DATA SHEET

NEC

# NPN SILICON GERMANIUM RF TRANSISTOR
# NESG260234

## NPN SiGe RF TRANSISTOR FOR MEDIUM OUTPUT POWER AMPLIFICATION (1 W) 3-PIN POWER MINIMOLD (34 PKG)

### FEATURES

- This product is suitable for medium output power (1 W) amplification
  $P_{out}$ = 30 dBm TYP. @ $V_{CE}$ = 6 V, $P_{in}$ = 15 dBm, f = 460 MHz
  $P_{out}$ = 30 dBm TYP. @ $V_{CE}$ = 6 V, $P_{in}$ = 20 dBm, f = 900 MHz
- MSG (Maximum Stable Gain) = 23 dB TYP. @ $V_{CE}$ = 6 V, Ic = 100 mA, f = 460 MHz
- Using UHS2-HV process (SiGe technology), $V_{CBO}$ (ABSOLUTE MAXIMUM RATINGS) = 25 V
- 3-pin power minimold (34 PKG)

### ORDERING INFORMATION

| Part Number | Order Number | Package | Quantity | Supplying Form |
|---|---|---|---|---|
| NESG260234 | NESG260234-AZ | 3-pin power minimold (Pb-Free) Note1, 2 | 25 pcs (Non reel) | • Magazine case |
| NESG260234-T1 | NESG260234-T1-AZ | | 1 kpcs/reel | • 12 mm wide embossed taping<br>• Pin 2 (Emitter) face the perforation side of the tape |

**Notes 1.** Contains Lead in the part except the electrode terminals.

**2.** With regards to terminal solder (the solder contains lead) plated products (conventionally plated), contact your nearby sales office.

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

### ABSOLUTE MAXIMUM RATINGS ($T_A$ = +25°C)

| Parameter | Symbol | Ratings | Unit |
|---|---|---|---|
| Collector to Base Voltage | $V_{CBO}$ | 25 | V |
| Collector to Emitter Voltage | $V_{CEO}$ | 9.2 | V |
| Emitter to Base Voltage | $V_{EBO}$ | 2.8 | V |
| Collector Current | $I_C$ | 600 | mA |
| Total Power Dissipation | $P_{tot}$ Note | 1.9 | W |
| Junction Temperature | $T_j$ | 150 | °C |
| Storage Temperature | $T_{stg}$ | −65 to +150 | °C |

**Note** Mounted on 34.2 $cm^2$ × 0.8 mm (t) glass epoxy PWB

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



Document No. PU10547EJ02V0DS (2nd edition)
Date Published May 2005 CP(K)
Printed in Japan

**The mark ★ shows major revised points.**

## THERMAL RESISTANCE ($T_A$ = +25°C)

| Parameter | Symbol | Ratings | Unit |
|---|---|---|---|
| Termal Resistance from Junction to Ambient [Note] | $Rth_{j-a}$ | 65 | °C/W |

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

## RECOMMENDED OPERATING RANGE ($T_A$ = +25°C)

| Parameter | Symbol | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|
| Collector to Emitter Voltage | $V_{CE}$ | – | 6.0 | 7.2 | V |
| Collector Current | $I_C$ | – | 400 | 500 | mA |
| Input Power [Note] | $P_{in}$ | – | 15 | 20 | dBm |

**Note** Input power under conditions of $V_{CE} \leq 6.0$ V, f = 460 MHz

## ELECTRICAL CHARACTERISTICS ($T_A$ = +25°C)

| Parameter | Symbol | Test Conditions | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|---|
| DC Characteristics | | | | | | |
| Collector Cut-off Current | $I_{CBO}$ | $V_{CB}$ = 9.2 V, $I_E$ = 0 mA | – | – | 1 | $\mu$A |
| Emitter Cut-off Current | $I_{EBO}$ | $V_{EB}$ = 1.0 V, $I_C$ = 0 mA | – | – | 1 | $\mu$A |
| DC Current Gain | $h_{FE}$ Note | $V_{CE}$ = 3 V, $I_C$ = 100 mA | 80 | 120 | 180 | – |
| RF Characteristics | | | | | | |
| Linner Gain (1) | $G_L$ | $V_{CE}$ = 6 V, $I_{C (set)}$ = 30 mA (RF OFF), f = 460 MHz, $P_{in}$ = 0 dBm | 19 | 22 | – | dB |
| Linner Gain (2) | $G_L$ | $V_{CE}$ = 6 V, $I_{C (set)}$ = 30 mA (RF OFF), f = 900 MHz, $P_{in}$ = 0 dBm | – | 19 | – | dB |
| Output Power (1) | $P_{out}$ | $V_{CE}$ = 6 V, $I_{C (set)}$ = 30 mA (RF OFF), f = 460 MHz, $P_{in}$ = 15 dBm | 28.5 | 30.0 | – | dBm |
| Output Power (2) | $P_{out}$ | $V_{CE}$ = 6 V, $I_{C (set)}$ = 30 mA (RF OFF), f = 900 MHz, $P_{in}$ = 20 dBm | – | 30.0 | – | dBm |
| Collector Efficiency (1) | $\eta_C$ | $V_{CE}$ = 6 V, $I_{C (set)}$ = 30 mA (RF OFF), f = 460 MHz, $P_{in}$ = 15 dBm | – | 50 | – | % |
| Collector Efficiency (2) | $\eta_C$ | $V_{CE}$ = 6 V, $I_{C (set)}$ = 30 mA (RF OFF), f = 900 MHz, $P_{in}$ = 20 dBm | – | 60 | – | % |

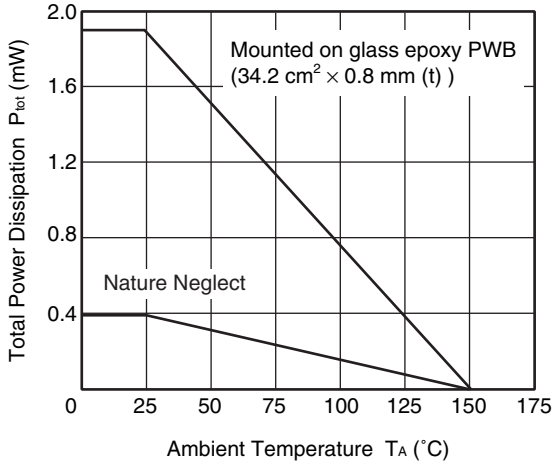
**Note** Pulse measurement: PW ≤ 350 $\mu$s, Duty Cycle ≤ 2%

## $h_{FE}$ CLASSIFICATION

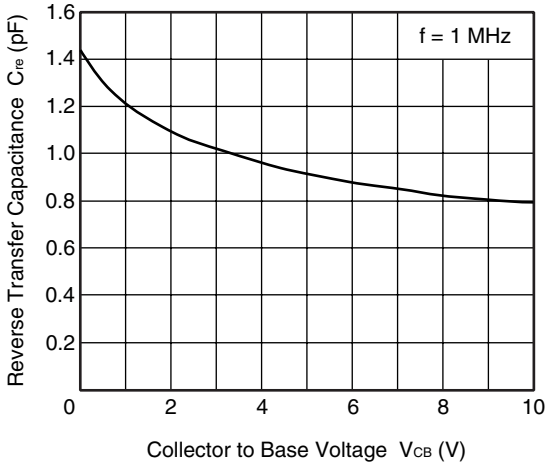
| Rank | FB |
|---|---|
| Marking | SP |
| $h_{FE}$ Value | 80 to 180 |

## ★ TYPICAL CHARACTERISTICS ($T_A$ = +25°C, unless otherwise specified)

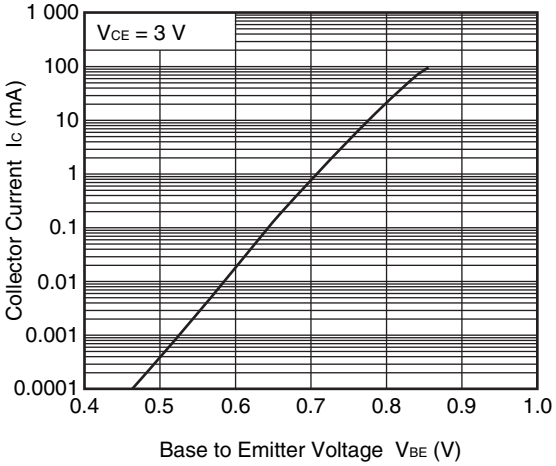
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



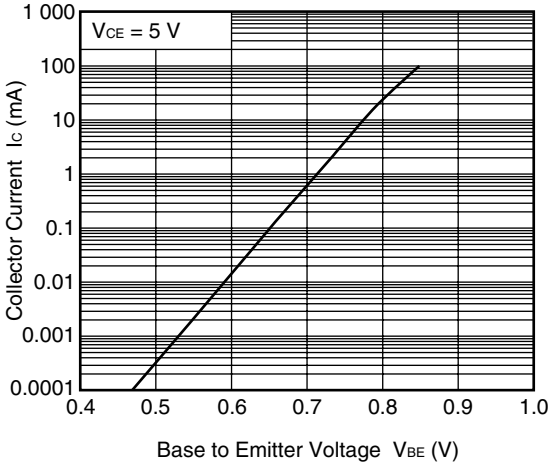

REVERSE TRANSFER CAPACITANCE vs. COLLECTOR TO BASE VOLTAGE



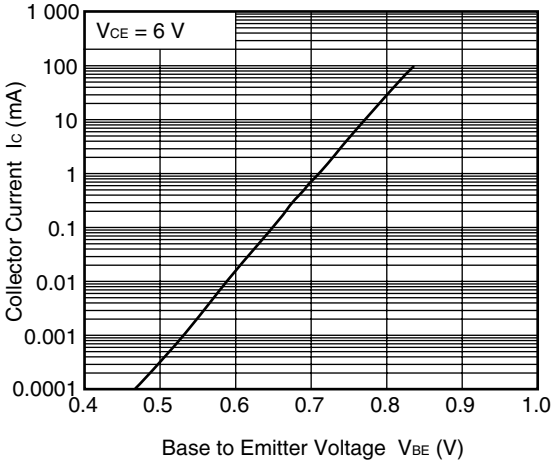

COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE



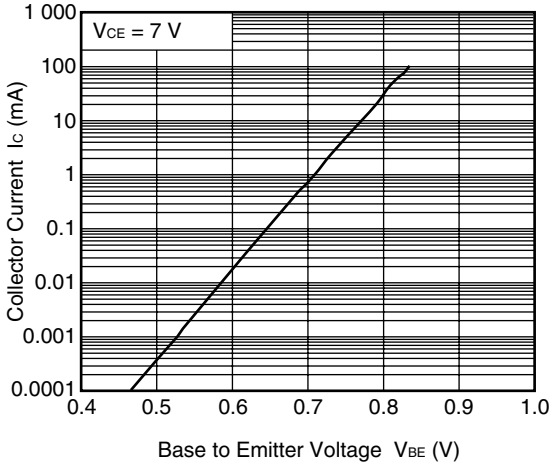

COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE




COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE

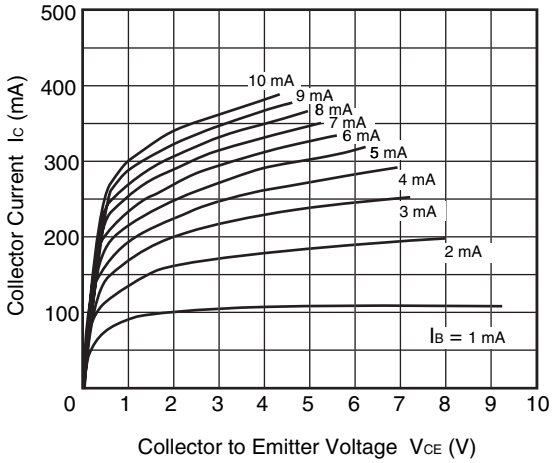



COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE

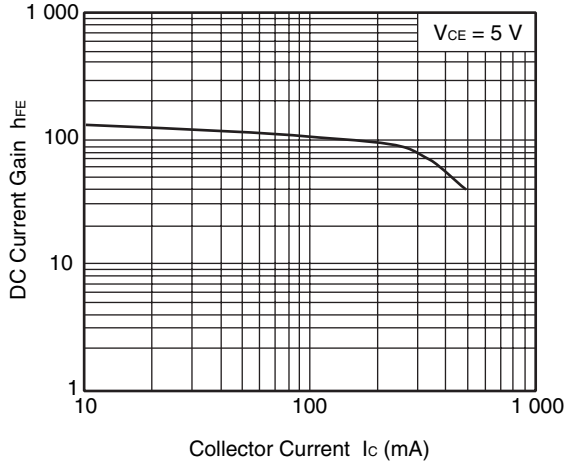



**Remark** The graphs indicate nominal characteristics.

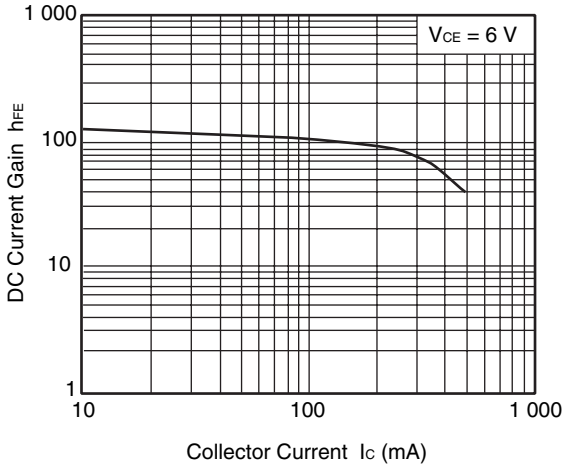
COLLECTOR CURRENT vs.
COLLECTOR TO EMITTER VOLTAGE



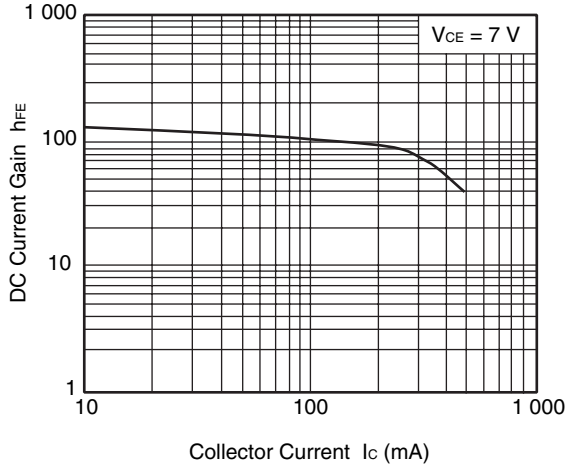

DC CURRENT GAIN vs.
COLLECTOR CURRENT



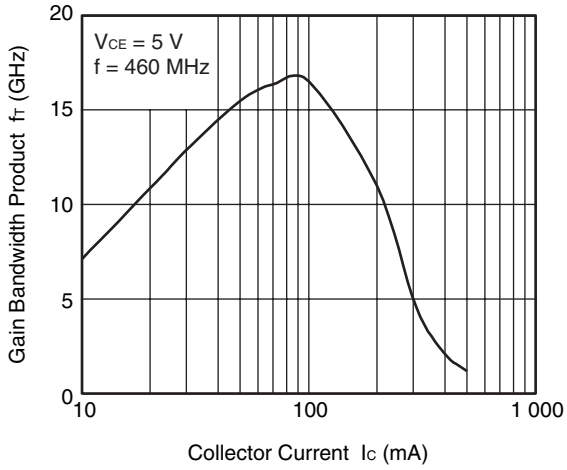

DC CURRENT GAIN vs.
COLLECTOR CURRENT




DC CURRENT GAIN vs.
COLLECTOR CURRENT

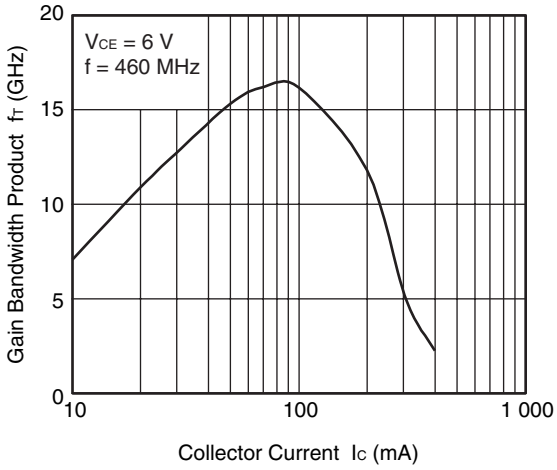



GAIN BANDWIDTH PRODUCT
vs. COLLECTOR CURRENT

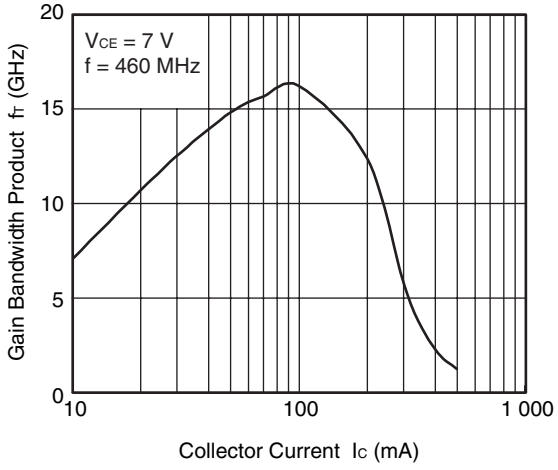



**Remark** The graphs indicate nominal characteristics.

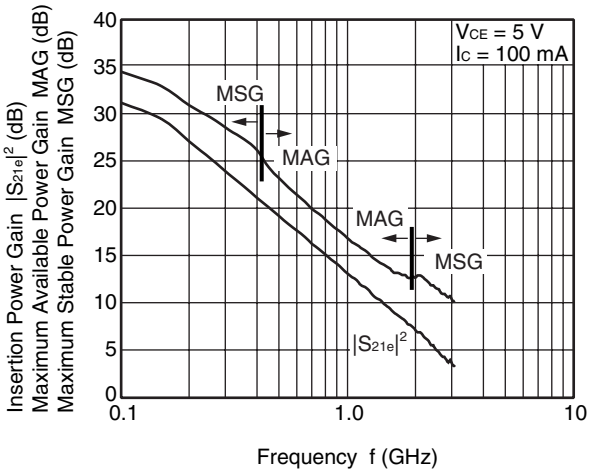
GAIN BANDWIDTH PRODUCT
vs. COLLECTOR CURRENT



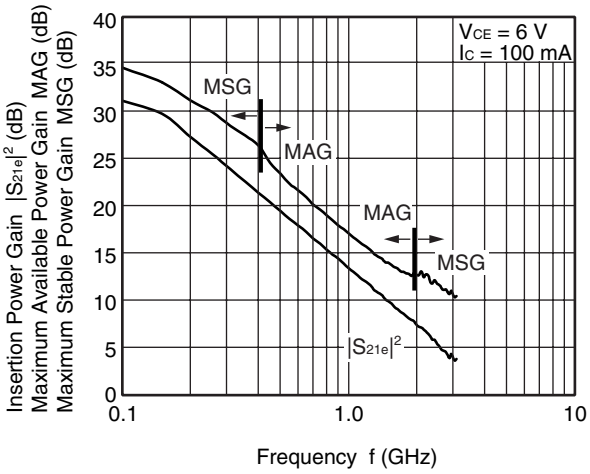

GAIN BANDWIDTH PRODUCT
vs. COLLECTOR CURRENT



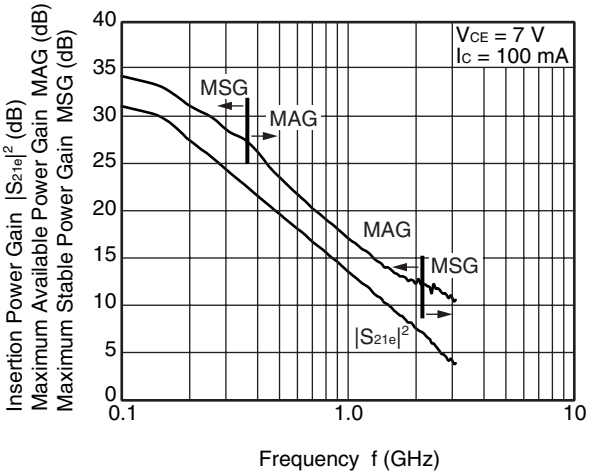

INSERTION POWER GAIN,
MAG, MSG vs. FREQUENCY



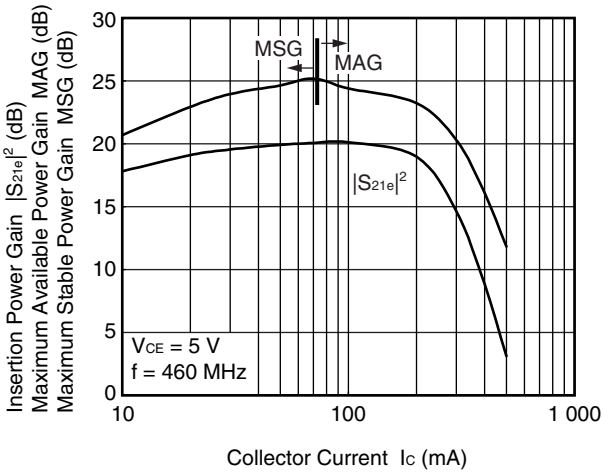

INSERTION POWER GAIN,
MAG, MSG vs. FREQUENCY




INSERTION POWER GAIN,
MAG, MSG vs. FREQUENCY

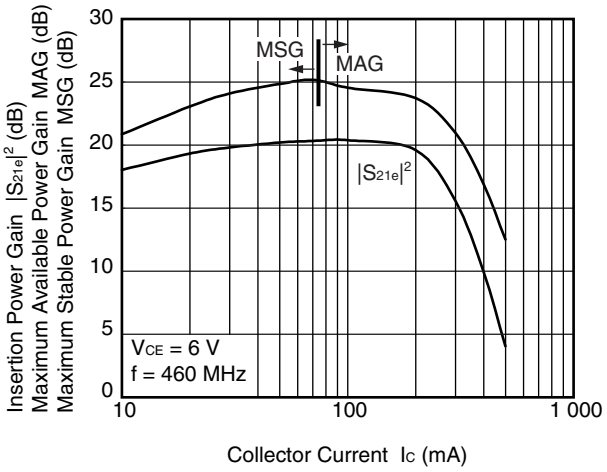



INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT

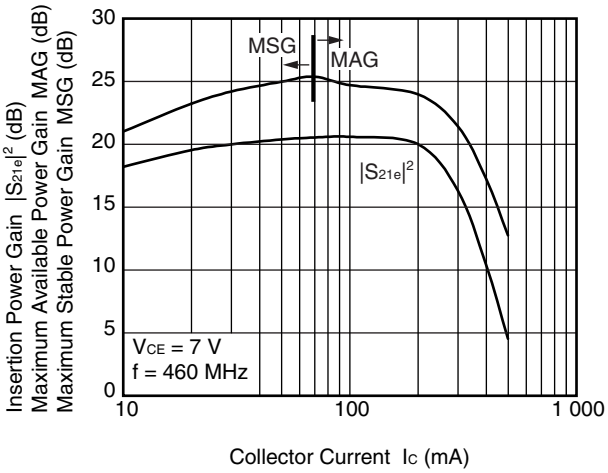



**Remark** The graphs indicate nominal characteristics.

INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT




INSERTION POWER GAIN, MAG, MSG
vs. COLLECTOR CURRENT




## ★ 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.

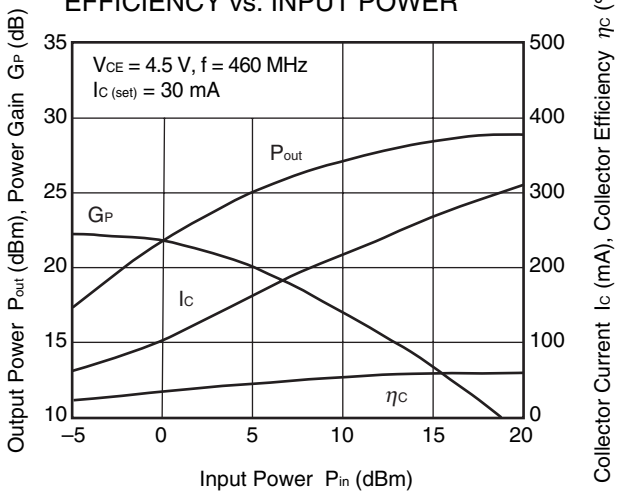
Click here to download S-parameters.

[RF and Microwave] → [Device Parameters]

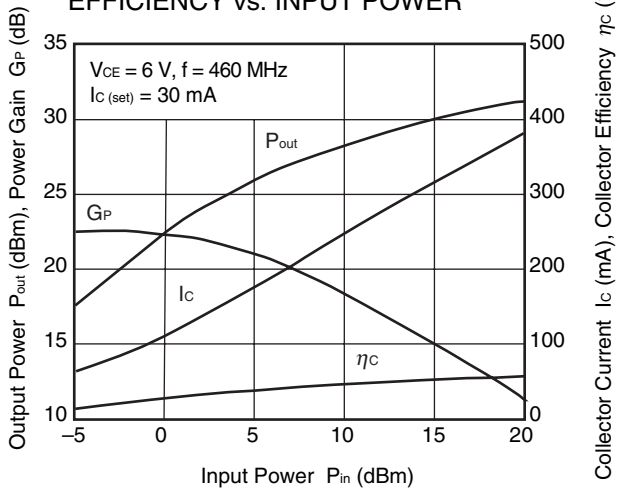
URL http://www.ncsd.necel.com/

## ★ PA EVALUATION CIRCUIT TYPICAL CHARACTERISTICS

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

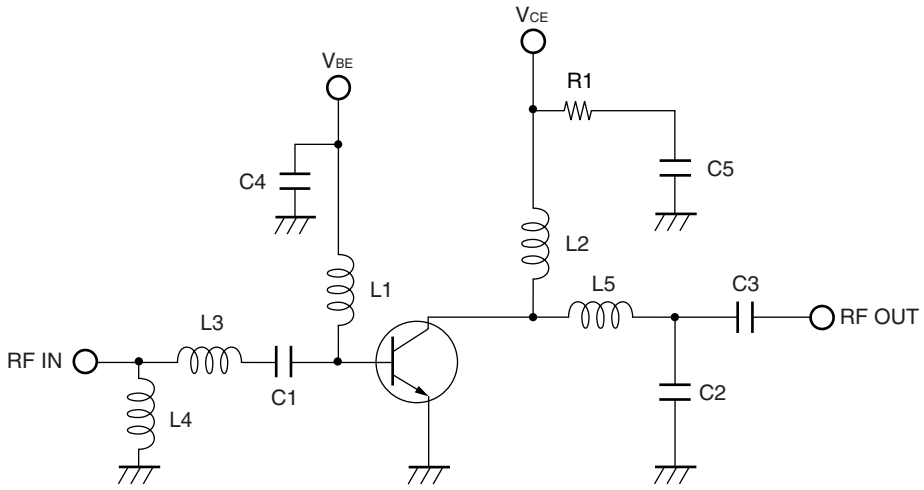



OUTPUT POWER, POWER GAIN,
COLLECTOR CURRENT, COLLECTOR
EFFICIENCY vs. INPUT POWER



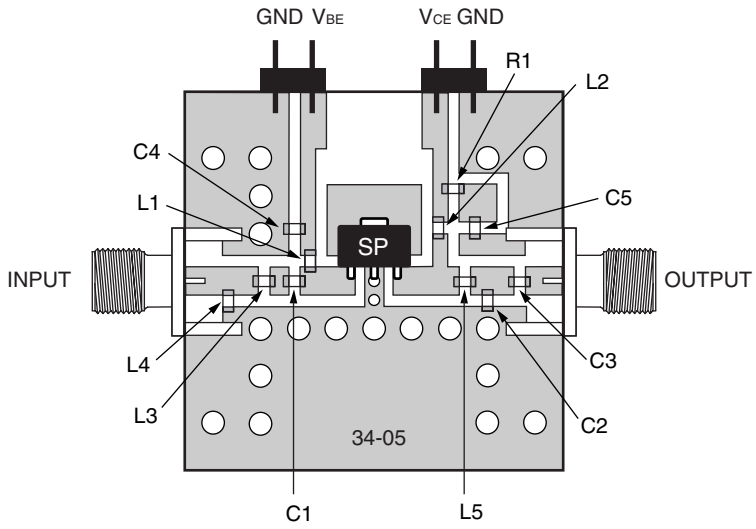

**Remark** The graphs indicate nominal characteristics.

## ★ 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.

## ★ EVALUATION BOARD (f = 460 MHz)




**Notes**

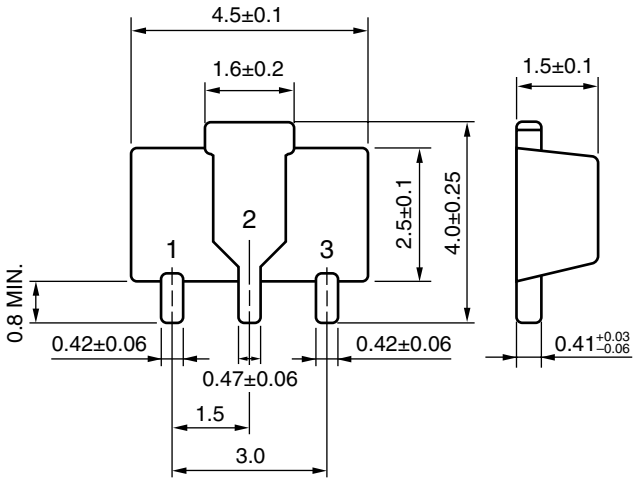
1. 20 × 20 mm, t = 0.8 mm double sided copper clad glass epoxy PWB.
2. Back side: GND pattern
3. Solder gold plated on pattern
4. ○: Through holes

## ★ COMPONENT LIST

| Component | Maker | Value | Size (TYPE) | Purpose |
|---|---|---|---|---|
| C1 | Murata | 10 pF | 1005 | Input DC Block/Input RF Matching |
| C2 | Murata | 4 pF | 1005 | Input RF Matching |
| C3 | Murata | 33 pF | 1005 | Input DC Block/Output RF Matching |
| C4 | Murata | 10 000 pF | 1005 | RF GND |
| C5 | Murata | 1 $\mu$F | 1608 | RF GND |
| L1 | Toko | 68 nH | 1005 | RF Block/Input RF Matching |
| L2 | Toko | 33 nH | LLQ2021 | RF Block/Output RF Matching |
| L3 | Toko | 1 nH | 1005 | Input RF Matching |
| L4 | Toko | 8.2 nH | 1005 | Input RF Matching |
| L5 | Toko | 8.2 nH | LLQ2021 | Output RF Matching |
| R1 | SSM | 15 Ω | 1608 | Improve Stability |

## PACKAGE DIMENSIONS

### 3-PIN POWER MINIMOLD (34 PKG) (UNIT: mm)




### PIN CONNECTIONS

1. Collector
2. Emitter
3. Base

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M8E 00.4-0110

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