PTVSxS1UR series
400 W Transient Voltage Suppressor

Rev. 01 — 2 February 2009   **Product data sheet**

1.   Product profile

1.1   General description

400 W unidirectional Transient Voltage Suppressor (TVS) in a SOD123W small and flat lead low-profile Surface-Mounted Device (SMD) plastic package, designed for transient overvoltage protection.

1.2   Features

- Rated peak pulse power: P_{PPM} = 400 W (350 W for 3V3)
- Reverse standoff voltage range: V_{RWM} = 3.3 V to 18 V
- Reverse current: I_{RM} = 0.001 µA
- Small plastic package suitable for surface-mounted design
- Very low package height: 1 mm
- AEC-Q101 qualified

1.3   Applications

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

1.4   Quick reference data
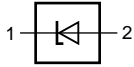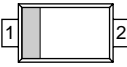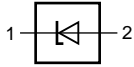
Table 1.   Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
P_{PPM}	rated peak pulse power	[1][2]	-	-	400	W
V_{RWM}	reverse standoff voltage		3.3	-	18	V

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

[2]   For PTVS3V3S1UR: P_{PPM} = 350 W

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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**
PTVS3V3S1UR to PTVS18VS1UR[1]	-	plastic surface-mounted package; 2 leads	SOD123W

[1]   The series consists of 18 types with reverse standoff voltages from 3.3 V to 18 V.

4. Marking

Table 4.   Marking codes

Type number	Marking code
PTVS3V3S1UR	A1
PTVS5V0S1UR	A2
PTVS6V0S1UR	A3
PTVS6V5S1UR	A4
PTVS7V0S1UR	A5
PTVS7V5S1UR	A6
PTVS8V0S1UR	A7
PTVS8V5S1UR	A8
PTVS9V0S1UR	A9
PTVS10VS1UR	AA
PTVS11VS1UR	AB
PTVS12VS1UR	AC
PTVS13VS1UR	AD
PTVS14VS1UR	AE
PTVS15VS1UR	AF
PTVS16VS1UR	AG
PTVS17VS1UR	AH
PTVS18VS1UR	AK

5. Limiting values

Table 5.   Limiting values

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

Symbol	Parameter	Conditions		Min	Max	Unit
P_{PPM}	rated peak pulse power		[1][2]	-	400	W
I_{PPM}	rated peak pulse current		[1]	-	see Table 7 and 8	
I_{FSM}	non-repetitive peak forward current	single half-sine wave; t_p = 8.3 ms		-	50	A
T_j	junction temperature			-	150	°C
T_{amb}	ambient temperature			−55	+150	°C
T_{stg}	storage temperature			−65	+150	°C

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

[2]   For PTVS3V3S1UR: P_{PPM} = 350 W

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
			[2]	-	-	140	K/W
			[3]	-	-	70	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		[4]	-	-	20	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^2.

[3]   Device mounted on a ceramic PCB, Al$_2$O$_3$, standard footprint.

[4]   Soldering point of cathode tab.

7. Characteristics

Table 7.   Characteristics per type; PTVS3V3S1UR to PTVS7V0S1UR

$T_j = 25\,°C$ unless otherwise specified.

Type number	Reverse standoff voltage V_RWM (V)	Breakdown voltage V_BR (V)			Reverse leakage current I_RM (µA)		Clamping voltage V_CL (V)	
		I_R = 10 mA			at V_{RWM} (V)			
	Max	Min	Typ	Max	Typ	Max	Max	I_{PPM} (A)
PTVS3V3S1UR	3.3	5.20	5.60	6.00	5	600	8.0	43.8
PTVS5V0S1UR	5.0	6.40	6.70	7.00	5	400	9.2	43.5
PTVS6V0S1UR	6.0	6.67	7.02	7.37	5	400	10.3	38.8
PTVS6V5S1UR	6.5	7.22	7.60	7.98	5	250	11.2	35.7
PTVS7V0S1UR	7.0	7.78	8.20	8.60	3	100	12.0	33.3

Table 8.   Characteristics per type; PTVS7V5S1UR to PTVS18VS1UR

$T_j = 25\,°C$ unless otherwise specified.

Type number	Reverse standoff voltage V_RWM (V)	Breakdown voltage V_BR (V)			Reverse leakage current I_RM (µA)		Clamping voltage V_CL (V)	
		I_R = 1 mA			at V_{RWM} (V)			
	Max	Min	Typ	Max	Typ	Max	Max	I_{PPM} (A)
PTVS7V5S1UR	7.5	8.33	8.77	9.21	0.2	50	12.9	31.0
PTVS8V0S1UR	8.0	8.89	9.36	9.83	0.03	25	13.6	29.4
PTVS8V5S1UR	8.5	9.44	9.92	10.40	0.01	10	14.4	27.8
PTVS9V0S1UR	9.0	10.00	10.55	11.10	0.005	5	15.4	26.0
PTVS10VS1UR	10	11.10	11.70	12.30	0.005	2.5	17.0	23.5
PTVS11VS1UR	11	12.20	12.85	13.50	0.005	2.5	18.2	22.0
PTVS12VS1UR	12	13.30	14.00	14.70	0.005	2.5	19.9	20.1
PTVS13VS1UR	13	14.40	15.15	15.90	0.001	0.1	21.5	18.6
PTVS14VS1UR	14	15.60	16.40	17.20	0.001	0.1	23.2	17.2
PTVS15VS1UR	15	16.70	17.60	18.50	0.001	0.1	24.4	16.4
PTVS16VS1UR	16	17.80	18.75	19.70	0.001	0.1	26.0	15.4
PTVS17VS1UR	17	18.90	19.90	20.90	0.001	0.1	27.6	14.5
PTVS18VS1UR	18	20.00	21.00	22.10	0.001	0.1	29.2	13.7
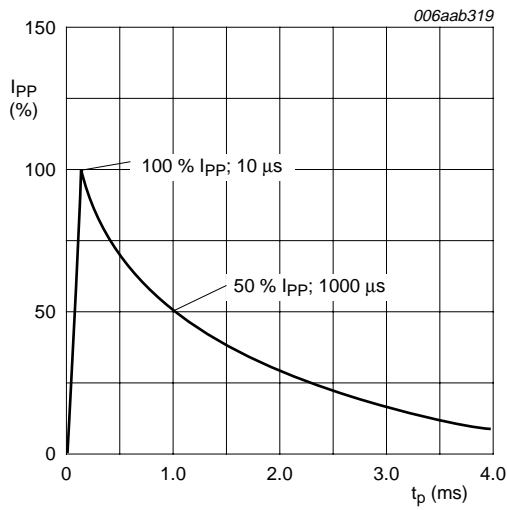
Fig 1. 10/1000 μs pulse waveform according to IEC 61643-321

I_{PP} (%)

100 % I_{PP}; 10 μs

50 % I_{PP}; 1000 μs

t_p (ms)

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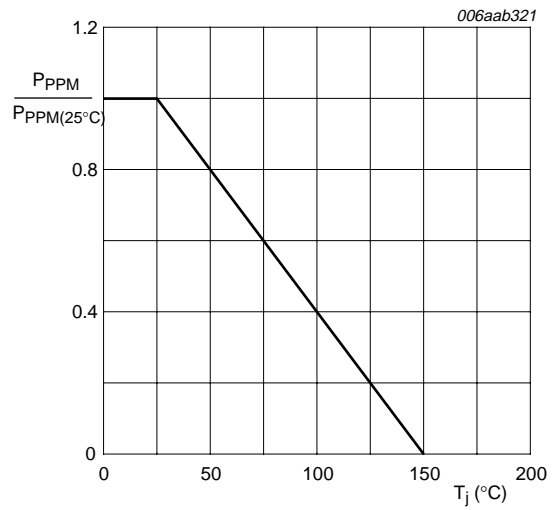
Fig 2. Relative variation of rated peak pulse power as a function of junction temperature; typical values

$\dfrac{P_{PPM}}{P_{PPM(25°C)}}$

T_j (°C)

006aab321

P_{PPM} (W)

(1)

(2)

t_p (μs)

006aab418
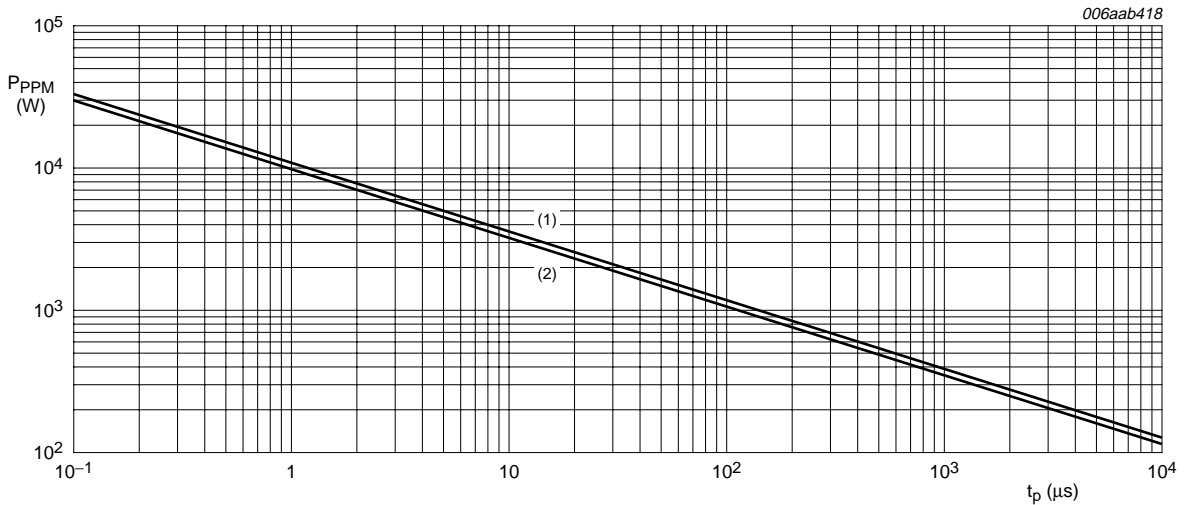
T_{amb} = 25 °C

(1) PTVS5V0S1UR to PTVS18VS1UR

(2) PTVS3V3S1UR

Fig 3. Rated peak pulse power as a function of pulse duration; typical values
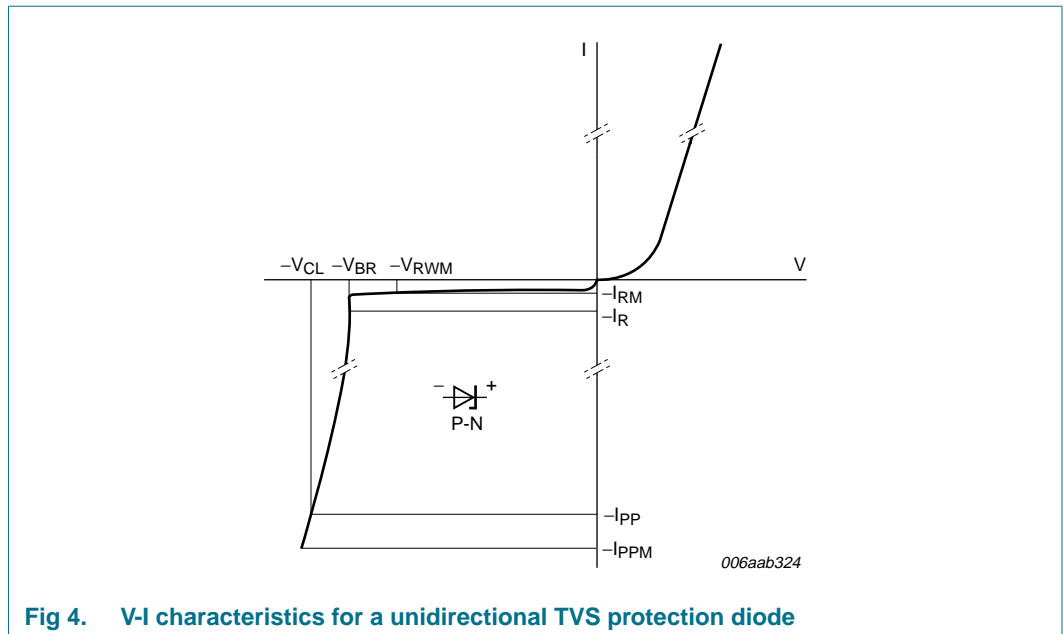
Fig 4. **V-I characteristics for a unidirectional TVS protection diode**

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.
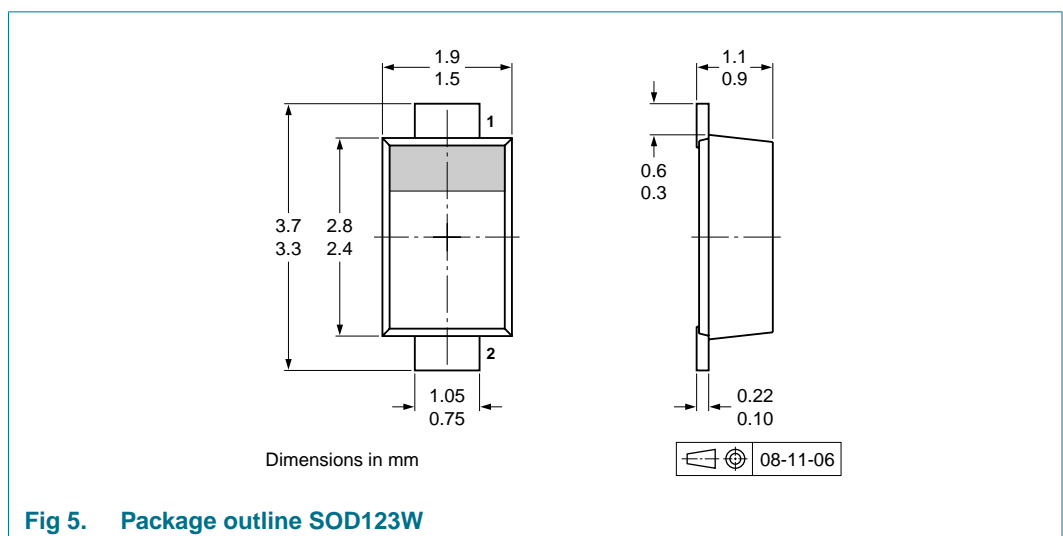
9. Package outline

Dimensions in mm

Fig 5. **Package outline SOD123W**

10. Packing information

Table 9.   Packing methods
The indicated -xxx are the last three digits of the 12NC ordering code.[1]

Type number	Package	Description	Packing quantity
			3000
PTVS3V3S1UR to PTVS18VS1UR[2]	SOD123W	4 mm pitch, 8 mm tape and reel	-115

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

[2]   The series consists of 18 types with reverse standoff voltages from 3.3 V to 18 V.

11. Soldering

Reflow soldering is the only recommended soldering method.

Fig 6.   Reflow soldering footprint SOD123W
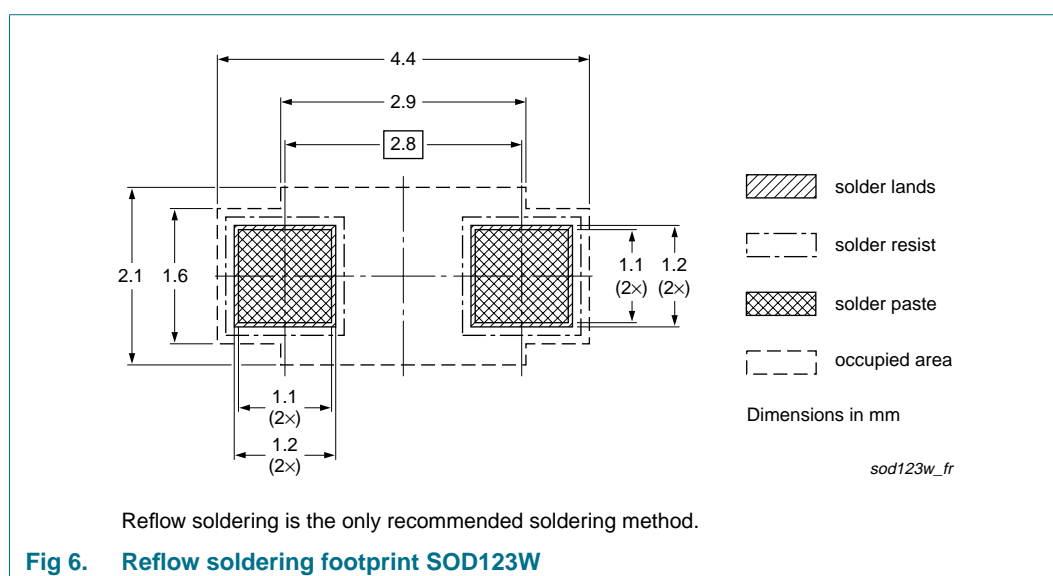
12. Revision history

Table 10. **Revision history**

Document ID	Release date	Data sheet status	Change notice	Supersedes
PTVSXS1UR_SER_1	20090202	Product data sheet	-	-

13. Legal information

13.1 Data sheet status

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.
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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