



# NPN SILICON GERMANIUM RF TRANSISTOR

# NESG2101M16

## NPN SiGe RF TRANSISTOR FOR MEDIUM OUTPUT POWER AMPLIFICATION (125 mW) 6-PIN LEAD-LESS MINIMOLD (M16, 1208 PKG)

### FEATURES

- The device is an ideal choice for medium output power, high-gain amplification and low distortion, low noise, high-gain amplification  
 $P_{O(1\text{ dB})} = 21\text{ dBm TYP. @ } V_{CE} = 3.6\text{ V, } I_c(\text{set}) = 10\text{ mA (RF OFF), } f = 2\text{ GHz}$   
 $NF = 0.6\text{ dB TYP., } G_a = 19.0\text{ dB TYP. @ } V_{CE} = 2\text{ V, } I_c = 7\text{ mA, } f = 1\text{ GHz}$
- Maximum stable power gain:  $MSG = 17.0\text{ dB TYP. @ } V_{CE} = 3\text{ V, } I_c = 50\text{ mA, } f = 2\text{ GHz}$
- High breakdown voltage technology for SiGe Tr. adopted:  $V_{CEO}$  (absolute maximum ratings) = 5.0 V
- 6-pin lead-less minimold (M16, 1208 PKG)

### <R> ORDERING INFORMATION

Part Number	Order Number	Package	Quantity	Supplying Form
NESG2101M16	NESG2101M16-A	6-pin lead-less minimold (M16, 1208 PKG) (Pb-Free)	50 pcs (Non reel)	• 8 mm wide embossed taping • Pin 1 (Collector), Pin 6 (Emitter) face the perforation side of the tape
NESG2101M16-T3	NESG2101M16-T3-A		10 kpcs/reel	

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

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

Parameter	Symbol	Ratings	Unit
Collector to Base Voltage	$V_{CBO}$	13.0	V
Collector to Emitter Voltage	$V_{CEO}$	5.0	V
Emitter to Base Voltage	$V_{EBO}$	1.5	V
Collector Current	$I_c$	100	mA
Total Power Dissipation	$P_{\text{tot}}$ <sup>Note</sup>	190	mW
Junction Temperature	$T_j$	150	$^\circ\text{C}$
Storage Temperature	$T_{\text{stg}}$	-65 to +150	$^\circ\text{C}$

**Note** Mounted on  $1.08\text{ cm}^2 \times 1.0\text{ mm (t)}$  glass epoxy PCB

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

The information in this document is subject to change without notice. Before using this document, please confirm that this is the latest version.

**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>EB0</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> = 15 mA	130	190	260	–
<b>RF Characteristics</b>						
Gain Bandwidth Product	f <sub>T</sub>	V <sub>CE</sub> = 3 V, I <sub>C</sub> = 50 mA, f = 2 GHz	14	17	–	GHz
Insertion Power Gain	S <sub>21e</sub>   <sup>2</sup>	V <sub>CE</sub> = 3 V, I <sub>C</sub> = 50 mA, f = 2 GHz	11.5	13.5	–	dB
Noise Figure (1)	NF	V <sub>CE</sub> = 2 V, I <sub>C</sub> = 10 mA, f = 2 GHz, Z <sub>S</sub> = Z <sub>Sopt</sub> , Z <sub>L</sub> = Z <sub>Lopt</sub>	–	0.9	1.2	dB
Noise Figure (2)	NF	V <sub>CE</sub> = 2 V, I <sub>C</sub> = 7 mA, f = 1 GHz, Z <sub>S</sub> = Z <sub>Sopt</sub> , Z <sub>L</sub> = Z <sub>Lopt</sub>	–	0.6	–	dB
Associated Gain (1)	G <sub>a</sub>	V <sub>CE</sub> = 2 V, I <sub>C</sub> = 10 mA, f = 2 GHz, Z <sub>S</sub> = Z <sub>Sopt</sub> , Z <sub>L</sub> = Z <sub>Lopt</sub>	11.0	13.0	–	dB
Associated Gain (2)	G <sub>a</sub>	V <sub>CE</sub> = 2 V, I <sub>C</sub> = 7 mA, f = 1 GHz, Z <sub>S</sub> = Z <sub>Sopt</sub> , Z <sub>L</sub> = Z <sub>Lopt</sub>	–	19.0	–	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	0.5	pF
Maximum Stable Power Gain	MSG <sup>Note 3</sup>	V <sub>CE</sub> = 3 V, I <sub>C</sub> = 50 mA, f = 2 GHz	14.5	17.0	–	dB
Gain 1 dB Compression Output Power	P <sub>O(1 dB)</sub>	V <sub>CE</sub> = 3.6 V, I <sub>C(set)</sub> = 10 mA (RF OFF), f = 2 GHz, Z <sub>S</sub> = Z <sub>Sopt</sub> , Z <sub>L</sub> = Z <sub>Lopt</sub>	–	21	–	dBm
Linear Gain	G <sub>L</sub>	V <sub>CE</sub> = 3.6 V, I <sub>C</sub> = 10 mA, f = 2 GHz, Z <sub>S</sub> = Z <sub>Sopt</sub> , Z <sub>L</sub> = Z <sub>Lopt</sub>	–	15	–	dBm

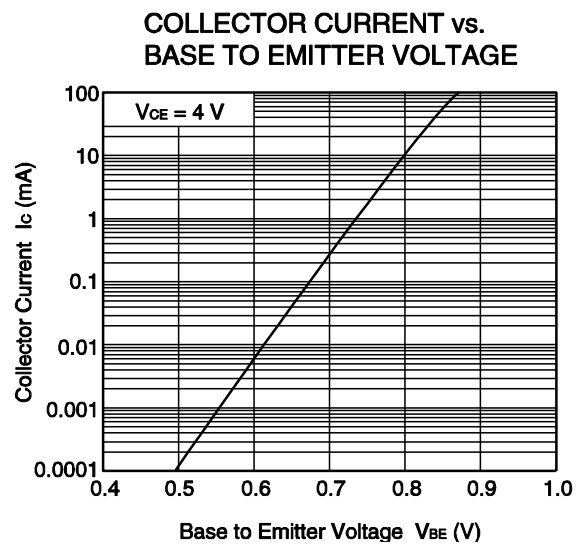
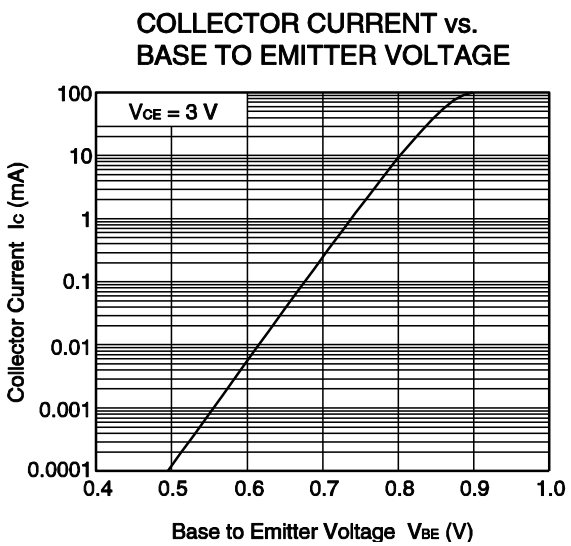
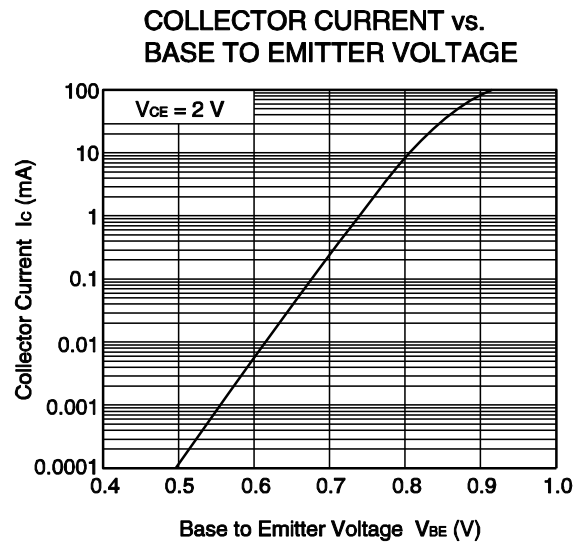
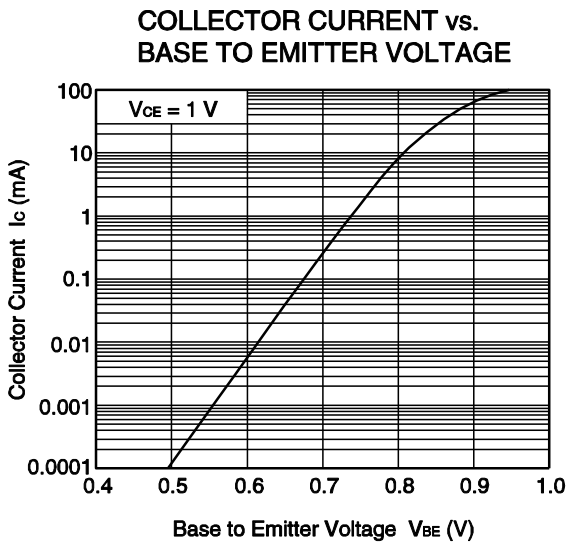
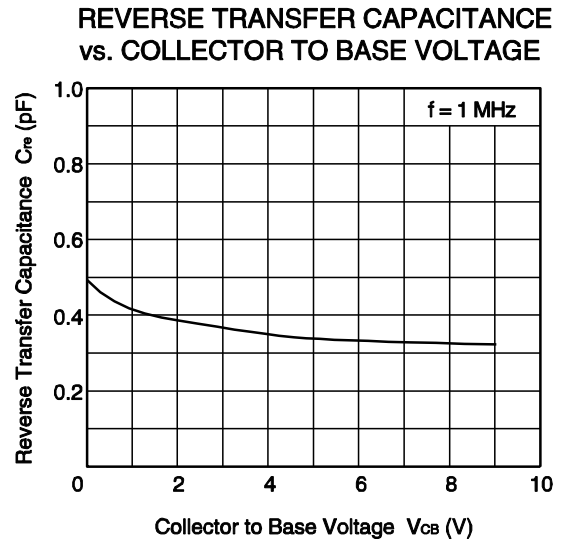
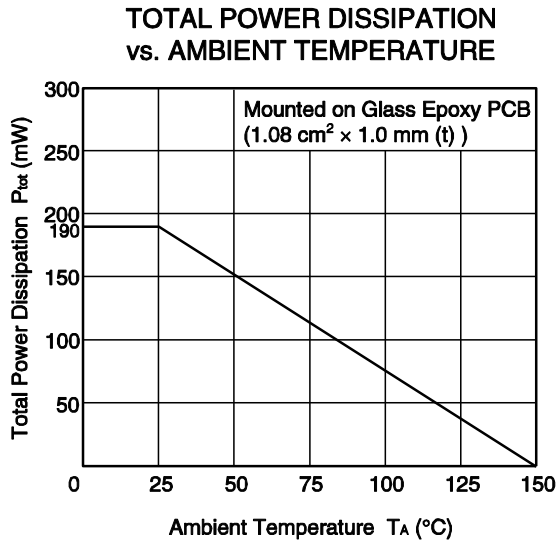
- Notes 1.** Pulse measurement: PW ≤ 350 μs, Duty Cycle ≤ 2%
- 2.** Collector to base capacitance when the emitter grounded
- 3.**  $MSG = \left| \frac{S_{21}}{S_{12}} \right|$

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

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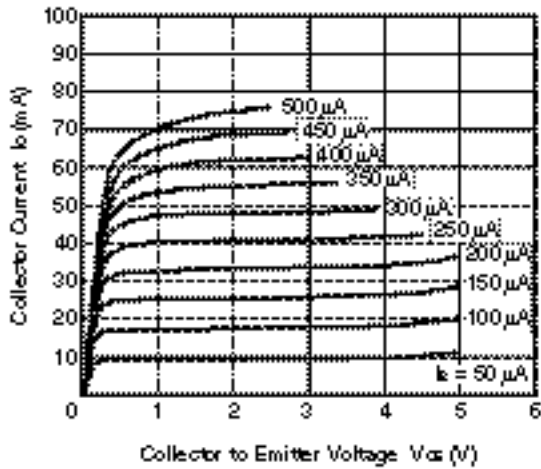
Rank	FB/YFB
Marking	zH
h <sub>FE</sub> Value	130 to 260

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

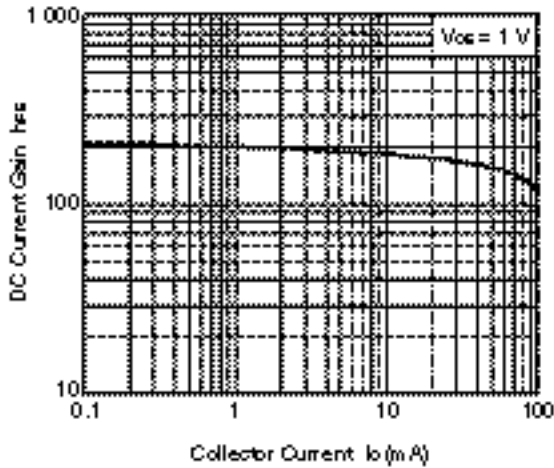


**Remark** The graphs indicate nominal characteristics.

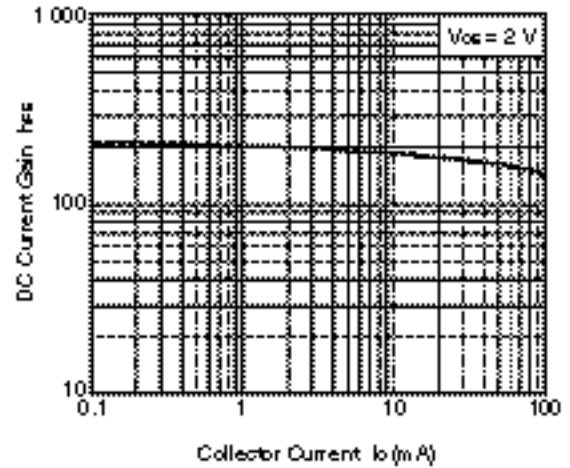
COLLECTOR CURRENT vs.  
COLLECTOR TO EMITTER VOLTAGE



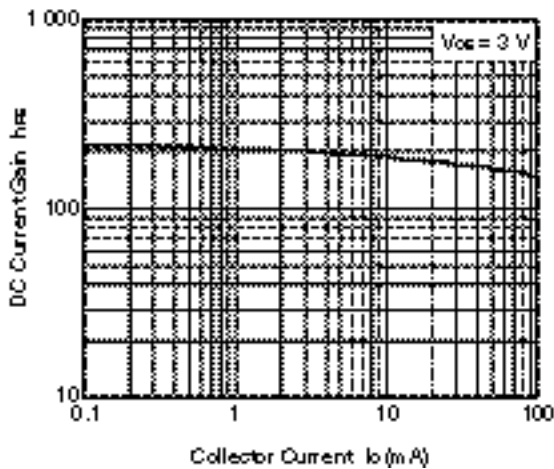
DC CURRENT GAIN vs.  
COLLECTOR CURRENT



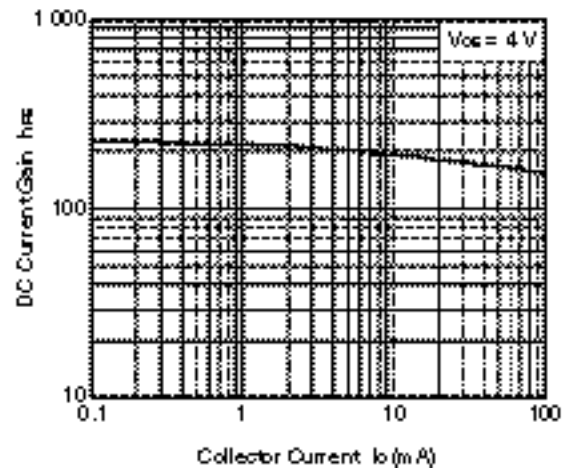
DC CURRENT GAIN vs.  
COLLECTOR CURRENT



DC CURRENT GAIN vs.  
COLLECTOR CURRENT

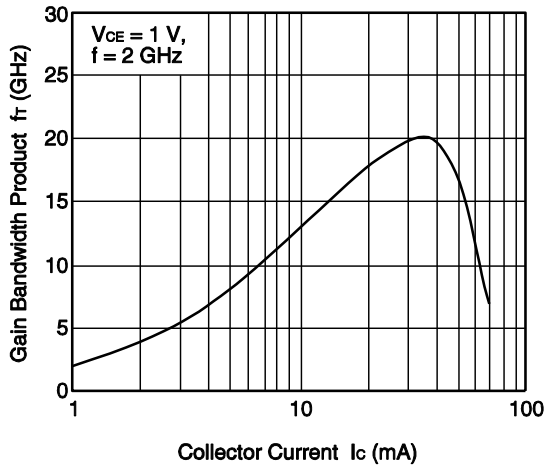


DC CURRENT GAIN vs.  
COLLECTOR CURRENT

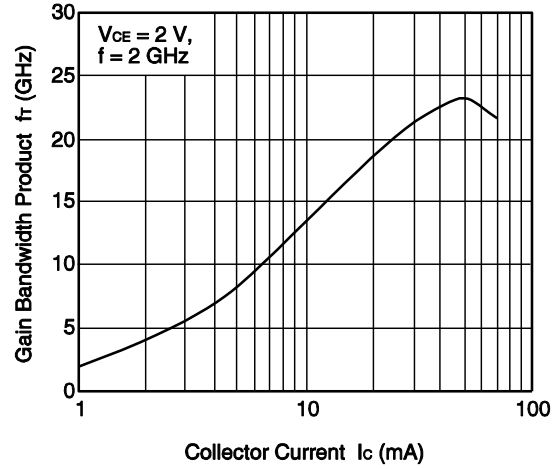


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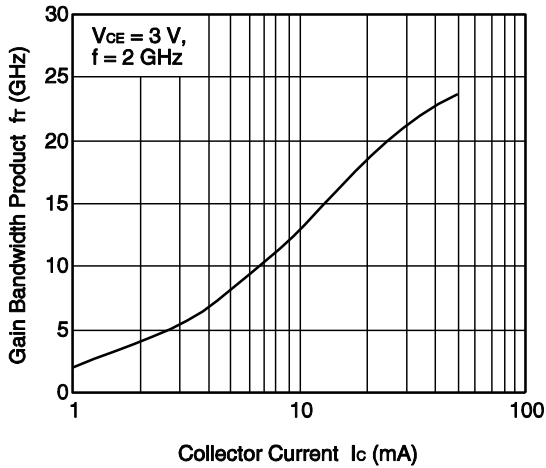
GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT



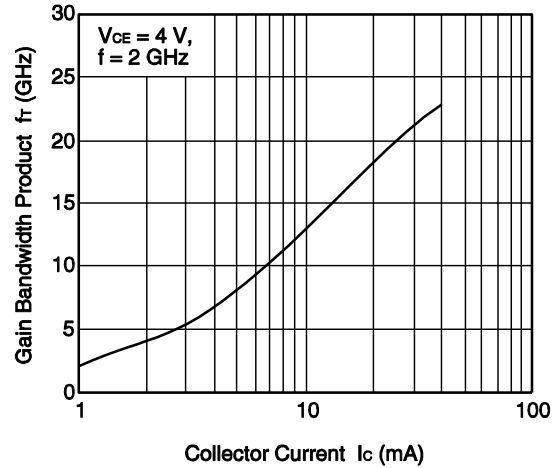
GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT



GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT

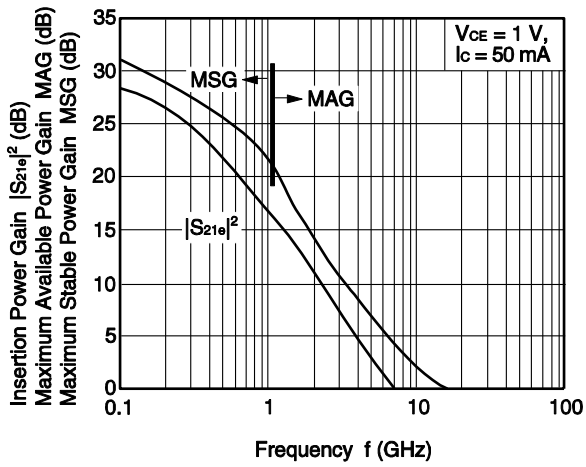


GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT

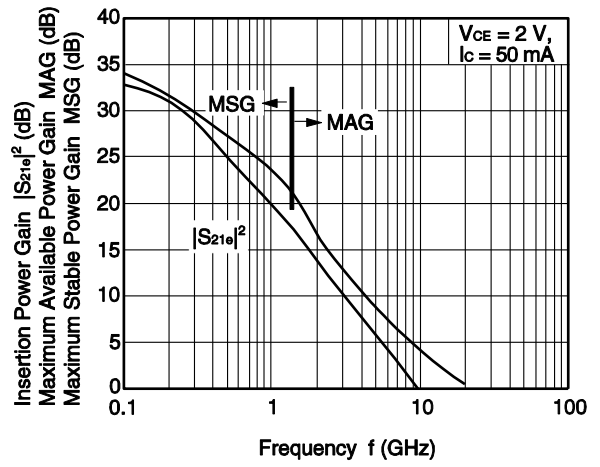


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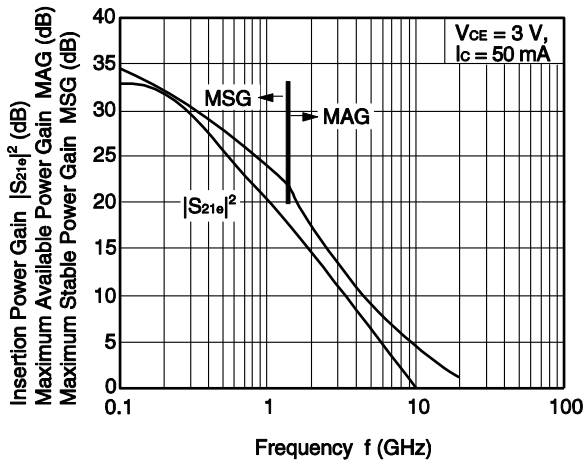
INSERTION POWER GAIN,  
MAG, MSG vs. FREQUENCY



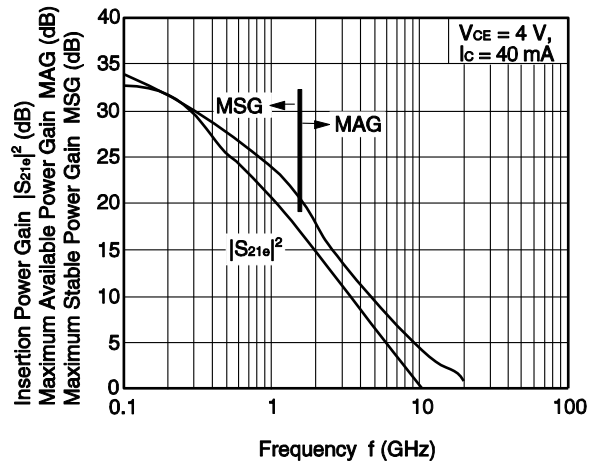
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MAG, MSG vs. FREQUENCY

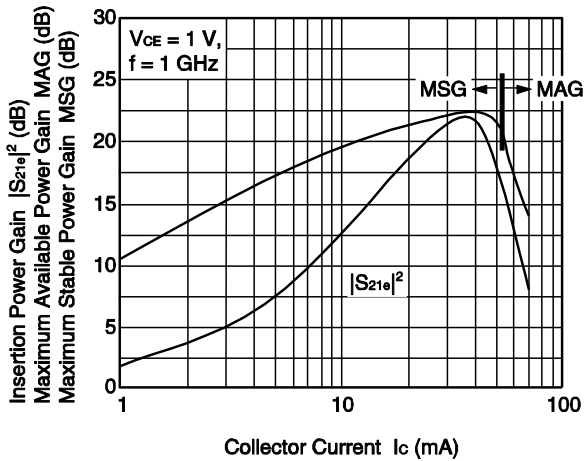


INSERTION POWER GAIN,  
MAG, MSG vs. FREQUENCY

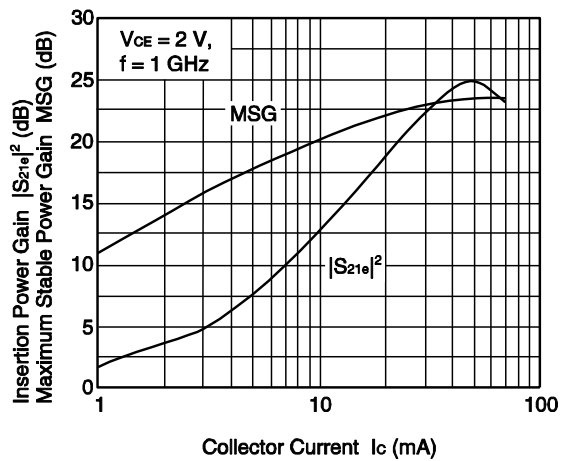


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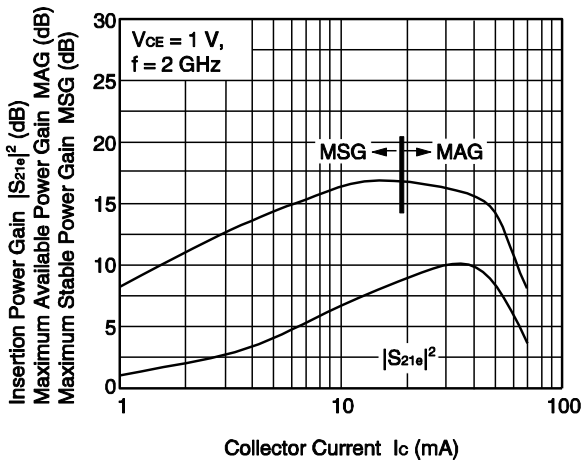
INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT



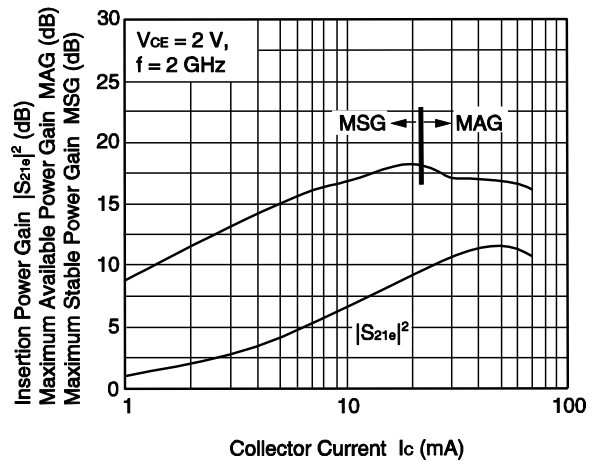
INSERTION POWER GAIN, MSG vs. COLLECTOR CURRENT



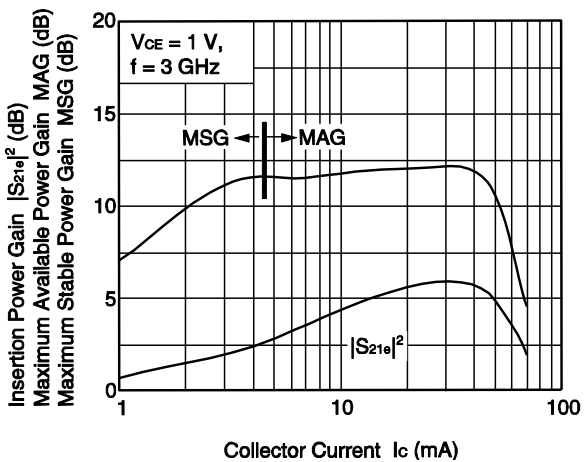
INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT



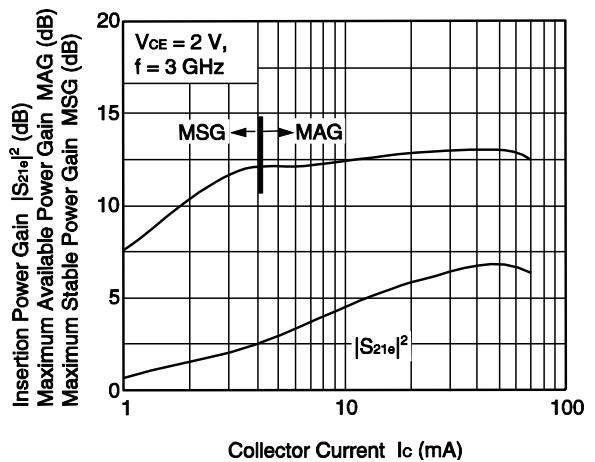
INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT



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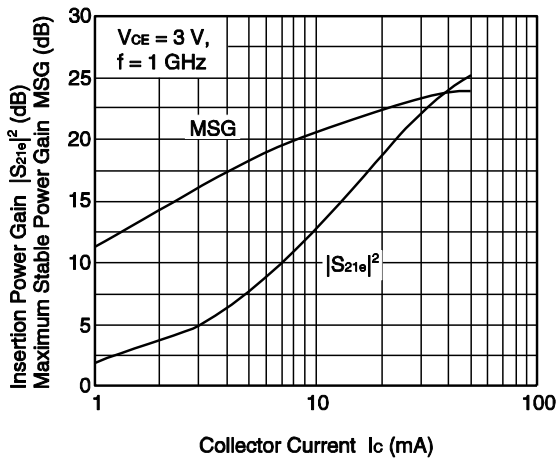


INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT

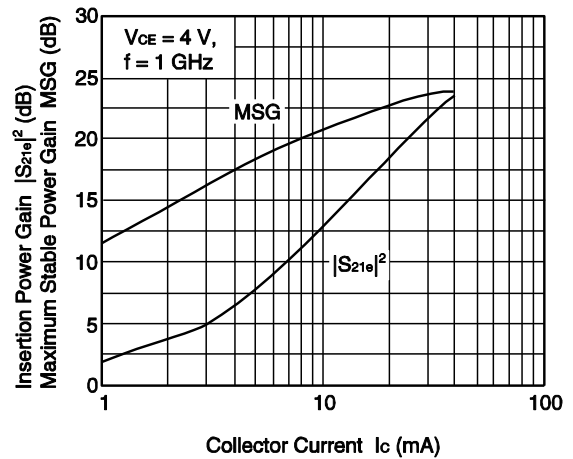


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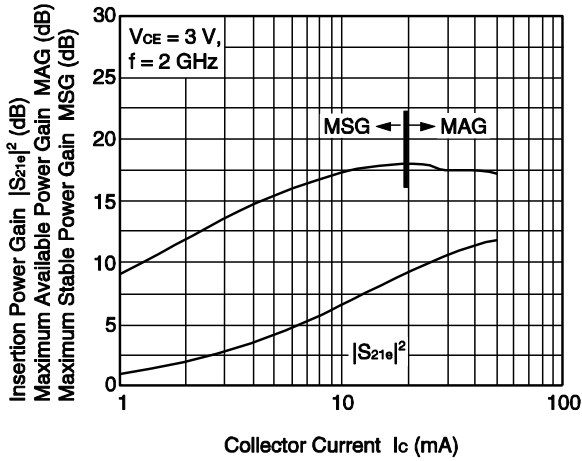
INSERTION POWER GAIN, MSG  
vs. COLLECTOR CURRENT



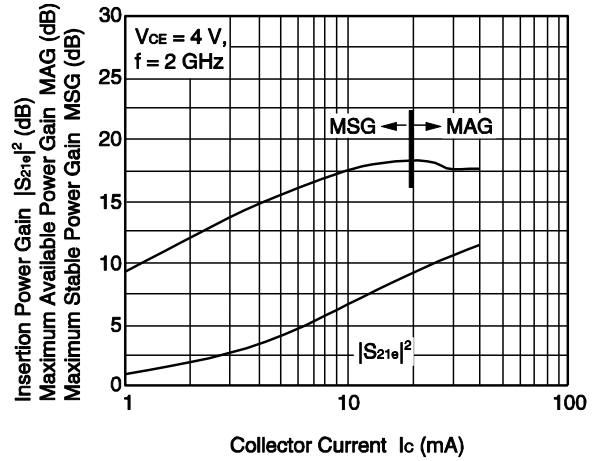
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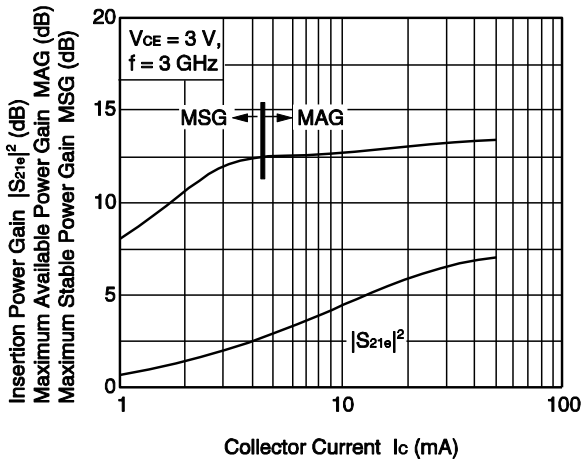
INSERTION POWER GAIN, MAG, MSG  
vs. COLLECTOR CURRENT



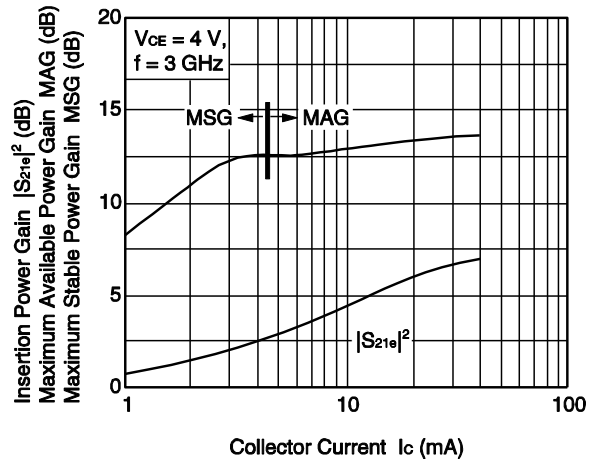
INSERTION POWER GAIN, MAG, MSG  
vs. COLLECTOR CURRENT



INSERTION POWER GAIN, MAG, MSG  
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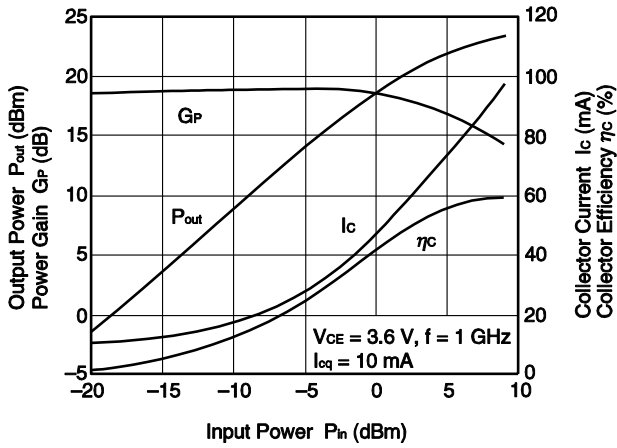
INSERTION POWER GAIN, MAG, MSG  
vs. COLLECTOR CURRENT



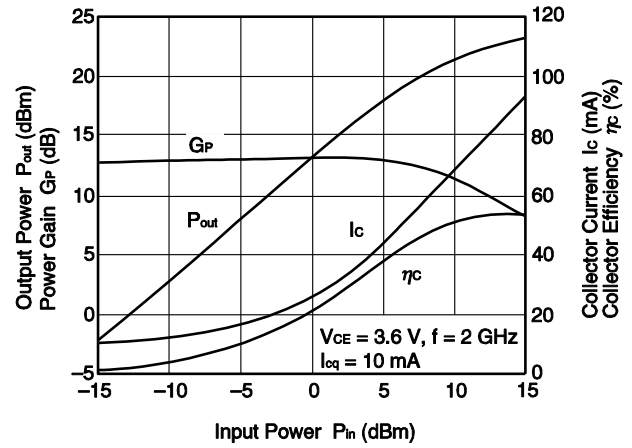
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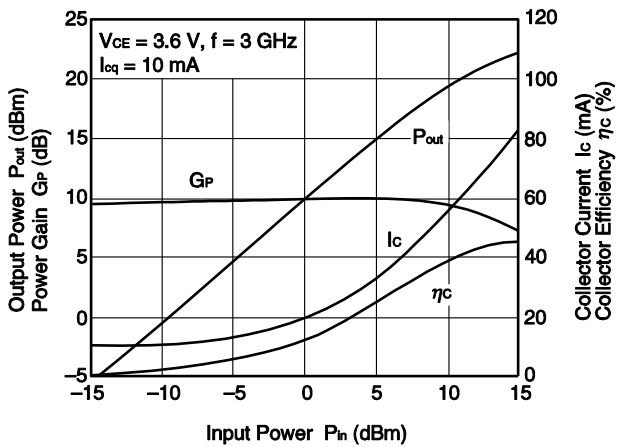
OUTPUT POWER, POWER GAIN,  $I_c$ ,  
COLLECTOR EFFICIENCY vs. INPUT POWER



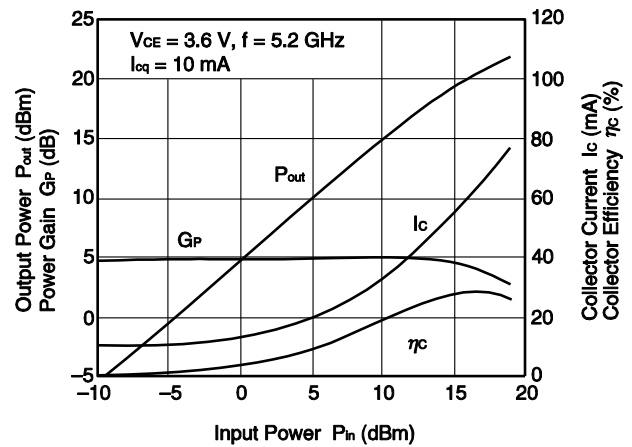
OUTPUT POWER, POWER GAIN,  $I_c$ ,  
COLLECTOR EFFICIENCY vs. INPUT POWER



OUTPUT POWER, POWER GAIN,  $I_c$ ,  
COLLECTOR EFFICIENCY vs. INPUT POWER

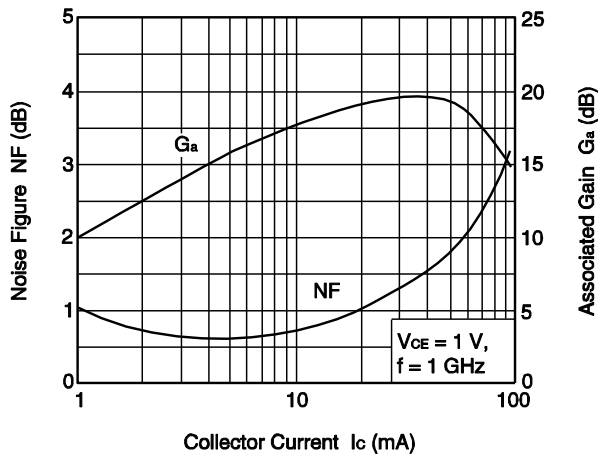


OUTPUT POWER, POWER GAIN,  $I_c$ ,  
COLLECTOR EFFICIENCY vs. INPUT POWER

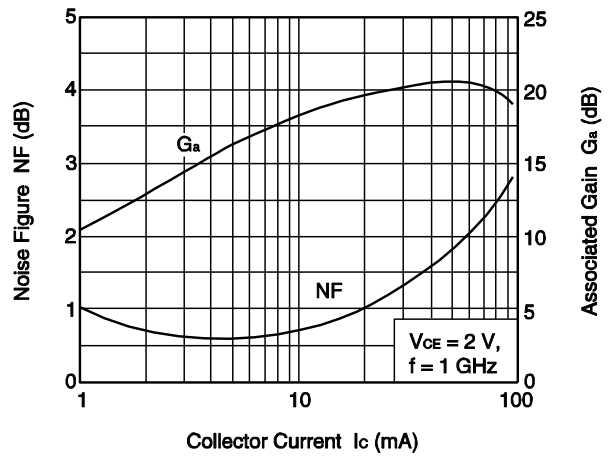


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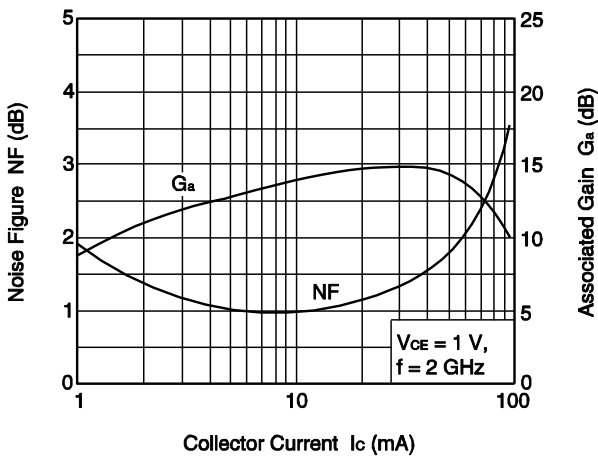
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



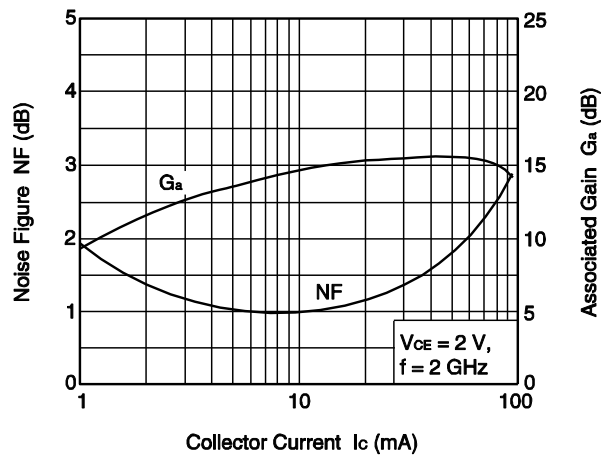
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



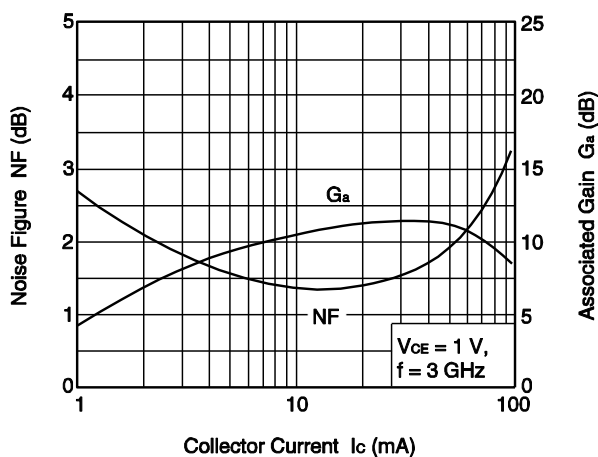
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



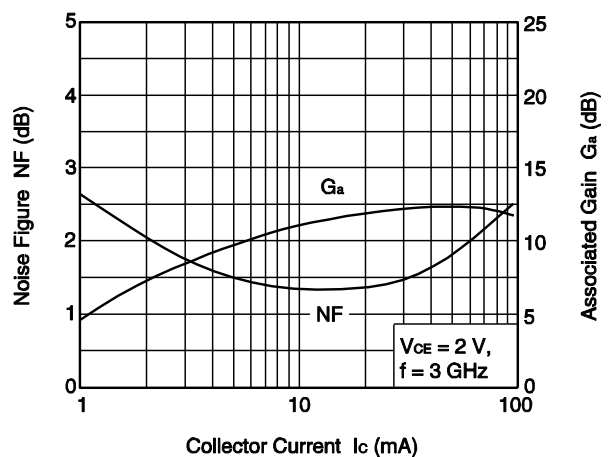
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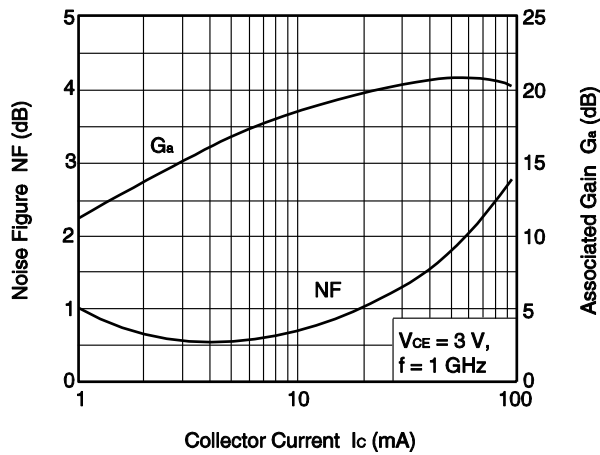


NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT

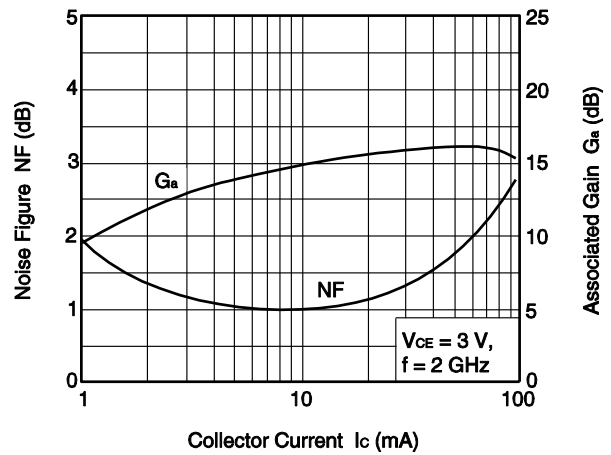


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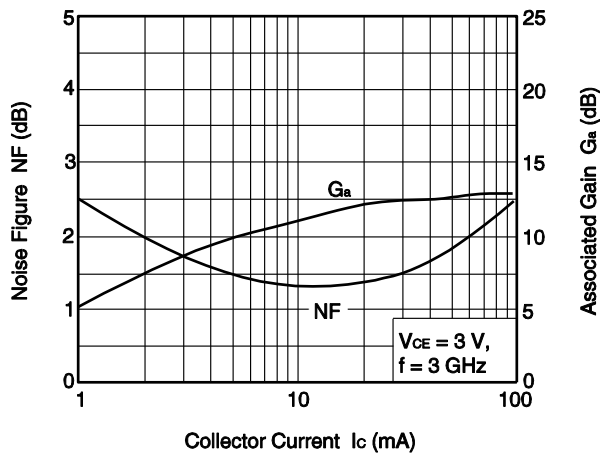
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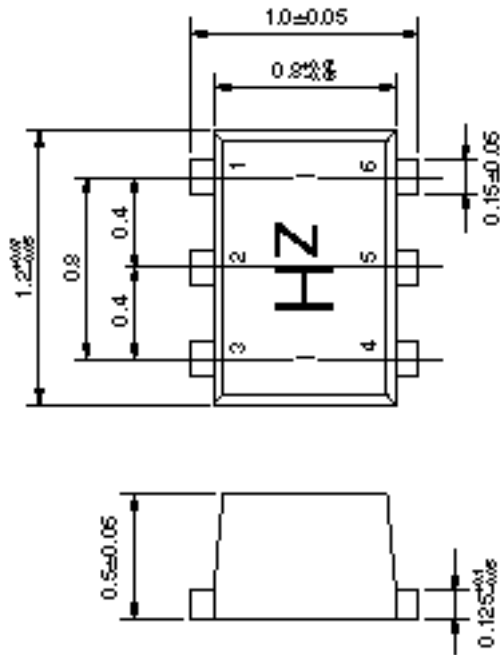
**Remark** The graphs indicate nominal characteristics.

<R> **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

6-PIN LEAD-LESS MINIMOLD (M16, 1208 PKG) (UNIT: mm)



PIN CONNECTIONS

- 1. Collector
- 2. Emitter
- 3. Emitter
- 4. Base
- 5. Emitter
- 6. Emitter

**Caution** All four Emitter-pins should be connected to PWB in order to obtain better Electrical performance and heat sinking.

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