NESG2031M05

NPN SiGe RF Transistor for Low Noise, High-Gain Amplification
Flat-Lead 4-Pin Thin-Type Super Minimold (M05)

R09DS0035EJ0400
Rev. 4.00
Jun 20, 2012

FEATURES

- The device is an ideal choice for low noise, high-gain at low current amplifications.
  - NF = 0.8 dB TYP., Ga = 17.0 dB TYP. @ V_{CE} = 2 V, I_C = 5 mA, f = 2 GHz
  - NF = 1.3 dB TYP., G_a = 10.0 dB TYP. @ V_{CE} = 2 V, I_C = 5 mA, f = 5.2 GHz
- Maximum stable power gain: MSG = 21.5 dB TYP. @ V_{CE} = 3 V, I_C = 20 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
NESG2031M05	NESG2031M05-A	Flat-lead 4-pin thin-type supper 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
NESG2031M05-T1	NESG2031M05-T1-A		3 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°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	35	mA
Total Power Dissipation	P_{tot} Note	175	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 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.

<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 = 20 mA, f = 2 GHz	20	25	–	GHz
Insertion Power Gain	$\lvert S_{21e} \rvert^2$	V_{CE} = 3 V, I_C = 20 mA, f = 2 GHz	16.0	18.0	–	dB
Noise Figure (1)	NF	V_{CE} = 2 V, I_C = 5 mA, f = 2 GHz, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$	–	0.8	1.1	dB
Noise Figure (2)	NF	V_{CE} = 2 V, I_C = 5 mA, f = 5.2 GHz, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$	–	1.3	–	dB
Associated Gain (1)	G_a	V_{CE} = 2 V, I_C = 5 mA, f = 2 GHz, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$	15.0	17.0	–	dB
Associated Gain (2)	G_a	V_{CE} = 2 V, I_C = 5 mA, f = 5.2 GHz, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$	–	10.0	–	dB
Reverse Transfer Capacitance	C_{re} Note 2	V_{CB} = 2 V, I_E = 0, f = 1 MHz	–	0.15	0.25	pF
Maximum Stable Power Gain	MSG Note 3	V_{CE} = 3 V, I_C = 20 mA, f = 2 GHz	19.0	21.5	–	dB
Gain 1 dB Compression Output Power	$P_{O\ (1\ dB)}$	V_{CE} = 3 V, I_C = 20 mA, f = 2 GHz, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$	–	13	–	dBm
3rd Order Intermodulation Distortion Output Intercept Point	OIP_3	V_{CE} = 3 V, I_C = 20 mA, f = 2 GHz, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$	–	23	–	dBm

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

2. Collector to base capacitance when the emitter grounded

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

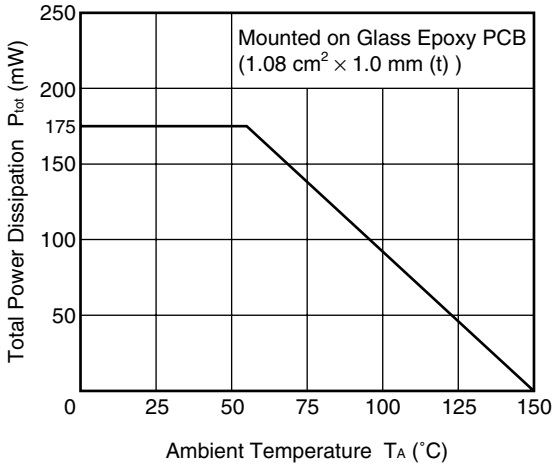
h_{FE} CLASSIFICATION

<R>

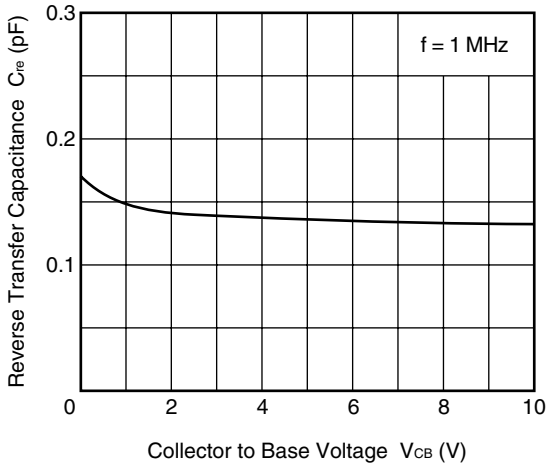
Rank	FB/YFB
Marking	T1H
h_{FE} Value	130 to 260

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

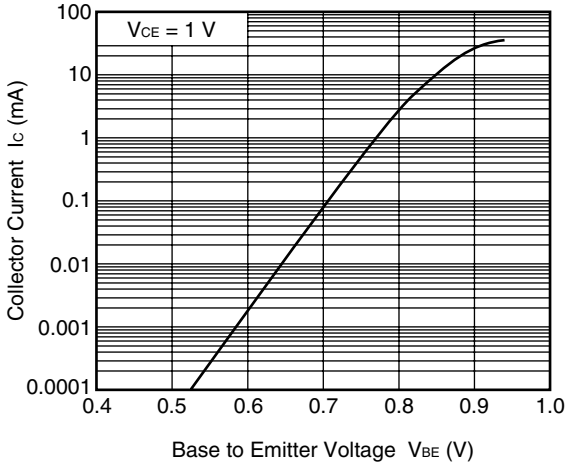
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



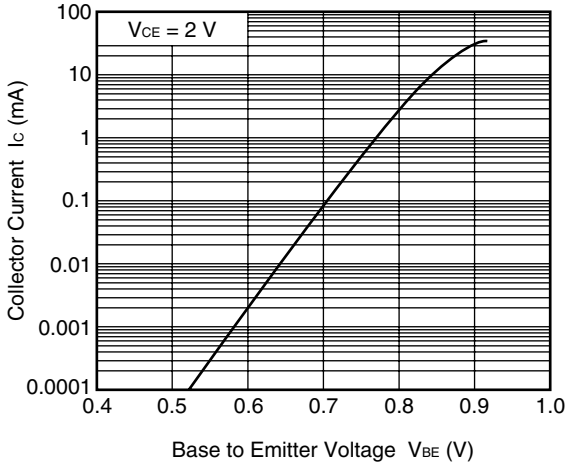
REVERSE TRANSFER CAPACITANCE vs. COLLECTOR TO BASE VOLTAGE



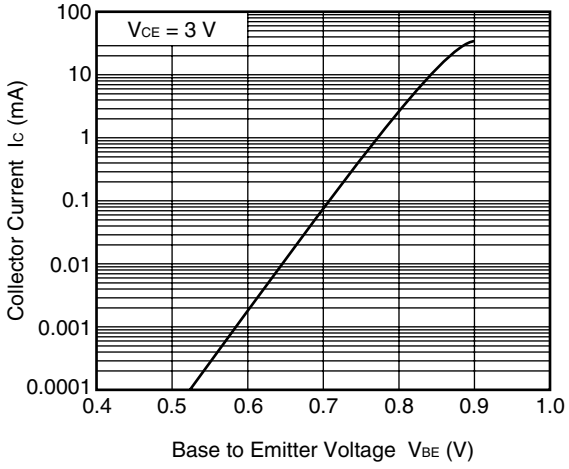
COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE



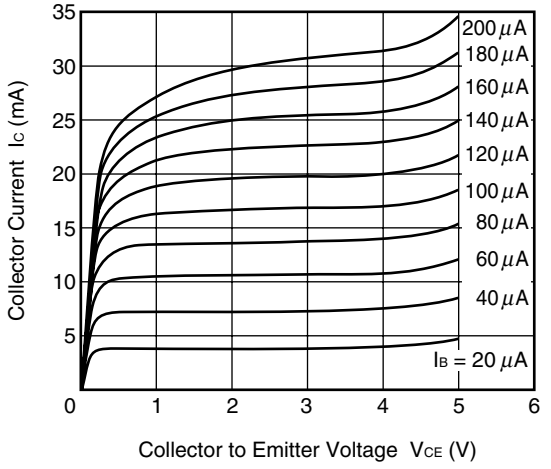
COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE



COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE

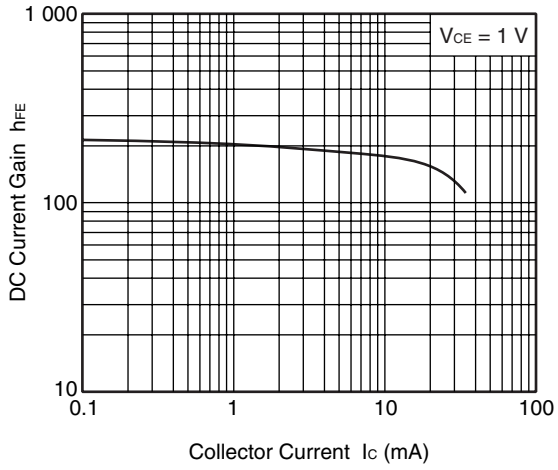


COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE

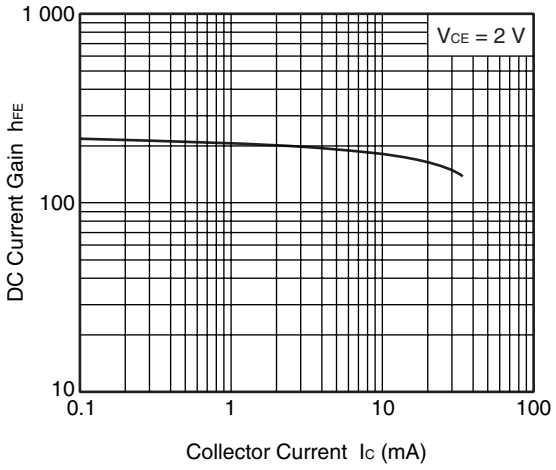


Remark The graph indicates nominal characteristics.

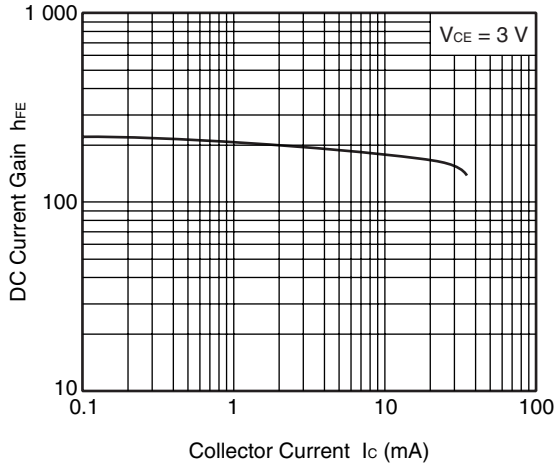
DC CURRENT GAIN vs.
COLLECTOR CURRENT



DC CURRENT GAIN vs.
COLLECTOR CURRENT

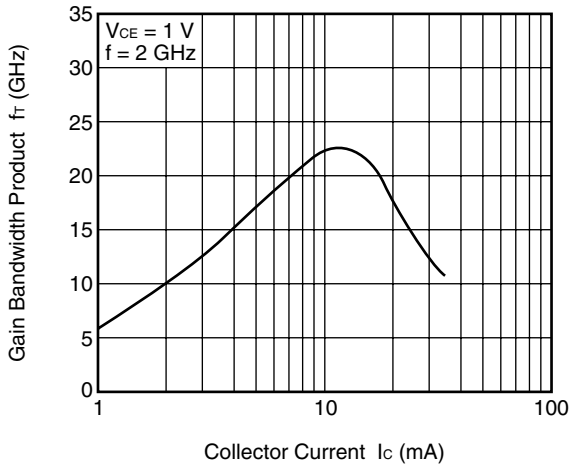


DC CURRENT GAIN vs.
COLLECTOR CURRENT

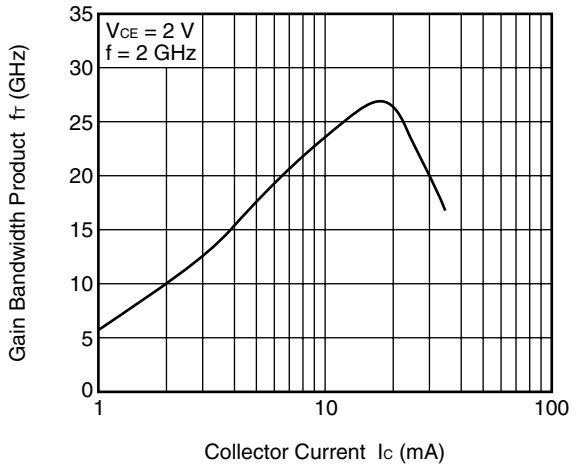


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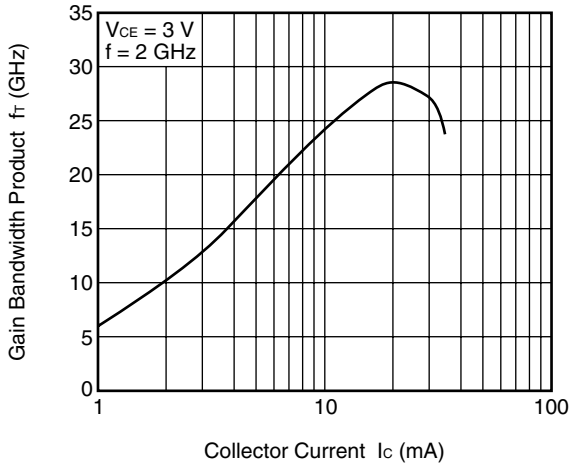
GAIN BANDWIDTH PRODUCT
vs. COLLECTOR CURRENT



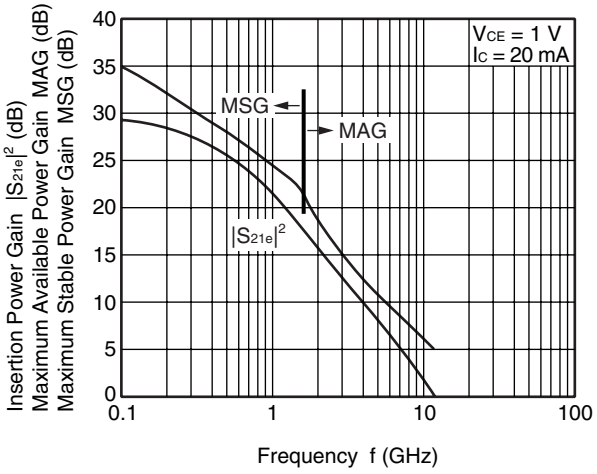
GAIN BANDWIDTH PRODUCT
vs. COLLECTOR CURRENT



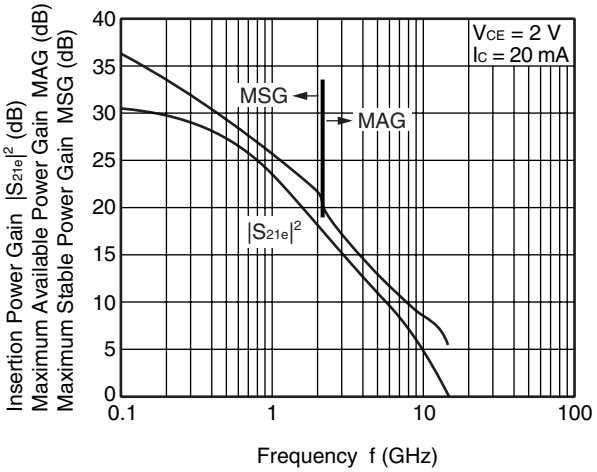
GAIN BANDWIDTH PRODUCT
vs. COLLECTOR CURRENT



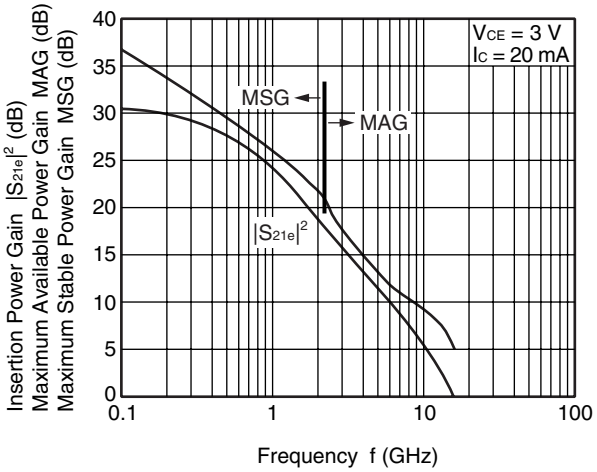
INSERTION POWER GAIN,
MAG, MSG vs. FREQUENCY



INSERTION POWER GAIN,
MAG, MSG vs. FREQUENCY

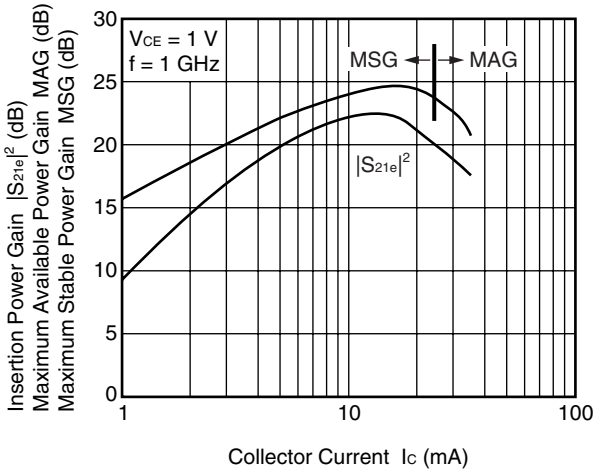


INSERTION POWER GAIN,
MAG, MSG vs. FREQUENCY

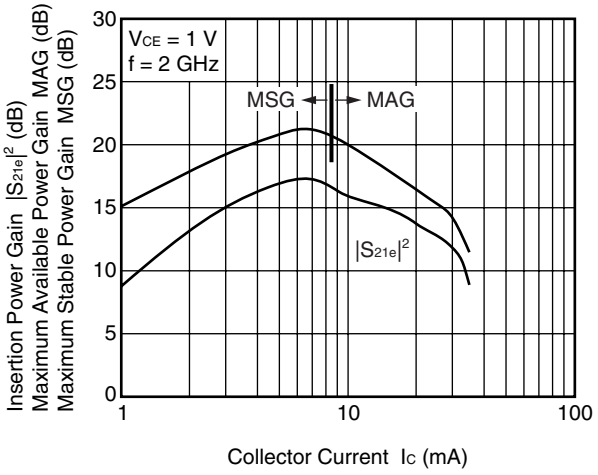


Remark The graph indicates nominal characteristics.

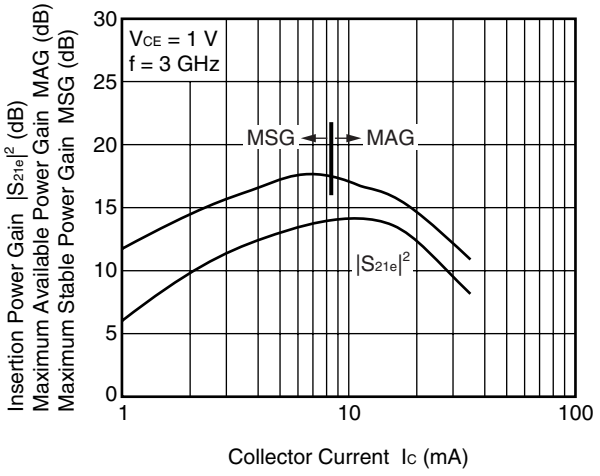
INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT



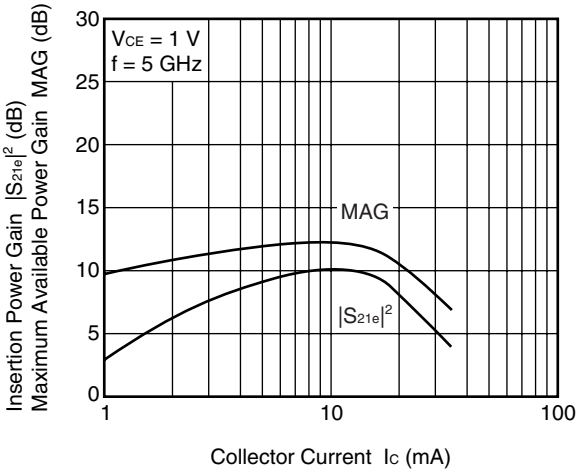
INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT



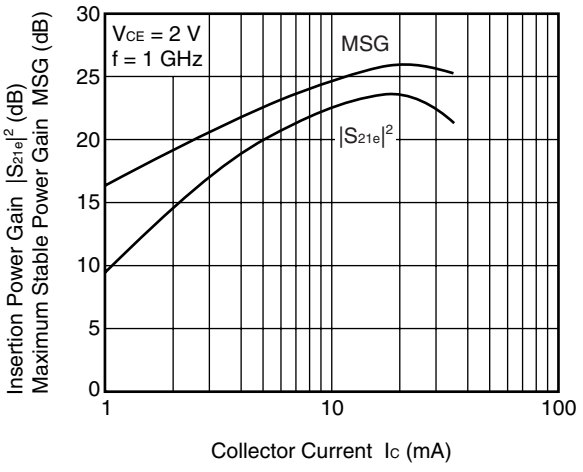
INSERTION POWER GAIN, MAG, MSG
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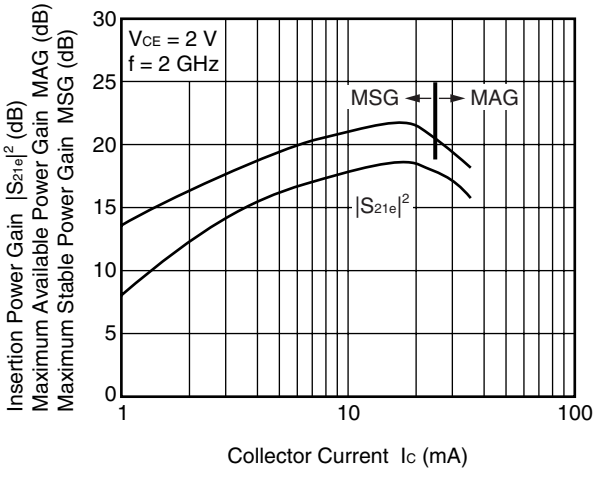
INSERTION POWER GAIN, MAG
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INSERTION POWER GAIN, MSG
vs. COLLECTOR CURRENT

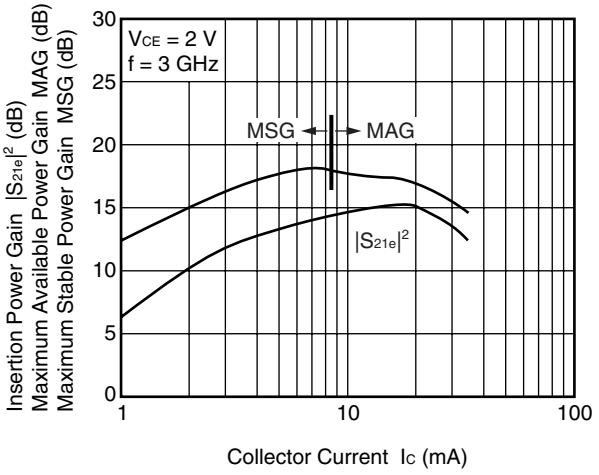


INSERTION POWER GAIN, MAG, MSG
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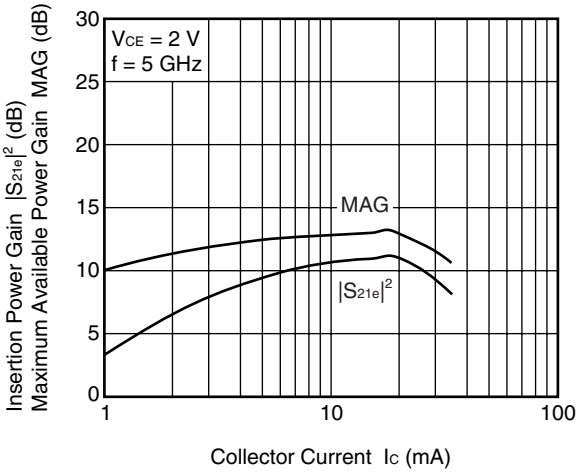


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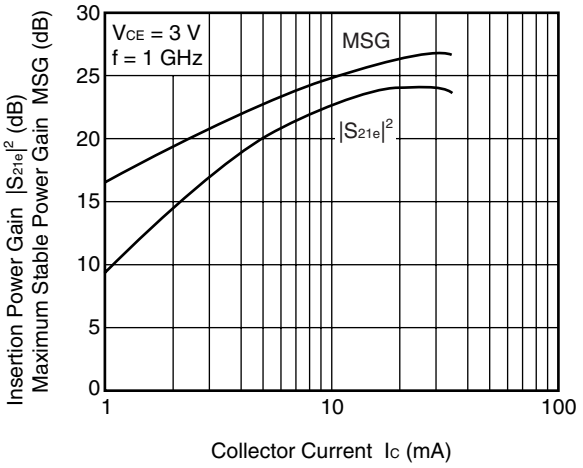
INSERTION POWER GAIN, MAG, MSG
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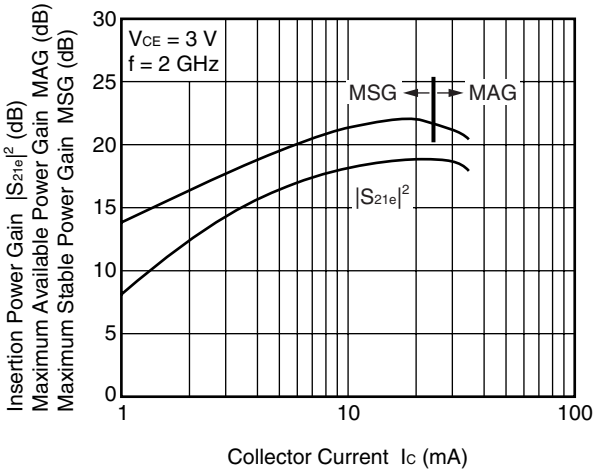
INSERTION POWER GAIN, MAG
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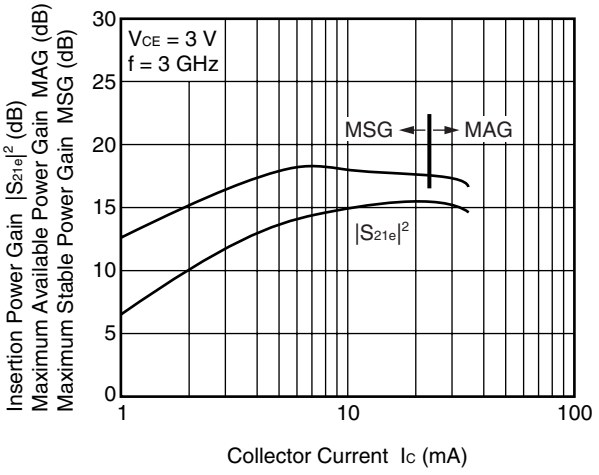
INSERTION POWER GAIN, MSG
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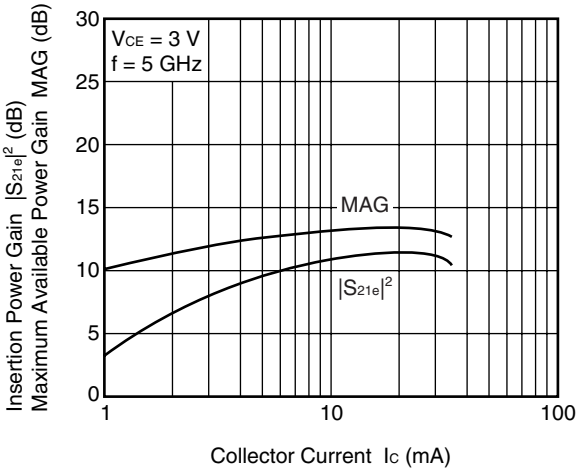
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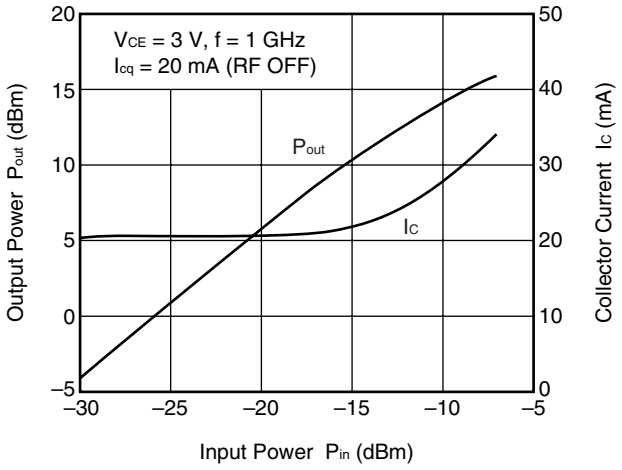


INSERTION POWER GAIN, MAG
vs. COLLECTOR CURRENT

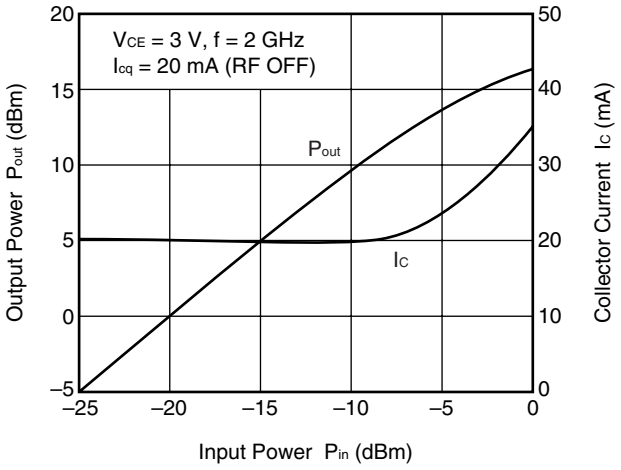


Remark The graph indicates nominal characteristics.

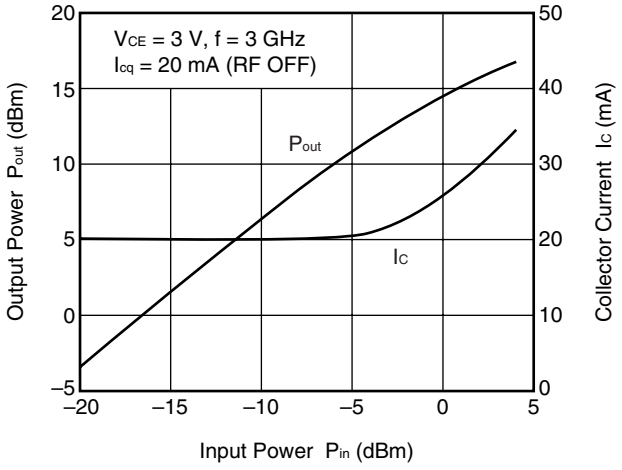
OUTPUT POWER, COLLECTOR CURRENT vs. INPUT POWER



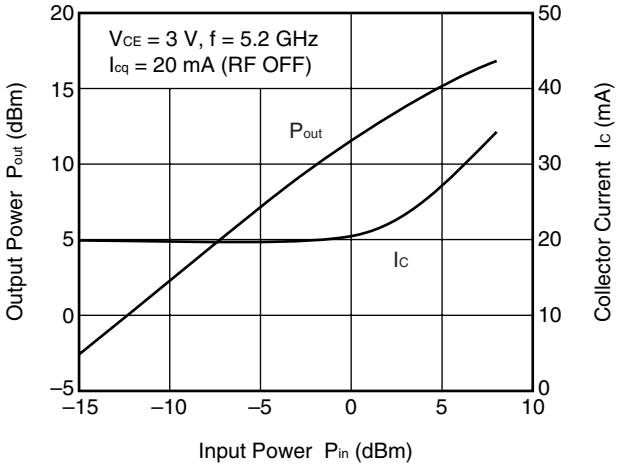
OUTPUT POWER, COLLECTOR CURRENT vs. INPUT POWER



OUTPUT POWER, COLLECTOR CURRENT vs. INPUT POWER

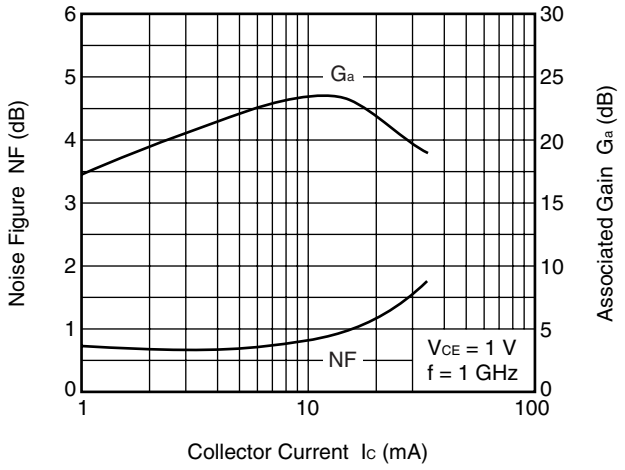


OUTPUT POWER, COLLECTOR CURRENT vs. INPUT POWER

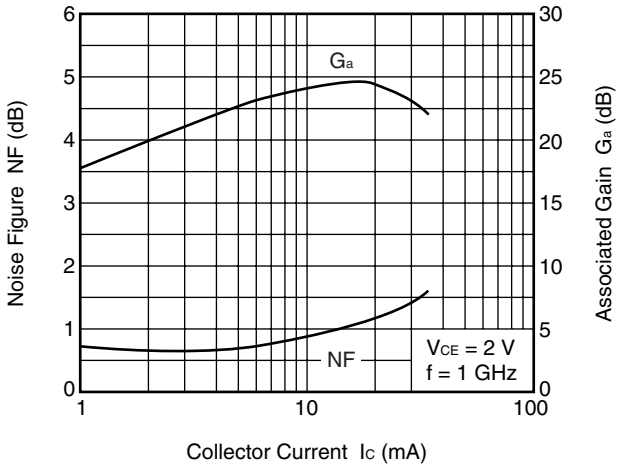


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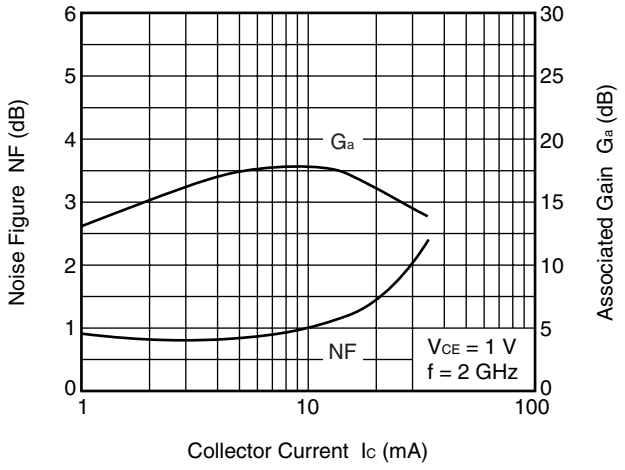
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



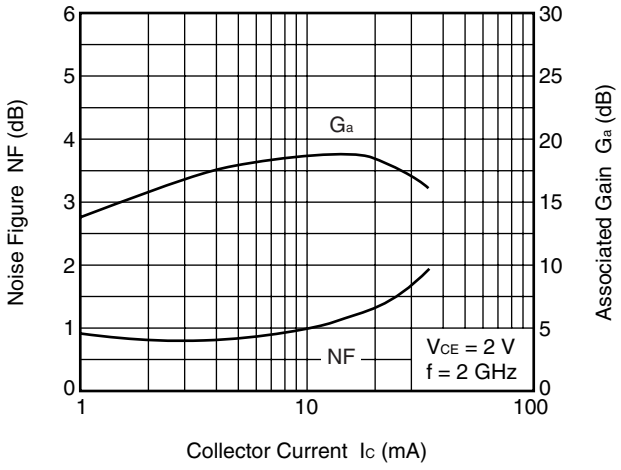
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



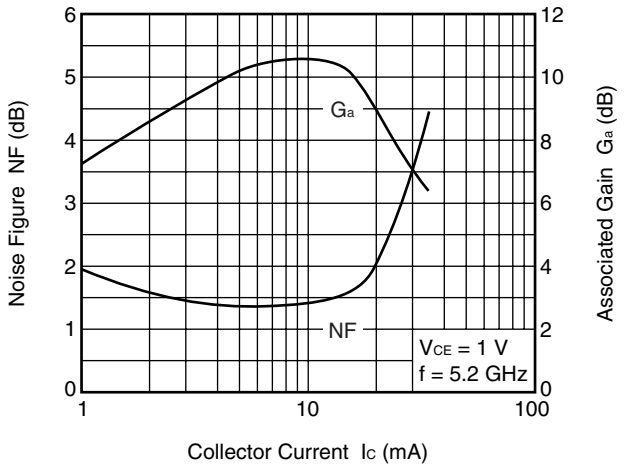
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



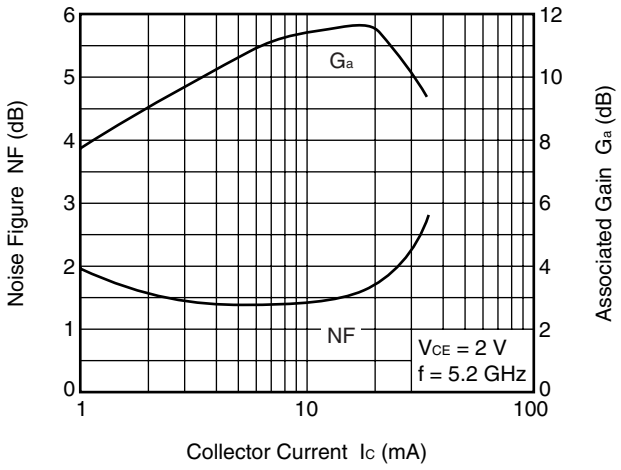
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT

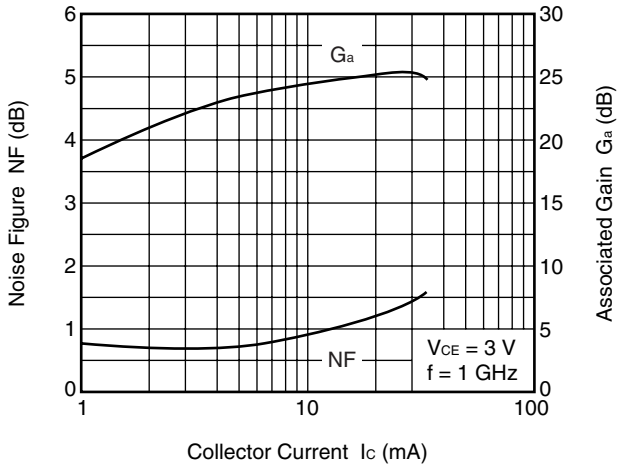


NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT

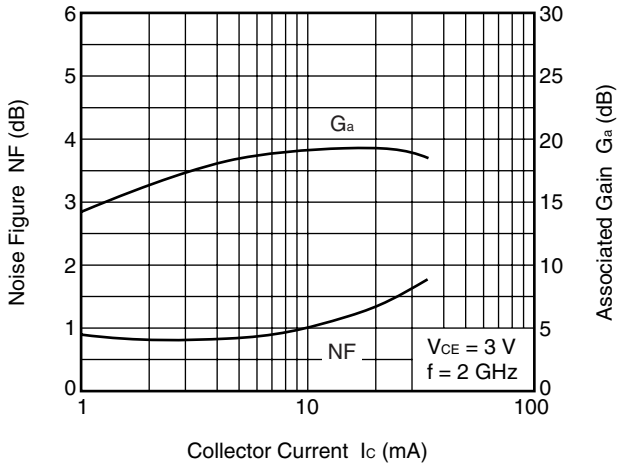


Remark The graph indicates nominal characteristics.

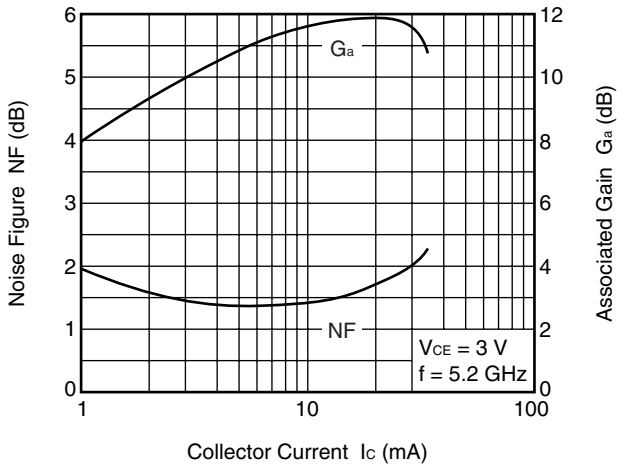
NOISE FIGURE, ASSOCIATED GAIN
vs. COLLECTOR CURRENT



NOISE FIGURE, ASSOCIATED GAIN
vs. COLLECTOR CURRENT



NOISE FIGURE, ASSOCIATED GAIN
vs. COLLECTOR CURRENT



Remark The graphs indicate nominal characteristics.

S-PARAMETERS

<R> 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.

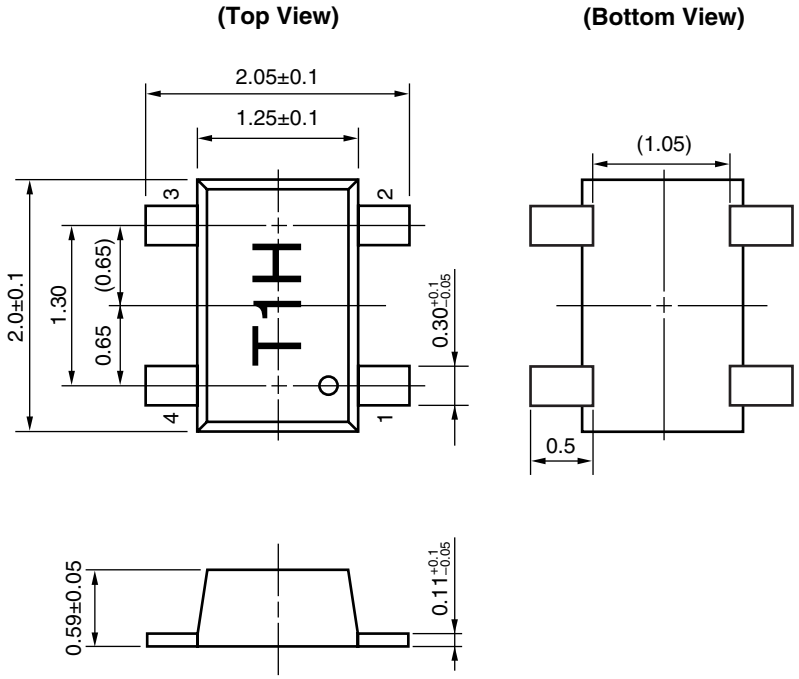
Click here to download S-parameters.

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

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

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

Revision History	NESG2031M05 Data Sheet

Rev.	Date	Description	
		Page	Summary
–	Sep 2004	–	Previous No. : PU10189EJ03V0DS
4.00	Jun 20, 2012	p.1	Modification of **ORDERING INFORMATION**
		p.2	Modification of **ELECTRICAL CHARACTERISTICS**
			Modification of **h_{FE} CLASSIFICATION**
		p.11	Modification of **S-PARAMETERS**
		p.12	Modification of **PACKAGE DIMENSIONS**

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