NEC

NPN SILICON RF TRANSISTOR
2SC5800

NPN SILICON RF TRANSISTOR FOR HIGH-FREQUENCY LOW NOISE FLAT-LEAD 3-PIN THIN-TYPE ULTRA SUPER MINIMOLD

FEATURES

- Low phase distortion, low voltage operation
- Ideal for OSC applications
- Flat-lead 3-pin thin-type ultra super minimold package

ORDERING INFORMATION

Part Number	Quantity	Supplying Form
2SC5800	50 pcs (Non reel)	• 8 mm wide embossed taping
2SC5800-T1	3 kpcs/reel	• Pin 3 (collector) face the perforation side of the tape

Remark To order evaluation samples, consult your NEC sales representative.
Unit sample quantity is 50 pcs.

ABSOLUTE MAXIMUM RATINGS (T_A = +25°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	200	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

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

Document No. P15660EJ1V0DS00 (1st edition)
Date Published July 2001 NS CP(K)
Printed in Japan

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_{BE} = 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%

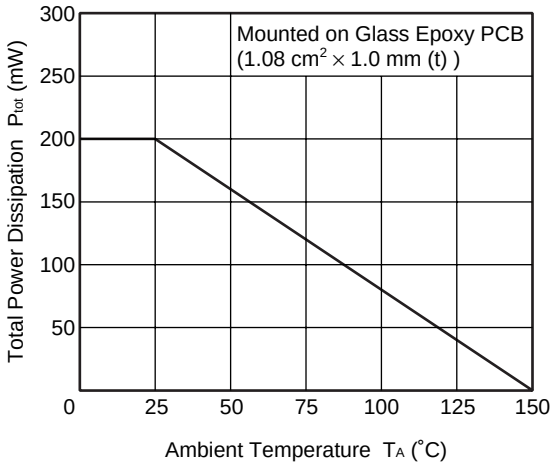
2. Collector to base capacitance when the emitter grounded

h_{FE} CLASSIFICATION

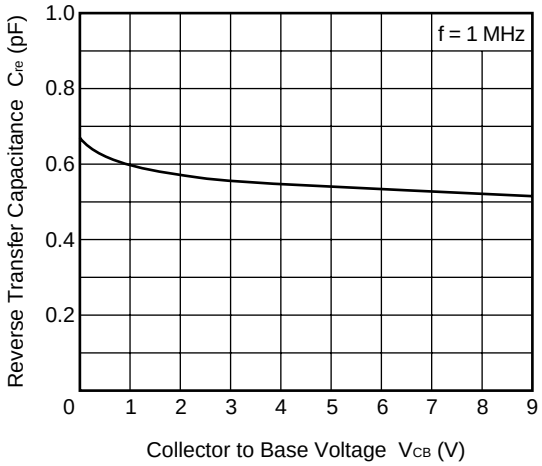
Rank	FB
Marking	80
h_{FE} Value	100 to 145

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

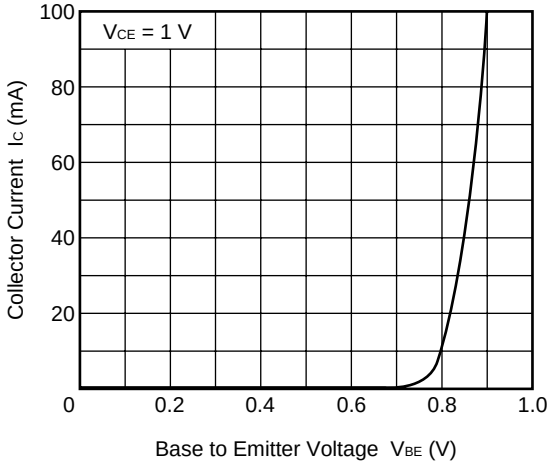
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



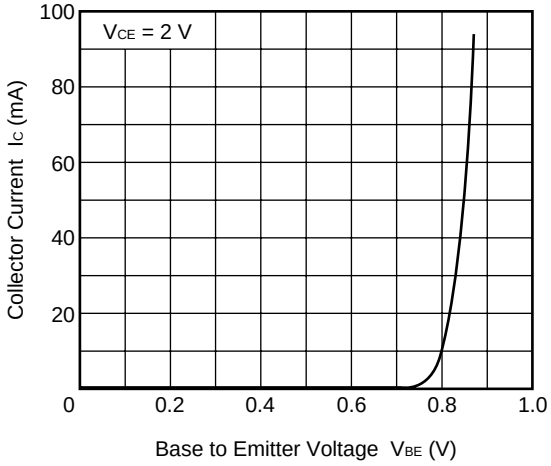
REVERSE TRANSFER CAPACITANCE vs. COLLECTOR TO BASE VOLTAGE



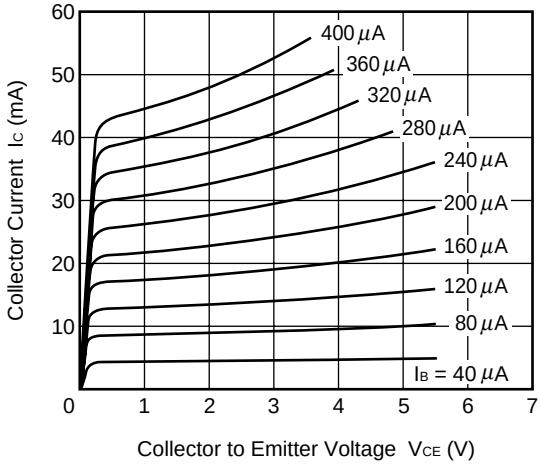
COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE



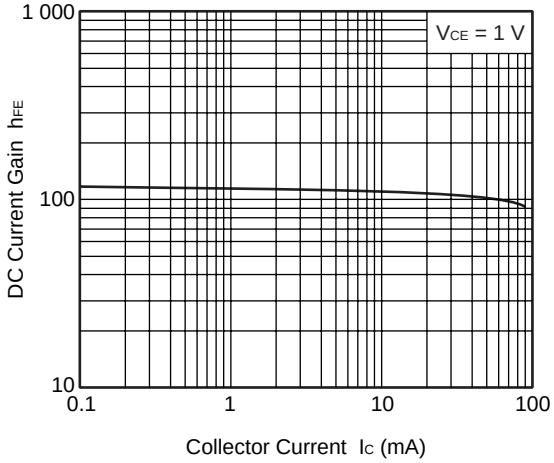
COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE



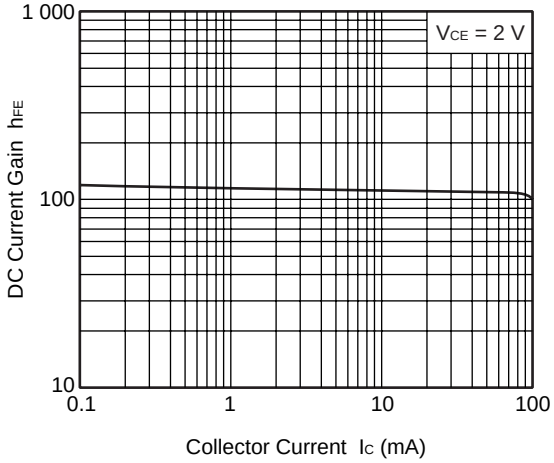
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



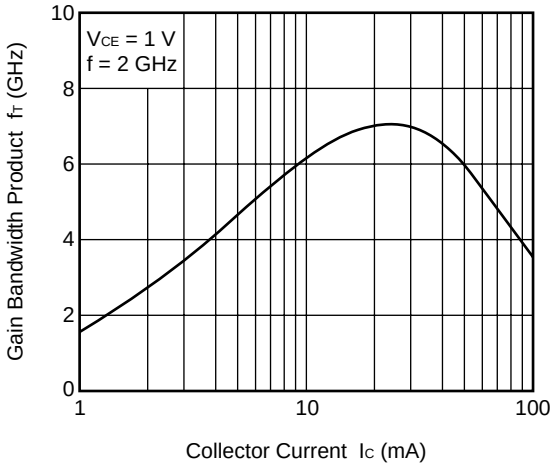
DC CURRENT GAIN vs.
COLLECTOR CURRENT



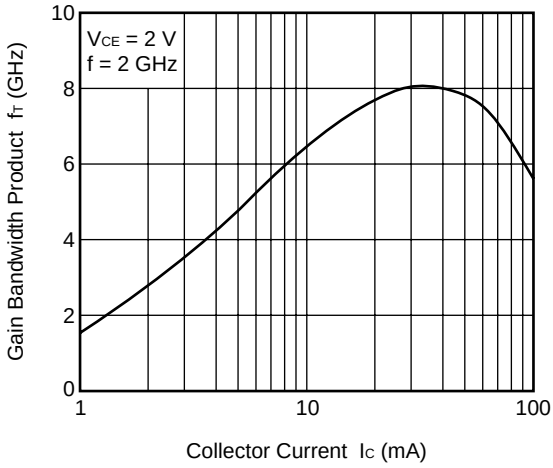
DC CURRENT GAIN vs.
COLLECTOR CURRENT



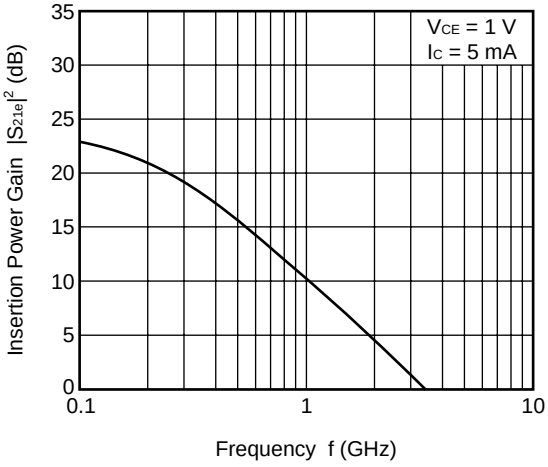
GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT



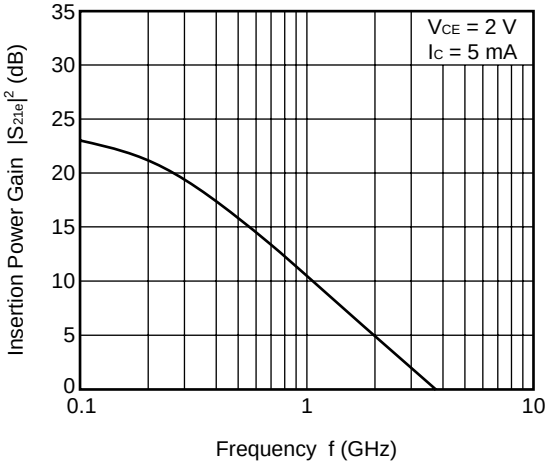
GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT



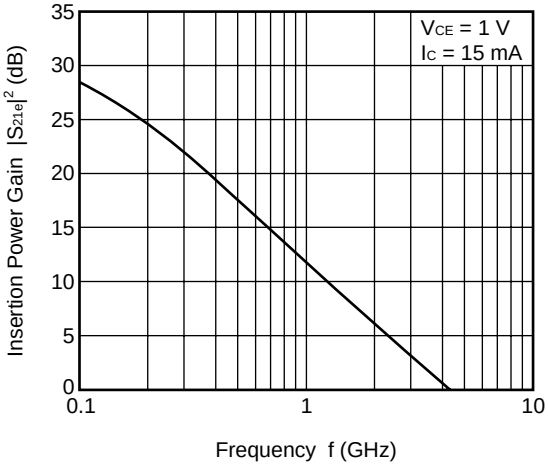
INSERTION POWER GAIN vs. FREQUENCY



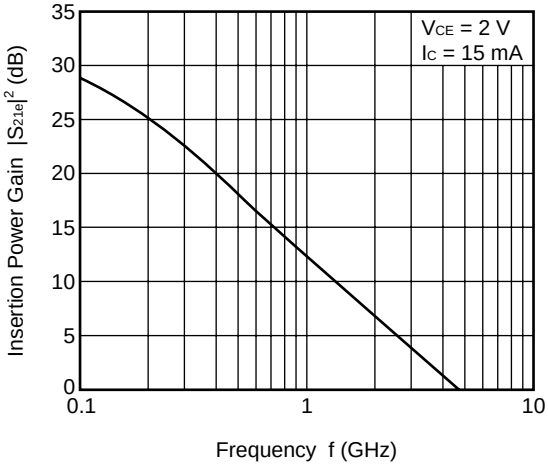
INSERTION POWER GAIN vs. FREQUENCY



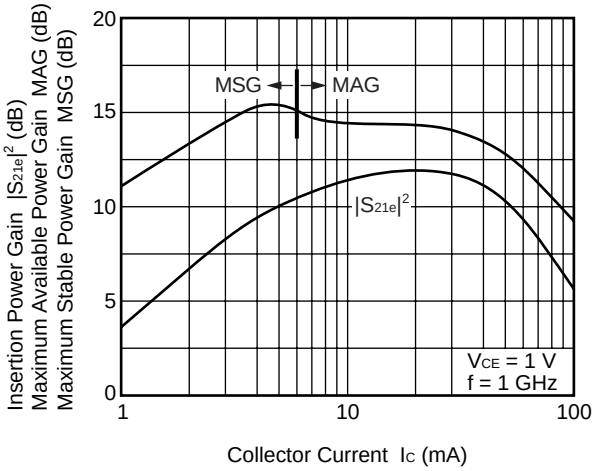
INSERTION POWER GAIN vs. FREQUENCY



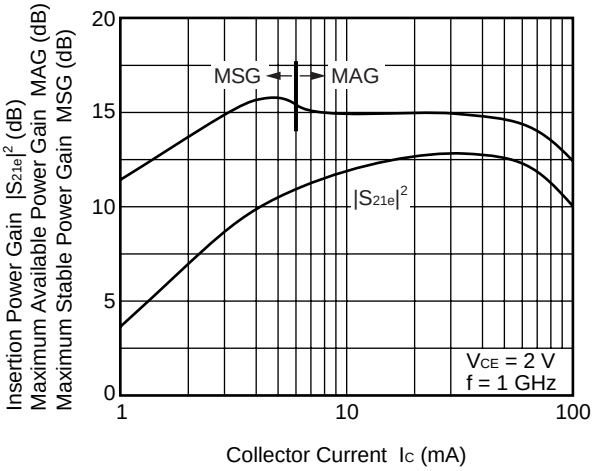
INSERTION POWER GAIN vs. FREQUENCY



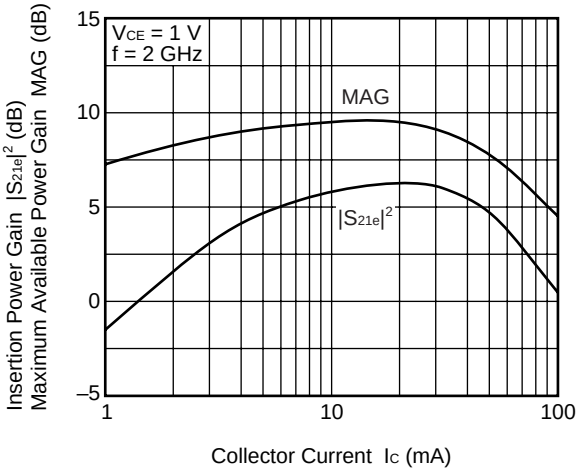
INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT



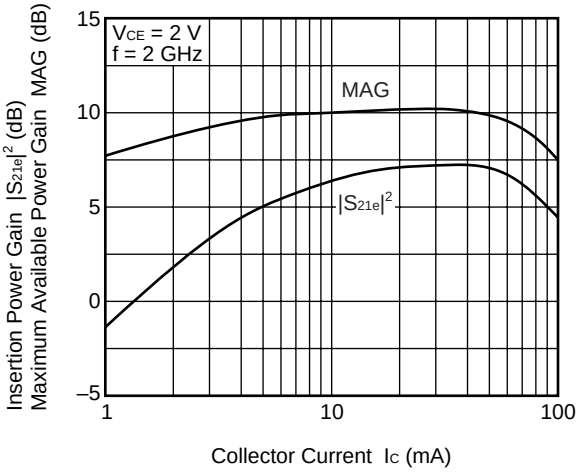
INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT



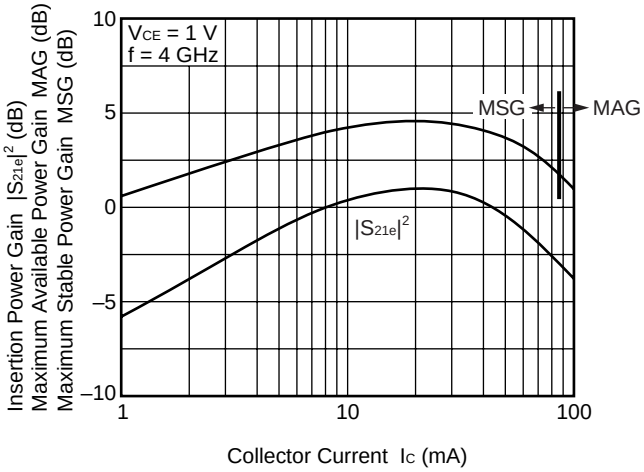
INSERTION POWER GAIN, MAG
vs. COLLECTOR CURRENT



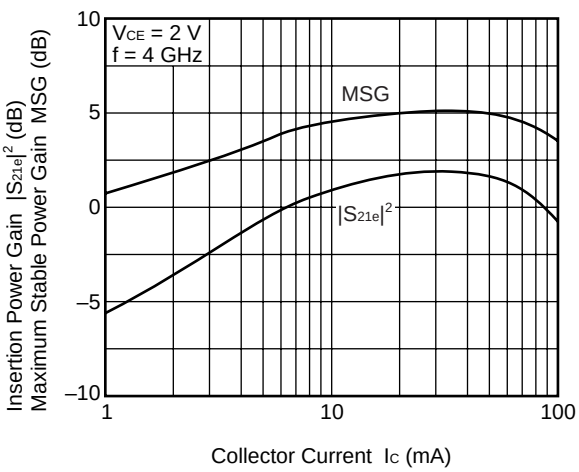
INSERTION POWER GAIN, MAG
vs. COLLECTOR CURRENT



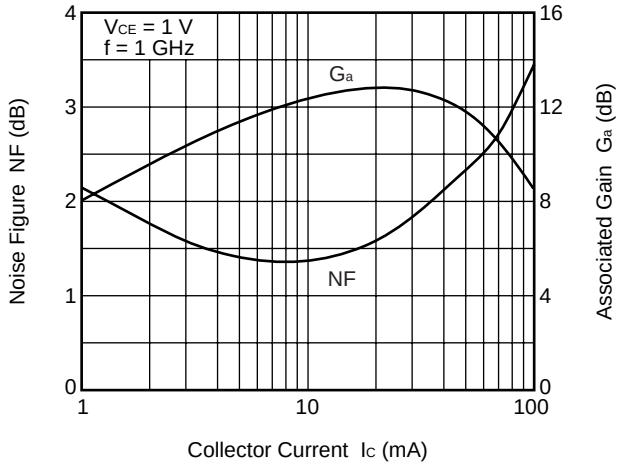
INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT



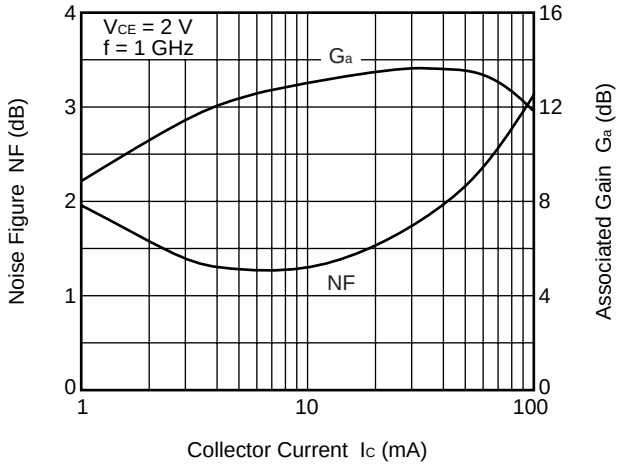
INSERTION POWER GAIN, MSG
vs. COLLECTOR CURRENT



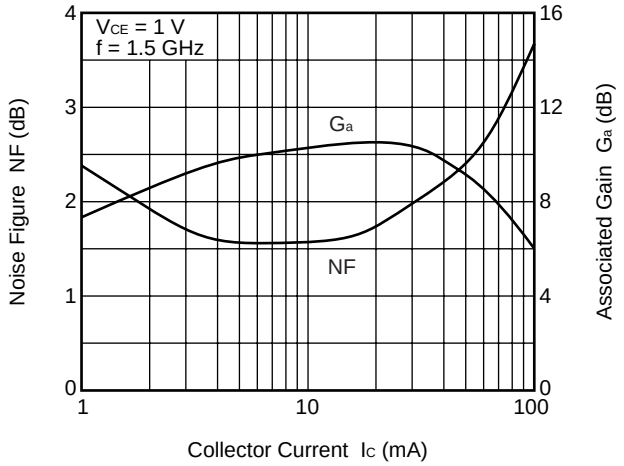
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



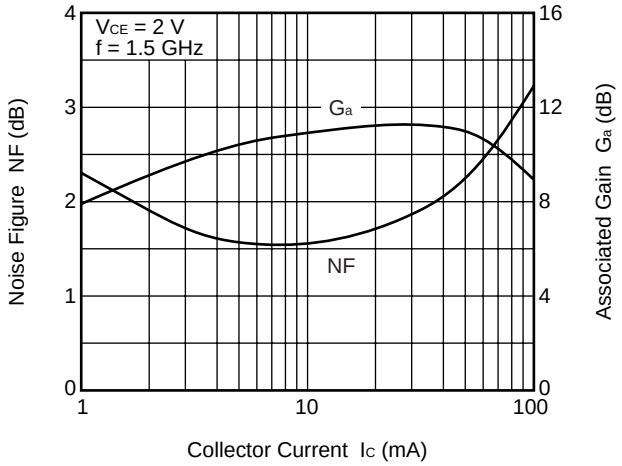
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



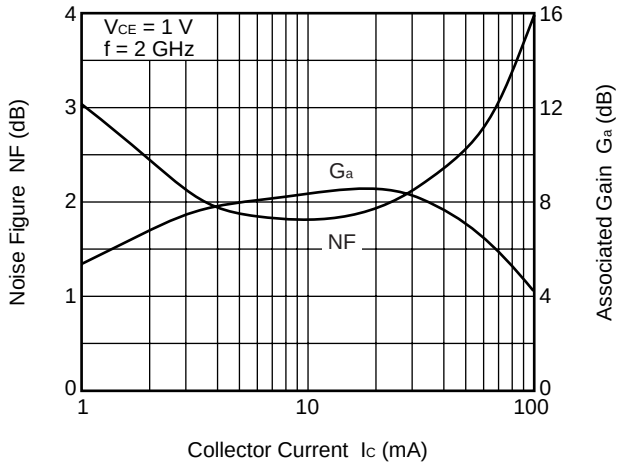
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



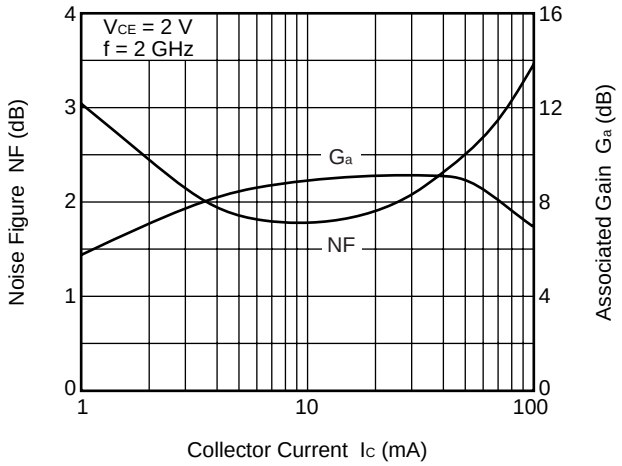
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



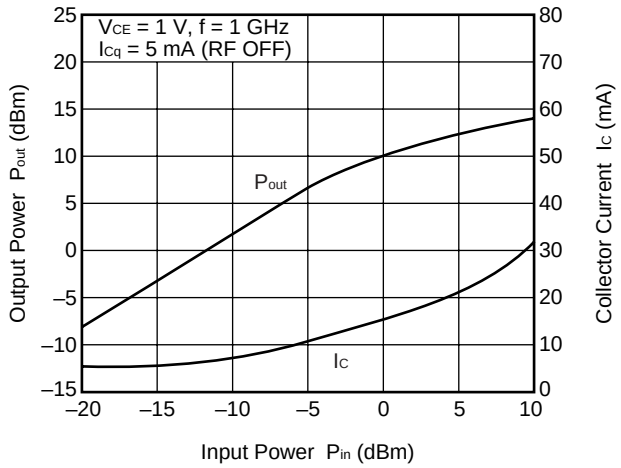
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



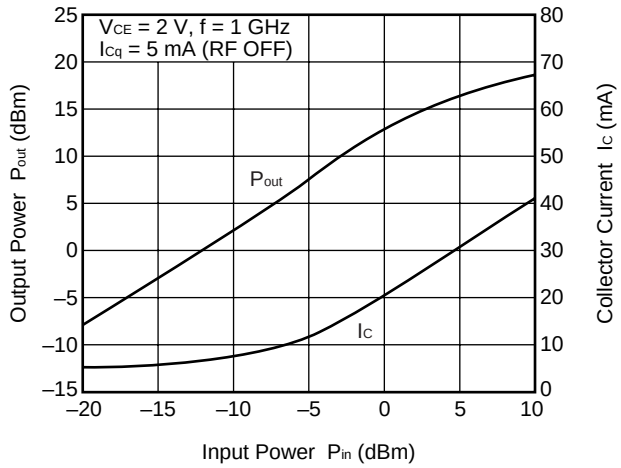
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



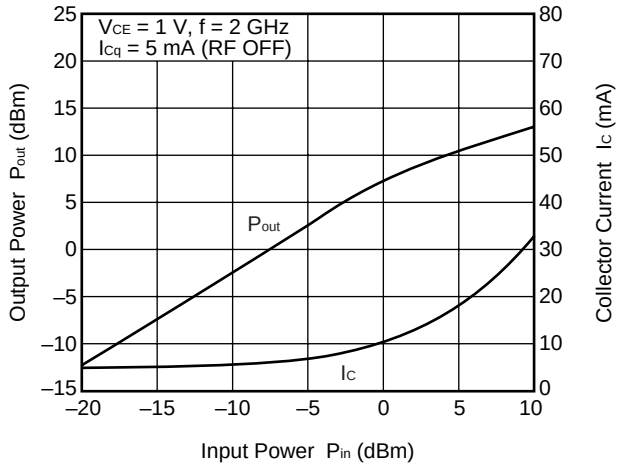
OUTPUT POWER, COLLECTOR CURRENT vs. INPUT POWER



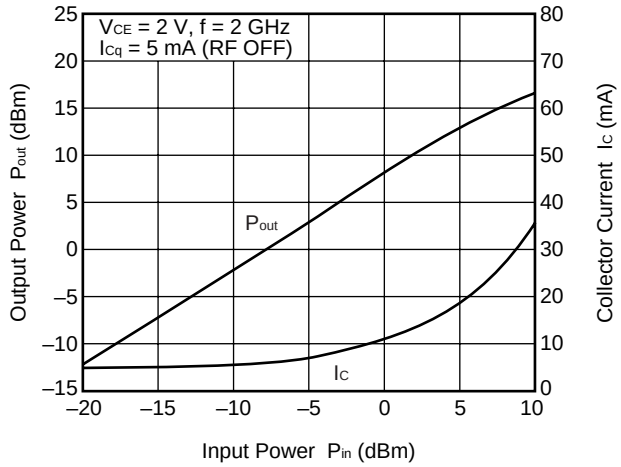
OUTPUT POWER, COLLECTOR CURRENT vs. INPUT POWER



OUTPUT POWER, COLLECTOR CURRENT vs. INPUT POWER



OUTPUT POWER, COLLECTOR CURRENT vs. INPUT POWER



Remark The graphs indicate nominal characteristics.

S-PARAMETERS

Note When K ≥ 1, the MAG (Maximum Available Power Gain) is used. $MAG = \left|\frac{S_{21}}{S_{12}}\right| (K - \sqrt{(K^2 - 1)})$

When K < 1, the MSG (Maximum Stable Power Gain) is used. $MSG = \left|\frac{S_{21}}{S_{12}}\right|$

V_{CE} = 1 V, I_C = 1 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}		K	MAG/MSG Note
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		(dB)
0.1	0.943	–24.3	3.561	164.4	0.040	74.1	0.984	–8.3	0.068	19.45
0.2	0.921	–47.8	3.390	147.2	0.074	62.9	0.940	–15.6	0.108	16.62
0.3	0.889	–68.9	3.108	134.1	0.099	51.3	0.886	–21.4	0.148	14.98
0.4	0.851	–86.4	2.757	122.2	0.115	41.9	0.833	–26.3	0.206	13.80
0.5	0.823	–101.1	2.455	112.2	0.124	34.7	0.788	–30.1	0.262	12.97
0.6	0.800	–113.6	2.194	104.1	0.129	28.9	0.752	–33.4	0.314	12.32
0.7	0.780	–124.3	1.970	96.5	0.129	24.2	0.724	–36.4	0.382	11.83
0.8	0.770	–133.6	1.787	89.7	0.127	20.8	0.702	–39.3	0.442	11.48
0.9	0.763	–141.2	1.634	84.1	0.123	18.3	0.683	–42.3	0.514	11.24
1.0	0.760	–148.3	1.502	79.0	0.117	16.8	0.669	–45.4	0.582	11.07
1.1	0.754	–154.4	1.392	74.1	0.110	16.3	0.657	–48.6	0.678	11.01
1.2	0.757	–160.2	1.304	69.4	0.103	17.0	0.648	–52.0	0.754	11.03
1.3	0.756	–165.0	1.219	65.5	0.095	18.9	0.640	–55.4	0.871	11.08
1.4	0.757	–169.8	1.141	61.5	0.088	22.5	0.635	–59.2	0.997	11.15
1.5	0.761	–174.1	1.079	57.9	0.081	28.4	0.630	–63.0	1.106	9.25
1.6	0.762	–178.3	1.025	54.4	0.077	36.1	0.627	–67.1	1.214	8.45
1.7	0.767	178.0	0.970	51.2	0.076	45.6	0.625	–71.4	1.271	7.94
1.8	0.766	174.0	0.923	47.9	0.079	55.5	0.624	–75.9	1.301	7.40
1.9	0.772	170.6	0.878	45.2	0.086	64.4	0.621	–80.7	1.228	7.20
2.0	0.779	167.1	0.839	42.0	0.097	71.6	0.623	–85.6	1.116	7.31
2.1	0.782	164.0	0.800	39.5	0.110	76.6	0.624	–90.5	1.028	7.57
2.2	0.785	161.1	0.767	37.8	0.126	79.7	0.624	–95.5	0.957	7.85
2.3	0.791	158.5	0.735	35.9	0.143	81.4	0.626	–100.9	0.889	7.11
2.4	0.794	156.0	0.701	34.2	0.161	82.1	0.629	–106.0	0.844	6.39
2.5	0.797	153.6	0.673	33.1	0.180	82.0	0.633	–111.2	0.811	5.72
2.6	0.800	151.1	0.642	31.6	0.200	81.5	0.637	–116.3	0.796	5.07
2.7	0.803	149.1	0.621	30.8	0.219	80.5	0.640	–121.3	0.781	4.54
2.8	0.803	147.1	0.601	29.9	0.238	79.3	0.645	–125.9	0.781	4.02
2.9	0.798	145.1	0.592	29.0	0.256	77.8	0.643	–130.7	0.798	3.63
3.0	0.801	143.2	0.574	29.3	0.276	76.0	0.646	–135.6	0.810	3.18
4.0	0.798	125.7	0.515	26.1	0.441	54.9	0.681	179.9	0.930	0.68
5.0	0.794	116.1	0.519	22.3	0.510	38.5	0.725	149.0	0.989	0.08

V_{CE} = 1 V, I_C = 3 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}		K	MAG/MSG
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		(dB)
0.1	0.863	–35.3	9.304	157.1	0.039	70.0	0.941	–15.7	0.106	23.82
0.2	0.798	–67.4	8.126	136.7	0.063	56.1	0.822	–27.1	0.176	21.12
0.3	0.745	–91.9	6.813	122.2	0.078	46.2	0.711	–34.2	0.253	19.41
0.4	0.698	–109.8	5.657	111.4	0.086	39.6	0.624	–38.5	0.351	18.18
0.5	0.667	–123.4	4.783	102.9	0.090	36.2	0.562	–41.3	0.447	17.25
0.6	0.655	–134.6	4.138	96.4	0.092	34.3	0.518	–43.5	0.526	16.52
0.7	0.643	–143.5	3.632	90.4	0.093	33.9	0.485	–45.4	0.619	15.91
0.8	0.635	–151.0	3.219	85.2	0.094	34.3	0.461	–47.3	0.714	15.37
0.9	0.630	–157.2	2.907	80.7	0.093	35.8	0.441	–49.3	0.807	14.93
1.0	0.633	–162.5	2.648	76.7	0.094	37.9	0.426	–51.6	0.879	14.50
1.1	0.634	–167.4	2.433	72.9	0.095	40.6	0.415	–54.2	0.953	14.10
1.2	0.636	–171.7	2.258	69.2	0.096	43.7	0.404	–57.0	1.014	13.00
1.3	0.638	–175.3	2.099	65.8	0.098	46.9	0.396	–60.0	1.069	11.69
1.4	0.639	–178.9	1.965	62.5	0.101	50.5	0.389	–63.4	1.112	10.85
1.5	0.644	177.6	1.850	59.4	0.106	54.1	0.384	–66.9	1.124	10.28
1.6	0.649	174.3	1.754	56.2	0.111	57.4	0.380	–70.7	1.127	9.82
1.7	0.657	171.5	1.660	53.3	0.117	60.4	0.376	–74.8	1.113	9.46
1.8	0.660	168.5	1.580	50.4	0.125	63.1	0.375	–79.1	1.099	9.09
1.9	0.665	165.9	1.502	47.6	0.134	65.4	0.373	–83.8	1.080	8.77
2.0	0.675	162.9	1.435	44.6	0.144	67.3	0.374	–88.4	1.035	8.84
2.1	0.682	160.8	1.370	41.9	0.155	68.7	0.376	–93.4	1.001	9.31
2.2	0.686	158.3	1.318	39.7	0.166	69.8	0.378	–98.3	0.975	8.99
2.3	0.695	156.2	1.263	37.5	0.178	70.3	0.380	–103.6	0.944	8.51
2.4	0.703	154.4	1.210	35.3	0.191	70.6	0.387	–108.8	0.909	8.01
2.5	0.706	152.4	1.164	33.3	0.205	70.4	0.394	–113.7	0.892	7.55
2.6	0.712	150.6	1.116	31.0	0.218	70.3	0.402	–118.8	0.870	7.08
2.7	0.717	149.1	1.074	29.4	0.232	69.9	0.410	–123.3	0.851	6.65
2.8	0.723	147.5	1.036	27.4	0.246	69.4	0.419	–127.8	0.832	6.24
2.9	0.721	145.8	1.009	25.4	0.260	68.6	0.424	–132.4	0.831	5.88
3.0	0.730	144.0	0.975	24.3	0.275	67.7	0.431	–137.1	0.815	5.50
4.0	0.767	128.6	0.739	12.7	0.416	52.9	0.527	–179.2	0.815	2.50
5.0	0.792	118.0	0.611	8.6	0.493	38.7	0.637	150.6	0.897	0.93

V_{CE} = 1 V, I_C = 5 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}		K	MAG/MSG
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		(dB)
0.1	0.782	–45.4	14.156	151.1	0.035	66.8	0.890	–22.1	0.145	26.04
0.2	0.699	–82.8	11.386	128.7	0.054	53.1	0.715	–35.8	0.258	23.21
0.3	0.650	–107.7	8.963	114.6	0.065	45.7	0.582	–42.7	0.373	21.43
0.4	0.609	–124.4	7.187	105.1	0.071	42.3	0.492	–46.3	0.502	20.08
0.5	0.594	–136.7	5.963	97.7	0.074	41.6	0.432	–48.1	0.608	19.05
0.6	0.582	–146.7	5.086	92.2	0.078	42.3	0.390	–49.7	0.707	18.15
0.7	0.576	–154.3	4.418	87.1	0.081	43.9	0.361	–51.1	0.797	17.35
0.8	0.576	–160.5	3.896	82.7	0.085	45.8	0.339	–52.5	0.877	16.63
0.9	0.574	–165.5	3.505	78.8	0.088	48.2	0.321	–54.2	0.944	15.98
1.0	0.579	–169.8	3.180	75.3	0.093	50.5	0.308	–56.4	0.988	15.33
1.1	0.579	–174.0	2.913	71.9	0.097	52.9	0.297	–58.8	1.037	13.58
1.2	0.587	–177.6	2.699	68.6	0.103	55.1	0.287	–61.5	1.054	12.77
1.3	0.587	179.3	2.505	65.6	0.109	57.1	0.279	–64.6	1.082	11.87
1.4	0.591	176.1	2.341	62.6	0.115	59.1	0.274	–68.1	1.092	11.23
1.5	0.596	173.4	2.201	59.8	0.123	60.8	0.268	–71.8	1.093	10.69
1.6	0.599	170.5	2.085	56.9	0.130	62.3	0.265	–75.7	1.091	10.21
1.7	0.609	168.1	1.972	54.3	0.138	63.6	0.261	–80.1	1.072	9.90
1.8	0.614	165.5	1.875	51.5	0.147	64.7	0.260	–84.7	1.062	9.53
1.9	0.620	163.2	1.786	49.0	0.157	65.4	0.259	–89.8	1.046	9.26
2.0	0.629	160.4	1.705	46.1	0.166	66.2	0.260	–94.7	1.025	9.14
2.1	0.636	158.5	1.628	43.6	0.177	66.6	0.262	–100.0	1.005	9.22
2.2	0.641	156.7	1.565	41.4	0.187	66.7	0.265	–105.4	0.989	9.23
2.3	0.651	154.7	1.505	39.3	0.198	66.8	0.269	–110.8	0.964	8.82
2.4	0.659	153.0	1.444	37.2	0.209	66.6	0.277	–116.0	0.946	8.40
2.5	0.666	151.3	1.387	35.1	0.221	66.1	0.284	–121.2	0.928	7.99
2.6	0.671	149.7	1.331	32.8	0.233	65.9	0.294	–126.2	0.915	7.57
2.7	0.678	148.3	1.287	31.1	0.244	65.4	0.303	–130.5	0.898	7.22
2.8	0.683	147.2	1.242	29.1	0.256	64.8	0.313	–134.8	0.884	6.86
2.9	0.685	145.7	1.212	27.1	0.268	64.2	0.321	–139.1	0.876	6.55
3.0	0.692	144.2	1.174	25.7	0.280	63.4	0.330	–143.5	0.863	6.22
4.0	0.745	129.6	0.886	11.3	0.404	51.0	0.443	177.5	0.819	3.41
5.0	0.784	119.5	0.701	4.2	0.482	38.3	0.577	149.8	0.860	1.63

V_{CE} = 1 V, I_C = 7 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}		K	MAG/MSG
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		(dB)
0.1	0.717	–54.3	17.949	146.4	0.032	63.9	0.844	–27.4	0.182	27.46
0.2	0.634	–94.2	13.441	123.2	0.049	51.0	0.634	–42.1	0.340	24.42
0.3	0.593	–118.5	10.199	110.0	0.057	46.6	0.496	–48.5	0.476	22.56
0.4	0.563	–134.5	8.038	101.3	0.062	45.8	0.410	–51.4	0.612	21.10
0.5	0.553	–145.4	6.594	94.7	0.067	47.1	0.354	–52.8	0.722	19.91
0.6	0.548	–153.8	5.604	89.7	0.072	48.8	0.317	–54.2	0.809	18.88
0.7	0.545	–160.6	4.847	85.2	0.077	51.0	0.290	–55.4	0.888	17.96
0.8	0.547	–166.2	4.262	81.2	0.083	52.8	0.270	–56.7	0.948	17.11
0.9	0.548	–170.5	3.831	77.6	0.089	55.3	0.254	–58.4	0.995	16.36
1.0	0.550	–174.4	3.467	74.5	0.095	57.1	0.242	–60.5	1.028	14.58
1.1	0.553	–177.9	3.173	71.3	0.102	58.9	0.231	–63.1	1.054	13.52
1.2	0.559	178.7	2.931	68.2	0.109	60.2	0.223	–65.9	1.065	12.75
1.3	0.563	176.2	2.723	65.5	0.116	61.5	0.216	–69.3	1.072	12.06
1.4	0.567	173.3	2.541	62.6	0.124	62.6	0.211	–73.1	1.077	11.42
1.5	0.574	170.7	2.389	59.9	0.132	63.6	0.206	–77.2	1.070	10.95
1.6	0.577	168.3	2.263	57.3	0.141	64.3	0.202	–81.6	1.066	10.49
1.7	0.586	166.0	2.137	54.8	0.150	64.9	0.199	–86.5	1.053	10.13
1.8	0.589	163.7	2.029	52.1	0.159	65.3	0.199	–91.6	1.051	9.68
1.9	0.597	161.5	1.933	49.8	0.169	65.5	0.199	–97.1	1.036	9.44
2.0	0.608	159.2	1.846	47.0	0.178	65.7	0.201	–102.4	1.015	9.41
2.1	0.615	157.2	1.764	44.6	0.189	65.7	0.204	–108.3	1.001	9.56
2.2	0.621	155.1	1.696	42.4	0.199	65.4	0.208	–113.8	0.989	9.31
2.3	0.629	153.6	1.631	40.4	0.209	65.1	0.214	–119.6	0.974	8.93
2.4	0.636	152.1	1.565	38.3	0.220	64.8	0.222	–124.8	0.960	8.53
2.5	0.642	150.5	1.508	36.3	0.230	64.1	0.231	–130.0	0.948	8.16
2.6	0.650	148.7	1.446	34.1	0.241	63.7	0.242	–134.8	0.936	7.78
2.7	0.655	147.8	1.399	32.4	0.252	63.2	0.251	–138.9	0.924	7.44
2.8	0.664	146.7	1.350	30.3	0.263	62.6	0.262	–143.0	0.908	7.10
2.9	0.664	145.2	1.322	28.3	0.274	61.9	0.271	–146.9	0.902	6.83
3.0	0.669	143.9	1.280	27.1	0.285	61.1	0.280	–150.9	0.896	6.52
4.0	0.730	130.4	0.975	11.8	0.399	49.6	0.398	173.3	0.835	3.88
5.0	0.778	120.2	0.770	2.9	0.474	38.0	0.542	148.2	0.848	2.11

V_{CE} = 1 V, I_C = 10 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}		K	MAG/MSG
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		(dB)
0.1	0.629	–65.6	22.146	140.8	0.031	61.6	0.780	–33.7	0.257	28.58
0.2	0.569	–107.8	15.408	117.8	0.043	52.0	0.544	–48.8	0.433	25.59
0.3	0.545	–130.5	11.295	105.5	0.050	50.2	0.411	–54.6	0.589	23.56
0.4	0.529	–144.4	8.772	98.0	0.056	51.2	0.332	–57.2	0.723	21.94
0.5	0.520	–153.7	7.124	92.0	0.062	53.3	0.282	–58.4	0.831	20.58
0.6	0.518	–161.2	6.027	87.6	0.069	55.6	0.250	–59.6	0.906	19.43
0.7	0.521	–166.7	5.190	83.5	0.076	57.8	0.226	–61.0	0.958	18.35
0.8	0.522	–171.7	4.570	79.8	0.083	59.5	0.208	–62.2	1.000	17.31
0.9	0.523	–175.0	4.090	76.6	0.091	61.1	0.194	–64.4	1.030	15.48
1.0	0.530	–178.5	3.700	73.7	0.099	62.4	0.183	–66.7	1.046	14.44
1.1	0.532	178.3	3.385	70.7	0.107	63.4	0.174	–69.7	1.061	13.51
1.2	0.538	175.5	3.126	67.9	0.115	64.2	0.166	–73.1	1.064	12.80
1.3	0.544	173.1	2.899	65.3	0.123	64.8	0.160	–77.0	1.065	12.15
1.4	0.547	170.8	2.708	62.6	0.132	65.2	0.156	–81.5	1.065	11.55
1.5	0.555	168.5	2.542	60.0	0.142	65.6	0.152	–86.4	1.057	11.08
1.6	0.559	165.9	2.404	57.5	0.151	65.7	0.150	–91.7	1.053	10.62
1.7	0.568	164.0	2.272	55.2	0.160	65.7	0.149	–97.4	1.042	10.27
1.8	0.573	161.8	2.154	52.6	0.170	65.7	0.150	–103.2	1.036	9.87
1.9	0.578	159.8	2.058	50.4	0.179	65.3	0.151	–109.3	1.030	9.54
2.0	0.590	157.5	1.961	47.6	0.189	65.2	0.155	–115.4	1.012	9.47
2.1	0.596	155.7	1.873	45.4	0.200	64.9	0.160	–121.5	1.004	9.35
2.2	0.603	154.2	1.804	43.3	0.209	64.5	0.167	–127.3	0.992	9.35
2.3	0.614	152.5	1.733	41.3	0.219	63.9	0.175	–132.9	0.977	8.97
2.4	0.620	151.1	1.664	39.3	0.229	63.4	0.184	–138.0	0.969	8.61
2.5	0.624	149.6	1.602	37.4	0.240	62.6	0.195	–142.8	0.963	8.25
2.6	0.634	148.1	1.539	35.2	0.250	62.0	0.206	–147.1	0.951	7.88
2.7	0.641	147.0	1.489	33.6	0.261	61.4	0.216	–150.7	0.939	7.57
2.8	0.646	146.0	1.440	31.6	0.271	60.7	0.227	–154.2	0.930	7.26
2.9	0.648	144.8	1.409	29.6	0.281	60.0	0.237	–157.7	0.923	7.00
3.0	0.653	143.6	1.367	28.3	0.292	59.1	0.246	–161.3	0.918	6.71
4.0	0.715	130.6	1.050	12.8	0.395	48.0	0.365	167.4	0.859	4.24
5.0	0.769	121.0	0.831	2.9	0.467	37.3	0.512	145.8	0.854	2.50

V_{CE} = 1 V, I_C = 20 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}		K	MAG/MSG
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		(dB)
0.1	0.484	–95.4	29.200	129.3	0.025	57.9	0.626	–47.5	0.420	30.75
0.2	0.486	–134.4	17.811	108.4	0.033	56.6	0.383	–62.5	0.660	27.28
0.3	0.493	–151.2	12.457	98.5	0.041	59.4	0.273	–68.2	0.809	24.79
0.4	0.491	–161.1	9.518	92.5	0.050	62.3	0.213	–71.4	0.908	22.81
0.5	0.495	–167.2	7.682	87.8	0.059	64.7	0.175	–73.5	0.963	21.16
0.6	0.496	–172.7	6.453	84.2	0.068	66.2	0.151	–76.1	1.001	19.57
0.7	0.499	–176.6	5.548	80.7	0.077	67.5	0.134	–79.1	1.026	17.58
0.8	0.504	179.7	4.858	77.6	0.087	68.1	0.120	–82.2	1.042	16.22
0.9	0.507	177.3	4.354	74.7	0.097	68.7	0.111	–86.5	1.049	15.19
1.0	0.513	174.7	3.933	72.2	0.106	68.8	0.103	–91.2	1.052	14.28
1.1	0.517	172.2	3.595	69.5	0.116	68.8	0.098	–96.7	1.054	13.48
1.2	0.525	170.4	3.316	66.9	0.126	68.7	0.094	–102.6	1.049	12.85
1.3	0.528	168.2	3.074	64.6	0.136	68.4	0.092	–109.4	1.051	12.16
1.4	0.533	166.4	2.865	62.1	0.146	68.0	0.093	–116.0	1.048	11.59
1.5	0.542	164.3	2.690	59.7	0.156	67.7	0.094	–123.3	1.040	11.14
1.6	0.547	162.1	2.541	57.5	0.166	67.1	0.098	–129.9	1.035	10.70
1.7	0.554	160.6	2.401	55.2	0.176	66.6	0.102	–136.6	1.029	10.29
1.8	0.559	158.6	2.273	52.7	0.186	65.9	0.109	–142.4	1.027	9.86
1.9	0.565	156.9	2.167	50.6	0.196	65.1	0.116	–148.1	1.022	9.53
2.0	0.577	155.0	2.066	48.1	0.206	64.5	0.125	–153.1	1.009	9.42
2.1	0.584	153.0	1.976	46.0	0.217	63.7	0.135	–157.7	1.002	9.35
2.2	0.590	151.6	1.898	44.1	0.226	63.0	0.145	–161.7	0.997	9.23
2.3	0.598	150.4	1.830	42.2	0.236	62.2	0.156	–165.6	0.988	8.90
2.4	0.606	149.2	1.757	40.4	0.246	61.3	0.168	–168.8	0.980	8.54
2.5	0.614	147.7	1.691	38.4	0.255	60.4	0.180	–171.5	0.974	8.21
2.6	0.619	146.3	1.627	36.4	0.266	59.6	0.192	–174.0	0.970	7.87
2.7	0.627	145.5	1.578	34.9	0.275	58.7	0.202	–176.3	0.960	7.59
2.8	0.633	144.5	1.520	32.9	0.285	57.9	0.213	–178.3	0.955	7.28
2.9	0.632	143.3	1.494	30.9	0.294	57.2	0.223	179.5	0.950	7.06
3.0	0.640	142.1	1.451	29.7	0.303	56.2	0.232	177.0	0.943	6.80
4.0	0.701	130.1	1.123	14.4	0.394	45.2	0.343	154.6	0.898	4.54
5.0	0.758	121.1	0.902	3.9	0.459	35.6	0.482	139.2	0.878	2.93

V_{CE} = 2 V, I_C = 1 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}		K	MAG/MSG
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		(dB)
0.1	0.942	–23.5	3.506	164.8	0.038	75.1	0.985	–7.6	0.061	19.68
0.2	0.925	–46.3	3.350	148.3	0.068	63.5	0.946	–14.5	0.108	16.90
0.3	0.898	–67.1	3.086	135.3	0.092	52.2	0.896	–20.2	0.141	15.25
0.4	0.854	–84.5	2.752	123.5	0.108	43.1	0.848	–24.7	0.203	14.05
0.5	0.827	–98.9	2.457	113.7	0.117	35.9	0.806	–28.4	0.257	13.22
0.6	0.803	–111.7	2.206	105.7	0.121	30.0	0.772	–31.6	0.305	12.59
0.7	0.784	–122.2	1.986	98.1	0.122	25.4	0.745	–34.7	0.369	12.10
0.8	0.772	–131.7	1.799	91.4	0.120	21.9	0.722	–37.3	0.436	11.75
0.9	0.766	–139.6	1.646	85.7	0.116	19.4	0.705	–40.3	0.500	11.51
1.0	0.761	–146.7	1.515	80.6	0.111	17.9	0.690	–43.3	0.573	11.35
1.1	0.756	–153.1	1.405	75.7	0.104	17.5	0.680	–46.4	0.665	11.31
1.2	0.757	–158.9	1.314	71.1	0.097	18.1	0.669	–49.6	0.755	11.33
1.3	0.759	–164.0	1.230	67.1	0.089	20.2	0.663	–53.0	0.854	11.40
1.4	0.757	–168.7	1.154	63.2	0.082	24.5	0.656	–56.5	0.997	11.50
1.5	0.756	–173.2	1.090	59.6	0.076	30.7	0.651	–60.3	1.138	9.32
1.6	0.762	–177.4	1.036	56.2	0.072	39.2	0.649	–64.1	1.222	8.77
1.7	0.767	178.7	0.977	53.0	0.071	49.5	0.645	–68.4	1.273	8.23
1.8	0.767	174.9	0.940	49.8	0.075	59.7	0.642	–72.7	1.265	7.88
1.9	0.769	171.3	0.888	46.9	0.083	68.7	0.640	–77.3	1.217	7.49
2.0	0.776	167.7	0.853	43.8	0.094	75.9	0.641	–82.1	1.090	7.74
2.1	0.780	164.6	0.810	41.3	0.108	80.5	0.641	–86.8	0.999	8.74
2.2	0.783	161.6	0.777	39.5	0.125	83.3	0.641	–91.9	0.925	7.95
2.3	0.790	158.9	0.746	38.0	0.142	84.8	0.640	–96.9	0.854	7.21
2.4	0.794	156.3	0.711	36.1	0.161	85.3	0.645	–102.1	0.805	6.46
2.5	0.797	153.8	0.682	34.7	0.180	84.8	0.647	–107.2	0.776	5.79
2.6	0.798	151.3	0.654	33.1	0.200	84.3	0.651	–112.3	0.762	5.15
2.7	0.799	149.3	0.631	32.5	0.219	83.2	0.651	–117.1	0.764	4.60
2.8	0.802	147.6	0.613	31.7	0.238	81.8	0.655	–121.8	0.752	4.11
2.9	0.794	145.4	0.600	30.8	0.257	80.2	0.653	–126.6	0.784	3.69
3.0	0.799	143.3	0.584	30.5	0.276	78.3	0.654	–131.6	0.788	3.26
4.0	0.794	125.9	0.524	27.4	0.444	56.6	0.682	–176.7	0.924	0.72
5.0	0.793	116.2	0.526	22.7	0.515	39.8	0.723	151.4	0.981	0.09

V_{CE} = 2 V, I_C = 3 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}		K	MAG/MSG
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		(dB)
0.1	0.870	–34.1	9.420	158.0	0.035	71.2	0.945	–14.7	0.091	24.28
0.2	0.801	–65.1	8.304	137.8	0.059	56.9	0.834	–25.5	0.180	21.51
0.3	0.747	–89.0	7.010	123.5	0.073	46.9	0.727	–32.3	0.258	19.80
0.4	0.697	–107.3	5.852	112.7	0.081	40.9	0.643	–36.4	0.350	18.57
0.5	0.665	–121.1	4.964	104.2	0.085	37.5	0.582	–39.1	0.445	17.66
0.6	0.647	–132.5	4.304	97.6	0.087	35.6	0.538	–41.1	0.529	16.93
0.7	0.634	–141.7	3.776	91.7	0.088	35.3	0.506	–43.1	0.621	16.31
0.8	0.626	–149.2	3.356	86.5	0.089	35.8	0.481	–44.7	0.717	15.79
0.9	0.625	–155.2	3.030	82.1	0.089	37.4	0.462	–46.6	0.800	15.33
1.0	0.623	–161.0	2.757	78.2	0.089	39.6	0.447	–48.7	0.881	14.89
1.1	0.623	–165.9	2.536	74.2	0.090	42.5	0.435	–51.1	0.958	14.50
1.2	0.628	–170.4	2.353	70.5	0.092	45.5	0.424	–53.7	1.011	13.45
1.3	0.629	–174.2	2.191	67.3	0.094	49.0	0.416	–56.7	1.063	12.15
1.4	0.630	–177.9	2.049	63.9	0.097	52.6	0.410	–59.7	1.104	11.28
1.5	0.635	178.8	1.926	60.8	0.102	56.3	0.403	–63.1	1.118	10.69
1.6	0.636	175.4	1.829	57.8	0.107	59.7	0.399	–66.6	1.124	10.19
1.7	0.645	172.7	1.729	54.9	0.114	62.9	0.395	–70.5	1.107	9.83
1.8	0.650	169.3	1.646	51.8	0.122	65.6	0.392	–74.6	1.088	9.51
1.9	0.653	166.7	1.567	49.2	0.131	67.8	0.390	–79.0	1.069	9.18
2.0	0.663	163.9	1.499	46.0	0.140	69.7	0.389	–83.5	1.025	9.33
2.1	0.669	161.5	1.431	43.5	0.152	71.1	0.390	–88.2	0.993	9.75
2.2	0.674	159.0	1.374	41.2	0.163	72.1	0.390	–93.1	0.966	9.26
2.3	0.683	157.1	1.319	39.0	0.175	72.5	0.392	–98.2	0.930	8.77
2.4	0.690	155.0	1.264	36.8	0.188	72.8	0.397	–103.2	0.901	8.28
2.5	0.695	153.1	1.215	34.7	0.202	72.6	0.402	–108.2	0.877	7.80
2.6	0.702	151.2	1.160	32.4	0.216	72.5	0.410	–113.2	0.855	7.31
2.7	0.709	149.7	1.125	30.7	0.229	72.0	0.416	–117.8	0.830	6.91
2.8	0.713	148.4	1.081	28.9	0.243	71.4	0.423	–122.4	0.817	6.48
2.9	0.710	146.6	1.055	27.0	0.258	70.7	0.427	–126.9	0.818	6.12
3.0	0.719	144.8	1.018	25.6	0.272	69.7	0.434	–131.6	0.804	5.73
4.0	0.759	129.3	0.769	13.2	0.416	54.7	0.522	–174.8	0.799	2.67
5.0	0.788	118.8	0.633	8.5	0.496	40.1	0.632	153.4	0.880	1.06

V_{CE} = 2 V, I_C = 5 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}		K	MAG/MSG
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		(dB)
0.1	0.798	–43.2	14.194	152.6	0.034	71.0	0.901	–20.4	0.100	26.18
0.2	0.707	–78.7	11.604	130.3	0.052	54.0	0.738	–33.2	0.260	23.51
0.3	0.652	–103.3	9.221	116.4	0.062	46.9	0.609	–39.9	0.367	21.74
0.4	0.608	–121.0	7.443	106.6	0.068	43.2	0.519	–43.1	0.490	20.41
0.5	0.586	–133.6	6.193	99.2	0.071	42.8	0.459	–44.9	0.600	19.39
0.6	0.574	–143.5	5.297	93.5	0.075	43.4	0.418	–46.3	0.698	18.51
0.7	0.568	–151.6	4.608	88.4	0.078	44.7	0.388	–47.5	0.786	17.72
0.8	0.563	–158.0	4.066	84.0	0.081	46.7	0.366	–48.8	0.870	16.99
0.9	0.562	–163.3	3.656	80.1	0.085	49.1	0.348	–50.4	0.938	16.35
1.0	0.566	–167.8	3.316	76.6	0.089	51.5	0.334	–52.2	0.987	15.72
1.1	0.567	–172.2	3.043	73.2	0.093	54.0	0.323	–54.4	1.029	14.09
1.2	0.571	–175.7	2.817	70.0	0.098	56.2	0.313	–56.9	1.057	13.11
1.3	0.574	–179.1	2.617	66.9	0.104	58.4	0.305	–59.7	1.075	12.32
1.4	0.576	177.8	2.443	64.0	0.111	60.4	0.298	–62.7	1.090	11.61
1.5	0.582	175.1	2.299	61.2	0.118	62.4	0.292	–66.1	1.088	11.09
1.6	0.587	172.0	2.176	58.3	0.125	63.9	0.288	–69.8	1.080	10.67
1.7	0.594	169.5	2.059	55.8	0.133	65.3	0.283	–73.9	1.068	10.29
1.8	0.601	166.7	1.956	52.9	0.142	66.4	0.281	–78.1	1.054	9.97
1.9	0.606	164.5	1.865	50.5	0.151	67.2	0.279	–82.8	1.041	9.68
2.0	0.613	161.8	1.782	47.5	0.161	68.1	0.278	–87.5	1.020	9.59
2.1	0.622	159.6	1.700	45.1	0.171	68.5	0.279	–92.5	0.996	9.97
2.2	0.628	157.7	1.637	43.0	0.182	68.8	0.280	–97.7	0.978	9.54
2.3	0.639	155.8	1.573	40.8	0.192	68.8	0.283	–103.0	0.953	9.13
2.4	0.644	154.1	1.506	38.6	0.204	68.6	0.288	–108.3	0.940	8.69
2.5	0.652	152.3	1.450	36.6	0.216	68.2	0.294	–113.4	0.918	8.28
2.6	0.656	150.6	1.389	34.2	0.227	67.9	0.302	–118.4	0.909	7.86
2.7	0.664	149.4	1.345	32.5	0.239	67.4	0.310	–122.9	0.888	7.50
2.8	0.671	148.0	1.296	30.5	0.252	66.9	0.318	–127.4	0.872	7.12
2.9	0.670	146.5	1.266	28.4	0.263	66.2	0.324	–131.9	0.868	6.82
3.0	0.678	145.3	1.225	27.1	0.276	65.4	0.332	–136.4	0.854	6.47
4.0	0.736	130.6	0.926	12.1	0.403	52.9	0.436	–177.3	0.803	3.61
5.0	0.781	120.2	0.732	4.5	0.484	39.8	0.571	153.1	0.840	1.80

V_{CE} = 2 V, I_C = 7 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}		K	MAG/MSG
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		(dB)
0.1	0.723	–50.2	18.053	147.9	0.032	65.6	0.859	–25.1	0.196	27.53
0.2	0.634	–89.7	13.837	125.1	0.046	52.3	0.662	–38.9	0.336	24.77
0.3	0.585	–114.1	10.591	111.7	0.054	47.6	0.526	–45.0	0.472	22.90
0.4	0.558	–130.4	8.393	102.8	0.060	46.7	0.439	–47.6	0.596	21.45
0.5	0.541	–141.4	6.890	96.1	0.065	47.9	0.383	–48.8	0.713	20.27
0.6	0.533	–150.8	5.854	91.1	0.069	49.7	0.345	–49.8	0.805	19.26
0.7	0.531	–158.0	5.082	86.5	0.074	51.6	0.318	–50.8	0.879	18.35
0.8	0.528	–163.8	4.470	82.5	0.080	53.8	0.298	–51.8	0.944	17.49
0.9	0.529	–167.9	4.014	78.9	0.085	55.9	0.282	–53.2	0.992	16.73
1.0	0.533	–172.2	3.635	75.8	0.091	57.9	0.269	–55.1	1.023	15.06
1.1	0.536	–176.1	3.329	72.6	0.098	59.8	0.258	–57.2	1.048	13.98
1.2	0.541	–179.4	3.079	69.5	0.104	61.4	0.249	–59.7	1.061	13.19
1.3	0.547	177.6	2.860	66.8	0.112	62.6	0.241	–62.7	1.066	12.51
1.4	0.549	175.0	2.668	64.0	0.119	63.9	0.235	–66.0	1.073	11.84
1.5	0.557	172.3	2.508	61.3	0.128	64.9	0.229	–69.6	1.064	11.39
1.6	0.559	170.0	2.373	58.7	0.136	65.6	0.225	–73.5	1.062	10.89
1.7	0.567	167.4	2.245	56.2	0.144	66.4	0.220	–77.9	1.053	10.51
1.8	0.574	165.0	2.131	53.6	0.154	66.8	0.218	–82.5	1.041	10.18
1.9	0.578	162.9	2.031	51.3	0.163	67.1	0.216	–87.5	1.033	9.84
2.0	0.590	160.2	1.940	48.4	0.173	67.3	0.216	–92.6	1.009	9.93
2.1	0.596	158.6	1.852	46.0	0.183	67.4	0.217	–98.1	0.997	10.05
2.2	0.602	156.5	1.780	44.0	0.193	67.2	0.220	–103.8	0.986	9.65
2.3	0.614	154.8	1.715	41.9	0.203	67.0	0.223	–109.3	0.962	9.26
2.4	0.618	153.3	1.643	39.8	0.214	66.6	0.229	–114.9	0.955	8.86
2.5	0.624	151.7	1.582	37.8	0.225	66.0	0.236	–120.1	0.943	8.48
2.6	0.633	150.1	1.518	35.5	0.236	65.6	0.245	–125.1	0.928	8.09
2.7	0.640	148.8	1.469	33.8	0.247	65.0	0.253	–129.6	0.913	7.74
2.8	0.647	147.9	1.419	31.8	0.258	64.5	0.262	–134.0	0.900	7.41
2.9	0.649	146.4	1.386	29.7	0.269	63.8	0.270	–138.3	0.891	7.12
3.0	0.655	145.0	1.346	28.5	0.281	63.0	0.278	–142.6	0.884	6.81
4.0	0.719	131.4	1.024	12.9	0.397	51.5	0.388	179.0	0.822	4.12
5.0	0.770	121.2	0.805	3.4	0.475	39.5	0.534	151.6	0.836	2.29

V_{CE} = 2 V, I_C = 10 mA, Z_O = 50 Ω

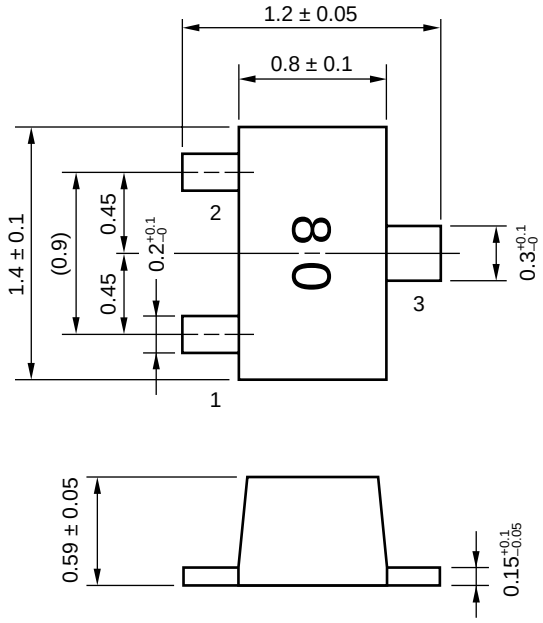
Frequency	S_{11}		S_{21}		S_{12}		S_{22}		K	MAG/MSG
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		(dB)
0.1	0.641	–61.2	22.663	142.5	0.028	61.4	0.799	–30.9	0.259	29.10
0.2	0.561	–102.1	16.085	119.4	0.040	53.0	0.572	–45.2	0.435	26.07
0.3	0.528	–125.6	11.886	107.0	0.048	51.5	0.438	–50.5	0.589	23.98
0.4	0.512	–140.6	9.283	99.2	0.054	52.4	0.358	–52.5	0.717	22.37
0.5	0.499	–150.6	7.550	93.2	0.060	54.3	0.308	–53.3	0.828	21.03
0.6	0.498	–158.5	6.387	88.8	0.066	56.6	0.275	–54.0	0.898	19.85
0.7	0.498	–164.3	5.515	84.7	0.073	58.8	0.251	–54.8	0.954	18.80
0.8	0.500	–169.2	4.847	81.0	0.080	60.6	0.233	–55.8	0.994	17.83
0.9	0.501	–172.9	4.341	77.9	0.087	62.1	0.219	–57.3	1.023	16.04
1.0	0.506	–176.6	3.930	74.9	0.095	63.4	0.207	–59.2	1.039	14.96
1.1	0.509	–179.8	3.596	72.0	0.103	64.6	0.197	–61.5	1.052	14.04
1.2	0.518	177.3	3.324	69.1	0.111	65.4	0.188	–64.2	1.053	13.37
1.3	0.518	174.7	3.078	66.6	0.119	65.9	0.181	–67.6	1.062	12.59
1.4	0.525	172.5	2.875	64.0	0.128	66.5	0.176	–71.3	1.058	12.04
1.5	0.531	170.0	2.698	61.5	0.137	66.9	0.171	–75.5	1.052	11.55
1.6	0.536	167.6	2.553	59.0	0.146	67.0	0.167	–79.9	1.047	11.11
1.7	0.543	165.4	2.414	56.6	0.155	67.2	0.163	–85.1	1.040	10.70
1.8	0.549	163.0	2.289	54.1	0.165	67.1	0.162	–90.5	1.032	10.33
1.9	0.554	161.3	2.185	51.9	0.174	66.9	0.161	–96.4	1.025	10.01
2.0	0.566	159.0	2.083	49.2	0.184	66.8	0.162	–102.0	1.009	9.97
2.1	0.573	157.2	1.988	47.0	0.194	66.5	0.165	–108.2	0.998	10.10
2.2	0.579	155.4	1.914	45.0	0.204	66.1	0.168	–114.4	0.990	9.73
2.3	0.590	153.8	1.844	43.0	0.213	65.5	0.174	–120.5	0.974	9.36
2.4	0.597	152.5	1.765	41.0	0.224	65.0	0.181	–126.0	0.966	8.97
2.5	0.605	151.0	1.704	39.1	0.234	64.2	0.189	–131.3	0.953	8.62
2.6	0.611	149.5	1.634	36.9	0.245	63.6	0.199	–136.2	0.947	8.25
2.7	0.619	148.5	1.583	35.2	0.255	63.0	0.208	–140.4	0.934	7.93
2.8	0.625	147.4	1.529	33.2	0.265	62.3	0.218	–144.3	0.925	7.61
2.9	0.627	146.2	1.494	31.1	0.275	61.6	0.226	–148.3	0.918	7.34
3.0	0.633	144.7	1.455	29.9	0.286	60.8	0.235	–152.2	0.909	7.07
4.0	0.701	132.0	1.114	14.0	0.392	49.8	0.347	173.1	0.848	4.54
5.0	0.763	122.1	0.878	3.5	0.467	38.9	0.497	149.2	0.838	2.74

V_{CE} = 2 V, I_C = 20 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}		K	MAG/MSG
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		(dB)
0.1	0.496	–86.5	30.622	131.8	0.024	62.5	0.662	–42.6	0.392	31.09
0.2	0.464	–127.3	19.196	110.4	0.031	58.0	0.420	–56.2	0.645	27.87
0.3	0.462	–145.8	13.510	100.2	0.040	60.5	0.305	–60.4	0.793	25.32
0.4	0.456	–157.0	10.353	94.1	0.048	62.9	0.242	–62.0	0.896	23.37
0.5	0.454	–163.7	8.367	89.3	0.056	65.2	0.203	–62.4	0.961	21.75
0.6	0.459	–169.7	7.037	85.6	0.065	67.0	0.177	–63.4	0.991	20.35
0.7	0.463	–173.9	6.056	82.3	0.074	68.2	0.158	–64.7	1.014	18.40
0.8	0.468	–177.8	5.305	79.0	0.083	69.0	0.144	–66.1	1.030	16.99
0.9	0.469	179.4	4.748	76.3	0.093	69.5	0.132	–68.5	1.041	15.87
1.0	0.474	176.8	4.291	73.7	0.102	69.7	0.123	–71.5	1.045	14.94
1.1	0.479	174.4	3.913	71.1	0.112	69.8	0.115	–75.1	1.048	14.10
1.2	0.486	172.5	3.616	68.7	0.121	69.8	0.109	–79.5	1.044	13.47
1.3	0.492	170.2	3.351	66.3	0.131	69.4	0.104	–84.6	1.042	12.83
1.4	0.495	168.4	3.125	63.8	0.140	69.3	0.101	–90.2	1.042	12.22
1.5	0.503	166.3	2.933	61.5	0.150	68.9	0.098	–96.8	1.036	11.75
1.6	0.510	164.1	2.773	59.2	0.160	68.3	0.097	–103.5	1.029	11.34
1.7	0.518	162.7	2.619	57.1	0.170	67.9	0.097	–110.9	1.022	10.96
1.8	0.524	160.7	2.482	54.8	0.180	67.3	0.100	–118.2	1.019	10.56
1.9	0.528	158.8	2.365	52.7	0.190	66.5	0.103	–125.5	1.016	10.20
2.0	0.539	156.7	2.254	50.2	0.199	66.0	0.109	–132.1	1.006	10.05
2.1	0.550	155.2	2.154	48.1	0.210	65.3	0.116	–138.5	0.995	10.12
2.2	0.556	153.6	2.075	46.3	0.219	64.6	0.124	–144.4	0.990	9.77
2.3	0.566	152.1	1.995	44.3	0.228	63.8	0.133	–149.8	0.980	9.41
2.4	0.573	150.8	1.915	42.5	0.238	63.0	0.143	–154.3	0.977	9.05
2.5	0.580	149.4	1.845	40.6	0.248	62.0	0.154	–158.4	0.970	8.72
2.6	0.587	148.3	1.771	38.5	0.258	61.2	0.165	–161.8	0.965	8.37
2.7	0.594	147.1	1.717	37.0	0.268	60.5	0.175	–164.7	0.957	8.07
2.8	0.600	146.4	1.659	35.1	0.277	59.7	0.186	–167.5	0.951	7.77
2.9	0.599	145.3	1.623	33.0	0.286	58.9	0.195	–170.2	0.949	7.54
3.0	0.609	143.9	1.578	31.8	0.296	58.0	0.203	–173.2	0.939	7.27
4.0	0.676	132.4	1.224	16.1	0.389	47.2	0.313	160.8	0.889	4.98
5.0	0.743	123.1	0.979	4.8	0.457	37.5	0.459	143.2	0.864	3.31

PACKAGE DIMENSIONS

FLAT-LEAD 3-PIN THIN-TYPE ULTRA SUPER MINIMOLD (UNIT: mm)



PIN CONNECTIONS

1. Emitter
2. Base
3. Collector

[MEMO]

[MEMO]

- **The information in this document is current as of July, 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 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