



# NPN SILICON GERMANIUM RF TRANSISTOR

## NESG270034

### NPN SiGe RF TRANSISTOR FOR MEDIUM OUTPUT POWER AMPLIFICATION (2 W) 3-PIN POWER MINIMOLD (34 PKG)

#### FEATURES

- This product is suitable for medium output power (2 W) amplification  
 $P_{out} = 33.5 \text{ dBm TYP. @ } V_{CE} = 6 \text{ V, } P_{in} = 20 \text{ dBm, } f = 460 \text{ MHz}$   
 $P_{out} = 31.5 \text{ dBm TYP. @ } V_{CE} = 6 \text{ V, } P_{in} = 20 \text{ dBm, } f = 900 \text{ MHz}$
- 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                                                                          |
|---------------|------------------|------------------------------------------------------------|----------------------|-----------------------------------------------------------------------------------------|
| NESG270034    | NESG270034-AZ    | 3-pin power minimold<br>(34 PKG) (Pb-Free) <sup>Note</sup> | 25 pcs<br>(Non reel) | • Magazine case                                                                         |
| NESG270034-T1 | NESG270034-T1-AZ |                                                            | 1 kpcs/reel          | • 12 mm wide embossed taping<br>• Pin 2 (Emitter) face the perforation side of the tape |

<R> **Note** Contains Lead in the part except the electrode terminals.

**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    | $V_{CBO}$                 | 25          | V                |
| Collector to Emitter Voltage | $V_{CEO}$                 | 9.2         | V                |
| Emitter to Base Voltage      | $V_{EBO}$                 | 2.8         | V                |
| Collector Current            | $I_C$                     | 750         | mA               |
| Total Power Dissipation      | $P_{tot}$ <sup>Note</sup> | 1.9         | 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**

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

**THERMAL RESISTANCE ( $T_A = +25^\circ\text{C}$ )**

| Parameter                                                   | Symbol      | Ratings | Unit               |
|-------------------------------------------------------------|-------------|---------|--------------------|
| Thermal Resistance from Junction to Ambient <sup>Note</sup> | $R_{thj-a}$ | 65      | $^\circ\text{C/W}$ |

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

**RECOMMENDED OPERATING RANGE ( $T_A = +25^\circ\text{C}$ )**

| Parameter                    | Symbol   | MIN. | TYP. | MAX. | Unit |
|------------------------------|----------|------|------|------|------|
| Collector to Emitter Voltage | $V_{CE}$ | –    | 6.0  | 7.2  | V    |
| Collector Current            | $I_C$    | –    | 600  | 750  | mA   |
| Input Power <sup>Note</sup>  | $P_{in}$ | –    | 20   | 23   | dBm  |

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

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

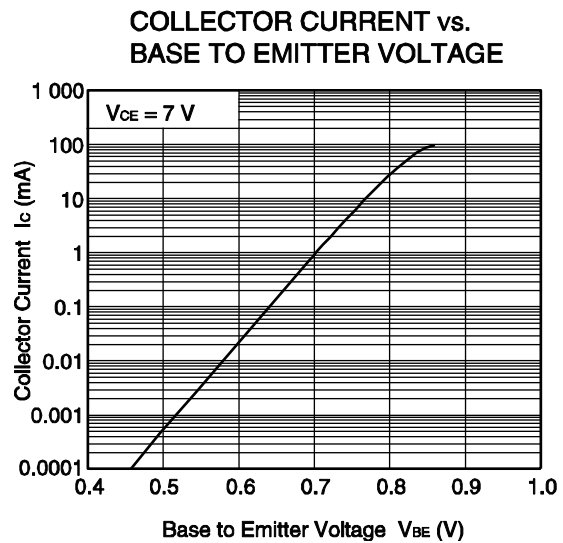
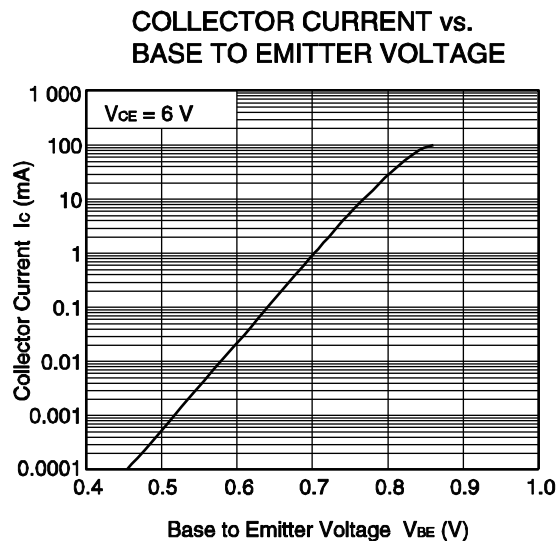
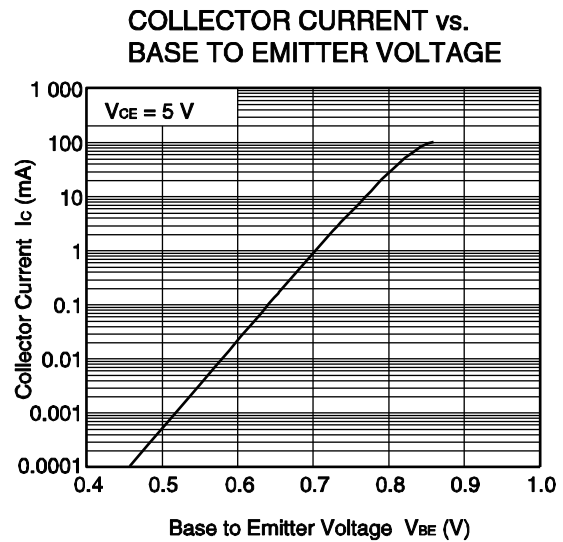
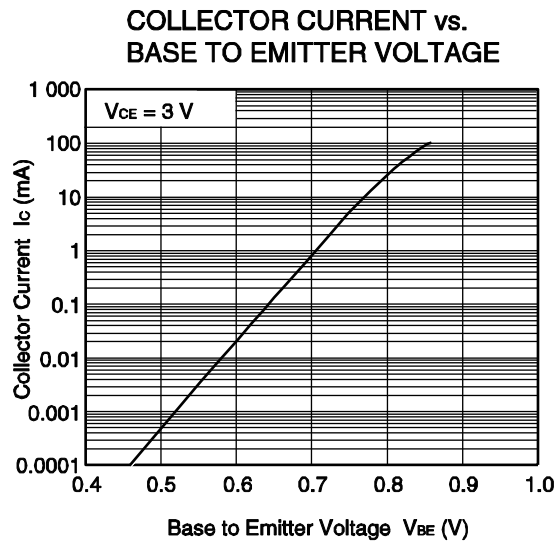
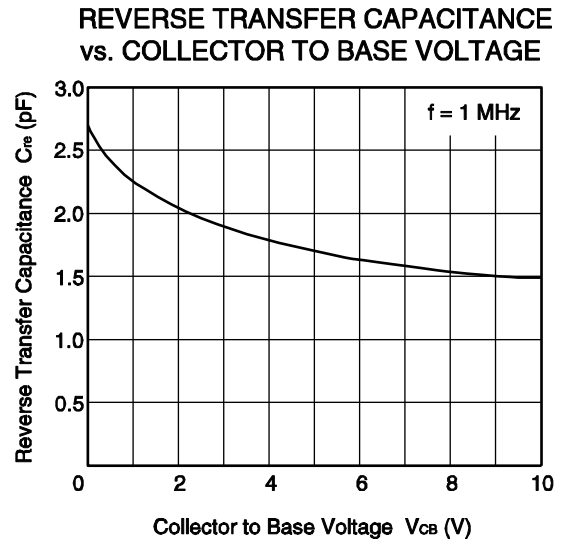
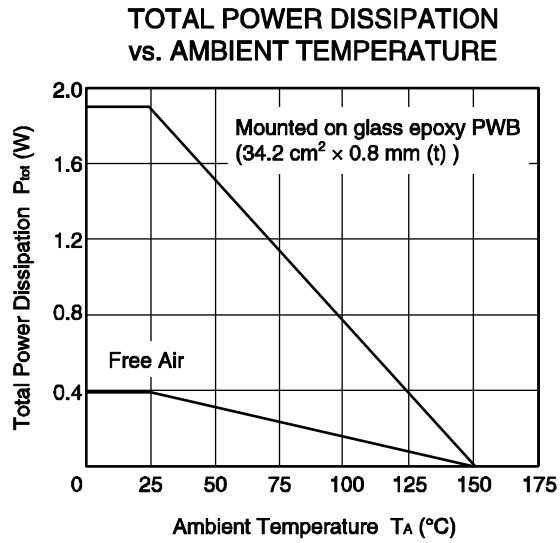
| Parameter                 | Symbol                   | Test Conditions                                                                                                         | MIN. | TYP. | MAX. | Unit          |
|---------------------------|--------------------------|-------------------------------------------------------------------------------------------------------------------------|------|------|------|---------------|
| DC Characteristics        |                          |                                                                                                                         |      |      |      |               |
| Collector Cut-off Current | $I_{CBO}$                | $V_{CB} = 9.2\text{ V}$ , $I_E = 0\text{ mA}$                                                                           | –    | –    | 1    | $\mu\text{A}$ |
| Emitter Cut-off Current   | $I_{EBO}$                | $V_{EB} = 1.0\text{ V}$ , $I_C = 0\text{ mA}$                                                                           | –    | –    | 1    | $\mu\text{A}$ |
| DC Current Gain           | $h_{FE}$ <sup>Note</sup> | $V_{CE} = 3\text{ V}$ , $I_C = 100\text{ mA}$                                                                           | 80   | 120  | 180  | –             |
| RF Characteristics        |                          |                                                                                                                         |      |      |      |               |
| Linner Gain (1)           | $G_L$                    | $V_{CE} = 6\text{ V}$ , $I_{C(\text{set})} = 30\text{ mA}$ (RF OFF),<br>$f = 460\text{ MHz}$ , $P_{in} = 0\text{ dBm}$  | 17.5 | 19.5 | –    | dB            |
| Linner Gain (2)           | $G_L$                    | $V_{CE} = 6\text{ V}$ , $I_{C(\text{set})} = 30\text{ mA}$ (RF OFF),<br>$f = 900\text{ MHz}$ , $P_{in} = 0\text{ dBm}$  | –    | 15   | –    | dB            |
| Output Power (1)          | $P_{out}$                | $V_{CE} = 6\text{ V}$ , $I_{C(\text{set})} = 30\text{ mA}$ (RF OFF),<br>$f = 460\text{ MHz}$ , $P_{in} = 20\text{ dBm}$ | 31.5 | 33.5 | –    | dBm           |
| Output Power (2)          | $P_{out}$                | $V_{CE} = 6\text{ V}$ , $I_{C(\text{set})} = 30\text{ mA}$ (RF OFF),<br>$f = 900\text{ MHz}$ , $P_{in} = 20\text{ dBm}$ | –    | 31.5 | –    | dBm           |
| Collector Efficiency (1)  | $\eta_C$                 | $V_{CE} = 6\text{ V}$ , $I_{C(\text{set})} = 30\text{ mA}$ (RF OFF),<br>$f = 460\text{ MHz}$ , $P_{in} = 20\text{ dBm}$ | –    | 60   | –    | %             |
| Collector Efficiency (2)  | $\eta_C$                 | $V_{CE} = 6\text{ V}$ , $I_{C(\text{set})} = 30\text{ mA}$ (RF OFF),<br>$f = 900\text{ MHz}$ , $P_{in} = 20\text{ dBm}$ | –    | 50   | –    | %             |

**Note** Pulse measurement:  $PW \leq 350\text{ }\mu\text{s}$ , Duty Cycle  $\leq 2\%$

 **$h_{FE}$  CLASSIFICATION**

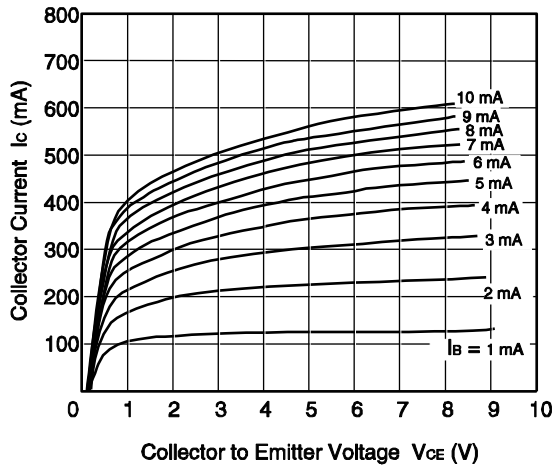
|                |           |
|----------------|-----------|
| Rank           | FB        |
| Marking        | SQ        |
| $h_{FE}$ Value | 80 to 180 |

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

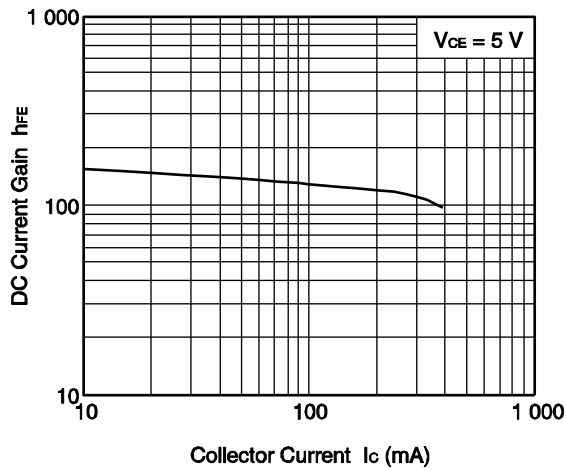


**Remark** The graph indicates nominal characteristics.

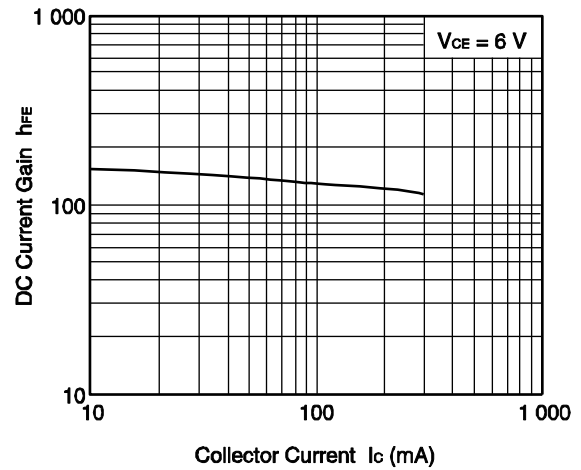
COLLECTOR CURRENT vs.  
COLLECTOR TO EMITTER VOLTAGE



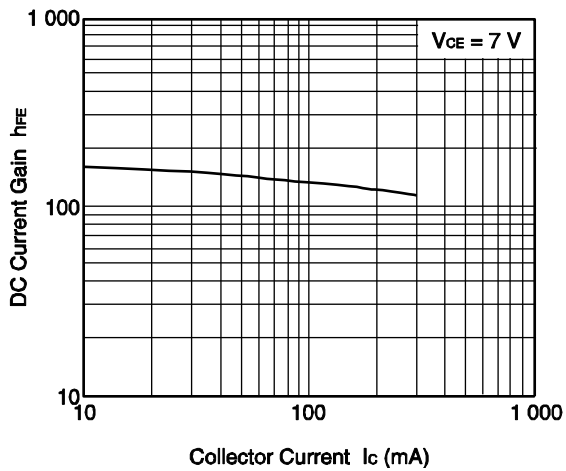
DC CURRENT GAIN vs.  
COLLECTOR CURRENT



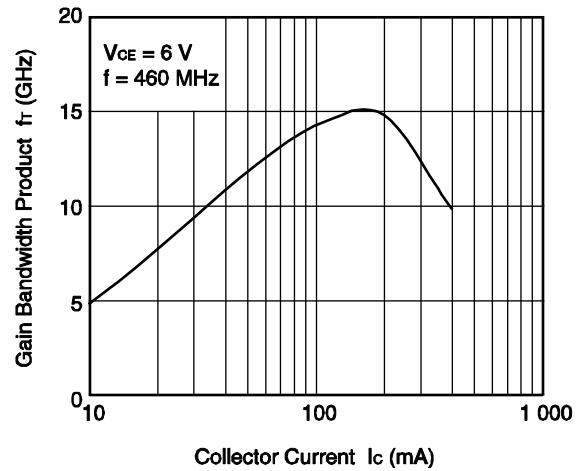
DC CURRENT GAIN vs.  
COLLECTOR CURRENT



DC CURRENT GAIN vs.  
COLLECTOR CURRENT

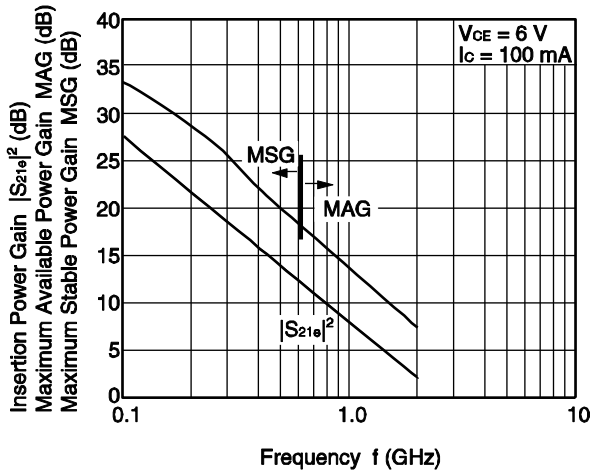


GAIN BANDWIDTH PRODUCT  
vs. COLLECTOR CURRENT

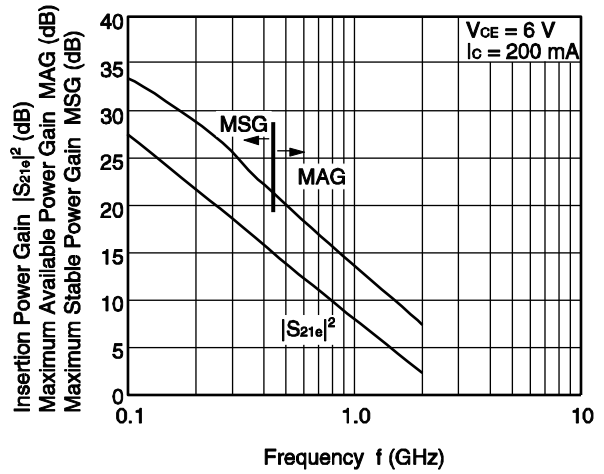


**Remark** The graph indicates nominal characteristics.

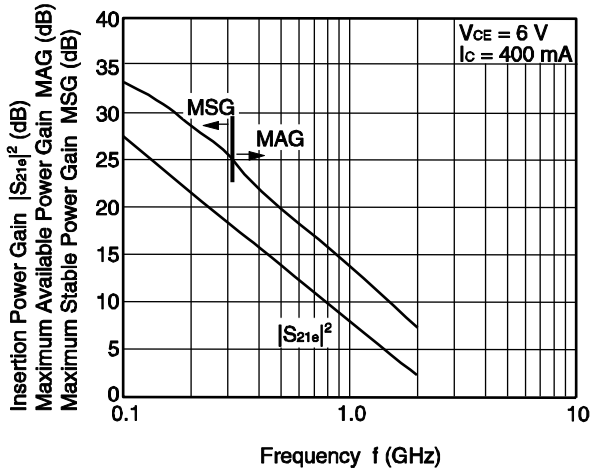
INSERTION POWER GAIN,  
MAG, MSG vs. FREQUENCY



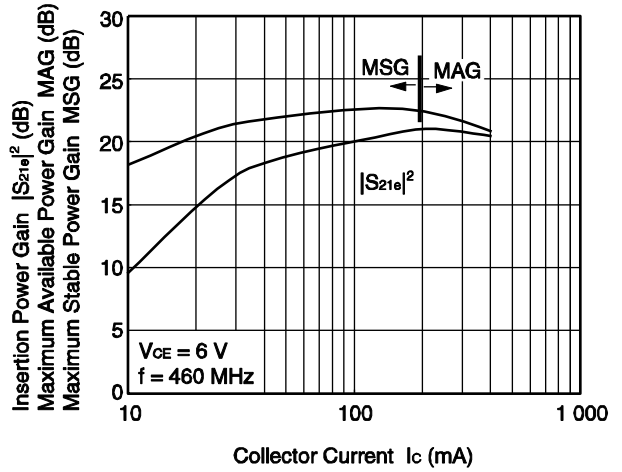
INSERTION POWER GAIN,  
MAG, MSG vs. FREQUENCY



INSERTION POWER GAIN,  
MAG, MSG vs. FREQUENCY



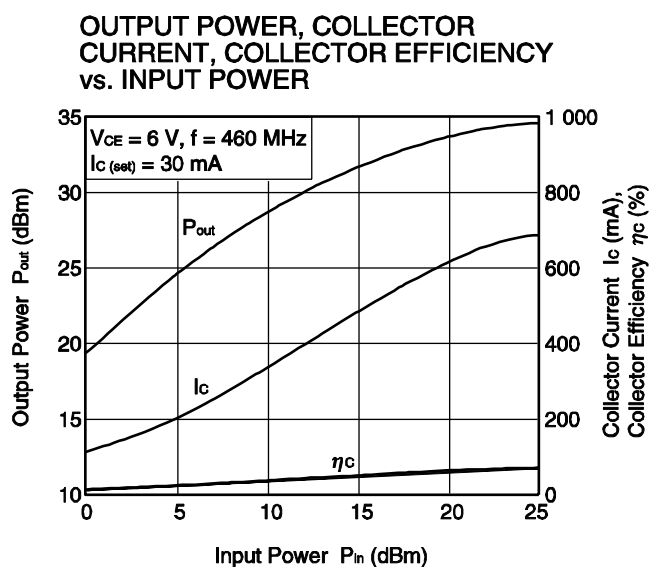
INSERTION POWER GAIN, MAG, MSG  
vs. COLLECTOR CURRENT



**Remark** The graph indicates nominal characteristics.

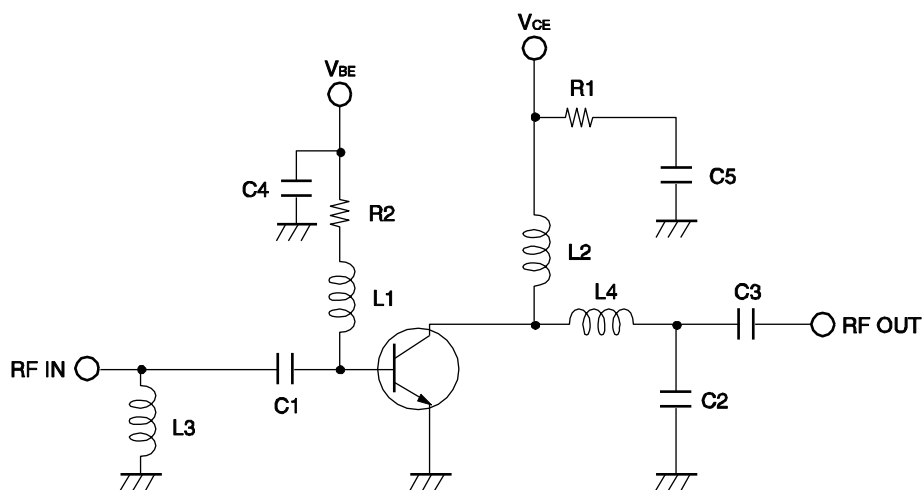
**S-PARAMETERS**

- 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/>

**PA EVALUATION CIRCUIT TYPICAL CHARACTERISTICS**

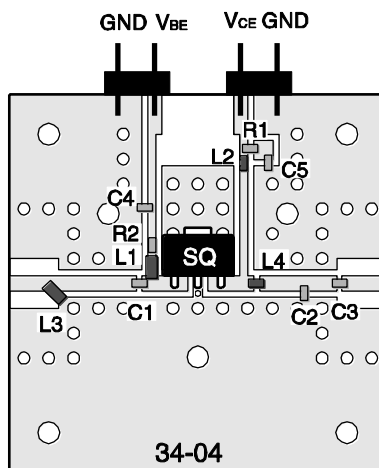
**Remark** The graph indicates nominal characteristics.

**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**

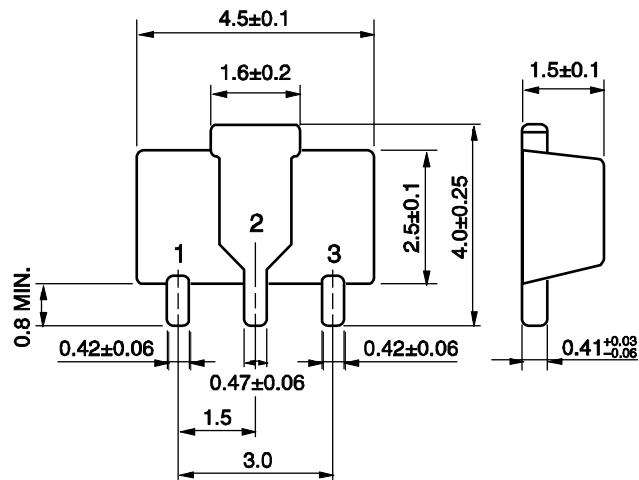
1. 38 × 38 mm, t = 0.8 mm double sided copper clad glass epoxy PWB.
2. Back side: GND pattern
3. Solder gold plated on pattern
4. ○: Through holes

## COMPONENT LIST

| Component | Maker  | Value       | Size (TYPE) | Purpose                           |
|-----------|--------|-------------|-------------|-----------------------------------|
| C1        | Murata | 11 pF       | 1005        | Input DC Block/Input RF Matching  |
| C2        | Murata | 9.5 pF      | 1005        | Input RF Matching                 |
| C3        | Murata | 39 pF       | 1005        | Input DC Block/Output RF Matching |
| C4        | Murata | 10 000 pF   | 1005        | RF GND                            |
| C5        | Murata | 10 000 pF   | 1005        | RF GND                            |
| L1        | Toko   | 390 nH      | 2012        | RF Block/Input RF Matching        |
| L2        | Toko   | 47 nH       | 1608        | RF Block/Output RF Matching       |
| L3        | Toko   | 5.6 nH      | 2012        | Input RF Matching                 |
| L4        | Toko   | 5.1 nH      | 1608        | Output RF Matching                |
| R1        | SSM    | 15 $\Omega$ | 1005        | Improve Stability                 |
| R2        | SSM    | 10 $\Omega$ | 1005        | Improve Stability                 |

**PACKAGE DIMENSIONS**

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



**PIN CONNECTIONS**

1. Collector
2. Emitter
3. Base