

**NPN EPITAXIAL SILICON TRANSISTOR
HIGH FREQUENCY LOW DISTORTION AMPLIFIER**

DESCRIPTION

The 2SC5337 is a high-frequency transistor designed for a low distortion and low noise amplifier on the VHF to UHF band, which is suitable for the CATV, tele-communication, and such.

FEATURES

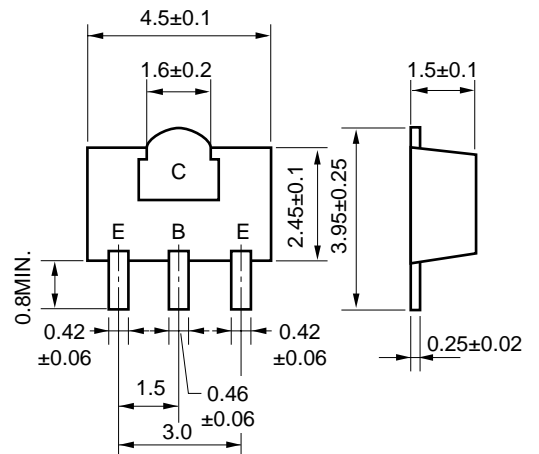
- Low distortion
 $IM_2 = 59 \text{ dB TYP. @ } V_{CE} = 10 \text{ V, } I_C = 50 \text{ mA}$
 $IM_3 = 82 \text{ dB TYP. @ } V_{CE} = 10 \text{ V, } I_C = 50 \text{ mA}$
- Low noise
 $NF = 1.5 \text{ dB TYP. @ } V_{CE} = 10 \text{ V, } I_C = 10 \text{ mA, } f = 1 \text{ GHz}$
- New power mini-mold package version of a 4-pin type gain-improved on the 2SC3356

ABSOLUTE MAXIMUM RATINGS ($T_A = 25 \text{ }^\circ\text{C}$)

Parameter	Symbol	Rating	Unit
Collector to Base Voltage	V_{CB0}	30	V
Collector to Emitter Voltage	V_{CEO}	15	V
Emitter to Base Voltage	V_{EBO}	3.0	V
Collector Current	I_C	250	mA
Total Power Dissipation	P_T ^{Note1}	2.0	W
Junction Temperature	T_j	150	$^\circ\text{C}$
Storage Temperature	T_{stg}	-65 to +150	$^\circ\text{C}$

PACKAGE DIMENSIONS

(in millimeters)



PIN CONNECTIONS
 E: Emitter
 C: Collector
 B: Base

Note 1. $0.7 \text{ mm} \times 16 \text{ cm}^2$ double sided ceramic substrate (Copper plating)

ELECTRICAL CHARACTERISTICS (T_A = 25 °C)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Collector Cutoff Current	I _{CBO}	V _{CB} = 20 V, I _E = 0		0.01	5.0	μA
Emitter Cutoff Current	I _{EBO}	V _{EB} = 2 V, I _C = 0		0.03	5.0	μA
DC Current Gain	h _{FE}	V _{CE} = 10 V, I _C = 50 mA ^{Note2}	40	120	200	
Insertion Power Gain	S _{21e} ²	V _{CE} = 10 V, I _C = 50 mA, f = 1 GHz	7.0	8.3		dB
Noise Figure 1	NF ₁	V _{CE} = 10 V, I _C = 50 mA, f = 500 MHz ^{Note3}		1.5	3.5	dB
Noise Figure 2	NF ₂	V _{CE} = 10 V, I _C = 50 mA, f = 1 GHz ^{Note3}		2.0	3.5	dB
2nd Order Intermodulation Distortion	IM ₂	V _{CE} = 10 V, I _C = 50 mA, R _S = R _L = 75 Ω P _{in} = 105 dB μV/75 Ω, f ₁ = 190 MHz f ₂ = 90 MHz, f = f ₁ - f ₂		59.0		dB
3rd Order Intermodulation Distortion	IM ₃	V _{CE} = 10 V, I _C = 50 mA, R _S = R _L = 75 Ω P _{in} = 105 dB μV/75 Ω, f ₁ = 190 MHz f ₂ = 200 MHz, f = 2 × f ₁ - f ₂		82.0		dB

Notes 2. Pulse measurement: PW ≤ 350 μS, Duty Cycle ≤ 2 %

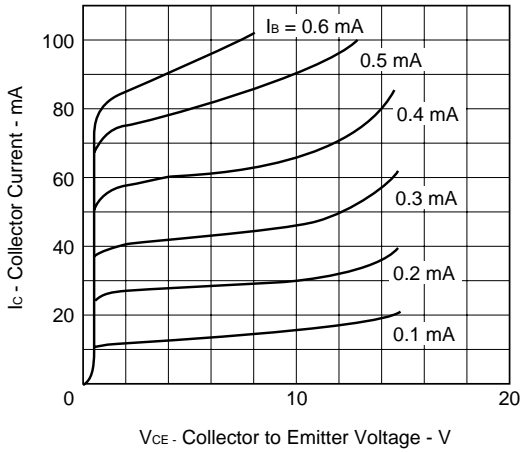
3. R_S = R_L = 50 Ω, tuned

h_{FE} Classification

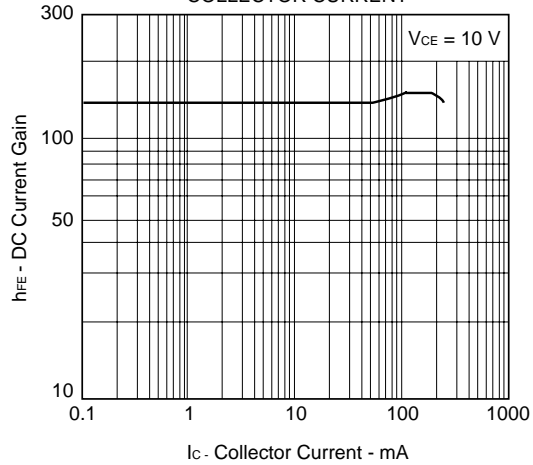
Rank	QQ	QR	QS
Marking	QQ	QR	QS
h _{FE}	40 to 80	60 to 120	100 to 200

TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^\circ\text{C}$)

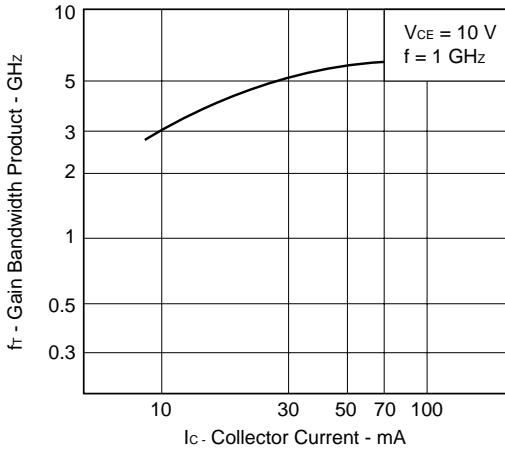
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



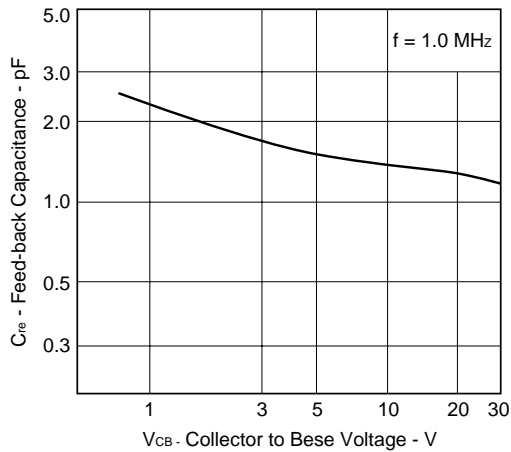
DC CURRENT GAIN vs. COLLECTOR CURRENT



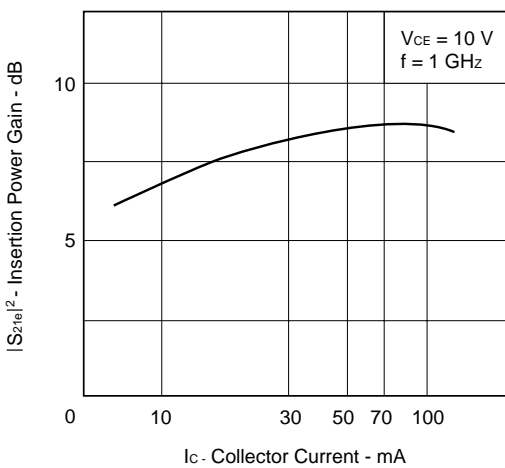
GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT



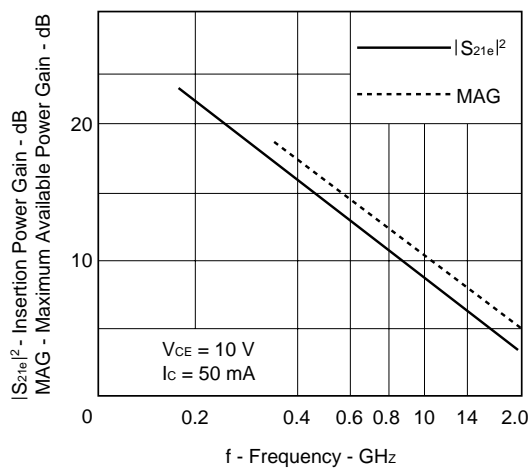
FEED-BACK CAPACITANCE vs. COLLECTOR TO BASE VOLTAGE



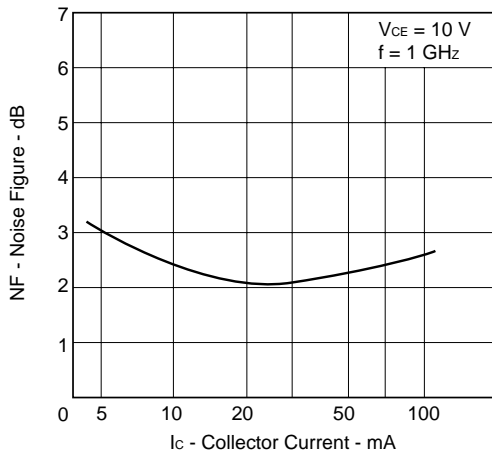
INSERTION POWER GAIN vs. COLLECTOR CURRENT



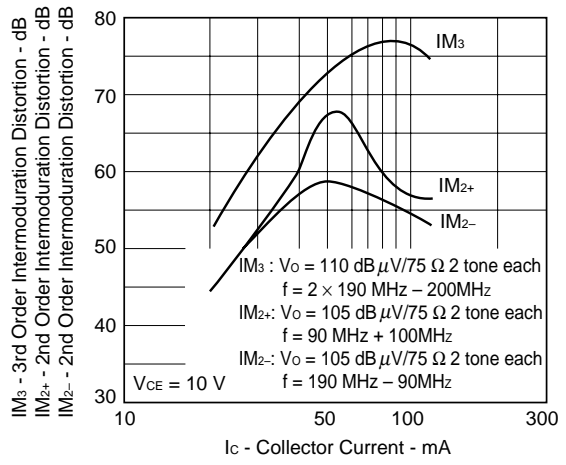
INSERTION POWER GAIN MAXIMUM AVAILABLE GAIN vs. FREQUENCY



NOISE FIGURE vs. COLLECTOR CURRENT



3RD ORDER INTERMODULATION DISTORTION, 2ND ORDER INTERMODULATION DISTORTION (+) AND 2ND ORDER INTERMODULATION DISTORTION (-) vs. COLLECTOR CURRENT



S-PARAMETER

$V_{CE} = 10\text{ V}, f = 1\text{ GHz}$

I_C (mA)	S_{11}		S_{21}		S_{12}		S_{22}	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
10.0	.553	175.2	2.007	64.7	.127	67.4	.336	- 91.0
30.0	.500	168.1	2.492	68.0	.156	69.9	.247	- 122.5
50.0	.490	166.3	2.561	68.1	.158	70.3	.223	- 131.3
70.0	.490	165.3	2.640	69.0	.167	71.2	.253	- 136.0
100.0	.492	164.8	2.601	68.6	.162	69.3	.225	- 138.1

$V_{CE} = 10\text{ V}, I_C = 50\text{ mA}$

f (MHz)	S_{11}		S_{21}		S_{12}		S_{22}	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100	.592	- 136.6	24.447	108.4	.030	50.5	.465	- 95.2
200	.577	- 160.0	12.746	96.5	.042	57.4	.335	- 123.0
300	.566	- 168.5	8.591	91.2	.055	67.3	.276	- 130.1
400	.558	- 174.0	6.438	87.2	.066	70.8	.269	- 132.7
500	.554	- 177.5	5.160	84.1	.083	68.6	.262	- 134.5
600	.542	- 179.4	4.312	82.3	.095	70.6	.262	- 139.1
700	.527	177.9	3.729	80.9	.112	71.2	.251	- 133.4
800	.519	175.8	3.292	78.7	.123	74.6	.252	- 132.9
900	.509	174.4	2.983	77.7	.136	75.0	.252	- 124.6
1000	.514	171.0	2.759	76.6	.151	75.3	.257	- 125.3
1100	.498	166.8	2.648	75.4	.166	75.8	.278	- 118.4
1200	.494	167.3	2.665	71.3	.180	74.7	.306	- 120.2
1300	.487	161.7	2.478	63.0	.194	75.9	.314	- 124.2
1400	.467	160.4	2.177	60.1	.216	74.7	.273	- 124.0
1500	.477	157.4	1.973	57.9	.230	74.9	.281	- 123.2
1600	.471	154.5	1.815	57.2	.240	73.2	.291	- 120.2
1700	.467	152.5	1.754	55.3	.260	72.9	.316	- 118.7
1800	.469	151.3	1.639	54.4	.273	70.5	.312	- 123.1
1900	.465	149.1	1.568	53.4	.285	69.9	.316	- 125.5
2000	.468	147.0	1.475	52.6	.289	69.3	.323	- 126.3

S-PARAMETER

V_{CE} = 10 V, I_C = 100 mA

f (MHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100	.564	-146.0	24.857	105.3	.019	50.2	.284	-116.1
200	.586	-165.8	12.845	94.5	.026	59.6	.204	-129.9
300	.576	-171.9	8.681	89.7	.041	73.2	.199	-138.7
400	.561	-176.3	6.541	86.3	.048	77.8	.200	-140.1
500	.550	179.9	5.209	83.5	.060	81.4	.196	-137.0
600	.540	178.2	4.358	82.2	.069	82.0	.182	-137.6
700	.538	175.7	3.772	80.6	.086	84.2	.216	-131.0
800	.521	174.6	3.332	78.4	.099	85.1	.210	-130.5
900	.510	173.2	3.037	77.0	.113	85.4	.222	-122.2
1000	.524	168.5	2.780	76.9	.119	83.5	.198	-120.1
1100	.502	165.2	2.680	75.3	.136	86.8	.213	-114.9
1200	.489	165.9	2.718	72.3	.156	83.5	.246	-114.9
1300	.488	161.1	2.578	63.0	.177	85.5	.251	-122.8
1400	.472	157.9	2.213	58.7	.184	81.8	.209	-127.2
1500	.480	155.3	2.012	57.8	.194	85.3	.252	-114.1
1600	.470	153.4	1.846	57.2	.219	82.2	.242	-117.6
1700	.465	151.1	1.745	56.5	.235	82.4	.240	-112.9
1800	.464	149.5	1.677	54.9	.248	79.0	.263	-121.9
1900	.460	147.9	1.571	53.3	.249	78.6	.281	-120.0
2000	.466	146.0	1.514	52.3	.264	77.4	.276	-124.0

No part of this document may be copied or reproduced in any form or by any means without the prior written consent of NEC Corporation. NEC Corporation assumes no responsibility for any errors which may appear in this document.

NEC Corporation does not assume any liability for infringement of patents, copyrights or other intellectual property rights of third parties by or arising from use of a device described herein or any other liability arising from use of such device. No license, either express, implied or otherwise, is granted under any patents, copyrights or other intellectual property rights of NEC Corporation or others.

While NEC Corporation has been making continuous effort to enhance the reliability of its semiconductor devices, the possibility of defects cannot be eliminated entirely. To minimize risks of damage or injury to persons or property arising from a defect in an NEC semiconductor device, customer must incorporate sufficient safety measures in its design, such as redundancy, fire-containment, and anti-failure features.

NEC devices are classified into the following three quality grades:

“Standard”, “Special”, and “Specific”. The Specific quality grade applies only to devices developed based on a customer designated "quality assurance program" for a specific application. The recommended applications of a device depend on its quality grade, as indicated below. Customers must check the quality grade of each device before using it in a particular application.

Standard : Computers, office equipment, communications equipment, test and measurement equipment, audio and visual equipment, home electronic appliances, machine tools, personal electronic equipment and industrial robots

Special: Transportation equipment (automobiles, trains, ships, etc.), traffic control systems, anti-disaster systems, anti-crime systems, safety equipment and medical equipment (not specifically designed for life support)

Specific: Aircrafts, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems or medical equipment for life support, etc.

The quality grade of NEC devices in “Standard” unless otherwise specified in NEC's Data Sheets or Data Books.

If customers intend to use NEC devices for applications other than those specified for Standard quality grade, they should contact NEC Sales Representative in advance.

Anti-radioactive design is not implemented in this product.