

# DATA SHEET

# NEC

## NPN SILICON RF TRANSISTOR 2SC5601

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

#### FEATURES

- Low voltage operation, low phase distortion
- Ideal for OSC applications
- 3-pin lead-less minimold package (1005 PKG)

#### ORDERING INFORMATION

Part Number	Quantity	Supplying Form
2SC5601	50 pcs (Non reel)	• 8 mm wide embossed taping
2SC5601-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<sub>A</sub> = +25°C)

Parameter	Symbol	Ratings	Unit
Collector to Base Voltage	V <sub>CBO</sub>	9.0	V
Collector to Emitter Voltage	V <sub>CEO</sub>	5.5	V
Emitter to Base Voltage	V <sub>EBO</sub>	1.5	V
Collector Current	I <sub>c</sub>	100	mA
Total Power Dissipation	P <sub>tot</sub> <sup>Note</sup>	140	mW
Junction Temperature	T <sub>j</sub>	150	°C
Storage Temperature	T <sub>stg</sub>	-65 to +150	°C

★ **Note** Mounted on 1.08 cm<sup>2</sup> × 1.0 mm (t) glass epoxy 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<sub>A</sub> = +25°C)**

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
DC Characteristics						
Collector Cut-off Current	I <sub>CBO</sub>	V <sub>CB</sub> = 5 V, I <sub>E</sub> = 0 mA	–	–	600	nA
Emitter Cut-off Current	I <sub>EBO</sub>	V <sub>EB</sub> = 1 V, I <sub>C</sub> = 0 mA	–	–	600	nA
DC Current Gain	h <sub>FE</sub> <sup>Note 1</sup>	V <sub>CE</sub> = 1 V, I <sub>C</sub> = 5 mA	80	–	160	–
RF Characteristics						
Gain Bandwidth Product	f <sub>T</sub>	V <sub>CE</sub> = 1 V, I <sub>C</sub> = 5 mA, f = 2 GHz	3.5	5.0	–	GHz
Insertion Power Gain	S <sub>21e</sub>   <sup>2</sup>	V <sub>CE</sub> = 1 V, I <sub>C</sub> = 5 mA, f = 2 GHz	3.5	4.0	–	dB
Noise Figure	NF	V <sub>CE</sub> = 1 V, I <sub>C</sub> = 5 mA, f = 2 GHz, Z <sub>S</sub> = Z <sub>opt</sub>	–	1.8	2.5	dB
Reverse Transfer Capacitance	C <sub>re</sub> <sup>Note 2</sup>	V <sub>CB</sub> = 0.5 V, I <sub>E</sub> = 0 mA, f = 1 MHz	–	0.8	1.0	pF

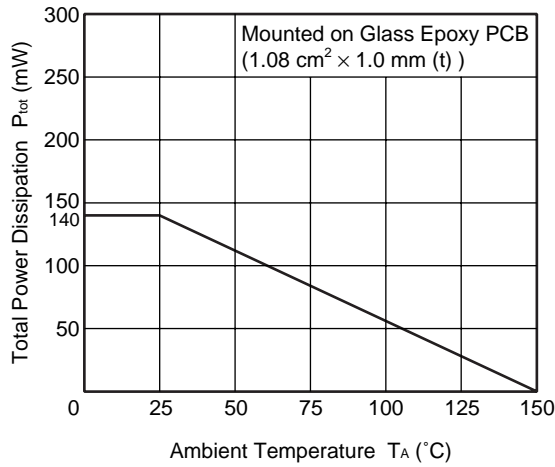
- Notes** 1. Pulse measurement: PW ≤ 350 μs, Duty Cycle ≤ 2%  
 2. Collector to base capacitance when the emitter grounded

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

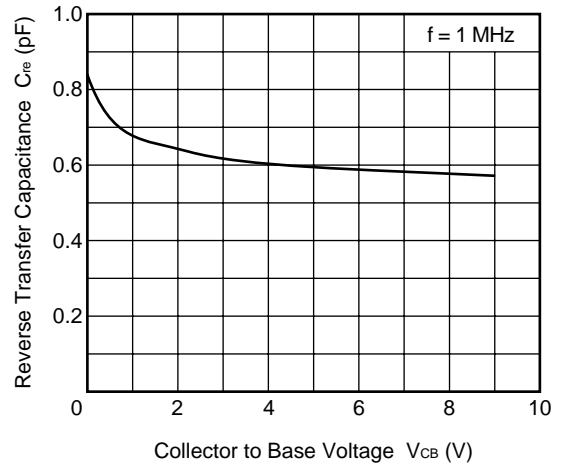
Rank	FB
Marking	B5
h <sub>FE</sub> Value	80 to 160

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

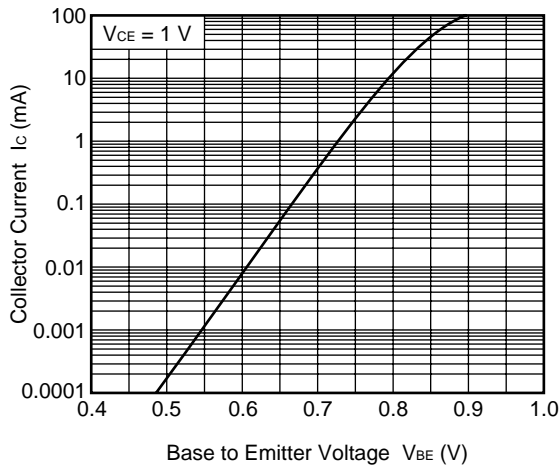
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



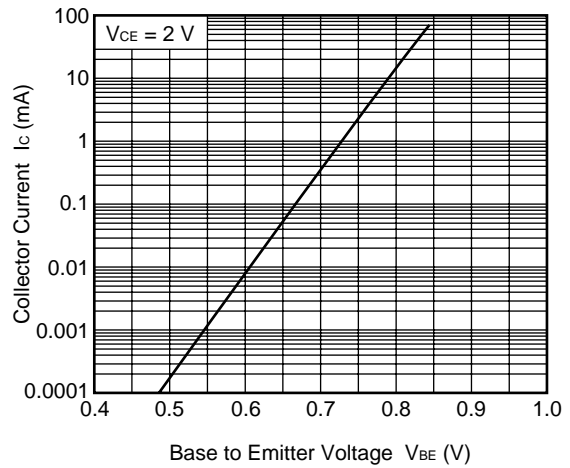
REVERSE TRANSFER CAPACITANCE vs. COLLECTOR TO BASE VOLTAGE



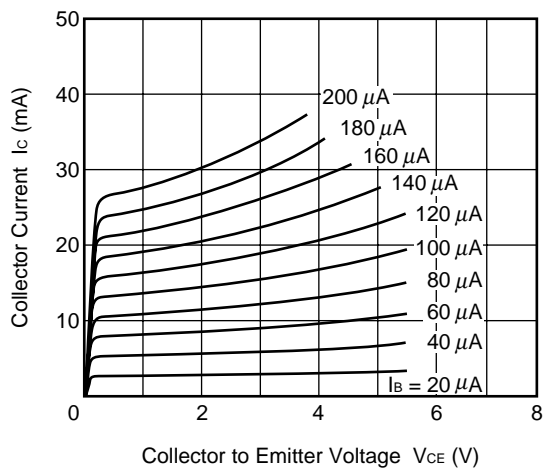
COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE



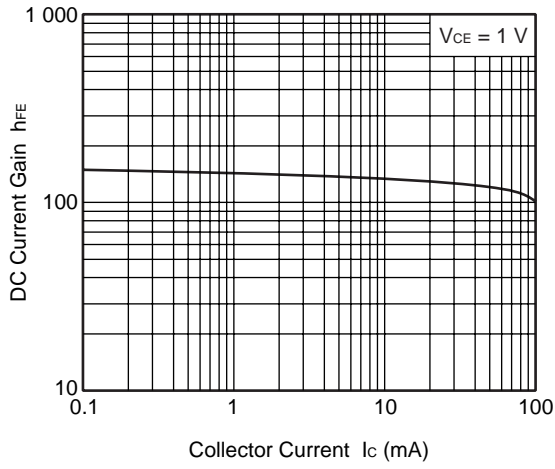
COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE



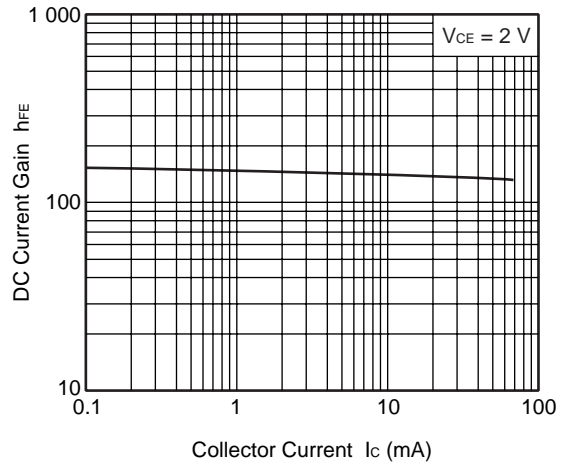
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



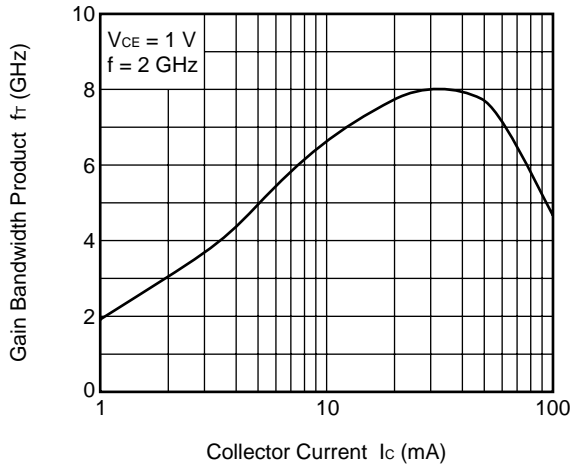
DC CURRENT GAIN vs.  
COLLECTOR CURRENT



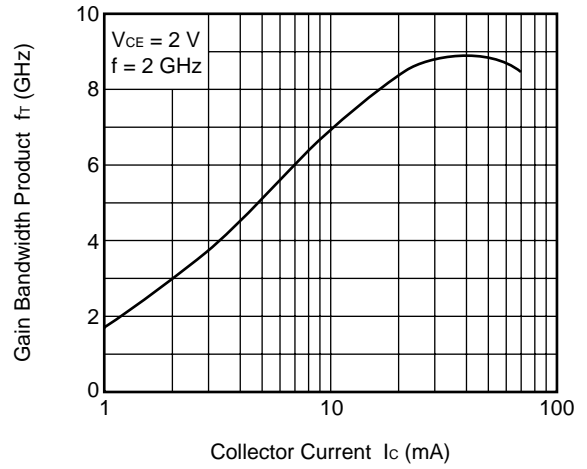
DC CURRENT GAIN vs.  
COLLECTOR CURRENT



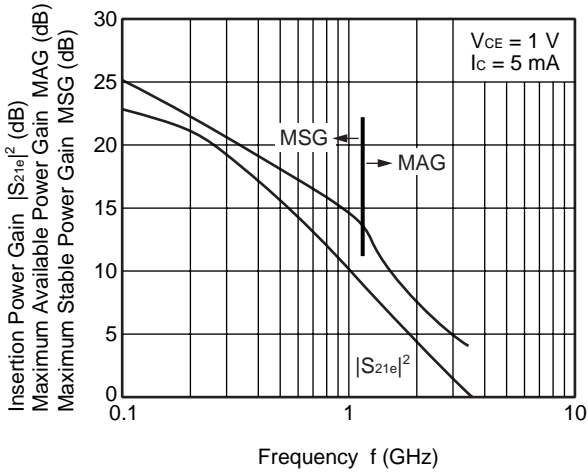
GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT



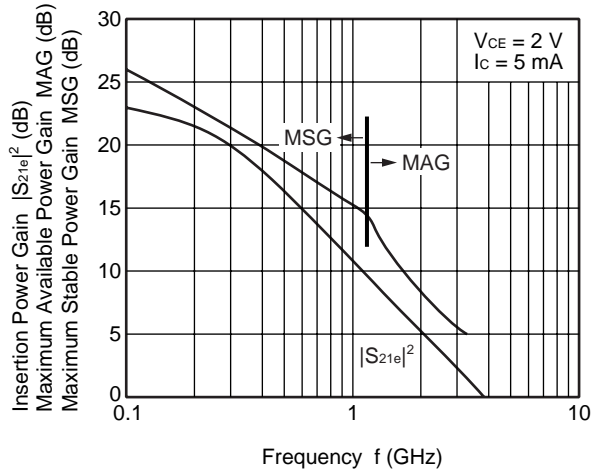
GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT



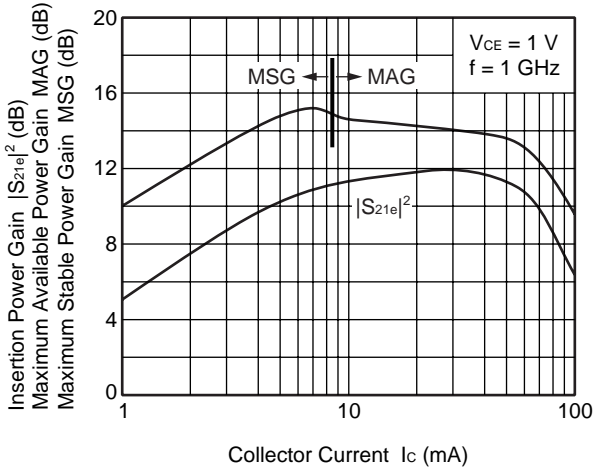
INSERTION POWER GAIN, MAG, MSG vs. FREQUENCY



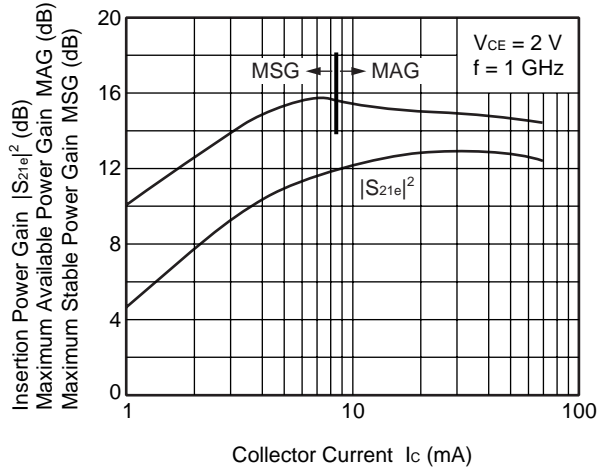
INSERTION POWER GAIN, MAG, MSG vs. FREQUENCY



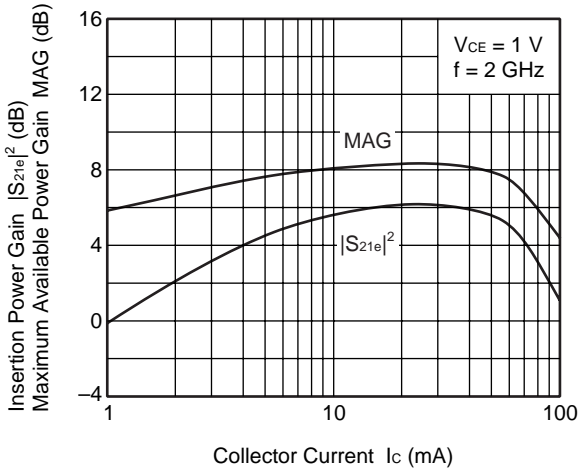
INSERTION POWER GAIN, MAG, MSG  
vs. COLLECTOR CURRENT



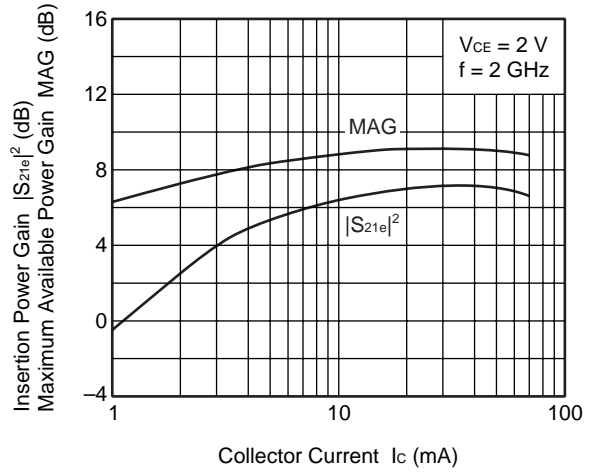
INSERTION POWER GAIN, MAG, MSG  
vs. COLLECTOR CURRENT



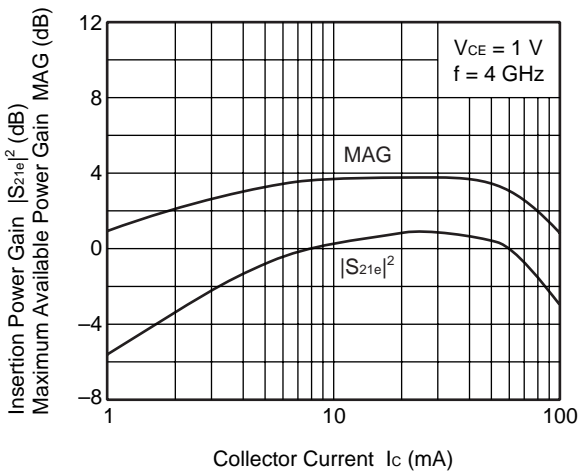
INSERTION POWER GAIN, MAG  
vs. COLLECTOR CURRENT



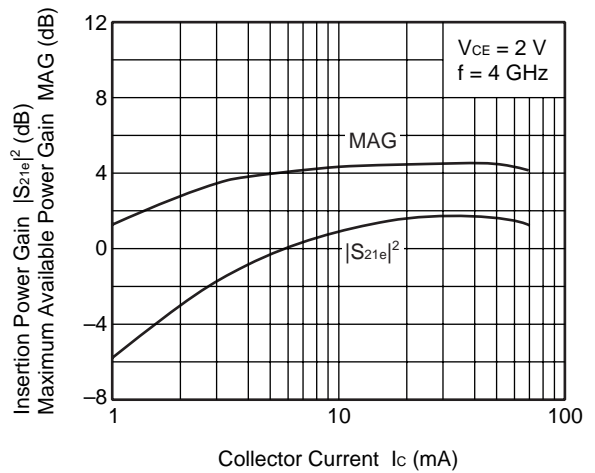
INSERTION POWER GAIN, MAG  
vs. COLLECTOR CURRENT



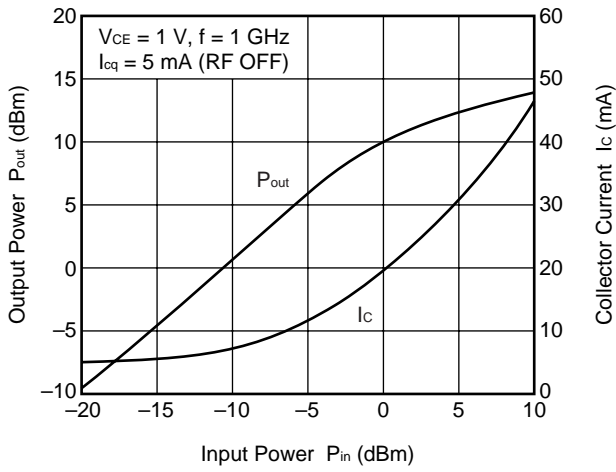
INSERTION POWER GAIN, MAG  
vs. COLLECTOR CURRENT



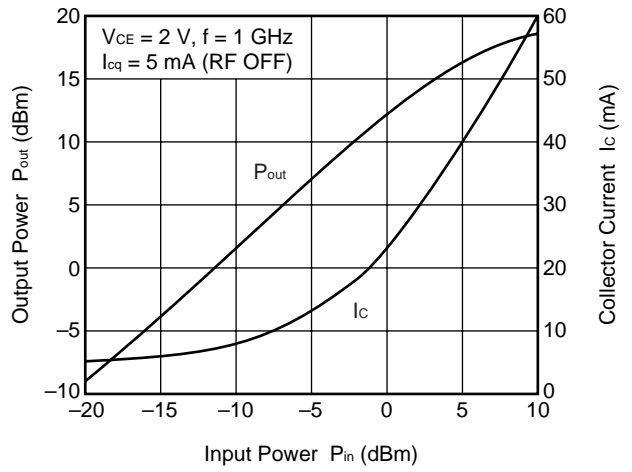
INSERTION POWER GAIN, MAG  
vs. COLLECTOR CURRENT



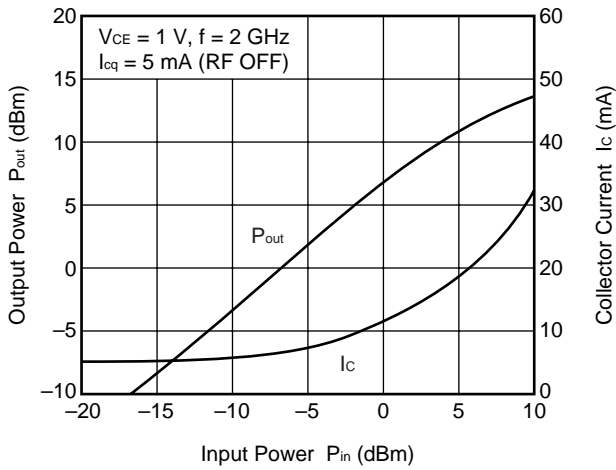
OUTPUT POWER, COLLECTOR CURRENT vs. INPUT POWER



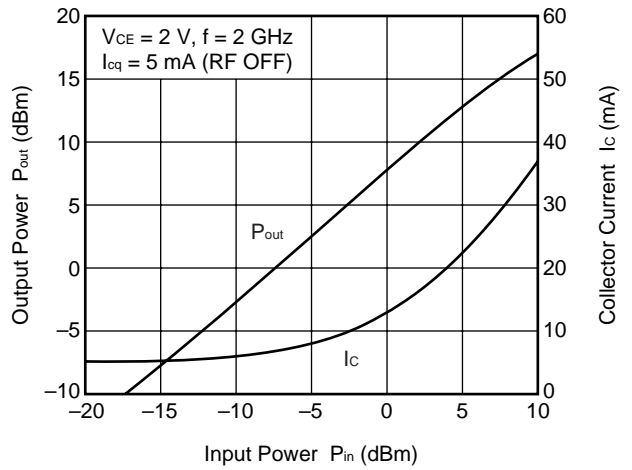
OUTPUT POWER, COLLECTOR CURRENT vs. INPUT POWER



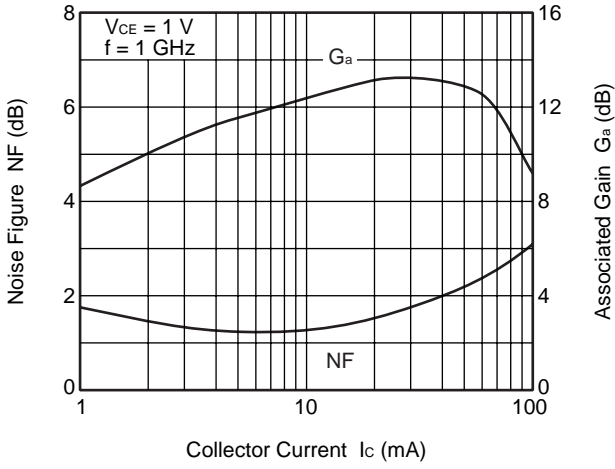
OUTPUT POWER, COLLECTOR CURRENT vs. INPUT POWER



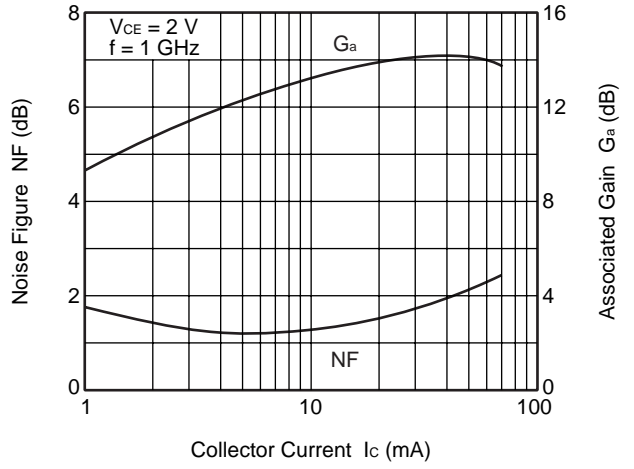
OUTPUT POWER, COLLECTOR CURRENT vs. INPUT POWER



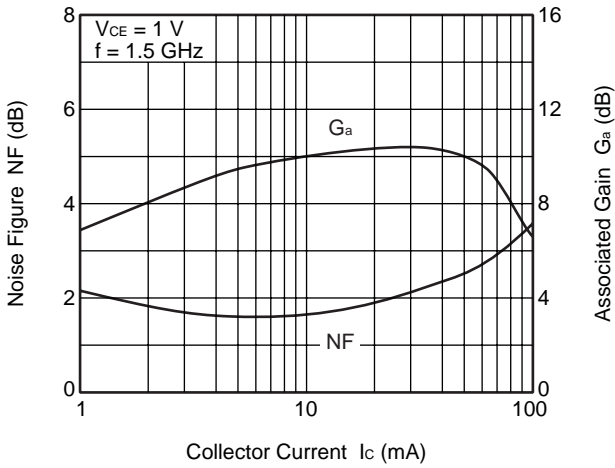
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



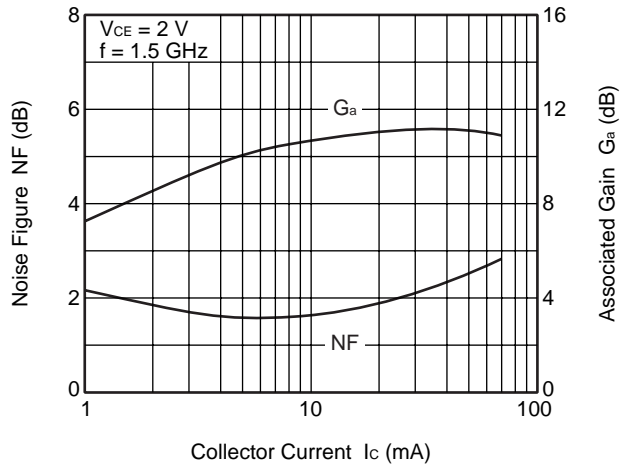
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



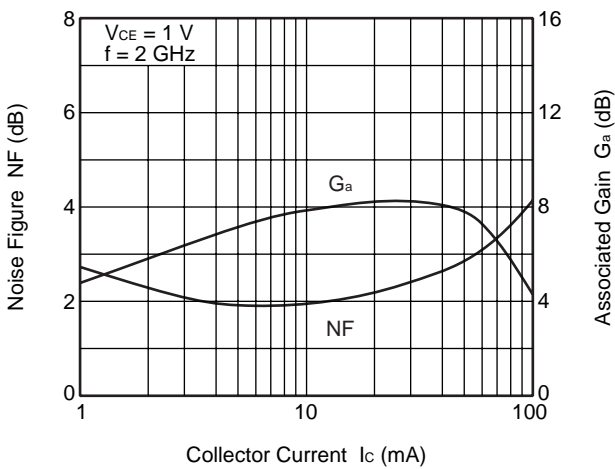
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



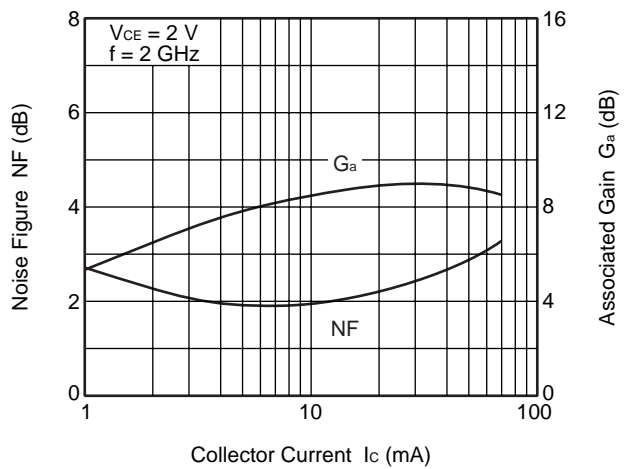
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



**Remark** The graphs indicate nominal characteristics.



S-PARAMETERS

V<sub>CE</sub> = 1 V, I<sub>C</sub> = 1 mA, Z<sub>0</sub> = 50 Ω

Frequency (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.956	-20.7	3.960	165.0	0.046	76.5	0.981	-9.1
0.2	0.923	-43.6	3.825	150.5	0.089	64.8	0.932	-17.6
0.3	0.880	-62.5	3.525	137.8	0.121	54.8	0.870	-24.6
0.4	0.834	-79.5	3.177	126.6	0.144	45.8	0.804	-30.2
0.5	0.798	-94.7	2.867	116.9	0.160	38.7	0.740	-34.7
0.6	0.766	-107.5	2.579	108.6	0.170	32.6	0.691	-38.2
0.7	0.745	-119.0	2.334	101.0	0.175	27.8	0.648	-41.1
0.8	0.728	-128.7	2.128	94.8	0.178	23.7	0.614	-43.6
0.9	0.715	-137.4	1.940	89.1	0.178	20.3	0.586	-46.1
1.0	0.710	-144.6	1.782	83.8	0.177	17.8	0.563	-48.4
1.1	0.704	-151.4	1.653	79.0	0.174	15.5	0.545	-50.8
1.2	0.701	-156.9	1.535	74.7	0.171	13.9	0.530	-52.9
1.3	0.703	-162.1	1.434	70.8	0.167	12.6	0.519	-55.6
1.4	0.700	-166.7	1.344	66.9	0.162	11.9	0.510	-58.3
1.5	0.700	-171.1	1.266	63.2	0.157	11.5	0.502	-61.1
1.6	0.702	-175.2	1.202	59.7	0.152	11.7	0.497	-64.1
1.7	0.700	-179.1	1.135	56.3	0.146	12.5	0.494	-67.1
1.8	0.705	177.4	1.077	53.3	0.141	13.4	0.492	-70.1
1.9	0.705	174.0	1.027	50.5	0.136	15.2	0.491	-73.2
2.0	0.708	171.0	0.984	48.1	0.132	17.3	0.491	-76.3
2.1	0.708	167.4	0.939	45.0	0.128	20.1	0.494	-79.4
2.2	0.712	164.5	0.904	42.5	0.125	23.3	0.495	-82.7
2.3	0.716	161.2	0.875	40.5	0.122	26.8	0.499	-85.7
2.4	0.719	158.1	0.832	38.1	0.122	30.7	0.502	-88.9
2.5	0.723	154.9	0.802	36.1	0.123	34.5	0.506	-92.0
2.6	0.725	152.2	0.771	34.2	0.125	38.6	0.509	-95.0
2.7	0.734	149.3	0.741	32.2	0.129	42.4	0.515	-97.9
2.8	0.739	146.7	0.712	30.7	0.136	46.2	0.520	-101.1
2.9	0.742	144.6	0.697	29.1	0.143	49.9	0.523	-103.4
3.0	0.742	142.2	0.674	27.8	0.150	52.8	0.525	-106.5
4.0	0.773	125.5	0.529	22.8	0.267	58.2	0.538	-137.6
5.0	0.772	110.8	0.488	19.8	0.387	46.3	0.567	-173.3

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

Frequency (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.878	-32.4	9.325	158.5	0.044	71.0	0.940	-17.5
0.2	0.812	-63.7	8.299	139.6	0.077	57.3	0.819	-31.6
0.3	0.750	-87.2	7.038	125.4	0.098	47.1	0.698	-41.3
0.4	0.700	-106.0	5.896	114.7	0.109	40.2	0.596	-48.0
0.5	0.667	-120.9	5.044	106.2	0.116	35.7	0.518	-52.5
0.6	0.645	-132.8	4.363	99.4	0.120	32.8	0.458	-55.9
0.7	0.632	-142.8	3.824	93.5	0.123	30.9	0.413	-58.4
0.8	0.626	-150.9	3.418	88.8	0.125	30.0	0.378	-60.8
0.9	0.622	-157.8	3.067	84.4	0.126	29.6	0.351	-63.1
1.0	0.622	-163.4	2.781	80.5	0.127	29.6	0.329	-65.3
1.1	0.623	-168.7	2.555	76.8	0.128	30.1	0.313	-67.6
1.2	0.622	-173.1	2.354	73.3	0.129	30.7	0.299	-69.8
1.3	0.626	-176.9	2.189	70.4	0.131	31.7	0.289	-72.5
1.4	0.625	179.4	2.043	67.3	0.132	32.8	0.281	-75.1
1.5	0.625	176.0	1.909	64.5	0.134	34.0	0.277	-78.0
1.6	0.630	172.7	1.808	61.6	0.136	35.4	0.273	-81.0
1.7	0.631	169.7	1.705	58.8	0.138	36.9	0.272	-84.1
1.8	0.632	166.9	1.615	56.4	0.141	38.3	0.271	-87.1
1.9	0.635	164.3	1.535	54.1	0.144	40.0	0.272	-90.1
2.0	0.640	161.8	1.468	51.9	0.148	41.4	0.274	-93.2
2.1	0.637	158.9	1.402	49.2	0.152	42.8	0.277	-96.2
2.2	0.641	156.3	1.352	46.8	0.156	44.2	0.280	-99.4
2.3	0.645	153.5	1.305	44.8	0.161	45.3	0.285	-102.1
2.4	0.649	151.0	1.249	42.7	0.166	46.4	0.290	-105.0
2.5	0.653	148.5	1.203	40.6	0.171	47.2	0.295	-107.7
2.6	0.658	146.2	1.159	38.7	0.177	48.1	0.301	-110.4
2.7	0.663	143.9	1.118	36.7	0.184	48.8	0.307	-112.7
2.8	0.670	142.0	1.078	34.9	0.191	49.7	0.313	-115.5
2.9	0.675	140.3	1.054	33.0	0.197	50.8	0.316	-117.4
3.0	0.676	138.2	1.020	31.6	0.203	51.2	0.320	-120.2
4.0	0.716	125.2	0.788	20.3	0.289	50.2	0.351	-148.6
5.0	0.740	112.2	0.658	11.3	0.380	41.7	0.412	178.8

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

Frequency (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.813	-43.8	14.006	152.5	0.041	67.0	0.892	-25.2
0.2	0.727	-80.4	11.491	131.1	0.067	52.4	0.714	-42.8
0.3	0.662	-105.1	9.118	117.2	0.080	44.8	0.569	-53.8
0.4	0.625	-123.4	7.344	107.4	0.088	40.3	0.464	-60.9
0.5	0.604	-136.9	6.131	100.3	0.093	38.3	0.390	-65.8
0.6	0.593	-147.4	5.216	94.5	0.097	37.6	0.337	-69.8
0.7	0.586	-155.8	4.533	89.5	0.101	37.6	0.298	-72.9
0.8	0.587	-162.5	4.014	85.5	0.105	38.3	0.268	-76.0
0.9	0.584	-168.3	3.590	81.8	0.108	39.1	0.245	-79.0
1.0	0.590	-173.0	3.242	78.4	0.112	40.2	0.228	-82.0
1.1	0.592	-177.2	2.966	75.2	0.116	41.3	0.214	-85.2
1.2	0.593	178.9	2.732	72.4	0.120	42.4	0.203	-88.3
1.3	0.597	175.7	2.534	69.7	0.125	43.5	0.196	-91.7
1.4	0.598	172.7	2.362	67.1	0.129	44.6	0.192	-95.1
1.5	0.600	169.7	2.209	64.5	0.134	45.6	0.189	-98.5
1.6	0.604	167.2	2.086	61.9	0.140	46.6	0.188	-101.9
1.7	0.607	164.2	1.963	59.5	0.145	47.6	0.188	-105.2
1.8	0.608	161.8	1.862	57.2	0.151	48.1	0.190	-108.5
1.9	0.609	159.6	1.771	54.9	0.157	48.9	0.193	-111.5
2.0	0.614	157.2	1.692	53.1	0.163	49.4	0.196	-114.4
2.1	0.613	154.6	1.613	50.6	0.169	50.1	0.201	-117.1
2.2	0.615	152.4	1.555	48.3	0.176	50.5	0.206	-120.0
2.3	0.620	149.7	1.500	46.5	0.182	50.7	0.212	-122.3
2.4	0.621	147.5	1.435	44.3	0.188	50.8	0.218	-124.8
2.5	0.628	145.2	1.385	42.5	0.195	50.9	0.224	-127.0
2.6	0.632	142.9	1.337	40.6	0.201	50.9	0.230	-129.3
2.7	0.639	141.1	1.286	38.8	0.208	50.9	0.235	-131.1
2.8	0.645	139.3	1.245	37.1	0.216	50.9	0.242	-133.4
2.9	0.647	137.7	1.216	35.2	0.223	51.3	0.245	-135.1
3.0	0.649	135.8	1.176	33.6	0.228	51.0	0.249	-137.4
4.0	0.690	124.4	0.914	21.3	0.304	47.1	0.285	-163.1
5.0	0.722	112.4	0.756	10.8	0.381	39.0	0.353	168.1

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

Frequency (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.764	-52.9	17.680	147.6	0.039	61.9	0.847	-31.3
0.2	0.668	-92.6	13.533	125.3	0.059	50.5	0.633	-51.4
0.3	0.617	-117.6	10.352	112.2	0.070	44.5	0.485	-63.0
0.4	0.590	-134.3	8.132	103.4	0.076	42.3	0.386	-70.8
0.5	0.575	-146.9	6.720	96.8	0.082	41.9	0.320	-76.4
0.6	0.569	-155.9	5.672	91.8	0.086	42.5	0.274	-81.2
0.7	0.565	-163.2	4.898	87.4	0.091	43.5	0.240	-85.4
0.8	0.569	-169.1	4.334	83.7	0.097	44.8	0.215	-89.6
0.9	0.570	-174.2	3.867	80.3	0.102	46.0	0.197	-93.7
1.0	0.575	-178.4	3.487	77.2	0.107	47.1	0.183	-98.0
1.1	0.578	177.9	3.186	74.4	0.113	48.3	0.173	-102.2
1.2	0.582	174.8	2.929	71.8	0.119	49.2	0.165	-106.3
1.3	0.585	171.9	2.715	69.4	0.125	50.0	0.161	-110.4
1.4	0.585	169.1	2.531	66.9	0.131	50.8	0.159	-114.4
1.5	0.588	166.4	2.365	64.5	0.138	51.4	0.159	-118.2
1.6	0.595	163.8	2.235	62.1	0.145	51.9	0.160	-121.5
1.7	0.595	161.3	2.101	59.7	0.152	52.3	0.162	-124.9
1.8	0.593	159.0	1.990	57.8	0.158	52.7	0.165	-127.9
1.9	0.597	156.9	1.891	55.5	0.165	52.9	0.170	-130.4
2.0	0.600	155.0	1.808	53.7	0.173	52.9	0.175	-133.0
2.1	0.602	152.3	1.725	51.3	0.180	53.2	0.180	-135.0
2.2	0.603	150.4	1.662	49.1	0.187	53.2	0.186	-137.5
2.3	0.607	147.7	1.604	47.4	0.194	53.0	0.192	-139.2
2.4	0.612	145.5	1.536	45.3	0.201	52.9	0.198	-141.2
2.5	0.617	143.2	1.481	43.5	0.207	52.4	0.204	-142.9
2.6	0.620	141.4	1.429	41.9	0.215	52.3	0.210	-144.5
2.7	0.627	139.3	1.377	40.0	0.222	51.9	0.215	-146.0
2.8	0.630	137.7	1.333	38.3	0.229	51.5	0.222	-147.9
2.9	0.635	136.1	1.303	36.5	0.236	51.6	0.225	-149.2
3.0	0.636	134.5	1.261	35.0	0.242	51.1	0.228	-151.2
4.0	0.679	123.9	0.982	22.5	0.313	45.6	0.266	-174.5
5.0	0.712	112.3	0.812	11.1	0.384	37.4	0.335	159.7

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

Frequency (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.693	-64.2	21.762	141.9	0.036	60.9	0.785	-38.9
0.2	0.608	-107.0	15.427	119.4	0.051	49.4	0.547	-60.9
0.3	0.577	-130.3	11.388	107.4	0.059	46.1	0.406	-73.4
0.4	0.558	-145.0	8.806	99.6	0.066	46.0	0.319	-82.1
0.5	0.550	-155.8	7.193	93.7	0.072	47.1	0.263	-89.1
0.6	0.552	-163.8	6.042	89.3	0.078	48.5	0.226	-95.3
0.7	0.554	-170.1	5.212	85.3	0.085	50.1	0.200	-100.9
0.8	0.559	-175.0	4.593	82.1	0.092	51.4	0.181	-106.7
0.9	0.559	-179.5	4.093	79.1	0.098	52.5	0.168	-112.2
1.0	0.565	177.0	3.689	76.3	0.105	53.5	0.159	-117.6
1.1	0.569	173.8	3.368	73.7	0.112	54.3	0.154	-122.8
1.2	0.572	170.7	3.098	71.1	0.119	54.9	0.150	-127.7
1.3	0.577	168.2	2.865	68.9	0.127	55.4	0.150	-132.2
1.4	0.578	165.8	2.670	66.7	0.134	55.8	0.150	-136.1
1.5	0.580	163.3	2.494	64.3	0.142	56.1	0.153	-139.5
1.6	0.584	161.1	2.352	62.0	0.150	56.0	0.156	-142.4
1.7	0.586	158.6	2.213	59.9	0.158	56.2	0.160	-145.2
1.8	0.588	156.6	2.096	57.9	0.166	56.1	0.164	-147.6
1.9	0.591	154.7	1.994	56.0	0.174	56.0	0.170	-149.5
2.0	0.590	152.8	1.905	54.3	0.181	55.7	0.175	-151.3
2.1	0.590	150.3	1.816	52.0	0.189	55.6	0.180	-152.8
2.2	0.595	148.1	1.748	49.8	0.197	55.3	0.186	-154.5
2.3	0.598	146.0	1.688	48.1	0.204	54.9	0.193	-155.6
2.4	0.603	143.9	1.619	46.1	0.211	54.4	0.198	-157.0
2.5	0.607	141.7	1.558	44.4	0.218	53.8	0.204	-158.2
2.6	0.611	139.6	1.505	42.6	0.226	53.2	0.209	-159.6
2.7	0.614	137.8	1.449	40.9	0.233	52.5	0.214	-160.8
2.8	0.623	136.3	1.404	39.2	0.241	52.0	0.221	-162.0
2.9	0.629	135.0	1.370	37.5	0.247	51.8	0.223	-163.4
3.0	0.628	133.3	1.329	35.9	0.254	51.1	0.226	-164.9
4.0	0.669	123.5	1.037	23.4	0.322	44.3	0.265	174.1
5.0	0.701	112.5	0.857	12.0	0.387	36.0	0.332	151.3

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

Frequency (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.545	-93.4	28.818	130.5	0.029	55.8	0.643	-55.1
0.2	0.535	-133.2	17.873	109.9	0.038	51.7	0.404	-80.4
0.3	0.531	-150.8	12.587	100.1	0.047	53.8	0.296	-95.4
0.4	0.530	-161.9	9.566	94.1	0.054	56.0	0.238	-106.9
0.5	0.534	-169.8	7.729	89.5	0.063	58.2	0.205	-116.7
0.6	0.540	-175.1	6.454	85.8	0.071	59.5	0.186	-125.3
0.7	0.545	-179.8	5.551	82.5	0.080	60.7	0.174	-132.6
0.8	0.550	176.4	4.893	79.8	0.088	61.5	0.168	-139.5
0.9	0.552	173.2	4.344	77.2	0.097	62.1	0.166	-145.3
1.0	0.558	170.4	3.907	74.7	0.106	62.4	0.166	-150.6
1.1	0.562	167.7	3.559	72.4	0.115	62.5	0.167	-155.1
1.2	0.566	165.4	3.275	70.1	0.123	62.4	0.169	-159.0
1.3	0.572	163.3	3.032	68.1	0.132	62.2	0.173	-162.2
1.4	0.571	161.2	2.823	66.1	0.141	62.0	0.177	-164.9
1.5	0.574	159.1	2.638	64.0	0.150	61.7	0.182	-167.1
1.6	0.578	157.1	2.487	61.9	0.159	61.2	0.186	-169.0
1.7	0.583	155.0	2.340	59.9	0.168	60.8	0.191	-170.6
1.8	0.584	153.1	2.214	58.0	0.177	60.2	0.196	-172.1
1.9	0.586	151.2	2.106	56.2	0.185	59.7	0.202	-173.0
2.0	0.587	149.7	2.009	54.6	0.194	58.9	0.207	-174.0
2.1	0.586	147.2	1.917	52.5	0.203	58.3	0.212	-174.8
2.2	0.589	145.2	1.845	50.3	0.211	57.7	0.217	-175.7
2.3	0.595	143.1	1.780	48.8	0.218	57.0	0.223	-176.2
2.4	0.598	141.0	1.708	47.0	0.226	56.2	0.228	-177.1
2.5	0.603	139.2	1.645	45.2	0.234	55.3	0.233	-177.7
2.6	0.603	137.2	1.590	43.5	0.242	54.3	0.237	-178.9
2.7	0.612	135.7	1.534	41.8	0.249	53.4	0.241	-179.6
2.8	0.616	134.1	1.485	40.3	0.257	52.6	0.247	179.5
2.9	0.619	132.9	1.446	38.6	0.264	52.1	0.249	178.3
3.0	0.620	131.5	1.402	37.2	0.270	51.2	0.251	177.1
4.0	0.657	122.6	1.098	24.7	0.335	42.8	0.288	159.1
5.0	0.693	112.2	0.909	13.3	0.393	34.2	0.352	140.1

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

Frequency (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.962	-19.3	3.474	166.6	0.040	76.4	0.986	-7.3
0.2	0.934	-39.4	3.387	153.2	0.078	67.5	0.950	-14.2
0.3	0.900	-56.9	3.174	141.2	0.108	57.6	0.902	-20.1
0.4	0.858	-73.2	2.904	130.4	0.131	48.9	0.849	-25.0
0.5	0.824	-87.8	2.659	120.9	0.147	41.8	0.797	-29.0
0.6	0.788	-100.9	2.419	112.4	0.158	35.5	0.752	-32.3
0.7	0.766	-112.4	2.204	104.8	0.165	30.3	0.714	-34.9
0.8	0.750	-122.5	2.027	98.5	0.168	26.1	0.681	-37.3
0.9	0.737	-131.3	1.860	92.5	0.169	22.3	0.655	-39.6
1.0	0.727	-139.2	1.716	87.1	0.168	19.4	0.633	-41.8
1.1	0.721	-146.2	1.596	82.2	0.166	16.8	0.615	-43.9
1.2	0.716	-152.1	1.484	78.0	0.162	14.7	0.600	-46.1
1.3	0.717	-157.7	1.390	73.8	0.158	13.1	0.588	-48.6
1.4	0.713	-162.8	1.303	69.8	0.153	12.2	0.579	-51.1
1.5	0.711	-167.4	1.230	66.0	0.148	11.7	0.572	-53.7
1.6	0.712	-171.7	1.166	62.4	0.142	11.5	0.566	-56.4
1.7	0.713	-175.9	1.102	59.0	0.137	12.2	0.561	-59.2
1.8	0.713	-179.7	1.048	55.9	0.131	13.0	0.559	-62.0
1.9	0.715	176.9	0.997	52.9	0.125	14.9	0.557	-64.8
2.0	0.716	173.5	0.958	50.6	0.120	17.0	0.556	-67.8
2.1	0.714	169.7	0.913	47.4	0.115	20.1	0.556	-70.8
2.2	0.719	166.6	0.884	44.9	0.111	23.6	0.556	-73.8
2.3	0.722	163.1	0.850	42.8	0.109	27.6	0.558	-76.7
2.4	0.727	159.8	0.811	40.4	0.108	32.3	0.559	-79.8
2.5	0.728	156.6	0.779	38.3	0.108	37.0	0.562	-82.7
2.6	0.730	153.7	0.750	36.4	0.110	41.7	0.564	-86.1
2.7	0.738	150.7	0.721	34.5	0.115	46.5	0.568	-88.7
2.8	0.744	148.0	0.693	33.1	0.122	50.9	0.573	-91.8
2.9	0.748	145.9	0.676	31.1	0.129	55.4	0.574	-94.0
3.0	0.750	143.4	0.655	30.0	0.136	58.5	0.574	-97.1
4.0	0.774	125.9	0.514	25.9	0.261	63.7	0.573	-127.7
5.0	0.767	111.1	0.482	23.4	0.389	50.7	0.585	-163.9

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

Frequency (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.887	-30.1	9.389	159.9	0.038	71.1	0.950	-15.0
0.2	0.827	-59.2	8.503	142.0	0.068	59.6	0.843	-27.4
0.3	0.762	-81.9	7.331	128.1	0.087	49.7	0.732	-36.1
0.4	0.704	-100.6	6.210	117.4	0.099	42.9	0.635	-41.9
0.5	0.663	-115.7	5.349	108.8	0.106	38.3	0.559	-45.8
0.6	0.645	-128.0	4.644	102.0	0.110	35.1	0.500	-48.7
0.7	0.625	-138.2	4.093	95.9	0.113	33.2	0.455	-50.6
0.8	0.616	-146.5	3.660	91.2	0.115	32.3	0.420	-52.4
0.9	0.612	-154.1	3.296	86.8	0.116	31.8	0.392	-54.1
1.0	0.611	-160.1	2.989	82.8	0.118	31.9	0.370	-55.8
1.1	0.610	-165.6	2.745	79.1	0.119	32.3	0.353	-57.5
1.2	0.610	-170.3	2.533	75.8	0.120	32.9	0.338	-59.3
1.3	0.613	-174.3	2.353	72.8	0.121	33.9	0.327	-61.4
1.4	0.612	-178.0	2.198	69.7	0.122	35.1	0.318	-63.6
1.5	0.611	178.5	2.057	66.8	0.124	36.6	0.312	-66.1
1.6	0.616	175.0	1.943	63.9	0.126	37.9	0.307	-68.6
1.7	0.618	171.7	1.833	61.1	0.129	39.6	0.303	-71.4
1.8	0.619	168.9	1.737	58.6	0.132	41.0	0.301	-74.0
1.9	0.620	166.0	1.649	56.2	0.135	42.7	0.300	-76.7
2.0	0.622	163.4	1.579	54.2	0.138	44.3	0.300	-79.6
2.1	0.626	160.6	1.507	51.4	0.142	45.8	0.301	-82.5
2.2	0.624	157.8	1.452	48.9	0.146	47.2	0.303	-85.4
2.3	0.631	154.9	1.400	47.0	0.151	48.3	0.306	-88.2
2.4	0.635	152.3	1.340	44.8	0.156	49.5	0.309	-91.1
2.5	0.638	149.8	1.288	42.8	0.161	50.5	0.312	-93.8
2.6	0.643	147.4	1.242	40.8	0.167	51.4	0.317	-96.7
2.7	0.648	145.1	1.195	38.9	0.174	52.3	0.321	-99.0
2.8	0.654	143.0	1.154	37.0	0.181	53.0	0.327	-101.9
2.9	0.660	141.3	1.128	35.1	0.187	54.3	0.328	-103.8
3.0	0.663	139.3	1.091	33.6	0.193	54.7	0.331	-106.6
4.0	0.705	126.1	0.836	22.2	0.280	53.9	0.347	-135.2
5.0	0.729	112.8	0.693	12.5	0.375	45.4	0.392	-169.7



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

Frequency (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.826	-39.3	14.149	154.5	0.035	67.7	0.908	-21.5
0.2	0.733	-73.7	11.903	133.9	0.060	55.1	0.748	-37.0
0.3	0.669	-98.7	9.658	120.1	0.073	47.1	0.611	-46.6
0.4	0.620	-116.9	7.835	110.3	0.081	42.6	0.506	-52.5
0.5	0.597	-130.9	6.583	102.7	0.086	40.4	0.431	-56.2
0.6	0.579	-142.2	5.626	96.8	0.090	39.5	0.377	-58.9
0.7	0.570	-150.9	4.895	91.8	0.094	39.5	0.336	-60.9
0.8	0.568	-158.4	4.344	87.7	0.098	40.1	0.305	-62.8
0.9	0.566	-164.3	3.886	83.9	0.101	41.0	0.280	-64.7
1.0	0.568	-169.6	3.515	80.4	0.105	42.0	0.261	-66.6
1.1	0.571	-174.1	3.219	77.3	0.108	43.0	0.246	-68.6
1.2	0.573	-178.1	2.962	74.4	0.112	44.1	0.233	-70.7
1.3	0.576	178.6	2.746	71.7	0.117	45.3	0.224	-73.1
1.4	0.579	175.2	2.560	69.2	0.121	46.5	0.217	-75.8
1.5	0.579	172.2	2.396	66.6	0.126	47.5	0.212	-78.7
1.6	0.582	169.2	2.261	63.9	0.131	48.5	0.208	-81.5
1.7	0.585	166.3	2.129	61.5	0.136	49.6	0.206	-84.6
1.8	0.586	163.8	2.016	59.2	0.142	50.3	0.205	-87.6
1.9	0.590	161.6	1.917	57.1	0.147	51.2	0.206	-90.5
2.0	0.589	159.1	1.831	55.2	0.153	51.7	0.207	-93.5
2.1	0.593	156.6	1.745	52.6	0.159	52.4	0.209	-96.7
2.2	0.594	154.2	1.680	50.4	0.165	52.9	0.212	-99.6
2.3	0.598	151.6	1.620	48.6	0.171	53.2	0.217	-102.3
2.4	0.603	149.1	1.552	46.5	0.177	53.4	0.220	-105.2
2.5	0.606	146.7	1.495	44.5	0.184	53.5	0.225	-107.8
2.6	0.611	144.4	1.441	42.7	0.191	53.5	0.230	-110.6
2.7	0.619	142.6	1.389	40.7	0.197	53.6	0.234	-112.6
2.8	0.623	140.6	1.343	38.9	0.205	53.6	0.239	-115.3
2.9	0.627	139.1	1.308	37.1	0.211	54.1	0.240	-117.4
3.0	0.632	137.0	1.269	35.5	0.217	54.0	0.245	-119.9
4.0	0.674	125.6	0.975	22.9	0.293	50.3	0.267	-147.7
5.0	0.709	113.4	0.805	12.0	0.374	42.3	0.321	-180.0

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

Frequency (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.775	-46.9	18.006	150.0	0.034	65.5	0.868	-26.9
0.2	0.669	-85.7	14.206	128.3	0.054	53.2	0.671	-44.3
0.3	0.606	-110.2	11.044	114.7	0.063	46.6	0.526	-54.2
0.4	0.575	-128.0	8.777	105.8	0.071	44.5	0.423	-60.1
0.5	0.555	-140.8	7.271	99.1	0.076	43.7	0.355	-64.0
0.6	0.549	-151.1	6.172	93.8	0.080	44.3	0.305	-67.0
0.7	0.545	-158.9	5.332	89.3	0.085	45.1	0.269	-69.4
0.8	0.544	-165.4	4.720	85.5	0.090	46.4	0.241	-71.8
0.9	0.546	-170.9	4.217	82.2	0.095	47.5	0.220	-74.2
1.0	0.547	-175.2	3.799	78.9	0.100	48.8	0.203	-76.8
1.1	0.551	-179.2	3.479	76.3	0.106	49.8	0.190	-79.5
1.2	0.555	177.4	3.203	73.7	0.111	50.8	0.179	-82.3
1.3	0.559	174.3	2.967	71.2	0.117	51.7	0.172	-85.4
1.4	0.560	171.6	2.763	68.8	0.123	52.5	0.166	-88.7
1.5	0.561	168.6	2.583	66.4	0.129	53.2	0.163	-92.0
1.6	0.565	165.9	2.433	63.9	0.136	53.7	0.161	-95.5
1.7	0.568	163.5	2.292	61.7	0.142	54.3	0.161	-98.9
1.8	0.571	161.1	2.170	59.6	0.149	54.6	0.161	-102.2
1.9	0.571	158.9	2.062	57.5	0.155	54.9	0.163	-105.3
2.0	0.573	156.8	1.971	55.7	0.162	55.1	0.166	-108.4
2.1	0.574	154.2	1.875	53.2	0.169	55.3	0.169	-111.3
2.2	0.577	151.7	1.809	51.0	0.176	55.4	0.174	-114.3
2.3	0.582	149.3	1.742	49.4	0.183	55.3	0.178	-116.8
2.4	0.585	146.9	1.670	47.3	0.189	55.1	0.183	-119.4
2.5	0.590	144.7	1.607	45.4	0.196	54.8	0.188	-121.7
2.6	0.593	142.6	1.552	43.6	0.203	54.5	0.193	-124.2
2.7	0.602	141.0	1.499	41.9	0.210	54.2	0.197	-126.1
2.8	0.607	139.0	1.445	40.0	0.218	53.9	0.203	-128.5
2.9	0.610	137.5	1.408	38.1	0.224	54.1	0.205	-130.3
3.0	0.614	135.9	1.365	36.8	0.230	53.8	0.209	-132.4
4.0	0.660	125.1	1.056	23.9	0.302	48.6	0.236	-159.2
5.0	0.699	113.4	0.866	12.4	0.375	40.6	0.293	170.7

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

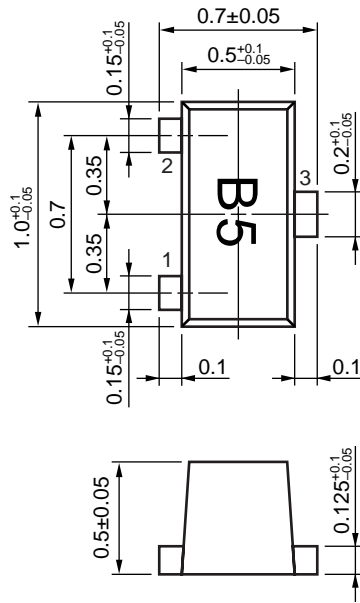
Frequency (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.691	-56.6	22.379	144.6	0.031	60.8	0.816	-33.3
0.2	0.600	-98.5	16.410	122.3	0.047	52.0	0.587	-52.3
0.3	0.556	-122.9	12.298	109.9	0.055	48.6	0.442	-62.3
0.4	0.536	-139.0	9.601	101.8	0.062	48.0	0.349	-68.6
0.5	0.523	-150.3	7.878	95.9	0.067	48.9	0.288	-73.0
0.6	0.521	-159.1	6.632	91.3	0.073	50.0	0.245	-76.8
0.7	0.524	-165.6	5.727	87.3	0.079	51.4	0.215	-80.1
0.8	0.525	-171.5	5.034	83.8	0.086	52.7	0.191	-83.5
0.9	0.527	-176.0	4.494	80.9	0.092	53.9	0.174	-87.2
1.0	0.532	-179.9	4.042	78.1	0.099	54.9	0.160	-90.9
1.1	0.537	176.4	3.707	75.4	0.106	55.7	0.150	-94.8
1.2	0.541	173.3	3.405	72.9	0.112	56.3	0.142	-98.7
1.3	0.544	170.6	3.149	70.7	0.119	56.8	0.136	-103.0
1.4	0.547	168.1	2.935	68.4	0.126	57.3	0.134	-107.0
1.5	0.546	165.4	2.742	66.2	0.133	57.6	0.133	-111.0
1.6	0.553	163.0	2.583	63.9	0.141	57.8	0.133	-114.5
1.7	0.555	160.6	2.430	61.8	0.148	57.9	0.135	-118.2
1.8	0.560	158.5	2.300	59.8	0.156	57.8	0.137	-121.6
1.9	0.561	156.3	2.188	57.6	0.163	57.8	0.140	-124.4
2.0	0.559	154.3	2.088	55.9	0.171	57.5	0.144	-127.2
2.1	0.562	151.7	1.992	53.7	0.178	57.4	0.149	-129.5
2.2	0.564	149.7	1.914	51.5	0.186	57.2	0.154	-132.3
2.3	0.571	147.3	1.846	49.9	0.193	56.9	0.160	-134.1
2.4	0.572	145.1	1.771	48.0	0.200	56.4	0.165	-136.3
2.5	0.580	143.0	1.706	46.1	0.207	55.9	0.170	-138.1
2.6	0.582	141.0	1.647	44.4	0.214	55.4	0.175	-140.0
2.7	0.591	139.2	1.586	42.5	0.221	54.8	0.180	-141.6
2.8	0.595	137.6	1.532	40.9	0.229	54.4	0.186	-143.5
2.9	0.598	136.1	1.495	39.1	0.235	54.3	0.188	-145.0
3.0	0.601	134.6	1.446	37.7	0.241	53.6	0.192	-147.0
4.0	0.644	124.7	1.119	24.7	0.310	47.3	0.222	-171.9
5.0	0.685	113.4	0.922	12.9	0.378	39.0	0.283	160.9

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

Frequency (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.560	-82.6	30.410	133.8	0.026	59.3	0.685	-46.7
0.2	0.513	-124.0	19.562	112.8	0.036	53.8	0.437	-67.8
0.3	0.494	-144.4	13.931	102.4	0.043	54.4	0.315	-78.9
0.4	0.493	-156.5	10.623	96.1	0.051	57.1	0.244	-87.0
0.5	0.494	-165.2	8.613	91.3	0.059	59.2	0.200	-93.6
0.6	0.497	-171.6	7.212	87.4	0.067	60.5	0.172	-100.1
0.7	0.500	-176.6	6.206	84.1	0.075	61.7	0.153	-106.1
0.8	0.507	179.4	5.446	81.4	0.083	62.5	0.139	-112.6
0.9	0.510	175.9	4.844	78.8	0.092	63.1	0.130	-118.9
1.0	0.516	172.7	4.365	76.2	0.100	63.4	0.125	-124.9
1.1	0.521	170.0	3.982	74.1	0.108	63.6	0.122	-130.5
1.2	0.527	167.6	3.662	71.7	0.116	63.6	0.120	-135.8
1.3	0.529	165.2	3.389	69.8	0.125	63.5	0.122	-140.4
1.4	0.532	163.1	3.154	67.7	0.133	63.5	0.124	-144.3
1.5	0.533	160.9	2.943	65.7	0.141	63.1	0.127	-147.9
1.6	0.539	158.7	2.776	63.6	0.150	62.6	0.131	-150.6
1.7	0.544	156.6	2.607	61.6	0.158	62.3	0.135	-153.2
1.8	0.544	154.4	2.472	59.8	0.167	61.7	0.140	-155.5
1.9	0.546	152.8	2.345	58.0	0.175	61.1	0.145	-157.1
2.0	0.547	151.2	2.238	56.5	0.183	60.6	0.150	-158.6
2.1	0.549	148.6	2.136	54.2	0.192	60.0	0.156	-159.7
2.2	0.551	146.8	2.054	52.1	0.199	59.5	0.161	-161.0
2.3	0.558	144.4	1.980	50.5	0.207	58.7	0.167	-161.8
2.4	0.562	142.4	1.897	48.8	0.214	57.9	0.172	-163.0
2.5	0.564	140.5	1.826	47.1	0.222	57.1	0.177	-163.9
2.6	0.568	138.8	1.764	45.4	0.229	56.3	0.182	-165.1
2.7	0.574	137.1	1.700	43.8	0.236	55.5	0.187	-165.9
2.8	0.581	135.7	1.640	42.3	0.245	54.8	0.193	-167.3
2.9	0.583	134.3	1.599	40.4	0.251	54.3	0.195	-168.4
3.0	0.586	133.0	1.553	39.1	0.257	53.4	0.197	-170.0
4.0	0.630	124.2	1.205	26.4	0.323	45.6	0.232	169.0
5.0	0.675	113.5	0.990	14.2	0.383	36.9	0.295	146.6

★ PACKAGE DIMENSIONS

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



(Bottom View)

**PIN CONNECTIONS**

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

- **The information in this document is current as of December, 2001. 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