



SANYO Semiconductors

DATA SHEET

2SC5539A — NPN Epitaxial Planar Silicon Transistor

VHF to UHF Low-Noise Amplifier and OSC Applications

Features

- Low noise : NF=1.1dB typ (f=1GHz).
- High gain : $|S_{21e}|^2=12\text{dB typ (f=1GHz)}$.
- High cut-off frequency : $f_T=7.5\text{GHz typ}$.
- 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}		12	V
Emitter-to-Base Voltage	V_{EB0}		2	V
Collector Current	I_C		100	mA
Collector Dissipation	P_C	When mounted on glass epoxy substrate	150	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}	$V_{CB}=10\text{V}, I_E=0\text{A}$			1.0	μA
Emitter Cutoff Current	I_{EBO}	$V_{EB}=1\text{V}, I_C=0\text{A}$			10	μA
DC Current Gain	h_{FE}	$V_{CE}=5\text{V}, I_C=30\text{mA}$	90		200	
Gain-Bandwidth Product	f_T	$V_{CE}=5\text{V}, I_C=30\text{mA}$	6	7.5		GHz
Output Capacitance	C_{ob}	$V_{CB}=5\text{V}, f=1\text{MHz}$		0.85	1.3	pF
Reverse Transfer Capacitance	C_{re}	$V_{CB}=5\text{V}, f=1\text{MHz}$		0.6		pF

Marking : ND

Continued on next page.

■ Any and all SANYO Semiconductor Co.,Ltd. products described or contained herein are, with regard to "standard application", intended for the use as general electronics equipment (home appliances, AV equipment, communication device, office equipment, industrial equipment etc.). The products mentioned herein shall not be intended for use for any "special application" (medical equipment whose purpose is to sustain life, aerospace instrument, nuclear control device, burning appliances, transportation machine, traffic signal system, safety equipment etc.) that shall require extremely high level of reliability and can directly threaten human lives in case of failure or malfunction of the product or may cause harm to human bodies, nor shall they grant any guarantee thereof. If you should intend to use our products for applications outside the standard applications of our customer who is considering such use and/or outside the scope of our intended standard applications, please consult with us prior to the intended use. If there is no consultation or inquiry before the intended use, our customer shall be solely responsible for the use.

■ Specifications of any and all SANYO Semiconductor Co.,Ltd. products described or contained herein stipulate the performance, characteristics, and functions of the described products in the independent state, and are not guarantees of the performance, characteristics, and functions of the described products as mounted in the customer's products or equipment. To verify symptoms and states that cannot be evaluated in an independent device, the customer should always evaluate and test devices mounted in the customer's products or equipment.

SANYO Semiconductor Co., Ltd.

www.semiconductor-sanyo.com/network

2SC5539A

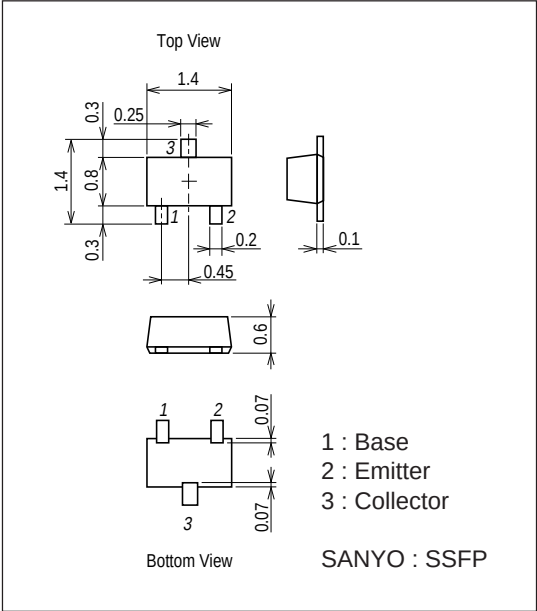
Continued from preceding page.

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Forward Transfer Gain	$ S_{21e} ^2$	$V_{CE}=5V, I_C=30mA, f=1GHz$	10	12		dB
Noise Figure	NF	$V_{CE}=5V, I_C=7mA, f=1GHz$		1.1	2.0	dB

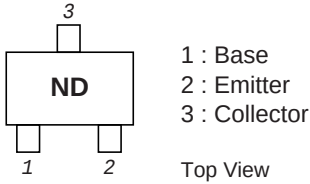
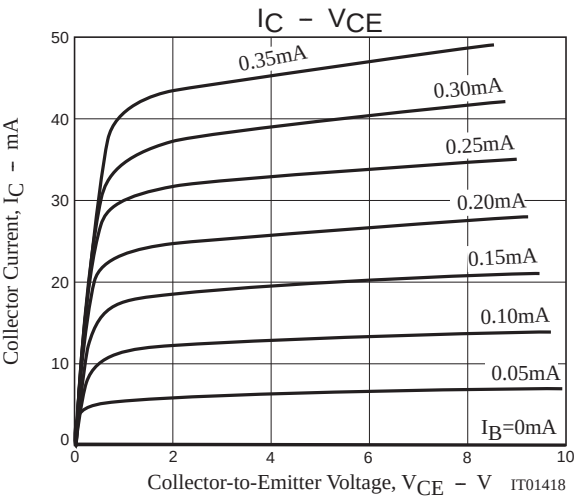
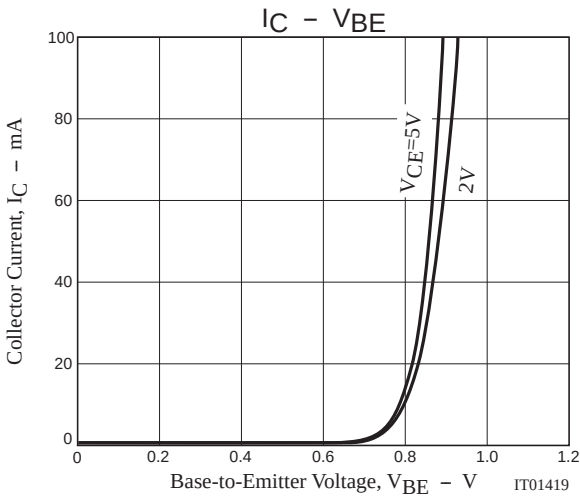
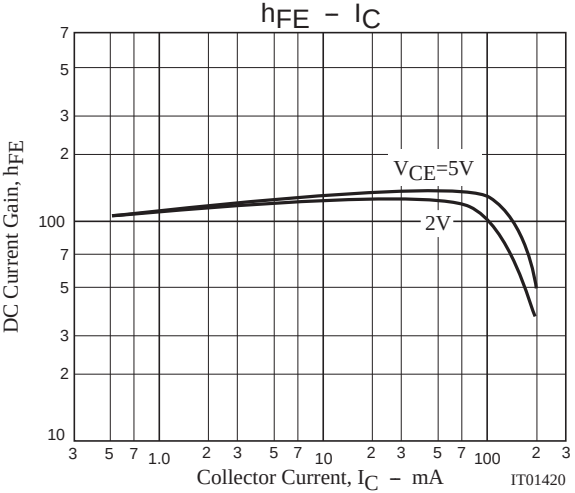
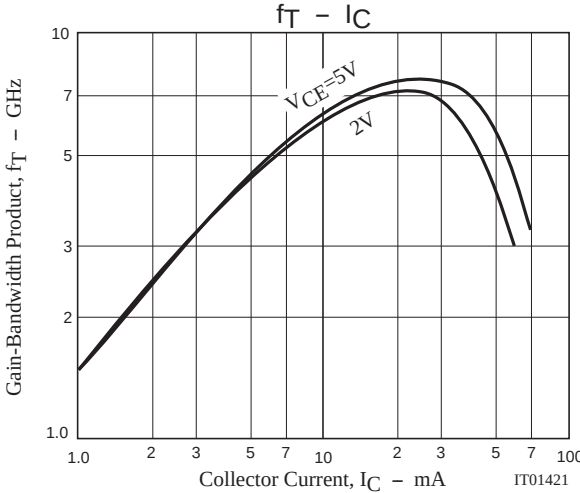
Package Dimensions

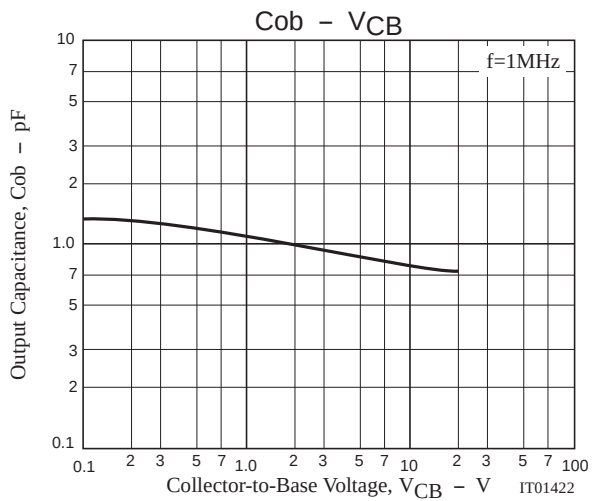
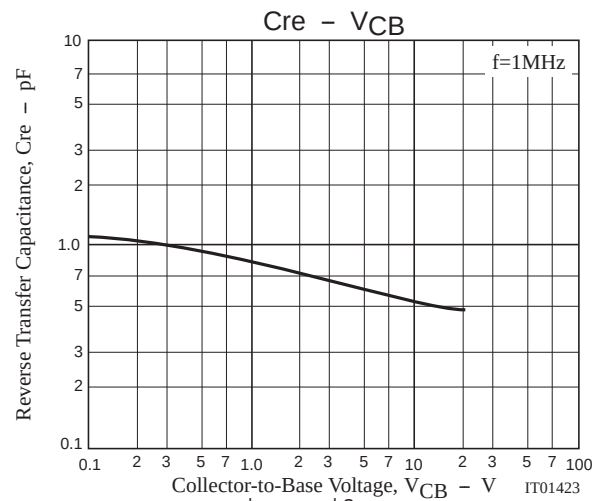
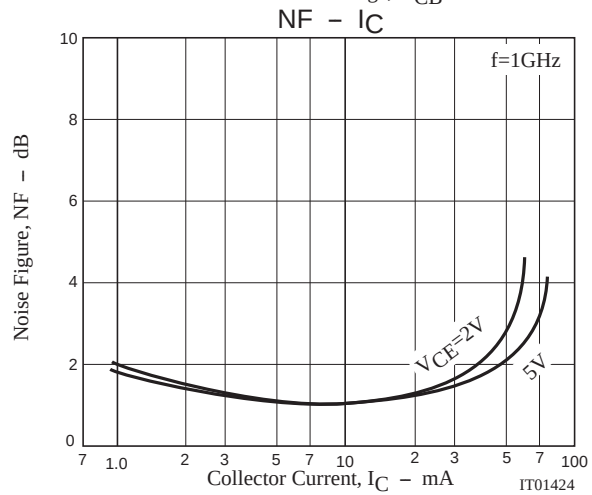
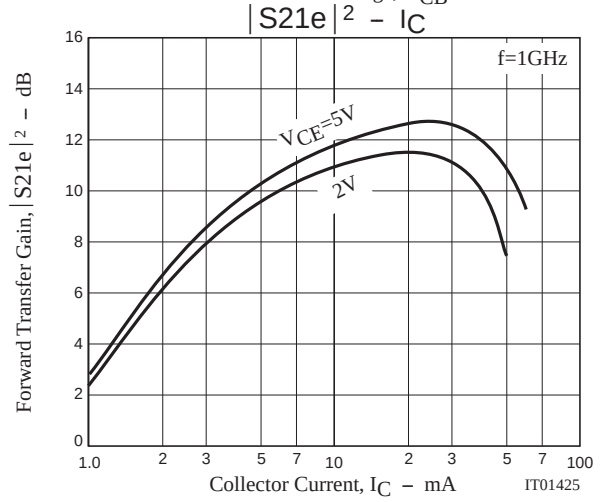
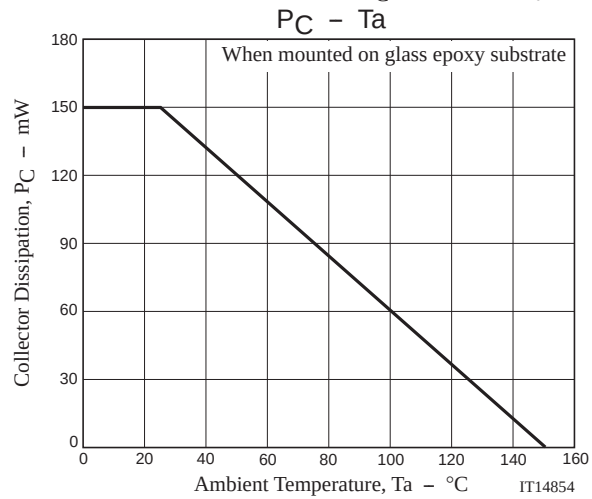
unit : mm (typ)

7029-002



Marking





2SC5539A

S Parameters (Common emitter)

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

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.828	-48.7	13.003	149.5	0.044	64.6	0.879	-25.1
200	0.741	-84.3	10.001	129.4	0.068	49.7	0.690	-40.4
400	0.666	-124.2	6.405	106.5	0.087	38.5	0.467	-53.3
600	0.640	-143.4	4.574	94.1	0.094	37.8	0.376	-57.5
800	0.626	-155.0	3.520	85.6	0.101	39.7	0.329	-60.6
1000	0.619	-163.0	2.852	79.0	0.108	42.9	0.301	-64.1
1200	0.613	-169.1	2.415	73.1	0.116	46.6	0.291	-67.1
1400	0.608	-174.2	2.098	67.9	0.125	50.0	0.287	-70.5
1600	0.604	-178.8	1.869	63.3	0.136	53.5	0.289	-73.7
1800	0.601	177.0	1.709	59.0	0.148	56.2	0.299	-76.4
2000	0.599	173.1	1.564	55.0	0.161	58.5	0.306	-79.5

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

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.731	-66.7	19.854	140.5	0.039	59.3	0.785	-37.3
200	0.649	-105.7	13.725	119.7	0.054	46.8	0.547	-55.9
400	0.605	-140.7	7.870	100.6	0.068	44.5	0.330	-71.5
600	0.591	-155.7	5.458	90.7	0.080	48.0	0.251	-77.2
800	0.585	-164.6	4.164	83.7	0.091	51.7	0.213	-81.2
1000	0.580	-170.7	3.383	78.2	0.105	55.6	0.195	-84.8
1200	0.575	-175.6	2.857	73.1	0.119	58.2	0.188	-87.8
1400	0.570	-179.9	2.476	68.7	0.134	60.0	0.186	-90.7
1600	0.568	176.3	2.204	64.6	0.150	61.3	0.188	-93.2
1800	0.563	172.6	1.995	60.6	0.167	62.1	0.193	-95.0
2000	0.560	169.2	1.822	57.0	0.184	62.4	0.197	-97.3

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

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.637	-88.2	26.053	131.0	0.032	55.5	0.668	-50.8
200	0.590	-126.0	16.158	111.8	0.043	47.8	0.422	-71.8
400	0.575	-153.8	8.749	96.1	0.057	52.2	0.247	-90.7
600	0.571	-164.9	5.965	88.0	0.072	57.5	0.187	-100.6
800	0.567	-171.7	4.528	82.2	0.089	61.1	0.161	-107.3
1000	0.563	-176.7	3.675	77.3	0.106	63.3	0.150	-112.0
1200	0.559	179.3	3.100	72.8	0.124	64.9	0.146	-115.0
1400	0.554	175.7	2.686	68.8	0.142	65.5	0.145	-117.6
1600	0.551	172.4	2.386	65.1	0.161	65.4	0.147	-119.1
1800	0.547	169.1	2.157	61.4	0.179	65.3	0.149	-119.9
2000	0.543	166.0	1.971	58.0	0.198	65.0	0.154	-120.5

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

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.601	-101.8	28.123	125.8	0.029	53.5	0.600	-57.7
200	0.578	-136.4	16.642	108.1	0.039	49.5	0.365	-79.2
400	0.575	-159.7	8.828	94.0	0.053	56.1	0.215	-99.5
600	0.573	-169.2	5.994	86.6	0.070	61.5	0.168	-110.4
800	0.570	-175.1	4.542	81.1	0.088	64.7	0.148	-117.6
1000	0.567	-179.4	3.681	76.5	0.106	66.6	0.140	-122.3
1200	0.562	177.0	3.109	72.2	0.125	67.5	0.137	-125.1
1400	0.558	173.6	2.690	68.3	0.144	67.7	0.138	-127.3
1600	0.555	170.6	2.391	64.6	0.163	67.3	0.140	-128.4
1800	0.551	167.5	2.161	61.1	0.183	66.8	0.143	-128.8
2000	0.547	164.4	1.975	57.7	0.202	65.9	0.146	-129.1

2SC5539A

S Parameters (Common emitter)

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

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.842	-43.0	13.211	152.2	0.035	68.0	0.905	-19.6
200	0.753	-76.7	10.474	132.8	0.056	53.0	0.746	-31.7
400	0.666	-116.6	6.960	109.6	0.073	41.7	0.542	-40.9
600	0.628	-137.8	5.029	96.7	0.081	40.2	0.452	-43.3
800	0.610	-150.4	3.885	87.9	0.086	42.6	0.409	-44.9
1000	0.602	-158.9	3.146	81.2	0.092	46.5	0.381	-47.0
1200	0.594	-165.4	2.663	75.3	0.100	50.4	0.371	-49.2
1400	0.589	-171.0	2.308	70.1	0.109	54.2	0.367	-52.0
1600	0.586	-175.8	2.054	65.5	0.118	57.8	0.369	-54.8
1800	0.581	179.7	1.876	61.1	0.129	60.5	0.378	-57.6
2000	0.578	175.5	1.713	57.1	0.141	63.5	0.383	-60.7

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

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.745	-58.2	20.417	144.3	0.031	63.5	0.829	-28.7
200	0.648	-96.1	14.809	123.3	0.046	50.4	0.612	-42.6
400	0.583	-133.3	8.762	103.2	0.059	46.3	0.398	-51.2
600	0.565	-149.8	6.104	92.8	0.069	50.1	0.318	-52.4
800	0.555	-159.9	4.666	85.6	0.079	54.1	0.281	-53.1
1000	0.548	-166.9	3.797	79.9	0.091	57.7	0.263	-54.4
1200	0.542	-172.1	3.203	74.7	0.104	60.8	0.255	-56.1
1400	0.538	-176.8	2.771	70.3	0.117	62.8	0.252	-58.6
1600	0.535	179.3	2.460	66.2	0.132	64.6	0.254	-60.8
1800	0.532	175.5	2.220	62.2	0.147	65.7	0.256	-63.3
2000	0.529	171.9	2.025	58.5	0.162	66.6	0.262	-65.9

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

Freq(MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.600	-87.0	30.637	130.8	0.024	57.5	0.670	-42.9
200	0.544	-124.7	18.945	111.8	0.033	52.0	0.427	-56.2
400	0.526	-152.5	10.236	96.4	0.047	58.2	0.255	-61.9
600	0.521	-163.7	6.972	88.5	0.061	63.3	0.198	-62.0
800	0.517	-170.7	5.289	82.8	0.077	66.4	0.174	-62.5
1000	0.514	-175.5	4.281	78.2	0.093	68.4	0.163	-63.3
1200	0.509	-179.5	3.605	73.8	0.109	69.6	0.160	-65.1
1400	0.505	177.1	3.115	69.9	0.126	70.1	0.160	-67.5
1600	0.503	173.8	2.764	66.3	0.143	70.0	0.163	-69.4
1800	0.499	170.7	2.492	62.7	0.160	70.0	0.167	-71.5
2000	0.496	167.6	2.270	59.3	0.178	69.5	0.173	-73.5

- SANYO Semiconductor Co.,Ltd. assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all SANYO Semiconductor Co.,Ltd. products described or contained herein.
- SANYO Semiconductor Co.,Ltd. strives to supply high-quality high-reliability products, however, any and all semiconductor products fail or malfunction with some probability. It is possible that these probabilistic failures or malfunction could give rise to accidents or events that could endanger human lives, trouble that could give rise to smoke or fire, or accidents that could cause damage to other property. When designing equipment, adopt safety measures so that these kinds of accidents or events cannot occur. Such measures include but are not limited to protective circuits and error prevention circuits for safe design, redundant design, and structural design.
- In the event that any or all SANYO Semiconductor Co.,Ltd. products described or contained herein are controlled under any of applicable local export control laws and regulations, such products may require the export license from the authorities concerned in accordance with the above law.
- No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording, or any information storage or retrieval system, or otherwise, without the prior written consent of SANYO Semiconductor Co.,Ltd.
- Any and all information described or contained herein are subject to change without notice due to product/technology improvement, etc. When designing equipment, refer to the "Delivery Specification" for the SANYO Semiconductor Co.,Ltd. product that you intend to use.
- Information (including circuit diagrams and circuit parameters) herein is for example only; it is not guaranteed for volume production.
- Upon using the technical information or products described herein, neither warranty nor license shall be granted with regard to intellectual property rights or any other rights of SANYO Semiconductor Co.,Ltd. or any third party. SANYO Semiconductor Co.,Ltd. shall not be liable for any claim or suits with regard to a third party's intellectual property rights which has resulted from the use of the technical information and products mentioned above.

This catalog provides information as of October, 2009. Specifications and information herein are subject to change without notice.