To our customers,

Old Company Name in Catalogs and Other Documents

On April 1st, 2010, NEC Electronics Corporation merged with Renesas Technology Corporation, and Renesas Electronics Corporation took over all the business of both companies. Therefore, although the old company name remains in this document, it is a valid Renesas Electronics document. We appreciate your understanding.

Renesas Electronics website: http://www.renesas.com

April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (http://www.renesas.com)

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DATA SHEET

NPN SILICON GERMANIUM RF TRANSISTOR
NESG2021M16

NPN SiGe RF TRANSISTOR FOR LOW NOISE, HIGH-GAIN AMPLIFICATION 6-PIN LEAD-LESS MINIMOLD (M16, 1208 PKG)

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
- 6-pin lead-less minimold (M16, 1208 PKG)

<R> ORDERING INFORMATION

Part Number	Order Number	Package	Quantity	Supplying Form
NESG2021M16	NESG2021M16-A	6-pin lead-less minimold (M16, 1208 PKG) (Pb-Free)	50 pcs (Non reel)	• 8 mm wide embossed taping • Pin 1 (Collector), Pin 6 (Emitter) face the perforation side of the tape
NESG2021M16-T3	NESG2021M16-T3-A		10 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 cm² × 1.0 mm (t) glass epoxy PCB

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

Document No. PU10393EJ03V0DS (3rd edition)
Date Published September 2009 NS
Printed in Japan

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 = 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, $I_{C\ (set)}$ = 12 mA (RF OFF), f = 2 GHz, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$	–	9	–	dBm
Output 3rd Order Intercept Point	OIP_3	V_{CE} = 3 V, $I_{C\ (set)}$ = 12 mA (RF OFF), f = 2 GHz, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$	–	17	–	dBm

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

2. Collector to base capacitance when the emitter grounded

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

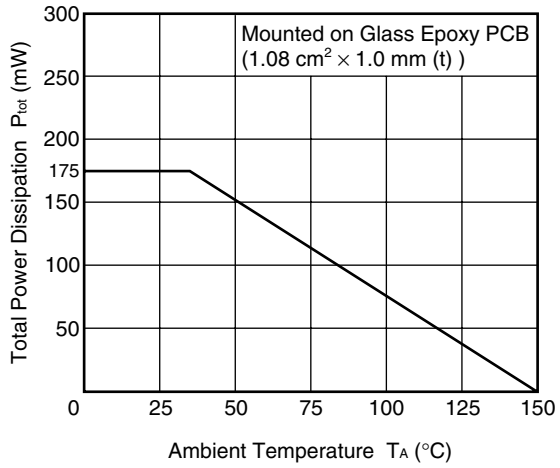
h_{FE} CLASSIFICATION

<R>

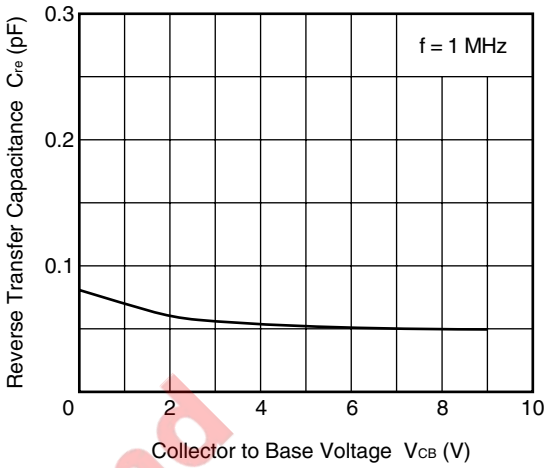
Rank	FB/YFB
Marking	zE
h_{FE} Value	130 to 260

<R> **TYPICAL CHARACTERISTICS (T_A = +25°C, unless otherwise specified)**

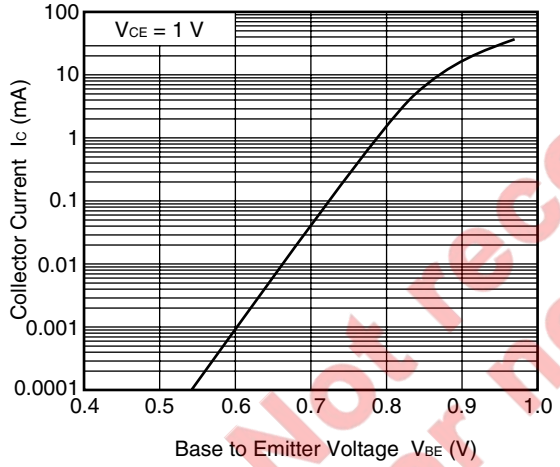
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



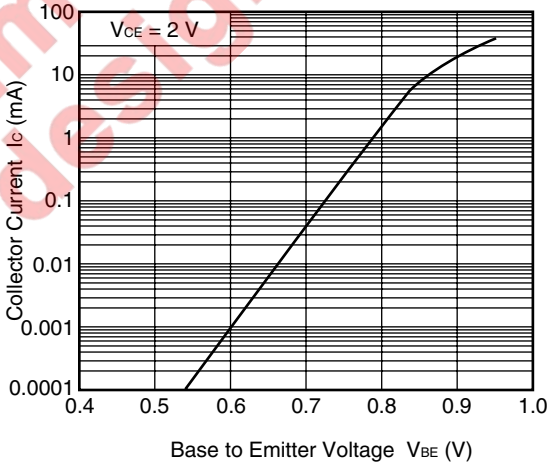
REVERSE TRANSFER CAPACITANCE vs. COLLECTOR TO BASE VOLTAGE



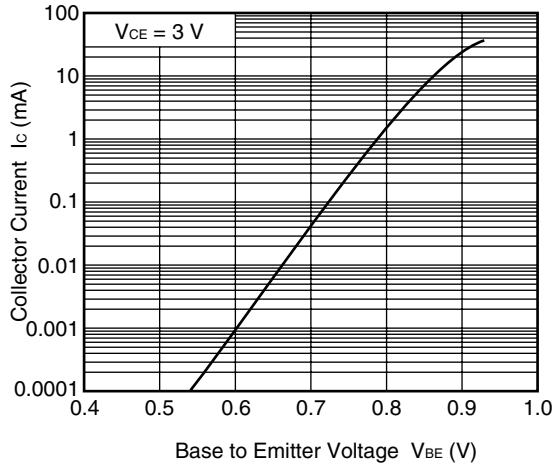
COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE



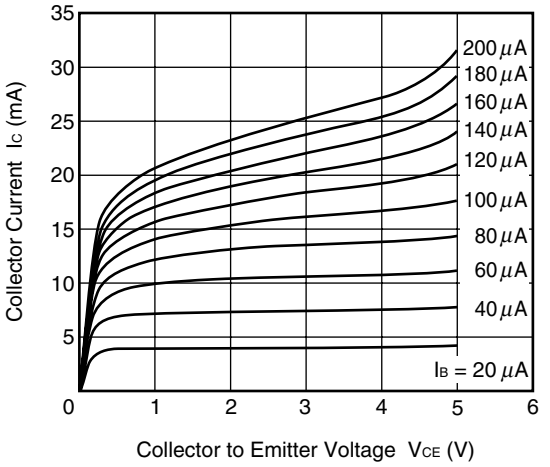
COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE



COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE

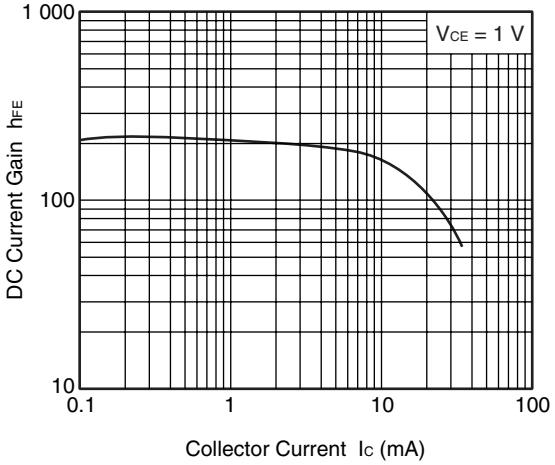


COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE

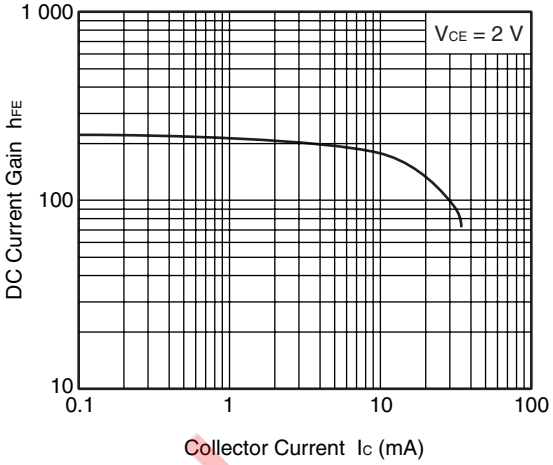


Remark The graphs indicate nominal characteristics.

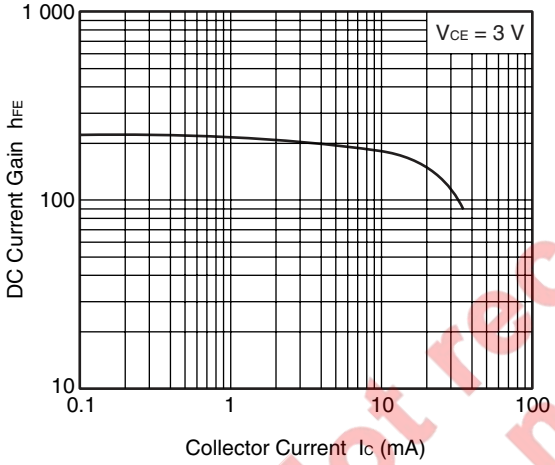
DC CURRENT GAIN vs.
COLLECTOR CURRENT



DC CURRENT GAIN vs.
COLLECTOR CURRENT



DC CURRENT GAIN vs.
COLLECTOR CURRENT



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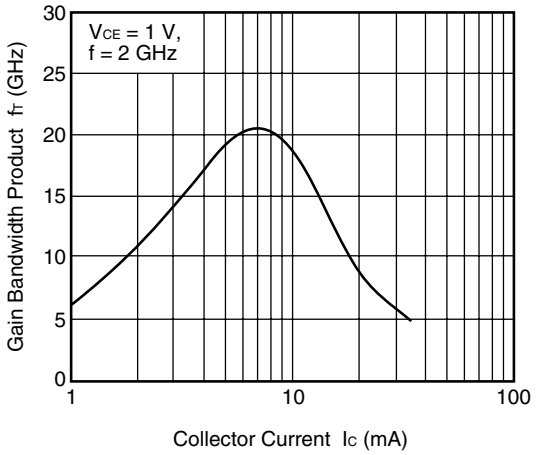
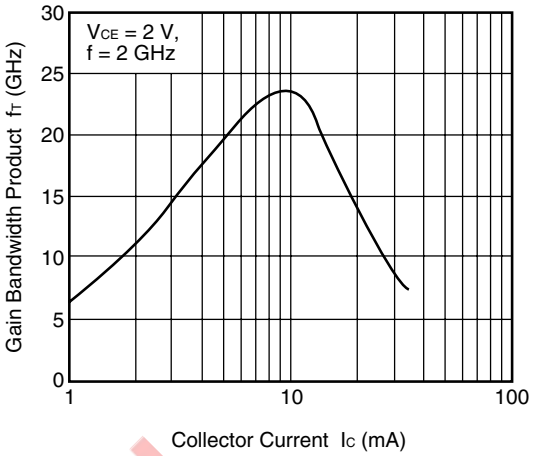
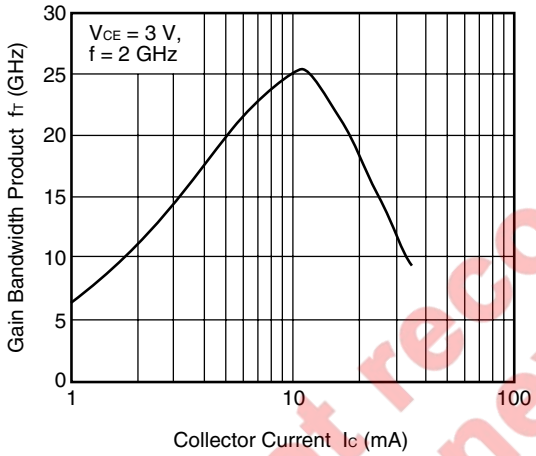
GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT



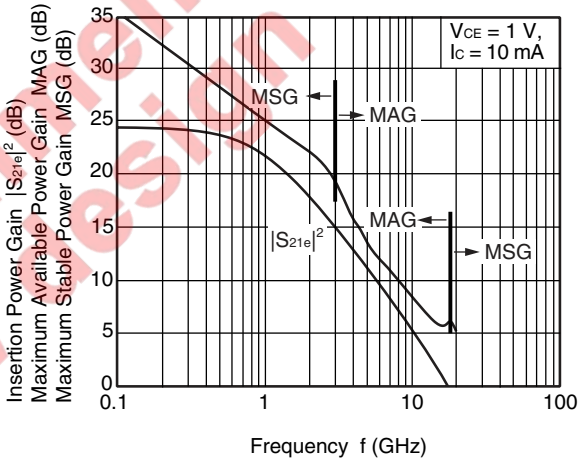
GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT



GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT



INSERTION POWER GAIN, MAG, MSG vs. FREQUENCY



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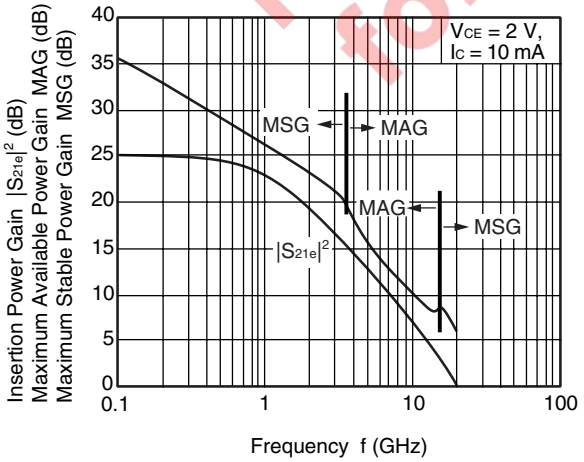

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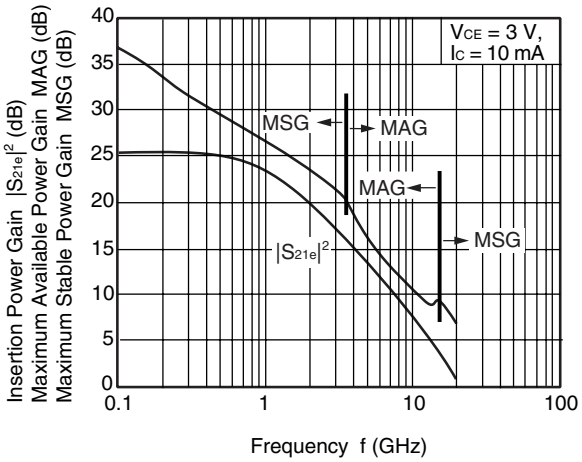

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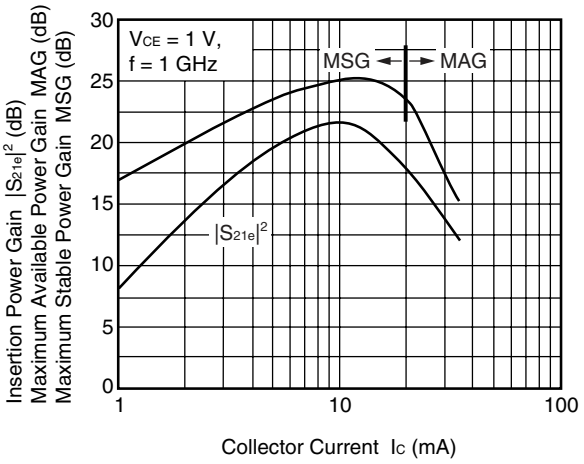

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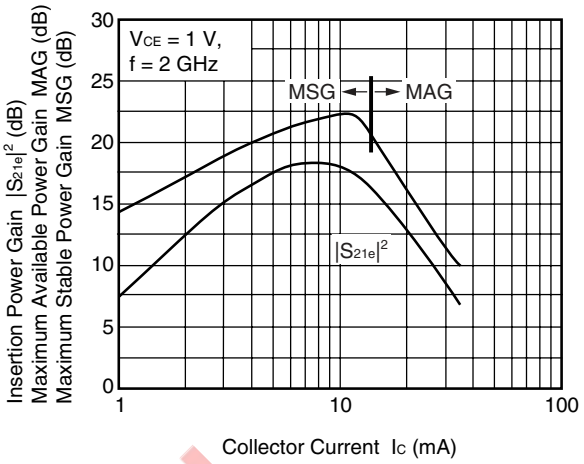

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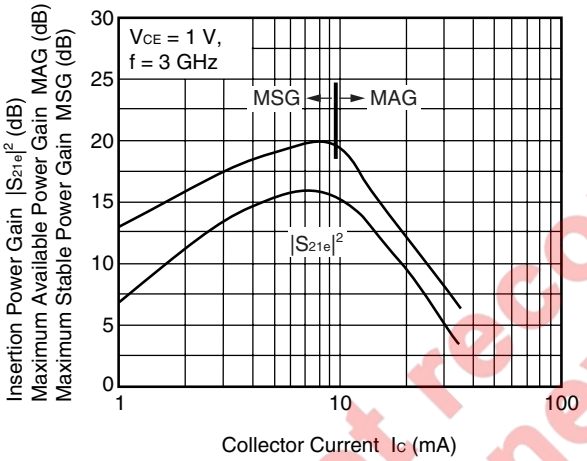

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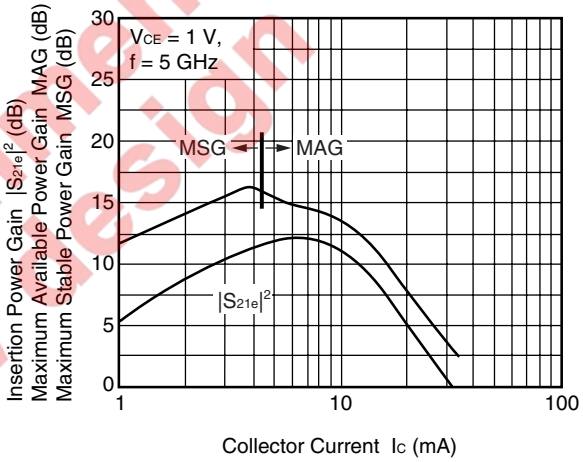

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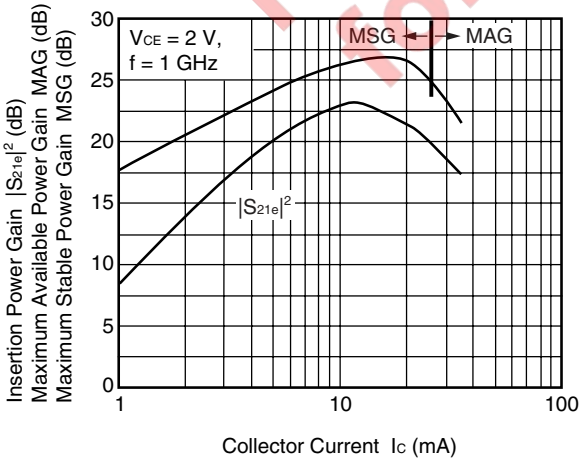

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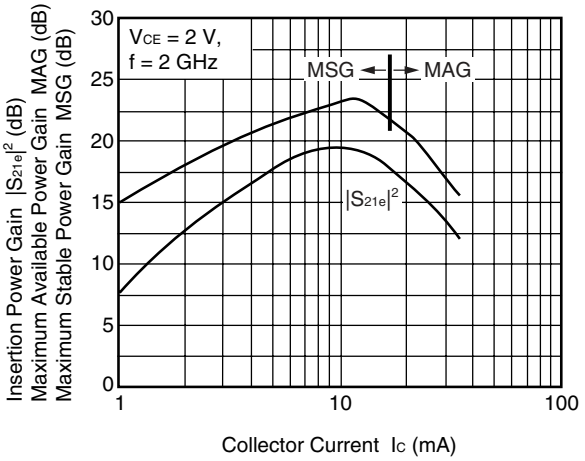

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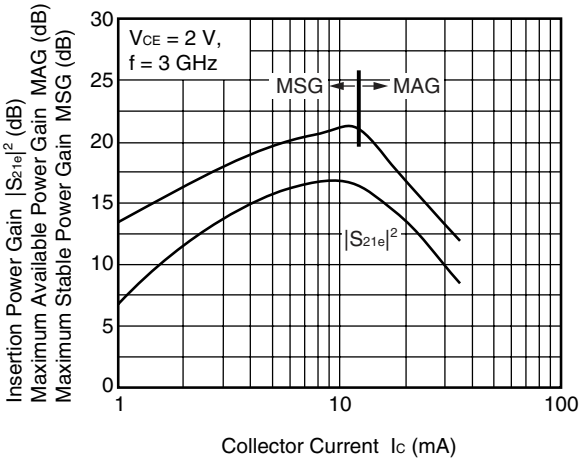

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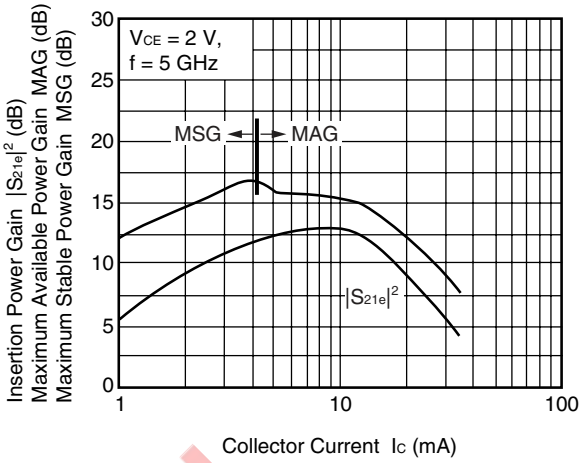

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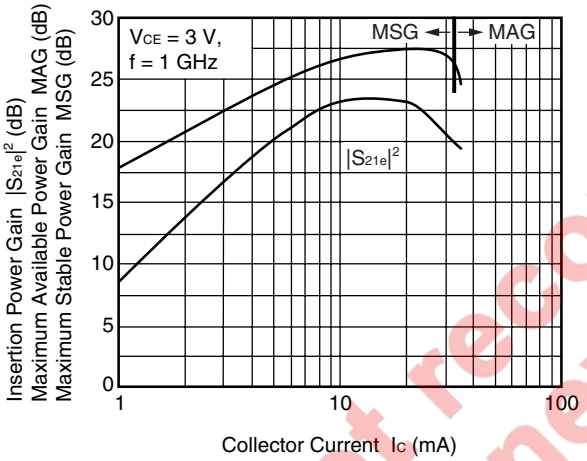

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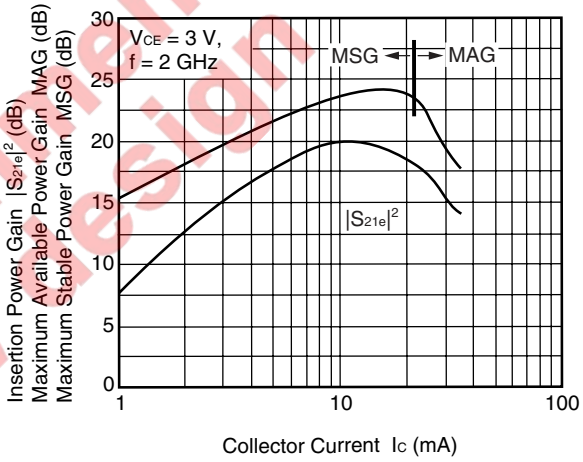

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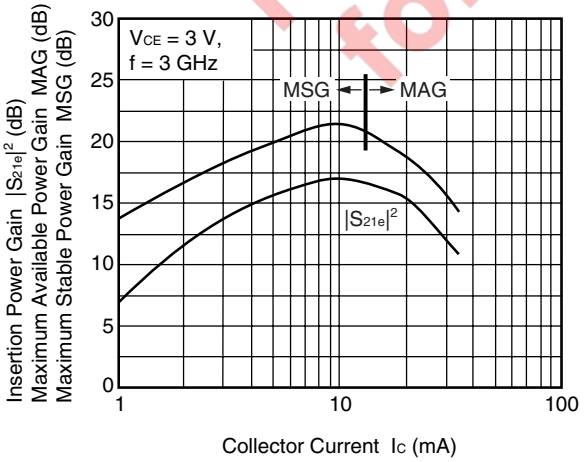

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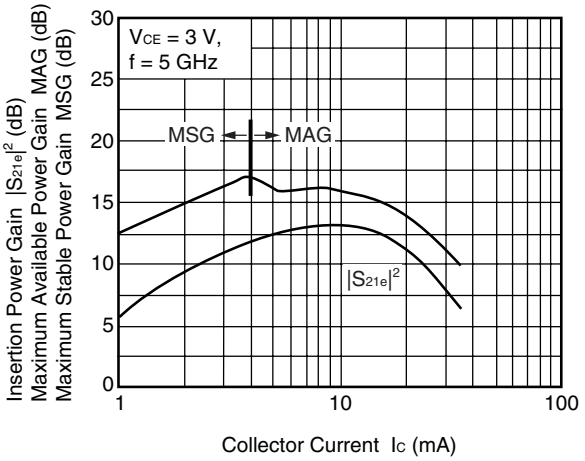
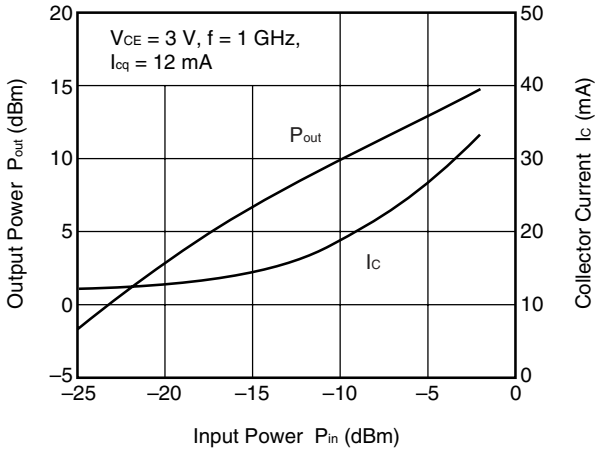
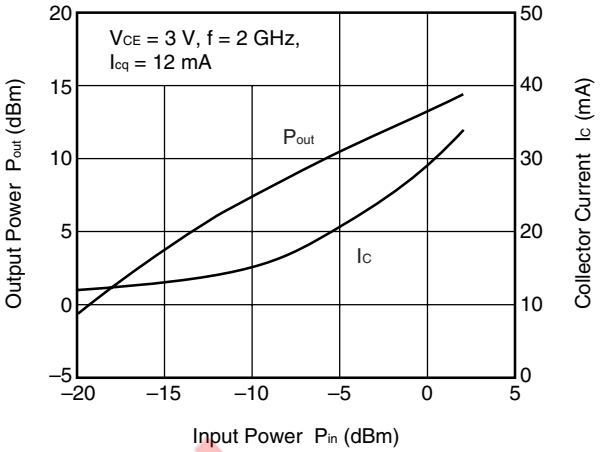


Remark The graphs indicate nominal characteristics.

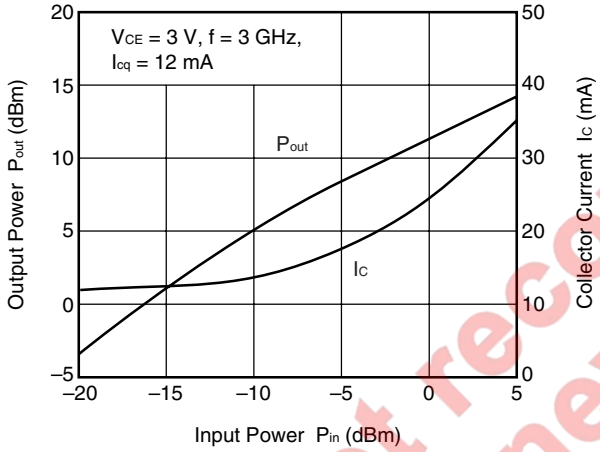
OUTPUT POWER, COLLECTOR CURRENT vs. INPUT POWER



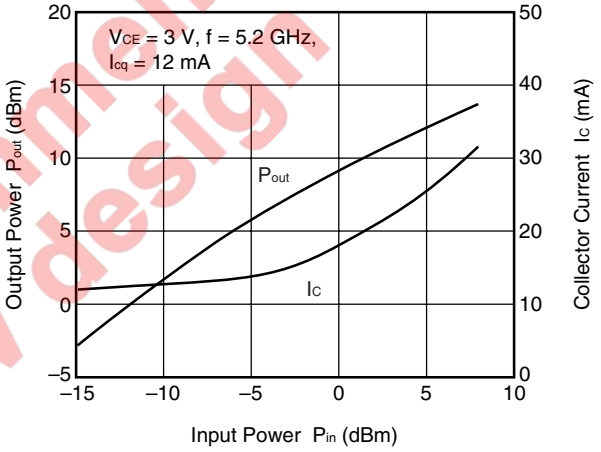
OUTPUT POWER, COLLECTOR CURRENT vs. INPUT POWER



OUTPUT POWER, COLLECTOR CURRENT vs. INPUT POWER

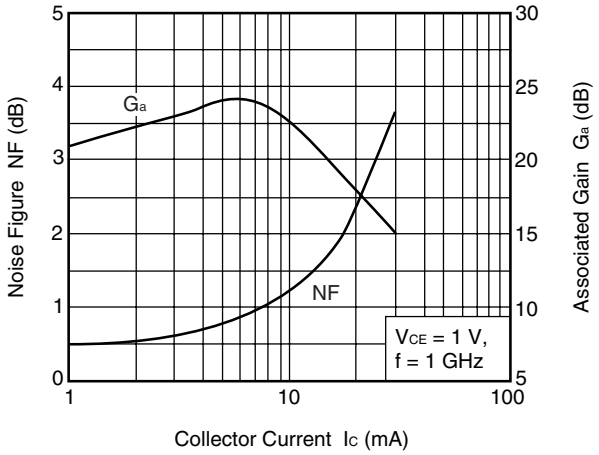


OUTPUT POWER, COLLECTOR CURRENT vs. INPUT POWER

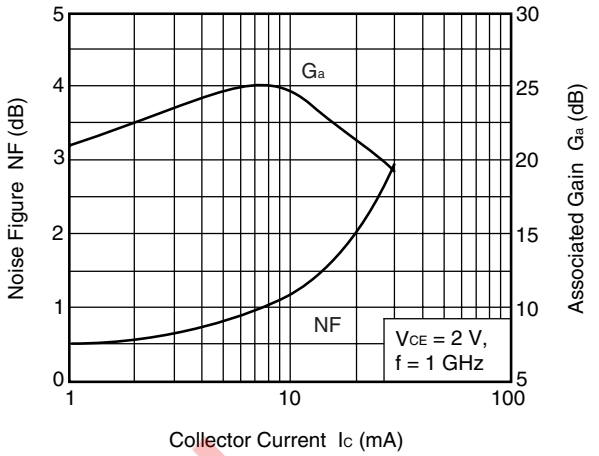


Remark The graphs indicate nominal characteristics.

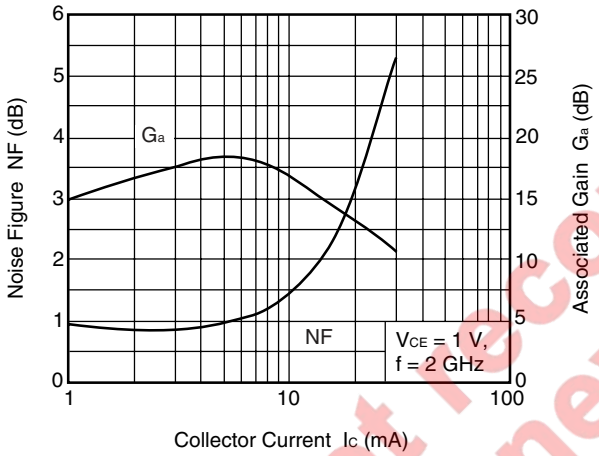
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



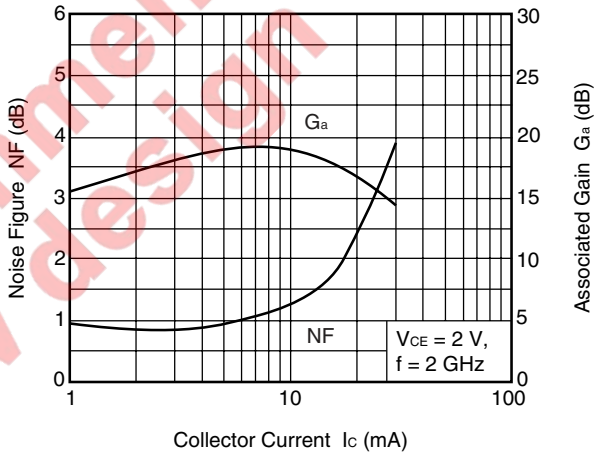
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



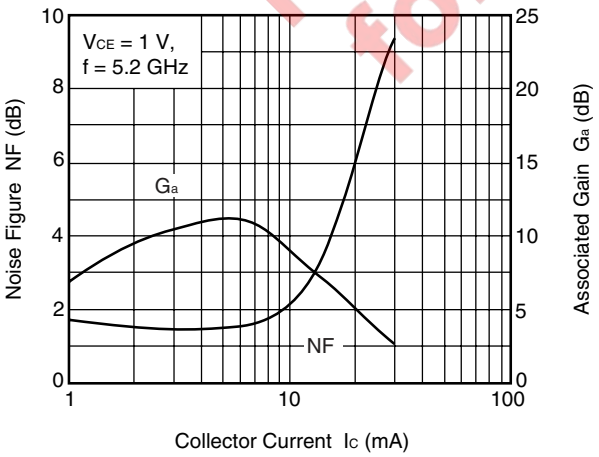
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



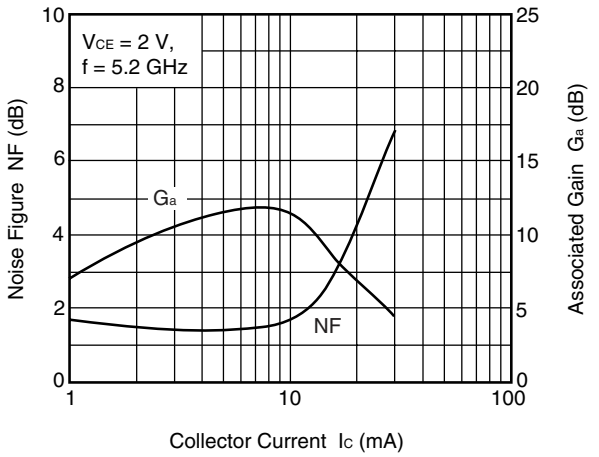
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT

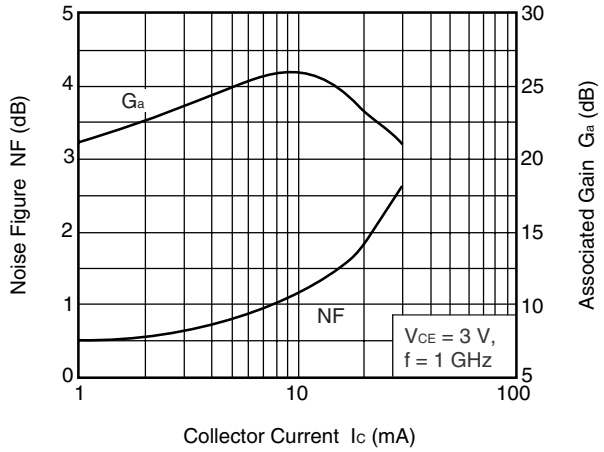


NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT

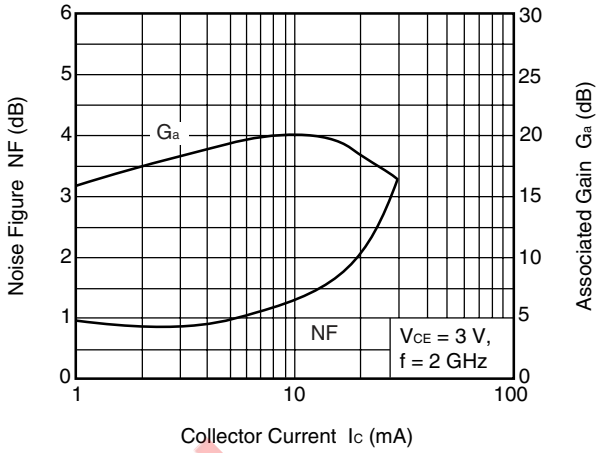


Remark The graphs indicate nominal characteristics.

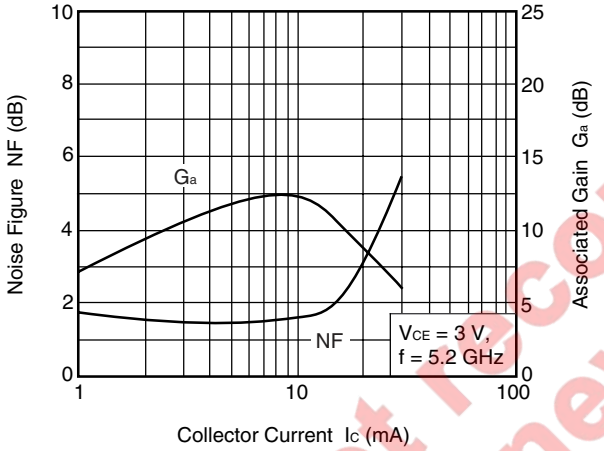
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



Remark The graphs indicate nominal characteristics.

<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.

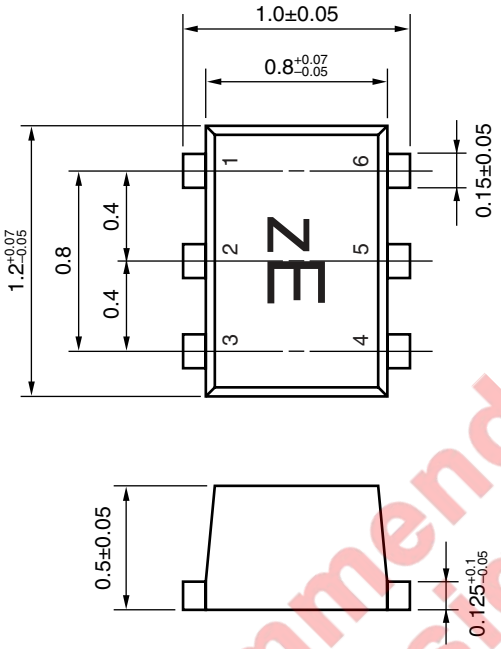
Click here to download S-parameters.

[RF and Microwave] → [Device Parameters]

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

PACKAGE DIMENSIONS

6-PIN LEAD-LESS MINIMOLD (M16, 1208 PKG) (UNIT: mm)



PIN CONNECTIONS

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

Caution All four Emitter-pins should be connected to PWB in order to obtain better Electrical performance and heat sinking.

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