

## 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. They are designed to replace 0201 size multilayer varistors (MLVs) in portable applications such as cell phones, notebook computers, and other portable electronics. They feature large cross-sectional area junctions for conducting high transient currents. These devices offer desirable characteristics for board level protection including fast response time, low operating and clamping voltage, and no device degradation.

$\mu$ Clamp<sup>®</sup>3311Z is constructed using Semtech's proprietary EPD process technology. The EPD process provides low standoff voltages with significant reductions in leakage currents and capacitance over silicon-avalanche diode processes. They feature a true operating voltage of 3.3 volts for superior protection when compared to traditional pn junction devices.

$\mu$ Clamp3311Z is in a 2-pin SLP0603P2X3A 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 3.3 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: **+/-14kV** (Contact) and **+/- 16kV** (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 line
- ◆ Low reverse current: <10nA typical (VR=5V)
- ◆ Working voltage: +/- 3.3V
- ◆ Low capacitance: 6pF typical
- ◆ Extremely low dynamic resistance: 0.21 Ohms (Typ)
- ◆ Solid-state silicon-avalanche technology

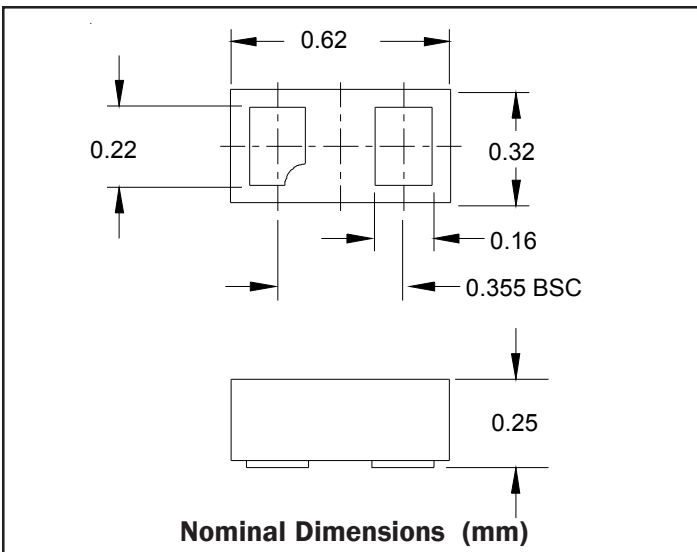
### Mechanical Characteristics

- ◆ SLP0603P2X3A 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

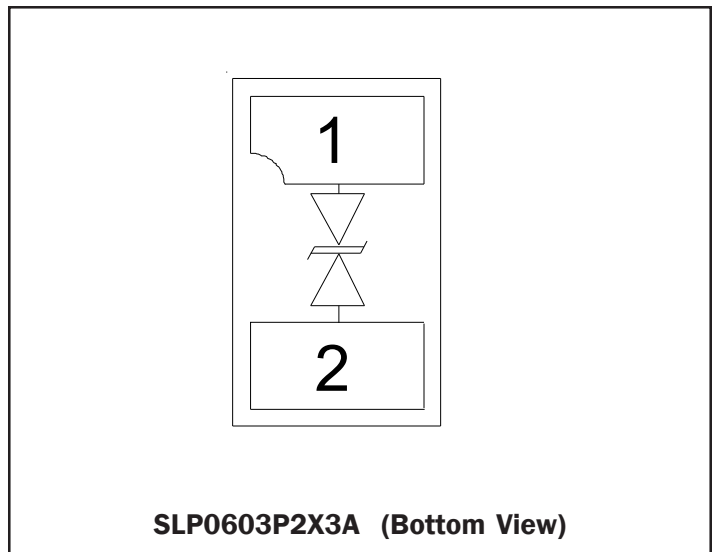
### Applications

- ◆ Cellular Handsets & Accessories
- ◆ 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)	$P_{pk}$	30	Watts
Maximum Peak Pulse Current (tp = 8/20μs)	$I_{pp}$	4	Amps
ESD per IEC 61000-4-2 (Air) <sup>1</sup> ESD per IEC 61000-4-2 (Contact) <sup>1</sup>	$V_{ESD}$	+/- 16 +/- 14	kV
Operating Temperature	$T_J$	-40 to +85	°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	$V_{RWM}$				3.3	V
Punch-Through Voltage	$V_{PT}$	$I_{PT} = 50\mu A$	3.65	4	4.4	V
Snap-Back Voltage	$V_{SB}$	$I_{SB} = 50mA$	2.8			V
Reverse Leakage Current	$I_R$	$V_{RWM} = 3.3V$		0.001	0.05	μA
Clamping Voltage	$V_C$	$I_{pp} = 1A, tp = 8/20\mu s$			5.5	V
Clamping Voltage	VC	$I_{pp} = 3A, tp = 8/20\mu s$			6.5	V
Clamping Voltage	$V_C$	$I_{pp} = 4A, tp = 8/20\mu s$			7.5	V
Dynamic Resistance <sup>2, 3</sup>	$R_D$	tp = 100ns		0.21		Ohms
Junction Capacitance	$C_j$	I/O pin to Gnd $V_R = 0V, f = 1MHz$		6	9	pF

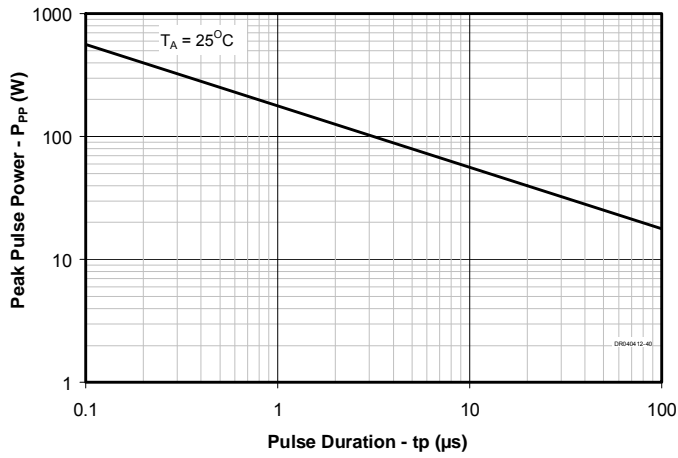
#### Notes

- 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  $I_{TLP} = 16A$

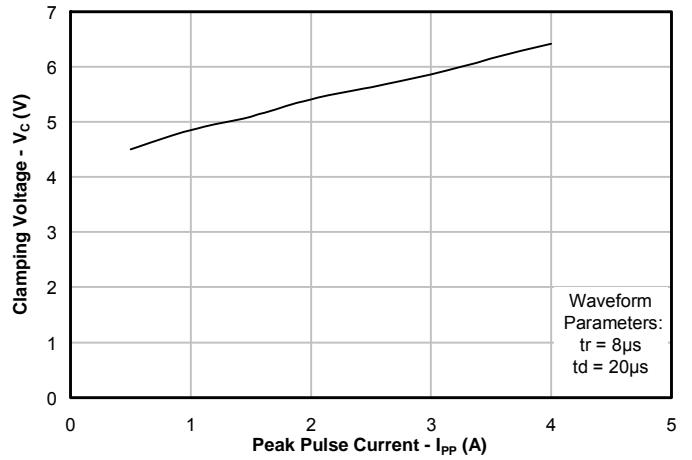
## PROTECTION PRODUCTS

### Typical Characteristics

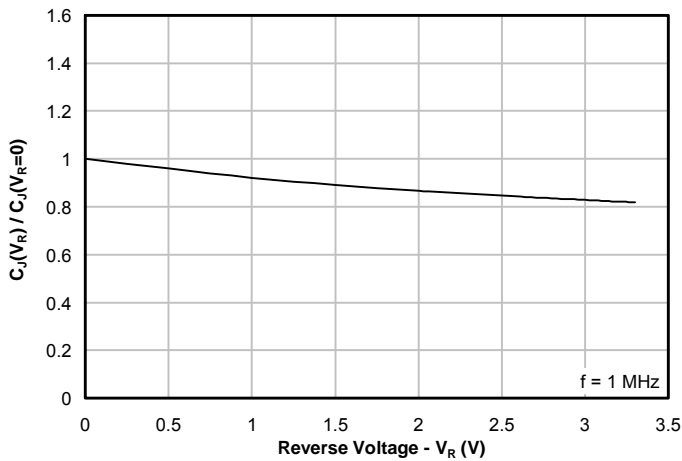
**Non-Repetitive Peak Pulse Power vs. Pulse Time**



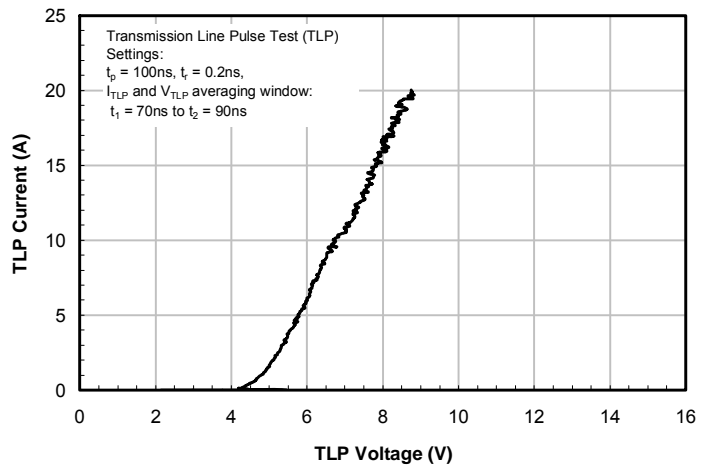
**Clamping Voltage vs. Peak Pulse Current ( $t_p=8/20\mu$ s)**



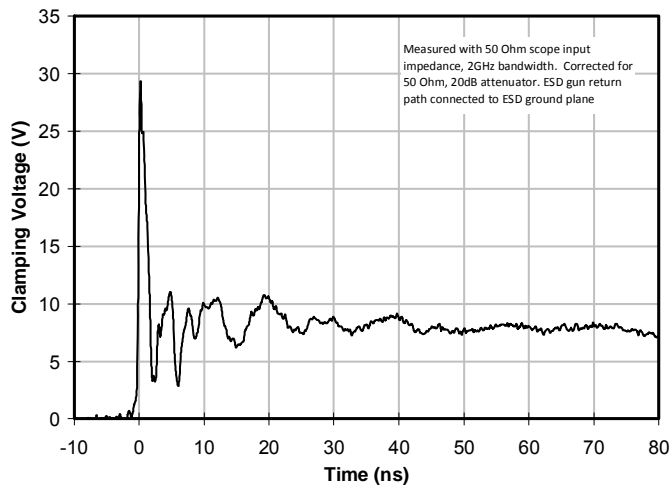
**Normalized Junction Capacitance vs. Reverse Voltage**



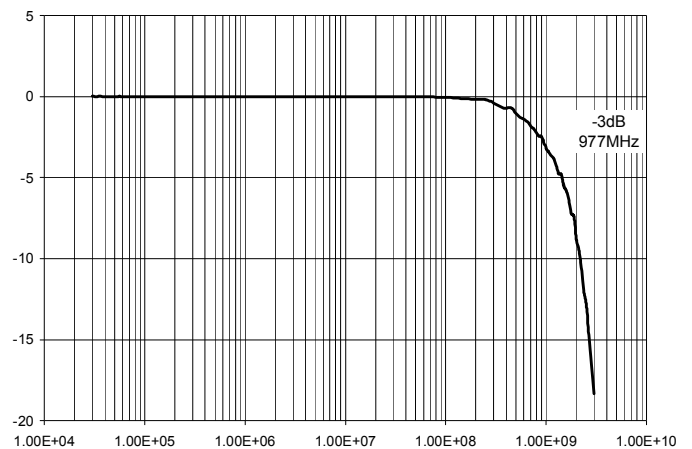
**TLP Characteristic**



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



**Typical Insertion Loss (S21)  
30KHz to 3GHz**



## PROTECTION PRODUCTS

### Applications Information

#### Device Connection Options

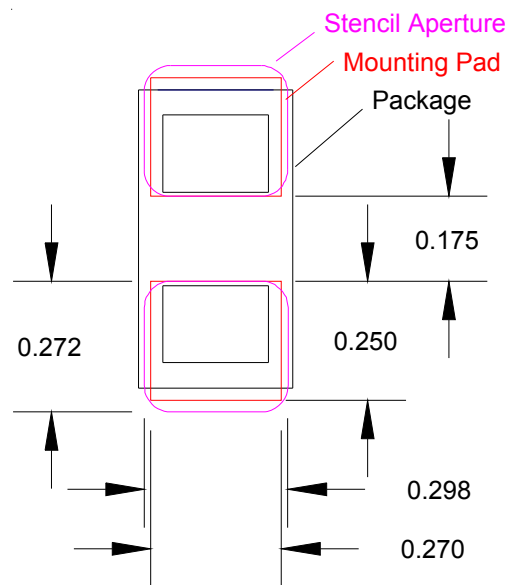
The  $\mu$ Clamp3311Z is designed to protect one data line operating up to 3.3 volts. It will present a high impedance to the protected line up to 3.3 volts. It will “turn on” when the line voltage exceeds 3.5 volts. The device is bidirectional and may be used on lines where the signal polarity is above and below ground. These devices are not recommended for use on DC power supply lines due to their snap-back voltage characteristic.

#### 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

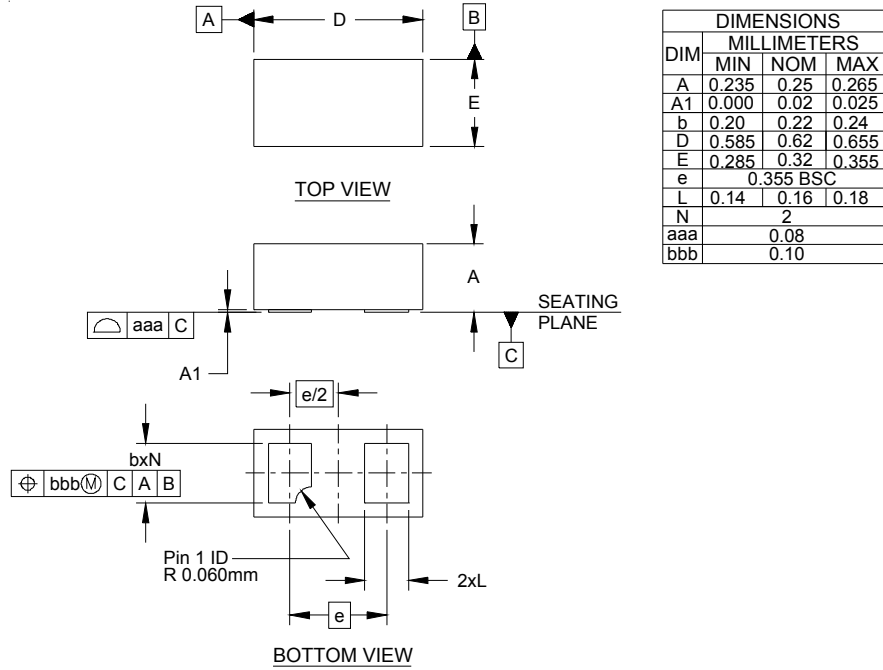
#### Circuit Diagram



#### Recommended Mounting Pattern

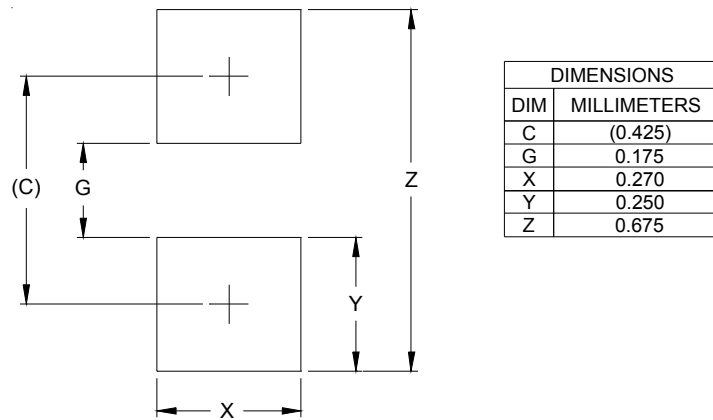
PROTECTION PRODUCTS

Outline Drawing - SLP0603P2X3A



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

Land Pattern - SLP0603P2X3A



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 date code matrix and Pin 1 location

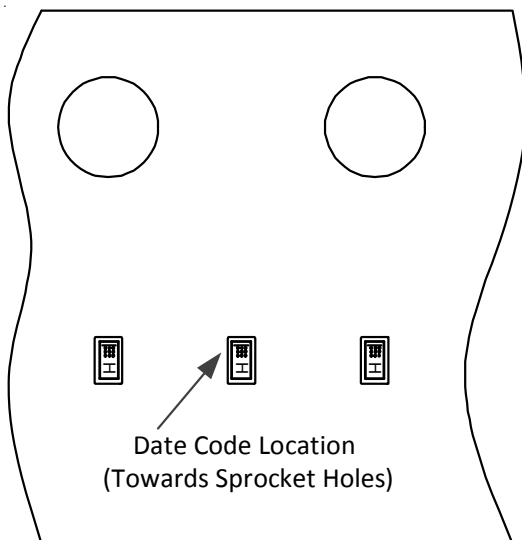
**Ordering Information**

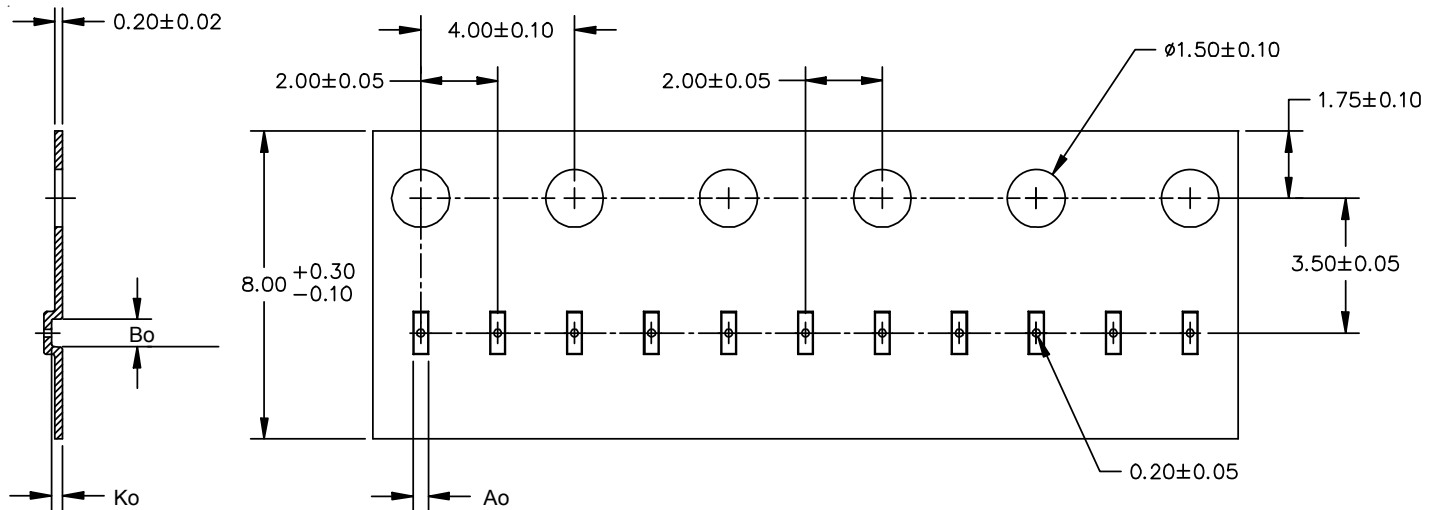
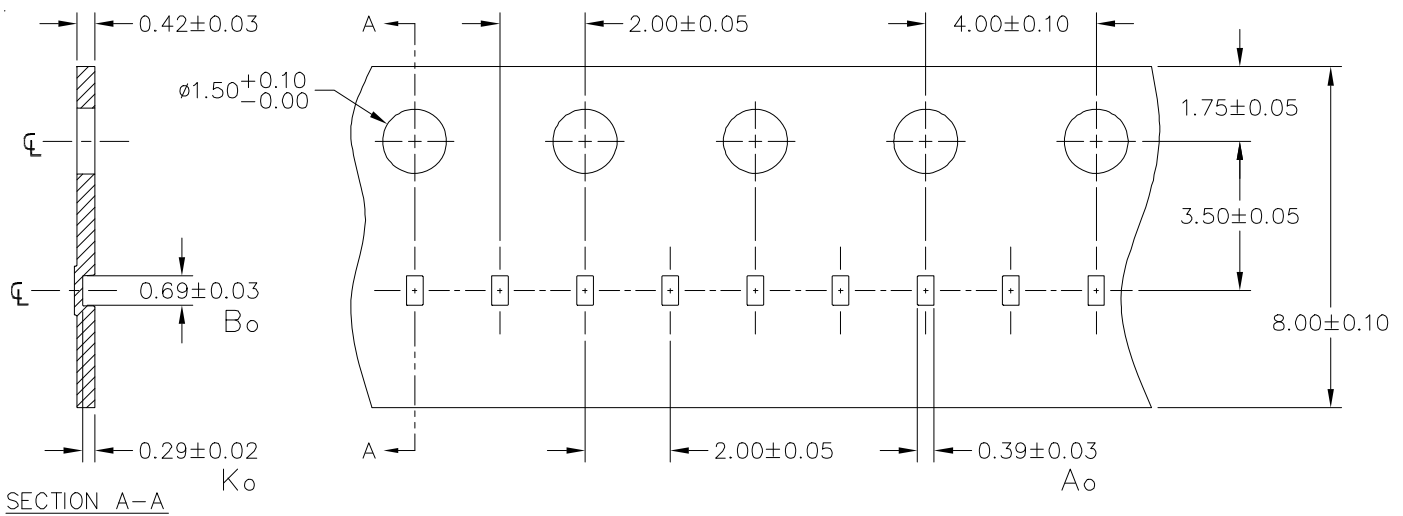
Ordering Number	Qty per Reel	Carrier Tape	Reel Size	Comments
uClamp3311Z.TNT	10,000	Plastic	7 Inch	Not Recommended for New Designs
uClamp3311Z.TFT	15,000	Paper	7 Inch	
uClamp3311Z.TVT	50,000	Paper	13 Inch	

Notes:

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

**Device Orientation in Tape**



**PROTECTION PRODUCTS**
**Carrier Tape Specification**
**Plastic Tape**

**Paper Tape**


Note: All dimensions in mm unless otherwise specified

**Contact Information**

Semtech Corporation  
Protection Products Division  
200 Flynn Rd., Camarillo, CA 93012  
Phone: (805)498-2111 FAX (805)498-3804