

**2SC5501**

## VHF to UHF Low-Noise Wide-Band Amplifier Applications

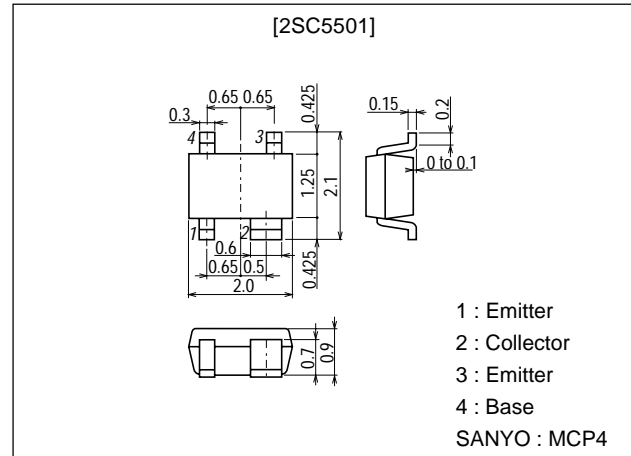
### Features

- Low noise :  $NF=1.0\text{dB}$  typ ( $f=1\text{GHz}$ ).
- High gain :  $|S_{21e}|^2=13\text{dB}$  typ ( $f=1\text{GHz}$ ).
- High cutoff frequency :  $f_T=7\text{GHz}$  typ.
- Large allowable collector dissipation :  
 $P_C=500\text{mW}$  max.

### Package Dimensions

unit:mm

2161



### 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	$V_{EBO}$		2	V
Collector Current	$I_C$		70	mA
Collector Dissipation	$P_C$	Mounted on a ceramic board (250mm <sup>2</sup> ×0.8mm)	500	mW
Junction Temperature	$T_J$		150	°C
Storage Temperature	$T_{stg}$		-55 to +150	°C

#### Electrical Characteristics at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Collector Cutoff Current	$I_{CBO}$	$V_{CB}=10\text{V}, I_E=0$			1.0	$\mu\text{A}$
Emitter Cutoff Current	$I_{EBO}$	$V_{EB}=1\text{V}, I_C=0$			10	$\mu\text{A}$
DC Current Gain	$h_{FE}$	$V_{CE}=5\text{V}, I_C=20\text{mA}$	90*		270*	
Gain-Bandwidth Product	$f_T$	$V_{CE}=5\text{V}, I_C=20\text{mA}$	5	7		GHz
Output Capacitance	$C_{ob}$	$V_{CB}=10\text{V}, f=1\text{MHz}$		0.75	1.2	pF
Reverse Transfer Capacitance	$C_{re}$	$V_{CB}=10\text{V}, f=1\text{MHz}$		0.4		pF

\* : The 2SC5501 is classified by 20mA  $h_{FE}$  as follows :

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Marking	LN	
	4	5
$h_{FE}$	90 to 180	135 to 270

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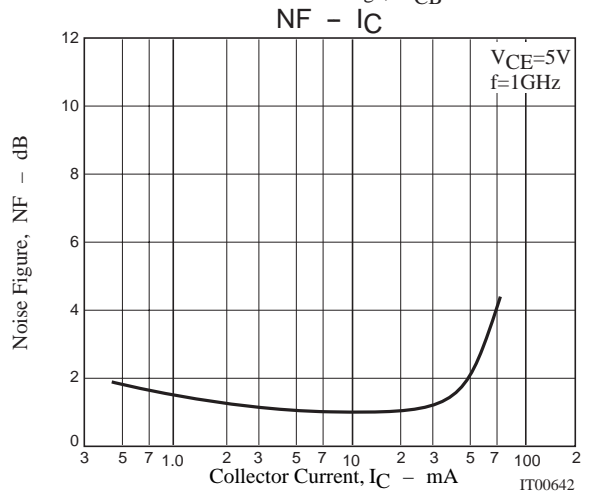
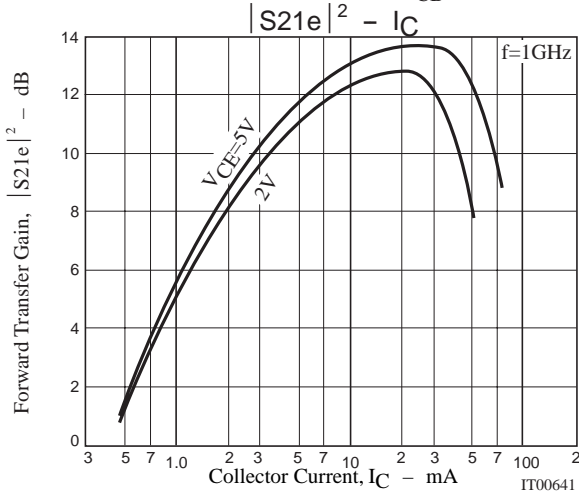
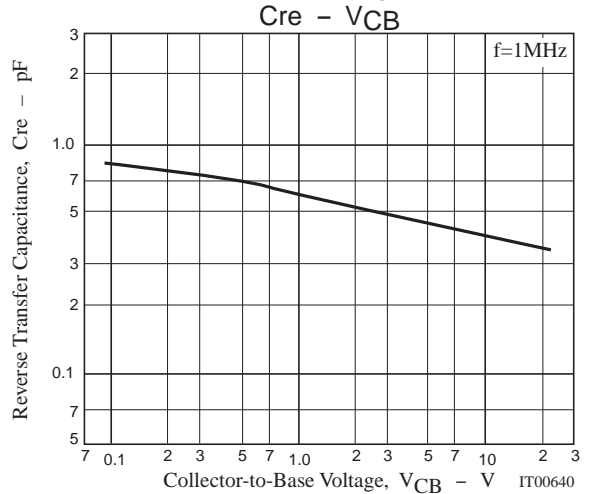
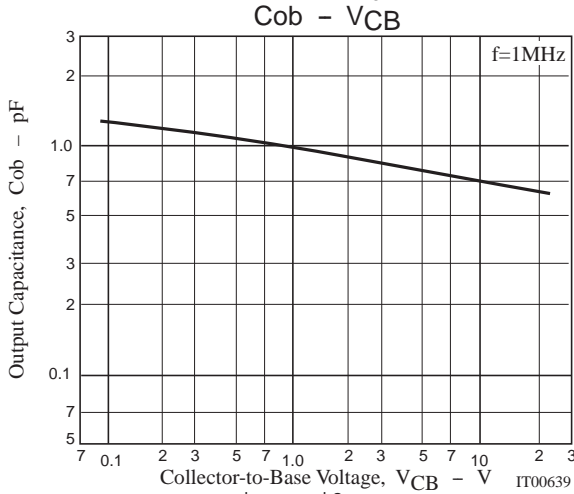
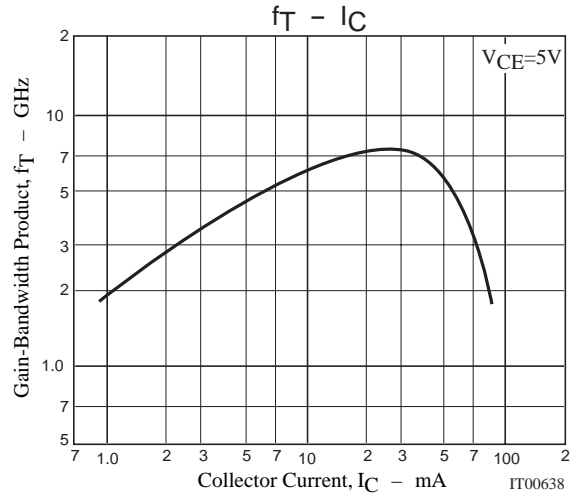
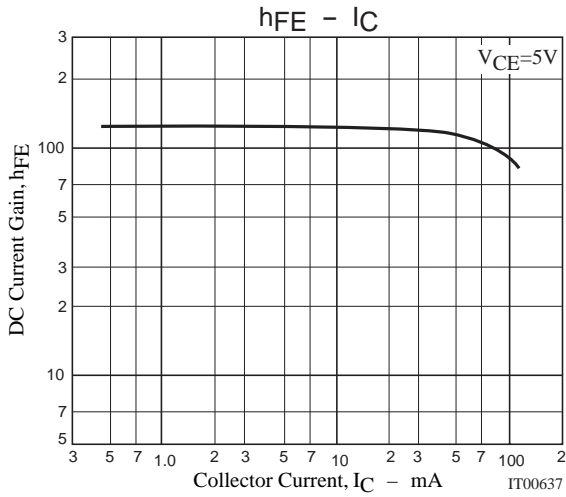
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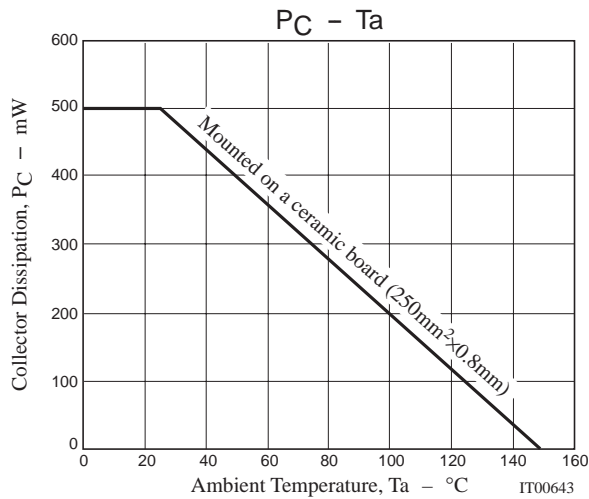
# 2SC5501

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Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Forward Transfer Gain	$ S_{21e} ^2 1$	$V_{CE}=5V, I_C=20mA, f=1GHz$	10	13		dB
	$ S_{21e} ^2 2$	$V_{CE}=2V, I_C=3mA, f=1GHz$		9		dB
Noise Figure	NF	$V_{CE}=5V, I_C=7mA, f=1GHz$		1.0	1.8	dB



# 2SC5501



## S Parameters (Common emitter)

$V_{CE}=2V$ ,  $I_C=1mA$ ,  $Z_O=50\Omega$

Freq (MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.974	-20.4	2.443	162.5	0.043	75.9	0.983	-8.7
200	0.950	-39.4	2.257	147.7	0.079	63.0	0.940	-16.6
400	0.906	-72.8	1.847	124.5	0.132	42.9	0.853	-28.8
600	0.852	-102.1	2.016	103.8	0.155	28.8	0.780	-35.7
800	0.809	-124.4	1.713	88.6	0.156	18.6	0.704	-43.6
1000	0.796	-139.9	1.299	74.7	0.165	11.5	0.694	-48.2
1200	0.764	-155.0	1.287	63.6	0.152	6.8	0.653	-54.7
1400	0.744	-167.3	1.213	54.0	0.145	3.8	0.666	-59.2
1600	0.734	-177.3	1.089	45.7	0.139	0.6	0.702	-63.9
1800	0.722	173.3	0.929	36.6	0.131	-2.1	0.709	-69.2
2000	0.711	164.9	0.791	28.5	0.118	4.1	0.707	-74.8

$V_{CE}=2V$ ,  $I_C=3mA$ ,  $Z_O=50\Omega$

Freq (MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.914	-30.2	6.935	155.9	0.041	71.2	0.946	-16.6
200	0.870	-54.3	5.731	139.8	0.070	55.6	0.826	-29.5
400	0.765	-100.1	5.112	113.5	0.098	36.8	0.634	-44.7
600	0.703	-129.1	4.069	95.7	0.109	28.5	0.544	-50.2
800	0.677	-147.3	3.250	83.3	0.112	24.8	0.481	-55.8
1000	0.645	-163.5	2.768	72.4	0.114	23.8	0.447	-60.1
1200	0.635	-173.9	2.366	63.5	0.114	25.2	0.444	-64.2
1400	0.624	176.9	2.068	55.4	0.119	25.1	0.441	-68.6
1600	0.623	169.5	1.794	48.5	0.122	24.9	0.462	-72.3
1800	0.616	161.8	1.631	41.1	0.127	28.8	0.449	-77.7
2000	0.603	154.4	1.472	34.7	0.135	30.5	0.474	-81.4

## 2SC5501

$V_{CE}=2V, I_C=7mA, Z_O=50\Omega$

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	-44.7	13.964	147.3	0.036	62.9	0.855	-28.9
200	0.730	-84.2	11.969	126.2	0.055	47.9	0.655	-45.7
400	0.642	-129.8	7.972	101.7	0.071	37.6	0.430	-60.7
600	0.603	-154.1	5.753	87.4	0.078	37.5	0.342	-66.5
800	0.593	-167.7	4.413	78.1	0.087	38.7	0.304	-70.9
1000	0.584	-177.5	3.548	69.6	0.097	39.3	0.285	-74.8
1200	0.577	174.2	2.983	62.4	0.106	40.8	0.282	-78.8
1400	0.571	166.8	2.574	55.4	0.118	41.8	0.280	-83.5
1600	0.566	159.7	2.283	49.5	0.130	42.1	0.293	-86.5
1800	0.566	154.0	2.027	42.8	0.141	41.9	0.301	-90.5
2000	0.560	148.0	1.834	36.8	0.156	41.0	0.311	-94.5

$V_{CE}=2V, I_C=10mA, Z_O=50\Omega$

Freq (MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.770	-56.0	18.252	142.4	0.033	60.2	0.796	-35.9
200	0.675	-99.1	14.590	119.8	0.048	46.3	0.559	-54.3
400	0.604	-142.2	8.907	97.2	0.060	42.0	0.361	-67.8
600	0.584	-160.9	6.149	85.3	0.071	42.6	0.282	-74.3
800	0.575	-173.4	4.720	76.6	0.082	45.0	0.249	-79.0
1000	0.568	177.3	3.802	68.5	0.094	46.6	0.240	-82.3
1200	0.562	169.7	3.203	61.8	0.106	46.8	0.239	-86.3
1400	0.558	163.2	2.738	55.2	0.120	46.6	0.243	-90.2
1600	0.555	157.1	2.400	49.5	0.134	46.2	0.251	-93.9
1800	0.551	150.6	2.171	43.4	0.148	45.5	0.264	-96.9
2000	0.549	145.3	1.950	37.7	0.164	44.0	0.272	-100.7

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

Freq (MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.976	-19.2	2.316	164.1	0.032	77.8	0.987	-7.2
200	0.959	-37.0	2.392	149.7	0.061	65.3	0.948	-14.1
400	0.917	-69.6	2.007	127.7	0.103	46.0	0.888	-22.7
600	0.869	-97.2	1.894	108.5	0.122	32.3	0.817	-30.4
800	0.826	-120.3	1.743	92.9	0.128	22.0	0.747	-36.9
1000	0.806	-136.9	1.422	79.5	0.131	15.4	0.763	-40.2
1200	0.774	-152.3	1.345	68.1	0.127	9.6	0.739	-45.5
1400	0.754	-164.6	1.206	58.0	0.123	5.5	0.734	-50.3
1600	0.745	-174.8	1.056	49.4	0.111	6.4	0.747	-55.0
1800	0.720	174.6	1.005	41.1	0.101	5.3	0.793	-59.3
2000	0.714	166.3	0.812	32.7	0.093	11.4	0.775	-64.6

## 2SC5501

$V_{CE}=5V, I_C=3mA, Z_0=50\Omega$

Freq (MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.935	-25.8	7.126	157.7	0.031	72.3	0.959	-12.4
200	0.864	-52.5	6.521	141.2	0.054	58.0	0.864	-23.1
400	0.790	-91.4	5.128	117.8	0.080	40.8	0.690	-35.7
600	0.705	-123.6	4.426	98.9	0.086	33.0	0.609	-40.1
800	0.658	-145.1	3.730	85.6	0.091	28.7	0.558	-44.2
1000	0.646	-157.6	2.953	75.4	0.095	27.1	0.521	-48.0
1200	0.628	-169.6	2.542	66.4	0.097	26.5	0.516	-51.6
1400	0.613	-179.5	2.221	57.9	0.098	29.5	0.516	-55.5
1600	0.607	172.2	1.974	51.2	0.102	32.8	0.528	-59.4
1800	0.607	164.8	1.697	43.6	0.105	33.7	0.534	-63.7
2000	0.599	157.5	1.578	36.9	0.113	36.4	0.527	-68.2

$V_{CE}=5V, I_C=7mA, Z_0=50\Omega$

Freq (MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.844	-39.2	14.003	150.3	0.028	65.9	0.886	-22.4
200	0.748	-74.3	12.502	129.9	0.044	50.9	0.712	-35.2
400	0.637	-120.9	8.689	105.1	0.059	41.2	0.515	-45.0
600	0.586	-146.5	6.395	90.2	0.066	40.3	0.423	-48.3
800	0.569	-161.6	4.930	80.2	0.073	41.5	0.387	-50.9
1000	0.556	-172.8	3.990	71.7	0.082	42.2	0.373	-53.7
1200	0.551	178.3	3.338	64.2	0.090	44.5	0.367	-57.2
1400	0.543	170.4	2.882	57.2	0.100	45.9	0.363	-61.2
1600	0.539	163.2	2.554	51.2	0.111	46.8	0.374	-64.7
1800	0.537	156.7	2.275	44.9	0.122	46.8	0.384	-68.6
2000	0.532	150.5	2.055	38.6	0.134	46.1	0.390	-72.6

$V_{CE}=5V, I_C=20mA, Z_0=50\Omega$

Freq (MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.668	-72.1	29.572	134.7	0.022	56.8	0.729	-36.1
200	0.572	-116.7	20.212	112.4	0.031	49.1	0.496	-48.2
400	0.527	-151.7	11.297	93.7	0.042	52.5	0.325	-52.4
600	0.514	-167.7	7.718	83.3	0.054	55.4	0.273	-53.6
800	0.511	-177.8	5.834	75.9	0.066	57.4	0.258	-55.7
1000	0.506	174.1	4.677	68.7	0.080	58.1	0.250	-58.7
1200	0.504	167.1	3.940	62.5	0.093	57.3	0.253	-62.5
1400	0.501	161.0	3.357	56.2	0.107	56.5	0.258	-66.5
1600	0.497	155.2	2.957	51.1	0.122	55.5	0.269	-70.6
1800	0.497	149.4	2.652	45.3	0.136	54.0	0.276	-74.5
2000	0.495	144.1	2.384	39.7	0.151	51.6	0.288	-78.5

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