DATA SHEET

NEC

NPN SILICON GERMANIUM RF TRANSISTOR
NESG2021M05

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

FEATURES

- The device is an ideal choice for low noise, high-gain at low current amplifications
  NF = 0.9 dB TYP., G_a = 18.0 dB TYP. @ V_{CE} = 2 V, I_C = 3 mA, f = 2 GHz
  NF = 1.3 dB TYP., G_a = 10.0 dB TYP. @ V_{CE} = 2 V, I_C = 3 mA, f = 5.2 GHz
- Maximum stable power gain: MSG = 22.5 dB TYP. @ V_{CE} = 3 V, I_C = 10 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

ORDERING INFORMATION

Part Number	Quantity	Supplying Form
NESG2021M05	50 pcs (Non reel)	• 8 mm wide embossed taping
NESG2021M05-T1	3 kpcs/reel	• Pin 3 (Collector), Pin 4 (Emitter) face the perforation side of the tape

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}	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 $cm^2 \times 1.0$ mm (t) glass epoxy PCB

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

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The mark ★ shows major revised points.

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 = 5 mA	130	190	260	–
	RF Characteristics						
	Gain Bandwidth Product	f_T	V_{CE} = 3 V, I_C = 10 mA, f = 2 GHz	20	25	–	GHz
	Insertion Power Gain	$\|S_{21e}\|^2$	V_{CE} = 3 V, I_C = 10 mA, f = 2 GHz	17.0	19.0	–	dB
	Noise Figure (1)	NF	V_{CE} = 2 V, I_C = 3 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 = 3 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 = 3 mA, f = 2 GHz, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$	15.0	18.0	–	dB
	Associated Gain (2)	G_a	V_{CE} = 2 V, I_C = 3 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 mA, f = 1 MHz	–	0.1	0.2	pF
	Maximum Stable Power Gain	MSG Note 3	V_{CE} = 3 V, I_C = 10 mA, f = 2 GHz	20.0	22.5	–	dB
★	Gain 1 dB Compression Output Power	$P_{O\ (1\ dB)}$	V_{CE} = 3 V, I_C = 12 mA, f = 2 GHz, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$	–	9.0	–	dBm
★	3rd Order Intermodulation Distortion Output Intercept Point	OIP_3	V_{CE} = 3 V, I_C = 12 mA, f = 2 GHz, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$	–	17.0	–	dBm

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

2. Collector to base capacitance when the emitter grounded

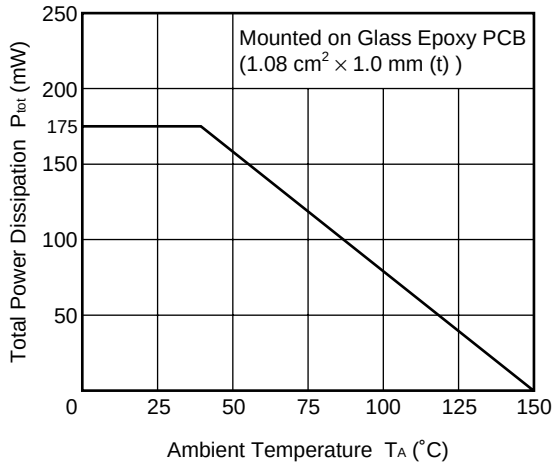
3. $MSG = \left| \frac{S_{21}}{S_{12}} \right|$

h_{FE} CLASSIFICATION

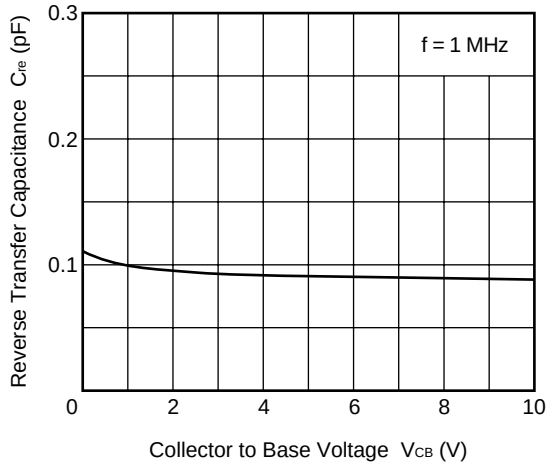
Rank	FB
Marking	T1G
h_{FE} Value	130 to 260

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

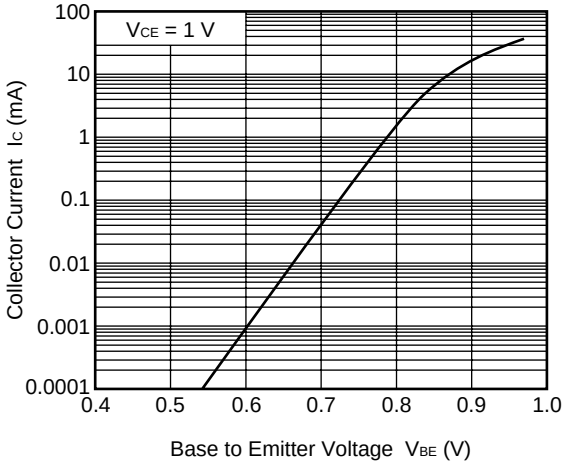
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



REVERSE TRANSFER CAPACITANCE vs. COLLECTOR TO BASE VOLTAGE



COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE



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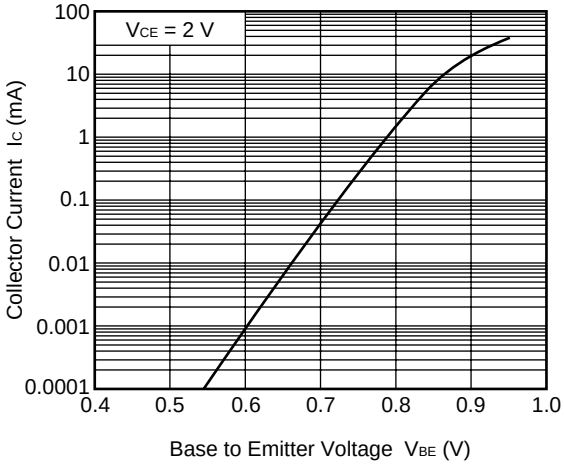

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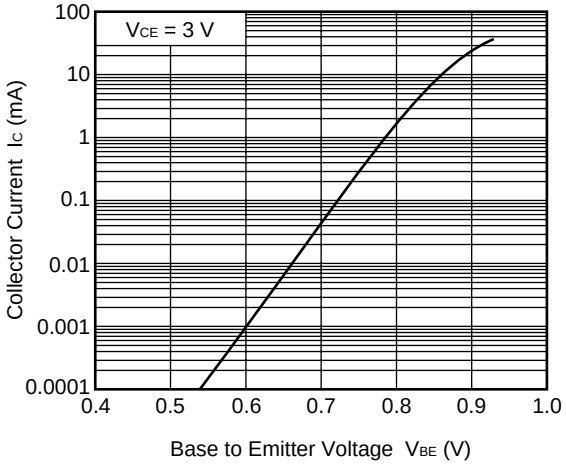
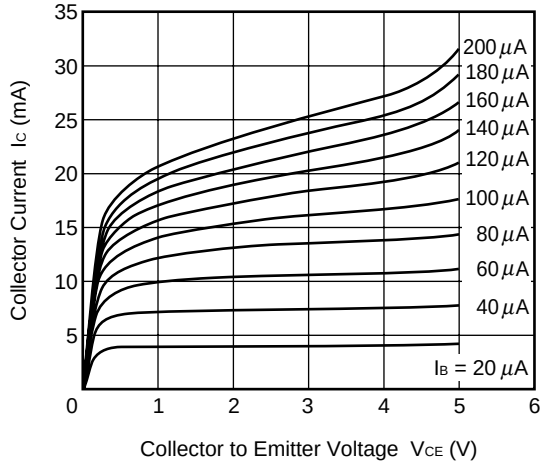
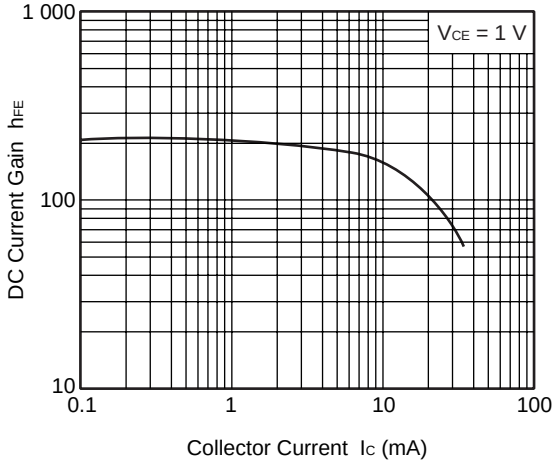


COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



DC CURRENT GAIN vs.
COLLECTOR CURRENT



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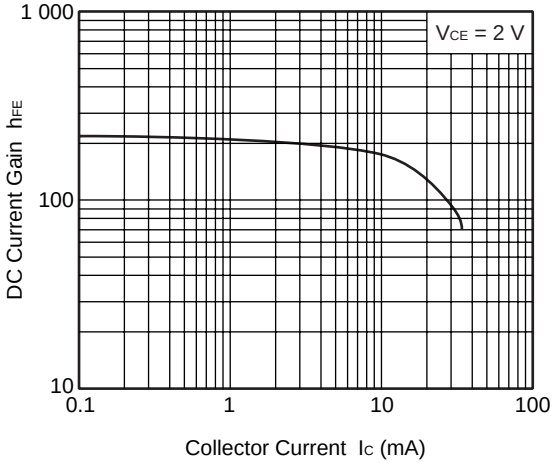

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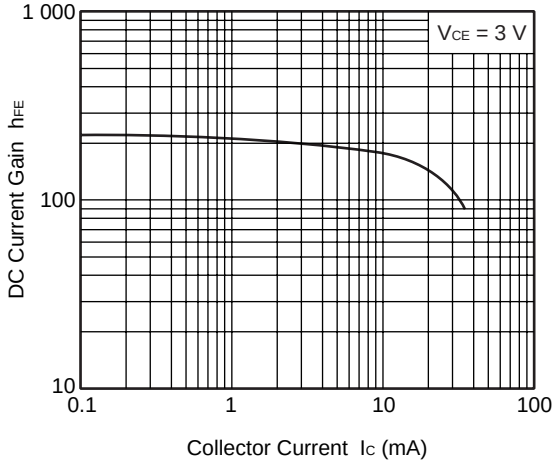
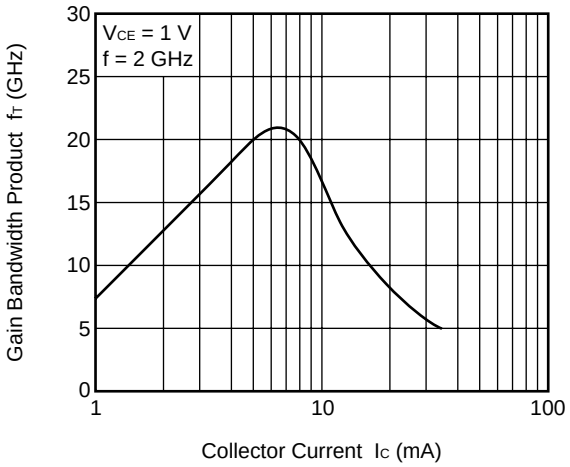


GAIN BANDWIDTH PRODUCT
vs. COLLECTOR CURRENT



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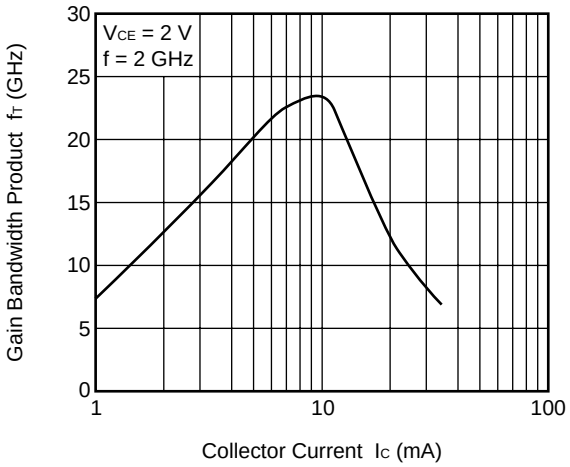

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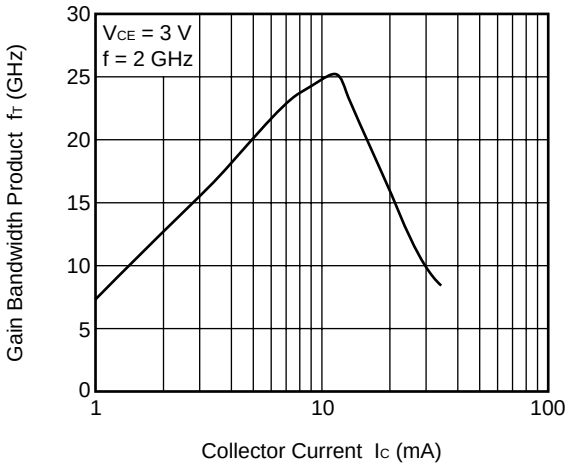
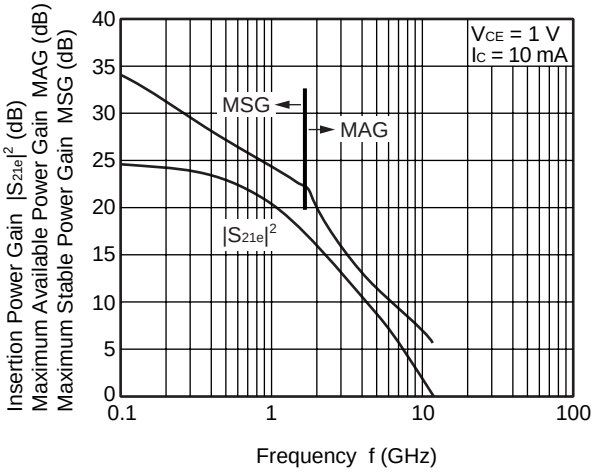


INSERTION POWER GAIN,
MAG, MSG vs. FREQUENCY



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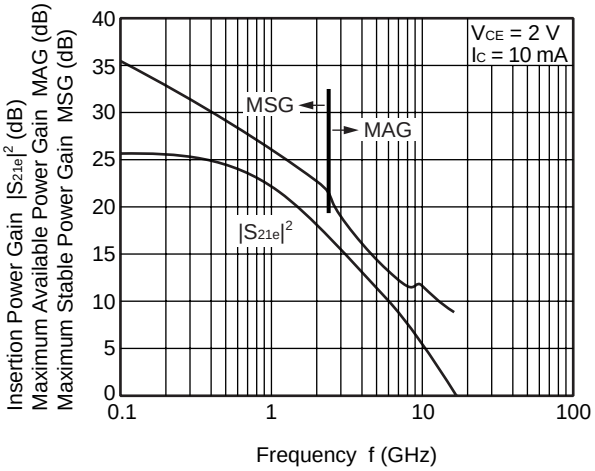

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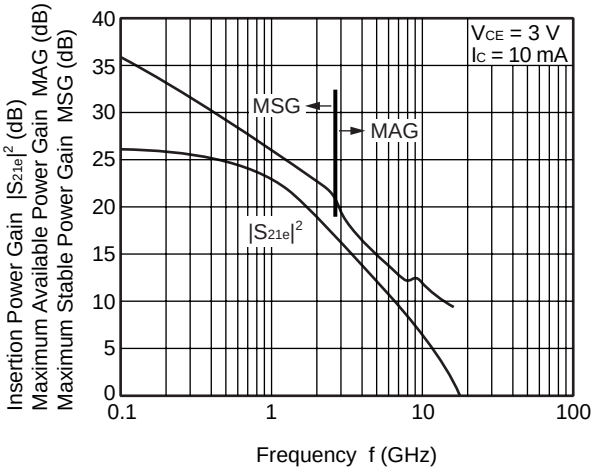

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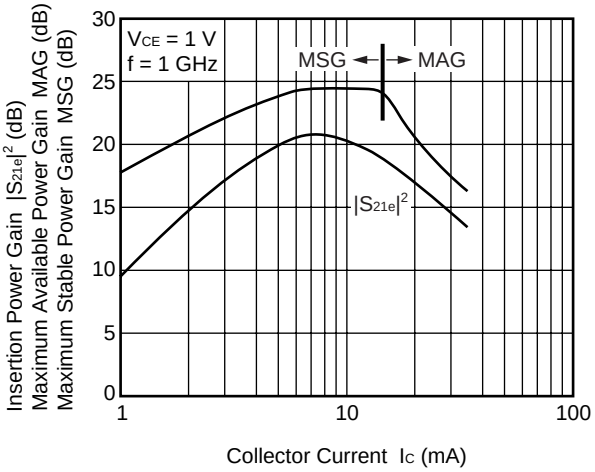

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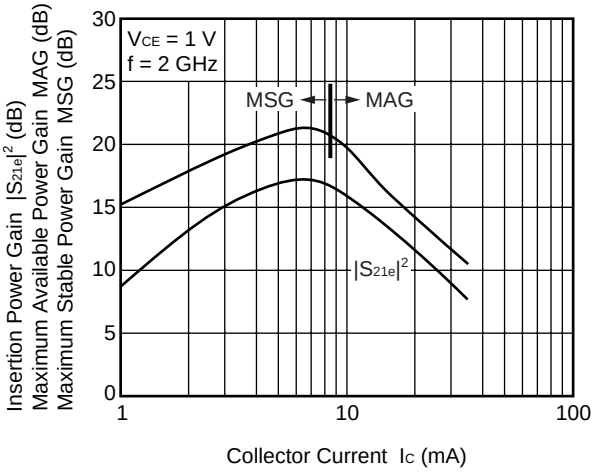

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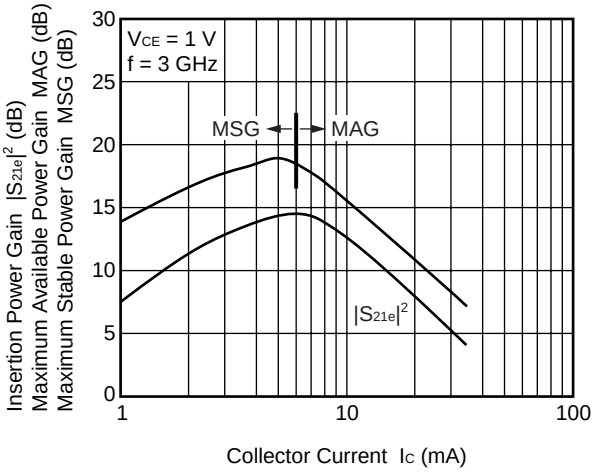

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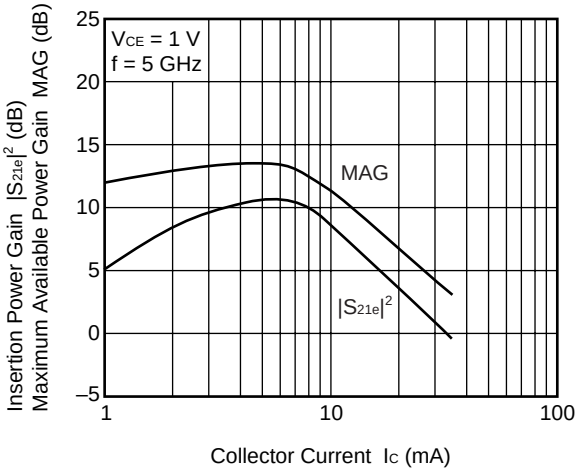

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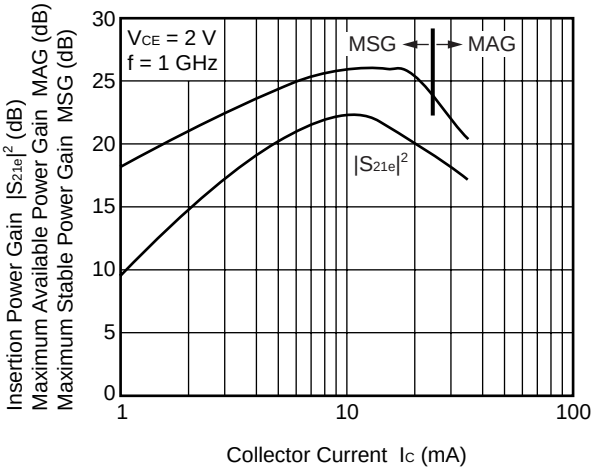

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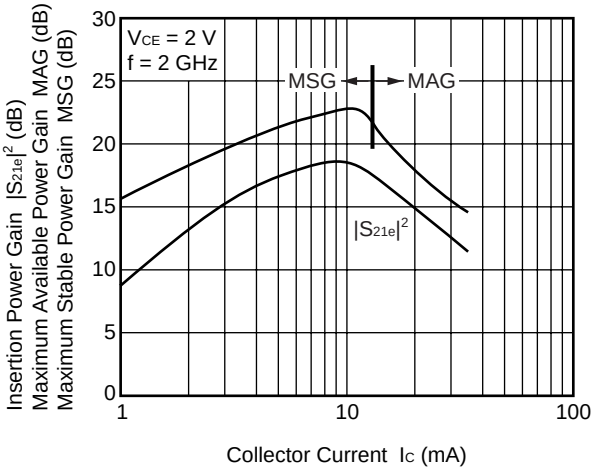

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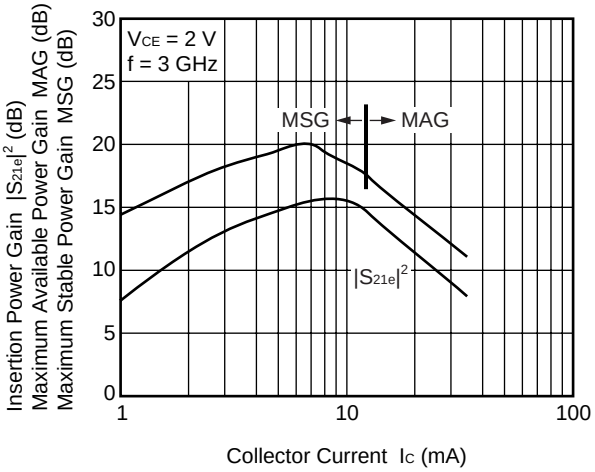

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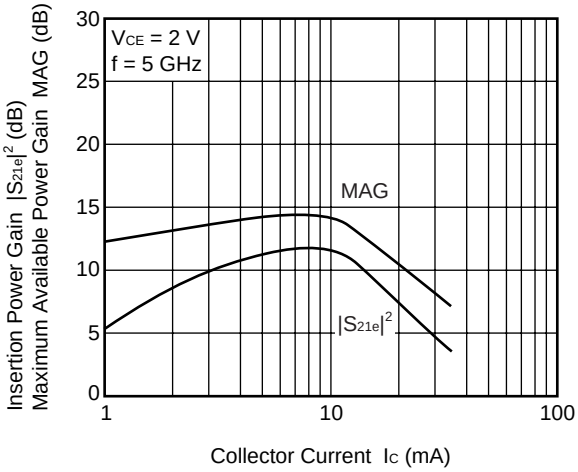

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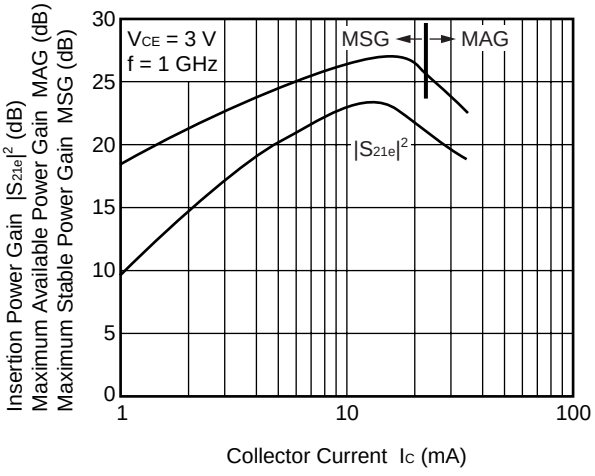

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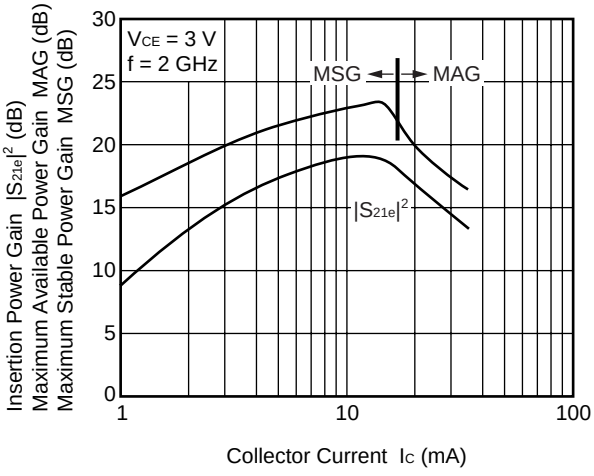

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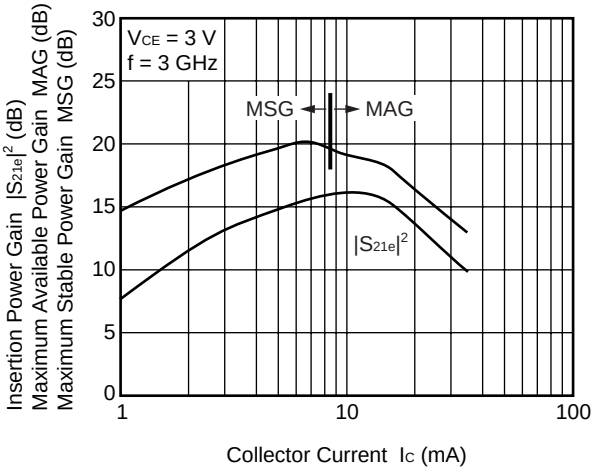

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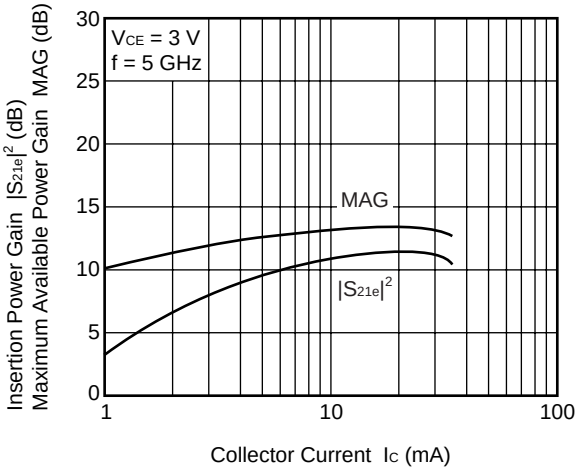
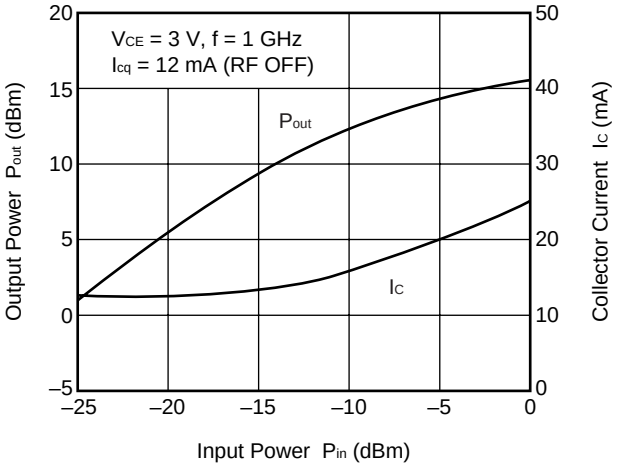


OUTPUT POWER, COLLECTOR CURRENT vs. INPUT POWER



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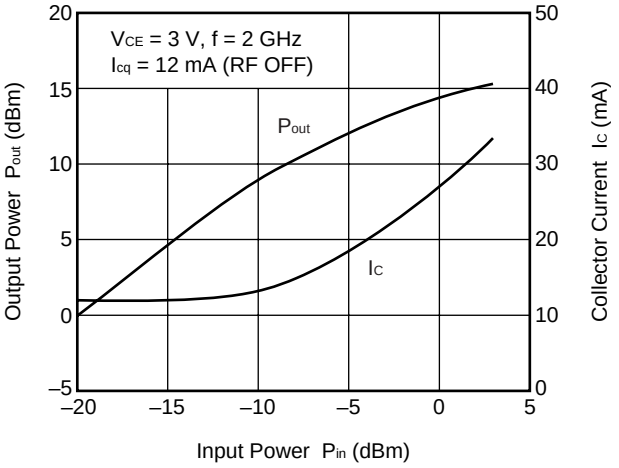

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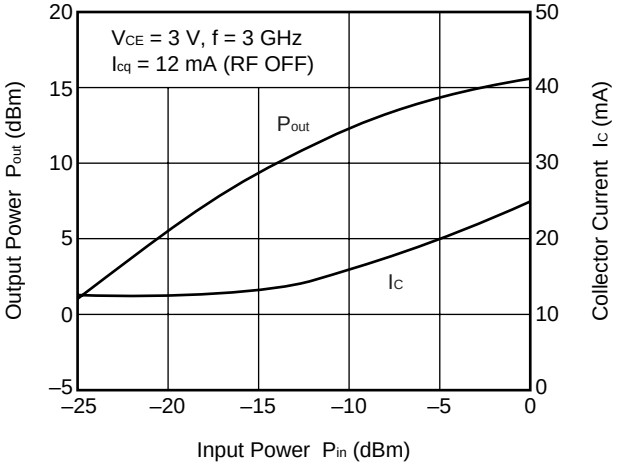

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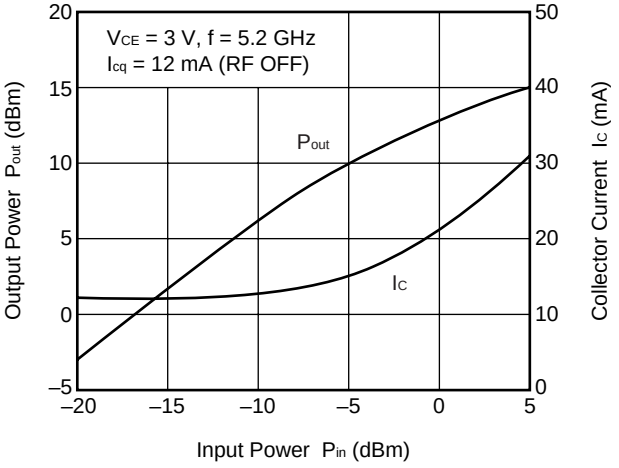
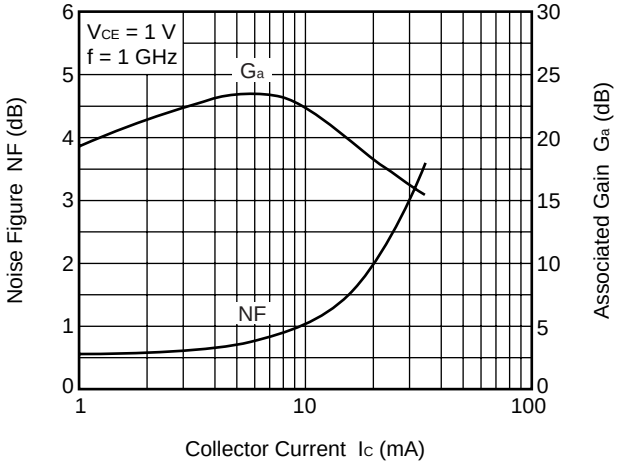


NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



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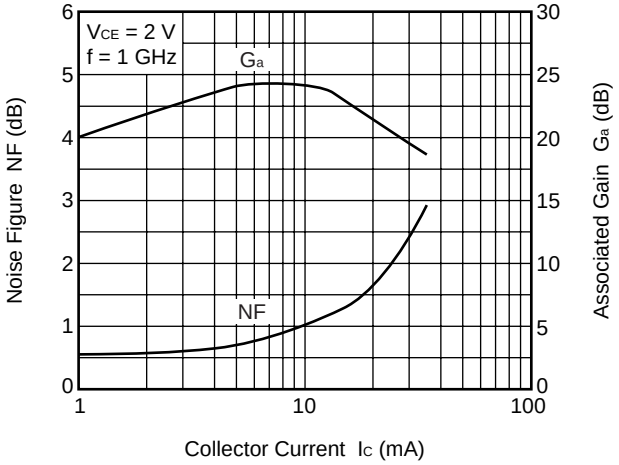

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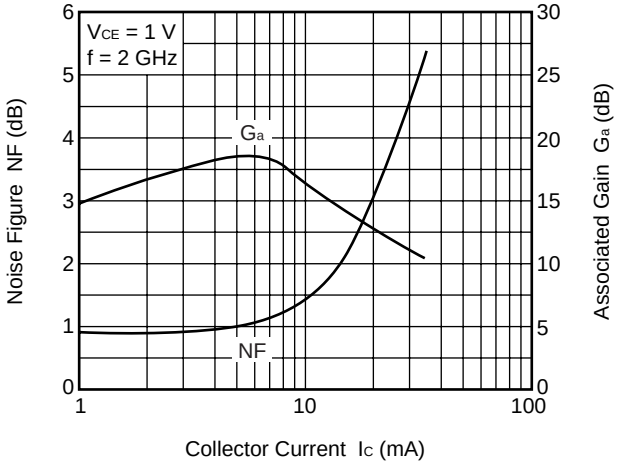

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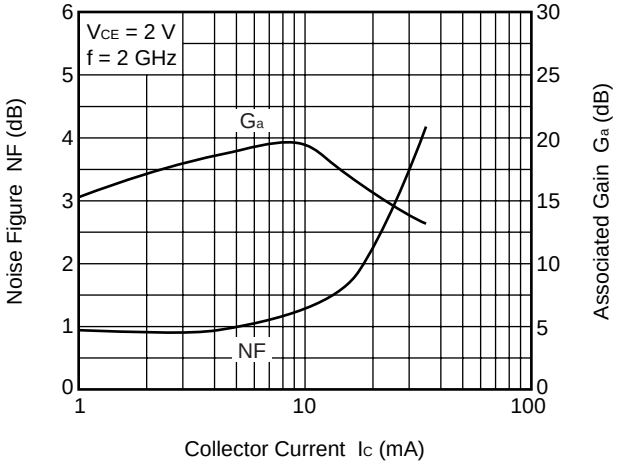

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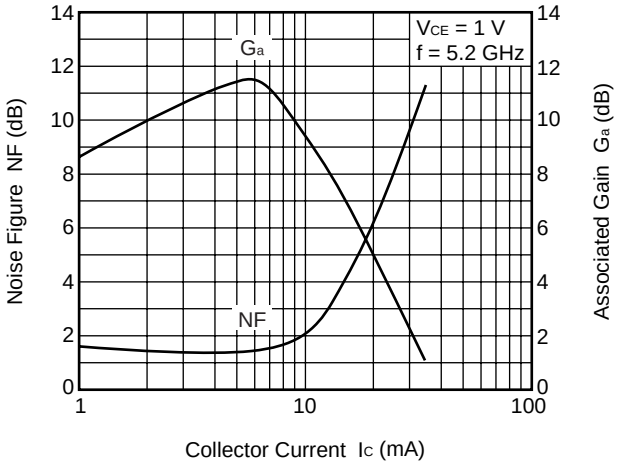

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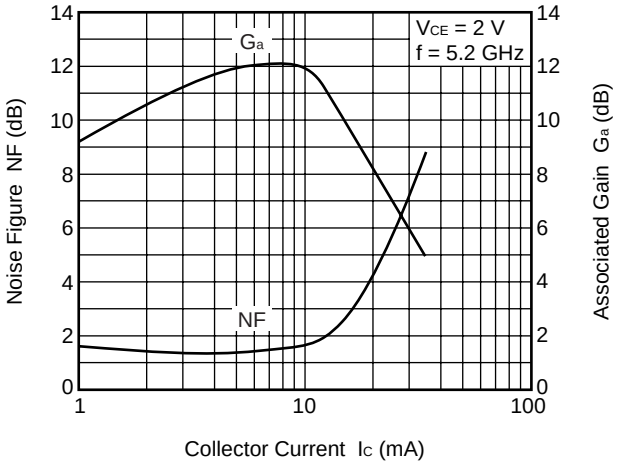

NOISE FIGURE, ASSOCIATED GAIN
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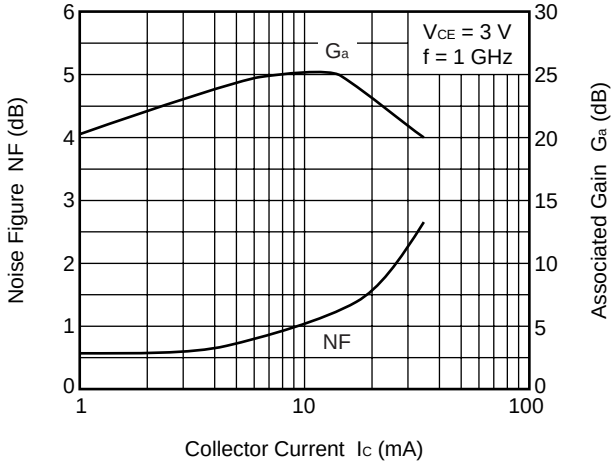

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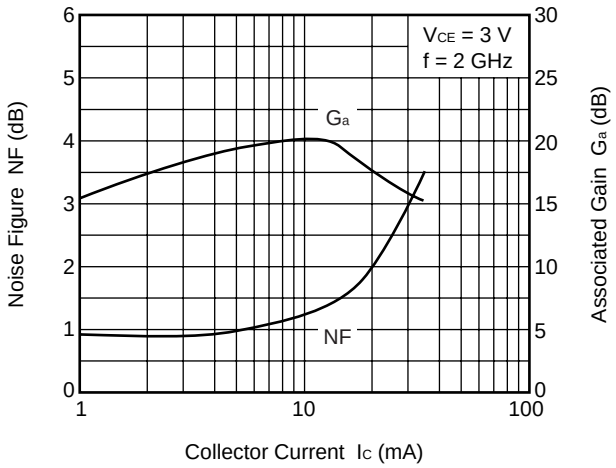

NOISE FIGURE, ASSOCIATED GAIN
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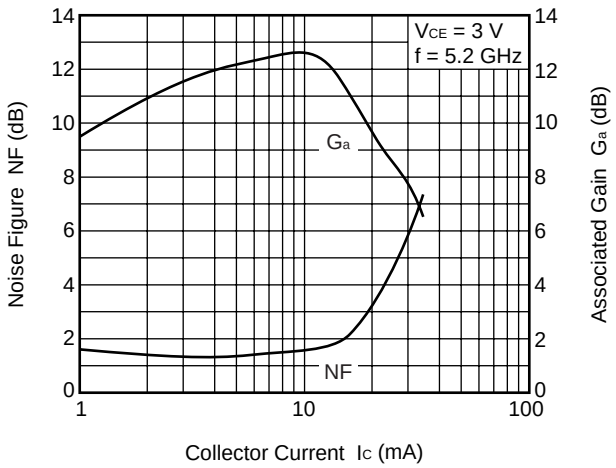


Remark The graphs indicate nominal characteristics.

S-PARAMETERS

S-parameters/Noise parameters are provided on the NEC Compound Semiconductor Devices Web site in a form (S2P) that enables direct import to a microwave circuit simulator without keyboard input.

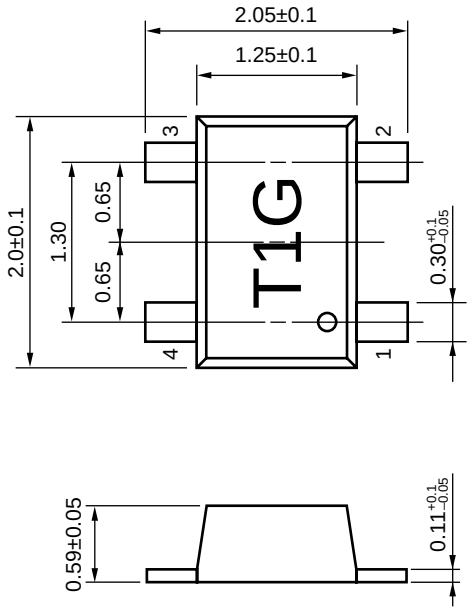
Click here to download S-parameters.

[RF and Microwave] → [Device Parameters]

URL http://www.csd-nec.com/

PACKAGE DIMENSIONS

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



PIN CONNECTIONS

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

- **The information in this document is current as of March, 2003. The information is subject to change without notice. For actual design-in, refer to the latest publications of NEC's data sheets or data books, etc., for the most up-to-date specifications of NEC semiconductor products. Not all products and/or types are available in every country. Please check with an NEC sales representative for availability and additional information.**
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