

**2SC5647**

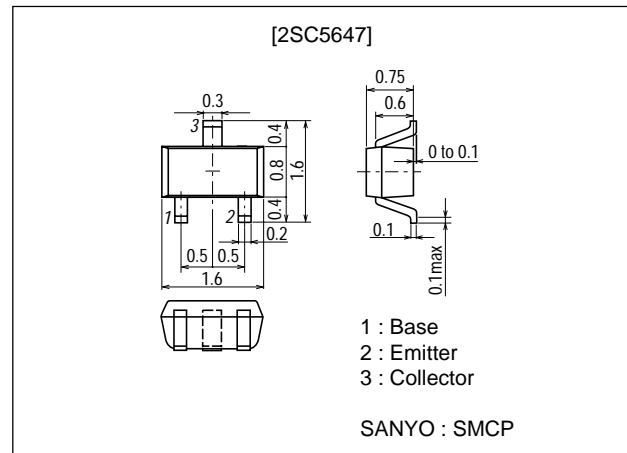
UHF to S Band Low-Noise Amplifier and OSC Applications

Features

- Low noise : NF=2.6dB typ (f=2GHz).
- High cutoff frequency : $f_T=9.0\text{GHz}$ typ ($V_{CE}=1\text{V}$).
- Low operating voltage.
- High gain : $|S_{21e}|^2=10.5\text{dB}$ typ (f=2GHz).

Package Dimensions

unit : mm
2106A



Specifications

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

Parameter	Symbol	Conditions	Ratings	Unit
Collector-to-Base Voltage	V_{CB0}		9	V
Collector-to-Emitter Voltage	V_{CE0}		4	V
Emitter-to-Base Voltage	V_{EB0}		2	V
Collector Current	I_C		20	mA
Collector Dissipation	P_C		80	mW
Junction Temperature	T_j		150	$^\circ\text{C}$
Storage Temperature	T_{stg}		-55 to +150	$^\circ\text{C}$

Marking : NH

Pay attention to handling since it is liable to be affected by static electricity due to the high-frequency process adopted.

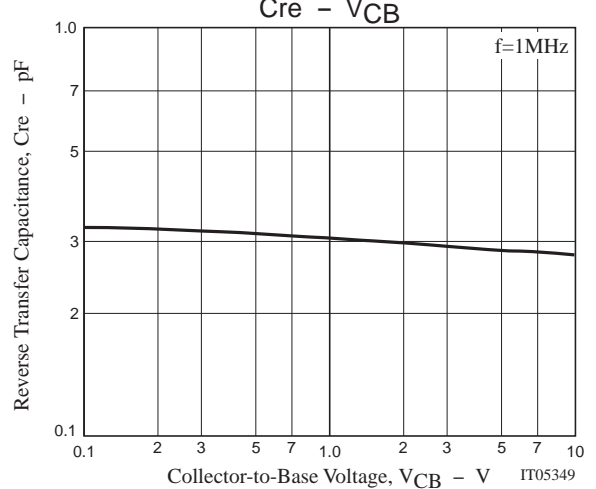
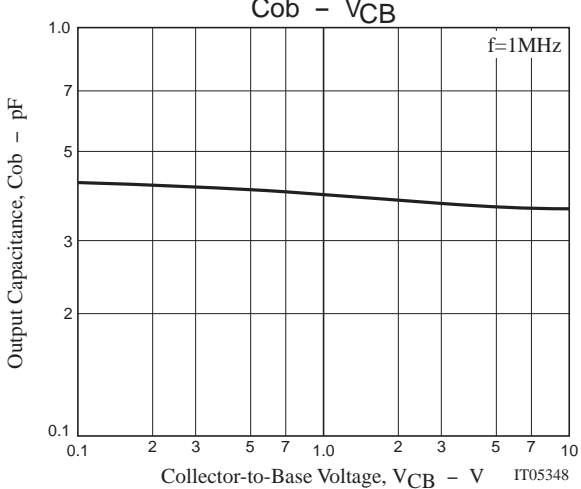
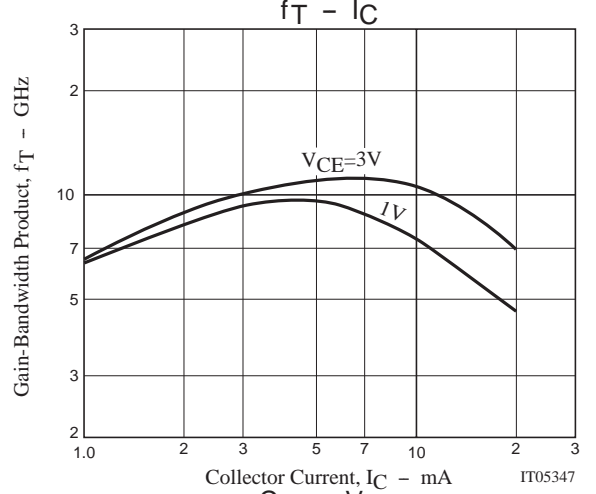
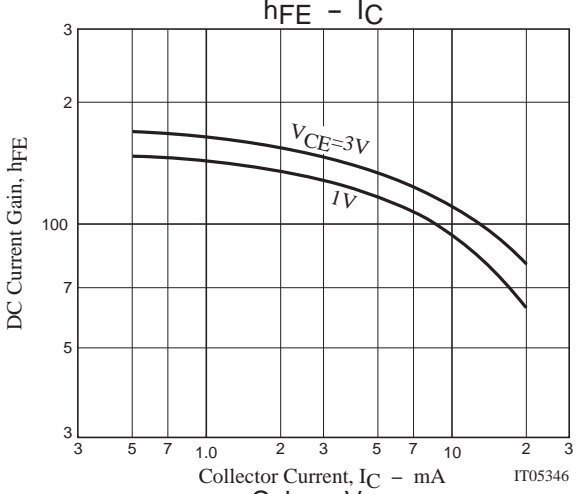
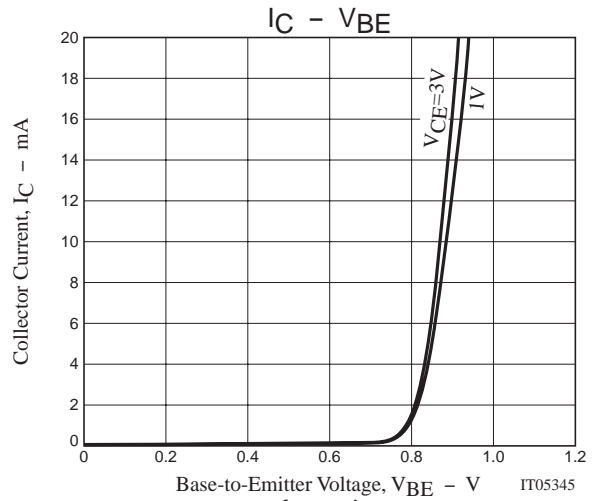
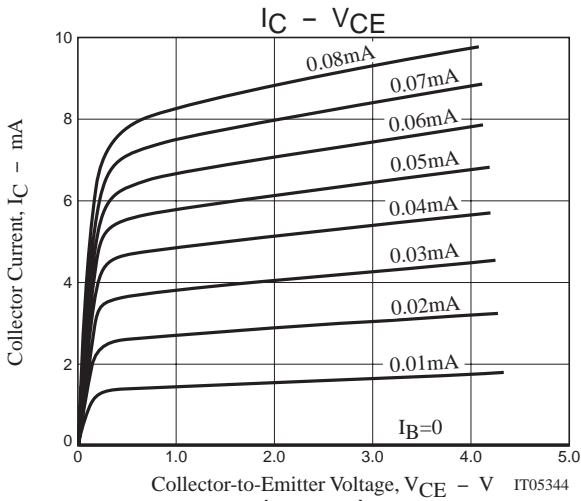
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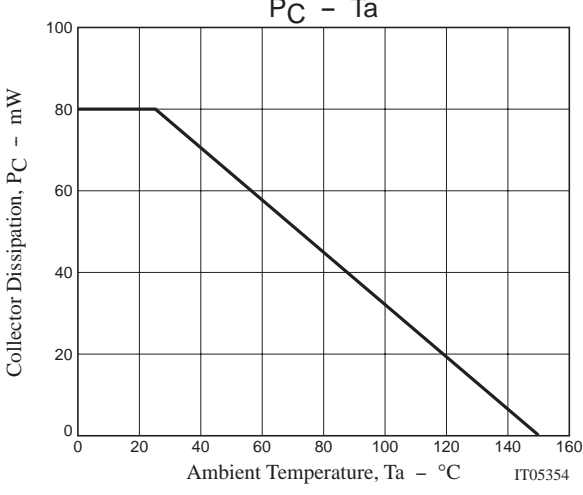
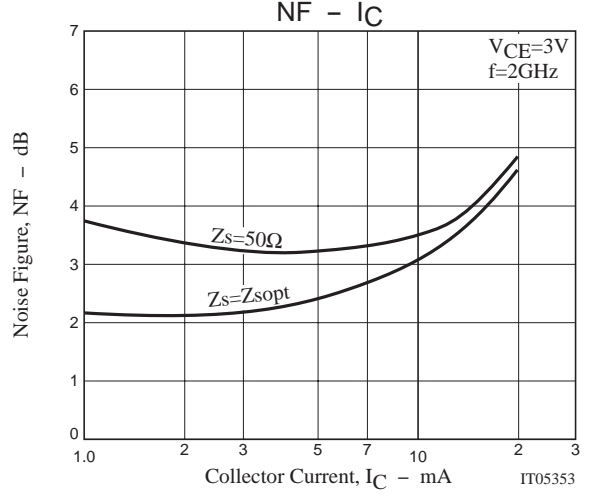
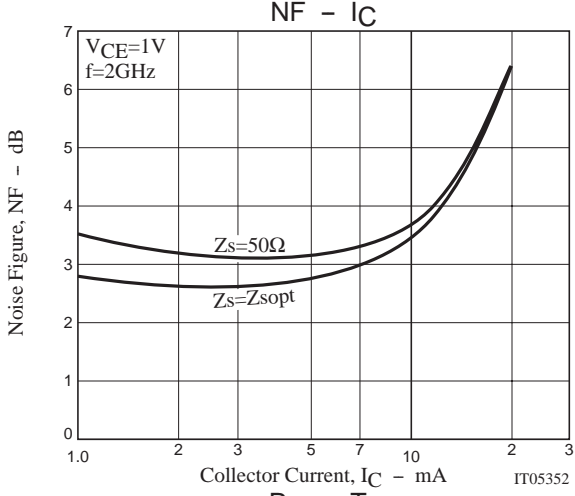
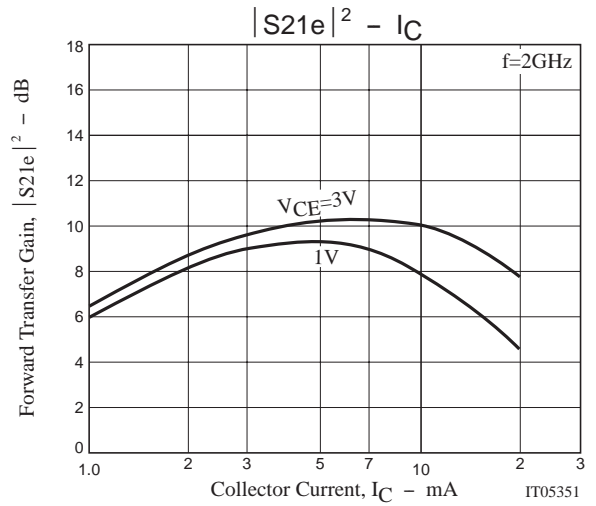
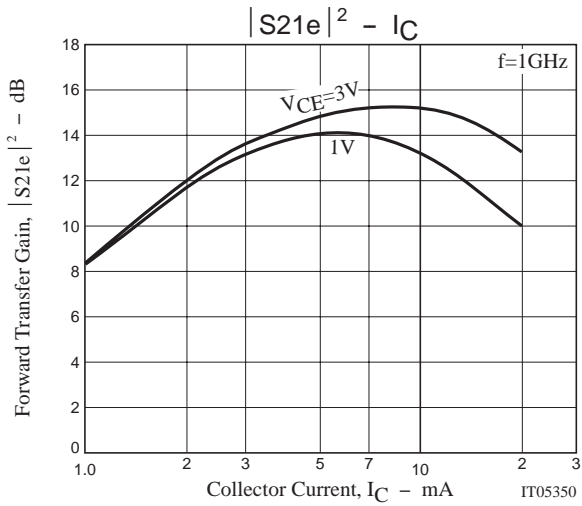
SANYO Electric Co., Ltd. Semiconductor Company

TOKYO OFFICE Tokyo Bldg., 1-10, 1 Chome, Ueno, Taito-ku, TOKYO, 110-8534 JAPAN

Electrical Characteristics at Ta=25°C

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Collector Cutoff Current	I_{CBO}	$V_{CB}=5V, I_E=0$			1.0	μA
Emitter Cutoff Current	I_{EBO}	$V_{EB}=1V, I_C=0$			10	μA
DC Current Gain	h_{FE}	$V_{CE}=1V, I_C=5mA$	100		160	
Gain-Bandwidth Product	f_T1	$V_{CE}=1V, I_C=3mA$	7.0	9.0		GHz
	f_T2	$V_{CE}=3V, I_C=7mA$	9.5	11.5		GHz
Output Capacitance	C_{ob}	$V_{CB}=1V, f=1MHz$		0.4	0.55	pF
Reverse Transfer Capacitance	C_{re}	$V_{CB}=1V, f=1MHz$		0.3	0.45	pF
Forward Transfer Gain	S21e 21	$V_{CE}=1V, I_C=3mA, f=2GHz$	7.5	9.0		dB
	S21e 22	$V_{CE}=3V, I_C=7mA, f=2GHz$	9.0	10.5		dB
Noise Figure	NF	$V_{CE}=1V, I_C=3mA, f=2GHz$		2.6	3.5	dB





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S Parameters (Common emitter)

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

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.980	-4.64	3.184	173.92	0.018	87.45	0.989	-4.46
200	0.974	-9.08	3.149	168.04	0.037	81.31	0.985	-8.99
400	0.949	-17.90	3.074	156.88	0.074	74.92	0.961	-17.49
600	0.917	-26.50	2.982	146.19	0.105	68.33	0.931	-25.63
800	0.874	-34.19	2.846	136.13	0.130	61.26	0.889	-33.18
1000	0.834	-41.52	2.747	126.87	0.156	56.36	0.856	-39.69
1200	0.784	-48.34	2.632	117.51	0.174	50.83	0.813	-46.38
1400	0.735	-54.62	2.485	108.66	0.189	47.33	0.779	-51.51
1600	0.683	-60.42	2.378	100.84	0.206	44.50	0.750	-56.53
1800	0.631	-65.27	2.266	93.32	0.218	41.44	0.720	-61.00
2000	0.585	-69.61	2.150	86.30	0.228	38.58	0.700	-65.27
2200	0.537	-73.62	2.060	78.96	0.237	36.67	0.668	-69.40
2400	0.499	-76.51	1.924	73.23	0.244	33.19	0.644	-71.98
2600	0.461	-79.94	1.874	68.11	0.249	32.25	0.629	-75.82
2800	0.431	-82.38	1.769	62.29	0.256	30.78	0.610	-78.54
3000	0.403	-86.40	1.740	57.82	0.261	30.45	0.599	-82.32

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

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.940	-8.05	6.900	170.47	0.018	82.23	0.973	-6.55
200	0.916	-15.62	6.735	161.75	0.036	78.95	0.954	-12.89
400	0.847	-29.59	6.246	145.63	0.068	70.33	0.890	-24.03
600	0.766	-42.00	5.650	132.05	0.091	62.49	0.814	-33.09
800	0.678	-51.87	5.010	120.51	0.109	58.57	0.745	-40.07
1000	0.608	-60.41	4.527	110.61	0.127	54.45	0.689	-45.55
1200	0.539	-67.61	4.060	101.81	0.140	51.41	0.641	-50.89
1400	0.481	-73.78	3.652	93.86	0.152	50.45	0.605	-54.50
1600	0.433	-79.23	3.373	86.73	0.166	49.15	0.579	-58.22
1800	0.384	-83.57	3.087	80.47	0.175	48.56	0.556	-61.39
2000	0.345	-87.53	2.858	74.52	0.189	47.23	0.542	-64.54
2200	0.306	-91.18	2.670	68.63	0.201	46.27	0.525	-67.92
2400	0.275	-93.01	2.454	63.79	0.211	44.51	0.505	-69.53
2600	0.246	-96.79	2.349	59.54	0.219	44.41	0.502	-72.68
2800	0.221	-97.68	2.194	54.49	0.233	43.78	0.490	-75.21
3000	0.204	-103.64	2.114	50.98	0.245	43.82	0.482	-78.68

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

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.897	-10.85	9.509	167.50	0.018	78.84	0.957	-8.01
200	0.860	-20.99	9.048	156.52	0.035	78.42	0.924	-15.54
400	0.751	-38.88	7.900	137.52	0.063	66.85	0.827	-24.31
600	0.641	-52.71	6.723	1228.80	0.083	61.20	0.732	-35.56
800	0.543	-62.52	5.701	111.18	0.099	57.31	0.659	-41.25
1000	0.475	-71.29	4.975	101.88	0.113	56.31	0.610	-45.39
1200	0.413	-78.25	4.359	93.79	0.125	54.36	0.565	-49.69
1400	0.364	-84.25	3.854	86.68	0.139	54.26	0.539	-52.27
1600	0.323	-89.98	3.490	80.46	0.152	53.46	0.522	-55.64
1800	0.288	-94.38	3.189	74.56	0.163	52.95	0.509	-58.40
2000	0.254	-99.32	2.923	69.18	0.177	52.45	0.501	-61.31
2200	0.223	-103.64	2.718	63.57	0.191	51.87	0.488	-64.67
2400	0.196	-104.93	2.492	59.07	0.202	49.64	0.476	-66.11
2600	0.173	-110.64	2.373	55.28	0.218	50.38	0.476	-69.50
2800	0.153	-111.86	2.206	50.32	0.230	48.22	0.468	-72.24
3000	0.139	-119.39	2.118	47.36	0.244	48.56	0.467	-75.63

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V_{CE}=1V, I_C=10mA, Z_O=50Ω

Freq(MHz)	S ₁₁	∠S ₁₁	S ₂₁	∠S ₂₁	S ₁₂	∠S ₁₂	S ₂₂	∠S ₂₂
100	0.790	-17.56	12.114	161.90	0.018	79.20	0.905	-10.27
200	0.723	-32.63	10.916	146.76	0.034	72.20	0.844	-18.72
400	0.563	-55.98	8.394	124.70	0.055	62.43	0.714	-29.01
600	0.445	-71.85	6.553	109.97	0.071	59.99	0.623	-34.44
800	0.364	-82.88	5.260	99.45	0.086	59.13	0.569	-37.86
1000	0.311	-92.59	4.431	91.17	0.099	59.93	0.541	-40.82
1200	0.271	-100.20	3.812	84.04	0.111	59.53	0.516	-44.43
1400	0.239	-108.12	3.323	77.56	0.126	59.52	0.507	-47.02
1600	0.214	-114.70	2.994	71.96	0.141	59.17	0.502	-50.47
1800	0.191	-121.18	2.716	66.67	0.153	58.97	0.497	-53.79
2000	0.171	-128.71	2.476	61.56	0.169	58.86	0.498	-57.16
2200	0.152	-136.05	2.306	56.24	0.185	57.79	0.493	-60.87
2400	0.135	-140.35	2.108	51.97	0.199	55.89	0.488	-62.69
2600	0.122	-149.70	2.007	48.35	0.213	55.96	0.495	-66.94
2800	0.108	-156.65	1.861	43.55	0.229	54.18	0.490	-70.03
3000	0.110	-165.38	1.783	40.65	0.245	54.31	0.491	-73.88

V_{CE}=3V, I_C=1mA, Z_O=50Ω

Freq(MHz)	S ₁₁	∠S ₁₁	S ₂₁	∠S ₂₁	S ₁₂	∠S ₁₂	S ₂₂	∠S ₂₂
100	0.982	-4.21	3.100	174.07	0.017	89.16	0.990	-4.16
200	0.978	-8.28	3.098	168.64	0.035	82.59	0.986	-8.44
400	0.957	-16.34	3.021	157.91	0.067	75.73	0.967	-16.41
600	0.929	-24.16	2.940	147.74	0.097	68.51	0.937	-24.18
800	0.889	-31.44	2.820	138.24	0.122	62.90	0.901	-31.11
1000	0.853	-38.19	2.732	129.30	0.146	58.22	0.872	-37.55
1200	0.806	-44.72	2.614	120.32	0.165	52.93	0.833	-44.09
1400	0.760	-50.47	2.479	111.61	0.181	49.58	0.797	-48.91
1600	0.716	-55.72	2.400	103.70	0.197	46.26	0.770	-54.03
1800	0.662	-60.40	2.304	96.29	0.210	43.82	0.743	-58.49
2000	0.618	-64.61	2.183	89.33	0.218	41.13	0.742	-62.68
2200	0.573	-67.87	2.089	82.12	0.231	38.51	0.694	-66.82
2400	0.535	-70.93	1.957	76.27	0.239	34.92	0.666	-69.35
2600	0.495	-74.06	1.921	71.05	0.246	33.82	0.653	-73.21
2800	0.467	-76.13	1.808	65.30	0.252	32.34	0.636	-76.37
3000	0.442	-79.74	1.774	61.07	0.257	32.64	0.624	-79.57

V_{CE}=3V, I_C=3mA, Z_O=50Ω

Freq(MHz)	S ₁₁	∠S ₁₁	S ₂₁	∠S ₂₁	S ₁₂	∠S ₁₂	S ₂₂	∠S ₂₂
100	0.947	-7.39	7.023	170.80	0.016	87.53	0.976	-6.22
200	0.926	-14.15	6.828	162.56	0.033	79.54	0.963	-12.10
400	0.863	-27.21	6.359	147.39	0.062	72.10	0.902	-22.53
600	0.785	-38.49	5.801	134.19	0.086	64.10	0.831	-31.19
800	0.704	-47.60	5.189	122.77	0.104	59.84	0.763	-38.11
1000	0.637	-55.35	4.720	113.22	0.121	55.90	0.711	-43.59
1200	0.570	-62.24	4.276	104.25	0.134	53.18	0.661	-48.69
1400	0.510	-68.01	3.858	96.35	0.145	52.02	0.626	-52.19
1600	0.460	-72.74	3.553	89.55	0.160	50.93	0.600	-56.00
1800	0.414	-76.54	3.276	83.22	0.169	49.80	0.577	-59.10
2000	0.372	-80.58	3.032	77.40	0.183	48.90	0.562	-62.38
2200	0.332	-83.52	2.837	71.31	0.196	47.59	0.540	-65.66
2400	0.301	-84.61	2.608	66.41	0.206	45.77	0.521	-66.97
2600	0.271	-87.36	2.499	62.31	0.217	45.97	0.516	-70.25
2800	0.246	-88.29	2.334	57.19	0.228	43.75	0.503	-72.80
3000	0.230	-93.01	2.249	53.74	0.238	45.10	0.497	-75.94

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V_{CE}=3V, I_C=5mA, Z_O=50Ω

Freq(MHz)	S ₁₁	∠S ₁₁	S ₂₁	∠S ₂₁	S ₁₂	∠S ₁₂	S ₂₂	∠S ₂₂
100	0.914	-9.39	9.445	168.58	0.017	85.01	0.968	-7.36
200	0.883	-18.11	9.067	158.60	0.033	79.17	0.942	-14.13
400	0.787	-33.64	8.064	140.96	0.059	69.73	0.858	-25.21
600	0.688	-46.19	7.025	126.79	0.080	62.55	0.769	-33.54
800	0.595	-55.36	6.045	115.37	0.095	60.36	0.693	-39.46
1000	0.525	-63.74	5.331	106.00	0.111	57.67	0.643	-43.99
1200	0.461	-69.74	4.711	97.73	0.122	55.55	0.596	-48.45
1400	0.407	-75.56	4.183	90.52	0.134	55.11	0.569	-50.94
1600	0.365	-80.10	3.809	84.27	0.148	54.32	0.545	-54.21
1800	0.326	-83.73	3.485	78.49	0.160	54.09	0.530	-57.07
2000	0.289	-87.26	3.193	73.22	0.174	53.36	0.521	-59.81
2200	0.256	-90.55	2.985	67.38	0.188	52.39	0.504	-63.16
2400	0.229	-91.48	2.731	62.95	0.198	49.90	0.488	-64.12
2600	0.206	-94.05	2.605	59.18	0.210	50.03	0.487	-67.57
2800	0.182	-95.06	2.429	54.38	0.223	49.09	0.475	-70.12
3000	0.168	-101.12	2.332	51.07	0.238	49.01	0.476	-73.01

V_{CE}=3V, I_C=10mA, Z_O=50Ω

Freq(MHz)	S ₁₁	∠S ₁₁	S ₂₁	∠S ₂₁	S ₁₂	∠S ₁₂	S ₂₂	∠S ₂₂
100	0.833	-13.55	12.957	164.54	0.017	86.30	0.950	-8.98
200	0.788	-25.76	11.964	151.29	0.031	73.45	0.901	-16.77
400	0.641	-45.13	9.726	130.85	0.052	67.99	0.780	-27.64
600	0.522	-58.57	7.869	116.11	0.070	62.14	0.684	-33.93
800	0.434	-68.03	6.454	105.48	0.082	61.75	0.617	-38.12
1000	0.373	-75.94	5.505	97.08	0.097	60.68	0.578	-40.91
1200	0.326	-82.26	4.763	89.82	0.111	60.92	0.546	-44.25
1400	0.288	-87.99	4.167	83.20	0.124	60.80	0.529	-46.41
1600	0.257	-93.26	3.758	77.71	0.138	60.19	0.519	-49.35
1800	0.227	-97.38	3.421	72.32	0.152	59.04	0.511	-52.04
2000	0.200	-102.17	3.124	67.27	0.166	59.51	0.508	-55.02
2200	0.175	-107.18	2.901	62.01	0.183	58.22	0.497	-58.48
2400	0.152	-108.10	2.649	57.93	0.194	56.04	0.486	-59.63
2600	0.134	-114.11	2.525	54.31	0.207	55.95	0.490	-63.15
2800	0.117	-115.19	2.346	49.60	0.220	54.66	0.487	-65.86
3000	0.109	-123.96	2.244	46.64	0.235	54.47	0.484	-69.55

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