Ordering number : ENN7456

NPN Epitaxial Planar Silicon Transistor

SBFP405B

UHF to C Band Low Noise Amplifier, Oscillation Applications

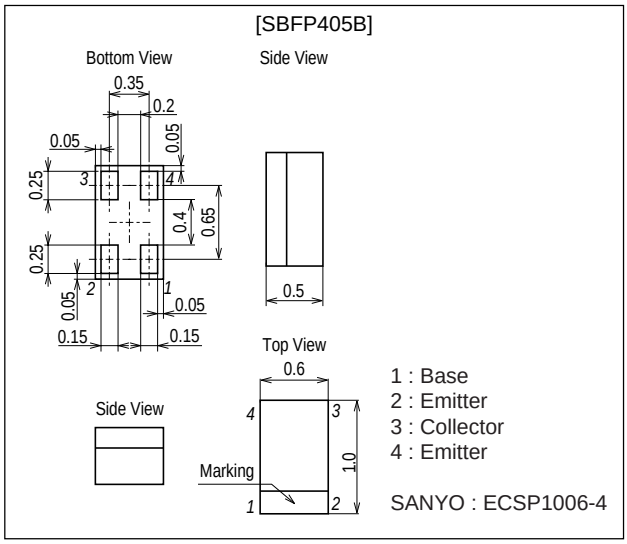
Features

- Low noise : NF=1.25dB typ (f=1.8GHz).
- High cutoff frequency : f_T=25GHz typ (V_{CE}=3V).
- High gain : $|S21e|^2$=18dB typ (f=1.8GHz).

Package Dimensions

unit : mm

2214



Specifications

Absolute Maximum Ratings at Ta=25°C

Parameter	Symbol	Conditions	Ratings	Unit
Collector-to-Base Voltage	V_{CBO}		15	V
Collector-to-Emitter Voltage	V_{CEO}		4.5	V
Emitter-to-Base Voltage	V_{EBO}		1.5	V
Collector Current	I_C		12	mA
Collector Dissipation	P_C		55	mW
Junction Temperature	Tj		150	°C
Storage Temperature	Tstg		−55 to +150	°C

Electrical Characteristics at Ta=25°C

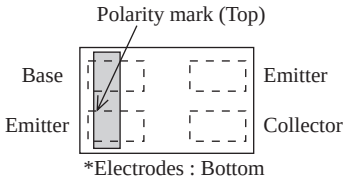
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Collector Cutoff Current	I_{CBO}	V_{CB}=5V, I_E=0			150	nA
Emitter Cutoff Current	I_{EBO}	V_{EB}=1.5V, I_C=0			15	µA
DC Current Gain	h_{FE}	V_{CE}=4V, I_C=5mA	50		150	
Gain-Bandwidth Product	f_T	V_{CE}=3V, I_C=10mA	18	25		GHz
Reverse Transfer Capacitance	Cre	V_{CB}=1V, f=1MHz		0.13	0.23	pF
Forward Transfer Gain	$\|S21e\|^2$	V_{CE}=2V, I_C=5mA, f=1.8GHz	14	18		dB
Noise Figure	NF	V_{CE}=2V, I_C=2mA, f=1.8GHz		1.25	1.65	dB

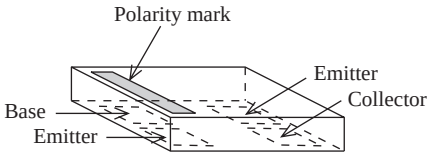
Marking : AB

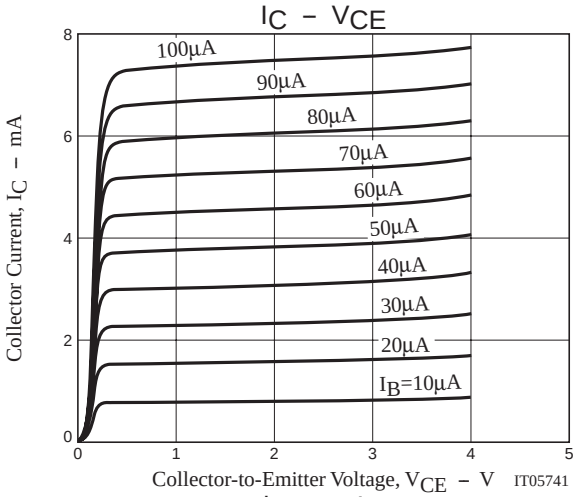
SANYO Electric Co.,Ltd. Semiconductor Company

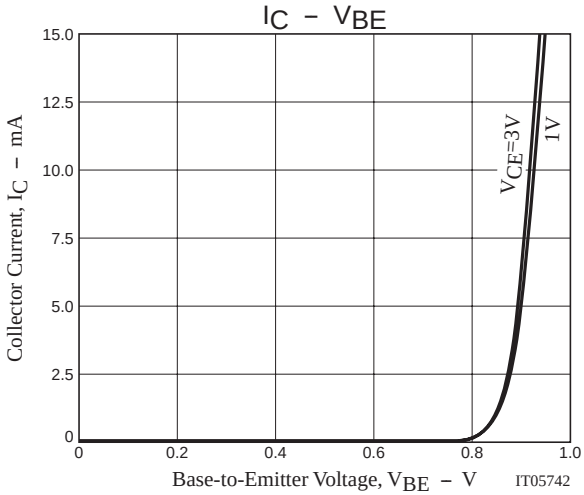
TOKYO OFFICE Tokyo Bldg., 1-10, 1 Chome, Ueno, Taito-ku, TOKYO, 110-8534 JAPAN

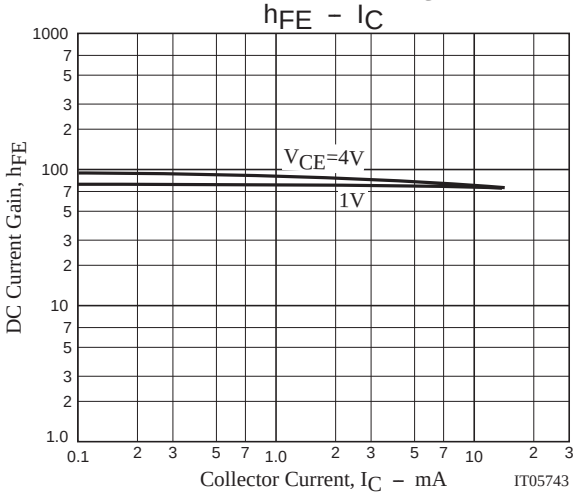
Electrical Connection (Top view)

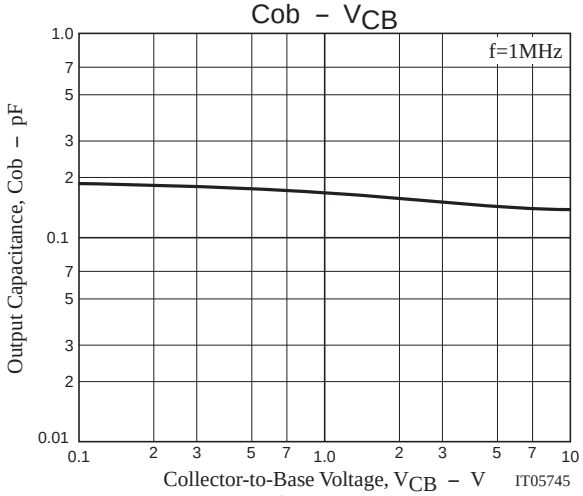


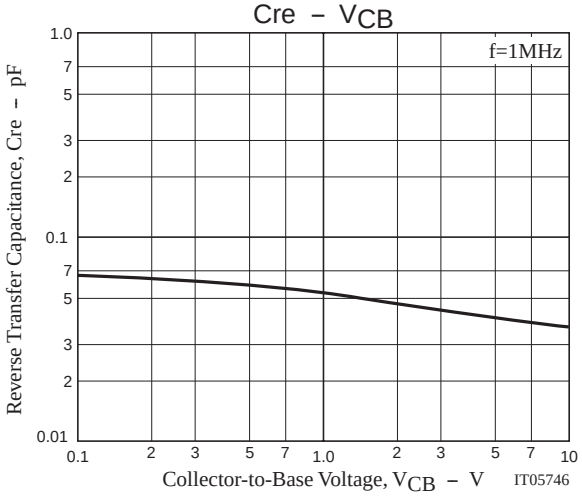


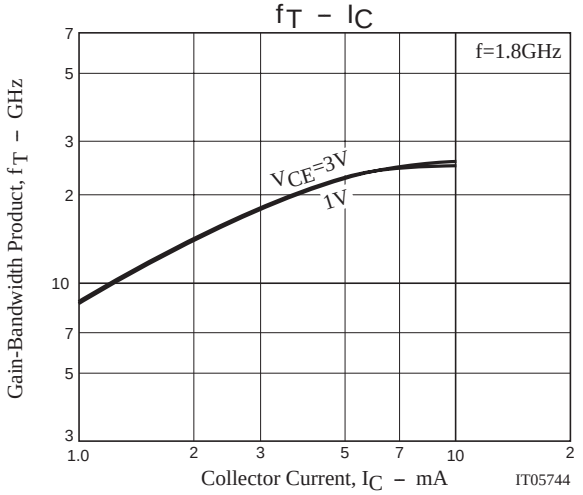


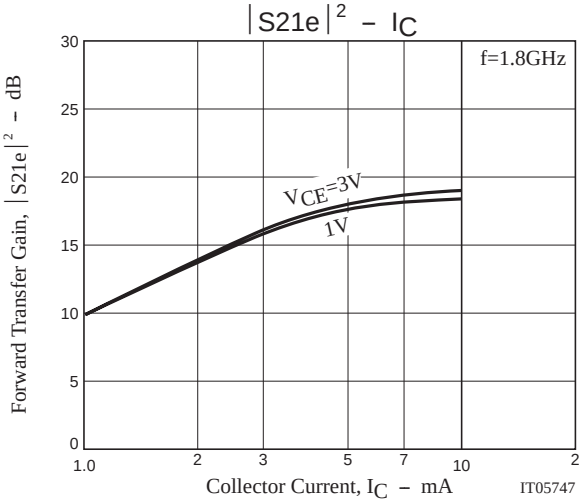


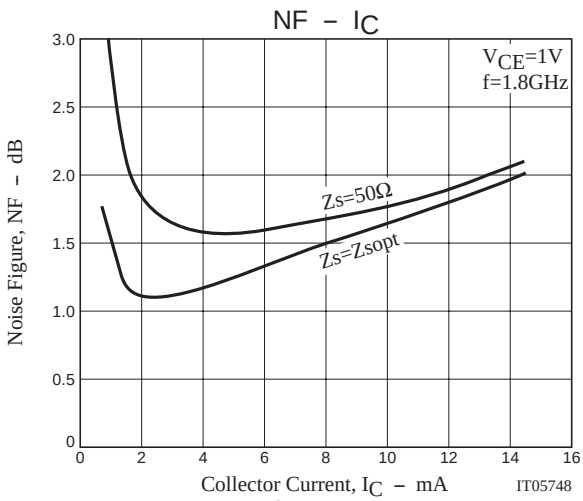


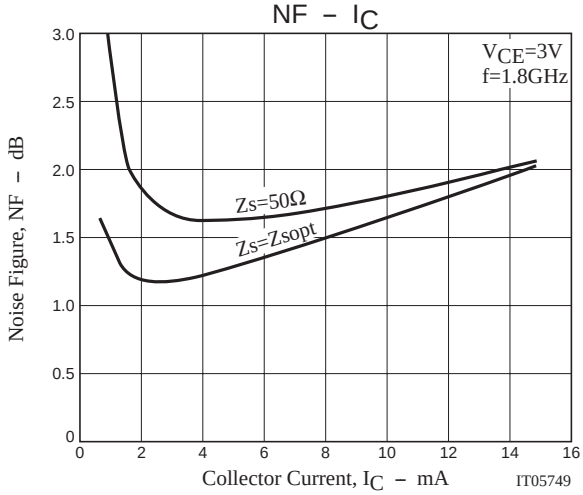


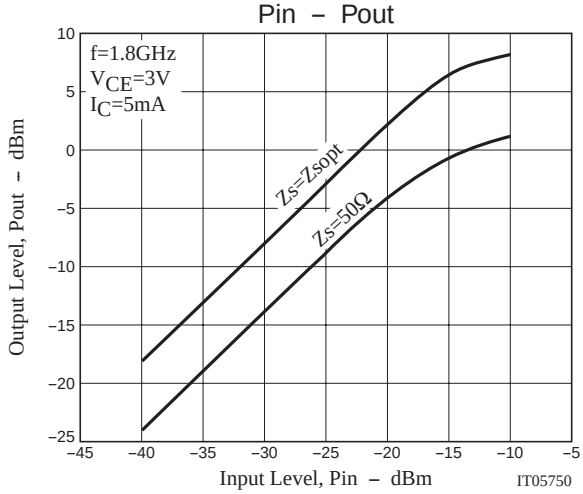


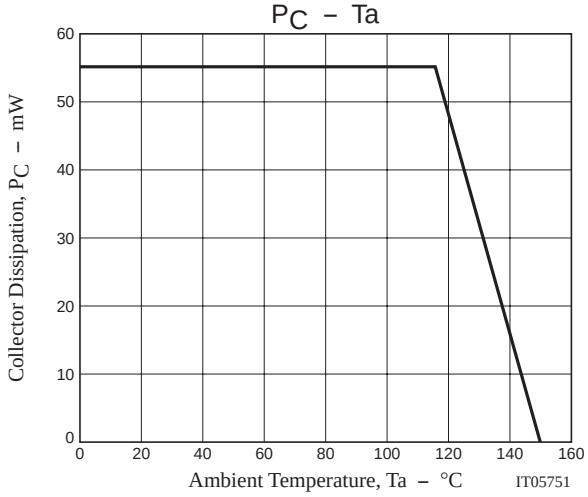



|S21e|² – IC
f=1.8GHz
VCE=3V
1V
Forward Transfer Gain, |S21e|² – dB
Collector Current, IC – mA
IT05747


NF – IC
VCE=1V
f=1.8GHz
Zs=50Ω
Zs=Zsopt
Noise Figure, NF – dB
Collector Current, IC – mA
IT05748


NF – IC
VCE=3V
f=1.8GHz
Zs=50Ω
Zs=Zsopt
Noise Figure, NF – dB
Collector Current, IC – mA
IT05749


Pin – Pout
f=1.8GHz
VCE=3V
IC=5mA
Zs=Zsopt
Zs=50Ω
Output Level, Pout – dBm
Input Level, Pin – dBm
IT05750


PC – Ta
Collector Dissipation, PC – mW
Ambient Temperature, Ta – °C
IT05751

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	0.967	–7.3	3.571	173.4	0.008	81.5	1.001	–4.2
400	0.946	–13.3	3.569	167.5	0.016	81.5	0.992	–8.2
600	0.952	–19.6	3.467	161.1	0.024	78.0	0.984	–12.2
800	0.936	–26.0	3.455	155.5	0.032	74.3	0.974	–16.0
1000	0.918	–32.5	3.381	148.3	0.039	70.3	0.961	–19.9
1200	0.908	–39.3	3.353	143.1	0.046	66.0	0.945	–23.6
1400	0.893	–45.0	3.272	137.2	0.053	62.0	0.932	–27.2
1600	0.877	–51.2	3.191	131.8	0.059	58.6	0.916	–30.7
1800	0.850	–56.7	3.098	125.8	0.066	55.2	0.900	–34.1
2000	0.833	–63.5	3.077	121.1	0.072	51.5	0.883	–37.3
2200	0.808	–69.0	2.968	115.0	0.077	47.7	0.868	–40.4
2400	0.789	–74.3	2.885	110.3	0.083	44.0	0.850	–43.5
2600	0.751	–80.2	2.789	104.3	0.088	40.5	0.833	–46.4
2800	0.736	–86.2	2.732	99.5	0.092	37.2	0.817	–49.2
3000	0.716	–91.5	2.661	94.7	0.096	34.2	0.802	–52.0
3200	0.704	–96.7	2.586	90.0	0.099	31.6	0.786	–54.6
3400	0.670	–101.7	2.483	85.9	0.103	28.4	0.770	–57.2
3600	0.653	–106.8	2.436	81.8	0.105	26.0	0.754	–59.8
3800	0.621	–111.9	2.365	77.0	0.108	23.3	0.741	–62.2
4000	0.604	–116.1	2.278	73.5	0.110	20.8	0.728	–64.6
4200	0.586	–121.5	2.234	69.1	0.112	18.3	0.715	–67.0
4400	0.569	–126.3	2.173	65.1	0.114	16.0	0.703	–69.6
4600	0.547	–131.7	2.098	61.1	0.116	13.9	0.691	–71.9
4800	0.534	–136.9	2.044	56.8	0.117	11.4	0.680	–74.3
5000	0.523	–142.1	2.009	53.4	0.119	9.2	0.669	–76.7
5200	0.510	–145.7	1.966	49.6	0.120	7.7	0.662	–79.0
5400	0.493	–151.9	1.890	45.9	0.121	5.6	0.652	–81.3
5600	0.479	–156.5	1.857	41.9	0.123	4.0	0.644	–83.6
5800	0.460	–161.2	1.806	38.8	0.124	1.9	0.634	–85.8
6000	0.445	–166.1	1.763	34.9	0.125	0.5	0.626	–88.0

S Parameters (Common emitter)

V_{CE}=1V, I_C=3mA, 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	0.890	–10.6	9.130	170.3	0.008	97.0	0.991	–5.7
400	0.865	–20.0	9.001	161.4	0.015	78.4	0.978	–10.9
600	0.854	–28.9	8.565	152.6	0.023	74.0	0.958	–16.0
800	0.827	–38.3	8.266	144.6	0.028	69.6	0.931	–20.8
1000	0.786	–46.3	7.854	135.5	0.036	64.2	0.903	–25.3
1200	0.754	–55.2	7.522	128.5	0.041	61.8	0.871	–29.5
1400	0.715	–62.5	7.080	121.7	0.045	56.7	0.845	–33.1
1600	0.674	–69.9	6.682	115.2	0.050	53.6	0.815	–36.7
1800	0.637	–76.5	6.249	109.1	0.054	51.0	0.789	–40.0
2000	0.609	–83.7	5.996	103.5	0.058	48.0	0.763	–42.9
2200	0.569	–90.1	5.607	97.7	0.062	45.4	0.740	–45.7
2400	0.538	–96.1	5.298	92.9	0.065	43.4	0.717	–48.4
2600	0.499	–102.6	4.989	87.3	0.068	41.1	0.696	–50.9
2800	0.474	–108.4	4.741	82.9	0.071	39.0	0.677	–53.2
3000	0.459	–113.5	4.510	78.5	0.074	36.8	0.660	–55.5
3200	0.435	–118.9	4.275	74.1	0.077	35.8	0.644	–57.6
3400	0.407	–123.6	4.059	70.5	0.080	33.8	0.629	–59.7
3600	0.389	–129.0	3.900	66.8	0.082	32.6	0.614	–61.7
3800	0.374	–134.2	3.726	62.6	0.085	31.4	0.602	–63.7
4000	0.360	–139.0	3.552	59.5	0.087	29.5	0.591	–65.7
4200	0.336	–144.1	3.427	55.6	0.090	28.1	0.580	–67.7
4400	0.328	–150.0	3.285	52.4	0.092	26.8	0.570	–70.0
4600	0.315	–154.1	3.150	48.6	0.095	25.3	0.562	–71.9
4800	0.305	–160.1	3.032	45.2	0.098	23.8	0.553	–74.0
5000	0.300	–165.8	2.948	42.0	0.101	22.4	0.545	–76.1
5200	0.290	–168.7	2.845	38.7	0.104	21.0	0.539	–78.3
5400	0.282	–173.9	2.731	35.6	0.107	19.6	0.532	–80.3
5600	0.275	–178.7	2.652	32.2	0.110	18.5	0.526	–82.4
5800	0.262	174.7	2.558	29.4	0.113	16.7	0.518	–84.5
6000	0.252	168.9	2.488	25.9	0.116	15.5	0.513	–86.4

S Parameters (Common emitter)

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	0.841	–13.3	13.312	167.7	0.008	80.1	0.985	–6.5
400	0.810	–24.5	12.942	156.9	0.015	75.4	0.959	–12.8
600	0.778	–36.2	12.021	146.3	0.022	71.9	0.929	–18.5
800	0.724	–46.6	11.295	137.1	0.027	66.5	0.891	–23.6
1000	0.677	–56.0	10.434	127.2	0.033	62.9	0.850	–28.1
1200	0.637	–65.3	9.721	119.7	0.037	58.5	0.811	–32.0
1400	0.591	–73.2	8.944	112.7	0.041	56.0	0.779	–35.4
1600	0.545	–80.2	8.255	106.3	0.045	54.0	0.747	–38.6
1800	0.501	–87.4	7.588	100.3	0.048	51.3	0.717	–41.4
2000	0.477	–95.0	7.154	95.0	0.051	49.2	0.693	–44.1
2200	0.446	–101.5	6.599	89.5	0.054	47.7	0.671	–46.5
2400	0.412	–107.8	6.152	85.1	0.058	46.4	0.649	–48.8
2600	0.377	–114.6	5.731	79.9	0.060	45.0	0.631	–50.9
2800	0.363	–119.8	5.404	75.8	0.064	42.8	0.615	–53.0
3000	0.344	–124.7	5.097	71.7	0.067	42.4	0.600	–55.0
3200	0.324	–129.8	4.806	67.7	0.070	40.6	0.587	–56.9
3400	0.304	–134.7	4.533	64.4	0.073	39.2	0.574	–58.8
3600	0.296	–141.8	4.328	61.0	0.076	38.6	0.561	–60.7
3800	0.280	–146.2	4.117	57.2	0.079	37.0	0.552	–62.5
4000	0.265	–151.4	3.919	54.1	0.083	35.4	0.543	–64.4
4200	0.253	–156.0	3.771	50.7	0.086	34.2	0.533	–66.4
4400	0.246	–161.5	3.592	47.5	0.090	32.8	0.525	–68.4
4600	0.239	–167.9	3.440	44.0	0.093	31.4	0.518	–70.5
4800	0.230	–173.0	3.304	40.8	0.097	29.7	0.512	–72.5
5000	0.229	–177.8	3.199	37.8	0.100	28.3	0.505	–74.7
5200	0.223	179.0	3.089	34.8	0.103	26.9	0.501	–76.7
5400	0.216	171.8	2.954	31.8	0.107	25.0	0.494	–78.7
5600	0.211	167.1	2.867	28.7	0.110	23.7	0.489	–80.8
5800	0.203	161.6	2.760	26.2	0.114	22.0	0.483	–82.8
6000	0.199	155.4	2.680	22.8	0.117	20.5	0.478	–84.8

S Parameters (Common emitter)

V_{CE}=1V, I_C=7mA, 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	0.800	–16.3	16.550	165.7	0.006	69.7	0.976	–7.4
400	0.754	–29.3	15.820	153.1	0.015	70.7	0.943	–14.3
600	0.699	–41.8	14.370	141.4	0.020	68.1	0.901	–20.2
800	0.648	–53.2	13.187	131.5	0.026	64.1	0.855	–25.2
1000	0.593	–63.7	11.919	121.3	0.030	61.9	0.809	–29.6
1200	0.546	–73.7	10.882	113.8	0.034	58.5	0.766	–33.1
1400	0.500	–81.1	9.850	106.9	0.038	56.6	0.733	–36.2
1600	0.455	–88.9	8.976	100.7	0.041	54.8	0.703	–38.9
1800	0.421	–95.5	8.174	95.0	0.044	52.9	0.676	–41.5
2000	0.401	–103.5	7.636	90.0	0.048	51.1	0.652	–43.9
2200	0.367	–109.3	6.988	84.7	0.051	50.2	0.632	–46.0
2400	0.338	–116.2	6.484	80.5	0.054	49.1	0.613	–48.1
2600	0.309	–123.4	6.016	75.8	0.057	47.5	0.596	–50.1
2800	0.303	–129.5	5.644	71.9	0.061	46.5	0.582	–52.0
3000	0.288	–134.8	5.302	68.0	0.064	45.4	0.570	–53.9
3200	0.279	–139.9	4.982	64.1	0.068	44.3	0.558	–55.8
3400	0.248	–145.6	4.692	61.0	0.071	43.4	0.546	–57.6
3600	0.241	–150.8	4.480	57.8	0.074	41.3	0.536	–59.4
3800	0.232	–156.6	4.245	54.1	0.078	40.3	0.528	–61.2
4000	0.219	–160.9	4.037	51.2	0.081	39.1	0.521	–63.1
4200	0.211	–167.0	3.883	47.9	0.085	37.1	0.512	–65.0
4400	0.212	–172.9	3.700	44.8	0.089	35.9	0.505	–67.2
4600	0.205	–177.6	3.533	41.6	0.093	34.5	0.500	–69.1
4800	0.199	175.7	3.386	38.5	0.096	33.0	0.493	–71.2
5000	0.193	171.3	3.275	35.7	0.100	31.1	0.487	–73.3
5200	0.191	167.6	3.161	32.6	0.104	29.7	0.483	–75.3
5400	0.189	160.6	3.022	29.9	0.107	28.0	0.477	–77.4
5600	0.185	156.9	2.929	26.6	0.111	26.2	0.473	–79.5
5800	0.181	151.2	2.819	24.2	0.114	24.6	0.467	–81.6
6000	0.189	144.9	2.736	21.0	0.118	23.0	0.464	–83.5

S Parameters (Common emitter)

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	0.729	–18.8	20.014	163.0	0.007	75.5	0.966	–8.5
400	0.678	–35.0	18.649	148.3	0.014	72.1	0.918	–15.9
600	0.626	–50.0	16.407	135.4	0.020	66.6	0.863	–21.9
800	0.553	–63.1	14.605	125.0	0.023	64.4	0.808	–26.5
1000	0.495	–74.3	12.882	114.7	0.028	61.0	0.761	–30.2
1200	0.448	–84.7	11.517	107.5	0.032	58.3	0.718	–33.3
1400	0.407	–93.8	10.273	100.8	0.035	56.8	0.687	–36.0
1600	0.371	–100.6	9.258	94.9	0.038	55.8	0.660	–38.3
1800	0.342	–108.7	8.351	89.6	0.042	54.3	0.636	–40.6
2000	0.327	–116.5	7.731	84.9	0.045	53.6	0.615	–42.7
2200	0.303	–123.5	7.044	79.9	0.048	52.4	0.599	–44.7
2400	0.284	–129.9	6.499	76.1	0.051	51.6	0.583	–46.7
2600	0.261	–138.2	6.011	71.6	0.055	50.7	0.569	–48.5
2800	0.247	–143.3	5.624	67.9	0.058	49.8	0.556	–50.4
3000	0.241	–150.0	5.271	64.3	0.062	48.7	0.547	–52.2
3200	0.233	–154.5	4.935	60.6	0.065	47.7	0.537	–54.1
3400	0.219	–161.0	4.642	57.7	0.069	45.9	0.527	–55.9
3600	0.216	–166.7	4.417	54.5	0.072	44.9	0.518	–57.7
3800	0.211	–172.0	4.187	51.1	0.076	43.4	0.512	–59.6
4000	0.196	–177.2	3.972	48.2	0.080	42.0	0.505	–61.4
4200	0.193	175.8	3.821	45.0	0.084	40.2	0.497	–63.4
4400	0.197	170.2	3.639	42.0	0.088	38.7	0.493	–65.6
4600	0.193	165.4	3.469	38.9	0.092	36.8	0.486	–67.6
4800	0.189	160.1	3.332	35.8	0.096	35.3	0.481	–69.6
5000	0.194	155.3	3.213	33.1	0.100	33.7	0.476	–71.7
5200	0.185	153.6	3.099	30.1	0.103	32.3	0.473	–73.9
5400	0.195	147.9	2.967	27.4	0.107	30.1	0.468	–75.9
5600	0.191	141.4	2.876	24.4	0.111	28.5	0.463	–78.1
5800	0.188	134.6	2.770	21.9	0.115	26.8	0.458	–80.2
6000	0.195	129.4	2.684	18.8	0.119	24.7	0.455	–82.3

S Parameters (Common emitter)

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	0.979	–6.1	3.494	173.8	0.005	80.7	0.999	–3.7
400	0.954	–12.6	3.506	168.3	0.012	81.1	0.995	–7.2
600	0.959	–18.2	3.410	162.3	0.018	80.2	0.990	–10.7
800	0.941	–24.7	3.400	156.8	0.023	75.4	0.982	–14.1
1000	0.925	–30.8	3.343	149.8	0.030	71.4	0.973	–17.6
1200	0.920	–37.2	3.333	144.8	0.035	68.7	0.961	–21.0
1400	0.904	–42.3	3.241	139.3	0.041	65.1	0.952	–24.1
1600	0.883	–48.2	3.185	133.9	0.047	62.0	0.940	–27.4
1800	0.858	–54.1	3.097	128.3	0.051	58.8	0.927	–30.4
2000	0.845	–60.2	3.084	123.4	0.056	55.2	0.914	–33.5
2200	0.820	–65.8	2.981	117.6	0.060	51.8	0.902	–36.4
2400	0.800	–71.2	2.905	113.1	0.065	48.6	0.888	–39.3
2600	0.765	–77.1	2.819	106.9	0.069	45.2	0.874	–42.1
2800	0.753	–82.3	2.766	102.4	0.073	42.6	0.862	–44.8
3000	0.737	–87.5	2.703	97.9	0.076	39.1	0.849	–47.4
3200	0.718	–92.7	2.630	93.1	0.079	36.4	0.835	–50.0
3400	0.687	–97.0	2.536	89.0	0.082	33.7	0.821	–52.5
3600	0.665	–102.3	2.486	84.9	0.084	31.4	0.807	–54.9
3800	0.641	–107.4	2.421	80.1	0.086	28.8	0.796	–57.2
4000	0.622	–111.5	2.333	76.6	0.088	26.2	0.784	–59.6
4200	0.600	–116.5	2.285	72.2	0.091	24.0	0.772	–62.0
4400	0.589	–121.5	2.223	68.3	0.092	21.7	0.761	–64.4
4600	0.562	–127.2	2.156	64.0	0.093	19.6	0.751	–66.7
4800	0.542	–131.7	2.098	60.0	0.095	17.9	0.741	–69.0
5000	0.541	–136.5	2.066	56.5	0.096	15.6	0.731	–71.3
5200	0.518	–140.2	2.018	52.7	0.098	13.7	0.724	–73.5
5400	0.502	–146.1	1.947	49.0	0.100	12.1	0.716	–75.7
5600	0.491	–150.0	1.903	45.1	0.101	10.5	0.707	–78.0
5800	0.468	–155.6	1.851	42.1	0.102	8.6	0.699	–80.2
6000	0.450	–160.4	1.815	38.2	0.103	7.0	0.692	–82.3

S Parameters (Common emitter)

V_{CE}=3V, I_C=3mA, 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	0.903	–8.9	9.036	170.6	0.006	69.0	0.995	–4.5
400	0.886	–18.5	8.934	162.4	0.012	76.0	0.985	–9.1
600	0.864	–27.3	8.534	154.0	0.017	75.3	0.970	–13.4
800	0.834	–35.4	8.271	146.3	0.023	71.6	0.952	–17.5
1000	0.800	–43.4	7.896	137.5	0.027	67.7	0.931	–21.3
1200	0.765	–52.0	7.608	130.7	0.031	62.9	0.906	–25.0
1400	0.726	–58.5	7.189	124.1	0.035	60.3	0.887	–28.4
1600	0.695	–65.2	6.814	117.6	0.039	58.5	0.865	–31.6
1800	0.651	–72.0	6.407	111.4	0.041	55.5	0.844	–34.6
2000	0.629	–79.1	6.170	106.0	0.045	52.9	0.822	–37.4
2200	0.589	–85.2	5.784	100.1	0.048	50.3	0.804	–40.1
2400	0.554	–90.1	5.467	95.4	0.051	48.2	0.785	–42.7
2600	0.516	–96.6	5.166	89.7	0.054	46.7	0.767	–45.1
2800	0.496	–101.8	4.932	85.2	0.056	44.1	0.751	–47.4
3000	0.469	–106.7	4.697	80.8	0.059	42.4	0.736	–49.7
3200	0.451	–112.5	4.466	76.4	0.061	41.4	0.723	–51.8
3400	0.413	–117.6	4.233	72.8	0.063	39.5	0.709	–53.9
3600	0.405	–122.1	4.066	69.2	0.066	38.2	0.696	–55.9
3800	0.381	–126.5	3.892	64.9	0.069	36.9	0.685	–57.8
4000	0.362	–131.3	3.705	61.8	0.070	35.4	0.675	–59.8
4200	0.342	–136.1	3.585	57.9	0.073	33.9	0.664	–61.9
4400	0.326	–141.7	3.429	54.6	0.076	32.8	0.656	–64.1
4600	0.316	–146.8	3.291	50.8	0.078	31.6	0.648	–66.1
4800	0.303	–151.8	3.171	47.3	0.081	30.3	0.640	–68.1
5000	0.293	–156.6	3.079	44.3	0.084	28.8	0.632	–70.2
5200	0.285	–160.1	2.981	41.0	0.086	27.5	0.627	–72.3
5400	0.272	–165.4	2.861	37.8	0.088	26.1	0.620	–74.4
5600	0.266	–170.4	2.769	34.4	0.091	24.8	0.615	–76.4
5800	0.248	–175.7	2.673	31.7	0.093	23.5	0.608	–78.5
6000	0.244	178.8	2.603	28.3	0.096	22.0	0.603	–80.4

S Parameters (Common emitter)

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	0.869	–11.7	13.188	168.1	0.004	79.0	0.991	–5.4
400	0.823	–23.4	12.844	158.2	0.010	79.4	0.972	–10.4
600	0.795	–33.1	12.016	148.0	0.016	73.6	0.951	–15.0
800	0.741	–42.5	11.363	139.2	0.020	70.4	0.924	–19.3
1000	0.688	–51.5	10.583	129.5	0.025	64.9	0.894	–23.2
1200	0.647	–60.3	9.922	122.2	0.028	62.5	0.863	–26.7
1400	0.604	–67.1	9.165	115.2	0.031	59.7	0.839	–29.8
1600	0.562	–74.9	8.508	108.7	0.034	58.1	0.814	–32.7
1800	0.518	–81.5	7.849	102.7	0.037	56.7	0.791	–35.4
2000	0.493	–88.6	7.425	97.5	0.039	53.9	0.771	–38.0
2200	0.457	–94.7	6.871	91.8	0.043	52.8	0.754	–40.3
2400	0.427	–100.2	6.421	87.4	0.045	51.4	0.734	–42.7
2600	0.391	–106.2	5.993	82.1	0.048	50.7	0.719	–44.8
2800	0.372	–111.8	5.661	78.0	0.050	49.0	0.705	–46.9
3000	0.353	–116.5	5.346	73.9	0.053	47.7	0.692	–48.9
3200	0.337	–121.4	5.046	69.9	0.056	46.4	0.680	–50.9
3400	0.310	–125.7	4.758	66.5	0.058	45.2	0.668	–52.8
3600	0.295	–130.3	4.548	63.1	0.061	43.7	0.656	–54.7
3800	0.278	–135.8	4.330	59.3	0.064	42.7	0.649	–56.6
4000	0.258	–140.5	4.114	56.2	0.067	41.5	0.639	–58.5
4200	0.248	–145.1	3.968	52.8	0.070	39.7	0.631	–60.5
4400	0.240	–152.1	3.783	49.5	0.073	38.8	0.624	–62.6
4600	0.227	–156.7	3.617	46.2	0.076	37.6	0.617	–64.6
4800	0.220	–162.6	3.479	42.9	0.078	36.3	0.611	–66.6
5000	0.212	–167.8	3.368	40.0	0.082	34.9	0.604	–68.7
5200	0.202	–170.4	3.246	36.9	0.085	33.2	0.601	–70.7
5400	0.202	–176.8	3.108	34.0	0.088	31.7	0.595	–72.8
5600	0.195	178.1	3.009	30.9	0.091	30.2	0.590	–74.8
5800	0.191	173.1	2.900	28.4	0.094	28.6	0.584	–76.9
6000	0.182	167.3	2.820	25.1	0.097	27.0	0.581	–78.8

S Parameters (Common emitter)

V_{CE}=3V, I_C=7mA, 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	0.804	–14.5	16.384	166.4	0.005	91.1	0.989	–5.8
400	0.772	–25.8	15.773	154.7	0.011	76.2	0.963	–11.3
600	0.720	–37.9	14.448	143.5	0.015	74.9	0.933	–16.1
800	0.663	–48.5	13.378	133.9	0.018	68.1	0.900	–20.3
1000	0.609	–58.0	12.216	123.8	0.022	65.2	0.866	–24.0
1200	0.564	–67.1	11.226	116.5	0.025	61.3	0.833	–27.3
1400	0.521	–74.1	10.223	109.6	0.028	60.5	0.808	–30.1
1600	0.475	–81.4	9.363	103.3	0.031	59.3	0.784	–32.8
1800	0.434	–87.7	8.553	97.4	0.034	57.4	0.762	–35.3
2000	0.413	–95.2	8.013	92.5	0.037	55.8	0.741	–37.6
2200	0.376	–101.5	7.366	87.1	0.040	55.0	0.725	–39.8
2400	0.350	–106.7	6.837	82.9	0.042	54.6	0.710	–42.1
2600	0.319	–112.8	6.350	78.0	0.045	53.2	0.694	–44.0
2800	0.307	–118.5	5.977	74.1	0.048	52.7	0.683	–46.0
3000	0.291	–124.7	5.623	70.2	0.051	51.2	0.672	–48.0
3200	0.276	–126.9	5.291	66.3	0.054	49.7	0.661	–49.9
3400	0.246	–133.0	4.975	63.1	0.056	49.1	0.650	–51.8
3600	0.238	–137.0	4.740	60.0	0.059	48.0	0.640	–53.7
3800	0.231	–142.3	4.509	56.2	0.063	46.4	0.633	–55.6
4000	0.207	–148.8	4.273	53.4	0.065	44.9	0.625	–57.4
4200	0.199	–153.4	4.113	50.0	0.068	43.3	0.618	–59.4
4400	0.196	–159.8	3.920	47.0	0.072	42.2	0.611	–61.6
4600	0.186	–167.1	3.745	43.7	0.075	40.7	0.606	–63.5
4800	0.180	–171.4	3.592	40.6	0.078	39.1	0.599	–65.5
5000	0.182	–175.4	3.483	37.7	0.082	37.6	0.594	–67.6
5200	0.170	–179.1	3.350	34.8	0.085	35.8	0.590	–69.7
5400	0.173	173.9	3.211	32.1	0.087	34.3	0.585	–71.7
5600	0.162	169.6	3.107	28.9	0.091	32.9	0.582	–73.8
5800	0.156	162.7	2.992	26.4	0.095	31.1	0.575	–75.9
6000	0.151	155.1	2.902	23.3	0.098	29.4	0.573	–77.8

S Parameters (Common emitter)

V_{CE}=3V, I_C=10mA, Z_O=50Ω

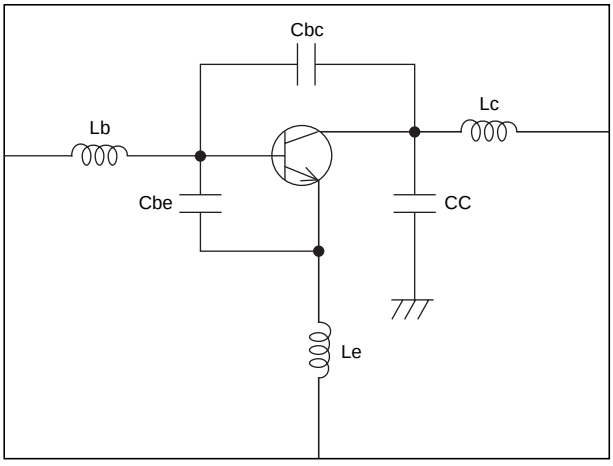
Freq(MHz)	$\|S_{11}\|$	$\angle S_{11}$	$\|S_{21}\|$	$\angle S_{21}$	$\|S_{12}\|$	$\angle S_{12}$	$\|S_{22}\|$	$\angle S_{22}$
200	0.745	–16.2	19.967	164.2	0.005	88.8	0.981	–6.4
400	0.707	–30.2	18.852	150.8	0.010	78.8	0.950	–12.3
600	0.647	–43.1	16.844	138.6	0.014	72.9	0.912	–17.1
800	0.583	–54.9	15.211	128.4	0.018	67.9	0.872	–21.1
1000	0.520	–65.3	13.572	118.2	0.021	64.2	0.837	–24.5
1200	0.479	–74.2	12.272	110.9	0.023	65.0	0.803	–27.4
1400	0.435	–81.1	11.011	104.2	0.026	62.4	0.778	–30.0
1600	0.396	–89.2	9.977	98.2	0.029	61.4	0.756	–32.5
1800	0.359	–95.7	9.040	92.7	0.032	59.3	0.736	–34.7
2000	0.338	–102.1	8.394	88.0	0.034	59.1	0.718	–36.9
2200	0.303	–108.9	7.670	82.9	0.037	58.1	0.704	–39.0
2400	0.281	–113.7	7.089	79.0	0.040	58.2	0.690	–41.1
2600	0.261	–121.5	6.569	74.2	0.043	57.3	0.677	–43.0
2800	0.251	–126.3	6.158	70.6	0.045	55.5	0.666	–45.0
3000	0.237	–131.8	5.770	67.0	0.049	54.7	0.657	–47.0
3200	0.224	–136.4	5.413	63.2	0.052	53.3	0.648	–48.8
3400	0.204	–142.4	5.084	60.3	0.055	51.9	0.638	–50.7
3600	0.202	–145.4	4.838	57.2	0.058	50.2	0.629	–52.6
3800	0.186	–153.3	4.599	53.7	0.062	49.3	0.622	–54.5
4000	0.169	–158.5	4.353	50.8	0.064	47.7	0.616	–56.4
4200	0.163	–165.8	4.192	47.6	0.068	46.3	0.609	–58.4
4400	0.160	–170.2	3.989	44.7	0.071	45.2	0.603	–60.4
4600	0.161	–174.9	3.806	41.5	0.075	43.3	0.598	–62.5
4800	0.150	176.3	3.646	38.5	0.078	41.7	0.593	–64.5
5000	0.153	171.0	3.525	35.8	0.081	39.7	0.588	–66.6
5200	0.145	168.1	3.404	33.0	0.085	38.4	0.585	–68.6
5400	0.148	162.1	3.255	30.1	0.088	36.4	0.580	–70.7
5600	0.144	158.2	3.151	27.2	0.091	34.8	0.576	–72.8
5800	0.142	149.2	3.033	24.7	0.095	33.3	0.571	–74.9
6000	0.144	141.9	2.943	21.7	0.098	31.4	0.568	–76.9

SPICE PARAMETERS

model : Gummel-Poon

Parameter	Value	Unit	Parameter	Value	Unit
IS	0.21024f	A	TF	4.5899p	S
BF	83.23		XTF	0.3641	
NF	1.0405		VTF	0.19762	V
VAF	39.251	V	ITF	1.3364m	A
IKF	0.16493	A	PTF	0	deg
ISE	15.761f	A	CJC	96.941f	F
NE	1.7763		VJC	0.99532	V
BR	10.526		MJC	0.48652	
NR	0.96647		XCJC	0.08161	
VAR	34.368	V	TR	1.4935n	S
IKR	250.52m	A	FC	0.99469	
ISC	37.223a	A	CJS	0	F
NC	1.3152		VJS	0.75	V
RB	15	Ω	MJS	0	
IRB	212.15m	A	CC	100f	F
RBM	1.3491	Ω	Cbc	4f	F
RE	1.9289	Ω	Cbe	100f	F
RC	0.12691	Ω	Lb	0.6n	H
XTB	0		Lc	0.6n	H
EG	1.11	eV	Le	0.3n	H
XTI	3				
CJE	3.7265f	F			
VJE	0.70367	V			
MJE	0.37747				

SCHEMATIC



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