PTVSxS1UTR series

High-temperature 400 W Transient Voltage Suppressor

Rev. 1 — 11 October 2011 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 in high-temperature applications.

1.2 Features and benefits

- Rated peak pulse power: P_{PPM} = 400 W (350 W for 3V3)
- Reverse standoff voltage range: V_{RWM} = 3.3 V to 64 V
- Reverse current: I_{RM} = 0.001 μA
- Very low package height: 1 mm
- High temperature stability $T_j \leq 185$ °C
- Small plastic package suitable for surface-mounted design
- AEC-Q101 qualified

1.3 Applications

- Power supply protection
- Automotive application
- Industrial application
- Power management
- High-temperature applications

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	-	64	V

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

[2] For PTVS3V3S1UTR: P_{PPM} = 350 W

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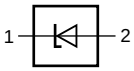
2. Pinning information

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[1]	Package		
	Name	Description	Version
PTVSxS1UTR series	-	plastic surface-mounted package; 2 leads	SOD123W

[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
PTVS3V3S1UTR	C2	PTVS20VS1UTR	CL
PTVS5V0S1UTR	C3	PTVS22VS1UTR	CM
PTVS6V0S1UTR	C4	PTVS24VS1UTR	CN
PTVS6V5S1UTR	C5	PTVS26VS1UTR	CP
PTVS7V0S1UTR	C6	PTVS28VS1UTR	CR
PTVS7V5S1UTR	C7	PTVS30VS1UTR	CS
PTVS8V0S1UTR	C8	PTVS33VS1UTR	CT
PTVS8V5S1UTR	C9	PTVS36VS1UTR	CU
PTVS9V0S1UTR	CA	PTVS40VS1UTR	CV
PTVS10VS1UTR	CB	PTVS43VS1UTR	CW
PTVS11VS1UTR	CC	PTVS45VS1UTR	CX
PTVS12VS1UTR	CD	PTVS48VS1UTR	CY
PTVS13VS1UTR	CE	PTVS51VS1UTR	CZ
PTVS14VS1UTR	CF	PTVS54VS1UTR	D1
PTVS15VS1UTR	CG	PTVS58VS1UTR	D2
PTVS16VS1UTR	CH	PTVS60VS1UTR	D3
PTVS17VS1UTR	CJ	PTVS64VS1UTR	D4
PTVS18VS1UTR	CK	-	-

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 9 and 10	
I_{FSM}	non-repetitive peak forward current	single half-sine wave; t_p = 8.3 ms		-	50	A
T_j	junction temperature			-	185	°C
T_{amb}	ambient temperature			−55	+185	°C
T_{stg}	storage temperature			−65	+185	°C

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

[2] For PTVS3V3S1UTR: P_{PPM} = 350 W

Table 6. ESD maximum ratings

T_{amb} = 25 °C unless otherwise specified.

Symbol	Parameter	Conditions		Min	Max	Unit
Per diode						
V_{ESD}	electrostatic discharge voltage	IEC 61000-4-2; level 4 (contact discharge)	[1]	-	30	kV

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

Table 7. ESD standards compliance

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

6. Thermal characteristics

Table 8. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	220	K/W
			[2]	-	-	130	K/W
			[3]	-	-	70	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		[4]	-	-	18	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_2O_3, standard footprint.

[4] Soldering point of cathode tab.

7. Characteristics

Table 9. Characteristics per type; PTVS3V3S1UTR to PTVS7V0S1UTR

T_j = 25 °C unless otherwise specified.

Type number PTVSxxx S1UTR	Reverse standoff voltage V_{RWM} (V)	Breakdown voltage V_{BR} (V)			Reverse leakage current I_{RM} (µA)			Clamping voltage V_{CL} (V)		Temperature coefficient S_Z (mV/K)
		I_R = 10 mA			at V_{RWM}		at V_{RWM} T_j = 150 °C			I_Z = 5 mA
	Max	Min	Typ	Max	Typ	Max	Typ	Max	I_{PPM} (A)	Typ
3V3	3.3	5.20	5.60	6.00	5	600	17	8.0	43.8	−1.0
5V0	5.0	6.40	6.70	7.00	5	400	17	9.2	43.5	2.5
6V0	6.0	6.67	7.02	7.37	5	400	17	10.3	38.8	3.2
6V5	6.5	7.22	7.60	7.98	5	250	17	11.2	35.7	3.6
7V0	7.0	7.78	8.20	8.60	3	100	9	12.0	33.3	4.3

Table 10. Characteristics per type; PTVS7V5S1UTR to PTVS64VS1UTR

T_j = 25 °C unless otherwise specified.

Type number PTVSxxx S1UTR	Reverse standoff voltage V_{RWM} (V)	Breakdown voltage V_{BR} (V)			Reverse leakage current I_{RM} (µA)			Clamping voltage V_{CL} (V)		Temperature coefficient S_Z (mV/K)
		I_R = 1 mA			at V_{RWM}		at V_{RWM} T_j = 150 °C			I_Z = 5 mA
	Max	Min	Typ	Max	Typ	Max	Typ	Max	I_{PPM} (A)	Typ
7V5	7.5	8.33	8.77	9.21	0.2	50	2	12.9	31.0	5.0
8V0	8.0	8.89	9.36	9.83	0.03	25	2	13.6	29.4	5.5
8V5	8.5	9.44	9.92	10.40	0.01	10	0.5	14.4	27.8	6.5
9V0	9.0	10.00	10.55	11.10	0.005	5	0.5	15.4	26.0	7.1
10V	10	11.10	11.70	12.30	0.005	2.5	0.5	17.0	23.5	8.1
11V	11	12.20	12.85	13.50	0.005	2.5	0.5	18.2	22.0	9.2
12V	12	13.30	14.00	14.70	0.005	2.5	0.5	19.9	20.1	10.3
13V	13	14.40	15.15	15.90	0.001	0.1	0.5	21.5	18.6	11.4
14V	14	15.60	16.40	17.20	0.001	0.1	0.5	23.2	17.2	13.2
15V	15	16.70	17.60	18.50	0.001	0.1	0.5	24.4	16.4	14.1
16V	16	17.80	18.75	19.70	0.001	0.1	0.5	26.0	15.4	15.9
17V	17	18.90	19.90	20.90	0.001	0.1	0.5	27.6	14.5	16.4
18V	18	20.00	21.00	22.10	0.001	0.1	0.5	29.2	13.7	18.5
20V	20	22.20	23.35	24.50	0.001	0.1	0.5	32.4	12.3	20.0
22V	22	24.40	25.60	26.90	0.001	0.1	0.5	35.5	11.3	23.8
24V	24	26.70	28.10	29.50	0.001	0.1	0.5	38.9	10.3	24.9
26V	26	28.90	30.40	31.90	0.001	0.1	0.5	42.1	9.5	29.1
28V	28	31.10	32.80	34.40	0.001	0.1	0.5	45.4	8.8	30.6
30V	30	33.30	35.10	36.80	0.001	0.1	0.5	48.4	8.3	34.4
33V	33	36.70	38.70	40.60	0.001	0.1	0.5	53.3	7.5	37.5
36V	36	40.00	42.10	44.20	0.001	0.1	0.5	58.1	6.9	42.3
40V	40	44.40	46.80	49.10	0.001	0.1	0.5	64.5	6.2	48.1
43V	43	47.80	50.30	52.80	0.001	0.1	0.5	69.4	5.8	51.6
45V	45	50.00	52.65	55.30	0.001	0.1	0.5	72.7	5.5	55.2
48V	48	53.30	56.10	58.90	0.001	0.1	0.5	77.4	5.2	58.2
51V	51	56.70	59.70	62.70	0.001	0.1	0.5	82.4	4.9	62.5
54V	54	60.00	63.15	66.30	0.001	0.1	0.5	87.1	4.6	66.1
58V	58	64.40	67.80	71.20	0.001	0.1	0.5	93.6	4.3	71.4
60V	60	66.70	70.20	73.70	0.001	0.1	0.5	96.8	4.1	74.1
64V	64	71.10	74.85	78.60	0.001	0.1	0.5	103.0	3.9	80.0

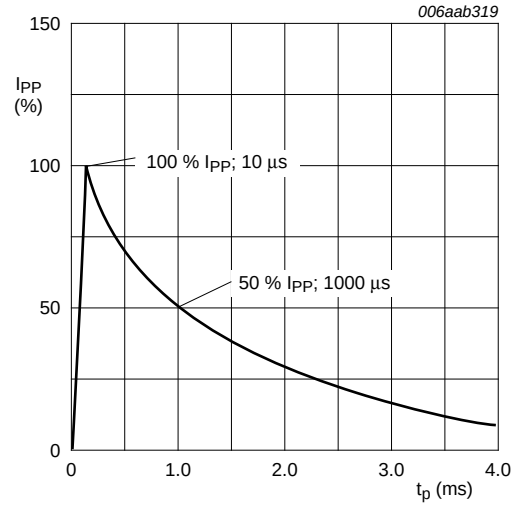


Fig 1. 10/1000 µs pulse waveform according to IEC 61643-321

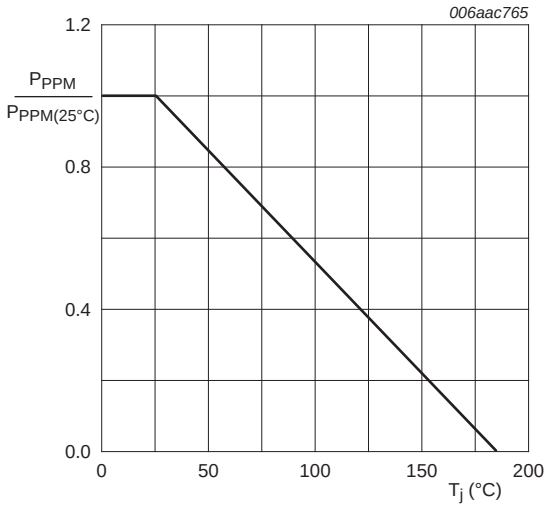
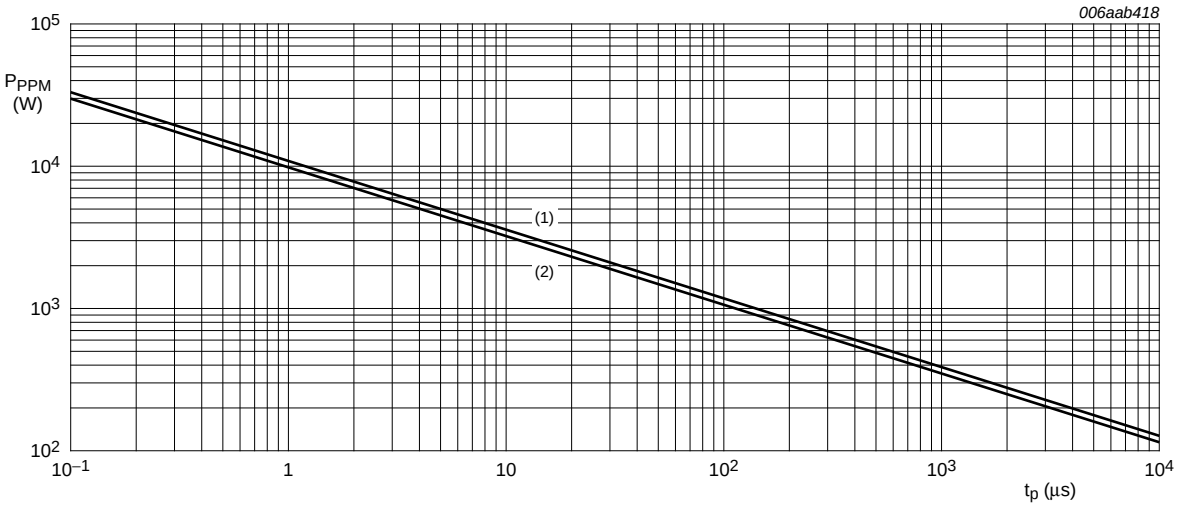


Fig 2. Relative variation of rated peak pulse power as a function of junction temperature; typical values



T_{amb} = 25 °C

(1) PTVS5V0S1UTR to PTVS64VS1UTR

(2) PTVS3V3S1UTR

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

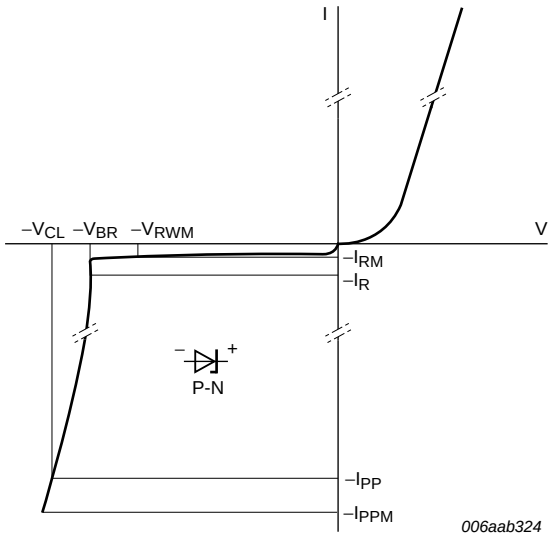


Fig 4. V-I characteristics for a unidirectional TVS protection diode

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

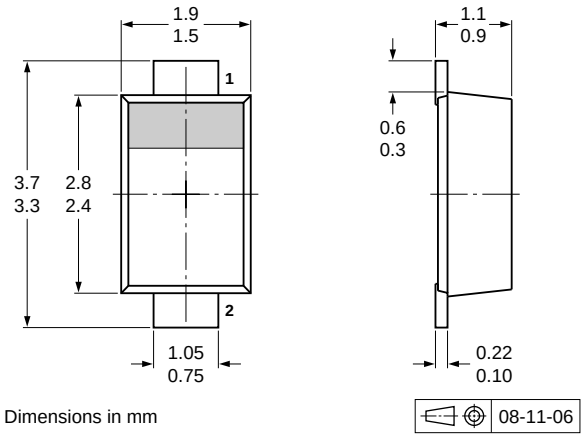


Fig 5. Package outline SOD123W

10. Packing information

Table 11. Packing methods

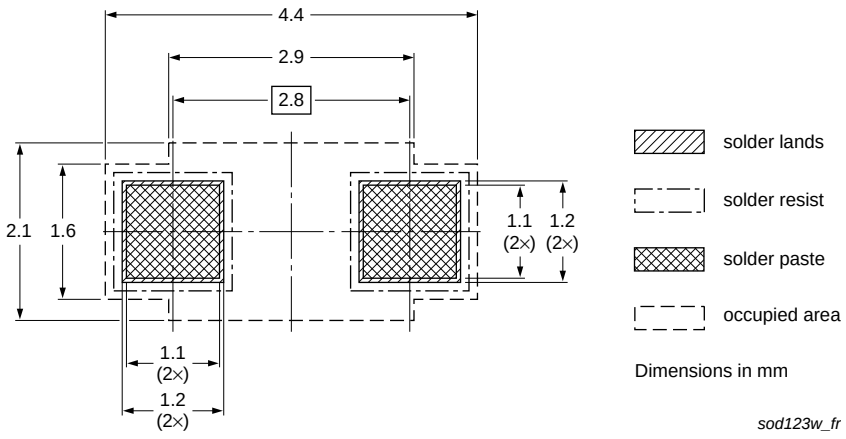
The indicated -xxx are the last three digits of the 12NC ordering code.[1]

Type number[2]	Package	Description	Packing quantity
			3000
PTVSxS1UTR series	SOD123W	4 mm pitch, 8 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



Reflow soldering is the only recommended soldering method.

Fig 6. Reflow soldering footprint SOD123W

12. Revision history

Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PTVSXS1UTR_SER v.1	20111011	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".

[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.nexperia.com.

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15. Contents

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