Ordering number : ENN7325

NPN Epitaxial Planar Silicon Transistor

EC3H11B

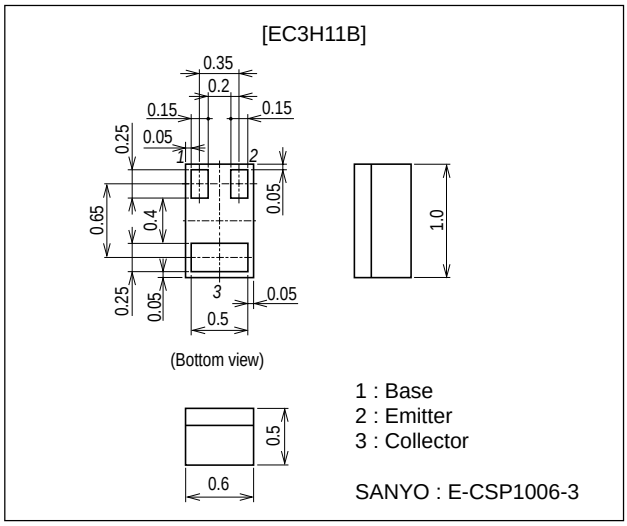
High-Frequency Low-Noise Amplifier and OSC Applications

Features

- Low noise : NF=1.5dB typ (f=2GHz).
- High cutoff frequency : f_T=6.0GHz typ (V_{CE}=1V).
  : f_T=10.5GHz typ (V_{CE}=3V).
- Low operating voltage.
- Ultraminiature (1006 size) and thin (0.5mm) leadless package.

Package Dimensions

unit : mm
2183



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

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	4.5	6.0		GHz
	f_T2	V_{CE}=3V, I_C=40mA	8.5	10.5		GHz
Output Capacitance	Cob	V_{CB}=1V, f=1MHz		1.05	1.3	pF
Reverse Transfer Capacitance	Cre	V_{CB}=1V, f=1MHz		0.8	1.0	pF

Marking : N

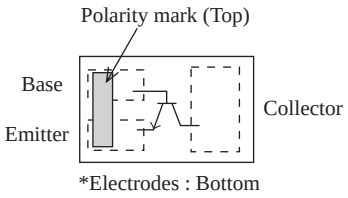
Continued on next page.

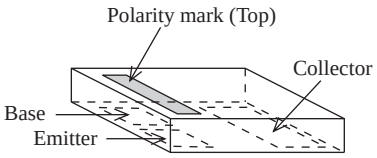
SANYO Electric Co.,Ltd. Semiconductor Company
TOKYO OFFICE Tokyo Bldg., 1-10, 1 Chome, Ueno, Taito-ku, TOKYO, 110-8534 JAPAN

Continued from preceding page.

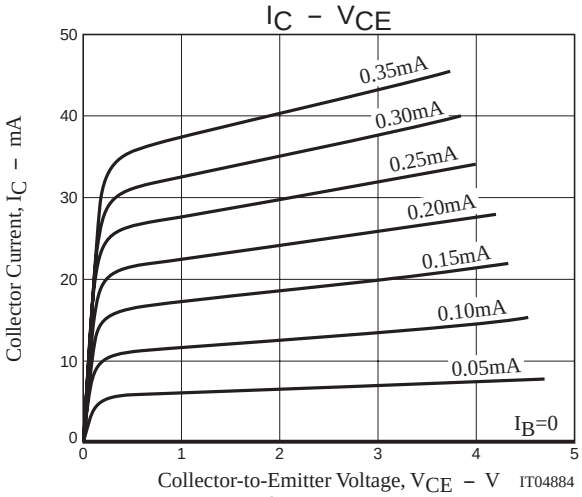
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Forward Transfer Gain	$\|S21e\|^2_1$	V_{CE}=1V, I_C=5mA, f=2GHz	4	5		dB
	$\|S21e\|^2_2$	V_{CE}=3V, I_C=40mA, f=2GHz	6.5	8.0		dB
Noise Figure	NF	V_{CE}=1V, I_C=7mA, f=2GHz		1.5	2.3	dB

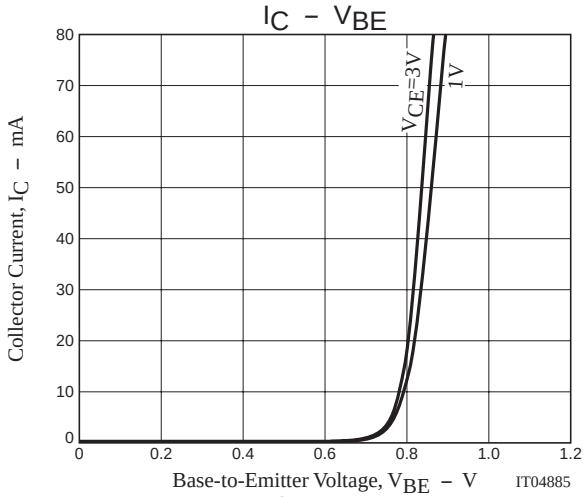
Electrical Connection (Top view)

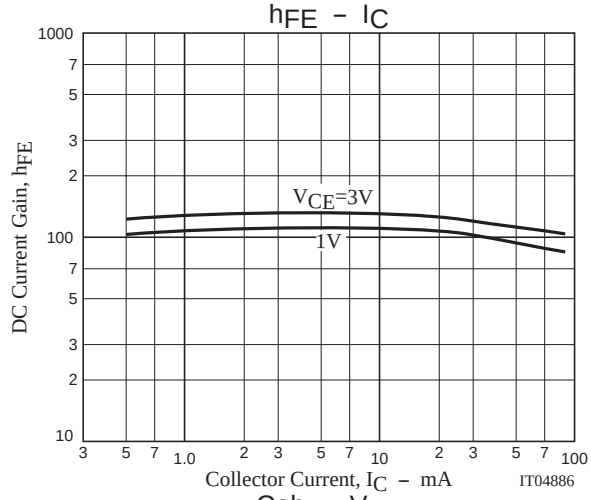


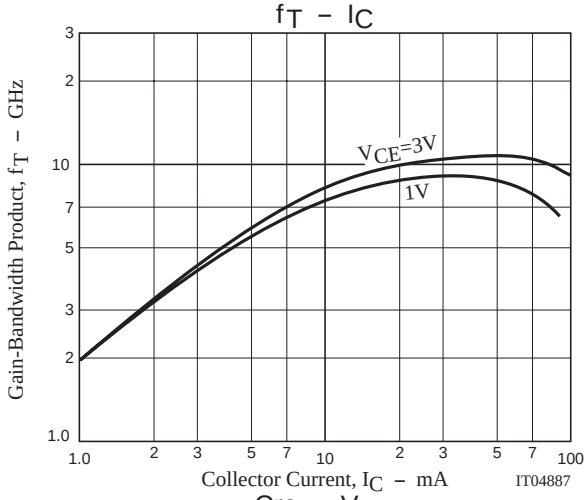


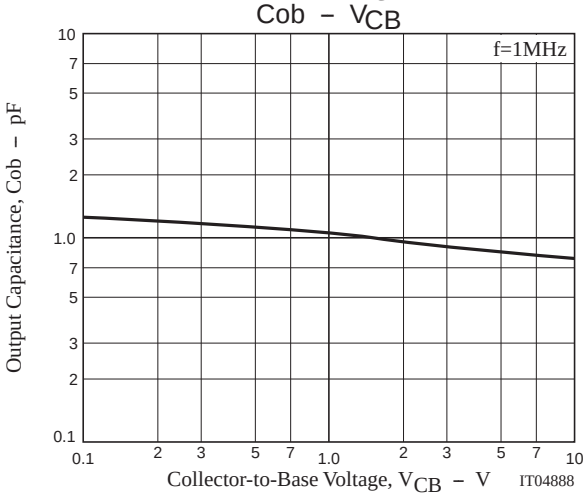
Pay attention to handling since it is liable to be affected by static electricity due to the high-frequency process adopted.

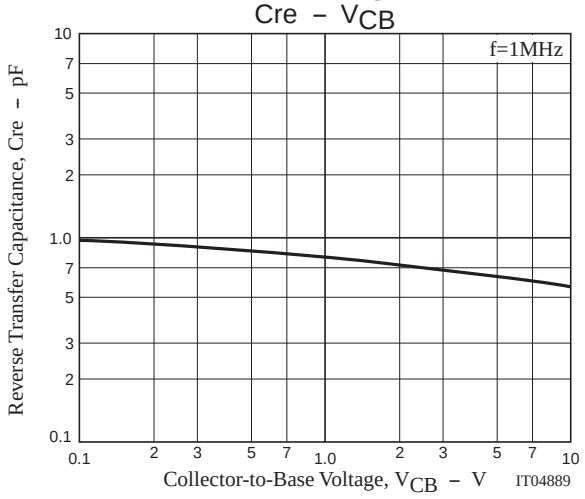


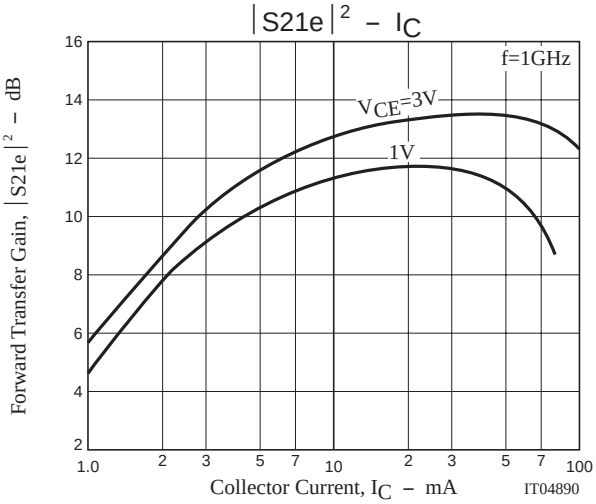


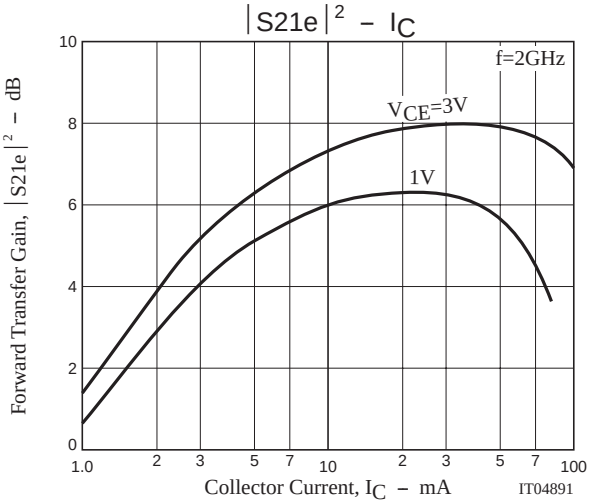


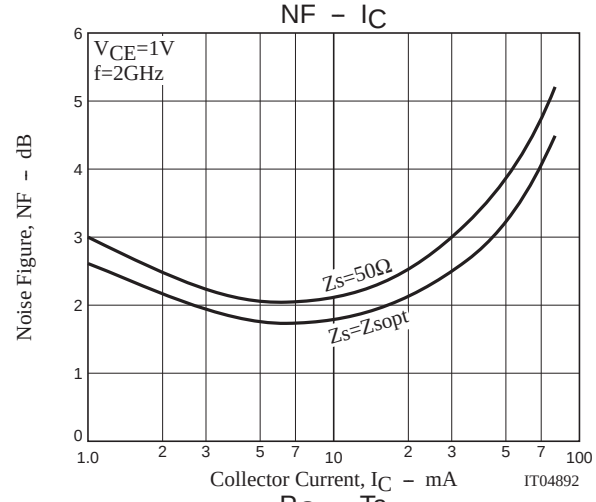


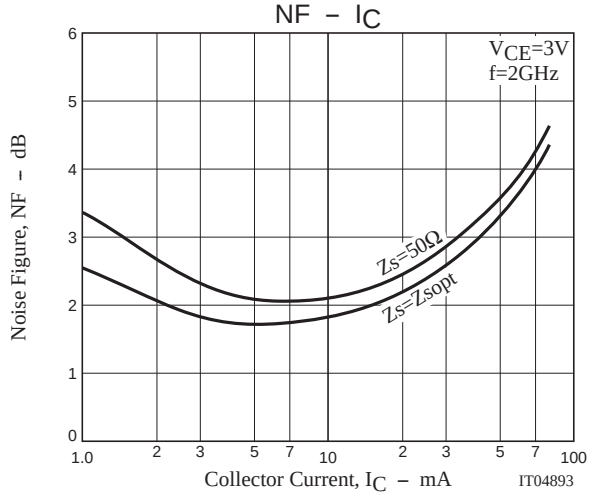


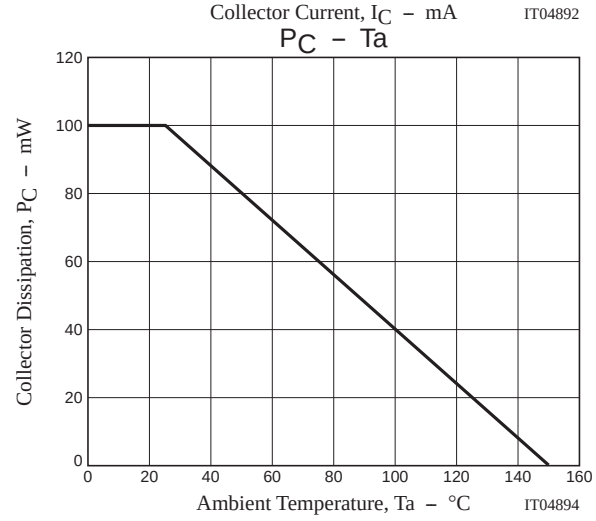



|S21e|² – IC
f=1GHz
VCE=3V
1V
Forward Transfer Gain, |S21e|² – dB
Collector Current, IC – mA
IT04890


|S21e|² – IC
f=2GHz
VCE=3V
1V
Forward Transfer Gain, |S21e|² – dB
Collector Current, IC – mA
IT04891


NF – IC
VCE=1V
f=2GHz
Zs=50Ω
Zs=Zsopt
Noise Figure, NF – dB
Collector Current, IC – mA
IT04892


NF – IC
VCE=3V
f=2GHz
Zs=50Ω
Zs=Zsopt
Noise Figure, NF – dB
Collector Current, IC – mA
IT04893


PC – Ta
Collector Dissipation, PC – mW
Ambient Temperature, Ta – °C
IT04894

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	0.964	−19.07	3.507	165.61	0.058	77.82	0.983	−10.63
200	0.940	−36.65	3.327	152.32	0.106	66.70	0.936	−20.97
400	0.878	−66.97	2.839	130.06	0.175	48.85	0.823	−36.84
600	0.823	−89.49	2.357	113.30	0.212	35.11	0.711	−46.92
800	0.783	−106.42	1.996	99.25	0.230	27.28	0.646	−55.07
1000	0.756	−118.66	1.746	88.71	0.237	20.78	0.599	−60.38
1200	0.729	−128.72	1.521	79.24	0.238	17.12	0.572	−64.14
1400	0.715	−136.62	1.353	71.05	0.233	14.54	0.556	−67.92
1600	0.704	−143.43	1.235	64.13	0.229	11.86	0.553	−71.89
1800	0.691	−149.92	1.141	58.12	0.219	10.66	0.548	−75.30
2000	0.676	−154.97	1.053	52.24	0.209	11.90	0.546	−78.98
2200	0.666	−160.29	0.984	46.80	0.201	12.64	0.546	−82.58
2400	0.654	−165.22	0.916	42.62	0.194	14.39	0.538	−85.98
2600	0.652	−169.54	0.860	38.70	0.188	16.89	0.543	−89.66
2800	0.639	−174.66	0.813	35.11	0.187	22.29	0.547	−93.09
3000	0.636	−178.58	0.769	32.17	0.185	26.82	0.547	−98.48

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	0.846	−40.41	12.794	153.73	0.049	70.40	0.894	−28.57
200	0.771	−72.62	10.651	133.89	0.081	54.06	0.740	−50.30
400	0.677	−112.29	7.058	110.50	0.110	39.95	0.515	−76.69
600	0.636	−132.29	5.105	97.98	0.120	37.08	0.400	−90.71
800	0.615	−144.75	3.981	88.29	0.130	35.33	0.351	−100.96
1000	0.603	−153.02	3.276	81.91	0.137	36.51	0.315	−106.69
1200	0.588	−158.73	2.774	75.75	0.147	38.56	0.296	−110.12
1400	0.576	−163.05	2.429	70.10	0.160	40.33	0.283	−113.34
1600	0.568	−167.84	2.175	65.36	0.170	40.77	0.277	−116.13
1800	0.563	−171.22	1.966	60.66	0.181	42.28	0.271	−117.78
2000	0.550	−174.69	1.814	56.27	0.193	43.79	0.259	−119.60
2200	0.539	−178.57	1.665	51.96	0.210	44.29	0.259	−122.86
2400	0.529	177.91	1.550	48.62	0.220	43.55	0.243	−124.49
2600	0.523	175.17	1.471	44.96	0.236	44.93	0.245	−125.10
2800	0.511	171.69	1.381	41.37	0.249	45.51	0.244	−126.90
3000	0.510	167.88	1.303	38.29	0.267	44.83	0.237	−130.18

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	0.738	−59.68	19.727	144.13	0.045	62.75	0.805	−42.82
200	0.662	−98.07	14.275	122.74	0.063	47.87	0.608	−71.16
400	0.611	−134.39	8.407	102.28	0.081	42.69	0.409	−101.75
600	0.593	−149.16	5.843	92.24	0.095	44.33	0.335	−117.32
800	0.583	−158.42	4.493	84.57	0.109	45.89	0.310	−127.11
1000	0.572	−163.82	3.659	79.16	0.125	48.28	0.288	−133.34
1200	0.560	−168.59	3.106	73.78	0.138	50.36	0.272	−137.61
1400	0.549	−172.10	2.727	69.18	0.156	51.31	0.266	−140.26
1600	0.545	−174.99	2.429	64.76	0.171	52.10	0.256	−142.55
1800	0.539	−178.32	2.191	60.61	0.188	51.01	0.249	−144.34
2000	0.524	179.02	2.013	56.58	0.202	51.48	0.240	−146.46
2200	0.515	175.61	1.855	52.42	0.222	51.69	0.239	−148.77
2400	0.511	172.50	1.724	49.41	0.238	50.30	0.219	−152.27
2600	0.497	169.64	1.632	46.34	0.253	50.53	0.211	−151.67
2800	0.488	166.07	1.534	42.54	0.274	49.13	0.207	−154.24
3000	0.482	162.94	1.447	39.57	0.293	47.51	0.201	−157.39

V_{CE}=1V, I_C=40mA, 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	0.546	−107.89	27.438	127.13	0.030	52.01	0.594	−74.53
200	0.574	−140.04	16.492	108.37	0.042	53.83	0.445	−109.47
400	0.591	−160.66	8.782	93.77	0.057	57.13	0.361	−138.63
600	0.588	−168.39	5.968	86.59	0.077	60.06	0.340	−150.47
800	0.590	−172.98	4.533	80.60	0.096	62.00	0.339	−156.88
1000	0.584	−176.25	3.698	75.82	0.118	63.44	0.327	−161.14
1200	0.569	−179.37	3.127	71.57	0.137	63.30	0.317	−164.56
1400	0.559	178.15	2.741	66.94	0.160	61.99	0.311	−166.03
1600	0.554	175.84	2.442	62.93	0.181	60.91	0.306	−168.41
1800	0.546	173.41	2.206	59.17	0.200	59.42	0.298	−170.60
2000	0.535	170.91	2.022	55.41	0.219	57.70	0.290	−173.47
2200	0.523	167.91	1.876	51.67	0.243	56.45	0.283	−175.72
2400	0.517	165.10	1.739	48.87	0.261	54.89	0.270	−179.45
2600	0.508	162.54	1.650	45.82	0.281	53.48	0.258	179.25
2800	0.495	159.68	1.560	42.26	0.301	51.47	0.246	176.23
3000	0.494	156.81	1.471	39.71	0.321	49.79	0.242	172.97

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	0.972	−16.53	3.352	167.63	0.046	78.74	0.989	−8.07
200	0.954	−31.95	3.178	155.74	0.086	70.82	0.951	−16.50
400	0.903	−59.51	2.794	135.14	0.148	53.57	0.867	−29.93
600	0.852	−81.50	2.391	118.76	0.184	40.99	0.772	−38.74
800	0.816	−98.19	2.069	105.11	0.203	32.29	0.707	−45.79
1000	0.779	−110.99	1.803	94.60	0.211	24.42	0.661	−50.92
1200	0.752	−121.24	1.605	85.04	0.211	21.11	0.634	−54.31
1400	0.731	−129.46	1.430	77.00	0.213	18.20	0.618	−57.53
1600	0.718	−137.31	1.311	70.11	0.209	16.46	0.609	−61.09
1800	0.703	−143.58	1.204	63.32	0.199	14.14	0.611	−64.04
2000	0.689	−149.78	1.109	57.29	0.193	14.65	0.602	−67.62
2200	0.673	−155.35	1.037	52.03	0.185	16.60	0.601	−71.09
2400	0.661	−160.61	0.966	47.68	0.179	17.95	0.590	−74.27
2600	0.660	−165.12	0.904	42.97	0.169	20.86	0.598	−77.27
2800	0.644	−170.34	0.841	39.64	0.166	25.75	0.600	−80.74
3000	0.637	−175.52	0.807	36.49	0.171	31.58	0.600	−85.13

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	0.870	−33.86	12.897	157.16	0.040	70.77	0.914	−22.40
200	0.795	−61.76	11.175	138.79	0.070	58.48	0.783	−40.32
400	0.685	−100.29	7.821	115.46	0.100	43.05	0.563	−62.52
600	0.628	−122.10	5.784	102.15	0.110	40.21	0.438	−73.89
800	0.600	−135.82	4.537	92.35	0.118	39.26	0.373	−81.80
1000	0.580	−144.70	3.752	85.42	0.128	38.97	0.331	−86.66
1200	0.563	−151.46	3.184	79.23	0.135	41.42	0.307	−88.45
1400	0.549	−156.68	2.773	73.72	0.147	42.78	0.290	−90.45
1600	0.540	−161.28	2.499	68.64	0.157	43.73	0.280	−92.53
1800	0.535	−165.08	2.256	64.02	0.166	45.68	0.276	−94.32
2000	0.522	−169.18	2.061	59.60	0.177	46.22	0.268	−95.53
2200	0.510	−172.97	1.896	55.02	0.192	47.18	0.268	−97.86
2400	0.502	−176.47	1.751	51.77	0.202	47.65	0.248	−98.90
2600	0.492	179.74	1.661	48.29	0.216	47.77	0.250	−98.90
2800	0.479	176.65	1.544	44.43	0.234	48.00	0.250	−99.70
3000	0.474	172.76	1.453	41.37	0.247	47.87	0.243	−102.59

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	0.771	–48.66	20.357	148.93	0.037	68.13	0.839	–33.35
200	0.679	–83.54	15.703	128.11	0.055	53.15	0.655	–56.93
400	0.592	–121.97	9.711	106.53	0.073	46.54	0.430	–82.38
600	0.559	–139.58	6.851	95.83	0.088	46.77	0.329	–95.67
800	0.545	–149.99	5.252	87.97	0.100	46.90	0.289	–104.99
1000	0.534	–157.10	4.303	82.27	0.112	50.25	0.260	–110.24
1200	0.517	–162.27	3.628	77.17	0.125	52.99	0.241	–112.59
1400	0.505	–165.64	3.151	72.11	0.144	53.01	0.227	–115.26
1600	0.497	–169.29	2.821	67.64	0.157	53.79	0.218	–117.91
1800	0.495	–172.56	2.512	63.14	0.174	53.53	0.210	–118.16
2000	0.482	–175.09	2.323	59.48	0.189	54.21	0.204	–119.97
2200	0.470	–178.73	2.137	55.43	0.204	54.20	0.196	–122.83
2400	0.457	177.56	1.973	52.43	0.220	52.42	0.180	–122.98
2600	0.457	174.28	1.863	49.12	0.239	51.98	0.177	–122.43
2800	0.441	171.63	1.746	45.54	0.252	51.56	0.175	–121.25
3000	0.433	168.02	1.641	42.45	0.272	51.17	0.164	–125.12

V_{CE}=3V, I_C=40mA, 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	0.544	–85.43	32.056	133.37	0.027	61.73	0.653	–56.38
200	0.520	–123.17	20.372	113.28	0.038	55.39	0.453	–86.38
400	0.519	–150.43	11.110	97.17	0.054	58.03	0.309	–115.37
600	0.514	–159.90	7.589	89.45	0.072	60.60	0.261	–129.69
800	0.508	–166.53	5.776	83.41	0.089	63.91	0.252	–137.12
1000	0.502	–170.43	4.686	78.67	0.108	63.24	0.235	–141.63
1200	0.490	–173.86	3.957	74.15	0.125	64.51	0.223	–145.31
1400	0.480	–176.10	3.428	70.14	0.144	63.86	0.219	–147.22
1600	0.472	–178.32	3.070	66.44	0.167	63.55	0.212	–149.77
1800	0.469	179.43	2.758	62.43	0.182	60.82	0.203	–150.93
2000	0.458	176.91	2.514	58.95	0.202	59.63	0.196	–152.87
2200	0.447	174.35	2.321	55.20	0.224	58.16	0.186	–154.84
2400	0.445	171.38	2.143	52.21	0.241	57.64	0.171	–159.37
2600	0.430	168.42	2.019	49.46	0.257	56.24	0.162	–158.75
2800	0.417	165.14	1.892	45.90	0.276	54.65	0.151	–159.12
3000	0.410	162.36	1.784	42.94	0.297	52.67	0.142	–163.78