# 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: ≤ 180 W
- Total power dissipation: ≤ 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

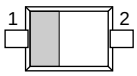
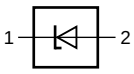
| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $V_F$ | forward voltage | $I_F$ = 100 mA | [1] | - | - | 1.1 | V |
| $P_{tot}$ | total power dissipation | $T_{amb}$ ≤ 25 °C | [2] | - | - | 500 | mW |

[1] Pulse test: $t_p$ ≤ 300 μs; δ ≤ 0.02.

[2] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated, mounting pad for cathode 16 $mm^2$.

## 2. Pinning information

Table 2. Pinning

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



006aaa152

[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 | $T_{amb} \leq 25$ °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] $t_p = 100$ μs; square wave; $T_j = 25$ °C before surge.

[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode 16 $mm^2$.

## 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 $mm^2$.

[2] Soldering point of cathode tab.

## 7. Characteristics

**Table 7. Characteristics**

*$T_j = 25$ °C unless otherwise specified.*

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $V_F$ | forward voltage | | [1] | | | | |
| | | $I_F = 10$ mA | | - | - | 0.9 | V |
| | | $I_F = 100$ mA | | - | - | 1.1 | V |

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

**Table 8. Characteristics per type; Zener TDZ2V4J to Zener TDZ24J**

*$T_j$ = 25 °C unless otherwise specified.*

| TDZxxxJ | Working voltage $V_Z$ (V) | | Differential resistance $r_{dif}$ (Ω) | | Reverse current $I_R$ (μA) | | Temperature coefficient $S_Z$ (mV/K) | | Diode capacitance $C_d$ (pF)[1] | Non-repetitive peak reverse current $I_{ZSM}$ (A)[2] |
|---|---|---|---|---|---|---|---|---|---|---|
| | $I_Z$ = 5 mA | | $I_Z$ = 1 mA | $I_Z$ = 5 mA | | | $I_Z$ = 5 mA | | | |
| | Min | Max | Max | Max | Max | $V_R$ (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 MHz; $V_R$ = 0 V

[2] $t_p$ = 100 μs; square wave; $T_j$ = 25 °C before surge.

**Table 9. Characteristics per type; Zener TDZ5V6J**

*$T_j$ = 25 °C unless otherwise specified.*

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

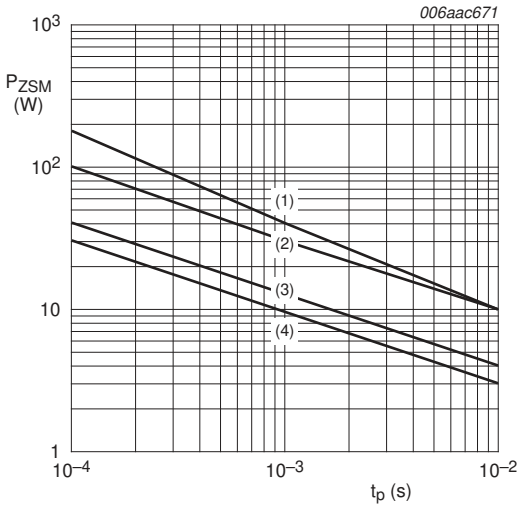
**Table 10. Characteristics per type; Zener TDZ27J to Zener TDZ30J**

*$T_j$ = 25 °C unless otherwise specified.*

| TDZxxxJ | Working voltage $V_Z$ (V) | | Differential resistance $r_{dif}$ (Ω) | | Reverse current $I_R$ (μA) | | Temperature coefficient $S_Z$ (mV/K) | | Diode capacitance $C_d$ (pF)[1] | Non-repetitive peak reverse current $I_{ZSM}$ (A)[2] |
|---|---|---|---|---|---|---|---|---|---|---|
| | $I_Z$ = 2 mA | | $I_Z$ = 0.5 mA | $I_Z$ = 2 mA | | | $I_Z$ = 2 mA | | | |
| | Min | Max | Max | Max | Max | $V_R$ (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 MHz; $V_R$ = 0 V

[2] $t_p$ = 100 μs; square wave; $T_j$ = 25 °C before surge.



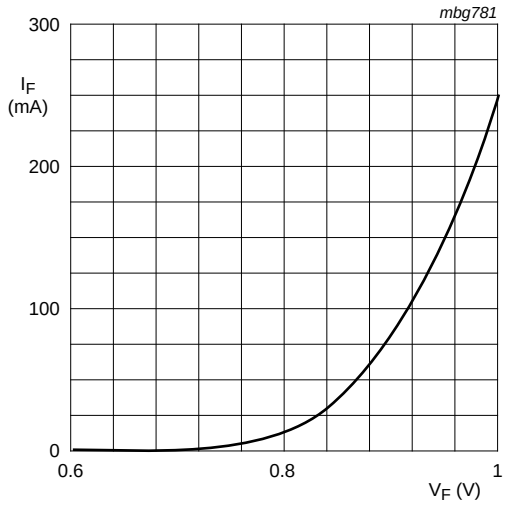

(1) TDZ2V4J to TDZ5V6J

(2) TDZ6V2J to TDZ6V8J

(3) TDZ7V5J to TDZ30J; $T_j$ = 25 °C before surge

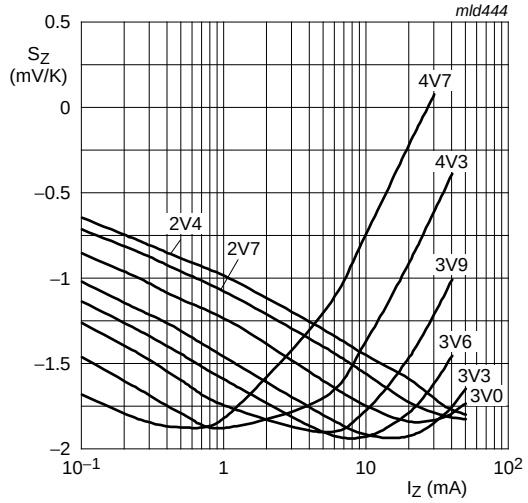
(4) TDZ7V5J to TDZ30J; $T_j$ = 150 °C before surge

**Fig 1. Non-repetitive peak reverse power dissipation as a function of pulse duration; maximum values**




$T_j$ = 25 °C

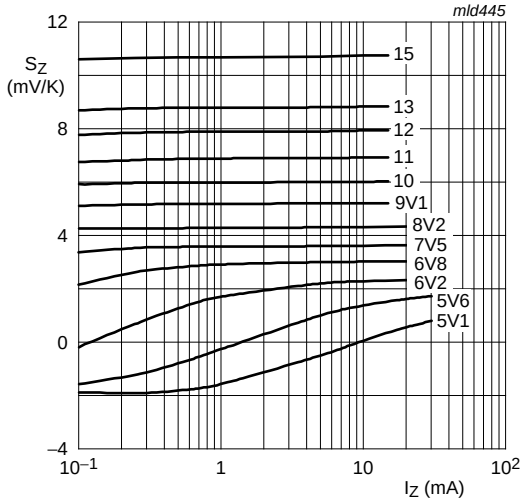
**Fig 2. Forward current as a function of forward voltage; typical values**




TDZ2V4J to TDZ4V7J

$T_j$ = 25 °C to 150 °C

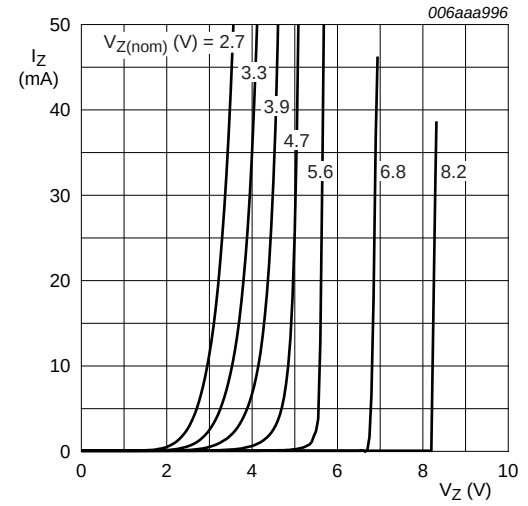
**Fig 3. Temperature coefficient as a function of working current; typical values**




TDZ5V1J to TDZ15J

$T_j$ = 25 °C to 150 °C

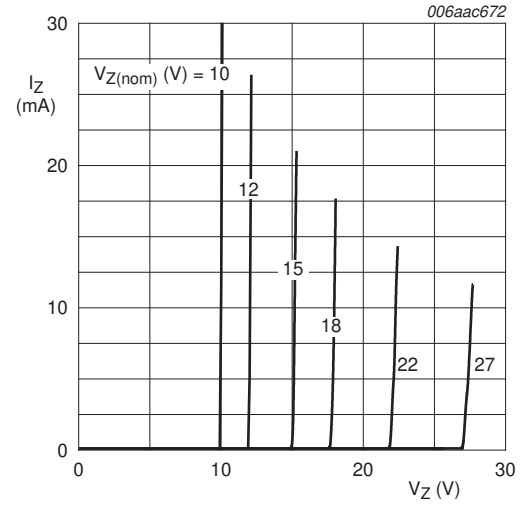
**Fig 4. Temperature coefficient as a function of working current; typical values**




TDZ2V7J to TDZ6V6J

$T_j$ = 25 °C

**Fig 5. Working current as a function of working voltage; typical values**




TDZ10J to TDZ27J

$T_j$ = 25 °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

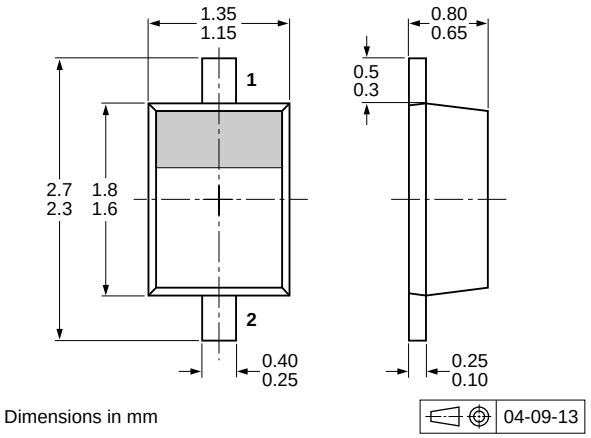



**Fig 7. Package outline SOD323F (SC-90)**

## 10. Packing information

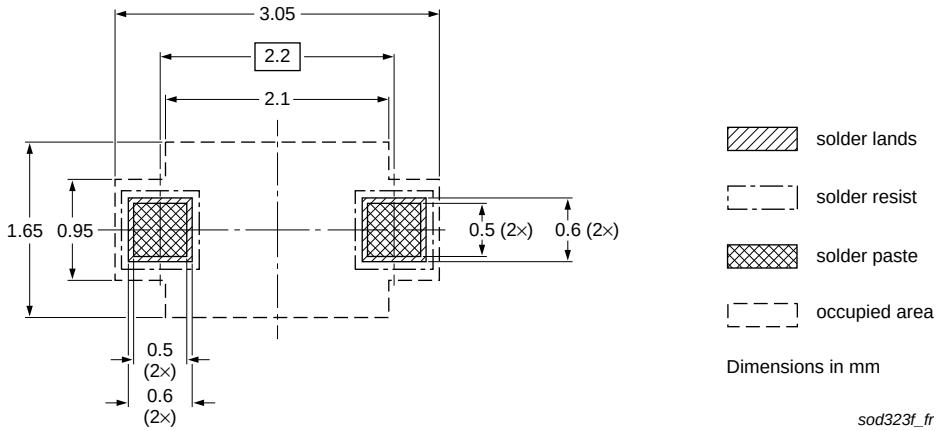
**Table 11. Packing methods**

*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.

## 11. Soldering




Reflow soldering is the only recommended soldering method.

**Fig 8. Reflow soldering footprint SOD323F (SC-90)**

## 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: | • 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.<br>• Added Table 8 to 10.<br>• Updated Figure 1 to 4 and added Figure 5 and 6. | | | |
| TDZ5V6J v.1 | 20100823 | Product data sheet | - | - |

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| Document status[1][2] | Product status[3] | Definition |
|---|---|---|
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| 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.nexperia.com.

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# 15. Contents





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**Date of release: 29 July 2011**