

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  
**2SC4536**

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

**DESCRIPTION**

The 2SC4536 is designed for use in middle power, low distortion low noise figure RF amplifier. It features excellent linearity and large dynamic range, which make it suitable for CATV, telecommunication, and other use, it employs plastic surface mount type package (SOT-89).

**FEATURES**

- ★ • Low distortion:  $IM_2 = 59.0$  dBc TYP.,  $IM_3 = 82.0$  dBc TYP. @  $V_{CE} = 10$  V,  $I_c = 50$  mA
- ★ • Low noise:  $NF = 2.0$  dB TYP. @  $V_{CE} = 10$  V,  $I_c = 50$  mA,  $f = 1$  GHz
- Large  $P_{tot}$  :  $P_{tot} = 2.0$  W (Mounted on double-sided copper-clad  $16\text{ cm}^2 \times 0.7$  mm (t) ceramic substrate)
- Small package : 3-pin power minimold package

★ **ORDERING INFORMATION**

Part Number	Quantity	Supplying Form
2SC4536	25 pcs (Non reel)	• 12 mm wide embossed taping
2SC4536-T1	1 kpcs/reel	• Collector face the perforation side of the tape

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

**ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = +25°C)**

Parameter	Symbol	Ratings	Unit
Collector to Base Voltage	$V_{CBO}$	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	$P_{tot}^{Note}$	2.0	W
Junction Temperature	$T_j$	150	°C
Storage Temperature	$T_{stg}$	-65 to +150	°C

**Note** Mounted on double-sided copper-clad  $16\text{ cm}^2 \times 0.7$  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.

**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = +25°C)**

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
DC Characteristics						
Collector Cut-off Current	I <sub>CBO</sub>	V <sub>CB</sub> = 20 V, I <sub>E</sub> = 0 mA	–	–	5.0	μA
Emitter Cut-off Current	I <sub>EBO</sub>	V <sub>EB</sub> = 2 V, I <sub>C</sub> = 0 mA	–	–	5.0	μA
★ DC Current Gain	h <sub>FE</sub> <sup>Note 1</sup>	V <sub>CE</sub> = 10 V, I <sub>C</sub> = 50 mA	60	–	200	–
RF Characteristics						
★ Insertion Power Gain	S <sub>21e</sub>   <sup>2</sup>	V <sub>CE</sub> = 10 V, I <sub>C</sub> = 50 mA, f = 1 GHz	5.5	7.2	–	dB
Noise Figure (1)	NF <sup>Note 2</sup>	V <sub>CE</sub> = 10 V, I <sub>C</sub> = 50 mA, f = 500 MHz	–	1.5	–	dB
Noise Figure (2)	NF <sup>Note 2</sup>	V <sub>CE</sub> = 10 V, I <sub>C</sub> = 50 mA, f = 1 GHz	–	2.0	–	dB
★ 2nd Order Intermodulation Distortion	IM <sub>2</sub>	V <sub>CE</sub> = 10 V, I <sub>C</sub> = 50 mA, R <sub>S</sub> = R <sub>L</sub> = 75 Ω, V <sub>O</sub> = 105 dBμV/75 Ω, f <sub>1</sub> = 190 MHz, f <sub>2</sub> = 90 MHz, f = f <sub>1</sub> – f <sub>2</sub>	–	59.0	–	dBc
★ 3rd Order Intermodulation Distortion	IM <sub>3</sub>	V <sub>CE</sub> = 10 V, I <sub>C</sub> = 50 mA, R <sub>S</sub> = R <sub>L</sub> = 75 Ω, V <sub>O</sub> = 105 dBμV/75 Ω, f <sub>1</sub> = 190 MHz, f <sub>2</sub> = 200 MHz, f = 2 × f <sub>1</sub> – f <sub>2</sub>	–	82.0	–	dBc

**Notes 1.** Pulse measurement: PW ≤ 350 μs, Duty Cycle ≤ 2%

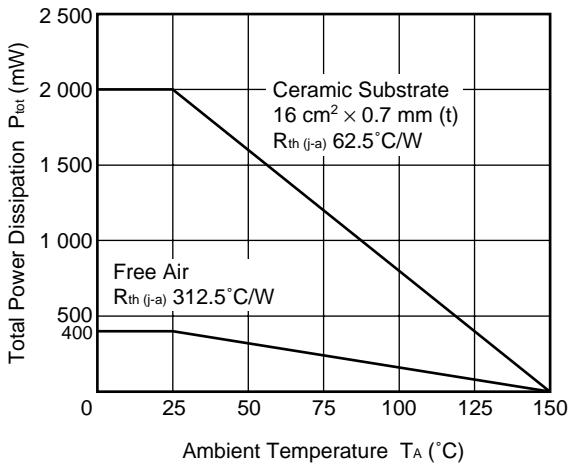
**2.** R<sub>S</sub> = R<sub>L</sub> = 50 Ω, tuned

★ **h<sub>FE</sub> CLASSIFICATION**

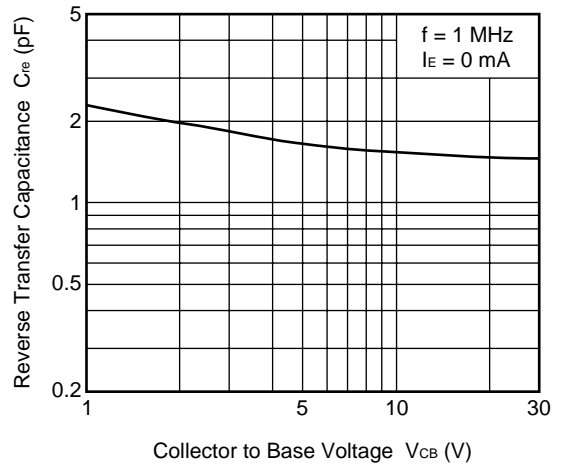
Rank	QR	QS
Marking	QR	QS
h <sub>FE</sub> Value	60 to 120	100 to 200

★ TYPICAL CHARACTERISTICS (T<sub>A</sub> = +25°C)

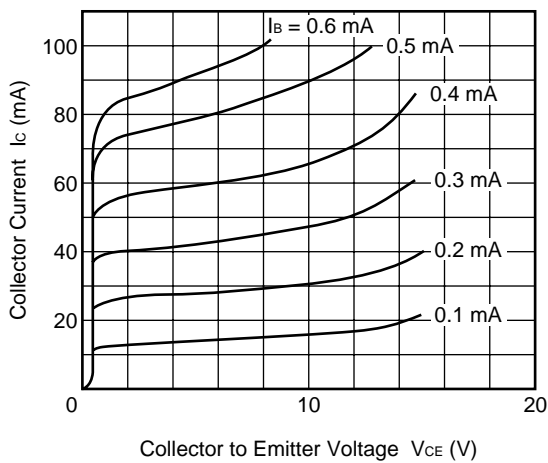
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



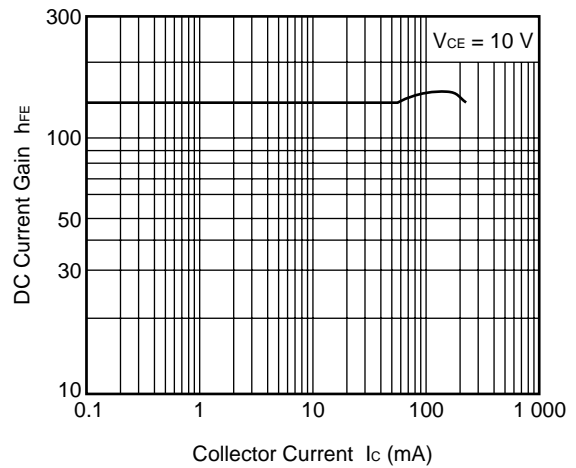
REVERSE TRANSFER CAPACITANCE vs. COLLECTOR TO BASE VOLTAGE



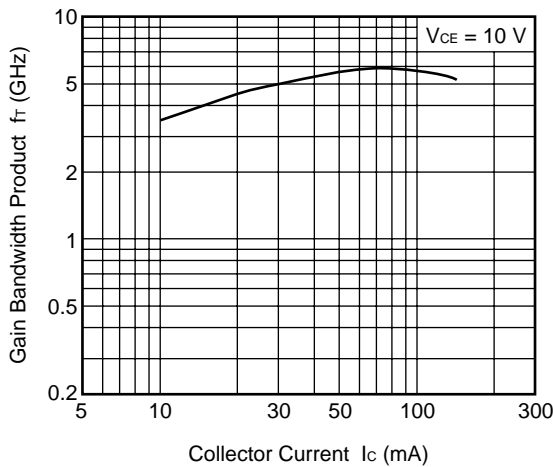
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



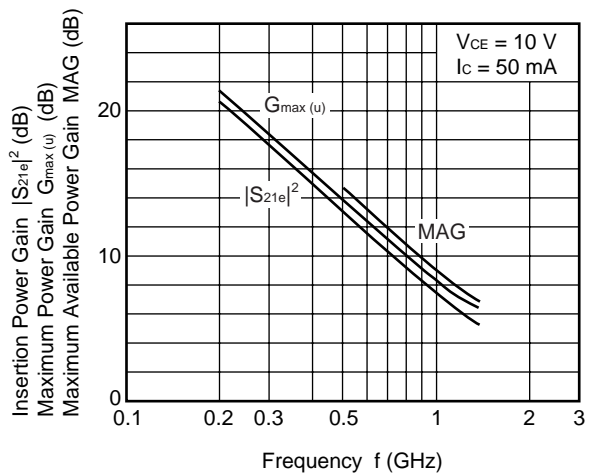
DC CURRENT GAIN vs. COLLECTOR CURRENT



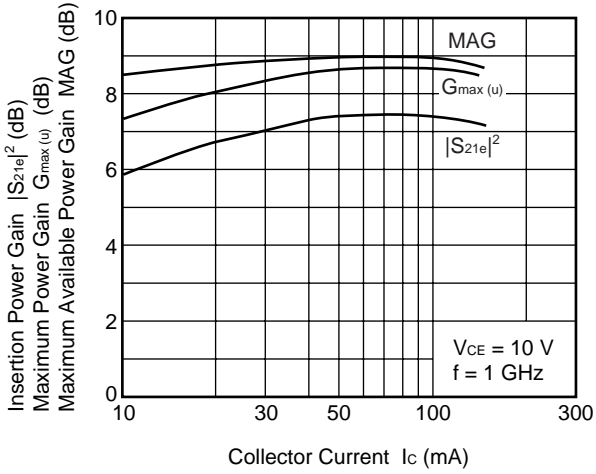
GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT



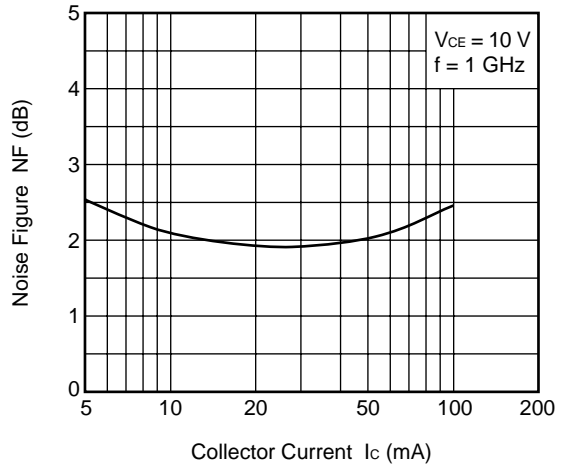
INSERTION POWER GAIN, MAXIMUM POWER GAIN, MAG vs. FREQUENCY



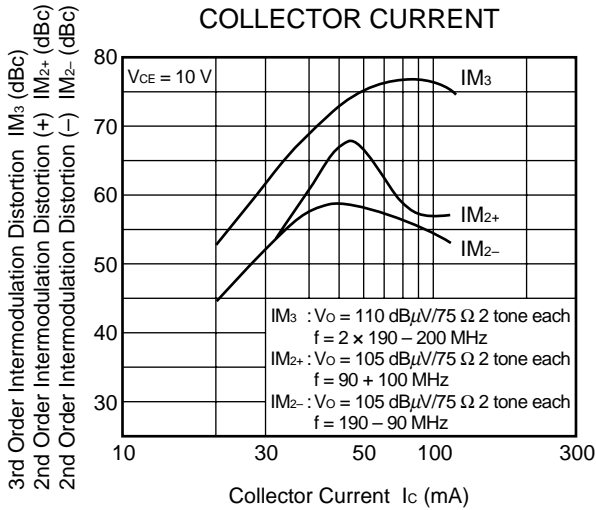
INSERTION POWER GAIN, MAXIMUM POWER GAIN, MAG vs. COLLECTOR CURRENT



NOISE FIGURE vs. COLLECTOR CURRENT



IM3, IM2+, IM2- 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.

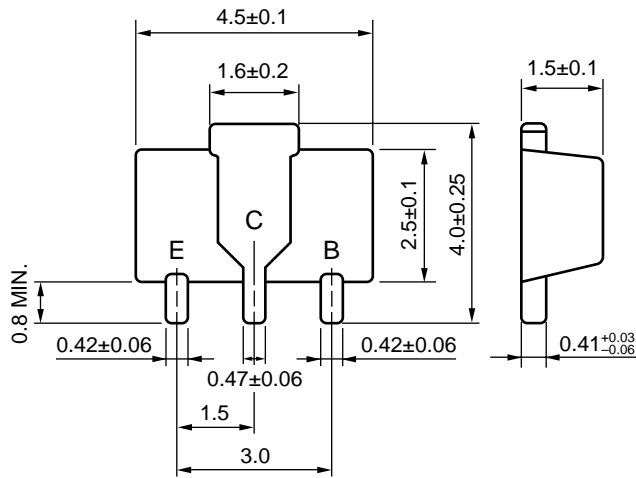
Click here to download S-parameters.

[RF and Microwave] → [Device Parameters]

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

★ PACKAGE DIMENSIONS

3-PIN POWER MINIMOLD (UNIT: mm)



**PIN CONNECTIONS**

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

(IEC : SOT-89)

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