

**EC3H09B**

High-Frequency Low-Noise Amplifier and OSC Applications

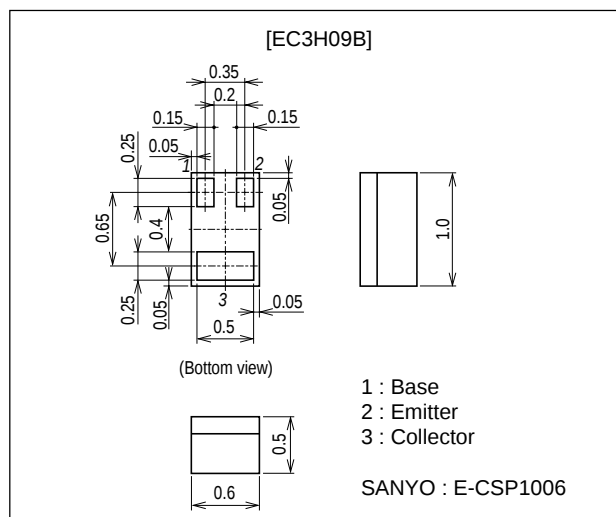
Features

- Low noise : NF=1.5dB typ (f=2GHz).
- High cut-off frequency : f_T =6.5GHz typ (V_{CE} =1V).
: f_T =11.2GHz 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 $T_a=25^\circ\text{C}$

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	$^\circ\text{C}$

Electrical Characteristics at $T_a=25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Collector Cutoff Current	I_{CBO}	$V_{CB}=5\text{V}, I_E=0$			1.0	μA
Emitter Cutoff Current	I_{EBO}	$V_{EB}=1\text{V}, I_C=0$			10	μA
DC Current Gain	h_{FE}	$V_{CE}=1\text{V}, I_C=5\text{mA}$	100		160	
Gain-Bandwidth Product	f_{T1}	$V_{CE}=1\text{V}, I_C=5\text{mA}$	5	6.5		GHz
	f_{T2}	$V_{CE}=3\text{V}, I_C=30\text{mA}$	9.5	11.2		GHz
Output Capacitance	C_{ob}	$V_{CB}=1\text{V}, f=1\text{MHz}$		0.95	1.2	pF
Reverse Transfer Capacitance	C_{re}	$V_{CB}=1\text{V}, f=1\text{MHz}$		0.7	0.9	pF

Marking : J

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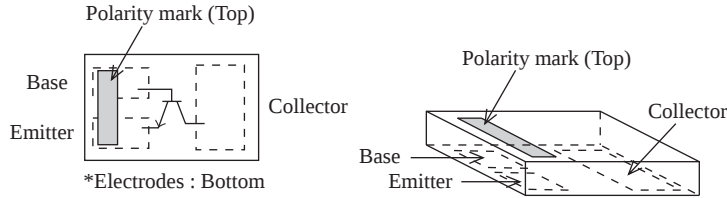
SANYO Electric Co.,Ltd. Semiconductor Company

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

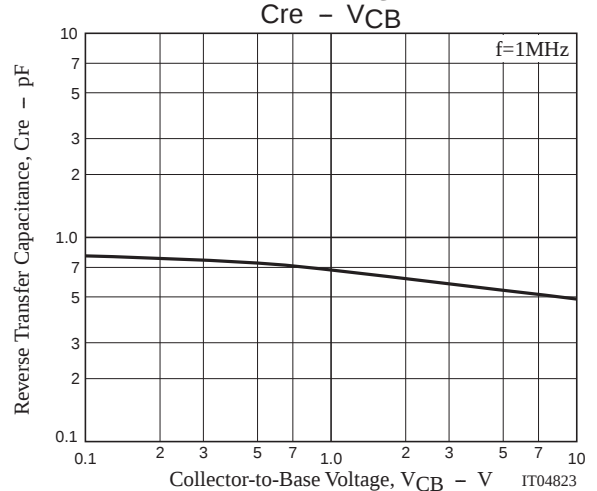
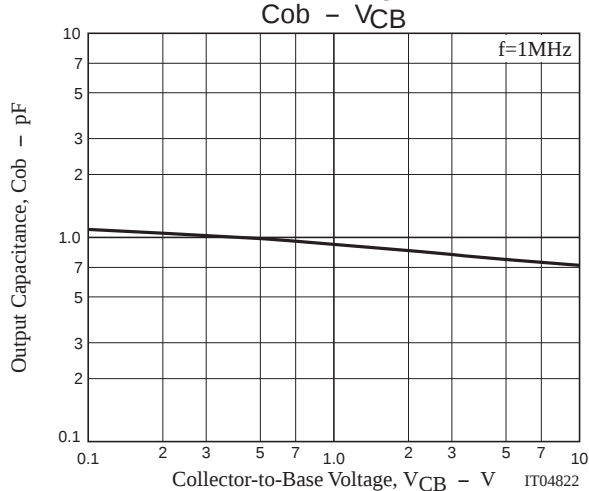
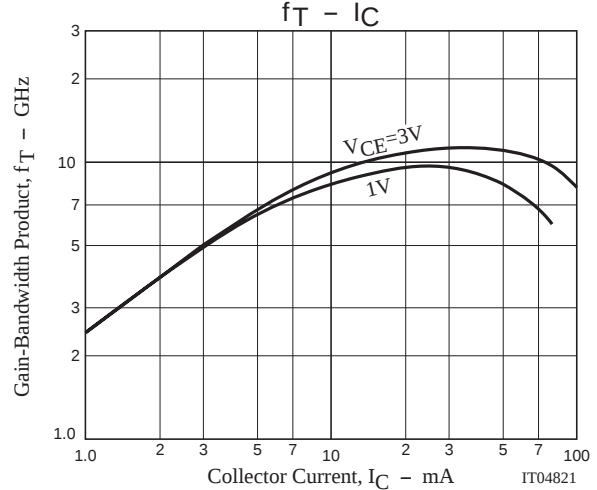
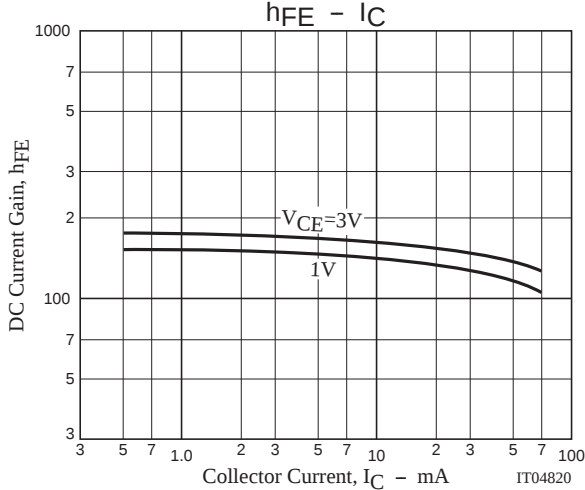
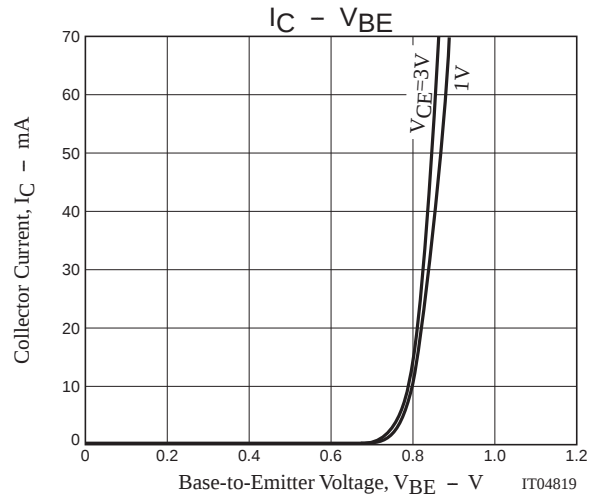
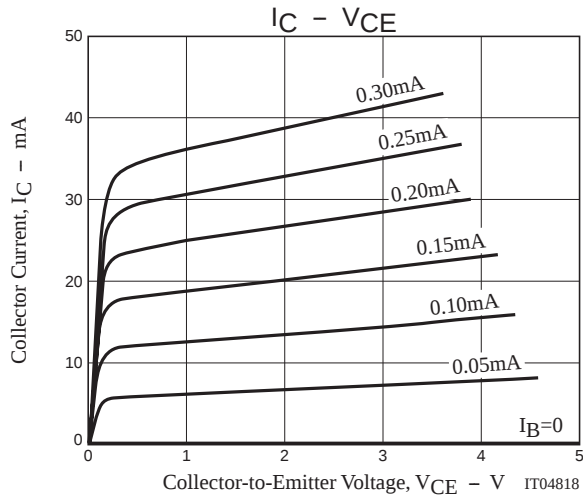
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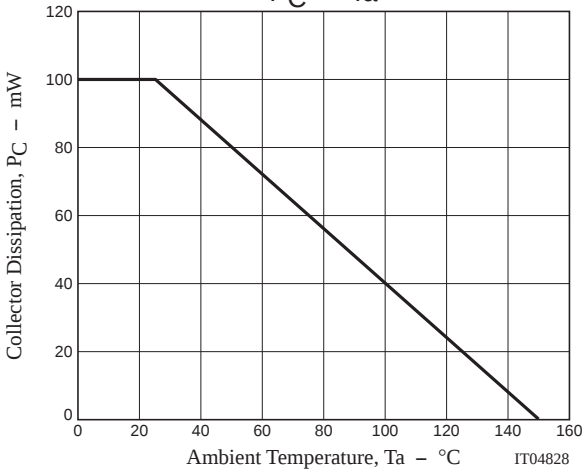
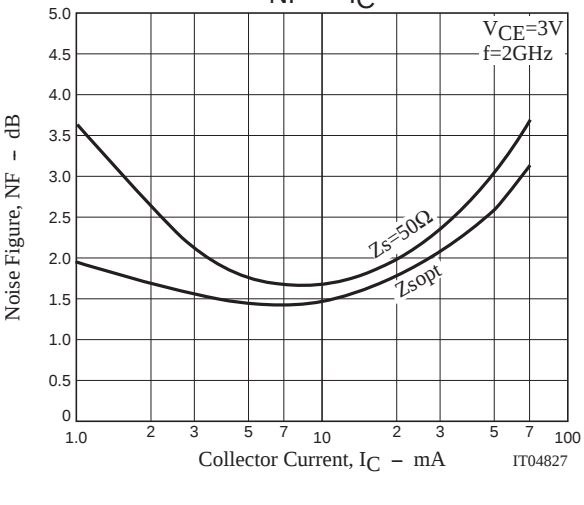
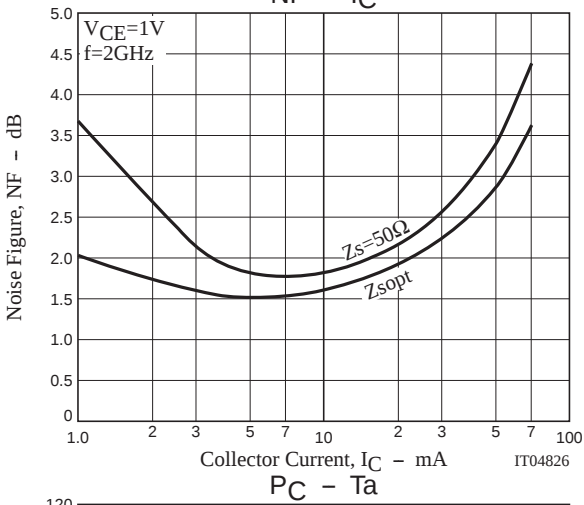
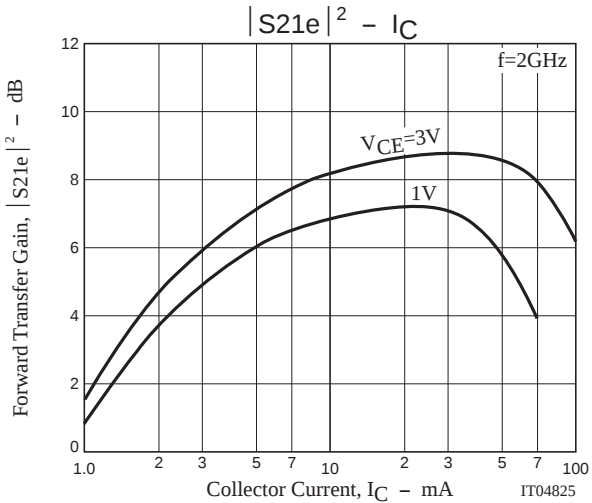
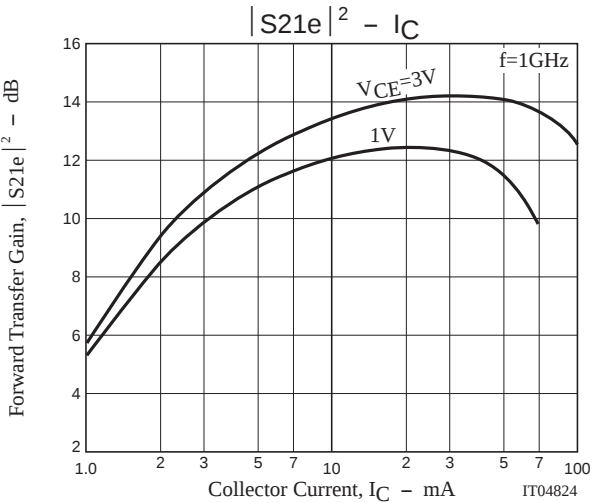
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Forward Transfer Gain	S21e ₂₁	V _{CE} =1V, I _C =5mA, f=2GHz	5	6		dB
	S21e ₂₂	V _{CE} =3V, I _C =30mA, f=2GHz	7.0	8.5		dB
Noise Figure	NF	V _{CE} =1V, I _C =5mA, f=2GHz		1.5	2.3	dB

Electrical Connection (Top view)



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





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S Parameters (Common emitter)

V_{CE}=1V, 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	0.968	-16.79	3.373	167.02	0.048	77.62	0.989	-9.19
200	0.948	-32.71	3.196	155.02	0.096	70.00	0.949	-18.45
400	0.892	-60.75	2.773	133.42	0.163	52.10	0.852	-33.03
600	0.836	-82.24	2.374	117.30	0.200	39.55	0.754	-42.69
800	0.789	-99.34	2.035	103.34	0.224	30.36	0.687	-50.89
1000	0.759	-112.13	1.789	92.87	0.235	23.93	0.634	-55.97
1200	0.733	-122.32	1.576	83.42	0.234	19.37	0.606	-59.85
1400	0.712	-130.00	1.406	75.11	0.234	16.71	0.587	-63.42
1600	0.698	-137.30	1.287	68.08	0.229	14.31	0.581	-66.83
1800	0.683	-144.17	1.192	61.55	0.222	12.16	0.573	-70.08
2000	0.669	-149.80	1.099	55.50	0.214	11.54	0.571	-73.08
2200	0.659	-154.81	1.024	50.19	0.206	13.07	0.569	-77.16
2400	0.642	-160.21	0.952	45.92	0.202	13.29	0.554	-79.81
2600	0.635	-164.74	0.897	41.45	0.193	16.16	0.565	-83.22
2800	0.629	-169.41	0.837	37.89	0.188	19.54	0.568	-86.83
3000	0.619	-174.07	0.799	34.37	0.190	22.49	0.563	-91.67

V_{CE}=1V, 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	0.849	-37.08	12.998	155.37	0.044	68.95	0.913	-25.28
200	0.777	-67.19	11.039	136.37	0.075	57.27	0.770	-45.63
400	0.674	-106.59	7.507	112.98	0.103	41.57	0.541	-69.90
600	0.626	-127.60	5.479	99.96	0.115	37.83	0.418	-82.80
800	0.601	-140.62	4.282	90.63	0.124	36.84	0.363	-91.97
1000	0.585	-148.69	3.528	83.85	0.133	38.00	0.321	-96.97
1200	0.566	-155.47	3.000	77.71	0.142	38.38	0.301	-101.59
1400	0.556	-160.27	2.601	72.26	0.150	42.15	0.287	-103.64
1600	0.548	-164.53	2.346	67.49	0.163	42.19	0.276	-105.98
1800	0.537	-168.47	2.124	62.94	0.173	42.68	0.268	-107.07
2000	0.526	-172.04	1.939	58.45	0.183	44.02	0.266	-108.83
2200	0.518	-175.49	1.789	54.03	0.198	44.36	0.260	-110.18
2400	0.507	-179.61	1.657	50.86	0.212	44.51	0.239	-112.95
2600	0.502	177.23	1.559	47.02	0.223	45.68	0.243	-113.25
2800	0.486	174.34	1.460	43.45	0.237	44.59	0.245	-114.77
3000	0.484	170.37	1.376	40.37	0.254	45.21	0.238	-117.97

V_{CE}=1V, 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	0.744	-54.61	20.098	146.36	0.041	63.26	0.830	-38.46
200	0.664	-91.71	15.053	125.03	0.057	49.61	0.635	-64.12
400	0.600	-128.66	9.029	104.15	0.078	43.88	0.418	-92.00
600	0.572	-145.12	6.310	94.13	0.094	45.10	0.332	-107.03
800	0.564	-155.02	4.843	86.30	0.101	46.33	0.298	-116.65
1000	0.553	-160.68	3.953	80.70	0.115	49.04	0.272	-122.54
1200	0.538	-166.08	3.348	75.88	0.131	49.55	0.257	-125.73
1400	0.526	-169.57	2.920	70.79	0.145	51.15	0.246	-129.15
1600	0.522	-172.62	2.602	66.59	0.161	52.21	0.239	-131.00
1800	0.513	-175.68	2.344	62.48	0.175	52.26	0.229	-131.76
2000	0.501	-178.84	2.145	58.31	0.191	52.49	0.223	-134.35
2200	0.493	177.69	1.982	54.28	0.208	52.76	0.217	-135.36
2400	0.485	174.42	1.831	51.23	0.225	51.63	0.199	-139.04
2600	0.480	171.65	1.725	47.98	0.239	51.38	0.199	-139.54
2800	0.464	168.72	1.624	44.29	0.258	50.51	0.191	-140.56
3000	0.457	165.14	1.523	41.28	0.275	48.68	0.185	-142.36

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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	0.575	-89.68	28.249	132.16	0.032	55.71	0.666	-61.14
200	0.563	-127.25	17.791	112.23	0.042	50.70	0.473	-93.27
400	0.562	-153.10	9.670	96.26	0.060	52.22	0.339	-123.23
600	0.557	-162.57	6.599	88.53	0.074	57.08	0.301	-137.20
800	0.554	-168.54	5.027	82.26	0.094	59.83	0.293	-143.84
1000	0.547	-172.35	4.085	77.32	0.112	61.67	0.281	-149.65
1200	0.535	-176.01	3.455	73.04	0.126	61.05	0.269	-152.59
1400	0.528	-178.43	3.012	68.78	0.150	60.68	0.263	-154.98
1600	0.520	179.21	2.684	64.94	0.169	60.12	0.257	-157.14
1800	0.512	176.62	2.419	61.21	0.185	59.47	0.248	-159.25
2000	0.504	174.49	2.214	57.44	0.206	58.32	0.239	-161.57
2200	0.493	171.77	2.052	53.73	0.223	57.35	0.232	-162.89
2400	0.485	168.47	1.890	50.78	0.240	55.22	0.216	-167.73
2600	0.473	165.31	1.784	47.90	0.260	53.81	0.205	-167.00
2800	0.465	162.52	1.675	44.25	0.280	53.36	0.200	-169.04
3000	0.456	159.36	1.587	41.33	0.298	51.09	0.196	-173.01

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	0.970	-15.47	3.608	168.02	0.038	80.41	0.991	-7.75
200	0.951	-30.01	3.500	156.99	0.074	71.14	0.961	-15.58
400	0.900	-56.20	3.095	137.61	0.135	55.53	0.878	-28.05
600	0.848	-77.42	2.674	122.02	0.167	43.47	0.789	-37.24
800	0.807	-94.03	2.306	109.09	0.188	35.30	0.722	-43.82
1000	0.771	-106.70	2.033	98.22	0.199	27.52	0.677	-48.89
1200	0.739	-117.20	1.784	88.90	0.203	24.35	0.644	-51.98
1400	0.719	-125.86	1.594	80.93	0.200	21.77	0.621	-55.03
1600	0.698	-133.28	1.465	73.97	0.198	19.48	0.611	-58.34
1800	0.684	-140.05	1.348	67.57	0.194	18.63	0.610	-60.96
2000	0.664	-145.84	1.251	61.77	0.187	17.16	0.600	-63.68
2200	0.647	-151.62	1.156	55.85	0.181	19.36	0.602	-67.40
2400	0.632	-157.11	1.075	51.61	0.177	19.72	0.580	-69.63
2600	0.625	-161.79	1.014	47.22	0.172	23.14	0.587	-72.38
2800	0.612	-166.55	0.942	43.17	0.168	25.73	0.595	-76.01
3000	0.599	-171.46	0.894	39.52	0.171	30.41	0.589	-79.78

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	0.867	-31.32	13.163	158.43	0.036	72.67	0.930	-20.32
200	0.799	-57.72	11.570	140.89	0.062	60.10	0.811	-36.80
400	0.684	-95.53	8.263	117.78	0.091	46.15	0.594	-57.52
600	0.622	-117.42	6.172	104.00	0.102	41.13	0.464	-67.59
800	0.587	-131.73	4.880	94.39	0.113	40.83	0.396	-74.82
1000	0.562	-140.79	4.044	87.36	0.119	41.10	0.353	-78.48
1200	0.543	-148.48	3.418	81.25	0.130	41.47	0.322	-81.14
1400	0.532	-153.64	2.983	75.97	0.142	43.39	0.306	-82.48
1600	0.519	-158.24	2.669	70.74	0.150	45.09	0.295	-84.21
1800	0.510	-162.43	2.411	66.30	0.159	45.01	0.290	-84.74
2000	0.498	-165.75	2.199	61.85	0.169	46.92	0.283	-85.85
2200	0.484	-170.11	2.024	57.26	0.182	49.20	0.281	-88.24
2400	0.476	-174.47	1.863	54.14	0.194	47.49	0.261	-89.10
2600	0.467	-178.08	1.753	50.36	0.206	48.56	0.266	-88.83
2800	0.455	179.00	1.634	46.50	0.219	49.39	0.267	-90.22
3000	0.447	174.76	1.536	43.70	0.229	48.85	0.260	-92.67

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$V_{CE}=3V$, $I_C=10mA$, $Z_O=50\Omega$

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.771	-45.05	20.792	150.58	0.032	69.91	0.866	-30.29
200	0.679	-78.66	16.411	130.13	0.053	55.62	0.686	-51.47
400	0.584	-116.88	10.301	108.37	0.071	46.72	0.452	-74.77
600	0.542	-135.32	7.317	97.53	0.084	48.29	0.344	-85.87
800	0.525	-146.54	5.624	89.73	0.093	48.59	0.299	-93.67
1000	0.514	-153.16	4.628	83.80	0.106	51.39	0.264	-98.43
1200	0.494	-158.86	3.894	78.36	0.115	53.88	0.242	-101.02
1400	0.483	-163.05	3.376	74.03	0.136	54.38	0.230	-102.97
1600	0.475	-166.71	3.014	69.51	0.148	54.71	0.222	-104.72
1800	0.469	-170.02	2.712	65.29	0.160	54.13	0.212	-105.32
2000	0.458	-173.05	2.474	61.37	0.176	55.40	0.207	-104.93
2200	0.445	-176.54	2.274	57.27	0.191	56.39	0.204	-106.24
2400	0.439	-179.77	2.093	54.29	0.206	53.64	0.184	-108.58
2600	0.430	-176.83	1.965	50.85	0.223	53.47	0.182	-107.06
2800	0.414	-173.71	1.841	47.44	0.238	52.52	0.179	-106.11
3000	0.408	-170.38	1.725	44.36	0.256	51.77	0.173	-106.92

$V_{CE}=3V$, $I_C=30mA$, $Z_O=50\Omega$

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.593	-71.61	31.509	138.07	0.025	60.92	0.729	-46.42
200	0.535	-109.79	21.047	117.38	0.040	55.16	0.510	-73.03
400	0.504	-141.59	11.799	99.86	0.054	54.25	0.324	-99.37
600	0.493	-154.02	8.060	91.58	0.070	59.83	0.258	-112.17
800	0.487	-161.10	6.164	85.15	0.085	61.28	0.237	-120.88
1000	0.479	-165.40	5.024	80.37	0.102	62.37	0.217	-125.73
1200	0.467	-169.58	4.235	75.94	0.119	63.82	0.204	-129.11
1400	0.457	-172.02	3.663	71.95	0.135	62.37	0.196	-129.95
1600	0.450	-174.70	3.241	68.39	0.154	62.67	0.188	-131.46
1800	0.442	-176.99	2.934	63.98	0.173	61.17	0.180	-131.51
2000	0.432	-179.45	2.665	60.62	0.187	60.24	0.169	-133.74
2200	0.421	-177.74	2.461	57.05	0.205	59.33	0.167	-132.95
2400	0.414	-174.32	2.265	54.03	0.220	58.39	0.149	-138.28
2600	0.406	-171.15	2.125	51.14	0.242	57.25	0.141	-135.47
2800	0.394	-168.11	1.993	47.61	0.257	55.56	0.135	-136.77
3000	0.387	-165.37	1.871	44.80	0.272	53.24	0.127	-139.05

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