

# DATA SHEET

# NEC

## NPN SILICON RF TRANSISTOR

# NE685M33

### NPN SILICON RF TRANSISTOR FOR HIGH-FREQUENCY LOW NOISE 3-PIN SUPER LEAD-LESS MINIMOLD (M33)

#### FEATURES

- Low noise  
NF = 1.5 dB TYP. @  $V_{CE} = 3\text{ V}$ ,  $I_C = 3\text{ mA}$ ,  $f = 2\text{ GHz}$
- $|S_{21e}|^2 = 11\text{ dB}$  TYP. @  $V_{CE} = 3\text{ V}$ ,  $I_C = 10\text{ mA}$ ,  $f = 2\text{ GHz}$
- ★ • 3-pin super lead-less minimold (M33) package

#### ORDERING INFORMATION

| Part Number | Quantity          | Supplying Form                                                                                                                              |
|-------------|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| NE685M33    | 50 pcs (Non reel) | <ul style="list-style-type: none"> <li>• 8 mm wide embossed taping</li> <li>• Pin 2 (Base) face the perforation side of the tape</li> </ul> |
| NE685M33-T3 | 10 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    | $V_{CBO}$                     | 9.0         | V                |
| Collector to Emitter Voltage | $V_{CEO}$                     | 6.0         | V                |
| Emitter to Base Voltage      | $V_{EBO}$                     | 2.0         | V                |
| Collector Current            | $I_C$                         | 30          | mA               |
| Total Power Dissipation      | $P_{tot}$ <small>Note</small> | 130         | 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.

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Not all devices/types available in every country. Please check with local NEC Compound Semiconductor Devices representative for availability and additional information.

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

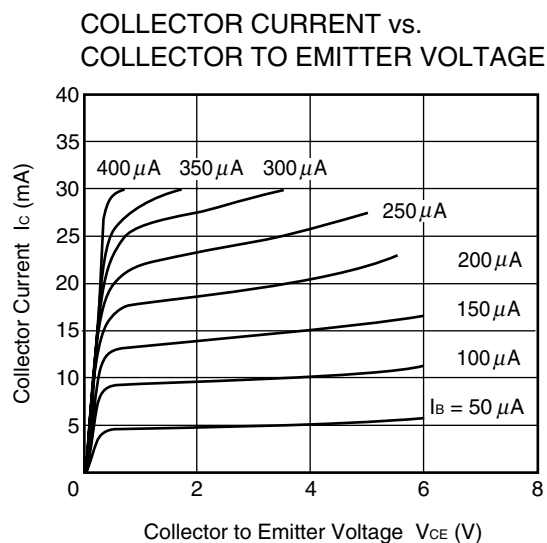
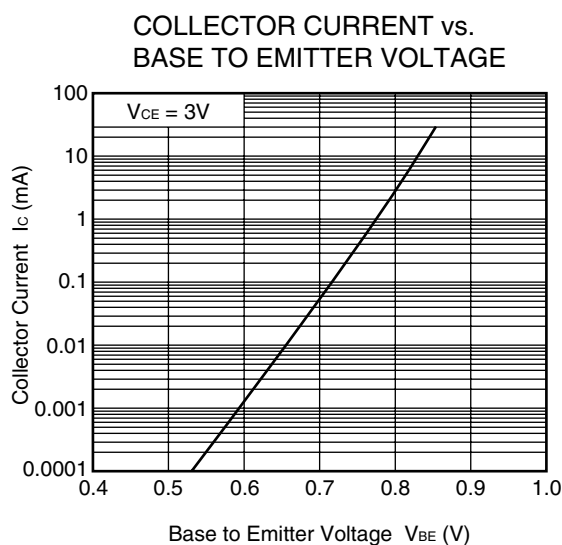
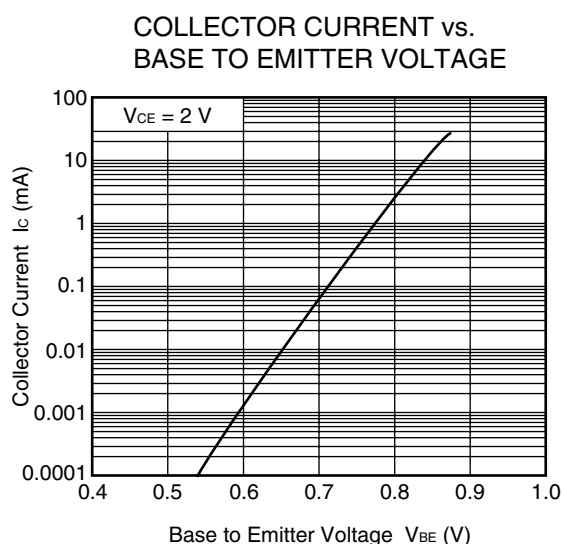
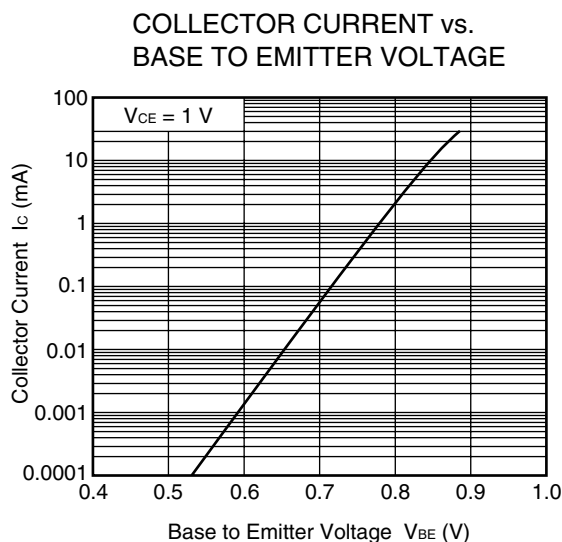
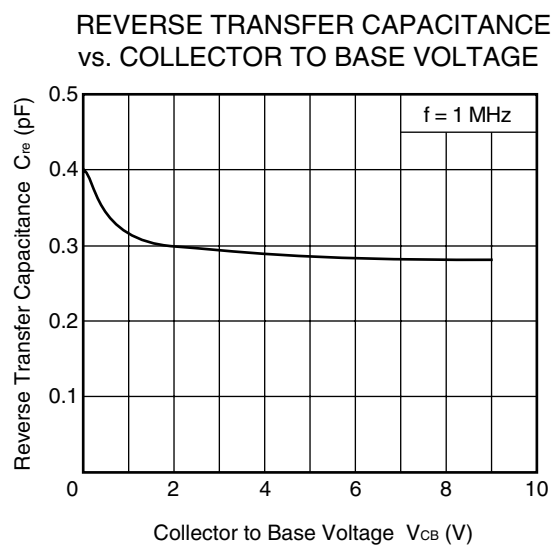
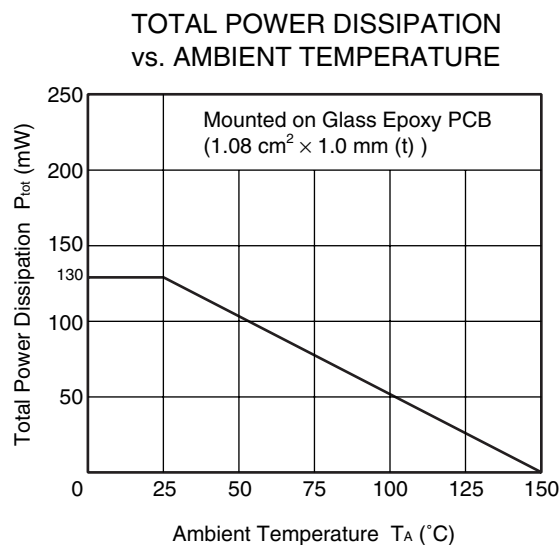
| Parameter                    | Symbol                     | Test Conditions                                                           | MIN. | TYP. | MAX. | Unit |
|------------------------------|----------------------------|---------------------------------------------------------------------------|------|------|------|------|
| 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              | $h_{FE}$ <sup>Note 1</sup> | $V_{CE} = 3\text{ V}, I_C = 10\text{ mA}$                                 | 75   | 110  | 150  | —    |
| RF Characteristics           |                            |                                                                           |      |      |      |      |
| Gain Bandwidth Product       | $f_T$                      | $V_{CE} = 3\text{ V}, I_C = 10\text{ mA}, f = 2\text{ GHz}$               | 10   | 12   | —    | GHz  |
| Insertion Power Gain         | $ S_{21e} ^2$              | $V_{CE} = 3\text{ V}, I_C = 10\text{ mA}, f = 2\text{ GHz}$               | 7    | 11   | —    | dB   |
| Noise Figure                 | NF                         | $V_{CE} = 3\text{ V}, I_C = 3\text{ mA}, f = 2\text{ GHz}, Z_S = Z_{opt}$ | —    | 1.5  | 2.5  | dB   |
| Reverse Transfer Capacitance | $C_{re}$ <sup>Note 2</sup> | $V_{CB} = 3\text{ V}, I_C = 0\text{ mA}, f = 1\text{ MHz}$                | —    | 0.4  | 0.7  | pF   |

- Notes** 1. Pulse measurement:  $PW \leq 350\text{ }\mu\text{s}$ , Duty Cycle  $\leq 2\%$   
 2. Collector to base capacitance when the emitter grounded

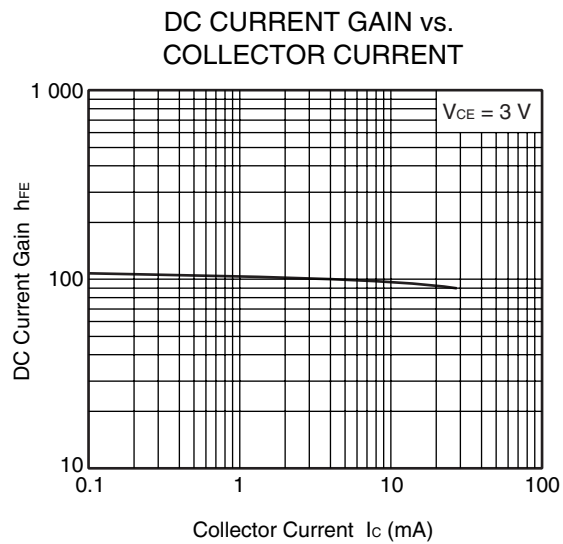
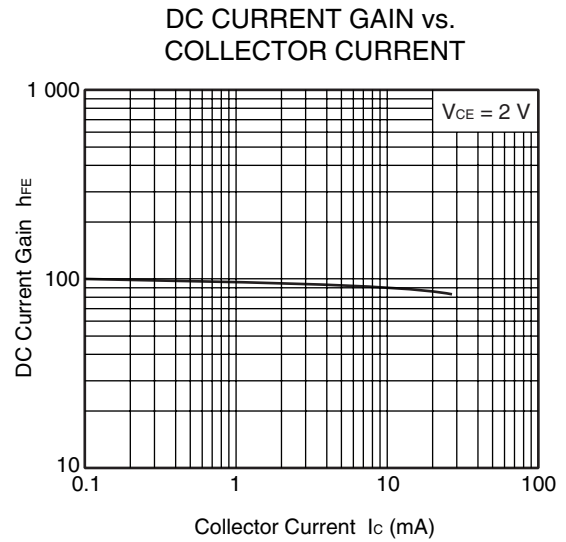
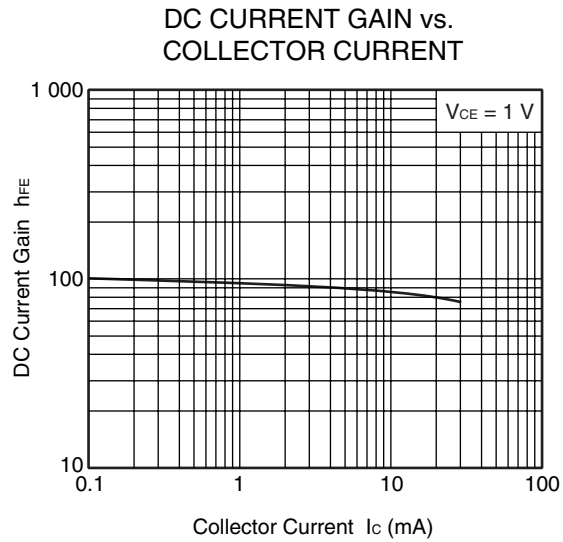
**$h_{FE}$  CLASSIFICATION**

|                |           |
|----------------|-----------|
| Rank           | FB        |
| Marking        | Y2        |
| $h_{FE}$ Value | 75 to 150 |

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



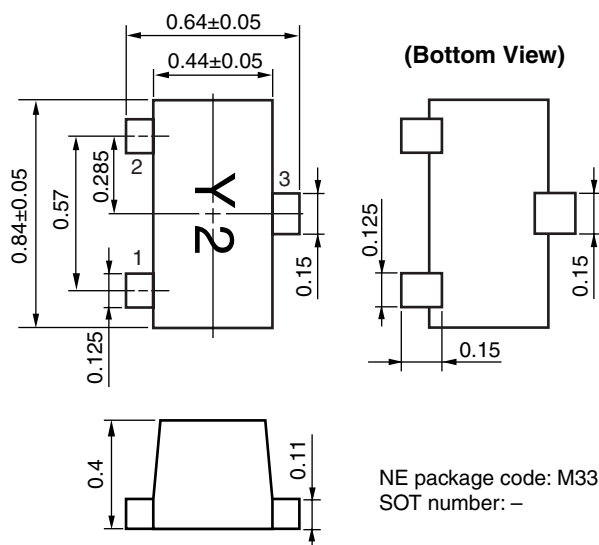
**Remark** The graphs indicate nominal characteristics.



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# PACKAGE DIMENSIONS

## 3-PIN SUPER LEAD-LESS MINIMOLD (M33) (UNIT: mm)



## PIN CONNECTIONS

1. Emitter
2. Base
3. Collector

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