

DATA SHEET

NEC

NPN SILICON RF TRANSISTOR 2SC5677

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

FEATURES

- Low voltage operation, low phase distortion
- Ideal for OSC applications
- 3-pin lead-less minimold package

ORDERING INFORMATION

Part Number	Quantity	Supplying Form
2SC5677	50 pcs (Non reel)	• 8 mm wide embossed taping
2SC5677-T3	10 kpcs/reel	• Pin 2 (Base) face the perforation side of the tape

Remark To order evaluation samples, contact your nearby sales office.
The unit sample quantity is 50 pcs.

ABSOLUTE MAXIMUM RATINGS (T_A = +25°C)

Parameter	Symbol	Ratings	Unit
Collector to Base Voltage	V _{CBO}	9	V
Collector to Emitter Voltage	V _{CEO}	5.5	V
Emitter to Base Voltage	V _{EBO}	1.5	V
Collector Current	I _C	100	mA
Total Power Dissipation	P _{tot} ^{Note}	140	mW
Junction Temperature	T _J	150	°C
Storage Temperature	T _{stg}	-65 to +150	°C

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

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 Compound Semiconductor Devices 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	—	—	200	nA
Emitter Cut-off Current	I _{EBO}	V _{EB} = 1 V, I _C = 0 mA	—	—	200	nA
DC Current Gain	h _{FE} ^{Note 1}	V _{CE} = 1 V, I _C = 10 mA	100	—	160	—
RF Characteristics						
Gain Bandwidth Product	f _T	V _{CE} = 1 V, I _C = 10 mA, f = 2 GHz	4.0	5.5	—	GHz
Insertion Power Gain	S _{21e} ²	V _{CE} = 1 V, I _C = 10 mA, f = 2 GHz	2.5	4.0	—	dB
Noise Figure	NF	V _{CE} = 1 V, I _C = 10 mA, f = 2 GHz, Z _S = Z _{opt}	—	1.8	3.0	dB
Reverse Transfer Capacitance	C _{re} ^{Note 2}	V _{CB} = 0.5 V, I _E = 0 mA, f = 1 MHz	—	0.9	1.2	pF

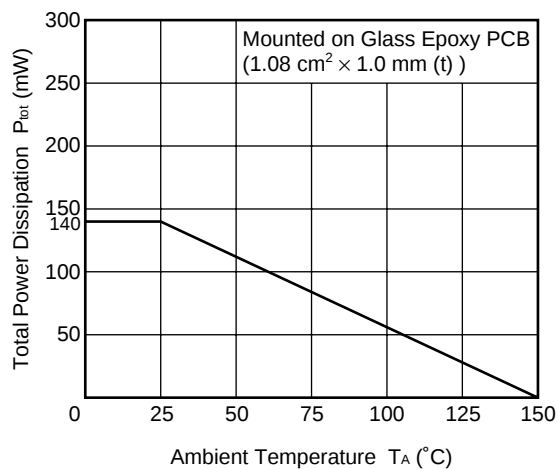
- Notes** **1.** Pulse measurement: PW ≤ 350 μs, Duty Cycle ≤ 2%
2. Collector to base capacitance when the emitter grounded

h_{FE} CLASSIFICATION

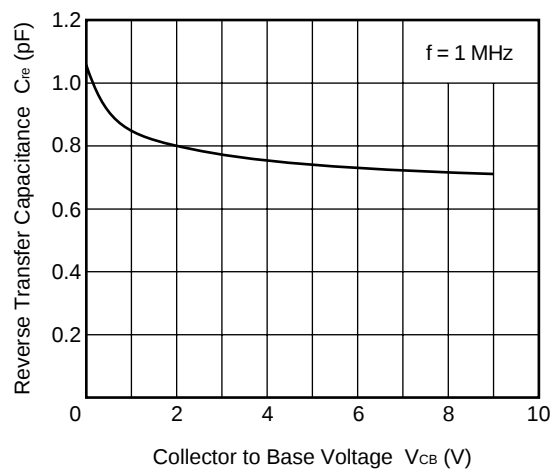
Rank	FB
Marking	D5
h _{FE} Value	100 to 160

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

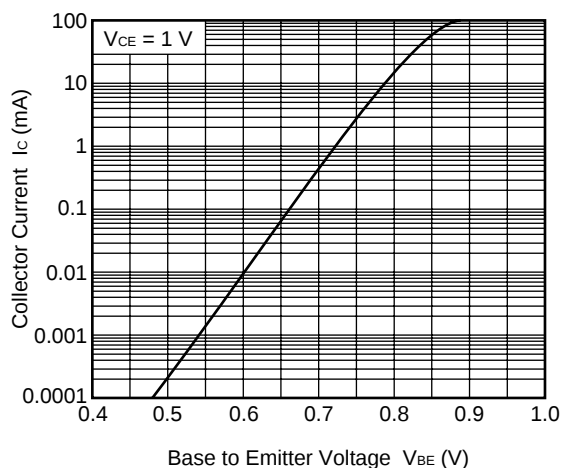
TOTAL POWER DISSIPATION
vs. AMBIENT TEMPERATURE



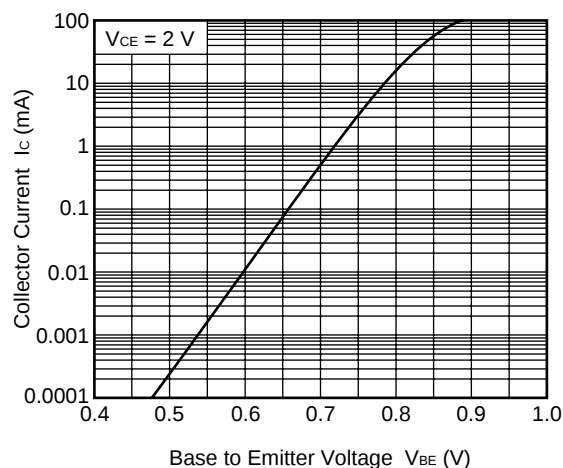
REVERSE TRANSFER CAPACITANCE
vs. COLLECTOR TO BASE VOLTAGE



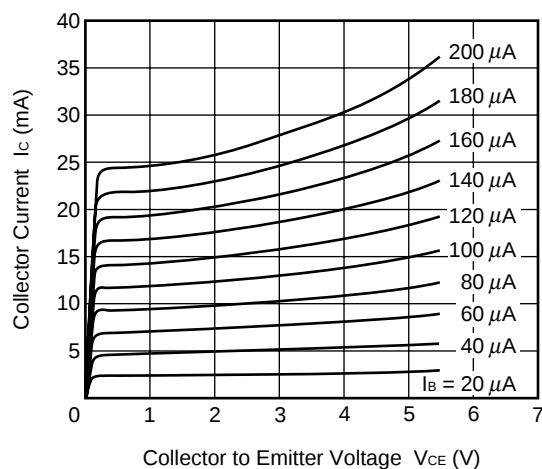
COLLECTOR CURRENT vs.
BASE TO EMITTER VOLTAGE

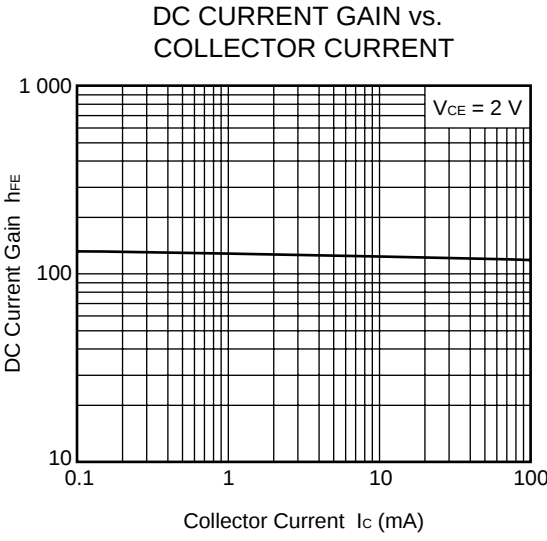
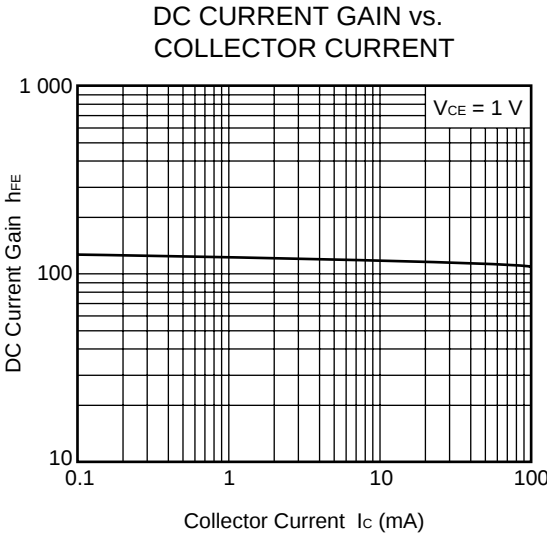


COLLECTOR CURRENT vs.
BASE TO EMITTER VOLTAGE

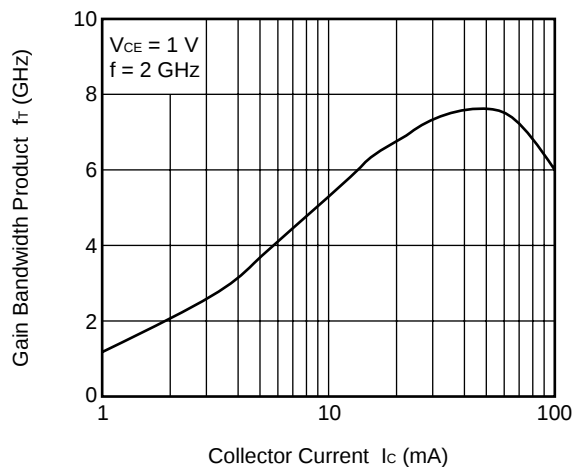


COLLECTOR CURRENT vs.
COLLECTOR TO EMITTER VOLTAGE

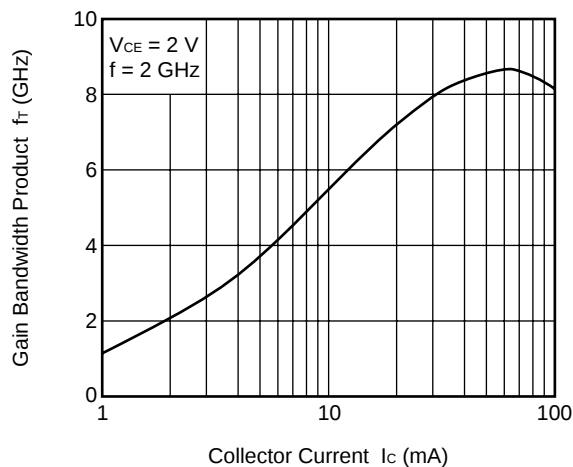




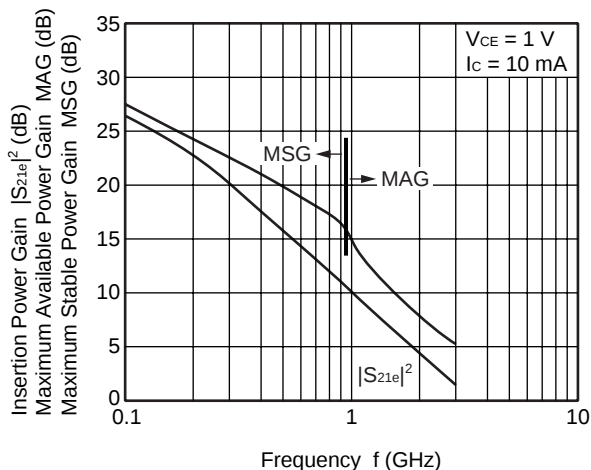
GAIN BANDWIDTH PRODUCT
vs. COLLECTOR CURRENT



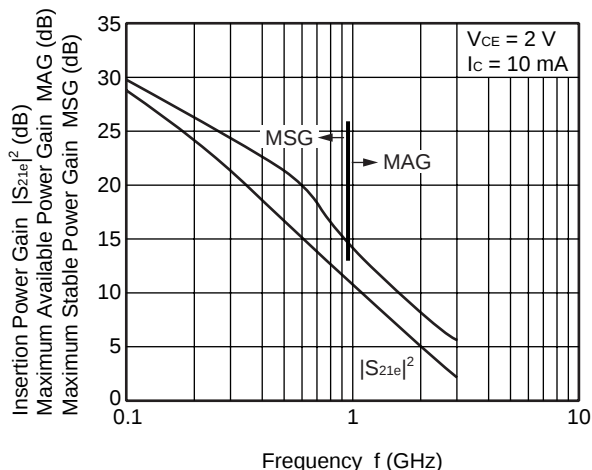
GAIN BANDWIDTH PRODUCT
vs. COLLECTOR CURRENT



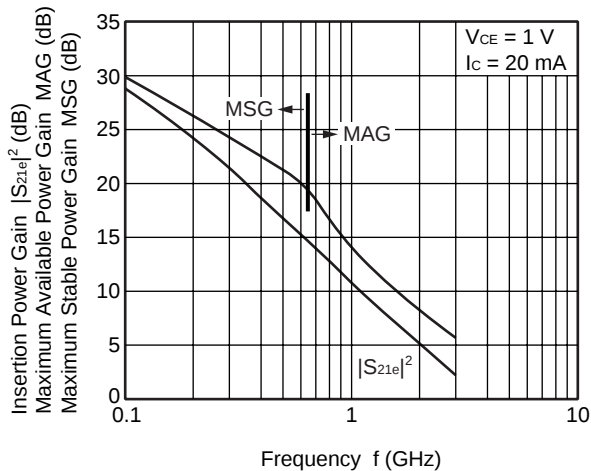
INSERTION POWER GAIN,
MAG, MSG vs. FREQUENCY



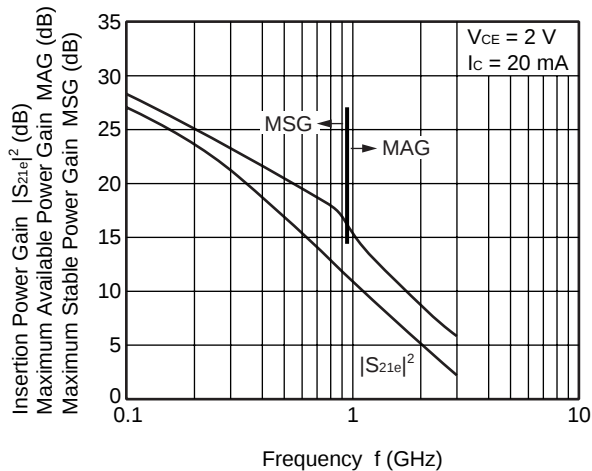
INSERTION POWER GAIN,
MAG, MSG vs. FREQUENCY



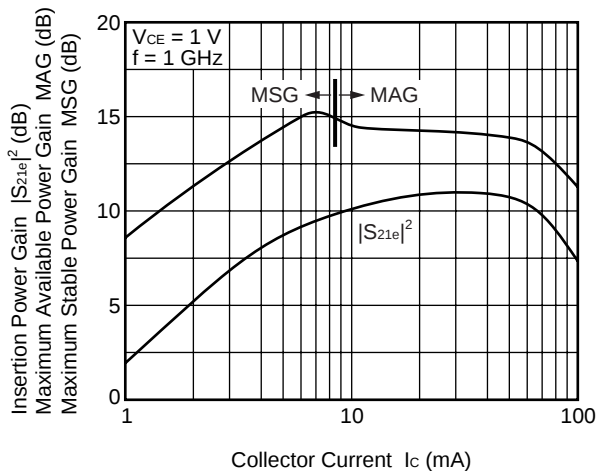
INSERTION POWER GAIN,
MAG, MSG vs. FREQUENCY



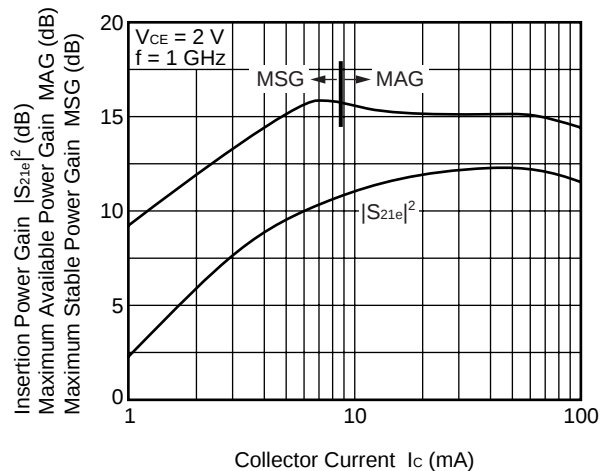
INSERTION POWER GAIN,
MAG, MSG vs. FREQUENCY



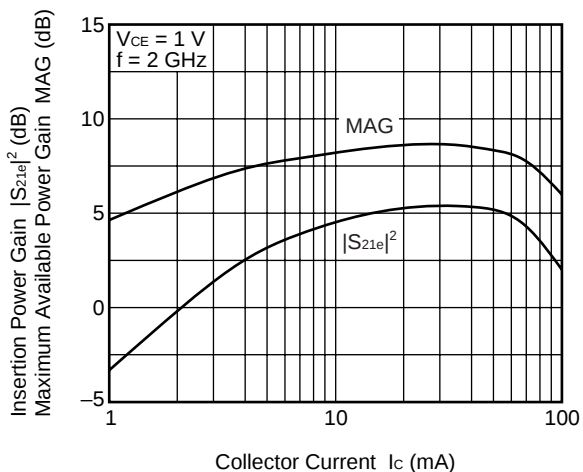
INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT



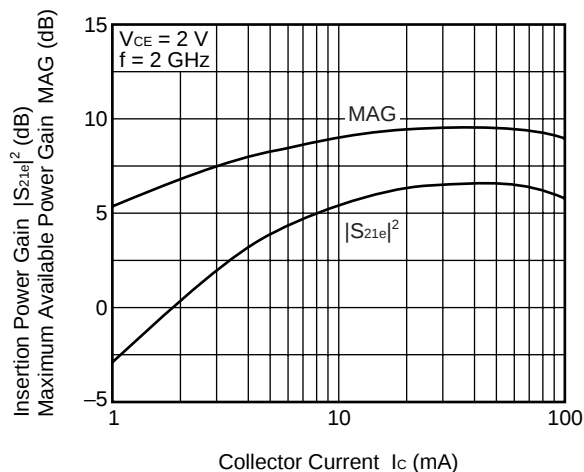
INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT



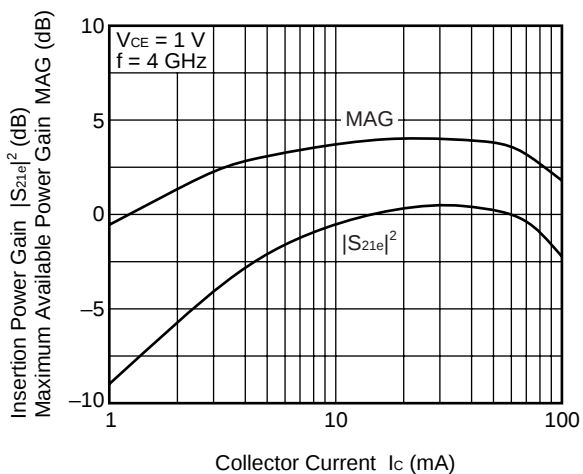
INSERTION POWER GAIN, MAG
vs. COLLECTOR CURRENT



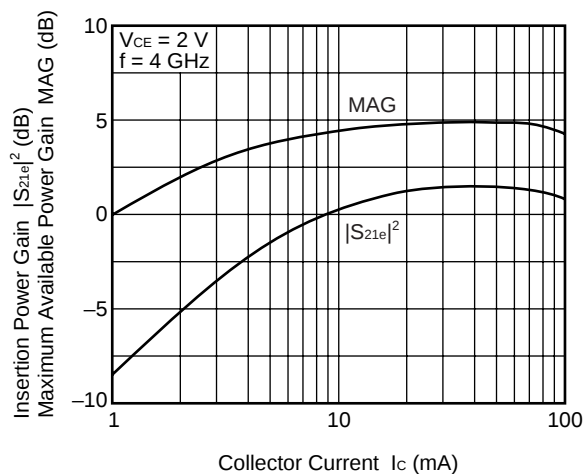
INSERTION POWER GAIN, MAG
vs. COLLECTOR CURRENT



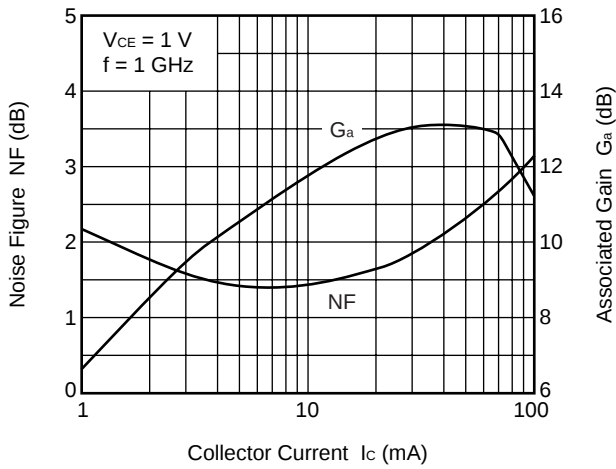
INSERTION POWER GAIN, MAG
vs. COLLECTOR CURRENT



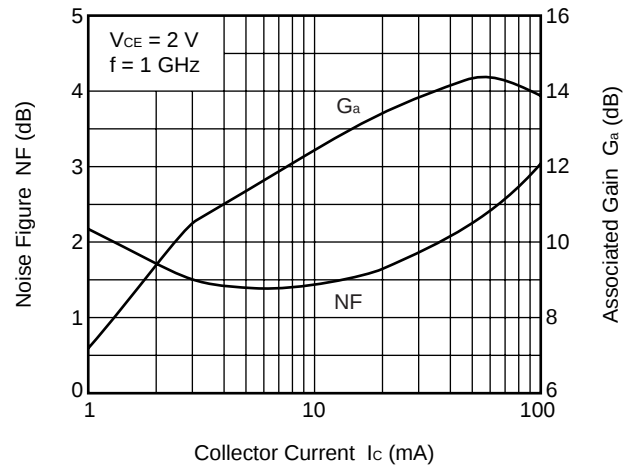
INSERTION POWER GAIN, MAG
vs. COLLECTOR CURRENT



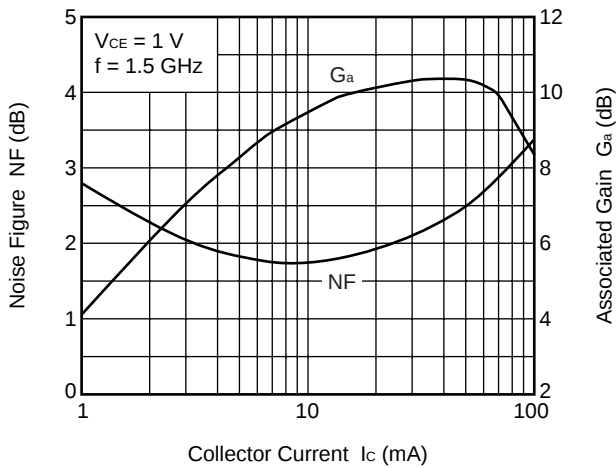
NOISE FIGURE, ASSOCIATED GAIN
vs. COLLECTOR CURRENT



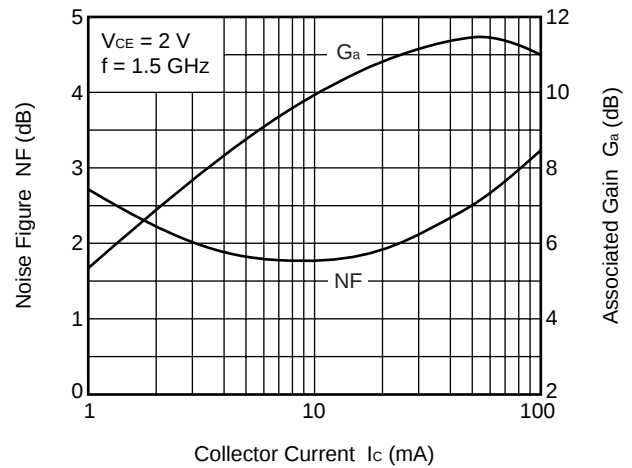
NOISE FIGURE, ASSOCIATED GAIN
vs. COLLECTOR CURRENT



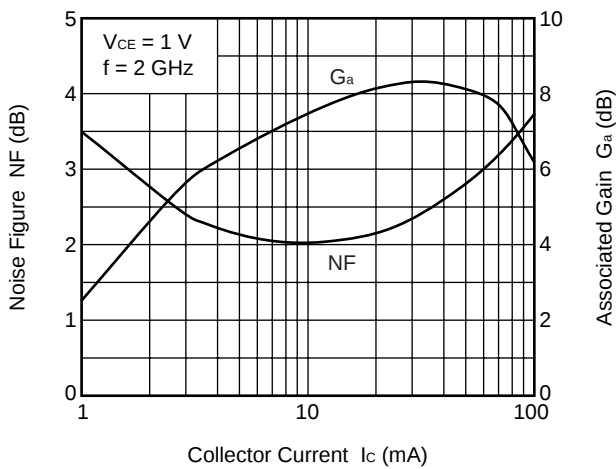
NOISE FIGURE, ASSOCIATED GAIN
vs. COLLECTOR CURRENT



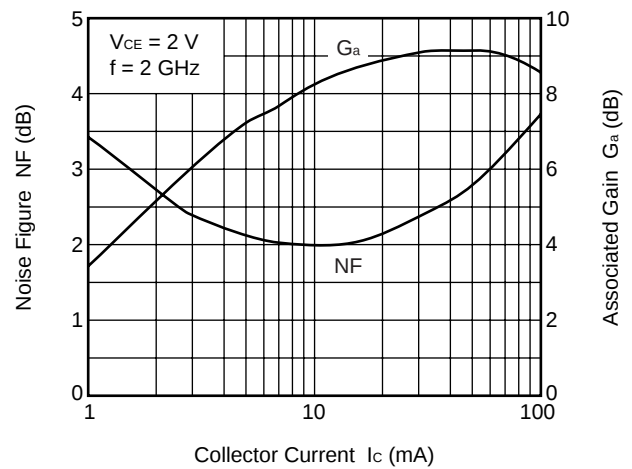
NOISE FIGURE, ASSOCIATED GAIN
vs. COLLECTOR CURRENT



NOISE FIGURE, ASSOCIATED GAIN
vs. COLLECTOR CURRENT



NOISE FIGURE, ASSOCIATED GAIN
vs. COLLECTOR CURRENT



Remark The graphs indicate nominal characteristics.

S-PARAMETERS

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

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.947	-29.5	3.608	160.0	0.057	73.6	0.973	-10.7
0.2	0.917	-53.5	3.217	144.5	0.103	59.3	0.914	-19.7
0.3	0.880	-74.6	2.835	130.7	0.135	47.2	0.845	-26.7
0.4	0.841	-91.6	2.454	119.1	0.156	38.0	0.784	-31.9
0.5	0.818	-105.4	2.156	109.6	0.168	30.9	0.735	-35.9
0.6	0.801	-116.5	1.905	101.8	0.174	25.2	0.699	-39.1
0.7	0.788	-125.3	1.684	95.2	0.177	20.6	0.672	-41.9
0.8	0.780	-132.7	1.518	89.4	0.178	16.9	0.651	-44.4
0.9	0.773	-139.0	1.376	84.0	0.176	13.8	0.639	-47.0
1.0	0.769	-144.4	1.257	79.3	0.173	11.2	0.628	-49.3
1.1	0.769	-148.9	1.156	75.1	0.170	9.1	0.622	-51.8
1.2	0.769	-153.0	1.063	71.2	0.165	7.4	0.616	-54.2
1.3	0.768	-156.7	0.991	67.5	0.160	6.1	0.613	-56.8
1.4	0.768	-159.9	0.928	64.3	0.155	5.0	0.613	-59.2
1.5	0.773	-162.8	0.876	60.9	0.149	4.5	0.611	-61.9
1.6	0.775	-165.4	0.825	58.1	0.143	4.2	0.612	-64.5
1.7	0.778	-167.9	0.781	55.3	0.137	4.4	0.613	-67.2
1.8	0.777	-170.3	0.740	53.0	0.130	5.0	0.615	-69.7
1.9	0.782	-172.6	0.706	50.3	0.123	5.9	0.618	-72.4
2.0	0.785	-174.7	0.682	48.0	0.117	7.6	0.620	-74.9
2.1	0.785	-176.5	0.652	46.3	0.110	9.4	0.622	-77.8
2.2	0.789	-178.4	0.623	45.0	0.104	11.9	0.628	-80.6
2.3	0.789	179.9	0.598	43.6	0.098	15.2	0.632	-83.1
2.4	0.790	178.2	0.571	42.0	0.095	19.1	0.635	-85.7
2.5	0.793	176.4	0.545	40.8	0.091	24.0	0.640	-88.5
2.6	0.794	174.7	0.525	39.9	0.088	29.4	0.643	-91.4
2.7	0.792	173.2	0.501	38.9	0.088	35.0	0.651	-93.9
2.8	0.794	171.6	0.481	37.9	0.090	41.2	0.657	-96.7
2.9	0.792	169.9	0.459	36.1	0.094	47.1	0.662	-98.7
3.0	0.796	167.9	0.453	35.4	0.098	53.6	0.665	-101.4
4.0	0.800	153.8	0.359	36.9	0.190	75.1	0.701	-124.2
5.0	0.776	141.8	0.358	45.8	0.304	71.7	0.715	-143.9

$V_{CE} = 1 \text{ V}$, $I_C = 3 \text{ mA}$, $Z_0 = 50 \Omega$

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.852	-45.4	9.505	152.4	0.054	67.2	0.915	-21.6
0.2	0.808	-77.9	7.706	133.4	0.086	50.2	0.767	-36.9
0.3	0.772	-102.0	6.199	119.8	0.103	39.1	0.637	-46.6
0.4	0.740	-118.8	5.049	109.9	0.111	32.3	0.547	-52.5
0.5	0.727	-130.7	4.213	102.5	0.116	28.2	0.485	-56.3
0.6	0.715	-139.9	3.623	96.6	0.118	25.4	0.442	-59.2
0.7	0.709	-146.8	3.156	91.9	0.118	23.7	0.413	-61.4
0.8	0.706	-152.3	2.782	87.8	0.118	22.8	0.392	-63.4
0.9	0.705	-157.0	2.497	84.0	0.118	22.3	0.380	-65.2
1.0	0.704	-160.8	2.259	80.6	0.118	22.5	0.370	-67.1
1.1	0.704	-164.1	2.065	77.6	0.117	22.8	0.364	-68.9
1.2	0.705	-167.1	1.898	74.7	0.116	23.6	0.359	-70.9
1.3	0.708	-169.7	1.763	71.9	0.115	24.6	0.357	-72.9
1.4	0.708	-172.2	1.641	69.5	0.114	25.7	0.357	-74.9
1.5	0.710	-174.1	1.548	66.9	0.114	27.3	0.358	-76.9
1.6	0.715	-175.9	1.454	64.5	0.113	29.0	0.361	-78.9
1.7	0.716	-177.9	1.381	62.3	0.113	31.0	0.363	-81.1
1.8	0.714	-179.7	1.308	60.4	0.113	33.1	0.367	-83.2
1.9	0.719	178.7	1.244	57.9	0.113	35.3	0.370	-85.4
2.0	0.722	177.2	1.199	56.0	0.114	37.8	0.374	-87.6
2.1	0.724	175.8	1.149	54.5	0.115	40.2	0.379	-90.0
2.2	0.726	174.5	1.101	53.1	0.116	42.3	0.385	-92.3
2.3	0.726	173.1	1.061	51.6	0.118	44.7	0.391	-94.5
2.4	0.725	171.7	1.014	49.9	0.121	46.9	0.396	-96.6
2.5	0.729	170.4	0.971	48.4	0.125	49.3	0.403	-98.9
2.6	0.729	169.0	0.938	47.1	0.128	51.3	0.411	-101.4
2.7	0.730	167.9	0.904	46.1	0.132	53.3	0.419	-103.4
2.8	0.731	166.8	0.870	44.8	0.137	55.1	0.428	-105.5
2.9	0.730	165.5	0.835	42.5	0.144	56.9	0.434	-107.3
3.0	0.734	163.7	0.821	40.9	0.150	59.4	0.441	-109.5
4.0	0.743	152.2	0.640	32.3	0.221	67.2	0.508	-127.7
5.0	0.735	142.0	0.538	31.4	0.312	65.7	0.559	-144.9

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

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.782	-58.5	13.952	146.3	0.049	62.1	0.858	-30.7
0.2	0.747	-95.4	10.477	126.0	0.072	45.3	0.658	-50.0
0.3	0.719	-118.8	8.002	113.4	0.083	36.5	0.517	-61.1
0.4	0.703	-134.0	6.328	104.8	0.088	32.4	0.427	-68.1
0.5	0.693	-144.0	5.204	98.4	0.091	30.1	0.370	-72.7
0.6	0.688	-151.5	4.413	93.6	0.093	29.5	0.332	-76.0
0.7	0.687	-156.9	3.815	89.6	0.095	29.6	0.307	-78.7
0.8	0.685	-161.3	3.364	86.2	0.096	30.4	0.289	-81.2
0.9	0.682	-165.2	3.001	83.1	0.097	31.3	0.278	-83.1
1.0	0.683	-168.4	2.717	80.2	0.099	32.5	0.270	-84.9
1.1	0.686	-171.0	2.478	77.7	0.100	34.0	0.265	-86.8
1.2	0.686	-173.4	2.273	75.2	0.102	35.7	0.262	-88.5
1.3	0.688	-175.8	2.112	72.7	0.104	37.3	0.261	-90.3
1.4	0.688	-177.7	1.964	70.6	0.106	38.9	0.261	-92.0
1.5	0.692	-179.5	1.852	68.3	0.108	40.6	0.263	-93.7
1.6	0.695	179.1	1.743	66.3	0.110	42.7	0.264	-95.5
1.7	0.698	177.6	1.654	64.3	0.113	44.5	0.267	-97.3
1.8	0.696	176.1	1.560	62.4	0.116	46.3	0.271	-99.0
1.9	0.699	174.6	1.487	60.4	0.119	47.9	0.275	-100.8
2.0	0.702	173.4	1.433	58.5	0.123	49.7	0.280	-102.6
2.1	0.703	172.1	1.374	57.0	0.126	51.3	0.285	-104.4
2.2	0.705	171.0	1.313	55.7	0.129	52.6	0.292	-106.3
2.3	0.705	169.9	1.268	54.3	0.134	53.9	0.298	-108.0
2.4	0.706	168.6	1.215	52.6	0.139	55.1	0.304	-109.8
2.5	0.708	167.4	1.168	51.4	0.144	56.4	0.311	-111.6
2.6	0.707	166.4	1.130	50.1	0.148	57.5	0.319	-113.5
2.7	0.708	165.1	1.089	49.0	0.153	58.3	0.327	-115.0
2.8	0.709	164.2	1.047	47.7	0.159	59.0	0.336	-116.8
2.9	0.708	163.1	1.008	45.6	0.168	59.7	0.343	-118.1
3.0	0.709	161.6	0.990	44.1	0.174	61.3	0.350	-119.8
4.0	0.717	151.1	0.781	33.7	0.240	64.5	0.419	-133.8
5.0	0.714	141.6	0.651	29.6	0.320	62.9	0.479	-148.2

$V_{CE} = 1\text{ V}$, $I_C = 7\text{ mA}$, $Z_0 = 50\ \Omega$

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.723	-68.6	17.413	141.3	0.044	58.1	0.806	-38.2
0.2	0.709	-108.3	12.280	120.9	0.063	42.7	0.581	-60.4
0.3	0.694	-130.1	9.079	109.2	0.070	36.0	0.443	-73.0
0.4	0.682	-143.3	7.053	101.6	0.074	34.0	0.363	-81.2
0.5	0.680	-151.9	5.769	95.9	0.077	33.3	0.313	-86.9
0.6	0.677	-158.3	4.872	91.8	0.080	34.1	0.281	-91.2
0.7	0.678	-163.3	4.212	88.3	0.082	35.4	0.259	-94.7
0.8	0.676	-166.8	3.699	85.3	0.085	37.0	0.245	-97.7
0.9	0.676	-170.4	3.298	82.5	0.088	38.6	0.236	-99.9
1.0	0.677	-173.0	2.980	79.9	0.090	40.5	0.229	-102.0
1.1	0.678	-175.1	2.719	77.6	0.094	42.2	0.225	-103.9
1.2	0.678	-177.3	2.491	75.3	0.097	44.1	0.223	-105.6
1.3	0.680	-179.2	2.314	73.2	0.100	45.9	0.222	-107.4
1.4	0.681	178.9	2.153	71.2	0.104	47.3	0.223	-108.7
1.5	0.682	177.5	2.029	69.1	0.108	49.0	0.224	-110.3
1.6	0.685	176.2	1.909	67.1	0.112	50.5	0.226	-111.8
1.7	0.687	174.9	1.810	65.3	0.116	52.0	0.229	-113.1
1.8	0.688	173.5	1.714	63.5	0.120	53.4	0.233	-114.4
1.9	0.691	172.0	1.631	61.6	0.125	54.5	0.237	-116.0
2.0	0.693	171.0	1.569	59.8	0.130	56.0	0.241	-117.4
2.1	0.693	169.9	1.506	58.5	0.134	56.8	0.247	-118.6
2.2	0.694	168.8	1.441	57.2	0.139	57.7	0.252	-120.1
2.3	0.694	167.8	1.389	55.9	0.144	58.4	0.259	-121.4
2.4	0.695	166.5	1.334	54.3	0.150	59.0	0.265	-122.7
2.5	0.695	165.5	1.283	53.0	0.156	59.8	0.271	-124.1
2.6	0.697	164.5	1.242	51.9	0.161	60.4	0.278	-125.4
2.7	0.696	163.5	1.199	50.8	0.166	60.8	0.286	-126.5
2.8	0.697	162.5	1.155	49.5	0.172	61.1	0.294	-127.8
2.9	0.695	161.4	1.110	47.5	0.181	61.3	0.301	-128.5
3.0	0.697	159.9	1.089	45.9	0.188	62.4	0.308	-129.8
4.0	0.702	150.0	0.869	35.2	0.251	63.3	0.373	-140.3
5.0	0.700	141.2	0.723	29.8	0.326	61.1	0.432	-152.4

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

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.662	-84.8	21.285	135.7	0.039	55.6	0.740	-48.0
0.2	0.672	-122.4	14.000	115.6	0.052	41.3	0.505	-73.0
0.3	0.671	-141.3	10.068	105.2	0.058	37.7	0.382	-87.4
0.4	0.670	-152.3	7.747	98.6	0.062	37.2	0.315	-97.1
0.5	0.672	-159.6	6.286	93.7	0.065	38.8	0.276	-104.2
0.6	0.670	-164.8	5.279	90.1	0.069	40.7	0.252	-109.7
0.7	0.672	-168.9	4.561	87.0	0.073	42.7	0.236	-113.8
0.8	0.672	-171.8	3.993	84.4	0.077	44.9	0.226	-117.3
0.9	0.673	-174.7	3.561	81.9	0.081	47.0	0.219	-120.0
1.0	0.671	-177.1	3.214	79.6	0.085	49.0	0.214	-122.2
1.1	0.673	-179.0	2.933	77.5	0.090	50.7	0.212	-124.1
1.2	0.674	179.2	2.687	75.4	0.094	52.3	0.210	-125.9
1.3	0.676	177.4	2.497	73.4	0.099	53.8	0.210	-127.2
1.4	0.676	176.0	2.320	71.6	0.104	55.0	0.210	-128.4
1.5	0.678	174.6	2.187	69.7	0.109	56.3	0.212	-129.8
1.6	0.682	173.5	2.057	67.8	0.115	57.3	0.214	-130.8
1.7	0.683	172.2	1.952	66.2	0.120	58.4	0.217	-131.8
1.8	0.681	171.1	1.847	64.6	0.126	59.3	0.220	-132.8
1.9	0.684	169.9	1.757	62.7	0.131	60.1	0.223	-133.7
2.0	0.686	168.6	1.690	61.1	0.137	60.8	0.227	-134.6
2.1	0.687	167.7	1.625	59.7	0.142	61.5	0.232	-135.6
2.2	0.689	166.8	1.555	58.6	0.148	61.8	0.236	-136.6
2.3	0.686	165.7	1.498	57.1	0.154	62.1	0.242	-137.4
2.4	0.686	164.7	1.439	55.8	0.160	62.4	0.247	-138.1
2.5	0.688	163.8	1.386	54.5	0.166	62.8	0.252	-138.8
2.6	0.687	162.6	1.342	53.4	0.172	62.9	0.259	-139.9
2.7	0.688	161.9	1.295	52.4	0.178	63.0	0.265	-140.4
2.8	0.688	160.9	1.251	51.2	0.185	62.8	0.273	-141.1
2.9	0.685	160.0	1.201	49.2	0.194	62.7	0.278	-141.4
3.0	0.688	158.5	1.181	47.7	0.201	63.5	0.284	-142.2
4.0	0.691	149.1	0.943	36.9	0.263	62.5	0.340	-148.9
5.0	0.688	140.6	0.793	30.5	0.334	59.7	0.394	-158.2

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

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.598	-115.7	27.392	125.2	0.028	49.1	0.609	-68.4
0.2	0.647	-145.6	16.255	107.5	0.037	43.5	0.403	-98.7
0.3	0.660	-158.5	11.288	99.4	0.041	45.4	0.324	-115.8
0.4	0.666	-165.4	8.549	94.3	0.046	48.3	0.289	-126.7
0.5	0.669	-170.2	6.881	90.7	0.052	51.6	0.270	-134.2
0.6	0.670	-173.8	5.763	87.8	0.058	54.5	0.259	-139.6
0.7	0.673	-176.6	4.958	85.3	0.063	56.8	0.252	-143.4
0.8	0.672	-179.0	4.346	83.1	0.070	58.8	0.248	-146.5
0.9	0.673	179.0	3.876	81.0	0.076	60.4	0.245	-148.8
1.0	0.673	177.2	3.499	79.0	0.082	61.9	0.243	-150.7
1.1	0.673	175.7	3.192	77.3	0.089	63.0	0.242	-152.3
1.2	0.675	174.3	2.926	75.5	0.095	63.8	0.241	-153.6
1.3	0.676	173.0	2.717	73.7	0.102	64.7	0.242	-154.8
1.4	0.677	171.7	2.524	72.1	0.108	65.0	0.242	-155.7
1.5	0.677	170.6	2.378	70.3	0.115	65.5	0.243	-156.6
1.6	0.680	169.5	2.237	68.7	0.122	66.0	0.244	-157.3
1.7	0.679	168.7	2.120	67.2	0.129	66.2	0.246	-158.0
1.8	0.679	167.6	2.007	65.8	0.135	66.7	0.248	-158.6
1.9	0.681	166.6	1.910	64.0	0.142	66.6	0.250	-159.2
2.0	0.683	165.6	1.837	62.4	0.149	66.9	0.252	-159.7
2.1	0.682	164.7	1.764	61.3	0.155	66.9	0.255	-160.2
2.2	0.684	163.8	1.689	60.2	0.162	66.8	0.258	-160.7
2.3	0.682	163.2	1.630	58.9	0.168	66.6	0.261	-161.0
2.4	0.681	162.1	1.571	57.6	0.176	66.3	0.265	-161.4
2.5	0.684	161.1	1.511	56.5	0.182	66.3	0.268	-161.6
2.6	0.685	160.3	1.465	55.4	0.188	66.0	0.272	-162.0
2.7	0.681	159.5	1.412	54.5	0.195	65.6	0.276	-162.2
2.8	0.682	158.5	1.365	53.4	0.202	65.1	0.282	-162.4
2.9	0.679	157.7	1.312	51.5	0.211	64.6	0.285	-162.2
3.0	0.681	156.3	1.289	50.0	0.219	64.9	0.288	-162.4
4.0	0.681	147.8	1.039	39.2	0.281	61.6	0.322	-164.9
5.0	0.673	139.7	0.881	32.3	0.348	57.8	0.362	-170.5

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

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.947	-27.5	3.595	161.1	0.050	75.7	0.977	-9.4
0.2	0.923	-50.7	3.263	146.4	0.091	61.1	0.927	-17.4
0.3	0.883	-71.6	2.913	133.0	0.120	49.2	0.866	-23.7
0.4	0.851	-88.4	2.534	121.7	0.139	40.1	0.810	-28.5
0.5	0.829	-102.3	2.232	112.4	0.151	32.9	0.764	-32.2
0.6	0.810	-113.4	1.973	104.6	0.158	27.2	0.728	-35.2
0.7	0.795	-122.7	1.757	98.1	0.161	22.6	0.703	-37.8
0.8	0.787	-130.2	1.580	92.3	0.161	18.9	0.684	-40.2
0.9	0.779	-136.7	1.432	87.0	0.161	15.8	0.671	-42.5
1.0	0.774	-142.3	1.310	82.3	0.158	13.2	0.660	-44.8
1.1	0.772	-147.1	1.213	78.2	0.155	11.2	0.653	-47.1
1.2	0.771	-151.2	1.111	74.3	0.151	9.6	0.646	-49.3
1.3	0.772	-155.3	1.040	70.7	0.147	8.2	0.642	-51.7
1.4	0.770	-158.5	0.973	67.5	0.142	7.1	0.641	-54.1
1.5	0.775	-161.5	0.914	64.2	0.136	6.7	0.639	-56.5
1.6	0.777	-164.2	0.863	61.4	0.131	6.7	0.638	-58.9
1.7	0.779	-166.8	0.821	58.7	0.125	6.9	0.638	-61.4
1.8	0.777	-169.4	0.775	56.3	0.119	7.8	0.639	-63.9
1.9	0.781	-171.7	0.740	53.5	0.113	8.8	0.640	-66.3
2.0	0.785	-173.9	0.715	51.5	0.106	10.6	0.643	-68.9
2.1	0.784	-175.7	0.685	49.9	0.100	12.7	0.646	-71.5
2.2	0.787	-177.6	0.652	48.5	0.095	15.6	0.647	-74.2
2.3	0.788	-179.3	0.622	47.0	0.090	19.2	0.650	-76.7
2.4	0.789	-178.9	0.596	45.2	0.087	23.3	0.652	-79.2
2.5	0.790	-176.9	0.571	44.1	0.084	28.5	0.656	-81.9
2.6	0.790	-175.3	0.551	42.9	0.082	34.3	0.658	-84.7
2.7	0.791	-173.7	0.526	42.0	0.082	40.2	0.664	-87.2
2.8	0.791	-172.1	0.503	41.0	0.085	46.3	0.671	-89.8
2.9	0.790	-170.4	0.484	39.1	0.089	52.3	0.675	-91.9
3.0	0.794	-168.4	0.477	38.2	0.094	58.9	0.676	-94.5
4.0	0.794	-154.1	0.375	38.5	0.187	78.8	0.708	-117.3
5.0	0.774	-142.2	0.363	46.6	0.300	74.7	0.718	-137.4

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

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.868	-41.3	9.680	154.0	0.046	68.9	0.928	-18.9
0.2	0.815	-73.6	8.033	135.8	0.076	52.4	0.794	-32.6
0.3	0.776	-97.6	6.540	122.4	0.093	41.6	0.671	-41.3
0.4	0.740	-114.4	5.369	112.4	0.101	34.5	0.583	-46.6
0.5	0.725	-126.8	4.514	104.7	0.106	30.2	0.521	-49.9
0.6	0.713	-136.5	3.886	98.8	0.108	27.4	0.478	-52.2
0.7	0.708	-143.8	3.390	94.0	0.109	25.7	0.449	-54.1
0.8	0.704	-149.6	3.004	89.8	0.109	24.8	0.426	-55.9
0.9	0.700	-154.5	2.688	86.1	0.109	24.3	0.413	-57.4
1.0	0.698	-158.6	2.442	82.7	0.109	24.3	0.401	-59.0
1.1	0.698	-162.1	2.228	79.6	0.108	24.7	0.394	-60.8
1.2	0.699	-165.2	2.043	76.7	0.108	25.5	0.389	-62.3
1.3	0.700	-168.0	1.902	74.0	0.106	26.6	0.385	-64.3
1.4	0.700	-170.4	1.769	71.5	0.106	27.7	0.385	-66.0
1.5	0.704	-172.7	1.666	69.0	0.106	29.3	0.385	-67.9
1.6	0.706	-174.5	1.571	66.7	0.105	31.3	0.384	-69.9
1.7	0.710	-176.4	1.484	64.6	0.105	33.3	0.386	-72.0
1.8	0.708	-178.2	1.405	62.5	0.105	35.5	0.389	-73.9
1.9	0.712	-179.9	1.342	60.2	0.106	37.8	0.391	-76.1
2.0	0.715	-178.3	1.288	58.3	0.107	40.5	0.393	-78.3
2.1	0.718	-177.0	1.235	56.7	0.107	42.8	0.397	-80.5
2.2	0.719	-175.6	1.180	55.4	0.109	45.1	0.402	-82.7
2.3	0.719	-174.1	1.137	53.8	0.111	47.4	0.407	-84.9
2.4	0.719	-172.7	1.085	52.0	0.114	49.8	0.411	-87.1
2.5	0.722	-171.3	1.042	50.7	0.118	52.2	0.416	-89.4
2.6	0.724	-170.1	1.009	49.3	0.121	54.3	0.423	-91.9
2.7	0.723	-168.8	0.969	48.2	0.125	56.3	0.430	-94.0
2.8	0.724	-167.7	0.932	46.7	0.130	58.2	0.437	-96.2
2.9	0.722	-166.3	0.895	44.5	0.137	59.9	0.442	-98.0
3.0	0.726	-164.5	0.879	43.0	0.143	62.6	0.448	-100.3
4.0	0.735	-152.8	0.682	33.5	0.214	70.2	0.509	-119.2
5.0	0.728	-142.4	0.565	31.7	0.305	68.7	0.556	-137.1

$V_{CE} = 2\text{ V}$, $I_C = 5\text{ mA}$, $Z_0 = 50\ \Omega$

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.797	-54.6	14.377	148.6	0.043	65.2	0.875	-26.9
0.2	0.752	-89.6	11.082	128.6	0.065	47.9	0.691	-44.2
0.3	0.715	-113.7	8.583	115.8	0.076	38.9	0.550	-53.9
0.4	0.695	-129.5	6.859	106.9	0.081	34.4	0.460	-59.7
0.5	0.685	-140.0	5.651	100.5	0.085	32.0	0.400	-63.3
0.6	0.679	-148.1	4.811	95.4	0.086	31.5	0.359	-66.0
0.7	0.675	-154.1	4.170	91.5	0.088	31.5	0.332	-68.0
0.8	0.674	-158.7	3.671	88.0	0.089	32.2	0.312	-69.8
0.9	0.672	-163.0	3.283	84.8	0.091	33.0	0.299	-71.2
1.0	0.673	-166.3	2.969	81.9	0.092	34.4	0.290	-72.8
1.1	0.674	-169.1	2.708	79.4	0.094	35.8	0.284	-74.3
1.2	0.674	-171.7	2.480	76.9	0.095	37.5	0.279	-75.8
1.3	0.676	-174.1	2.306	74.5	0.097	39.0	0.277	-77.5
1.4	0.677	-176.1	2.144	72.3	0.099	40.7	0.277	-79.0
1.5	0.680	-177.9	2.019	70.1	0.101	42.7	0.277	-80.7
1.6	0.682	-179.5	1.899	68.0	0.103	44.6	0.277	-82.6
1.7	0.683	178.8	1.802	66.1	0.106	46.4	0.279	-84.2
1.8	0.683	177.3	1.705	64.3	0.109	48.2	0.282	-86.0
1.9	0.686	176.0	1.620	62.3	0.112	50.1	0.284	-88.0
2.0	0.688	174.6	1.556	60.3	0.116	51.8	0.288	-89.8
2.1	0.692	173.2	1.494	58.9	0.119	53.4	0.293	-91.8
2.2	0.692	172.1	1.430	57.7	0.122	54.8	0.297	-93.8
2.3	0.693	171.0	1.377	56.1	0.127	56.2	0.302	-95.6
2.4	0.692	169.7	1.320	54.5	0.132	57.3	0.307	-97.6
2.5	0.695	168.5	1.268	53.2	0.136	58.7	0.313	-99.6
2.6	0.695	167.2	1.227	51.9	0.141	59.8	0.319	-101.7
2.7	0.695	166.3	1.180	50.9	0.146	60.7	0.327	-103.4
2.8	0.697	165.2	1.136	49.5	0.152	61.4	0.335	-105.3
2.9	0.695	163.9	1.092	47.4	0.160	62.2	0.341	-106.7
3.0	0.697	162.4	1.072	45.8	0.166	63.9	0.348	-108.7
4.0	0.705	151.8	0.841	34.9	0.231	67.1	0.413	-124.3
5.0	0.704	142.3	0.692	30.2	0.311	65.5	0.469	-139.8

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

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.732	-63.6	18.111	143.9	0.040	61.8	0.830	-33.3
0.2	0.701	-102.2	13.140	123.7	0.057	45.7	0.616	-53.0
0.3	0.685	-124.8	9.840	111.6	0.065	38.6	0.474	-63.8
0.4	0.670	-138.9	7.709	103.6	0.069	35.7	0.388	-70.5
0.5	0.664	-148.3	6.307	97.9	0.072	35.1	0.333	-74.8
0.6	0.662	-155.2	5.335	93.5	0.075	35.8	0.297	-77.9
0.7	0.659	-160.2	4.620	89.9	0.077	36.9	0.273	-80.4
0.8	0.661	-164.4	4.062	86.9	0.080	38.5	0.255	-82.7
0.9	0.660	-167.9	3.624	84.1	0.082	40.0	0.244	-84.5
1.0	0.661	-170.8	3.276	81.5	0.085	41.8	0.236	-86.1
1.1	0.660	-173.3	2.987	79.2	0.088	43.7	0.230	-87.9
1.2	0.662	-175.5	2.737	76.9	0.091	45.4	0.227	-89.3
1.3	0.665	-177.7	2.543	74.7	0.094	47.2	0.225	-90.9
1.4	0.665	-179.3	2.360	72.7	0.098	48.8	0.224	-92.4
1.5	0.668	179.1	2.222	70.6	0.101	50.3	0.225	-93.9
1.6	0.671	177.5	2.092	68.7	0.105	52.1	0.226	-95.4
1.7	0.672	176.3	1.981	66.9	0.110	53.6	0.228	-97.2
1.8	0.671	174.9	1.876	65.2	0.114	55.0	0.231	-98.5
1.9	0.676	173.5	1.785	63.4	0.118	56.1	0.234	-100.1
2.0	0.676	172.2	1.716	61.6	0.123	57.6	0.237	-101.9
2.1	0.675	171.0	1.644	60.2	0.127	58.5	0.242	-103.6
2.2	0.678	169.9	1.574	58.9	0.131	59.4	0.247	-105.2
2.3	0.678	169.0	1.515	57.5	0.137	60.2	0.252	-106.7
2.4	0.679	167.8	1.456	55.9	0.142	60.9	0.257	-108.4
2.5	0.680	166.7	1.397	54.7	0.148	61.8	0.263	-110.1
2.6	0.682	165.5	1.352	53.4	0.153	62.3	0.269	-111.7
2.7	0.681	164.7	1.304	52.4	0.158	62.8	0.276	-113.1
2.8	0.682	163.5	1.257	51.1	0.164	63.1	0.284	-114.8
2.9	0.680	162.5	1.208	49.0	0.172	63.4	0.290	-115.7
3.0	0.684	161.0	1.186	47.5	0.179	64.6	0.297	-117.3
4.0	0.689	151.2	0.934	36.3	0.242	65.7	0.360	-129.8
5.0	0.688	142.1	0.772	30.3	0.316	63.6	0.418	-143.3

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

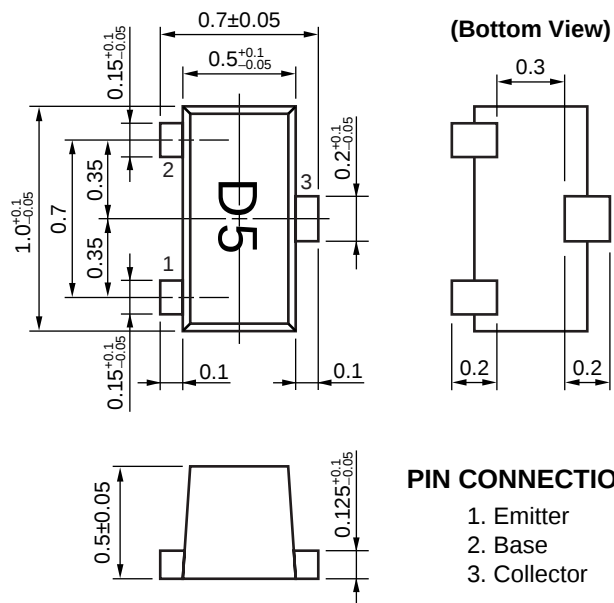
Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.671	-76.4	22.301	138.6	0.035	57.2	0.771	-41.7
0.2	0.663	-115.9	15.174	118.4	0.048	44.3	0.536	-63.8
0.3	0.658	-135.9	11.031	107.4	0.054	39.4	0.402	-76.0
0.4	0.654	-148.3	8.529	100.6	0.058	38.9	0.327	-84.0
0.5	0.650	-155.8	6.924	95.6	0.062	40.2	0.281	-89.6
0.6	0.652	-161.8	5.842	91.7	0.065	42.1	0.250	-94.0
0.7	0.651	-166.2	5.038	88.5	0.069	43.9	0.231	-97.3
0.8	0.652	-169.6	4.416	85.7	0.072	46.0	0.217	-100.1
0.9	0.651	-172.6	3.943	83.3	0.076	48.1	0.208	-102.5
1.0	0.652	-175.1	3.558	81.0	0.080	50.1	0.201	-104.6
1.1	0.654	-177.2	3.246	78.9	0.085	51.8	0.197	-106.4
1.2	0.654	-179.2	2.972	76.8	0.089	53.6	0.194	-108.1
1.3	0.655	179.1	2.759	74.9	0.094	54.9	0.193	-109.6
1.4	0.656	177.4	2.564	73.0	0.099	56.1	0.193	-110.9
1.5	0.658	176.2	2.415	71.0	0.104	57.4	0.193	-112.2
1.6	0.661	174.8	2.268	69.3	0.109	58.6	0.195	-113.6
1.7	0.662	173.8	2.153	67.6	0.114	59.7	0.197	-114.9
1.8	0.661	172.4	2.034	66.0	0.119	60.6	0.199	-116.1
1.9	0.663	171.2	1.936	64.2	0.124	61.3	0.202	-117.3
2.0	0.665	170.1	1.861	62.6	0.130	62.2	0.206	-118.5
2.1	0.666	169.0	1.789	61.2	0.135	62.9	0.210	-119.6
2.2	0.668	167.9	1.710	60.1	0.140	63.2	0.214	-121.0
2.3	0.667	167.0	1.646	58.7	0.146	63.5	0.219	-122.2
2.4	0.666	166.1	1.581	57.3	0.152	63.9	0.224	-123.3
2.5	0.669	164.9	1.521	56.0	0.158	64.3	0.229	-124.4
2.6	0.670	163.9	1.472	54.8	0.164	64.6	0.235	-125.6
2.7	0.669	162.9	1.418	53.9	0.170	64.6	0.242	-126.5
2.8	0.670	162.1	1.367	52.5	0.176	64.6	0.250	-127.7
2.9	0.667	161.1	1.313	50.7	0.185	64.5	0.255	-128.1
3.0	0.670	159.7	1.291	49.1	0.191	65.3	0.261	-129.2
4.0	0.674	150.3	1.024	38.0	0.253	64.6	0.319	-137.9
5.0	0.673	141.8	0.851	31.2	0.323	61.9	0.373	-148.8

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

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.579	-107.1	29.715	128.4	0.027	52.4	0.641	-59.4
0.2	0.616	-139.7	18.117	109.9	0.034	45.9	0.415	-86.3
0.3	0.634	-154.1	12.676	101.3	0.039	46.9	0.316	-101.7
0.4	0.638	-162.4	9.648	96.0	0.044	49.3	0.268	-112.4
0.5	0.641	-167.8	7.763	92.0	0.049	52.6	0.241	-119.8
0.6	0.640	-171.5	6.516	88.9	0.055	55.5	0.225	-125.5
0.7	0.644	-174.7	5.608	86.5	0.060	57.4	0.215	-129.8
0.8	0.644	-177.1	4.911	84.3	0.066	59.7	0.207	-133.2
0.9	0.643	-179.3	4.378	82.2	0.072	61.2	0.203	-135.9
1.0	0.644	178.9	3.943	80.3	0.078	62.6	0.200	-138.0
1.1	0.645	177.2	3.596	78.4	0.084	63.8	0.198	-139.9
1.2	0.645	175.7	3.300	76.7	0.091	64.6	0.197	-141.5
1.3	0.648	174.2	3.061	75.0	0.097	65.5	0.196	-142.7
1.4	0.647	173.1	2.844	73.4	0.103	65.9	0.196	-143.9
1.5	0.650	172.0	2.679	71.6	0.109	66.5	0.197	-144.8
1.6	0.651	170.8	2.519	70.0	0.116	66.9	0.198	-145.7
1.7	0.653	169.8	2.385	68.6	0.122	67.3	0.200	-146.6
1.8	0.651	168.9	2.257	67.1	0.129	67.7	0.201	-147.3
1.9	0.653	167.7	2.143	65.5	0.135	67.7	0.203	-147.9
2.0	0.656	166.8	2.061	63.8	0.142	67.9	0.206	-148.5
2.1	0.655	166.0	1.979	62.7	0.147	68.0	0.208	-149.1
2.2	0.657	165.0	1.891	61.7	0.154	67.8	0.212	-149.7
2.3	0.657	164.2	1.824	60.4	0.161	67.7	0.216	-150.2
2.4	0.655	163.3	1.756	59.0	0.167	67.4	0.219	-150.5
2.5	0.656	162.4	1.684	57.9	0.174	67.5	0.223	-150.9
2.6	0.659	161.3	1.634	56.8	0.180	67.2	0.227	-151.5
2.7	0.657	160.5	1.577	55.9	0.186	67.0	0.232	-151.8
2.8	0.658	159.6	1.521	54.8	0.192	66.5	0.238	-151.9
2.9	0.655	158.9	1.462	52.9	0.201	66.0	0.241	-151.8
3.0	0.657	157.6	1.433	51.4	0.209	66.4	0.245	-152.0
4.0	0.657	149.0	1.145	40.5	0.269	63.4	0.285	-154.9
5.0	0.657	141.0	0.961	33.0	0.335	59.8	0.328	-161.4

PACKAGE DIMENSIONS

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



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