



# NPN SILICON GERMANIUM RF TRANSISTOR

## NESG3032M14

### NPN SiGe RF TRANSISTOR FOR LOW NOISE, HIGH-GAIN AMPLIFICATION 4-PIN LEAD-LESS MINIMOLD (M14, 1208 PACKAGE)

#### FEATURES

- The device is an ideal choice for low noise, high-gain amplification  
NF = 0.6 dB TYP. @  $V_{CE} = 2\text{ V}$ ,  $I_c = 6\text{ mA}$ ,  $f = 2.0\text{ GHz}$
- Maximum stable power gain: MSG = 20.5 dB TYP. @  $V_{CE} = 2\text{ V}$ ,  $I_c = 15\text{ mA}$ ,  $f = 2.0\text{ GHz}$
- SiGe HBT technology (UHS3) adopted:  $f_{max} = 110\text{ GHz}$
- 4-pin lead-less minimold (M14, 1208 package)

#### ORDERING INFORMATION

| Part Number    | Order Number     | Package  | Quantity             | Supplying Form   |
|----------------|------------------|--|----------------------|--|
| NESG3032M14    | NESG3032M14-A    | 4-pin lead-less minimold<br>(M14, 1208 package)<br>(Pb-Free) | 50 pcs<br>(Non reel) | • 8 mm wide embossed taping<br>• Pin 1 (Collector), Pin 4 (Emitter) face the<br>perforation side of the tape |
| NESG3032M14-T3 | NESG3032M14-T3-A |  | 10 kpcs/reel         |  |

**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 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.

ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = +25°C)

| Parameter   | Symbol                            | Test Conditions   | MIN. | TYP. | MAX. | Unit |
|---|-----------------------------------|---|------|------|------|------|
| DC Characteristics  |                                   |   |      |      |      |      |
| Collector Cut-off Current                                   | I <sub>CB0</sub>                  | V <sub>CB</sub> = 5 V, I <sub>E</sub> = 0 mA  | –    | –    | 100  | nA   |
| Emitter Cut-off Current                                     | I <sub>EB0</sub>                  | V <sub>EB</sub> = 1 V, I <sub>C</sub> = 0 mA  | –    | –    | 100  | nA   |
| DC Current Gain   | h <sub>FE</sub> <sup>Note 1</sup> | 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> = 2 V, I <sub>C</sub> = 15 mA, f = 2.0 GHz  | 15.0 | 17.5 | –    | dB   |
| Noise Figure  | NF                                | V <sub>CE</sub> = 2 V, I <sub>C</sub> = 6 mA, f = 2.0 GHz,<br>Z <sub>S</sub> = Z <sub>Sopt</sub> , Z <sub>L</sub> = Z <sub>Lopt</sub>       | –    | 0.60 | 0.85 | dB   |
| Associated Gain   | G <sub>a</sub>                    | V <sub>CE</sub> = 2 V, I <sub>C</sub> = 6 mA, f = 2.0 GHz,<br>Z <sub>S</sub> = Z <sub>Sopt</sub> , Z <sub>L</sub> = Z <sub>Lopt</sub>       | –    | 17.5 | –    | dB   |
| Reverse Transfer Capacitance                                | C <sub>re</sub> <sup>Note 2</sup> | 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 <sup>Note 3</sup>             | V <sub>CE</sub> = 2 V, I <sub>C</sub> = 15 mA, f = 2.0 GHz  | 17.5 | 20.5 | –    | dB   |
| Gain 1 dB Compression Output Power                          | P <sub>O(1dB)</sub>               | V <sub>CE</sub> = 3 V, I <sub>C(set)</sub> = 20 mA,<br>f = 2.0 GHz, Z <sub>S</sub> = Z <sub>Sopt</sub> , Z <sub>L</sub> = Z <sub>Lopt</sub> | –    | 12.5 | –    | dBm  |
| 3rd Order Intermodulation Distortion Output Intercept Point | OIP <sub>3</sub>                  | V <sub>CE</sub> = 3 V, I <sub>C(set)</sub> = 20 mA,<br>f = 2.0 GHz, Z <sub>S</sub> = Z <sub>Sopt</sub> , Z <sub>L</sub> = Z <sub>Lopt</sub> | –    | 24.0 | –    | 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               | zN         |
| h <sub>FE</sub> Value | 220 to 380 |

## 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.

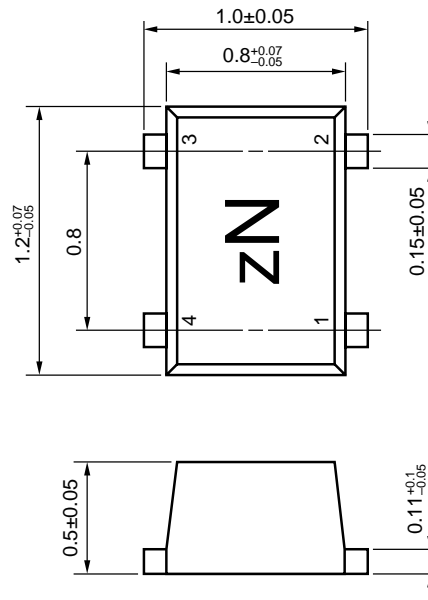
Click here to download S-parameters.

[RF and Microwave] → [Device Parameters]

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

## PACKAGE DIMENSIONS

4-PIN LEAD-LESS MINIMOLD (M14, 1208 PACKAGE) (UNIT: mm)



## PIN CONNECTIONS

1. Collector
2. Emitter
3. Base
4. NC (Connected with Pin 2)

When the product(s) listed in this document is subject to any applicable import or export control laws and regulation of the authority having competent jurisdiction, such product(s) shall not be imported or exported without obtaining the import or export license.

• **The information in this document is current as of July, 2005. 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.**

• No part of this document may be copied or reproduced in any form or by any means without prior written consent of NEC. NEC assumes no responsibility for any errors that may appear in this document.

• NEC does not assume any liability for infringement of patents, copyrights or other intellectual property rights of third parties by or arising from the use of NEC semiconductor products listed in this document or any other liability arising from the use of such products. No license, express, implied or otherwise, is granted under any patents, copyrights or other intellectual property rights of NEC or others.

• Descriptions of circuits, software and other related information in this document are provided for illustrative purposes in semiconductor product operation and application examples. The incorporation of these circuits, software and information in the design of customer's equipment shall be done under the full responsibility of customer. NEC assumes no responsibility for any losses incurred by customers or third parties arising from the use of these circuits, software and information.

• While NEC endeavours to enhance the quality, reliability and safety of NEC semiconductor products, customers agree and acknowledge that the possibility of defects thereof cannot be eliminated entirely. To minimize risks of damage to property or injury (including death) to persons arising from defects in NEC semiconductor products, customers must incorporate sufficient safety measures in their design, such as redundancy, fire-containment, and anti-failure features.

• NEC semiconductor products are classified into the following three quality grades:

"Standard", "Special" and "Specific". The "Specific" quality grade applies only to semiconductor products developed based on a customer-designated "quality assurance program" for a specific application. The recommended applications of a semiconductor product depend on its quality grade, as indicated below. Customers must check the quality grade of each semiconductor product before using it in a particular application.

"Standard": Computers, office equipment, communications equipment, test and measurement equipment, audio and visual equipment, home electronic appliances, machine tools, personal electronic equipment and industrial robots

"Special": Transportation equipment (automobiles, trains, ships, etc.), traffic control systems, anti-disaster systems, anti-crime systems, safety equipment and medical equipment (not specifically designed for life support)

"Specific": Aircraft, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems and medical equipment for life support, etc.

The quality grade of NEC semiconductor products is "Standard" unless otherwise expressly specified in NEC's data sheets or data books, etc. If customers wish to use NEC semiconductor products in applications not intended by NEC, they must contact an NEC sales representative in advance to determine NEC's willingness to support a given application.

(Note)

(1) "NEC" as used in this statement means NEC Corporation, NEC Compound Semiconductor Devices, Ltd. and also includes its majority-owned subsidiaries.

(2) "NEC semiconductor products" means any semiconductor product developed or manufactured by or for NEC (as defined above).

M8E 00.4-0110

► For further information, please contact

**NEC Compound Semiconductor Devices, Ltd.** <http://www.ncsd.necel.com/>

E-mail: [salesinfo@ml.ncsd.necel.com](mailto:salesinfo@ml.ncsd.necel.com) (sales and general)

[techinfo@ml.ncsd.necel.com](mailto:techinfo@ml.ncsd.necel.com) (technical)

Sales Division TEL: +81-44-435-1573 FAX: +81-44-435-1579

**NEC Compound Semiconductor Devices Hong Kong Limited**

E-mail: [ncsd-hk@elhk.nec.com.hk](mailto:ncsd-hk@elhk.nec.com.hk) (sales, technical and general)

Hong Kong Head Office TEL: +852-3107-7303 FAX: +852-3107-7309

Taipei Branch Office TEL: +886-2-8712-0478 FAX: +886-2-2545-3859

Korea Branch Office TEL: +82-2-558-2120 FAX: +82-2-558-5209

**NEC Electronics (Europe) GmbH** <http://www.ee.nec.de/>

TEL: +49-211-6503-0 FAX: +49-211-6503-1327

**California Eastern Laboratories, Inc.** <http://www.cel.com/>

TEL: +1-408-988-3500 FAX: +1-408-988-0279

Subject: Compliance with EU Directives

CEL certifies, to its knowledge, that semiconductor and laser products detailed below are compliant with the requirements of European Union (EU) Directive 2002/95/EC Restriction on Use of Hazardous Substances in electrical and electronic equipment (RoHS) and the requirements of EU Directive 2003/11/EC Restriction on Penta and Octa BDE.

CEL Pb-free products have the same base part number with a suffix added. The suffix –A indicates that the device is Pb-free. The –AZ suffix is used to designate devices containing Pb which are exempted from the requirement of RoHS directive (\*). In all cases the devices have Pb-free terminals. All devices with these suffixes meet the requirements of the RoHS directive.

This status is based on CEL’s understanding of the EU Directives and knowledge of the materials that go into its products as of the date of disclosure of this information.

| Restricted Substance per RoHS | Concentration Limit per RoHS (values are not yet fixed) | Concentration contained in CEL devices |     |
|-------------------------------|---|--|-----|
|                               |   | -A                                     | -AZ |
| Lead (Pb)                     | < 1000 PPM  | Not Detected                           | (*) |
| Mercury                       | < 1000 PPM  | Not Detected                           |     |
| Cadmium                       | < 100 PPM   | Not Detected                           |     |
| Hexavalent Chromium           | < 1000 PPM  | Not Detected                           |     |
| PBB                           | < 1000 PPM  | Not Detected                           |     |
| PBDE                          | < 1000 PPM  | Not Detected                           |     |

If you should have any additional questions regarding our devices and compliance to environmental standards, please do not hesitate to contact your local representative.

Important Information and Disclaimer: Information provided by CEL on its website or in other communications concerning the substance content of its products represents knowledge and belief as of the date that it is provided. CEL bases its knowledge and belief on information provided by third parties and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. CEL has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. CEL and CEL suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall CEL’s liability arising out of such information exceed the total purchase price of the CEL part(s) at issue sold by CEL to customer on an annual basis.

See CEL Terms and Conditions for additional clarification of warranties and liability.