



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

Remark To order evaluation samples, contact your nearby sales office.
Unit sample quantity is 50 pcs.

ABSOLUTE MAXIMUM RATINGS ($T_A = +25^{\circ}\text{C}$)

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

The information in this document is subject to change without notice. Before using this document, please confirm that this is the latest version.

ELECTRICAL CHARACTERISTICS ($T_A = +25^\circ\text{C}$)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
DC Characteristics						
Collector Cut-off Current	I_{CBO}	$V_{CB} = 5\text{ V}, I_E = 0\text{ mA}$	–	–	100	nA
Emitter Cut-off Current	I_{EBO}	$V_{EB} = 1\text{ V}, I_C = 0\text{ mA}$	–	–	100	nA
DC Current Gain	h_{FE} ^{Note 1}	$V_{CE} = 2\text{ V}, I_C = 5\text{ mA}$	130	190	260	–
RF Characteristics						
Gain Bandwidth Product	f_T	$V_{CE} = 3\text{ V}, I_C = 10\text{ mA}, f = 2\text{ GHz}$	20	25	–	GHz
Insertion Power Gain	$ S_{21e} ^2$	$V_{CE} = 3\text{ V}, I_C = 10\text{ mA}, f = 2\text{ GHz}$	17.0	19.0	–	dB
Noise Figure (1)	NF	$V_{CE} = 2\text{ V}, I_C = 3\text{ mA}, f = 2\text{ GHz}, Z_S = Z_{Sopt}, Z_L = Z_{Lopt}$	–	0.9	1.2	dB
Noise Figure (2)	NF	$V_{CE} = 2\text{ V}, I_C = 3\text{ mA}, f = 5.2\text{ GHz}, Z_S = Z_{Sopt}, Z_L = Z_{Lopt}$	–	1.3	–	dB
Associated Gain (1)	G_a	$V_{CE} = 2\text{ V}, I_C = 3\text{ mA}, f = 2\text{ GHz}, Z_S = Z_{Sopt}, Z_L = Z_{Lopt}$	15.0	18.0	–	dB
Associated Gain (2)	G_a	$V_{CE} = 2\text{ V}, I_C = 3\text{ mA}, f = 5.2\text{ GHz}, Z_S = Z_{Sopt}, Z_L = Z_{Lopt}$	–	10.0	–	dB
Reverse Transfer Capacitance	C_{re} ^{Note 2}	$V_{CB} = 2\text{ V}, I_E = 0\text{ mA}, f = 1\text{ MHz}$	–	0.1	0.2	pF
Maximum Stable Power Gain	MSG ^{Note 3}	$V_{CE} = 3\text{ V}, I_C = 10\text{ mA}, f = 2\text{ GHz}$	20.0	22.5	–	dB
Gain 1 dB Compression Output Power	$P_{O(1\text{ dB})}$	$V_{CE} = 3\text{ V}, I_C = 12\text{ mA}, f = 2\text{ GHz}, Z_S = Z_{Sopt}, Z_L = Z_{Lopt}$	–	9.0	–	dBm
3rd Order Intermodulation Distortion Output Intercept Point	OIP_3	$V_{CE} = 3\text{ V}, I_C = 12\text{ mA}, f = 2\text{ GHz}, Z_S = Z_{Sopt}, Z_L = Z_{Lopt}$	–	17.0	–	dBm

Notes 1. Pulse measurement: $PW \leq 350\text{ }\mu\text{s}$, Duty Cycle $\leq 2\%$

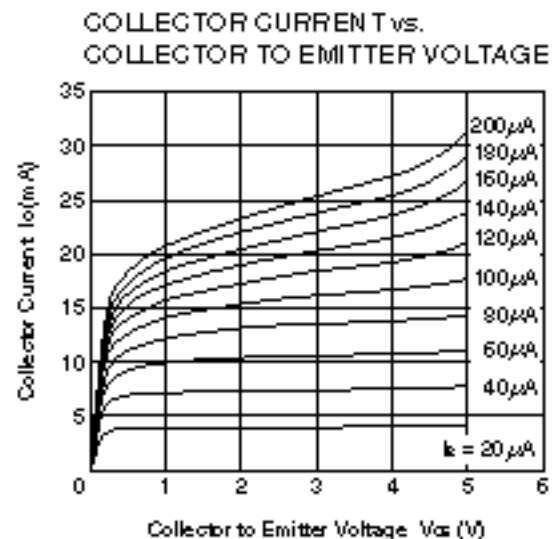
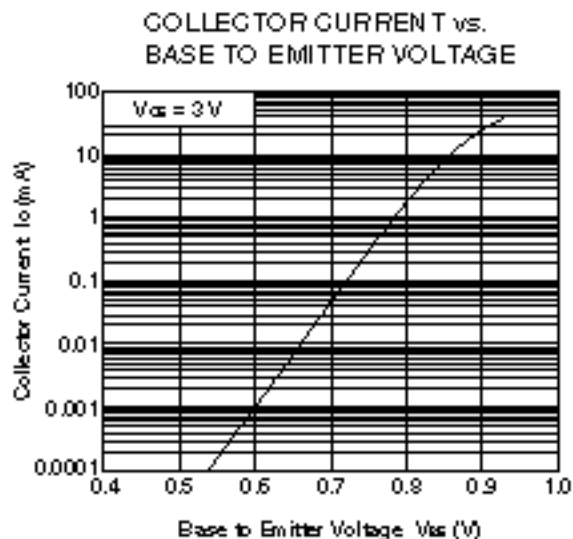
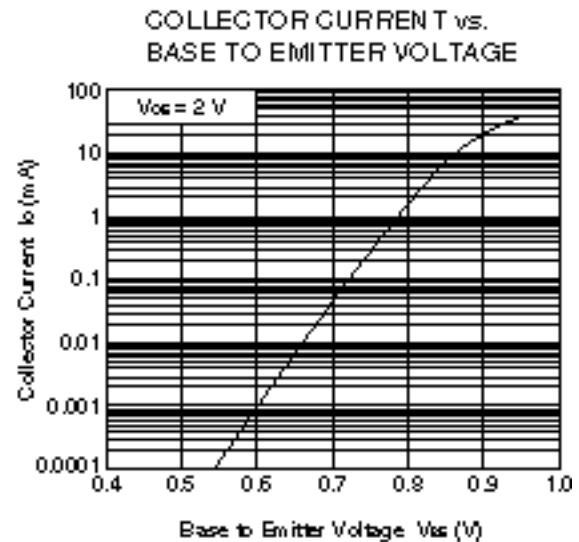
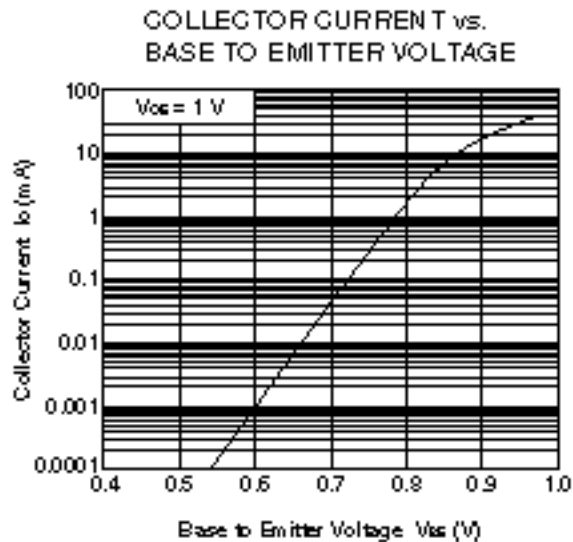
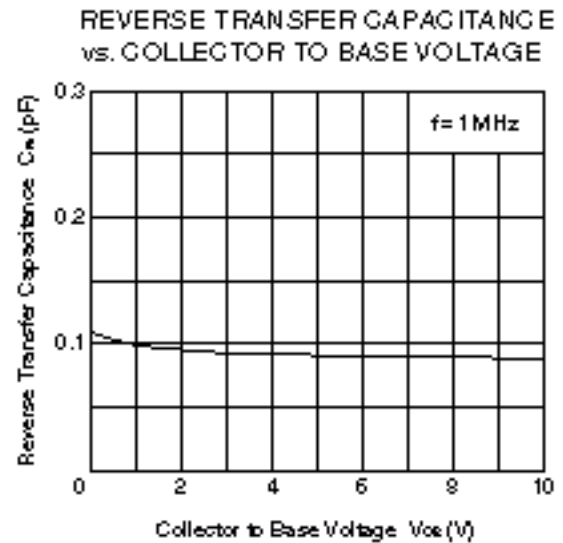
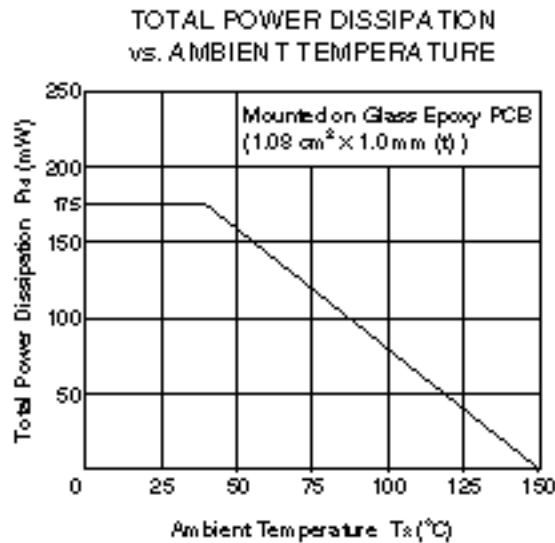
2. Collector to base capacitance when the emitter grounded

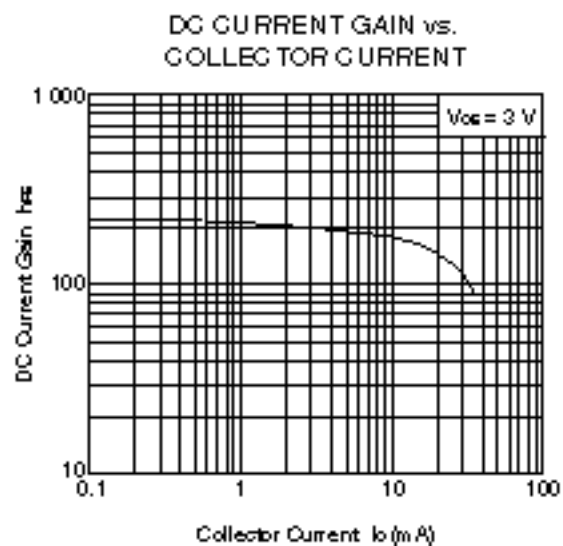
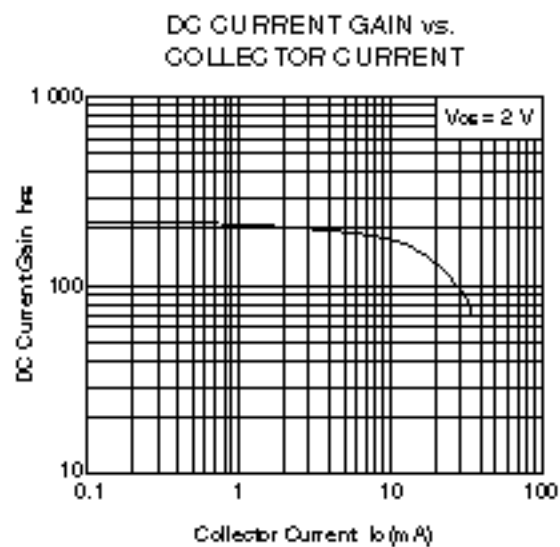
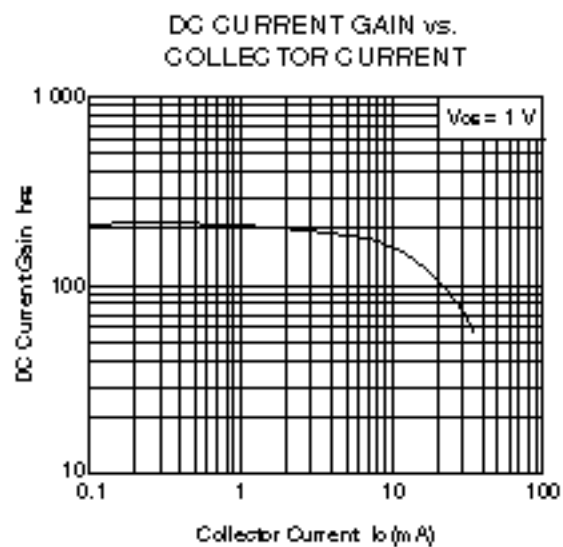
$$3. \text{ MSG} = \left| \frac{S_{21}}{S_{12}} \right|$$

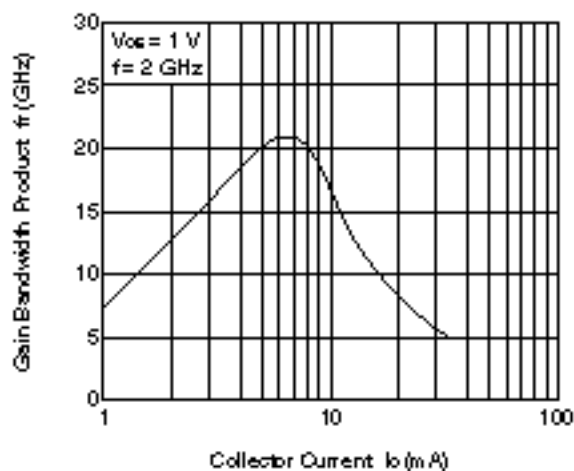
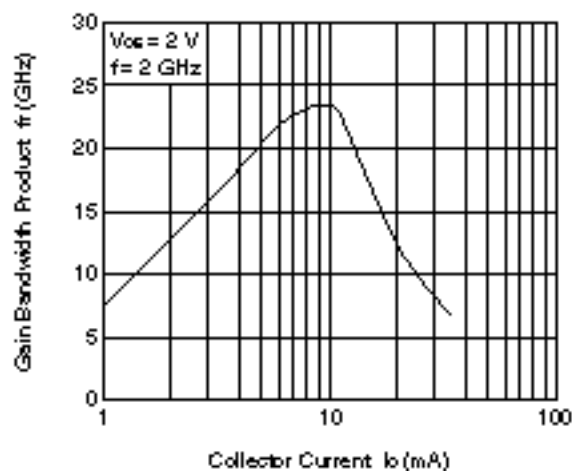
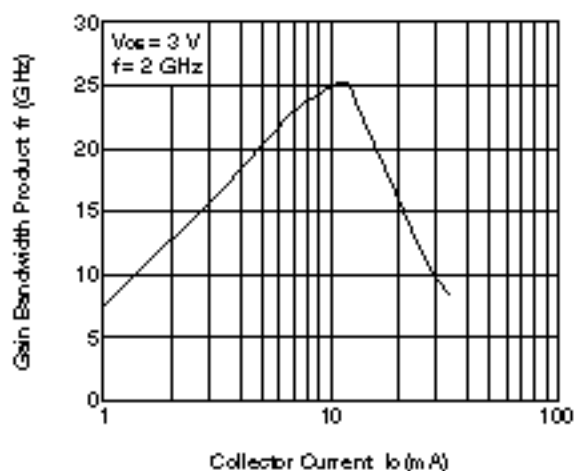
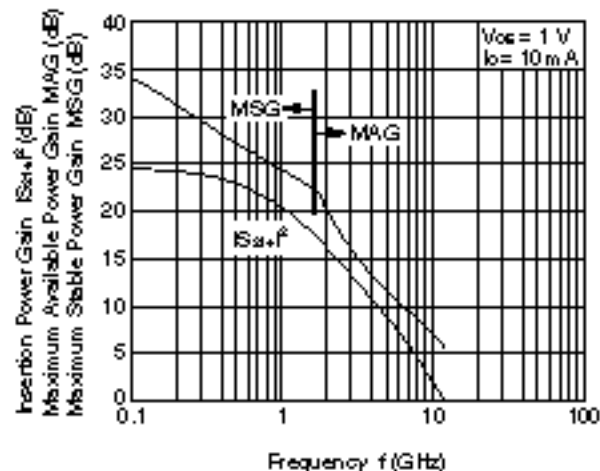
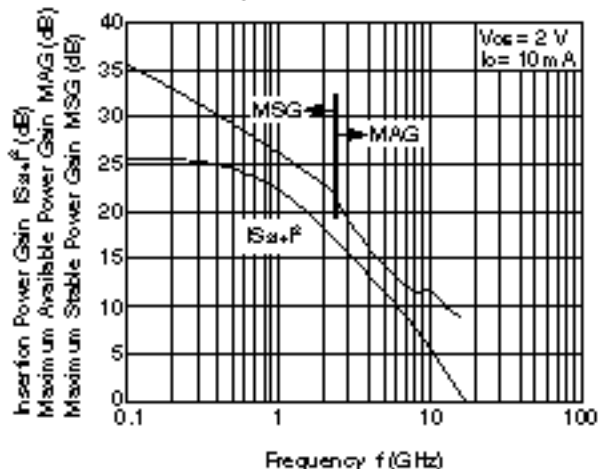
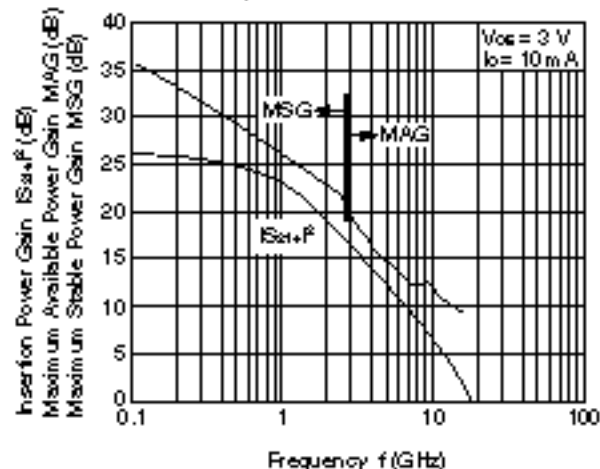
 h_{FE} CLASSIFICATION

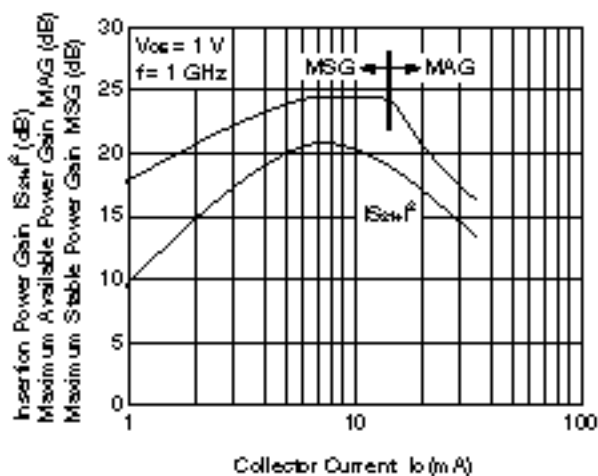
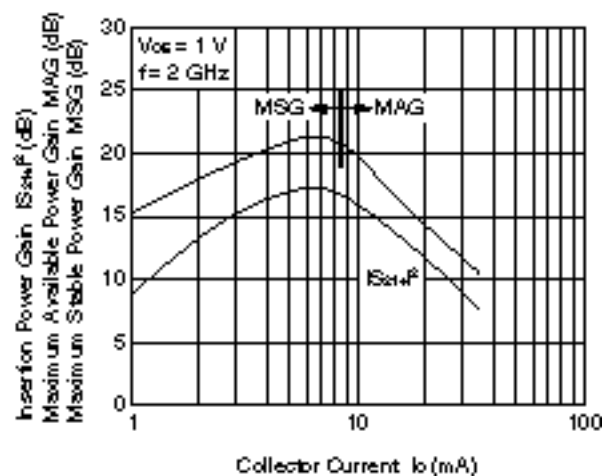
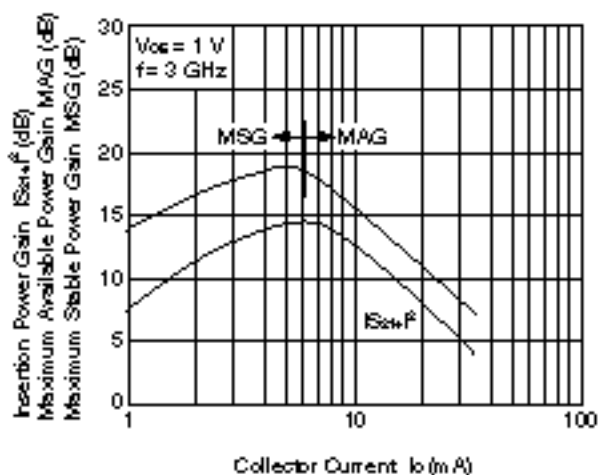
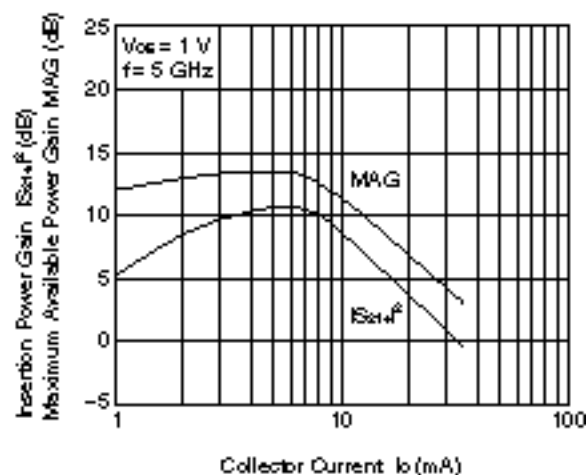
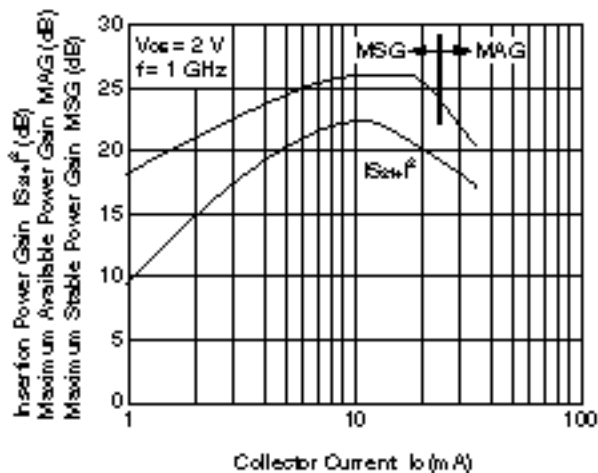
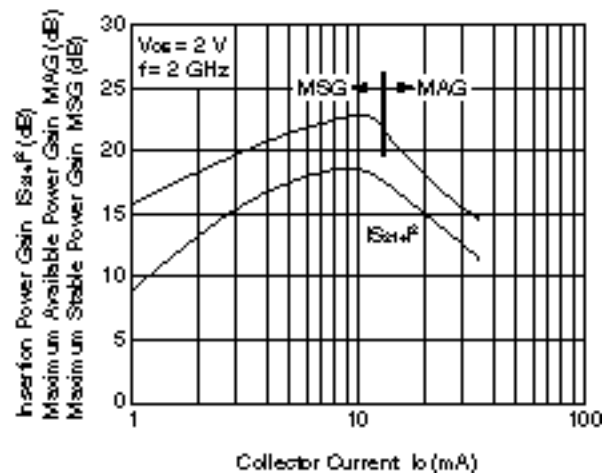
Rank	FB
Marking	T1G
h_{FE} Value	130 to 260

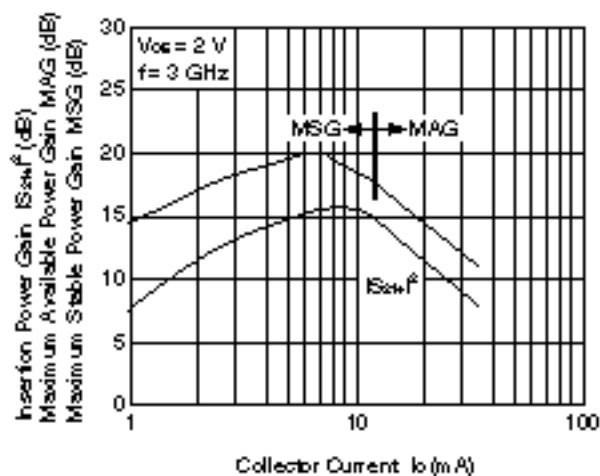
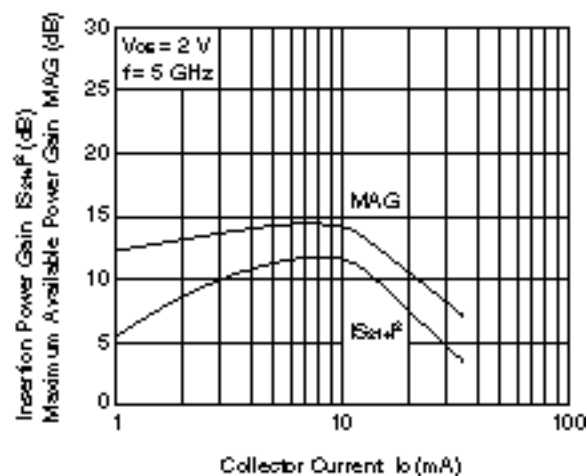
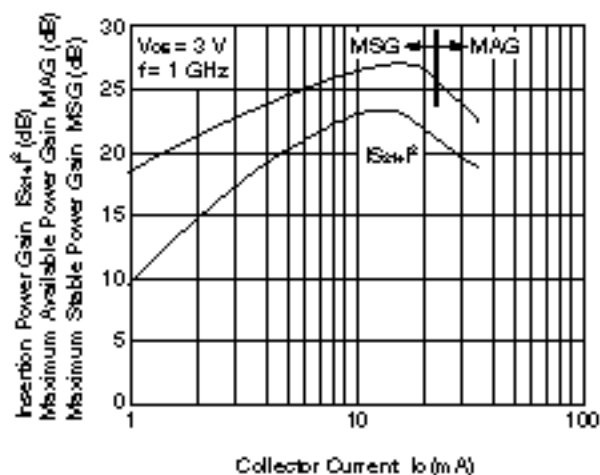
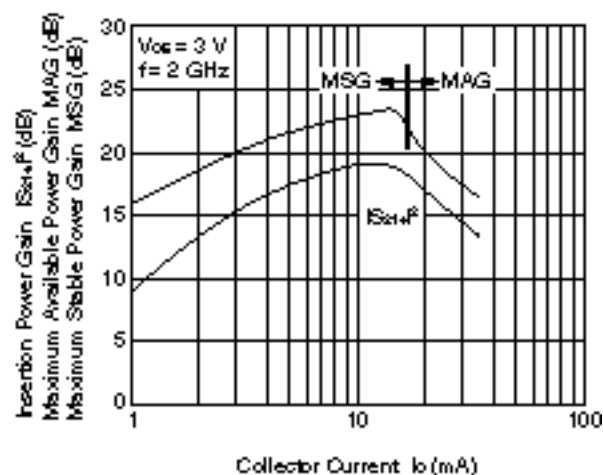
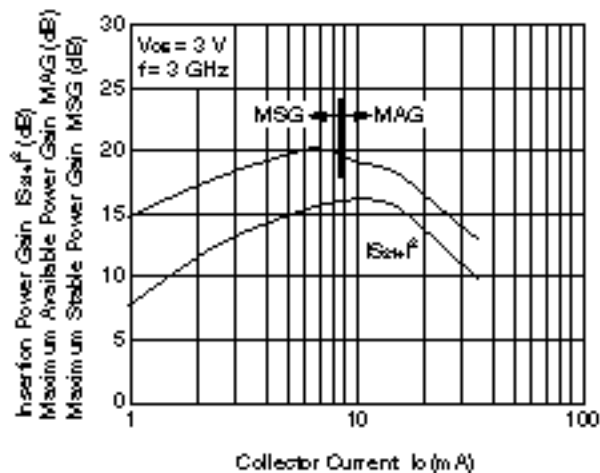
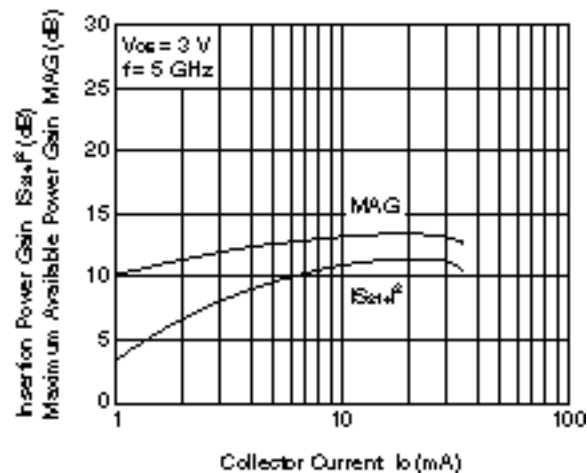
• TYPICAL CHARACTERISTICS ($T_A = +25^\circ\text{C}$, unless otherwise specified)

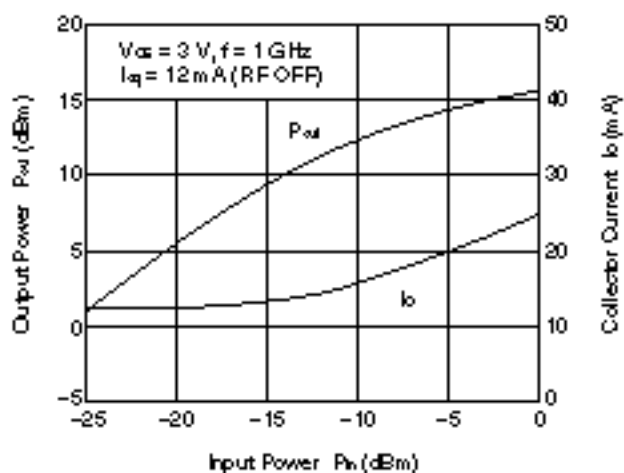
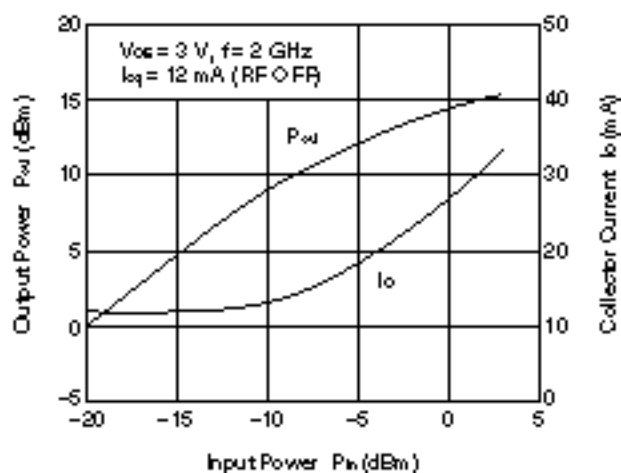
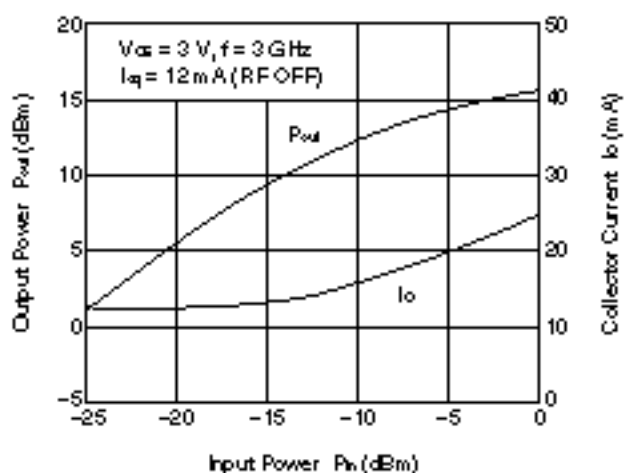
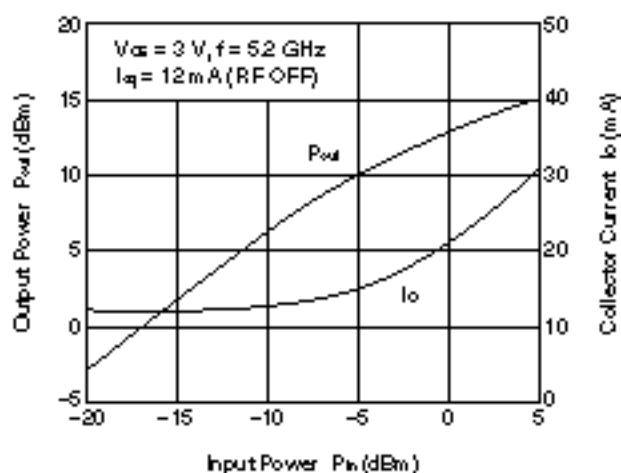


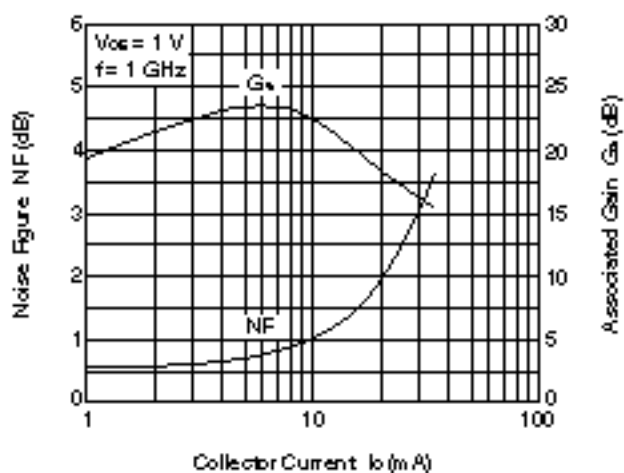
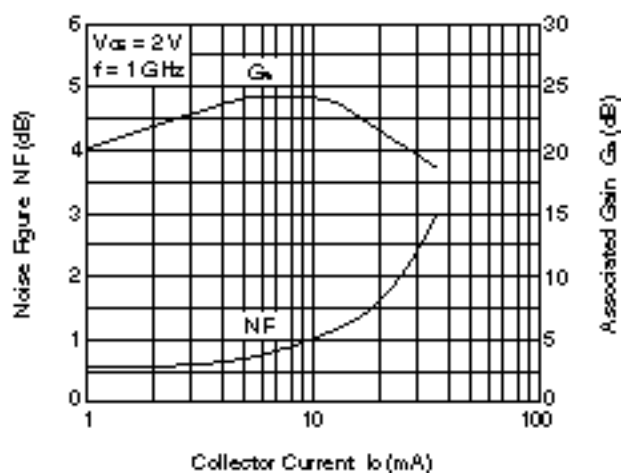
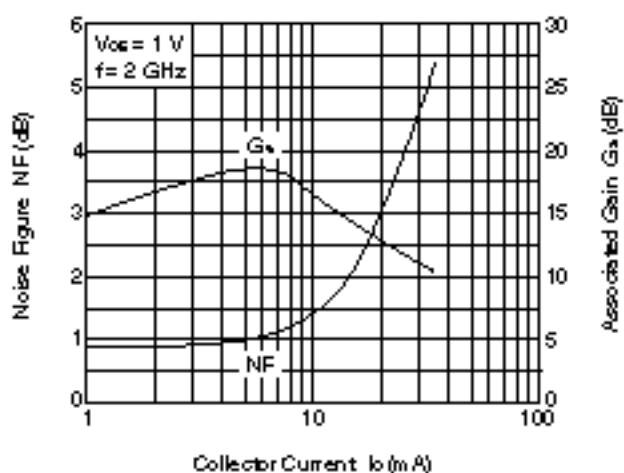
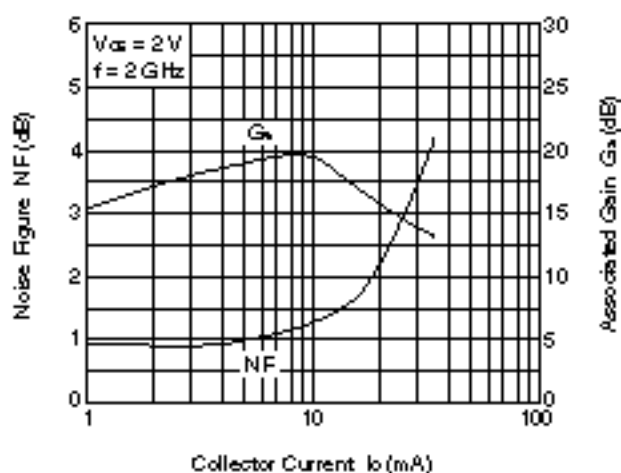
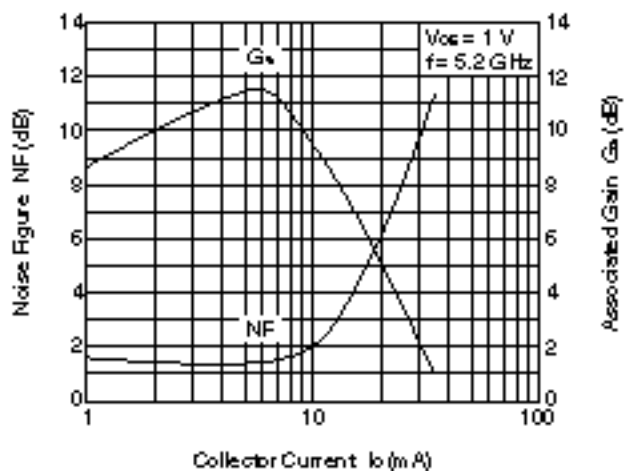
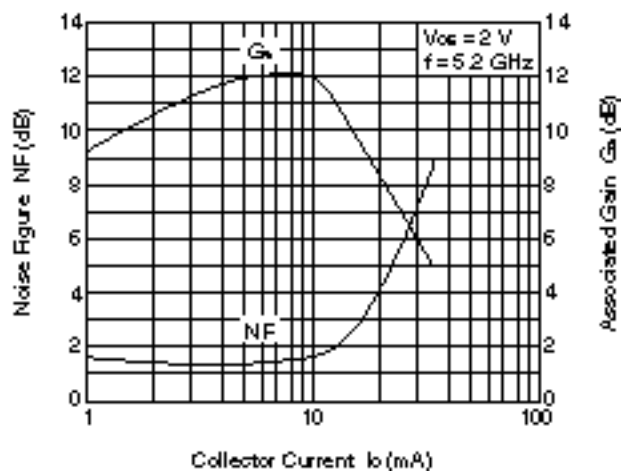


GAIN BANDWIDTH PRODUCT
vs. COLLECTOR CURRENTGAIN BANDWIDTH PRODUCT
vs. COLLECTOR CURRENTGAIN BANDWIDTH PRODUCT
vs. COLLECTOR CURRENTINSERTION POWER GAIN,
MAG, MSG vs. FREQUENCYINSERTION POWER GAIN,
MAG, MSG vs. FREQUENCYINSERTION POWER GAIN,
MAG, MSG vs. FREQUENCY

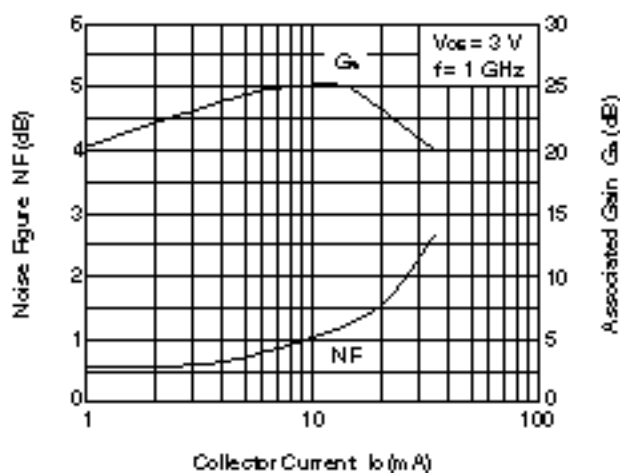
INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENTINSERTION POWER GAIN, MAG, MSG
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vs. COLLECTOR CURRENTINSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENTINSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT

INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENTINSERTION POWER GAIN, MAG
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vs. COLLECTOR CURRENT

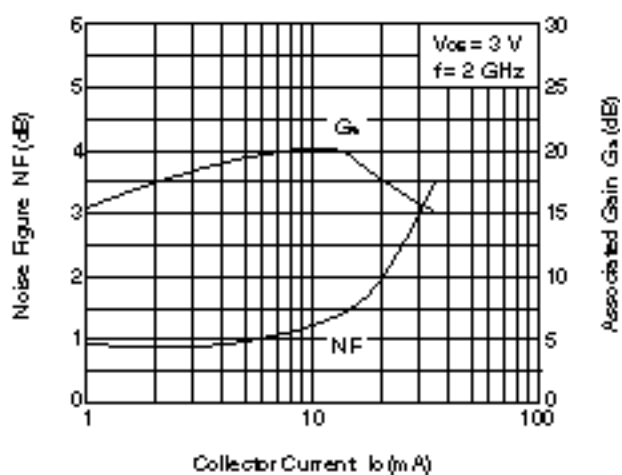
OUTPUT POWER, COLLECTOR
CURRENT vs. INPUT POWEROUTPUT POWER, COLLECTOR
CURRENT vs. INPUT POWEROUTPUT POWER, COLLECTOR
CURRENT vs. INPUT POWEROUTPUT POWER, COLLECTOR
CURRENT vs. INPUT POWER

NOISE FIGURE, ASSOCIATED GAIN
vs. COLLECTOR CURRENTNOISE FIGURE, ASSOCIATED GAIN
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vs. COLLECTOR CURRENTNOISE FIGURE, ASSOCIATED GAIN
vs. COLLECTOR CURRENT

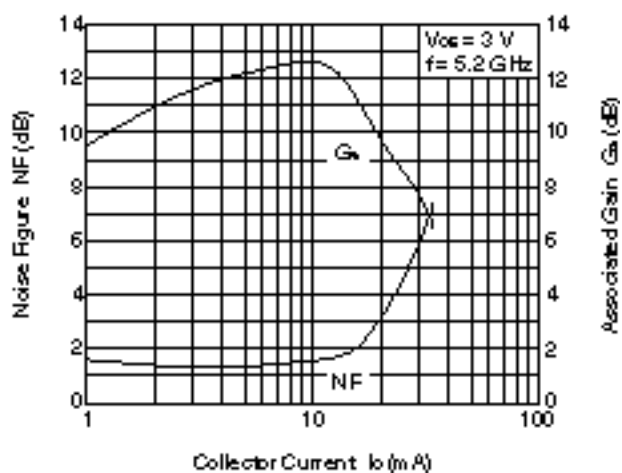
NOISE FIGURE, ASSOCIATED GAIN
vs. COLLECTOR CURRENT



NOISE FIGURE, ASSOCIATED GAIN
vs. COLLECTOR CURRENT



NOISE FIGURE, ASSOCIATED GAIN
vs. COLLECTOR CURRENT



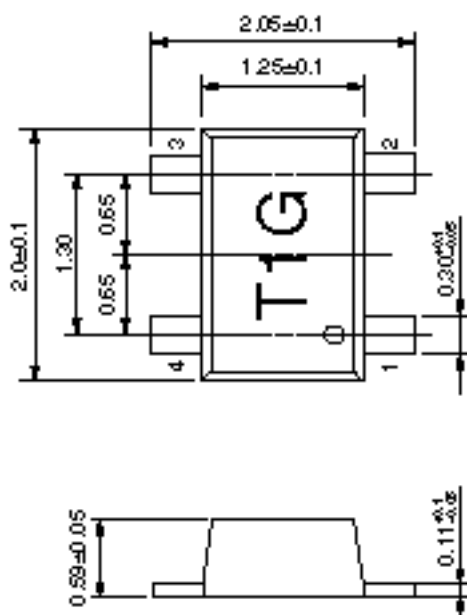
Remark The graphs indicate nominal characteristics.

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

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



PIN CONNECTIONS

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