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Kind regards,

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# 1PS301

## Dual high-speed switching diode

Rev. 5 — 6 March 2012

Product data sheet

## 1. Product profile

### 1.1 General description

Dual high-speed switching diode, encapsulated in a very small SOT323 (SC-70) Surface-Mounted Device (SMD) plastic package.

### 1.2 Features and benefits

- High switching speed:  $t_{rr} \leq 4$  ns
- Repetitive peak reverse voltage:  $V_{RRM} \leq 85$  V
- Reverse voltage:  $V_R \leq 80$  V
- AEC-Q101 qualified
- Low capacitance:  $C_d \leq 1.5$  pF
- Repetitive peak forward current:  $I_{FRM} \leq 500$  mA
- Very small SMD plastic package

### 1.3 Applications

- High-speed switching
- General-purpose switching

### 1.4 Quick reference data

Table 1. Quick reference data

| Symbol           | Parameter             | Conditions   | Min   | Typ | Max | Unit    |
|------------------|-----------------------|--------------|-------|-----|-----|---------|
| <b>Per diode</b> |                       |              |       |     |     |         |
| $I_F$            | forward current       |              | [1]   |     |     |         |
|                  |                       |              | [2] - | -   | 250 | mA      |
|                  |                       |              | [3] - | -   | 160 | mA      |
| $I_R$            | reverse current       | $V_R = 80$ V | -     | -   | 0.5 | $\mu$ A |
| $V_R$            | reverse voltage       |              | -     | -   | 80  | V       |
| $t_{rr}$         | reverse recovery time |              | [4] - | -   | 4   | ns      |

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

[2] Single diode loaded.

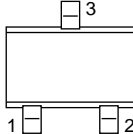
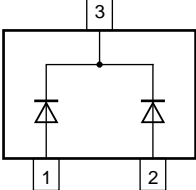
[3] Double diode loaded.

[4] When switched from  $I_F = 10$  mA to  $I_R = 10$  mA;  $R_L = 100 \Omega$ ; measured at  $I_R = 1$  mA.



## 2. Pinning information

Table 2. Pinning

| Pin | Description     | Simplified outline   | Graphic symbol  |
|-----|-----------------|--|---|
| 1   | anode (diode 1) |  |  |
| 2   | anode (diode 2) |  |   |
| 3   | common cathode  |  |   |

006aab034

## 3. Ordering information

Table 3. Ordering information

| Type number | Package |  |         |
|-------------|---------|--|---------|
|             | Name    | Description                              | Version |
| 1PS301      | SC-70   | plastic surface-mounted package; 3 leads | SOT323  |

## 4. Marking

Table 4. Marking codes

| Type number | Marking code <sup>[1]</sup> |
|-------------|-----------------------------|
| 1PS301      | B*3                         |

[1] \* = placeholder for manufacturing site code

## 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> |                                     |  |     |     |      |
| $V_{RRM}$        | repetitive peak reverse voltage     |  | -   | 85  | V    |
| $V_R$            | reverse voltage                     |  | -   | 80  | V    |
| $I_F$            | forward current                     | <sup>[1]</sup>                               |     |     |      |
|                  |                                     | <sup>[2]</sup> -                             |     | 250 | mA   |
|                  |                                     | <sup>[3]</sup> -                             |     | 160 | mA   |
| $I_{FRM}$        | repetitive peak forward current     | $t_p \leq 0.5 \mu s$ ;<br>$\delta \leq 0.25$ | -   | 500 | mA   |
| $I_{FSM}$        | non-repetitive peak forward current | square wave <sup>[4]</sup>                   |     |     |      |
|                  |                                     | $t_p = 1 \mu s$                              | -   | 4   | A    |
|                  |                                     | $t_p = 1 s$                                  | -   | 0.5 | A    |

**Table 5. Limiting values ...continued***In accordance with the Absolute Maximum Rating System (IEC 60134).*

| Symbol            | Parameter               | Conditions                         | Min   | Max  | Unit |
|-------------------|-------------------------|------------------------------------|-------|------|------|
| <b>Per device</b> |                         |                                    |       |      |      |
| $P_{\text{tot}}$  | total power dissipation | $T_{\text{amb}} \leq 25\text{ °C}$ | [1] - | 300  | mW   |
| $T_{\text{j}}$    | junction temperature    |                                    | -     | 150  | °C   |
| $T_{\text{amb}}$  | ambient temperature     |                                    | -55   | +150 | °C   |
| $T_{\text{stg}}$  | storage temperature     |                                    | -65   | +150 | °C   |

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

[2] Single diode loaded.

[3] Double diode loaded.

[4]  $T_{\text{j}} = 25\text{ °C}$  before surge.

## 6. Thermal characteristics

**Table 6. Thermal characteristics**

| Symbol                | Parameter  | Conditions  | Min   | Typ | Max | Unit |
|-----------------------|--|-------------|-------|-----|-----|------|
| <b>Per device</b>     |  |             |       |     |     |      |
| $R_{\text{th(j-a)}}$  | thermal resistance from junction to ambient      | in free air | [1] - | -   | 415 | K/W  |
| $R_{\text{th(j-sp)}}$ | thermal resistance from junction to solder point |             | -     | -   | 200 | K/W  |

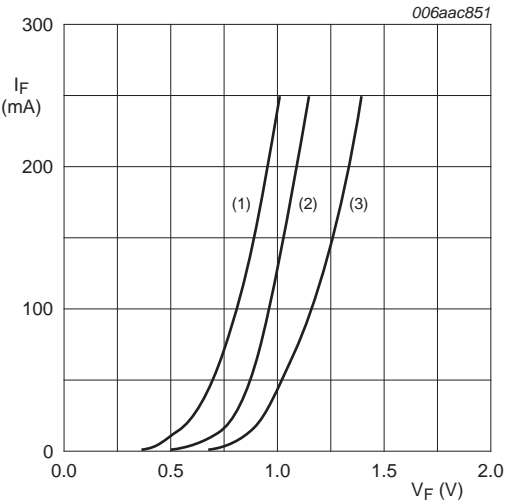
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

## 7. Characteristics

**Table 7. Characteristics** *$T_{\text{amb}} = 25\text{ °C}$  unless otherwise specified.*

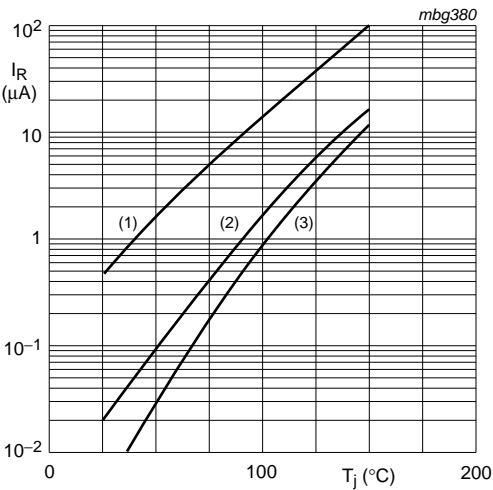
| Symbol           | Parameter                | Conditions   | Min   | Typ | Max  | Unit |
|------------------|--------------------------|--|-------|-----|------|------|
| <b>Per diode</b> |                          |  |       |     |      |      |
| $V_{\text{F}}$   | forward voltage          | $I_{\text{F}} = 1\text{ mA}$                               | -     | 610 | -    | mV   |
|                  |                          | $I_{\text{F}} = 10\text{ mA}$                              | -     | 740 | -    | mV   |
|                  |                          | $I_{\text{F}} = 50\text{ mA}$                              | -     | -   | 1.0  | V    |
|                  |                          | $I_{\text{F}} = 100\text{ mA}$                             | -     | -   | 1.2  | V    |
| $I_{\text{R}}$   | reverse current          | $V_{\text{R}} = 25\text{ V}$                               | -     | -   | 30   | nA   |
|                  |                          | $V_{\text{R}} = 80\text{ V}$                               | -     | -   | 0.5  | μA   |
|                  |                          | $V_{\text{R}} = 25\text{ V}; T_{\text{j}} = 150\text{ °C}$ | -     | -   | 30   | μA   |
|                  |                          | $V_{\text{R}} = 80\text{ V}; T_{\text{j}} = 150\text{ °C}$ | -     | -   | 100  | μA   |
| $C_{\text{d}}$   | diode capacitance        | $f = 1\text{ MHz}; V_{\text{R}} = 0\text{ V}$              | -     | -   | 1.5  | pF   |
| $t_{\text{rr}}$  | reverse recovery time    |  | [1] - | -   | 4    | ns   |
| $V_{\text{FR}}$  | forward recovery voltage |  | [2] - | -   | 1.75 | V    |

[1] When switched from  $I_{\text{F}} = 10\text{ mA}$  to  $I_{\text{R}} = 10\text{ mA}$ ;  $R_{\text{L}} = 100\text{ Ω}$ ; measured at  $I_{\text{R}} = 1\text{ mA}$ .[2] When switched from  $I_{\text{F}} = 10\text{ mA}$ ;  $t_{\text{r}} = 20\text{ ns}$ .



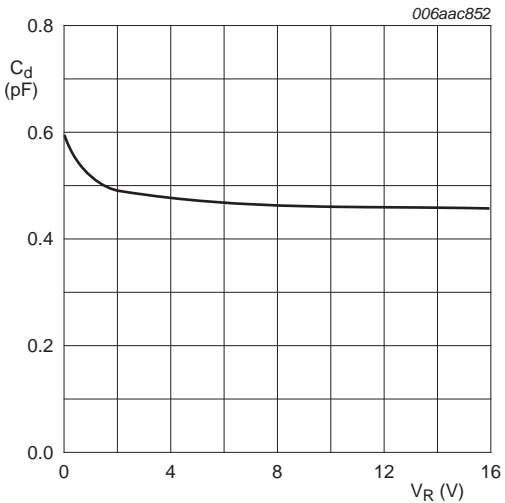
- (1)  $T_j = 150\text{ }^{\circ}\text{C}$ ; typical values
- (2)  $T_j = 25\text{ }^{\circ}\text{C}$ ; typical values
- (3)  $T_j = 25\text{ }^{\circ}\text{C}$ ; maximum values

Fig 1. Forward current as a function of forward voltage



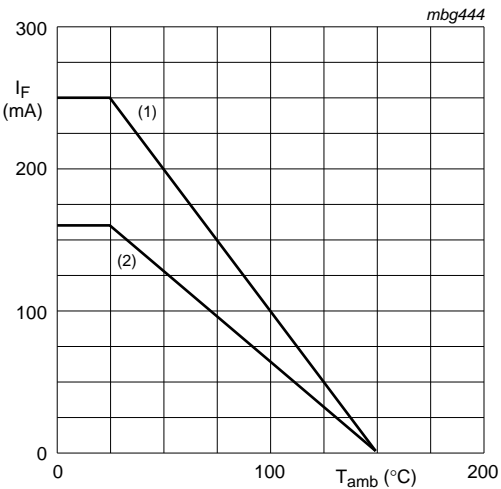
- (1)  $V_R = 80\text{ V}$ ; maximum values
- (2)  $V_R = 80\text{ V}$ ; typical values
- (3)  $V_R = 25\text{ V}$ ; typical values

Fig 2. Reverse current as a function of junction temperature



$f = 1\text{ MHz}$ ;  $T_{amb} = 25\text{ }^{\circ}\text{C}$

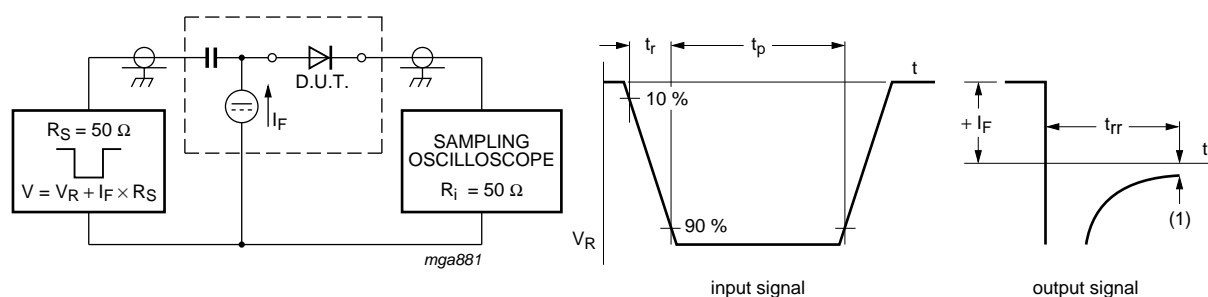
Fig 3. Diode capacitance as a function of reverse voltage; typical values



- FR4 PCB, standard footprint
- (1) single diode loaded
  - (2) double diode loaded

Fig 4. Forward current as a function of ambient temperature; derating curves

## 8. Test information

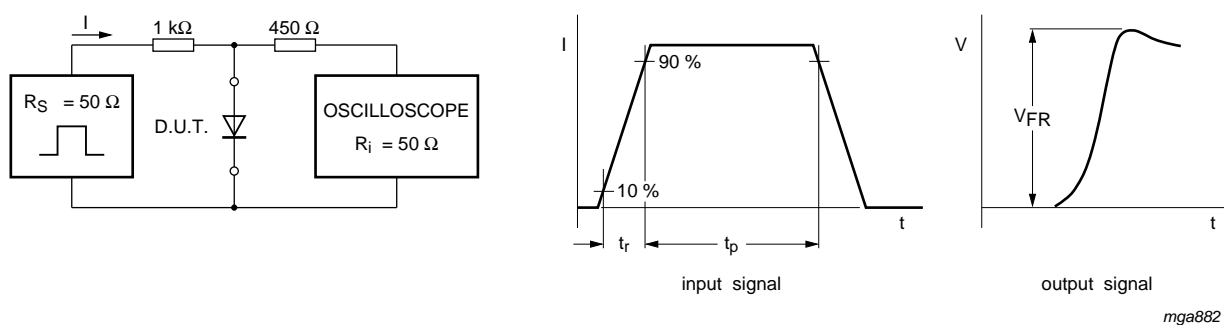


(1)  $I_R = 1 \text{ mA}$

Input signal: reverse pulse rise time  $t_r = 0.6 \text{ ns}$ ; reverse voltage pulse duration  $t_p = 100 \text{ ns}$ ; duty cycle  $\delta = 0.05$

Oscilloscope: rise time  $t_r = 0.35 \text{ ns}$

**Fig 5. Reverse recovery time test circuit and waveforms**



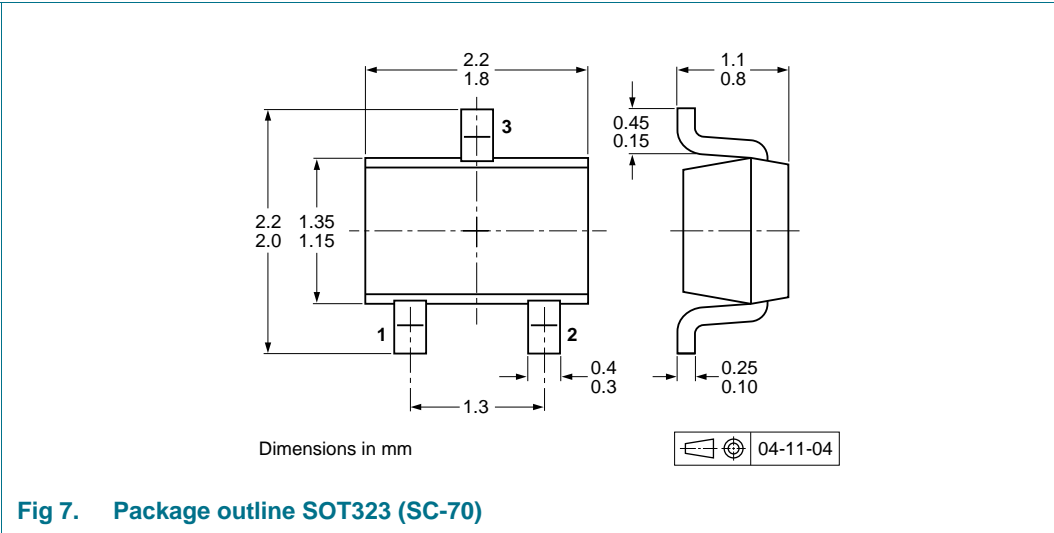
Input signal: forward pulse rise time  $t_r = 20 \text{ ns}$ ; forward current pulse duration  $t_p \geq 100 \text{ ns}$ ; duty cycle  $\delta \leq 0.005$

**Fig 6. Forward recovery voltage test circuit and waveforms**

### 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

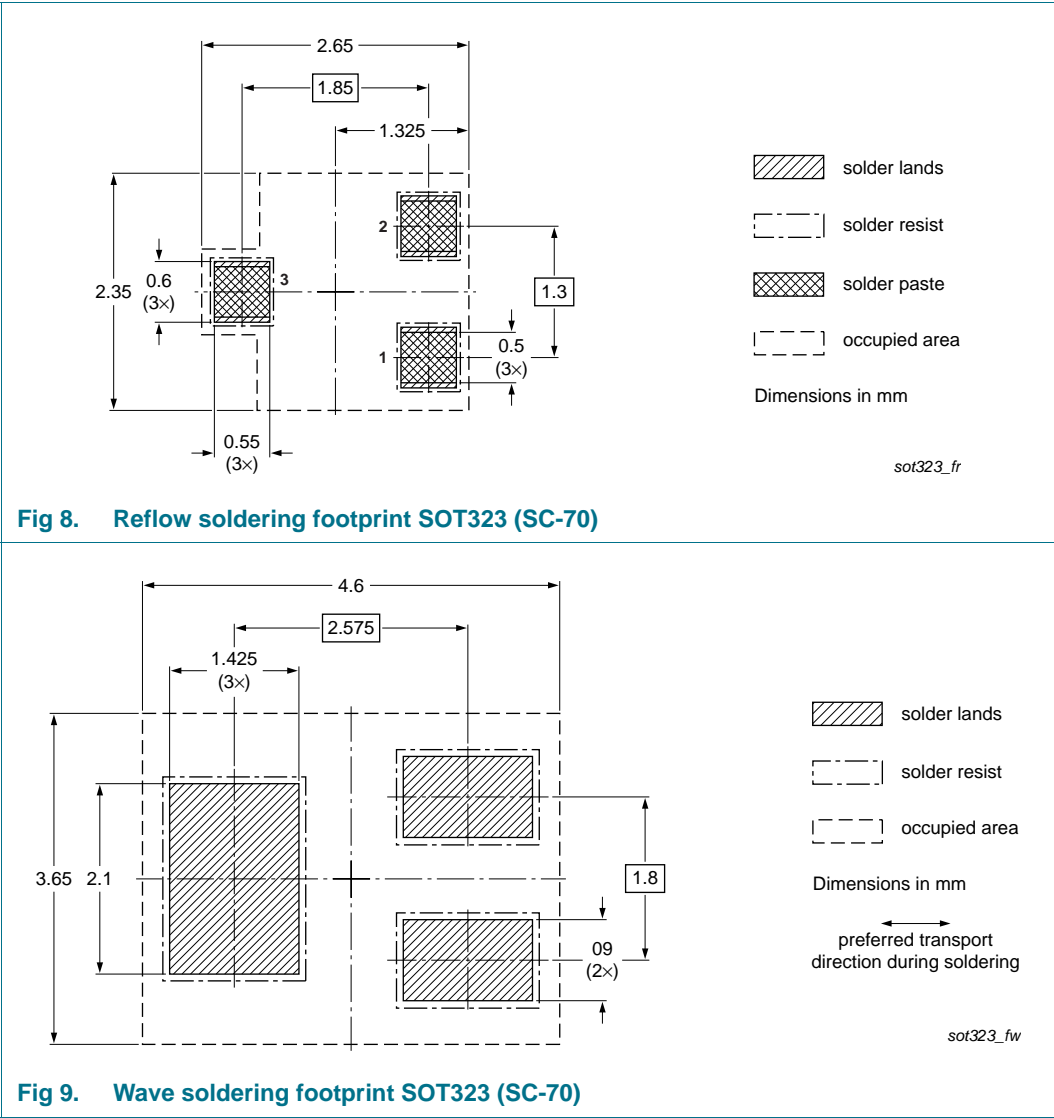
Table 8. Packing methods

The indicated -xxx are the last three digits of the 12NC ordering code.<sup>[1]</sup>

| Type number | Package | Description                    | Packing quantity |       |
|-------------|---------|--------------------------------|------------------|-------|
|             |         |                                | 3000             | 10000 |
| 1PS301      | SOT323  | 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





## 12. Revision history

Table 9. Revision history

| Document ID    | Release date   | Data sheet status     | Change notice | Supersedes |
|----------------|--|-----------------------|---------------|------------|
| 1PS301 v.5     | 20120306   | Product data sheet    | -             | 1PS301 v.4 |
| Modifications: | <ul style="list-style-type: none"><li>• The format of this document has been redesigned to comply with the new identity guidelines of NXP Semiconductors.</li><li>• Legal texts have been adapted to the new company name where appropriate.</li><li>• <a href="#">Section 1.1 "General description"</a>: amended</li><li>• <a href="#">Table 1 "Quick reference data"</a>: added</li><li>• <a href="#">Section 4 "Marking"</a>: updated</li><li>• <a href="#">Section 8 "Test information"</a>: added</li><li>• <a href="#">Figure 7</a>: superseded by minimized package outline drawing</li><li>• <a href="#">Section 10 "Packing information"</a>: added</li><li>• <a href="#">Section 11 "Soldering"</a>: added</li><li>• <a href="#">Section 13 "Legal information"</a>: updated</li></ul> |                       |               |            |
| 1PS301 v.4     | 19990506   | Product data sheet    | -             | 1PS301 v.3 |
| 1PS301 v.3     | 19961004   | Product specification | -             | 1PS301 v.2 |
| 1PS301 v.2     | 19960903   | Product specification | -             | 1PS301 v.1 |
| 1PS301 v.1     | 19960403   | Product specification | -             | -          |

## 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.                                     |

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

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Please be aware that important notices concerning this document and the product(s) described herein, have been included in section 'Legal information'.

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