



# PTVSxP1UP series

## 600 W Transient Voltage Suppressor

Rev. 2 — 6 January 2011

Product data sheet

## 1. Product profile

### 1.1 General description

600 W unidirectional Transient Voltage Suppressor (TVS) in a SOD128 small and flat lead Surface-Mounted Device (SMD) plastic package, designed for transient overvoltage protection.

### 1.2 Features and benefits

- Rated peak pulse power:  $P_{PPM} = 600\text{ W}$
- Reverse standoff voltage range:  $V_{RWM} = 3.3\text{ V to }64\text{ V}$
- Reverse current:  $I_{RM} = 0.001\text{ }\mu\text{A}$
- Very low package height: 1 mm
- Small plastic package suitable for surface-mounted design
- AEC-Q101 qualified

### 1.3 Applications

- Power supply protection
- Automotive application
- Industrial application
- Power management

### 1.4 Quick reference data

Table 1. Quick reference data

| Symbol    | Parameter                | Conditions | Min | Typ | Max | Unit |
|-----------|--------------------------|------------|-----|-----|-----|------|
| $P_{PPM}$ | rated peak pulse power   | [1]        | -   | -   | 600 | W    |
| $V_{RWM}$ | reverse standoff voltage |            | 3.3 | -   | 64  | V    |

[1] In accordance with IEC 61643-321 (10/1000  $\mu\text{s}$  current waveform).



## 2. Pinning information

Table 2. Pinning

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

[1] The marking bar indicates the cathode.

## 3. Ordering information

Table 3. Ordering information

| Type number <sup>[1]</sup> | Package |                                          |         |
|----------------------------|---------|------------------------------------------|---------|
|                            | Name    | Description                              | Version |
| PTVSxP1UP series           | -       | plastic surface-mounted package; 2 leads | SOD128  |

[1] The series consists of 35 types with reverse standoff voltages from 3.3 V to 64 V.

## 4. Marking

Table 4. Marking codes

| Type number | Marking code | Type number | Marking code |
|-------------|--------------|-------------|--------------|
| PTVS3V3P1UP | AJ           | PTVS20VP1UP | B3           |
| PTVS5V0P1UP | AK           | PTVS22VP1UP | B4           |
| PTVS6V0P1UP | AL           | PTVS24VP1UP | B5           |
| PTVS6V5P1UP | AM           | PTVS26VP1UP | B6           |
| PTVS7V0P1UP | AN           | PTVS28VP1UP | B7           |
| PTVS7V5P1UP | AP           | PTVS30VP1UP | B8           |
| PTVS8V0P1UP | AQ           | PTVS33VP1UP | B9           |
| PTVS8V5P1UP | AR           | PTVS36VP1UP | BA           |
| PTVS9V0P1UP | AS           | PTVS40VP1UP | BB           |
| PTVS10VP1UP | AT           | PTVS43VP1UP | BC           |
| PTVS11VP1UP | AU           | PTVS45VP1UP | BD           |
| PTVS12VP1UP | AV           | PTVS48VP1UP | BE           |
| PTVS13VP1UP | AW           | PTVS51VP1UP | BF           |
| PTVS14VP1UP | AX           | PTVS54VP1UP | BG           |
| PTVS15VP1UP | AY           | PTVS58VP1UP | BH           |
| PTVS16VP1UP | AZ           | PTVS60VP1UP | BJ           |
| PTVS17VP1UP | B1           | PTVS64VP1UP | BK           |
| PTVS18VP1UP | B2           | -           | -            |

## 5. Limiting values

**Table 5. Limiting values**

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

| Symbol           | Parameter                           | Conditions                                     | Min | Max                      | Unit |
|------------------|-------------------------------------|------------------------------------------------|-----|--------------------------|------|
| P <sub>PPM</sub> | rated peak pulse power              | [1]                                            | -   | 600                      | W    |
| I <sub>PPM</sub> | rated peak pulse current            | [1]                                            | -   | see<br>Table 9<br>and 10 |      |
| I <sub>FSM</sub> | Non-repetitive peak forward current | single half-sine wave; t <sub>p</sub> = 8.3 ms | -   | 100                      | A    |
| T <sub>j</sub>   | junction temperature                |                                                | -   | 150                      | °C   |
| T <sub>amb</sub> | ambient temperature                 |                                                | -55 | +150                     | °C   |
| T <sub>stg</sub> | storage temperature                 |                                                | -65 | +150                     | °C   |

[1] In accordance with IEC 61643-321 (10/1000 µs current waveform).

**Table 6. ESD maximum ratings**

T<sub>amb</sub> = 25 °C unless otherwise specified.

| Symbol           | Parameter                       | Conditions                        | Min    | Max | Unit  |
|------------------|---------------------------------|-----------------------------------|--------|-----|-------|
| <b>Per diode</b> |                                 |                                   |        |     |       |
| V <sub>ESD</sub> | electrostatic discharge voltage | IEC 61000-4-2 (contact discharge) | [1][2] | -   | 30 kV |

[1] Device stressed with ten non-repetitive ElectroStatic Discharge (ESD) pulses.

[2] Soldering point of cathode tab.

**Table 7. ESD standards compliance**

| Standard                                | Conditions                      |
|-----------------------------------------|---------------------------------|
| <b>Per diode</b>                        |                                 |
| IEC 61000-4-2; level 4 (ESD)            | > 15 kV (air); > 8 kV (contact) |
| MIL-STD-883; class 3 (human body model) | > 4 kV                          |

## 6. Thermal characteristics

**Table 8. Thermal characteristics**

| Symbol                | Parameter                                        | Conditions  | Min | Typ | Max | Unit    |
|-----------------------|--------------------------------------------------|-------------|-----|-----|-----|---------|
| R <sub>th(j-a)</sub>  | thermal resistance from junction to ambient      | in free air | [1] | -   | -   | 200 K/W |
|                       |                                                  |             | [2] | -   | -   | 120 K/W |
|                       |                                                  |             | [3] | -   | -   | 60 K/W  |
| R <sub>th(j-sp)</sub> | thermal resistance from junction to solder point |             | [4] | -   | -   | 12 K/W  |

[1] Device mounted on an FR4 Printed-Circuit Board (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] Device mounted on a ceramic PCB, Al<sub>2</sub>O<sub>3</sub>, standard footprint.

[4] Soldering point of cathode tab.

## 7. Characteristics

**Table 9. Characteristics per type; PTVS3V3P1UP to PTVS7V0P1UP**

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

| Type number | Reverse standoff voltage<br>$V_{RWM}$ (V) | Breakdown voltage<br>$V_{BR}$ (V) |      |      | Reverse leakage current<br>$I_{RM}$ ( $\mu$ A) |     | Clamping voltage<br>$V_{CL}$ (V) |               |
|-------------|-------------------------------------------|-----------------------------------|------|------|------------------------------------------------|-----|----------------------------------|---------------|
|             |                                           | $I_R = 10$ mA                     |      |      | at $V_{RWM}$ (V)                               |     |                                  |               |
|             | Max                                       | Min                               | Typ  | Max  | Typ                                            | Max | Max                              | $I_{PPM}$ (A) |
| PTVS3V3P1UP | 3.3                                       | 5.20                              | 5.60 | 6.00 | 5                                              | 600 | 8.0                              | 75.0          |
| PTVS5V0P1UP | 5.0                                       | 6.40                              | 6.70 | 7.00 | 5                                              | 400 | 9.2                              | 65.2          |
| PTVS6V0P1UP | 6.0                                       | 6.67                              | 7.02 | 7.37 | 5                                              | 400 | 10.3                             | 58.3          |
| PTVS6V5P1UP | 6.5                                       | 7.22                              | 7.60 | 7.98 | 5                                              | 250 | 11.2                             | 53.6          |
| PTVS7V0P1UP | 7.0                                       | 7.78                              | 8.20 | 8.60 | 3                                              | 100 | 12.0                             | 50.0          |

**Table 10. Characteristics per type; PTVS7V5P1UP to PTVS64VP1UP**

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

| Type number | Reverse standoff voltage<br>V <sub>RWM</sub> (V) | Breakdown voltage<br>V <sub>BR</sub> (V) |       |       | Reverse leakage current<br>I <sub>RM</sub> (μA) |     | Clamping voltage<br>V <sub>CL</sub> (V) |                      |
|-------------|--------------------------------------------------|------------------------------------------|-------|-------|-------------------------------------------------|-----|-----------------------------------------|----------------------|
|             |                                                  | I <sub>R</sub> = 1 mA                    |       |       | at V <sub>RWM</sub> (V)                         |     |                                         |                      |
|             | Max                                              | Min                                      | Typ   | Max   | Typ                                             | Max | Max                                     | I <sub>PPM</sub> (A) |
| PTVS7V5P1UP | 7.5                                              | 8.33                                     | 8.77  | 9.21  | 0.2                                             | 50  | 12.9                                    | 46.5                 |
| PTVS8V0P1UP | 8.0                                              | 8.89                                     | 9.36  | 9.83  | 0.03                                            | 25  | 13.6                                    | 44.1                 |
| PTVS8V5P1UP | 8.5                                              | 9.44                                     | 9.92  | 10.40 | 0.01                                            | 10  | 14.4                                    | 41.7                 |
| PTVS9V0P1UP | 9.0                                              | 10.00                                    | 10.55 | 11.10 | 0.005                                           | 5   | 15.4                                    | 39.0                 |
| PTVS10VP1UP | 10                                               | 11.10                                    | 11.70 | 12.30 | 0.005                                           | 2.5 | 17.0                                    | 35.3                 |
| PTVS11VP1UP | 11                                               | 12.20                                    | 12.85 | 13.50 | 0.005                                           | 2.5 | 18.2                                    | 33.0                 |
| PTVS12VP1UP | 12                                               | 13.30                                    | 14.00 | 14.70 | 0.005                                           | 2.5 | 19.9                                    | 30.2                 |
| PTVS13VP1UP | 13                                               | 14.40                                    | 15.15 | 15.90 | 0.001                                           | 0.1 | 21.5                                    | 27.9                 |
| PTVS14VP1UP | 14                                               | 15.60                                    | 16.40 | 17.20 | 0.001                                           | 0.1 | 23.2                                    | 25.9                 |
| PTVS15VP1UP | 15                                               | 16.70                                    | 17.60 | 18.50 | 0.001                                           | 0.1 | 24.4                                    | 24.6                 |
| PTVS16VP1UP | 16                                               | 17.80                                    | 18.75 | 19.70 | 0.001                                           | 0.1 | 26.0                                    | 23.1                 |
| PTVS17VP1UP | 17                                               | 18.90                                    | 19.90 | 20.90 | 0.001                                           | 0.1 | 27.6                                    | 21.7                 |
| PTVS18VP1UP | 18                                               | 20.00                                    | 21.00 | 22.10 | 0.001                                           | 0.1 | 29.2                                    | 20.5                 |
| PTVS20VP1UP | 20                                               | 22.20                                    | 23.35 | 24.50 | 0.001                                           | 0.1 | 32.4                                    | 18.5                 |
| PTVS22VP1UP | 22                                               | 24.40                                    | 25.60 | 26.90 | 0.001                                           | 0.1 | 35.5                                    | 16.9                 |
| PTVS24VP1UP | 24                                               | 26.70                                    | 28.10 | 29.50 | 0.001                                           | 0.1 | 38.9                                    | 15.4                 |
| PTVS26VP1UP | 26                                               | 28.90                                    | 30.40 | 31.90 | 0.001                                           | 0.1 | 42.1                                    | 14.3                 |
| PTVS28VP1UP | 28                                               | 31.10                                    | 32.80 | 34.40 | 0.001                                           | 0.1 | 45.4                                    | 13.2                 |
| PTVS30VP1UP | 30                                               | 33.30                                    | 35.10 | 36.80 | 0.001                                           | 0.1 | 48.4                                    | 12.4                 |
| PTVS33VP1UP | 33                                               | 36.70                                    | 38.70 | 40.60 | 0.001                                           | 0.1 | 53.3                                    | 11.3                 |
| PTVS36VP1UP | 36                                               | 40.00                                    | 42.10 | 44.20 | 0.001                                           | 0.1 | 58.1                                    | 10.3                 |
| PTVS40VP1UP | 40                                               | 44.40                                    | 46.80 | 49.10 | 0.001                                           | 0.1 | 64.5                                    | 9.3                  |

**Table 10. Characteristics per type; PTVS7V5P1UP to PTVS64VP1UP ...continued** $T_j = 25\text{ }^{\circ}\text{C}$  unless otherwise specified.

| Type number | Reverse standoff voltage<br>V <sub>RWM</sub> (V) | Breakdown voltage<br>V <sub>BR</sub> (V) |       |       | Reverse leakage current<br>I <sub>RM</sub> (μA) |     | Clamping voltage<br>V <sub>CL</sub> (V) |                      |
|-------------|--------------------------------------------------|------------------------------------------|-------|-------|-------------------------------------------------|-----|-----------------------------------------|----------------------|
|             |                                                  | I <sub>R</sub> = 1 mA                    |       |       | at V <sub>RWM</sub> (V)                         |     |                                         |                      |
|             | Max                                              | Min                                      | Typ   | Max   | Typ                                             | Max | Max                                     | I <sub>PPM</sub> (A) |
| PTVS43VP1UP | 43                                               | 47.80                                    | 50.30 | 52.80 | 0.001                                           | 0.1 | 69.4                                    | 8.6                  |
| PTVS45VP1UP | 45                                               | 50.00                                    | 52.65 | 55.30 | 0.001                                           | 0.1 | 72.7                                    | 8.3                  |
| PTVS48VP1UP | 48                                               | 53.30                                    | 56.10 | 58.90 | 0.001                                           | 0.1 | 77.4                                    | 7.8                  |
| PTVS51VP1UP | 51                                               | 56.70                                    | 59.70 | 62.70 | 0.001                                           | 0.1 | 82.4                                    | 7.3                  |
| PTVS54VP1UP | 54                                               | 60.00                                    | 63.15 | 66.30 | 0.001                                           | 0.1 | 87.1                                    | 6.9                  |
| PTVS58VP1UP | 58                                               | 64.40                                    | 67.80 | 71.20 | 0.001                                           | 0.1 | 93.6                                    | 6.4                  |
| PTVS60VP1UP | 60                                               | 66.70                                    | 70.20 | 73.70 | 0.001                                           | 0.1 | 96.8                                    | 6.2                  |
| PTVS64VP1UP | 64                                               | 71.10                                    | 74.85 | 78.60 | 0.001                                           | 0.1 | 103.0                                   | 5.8                  |

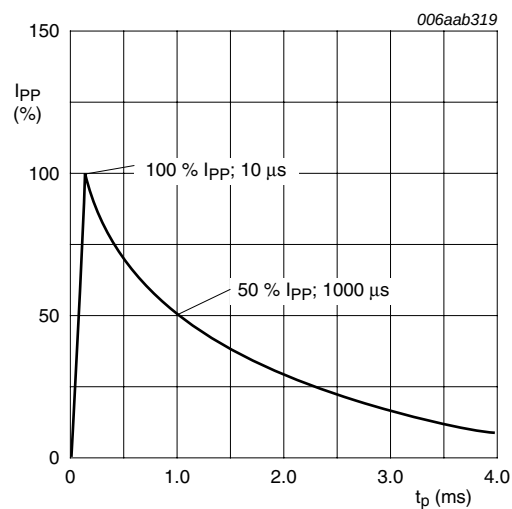


Fig 1. 10/1000  $\mu$ s pulse waveform according to IEC 61643-321

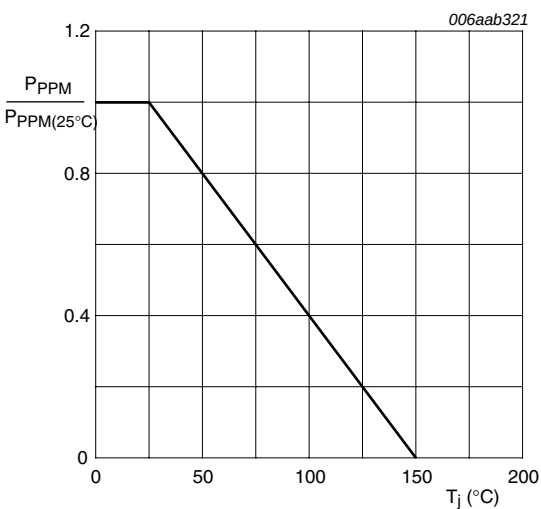


Fig 2. Relative variation of rated peak pulse power as a function of junction temperature; typical values

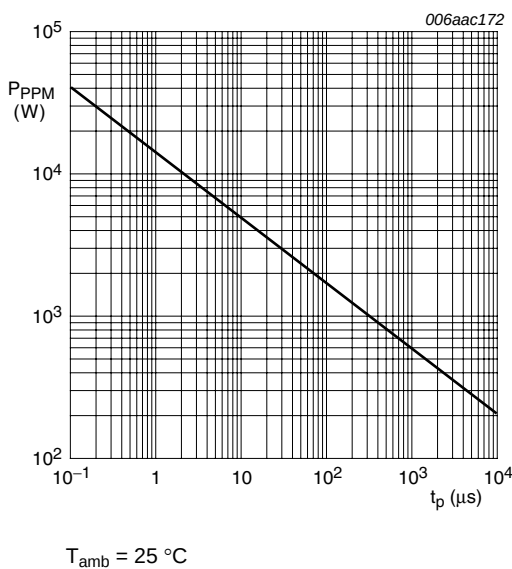
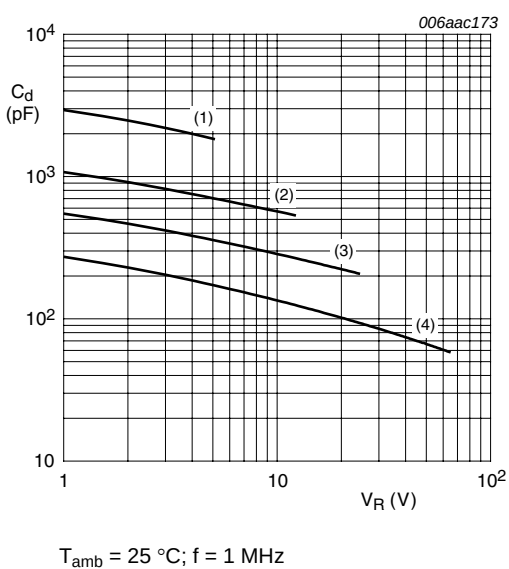
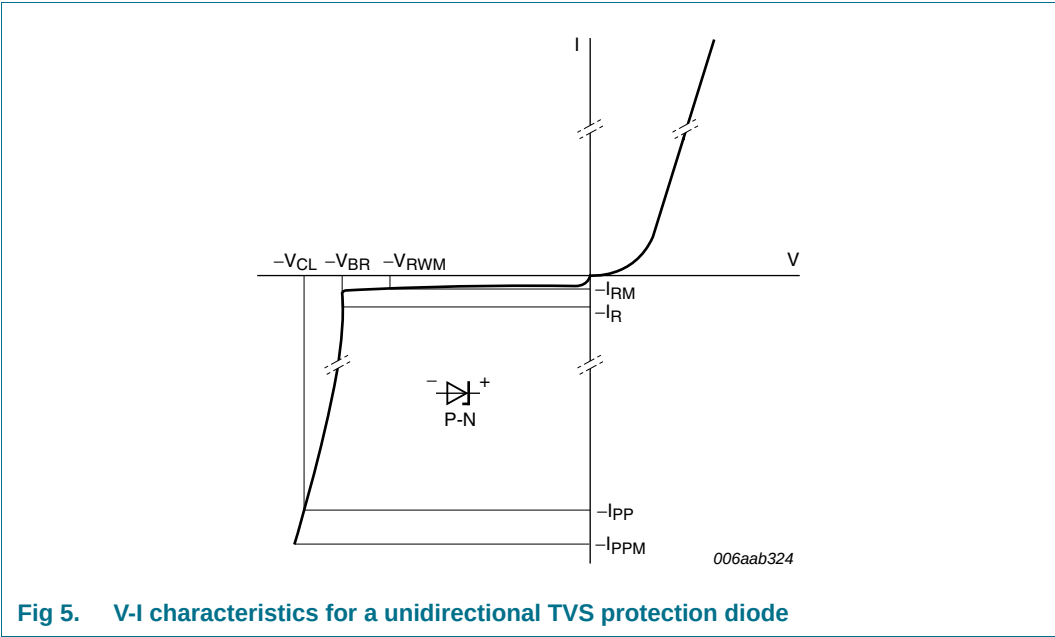


Fig 3. Rated peak pulse power as a function of pulse duration; typical values



- (1) PTVS5V0P1UP
- (2) PTVS12VP1UP
- (3) PTVS24VP1UP
- (4) PTVS64VP1UP

Fig 4. Diode capacitance as a function of reverse voltage; typical values

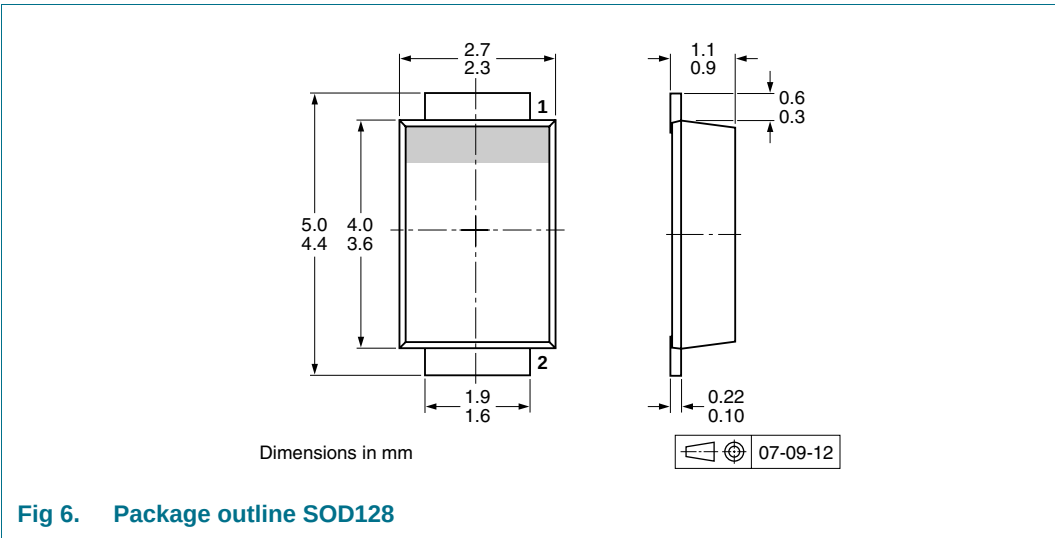


8. Test information

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

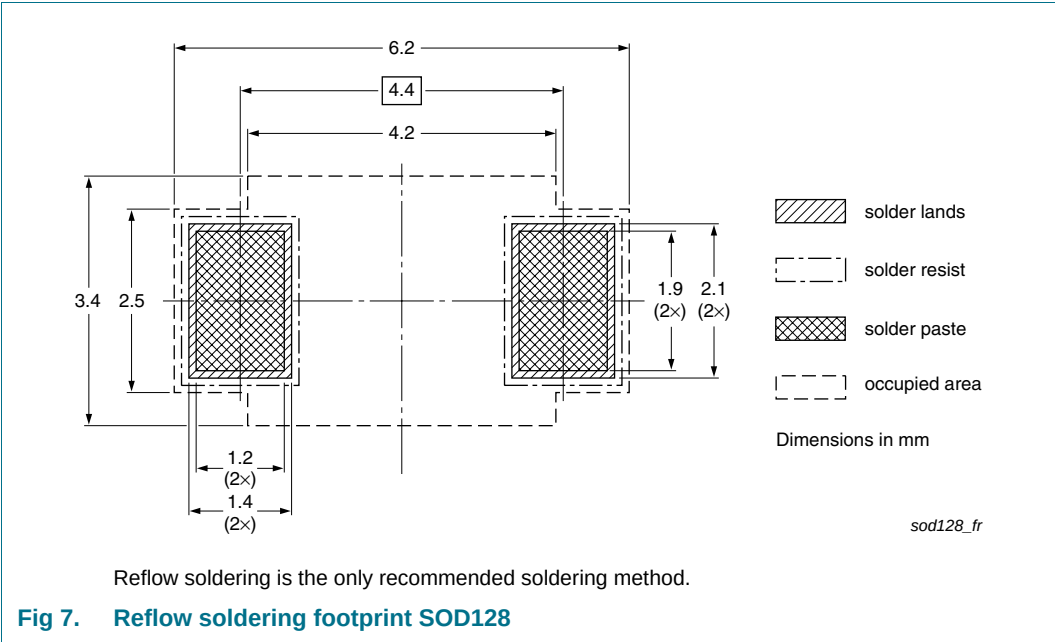
Table 11. Packing methods

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

| Type number <sup>[2]</sup> | Package | Description                     | Packing quantity |
|----------------------------|---------|---------------------------------|------------------|
|                            |         |                                 | 3000             |
| PTVSxP1UP series           | SOD128  | 4 mm pitch, 12 mm tape and reel | -115             |

- [1] For further information and the availability of packing methods, see [Section 14](#).  
[2] The series consists of 35 types with reverse standoff voltages from 3.3 V to 64 V.

11. Soldering





## 12. Revision history

Table 12. Revision history

| Document ID       | Release date                                                                                                                                                               | Data sheet status  | Change notice | Supersedes        |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|---------------|-------------------|
| PTVSXP1UP_SER v.2 | 20110106                                                                                                                                                                   | Product data sheet | -             | PTVSXP1UP_SER v.1 |
| Modifications:    | <ul style="list-style-type: none"><li>• <a href="#">Table 6 “ESD maximum ratings”</a>: added.</li><li>• <a href="#">Section 13 “Legal information”</a>: updated.</li></ul> |                    |               |                   |
| PTVSXP1UP_SER v.1 | 20100527                                                                                                                                                                   | 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".

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Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



#### Как с нами связаться

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