



SANYO Semiconductors

DATA SHEET

NPN Epitaxial Planar Silicon Transistor

55GN01F — UHF Wide-band Low-noise Amplifier Applications

Features

- High cut-off frequency : $f_T = 5.5\text{GHz}$ typ.
- High gain : $|S_{21e}|^2 = 11\text{dB}$ typ ($f = 1\text{GHz}$).
=19dB typ ($f = 400\text{MHz}$).
- Ultrasmall package permitting applied sets to be small and slim.

Specifications

Absolute Maximum Ratings at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Collector-to-Base Voltage	V_{CB0}		20	V
Collector-to-Emitter Voltage	V_{CEO}		10	V
Emitter-to-Base Voltage	V_{EB0}		3	V
Collector Current	I_C		70	mA
Collector Dissipation	P_C		250	mW
Junction Temperature	T_J		150	$^\circ\text{C}$
Storage Temperature	T_{stg}		-55 to +150	$^\circ\text{C}$

Electrical Characteristics at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Collector Cutoff Current	I_{CB0}	$V_{CB} = 10\text{V}, I_E = 0$			0.1	μA
Emitter Cutoff Current	I_{EB0}	$V_{EB} = 2\text{V}, I_C = 0$			1	μA
DC Current Gain	h_{FE}	$V_{CE} = 5\text{V}, I_C = 10\text{mA}$	100		160	
Gain-Bandwidth Product	f_T1	$V_{CE} = 3\text{V}, I_C = 5\text{mA}$	3.0	4.5		GHz
	f_T2	$V_{CE} = 5\text{V}, I_C = 20\text{mA}$		5.5		GHz
Output Capacitance	C_{ob}	$V_{CB} = 10\text{V}, f = 1\text{MHz}$		0.95	1.2	pF
Reverse Transfer Capacitance	C_{re}	$V_{CB} = 10\text{V}, f = 1\text{MHz}$		0.6		pF
Forward Transfer Gain	$ S_{21e} ^2 1$	$V_{CE} = 5\text{V}, I_C = 20\text{mA}, f = 1\text{GHz}$	8	11		dB
	$ S_{21e} ^2 2$	$V_{CE} = 5\text{V}, I_C = 20\text{mA}, f = 400\text{MHz}$	16	19		dB
Noise Figure	NF	$V_{CE} = 3\text{V}, I_C = 5\text{mA}, f = 1\text{GHz}, Z_S = Z_L = 50\Omega$		1.9		dB

Marking : ZD

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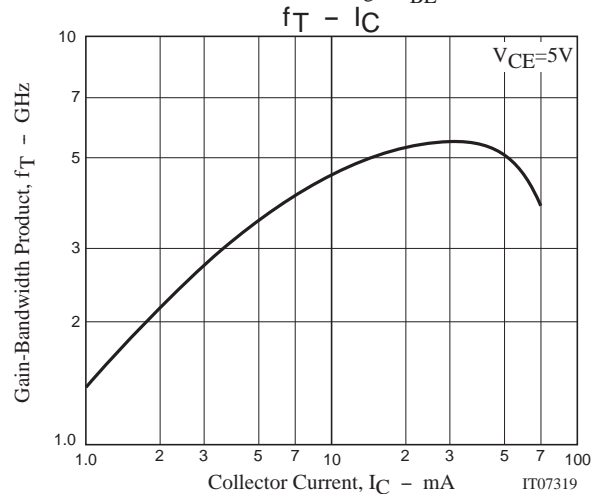
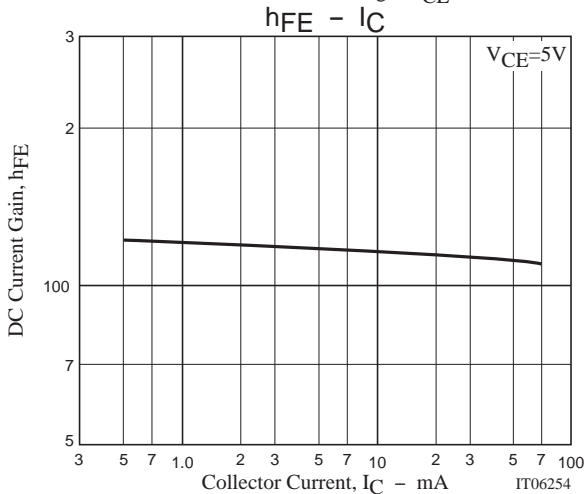
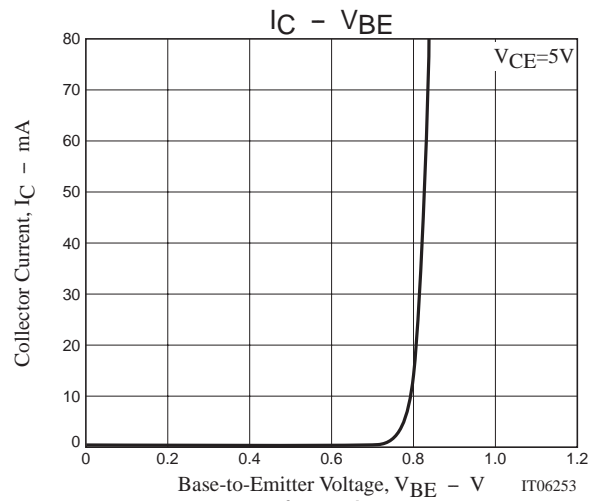
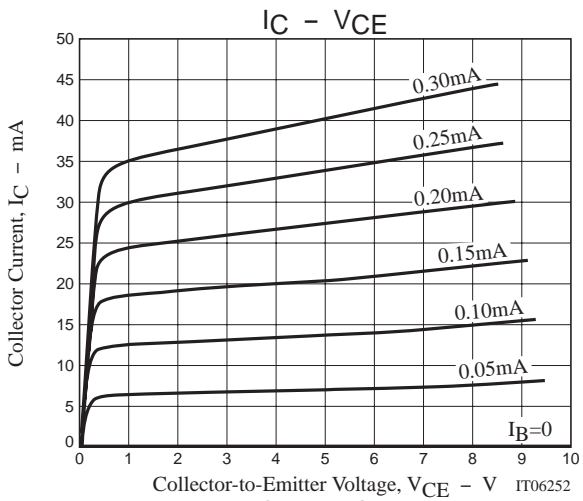
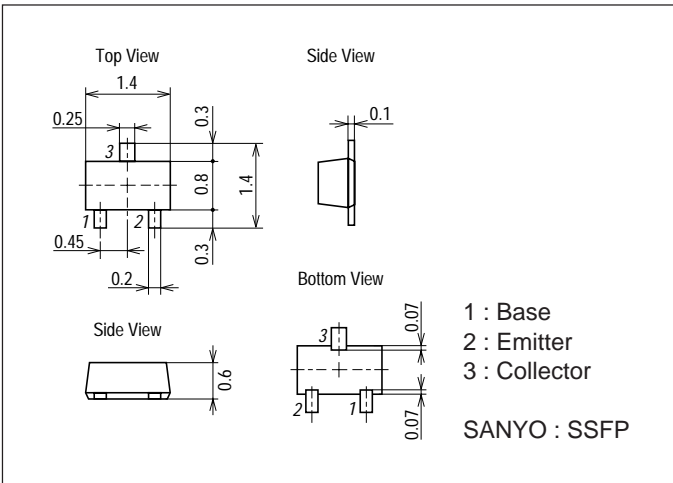
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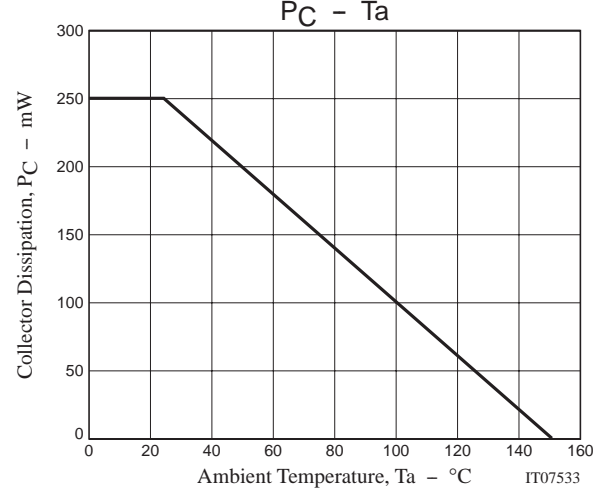
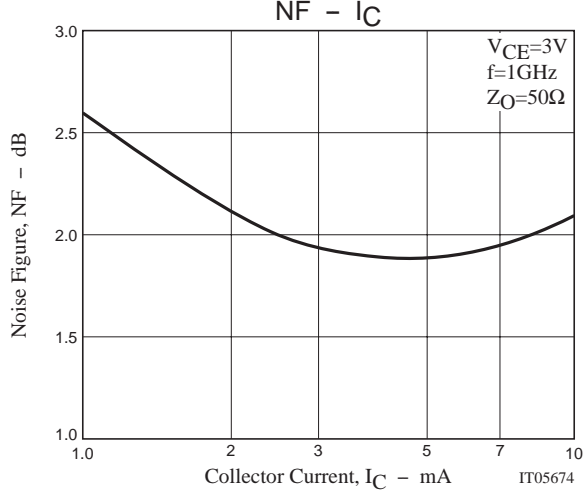
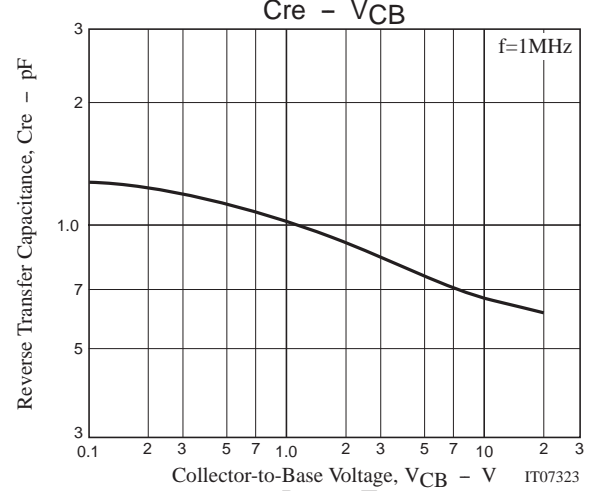
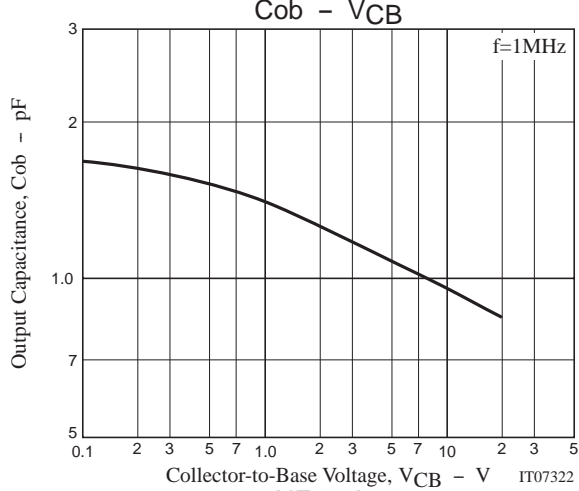
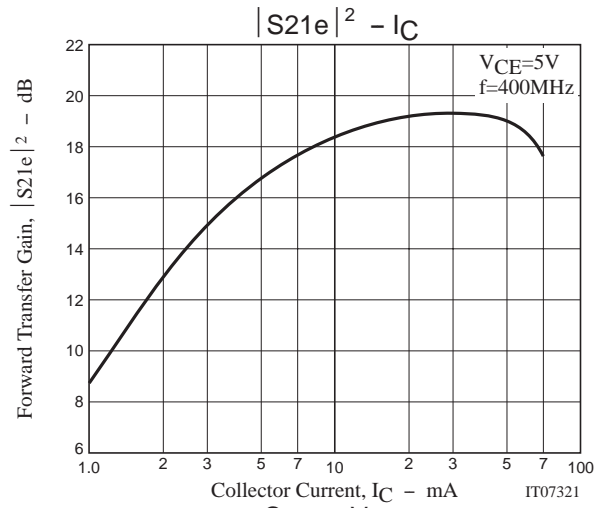
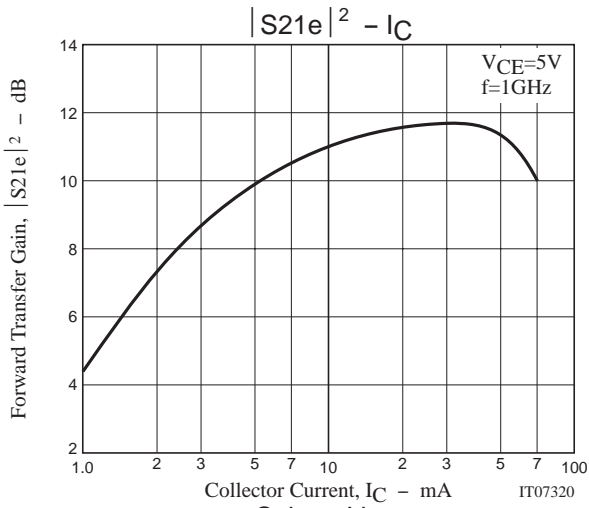
Package Dimensions

unit : mm

2159A



55GN01F



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S Parameters (Common emitter)

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

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.960	-21.33	3.404	164.99	0.046	77.57	0.986	-9.38
200	0.943	-40.21	3.215	151.43	0.085	64.91	0.938	-18.56
400	0.888	-72.87	2.700	128.23	0.139	46.91	0.838	-31.44
600	0.853	-97.36	2.288	110.64	0.167	34.66	0.757	-40.30
800	0.816	-115.67	1.926	96.26	0.179	26.17	0.706	-46.95
1000	0.788	-129.19	1.659	84.81	0.180	19.95	0.676	-52.20
1200	0.767	-140.35	1.451	74.89	0.174	16.50	0.664	-56.92
1400	0.749	-149.12	1.286	66.48	0.168	14.89	0.662	-61.86
1600	0.734	-156.38	1.162	59.19	0.160	14.19	0.668	-66.10
1800	0.719	-163.17	1.061	52.60	0.149	15.77	0.677	-70.98
2000	0.705	-169.31	0.977	46.28	0.141	19.10	0.683	-75.24
2200	0.694	-174.71	0.893	41.12	0.136	24.16	0.695	-79.81
2400	0.683	-179.60	0.825	36.38	0.135	30.74	0.705	-84.33
2600	0.675	-174.53	0.765	32.38	0.141	38.01	0.717	-88.85
2800	0.664	-169.68	0.709	29.26	0.149	45.42	0.729	-93.41
3000	0.653	-165.11	0.667	26.87	0.163	51.07	0.737	-97.77

$V_{CE}=5V, I_C=3mA, Z_O=50\Omega$

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.897	-35.17	8.858	157.25	0.044	71.22	0.940	-17.73
200	0.846	-64.07	7.795	138.86	0.073	55.30	0.816	-31.57
400	0.761	-104.22	5.532	114.15	0.100	39.30	0.626	-45.72
600	0.727	-127.47	4.177	99.10	0.110	33.80	0.530	-52.62
800	0.698	-142.65	3.306	87.99	0.115	31.00	0.483	-57.50
1000	0.681	-152.69	2.715	79.36	0.120	30.86	0.461	-61.55
1200	0.670	-160.54	2.308	72.11	0.121	33.53	0.456	-65.03
1400	0.656	-166.79	2.012	65.45	0.124	35.60	0.461	-69.34
1600	0.647	-172.10	1.793	59.66	0.130	38.30	0.468	-72.55
1800	0.635	-176.87	1.621	54.21	0.135	41.86	0.479	-76.57
2000	0.628	-178.54	1.481	48.73	0.144	45.68	0.490	-80.11
2200	0.616	-173.99	1.351	44.05	0.153	48.13	0.501	-83.71
2400	0.611	-169.80	1.246	39.67	0.167	50.77	0.518	-87.42
2600	0.601	-166.00	1.157	35.62	0.178	53.54	0.528	-91.49
2800	0.597	-162.06	1.079	32.28	0.196	55.92	0.543	-95.09
3000	0.588	-158.02	1.015	29.15	0.215	56.86	0.555	-98.59

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S Parameters (Common emitter)

$V_{CE}=5V, I_C=5mA, Z_O=50\Omega$

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.842	-46.44	13.174	151.15	0.040	64.28	0.891	-24.16
200	0.777	-81.34	10.723	130.44	0.062	50.01	0.716	-39.59
400	0.699	-121.57	6.861	106.89	0.080	39.73	0.508	-52.96
600	0.679	-141.39	4.942	94.02	0.089	37.45	0.424	-58.67
800	0.661	-153.84	3.830	84.43	0.096	38.27	0.390	-62.90
1000	0.648	-162.04	3.117	77.09	0.103	40.59	0.376	-66.27
1200	0.641	-168.02	2.643	70.51	0.111	43.94	0.374	-69.52
1400	0.629	-173.53	2.286	64.60	0.120	46.56	0.382	-73.45
1600	0.620	-177.70	2.039	59.33	0.130	48.48	0.390	-76.69
1800	0.610	177.97	1.841	54.24	0.139	50.63	0.400	-79.97
2000	0.603	173.76	1.676	49.26	0.153	53.08	0.413	-83.21
2200	0.594	169.87	1.528	44.84	0.167	53.92	0.426	-86.71
2400	0.588	166.14	1.413	40.43	0.181	55.16	0.441	-89.93
2600	0.580	162.49	1.313	36.57	0.195	56.19	0.453	-93.54
2800	0.576	158.82	1.231	33.47	0.213	57.85	0.466	-96.88
3000	0.565	155.09	1.156	30.12	0.232	57.84	0.481	-99.87

$V_{CE}=5V, I_C=10mA, Z_O=50\Omega$

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.739	-68.53	20.705	140.20	0.033	59.97	0.784	-35.06
200	0.678	-107.92	14.465	118.48	0.048	46.54	0.555	-51.65
400	0.639	-142.44	8.256	98.88	0.060	44.77	0.362	-62.32
600	0.636	-156.46	5.721	88.62	0.070	47.35	0.306	-66.66
800	0.628	-165.41	4.393	80.84	0.082	51.17	0.286	-70.68
1000	0.620	-171.30	3.549	74.44	0.094	53.84	0.280	-73.86
1200	0.615	-176.02	2.981	68.87	0.108	55.37	0.285	-76.55
1400	0.606	179.70	2.584	63.58	0.121	57.13	0.297	-80.44
1600	0.599	176.38	2.298	58.72	0.134	58.54	0.307	-83.02
1800	0.589	173.12	2.065	54.21	0.149	58.63	0.319	-86.36
2000	0.586	169.27	1.889	49.40	0.165	59.48	0.329	-88.76
2200	0.573	165.75	1.719	45.30	0.179	59.22	0.344	-91.59
2400	0.567	162.49	1.589	41.42	0.195	59.66	0.362	-94.36
2600	0.562	158.91	1.481	37.55	0.211	59.11	0.374	-97.29
2800	0.558	155.91	1.385	34.30	0.229	59.13	0.388	-100.28
3000	0.548	152.46	1.310	31.07	0.248	58.50	0.400	-102.49

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S Parameters (Common emitter)

$V_{CE}=5V, I_C=15mA, Z_O=50\Omega$

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.680	-83.50	24.897	133.56	0.029	56.21	0.704	-41.82
200	0.639	-122.13	16.056	112.77	0.040	47.85	0.468	-57.53
400	0.621	-151.34	8.769	95.48	0.052	50.10	0.300	-67.15
600	0.623	-162.54	6.015	86.49	0.064	53.63	0.258	-70.98
800	0.620	-170.29	4.606	79.25	0.079	57.27	0.244	-74.71
1000	0.611	-175.21	3.708	73.36	0.093	58.61	0.243	-78.49
1200	0.606	-179.14	3.121	67.87	0.107	60.22	0.249	-80.66
1400	0.599	176.96	2.697	63.02	0.122	61.45	0.262	-84.17
1600	0.593	174.14	2.394	58.44	0.138	61.14	0.275	-86.76
1800	0.584	170.85	2.158	54.02	0.153	61.15	0.287	-89.61
2000	0.577	167.75	1.973	49.36	0.168	61.74	0.298	-91.80
2200	0.569	164.22	1.790	45.54	0.184	61.18	0.314	-94.29
2400	0.564	160.80	1.659	41.46	0.201	60.23	0.330	-97.05
2600	0.556	157.53	1.542	37.83	0.216	60.12	0.342	-99.52
2800	0.552	154.68	1.446	34.40	0.234	59.34	0.352	-101.94
3000	0.543	151.47	1.361	31.44	0.253	58.86	0.366	-103.99

$V_{CE}=5V, I_C=20mA, Z_O=50\Omega$

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.641	-94.49	27.471	128.94	0.027	55.26	0.649	-46.11
200	0.620	-130.76	16.818	109.44	0.036	46.79	0.413	-61.30
400	0.615	-156.41	9.019	93.57	0.048	53.11	0.265	-70.11
600	0.619	-165.97	6.162	85.24	0.062	57.92	0.228	-73.77
800	0.615	-172.83	4.701	78.51	0.078	61.14	0.223	-77.54
1000	0.608	-177.23	3.787	72.80	0.092	61.33	0.223	-81.02
1200	0.605	179.19	3.189	67.44	0.108	63.68	0.231	-83.24
1400	0.597	175.70	2.755	62.79	0.123	63.07	0.245	-86.33
1600	0.590	172.88	2.442	58.12	0.138	62.89	0.255	-88.33
1800	0.581	169.98	2.201	53.81	0.156	63.03	0.272	-91.87
2000	0.578	166.61	2.013	49.41	0.172	62.58	0.281	-93.44
2200	0.567	163.21	1.834	45.29	0.187	61.81	0.298	-95.50
2400	0.564	160.39	1.691	41.48	0.204	61.15	0.311	-98.00
2600	0.556	157.07	1.572	37.96	0.218	61.01	0.326	-100.45
2800	0.552	153.99	1.478	34.76	0.239	59.99	0.337	-102.57
3000	0.544	151.04	1.389	31.49	0.256	58.80	0.349	-104.89

55GN01F

S Parameters (Common emitter)

$V_{CE}=5V, I_C=30mA, Z_O=50\Omega$

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.606	-108.75	29.954	123.54	0.022	52.56	0.574	-51.26
200	0.604	-140.73	17.448	105.68	0.031	50.23	0.355	-64.86
400	0.610	-161.95	9.185	91.52	0.044	57.91	0.229	-71.81
600	0.617	-169.73	6.244	83.80	0.061	62.49	0.202	-74.91
800	0.612	-175.60	4.752	77.41	0.077	64.49	0.201	-79.23
1000	0.608	-179.42	3.833	71.88	0.091	66.02	0.204	-82.01
1200	0.604	177.51	3.213	66.72	0.108	65.81	0.214	-84.26
1400	0.598	174.16	2.786	62.07	0.124	64.91	0.229	-87.74
1600	0.591	171.45	2.465	57.60	0.141	64.74	0.242	-89.81
1800	0.584	168.71	2.221	53.24	0.156	64.27	0.255	-92.03
2000	0.582	165.57	2.027	48.84	0.173	63.95	0.266	-93.76
2200	0.569	162.47	1.842	44.77	0.189	62.96	0.281	-96.01
2400	0.566	159.27	1.707	41.02	0.205	62.39	0.298	-98.15
2600	0.560	156.39	1.589	37.71	0.221	61.62	0.312	-100.74
2800	0.555	153.39	1.489	34.29	0.241	60.71	0.324	-103.01
3000	0.546	150.41	1.401	31.06	0.260	59.58	0.339	-104.84

$V_{CE}=5V, I_C=50mA, Z_O=50\Omega$

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.587	-124.93	30.667	118.01	0.020	53.81	0.493	-53.52
200	0.607	-151.01	17.135	101.95	0.027	56.26	0.302	-62.86
400	0.618	-167.42	8.863	89.36	0.042	61.87	0.204	-65.99
600	0.625	-173.36	6.015	82.09	0.057	67.05	0.188	-69.08
800	0.625	-178.39	4.579	75.84	0.073	68.51	0.192	-73.08
1000	0.621	178.24	3.676	70.38	0.090	67.50	0.200	-76.57
1200	0.617	175.49	3.102	65.41	0.106	67.96	0.213	-79.88
1400	0.611	172.50	2.675	60.74	0.123	67.75	0.228	-83.13
1600	0.605	170.02	2.371	56.11	0.138	67.29	0.245	-85.73
1800	0.598	167.32	2.131	51.76	0.155	65.91	0.261	-88.36
2000	0.594	164.43	1.944	47.33	0.173	65.72	0.273	-90.18
2200	0.587	161.08	1.771	43.20	0.189	64.76	0.291	-93.08
2400	0.582	158.20	1.636	39.59	0.204	63.82	0.308	-95.85
2600	0.575	155.22	1.517	36.00	0.222	63.08	0.325	-98.58
2800	0.571	151.88	1.420	32.74	0.241	62.62	0.341	-100.91
3000	0.564	149.04	1.345	29.50	0.259	61.30	0.351	-102.73

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