Ordering number : ENN7352

NPN Epitaxial Planar Silicon Transistor

2SC5666

UHF to S Band Low-Noise Amplifier and OSC Applications

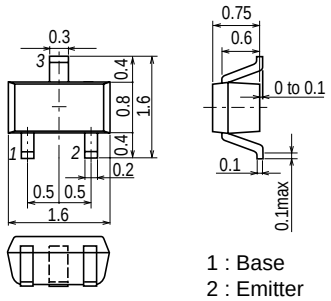
Features

- Low noise : NF=1.3dB typ (f=2GHz).
- High cutoff frequency : f_T=8.5GHz typ (V_{CE}=1V).
  : f_T=12.5GHz typ (V_{CE}=3V).
- Low operating voltage.
- High gain : $|S21e|^2$=10.5dB typ (f=2GHz).

Package Dimensions

unit : mm
2106A

[2SC5666]



1 : Base
2 : Emitter
3 : Collector

SANYO : SMCP

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		40	mA
Collector Dissipation	P_C		100	mW
Junction Temperature	Tj		150	°C
Storage Temperature	Tstg		–55 to +150	°C

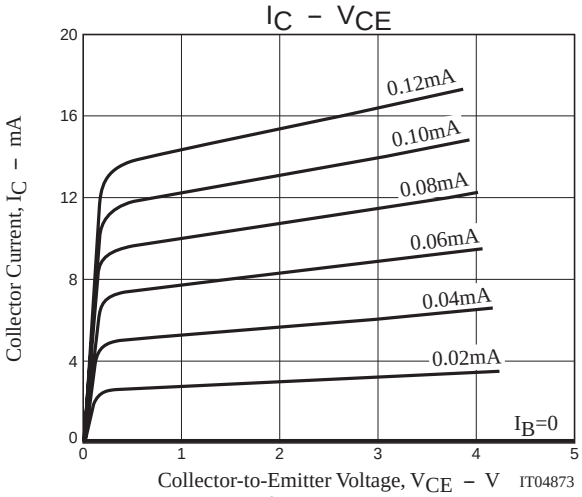
Marking : NJ

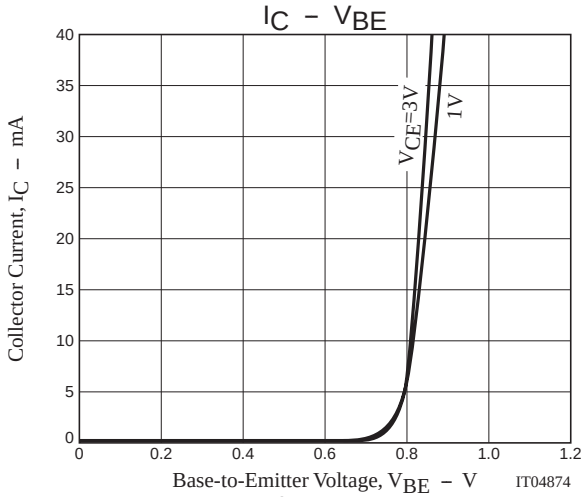
Pay attention to handling since it is liable to be affected by static electricity due to the high-frequency process adopted.

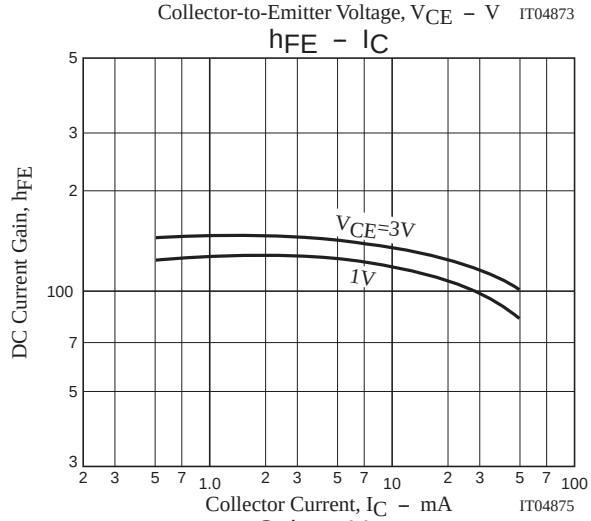
SANYO Electric Co.,Ltd. Semiconductor Company
TOKYO OFFICE Tokyo Bldg., 1-10, 1 Chome, Ueno, Taito-ku, TOKYO, 110-8534 JAPAN

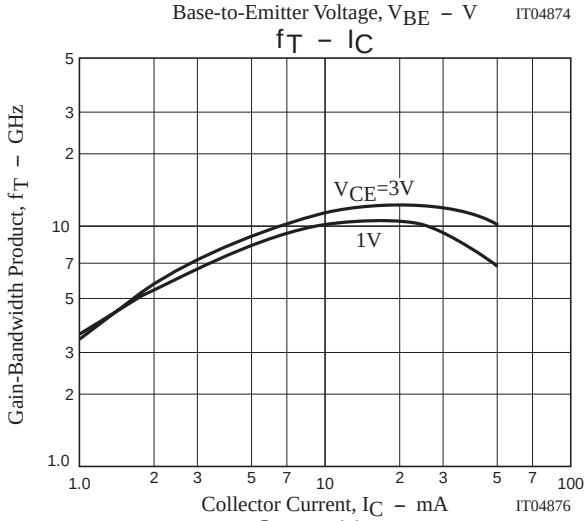
Electrical Characteristics at Ta=25°C

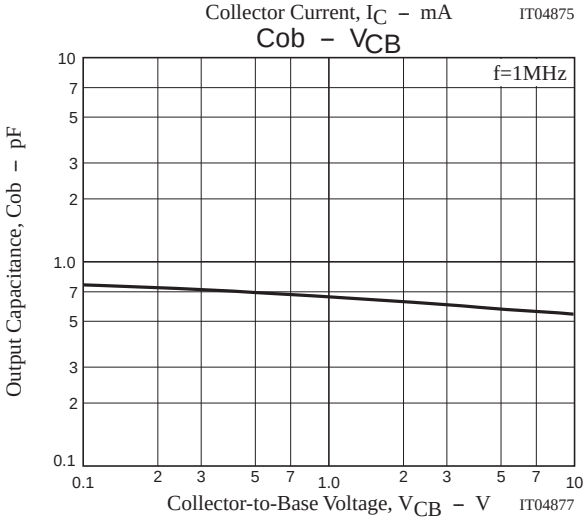
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Collector Cutoff Current	I_{CBO}	V_{CB}=5V, I_E=0			1.0	nA
Emitter Cutoff Current	I_{EBO}	V_{EB}=1V, I_C=0			10	μA
DC Current Gain	h_{FE}	V_{CE}=1V, I_C=5mA	100		160	
Gain-Bandwidth Product	f_T1	V_{CE}=1V, I_C=5mA	7.0	8.5		GHz
	f_T2	V_{CE}=3V, I_C=20mA	10.5	12.5		GHz
Output Capacitance	Cob	V_{CB}=1V, f=1MHz		0.65	0.8	pF
Reverse Transfer Capacitance	Cre	V_{CB}=1V, f=1MHz		0.5	0.7	pF
Forward Transfer Gain	$\|S21e\|^2 1$	V_{CE}=1V, I_C=5mA, f=2GHz	7.0	8.5		dB
	$\|S21e\|^2 2$	V_{CE}=3V, I_C=20mA, f=2GHz	9.0	10.5		dB
Noise Figure	NF	V_{CE}=1V, I_C=3mA, f=2GHz		1.3	2.0	dB

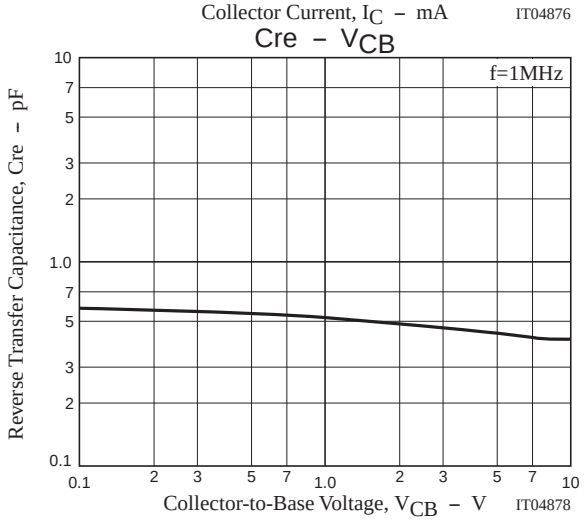


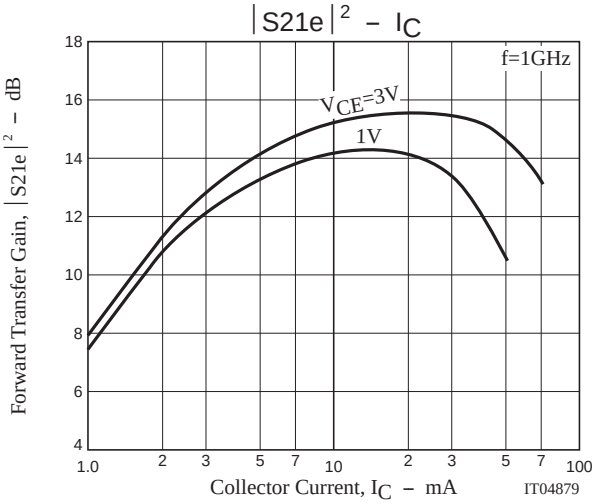


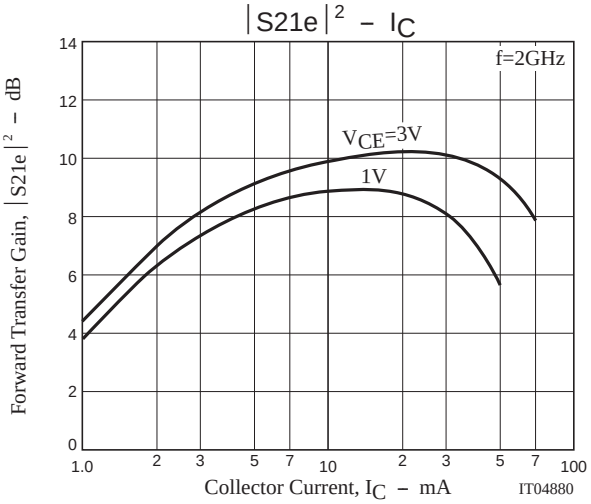


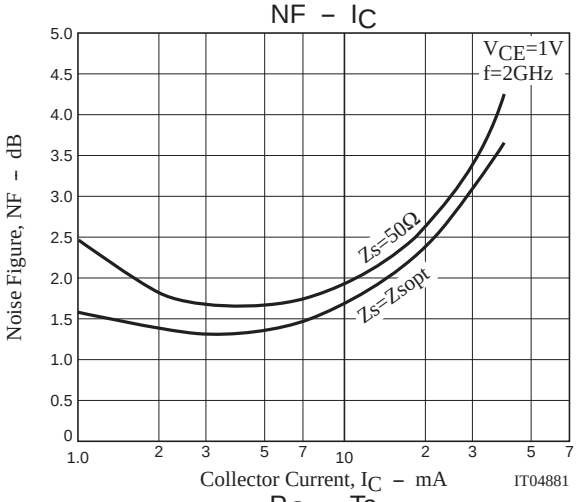


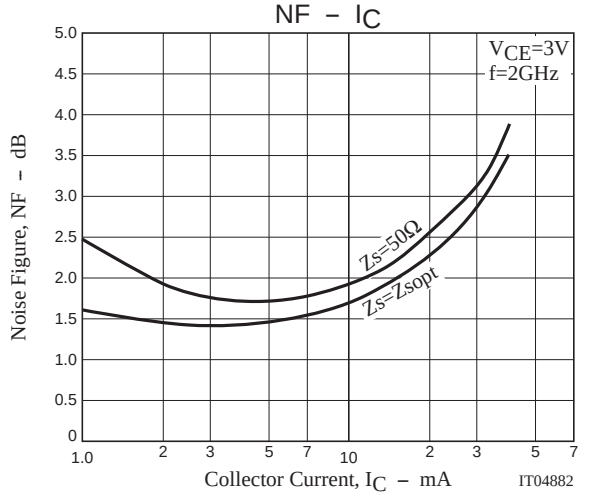


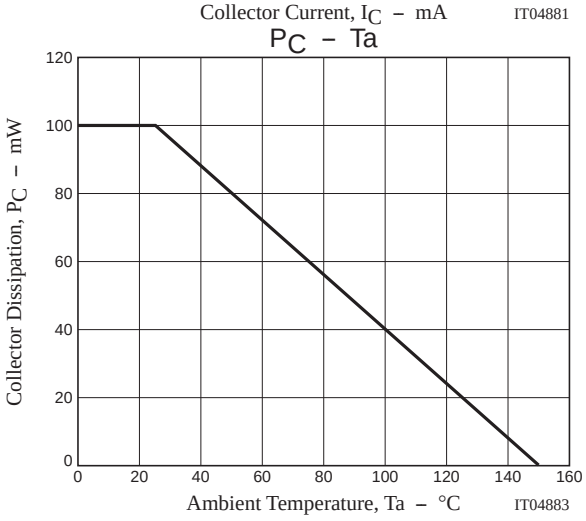



|S21e|² – IC
f=1GHz
VCE=3V
1V
Forward Transfer Gain, |S21e|² – dB
Collector Current, IC – mA
IT04879


|S21e|² – IC
f=2GHz
VCE=3V
1V
Forward Transfer Gain, |S21e|² – dB
Collector Current, IC – mA
IT04880


NF – IC
VCE=1V
f=2GHz
Zs=50Ω
Zs=Zsopt
Noise Figure, NF – dB
Collector Current, IC – mA
IT04881


NF – IC
VCE=3V
f=2GHz
Zs=50Ω
Zs=Zsopt
Noise Figure, NF – dB
Collector Current, IC – mA
IT04882


PC – Ta
Collector Dissipation, PC – mW
Ambient Temperature, Ta – °C
IT04883

S Parameters (Common emitter)

V_{CE}=1V, I_C=1mA, Z_O=50Ω

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	–9.37	3.452	171.30	0.032	84.64	0.981	–6.86
200	0.959	–18.52	3.379	163.09	0.063	77.16	0.969	–13.36
400	0.920	–36.02	3.180	147.72	0.118	64.82	0.920	–25.40
600	0.870	–52.54	2.983	133.52	0.160	54.30	0.857	–36.21
800	0.809	–66.25	2.729	120.80	0.191	46.36	0.788	–45.12
1000	0.766	–79.65	2.257	109.78	0.213	39.67	0.736	–52.58
1200	0.710	–91.49	2.341	99.29	0.227	33.53	0.684	–59.58
1400	0.665	–101.98	2.127	89.83	0.234	29.19	0.646	–64.55
1600	0.624	–111.34	1.982	81.46	0.241	25.57	0.618	–69.64
1800	0.584	–119.75	1.850	73.70	0.242	23.60	0.592	–73.65
2000	0.547	–127.71	1.722	66.76	0.241	21.39	0.576	–77.85
2200	0.519	–134.50	1.627	59.90	0.242	19.82	0.556	–81.78
2400	0.497	–140.47	1.503	54.19	0.236	18.05	0.545	–83.82
2600	0.476	–147.99	1.439	49.22	0.235	18.66	0.537	–87.87
2800	0.456	–153.82	1.358	43.69	0.232	19.00	0.529	–91.11
3000	0.449	–160.19	1.311	39.62	0.234	20.75	0.526	–94.26

V_{CE}=1V, I_C=5mA, Z_O=50Ω

Freq(MHz)	$\|S_{11}\|$	$\angle S_{11}$	$\|S_{21}\|$	$\angle S_{21}$	$\|S_{12}\|$	$\angle S_{12}$	$\|S_{22}\|$	$\angle S_{22}$
100	0.868	–20.41	12.043	163.10	0.030	78.85	0.927	–15.14
200	0.810	–39.31	11.132	148.63	0.056	68.05	0.855	–28.24
400	0.676	–70.04	8.818	126.73	0.091	55.91	0.688	–47.24
600	0.580	–93.06	7.015	111.29	0.110	49.19	0.559	–59.83
800	0.510	–108.65	5.644	100.66	0.124	46.95	0.472	–68.06
1000	0.476	–122.60	4.793	91.68	0.136	45.10	0.421	–74.33
1200	0.444	–133.21	4.110	84.27	0.146	45.28	0.379	–80.89
1400	0.422	–142.46	3.570	77.70	0.160	45.45	0.351	–84.60
1600	0.407	–150.73	3.197	71.90	0.172	44.75	0.336	–88.68
1800	0.390	–157.43	2.891	66.51	0.184	45.30	0.322	–92.79
2000	0.378	–164.63	2.631	61.53	0.198	44.74	0.317	–95.95
2200	0.366	–171.48	2.431	56.60	0.211	44.47	0.307	–99.98
2400	0.348	–176.15	2.230	52.36	0.220	43.18	0.292	–101.62
2600	0.345	177.81	2.110	48.75	0.233	43.72	0.297	–105.11
2800	0.335	172.40	1.972	44.29	0.249	42.73	0.292	–108.53
3000	0.338	167.48	1.877	40.82	0.264	42.60	0.288	–112.12

V_{CE}=1V, I_C=10mA, Z_O=50Ω

Freq(MHz)	$\|S_{11}\|$	$\angle S_{11}$	$\|S_{21}\|$	$\angle S_{21}$	$\|S_{12}\|$	$\angle S_{12}$	$\|S_{22}\|$	$\angle S_{22}$
100	0.764	–29.84	18.265	156.65	0.028	74.42	0.874	–21.28
200	0.676	–54.78	15.535	138.81	0.048	63.90	0.754	–37.68
400	0.536	–90.44	10.885	116.45	0.075	55.09	0.546	–57.82
600	0.467	–113.60	8.066	102.71	0.091	52.85	0.427	–69.47
800	0.422	–128.36	6.297	93.75	0.106	53.04	0.355	–76.91
1000	0.411	–140.25	5.231	86.09	0.122	52.50	0.319	–82.75
1200	0.392	–149.73	4.441	79.76	0.136	52.76	0.290	–89.60
1400	0.382	–157.82	3.830	74.05	0.150	53.24	0.273	–92.78
1600	0.377	–164.52	3.419	69.03	0.167	52.21	0.264	–97.51
1800	0.367	–170.55	3.078	64.23	0.181	52.36	0.257	–100.85
2000	0.360	–176.92	2.791	59.58	0.199	51.67	0.258	–104.60
2200	0.354	177.02	2.576	55.23	0.213	50.42	0.250	–108.98
2400	0.337	172.42	2.363	51.24	0.229	49.07	0.240	–110.28
2600	0.341	167.28	2.225	47.94	0.244	48.69	0.243	–114.43
2800	0.333	162.15	2.085	43.63	0.259	47.55	0.242	–118.13
3000	0.341	158.12	1.974	40.45	0.275	46.58	0.241	–121.69

V_{CE}=1V, I_C=20mA, Z_O=50Ω

Freq(MHz)	$\|S_{11}\|$	$\angle S_{11}$	$\|S_{21}\|$	$\angle S_{21}$	$\|S_{12}\|$	$\angle S_{12}$	$\|S_{22}\|$	$\angle S_{22}$
100	0.618	–42.72	23.610	149.60	0.026	72.24	0.790	–27.83
200	0.529	–74.27	18.319	129.80	0.044	62.28	0.629	–46.47
400	0.441	–112.50	11.603	108.70	0.064	57.35	0.427	–66.16
600	0.410	–133.77	8.264	96.73	0.081	57.08	0.330	–77.07
800	0.391	–146.17	6.377	88.96	0.098	58.13	0.278	–84.38
1000	0.392	–155.66	5.230	82.09	0.114	58.23	0.253	–90.30
1200	0.384	–163.36	4.421	76.40	0.132	58.63	0.236	–97.18
1400	0.382	–169.82	3.811	71.22	0.150	58.66	0.225	–100.40
1600	0.380	–175.23	3.387	66.29	0.167	57.19	0.224	–105.09
1800	0.375	179.48	3.040	61.86	0.183	56.13	0.223	–108.81
2000	0.373	174.13	2.759	57.48	0.201	55.60	0.224	–112.07
2200	0.371	168.30	2.546	53.22	0.218	54.10	0.222	–116.70
2400	0.354	164.25	2.333	49.47	0.234	51.73	0.210	–188.27
2600	0.359	159.82	2.196	46.39	0.252	51.46	0.223	–122.85
2800	0.353	155.08	2.061	42.15	0.267	50.15	0.219	–126.76
3000	0.359	151.50	1.947	38.90	0.285	48.68	0.221	–129.41

V_{CE}=3V, I_C=1mA, Z_O=50Ω

Freq(MHz)	$\|S_{11}\|$	$\angle S_{11}$	$\|S_{21}\|$	$\angle S_{21}$	$\|S_{12}\|$	$\angle S_{12}$	$\|S_{22}\|$	$\angle S_{22}$
100	0.979	–8.01	3.212	172.18	0.027	83.62	0.980	–5.69
200	0.969	–16.02	3.145	164.97	0.054	77.88	0.972	–11.21
400	0.935	–31.19	3.003	150.84	0.101	67.28	0.936	–21.65
600	0.896	–45.81	2.854	137.86	0.140	57.41	0.885	–31.17
800	0.841	–58.39	2.652	125.81	0.169	50.17	0.826	–39.37
1000	0.804	–70.63	2.496	115.17	0.192	43.47	0.784	–46.14
1200	0.750	–81.70	2.346	104.72	0.207	37.49	0.734	–52.92
1400	0.703	–91.99	2.157	95.17	0.217	33.26	0.697	–57.77
1600	0.661	–101.18	2.025	86.77	0.222	29.47	0.669	–62.63
1800	0.616	–109.04	1.907	79.04	0.227	26.52	0.643	–66.73
2000	0.575	–116.98	1.783	71.85	0.227	24.28	0.627	–70.63
2200	0.546	–124.19	1.688	64.68	0.229	23.06	0.603	–74.47
2400	0.516	–130.14	1.564	58.81	0.225	20.92	0.592	–76.39
2600	0.493	–136.84	1.507	53.54	0.220	21.44	0.582	–79.98
2800	0.469	–143.06	1.413	47.78	0.218	21.52	0.575	–83.30
3000	0.458	–149.94	1.375	43.64	0.221	22.84	0.570	–86.69

V_{CE}=3V, I_C=5mA, Z_O=50Ω

Freq(MHz)	$\|S_{11}\|$	$\angle S_{11}$	$\|S_{21}\|$	$\angle S_{21}$	$\|S_{12}\|$	$\angle S_{12}$	$\|S_{22}\|$	$\angle S_{22}$
100	0.895	–17.00	11.719	164.93	0.027	80.24	0.931	–12.58
200	0.843	–32.71	11.021	151.89	0.048	71.52	0.873	–23.48
400	0.717	–59.47	9.077	131.27	0.081	59.96	0.734	–40.15
600	0.610	–80.49	7.427	115.92	0.101	52.95	0.610	–51.48
800	0.527	–95.40	6.067	104.96	0.115	49.60	0.520	–58.67
1000	0.481	–108.76	5.220	95.80	0.128	47.92	0.468	–64.49
1200	0.440	–119.43	4.503	88.43	0.139	48.04	0.421	–70.05
1400	0.408	–129.14	3.922	81.66	0.150	47.25	0.391	–73.23
1600	0.389	–137.62	3.535	75.58	0.162	47.13	0.371	–77.00
1800	0.367	–144.43	3.197	70.19	0.174	46.76	0.356	–80.26
2000	0.349	–152.28	2.917	65.15	0.184	46.96	0.348	–83.46
2200	0.334	–159.10	2.699	60.25	0.199	46.78	0.336	–87.00
2400	0.313	–163.95	2.467	55.92	0.207	45.92	0.322	–88.01
2600	0.310	–170.55	2.339	52.24	0.221	45.95	0.320	–91.33
2800	0.296	–175.85	2.183	47.62	0.233	45.33	0.313	–94.61
3000	0.300	178.00	2.081	44.35	0.248	45.02	0.311	–98.19

V_{CE}=3V, I_C=10mA, Z_O=50Ω

Freq(MHz)	$\|S_{11}\|$	$\angle S_{11}$	$\|S_{21}\|$	$\angle S_{21}$	$\|S_{12}\|$	$\angle S_{12}$	$\|S_{22}\|$	$\angle S_{22}$
100	0.810	−24.23	18.091	159.23	0.024	75.47	0.888	−17.34
200	0.727	−44.76	15.845	143.22	0.043	68.43	0.788	−31.12
400	0.571	−76.23	11.634	121.04	0.069	58.69	0.602	−48.48
600	0.473	−98.02	8.836	107.04	0.085	56.11	0.479	−58.66
800	0.415	−112.49	6.986	97.68	0.099	55.44	0.401	−64.92
1000	0.389	−125.02	5.845	89.81	0.113	54.58	0.360	−69.48
1200	0.362	−134.86	4.979	83.32	0.127	54.86	0.325	−75.26
1400	0.344	−144.09	4.310	77.63	0.142	54.58	0.305	−77.55
1600	0.333	−151.39	3.847	72.54	0.157	54.44	0.294	−81.52
1800	0.322	−157.65	3.470	67.71	0.171	54.60	0.285	−84.96
2000	0.314	−164.79	3.145	63.28	0.186	53.05	0.279	−87.88
2200	0.304	−171.79	2.912	58.68	0.203	53.17	0.270	−91.98
2400	0.286	−176.05	2.664	54.79	0.213	51.27	0.257	−93.01
2600	0.288	177.53	2.514	51.61	0.228	50.93	0.262	−96.25
2800	0.279	172.50	2.342	47.27	0.246	50.16	0.251	−100.34
3000	0.285	168.03	2.231	44.06	0.259	48.61	0.252	−103.57

V_{CE}=3V, I_C=20mA, Z_O=50Ω

Freq(MHz)	$\|S_{11}\|$	$\angle S_{11}$	$\|S_{21}\|$	$\angle S_{21}$	$\|S_{12}\|$	$\angle S_{12}$	$\|S_{22}\|$	$\angle S_{22}$
100	0.687	−32.49	24.296	153.10	0.022	75.55	0.833	−22.46
200	0.586	−58.40	19.679	134.65	0.038	64.60	0.694	−37.92
400	0.448	−92.92	13.058	113.27	0.058	60.12	0.493	−54.16
600	0.385	−114.95	9.489	100.88	0.076	58.66	0.383	−62.72
800	0.351	−128.20	7.348	92.79	0.091	59.71	0.322	−68.12
1000	0.339	−139.45	6.081	85.93	0.106	59.17	0.292	−72.14
1200	0.326	−148.09	5.153	80.07	0.123	60.25	0.266	−77.46
1400	0.321	−155.61	4.444	75.02	0.139	60.09	0.252	−79.72
1600	0.317	−162.36	3.960	70.25	0.156	59.58	0.248	−83.95
1800	0.309	−168.19	3.567	65.83	0.172	59.01	0.242	−87.72
2000	0.305	−174.56	3.224	61.44	0.187	57.22	0.241	−90.83
2200	0.300	178.81	2.987	57.40	0.206	56.28	0.235	−95.69
2400	0.285	174.62	2.725	53.65	0.218	54.42	0.220	−95.46
2600	0.288	169.71	2.568	50.67	0.235	53.79	0.228	−99.86
2800	0.282	164.54	2.401	46.41	0.251	52.35	0.219	−103.68
3000	0.289	160.80	2.275	43.43	0.267	51.29	0.225	−107.39

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