



SANYO Semiconductors

## DATA SHEET

NPN Epitaxial Planar Silicon Transistor

# 80GN01M — UHF Wide-band Low-noise Amplifier Applications

## Features

- High cutoff frequency :  $f_T = 8.0\text{GHz}$  typ.
- High gain :  $|S_{21e}|^2 = 11.0\text{dB}$  typ ( $f = 1\text{GHz}$ ).

## Specifications

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

Parameter	Symbol	Conditions	Ratings	Unit
Collector-to-Base Voltage	$V_{CBO}$		11	V
Collector-to-Emitter Voltage	$V_{CEO}$		5.5	V
Emitter-to-Base Voltage	$V_{EBO}$		2	V
Collector Current	$I_C$		80	mA
Collector Dissipation	$P_C$	Mounted on a ceramic board (250mm <sup>2</sup> X0.8mm)	400	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	$I_{CBO}$	$V_{CB} = 10\text{V}, I_E = 0$			0.1	$\mu\text{A}$
Emitter Cutoff Current	$I_{EBO}$	$V_{EB} = 1\text{V}, I_C = 0$			1	$\mu\text{A}$
DC Current Gain	$h_{FE}$	$V_{CE} = 3\text{V}, I_C = 10\text{mA}$	100		180	
Gain-Bandwidth Product	$f_T1$	$V_{CE} = 1\text{V}, I_C = 5\text{mA}$		4.5		GHz
	$f_T2$	$V_{CE} = 3\text{V}, I_C = 30\text{mA}$	6.0	8.0		GHz
Output Capacitance	$C_{ob}$	$V_{CB} = 1\text{V}, f = 1\text{MHz}$		1.3	1.6	pF
Reverse Transfer Capacitance	$C_{re}$	$V_{CB} = 1\text{V}, f = 1\text{MHz}$		1.0		pF
Forward Transfer Gain	$ S_{21e} ^{21}$	$V_{CE} = 1\text{V}, I_C = 5\text{mA}, f = 1\text{GHz}$		8.5		dB
	$ S_{21e} ^{22}$	$V_{CE} = 3\text{V}, I_C = 30\text{mA}, f = 1\text{GHz}$	8.5	11.0		dB
Noise Figure	NF	$V_{CE} = 3\text{V}, I_C = 5\text{mA}, f = 1\text{GHz}$		1.2	1.9	dB

Marking : ZF

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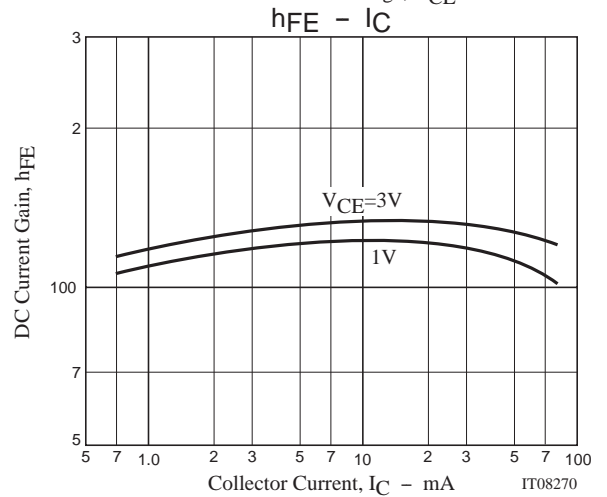
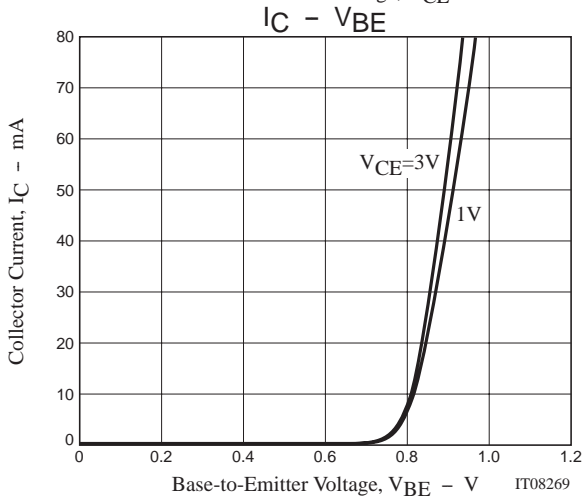
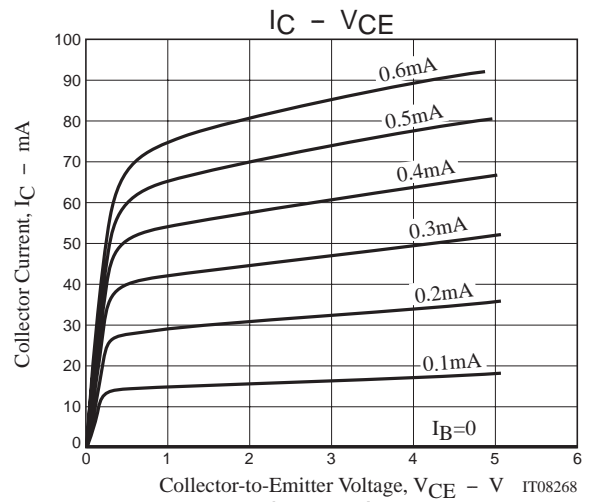
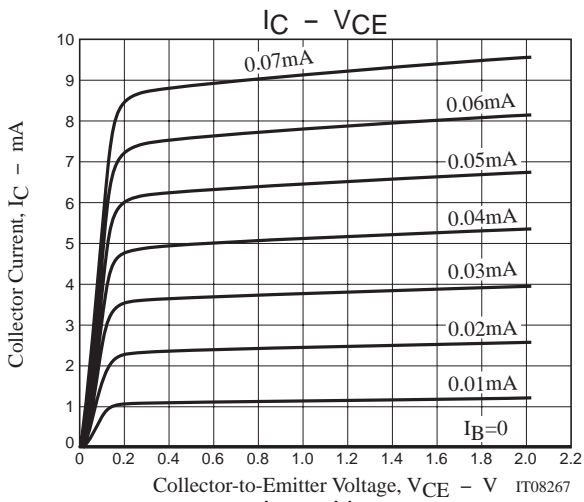
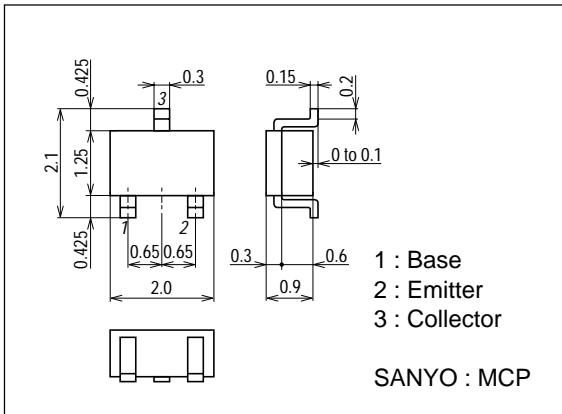
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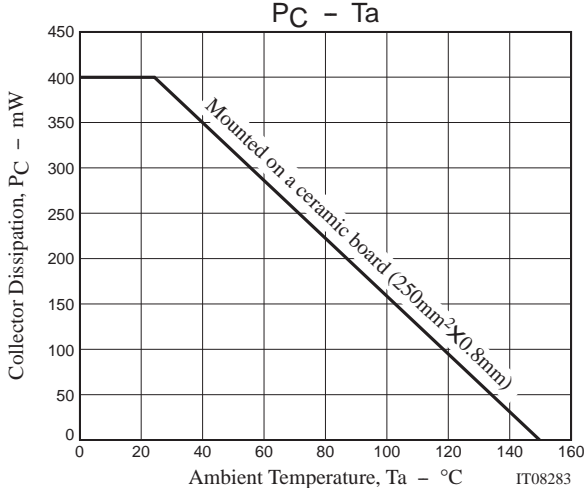
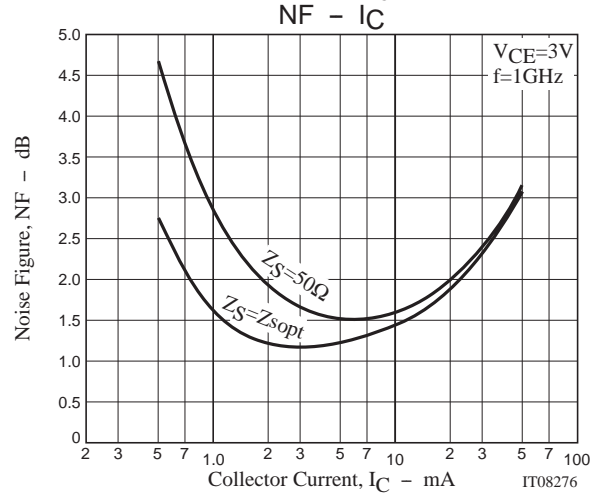
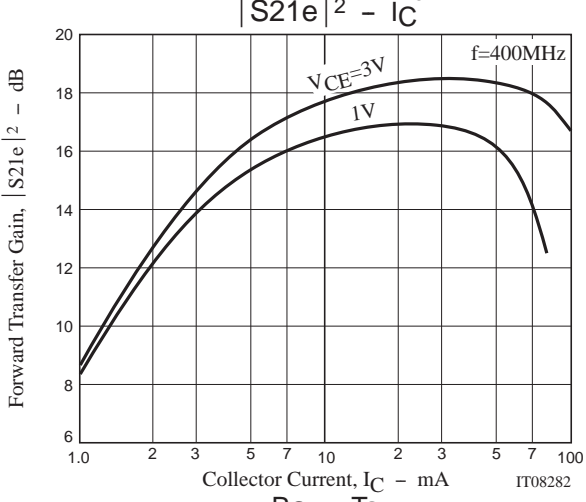
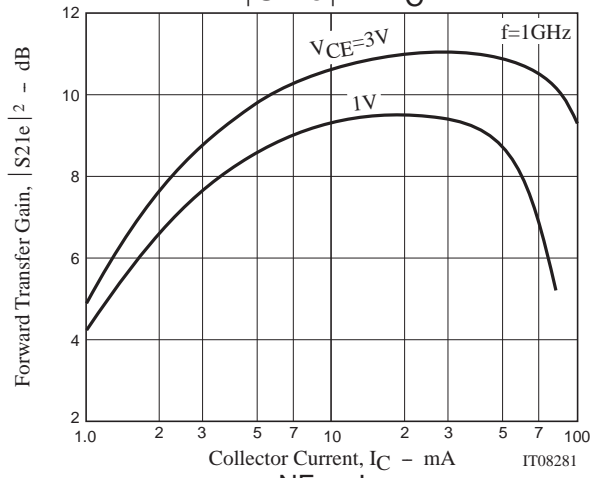
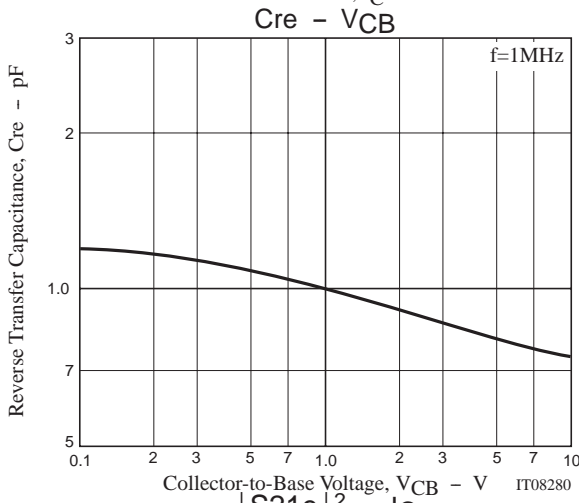
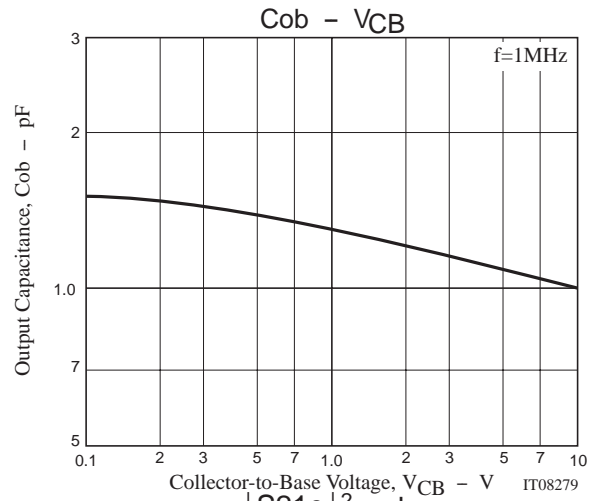
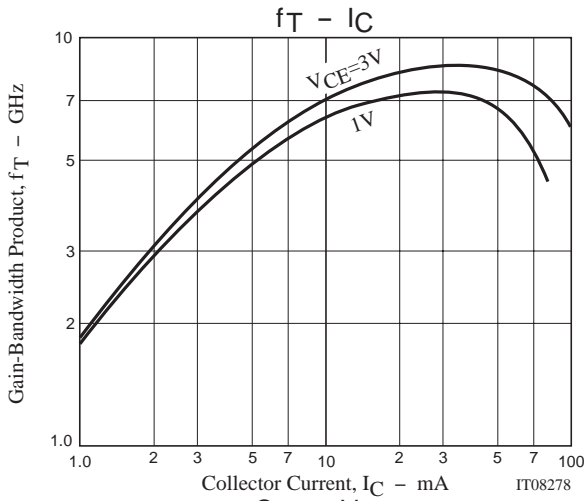
Package Dimensions

unit : mm

2059C



# 80GN01M



# 80GN01M

## S Parameters (Common emitter)

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

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.956	-20.54	3.295	163.92	0.068	77.37	0.975	-13.20
200	0.922	-39.78	3.108	149.24	0.128	64.92	0.920	-25.40
400	0.827	-72.85	2.626	123.95	0.208	45.99	0.783	-44.61
600	0.731	-97.22	2.168	105.03	0.243	33.29	0.659	-57.93
800	0.697	-118.51	1.867	89.25	0.261	24.73	0.579	-67.94
1000	0.652	-134.21	1.619	77.09	0.261	19.38	0.529	-76.08
1200	0.629	-147.67	1.434	66.44	0.254	16.01	0.498	-82.86
1400	0.608	-158.64	1.291	57.31	0.244	15.58	0.482	-88.87
1600	0.595	-168.72	1.180	49.55	0.233	16.13	0.472	-94.76
1800	0.582	-178.11	1.085	42.84	0.225	19.12	0.474	-100.88
2000	0.575	173.49	1.010	37.06	0.222	24.12	0.481	-106.58

$V_{CE}=1V, I_C=3mA, Z_O=50\Omega$

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.886	-33.17	8.175	156.07	0.065	70.38	0.921	-24.39
200	0.799	-61.97	7.048	136.72	0.109	56.14	0.785	-43.73
400	0.655	-102.50	4.946	110.83	0.153	41.47	0.563	-68.23
600	0.568	-126.48	3.660	95.08	0.172	36.51	0.437	-82.75
800	0.551	-144.95	2.924	82.98	0.185	35.04	0.375	-93.13
1000	0.523	-157.85	2.424	73.83	0.196	35.53	0.341	-101.78
1200	0.513	-167.99	2.097	65.57	0.208	35.84	0.321	-109.04
1400	0.502	-176.97	1.854	58.38	0.224	37.51	0.314	-114.66
1600	0.496	175.00	1.666	52.02	0.240	38.08	0.307	-120.87
1800	0.488	167.60	1.514	46.35	0.257	39.28	0.306	-125.72
2000	0.484	161.09	1.402	41.22	0.277	39.93	0.313	-130.24

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

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.828	-42.89	11.598	150.07	0.061	66.72	0.873	-32.12
200	0.717	-76.65	9.247	128.83	0.097	53.08	0.689	-54.95
400	0.577	-118.10	5.885	104.24	0.128	43.72	0.463	-81.50
600	0.510	-139.81	4.174	90.72	0.147	42.40	0.358	-96.67
800	0.506	-155.89	3.275	80.01	0.166	42.47	0.313	-107.65
1000	0.487	-167.10	2.694	71.95	0.187	43.50	0.291	-116.49
1200	0.482	-175.97	2.308	64.63	0.206	44.04	0.281	-124.07
1400	0.475	176.19	2.034	58.03	0.230	44.44	0.278	-129.69
1600	0.470	169.08	1.817	52.12	0.251	43.96	0.276	-135.71
1800	0.464	162.14	1.648	46.89	0.275	44.11	0.275	-140.56
2000	0.461	156.06	1.525	42.02	0.298	43.74	0.281	-144.18

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

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.724	-59.96	16.659	140.63	0.054	60.41	0.780	-45.03
200	0.600	-98.37	11.690	118.32	0.079	50.83	0.556	-71.56
400	0.504	-137.18	6.700	97.29	0.106	48.07	0.362	-99.78
600	0.463	-154.59	4.617	86.08	0.130	50.49	0.294	-116.23
800	0.472	-167.54	3.571	77.01	0.157	51.80	0.271	-126.97
1000	0.464	-176.92	2.916	70.08	0.185	51.73	0.264	-135.25
1200	0.461	175.77	2.488	63.44	0.211	51.55	0.265	-142.37
1400	0.455	168.89	2.181	57.52	0.240	50.65	0.265	-147.26
1600	0.452	162.80	1.948	52.09	0.266	48.84	0.270	-152.88
1800	0.448	156.61	1.760	47.15	0.291	47.84	0.269	-157.13
2000	0.446	151.00	1.627	42.50	0.316	46.45	0.274	-160.83

# 80GN01M

## S Parameters (Common emitter)

$V_{CE}=1V, I_C=15mA, Z_O=50\Omega$

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.660	-70.58	19.101	135.39	0.050	58.63	0.719	-52.62
200	0.553	-110.01	12.531	113.66	0.072	50.34	0.493	-80.58
400	0.484	-145.93	6.950	94.53	0.099	52.00	0.328	-109.82
600	0.452	-161.20	4.743	84.31	0.126	54.48	0.278	-126.33
800	0.466	-172.58	3.650	75.89	0.155	55.39	0.262	-136.66
1000	0.455	179.30	2.981	69.22	0.186	55.26	0.262	-143.92
1200	0.458	172.55	2.528	62.98	0.215	54.45	0.266	-150.18
1400	0.454	166.11	2.226	57.16	0.245	52.88	0.269	-154.48
1600	0.450	160.47	1.983	51.99	0.273	50.62	0.273	-159.91
1800	0.447	154.42	1.792	47.23	0.299	48.85	0.277	-163.99
2000	0.445	148.88	1.658	42.68	0.327	46.91	0.280	-167.09

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

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.622	-78.24	20.412	131.97	0.048	57.71	0.679	-57.92
200	0.529	-117.45	12.895	110.93	0.066	52.23	0.457	-86.71
400	0.478	-150.89	7.032	92.91	0.096	54.54	0.312	-116.27
600	0.450	-164.80	4.777	83.44	0.124	56.77	0.271	-132.34
800	0.465	-175.14	3.662	75.14	0.155	57.08	0.262	-141.86
1000	0.459	177.15	2.981	68.65	0.187	56.80	0.263	-148.83
1200	0.457	170.55	2.535	62.66	0.217	55.34	0.268	-154.70
1400	0.454	164.53	2.229	56.95	0.248	53.64	0.272	-158.33
1600	0.453	158.96	1.985	51.78	0.277	51.46	0.278	-163.99
1800	0.448	153.13	1.799	47.15	0.304	49.69	0.280	-167.87
2000	0.449	147.83	1.662	42.64	0.332	47.74	0.286	-171.29

$V_{CE}=1V, I_C=30mA, Z_O=50\Omega$

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.576	-88.77	21.448	127.78	0.046	57.54	0.624	-64.83
200	0.511	-127.32	13.034	107.74	0.063	53.95	0.416	-94.83
400	0.479	-157.33	6.966	91.11	0.092	57.28	0.298	-124.53
600	0.455	-169.52	4.725	82.02	0.123	59.99	0.269	-139.67
800	0.472	-178.75	3.617	74.14	0.157	59.59	0.266	-148.50
1000	0.466	173.99	2.951	67.74	0.188	58.52	0.270	-154.66
1200	0.467	168.02	2.507	61.75	0.221	56.73	0.276	-160.08
1400	0.465	162.33	2.201	56.27	0.253	54.89	0.281	-163.64
1600	0.463	157.02	1.960	51.14	0.281	52.00	0.287	-168.45
1800	0.459	151.18	1.774	46.53	0.308	50.03	0.291	-172.38
2000	0.457	146.23	1.639	42.16	0.335	47.74	0.295	-175.46

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

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.541	-105.23	20.840	123.11	0.043	54.86	0.546	-75.41
200	0.522	-139.98	12.158	104.23	0.059	54.05	0.375	-107.58
400	0.508	-165.14	6.412	88.71	0.093	59.63	0.295	-136.67
600	0.489	-175.36	4.346	79.93	0.124	60.87	0.280	-150.07
800	0.507	176.63	3.326	72.11	0.160	60.52	0.280	-157.51
1000	0.504	169.85	2.708	65.81	0.193	59.10	0.288	-162.58
1200	0.502	164.28	2.306	59.62	0.224	57.19	0.296	-167.03
1400	0.498	158.60	2.033	54.08	0.259	54.41	0.303	-170.53
1600	0.497	153.73	1.813	48.96	0.288	51.84	0.308	-175.18
1800	0.492	148.28	1.643	44.37	0.316	49.68	0.312	-178.59
2000	0.492	143.19	1.523	39.94	0.345	47.53	0.315	-178.59

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## S Parameters (Common emitter)

$V_{CE}=3V, I_C=1mA, Z_O=50\Omega$

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.964	-17.84	3.277	165.86	0.055	79.65	0.980	-10.68
200	0.937	-35.11	3.115	152.72	0.104	67.64	0.941	-20.75
400	0.853	-65.37	2.703	129.51	0.175	50.87	0.828	-37.06
600	0.764	-89.02	2.297	111.38	0.211	38.26	0.717	-48.97
800	0.721	-110.16	2.008	95.87	0.227	29.63	0.638	-57.71
1000	0.669	-126.29	1.750	83.56	0.230	23.81	0.587	-65.20
1200	0.641	-139.94	1.567	72.93	0.225	20.42	0.552	-71.16
1400	0.615	-151.82	1.413	63.61	0.218	20.44	0.533	-76.47
1600	0.596	-162.61	1.286	55.67	0.207	20.75	0.519	-82.10
1800	0.579	-172.65	1.183	48.81	0.201	25.48	0.520	-87.37
2000	0.570	178.64	1.096	42.60	0.199	30.73	0.522	-93.17

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

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.901	-28.24	8.232	158.83	0.051	73.32	0.939	-19.50
200	0.823	-53.31	7.372	141.17	0.091	61.00	0.827	-35.29
400	0.670	-91.19	5.419	115.92	0.133	46.03	0.621	-56.00
600	0.570	-115.25	4.100	99.85	0.152	40.95	0.488	-67.98
800	0.538	-134.84	3.301	87.52	0.165	39.16	0.415	-76.40
1000	0.501	-148.65	2.748	78.32	0.177	38.53	0.376	-83.30
1200	0.485	-159.77	2.371	70.04	0.188	40.04	0.347	-89.30
1400	0.472	-169.48	2.102	62.70	0.204	41.44	0.337	-94.28
1600	0.462	-177.93	1.876	56.25	0.218	42.33	0.327	-99.63
1800	0.452	173.93	1.709	50.47	0.234	43.51	0.323	-104.28
2000	0.447	166.68	1.577	45.15	0.254	44.67	0.326	-109.21

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

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.846	-36.21	11.907	153.60	0.048	70.69	0.899	-25.66
200	0.738	-65.96	9.927	133.45	0.081	57.10	0.741	-44.44
400	0.573	-105.57	6.593	108.82	0.114	47.19	0.511	-66.05
600	0.489	-128.10	4.760	94.79	0.133	45.84	0.392	-77.81
800	0.473	-145.76	3.753	84.03	0.149	45.99	0.333	-86.51
1000	0.448	-157.90	3.089	76.14	0.168	46.98	0.303	-93.92
1200	0.439	-167.78	2.645	68.73	0.188	47.60	0.285	-100.68
1400	0.427	-176.29	2.328	62.11	0.210	48.49	0.277	-105.35
1600	0.422	176.22	2.076	56.22	0.231	48.01	0.270	-111.30
1800	0.416	168.72	1.880	50.90	0.252	47.87	0.267	-116.11
2000	0.415	161.92	1.734	45.82	0.276	47.77	0.270	-120.15

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

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.752	-49.04	17.433	145.33	0.045	66.35	0.825	-35.32
200	0.613	-83.85	12.887	123.54	0.068	55.11	0.612	-56.92
400	0.475	-123.37	7.695	101.40	0.095	51.87	0.391	-78.66
600	0.418	-142.61	5.347	89.95	0.118	53.90	0.299	-91.21
800	0.417	-157.55	4.150	80.76	0.143	54.74	0.259	-99.99
1000	0.404	-167.70	3.393	73.80	0.168	54.78	0.246	-108.06
1200	0.401	-175.94	2.881	67.19	0.193	54.78	0.237	-114.94
1400	0.393	176.83	2.530	61.46	0.221	54.06	0.236	-119.77
1600	0.391	170.15	2.248	56.08	0.245	52.66	0.232	-126.58
1800	0.388	163.69	2.031	51.21	0.270	51.20	0.234	-131.38
2000	0.387	157.76	1.872	46.60	0.294	50.00	0.235	-135.07

# 80GN01M

## S Parameters (Common emitter)

$V_{CE}=3V, I_C=15mA, Z_O=50\Omega$

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.692	-57.03	20.333	140.52	0.043	64.73	0.776	-40.86
200	0.551	-93.57	14.101	118.68	0.061	56.10	0.544	-63.43
400	0.438	-131.74	8.082	98.47	0.089	55.37	0.341	-85.61
600	0.392	-149.29	5.568	87.91	0.113	58.08	0.264	-98.46
800	0.398	-162.44	4.287	79.51	0.140	58.22	0.237	-107.48
1000	0.388	-171.59	3.500	72.96	0.167	58.14	0.227	-115.58
1200	0.387	-179.07	2.974	66.84	0.195	57.36	0.223	-122.14
1400	0.384	174.18	2.600	61.12	0.226	56.03	0.225	-127.15
1600	0.382	167.98	2.308	55.89	0.251	54.22	0.224	-133.51
1800	0.380	161.38	2.087	51.25	0.276	52.78	0.223	-138.49
2000	0.377	155.70	1.918	46.75	0.302	50.92	0.229	-142.54

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

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.651	-62.27	22.018	137.48	0.039	63.55	0.741	-44.56
200	0.517	-99.76	14.748	115.96	0.058	55.43	0.505	-67.39
400	0.420	-136.79	8.253	96.64	0.087	57.08	0.314	-89.58
600	0.382	-153.06	5.658	86.80	0.112	59.42	0.248	-102.48
800	0.391	-165.41	4.346	78.74	0.141	60.08	0.224	-111.83
1000	0.384	-174.15	3.535	72.39	0.170	59.72	0.218	-120.10
1200	0.381	178.81	3.005	66.34	0.196	58.26	0.217	-126.45
1400	0.377	172.10	2.633	60.81	0.226	57.00	0.217	-130.90
1600	0.378	166.18	2.337	55.72	0.254	54.91	0.220	-137.78
1800	0.376	160.07	2.108	51.03	0.279	53.32	0.222	-142.59
2000	0.375	154.22	1.935	46.67	0.305	51.28	0.226	-145.91

$V_{CE}=3V, I_C=30mA, Z_O=50\Omega$

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.603	-69.36	23.718	133.96	0.039	63.18	0.695	-48.95
200	0.483	-107.50	15.286	112.88	0.055	57.35	0.459	-71.92
400	0.405	-142.81	8.377	94.93	0.082	58.56	0.285	-94.21
600	0.373	-157.70	5.704	85.46	0.110	61.67	0.229	-107.89
800	0.385	-168.92	4.374	77.69	0.140	61.85	0.211	-117.08
1000	0.380	-177.05	3.561	71.53	0.170	60.61	0.210	-123.98
1200	0.381	176.31	3.024	65.61	0.199	59.65	0.211	-130.60
1400	0.379	170.09	2.642	60.37	0.229	57.84	0.215	-135.48
1600	0.377	164.19	2.349	55.18	0.256	55.19	0.217	-142.20
1800	0.375	158.47	2.116	50.74	0.283	53.45	0.221	-146.82
2000	0.374	152.82	1.948	46.16	0.309	51.78	0.223	-150.27

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

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.556	-77.67	24.672	130.61	0.036	61.99	0.646	-52.80
200	0.459	-116.28	15.318	110.26	0.053	58.39	0.416	-75.83
400	0.404	-149.20	8.274	93.23	0.082	60.93	0.260	-98.12
600	0.378	-162.46	5.620	84.26	0.111	63.32	0.214	-111.37
800	0.393	-172.60	4.307	76.71	0.140	63.29	0.199	-120.20
1000	0.389	179.97	3.503	70.54	0.171	62.01	0.199	-127.24
1200	0.390	173.85	2.968	64.74	0.199	60.01	0.205	-133.91
1400	0.389	167.87	2.600	59.38	0.231	58.49	0.208	-138.38
1600	0.388	162.41	2.309	54.38	0.259	56.01	0.212	-144.24
1800	0.386	156.73	2.081	49.79	0.285	54.11	0.216	-148.73
2000	0.387	151.27	1.918	45.53	0.311	51.72	0.221	-152.20

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