



SANYO Semiconductors

DATA SHEET

15GN03SA

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

Applications

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

Features

- High cut-off frequency : $f_T=1.5\text{GHz}$ typ.
- High gain : $|S_{21e}|^2=13\text{dB}$ typ ($f=0.4\text{GHz}$).
- Ultrasmall package permitting applied sets to be small and slim.

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_{CEO}		10	V
Emitter-to-Base Voltage	V_{EBO}		3	V
Collector Current	I_C		70	mA
Collector Dissipation	P_C		100	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	μA
Emitter Cutoff Current	I_{EBO}	$V_{EB}=2\text{V}, I_C=0\text{A}$			1	μA
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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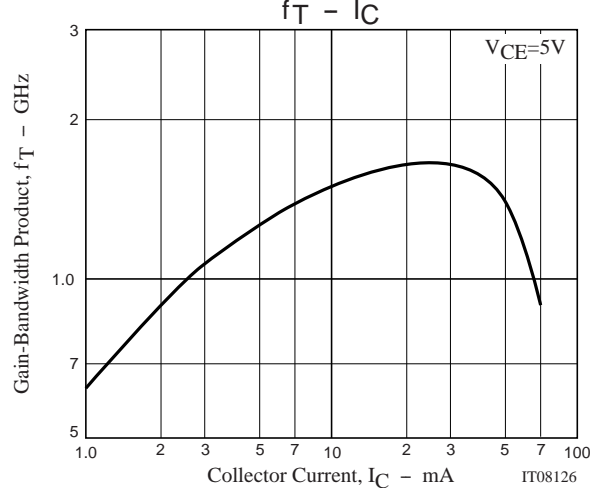
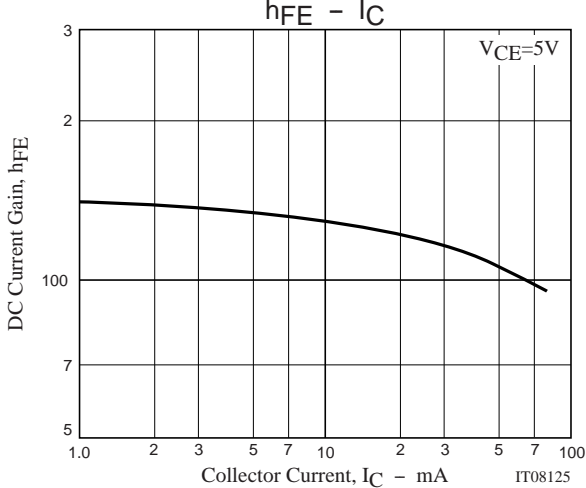
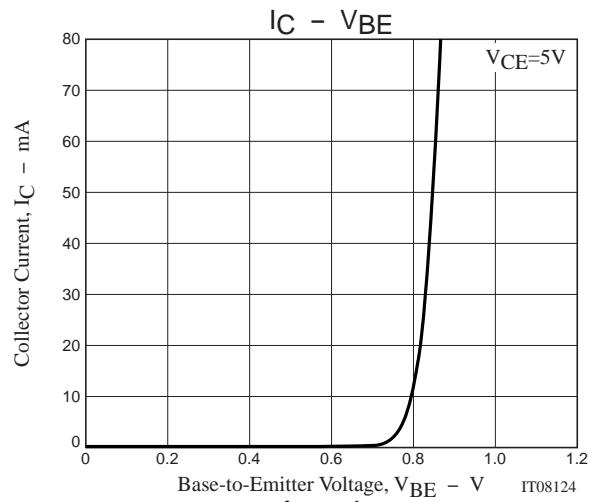
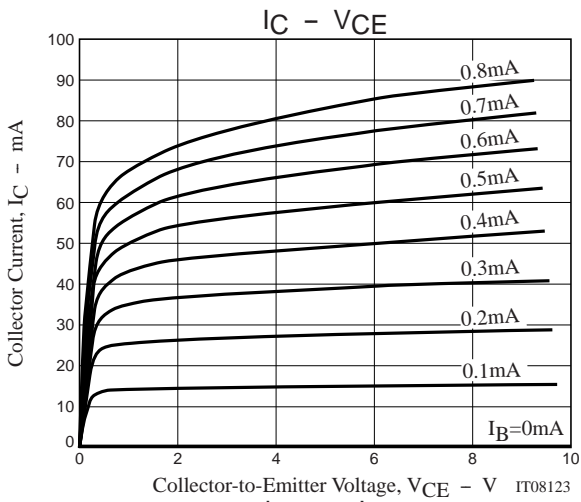
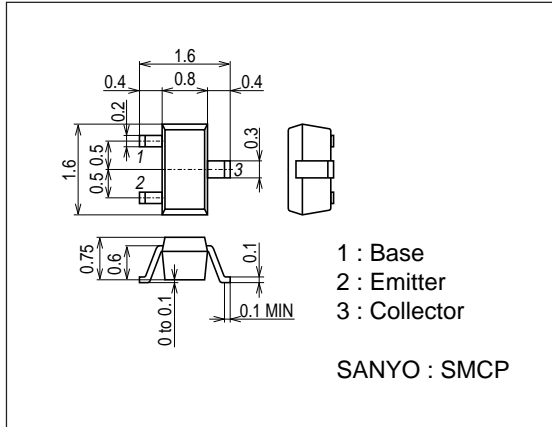
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Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Output Capacitance	Cob	V _{CB} =10V, f=1MHz		0.9	1.2	pF
Reverse Transfer Capacitance	Cre	V _{CB} =10V, f=1MHz		0.6		pF
Forward Transfer Gain	S _{21e} ²	V _{CE} =5V, I _C =20mA, f=0.4GHz	10	13		dB
Noise Figure	NF	V _{CE} =3V, I _C =2mA, f=0.4GHz		1.6		dB

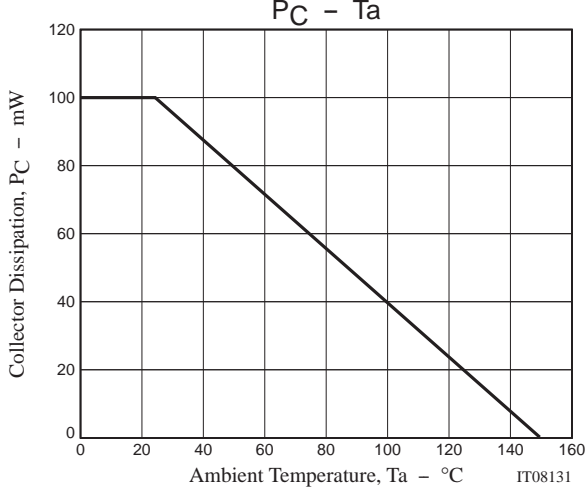
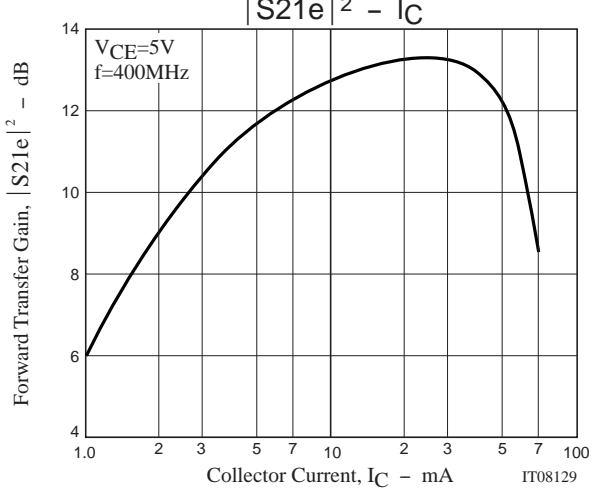
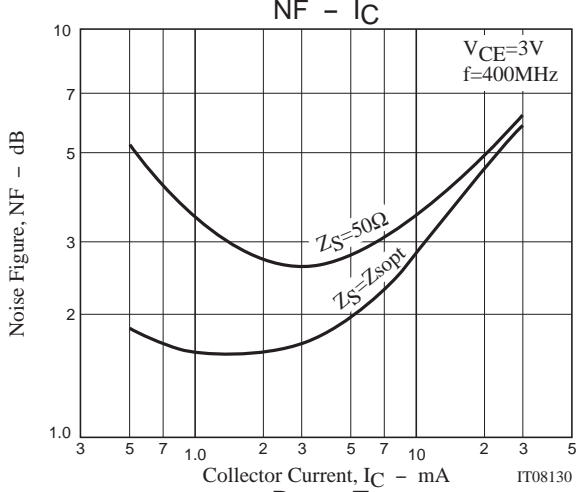
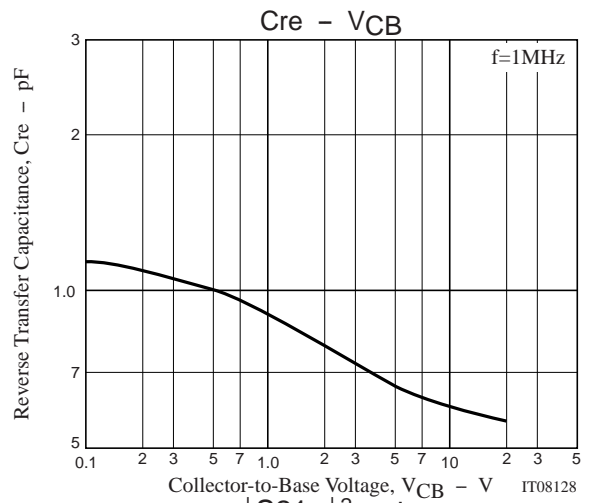
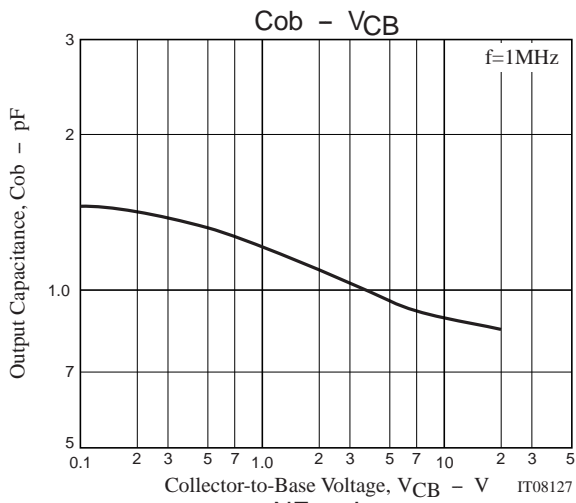
Package Dimensions

unit : mm (typ)

7027-002



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S Parameters (Common emitter)

V_{CE}=5V, I_C=1mA, Z_O=50Ω

Freq(MHz)	S ₁₁	∠S ₁₁	S ₂₁	∠S ₂₁	S ₁₂	∠S ₁₂	S ₂₂	∠S ₂₂
100	0.943	-36.97	3.273	155.15	0.043	69.08	0.967	-8.53
200	0.884	-67.33	2.788	135.32	0.072	53.66	0.912	-15.10
300	0.835	-90.72	2.345	119.87	0.089	42.67	0.863	-19.22
400	0.796	-108.84	1.985	108.09	0.094	34.96	0.826	-22.13
500	0.773	-121.99	1.715	98.54	0.094	32.18	0.808	-24.68
600	0.757	-133.06	1.495	90.77	0.091	29.52	0.796	-27.45
700	0.747	-141.92	1.326	84.15	0.087	29.95	0.790	-30.22
800	0.742	-148.93	1.204	78.39	0.081	32.55	0.790	-33.18
900	0.736	-155.29	1.094	73.18	0.075	38.42	0.795	-35.94
1000	0.732	-160.69	1.006	69.03	0.072	47.05	0.793	-38.82

V_{CE}=5V, I_C=3mA, Z_O=50Ω

Freq(MHz)	S ₁₁	∠S ₁₁	S ₂₁	∠S ₂₁	S ₁₂	∠S ₁₂	S ₂₂	∠S ₂₂
100	0.840	-62.35	7.872	140.90	0.036	59.22	0.884	-13.98
200	0.742	-101.75	5.680	117.87	0.051	44.52	0.776	-19.10
300	0.694	-124.66	4.222	104.25	0.057	40.79	0.722	-20.98
400	0.674	-139.18	3.324	95.32	0.059	40.26	0.695	-22.44
500	0.661	-149.13	2.745	88.33	0.059	45.31	0.686	-24.35
600	0.657	-156.52	2.329	82.52	0.060	50.45	0.682	-26.73
700	0.656	-162.31	2.030	77.58	0.063	57.99	0.681	-29.15
800	0.654	-167.20	1.808	73.11	0.068	63.76	0.684	-32.05
900	0.654	-171.42	1.632	68.95	0.073	72.04	0.689	-34.87
1000	0.656	-174.93	1.490	65.50	0.082	78.28	0.693	-37.73

V_{CE}=5V, I_C=5mA, Z_O=50Ω

Freq(MHz)	S ₁₁	∠S ₁₁	S ₂₁	∠S ₂₁	S ₁₂	∠S ₁₂	S ₂₂	∠S ₂₂
100	0.764	-78.80	10.674	132.18	0.032	53.42	0.824	-16.44
200	0.675	-118.13	6.892	110.39	0.043	45.09	0.711	-19.51
300	0.643	-138.42	4.905	98.72	0.046	48.08	0.661	-20.42
400	0.633	-150.22	3.806	90.79	0.049	50.31	0.645	-21.59
500	0.627	-157.84	3.112	84.79	0.052	56.84	0.640	-23.43
600	0.627	-164.10	2.626	79.63	0.057	62.40	0.640	-25.81
700	0.626	-168.63	2.280	75.35	0.062	68.40	0.639	-28.44
800	0.629	-172.39	2.025	71.19	0.070	74.50	0.643	-31.20
900	0.630	-175.77	1.824	67.34	0.077	78.67	0.650	-34.10
1000	0.632	-178.89	1.663	64.07	0.090	83.70	0.655	-36.92

V_{CE}=5V, I_C=10mA, Z_O=50Ω

Freq(MHz)	S ₁₁	∠S ₁₁	S ₂₁	∠S ₂₁	S ₁₂	∠S ₁₂	S ₂₂	∠S ₂₂
100	0.660	-103.13	14.230	120.64	0.024	49.45	0.728	-18.47
200	0.610	-137.53	8.234	102.03	0.034	50.63	0.626	-18.73
300	0.596	-152.55	5.660	92.68	0.037	56.96	0.597	-19.00
400	0.596	-161.17	4.324	86.37	0.043	63.29	0.586	-20.07
500	0.596	-166.66	3.511	81.12	0.050	68.02	0.587	-21.96
600	0.597	-171.07	2.958	76.64	0.057	73.05	0.590	-24.55
700	0.602	-174.45	2.559	72.58	0.066	77.96	0.591	-27.10
800	0.605	-177.26	2.267	68.82	0.077	80.92	0.596	-29.89
900	0.609	-179.81	2.032	65.06	0.086	84.59	0.604	-32.87
1000	0.611	-177.85	1.855	61.96	0.098	86.94	0.610	-35.66

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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	0.614	-115.86	15.733	115.13	0.023	51.64	0.676	-18.67
200	0.587	-145.92	8.727	98.59	0.027	55.81	0.591	-17.74
300	0.580	-158.32	5.933	90.16	0.035	64.46	0.569	-17.98
400	0.582	-165.43	4.534	84.32	0.042	67.60	0.560	-19.12
500	0.586	-169.89	3.666	79.39	0.050	73.83	0.563	-21.07
600	0.589	-173.59	3.082	74.95	0.060	77.42	0.566	-23.60
700	0.594	-176.43	2.666	71.13	0.070	81.51	0.570	-26.22
800	0.599	-178.95	2.356	67.32	0.079	83.27	0.577	-29.13
900	0.604	-178.83	2.116	63.75	0.089	86.12	0.584	-32.05
1000	0.608	-176.67	1.926	60.55	0.100	87.51	0.590	-34.85

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

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.590	-123.88	16.491	111.84	0.020	52.74	0.645	-18.38
200	0.576	-150.93	8.952	96.58	0.026	58.67	0.573	-17.01
300	0.575	-161.70	6.065	88.73	0.034	65.27	0.553	-17.43
400	0.577	-167.82	4.616	82.83	0.043	69.85	0.547	-18.44
500	0.581	-171.66	3.726	78.17	0.051	74.84	0.550	-20.51
600	0.587	-174.81	3.132	73.88	0.061	80.30	0.556	-22.94
700	0.592	-177.52	2.703	69.83	0.070	81.90	0.559	-25.72
800	0.596	-179.80	2.389	66.21	0.081	84.16	0.566	-28.69
900	0.604	-178.21	2.144	62.50	0.091	86.52	0.576	-31.45
1000	0.608	-176.32	1.946	59.43	0.103	87.71	0.581	-34.28

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

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.572	-133.60	16.914	108.03	0.018	53.38	0.612	-17.49
200	0.570	-156.29	8.987	94.10	0.025	60.38	0.553	-15.82
300	0.573	-165.13	6.063	86.71	0.034	67.36	0.539	-16.11
400	0.581	-170.15	4.598	81.02	0.043	74.29	0.538	-17.30
500	0.586	-173.46	3.714	76.38	0.051	78.10	0.541	-19.51
600	0.592	-176.41	3.102	71.91	0.061	80.37	0.546	-22.19
700	0.597	-178.61	2.685	68.04	0.071	84.52	0.552	-24.92
800	0.605	-179.29	2.363	64.13	0.083	83.99	0.560	-28.08
900	0.612	-177.37	2.117	60.46	0.093	86.96	0.571	-30.99
1000	0.618	-175.30	1.919	57.30	0.105	89.37	0.579	-33.87

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

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.587	-145.69	15.447	103.29	0.015	56.49	0.581	-15.11
200	0.598	-163.07	8.069	90.62	0.024	64.68	0.545	-14.00
300	0.605	-169.75	5.391	83.37	0.034	72.91	0.536	-14.90
400	0.613	-173.58	4.075	77.64	0.041	77.20	0.536	-16.65
500	0.621	-176.33	3.277	72.72	0.051	82.02	0.542	-19.12
600	0.628	-178.89	2.735	68.14	0.060	83.52	0.551	-22.03
700	0.640	-178.96	2.338	64.06	0.071	85.56	0.556	-25.23
800	0.649	-177.02	2.065	60.00	0.083	88.30	0.566	-28.52
900	0.655	-175.07	1.839	56.23	0.094	90.06	0.577	-31.54
1000	0.663	-172.97	1.661	52.87	0.107	91.44	0.587	-35.17

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