Ordering number : ENN6578

NPN Epitaxial Planar Silicon Transistor

EC3H07B

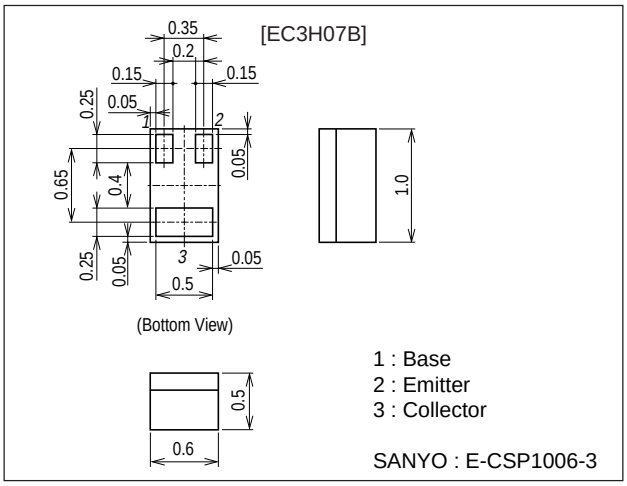
UHF to S Band Low-Noise Amplifier and OSC Applications

Features

- Low noise : NF=1.5dB typ (f=2GHz).
- High cut-off frequency : f_T=10GHz typ (V_{CE}=1V).
  : f_T=12.5GHz typ (V_{CE}=3V).
- Low operating voltage.
- High gain : $|S21e|^2$=9.5dB typ (f=2GHz).
- 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		30	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

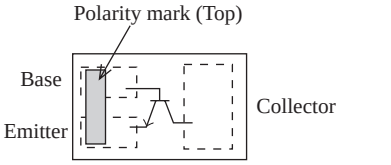
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Collector Cutoff Current	I_{CBO}	V_{CB}=5V, I_E=0			1.0	μA
Emitter Cutoff Current	I_{EBO}	V_{EB}=1V, I_C=0			10	μA
DC Current Gain	h_{FE}	V_{CE}=1V, I_C=5mA	100		160	
Gain-Bandwidth Product	f_T1	V_{CE}=1V, I_C=5mA	8	10		GHz
	f_T2	V_{CE}=3V, I_C=15mA		12.5		GHz
Output Capacitance	Cob	V_{CB}=1V, f=1MHz		0.55	0.7	pF
Reverse Transfer Capacitance	Cre	V_{CB}=1V, f=1MHz		0.4		pF
Forward Transfer Gain	$\|S21e\|^2_1$	V_{CE}=1V, I_C=5mA, f=2GHz	8	9.5		dB
	$\|S21e\|^2_2$	V_{CE}=3V, I_C=15mA, f=2GHz		10.5		dB
Noise Figure	NF	V_{CE}=1V, I_C=3mA, f=2GHz		1.5	2.3	dB

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

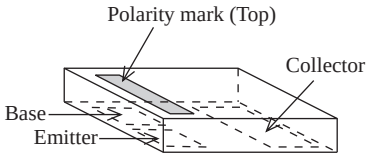
Type No. Indication (Top view)

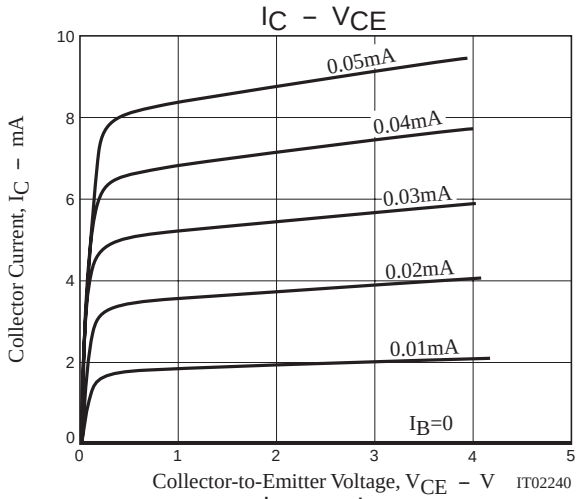
This product adopts a high-frequency process. Please be careful when handling it beause it is susceptible to static electricity.

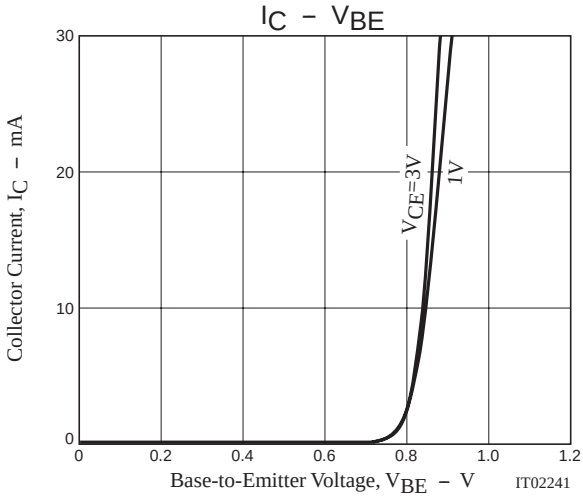
Electrical Connection (Top view)

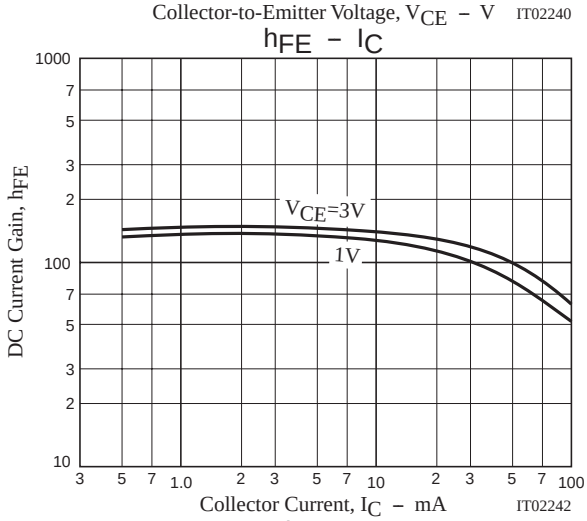


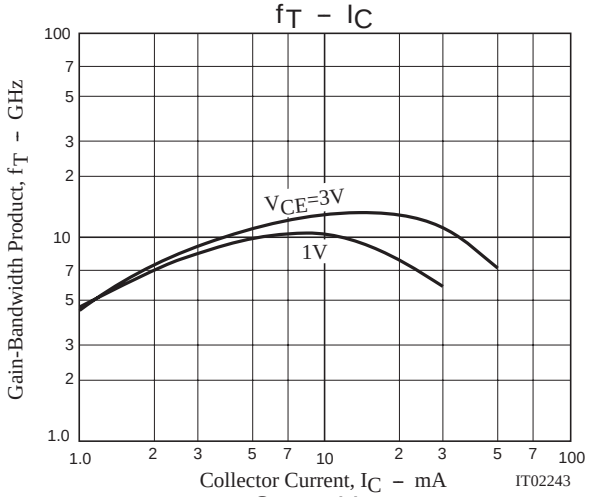
*Electrodes : on the bottom

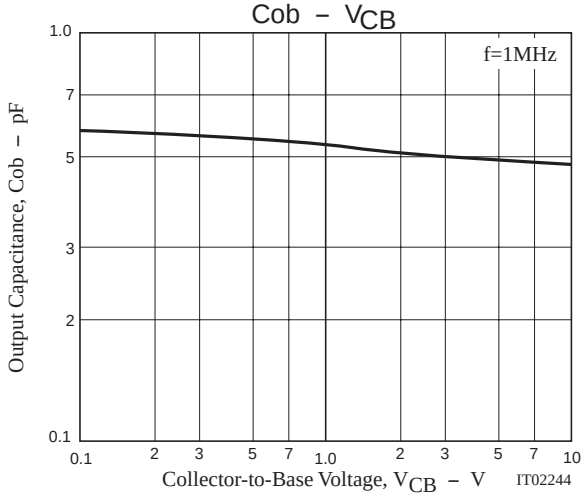


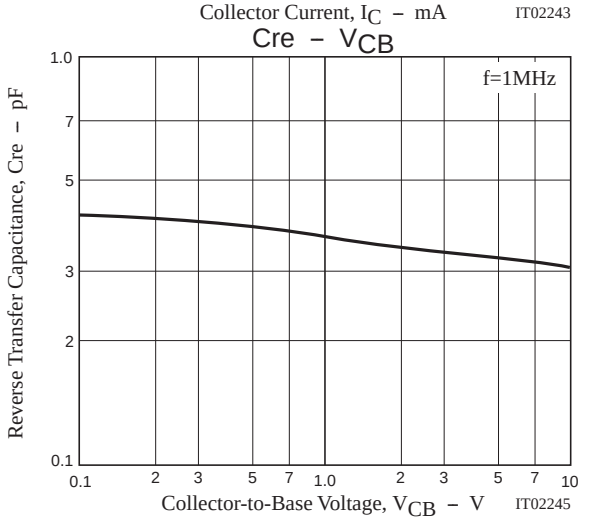


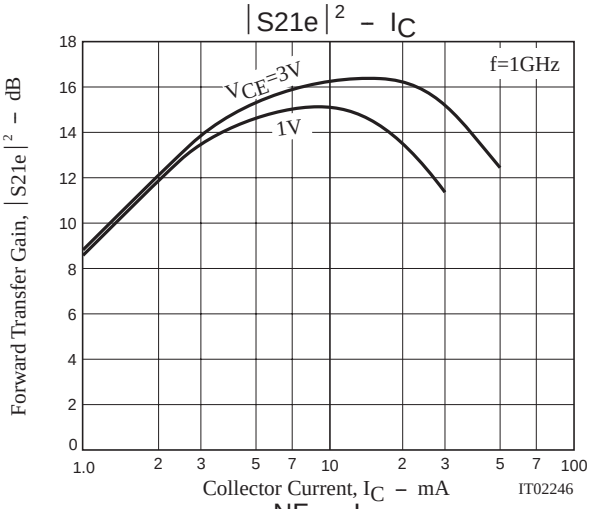


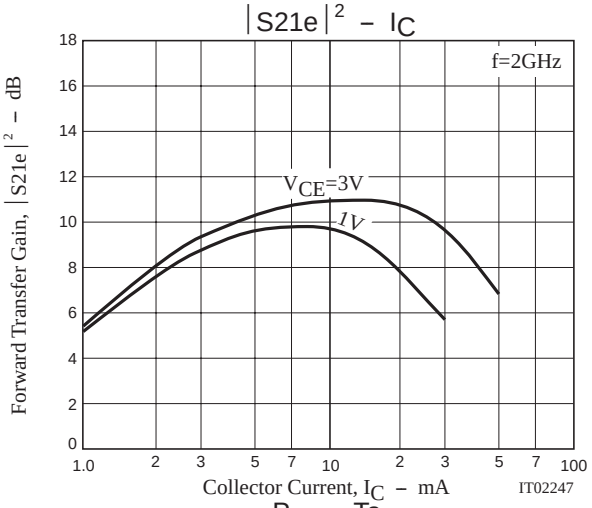


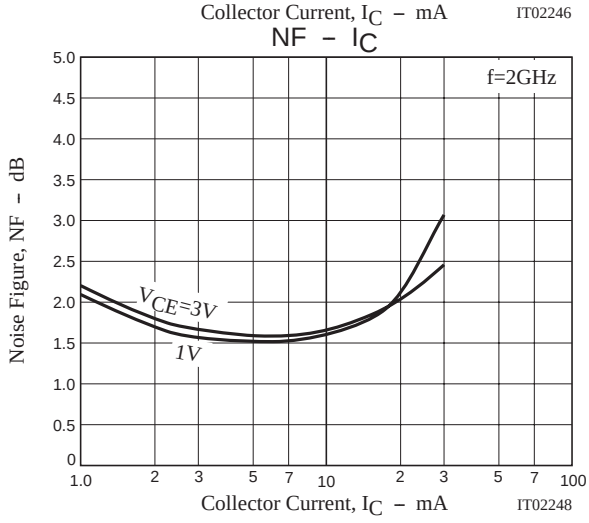


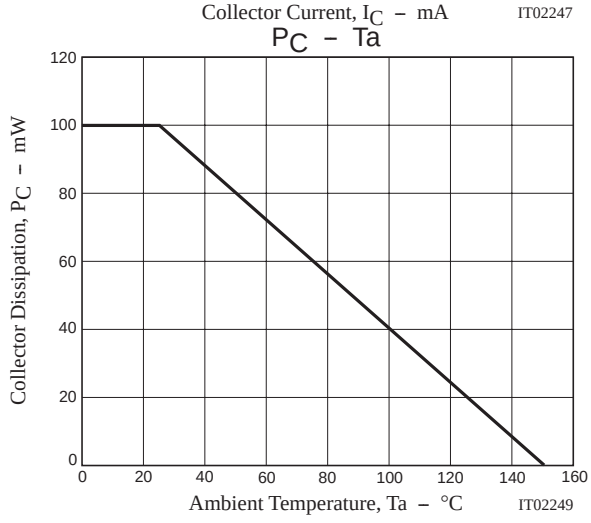












S Parameters (Common emitter)

V_{CE}=1V, I_C=1mA, Z_O=50Ω

Freq(MHz)	$\|S_{11}\|$	$\angle S_{11}$	$\|S_{21}\|$	$\angle S_{21}$	$\|S_{12}\|$	$\angle S_{12}$	$\|S_{22}\|$	$\angle S_{22}$
200	0.970	–13.4	3.174	166.3	0.046	79.8	0.981	–10.3
400	0.939	–26.1	3.115	153.6	0.087	70.3	0.948	–19.9
600	0.892	–38.6	2.986	141.5	0.122	61.2	0.899	–28.4
800	0.839	–50.0	2.803	130.5	0.149	54.2	0.849	–36.1
1000	0.791	–59.7	2.596	121.8	0.171	48.5	0.798	–42.4
1200	0.739	–69.5	2.426	112.0	0.185	43.3	0.757	–48.6
1400	0.686	–77.7	2.210	104.5	0.195	39.7	0.708	–54.0
1600	0.649	–85.1	2.077	97.8	0.204	36.1	0.680	–58.0
1800	0.623	–91.6	1.987	90.9	0.210	33.3	0.651	–61.7
2000	0.595	–97.8	1.871	84.8	0.212	31.3	0.632	–65.1
2200	0.568	–104.1	1.768	78.9	0.213	30.0	0.617	–68.2
2400	0.542	–109.7	1.682	73.4	0.217	28.8	0.611	–72.5
2600	0.523	–114.6	1.593	68.4	0.212	27.9	0.579	–75.1
2800	0.505	–119.6	1.541	64.1	0.209	29.2	0.570	–75.8
3000	0.489	–124.1	1.468	60.2	0.216	31.2	0.604	–75.7

V_{CE}=1V, I_C=5mA, Z_O=50Ω

Freq(MHz)	$\|S_{11}\|$	$\angle S_{11}$	$\|S_{21}\|$	$\angle S_{21}$	$\|S_{12}\|$	$\angle S_{12}$	$\|S_{22}\|$	$\angle S_{22}$
200	0.859	–31.5	11.298	153.4	0.042	70.7	0.901	–22.4
400	0.740	–55.7	9.494	133.0	0.072	59.4	0.763	–38.4
600	0.619	–76.3	7.753	118.3	0.088	52.9	0.631	–49.6
800	0.546	–90.6	6.351	108.4	0.099	49.4	0.548	–56.1
1000	0.480	–104.5	5.414	100.0	0.108	48.0	0.471	–61.0
1200	0.443	–113.5	4.629	94.2	0.116	48.2	0.422	–64.5
1400	0.418	–121.2	4.063	88.7	0.124	48.6	0.399	–67.9
1600	0.393	–127.4	3.615	83.7	0.130	49.3	0.372	–70.3
1800	0.382	–132.4	3.292	79.3	0.140	49.9	0.356	–72.1
2000	0.372	–138.0	3.003	75.1	0.147	51.6	0.343	–74.1
2200	0.360	–143.3	2.764	71.2	0.157	51.9	0.333	–76.7
2400	0.352	–148.2	2.567	67.3	0.166	51.9	0.338	–79.6
2600	0.349	–152.4	2.408	63.9	0.173	52.6	0.310	–81.9
2800	0.348	–155.5	2.272	60.5	0.183	53.8	0.301	–83.5
3000	0.348	–158.1	2.154	57.7	0.194	53.9	0.293	–85.3

V_{CE}=1V, I_C=10mA, Z_O=50Ω

Freq(MHz)	$\|S_{11}\|$	$\angle S_{11}$	$\|S_{21}\|$	$\angle S_{21}$	$\|S_{12}\|$	$\angle S_{12}$	$\|S_{22}\|$	$\angle S_{22}$
200	0.747	–46.5	15.679	144.0	0.039	66.9	0.807	–30.4
400	0.588	–77.7	11.464	122.1	0.059	55.5	0.614	–46.8
600	0.490	–98.9	8.634	108.9	0.072	51.8	0.485	–55.5
800	0.438	–114.0	6.882	99.9	0.082	52.0	0.410	–60.2
1000	0.404	–125.0	5.688	93.3	0.091	53.3	0.362	–62.9
1200	0.384	–133.1	4.844	87.9	0.100	55.0	0.330	–64.4
1400	0.371	–139.6	4.207	83.1	0.111	56.1	0.312	–67.3
1600	0.357	–145.5	3.734	78.6	0.121	56.4	0.299	–69.3
1800	0.350	–150.9	3.354	74.9	0.132	57.6	0.287	–70.4
2000	0.348	–155.0	3.069	71.0	0.141	58.8	0.280	–72.5
2200	0.344	–158.7	2.818	67.7	0.152	59.4	0.275	–75.6
2400	0.342	–163.1	2.615	64.0	0.165	58.9	0.280	–78.4
2600	0.341	–165.4	2.435	60.8	0.175	60.2	0.262	–79.9
2800	0.341	–168.4	2.287	57.9	0.187	60.5	0.257	–81.5
3000	0.349	–171.5	2.181	55.4	0.200	59.5	0.255	–83.7

V_{CE}=1V, I_C=20mA, Z_O=50Ω

Freq(MHz)	$\|S_{11}\|$	$\angle S_{11}$	$\|S_{21}\|$	$\angle S_{21}$	$\|S_{12}\|$	$\angle S_{12}$	$\|S_{22}\|$	$\angle S_{22}$
200	0.598	–71.6	16.506	131.7	0.036	57.2	0.648	–37.6
400	0.476	–108.0	10.451	110.5	0.050	52.1	0.448	–50.7
600	0.429	–128.1	7.427	99.3	0.061	54.2	0.353	–55.1
800	0.410	–141.1	5.736	91.8	0.071	56.7	0.307	–57.5
1000	0.398	–149.3	4.699	85.9	0.080	58.4	0.282	–59.0
1200	0.393	–155.7	3.949	81.0	0.092	60.5	0.268	–60.1
1400	0.388	–160.9	3.420	76.7	0.104	61.9	0.265	–63.5
1600	0.383	–165.3	3.042	72.4	0.116	62.8	0.261	–65.4
1800	0.382	–169.0	2.726	68.7	0.126	63.5	0.261	–67.7
2000	0.382	–172.0	2.491	65.1	0.139	64.4	0.259	–70.2
2200	0.382	–175.0	2.294	61.9	0.152	65.1	0.258	–74.0
2400	0.381	–177.9	2.131	58.4	0.166	64.7	0.268	–77.5
2600	0.383	179.9	2.003	55.4	0.175	64.6	0.254	–80.2
2800	0.386	177.0	1.859	52.4	0.191	65.0	0.253	–82.3
3000	0.390	175.0	1.765	49.6	0.205	64.2	0.252	–85.1

V_{CE}=3V, I_C=1mA, Z_O=50Ω

Freq(MHz)	$\|S_{11}\|$	$\angle S_{11}$	$\|S_{21}\|$	$\angle S_{21}$	$\|S_{12}\|$	$\angle S_{12}$	$\|S_{22}\|$	$\angle S_{22}$
200	0.973	–12.2	3.240	167.1	0.040	80.6	0.984	–9.2
400	0.946	–24.1	3.185	155.4	0.077	72.0	0.957	–17.9
600	0.901	–35.8	3.049	144.0	0.108	63.2	0.915	–25.8
800	0.850	–46.4	2.870	134.1	0.133	56.5	0.871	–33.0
1000	0.813	–55.6	2.679	124.0	0.155	51.3	0.825	–39.1
1200	0.753	–64.9	2.493	116.4	0.167	46.1	0.784	–44.9
1400	0.713	–72.1	2.332	108.5	0.178	42.5	0.740	–49.7
1600	0.678	–79.4	2.215	100.4	0.188	39.1	0.713	–53.8
1800	0.643	–86.8	2.042	93.6	0.191	36.2	0.689	–57.5
2000	0.609	–92.9	1.916	87.7	0.195	34.4	0.670	–60.9
2200	0.581	–98.9	1.811	81.8	0.196	33.1	0.653	–64.1
2400	0.552	–104.5	1.726	76.4	0.200	32.3	0.646	–68.2
2600	0.530	–109.0	1.632	71.6	0.195	31.3	0.611	–70.8
2800	0.510	–113.8	1.552	67.4	0.194	33.0	0.601	–71.5
3000	0.493	–118.3	1.505	63.6	0.200	35.3	0.635	–71.4

V_{CE}=3V, I_C=5mA, Z_O=50Ω

Freq(MHz)	$\|S_{11}\|$	$\angle S_{11}$	$\|S_{21}\|$	$\angle S_{21}$	$\|S_{12}\|$	$\angle S_{12}$	$\|S_{22}\|$	$\angle S_{22}$
200	0.876	–27.6	11.400	155.7	0.036	73.0	0.919	–19.4
400	0.756	–50.7	9.463	137.5	0.065	61.9	0.788	–34.8
600	0.634	–70.0	8.035	122.7	0.081	55.4	0.673	–44.7
800	0.555	–83.7	6.684	112.7	0.093	51.2	0.588	–50.8
1000	0.490	–95.2	5.807	103.8	0.101	50.0	0.515	–55.3
1200	0.450	–103.5	5.045	97.1	0.107	50.0	0.477	–58.1
1400	0.421	–111.2	4.444	91.5	0.116	50.3	0.442	–61.5
1600	0.392	–117.2	3.968	86.3	0.123	51.4	0.413	–63.7
1800	0.376	–123.2	3.601	82.0	0.131	52.0	0.393	–65.4
2000	0.359	–128.9	3.300	77.8	0.138	53.2	0.377	–67.3
2200	0.345	–133.9	3.026	74.3	0.149	53.9	0.360	–69.6
2400	0.336	–138.9	2.798	70.4	0.157	54.0	0.361	–72.2
2600	0.333	–142.0	2.636	66.9	0.164	54.2	0.335	–73.9
2800	0.329	–145.8	2.477	63.6	0.174	55.5	0.331	–74.9
3000	0.333	–148.6	2.369	60.7	0.184	55.7	0.327	–77.1

V_{CE}=3V, I_C=10mA, Z_O=50Ω

Freq(MHz)	$\|S_{11}\|$	$\angle S_{11}$	$\|S_{21}\|$	$\angle S_{21}$	$\|S_{12}\|$	$\angle S_{12}$	$\|S_{22}\|$	$\angle S_{22}$
200	0.782	–38.7	16.264	148.0	0.034	68.7	0.853	–25.8
400	0.618	–67.3	12.556	126.5	0.055	58.7	0.671	–41.8
600	0.512	–86.2	9.670	113.1	0.067	55.8	0.544	–49.9
800	0.444	–101.0	7.790	103.6	0.077	54.5	0.462	–54.7
1000	0.398	–112.0	6.474	96.8	0.086	55.1	0.408	–57.2
1200	0.372	–120.3	5.540	91.1	0.096	56.5	0.373	–59.0
1400	0.352	–127.6	4.824	86.4	0.105	57.9	0.351	–61.1
1600	0.333	–133.0	4.287	82.0	0.115	58.3	0.334	–62.8
1800	0.323	–139.0	3.864	78.3	0.122	59.6	0.320	–63.9
2000	0.318	–143.6	3.524	74.6	0.135	60.3	0.311	–65.0
2200	0.311	–147.8	3.233	71.3	0.144	60.7	0.302	–67.6
2400	0.306	–152.1	3.008	67.7	0.155	60.3	0.306	–70.4
2600	0.303	–154.0	2.801	64.6	0.165	61.1	0.286	–71.5
2800	0.305	–158.4	2.623	61.6	0.175	62.0	0.281	–72.2
3000	0.308	–161.8	2.503	59.1	0.188	61.5	0.275	–73.7

V_{CE}=3V, I_C=20mA, Z_O=50Ω

Freq(MHz)	$\|S_{11}\|$	$\angle S_{11}$	$\|S_{21}\|$	$\angle S_{21}$	$\|S_{12}\|$	$\angle S_{12}$	$\|S_{22}\|$	$\angle S_{22}$
200	0.598	–71.6	16.506	131.7	0.036	57.2	0.648	–37.6
400	0.476	–108.0	10.451	110.5	0.050	52.1	0.448	–50.7
600	0.429	–128.1	7.427	99.3	0.061	54.2	0.353	–55.1
800	0.410	–141.1	5.736	91.8	0.071	56.7	0.307	–57.5
1000	0.398	–149.3	4.699	85.9	0.080	58.4	0.282	–59.0
1200	0.393	–155.7	3.949	81.0	0.092	60.5	0.268	–60.1
1400	0.388	–160.9	3.420	76.7	0.104	61.9	0.265	–63.5
1600	0.383	–165.3	3.042	72.4	0.116	62.8	0.261	–65.4
1800	0.382	–169.0	2.726	68.7	0.126	63.5	0.261	–67.7
2000	0.382	–172.0	2.491	65.1	0.139	64.4	0.259	–70.2
2200	0.382	–175.0	2.294	61.9	0.152	65.1	0.258	–74.0
2400	0.381	–177.9	2.131	58.4	0.166	64.7	0.268	–77.5
2600	0.383	179.9	2.003	55.4	0.175	64.6	0.254	–80.2
2800	0.386	177.0	1.859	52.4	0.191	65.0	0.253	–82.3
3000	0.390	175.0	1.765	49.6	0.205	64.2	0.252	–85.1