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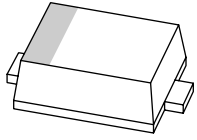
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# NZH series

## 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
- Small plastic package suitable for surface-mounted design
- Wide working voltage range
- 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    |

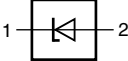
[1] Pulse test:  $t_p \leq 300$   $\mu$ s;  $\delta \leq 0.02$ .

[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 <a href="#">[1]</a> |  |  |
| 2   | anode                       |                                                                                     |                                                                                     |

006aaa152

[1] The marking bar indicates the cathode.

## 3. Ordering information

Table 3. Ordering information

| Type number                              | Package |                                          |         |
|------------------------------------------|---------|------------------------------------------|---------|
|                                          | Name    | Description                              | Version |
| NZH3V0B to<br>NZH30C <a href="#">[1]</a> | -       | 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)[1] |
|--------|-------------------------------------------------------|------|--------------------------------------------------------------|----------------------|--------------------------------------------|-----------|---------------------------------------|
|        | 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** $T_j = 25\text{ }^{\circ}\text{C}$  unless otherwise specified.

| NZHxxx | Working voltage<br>$V_Z$ (V);<br>$I_Z = 20\text{ mA}$ |       | Maximum differential<br>resistance<br>$r_{\text{dif}}$ ( $\Omega$ ) |                      | 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                                               |
| 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                                                |

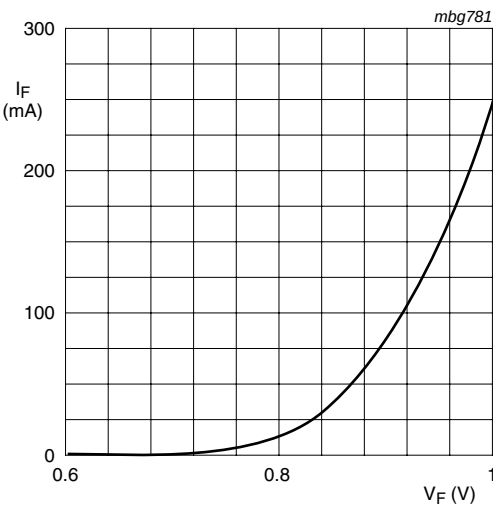
[1]  $f = 1\text{ MHz}$ ;  $V_R = 0\text{ V}$ **Table 9. Characteristics per type; NZH11C to NZH20C** $T_j = 25\text{ }^{\circ}\text{C}$  unless otherwise specified.

| NZHxxx | Working voltage<br>$V_Z$ (V);<br>$I_Z = 10\text{ mA}$ |       | Maximum differential<br>resistance<br>$r_{\text{dif}}$ ( $\Omega$ ) |                      | Reverse current<br>$I_R$ ( $\mu\text{A}$ ) |           | Diode<br>capacitance<br>$C_d$ (pF) <sup>[1]</sup> |
|--------|-------------------------------------------------------|-------|---------------------------------------------------------------------|----------------------|--------------------------------------------|-----------|---------------------------------------------------|
|        | Min                                                   | Max   | $I_Z = 1\text{ mA}$                                                 | $I_Z = 10\text{ mA}$ | Max                                        | $V_R$ (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]  $f = 1\text{ MHz}$ ;  $V_R = 0\text{ V}$ **Table 10. Characteristics per type; NZH22C to NZH30C** $T_j = 25\text{ }^{\circ}\text{C}$  unless otherwise specified.

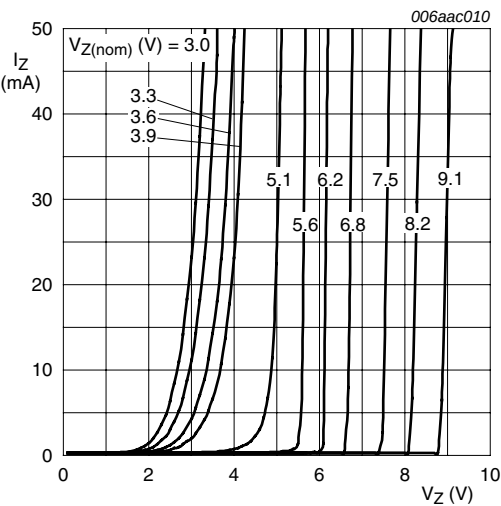
| NZHxxx | Working voltage<br>$V_Z$ (V);<br>$I_Z = 5\text{ mA}$ |       | Maximum differential<br>resistance<br>$r_{\text{dif}}$ ( $\Omega$ ) |                     | Reverse current<br>$I_R$ ( $\mu\text{A}$ ) |           | Diode<br>capacitance<br>$C_d$ (pF) <sup>[1]</sup> |
|--------|------------------------------------------------------|-------|---------------------------------------------------------------------|---------------------|--------------------------------------------|-----------|---------------------------------------------------|
|        | Min                                                  | Max   | $I_Z = 1\text{ mA}$                                                 | $I_Z = 5\text{ mA}$ | Max                                        | $V_R$ (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]  $f = 1\text{ MHz}$ ;  $V_R = 0\text{ V}$



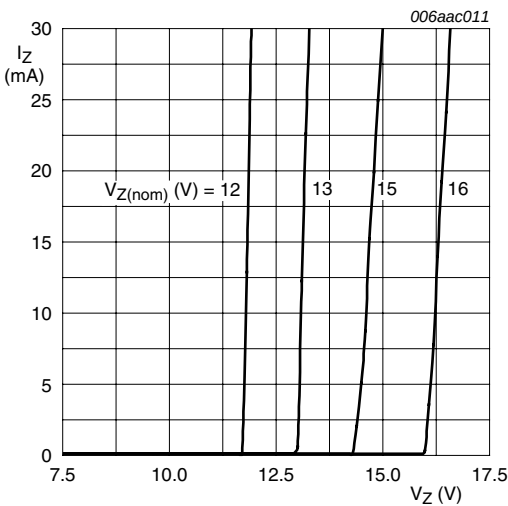
$T_j = 25\text{ }^{\circ}\text{C}$

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



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

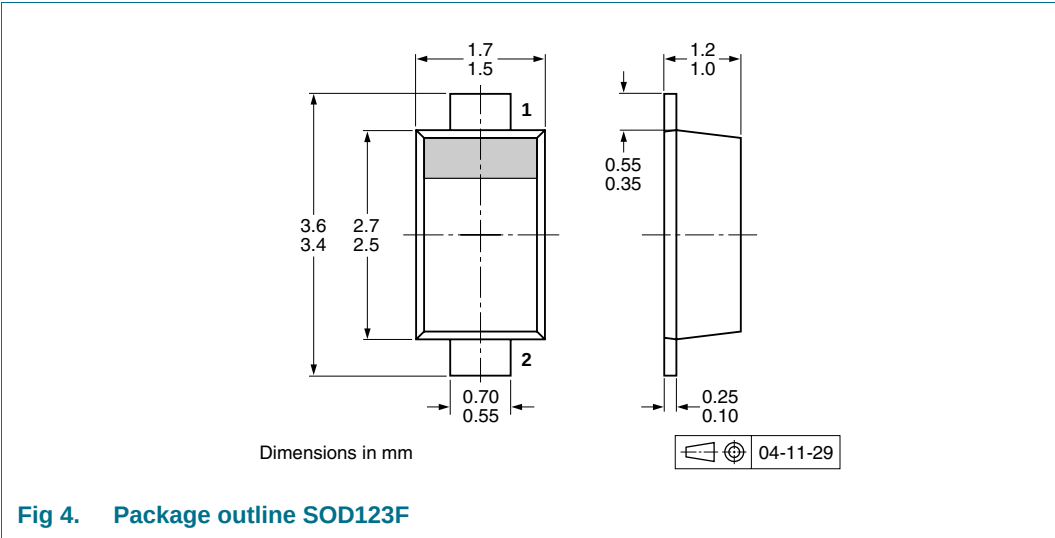
Fig 2. Working current as a function of working voltage; typical values



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

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

8. Package outline



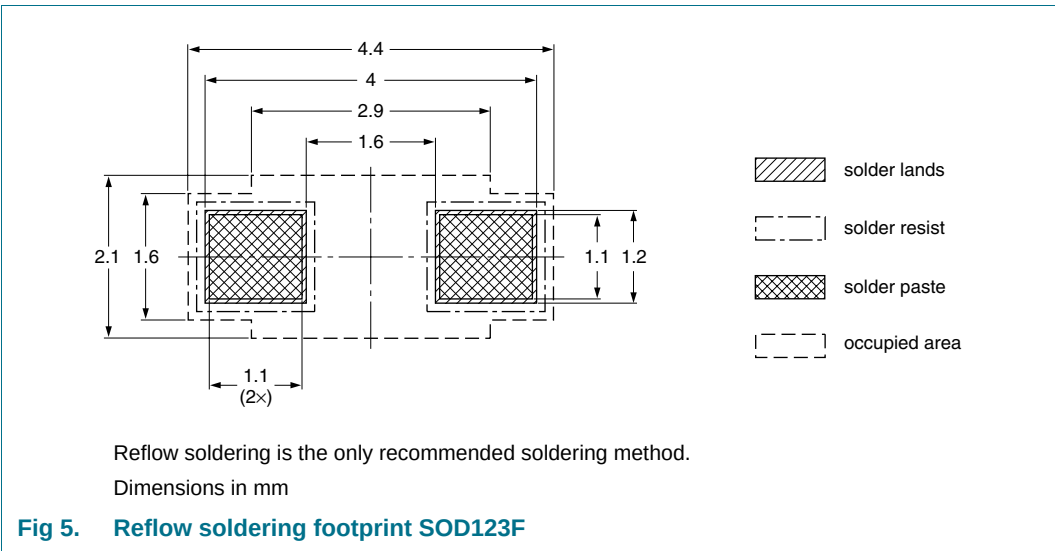
9. Packing information

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 | -             | -          |



## 12. Legal information

### 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.                                     |

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

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