PTVSxP1UTP series

High-temperature 600 W Transient Voltage Suppressor

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

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
- 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]	-	-	600	W
V_{RWM}	reverse standoff voltage			3.3	-	64	V

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

2. Pinning information

Table 2. Pinning

Pin	Description		Simplified outline	Graphic symbol
1	cathode	[1]		 sym035
2	anode			

[1] The marking bar indicates the cathode.

3. Ordering information

Table 3. Ordering information

Type number[1]	Package		
	Name	Description	Version
PTVSxP1UTP 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
PTVS3V3P1UTP	C5	PTVS20VP1UTP	CP
PTVS5V0P1UTP	C6	PTVS22VP1UTP	CR
PTVS6V0P1UTP	C7	PTVS24VP1UTP	CS
PTVS6V5P1UTP	C8	PTVS26VP1UTP	CT
PTVS7V0P1UTP	C9	PTVS28VP1UTP	CU
PTVS7V5P1UTP	CA	PTVS30VP1UTP	CV
PTVS8V0P1UTP	CB	PTVS33VP1UTP	CW
PTVS8V5P1UTP	CC	PTVS36VP1UTP	CX
PTVS9V0P1UTP	CD	PTVS40VP1UTP	CY
PTVS10VP1UTP	CE	PTVS43VP1UTP	CZ
PTVS11VP1UTP	CF	PTVS45VP1UTP	D1
PTVS12VP1UTP	CG	PTVS48VP1UTP	D2
PTVS13VP1UTP	CH	PTVS51VP1UTP	D3
PTVS14VP1UTP	CJ	PTVS54VP1UTP	D4
PTVS15VP1UTP	CK	PTVS58VP1UTP	D5
PTVS16VP1UTP	CL	PTVS60VP1UTP	D6
PTVS17VP1UTP	CM	PTVS64VP1UTP	D7
PTVS18VP1UTP	CN	-	-

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			-	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).

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]	-	-	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; PTVS3V3P1UTP to PTVS7V0P1UTP

T_j = 25 °C unless otherwise specified.

Type number PTVSxxx P1UTP	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	75.0	−1.0
5V0	5.0	6.40	6.70	7.00	5	400	17	9.2	65.2	2.5
6V0	6.0	6.67	7.02	7.37	5	400	17	10.3	58.3	3.2
6V5	6.5	7.22	7.60	7.98	5	250	17	11.2	53.6	3.6
7V0	7.0	7.78	8.20	8.60	3	100	9	12.0	50.0	4.3

Table 10. Characteristics per type; PTVS7V5P1UTP to PTVS64VP1UTP

T_j = 25 °C unless otherwise specified.

Type number PTVSxxx P1UTP	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	2.0	12.9	46.5	5.0
8V0	8.0	8.89	9.36	9.83	0.03	25	2.0	13.6	44.1	5.5
8V5	8.5	9.44	9.92	10.40	0.01	10	0.5	14.4	41.7	6.5
9V0	9.0	10.00	10.55	11.10	0.005	5	0.5	15.4	39.0	7.1
10V	10	11.10	11.70	12.30	0.005	2.5	0.5	17.0	35.3	8.1
11V	11	12.20	12.85	13.50	0.005	2.5	0.5	18.2	33.0	9.2
12V	12	13.30	14.00	14.70	0.005	2.5	0.5	19.9	30.2	10.3
13V	13	14.40	15.15	15.90	0.001	0.1	0.5	21.5	27.9	11.4
14V	14	15.60	16.40	17.20	0.001	0.1	0.5	23.2	25.9	13.2
15V	15	16.70	17.60	18.50	0.001	0.1	0.5	24.4	24.6	14.1
16V	16	17.80	18.75	19.70	0.001	0.1	0.5	26.0	23.1	15.9
17V	17	18.90	19.90	20.90	0.001	0.1	0.5	27.6	21.7	16.4
18V	18	20.00	21.00	22.10	0.001	0.1	0.5	29.2	20.5	18.5
20V	20	22.20	23.35	24.50	0.001	0.1	0.5	32.4	18.5	20.0
22V	22	24.40	25.60	26.90	0.001	0.1	0.5	35.5	16.9	23.8
24V	24	26.70	28.10	29.50	0.001	0.1	0.5	38.9	15.4	24.9
26V	26	28.90	30.40	31.90	0.001	0.1	0.5	42.1	14.3	29.1
28V	28	31.10	32.80	34.40	0.001	0.1	0.5	45.4	13.2	30.6
30V	30	33.30	35.10	36.80	0.001	0.1	0.5	48.4	12.4	34.4
33V	33	36.70	38.70	40.60	0.001	0.1	0.5	53.3	11.3	37.5
36V	36	40.00	42.10	44.20	0.001	0.1	0.5	58.1	10.3	42.3

Table 10. Characteristics per type; PTVS7V5P1UTP to PTVS64VP1UTP *…continued*

T_j = 25 °C unless otherwise specified.

Type number PTVSxxx P1UTP	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
40V	40	44.40	46.80	49.10	0.001	0.1	0.5	64.5	9.3	48.1
43V	43	47.80	50.30	52.80	0.001	0.1	0.5	69.4	8.6	51.6
45V	45	50.00	52.65	55.30	0.001	0.1	0.5	72.7	8.3	55.2
48V	48	53.30	56.10	58.90	0.001	0.1	0.5	77.4	7.8	58.2
51V	51	56.70	59.70	62.70	0.001	0.1	0.5	82.4	7.3	62.5
54V	54	60.00	63.15	66.30	0.001	0.1	0.5	87.1	6.9	66.1
58V	58	64.40	67.80	71.20	0.001	0.1	0.5	93.6	6.4	71.4
60V	60	66.70	70.20	73.70	0.001	0.1	0.5	96.8	6.2	74.1
64V	64	71.10	74.85	78.60	0.001	0.1	0.5	103.0	5.8	80.0

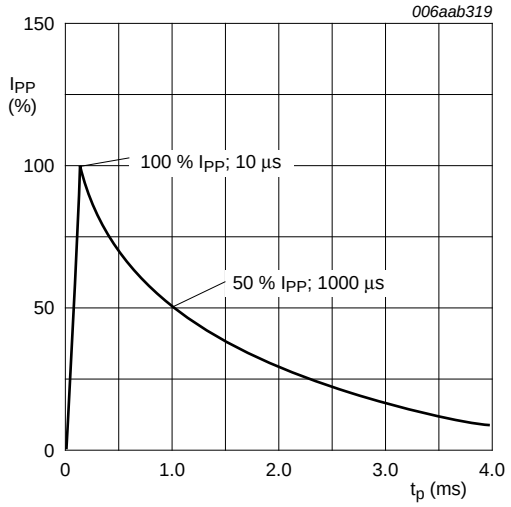


Fig 1. 10/1000 µs pulse waveform according to IEC 61643-321

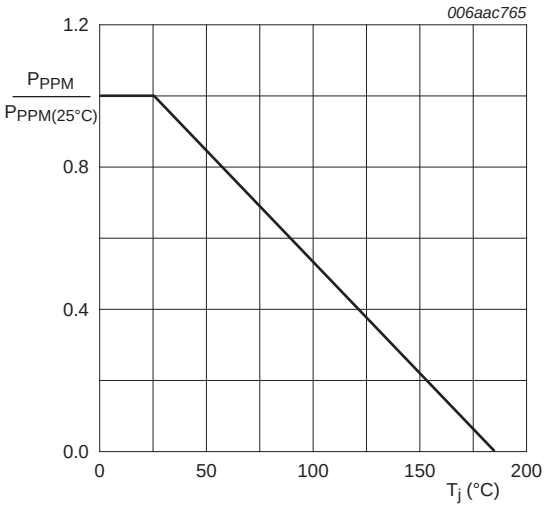
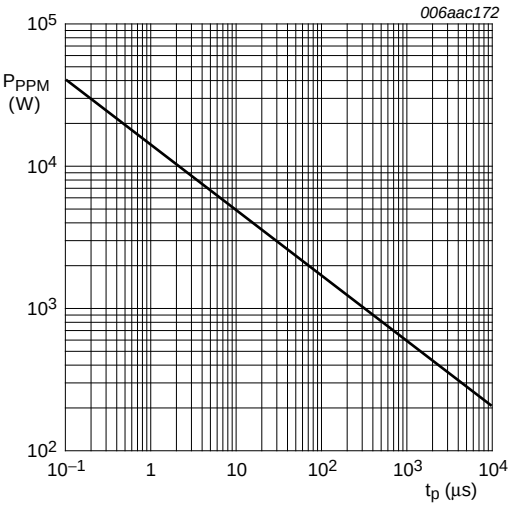
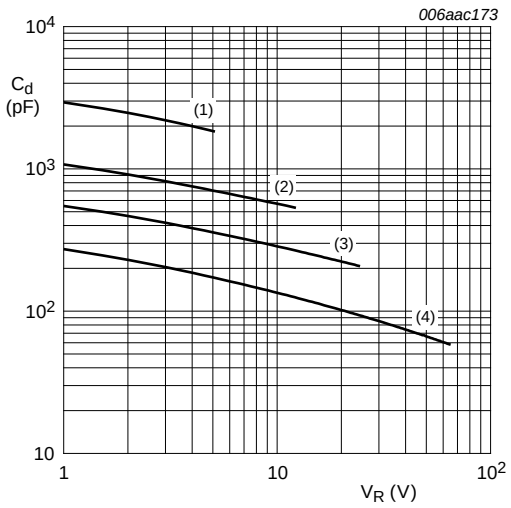


Fig 2. Relative variation of rated peak pulse power as a function of junction temperature; typical values



T_{amb} = 25 °C

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



T_{amb} = 25 °C; f = 1 MHz

(1) PTVS5V0P1UTP

(2) PTVS12VP1UTP

(3) PTVS24VP1UTP

(4) PTVS64VP1UTP

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

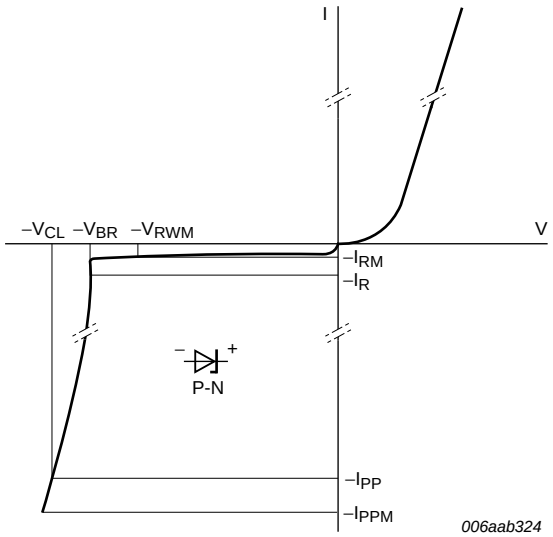


Fig 5. V-I characteristics for a unidirectional TVS protection diode

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

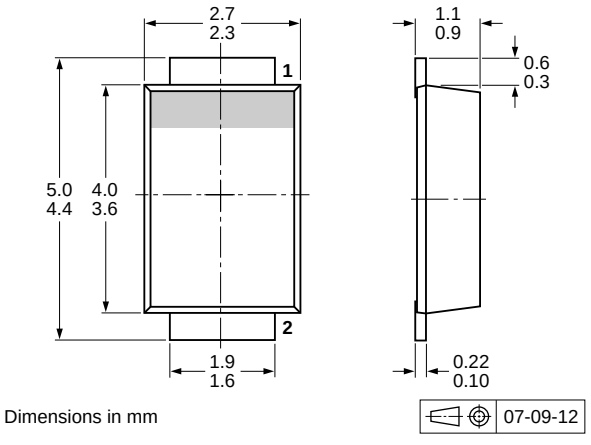


Fig 6. Package outline SOD128

10. Packing information

Table 11. Packing methods

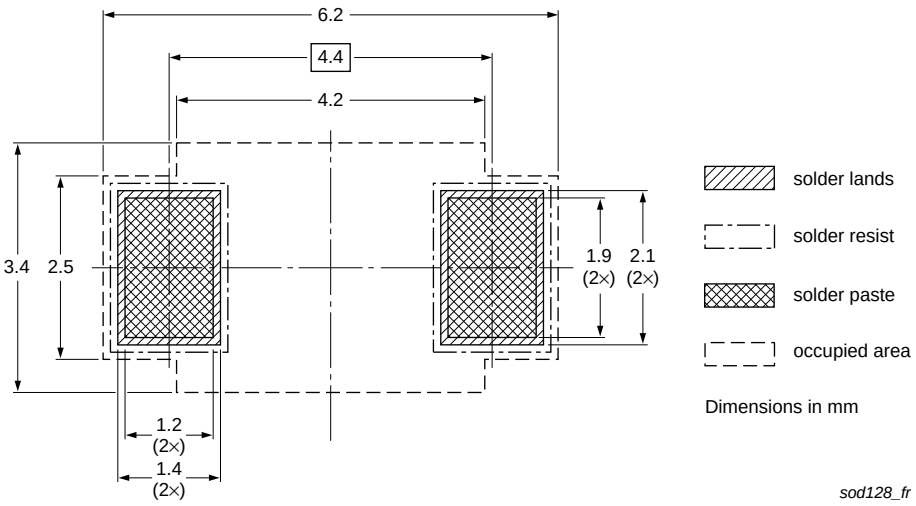
The indicated -xxx are the last three digits of the 12NC ordering code.[1]

Type number[2]	Package	Description	Packing quantity
			3000
PTVSxP1UTP 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
PTVSXP1UTP_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".

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For more information, please visit: **http://www.nexperia.com**

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15. Contents

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