

## Important notice

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Kind regards,

Team Nexperia



# TDZxJ series

## Single Zener diodes

Rev. 2 — 29 July 2011

Product data sheet

## 1. Product profile

### 1.1 General description

General-purpose Zener diodes in a SOD323F (SC-90) very small and flat lead Surface-Mounted Device (SMD) plastic package.

### 1.2 Features and benefits

- Non-repetitive peak reverse power dissipation:  $\leq 180$  W
- Total power dissipation:  $\leq 500$  mW
- Very small plastic package suitable for surface-mounted design
- Low differential resistance
- AEC-Q101 qualified

### 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         | $I_F = 100$ mA       | [1] - | -   | 1.1 | V    |
| $P_{tot}$ | total power dissipation | $T_{amb} \leq 25$ °C | [2] - | -   | 500 | mW   |

[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 16 mm<sup>2</sup>.

## 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 |
| TDZxJ series | SC-90   | plastic surface-mounted package; 2 leads | SOD323F |

### 4. Marking

Table 4. Marking codes

| Type number | Marking code | Type number | Marking code |
|-------------|--------------|-------------|--------------|
| TDZ2V4J     | 3A           | TDZ9V1J     | 3Q           |
| TDZ2V7J     | 3B           | TDZ10J      | 3R           |
| TDZ3V0J     | 3C           | TDZ11J      | 3S           |
| TDZ3V3J     | 3D           | TDZ12J      | 3T           |
| TDZ3V6J     | 3E           | TDZ13J      | 3U           |
| TDZ3V9J     | 3F           | TDZ15J      | 3V           |
| TDZ4V3J     | 3G           | TDZ16J      | 3W           |
| TDZ4V7J     | 3H           | TDZ18J      | 3Y           |
| TDZ5V1J     | 3J           | TDZ20J      | 3Z           |
| TDZ5V6J     | JQ           | TDZ22J      | 4A           |
| TDZ6V2J     | 3K           | TDZ24J      | 4B           |
| TDZ6V8J     | 3L           | TDZ27J      | 4C           |
| TDZ7V5J     | 3N           | TDZ30J      | 4D           |
| TDZ8V2J     | 3P           | -           | -            |

## 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   |
| $I_{ZSM}$ | non-repetitive peak reverse current           |                             | [1] - | see Table 8 and 10 |      |
| $P_{ZSM}$ | non-repetitive peak reverse power dissipation |                             | [1]   |                    |      |
|           | TDZ2V4J to TDZ5V6J                            |                             | -     | 180                | W    |
|           | TDZ6V2J to TDZ6V8J                            |                             | -     | 100                | W    |
|           | TDZ7V5J to TDZ30J                             |                             | -     | 40                 | W    |
| $P_{tot}$ | total power dissipation                       | $T_{amb} \leq 25\text{ °C}$ | [2] - | 500                | mW   |
| $T_j$     | junction temperature                          |                             | -     | 150                | °C   |
| $T_{amb}$ | ambient temperature                           |                             | -55   | +150               | °C   |
| $T_{stg}$ | storage temperature                           |                             | -65   | +150               | °C   |

[1]  $t_p = 100\text{ }\mu\text{s}$ ; square wave;  $T_j = 25\text{ °C}$  before surge.

[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode 16 mm<sup>2</sup>.

## 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  |
| $R_{th(j-sp)}$ | thermal resistance from junction to solder point |             | [2] - | -   | 25  | K/W  |

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode 16 mm<sup>2</sup>.

[2] 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 |                       | [1] |     |     |      |
|        |                 | $I_F = 10\text{ mA}$  | -   | -   | 0.9 | V    |
|        |                 | $I_F = 100\text{ mA}$ | -   | -   | 1.1 | V    |

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

**Table 8. Characteristics per type; Zener TDZ2V4J to Zener TDZ24J** $T_j = 25\text{ }^{\circ}\text{C}$  unless otherwise specified.

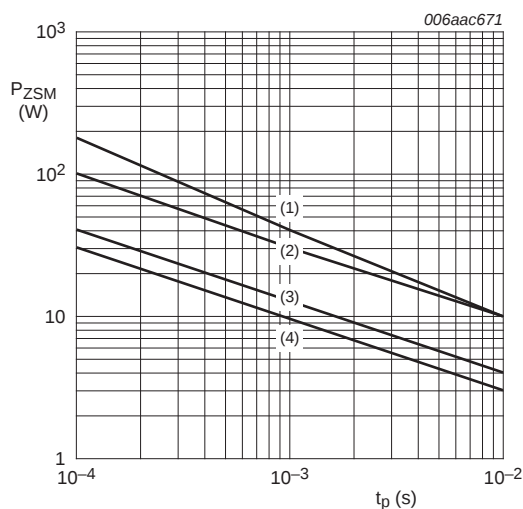
| TDZxxxJ | Working voltage<br>V <sub>Z</sub> (V) |       | Differential resistance<br>r <sub>dif</sub> (Ω) |                       | Reverse current<br>I <sub>R</sub> (μA) |                    | Temperature coefficient<br>S <sub>Z</sub> (mV/K) |     | Diode capacitance<br>C <sub>d</sub> (pF) <sup>[1]</sup> | Non-repetitive peak reverse current<br>I <sub>ZSM</sub> (A) <sup>[2]</sup> |
|---------|---------------------------------------|-------|-------------------------------------------------|-----------------------|----------------------------------------|--------------------|--------------------------------------------------|-----|---------------------------------------------------------|----------------------------------------------------------------------------|
|         | I <sub>Z</sub> = 5 mA                 |       | I <sub>Z</sub> = 1 mA                           | I <sub>Z</sub> = 5 mA |                                        |                    | I <sub>Z</sub> = 5 mA                            |     |                                                         |                                                                            |
|         | Min                                   | Max   | Max                                             | Max                   | Max                                    | V <sub>R</sub> (V) | Min                                              | Max | Max                                                     | Max                                                                        |
| 2V4     | 2.35                                  | 2.45  | 400                                             | 100                   | 50                                     | 1.0                | −3.5                                             | 0   | 450                                                     | 15                                                                         |
| 2V7     | 2.65                                  | 2.75  | 450                                             | 100                   | 20                                     | 1.0                | −3.5                                             | 0   | 440                                                     | 15                                                                         |
| 3V0     | 2.94                                  | 3.06  | 500                                             | 95                    | 10                                     | 1.0                | −3.5                                             | 0   | 425                                                     | 15                                                                         |
| 3V3     | 3.23                                  | 3.37  | 500                                             | 95                    | 5                                      | 1.0                | −3.5                                             | 0   | 410                                                     | 15                                                                         |
| 3V6     | 3.53                                  | 3.67  | 500                                             | 90                    | 5                                      | 1.0                | −3.5                                             | 0   | 390                                                     | 15                                                                         |
| 3V9     | 3.82                                  | 3.98  | 500                                             | 90                    | 3                                      | 1.0                | −3.5                                             | 0   | 370                                                     | 15                                                                         |
| 4V3     | 4.21                                  | 4.39  | 600                                             | 90                    | 3                                      | 1.0                | −3.5                                             | 0   | 350                                                     | 15                                                                         |
| 4V7     | 4.61                                  | 4.79  | 500                                             | 80                    | 3                                      | 2.0                | −3.5                                             | 0.2 | 325                                                     | 15                                                                         |
| 5V1     | 5.00                                  | 5.20  | 480                                             | 60                    | 2                                      | 2.0                | −2.7                                             | 1.2 | 300                                                     | 15                                                                         |
| 5V6     | 5.49                                  | 5.71  | 400                                             | 40                    | 10                                     | 2.5                | −2                                               | 2.5 | 275                                                     | 15                                                                         |
| 6V2     | 6.08                                  | 6.32  | 150                                             | 10                    | 3                                      | 4.0                | 0.4                                              | 3.7 | 250                                                     | 12                                                                         |
| 6V8     | 6.66                                  | 6.94  | 80                                              | 15                    | 2                                      | 4.0                | 1.2                                              | 4.5 | 215                                                     | 12                                                                         |
| 7V5     | 7.5                                   | 7.65  | 80                                              | 10                    | 1                                      | 5.0                | 2.5                                              | 5.3 | 170                                                     | 4.0                                                                        |
| 8V2     | 8.04                                  | 8.36  | 80                                              | 10                    | 0.70                                   | 5.0                | 3.2                                              | 6.2 | 150                                                     | 4.0                                                                        |
| 9V1     | 8.92                                  | 9.28  | 100                                             | 10                    | 0.50                                   | 6.0                | 3.8                                              | 7.0 | 120                                                     | 3.0                                                                        |
| 10      | 9.80                                  | 10.20 | 150                                             | 10                    | 0.20                                   | 7.0                | 4.5                                              | 8.0 | 110                                                     | 3.0                                                                        |
| 11      | 10.80                                 | 11.20 | 150                                             | 10                    | 0.10                                   | 8.0                | 5.4                                              | 9.0 | 108                                                     | 2.5                                                                        |
| 12      | 11.80                                 | 12.20 | 150                                             | 10                    | 0.10                                   | 8.0                | 6.0                                              | 10  | 105                                                     | 2.5                                                                        |
| 13      | 12.70                                 | 13.30 | 170                                             | 10                    | 0.10                                   | 8.0                | 7.0                                              | 11  | 103                                                     | 2.5                                                                        |
| 15      | 14.70                                 | 15.30 | 200                                             | 15                    | 0.05                                   | 10.5               | 9.2                                              | 13  | 99                                                      | 2.0                                                                        |
| 16      | 15.70                                 | 16.30 | 200                                             | 20                    | 0.05                                   | 11.2               | 10.4                                             | 14  | 97                                                      | 1.5                                                                        |
| 18      | 17.6                                  | 18.4  | 225                                             | 20                    | 0.05                                   | 12.6               | 12.4                                             | 16  | 93                                                      | 1.5                                                                        |
| 20      | 19.6                                  | 20.4  | 225                                             | 20                    | 0.05                                   | 14.0               | 14.4                                             | 18  | 88                                                      | 1.5                                                                        |
| 22      | 21.6                                  | 22.4  | 250                                             | 25                    | 0.05                                   | 15.4               | 16.4                                             | 20  | 84                                                      | 1.25                                                                       |
| 24      | 23.5                                  | 24.5  | 250                                             | 30                    | 0.05                                   | 16.8               | 18.4                                             | 22  | 80                                                      | 1.25                                                                       |

[1]  $f = 1\text{ MHz}$ ;  $V_R = 0\text{ V}$ [2]  $t_p = 100\text{ }\mu\text{s}$ ; square wave;  $T_j = 25\text{ }^{\circ}\text{C}$  before surge.**Table 9. Characteristics per type; Zener TDZ5V6J** $T_j = 25\text{ }^{\circ}\text{C}$  unless otherwise specified.

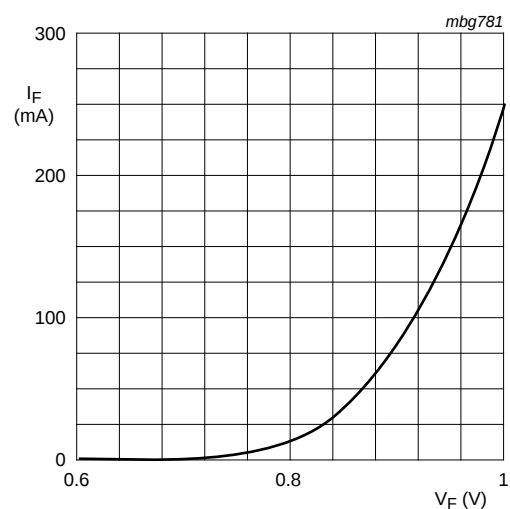
| TDZxxxJ | Working voltage<br>$V_Z$ (V) |      | Differential resistance<br>$r_{dif}$ ( $\Omega$ ) |                      | Temperature coefficient<br>$S_Z$ (mV/K) |     |
|---------|------------------------------|------|---------------------------------------------------|----------------------|-----------------------------------------|-----|
|         | $I_Z = 10\text{ mA}$         |      | $I_Z = 0.5\text{ mA}$                             | $I_Z = 10\text{ mA}$ | $I_Z = 5\text{ mA}$                     |     |
|         | Min                          | Max  | Max                                               | Max                  | Min                                     | Max |
| 5V6     | 5.20                         | 6.00 | 500                                               | 7                    | -1.7                                    | 2.8 |

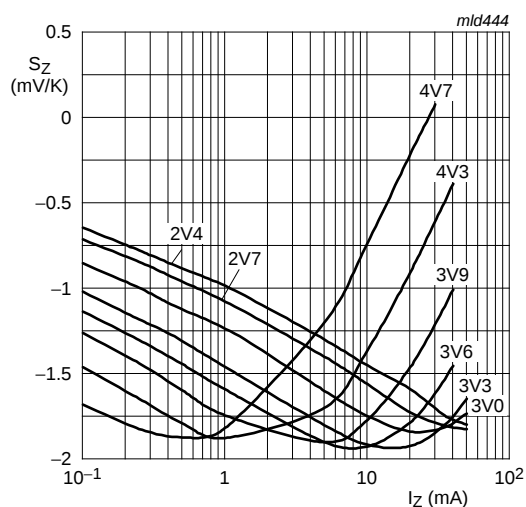
**Table 10. Characteristics per type; Zener TDZ27J to Zener TDZ30J** $T_j = 25\text{ }^{\circ}\text{C}$  unless otherwise specified.

| TDZxxxJ | Working voltage<br>V <sub>Z</sub> (V) |      | Differential resistance<br>r <sub>dif</sub> (Ω) |                       | Reverse current<br>I <sub>R</sub> (μA) |                    | Temperature coefficient<br>S <sub>Z</sub> (mV/K) |      | Diode capacitance<br>C <sub>d</sub> (pF) <sup>[1]</sup> | Non-repetitive peak reverse current<br>I <sub>ZSM</sub> (A) <sup>[2]</sup> |
|---------|---------------------------------------|------|-------------------------------------------------|-----------------------|----------------------------------------|--------------------|--------------------------------------------------|------|---------------------------------------------------------|----------------------------------------------------------------------------|
|         | I <sub>Z</sub> = 2 mA                 |      | I <sub>Z</sub> = 0.5 mA                         | I <sub>Z</sub> = 2 mA |                                        |                    | I <sub>Z</sub> = 2 mA                            |      |                                                         |                                                                            |
|         | Min                                   | Max  | Max                                             | Max                   | Max                                    | V <sub>R</sub> (V) | Min                                              | Max  | Max                                                     | Max                                                                        |
| 27      | 26.5                                  | 27.5 | 250                                             | 40                    | 0.05                                   | 18.9               | 21.4                                             | 25.3 | 73                                                      | 1                                                                          |
| 30      | 29.4                                  | 30.6 | 250                                             | 40                    | 0.05                                   | 21                 | 24.4                                             | 29.4 | 66                                                      | 1                                                                          |

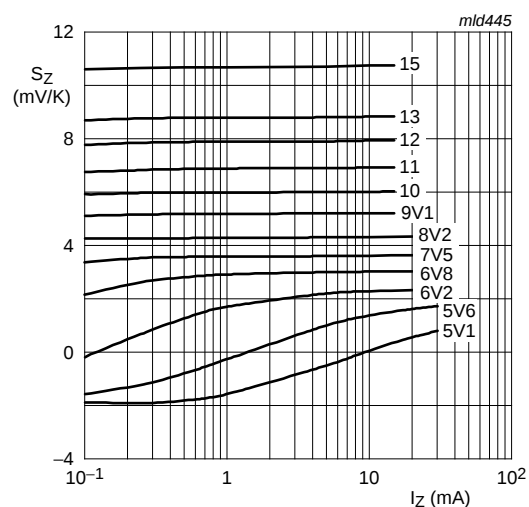
[1]  $f = 1\text{ MHz}$ ;  $V_R = 0\text{ V}$ [2]  $t_p = 100\text{ }\mu\text{s}$ ; square wave;  $T_j = 25\text{ }^{\circ}\text{C}$  before surge.

- (1) TDZ2V4J to TDZ5V6J
- (2) TDZ6V2J to TDZ6V8J
- (3) TDZ7V5J to TDZ30J;  $T_j = 25\text{ }^{\circ}\text{C}$  before surge
- (4) TDZ7V5J to TDZ30J;  $T_j = 150\text{ }^{\circ}\text{C}$  before surge

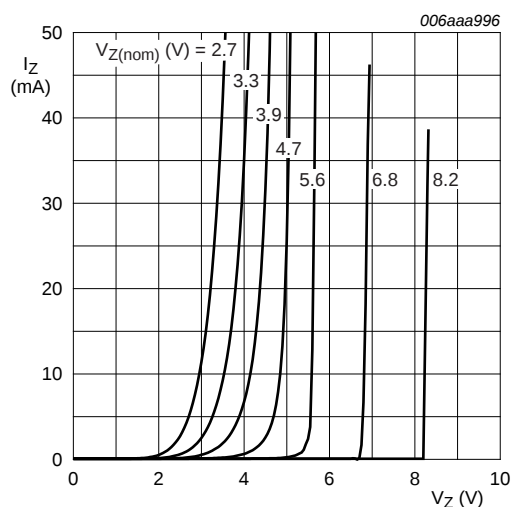
**Fig 1. Non-repetitive peak reverse power dissipation as a function of pulse duration; maximum values** $T_j = 25\text{ }^{\circ}\text{C}$ **Fig 2. Forward current as a function of forward voltage; typical values**



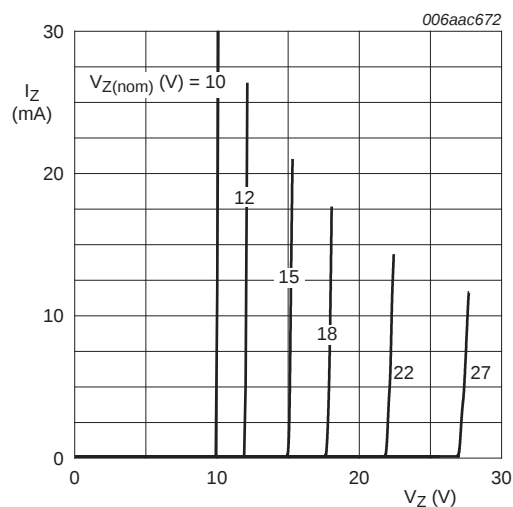
TDZ2V4J to TDZ4V7J

 $T_j = 25\text{ }^{\circ}\text{C}$  to  $150\text{ }^{\circ}\text{C}$ **Fig 3. Temperature coefficient as a function of working current; typical values**

TDZ5V1J to TDZ15J

 $T_j = 25\text{ }^{\circ}\text{C}$  to  $150\text{ }^{\circ}\text{C}$ **Fig 4. Temperature coefficient as a function of working current; typical values**

TDZ2V7J to TDZ6V6J

 $T_j = 25\text{ }^{\circ}\text{C}$ **Fig 5. Working current as a function of working voltage; typical values**

TDZ10J to TDZ27J

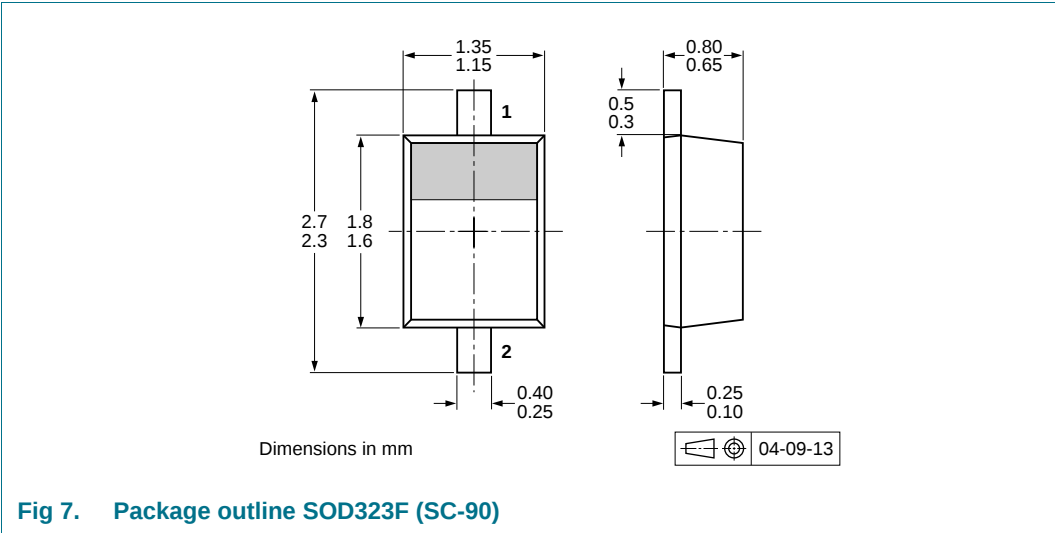
 $T_j = 25\text{ }^{\circ}\text{C}$ **Fig 6. Working current as a function of working voltage; typical values**

## 8. Test information

### 8.1 Quality information

This product has been qualified in accordance with the Automotive Electronics Council (AEC) standard *Q101 - Stress test qualification for discrete semiconductors*, and is suitable for use in automotive applications.

9. Package outline



10. Packing information

**Table 11. Packing methods**

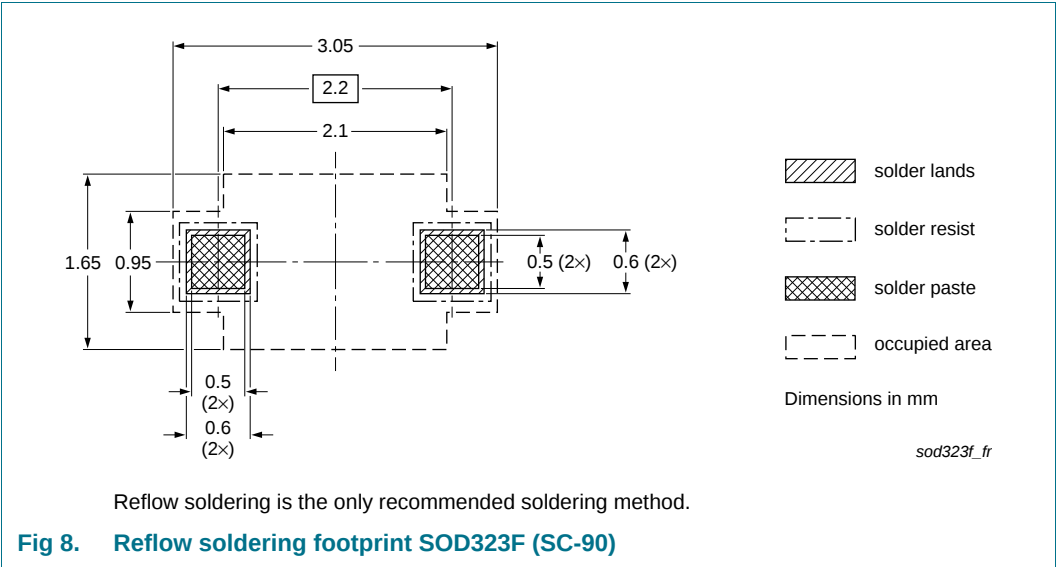
*The indicated -xxx are the last three digits of the 12NC ordering code.*[\[1\]](#)

| Type number  | Package | Description                    | Packing quantity |       |
|--------------|---------|--------------------------------|------------------|-------|
|              |         |                                | 3000             | 10000 |
| TDZxJ series | SOD323F | 4 mm pitch, 8 mm tape and reel | -115             | -135  |

[1] For further information and the availability of packing methods, see [Section 14](#).

[1] For further information and the availability of packing methods, see [Section 14](#).

11. Soldering



## 12. Revision history

**Table 12. Revision history**

| Document ID    | Release date                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Data sheet status  | Change notice | Supersedes  |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|---------------|-------------|
| TDZXJ_SER v.2  | 20110729                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Product data sheet | -             | TDZ5V6J v.1 |
| Modifications: | <ul style="list-style-type: none"><li>Added type numbers TDZ2V4J, TDZ2V7J, TDZ3V0J, TDZ3V3J, TDZ3V6J, TDZ3V9J, TDZ4V3J, TDZ4V7J, TDZ5V1J, TDZ6V2J, TDZ6V8J, TDZ7V5J, TDZ8V2J, TDZ9V1J, TDZ10J, TDZ11J, TDZ12J, TDZ13J, TDZ15J, TDZ16J, TDZ18J, TDZ20J, TDZ22J, TDZ24J, TDZ27J and TDZ30J.</li><li>Added <a href="#">Table 8</a> to <a href="#">10</a>.</li><li>Updated <a href="#">Figure 1</a> to <a href="#">4</a> and added <a href="#">Figure 5</a> and <a href="#">6</a>.</li></ul> |                    |               |             |
| TDZ5V6J v.1    | 20100823                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Product data sheet | -             | -           |

## 13. Legal information

### 13.1 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".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL <http://www.nxp.com>.

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**Quick reference data** — The Quick reference data is an extract of the product data given in the Limiting values and Characteristics sections of this document, and as such is not complete, exhaustive or legally binding.

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For sales office addresses, please send an email to: [salesaddresses@nxp.com](mailto:salesaddresses@nxp.com)

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