

**PROTECTION PRODUCTS - Z-Pak™**
**Description**

$\mu$ Clamp<sup>®</sup> TVS diodes are designed to protect sensitive electronics from damage or latch-up due to ESD. It is 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.

$\mu$ Clamp<sup>®</sup>0541Z 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 lead-free NiAu. Each device will protect one line operating at 5 volts. It 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 MP3 players.

**Features**

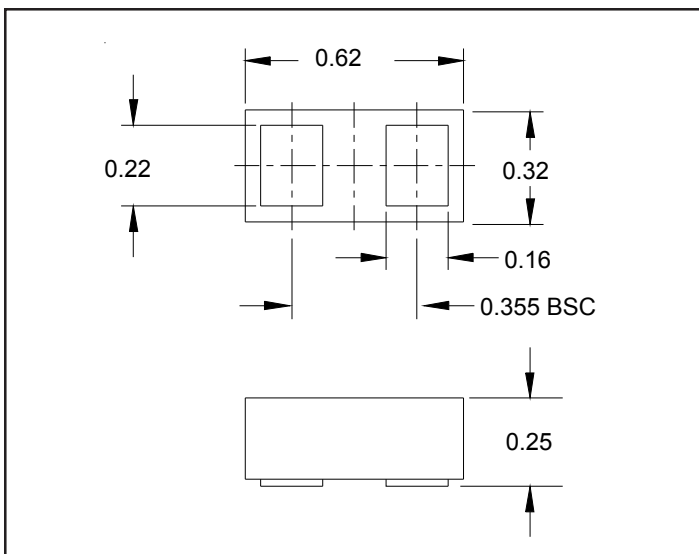
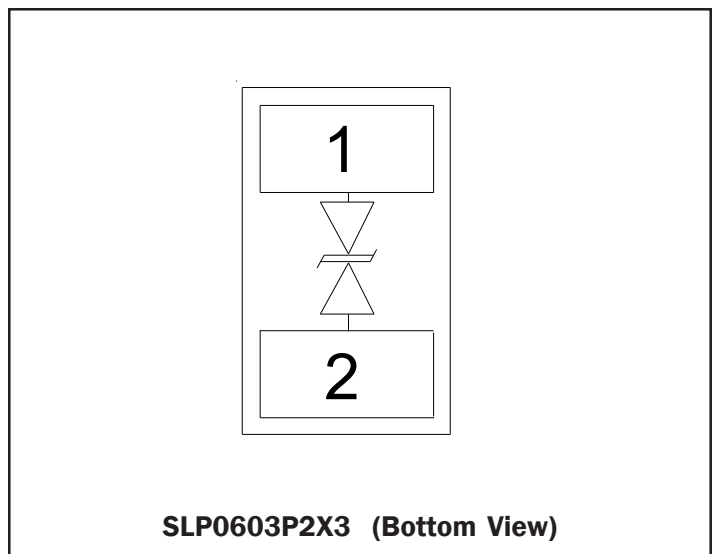
- ◆ High ESD withstand Voltage: **+/-17kV** (Contact/Air) per **IEC 61000-4-2**
- ◆ Able to withstand over 1000 ESD strikes per IEC 61000-4-2 Level 4
- ◆ Ultra-small **0201 package**
- ◆ Protects one data or power line
- ◆ Low reverse current: <10nA typical (VR=5V)
- ◆ Working voltage: +/- 5V
- ◆ Low capacitance: 6.5pF typical
- ◆ 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 + dot matrix date code
- ◆ Packaging : Tape and Reel

**Applications**

- ◆ Cellular Handsets & Accessories
- ◆ Keypads, Side Keys, Audio Ports
- ◆ Portable Instrumentation
- ◆ Digital Lines
- ◆ Tablet PC

**Nominal Dimensions**

**Schematic**


**PROTECTION PRODUCTS**
**Absolute Maximum Rating**

Rating	Symbol	Value	Units
Peak Pulse Power (tp = 8/20μs)	$P_{pk}$	25	Watts
Maximum Peak Pulse Current (tp = 8/20μs)	$I_{pp}$	2	Amps
ESD per IEC 61000-4-2 (Air) <sup>1</sup> ESD per IEC 61000-4-2 (Contact) <sup>1</sup>	$V_{ESD}$	+/- 17 +/- 17	kV
Operating Temperature	$T_J$	-55 to +125	°C
Storage Temperature	$T_{STG}$	-55 to +150	°C

**Electrical Characteristics (T=25°C)**

Parameter	Symbol	Conditions	Minimum	Typical	Maximum	Units
Reverse Stand-Off Voltage	$V_{RWM}$	Pin 1 to 2 or 2 to 1			5	V
Reverse Breakdown Voltage	$V_{BR}$	$I_t = 1mA$ Pin 1 to 2 or 2 to 1	6	8.2	9.5	V
Reverse Leakage Current	$I_R$	$V_{RWM} = 5V, T=25°C$ Pin 1 to 2 or 2 to 1		3	50	nA
Clamping Voltage	$V_C$	$I_{pp} = 1A, tp = 8/20μs$ Pin 1 to 2 or 2 to 1			12	V
Clamping Voltage	$V_C$	$I_{pp} = 2A, tp = 8/20μs$ Pin 1 to 2 or 2 to 1			15	V
Dynamic Resistance <sup>2, 3</sup>	$R_{DYN}$	tlp = 0.2 / 100ns		0.78		Ohms
Junction Capacitance	$C_J$	$V_R = 0V, f = 1MHz$		6.5	9	pF

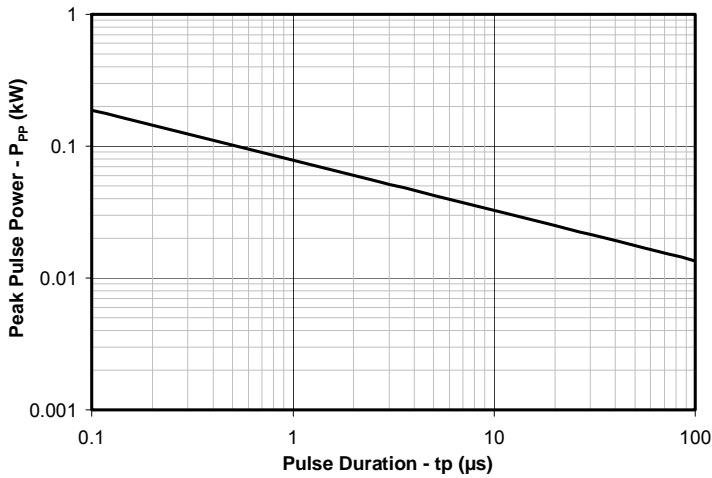
**Notes**

- 1)ESD gun return path connected to ESD ground reference plane.
- 2)Transmission Line Pulse Test (TLP) Settings:  $t_p = 100ns, t_r = 0.2ns, I_{TLP}$  and  $V_{TLP}$  averaging window:  $t_1 = 70ns$  to  $t_2 = 90ns$ .
- 3) Dynamic resistance calculated from  $I_{TLP} = 4A$  to  $I_{TLP} = 16A$

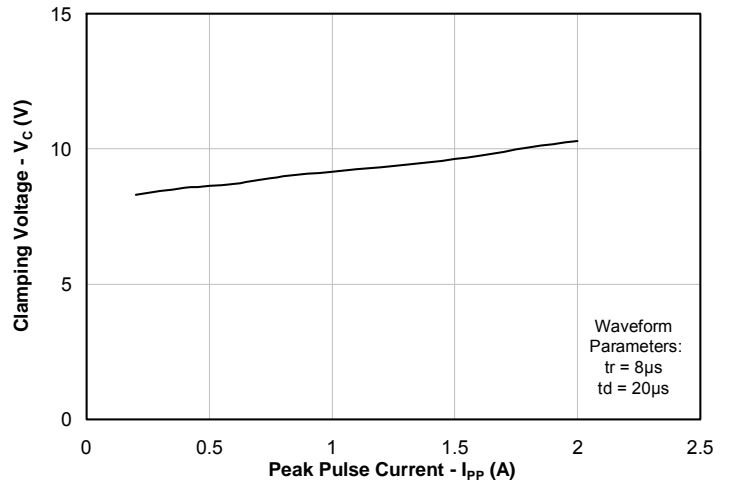
PROTECTION PRODUCTS

Typical Characteristics

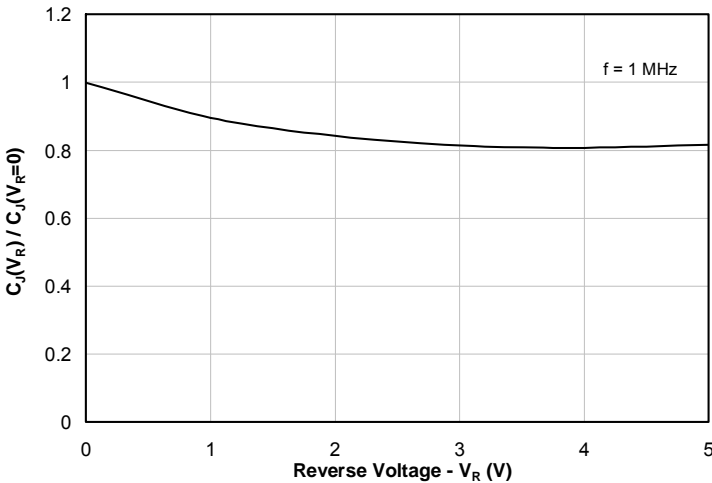
Non-Repetitive Peak Pulse Power vs. Pulse Time



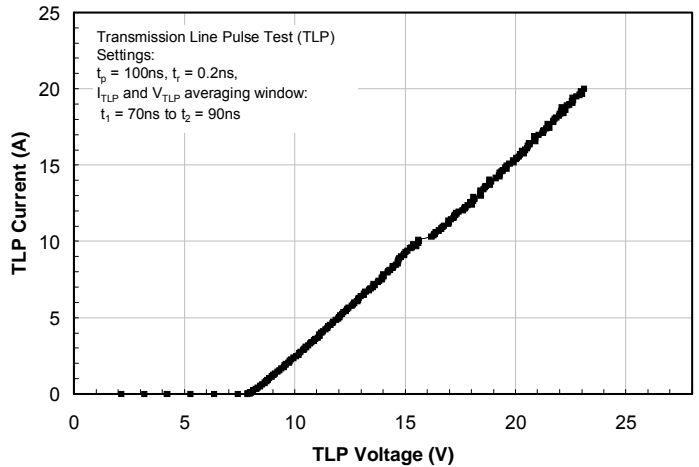
Clamping Voltage vs. Peak Pulse Current (t<sub>p</sub>=8/20μs)



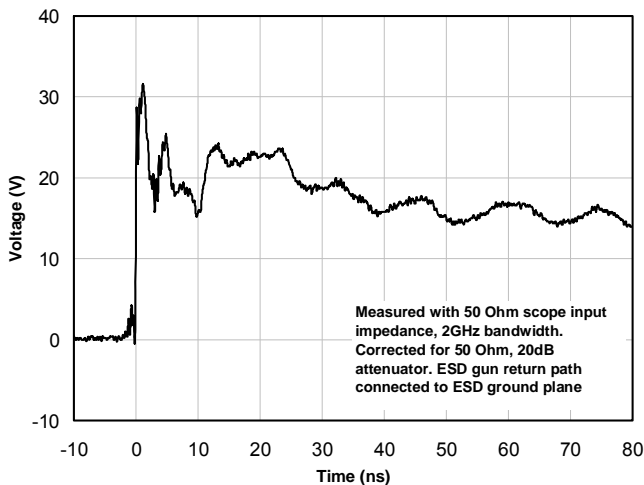
Junction Capacitance vs. Reverse Voltage



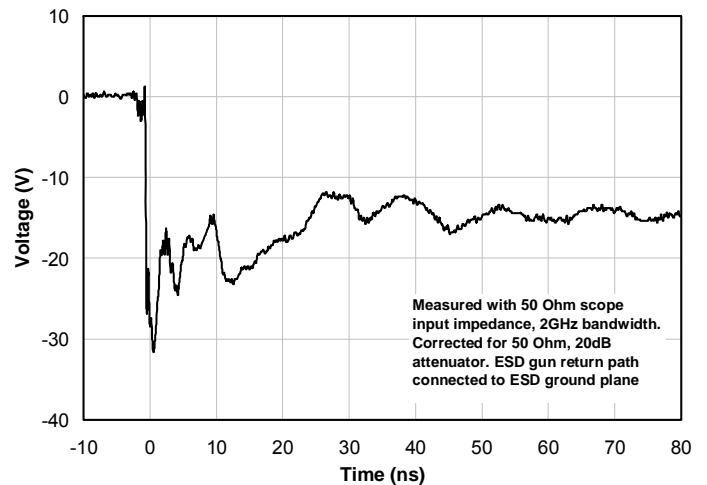
TLP Characteristic



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



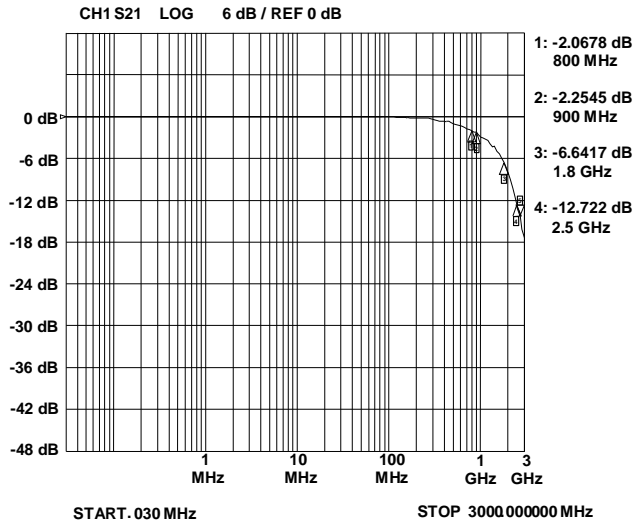
ESD Clamping (-8kV Contact per IEC 61000-4-2)



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Typical Characteristics

Typical Insertion Loss S21

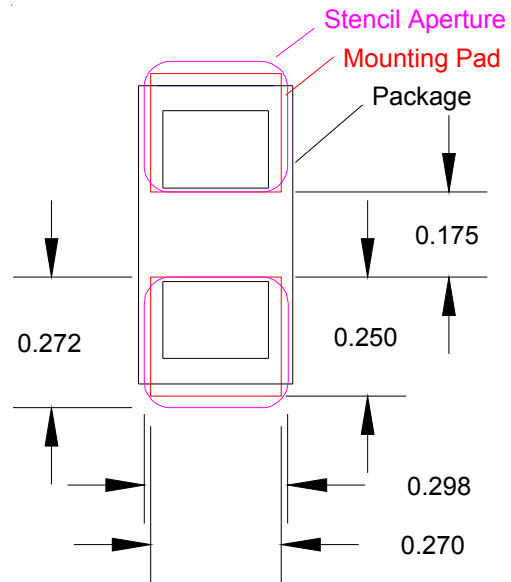


Applications Information

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.

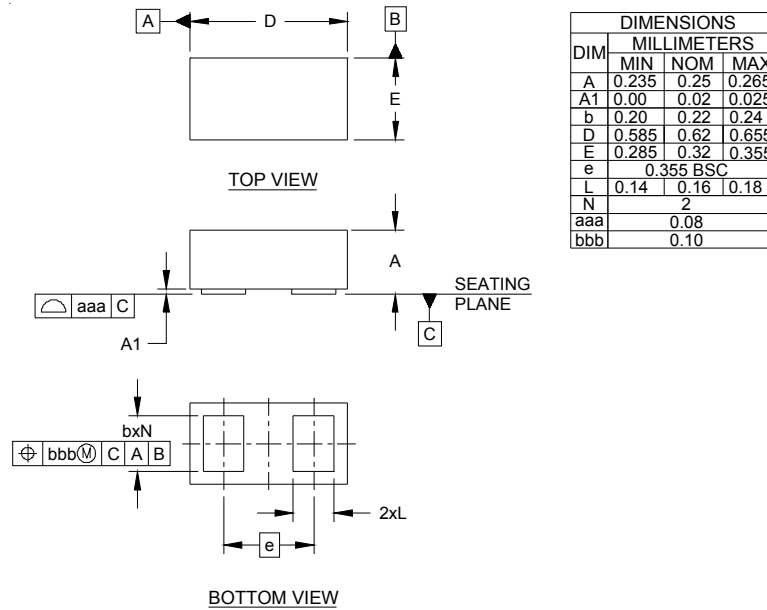
Assembly Parameter	Recommendation
Solder Stencil Design	Laser cut, Electro-polished
Aperture shape	Rectangular with rounded corners
Solder Stencil Thickness	0.100 mm (0.004")
Solder Paste Type	Type 4 size sphere or smaller
Solder Reflow Profile	Per JEDEC J-STD-020
PCB Solder Pad Design	Non-Solder mask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



Recommended Mounting Pattern

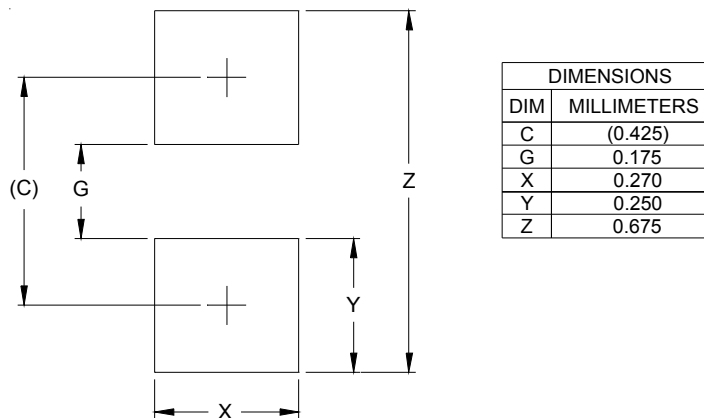
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Outline Drawing - SLP0603P2X3



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

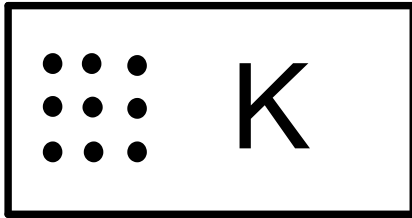
Land Pattern - SLP0603P2X3



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.

**PROTECTION PRODUCTS**

**Marking Code**



Notes:

1) Dots represent matrix date code

**Ordering Information**

Ordering Number	Qty per Reel	Carrier Tape	Reel Size	Comments
uClamp0541Z.TNT	10,000	Plastic	7 Inch	Not Recommended for New Designs
uClamp0541Z.TFT	15,000	Paper	7 Inch	
uClamp0541Z.TVT	50,000	Paper	13 Inch	

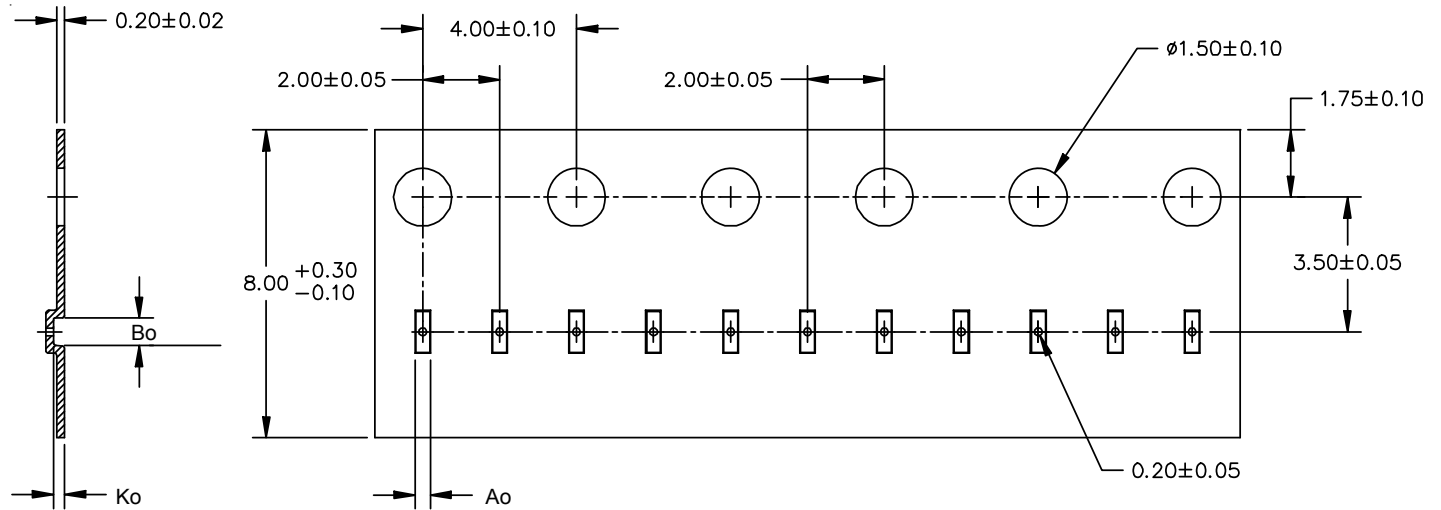
Notes:

1) MicroClamp, uClamp and  $\mu$ Clamp are trademarks of Semtech Corporation

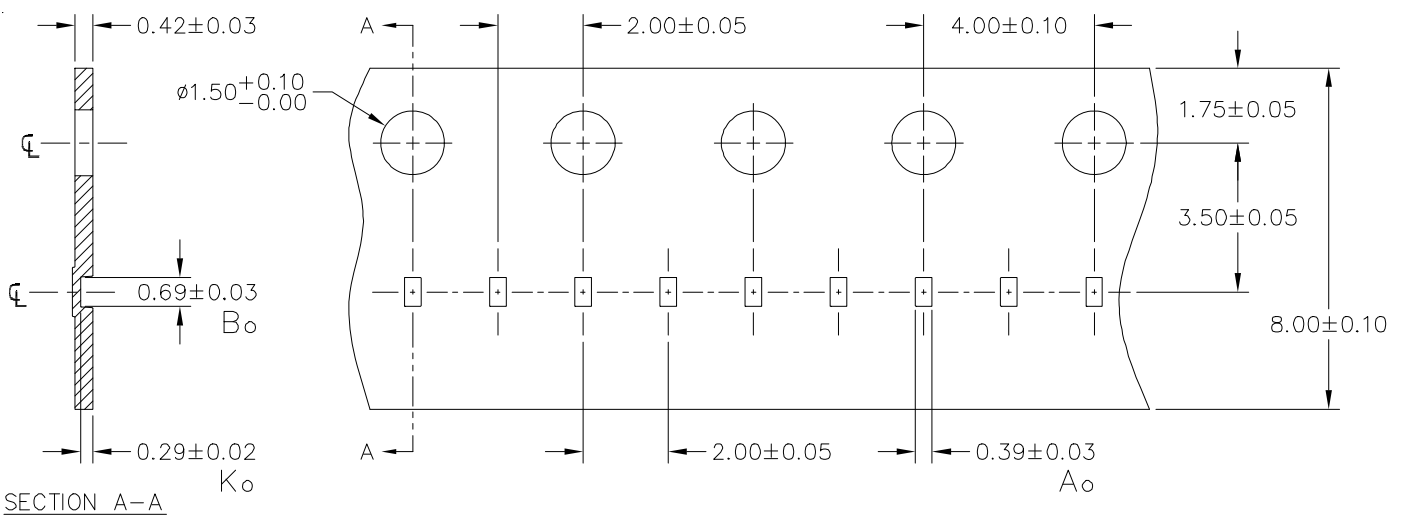
**PROTECTION PRODUCTS**

**Carrier Tape Specification**

**Plastic Tape**

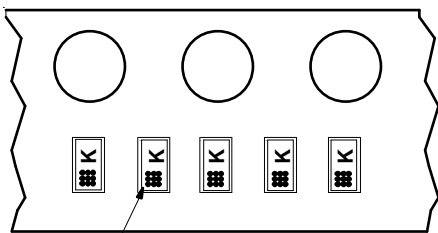


**Paper Tape**



Note: All dimensions in mm unless otherwise specified

**Device Orientation in Tape**



Date Code Location  
(Away from Sprocket Holes)

**Contact Information**

Semtech Corporation  
Protection Products Division  
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Phone: (805)498-2111 FAX (805)498-3804



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