

# NE202930

R09DS0003EJ0100

Rev.1.00

Jul 14, 2010

## Silicon NPN Epitaxial High Frequency Transistor

### FEATURES

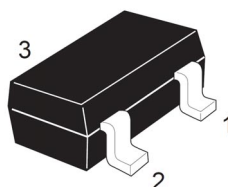
- High transition frequency  $f_T = 11$  GHz TYP.
- Ideal for low noise and low distortion amplification
- Suitable for equipments of low collector voltage (Less than 5 V)
- Suitable for up to 1 GHz applications

### APPLICATIONS

- LNA (Low Noise Amplifier) or power splitter for digital-TV

### OUTLINE

RENESAS Package code: 30  
(Package name: 3-pin super minimold (30 PKG))



1. Emitter
2. Base
3. Collector

Note: Marking is "R7D"

### ORDERING INFORMATION

Part Number	Order Number	Package	Marking	Supplying Form
NE202930-T1	NE202930-T1-A	3-pin super minimold (30 PKG) (Pb-Free)	R7D	<ul style="list-style-type: none"> <li>• Embossed tape 8 mm wide</li> <li>• Pin 3 face the perforation side of the tape</li> <li>• Qty 3 kpcs/reel</li> </ul>

**Remark** To order evaluation samples, please contact your nearby sales office.  
Part number for sample order: NE202930

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

Parameter	Symbol	Ratings	Unit
Collector to Base Voltage	$V_{CBO}$	9	V
Collector to Emitter Voltage (Base Short)	$V_{CES}$	9	V
Collector to Emitter Voltage (Base Open)	$V_{CEO}$	6	V
Emitter to Base Voltage	$V_{EBO}$	2	V
Collector Current	$I_C$	100	mA
Total Power Dissipation <sup>Note</sup>	$P_{tot}$	150	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.

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

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	–	–	100	nA
Emitter Cut-off Current	I <sub>EBO</sub>	V <sub>EB</sub> = 1 V, I <sub>C</sub> = 0	–	–	100	nA
DC Current Gain	h <sub>FE</sub> <sup>Note 1</sup>	V <sub>CE</sub> = 5 V, I <sub>C</sub> = 5 mA	85	140	205	–
RF Characteristics						
Gain Bandwidth Product	f <sub>T</sub>	V <sub>CE</sub> = 5 V, I <sub>C</sub> = 30 mA, f = 1 GHz	–	11.0	–	GHz
Insertion Power Gain	S <sub>21e</sub>   <sup>2</sup>	V <sub>CE</sub> = 5 V, I <sub>C</sub> = 30 mA, f = 1 GHz	11.5	13.5	–	dB
Noise Figure (1)	NF1	V <sub>CE</sub> = 5 V, I <sub>C</sub> = 5 mA, f = 1 GHz, Z <sub>S</sub> = Z <sub>Sopt</sub> , Z <sub>L</sub> = 50 Ω	–	1.15	1.5	dB
Noise Figure (2)	NF2	V <sub>CE</sub> = 5 V, I <sub>C</sub> = 30 mA, f = 1 GHz, Z <sub>S</sub> = Z <sub>Sopt</sub> , Z <sub>L</sub> = Z <sub>Lopt</sub>	–	1.5	–	dB
Associated Gain (1)	G <sub>a1</sub>	V <sub>CE</sub> = 5 V, I <sub>C</sub> = 5 mA, f = 1 GHz, Z <sub>S</sub> = Z <sub>Sopt</sub> , Z <sub>L</sub> = 50 Ω	10.0	12.0	–	dB
Associated Gain (2)	G <sub>a2</sub>	V <sub>CE</sub> = 5 V, I <sub>C</sub> = 30 mA, f = 1 GHz, Z <sub>S</sub> = Z <sub>Sopt</sub> , Z <sub>L</sub> = Z <sub>Lopt</sub>	–	13.5	–	dB
Reverse Transfer Capacitance	C <sub>re</sub> <sup>Note 2</sup>	V <sub>CB</sub> = 5 V, I <sub>E</sub> = 0, f = 1 MHz	–	0.6	0.8	pF
Maximum Stable Power Gain	MSG <sup>Note 3</sup>	V <sub>CE</sub> = 5 V, I <sub>C</sub> = 30 mA, f = 1 GHz	13.5	15.5	–	dB
Gain 1 dB Compression Output Power	P <sub>O(1 dB)</sub>	V <sub>CE</sub> = 5 V, I <sub>C(set)</sub> = 30 mA, f = 1 GHz, Z <sub>S</sub> = Z <sub>Sopt</sub> , Z <sub>L</sub> = Z <sub>Lopt</sub>	–	19	–	dBm
Output 3rd Order Intercept Point	OIP <sub>3</sub>	V <sub>CE</sub> = 5 V, I <sub>C(set)</sub> = 30 mA, f = 1 GHz, Δf = 1 MHz, Z <sub>S</sub> = Z <sub>Sopt</sub> , Z <sub>L</sub> = Z <sub>Lopt</sub>	–	32	–	dBm

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

2. Collector to base capacitance when the emitter grounded.

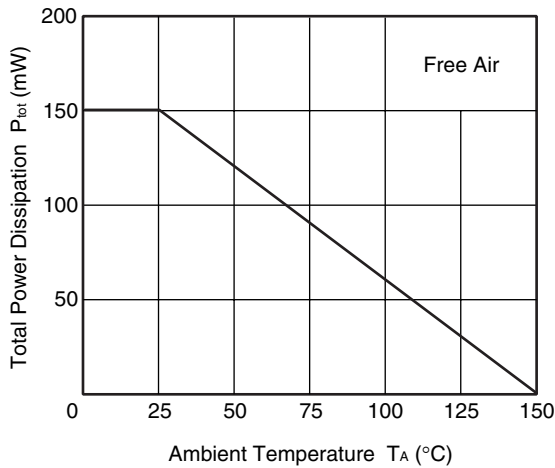
$$3. \text{MSG} = \left| \frac{S_{21}}{S_{12}} \right|$$

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

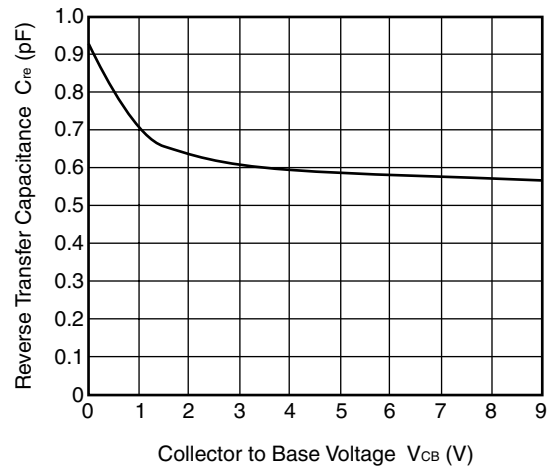
Rank	YFB
Marking	R7D
h <sub>FE</sub> Value	85 to 205

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

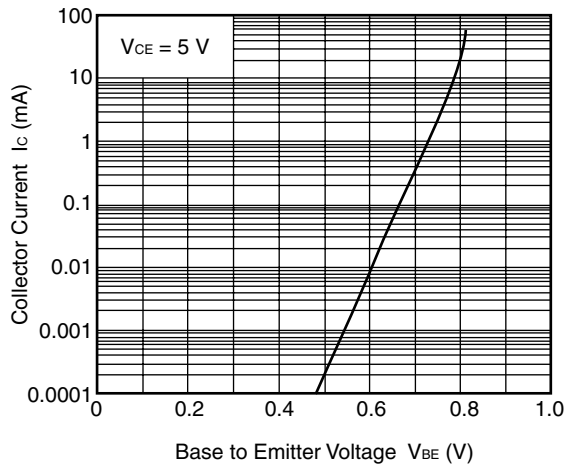
**TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE**



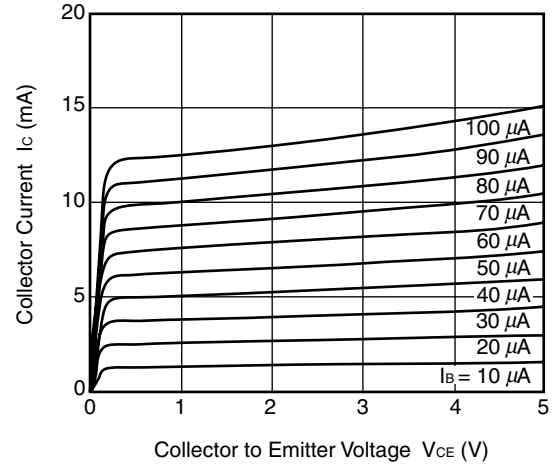
**REVERSE TRANSFER CAPACITANCE vs. COLLECTOR TO BASE VOLTAGE**



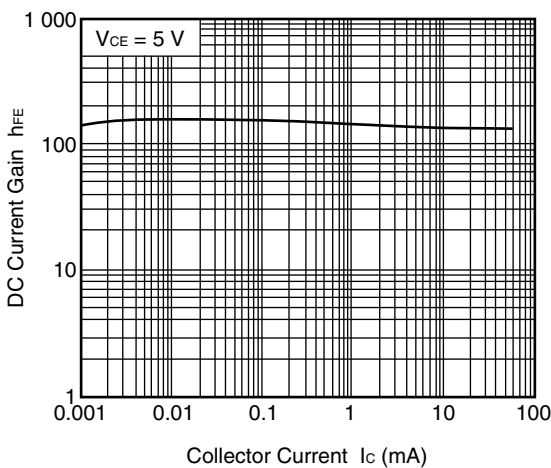
**COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE**



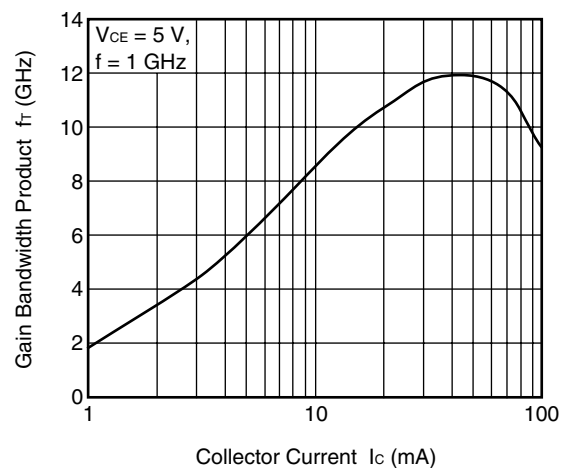
**COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE**



**DC CURRENT GAIN vs. COLLECTOR CURRENT**

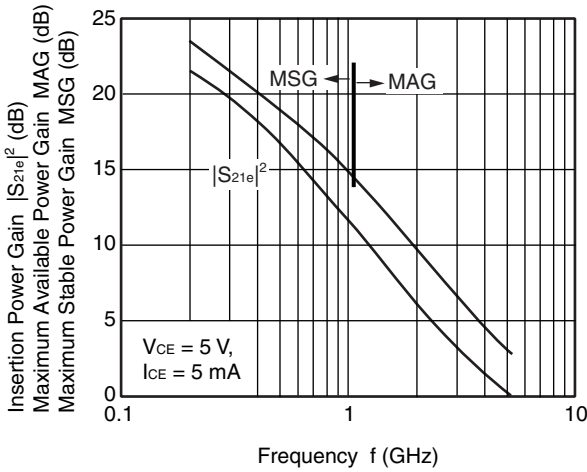


**GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT**

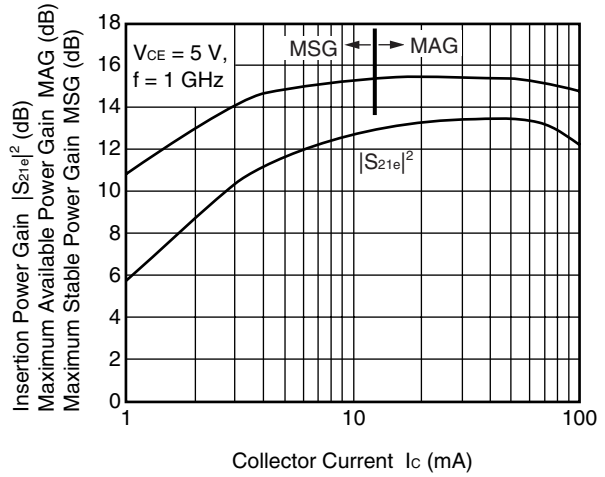


**Remark** The graphs indicate nominal characteristics.

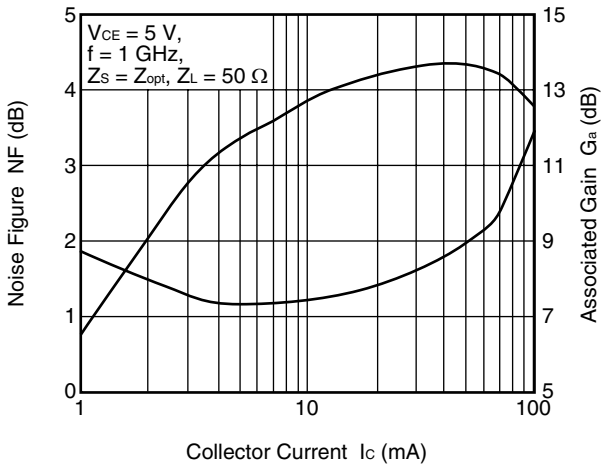
INSERTION POWER GAIN, MAG, MSG vs. FREQUENCY



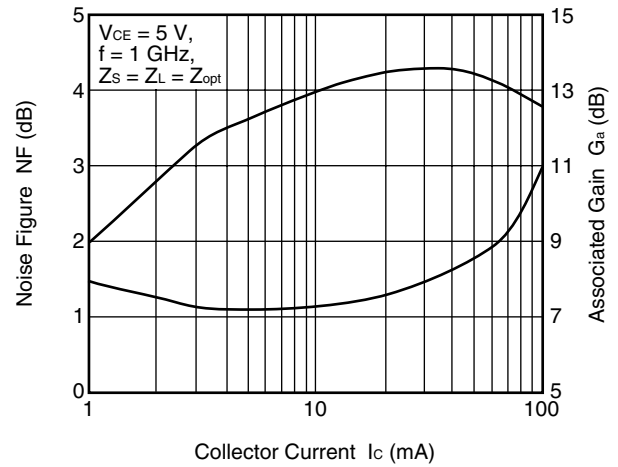
INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT



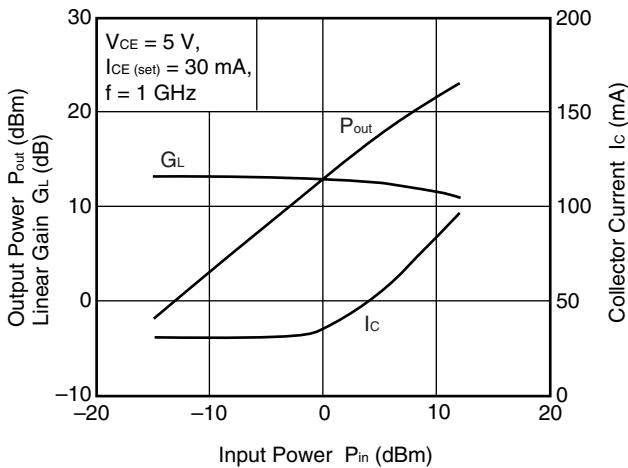
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



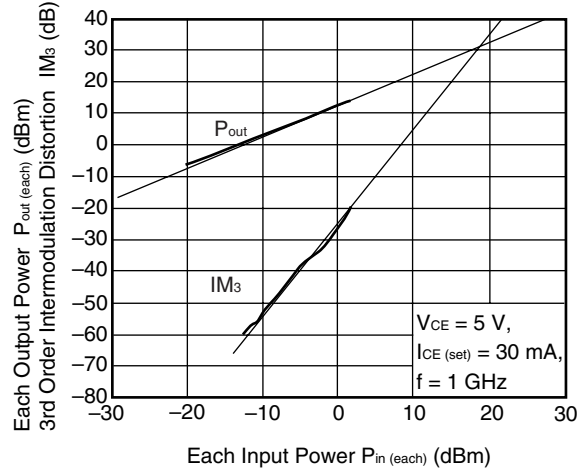
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



OUTPUT POWER, LINEAR GAIN, COLLECTOR CURRENT vs. INPUT POWER



EACH OUTPUT POWER, IM3 vs. EACH INPUT POWER



**Remark** The graphs indicate nominal characteristics.

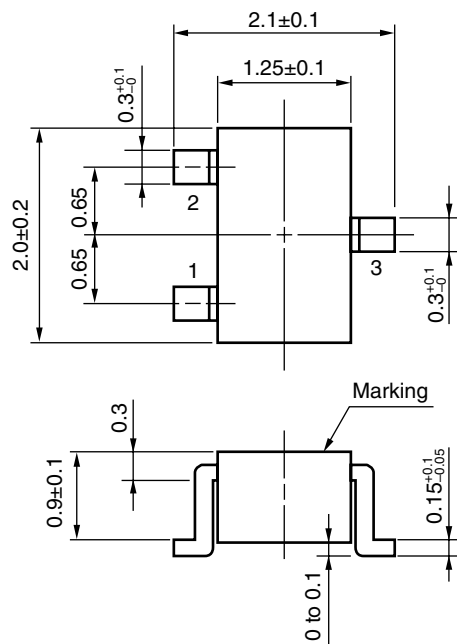
## S-PARAMETERS

S-parameters and noise parameters are provided on our Web site in a format (S2P) that enables the direct import of the parameters to microwave circuit simulators without the need for keyboard inputs.

Click here to download S-parameters.

[RF and Microwave] → [Device Parameters]

URL <http://www2.renesas.com/microwave/en/download.html>

**PACKAGE DIMENSIONS****3-PIN SUPER MINIMOLD (30 PKG) (UNIT: mm)****PIN CONNECTIONS**

1. Emitter
2. Base
3. Collector

<b>Revision History</b>	<b>NE202930 Data Sheet</b>
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<b>Rev.</b>	<b>Date</b>	<b>Description</b>	
		<b>Page</b>	<b>Summary</b>
1.00	Jul 14, 2010	–	First edition issued

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