DATA SHEET

NEC

NPN SILICON GERMANIUM RF TRANSISTOR
NESG3031M05

NPN SiGe RF TRANSISTOR FOR LOW NOISE, HIGH-GAIN AMPLIFICATION FLAT-LEAD 4-PIN THIN-TYPE SUPER MINIMOLD (M05, 2012 PKG)

FEATURES

- The device is an ideal choice for low noise, high-gain amplification
  NF = 0.6 dB TYP., G_a = 16.0 dB TYP. @ V_{CE} = 2 V, I_C = 6 mA, f = 2.4 GHz
  NF = 0.95 dB TYP., G_a = 10.0 dB TYP. @ V_{CE} = 2 V, I_C = 6 mA, f = 5.2 GHz
  NF = 1.1 dB TYP., G_a = 9.5 dB TYP. @ V_{CE} = 2 V, I_C = 6 mA, f = 5.8 GHz
- Maximum stable power gain: MSG = 14.0 dB TYP. @ V_{CE} = 3 V, I_C = 20 mA, f = 5.8 GHz
- SiGe HBT technology (UHS3) adopted: f_{max} = 110 GHz
- Flat-lead 4-pin thin-type super minimold (M05, 2012 PKG)

<R> ORDERING INFORMATION

Part Number	Order Number	Package	Quantity	Supplying Form
NESG3031M05	NESG3031M05-A	Flat-lead 4-pin thin-type super minimold (M05, 2012 PKG) (Pb-Free)	50 pcs (Non reel)	• 8 mm wide embossed taping • Pin 3 (Collector), Pin 4 (Emitter) face the perforation side of the tape
NESG3031M05-T1	NESG3031M05-T1-A		3 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 × 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} = 3 V, I_C = 20 mA, f = 5.8 GHz	6.0	8.5	–	dB
Noise Figure (1)	NF	V_{CE} = 2 V, I_C = 6 mA, f = 2.4 GHz, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$	–	0.6	–	dB
Noise Figure (2)	NF	V_{CE} = 2 V, I_C = 6 mA, f = 5.2 GHz, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$	–	0.95	–	dB
Noise Figure (3)	NF	V_{CE} = 2 V, I_C = 6 mA, f = 5.8 GHz, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$	–	1.1	1.5	dB
Associated Gain (1)	G_a	V_{CE} = 2 V, I_C = 6 mA, f = 2.4 GHz, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$	–	16.0	–	dB
Associated Gain (2)	G_a	V_{CE} = 2 V, I_C = 6 mA, f = 5.2 GHz, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$	–	10.0	–	dB
Associated Gain (3)	G_a	V_{CE} = 2 V, I_C = 6 mA, f = 5.8 GHz, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$	7.5	9.5	–	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} = 3 V, I_C = 20 mA, f = 5.8 GHz	11.0	14.0	–	dB
Gain 1 dB Compression Output Power	$P_{O\ (1\ dB)}$	V_{CE} = 3 V, $I_{C\ (set)}$ = 20 mA, f = 5.8 GHz, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$	–	13.0	–	dBm
Output 3rd Order Intercept Point	OIP_3	V_{CE} = 3 V, $I_{C\ (set)}$ = 20 mA, f = 5.8 GHz, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$	–	18.0	–	dBm

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

2. Collector to base capacitance when the emitter grounded

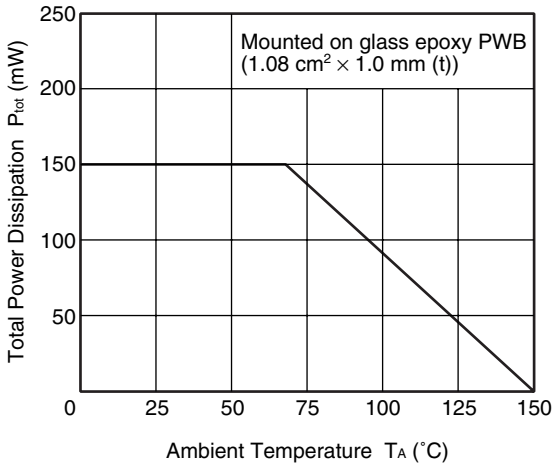
3. $MSG = \left| \frac{S_{21}}{S_{12}} \right|$

h_{FE} CLASSIFICATION

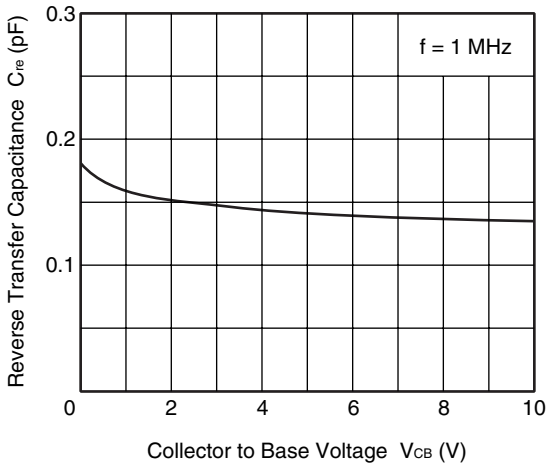
Rank	FB
Marking	T1K
h_{FE} Value	220 to 380

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

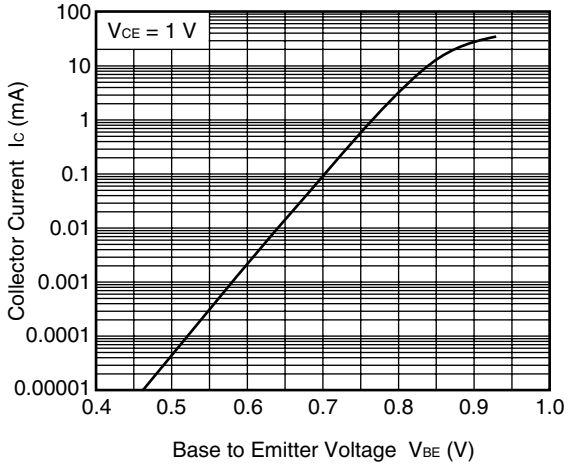
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



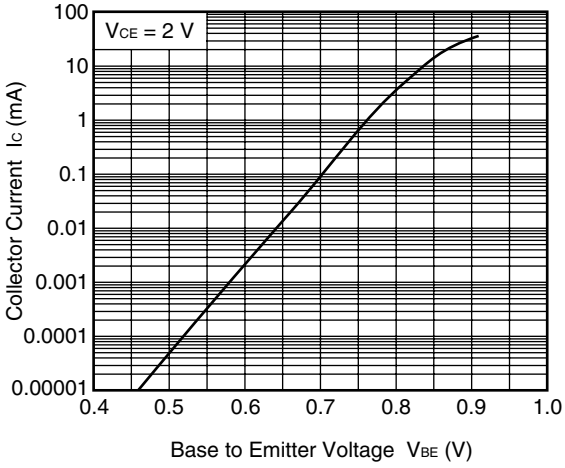
REVERSE TRANSFER CAPACITANCE vs. COLLECTOR TO BASE VOLTAGE



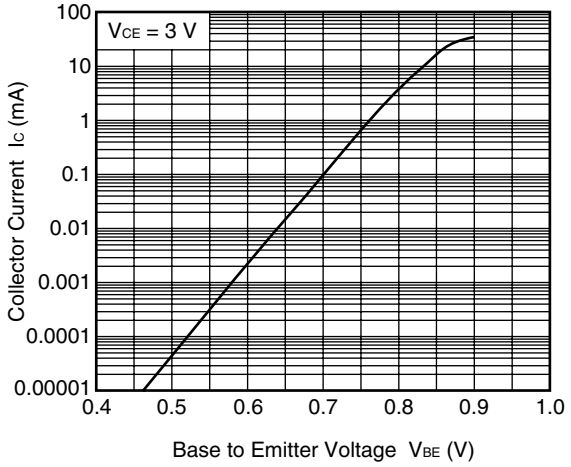
COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE



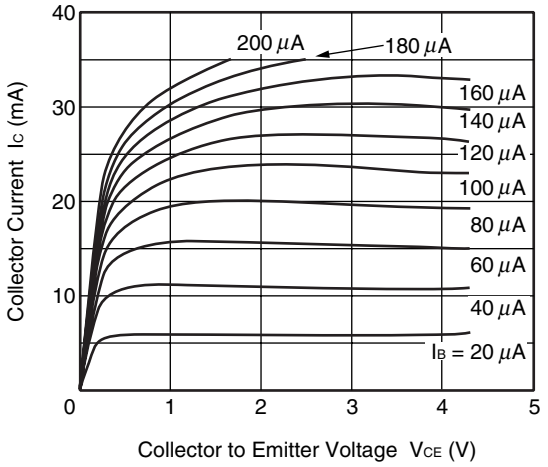
COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE



COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE

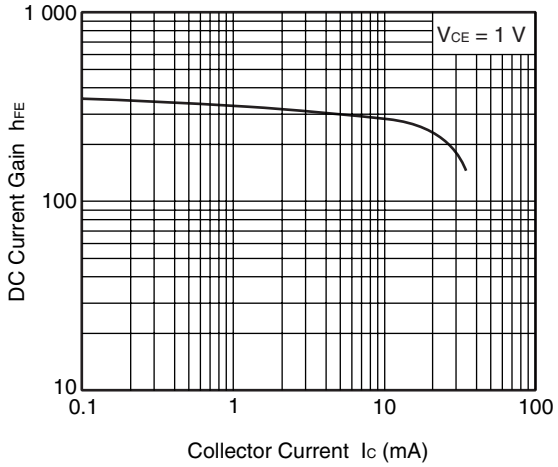


COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE

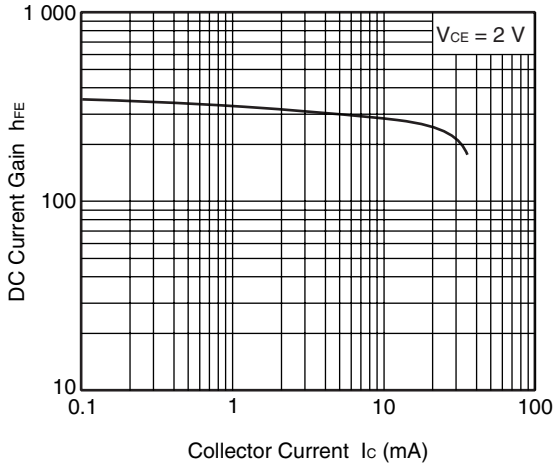


Remark The graphs indicate nominal characteristics.

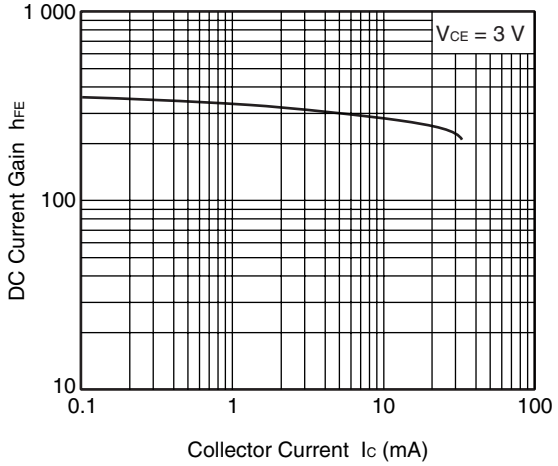
DC CURRENT GAIN vs.
COLLECTOR CURRENT



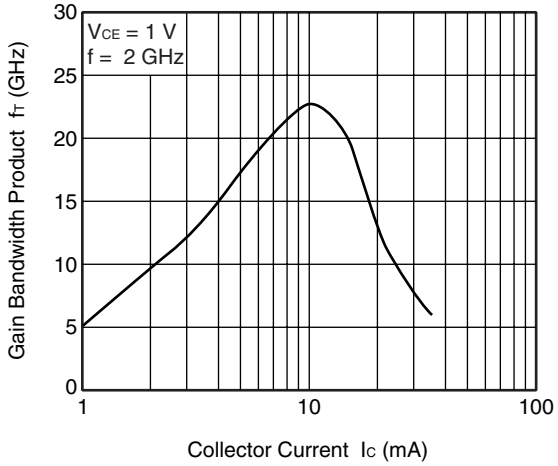
DC CURRENT GAIN vs.
COLLECTOR CURRENT



DC CURRENT GAIN vs.
COLLECTOR CURRENT



GAIN BANDWIDTH PRODUCT
vs. COLLECTOR CURRENT



GAIN BANDWIDTH PRODUCT
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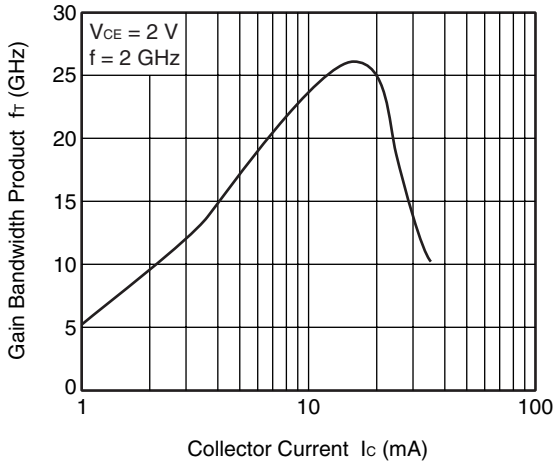
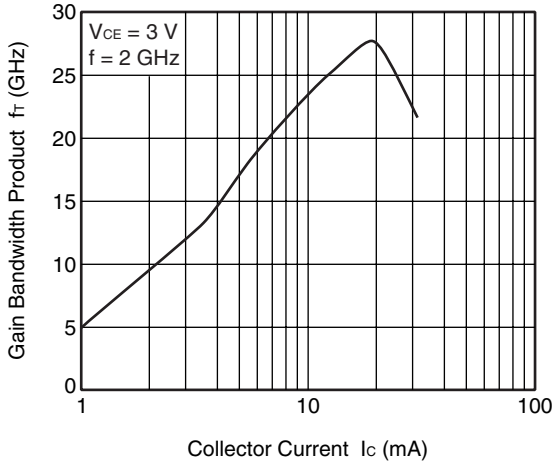


GAIN BANDWIDTH PRODUCT
vs. COLLECTOR CURRENT



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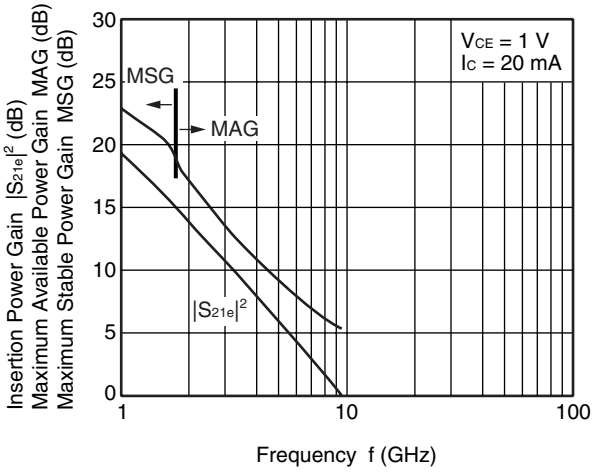
INSERTION POWER GAIN, MAG, MSG vs. FREQUENCY



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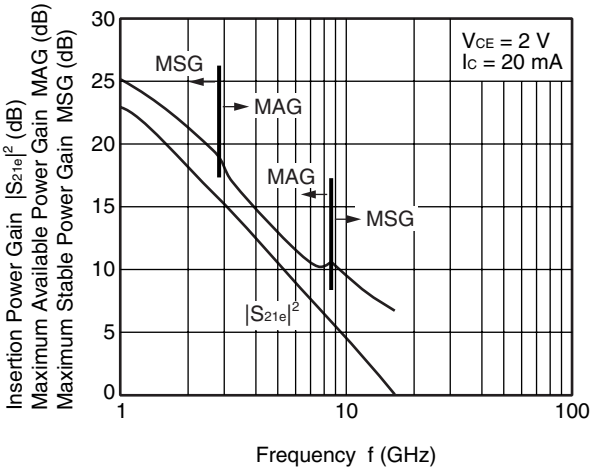

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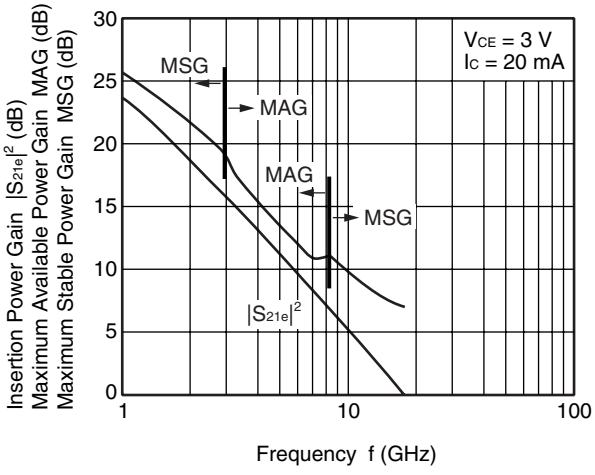

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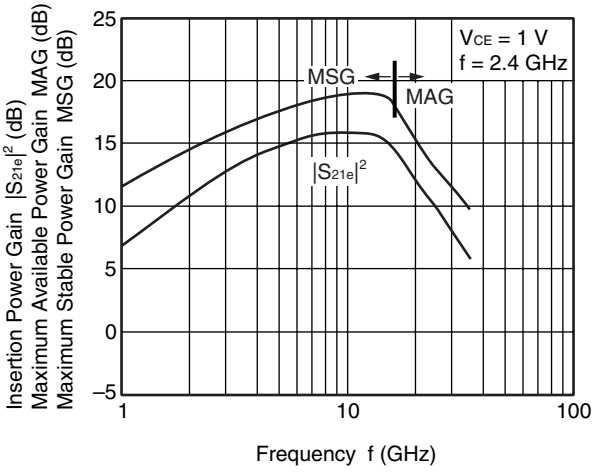
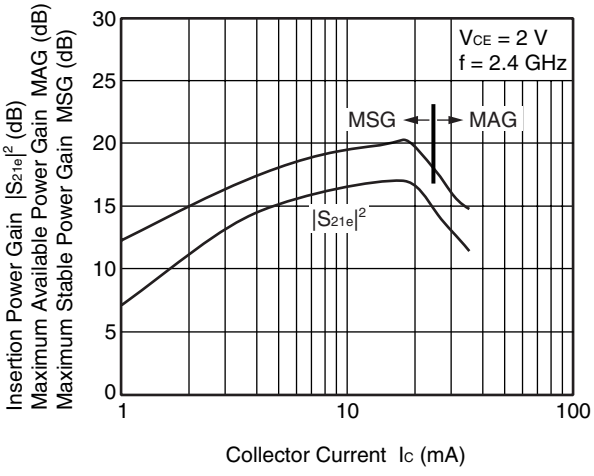


INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT



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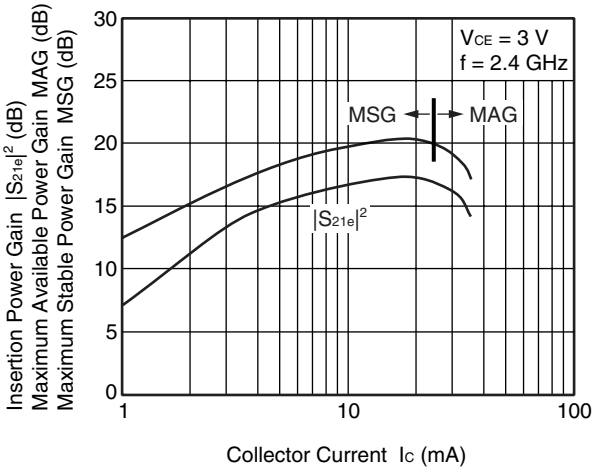

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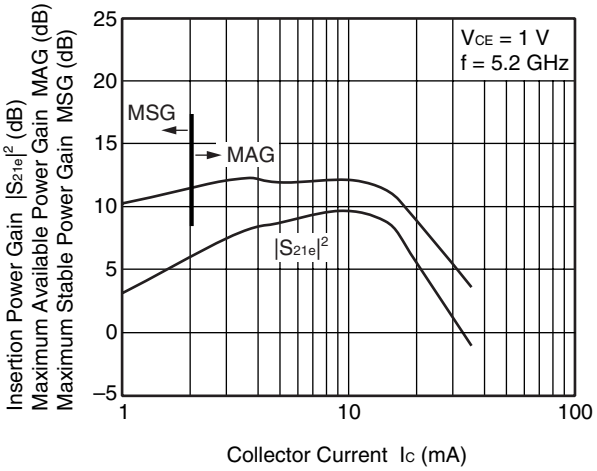

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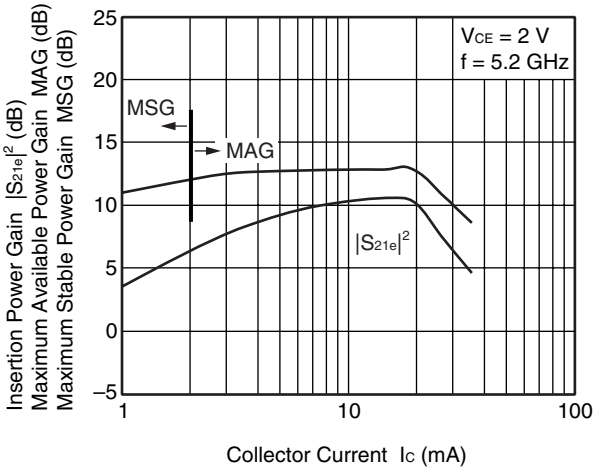

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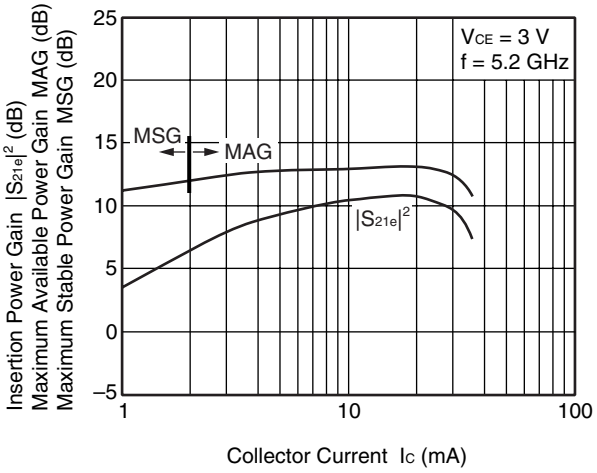

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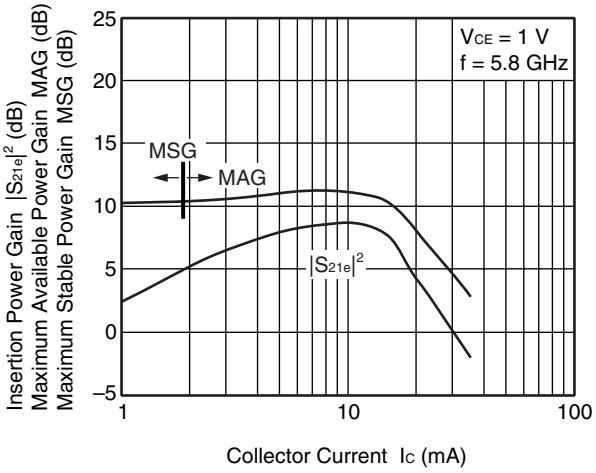

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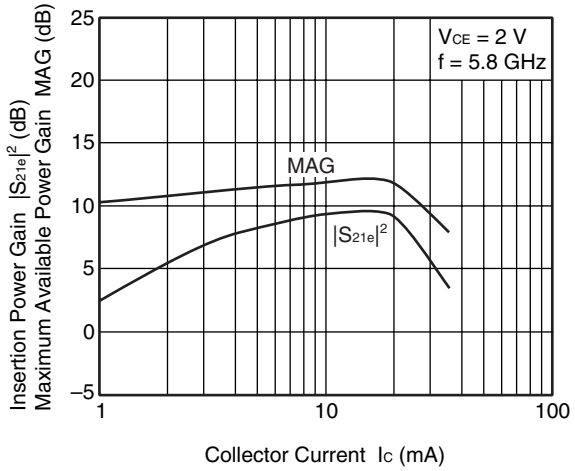

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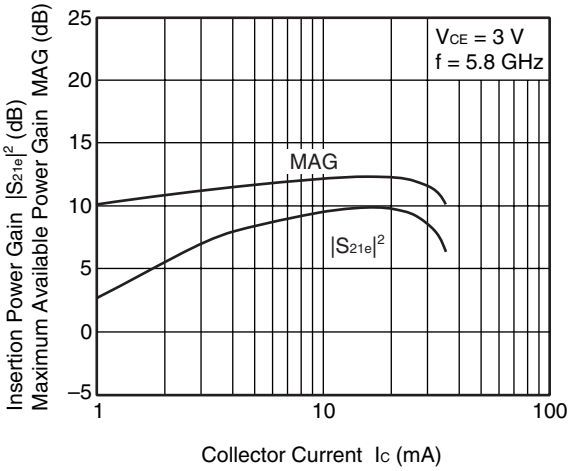

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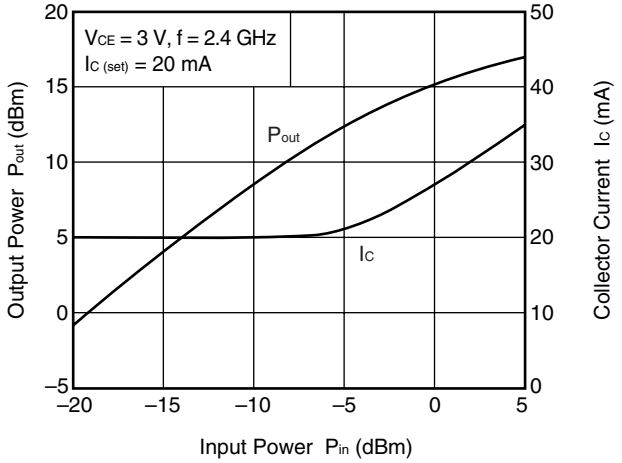
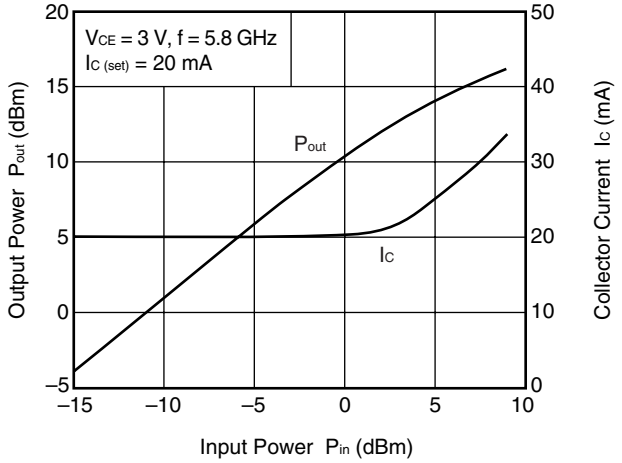
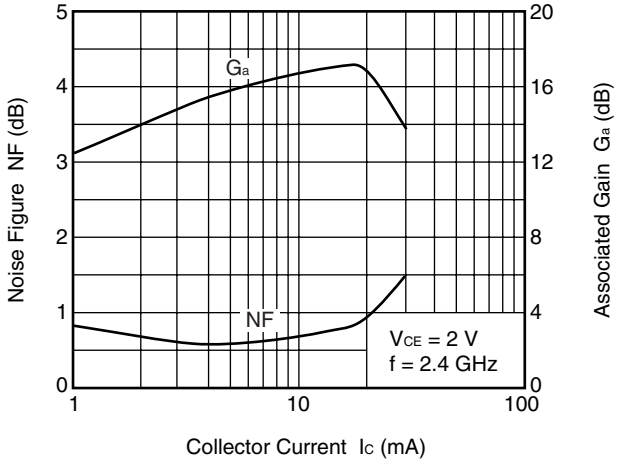
OUTPUT POWER, COLLECTOR CURRENT vs. INPUT POWER



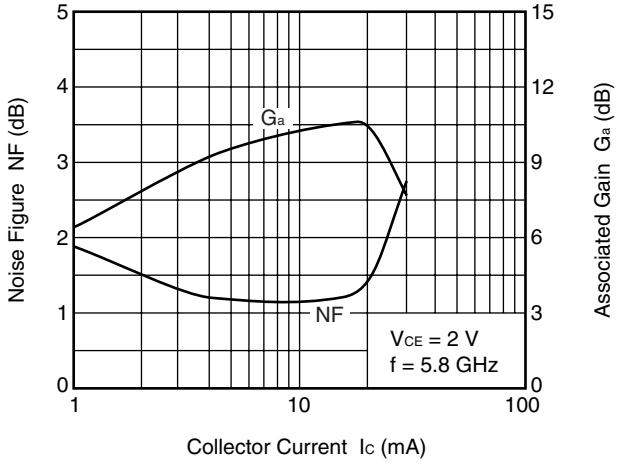
OUTPUT POWER, COLLECTOR CURRENT vs. INPUT POWER



NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



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.

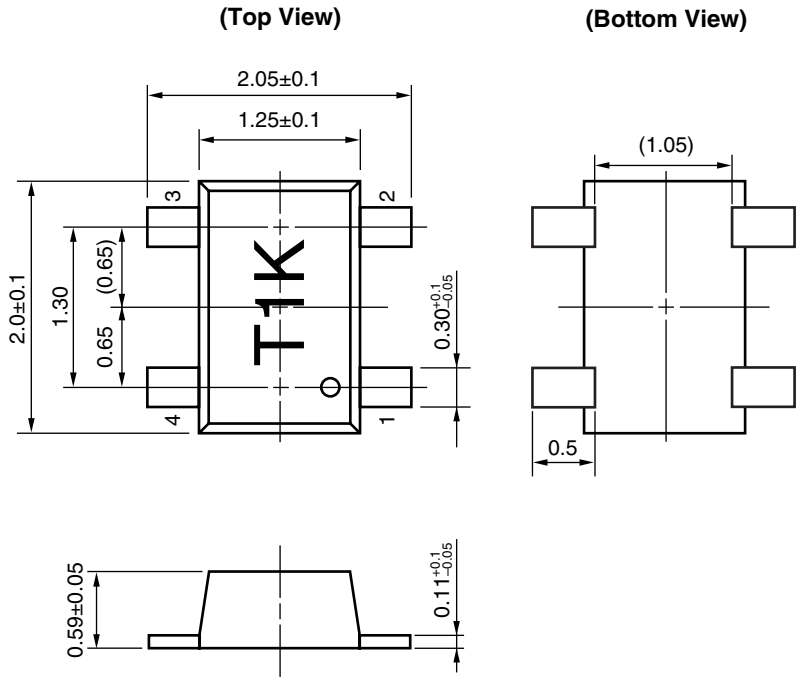
Click here to download S-parameters.

[RF and Microwave] → [Device Parameters]

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

<R> **PACKAGE DIMENSIONS**

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



PIN CONNECTIONS

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

Remark ( ) : Reference value

- **The information in this document is current as of December, 2008. The information is subject to change without notice. For actual design-in, refer to the latest publications of NEC Electronics data sheets or data books, etc., for the most up-to-date specifications of NEC Electronics products. Not all products and/or types are available in every country. Please check with an NEC Electronics sales representative for availability and additional information.**
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