



SANYO Semiconductors

## DATA SHEET

# 55GN01NA

NPN Epitaxial Planar Silicon Transistor

## UHF Wide-band Low-noise Amplifier Applications

### Features

- High cutoff frequency :  $f_T = 5.5\text{GHz}$  typ.
- High gain :  $|S_{21e}|^2 = 7\text{dB}$  typ ( $f = 1\text{GHz}$ ).  
=13dB typ ( $f = 400\text{MHz}$ ).

### Specifications

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

Parameter	Symbol	Conditions	Ratings	Unit
Collector-to-Base Voltage	$V_{CBO}$		20	V
Collector-to-Emitter Voltage	$V_{CEO}$		10	V
Emitter-to-Base Voltage	$V_{EBO}$		3	V
Collector Current	$I_C$		70	mA
Collector Dissipation	$P_C$		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	$I_{CBO}$	$V_{CB} = 10\text{V}, I_E = 0\text{A}$			0.1	$\mu\text{A}$
Emitter Cutoff Current	$I_{EBO}$	$V_{EB} = 2\text{V}, I_C = 0\text{A}$			1	$\mu\text{A}$
DC Current Gain	$h_{FE}$	$V_{CE} = 5\text{V}, I_C = 10\text{mA}$	100		180	
Gain-Bandwidth Product	$f_T$	$V_{CE} = 5\text{V}, I_C = 20\text{mA}$	3.5	5.5		GHz
Output Capacitance	$C_{ob}$	$V_{CB} = 10\text{V}, f = 1\text{MHz}$		1.2	1.4	pF
Reverse Transfer Capacitance	$C_{re}$	$V_{CB} = 10\text{V}, f = 1\text{MHz}$		0.8		pF

Marking : ZD

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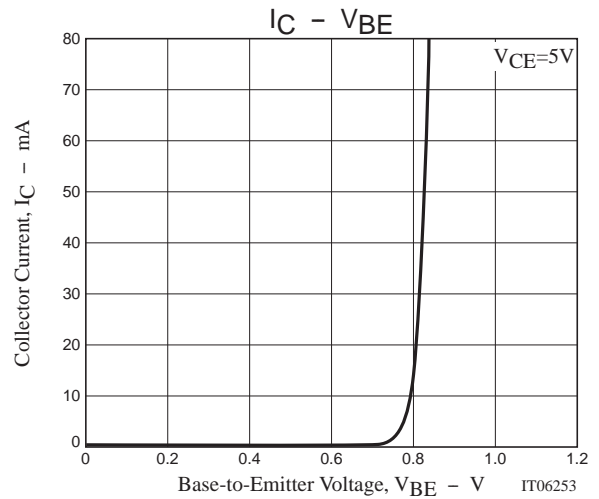
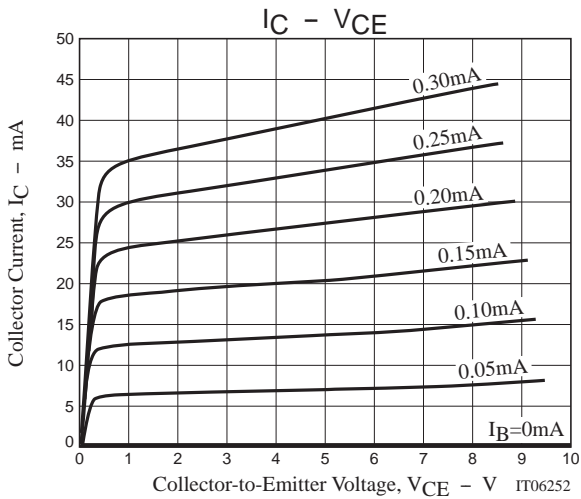
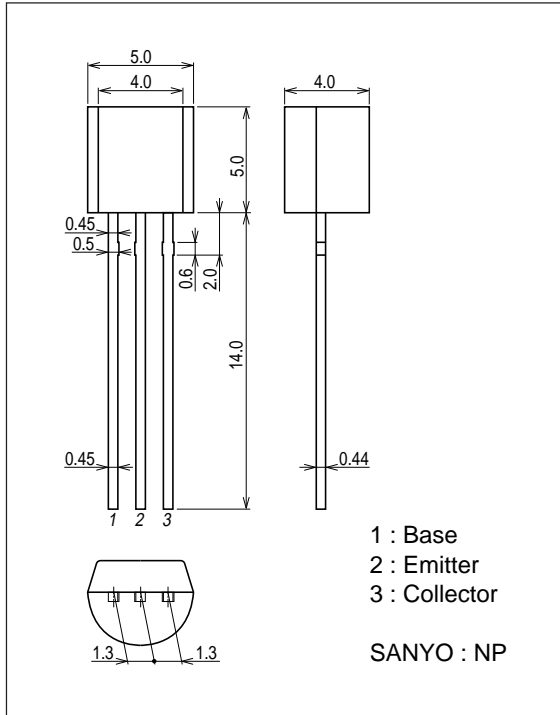
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Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Forward Transfer Gain	S <sub>21e</sub>   <sup>21</sup>	V <sub>CE</sub> =5V, I <sub>C</sub> =20mA, f=1GHz	5	7		dB
	S <sub>21e</sub>   <sup>22</sup>	V <sub>CE</sub> =5V, I <sub>C</sub> =20mA, f=400MHz	10	13		dB
Noise Figure	NF	V <sub>CE</sub> =3V, I <sub>C</sub> =5mA, f=1GHz, Z <sub>S</sub> =Z <sub>L</sub> =50Ω		1.9		dB

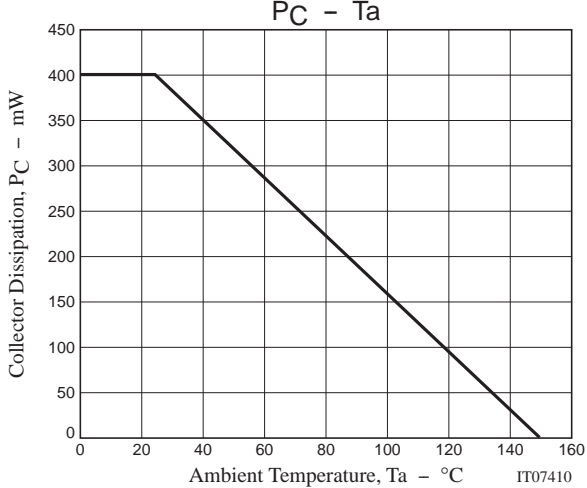
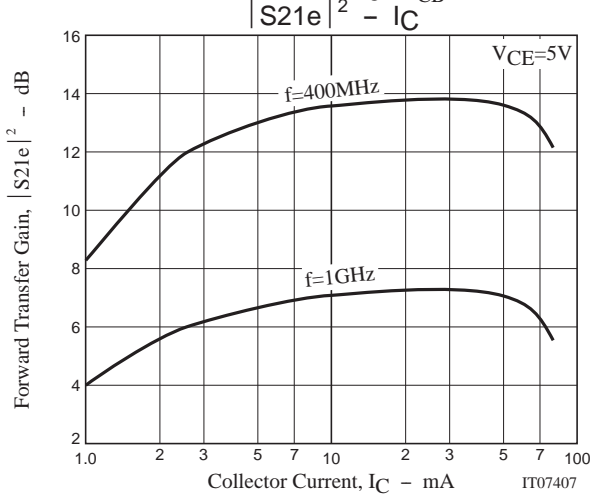
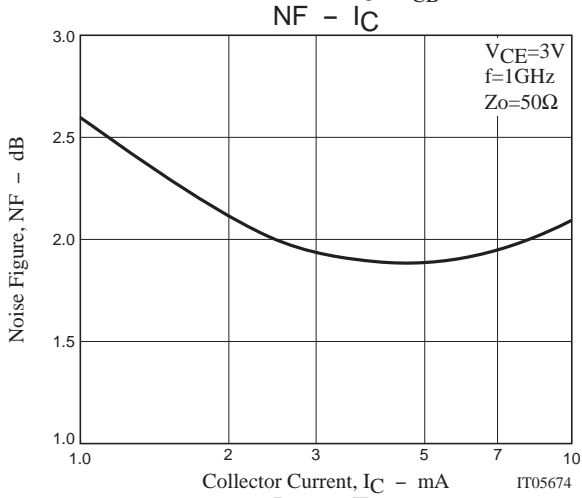
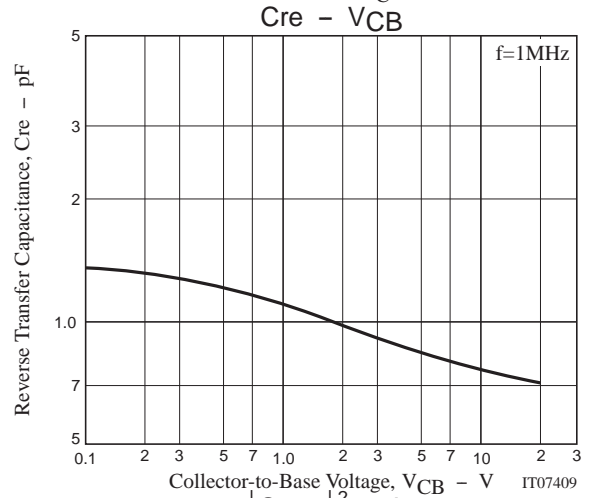
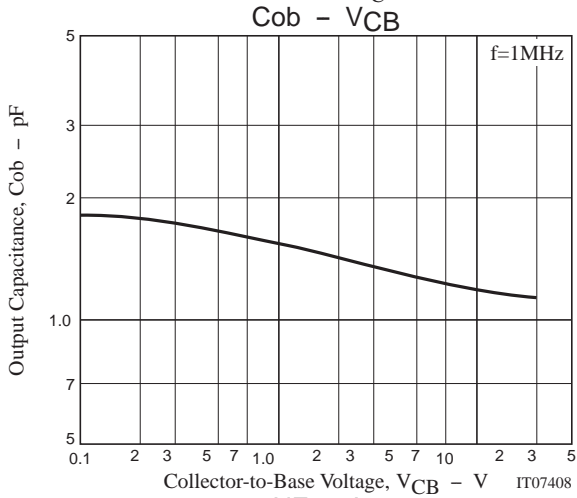
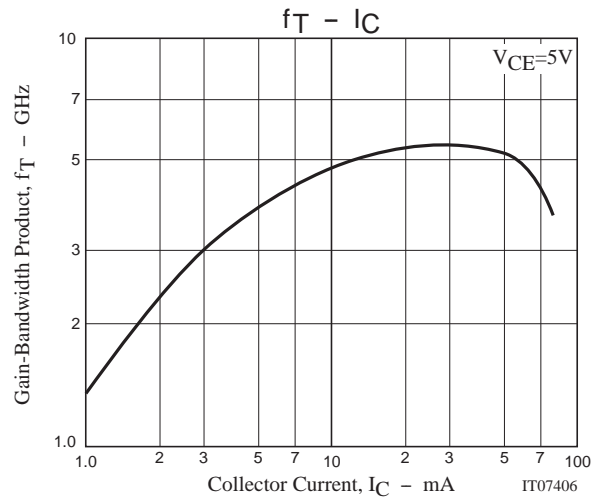
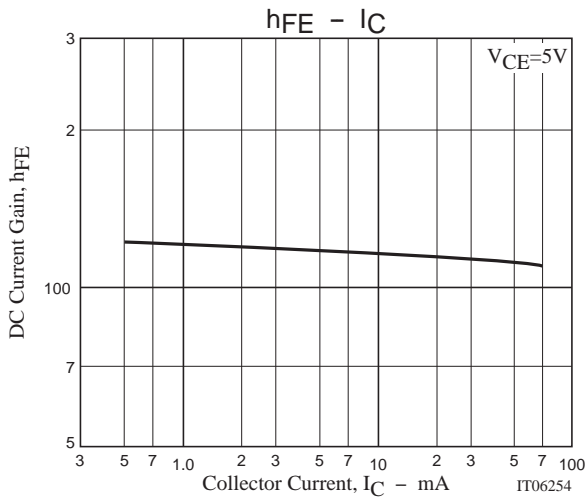
## Package Dimensions

unit : mm (typ)

7522-003



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## S Parameters (Common emitter)

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

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.943	-21.54	3.196	157.89	0.049	75.41	0.976	-12.26
200	0.859	-42.64	3.033	137.45	0.089	62.59	0.918	-23.34
400	0.621	-84.31	2.581	101.05	0.141	42.68	0.765	-40.98
600	0.398	-128.72	2.188	70.15	0.163	34.48	0.643	-53.98
800	0.293	175.87	1.845	43.99	0.186	31.55	0.557	-67.68
1000	0.321	128.34	1.586	21.39	0.224	30.55	0.476	-85.66
1200	0.412	98.48	1.387	1.15	0.286	25.00	0.402	-111.30
1400	0.506	79.14	1.203	-17.54	0.360	14.93	0.338	-149.61
1600	0.608	63.42	1.041	-34.64	0.428	1.54	0.338	162.40
1800	0.682	49.93	0.880	-48.35	0.479	-13.03	0.409	121.17
2000	0.730	37.12	0.746	-59.47	0.510	-27.54	0.507	91.78

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

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.804	-32.40	8.238	142.84	0.045	73.04	0.893	-19.66
200	0.585	-55.65	6.453	116.32	0.073	62.58	0.746	-30.06
400	0.290	-84.97	4.082	82.70	0.123	54.56	0.584	-41.23
600	0.130	-115.59	2.993	59.77	0.168	48.90	0.499	-51.80
800	0.085	161.69	2.401	40.03	0.223	40.68	0.418	-66.00
1000	0.175	112.07	2.029	21.35	0.280	31.13	0.324	-84.62
1200	0.293	91.78	1.768	3.22	0.336	20.03	0.227	-112.98
1400	0.412	77.04	1.538	-14.06	0.389	7.76	0.157	-164.54
1600	0.531	63.46	1.337	-30.59	0.433	-5.27	0.199	134.30
1800	0.621	50.74	1.147	-45.02	0.466	-17.84	0.303	100.00
2000	0.685	38.34	0.990	-57.83	0.491	-30.60	0.411	79.31

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

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.682	-38.10	11.302	132.99	0.040	71.69	0.817	-22.99
200	0.442	-56.42	7.763	106.10	0.068	65.81	0.660	-30.32
400	0.208	-71.35	4.460	77.25	0.121	59.57	0.531	-39.30
600	0.088	-86.87	3.190	57.12	0.176	52.06	0.459	-50.11
800	0.034	149.18	2.542	39.04	0.235	42.45	0.378	-65.34
1000	0.140	104.71	2.150	21.30	0.295	30.94	0.279	-84.88
1200	0.266	89.28	1.863	3.90	0.350	18.79	0.177	-116.24
1400	0.390	75.83	1.622	-12.95	0.401	5.97	0.121	179.23
1600	0.510	63.13	1.413	-28.93	0.438	-6.84	0.192	118.31
1800	0.602	50.55	1.219	-43.09	0.467	-19.34	0.299	90.37
2000	0.668	38.16	1.055	-55.85	0.490	-31.84	0.403	72.89

$V_{CE}=5V, I_C=10mA, Z_O=50\Omega$

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.485	-41.64	15.144	118.22	0.036	72.52	0.696	-25.07
200	0.302	-47.04	8.855	95.57	0.063	71.31	0.571	-27.92
400	0.173	-47.23	4.759	72.34	0.123	63.65	0.483	-36.07
600	0.093	-47.78	3.367	54.88	0.184	54.28	0.422	-48.07
800	0.016	30.84	2.673	38.26	0.246	42.91	0.342	-64.25
1000	0.113	95.22	2.252	21.35	0.309	30.98	0.237	-85.29
1200	0.241	86.37	1.949	4.47	0.363	17.56	0.132	-122.60
1400	0.369	74.46	1.689	-11.79	0.410	4.53	0.105	153.44
1600	0.493	62.03	1.477	-27.39	0.444	-8.58	0.202	103.83
1800	0.588	50.01	1.273	-40.99	0.468	-21.13	0.313	81.36
2000	0.656	37.87	1.111	-53.67	0.489	-33.27	0.409	66.66

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## S Parameters (Common emitter)

$V_{CE}=5V, I_C=15mA, Z_O=50\Omega$

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.393	-39.40	16.513	111.47	0.034	76.73	0.638	-24.75
200	0.262	-38.91	9.160	91.74	0.063	73.11	0.540	-25.92
400	0.173	-37.43	4.855	70.51	0.125	65.36	0.468	-34.48
600	0.104	-38.16	3.423	54.12	0.187	55.16	0.409	-47.14
800	0.028	7.07	2.718	37.90	0.252	43.45	0.329	-63.84
1000	0.106	91.07	2.289	21.31	0.314	30.76	0.221	-85.01
1200	0.234	85.64	1.977	4.65	0.369	17.31	0.117	-126.09
1400	0.364	74.15	1.712	-11.33	0.414	3.76	0.106	143.44
1600	0.488	61.92	1.493	-26.87	0.447	-9.20	0.213	99.23
1800	0.582	49.99	1.298	-40.45	0.470	-21.60	0.321	78.78
2000	0.651	37.88	1.128	-52.86	0.488	-33.58	0.415	64.58

$V_{CE}=5V, I_C=20mA, Z_O=50\Omega$

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.346	-36.01	17.139	107.73	0.033	76.49	0.608	-23.92
200	0.246	-33.91	9.298	89.56	0.063	75.27	0.526	-24.72
400	0.173	-32.88	4.887	69.69	0.125	66.04	0.463	-33.79
600	0.108	-33.77	3.442	53.42	0.189	55.58	0.403	-46.59
800	0.034	7.28	2.732	37.56	0.255	43.56	0.321	-63.41
1000	0.104	89.49	2.301	21.18	0.315	30.73	0.213	-85.68
1200	0.232	85.18	1.991	4.67	0.371	17.24	0.110	-127.83
1400	0.363	73.90	1.721	-11.37	0.413	3.77	0.107	139.24
1600	0.486	61.86	1.504	-26.71	0.447	-9.38	0.216	97.22
1800	0.582	49.85	1.298	-40.20	0.469	-21.77	0.324	77.62
2000	0.652	37.81	1.132	-52.56	0.488	-33.82	0.417	63.99

$V_{CE}=5V, I_C=30mA, Z_O=50\Omega$

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.293	-31.14	17.643	103.73	0.033	80.19	0.576	-22.37
200	0.228	-27.21	9.367	87.38	0.063	75.47	0.511	-23.14
400	0.169	-27.83	4.896	68.61	0.125	66.51	0.455	-32.68
600	0.107	-29.09	3.448	52.73	0.190	55.90	0.397	-45.90
800	0.039	15.22	2.739	36.98	0.255	43.60	0.316	-62.93
1000	0.110	88.31	2.302	20.77	0.316	30.46	0.206	-85.04
1200	0.238	84.51	1.989	4.29	0.371	17.10	0.102	-127.75
1400	0.367	73.61	1.719	-11.62	0.415	3.59	0.106	134.87
1600	0.491	61.74	1.503	-26.98	0.448	-9.46	0.219	95.38
1800	0.584	49.63	1.295	-40.37	0.470	-21.95	0.327	76.66
2000	0.654	37.73	1.133	-52.81	0.488	-33.87	0.418	62.92

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

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.234	-26.34	17.554	100.28	0.033	79.67	0.552	-20.20
200	0.190	-22.28	9.191	85.28	0.063	77.35	0.504	-21.25
400	0.141	-22.30	4.777	67.06	0.126	66.81	0.454	-31.75
600	0.085	-19.60	3.367	51.37	0.189	55.97	0.397	-45.02
800	0.045	52.54	2.670	35.54	0.255	43.62	0.315	-62.21
1000	0.136	89.35	2.250	19.09	0.317	30.77	0.206	-83.77
1200	0.261	83.49	1.943	2.65	0.371	17.07	0.101	-126.95
1400	0.390	72.58	1.678	-13.25	0.413	3.62	0.102	135.16
1600	0.510	60.71	1.460	-28.69	0.448	-9.60	0.217	95.69
1800	0.600	48.78	1.265	-42.00	0.469	-21.99	0.323	76.16
2000	0.667	37.06	1.104	-54.45	0.489	-34.03	0.415	63.17

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