

To our customers,

Old Company Name in Catalogs and Other Documents

On April 1st, 2010, NEC Electronics Corporation merged with Renesas Technology Corporation, and Renesas Electronics Corporation took over all the business of both companies. Therefore, although the old company name remains in this document, it is a valid Renesas Electronics document. We appreciate your understanding.

Renesas Electronics website: <http://www.renesas.com>

April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

Send any inquiries to <http://www.renesas.com/inquiry>.

Notice

1. All information included in this document is current as of the date this document is issued. Such information, however, is subject to change without any prior notice. Before purchasing or using any Renesas Electronics products listed herein, please confirm the latest product information with a Renesas Electronics sales office. Also, please pay regular and careful attention to additional and different information to be disclosed by Renesas Electronics such as that disclosed through our website.
2. Renesas Electronics 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 Renesas Electronics products or technical information described in this document. No license, express, implied or otherwise, is granted hereby under any patents, copyrights or other intellectual property rights of Renesas Electronics or others.
3. You should not alter, modify, copy, or otherwise misappropriate any Renesas Electronics product, whether in whole or in part.
4. Descriptions of circuits, software and other related information in this document are provided only to illustrate the operation of semiconductor products and application examples. You are fully responsible for the incorporation of these circuits, software, and information in the design of your equipment. Renesas Electronics assumes no responsibility for any losses incurred by you or third parties arising from the use of these circuits, software, or information.
5. When exporting the products or technology described in this document, you should comply with the applicable export control laws and regulations and follow the procedures required by such laws and regulations. You should not use Renesas Electronics products or the technology described in this document for any purpose relating to military applications or use by the military, including but not limited to the development of weapons of mass destruction. Renesas Electronics products and technology may not be used for or incorporated into any products or systems whose manufacture, use, or sale is prohibited under any applicable domestic or foreign laws or regulations.
6. Renesas Electronics has used reasonable care in preparing the information included in this document, but Renesas Electronics does not warrant that such information is error free. Renesas Electronics assumes no liability whatsoever for any damages incurred by you resulting from errors in or omissions from the information included herein.
7. Renesas Electronics products are classified according to the following three quality grades: “Standard”, “High Quality”, and “Specific”. The recommended applications for each Renesas Electronics product depends on the product’s quality grade, as indicated below. You must check the quality grade of each Renesas Electronics product before using it in a particular application. You may not use any Renesas Electronics product for any application categorized as “Specific” without the prior written consent of Renesas Electronics. Further, you may not use any Renesas Electronics product for any application for which it is not intended without the prior written consent of Renesas Electronics. Renesas Electronics shall not be in any way liable for any damages or losses incurred by you or third parties arising from the use of any Renesas Electronics product for an application categorized as “Specific” or for which the product is not intended where you have failed to obtain the prior written consent of Renesas Electronics. The quality grade of each Renesas Electronics product is “Standard” unless otherwise expressly specified in a Renesas Electronics data sheets or data books, etc.
 - “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.
 - “High Quality”: 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; medical equipment or systems for life support (e.g. artificial life support devices or systems), surgical implantations, or healthcare intervention (e.g. excision, etc.), and any other applications or purposes that pose a direct threat to human life.
8. You should use the Renesas Electronics products described in this document within the range specified by Renesas Electronics, especially with respect to the maximum rating, operating supply voltage range, movement power voltage range, heat radiation characteristics, installation and other product characteristics. Renesas Electronics shall have no liability for malfunctions or damages arising out of the use of Renesas Electronics products beyond such specified ranges.
9. Although Renesas Electronics endeavors to improve the quality and reliability of its products, semiconductor products have specific characteristics such as the occurrence of failure at a certain rate and malfunctions under certain use conditions. Further, Renesas Electronics products are not subject to radiation resistance design. Please be sure to implement safety measures to guard them against the possibility of physical injury, and injury or damage caused by fire in the event of the failure of a Renesas Electronics product, such as safety design for hardware and software including but not limited to redundancy, fire control and malfunction prevention, appropriate treatment for aging degradation or any other appropriate measures. Because the evaluation of microcomputer software alone is very difficult, please evaluate the safety of the final products or system manufactured by you.
10. Please contact a Renesas Electronics sales office for details as to environmental matters such as the environmental compatibility of each Renesas Electronics product. Please use Renesas Electronics products in compliance with all applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive. Renesas Electronics assumes no liability for damages or losses occurring as a result of your noncompliance with applicable laws and regulations.
11. This document may not be reproduced or duplicated, in any form, in whole or in part, without prior written consent of Renesas Electronics.
12. Please contact a Renesas Electronics sales office if you have any questions regarding the information contained in this document or Renesas Electronics products, or if you have any other inquiries.

(Note 1) “Renesas Electronics” as used in this document means Renesas Electronics Corporation and also includes its majority-owned subsidiaries.

(Note 2) “Renesas Electronics product(s)” means any product developed or manufactured by or for Renesas Electronics.

NPN SILICON RF TWIN TRANSISTOR

Phase-out/Discontinued

μPA841TD

**NPN SILICON RF TRANSISTOR (WITH 2 DIFFERENT ELEMENTS)
IN A 6-PIN LEAD-LESS MINIMOLD**

FEATURES

- Low voltage operation
- 2 different built-in transistors (2SC5435, 2SC5600)
 - Q1: Built-in high-gain transistor
 $f_T = 12.0 \text{ GHz TYP.}$, $|S_{21e}|^2 = 8.5 \text{ dB TYP. @ } V_{CE} = 3 \text{ V, } I_c = 10 \text{ mA, } f = 2 \text{ GHz}$
 - Q2: Built-in low phase distortion transistor suited for OSC operation
 $f_T = 5.0 \text{ GHz TYP.}$, $|S_{21e}|^2 = 4.0 \text{ dB TYP. @ } V_{CE} = 1 \text{ V, } I_c = 5 \text{ mA, } f = 2 \text{ GHz}$
- 6-pin lead-less minimold package

BUILT-IN TRANSISTORS

	Q1	Q2
3-pin thin-type ultra super minimold part No.	2SC5435	2SC5600

ORDERING INFORMATION

Part Number	Quantity	Supplying Form
μPA841TD	50 pcs (Non reel)	• 8 mm wide embossed taping
μPA841TD-T3	10 kpcs/reel	• Pin 1 (Q1 Collector), Pin 6 (Q1 Base) face the perforation side of the tape

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

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 representative for availability and additional information.

ABSOLUTE MAXIMUM RATINGS (T_A = +25°C)

Parameter	Symbol	Ratings		Unit
		Q1	Q2	
Collector to Base Voltage	V _{CB0}	9	9	V
Collector to Emitter Voltage	V _{CEO}	6	5.5	V
Emitter to Base Voltage	V _{EBO}	2	1.5	V
Collector Current	I _C	30	100	mA
Total Power Dissipation	P _{tot} ^{Note}	180	190	mW
		210 in 2 elements		
Junction Temperature	T _j	150		°C
Storage Temperature	T _{stg}	-65 to +150		°C

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

ELECTRICAL CHARACTERISTICS (T_A = +25°C)

(1) Q1

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Collector Cut-off Current	I _{CB0}	V _{CB} = 5 V, I _E = 0 mA	-	-	100	nA
Emitter Cut-off Current	I _{EBO}	V _{BE} = 1 V, I _C = 0 mA	-	-	100	nA
DC Current Gain	h _{FE} ^{Note 1}	V _{CE} = 3 V, I _C = 10 mA	75	-	150	-
Gain Bandwidth Product	f _T	V _{CE} = 3 V, I _C = 10 mA, f = 2 GHz	10.0	12.0	-	GHz
Insertion Power Gain	S _{21e} ²	V _{CE} = 3 V, I _C = 10 mA, f = 2 GHz	7.0	8.5	-	dB
Noise Figure	NF	V _{CE} = 3 V, I _C = 3 mA, f = 2 GHz, Z _S = Z _{opt}	-	1.5	2.5	dB
Reverse Transfer Capacitance	C _{re} ^{Note 2}	V _{CB} = 3 V, I _E = 0 mA, f = 1 MHz	-	0.4	0.7	pF

(2) Q2

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Collector Cut-off Current	I _{CB0}	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	-	160	-
Gain Bandwidth Product (1)	f _T	V _{CE} = 1 V, I _C = 5 mA, f = 2 GHz	3.5	5.0	-	GHz
Gain Bandwidth Product (2)	f _T	V _{CE} = 1 V, I _C = 15 mA, f = 2 GHz	5.5	6.5	-	GHz
Insertion Power Gain (1)	S _{21e} ²	V _{CE} = 1 V, I _C = 5 mA, f = 2 GHz	3.5	4.0	-	dB
Insertion Power Gain (2)	S _{21e} 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 = 5 mA, f = 2 GHz, Z _S = Z _{opt}	-	1.5	2.5	dB
Reverse Transfer Capacitance	C _{re} ^{Note 2}	V _{CB} = 0.5 V, I _E = 0 mA, f = 1 MHz	-	0.8	1.0	pF

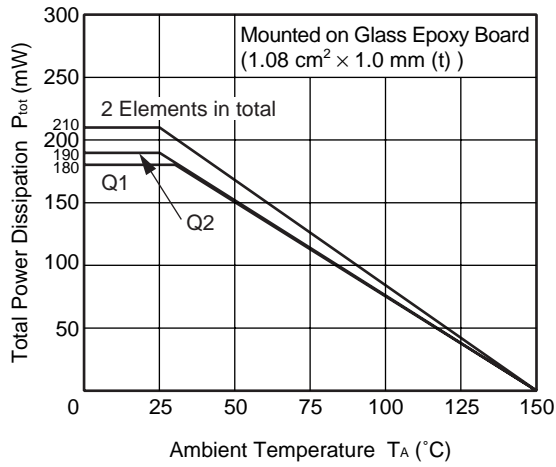
- Notes** 1. Pulse measurement: PW ≤ 350 μs, Duty Cycle ≤ 2%
 2. Collector to base capacitance when the emitter grounded

hFE CLASSIFICATION

Rank	FB
Marking	nQ
hFE Value of Q1	75 to 150
hFE Value of Q2	100 to 160

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

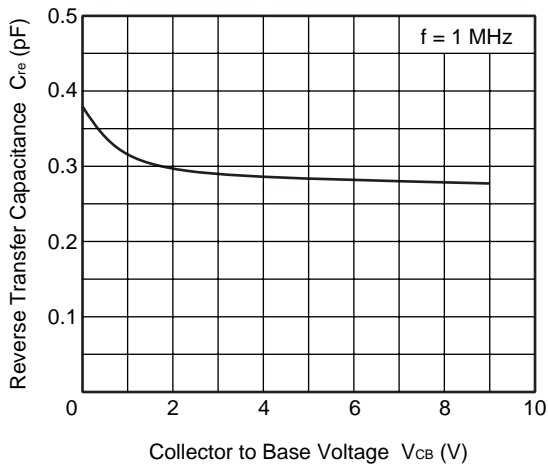
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



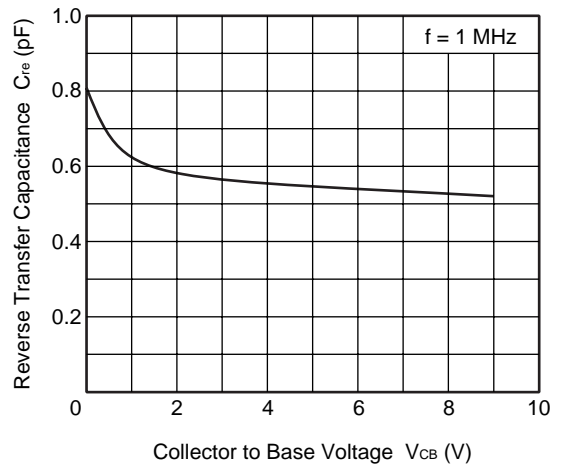
Q1

Q2

REVERSE TRANSFER CAPACITANCE vs. COLLECTOR TO BASE VOLTAGE

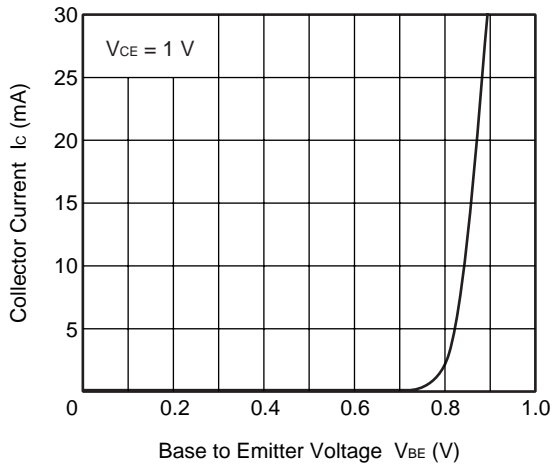


REVERSE TRANSFER CAPACITANCE vs. COLLECTOR TO BASE VOLTAGE



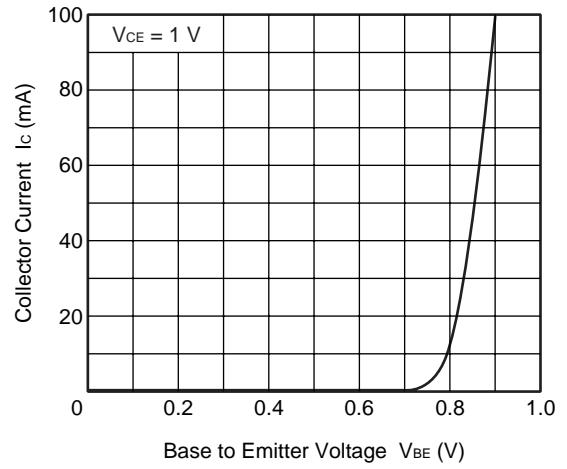
Q1

COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE

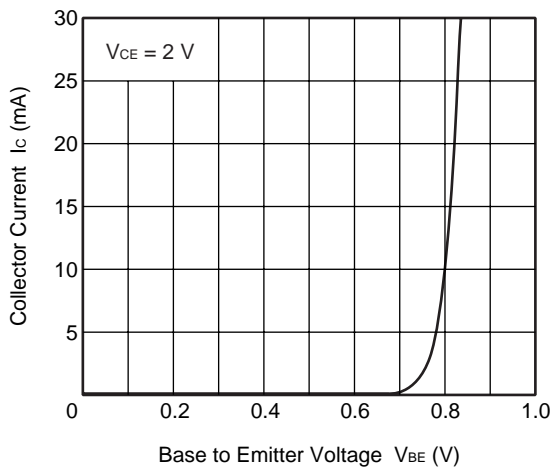


Q2

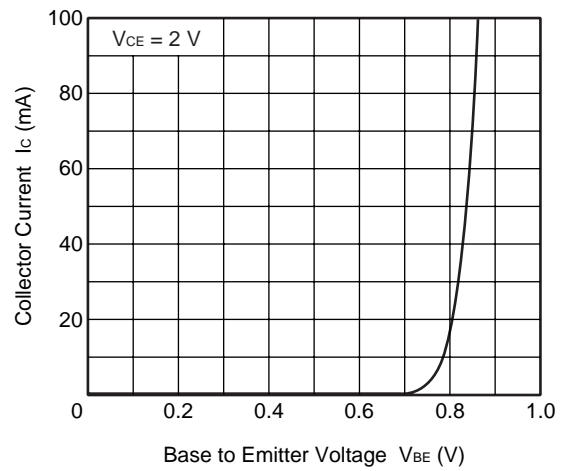
COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE



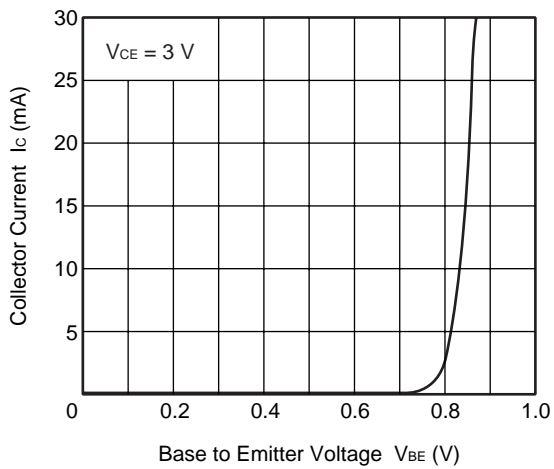
COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE



COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE

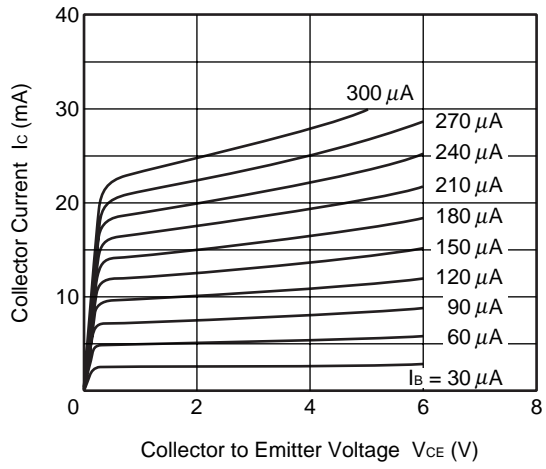


COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE



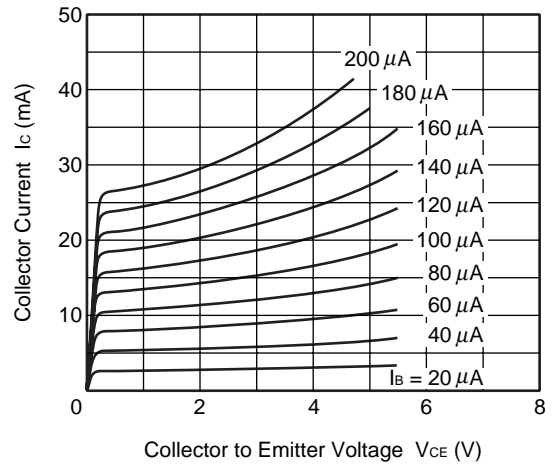
Q1

COLLECTOR CURRENT vs.
COLLECTOR TO EMITTER VOLTAGE



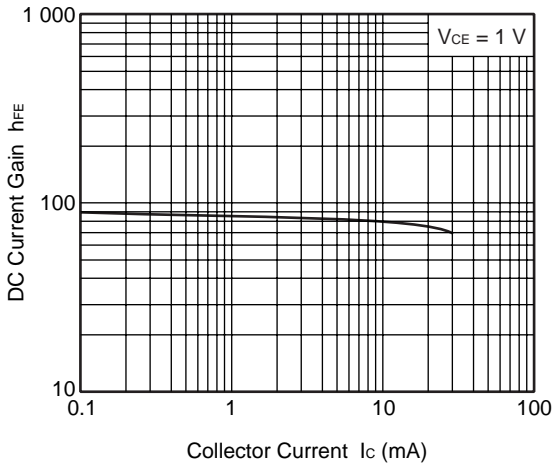
Q2

COLLECTOR CURRENT vs.
COLLECTOR TO EMITTER VOLTAGE



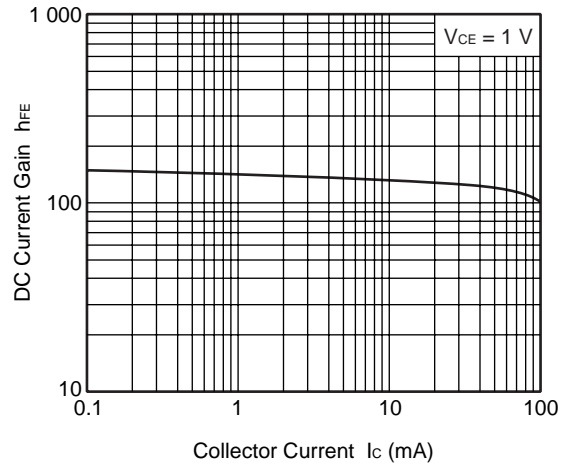
Q1

DC CURRENT GAIN vs. COLLECTOR CURRENT

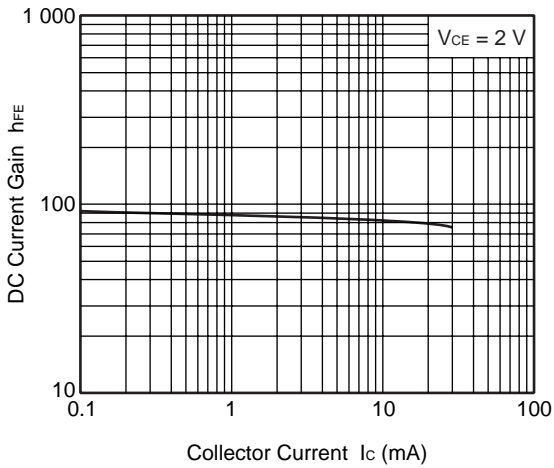


Q2

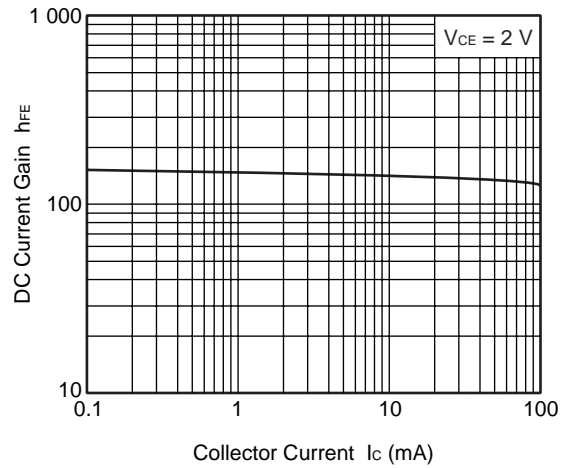
DC CURRENT GAIN vs. COLLECTOR CURRENT



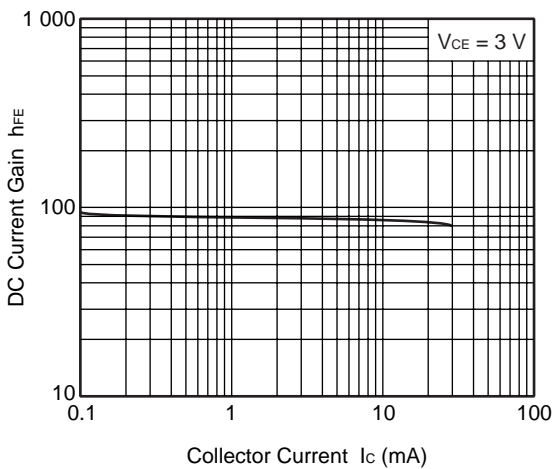
DC CURRENT GAIN vs. COLLECTOR CURRENT



DC CURRENT GAIN vs. COLLECTOR CURRENT

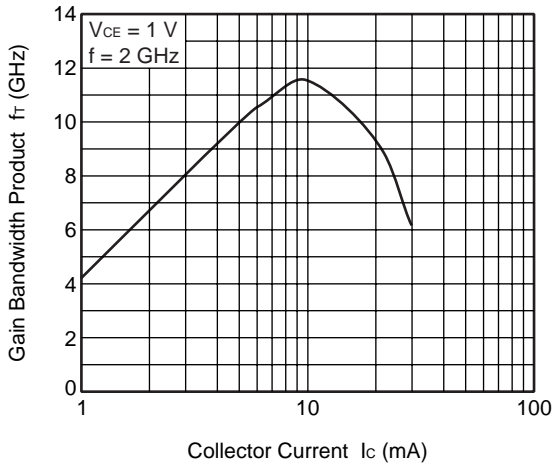


DC CURRENT GAIN vs. COLLECTOR CURRENT



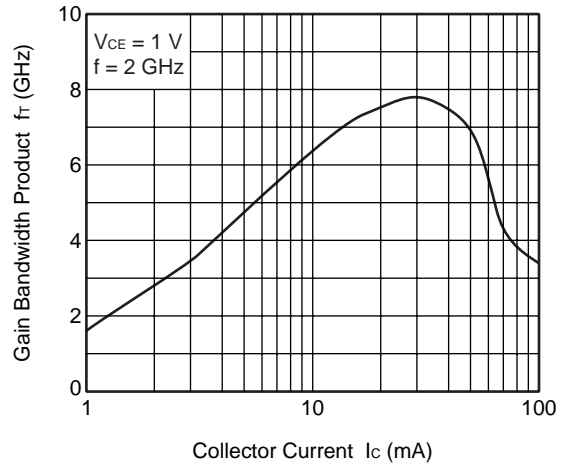
Q1

GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT

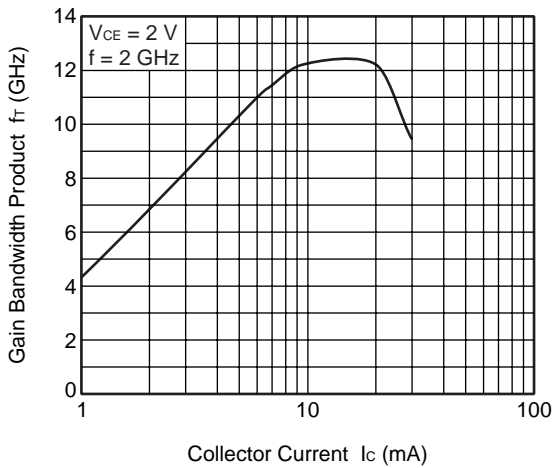


Q2

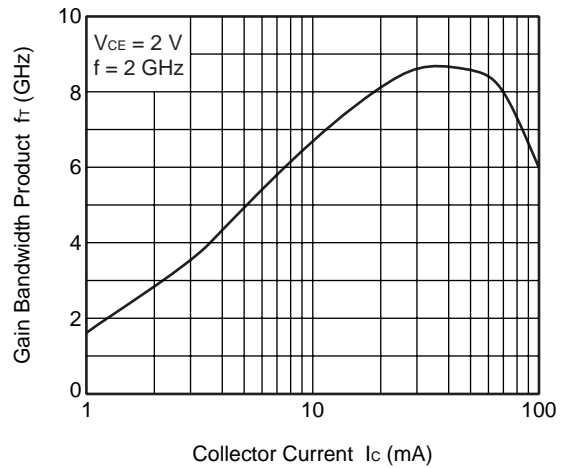
GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT



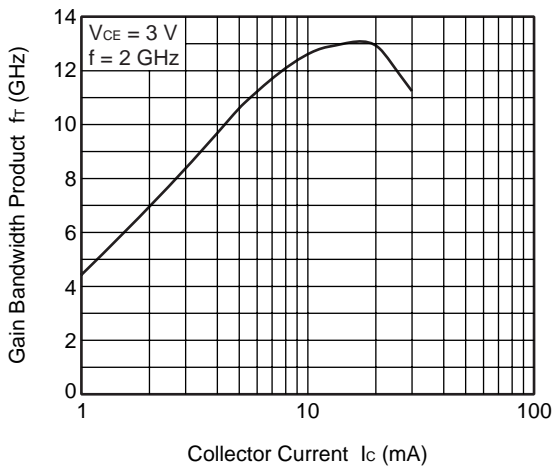
GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT



GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT

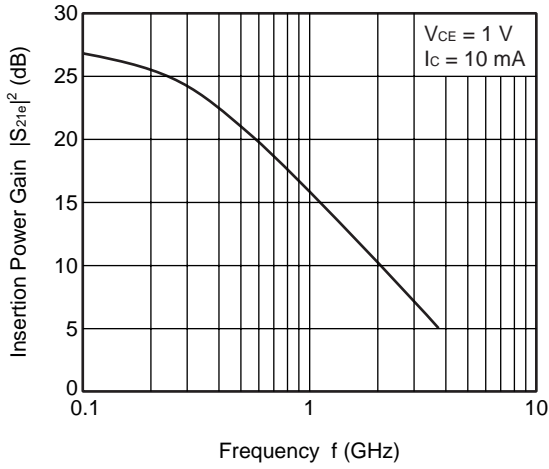


GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT



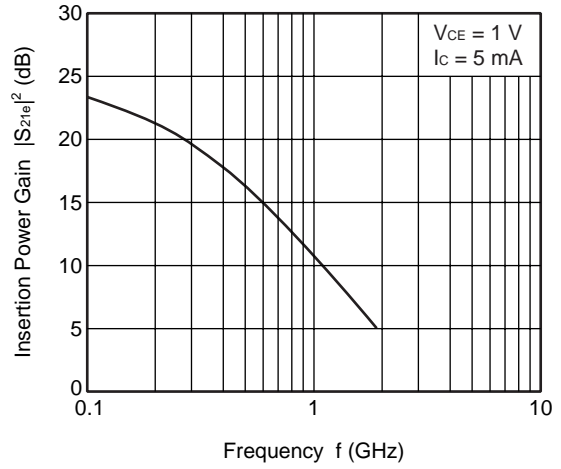
Q1

INSERTION POWER GAIN vs. FREQUENCY

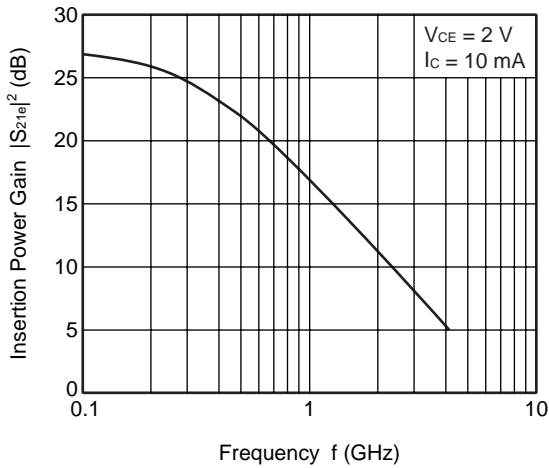


Q2

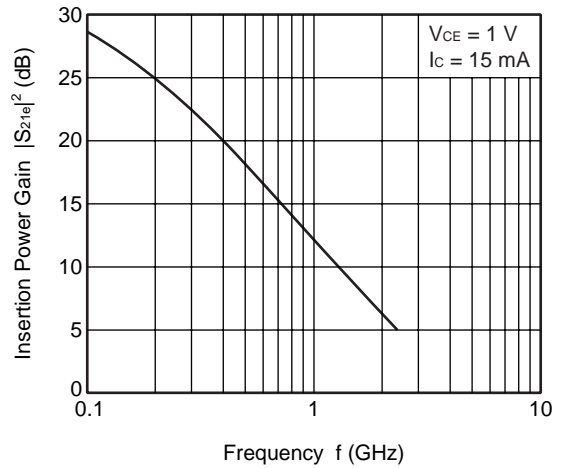
INSERTION POWER GAIN vs. FREQUENCY



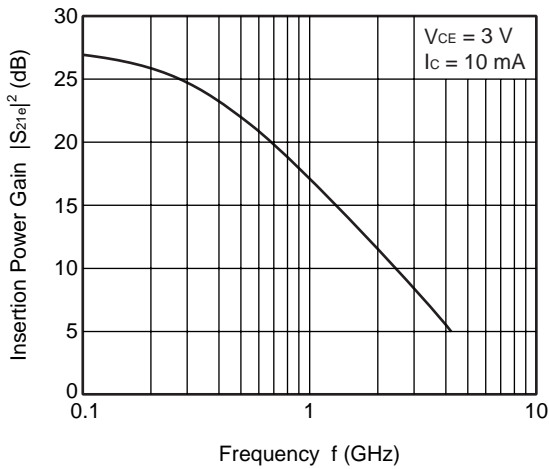
INSERTION POWER GAIN vs. FREQUENCY



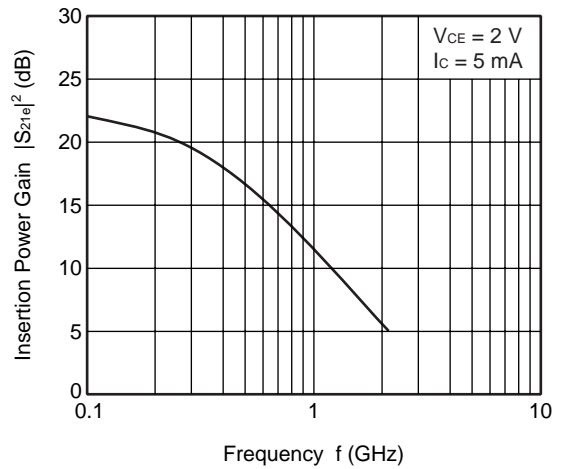
INSERTION POWER GAIN vs. FREQUENCY



INSERTION POWER GAIN vs. FREQUENCY

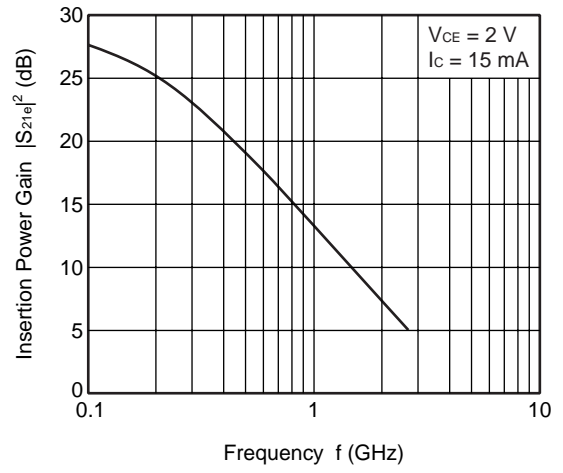


INSERTION POWER GAIN vs. FREQUENCY



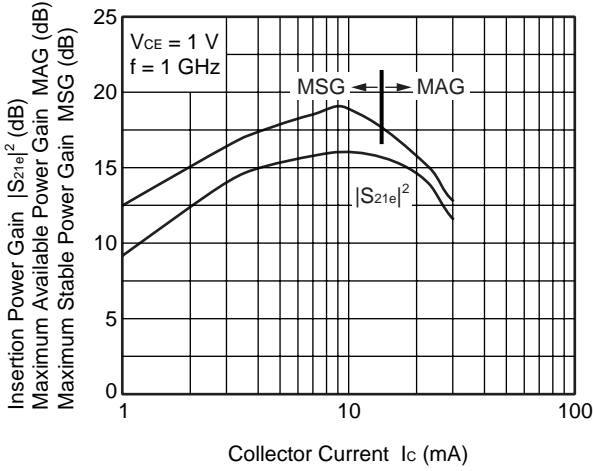
Q2

INSERTION POWER GAIN vs. FREQUENCY



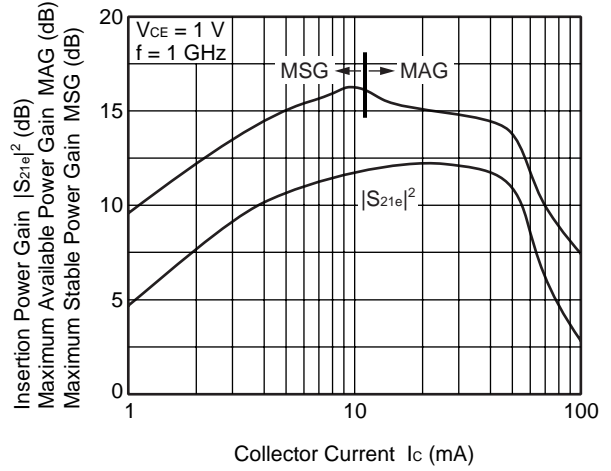
Q1

INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT

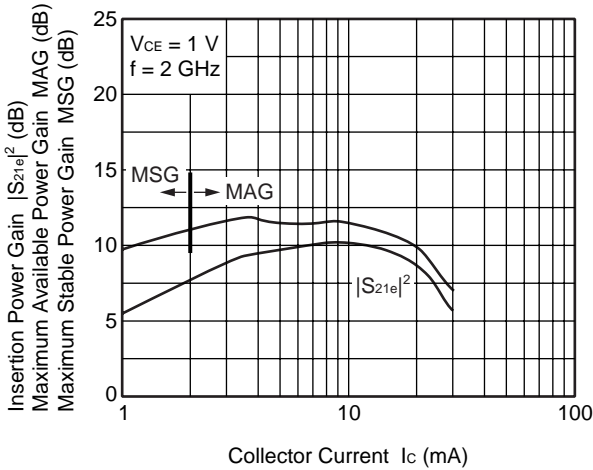


Q2

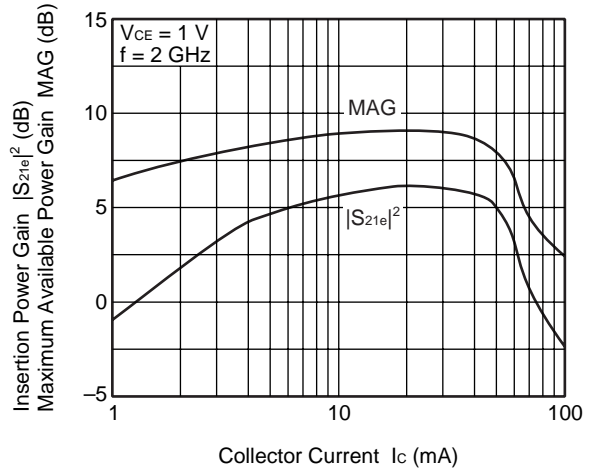
INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT



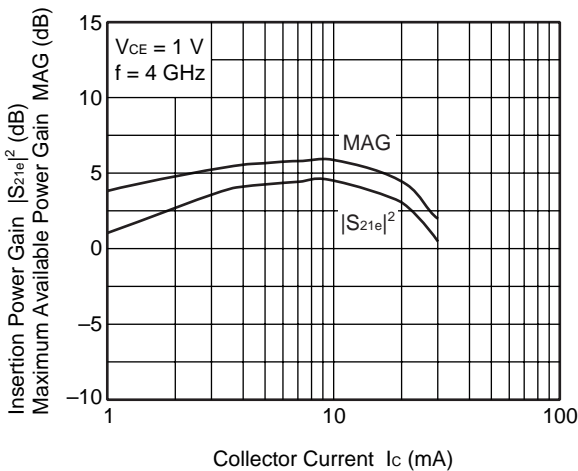
INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT



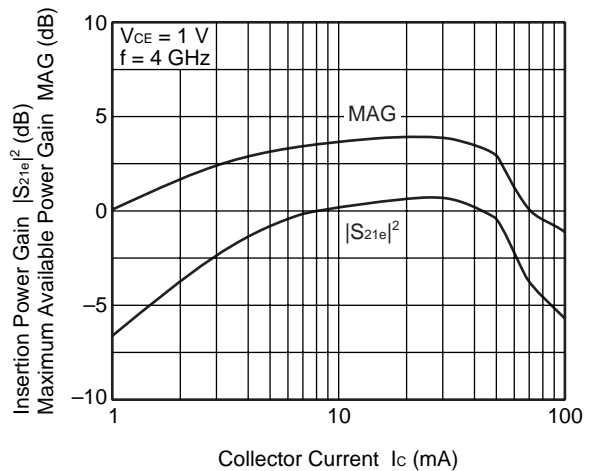
INSERTION POWER GAIN, MAG vs. COLLECTOR CURRENT



INSERTION POWER GAIN, MAG vs. COLLECTOR CURRENT

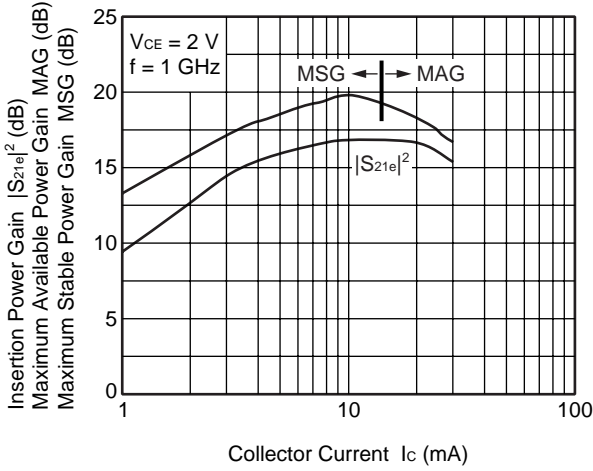


INSERTION POWER GAIN, MAG vs. COLLECTOR CURRENT



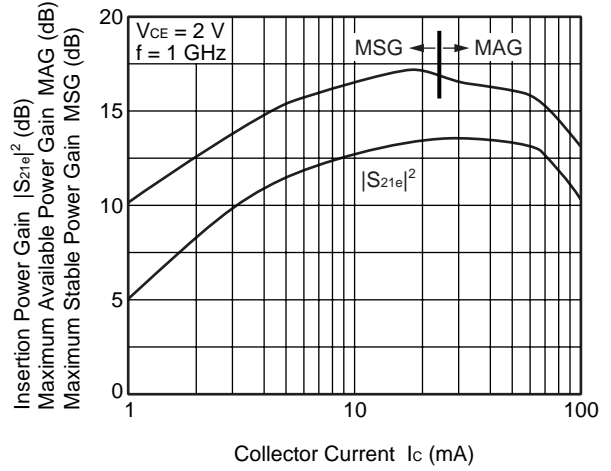
Q1

INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT

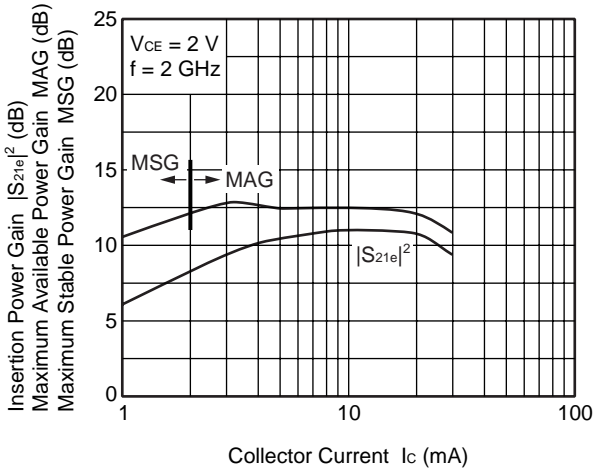


Q2

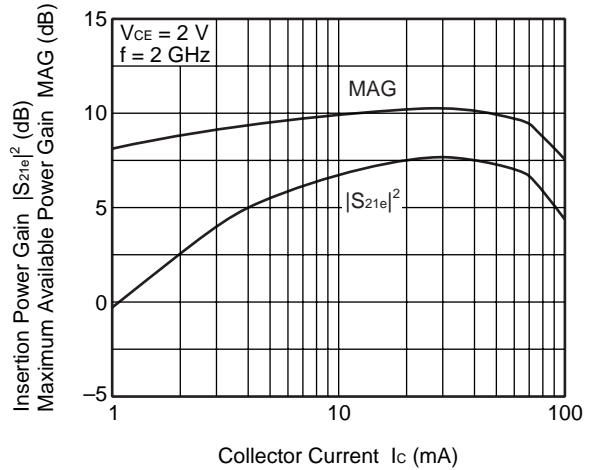
INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT



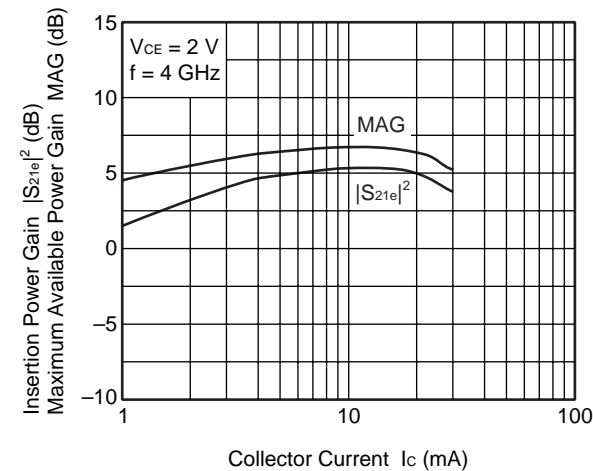
INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT



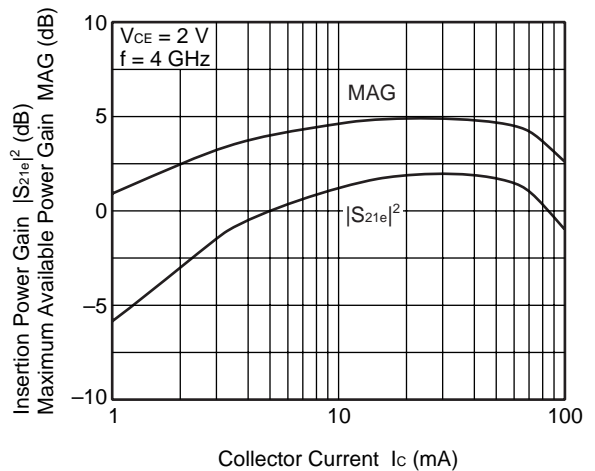
INSERTION POWER GAIN, MAG vs. COLLECTOR CURRENT



INSERTION POWER GAIN, MAG vs. COLLECTOR CURRENT

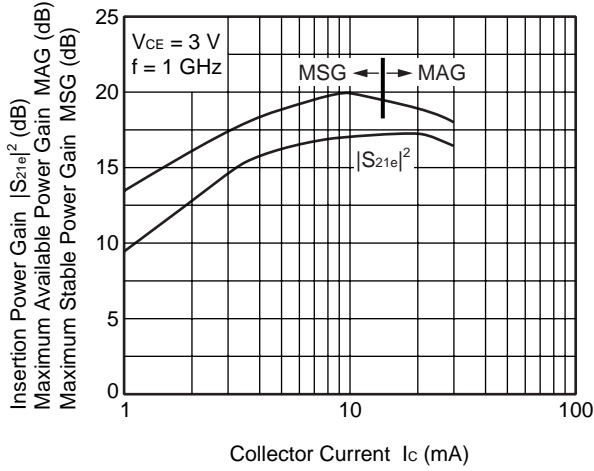


INSERTION POWER GAIN, MAG vs. COLLECTOR CURRENT

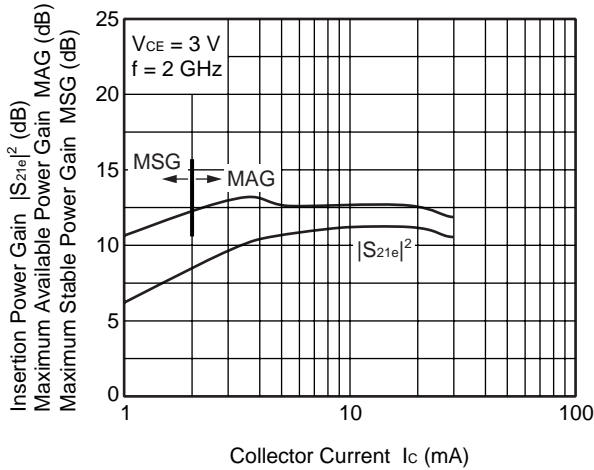


Q1

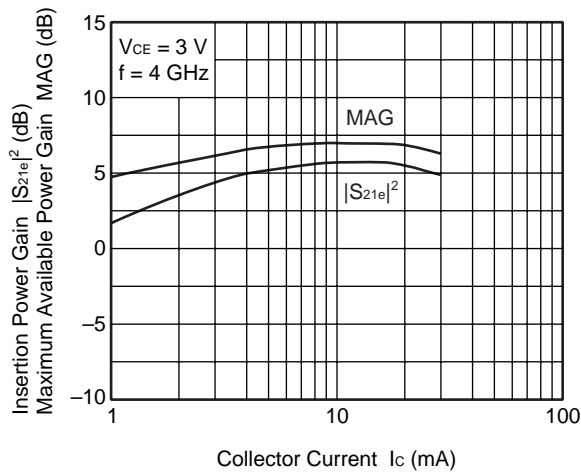
INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT



INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT

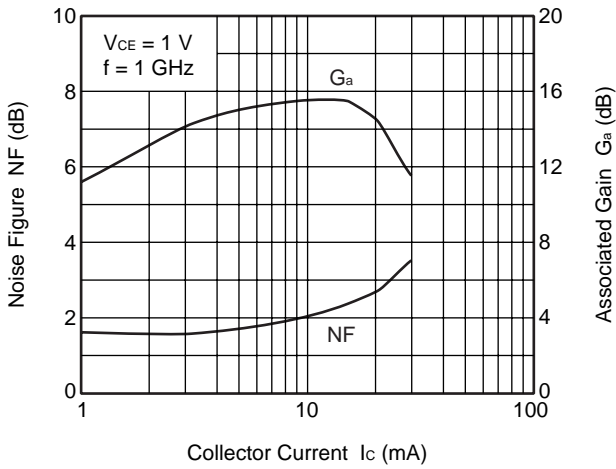


INSERTION POWER GAIN, MAG vs. COLLECTOR CURRENT



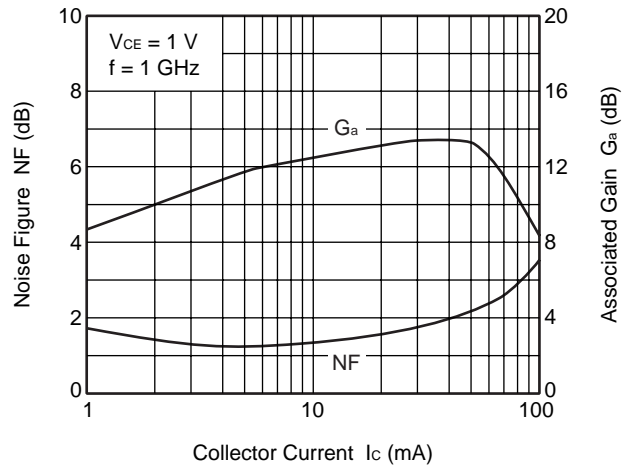
Q1

NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT

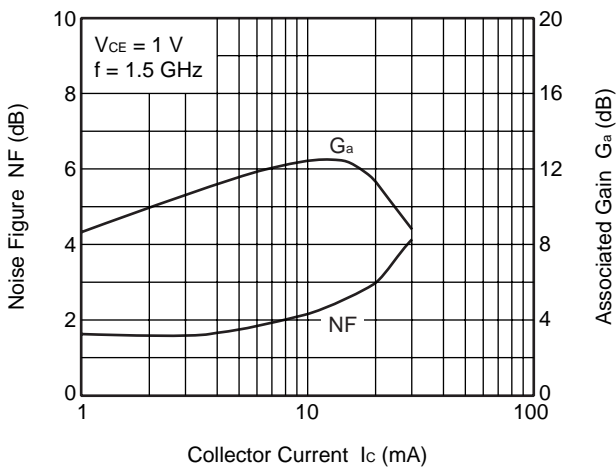


Q2

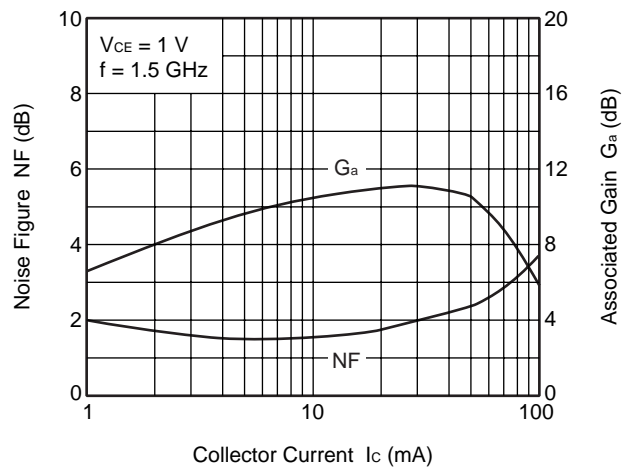
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



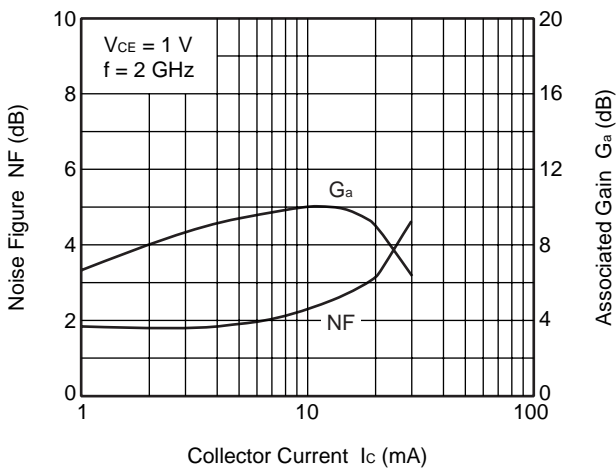
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



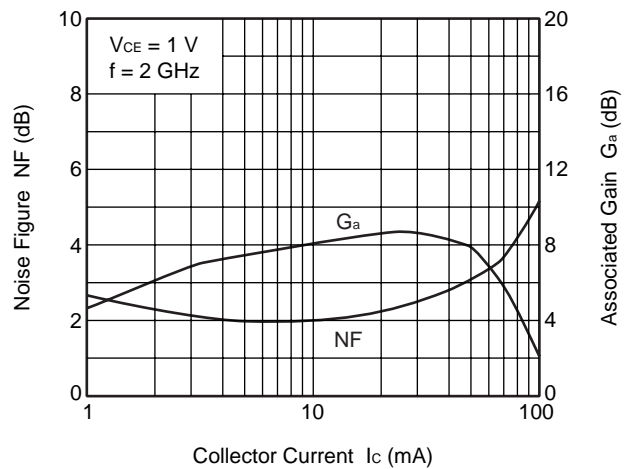
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT

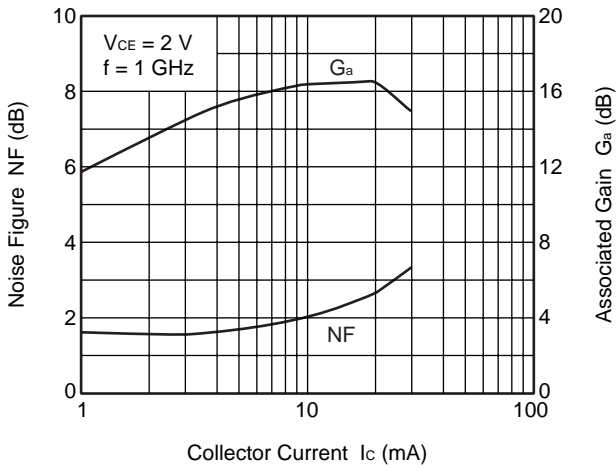


NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



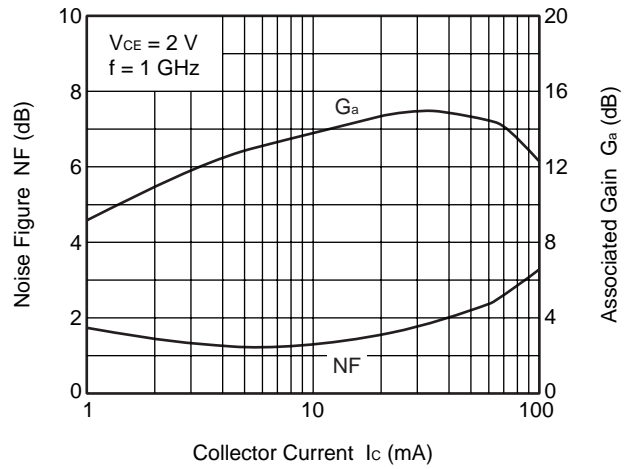
Q1

NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT

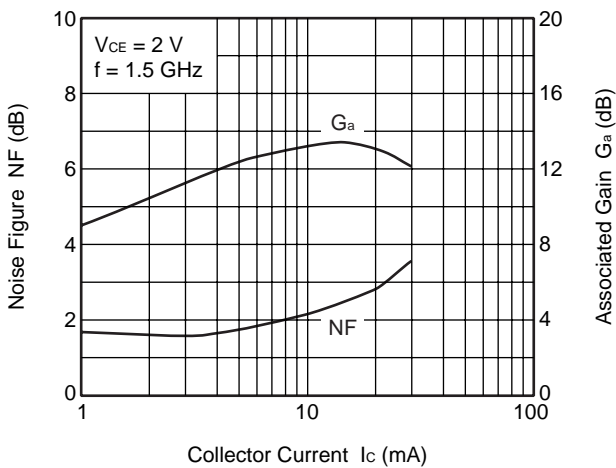


Q2

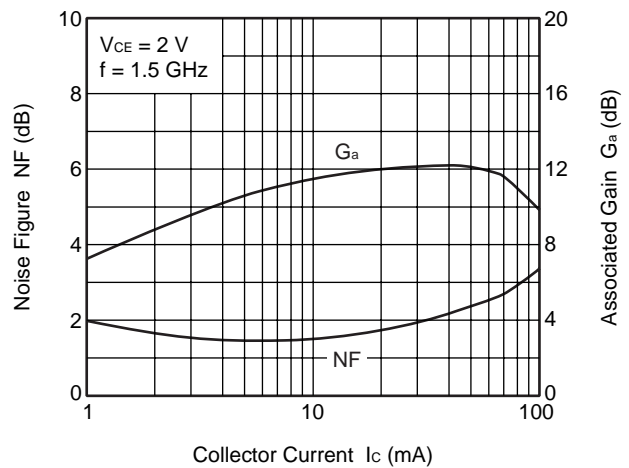
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



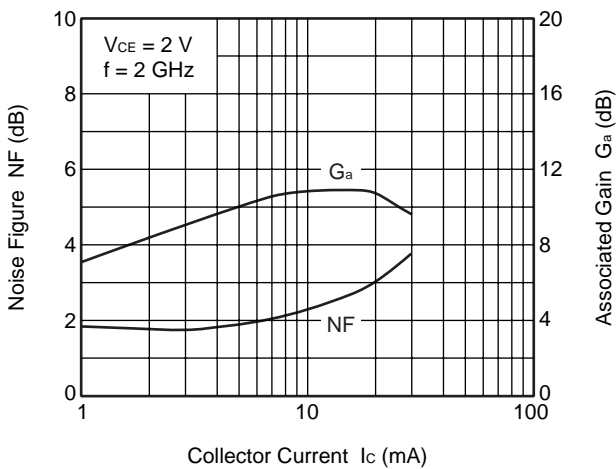
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



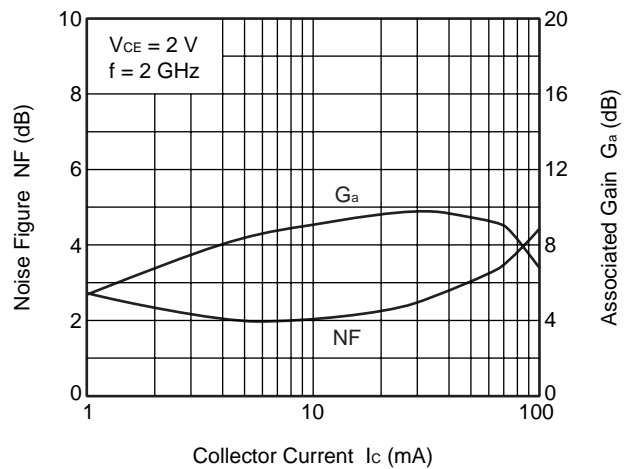
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT

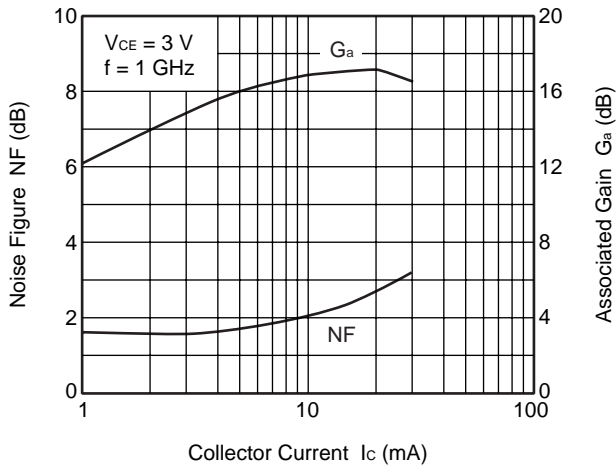


NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT

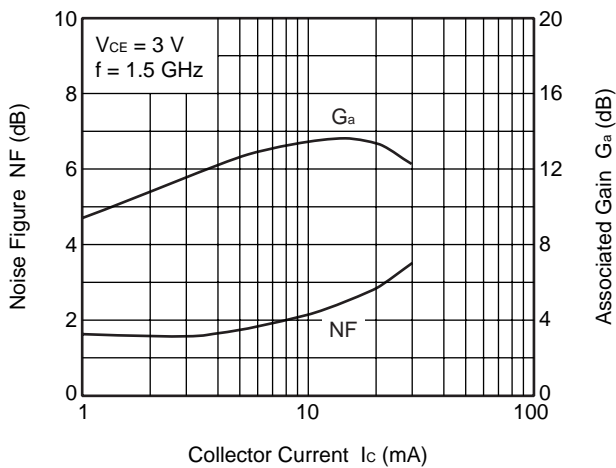


Q1

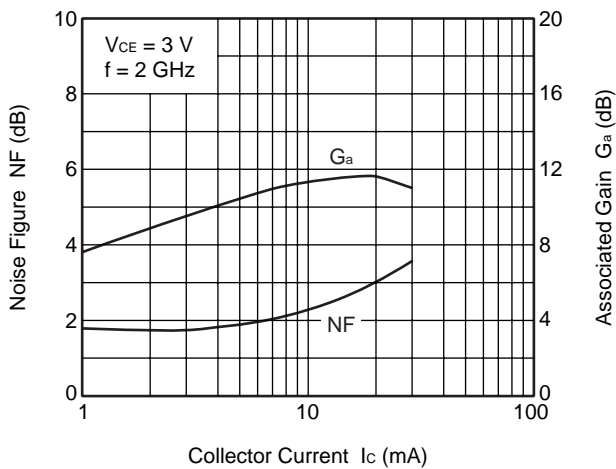
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



Remark The graphs indicate nominal characteristics.

S-PARAMETERS Q1

Note When $K \geq 1$, 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. $MSG = \left| \frac{S_{21}}{S_{12}} \right|$

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

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂		K	MAG/MSG (dB)	Note
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)			
0.1	0.952	-7.1	3.547	172.9	0.020	86.6	0.992	-3.7	0.040	22.55	
0.2	0.943	-14.4	3.539	167.2	0.040	80.9	0.989	-7.3	0.083	19.44	
0.3	0.931	-21.5	3.494	161.1	0.060	76.6	0.971	-10.6	0.123	17.67	
0.4	0.905	-28.3	3.407	154.8	0.079	72.0	0.951	-14.3	0.175	16.35	
0.5	0.880	-35.8	3.352	148.4	0.096	67.8	0.929	-17.9	0.212	15.41	
0.6	0.845	-43.0	3.274	142.1	0.112	63.4	0.900	-21.6	0.255	14.64	
0.7	0.809	-50.3	3.172	136.6	0.127	59.1	0.870	-25.0	0.293	13.97	
0.8	0.770	-57.2	3.067	130.7	0.140	55.3	0.837	-28.4	0.339	13.39	
0.9	0.731	-64.5	2.965	125.0	0.152	51.5	0.807	-31.9	0.375	12.92	
1.0	0.692	-71.4	2.864	119.5	0.161	48.1	0.775	-34.9	0.419	12.49	
1.1	0.658	-78.5	2.756	114.6	0.169	44.8	0.746	-37.8	0.454	12.11	
1.2	0.626	-85.5	2.640	110.0	0.177	42.1	0.717	-40.4	0.488	11.75	
1.3	0.596	-92.3	2.536	105.5	0.182	39.4	0.693	-42.8	0.522	11.44	
1.4	0.571	-98.7	2.420	101.1	0.186	36.9	0.669	-45.3	0.559	11.13	
1.5	0.549	-104.8	2.325	96.9	0.190	34.8	0.648	-47.3	0.595	10.87	
1.6	0.530	-110.8	2.237	93.2	0.193	32.8	0.628	-49.2	0.629	10.65	
1.7	0.513	-116.9	2.141	89.7	0.195	31.1	0.609	-50.9	0.666	10.41	
1.8	0.498	-122.2	2.059	86.1	0.196	29.5	0.592	-52.3	0.705	10.21	
1.9	0.487	-127.6	1.976	83.4	0.197	28.2	0.577	-53.6	0.738	10.00	
2.0	0.472	-132.0	1.907	80.2	0.198	27.0	0.562	-54.7	0.785	9.83	
2.1	0.468	-137.5	1.844	77.5	0.198	26.1	0.552	-56.3	0.806	9.68	
2.2	0.456	-141.5	1.769	74.8	0.198	25.3	0.538	-57.2	0.859	9.50	
2.3	0.455	-147.0	1.721	72.3	0.199	24.5	0.533	-58.3	0.870	9.37	
2.4	0.447	-150.7	1.663	69.8	0.200	23.9	0.518	-59.2	0.920	9.21	
2.5	0.445	-155.3	1.611	67.5	0.200	23.5	0.512	-60.4	0.944	9.07	
2.6	0.437	-158.8	1.570	65.5	0.200	22.7	0.505	-62.0	0.978	8.95	
2.7	0.437	-162.3	1.517	63.2	0.200	22.3	0.499	-62.7	1.010	8.17	
2.8	0.433	-166.1	1.469	61.3	0.199	22.1	0.491	-64.2	1.052	7.28	
2.9	0.426	-169.4	1.409	58.1	0.200	21.3	0.472	-65.2	1.130	6.28	
3.0	0.419	-173.8	1.381	55.7	0.200	21.3	0.465	-68.0	1.159	5.97	
4.0	0.436	149.3	1.136	34.9	0.208	23.7	0.424	-88.2	1.339	3.89	
5.0	0.503	118.2	0.905	16.8	0.232	24.5	0.397	-112.6	1.439	1.97	

V_{CE} = 1 V, I_c = 3 mA, Z_o = 50 Ω

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂		K	MAG/MSG (dB)
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		
0.1	0.853	-13.4	9.491	169.0	0.019	83.5	0.980	-7.6	0.070	26.93
0.2	0.839	-25.7	9.175	158.6	0.038	75.3	0.952	-14.8	0.151	23.88
0.3	0.791	-37.4	8.690	149.4	0.054	69.5	0.897	-21.0	0.223	22.06
0.4	0.735	-48.4	8.100	140.7	0.068	64.1	0.841	-27.0	0.288	20.74
0.5	0.673	-59.7	7.538	132.5	0.080	59.6	0.778	-32.1	0.354	19.76
0.6	0.617	-69.9	6.973	125.3	0.089	55.5	0.717	-36.6	0.421	18.95
0.7	0.565	-79.4	6.435	119.2	0.097	52.3	0.660	-40.3	0.484	18.22
0.8	0.516	-88.6	5.919	113.5	0.103	49.9	0.608	-43.7	0.548	17.58
0.9	0.475	-97.9	5.470	108.4	0.109	47.9	0.564	-46.8	0.603	17.02
1.0	0.440	-106.4	5.081	103.7	0.113	46.2	0.525	-49.7	0.660	16.52
1.1	0.417	-114.8	4.728	99.6	0.118	44.9	0.493	-52.1	0.705	16.04
1.2	0.397	-122.6	4.398	95.9	0.122	44.2	0.463	-54.3	0.752	15.59
1.3	0.384	-130.3	4.113	92.2	0.125	43.4	0.441	-56.2	0.792	15.17
1.4	0.371	-137.5	3.859	89.0	0.129	42.8	0.421	-58.2	0.831	14.77
1.5	0.364	-143.4	3.637	85.8	0.132	42.3	0.404	-59.7	0.868	14.40
1.6	0.357	-149.6	3.441	83.0	0.135	42.1	0.389	-61.0	0.903	14.07
1.7	0.355	-155.0	3.252	80.4	0.138	41.9	0.375	-62.3	0.935	13.72
1.8	0.352	-159.9	3.090	77.7	0.141	41.8	0.362	-63.2	0.967	13.40
1.9	0.352	-164.5	2.940	75.6	0.145	41.9	0.353	-64.2	0.993	13.08
2.0	0.345	-168.5	2.810	73.2	0.148	41.7	0.340	-64.8	1.030	11.73
2.1	0.355	-172.8	2.697	71.1	0.151	41.8	0.334	-66.0	1.040	11.30
2.2	0.349	-176.2	2.578	69.3	0.154	41.9	0.321	-66.3	1.079	10.52
2.3	0.360	-179.9	2.488	67.3	0.158	41.9	0.317	-67.1	1.079	10.26
2.4	0.357	-177.4	2.396	65.4	0.162	41.9	0.304	-68.2	1.106	9.72
2.5	0.362	-174.0	2.305	63.6	0.166	42.0	0.300	-69.1	1.118	9.35
2.6	0.359	-171.4	2.235	62.4	0.169	42.0	0.294	-70.9	1.136	8.97
2.7	0.367	-169.1	2.155	60.6	0.173	42.0	0.287	-70.9	1.144	8.64
2.8	0.366	-165.8	2.079	59.2	0.177	41.8	0.282	-73.1	1.167	8.23
2.9	0.359	-164.2	1.983	56.7	0.181	41.2	0.267	-74.4	1.212	7.62
3.0	0.358	-159.3	1.937	54.8	0.185	41.3	0.267	-77.6	1.215	7.39
4.0	0.403	-131.3	1.524	36.4	0.230	39.4	0.251	-102.6	1.228	5.34
5.0	0.486	-107.7	1.201	21.1	0.275	32.1	0.242	-133.9	1.232	3.50

V_{CE} = 1 V, I_c = 5 mA, Z_o = 50 Ω

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂		K	MAG/MSG (dB)
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		
0.1	0.783	-18.8	14.076	165.6	0.018	80.3	0.964	-10.8	0.110	28.87
0.2	0.747	-34.7	13.183	152.2	0.036	72.3	0.907	-20.3	0.206	25.70
0.3	0.673	-49.8	12.003	141.1	0.049	65.6	0.823	-27.8	0.305	23.94
0.4	0.607	-62.9	10.741	131.5	0.060	61.0	0.742	-34.4	0.390	22.55
0.5	0.537	-76.1	9.603	123.1	0.068	57.1	0.663	-39.4	0.478	21.49
0.6	0.481	-87.4	8.612	116.2	0.075	54.3	0.594	-43.5	0.559	20.61
0.7	0.437	-98.0	7.754	110.7	0.081	52.7	0.535	-46.7	0.630	19.83
0.8	0.398	-108.0	6.998	105.4	0.086	51.5	0.486	-49.5	0.700	19.11
0.9	0.372	-118.1	6.348	100.9	0.091	50.6	0.444	-52.1	0.759	18.45
1.0	0.351	-127.1	5.824	96.9	0.095	50.1	0.410	-54.6	0.812	17.85
1.1	0.338	-135.6	5.367	93.4	0.100	49.8	0.383	-56.7	0.856	17.31
1.2	0.332	-143.4	4.940	90.4	0.104	49.8	0.359	-58.8	0.896	16.76
1.3	0.326	-151.0	4.598	87.4	0.109	49.7	0.342	-60.4	0.931	16.27
1.4	0.325	-156.9	4.286	84.5	0.113	49.6	0.326	-62.2	0.962	15.79
1.5	0.322	-162.3	4.028	81.7	0.117	49.5	0.313	-63.7	0.990	15.36
1.6	0.324	-167.9	3.798	79.3	0.122	49.6	0.303	-64.9	1.013	14.25
1.7	0.327	-172.4	3.582	77.0	0.126	49.6	0.291	-66.2	1.036	13.37
1.8	0.326	-176.7	3.393	74.6	0.131	49.6	0.282	-67.0	1.060	12.65
1.9	0.330	-179.2	3.224	72.8	0.135	49.6	0.275	-68.1	1.075	12.11
2.0	0.326	-176.0	3.078	70.5	0.140	49.6	0.264	-68.5	1.098	11.53
2.1	0.338	-172.5	2.946	68.7	0.144	49.6	0.260	-69.7	1.101	11.17
2.2	0.336	-170.4	2.817	67.1	0.148	49.7	0.248	-70.0	1.125	10.63
2.3	0.347	-167.5	2.713	65.3	0.153	49.5	0.245	-70.8	1.120	10.37
2.4	0.345	-165.2	2.609	63.6	0.159	49.4	0.234	-72.1	1.138	9.91
2.5	0.352	-162.6	2.509	62.1	0.163	49.3	0.231	-72.9	1.142	9.58
2.6	0.351	-160.3	2.432	60.8	0.168	49.3	0.224	-75.0	1.150	9.25
2.7	0.358	-158.5	2.340	59.2	0.173	49.0	0.219	-74.9	1.156	8.92
2.8	0.359	-155.9	2.260	57.8	0.178	48.6	0.215	-77.6	1.168	8.56
2.9	0.352	-154.4	2.158	55.6	0.183	47.8	0.202	-79.5	1.199	8.02
3.0	0.353	-150.0	2.104	53.8	0.188	47.8	0.205	-83.1	1.197	7.80
4.0	0.402	-125.3	1.631	36.5	0.239	43.3	0.203	-111.7	1.191	5.69
5.0	0.486	-104.8	1.283	22.1	0.288	33.9	0.212	-147.2	1.187	3.87

V_{CE} = 1 V, I_c = 7 mA, Z_o = 50 Ω

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂		K	MAG/MSG (dB)
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		
0.1	0.731	-22.4	17.662	162.6	0.018	78.1	0.946	-13.2	0.161	29.87
0.2	0.666	-42.3	16.079	147.1	0.033	70.1	0.866	-24.3	0.258	26.86
0.3	0.585	-59.7	14.117	135.1	0.045	63.9	0.761	-32.4	0.375	24.99
0.4	0.515	-74.0	12.267	125.3	0.054	59.6	0.666	-38.8	0.480	23.58
0.5	0.451	-88.1	10.693	117.2	0.061	57.0	0.584	-43.3	0.575	22.45
0.6	0.402	-100.5	9.403	110.6	0.067	55.3	0.515	-46.9	0.662	21.49
0.7	0.369	-111.7	8.357	105.7	0.072	54.5	0.460	-49.5	0.733	20.63
0.8	0.341	-122.4	7.466	100.9	0.077	54.0	0.414	-52.0	0.801	19.85
0.9	0.326	-132.1	6.722	96.9	0.082	53.8	0.378	-54.2	0.857	19.14
1.0	0.313	-141.7	6.135	93.3	0.087	54.0	0.348	-56.6	0.904	18.48
1.1	0.309	-149.3	5.624	90.1	0.092	53.9	0.325	-58.5	0.941	17.86
1.2	0.309	-156.8	5.163	87.3	0.097	54.2	0.304	-60.5	0.976	17.26
1.3	0.309	-163.3	4.802	84.6	0.102	54.2	0.290	-62.1	1.003	16.41
1.4	0.311	-168.8	4.464	82.0	0.107	54.2	0.278	-63.8	1.027	15.21
1.5	0.312	-173.7	4.191	79.4	0.112	54.3	0.267	-65.3	1.047	14.41
1.6	0.316	-178.2	3.945	77.1	0.117	54.2	0.259	-66.6	1.062	13.76
1.7	0.320	-178.1	3.712	75.0	0.122	54.2	0.249	-67.9	1.081	13.10
1.8	0.320	-174.4	3.516	72.8	0.127	54.2	0.241	-68.7	1.098	12.52
1.9	0.327	-170.6	3.333	71.1	0.132	54.1	0.236	-69.8	1.108	12.02
2.0	0.324	-168.0	3.181	69.1	0.137	53.9	0.227	-70.2	1.126	11.50
2.1	0.338	-165.7	3.047	67.3	0.142	53.9	0.224	-71.4	1.121	11.20
2.2	0.334	-162.9	2.914	65.8	0.147	53.8	0.212	-71.5	1.141	10.69
2.3	0.348	-160.7	2.803	64.2	0.153	53.6	0.210	-72.5	1.131	10.44
2.4	0.345	-159.0	2.694	62.5	0.158	53.3	0.199	-73.9	1.146	9.99
2.5	0.353	-156.7	2.591	61.0	0.163	53.0	0.197	-74.8	1.145	9.69
2.6	0.353	-154.3	2.509	59.9	0.169	52.8	0.192	-77.4	1.152	9.36
2.7	0.359	-153.2	2.414	58.3	0.174	52.4	0.186	-77.2	1.155	9.03
2.8	0.361	-150.8	2.330	57.2	0.179	51.8	0.183	-80.3	1.164	8.69
2.9	0.354	-149.1	2.223	55.0	0.185	50.9	0.171	-82.7	1.192	8.15
3.0	0.355	-145.1	2.167	53.2	0.191	50.7	0.175	-86.6	1.187	7.94
4.0	0.404	-122.9	1.674	36.3	0.244	45.0	0.183	-117.4	1.175	5.83
5.0	0.490	-103.1	1.316	22.5	0.294	34.8	0.204	-154.4	1.167	4.04

V_{CE} = 1 V, I_c = 10 mA, Z_o = 50 Ω

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂		K	MAG/MSG (dB)
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		
0.1	0.648	-29.0	21.750	159.0	0.017	76.3	0.924	-16.1	0.191	31.18
0.2	0.574	-52.1	18.960	141.4	0.030	67.2	0.810	-28.7	0.332	27.97
0.3	0.489	-71.7	15.944	128.7	0.040	62.5	0.686	-36.9	0.469	26.00
0.4	0.426	-88.0	13.412	119.2	0.048	59.7	0.584	-42.6	0.583	24.48
0.5	0.373	-103.3	11.427	111.5	0.054	58.2	0.504	-46.3	0.686	23.25
0.6	0.340	-116.3	9.904	105.5	0.060	57.8	0.440	-49.0	0.772	22.21
0.7	0.319	-127.6	8.699	101.1	0.065	57.4	0.391	-51.0	0.841	21.26
0.8	0.302	-138.3	7.716	96.8	0.071	57.6	0.351	-52.9	0.902	20.39
0.9	0.297	-147.7	6.924	93.2	0.076	57.8	0.320	-54.9	0.949	19.62
1.0	0.294	-156.2	6.289	90.0	0.081	58.1	0.294	-57.0	0.987	18.90
1.1	0.298	-163.2	5.752	87.1	0.086	58.3	0.275	-58.8	1.014	17.50
1.2	0.302	-168.7	5.272	84.8	0.092	58.6	0.258	-60.8	1.041	16.34
1.3	0.306	-175.1	4.878	82.1	0.097	58.6	0.247	-62.4	1.061	15.48
1.4	0.310	-179.3	4.535	79.7	0.103	58.6	0.238	-64.3	1.078	14.73
1.5	0.313	-176.2	4.245	77.4	0.109	58.5	0.229	-65.8	1.093	14.07
1.6	0.320	-172.7	4.002	75.3	0.114	58.4	0.223	-67.1	1.100	13.52
1.7	0.324	-169.6	3.760	73.3	0.120	58.4	0.215	-68.4	1.115	12.92
1.8	0.327	-166.6	3.562	71.2	0.125	58.1	0.209	-69.4	1.124	12.41
1.9	0.333	-163.7	3.377	69.6	0.131	57.9	0.205	-70.6	1.131	11.93
2.0	0.332	-161.1	3.223	67.6	0.136	57.7	0.197	-70.8	1.140	11.47
2.1	0.343	-158.8	3.086	66.0	0.142	57.4	0.195	-72.2	1.136	11.14
2.2	0.340	-156.9	2.947	64.5	0.147	57.1	0.184	-72.3	1.153	10.65
2.3	0.356	-155.6	2.839	62.9	0.153	56.8	0.183	-73.4	1.138	10.43
2.4	0.353	-153.7	2.728	61.4	0.159	56.3	0.173	-75.0	1.150	10.00
2.5	0.360	-151.8	2.621	60.0	0.164	56.0	0.172	-76.1	1.150	9.69
2.6	0.360	-149.9	2.540	58.9	0.170	55.6	0.166	-79.0	1.154	9.37
2.7	0.367	-148.7	2.445	57.5	0.175	55.0	0.161	-79.1	1.154	9.06
2.8	0.368	-146.5	2.360	56.3	0.181	54.3	0.159	-82.4	1.161	8.73
2.9	0.360	-145.3	2.250	54.3	0.187	53.3	0.149	-85.4	1.186	8.20
3.0	0.361	-141.2	2.191	52.6	0.193	53.0	0.154	-89.3	1.182	7.96
4.0	0.411	-120.5	1.687	35.9	0.248	46.5	0.169	-122.4	1.187	5.85
5.0	0.496	-101.9	1.322	22.3	0.298	35.7	0.200	-159.8	1.159	4.05

V_{CE} = 1 V, I_c = 20 mA, Z_o = 50 Ω

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂		K	MAG/MSG (dB)
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		
0.1	0.465	-48.9	26.851	149.0	0.016	74.9	0.815	-23.4	0.353	32.23
0.2	0.402	-84.3	20.632	128.1	0.026	63.2	0.639	-37.0	0.556	28.96
0.3	0.351	-109.5	15.878	115.8	0.033	60.8	0.504	-42.6	0.733	26.80
0.4	0.330	-127.2	12.668	107.4	0.040	61.1	0.415	-45.5	0.856	25.04
0.5	0.320	-142.0	10.429	101.3	0.045	61.7	0.354	-46.6	0.956	23.63
0.6	0.313	-152.8	8.867	96.4	0.051	62.6	0.309	-47.3	1.030	21.32
0.7	0.315	-161.6	7.698	92.8	0.057	63.4	0.276	-47.9	1.079	19.58
0.8	0.318	-169.6	6.765	89.3	0.063	63.8	0.249	-48.8	1.123	18.17
0.9	0.324	-175.5	6.024	86.4	0.069	64.1	0.230	-50.1	1.158	17.01
1.0	0.330	179.0	5.444	83.8	0.075	64.4	0.213	-52.0	1.182	16.04
1.1	0.339	174.7	4.967	81.3	0.081	64.5	0.202	-53.8	1.194	15.22
1.2	0.348	171.3	4.529	79.1	0.087	64.5	0.192	-56.2	1.211	14.38
1.3	0.356	167.3	4.195	76.9	0.093	64.5	0.186	-58.0	1.217	13.72
1.4	0.361	164.9	3.897	74.8	0.099	64.3	0.181	-60.2	1.226	13.07
1.5	0.367	161.8	3.642	72.6	0.105	64.1	0.177	-62.0	1.233	12.49
1.6	0.373	159.5	3.426	70.6	0.111	63.7	0.174	-63.6	1.237	11.96
1.7	0.376	157.3	3.218	68.8	0.117	63.4	0.171	-65.3	1.243	11.41
1.8	0.380	155.1	3.046	66.8	0.123	63.0	0.167	-66.4	1.247	10.93
1.9	0.385	153.2	2.890	65.3	0.129	62.7	0.166	-68.1	1.247	10.49
2.0	0.385	151.0	2.757	63.5	0.135	62.2	0.160	-68.5	1.255	10.06
2.1	0.398	149.9	2.640	61.9	0.141	61.7	0.161	-70.4	1.240	9.76
2.2	0.395	148.0	2.528	60.4	0.147	61.4	0.152	-70.7	1.253	9.33
2.3	0.406	147.1	2.432	59.0	0.153	60.8	0.152	-72.1	1.237	9.07
2.4	0.404	145.6	2.339	57.5	0.159	60.3	0.144	-74.4	1.246	8.68
2.5	0.410	144.5	2.250	56.2	0.165	59.7	0.145	-75.8	1.240	8.38
2.6	0.411	142.5	2.179	55.1	0.171	59.3	0.141	-79.3	1.242	8.08
2.7	0.416	141.9	2.100	53.8	0.177	58.6	0.136	-79.2	1.239	7.79
2.8	0.419	139.9	2.025	52.6	0.183	57.8	0.136	-83.7	1.244	7.47
2.9	0.408	138.8	1.931	50.7	0.189	56.7	0.127	-87.2	1.276	6.93
3.0	0.411	135.4	1.881	49.0	0.196	56.3	0.133	-91.9	1.268	6.72
4.0	0.459	116.0	1.452	32.2	0.253	48.5	0.160	-127.9	1.234	4.67
5.0	0.536	99.1	1.141	19.5	0.304	36.9	0.204	-164.6	1.216	2.94

V_{CE} = 2 V, I_c = 1 mA, Z_o = 50 Ω

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂		K	MAG/MSG (dB)
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		
0.1	0.965	-7.3	3.547	173.5	0.018	87.6	0.993	-3.2	0.014	22.98
0.2	0.946	-13.5	3.554	168.1	0.035	82.3	0.992	-6.3	0.066	20.12
0.3	0.930	-19.9	3.510	162.4	0.051	77.9	0.976	-9.0	0.121	18.37
0.4	0.911	-26.3	3.439	156.4	0.068	73.6	0.960	-12.3	0.166	17.06
0.5	0.887	-33.4	3.397	150.3	0.083	69.7	0.941	-15.4	0.203	16.13
0.6	0.855	-40.2	3.321	144.3	0.097	65.6	0.917	-18.7	0.244	15.35
0.7	0.821	-46.7	3.230	139.1	0.110	61.5	0.890	-21.8	0.285	14.67
0.8	0.786	-53.4	3.137	133.3	0.122	57.8	0.860	-24.8	0.330	14.10
0.9	0.746	-60.4	3.039	127.8	0.132	54.1	0.835	-27.8	0.366	13.61
1.0	0.708	-67.1	2.949	122.5	0.141	50.9	0.805	-30.7	0.406	13.19
1.1	0.672	-73.9	2.848	117.7	0.149	47.8	0.779	-33.2	0.442	12.82
1.2	0.642	-80.6	2.738	113.1	0.156	45.1	0.753	-35.5	0.475	12.45
1.3	0.611	-87.1	2.639	108.8	0.161	42.5	0.731	-37.8	0.509	12.14
1.4	0.585	-93.2	2.524	104.4	0.166	40.1	0.708	-40.0	0.546	11.83
1.5	0.562	-99.3	2.430	100.2	0.169	38.0	0.689	-41.9	0.579	11.57
1.6	0.540	-105.3	2.344	96.5	0.172	36.0	0.669	-43.7	0.615	11.35
1.7	0.523	-111.0	2.250	92.9	0.174	34.3	0.650	-45.3	0.651	11.11
1.8	0.506	-116.6	2.161	89.4	0.175	32.8	0.634	-46.6	0.691	10.91
1.9	0.493	-121.8	2.076	86.6	0.177	31.5	0.620	-47.9	0.724	10.69
2.0	0.476	-126.5	2.007	83.4	0.178	30.4	0.606	-49.0	0.770	10.52
2.1	0.468	-132.1	1.939	80.7	0.178	29.5	0.596	-50.4	0.793	10.36
2.2	0.455	-136.0	1.864	78.1	0.178	28.7	0.582	-51.1	0.849	10.19
2.3	0.452	-141.5	1.811	75.5	0.179	28.1	0.579	-52.0	0.858	10.04
2.4	0.446	-145.2	1.753	73.1	0.180	27.5	0.564	-53.0	0.902	9.89
2.5	0.442	-150.1	1.699	70.7	0.180	27.2	0.558	-54.0	0.927	9.74
2.6	0.432	-153.3	1.655	69.0	0.181	26.6	0.551	-55.4	0.963	9.62
2.7	0.432	-157.3	1.598	66.7	0.181	26.2	0.545	-56.1	0.994	9.46
2.8	0.425	-161.2	1.548	64.7	0.181	25.9	0.536	-57.5	1.039	8.12
2.9	0.419	-164.3	1.485	61.5	0.181	25.2	0.518	-58.5	1.117	7.05
3.0	0.410	-169.1	1.455	59.1	0.182	25.3	0.509	-61.0	1.150	6.68
4.0	0.421	152.7	1.199	38.3	0.193	28.8	0.466	-79.4	1.313	4.58
5.0	0.485	119.8	0.957	19.6	0.221	29.8	0.430	-101.8	1.397	2.61

V_{CE} = 2 V, I_c = 3 mA, Z_o = 50 Ω

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂		K	MAG/MSG (dB)
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		
0.1	0.875	-11.4	9.429	169.8	0.018	86.2	0.984	-6.3	0.050	27.29
0.2	0.845	-23.2	9.182	160.1	0.032	77.3	0.961	-12.4	0.143	24.53
0.3	0.804	-34.0	8.752	151.4	0.046	71.7	0.914	-17.7	0.212	22.80
0.4	0.751	-44.0	8.224	143.1	0.059	66.4	0.864	-22.7	0.286	21.43
0.5	0.693	-54.3	7.717	135.3	0.070	62.2	0.811	-27.2	0.346	20.45
0.6	0.636	-63.9	7.192	128.2	0.078	58.4	0.756	-31.1	0.412	19.63
0.7	0.585	-72.7	6.672	122.2	0.086	55.1	0.704	-34.4	0.473	18.91
0.8	0.531	-81.2	6.180	116.4	0.092	52.7	0.656	-37.3	0.539	18.27
0.9	0.490	-90.1	5.735	111.2	0.097	50.6	0.616	-40.0	0.590	17.70
1.0	0.449	-98.2	5.358	106.5	0.102	49.0	0.576	-42.4	0.647	17.20
1.1	0.422	-106.3	5.003	102.4	0.106	47.8	0.545	-44.4	0.692	16.74
1.2	0.398	-114.0	4.659	98.7	0.110	46.9	0.516	-46.2	0.739	16.27
1.3	0.380	-121.6	4.379	95.1	0.114	46.1	0.495	-47.8	0.776	15.86
1.4	0.365	-128.6	4.100	91.7	0.117	45.5	0.475	-49.5	0.816	15.44
1.5	0.353	-135.1	3.879	88.5	0.120	45.1	0.457	-50.8	0.852	15.09
1.6	0.345	-141.3	3.676	85.6	0.123	44.8	0.442	-51.9	0.887	14.75
1.7	0.339	-147.0	3.478	83.0	0.126	44.6	0.428	-53.0	0.920	14.40
1.8	0.333	-152.0	3.303	80.3	0.129	44.5	0.417	-53.8	0.953	14.08
1.9	0.331	-157.7	3.144	78.2	0.132	44.5	0.407	-54.6	0.980	13.76
2.0	0.325	-161.6	3.010	75.7	0.135	44.4	0.395	-55.1	1.012	12.79
2.1	0.332	-166.5	2.886	73.7	0.138	44.5	0.388	-56.2	1.025	12.23
2.2	0.324	-169.5	2.761	71.7	0.142	44.6	0.376	-56.4	1.062	11.38
2.3	0.334	-173.8	2.663	69.8	0.145	44.7	0.373	-57.0	1.062	11.12
2.4	0.330	-176.8	2.564	67.9	0.149	44.7	0.361	-57.7	1.090	10.53
2.5	0.336	179.5	2.468	66.2	0.153	44.9	0.357	-58.5	1.098	10.18
2.6	0.332	176.4	2.394	64.8	0.156	44.9	0.349	-59.8	1.118	9.78
2.7	0.340	174.1	2.306	63.0	0.160	44.9	0.344	-59.8	1.126	9.44
2.8	0.338	170.6	2.227	61.6	0.163	44.9	0.339	-61.4	1.148	9.02
2.9	0.332	168.5	2.123	59.0	0.167	44.4	0.323	-62.4	1.194	8.38
3.0	0.329	163.7	2.071	57.1	0.171	44.4	0.321	-65.2	1.199	8.13
4.0	0.371	133.9	1.630	39.0	0.215	43.1	0.293	-86.6	1.210	6.03
5.0	0.459	109.6	1.290	23.4	0.262	35.9	0.264	-114.5	1.202	4.20

V_{CE} = 2 V, I_c = 5 mA, Z_o = 50 Ω

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂		K	MAG/MSG (dB)
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		
0.1	0.812	-16.7	14.092	166.6	0.016	84.9	0.970	-8.9	0.058	29.48
0.2	0.760	-31.0	13.350	154.1	0.030	73.8	0.924	-17.1	0.206	26.44
0.3	0.690	-44.5	12.274	143.6	0.042	68.2	0.851	-23.4	0.299	24.62
0.4	0.623	-56.5	11.100	134.3	0.052	63.6	0.779	-29.0	0.385	23.27
0.5	0.554	-68.7	10.037	125.9	0.060	59.9	0.708	-33.3	0.468	22.23
0.6	0.494	-79.0	9.066	119.0	0.067	57.2	0.643	-36.8	0.551	21.34
0.7	0.445	-89.0	8.205	113.4	0.072	55.5	0.588	-39.5	0.618	20.54
0.8	0.401	-98.6	7.428	108.2	0.078	54.2	0.539	-41.7	0.688	19.81
0.9	0.370	-108.4	6.770	103.5	0.082	53.2	0.500	-43.8	0.744	19.16
1.0	0.342	-117.2	6.233	99.5	0.087	52.8	0.466	-45.7	0.797	18.57
1.1	0.324	-125.9	5.760	95.8	0.091	52.3	0.439	-47.3	0.842	18.03
1.2	0.316	-133.7	5.318	92.9	0.095	52.3	0.415	-48.9	0.879	17.47
1.3	0.305	-141.5	4.958	89.7	0.099	52.1	0.397	-50.1	0.914	16.99
1.4	0.299	-148.1	4.628	86.8	0.103	52.0	0.382	-51.5	0.946	16.51
1.5	0.296	-154.5	4.343	84.1	0.107	52.0	0.369	-52.6	0.974	16.06
1.6	0.296	-160.2	4.107	81.6	0.112	52.1	0.357	-53.6	0.995	15.66
1.7	0.294	-165.2	3.873	79.3	0.116	52.0	0.346	-54.5	1.020	14.38
1.8	0.295	-169.9	3.673	76.9	0.120	52.1	0.337	-55.1	1.041	13.63
1.9	0.297	-174.4	3.484	75.1	0.124	52.1	0.330	-55.9	1.059	13.00
2.0	0.291	-178.1	3.328	72.9	0.128	52.1	0.320	-56.2	1.081	12.39
2.1	0.304	177.7	3.185	71.1	0.132	52.2	0.315	-57.2	1.085	12.04
2.2	0.301	175.1	3.050	69.4	0.137	52.2	0.304	-57.1	1.106	11.50
2.3	0.314	172.1	2.938	67.7	0.141	52.2	0.302	-57.8	1.100	11.25
2.4	0.310	170.1	2.825	66.0	0.146	52.0	0.291	-58.5	1.118	10.77
2.5	0.319	167.1	2.717	64.5	0.151	52.0	0.288	-59.3	1.119	10.46
2.6	0.316	164.4	2.630	63.2	0.155	52.0	0.281	-60.7	1.132	10.08
2.7	0.324	162.5	2.533	61.7	0.160	51.7	0.277	-60.4	1.135	9.76
2.8	0.324	159.5	2.442	60.4	0.164	51.4	0.271	-62.3	1.149	9.38
2.9	0.317	158.0	2.333	58.0	0.169	50.6	0.257	-63.6	1.182	8.81
3.0	0.316	153.6	2.272	56.2	0.175	50.6	0.257	-66.7	1.181	8.57
4.0	0.366	127.8	1.762	39.2	0.225	46.8	0.239	-91.2	1.172	6.43
5.0	0.456	106.2	1.391	24.5	0.274	37.5	0.219	-123.8	1.161	4.62

V_{CE} = 2 V, I_c = 7 mA, Z_o = 50 Ω

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂		K	MAG/MSG (dB)
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		
0.1	0.725	-19.1	17.802	163.8	0.015	80.7	0.958	-11.0	0.153	30.60
0.2	0.685	-37.4	16.382	149.5	0.029	72.5	0.890	-20.4	0.247	27.59
0.3	0.607	-53.1	14.584	138.0	0.039	66.6	0.798	-27.3	0.361	25.74
0.4	0.533	-66.2	12.825	128.3	0.048	62.2	0.712	-32.7	0.469	24.30
0.5	0.464	-79.3	11.315	120.1	0.054	59.8	0.635	-36.4	0.562	23.20
0.6	0.410	-90.2	10.021	113.5	0.060	58.2	0.569	-39.2	0.647	22.23
0.7	0.370	-101.1	8.952	108.4	0.065	56.9	0.517	-41.4	0.716	21.36
0.8	0.333	-111.3	8.035	103.5	0.070	56.7	0.472	-43.1	0.784	20.59
0.9	0.310	-121.5	7.261	99.4	0.075	56.3	0.436	-44.8	0.839	19.87
1.0	0.292	-130.5	6.641	95.7	0.079	56.3	0.405	-46.4	0.886	19.22
1.1	0.285	-139.2	6.104	92.5	0.084	56.3	0.382	-47.8	0.922	18.61
1.2	0.279	-146.9	5.613	89.7	0.089	56.3	0.362	-49.3	0.956	18.01
1.3	0.277	-154.8	5.219	86.9	0.094	56.4	0.348	-50.4	0.981	17.47
1.4	0.277	-160.9	4.862	84.2	0.098	56.4	0.335	-51.8	1.005	16.50
1.5	0.277	-166.2	4.553	81.8	0.103	56.3	0.324	-52.8	1.026	15.46
1.6	0.279	-171.3	4.297	79.4	0.108	56.5	0.315	-53.8	1.042	14.76
1.7	0.282	-175.9	4.045	77.3	0.112	56.4	0.305	-54.7	1.059	14.08
1.8	0.284	-179.7	3.836	75.1	0.117	56.4	0.298	-55.3	1.075	13.50
1.9	0.288	-176.4	3.635	73.4	0.122	56.4	0.292	-56.0	1.086	12.96
2.0	0.286	172.6	3.469	71.3	0.127	56.2	0.283	-56.2	1.102	12.44
2.1	0.297	169.8	3.321	69.6	0.131	56.1	0.280	-57.3	1.101	12.09
2.2	0.294	166.9	3.171	68.0	0.136	56.1	0.270	-57.0	1.121	11.56
2.3	0.307	164.9	3.059	66.4	0.141	55.9	0.268	-57.7	1.110	11.34
2.4	0.306	162.7	2.941	64.8	0.146	55.7	0.257	-58.4	1.123	10.89
2.5	0.313	160.6	2.825	63.3	0.151	55.5	0.255	-59.3	1.124	10.57
2.6	0.313	157.8	2.737	62.1	0.156	55.3	0.248	-60.8	1.131	10.24
2.7	0.318	156.6	2.635	60.6	0.161	54.9	0.244	-60.6	1.133	9.91
2.8	0.319	153.8	2.536	59.4	0.166	54.4	0.239	-62.8	1.146	9.52
2.9	0.312	152.3	2.423	57.2	0.172	53.6	0.226	-64.1	1.173	8.98
3.0	0.315	148.1	2.362	55.5	0.177	53.5	0.227	-67.5	1.167	8.77
4.0	0.367	124.5	1.825	39.0	0.230	48.3	0.214	-94.0	1.152	6.64
5.0	0.455	104.3	1.438	24.9	0.280	38.3	0.202	-129.6	1.143	4.81

V_{CE} = 2 V, I_c = 10 mA, Z_o = 50 Ω

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂		K	MAG/MSG (dB)
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		
0.1	0.670	-23.0	22.008	160.6	0.014	77.1	0.939	-13.3	0.218	31.83
0.2	0.595	-45.4	19.593	144.3	0.027	71.1	0.845	-23.9	0.311	28.68
0.3	0.510	-62.4	16.792	132.0	0.035	64.8	0.734	-30.8	0.456	26.77
0.4	0.439	-77.2	14.296	122.3	0.043	62.3	0.640	-35.7	0.566	25.25
0.5	0.380	-91.1	12.312	114.7	0.048	61.0	0.563	-38.7	0.664	24.05
0.6	0.336	-103.6	10.745	108.5	0.054	60.2	0.501	-40.8	0.747	22.98
0.7	0.306	-115.0	9.495	103.8	0.059	59.9	0.452	-42.2	0.814	22.04
0.8	0.281	-125.5	8.443	99.4	0.064	60.0	0.412	-43.5	0.877	21.18
0.9	0.269	-135.7	7.598	95.8	0.069	60.0	0.382	-44.7	0.923	20.41
1.0	0.258	-145.3	6.916	92.4	0.074	60.3	0.355	-46.2	0.962	19.69
1.1	0.259	-152.9	6.330	89.5	0.079	60.3	0.336	-47.3	0.988	19.01
1.2	0.260	-160.4	5.811	87.0	0.085	60.5	0.318	-48.7	1.015	17.61
1.3	0.262	-166.8	5.394	84.4	0.090	60.6	0.307	-49.8	1.034	16.67
1.4	0.267	-172.3	5.015	82.0	0.095	60.5	0.296	-51.2	1.051	15.86
1.5	0.269	-177.0	4.702	79.5	0.100	60.4	0.287	-52.2	1.063	15.18
1.6	0.274	178.4	4.422	77.5	0.105	60.4	0.280	-53.2	1.075	14.57
1.7	0.277	174.7	4.161	75.5	0.110	60.3	0.272	-54.1	1.089	13.95
1.8	0.280	171.1	3.940	73.5	0.115	60.0	0.266	-54.8	1.098	13.43
1.9	0.287	168.2	3.736	71.9	0.121	59.9	0.262	-55.6	1.104	12.95
2.0	0.284	165.3	3.564	70.0	0.126	59.6	0.254	-55.7	1.115	12.46
2.1	0.296	162.6	3.410	68.3	0.131	59.5	0.252	-56.8	1.112	12.13
2.2	0.294	160.5	3.258	66.8	0.136	59.3	0.242	-56.5	1.125	11.63
2.3	0.308	158.9	3.140	65.3	0.141	58.9	0.240	-57.3	1.115	11.40
2.4	0.304	156.9	3.017	63.8	0.147	58.5	0.230	-57.9	1.127	10.96
2.5	0.314	154.9	2.897	62.5	0.152	58.2	0.229	-59.0	1.124	10.65
2.6	0.313	152.8	2.804	61.2	0.157	57.9	0.222	-60.7	1.130	10.32
2.7	0.321	151.4	2.699	59.7	0.163	57.3	0.218	-60.5	1.129	10.02
2.8	0.321	148.9	2.602	58.5	0.168	56.8	0.214	-62.7	1.139	9.65
2.9	0.315	147.6	2.484	56.5	0.173	55.9	0.202	-64.3	1.163	9.11
3.0	0.317	143.3	2.421	54.9	0.179	55.6	0.204	-67.9	1.157	8.90
4.0	0.367	121.7	1.856	38.6	0.233	49.6	0.195	-96.6	1.145	6.69
5.0	0.457	103.0	1.462	24.9	0.284	39.0	0.190	-134.7	1.134	4.89

V_{CE} = 2 V, I_c = 20 mA, Z_o = 50 Ω

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂		K	MAG/MSG (dB)
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		
0.1	0.486	-36.9	29.425	153.6	0.013	79.1	0.883	-18.0	0.281	33.51
0.2	0.419	-65.2	23.883	133.9	0.023	68.4	0.737	-29.6	0.478	30.21
0.3	0.345	-87.4	19.002	121.4	0.029	65.7	0.608	-35.0	0.646	28.16
0.4	0.300	-104.1	15.432	112.6	0.035	64.8	0.516	-37.7	0.768	26.41
0.5	0.272	-120.6	12.867	106.0	0.041	65.2	0.451	-38.7	0.853	24.93
0.6	0.254	-133.4	11.011	100.8	0.046	65.3	0.402	-39.2	0.928	23.75
0.7	0.250	-145.0	9.606	97.0	0.052	65.7	0.365	-39.4	0.971	22.64
0.8	0.243	-155.2	8.466	93.4	0.058	66.4	0.336	-39.9	1.018	20.85
0.9	0.247	-163.0	7.570	90.3	0.063	66.5	0.314	-40.6	1.047	19.46
1.0	0.251	-170.3	6.858	87.5	0.069	66.7	0.294	-41.7	1.070	18.37
1.1	0.257	-176.3	6.251	85.0	0.074	66.7	0.281	-42.7	1.086	17.45
1.2	0.268	179.4	5.716	83.0	0.080	66.7	0.268	-44.2	1.101	16.60
1.3	0.273	174.3	5.300	80.7	0.086	66.5	0.261	-45.3	1.109	15.90
1.4	0.280	171.0	4.916	78.5	0.092	66.3	0.253	-46.8	1.117	15.22
1.5	0.284	167.4	4.605	76.4	0.097	66.1	0.248	-48.0	1.124	14.62
1.6	0.292	164.5	4.327	74.4	0.103	65.7	0.244	-49.2	1.125	14.09
1.7	0.295	161.9	4.068	72.6	0.108	65.4	0.238	-50.3	1.134	13.52
1.8	0.299	159.5	3.851	70.7	0.114	65.0	0.234	-51.0	1.138	13.03
1.9	0.307	156.5	3.650	69.2	0.119	64.6	0.231	-52.1	1.140	12.58
2.0	0.306	154.9	3.481	67.3	0.125	64.1	0.225	-52.1	1.146	12.13
2.1	0.319	152.8	3.334	65.8	0.130	63.8	0.224	-53.6	1.137	11.83
2.2	0.315	151.1	3.185	64.4	0.136	63.4	0.216	-53.2	1.149	11.35
2.3	0.329	150.6	3.067	63.0	0.142	62.9	0.216	-54.2	1.134	11.13
2.4	0.325	148.9	2.944	61.6	0.148	62.3	0.206	-55.0	1.144	10.69
2.5	0.335	147.6	2.832	60.3	0.153	61.9	0.206	-56.1	1.138	10.42
2.6	0.335	145.5	2.741	59.3	0.159	61.4	0.200	-58.1	1.141	10.09
2.7	0.340	144.9	2.639	58.0	0.164	60.7	0.197	-58.0	1.141	9.78
2.8	0.342	142.7	2.544	56.8	0.169	60.1	0.193	-60.5	1.147	9.44
2.9	0.333	141.9	2.424	54.9	0.175	58.9	0.182	-62.2	1.173	8.88
3.0	0.337	138.0	2.363	53.2	0.182	58.5	0.184	-66.3	1.165	8.69
4.0	0.387	118.4	1.811	37.2	0.237	51.5	0.179	-97.7	1.147	6.50
5.0	0.476	101.3	1.424	23.9	0.289	40.1	0.182	-138.2	1.132	4.72

V_{CE} = 3 V, I_c = 1 mA, Z_o = 50 Ω

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂		K	MAG/MSG (dB)
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		
0.1	0.951	-6.6	3.571	173.3	0.017	87.1	0.996	-2.9	0.037	23.30
0.2	0.948	-13.1	3.558	168.3	0.033	82.6	0.993	-5.9	0.067	20.34
0.3	0.935	-19.4	3.515	162.8	0.048	78.4	0.975	-8.6	0.118	18.60
0.4	0.911	-25.8	3.442	156.8	0.064	74.1	0.962	-11.7	0.165	17.29
0.5	0.890	-32.5	3.406	150.9	0.079	70.1	0.944	-14.6	0.205	16.36
0.6	0.858	-39.1	3.337	145.0	0.092	66.2	0.920	-17.8	0.246	15.58
0.7	0.825	-45.5	3.248	139.8	0.105	62.3	0.895	-20.6	0.286	14.90
0.8	0.789	-52.2	3.160	134.1	0.116	58.6	0.867	-23.6	0.328	14.34
0.9	0.752	-59.0	3.066	128.7	0.126	55.1	0.842	-26.6	0.365	13.86
1.0	0.714	-65.4	2.974	123.4	0.135	51.8	0.815	-29.3	0.406	13.43
1.1	0.680	-72.1	2.876	118.7	0.142	48.8	0.789	-31.8	0.440	13.05
1.2	0.646	-78.7	2.769	114.2	0.149	46.2	0.765	-34.1	0.473	12.68
1.3	0.615	-85.0	2.668	109.8	0.155	43.5	0.743	-36.2	0.507	12.37
1.4	0.591	-91.5	2.557	105.4	0.159	41.2	0.719	-38.4	0.542	12.06
1.5	0.566	-97.4	2.463	101.2	0.163	39.1	0.701	-40.3	0.578	11.80
1.6	0.546	-103.3	2.378	97.6	0.165	37.2	0.682	-42.0	0.610	11.58
1.7	0.525	-109.1	2.282	94.0	0.168	35.5	0.663	-43.5	0.649	11.34
1.8	0.507	-114.2	2.195	90.5	0.169	34.0	0.647	-44.8	0.690	11.14
1.9	0.494	-119.7	2.110	87.7	0.170	32.7	0.634	-46.2	0.721	10.93
2.0	0.477	-124.1	2.041	84.4	0.172	31.5	0.618	-47.2	0.769	10.75
2.1	0.467	-129.8	1.973	81.8	0.172	30.6	0.609	-48.6	0.794	10.60
2.2	0.453	-133.9	1.895	79.1	0.172	30.0	0.596	-49.3	0.845	10.41
2.3	0.451	-139.2	1.841	76.7	0.173	29.3	0.593	-50.2	0.855	10.27
2.4	0.442	-143.2	1.782	74.2	0.174	28.8	0.578	-51.1	0.901	10.10
2.5	0.438	-148.1	1.728	71.9	0.174	28.5	0.573	-52.1	0.923	9.96
2.6	0.429	-151.4	1.679	70.0	0.175	28.0	0.565	-53.2	0.962	9.82
2.7	0.429	-155.5	1.627	67.6	0.175	27.7	0.560	-53.8	0.989	9.68
2.8	0.422	-159.5	1.573	65.8	0.175	27.5	0.551	-55.0	1.036	8.39
2.9	0.414	-162.7	1.509	62.4	0.175	26.8	0.531	-56.0	1.121	7.23
3.0	0.405	-167.3	1.480	60.1	0.176	26.9	0.523	-58.6	1.149	6.90
4.0	0.413	153.8	1.219	39.3	0.189	30.5	0.479	-76.4	1.308	4.77
5.0	0.479	120.3	0.974	20.6	0.218	31.4	0.441	-98.5	1.385	2.80

V_{CE} = 3 V, I_c = 3 mA, Z_o = 50 Ω

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂		K	MAG/MSG (dB)
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		
0.1	0.875	-11.6	9.462	170.0	0.016	80.1	0.985	-6.1	0.134	27.70
0.2	0.851	-22.5	9.220	160.5	0.031	77.7	0.963	-11.8	0.142	24.78
0.3	0.810	-32.9	8.796	152.0	0.044	72.2	0.918	-16.7	0.212	23.02
0.4	0.758	-42.6	8.287	143.8	0.056	67.3	0.872	-21.7	0.281	21.67
0.5	0.699	-52.5	7.800	136.0	0.066	63.1	0.820	-25.7	0.348	20.70
0.6	0.641	-61.9	7.283	129.0	0.075	59.2	0.767	-29.6	0.412	19.88
0.7	0.590	-70.5	6.773	123.1	0.083	56.1	0.718	-32.7	0.471	19.14
0.8	0.538	-78.8	6.291	117.4	0.088	53.7	0.670	-35.5	0.535	18.52
0.9	0.491	-87.3	5.841	112.1	0.094	51.6	0.629	-38.1	0.591	17.95
1.0	0.453	-95.1	5.459	107.4	0.099	50.1	0.592	-40.3	0.645	17.43
1.1	0.424	-103.3	5.101	103.3	0.103	48.8	0.561	-42.3	0.688	16.97
1.2	0.398	-111.0	4.754	99.7	0.106	48.0	0.532	-44.1	0.734	16.50
1.3	0.377	-118.4	4.479	96.0	0.110	47.2	0.511	-45.5	0.774	16.10
1.4	0.362	-125.3	4.192	92.7	0.113	46.5	0.491	-47.1	0.814	15.68
1.5	0.349	-131.7	3.968	89.4	0.116	46.1	0.474	-48.4	0.849	15.32
1.6	0.341	-138.1	3.758	86.5	0.120	45.8	0.459	-49.5	0.881	14.97
1.7	0.333	-144.2	3.555	83.9	0.123	45.6	0.445	-50.5	0.916	14.62
1.8	0.327	-149.3	3.383	81.1	0.126	45.4	0.433	-51.2	0.948	14.30
1.9	0.323	-154.9	3.217	79.0	0.129	45.4	0.423	-52.0	0.975	13.98
2.0	0.317	-158.8	3.078	76.5	0.132	45.5	0.412	-52.3	1.007	13.15
2.1	0.322	-163.8	2.952	74.5	0.135	45.5	0.405	-53.4	1.020	12.54
2.2	0.315	-167.3	2.826	72.5	0.138	45.6	0.394	-53.5	1.058	11.66
2.3	0.323	-171.9	2.729	70.6	0.141	45.6	0.391	-54.2	1.056	11.41
2.4	0.321	-174.5	2.623	68.7	0.145	45.8	0.378	-54.8	1.084	10.80
2.5	0.326	-178.5	2.528	67.0	0.149	45.9	0.375	-55.5	1.091	10.47
2.6	0.323	-178.3	2.453	65.7	0.152	45.9	0.367	-56.8	1.111	10.05
2.7	0.329	-175.8	2.363	63.9	0.155	45.8	0.362	-56.8	1.121	9.70
2.8	0.327	-172.6	2.277	62.4	0.159	45.8	0.356	-58.3	1.144	9.26
2.9	0.322	-170.4	2.176	59.9	0.163	45.2	0.340	-59.2	1.187	8.64
3.0	0.318	-165.6	2.124	58.0	0.167	45.4	0.338	-61.9	1.191	8.40
4.0	0.360	-135.1	1.668	40.0	0.211	44.3	0.306	-82.3	1.204	6.26
5.0	0.449	-110.0	1.323	24.2	0.258	37.1	0.272	-109.0	1.194	4.44

V_{CE} = 3 V, I_c = 5 mA, Z_o = 50 Ω

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂		K	MAG/MSG (dB)
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		
0.1	0.800	-14.8	14.185	166.6	0.016	81.3	0.972	-8.5	0.138	29.61
0.2	0.762	-29.9	13.456	154.6	0.029	74.6	0.928	-16.1	0.203	26.73
0.3	0.699	-43.3	12.386	144.2	0.040	68.8	0.859	-22.2	0.293	24.91
0.4	0.632	-54.5	11.241	135.0	0.050	64.4	0.790	-27.6	0.383	23.52
0.5	0.560	-66.3	10.196	126.7	0.058	60.6	0.721	-31.6	0.469	22.47
0.6	0.500	-76.5	9.233	119.8	0.064	58.2	0.657	-35.0	0.546	21.58
0.7	0.451	-86.0	8.357	114.2	0.070	56.2	0.602	-37.4	0.617	20.77
0.8	0.404	-95.3	7.591	108.9	0.075	55.0	0.554	-39.6	0.686	20.05
0.9	0.369	-104.6	6.941	104.4	0.079	54.2	0.516	-41.6	0.742	19.41
1.0	0.339	-113.4	6.384	100.2	0.084	53.6	0.482	-43.4	0.796	18.81
1.1	0.321	-122.2	5.896	96.7	0.088	53.2	0.454	-44.8	0.840	18.27
1.2	0.309	-130.1	5.456	93.6	0.092	53.1	0.431	-46.3	0.877	17.72
1.3	0.298	-137.9	5.089	90.4	0.096	53.0	0.414	-47.5	0.909	17.22
1.4	0.292	-144.9	4.753	87.5	0.101	52.9	0.399	-48.8	0.939	16.75
1.5	0.285	-150.8	4.461	84.7	0.105	52.9	0.386	-49.8	0.968	16.29
1.6	0.284	-157.1	4.214	82.2	0.109	52.9	0.375	-50.8	0.990	15.89
1.7	0.283	-162.3	3.973	79.9	0.113	52.9	0.363	-51.6	1.014	14.73
1.8	0.282	-167.1	3.771	77.6	0.117	53.0	0.354	-52.2	1.035	13.94
1.9	0.283	-171.9	3.576	75.8	0.121	53.0	0.347	-52.9	1.054	13.29
2.0	0.280	-175.6	3.416	73.6	0.125	52.9	0.337	-53.1	1.075	12.69
2.1	0.290	-179.7	3.275	71.7	0.129	53.0	0.333	-54.1	1.077	12.34
2.2	0.289	-177.4	3.131	70.0	0.133	53.0	0.322	-53.9	1.099	11.79
2.3	0.298	-173.9	3.016	68.4	0.138	53.0	0.320	-54.6	1.096	11.51
2.4	0.297	-171.5	2.900	66.7	0.143	52.8	0.308	-55.2	1.112	11.04
2.5	0.304	-168.7	2.789	65.2	0.147	52.8	0.306	-56.0	1.114	10.72
2.6	0.302	-165.9	2.700	64.0	0.152	52.7	0.299	-57.3	1.127	10.34
2.7	0.309	-164.1	2.600	62.4	0.156	52.4	0.294	-57.3	1.131	10.02
2.8	0.310	-161.1	2.507	61.1	0.160	52.1	0.289	-58.9	1.144	9.64
2.9	0.303	-159.6	2.393	58.8	0.166	51.3	0.275	-60.0	1.175	9.06
3.0	0.304	-154.7	2.335	56.9	0.171	51.3	0.274	-63.0	1.172	8.85
4.0	0.353	-128.4	1.811	40.1	0.221	47.7	0.251	-85.9	1.164	6.69
5.0	0.441	-106.4	1.435	25.2	0.270	38.6	0.224	-117.1	1.155	4.87

V_{CE} = 3 V, I_c = 7 mA, Z_o = 50 Ω

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂		K	MAG/MSG (dB)
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		
0.1	0.736	-18.2	17.762	164.3	0.014	81.1	0.961	-10.3	0.147	30.92
0.2	0.696	-35.5	16.431	150.3	0.028	71.8	0.898	-19.2	0.263	27.73
0.3	0.619	-50.5	14.686	138.8	0.038	67.4	0.810	-25.7	0.360	25.92
0.4	0.544	-63.0	12.978	129.3	0.046	63.4	0.727	-31.0	0.463	24.51
0.5	0.473	-75.5	11.479	121.2	0.052	60.7	0.652	-34.6	0.556	23.40
0.6	0.418	-86.5	10.202	114.6	0.058	59.0	0.588	-37.3	0.639	22.44
0.7	0.373	-96.5	9.131	109.4	0.063	57.7	0.535	-39.3	0.711	21.58
0.8	0.334	-106.4	8.216	104.5	0.068	57.3	0.491	-41.0	0.777	20.80
0.9	0.310	-116.3	7.430	100.4	0.073	57.0	0.456	-42.5	0.830	20.08
1.0	0.288	-125.7	6.799	96.6	0.077	57.0	0.425	-44.0	0.878	19.43
1.1	0.277	-134.5	6.255	93.3	0.082	56.7	0.402	-45.2	0.915	18.83
1.2	0.271	-142.6	5.762	90.5	0.087	56.9	0.381	-46.6	0.947	18.23
1.3	0.266	-150.7	5.365	87.7	0.091	56.8	0.366	-47.6	0.973	17.69
1.4	0.265	-156.6	4.988	85.1	0.096	56.9	0.353	-48.9	0.999	17.16
1.5	0.262	-162.8	4.679	82.5	0.101	57.0	0.342	-49.9	1.020	15.80
1.6	0.266	-168.0	4.408	80.2	0.105	57.1	0.333	-50.8	1.035	15.08
1.7	0.268	-172.8	4.153	78.0	0.110	56.9	0.324	-51.6	1.054	14.36
1.8	0.270	-177.0	3.940	75.8	0.114	57.0	0.316	-52.1	1.066	13.80
1.9	0.272	-178.7	3.734	74.1	0.119	56.9	0.310	-52.9	1.079	13.25
2.0	0.272	-175.5	3.565	72.1	0.124	56.8	0.301	-53.0	1.094	12.73
2.1	0.282	-171.9	3.415	70.4	0.128	56.7	0.298	-54.0	1.094	12.39
2.2	0.275	-169.3	3.262	68.8	0.133	56.6	0.288	-53.8	1.117	11.82
2.3	0.292	-166.7	3.145	67.2	0.138	56.4	0.286	-54.4	1.103	11.62
2.4	0.290	-164.8	3.021	65.6	0.143	56.2	0.275	-55.0	1.117	11.16
2.5	0.298	-162.1	2.906	64.1	0.148	56.1	0.273	-55.8	1.116	10.86
2.6	0.297	-159.4	2.812	63.0	0.153	55.9	0.267	-57.1	1.124	10.50
2.7	0.302	-158.0	2.709	61.5	0.158	55.6	0.263	-56.8	1.127	10.18
2.8	0.304	-155.1	2.610	60.3	0.162	55.2	0.257	-58.7	1.139	9.80
2.9	0.298	-154.0	2.490	58.1	0.168	54.2	0.244	-59.9	1.167	9.25
3.0	0.299	-149.4	2.429	56.4	0.173	54.1	0.244	-63.2	1.161	9.03
4.0	0.352	-125.5	1.873	39.9	0.225	49.2	0.226	-88.1	1.148	6.87
5.0	0.443	-104.8	1.478	25.7	0.275	39.2	0.204	-122.3	1.138	5.04

V_{CE} = 3 V, I_c = 10 mA, Z_o = 50 Ω

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂		K	MAG/MSG (dB)
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		
0.1	0.676	-22.3	22.003	161.3	0.014	82.7	0.944	-12.5	0.152	32.02
0.2	0.612	-42.9	19.679	145.3	0.025	71.9	0.855	-22.6	0.304	28.88
0.3	0.526	-59.1	16.963	133.1	0.034	66.5	0.749	-29.2	0.442	26.92
0.4	0.451	-73.0	14.543	123.5	0.042	63.2	0.658	-33.9	0.557	25.44
0.5	0.386	-86.6	12.577	115.7	0.047	61.7	0.583	-36.7	0.654	24.24
0.6	0.340	-98.4	10.996	109.6	0.053	60.8	0.521	-38.8	0.738	23.19
0.7	0.306	-109.1	9.727	104.9	0.058	60.4	0.473	-40.0	0.806	22.26
0.8	0.278	-119.8	8.676	100.4	0.063	60.5	0.433	-41.2	0.865	21.39
0.9	0.263	-130.2	7.819	96.7	0.068	60.4	0.402	-42.4	0.909	20.61
1.0	0.250	-139.7	7.112	93.3	0.073	60.8	0.375	-43.6	0.950	19.90
1.1	0.246	-148.1	6.522	90.4	0.078	60.8	0.356	-44.7	0.980	19.24
1.2	0.246	-155.8	5.980	87.9	0.083	61.0	0.337	-46.0	1.006	18.10
1.3	0.247	-163.1	5.562	85.3	0.088	61.0	0.326	-47.0	1.024	17.07
1.4	0.250	-168.6	5.172	82.9	0.093	61.0	0.315	-48.3	1.042	16.21
1.5	0.252	-173.7	4.838	80.5	0.098	60.8	0.306	-49.2	1.057	15.48
1.6	0.256	-178.4	4.560	78.3	0.103	60.8	0.298	-50.1	1.066	14.90
1.7	0.259	-177.6	4.292	76.4	0.108	60.6	0.291	-51.0	1.078	14.28
1.8	0.264	-173.8	4.069	74.3	0.113	60.4	0.284	-51.6	1.088	13.76
1.9	0.268	-169.8	3.851	72.7	0.118	60.3	0.279	-52.3	1.097	13.24
2.0	0.267	-167.1	3.675	70.8	0.123	60.1	0.272	-52.4	1.107	12.75
2.1	0.280	-164.5	3.517	69.1	0.128	59.9	0.269	-53.4	1.103	12.44
2.2	0.277	-161.9	3.364	67.6	0.133	59.7	0.260	-53.0	1.117	11.95
2.3	0.289	-160.6	3.234	66.2	0.138	59.4	0.259	-53.8	1.108	11.68
2.4	0.288	-158.7	3.110	64.7	0.144	59.0	0.248	-54.3	1.119	11.25
2.5	0.295	-156.7	2.991	63.3	0.149	58.7	0.247	-55.2	1.117	10.94
2.6	0.296	-154.1	2.893	62.1	0.154	58.5	0.240	-56.7	1.121	10.61
2.7	0.302	-152.9	2.786	60.6	0.159	57.9	0.237	-56.3	1.122	10.30
2.8	0.303	-150.5	2.686	59.5	0.164	57.5	0.231	-58.4	1.132	9.93
2.9	0.297	-149.2	2.563	57.4	0.170	56.4	0.219	-59.7	1.156	9.39
3.0	0.299	-144.6	2.496	55.7	0.176	56.1	0.220	-63.4	1.150	9.17
4.0	0.350	-122.8	1.917	39.7	0.229	50.4	0.205	-90.2	1.137	6.98
5.0	0.444	-103.5	1.513	25.9	0.280	39.6	0.190	-127.2	1.124	5.19

V_{CE} = 3 V, I_c = 20 mA, Z_o = 50 Ω

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂		K	MAG/MSG (dB)
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		
0.1	0.524	-31.2	29.776	154.7	0.013	79.3	0.896	-16.9	0.280	33.61
0.2	0.445	-59.6	24.547	135.5	0.022	69.8	0.758	-28.0	0.454	30.48
0.3	0.363	-80.1	19.730	122.9	0.029	66.8	0.631	-33.4	0.617	28.32
0.4	0.308	-95.6	16.104	113.9	0.035	65.3	0.540	-36.1	0.741	26.63
0.5	0.269	-112.0	13.477	107.4	0.040	65.7	0.475	-37.1	0.831	25.23
0.6	0.247	-124.7	11.550	102.1	0.046	65.9	0.424	-37.7	0.902	24.02
0.7	0.233	-136.9	10.103	98.2	0.051	66.0	0.387	-37.9	0.951	22.94
0.8	0.225	-147.7	8.906	94.4	0.057	66.7	0.357	-38.3	0.995	21.97
0.9	0.226	-156.8	7.971	91.4	0.062	66.8	0.334	-38.9	1.025	20.13
1.0	0.226	-164.9	7.224	88.5	0.068	67.0	0.314	-39.9	1.048	18.94
1.1	0.232	-172.0	6.593	86.0	0.073	67.0	0.300	-40.9	1.065	17.99
1.2	0.239	-176.8	6.038	84.0	0.079	67.0	0.287	-42.1	1.081	17.11
1.3	0.245	177.6	5.595	81.6	0.084	66.9	0.279	-43.1	1.090	16.40
1.4	0.253	174.0	5.198	79.5	0.090	66.6	0.271	-44.5	1.097	15.73
1.5	0.258	170.1	4.867	77.4	0.095	66.3	0.265	-45.6	1.103	15.13
1.6	0.265	166.8	4.569	75.4	0.101	65.9	0.261	-46.6	1.106	14.58
1.7	0.270	163.8	4.302	73.6	0.106	65.5	0.255	-47.6	1.112	14.03
1.8	0.273	161.0	4.071	71.7	0.112	65.3	0.250	-48.3	1.119	13.52
1.9	0.280	158.5	3.855	70.3	0.117	64.8	0.247	-49.3	1.122	13.05
2.0	0.279	156.3	3.676	68.4	0.122	64.4	0.241	-49.3	1.129	12.59
2.1	0.291	154.3	3.521	66.9	0.128	64.0	0.240	-50.6	1.120	12.29
2.2	0.289	152.4	3.365	65.5	0.134	63.6	0.232	-50.1	1.130	11.82
2.3	0.302	151.6	3.239	64.2	0.139	63.2	0.231	-51.1	1.118	11.58
2.4	0.299	150.2	3.110	62.8	0.145	62.6	0.222	-51.7	1.127	11.15
2.5	0.309	148.8	2.989	61.4	0.150	62.1	0.221	-52.7	1.123	10.86
2.6	0.308	146.5	2.894	60.4	0.156	61.7	0.215	-54.3	1.126	10.53
2.7	0.313	146.2	2.788	59.1	0.161	61.1	0.212	-53.8	1.126	10.23
2.8	0.314	143.9	2.685	58.0	0.166	60.4	0.207	-56.2	1.134	9.86
2.9	0.309	142.6	2.562	55.9	0.172	59.3	0.195	-57.7	1.156	9.34
3.0	0.311	138.8	2.494	54.4	0.178	59.0	0.197	-61.8	1.151	9.11
4.0	0.364	119.3	1.908	38.6	0.233	52.0	0.186	-91.3	1.133	6.91
5.0	0.454	101.8	1.502	25.3	0.284	40.8	0.178	-131.4	1.123	5.10

S-PARAMETERS Q2

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

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂		K	MAG/MSG (dB)
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		
0.1	0.969	-20.0	3.596	166.2	0.045	76.0	0.989	-7.4	0.092	19.04
0.2	0.946	-39.8	3.407	153.4	0.086	67.1	0.949	-14.7	0.087	15.99
0.3	0.906	-58.9	3.167	140.9	0.119	56.7	0.898	-21.1	0.128	14.25
0.4	0.868	-75.3	2.906	129.3	0.145	47.6	0.839	-26.5	0.186	13.01
0.5	0.843	-90.0	2.676	119.9	0.164	39.8	0.783	-30.9	0.226	12.13
0.6	0.806	-103.7	2.427	110.7	0.176	33.1	0.728	-34.8	0.282	11.39
0.7	0.778	-115.5	2.212	103.1	0.184	27.3	0.686	-37.9	0.333	10.79
0.8	0.760	-125.9	2.016	96.3	0.188	22.4	0.647	-41.0	0.382	10.31
0.9	0.749	-135.1	1.840	89.9	0.190	18.1	0.618	-43.9	0.428	9.87
1.0	0.741	-143.3	1.700	84.0	0.189	14.6	0.593	-46.6	0.477	9.55
1.1	0.732	-150.5	1.571	78.9	0.187	11.4	0.576	-49.4	0.530	9.25
1.2	0.731	-157.1	1.451	74.0	0.183	8.8	0.560	-52.0	0.580	8.99
1.3	0.734	-162.8	1.356	69.6	0.179	6.5	0.551	-54.8	0.621	8.80
1.4	0.734	-167.8	1.266	65.4	0.174	4.5	0.543	-57.5	0.680	8.62
1.5	0.736	-172.3	1.190	61.5	0.168	3.1	0.540	-60.2	0.729	8.50
1.6	0.739	-176.3	1.121	57.7	0.163	1.9	0.535	-62.8	0.791	8.38
1.7	0.743	179.9	1.054	54.5	0.156	1.1	0.537	-65.4	0.844	8.29
1.8	0.744	176.4	1.000	51.2	0.150	0.9	0.534	-68.0	0.920	8.25
1.9	0.745	172.8	0.947	48.2	0.143	0.9	0.537	-70.5	0.997	8.21
2.0	0.749	170.0	0.903	45.1	0.137	1.8	0.535	-72.9	1.076	6.52
2.1	0.751	167.1	0.871	43.0	0.130	2.9	0.539	-75.5	1.134	6.03
2.2	0.752	164.4	0.831	40.5	0.125	4.4	0.538	-78.0	1.240	5.29
2.3	0.756	161.4	0.799	38.4	0.119	6.6	0.543	-80.5	1.302	4.97
2.4	0.761	158.7	0.769	36.1	0.115	8.9	0.539	-83.0	1.386	4.56
2.5	0.762	156.0	0.738	34.0	0.111	12.2	0.542	-85.9	1.474	4.15
2.6	0.766	153.3	0.711	32.4	0.107	15.8	0.543	-88.8	1.555	3.83
2.7	0.764	150.5	0.686	30.4	0.106	20.0	0.545	-91.7	1.636	3.45
2.8	0.768	147.9	0.658	29.1	0.106	24.2	0.545	-94.4	1.691	3.09
2.9	0.755	144.8	0.625	27.0	0.109	28.0	0.542	-97.5	1.861	2.24
3.0	0.749	141.3	0.605	24.8	0.113	32.5	0.539	-101.1	1.923	1.75
4.0	0.781	123.7	0.468	14.0	0.181	51.3	0.579	-134.6	1.464	0.09
5.0	0.789	101.1	0.394	12.0	0.286	40.3	0.626	-164.0	1.283	-1.81

V_{CE} = 1 V, I_C = 3 mA, Z_o = 50 Ω

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂		K	MAG/MSG (dB)
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		
0.1	0.913	-33.3	9.705	159.5	0.044	72.6	0.948	-16.0	0.062	23.46
0.2	0.851	-61.4	8.525	141.8	0.075	58.1	0.834	-29.6	0.131	20.56
0.3	0.780	-86.0	7.262	127.5	0.096	47.1	0.717	-39.4	0.205	18.80
0.4	0.732	-105.4	6.153	116.2	0.108	39.5	0.612	-46.6	0.276	17.54
0.5	0.704	-120.5	5.315	107.6	0.116	34.1	0.531	-51.5	0.344	16.61
0.6	0.680	-133.0	4.598	100.4	0.120	30.4	0.464	-55.7	0.417	15.83
0.7	0.667	-143.3	4.040	94.4	0.123	27.6	0.416	-58.8	0.485	15.17
0.8	0.657	-152.1	3.589	89.4	0.124	25.9	0.377	-62.0	0.557	14.61
0.9	0.655	-159.4	3.209	84.7	0.125	24.5	0.349	-64.8	0.620	14.08
1.0	0.653	-165.8	2.911	80.5	0.125	24.1	0.327	-67.8	0.686	13.66
1.1	0.655	-171.3	2.662	76.7	0.126	23.6	0.312	-70.6	0.743	13.26
1.2	0.658	-176.5	2.436	73.2	0.126	23.6	0.299	-73.4	0.805	12.88
1.3	0.663	-179.6	2.259	69.9	0.125	23.8	0.293	-76.2	0.855	12.57
1.4	0.665	-175.8	2.101	66.8	0.126	24.4	0.287	-78.8	0.913	12.24
1.5	0.667	-172.4	1.964	63.7	0.125	25.2	0.286	-81.2	0.967	11.95
1.6	0.673	-169.6	1.845	61.0	0.126	25.9	0.282	-83.7	1.010	11.04
1.7	0.677	-166.6	1.731	58.4	0.126	27.0	0.285	-85.8	1.056	9.92
1.8	0.678	-164.0	1.637	55.7	0.127	28.4	0.283	-88.0	1.112	9.07
1.9	0.680	-161.6	1.555	53.3	0.128	29.5	0.287	-89.9	1.147	8.51
2.0	0.681	-159.4	1.481	50.7	0.130	31.2	0.286	-91.9	1.193	7.93
2.1	0.684	-157.0	1.425	48.7	0.131	32.6	0.290	-94.0	1.209	7.60
2.2	0.685	-155.0	1.361	46.6	0.134	33.8	0.289	-96.1	1.244	7.11
2.3	0.691	-152.5	1.310	44.8	0.136	35.3	0.293	-98.1	1.243	6.85
2.4	0.692	-150.5	1.263	42.7	0.140	36.4	0.291	-100.3	1.265	6.47
2.5	0.696	-148.2	1.216	40.7	0.144	37.8	0.294	-102.8	1.264	6.19
2.6	0.698	-146.0	1.172	38.8	0.147	38.9	0.296	-105.2	1.284	5.83
2.7	0.698	-143.8	1.131	36.9	0.151	39.8	0.298	-108.0	1.299	5.47
2.8	0.698	-141.6	1.088	35.2	0.156	40.5	0.300	-110.5	1.314	5.09
2.9	0.688	-138.9	1.039	32.9	0.163	40.5	0.302	-113.6	1.361	4.47
3.0	0.685	-135.9	1.004	30.6	0.169	41.2	0.303	-116.9	1.373	4.08
4.0	0.726	-121.3	0.781	15.4	0.222	44.3	0.375	-147.7	1.243	2.50
5.0	0.753	-101.1	0.605	4.5	0.295	34.3	0.461	-171.6	1.156	0.72

V_{CE} = 1 V, I_C = 5 mA, Z_o = 50 Ω

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂		K	MAG/MSG (dB)
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		
0.1	0.843	-43.2	14.558	153.7	0.041	66.1	0.905	-23.2	0.130	25.50
0.2	0.769	-77.8	11.865	133.5	0.066	53.2	0.736	-40.7	0.185	22.54
0.3	0.702	-104.2	9.473	119.4	0.080	43.8	0.590	-52.0	0.283	20.72
0.4	0.664	-122.6	7.711	109.1	0.088	38.1	0.481	-60.0	0.380	19.44
0.5	0.651	-136.6	6.482	101.4	0.093	34.9	0.403	-65.5	0.458	18.45
0.6	0.633	-147.8	5.516	95.3	0.096	33.3	0.344	-70.5	0.552	17.59
0.7	0.628	-156.5	4.788	90.2	0.099	32.4	0.302	-74.5	0.629	16.85
0.8	0.627	-164.0	4.217	86.0	0.101	32.5	0.270	-78.9	0.704	16.20
0.9	0.627	-170.1	3.760	82.0	0.104	32.6	0.248	-82.9	0.771	15.59
1.0	0.629	-175.3	3.396	78.5	0.106	33.3	0.231	-87.1	0.834	15.06
1.1	0.631	-179.8	3.092	75.3	0.108	33.7	0.221	-90.8	0.891	14.56
1.2	0.637	-175.6	2.827	72.2	0.111	34.5	0.213	-94.5	0.939	14.06
1.3	0.641	-172.2	2.615	69.3	0.113	35.5	0.210	-97.7	0.981	13.63
1.4	0.647	-168.9	2.430	66.6	0.117	36.4	0.207	-100.9	1.015	12.45
1.5	0.649	-166.3	2.268	64.0	0.119	37.4	0.207	-103.3	1.055	11.36
1.6	0.653	-163.6	2.133	61.4	0.122	38.1	0.206	-106.1	1.081	10.67
1.7	0.659	-161.3	2.002	59.1	0.126	39.0	0.209	-107.7	1.103	10.07
1.8	0.660	-159.0	1.892	56.8	0.129	40.2	0.208	-110.0	1.138	9.41
1.9	0.663	-156.7	1.796	54.6	0.133	40.9	0.211	-111.4	1.149	8.96
2.0	0.665	-154.7	1.712	52.1	0.137	41.8	0.210	-113.3	1.169	8.48
2.1	0.668	-152.7	1.643	50.3	0.141	42.6	0.214	-114.9	1.173	8.14
2.2	0.667	-151.0	1.575	48.5	0.146	43.1	0.213	-116.9	1.192	7.68
2.3	0.671	-148.8	1.512	46.7	0.151	43.7	0.217	-118.4	1.189	7.38
2.4	0.673	-146.8	1.458	44.6	0.156	44.0	0.216	-120.5	1.193	7.06
2.5	0.675	-145.0	1.405	42.8	0.161	44.4	0.220	-122.6	1.192	6.75
2.6	0.676	-142.9	1.356	41.2	0.166	44.7	0.220	-124.9	1.203	6.40
2.7	0.678	-140.9	1.306	39.2	0.172	44.8	0.224	-127.5	1.207	6.07
2.8	0.678	-138.6	1.261	37.6	0.177	44.6	0.226	-130.0	1.214	5.73
2.9	0.667	-136.4	1.204	35.2	0.185	43.8	0.231	-132.9	1.251	5.12
3.0	0.663	-133.4	1.165	33.1	0.192	43.7	0.234	-135.8	1.267	4.72
4.0	0.706	-119.9	0.909	17.7	0.241	42.5	0.318	-161.9	1.188	3.14
5.0	0.737	-100.6	0.705	5.2	0.303	31.8	0.406	-179.3	1.135	1.43

V_{CE} = 1 V, I_c = 7 mA, Z_o = 50 Ω

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂		K	MAG/MSG (dB)
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		
0.1	0.794	-52.8	18.401	149.1	0.038	64.6	0.862	-29.1	0.121	26.86
0.2	0.722	-90.1	14.049	127.9	0.059	50.3	0.658	-49.1	0.230	23.75
0.3	0.655	-116.7	10.776	114.2	0.069	42.2	0.507	-61.3	0.358	21.92
0.4	0.631	-134.0	8.572	104.8	0.075	38.9	0.403	-70.1	0.465	20.55
0.5	0.622	-146.4	7.099	97.8	0.080	37.5	0.332	-76.5	0.558	19.49
0.6	0.613	-156.3	5.999	92.4	0.084	37.3	0.281	-82.9	0.654	18.56
0.7	0.612	-164.2	5.187	87.9	0.087	37.3	0.246	-88.0	0.733	17.75
0.8	0.613	-170.6	4.552	84.1	0.091	38.2	0.221	-94.0	0.804	17.00
0.9	0.617	-176.0	4.042	80.5	0.095	38.9	0.204	-99.0	0.863	16.30
1.0	0.620	179.4	3.649	77.4	0.098	40.0	0.193	-104.5	0.918	15.70
1.1	0.623	175.0	3.320	74.4	0.102	40.8	0.187	-108.9	0.964	15.12
1.2	0.628	171.0	3.034	71.5	0.106	41.6	0.183	-113.2	1.004	14.17
1.3	0.636	168.2	2.801	69.0	0.110	42.6	0.183	-116.6	1.030	13.00
1.4	0.638	165.3	2.602	66.5	0.115	43.4	0.183	-119.9	1.060	12.06
1.5	0.643	162.8	2.430	64.0	0.119	44.2	0.184	-122.1	1.080	11.38
1.6	0.648	160.5	2.287	61.6	0.124	44.8	0.185	-124.9	1.093	10.81
1.7	0.652	158.2	2.142	59.4	0.128	45.4	0.188	-126.2	1.111	10.21
1.8	0.652	156.2	2.028	57.2	0.133	46.2	0.188	-128.5	1.133	9.63
1.9	0.655	154.1	1.922	55.2	0.138	46.5	0.192	-129.5	1.141	9.16
2.0	0.656	152.2	1.834	52.8	0.143	47.0	0.190	-131.3	1.155	8.70
2.1	0.658	150.5	1.762	51.2	0.148	47.3	0.194	-132.5	1.155	8.37
2.2	0.659	148.6	1.688	49.4	0.154	47.3	0.193	-134.5	1.162	7.97
2.3	0.663	146.5	1.618	47.7	0.160	47.4	0.196	-135.8	1.158	7.65
2.4	0.664	144.9	1.562	45.6	0.166	47.4	0.196	-137.8	1.161	7.32
2.5	0.667	142.9	1.505	43.8	0.172	47.5	0.199	-139.4	1.155	7.04
2.6	0.668	141.0	1.451	42.2	0.177	47.3	0.201	-141.6	1.161	6.69
2.7	0.669	139.1	1.400	40.4	0.183	47.0	0.204	-144.0	1.167	6.36
2.8	0.669	137.1	1.350	38.9	0.189	46.4	0.207	-146.2	1.176	6.00
2.9	0.658	134.9	1.290	36.6	0.197	45.3	0.214	-148.7	1.205	5.42
3.0	0.652	132.0	1.248	34.4	0.204	45.0	0.217	-151.1	1.223	5.01
4.0	0.698	119.0	0.977	19.3	0.252	41.9	0.304	-172.3	1.157	3.49
5.0	0.727	100.4	0.760	6.3	0.309	30.6	0.388	172.3	1.129	1.72

V_{CE} = 1 V, I_c = 10 mA, Z_o = 50 Ω

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂		K	MAG/MSG (dB)
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		
0.1	0.719	-63.4	22.631	143.4	0.035	62.6	0.806	-36.4	0.167	28.07
0.2	0.660	-103.7	16.109	121.7	0.051	48.3	0.574	-58.7	0.306	24.97
0.3	0.621	-129.0	11.887	109.3	0.059	43.2	0.427	-71.9	0.446	23.04
0.4	0.606	-144.9	9.279	100.8	0.064	41.5	0.335	-82.0	0.568	21.58
0.5	0.602	-155.7	7.600	94.6	0.070	41.5	0.276	-89.7	0.666	20.37
0.6	0.602	-164.2	6.377	89.9	0.074	42.6	0.236	-98.0	0.758	19.35
0.7	0.602	-170.9	5.497	85.8	0.079	43.4	0.209	-104.6	0.833	18.45
0.8	0.606	-176.6	4.826	82.4	0.083	44.6	0.192	-112.1	0.892	17.63
0.9	0.609	178.8	4.278	79.3	0.089	45.6	0.183	-118.2	0.942	16.83
1.0	0.615	174.6	3.852	76.4	0.094	46.7	0.178	-124.3	0.982	16.14
1.1	0.619	170.8	3.506	73.6	0.099	47.5	0.177	-128.7	1.016	14.74
1.2	0.624	167.4	3.197	71.1	0.104	48.3	0.177	-133.0	1.043	13.59
1.3	0.632	164.8	2.953	68.6	0.109	49.0	0.179	-136.0	1.059	12.83
1.4	0.635	162.0	2.744	66.2	0.115	49.5	0.182	-139.1	1.078	12.07
1.5	0.639	159.7	2.559	63.9	0.120	50.0	0.184	-140.8	1.092	11.42
1.6	0.642	157.6	2.406	61.7	0.126	50.3	0.186	-143.3	1.102	10.86
1.7	0.648	155.7	2.257	59.6	0.132	50.4	0.189	-144.3	1.109	10.34
1.8	0.648	153.8	2.136	57.6	0.137	50.8	0.190	-146.5	1.125	9.77
1.9	0.648	151.8	2.028	55.6	0.143	50.8	0.193	-147.0	1.132	9.31
2.0	0.651	150.0	1.932	53.5	0.149	51.0	0.193	-148.8	1.136	8.88
2.1	0.656	148.3	1.856	51.8	0.155	50.9	0.195	-149.7	1.128	8.60
2.2	0.654	146.7	1.777	50.1	0.161	50.6	0.194	-151.7	1.137	8.17
2.3	0.658	144.9	1.704	48.5	0.168	50.4	0.197	-152.7	1.133	7.85
2.4	0.659	142.9	1.647	46.5	0.174	50.0	0.197	-154.5	1.131	7.55
2.5	0.660	141.2	1.586	44.8	0.181	49.7	0.200	-156.0	1.129	7.24
2.6	0.663	139.4	1.529	43.1	0.187	49.4	0.201	-158.1	1.132	6.92
2.7	0.663	137.7	1.477	41.4	0.193	48.7	0.205	-160.1	1.135	6.60
2.8	0.661	135.5	1.423	39.8	0.199	48.0	0.209	-162.0	1.147	6.21
2.9	0.650	133.4	1.358	37.6	0.207	46.6	0.215	-163.6	1.175	5.63
3.0	0.645	130.5	1.314	35.5	0.215	45.9	0.219	-165.8	1.188	5.24
4.0	0.691	118.2	1.031	20.7	0.261	41.5	0.304	177.8	1.138	3.70
5.0	0.720	99.8	0.808	7.5	0.316	29.5	0.383	165.3	1.118	2.00

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

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂		K	MAG/MSG (dB)
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		
0.1	0.604	-90.6	29.779	132.5	0.030	54.5	0.674	-52.0	0.286	30.02
0.2	0.594	-129.7	18.706	111.9	0.039	47.9	0.431	-78.3	0.472	26.82
0.3	0.587	-149.6	13.156	101.8	0.046	48.2	0.315	-94.2	0.638	24.61
0.4	0.589	-161.3	10.043	95.2	0.052	49.5	0.255	-107.4	0.758	22.88
0.5	0.590	-169.2	8.131	90.0	0.058	51.4	0.220	-118.0	0.850	21.50
0.6	0.592	-175.4	6.789	86.2	0.064	53.4	0.202	-128.3	0.919	20.24
0.7	0.597	-179.5	5.830	82.9	0.071	54.6	0.193	-136.0	0.967	19.17
0.8	0.603	-174.8	5.103	79.9	0.077	55.5	0.191	-143.6	1.004	17.82
0.9	0.610	-171.2	4.515	77.2	0.084	56.3	0.191	-148.8	1.028	16.27
1.0	0.614	-168.1	4.060	74.7	0.091	56.8	0.195	-153.6	1.049	15.13
1.1	0.620	-165.0	3.677	72.2	0.098	57.1	0.200	-156.6	1.065	14.19
1.2	0.627	-162.1	3.365	70.1	0.105	57.3	0.205	-159.4	1.074	13.41
1.3	0.632	-160.0	3.105	67.8	0.112	57.5	0.209	-161.3	1.080	12.72
1.4	0.636	-157.7	2.883	65.7	0.119	57.3	0.214	-163.3	1.088	12.05
1.5	0.642	-155.7	2.690	63.6	0.125	57.3	0.217	-164.4	1.089	11.50
1.6	0.644	-153.7	2.527	61.6	0.132	57.0	0.221	-166.1	1.095	10.94
1.7	0.648	-152.1	2.374	59.7	0.139	56.8	0.223	-166.6	1.097	10.44
1.8	0.650	-150.4	2.246	57.7	0.145	56.6	0.225	-168.4	1.101	9.95
1.9	0.649	-148.6	2.130	55.8	0.152	56.1	0.227	-168.7	1.107	9.47
2.0	0.655	-147.0	2.033	53.9	0.159	55.7	0.227	-170.4	1.102	9.13
2.1	0.654	-145.5	1.950	52.3	0.166	55.2	0.228	-171.2	1.104	8.74
2.2	0.653	-143.7	1.870	50.6	0.173	54.5	0.228	-173.0	1.108	8.35
2.3	0.656	-142.3	1.789	49.1	0.180	53.8	0.230	-173.8	1.104	8.01
2.4	0.659	-140.4	1.730	47.3	0.187	53.1	0.230	-175.5	1.098	7.75
2.5	0.660	-138.8	1.667	45.6	0.195	52.5	0.232	-176.6	1.094	7.45
2.6	0.660	-137.1	1.609	44.1	0.201	51.7	0.234	-178.6	1.100	7.11
2.7	0.660	-135.3	1.551	42.3	0.208	50.8	0.238	-180.0	1.103	6.77
2.8	0.659	-133.5	1.496	41.0	0.214	49.7	0.242	-178.5	1.113	6.40
2.9	0.649	-131.3	1.432	38.8	0.222	48.0	0.248	-177.6	1.133	5.88
3.0	0.644	-128.5	1.383	36.8	0.230	47.1	0.251	-176.0	1.144	5.49
4.0	0.686	-117.0	1.085	22.3	0.275	40.9	0.330	-164.8	1.116	3.88
5.0	0.716	-99.2	0.853	9.3	0.325	28.2	0.397	-155.2	1.106	2.21

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

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂		K	MAG/MSG (dB)
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		
0.1	0.979	-18.5	3.473	167.8	0.037	77.8	0.993	-5.8	0.067	19.77
0.2	0.959	-35.7	3.322	156.0	0.071	69.5	0.962	-12.0	0.080	16.69
0.3	0.914	-53.4	3.132	144.2	0.101	60.1	0.921	-17.2	0.126	14.93
0.4	0.877	-69.0	2.916	133.2	0.125	51.6	0.872	-22.1	0.179	13.70
0.5	0.849	-83.3	2.719	124.1	0.143	44.3	0.828	-26.0	0.214	12.81
0.6	0.813	-96.7	2.499	115.1	0.155	37.8	0.778	-29.3	0.269	12.07
0.7	0.785	-108.6	2.294	107.6	0.164	32.1	0.739	-32.3	0.312	11.47
0.8	0.763	-119.1	2.105	100.7	0.168	27.3	0.701	-35.1	0.364	10.98
0.9	0.747	-128.7	1.933	94.3	0.171	23.2	0.674	-37.7	0.409	10.53
1.0	0.734	-137.3	1.792	88.5	0.171	19.8	0.649	-40.2	0.460	10.20
1.1	0.725	-145.0	1.665	83.2	0.170	16.6	0.630	-42.8	0.507	9.90
1.2	0.724	-152.0	1.540	78.3	0.168	14.1	0.615	-45.1	0.553	9.63
1.3	0.722	-158.2	1.440	74.1	0.165	11.8	0.605	-47.7	0.596	9.41
1.4	0.721	-163.7	1.348	69.7	0.161	10.1	0.595	-50.2	0.650	9.22
1.5	0.722	-168.6	1.268	65.7	0.157	8.9	0.591	-52.5	0.699	9.08
1.6	0.723	-173.0	1.197	61.9	0.152	7.9	0.584	-55.1	0.759	8.96
1.7	0.728	-177.0	1.128	58.8	0.147	7.3	0.584	-57.4	0.802	8.84
1.8	0.728	-179.3	1.068	55.3	0.142	7.2	0.581	-59.8	0.877	8.78
1.9	0.726	-175.6	1.016	52.4	0.137	7.5	0.583	-62.2	0.943	8.71
2.0	0.732	-172.5	0.969	49.2	0.131	8.4	0.579	-64.3	1.007	8.17
2.1	0.734	-169.2	0.936	47.1	0.127	9.8	0.583	-66.6	1.045	7.39
2.2	0.733	-166.5	0.891	44.7	0.122	11.3	0.580	-68.9	1.153	6.26
2.3	0.735	-163.3	0.857	42.6	0.118	13.2	0.582	-71.2	1.206	5.86
2.4	0.739	-160.5	0.827	40.2	0.115	15.6	0.578	-73.5	1.268	5.46
2.5	0.741	-157.6	0.796	38.1	0.113	18.7	0.580	-76.1	1.324	5.08
2.6	0.743	-154.9	0.769	36.4	0.110	21.7	0.580	-78.8	1.392	4.72
2.7	0.742	-152.1	0.740	34.2	0.110	25.4	0.579	-81.4	1.458	4.27
2.8	0.742	-149.3	0.709	32.8	0.111	28.8	0.578	-83.9	1.523	3.80
2.9	0.732	-146.0	0.677	30.5	0.114	31.8	0.572	-86.7	1.644	3.04
3.0	0.725	-142.5	0.653	28.1	0.119	35.6	0.568	-90.2	1.704	2.51
4.0	0.758	-124.4	0.511	16.1	0.184	52.1	0.587	-122.6	1.354	0.89
5.0	0.768	-101.7	0.421	12.0	0.286	41.6	0.624	-153.2	1.226	-1.18

V_{CE} = 2 V, I_c = 3 mA, Z_o = 50 Ω

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂		K	MAG/MSG (dB)
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		
0.1	0.923	-26.4	8.742	163.2	0.037	76.3	0.968	-11.8	0.054	23.78
0.2	0.881	-50.3	7.981	147.8	0.065	63.7	0.889	-22.5	0.111	20.87
0.3	0.813	-72.5	7.075	134.4	0.087	53.5	0.796	-30.8	0.175	19.09
0.4	0.753	-90.5	6.189	123.0	0.102	45.7	0.704	-37.3	0.252	17.82
0.5	0.719	-106.0	5.482	114.1	0.112	39.6	0.627	-41.9	0.308	16.91
0.6	0.685	-119.4	4.820	106.4	0.118	35.5	0.560	-45.6	0.375	16.12
0.7	0.663	-130.5	4.287	100.1	0.122	32.1	0.508	-48.4	0.437	15.47
0.8	0.648	-140.4	3.833	94.7	0.124	29.9	0.465	-51.0	0.500	14.91
0.9	0.638	-148.6	3.452	89.6	0.126	28.1	0.433	-53.4	0.560	14.38
1.0	0.634	-155.9	3.146	85.1	0.126	27.1	0.406	-55.7	0.618	13.96
1.1	0.631	-162.6	2.886	81.1	0.127	26.3	0.387	-58.0	0.675	13.56
1.2	0.632	-168.3	2.648	77.3	0.127	26.0	0.371	-60.2	0.730	13.18
1.3	0.635	-173.2	2.456	73.9	0.127	25.9	0.361	-62.5	0.778	12.85
1.4	0.638	-177.5	2.290	70.6	0.128	25.0	0.351	-64.7	0.826	12.53
1.5	0.639	178.6	2.140	67.4	0.128	26.5	0.347	-66.8	0.878	12.24
1.6	0.643	175.2	2.016	64.5	0.128	27.1	0.340	-68.9	0.918	11.96
1.7	0.647	171.9	1.893	61.7	0.129	27.9	0.341	-70.9	0.960	11.67
1.8	0.649	169.2	1.791	59.0	0.129	28.9	0.336	-72.7	1.009	10.85
1.9	0.650	166.1	1.699	56.5	0.130	29.8	0.338	-74.6	1.049	9.80
2.0	0.655	163.7	1.619	53.8	0.131	31.2	0.334	-76.3	1.080	9.19
2.1	0.655	161.0	1.557	51.9	0.133	32.6	0.337	-78.2	1.108	8.69
2.2	0.656	158.8	1.489	49.7	0.135	33.6	0.334	-80.1	1.143	8.14
2.3	0.658	156.3	1.430	47.7	0.137	34.9	0.337	-81.9	1.160	7.76
2.4	0.662	153.9	1.377	45.5	0.140	35.9	0.334	-83.9	1.173	7.40
2.5	0.665	151.5	1.329	43.6	0.143	37.2	0.335	-86.0	1.180	7.10
2.6	0.666	149.1	1.279	41.8	0.146	38.3	0.334	-88.2	1.207	6.68
2.7	0.667	147.0	1.236	39.7	0.150	39.1	0.334	-90.8	1.217	6.35
2.8	0.668	144.5	1.185	38.1	0.154	39.8	0.334	-93.1	1.240	5.91
2.9	0.657	141.6	1.135	35.6	0.160	39.8	0.332	-96.1	1.291	5.26
3.0	0.651	138.5	1.096	33.1	0.167	40.6	0.331	-99.2	1.318	4.79
4.0	0.699	123.2	0.858	17.3	0.217	44.4	0.372	-131.4	1.188	3.35
5.0	0.730	102.5	0.660	4.6	0.289	35.2	0.446	-158.8	1.110	1.56

V_{CE} = 2 V, I_c = 5 mA, Z_o = 50 Ω

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂		K	MAG/MSG (dB)
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		
0.1	0.884	-32.2	12.773	159.4	0.033	73.9	0.946	-16.4	0.066	25.84
0.2	0.817	-61.2	11.148	141.8	0.061	60.3	0.826	-30.2	0.147	22.64
0.3	0.735	-85.5	9.420	127.8	0.078	49.9	0.704	-40.1	0.240	20.84
0.4	0.682	-104.3	7.946	116.8	0.088	43.8	0.596	-47.2	0.324	19.55
0.5	0.654	-119.4	6.846	108.4	0.095	39.4	0.514	-52.1	0.393	18.58
0.6	0.628	-132.2	5.914	101.6	0.099	36.6	0.447	-56.1	0.472	17.74
0.7	0.614	-142.6	5.188	96.0	0.103	34.8	0.397	-59.2	0.543	17.03
0.8	0.603	-151.5	4.596	91.3	0.105	33.8	0.356	-62.1	0.616	16.41
0.9	0.600	-158.8	4.108	86.9	0.108	33.3	0.327	-64.9	0.677	15.80
1.0	0.600	-165.2	3.733	83.0	0.110	33.5	0.303	-67.7	0.736	15.32
1.1	0.599	-171.0	3.410	79.4	0.112	33.5	0.286	-70.4	0.792	14.84
1.2	0.604	-176.2	3.123	76.1	0.114	33.9	0.272	-73.0	0.839	14.37
1.3	0.609	179.6	2.891	73.1	0.116	34.4	0.264	-75.7	0.878	13.95
1.4	0.612	176.0	2.690	70.2	0.119	35.1	0.256	-78.2	0.922	13.56
1.5	0.615	172.6	2.512	67.4	0.121	35.8	0.252	-80.3	0.958	13.18
1.6	0.618	169.5	2.361	64.7	0.124	36.6	0.247	-82.7	0.993	12.81
1.7	0.624	166.8	2.217	62.3	0.126	37.3	0.247	-84.5	1.017	11.64
1.8	0.624	164.2	2.098	59.7	0.129	38.3	0.243	-86.5	1.052	10.71
1.9	0.625	161.7	1.989	57.6	0.132	39.0	0.245	-87.9	1.078	10.07
2.0	0.628	159.3	1.894	55.1	0.135	39.9	0.242	-89.7	1.102	9.51
2.1	0.635	157.0	1.818	53.3	0.139	40.8	0.244	-91.4	1.101	9.22
2.2	0.634	155.0	1.741	51.3	0.143	41.3	0.241	-93.1	1.126	8.70
2.3	0.637	152.7	1.672	49.5	0.147	42.0	0.243	-94.7	1.130	8.36
2.4	0.637	150.6	1.610	47.2	0.152	42.3	0.241	-96.6	1.142	7.97
2.5	0.640	148.6	1.552	45.4	0.157	43.0	0.242	-98.7	1.142	7.67
2.6	0.643	146.3	1.496	43.6	0.161	43.3	0.241	-100.8	1.152	7.31
2.7	0.643	144.2	1.442	41.8	0.166	43.5	0.241	-103.4	1.165	6.93
2.8	0.642	141.9	1.388	40.3	0.171	43.5	0.241	-105.8	1.182	6.51
2.9	0.634	139.2	1.328	37.7	0.178	42.9	0.242	-109.0	1.213	5.95
3.0	0.626	136.4	1.282	35.4	0.185	42.9	0.243	-112.1	1.236	5.48
4.0	0.678	122.1	1.005	19.4	0.232	43.0	0.298	-143.6	1.151	4.01
5.0	0.714	102.5	0.776	5.7	0.295	33.1	0.379	-167.1	1.095	2.33

V_{CE} = 2 V, I_c = 7 mA, Z_o = 50 Ω

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂		K	MAG/MSG (dB)
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		
0.1	0.841	-38.1	15.815	156.7	0.034	68.6	0.925	-19.9	0.131	26.68
0.2	0.770	-68.5	13.281	137.6	0.057	57.5	0.778	-35.8	0.190	23.68
0.3	0.692	-94.2	10.864	123.6	0.071	48.9	0.641	-46.5	0.282	21.84
0.4	0.641	-113.0	8.964	113.1	0.080	43.2	0.530	-54.2	0.381	20.51
0.5	0.619	-127.6	7.608	105.3	0.086	40.1	0.448	-59.3	0.458	19.48
0.6	0.598	-139.6	6.522	98.8	0.090	38.6	0.383	-63.9	0.544	18.62
0.7	0.588	-149.5	5.686	93.7	0.093	37.6	0.336	-67.4	0.620	17.86
0.8	0.583	-157.7	5.030	89.4	0.097	37.3	0.299	-71.2	0.688	17.16
0.9	0.583	-164.4	4.483	85.3	0.100	37.5	0.273	-74.5	0.748	16.52
1.0	0.584	-170.4	4.049	81.7	0.103	38.1	0.251	-78.0	0.805	15.95
1.1	0.585	-175.7	3.698	78.5	0.106	38.6	0.237	-81.4	0.853	15.42
1.2	0.589	179.7	3.381	75.5	0.110	39.1	0.225	-84.6	0.896	14.89
1.3	0.595	175.9	3.129	72.7	0.113	39.8	0.218	-87.6	0.931	14.44
1.4	0.597	172.3	2.911	69.9	0.116	40.4	0.212	-90.6	0.966	13.98
1.5	0.604	169.3	2.715	67.3	0.120	41.2	0.209	-92.9	0.991	13.56
1.6	0.607	166.5	2.552	64.8	0.123	41.8	0.205	-95.6	1.015	12.39
1.7	0.611	163.9	2.395	62.6	0.127	42.4	0.206	-97.3	1.037	11.57
1.8	0.614	161.5	2.267	60.2	0.131	43.2	0.202	-99.5	1.060	10.88
1.9	0.614	159.1	2.150	58.1	0.136	43.6	0.205	-100.8	1.079	10.29
2.0	0.616	157.1	2.047	55.7	0.140	44.2	0.201	-102.7	1.097	9.76
2.1	0.621	155.0	1.965	53.9	0.145	44.8	0.203	-104.1	1.094	9.47
2.2	0.620	153.0	1.882	52.1	0.149	45.0	0.200	-106.0	1.113	8.96
2.3	0.624	150.9	1.804	50.3	0.154	45.2	0.202	-107.3	1.114	8.62
2.4	0.625	148.6	1.740	48.3	0.160	45.3	0.199	-109.3	1.120	8.26
2.5	0.628	146.5	1.676	46.4	0.165	45.6	0.201	-111.3	1.120	7.96
2.6	0.630	144.7	1.617	44.8	0.170	45.6	0.200	-113.4	1.124	7.64
2.7	0.630	142.7	1.557	42.9	0.176	45.4	0.201	-116.1	1.135	7.24
2.8	0.630	140.4	1.502	41.2	0.181	45.0	0.201	-118.6	1.148	6.86
2.9	0.620	138.0	1.434	38.9	0.188	44.1	0.204	-121.8	1.177	6.27
3.0	0.614	135.1	1.385	36.7	0.195	43.9	0.205	-124.7	1.198	5.83
4.0	0.668	121.4	1.086	21.0	0.242	42.2	0.269	-154.2	1.130	4.34
5.0	0.704	102.3	0.841	7.0	0.299	31.7	0.352	-174.3	1.093	2.63

V_{CE} = 2 V, I_c = 10 mA, Z_o = 50 Ω

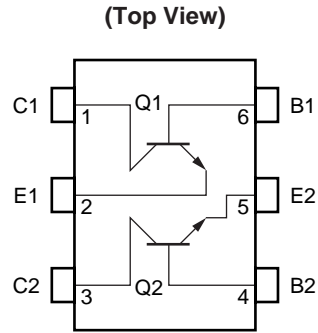
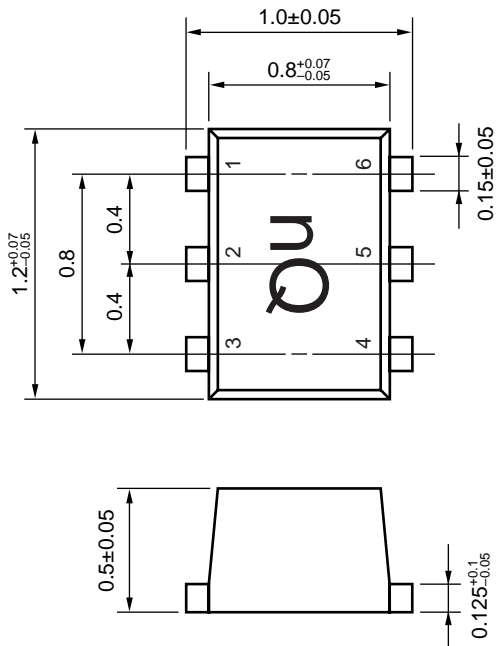
Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂		K	MAG/MSG (dB)
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		
0.1	0.792	-43.7	19.358	153.1	0.032	68.6	0.894	-24.2	0.134	27.78
0.2	0.720	-78.0	15.514	133.0	0.053	55.6	0.720	-42.1	0.225	24.70
0.3	0.642	-104.1	12.302	119.1	0.064	47.7	0.571	-53.6	0.346	22.82
0.4	0.606	-122.4	9.911	109.3	0.071	43.7	0.461	-61.8	0.448	21.42
0.5	0.588	-136.0	8.295	102.0	0.077	41.7	0.384	-67.5	0.537	20.34
0.6	0.573	-147.4	7.048	96.2	0.081	41.5	0.325	-72.8	0.626	19.40
0.7	0.567	-156.5	6.125	91.5	0.085	41.2	0.283	-77.1	0.700	18.57
0.8	0.566	-164.0	5.393	87.5	0.089	41.7	0.250	-82.0	0.768	17.84
0.9	0.565	-169.9	4.799	83.8	0.093	42.2	0.228	-86.3	0.825	17.11
1.0	0.570	-175.3	4.332	80.6	0.097	43.0	0.211	-90.8	0.872	16.49
1.1	0.572	179.8	3.941	77.6	0.102	43.7	0.200	-95.0	0.914	15.89
1.2	0.579	175.6	3.608	74.8	0.106	44.2	0.191	-99.1	0.947	15.32
1.3	0.586	172.1	3.333	72.1	0.110	45.0	0.187	-102.5	0.972	14.80
1.4	0.590	169.0	3.099	69.6	0.115	45.5	0.183	-106.0	0.996	14.31
1.5	0.592	166.1	2.893	67.2	0.119	46.1	0.182	-108.4	1.020	12.97
1.6	0.597	163.5	2.718	64.9	0.124	46.6	0.180	-111.5	1.037	12.23
1.7	0.600	161.2	2.550	62.7	0.129	47.0	0.181	-113.1	1.053	11.55
1.8	0.604	159.0	2.412	60.5	0.134	47.6	0.178	-115.6	1.068	10.97
1.9	0.604	156.6	2.287	58.4	0.139	47.7	0.180	-116.7	1.081	10.42
2.0	0.607	154.5	2.179	56.1	0.144	48.0	0.177	-118.6	1.092	9.95
2.1	0.610	153.0	2.090	54.6	0.149	48.3	0.178	-119.9	1.092	9.61
2.2	0.610	150.9	2.002	52.7	0.155	48.2	0.176	-121.9	1.103	9.16
2.3	0.614	149.0	1.919	51.0	0.161	48.1	0.178	-123.2	1.101	8.84
2.4	0.613	146.9	1.851	49.0	0.167	47.9	0.176	-125.2	1.107	8.47
2.5	0.618	145.0	1.781	47.3	0.173	47.8	0.177	-127.1	1.102	8.19
2.6	0.621	143.2	1.717	45.6	0.178	47.6	0.176	-129.2	1.106	7.86
2.7	0.619	141.1	1.657	43.7	0.184	47.3	0.178	-132.0	1.117	7.47
2.8	0.618	138.8	1.592	42.2	0.189	46.6	0.180	-134.4	1.132	7.04
2.9	0.610	136.7	1.521	40.0	0.197	45.5	0.184	-137.3	1.153	6.50
3.0	0.603	133.8	1.471	37.9	0.204	45.0	0.186	-140.1	1.171	6.07
4.0	0.658	120.7	1.154	22.5	0.250	41.8	0.258	-165.5	1.117	4.56
5.0	0.695	102.2	0.898	8.3	0.304	30.7	0.339	177.8	1.089	2.88

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

Frequency (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂		K	MAG/MSG (dB)
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)		
0.1	0.696	-58.8	26.734	145.0	0.030	62.3	0.816	-34.0	0.223	29.50
0.2	0.621	-98.8	19.291	123.6	0.043	51.4	0.592	-55.5	0.340	26.49
0.3	0.574	-124.2	14.365	111.1	0.052	47.9	0.442	-68.2	0.484	24.45
0.4	0.554	-140.9	11.256	102.6	0.058	47.1	0.347	-77.6	0.603	22.91
0.5	0.551	-152.0	9.232	96.4	0.063	47.4	0.284	-84.8	0.696	21.67
0.6	0.545	-161.3	7.772	91.7	0.068	48.4	0.240	-92.5	0.781	20.56
0.7	0.546	-168.2	6.696	87.8	0.073	49.2	0.211	-98.9	0.845	19.60
0.8	0.550	-174.4	5.880	84.5	0.079	50.3	0.191	-106.3	0.896	18.72
0.9	0.555	-179.4	5.213	81.3	0.085	51.1	0.179	-112.3	0.935	17.88
1.0	0.562	-176.4	4.692	78.5	0.091	52.0	0.171	-118.6	0.965	17.14
1.1	0.565	-172.3	4.269	75.9	0.096	52.4	0.169	-123.5	0.992	16.47
1.2	0.572	-168.8	3.896	73.4	0.102	52.9	0.167	-128.4	1.013	15.12
1.3	0.580	-166.0	3.597	71.0	0.108	53.3	0.168	-131.8	1.024	14.27
1.4	0.582	-163.2	3.343	68.8	0.114	53.5	0.169	-135.3	1.039	13.45
1.5	0.588	-160.6	3.114	66.6	0.120	53.8	0.170	-137.4	1.050	12.77
1.6	0.592	-158.7	2.929	64.4	0.126	53.8	0.171	-140.3	1.055	12.22
1.7	0.596	-156.5	2.748	62.5	0.132	53.9	0.173	-141.4	1.063	11.65
1.8	0.596	-154.7	2.597	60.4	0.138	53.8	0.173	-144.1	1.076	11.06
1.9	0.599	-152.8	2.464	58.6	0.144	53.5	0.175	-144.7	1.078	10.63
2.0	0.603	-151.0	2.347	56.4	0.150	53.5	0.173	-146.9	1.080	10.22
2.1	0.604	-149.2	2.249	54.9	0.156	53.2	0.174	-147.9	1.082	9.83
2.2	0.602	-147.7	2.157	53.3	0.163	52.8	0.173	-150.0	1.089	9.40
2.3	0.608	-145.8	2.065	51.6	0.170	52.3	0.174	-151.0	1.083	9.10
2.4	0.607	-143.8	1.992	49.7	0.176	51.8	0.173	-153.1	1.085	8.75
2.5	0.612	-142.2	1.917	48.1	0.183	51.3	0.175	-154.7	1.080	8.48
2.6	0.609	-140.5	1.848	46.5	0.189	50.7	0.175	-157.1	1.091	8.07
2.7	0.612	-138.6	1.781	44.8	0.195	50.1	0.178	-159.0	1.093	7.75
2.8	0.611	-136.6	1.717	43.3	0.201	49.1	0.181	-161.2	1.100	7.39
2.9	0.602	-134.3	1.640	41.1	0.209	47.6	0.187	-162.9	1.120	6.83
3.0	0.595	-131.5	1.582	39.1	0.216	46.8	0.190	-165.1	1.136	6.40
4.0	0.648	-119.5	1.239	24.3	0.262	41.8	0.267	-177.6	1.100	4.82
5.0	0.687	-101.4	0.965	10.3	0.312	29.7	0.341	-165.7	1.085	3.13

PACKAGE DIMENSIONS

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



PIN CONNECTIONS

- 1. Collector (Q1)
- 2. Emitter (Q1)
- 3. Collector (Q2)
- 4. Base (Q2)
- 5. Emitter (Q2)
- 6. Base (Q1)

[MEMO]

- **The information in this document is current as of June, 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).