# NESG2101M05

NPN SiGe RF Transistor for Medium Output Power Amplification (125 mW)
Flat-Lead 4-Pin Thin-Type Super Minimold (M05)

R09DS0036EJ0300
Rev. 3.00
Jun 20, 2012

## FEATURES

- The device is an ideal choice for medium output power, high-gain amplification and low distortion, low noise, high-gain amplification
  - $P_{O\ (1\ dB)}$ = 21 dBm TYP. @ $V_{CE}$ = 3.6 V, $I_{Cq}$ = 10 mA, f = 2 GHz
  - NF = 0.6 dB TYP., $G_a$ = 19.0 dB TYP. @ $V_{CE}$ = 2 V, $I_C$ = 7 mA, f = 1 GHz
- Maximum stable power gain: MSG = 17.0 dB TYP. @ $V_{CE}$ = 3 V, $I_C$ = 50 mA, f = 2 GHz
- High breakdown voltage technology for SiGe Tr. adopted: $V_{CEO}$ (absolute maximum ratings) = 5.0 V
- Flat-lead 4-pin thin-type super minimold (M05) package

## <R> ORDERING INFORMATION

| Part Number | Order Number | Package | Quantity | Supplying Form |
|---|---|---|---|---|
| NESG2101M05 | NESG2101M05-A | Flat-lead 4-pin thin-type supper minimold (M05, 2012 PKG) (Pb-Free) | 50 pcs (Non reel) | • 8 mm wide embossed taping<br>• Pin 3 (Collector), Pin 4 (Emitter) face the perforation side of the tape |
| NESG2101M05-T1 | NESG2101M05-T1-A | | 3 kpcs/reel | |

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

Not recommend for new design

## ABSOLUTE MAXIMUM RATINGS ($T_A$ = +25°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 | $P_{tot}$ Note | 500 | mW |
| Junction Temperature | $T_j$ | 150 | °C |
| Storage Temperature | $T_{stg}$ | –65 to +150 | °C |

Note: Mounted on 38 $cm^2$ × 0.4 mm (t) polyimide PCB

**CAUTION**

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

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.



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## <R> 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 | – | – | 100 | nA |
| Emitter Cut-off Current | $I_{EBO}$ | $V_{EB}$ = 1 V, $I_C$ = 0 | – | – | 100 | nA |
| DC Current Gain | $h_{FE}$ Note 1 | $V_{CE}$ = 2 V, $I_C$ = 5 mA | 130 | 190 | 260 | – |
| RF Characteristics | | | | | | |
| Gain Bandwidth Product | $f_T$ | $V_{CE}$ = 3 V, $I_C$ = 50 mA, f = 2 GHz | 14 | 17 | – | GHz |
| Insertion Power Gain | $\lvert S_{21e} \rvert^2$ | $V_{CE}$ = 3 V, $I_C$ = 50 mA, f = 2 GHz | 11.5 | 13.5 | – | dB |
| Noise Figure (1) | NF | $V_{CE}$ = 2 V, $I_C$ = 10 mA, f = 2 GHz, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$ | – | 0.9 | 1.2 | dB |
| Noise Figure (2) | NF | $V_{CE}$ = 2 V, $I_C$ = 7 mA, f = 1 GHz, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$ | – | 0.6 | – | dB |
| Associated Gain (1) | $G_a$ | $V_{CE}$ = 2 V, $I_C$ = 10 mA, f = 2 GHz, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$ | 11.0 | 13.0 | – | dB |
| Associated Gain (2) | $G_a$ | $V_{CE}$ = 2 V, $I_C$ = 7 mA, f = 1 GHz, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$ | – | 19.0 | – | dB |
| Reverse Transfer Capacitance | $C_{re}$ Note 2 | $V_{CB}$ = 2 V, $I_E$ = 0, f = 1 MHz | – | 0.4 | 0.5 | pF |
| Maximum Stable Power Gain | MSG Note 3 | $V_{CE}$ = 3 V, $I_C$ = 50 mA, f = 2 GHz | 14.5 | 17.0 | – | dB |
| Gain 1 dB Compression Output Power | $P_{O\ (1\ dB)}$ | $V_{CE}$ = 3.6 V, $I_{Cq}$ = 10 mA, f = 2 GHz | – | 21 | – | dBm |
| Linear Gain | $G_L$ | $V_{CE}$ = 3.6 V, $I_{Cq}$ = 10 mA, f = 2 GHz | – | 15 | – | dB |

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

2. Collector to base capacitance when the emitter grounded

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

## $h_{FE}$ CLASSIFICATION

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| Rank | FB/YFB |
|---|---|
| Marking | T1J |
| $h_{FE}$ Value | 130 to 260 |

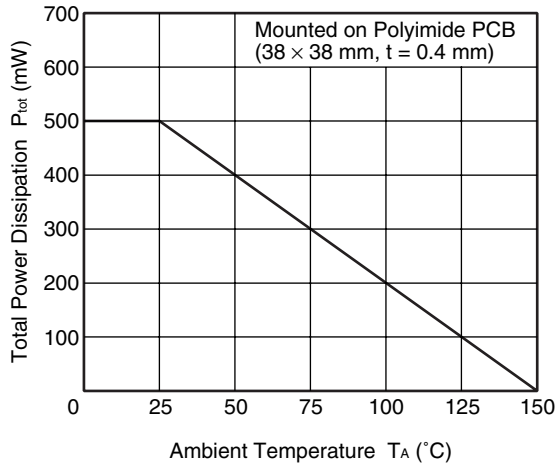
Not recommend for new design



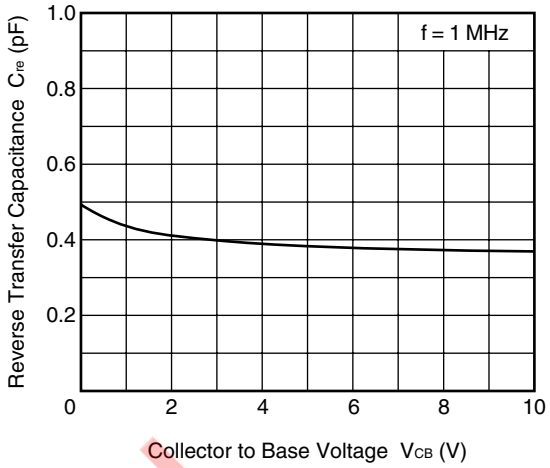
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## TYPICAL CHARACTERISTICS ($T_A$ = +25°C, unless otherwise specified)

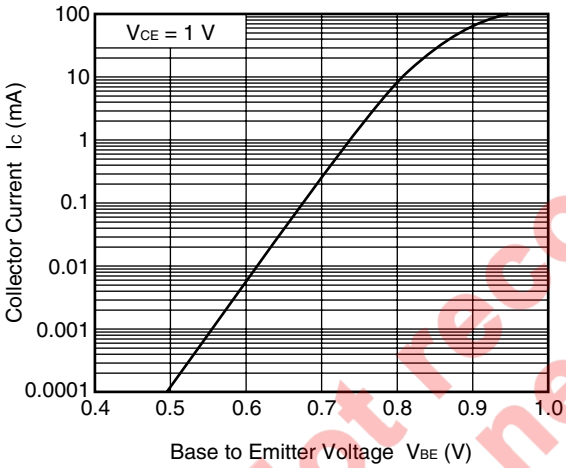
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



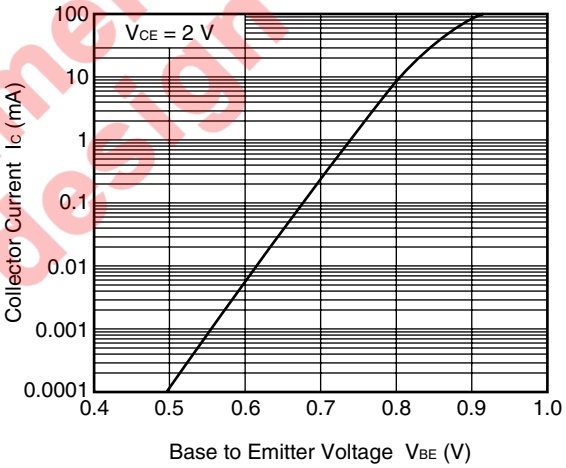

REVERSE TRANSFER CAPACITANCE vs. COLLECTOR TO BASE VOLTAGE



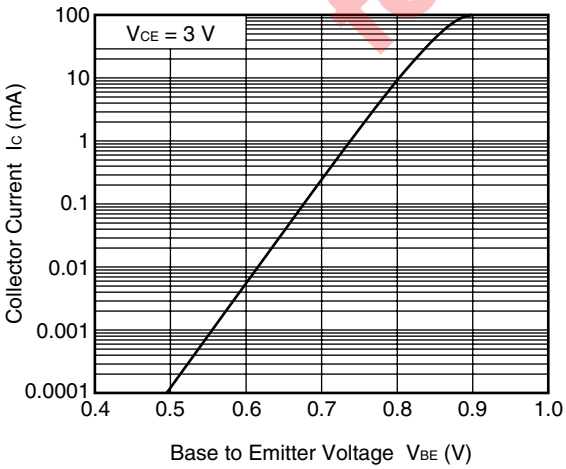

COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE



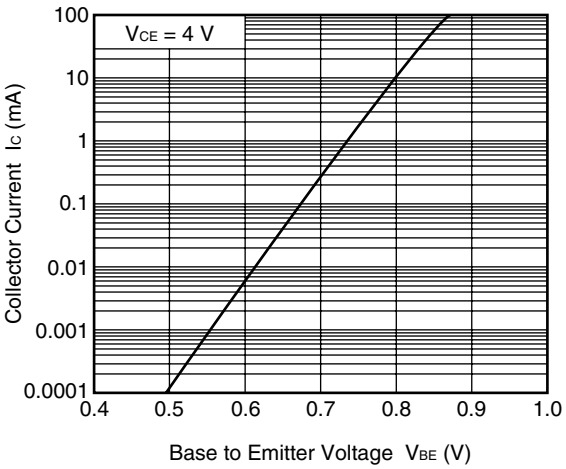

COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE




COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE




COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE



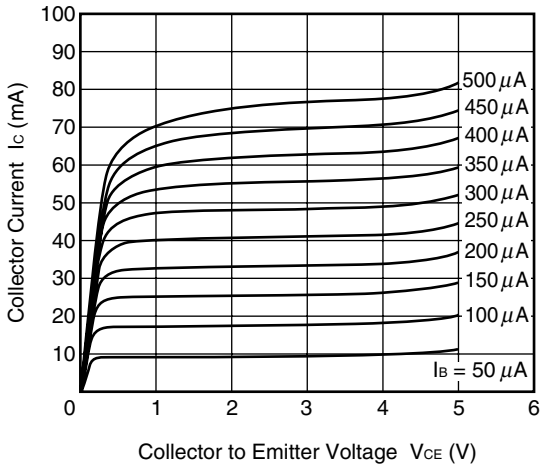

Not recommend for new design

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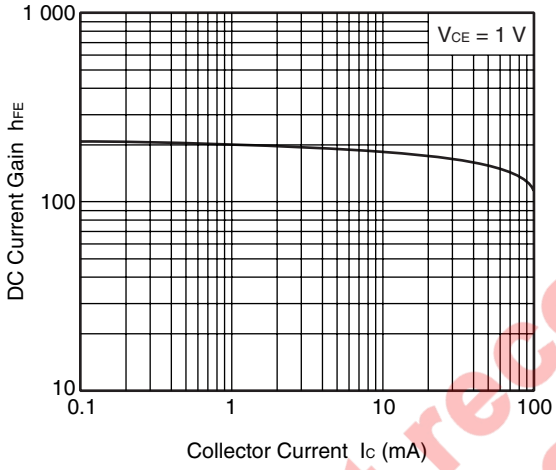


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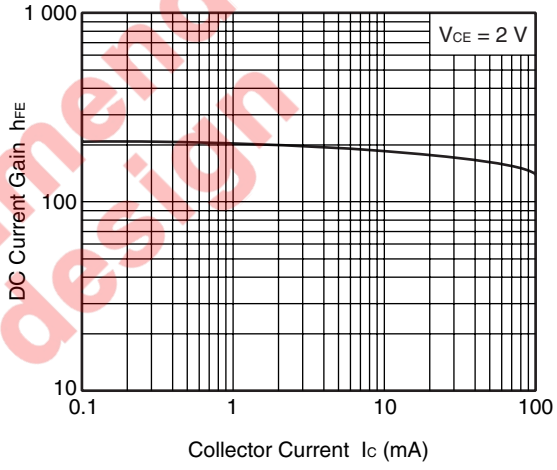
COLLECTOR CURRENT vs.
COLLECTOR TO EMITTER VOLTAGE



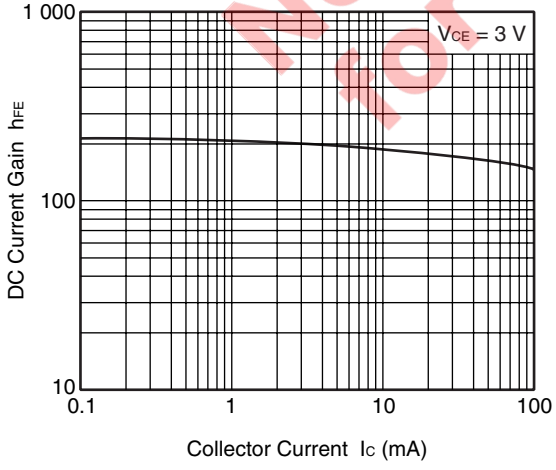

DC CURRENT GAIN vs.
COLLECTOR CURRENT



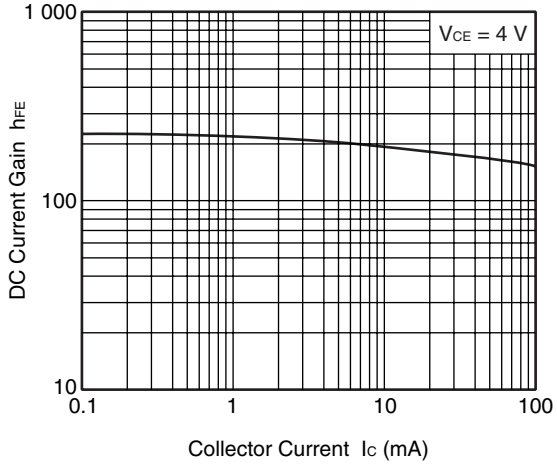

DC CURRENT GAIN vs.
COLLECTOR CURRENT




DC CURRENT GAIN vs.
COLLECTOR CURRENT




DC CURRENT GAIN vs.
COLLECTOR CURRENT



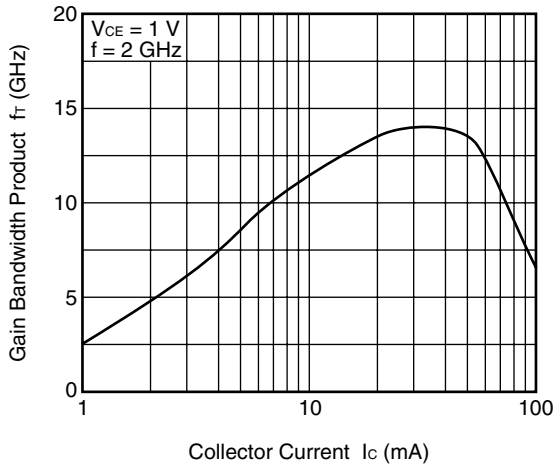

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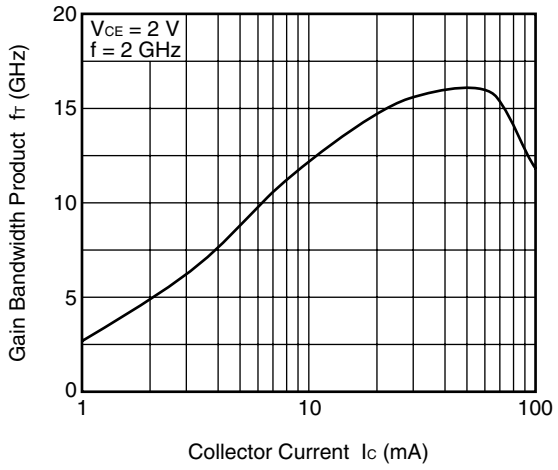


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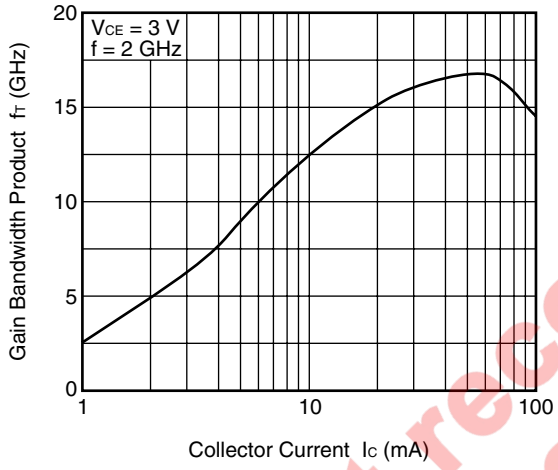
GAIN BANDWIDTH PRODUCT
vs. COLLECTOR CURRENT



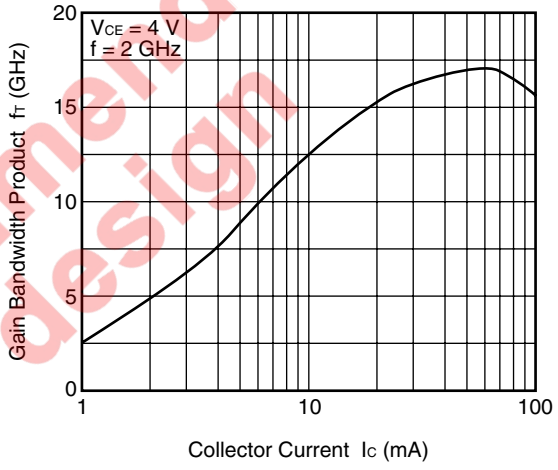

GAIN BANDWIDTH PRODUCT
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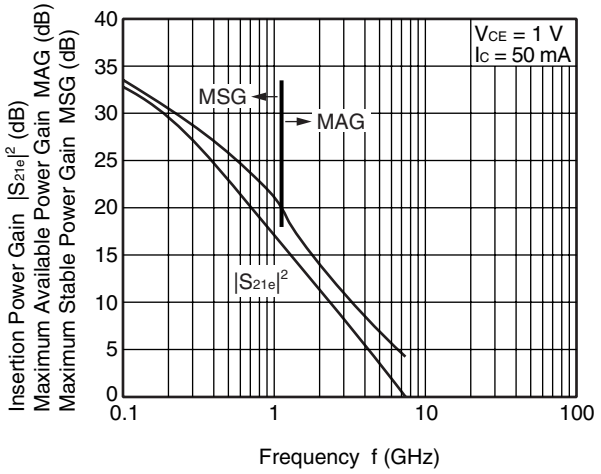

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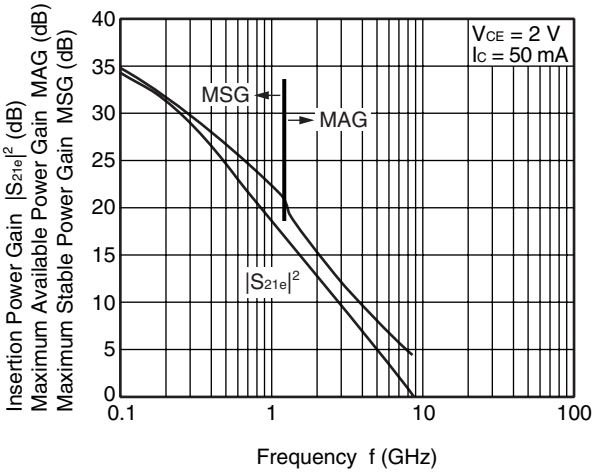


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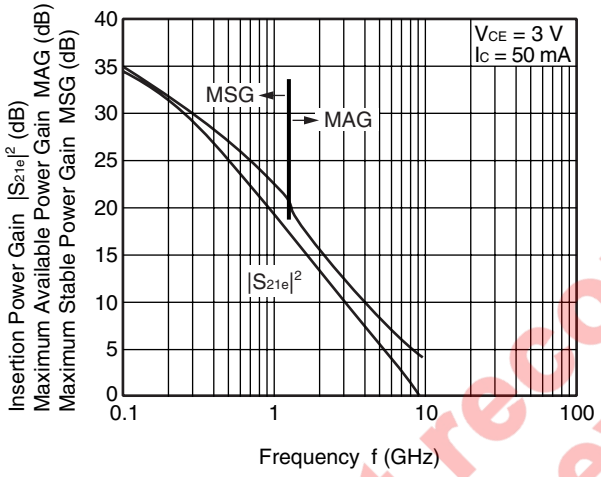
INSERTION POWER GAIN,
MAG, MSG vs. FREQUENCY



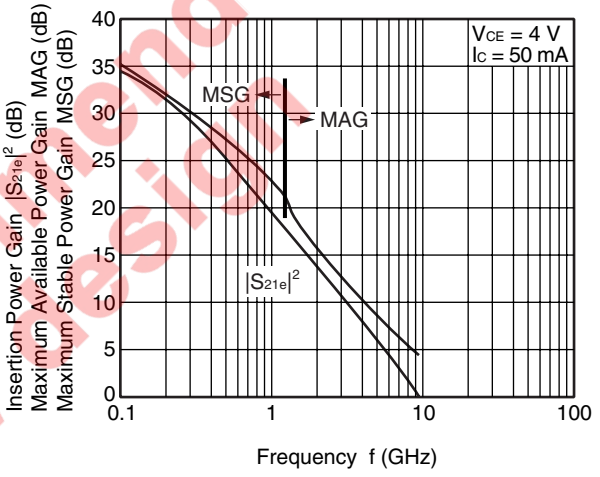

INSERTION POWER GAIN,
MAG, MSG vs. FREQUENCY




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MAG, MSG vs. FREQUENCY




INSERTION POWER GAIN,
MAG, MSG vs. FREQUENCY



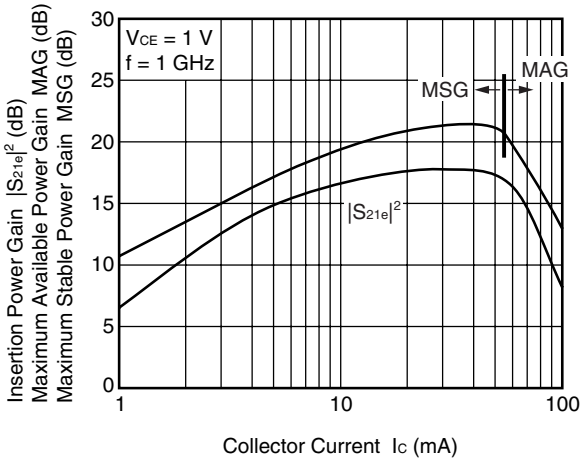

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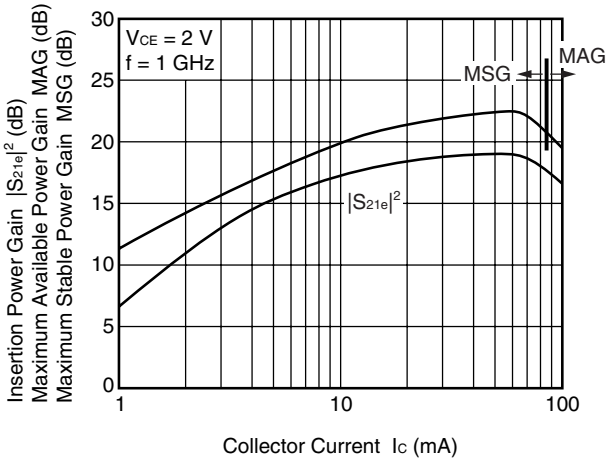


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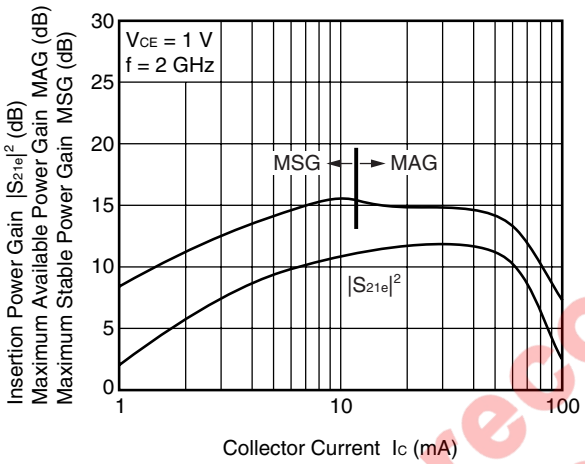
INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT



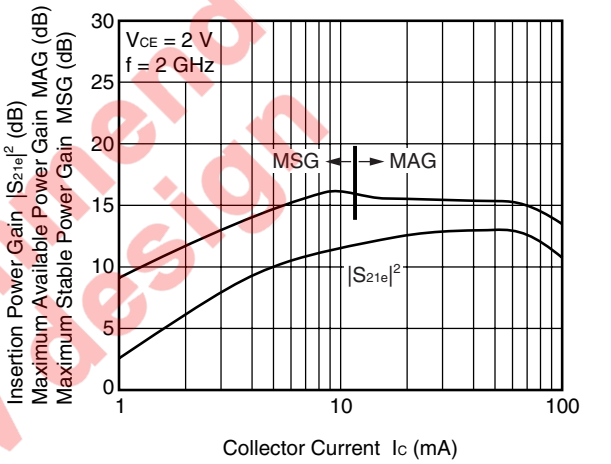

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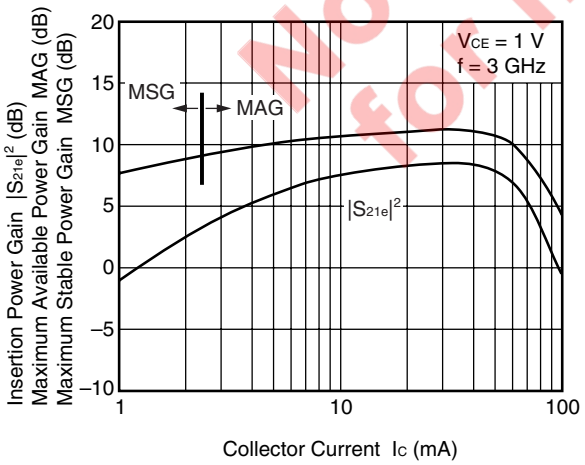

INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT



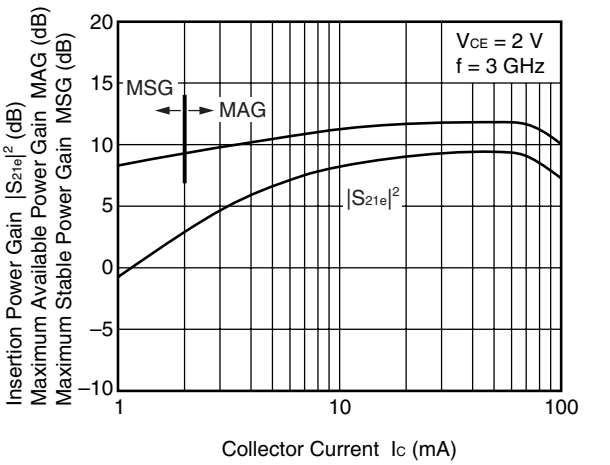

INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT




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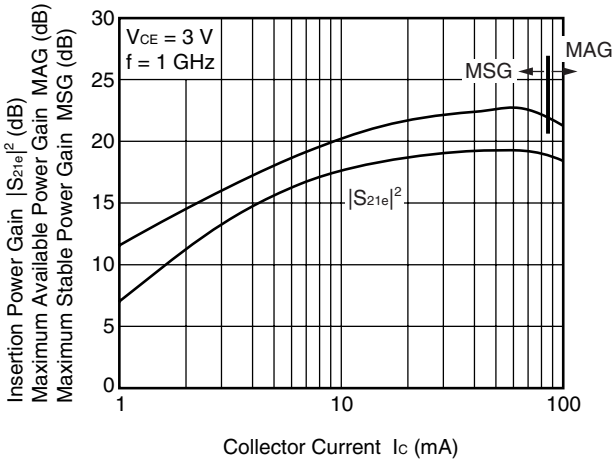

Not recommend for new design

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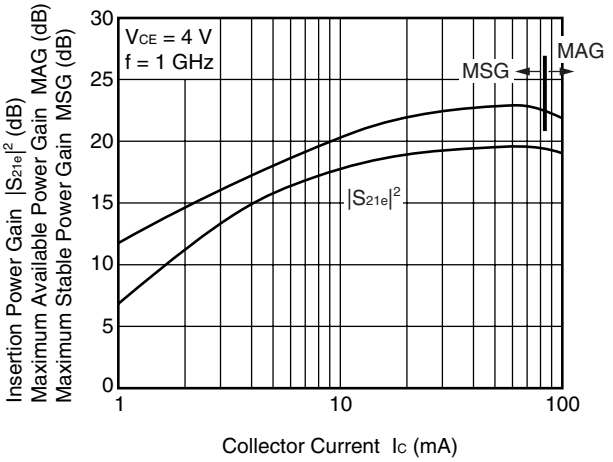


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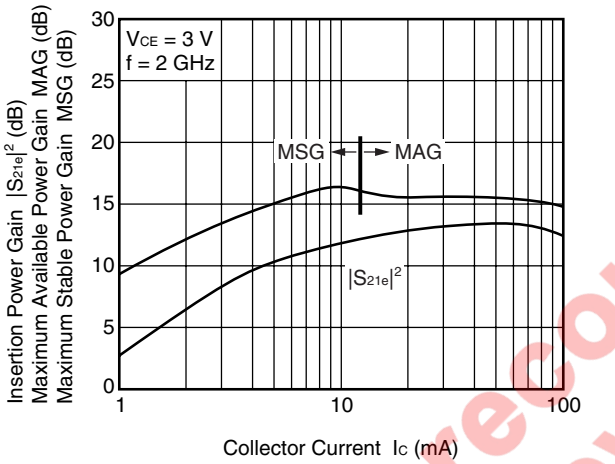
INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT



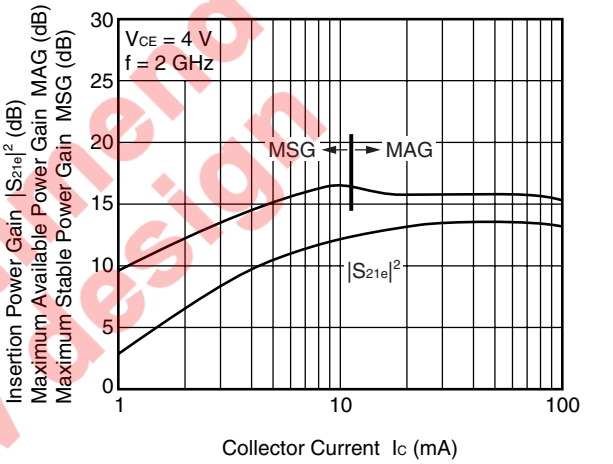

INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT



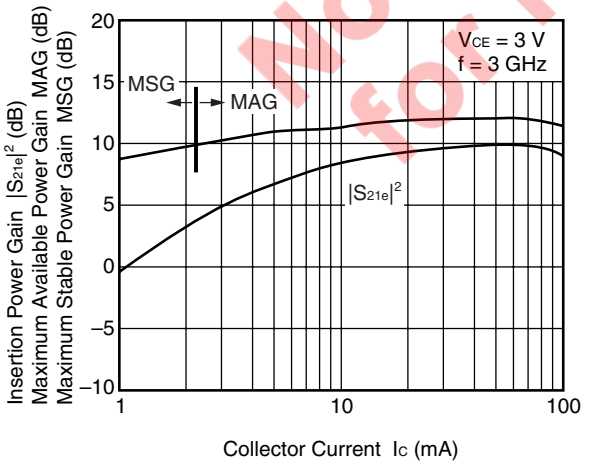

INSERTION POWER GAIN, MAG, MSG
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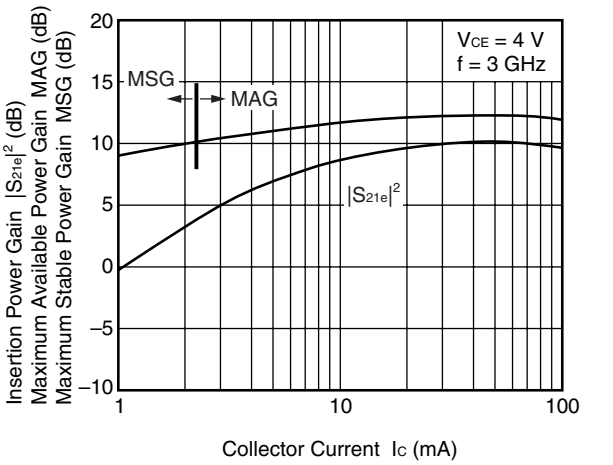

INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT




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vs. COLLECTOR CURRENT




INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT



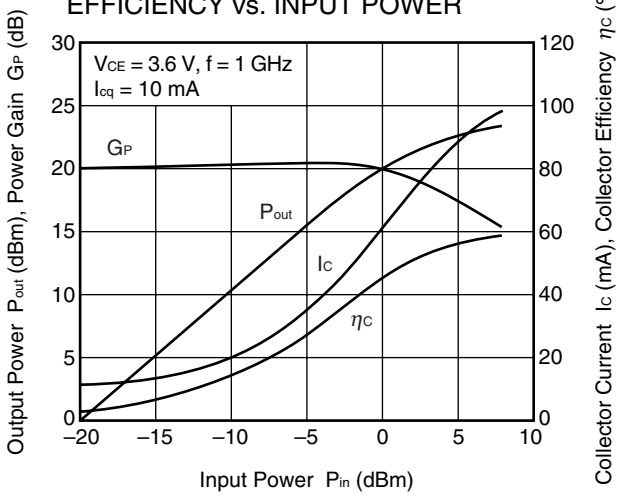

Not recommend for new design

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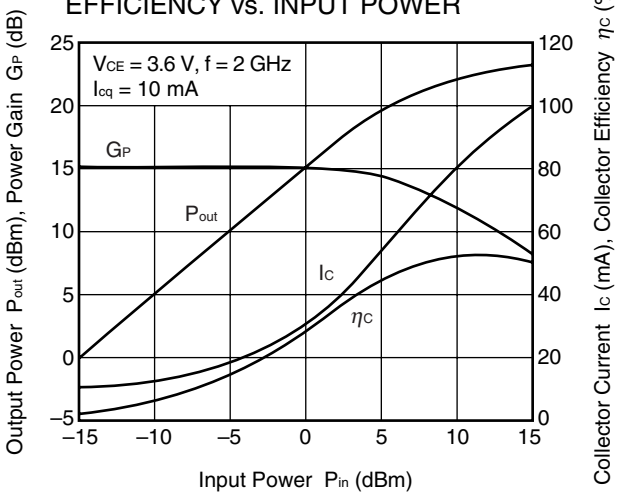


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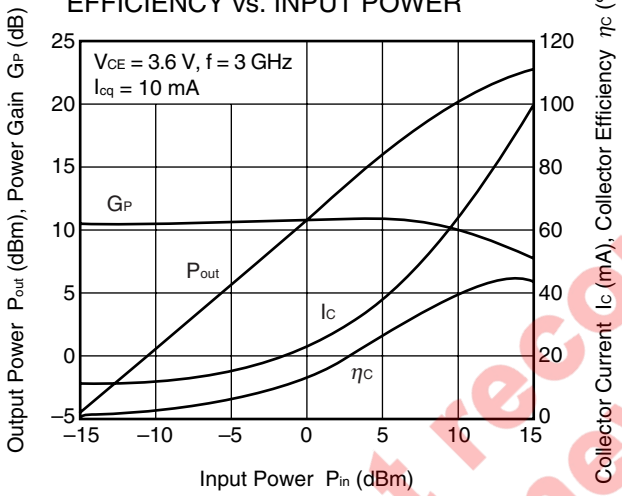
OUTPUT POWER, POWER GAIN, COLLECTOR CURRENT, COLLECTOR EFFICIENCY vs. INPUT POWER



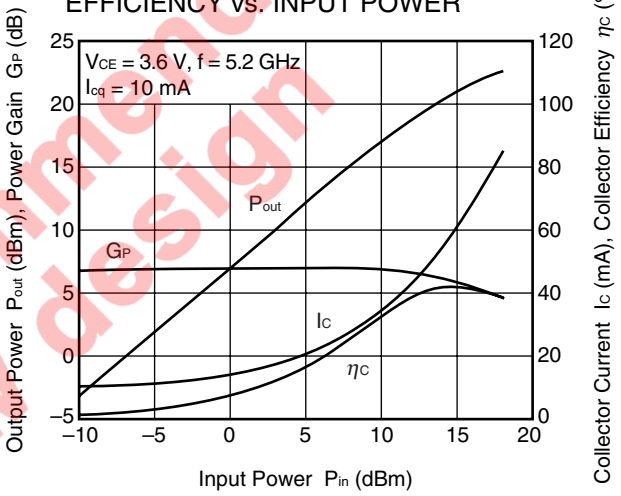

OUTPUT POWER, POWER GAIN, COLLECTOR CURRENT, COLLECTOR EFFICIENCY vs. INPUT POWER




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




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



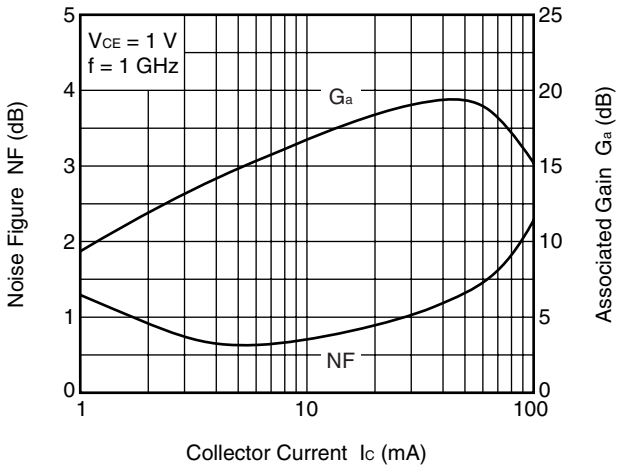

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Not recommend for new design

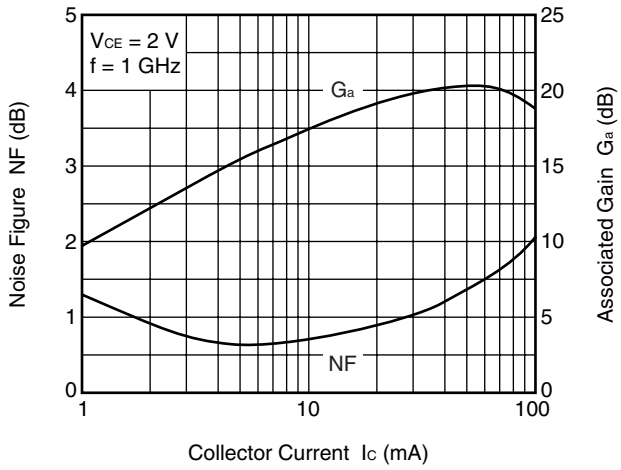


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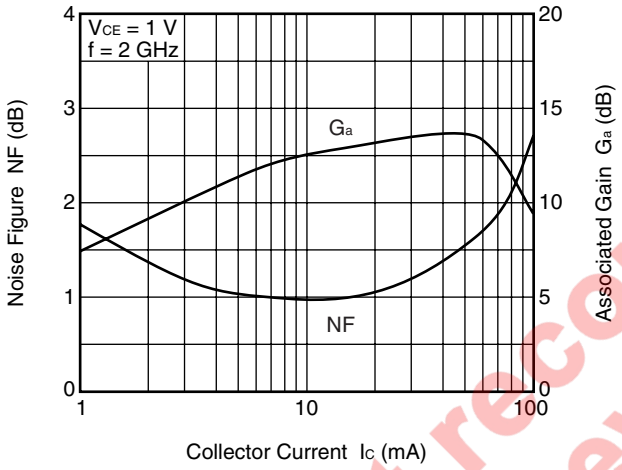
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



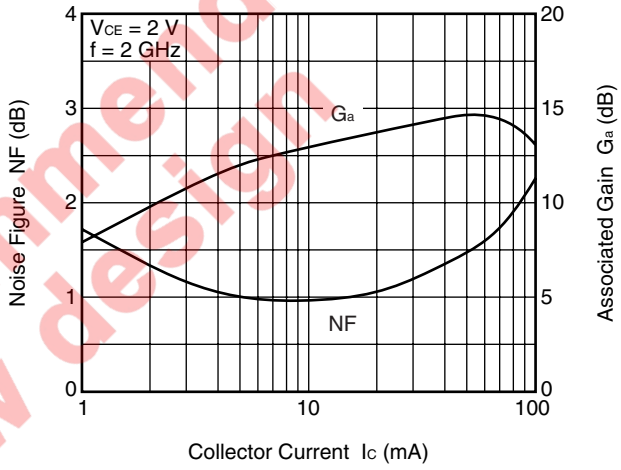

NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



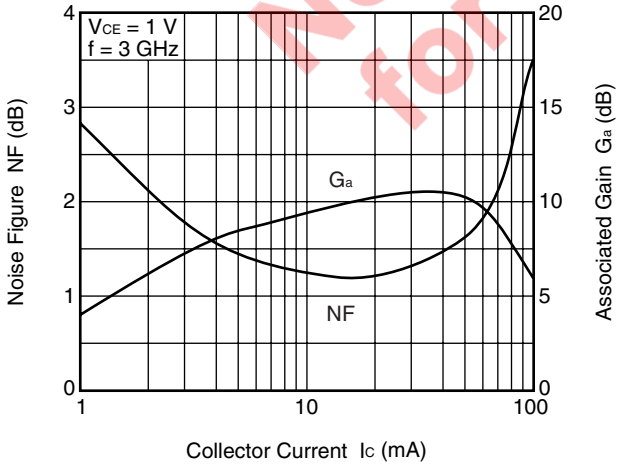

NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



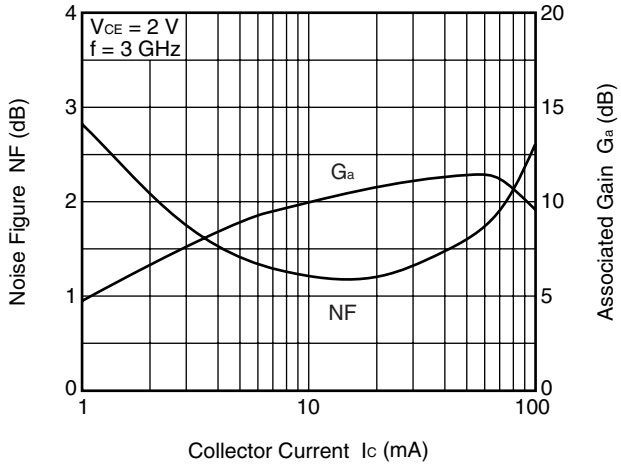

NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT




NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT




NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



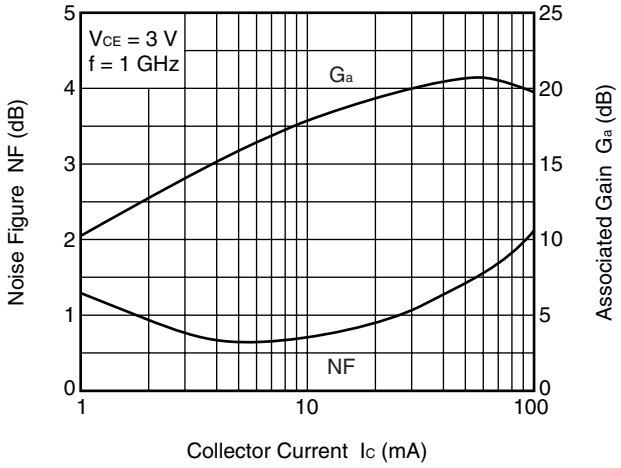

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**Remark** The graphs indicate nominal characteristics.

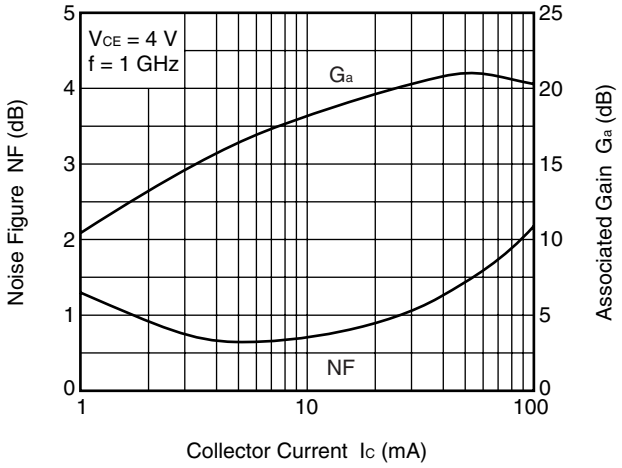


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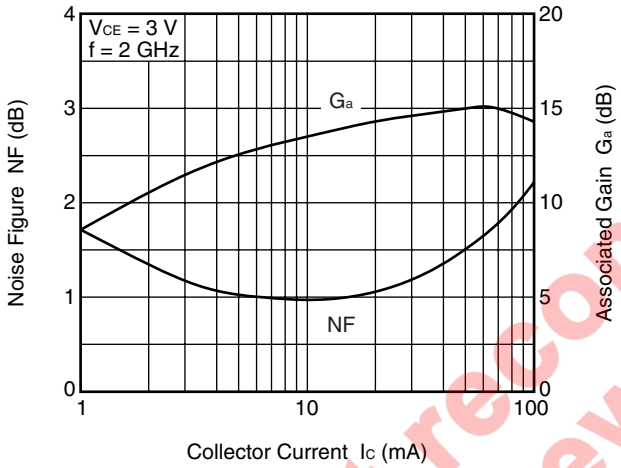
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



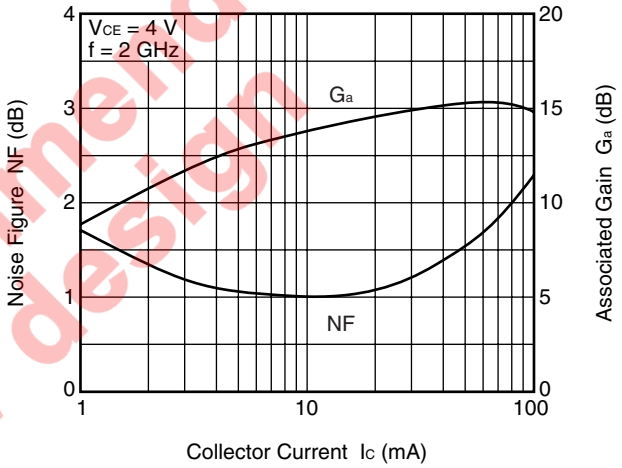

NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



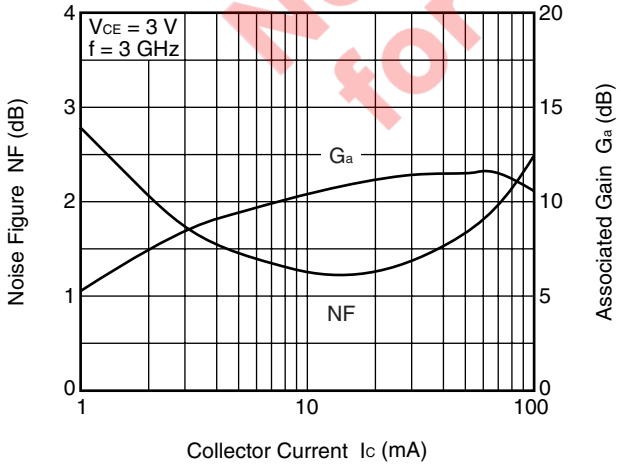

NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



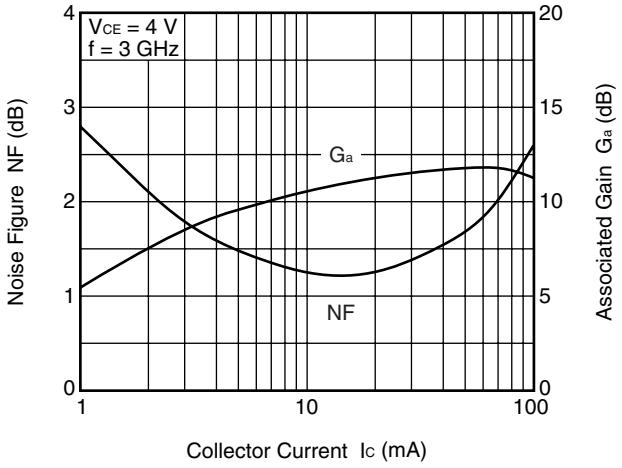

NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT




NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT




NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT




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**Remark** The graphs indicate nominal characteristics.



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S-parameters and noise parameters are provided on our web site in a form (S2P) that enables direct import of the parameters to microwave circuit simulators without the need for keyboard inputs.

Click here to download S-parameters.

[Products] → [RF Devices] → [Device Parameters]

URL http://www.renesas.com/products/microwave/

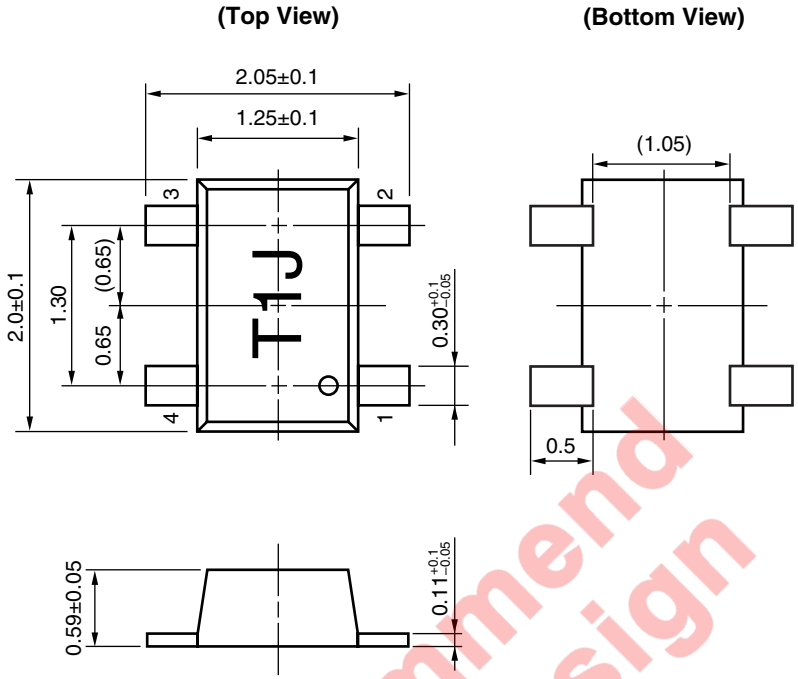
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## PACKAGE DIMENSIONS

<R> **FLAT-LEAD 4-PIN THIN-TYPE SUPER MINIMOLD (M05, 2012 PKG) (UNIT: mm)**




**PIN CONNENTION**

1. Base
2. Emitter
3. Collector
4. Emitter

**Remark** ( ) : Reference value

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| Revision History | NESG2101M05 Data Sheet |
|---|---|

| Rev. | Date | Description | |
|---|---|---|---|
| | | Page | Summary |
| – | Mar 2003 | – | Previous No. : PU10190EJ02V0DS |
| 3.00 | Jun 20, 2012 | p.1 | Modification of **ORDERING INFORMATION** |
| | | p.2 | Modification of **ELECTRICAL CHARACTERISTICS** |
| | | | Modification of **$h_{FE}$ CLASSIFICATION** |
| | | p.12 | Modification of **S-PARAMETERS** |
| | | p.13 | Modification of **PACKAGE DIMENSIONS** |

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