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 W
- 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
- 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 μs current waveform).

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2. Pinning information

Table 2. Pinning

Pin	Description		Simplified outline	Graphic symbol
1	cathode	[1]		
2	anode			

[1] The marking bar indicates the cathode.

3. Ordering information

Table 3. Ordering information

Type number[1]	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_{PPM}	rated peak pulse power		[1]	-	600	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		-	100	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).

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 (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
Per diode	
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
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	200	K/W
			[2]	-	-	120	K/W
			[3]	-	-	60	K/W
$R_{th(j-sp)}$	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^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; PTVS3V3P1UP to PTVS7V0P1UP

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)
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 °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)
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 °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)
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

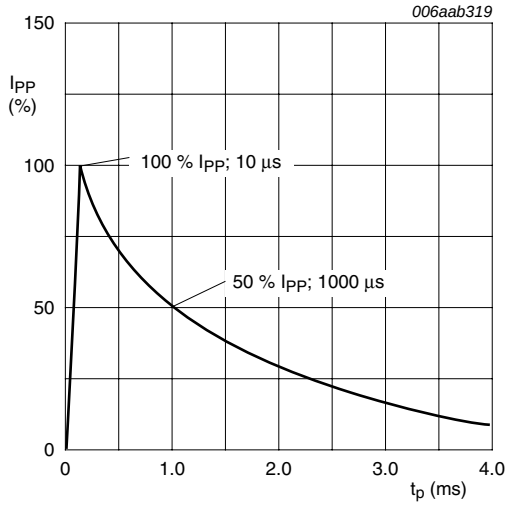


Fig 1. 10/1000 µs pulse waveform according to IEC 61643-321

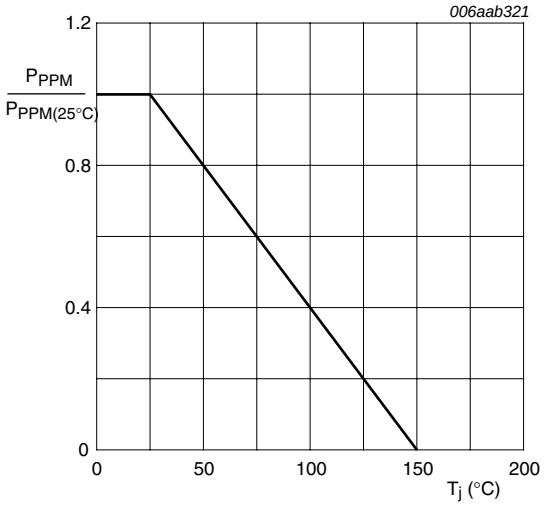
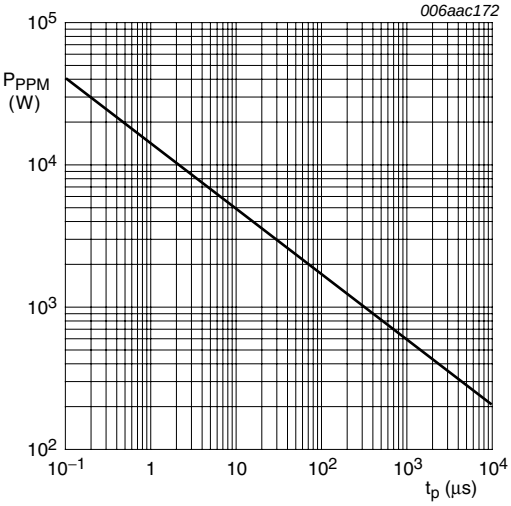
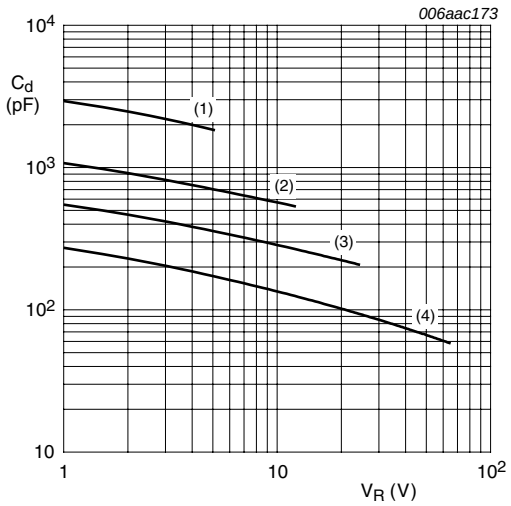


Fig 2. Relative variation of rated peak pulse power as a function of junction temperature; typical values



T_{amb} = 25 °C

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



T_{amb} = 25 °C; f = 1 MHz

(1) PTVS5V0P1UP

(2) PTVS12VP1UP

(3) PTVS24VP1UP

(4) PTVS64VP1UP

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

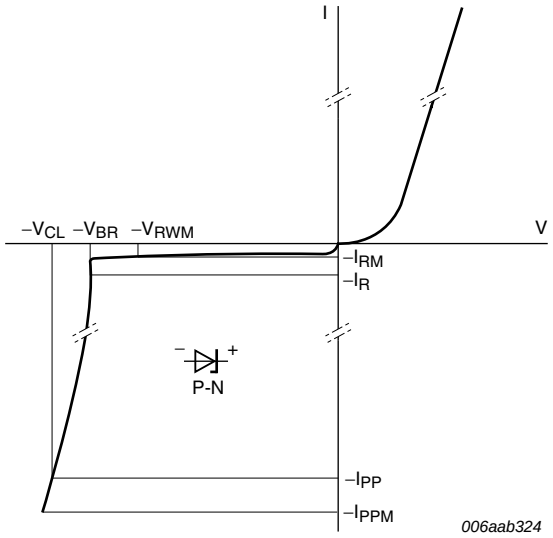


Fig 5. V-I characteristics for a unidirectional TVS protection diode

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

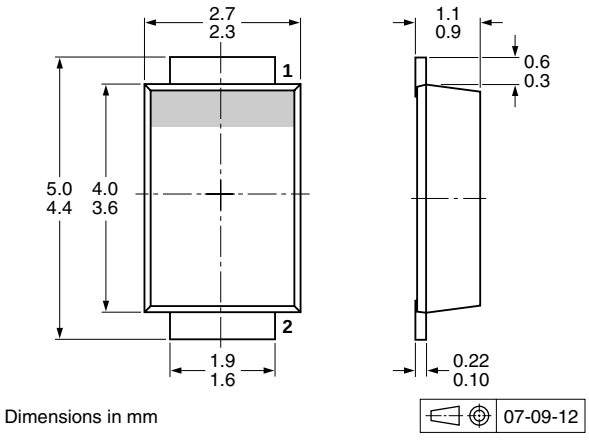


Fig 6. Package outline SOD128

10. Packing information

Table 11. Packing methods

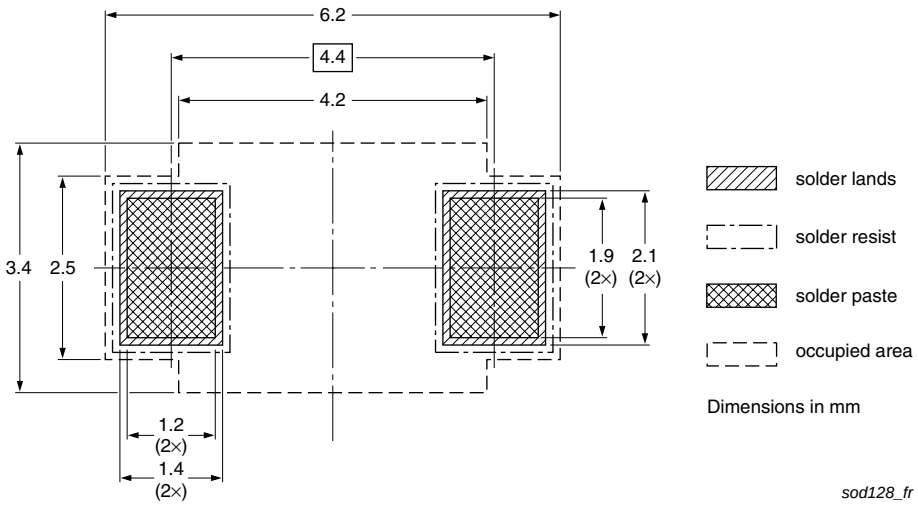
The indicated -xxx are the last three digits of the 12NC ordering code.[1]

Type number[2]	Package	Description	Packing quantity
			3000
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



Reflow soldering is the only recommended soldering method.

Fig 7. Reflow soldering footprint SOD128

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:	• Table 6 “ESD maximum ratings”: added. • Section 13 “Legal information”: updated.			
PTVSXP1UP_SER v.1	20100527	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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14. Contact information

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15. Contents

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Date of release: 06 January 2011