Ordering number : ENA1922

SANYO Semiconductors
DATA SHEET

MCH4016 — NPN Epitaxial Planar Silicon Transistor
High-Frequency Low-Noise Amplifier

Features

- Low-noise use : NF=1.2dB typ (f=1GHz)
- High cut-off frequency : f_T=10GHz typ (V_{CE}=5V)
- High gain : $|S21e|^2$=18dB typ (f=1GHz)
- Halogen free compliance

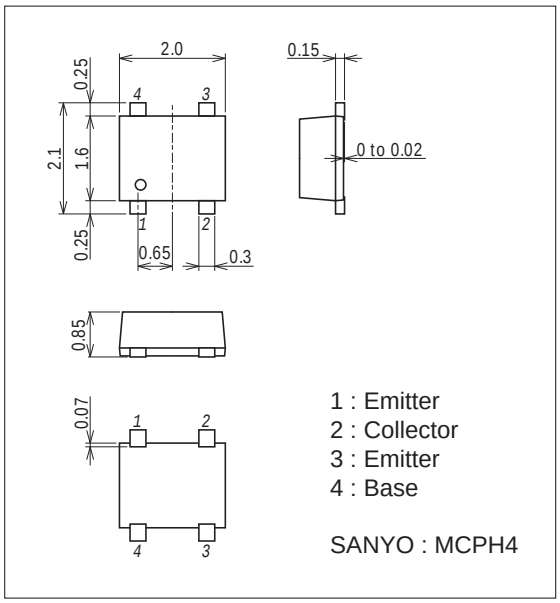
Specifications

Absolute Maximum Ratings at Ta=25°C

Parameter	Symbol	Conditions	Ratings	Unit
Collector-to- Base Voltage	V_{CBO}		20	V
Collector-to-Emitter Voltage	V_{CEO}		12	V
Emitter-to-Base Voltage	V_{EBO}		2	V
Collector Current	I_C		30	mA
Collector Dissipation	P_C		350	mW
Junction Temperature	Tj		150	°C
Storage Temperature	Tstg		−55 to +150	°C

Package Dimensions

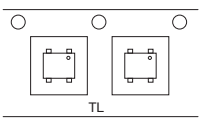
unit : mm (typ)
7020A-003



Product & Package Information

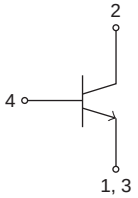
- Package : MCPH4
- JEITA, JEDEC : SC-82AB, SOT-343, SC-82
- Minimum Packing Quantity : 3,000 pcs./reel

Packing Type: TL



Marking

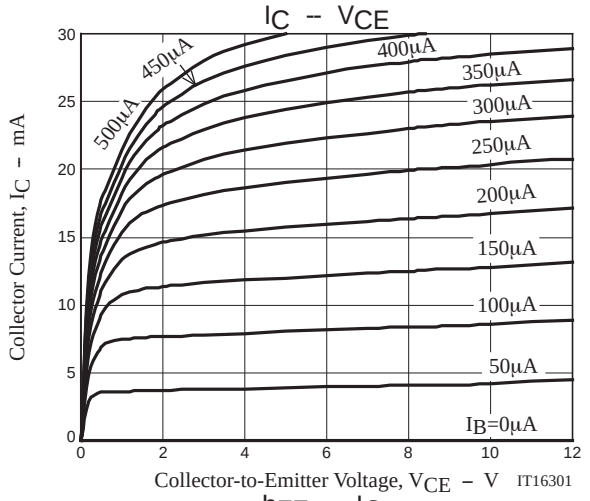
Electrical Connection

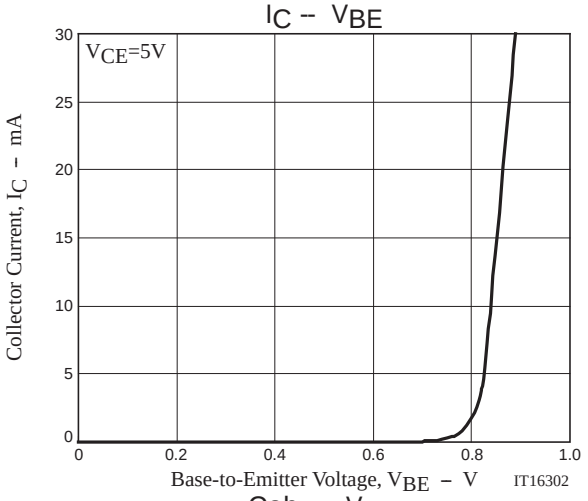


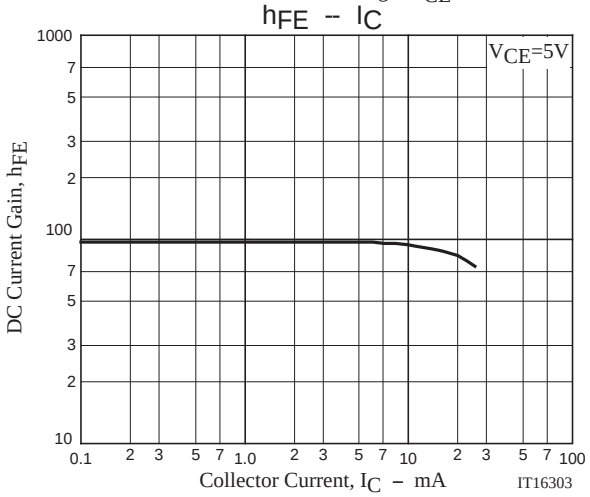
Electrical Characteristics at Ta=25°C

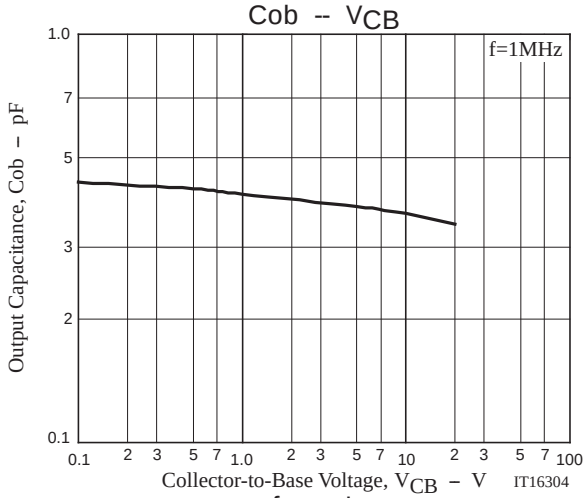
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Collector Cutoff Current	I_{CBO}	V_{CB}=5V, I_E=0A			1.0	μA
Emitter Cutoff Current	I_{EBO}	V_{EB}=1V, I_C=0A			1.0	μA
DC Current Gain	h_{FE}	V_{CE}=5V, I_C=5mA	60		150	
Gain-Bandwidth Product	f_T	V_{CE}=5V, I_C=10mA	8	10		GHz
Forward Transfer Gain	$\|S21e\|^2$	V_{CE}=5V, I_C=10mA, f=1GHz	15	18		dB
Noise Figure	NF	V_{CE}=5V, I_C=10mA, f=1GHz		1.2	1.8	dB

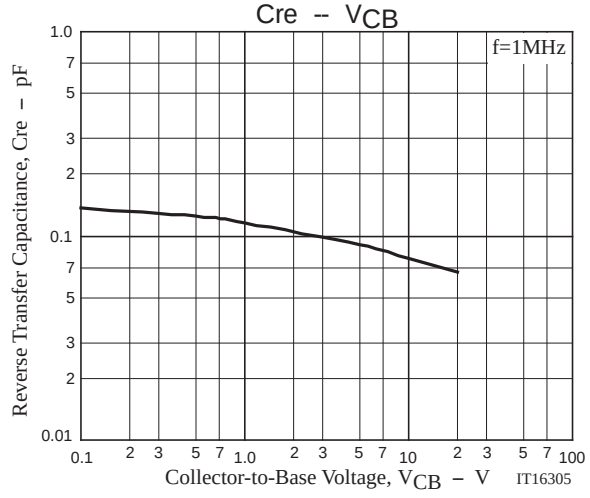
Pay attention to handling since it is liable to be affected by static electricity due to the high-frequency process adopted.

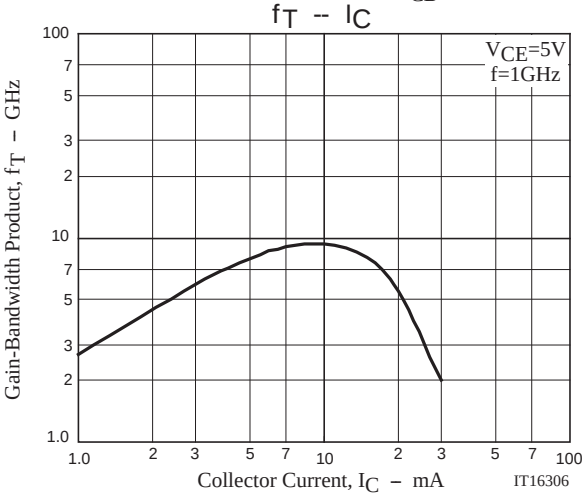


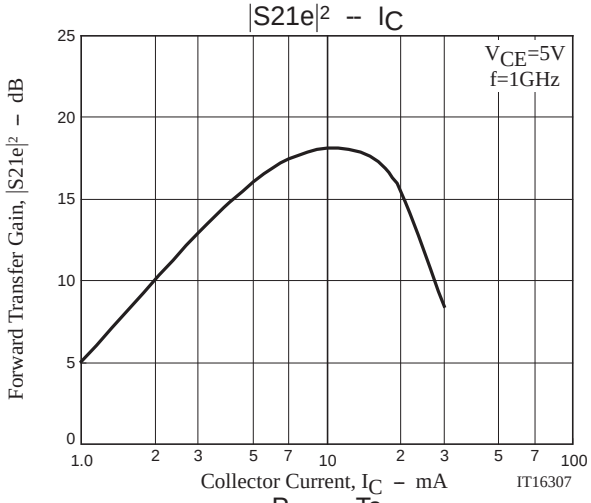


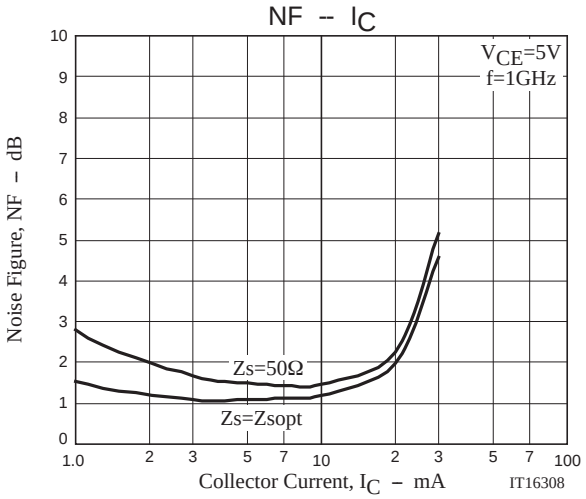


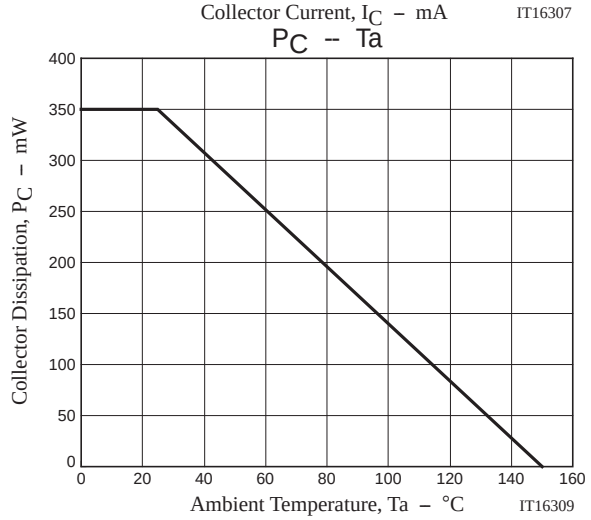












S Parameters (Common emitter)

V_{CE}=3V, I_C=5mA

Freq(MHz)	|S11|	∠S11	|S21|	∠S21	|S12|	∠S12	|S22|	∠S22
100	0.885	-10.8	9.149	167.9	0.006	98.4	0.991	-5.9
200	0.888	-16.7	8.897	156.7	0.013	91.0	0.991	-12.6
300	0.849	-29.7	8.746	150.1	0.020	87.4	0.976	-18.8
400	0.849	-35.3	8.564	143.8	0.027	82.6	0.960	-25.3
500	0.797	-52.2	8.342	134.4	0.035	76.3	0.919	-32.9
600	0.784	-60.4	7.915	128.4	0.042	72.1	0.887	-37.8
700	0.752	-72.5	7.637	121.1	0.047	67.4	0.846	-43.5
800	0.716	-82.3	7.303	114.4	0.052	63.7	0.806	-48.2
900	0.691	269.9	6.819	109.1	0.055	60.5	0.773	-52.4
1000	0.648	260.1	6.603	102.9	0.058	58.4	0.735	-55.7
1200	0.591	245.3	5.916	93.6	0.062	55.2	0.684	-61.5
1400	0.553	234.4	5.241	86.7	0.065	53.9	0.651	-65.5
1600	0.522	225.3	4.694	80.8	0.069	53.9	0.630	-68.6
1800	0.496	217.5	4.224	75.6	0.072	54.3	0.614	-71.1
2000	0.475	210.3	3.835	70.8	0.075	55.2	0.604	-73.5
2200	0.454	203.0	3.532	66.3	0.080	56.5	0.603	-75.4
2400	0.441	196.3	3.267	61.7	0.084	57.4	0.605	-78.2
2600	0.426	189.5	3.033	57.7	0.088	58.6	0.601	-80.1
2800	0.417	183.2	2.861	53.9	0.094	59.9	0.608	-81.3
3000	0.415	177.1	2.700	49.3	0.100	60.0	0.626	-84.1

S Parameters (Common emitter)

V_{CE}=3V, I_C=10mA

Freq(MHz)	|S11|	∠S11	|S21|	∠S21	|S12|	∠S12	|S22|	∠S22
100	0.772	-17.9	14.674	162.9	0.005	91.6	0.981	-7.6
200	0.757	-28.1	13.995	149.9	0.012	86.4	0.967	-15.4
300	0.696	-49.8	13.409	139.6	0.017	81.6	0.931	-22.4
400	0.687	-59.6	12.760	131.8	0.023	78.0	0.893	-29.2
500	0.638	-84.0	11.990	119.8	0.028	72.9	0.832	-36.5
600	0.628	266.0	10.954	113.3	0.033	69.6	0.789	-40.8
700	0.600	251.6	10.102	105.2	0.036	67.3	0.746	-45.6
800	0.582	243.0	9.048	99.8	0.039	65.5	0.705	-49.4
900	0.564	234.3	8.358	94.6	0.042	64.6	0.675	-52.7
1000	0.546	227.8	7.593	90.5	0.044	63.9	0.644	-55.4
1200	0.520	216.4	6.467	83.3	0.049	63.8	0.606	-60.0
1400	0.503	207.8	5.601	77.7	0.054	64.9	0.585	-63.1
1600	0.487	200.5	4.943	72.7	0.059	66.1	0.575	-65.7
1800	0.474	193.8	4.412	68.3	0.064	67.1	0.568	-67.9
2000	0.464	187.4	3.984	64.0	0.070	68.1	0.566	-70.1
2200	0.453	181.1	3.638	60.0	0.076	68.9	0.572	-72.1
2400	0.447	175.5	3.353	55.9	0.083	69.5	0.580	-75.0
2600	0.439	169.7	3.093	52.2	0.089	69.9	0.581	-77.0
2800	0.436	164.4	2.902	48.7	0.097	70.3	0.592	-78.3
3000	0.438	159.4	2.730	44.4	0.105	69.6	0.614	-81.2

V_{CE}=3V, I_C=15mA

Freq(MHz)	|S11|	∠S11	|S21|	∠S21	|S12|	∠S12	|S22|	∠S22
100	0.658	-27.9	17.323	158.7	0.007	76.6	0.954	-8.8
200	0.626	-45.6	15.793	144.0	0.011	74.7	0.917	-16.8
300	0.580	-77.0	14.532	129.9	0.016	73.2	0.865	-23.0
400	0.574	267.3	12.943	120.3	0.019	71.7	0.817	-28.2
500	0.566	244.1	11.483	108.1	0.023	69.0	0.761	-33.8
600	0.567	234.2	10.197	101.8	0.026	67.5	0.726	-37.0
700	0.565	223.8	8.885	95.3	0.028	68.3	0.695	-40.6
800	0.561	216.8	7.827	90.7	0.031	68.4	0.667	-43.7
900	0.558	210.6	7.057	86.4	0.033	69.1	0.649	-46.3
1000	0.551	205.6	6.338	82.9	0.036	69.8	0.629	-48.7
1200	0.544	197.0	5.285	76.6	0.041	71.6	0.608	-53.1
1400	0.538	190.2	4.539	71.3	0.046	73.4	0.600	-56.4
1600	0.532	184.2	3.977	66.5	0.053	75.1	0.601	-59.5
1800	0.526	178.6	3.536	62.1	0.059	76.2	0.602	-62.3
2000	0.522	173.1	3.182	57.9	0.066	77.2	0.606	-65.1
2200	0.517	167.5	2.894	53.8	0.073	77.8	0.617	-67.7
2400	0.514	162.6	2.657	49.7	0.081	77.9	0.628	-71.1
2600	0.511	157.4	2.439	45.9	0.089	77.9	0.632	-73.7
2800	0.511	152.7	2.277	42.3	0.098	77.8	0.646	-75.5
3000	0.513	148.3	2.136	38.0	0.107	76.6	0.671	-79.0

S Parameters (Common emitter)

V_{CE}=3V, I_C=20mA

Freq(MHz)	|S11|	∠S11	|S21|	∠S21	|S12|	∠S12	|S22|	∠S22
100	0.549	-44.6	18.205	153.5	0.008	79.1	0.907	-10.1
200	0.527	-76.1	15.342	135.9	0.011	62.5	0.842	-16.7
300	0.543	248.7	12.862	118.8	0.014	63.2	0.790	-21.1
400	0.558	231.8	10.435	108.2	0.016	62.9	0.755	-24.4
500	0.584	215.9	8.577	98.2	0.018	63.7	0.716	-28.7
600	0.593	208.7	7.275	92.7	0.021	66.6	0.696	-31.1
700	0.603	201.7	6.174	87.3	0.023	68.5	0.681	-34.3
800	0.606	196.9	5.422	83.4	0.025	71.2	0.665	-37.2
900	0.610	192.5	4.769	79.5	0.028	73.0	0.657	-39.8
1000	0.608	189.0	4.284	76.3	0.030	74.7	0.646	-42.4
1200	0.608	182.6	3.525	70.3	0.036	78.4	0.639	-47.3
1400	0.607	177.4	3.011	65.2	0.042	80.9	0.641	-51.4
1600	0.605	172.4	2.624	60.2	0.049	82.5	0.648	-55.2
1800	0.603	167.7	2.328	55.7	0.056	83.9	0.654	-58.8
2000	0.602	162.9	2.091	51.3	0.064	84.4	0.661	-62.2
2200	0.600	157.9	1.897	47.1	0.073	84.7	0.673	-65.5
2400	0.599	153.5	1.732	42.8	0.081	84.6	0.686	-69.5
2600	0.598	148.7	1.584	38.9	0.090	84.2	0.690	-72.6
2800	0.598	144.3	1.474	35.2	0.100	83.6	0.706	-75.0
3000	0.600	140.3	1.377	30.8	0.111	82.0	0.731	-79.0

V_{CE}=5V, I_C=5mA

Freq(MHz)	|S11|	∠S11	|S21|	∠S21	|S12|	∠S12	|S22|	∠S22
100	0.890	-10.5	9.159	168.3	0.006	97.5	0.994	-5.7
200	0.895	-16.1	8.952	157.5	0.012	91.7	0.995	-11.9
300	0.857	-28.6	8.775	150.8	0.019	88.8	0.982	-17.9
400	0.858	-34.1	8.515	144.6	0.026	85.2	0.969	-24.1
500	0.807	-50.6	8.382	135.3	0.033	79.0	0.931	-31.5
600	0.794	-58.8	7.984	129.2	0.040	74.2	0.900	-36.3
700	0.762	-70.5	7.684	122.0	0.045	69.6	0.862	-42.0
800	0.724	-80.4	7.385	115.1	0.050	65.6	0.823	-46.6
900	0.700	-87.9	6.977	109.9	0.053	62.3	0.790	-50.8
1000	0.656	262.1	6.691	103.6	0.056	60.2	0.752	-54.1
1200	0.597	247.3	6.001	94.2	0.060	57.0	0.701	-59.8
1400	0.557	236.3	5.323	87.2	0.064	55.5	0.668	-63.8
1600	0.525	227.3	4.769	81.3	0.066	55.5	0.647	-66.9
1800	0.498	219.4	4.288	76.0	0.070	56.0	0.631	-69.8
2000	0.476	212.2	3.897	71.1	0.073	56.9	0.621	-71.8
2200	0.454	204.8	3.588	66.6	0.077	58.2	0.620	-73.8
2400	0.440	198.1	3.319	62.0	0.082	59.1	0.622	-76.6
2600	0.425	191.2	3.081	58.0	0.086	60.5	0.618	-78.6
2800	0.415	184.9	2.906	54.1	0.092	61.7	0.626	-79.8
3000	0.413	178.7	2.743	49.5	0.098	61.8	0.644	-82.6

S Parameters (Common emitter)

V_{CE}=5V, I_C=10mA

Freq(MHz)	|S11|	∠S11	|S21|	∠S21	|S12|	∠S12	|S22|	∠S22
100	0.786	-15.9	15.297	164.4	0.004	84.8	0.985	-6.9
200	0.783	-25.0	14.577	151.8	0.011	89.1	0.977	-14.4
300	0.724	-45.0	14.127	141.8	0.016	86.4	0.947	-21.2
400	0.718	-53.7	13.473	134.2	0.022	81.6	0.914	-27.9
500	0.658	-77.4	12.720	122.1	0.027	75.2	0.857	-35.2
600	0.645	-87.3	11.734	115.6	0.031	72.3	0.814	-39.6
700	0.611	257.7	10.764	107.2	0.035	69.8	0.771	-44.5
800	0.588	248.7	9.679	101.5	0.038	68.0	0.730	-48.4
900	0.567	239.6	8.908	96.2	0.041	66.7	0.698	-51.7
1000	0.546	232.6	8.103	91.9	0.043	66.2	0.666	-54.5
1200	0.515	220.7	6.875	84.5	0.048	65.7	0.625	-59.1
1400	0.495	211.6	5.944	78.8	0.053	66.2	0.602	-62.3
1600	0.478	204.0	5.233	73.8	0.058	67.3	0.591	-64.9
1800	0.463	197.1	4.667	69.3	0.063	68.2	0.583	-67.0
2000	0.452	190.6	4.211	65.0	0.069	69.3	0.579	-69.2
2200	0.440	184.1	3.845	61.0	0.075	70.1	0.585	-71.2
2400	0.433	178.3	3.538	56.9	0.082	70.5	0.592	-74.0
2600	0.425	172.3	3.263	53.3	0.088	71.0	0.592	-75.9
2800	0.421	167.0	3.059	49.8	0.096	71.3	0.604	-77.2
3000	0.423	161.8	2.878	45.5	0.104	70.6	0.625	-80.2

V_{CE}=5V, I_C=15mA

Freq(MHz)	|S11|	∠S11	|S21|	∠S21	|S12|	∠S12	|S22|	∠S22
100	0.690	-23.0	18.633	161.1	0.004	89.2	0.977	-7.7
200	0.671	-37.6	17.368	147.1	0.010	85.7	0.954	-15.5
300	0.614	-64.9	16.210	134.0	0.014	82.3	0.912	-22.2
400	0.604	-78.6	14.819	124.8	0.019	78.2	0.868	-28.1
500	0.571	257.3	13.309	112.3	0.023	75.6	0.808	-34.5
600	0.567	246.6	12.148	105.7	0.026	72.8	0.768	-38.2
700	0.555	235.0	10.514	98.8	0.029	71.6	0.730	-42.3
800	0.547	227.1	9.296	93.9	0.032	71.3	0.696	-45.5
900	0.539	220.1	8.434	89.4	0.035	71.4	0.671	-48.4
1000	0.529	214.5	7.590	85.8	0.037	72.0	0.645	-50.8
1200	0.515	205.0	6.371	79.3	0.042	72.4	0.616	-55.1
1400	0.505	197.5	5.483	74.1	0.048	73.6	0.602	-58.2
1600	0.495	191.0	4.816	69.4	0.054	74.7	0.598	-60.9
1800	0.487	184.9	4.285	65.1	0.060	75.7	0.595	-63.4
2000	0.481	179.1	3.860	60.9	0.066	76.5	0.596	-65.8
2200	0.473	173.3	3.516	57.0	0.074	76.8	0.605	-68.1
2400	0.470	168.1	3.234	53.0	0.081	76.9	0.615	-71.2
2600	0.465	162.7	2.975	49.3	0.088	77.1	0.617	-73.5
2800	0.463	157.8	2.784	45.9	0.097	77.0	0.631	-75.0
3000	0.466	153.2	2.616	41.6	0.106	75.9	0.654	-78.3

S Parameters (Common emitter)

V_{CE}=5V, I_C=20mA

Freq(MHz)	|S11|	∠S11	|S21|	∠S21	|S12|	∠S12	|S22|	∠S22
100	0.590	-34.1	20.159	157.3	0.004	89.1	0.951	-8.1
200	0.566	-57.8	18.680	141.3	0.009	75.1	0.911	-15.4
300	0.542	268.4	15.660	125.2	0.013	73.1	0.862	-20.7
400	0.543	251.1	13.055	114.8	0.015	73.2	0.822	-25.1
500	0.552	231.6	11.336	103.8	0.018	73.1	0.775	-30.0
600	0.558	222.5	9.699	97.8	0.021	73.8	0.747	-32.8
700	0.563	213.8	8.425	91.9	0.023	74.6	0.723	-36.1
800	0.564	207.7	7.401	87.6	0.026	75.0	0.701	-39.1
900	0.566	202.4	6.573	83.6	0.029	76.5	0.687	-41.7
1000	0.563	198.0	5.899	80.3	0.031	77.5	0.670	-44.2
1200	0.560	190.5	4.872	74.2	0.037	79.7	0.655	-48.7
1400	0.557	184.4	4.165	69.1	0.043	81.5	0.651	-52.4
1600	0.553	178.9	3.633	64.4	0.049	82.9	0.654	-55.8
1800	0.550	173.7	3.225	59.9	0.056	83.8	0.656	-58.9
2000	0.548	168.5	2.897	55.7	0.064	84.4	0.661	-62.0
2200	0.544	163.2	2.631	51.7	0.072	84.5	0.672	-65.0
2400	0.543	158.6	2.407	47.5	0.080	84.4	0.684	-68.7
2600	0.541	153.5	2.206	43.7	0.089	84.1	0.687	-71.5
2800	0.541	149.0	2.056	40.2	0.098	83.6	0.702	-73.6
3000	0.543	144.8	1.925	35.7	0.109	82.0	0.727	-77.4

V_{CE}=8V, I_C=5mA

Freq(MHz)	|S11|	∠S11	|S21|	∠S21	|S12|	∠S12	|S22|	∠S22
100	0.895	-10.3	9.140	168.5	0.005	104.3	0.993	-5.4
200	0.899	-15.8	8.948	157.7	0.011	95.9	0.997	-11.4
300	0.861	-28.2	8.761	151.1	0.017	91.9	0.985	-17.1
400	0.863	-33.7	8.569	144.9	0.024	86.3	0.974	-23.2
500	0.814	-49.9	8.378	135.6	0.032	80.2	0.940	-30.3
600	0.799	-58.0	7.994	129.6	0.038	76.0	0.910	-35.0
700	0.769	-69.6	7.683	122.3	0.043	71.1	0.873	-40.5
800	0.730	-79.5	7.405	115.4	0.047	67.1	0.835	-45.0
900	0.706	-86.9	7.086	110.2	0.051	63.9	0.803	-49.2
1000	0.661	263.1	6.712	103.9	0.054	61.8	0.766	-52.4
1200	0.601	248.3	6.025	94.4	0.058	58.6	0.716	-58.1
1400	0.561	237.4	5.346	87.4	0.061	57.2	0.683	-62.1
1600	0.528	228.3	4.790	81.3	0.064	57.0	0.663	-65.1
1800	0.500	220.4	4.303	76.1	0.068	57.5	0.648	-68.2
2000	0.477	213.1	3.913	71.1	0.071	58.5	0.638	-70.1
2200	0.456	205.8	3.602	66.5	0.075	59.9	0.636	-72.2
2400	0.440	199.0	3.332	61.9	0.080	60.9	0.640	-75.0
2600	0.425	192.1	3.091	57.9	0.084	62.3	0.635	-77.0
2800	0.415	185.7	2.915	53.9	0.090	63.7	0.643	-78.3
3000	0.413	179.5	2.752	49.3	0.097	63.9	0.662	-81.2

S Parameters (Common emitter)

V_{CE}=8V, I_C=10mA

Freq(MHz)	|S11|	∠S11	|S21|	∠S21	|S12|	∠S12	|S22|	∠S22
100	0.800	-14.8	15.446	165.2	0.004	97.8	0.988	-6.4
200	0.800	-23.6	14.773	152.8	0.010	90.4	0.982	-13.6
300	0.741	-42.8	14.286	142.9	0.015	87.2	0.957	-20.1
400	0.738	-50.8	13.553	135.5	0.021	82.8	0.926	-26.6
500	0.672	-74.3	12.891	123.3	0.026	77.6	0.873	-33.8
600	0.659	-84.2	11.828	116.7	0.030	74.6	0.832	-38.2
700	0.621	260.7	10.924	108.2	0.034	71.9	0.790	-43.0
800	0.595	251.5	9.849	102.4	0.037	69.7	0.749	-46.9
900	0.573	242.3	9.050	97.0	0.040	68.3	0.717	-50.2
1000	0.550	235.2	8.241	92.5	0.042	67.6	0.685	-53.0
1200	0.517	223.0	6.985	85.0	0.047	67.2	0.644	-57.6
1400	0.496	213.7	6.037	79.2	0.051	67.5	0.621	-60.8
1600	0.477	205.9	5.312	74.2	0.056	68.6	0.609	-63.4
1800	0.461	198.9	4.734	69.6	0.062	69.5	0.600	-65.6
2000	0.449	192.3	4.273	65.3	0.067	70.5	0.597	-67.8
2200	0.437	185.8	3.898	61.3	0.074	71.3	0.602	-69.8
2400	0.429	179.9	3.586	57.1	0.080	71.8	0.609	-72.7
2600	0.420	173.8	3.305	53.4	0.086	72.2	0.609	-74.7
2800	0.417	168.4	3.098	49.9	0.094	72.6	0.621	-76.0
3000	0.418	163.1	2.915	45.6	0.102	71.9	0.642	-79.0

V_{CE}=8V, I_C=15mA

Freq(MHz)	|S11|	∠S11	|S21|	∠S21	|S12|	∠S12	|S22|	∠S22
100	0.709	-20.9	19.385	162.4	0.006	103.7	0.982	-7.2
200	0.697	-34.3	18.267	148.6	0.009	85.4	0.966	-14.6
300	0.638	-59.6	17.076	135.9	0.014	85.2	0.930	-21.1
400	0.626	-72.1	15.568	126.9	0.018	81.0	0.889	-27.1
500	0.581	263.6	14.172	114.3	0.022	77.5	0.832	-33.7
600	0.574	252.7	12.755	107.5	0.026	75.6	0.790	-37.5
700	0.557	240.4	11.234	100.4	0.029	74.2	0.752	-41.7
800	0.545	232.0	9.951	95.2	0.031	73.4	0.716	-45.1
900	0.535	224.6	9.003	90.7	0.034	73.0	0.690	-47.9
1000	0.523	218.7	8.110	86.9	0.037	72.8	0.663	-50.5
1200	0.506	208.7	6.790	80.4	0.042	73.3	0.631	-54.7
1400	0.495	200.8	5.833	75.1	0.047	74.5	0.614	-57.8
1600	0.484	194.0	5.113	70.4	0.053	75.5	0.609	-60.5
1800	0.474	187.8	4.548	66.0	0.059	76.3	0.605	-62.9
2000	0.467	181.8	4.094	61.9	0.066	76.9	0.605	-65.2
2200	0.459	175.8	3.728	58.0	0.073	77.5	0.613	-67.5
2400	0.455	170.5	3.426	53.9	0.080	77.6	0.622	-70.5
2600	0.449	164.9	3.151	50.3	0.087	77.7	0.624	-72.7
2800	0.447	159.9	2.948	46.9	0.096	77.8	0.638	-74.2
3000	0.450	155.2	2.771	42.6	0.105	76.5	0.661	-77.4

S Parameters (Common emitter)

V_{CE}=8V, I_C=20mA

Freq(MHz)	|S11|	∠S11	|S21|	∠S21	|S12|	∠S12	|S22|	∠S22
100	0.625	-28.6	21.189	159.5	0.003	96.6	0.972	-7.4
200	0.605	-48.6	19.191	144.3	0.009	84.0	0.944	-14.7
300	0.562	-79.4	17.244	129.0	0.012	81.0	0.901	-20.5
400	0.554	264.2	15.103	118.9	0.015	79.6	0.859	-25.6
500	0.545	243.0	13.058	107.4	0.019	77.5	0.808	-31.1
600	0.547	233.0	11.235	101.1	0.022	76.9	0.774	-34.3
700	0.545	223.3	9.930	95.0	0.024	76.6	0.744	-37.8
800	0.543	216.3	8.732	90.4	0.027	77.2	0.716	-40.9
900	0.542	210.4	7.830	86.2	0.030	77.3	0.697	-43.6
1000	0.536	205.4	7.027	82.8	0.033	78.4	0.676	-46.0
1200	0.530	197.0	5.845	76.7	0.038	79.4	0.653	-50.4
1400	0.524	190.3	5.010	71.6	0.044	80.7	0.645	-53.8
1600	0.518	184.4	4.383	67.0	0.050	81.8	0.644	-56.8
1800	0.512	178.8	3.893	62.6	0.057	82.6	0.644	-59.7
2000	0.509	173.3	3.502	58.5	0.064	83.3	0.647	-62.4
2200	0.503	167.8	3.183	54.6	0.071	83.4	0.657	-65.1
2400	0.501	162.9	2.921	50.5	0.079	83.3	0.668	-68.6
2600	0.498	157.7	2.681	46.8	0.087	83.0	0.670	-71.1
2800	0.497	153.0	2.504	43.3	0.097	82.7	0.685	-73.0
3000	0.501	148.7	2.349	39.0	0.106	81.1	0.710	-76.5

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