



SANYO Semiconductors

DATA SHEET

NPN Epitaxial Planar Silicon Transistor

SBFP540M — UHF to C Band Low Noise Amplifier, Low Phase Noise Oscillation Applications

Features

- Low noise : NF=0.9dB typ (f=1.8GHz).
- High cut-off frequency : $f_T=20\text{GHz}$ typ ($V_{CE}=1\text{V}$),
: $f_T=29\text{GHz}$ typ ($V_{CE}=4\text{V}$).
- Low voltage operation.
- High Gain : $|S_{21e}|^2=18.5\text{dB}$ typ (f=1.8GHz).

Specifications

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

Parameter	Symbol	Conditions	Ratings	Unit
Collector-to-Base Voltage	V_{CBO}		14	V
Collector-to-Emitter Voltage	V_{CEO}		4.5	V
Emitter-to-Base Voltage	V_{EBO}		1	V
Collector Current	I_C		80	mA
Collector Dissipation	P_C		250	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}	$V_{CB}=5\text{V}, I_E=0$			200	nA
Emitter Cutoff Current	I_{EBO}	$V_{EB}=1\text{V}, I_C=0$			70	μA
DC Current Gain	h_{FE}	$V_{CE}=3.5\text{V}, I_C=20\text{mA}$	50		200	
Gain-Bandwidth Product	$f_T(1)$	$V_{CE}=1\text{V}, I_C=10\text{mA}$		20		GHz
	$f_T(2)$	$V_{CE}=4\text{V}, I_C=50\text{mA}$	22	29		GHz
Reverse Transfer Capacitance	C_{re}	$V_{CB}=2\text{V}, f=1\text{MHz}$		0.14	0.24	pF
Forward Transfer Gain	$ S_{21e} ^2(1)$	$V_{CE}=1\text{V}, I_C=10\text{mA}, f=1.8\text{GHz}$		17.5		dB
	$ S_{21e} ^2(2)$	$V_{CE}=2\text{V}, I_C=20\text{mA}, f=1.8\text{GHz}$	16	18.5		dB
Noise Figure	NF	$V_{CE}=2\text{V}, I_C=5\text{mA}, f=1.8\text{GHz}$		0.9	1.3	dB

Marking : MC

- Any and all SANYO products described or contained herein do not have specifications that can handle applications that require extremely high levels of reliability, such as life-support systems, aircraft's control systems, or other applications whose failure can be reasonably expected to result in serious physical and/or material damage. Consult with your SANYO representative nearest you before using any SANYO products described or contained herein in such applications.
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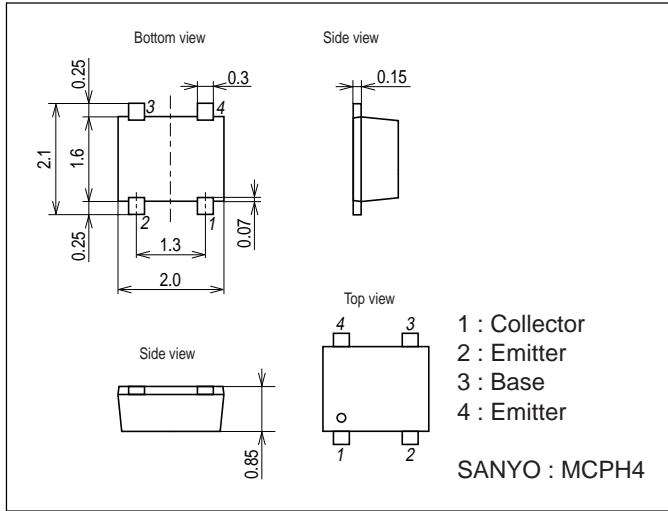
SANYO Electric Co., Ltd. Semiconductor Company

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

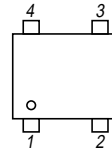
SBFP540M

Package Dimensions

unit : mm
2213

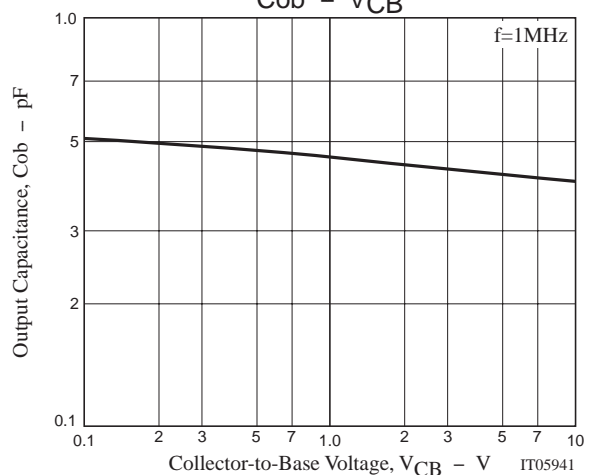
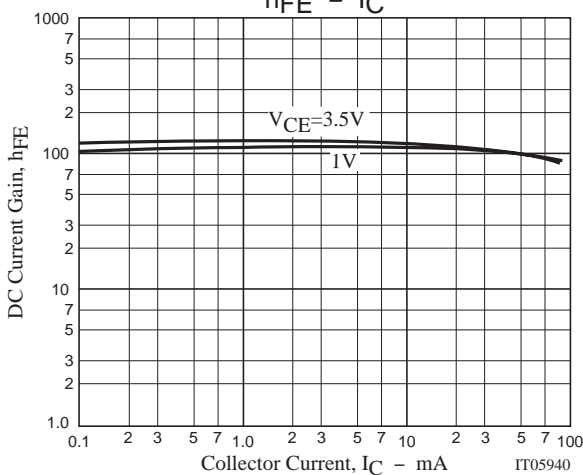
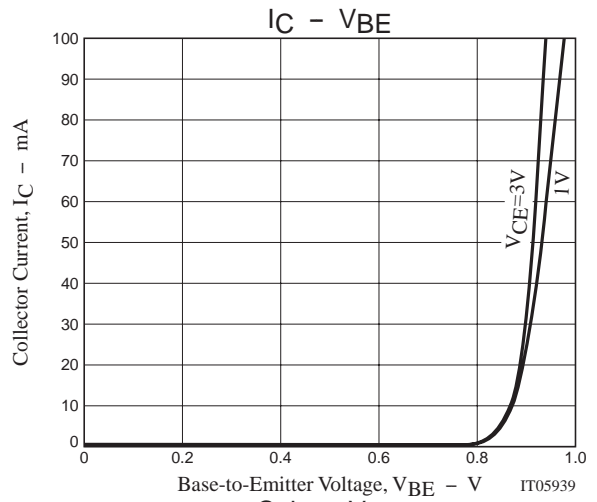
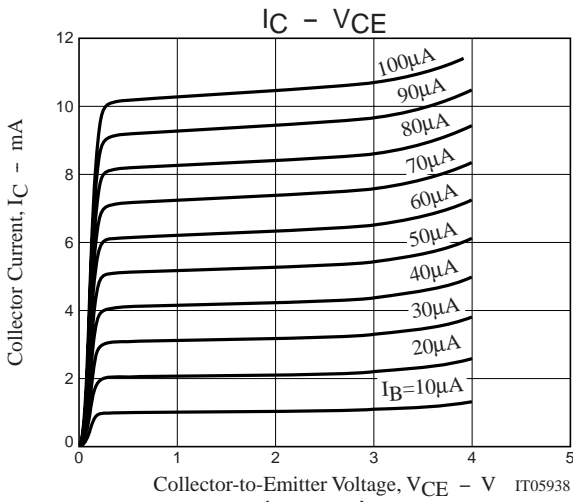


Electrical Connection

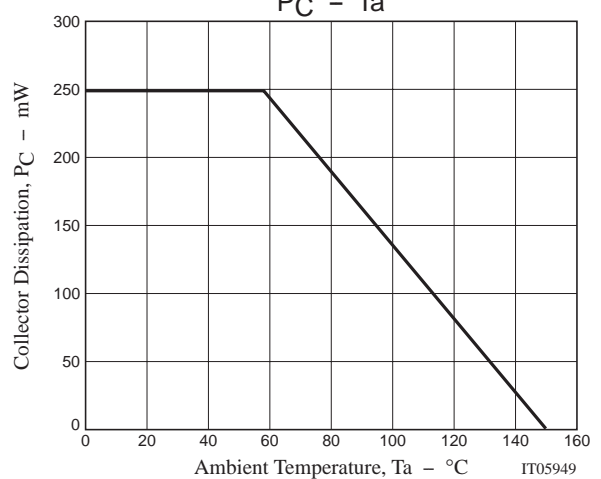
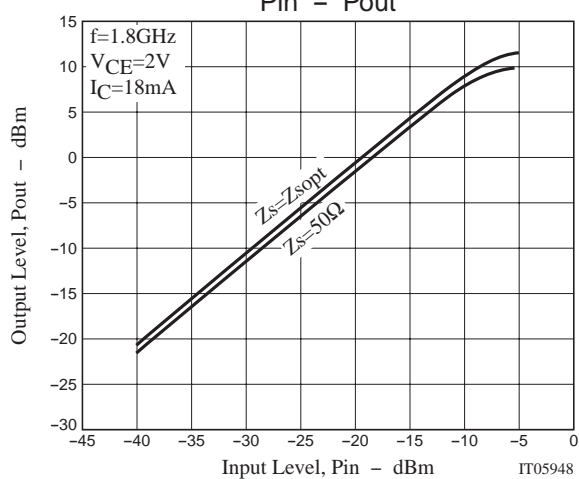
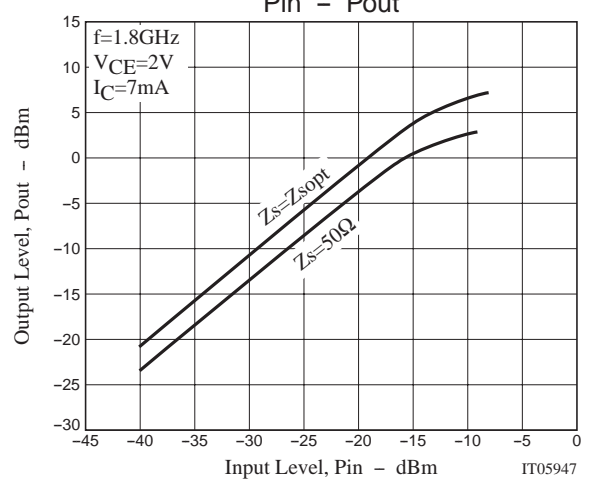
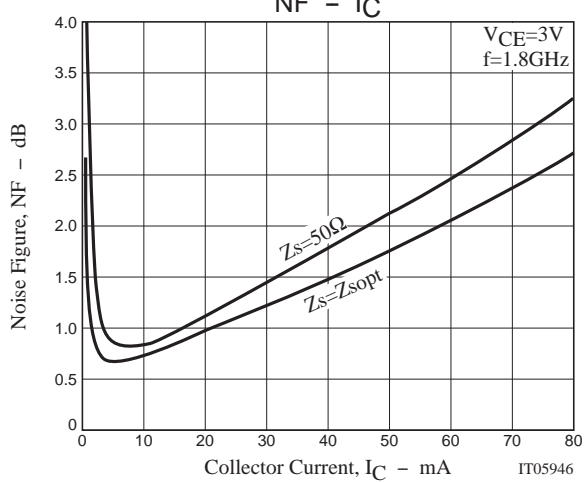
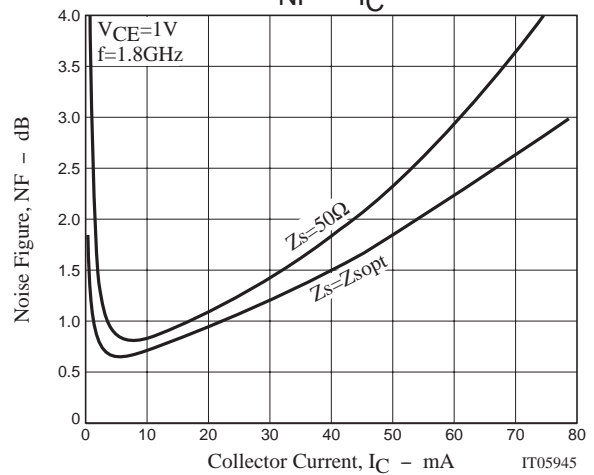
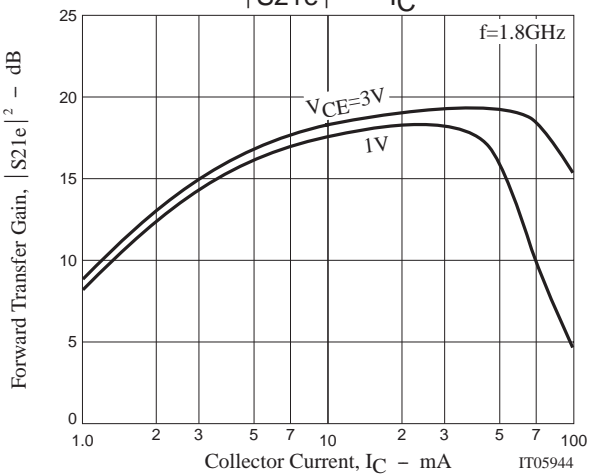
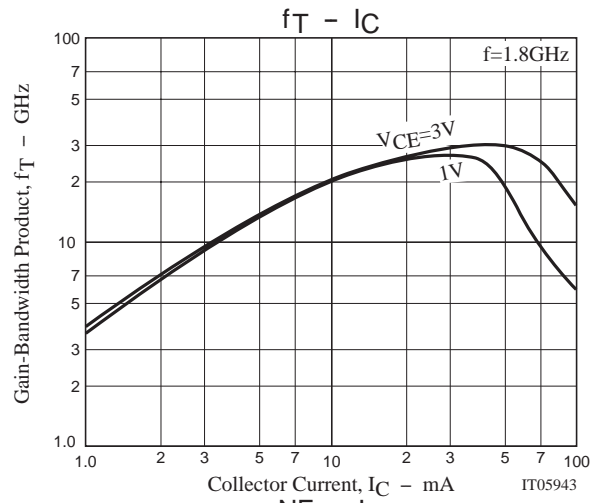
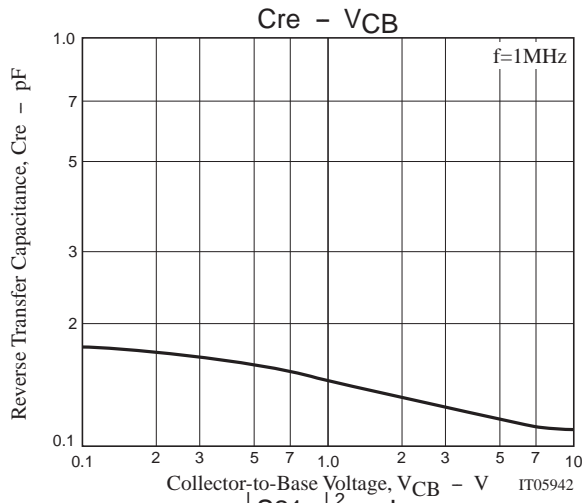


- 1 : Collector
 - 2 : Emitter
 - 3 : Base
 - 4 : Emitter
- Top view

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



SBFP540M



SBFP540M

S Parameters (Common emitter)

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

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
200	0.876	-20.4	9.668	161.0	0.019	77.5	0.957	-15.3
400	0.850	-40.7	9.383	146.6	0.036	65.5	0.890	-28.0
600	0.771	-57.2	8.338	134.1	0.046	56.9	0.791	-35.9
800	0.700	-75.0	8.228	123.2	0.054	50.9	0.719	-44.4
1000	0.670	-87.8	7.416	114.3	0.061	45.1	0.644	-49.6
1200	0.607	-104.1	7.039	106.3	0.065	42.8	0.594	-54.7
1400	0.573	-115.4	6.399	100.0	0.069	40.1	0.554	-57.3
1600	0.542	-125.5	5.881	93.8	0.071	38.9	0.507	-60.1
1800	0.520	-134.6	5.388	89.0	0.074	37.9	0.486	-63.2
2000	0.504	-141.7	4.792	84.6	0.077	37.2	0.475	-62.5
2200	0.500	-149.5	4.619	80.2	0.079	36.4	0.441	-65.9
2400	0.490	-156.6	4.326	75.8	0.083	35.3	0.422	-67.4
2600	0.481	-162.8	3.999	71.4	0.085	35.5	0.408	-68.0
2800	0.477	-168.3	3.685	68.1	0.089	34.8	0.406	-68.4
3000	0.477	-174.8	3.609	64.7	0.091	34.7	0.373	-72.0
3200	0.478	179.5	3.418	61.0	0.093	34.2	0.355	-73.6
3400	0.472	173.7	3.239	57.6	0.095	34.5	0.342	-75.2
3600	0.473	169.4	3.086	54.3	0.098	33.5	0.328	-77.7
3800	0.477	165.0	2.949	50.9	0.101	33.6	0.315	-79.5
4000	0.484	160.1	2.809	47.7	0.104	32.9	0.301	-81.7
4200	0.485	155.6	2.696	44.5	0.107	32.6	0.288	-84.4
4400	0.480	151.3	2.599	41.4	0.110	31.9	0.276	-87.9
4600	0.487	147.7	2.494	38.4	0.113	31.1	0.267	-90.6
4800	0.496	143.9	2.408	35.7	0.115	31.0	0.259	-92.6
5000	0.498	139.5	2.325	32.6	0.121	30.4	0.250	-96.5
5200	0.500	136.1	2.213	29.5	0.122	29.3	0.257	-98.9
5400	0.495	132.5	2.167	26.6	0.127	28.6	0.245	-102.5
5600	0.501	129.5	2.033	24.1	0.129	27.7	0.263	-104.0
5800	0.504	126.1	2.032	21.4	0.132	26.9	0.243	-108.8
6000	0.502	121.7	1.974	18.3	0.137	25.7	0.242	-110.7

SBFP540M

S Parameters (Common emitter)

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

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
200	0.707	-34.7	22.662	155.4	0.017	74.7	0.916	-21.3
400	0.663	-64.5	19.734	136.3	0.030	62.5	0.801	-38.1
600	0.553	-83.7	16.022	121.3	0.038	53.7	0.673	-50.1
800	0.518	-99.6	13.440	111.9	0.044	53.4	0.602	-54.0
1000	0.477	-117.4	11.232	103.1	0.050	49.3	0.508	-56.9
1200	0.458	-128.7	9.820	96.5	0.052	49.5	0.460	-65.7
1400	0.439	-138.8	8.529	91.3	0.058	48.9	0.417	-66.8
1600	0.431	-147.0	7.615	86.1	0.062	47.8	0.398	-69.0
1800	0.419	-154.2	6.842	82.4	0.066	49.1	0.357	-69.3
2000	0.408	-160.9	6.116	79.0	0.069	49.0	0.349	-69.5
2200	0.402	-167.4	5.675	75.2	0.074	48.0	0.323	-73.7
2400	0.403	-172.2	5.259	71.3	0.079	46.9	0.315	-73.6
2600	0.399	-177.0	4.892	67.7	0.083	48.1	0.296	-74.9
2800	0.403	177.1	4.523	64.7	0.086	46.8	0.287	-75.5
3000	0.408	171.3	4.304	61.4	0.092	44.7	0.270	-79.2
3200	0.410	166.7	4.061	58.4	0.096	46.5	0.254	-78.7
3400	0.411	162.5	3.823	55.4	0.099	44.5	0.241	-80.0
3600	0.415	158.2	3.639	52.3	0.105	42.7	0.223	-83.4
3800	0.416	154.5	3.468	49.4	0.107	42.6	0.214	-86.7
4000	0.416	151.4	3.292	46.5	0.114	41.3	0.208	-90.3
4200	0.433	147.9	3.159	43.8	0.120	39.9	0.192	-91.4
4400	0.434	143.4	3.034	40.9	0.121	38.5	0.176	-97.0
4600	0.438	141.0	2.911	38.1	0.129	38.2	0.167	-100.7
4800	0.440	137.3	2.813	35.2	0.132	37.2	0.169	-102.6
5000	0.450	133.8	2.711	32.5	0.137	35.0	0.158	-106.3
5200	0.457	130.2	2.616	29.9	0.140	34.5	0.156	-109.8
5400	0.452	126.7	2.522	27.1	0.143	31.7	0.154	-115.5
5600	0.453	124.1	2.420	24.8	0.147	31.0	0.165	-114.8
5800	0.457	120.7	2.368	22.0	0.151	30.1	0.154	-119.8
6000	0.459	117.2	2.308	19.0	0.154	28.1	0.147	-122.1

SBFP540M

S Parameters (Common emitter)

$V_{CE}=1V, I_C=20mA, Z_O=50\Omega$

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
200	0.537	-53.4	33.150	147.3	0.015	70.0	0.852	-28.8
400	0.506	-88.9	26.213	126.0	0.026	61.0	0.685	-48.4
600	0.415	-110.0	19.932	111.8	0.031	56.9	0.547	-59.4
800	0.397	-123.5	15.931	103.4	0.035	56.5	0.476	-62.4
1000	0.387	-140.8	13.023	96.3	0.041	56.7	0.386	-63.7
1200	0.381	-149.3	11.107	90.1	0.046	57.0	0.354	-73.1
1400	0.376	-158.0	9.608	85.9	0.051	58.1	0.312	-73.8
1600	0.371	-164.0	8.458	81.8	0.058	56.9	0.307	-75.6
1800	0.368	-169.9	7.533	78.4	0.061	58.7	0.271	-74.4
2000	0.362	-176.5	6.826	75.4	0.067	57.0	0.259	-76.3
2200	0.360	179.0	6.200	71.5	0.073	57.7	0.243	-79.3
2400	0.362	174.8	5.765	68.4	0.080	56.6	0.241	-78.7
2600	0.358	171.1	5.366	65.3	0.084	55.6	0.226	-80.9
2800	0.365	165.2	4.976	62.4	0.091	52.0	0.208	-80.3
3000	0.376	161.0	4.676	59.1	0.094	53.0	0.199	-83.5
3200	0.374	157.3	4.401	56.5	0.101	49.9	0.186	-83.3
3400	0.377	153.5	4.142	53.7	0.106	51.1	0.174	-85.0
3600	0.385	149.6	3.941	51.0	0.114	48.0	0.158	-89.8
3800	0.384	146.6	3.762	48.2	0.114	47.2	0.149	-95.3
4000	0.387	144.4	3.566	45.5	0.120	45.7	0.143	-97.0
4200	0.407	141.1	3.418	43.0	0.127	43.6	0.130	-102.8
4400	0.408	137.5	3.282	40.3	0.131	42.0	0.119	-109.2
4600	0.415	134.9	3.134	37.6	0.136	41.5	0.110	-114.6
4800	0.417	132.0	3.019	34.9	0.139	39.9	0.112	-118.0
5000	0.425	128.4	2.919	32.3	0.147	37.7	0.105	-122.6
5200	0.430	125.1	2.835	29.7	0.151	35.7	0.100	-125.7
5400	0.428	122.0	2.719	27.0	0.154	34.4	0.102	-135.4
5600	0.430	119.6	2.641	24.8	0.157	32.6	0.110	-133.9
5800	0.433	116.5	2.557	21.9	0.162	31.7	0.103	-138.8
6000	0.437	112.9	2.483	19.3	0.167	29.0	0.100	-142.1

SBFP540M

S Parameters (Common emitter)

$V_{CE}=1V, I_C=40mA, Z_O=50\Omega$

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
200	0.419	-92.2	37.063	136.8	0.013	64.9	0.725	-37.5
400	0.444	-123.4	26.701	116.1	0.022	63.0	0.539	-56.3
600	0.398	-142.6	19.635	104.1	0.027	63.1	0.411	-67.6
800	0.388	-150.9	15.453	96.8	0.033	65.0	0.365	-68.5
1000	0.405	-163.9	12.829	91.3	0.039	65.9	0.292	-69.4
1200	0.405	-168.1	10.462	85.8	0.045	63.4	0.271	-78.5
1400	0.403	-174.7	9.240	81.8	0.051	64.6	0.218	-79.3
1600	0.407	-179.8	7.866	78.3	0.057	61.9	0.238	-78.8
1800	0.407	175.2	7.087	74.8	0.065	63.4	0.195	-81.3
2000	0.399	169.8	6.479	72.1	0.070	61.8	0.200	-78.0
2200	0.396	167.2	5.842	68.1	0.075	61.3	0.177	-85.3
2400	0.395	162.9	5.379	65.5	0.082	60.0	0.186	-83.0
2600	0.392	159.2	5.024	62.7	0.089	59.7	0.165	-89.0
2800	0.401	154.4	4.712	60.0	0.094	57.9	0.155	-83.9
3000	0.414	150.3	4.362	56.7	0.100	54.9	0.143	-93.0
3200	0.414	147.1	4.081	54.2	0.109	54.3	0.125	-86.8
3400	0.420	143.8	3.862	51.5	0.112	53.2	0.113	-94.4
3600	0.436	140.3	3.678	48.5	0.119	51.8	0.103	-96.2
3800	0.430	137.8	3.490	46.1	0.125	50.4	0.096	-108.1
4000	0.432	135.3	3.340	43.5	0.127	47.6	0.098	-109.1
4200	0.451	132.5	3.174	40.7	0.136	47.2	0.093	-110.5
4400	0.469	128.9	3.052	37.9	0.141	45.7	0.077	-125.3
4600	0.469	127.0	2.899	35.2	0.146	41.6	0.075	-142.1
4800	0.471	124.1	2.801	32.3	0.149	41.2	0.079	-131.3
5000	0.486	121.5	2.690	30.0	0.156	39.5	0.067	-139.1
5200	0.488	118.8	2.669	27.9	0.159	37.8	0.075	-158.4
5400	0.497	116.1	2.503	25.1	0.164	36.2	0.075	-164.2
5600	0.493	114.2	2.527	23.0	0.167	34.0	0.080	-156.0
5800	0.499	110.9	2.365	19.9	0.174	31.2	0.079	-160.2
6000	0.503	107.6	2.314	17.1	0.175	29.8	0.070	-171.7

SBFP540M

S Parameters (Common emitter)

$V_{CE}=2V, I_C=5mA, Z_O=50\Omega$

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
200	0.830	-22.9	13.797	162.5	0.016	78.6	0.963	-13.1
400	0.809	-44.1	12.849	147.2	0.030	68.1	0.909	-24.5
600	0.727	-60.6	11.142	134.1	0.039	59.9	0.832	-32.5
800	0.685	-76.7	10.049	123.4	0.047	53.4	0.753	-39.5
1000	0.653	-90.0	8.799	114.1	0.054	48.2	0.695	-44.3
1200	0.598	-102.4	8.026	107.1	0.057	45.6	0.646	-48.6
1400	0.572	-112.2	7.176	100.7	0.060	43.1	0.606	-52.1
1600	0.547	-121.5	6.505	94.7	0.064	41.7	0.567	-54.7
1800	0.521	-130.0	5.933	89.9	0.066	41.3	0.538	-56.9
2000	0.505	-136.8	5.227	85.6	0.069	39.9	0.532	-57.6
2200	0.493	-144.0	5.005	81.1	0.071	39.1	0.495	-60.2
2400	0.481	-150.5	4.651	77.1	0.074	38.8	0.476	-61.6
2600	0.473	-156.0	4.280	73.0	0.076	38.4	0.465	-61.8
2800	0.466	-161.6	3.929	69.8	0.079	37.7	0.459	-62.7
3000	0.458	-168.7	3.863	66.3	0.081	38.3	0.427	-65.8
3200	0.457	-174.2	3.645	62.8	0.082	37.7	0.410	-67.2
3400	0.455	-179.8	3.464	59.5	0.085	37.6	0.400	-68.4
3600	0.455	174.9	3.297	56.2	0.087	38.2	0.386	-70.1
3800	0.458	170.3	3.146	53.1	0.091	37.8	0.375	-71.7
4000	0.463	165.8	3.002	50.0	0.093	37.6	0.364	-73.6
4200	0.468	160.9	2.885	46.9	0.096	37.2	0.352	-75.8
4400	0.471	156.3	2.783	43.7	0.099	36.7	0.339	-78.0
4600	0.478	152.0	2.671	40.7	0.101	36.6	0.331	-80.2
4800	0.483	148.4	2.567	37.8	0.104	36.1	0.323	-82.5
5000	0.483	144.4	2.487	34.9	0.108	35.7	0.316	-85.0
5200	0.493	141.5	2.356	32.1	0.110	35.0	0.320	-87.3
5400	0.491	137.6	2.322	29.1	0.115	34.4	0.307	-90.3
5600	0.500	134.5	2.179	26.7	0.117	33.6	0.323	-93.2
5800	0.500	131.6	2.170	23.6	0.121	33.3	0.308	-95.7
6000	0.501	127.8	2.114	20.6	0.124	31.9	0.305	-98.5

SBFP540M

S Parameters (Common emitter)

$V_{CE}=2V, I_C=10mA, Z_O=50\Omega$

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
200	0.705	-31.6	23.214	157.0	0.014	74.6	0.932	-18.1
400	0.663	-59.0	20.346	138.4	0.026	64.6	0.832	-32.6
600	0.570	-78.7	16.818	124.1	0.032	58.2	0.721	-40.8
800	0.526	-95.5	14.144	113.5	0.038	54.2	0.628	-47.6
1000	0.497	-109.1	12.009	105.0	0.043	52.0	0.564	-52.0
1200	0.459	-121.0	10.465	98.6	0.047	51.9	0.516	-55.0
1400	0.438	-129.9	9.179	93.0	0.050	51.0	0.482	-58.0
1600	0.423	-138.4	8.140	87.9	0.054	51.2	0.446	-59.9
1800	0.409	-146.2	7.337	83.7	0.058	51.6	0.421	-61.4
2000	0.399	-152.6	6.547	80.0	0.062	50.8	0.412	-62.2
2200	0.389	-159.0	6.103	76.1	0.066	51.2	0.385	-63.8
2400	0.383	-164.6	5.631	72.6	0.070	50.5	0.370	-64.8
2600	0.379	-169.7	5.211	69.1	0.074	50.1	0.358	-64.7
2800	0.376	-174.7	4.826	66.2	0.078	49.5	0.350	-65.6
3000	0.373	179.2	4.598	63.0	0.082	49.4	0.327	-68.1
3200	0.376	174.2	4.335	60.0	0.086	48.8	0.315	-69.2
3400	0.377	169.4	4.107	57.0	0.090	47.5	0.305	-70.3
3600	0.382	164.7	3.896	54.1	0.095	47.5	0.293	-71.7
3800	0.385	160.6	3.717	51.3	0.099	46.5	0.282	-73.3
4000	0.393	156.9	3.548	48.5	0.102	45.4	0.271	-75.3
4200	0.400	152.4	3.398	45.6	0.106	44.7	0.260	-77.3
4400	0.406	148.5	3.259	42.7	0.111	43.6	0.248	-79.7
4600	0.414	144.7	3.133	40.0	0.114	42.3	0.241	-82.0
4800	0.421	141.6	3.011	37.3	0.118	41.2	0.232	-84.2
5000	0.425	138.1	2.912	34.7	0.122	40.1	0.226	-86.7
5200	0.432	135.3	2.793	32.0	0.125	38.6	0.226	-89.4
5400	0.434	132.0	2.716	29.3	0.130	37.6	0.217	-92.5
5600	0.441	129.3	2.606	26.8	0.133	36.4	0.226	-95.3
5800	0.441	126.5	2.548	23.9	0.138	34.8	0.218	-97.9
6000	0.442	122.8	2.483	21.2	0.140	33.5	0.216	-100.8

SBFP540M

S Parameters (Common emitter)

$V_{CE}=2V, I_C=20mA, Z_O=50\Omega$

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
200	0.536	-44.9	34.694	150.4	0.013	72.5	0.883	-23.8
400	0.493	-79.0	27.733	129.0	0.021	65.4	0.733	-40.1
600	0.419	-100.8	21.450	114.9	0.026	60.8	0.606	-47.4
800	0.393	-117.0	17.173	105.3	0.031	60.3	0.512	-53.2
1000	0.381	-129.7	14.203	97.9	0.036	59.5	0.454	-56.7
1200	0.362	-140.3	12.103	92.3	0.041	59.9	0.416	-58.5
1400	0.351	-147.7	10.460	87.5	0.045	60.8	0.386	-61.0
1600	0.346	-155.0	9.212	83.2	0.051	60.6	0.360	-62.3
1800	0.338	-161.5	8.220	79.4	0.055	60.3	0.339	-63.1
2000	0.334	-167.3	7.408	76.0	0.060	59.8	0.331	-64.1
2200	0.328	-172.6	6.778	72.7	0.065	59.3	0.312	-65.0
2400	0.325	-177.6	6.252	69.6	0.070	58.9	0.299	-65.7
2600	0.324	178.1	5.802	66.5	0.075	58.0	0.290	-65.7
2800	0.324	173.5	5.395	63.8	0.080	57.3	0.280	-66.1
3000	0.324	168.4	5.068	60.9	0.085	55.9	0.265	-68.1
3200	0.330	164.1	4.769	58.1	0.090	55.1	0.253	-69.3
3400	0.333	160.0	4.511	55.4	0.095	53.7	0.246	-70.3
3600	0.338	156.0	4.275	52.7	0.100	52.7	0.235	-71.4
3800	0.343	152.4	4.077	50.0	0.105	51.0	0.224	-73.2
4000	0.353	149.3	3.893	47.4	0.110	50.3	0.214	-75.1
4200	0.361	145.5	3.722	44.7	0.113	48.5	0.204	-77.7
4400	0.369	142.1	3.563	42.0	0.119	47.2	0.194	-80.1
4600	0.378	138.6	3.423	39.5	0.123	45.4	0.186	-82.7
4800	0.385	135.8	3.293	36.9	0.126	44.1	0.178	-85.0
5000	0.391	132.9	3.181	34.4	0.131	42.7	0.172	-88.0
5200	0.396	130.2	3.066	31.9	0.135	40.9	0.168	-90.6
5400	0.400	127.5	2.966	29.3	0.139	39.5	0.164	-93.7
5600	0.406	124.9	2.871	26.9	0.143	38.0	0.165	-97.0
5800	0.408	122.2	2.786	24.2	0.148	36.3	0.163	-100.1
6000	0.408	118.7	2.718	21.5	0.152	34.6	0.162	-102.7

SBFP540M

S Parameters (Common emitter)

$V_{CE}=3V, I_C=5mA, Z_O=50\Omega$

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
200	0.841	-23.5	13.680	161.4	0.015	74.7	0.963	-13.3
400	0.818	-45.8	12.839	145.5	0.028	65.8	0.916	-25.1
600	0.728	-61.4	11.144	130.5	0.036	54.8	0.833	-36.1
800	0.688	-78.2	10.131	119.9	0.043	51.5	0.787	-41.0
1000	0.621	-96.2	8.897	108.6	0.049	42.1	0.720	-44.8
1200	0.589	-110.1	8.174	99.5	0.054	39.6	0.658	-53.2
1400	0.547	-122.9	7.224	91.8	0.054	36.0	0.623	-55.9
1600	0.527	-132.9	6.607	85.1	0.059	32.8	0.559	-59.5
1800	0.497	-142.7	5.968	79.4	0.062	33.3	0.560	-61.5
2000	0.472	-151.3	5.202	74.3	0.062	29.8	0.552	-63.4
2200	0.461	-159.5	5.029	68.8	0.065	28.5	0.521	-67.9
2400	0.464	-166.6	4.713	63.4	0.068	27.1	0.511	-69.6
2600	0.455	-173.4	4.351	57.9	0.071	25.8	0.497	-71.2
2800	0.459	177.7	3.972	53.1	0.073	22.4	0.489	-73.3
3000	0.456	170.3	3.904	48.5	0.073	24.3	0.463	-77.4
3200	0.453	163.6	3.700	44.1	0.077	20.7	0.453	-78.9
3400	0.449	157.0	3.488	39.7	0.080	20.6	0.433	-81.1
3600	0.452	150.9	3.325	35.2	0.082	19.3	0.415	-84.7
3800	0.446	145.5	3.177	30.9	0.083	18.5	0.405	-87.6
4000	0.448	140.4	3.027	26.8	0.087	17.4	0.397	-90.7
4200	0.460	134.5	2.922	22.7	0.092	15.2	0.381	-92.6
4400	0.454	128.9	2.805	18.5	0.095	14.5	0.366	-96.3
4600	0.460	124.0	2.696	14.3	0.096	13.5	0.362	-98.8
4800	0.463	118.5	2.607	9.9	0.100	10.8	0.359	-102.5
5000	0.461	112.9	2.525	5.8	0.102	9.9	0.351	-105.6
5200	0.464	108.1	2.396	1.8	0.105	7.1	0.351	-108.9
5400	0.451	103.3	2.343	-2.2	0.108	6.0	0.339	-113.6
5600	0.458	99.2	2.202	-5.7	0.113	4.2	0.360	-117.4
5800	0.459	94.3	2.206	-9.8	0.116	2.1	0.341	-120.0
6000	0.465	89.1	2.148	-13.8	0.122	0.9	0.337	-122.6

SBFP540M

S Parameters (Common emitter)

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

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
200	0.715	-31.7	23.200	156.0	0.014	69.6	0.935	-17.8
400	0.672	-59.9	20.567	136.8	0.024	61.5	0.843	-32.4
600	0.561	-79.2	16.910	120.4	0.030	55.6	0.729	-43.5
800	0.517	-96.4	14.395	109.8	0.035	51.9	0.668	-47.8
1000	0.469	-115.6	12.185	99.2	0.040	47.6	0.586	-50.4
1200	0.443	-128.2	10.665	91.0	0.044	43.2	0.538	-58.8
1400	0.419	-140.4	9.277	84.1	0.047	44.1	0.498	-60.5
1600	0.406	-150.5	8.295	78.1	0.051	42.4	0.482	-63.3
1800	0.387	-159.2	7.362	73.1	0.055	42.3	0.443	-64.5
2000	0.370	-168.5	6.550	68.3	0.059	40.1	0.434	-66.0
2200	0.361	-175.5	6.131	63.5	0.063	40.1	0.416	-69.6
2400	0.364	179.0	5.710	58.9	0.066	38.0	0.409	-71.2
2600	0.364	173.1	5.294	54.0	0.068	37.6	0.392	-73.0
2800	0.371	165.0	4.863	49.6	0.075	35.0	0.386	-75.0
3000	0.372	158.3	4.649	45.3	0.077	32.6	0.372	-78.0
3200	0.370	152.4	4.380	41.2	0.081	31.0	0.363	-79.1
3400	0.371	146.8	4.125	37.2	0.084	29.2	0.345	-81.5
3600	0.372	141.4	3.928	33.2	0.087	28.4	0.328	-85.5
3800	0.373	136.7	3.746	29.3	0.091	25.6	0.314	-88.1
4000	0.379	132.3	3.568	25.6	0.096	25.5	0.309	-91.1
4200	0.391	126.9	3.436	21.6	0.101	21.5	0.294	-92.7
4400	0.385	121.9	3.291	17.7	0.104	21.0	0.280	-96.4
4600	0.395	117.5	3.171	13.8	0.110	19.0	0.273	-99.7
4800	0.398	112.2	3.075	9.7	0.113	15.2	0.271	-102.4
5000	0.400	107.2	2.966	5.7	0.119	13.2	0.264	-105.5
5200	0.399	101.6	2.847	1.7	0.124	11.1	0.259	-108.7
5400	0.390	97.8	2.747	-1.9	0.125	8.5	0.251	-113.6
5600	0.397	94.7	2.637	-5.3	0.129	6.2	0.262	-117.7
5800	0.395	89.9	2.592	-9.4	0.132	4.0	0.255	-119.8
6000	0.401	84.8	2.529	-13.1	0.136	0.9	0.251	-122.3

SBFP540M

S Parameters (Common emitter)

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

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
200	0.547	-43.7	34.553	149.7	0.012	73.1	0.889	-22.9
400	0.497	-78.1	28.092	127.6	0.019	68.3	0.749	-39.0
600	0.399	-100.2	21.594	111.6	0.025	57.4	0.626	-49.3
800	0.373	-116.0	17.425	101.5	0.030	56.2	0.560	-52.3
1000	0.355	-135.9	14.386	92.3	0.033	53.7	0.482	-53.8
1200	0.344	-146.9	12.314	85.2	0.037	54.3	0.441	-62.1
1400	0.332	-158.5	10.565	79.2	0.043	52.8	0.408	-62.8
1600	0.328	-166.0	9.336	73.9	0.048	54.0	0.399	-64.9
1800	0.319	-174.4	8.304	69.1	0.052	51.7	0.368	-65.1
2000	0.311	177.2	7.414	64.8	0.056	48.4	0.356	-66.7
2200	0.308	171.2	6.802	60.4	0.062	48.5	0.345	-70.1
2400	0.307	166.6	6.341	55.9	0.067	46.0	0.344	-71.3
2600	0.304	161.3	5.879	51.5	0.073	43.4	0.326	-72.7
2800	0.317	153.8	5.427	47.3	0.077	39.9	0.319	-74.6
3000	0.325	148.9	5.123	43.1	0.081	39.5	0.313	-77.7
3200	0.323	142.6	4.818	39.5	0.085	37.2	0.304	-78.8
3400	0.325	138.1	4.524	35.7	0.091	34.3	0.292	-80.5
3600	0.331	133.3	4.297	31.8	0.095	33.7	0.275	-84.9
3800	0.331	128.8	4.095	28.1	0.100	30.1	0.262	-88.3
4000	0.334	125.2	3.911	24.6	0.102	27.9	0.254	-91.5
4200	0.350	120.1	3.767	20.8	0.110	24.4	0.244	-92.8
4400	0.348	115.8	3.600	17.1	0.114	22.3	0.224	-96.2
4600	0.355	111.4	3.469	13.5	0.117	21.5	0.217	-99.0
4800	0.359	106.7	3.355	9.5	0.121	17.4	0.216	-102.8
5000	0.362	101.7	3.246	5.6	0.127	15.2	0.210	-105.2
5200	0.362	97.0	3.122	1.7	0.131	12.9	0.201	-108.5
5400	0.357	93.2	3.000	-1.8	0.134	10.0	0.196	-113.8
5600	0.364	89.9	2.914	-5.2	0.136	6.8	0.203	-117.3
5800	0.362	85.6	2.827	-9.0	0.141	5.1	0.199	-118.8
6000	0.368	80.2	2.762	-12.9	0.148	2.6	0.199	-121.3

SBFP540M

S Parameters (Common emitter)

$V_{CE}=3V, I_C=40mA, Z_O=50\Omega$

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
200	0.378	-59.9	44.381	144.9	0.011	75.9	0.839	-25.8
400	0.367	-97.7	32.694	123.1	0.017	76.8	0.668	-41.2
600	0.305	-119.0	24.123	109.2	0.022	67.7	0.543	-48.6
800	0.299	-130.2	18.968	101.2	0.025	68.9	0.486	-49.0
1000	0.303	-147.4	15.435	94.7	0.034	67.2	0.415	-47.5
1200	0.301	-153.1	13.036	88.6	0.038	65.2	0.386	-54.7
1400	0.300	-161.9	11.295	84.6	0.042	68.9	0.358	-55.0
1600	0.296	-167.4	9.936	79.9	0.048	67.2	0.352	-56.5
1800	0.294	-172.4	8.849	77.3	0.051	68.1	0.326	-54.7
2000	0.284	-179.6	7.890	73.7	0.058	65.8	0.313	-54.1
2200	0.287	176.3	7.219	71.4	0.062	64.7	0.300	-57.5
2400	0.287	171.9	6.630	68.1	0.069	65.3	0.299	-57.2
2600	0.282	167.5	6.160	65.6	0.075	60.2	0.290	-58.1
2800	0.293	162.4	5.700	62.7	0.079	62.2	0.275	-58.4
3000	0.301	157.4	5.362	59.8	0.084	59.6	0.265	-60.5
3200	0.304	153.1	5.041	57.4	0.092	60.2	0.260	-59.0
3400	0.308	149.9	4.744	54.9	0.096	55.6	0.252	-58.9
3600	0.319	146.2	4.505	52.4	0.101	56.3	0.237	-61.3
3800	0.319	143.0	4300	49.8	0.104	55.9	0.223	-61.4
4000	0.325	141.0	4.106	47.3	0.113	53.9	0.219	-65.1
4200	0.343	138.2	3.930	44.8	0.115	51.2	0.204	-67.0
4400	0.349	133.9	3.767	42.4	0.122	50.4	0.197	-67.5
4600	0.355	131.1	3.622	39.7	0.124	48.5	0.185	-70.2
4800	0.359	129.1	3.482	37.1	0.132	47.6	0.184	-73.0
5000	0.374	126.4	3.363	34.6	0.135	44.8	0.179	-73.0
5200	0.378	123.4	3.255	32.2	0.137	44.2	0.168	-75.7
5400	0.383	120.8	3.130	29.8	0.142	42.5	0.161	-82.2
5600	0.385	118.4	3.041	27.5	0.146	40.9	0.166	-85.0
5800	0.388	116.0	2.961	24.7	0.151	38.7	0.169	-86.0
6000	0.395	112.2	2.859	22.0	0.154	35.9	0.158	-88.1

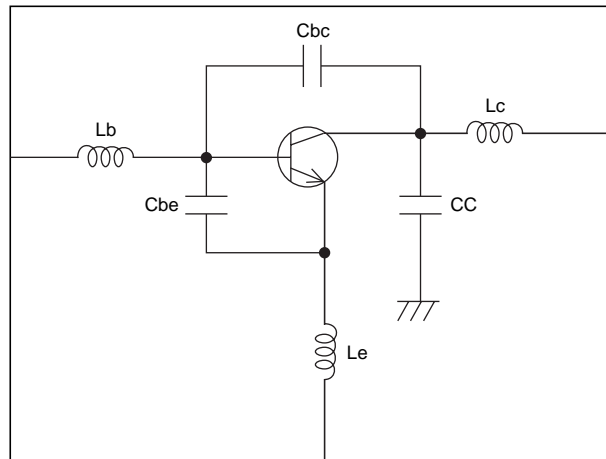
SBFP540M

SPICE PARAMETERS

model : Gummel-Poon

Parameter	Value	Unit	Parameter	Value	Unit
IS	82.84a	A	TF	6.76p	S
BF	107.5		XTF	0.4219	
NF	1		VTF	0.23794	V
VAF	28.383	V	ITF	1m	A
IKF	0.48731	A	PTF	0	deg
ISE	11.15p	A	CJC	234f	F
NE	3.19		VJC	0.81969	V
BR	5.5		MJC	0.30232	
NR	1		XCJC	0.3	
VAR	19.705	V	TR	2.324n	S
IKR	0.02	A	FC	0.73234	
ISC	19.237f	A	CJS	0	F
NC	1.172		VJS	0.75	V
RB	5.4	Ω	MJS	0	
IRB	729.83 μ	A	CC	20f	F
RBM	1.3	Ω	Cbc	20f	F
RE	0.31111	Ω	Cbe	20f	F
RC	4	Ω	Lb	0.80n	H
XTB	0		Lc	0.84n	H
EG	1.11	eV	Le	1.0n	H
XTI	3				
CJE	1.8063f	F			
VJE	0.8051	V			
MJE	0.46576				

SCHEMATIC



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