DATA SHEET

NEC

# NPN SILICON GERMANIUM RF TRANSISTOR
# NESG3032M14

## NPN SiGe RF TRANSISTOR FOR LOW NOISE, HIGH-GAIN AMPLIFICATION 4-PIN LEAD-LESS MINIMOLD (M14, 1208 PACKAGE)

### FEATURES

- The device is an ideal choice for low noise, high-gain amplification
  NF = 0.6 dB TYP. @ $V_{CE}$ = 2 V, $I_C$ = 6 mA, f = 2.0 GHz
- Maximum stable power gain: MSG = 20.5 dB TYP. @ $V_{CE}$ = 2 V, $I_C$ = 15 mA, f = 2.0 GHz
- SiGe HBT technology (UHS3) adopted: $f_{max}$ = 110 GHz
- 4-pin lead-less minimold (M14, 1208 package)

### <R> ORDERING INFORMATION

| Part Number | Order Number | Package | Quantity | Supplying Form |
|---|---|---|---|---|
| NESG3032M14 | NESG3032M14-A | 4-pin lead-less minimold (M14, 1208 package) (Pb-Free) | 50 pcs (Non reel) | • 8 mm wide embossed taping<br>• Pin 1 (Collector), Pin 4 (NC) face the perforation side of the tape |
| NESG3032M14-T3 | NESG3032M14-T3-A | | 10 kpcs/reel | |

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

### ABSOLUTE MAXIMUM RATINGS ($T_A$ = +25°C)

| Parameter | Symbol | Ratings | Unit |
|---|---|---|---|
| Collector to Base Voltage | $V_{CBO}$ | 12.0 | V |
| Collector to Emitter Voltage | $V_{CEO}$ | 4.3 | V |
| Emitter to Base Voltage | $V_{EBO}$ | 1.5 | V |
| Collector Current | $I_C$ | 35 | mA |
| Total Power Dissipation | $P_{tot}$ Note | 150 | mW |
| Junction Temperature | $T_j$ | 150 | °C |
| Storage Temperature | $T_{stg}$ | –65 to +150 | °C |

**Note** Mounted on 1.08 $cm^2 \times 1.0$ mm (t) glass epoxy PWB

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



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The mark <R> shows major revised points.



The revised points can be easily searched by copying an "<R>" in the PDF file and specifying it in the "Find what:" field.

## ELECTRICAL CHARACTERISTICS ($T_A$ = +25°C)

| Parameter | Symbol | Test Conditions | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|---|
| DC Characteristics | | | | | | |
| Collector Cut-off Current | $I_{CBO}$ | $V_{CB}$ = 5 V, $I_E$ = 0 mA | – | – | 100 | nA |
| Emitter Cut-off Current | $I_{EBO}$ | $V_{EB}$ = 1 V, $I_C$ = 0 mA | – | – | 100 | nA |
| DC Current Gain | $h_{FE}$ Note 1 | $V_{CE}$ = 2 V, $I_C$ = 6 mA | 220 | 300 | 380 | – |
| RF Characteristics | | | | | | |
| Insertion Power Gain | $\|S_{21e}\|^2$ | $V_{CE}$ = 2 V, $I_C$ = 15 mA, f = 2.0 GHz | 15.0 | 17.5 | – | dB |
| Noise Figure | NF | $V_{CE}$ = 2 V, $I_C$ = 6 mA, f = 2.0 GHz, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$ | – | 0.60 | 0.85 | dB |
| Associated Gain | $G_a$ | $V_{CE}$ = 2 V, $I_C$ = 6 mA, f = 2.0 GHz, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$ | – | 17.5 | – | dB |
| Reverse Transfer Capacitance | $C_{re}$ Note 2 | $V_{CB}$ = 2 V, $I_E$ = 0 mA, f = 1 MHz | – | 0.15 | 0.25 | pF |
| Maximum Stable Power Gain | MSG Note 3 | $V_{CE}$ = 2 V, $I_C$ = 15 mA, f = 2.0 GHz | 17.5 | 20.5 | – | dB |
| Gain 1 dB Compression Output Power | $P_{O\ (1\ dB)}$ | $V_{CE}$ = 3 V, $I_{C\ (set)}$ = 20 mA, f = 2.0 GHz, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$ | – | 12.5 | – | dBm |
| 3rd Order Intermodulation Distortion Output Intercept Point | $OIP_3$ | $V_{CE}$ = 3 V, $I_{C\ (set)}$ = 20 mA, f = 2.0 GHz, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$ | – | 24.0 | – | dBm |

**Notes 1.** Pulse measurement: PW ≤ 350 $\mu$s, Duty Cycle ≤ 2%

**2.** Collector to base capacitance when the emitter grounded

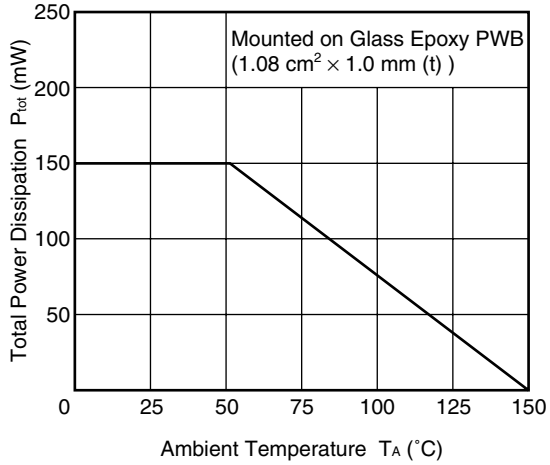
**3.** $MSG = \left| \frac{S_{21}}{S_{12}} \right|$

## $h_{FE}$ CLASSIFICATION

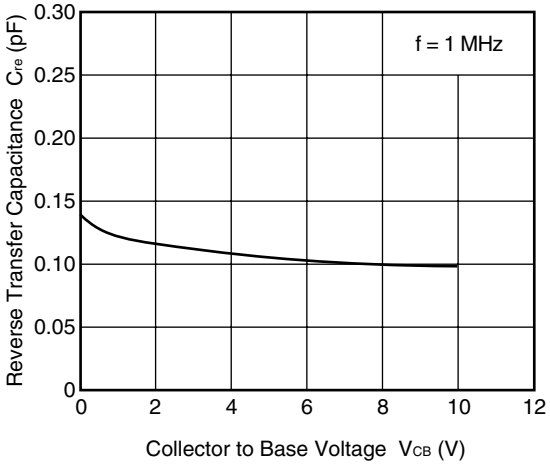
| Rank | FB |
|---|---|
| Marking | zN |
| $h_{FE}$ Value | 220 to 380 |

<R> **TYPICAL CHARACTERISTICS ($T_A$ = +25°C, unless otherwise specified)**

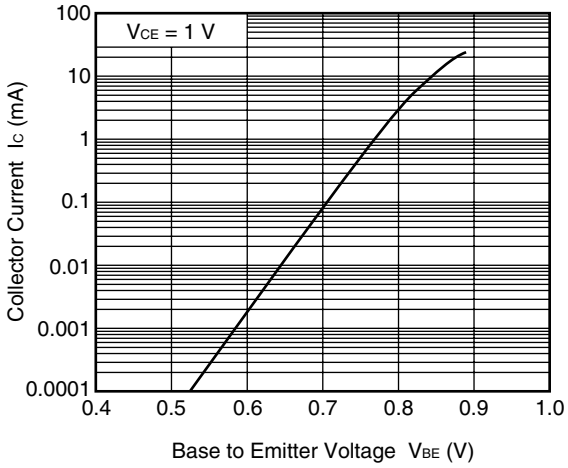
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



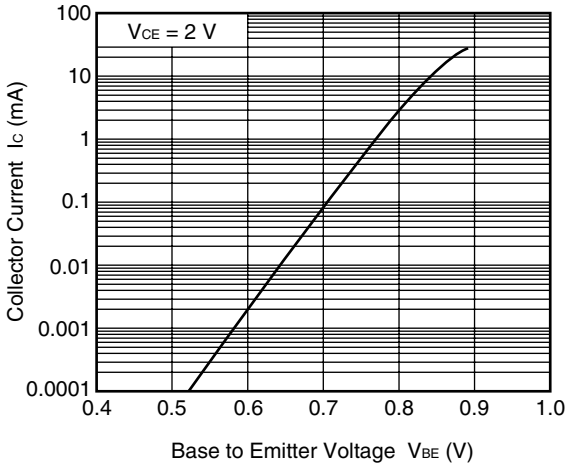

REVERSE TRANSFER CAPACITANCE vs. COLLECTOR TO BASE VOLTAGE



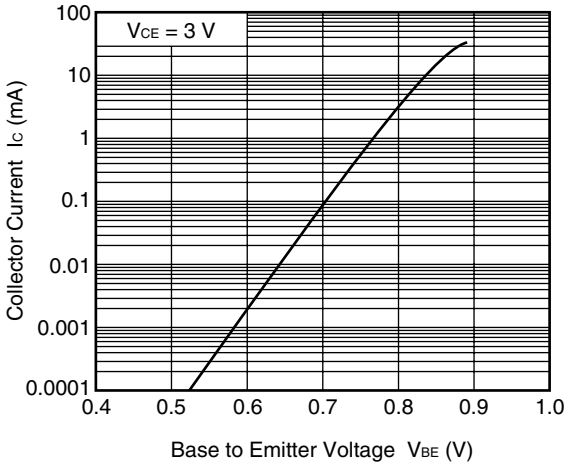

COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE



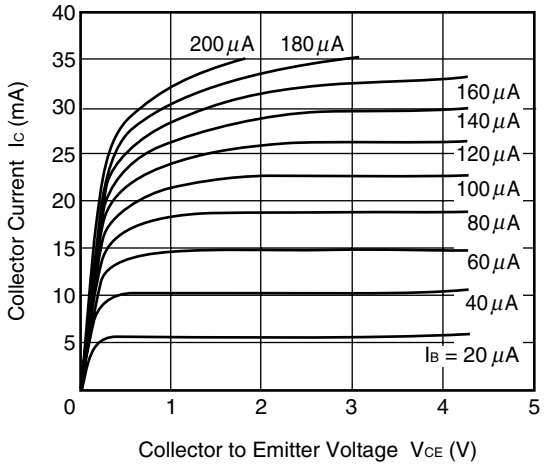

COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE




COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE

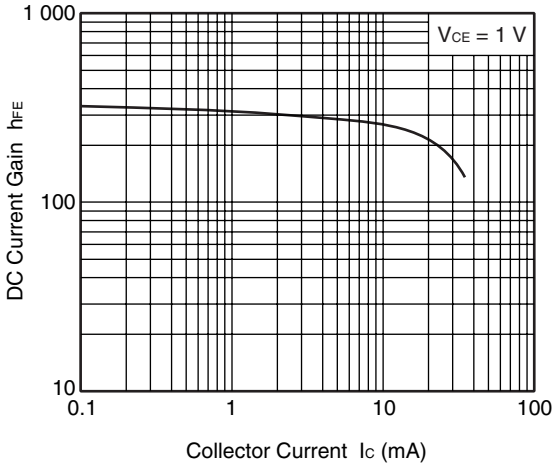



COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE

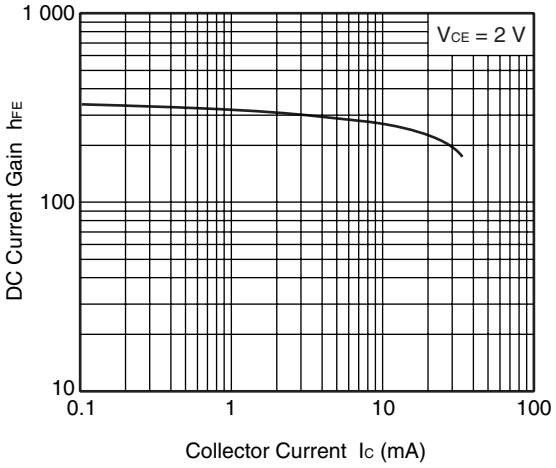



**Remark** The graphs indicate nominal characteristics.

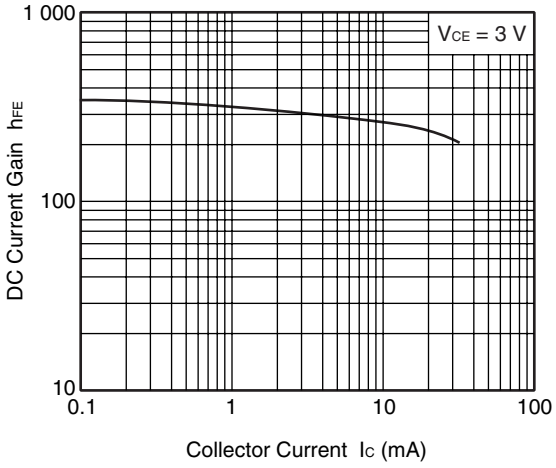
DC CURRENT GAIN vs.
COLLECTOR CURRENT




DC CURRENT GAIN vs.
COLLECTOR CURRENT




DC CURRENT GAIN vs.
COLLECTOR CURRENT

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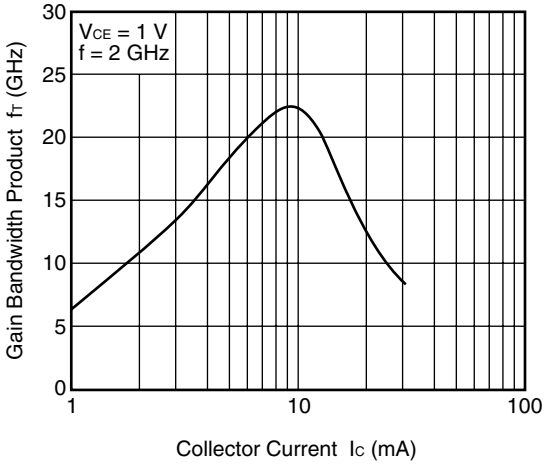
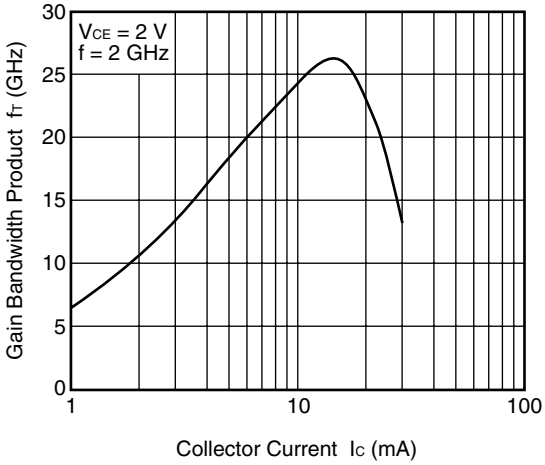
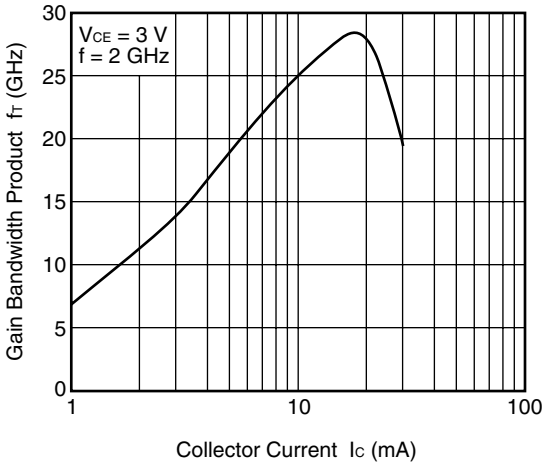
GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT



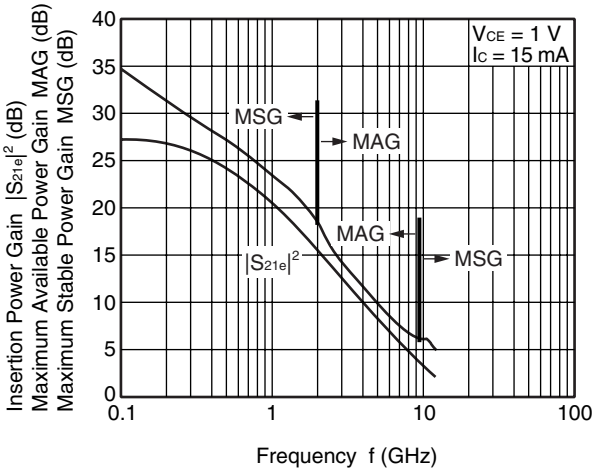

GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT



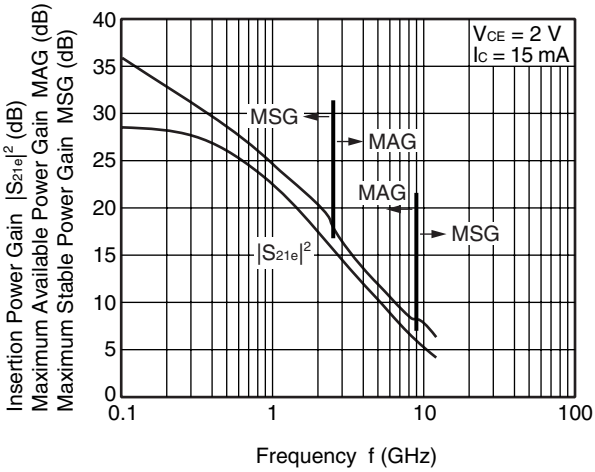

GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT



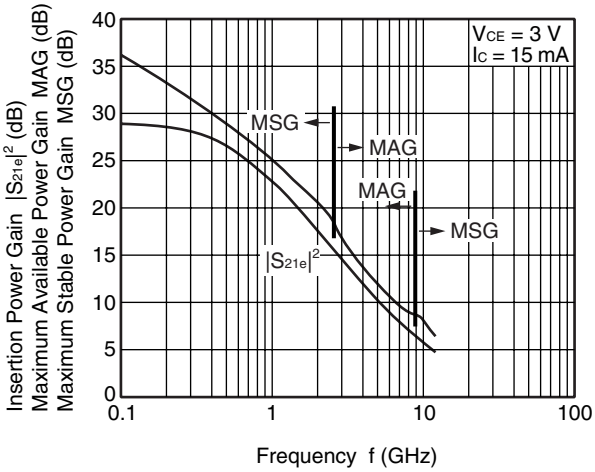

INSERTION POWER GAIN, MAG, MSG vs. FREQUENCY




INSERTION POWER GAIN, MAG, MSG vs. FREQUENCY




INSERTION POWER GAIN, MAG, MSG vs. FREQUENCY

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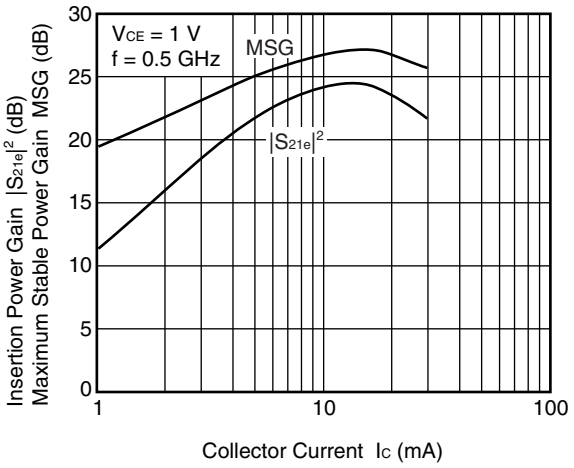
INSERTION POWER GAIN, MSG
vs. COLLECTOR CURRENT

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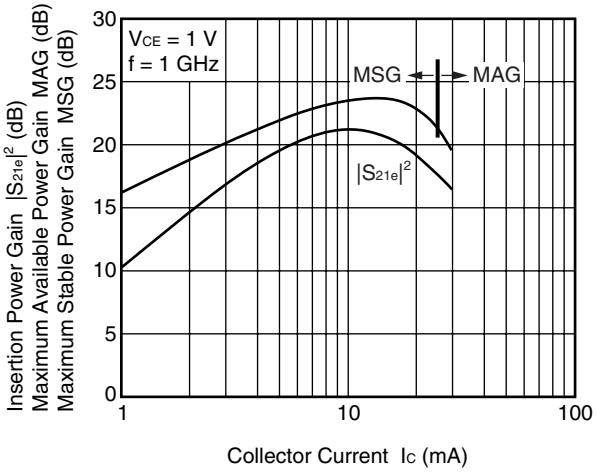
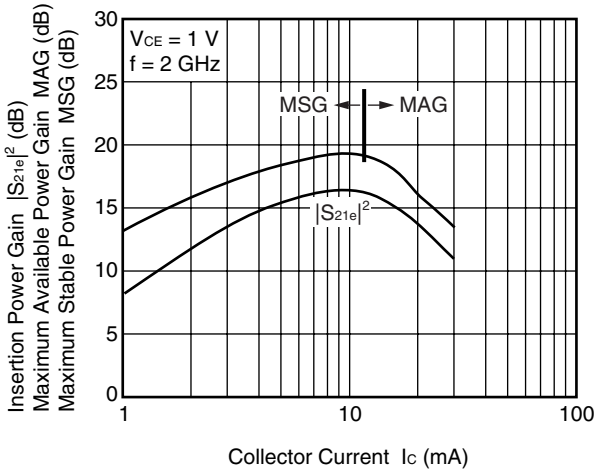
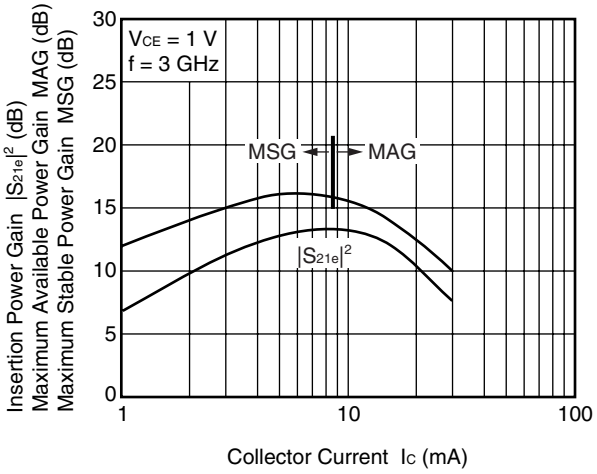



INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT




INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT

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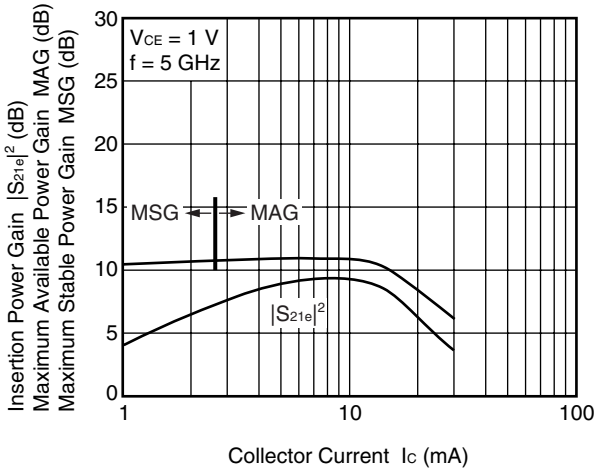
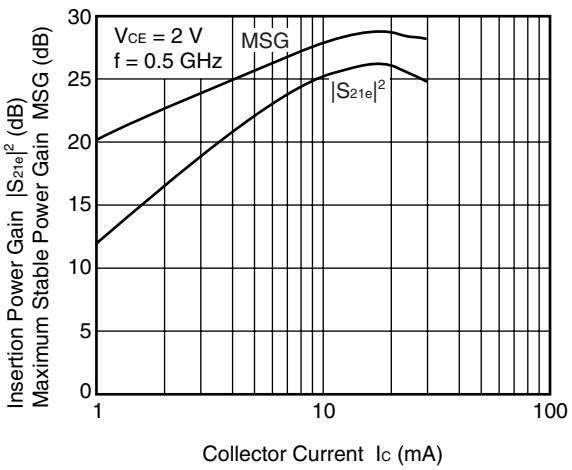
vs. COLLECTOR CURRENT




INSERTION POWER GAIN, MSG
vs. COLLECTOR CURRENT

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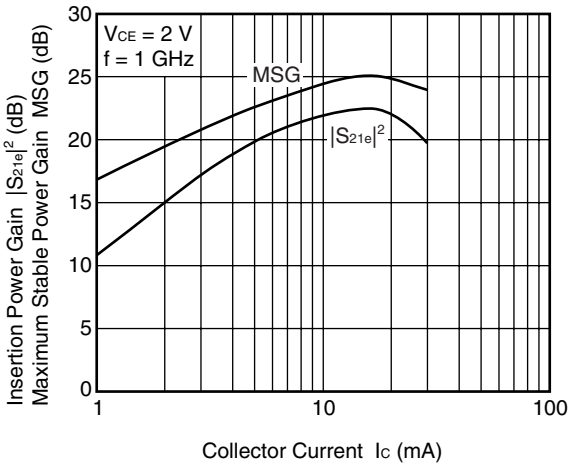
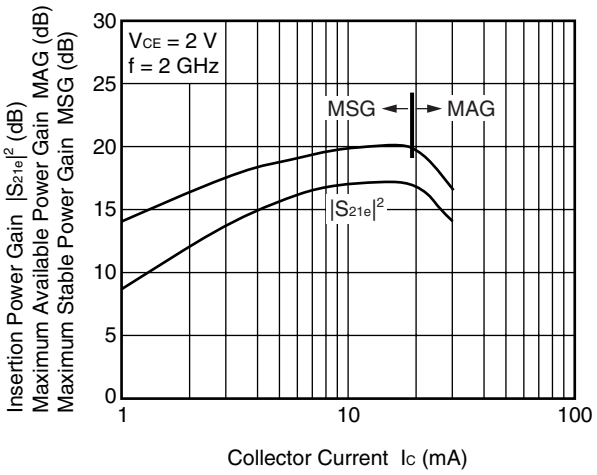
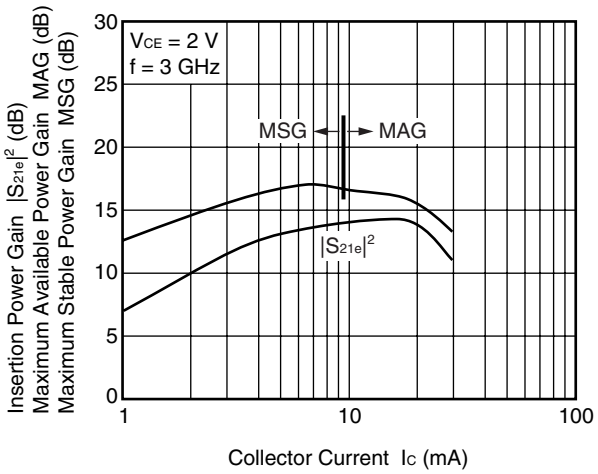
INSERTION POWER GAIN, MSG
vs. COLLECTOR CURRENT



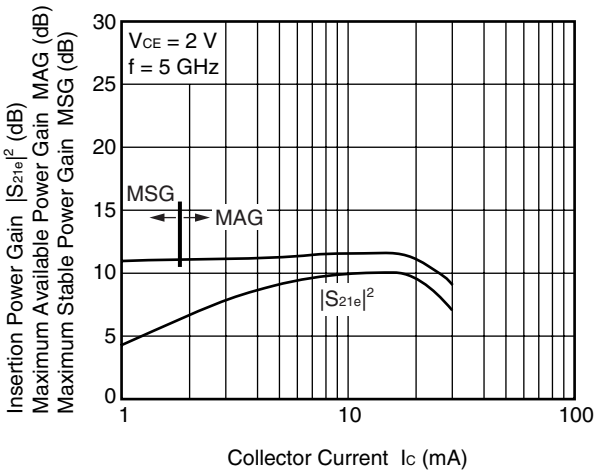

INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT



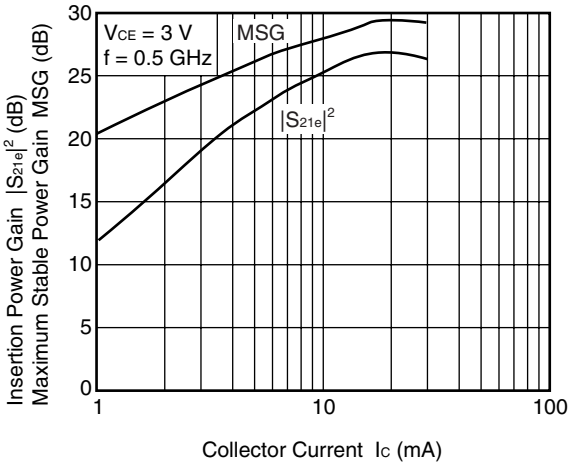

INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT



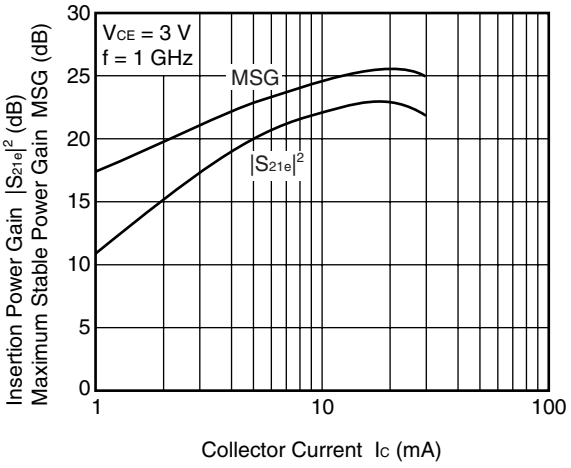

INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT




INSERTION POWER GAIN, MSG
vs. COLLECTOR CURRENT




INSERTION POWER GAIN, MSG
vs. COLLECTOR CURRENT

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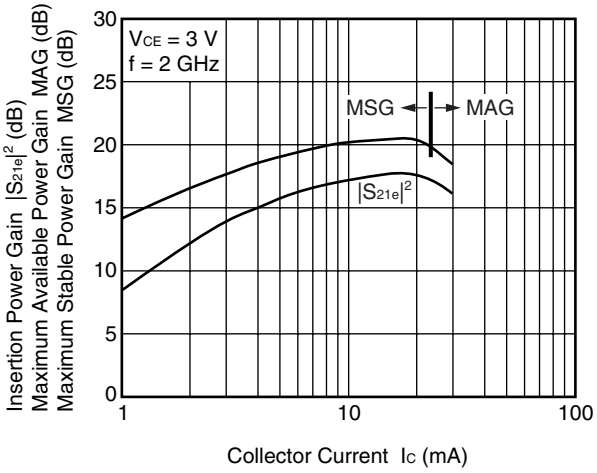
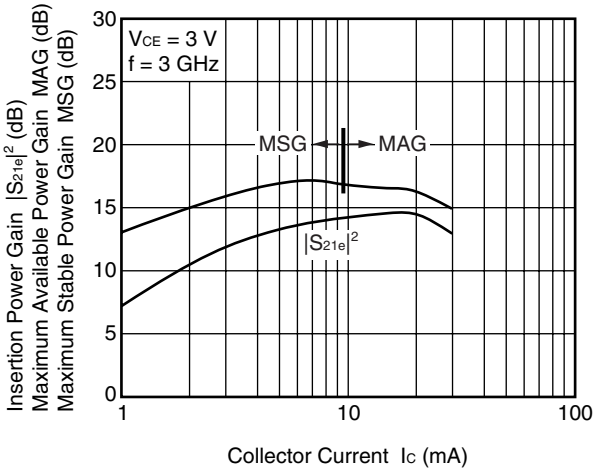
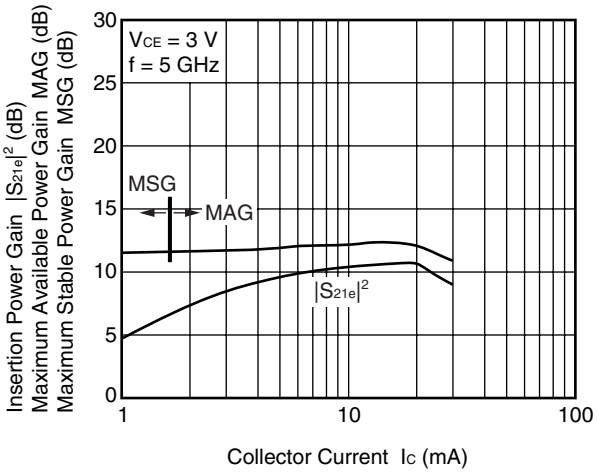
INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT




INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT

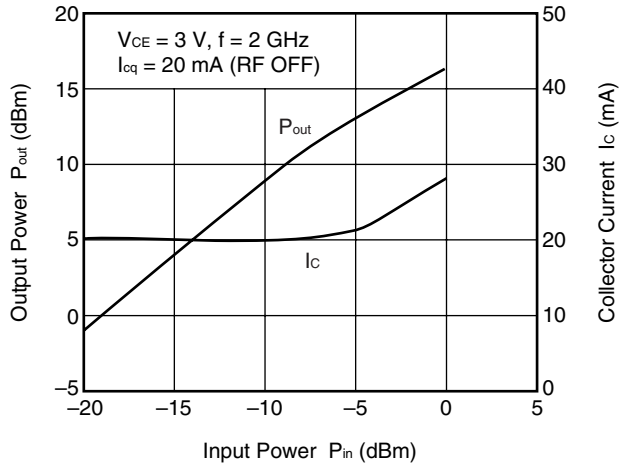



INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT



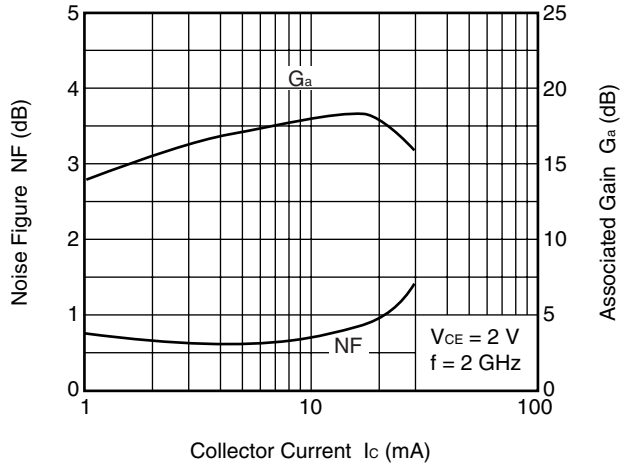

**Remark** The graphs indicate nominal characteristics.

OUTPUT POWER, COLLECTOR CURRENT vs. INPUT POWER




Measuring method : Measured at power matched with external sleeve tuner. (The load resistance is not inserted between the base DC power supply and Bias Tee.)

NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT




**Remark** The graphs indicate nominal characteristics.

<R> **S-PARAMETERS**

S-parameters/Noise parameters are provided on our web site in a form (S2P) that enables direct import to a microwave circuit simulator without keyboard input.

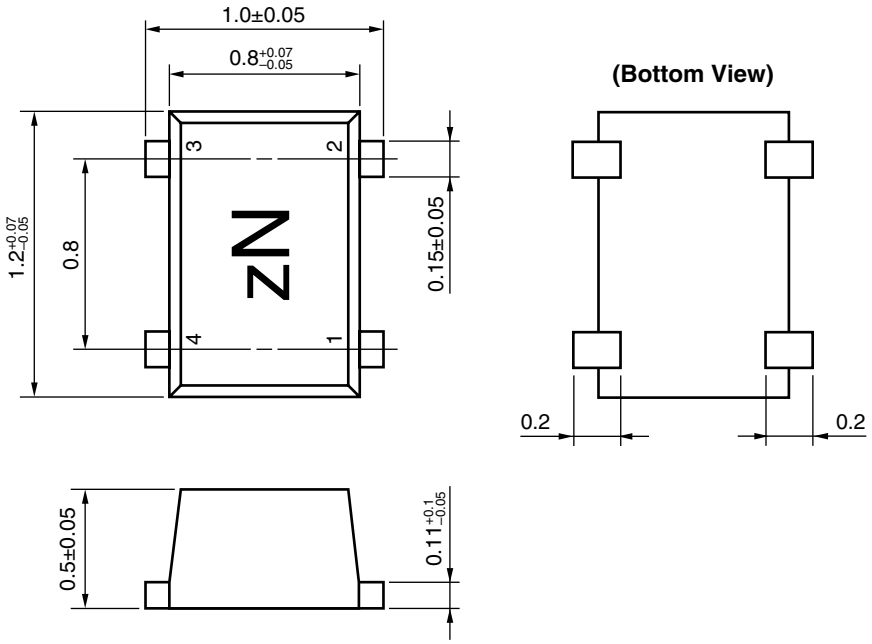
Click here to download S-parameters.

[RF and Microwave] → [Device Parameters]

URL http://www.ncsd.necel.com/microwave/index.html

<R> **PACKAGE DIMENSIONS**

**4-PIN LEAD-LESS MINIMOLD (M14, 1208 PACKAGE) (UNIT: mm)**




**PIN CONNECTIONS**

1. Collector
2. Emitter
3. Base
4. NC (Connected with Pin 2) **Note**

**Note** A NC pin is Non-connection in the mold package (When NC-pin is open state, It will get an influences of floating capacitance. Therefore, we recommend connect to NC pin and Emitter pin).

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