

DATA SHEET

NEC

NPN SILICON GERMANIUM RF TRANSISTOR

NESG2031M05

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 amplification
NF = 0.8 dB TYP., $G_a = 17.0$ 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

ORDERING INFORMATION

Part Number	Quantity	Supplying Form
NESG2031M05	50 pcs (Non reel)	• 8 mm wide embossed taping
NESG2031M05-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 ($T_A = +25^\circ\text{C}$)

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	$^\circ\text{C}$
Storage Temperature	T_{stg}	-65 to +150	$^\circ\text{C}$

Note Mounted on $1.08\text{ cm}^2 \times 1.0\text{ mm}$ (t) glass epoxy PCB

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

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Not all devices/types available in every country. Please check with local NEC Compound Semiconductor Devices representative for availability and additional information.

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 = 20 mA, f = 2 GHz	20	25	–	GHz
Insertion Power Gain	S _{21e} 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 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 = 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

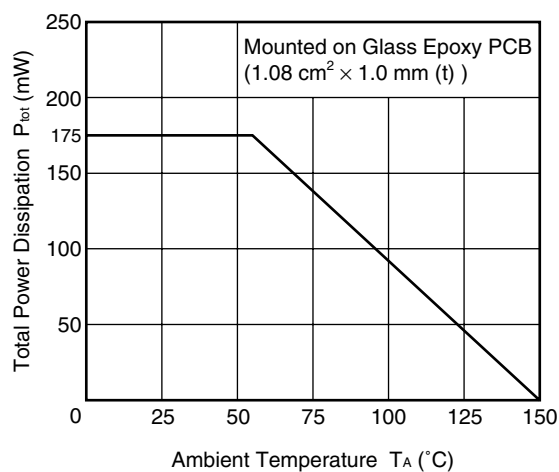
3. $MSG = \left| \frac{S_{21}}{S_{12}} \right|$

h_{FE} CLASSIFICATION

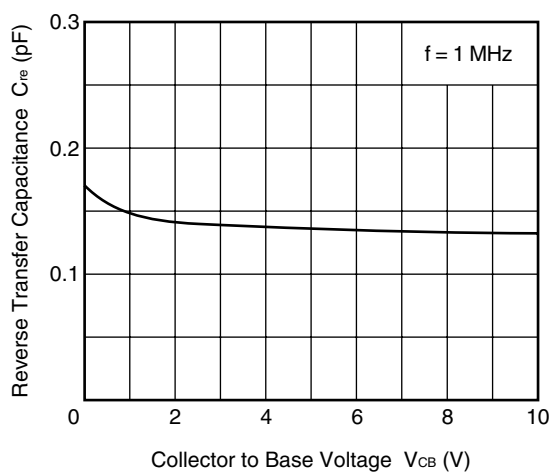
Rank	FB
Marking	T1H
h _{FE} Value	130 to 260

★ TYPICAL CHARACTERISTICS ($T_A = +25^\circ\text{C}$, unless otherwise specified)

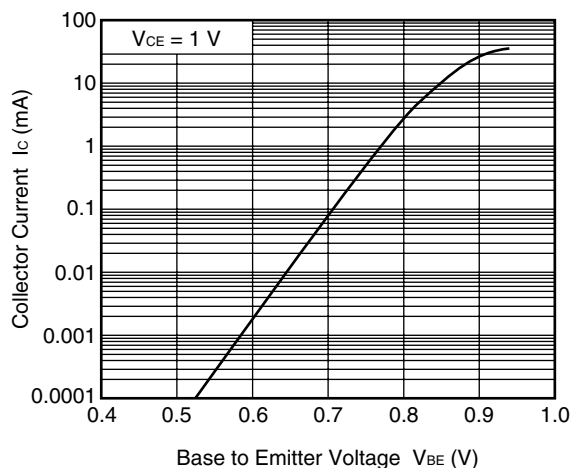
TOTAL POWER DISSIPATION
vs. AMBIENT TEMPERATURE



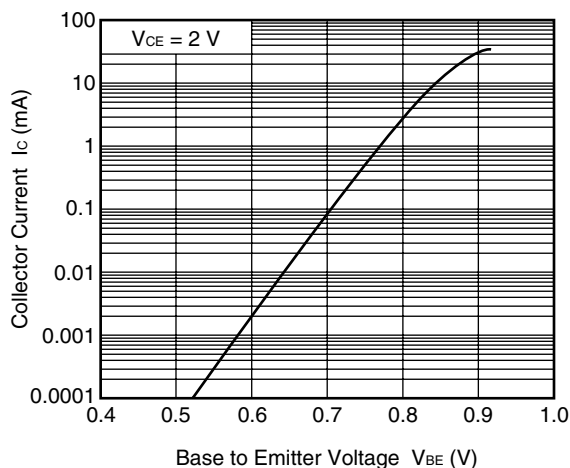
REVERSE TRANSFER CAPACITANCE
vs. COLLECTOR TO BASE VOLTAGE



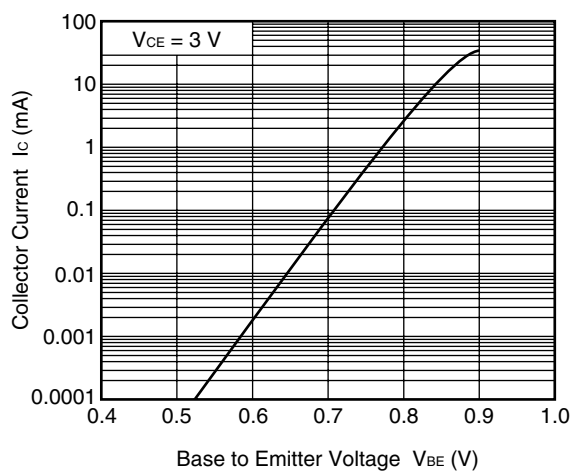
COLLECTOR CURRENT vs.
BASE TO EMITTER VOLTAGE



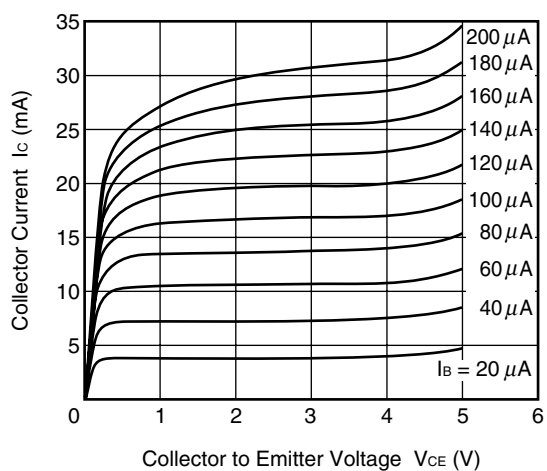
COLLECTOR CURRENT vs.
BASE TO EMITTER VOLTAGE



COLLECTOR CURRENT vs.
BASE TO EMITTER VOLTAGE

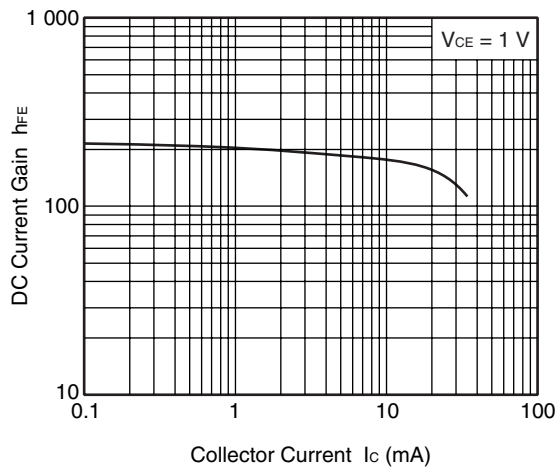


COLLECTOR CURRENT vs.
COLLECTOR TO EMITTER VOLTAGE

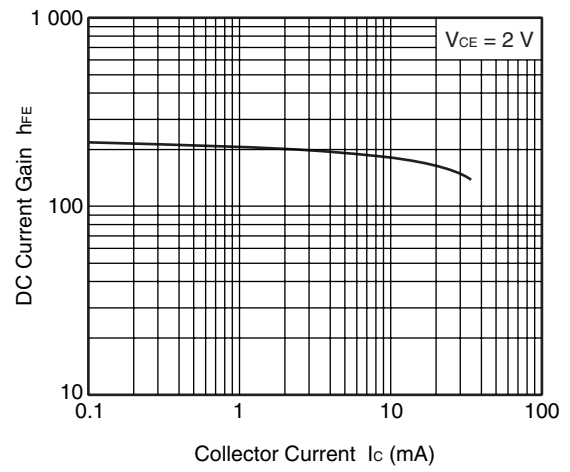


Remark The graphs indicate nominal characteristics.

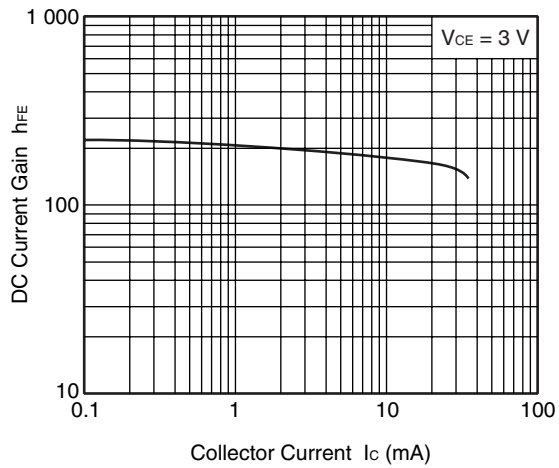
DC CURRENT GAIN vs.
COLLECTOR CURRENT



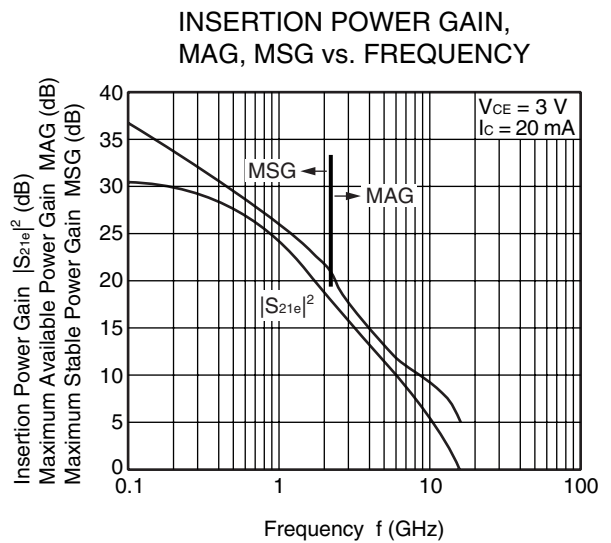
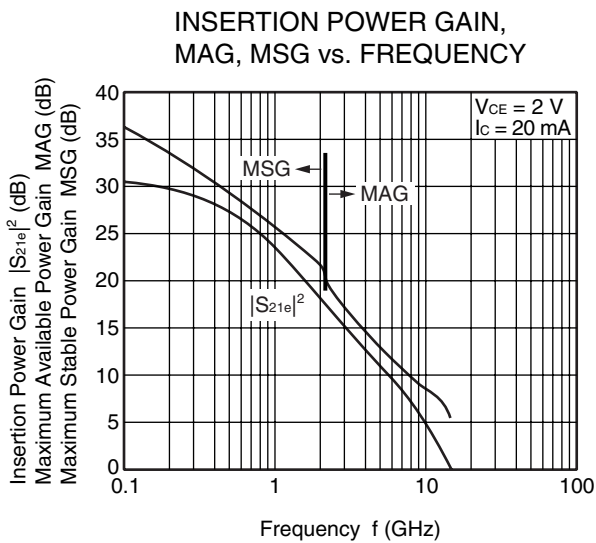
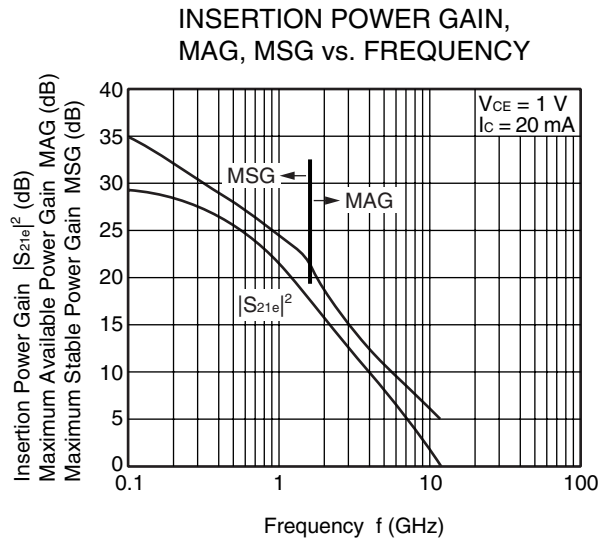
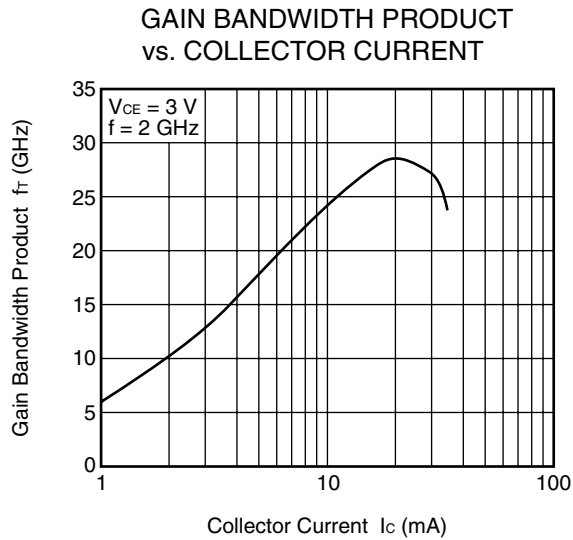
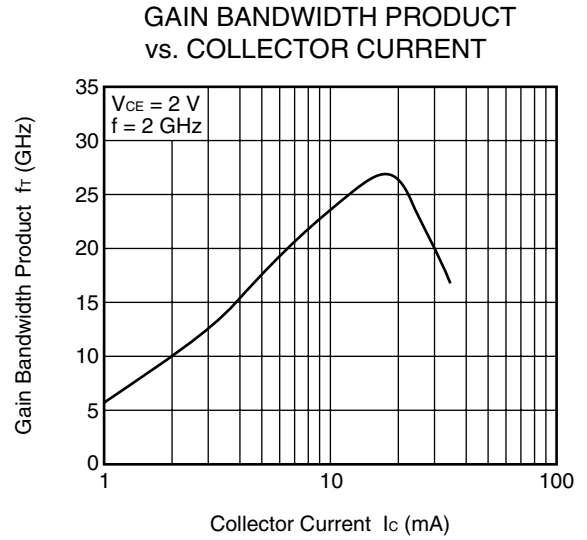
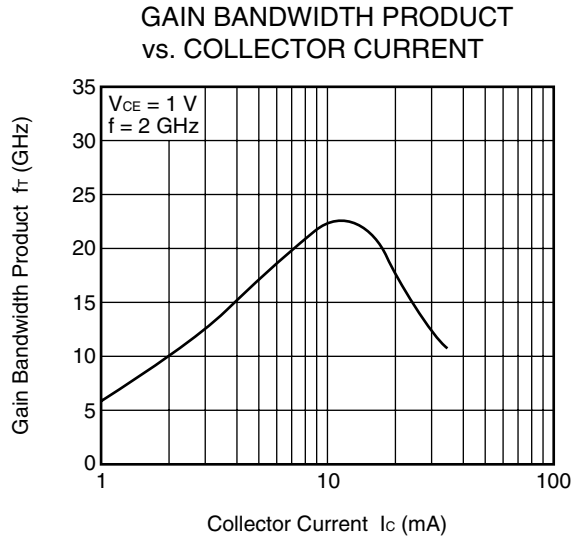
DC CURRENT GAIN vs.
COLLECTOR CURRENT



DC CURRENT GAIN vs.
COLLECTOR CURRENT

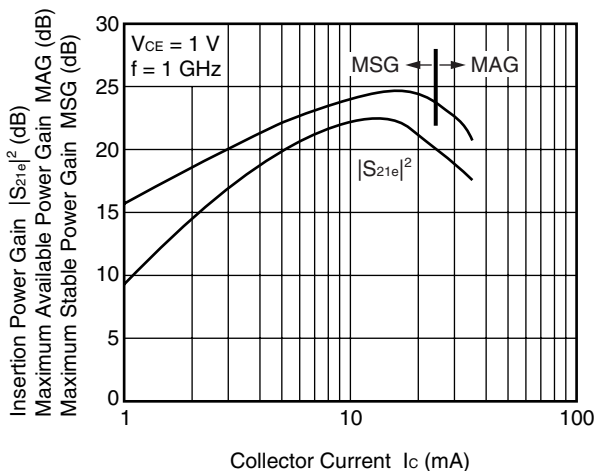


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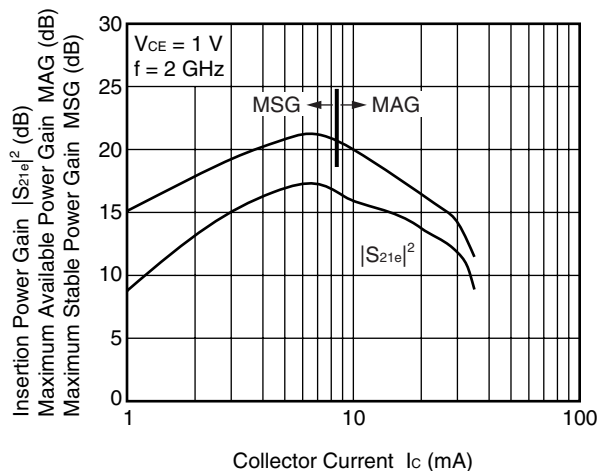


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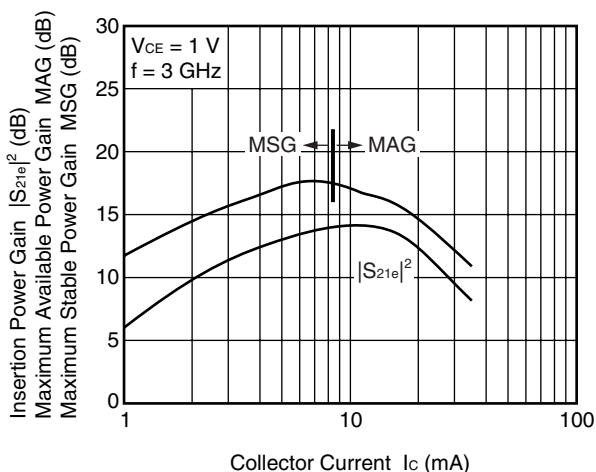
INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT



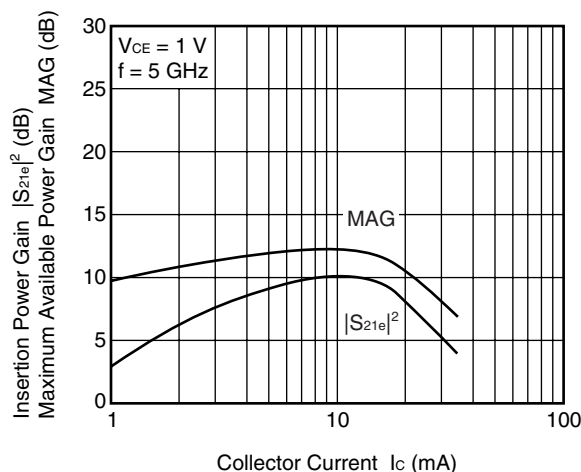
INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT



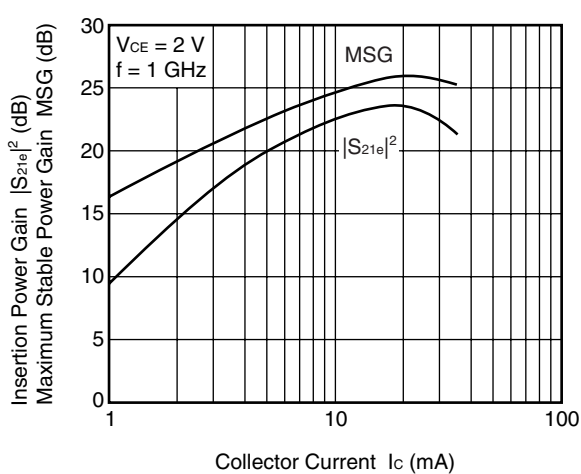
INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT



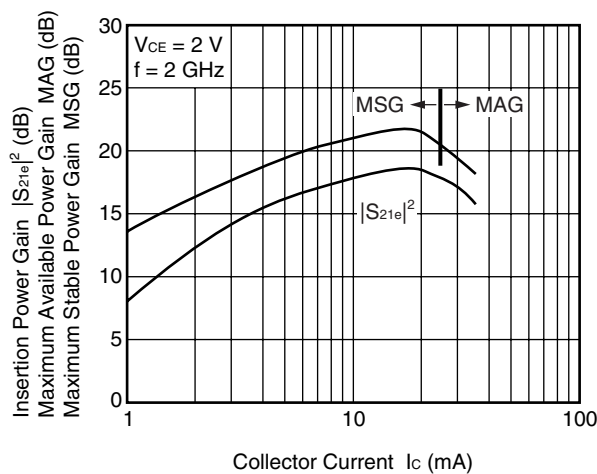
INSERTION POWER GAIN, MAG
vs. COLLECTOR CURRENT



INSERTION POWER GAIN, MSG
vs. COLLECTOR CURRENT

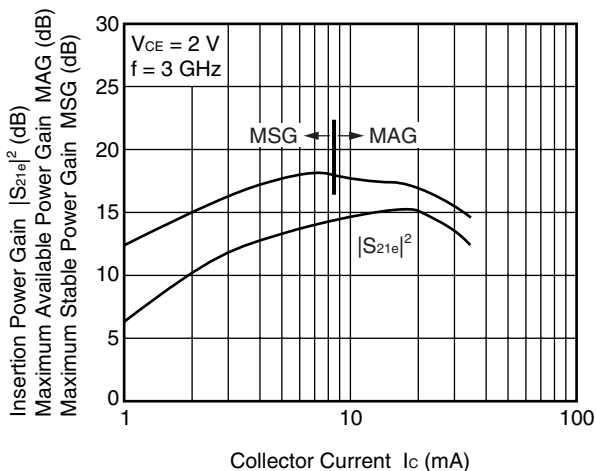


INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT

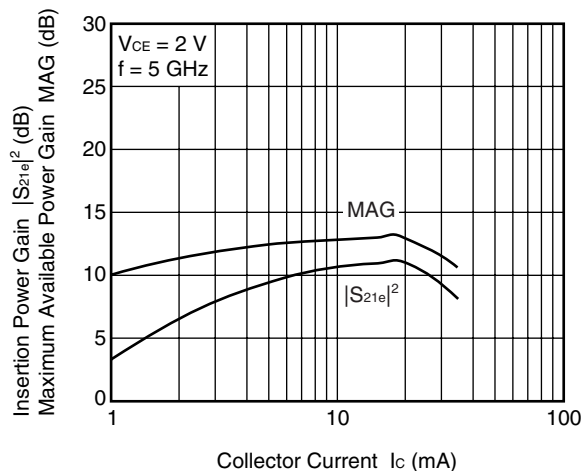


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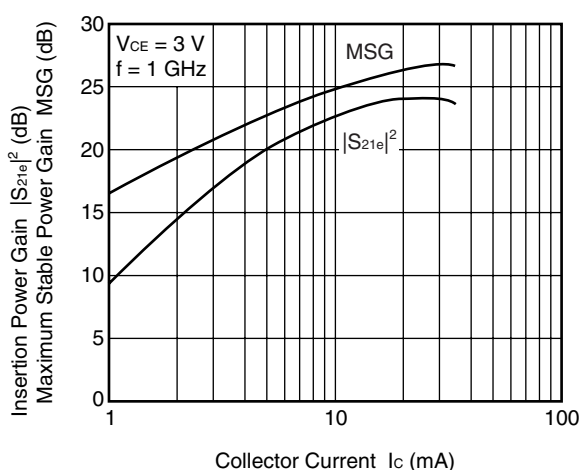
INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT



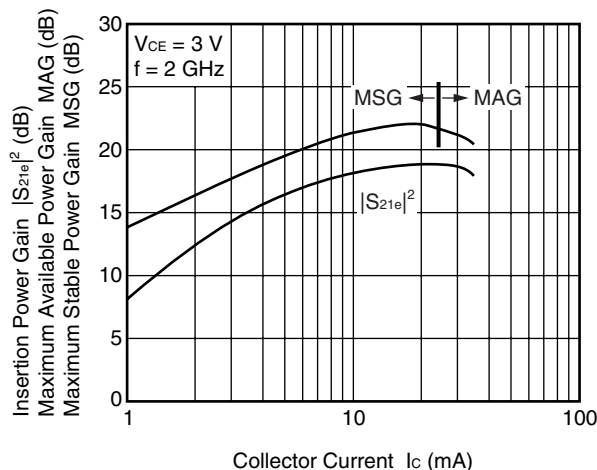
INSERTION POWER GAIN, MAG
vs. COLLECTOR CURRENT



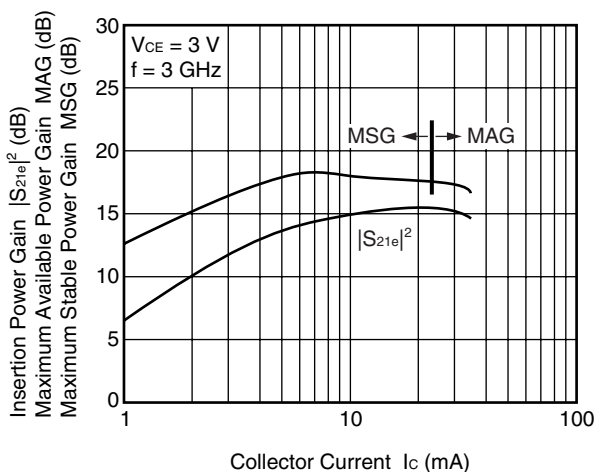
INSERTION POWER GAIN, MSG
vs. COLLECTOR CURRENT



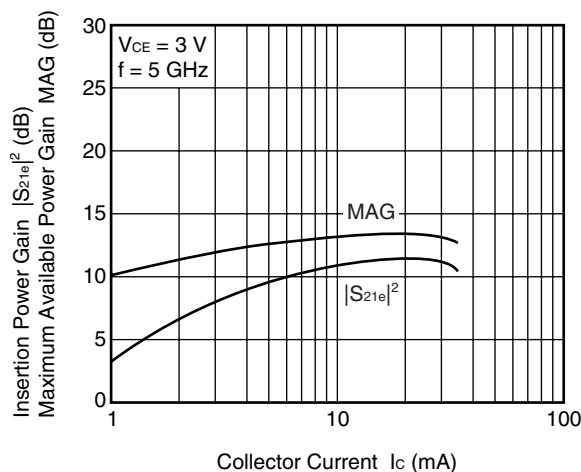
INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT



INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT

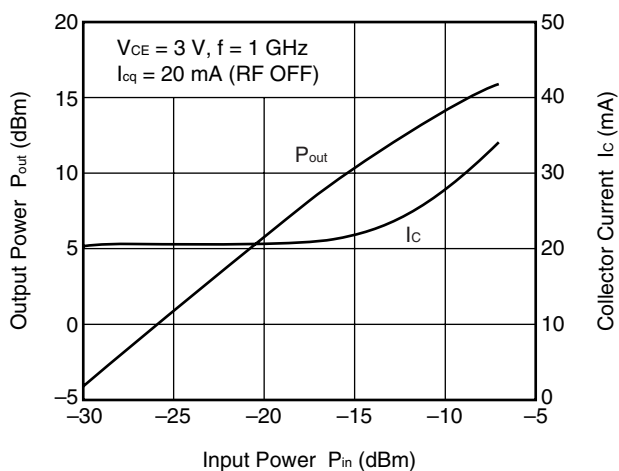


INSERTION POWER GAIN, MAG
vs. COLLECTOR CURRENT

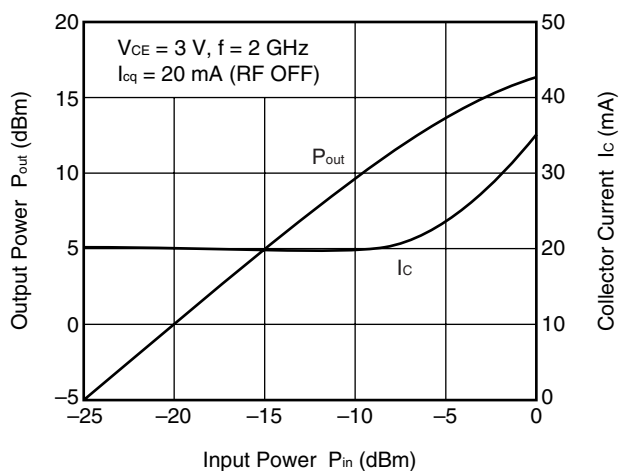


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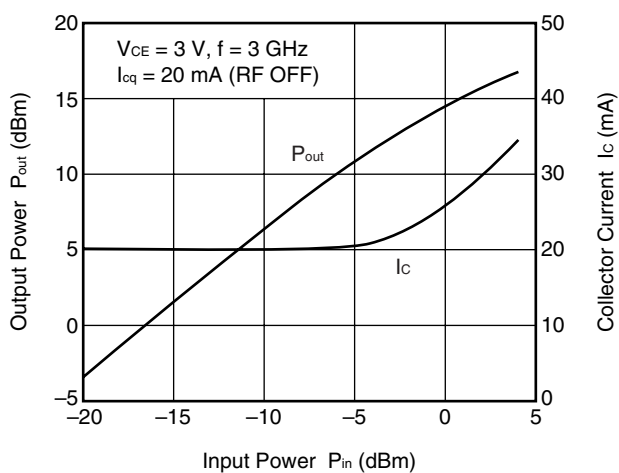
OUTPUT POWER, COLLECTOR
CURRENT vs. INPUT POWER



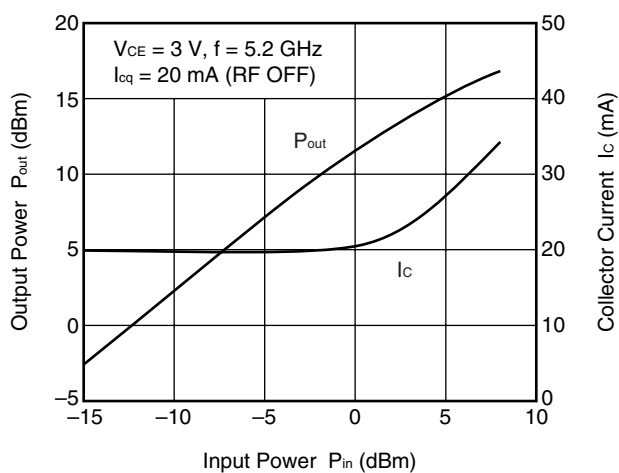
OUTPUT POWER, COLLECTOR
CURRENT vs. INPUT POWER



OUTPUT POWER, COLLECTOR
CURRENT vs. INPUT POWER

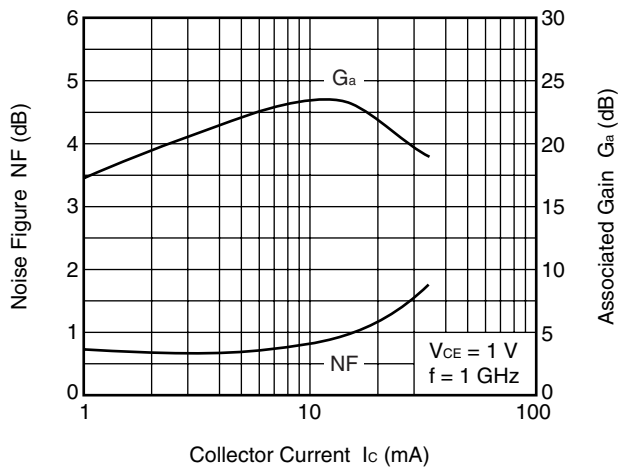


OUTPUT POWER, COLLECTOR
CURRENT vs. INPUT POWER

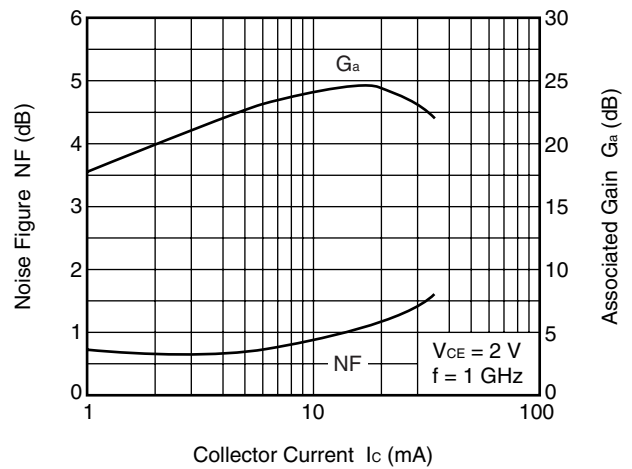


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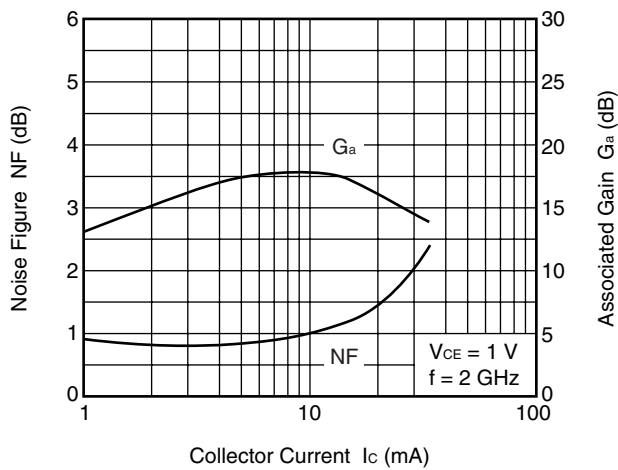
NOISE FIGURE, ASSOCIATED GAIN
vs. COLLECTOR CURRENT



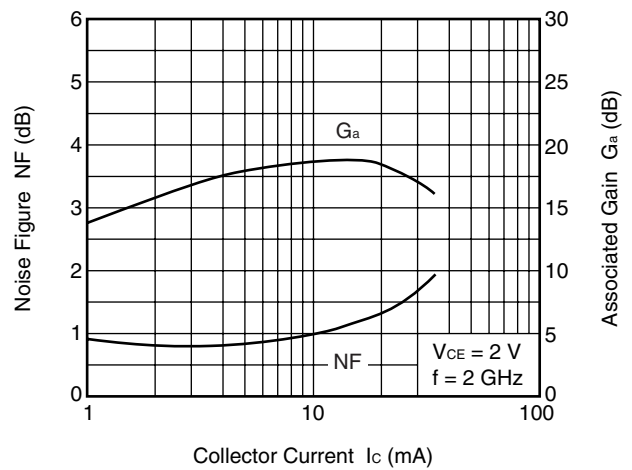
NOISE FIGURE, ASSOCIATED GAIN
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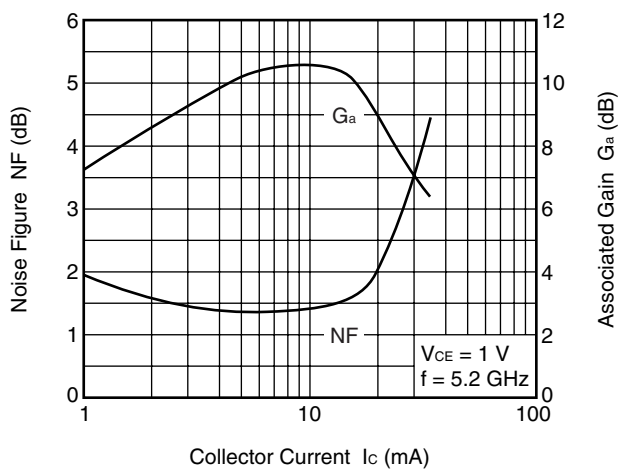
NOISE FIGURE, ASSOCIATED GAIN
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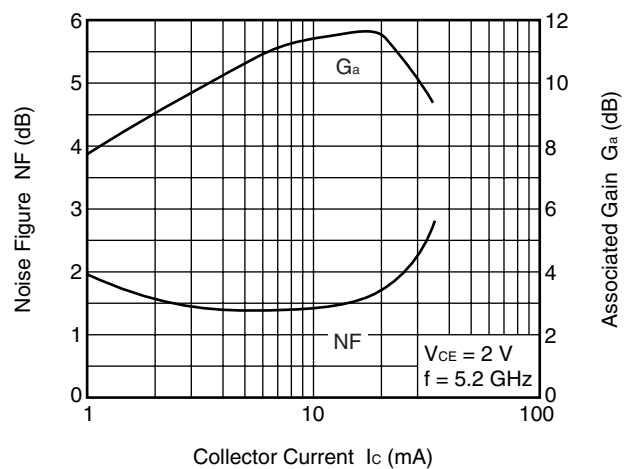
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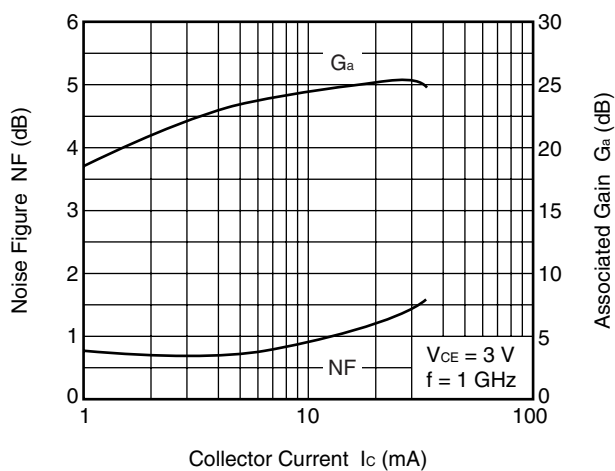


NOISE FIGURE, ASSOCIATED GAIN
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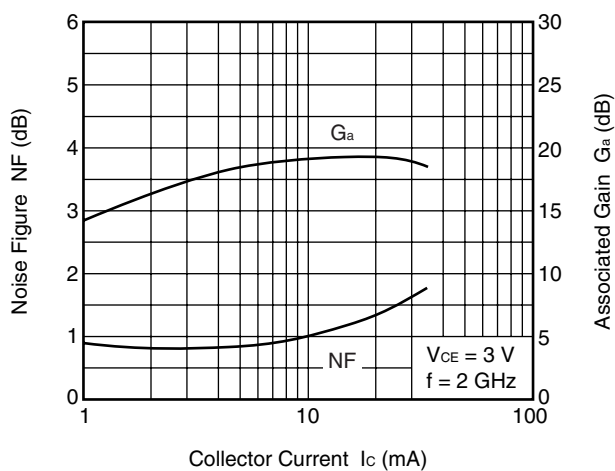


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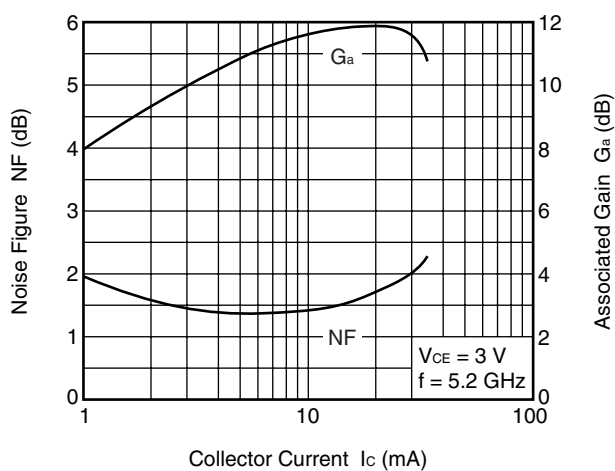
NOISE FIGURE, ASSOCIATED GAIN
vs. COLLECTOR CURRENT



NOISE FIGURE, ASSOCIATED GAIN
vs. COLLECTOR CURRENT



NOISE FIGURE, ASSOCIATED GAIN
vs. COLLECTOR CURRENT



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.

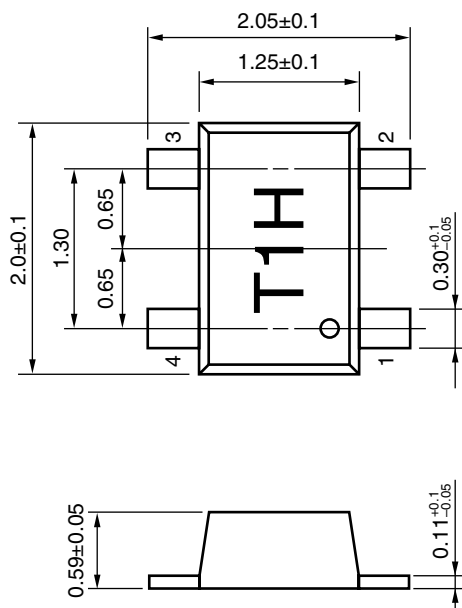
Click here to download S-parameters.

[RF and Microwave] → [Device Parameters]

URL <http://www.ncsd.necel.com/>

PACKAGE DIMENSIONS

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



PIN CONNECTIONS

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

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M8E 00.4-0110

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