



# THE DATASHEET OF PZU3.3DB2,115

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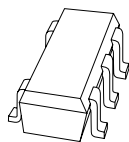
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Kind regards,

Team Nexperia



# PZUxDB2 series

## Dual Zener diodes

Rev. 01 — 31 March 2008

Product data sheet

## 1. Product profile

### 1.1 General description

Dual isolated general-purpose Zener diodes in SOT353 (SC-88A) very small Surface-Mounted Device (SMD) standard plastic and dark-green plastic packages.

### 1.2 Features

- Non-repetitive peak reverse power dissipation:  $P_{ZSM} = 40 \text{ W}$
- Total power dissipation:  $P_{tot} \leq 250 \text{ mW}$
- Tolerance series:  
B2: approximately  $\pm 2 \%$
- Wide working voltage range:  
nominal 2.7 V to 24 V
- Dual isolated diodes configuration
- Small standard plastic package suitable for surface-mounted design
- Small dark-green, halogen-free plastic package suitable for surface-mounted design
- AEC-Q101 qualified

### 1.3 Applications

- General regulation functions

### 1.4 Quick reference data

Table 1. Quick reference data

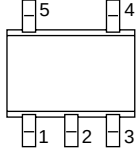
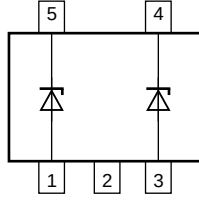
| Symbol    | Parameter                                     | Conditions             | Min   | Typ | Max | Unit |
|-----------|-----------------------------------------------|------------------------|-------|-----|-----|------|
| Per diode |                                               |                        |       |     |     |      |
| $V_F$     | forward voltage                               | $I_F = 100 \text{ mA}$ | [1] - | -   | 1.1 | V    |
| $P_{ZSM}$ | non-repetitive peak reverse power dissipation |                        | [2] - | -   | 40  | W    |

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

[2]  $t_p = 100 \mu\text{s}$ ; square wave;  $T_j = 25 \text{ }^\circ\text{C}$  prior to surge

## 2. Pinning information

Table 2. Pinning

| Pin | Description       | Simplified outline                                                                  | Graphic symbol                                                                      |
|-----|-------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| 1   | anode (diode 1)   |  |  |
| 2   | not connected     |                                                                                     |                                                                                     |
| 3   | anode (diode 2)   |                                                                                     |                                                                                     |
| 4   | cathode (diode 2) |                                                                                     |                                                                                     |
| 5   | cathode (diode 1) |                                                                                     |                                                                                     |

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## 3. Ordering information

Table 3. Ordering information

| Type number                                   | Package |                                          |         |
|-----------------------------------------------|---------|------------------------------------------|---------|
|                                               | Name    | Description                              | Version |
| PZU2.7DB2 to PZU24DB2 <sup>[1]</sup>          | SC-88A  | plastic surface-mounted package; 5 leads | SOT353  |
| PZU2.7DB2/DG to PZU24DB2/DG <sup>[1][2]</sup> |         |                                          |         |

[1] The series consists of 25 types with nominal working voltages from 2.7 V to 24 V.

[2] /DG: halogen-free plastic package

## 4. Marking

Table 4. Marking codes

| Type number | Marking code <sup>[1]</sup> | Type number <sup>[2]</sup> | Marking code <sup>[1]</sup> |
|-------------|-----------------------------|----------------------------|-----------------------------|
| PZU2.7DB2   | T1*                         | PZU2.7DB2/DG               | U1*                         |
| PZU3.0DB2   | T2*                         | PZU3.0DB2/DG               | U2*                         |
| PZU3.3DB2   | T3*                         | PZU3.3DB2/DG               | U3*                         |
| PZU3.6DB2   | T4*                         | PZU3.6DB2/DG               | U4*                         |
| PZU3.9DB2   | T5*                         | PZU3.9DB2/DG               | U5*                         |
| PZU4.3DB2   | T6*                         | PZU4.3DB2/DG               | U6*                         |
| PZU4.7DB2   | T7*                         | PZU4.7DB2/DG               | U7*                         |
| PZU5.1DB2   | T8*                         | PZU5.1DB2/DG               | U8*                         |
| PZU5.6DB2   | T9*                         | PZU5.6DB2/DG               | U9*                         |
| PZU6.2DB2   | TA*                         | PZU6.2DB2/DG               | UA*                         |
| PZU6.8DB2   | TB*                         | PZU6.8DB2/DG               | UB*                         |
| PZU7.5DB2   | TC*                         | PZU7.5DB2/DG               | UC*                         |
| PZU8.2DB2   | TD*                         | PZU8.2DB2/DG               | UD*                         |
| PZU9.1DB2   | TE*                         | PZU9.1DB2/DG               | UE*                         |

Table 4. Marking codes ...continued

| Type number | Marking code <sup>[1]</sup> | Type number <sup>[2]</sup> | Marking code <sup>[1]</sup> |
|-------------|-----------------------------|----------------------------|-----------------------------|
| PZU10DB2    | TF*                         | PZU10DB2/DG                | UF*                         |
| PZU11DB2    | TG*                         | PZU11DB2/DG                | UG*                         |
| PZU12DB2    | TH*                         | PZU12DB2/DG                | UH*                         |
| PZU13DB2    | TK*                         | PZU13DB2/DG                | UK*                         |
| PZU14DB2    | TL*                         | PZU14DB2/DG                | UL*                         |
| PZU15DB2    | TM*                         | PZU15DB2/DG                | UM*                         |
| PZU16DB2    | TN*                         | PZU16DB2/DG                | UN*                         |
| PZU18DB2    | TP*                         | PZU18DB2/DG                | UP*                         |
| PZU20DB2    | TR*                         | PZU20DB2/DG                | UR*                         |
| PZU22DB2    | TS*                         | PZU22DB2/DG                | US*                         |
| PZU24DB2    | TT*                         | PZU24DB2/DG                | UT*                         |

[1] \* = -: made in Hong Kong

\* = p: made in Hong Kong

\* = t: made in Malaysia

\* = W: made in China

[2] /DG: halogen-free plastic package

## 5. Limiting values

Table 5. Limiting values

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

| Symbol            | Parameter                                     | Conditions                  | Min              | Max                         | Unit |
|-------------------|-----------------------------------------------|-----------------------------|------------------|-----------------------------|------|
| <b>Per diode</b>  |                                               |                             |                  |                             |      |
| $I_F$             | forward current                               |                             | -                | 200                         | mA   |
| $I_{ZSM}$         | non-repetitive peak reverse current           |                             | <sup>[1]</sup> - | see <a href="#">Table 8</a> |      |
| $P_{ZSM}$         | non-repetitive peak reverse power dissipation |                             | <sup>[1]</sup> - | 40                          | W    |
| <b>Per device</b> |                                               |                             |                  |                             |      |
| $P_{tot}$         | total power dissipation                       | $T_{amb} \leq 25\text{ °C}$ | <sup>[2]</sup> - | 250                         | mW   |
|                   |                                               |                             | <sup>[3]</sup> - | 275                         | 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;  $T_j = 25\text{ °C}$  prior to surge

[2] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.

[3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode  $1\text{ cm}^2$ .

## 6. Thermal characteristics

**Table 6. Thermal characteristics**

| Symbol            | Parameter                                        | Conditions  | Min   | Typ | Max | Unit |
|-------------------|--------------------------------------------------|-------------|-------|-----|-----|------|
| <b>Per device</b> |                                                  |             |       |     |     |      |
| $R_{th(j-a)}$     | thermal resistance from junction to ambient      | in free air | [1] - | -   | 500 | K/W  |
|                   |                                                  |             | [2] - | -   | 455 | K/W  |
| $R_{th(j-sp)}$    | thermal resistance from junction to solder point |             | [3] - | -   | 200 | K/W  |

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

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

[3] Soldering points at pin 4 and pin 5.

## 7. Characteristics

**Table 7. Characteristics**

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

| Symbol           | Parameter       | Conditions            | Min | Typ | Max | Unit |
|------------------|-----------------|-----------------------|-----|-----|-----|------|
| <b>Per diode</b> |                 |                       |     |     |     |      |
| $V_F$            | 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; PZU2.7DB2 to PZU24DB2 and PZU2.7DB2/DG to PZU24DB2/DG**

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

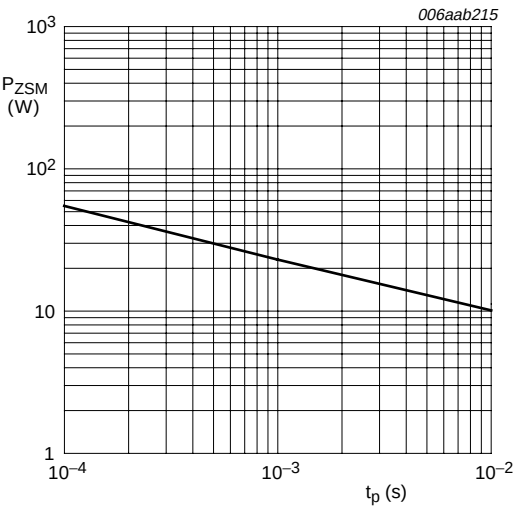
| PZUxDB2<br>PZUxDB2/DG | Working voltage<br>$V_Z$ (V) |      | Differential resistance<br>$r_{dif}$ ( $\Omega$ ) |                     | Reverse current<br>$I_R$ ( $\mu\text{A}$ ) |           | Temperature coefficient<br>$S_Z$ (mV/K) | Diode capacitance<br>$C_d$ (pF) [1] | Non-repetitive peak reverse current<br>$I_{ZSM}$ (A) [2] |
|-----------------------|------------------------------|------|---------------------------------------------------|---------------------|--------------------------------------------|-----------|-----------------------------------------|-------------------------------------|----------------------------------------------------------|
|                       | $I_Z = 5\text{ mA}$          |      | $I_Z = 0.5\text{ mA}$                             | $I_Z = 5\text{ mA}$ |                                            |           | $I_Z = 5\text{ mA}$                     |                                     |                                                          |
|                       | Min                          | Max  | Max                                               | Max                 | Max                                        | $V_R$ (V) | Typ                                     | Max                                 | Max                                                      |
| 2.7                   | 2.65                         | 2.9  | 1000                                              | 100                 | 20                                         | 1         | -2.0                                    | 440                                 | 8                                                        |
| 3.0                   | 2.95                         | 3.2  | 1000                                              | 95                  | 10                                         | 1         | -2.1                                    | 425                                 | 8                                                        |
| 3.3                   | 3.25                         | 3.5  | 1000                                              | 95                  | 5                                          | 1         | -2.4                                    | 410                                 | 8                                                        |
| 3.6                   | 3.55                         | 3.8  | 1000                                              | 90                  | 5                                          | 1         | -2.4                                    | 390                                 | 8                                                        |
| 3.9                   | 3.87                         | 4.1  | 1000                                              | 90                  | 3                                          | 1         | -2.5                                    | 370                                 | 8                                                        |
| 4.3                   | 4.15                         | 4.34 | 1000                                              | 90                  | 3                                          | 1         | -2.5                                    | 350                                 | 8                                                        |
| 4.7                   | 4.55                         | 4.75 | 800                                               | 80                  | 2                                          | 1         | -1.4                                    | 325                                 | 8                                                        |
| 5.1                   | 4.98                         | 5.2  | 250                                               | 60                  | 2                                          | 1.5       | 0.3                                     | 300                                 | 5.5                                                      |
| 5.6                   | 5.49                         | 5.73 | 100                                               | 40                  | 1                                          | 2.5       | 1.9                                     | 275                                 | 5.5                                                      |
| 6.2                   | 6.06                         | 6.33 | 80                                                | 30                  | 0.5                                        | 3         | 2.7                                     | 250                                 | 5.5                                                      |
| 6.8                   | 6.65                         | 6.93 | 60                                                | 20                  | 0.5                                        | 3.5       | 3.4                                     | 215                                 | 5.5                                                      |
| 7.5                   | 7.28                         | 7.6  | 60                                                | 10                  | 0.5                                        | 4         | 4.0                                     | 170                                 | 3.5                                                      |

**Table 8. Characteristics per type; PZU2.7DB2 to PZU24DB2 and PZU2.7DB2/DG to PZU24DB2/DG ...continued**  
 $T_j = 25^\circ\text{C}$  unless otherwise specified.

| PZUxDB2<br>PZUxDB2/DG | Working voltage<br>$V_Z$ (V) |       | Differential resistance<br>$r_{\text{dif}}$ ( $\Omega$ ) |                     | Reverse current<br>$I_R$ ( $\mu\text{A}$ ) |           | Temperature coefficient<br>$S_Z$ (mV/K) | Diode capacitance<br>$C_d$ (pF) <sup>[1]</sup> | Non-repetitive peak reverse current<br>$I_{ZSM}$ (A) <sup>[2]</sup> |
|-----------------------|------------------------------|-------|----------------------------------------------------------|---------------------|--------------------------------------------|-----------|-----------------------------------------|------------------------------------------------|---------------------------------------------------------------------|
|                       | $I_Z = 5\text{ mA}$          |       | $I_Z = 0.5\text{ mA}$                                    | $I_Z = 5\text{ mA}$ |                                            |           | $I_Z = 5\text{ mA}$                     |                                                |                                                                     |
|                       | Min                          | Max   | Max                                                      | Max                 | Max                                        | $V_R$ (V) | Typ                                     | Max                                            | Max                                                                 |
| 8.2                   | 8.02                         | 8.36  | 60                                                       | 10                  | 0.5                                        | 5         | 4.6                                     | 150                                            | 3.5                                                                 |
| 9.1                   | 8.85                         | 9.23  | 60                                                       | 10                  | 0.5                                        | 6         | 5.5                                     | 120                                            | 3.5                                                                 |
| 10                    | 9.77                         | 10.21 | 60                                                       | 10                  | 0.1                                        | 7         | 6.4                                     | 110                                            | 3.5                                                                 |
| 11                    | 10.76                        | 11.22 | 60                                                       | 10                  | 0.1                                        | 8         | 7.4                                     | 108                                            | 3                                                                   |
| 12                    | 11.74                        | 12.24 | 80                                                       | 10                  | 0.1                                        | 9         | 8.4                                     | 105                                            | 3                                                                   |
| 13                    | 12.91                        | 13.49 | 80                                                       | 10                  | 0.1                                        | 10        | 9.4                                     | 103                                            | 2.5                                                                 |
| 14                    | 13.7                         | 14.3  | 80                                                       | 10                  | 0.1                                        | 11        | 10.4                                    | 101                                            | 2                                                                   |
| 15                    | 14.34                        | 14.98 | 80                                                       | 15                  | 0.05                                       | 11        | 11.4                                    | 99                                             | 2                                                                   |
| 16                    | 15.85                        | 16.51 | 80                                                       | 20                  | 0.05                                       | 12        | 12.4                                    | 97                                             | 1.5                                                                 |
| 18                    | 17.56                        | 18.35 | 80                                                       | 20                  | 0.05                                       | 13        | 14.4                                    | 93                                             | 1.5                                                                 |
| 20                    | 19.52                        | 20.39 | 100                                                      | 20                  | 0.05                                       | 15        | 16.4                                    | 88                                             | 1.5                                                                 |
| 22                    | 21.54                        | 22.47 | 100                                                      | 25                  | 0.05                                       | 17        | 18.4                                    | 84                                             | 1.3                                                                 |
| 24                    | 23.72                        | 24.78 | 120                                                      | 30                  | 0.05                                       | 19        | 20.4                                    | 80                                             | 1.3                                                                 |

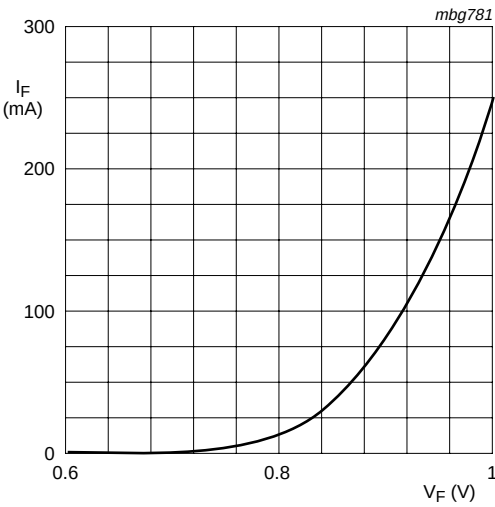
[1]  $f = 1\text{ MHz}$ ;  $V_R = 0\text{ V}$

[2]  $t_p = 100\text{ }\mu\text{s}$ ; square wave;  $T_j = 25^\circ\text{C}$  prior to surge



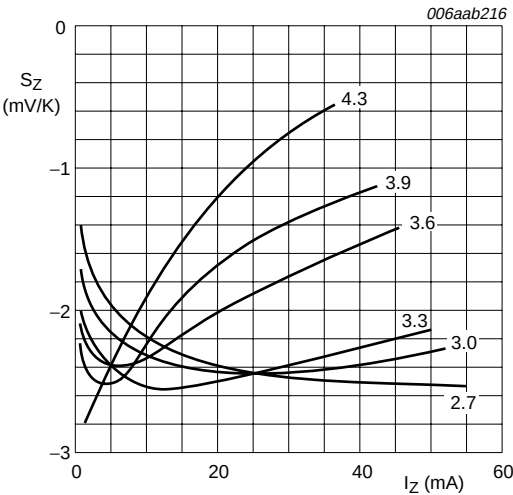
$T_j = 25\text{ }^{\circ}\text{C}$  (prior to surge)

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



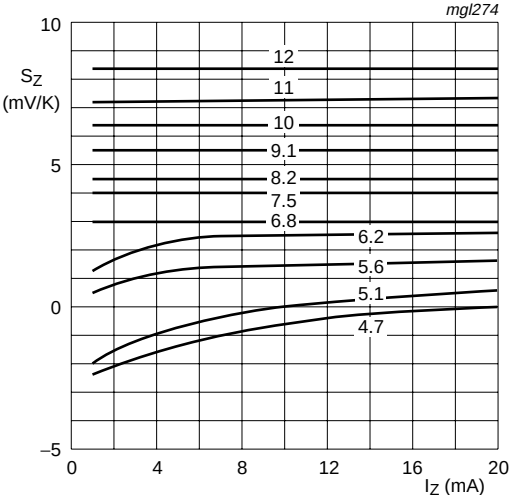
$T_j = 25\text{ }^{\circ}\text{C}$

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



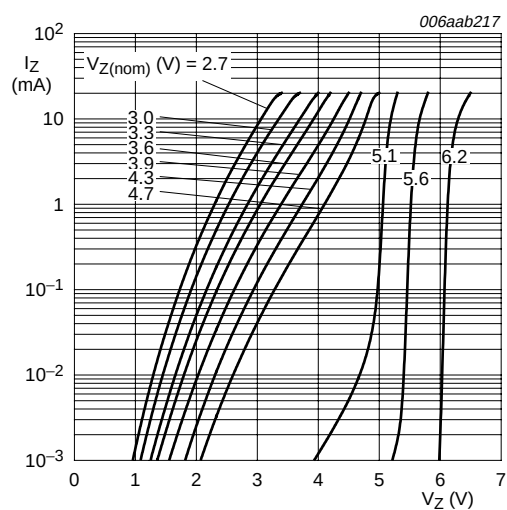
$T_j = 25\text{ }^{\circ}\text{C}$  to  $150\text{ }^{\circ}\text{C}$   
PZU2.7DB2 to PZU4.3DB2  
PZU2.7DB2/DG to PZU4.3DB2/DG

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



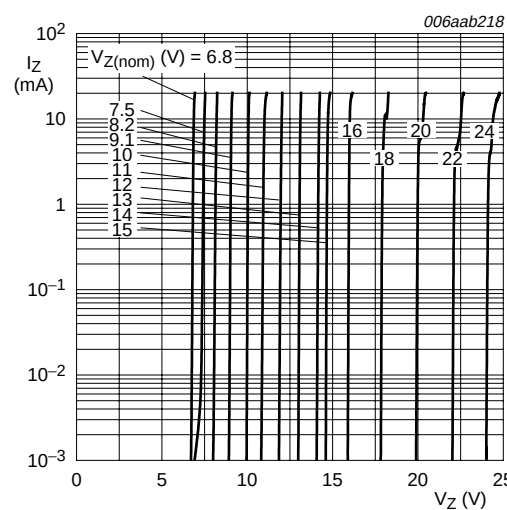
$T_j = 25\text{ }^{\circ}\text{C}$  to  $150\text{ }^{\circ}\text{C}$   
PZU4.7DB2 to PZU12DB2  
PZU4.7DB2/DG to PZU12DB2/DG

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



$T_j = 25\text{ }^{\circ}\text{C}$   
PZU2.7DB2 to PZU6.2DB2  
PZU2.7DB2/DG to PZU6.2DB2/DG

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



$T_j = 25\text{ }^{\circ}\text{C}$   
PZU6.8DB2 to PZU24DB2  
PZU6.8DB2/DG to PZU24DB2/DG

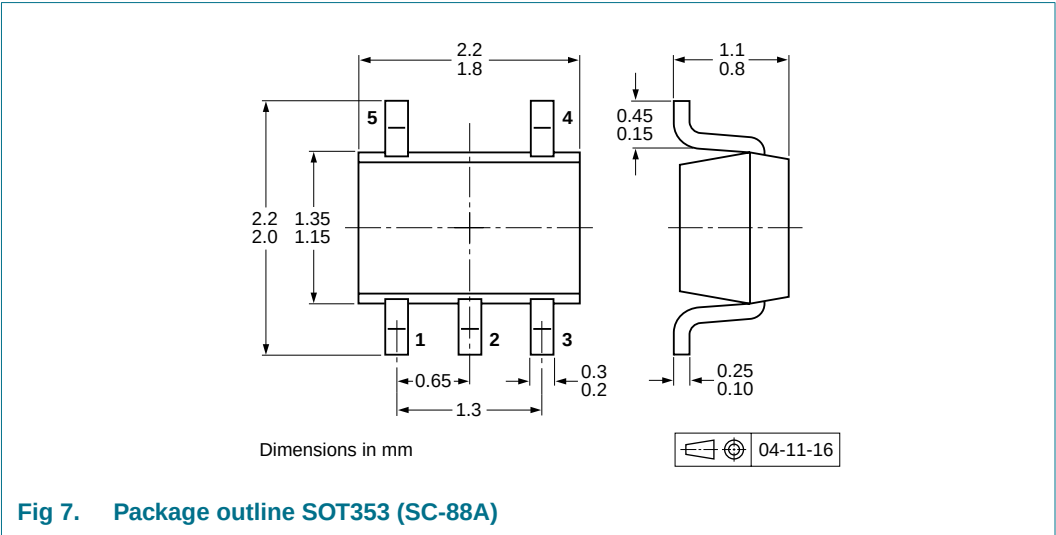
Fig 6. Working current as a function of working voltage; typical values

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 9. 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 |
| PZU2.7DB2 to<br>PZU24DB2       | SOT353  | 4 mm pitch, 8 mm tape and reel | -115             | -135  |
| PZU2.7DB2/DG to<br>PZU24DB2/DG |         |                                |                  |       |

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

11. Soldering

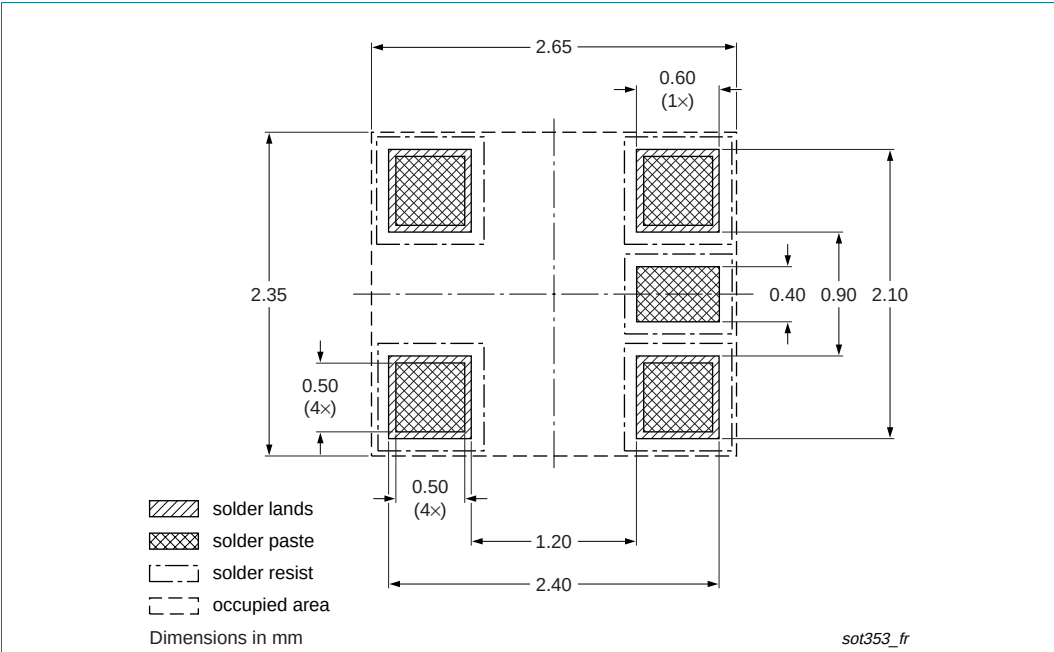


Fig 8. Reflow soldering footprint SOT353 (SC-88A)

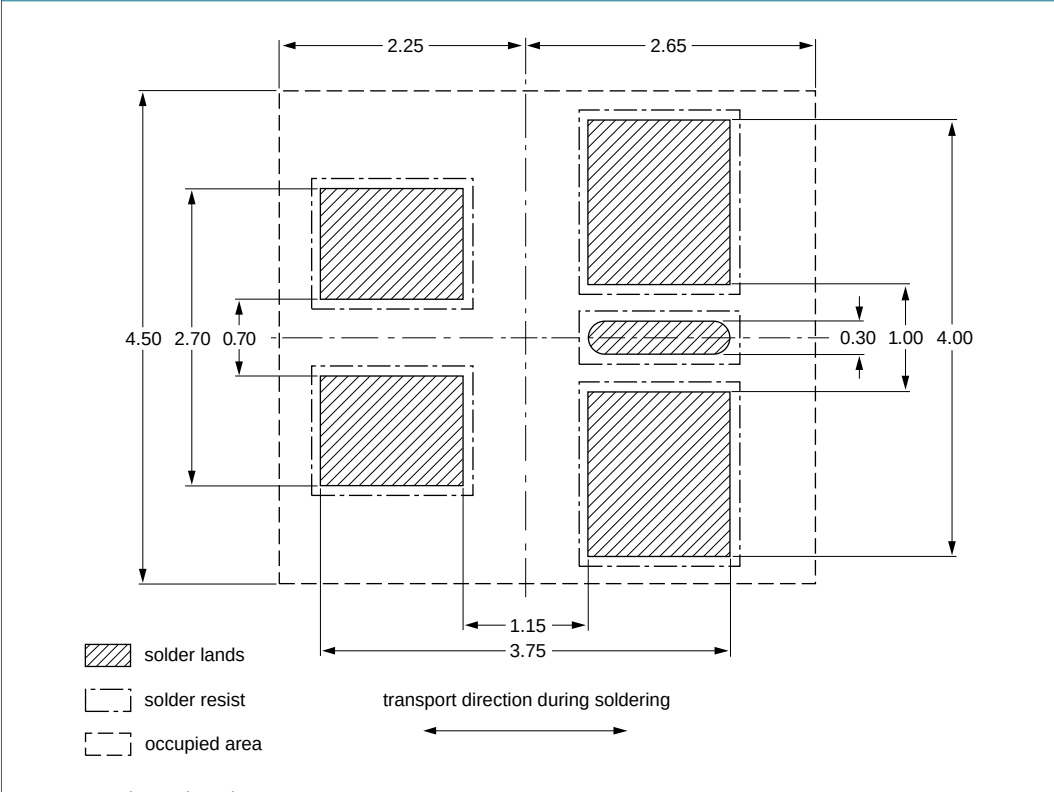


Fig 9. Wave soldering footprint SOT353 (SC-88A)

12. Revision history

Table 10. Revision history

| Document ID   | Release date | Data sheet status  | Change notice | Supersedes |
|---------------|--------------|--------------------|---------------|------------|
| PZUXDB2_SER_1 | 20080331     | 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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## 15. Contents

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