



# NPN SILICON GERMANIUM RF TRANSISTOR

# NESG250134

## NPN SiGe RF TRANSISTOR FOR MEDIUM OUTPUT POWER AMPLIFICATION (800 mW) 3-PIN POWER MINIMOLD (34 PACKAGE)

### FEATURES

- This product is suitable for medium output power (800 mW) amplification  
     $P_o = 29$  dBm TYP. @  $V_{CE} = 3.6$  V,  $P_{in} = 15$  dBm,  $f = 460$  MHz  
     $P_o = 29$  dBm TYP. @  $V_{CE} = 3.6$  V,  $P_{in} = 20$  dBm,  $f = 900$  MHz
- MSG (Maximum Stable Gain) = 23 dB TYP., @  $V_{CE} = 3.6$  V,  $I_c = 100$  mA,  $f = 460$  MHz
- Using UHS2-HV process (SiGe technology),  $V_{CBO}$  (ABSOLUTE MAXIMUM RATINGS) = 20 V
- 3-pin power minimold (34 package)

### ORDERING INFORMATION

Part Number	Quantity	Supplying Form
NESG250134-A	25 pcs (Non reel)	• 12 mm wide embossed taping
NESG250134-T1-A	1 kpcs/reel	• Pin 2 (Emitter) face the perforation side of the tape

**Remark** To order evaluation samples, contact your nearby sales office.  
Unit sample quantity is 25 pcs.

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

Parameter	Symbol	Ratings	Unit
Collector to Base Voltage	$V_{CBO}$	20	V
Collector to Emitter Voltage	$V_{CEO}$	9.2	V
Emitter to Base Voltage	$V_{EBO}$	2.8	V
Collector Current	$I_c$	500	mA
Total Power Dissipation	$P_{tot}$ <sup>Note</sup>	1.5	W
Junction Temperature	$T_j$	150	$^\circ\text{C}$
Storage Temperature	$T_{stg}$	-65 to +150	$^\circ\text{C}$

**Note** Mounted on  $34.2 \text{ cm}^2 \times 0.8 \text{ mm}$  (t) glass epoxy PWB

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

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**THERMAL RESISTANCE (T<sub>A</sub> = +25°C)**

Parameter	Symbol	Ratings	Unit
Thermal Resistance from Junction to Ambient <sup>Note</sup>	R <sub>thj-a</sub>	80	°C/W

**Note** Mounted on 34.2 cm<sup>2</sup> × 0.8 mm (t) glass epoxy PWB

**RECOMMENDED OPERATING RANGE (T<sub>A</sub> = +25°C)**

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Collector to Emitter Voltage	V <sub>CE</sub>	–	3.6	4.5	V
Collector Current	I <sub>c</sub>	–	400	500	mA
Input Power <sup>Note</sup>	P <sub>in</sub>	–	12	17	dBm

**Note** Input power under conditions of V<sub>CE</sub> ≤ 4.5 V, f = 460 MHz

**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	–	–	1	μA
Emitter Cut-off Current	I <sub>EBO</sub>	V <sub>EB</sub> = 0.5 V, I <sub>C</sub> = 0 mA	–	–	1	μA
DC Current Gain	h <sub>FE</sub> <sup>Note 1</sup>	V <sub>CE</sub> = 3 V, I <sub>C</sub> = 100 mA	80	120	180	–
RF Characteristics						
Gain Bandwidth Product	f <sub>T</sub>	V <sub>CE</sub> = 3.6 V, I <sub>C</sub> = 100 mA, f = 460 MHz	–	10	–	GHz
Insertion Power Gain	S <sub>21e</sub>   <sup>2</sup>	V <sub>CE</sub> = 3.6 V, I <sub>C</sub> = 100 mA, f = 460 MHz	–	19	–	dB
Maximum Satble Gain	MSG <sup>Note 2</sup>	V <sub>CE</sub> = 3.6 V, I <sub>C</sub> = 100 mA, f = 460 MHz	–	23	–	dB
Linner gain (1)	G <sub>L</sub>	V <sub>CE</sub> = 3.6 V, I <sub>C (set)</sub> = 30 mA (RF OFF), f = 460 MHz, P <sub>in</sub> = 0 dBm	16	19	–	dB
Linner gain (2)	G <sub>L</sub>	V <sub>CE</sub> = 3.6 V, I <sub>C (set)</sub> = 30 mA (RF OFF), f = 900 MHz, P <sub>in</sub> = 0 dBm	–	16	–	dB
Output Power (1)	P <sub>O</sub>	V <sub>CE</sub> = 3.6 V, I <sub>C (set)</sub> = 30 mA (RF OFF), f = 460 MHz, P <sub>in</sub> = 15 dBm	27	29	–	dBm
Output Power (2)	P <sub>O</sub>	V <sub>CE</sub> = 3.6 V, I <sub>C (set)</sub> = 30 mA (RF OFF), f = 900 MHz, P <sub>in</sub> = 20 dBm	–	29	–	dBm
Collector Efficiency (1)	η <sub>c</sub>	V <sub>CE</sub> = 3.6 V, I <sub>C (set)</sub> = 30 mA (RF OFF), f = 460 MHz, P <sub>in</sub> = 15 dBm	–	60	–	%
Collector Efficiency (2)	η <sub>c</sub>	V <sub>CE</sub> = 3.6 V, I <sub>C (set)</sub> = 30 mA (RF OFF), f = 900 MHz, P <sub>in</sub> = 20 dBm	–	60	–	%

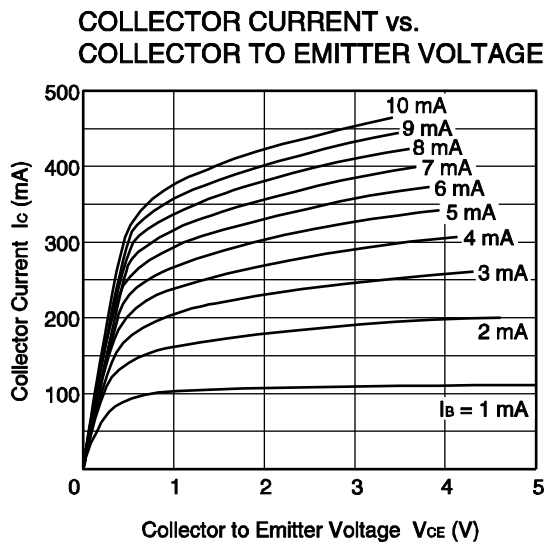
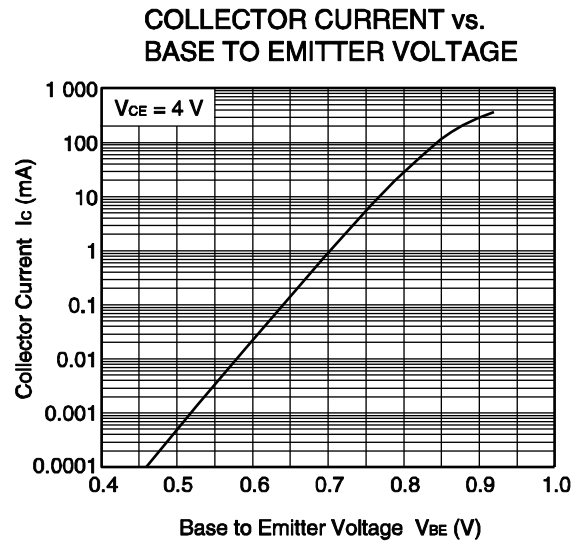
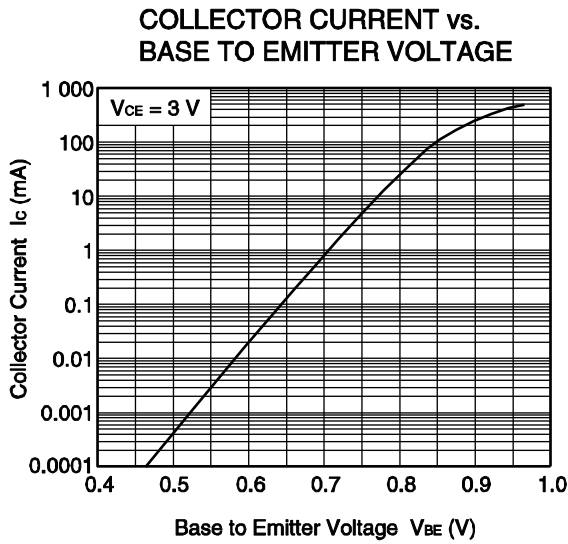
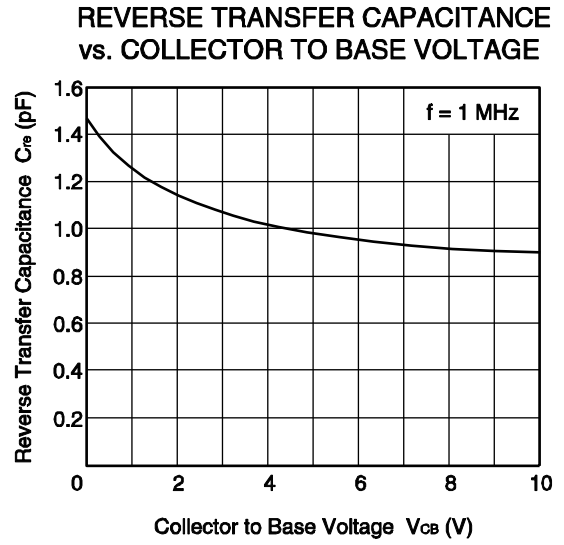
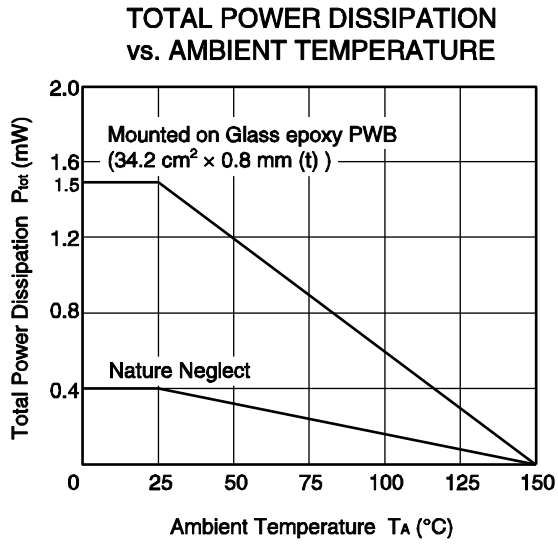
**Notes 1.** Pulse measurement: PW ≤ 350 μs, Duty Cycle ≤ 2%

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

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

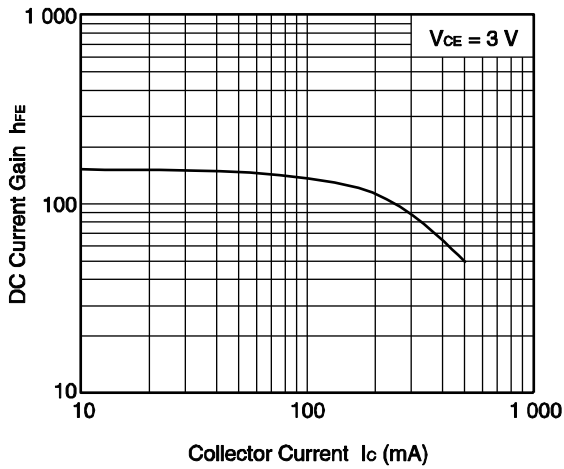
Rank	FB
Marking	SN
h <sub>FE</sub> Value	80 to 180

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

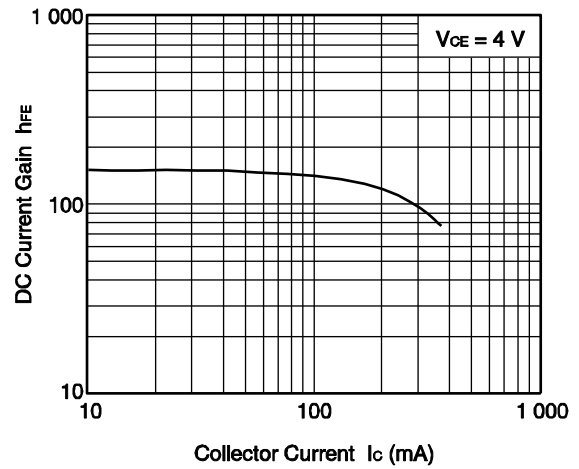


Remark The graphs indicate nominal characteristics.

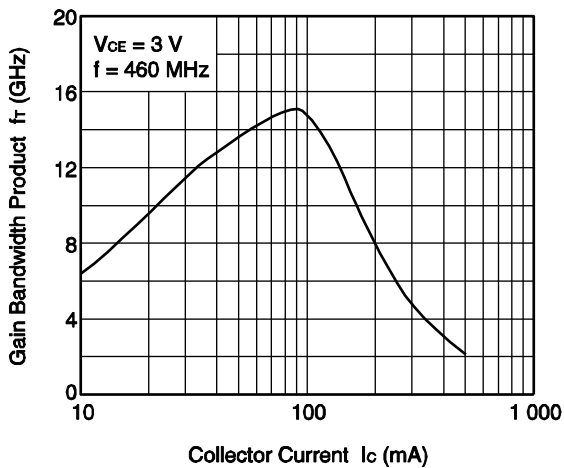
DC CURRENT GAIN vs. COLLECTOR CURRENT



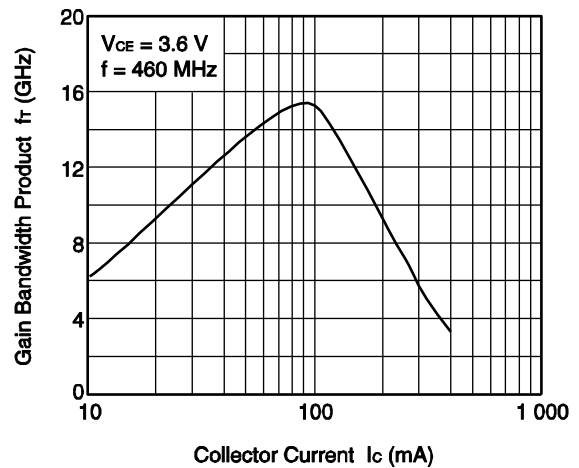
DC CURRENT GAIN vs. COLLECTOR CURRENT



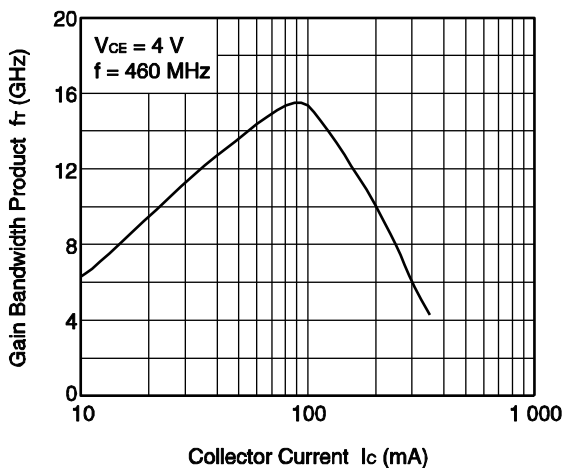
GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT



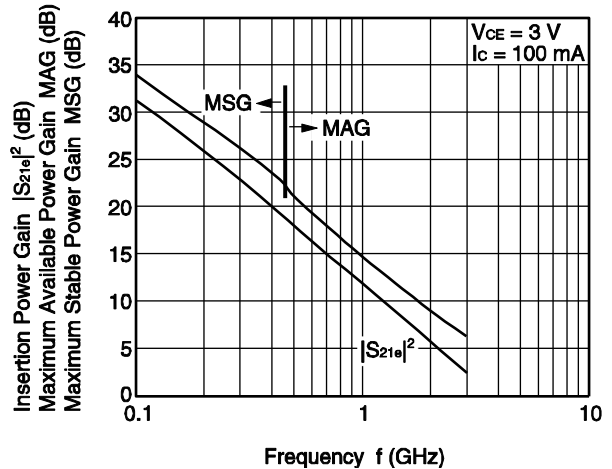
GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT



GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT

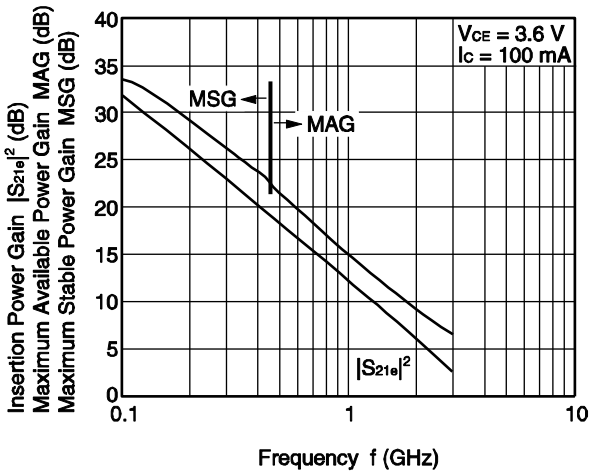


INSERTION POWER GAIN, MAG, MSG vs. FREQUENCY

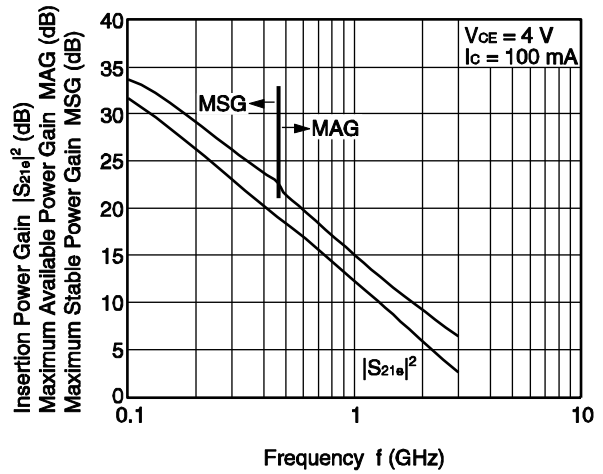


Remark The graphs indicate nominal characteristics.

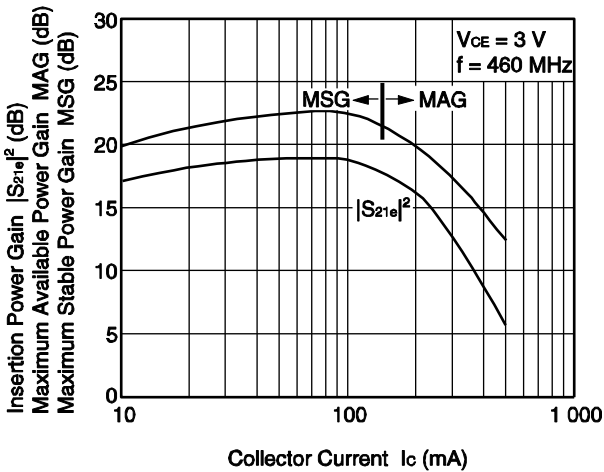
INSERTION POWER GAIN, MAG, MSG vs. FREQUENCY



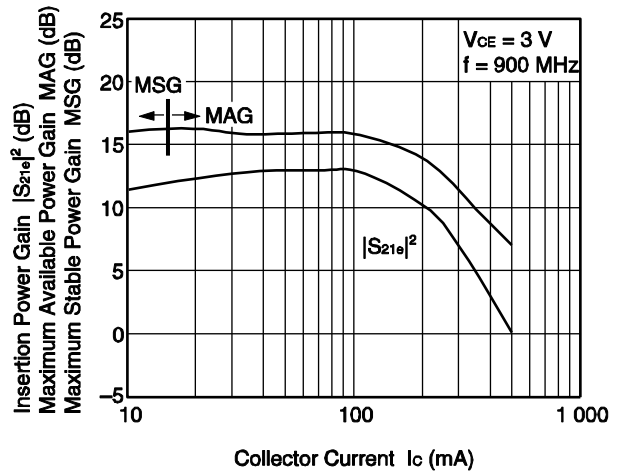
INSERTION POWER GAIN, MAG, MSG vs. FREQUENCY



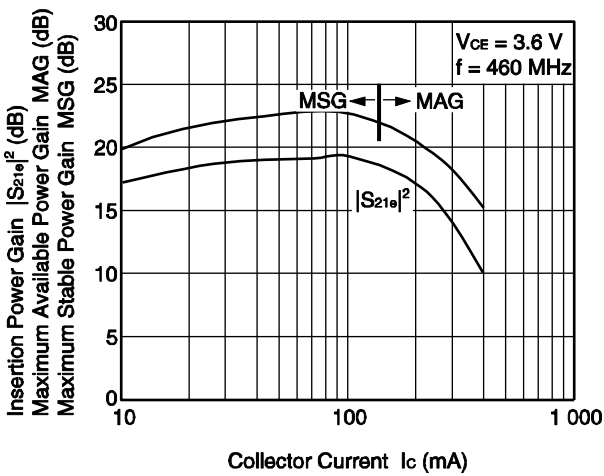
INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT



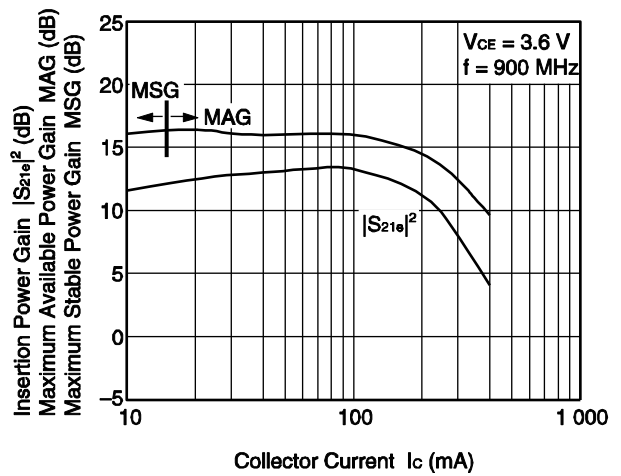
INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT



INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT

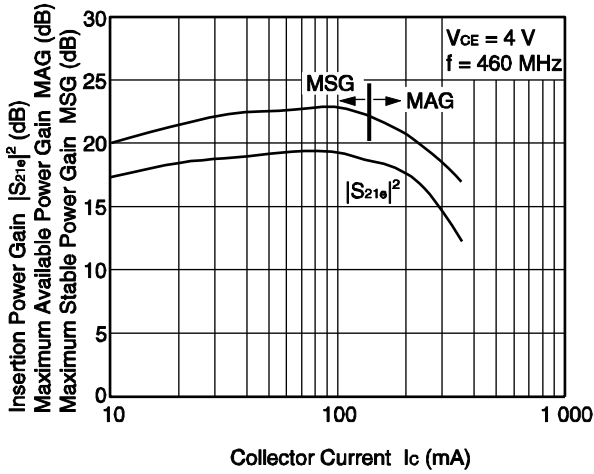


INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT

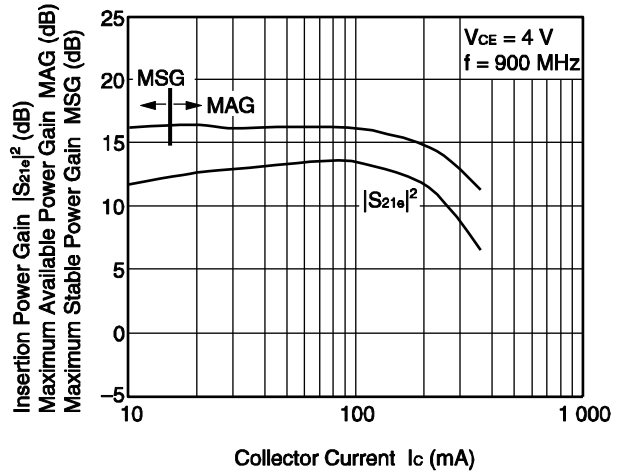


Remark The graphs indicate nominal characteristics.

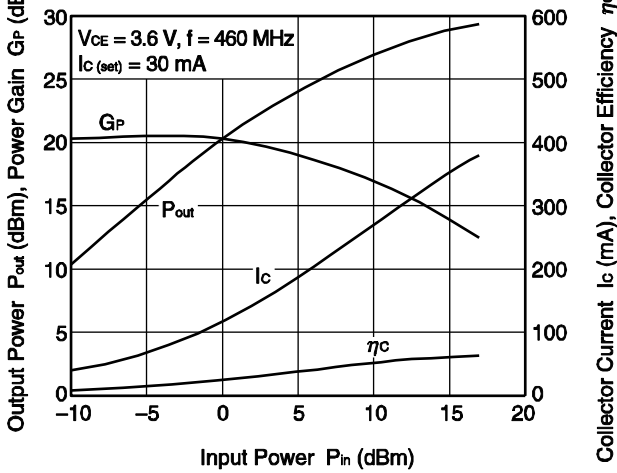
INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT



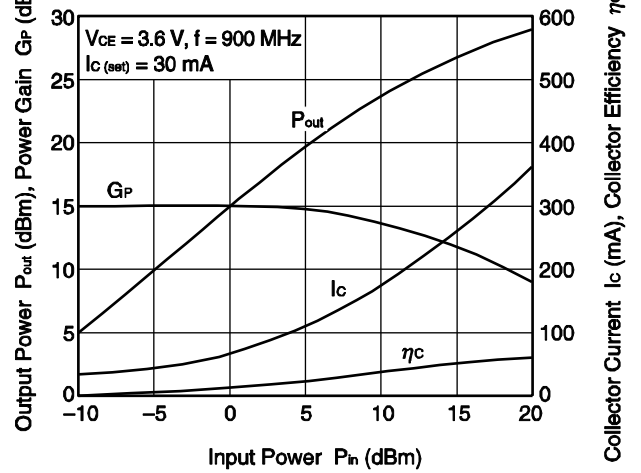
INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT



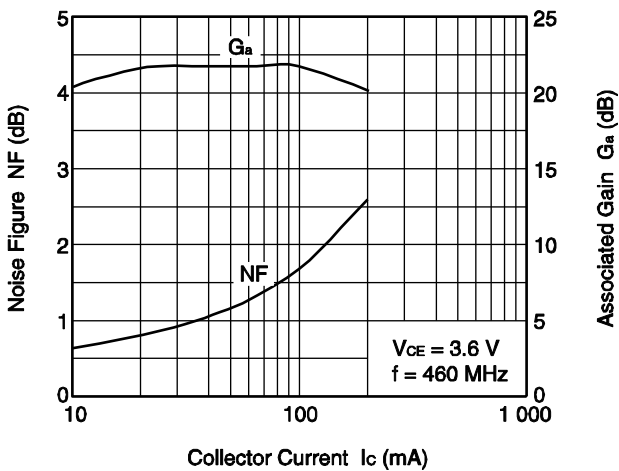
OUTPUT POWER, POWER GAIN, COLLECTOR CURRENT, COLLECTOR EFFICIENCY vs. INPUT POWER



OUTPUT POWER, POWER GAIN, COLLECTOR CURRENT, COLLECTOR EFFICIENCY vs. INPUT POWER

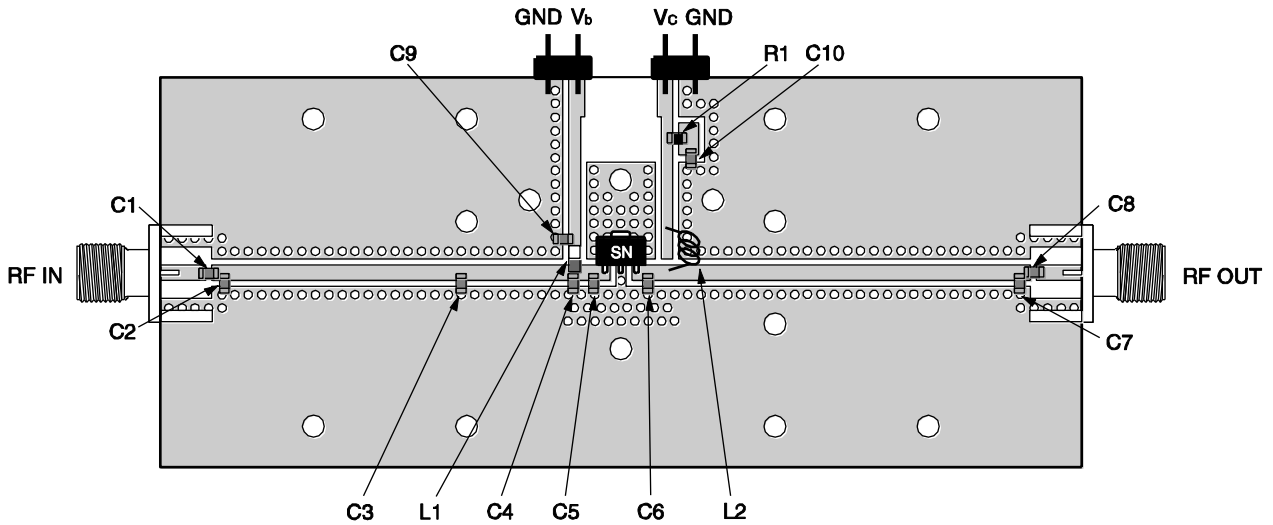


NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



Remark The graphs indicate nominal characteristics.

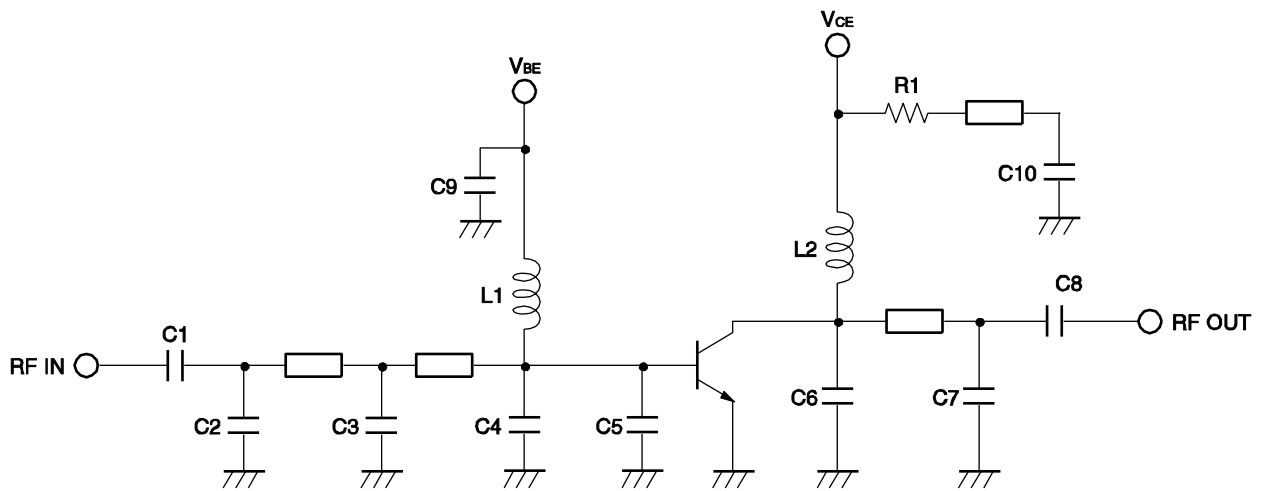
PA EVALUATION BOARD (f = 460 MHz)



Notes

1. 38 × 90 mm, t = 0.8 mm double sided copper clad glass epoxy PWB.
2. Back side: GND pattern
3. Solder gold plated on pattern
4. ○: Through holes

PA EVALUATION CIRCUIT (f = 460 MHz)



The application circuits and their parameters are for reference only and are not intended for use in actual design-ins.

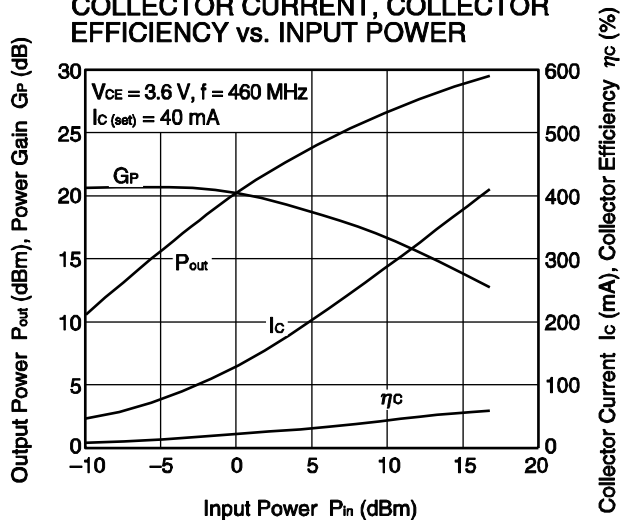


**COMPONENT LIST**

	Value	Maker
C1	30 pF	Murata
C2	6 pF	Murata
C3, C4	7 pF	Murata
C5	3 pF	Murata
C6	0.5 pF	Murata
C7	5 pF	Murata
C8	10 pF	Murata
C9, C10	100 nF	Murata
L1	100 nH	Toko
L2	3 nH	Toko
R1	30 Ω	SSM

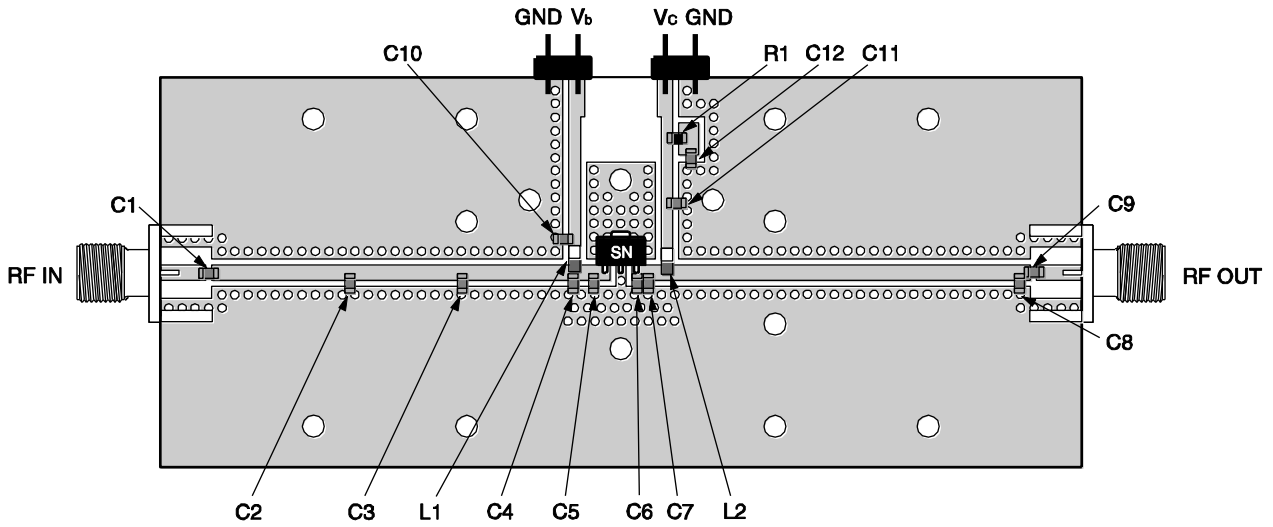
**PA EVALUATION CIRCUIT TYPICAL CHARACTERISTICS**

**OUTPUT POWER, POWER GAIN, COLLECTOR CURRENT, COLLECTOR EFFICIENCY vs. INPUT POWER**



**Remark** The graph indicates nominal characteristics.

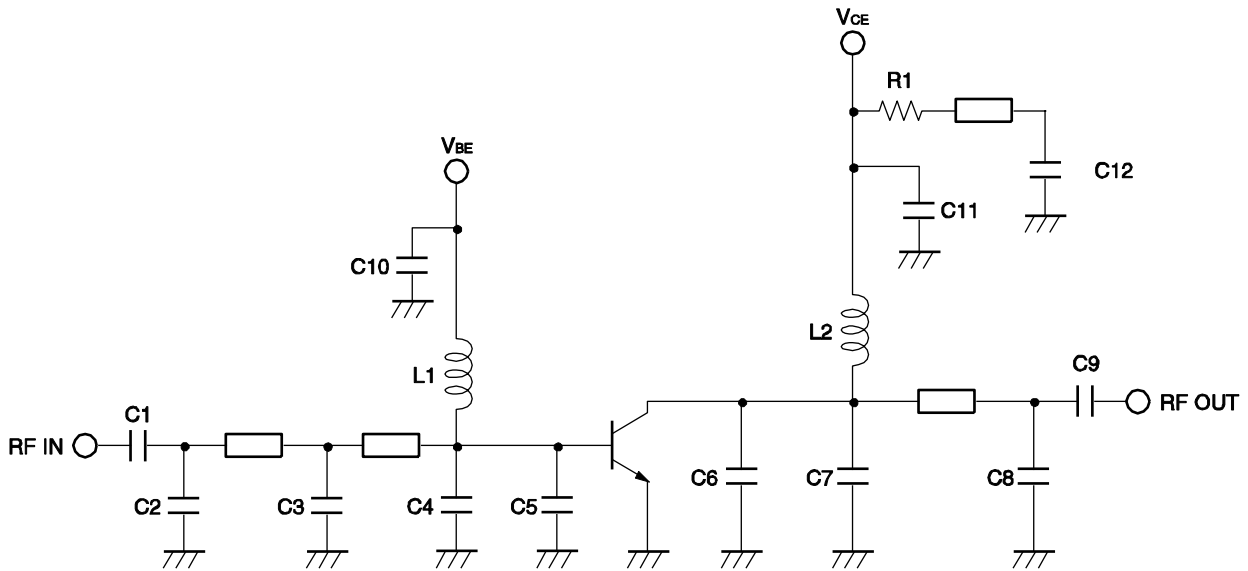
**DISTORTION EVALUATION BOARD (f = 460 MHz)**



**Notes**

1. 38 × 90 mm, t = 0.8 mm, double sided copper clad glass epoxy PWB.
2. Back side: GND pattern
3. Solder gold plated on pattern
4. ◦○: Through holes

**DISTORTION EVALUATION CIRCUIT (f = 460 MHz)**



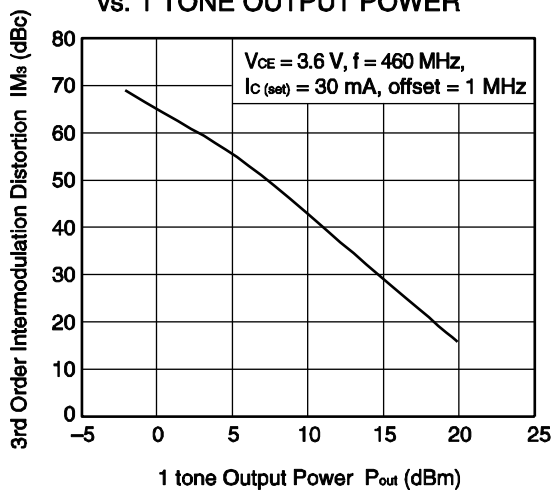
The application circuits and their parameters are for reference only and are not intended for use in actual design-ins.

**COMPONENT LIST**

	Value	Maker
C1	47 pF	Murata
C2	12 pF	Murata
C3, C4	7 pF	Murata
C5	3 pF	Murata
C6	6 pF	Murata
C7	0.5 pF	Murata
C8	5 pF	Murata
C9	51 pF	Murata
C10, C12	100 nF	Murata
C11	1 $\mu$ F	Murata
L1	100 nH	Toko
L2	15 nH	Toko
R1	30 $\Omega$	SSM

**DISTORTION EVALUATION CIRCUIT TYPICAL CHARACTERISTICS**

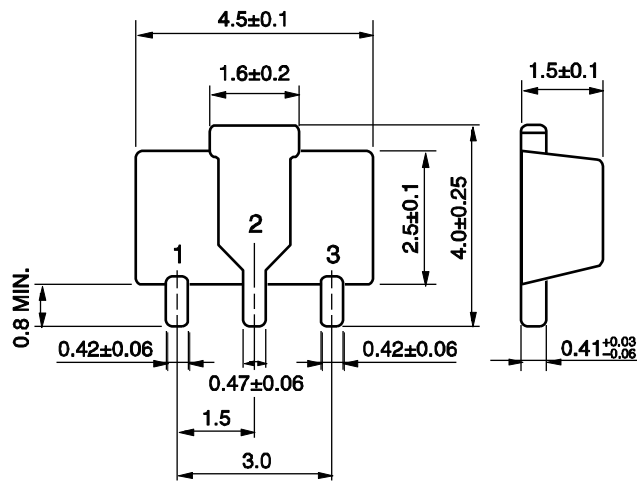
**3RD ORDER  
INTERMODULATION DISTORTION  
vs. 1 TONE OUTPUT POWER**



**Remark** The graph indicates nominal characteristics.

**PACKAGE DIMENSIONS**

**3-PIN POWER MINIMOLD (34 PACKAGE) (UNIT: mm)**



**PIN CONNECTIONS**

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

- **The information in this document is current as of July, 2004. The information is subject to change without notice. For actual design-in, refer to the latest publications of NEC's data sheets or data books, etc., for the most up-to-date specifications of NEC semiconductor products. Not all products and/or types are available in every country. Please check with an NEC sales representative for availability and additional information.**
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