

**2SC5414**

High-Frequency Low-Noise Amplifier Applications

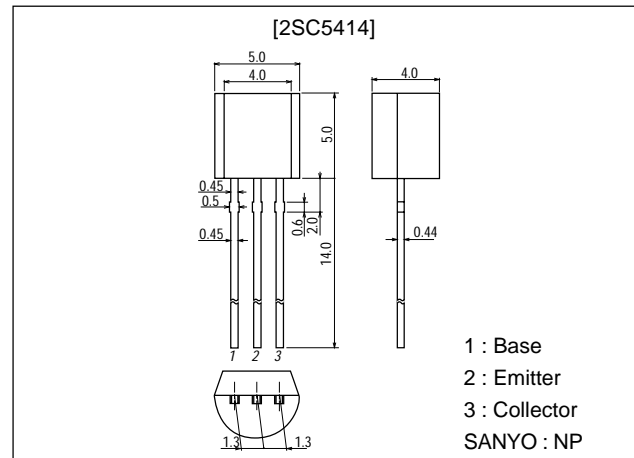
Features

- High gain : $|S_{21e}|^2=9.5\text{dB typ (f=1GHz)}$.
- High cutoff frequency : $f_T=6.7\text{GHz typ}$.

Package Dimensions

unit:mm

2004B



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}		12	V
Emitter-to-Base Voltage	V_{EB0}		2	V
Collector Current	I_C		100	mA
Collector Dissipation	P_C		400	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_{CB0}	$V_{CB}=10\text{V}, I_E=0$			1.0	μA
Emitter Cutoff Current	I_{EB0}	$V_{EB}=1\text{V}, I_C=0$			10	μA
DC Current Gain	h_{FE1}	$V_{CE}=5\text{V}, I_C=30\text{mA}$	90*		270*	
	h_{FE2}	$V_{CE}=5\text{V}, I_C=70\text{mA}$	70			
Gain-Bandwidth Product	f_T	$V_{CE}=5\text{V}, I_C=30\text{mA}$	5	6.7		GHz
Output Capacitance	C_{ob}	$V_{CB}=5\text{V}, f=1\text{MHz}$		1.0	1.5	pF
Reverse Transfer Capacitance	C_{re}	$V_{CB}=5\text{V}, f=1\text{MHz}$		0.6		pF
Forward Transfer Gain	$ S_{21e} ^2$	$V_{CE}=5\text{V}, I_C=30\text{mA}, f=1\text{GHz}$	8	9.5		dB
Noise Figure	NF	$V_{CE}=5\text{V}, I_C=7\text{mA}, f=1\text{GHz}$		1.1	2.0	dB

* The 2SC5414 is classified by 30mA h_{FE} as follows :

90	E	180	135	F	270
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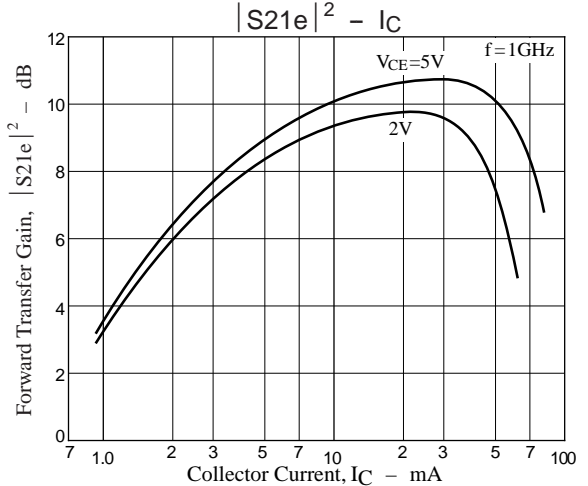
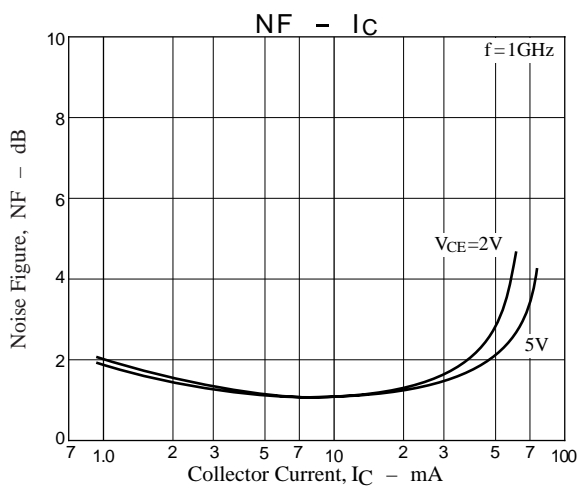
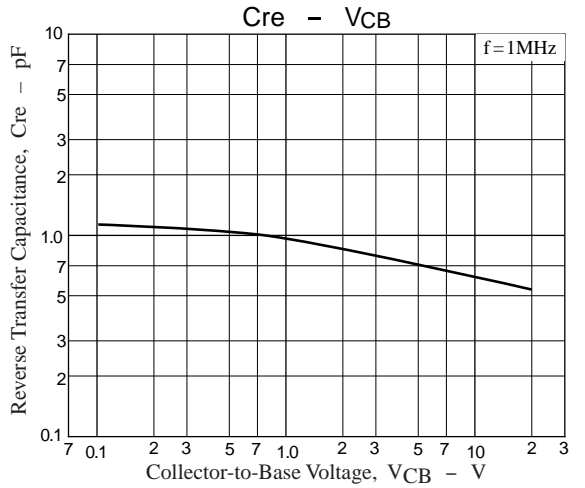
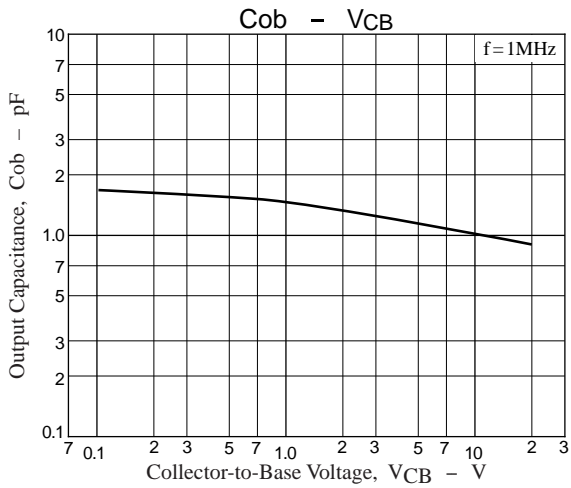
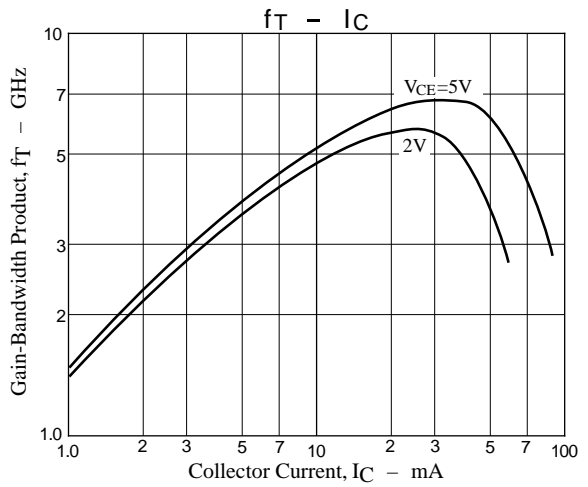
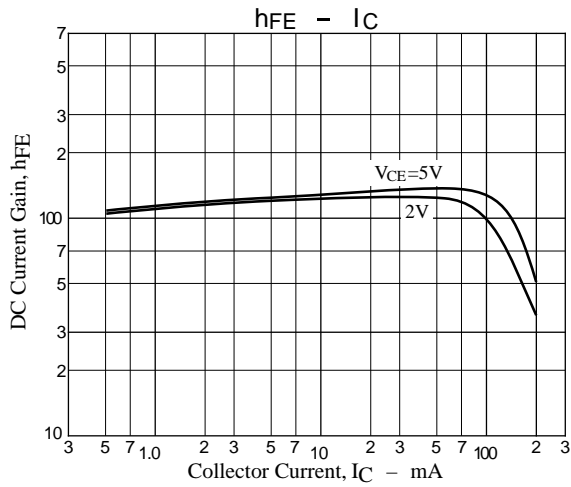
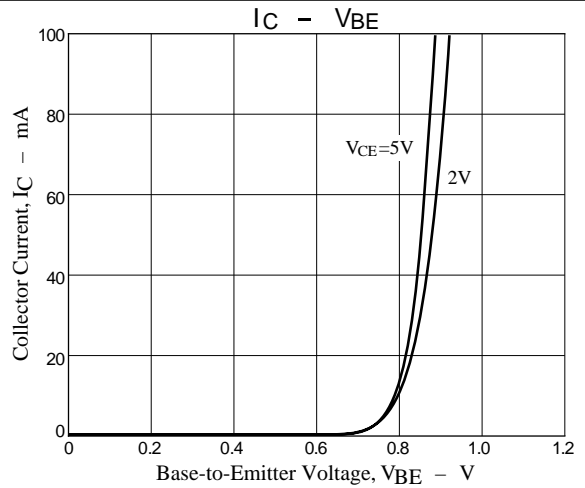
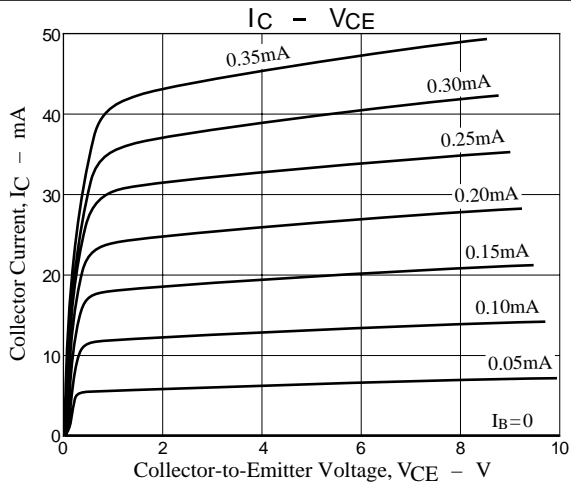
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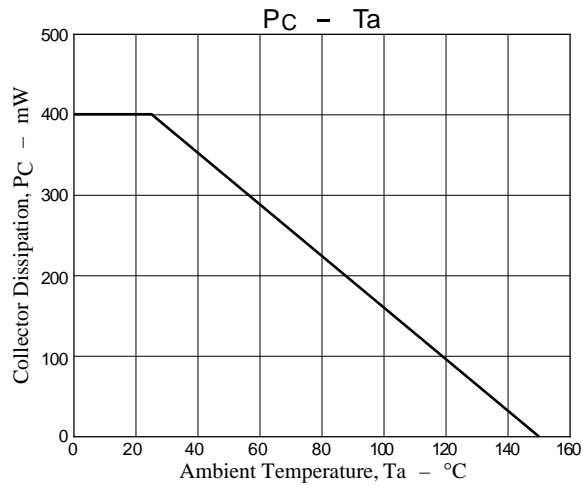
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2SC5414



2SC5414



S Parameters (Common emitter)

V_{CE}=2V, 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	0.789	-46.1	12.790	142.7	0.041	66.1	0.870	-25.4
200	0.604	-80.1	9.631	117.8	0.063	53.1	0.691	-39.5
400	0.404	-123.7	5.802	90.2	0.090	44.6	0.510	-51.7
600	0.331	-153.8	4.101	72.4	0.112	42.2	0.444	-58.8
800	0.297	-177.9	3.180	58.0	0.137	39.3	0.419	-66.4
1000	0.281	160.9	2.642	45.5	0.163	35.7	0.413	-74.1
1200	0.275	140.4	2.254	32.7	0.190	31.0	0.410	-82.5
1400	0.277	122.6	1.983	21.5	0.218	26.0	0.405	-90.9
1600	0.281	103.9	1.787	10.3	0.247	20.5	0.395	-99.8
1800	0.295	89.0	1.626	-0.1	0.278	14.4	0.390	-108.3
2000	0.314	73.5	1.511	-10.3	0.311	7.7	0.380	-117.5

V_{CE}=2V, 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	0.638	-60.1	18.641	131.8	0.036	63.1	0.754	-33.9
200	0.438	-95.8	12.165	107.7	0.054	55.5	0.549	-45.7
400	0.289	-138.8	6.728	84.2	0.083	53.2	0.392	-53.9
600	0.245	-168.0	4.654	69.1	0.113	50.5	0.348	-59.7
800	0.227	170.3	3.575	56.2	0.146	45.7	0.336	-67.3
1000	0.221	150.3	2.950	44.5	0.177	40.1	0.335	-75.3
1200	0.215	130.3	2.520	32.5	0.221	30.9	0.332	-86.7
1400	0.218	113.3	2.203	21.6	0.240	27.0	0.331	-92.3
1600	0.231	96.2	1.978	11.2	0.272	20.1	0.320	-101.1
1800	0.243	80.8	1.805	1.2	0.304	13.0	0.314	-109.7
2000	0.267	66.9	1.668	-8.9	0.336	5.5	0.306	-118.6

2SC5414

$V_{CE}=2V, I_C=20mA, Z_O=50\Omega$

Freq (MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.476	-75.8	22.939	121.7	0.031	62.9	0.633	-40.4
200	0.317	-113.1	13.544	100.3	0.047	61.2	0.427	-48.3
400	0.227	-155.0	7.193	80.3	0.081	59.5	0.319	-53.3
600	0.206	178.6	4.913	66.5	0.116	55.1	0.293	-59.0
800	0.195	158.2	3.764	54.3	0.151	49.1	0.289	-67.1
1000	0.194	139.7	3.091	43.4	0.186	42.4	0.291	-75.4
1200	0.198	121.4	2.632	32.0	0.220	34.9	0.294	-84.4
1400	0.204	105.8	2.305	21.3	0.253	27.5	0.290	-93.3
1600	0.213	89.2	2.066	11.2	0.285	20.1	0.281	-102.3
1800	0.230	75.2	1.881	1.5	0.318	12.5	0.275	-111.0
2000	0.252	62.9	1.742	-8.4	0.350	4.6	0.264	-120.0

$V_{CE}=2V, I_C=30mA, Z_O=50\Omega$

Freq (MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.403	-88.7	23.847	116.6	0.028	63.5	0.561	-42.5
200	0.284	-126.8	13.541	96.9	0.045	63.7	0.380	-47.5
400	0.228	-167.6	7.074	78.2	0.081	61.5	0.295	-51.3
600	0.217	169.3	4.827	65.0	0.116	56.8	0.275	-57.2
800	0.213	151.0	3.687	52.8	0.153	50.3	0.276	-66.0
1000	0.211	134.3	3.034	42.2	0.188	43.2	0.281	-74.9
1200	0.216	117.8	2.579	30.8	0.223	35.5	0.283	-84.2
1400	0.222	103.1	2.262	20.4	0.256	27.9	0.280	-93.2
1600	0.238	87.6	2.029	10.3	0.289	20.3	0.271	-102.4
1800	0.248	74.2	1.840	0.3	0.321	12.6	0.265	-111.2
2000	0.271	61.6	1.706	-9.7	0.354	4.5	0.254	-120.5

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

Freq (MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.807	-41.4	12.983	145.1	0.032	68.1	0.899	-20.6
200	0.627	-72.5	10.034	120.7	0.052	55.7	0.748	-32.3
400	0.399	-114.4	6.208	92.5	0.074	47.6	0.590	-42.7
600	0.314	-144.0	4.422	74.9	0.093	54.2	0.532	-49.4
800	0.266	-169.8	3.425	60.3	0.115	42.9	0.514	-56.8
1000	0.242	168.7	2.831	47.9	0.137	39.8	0.512	-64.6
1200	0.230	146.1	2.422	35.3	0.161	35.8	0.510	-72.6
1400	0.227	125.8	2.121	24.0	0.186	31.3	0.508	-80.8
1600	0.237	105.7	1.902	13.1	0.212	26.4	0.504	-89.1
1800	0.249	88.5	1.725	3.1	0.240	21.0	0.501	-97.2
2000	0.273	72.7	1.595	-7.2	0.271	14.8	0.497	-106.0

2SC5414

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

Freq (MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.664	-52.5	19.156	134.9	0.029	65.7	0.807	-26.7
200	0.450	-85.2	13.004	110.4	0.044	58.6	0.621	-36.3
400	0.264	-124.5	7.320	86.3	0.069	55.5	0.490	-42.7
600	0.206	-153.2	5.075	70.9	0.095	53.3	0.450	-48.6
800	0.175	-178.9	3.884	58.1	0.122	48.7	0.444	-56.0
1000	0.163	159.7	3.190	46.8	0.150	43.8	0.446	-64.0
1200	0.156	135.8	2.715	35.0	0.178	37.8	0.446	-72.4
1400	0.158	115.9	2.376	24.3	0.204	31.8	0.448	-80.6
1600	0.174	95.5	2.127	14.0	0.233	25.5	0.439	-88.9
1800	0.188	77.7	1.938	4.1	0.262	19.0	0.434	-96.9
2000	0.212	62.7	1.788	-5.6	0.292	12.0	0.431	-105.3

$V_{CE}=5V, I_C=30mA, Z_0=50\Omega$

Freq (MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.423	-71.0	26.259	120.2	0.024	66.3	0.647	-32.7
200	0.258	-103.4	15.300	99.6	0.038	65.6	0.482	-36.2
400	0.155	-145.0	8.070	80.5	0.068	63.8	0.405	-39.6
600	0.129	173.2	5.493	67.5	0.098	59.1	0.388	-45.9
800	0.119	161.6	4.203	55.9	0.129	53.1	0.390	-54.2
1000	0.116	140.1	3.436	45.4	0.160	46.5	0.396	-62.7
1200	0.119	117.4	2.914	34.2	0.190	39.4	0.401	-71.8
1400	0.129	98.0	2.545	24.3	0.219	32.5	0.398	-80.2
1600	0.146	79.7	2.284	14.2	0.249	25.3	0.393	-88.6
1800	0.160	65.1	2.064	4.9	0.278	18.2	0.389	-96.9
2000	0.187	54.4	1.913	-4.9	0.308	10.7	0.386	-105.3

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

Freq (MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.381	-82.7	25.958	114.6	0.023	65.6	0.611	-32.2
200	0.251	-120.2	14.443	95.9	0.037	65.8	0.465	-34.5
400	0.185	-164.6	7.561	78.0	0.067	64.0	0.405	-38.7
600	0.174	170.5	5.153	64.8	0.096	59.6	0.396	-46.0
800	0.163	149.4	3.904	52.8	0.127	53.5	0.401	-54.9
1000	0.167	130.7	3.194	41.9	0.157	47.1	0.406	-63.5
1200	0.176	112.8	2.696	31.0	0.187	39.8	0.410	-72.9
1400	0.184	96.6	2.358	20.5	0.216	32.9	0.409	-81.5
1600	0.197	80.7	2.115	10.1	0.246	25.9	0.404	-90.3
1800	0.214	68.1	1.908	0.1	0.275	18.8	0.400	-98.2
2000	0.243	55.0	1.766	-9.6	0.305	11.1	0.392	-106.2

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