

DATA SHEET

NEC

NPN SILICON RF TRANSISTOR 2SC5746

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
2SC5746	50 pcs (Non reel)	• 8 mm wide embossed taping
2SC5746-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}	15	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)

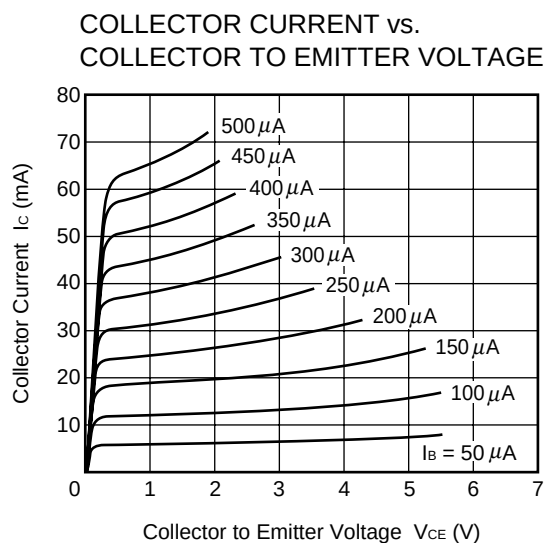
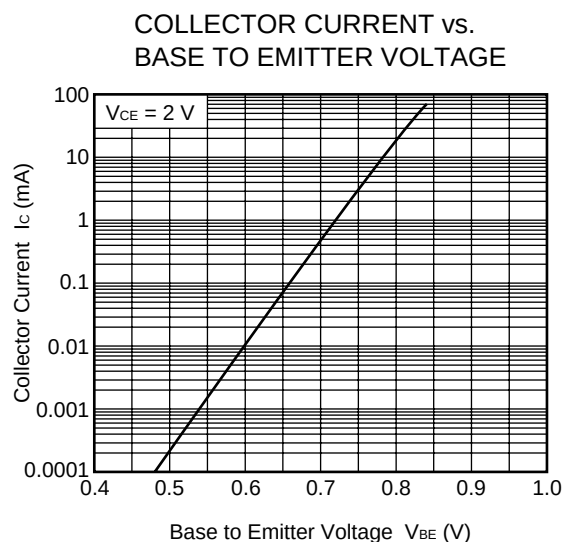
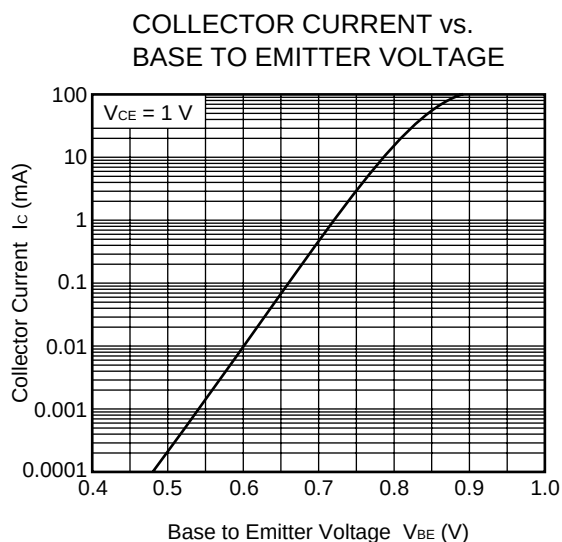
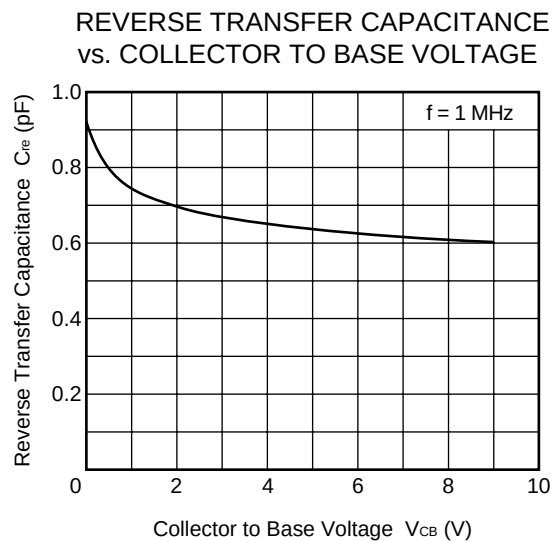
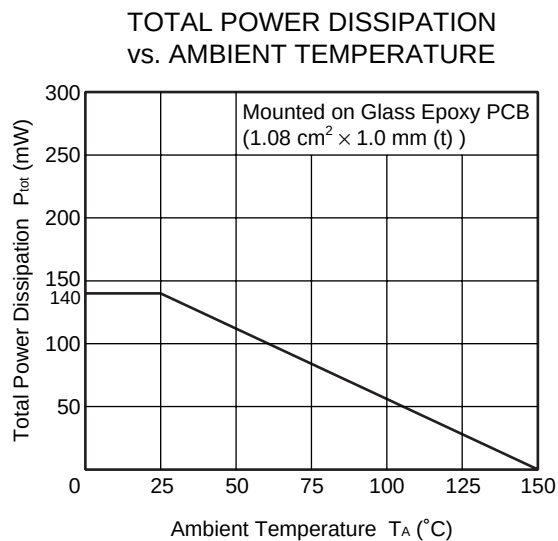
Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
DC Characteristics						
Collector Cut-off Current	I _{CBO}	V _{CB} = 5 V, I _E = 0 mA	–	–	100	nA
Emitter Cut-off Current	I _{EBO}	V _{EB} = 1 V, I _C = 0 mA	–	–	100	nA
DC Current Gain	h _{FE} ^{Note 1}	V _{CE} = 1 V, I _C = 10 mA	100	–	145	–
RF Characteristics						
Gain Bandwidth Product	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	3.0	4.5	–	dB
Noise Figure	NF	V _{CE} = 1 V, I _C = 10 mA, f = 2 GHz, Z _S = Z _{opt}	–	2.0	3.0	dB
Reverse Transfer Capacitance	C _{re} ^{Note 2}	V _{CB} = 0.5 V, I _E = 0 mA, f = 1 MHz	0.65	0.75	0.85	pF

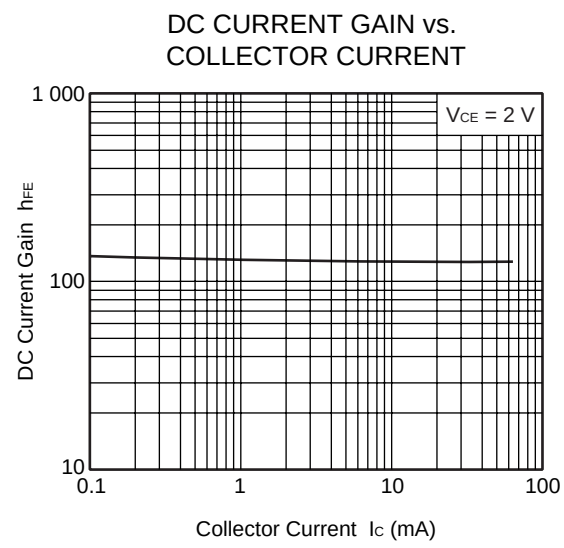
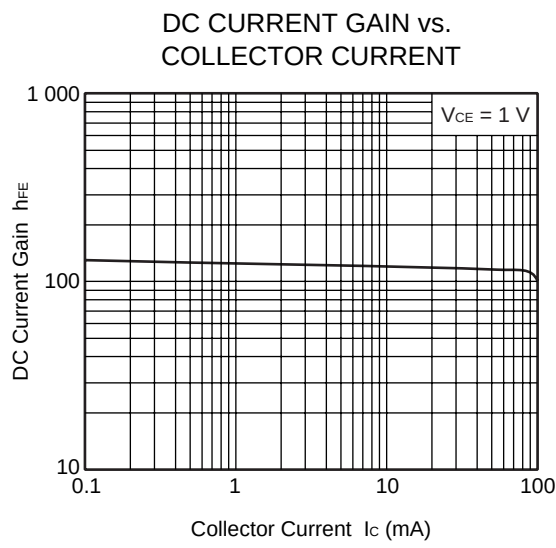
- Notes** **1.** Pulse measurement: PW ≤ 350 μs, Duty Cycle ≤ 2%
2. Collector to base capacitance when the emitter grounded

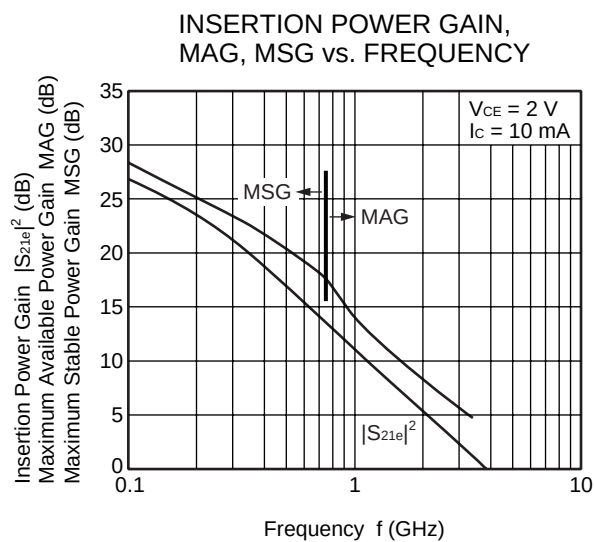
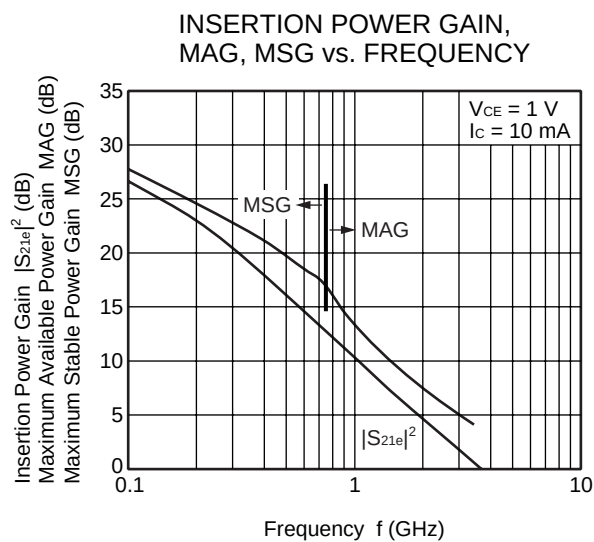
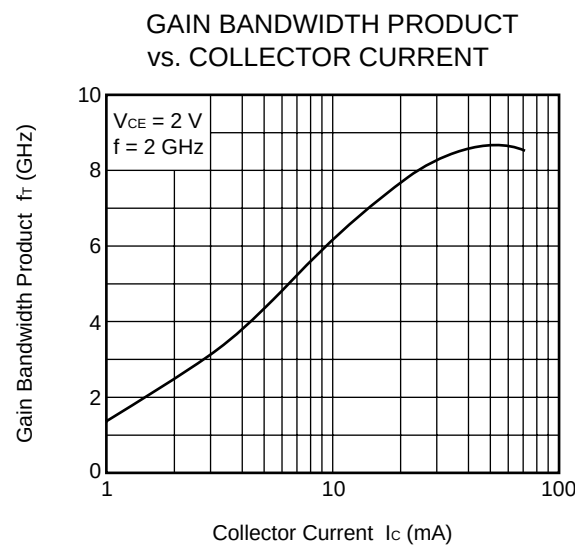
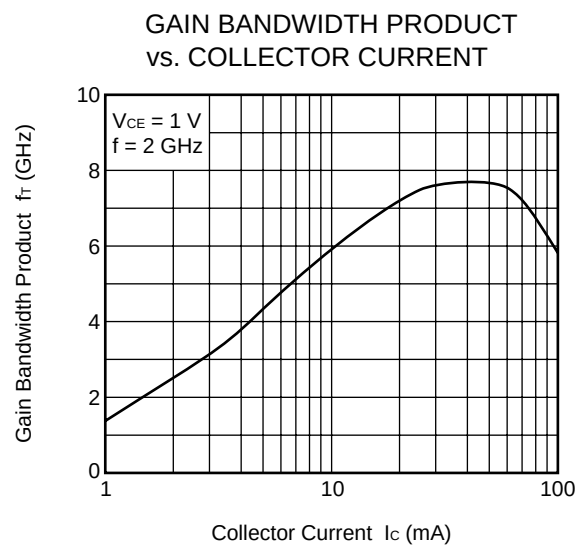
h_{FE} CLASSIFICATION

Rank	FB
Marking	Y5
h _{FE} Value	100 to 145

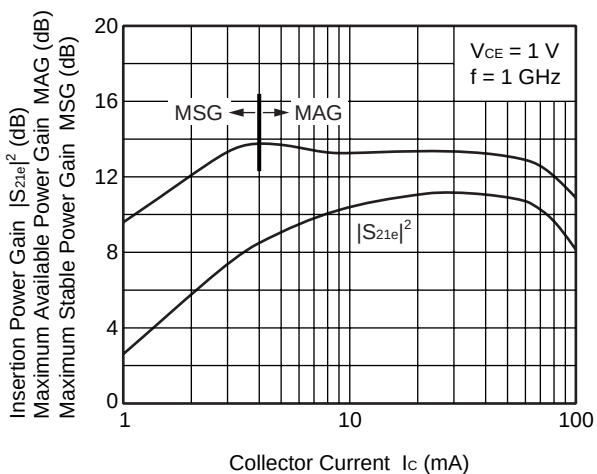
TYPICAL CHARACTERISTICS (Unless otherwise specified, $T_A = +25^\circ\text{C}$)



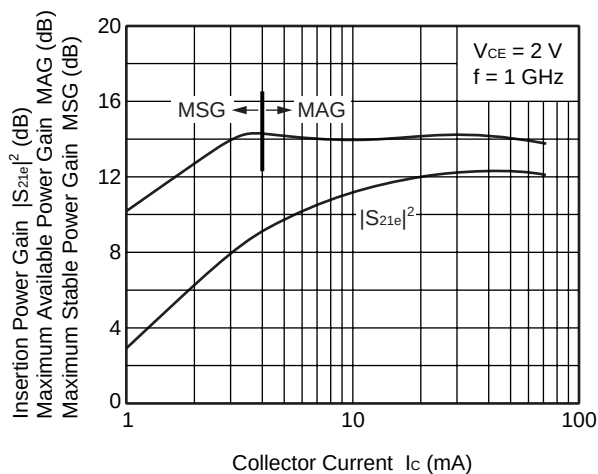




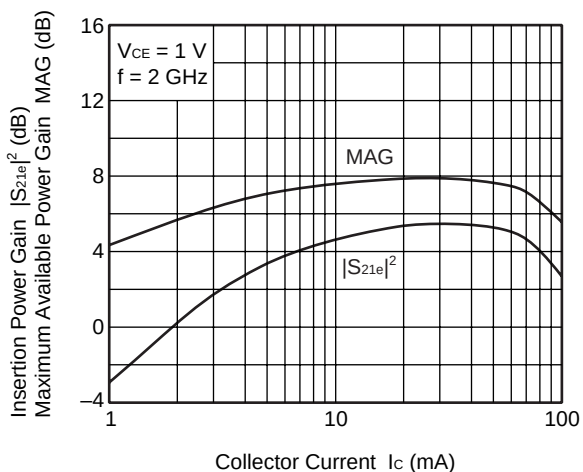
INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT



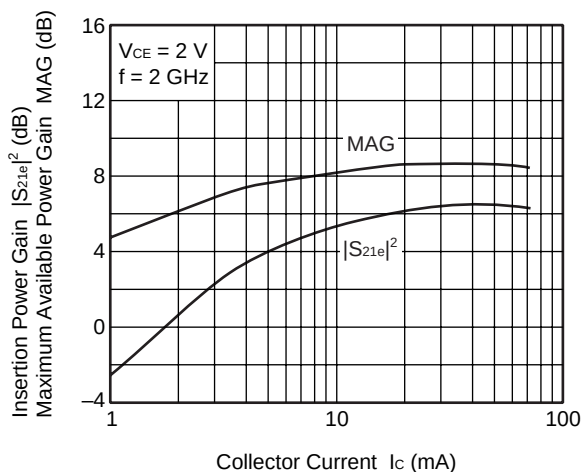
INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT



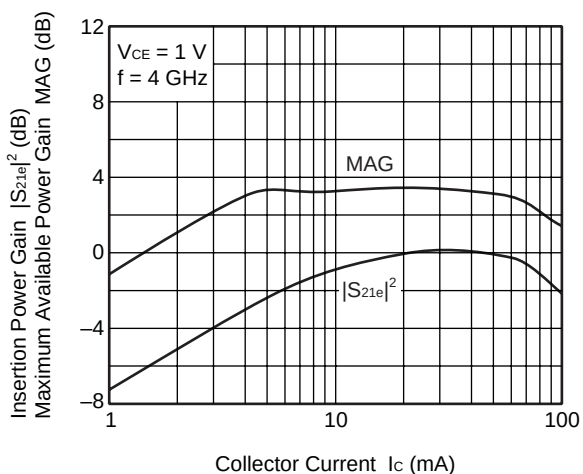
INSERTION POWER GAIN, MAG
vs. COLLECTOR CURRENT



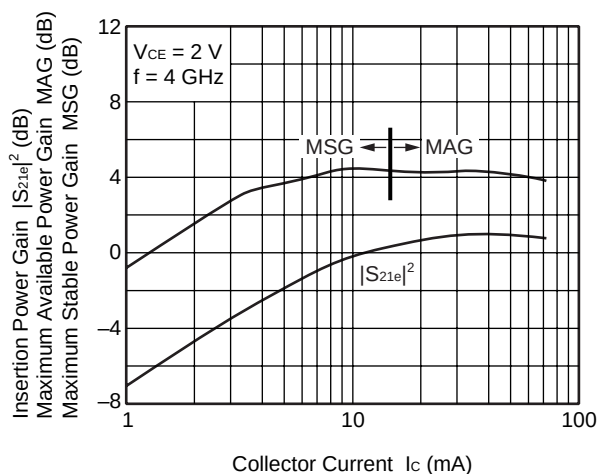
INSERTION POWER GAIN, MAG
vs. COLLECTOR CURRENT



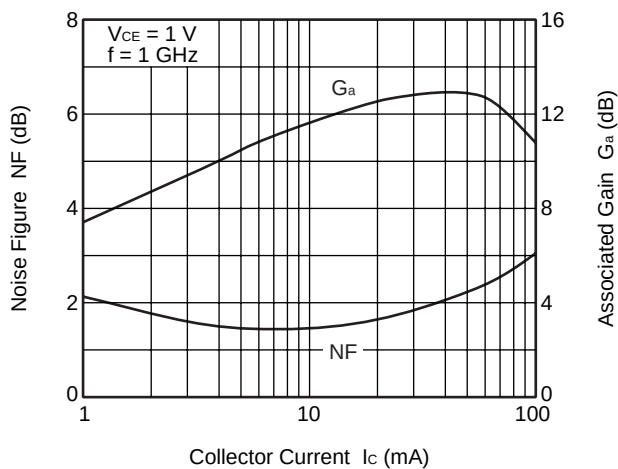
INSERTION POWER GAIN, MAG
vs. COLLECTOR CURRENT



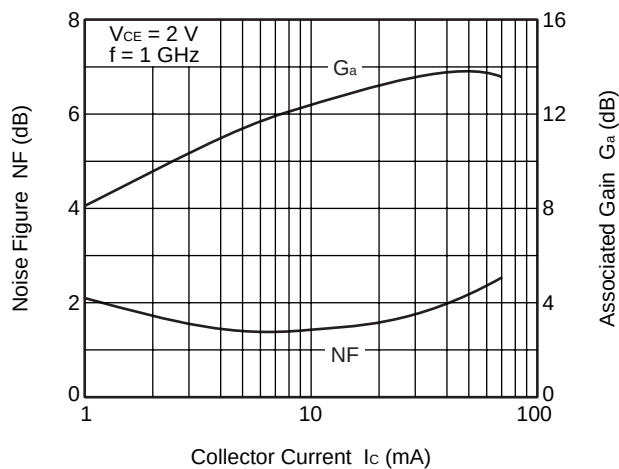
INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT



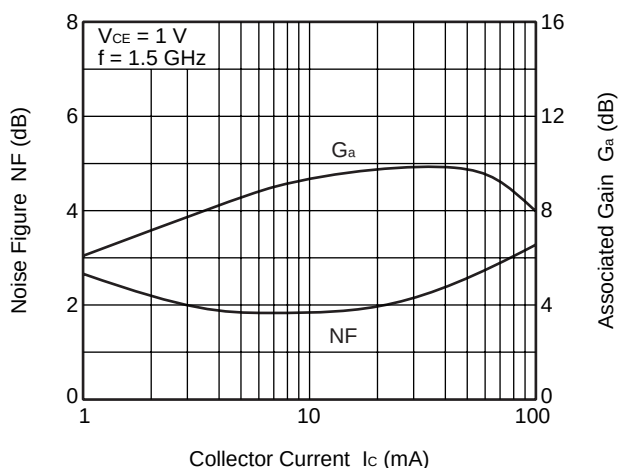
NOISE FIGURE, ASSOCIATED GAIN
vs. COLLECTOR CURRENT



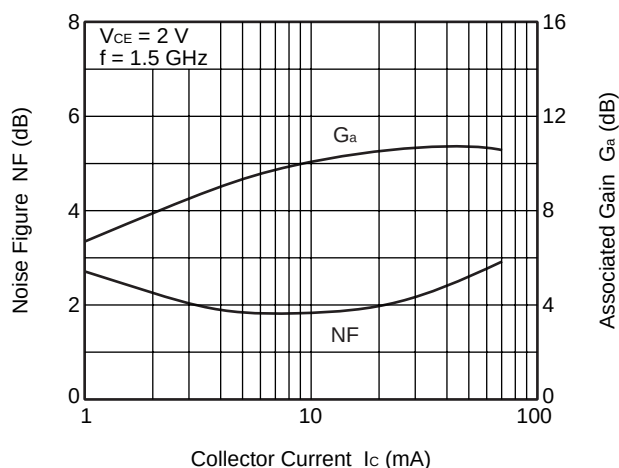
NOISE FIGURE, ASSOCIATED GAIN
vs. COLLECTOR CURRENT



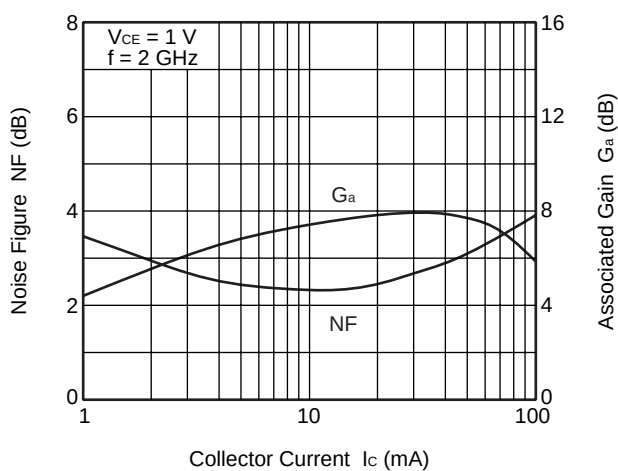
NOISE FIGURE, ASSOCIATED GAIN
vs. COLLECTOR CURRENT



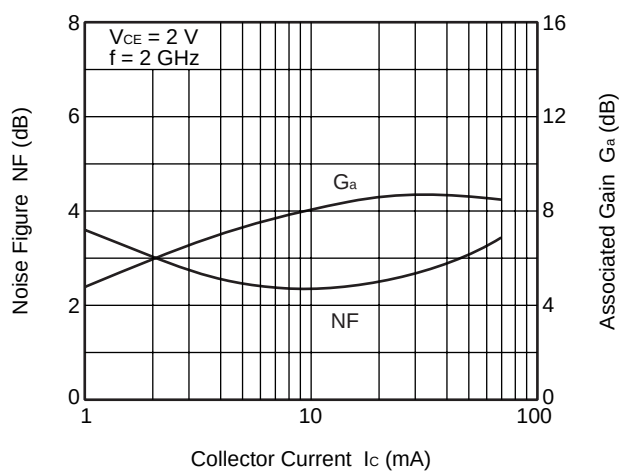
NOISE FIGURE, ASSOCIATED GAIN
vs. COLLECTOR CURRENT



NOISE FIGURE, ASSOCIATED GAIN
vs. COLLECTOR CURRENT



NOISE FIGURE, ASSOCIATED GAIN
vs. COLLECTOR CURRENT



Remark The graphs indicate nominal characteristics.

S-PARAMETERS

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

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.957	-27.9	3.525	161.4	0.050	73.6	0.979	-9.7
0.2	0.919	-52.0	3.284	144.8	0.094	59.8	0.922	-18.1
0.3	0.873	-73.9	2.934	130.7	0.123	47.9	0.858	-24.8
0.4	0.834	-92.2	2.580	119.0	0.142	38.4	0.799	-29.8
0.5	0.801	-107.3	2.280	108.3	0.153	30.8	0.747	-33.8
0.6	0.779	-120.2	2.015	99.9	0.158	24.9	0.708	-37.2
0.7	0.762	-131.1	1.808	92.4	0.160	19.8	0.676	-40.2
0.8	0.748	-140.4	1.630	85.9	0.157	16.0	0.653	-43.3
0.9	0.747	-148.1	1.482	79.8	0.154	12.8	0.636	-46.4
1.0	0.741	-155.1	1.353	74.5	0.148	10.5	0.623	-49.5
1.1	0.741	-161.4	1.248	69.7	0.142	8.8	0.613	-53.0
1.2	0.740	-166.6	1.148	65.2	0.134	7.9	0.604	-56.5
1.3	0.742	-171.2	1.069	61.1	0.126	7.8	0.600	-60.2
1.4	0.745	-175.9	1.003	57.1	0.117	8.5	0.596	-64.0
1.5	0.751	-179.8	0.941	53.6	0.108	10.7	0.596	-67.8
1.6	0.756	176.2	0.887	50.3	0.101	13.5	0.596	-71.7
1.7	0.754	172.9	0.834	47.5	0.094	18.5	0.598	-75.7
1.8	0.760	169.7	0.793	44.8	0.088	24.7	0.600	-79.8
1.9	0.764	166.5	0.748	42.2	0.086	32.1	0.603	-83.7
2.0	0.766	163.4	0.714	40.4	0.086	40.5	0.607	-87.5
2.1	0.771	160.6	0.676	37.9	0.090	48.3	0.612	-91.6
2.2	0.777	157.9	0.647	36.4	0.096	55.4	0.616	-95.7
2.3	0.778	155.2	0.612	34.8	0.106	61.1	0.623	-99.4
2.4	0.782	152.6	0.586	33.4	0.117	65.4	0.628	-103.0
2.5	0.788	150.0	0.563	32.4	0.130	68.8	0.634	-106.8
2.6	0.786	147.4	0.543	31.7	0.144	70.8	0.642	-110.4
2.7	0.783	145.3	0.523	30.9	0.159	72.0	0.644	-113.7
2.8	0.785	142.9	0.504	31.1	0.174	72.6	0.651	-117.0
2.9	0.780	140.1	0.488	31.1	0.190	72.5	0.649	-120.3
3.0	0.785	137.6	0.474	30.8	0.207	72.2	0.651	-123.9
4.0	0.786	118.2	0.432	31.3	0.365	58.9	0.663	-158.2
5.0	0.776	107.1	0.472	26.7	0.464	42.5	0.674	167.3

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

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.861	-42.3	9.382	153.3	0.047	67.5	0.923	-19.4
0.2	0.796	-74.7	7.891	133.3	0.078	51.9	0.778	-33.3
0.3	0.737	-100.0	6.413	118.8	0.094	41.6	0.653	-42.0
0.4	0.699	-118.3	5.258	108.6	0.103	35.2	0.559	-47.2
0.5	0.673	-132.2	4.423	99.9	0.107	31.1	0.493	-50.8
0.6	0.658	-143.2	3.778	93.4	0.109	29.2	0.446	-53.5
0.7	0.650	-151.9	3.308	87.7	0.110	28.0	0.412	-55.9
0.8	0.647	-159.2	2.928	82.8	0.110	27.8	0.387	-58.3
0.9	0.648	-165.2	2.629	78.2	0.110	28.2	0.370	-60.8
1.0	0.644	-170.4	2.378	74.4	0.110	29.3	0.356	-63.5
1.1	0.647	-175.3	2.179	70.6	0.109	30.9	0.347	-66.5
1.2	0.651	-179.6	2.000	67.0	0.110	32.8	0.339	-69.7
1.3	0.652	177.2	1.852	63.8	0.110	35.1	0.336	-73.2
1.4	0.657	173.5	1.730	60.6	0.111	37.6	0.334	-76.6
1.5	0.663	170.6	1.623	57.7	0.113	40.5	0.334	-80.3
1.6	0.670	167.5	1.531	54.8	0.116	43.2	0.336	-83.9
1.7	0.671	165.1	1.443	52.2	0.119	46.1	0.340	-87.8
1.8	0.678	162.5	1.369	49.6	0.124	48.7	0.343	-91.5
1.9	0.681	159.7	1.297	47.2	0.129	51.2	0.349	-95.0
2.0	0.684	157.8	1.242	45.2	0.135	53.6	0.355	-98.6
2.1	0.691	155.3	1.173	42.6	0.142	55.6	0.363	-102.1
2.2	0.695	153.3	1.130	40.8	0.149	57.3	0.370	-105.7
2.3	0.699	151.2	1.082	38.6	0.158	58.9	0.378	-109.0
2.4	0.701	148.9	1.035	36.7	0.168	60.0	0.388	-112.1
2.5	0.707	146.9	0.996	35.0	0.178	61.1	0.397	-115.3
2.6	0.709	144.8	0.961	33.4	0.186	61.7	0.407	-118.2
2.7	0.709	143.0	0.925	31.8	0.197	62.0	0.414	-121.1
2.8	0.711	141.0	0.893	30.7	0.208	62.3	0.423	-123.8
2.9	0.707	138.7	0.860	29.4	0.219	62.1	0.427	-126.7
3.0	0.714	136.6	0.830	27.7	0.231	62.0	0.433	-129.6
4.0	0.746	119.6	0.636	18.0	0.353	53.8	0.494	-160.7
5.0	0.766	108.9	0.561	13.1	0.444	41.1	0.554	166.4

$V_{CE} = 1 \text{ V}$, $I_C = 5 \text{ mA}$, $Z_0 = 50 \Omega$

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.789	-53.2	13.948	146.9	0.043	62.7	0.865	-27.6
0.2	0.711	-91.1	10.810	125.5	0.067	48.3	0.664	-44.8
0.3	0.658	-116.3	8.283	111.8	0.077	40.4	0.522	-54.1
0.4	0.632	-133.2	6.579	102.8	0.083	37.1	0.429	-59.6
0.5	0.614	-145.4	5.422	95.5	0.087	35.8	0.366	-63.4
0.6	0.610	-154.8	4.585	89.9	0.090	36.3	0.323	-66.3
0.7	0.606	-162.2	3.981	85.0	0.093	37.0	0.294	-69.1
0.8	0.607	-168.4	3.508	80.9	0.096	38.5	0.272	-71.8
0.9	0.609	-173.3	3.140	77.0	0.099	39.9	0.256	-74.9
1.0	0.611	-177.9	2.832	73.6	0.102	41.7	0.245	-78.0
1.1	0.614	178.1	2.592	70.3	0.106	43.5	0.237	-81.3
1.2	0.619	174.5	2.373	67.2	0.110	45.4	0.232	-85.0
1.3	0.622	171.7	2.201	64.5	0.115	47.3	0.230	-88.6
1.4	0.627	168.7	2.054	61.5	0.119	48.9	0.230	-92.3
1.5	0.632	166.1	1.925	58.9	0.125	50.7	0.232	-96.1
1.6	0.639	163.3	1.811	56.1	0.130	52.0	0.236	-99.8
1.7	0.639	161.1	1.713	53.8	0.137	53.6	0.241	-103.5
1.8	0.645	158.9	1.621	51.5	0.143	54.8	0.245	-107.1
1.9	0.649	156.5	1.537	49.2	0.150	55.7	0.252	-110.2
2.0	0.650	154.7	1.477	47.2	0.157	56.9	0.259	-113.4
2.1	0.658	152.6	1.398	45.0	0.165	57.5	0.268	-116.4
2.2	0.662	150.7	1.344	43.0	0.173	58.0	0.276	-119.7
2.3	0.665	148.8	1.289	40.9	0.182	58.6	0.284	-122.3
2.4	0.669	146.9	1.237	39.0	0.191	58.8	0.294	-124.9
2.5	0.674	145.1	1.191	37.3	0.200	59.2	0.304	-127.4
2.6	0.675	143.1	1.150	35.6	0.208	59.2	0.314	-129.8
2.7	0.676	141.4	1.109	33.9	0.218	59.1	0.321	-132.1
2.8	0.678	139.7	1.073	32.7	0.228	59.0	0.330	-134.2
2.9	0.675	137.7	1.032	31.2	0.237	58.6	0.335	-136.7
3.0	0.681	135.5	0.999	29.3	0.248	58.2	0.342	-139.1
4.0	0.722	120.3	0.762	16.9	0.351	50.8	0.414	-166.9
5.0	0.753	109.8	0.639	9.2	0.433	39.7	0.490	162.9

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

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	-63.6	17.549	141.9	0.040	59.2	0.810	-34.4
0.2	0.656	-103.5	12.691	120.2	0.058	46.8	0.581	-53.5
0.3	0.609	-127.6	9.379	107.2	0.066	41.7	0.440	-63.5
0.4	0.600	-143.1	7.336	99.4	0.072	40.7	0.352	-69.7
0.5	0.588	-153.8	5.995	92.8	0.077	41.1	0.296	-74.3
0.6	0.587	-161.9	5.036	87.9	0.081	42.6	0.258	-78.1
0.7	0.586	-168.5	4.362	83.5	0.086	44.0	0.232	-81.8
0.8	0.587	-173.7	3.832	79.8	0.091	45.9	0.214	-85.3
0.9	0.592	-178.2	3.421	76.2	0.096	47.6	0.201	-89.3
1.0	0.594	178.0	3.090	73.2	0.101	49.1	0.192	-93.1
1.1	0.600	174.1	2.823	70.0	0.107	50.7	0.187	-97.0
1.2	0.602	171.2	2.583	67.3	0.113	52.1	0.184	-101.3
1.3	0.605	168.3	2.394	64.6	0.120	53.4	0.184	-105.1
1.4	0.613	165.8	2.231	61.9	0.126	54.4	0.186	-109.1
1.5	0.618	163.3	2.092	59.4	0.133	55.5	0.189	-112.7
1.6	0.623	160.8	1.968	56.9	0.140	56.1	0.194	-116.1
1.7	0.623	158.8	1.859	54.7	0.147	57.0	0.200	-119.6
1.8	0.630	156.9	1.764	52.5	0.155	57.5	0.206	-122.9
1.9	0.635	154.6	1.671	50.3	0.163	57.8	0.214	-125.6
2.0	0.635	152.7	1.604	48.5	0.170	58.3	0.221	-128.1
2.1	0.642	151.0	1.522	46.3	0.179	58.4	0.230	-130.7
2.2	0.646	149.0	1.463	44.4	0.187	58.5	0.238	-133.1
2.3	0.650	147.2	1.403	42.4	0.195	58.6	0.247	-135.2
2.4	0.653	145.4	1.349	40.5	0.205	58.6	0.256	-137.2
2.5	0.657	143.6	1.300	38.7	0.214	58.6	0.265	-139.1
2.6	0.658	141.9	1.258	37.1	0.222	58.2	0.274	-140.9
2.7	0.659	140.3	1.211	35.3	0.231	57.8	0.281	-142.9
2.8	0.660	138.7	1.172	34.2	0.240	57.6	0.289	-144.5
2.9	0.659	136.8	1.132	32.7	0.248	56.9	0.295	-146.5
3.0	0.664	134.8	1.095	30.7	0.259	56.5	0.301	-148.5
4.0	0.707	120.5	0.834	17.4	0.353	48.9	0.375	-173.2
5.0	0.745	110.3	0.696	8.0	0.428	38.5	0.454	158.9

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

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.646	-76.2	21.449	136.1	0.037	56.3	0.742	-42.7
0.2	0.600	-117.3	14.406	114.8	0.050	45.9	0.495	-63.6
0.3	0.580	-138.9	10.350	103.4	0.057	44.9	0.364	-74.8
0.4	0.572	-152.0	7.980	96.3	0.063	45.8	0.288	-82.4
0.5	0.567	-161.4	6.478	90.6	0.069	47.6	0.241	-88.5
0.6	0.568	-168.3	5.421	86.0	0.075	49.6	0.210	-94.0
0.7	0.568	-174.0	4.685	82.1	0.082	51.2	0.189	-99.3
0.8	0.572	-178.6	4.108	78.8	0.088	53.1	0.176	-104.1
0.9	0.579	177.7	3.671	75.5	0.096	54.4	0.168	-109.2
1.0	0.581	173.9	3.306	72.7	0.103	55.6	0.162	-114.0
1.1	0.586	170.8	3.020	69.9	0.110	56.6	0.161	-118.6
1.2	0.589	168.0	2.762	67.2	0.117	57.4	0.161	-123.0
1.3	0.593	165.5	2.559	64.8	0.125	58.1	0.163	-126.8
1.4	0.601	163.0	2.388	62.3	0.133	58.6	0.167	-130.3
1.5	0.605	160.9	2.236	60.0	0.141	59.2	0.172	-133.4
1.6	0.611	158.6	2.106	57.6	0.149	59.3	0.179	-136.3
1.7	0.612	156.9	1.990	55.6	0.157	59.5	0.186	-139.0
1.8	0.618	154.9	1.884	53.5	0.165	59.6	0.192	-141.5
1.9	0.622	152.8	1.789	51.4	0.174	59.5	0.199	-143.5
2.0	0.622	151.1	1.714	49.5	0.182	59.4	0.207	-145.4
2.1	0.629	149.0	1.628	47.5	0.190	59.2	0.215	-147.2
2.2	0.631	147.7	1.567	45.6	0.199	59.0	0.223	-149.0
2.3	0.634	145.9	1.503	43.6	0.208	58.6	0.231	-150.3
2.4	0.640	144.1	1.445	41.9	0.217	58.4	0.239	-151.5
2.5	0.643	142.5	1.395	40.1	0.226	58.0	0.247	-153.0
2.6	0.645	140.9	1.349	38.6	0.234	57.5	0.255	-154.2
2.7	0.644	139.2	1.301	36.8	0.242	56.9	0.261	-155.6
2.8	0.646	137.8	1.259	35.5	0.251	56.5	0.268	-156.7
2.9	0.644	136.0	1.217	34.0	0.259	55.7	0.274	-158.3
3.0	0.650	133.9	1.179	32.1	0.269	55.1	0.279	-159.9
4.0	0.692	120.5	0.903	18.3	0.355	47.0	0.350	179.0
5.0	0.737	110.7	0.751	8.0	0.424	37.2	0.430	153.6

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

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.523	-107.1	28.056	125.1	0.026	54.7	0.593	-60.7
0.2	0.539	-141.2	16.732	106.3	0.038	52.3	0.363	-85.6
0.3	0.546	-156.9	11.598	97.2	0.045	54.3	0.268	-100.5
0.4	0.544	-166.6	8.807	91.7	0.054	57.6	0.220	-111.9
0.5	0.549	-173.0	7.079	87.0	0.062	59.9	0.194	-121.3
0.6	0.552	-178.1	5.913	83.5	0.071	61.8	0.180	-129.4
0.7	0.557	177.7	5.093	80.2	0.080	62.7	0.173	-136.1
0.8	0.561	174.2	4.466	77.2	0.089	63.5	0.170	-141.9
0.9	0.565	171.0	3.979	74.4	0.099	63.8	0.171	-146.9
1.0	0.568	168.2	3.578	72.1	0.108	64.1	0.172	-151.3
1.1	0.575	165.5	3.269	69.5	0.117	64.2	0.176	-154.8
1.2	0.578	163.3	2.987	67.2	0.126	64.0	0.181	-158.0
1.3	0.583	161.0	2.770	65.0	0.136	63.9	0.186	-160.5
1.4	0.589	159.0	2.580	62.7	0.144	63.6	0.192	-162.7
1.5	0.594	157.2	2.415	60.6	0.154	63.5	0.198	-164.5
1.6	0.602	155.3	2.274	58.4	0.163	62.9	0.205	-166.1
1.7	0.599	153.5	2.149	56.4	0.172	62.5	0.212	-167.6
1.8	0.605	151.9	2.036	54.5	0.181	62.0	0.218	-169.1
1.9	0.611	150.1	1.934	52.7	0.190	61.2	0.225	-170.2
2.0	0.610	148.4	1.854	51.0	0.199	60.8	0.231	-171.2
2.1	0.617	146.7	1.760	49.1	0.208	60.0	0.237	-172.1
2.2	0.619	145.3	1.694	47.3	0.216	59.4	0.244	-173.0
2.3	0.623	143.6	1.624	45.4	0.226	58.9	0.250	-173.6
2.4	0.625	141.9	1.566	43.8	0.235	58.1	0.256	-174.1
2.5	0.628	140.4	1.509	42.0	0.244	57.5	0.262	-174.9
2.6	0.629	138.9	1.459	40.5	0.252	56.7	0.267	-175.6
2.7	0.627	137.5	1.410	38.9	0.261	55.8	0.271	-176.6
2.8	0.632	136.1	1.370	37.6	0.269	55.2	0.275	-177.1
2.9	0.627	134.2	1.324	36.1	0.276	54.1	0.279	-178.2
3.0	0.633	132.5	1.281	34.2	0.286	53.3	0.282	-179.3
4.0	0.677	120.2	0.992	20.1	0.363	44.3	0.343	164.6
5.0	0.723	111.1	0.823	8.8	0.421	34.9	0.416	143.4

$V_{CE} = 2\text{ V}$, $I_C = 1\text{ mA}$, $Z_0 = 50\ \Omega$

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.943	-26.9	3.564	162.2	0.044	75.2	0.983	-8.5
0.2	0.925	-50.1	3.320	146.4	0.082	61.5	0.932	-16.1
0.3	0.880	-71.2	2.990	132.7	0.109	49.6	0.874	-22.1
0.4	0.837	-89.4	2.642	121.3	0.127	40.5	0.819	-26.8
0.5	0.807	-104.7	2.351	110.9	0.138	32.6	0.773	-30.5
0.6	0.784	-117.5	2.090	102.4	0.143	26.8	0.736	-33.8
0.7	0.765	-128.4	1.876	94.9	0.144	21.8	0.706	-36.6
0.8	0.752	-138.1	1.695	88.5	0.142	18.0	0.684	-39.4
0.9	0.749	-146.1	1.542	82.4	0.139	14.8	0.667	-42.2
1.0	0.742	-153.1	1.411	77.3	0.134	12.7	0.654	-45.2
1.1	0.741	-159.6	1.301	72.5	0.128	11.2	0.643	-48.3
1.2	0.739	-165.1	1.199	67.9	0.121	10.4	0.634	-51.5
1.3	0.739	-169.9	1.115	63.9	0.113	10.6	0.629	-55.1
1.4	0.745	-174.7	1.046	60.0	0.105	11.6	0.625	-58.6
1.5	0.747	-178.8	0.981	56.4	0.097	14.1	0.623	-62.1
1.6	0.751	177.1	0.925	53.0	0.090	17.8	0.623	-65.8
1.7	0.751	173.9	0.872	50.3	0.084	23.5	0.623	-69.7
1.8	0.757	170.4	0.827	47.6	0.080	30.3	0.624	-73.5
1.9	0.762	167.0	0.779	44.9	0.079	38.4	0.627	-77.3
2.0	0.760	164.2	0.744	43.1	0.080	47.1	0.628	-81.2
2.1	0.768	161.2	0.703	40.7	0.085	54.9	0.632	-85.1
2.2	0.772	158.5	0.676	39.0	0.093	61.8	0.634	-89.0
2.3	0.775	155.8	0.641	37.4	0.103	67.3	0.639	-92.6
2.4	0.775	153.1	0.614	35.9	0.115	71.1	0.645	-96.2
2.5	0.779	150.4	0.589	34.8	0.128	74.0	0.649	-99.9
2.6	0.780	147.9	0.569	34.0	0.142	75.7	0.654	-103.5
2.7	0.778	145.5	0.545	33.3	0.157	76.5	0.657	-106.9
2.8	0.780	143.2	0.526	33.2	0.172	77.1	0.662	-110.1
2.9	0.774	140.6	0.509	33.1	0.188	76.6	0.659	-113.3
3.0	0.779	137.8	0.493	32.6	0.205	76.2	0.660	-116.8
4.0	0.780	118.3	0.443	32.8	0.365	62.2	0.665	-151.3
5.0	0.773	107.0	0.481	28.1	0.469	45.2	0.669	173.3

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

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.858	-39.4	9.561	154.6	0.041	69.0	0.933	-17.2
0.2	0.802	-71.0	8.172	135.3	0.070	53.7	0.802	-29.6
0.3	0.738	-95.4	6.722	121.1	0.085	43.6	0.684	-37.4
0.4	0.697	-113.9	5.548	110.6	0.093	37.3	0.595	-42.0
0.5	0.667	-128.3	4.691	102.0	0.098	33.3	0.530	-45.0
0.6	0.653	-139.8	4.021	95.4	0.100	31.1	0.483	-47.3
0.7	0.641	-148.6	3.525	89.6	0.101	30.0	0.449	-49.3
0.8	0.637	-156.3	3.122	84.8	0.101	29.9	0.425	-51.3
0.9	0.634	-162.7	2.807	80.1	0.101	30.5	0.406	-53.5
1.0	0.634	-168.2	2.543	76.4	0.101	31.6	0.392	-55.8
1.1	0.637	-173.4	2.331	72.5	0.101	33.3	0.382	-58.4
1.2	0.637	-177.5	2.138	69.0	0.101	35.4	0.373	-61.2
1.3	0.641	178.8	1.984	65.8	0.102	38.0	0.368	-64.3
1.4	0.646	175.1	1.849	62.6	0.103	40.5	0.364	-67.5
1.5	0.652	171.9	1.736	59.8	0.105	43.6	0.363	-70.8
1.6	0.656	168.8	1.635	56.8	0.108	46.5	0.363	-74.4
1.7	0.658	166.3	1.542	54.1	0.112	49.6	0.365	-78.0
1.8	0.663	163.7	1.463	51.8	0.116	52.3	0.366	-81.5
1.9	0.671	160.9	1.386	49.2	0.121	54.7	0.371	-85.0
2.0	0.670	158.7	1.326	47.1	0.127	57.3	0.375	-88.4
2.1	0.677	156.3	1.254	44.7	0.135	59.3	0.381	-92.0
2.2	0.682	154.2	1.206	42.6	0.142	61.0	0.386	-95.6
2.3	0.685	152.0	1.153	40.5	0.151	62.5	0.393	-98.9
2.4	0.691	149.9	1.106	38.5	0.161	63.7	0.401	-102.2
2.5	0.693	147.7	1.065	36.7	0.170	64.7	0.409	-105.4
2.6	0.696	145.8	1.022	35.1	0.180	65.2	0.417	-108.5
2.7	0.696	143.8	0.985	33.4	0.190	65.5	0.423	-111.3
2.8	0.697	141.9	0.950	32.3	0.201	65.8	0.430	-114.2
2.9	0.697	139.7	0.912	30.9	0.212	65.6	0.434	-117.2
3.0	0.702	137.3	0.881	29.1	0.225	65.5	0.440	-120.1
4.0	0.736	120.4	0.670	18.9	0.349	57.3	0.490	-152.2
5.0	0.758	109.3	0.580	13.4	0.445	43.9	0.543	173.3

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

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.784	-48.9	14.252	148.7	0.038	64.9	0.882	-24.2
0.2	0.716	-85.5	11.266	127.9	0.060	50.1	0.697	-39.4
0.3	0.652	-110.4	8.758	114.1	0.070	42.7	0.560	-47.6
0.4	0.624	-128.3	7.009	104.9	0.076	39.3	0.466	-52.0
0.5	0.604	-141.1	5.808	97.4	0.080	37.7	0.403	-54.8
0.6	0.594	-151.1	4.912	91.7	0.083	38.0	0.360	-57.0
0.7	0.590	-158.8	4.277	86.9	0.086	38.9	0.329	-58.9
0.8	0.589	-165.1	3.771	82.7	0.089	40.1	0.307	-60.8
0.9	0.592	-170.5	3.372	78.7	0.092	41.8	0.290	-63.1
1.0	0.590	-175.5	3.049	75.4	0.095	43.6	0.277	-65.5
1.1	0.597	-179.7	2.787	72.1	0.099	45.6	0.268	-68.2
1.2	0.598	176.6	2.553	69.0	0.103	47.5	0.260	-71.2
1.3	0.604	173.5	2.367	66.1	0.107	49.5	0.256	-74.5
1.4	0.609	170.5	2.209	63.1	0.111	51.2	0.254	-77.8
1.5	0.613	167.6	2.070	60.5	0.117	53.1	0.253	-81.3
1.6	0.620	164.9	1.951	57.9	0.123	54.6	0.255	-84.9
1.7	0.619	162.8	1.840	55.6	0.128	56.2	0.257	-88.6
1.8	0.627	160.4	1.747	53.2	0.135	57.5	0.260	-92.3
1.9	0.634	158.1	1.654	50.9	0.142	58.5	0.265	-95.6
2.0	0.633	155.9	1.583	49.1	0.149	59.7	0.270	-98.9
2.1	0.640	153.9	1.500	46.7	0.157	60.4	0.276	-102.3
2.2	0.646	152.0	1.443	44.7	0.164	61.0	0.283	-105.7
2.3	0.648	149.9	1.380	42.6	0.173	61.6	0.291	-108.6
2.4	0.653	148.1	1.325	40.7	0.182	61.8	0.299	-111.6
2.5	0.656	146.1	1.277	38.8	0.191	62.3	0.307	-114.4
2.6	0.660	144.2	1.230	37.2	0.199	62.3	0.316	-117.1
2.7	0.661	142.6	1.186	35.4	0.209	62.2	0.322	-119.7
2.8	0.663	140.9	1.146	34.1	0.218	62.1	0.330	-122.0
2.9	0.660	138.6	1.104	32.5	0.228	61.6	0.335	-124.7
3.0	0.665	136.6	1.067	30.7	0.239	61.4	0.341	-127.3
4.0	0.711	121.2	0.805	17.6	0.345	54.1	0.404	-157.1
5.0	0.746	110.4	0.672	9.3	0.432	42.6	0.473	170.4

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

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.736	-58.8	17.991	144.2	0.034	62.4	0.835	-30.0
0.2	0.653	-97.5	13.335	122.7	0.053	49.3	0.617	-46.7
0.3	0.606	-121.9	10.018	109.7	0.061	43.8	0.476	-55.2
0.4	0.584	-137.9	7.865	101.5	0.067	42.4	0.387	-59.7
0.5	0.571	-149.3	6.449	94.7	0.071	42.6	0.329	-62.8
0.6	0.563	-157.9	5.440	89.6	0.076	44.2	0.289	-65.2
0.7	0.564	-164.8	4.708	85.2	0.080	45.5	0.261	-67.5
0.8	0.563	-170.7	4.138	81.5	0.085	47.4	0.241	-69.8
0.9	0.568	-175.5	3.703	77.8	0.090	49.2	0.226	-72.6
1.0	0.572	-179.6	3.342	74.8	0.095	50.9	0.214	-75.4
1.1	0.576	176.4	3.057	71.7	0.100	52.4	0.207	-78.5
1.2	0.580	173.1	2.793	68.9	0.106	53.9	0.201	-82.1
1.3	0.582	170.2	2.593	66.2	0.112	55.3	0.198	-85.5
1.4	0.588	167.5	2.414	63.6	0.118	56.4	0.197	-89.4
1.5	0.594	165.0	2.263	61.1	0.125	57.6	0.198	-93.1
1.6	0.600	162.5	2.132	58.6	0.132	58.3	0.200	-96.8
1.7	0.601	160.3	2.013	56.4	0.139	59.2	0.204	-100.6
1.8	0.607	158.3	1.907	54.1	0.146	59.8	0.208	-104.2
1.9	0.613	156.1	1.810	52.0	0.154	60.3	0.213	-107.3
2.0	0.612	154.4	1.731	50.1	0.161	60.7	0.219	-110.4
2.1	0.622	152.1	1.643	47.9	0.169	60.9	0.226	-113.6
2.2	0.626	150.4	1.580	46.0	0.177	61.1	0.233	-116.7
2.3	0.628	148.4	1.511	43.9	0.186	61.2	0.241	-119.3
2.4	0.631	146.9	1.453	42.0	0.195	61.1	0.250	-121.7
2.5	0.637	144.8	1.401	40.2	0.204	61.2	0.258	-124.2
2.6	0.639	143.2	1.350	38.6	0.211	61.0	0.266	-126.4
2.7	0.639	141.6	1.303	36.7	0.220	60.6	0.272	-128.6
2.8	0.643	140.1	1.260	35.5	0.229	60.3	0.280	-130.7
2.9	0.639	137.9	1.214	33.9	0.238	59.7	0.285	-133.1
3.0	0.646	136.0	1.174	32.1	0.249	59.3	0.291	-135.3
4.0	0.692	121.6	0.890	18.2	0.345	52.0	0.357	-162.7
5.0	0.736	111.3	0.735	8.4	0.426	41.4	0.433	166.7

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

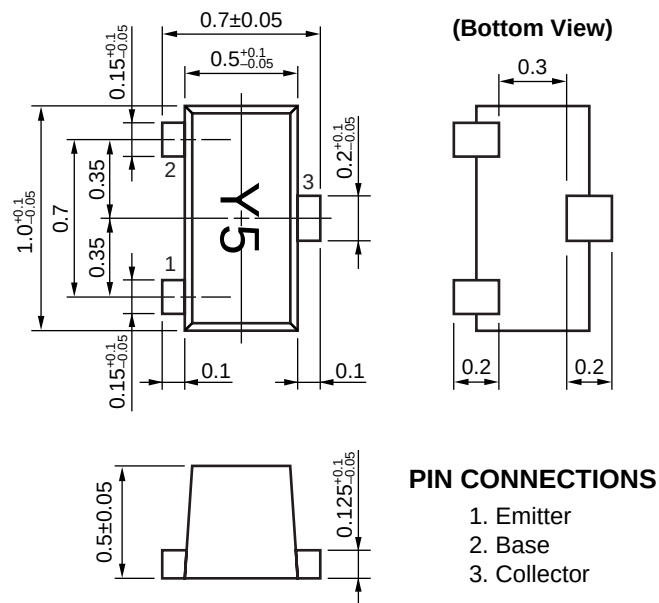
Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.651	-68.8	22.189	138.6	0.032	58.6	0.773	-37.0
0.2	0.596	-109.9	15.349	117.2	0.046	49.2	0.531	-55.2
0.3	0.561	-133.1	11.165	105.5	0.053	46.2	0.396	-64.0
0.4	0.546	-147.4	8.649	98.2	0.059	47.4	0.314	-69.3
0.5	0.543	-157.4	7.035	92.1	0.065	48.8	0.263	-73.0
0.6	0.539	-164.8	5.884	87.6	0.071	51.0	0.228	-76.2
0.7	0.539	-170.7	5.088	83.7	0.077	52.7	0.204	-79.6
0.8	0.544	-175.8	4.484	80.3	0.083	54.4	0.188	-82.8
0.9	0.550	-179.9	3.997	77.0	0.090	55.8	0.176	-86.8
1.0	0.553	176.3	3.605	74.3	0.096	57.1	0.166	-90.4
1.1	0.557	173.0	3.291	71.5	0.103	58.2	0.161	-94.4
1.2	0.563	169.9	3.013	68.8	0.111	59.0	0.157	-98.8
1.3	0.564	167.2	2.792	66.3	0.118	59.9	0.157	-102.7
1.4	0.571	164.8	2.601	63.8	0.125	60.3	0.158	-106.7
1.5	0.575	162.5	2.437	61.5	0.133	60.9	0.160	-110.6
1.6	0.584	160.1	2.291	59.2	0.141	61.1	0.164	-114.3
1.7	0.585	158.3	2.165	57.1	0.148	61.5	0.169	-117.8
1.8	0.592	156.4	2.052	54.9	0.156	61.5	0.174	-121.2
1.9	0.597	154.2	1.946	53.0	0.164	61.5	0.181	-123.9
2.0	0.596	152.7	1.866	51.1	0.172	61.6	0.186	-126.5
2.1	0.604	150.6	1.770	49.0	0.181	61.4	0.194	-129.0
2.2	0.607	149.0	1.703	47.1	0.189	61.1	0.201	-131.6
2.3	0.611	147.1	1.628	45.2	0.198	61.0	0.209	-133.6
2.4	0.613	145.4	1.568	43.4	0.207	60.7	0.218	-135.4
2.5	0.620	143.8	1.508	41.5	0.215	60.4	0.225	-137.3
2.6	0.620	142.2	1.461	40.0	0.223	59.9	0.233	-139.1
2.7	0.620	140.8	1.408	38.1	0.232	59.4	0.239	-140.9
2.8	0.624	139.1	1.362	36.9	0.240	58.9	0.246	-142.3
2.9	0.622	137.2	1.316	35.3	0.249	58.2	0.252	-144.4
3.0	0.627	135.4	1.272	33.5	0.259	57.7	0.257	-146.0
4.0	0.676	121.7	0.970	19.1	0.346	50.0	0.324	-170.4
5.0	0.726	111.8	0.798	8.2	0.420	40.0	0.401	161.4

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

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.514	-96.6	29.759	127.9	0.025	58.6	0.628	-52.3
0.2	0.511	-134.6	18.285	108.6	0.035	52.9	0.387	-72.9
0.3	0.505	-152.4	12.749	99.1	0.043	56.1	0.278	-84.0
0.4	0.508	-162.0	9.706	93.3	0.051	58.7	0.218	-92.1
0.5	0.511	-169.8	7.825	88.6	0.058	60.4	0.183	-99.2
0.6	0.514	-175.3	6.541	84.9	0.067	62.5	0.161	-105.7
0.7	0.517	-179.9	5.630	81.4	0.076	63.5	0.148	-111.9
0.8	0.518	176.6	4.932	78.6	0.084	64.2	0.140	-117.8
0.9	0.526	173.3	4.396	75.9	0.092	64.8	0.136	-123.8
1.0	0.531	170.4	3.960	73.6	0.101	65.1	0.134	-129.2
1.1	0.536	167.4	3.621	71.0	0.110	65.4	0.134	-133.8
1.2	0.541	165.1	3.305	68.7	0.119	65.4	0.137	-138.4
1.3	0.545	162.9	3.064	66.4	0.128	65.2	0.140	-141.9
1.4	0.552	160.9	2.856	64.2	0.136	65.1	0.145	-145.2
1.5	0.558	158.8	2.671	62.0	0.145	64.9	0.151	-147.8
1.6	0.564	156.8	2.517	59.9	0.154	64.4	0.157	-150.2
1.7	0.565	155.0	2.376	58.0	0.163	64.1	0.164	-152.4
1.8	0.571	153.5	2.250	56.0	0.171	63.6	0.170	-154.6
1.9	0.578	151.3	2.138	54.1	0.180	63.0	0.177	-156.0
2.0	0.578	150.1	2.048	52.4	0.189	62.6	0.183	-157.5
2.1	0.584	148.3	1.942	50.5	0.197	61.9	0.190	-158.7
2.2	0.586	147.0	1.868	48.8	0.206	61.4	0.196	-160.0
2.3	0.589	145.0	1.787	46.9	0.215	60.8	0.203	-160.8
2.4	0.593	143.5	1.722	45.1	0.224	60.1	0.210	-161.6
2.5	0.596	141.9	1.662	43.5	0.233	59.5	0.216	-162.5
2.6	0.598	140.3	1.604	42.0	0.240	58.7	0.222	-163.3
2.7	0.599	139.1	1.549	40.3	0.249	57.9	0.227	-164.4
2.8	0.601	137.5	1.501	39.0	0.257	57.2	0.231	-165.2
2.9	0.598	135.7	1.452	37.5	0.265	56.3	0.236	-166.5
3.0	0.605	134.0	1.406	35.5	0.274	55.6	0.239	-167.5
4.0	0.654	121.5	1.075	21.0	0.353	46.9	0.302	173.9
5.0	0.709	112.4	0.887	9.1	0.415	37.6	0.377	150.2

★ PACKAGE DIMENSIONS

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



PIN CONNECTIONS

1. Emitter
2. Base
3. Collector

- **The information in this document is current as of January, 2002. The information is subject to change without notice. For actual design-in, refer to the latest publications of NEC's data sheets or data books, etc., for the most up-to-date specifications of NEC semiconductor products. Not all products and/or types are available in every country. Please check with an NEC sales representative for availability and additional information.**
- No part of this document may be copied or reproduced in any form or by any means without prior written consent of NEC. NEC assumes no responsibility for any errors that may appear in this document.
- NEC does not assume any liability for infringement of patents, copyrights or other intellectual property rights of third parties by or arising from the use of NEC semiconductor products listed in this document or any other liability arising from the use of such products. No license, express, implied or otherwise, is granted under any patents, copyrights or other intellectual property rights of NEC or others.
- Descriptions of circuits, software and other related information in this document are provided for illustrative purposes in semiconductor product operation and application examples. The incorporation of these circuits, software and information in the design of customer's equipment shall be done under the full responsibility of customer. NEC assumes no responsibility for any losses incurred by customers or third parties arising from the use of these circuits, software and information.
- While NEC endeavours to enhance the quality, reliability and safety of NEC semiconductor products, customers agree and acknowledge that the possibility of defects thereof cannot be eliminated entirely. To minimize risks of damage to property or injury (including death) to persons arising from defects in NEC semiconductor products, customers must incorporate sufficient safety measures in their design, such as redundancy, fire-containment, and anti-failure features.
- NEC semiconductor products are classified into the following three quality grades:
 "Standard", "Special" and "Specific". The "Specific" quality grade applies only to semiconductor products developed based on a customer-designated "quality assurance program" for a specific application. The recommended applications of a semiconductor product depend on its quality grade, as indicated below. Customers must check the quality grade of each semiconductor product before using it in a particular application.
 "Standard": Computers, office equipment, communications equipment, test and measurement equipment, audio and visual equipment, home electronic appliances, machine tools, personal electronic equipment and industrial robots
 "Special": Transportation equipment (automobiles, trains, ships, etc.), traffic control systems, anti-disaster systems, anti-crime systems, safety equipment and medical equipment (not specifically designed for life support)
 "Specific": Aircraft, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems and medical equipment for life support, etc.
 The quality grade of NEC semiconductor products is "Standard" unless otherwise expressly specified in NEC's data sheets or data books, etc. If customers wish to use NEC semiconductor products in applications not intended by NEC, they must contact an NEC sales representative in advance to determine NEC's willingness to support a given application.
 (Note)
 (1) "NEC" as used in this statement means NEC Corporation, NEC Compound Semiconductor Devices, Ltd. and also includes its majority-owned subsidiaries.
 (2) "NEC semiconductor products" means any semiconductor product developed or manufactured by or for NEC (as defined above).

M8E 00.4-0110

► **Business issue**

NEC Compound Semiconductor Devices, Ltd.

5th Sales Group, Sales Division TEL: +81-3-3798-6372 FAX: +81-3-3798-6783 E-mail: salesinfo@csd-nec.com

NEC Compound Semiconductor Devices Hong Kong Limited

Hong Kong Head Office TEL: +852-3107-7303 FAX: +852-3107-7309

Taipei Branch Office TEL: +886-2-8712-0478 FAX: +886-2-2545-3859

Korea Branch Office TEL: +82-2-528-0301 FAX: +82-2-528-0302

NEC Electron Devices European Operations <http://www.nec.de/>

TEL: +49-211-6503-101 FAX: +49-211-6503-487

California Eastern Laboratories, Inc. <http://www.cel.com/>

TEL: +1-408-988-3500 FAX: +1-408-988-0279

► **Technical issue**

NEC Compound Semiconductor Devices, Ltd. <http://www.csd-nec.com/>

Sales Engineering Group, Sales Division

E-mail: techinfo@csd-nec.com FAX: +81-44-435-1918