

# DATA SHEET

# NEC

## NPN SILICON GERMANIUM RF TRANSISTOR

# NESG220034

### NPN SiGe RF TRANSISTOR FOR UHF-BAND, LOW NOISE, LOW DISTORTION AMPLIFICATION 3-PIN POWER MINIMOLD (34 PKG)

#### FEATURES

- The device is an ideal choice for low noise, low distortion amplification.  
NF = 0.7 dB TYP. @  $V_{CE} = 5\text{ V}$ ,  $I_C = 10\text{ mA}$ ,  $f = 1\text{ GHz}$
- $P_{O(1\text{ dB})} = 22.5\text{ dBm}$  TYP. @  $V_{CE} = 5\text{ V}$ ,  $I_{C(\text{set})} = 40\text{ mA}$ ,  $f = 1\text{ GHz}$
- $OIP_3 = 35\text{ dBm}$  TYP. @  $V_{CE} = 5\text{ V}$ ,  $I_{C(\text{set})} = 40\text{ mA}$ ,  $f = 1\text{ GHz}$
- Maximum stable power gain:  $MSG = 12.5\text{ dB}$  TYP. @  $V_{CE} = 5\text{ V}$ ,  $I_C = 40\text{ mA}$ ,  $f = 1\text{ GHz}$
- SiGe HBT technology (UHS2) :  $f_T = 11.5\text{ GHz}$
- This product is improvement of ESD of NESG2xxx series.
- 3-pin power minimold (34 PKG)

#### ORDERING INFORMATION

Part Number	Order Number	Package	Quantity	Supplying Form
NESG220034	NESG220034-A	3-pin power minimold (34 PKG) (Pb-Free)	25 pcs (Non reel)	• Magazine case
NESG220034-T1	NESG220034-T1-A		1 kpcs/reel	• 12 mm wide embossed taping • Pin 2 (Collector) face the perforation side of the tape

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

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

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Not all products and/or types are available in every country. Please check with an NEC Electronics sales representative for availability and additional information.

**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	V <sub>CES</sub>	13	V
Collector to Emitter Voltage	V <sub>CEO</sub>	5.5	V
Base Current <sup>Note 1</sup>	I <sub>B</sub>	36	mA
Collector Current	I <sub>C</sub>	200	mA
Total Power Dissipation	P <sub>tot</sub> <sup>Note 2</sup>	886	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>	141	°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>	-	40	-	mA

**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> = 10 mA	140	180	260	–
<b>RF Characteristics</b>						
Gain Bandwidth Product	f <sub>T</sub>	V <sub>CE</sub> = 5 V, I <sub>C</sub> = 40 mA, f = 1 GHz	–	11.5	–	GHz
Insertion Power Gain	S <sub>21e</sub>   <sup>2</sup>	V <sub>CE</sub> = 5 V, I <sub>C</sub> = 40 mA, f = 1 GHz	9.5	11.5	–	dB
Noise Figure (1)	NF1	V <sub>CE</sub> = 5 V, I <sub>C</sub> = 10 mA, f = 1 GHz, Z <sub>S</sub> = Z <sub>Sopt</sub> , Z <sub>L</sub> = 50Ω	–	0.7	1.1	dB
Noise Figure (2)	NF2	V <sub>CE</sub> = 5 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>	–	0.9	–	dB
Associated Gain (1)	G <sub>a1</sub>	V <sub>CE</sub> = 5 V, I <sub>C</sub> = 10 mA, f = 1 GHz, Z <sub>S</sub> = Z <sub>Sopt</sub> , Z <sub>L</sub> = 50Ω	8.5	10.5	–	dB
Associated Gain (2)	G <sub>a2</sub>	V <sub>CE</sub> = 5 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> = 5 V, I <sub>E</sub> = 0 mA, f = 1 MHz	–	0.9	1.1	pF
Maximum Stable Power Gain	MSG <sup>Note 3</sup>	V <sub>CE</sub> = 5 V, I <sub>C</sub> = 40 mA, f = 1 GHz	11.0	12.5	–	dB
Gain 1 dB Compression Output Power	P <sub>O(1 dB)</sub>	V <sub>CE</sub> = 5 V, I <sub>C(set)</sub> = 40 mA, f = 1 GHz, Z <sub>S</sub> = Z <sub>Sopt</sub> , Z <sub>L</sub> = Z <sub>Lopt</sub>	–	22.5	–	dBm
Output 3rd Order Intercept Point	OIP <sub>3</sub>	V <sub>CE</sub> = 5 V, I <sub>C(set)</sub> = 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	–	dBm

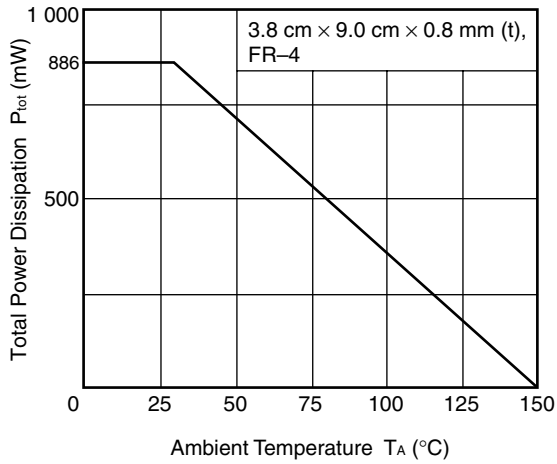
- Notes**
1. Pulse measurement: PW ≤ 350 μs, Duty Cycle ≤ 2%
  2. Collector to base capacitance when the emitter grounded.
  3.  $MSG = \left| \frac{S_{21}}{S_{12}} \right|$

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

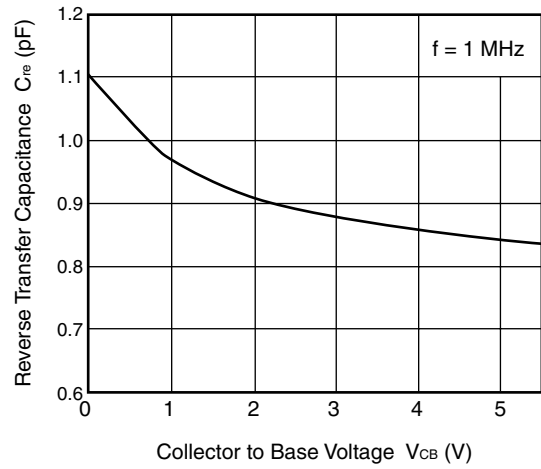
Rank	FB
Marking	SS
h <sub>FE</sub> Value	140 to 260

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

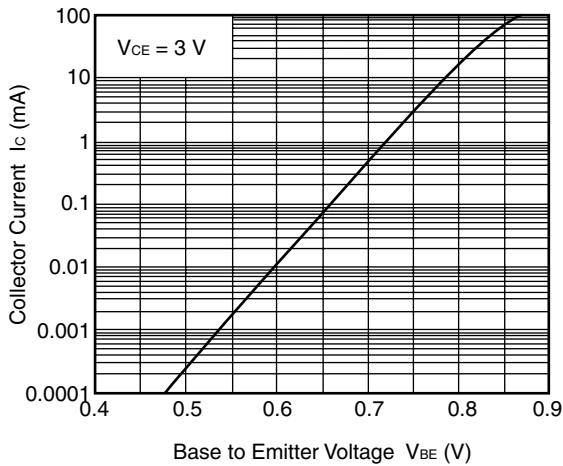
**TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE**



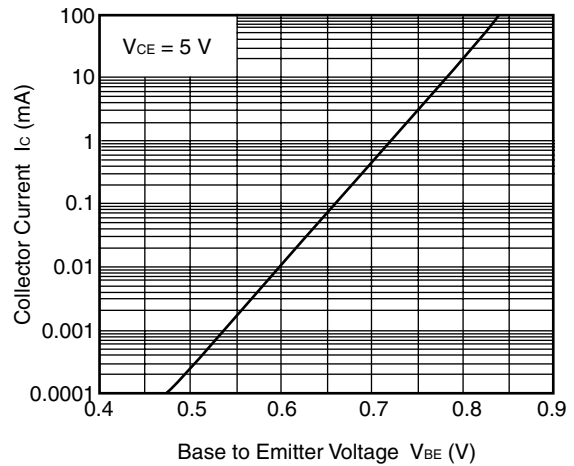
**REVERSE TRANSFER CAPACITANCE vs. COLLECTOR TO BASE VOLTAGE**



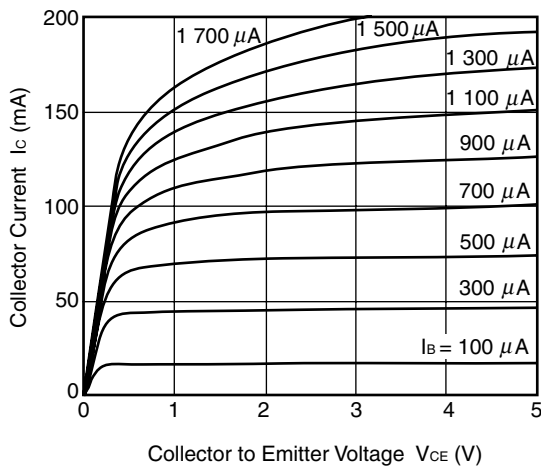
**COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE**



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

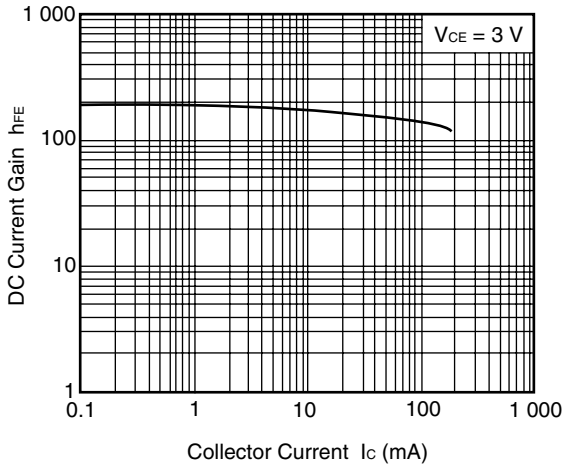


**COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE**

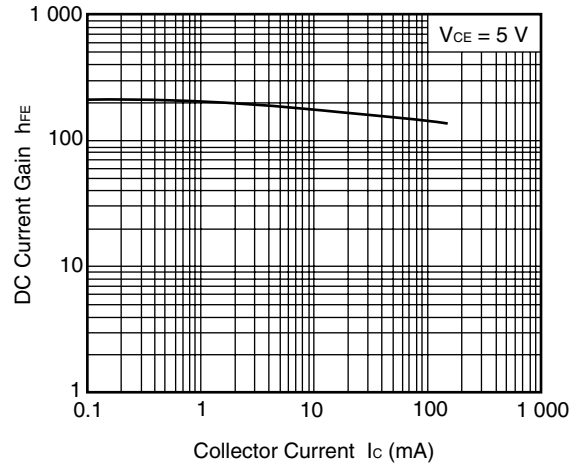


**Remark** The graphs indicate nominal characteristics.

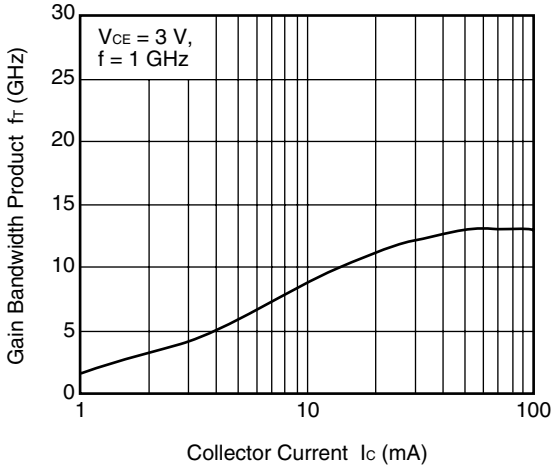
DC CURRENT GAIN vs. COLLECTOR CURRENT



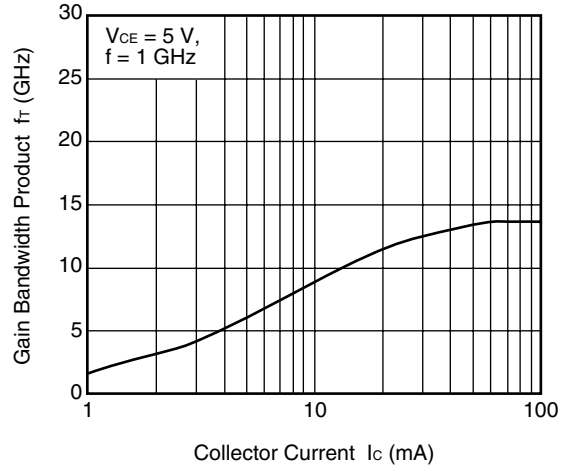
DC CURRENT GAIN vs. COLLECTOR CURRENT



GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT

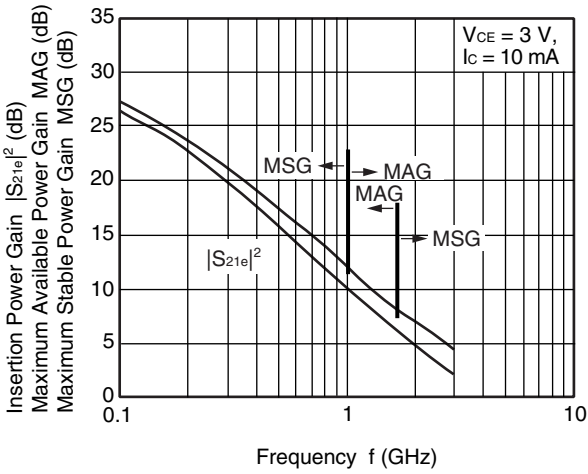


GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT

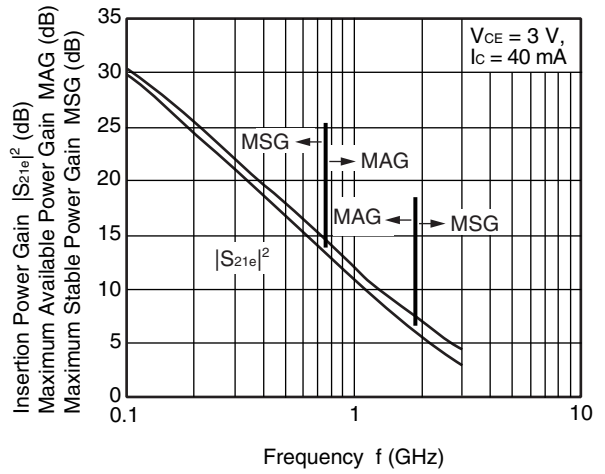


**Remark** The graphs indicate nominal characteristics.

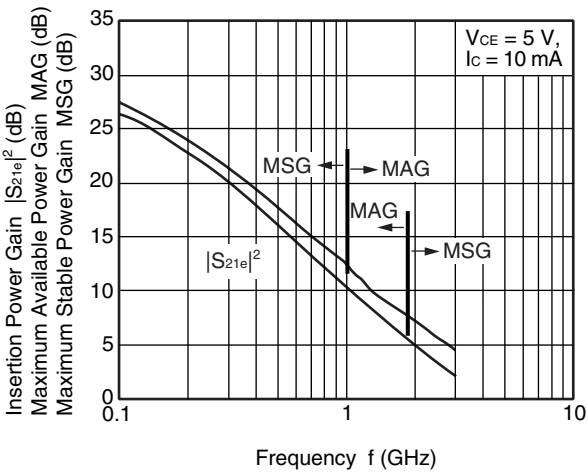
INSERTION POWER GAIN, MAG, MSG vs. FREQUENCY



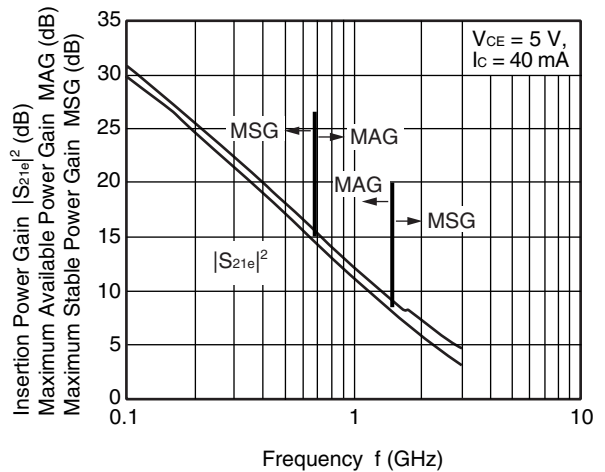
INSERTION POWER GAIN, MAG, MSG vs. FREQUENCY



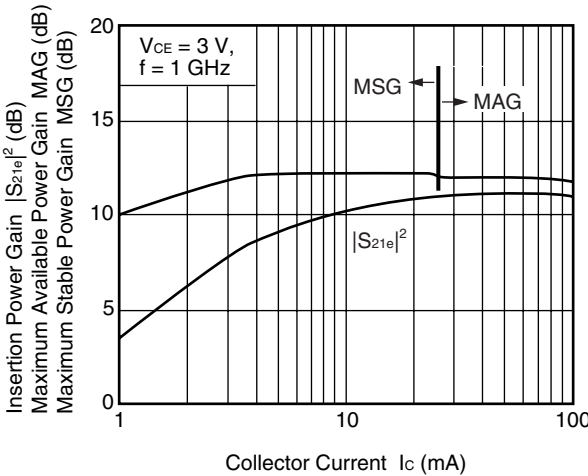
INSERTION POWER GAIN, MAG, MSG vs. FREQUENCY



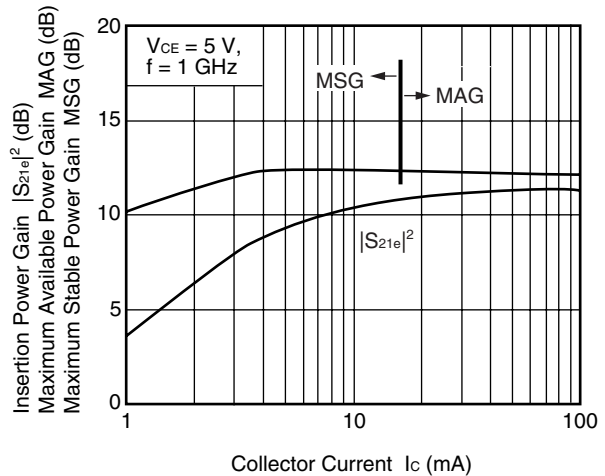
INSERTION POWER GAIN, MAG, MSG vs. FREQUENCY



INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT

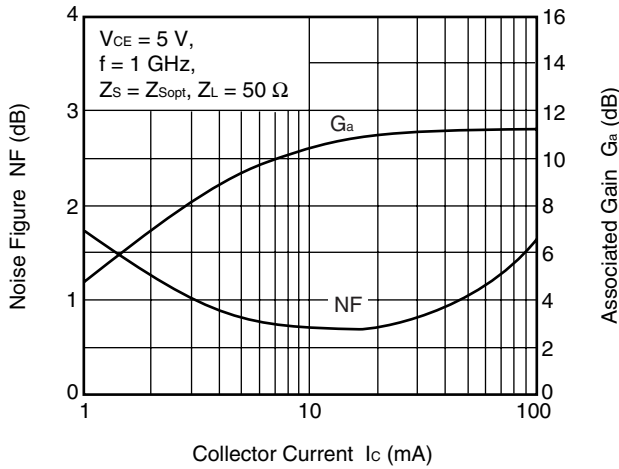


INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT

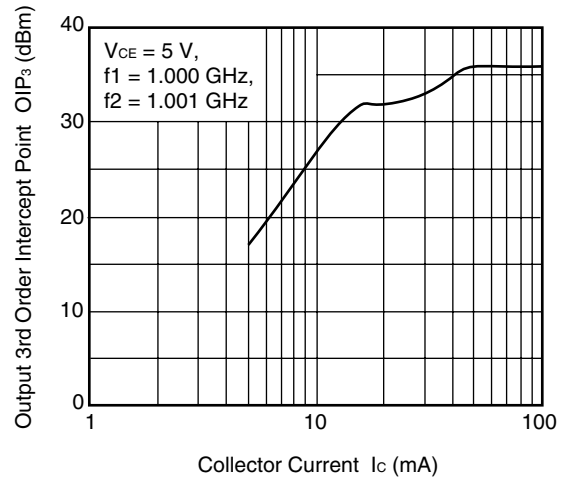


**Remark** The graphs indicate nominal characteristics.

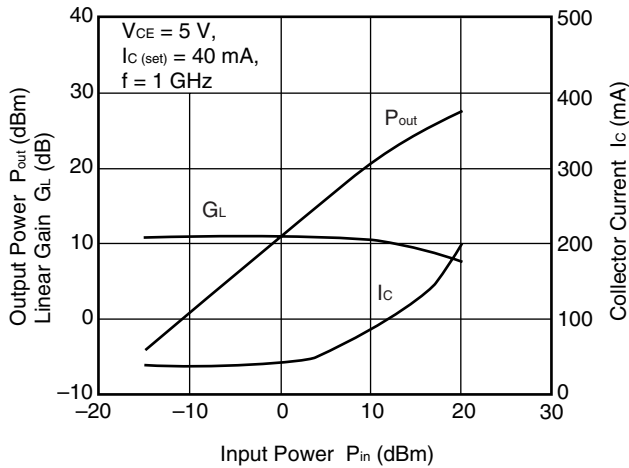
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



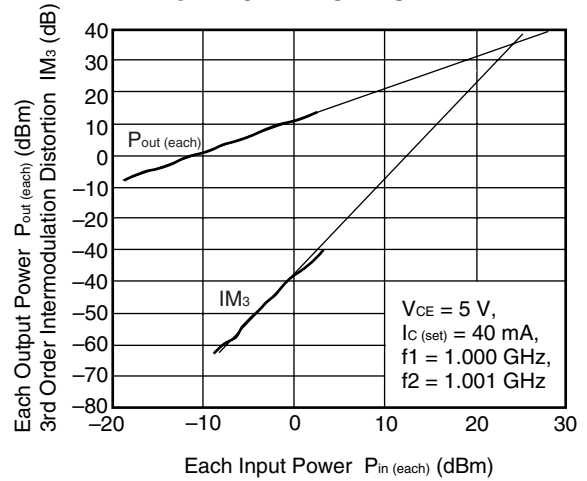
OUTPUT 3RD ORDER INTERCEPT POINT vs. COLLECTOR CURRENT



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**

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.

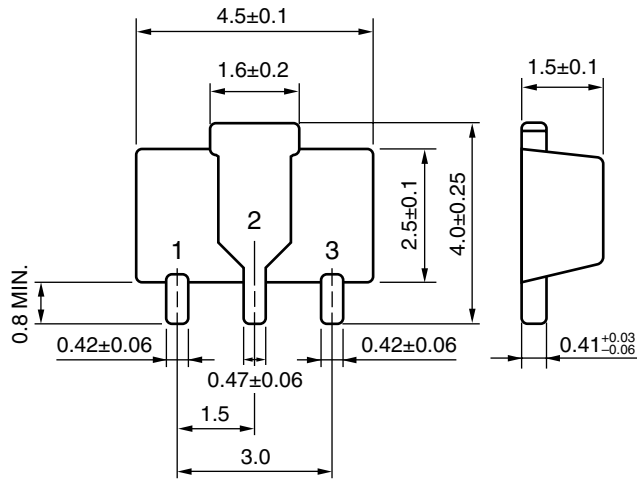
Click here to download S-parameters.

[RF and Microwave] → [Device Parameters]

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

PACKAGE DIMENSIONS

3-PIN POWER MINIMOLD (34 PKG) (UNIT: mm)



PIN CONNECTIONS

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



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