

To our customers,

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## Old Company Name in Catalogs and Other Documents

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

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NPN SILICON GERMANIUM RF TRANSISTOR  
**NESG210833**

NPN SiGe RF TRANSISTOR FOR  
 UHF-BAND, LOW NOISE, LOW DISTORTION AMPLIFICATION  
 3-PIN MINIMOLD (33 PKG)

**FEATURES**

- The device is an ideal choice for low noise, low distortion amplification.  
 NF = 0.7 dB TYP. @  $V_{CE} = 5\text{ V}$ ,  $I_C = 5\text{ mA}$ ,  $f = 1\text{ GHz}$   
 NF = 0.9 dB TYP. @  $V_{CE} = 5\text{ V}$ ,  $I_C = 30\text{ mA}$ ,  $f = 1\text{ GHz}$
- $P_{O(1\text{ dB})} = 18.5\text{ dBm}$  TYP. @  $V_{CE} = 5\text{ V}$ ,  $I_{C(\text{set})} = 30\text{ mA}$ ,  $f = 1\text{ GHz}$
- $OIP_3 = 31\text{ dBm}$  TYP. @  $V_{CE} = 5\text{ V}$ ,  $I_{C(\text{set})} = 30\text{ mA}$ ,  $f = 1\text{ GHz}$
- Maximum stable power gain:  $MSG = 16.0\text{ dB}$  TYP. @  $V_{CE} = 5\text{ V}$ ,  $I_C = 30\text{ mA}$ ,  $f = 1\text{ GHz}$
- SiGe HBT technology (UHS2) :  $f_T = 15.5\text{ GHz}$
- 3-pin minimold (33 PKG)

**ORDERING INFORMATION**

Part Number	Order Number	Package	Quantity	Supplying Form
NESG210833	NESG210833-A	3-pin minimold (33 PKG) (Pb-Free)	50 pcs (Non reel)	• 8 mm wide embossed taping • Pin 3 (Collector) face the perforation side of the tape
NESG210833-T1B	NESG210833-T1B-A		3 kpcs/reel	

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

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

Parameter	Symbol	Ratings	Unit
Collector to Base Voltage	$V_{CBO}$	5.5	V
Collector to Emitter Voltage	$V_{CES}$	13	V
Collector to Emitter Voltage	$V_{CEO}$	5.5	V
Base Current <sup>Note 1</sup>	$I_B$	36	mA
Collector Current	$I_C$	100	mA
Total Power Dissipation	$P_{tot}$ <sup>Note 2</sup>	480	mW
Junction Temperature	$T_J$	150	°C
Storage Temperature	$T_{stg}$	-65 to +150	°C

<R>

- Notes 1.** Depend on the ESD protect device.  
**2.** Mounted on 3.8 cm × 9.0 cm × 0.8 mm (t) glass epoxy PWB

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

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**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

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

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
<b>DC Characteristics</b>						
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> = 0.4 V, I <sub>C</sub> = 0 mA	–	–	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	140	180	260	–
Reverse Transfer Capacitance	C <sub>re</sub> <sup>Note 2</sup>	V <sub>CB</sub> = 5 V, I <sub>E</sub> = 0 mA, f = 1 MHz	–	0.5	0.7	pF
<b>RF Characteristics</b>						
Gain Bandwidth Product	f <sub>T</sub>	V <sub>CE</sub> = 5 V, I <sub>C</sub> = 30 mA, f = 1 GHz	–	15.5	–	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	12.5	14.5	–	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	–	0.7	1.1	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>	–	0.9	–	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	11	13	–	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>	–	14.5	–	dB
Maximum Stable Power Gain	MSG <sup>Note 3</sup>	V <sub>CE</sub> = 5 V, I <sub>C</sub> = 30 mA, f = 1 GHz	14	16	–	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>	–	18.5	–	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>	–	31	–	dBm

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

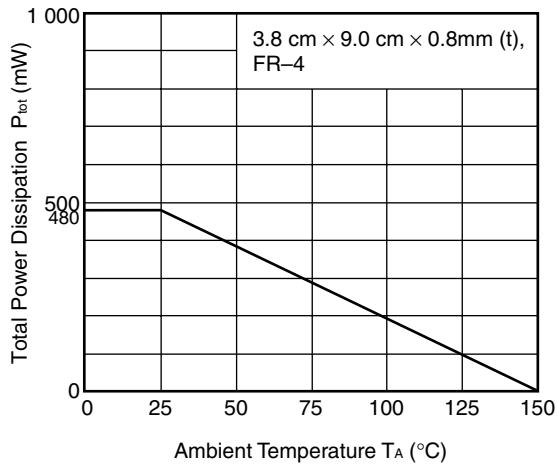
3.  $MSG = \left| \frac{S_{21}}{S_{12}} \right|$

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

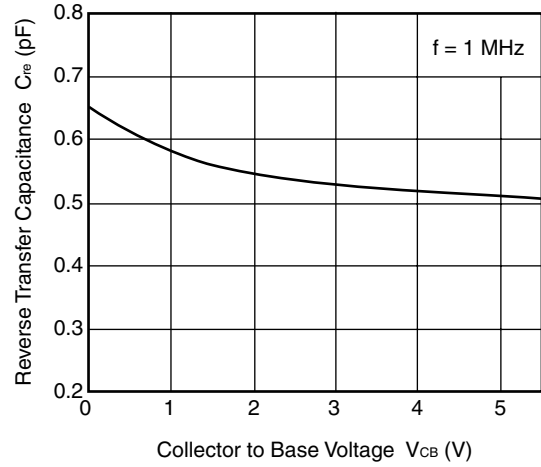
Rank	FB
Marking	R7C
h <sub>FE</sub> Value	140 to 260

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

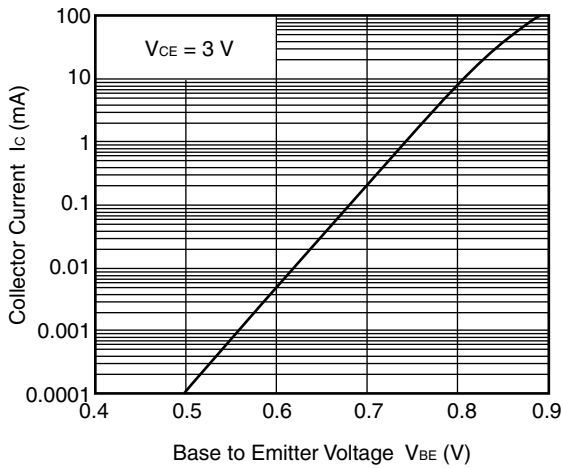
**TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE**



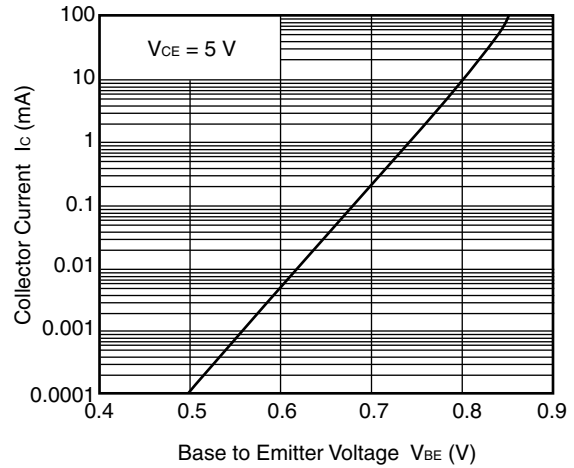
**REVERSE TRANSFER CAPACITANCE vs. COLLECTOR TO BASE VOLTAGE**



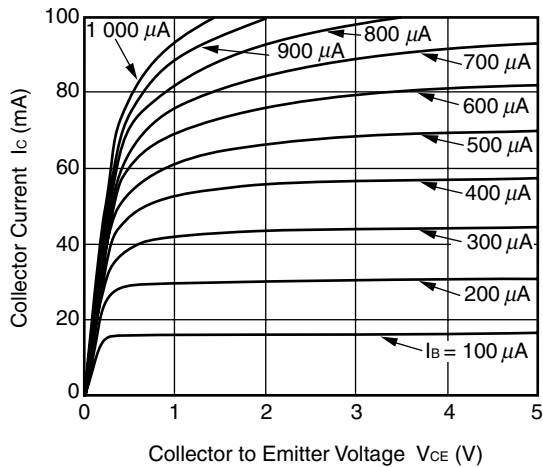
**COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE**



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

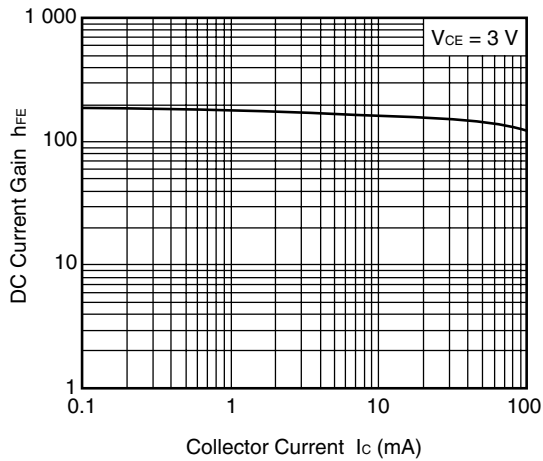


**COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE**

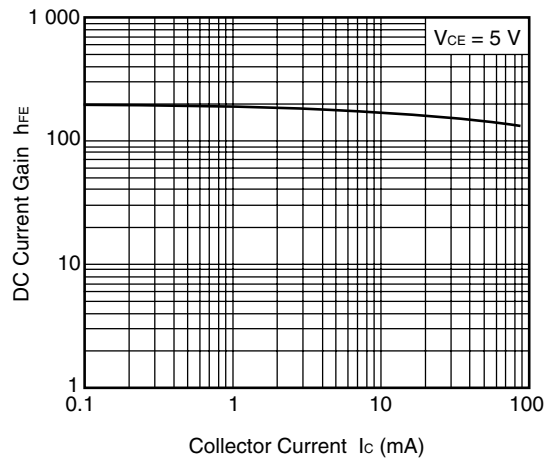


**Remark** The graphs indicate nominal characteristics.

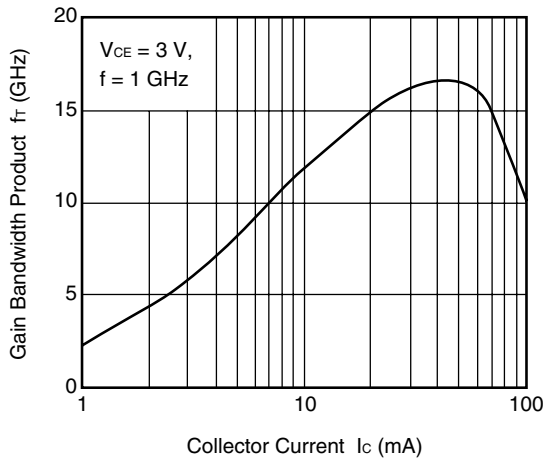
DC CURRENT GAIN vs. COLLECTOR CURRENT



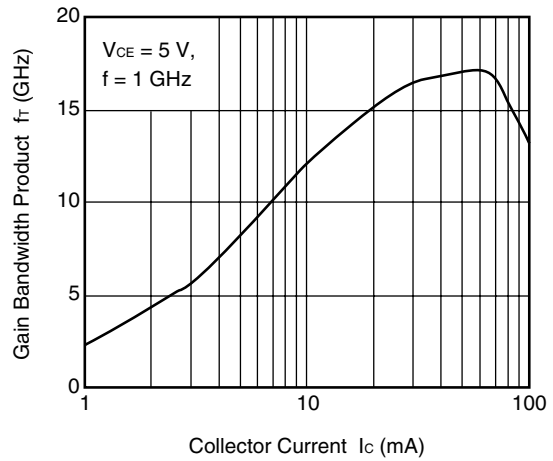
DC CURRENT GAIN vs. COLLECTOR CURRENT



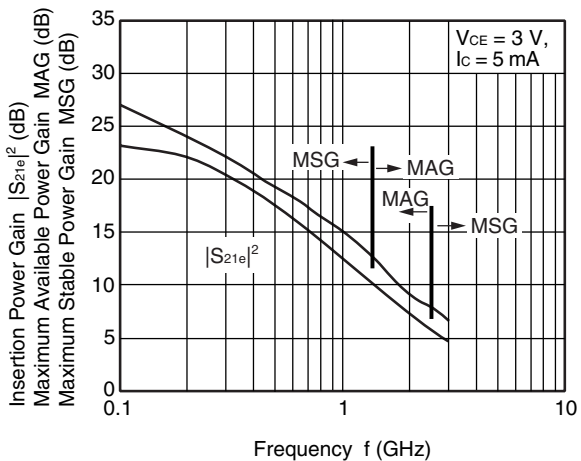
GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT



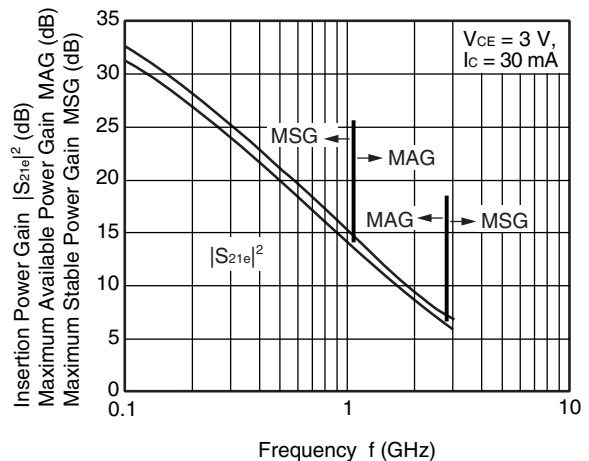
GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT



INSERTION POWER GAIN, MAG, MSG vs. FREQUENCY

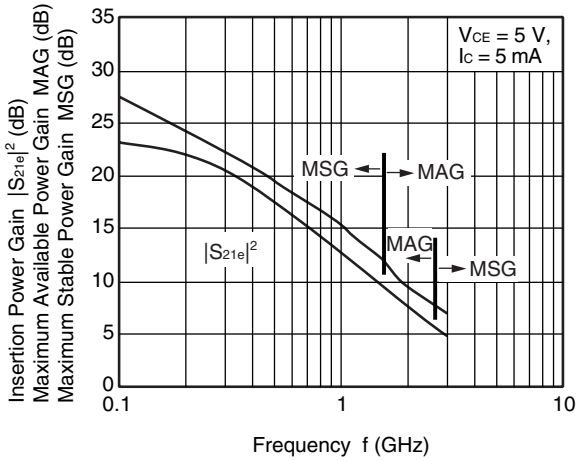


INSERTION POWER GAIN, MAG, MSG vs. FREQUENCY

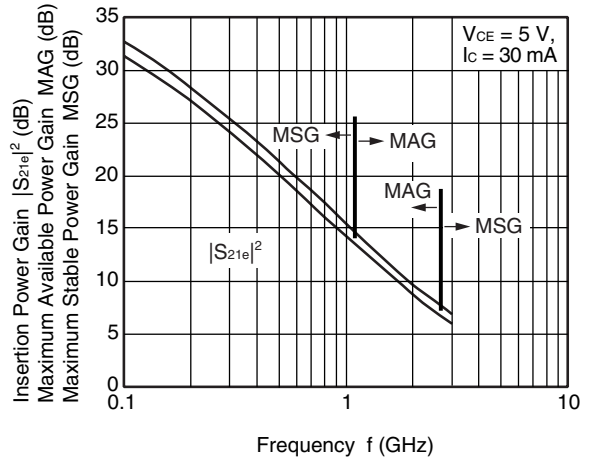


**Remark** The graphs indicate nominal characteristics.

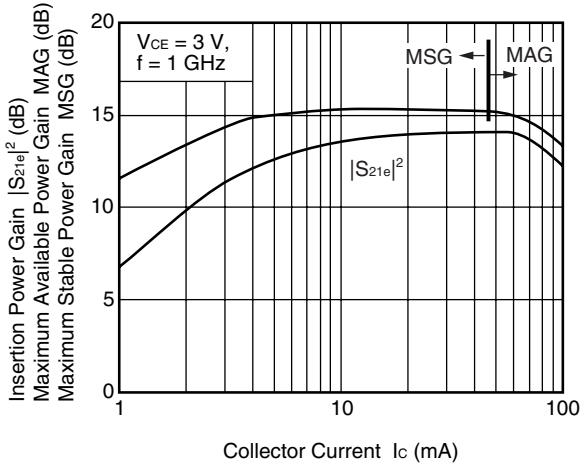
INSERTION POWER GAIN, MAG, MSG vs. FREQUENCY



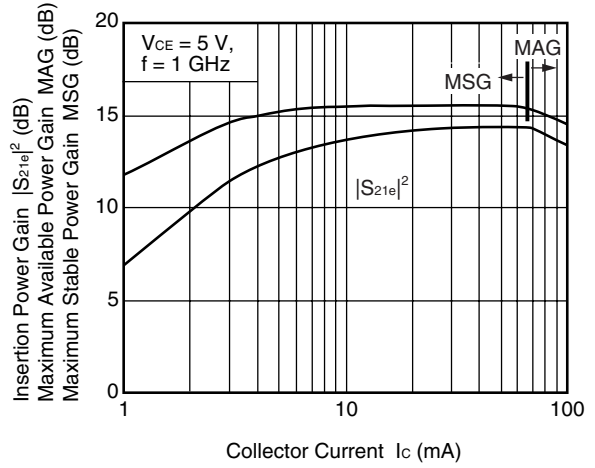
INSERTION POWER GAIN, MAG, MSG vs. FREQUENCY



INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT

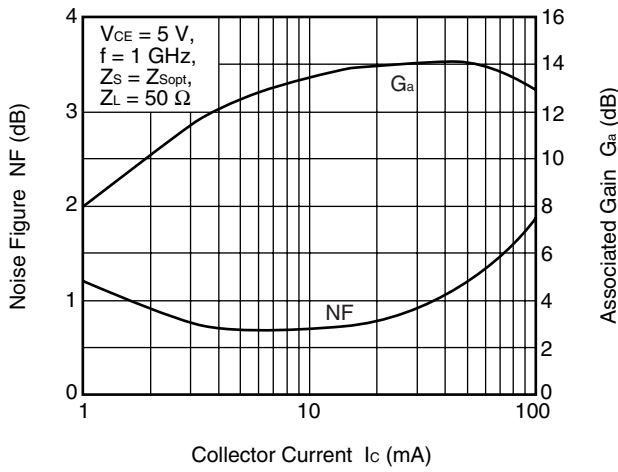


INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT

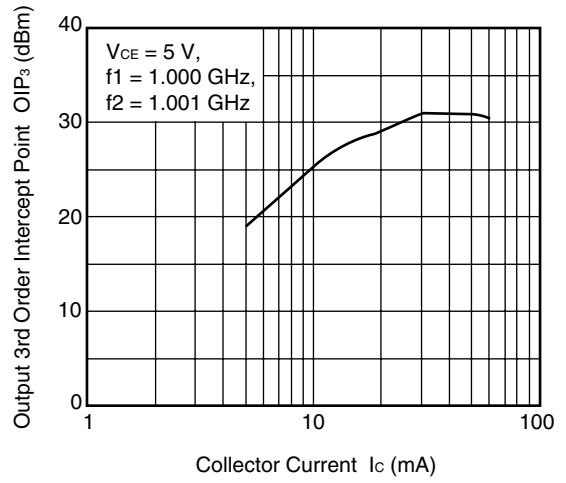


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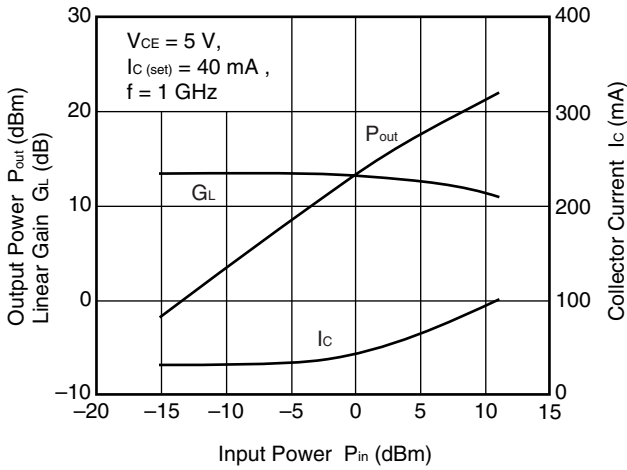
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



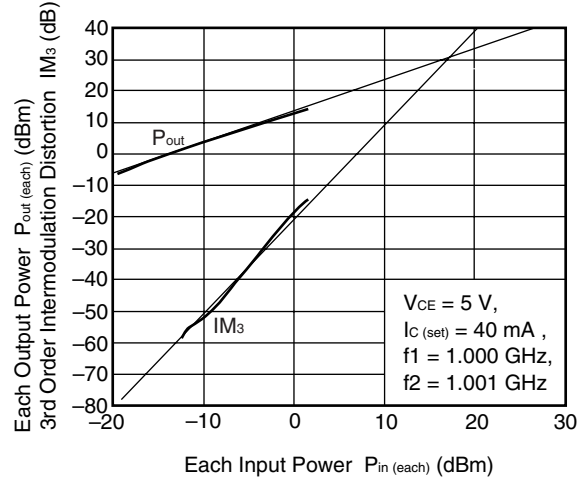
OUTPUT 3RD ORDER INTERCEPT POINT vs. COLLECTOR CURRENT



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



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



**Remark** The graphs indicate nominal characteristics.

**S-PARAMETERS**

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Click here to download S-parameters.

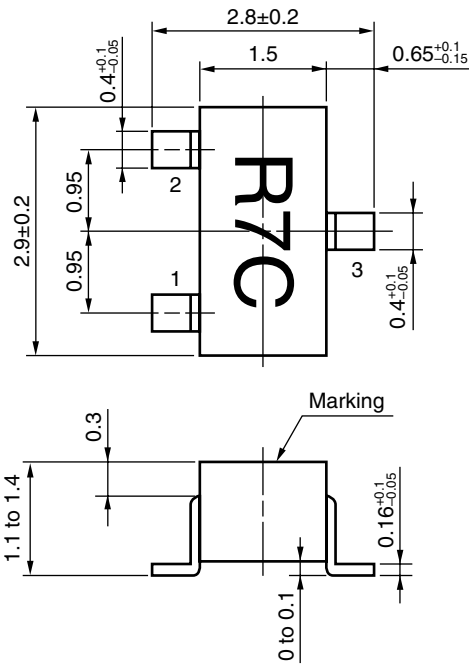
[RF and Microwave] → [Device Parameters]

URL <http://www.necel.com/microwave/en/>



PACKAGE DIMENSIONS

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



PIN CONNECTIONS

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

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