



# EC3H10B

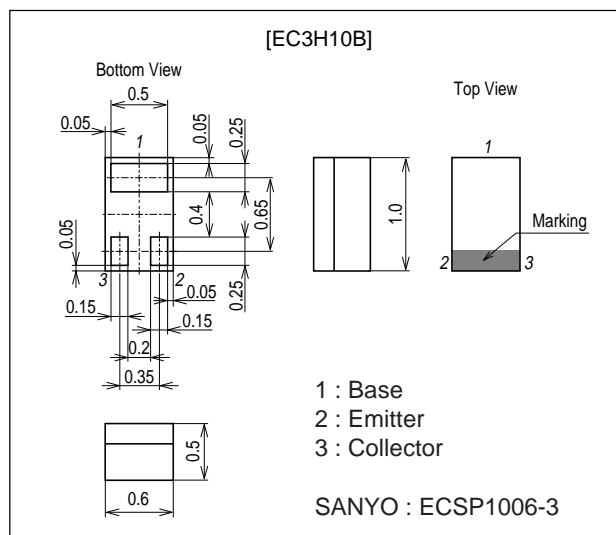
## UHF to S Band Low-Noise Amplifier and OSC Applications

### Features

- Low noise : NF=1.3dB typ (f=2GHz).
- High gain-bandwidth product  
:  $f_T=8.5\text{GHz}$  typ ( $V_{CE}=1\text{V}$ ).  
:  $f_T=12.5\text{GHz}$  typ ( $V_{CE}=3\text{V}$ ).
- Low operating voltage.
- High gain :  $|S_{21e}|^2=10.5\text{dB}$  typ (f=2GHz).
- Ultraminiature (1006 size) and thin (0.5mm) leadless package.

### Package Dimensions

unit : mm  
2183A



### Specifications

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

Parameter	Symbol	Conditions	Ratings	Unit
Collector-to-Base Voltage	$V_{CB0}$		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	$T_j$		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	$\mu\text{A}$
Emitter Cutoff Current	$I_{EBO}$	$V_{EB}=1\text{V}, I_C=0$			10	$\mu\text{A}$
DC Current Gain	$h_{FE}$	$V_{CE}=1\text{V}, I_C=5\text{mA}$	100		160	
Gain-Bandwidth Product	$f_{T1}$	$V_{CE}=1\text{V}, I_C=5\text{mA}$	7.0	8.5		GHz
	$f_{T2}$	$V_{CE}=3\text{V}, I_C=20\text{mA}$	10.5	12.5		GHz
Output Capacitance	$C_{ob}$	$V_{CB}=1\text{V}, f=1\text{MHz}$		0.65	0.8	pF
Reverse Transfer Capacitance	$C_{re}$	$V_{CB}=1\text{V}, f=1\text{MHz}$		0.5	0.7	pF

Marking : M

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- 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**

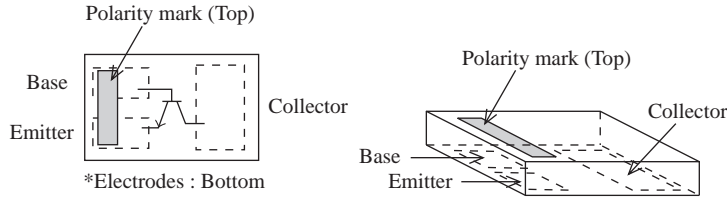
TOKYO OFFICE Tokyo Bldg., 1-10, 1 Chome, Ueno, Taito-ku, TOKYO, 110-8534 JAPAN

# EC3H10B

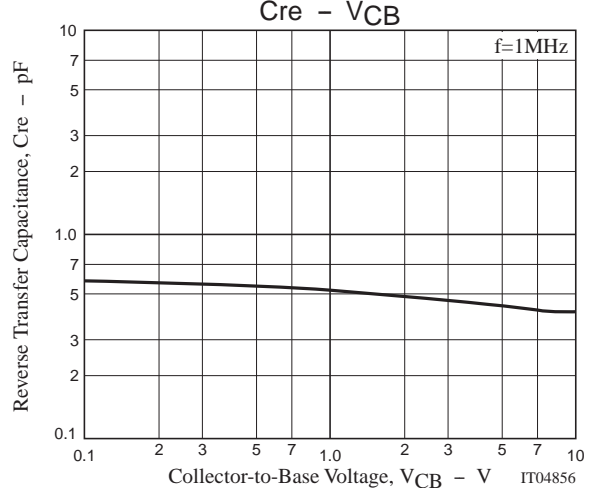
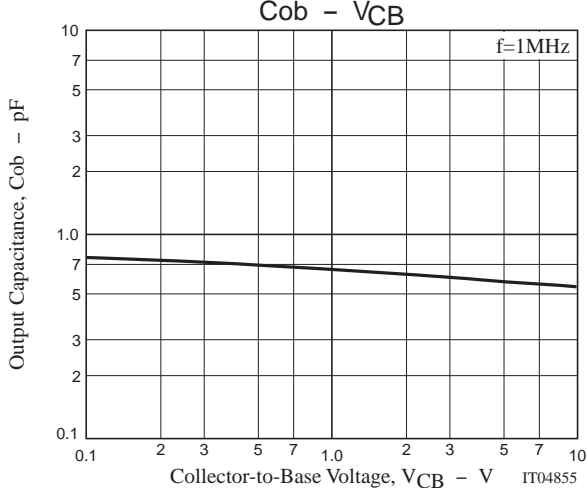
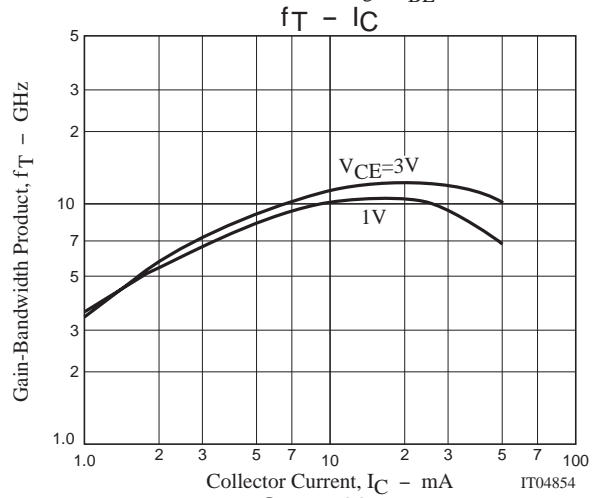
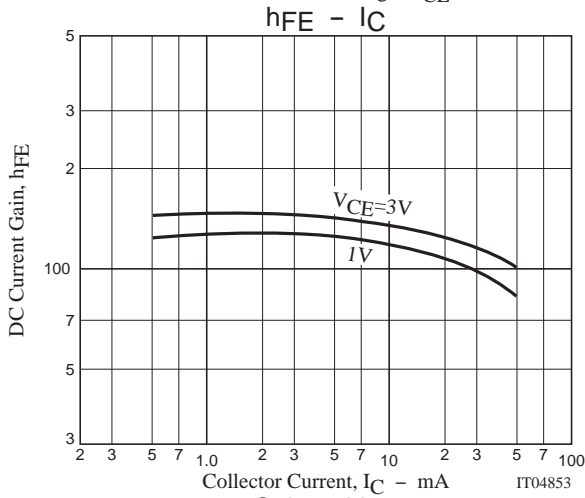
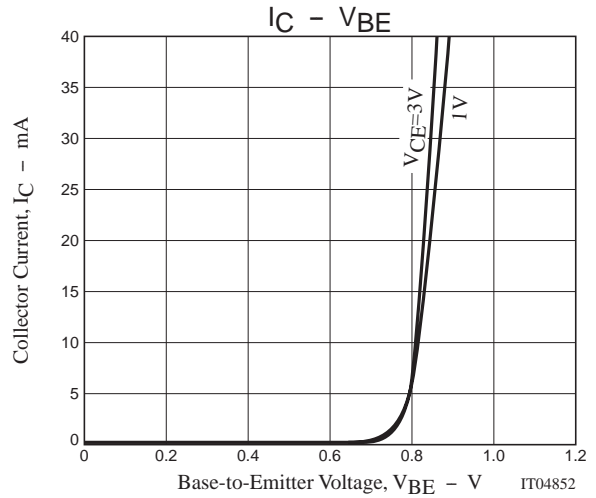
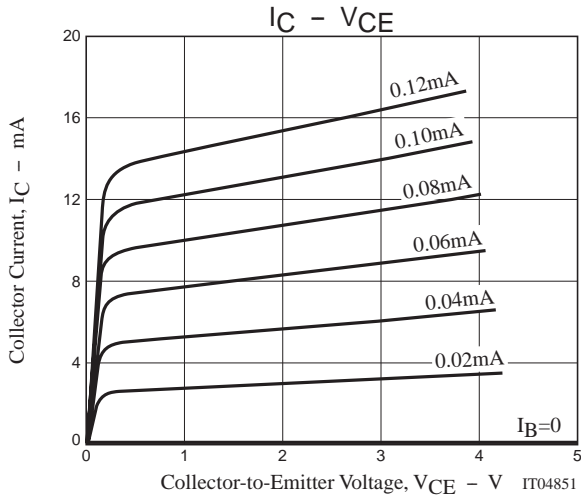
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Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Forward Transfer Gain	S21e 21	$V_{CE}=1V, I_C=5mA, f=2GHz$	7.0	8.5		dB
	S21e 22	$V_{CE}=3V, I_C=20mA, f=2GHz$	9.0	10.5		dB
Noise Figure	NF	$V_{CE}=1V, I_C=3mA, f=2GHz$		1.3	2.0	dB

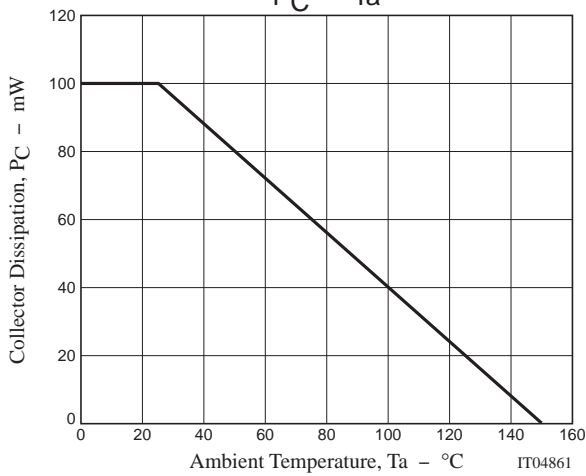
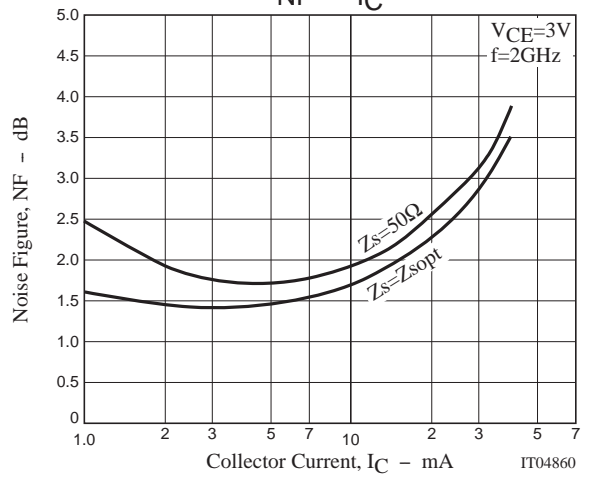
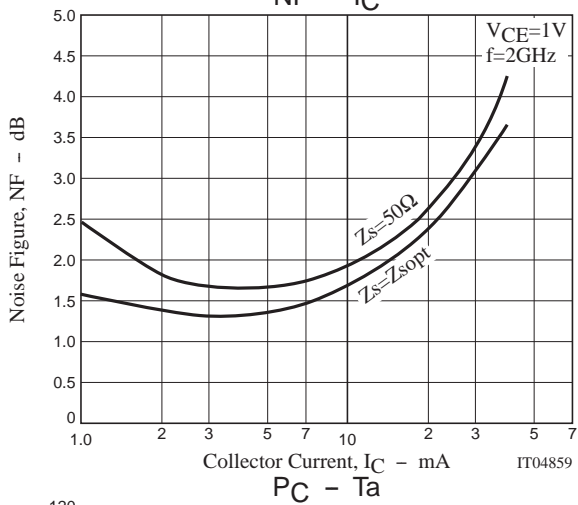
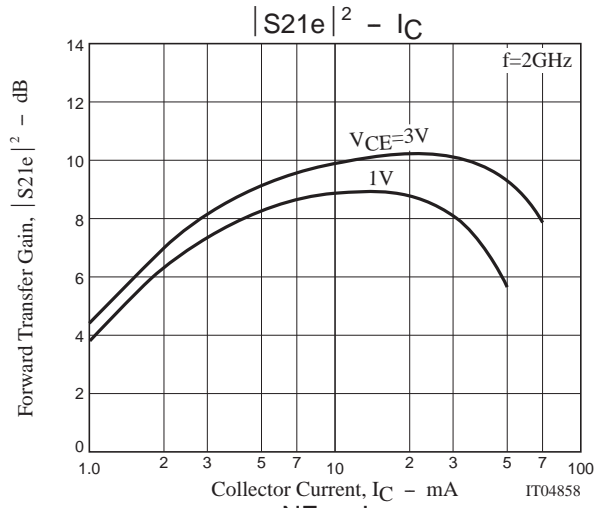
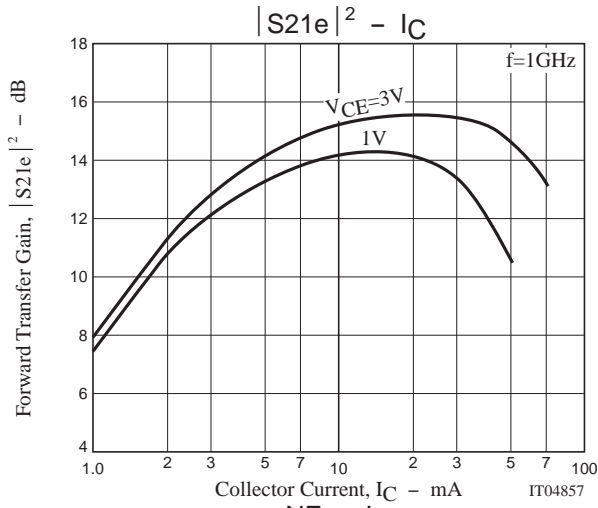
## Electrical Connection (Top view)



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



# EC3H10B



## EC3H10B

### S Parameters (Common emitter)

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

Freq(MHz)	S <sub>11</sub>	∠S <sub>11</sub>	S <sub>21</sub>	∠S <sub>21</sub>	S <sub>12</sub>	∠S <sub>12</sub>	S <sub>22</sub>	∠S <sub>22</sub>
100	0.966	-10.18	3.348	171.02	0.033	81.34	0.996	-6.60
200	0.954	-19.78	3.308	162.27	0.063	75.33	0.973	-13.63
400	0.918	-38.13	3.066	146.51	0.117	64.65	0.927	-26.09
600	0.872	-54.37	2.810	132.56	0.155	53.04	0.860	-36.18
800	0.823	-68.52	2.534	120.11	0.185	45.04	0.805	-45.08
1000	0.781	-79.69	2.315	109.91	0.207	37.79	0.754	-51.79
1200	0.742	-90.36	2.089	100.31	0.216	31.40	0.716	-56.99
1400	0.710	-98.20	1.897	92.03	0.217	28.68	0.679	-61.32
1600	0.682	-105.57	1.780	84.47	0.225	24.81	0.658	-65.47
1800	0.653	-113.33	1.661	77.87	0.227	21.43	0.640	-68.69
2000	0.632	-119.42	1.540	71.14	0.220	20.09	0.626	-71.66
2200	0.608	-124.78	1.433	65.15	0.216	19.87	0.616	-74.92
2400	0.583	-130.62	1.332	59.95	0.218	18.15	0.588	-77.97
2600	0.562	-135.46	1.270	54.87	0.210	16.94	0.595	-80.37
2800	0.546	-140.04	1.180	50.74	0.204	18.81	0.593	-83.30
3000	0.532	-145.38	1.125	46.22	0.200	20.50	0.578	-86.63

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

Freq(MHz)	S <sub>11</sub>	∠S <sub>11</sub>	S <sub>21</sub>	∠S <sub>21</sub>	S <sub>12</sub>	∠S <sub>12</sub>	S <sub>22</sub>	∠S <sub>22</sub>
100	0.853	-23.57	12.584	162.11	0.030	74.50	0.945	-16.66
200	0.794	-43.95	11.441	146.82	0.054	65.86	0.859	-30.98
400	0.678	-76.80	8.828	124.88	0.085	52.22	0.686	-51.44
600	0.599	-98.32	6.856	110.74	0.100	46.26	0.554	-63.68
800	0.551	-113.73	5.528	100.17	0.114	43.53	0.478	-72.17
1000	0.517	-123.97	4.640	92.52	0.121	42.57	0.424	-77.68
1200	0.491	-132.43	3.955	85.94	0.130	41.80	0.389	-81.59
1400	0.475	-138.13	3.470	80.05	0.140	43.03	0.368	-84.05
1600	0.458	-143.35	3.109	74.93	0.149	44.11	0.352	-86.38
1800	0.447	-148.20	2.801	70.20	0.156	46.11	0.343	-88.36
2000	0.429	-152.73	2.564	65.50	0.167	44.82	0.334	-89.37
2200	0.418	-156.75	2.363	60.89	0.176	45.63	0.329	-91.54
2400	0.405	-161.57	2.172	57.30	0.189	45.57	0.302	-93.00
2600	0.390	-165.33	2.037	53.40	0.197	46.26	0.308	-92.87
2800	0.378	-168.79	1.894	49.62	0.209	47.07	0.306	-94.34
3000	0.367	-172.91	1.781	46.31	0.220	46.71	0.299	-97.01

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

Freq(MHz)	S <sub>11</sub>	∠S <sub>11</sub>	S <sub>21</sub>	∠S <sub>21</sub>	S <sub>12</sub>	∠S <sub>12</sub>	S <sub>22</sub>	∠S <sub>22</sub>
100	0.740	-34.68	19.196	155.35	0.029	72.08	0.893	-23.63
200	0.659	-62.45	16.001	136.78	0.045	60.98	0.753	-42.10
400	0.553	-99.15	10.869	114.69	0.071	49.28	0.541	-63.94
600	0.502	-119.57	7.934	102.50	0.081	49.82	0.421	-75.53
800	0.477	-132.94	6.203	93.60	0.091	50.48	0.365	-83.92
1000	0.463	-141.40	5.115	87.39	0.103	49.79	0.324	-88.47
1200	0.446	-147.69	4.332	81.56	0.118	50.51	0.302	-92.19
1400	0.430	-152.09	3.762	76.53	0.126	51.18	0.281	-93.99
1600	0.422	-156.63	3.376	71.98	0.140	53.57	0.277	-95.99
1800	0.413	-159.90	3.039	67.59	0.152	52.20	0.270	-96.69
2000	0.403	-163.28	2.749	63.28	0.165	52.88	0.259	-97.79
2200	0.393	-167.23	2.543	59.02	0.179	53.45	0.255	-99.19
2400	0.383	-171.33	2.335	55.78	0.192	52.68	0.238	-101.56
2600	0.367	-174.62	2.189	52.39	0.205	52.41	0.236	-101.83
2800	0.357	-178.14	2.036	48.84	0.220	52.47	0.239	-101.09
3000	0.352	177.61	1.909	45.55	0.231	50.86	0.232	-103.66

## EC3H10B

V<sub>CE</sub>=1V, I<sub>C</sub>=20mA, Z<sub>O</sub>=50Ω

Freq(MHz)	S <sub>11</sub>	∠S <sub>11</sub>	S <sub>21</sub>	∠S <sub>21</sub>	S <sub>12</sub>	∠S <sub>12</sub>	S <sub>22</sub>	∠S <sub>22</sub>
100	0.594	-49.82	24.785	148.01	0.025	72.02	0.811	-31.43
200	0.529	-84.40	18.725	127.80	0.037	56.55	0.630	-52.33
400	0.481	-121.13	11.581	107.41	0.057	53.29	0.423	-74.50
600	0.463	-137.85	8.185	97.08	0.075	54.31	0.328	-85.91
800	0.456	-148.08	6.301	89.39	0.084	56.58	0.294	-94.15
1000	0.443	-154.24	5.174	83.67	0.097	56.03	0.262	-98.12
1200	0.433	-159.42	4.360	78.48	0.109	58.69	0.245	-101.27
1400	0.422	-163.01	3.773	73.83	0.125	59.80	0.239	-102.87
1600	0.416	-166.20	3.368	69.48	0.139	58.81	0.234	-104.19
1800	0.412	-169.32	3.032	65.23	0.154	58.89	0.227	-104.67
2000	0.403	-172.24	2.756	61.13	0.173	58.35	0.220	-106.67
2200	0.394	-175.17	2.529	57.32	0.182	57.49	0.221	-107.50
2400	0.384	-179.07	2.328	53.99	0.199	55.52	0.200	-108.60
2600	0.376	177.22	2.188	50.68	0.215	54.97	0.203	-107.98
2800	0.366	174.44	2.042	47.10	0.229	54.70	0.202	-107.71
3000	0.361	170.89	1.908	43.96	0.245	53.28	0.197	-110.19

V<sub>CE</sub>=3V, I<sub>C</sub>=1mA, Z<sub>O</sub>=50Ω

Freq(MHz)	S <sub>11</sub>	∠S <sub>11</sub>	S <sub>21</sub>	∠S <sub>21</sub>	S <sub>12</sub>	∠S <sub>12</sub>	S <sub>22</sub>	∠S <sub>22</sub>
100	0.970	-9.20	3.333	171.54	0.027	82.40	0.996	-5.81
200	0.961	-17.91	3.263	163.64	0.054	78.02	0.979	-11.92
400	0.928	-34.35	3.072	149.13	0.100	65.99	0.941	-22.76
600	0.888	-49.38	2.830	136.53	0.136	56.41	0.891	-31.77
800	0.845	-62.90	2.596	124.36	0.163	48.44	0.836	-39.80
1000	0.808	-73.30	2.396	114.35	0.183	41.27	0.791	-46.34
1200	0.762	-83.52	2.185	105.21	0.193	36.08	0.753	-51.05
1400	0.734	-91.47	2.008	96.91	0.194	32.39	0.724	-55.33
1600	0.706	-99.05	1.867	89.41	0.205	28.67	0.697	-59.51
1800	0.678	-106.60	1.749	82.35	0.203	25.66	0.681	-62.60
2000	0.647	-112.45	1.629	75.99	0.201	23.67	0.666	-65.31
2200	0.624	-117.88	1.517	69.90	0.193	22.90	0.655	-68.58
2400	0.592	-123.96	1.430	64.62	0.200	20.92	0.627	-71.07
2600	0.575	-128.84	1.344	59.23	0.188	22.66	0.627	-73.73
2800	0.551	-133.39	1.252	54.67	0.186	23.54	0.626	-76.48
3000	0.535	-138.78	1.191	50.46	0.185	24.66	0.611	-80.08

V<sub>CE</sub>=3V, I<sub>C</sub>=5mA, Z<sub>O</sub>=50Ω

Freq(MHz)	S <sub>11</sub>	∠S <sub>11</sub>	S <sub>21</sub>	∠S <sub>21</sub>	S <sub>12</sub>	∠S <sub>12</sub>	S <sub>22</sub>	∠S <sub>22</sub>
100	0.872	-20.00	12.569	163.91	0.024	80.67	0.955	-13.72
200	0.821	-37.81	11.639	149.96	0.046	69.15	0.883	-26.22
400	0.705	-67.20	9.299	129.03	0.077	56.78	0.728	-44.23
600	0.618	-88.08	7.425	114.73	0.093	48.16	0.604	-55.42
800	0.557	-103.15	6.047	104.09	0.103	46.83	0.521	-63.21
1000	0.514	-113.57	5.124	96.11	0.114	45.39	0.468	-68.12
1200	0.482	-122.54	4.370	89.44	0.120	43.78	0.431	-71.04
1400	0.455	-128.18	3.828	83.84	0.129	46.86	0.408	-73.29
1600	0.437	-133.82	3.437	78.23	0.140	46.41	0.389	-75.36
1800	0.427	-139.26	3.113	73.43	0.144	47.81	0.379	-76.48
2000	0.409	-143.36	2.842	68.61	0.155	47.52	0.364	-78.15
2200	0.393	-147.25	2.604	64.11	0.162	48.92	0.358	-79.73
2400	0.380	-152.52	2.393	60.32	0.174	48.05	0.336	-80.91
2600	0.360	-156.10	2.245	56.59	0.184	48.94	0.339	-80.93
2800	0.348	-159.92	2.087	52.84	0.199	49.40	0.338	-82.21
3000	0.337	-163.70	1.955	49.41	0.204	49.05	0.333	-83.76

## EC3H10B

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

Freq(MHz)	S <sub>11</sub>	∠S <sub>11</sub>	S <sub>21</sub>	∠S <sub>21</sub>	S <sub>12</sub>	∠S <sub>12</sub>	S <sub>22</sub>	∠S <sub>22</sub>
100	0.776	-28.75	19.477	157.95	0.024	76.57	0.915	-19.36
200	0.695	-52.76	16.690	140.82	0.040	64.76	0.793	-35.33
400	0.570	-86.42	11.885	118.87	0.062	55.28	0.592	-54.48
600	0.497	-107.19	8.828	106.30	0.074	51.77	0.466	-64.68
800	0.458	-121.36	6.985	97.08	0.086	52.06	0.403	-71.60
1000	0.435	-130.10	5.763	90.51	0.099	52.97	0.358	-75.82
1200	0.413	-136.78	4.916	84.44	0.107	52.41	0.328	-77.78
1400	0.394	-141.50	4.255	79.61	0.119	54.91	0.315	-79.04
1600	0.384	-146.20	3.815	74.94	0.135	55.65	0.304	-81.24
1800	0.373	-150.25	3.439	70.77	0.141	55.22	0.293	-81.40
2000	0.359	-153.98	3.109	67.09	0.154	55.75	0.292	-83.54
2200	0.347	-157.26	2.874	62.35	0.165	56.03	0.286	-84.03
2400	0.337	-162.53	2.619	58.90	0.179	55.54	0.260	-85.40
2600	0.322	-165.60	2.454	55.55	0.191	54.82	0.268	-84.59
2800	0.312	-168.77	2.274	51.93	0.201	54.38	0.263	-83.91
3000	0.301	-172.95	2.141	48.84	0.217	52.52	0.258	-86.03

$V_{CE}=3V, I_C=20mA, Z_O=50\Omega$

Freq(MHz)	S <sub>11</sub>	∠S <sub>11</sub>	S <sub>21</sub>	∠S <sub>21</sub>	S <sub>12</sub>	∠S <sub>12</sub>	S <sub>22</sub>	∠S <sub>22</sub>
100	0.646	-39.38	26.074	151.67	0.022	69.96	0.854	-25.36
200	0.562	-68.70	20.622	132.45	0.037	61.00	0.695	-43.07
400	0.465	-104.75	13.273	111.45	0.053	56.88	0.482	-62.06
600	0.426	-123.47	9.528	100.40	0.067	57.14	0.375	-70.90
800	0.409	-135.50	7.388	92.58	0.077	57.79	0.323	-77.53
1000	0.396	-142.77	6.064	86.78	0.091	58.67	0.290	-80.48
1200	0.380	-148.50	5.123	81.59	0.101	60.16	0.270	-82.59
1400	0.366	-152.22	4.417	77.51	0.118	60.61	0.259	-83.67
1600	0.360	-155.99	3.939	72.73	0.131	61.71	0.255	-85.27
1800	0.351	-159.19	3.555	68.92	0.141	60.58	0.249	-85.65
2000	0.343	-161.69	3.225	64.63	0.157	61.10	0.243	-86.04
2200	0.334	-164.80	2.971	60.79	0.172	60.43	0.244	-86.64
2400	0.330	-169.94	2.708	57.80	0.185	58.86	0.219	-87.76
2600	0.316	-172.62	2.548	54.48	0.194	57.42	0.225	-85.95
2800	0.301	-176.51	2.356	50.86	0.213	56.75	0.226	-86.66
3000	0.292	-179.98	2.208	48.01	0.221	56.34	0.221	-87.50

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