CEL

NPN SILICON RF TRANSISTOR
NE851M13 / 2SC5801

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

FEATURES

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

ORDERING INFORMATION

Part Number	Quantity	Supplying Form
NE851M13-A 2SC5801-A	50 pcs (Non reel)	• 8 mm wide embossed taping
NE851M13-T3-A 2SC5801-T3-A	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}	9.0	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 $cm^2 \times 1.0$ mm (t) glass epoxy PCB

Caution: Observe precautions when handling because these devices are sensitive to electrostatic discharge

The information in this document is subject to change without notice. Before using this document, please confirm that this is the latest version.

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The mark ★ shows major revised points.

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	–	–	600	nA
Emitter Cut-off Current	I_{EBO}	V_{EB} = 1 V, I_C = 0 mA	–	–	600	nA
DC Current Gain	h_{FE} Note 1	V_{CE} = 1 V, I_C = 5 mA	100	120	145	–
RF Characteristics						
Gain Bandwidth Product (1)	f_T	V_{CE} = 1 V, I_C = 5 mA, f = 2 GHz	3.0	4.5	–	GHz
Gain Bandwidth Product (2)	f_T	V_{CE} = 1 V, I_C = 15 mA, f = 2 GHz	5.0	6.5	–	GHz
Insertion Power Gain (1)	$\lvert S_{21e} \rvert^2$	V_{CE} = 1 V, I_C = 5 mA, f = 2 GHz	3.0	4.0	–	dB
Insertion Power Gain (2)	$\lvert S_{21e} \rvert^2$	V_{CE} = 1 V, I_C = 15 mA, f = 2 GHz	4.5	5.5	–	dB
Noise Figure	NF	V_{CE} = 1 V, I_C = 10 mA, f = 2 GHz, $Z_S = Z_{opt}$	–	1.9	2.5	dB
Reverse Transfer Capacitance	C_{re} Note 2	V_{CB} = 0.5 V, I_E = 0 mA, f = 1 MHz	–	0.6	0.8	pF

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

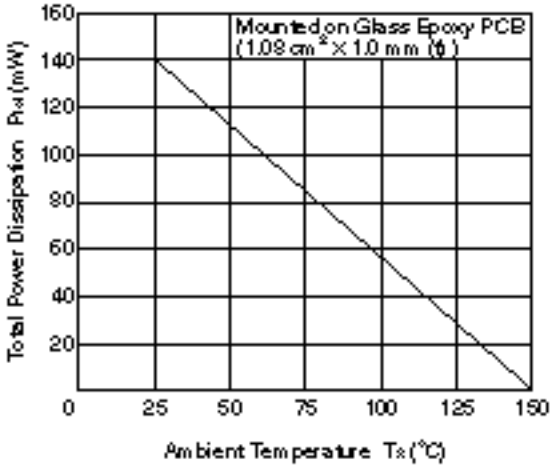
2. Collector to base capacitance when the emitter grounded

h_{FE} CLASSIFICATION

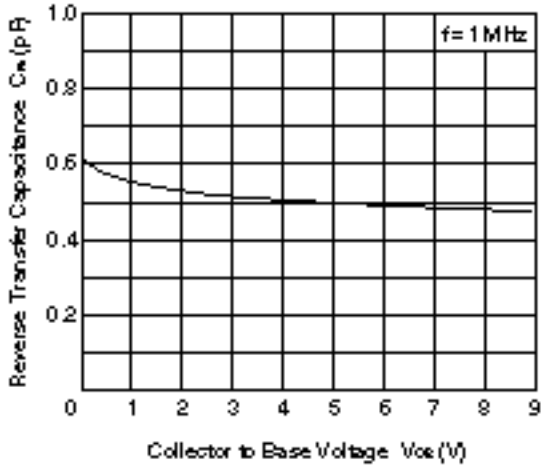
Rank	FB
Marking	E7
h_{FE} Value	100 to 145

TYPICAL CHARACTERISTICS (Unless otherwise specified, T_A = +25°C)

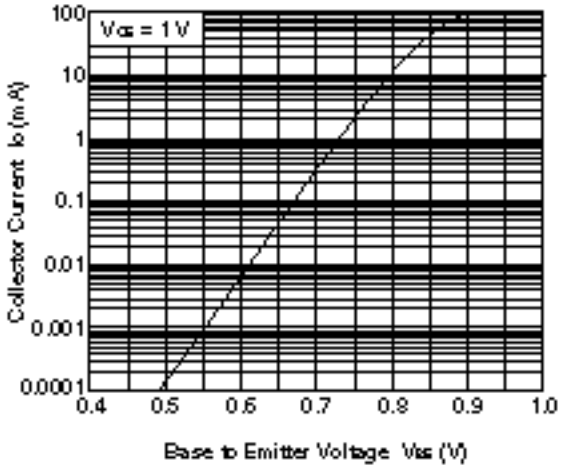
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



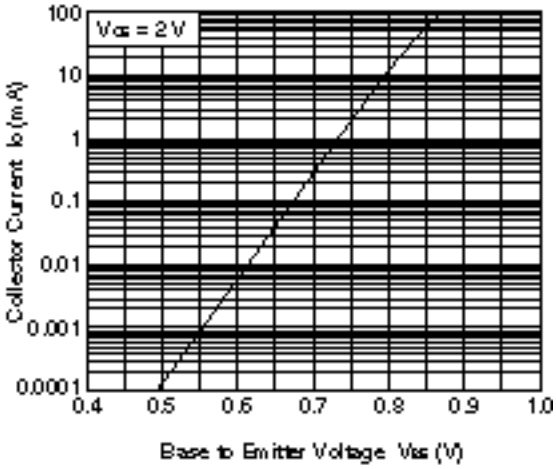
REVERSE TRANSFER CAPACITANCE vs. COLLECTOR TO BASE VOLTAGE



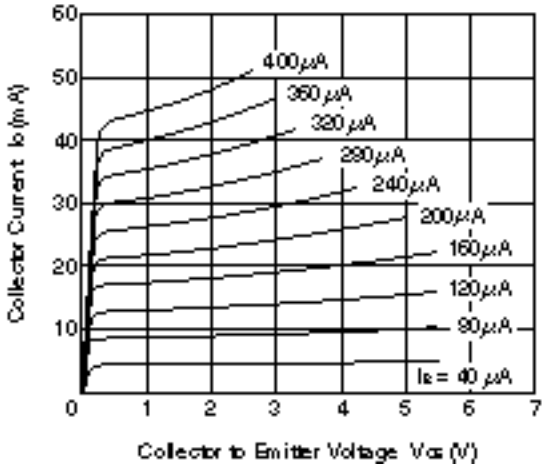
COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE



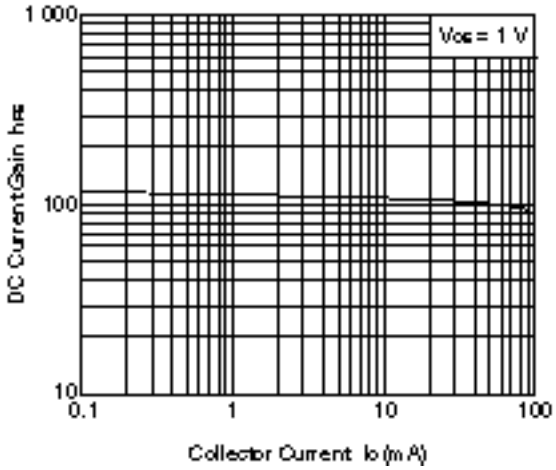
COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE



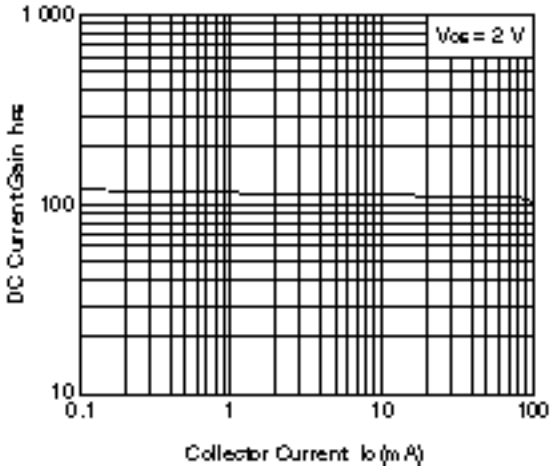
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



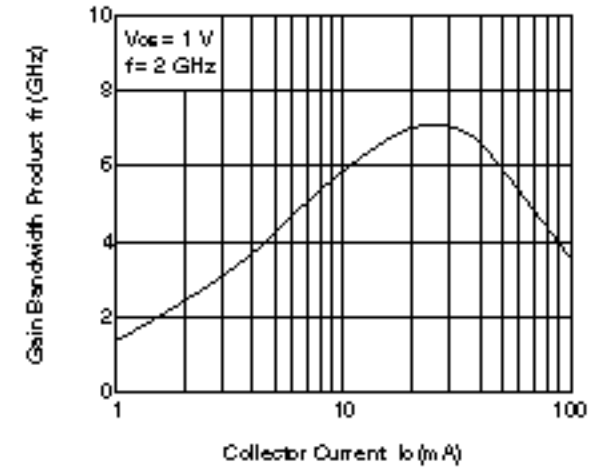
DC CURRENT GAIN vs.
COLLECTOR CURRENT



DC CURRENT GAIN vs.
COLLECTOR CURRENT



GAIN BANDWIDTH PRODUCT
vs. COLLECTOR CURRENT



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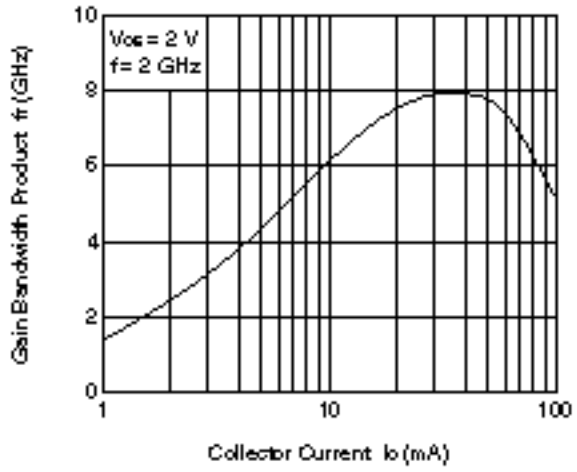
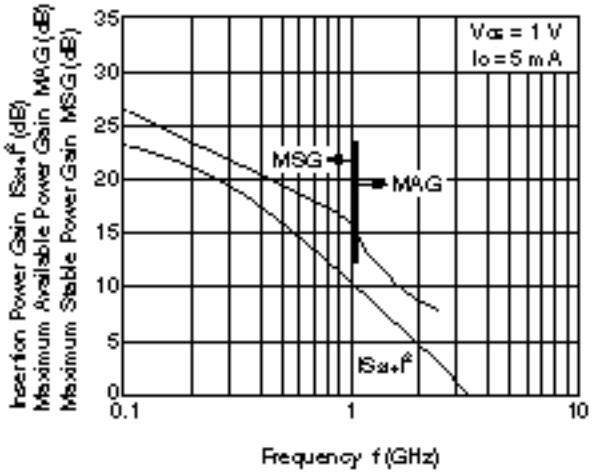
vs. COLLECTOR CURRENT



INSERTION POWER GAIN,
MAG, MSG vs. FREQUENCY



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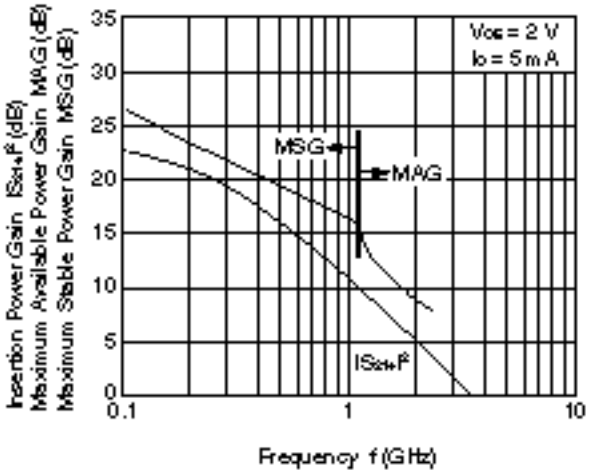

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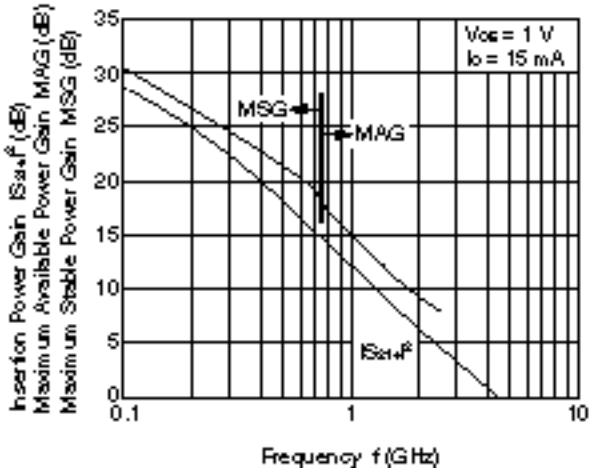

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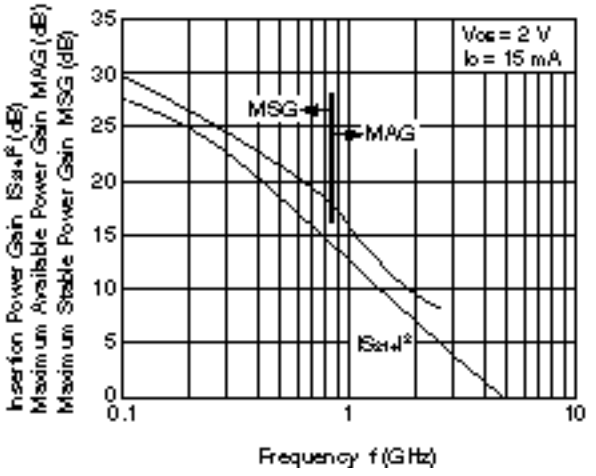

INSERTION POWER GAIN, MAG, MSG
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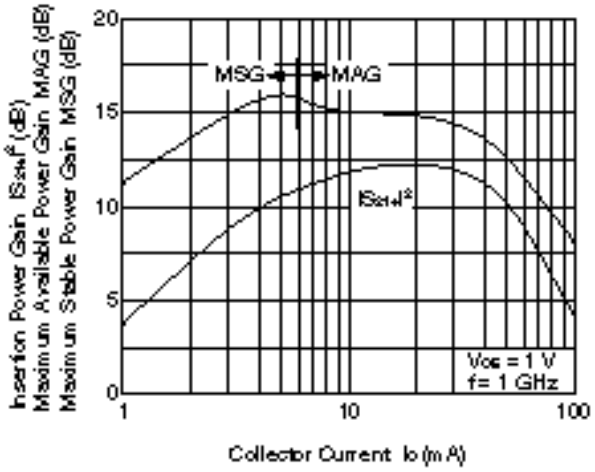

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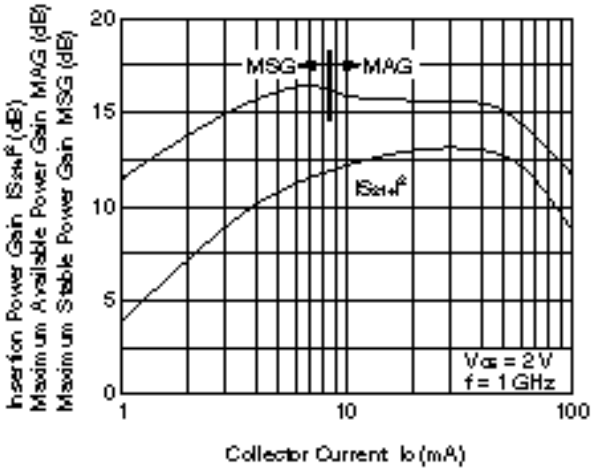

INSERTION POWER GAIN, MAG
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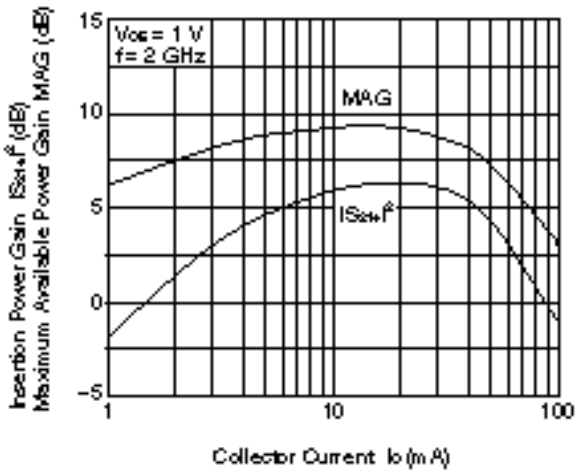

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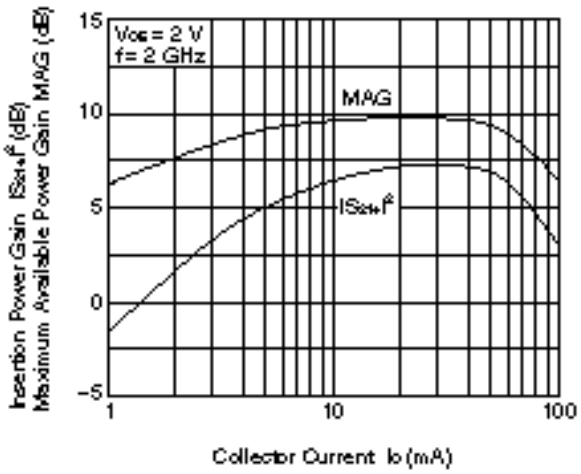

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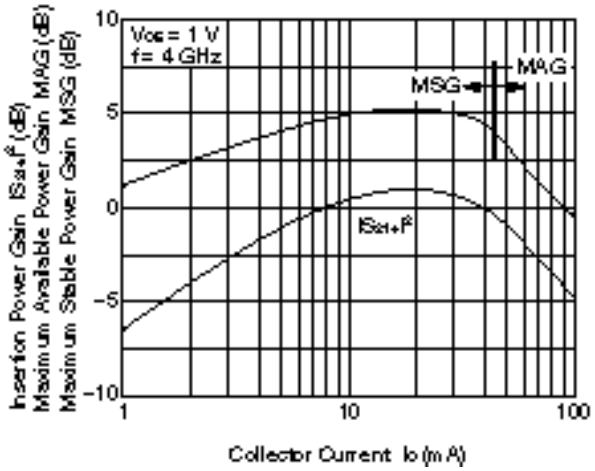

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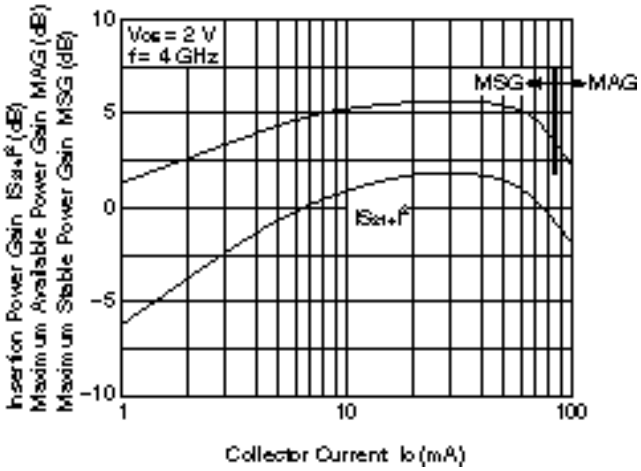
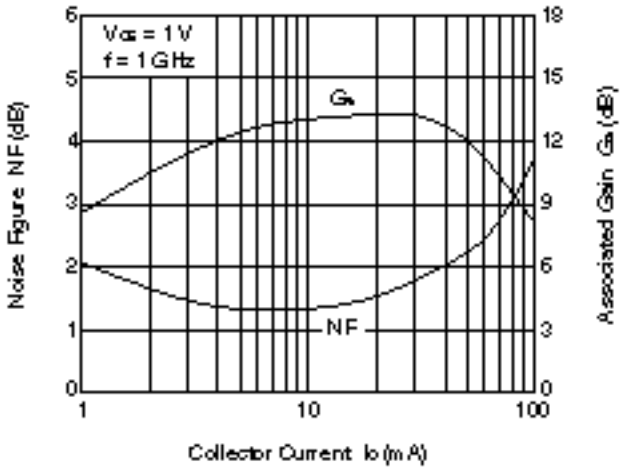
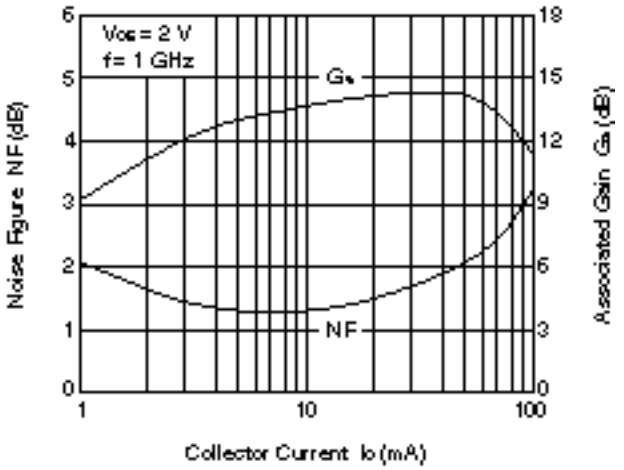


NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



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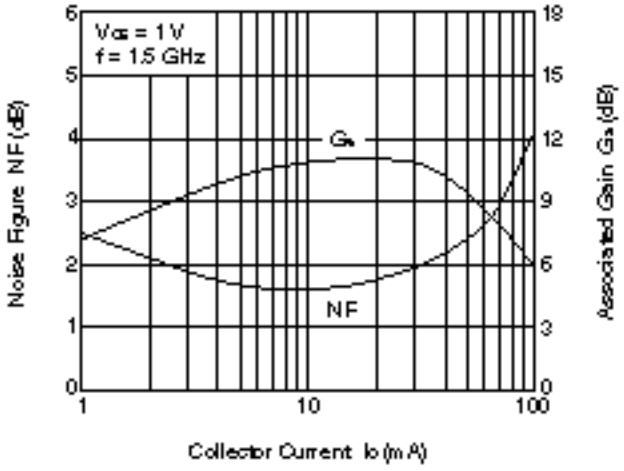
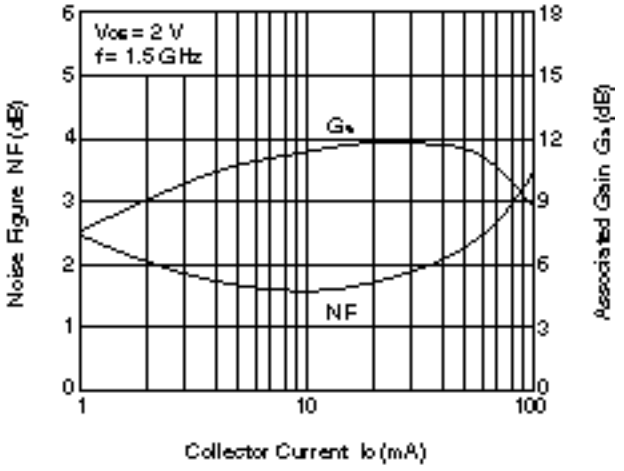


NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



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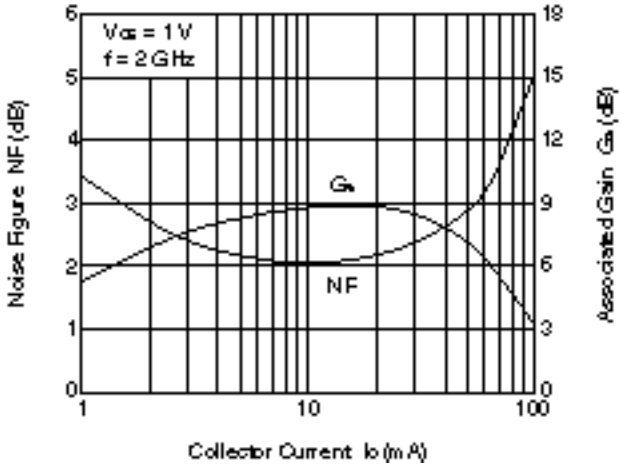

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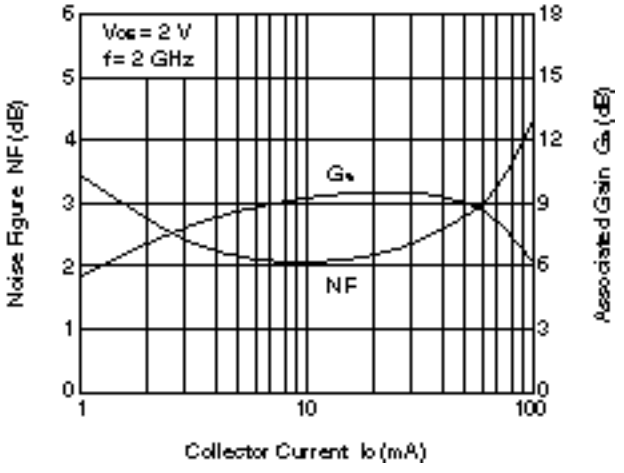
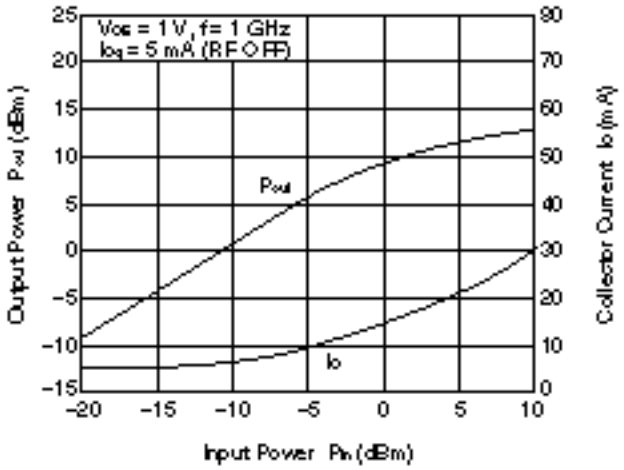


OUTPUT POWER, COLLECTOR CURRENT vs. INPUT POWER



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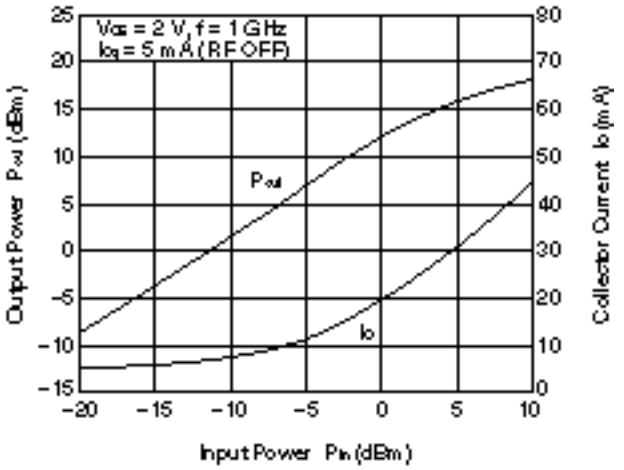

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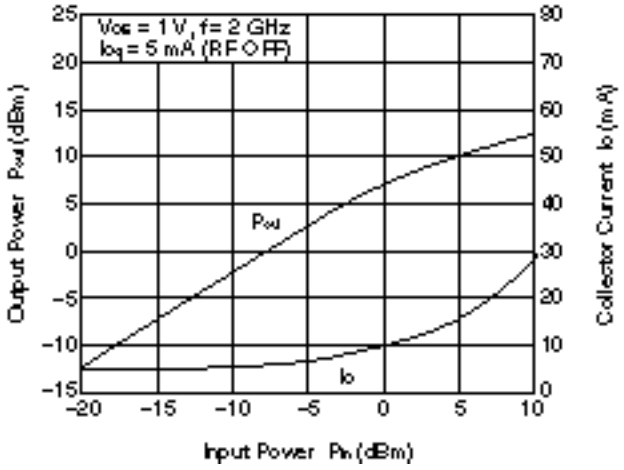

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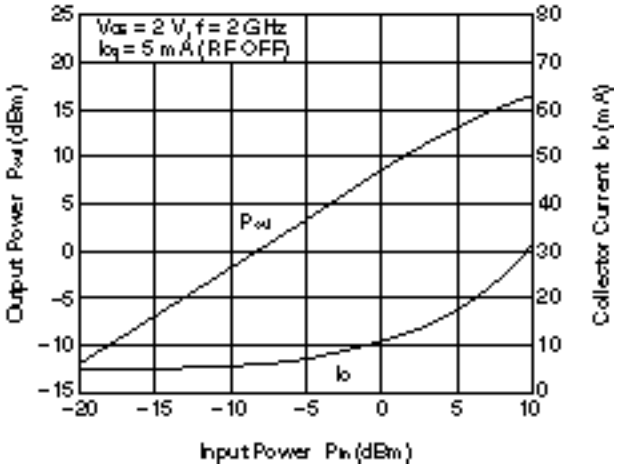


Remark The graphs indicate nominal characteristics.

S-PARAMETERS

V_{CE} = 1 V, I_C = 1 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.960	−24.8	3.647	164.0	0.037	77.4	0.985	−7.1
0.2	0.935	−46.8	3.442	149.0	0.068	63.8	0.948	−13.7
0.3	0.895	−66.5	3.123	136.4	0.092	52.5	0.901	−19.2
0.4	0.856	−84.6	2.817	124.2	0.108	43.5	0.851	−23.6
0.5	0.823	−99.7	2.518	114.5	0.119	35.8	0.809	−27.1
0.6	0.798	−112.9	2.255	106.1	0.124	30.0	0.772	−30.3
0.7	0.782	−124.0	2.031	98.7	0.125	25.0	0.743	−33.1
0.8	0.768	−133.5	1.848	92.0	0.124	21.1	0.717	−36.0
0.9	0.762	−141.9	1.680	86.1	0.121	17.9	0.699	−38.8
1.0	0.755	−149.4	1.544	80.5	0.116	16.0	0.685	−41.7
1.1	0.751	−155.9	1.419	75.7	0.110	14.6	0.676	−44.8
1.2	0.746	−162.1	1.312	70.9	0.104	14.1	0.668	−48.0
1.3	0.749	−167.2	1.219	67.0	0.097	14.6	0.665	−51.0
1.4	0.750	−172.3	1.139	63.0	0.090	16.3	0.661	−54.3
1.5	0.759	−176.7	1.069	59.3	0.083	19.5	0.661	−57.4
1.6	0.759	179.5	1.004	56.0	0.077	24.1	0.658	−60.7
1.7	0.762	175.6	0.945	52.8	0.072	30.8	0.657	−64.0
1.8	0.763	171.9	0.891	49.9	0.070	39.4	0.655	−67.1
1.9	0.769	168.7	0.846	47.5	0.071	48.5	0.654	−70.5
2.0	0.771	165.3	0.801	44.8	0.075	57.5	0.653	−74.0
2.1	0.774	162.5	0.765	42.9	0.081	65.5	0.654	−77.5
2.2	0.781	159.9	0.731	40.5	0.090	71.8	0.656	−81.1
2.3	0.781	157.3	0.706	39.0	0.101	76.4	0.656	−84.6
2.4	0.785	154.6	0.678	37.8	0.114	79.2	0.656	−88.3
2.5	0.787	152.2	0.650	36.2	0.128	81.1	0.657	−92.2
2.6	0.787	149.6	0.629	35.5	0.142	82.4	0.659	−96.2
2.7	0.790	147.3	0.606	34.7	0.158	82.4	0.660	−100.2
2.8	0.798	145.1	0.586	33.9	0.173	82.1	0.664	−103.7
2.9	0.793	143.1	0.564	33.9	0.189	81.2	0.662	−107.4
3.0	0.791	140.6	0.538	33.1	0.206	80.1	0.657	−111.3
4.0	0.789	119.6	0.474	30.6	0.364	66.0	0.674	−145.9
5.0	0.786	106.8	0.491	26.8	0.467	44.6	0.662	177.0

V_{CE} = 1 V, I_C = 3 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.893	–35.5	9.572	157.0	0.034	72.9	0.947	–13.9
0.2	0.812	–65.6	8.351	138.3	0.060	57.1	0.838	–24.8
0.3	0.757	–88.9	7.005	124.8	0.075	46.7	0.735	–31.6
0.4	0.713	–107.5	5.893	113.4	0.083	40.2	0.649	–35.8
0.5	0.678	–122.4	5.003	105.0	0.087	36.0	0.588	–38.4
0.6	0.659	–134.2	4.333	98.2	0.089	33.7	0.541	–40.6
0.7	0.648	–143.5	3.801	92.4	0.090	32.3	0.507	–42.4
0.8	0.641	–151.5	3.385	87.1	0.090	32.4	0.480	–44.3
0.9	0.639	–158.2	3.038	82.7	0.090	32.5	0.461	–46.5
1.0	0.637	–164.3	2.763	78.3	0.090	33.9	0.447	–48.9
1.1	0.634	–169.4	2.525	74.6	0.090	36.0	0.438	–51.4
1.2	0.635	–174.3	2.319	70.8	0.090	38.1	0.430	–54.1
1.3	0.640	–178.3	2.148	67.7	0.090	40.8	0.426	–56.6
1.4	0.642	177.8	2.005	64.4	0.092	44.0	0.424	–59.4
1.5	0.649	174.4	1.879	61.3	0.093	47.2	0.422	–62.1
1.6	0.654	171.4	1.762	58.3	0.097	50.5	0.421	–65.0
1.7	0.658	168.5	1.662	55.5	0.100	53.8	0.422	–67.8
1.8	0.663	165.7	1.568	52.8	0.105	57.4	0.421	–70.6
1.9	0.668	163.1	1.489	50.6	0.110	60.1	0.421	–73.5
2.0	0.673	160.5	1.419	47.9	0.117	62.9	0.421	–76.7
2.1	0.679	158.4	1.354	45.8	0.124	65.2	0.422	–80.1
2.2	0.686	156.1	1.298	43.1	0.132	67.1	0.424	–83.4
2.3	0.687	154.1	1.254	41.3	0.141	68.6	0.426	–86.7
2.4	0.693	152.1	1.203	39.7	0.151	69.6	0.428	–90.2
2.5	0.698	150.0	1.155	37.5	0.161	70.5	0.431	–93.9
2.6	0.700	148.0	1.118	36.0	0.171	71.1	0.434	–97.5
2.7	0.707	146.1	1.079	34.4	0.182	71.2	0.438	–101.2
2.8	0.715	144.2	1.040	32.7	0.194	71.0	0.443	–104.6
2.9	0.711	142.8	1.001	31.6	0.205	70.5	0.446	–108.2
3.0	0.712	140.4	0.955	30.0	0.218	70.0	0.449	–111.9
4.0	0.744	122.0	0.726	17.2	0.345	61.5	0.511	–144.6
5.0	0.776	109.4	0.605	11.5	0.446	44.0	0.547	178.4

V_{CE} = 1 V, I_C = 5 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.810	–44.0	14.367	151.3	0.031	68.3	0.903	–19.7
0.2	0.731	–79.5	11.617	130.9	0.053	54.0	0.743	–32.7
0.3	0.670	–103.5	9.232	117.6	0.063	44.9	0.615	–39.5
0.4	0.629	–121.5	7.487	107.3	0.069	41.5	0.524	–43.1
0.5	0.607	–135.3	6.227	99.9	0.072	40.0	0.462	–45.2
0.6	0.593	–145.7	5.314	94.0	0.075	39.8	0.419	–46.7
0.7	0.589	–154.1	4.631	89.0	0.078	40.5	0.388	–48.1
0.8	0.584	–160.9	4.093	84.5	0.080	41.9	0.363	–49.9
0.9	0.587	–166.4	3.660	80.7	0.083	43.4	0.347	–51.9
1.0	0.589	–171.8	3.314	76.9	0.086	45.6	0.334	–54.2
1.1	0.590	–176.3	3.023	73.7	0.089	47.8	0.326	–56.7
1.2	0.588	179.5	2.774	70.4	0.092	49.8	0.320	–59.3
1.3	0.598	176.3	2.569	67.5	0.096	52.1	0.317	–61.8
1.4	0.600	172.8	2.394	64.6	0.100	54.2	0.314	–64.5
1.5	0.611	169.9	2.242	61.8	0.105	56.1	0.315	–67.1
1.6	0.612	167.4	2.104	59.1	0.110	57.9	0.313	–69.9
1.7	0.618	164.6	1.985	56.5	0.116	59.6	0.314	–72.7
1.8	0.623	162.3	1.875	54.0	0.123	61.4	0.312	–75.5
1.9	0.626	160.1	1.780	51.9	0.129	62.8	0.313	–78.3
2.0	0.632	157.6	1.696	49.4	0.137	64.0	0.313	–81.6
2.1	0.637	156.0	1.618	47.3	0.144	65.1	0.315	–84.9
2.2	0.645	154.1	1.554	44.9	0.152	65.9	0.316	–88.2
2.3	0.649	152.0	1.501	43.1	0.160	66.4	0.319	–91.5
2.4	0.653	150.4	1.440	41.3	0.169	66.8	0.321	–94.9
2.5	0.657	148.6	1.387	39.3	0.179	67.1	0.325	–98.5
2.6	0.661	146.8	1.341	37.7	0.187	67.2	0.329	–102.1
2.7	0.667	145.0	1.299	36.0	0.198	67.0	0.333	–105.8
2.8	0.676	143.5	1.253	34.3	0.207	66.7	0.339	–109.1
2.9	0.672	142.3	1.206	33.1	0.217	66.1	0.343	–112.7
3.0	0.674	139.8	1.158	31.4	0.228	65.6	0.347	–116.3
4.0	0.717	123.0	0.879	16.2	0.340	58.5	0.423	–147.3
5.0	0.764	110.8	0.707	7.5	0.433	43.0	0.477	176.5

V_{CE} = 1 V, I_C = 7 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.765	–52.5	18.026	147.1	0.030	66.5	0.864	–24.4
0.2	0.670	–90.6	13.741	125.7	0.047	51.9	0.669	–38.5
0.3	0.614	–113.9	10.555	113.0	0.055	45.6	0.533	–45.0
0.4	0.585	–131.2	8.386	103.5	0.061	43.9	0.445	–48.2
0.5	0.569	–143.6	6.904	96.9	0.065	44.0	0.387	–49.8
0.6	0.561	–153.0	5.861	91.7	0.069	45.2	0.346	–51.1
0.7	0.558	–160.5	5.069	87.1	0.073	46.8	0.319	–52.5
0.8	0.560	–166.7	4.468	83.1	0.077	48.7	0.297	–54.2
0.9	0.563	–171.6	3.993	79.7	0.081	50.3	0.282	–56.3
1.0	0.565	–176.2	3.614	76.1	0.086	52.2	0.270	–58.8
1.1	0.566	179.7	3.293	73.1	0.090	54.0	0.263	–61.4
1.2	0.567	175.8	3.024	70.0	0.096	55.8	0.258	–64.2
1.3	0.576	172.9	2.797	67.4	0.101	57.3	0.256	–66.9
1.4	0.577	169.7	2.607	64.7	0.107	58.8	0.254	–69.6
1.5	0.586	167.1	2.437	62.1	0.113	60.0	0.254	–72.3
1.6	0.592	164.9	2.290	59.5	0.119	61.1	0.253	–75.1
1.7	0.595	162.3	2.159	57.0	0.126	62.1	0.254	–78.0
1.8	0.600	160.2	2.043	54.6	0.133	63.2	0.253	–80.8
1.9	0.606	158.1	1.937	52.6	0.140	63.9	0.253	–83.7
2.0	0.613	155.9	1.846	50.2	0.148	64.5	0.254	–87.0
2.1	0.618	154.5	1.760	48.3	0.155	65.0	0.256	–90.3
2.2	0.623	152.6	1.691	45.8	0.164	65.4	0.258	–93.7
2.3	0.626	151.0	1.636	44.1	0.172	65.5	0.261	–97.1
2.4	0.632	149.2	1.569	42.4	0.180	65.5	0.263	–100.5
2.5	0.638	147.6	1.513	40.4	0.189	65.4	0.267	–104.1
2.6	0.641	145.8	1.465	38.8	0.198	65.5	0.272	–107.6
2.7	0.647	144.3	1.415	37.2	0.207	65.0	0.276	–111.3
2.8	0.654	142.8	1.370	35.5	0.216	64.7	0.282	–114.6
2.9	0.653	141.5	1.320	34.2	0.225	64.0	0.287	–118.2
3.0	0.655	139.6	1.267	32.5	0.236	63.3	0.293	–121.7
4.0	0.699	123.2	0.964	16.5	0.339	56.4	0.373	–150.9
5.0	0.757	111.7	0.775	6.6	0.426	42.0	0.437	174.0

V_{CE} = 1 V, I_C = 10 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.677	–63.6	22.358	141.5	0.028	63.8	0.805	–30.3
0.2	0.598	–103.1	15.866	120.0	0.042	51.4	0.581	–45.2
0.3	0.560	–125.7	11.779	108.2	0.049	47.4	0.446	–51.1
0.4	0.547	–141.4	9.186	99.8	0.054	48.3	0.365	–54.0
0.5	0.538	–152.5	7.505	94.1	0.059	49.7	0.313	–55.2
0.6	0.534	–160.4	6.324	89.3	0.065	51.5	0.277	–56.7
0.7	0.536	–166.7	5.454	85.3	0.070	53.4	0.253	–58.2
0.8	0.538	–172.5	4.818	81.5	0.076	55.3	0.233	–60.3
0.9	0.542	–176.7	4.281	78.4	0.081	56.7	0.220	–62.8
1.0	0.546	179.3	3.867	75.3	0.088	58.2	0.211	–65.7
1.1	0.547	175.6	3.526	72.5	0.094	59.6	0.205	–68.7
1.2	0.551	172.2	3.238	69.7	0.100	60.6	0.202	–71.8
1.3	0.559	169.6	2.996	67.2	0.107	61.6	0.200	–74.8
1.4	0.563	166.6	2.789	64.7	0.114	62.4	0.199	–77.8
1.5	0.570	164.3	2.612	62.2	0.120	63.1	0.200	–80.5
1.6	0.577	162.3	2.449	59.7	0.128	63.5	0.199	–83.5
1.7	0.579	159.9	2.311	57.4	0.135	63.9	0.201	–86.5
1.8	0.585	158.0	2.186	55.1	0.143	64.6	0.200	–89.5
1.9	0.590	156.4	2.074	53.2	0.150	64.8	0.201	–92.5
2.0	0.596	154.4	1.977	51.0	0.158	64.9	0.202	–95.9
2.1	0.602	152.9	1.890	49.0	0.166	65.0	0.205	–99.4
2.2	0.607	151.1	1.815	46.6	0.174	64.9	0.207	–102.9
2.3	0.610	149.6	1.752	45.0	0.183	64.8	0.211	–106.3
2.4	0.615	147.9	1.682	43.4	0.191	64.4	0.214	–109.7
2.5	0.621	146.5	1.622	41.4	0.200	64.2	0.219	–113.4
2.6	0.624	144.8	1.570	39.9	0.208	63.9	0.224	–116.8
2.7	0.629	143.4	1.521	38.3	0.217	63.4	0.229	–120.4
2.8	0.639	141.9	1.469	36.5	0.226	62.8	0.235	–123.5
2.9	0.634	140.8	1.419	35.3	0.234	62.0	0.241	–127.1
3.0	0.638	138.9	1.363	33.7	0.244	61.3	0.247	–130.2
4.0	0.683	123.5	1.046	17.3	0.339	54.3	0.332	–156.8
5.0	0.745	112.4	0.836	6.5	0.419	40.9	0.401	169.7

V_{CE} = 1 V, I_C = 20 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.548	–90.3	29.336	130.4	0.023	61.8	0.661	–43.3
0.2	0.521	–128.7	18.420	110.6	0.033	54.3	0.419	–58.5
0.3	0.512	–146.7	13.042	100.9	0.040	55.2	0.305	–64.2
0.4	0.512	–158.1	9.968	94.3	0.047	57.6	0.241	–67.5
0.5	0.513	–166.4	8.032	89.5	0.054	60.1	0.202	–69.8
0.6	0.515	–172.3	6.765	85.6	0.062	61.8	0.175	–72.7
0.7	0.521	–176.9	5.799	82.3	0.069	63.4	0.157	–75.6
0.8	0.523	178.9	5.092	79.1	0.077	64.6	0.144	–79.8
0.9	0.530	175.5	4.540	76.5	0.085	65.1	0.137	–84.1
1.0	0.535	172.0	4.094	73.6	0.093	65.7	0.132	–89.0
1.1	0.537	169.3	3.720	71.2	0.101	66.2	0.131	–93.4
1.2	0.541	166.5	3.418	68.8	0.109	66.3	0.131	–97.4
1.3	0.549	164.6	3.162	66.5	0.117	66.3	0.133	–101.1
1.4	0.553	161.7	2.943	64.2	0.125	66.5	0.134	–104.4
1.5	0.561	159.9	2.754	61.8	0.133	66.4	0.137	–107.4
1.6	0.565	158.1	2.590	59.6	0.142	66.3	0.138	–110.6
1.7	0.570	156.4	2.439	57.5	0.150	66.0	0.142	–113.5
1.8	0.574	154.6	2.311	55.4	0.158	65.8	0.143	–117.2
1.9	0.579	152.7	2.192	53.5	0.166	65.6	0.146	–120.1
2.0	0.582	151.1	2.088	51.4	0.175	65.2	0.149	–123.5
2.1	0.592	149.7	1.994	49.7	0.183	64.7	0.154	–126.9
2.2	0.595	148.6	1.916	47.4	0.191	64.2	0.158	–130.2
2.3	0.600	147.0	1.853	45.7	0.200	63.7	0.163	–133.1
2.4	0.604	145.8	1.779	44.2	0.208	63.1	0.168	–136.2
2.5	0.608	144.2	1.715	42.3	0.217	62.5	0.174	–139.2
2.6	0.612	143.0	1.661	40.8	0.225	61.9	0.180	–141.9
2.7	0.620	141.3	1.609	39.2	0.233	61.2	0.187	–145.0
2.8	0.624	140.3	1.553	37.6	0.242	60.4	0.195	–147.5
2.9	0.622	139.1	1.507	36.5	0.250	59.4	0.203	–150.2
3.0	0.625	137.0	1.447	34.7	0.259	58.6	0.209	–152.4
4.0	0.671	123.0	1.118	18.5	0.345	50.9	0.294	–171.6
5.0	0.736	112.6	0.901	6.8	0.413	38.4	0.370	159.0

V_{CE} = 2 V, I_C = 1 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.963	–23.1	3.555	164.3	0.034	78.5	0.988	–6.3
0.2	0.933	–44.8	3.386	150.1	0.064	64.9	0.954	–12.6
0.3	0.896	–63.8	3.082	137.9	0.086	54.3	0.913	–17.7
0.4	0.859	–81.6	2.796	125.9	0.102	45.3	0.866	–21.9
0.5	0.819	–96.6	2.509	116.2	0.112	38.0	0.827	–25.3
0.6	0.791	–109.8	2.258	107.8	0.117	32.2	0.792	–28.3
0.7	0.769	–120.9	2.038	100.5	0.119	27.2	0.763	–31.2
0.8	0.756	–130.7	1.860	93.6	0.118	23.6	0.740	–33.9
0.9	0.747	–139.3	1.692	87.8	0.115	20.7	0.722	–36.6
1.0	0.739	–147.1	1.559	82.3	0.111	18.9	0.706	–39.6
1.1	0.735	–153.8	1.437	77.4	0.106	17.8	0.696	–42.4
1.2	0.729	–160.1	1.328	72.5	0.100	17.6	0.689	–45.6
1.3	0.731	–165.4	1.234	68.8	0.093	18.4	0.686	–48.5
1.4	0.732	–170.7	1.155	64.7	0.087	20.4	0.680	–51.6
1.5	0.736	–175.2	1.084	61.1	0.081	24.0	0.680	–54.7
1.6	0.740	–179.4	1.019	57.7	0.077	28.8	0.677	–57.8
1.7	0.740	176.8	0.960	54.6	0.073	35.5	0.676	–61.0
1.8	0.743	172.9	0.904	51.6	0.072	43.6	0.673	–64.2
1.9	0.746	169.5	0.860	49.3	0.074	52.0	0.670	–67.3
2.0	0.750	166.2	0.818	46.7	0.078	60.1	0.669	–70.7
2.1	0.754	163.3	0.778	44.6	0.085	67.1	0.668	–74.1
2.2	0.758	160.6	0.744	42.3	0.094	72.6	0.668	–77.6
2.3	0.761	157.8	0.721	40.7	0.105	76.7	0.669	–81.1
2.4	0.764	155.3	0.691	39.5	0.118	79.3	0.668	–84.8
2.5	0.766	152.6	0.665	37.7	0.131	81.1	0.668	–88.6
2.6	0.767	150.3	0.640	37.1	0.145	82.2	0.669	–92.2
2.7	0.771	147.7	0.623	36.4	0.160	82.2	0.670	–96.2
2.8	0.776	145.6	0.598	35.3	0.175	82.0	0.672	–99.8
2.9	0.770	143.5	0.577	35.3	0.191	81.1	0.668	–103.4
3.0	0.769	140.8	0.552	34.5	0.207	80.0	0.662	–107.2
4.0	0.771	120.0	0.484	31.0	0.362	66.4	0.671	–141.6
5.0	0.770	106.9	0.497	27.0	0.468	45.2	0.652	–179.2

V_{CE} = 2 V, I_C = 3 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.891	–32.4	9.143	158.8	0.032	73.9	0.956	–12.2
0.2	0.826	–60.1	8.119	141.0	0.057	60.0	0.864	–22.2
0.3	0.766	–82.6	6.925	127.7	0.072	49.0	0.769	–28.7
0.4	0.714	–101.1	5.899	116.1	0.081	42.4	0.687	–33.0
0.5	0.674	–116.1	5.051	107.7	0.085	38.3	0.624	–35.7
0.6	0.651	–128.4	4.399	100.6	0.088	35.6	0.578	–37.9
0.7	0.635	–138.2	3.876	94.7	0.090	34.2	0.543	–39.6
0.8	0.626	–146.8	3.464	89.2	0.090	33.9	0.517	–41.7
0.9	0.620	–153.8	3.112	84.7	0.090	34.0	0.497	–43.6
1.0	0.619	–160.5	2.830	80.3	0.090	35.2	0.480	–46.0
1.1	0.615	–166.0	2.588	76.4	0.090	37.0	0.470	–48.2
1.2	0.615	–171.1	2.384	72.7	0.090	39.0	0.461	–50.8
1.3	0.621	–175.2	2.211	69.4	0.090	41.7	0.457	–53.3
1.4	0.623	–179.5	2.064	66.1	0.092	44.6	0.454	–55.8
1.5	0.629	176.8	1.931	63.0	0.094	47.7	0.452	–58.4
1.6	0.632	173.8	1.813	60.0	0.097	50.9	0.449	–61.0
1.7	0.635	170.5	1.712	57.1	0.100	54.2	0.449	–63.8
1.8	0.642	167.5	1.617	54.4	0.105	57.6	0.447	–66.5
1.9	0.643	164.7	1.532	52.1	0.110	60.4	0.446	–69.3
2.0	0.649	162.3	1.458	49.4	0.117	63.1	0.445	–72.3
2.1	0.656	160.0	1.393	47.4	0.123	65.4	0.445	–75.5
2.2	0.663	157.7	1.338	44.7	0.131	67.2	0.446	–78.8
2.3	0.665	155.4	1.292	42.8	0.140	68.7	0.448	–81.9
2.4	0.671	153.3	1.239	41.1	0.149	69.8	0.448	–85.3
2.5	0.675	151.2	1.192	39.1	0.159	70.6	0.450	–88.8
2.6	0.678	149.2	1.152	37.5	0.169	71.3	0.452	–92.3
2.7	0.684	147.1	1.115	35.8	0.180	71.4	0.454	–96.0
2.8	0.690	145.3	1.074	34.1	0.191	71.4	0.459	–99.3
2.9	0.689	143.7	1.033	33.1	0.203	70.8	0.460	–102.9
3.0	0.691	141.4	0.987	31.3	0.215	70.4	0.461	–106.7
4.0	0.724	122.4	0.753	17.9	0.343	62.2	0.511	–139.4
5.0	0.759	109.9	0.625	11.9	0.445	44.8	0.538	–177.3

V_{CE} = 2 V, I_C = 5 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.829	–38.6	13.522	154.1	0.030	68.9	0.925	–17.0
0.2	0.747	–71.2	11.312	134.6	0.051	56.9	0.787	–29.1
0.3	0.680	–94.1	9.211	121.4	0.062	47.7	0.666	–35.8
0.4	0.632	–113.2	7.570	110.6	0.069	43.3	0.576	–39.7
0.5	0.601	–127.2	6.341	103.0	0.074	41.3	0.512	–41.8
0.6	0.582	–138.7	5.453	96.8	0.077	40.9	0.465	–43.4
0.7	0.572	–147.6	4.764	91.5	0.079	40.9	0.432	–44.9
0.8	0.570	–155.4	4.231	86.9	0.081	42.1	0.405	–46.5
0.9	0.564	–161.5	3.787	82.9	0.084	43.4	0.386	–48.4
1.0	0.564	–167.3	3.433	79.1	0.087	45.3	0.372	–50.5
1.1	0.565	–172.0	3.134	75.6	0.089	47.3	0.362	–52.7
1.2	0.564	–176.7	2.880	72.3	0.093	49.3	0.355	–55.0
1.3	0.573	179.8	2.669	69.4	0.096	51.4	0.351	–57.4
1.4	0.574	176.0	2.488	66.4	0.100	53.5	0.347	–59.9
1.5	0.582	172.8	2.330	63.7	0.105	55.4	0.346	–62.3
1.6	0.587	170.0	2.186	60.9	0.109	57.3	0.343	–64.8
1.7	0.592	167.2	2.063	58.2	0.115	59.0	0.343	–67.5
1.8	0.596	164.6	1.950	55.8	0.121	60.9	0.340	–70.0
1.9	0.602	162.1	1.851	53.6	0.128	62.3	0.340	–72.7
2.0	0.607	160.0	1.763	51.1	0.135	63.5	0.338	–75.7
2.1	0.611	157.8	1.686	48.9	0.141	64.8	0.339	–78.8
2.2	0.616	155.9	1.614	46.4	0.150	65.6	0.340	–82.0
2.3	0.622	154.0	1.563	44.7	0.158	66.3	0.341	–85.2
2.4	0.628	152.0	1.497	42.8	0.166	66.8	0.342	–88.4
2.5	0.632	150.2	1.442	40.9	0.175	67.1	0.344	–92.0
2.6	0.636	148.4	1.396	39.3	0.184	67.3	0.347	–95.3
2.7	0.641	146.6	1.348	37.6	0.194	67.2	0.350	–99.0
2.8	0.651	144.8	1.303	35.7	0.203	66.9	0.354	–102.4
2.9	0.649	143.4	1.257	34.4	0.214	66.4	0.356	–105.9
3.0	0.650	141.3	1.201	32.7	0.224	66.0	0.360	–109.5
4.0	0.696	123.7	0.915	17.2	0.336	59.2	0.424	–141.1
5.0	0.748	111.5	0.734	8.0	0.432	43.9	0.468	–178.3

V_{CE} = 2 V, I_C = 7 mA, Z_O = 50 Ω

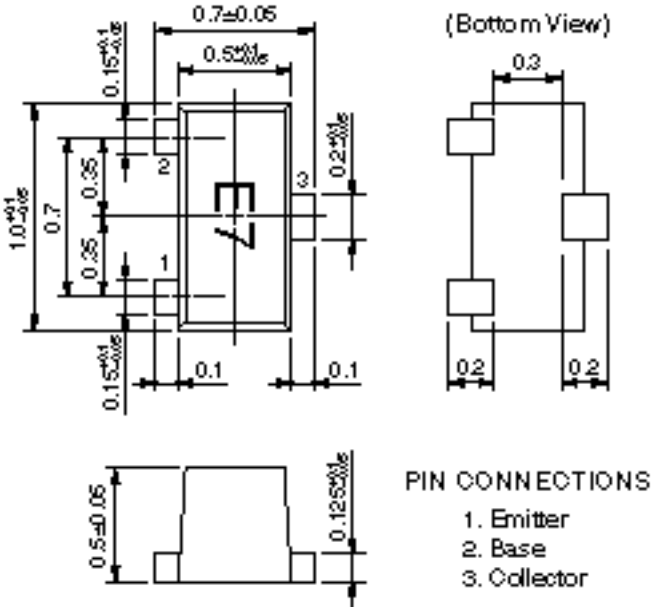
Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.792	–45.0	16.829	150.9	0.029	71.3	0.896	–20.6
0.2	0.692	–79.1	13.451	130.2	0.047	55.3	0.728	–34.0
0.3	0.627	–103.2	10.627	117.2	0.056	48.2	0.596	–40.7
0.4	0.583	–120.9	8.572	107.2	0.062	45.3	0.504	–44.3
0.5	0.559	–134.6	7.111	100.2	0.067	44.6	0.442	–46.1
0.6	0.543	–145.1	6.071	94.5	0.071	45.3	0.397	–47.5
0.7	0.539	–153.1	5.266	89.8	0.075	46.1	0.366	–48.7
0.8	0.535	–160.4	4.662	85.3	0.078	47.9	0.340	–50.2
0.9	0.536	–166.0	4.161	81.9	0.082	49.3	0.323	–52.1
1.0	0.536	–171.3	3.772	78.3	0.086	51.1	0.309	–54.2
1.1	0.538	–175.8	3.439	75.2	0.091	53.0	0.301	–56.5
1.2	0.541	–180.0	3.162	72.1	0.096	54.4	0.294	–58.9
1.3	0.546	176.5	2.929	69.4	0.101	56.1	0.290	–61.4
1.4	0.551	173.1	2.725	66.6	0.106	57.6	0.287	–63.8
1.5	0.556	170.3	2.553	63.9	0.112	58.9	0.285	–66.3
1.6	0.562	167.8	2.395	61.3	0.118	60.0	0.283	–68.7
1.7	0.568	165.2	2.264	58.9	0.124	61.1	0.282	–71.3
1.8	0.573	162.8	2.141	56.4	0.131	62.3	0.280	–73.9
1.9	0.576	160.5	2.029	54.4	0.137	63.3	0.279	–76.6
2.0	0.586	158.3	1.936	52.0	0.145	63.9	0.278	–79.6
2.1	0.587	156.5	1.848	49.9	0.152	64.5	0.279	–82.8
2.2	0.595	154.8	1.772	47.6	0.160	65.0	0.279	–86.0
2.3	0.598	152.9	1.716	45.9	0.168	65.3	0.281	–89.1
2.4	0.603	151.1	1.646	44.2	0.176	65.4	0.282	–92.5
2.5	0.610	149.5	1.586	42.1	0.185	65.4	0.284	–96.0
2.6	0.613	147.8	1.533	40.5	0.193	65.4	0.288	–99.4
2.7	0.620	146.0	1.485	38.8	0.203	65.1	0.291	–103.0
2.8	0.628	144.4	1.436	37.1	0.211	64.7	0.295	–106.3
2.9	0.623	143.1	1.383	35.8	0.221	64.1	0.299	–109.9
3.0	0.627	141.1	1.326	33.9	0.231	63.6	0.302	–113.5
4.0	0.675	124.6	1.015	17.9	0.334	57.2	0.372	–143.9
5.0	0.736	112.6	0.813	7.2	0.424	43.1	0.425	179.5

V_{CE} = 2 V, I_C = 10 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.724	–51.4	20.657	146.8	0.026	69.3	0.857	–25.0
0.2	0.630	–88.3	15.613	125.7	0.043	54.5	0.660	–39.3
0.3	0.573	–111.7	11.959	113.2	0.051	49.2	0.523	–46.0
0.4	0.538	–129.2	9.485	104.0	0.057	47.9	0.433	–49.2
0.5	0.520	–141.6	7.783	97.7	0.062	48.7	0.374	–50.8
0.6	0.513	–151.5	6.608	92.4	0.067	50.1	0.332	–52.1
0.7	0.508	–159.0	5.732	88.2	0.072	51.5	0.303	–53.3
0.8	0.509	–165.5	5.050	84.2	0.077	53.4	0.281	–55.0
0.9	0.512	–170.5	4.496	80.9	0.082	54.7	0.265	–56.9
1.0	0.512	–175.4	4.080	77.7	0.088	56.2	0.252	–59.3
1.1	0.514	–179.4	3.716	74.8	0.093	57.8	0.244	–61.8
1.2	0.517	176.5	3.414	71.9	0.099	58.9	0.238	–64.4
1.3	0.524	173.7	3.162	69.3	0.105	59.9	0.234	–66.9
1.4	0.529	170.4	2.943	66.7	0.112	60.8	0.232	–69.4
1.5	0.536	167.9	2.752	64.2	0.119	61.7	0.231	–72.0
1.6	0.541	165.6	2.584	61.7	0.125	62.3	0.228	–74.5
1.7	0.547	162.9	2.443	59.4	0.132	62.8	0.228	–77.2
1.8	0.551	161.0	2.306	57.0	0.140	63.5	0.226	–79.8
1.9	0.555	158.8	2.192	55.1	0.147	63.9	0.226	–82.7
2.0	0.559	156.6	2.087	52.8	0.154	64.1	0.225	–85.8
2.1	0.567	155.1	1.994	50.8	0.162	64.4	0.226	–89.1
2.2	0.573	153.5	1.915	48.6	0.170	64.4	0.226	–92.3
2.3	0.579	151.8	1.854	46.9	0.178	64.3	0.228	–95.6
2.4	0.581	150.1	1.778	45.2	0.186	64.2	0.230	–98.9
2.5	0.587	148.6	1.711	43.2	0.194	64.0	0.233	–102.6
2.6	0.591	146.9	1.657	41.6	0.202	63.9	0.236	–106.0
2.7	0.597	145.4	1.605	40.0	0.211	63.4	0.239	–109.7
2.8	0.606	143.9	1.552	38.3	0.220	62.9	0.244	–112.9
2.9	0.603	142.7	1.498	36.9	0.229	62.2	0.248	–116.6
3.0	0.607	140.7	1.438	35.2	0.238	61.6	0.253	–119.9
4.0	0.660	124.9	1.106	18.6	0.333	55.1	0.326	–148.6
5.0	0.726	113.5	0.885	7.1	0.416	42.0	0.386	175.8

V_{CE} = 2 V, I_C = 20 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.1	0.645	–63.9	26.760	140.2	0.025	65.1	0.781	–32.9
0.2	0.542	–103.8	18.622	119.0	0.037	54.7	0.551	–48.9
0.3	0.501	–125.9	13.713	107.7	0.045	52.9	0.415	–55.5
0.4	0.484	–141.4	10.643	99.7	0.051	53.6	0.333	–59.0
0.5	0.477	–152.5	8.670	94.3	0.058	55.6	0.281	–60.8
0.6	0.476	–160.4	7.318	89.8	0.065	57.6	0.244	–62.7
0.7	0.477	–166.7	6.299	86.1	0.071	59.0	0.219	–64.6
0.8	0.478	–172.5	5.545	82.5	0.078	60.4	0.199	–67.2
0.9	0.482	–176.8	4.936	79.7	0.085	61.2	0.186	–70.1
1.0	0.487	179.0	4.462	76.7	0.092	62.1	0.175	–73.3
1.1	0.489	175.5	4.060	74.0	0.099	62.9	0.170	–76.7
1.2	0.492	172.0	3.730	71.5	0.107	63.3	0.165	–80.0
1.3	0.500	169.7	3.452	69.1	0.114	63.6	0.163	–83.2
1.4	0.506	166.6	3.215	66.9	0.122	64.0	0.162	–86.0
1.5	0.513	164.5	3.009	64.5	0.130	64.1	0.161	–88.7
1.6	0.517	162.5	2.823	62.1	0.137	64.1	0.160	–91.7
1.7	0.520	160.3	2.664	60.1	0.145	64.2	0.160	–94.6
1.8	0.528	158.2	2.520	57.9	0.153	64.3	0.159	–97.8
1.9	0.530	156.6	2.394	56.1	0.160	64.1	0.159	–100.8
2.0	0.538	154.5	2.283	53.9	0.169	63.7	0.160	–104.4
2.1	0.543	153.1	2.178	52.1	0.176	63.6	0.162	–107.9
2.2	0.551	151.6	2.090	49.9	0.184	63.2	0.163	–111.4
2.3	0.552	150.0	2.024	48.3	0.192	62.8	0.166	–114.7
2.4	0.556	148.5	1.941	46.6	0.201	62.4	0.168	–118.1
2.5	0.564	147.2	1.869	44.8	0.209	61.9	0.173	–121.8
2.6	0.569	145.9	1.813	43.3	0.216	61.5	0.177	–124.8
2.7	0.575	144.2	1.756	41.7	0.225	60.8	0.182	–128.5
2.8	0.580	142.9	1.694	40.0	0.233	60.1	0.187	–131.4
2.9	0.579	141.8	1.641	38.7	0.241	59.3	0.193	–134.8
3.0	0.582	139.9	1.576	37.0	0.250	58.5	0.199	–137.8
4.0	0.635	125.2	1.221	20.5	0.336	51.7	0.274	–161.0
5.0	0.708	114.5	0.984	8.1	0.407	39.6	0.342	166.2

PACKAGE DIMENSIONS

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