

# NESG340033

R09DS0016EJ0100

Rev.1.00

Mar 29, 2011

## NPN Silicon Germanium RF Transistor

### DESCRIPTION

The NESG340033 is an ideal choice for low noise, low distortion amplification.

### FEATURES

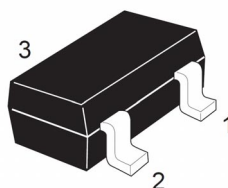
- $NF = 0.65 \text{ dB TYP. @ } V_{CE} = 3.3 \text{ V, } I_C = 15 \text{ mA, } f = 1 \text{ GHz}$
- $P_{o(1 \text{ dB})} = 21 \text{ dBm TYP. @ } V_{CE} = 3.3 \text{ V, } I_{C(\text{set})} = 40 \text{ mA, } f = 1 \text{ GHz}$
- $OIP_3 = 35.5 \text{ dBm TYP. @ } V_{CE} = 3.3 \text{ V, } I_{C(\text{set})} = 50 \text{ mA, } f = 1 \text{ GHz}$
- Maximum stable power gain:  $MSG = 13.0 \text{ dB TYP. @ } V_{CE} = 3.3 \text{ V, } I_C = 40 \text{ mA, } f = 1 \text{ GHz}$
- SiGe HBT technology (UHS3) :  $f_T = 10 \text{ GHz}$
- This product is improvement of ESD
- 3-pin minimold (33 PKG)

### APPLICATIONS

- Suitable for up to 1GHz applications.  
e.g. LNA (Low Noise Amplifier) or Power splitter for Digital-TV.

### OUTLINE

RENESAS Package code: 33  
(Package name: 3-pin minimold (33 PKG))



1. Emitter
2. Base
3. Collector

Note: Marking is "R7E"

### ORDERING INFORMATION

Part Number	Order Number	Package	Quantity	Supplying Form
NESG340033	NESG340033-A	3-pin minimold (33 PKG)	50 pcs (Non reel)	<ul style="list-style-type: none"> <li>• Embossed tape 8 mm wide</li> <li>• Pin 3 face the perforation side of the tape</li> </ul>
NESG340033-T1B	NESG340033-T1B-A	(Pb-Free)	3 kpcs/reel	<ul style="list-style-type: none"> <li>• Qty 3 kpcs/reel</li> </ul>

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

### CAUTION

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

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

Parameter	Symbol	Ratings	Unit
Collector to Base Voltage	V <sub>CBO</sub>	5.5	V
Collector to Emitter Voltage (Base Short)	V <sub>CES</sub>	13	V
Collector to Emitter Voltage (Base Open)	V <sub>CEO</sub>	5.5	V
Base Current <sup>Note1</sup>	I <sub>B</sub>	36	mA
Collector Current	I <sub>C</sub>	400	mA
Total Power Dissipation <sup>Note2</sup>	P <sub>tot</sub>	480	mW
Junction Temperature	T <sub>j</sub>	150	°C
Storage Temperature	T <sub>stg</sub>	-65 to +150	°C

Notes: 1. Depend on the ESD protect device.

2. Mounted on 3.8 cm × 9.0 cm × 0.8 mm (t) glass epoxy PWB

**THERMAL RESISTANCE (T<sub>A</sub> = +25°C)**

Parameter	Symbol	Ratings	Unit
Thermal Resistance from Junction to Ambient <sup>Note</sup>	R <sub>thj-a</sub>	260	°C/W

Note: Mounted on 3.8 cm × 9.0 cm × 0.8 mm (t) glass epoxy PWB

**RECOMMENDED OPERATING RANGE (T<sub>A</sub> = +25°C)**

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Collector Current	I <sub>C</sub>	–	50	–	mA

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	–	–	100	nA
Emitter Cut-off Current	I <sub>EBO</sub>	V <sub>EB</sub> = 0.4 V, I <sub>C</sub> = 0	–	–	100	nA
DC Current Gain	h <sub>FE</sub> <sup>Note1</sup>	V <sub>CE</sub> = 3.3 V, I <sub>C</sub> = 15 mA	200	300	400	–
RF Characteristics						
Gain Bandwidth Product	f <sub>T</sub>	V <sub>CE</sub> = 3.3 V, I <sub>C</sub> = 40 mA, f = 1 GHz	–	10.0	–	GHz
Insertion Power Gain	S <sub>21e</sub>   <sup>2</sup>	V <sub>CE</sub> = 3.3 V, I <sub>C</sub> = 40 mA, f = 1 GHz	9.5	11.5	–	dB
Noise Figure (1)	NF1	V <sub>CE</sub> = 3.3 V, I <sub>C</sub> = 15 mA, f = 1 GHz, Z <sub>S</sub> = Z <sub>Sopt</sub> , Z <sub>L</sub> = 50 Ω	–	0.65	1.05	dB
Noise Figure (2)	NF2	V <sub>CE</sub> = 3.3 V, I <sub>C</sub> = 40 mA, f = 1 GHz, Z <sub>S</sub> = Z <sub>Sopt</sub> , Z <sub>L</sub> = Z <sub>Lopt</sub>	–	0.7	–	dB
Associated Gain (1)	G <sub>a1</sub>	V <sub>CE</sub> = 3.3 V, I <sub>C</sub> = 15 mA, f = 1 GHz, Z <sub>S</sub> = Z <sub>Sopt</sub> , Z <sub>L</sub> = 50 Ω	9.5	11.5	–	dB
Associated Gain (2)	G <sub>a2</sub>	V <sub>CE</sub> = 3.3 V, I <sub>C</sub> = 40 mA, f = 1 GHz, Z <sub>S</sub> = Z <sub>Sopt</sub> , Z <sub>L</sub> = Z <sub>Lopt</sub>	–	12.0	–	dB
Reverse Transfer Capacitance	C <sub>re</sub> <sup>Note 2</sup>	V <sub>CB</sub> = 3.3 V, I <sub>E</sub> = 0, f = 1 MHz	–	0.95	1.15	pF
Maximum Stable Power Gain	MSG <sup>Note 3</sup>	V <sub>CE</sub> = 3.3 V, I <sub>C</sub> = 40 mA, f = 1 GHz	11.0	13.0	–	dB
Gain 1 dB Compression Output Power	P <sub>O</sub> (1 dB)	V <sub>CE</sub> = 3.3 V, I <sub>C</sub> (set) = 40 mA, f = 1 GHz, Z <sub>S</sub> = Z <sub>Sopt</sub> , Z <sub>L</sub> = Z <sub>Lopt</sub>	–	21.0	–	dBm
Output 3rd Order Intercept Point 1	OIP <sub>3</sub> 1	V <sub>CE</sub> = 3.3 V, I <sub>C</sub> (set) = 40 mA, f = 1 GHz, Δf = 1 MHz, Z <sub>S</sub> = Z <sub>Sopt</sub> , Z <sub>L</sub> = Z <sub>Lopt</sub>	–	35.0	–	dBm
Output 3rd Order Intercept Point 2	OIP <sub>3</sub> 2	V <sub>CE</sub> = 3.3 V, I <sub>C</sub> (set) = 50 mA, f = 1 GHz, Δf = 1 MHz, Z <sub>S</sub> = Z <sub>Sopt</sub> , Z <sub>L</sub> = Z <sub>Lopt</sub>	–	35.5	–	dBm

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

2. Collector to base capacitance when the emitter grounded.

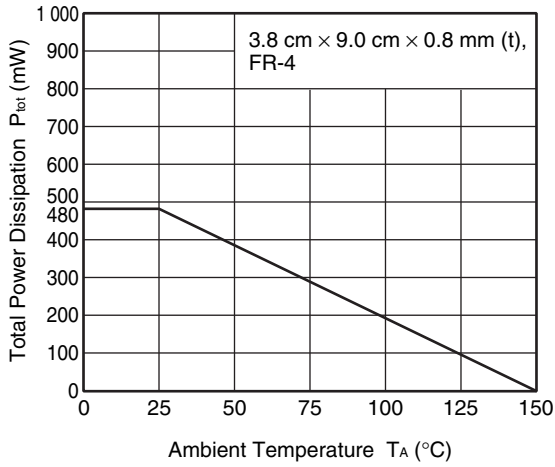
$$3. \text{MSG} = \left| \frac{S_{21}}{S_{12}} \right|$$

h<sub>FE</sub> CLASSIFICATION

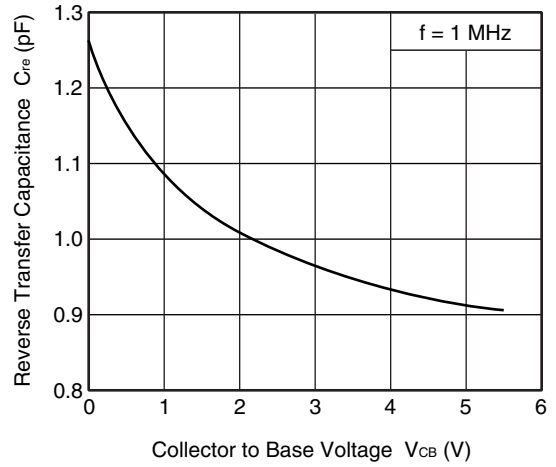
Rank	YFB
Marking	R7E
h <sub>FE</sub> Value	200 to 400

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

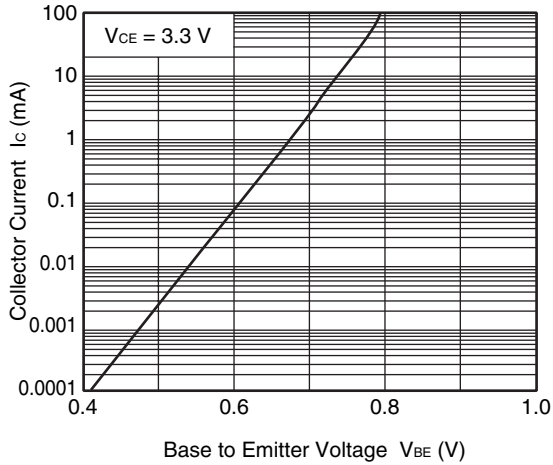
**TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE**



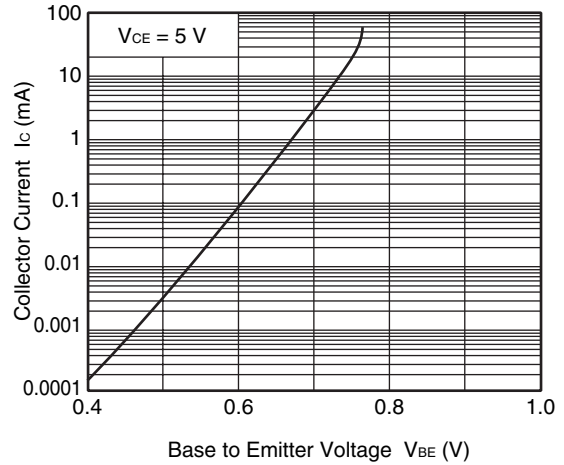
**REVERSE TRANSFER CAPACITANCE vs. COLLECTOR TO BASE VOLTAGE**



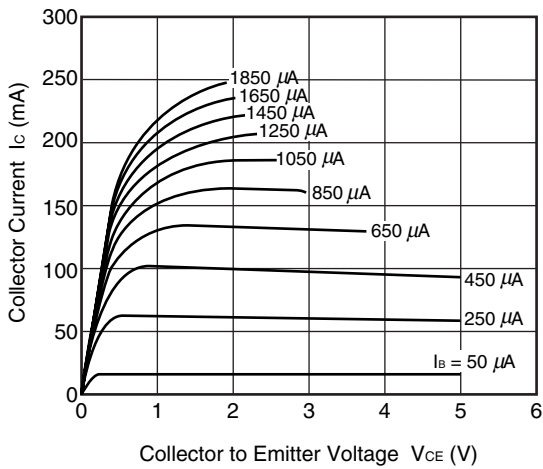
**COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE**



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

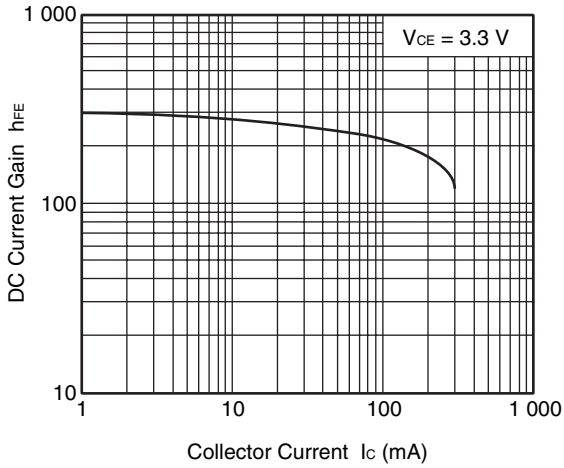


**COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE**

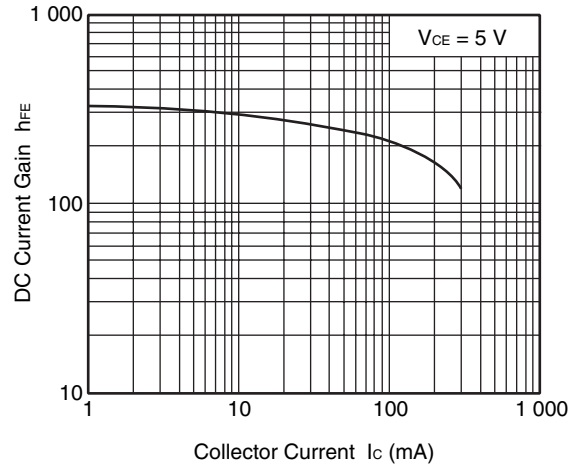


**Remark** The graphs indicate nominal characteristics.

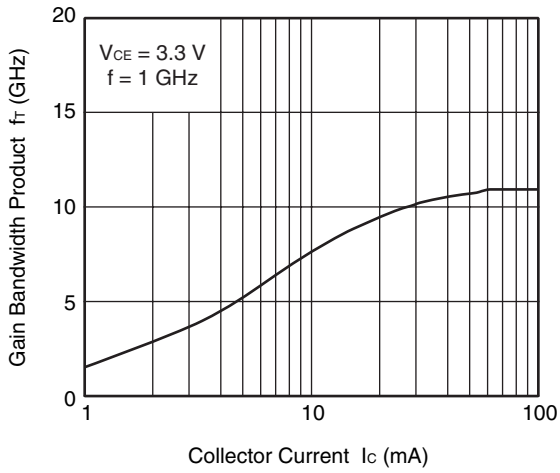
DC CURRENT GAIN vs. COLLECTOR CURRENT



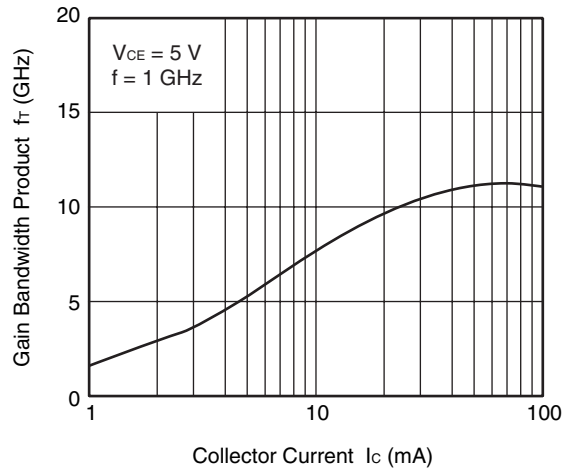
DC CURRENT GAIN vs. COLLECTOR CURRENT



GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT

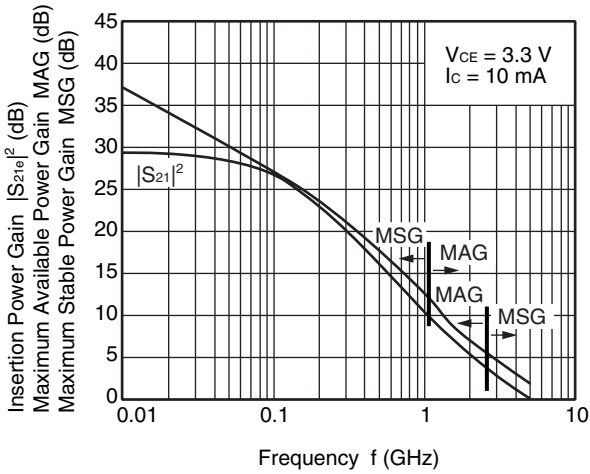


GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT

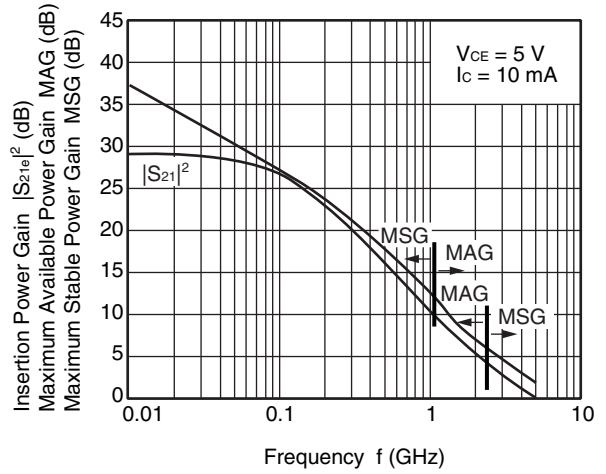


**Remark** The graphs indicate nominal characteristics.

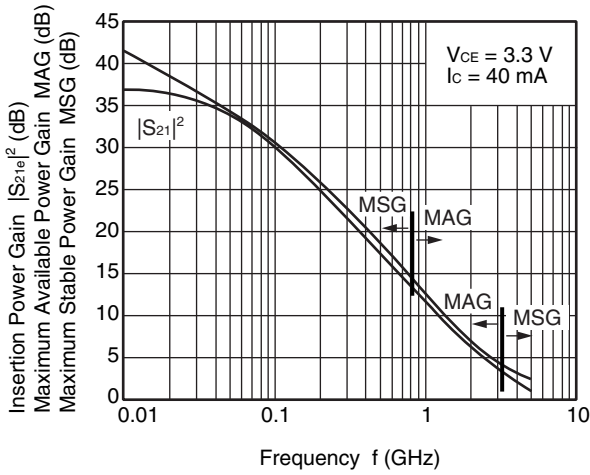
INSERTION POWER GAIN, MAG, MSG vs. FREQUENCY



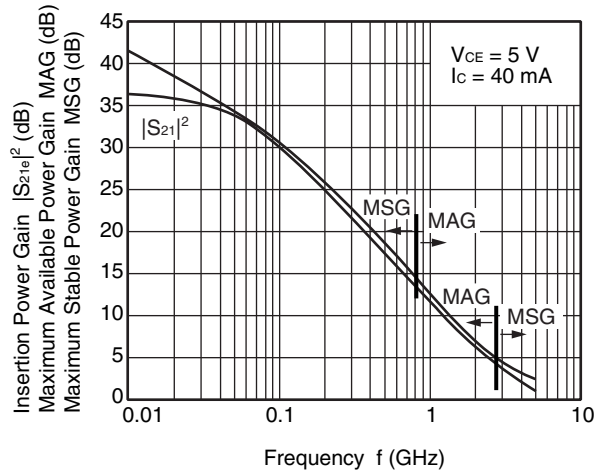
INSERTION POWER GAIN, MAG, MSG vs. FREQUENCY



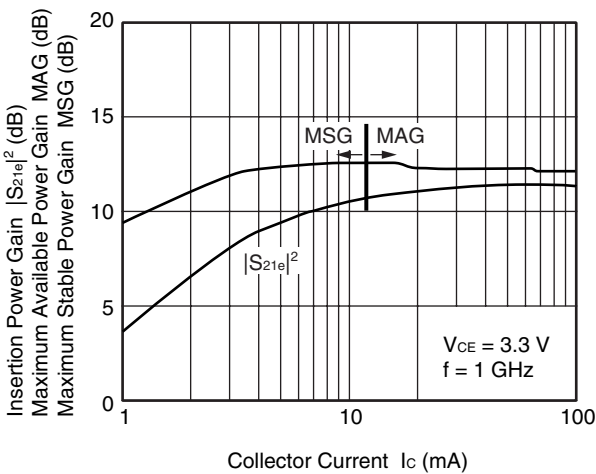
INSERTION POWER GAIN, MAG, MSG vs. FREQUENCY



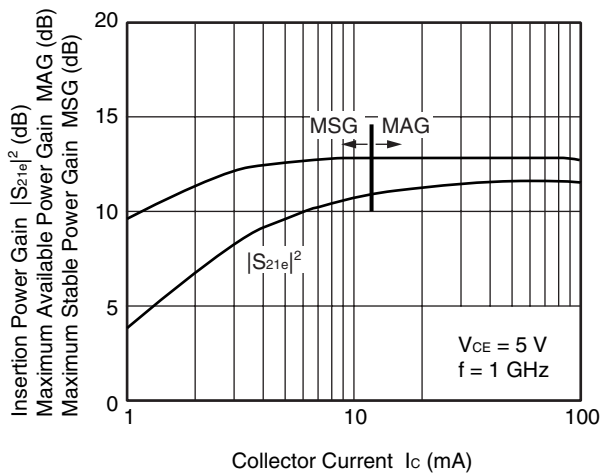
INSERTION POWER GAIN, MAG, MSG vs. FREQUENCY



INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT

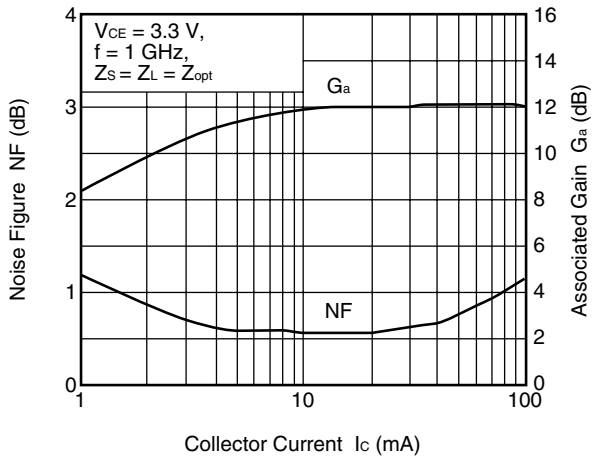


INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT

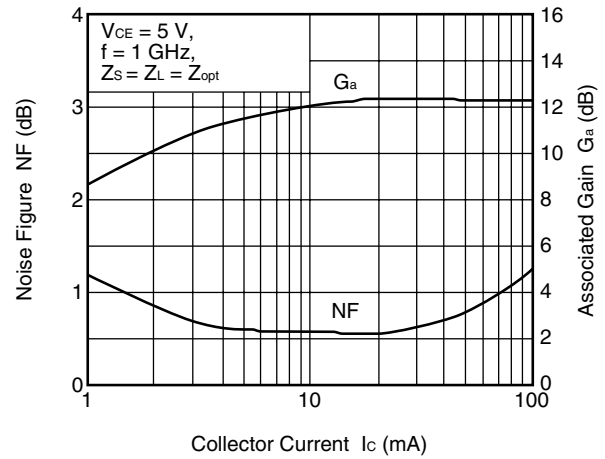


**Remark** The graphs indicate nominal characteristics.

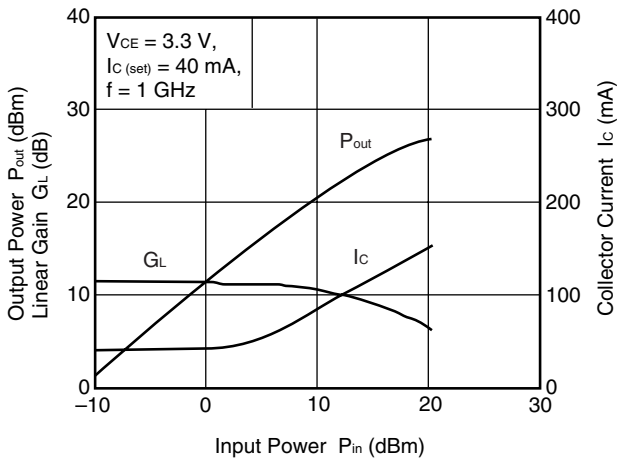
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



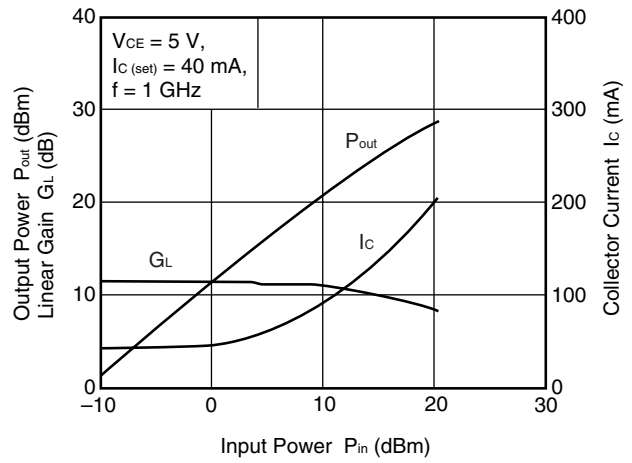
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



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

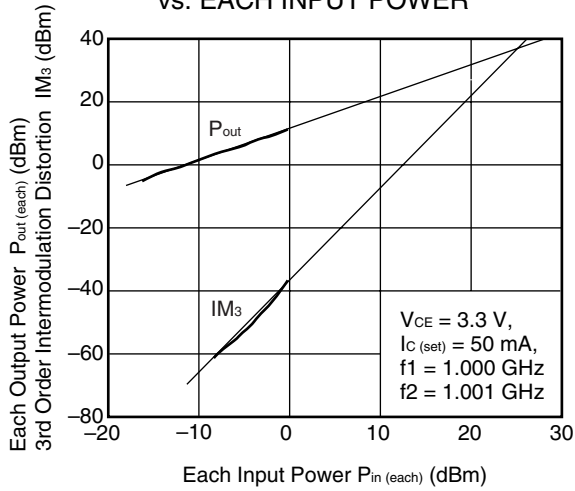


OUTPUT POWER, LINEAR GAIN, COLLECTOR CURRENT vs. INPUT POWER

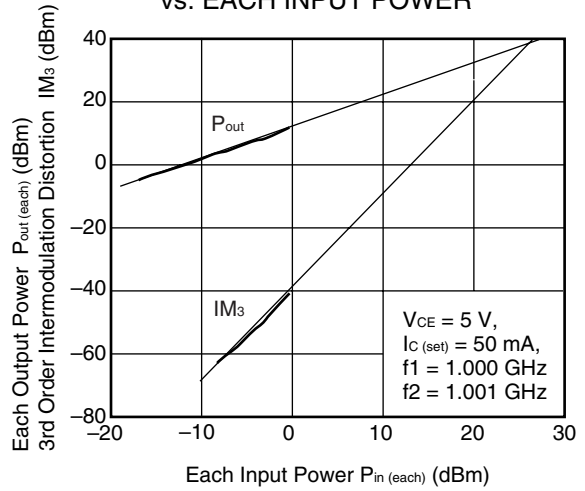


**Remark** The graphs indicate nominal characteristics.

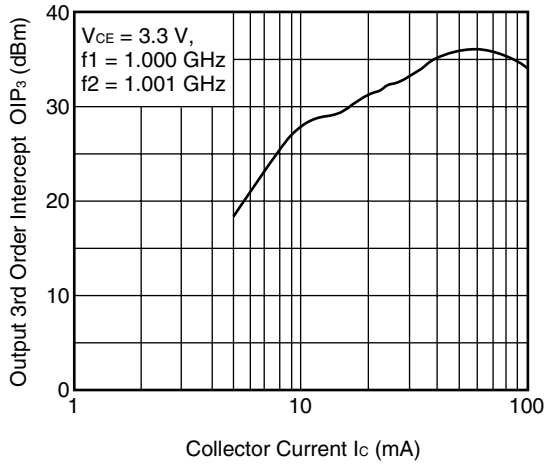
EACH OUTPUT POWER,  $IM_3$   
vs. EACH INPUT POWER



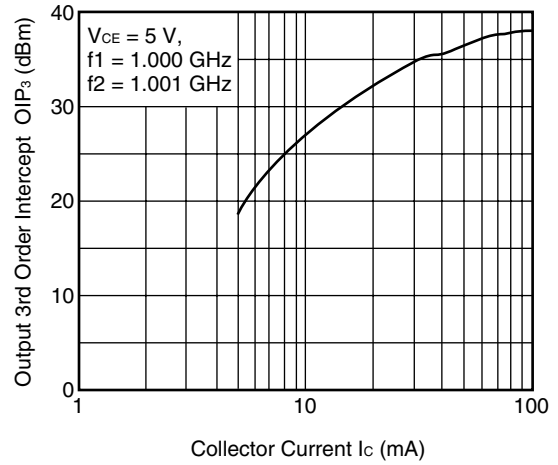
EACH OUTPUT POWER,  $IM_3$   
vs. EACH INPUT POWER



OUTPUT 3RD ORDER INTERCEPT POINT  
vs. COLLECTOR CURRENT



OUTPUT 3RD ORDER INTERCEPT POINT  
vs. COLLECTOR CURRENT



**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.

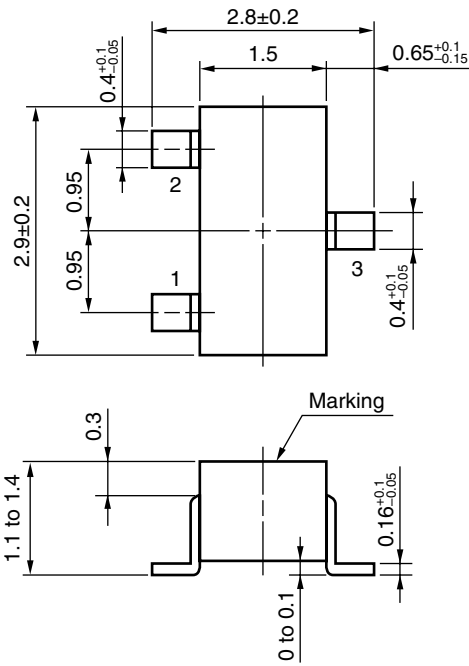
Click here to download S-parameters.

[RF and Microwave] → [Device Parameters]

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

**PACKAGE DIMENSIONS**

**3-PIN MINIMOLD (33 PKG) (UNIT: mm)**



**PIN CONNECTIONS**

- 1. Emitter
- 2. Base
- 3. Collector

<b>Revision History</b>	<b>NESG340033 Data Sheet</b>
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<b>Rev.</b>	<b>Date</b>	<b>Description</b>	
		<b>Page</b>	<b>Summary</b>
1.00	Mar 29, 2011	–	First edition issued

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