

To our customers,

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## Old Company Name in Catalogs and Other Documents

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On April 1<sup>st</sup>, 2010, NEC Electronics Corporation merged with Renesas Technology Corporation, and Renesas Electronics Corporation took over all the business of both companies. Therefore, although the old company name remains in this document, it is a valid Renesas Electronics document. We appreciate your understanding.

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  
**2SC5186**

NPN EPITAXIAL SILICON RF TRANSISTOR  
 FOR LOW-NOISE MICROWAVE AMPLIFICATION  
 3-PIN ULTRA SUPER MINIMOLD

**FEATURES**

- Low noise  
 NF = 1.3 dB TYP. @  $V_{CE} = 2\text{ V}$ ,  $I_c = 3\text{ mA}$ ,  $f = 2\text{ GHz}$   
 NF = 1.3 dB TYP. @  $V_{CE} = 1\text{ V}$ ,  $I_c = 3\text{ mA}$ ,  $f = 2\text{ GHz}$
- 3-pin ultra super minimold package

**ORDERING INFORMATION**

Part Number	Quantity	Supplying Form
2SC5186	50 pcs (Non reel)	<ul style="list-style-type: none"> <li>• 8 mm wide embossed taping</li> <li>• Pin 3 (collector) face the perforation side of the tape</li> </ul>
2SC5186-T1	3 kpcs/reel	

**Remark** To order evaluation samples, contact your nearby sales office.  
 The unit sample quantity is 50 pcs.

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

Parameter	Symbol	Ratings	Unit
Collector to Base Voltage	$V_{CBO}$	5	V
Collector to Emitter Voltage	$V_{CEO}$	3	V
Emitter to Base Voltage	$V_{EBO}$	2	V
Collector Current	$I_c$	30	mA
Total Power Dissipation	$P_{tot}^{\text{Note}}$	90	mW
Junction Temperature	$T_j$	150	$^\circ\text{C}$
Storage Temperature	$T_{stg}$	-65 to +150	$^\circ\text{C}$

**Note** Free air

**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> = 5 V, I <sub>E</sub> = 0 mA	–	–	100	nA
Emitter Cut-off Current	I <sub>EBO</sub>	V <sub>EB</sub> = 1 V, I <sub>C</sub> = 0 mA	–	–	100	nA
DC Current Gain	h <sub>FE</sub> <sup>Note 1</sup>	V <sub>CE</sub> = 2 V, I <sub>C</sub> = 20 mA	70	–	140	–
RF Characteristics						
Gain Bandwidth Product (1)	f <sub>T</sub>	V <sub>CE</sub> = 2 V, I <sub>C</sub> = 20 mA, f = 2 GHz	9	11	–	GHz
Gain Bandwidth Product (2)	f <sub>T</sub>	V <sub>CE</sub> = 1 V, I <sub>C</sub> = 10 mA, f = 2 GHz	7	9	–	GHz
Insertion Power Gain (1)	S <sub>21e</sub>   <sup>2</sup>	V <sub>CE</sub> = 2 V, I <sub>C</sub> = 20 mA, f = 2 GHz	8.5	10	–	dB
Insertion Power Gain (2)	S <sub>21e</sub>   <sup>2</sup>	V <sub>CE</sub> = 1 V, I <sub>C</sub> = 10 mA, f = 2 GHz	6.0	7.5	–	dB
Noise Figure (1)	NF	V <sub>CE</sub> = 2 V, I <sub>C</sub> = 3 mA, f = 2 GHz	–	1.3	2.0	dB
Noise Figure (2)	NF	V <sub>CE</sub> = 1 V, I <sub>C</sub> = 3 mA, f = 2 GHz	–	1.3	2.0	dB
Reverse Transfer Capacitance	C <sub>re</sub> <sup>Note 2</sup>	V <sub>CB</sub> = 2 V, I <sub>E</sub> = 0 mA, f = 1 MHz	–	0.4	0.8	pF

- Notes** 1. Pulse measurement: PW ≤ 350 μs, Duty Cycle ≤ 2%  
 2. Collector to base capacitance when the emitter grounded

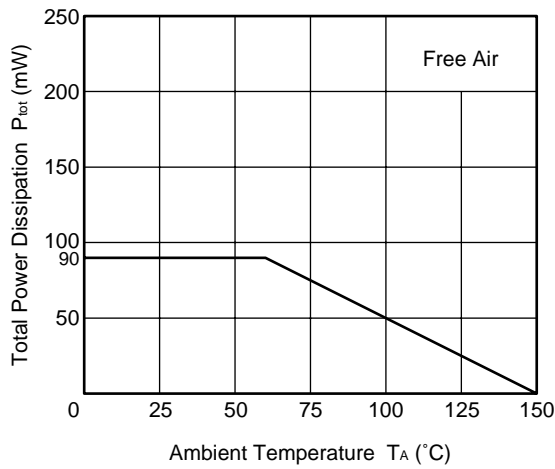
**h<sub>FE</sub> CLASSIFICATION**

Rank	FB
Marking	86
h <sub>FE</sub> Value	70 to 140

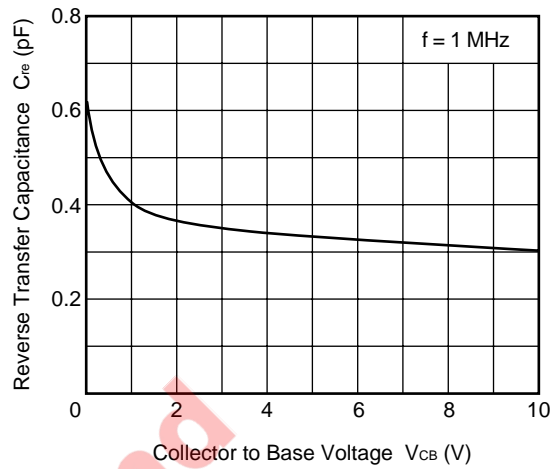
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★ TYPICAL CHARACTERISTICS (T<sub>A</sub> = +25°C, unless otherwise specified)

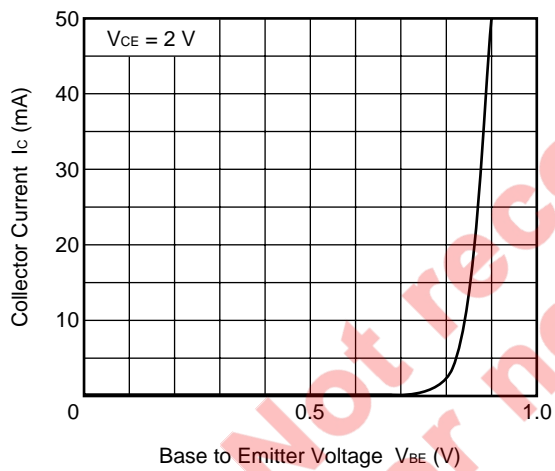
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



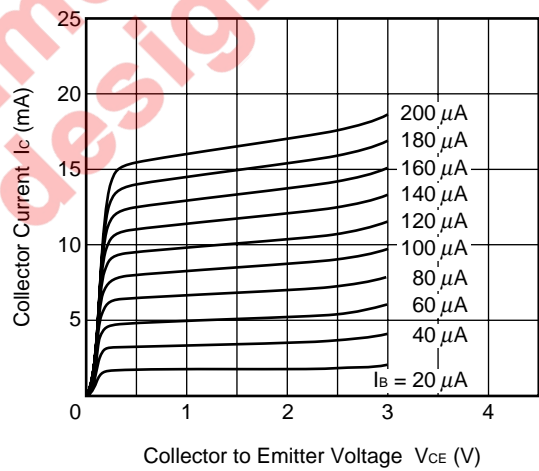
REVERSE TRANSFER CAPACITANCE vs. COLLECTOR TO BASE VOLTAGE



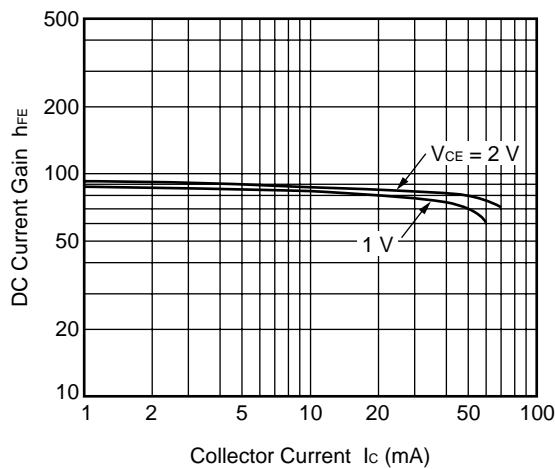
COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE



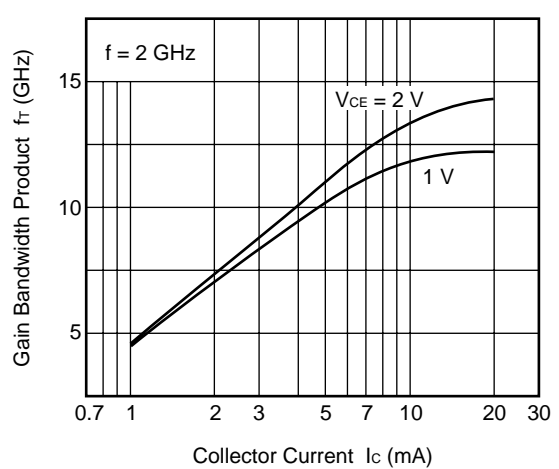
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



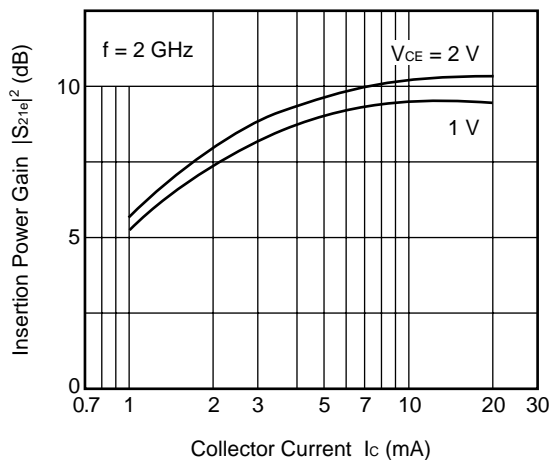
DC CURRENT GAIN vs. COLLECTOR CURRENT



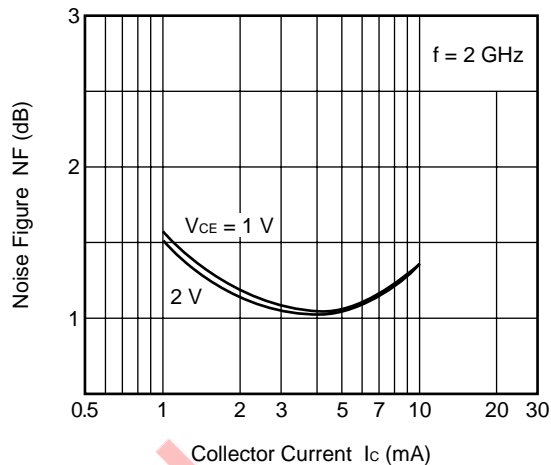
GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT



INSERTION POWER GAIN vs. COLLECTOR CURRENT



NOISE FIGURE vs. COLLECTOR CURRENT



**Remark** The graphs indicate nominal characteristics.

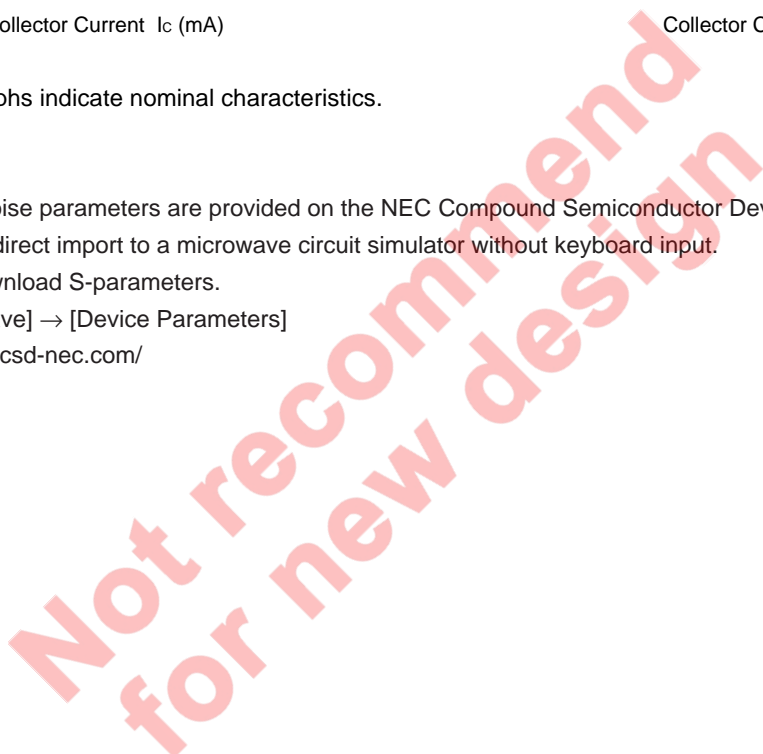
**S-PARAMETERS**

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.

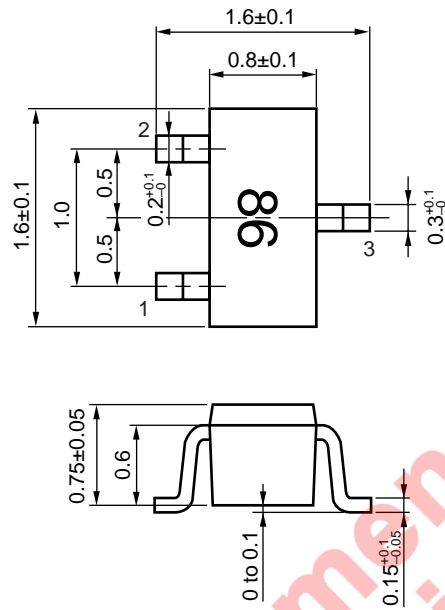
[RF and Microwave] → [Device Parameters]

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



PACKAGE DIMENSIONS

3-PIN ULTRA SUPER MINIMOLD (UNIT: mm)



PIN CONNECTIONS

1. Emitter
2. Base
3. Collector

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M8E 00.4-0110

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► **Technical issue**

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