



SANYO Semiconductors

DATA SHEET

2SC5538A

NPN Epitaxial Planar Silicon Transistor
**VHF to UHF Band OSC,
 High-Frequency Amplifier Applications**

Features

- High gain : $|S_{21e}|^2=10.5\text{dB typ (f=1GHz)}$.
- High cut-off frequency : $f_T=5.2\text{GHz typ}$.
- Ultrasmall, slim flat-lead package (1.4mm×0.8mm×0.6mm).
- Halogen free compliance.

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}		2	V
Collector Current	I _C		100	mA
Collector Dissipation	P _C		100	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} =10V, I _E =0A			1.0	μA
Emitter Cutoff Current	I _{EBO}	V _{EB} =1V, I _C =0A			10	μA
DC Current Gain	h _{FE1}	V _{CE} =3V, I _C =7mA	110		200	
	h _{FE2}	V _{CE} =3V, I _C =30mA	100			
Gain-Bandwidth Product	f _T	V _{CE} =3V, I _C =7mA	3	5.2		GHz
Output Capacitance	C _{ob}	V _{CB} =3V, f=1MHz		1.0	1.5	pF
Reverse Transfer Capacitance	C _{re}	V _{CB} =3V, f=1MHz		0.7		pF

Marking : NA

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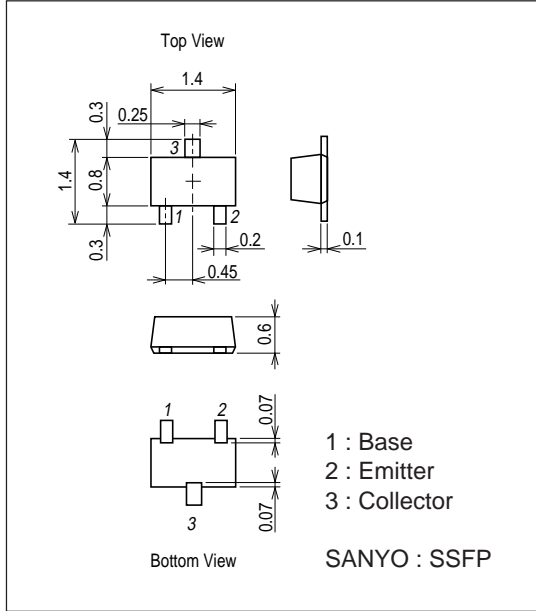
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Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Forward Transfer Gain	$ S_{21e} ^2$	$V_{CE}=3V, I_C=7mA, f=1GHz$	8	10.5		dB
Noise Figure	NF	$V_{CE}=3V, I_C=7mA, f=1GHz$		1.4	2.5	dB

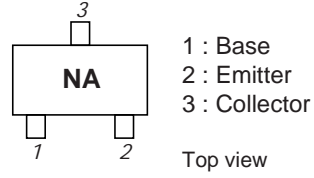
Package Dimensions

unit : mm (typ)

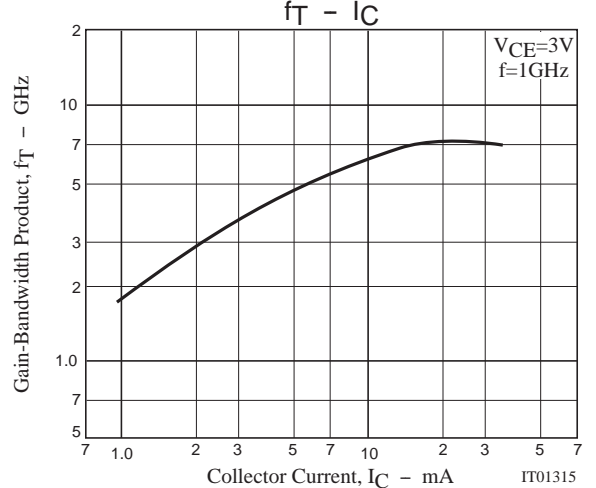
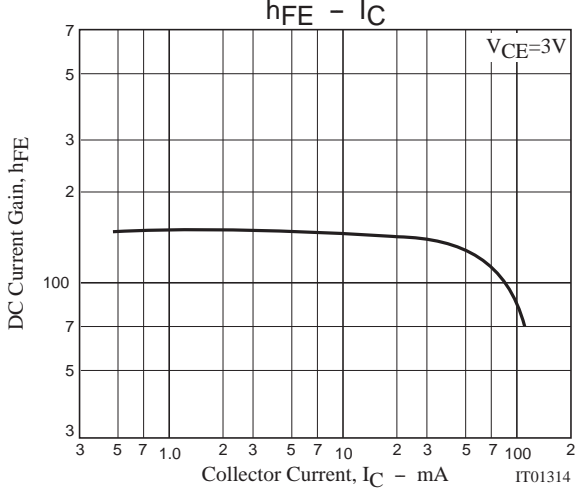
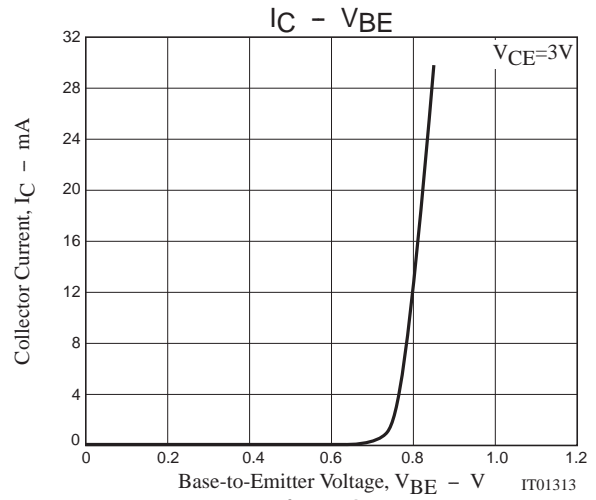
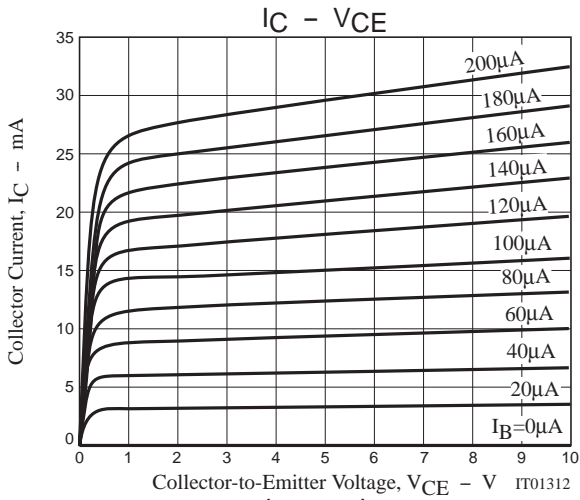
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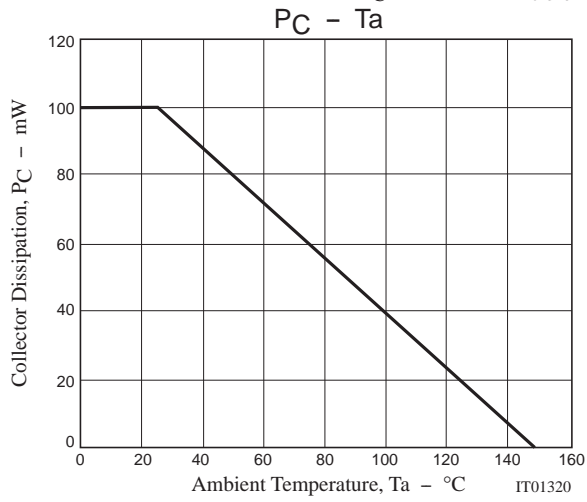
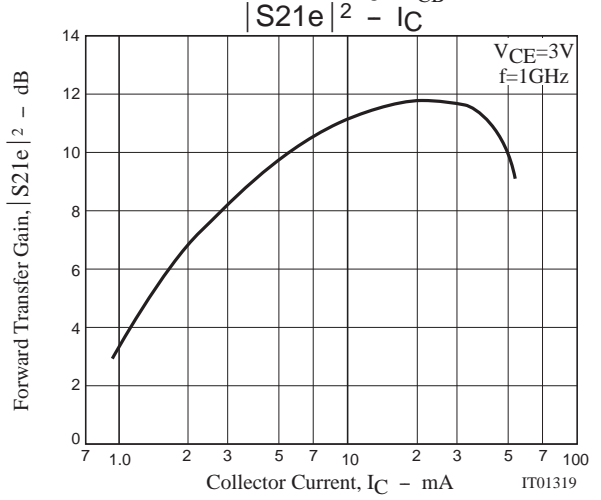
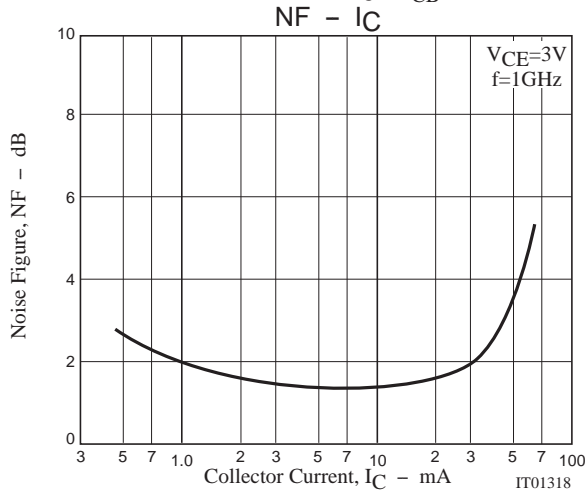
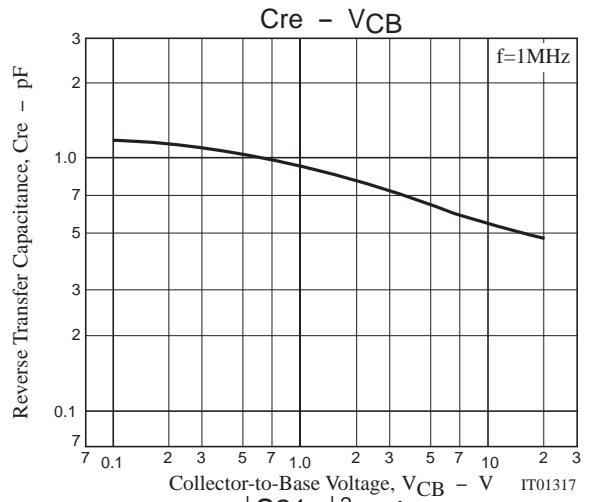
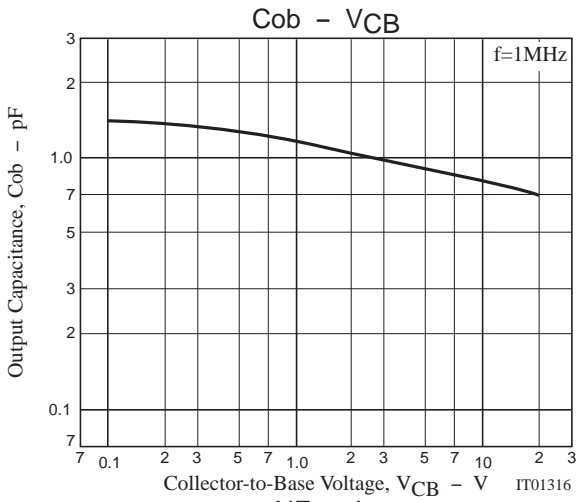
Marking



Top view



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S Parameters (Common emitter)

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

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.874	-40.6	8.627	152.3	0.062	67.9	0.918	-23.4
200	0.785	-71.6	6.874	132.5	0.101	52.1	0.748	-41.7
400	0.651	-114.8	4.701	107.3	0.135	37.1	0.537	-57.6
600	0.613	-136.9	3.365	92.8	0.152	31.1	0.430	-65.6
800	0.581	-153.9	2.716	81.9	0.155	29.9	0.361	-74.3
1000	0.568	-164.2	2.218	73.4	0.161	30.0	0.326	-80.2
1200	0.556	-172.0	1.863	66.2	0.170	30.5	0.300	-86.1
1400	0.563	-178.1	1.626	59.6	0.177	32.7	0.297	-92.3
1600	0.558	175.4	1.473	53.9	0.185	35.4	0.306	-96.5
1800	0.560	168.9	1.345	48.1	0.196	37.4	0.313	-100.6
2000	0.567	163.1	1.230	42.5	0.205	38.0	0.335	-102.9

$V_{CE}=3V, I_C=7mA, Z_O=50\Omega$

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.789	-48.3	16.232	147.7	0.039	66.1	0.862	-27.2
200	0.670	-83.7	12.431	126.4	0.061	53.0	0.673	-44.6
400	0.552	-123.8	7.607	104.7	0.081	45.2	0.438	-59.1
600	0.522	-145.3	5.401	92.7	0.094	45.9	0.333	-65.1
800	0.504	-158.5	4.155	84.1	0.106	48.2	0.290	-68.7
1000	0.488	-169.1	3.425	77.1	0.121	49.1	0.270	-71.0
1200	0.478	-176.1	2.849	71.0	0.136	51.0	0.253	-74.7
1400	0.481	178.4	2.511	65.6	0.152	52.2	0.239	-79.6
1600	0.478	172.7	2.237	60.7	0.167	52.8	0.240	-82.8
1800	0.492	167.4	2.016	55.5	0.185	53.2	0.245	-86.7
2000	0.489	162.0	1.844	50.5	0.200	52.7	0.248	-90.0

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

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.643	-66.4	26.381	137.4	0.029	62.8	0.748	-36.3
200	0.530	-104.6	17.543	116.5	0.041	54.2	0.531	-52.5
400	0.459	-140.3	9.835	98.9	0.058	55.4	0.322	-62.7
600	0.447	-157.2	6.805	89.4	0.074	59.2	0.246	-65.5
800	0.440	-168.4	5.210	82.4	0.092	61.4	0.213	-68.6
1000	0.434	-175.9	4.194	76.6	0.110	61.9	0.199	-70.2
1200	0.437	177.1	3.518	71.5	0.129	62.3	0.191	-72.9
1400	0.437	173.0	3.077	66.7	0.148	61.8	0.184	-76.5
1600	0.438	168.4	2.730	62.5	0.166	61.6	0.181	-80.9
1800	0.439	164.2	2.459	58.0	0.186	60.7	0.186	-84.8
2000	0.444	159.1	2.249	53.5	0.203	59.5	0.192	-87.3

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