.5	1.124	7.39
1.6	0.733	179.3	0.950	49.8	0.107	28.0	0.562	-77.2	1.232	6.58
1.7	0.735	175.7	0.901	46.8	0.104	34.9	0.563	-82.0	1.315	6.00
1.8	0.741	172.2	0.855	43.9	0.106	42.4	0.557	-87.0	1.354	5.53
1.9	0.745	168.8	0.813	41.2	0.111	49.5	0.562	-92.3	1.328	5.23
2.0	0.751	165.4	0.772	38.3	0.120	56.2	0.559	-97.4	1.290	4.86
2.1	0.757	162.5	0.745	35.9	0.132	61.5	0.566	-103.1	1.187	4.89
2.2	0.763	159.9	0.713	34.1	0.147	65.7	0.566	-108.5	1.125	4.71
2.3	0.763	157.1	0.684	32.0	0.163	68.2	0.575	-114.1	1.077	4.54
2.4	0.768	154.2	0.657	30.6	0.180	69.8	0.577	-119.8	1.033	4.50
2.5	0.770	151.9	0.632	29.0	0.198	70.4	0.582	-125.3	1.008	4.51
2.6	0.774	149.1	0.608	28.0	0.217	70.4	0.584	-130.9	0.989	4.48
2.7	0.774	146.9	0.584	27.1	0.234	70.2	0.589	-136.4	1.000	3.97
2.8	0.775	144.8	0.563	26.9	0.250	70.4	0.588	-140.9	1.028	2.51
2.9	0.769	143.2	0.552	26.9	0.270	70.0	0.595	-145.0	1.026	2.11
3.0	0.770	141.0	0.549	27.5	0.294	68.8	0.601	-149.5	1.004	2.34
4.0	0.775	125.4	0.523	25.8	0.457	48.5	0.675	167.8	0.981	0.59
5.0	0.767	113.8	0.521	21.8	0.525	33.3	0.716	140.8	1.021	-0.93

$V_{CE} = 1\text{ V}$ ,  $I_C = 3\text{ mA}$ ,  $Z_o = 50\ \Omega$

Frequency (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>		K	MAG/MSG (dB)
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		
0.1	0.870	-40.6	9.585	153.5	0.050	69.0	0.916	-20.2	0.096	22.83
0.2	0.784	-74.3	7.830	132.5	0.080	52.3	0.763	-34.6	0.201	19.93
0.3	0.717	-99.5	6.370	117.4	0.096	42.8	0.636	-43.0	0.296	18.22
0.4	0.669	-116.8	5.188	107.1	0.104	37.7	0.539	-48.3	0.401	16.97
0.5	0.644	-130.6	4.379	98.8	0.109	34.8	0.475	-51.3	0.496	16.05
0.6	0.625	-141.0	3.741	92.3	0.112	33.6	0.425	-54.3	0.600	15.25
0.7	0.619	-149.4	3.284	86.6	0.114	33.5	0.393	-56.4	0.684	14.60
0.8	0.615	-156.6	2.914	81.9	0.115	34.4	0.364	-59.2	0.776	14.05
0.9	0.614	-162.0	2.625	77.3	0.117	35.8	0.348	-61.7	0.849	13.51
1.0	0.616	-167.4	2.384	73.4	0.119	37.1	0.328	-65.1	0.925	13.02
1.1	0.619	-171.7	2.194	69.6	0.120	39.1	0.320	-68.1	0.986	12.61
1.2	0.622	-175.8	2.033	66.1	0.123	41.7	0.308	-71.9	1.045	10.88
1.3	0.625	-179.4	1.898	62.6	0.126	44.0	0.305	-75.7	1.081	10.03
1.4	0.628	177.1	1.778	59.3	0.131	46.7	0.296	-79.8	1.118	9.24
1.5	0.633	174.0	1.671	56.0	0.136	48.9	0.296	-84.1	1.133	8.66
1.6	0.638	170.9	1.576	53.1	0.143	51.5	0.290	-88.8	1.148	8.09
1.7	0.642	168.2	1.493	50.4	0.150	53.6	0.292	-93.6	1.151	7.62
1.8	0.649	165.5	1.414	47.6	0.159	55.5	0.289	-98.9	1.144	7.20
1.9	0.654	162.9	1.346	45.0	0.168	56.8	0.294	-104.3	1.128	6.86
2.0	0.663	160.1	1.284	42.0	0.179	58.2	0.294	-109.7	1.104	6.59
2.1	0.668	158.0	1.236	39.5	0.190	59.3	0.303	-115.3	1.077	6.44
2.2	0.676	156.0	1.185	37.2	0.202	60.1	0.306	-120.7	1.053	6.28
2.3	0.679	153.7	1.136	34.6	0.213	60.6	0.318	-126.0	1.037	6.08
2.4	0.687	151.7	1.099	32.6	0.226	60.9	0.324	-131.4	1.013	6.18
2.5	0.690	149.8	1.053	30.5	0.237	60.8	0.335	-136.5	1.007	5.96
2.6	0.697	147.5	1.013	28.5	0.250	60.6	0.342	-141.6	0.993	6.07
2.7	0.700	145.8	0.974	26.7	0.261	60.4	0.352	-146.6	0.996	5.72
2.8	0.702	143.9	0.932	25.3	0.271	60.6	0.357	-150.5	1.012	4.69
2.9	0.702	143.0	0.912	23.9	0.285	60.7	0.372	-153.7	0.996	5.05
3.0	0.705	141.0	0.899	23.1	0.303	60.3	0.383	-157.5	0.970	4.72
4.0	0.750	127.2	0.709	13.8	0.439	46.0	0.527	165.2	0.903	2.09
5.0	0.765	115.3	0.597	9.8	0.512	33.2	0.628	140.9	0.966	0.67

$V_{CE} = 1\text{ V}$ ,  $I_C = 5\text{ mA}$ ,  $Z_o = 50\ \Omega$

Frequency (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>		K	MAG/MSG (dB)
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		
0.1	0.775	-52.7	14.305	146.3	0.045	64.6	0.851	-28.7	0.157	25.02
0.2	0.692	-91.6	10.628	124.2	0.067	49.3	0.640	-45.8	0.283	21.98
0.3	0.630	-116.4	8.126	110.0	0.078	42.9	0.498	-54.5	0.421	20.17
0.4	0.601	-132.3	6.407	101.2	0.084	41.1	0.404	-59.6	0.547	18.81
0.5	0.582	-144.0	5.300	94.0	0.090	41.1	0.345	-62.5	0.662	17.72
0.6	0.575	-153.0	4.483	88.6	0.094	42.2	0.299	-65.5	0.763	16.77
0.7	0.572	-160.2	3.899	83.8	0.099	43.7	0.271	-67.6	0.845	15.94
0.8	0.570	-165.8	3.444	79.8	0.104	45.7	0.246	-70.9	0.921	15.18
0.9	0.574	-170.4	3.096	75.8	0.111	47.4	0.233	-73.7	0.965	14.47
1.0	0.577	-174.8	2.801	72.4	0.116	48.9	0.217	-77.9	1.015	13.06
1.1	0.579	-178.5	2.572	69.0	0.122	50.5	0.210	-81.2	1.052	11.84
1.2	0.586	178.2	2.375	65.9	0.129	52.3	0.199	-85.9	1.075	10.97
1.3	0.587	175.1	2.211	62.7	0.137	53.7	0.197	-89.9	1.095	10.21
1.4	0.593	172.4	2.072	59.9	0.145	55.1	0.191	-95.1	1.101	9.62
1.5	0.595	169.8	1.943	56.8	0.153	56.1	0.192	-99.6	1.110	9.02
1.6	0.602	167.1	1.831	54.1	0.162	57.2	0.189	-105.4	1.110	8.51
1.7	0.608	164.6	1.735	51.7	0.172	57.9	0.193	-110.5	1.103	8.09
1.8	0.615	162.1	1.644	49.0	0.182	58.4	0.192	-116.7	1.096	7.68
1.9	0.622	159.6	1.566	46.5	0.192	58.6	0.200	-122.2	1.082	7.37
2.0	0.628	157.4	1.492	43.8	0.203	58.7	0.203	-128.1	1.073	7.02
2.1	0.634	155.8	1.436	41.4	0.214	59.0	0.214	-133.2	1.052	6.87
2.2	0.645	153.8	1.378	39.2	0.225	59.1	0.220	-138.8	1.035	6.72
2.3	0.647	151.7	1.318	36.8	0.235	58.8	0.234	-143.4	1.033	6.37
2.4	0.656	149.9	1.274	34.7	0.247	58.6	0.241	-148.5	1.016	6.35
2.5	0.658	148.4	1.226	32.5	0.257	58.0	0.254	-152.8	1.015	6.04
2.6	0.668	146.2	1.181	30.5	0.268	57.5	0.263	-157.4	1.000	6.42
2.7	0.670	144.5	1.135	28.6	0.278	57.1	0.275	-161.6	1.007	5.59
2.8	0.672	142.8	1.091	27.4	0.286	57.1	0.281	-165.0	1.019	4.97
2.9	0.672	141.9	1.067	25.6	0.298	57.2	0.296	-167.1	1.008	4.98
3.0	0.676	140.5	1.055	24.7	0.313	56.9	0.308	-169.9	0.983	5.28
4.0	0.733	127.8	0.829	12.8	0.433	44.1	0.462	159.6	0.902	2.82
5.0	0.759	116.3	0.670	6.2	0.503	32.6	0.579	138.8	0.940	1.25

$V_{CE} = 1\text{ V}$ ,  $I_C = 7\text{ mA}$ ,  $Z_o = 50\ \Omega$

Frequency (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>		K	MAG/MSG (dB)
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		
0.1	0.717	-63.7	17.737	141.2	0.041	61.8	0.791	-35.5	0.189	26.31
0.2	0.631	-103.9	12.300	118.7	0.059	48.2	0.555	-53.8	0.365	23.16
0.3	0.589	-127.6	9.086	105.7	0.067	44.8	0.414	-62.7	0.517	21.29
0.4	0.565	-141.5	7.055	97.8	0.074	45.4	0.327	-68.2	0.659	19.78
0.5	0.552	-152.3	5.784	91.4	0.081	46.6	0.274	-71.4	0.771	18.55
0.6	0.547	-160.0	4.872	86.6	0.088	48.7	0.234	-75.4	0.862	17.45
0.7	0.547	-165.9	4.217	82.2	0.095	50.5	0.209	-77.9	0.927	16.48
0.8	0.551	-171.1	3.722	78.6	0.102	52.5	0.188	-82.2	0.979	15.62
0.9	0.552	-174.8	3.340	74.9	0.111	54.0	0.177	-85.7	1.012	14.14
1.0	0.560	-179.0	3.023	71.8	0.118	55.1	0.164	-91.4	1.040	12.85
1.1	0.561	177.8	2.767	68.6	0.126	56.3	0.158	-95.3	1.065	11.85
1.2	0.568	175.0	2.555	65.7	0.135	57.3	0.151	-101.3	1.075	11.10
1.3	0.572	172.3	2.375	62.7	0.144	58.1	0.150	-105.7	1.082	10.42
1.4	0.577	169.7	2.225	59.9	0.154	58.9	0.147	-112.0	1.084	9.84
1.5	0.580	167.3	2.082	57.1	0.163	59.2	0.150	-116.8	1.088	9.25
1.6	0.587	164.9	1.963	54.6	0.173	59.5	0.149	-123.4	1.089	8.74
1.7	0.593	162.7	1.858	52.2	0.183	59.7	0.155	-128.6	1.080	8.33
1.8	0.601	160.3	1.760	49.8	0.194	59.7	0.158	-135.1	1.074	7.91
1.9	0.608	158.1	1.675	47.4	0.204	59.4	0.168	-139.9	1.064	7.60
2.0	0.613	155.9	1.599	44.8	0.216	59.1	0.174	-145.7	1.056	7.25
2.1	0.620	154.4	1.541	42.4	0.226	58.9	0.186	-149.8	1.041	7.09
2.2	0.628	152.4	1.477	40.4	0.237	58.6	0.194	-155.1	1.031	6.87
2.3	0.633	150.9	1.412	37.9	0.248	58.0	0.209	-158.6	1.026	6.58
2.4	0.642	149.0	1.366	35.8	0.258	57.6	0.217	-163.2	1.012	6.56
2.5	0.644	147.6	1.313	33.8	0.268	56.9	0.231	-166.6	1.014	6.18
2.6	0.653	145.5	1.266	31.9	0.279	56.1	0.240	-170.5	1.004	6.19
2.7	0.656	143.8	1.219	29.9	0.287	55.7	0.252	-174.0	1.008	5.74
2.8	0.658	142.4	1.173	28.8	0.295	55.6	0.258	-176.9	1.020	5.13
2.9	0.658	141.7	1.149	27.0	0.306	55.6	0.272	-178.1	1.009	5.18
3.0	0.660	139.8	1.133	25.9	0.320	55.2	0.283	179.6	0.995	5.49
4.0	0.724	128.1	0.895	13.3	0.430	42.8	0.434	154.6	0.910	3.18
5.0	0.754	116.6	0.721	5.5	0.498	32.2	0.552	136.6	0.936	1.61

$V_{CE} = 1\text{ V}$ ,  $I_C = 10\text{ mA}$ ,  $Z_0 = 50\ \Omega$

Frequency (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>		K	MAG/MSG (dB)
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		
0.1	0.646	-77.1	21.584	134.8	0.036	58.9	0.713	-43.7	0.253	27.73
0.2	0.571	-117.0	13.849	113.1	0.051	49.0	0.464	-63.4	0.475	24.38
0.3	0.545	-138.7	9.923	101.6	0.059	48.8	0.334	-72.8	0.644	22.27
0.4	0.531	-151.1	7.627	94.7	0.067	51.1	0.259	-79.4	0.781	20.59
0.5	0.529	-159.9	6.204	89.1	0.075	53.4	0.213	-83.7	0.871	19.18
0.6	0.527	-166.2	5.207	84.7	0.083	55.7	0.181	-89.6	0.944	17.95
0.7	0.532	-171.7	4.504	80.8	0.093	57.1	0.160	-93.5	0.983	16.87
0.8	0.535	-176.2	3.961	77.5	0.102	58.9	0.144	-100.0	1.021	15.01
0.9	0.538	-179.2	3.550	74.0	0.112	59.7	0.136	-104.7	1.036	13.84
1.0	0.545	177.3	3.215	71.2	0.122	60.2	0.128	-112.6	1.052	12.83
1.1	0.548	174.6	2.940	68.2	0.131	60.9	0.125	-117.4	1.066	11.95
1.2	0.555	171.8	2.710	65.5	0.141	61.3	0.123	-125.0	1.069	11.22
1.3	0.557	169.4	2.518	62.7	0.151	61.5	0.125	-129.5	1.075	10.54
1.4	0.564	167.3	2.357	60.1	0.162	61.6	0.126	-136.5	1.070	10.01
1.5	0.570	165.0	2.206	57.5	0.173	61.4	0.131	-140.7	1.069	9.47
1.6	0.575	162.8	2.079	55.0	0.183	61.3	0.135	-147.5	1.068	8.95
1.7	0.581	160.9	1.967	52.7	0.194	61.0	0.143	-151.5	1.062	8.54
1.8	0.588	158.6	1.866	50.4	0.205	60.6	0.149	-157.5	1.058	8.12
1.9	0.595	156.5	1.774	48.1	0.216	59.9	0.160	-160.8	1.049	7.79
2.0	0.601	154.4	1.691	45.7	0.227	59.4	0.169	-165.7	1.044	7.43
2.1	0.607	152.9	1.626	43.4	0.238	58.8	0.182	-168.4	1.035	7.21
2.2	0.618	151.3	1.562	41.4	0.249	58.2	0.191	-172.6	1.022	7.08
2.3	0.620	149.7	1.493	38.9	0.258	57.5	0.205	-174.9	1.024	6.68
2.4	0.629	147.9	1.446	37.1	0.269	56.8	0.214	-178.7	1.012	6.63
2.5	0.633	146.6	1.391	35.1	0.278	56.0	0.227	179.0	1.011	6.35
2.6	0.640	144.6	1.339	33.1	0.289	55.1	0.236	175.7	1.007	6.15
2.7	0.644	143.0	1.292	31.2	0.297	54.4	0.249	173.1	1.010	5.78
2.8	0.644	141.6	1.241	30.0	0.304	54.2	0.255	170.5	1.024	5.16
2.9	0.647	140.8	1.219	28.3	0.314	54.2	0.267	170.2	1.011	5.23
3.0	0.648	139.3	1.203	27.2	0.327	53.7	0.276	168.5	0.999	5.65
4.0	0.712	128.3	0.954	14.0	0.430	41.6	0.418	148.9	0.924	3.47
5.0	0.749	117.0	0.768	5.2	0.493	31.6	0.531	133.7	0.936	1.93

$V_{CE} = 1\text{ V}$ ,  $I_C = 20\text{ mA}$ ,  $Z_O = 50\ \Omega$

Frequency (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>		K	MAG/MSG (dB)
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		
0.1	0.509	-106.8	27.689	123.0	0.028	56.8	0.549	-61.1	0.447	30.02
0.2	0.513	-142.2	15.848	104.6	0.039	56.5	0.323	-83.4	0.697	26.12
0.3	0.507	-156.7	10.950	95.6	0.049	59.9	0.229	-96.3	0.850	23.52
0.4	0.504	-165.1	8.296	90.2	0.059	63.0	0.181	-107.4	0.943	21.47
0.5	0.507	-171.8	6.716	85.6	0.071	64.8	0.152	-115.9	0.987	19.79
0.6	0.510	-176.2	5.616	82.0	0.082	66.2	0.136	-126.2	1.019	17.51
0.7	0.517	-179.9	4.843	78.7	0.094	66.7	0.127	-133.4	1.031	16.06
0.8	0.522	176.9	4.253	75.9	0.105	67.2	0.124	-142.5	1.045	14.77
0.9	0.524	174.4	3.807	72.8	0.117	66.9	0.124	-148.0	1.049	13.76
1.0	0.532	171.8	3.436	70.3	0.129	66.5	0.128	-156.0	1.053	12.86
1.1	0.535	169.6	3.144	67.5	0.140	66.4	0.130	-160.3	1.056	12.07
1.2	0.543	167.6	2.898	65.0	0.152	65.9	0.136	-166.1	1.054	11.39
1.3	0.546	165.4	2.688	62.4	0.163	65.4	0.141	-168.9	1.054	10.75
1.4	0.552	163.6	2.518	60.0	0.175	64.8	0.148	-174.0	1.050	10.21
1.5	0.558	161.8	2.354	57.5	0.187	64.0	0.155	-176.1	1.047	9.69
1.6	0.565	159.9	2.215	55.3	0.198	63.3	0.163	179.4	1.045	9.19
1.7	0.570	158.1	2.091	53.2	0.209	62.5	0.172	177.5	1.043	8.73
1.8	0.577	156.0	1.982	51.0	0.221	61.7	0.182	173.6	1.039	8.32
1.9	0.584	154.2	1.886	48.9	0.232	60.5	0.192	172.2	1.034	7.98
2.0	0.591	152.2	1.799	46.5	0.243	59.5	0.203	169.1	1.030	7.63
2.1	0.599	150.9	1.729	44.4	0.254	58.6	0.214	168.0	1.021	7.45
2.2	0.607	149.7	1.658	42.4	0.264	57.7	0.224	165.0	1.015	7.23
2.3	0.611	148.0	1.585	40.1	0.275	56.6	0.236	164.2	1.015	6.86
2.4	0.618	146.4	1.531	38.2	0.285	55.8	0.245	161.4	1.010	6.68
2.5	0.623	145.1	1.475	36.3	0.294	54.8	0.256	160.1	1.009	6.43
2.6	0.630	143.2	1.422	34.5	0.303	53.7	0.265	157.5	1.006	6.23
2.7	0.634	141.8	1.369	32.8	0.311	52.9	0.276	155.9	1.009	5.84
2.8	0.635	140.2	1.317	31.5	0.318	52.5	0.281	153.9	1.020	5.30
2.9	0.635	139.7	1.295	29.8	0.327	52.4	0.290	154.2	1.013	5.27
3.0	0.638	138.4	1.280	28.8	0.339	51.8	0.297	153.0	1.002	5.47
4.0	0.702	128.1	1.024	15.7	0.431	39.7	0.418	139.4	0.943	3.75
5.0	0.743	117.4	0.829	6.1	0.488	30.5	0.517	128.0	0.944	2.30

$V_{CE} = 2\text{ V}$ ,  $I_C = 1\text{ mA}$ ,  $Z_o = 50\ \Omega$

Frequency (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>		K	MAG/MSG (dB)
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		
0.1	0.955	-24.1	3.607	163.2	0.047	77.4	0.982	-8.7	0.039	18.84
0.2	0.924	-48.4	3.306	146.8	0.085	62.1	0.930	-16.8	0.115	15.92
0.3	0.875	-69.7	3.014	132.5	0.112	50.6	0.877	-23.1	0.169	14.29
0.4	0.830	-86.8	2.657	120.9	0.130	42.0	0.815	-28.0	0.233	13.11
0.5	0.798	-101.8	2.383	110.6	0.141	34.7	0.770	-31.9	0.293	12.28
0.6	0.767	-114.2	2.115	102.2	0.145	29.2	0.725	-35.4	0.364	11.63
0.7	0.750	-125.2	1.913	94.8	0.146	24.8	0.699	-38.2	0.420	11.16
0.8	0.735	-134.3	1.732	88.5	0.144	21.8	0.669	-41.5	0.499	10.81
0.9	0.729	-142.1	1.586	82.4	0.141	19.8	0.656	-44.4	0.559	10.52
1.0	0.723	-149.1	1.455	77.2	0.136	18.2	0.634	-47.6	0.649	10.31
1.1	0.723	-155.3	1.352	72.6	0.129	17.3	0.628	-50.9	0.715	10.20
1.2	0.725	-161.0	1.259	68.3	0.121	17.9	0.613	-54.3	0.814	10.17
1.3	0.722	-166.1	1.185	64.0	0.114	19.5	0.611	-58.2	0.912	10.18
1.4	0.723	-170.9	1.115	60.1	0.106	22.7	0.602	-61.9	1.033	9.10
1.5	0.725	-175.1	1.050	56.2	0.100	27.0	0.601	-66.1	1.134	7.97
1.6	0.728	-179.3	0.993	53.0	0.096	33.4	0.592	-70.3	1.252	7.12
1.7	0.728	177.0	0.943	49.9	0.095	41.1	0.593	-74.9	1.320	6.57
1.8	0.736	173.3	0.894	46.8	0.098	49.2	0.587	-79.6	1.332	6.17
1.9	0.739	169.6	0.852	44.4	0.104	56.5	0.589	-84.6	1.298	5.85
2.0	0.744	166.2	0.809	41.3	0.114	63.0	0.583	-89.5	1.251	5.48
2.1	0.748	163.5	0.780	38.9	0.128	68.1	0.589	-94.8	1.145	5.55
2.2	0.756	160.5	0.746	36.9	0.143	71.9	0.587	-100.0	1.078	5.47
2.3	0.755	157.8	0.716	34.8	0.160	74.0	0.594	-105.4	1.026	5.52
2.4	0.760	154.8	0.691	33.4	0.178	75.4	0.592	-110.9	0.985	5.90
2.5	0.763	152.5	0.664	31.5	0.196	75.6	0.597	-116.4	0.954	5.30
2.6	0.767	149.9	0.638	30.5	0.215	75.5	0.596	-122.0	0.943	4.72
2.7	0.767	147.4	0.614	29.2	0.233	75.1	0.598	-127.4	0.950	4.20
2.8	0.768	145.4	0.591	29.2	0.250	74.9	0.597	-131.9	0.971	3.73
2.9	0.764	143.9	0.580	28.9	0.271	74.1	0.603	-136.3	0.966	3.30
3.0	0.764	141.5	0.574	29.2	0.294	72.8	0.606	-141.0	0.956	2.91
4.0	0.770	125.8	0.539	27.1	0.462	51.6	0.670	174.3	0.962	0.67
5.0	0.760	114.0	0.531	22.3	0.533	35.4	0.709	145.1	1.014	-0.75



$V_{CE} = 2\text{ V}$ ,  $I_C = 3\text{ mA}$ ,  $Z_o = 50\ \Omega$

Frequency (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>		K	MAG/MSG (dB)
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		
0.1	0.876	-37.3	9.687	155.0	0.043	70.1	0.927	-17.6	0.108	23.48
0.2	0.791	-70.0	8.063	134.9	0.071	55.0	0.791	-30.4	0.192	20.57
0.3	0.723	-94.2	6.658	119.8	0.087	45.3	0.674	-38.0	0.290	18.86
0.4	0.671	-111.7	5.465	109.5	0.094	39.9	0.580	-42.5	0.396	17.63
0.5	0.639	-126.1	4.640	101.0	0.100	36.9	0.519	-45.2	0.490	16.68
0.6	0.616	-136.9	3.978	94.5	0.102	35.7	0.468	-47.6	0.599	15.92
0.7	0.611	-145.6	3.496	88.8	0.104	35.6	0.437	-49.2	0.677	15.27
0.8	0.605	-152.9	3.107	84.1	0.105	36.5	0.407	-51.5	0.772	14.71
0.9	0.602	-159.1	2.803	79.4	0.107	37.9	0.391	-53.6	0.844	14.17
1.0	0.602	-164.6	2.545	75.6	0.109	39.8	0.372	-56.3	0.927	13.69
1.1	0.602	-169.1	2.344	71.8	0.111	41.8	0.363	-59.0	0.988	13.25
1.2	0.606	-173.6	2.169	68.3	0.113	44.6	0.349	-62.0	1.046	11.51
1.3	0.609	-177.4	2.024	64.9	0.117	47.0	0.345	-65.4	1.083	10.64
1.4	0.612	179.1	1.898	61.7	0.121	49.9	0.335	-68.9	1.117	9.88
1.5	0.615	175.9	1.783	58.2	0.126	52.5	0.333	-72.7	1.137	9.24
1.6	0.619	172.8	1.682	55.5	0.133	55.1	0.325	-76.7	1.151	8.67
1.7	0.625	170.0	1.593	52.7	0.140	57.4	0.324	-81.2	1.143	8.26
1.8	0.629	167.0	1.513	49.8	0.149	59.5	0.318	-85.9	1.141	7.79
1.9	0.636	164.3	1.440	47.2	0.158	60.9	0.321	-90.8	1.118	7.50
2.0	0.644	161.7	1.370	44.2	0.169	62.3	0.317	-95.9	1.095	7.20
2.1	0.650	159.7	1.322	41.8	0.181	63.6	0.323	-101.3	1.058	7.17
2.2	0.658	157.3	1.265	39.4	0.192	64.6	0.323	-106.5	1.038	6.98
2.3	0.661	155.2	1.213	36.9	0.204	64.9	0.331	-112.0	1.023	6.81
2.4	0.671	152.8	1.172	34.9	0.217	65.4	0.333	-117.2	0.994	7.33
2.5	0.673	151.2	1.128	32.6	0.229	65.1	0.341	-122.5	0.981	6.92
2.6	0.680	149.0	1.082	30.7	0.243	65.0	0.346	-127.6	0.969	6.48
2.7	0.685	147.0	1.044	28.8	0.256	64.8	0.355	-132.7	0.957	6.11
2.8	0.689	145.4	1.006	27.3	0.268	64.6	0.362	-137.0	0.954	5.75
2.9	0.691	143.9	0.980	25.3	0.281	64.1	0.375	-141.4	0.938	5.42
3.0	0.693	142.0	0.957	24.4	0.297	63.6	0.381	-146.0	0.933	5.08
4.0	0.742	128.2	0.750	14.4	0.439	49.4	0.513	173.1	0.873	2.33
5.0	0.759	116.1	0.621	9.9	0.518	35.5	0.615	145.9	0.946	0.79

$V_{CE} = 2\text{ V}$ ,  $I_C = 5\text{ mA}$ ,  $Z_o = 50\ \Omega$

Frequency (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>		K	MAG/MSG (dB)
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		
0.1	0.794	-47.8	14.460	148.6	0.040	65.8	0.872	-24.8	0.166	25.54
0.2	0.692	-85.3	11.056	126.8	0.060	51.9	0.679	-39.8	0.284	22.62
0.3	0.628	-110.0	8.593	112.6	0.072	45.4	0.543	-47.2	0.413	20.78
0.4	0.587	-126.6	6.822	103.4	0.078	43.3	0.448	-51.2	0.544	19.43
0.5	0.565	-139.0	5.668	96.2	0.083	42.9	0.390	-53.1	0.657	18.35
0.6	0.557	-148.6	4.813	90.6	0.087	43.8	0.344	-55.1	0.759	17.43
0.7	0.556	-156.2	4.187	85.8	0.092	45.4	0.316	-56.4	0.833	16.59
0.8	0.550	-162.4	3.699	81.8	0.096	47.3	0.290	-58.6	0.916	15.84
0.9	0.552	-167.3	3.324	77.7	0.102	49.3	0.275	-60.5	0.964	15.12
1.0	0.555	-171.8	3.016	74.3	0.108	51.2	0.258	-63.4	1.013	13.77
1.1	0.557	-175.6	2.763	71.0	0.114	52.8	0.249	-66.0	1.049	12.51
1.2	0.563	-179.3	2.551	67.9	0.120	54.7	0.237	-69.5	1.075	11.60
1.3	0.564	177.9	2.376	64.8	0.127	56.2	0.233	-72.9	1.092	10.87
1.4	0.569	174.6	2.227	61.8	0.135	57.7	0.224	-76.8	1.102	10.24
1.5	0.573	171.9	2.091	58.8	0.143	58.9	0.223	-80.9	1.103	9.69
1.6	0.579	169.0	1.968	56.2	0.152	60.0	0.215	-85.5	1.107	9.14
1.7	0.585	166.7	1.864	53.6	0.161	60.9	0.216	-90.4	1.095	8.75
1.8	0.594	164.1	1.768	51.1	0.171	61.6	0.211	-95.7	1.087	8.36
1.9	0.599	161.9	1.681	48.7	0.181	61.8	0.215	-101.3	1.074	8.02
2.0	0.605	159.2	1.600	45.9	0.192	62.2	0.213	-106.9	1.068	7.62
2.1	0.612	157.7	1.546	43.4	0.203	62.5	0.220	-112.8	1.041	7.58
2.2	0.621	155.6	1.480	41.2	0.214	62.7	0.221	-118.3	1.026	7.41
2.3	0.627	153.7	1.420	38.7	0.224	62.4	0.231	-123.8	1.014	7.30
2.4	0.633	151.7	1.371	36.7	0.236	62.4	0.235	-129.2	1.003	7.30
2.5	0.637	149.9	1.320	34.5	0.247	61.9	0.245	-134.4	0.995	7.28
2.6	0.645	148.1	1.269	32.6	0.259	61.6	0.251	-139.2	0.985	6.91
2.7	0.650	146.5	1.225	30.7	0.270	61.1	0.263	-144.1	0.978	6.57
2.8	0.655	144.8	1.182	29.1	0.280	60.8	0.271	-148.1	0.975	6.25
2.9	0.660	143.7	1.157	27.1	0.291	60.3	0.286	-151.9	0.956	5.99
3.0	0.663	141.8	1.130	25.9	0.305	59.8	0.294	-156.3	0.951	5.69
4.0	0.721	129.4	0.881	13.6	0.430	47.6	0.440	168.4	0.876	3.12
5.0	0.752	117.2	0.701	6.3	0.507	35.2	0.561	144.3	0.920	1.41

$V_{CE} = 2\text{ V}$ ,  $I_C = 7\text{ mA}$ ,  $Z_o = 50\ \Omega$

Frequency (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>		K	MAG/MSG (dB)
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		
0.1	0.724	-56.4	18.241	143.4	0.037	63.1	0.818	-30.8	0.214	26.98
0.2	0.627	-96.7	12.992	121.2	0.054	50.4	0.594	-46.8	0.367	23.82
0.3	0.568	-121.0	9.719	108.0	0.062	46.9	0.455	-53.9	0.523	21.94
0.4	0.543	-136.4	7.603	99.9	0.069	47.3	0.366	-57.6	0.657	20.44
0.5	0.529	-147.4	6.249	93.3	0.075	48.1	0.313	-59.3	0.767	19.22
0.6	0.522	-155.6	5.274	88.3	0.081	50.3	0.272	-61.4	0.858	18.11
0.7	0.523	-162.5	4.580	84.0	0.088	52.3	0.246	-62.6	0.920	17.16
0.8	0.523	-167.8	4.034	80.4	0.095	54.3	0.223	-65.0	0.979	16.29
0.9	0.524	-172.2	3.625	76.6	0.102	55.7	0.210	-67.1	1.012	14.83
1.0	0.529	-176.2	3.274	73.6	0.110	57.2	0.194	-70.6	1.045	13.44
1.1	0.532	-179.5	3.002	70.5	0.118	58.5	0.187	-73.5	1.063	12.54
1.2	0.542	177.4	2.769	67.6	0.126	59.6	0.176	-77.6	1.071	11.80
1.3	0.542	174.6	2.576	64.6	0.135	60.4	0.173	-81.4	1.082	11.08
1.4	0.546	171.8	2.413	61.8	0.144	61.2	0.165	-86.2	1.087	10.45
1.5	0.552	169.4	2.258	59.1	0.153	61.6	0.165	-90.8	1.084	9.92
1.6	0.559	166.8	2.127	56.6	0.163	62.1	0.158	-96.3	1.083	9.41
1.7	0.564	164.8	2.015	54.2	0.173	62.3	0.160	-101.8	1.075	9.01
1.8	0.570	162.2	1.911	51.8	0.183	62.6	0.157	-108.2	1.070	8.56
1.9	0.577	160.0	1.819	49.5	0.193	62.2	0.163	-114.1	1.059	8.24
2.0	0.585	157.6	1.733	46.8	0.204	62.1	0.163	-120.5	1.050	7.92
2.1	0.593	156.2	1.668	44.4	0.215	62.0	0.172	-126.3	1.033	7.79
2.2	0.601	154.5	1.600	42.3	0.226	61.8	0.176	-132.2	1.022	7.59
2.3	0.605	152.8	1.533	39.9	0.236	61.4	0.187	-137.2	1.017	7.33
2.4	0.614	150.7	1.480	37.9	0.247	61.1	0.192	-142.7	1.005	7.34
2.5	0.618	149.2	1.426	35.9	0.257	60.4	0.204	-147.3	1.000	7.44
2.6	0.624	147.3	1.375	33.9	0.269	59.7	0.211	-151.9	0.994	7.09
2.7	0.632	145.9	1.326	32.0	0.279	59.2	0.223	-156.1	0.984	6.77
2.8	0.637	144.4	1.280	30.3	0.288	58.8	0.232	-159.8	0.983	6.47
2.9	0.643	143.4	1.252	28.4	0.299	58.3	0.248	-162.9	0.968	6.22
3.0	0.641	141.4	1.226	27.2	0.311	57.8	0.256	-166.6	0.969	5.96
4.0	0.707	129.8	0.960	14.1	0.426	46.2	0.403	163.2	0.889	3.53
5.0	0.747	117.9	0.762	5.3	0.501	34.7	0.529	142.3	0.910	1.82

$V_{CE} = 2\text{ V}$ ,  $I_C = 10\text{ mA}$ ,  $Z_O = 50\ \Omega$

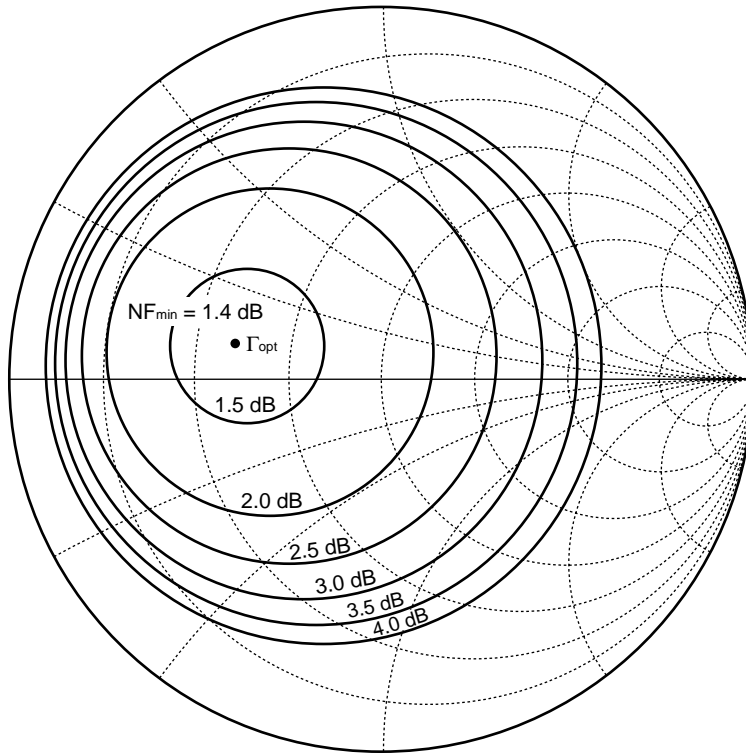
Frequency (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>		K	MAG/MSG (dB)
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		
0.1	0.650	-70.3	22.450	137.6	0.033	61.4	0.746	-37.7	0.250	28.37
0.2	0.562	-109.7	14.814	115.5	0.046	51.4	0.502	-54.4	0.469	25.05
0.3	0.522	-132.0	10.756	103.8	0.055	50.5	0.371	-61.2	0.638	22.93
0.4	0.507	-145.6	8.275	96.4	0.062	52.9	0.292	-65.0	0.773	21.28
0.5	0.499	-155.5	6.753	90.7	0.070	54.9	0.245	-66.8	0.863	19.85
0.6	0.496	-162.7	5.677	86.5	0.078	57.0	0.209	-69.4	0.937	18.63
0.7	0.498	-168.3	4.910	82.4	0.086	58.6	0.186	-70.9	0.980	17.54
0.8	0.503	-172.8	4.328	79.2	0.095	60.3	0.166	-74.5	1.014	15.86
0.9	0.505	-176.7	3.874	75.7	0.104	61.4	0.155	-77.2	1.036	14.55
1.0	0.509	179.8	3.504	73.0	0.113	62.2	0.142	-82.0	1.055	13.47
1.1	0.514	177.2	3.208	69.9	0.123	62.8	0.136	-85.6	1.062	12.65
1.2	0.522	174.2	2.962	67.3	0.132	63.3	0.127	-91.4	1.065	11.94
1.3	0.524	171.9	2.748	64.5	0.142	63.6	0.126	-95.9	1.069	11.26
1.4	0.530	169.3	2.573	61.9	0.152	63.8	0.120	-102.2	1.068	10.69
1.5	0.536	167.0	2.404	59.3	0.162	63.7	0.121	-107.3	1.066	10.14
1.6	0.540	164.8	2.267	56.9	0.172	63.7	0.118	-114.6	1.067	9.60
1.7	0.545	162.7	2.145	54.6	0.183	63.5	0.123	-120.4	1.062	9.17
1.8	0.556	160.5	2.032	52.3	0.194	63.2	0.123	-128.0	1.053	8.81
1.9	0.562	158.8	1.936	50.0	0.204	62.6	0.131	-133.7	1.046	8.46
2.0	0.568	156.5	1.845	47.6	0.215	62.1	0.135	-140.4	1.040	8.11
2.1	0.576	155.2	1.776	45.3	0.226	61.6	0.146	-145.2	1.025	7.99
2.2	0.586	153.4	1.703	43.3	0.236	61.2	0.152	-150.9	1.016	7.80
2.3	0.588	151.8	1.628	40.9	0.247	60.5	0.165	-154.8	1.017	7.39
2.4	0.599	149.9	1.575	39.0	0.257	60.0	0.172	-159.8	1.004	7.51
2.5	0.604	148.7	1.514	37.0	0.267	59.2	0.184	-163.3	1.001	7.35
2.6	0.610	146.8	1.460	35.1	0.278	58.4	0.192	-167.3	0.995	7.21
2.7	0.617	145.3	1.411	33.3	0.287	57.8	0.205	-170.5	0.990	6.91
2.8	0.621	143.9	1.364	31.6	0.296	57.3	0.214	-173.5	0.991	6.63
2.9	0.626	142.9	1.332	29.7	0.306	56.7	0.230	-175.5	0.980	6.38
3.0	0.629	141.1	1.306	28.4	0.317	56.2	0.238	-178.8	0.976	6.15
4.0	0.693	130.1	1.030	14.9	0.424	44.9	0.380	157.1	0.906	3.85
5.0	0.738	118.6	0.817	5.3	0.496	34.2	0.504	139.3	0.914	2.17

$V_{CE} = 2\text{ V}$ ,  $I_C = 20\text{ mA}$ ,  $Z_O = 50\ \Omega$

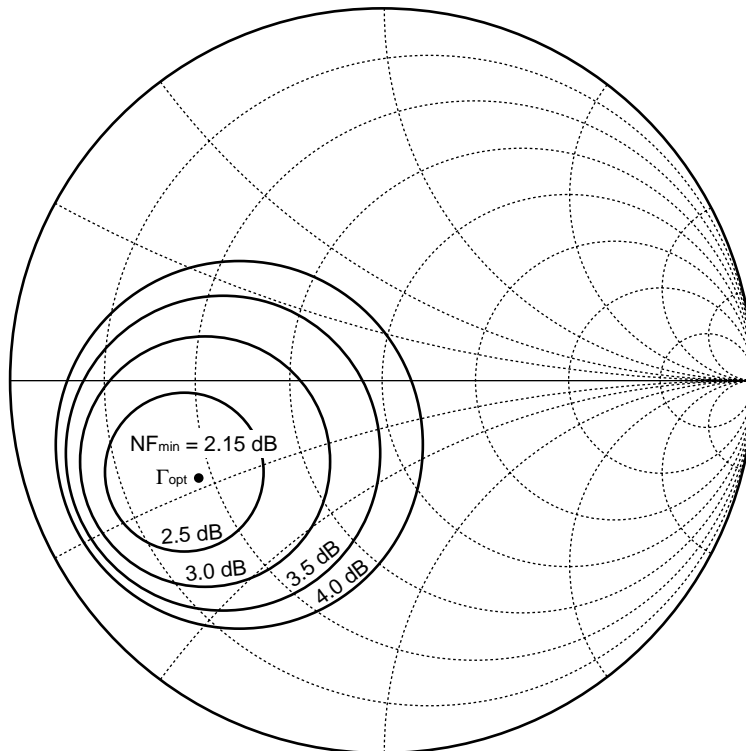
Frequency (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>		K	MAG/MSG (dB)
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		
0.1	0.514	-97.2	29.574	126.0	0.026	61.4	0.587	-52.3	0.420	30.55
0.2	0.471	-134.3	17.328	106.8	0.036	57.6	0.351	-69.6	0.692	26.77
0.3	0.467	-151.3	12.058	97.4	0.046	61.2	0.246	-77.2	0.841	24.22
0.4	0.463	-160.9	9.163	91.8	0.055	64.1	0.188	-83.1	0.933	22.18
0.5	0.463	-168.0	7.422	87.1	0.066	65.9	0.152	-86.8	0.981	20.51
0.6	0.467	-173.0	6.211	83.6	0.076	67.2	0.128	-93.3	1.016	18.33
0.7	0.471	-176.9	5.356	80.2	0.087	67.8	0.112	-97.4	1.031	16.80
0.8	0.476	179.6	4.697	77.3	0.098	68.4	0.100	-105.6	1.045	15.49
0.9	0.480	176.9	4.209	74.3	0.110	68.5	0.094	-111.2	1.048	14.51
1.0	0.487	174.0	3.799	71.8	0.120	68.3	0.090	-120.7	1.053	13.58
1.1	0.490	172.0	3.475	69.1	0.131	68.1	0.089	-126.4	1.056	12.78
1.2	0.499	169.7	3.202	66.7	0.143	67.7	0.089	-135.8	1.053	12.11
1.3	0.501	167.7	2.969	64.2	0.154	67.2	0.092	-140.2	1.054	11.44
1.4	0.506	165.7	2.779	61.8	0.165	66.8	0.094	-148.4	1.052	10.88
1.5	0.514	164.2	2.597	59.3	0.175	65.9	0.100	-152.2	1.047	10.38
1.6	0.520	161.9	2.447	57.2	0.187	65.4	0.105	-159.9	1.047	9.86
1.7	0.526	160.2	2.312	55.1	0.198	64.7	0.113	-163.3	1.042	9.43
1.8	0.534	158.1	2.191	52.9	0.209	64.0	0.120	-169.5	1.039	9.00
1.9	0.541	156.3	2.085	50.8	0.220	62.8	0.131	-171.8	1.032	8.68
2.0	0.550	154.2	1.985	48.4	0.231	62.0	0.140	-176.7	1.027	8.32
2.1	0.557	153.1	1.910	46.4	0.241	61.2	0.152	-178.4	1.020	8.13
2.2	0.567	151.8	1.831	44.3	0.252	60.4	0.160	177.5	1.013	7.92
2.3	0.572	150.3	1.749	42.2	0.262	59.5	0.173	176.3	1.012	7.58
2.4	0.579	148.5	1.690	40.3	0.272	58.6	0.182	172.8	1.007	7.41
2.5	0.585	147.3	1.630	38.5	0.281	57.7	0.194	171.1	1.004	7.26
2.6	0.593	145.5	1.572	36.6	0.292	56.7	0.201	168.3	0.999	7.32
2.7	0.597	144.4	1.518	34.8	0.301	55.9	0.214	166.7	0.998	7.03
2.8	0.602	142.9	1.467	33.3	0.309	55.3	0.222	164.7	0.999	6.77
2.9	0.608	141.9	1.435	31.3	0.318	54.7	0.236	164.3	0.990	6.55
3.0	0.609	140.3	1.408	30.2	0.328	54.1	0.244	162.0	0.989	6.33
4.0	0.678	130.4	1.116	16.7	0.423	42.8	0.369	146.2	0.930	4.21
5.0	0.730	119.1	0.896	6.1	0.487	33.1	0.481	133.3	0.923	2.64

**EQUAL NF CIRCLE**

$V_{CE} = 1\text{ V}$   
 $I_C = 10\text{ mA}$   
 $f = 1\text{ GHz}$



$V_{CE} = 1\text{ V}$   
 $I_C = 10\text{ mA}$   
 $f = 2\text{ GHz}$



**NOISE PARAMETERS**

V<sub>CE</sub> = 1 V, I<sub>c</sub> = 3 mA

f (GHz)	NF <sub>min</sub> (dB)	G <sub>a</sub> (dB)	Γ <sub>opt</sub>		Rn/50
			MAG.	ANG.	
0.8	1.22	11.7	0.43	125.4	0.11
0.9	1.32	10.9	0.46	135.5	0.11
1.0	1.42	10.2	0.48	144.6	0.10
1.5	1.91	7.9	0.59	177.4	0.07
1.8	2.21	6.9	0.65	-170.0	0.07
1.9	2.31	6.5	0.66	-166.5	0.08
2.0	2.41	6.2	0.68	-163.3	0.09
2.5	2.90	4.8	0.72	-147.6	0.21

V<sub>CE</sub> = 2 V, I<sub>c</sub> = 3 mA

f (GHz)	NF <sub>min</sub> (dB)	G <sub>a</sub> (dB)	Γ <sub>opt</sub>		Rn/50
			MAG.	ANG.	
0.8	1.17	12.3	0.43	122.5	0.12
0.9	1.27	11.5	0.46	132.8	0.11
1.0	1.38	10.8	0.48	142.1	0.11
1.5	1.90	8.4	0.58	176.0	0.07
1.8	2.21	7.4	0.64	-171.0	0.07
1.9	2.32	7.1	0.65	-167.4	0.08
2.0	2.42	6.8	0.67	-164.0	0.09
2.5	2.94	5.3	0.72	-148.1	0.21

V<sub>CE</sub> = 1 V, I<sub>c</sub> = 5 mA

f (GHz)	NF <sub>min</sub> (dB)	G <sub>a</sub> (dB)	Γ <sub>opt</sub>		Rn/50
			MAG.	ANG.	
0.8	1.19	12.5	0.37	132.6	0.10
0.9	1.27	11.7	0.40	142.3	0.09
1.0	1.36	11.0	0.43	150.9	0.09
1.5	1.78	8.4	0.55	-178.4	0.07
1.8	2.04	7.4	0.61	-167.0	0.08
1.9	2.12	7.0	0.63	-163.8	0.08
2.0	2.21	6.7	0.65	-160.8	0.09
2.5	2.63	5.3	0.71	-145.6	0.20

V<sub>CE</sub> = 2 V, I<sub>c</sub> = 5 mA

f (GHz)	NF <sub>min</sub> (dB)	G <sub>a</sub> (dB)	Γ <sub>opt</sub>		Rn/50
			MAG.	ANG.	
0.8	1.15	13.1	0.36	128.7	0.10
0.9	1.24	12.3	0.39	138.7	0.10
1.0	1.33	11.6	0.42	147.7	0.09
1.5	1.78	9.1	0.54	179.9	0.07
1.8	2.04	8.0	0.60	-167.9	0.08
1.9	2.13	7.7	0.62	-164.6	0.08
2.0	2.22	7.3	0.64	-161.5	0.09
2.5	2.67	5.9	0.70	-146.0	0.20

V<sub>CE</sub> = 1 V, I<sub>c</sub> = 7 mA

f (GHz)	NF <sub>min</sub> (dB)	G <sub>a</sub> (dB)	Γ <sub>opt</sub>		Rn/50
			MAG.	ANG.	
0.8	1.21	13.0	0.34	140.7	0.09
0.9	1.29	12.2	0.37	149.3	0.09
1.0	1.37	11.4	0.41	157.0	0.08
1.5	1.77	8.8	0.54	-175.2	0.07
1.8	2.00	7.7	0.60	-164.3	0.08
1.9	2.08	7.3	0.62	-161.3	0.09
2.0	2.16	7.0	0.63	-158.4	0.10
2.5	2.56	5.5	0.69	-143.7	0.20

V<sub>CE</sub> = 2 V, I<sub>c</sub> = 7 mA

f (GHz)	NF <sub>min</sub> (dB)	G <sub>a</sub> (dB)	Γ <sub>opt</sub>		Rn/50
			MAG.	ANG.	
0.8	1.18	13.8	0.33	138.1	0.09
0.9	1.26	12.9	0.36	147.1	0.09
1.0	1.34	12.1	0.39	155.2	0.09
1.5	1.74	9.5	0.52	-175.8	0.07
1.8	1.98	8.3	0.59	-164.8	0.08
1.9	2.07	8.0	0.61	-161.8	0.09
2.0	2.15	7.7	0.63	-158.9	0.10
2.5	2.55	6.2	0.69	-144.0	0.20

V<sub>CE</sub> = 1 V, I<sub>c</sub> = 10 mA

f (GHz)	NF <sub>min</sub> (dB)	G <sub>a</sub> (dB)	Γ <sub>opt</sub>		Rn/50
			MAG.	ANG.	
0.8	1.25	13.5	0.33	151.8	0.08
0.9	1.32	12.6	0.36	158.8	0.08
1.0	1.40	11.8	0.40	165.2	0.08
1.5	1.77	9.1	0.53	-170.9	0.07
1.8	2.00	7.9	0.59	-161.0	0.09
1.9	2.07	7.6	0.61	-158.1	0.10
2.0	2.15	7.2	0.63	-155.4	0.11
2.5	2.52	5.7	0.69	-142.2	0.21

V<sub>CE</sub> = 2 V, I<sub>c</sub> = 10 mA

f (GHz)	NF <sub>min</sub> (dB)	G <sub>a</sub> (dB)	Γ <sub>opt</sub>		Rn/50
			MAG.	ANG.	
0.8	1.24	14.3	0.32	150.6	0.08
0.9	1.32	13.4	0.35	157.6	0.08
1.0	1.39	12.6	0.39	164.0	0.08
1.5	1.78	9.8	0.52	-171.5	0.08
1.8	2.02	8.6	0.59	-161.2	0.09
1.9	2.09	8.3	0.60	-158.3	0.10
2.0	2.17	7.9	0.62	-155.5	0.11
2.5	2.56	6.4	0.68	-142.4	0.21

$V_{CE} = 1\text{ V}, I_C = 20\text{ mA}$

f (GHz)	NF <sub>min</sub> (dB)	G <sub>a</sub> (dB)	Γ <sub>opt</sub>		Rn/50
			MAG.	ANG.	
0.8	1.47	14.1	0.38	173.0	0.07
0.9	1.55	13.2	0.42	176.6	0.08
1.0	1.62	12.4	0.45	-179.8	0.08
1.5	2.00	9.4	0.57	-163.1	0.09
1.8	2.22	8.2	0.63	-154.3	0.12
1.9	2.30	7.8	0.64	-151.6	0.14
2.0	2.37	7.5	0.65	-149.1	0.16
2.5	2.75	5.9	0.71	-138.5	0.28

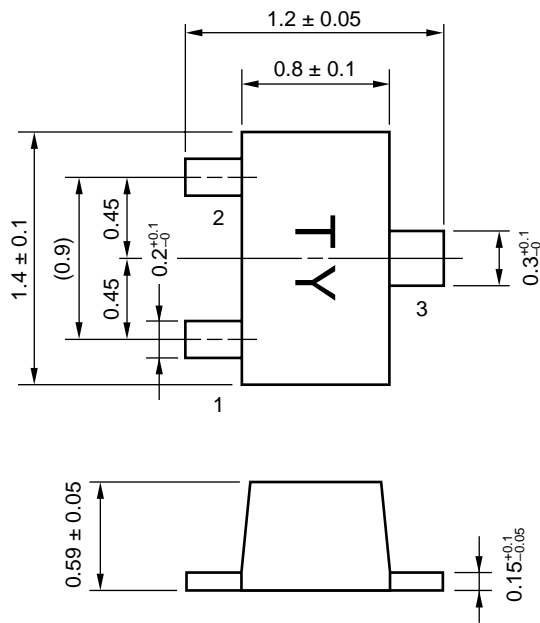
$V_{CE} = 2\text{ V}, I_C = 20\text{ mA}$

f (GHz)	NF <sub>min</sub> (dB)	G <sub>a</sub> (dB)	Γ <sub>opt</sub>		Rn/50
			MAG.	ANG.	
0.8	1.50	15.0	0.38	172.9	0.08
0.9	1.58	14.1	0.41	176.5	0.08
1.0	1.66	13.3	0.44	-179.9	0.08
1.5	2.06	10.3	0.57	-163.3	0.09
1.8	2.30	9.0	0.62	-154.5	0.13
1.9	2.38	8.6	0.64	-151.7	0.14
2.0	2.46	8.3	0.65	-149.1	0.16
2.5	2.86	6.7	0.71	-138.3	0.30



**PACKAGE DIMENSIONS**

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



**PIN CONNECTIONS**

- 1. Emitter
- 2. Base
- 3. Collector

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