

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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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
 $NF = 0.9 \text{ dB TYP.}$, $G_a = 18.0 \text{ dB TYP.}$ @ $V_{CE} = 2 \text{ V}$, $I_C = 3 \text{ mA}$, $f = 2 \text{ GHz}$
 $NF = 1.3 \text{ dB TYP.}$, $G_a = 10.0 \text{ dB TYP.}$ @ $V_{CE} = 2 \text{ V}$, $I_C = 3 \text{ mA}$, $f = 5.2 \text{ GHz}$
- Maximum stable power gain: $MSG = 22.5 \text{ dB TYP.}$ @ $V_{CE} = 3 \text{ V}$, $I_C = 10 \text{ mA}$, $f = 2 \text{ GHz}$
- 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 ($T_A = +25^\circ\text{C}$)

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

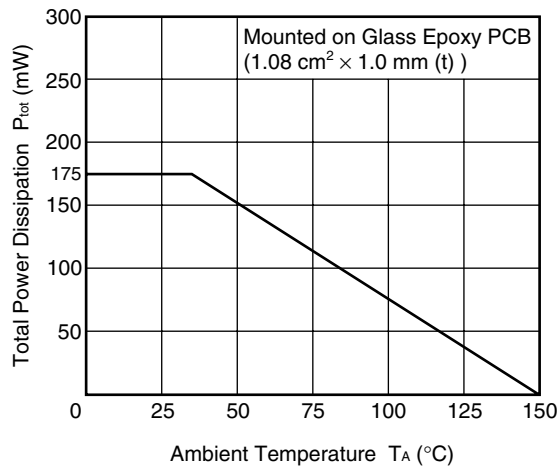
h_{FE} CLASSIFICATION

<R>

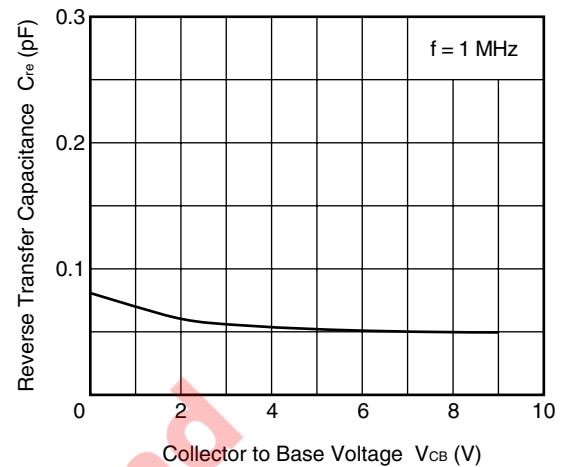
Rank	FB/YFB
Marking	zE
h _{FE} Value	130 to 260

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

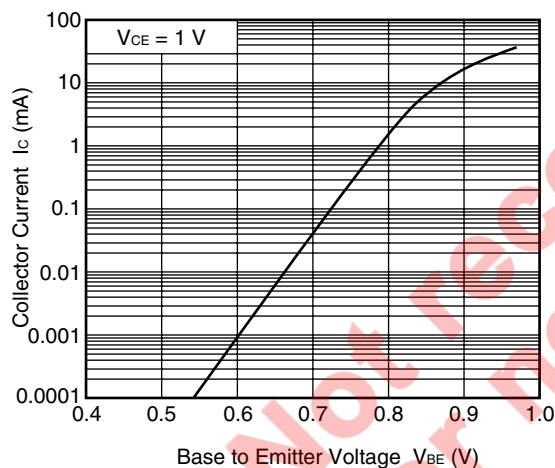
**TOTAL POWER DISSIPATION
vs. AMBIENT TEMPERATURE**



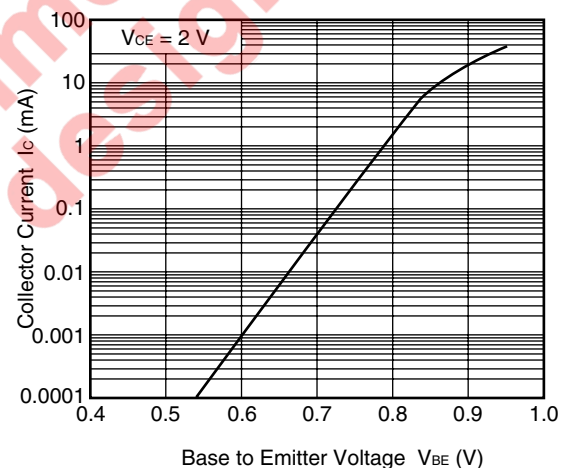
**REVERSE TRANSFER CAPACITANCE
vs. COLLECTOR TO BASE VOLTAGE**



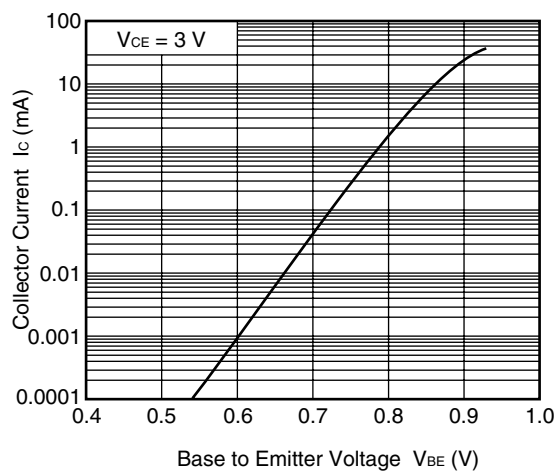
**COLLECTOR CURRENT vs.
BASE TO EMITTER VOLTAGE**



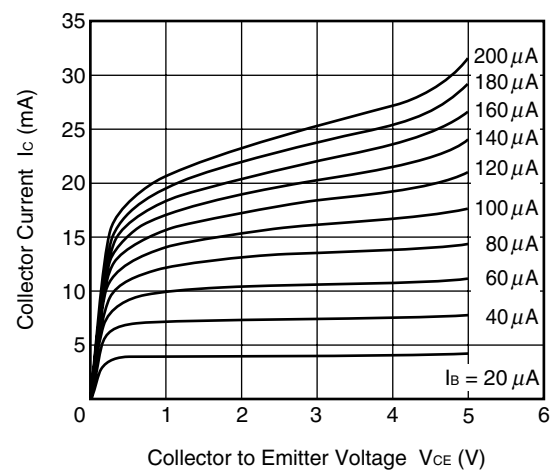
**COLLECTOR CURRENT vs.
BASE TO EMITTER VOLTAGE**



**COLLECTOR CURRENT vs.
BASE TO EMITTER VOLTAGE**

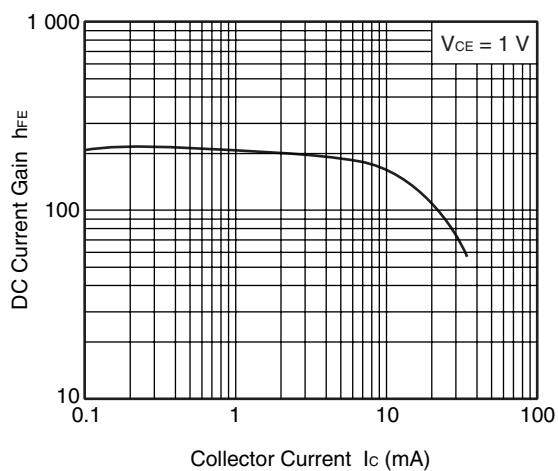


**COLLECTOR CURRENT vs.
COLLECTOR TO EMITTER VOLTAGE**

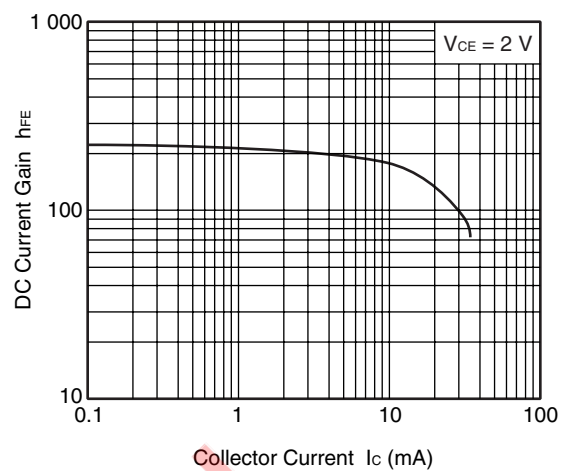


Remark The graphs indicate nominal characteristics.

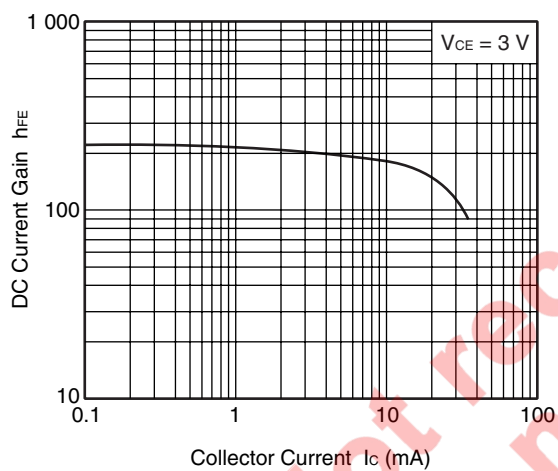
DC CURRENT GAIN vs.
COLLECTOR CURRENT



DC CURRENT GAIN vs.
COLLECTOR CURRENT

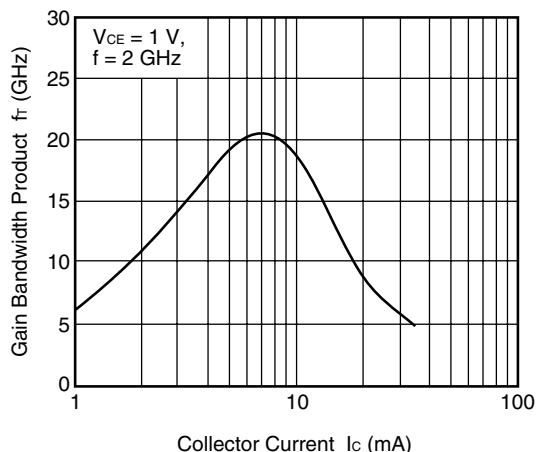


DC CURRENT GAIN vs.
COLLECTOR CURRENT

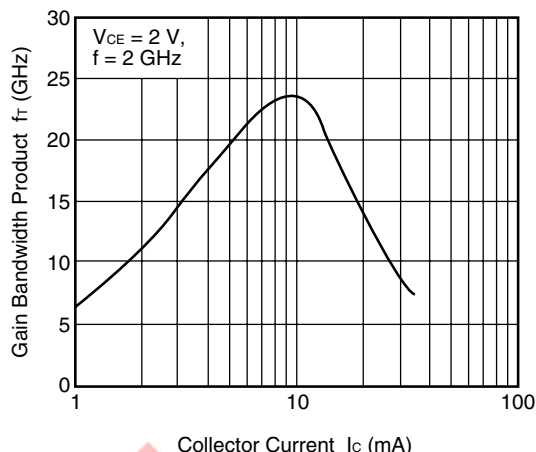


Remark The graphs indicate nominal characteristics.

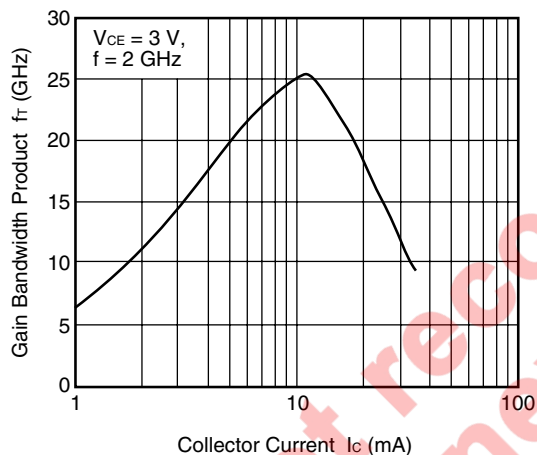
GAIN BANDWIDTH PRODUCT
vs. COLLECTOR CURRENT



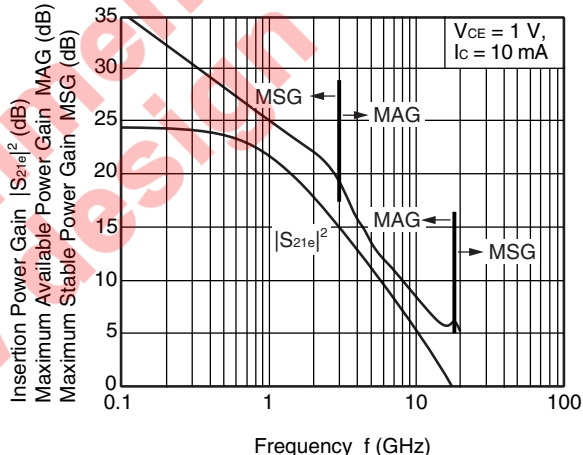
GAIN BANDWIDTH PRODUCT
vs. COLLECTOR CURRENT



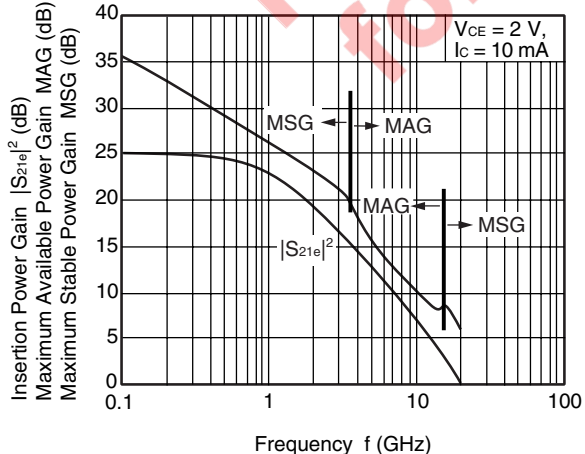
GAIN BANDWIDTH PRODUCT
vs. COLLECTOR CURRENT



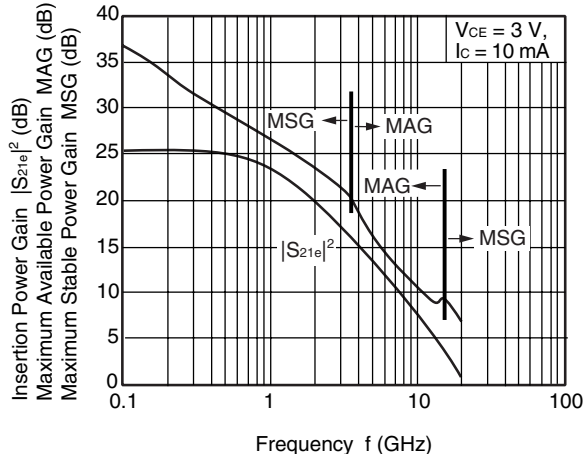
INSERTION POWER GAIN,
MAG, MSG vs. FREQUENCY



INSERTION POWER GAIN,
MAG, MSG vs. FREQUENCY

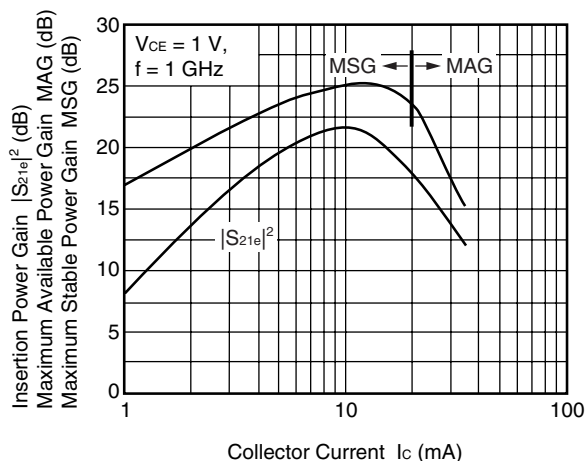


INSERTION POWER GAIN,
MAG, MSG vs. FREQUENCY

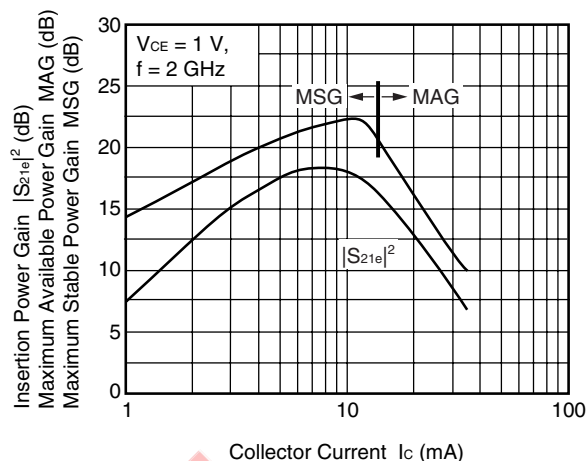


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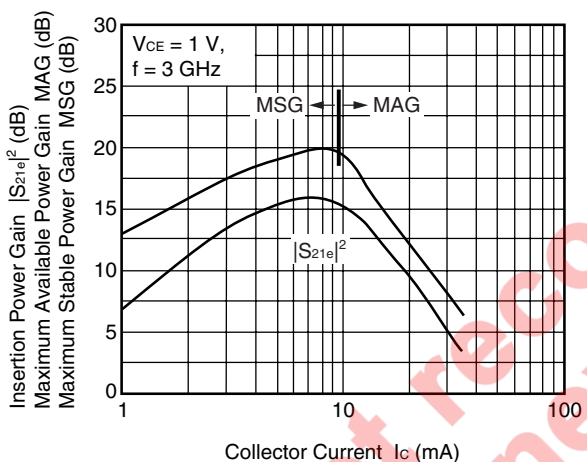
INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT



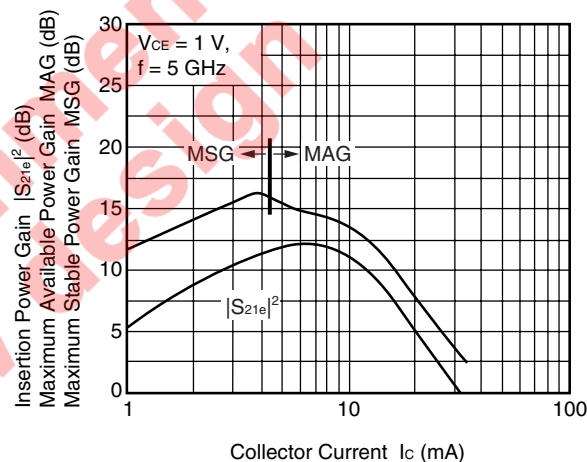
INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT



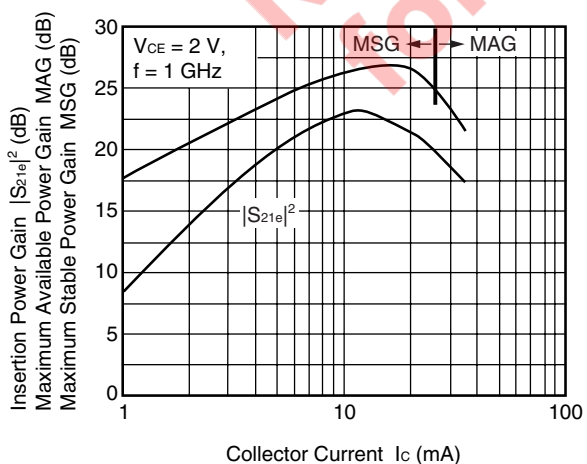
INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT



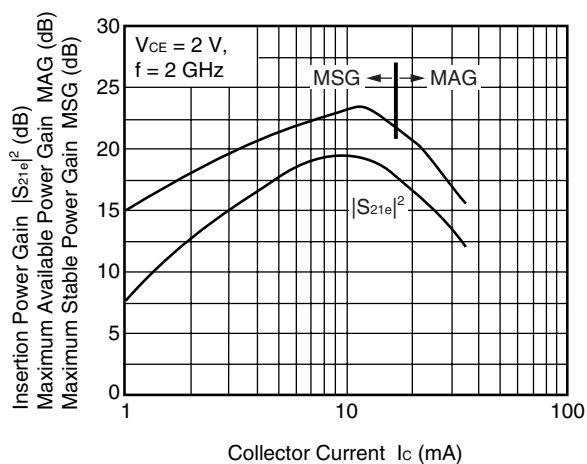
INSERTION POWER GAIN, MAG, MSG
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vs. COLLECTOR CURRENT

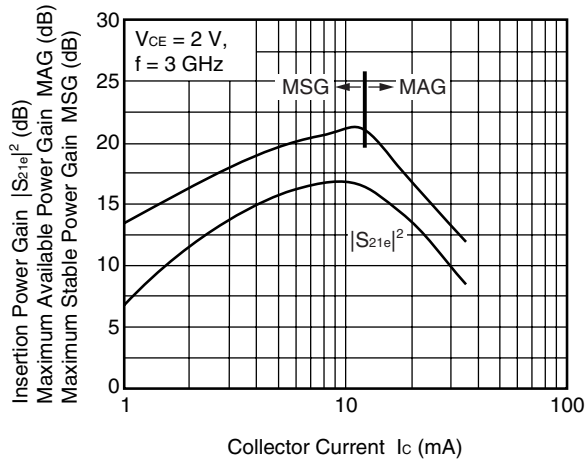


INSERTION POWER GAIN, MAG, MSG
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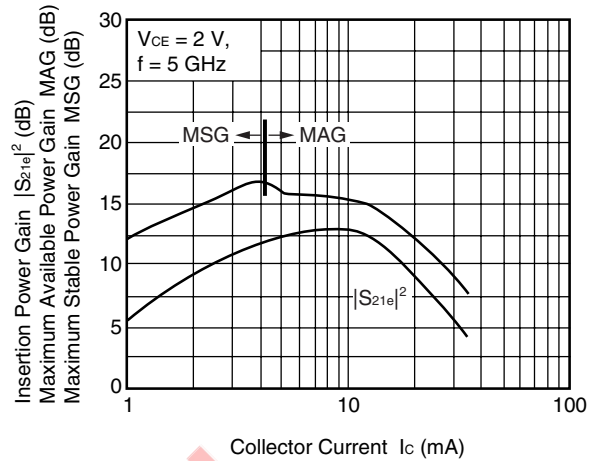


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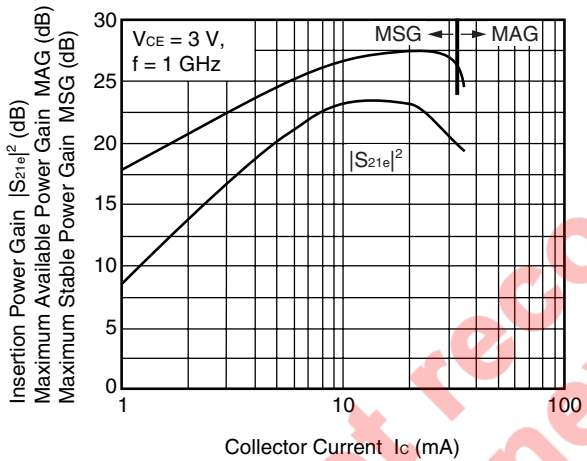
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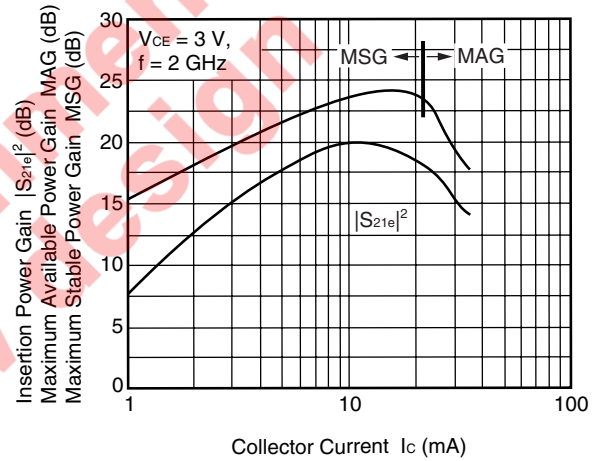
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vs. COLLECTOR CURRENT



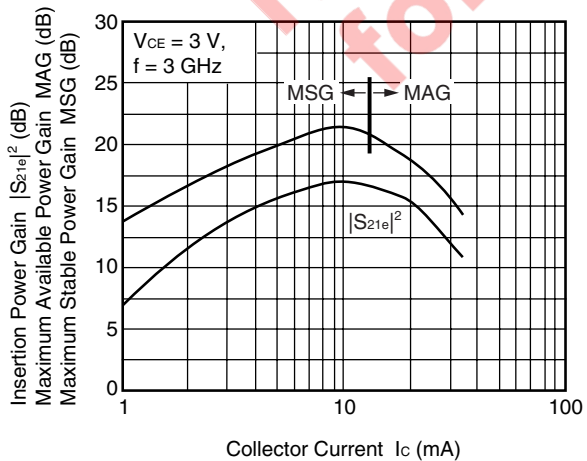
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vs. COLLECTOR CURRENT



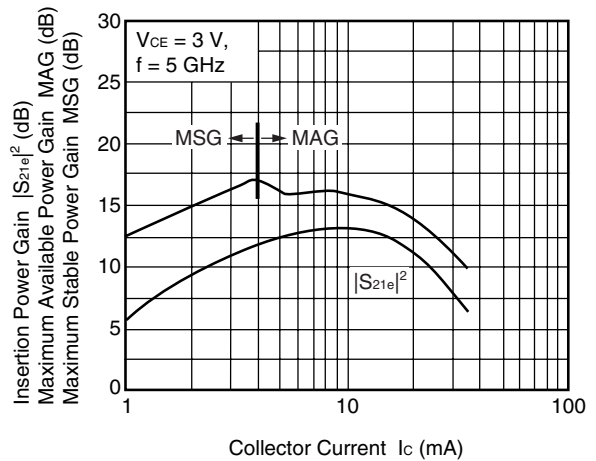
INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT



INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT

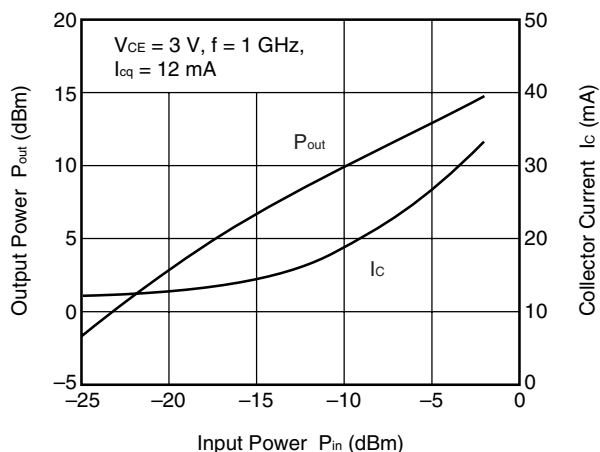


INSERTION POWER GAIN, MAG, MSG
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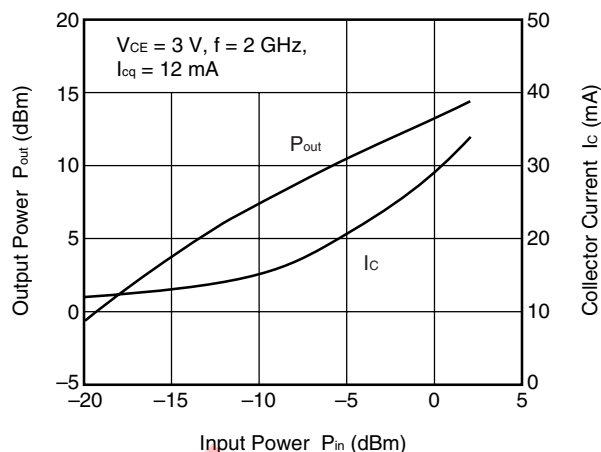


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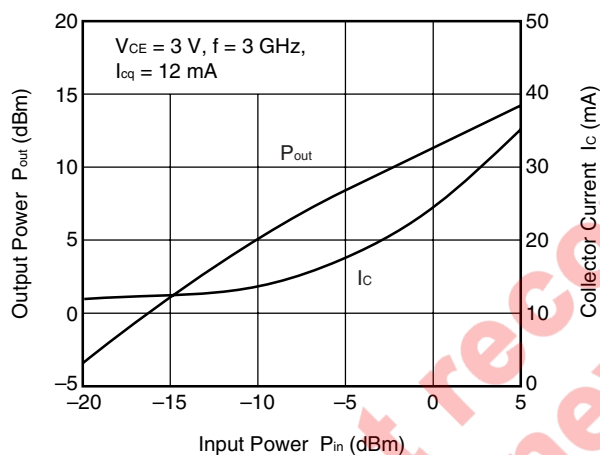
OUTPUT POWER, COLLECTOR CURRENT vs. INPUT POWER



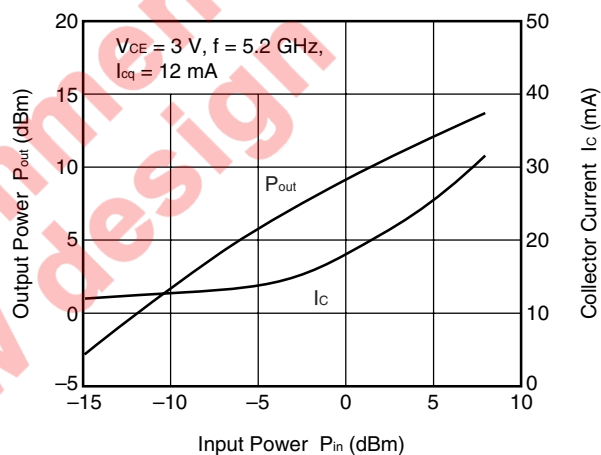
OUTPUT POWER, COLLECTOR CURRENT vs. INPUT POWER



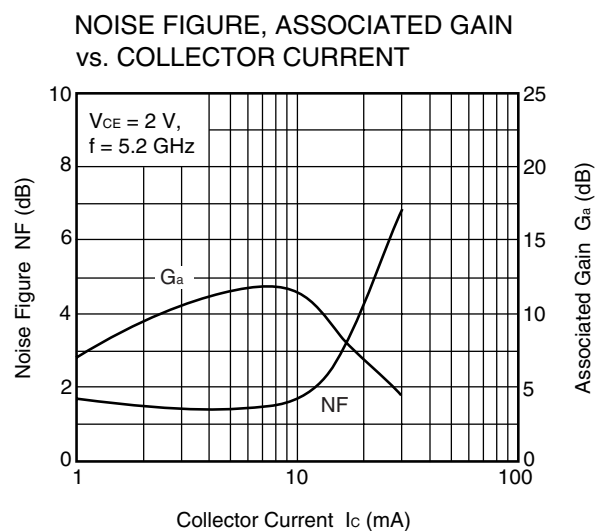
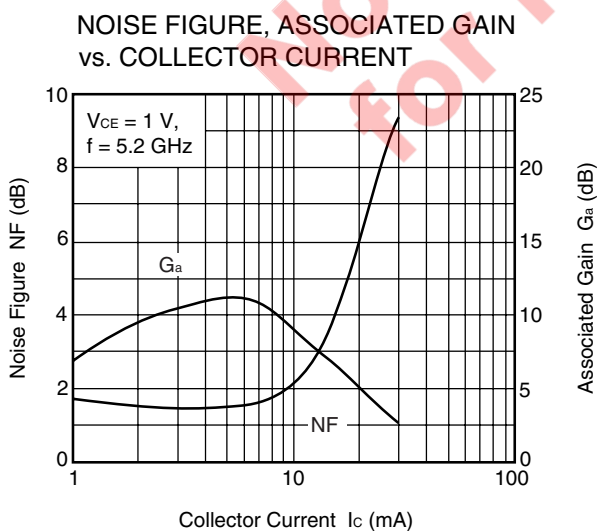
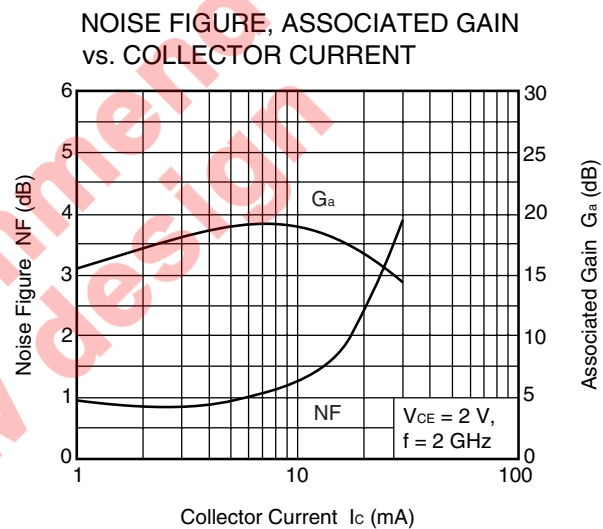
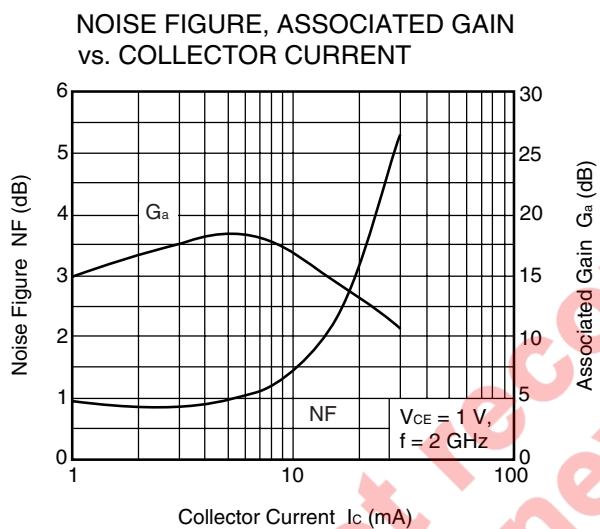
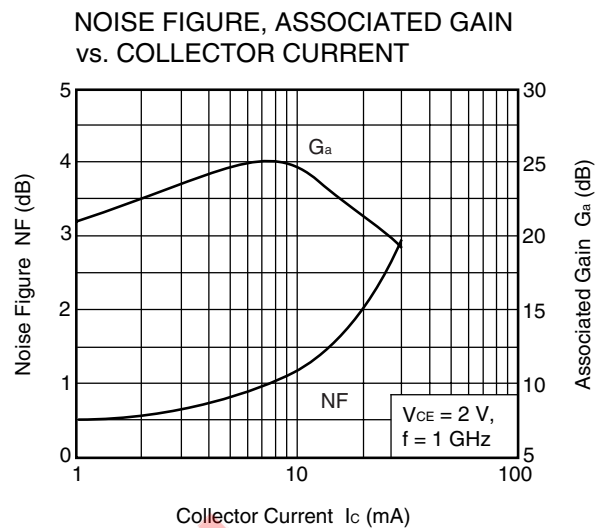
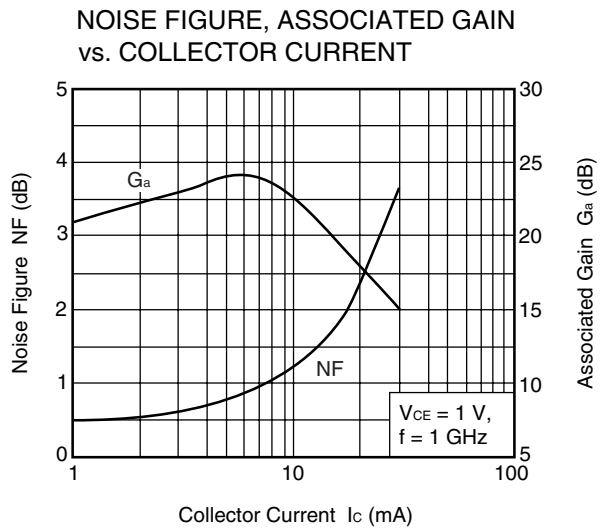
OUTPUT POWER, COLLECTOR CURRENT vs. INPUT POWER



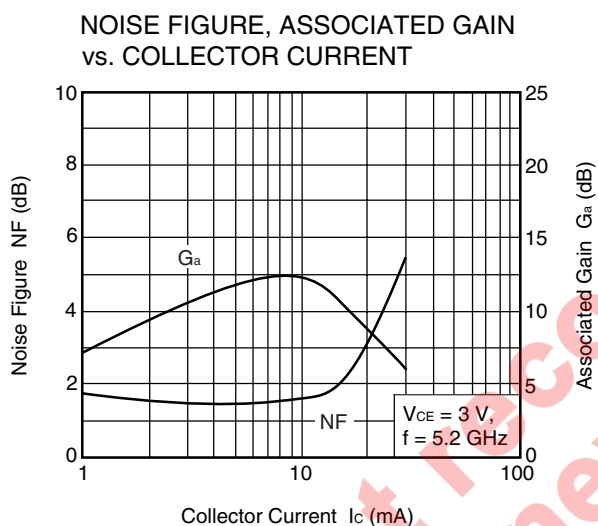
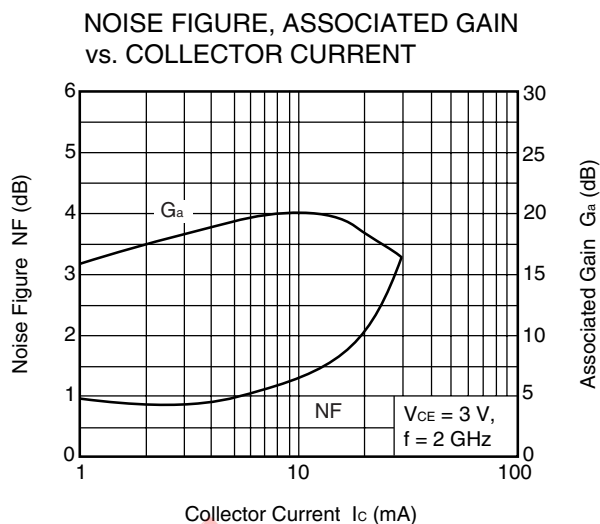
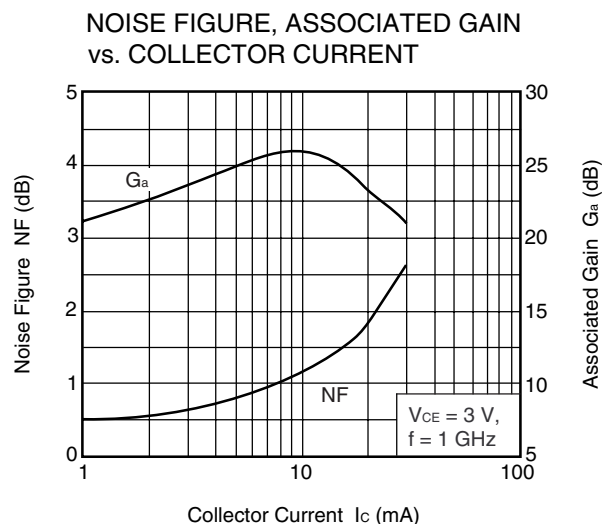
OUTPUT POWER, COLLECTOR CURRENT vs. INPUT POWER



Remark The graphs indicate nominal characteristics.



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<R> S-PARAMETERS

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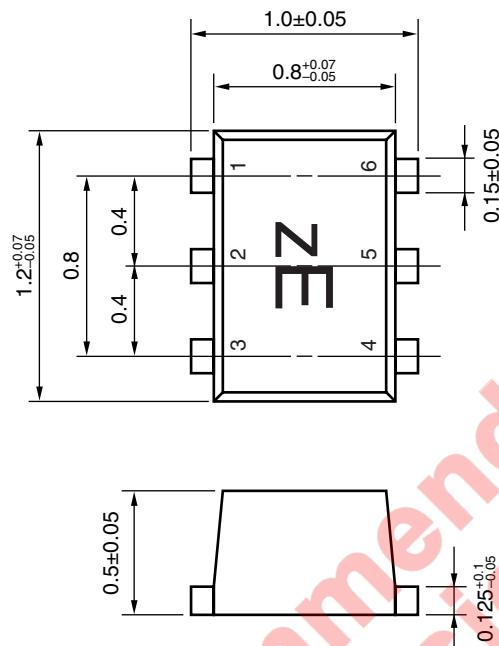
Click here to download S-parameters.

[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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 - "Specific": Aircraft, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems and medical equipment for life support, etc.

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(Note)

- (1) "NEC Electronics" as used in this statement means NEC Electronics Corporation and also includes its majority-owned subsidiaries.
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