

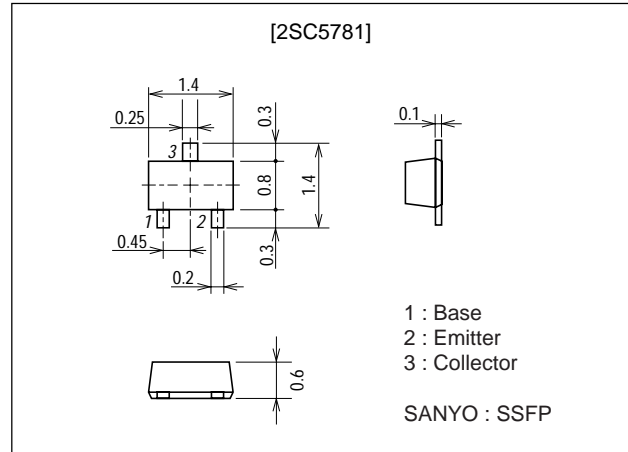
**2SC5781**

High-Frequency Low-Noise Amplifier and OSC Applications

Features

- Low-noise use : NF=1.5dB typ (f=2GHz).
- High cutoff frequency : $f_T=6.5\text{GHz}$ typ ($V_{CE}=1\text{V}$).
- Low operating voltage. : $f_T=11.2\text{GHz}$ typ ($V_{CE}=3\text{V}$).
- Ultraminiature and thin flat leadless package (1.4mmX0.8mmX0.6mm).

Package Dimensions

unit : mm
2159

Specifications

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

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	$^\circ\text{C}$
Storage Temperature	T_{stg}		-55 to +150	$^\circ\text{C}$

Marking : NK

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

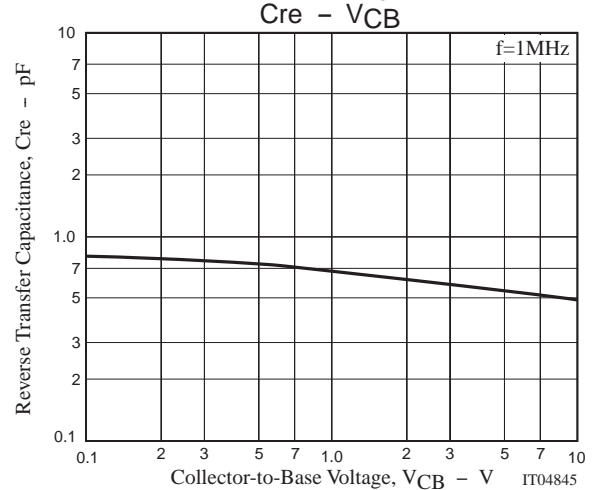
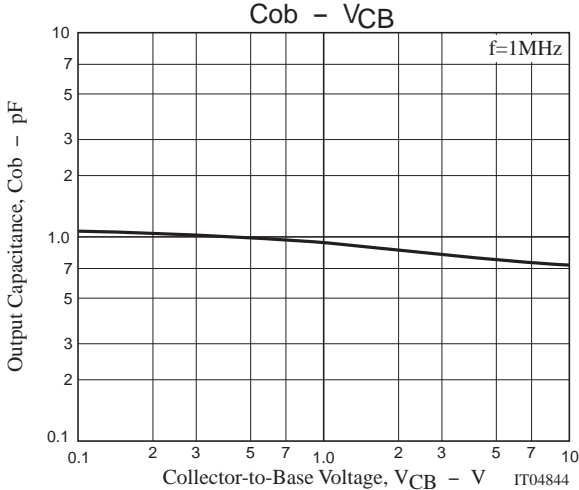
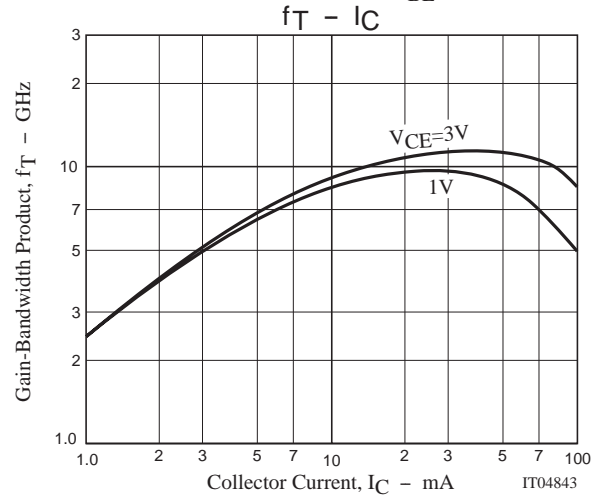
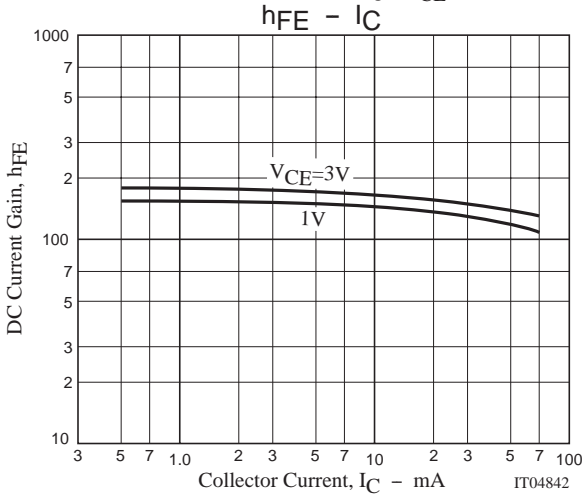
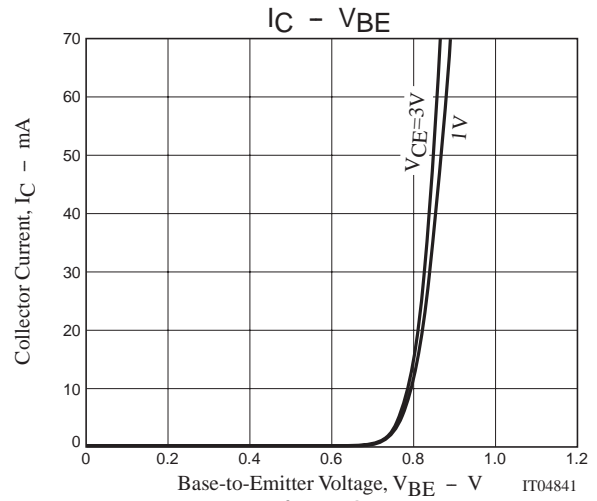
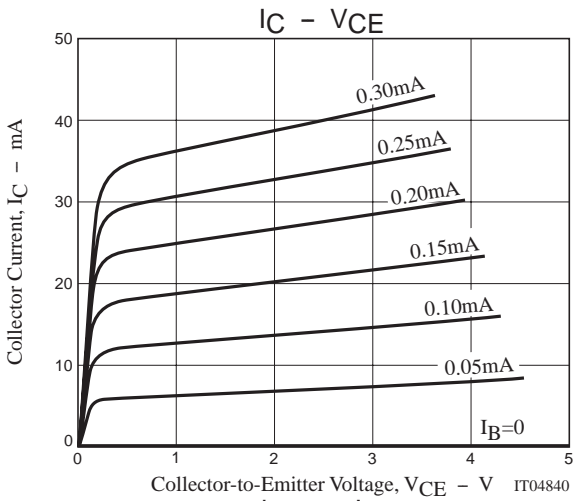
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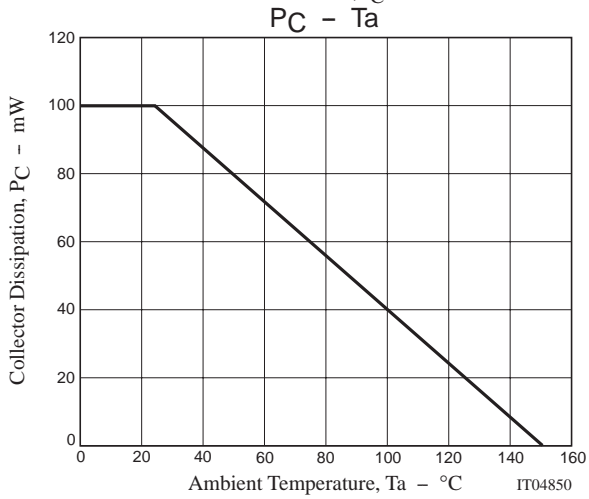
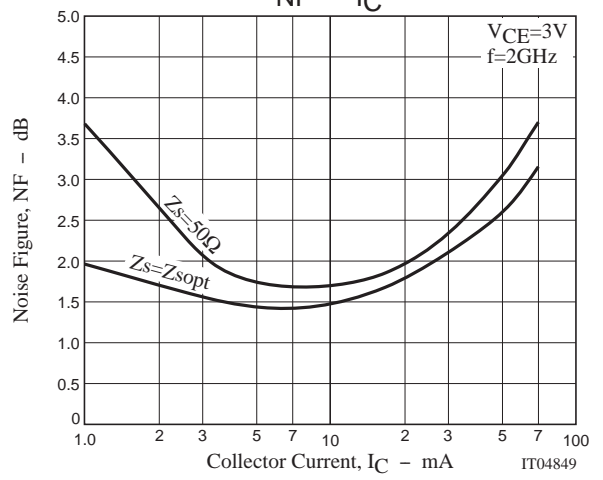
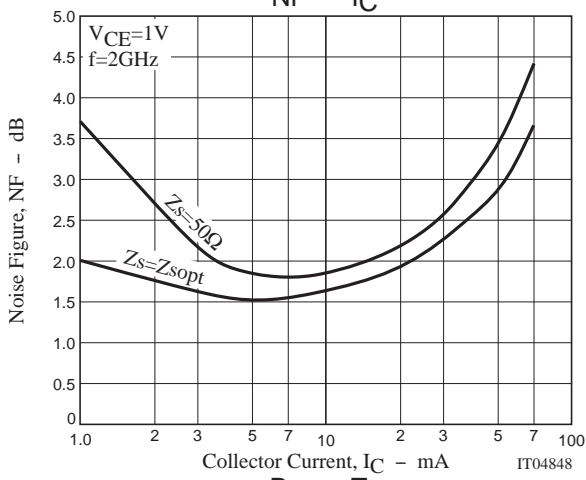
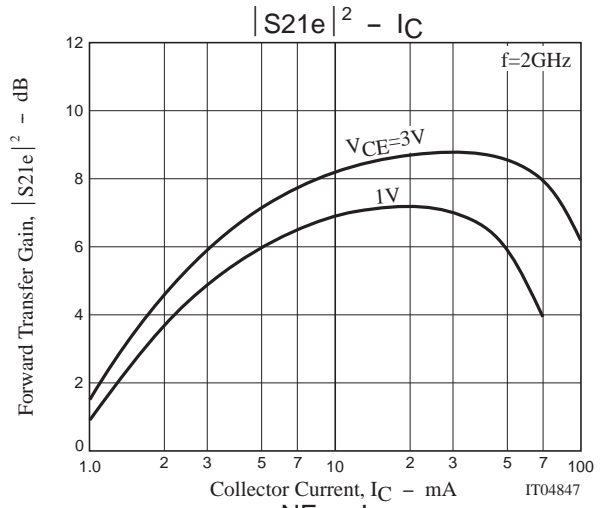
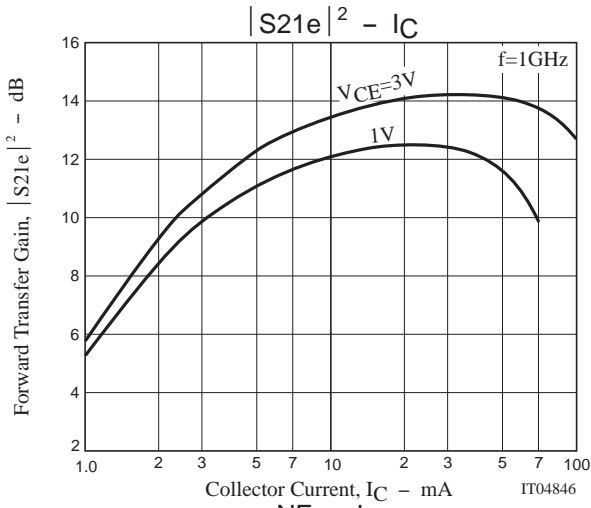
TOKYO OFFICE Tokyo Bldg., 1-10, 1 Chome, Ueno, Taito-ku, TOKYO, 110-8534 JAPAN

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	$V_{CE}=1V, I_C=5mA$	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	0.971	-15.85	3.380	167.88	0.050	80.84	0.980	-9.02
200	0.954	-30.74	3.250	156.60	0.096	70.54	0.951	-17.86
400	0.904	-57.89	2.884	136.35	0.166	54.59	0.859	-32.21
600	0.853	-80.69	2.532	119.32	0.209	41.34	0.765	-43.25
800	0.800	-97.52	2.187	105.51	0.232	32.68	0.685	-51.46
1000	0.776	-112.37	1.945	93.98	0.246	25.90	0.636	-57.69
1200	0.743	-123.86	1.738	83.67	0.249	20.35	0.596	-63.60
1400	0.715	-133.61	1.542	74.58	0.249	17.30	0.575	-67.39
1600	0.696	-141.80	1.410	66.83	0.247	14.20	0.562	-71.69
1800	0.675	-148.61	1.302	59.91	0.240	12.23	0.554	-75.23
2000	0.653	-155.25	1.202	53.69	0.232	11.20	0.551	-79.23
2200	0.641	-160.47	1.123	47.56	0.229	11.28	0.549	-83.03
2400	0.624	-165.23	1.035	42.55	0.218	10.89	0.555	-85.42
2600	0.616	-170.56	0.985	38.40	0.211	13.36	0.560	-89.61
2800	0.606	-175.16	0.926	33.88	0.204	15.52	0.561	-93.05
3000	0.603	-179.53	0.892	30.67	0.204	18.68	0.572	-96.47

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

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.871	-33.60	12.741	157.30	0.045	71.44	0.903	-23.76
200	0.801	-62.11	11.168	139.20	0.077	57.49	0.775	-42.58
400	0.692	-101.55	7.857	115.68	0.110	44.43	0.559	-66.24
600	0.637	-125.40	5.815	101.24	0.125	39.26	0.436	-80.70
800	0.604	-139.34	4.525	92.20	0.136	38.32	0.368	-89.66
1000	0.595	-150.11	3.771	84.11	0.146	38.32	0.333	-96.57
1200	0.581	-158.14	3.192	77.62	0.156	38.92	0.308	-103.45
1400	0.569	-164.51	2.762	71.88	0.167	40.01	0.295	-107.00
1600	0.562	-169.74	2.465	66.59	0.178	41.08	0.289	-111.19
1800	0.549	-174.42	2.226	61.71	0.188	41.45	0.287	-114.25
2000	0.539	-178.98	2.017	57.32	0.200	41.98	0.289	-117.08
2200	0.532	-176.71	1.868	53.18	0.213	42.12	0.285	-120.26
2400	0.512	-173.33	1.720	49.27	0.224	41.94	0.282	-121.62
2600	0.510	-169.38	1.626	46.14	0.237	42.74	0.289	-123.96
2800	0.499	-166.01	1.526	42.19	0.252	42.82	0.289	-126.97
3000	0.499	-162.84	1.455	38.85	0.265	42.50	0.293	-129.04

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

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.766	-50.21	20.304	148.39	0.042	66.50	0.821	-35.90
200	0.685	-86.23	15.604	127.61	0.064	52.56	0.635	-60.58
400	0.604	-125.31	9.606	106.22	0.085	45.80	0.423	-87.61
600	0.580	-144.45	6.741	94.72	0.098	45.66	0.335	-103.19
800	0.560	-155.05	5.161	87.24	0.113	48.34	0.291	-113.78
1000	0.562	-162.97	4.237	80.46	0.128	49.23	0.276	-121.26
1200	0.553	-168.91	3.566	75.22	0.143	50.29	0.266	-128.44
1400	0.544	-174.17	3.073	70.43	0.160	51.03	0.259	-131.36
1600	0.540	-178.43	2.722	65.76	0.176	51.34	0.259	-134.87
1800	0.531	-177.49	2.452	61.51	0.191	51.08	0.258	-137.35
2000	0.523	-173.39	2.220	57.64	0.208	50.69	0.263	-139.87
2200	0.517	-169.78	2.055	53.86	0.224	49.54	0.262	-142.63
2400	0.498	-166.69	1.891	50.19	0.239	48.88	0.255	-144.33
2600	0.497	-163.19	1.779	47.54	0.255	48.08	0.266	-145.74
2800	0.487	-159.70	1.677	43.75	0.271	47.55	0.264	-149.39
3000	0.485	-157.10	1.596	40.71	0.286	46.39	0.266	-151.05

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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	0.589	-85.55	29.353	133.75	0.033	59.04	0.644	-58.59
200	0.567	-123.42	18.884	113.54	0.045	49.58	0.451	-89.29
400	0.563	-152.10	10.391	97.37	0.064	56.45	0.325	-119.52
600	0.561	-163.93	7.061	88.52	0.082	58.12	0.290	-134.60
800	0.555	-170.23	5.332	82.75	0.102	60.29	0.276	-143.74
1000	0.558	-175.48	4.352	77.11	0.122	60.64	0.274	-148.10
1200	0.554	-179.48	3.649	72.70	0.142	61.00	0.277	-153.67
1400	0.549	176.48	3.139	68.39	0.163	60.53	0.276	-155.53
1600	0.548	173.45	2.778	64.36	0.181	58.80	0.281	-157.91
1800	0.541	170.18	2.497	60.43	0.201	57.21	0.282	-160.08
2000	0.534	166.66	2.261	56.81	0.218	56.57	0.286	-160.95
2200	0.527	163.24	2.093	53.46	0.239	55.47	0.288	-163.57
2400	0.509	160.36	1.928	50.20	0.253	52.99	0.281	-165.92
2600	0.510	157.48	1.814	47.71	0.273	52.30	0.289	-166.64
2800	0.498	154.36	1.713	43.95	0.291	50.64	0.289	-169.47
3000	0.498	151.60	1.629	41.08	0.309	49.31	0.293	-170.68

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	-14.05	3.408	169.19	0.038	82.76	0.982	-7.41
200	0.961	-27.46	3.325	158.97	0.076	73.00	0.960	-14.50
400	0.917	-52.38	3.011	140.57	0.136	58.35	0.890	-26.59
600	0.871	-73.88	2.687	124.62	0.174	46.13	0.807	-36.28
800	0.820	-90.47	2.346	111.29	0.196	37.43	0.736	-43.38
1000	0.792	-105.13	2.125	99.93	0.212	30.54	0.691	-49.05
1200	0.761	-116.92	1.908	89.68	0.217	25.24	0.647	-54.49
1400	0.732	-127.02	1.710	80.59	0.218	21.74	0.622	-58.04
1600	0.706	-135.80	1.561	72.82	0.217	19.07	0.608	-61.87
1800	0.679	-143.15	1.446	65.86	0.212	17.01	0.600	-65.17
2000	0.659	-149.92	1.333	59.28	0.207	16.59	0.594	-68.63
2200	0.644	-155.74	1.245	53.02	0.202	17.00	0.588	-72.36
2400	0.623	-160.91	1.149	48.25	0.195	15.90	0.592	-74.59
2600	0.613	-166.26	1.093	43.77	0.190	18.78	0.595	-78.29
2800	0.602	-170.70	1.014	39.02	0.185	21.80	0.602	-81.72
3000	0.595	-175.81	0.988	35.60	0.186	25.41	0.603	-84.88

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	0.890	-27.81	12.784	160.33	0.036	73.51	0.919	-18.45
200	0.824	-52.54	11.539	143.87	0.063	62.54	0.820	-33.56
400	0.703	-89.40	8.595	120.77	0.096	48.38	0.618	-53.27
600	0.634	-113.60	6.546	105.99	0.112	43.53	0.486	-64.75
800	0.587	-128.86	5.150	96.26	0.121	42.27	0.408	-71.40
1000	0.571	-140.61	4.322	88.02	0.132	41.45	0.365	-77.00
1200	0.551	-149.35	3.677	81.40	0.141	41.70	0.334	-82.35
1400	0.539	-156.54	3.180	75.50	0.153	43.15	0.314	-85.19
1600	0.529	-162.46	2.840	70.15	0.163	43.15	0.304	-88.73
1800	0.516	-167.57	2.565	65.36	0.173	44.41	0.298	-91.40
2000	0.505	-172.58	2.331	60.75	0.183	44.61	0.298	-94.33
2200	0.497	-176.97	2.152	56.34	0.196	45.32	0.294	-97.49
2400	0.477	179.26	1.972	52.54	0.205	44.85	0.288	-98.18
2600	0.477	175.07	1.866	49.08	0.217	45.43	0.294	-101.55
2800	0.464	171.59	1.746	45.07	0.230	45.66	0.293	-104.04
3000	0.464	168.16	1.661	42.15	0.245	45.45	0.298	-106.47

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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	0.796	-40.50	20.836	152.57	0.033	70.75	0.853	-27.81
200	0.703	-72.37	16.912	132.90	0.053	57.11	0.690	-47.30
400	0.585	-111.58	10.963	110.79	0.076	50.31	0.466	-69.23
600	0.541	-133.03	7.840	98.47	0.088	49.59	0.355	-81.50
800	0.517	-145.08	6.033	90.56	0.103	50.68	0.296	-88.80
1000	0.512	-154.14	4.961	83.91	0.116	52.15	0.266	-94.97
1200	0.502	-161.24	4.193	78.38	0.129	52.32	0.247	-101.40
1400	0.495	-166.99	3.610	73.45	0.146	53.18	0.237	-104.51
1600	0.490	-171.89	3.198	68.90	0.161	53.46	0.233	-108.01
1800	0.482	-175.95	2.888	64.64	0.176	53.25	0.230	-110.87
2000	0.474	179.57	2.615	60.65	0.192	53.35	0.233	-113.76
2200	0.467	175.28	2.417	56.83	0.206	52.69	0.232	-117.54
2400	0.450	172.25	2.211	53.30	0.220	50.84	0.222	-118.81
2600	0.449	168.43	2.083	50.43	0.234	51.20	0.231	-120.04
2800	0.438	165.32	1.951	46.51	0.251	50.12	0.229	-124.36
3000	0.441	162.31	1.861	43.90	0.266	49.63	0.233	-126.60

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	-65.99	32.534	139.89	0.027	62.99	0.710	-43.37
200	0.539	-103.58	22.274	119.16	0.040	56.64	0.499	-67.62
400	0.492	-138.32	12.703	101.30	0.058	58.24	0.316	-91.09
600	0.482	-153.22	8.731	91.97	0.074	60.59	0.250	-104.90
800	0.472	-161.39	6.623	85.91	0.092	61.62	0.220	-114.38
1000	0.477	-167.62	5.388	80.21	0.111	62.21	0.209	-119.60
1200	0.473	-172.63	4.538	75.69	0.127	61.39	0.204	-127.44
1400	0.470	-176.82	3.894	71.53	0.146	61.42	0.201	-129.35
1600	0.469	179.72	3.447	67.48	0.166	60.90	0.205	-132.33
1800	0.463	176.19	3.095	63.82	0.182	60.06	0.206	-135.02
2000	0.461	172.47	2.801	60.20	0.201	58.74	0.209	-136.37
2200	0.456	168.49	2.582	56.76	0.217	57.38	0.212	-140.69
2400	0.437	165.69	2.372	53.44	0.232	55.66	0.203	-142.18
2600	0.439	162.56	2.227	51.05	0.248	54.86	0.214	-143.27
2800	0.430	159.33	2.092	47.29	0.266	52.93	0.213	-147.80
3000	0.434	156.77	1.979	44.36	0.285	51.95	0.217	-148.95

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