



2SC5665

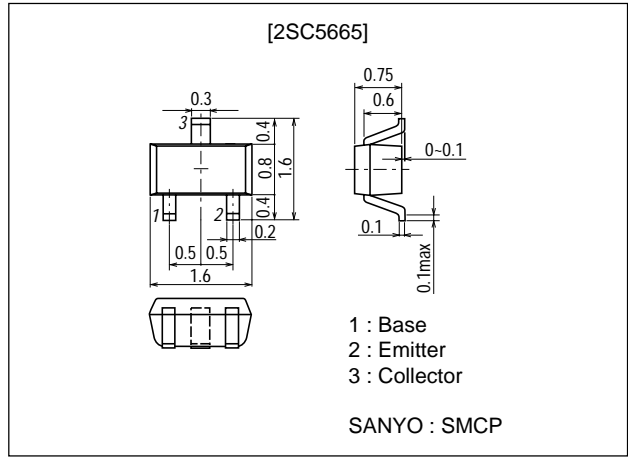
High-Frequency Low-Noise Amplifier and OSC Applications

Features

- Low-noise use : NF=1.5dB typ (f=2GHz).
- High cut-off frequency : $f_T=6.5\text{GHz typ (}V_{CE}=1\text{V)}$.
: $f_T=11.2\text{GHz typ (}V_{CE}=3\text{V)}$.
- Low operating voltage.

Package Dimensions

unit : mm
2106A



Specifications

Absolute Maximum Ratings at Ta=25°C

Parameter	Symbol	Conditions	Ratings	Unit
Collector-to-Base Voltage	V_{CBO}		9	V
Collector-to-Emitter Voltage	V_{CEO}		4	V
Emitter-to-Base Voltage	V_{EBO}		2	V
Collector Current	I_C		70	mA
Collector Dissipation	P_C		100	mW
Junction Temperature	T_J		150	°C
Storage Temperature	T_{stg}		-55 to +150	°C

Marking : NK

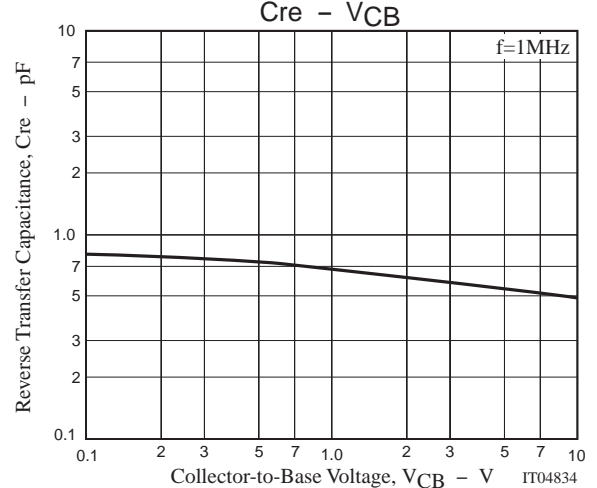
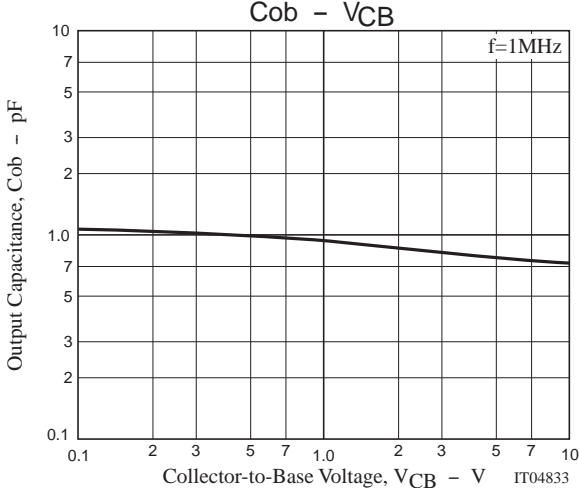
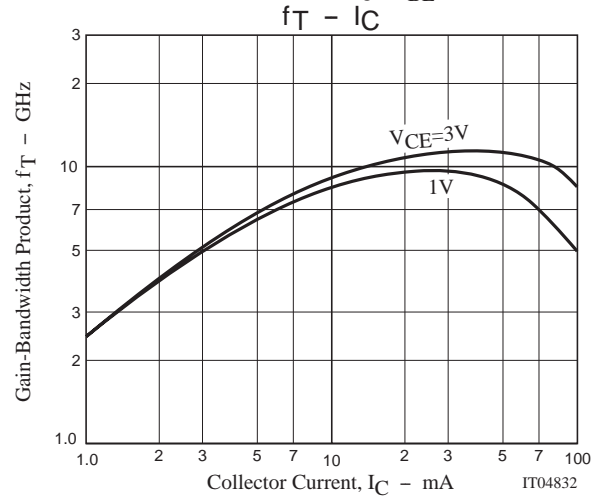
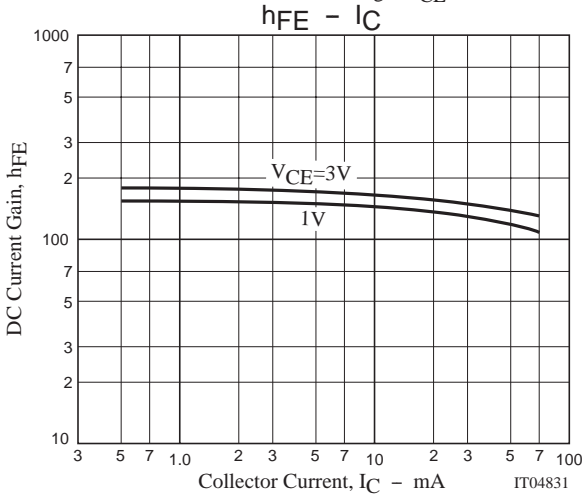
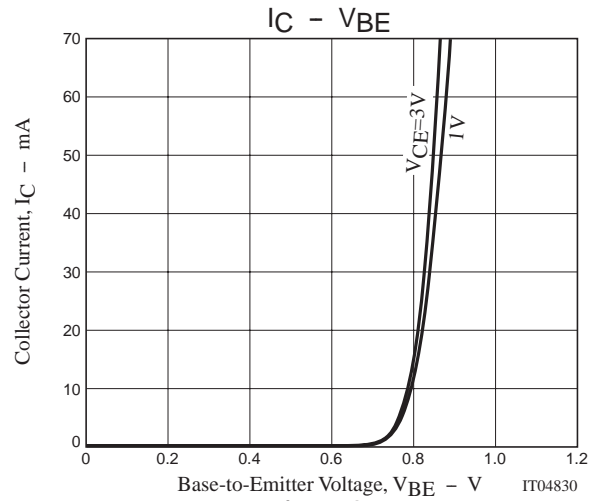
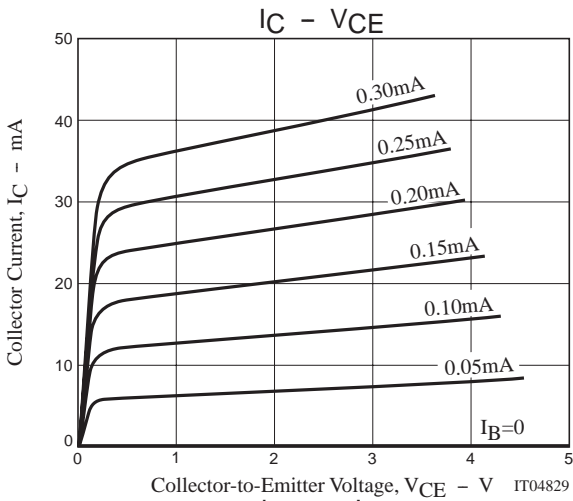
This product adopts a high-frequency process. Please be careful when handling it because it is susceptible to static electricity.

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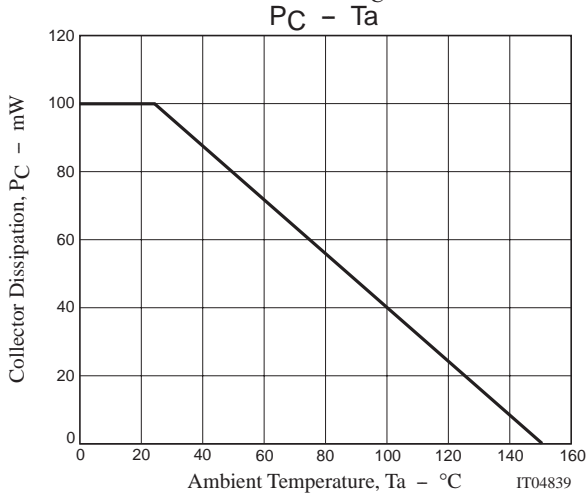
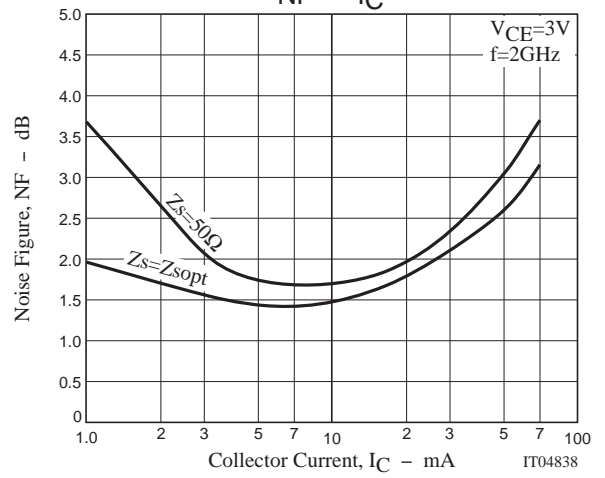
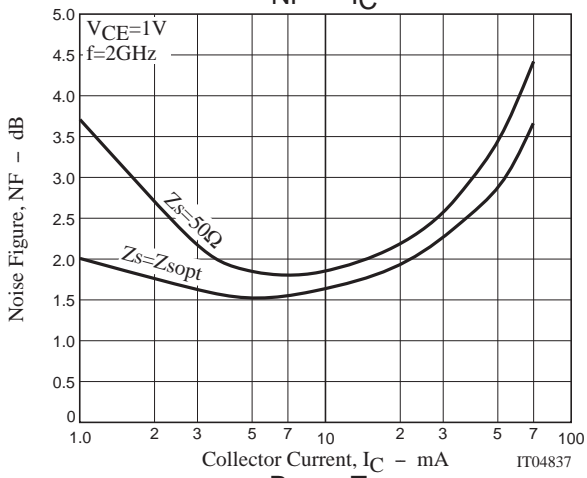
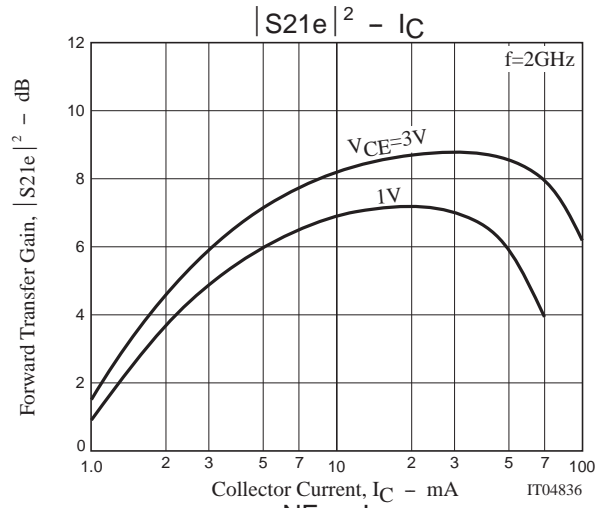
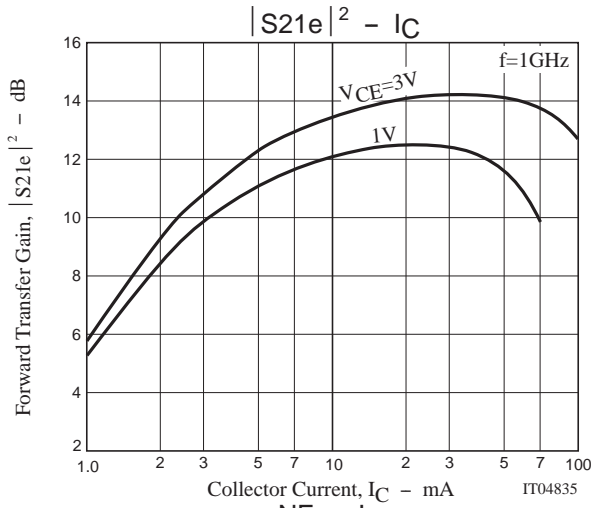
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Electrical Characteristics at Ta=25°C

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	$V_{CE}=1V, I_C=5mA$	5	6.5		GHz
	f_T2	$V_{CE}=3V, I_C=30mA$	9.5	11.2		GHz
Output Capacitance	C_{ob}	$V_{CB}=1V, f=1MHz$		0.95	1.2	pF
Reverse Transfer Capacitance	C_{re}	$V_{CB}=1V, f=1MHz$		0.7	0.9	pF
Forward Transfer Gain	$ S_{21e} ^{21}$	$V_{CE}=1V, I_C=5mA, f=2GHz$	5	6		dB
	$ S_{21e} ^{22}$	$V_{CE}=3V, I_C=30mA, f=2GHz$	7.0	8.5		dB
Noise Figure	NF	$V_{CE}=1V, I_C=5mA, f=2GHz$		1.5	2.3	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	0.973	-15.90	3.638	167.29	0.050	79.91	0.977	-9.40
200	0.948	-31.19	3.482	155.57	0.095	70.33	0.946	-18.29
400	0.881	-58.99	3.073	134.82	0.166	54.39	0.847	-32.76
600	0.817	-82.35	2.684	117.37	0.205	41.95	0.745	-43.72
800	0.751	-100.32	2.310	103.16	0.226	33.75	0.660	-51.78
1000	0.716	-115.88	2.051	91.40	0.241	27.55	0.608	-57.99
1200	0.676	-128.75	1.832	80.86	0.245	22.89	0.562	-63.64
1400	0.645	-139.90	1.623	71.76	0.244	20.24	0.535	-67.36
1600	0.622	-149.21	1.484	63.80	0.243	18.33	0.521	-71.36
1800	0.597	-157.60	1.375	56.78	0.235	17.45	0.510	-75.10
2000	0.576	-165.50	1.265	50.45	0.232	17.98	0.502	-79.16
2200	0.561	-172.48	1.189	44.29	0.231	19.25	0.496	-83.13
2400	0.544	-178.67	1.096	39.32	0.226	20.11	0.497	-85.82
2600	0.537	174.51	1.044	35.03	0.226	23.31	0.497	-89.94
2800	0.526	168.64	0.985	30.51	0.230	26.53	0.498	-94.15
3000	0.524	162.85	0.945	27.09	0.237	29.18	0.500	-98.39

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

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.866	-32.91	12.661	156.28	0.045	72.01	0.898	-23.29
200	0.779	-60.72	10.936	137.67	0.078	58.69	0.765	-41.46
400	0.636	-99.74	7.611	113.72	0.112	46.99	0.544	-63.29
600	0.566	-124.52	5.620	99.23	0.128	43.52	0.419	-76.06
800	0.524	-139.66	4.366	89.54	0.145	42.78	0.351	-84.07
1000	0.513	-151.48	3.632	81.28	0.160	42.91	0.314	-90.89
1200	0.493	-161.01	3.087	74.54	0.174	43.71	0.286	-97.65
1400	0.483	-168.73	2.667	68.39	0.188	43.77	0.269	-101.52
1600	0.475	-175.51	2.387	62.84	0.206	43.96	0.260	-106.33
1800	0.464	178.02	2.155	57.63	0.220	43.91	0.254	-109.97
2000	0.456	172.06	1.961	52.90	0.235	43.59	0.256	-113.34
2200	0.448	166.58	1.823	48.32	0.255	43.40	0.251	-117.73
2400	0.433	161.66	1.680	44.30	0.267	42.03	0.240	-119.28
2600	0.434	156.29	1.591	40.69	0.285	42.26	0.245	-123.90
2800	0.426	151.59	1.498	36.47	0.305	41.45	0.242	-127.36
3000	0.429	147.16	1.426	33.28	0.322	40.63	0.243	-131.22

$V_{CE}=1V, I_C=10mA, Z_O=50\Omega$

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.760	-47.73	19.641	147.15	0.042	66.87	0.814	-34.53
200	0.643	-82.37	14.907	126.09	0.064	55.24	0.622	-57.00
400	0.529	-121.66	9.114	104.56	0.090	49.92	0.405	-80.69
600	0.493	-142.40	6.406	92.74	0.109	49.93	0.311	-94.97
800	0.470	-154.81	4.890	84.83	0.128	52.01	0.264	-104.53
1000	0.467	-164.08	4.015	77.98	0.150	52.31	0.246	-111.58
1200	0.460	-171.57	3.386	72.18	0.168	52.82	0.232	-119.56
1400	0.453	-178.17	2.916	66.85	0.189	52.14	0.224	-123.80
1600	0.451	176.26	2.601	61.96	0.211	51.27	0.221	-128.76
1800	0.444	170.62	2.345	57.29	0.229	50.17	0.220	-131.99
2000	0.439	165.17	2.130	53.05	0.250	49.26	0.223	-135.27
2200	0.434	159.62	1.968	48.98	0.271	48.40	0.221	-140.67
2400	0.418	155.46	1.819	45.02	0.288	46.39	0.210	-142.60
2600	0.420	150.61	1.718	41.86	0.306	45.52	0.220	-145.84
2800	0.413	146.05	1.617	37.82	0.326	43.96	0.216	-150.89
3000	0.418	142.11	1.540	34.56	0.344	42.94	0.217	-154.44

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V_{CE}=1V, I_C=30mA, Z_O=50Ω

Freq(MHz)	S ₁₁	∠S ₁₁	S ₂₁	∠S ₂₁	S ₁₂	∠S ₁₂	S ₂₂	∠S ₂₂
100	0.564	-78.88	27.793	132.50	0.035	59.72	0.635	-54.80
200	0.499	-117.16	17.678	112.56	0.050	55.31	0.430	-81.31
400	0.469	-148.48	9.719	96.01	0.074	58.68	0.287	-108.63
600	0.466	-162.54	6.623	86.79	0.099	61.11	0.245	-124.23
800	0.458	-170.76	5.014	80.54	0.122	61.57	0.228	-134.22
1000	0.462	-177.08	4.087	74.56	0.147	61.13	0.224	-139.82
1200	0.458	177.39	3.430	69.50	0.171	59.97	0.228	-147.14
1400	0.455	172.21	2.957	64.66	0.197	59.16	0.226	-150.62
1600	0.456	167.74	2.629	60.38	0.221	56.51	0.231	-153.81
1800	0.450	162.98	2.368	56.01	0.242	55.02	0.233	-157.12
2000	0.446	158.06	2.144	52.06	0.265	53.62	0.237	-159.69
2200	0.445	153.26	1.987	48.32	0.288	51.32	0.239	-163.69
2400	0.426	149.46	1.839	44.39	0.306	48.60	0.230	-167.13
2600	0.432	144.79	1.737	41.66	0.328	47.68	0.239	-168.79
2800	0.425	140.76	1.636	37.82	0.349	45.49	0.241	-173.69
3000	0.430	137.35	1.560	34.71	0.369	43.34	0.244	-176.60

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	0.976	-14.07	3.602	168.75	0.040	81.40	0.981	-7.61
200	0.957	-27.92	3.521	158.07	0.077	72.40	0.959	-14.89
400	0.898	-53.12	3.162	138.86	0.138	57.73	0.880	-27.16
600	0.838	-75.05	2.823	122.46	0.175	46.08	0.789	-36.89
800	0.772	-92.77	2.443	108.76	0.197	38.15	0.715	-43.80
1000	0.734	-108.47	2.209	97.05	0.210	31.60	0.666	-49.31
1200	0.691	-121.27	1.969	86.65	0.215	27.46	0.619	-54.14
1400	0.655	-132.71	1.763	77.42	0.217	24.67	0.586	-57.82
1600	0.629	-142.67	1.619	69.41	0.217	22.52	0.571	-61.40
1800	0.599	-151.50	1.499	62.32	0.211	21.77	0.555	-64.88
2000	0.577	-159.75	1.383	55.54	0.209	22.72	0.554	-68.05
2200	0.557	-167.05	1.290	49.38	0.207	23.85	0.545	-71.45
2400	0.538	-173.71	1.190	44.12	0.205	25.28	0.539	-74.21
2600	0.531	179.47	1.140	39.85	0.205	27.97	0.540	-78.45
2800	0.517	173.31	1.063	34.90	0.210	32.21	0.542	-82.00
3000	0.511	166.83	1.024	31.52	0.218	34.96	0.543	-85.49

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	0.885	-27.59	12.804	158.98	0.036	72.81	0.919	-18.67
200	0.806	-51.67	11.316	141.97	0.065	62.97	0.806	-33.45
400	0.649	-87.77	8.294	118.38	0.097	51.37	0.600	-51.61
600	0.561	-112.50	6.258	103.49	0.115	46.54	0.472	-61.44
800	0.507	-128.21	4.928	93.38	0.129	45.93	0.394	-67.46
1000	0.484	-141.12	4.122	85.20	0.143	46.14	0.350	-72.22
1200	0.460	-151.51	3.508	78.17	0.158	46.72	0.319	-77.35
1400	0.446	-160.21	3.037	72.04	0.173	46.78	0.299	-80.01
1600	0.437	-167.47	2.718	66.44	0.187	46.84	0.286	-83.67
1800	0.423	-174.51	2.451	61.29	0.202	46.90	0.279	-86.94
2000	0.415	179.14	2.234	56.62	0.217	47.19	0.274	-90.29
2200	0.407	172.97	2.069	51.91	0.233	46.61	0.265	-94.06
2400	0.392	167.89	1.900	47.68	0.248	46.16	0.254	-95.15
2600	0.392	162.21	1.803	44.31	0.265	45.33	0.257	-99.53
2800	0.383	157.32	1.688	39.78	0.283	44.75	0.249	-102.43
3000	0.390	152.58	1.607	36.62	0.300	44.54	0.249	-105.80

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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	0.795	-38.83	20.116	150.98	0.034	71.48	0.850	-27.09
200	0.667	-68.89	16.006	130.98	0.055	59.34	0.677	-45.00
400	0.517	-106.98	10.232	108.83	0.081	53.97	0.454	-63.68
600	0.457	-129.59	7.307	96.42	0.098	53.52	0.345	-73.72
800	0.424	-143.24	5.632	88.34	0.117	54.12	0.287	-80.01
1000	0.417	-153.63	4.623	81.35	0.137	54.80	0.256	-84.72
1200	0.404	-162.53	3.919	75.61	0.154	55.07	0.235	-91.08
1400	0.397	-169.68	3.377	70.16	0.173	54.91	0.222	-94.48
1600	0.394	-175.88	3.005	65.29	0.193	53.77	0.216	-98.90
1800	0.386	178.14	2.707	60.74	0.211	53.13	0.210	-102.78
2000	0.382	172.14	2.457	56.49	0.229	52.13	0.210	-105.89
2200	0.378	165.97	2.275	52.14	0.249	50.73	0.203	-110.23
2400	0.360	161.52	2.086	48.28	0.266	48.89	0.194	-112.42
2600	0.367	156.28	1.973	45.29	0.283	48.55	0.198	-117.32
2800	0.359	151.26	1.850	41.08	0.304	47.16	0.191	-121.17
3000	0.364	147.35	1.757	38.08	0.321	45.84	0.193	-125.07

V_{CE}=3V, I_C=30mA, Z_O=50Ω

Freq(MHz)	S ₁₁	∠S ₁₁	S ₂₁	∠S ₂₁	S ₁₂	∠S ₁₂	S ₂₂	∠S ₂₂
100	0.610	-59.72	30.149	138.49	0.029	64.74	0.708	-40.43
200	0.490	-95.34	20.431	117.93	0.044	61.00	0.494	-61.10
400	0.404	-131.27	11.585	100.08	0.067	60.86	0.306	-79.35
600	0.385	-149.05	7.980	90.46	0.090	62.74	0.235	-90.20
800	0.371	-159.04	6.070	83.97	0.110	63.56	0.200	-98.49
1000	0.375	-166.62	4.943	78.09	0.134	63.10	0.188	-103.89
1200	0.371	-173.58	4.162	73.16	0.156	62.14	0.179	-112.07
1400	0.370	-179.09	3.590	68.34	0.179	61.01	0.174	-115.63
1600	0.370	175.69	3.177	63.92	0.201	59.02	0.174	-121.09
1800	0.366	170.49	2.862	59.86	0.219	57.50	0.174	-124.53
2000	0.365	165.26	2.596	55.95	0.241	55.78	0.177	-127.77
2200	0.365	159.72	2.401	52.04	0.264	53.87	0.176	-133.31
2400	0.348	155.45	2.206	48.51	0.281	51.40	0.166	-136.62
2600	0.353	150.78	2.083	45.71	0.302	50.38	0.176	-139.63
2800	0.349	146.26	1.949	41.64	0.321	48.56	0.171	-145.90
3000	0.357	142.59	1.853	38.66	0.342	46.93	0.174	-149.31

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