



SANYO Semiconductors

## DATA SHEET

# 15GN03FA

 — NPN Epitaxial Planar Silicon Transistor  
**VHF High-frequency Amplifier Applications**

## Applications

- VHF, RF, MIXER, OSC, IF amplifier.

## Features

- High cutoff frequency :  $f_T=1.5\text{GHz}$  typ.
- High gain :  $|S_{21e}|^2=14\text{dB}$  typ ( $f=0.4\text{GHz}$ ).
- Ultrasmall package permitting applied sets to be small and slim.
- Halogen free compliance.

## Specifications

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

Parameter	Symbol	Conditions	Ratings	Unit
Collector-to-Base Voltage	$V_{CB0}$		20	V
Collector-to-Emitter Voltage	$V_{CE0}$		10	V
Emitter-to-Base Voltage	$V_{EB0}$		3	V
Collector Current	$I_C$		70	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	$I_{CBO}$	$V_{CB}=10\text{V}, I_E=0\text{A}$			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	$f_T$	$V_{CE}=5\text{V}, I_C=20\text{mA}$	1.0	1.5		GHz

Marking : ZC

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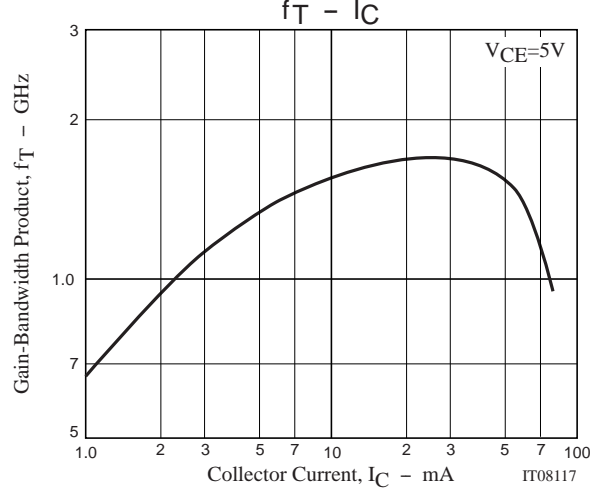
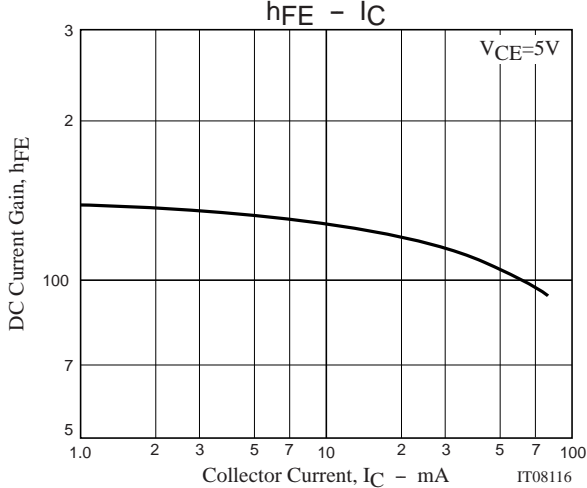
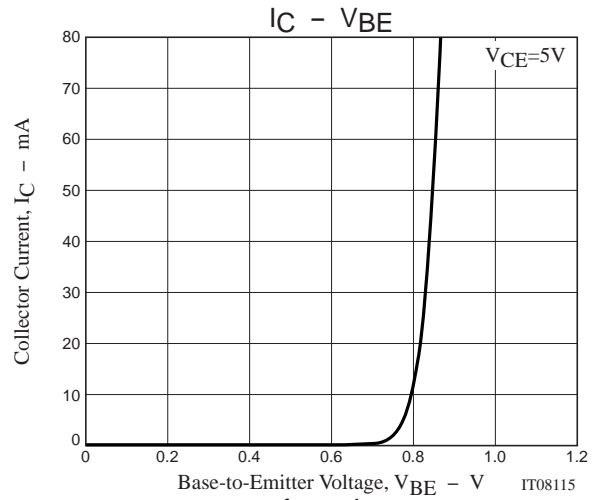
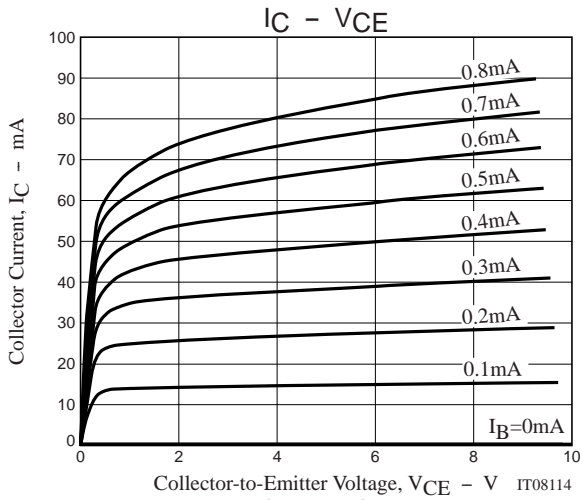
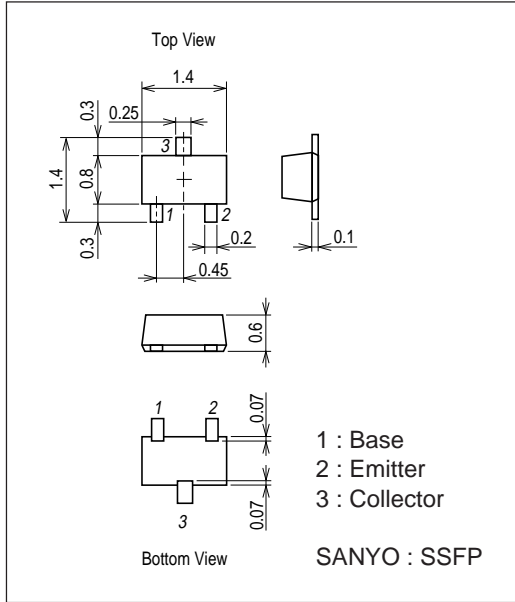
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Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Output Capacitance	Cob	V <sub>CB</sub> =10V, f=1MHz		0.9	1.2	pF
Reverse Transfer Capacitance	Cre	V <sub>CB</sub> =10V, f=1MHz		0.6		pF
Forward Transfer Gain	S <sub>21e</sub>   <sup>2</sup>	V <sub>CE</sub> =5V, I <sub>C</sub> =20mA, f=0.4GHz	11	14		dB
Noise Figure	NF	V <sub>CE</sub> =3V, I <sub>C</sub> =2mA, f=0.4GHz		1.6		dB

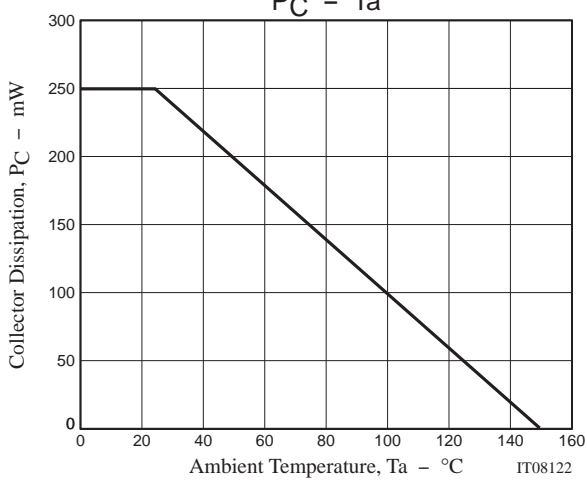
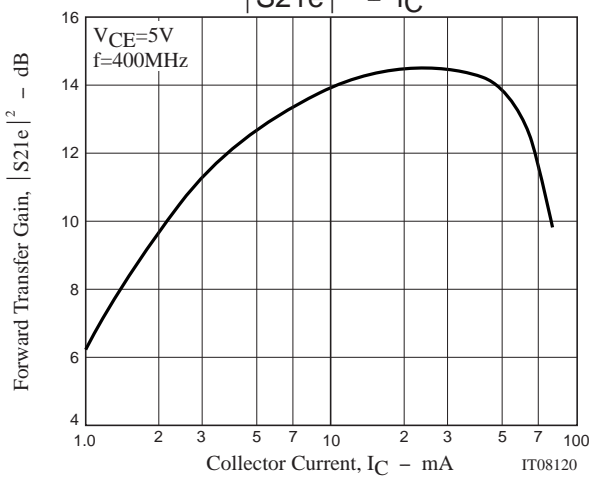
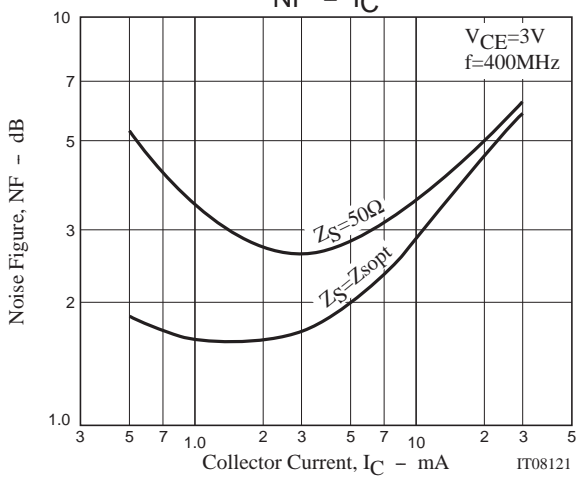
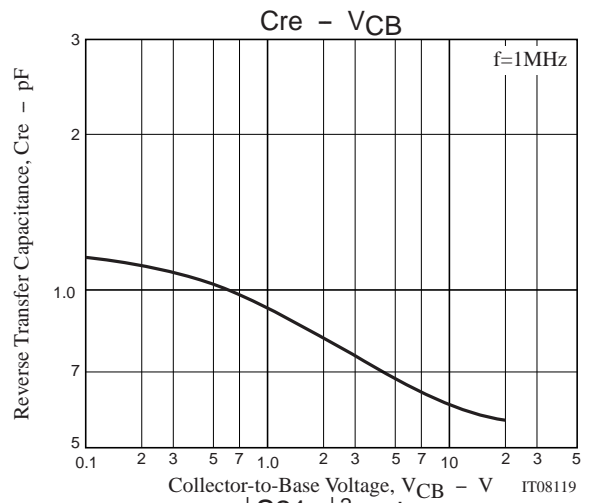
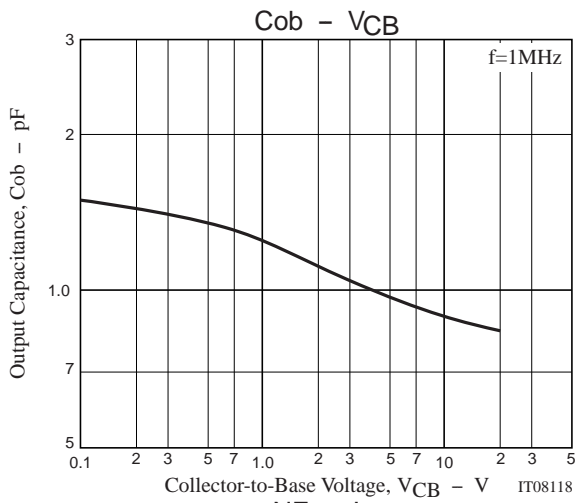
## Package Dimensions

unit : mm (typ)

7029-002



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## 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	0.961	-34.18	3.294	157.68	0.040	70.32	0.974	-8.70
200	0.932	-63.71	2.882	139.23	0.068	53.42	0.920	-15.14
300	0.907	-86.85	2.472	124.36	0.087	40.84	0.873	-19.79
400	0.887	-104.47	2.112	112.52	0.096	32.90	0.842	-23.48
500	0.871	-117.78	1.834	102.94	0.099	28.12	0.818	-26.33
600	0.859	-128.62	1.605	94.86	0.101	23.64	0.802	-29.35
700	0.857	-137.14	1.432	87.95	0.097	19.29	0.798	-32.27
800	0.850	-144.21	1.289	81.60	0.095	17.58	0.796	-35.02
900	0.845	-150.72	1.176	76.29	0.090	17.23	0.797	-38.01
1000	0.839	-156.10	1.081	70.99	0.085	16.55	0.797	-41.02

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

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.892	-58.77	8.161	145.03	0.034	56.36	0.902	-14.46
200	0.843	-98.07	6.099	122.67	0.051	42.43	0.786	-20.13
300	0.817	-121.82	4.658	108.72	0.055	33.87	0.727	-22.56
400	0.803	-136.85	3.715	98.70	0.058	30.68	0.700	-24.99
500	0.792	-146.48	3.051	91.64	0.058	28.74	0.687	-26.83
600	0.786	-154.00	2.599	85.58	0.058	29.60	0.678	-29.37
700	0.788	-159.54	2.257	80.45	0.056	31.43	0.677	-32.02
800	0.787	-164.23	2.001	75.47	0.055	35.06	0.680	-34.73
900	0.784	-168.41	1.798	71.27	0.054	40.40	0.683	-37.51
1000	0.782	-171.95	1.635	67.12	0.056	43.46	0.687	-40.32

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

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.836	-76.63	11.501	136.45	0.030	52.40	0.838	-17.51
200	0.798	-117.27	7.726	114.17	0.040	37.48	0.709	-21.18
300	0.781	-137.77	5.593	101.72	0.043	34.01	0.658	-22.46
400	0.773	-149.33	4.358	93.38	0.044	33.11	0.638	-24.37
500	0.769	-156.90	3.532	87.35	0.046	36.56	0.630	-26.09
600	0.766	-162.43	2.982	81.95	0.045	39.81	0.625	-28.60
700	0.769	-167.07	2.577	77.34	0.045	42.61	0.624	-31.24
800	0.770	-170.74	2.274	72.95	0.048	47.50	0.632	-33.83
900	0.768	-173.91	2.041	69.14	0.049	53.32	0.637	-36.62
1000	0.765	-176.92	1.844	65.26	0.054	58.93	0.643	-39.47

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

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.767	-103.15	15.822	124.63	0.023	46.33	0.734	-20.47
200	0.755	-138.50	9.411	104.65	0.028	38.32	0.619	-20.77
300	0.754	-153.35	6.527	94.69	0.030	38.73	0.584	-21.03
400	0.752	-161.57	4.982	87.97	0.033	42.64	0.572	-22.78
500	0.750	-166.80	4.014	82.84	0.035	48.31	0.572	-24.69
600	0.748	-170.55	3.373	78.22	0.037	54.47	0.569	-27.25
700	0.753	-173.80	2.897	73.96	0.041	59.86	0.572	-29.68
800	0.756	-176.67	2.549	69.82	0.044	62.98	0.581	-32.50
900	0.757	-179.14	2.277	66.41	0.049	68.43	0.588	-35.36
1000	0.755	178.64	2.056	62.61	0.053	72.29	0.593	-38.13

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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	0.738	-117.62	17.843	118.37	0.020	37.24	0.676	-21.03
200	0.743	-147.93	10.060	100.54	0.023	37.86	0.576	-19.90
300	0.747	-159.66	6.883	91.63	0.025	46.10	0.554	-19.99
400	0.745	-166.45	5.220	85.36	0.029	50.71	0.546	-21.67
500	0.744	-170.73	4.196	80.63	0.032	56.16	0.545	-23.38
600	0.745	-173.77	3.511	76.05	0.037	61.92	0.546	-26.19
700	0.752	-176.53	3.020	72.07	0.040	66.25	0.552	-28.81
800	0.756	-179.03	2.658	68.01	0.044	70.92	0.560	-31.80
900	0.755	178.79	2.361	64.63	0.049	74.88	0.565	-34.57
1000	0.756	176.76	2.132	60.89	0.053	76.28	0.574	-37.19

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

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.726	-126.53	18.861	114.70	0.017	40.89	0.640	-21.11
200	0.739	-153.13	10.358	98.19	0.022	42.84	0.553	-18.93
300	0.745	-163.18	7.042	89.82	0.024	49.20	0.536	-19.14
400	0.745	-169.08	5.324	83.86	0.027	55.62	0.530	-20.71
500	0.745	-172.83	4.271	79.22	0.031	60.79	0.533	-22.65
600	0.746	-175.56	3.573	74.72	0.035	67.12	0.534	-25.56
700	0.753	-177.99	3.062	70.86	0.039	71.29	0.539	-28.07
800	0.756	179.89	2.695	66.61	0.043	73.72	0.550	-30.95
900	0.757	177.73	2.394	63.36	0.050	76.38	0.557	-33.79
1000	0.758	175.84	2.152	59.54	0.055	80.04	0.565	-36.64

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

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.717	-137.48	19.630	110.26	0.015	44.21	0.601	-20.34
200	0.738	-159.18	10.491	95.35	0.018	47.49	0.531	-17.41
300	0.746	-167.18	7.088	87.53	0.021	53.11	0.517	-17.66
400	0.748	-172.07	5.346	81.72	0.026	61.37	0.517	-19.37
500	0.748	-175.06	4.275	77.20	0.030	66.16	0.521	-21.62
600	0.752	-177.32	3.568	72.74	0.034	71.42	0.527	-24.47
700	0.760	-179.44	3.054	68.73	0.039	73.32	0.532	-26.91
800	0.764	178.51	2.662	64.73	0.044	78.79	0.543	-29.78
900	0.766	176.85	2.365	61.05	0.049	79.65	0.553	-32.93
1000	0.766	174.89	2.129	57.53	0.055	81.62	0.562	-35.85

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

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.726	-148.90	18.826	105.46	0.013	44.77	0.567	-18.27
200	0.751	-165.14	9.843	92.00	0.017	52.99	0.521	-15.19
300	0.762	-171.12	6.595	84.51	0.020	59.41	0.513	-16.09
400	0.764	-174.96	4.946	78.62	0.024	66.61	0.516	-18.39
500	0.767	-177.43	3.935	74.00	0.029	73.69	0.522	-20.54
600	0.772	-179.26	3.268	69.60	0.033	75.14	0.529	-23.65
700	0.780	178.77	2.784	65.39	0.038	78.53	0.537	-26.50
800	0.786	176.95	2.430	60.89	0.043	80.73	0.548	-29.67
900	0.789	175.17	2.150	57.73	0.050	83.79	0.559	-32.92
1000	0.791	173.32	1.926	53.98	0.054	84.92	0.569	-35.99

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