
# 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**

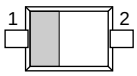
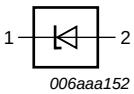
| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $V_F$ | forward voltage | $I_F$ = 100 mA | [1] | - | - | 1.1 | V |
| $P_{tot}$ | total power dissipation | $T_{amb}$ ≤ 25 °C | [2] | - | - | 500 | mW |

[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] |   |   006aaa152 |
| 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 | $T_{amb} \leq 25$ °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 |

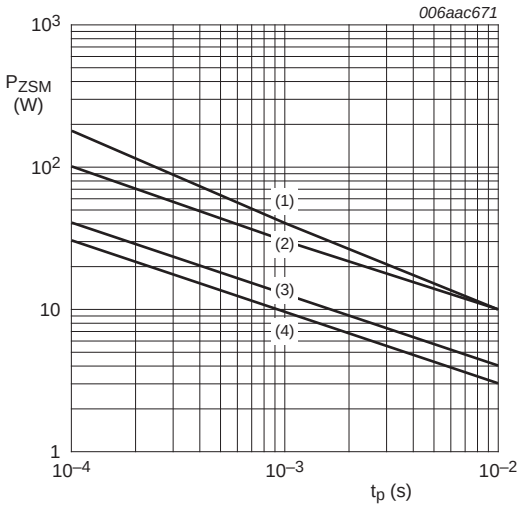
**Table 10. Characteristics per type; Zener TDZ27J to Zener TDZ30J**

*$T_j$ = 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.



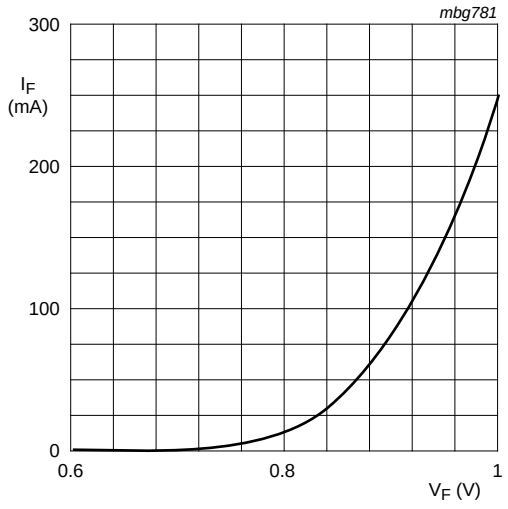

(1) TDZ2V4J to TDZ5V6J

(2) TDZ6V2J to TDZ6V8J

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

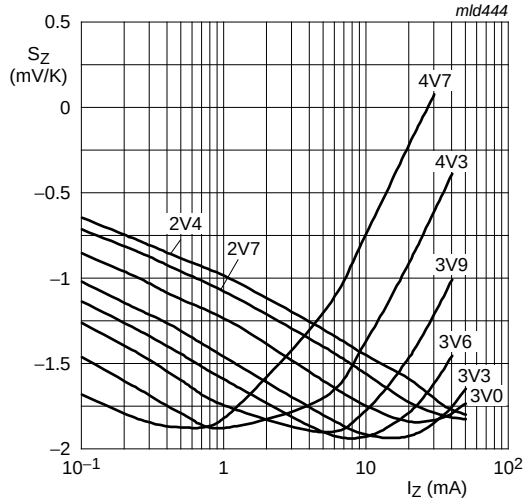
(4) TDZ7V5J to TDZ30J; $T_j$ = 150 °C before surge

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




$T_j$ = 25 °C

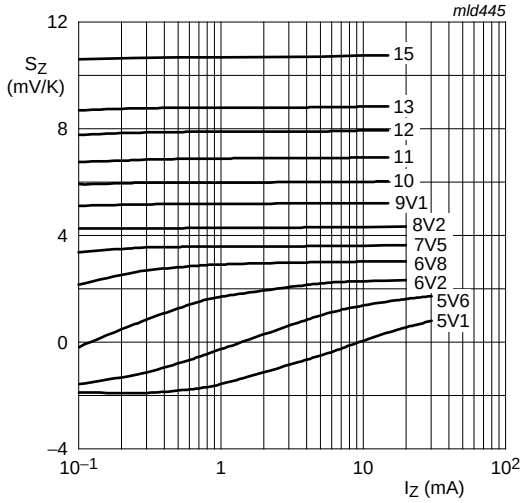
**Fig 2. Forward current as a function of forward voltage; typical values**




TDZ2V4J to TDZ4V7J

$T_j$ = 25 °C to 150 °C

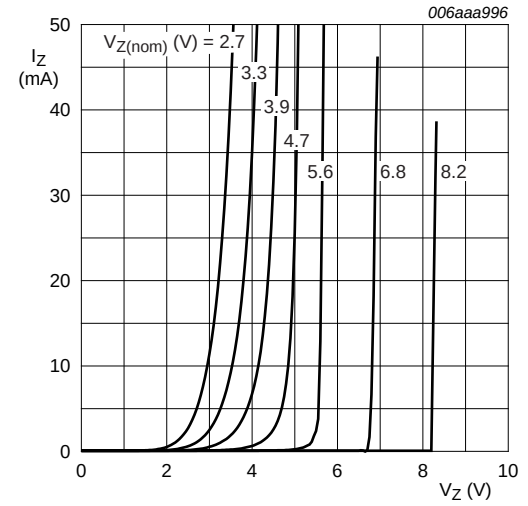
**Fig 3. Temperature coefficient as a function of working current; typical values**




TDZ5V1J to TDZ15J

$T_j$ = 25 °C to 150 °C

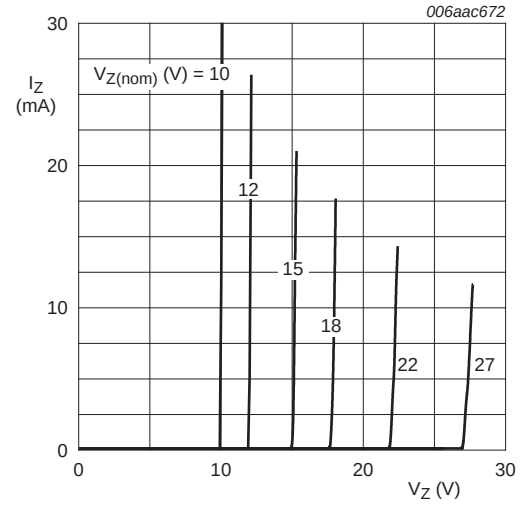
**Fig 4. Temperature coefficient as a function of working current; typical values**




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

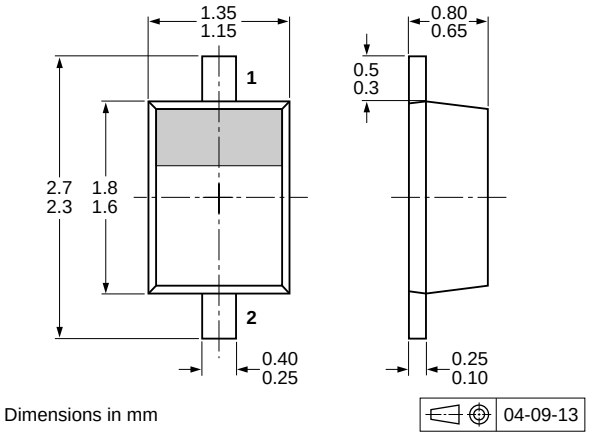



**Fig 7. Package outline SOD323F (SC-90)**

## 10. Packing information

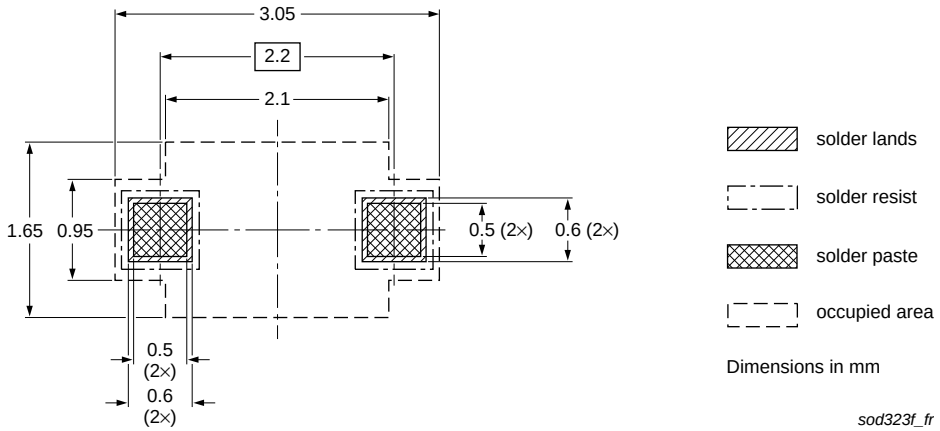
**Table 11. Packing methods**

*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 |
|---|---|---|
| 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. |
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[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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