

# NPN SILICON GERMANIUM RF TRANSISTOR 2SC5761

### NPN SiGe RF TRANSISTOR FOR LOW NOISE · HIGH-GAIN AMPLIFICATION FLAT-LEAD 4-PIN THIN-TYPE SUPER MINIMOLD (M04)

#### FEATURES

- Ideal for low noise · high-gain amplification
- ★ NF = 0.9 dB TYP. @  $V_{CE} = 2\text{ V}$ ,  $I_C = 5\text{ mA}$ ,  $f = 2\text{ GHz}$
- Maximum stable power gain: MSG = 20.0 dB TYP. @  $V_{CE} = 2\text{ V}$ ,  $I_C = 20\text{ mA}$ ,  $f = 2\text{ GHz}$
- SiGe technology ( $f_T = 60\text{ GHz}$ ,  $f_{max} = 60\text{ GHz}$ )
- Flat-lead 4-pin thin-type super minimold (M04) package

#### ORDERING INFORMATION

Part Number	Quantity	Supplying Form
2SC5761	50 pcs (Non reel)	• 8 mm wide embossed taping • Pin 1 (Emitter), Pin 2 (Collector) face the perforation side of the tape
2SC5761-T2	3 kpcs/reel	

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

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

Parameter	Symbol	Ratings	Unit
Collector to Base Voltage	$V_{CBO}$	8.0	V
Collector to Emitter Voltage	$V_{CEO}$	2.3	V
Emitter to Base Voltage	$V_{EBO}$	1.2	V
Collector Current	$I_C$	35	mA
Total Power Dissipation	$P_{tot}$ <sup>Note</sup>	80	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 substrate

#### THERMAL RESISTANCE

Parameter	Symbol	Value	Unit
Junction to Case Resistance	$R_{th(j-c)}$	150	$^\circ\text{C/W}$

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

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**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = +25°C)**

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
DC Characteristics						
Collector Cut-off Current	I <sub>CBO</sub>	V <sub>CB</sub> = 5 V, I <sub>E</sub> = 0 mA	–	–	200	nA
Emitter Cut-off Current	I <sub>EBO</sub>	V <sub>BE</sub> = 0.5 V, I <sub>C</sub> = 0 mA	–	–	200	nA
DC Current Gain	h <sub>FE</sub> <sup>Note 1</sup>	V <sub>CE</sub> = 2 V, I <sub>C</sub> = 5 mA	200	–	400	–
RF Characteristics						
Insertion Power Gain	S <sub>21e</sub>   <sup>2</sup>	V <sub>CE</sub> = 2 V, I <sub>C</sub> = 20 mA, f = 2 GHz	16.0	18.0	–	dB
Noise Figure	NF	V <sub>CE</sub> = 2 V, I <sub>C</sub> = 5 mA, f = 2 GHz, Z <sub>S</sub> = Z <sub>opt</sub>	–	0.9	1.1	dB
Reverse Transfer Capacitance	C <sub>re</sub> <sup>Note 2</sup>	V <sub>CB</sub> = 2 V, I <sub>E</sub> = 0 mA, f = 1 MHz	–	0.17	0.22	pF
Maximum Stable Power Gain	MSG <sup>Note 3</sup>	V <sub>CE</sub> = 2 V, I <sub>C</sub> = 20 mA, f = 2 GHz	18.0	20.0	–	dB
Gain 1 dB Compression Output Power	P <sub>O</sub> (1 dB)	V <sub>CE</sub> = 2 V, I <sub>C</sub> = 20 mA, f = 2 GHz	–	12.0	–	dBm
3rd Order Intermodulation Distortion Output Intercept Point	OIP <sub>3</sub>	V <sub>CE</sub> = 2 V, I <sub>C</sub> = 20 mA, f = 2 GHz	–	22.0	–	dBm

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

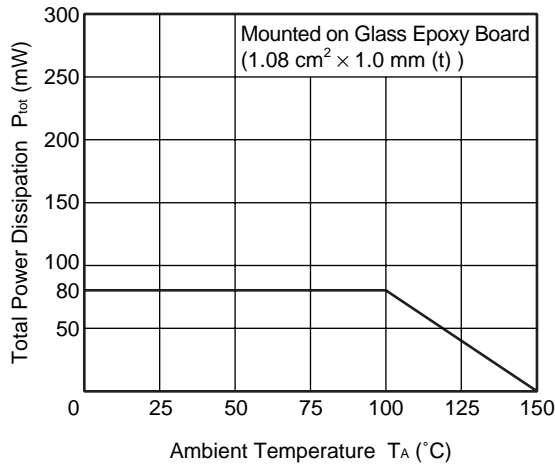
3.  $MSG = \left| \frac{S_{21}}{S_{12}} \right|$

**h<sub>FE</sub> CLASSIFICATION**

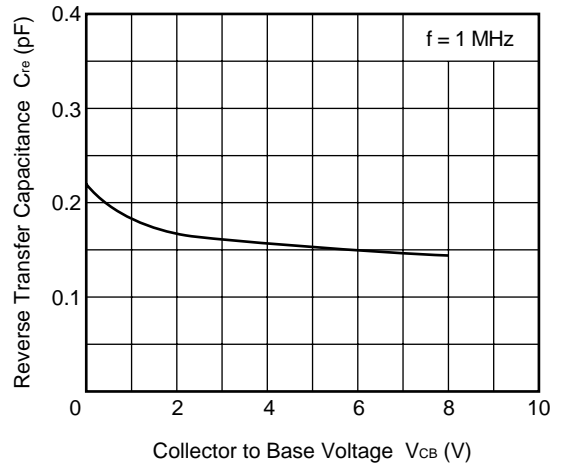
Rank	FB
Marking	T16
h <sub>FE</sub> Value	200 to 400

TYPICAL CHARACTERISTICS (T<sub>A</sub> = +25°C, unless otherwise specified)

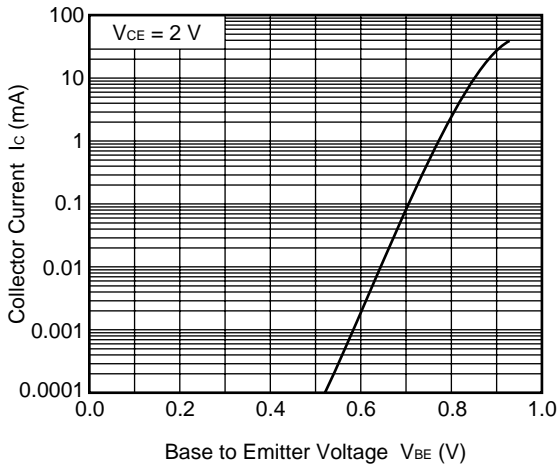
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



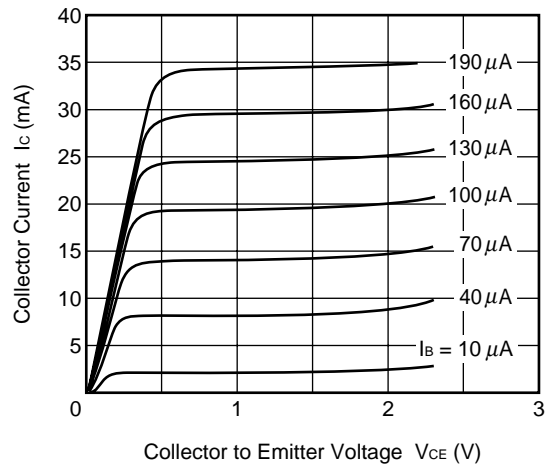
REVERSE TRANSFER CAPACITANCE vs. COLLECTOR TO BASE VOLTAGE



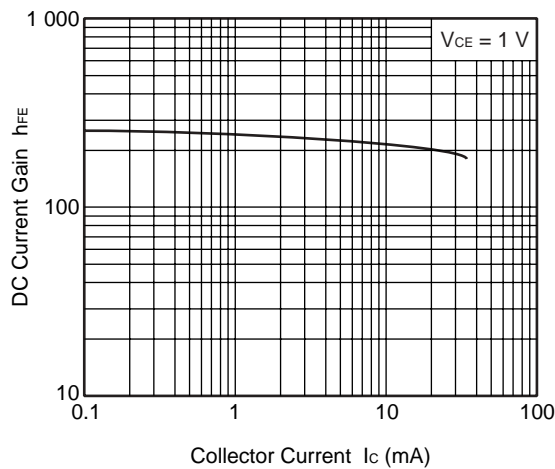
COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE



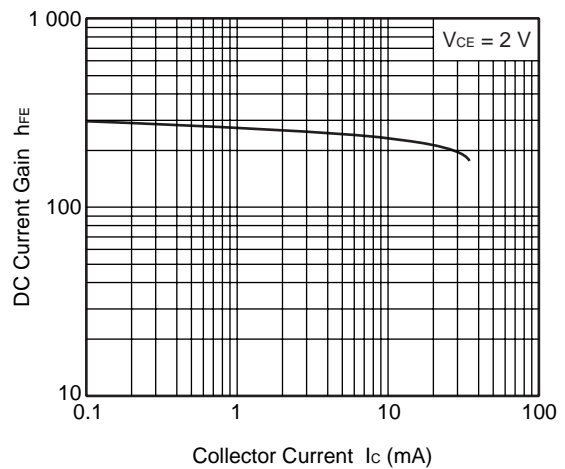
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



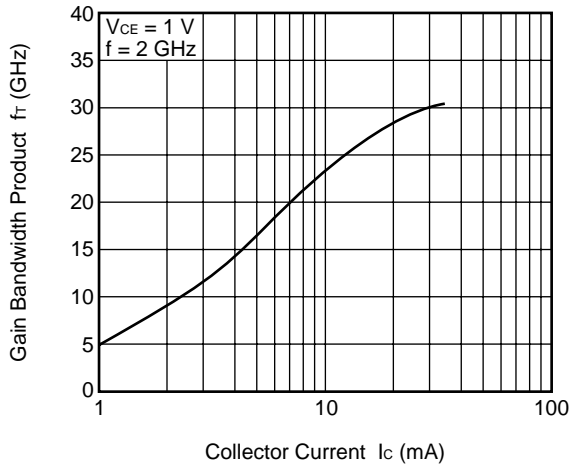
DC CURRENT GAIN vs. COLLECTOR CURRENT



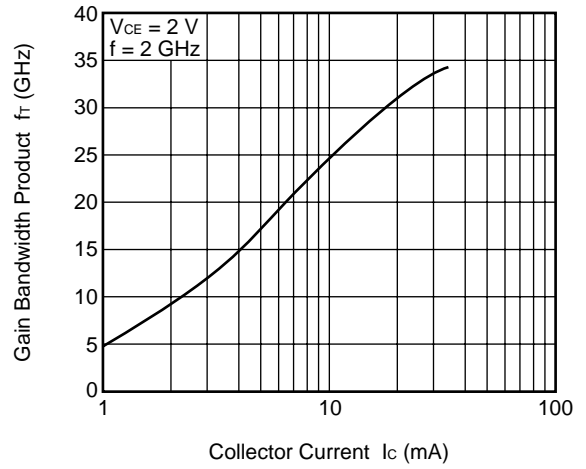
DC CURRENT GAIN vs. COLLECTOR CURRENT



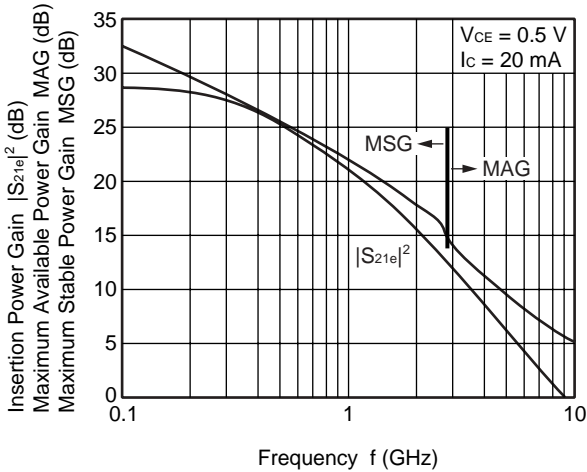
GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT



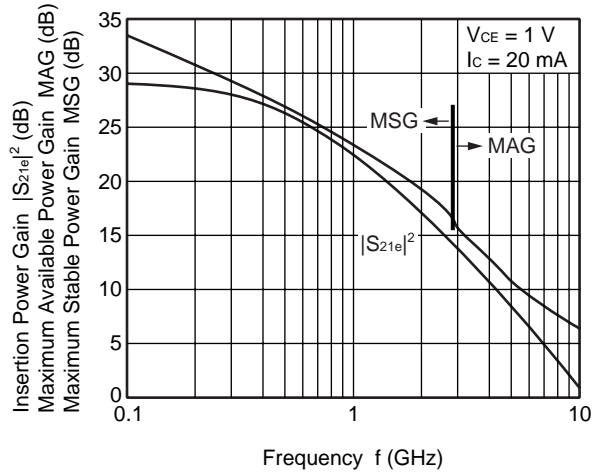
GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT



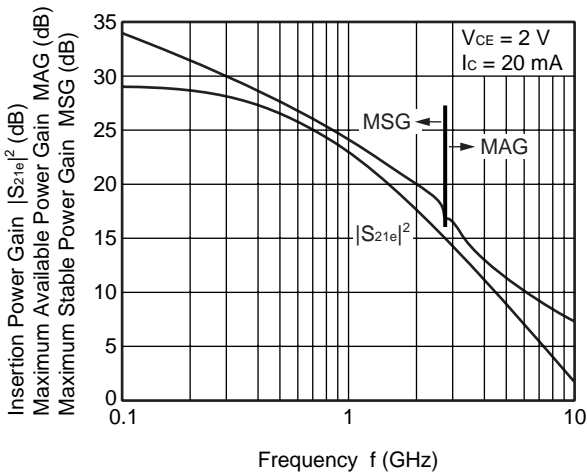
INSERTION POWER GAIN, MAG, MSG vs. FREQUENCY



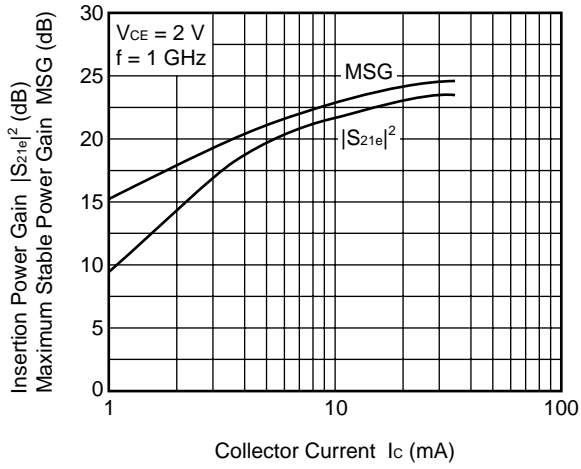
INSERTION POWER GAIN, MAG, MSG vs. FREQUENCY



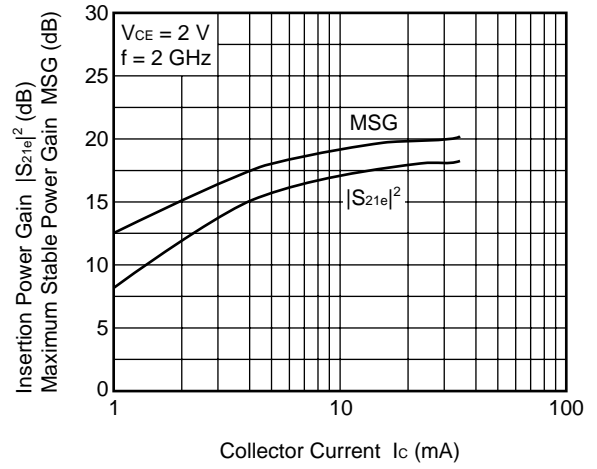
INSERTION POWER GAIN, MAG, MSG vs. FREQUENCY



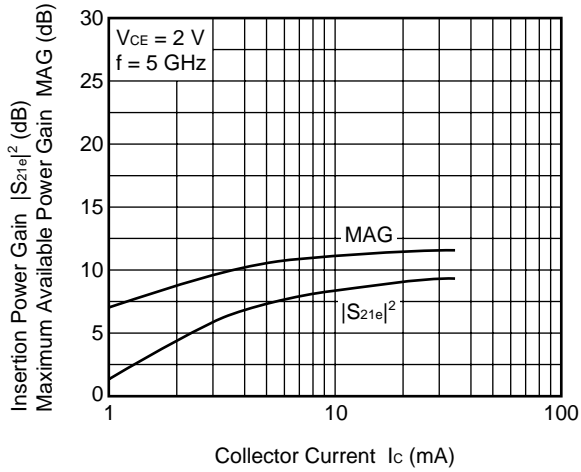
INSERTION POWER GAIN, MSG  
vs. COLLECTOR CURRENT



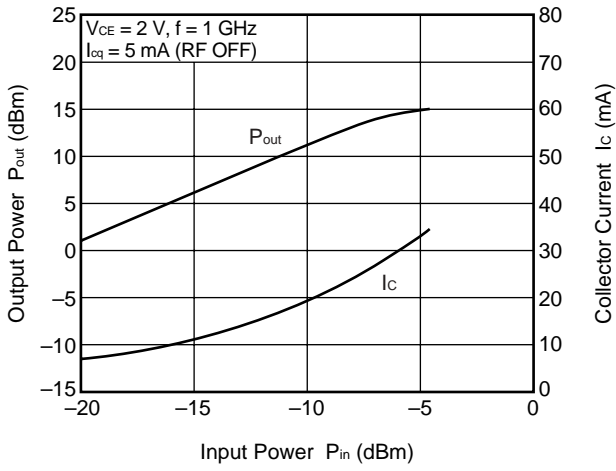
INSERTION POWER GAIN, MSG  
vs. COLLECTOR CURRENT



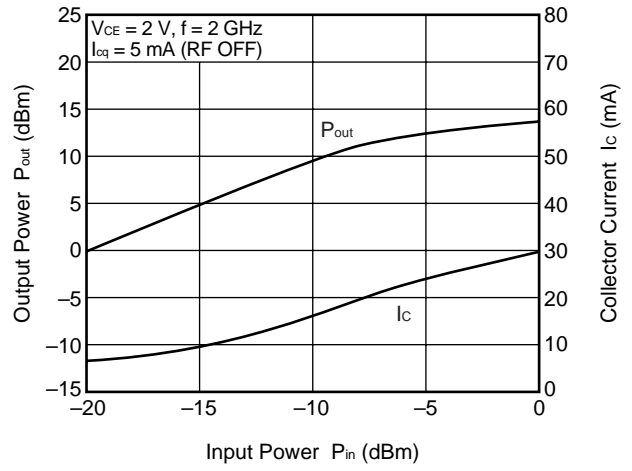
INSERTION POWER GAIN, MAG  
vs. COLLECTOR CURRENT



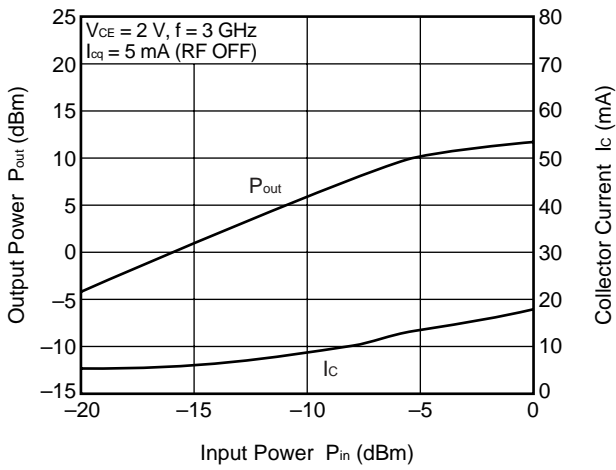
OUTPUT POWER, COLLECTOR CURRENT vs. INPUT POWER



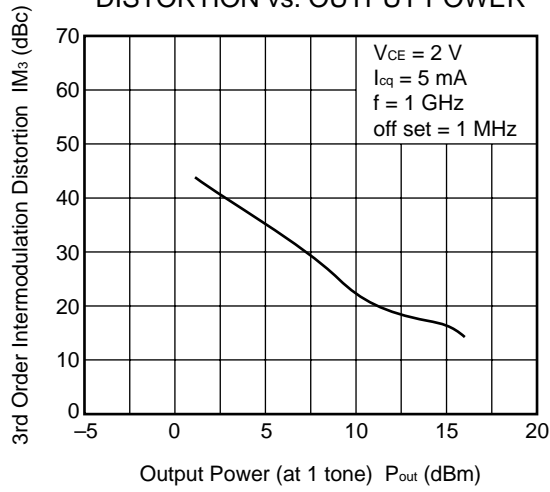
OUTPUT POWER, COLLECTOR CURRENT vs. INPUT POWER



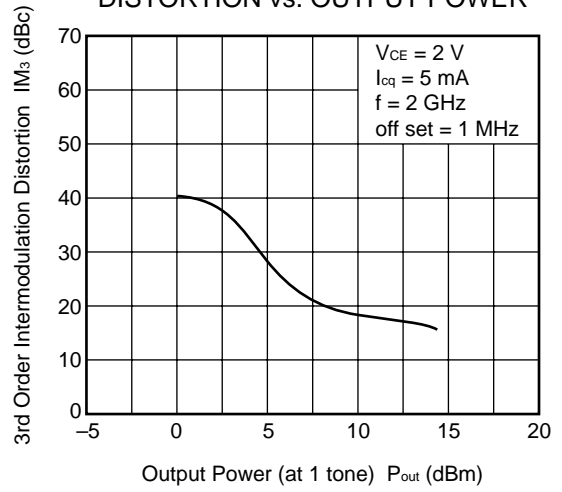
OUTPUT POWER, COLLECTOR CURRENT vs. INPUT POWER



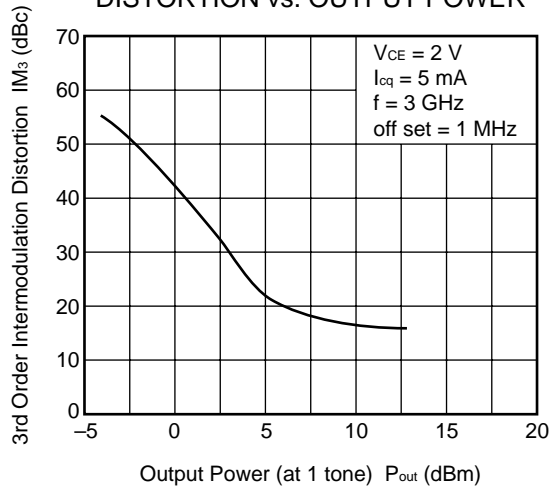
3RD ORDER INTERMODULATION DISTORTION vs. OUTPUT POWER



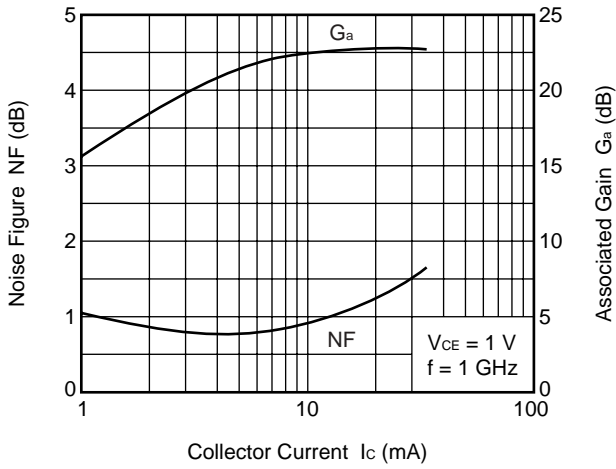
3RD ORDER INTERMODULATION DISTORTION vs. OUTPUT POWER



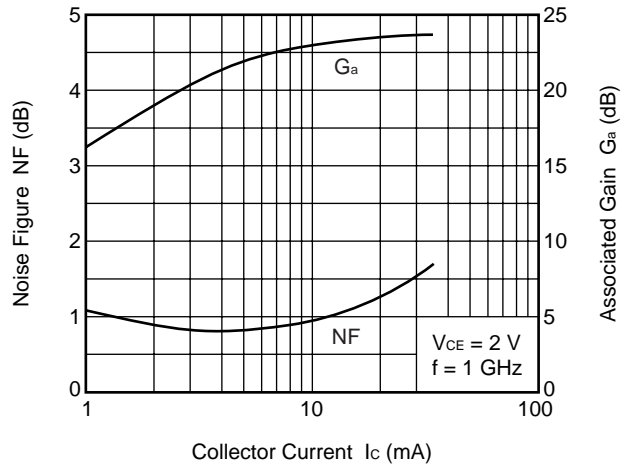
3RD ORDER INTERMODULATION DISTORTION vs. OUTPUT POWER



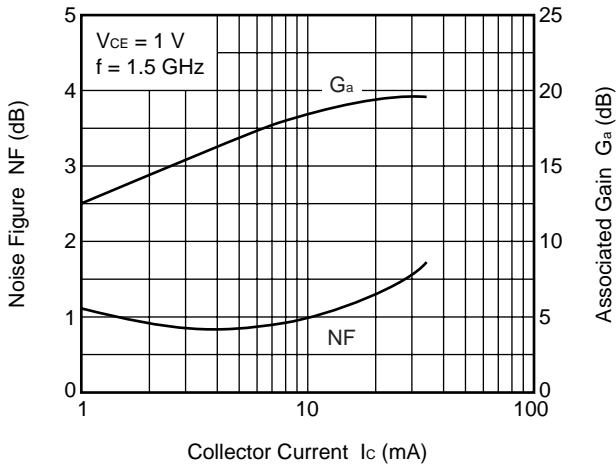
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



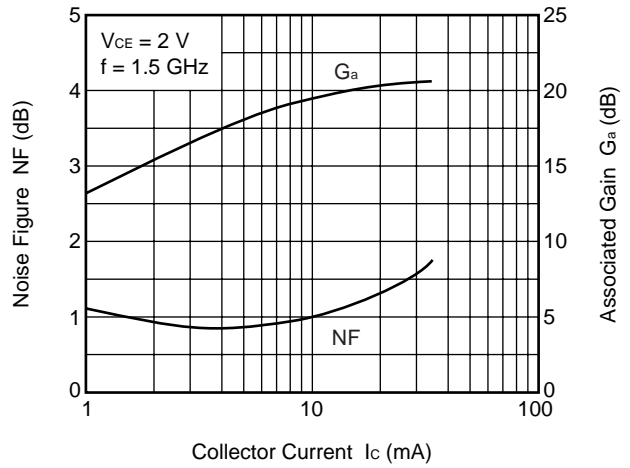
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



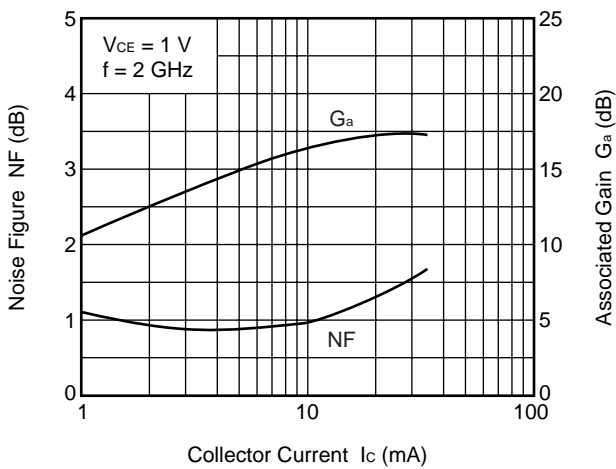
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



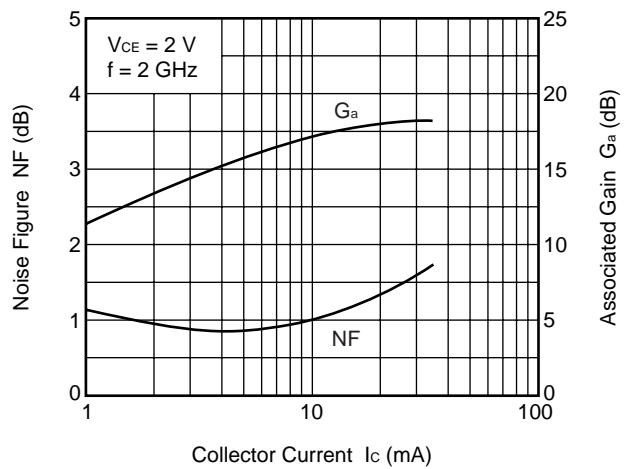
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT

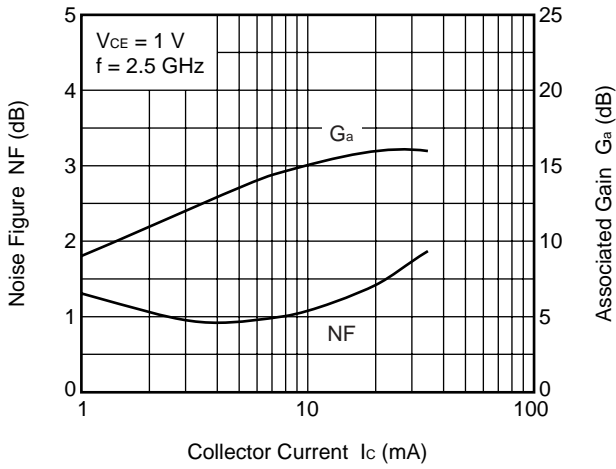


NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT

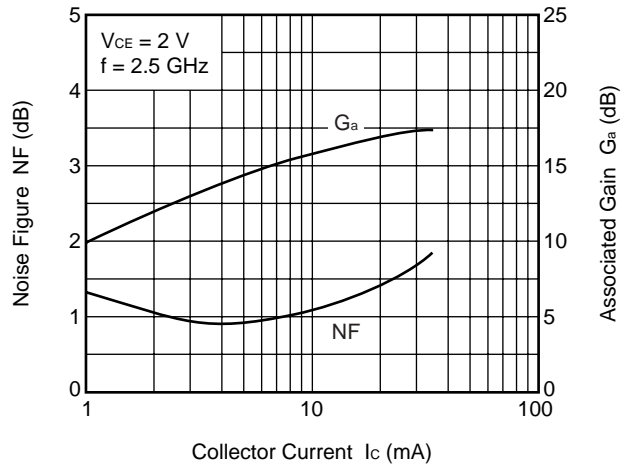




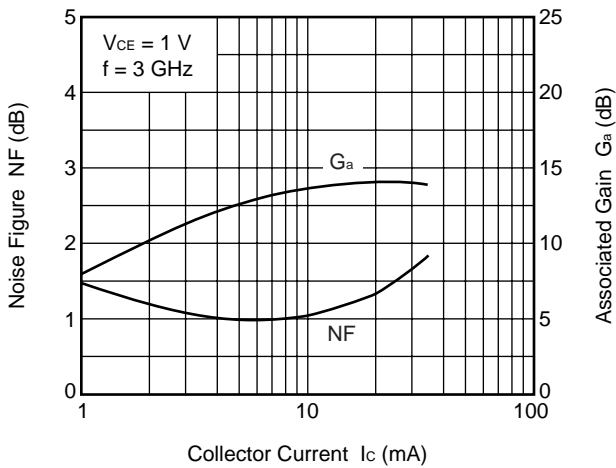
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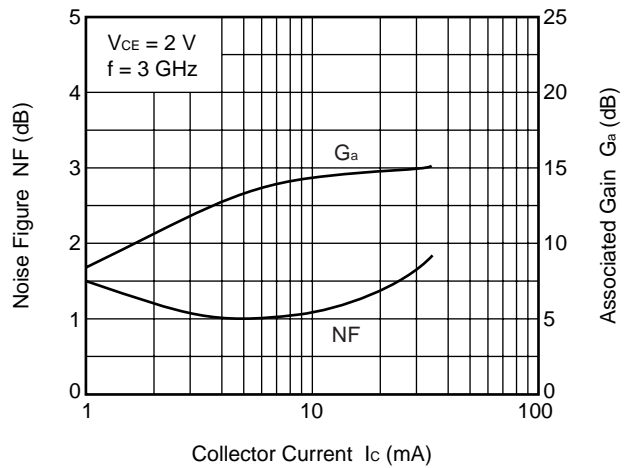
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



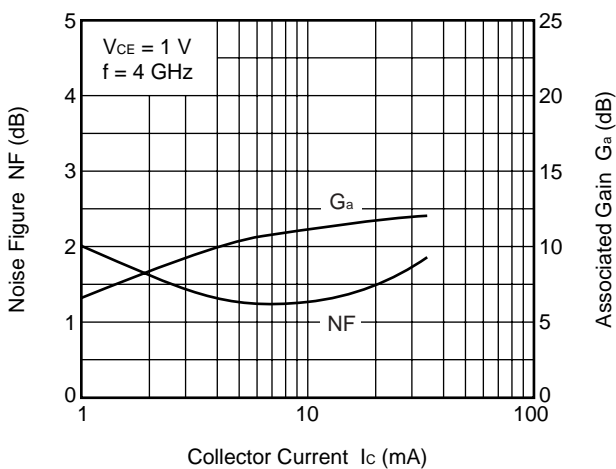
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



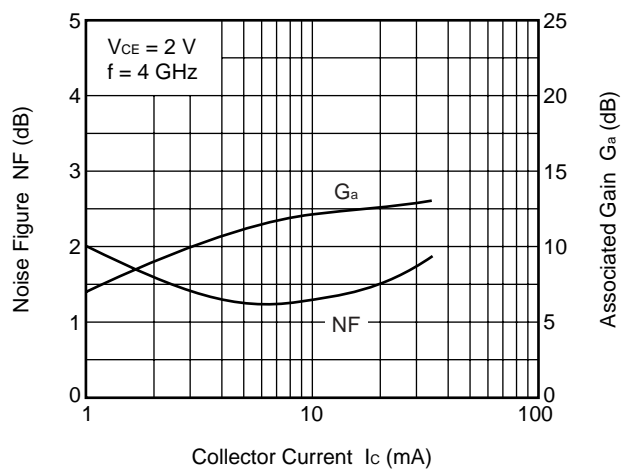
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



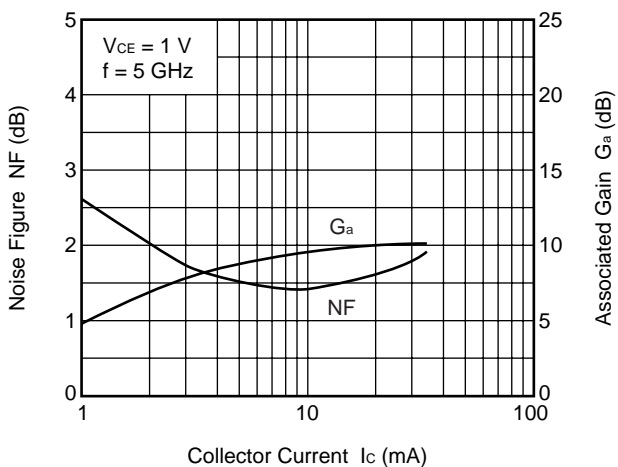
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



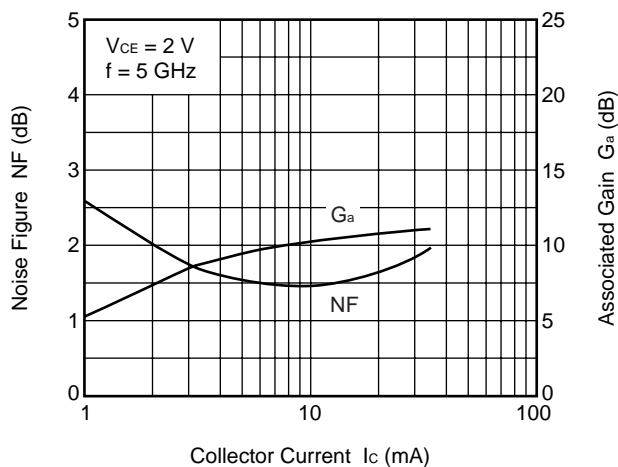
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



**Remark** The graphs indicate nominal characteristics.

**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.

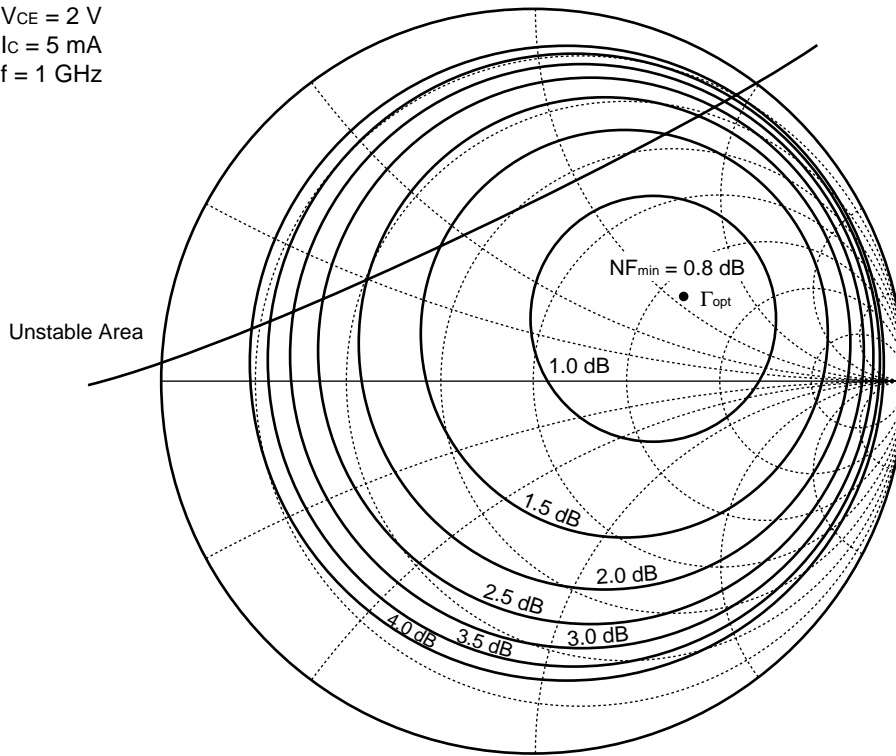
Click here to download S-parameters.

[RF and Microwave] → [Device Parameters]

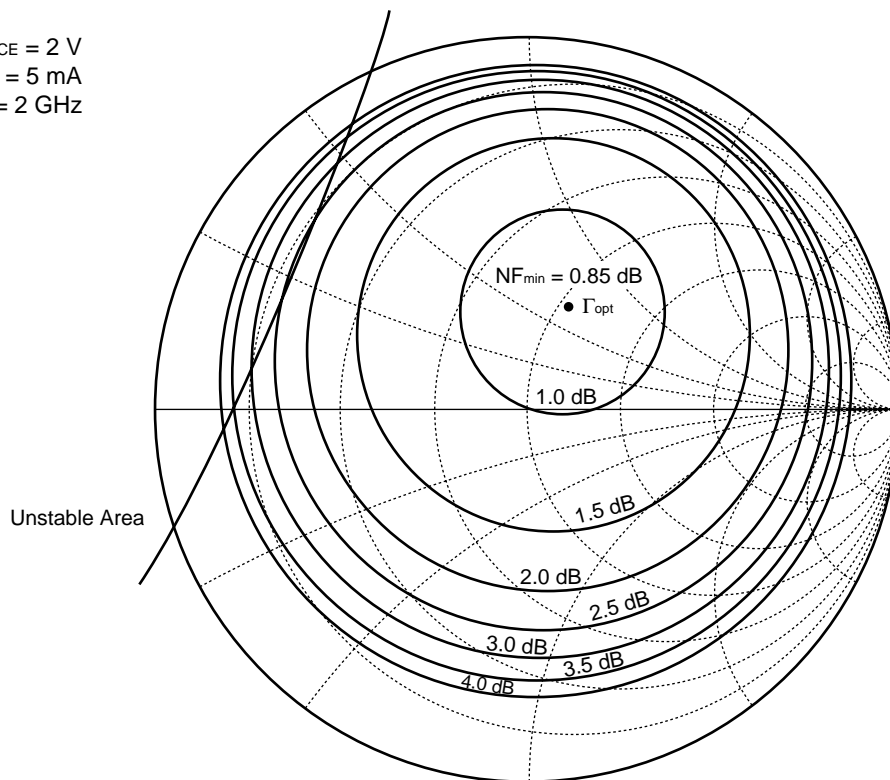
URL <http://www.csd-nec.com/>

EQUAL NF CIRCLE

$V_{CE} = 2\text{ V}$   
 $I_c = 5\text{ mA}$   
 $f = 1\text{ GHz}$

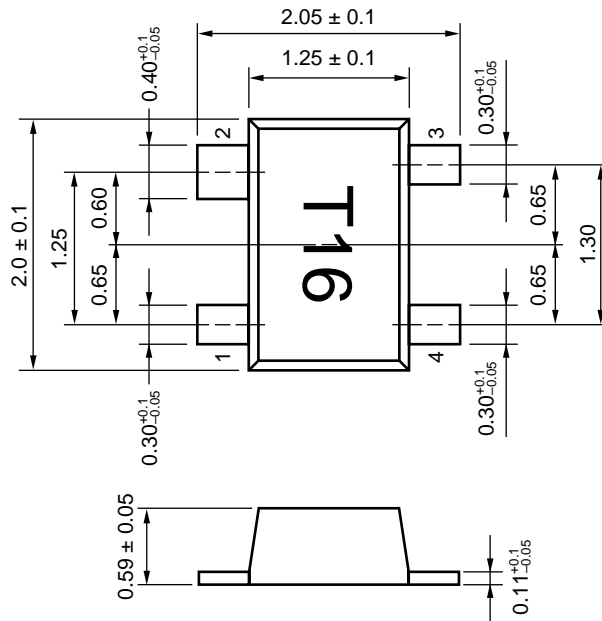


$V_{CE} = 2\text{ V}$   
 $I_c = 5\text{ mA}$   
 $f = 2\text{ GHz}$



PACKAGE DIMENSIONS

FLAT-LEAD 4-PIN THIN-TYPE SUPER MINIMOLD (M04) (UNIT: mm)



PIN CONNECTIONS

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

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