

DATA SHEET

NEC

NPN SILICON RF TRANSISTOR 2SC5651

NPN SILICON RF TRANSISTOR FOR HIGH-FREQUENCY LOW NOISE 3-PIN NON-LEAD MINIMOLD

FEATURES

- 1006 package employed (1.0 × 0.6 × 0.5 mm)
- NF = 1.9 dB TYP., $|S_{21e}|^2 = 4.0$ dB TYP. @ $V_{CE} = 1$ V, $I_c = 3$ mA, $f = 2$ GHz

ORDERING INFORMATION

Part Number	Quantity	Supplying Form
2SC5651	50 pcs (Non reel)	• 8 mm wide paper carrier taping
2SC5651-T1	10 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 ($T_A = +25^\circ\text{C}$)

Parameter	Symbol	Ratings	Unit
Collector to Base Voltage	V_{CBO}	9	V
Collector to Emitter Voltage	V_{CEO}	6	V
Emitter to Base Voltage	V_{EBO}	2	V
Collector Current	I_c	100	mA
Total Power Dissipation	P_{tot}^{Note}	150	mW
Junction Temperature	T_j	150	$^\circ\text{C}$
Storage Temperature	T_{stg}	-65 to +150	$^\circ\text{C}$

Note Mounted on 1.08 cm² × 1.0 mm (t) glass epoxy substrate

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

The information in this document is subject to change without notice. Before using this document, please confirm that this is the latest version.
Not all devices/types available in every country. Please check with local NEC representative for availability and additional information.

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 = 3 mA	80	–	145	–
RF Characteristics						
Gain Bandwidth Product	f _T	V _{CE} = 1 V, I _C = 3 mA, f = 2 GHz	4.0	4.5	–	GHz
Insertion Power Gain	S _{21e} ²	V _{CE} = 1 V, I _C = 3 mA, f = 2 GHz	3.0	4.0	–	dB
Noise Figure	NF	V _{CE} = 1 V, I _C = 3 mA, f = 2 GHz, Z _S = Z _{opt}	–	1.9	2.5	dB
Reverse Transfer Capacitance	C _{re} ^{Note 2}	V _{CB} = 1 V, I _E = 0 mA, f = 1 MHz	–	0.7	0.8	pF

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

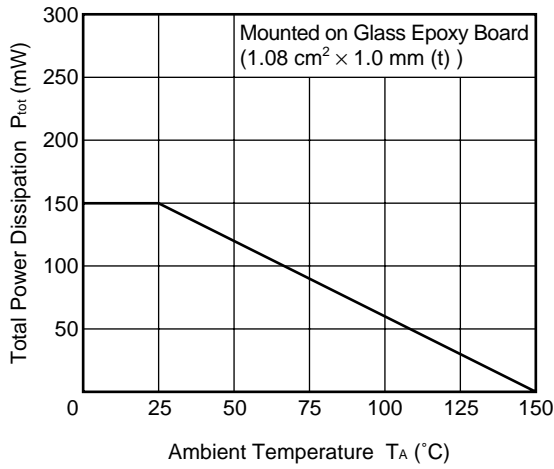
2. Collector to base capacitance measured using capacitance meter (self-balancing bridge method) when the emitter is connected to the guard pin

h_{FE} CLASSIFICATION

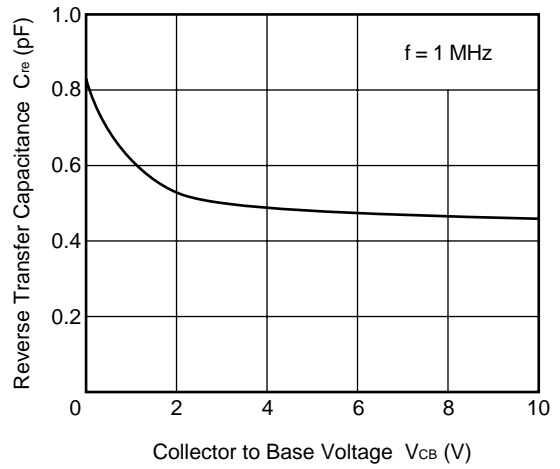
Rank	EB	FB
Marking	D	
h _{FE} Value	80 to 110	100 to 145

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

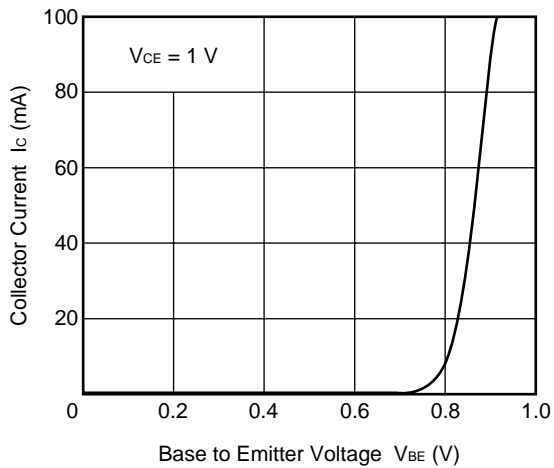
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



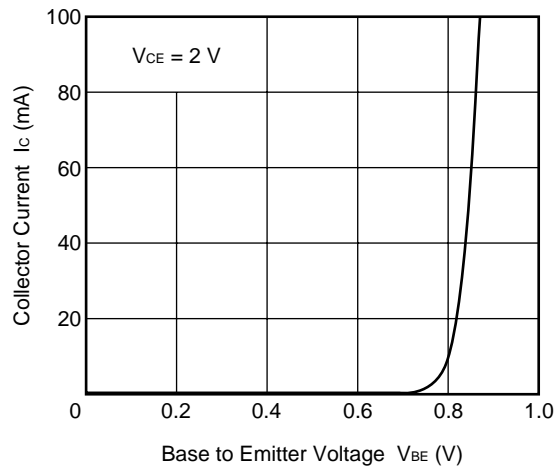
REVERSE TRANSFER CAPACITANCE vs. COLLECTOR TO BASE VOLTAGE



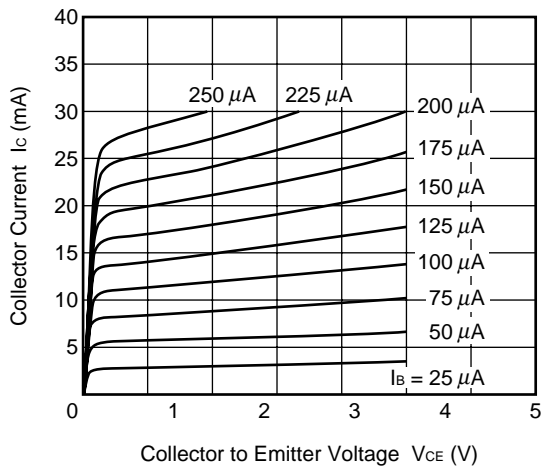
COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE



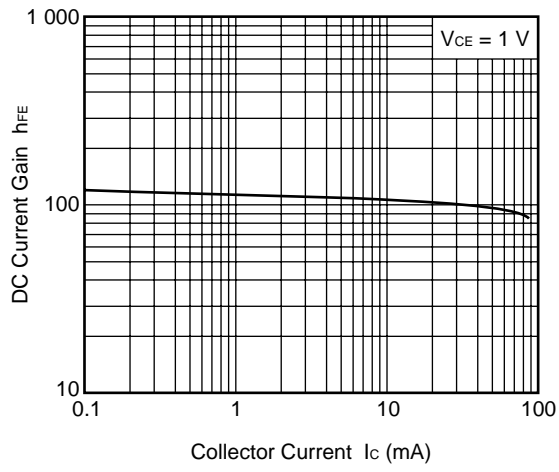
COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE



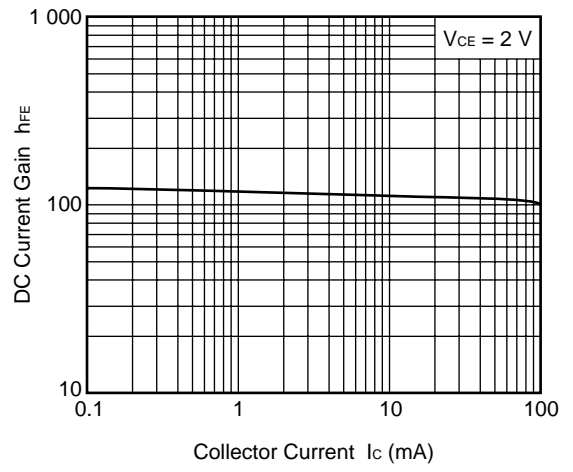
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



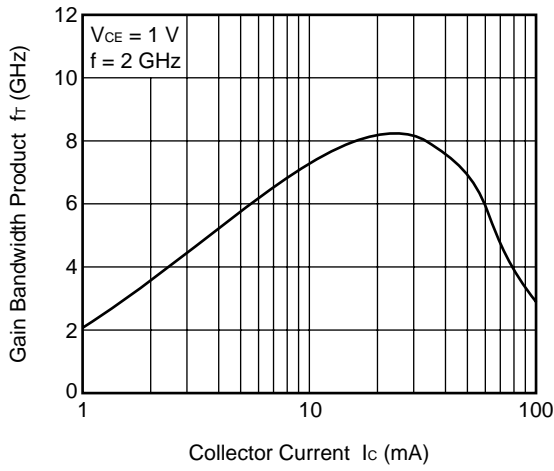
DC CURRENT GAIN vs.
COLLECTOR CURRENT



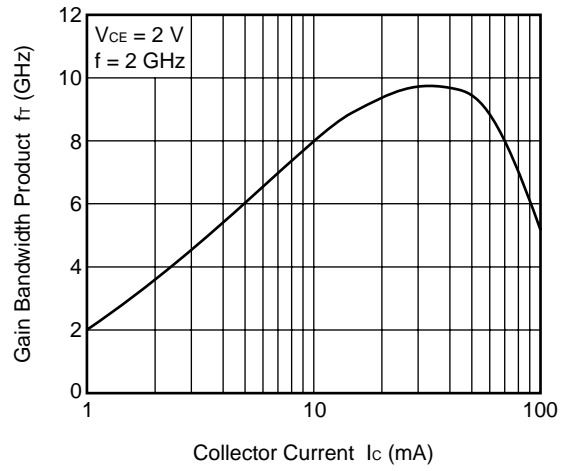
DC CURRENT GAIN vs.
COLLECTOR CURRENT



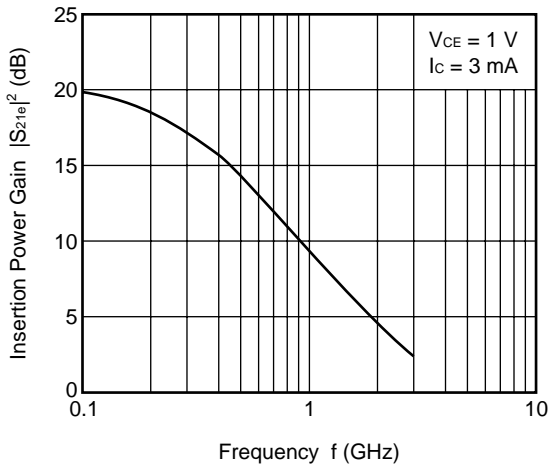
GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT



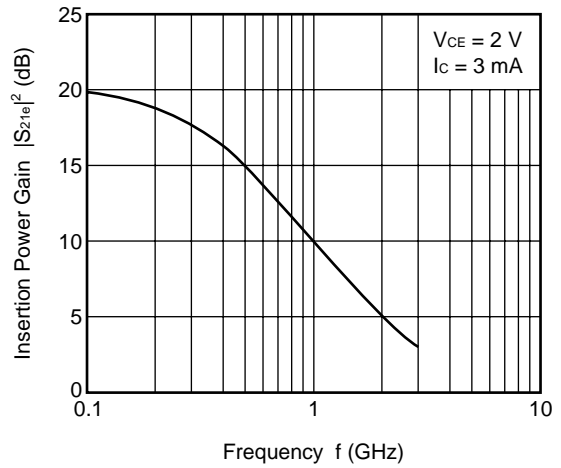
GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT



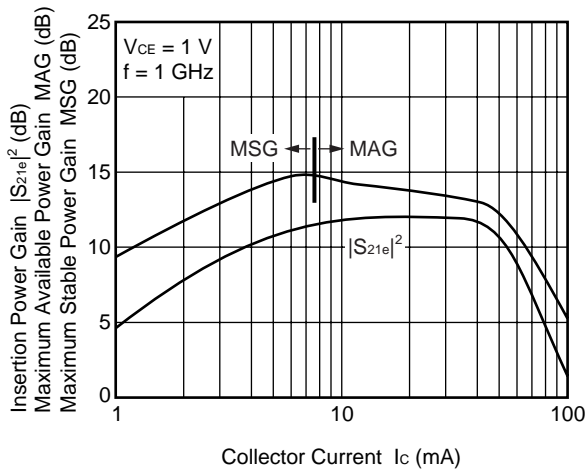
INSERTION POWER GAIN vs. FREQUENCY



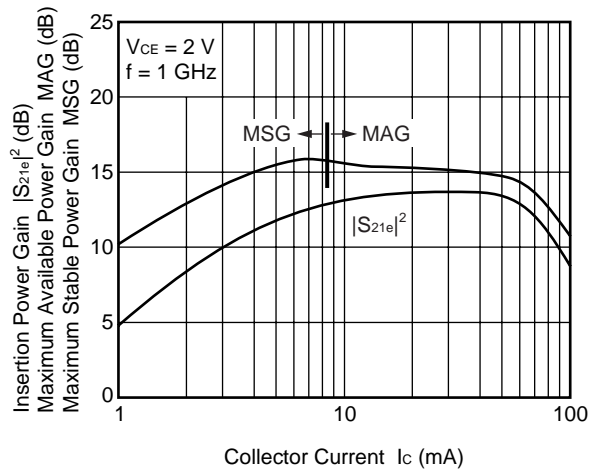
INSERTION POWER GAIN vs. FREQUENCY



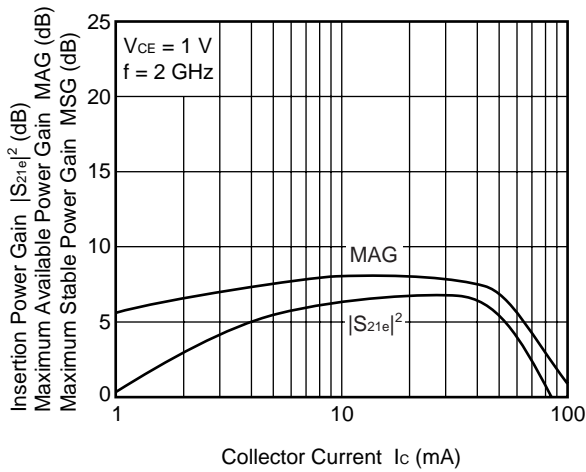
INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT



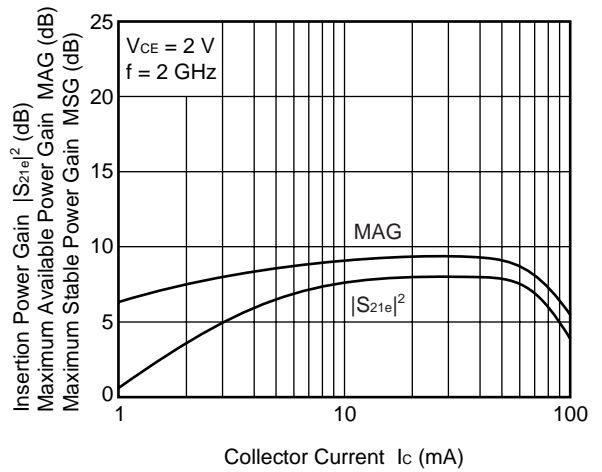
INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT



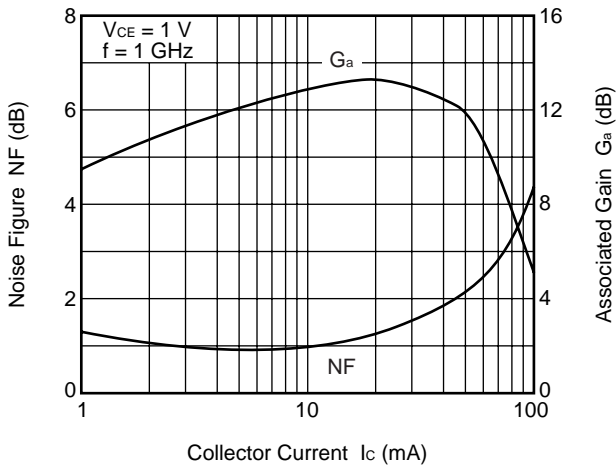
INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT



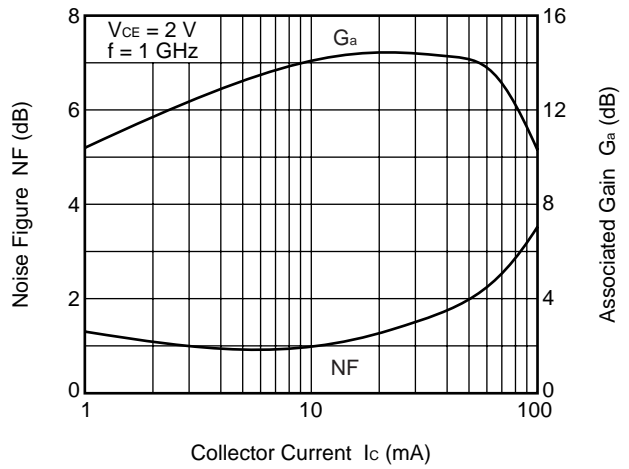
INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT



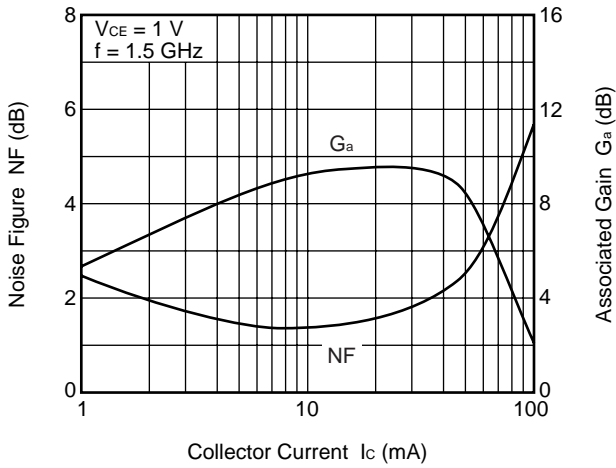
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



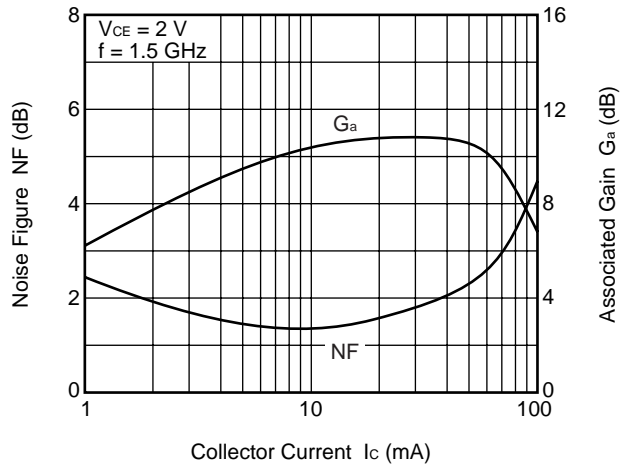
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



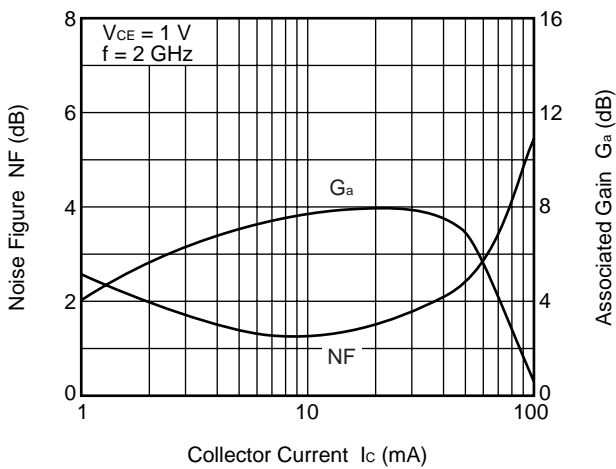
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



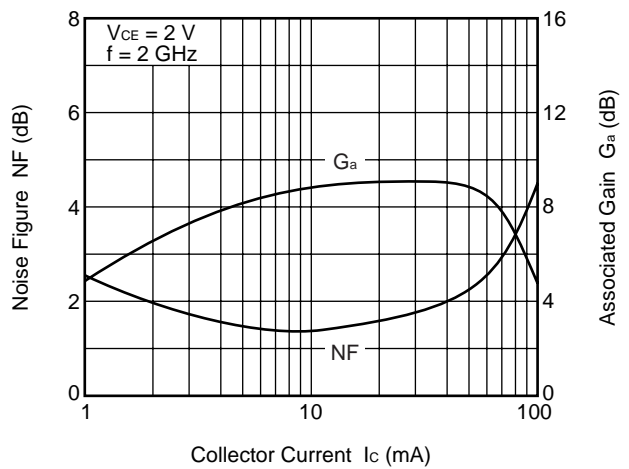
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



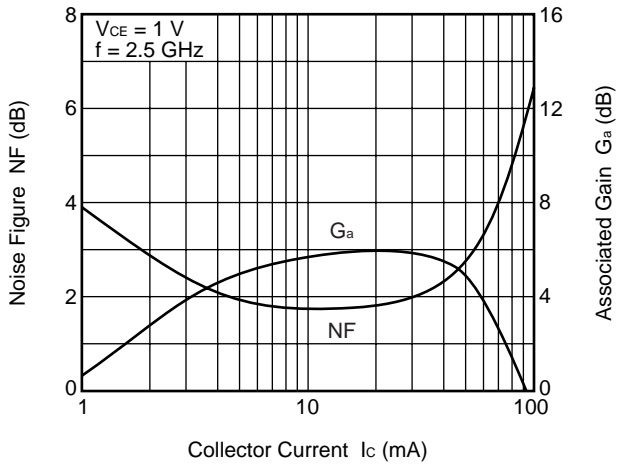
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



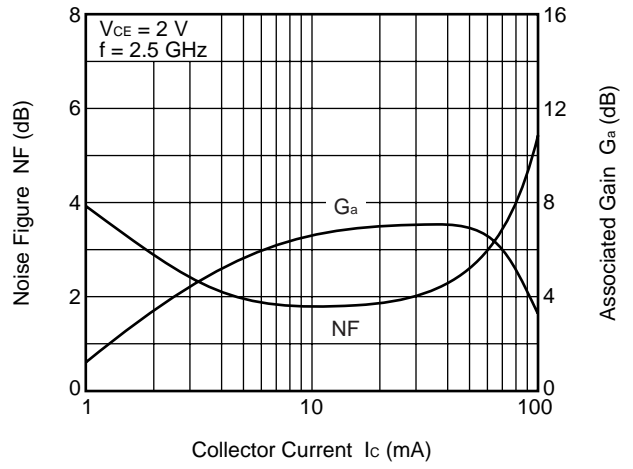
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



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

When $K < 1$, the MSG (Maximum Stable 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 ₁₁		S ₂₁		S ₁₂		S ₂₂		K	MAG/MSG ^{Note} (dB)
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		
0.1	0.950	-19.8	3.559	165.4	0.046	78.1	0.988	-8.1	0.065	18.90
0.2	0.925	-35.7	3.349	152.7	0.085	68.8	0.948	-15.7	0.123	15.95
0.3	0.879	-51.3	3.059	142.0	0.118	59.3	0.892	-22.5	0.174	14.15
0.4	0.854	-65.4	2.836	132.1	0.143	51.5	0.837	-28.0	0.216	12.96
0.5	0.808	-77.8	2.576	122.9	0.162	45.0	0.784	-32.8	0.275	12.03
0.6	0.774	-88.2	2.338	115.0	0.174	39.9	0.735	-36.6	0.335	11.28
0.7	0.747	-97.2	2.147	108.0	0.182	35.6	0.694	-39.7	0.393	10.71
0.8	0.720	-105.1	1.976	102.4	0.187	32.4	0.660	-42.7	0.449	10.23
0.9	0.705	-111.6	1.815	97.7	0.190	29.7	0.636	-45.3	0.497	9.79
1.0	0.691	-117.3	1.685	92.8	0.191	27.5	0.615	-47.6	0.553	9.45
1.1	0.680	-122.8	1.572	88.6	0.191	25.9	0.596	-49.8	0.608	9.15
1.2	0.672	-127.5	1.483	84.6	0.190	24.6	0.584	-51.9	0.658	8.93
1.3	0.662	-131.8	1.394	80.8	0.188	23.7	0.574	-53.6	0.720	8.71
1.4	0.657	-135.7	1.328	77.6	0.186	23.3	0.563	-55.6	0.771	8.55
1.5	0.648	-139.2	1.264	74.8	0.183	23.0	0.558	-57.5	0.831	8.40
1.6	0.647	-142.4	1.212	71.7	0.180	23.3	0.552	-59.2	0.876	8.28
1.7	0.640	-145.2	1.160	69.1	0.177	23.6	0.545	-60.7	0.948	8.17
1.8	0.634	-148.6	1.122	66.9	0.173	24.6	0.536	-62.7	1.009	7.53
1.9	0.632	-151.6	1.077	64.4	0.171	25.6	0.532	-64.2	1.066	6.42
2.0	0.628	-154.3	1.041	62.1	0.169	27.1	0.524	-65.9	1.128	5.72
2.1	0.622	-157.2	1.017	59.4	0.167	29.1	0.515	-67.8	1.192	5.20
2.2	0.619	-160.1	0.992	57.3	0.165	31.5	0.506	-70.0	1.249	4.79
2.3	0.618	-163.0	0.967	54.8	0.164	34.3	0.498	-72.2	1.295	4.45
2.4	0.613	-165.8	0.942	52.8	0.164	37.0	0.487	-74.6	1.364	4.00
2.5	0.609	-168.6	0.928	50.9	0.165	40.1	0.477	-77.4	1.398	3.75
2.6	0.605	-171.9	0.904	48.5	0.166	43.0	0.469	-80.6	1.448	3.38
2.7	0.602	-174.7	0.884	46.6	0.170	46.0	0.463	-84.1	1.465	3.11
2.8	0.603	-177.7	0.867	44.8	0.175	49.3	0.456	-87.7	1.459	2.93
2.9	0.601	179.4	0.851	43.4	0.182	51.9	0.449	-90.8	1.458	2.69
3.0	0.600	176.5	0.833	41.8	0.189	54.4	0.441	-94.9	1.459	2.43
4.0	0.640	155.3	0.683	29.6	0.328	61.1	0.407	-140.7	1.147	0.85
5.0	0.631	146.0	0.636	25.9	0.472	51.9	0.427	170.3	1.111	-0.73

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

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂		K	MAG/MSG (dB)
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		
0.1	0.858	-30.9	9.645	157.6	0.043	74.1	0.946	-16.9	0.105	23.54
0.2	0.804	-55.9	8.374	141.4	0.075	61.1	0.832	-30.4	0.184	20.50
0.3	0.723	-76.2	7.041	128.9	0.095	51.8	0.710	-40.3	0.277	18.70
0.4	0.678	-92.7	6.033	118.9	0.109	46.0	0.611	-47.3	0.349	17.44
0.5	0.634	-105.4	5.166	110.9	0.117	42.2	0.532	-52.2	0.436	16.44
0.6	0.603	-115.7	4.489	104.4	0.123	40.3	0.472	-55.9	0.518	15.61
0.7	0.581	-123.9	3.966	98.9	0.128	39.2	0.426	-58.7	0.596	14.90
0.8	0.567	-130.3	3.568	94.8	0.132	38.8	0.392	-61.1	0.663	14.32
0.9	0.558	-135.9	3.221	91.3	0.136	39.0	0.365	-63.0	0.727	13.76
1.0	0.549	-140.3	2.943	87.7	0.139	39.5	0.345	-64.7	0.790	13.27
1.1	0.539	-144.1	2.704	84.7	0.142	40.1	0.328	-66.2	0.854	12.79
1.2	0.536	-147.7	2.521	81.8	0.146	41.0	0.316	-67.4	0.901	12.39
1.3	0.530	-151.1	2.347	78.7	0.149	42.1	0.306	-68.4	0.951	11.96
1.4	0.523	-153.6	2.213	76.4	0.153	43.4	0.298	-69.4	0.998	11.60
1.5	0.522	-156.1	2.089	74.1	0.157	44.5	0.291	-70.1	1.030	10.16
1.6	0.516	-158.5	1.990	71.7	0.162	45.7	0.285	-70.8	1.063	9.36
1.7	0.513	-160.5	1.892	69.6	0.167	46.8	0.279	-71.1	1.093	8.69
1.8	0.511	-162.7	1.815	67.5	0.172	48.0	0.271	-72.1	1.115	8.16
1.9	0.508	-164.9	1.738	65.3	0.178	48.9	0.266	-72.7	1.135	7.66
2.0	0.502	-166.9	1.675	63.4	0.185	50.0	0.257	-73.3	1.156	7.18
2.1	0.500	-168.9	1.620	61.0	0.191	51.0	0.249	-74.3	1.165	6.81
2.2	0.497	-171.4	1.566	59.3	0.198	51.9	0.240	-75.9	1.179	6.42
2.3	0.498	-173.5	1.520	57.0	0.206	52.9	0.233	-77.5	1.178	6.13
2.4	0.494	-175.5	1.472	55.1	0.212	53.5	0.223	-79.5	1.195	5.74
2.5	0.492	-177.8	1.440	53.2	0.221	54.0	0.213	-82.3	1.192	5.49
2.6	0.492	179.8	1.397	51.3	0.229	54.4	0.205	-85.2	1.196	5.18
2.7	0.489	177.5	1.360	49.2	0.237	54.6	0.198	-89.2	1.201	4.88
2.8	0.492	174.9	1.331	47.3	0.246	55.2	0.192	-93.4	1.190	4.69
2.9	0.491	172.8	1.301	45.9	0.254	55.3	0.185	-97.4	1.191	4.44
3.0	0.492	170.6	1.269	44.1	0.262	55.4	0.180	-102.9	1.193	4.20
4.0	0.561	154.9	1.015	29.1	0.360	52.3	0.177	-160.9	1.088	2.70
5.0	0.584	148.2	0.879	20.3	0.459	46.0	0.250	152.3	1.052	1.42

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

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂		K	MAG/MSG (dB)
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		
0.1	0.780	-40.8	14.284	151.7	0.040	70.8	0.901	-24.0	0.138	25.57
0.2	0.704	-70.9	11.589	133.3	0.066	57.1	0.731	-41.1	0.259	22.47
0.3	0.623	-93.4	9.206	120.8	0.080	49.8	0.584	-52.2	0.379	20.60
0.4	0.585	-109.0	7.544	111.7	0.090	46.2	0.480	-59.7	0.478	19.23
0.5	0.557	-121.5	6.305	104.7	0.097	45.0	0.405	-64.9	0.571	18.14
0.6	0.530	-130.7	5.392	99.2	0.103	44.8	0.348	-68.9	0.669	17.19
0.7	0.519	-137.5	4.703	94.5	0.108	45.5	0.307	-72.0	0.747	16.38
0.8	0.510	-143.1	4.200	91.1	0.114	46.5	0.278	-74.6	0.811	15.66
0.9	0.507	-147.5	3.771	88.3	0.120	47.6	0.254	-76.7	0.866	14.98
1.0	0.500	-151.4	3.431	85.1	0.126	48.8	0.237	-78.4	0.918	14.36
1.1	0.493	-154.2	3.143	82.5	0.132	49.8	0.223	-79.9	0.965	13.76
1.2	0.492	-157.0	2.917	79.9	0.138	51.0	0.212	-80.9	0.995	13.24
1.3	0.484	-159.8	2.711	77.2	0.145	52.0	0.203	-81.4	1.033	11.61
1.4	0.480	-161.9	2.549	75.1	0.152	53.1	0.195	-81.9	1.057	10.78
1.5	0.478	-164.0	2.407	73.2	0.159	53.8	0.189	-82.0	1.074	10.13
1.6	0.475	-165.6	2.285	70.9	0.167	54.6	0.183	-82.0	1.087	9.57
1.7	0.472	-167.3	2.174	69.0	0.174	55.3	0.177	-81.5	1.101	9.02
1.8	0.466	-169.2	2.074	67.1	0.183	55.9	0.169	-82.0	1.116	8.48
1.9	0.465	-170.7	1.985	65.2	0.191	56.1	0.163	-81.6	1.122	8.04
2.0	0.461	-172.6	1.907	63.4	0.200	56.5	0.155	-81.7	1.129	7.61
2.1	0.459	-174.4	1.839	61.1	0.209	56.8	0.148	-82.3	1.132	7.24
2.2	0.459	-176.5	1.778	59.5	0.217	57.0	0.139	-83.7	1.133	6.91
2.3	0.456	-178.2	1.717	57.4	0.227	57.2	0.132	-85.4	1.137	6.55
2.4	0.453	-179.8	1.663	55.5	0.235	57.1	0.124	-87.6	1.144	6.20
2.5	0.454	177.8	1.623	53.7	0.245	57.0	0.115	-91.2	1.137	5.97
2.6	0.456	175.9	1.571	52.0	0.254	56.7	0.108	-95.3	1.138	5.66
2.7	0.451	174.0	1.531	50.0	0.263	56.4	0.102	-101.2	1.143	5.36
2.8	0.453	171.8	1.492	48.3	0.273	56.3	0.097	-107.6	1.137	5.13
2.9	0.455	169.9	1.455	46.8	0.281	55.9	0.094	-114.5	1.136	4.89
3.0	0.458	167.8	1.419	45.0	0.289	55.6	0.093	-122.8	1.137	4.66
4.0	0.535	153.9	1.128	30.5	0.376	49.8	0.137	168.0	1.072	3.13
5.0	0.563	148.8	0.975	21.1	0.460	43.3	0.225	132.9	1.048	1.92

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

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂		K	MAG/MSG (dB)
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		
0.1	0.703	-49.0	17.899	147.0	0.039	67.5	0.858	-29.8	0.206	26.63
0.2	0.630	-83.2	13.655	127.4	0.059	55.1	0.653	-49.2	0.326	23.68
0.3	0.560	-105.5	10.450	115.6	0.070	49.9	0.500	-61.0	0.470	21.72
0.4	0.533	-121.2	8.390	107.1	0.079	48.3	0.400	-69.0	0.579	20.26
0.5	0.514	-131.7	6.902	101.1	0.086	48.5	0.330	-74.7	0.679	19.05
0.6	0.497	-140.0	5.862	96.3	0.093	49.5	0.281	-79.4	0.771	18.01
0.7	0.489	-146.0	5.090	92.0	0.100	50.8	0.245	-83.3	0.842	17.09
0.8	0.485	-151.1	4.533	88.9	0.107	52.4	0.219	-86.6	0.895	16.28
0.9	0.479	-154.4	4.060	86.4	0.114	53.5	0.200	-89.3	0.942	15.51
1.0	0.478	-157.9	3.684	83.5	0.122	54.7	0.184	-91.5	0.977	14.81
1.1	0.472	-160.1	3.374	81.3	0.130	55.8	0.171	-93.5	1.011	13.51
1.2	0.470	-162.8	3.123	78.9	0.138	56.7	0.162	-94.5	1.033	12.44
1.3	0.464	-165.2	2.900	76.4	0.146	57.4	0.153	-95.1	1.058	11.51
1.4	0.459	-166.6	2.724	74.4	0.155	58.3	0.145	-95.5	1.073	10.81
1.5	0.457	-168.4	2.570	72.6	0.163	58.7	0.138	-95.5	1.083	10.21
1.6	0.454	-169.8	2.437	70.5	0.172	59.1	0.132	-94.9	1.090	9.68
1.7	0.451	-171.1	2.313	68.7	0.181	59.3	0.125	-94.1	1.098	9.15
1.8	0.448	-172.9	2.209	66.9	0.190	59.6	0.117	-94.3	1.104	8.68
1.9	0.447	-174.6	2.114	64.9	0.199	59.5	0.111	-93.4	1.107	8.26
2.0	0.441	-175.8	2.023	63.4	0.209	59.4	0.103	-93.3	1.114	7.80
2.1	0.440	-177.7	1.957	61.1	0.219	59.4	0.096	-93.9	1.111	7.48
2.2	0.441	-179.2	1.888	59.6	0.229	59.2	0.088	-95.8	1.110	7.15
2.3	0.438	178.9	1.821	57.6	0.239	59.1	0.081	-98.1	1.113	6.78
2.4	0.436	177.7	1.762	55.8	0.248	58.6	0.074	-101.9	1.117	6.45
2.5	0.436	175.6	1.719	54.0	0.258	58.3	0.066	-107.9	1.111	6.22
2.6	0.438	173.6	1.662	52.4	0.268	57.5	0.061	-115.1	1.111	5.90
2.7	0.436	172.0	1.615	50.4	0.277	57.1	0.059	-125.3	1.114	5.61
2.8	0.438	169.9	1.574	48.8	0.287	56.7	0.058	-135.9	1.110	5.37
2.9	0.438	168.0	1.534	47.3	0.296	56.2	0.059	-146.6	1.110	5.13
3.0	0.443	166.1	1.493	45.4	0.304	55.6	0.064	-156.4	1.111	4.89
4.0	0.520	153.5	1.183	31.5	0.386	48.6	0.144	147.9	1.067	3.28
5.0	0.553	148.9	1.022	22.0	0.464	42.0	0.232	121.6	1.045	2.14

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

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂		K	MAG/MSG (dB)
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		
0.1	0.619	-59.7	21.980	141.3	0.034	66.1	0.795	-37.2	0.250	28.06
0.2	0.560	-97.3	15.630	121.4	0.051	53.9	0.564	-58.6	0.417	24.82
0.3	0.509	-119.5	11.541	110.5	0.061	52.1	0.416	-71.2	0.576	22.77
0.4	0.493	-133.1	9.069	103.1	0.069	52.1	0.326	-80.2	0.692	21.16
0.5	0.484	-142.4	7.401	97.9	0.077	53.7	0.267	-87.1	0.786	19.81
0.6	0.474	-149.4	6.253	93.5	0.086	55.2	0.226	-93.0	0.863	18.64
0.7	0.467	-154.6	5.398	89.8	0.094	56.7	0.197	-98.3	0.923	17.59
0.8	0.464	-158.7	4.801	87.2	0.102	58.2	0.176	-102.9	0.964	16.71
0.9	0.464	-161.3	4.295	84.9	0.111	59.4	0.160	-106.8	0.993	15.86
1.0	0.461	-164.2	3.898	82.1	0.120	60.5	0.147	-110.3	1.020	14.24
1.1	0.455	-165.9	3.559	80.1	0.130	61.2	0.137	-113.1	1.043	13.12
1.2	0.453	-168.0	3.292	77.9	0.139	61.7	0.128	-114.7	1.055	12.30
1.3	0.450	-170.0	3.055	75.6	0.149	62.1	0.120	-116.0	1.068	11.53
1.4	0.447	-171.8	2.870	73.7	0.159	62.5	0.112	-116.9	1.074	10.92
1.5	0.444	-172.7	2.702	72.0	0.168	62.5	0.105	-117.4	1.081	10.32
1.6	0.441	-174.0	2.563	70.0	0.178	62.6	0.097	-117.1	1.084	9.82
1.7	0.435	-175.3	2.431	68.3	0.188	62.6	0.089	-116.9	1.092	9.27
1.8	0.432	-176.5	2.319	66.6	0.198	62.5	0.081	-117.8	1.093	8.82
1.9	0.430	-177.7	2.214	64.8	0.208	62.1	0.074	-117.7	1.095	8.39
2.0	0.427	-179.4	2.124	63.1	0.219	61.7	0.066	-119.1	1.095	7.99
2.1	0.426	179.6	2.049	61.1	0.229	61.3	0.059	-121.8	1.092	7.66
2.2	0.424	177.9	1.974	59.6	0.239	60.9	0.052	-127.1	1.095	7.29
2.3	0.423	176.3	1.904	57.7	0.250	60.4	0.047	-133.4	1.094	6.95
2.4	0.422	175.1	1.838	55.9	0.259	59.8	0.043	-142.7	1.097	6.61
2.5	0.421	173.2	1.793	54.3	0.269	59.2	0.042	-155.3	1.093	6.37
2.6	0.424	171.5	1.736	52.6	0.279	58.3	0.042	-167.5	1.092	6.09
2.7	0.424	169.8	1.680	50.8	0.289	57.5	0.048	-178.3	1.095	5.77
2.8	0.426	167.9	1.639	49.0	0.299	57.0	0.055	173.6	1.090	5.56
2.9	0.428	166.2	1.594	47.6	0.309	56.3	0.062	167.4	1.090	5.30
3.0	0.429	164.3	1.553	46.0	0.316	55.6	0.071	163.1	1.093	5.05
4.0	0.510	152.7	1.224	32.4	0.394	47.6	0.166	133.9	1.062	3.40
5.0	0.542	148.4	1.057	22.8	0.469	40.7	0.250	113.0	1.045	2.23

$V_{CE} = 1\text{ V}$, $I_C = 20\text{ mA}$, $Z_0 = 50\ \Omega$

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂		K	MAG/MSG (dB)
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		
0.1	0.485	-88.5	28.487	130.8	0.028	61.6	0.655	-52.5	0.389	30.04
0.2	0.476	-126.4	17.979	111.9	0.040	57.7	0.416	-76.8	0.611	26.51
0.3	0.456	-142.8	12.652	103.1	0.049	59.2	0.300	-92.1	0.781	24.09
0.4	0.459	-152.1	9.737	97.4	0.059	61.7	0.237	-104.1	0.872	22.16
0.5	0.461	-158.7	7.862	93.2	0.069	63.3	0.200	-114.0	0.933	20.54
0.6	0.458	-163.2	6.614	89.7	0.080	65.1	0.176	-122.9	0.977	19.19
0.7	0.453	-166.3	5.684	86.5	0.090	66.1	0.160	-130.7	1.011	17.35
0.8	0.455	-169.4	5.037	84.4	0.100	67.0	0.150	-137.0	1.028	15.97
0.9	0.454	-171.0	4.500	82.5	0.111	67.5	0.141	-142.5	1.043	14.80
1.0	0.450	-173.0	4.067	80.3	0.122	67.9	0.135	-147.4	1.056	13.78
1.1	0.446	-174.4	3.722	78.4	0.133	68.0	0.129	-151.3	1.065	12.91
1.2	0.445	-175.6	3.438	76.4	0.144	67.9	0.123	-154.1	1.067	12.19
1.3	0.441	-177.3	3.192	74.2	0.155	67.7	0.116	-156.9	1.073	11.49
1.4	0.437	-178.2	2.994	72.6	0.166	67.6	0.109	-159.7	1.074	10.89
1.5	0.436	-179.1	2.817	71.0	0.177	67.2	0.103	-162.3	1.075	10.35
1.6	0.432	180.0	2.670	69.1	0.188	66.7	0.095	-165.1	1.074	9.86
1.7	0.427	179.1	2.533	67.5	0.199	66.2	0.087	-168.4	1.077	9.36
1.8	0.424	177.7	2.411	65.9	0.211	65.7	0.082	-173.2	1.078	8.89
1.9	0.423	176.9	2.308	64.1	0.221	64.9	0.075	-177.4	1.075	8.51
2.0	0.419	175.7	2.209	62.7	0.233	64.2	0.071	176.3	1.076	8.09
2.1	0.416	174.5	2.127	60.6	0.244	63.5	0.069	169.7	1.075	7.74
2.2	0.416	173.2	2.050	59.3	0.254	62.6	0.069	162.4	1.074	7.41
2.3	0.416	172.2	1.975	57.4	0.265	61.9	0.071	156.5	1.073	7.07
2.4	0.413	170.8	1.904	55.8	0.275	61.0	0.074	150.6	1.076	6.71
2.5	0.414	169.3	1.851	54.1	0.286	60.2	0.080	145.9	1.073	6.46
2.6	0.418	167.9	1.791	52.6	0.297	58.9	0.086	141.4	1.071	6.18
2.7	0.414	166.5	1.737	50.8	0.306	58.0	0.095	139.6	1.075	5.86
2.8	0.419	164.4	1.691	49.1	0.317	57.2	0.103	137.9	1.071	5.65
2.9	0.420	163.0	1.641	47.7	0.326	56.3	0.112	137.0	1.072	5.37
3.0	0.423	161.2	1.602	46.0	0.334	55.5	0.120	135.8	1.073	5.16
4.0	0.508	151.0	1.256	33.0	0.408	46.2	0.213	122.1	1.053	3.48
5.0	0.537	147.4	1.083	23.8	0.476	39.0	0.290	104.9	1.043	2.29

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

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂		K	MAG/MSG (dB)
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		
0.1	0.961	-17.0	3.360	166.5	0.037	80.2	0.992	-6.4	0.064	19.63
0.2	0.936	-32.1	3.197	155.4	0.068	70.9	0.964	-12.4	0.117	16.73
0.3	0.897	-46.5	2.967	145.5	0.096	62.5	0.919	-17.8	0.163	14.91
0.4	0.870	-59.5	2.777	136.3	0.118	55.0	0.877	-22.6	0.204	13.72
0.5	0.834	-71.6	2.560	127.3	0.135	48.7	0.834	-26.6	0.254	12.79
0.6	0.799	-81.7	2.347	119.7	0.147	43.7	0.793	-30.0	0.311	12.04
0.7	0.770	-90.7	2.171	112.8	0.155	39.4	0.757	-32.9	0.367	11.46
0.8	0.744	-98.7	2.012	107.2	0.160	36.0	0.727	-35.5	0.418	10.99
0.9	0.728	-105.5	1.858	102.4	0.163	33.2	0.704	-37.8	0.462	10.56
1.0	0.710	-111.7	1.731	97.6	0.164	31.0	0.683	-40.0	0.521	10.22
1.1	0.695	-117.1	1.613	93.5	0.165	29.2	0.667	-41.9	0.578	9.91
1.2	0.684	-122.1	1.526	89.6	0.164	27.9	0.654	-43.7	0.632	9.70
1.3	0.676	-126.8	1.438	85.7	0.162	27.1	0.646	-45.4	0.683	9.48
1.4	0.665	-130.8	1.370	82.4	0.160	26.6	0.636	-47.1	0.745	9.33
1.5	0.660	-134.7	1.302	79.7	0.157	26.4	0.629	-48.7	0.798	9.18
1.6	0.655	-137.9	1.246	76.6	0.155	26.7	0.624	-50.1	0.851	9.06
1.7	0.647	-141.2	1.194	74.1	0.151	27.2	0.619	-51.5	0.919	8.97
1.8	0.641	-144.4	1.159	71.9	0.148	28.3	0.610	-53.1	0.980	8.92
1.9	0.636	-147.6	1.109	69.2	0.146	29.6	0.605	-54.5	1.050	7.44
2.0	0.630	-150.7	1.072	66.9	0.144	31.4	0.599	-55.8	1.117	6.64
2.1	0.627	-153.9	1.047	64.2	0.142	33.8	0.591	-57.3	1.170	6.18
2.2	0.619	-156.7	1.020	62.4	0.140	36.8	0.583	-59.1	1.241	5.67
2.3	0.615	-159.9	0.993	60.0	0.139	40.1	0.574	-60.9	1.303	5.24
2.4	0.609	-162.6	0.969	57.7	0.139	43.3	0.567	-63.0	1.364	4.84
2.5	0.604	-166.0	0.953	55.7	0.140	46.9	0.556	-65.2	1.406	4.53
2.6	0.601	-169.2	0.930	54.0	0.142	50.5	0.549	-67.7	1.440	4.21
2.7	0.595	-172.1	0.907	51.6	0.146	53.9	0.542	-70.5	1.470	3.87
2.8	0.595	-175.4	0.893	49.9	0.152	57.7	0.536	-73.3	1.448	3.73
2.9	0.591	-178.4	0.879	48.7	0.159	60.7	0.527	-75.7	1.441	3.48
3.0	0.591	178.7	0.856	47.0	0.167	63.6	0.515	-79.1	1.447	3.13
4.0	0.623	156.5	0.711	34.3	0.317	70.6	0.453	-118.7	1.081	1.77
5.0	0.614	146.6	0.662	29.9	0.476	59.3	0.424	-168.4	1.063	-0.09

$V_{CE} = 2\text{ V}$, $I_C = 3\text{ mA}$, $Z_0 = 50\ \Omega$

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂		K	MAG/MSG (dB)
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		
0.1	0.859	-27.1	9.631	159.8	0.035	77.0	0.960	-13.1	0.098	24.41
0.2	0.815	-49.4	8.536	145.0	0.061	64.6	0.871	-24.1	0.179	21.43
0.3	0.744	-67.7	7.346	133.0	0.080	55.6	0.766	-32.1	0.271	19.65
0.4	0.693	-83.5	6.407	123.1	0.092	49.7	0.678	-37.9	0.341	18.41
0.5	0.647	-96.6	5.559	115.0	0.101	45.8	0.605	-41.8	0.419	17.41
0.6	0.609	-106.8	4.865	108.3	0.107	43.6	0.546	-44.6	0.502	16.58
0.7	0.584	-115.4	4.335	102.7	0.112	42.4	0.501	-46.7	0.575	15.89
0.8	0.564	-122.3	3.904	98.5	0.115	41.9	0.467	-48.4	0.646	15.31
0.9	0.548	-128.1	3.534	94.9	0.118	42.1	0.441	-49.6	0.712	14.75
1.0	0.538	-133.3	3.229	91.2	0.121	42.4	0.420	-50.9	0.775	14.25
1.1	0.529	-137.2	2.972	88.1	0.124	43.1	0.404	-51.9	0.836	13.78
1.2	0.522	-141.1	2.771	85.2	0.127	44.1	0.392	-52.6	0.887	13.38
1.3	0.514	-144.6	2.577	82.2	0.130	45.1	0.384	-53.4	0.939	12.96
1.4	0.507	-147.6	2.431	79.8	0.134	46.5	0.376	-54.2	0.981	12.59
1.5	0.501	-150.2	2.293	77.6	0.138	47.7	0.369	-54.8	1.022	11.31
1.6	0.497	-153.0	2.181	75.1	0.141	49.1	0.365	-55.3	1.052	10.49
1.7	0.493	-154.9	2.073	73.1	0.146	50.3	0.360	-55.6	1.082	9.79
1.8	0.487	-157.5	1.987	71.1	0.151	51.7	0.353	-56.3	1.108	9.20
1.9	0.484	-159.8	1.898	68.9	0.156	52.9	0.349	-56.7	1.127	8.68
2.0	0.478	-162.3	1.824	67.0	0.162	54.1	0.342	-57.0	1.146	8.20
2.1	0.475	-164.2	1.763	64.7	0.168	55.4	0.335	-57.5	1.157	7.81
2.2	0.471	-166.7	1.707	63.1	0.174	56.6	0.328	-58.6	1.168	7.43
2.3	0.471	-168.8	1.657	60.7	0.181	57.8	0.321	-59.5	1.166	7.15
2.4	0.466	-170.9	1.601	58.9	0.188	58.6	0.313	-60.6	1.182	6.73
2.5	0.462	-173.4	1.566	57.0	0.195	59.4	0.302	-62.2	1.184	6.45
2.6	0.461	-176.0	1.522	55.1	0.203	59.9	0.294	-64.1	1.184	6.16
2.7	0.459	-178.1	1.481	53.2	0.210	60.5	0.286	-66.4	1.187	5.86
2.8	0.460	179.2	1.447	51.4	0.219	61.2	0.277	-68.9	1.180	5.63
2.9	0.460	176.7	1.414	50.0	0.228	61.4	0.268	-71.2	1.175	5.40
3.0	0.459	174.5	1.375	48.1	0.236	61.7	0.259	-74.8	1.181	5.09
4.0	0.528	158.0	1.105	32.9	0.339	59.8	0.195	-117.6	1.051	3.75
5.0	0.561	151.4	0.951	23.2	0.448	53.0	0.197	-176.0	1.007	2.76

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

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂		K	MAG/MSG (dB)
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		
0.1	0.809	-35.7	14.577	154.6	0.032	73.1	0.924	-18.9	0.131	26.53
0.2	0.714	-62.3	12.203	137.0	0.055	60.8	0.782	-32.7	0.259	23.49
0.3	0.635	-83.1	9.950	124.8	0.068	53.4	0.648	-41.5	0.372	21.66
0.4	0.585	-99.4	8.306	115.4	0.077	49.9	0.547	-47.2	0.467	20.32
0.5	0.546	-111.8	6.985	108.1	0.084	48.4	0.472	-50.6	0.563	19.18
0.6	0.521	-121.3	6.026	102.5	0.090	48.0	0.416	-52.8	0.651	18.27
0.7	0.498	-128.4	5.265	97.6	0.095	48.4	0.374	-54.5	0.737	17.44
0.8	0.485	-135.0	4.709	94.1	0.100	49.4	0.343	-55.6	0.802	16.73
0.9	0.478	-139.8	4.233	91.1	0.105	50.3	0.320	-56.4	0.857	16.04
1.0	0.471	-143.9	3.852	87.9	0.111	51.6	0.302	-57.2	0.908	15.42
1.1	0.462	-147.3	3.531	85.3	0.116	52.8	0.289	-57.7	0.955	14.82
1.2	0.457	-150.4	3.271	82.9	0.122	53.8	0.279	-58.0	0.990	14.28
1.3	0.451	-153.8	3.043	80.1	0.128	55.0	0.272	-58.1	1.022	12.84
1.4	0.445	-156.0	2.859	78.0	0.134	56.2	0.265	-58.2	1.047	11.95
1.5	0.440	-157.9	2.691	76.1	0.141	57.0	0.261	-58.1	1.071	11.20
1.6	0.439	-160.0	2.556	73.9	0.147	57.9	0.257	-57.9	1.077	10.69
1.7	0.434	-161.5	2.423	72.1	0.154	58.6	0.253	-57.5	1.095	10.08
1.8	0.429	-163.7	2.314	70.2	0.161	59.5	0.248	-57.4	1.107	9.57
1.9	0.426	-165.6	2.210	68.4	0.169	59.8	0.245	-57.2	1.114	9.11
2.0	0.423	-167.4	2.118	66.6	0.177	60.4	0.239	-56.8	1.119	8.68
2.1	0.419	-169.1	2.046	64.4	0.185	60.9	0.233	-56.7	1.121	8.31
2.2	0.418	-171.0	1.974	62.8	0.193	61.3	0.226	-57.1	1.124	7.95
2.3	0.416	-173.1	1.907	60.8	0.202	61.7	0.221	-57.6	1.123	7.62
2.4	0.413	-174.7	1.843	59.1	0.210	61.8	0.213	-58.1	1.131	7.24
2.5	0.411	-177.0	1.801	57.3	0.218	61.9	0.203	-59.3	1.126	7.00
2.6	0.410	-179.0	1.743	55.5	0.227	61.6	0.195	-60.9	1.130	6.67
2.7	0.407	179.0	1.692	53.8	0.236	61.6	0.187	-63.2	1.133	6.34
2.8	0.411	176.8	1.652	52.0	0.245	61.5	0.179	-65.7	1.125	6.15
2.9	0.411	174.6	1.608	50.7	0.254	61.3	0.169	-68.1	1.125	5.87
3.0	0.413	172.3	1.568	48.8	0.261	61.1	0.162	-72.1	1.124	5.64
4.0	0.490	158.1	1.249	34.3	0.353	56.4	0.101	-129.3	1.050	4.12
5.0	0.529	152.9	1.070	24.1	0.445	49.7	0.133	159.5	1.018	2.99

$V_{CE} = 2\text{ V}$, $I_C = 7\text{ mA}$, $Z_0 = 50\ \Omega$

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂		K	MAG/MSG (dB)
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		
0.1	0.721	-41.5	18.560	150.2	0.031	71.5	0.889	-23.5	0.192	27.71
0.2	0.643	-72.5	14.674	131.5	0.049	58.8	0.710	-39.1	0.320	24.77
0.3	0.558	-94.4	11.496	119.4	0.061	53.6	0.564	-47.9	0.462	22.79
0.4	0.523	-109.8	9.366	110.7	0.068	51.9	0.463	-53.3	0.566	21.36
0.5	0.493	-121.8	7.779	104.3	0.075	51.4	0.391	-56.5	0.667	20.15
0.6	0.469	-130.4	6.638	99.4	0.082	52.3	0.340	-58.5	0.757	19.10
0.7	0.456	-137.5	5.764	94.7	0.088	53.7	0.302	-59.8	0.830	18.16
0.8	0.447	-143.0	5.140	91.7	0.094	54.9	0.274	-60.8	0.885	17.36
0.9	0.440	-146.9	4.602	89.0	0.101	56.2	0.254	-61.4	0.933	16.58
1.0	0.434	-150.6	4.179	86.1	0.108	57.4	0.238	-61.8	0.973	15.89
1.1	0.429	-153.5	3.828	83.8	0.115	58.5	0.226	-62.0	1.004	14.84
1.2	0.425	-156.3	3.539	81.5	0.122	59.3	0.218	-62.0	1.028	13.60
1.3	0.419	-158.7	3.287	79.0	0.129	60.2	0.211	-61.6	1.050	12.68
1.4	0.418	-160.9	3.086	77.0	0.137	61.0	0.206	-61.1	1.060	12.02
1.5	0.411	-162.5	2.902	75.3	0.145	61.7	0.202	-60.7	1.078	11.33
1.6	0.408	-164.1	2.747	73.2	0.153	62.1	0.199	-59.8	1.083	10.80
1.7	0.405	-165.4	2.606	71.4	0.160	62.5	0.196	-58.8	1.091	10.26
1.8	0.400	-167.2	2.485	69.7	0.169	62.8	0.191	-58.1	1.097	9.77
1.9	0.398	-168.9	2.371	67.9	0.177	62.9	0.189	-57.2	1.099	9.34
2.0	0.396	-170.5	2.273	66.3	0.187	63.0	0.184	-56.3	1.100	8.93
2.1	0.392	-172.0	2.192	64.2	0.195	63.2	0.179	-55.6	1.101	8.56
2.2	0.391	-173.7	2.113	62.8	0.204	63.2	0.173	-55.6	1.102	8.21
2.3	0.389	-175.1	2.037	60.8	0.213	63.3	0.167	-55.6	1.103	7.85
2.4	0.387	-177.1	1.968	59.1	0.222	63.0	0.160	-55.8	1.106	7.50
2.5	0.386	-178.9	1.918	57.5	0.231	62.8	0.152	-56.6	1.102	7.25
2.6	0.385	179.0	1.857	55.9	0.240	62.2	0.143	-57.7	1.104	6.93
2.7	0.382	177.3	1.803	54.0	0.249	61.9	0.135	-60.2	1.108	6.61
2.8	0.384	175.0	1.757	52.4	0.258	61.6	0.127	-62.7	1.103	6.38
2.9	0.387	173.2	1.711	51.1	0.267	61.2	0.118	-65.5	1.101	6.14
3.0	0.390	171.1	1.667	49.4	0.275	60.7	0.111	-70.1	1.100	5.90
4.0	0.472	158.0	1.320	35.2	0.362	54.8	0.063	-153.9	1.047	4.29
5.0	0.511	153.4	1.135	25.0	0.446	48.1	0.127	137.8	1.021	3.16

$V_{CE} = 2\text{ V}$, $I_C = 10\text{ mA}$, $Z_0 = 50\ \Omega$

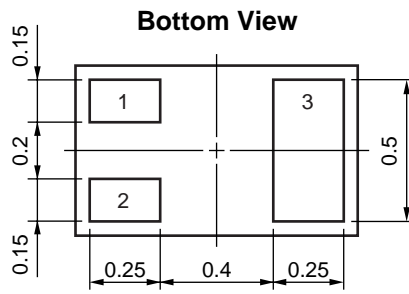
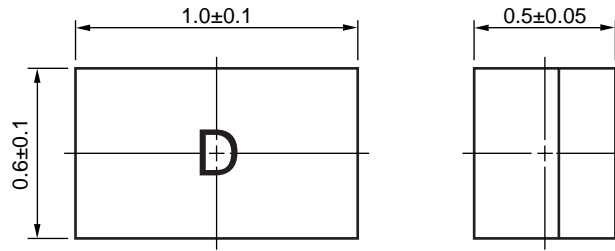
Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂		K	MAG/MSG (dB)
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		
0.1	0.647	-50.4	23.082	145.2	0.028	69.6	0.840	-29.1	0.233	29.15
0.2	0.559	-85.4	17.186	125.6	0.044	58.6	0.626	-45.8	0.405	25.95
0.3	0.490	-106.5	12.928	114.1	0.053	55.3	0.477	-54.6	0.568	23.89
0.4	0.462	-121.5	10.284	106.4	0.061	55.3	0.381	-59.8	0.681	22.27
0.5	0.445	-132.2	8.453	100.6	0.068	56.2	0.317	-62.8	0.774	20.92
0.6	0.430	-139.8	7.161	96.2	0.075	57.7	0.271	-64.7	0.852	19.77
0.7	0.422	-146.0	6.189	92.3	0.083	59.1	0.237	-66.1	0.912	18.72
0.8	0.413	-150.7	5.511	89.5	0.091	60.5	0.214	-67.0	0.953	17.82
0.9	0.412	-153.9	4.920	87.2	0.099	61.8	0.196	-67.4	0.986	16.98
1.0	0.406	-157.0	4.450	84.6	0.107	62.8	0.181	-67.8	1.014	15.47
1.1	0.403	-159.6	4.071	82.4	0.115	63.5	0.171	-67.8	1.034	14.35
1.2	0.399	-161.8	3.765	80.3	0.123	64.1	0.164	-67.2	1.049	13.49
1.3	0.392	-164.1	3.492	77.9	0.132	64.6	0.159	-66.2	1.065	12.67
1.4	0.391	-165.3	3.276	76.2	0.141	65.1	0.154	-65.3	1.070	12.06
1.5	0.389	-167.1	3.077	74.5	0.149	65.3	0.150	-64.1	1.076	11.46
1.6	0.384	-168.1	2.916	72.6	0.158	65.4	0.148	-62.5	1.078	10.95
1.7	0.379	-169.2	2.764	71.0	0.167	65.5	0.145	-60.5	1.084	10.42
1.8	0.376	-170.8	2.630	69.3	0.176	65.5	0.141	-59.1	1.086	9.95
1.9	0.374	-172.3	2.509	67.7	0.186	65.3	0.140	-57.3	1.086	9.52
2.0	0.372	-173.5	2.403	66.1	0.195	65.1	0.136	-55.4	1.087	9.11
2.1	0.368	-174.7	2.313	64.1	0.205	64.9	0.131	-54.1	1.086	8.74
2.2	0.367	-176.1	2.229	62.7	0.213	64.6	0.126	-53.3	1.087	8.40
2.3	0.366	-177.8	2.149	60.8	0.223	64.4	0.121	-52.6	1.085	8.06
2.4	0.363	-178.9	2.074	59.2	0.232	63.9	0.115	-52.2	1.090	7.68
2.5	0.364	179.2	2.017	57.5	0.242	63.5	0.107	-52.5	1.085	7.43
2.6	0.364	177.4	1.950	56.0	0.250	62.7	0.099	-52.9	1.088	7.11
2.7	0.363	175.7	1.894	54.3	0.260	62.2	0.091	-55.3	1.088	6.82
2.8	0.367	173.4	1.844	52.6	0.270	61.7	0.083	-58.2	1.082	6.60
2.9	0.366	171.9	1.791	51.4	0.278	61.1	0.074	-60.9	1.085	6.30
3.0	0.370	170.1	1.740	49.7	0.286	60.5	0.066	-66.6	1.087	6.04
4.0	0.458	157.8	1.377	36.0	0.370	53.6	0.055	163.3	1.043	4.43
5.0	0.500	153.5	1.179	25.9	0.449	46.5	0.140	120.7	1.024	3.23

$V_{CE} = 2\text{ V}$, $I_C = 20\text{ mA}$, $Z_0 = 50\ \Omega$

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂		K	MAG/MSG (dB)
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		
0.1	0.476	-73.8	31.386	135.0	0.024	66.2	0.717	-40.4	0.383	31.18
0.2	0.430	-111.6	20.639	115.6	0.035	60.4	0.472	-58.1	0.604	27.74
0.3	0.404	-130.8	14.731	106.3	0.043	62.4	0.338	-66.4	0.763	25.31
0.4	0.396	-141.7	11.399	100.1	0.052	63.8	0.261	-71.7	0.858	23.38
0.5	0.391	-150.0	9.246	95.6	0.061	65.3	0.211	-75.0	0.923	21.78
0.6	0.386	-155.7	7.780	92.0	0.070	66.9	0.176	-77.8	0.970	20.44
0.7	0.382	-159.8	6.686	88.7	0.080	68.2	0.151	-80.0	1.003	18.88
0.8	0.380	-163.0	5.944	86.4	0.089	69.0	0.133	-81.7	1.019	17.39
0.9	0.379	-165.0	5.296	84.5	0.099	69.5	0.119	-82.6	1.034	16.16
1.0	0.377	-167.5	4.786	82.3	0.108	69.9	0.108	-83.6	1.048	15.11
1.1	0.373	-168.4	4.367	80.4	0.118	70.1	0.100	-83.4	1.056	14.23
1.2	0.372	-170.0	4.034	78.6	0.128	70.0	0.094	-82.4	1.059	13.50
1.3	0.368	-171.7	3.735	76.4	0.137	70.0	0.089	-79.8	1.066	12.77
1.4	0.364	-172.6	3.504	74.9	0.147	70.0	0.085	-77.4	1.067	12.18
1.5	0.361	-173.6	3.288	73.4	0.157	69.6	0.082	-74.3	1.069	11.60
1.6	0.357	-174.5	3.108	71.6	0.167	69.4	0.079	-70.4	1.069	11.09
1.7	0.355	-175.3	2.945	70.0	0.177	69.0	0.077	-65.7	1.069	10.62
1.8	0.351	-176.3	2.802	68.5	0.187	68.6	0.074	-61.8	1.069	10.15
1.9	0.351	-177.5	2.672	67.0	0.197	67.9	0.073	-57.3	1.066	9.75
2.0	0.346	-178.3	2.555	65.6	0.207	67.4	0.071	-52.6	1.068	9.32
2.1	0.343	-179.1	2.457	63.7	0.217	66.8	0.068	-48.7	1.066	8.96
2.2	0.344	179.8	2.362	62.3	0.227	66.2	0.064	-45.8	1.066	8.61
2.3	0.342	178.3	2.273	60.5	0.237	65.7	0.060	-42.5	1.065	8.26
2.4	0.340	177.3	2.192	59.0	0.246	64.9	0.055	-39.3	1.068	7.90
2.5	0.342	175.6	2.132	57.4	0.256	64.2	0.049	-36.9	1.064	7.66
2.6	0.342	174.1	2.060	55.9	0.266	63.2	0.043	-33.1	1.064	7.34
2.7	0.340	172.9	1.996	54.4	0.275	62.5	0.035	-32.9	1.068	7.01
2.8	0.343	170.6	1.941	52.9	0.285	61.8	0.027	-32.1	1.065	6.78
2.9	0.348	169.4	1.886	51.6	0.294	61.0	0.018	-28.5	1.064	6.53
3.0	0.349	167.4	1.833	50.0	0.302	60.2	0.009	-28.6	1.067	6.26
4.0	0.443	156.9	1.440	37.0	0.382	52.1	0.090	126.0	1.039	4.56
5.0	0.487	153.3	1.229	27.1	0.454	44.7	0.177	106.1	1.026	3.33

PACKAGE DIMENSIONS

3-PIN NON-LEAD MINIMOLD (UNIT: mm)



PIN CONNECTIONS

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

[MEMO]

[MEMO]

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