

# NZH series

## Single Zener diodes

Rev. 01 — 27 January 2010

Product data sheet

## 1. Product profile

### 1.1 General description

General-purpose Zener diodes in a SOD123F small and flat lead Surface-Mounted Device (SMD) plastic package.

### 1.2 Features

- Total power dissipation:  $\leq 500$  mW
- Wide working voltage range
- Small plastic package suitable for surface-mounted design
- Low differential resistance

### 1.3 Applications

- General regulation functions

### 1.4 Quick reference data

Table 1. Quick reference data

| Symbol    | Parameter               | Conditions           | Min   | Typ | Max | Unit |
|-----------|-------------------------|----------------------|-------|-----|-----|------|
| $V_F$     | forward voltage         | $I_F = 10$ mA        | [1] - | -   | 0.9 | V    |
| $P_{tot}$ | total power dissipation | $T_{amb} \leq 25$ °C | [2] - | -   | 500 | mW   |
|           |                         |                      | [3] - | -   | 1   | W    |

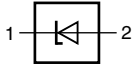

[1] Pulse test:  $t_p \leq 300$   $\mu$ s;  $\delta \leq 0.02$ .

[2] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated, mounting pad for cathode 1 cm<sup>2</sup>.

[3] Device mounted on a ceramic PCB, Al<sub>2</sub>O<sub>3</sub>, standard footprint.

## 2. Pinning information

Table 2. Pinning

| Pin | Description | Simplified outline  | Graphic symbol  |
|-----|-------------|---|---|
| 1   | cathode     | [1]   |  |
| 2   | anode       |  |   |

[1] The marking bar indicates the cathode.

## 3. Ordering information

Table 3. Ordering information

| Type number             | Package |  |         |
|-------------------------|---------|--|---------|
|                         | Name    | Description                              | Version |
| NZH3V0B to<br>NZH30C[1] | -       | plastic surface-mounted package; 2 leads | SOD123F |

[1] The series consists of 25 types with nominal working voltages from 3.0 V to 30 V.

## 4. Marking

Table 4. Marking codes

| Type number | Marking code | Type number | Marking code |
|-------------|--------------|-------------|--------------|
| NZH3V0B     | CH           | NZH10C      | CW           |
| NZH3V3A     | CJ           | NZH11C      | CX           |
| NZH3V6B     | CK           | NZH12B      | CY           |
| NZH3V9B     | CL           | NZH13B      | D9           |
| NZH4V3B     | CM           | NZH15B      | D1           |
| NZH4V7B     | CN           | NZH16C      | D2           |
| NZH5V1B     | CP           | NZH18C      | D3           |
| NZH5V6B     | CQ           | NZH20C      | D4           |
| NZH6V2B     | CR           | NZH22C      | D5           |
| NZH6V8B     | CS           | NZH24C      | D6           |
| NZH7V5C     | CT           | NZH27C      | D7           |
| NZH8V2B     | CU           | NZH30C      | DA           |
| NZH9V1B     | CV           | -           | -            |

## 5. Limiting values

**Table 5. Limiting values**

In accordance with the Absolute Maximum Rating System (IEC 60134).

| Symbol    | Parameter               | Conditions                  | Min | Max  | Unit |    |
|-----------|-------------------------|-----------------------------|-----|------|------|----|
| $I_F$     | forward current         |                             | -   | 250  | mA   |    |
| $P_{tot}$ | total power dissipation | $T_{amb} \leq 25\text{ °C}$ | [1] | -    | 500  | mW |
|           |                         |                             | [2] | -    | 1    | W  |
| $T_j$     | junction temperature    |                             | -   | 150  | °C   |    |
| $T_{amb}$ | ambient temperature     |                             | -55 | +150 | °C   |    |
| $T_{stg}$ | storage temperature     |                             | -65 | +150 | °C   |    |

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode 1 cm<sup>2</sup>.

[2] Device mounted on a ceramic PCB, Al<sub>2</sub>O<sub>3</sub>, standard footprint.

## 6. Thermal characteristics

**Table 6. Thermal characteristics**

| Symbol         | Parameter  | Conditions  | Min | Typ | Max | Unit |     |
|----------------|--|-------------|-----|-----|-----|------|-----|
| $R_{th(j-a)}$  | thermal resistance from junction to ambient      | in free air | [1] | -   | -   | 250  | K/W |
|                |  |             | [2] | -   | -   | 125  | K/W |
| $R_{th(j-sp)}$ | thermal resistance from junction to solder point |             | [3] | -   | -   | 70   | K/W |

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode 1 cm<sup>2</sup>.

[2] Device mounted on a ceramic PCB, Al<sub>2</sub>O<sub>3</sub>, standard footprint.

[3] Soldering point of cathode tab.

## 7. Characteristics

**Table 7. Characteristics**

$T_j = 25\text{ °C}$  unless otherwise specified.

| Symbol | Parameter       | Conditions           | Min | Typ | Max | Unit |   |
|--------|-----------------|----------------------|-----|-----|-----|------|---|
| $V_F$  | forward voltage | $I_F = 10\text{ mA}$ | [1] | -   | -   | 0.9  | V |

[1] Pulse test:  $t_p \leq 300\text{ }\mu\text{s}$ ;  $\delta \leq 0.02$ .

**Table 8. Characteristics per type; NZH3V0B to NZH10C**

$T_j = 25\text{ °C}$  unless otherwise specified.

| NZHxxx | Working voltage<br>$V_Z$ (V);<br>$I_Z = 20\text{ mA}$ |      | Maximum differential<br>resistance<br>$r_{dif}$ ( $\Omega$ ) |                      | Reverse current<br>$I_R$ ( $\mu\text{A}$ ) |           | Diode<br>capacitance<br>$C_d$ (pF) <sup>[1]</sup> |
|--------|---|------|--|----------------------|--|-----------|---|
|        | Min   | Max  | $I_Z = 1\text{ mA}$  | $I_Z = 20\text{ mA}$ | Max  | $V_R$ (V) | Max   |
| 3V0B   | 2.85  | 3.15 | 1000   | 80                   | 50   | 1         | 450   |
| 3V3A   | 3.16  | 3.38 | 1000   | 70                   | 20   | 1         | 450   |
| 3V6B   | 3.42  | 3.78 | 1000   | 60                   | 5  | 1         | 450   |
| 3V9B   | 3.71  | 4.10 | 1000   | 50                   | 5  | 1         | 450   |

**Table 8. Characteristics per type; NZH3V0B to NZH10C ...continued**  
*T<sub>j</sub> = 25 °C unless otherwise specified.*

| NZHxxx | Working voltage<br>V <sub>Z</sub> (V);<br>I <sub>Z</sub> = 20 mA |       | Maximum differential<br>resistance<br>r <sub>diff</sub> (Ω) |                        | Reverse current<br>I <sub>R</sub> (μA) |                    | Diode<br>capacitance<br>C <sub>d</sub> (pF) <sup>[1]</sup> |
|--------|--|-------|---|------------------------|--|--------------------|--|
|        | Min  | Max   | I <sub>Z</sub> = 1 mA                                       | I <sub>Z</sub> = 20 mA | Max                                    | V <sub>R</sub> (V) | Max  |
| 4V3B   | 4.17   | 4.43  | 1000  | 40                     | 5                                      | 1                  | 450  |
| 4V7B   | 4.55   | 4.80  | 900   | 25                     | 5                                      | 1                  | 300  |
| 5V1B   | 4.94   | 5.20  | 800   | 20                     | 5                                      | 1.5                | 300  |
| 5V6B   | 5.45   | 5.73  | 500   | 13                     | 5                                      | 2.5                | 300  |
| 6V2B   | 5.96   | 6.27  | 300   | 10                     | 5                                      | 3                  | 200  |
| 6V8B   | 6.49   | 6.83  | 150   | 8                      | 2                                      | 3.5                | 200  |
| 7V5C   | 7.29   | 7.67  | 120   | 8                      | 0.5                                    | 4                  | 150  |
| 8V2B   | 8.02   | 8.36  | 120   | 8                      | 0.5                                    | 5                  | 150  |
| 9V1B   | 8.85   | 9.23  | 120   | 8                      | 0.5                                    | 6                  | 150  |
| 10C    | 9.70   | 10.20 | 120   | 8                      | 0.2                                    | 7                  | 90   |

[1] f = 1 MHz; V<sub>R</sub> = 0 V

**Table 9. Characteristics per type; NZH11C to NZH20C**  
*T<sub>j</sub> = 25 °C unless otherwise specified.*

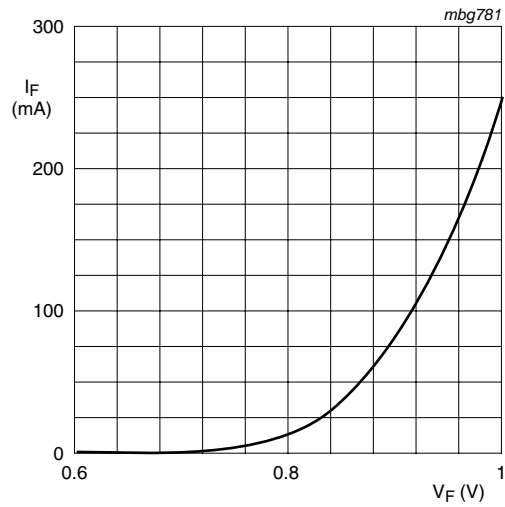
| NZHxxx | Working voltage<br>V <sub>Z</sub> (V);<br>I <sub>Z</sub> = 10 mA |       | Maximum differential<br>resistance<br>r <sub>diff</sub> (Ω) |                        | Reverse current<br>I <sub>R</sub> (μA) |                    | Diode<br>capacitance<br>C <sub>d</sub> (pF) <sup>[1]</sup> |
|--------|--|-------|---|------------------------|--|--------------------|--|
|        | Min  | Max   | I <sub>Z</sub> = 1 mA                                       | I <sub>Z</sub> = 10 mA | Max                                    | V <sub>R</sub> (V) | Max  |
| 11C    | 10.82  | 11.38 | 120   | 10                     | 0.04                                   | 8                  | 85   |
| 12B    | 11.44  | 12.03 | 110   | 12                     | 0.04                                   | 9                  | 85   |
| 13B    | 12.35  | 13.65 | 110   | 14                     | 0.04                                   | 10                 | 80   |
| 15B    | 14.25  | 15.75 | 110   | 16                     | 0.04                                   | 11                 | 75   |
| 16C    | 15.69  | 16.51 | 150   | 18                     | 0.04                                   | 12                 | 75   |
| 18C    | 17.42  | 18.33 | 150   | 23                     | 0.04                                   | 13                 | 70   |
| 20C    | 19.23  | 20.22 | 200   | 28                     | 0.04                                   | 15                 | 60   |

[1] f = 1 MHz; V<sub>R</sub> = 0 V

**Table 10. Characteristics per type; NZH22C to NZH30C**  
*T<sub>j</sub> = 25 °C unless otherwise specified.*

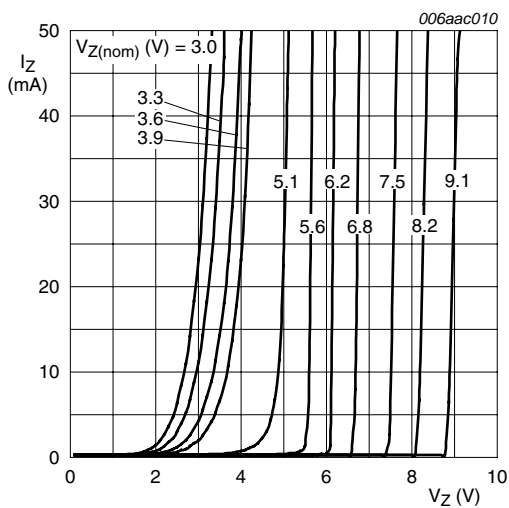
| NZHxxx | Working voltage<br>V <sub>Z</sub> (V);<br>I <sub>Z</sub> = 5 mA |       | Maximum differential<br>resistance<br>r <sub>diff</sub> (Ω) |                       | Reverse current<br>I <sub>R</sub> (μA) |                    | Diode<br>capacitance<br>C <sub>d</sub> (pF) <sup>[1]</sup> |
|--------|---|-------|---|-----------------------|--|--------------------|--|
|        | Min   | Max   | I <sub>Z</sub> = 1 mA                                       | I <sub>Z</sub> = 5 mA | Max                                    | V <sub>R</sub> (V) | Max  |
| 22C    | 21.08   | 22.17 | 200   | 30                    | 0.04                                   | 17                 | 60   |
| 24C    | 23.12   | 24.31 | 200   | 35                    | 0.04                                   | 19                 | 55   |
| 27C    | 25.63   | 26.95 | 250   | 45                    | 0.04                                   | 21                 | 50   |
| 30C    | 28.50   | 31.50 | 250   | 55                    | 0.04                                   | 23                 | 50   |

[1] f = 1 MHz; V<sub>R</sub> = 0 V



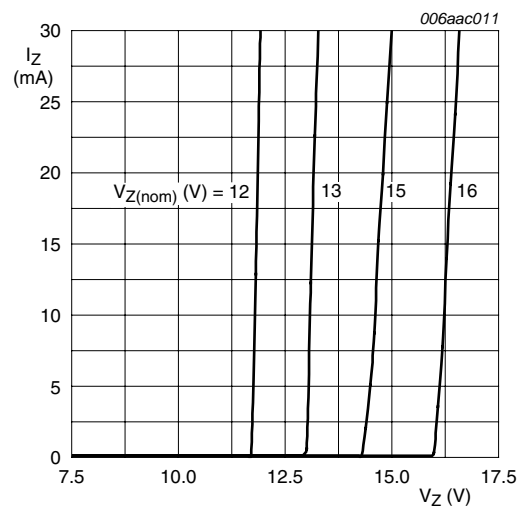
$T_j = 25\text{ }^\circ\text{C}$

**Fig 1. Forward current as a function of forward voltage; typical values**



$T_j = 25\text{ }^\circ\text{C}$

**Fig 2. Working current as a function of working voltage; typical values**



$T_j = 25\text{ }^\circ\text{C}$

**Fig 3. Working current as a function of working voltage; typical values**

### 8. Package outline

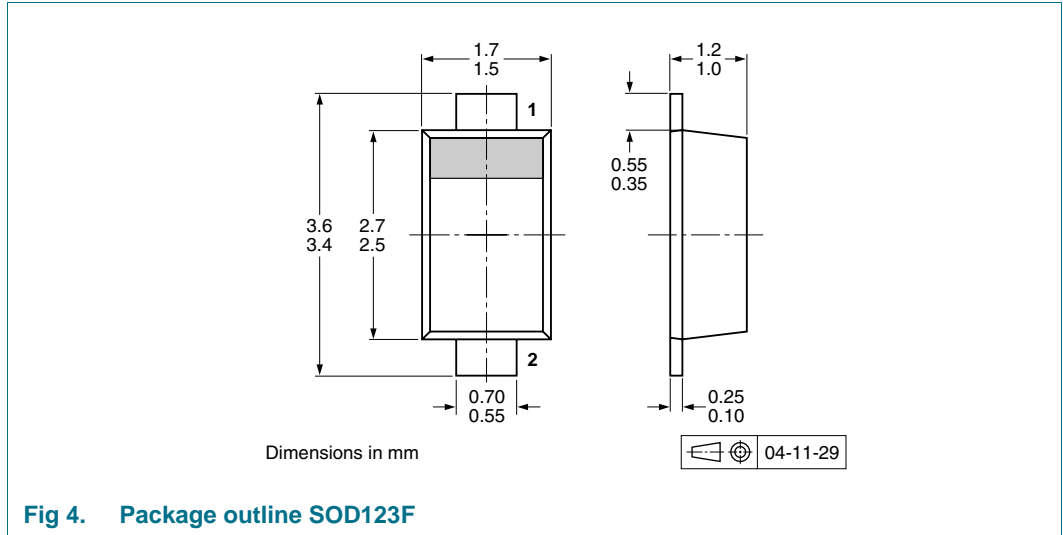


Fig 4. Package outline SOD123F

### 9. Packing information

Table 11. Packing methods

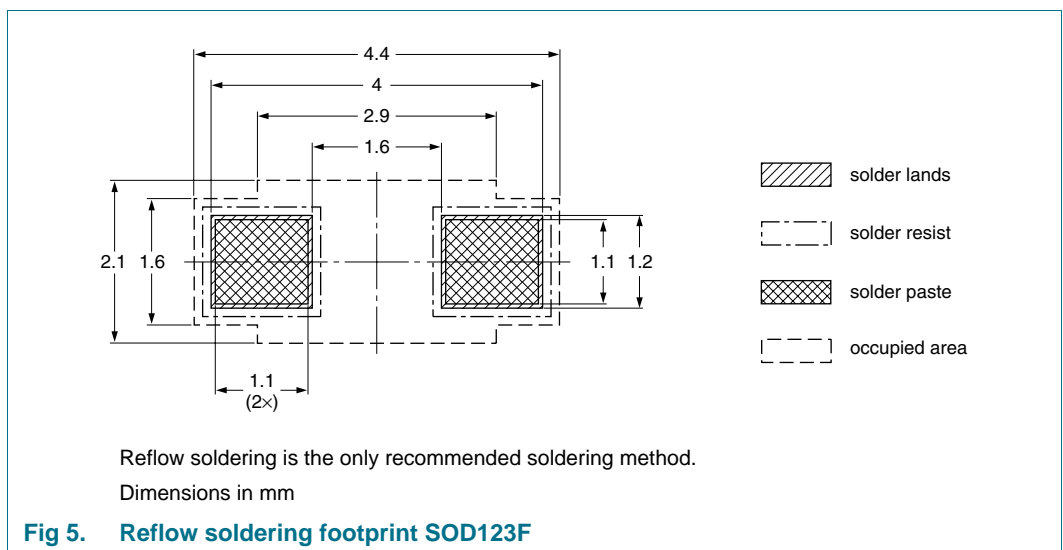
The indicated -xxx are the last three digits of the 12NC ordering code.<sup>[1]</sup>

| Type number                      | Package | Description                    | Packing quantity |       |
|----------------------------------|---------|--------------------------------|------------------|-------|
|                                  |         |                                | 3000             | 10000 |
| NZH3V0B to NZH30C <sup>[2]</sup> | SOD123F | 4 mm pitch, 8 mm tape and reel | -115             | -135  |

[1] For further information and the availability of packing methods, see Section 13.

[2] The series consists of 25 types with nominal working voltages from 3.0 V to 30 V.

### 10. Soldering



## 11. Revision history

Table 12. Revision history

| Document ID | Release date | Data sheet status  | Change notice | Supersedes |
|-------------|--------------|--------------------|---------------|------------|
| NZH_SER_1   | 20100127     | Product data sheet | -             | -          |

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### 12.1 Data sheet status

| Document status <sup>[1][2]</sup> | Product status <sup>[3]</sup> | Definition  |
|-----------------------------------|-------------------------------|---|
| Objective [short] data sheet      | Development                   | This document contains data from the objective specification for product development. |
| Preliminary [short] data sheet    | Qualification                 | This document contains data from the preliminary specification.                       |
| Product [short] data sheet        | Production                    | This document contains the product specification.                                     |

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

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