



# 2SC5503

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

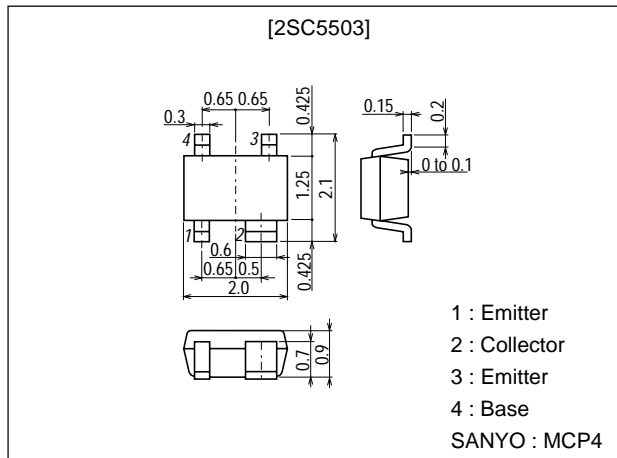
### Features

- Low noise :  $NF=1.2\text{dB typ (}f=1\text{GHz)}$ .
- High gain :  $|S_{21e}|^2=15\text{dB typ (}f=1\text{GHz)}$ .
- High cutoff frequency :  $f_T=9.0\text{GHz typ}$ .

### 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	$V_{CBO}$		16	V
Collector-to-Emitter Voltage	$V_{CEO}$		8	V
Emitter-to-Base Voltage	$V_{EBO}$		1.5	V
Collector Current	$I_C$		50	mA
Collector Dissipation	$P_C$	Mounted on a ceramic board (250mm <sup>2</sup> ×0.8mm)	400	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	$h_{FE}$	$V_{CE}=5\text{V}, I_C=15\text{mA}$	90*		270*	
Gain-Bandwidth Product	$f_T$	$V_{CE}=5\text{V}, I_C=15\text{mA}$		9.0		GHz
Output Capacitance	$C_{ob}$	$V_{CB}=10\text{V}, f=1\text{MHz}$		0.6	1.1	pF
Reverse Transfer Capacitance	$C_{re}$	$V_{CB}=10\text{V}, f=1\text{MHz}$		0.3		pF

\* : The 2SC5503 is classified by 15mA  $h_{FE}$  as follows :

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

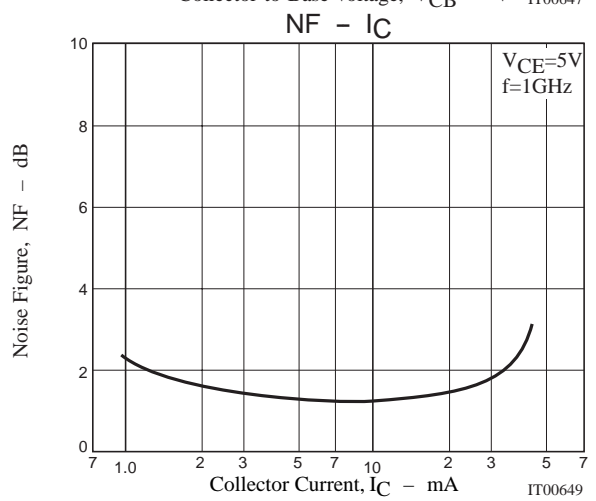
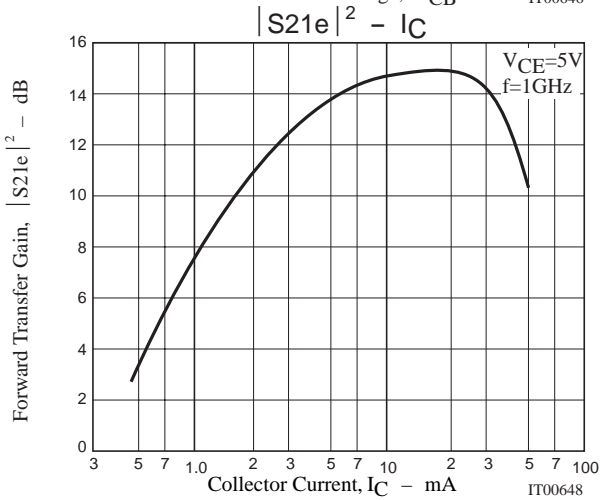
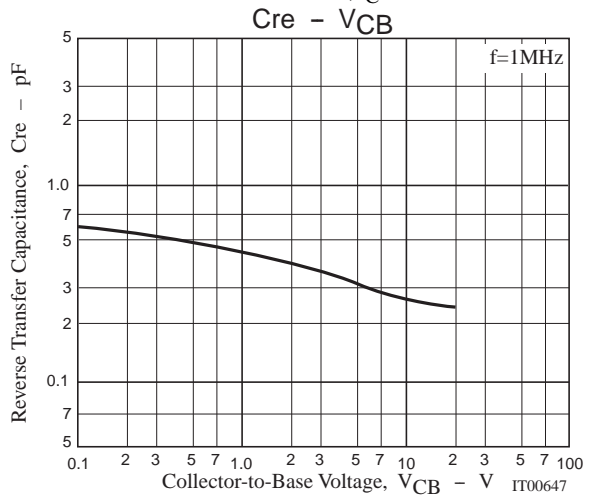
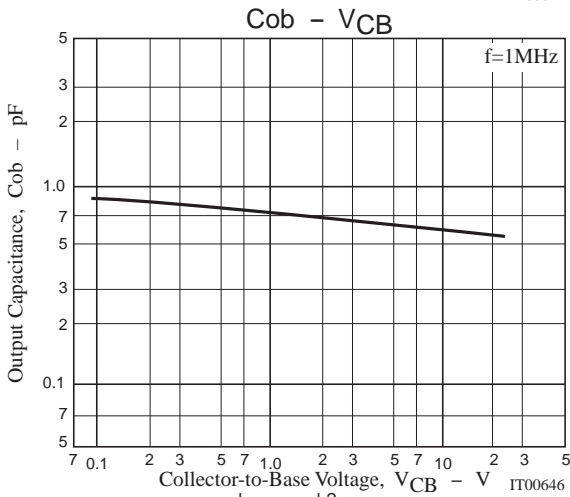
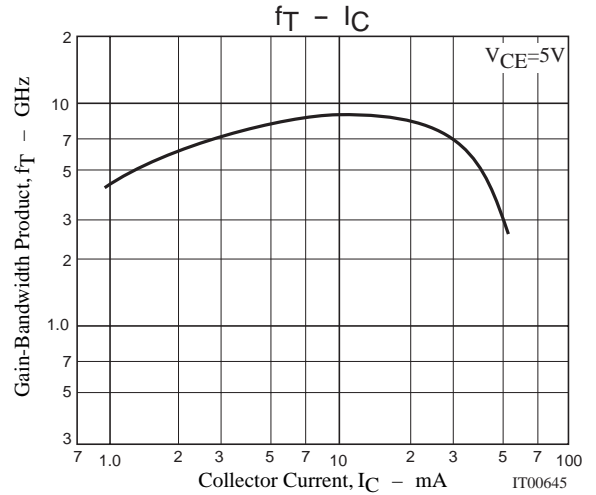
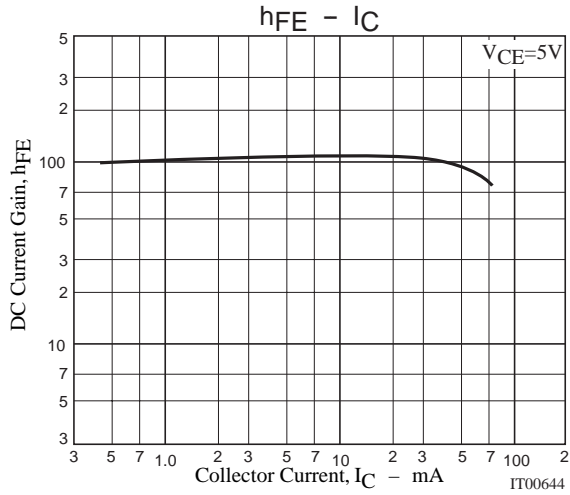
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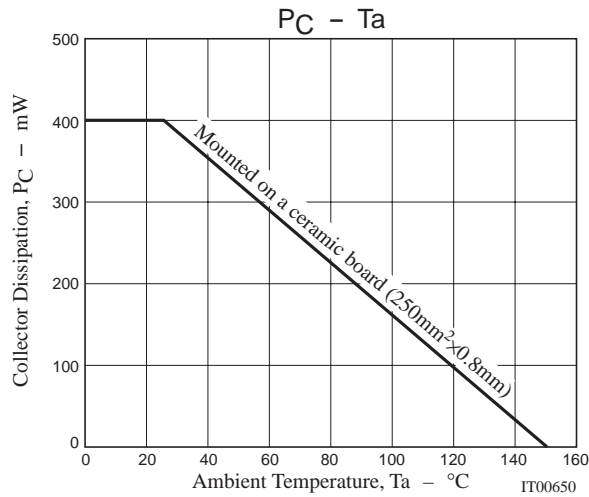
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Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Forward Transfer Gain	$ S_{21e} ^2$	$V_{CE}=5V, I_C=15mA, f=1GHz$	12	15		dB
Noise Figure	NF	$V_{CE}=5V, I_C=5mA, f=1GHz$		1.2	2.5	dB



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### 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	0.978	-11.2	2.735	166.9	0.030	81.5	0.990	-6.0
200	0.950	-24.0	2.456	155.8	0.059	72.5	0.967	-12.4
400	0.912	-44.5	2.225	137.6	0.108	57.7	0.896	-24.9
600	0.845	-66.6	2.181	121.0	0.134	45.6	0.840	-31.8
800	0.763	-89.1	2.297	105.2	0.156	35.6	0.783	-38.8
1000	0.745	-102.3	1.813	93.4	0.170	29.5	0.707	-45.4
1200	0.672	-121.1	1.837	81.0	0.174	23.0	0.687	-49.9
1400	0.638	-135.1	1.641	70.1	0.171	20.2	0.682	-53.4
1600	0.601	-148.7	1.514	61.3	0.165	19.4	0.670	-57.8
1800	0.578	-160.5	1.284	52.0	0.168	15.1	0.655	-61.9
2000	0.569	-171.0	1.286	43.6	0.162	17.9	0.626	-66.2

$V_{CE}=2V, I_C=5mA, Z_O=50\Omega$

Freq (MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.867	-24.3	10.957	156.6	0.028	73.8	0.933	-15.9
200	0.783	-45.5	9.406	140.8	0.048	62.3	0.812	-29.1
400	0.622	-84.4	7.739	116.6	0.071	50.6	0.610	-43.1
600	0.504	-113.8	6.123	99.4	0.086	47.0	0.508	-48.5
800	0.441	-135.3	4.951	87.5	0.098	46.0	0.446	-51.8
1000	0.402	-151.6	4.086	77.6	0.110	46.9	0.405	-54.9
1200	0.377	-165.8	3.524	69.2	0.123	46.6	0.393	-57.6
1400	0.368	-175.7	3.026	61.8	0.135	46.6	0.389	-60.9
1600	0.362	175.3	2.672	56.0	0.151	45.5	0.382	-63.8
1800	0.353	164.8	2.427	49.0	0.165	44.8	0.379	-67.6
2000	0.351	156.6	2.206	42.8	0.182	44.5	0.383	-71.0

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$V_{CE}=2V, I_C=10mA, Z_0=50\Omega$

Freq (MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.745	-37.2	18.245	149.0	0.025	68.9	0.858	-24.0
200	0.612	-70.0	15.211	128.7	0.041	59.0	0.674	-38.0
400	0.455	-113.3	10.170	104.5	0.057	54.1	0.465	-48.1
600	0.384	-140.0	7.289	90.5	0.073	55.3	0.381	-51.2
800	0.359	-157.0	5.621	81.3	0.088	55.9	0.338	-53.2
1000	0.345	-169.2	4.530	73.4	0.105	55.8	0.316	-55.4
1200	0.336	179.5	3.855	66.3	0.122	54.9	0.308	-58.4
1400	0.330	170.2	3.306	59.7	0.139	54.1	0.306	-62.0
1600	0.328	162.3	2.928	54.2	0.156	52.2	0.311	-65.1
1800	0.328	154.2	2.637	48.1	0.175	50.6	0.310	-68.9
2000	0.328	146.7	2.380	42.4	0.193	48.7	0.316	-72.6

$V_{CE}=2V, I_C=15mA, Z_0=50\Omega$

Freq (MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.643	-50.0	23.482	143.0	0.022	67.2	0.804	-28.7
200	0.508	-88.2	17.997	120.8	0.036	59.3	0.590	-42.0
400	0.390	-131.0	10.891	98.7	0.052	59.1	0.398	-48.9
600	0.356	-152.1	7.550	87.3	0.068	59.7	0.327	-50.4
800	0.343	-166.9	5.766	78.9	0.086	60.3	0.298	-52.1
1000	0.335	-178.2	4.650	71.4	0.104	59.8	0.283	-54.7
1200	0.330	172.4	3.934	64.9	0.122	58.5	0.281	-57.8
1400	0.327	164.4	3.364	58.7	0.140	57.2	0.279	-61.5
1600	0.325	157.1	2.982	53.4	0.159	55.0	0.284	-64.8
1800	0.328	149.2	2.683	47.5	0.178	52.8	0.289	-68.9
2000	0.327	142.5	2.426	41.9	0.197	50.3	0.294	-72.6

$V_{CE}=5V, I_C=1mA, Z_0=50\Omega$

Freq (MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.975	-11.0	2.523	168.1	0.024	81.1	0.994	-5.4
200	0.962	-21.2	2.045	158.4	0.047	74.1	0.976	-10.3
400	0.927	-41.1	2.215	140.2	0.088	60.0	0.925	-20.3
600	0.855	-62.8	2.270	123.7	0.116	49.2	0.892	-25.9
800	0.803	-80.8	2.055	110.3	0.130	39.3	0.831	-33.1
1000	0.765	-97.0	1.853	97.5	0.142	32.9	0.772	-38.4
1200	0.690	-115.2	1.867	85.0	0.140	28.2	0.728	-43.5
1400	0.615	-132.6	1.851	73.4	0.143	25.1	0.729	-46.8
1600	0.600	-144.0	1.624	64.9	0.146	21.2	0.754	-50.2
1800	0.582	-155.5	1.503	55.5	0.142	20.9	0.702	-54.6
2000	0.527	-169.9	1.390	47.0	0.139	23.9	0.718	-58.0

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

Freq (MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.881	-21.7	10.542	158.6	0.023	76.3	0.947	-13.4
200	0.806	-40.6	9.637	142.8	0.040	64.6	0.839	-24.0
400	0.638	-76.7	8.085	119.3	0.061	53.2	0.681	-34.6
600	0.521	-102.7	6.372	103.0	0.074	49.4	0.573	-39.2
800	0.436	-124.9	5.262	90.4	0.085	48.4	0.513	-42.0
1000	0.381	-142.5	4.419	79.8	0.095	50.2	0.487	-44.2
1200	0.357	-156.0	3.792	71.7	0.107	49.6	0.472	-46.7
1400	0.338	-167.4	3.253	64.1	0.119	49.4	0.464	-49.7
1600	0.335	-176.3	2.859	58.4	0.131	49.5	0.461	-52.4
1800	0.316	171.2	2.634	51.3	0.145	49.4	0.466	-55.7
2000	0.316	162.6	2.377	45.0	0.160	48.8	0.467	-58.9

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

Freq (MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.776	-32.1	18.500	151.2	0.020	70.4	0.890	-19.1
200	0.638	-61.2	15.777	131.6	0.034	62.6	0.732	-30.0
400	0.451	-102.4	10.900	107.1	0.050	56.7	0.538	-37.8
600	0.360	-129.3	7.927	92.7	0.063	57.6	0.459	-39.4
800	0.325	-147.1	6.112	83.4	0.076	58.4	0.422	-40.9
1000	0.305	-160.4	4.949	75.3	0.091	58.3	0.402	-42.7
1200	0.293	-172.0	4.188	68.4	0.106	57.9	0.397	-45.2
1400	0.285	177.7	3.600	61.6	0.120	57.4	0.393	-48.3
1600	0.280	168.6	3.191	56.3	0.137	56.2	0.398	-51.4
1800	0.281	160.3	2.881	50.3	0.153	54.4	0.399	-54.8
2000	0.280	152.0	2.607	44.4	0.169	52.8	0.404	-58.3

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

Freq (MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.683	-41.4	24.196	145.9	0.019	70.5	0.843	-22.7
200	0.524	-76.6	19.160	123.9	0.030	61.6	0.654	-32.9
400	0.373	-117.4	11.820	101.5	0.045	60.4	0.479	-37.3
600	0.318	-141.2	8.273	89.3	0.059	61.7	0.416	-37.9
800	0.296	-157.5	6.341	80.9	0.074	62.2	0.388	-39.0
1000	0.284	-169.6	5.112	73.4	0.090	61.9	0.377	-41.0
1200	0.278	179.7	4.321	66.9	0.106	61.2	0.374	-43.8
1400	0.274	170.7	3.700	60.5	0.122	59.8	0.372	-47.1
1600	0.272	162.7	3.271	55.4	0.138	58.6	0.379	-50.3
1800	0.273	154.4	2.952	49.6	0.156	56.3	0.382	-53.8
2000	0.273	147.1	2.671	44.0	0.173	54.4	0.387	-57.6

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