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Ordering number : ENN7321

NPN Epitaxial Planar Silicon Transistor

2SC5781

High-Frequency Low-Noise Amplifier and OSC Applications

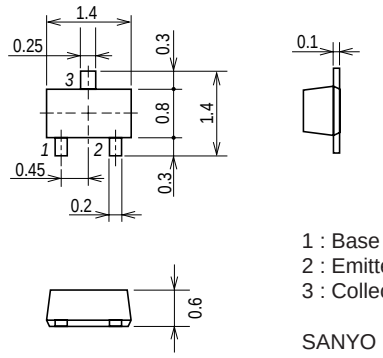
Features

- Low-noise use : NF=1.5dB typ (f=2GHz).
- High cutoff frequency : f_T=6.5GHz typ (V_{CE}=1V).
  : f_T=11.2GHz typ (V_{CE}=3V).
- Low operating voltage.
- Ultraminiature and thin flat leadless package (1.4mm×0.8mm×0.6mm).

Package Dimensions

unit : mm
2159

[2SC5781]



1 : Base
2 : Emitter
3 : Collector

SANYO : SSFP

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	Tj		150	°C
Storage Temperature	Tstg		–55 to +150	°C

Marking : NK

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

■ Any and all SANYO products described or contained herein do not have specifications that can handle applications that require extremely high levels of reliability, such as life-support systems, aircraft's control systems, or other applications whose failure can be reasonably expected to result in serious physical and/or material damage. Consult with your SANYO representative nearest you before using any SANYO products described or contained herein in such applications.

■ SANYO assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all SANYO products described or contained herein.

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

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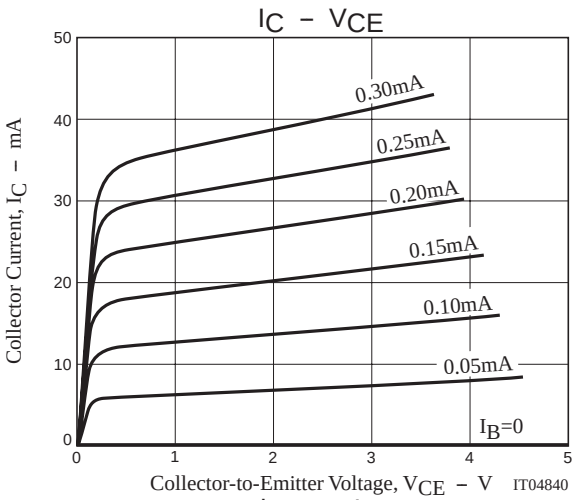
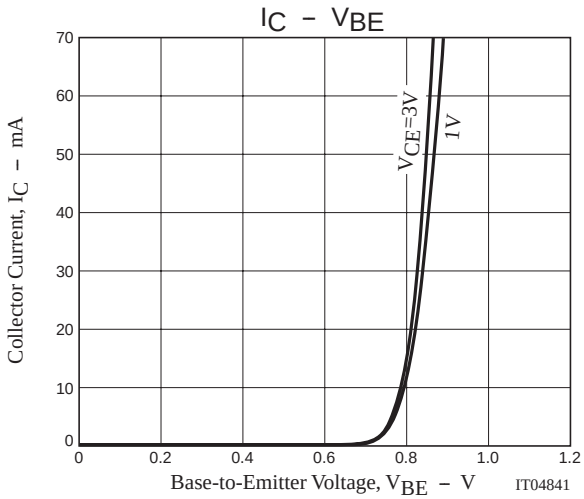
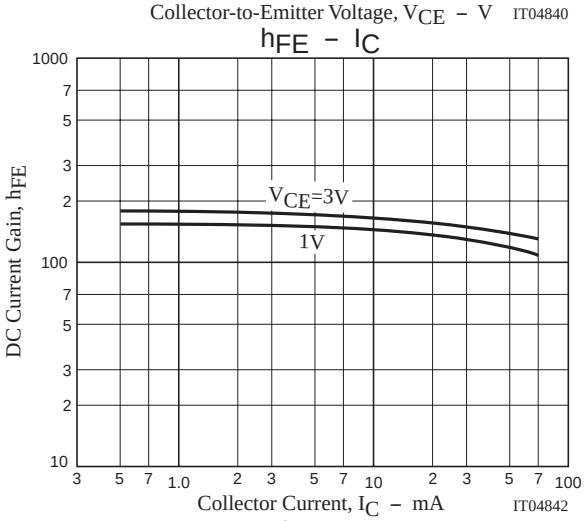
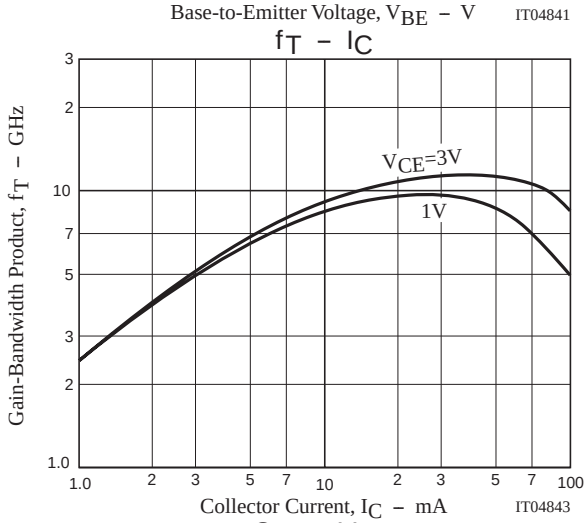
Electrical Characteristics at Ta=25°C

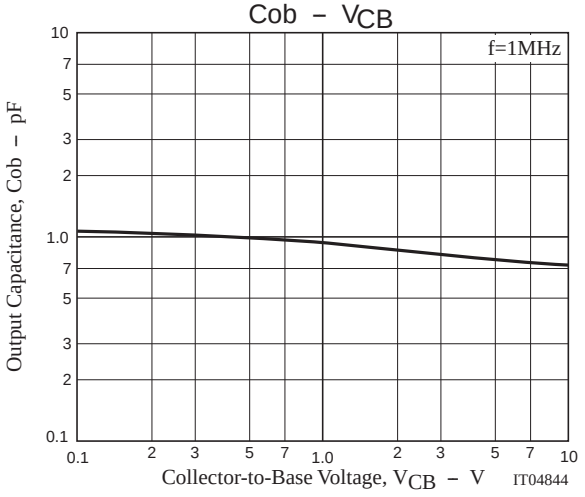
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Collector Cutoff Current	I_{CBO}	V_{CB}=5V, I_E=0			1.0	μA
Emitter Cutoff Current	I_{EBO}	V_{EB}=1V, I_C=0			10	μA
DC Current Gain	h_{FE}	V_{CE}=1V, I_C=5mA	100		160	
Gain-Bandwidth Product	f_T1	V_{CE}=1V, I_C=5mA	5	6.5		GHz
	f_T2	V_{CE}=3V, I_C=30mA	9.5	11.2		GHz
Output Capacitance	Cob	V_{CB}=1V, f=1MHz		0.95	1.2	pF
Reverse Transfer Capacitance	Cre	V_{CB}=1V, f=1MHz		0.7	0.9	pF
Forward Transfer Gain	$\|S21e\|^2 1$	V_{CE}=1V, I_C=5mA, f=2GHz	5	6		dB
	$\|S21e\|^2 2$	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

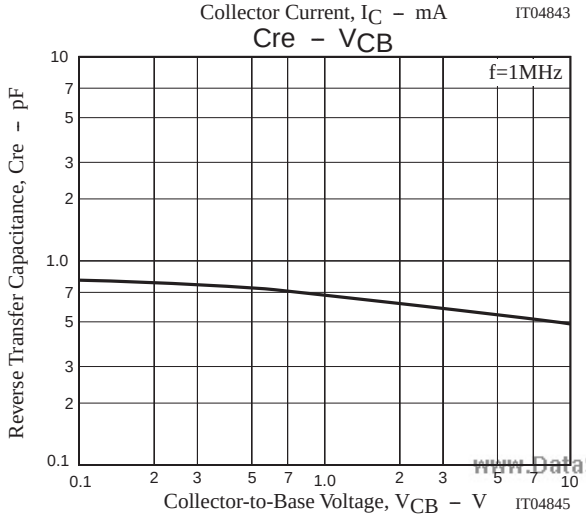












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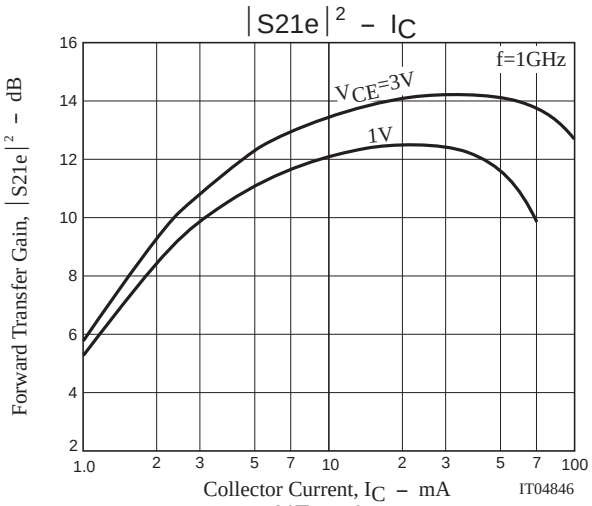

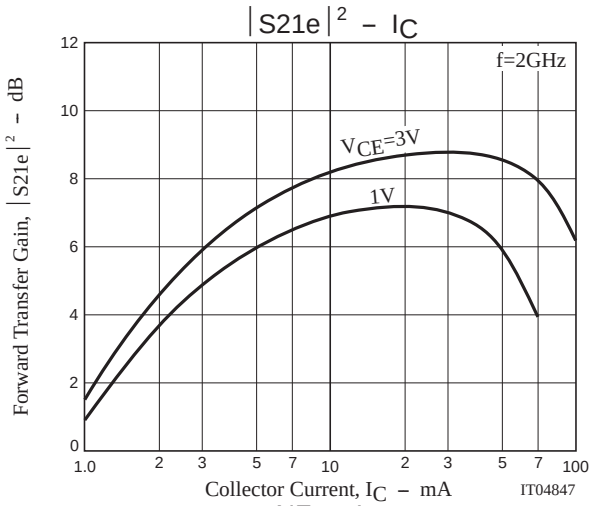

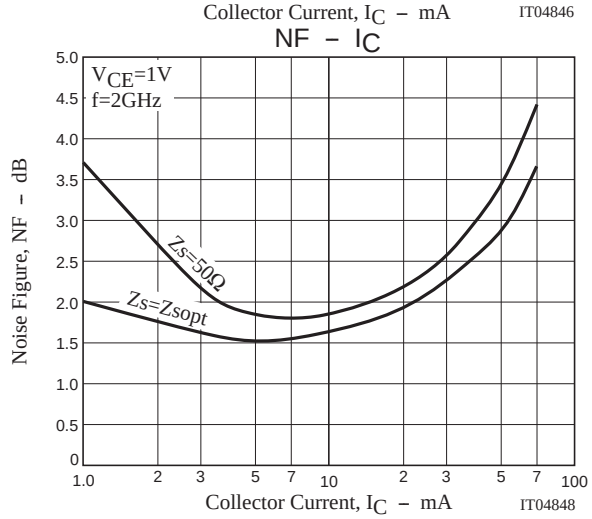

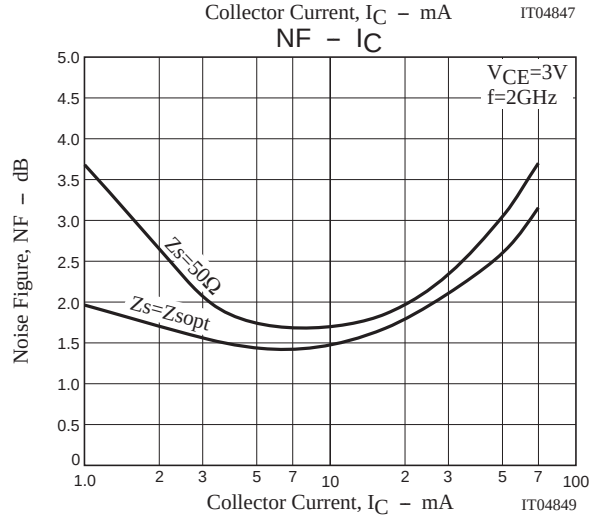

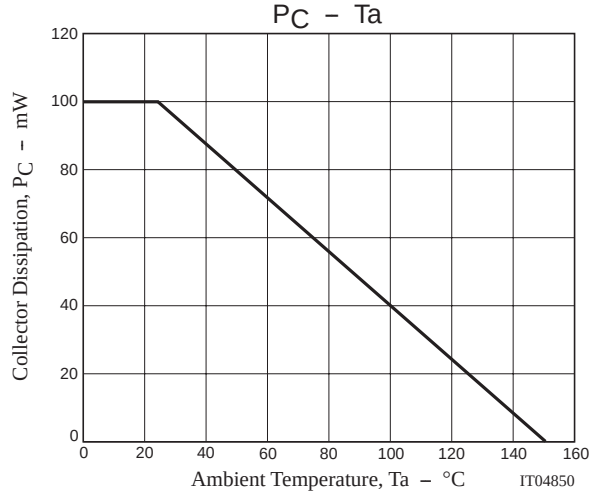

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S Parameters (Common emitter)

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	0.971	–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=50Ω

Freq(MHz)	$\|S_{11}\|$	$\angle S_{11}$	$\|S_{21}\|$	$\angle S_{21}$	$\|S_{12}\|$	$\angle S_{12}$	$\|S_{22}\|$	$\angle S_{22}$
100	0.871	–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=50Ω

Freq(MHz)	$\|S_{11}\|$	$\angle S_{11}$	$\|S_{21}\|$	$\angle S_{21}$	$\|S_{12}\|$	$\angle S_{12}$	$\|S_{22}\|$	$\angle S_{22}$
100	0.766	–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)	$\|S_{11}\|$	$\angle S_{11}$	$\|S_{21}\|$	$\angle S_{21}$	$\|S_{12}\|$	$\angle S_{12}$	$\|S_{22}\|$	$\angle S_{22}$
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)	$\|S_{11}\|$	$\angle S_{11}$	$\|S_{21}\|$	$\angle S_{21}$	$\|S_{12}\|$	$\angle S_{12}$	$\|S_{22}\|$	$\angle S_{22}$
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)	$\|S_{11}\|$	$\angle S_{11}$	$\|S_{21}\|$	$\angle S_{21}$	$\|S_{12}\|$	$\angle S_{12}$	$\|S_{22}\|$	$\angle S_{22}$
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)	$\|S_{11}\|$	$\angle S_{11}$	$\|S_{21}\|$	$\angle S_{21}$	$\|S_{12}\|$	$\angle S_{12}$	$\|S_{22}\|$	$\angle S_{22}$
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)	$\|S_{11}\|$	$\angle S_{11}$	$\|S_{21}\|$	$\angle S_{21}$	$\|S_{12}\|$	$\angle S_{12}$	$\|S_{22}\|$	$\angle S_{22}$
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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