

To our customers,

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## Old Company Name in Catalogs and Other Documents

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Renesas Electronics website: <http://www.renesas.com>

April 1<sup>st</sup>, 2010  
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

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## NPN SILICON RF TRANSISTOR

# 2SC3357

### NPN EPITAXIAL SILICON RF TRANSISTOR FOR HIGH-FREQUENCY LOW-NOISE AMPLIFICATION 3-PIN POWER MINIMOLD

#### FEATURES

- Low noise and high gain
- ★ NF = 1.1 dB TYP.,  $G_a = 7.5$  dB TYP. @  $V_{CE} = 10$  V,  $I_c = 7$  mA,  $f = 1$  GHz  
NF = 1.8 dB TYP.,  $G_a = 9.0$  dB TYP. @  $V_{CE} = 10$  V,  $I_c = 40$  mA,  $f = 1$  GHz
- ★ • High power gain : MAG = 10 dB TYP. @  $I_c = 40$  mA,  $f = 1$  GHz
- Large  $P_{tot}$  :  $P_{tot} = 1.2$  W (Mounted on  $16\text{ cm}^2 \times 0.7$  mm (t) ceramic substrate)
- Small package : 3-pin power minimold package

#### ★ ORDERING INFORMATION

Part Number	Quantity	Supplying Form
2SC3357	25 pcs (Non reel)	<ul style="list-style-type: none"> <li>• 12 mm wide embossed taping</li> <li>• Collector face the perforation side of the tape</li> </ul>
2SC3357-T1	1 kpcs/reel	

**Remark** To order evaluation samples, contact your nearby sales office.  
The unit sample quantity is 25 pcs.

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

Parameter	Symbol	Ratings	Unit
Collector to Base Voltage	$V_{CBO}$	20	V
Collector to Emitter Voltage	$V_{CEO}$	12	V
Emitter to Base Voltage	$V_{EBO}$	3.0	V
Collector Current	$I_c$	100	mA
Total Power Dissipation	$P_{tot}^{\text{Note}}$	1.2	W
Junction Temperature	$T_j$	150	$^\circ\text{C}$
Storage Temperature	$T_{stg}$	-65 to +150	$^\circ\text{C}$

**Note** Mounted on  $16\text{ cm}^2 \times 0.7$  mm (t) ceramic substrate

**Caution** Observe precautions when handling because these devices are sensitive to electrostatic discharge.

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Not all devices/types available in every country. Please check with local NEC Compound Semiconductor Devices representative for availability and additional information.

## THERMAL RESISTANCE

Parameter	Symbol	Value	Unit
Junction to Ambient Resistance	$R_{th(j-a)}$ <sup>Note</sup>	62.5	°C/W

**Note** Mounted on  $16\text{ cm}^2 \times 0.7\text{ mm}$  (t) ceramic substrate

## ELECTRICAL CHARACTERISTICS ( $T_A = +25^\circ\text{C}$ )

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
DC Characteristics						
Collector Cut-off Current	$I_{CBO}$	$V_{CB} = 10\text{ V}, I_E = 0\text{ mA}$	—	—	1.0	$\mu\text{A}$
Emitter Cut-off Current	$I_{EBO}$	$V_{EB} = 1.0\text{ V}, I_C = 0\text{ mA}$	—	—	1.0	$\mu\text{A}$
DC Current Gain	$h_{FE}$ <sup>Note 1</sup>	$V_{CE} = 10\text{ V}, I_C = 20\text{ mA}$	50	120	250	—
RF Characteristics						
Gain Bandwidth Product	$f_T$	$V_{CE} = 10\text{ V}, I_C = 20\text{ mA}$	—	6.5	—	GHz
Insertion Power Gain	$ S_{21e} ^2$	$V_{CE} = 10\text{ V}, I_C = 20\text{ mA}, f = 1\text{ GHz}$	—	9.0	—	dB
Noise Figure (1)	NF	$V_{CE} = 10\text{ V}, I_C = 7\text{ mA}, f = 1\text{ GHz}$	—	1.1	—	dB
Noise Figure (2)	NF	$V_{CE} = 10\text{ V}, I_C = 40\text{ mA}, f = 1\text{ GHz}$	—	1.8	3.0	dB
Reverse Transfer Capacitance	$C_{re}$ <sup>Note 2</sup>	$V_{CB} = 10\text{ V}, I_E = 0\text{ mA}, f = 1\text{ MHz}$	—	0.65	1.0	pF

**Notes 1.** Pulse measurement:  $PW \leq 350\text{ }\mu\text{s}$ , Duty Cycle  $\leq 2\%$

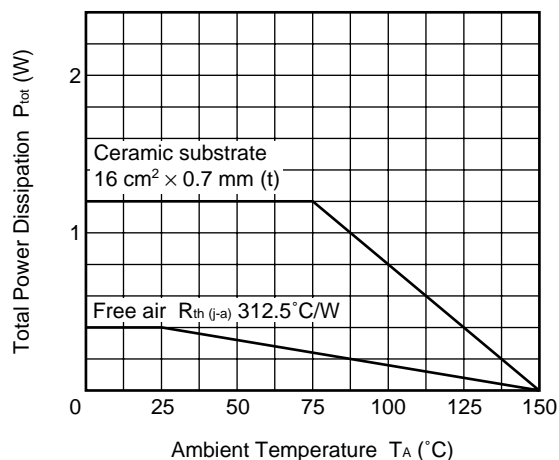
**2.** The emitter terminal and the case shall be connected to the guard terminal of the three-terminal capacitance bridge.

## $h_{FE}$ CLASSIFICATION

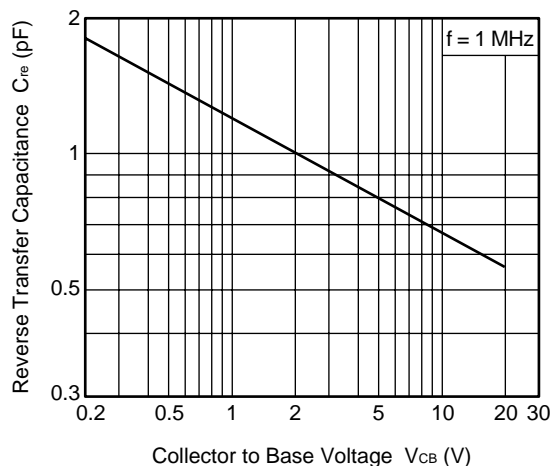
Rank	RH	RF	RE
Marking	RH	RF	RE
$h_{FE}$ Value	50 to 100	80 to 160	125 to 250

★ TYPICAL CHARACTERISTICS ( $T_A = +25^\circ\text{C}$ , unless otherwise specified)

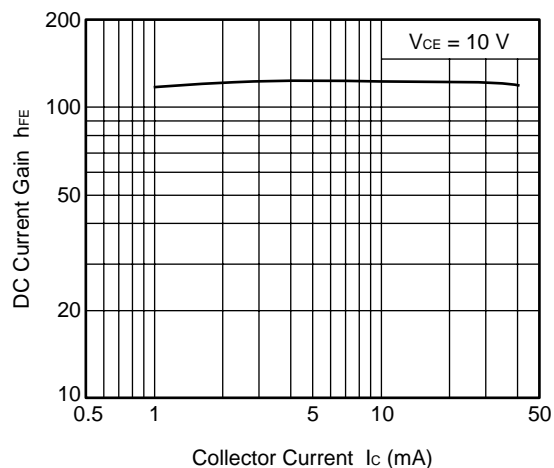
TOTAL POWER DISSIPATION  
vs. AMBIENT TEMPERATURE



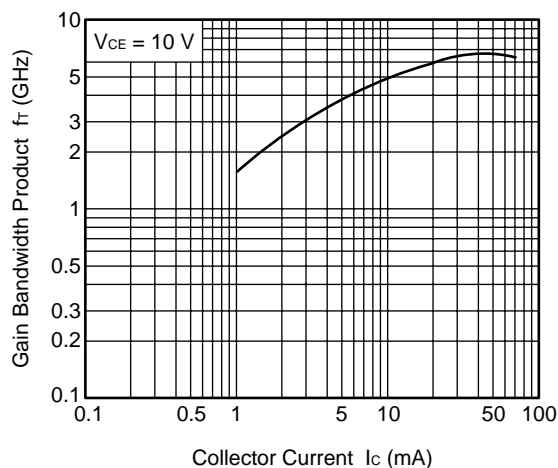
REVERSE TRANSFER CAPACITANCE  
vs. COLLECTOR TO BASE VOLTAGE



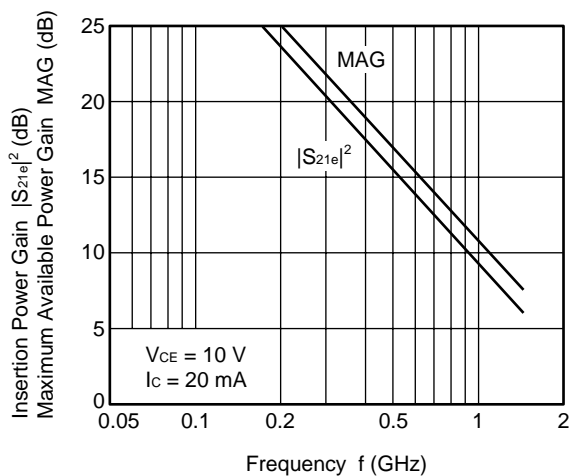
DC CURRENT GAIN vs.  
COLLECTOR CURRENT



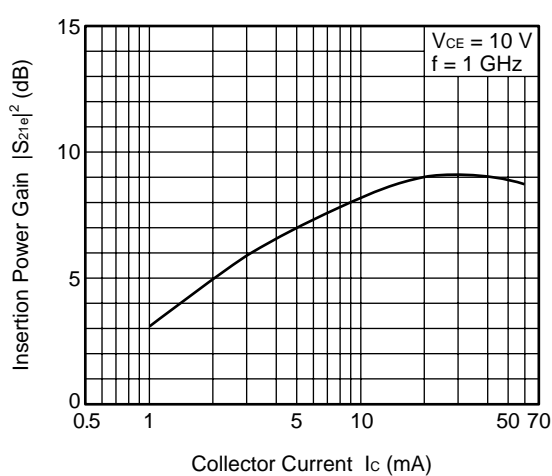
GAIN BANDWIDTH PRODUCT  
vs. COLLECTOR CURRENT

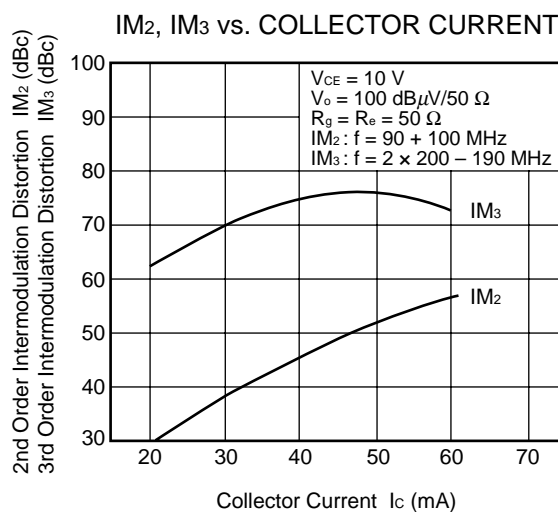
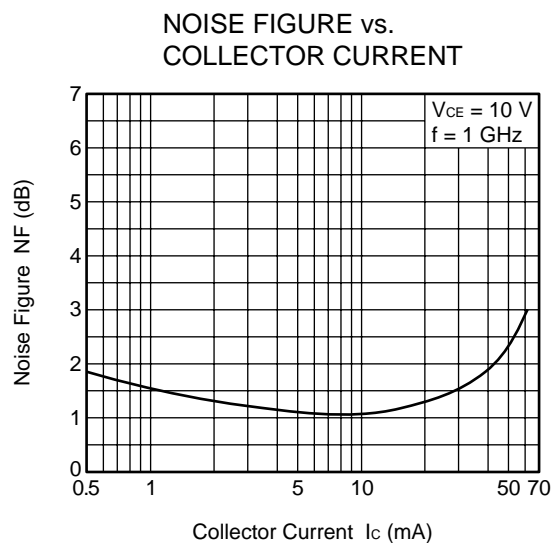


INSERTION POWER GAIN, MAG  
vs. FREQUENCY



INSERTION POWER GAIN  
vs. COLLECTOR CURRENT





**Remark** The graphs indicate nominal characteristics.

## S-PARAMETERS

S-parameters/Noise parameters are provided on the NEC Compound Semiconductor Devices Web site in a form (S2P) that enables direct import to a microwave circuit simulator without keyboard input.

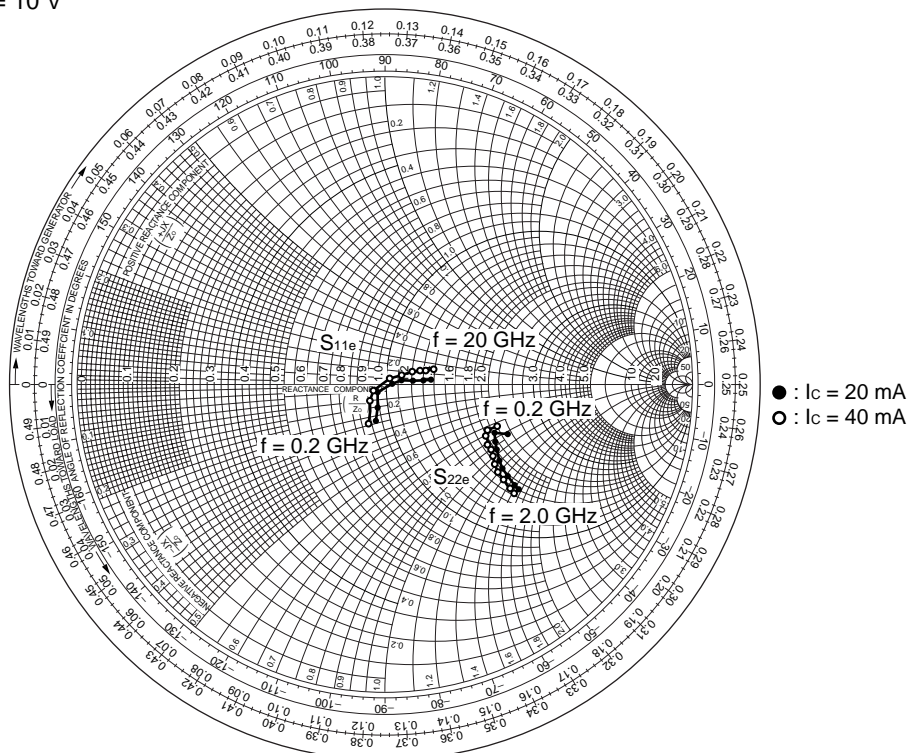
Click here to download S-parameters.

[RF and Microwave] → [Device Parameters]

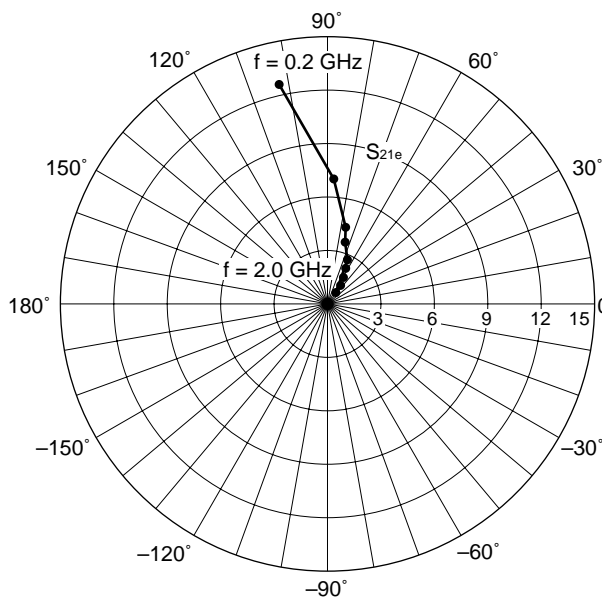
URL <http://www.csd-nec.com/>

★ SMITH CHART

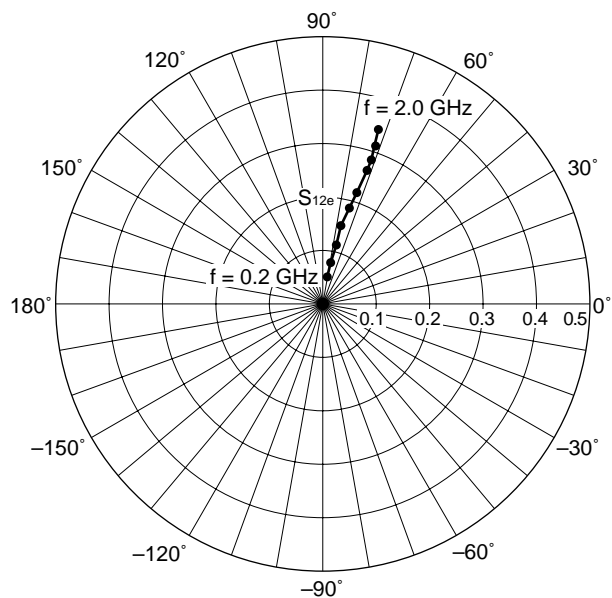
$S_{11e}$ ,  $S_{22e}$ -FREQUENCY  
CONDITION :  $V_{CE} = 10\text{ V}$



$S_{21e}$ -FREQUENCY  
CONDITION :  $V_{CE} = 10\text{ V}$ ,  $I_C = 20\text{ mA}$

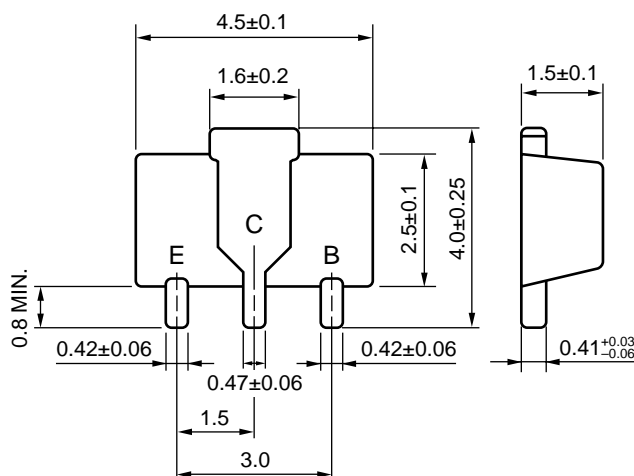


$S_{12e}$ -FREQUENCY  
CONDITION :  $V_{CE} = 10\text{ V}$ ,  $I_C = 20\text{ mA}$



★ PACKAGE DIMENSIONS

3-PIN POWER MINIMOLD (UNIT: mm)



**PIN CONNECTIONS**

E : Emitter  
C : Collector (Fin)  
B : Base

(IEC : SOT-89)

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