

**2SC5541**

## UHF to S Band Low-Noise Amplifier Applications

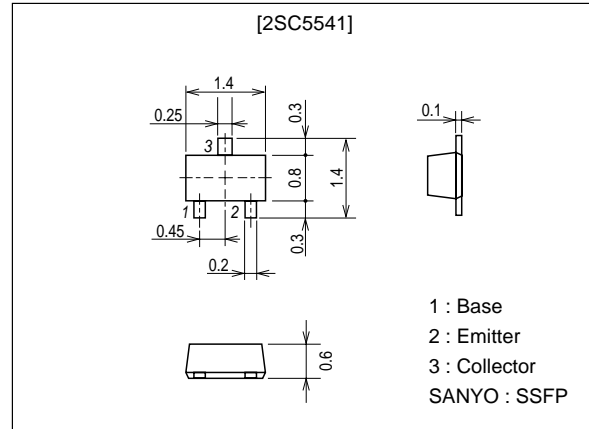
### Features

- Low noise :  $NF=1.2\text{dB typ (}f=2\text{GHz)}$ .
- High gain :  $|S_{21e}|^2=10\text{dB typ (}f=2\text{GHz)}$ .
- High cutoff frequency :  $f_T=13\text{GHz typ}$ .
- Ultrasmall, slim flat-lead package.  
(1.4mm × 0.8mm × 0.6mm)

### Package Dimensions

unit:mm

2159



### Specifications

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

Parameter	Symbol	Conditions	Ratings	Unit
Collector-to-Base Voltage	$V_{CB0}$		9	V
Collector-to-Emitter Voltage	$V_{CEO}$		6	V
Emitter-to-Base Voltage	$V_{EBO}$		1.5	V
Collector Current	$I_C$		30	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	$I_{CBO}$	$V_{CB}=5\text{V}, I_E=0$			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	$h_{FE}$	$V_{CE}=5\text{V}, I_C=10\text{mA}$	90		200	
Gain-Bandwidth Product	$f_T$	$V_{CE}=5\text{V}, I_C=10\text{mA}$	10	13		GHz
Reverse Transfer Capacitance	Cre	$V_{CB}=5\text{V}, f=1\text{MHz}$		0.3	0.6	pF
Forward Transfer Gain	$ S_{21e} ^2 1$	$V_{CE}=5\text{V}, I_C=10\text{mA}, f=2\text{GHz}$	8	10		dB
	$ S_{21e} ^2 2$	$V_{CE}=1\text{V}, I_C=3\text{mA}, f=2\text{GHz}$		8		dB
Noise Figure	NF	$V_{CE}=5\text{V}, I_C=5\text{mA}, f=2\text{GHz}$		1.2	2.0	dB

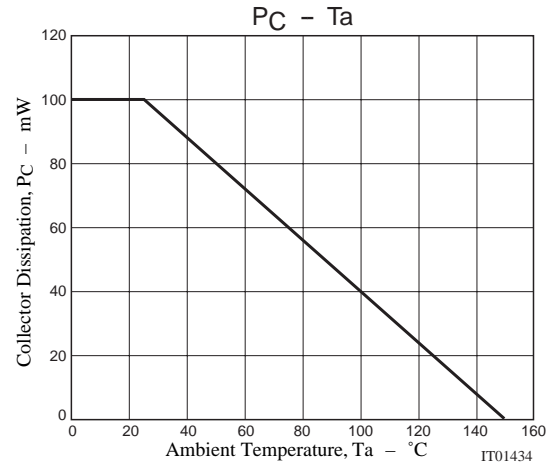
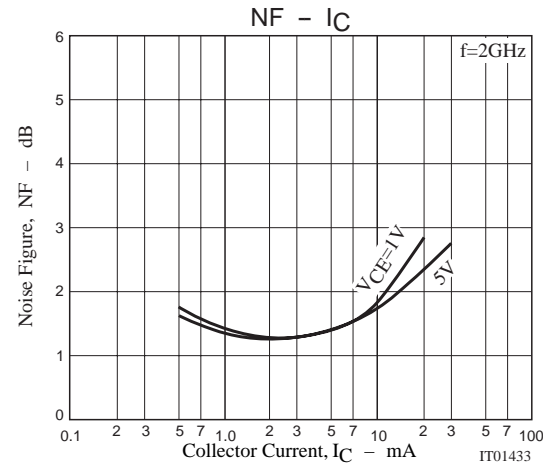
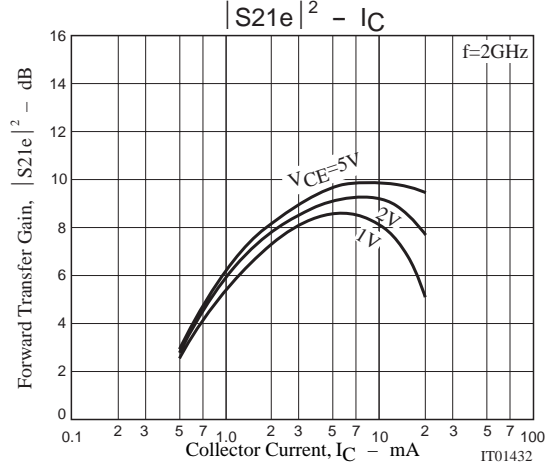
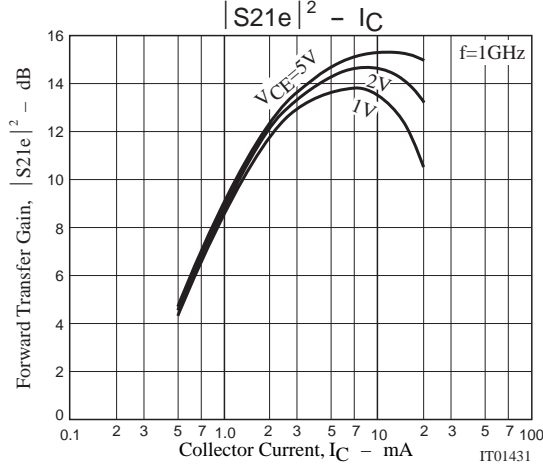
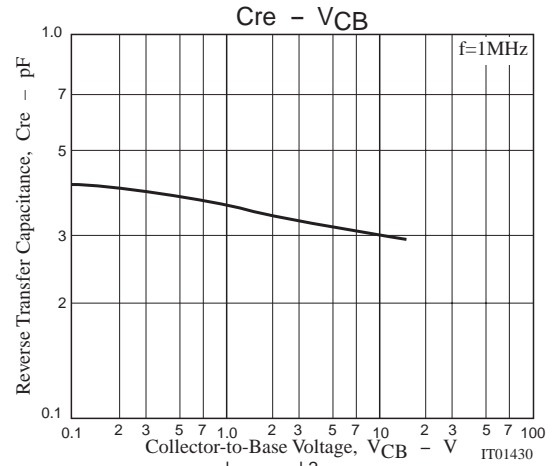
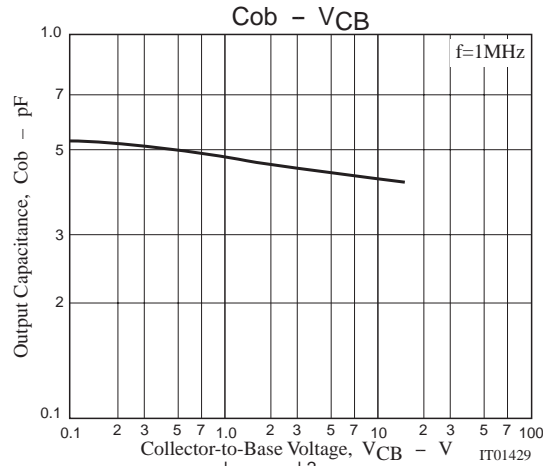
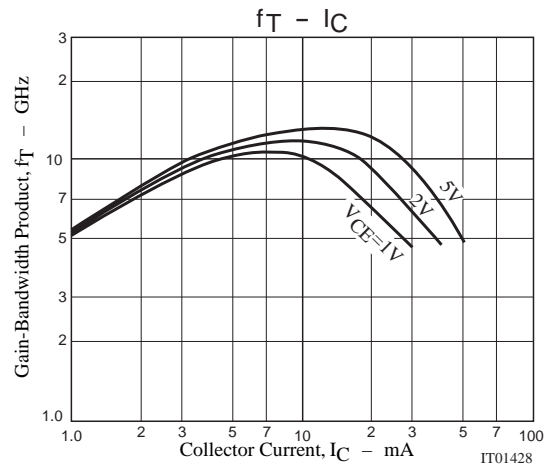
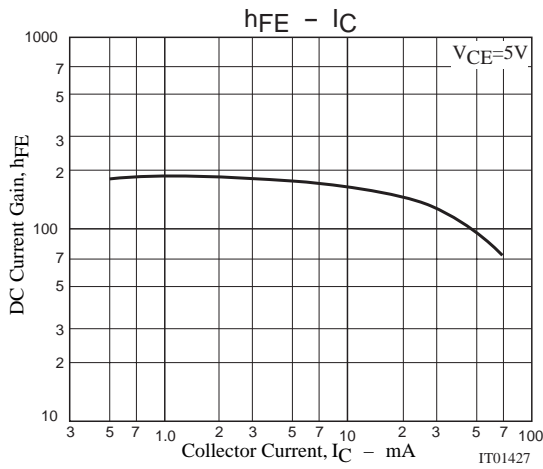
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### S Parameters (Common emitter)

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

Freq (MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.972	-7.4	3.143	173.0	0.025	85.2	0.994	-4.9
200	0.963	-13.9	3.438	164.9	0.049	79.1	0.981	-9.6
400	0.928	-28.6	3.072	153.3	0.093	70.0	0.945	-18.7
600	0.885	-40.7	2.860	142.2	0.129	61.6	0.886	-27.2
800	0.833	-52.5	2.719	131.0	0.157	54.8	0.833	-33.8
1000	0.784	-62.8	2.701	119.8	0.182	49.1	0.801	-38.4
1200	0.731	-72.3	2.470	111.1	0.198	44.0	0.758	-43.5
1400	0.682	-80.9	2.272	103.8	0.208	40.3	0.716	-48.1
1600	0.640	-88.5	2.113	97.1	0.216	37.5	0.680	-51.8
1800	0.594	-96.0	1.848	92.1	0.215	35.8	0.624	-56.1
2000	0.563	-101.8	1.742	86.4	0.218	34.4	0.598	-58.7

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

Freq (MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.924	-12.8	8.738	168.4	0.024	82.4	0.979	-8.9
200	0.883	-25.4	8.068	158.5	0.046	73.9	0.939	-17.3
400	0.795	-47.3	7.223	140.3	0.081	62.9	0.831	-30.8
600	0.694	-65.9	6.175	126.2	0.103	55.3	0.718	-40.5
800	0.609	-80.7	5.293	115.1	0.119	50.6	0.624	-47.1
1000	0.546	-92.1	4.576	106.6	0.131	48.1	0.549	-51.8
1200	0.496	-101.8	4.016	99.1	0.140	46.9	0.500	-55.0
1400	0.456	-110.4	3.562	92.8	0.148	46.6	0.463	-57.7
1600	0.423	-117.8	3.221	87.5	0.157	46.9	0.437	-59.9
1800	0.396	-124.7	2.950	82.2	0.165	47.3	0.422	-61.6
2000	0.371	-130.9	2.701	77.9	0.174	48.1	0.406	-63.1

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

Freq (MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.878	-17.5	12.575	165.2	0.023	80.7	0.964	-11.8
200	0.816	-33.9	11.443	152.8	0.044	71.1	0.896	-22.3
400	0.692	-60.7	9.521	132.1	0.072	59.7	0.740	-37.5
600	0.582	-80.9	7.660	117.9	0.089	53.9	0.609	-46.5
800	0.501	-96.1	6.284	107.6	0.101	52.2	0.515	-52.0
1000	0.445	-107.9	5.301	99.9	0.113	51.9	0.445	-55.5
1200	0.407	-117.2	4.558	93.4	0.123	52.1	0.402	-57.6
1400	0.378	-125.2	3.988	88.0	0.134	52.7	0.372	-59.5
1600	0.355	-132.3	3.572	83.4	0.145	53.7	0.353	-60.9
1800	0.337	-138.4	3.234	78.9	0.155	54.5	0.341	-62.1
2000	0.319	-144.5	2.949	75.2	0.166	55.0	0.332	-63.0

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$V_{CE}=5V, I_C=10mA, Z_0=50\Omega$

Freq (MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.791	-25.7	18.873	159.7	0.022	76.6	0.933	-16.5
200	0.700	-47.9	16.389	143.5	0.039	66.5	0.817	-29.5
400	0.548	-80.3	11.932	121.7	0.060	58.0	0.604	-45.1
600	0.455	-101.3	8.981	108.4	0.073	56.3	0.474	-51.5
800	0.399	-116.5	7.081	99.6	0.086	57.1	0.395	-54.9
1000	0.362	-127.9	5.836	93.3	0.098	58.5	0.344	-56.5
1200	0.339	-136.5	4.954	87.8	0.110	59.7	0.314	-57.5
1400	0.321	-143.7	4.295	83.3	0.123	61.0	0.293	-58.6
1600	0.308	-150.0	3.821	79.3	0.136	61.6	0.281	-59.3
1800	0.296	-155.3	3.450	75.4	0.150	61.7	0.273	-60.0
2000	0.286	-160.7	3.136	71.9	0.163	62.1	0.269	-60.6

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

Freq (MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.968	-8.3	3.360	172.1	0.029	84.1	0.992	-5.7
200	0.958	-15.5	3.297	164.7	0.057	77.6	0.974	-11.2
400	0.916	-32.1	3.354	150.2	0.107	68.2	0.939	-20.7
600	0.868	-45.1	2.806	138.1	0.147	58.7	0.867	-31.2
800	0.810	-57.8	2.590	126.8	0.177	51.5	0.800	-38.8
1000	0.758	-68.9	2.508	116.7	0.200	45.6	0.755	-43.8
1200	0.704	-79.0	2.307	107.8	0.215	40.8	0.708	-48.9
1400	0.656	-88.0	2.132	100.1	0.226	37.1	0.667	-53.5
1600	0.616	-95.8	1.994	93.3	0.235	34.1	0.634	-57.2
1800	0.571	-103.7	1.831	86.9	0.241	31.4	0.596	-61.3
2000	0.542	-109.8	1.714	81.3	0.242	29.8	0.572	-64.1

$V_{CE}=1V, I_C=3mA, Z_0=50\Omega$

Freq (MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.910	-15.2	8.785	167.2	0.028	80.4	0.972	-10.6
200	0.869	-29.1	8.118	155.9	0.053	71.7	0.919	-20.4
400	0.774	-53.8	7.103	136.8	0.091	60.0	0.799	-35.1
600	0.663	-75.3	5.903	122.4	0.114	51.9	0.672	-46.0
800	0.581	-91.1	4.976	111.1	0.130	47.6	0.577	-53.2
1000	0.530	-101.8	4.281	102.4	0.142	45.0	0.509	-58.2
1200	0.487	-111.7	3.727	95.0	0.151	44.4	0.460	-62.0
1400	0.453	-120.3	3.285	89.0	0.159	44.1	0.423	-65.2
1600	0.428	-127.7	2.963	83.7	0.168	44.3	0.396	-67.6
1800	0.403	-135.6	2.692	78.7	0.177	44.9	0.376	-69.6
2000	0.384	-142.0	2.471	74.4	0.185	45.6	0.361	-71.2

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

Freq (MHz)	S <sub>11</sub>	∠ S <sub>11</sub>	S <sub>21</sub>	∠ S <sub>21</sub>	S <sub>12</sub>	∠ S <sub>12</sub>	S <sub>22</sub>	∠ S <sub>22</sub>
100	0.857	-21.1	12.331	163.7	0.027	78.3	0.954	-13.8
200	0.792	-39.6	11.318	149.6	0.050	68.1	0.872	-25.8
400	0.658	-70.8	9.000	128.2	0.079	56.1	0.691	-43.2
600	0.561	-91.5	7.120	113.8	0.097	51.3	0.555	-52.7
800	0.493	-107.4	5.760	103.6	0.109	49.5	0.463	-58.7
1000	0.448	-119.9	4.816	96.1	0.120	49.4	0.401	-62.5
1200	0.418	-129.5	4.125	89.9	0.131	50.0	0.361	-65.2
1400	0.395	-137.6	3.602	84.5	0.141	51.0	0.332	-67.5
1600	0.378	-144.6	3.221	79.9	0.153	51.9	0.313	-69.2
1800	0.364	-150.5	2.915	75.6	0.165	52.5	0.300	-70.5
2000	0.351	-156.3	2.663	71.6	0.176	53.2	0.291	-71.9

$V_{CE}=1V, I_C=10mA, Z_O=50\Omega$

Freq (MHz)	S <sub>11</sub>	∠ S <sub>11</sub>	S <sub>21</sub>	∠ S <sub>21</sub>	S <sub>12</sub>	∠ S <sub>12</sub>	S <sub>22</sub>	∠ S <sub>22</sub>
100	0.752	-33.0	18.187	156.6	0.026	74.2	0.901	-19.8
200	0.659	-59.8	15.275	138.5	0.044	62.9	0.760	-34.4
400	0.526	-97.2	10.561	116.3	0.064	53.9	0.535	-50.4
600	0.461	-118.5	7.741	103.8	0.077	53.6	0.410	-56.8
800	0.425	-133.0	6.044	95.4	0.090	55.1	0.341	-60.0
1000	0.404	-143.4	4.963	89.1	0.102	56.8	0.298	-61.8
1200	0.389	-151.3	4.204	83.7	0.115	58.5	0.274	-63.2
1400	0.377	-157.9	3.645	79.2	0.128	59.6	0.257	-64.6
1600	0.369	-163.4	3.245	75.2	0.143	60.7	0.248	-65.7
1800	0.360	-168.5	2.927	71.2	0.157	61.1	0.243	-66.6
2000	0.354	-173.2	2.663	67.7	0.171	61.5	0.242	-67.7

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