

Ordering number:ENN5436A

NPN Epitaxial Planar Silicon Transistor



TS4162

VHF Band Low-Noise Amplifier and OSC Applications

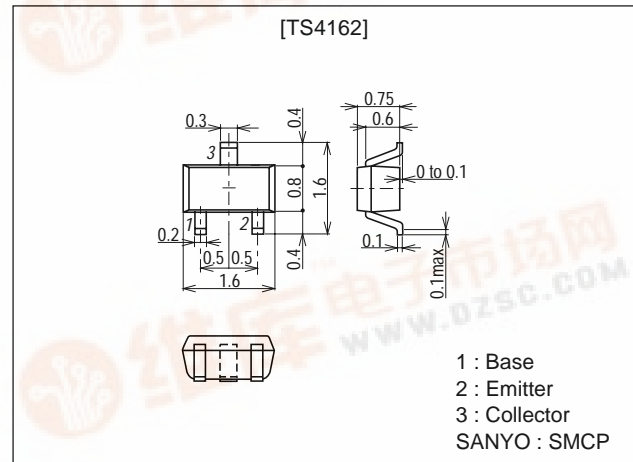
Features

- Low noise : NF=1.8dB typ (f=150MHz).
- High gain : $|S_{21e}|^2=16\text{dB typ (f=150MHz)}$.
- Ultrasmall package facilitates miniaturization in end products

Package Dimensions

unit:mm

2106A



Specifications

Absolute Maximum Ratings at Ta = 25°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 _{EBO}		2	V
Collector Current	I _C		50	mA
Collector Dissipation	P _C		100	mW
Junction Temperature	T _J		150	°C
Storage Temperature	T _{stg}		-55 to +150	°C

Electrical Characteristics at Ta = 25°C

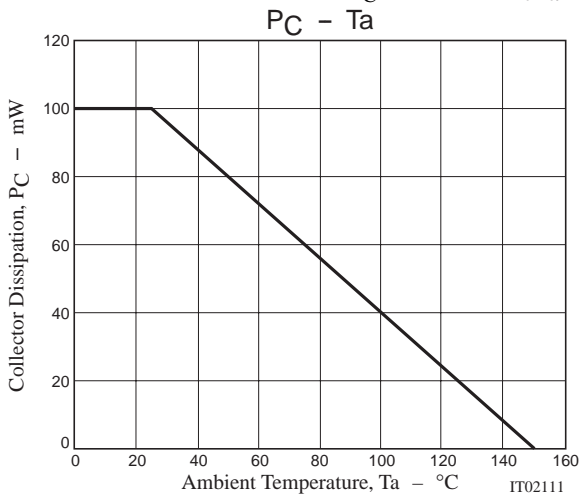
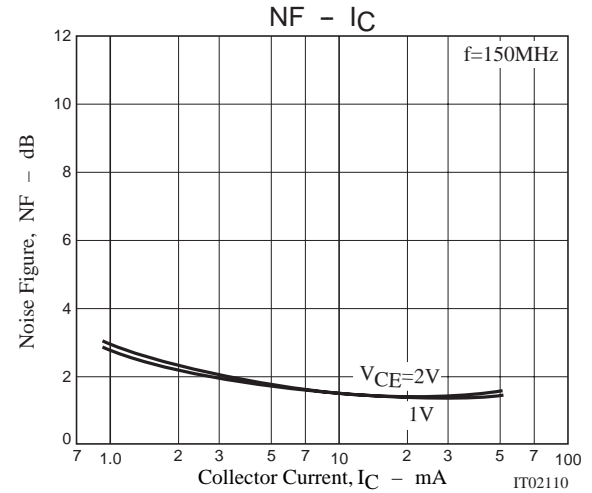
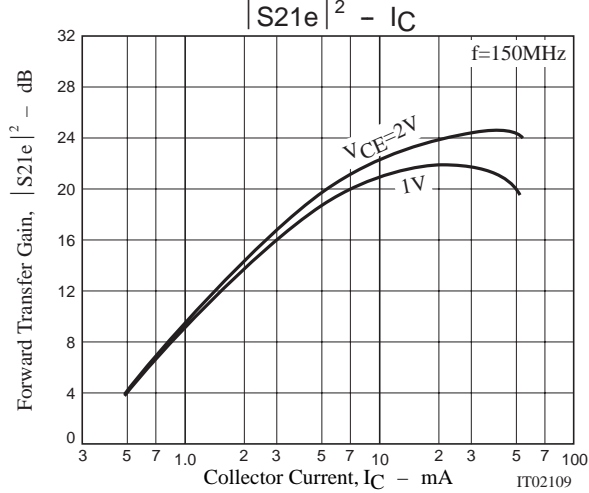
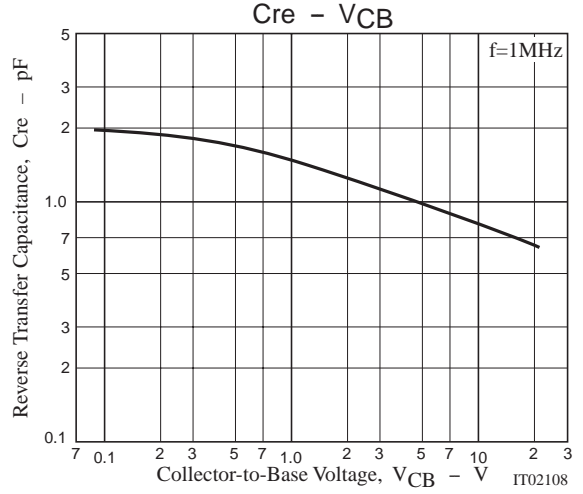
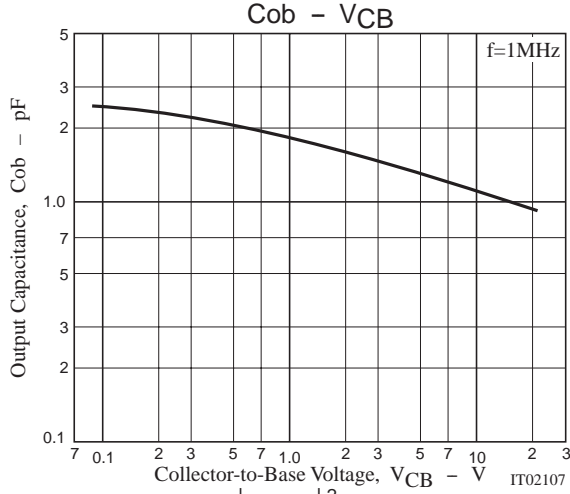
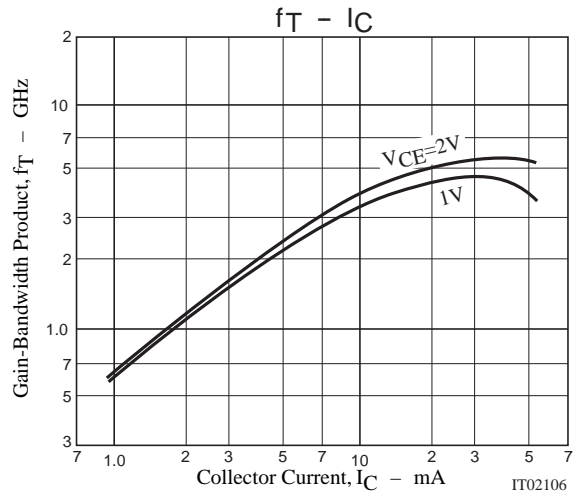
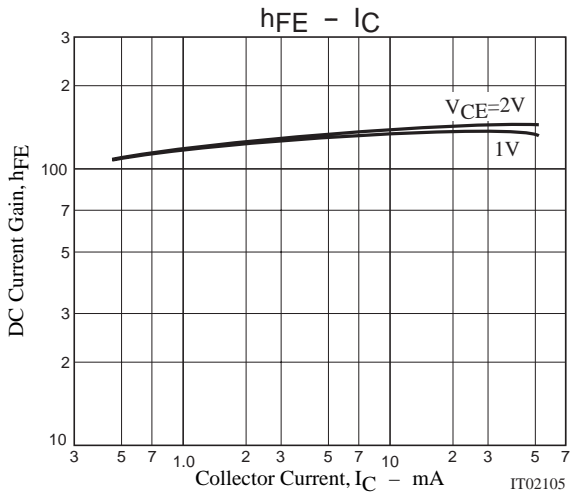
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Collector Cutoff Current	I _{CB0}	V _{CB} =10V, I _E =0			1.0	μA
Emitter Cutoff Current	I _{EBO}	V _{EB} =1V, I _C =0			10	μA
DC Current Gain	h _{FE 1}	V _{CE} =2V, I _C =3mA	80		200	
	h _{FE 2}	V _{CE} =2V, I _C =50mA	70			
Gain-Bandwidth Product	f _T	V _{CE} =2V, I _C =3mA	1.0	1.7		GHz
Output Capacitance	C _{ob}	V _{CB} =10V, f=1MHz		1.1	1.8	pF
Reverse Transfer Capacitance	C _{re}	V _{CB} =10V, f=1MHz		0.8		pF
Forward Transfer Gain	$ S_{21e} ^2$	V _{CE} =2V, I _C =3mA, f=150MHz	13	16		dB
Noise Figure	NF	V _{CE} =2V, I _C =3mA, f=150MHz		1.8	3.0	dB

Marking : MA

- Any and all SANYO products described or contained herein do not have specifications that can handle applications that require extremely high levels of reliability, such as life-support systems, aircraft's control systems, or other applications whose failure can be reasonably expected to result in serious physical and/or material damage. Consult with your SANYO representative nearest you before using any SANYO products described or contained herein in such applications.
- SANYO 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 products described or contained herein.



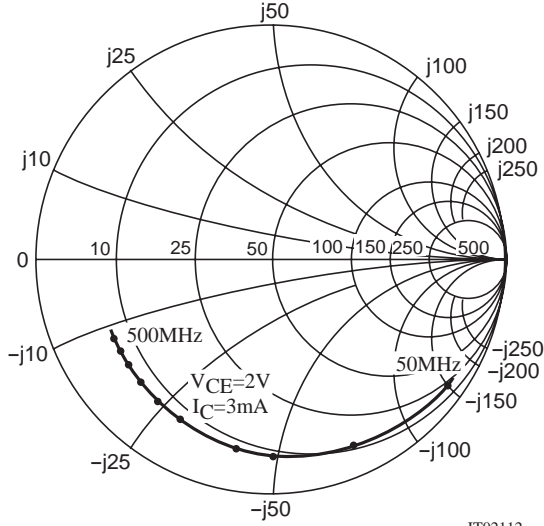
TS4162



TS4162

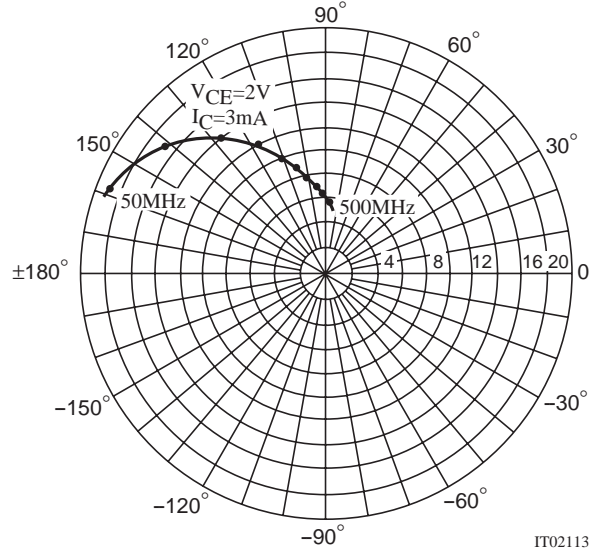
S parameter [Tr1]

S11e
f=50 to 500MHz(50MHz Step)



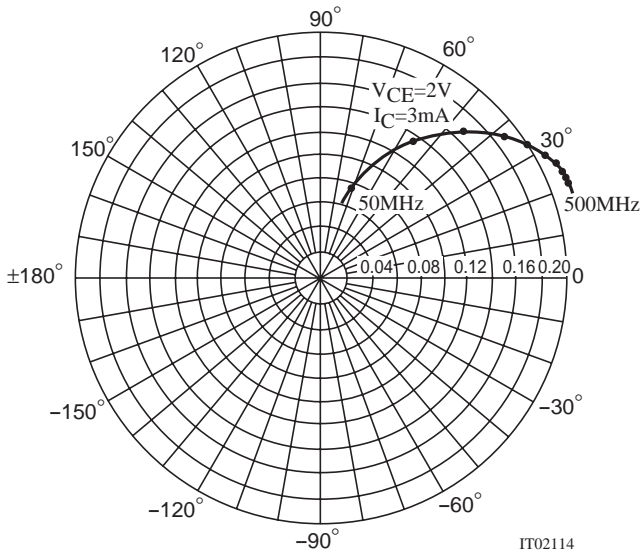
IT02112

S21e
f=50 to 500MHz(50MHz Step)



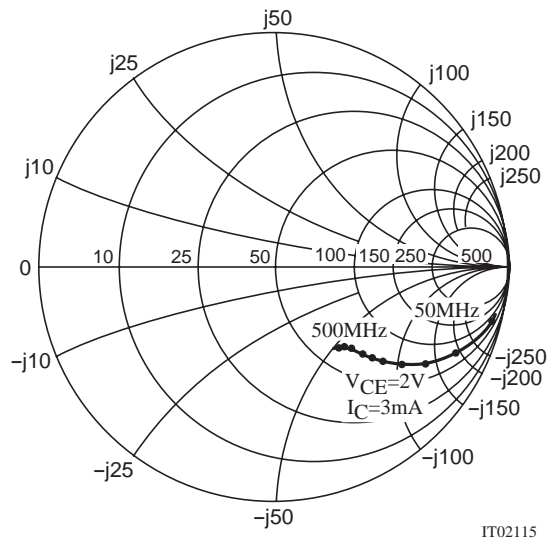
IT02113

S12e
f=50 to 500MHz(50MHz Step)



IT02114

S22e
f=50 to 500MHz(50MHz Step)



IT02115

S Parameters (Common emitter)

$V_{CE}=2V, I_C=1mA, Z_0=50\Omega$

Freq (MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
50	0.965	-25.6	3.48	163.7	0.040	75.3	0.985	-7.1
100	0.948	-49.3	3.30	149.2	0.075	62.8	0.951	-13.3
150	0.922	-69.5	2.96	136.6	0.101	51.8	0.907	-18.0
200	0.903	-86.0	2.65	126.3	0.119	42.9	0.859	-21.7
250	0.885	-99.4	2.33	117.3	0.131	35.9	0.819	-24.6
300	0.873	-110.4	2.07	110.1	0.139	30.1	0.791	-26.9
350	0.866	-119.4	1.89	103.8	0.145	25.4	0.778	-28.7
400	0.854	-127.4	1.73	97.8	0.147	21.2	0.753	-30.8
450	0.846	-133.9	1.58	92.9	0.148	17.7	0.742	-32.7
500	0.847	-138.9	1.44	88.5	0.148	15.0	0.736	-34.4

TS4162

$V_{CE}=2V, I_C=3mA, Z_O=50\Omega$

Freq (MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
50	0.909	-35.9	9.43	158.4	0.038	71.0	0.949	-14.8
100	0.873	-66.2	8.30	141.0	0.067	56.0	0.849	-26.1
150	0.836	-89.8	7.03	127.6	0.084	44.9	0.744	-33.4
200	0.815	-106.3	5.94	117.9	0.095	37.5	0.658	-38.0
250	0.794	-119.1	5.05	110.4	0.100	32.4	0.590	-41.4
300	0.784	-128.7	4.36	104.3	0.104	28.7	0.550	-43.2
350	0.779	-136.3	3.90	99.4	0.107	26.0	0.518	-44.7
400	0.769	-143.1	3.46	94.8	0.108	23.9	0.493	-45.8
450	0.767	-148.1	3.13	91.3	0.108	22.4	0.474	-47.2
500	0.766	-152.1	2.83	87.8	0.108	21.7	0.463	-48.5

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

Freq (MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
50	0.775	-61.9	23.54	145.3	0.033	61.4	0.836	-34.4
100	0.731	-101.2	17.31	124.8	0.048	46.5	0.624	-55.2
150	0.709	-124.3	13.06	112.7	0.056	39.6	0.481	-67.0
200	0.704	-136.7	10.22	105.5	0.060	37.1	0.387	-75.8
250	0.695	-146.3	8.43	100.2	0.064	36.5	0.335	-80.4
300	0.695	-152.6	7.09	96.2	0.066	36.8	0.296	-85.3
350	0.695	-157.6	6.21	92.7	0.070	37.2	0.270	-87.4
400	0.694	-162.0	5.45	89.8	0.072	38.5	0.245	-91.4
450	0.696	-164.9	4.84	87.5	0.075	39.9	0.231	-95.3
500	0.694	-167.7	4.39	85.0	0.078	41.5	0.222	-97.9

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

Freq (MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
50	0.647	-98.6	37.50	129.9	0.024	52.4	0.665	-61.6
100	0.657	-134.1	22.96	111.5	0.032	44.8	0.448	-90.7
150	0.663	-149.5	16.09	103.0	0.037	44.8	0.353	-107.8
200	0.665	-157.6	12.33	97.8	0.041	47.3	0.308	-119.8
250	0.664	-163.2	9.95	94.3	0.046	49.5	0.286	-128.1
300	0.667	-167.3	8.35	91.3	0.051	52.2	0.271	-133.9
350	0.669	-170.2	7.23	89.0	0.055	54.0	0.258	-138.9
400	0.672	-173.0	6.33	86.9	0.060	55.9	0.253	-143.4
450	0.670	-174.9	5.64	85.1	0.066	57.2	0.251	-146.5
500	0.671	-176.6	5.08	83.3	0.071	58.3	0.250	-148.4

- Specifications of any and all SANYO 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 Electric Co., Ltd. strives to supply high-quality high-reliability products. However, any and all semiconductor products fail with some probability. It is possible that these probabilistic failures could give rise to accidents or events that could endanger human lives, that could give rise to smoke or fire, or 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 products (including technical data, services) described or contained herein are controlled under any of applicable local export control laws and regulations, such products must not be exported without obtaining 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 permission of SANYO Electric 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 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. SANYO believes information herein is accurate and reliable, but no guarantees are made or implied regarding its use or any infringements of intellectual property rights or other rights of third parties.