

## PROTECTION PRODUCTS - μClamp®

### Description

μClamp® TVS diodes are designed to protect sensitive electronics from damage or latch-up due to ESD. They are designed to replace 0201 size multilayer varistors (MLVs) in portable applications such as cell phones, notebook computers, and other portable electronics. It features large cross-sectional area junctions for conducting high transient currents. This device offers desirable characteristics for board level protection including fast response time, low operating and clamping voltage, and no device degradation.

μClamp®0501Z features extremely good ESD protection characteristics highlighted by low typical dynamic resistance, and low peak ESD clamping voltage. Each device will protect one data or power line operating at +5 Volts. μClamp0501Z is in a 2-pin SLP0603P2X3 package. It measures 0.6 x 0.3 mm with a nominal height of only 0.25mm. Leads are finished with NiAu. The small package gives the designer the flexibility to protect single lines in applications where arrays are not practical. The combination of small size and high ESD surge capability makes them ideal for use in portable applications such as cellular phones, digital cameras, and tablet PC's.

### Features

- ◆ Transient protection for data lines to **IEC 61000-4-2 (ESD) ±15kV (air), ±8kV (contact)**
- ◆ Ultra-small package
- ◆ Protects one data or power line
- ◆ Low ESD clamping voltage
- ◆ Working voltage: +5V
- ◆ Low capacitance: 10pF maximum
- ◆ Low leakage current
- ◆ Solid-state silicon-avalanche technology

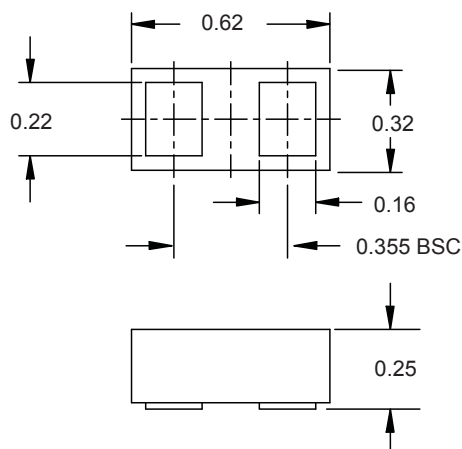
### Mechanical Characteristics

- ◆ SLP0603P2X3 package
- ◆ Pb-Free, Halogen Free, RoHS/WEEE Compliant
- ◆ Nominal Dimensions: 0.6 x 0.3 x 0.25 mm
- ◆ Lead Finish: NiAu
- ◆ Marking: Marking Code
- ◆ Packaging: Tape and Reel

### Applications

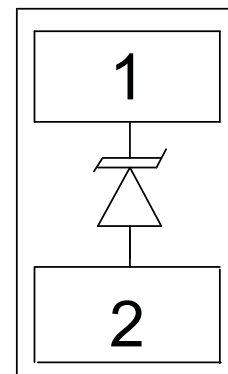
- ◆ Cellular Handsets & Accessories
- ◆ Notebook Computers
- ◆ Tablet PC
- ◆ Portable Instrumentation
- ◆ Peripherals

### Package Dimensions



**Nominal Dimensions in mm**

### Schematic & Pin Configuration



**SLP0603P2X3 (Bottom View)**

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Absolute Maximum Ratings

Rating	Symbol	Value	Units
Peak Pulse Power (tp = 8/20μs)	P <sub>PK</sub>	12	W
Peak Pulse Current (tp = 8/20μs)	I <sub>PP</sub>	1	A
ESD per IEC 61000-4-2 (Air) <sup>(1)</sup> ESD per IEC 61000-4-2 (Contact) <sup>(1)</sup>	V <sub>ESD</sub>	±15 ±8	kV
Operating Temperature	T <sub>J</sub>	-55 to +125	°C
Storage Temperature	T <sub>STG</sub>	-55 to +150	°C

Electrical Characteristics (T=25°C unless otherwise specified)

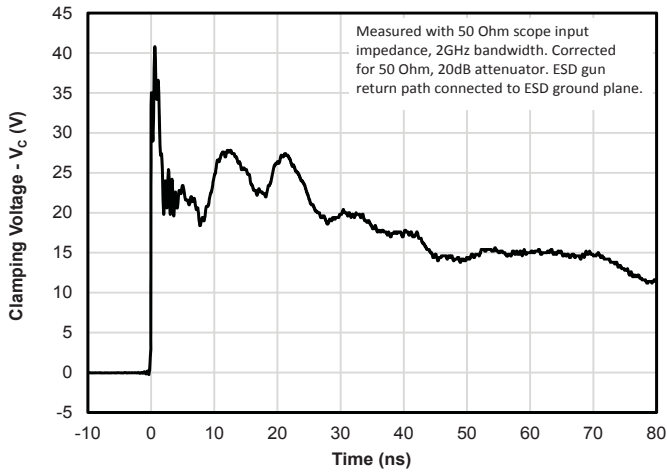
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Reverse Stand-Off Voltage	V <sub>RWM</sub>	Pin 1 to 2			5	V
Reverse breakdown Voltage	V <sub>BR</sub>	I <sub>BR</sub> = 1mA Pin 1 to 2	6.5	7.5	9	V
Reverse Leakage Current	I <sub>R</sub>	V <sub>RWM</sub> = 5V Pin 1 to 2		3	50	nA
Clamping Voltage	V <sub>C</sub>	I <sub>PP</sub> = 1A, tp = 8/20μs			12	V
Forward Voltage	V <sub>F</sub>	I <sub>F</sub> = 10mA Pin 2 to 1		1	1.2	V
ESD Clamping Voltage <sup>2</sup>	V <sub>C</sub>	I <sub>PP</sub> = +4A tp = 0.2/100ns		11		V
ESD Clamping Voltage <sup>2</sup>	V <sub>C</sub>	I <sub>PP</sub> = +16A tp = 0.2/100ns		22		V
Dynamic Resistance <sup>2, 3</sup>	R <sub>DYN</sub>	tp = 100ns		0.9		Ohms
Junction Capacitance	C <sub>J</sub>	I/O pin to GND f = 1MHz				pF
		V <sub>R</sub> = 0V		8	10	

- Notes
- 1) Measured with a 20dB attenuator, 50 Ohm scope input impedance, 2GHz bandwidth. ESD gun return path connected to ESD ground plane.
  - 2) Transmission Line Pulse Test (TLP) Settings: tp = 100ns, tr = 0.2ns, I<sub>TLP</sub> and V<sub>TLP</sub> averaging window: t1 = 70ns to t2 = 90ns.
  - 3) Dynamic resistance calculated from I<sub>TLP</sub> = 4A to I<sub>TLP</sub> = 16A

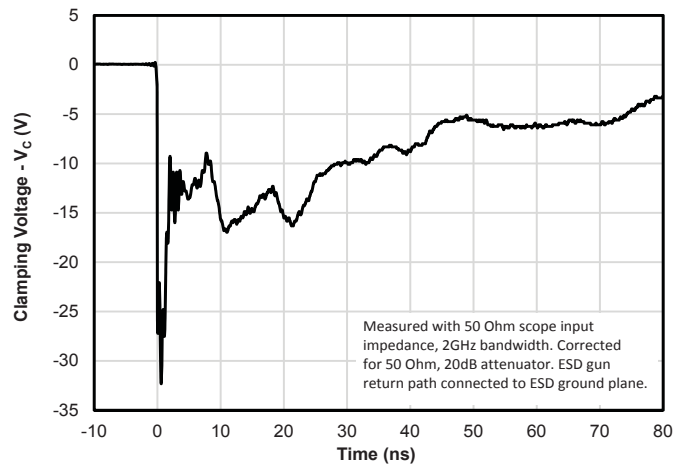
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Typical Characteristics

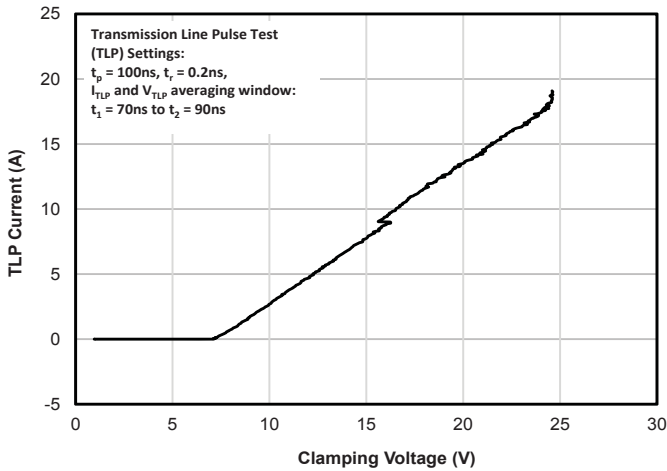
ESD Clamping (8kV Contact per IEC 61000-4-2)



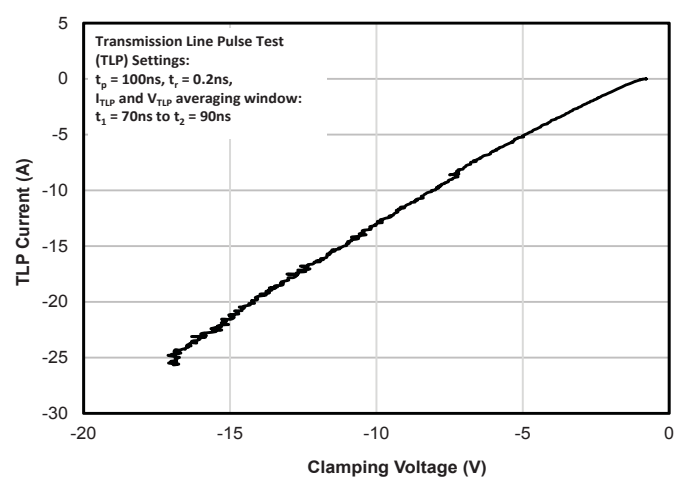
ESD Clamping (-8kV Contact per IEC 61000-4-2)



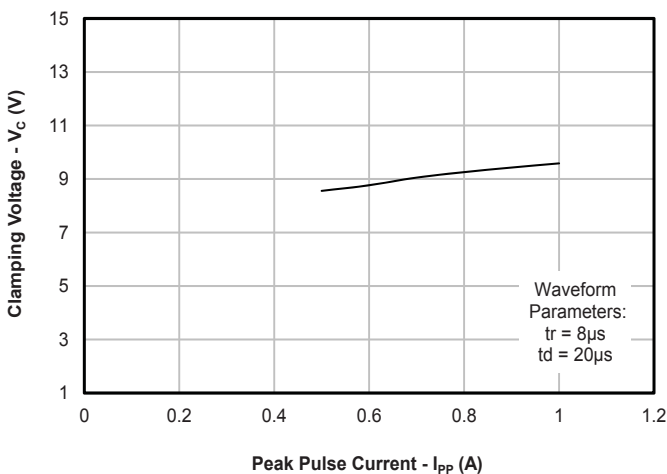
TLP Characteristic (Positive Pulse)



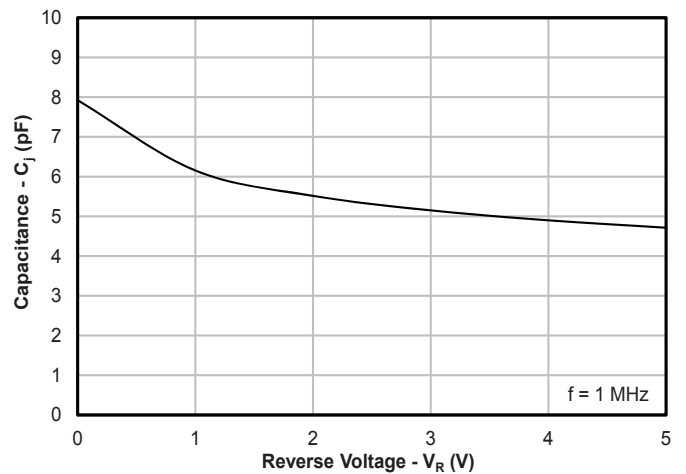
TLP Characteristic (Negative Pulse)



Clamping Voltage vs. Peak Pulse Current ( $t_p=8/20\mu\text{s}$ )



Junction Capacitance vs. Reverse Voltage



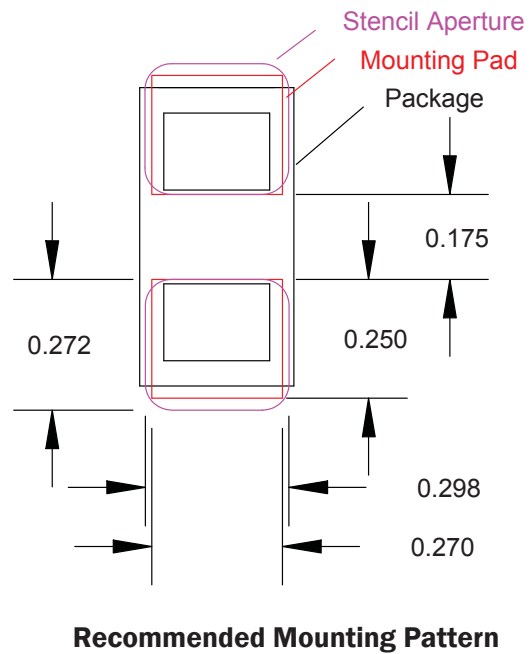
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Applications Information

**Assembly Guidelines**

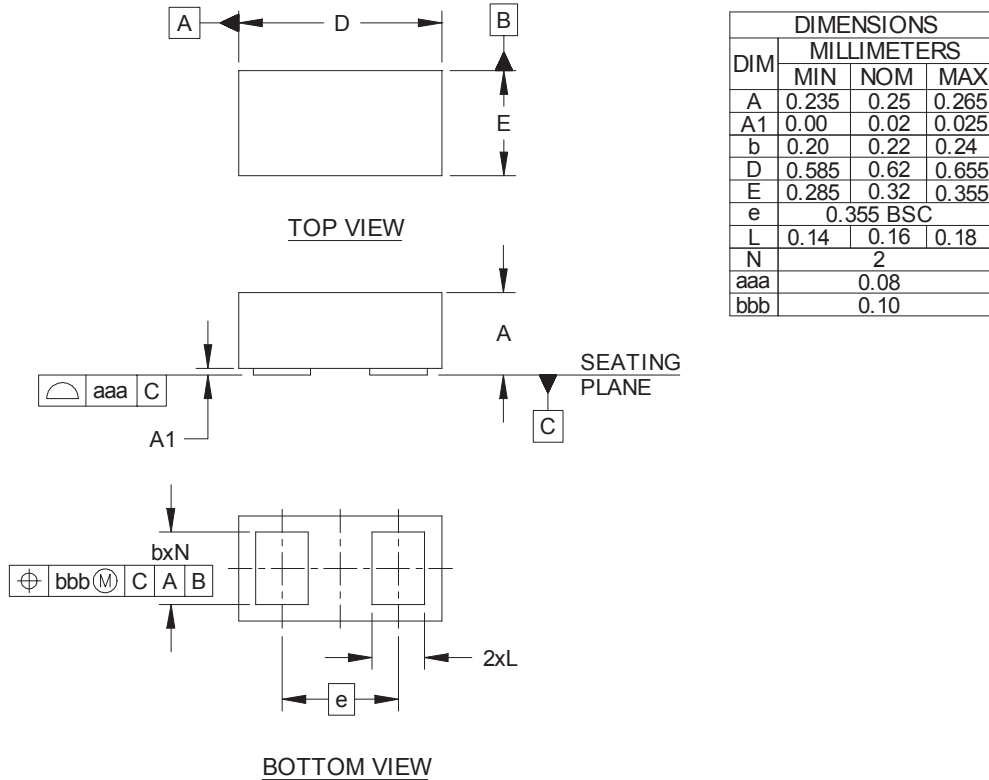
The small size of this device means that some care must be taken during the mounting process to insure reliable solder joint. The table below provides Semtech's recommended assembly guidelines for mounting this device. The figure at the right details Semtech's recommended aperture based on the below recommendations. Note that these are only recommendations and should serve only as a starting point for design since there are many factors that affect the assembly process. The exact manufacturing parameters will require some experimentation to get the desired solder application.

Assembly Parameter	Recommendation
Solder Stencil Design	Laser cut, Electro-polished
Aperture shape	Rectangular with rounded corners
Solder Stencil Thickness	0.100 mm (0.004")
Solder Paste Type	Type 4 size sphere or smaller
Solder Reflow Profile	Per JEDEC J-STD-020
PCB Solder Pad Design	Non-Solder mask defined
PCB Pad Finish	OSP OR NiAu



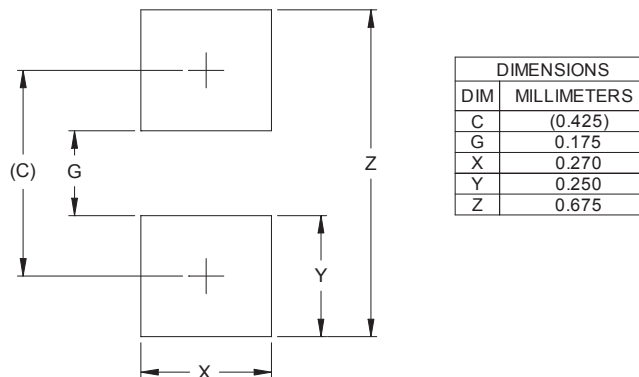
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Outline Drawing - SLP0603P2X3



NOTES:  
 1. CONTROLLING DIMENSIONS ARE IN MILLIMETERS (ANGLES IN DEGREES).

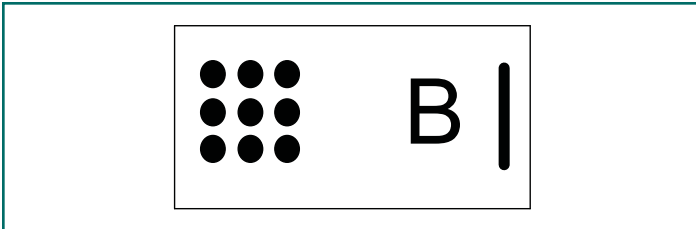
Land Pattern - SLP0603P2X3



NOTES:  
 1. CONTROLLING DIMENSIONS ARE IN MILLIMETERS (ANGLES IN DEGREES).  
 2. THIS LAND PATTERN IS FOR REFERENCE PURPOSES ONLY.  
 CONSULT YOUR MANUFACTURING GROUP TO ENSURE YOUR  
 COMPANY'S MANUFACTURING GUIDELINES ARE MET.

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Marking



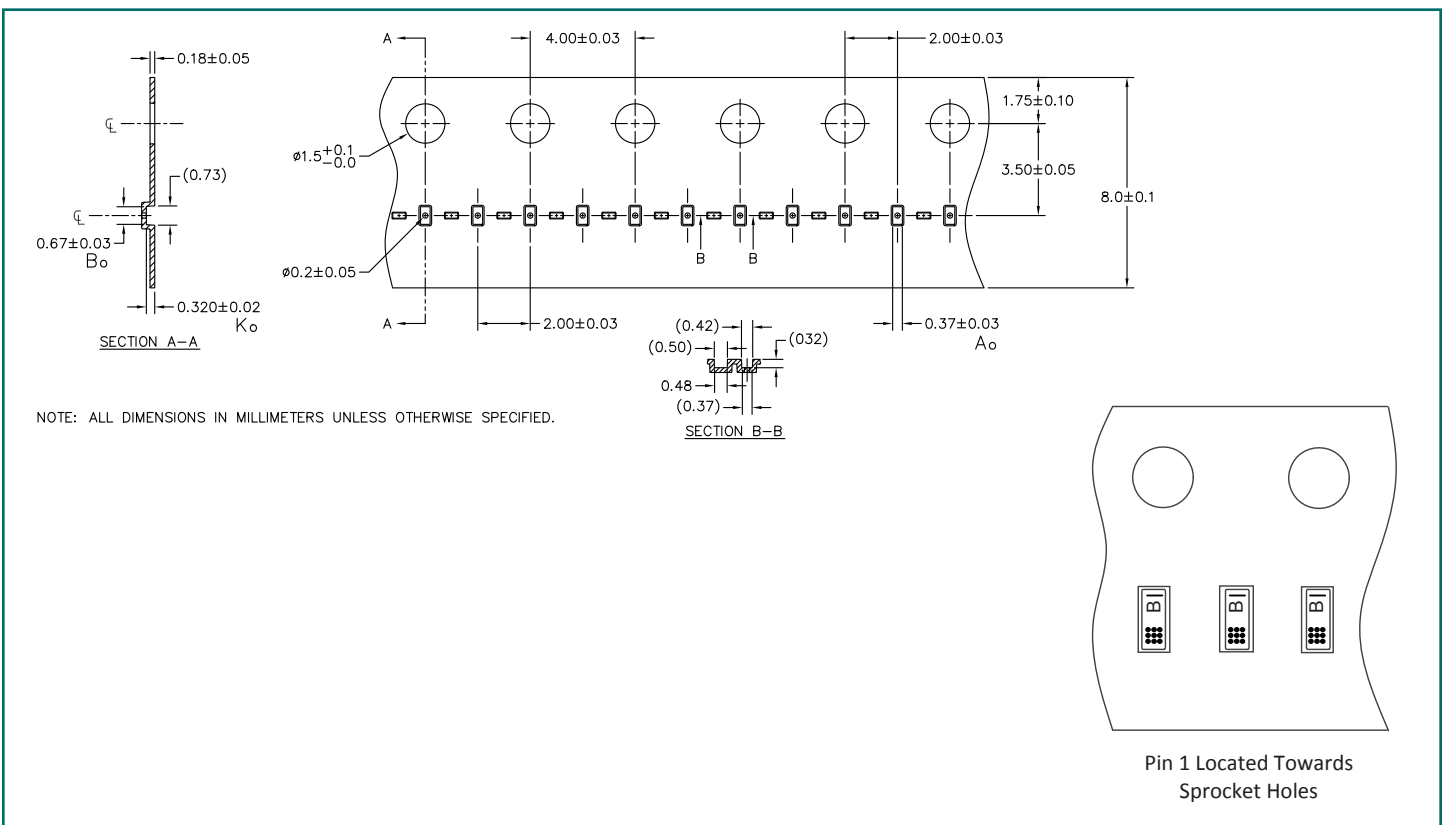
Notes:  
 Dots represent date code matrix  
 Bar is pin 1 location

Ordering Information

Part Number	Qty per Reel	Reel Size
μClamp0501Z.TNT	10000	7"

Notes:  
 1) MicroClamp, uClamp and μClamp are trademarks of Semtech Corporation.

Tape and Reel Specification



Contact Information

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