

To our customers,

Old Company Name in Catalogs and Other Documents

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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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Not recommended
for new design

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NPN SILICON GERMANIUM RF TRANSISTOR
NESG3031M05

NPN SiGe RF TRANSISTOR FOR
 LOW NOISE, HIGH-GAIN AMPLIFICATION
 FLAT-LEAD 4-PIN THIN-TYPE SUPER MINIMOLD (M05, 2012 PKG)

FEATURES

- The device is an ideal choice for low noise, high-gain amplification
 NF = 0.6 dB TYP., $G_a = 16.0$ dB TYP. @ $V_{CE} = 2$ V, $I_c = 6$ mA, $f = 2.4$ GHz
 NF = 0.95 dB TYP., $G_a = 10.0$ dB TYP. @ $V_{CE} = 2$ V, $I_c = 6$ mA, $f = 5.2$ GHz
 NF = 1.1 dB TYP., $G_a = 9.5$ dB TYP. @ $V_{CE} = 2$ V, $I_c = 6$ mA, $f = 5.8$ GHz
- Maximum stable power gain: MSG = 14.0 dB TYP. @ $V_{CE} = 3$ V, $I_c = 20$ mA, $f = 5.8$ GHz
- SiGe HBT technology (UHS3) adopted: $f_{max} = 110$ GHz
- Flat-lead 4-pin thin-type super minimold (M05, 2012 PKG)

<R> **ORDERING INFORMATION**

Part Number	Order Number	Package	Quantity	Supplying Form
NESG3031M05	NESG3031M05-A	Flat-lead 4-pin thin-type super minimold (M05, 2012 PKG) (Pb-Free)	50 pcs (Non reel)	<ul style="list-style-type: none"> 8 mm wide embossed taping Pin 3 (Collector), Pin 4 (Emitter) face the perforation side of the tape
NESG3031M05-T1	NESG3031M05-T1-A		3 kpcs/reel	

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}	12.0	V
Collector to Emitter Voltage	V_{CEO}	4.3	V
Emitter to Base Voltage	V_{EBO}	1.5	V
Collector Current	I_c	35	mA
Total Power Dissipation	P_{tot}^{Note}	150	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 PWB

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 = 6 mA	220	300	380	–
RF Characteristics						
Insertion Power Gain	S _{21e} ²	V _{CE} = 3 V, I _C = 20 mA, f = 5.8 GHz	6.0	8.5	–	dB
Noise Figure (1)	NF	V _{CE} = 2 V, I _C = 6 mA, f = 2.4 GHz, Z _S = Z _{Sopt} , Z _L = Z _{Lopt}	–	0.6	–	dB
Noise Figure (2)	NF	V _{CE} = 2 V, I _C = 6 mA, f = 5.2 GHz, Z _S = Z _{Sopt} , Z _L = Z _{Lopt}	–	0.95	–	dB
Noise Figure (3)	NF	V _{CE} = 2 V, I _C = 6 mA, f = 5.8 GHz, Z _S = Z _{Sopt} , Z _L = Z _{Lopt}	–	1.1	1.5	dB
Associated Gain (1)	G _a	V _{CE} = 2 V, I _C = 6 mA, f = 2.4 GHz, Z _S = Z _{Sopt} , Z _L = Z _{Lopt}	–	16.0	–	dB
Associated Gain (2)	G _a	V _{CE} = 2 V, I _C = 6 mA, f = 5.2 GHz, Z _S = Z _{Sopt} , Z _L = Z _{Lopt}	–	10.0	–	dB
Associated Gain (3)	G _a	V _{CE} = 2 V, I _C = 6 mA, f = 5.8 GHz, Z _S = Z _{Sopt} , Z _L = Z _{Lopt}	7.5	9.5	–	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 = 5.8 GHz	11.0	14.0	–	dB
Gain 1 dB Compression Output Power	P _O (1 dB)	V _{CE} = 3 V, I _C (set) = 20 mA, f = 5.8 GHz, Z _S = Z _{Sopt} , Z _L = Z _{Lopt}	–	13.0	–	dBm
Output 3rd Order Intercept Point	OIP ₃	V _{CE} = 3 V, I _C (set) = 20 mA, f = 5.8 GHz, Z _S = Z _{Sopt} , Z _L = Z _{Lopt}	–	18.0	–	dBm

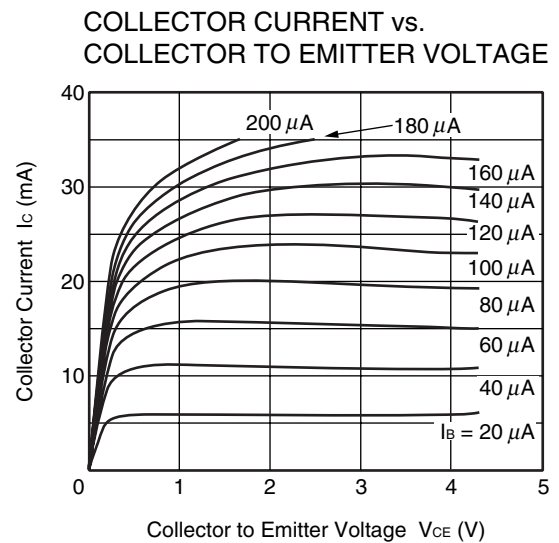
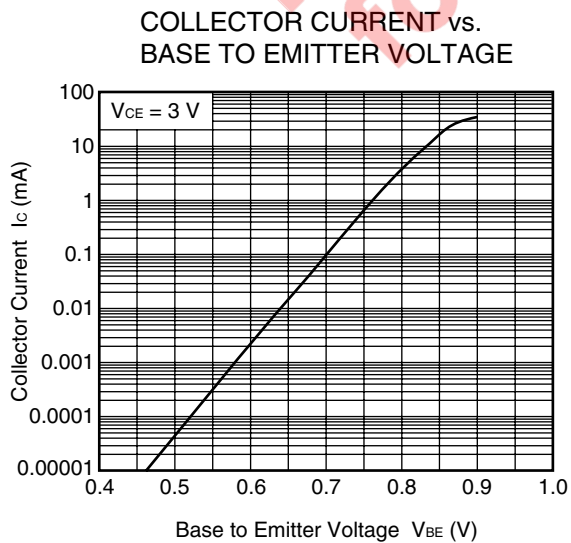
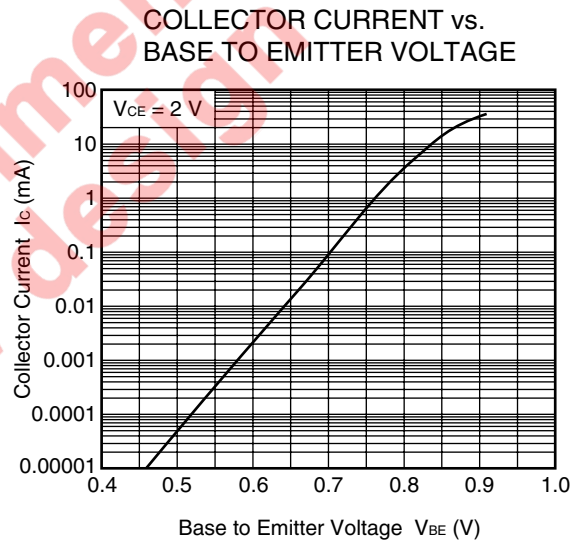
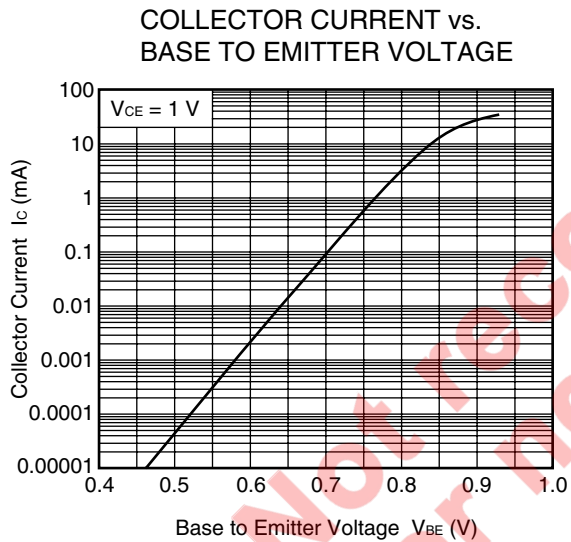
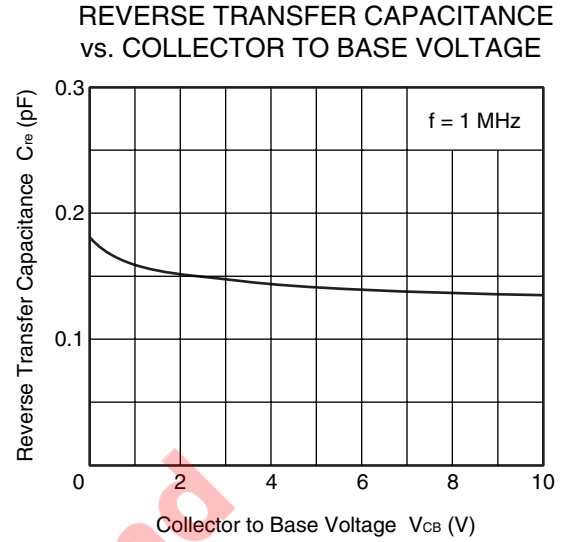
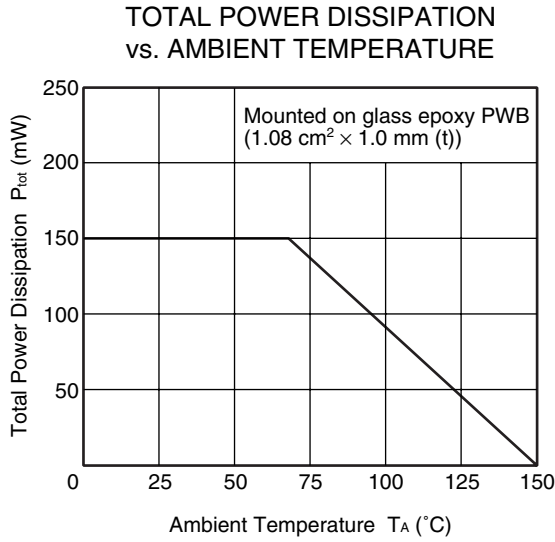
- Notes** 1. Pulse measurement: PW ≤ 350 μs, Duty Cycle ≤ 2%
 2. Collector to base capacitance when the emitter grounded

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

h_{FE} CLASSIFICATION

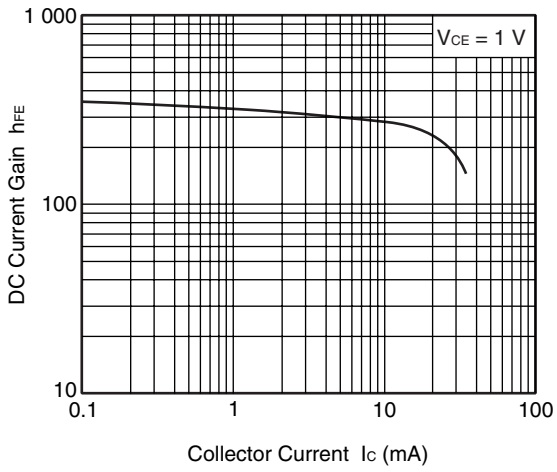
Rank	FB
Marking	T1K
h _{FE} Value	220 to 380

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

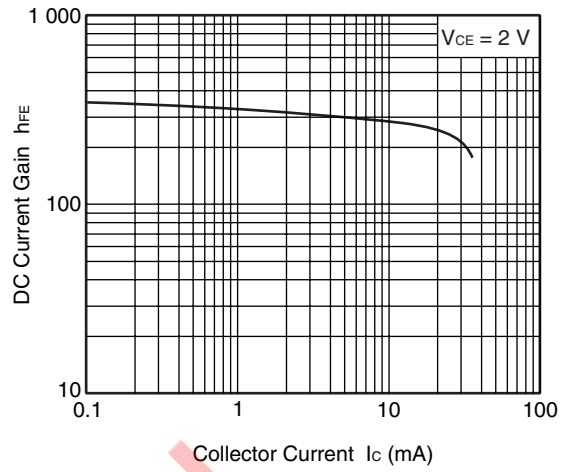


Remark The graphs indicate nominal characteristics.

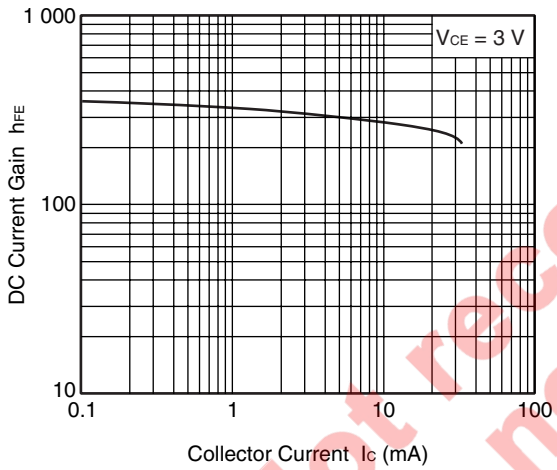
DC CURRENT GAIN vs. COLLECTOR CURRENT



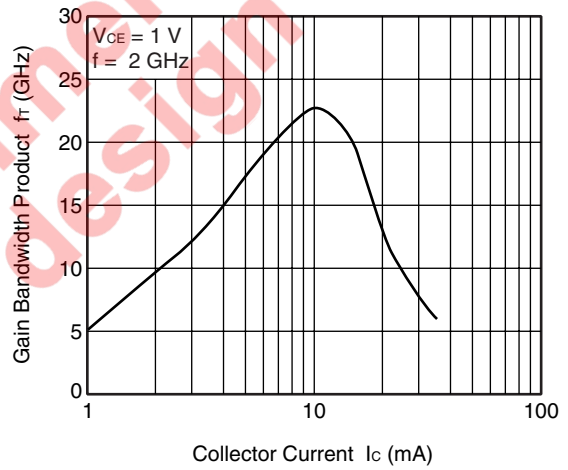
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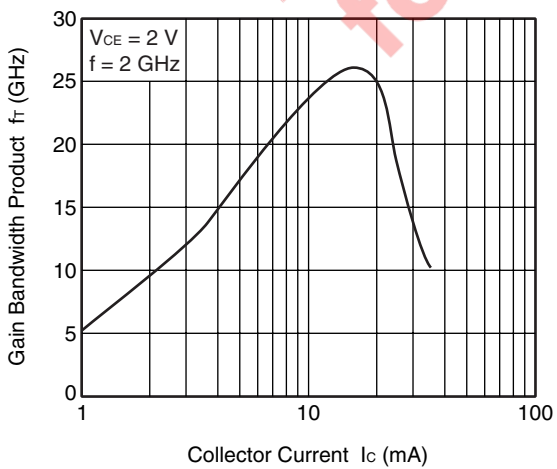
DC CURRENT GAIN vs. COLLECTOR CURRENT



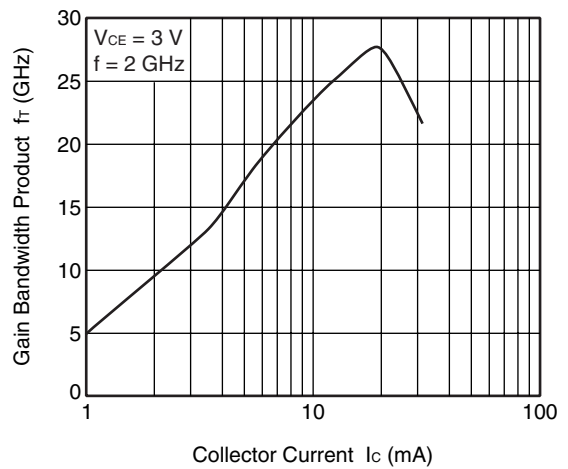
GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT



GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT

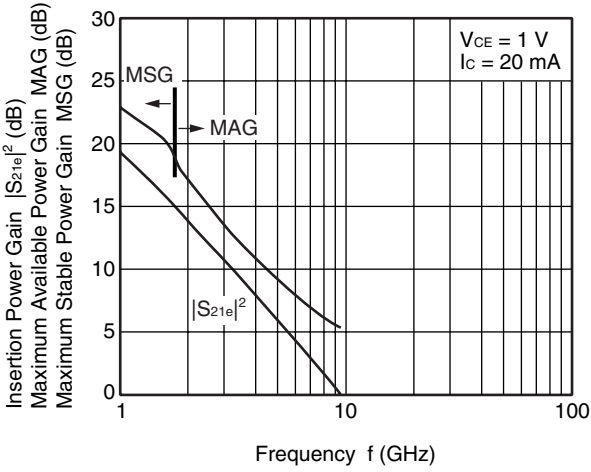


GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT

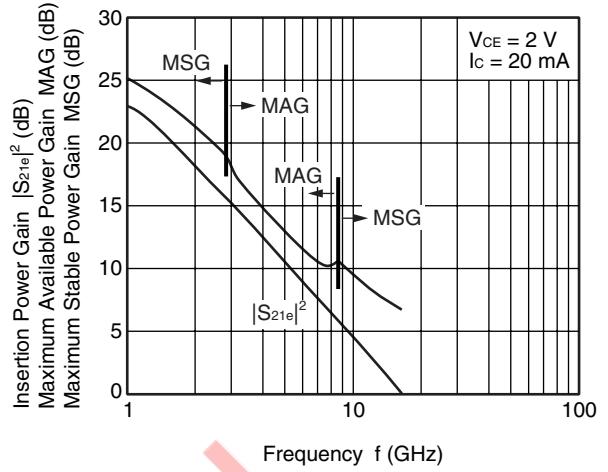


Remark The graphs indicate nominal characteristics.

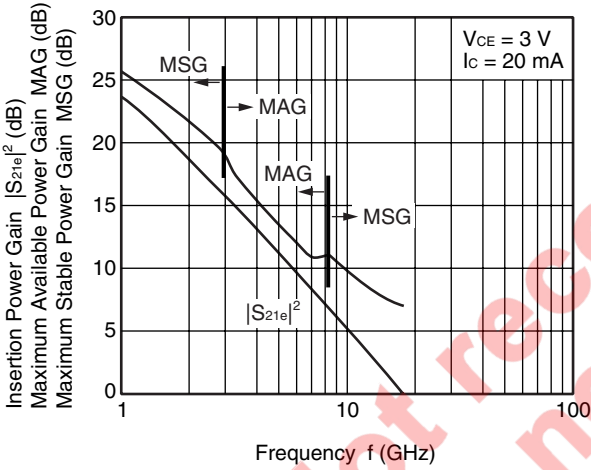
INSERTION POWER GAIN, MAG, MSG vs. FREQUENCY



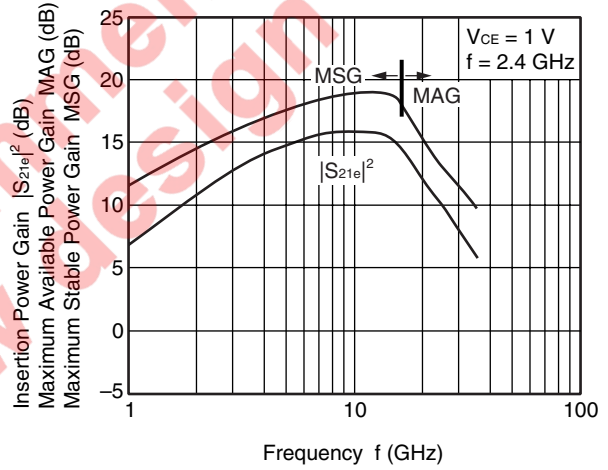
INSERTION POWER GAIN, MAG, MSG vs. FREQUENCY



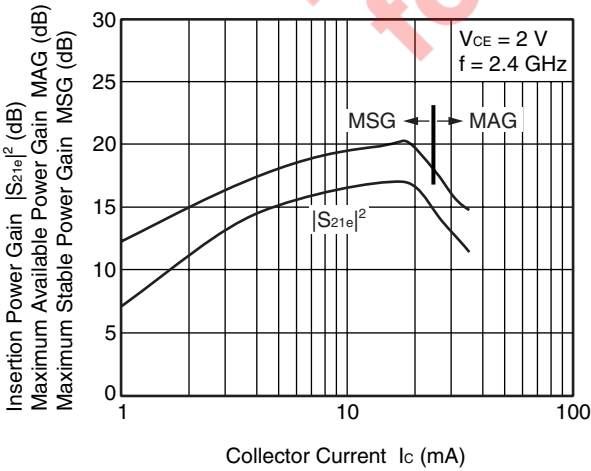
INSERTION POWER GAIN, MAG, MSG vs. FREQUENCY



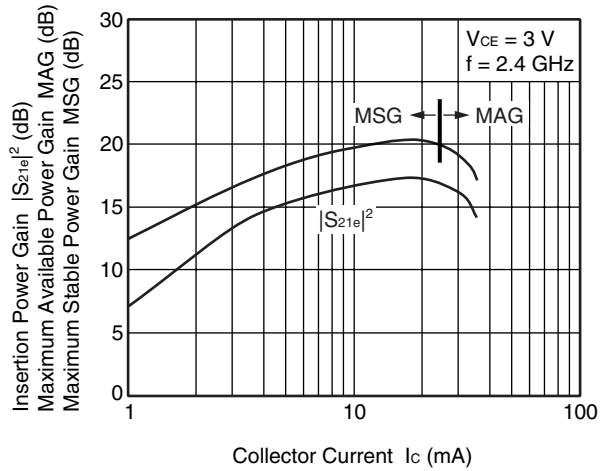
INSERTION POWER GAIN, MAG, MSG vs. FREQUENCY



INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT

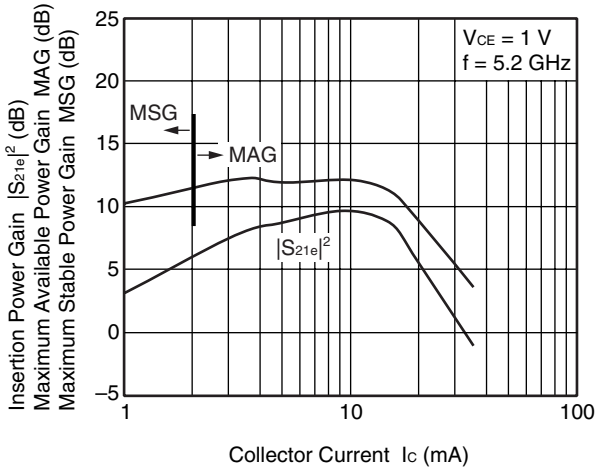


INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT

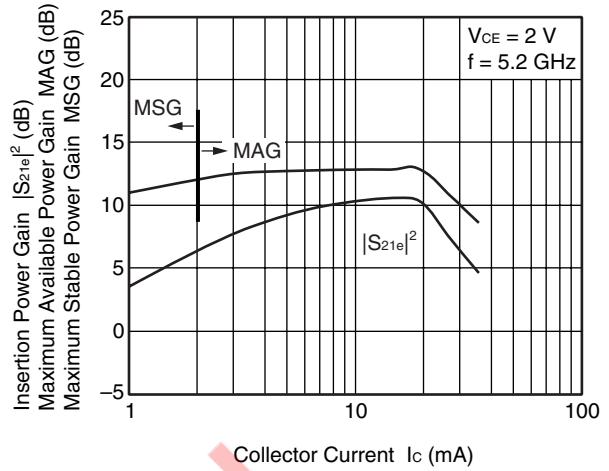


Remark The graphs indicate nominal characteristics.

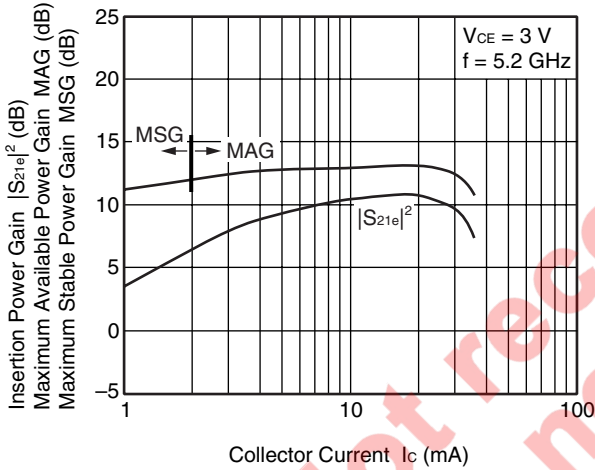
INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT



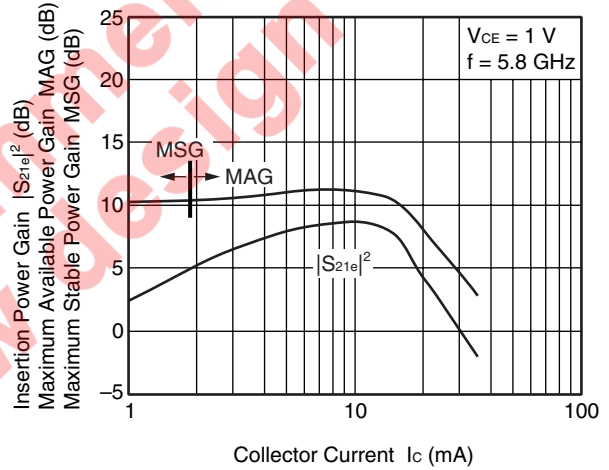
INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT



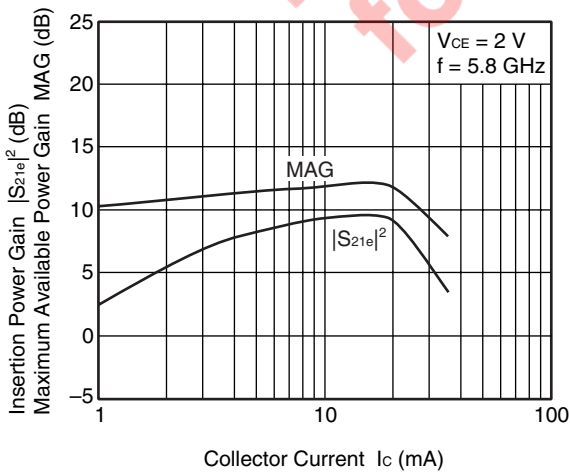
INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT



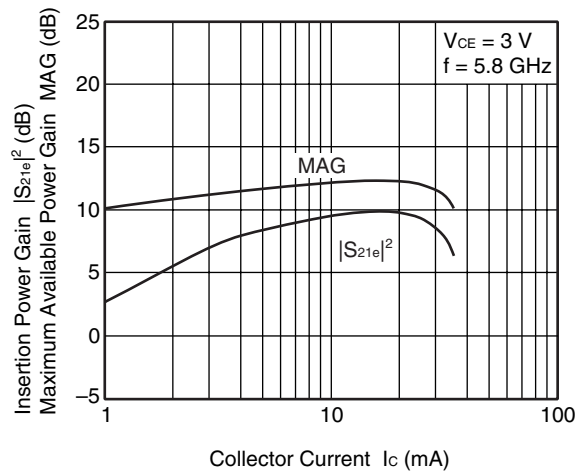
INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT



INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT

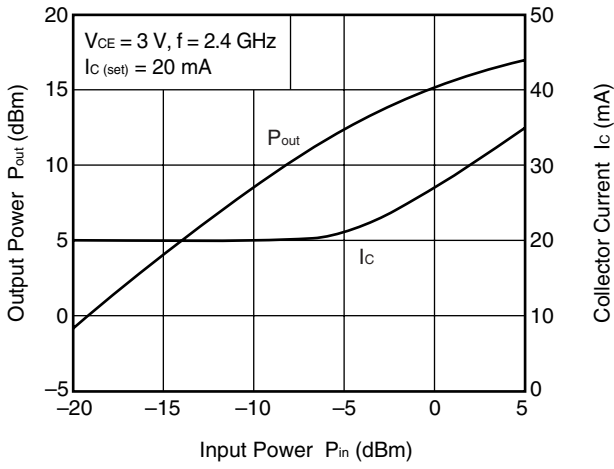


INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT

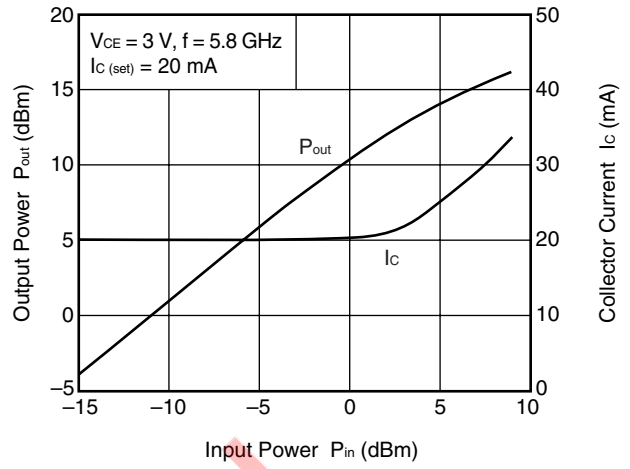


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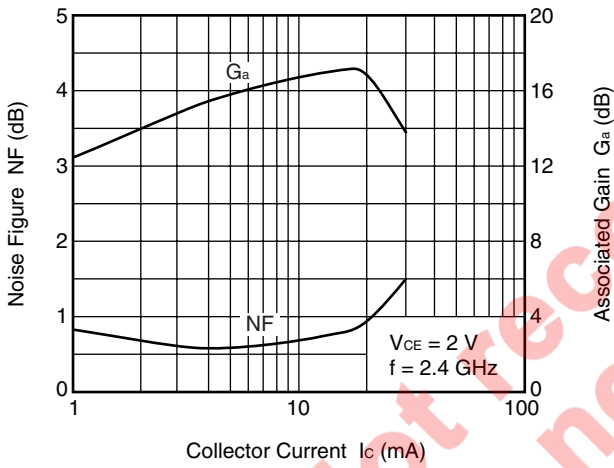
OUTPUT POWER, COLLECTOR CURRENT vs. INPUT POWER



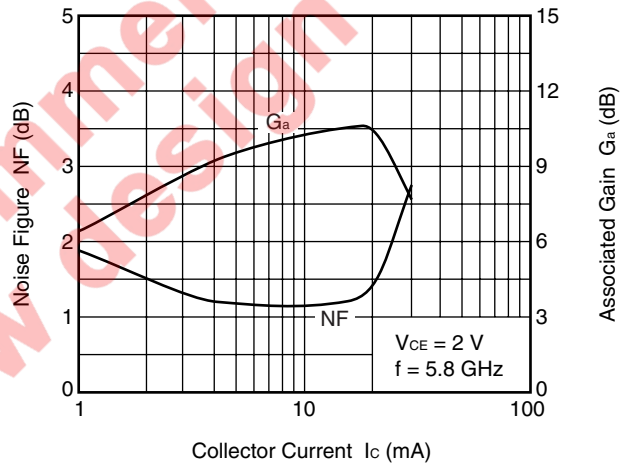
OUTPUT POWER, COLLECTOR CURRENT vs. INPUT POWER



NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



Remark The graphs indicate nominal characteristics.

<R> S-PARAMETERS

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Click here to download S-parameters.

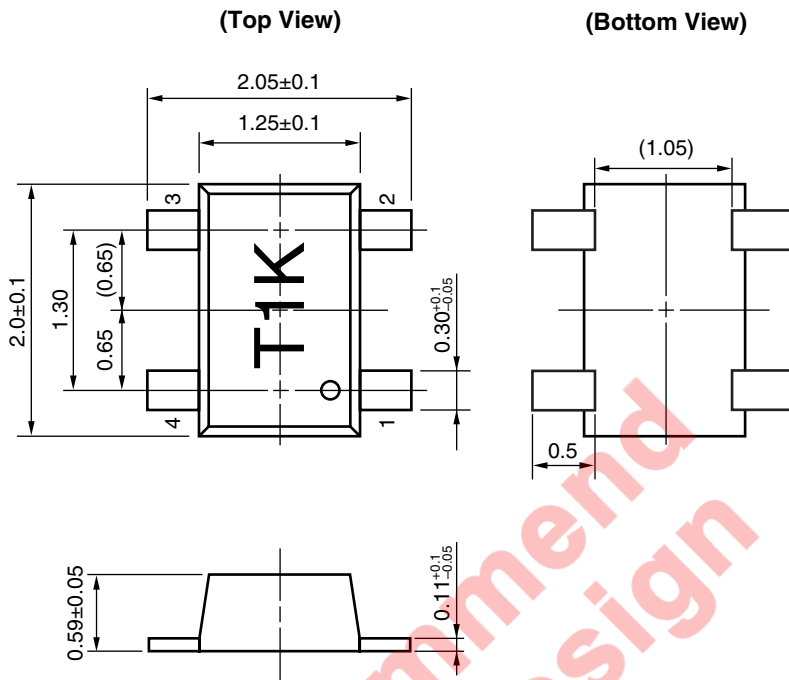
[RF and Microwave] → [Device Parameters]

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

**Not recommend
for new design**

<R> PACKAGE DIMENSIONS

FLAT-LEAD 4-PIN THIN-TYPE SUPER MINIMOLD (M05, 2012 PKG) (UNIT: mm)



PIN CONNECTIONS

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

Remark () : Reference value

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