



# NEC's NPN SiGe HIGH FREQUENCY TRANSISTOR

# NESG3031M14

## FEATURES

- **LOW NOISE FIGURE AND HIGH-GAIN**  
 $NF = 0.95 \text{ dB TYP}$ ,  $G_a = 10 \text{ dB TYP}$  @  $V_{CE} = 2 \text{ V}$ ,  $I_c = 6 \text{ mA}$ ,  $f = 5.2 \text{ GHz}$   
 $NF = 1.1 \text{ dB TYP}$ ,  $G_a = 9.5 \text{ dB TYP}$  @  $V_{CE} = 2 \text{ V}$ ,  $I_c = 6 \text{ mA}$ ,  $f = 5.8 \text{ GHz}$
- **MAXIMUM STABLE POWER GAIN:**  
 $MSG = 15.0 \text{ dB TYP}$  @  $V_{CE} = 3 \text{ V}$ ,  $I_c = 20 \text{ mA}$ ,  $f = 5.8 \text{ GHz}$
- **SiGe HBT TECHNOLOGY:**  
 USH3 process,  $f_{max} = 110 \text{ GHz}$
- **M14 PACKAGE:**  
 4-pin lead-less minimold package

## ORDERING INFORMATION

| PART NUMBER    | QUANTITY          | SUPPLYING FORM                                                             |
|----------------|-------------------|----------------------------------------------------------------------------|
| NESG3031M14    | 50 pcs (Non reel) | • 8 mm wide embossed taping                                                |
| NESG3031M14-T3 | 10 kpcs/reel      | • Pin 1 (Collector), Pin 4 (Emitter) face the perforation side of the tape |

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

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

| PARAMETER                    | SYMBOL                    | RATINGS     | UNIT             |
|------------------------------|---------------------------|-------------|------------------|
| Collector to Base Voltage    | $V_{CBO}$                 | 12.0        | V                |
| Collector to Emitter Voltage | $V_{CEO}$                 | 4.3         | V                |
| Emitter to Base Voltage      | $V_{EBO}$                 | 1.5         | V                |
| Collector Current            | $I_c$                     | 35          | mA               |
| Total Power Dissipation      | $P_{tot}$ <sup>Note</sup> | 150         | 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

## 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                                                                                                 | –    | –    | 100  | nA   |
| Emitter Cut-off Current                                     | I <sub>EBO</sub>                      | V <sub>EB</sub> = 1 V, I <sub>C</sub> = 0 mA                                                                                                 | –    | –    | 100  | nA   |
| DC Current Gain                                             | h <sub>FE</sub> <small>Note 1</small> | V <sub>CE</sub> = 2 V, I <sub>C</sub> = 6 mA                                                                                                 | 220  | 300  | 380  | –    |
| RF Characteristics                                          |                                       |                                                                                                                                              |      |      |      |      |
| Insertion Power Gain                                        | S <sub>21e</sub>   <sup>2</sup>       | V <sub>CE</sub> = 3 V, I <sub>C</sub> = 20 mA, f = 5.8 GHz                                                                                   | 6.5  | 9.0  | –    | dB   |
| Noise Figure (1)                                            | NF                                    | V <sub>CE</sub> = 2 V, I <sub>C</sub> = 6 mA, f = 5.2 GHz,<br>Z <sub>S</sub> = Z <sub>Sopt</sub> , Z <sub>L</sub> = Z <sub>Lopt</sub>        | –    | 0.95 | –    | dB   |
| Noise Figure (2)                                            | NF                                    | V <sub>CE</sub> = 2 V, I <sub>C</sub> = 6 mA, f = 5.8 GHz,<br>Z <sub>S</sub> = Z <sub>Sopt</sub> , Z <sub>L</sub> = Z <sub>Lopt</sub>        | –    | 1.1  | 1.5  | dB   |
| Associated Gain (1)                                         | G <sub>a</sub>                        | V <sub>CE</sub> = 2 V, I <sub>C</sub> = 6 mA, f = 5.2 GHz,<br>Z <sub>S</sub> = Z <sub>Sopt</sub> , Z <sub>L</sub> = Z <sub>Lopt</sub>        | –    | 10.0 | –    | dB   |
| Associated Gain (2)                                         | G <sub>a</sub>                        | V <sub>CE</sub> = 2 V, I <sub>C</sub> = 6 mA, f = 5.8 GHz,<br>Z <sub>S</sub> = Z <sub>Sopt</sub> , Z <sub>L</sub> = Z <sub>Lopt</sub>        | 7.5  | 9.5  | –    | dB   |
| Reverse Transfer Capacitance                                | C <sub>re</sub> <small>Note 2</small> | V <sub>CB</sub> = 2 V, I <sub>E</sub> = 0 mA, f = 1 MHz                                                                                      | –    | 0.15 | 0.25 | pF   |
| Maximum Stable Power Gain                                   | MSG <small>Note 3</small>             | V <sub>CE</sub> = 3 V, I <sub>C</sub> = 20 mA, f = 5.8 GHz                                                                                   | 12.0 | 15.0 | –    | dB   |
| Gain 1 dB Compression Output Power                          | P <sub>O</sub> (1 dB)                 | V <sub>CE</sub> = 3 V, I <sub>C</sub> (set) = 20 mA,<br>f = 5.8 GHz, Z <sub>S</sub> = Z <sub>Sopt</sub> , Z <sub>L</sub> = Z <sub>Lopt</sub> | –    | 13.0 | –    | dBm  |
| 3rd Order Intermodulation Distortion Output Intercept Point | OIP <sub>3</sub>                      | V <sub>CE</sub> = 3 V, I <sub>C</sub> (set) = 20 mA,<br>f = 5.8 GHz, Z <sub>S</sub> = Z <sub>Sopt</sub> , Z <sub>L</sub> = Z <sub>Lopt</sub> | –    | 18.0 | –    | dBm  |

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

2. Collector to base capacitance when the emitter grounded

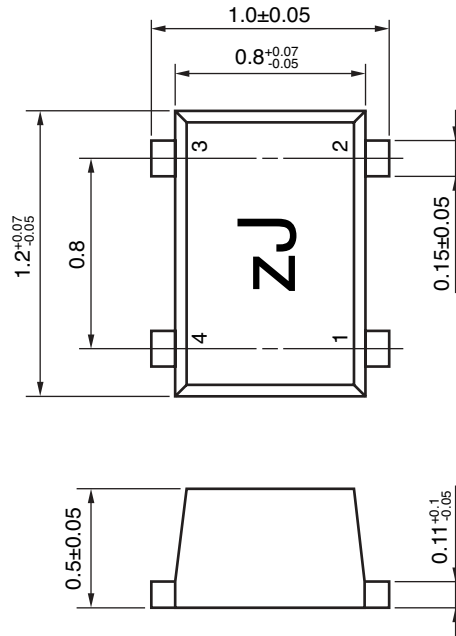
$$3. \text{MSG} = \left| \frac{S_{21}}{S_{12}} \right|$$

## h<sub>FE</sub> CLASSIFICATION

| RANK                  | FB         |
|-----------------------|------------|
| Marking               | zJ         |
| h <sub>FE</sub> Value | 220 to 380 |

## PACKAGE DIMENSIONS (Units in mm)

### 4-PIN LEAD-LESS MINIMOLD (M14, 1208 PACKAGE)



### PIN CONNECTIONS

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

#### Life Support Applications

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