

PROTECTION PRODUCTS

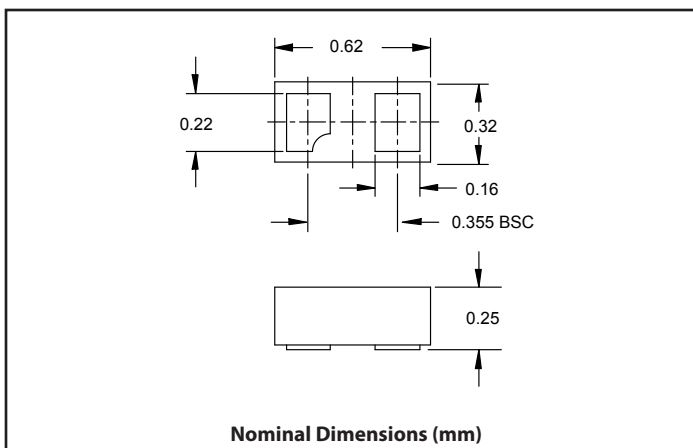
Description

μClamp® TVS diodes are designed to protect sensitive electronics from damage or latch-up due to ESD. 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.

μClamp®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.

μClamp3311Z is in a 2-pin SLP0603P2X3A package. It measures 0.62 x 0.32 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 tablets.

Package Dimension



Features

- High ESD withstand Voltage: +/-14kV (Contact) and +/- 16kV (Air) per IEC 61000-4-2
- Able to withstand over 1000 ESD strikes per IEC61000-4-2 Level 4
- Ultra-small 0201 package
- Protects one data line
- Working voltage: +/- 3.3V
- Low capacitance: 6pF typical
- Low leakage current: <10 nA typical ($V_R=3.3V$)
- Extremely low dynamic resistance: 0.21Ω (Typ.)
- Solid-state silicon-avalanche technology

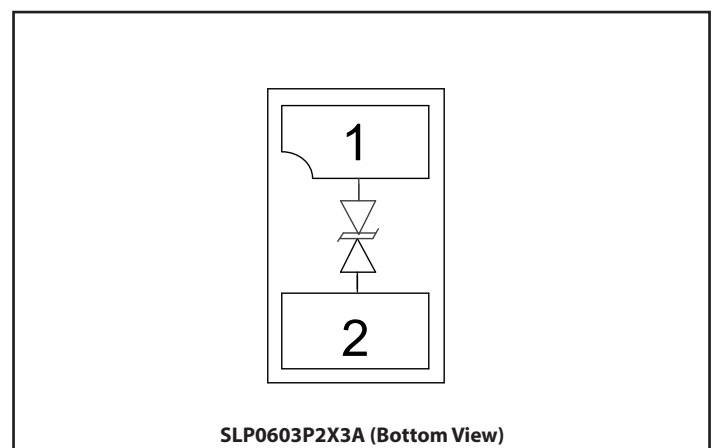
Mechanical Characteristics

- SLP0603P2X3A package
- Pb-Free, Halogen Free, RoHS/WEEE compliant
- Nominal Dimensions: 0.62 x 0.32 x 0.25 mm
- Lead Finish: NiAu
- Marking: Marking code + dot matrix code
- Packaging: Tape and Reel

Applications

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

Schematic & Pin Configuration



Absolute Maximum Rating

Rating	Symbol	Value	Units
Peak Pulse Power (tp = 8/20μs)	P _{PK}	30	W
Peak Pulse Current (tp = 8/20μs)	I _{PP}	4	A
ESD per IEC 61000-4-2 (Air) ⁽¹⁾ ESD per IEC 61000-4-2 (Contact) ⁽¹⁾	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 unless otherwise specified)

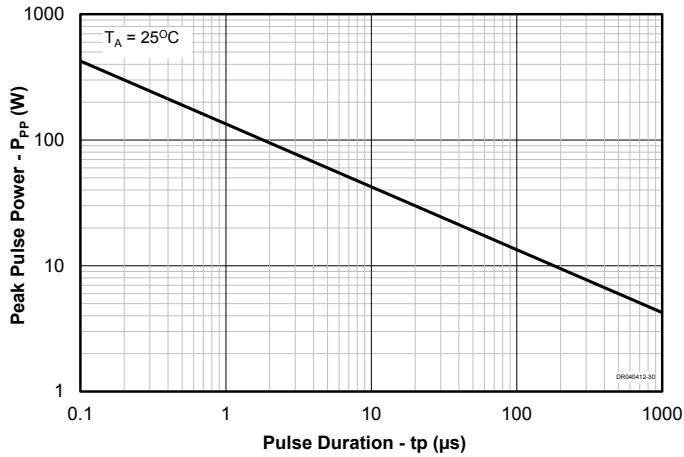
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Reverse Stand-Off Voltage	V _{RWM}				3.3	V
Punch-Through Voltage	V _{PT}	I _t = 50μA	3.65	4	4.4	V
Snap-Back Voltage	V _{SB}	I _{SB} = 50mA	2.8			
Reverse Leakage Current	I _R	V _{RWM} = 3.3V		<1	50	nA
Clamping Voltage	V _C	tp = 8/20μs	I _{PP} = 1A		5.5	V
			I _{PP} = 3A		6.5	
			I _{PP} = 4A		7.5	
ESD Clamping Voltage ²	V _C	tp = 0.2/100ns	I _{PP} = 4A	6		V
			I _{PP} = 16A	8.5		
Dynamic Resistance ^{2,3}	R _{DYN}	tp = 0.2/100ns		0.21		Ω
Junction Capacitance	C _J	V _R = 0V, f = 1MHz	T = 25°C	6	9	pF

Notes

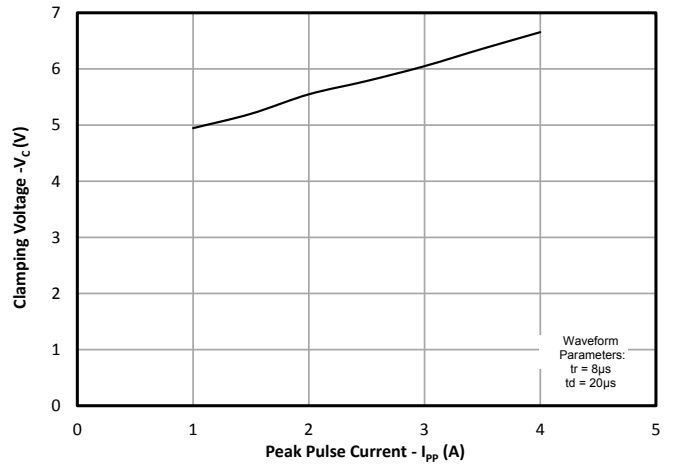
- ESD gun return path connected to ground reference plane.
- Transmission Line Pulse Test (TLP) Settings: tp = 100ns, tr = 0.2ns, I_{TLP} and V_{TLP} averaging window: t₁ = 70ns to t₂ = 90ns.
- Dynamic resistance calculated from I_{TLP} = 4A to I_{TLP} = 16A.

Typical Characteristics

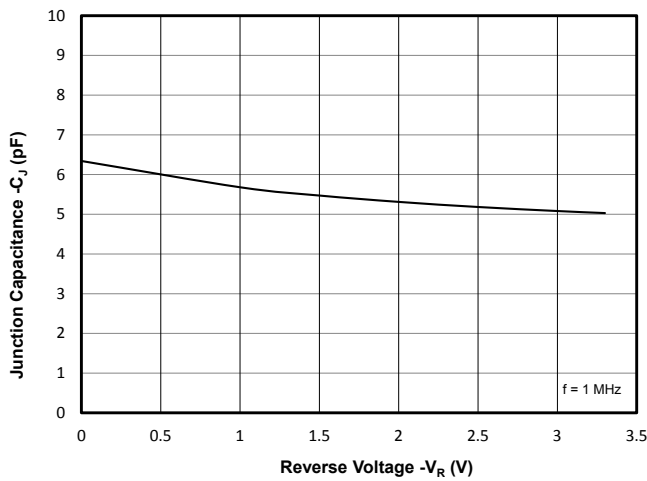
Non-Repetitive Peak Pulse Power vs. Pulse Time



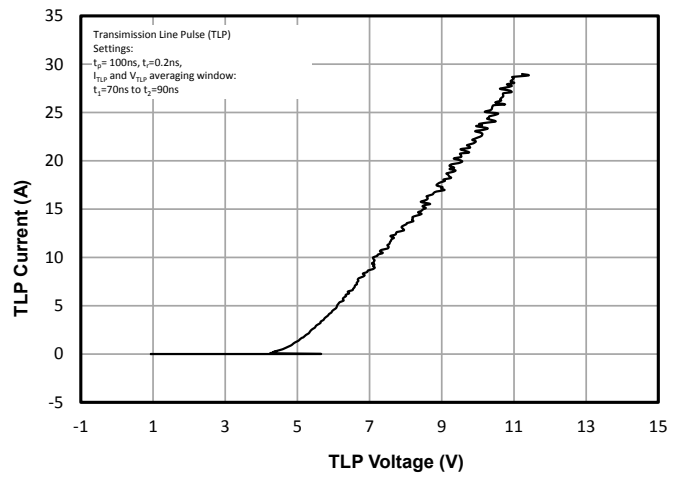
Clamping Voltage vs. Peak Pulse Current ($t_p=8/20 \mu\text{s}$)



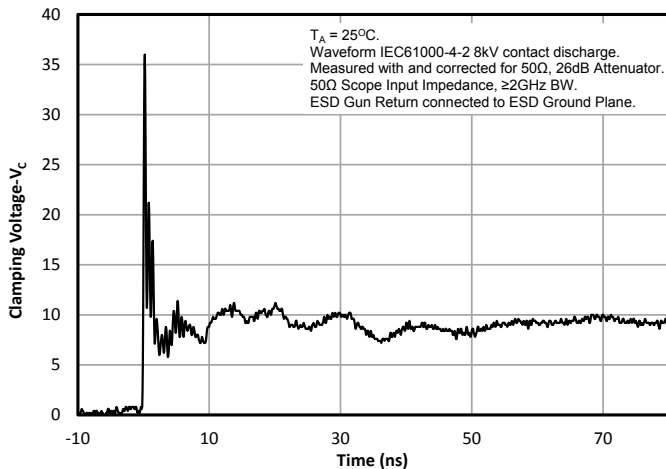
Junction Capacitance vs. Reverse Voltage



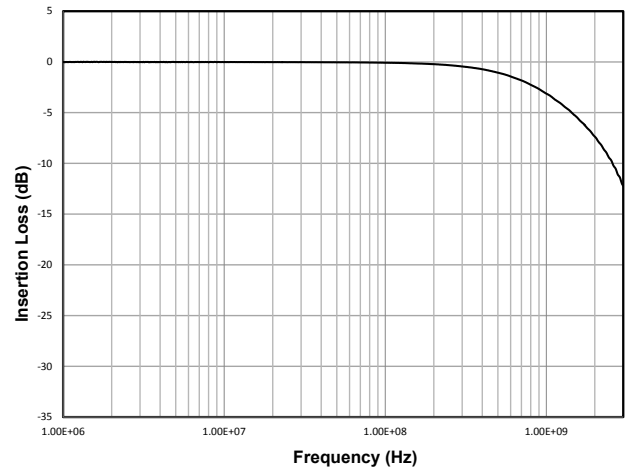
TLP Characteristic



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



Typical Insertion Loss (S21)



Application Information

Assembly Guidelines

The small size of this device means that some care must be taken during the mounting process to insure reliable solder joints. The figure at the right details Semtech's recommended mounting pattern. Recommended assembly guidelines are shown in Table 1. 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. Exact manufacturing parameters will require some experimentation to get the desired solder application.

Solder Stencil

Stencil design is one of the key factors which will determine the volume of solder paste which is deposited onto the land pad. The area ratio of the stencil aperture will determine how well the stencil will print. The area ratio takes into account the aperture shape, aperture size, and stencil thickness. A minimum area ratio of 0.66 is preferred for the subject package. The area ratio of a rectangular aperture is given as:

$$\text{Area Ratio} = (L * W) / (2 * (L + W) * T)$$

Where:

L = Aperture Length

W = Aperture Width

T = Stencil Thickness

Semtech recommends a stencil with square aperture and rounded corners for consistent solder release. The stencil should be laser cut with electropolished finish. A stencil thickness of 0.075mm (0.003") is recommended. A 0.100mm (0.004") stencil may be used, however the stencil opening may need to be increased slightly to achieve the desired area ratio to ensure proper solder coverage on the pad.

Recommended Mounting Pattern

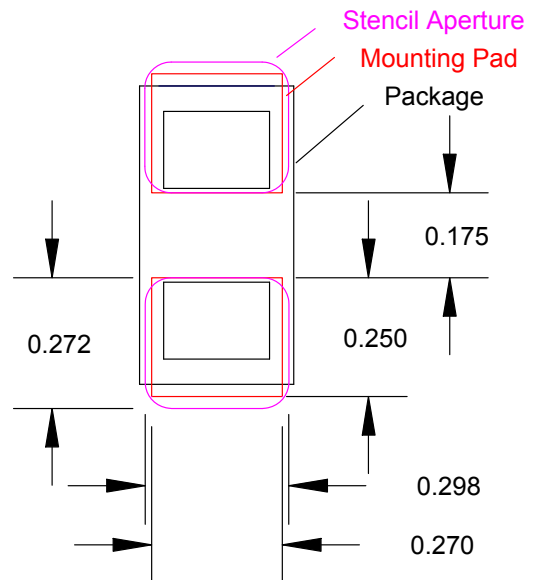
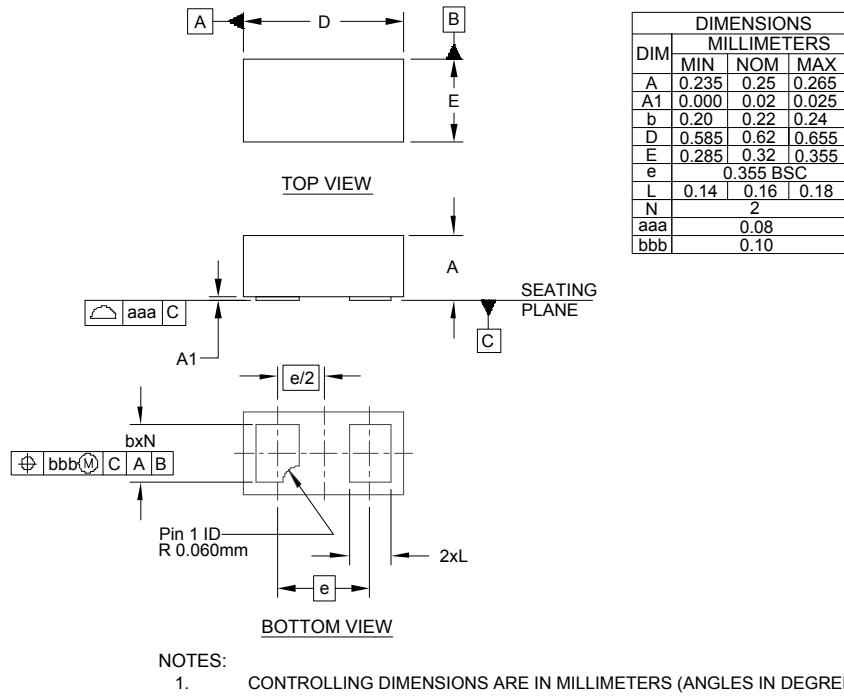


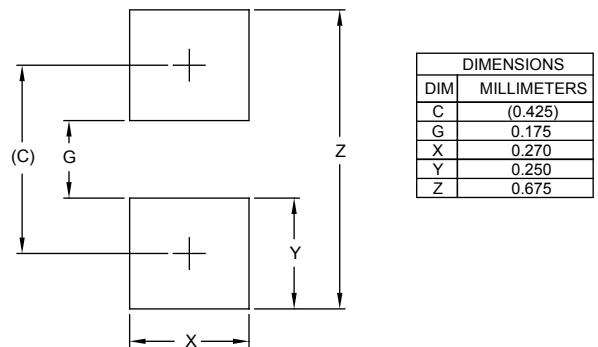
Table 1 - Assembly Guidelines

Assembly Parameter	Recommendation
Solder Stencil Design	Laser Cut, Electro-Polished
Aperture Shape	Rectangular with Rounded Corners
Solder Stencil Thickness	0.075mm (0.003") or 0.100mm (0.004")
Solder Paste Type	Type 4 Size Sphere or Smaller
Solder Reflow Profile	Per JEDEC J-STD-020
PCB Solder Pad Design	Solder Mask Defined
PCB Pad Finish	OSP or NiAu

Outline Drawing - SLP0603P2X3A

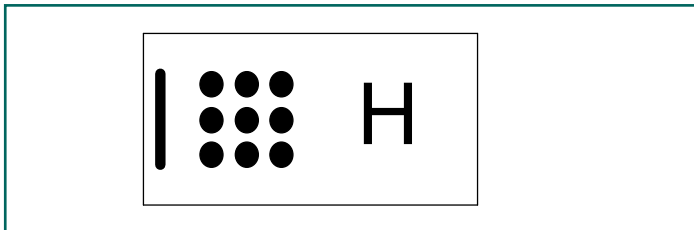


Land Pattern - SLP0603P2X3A



- 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.

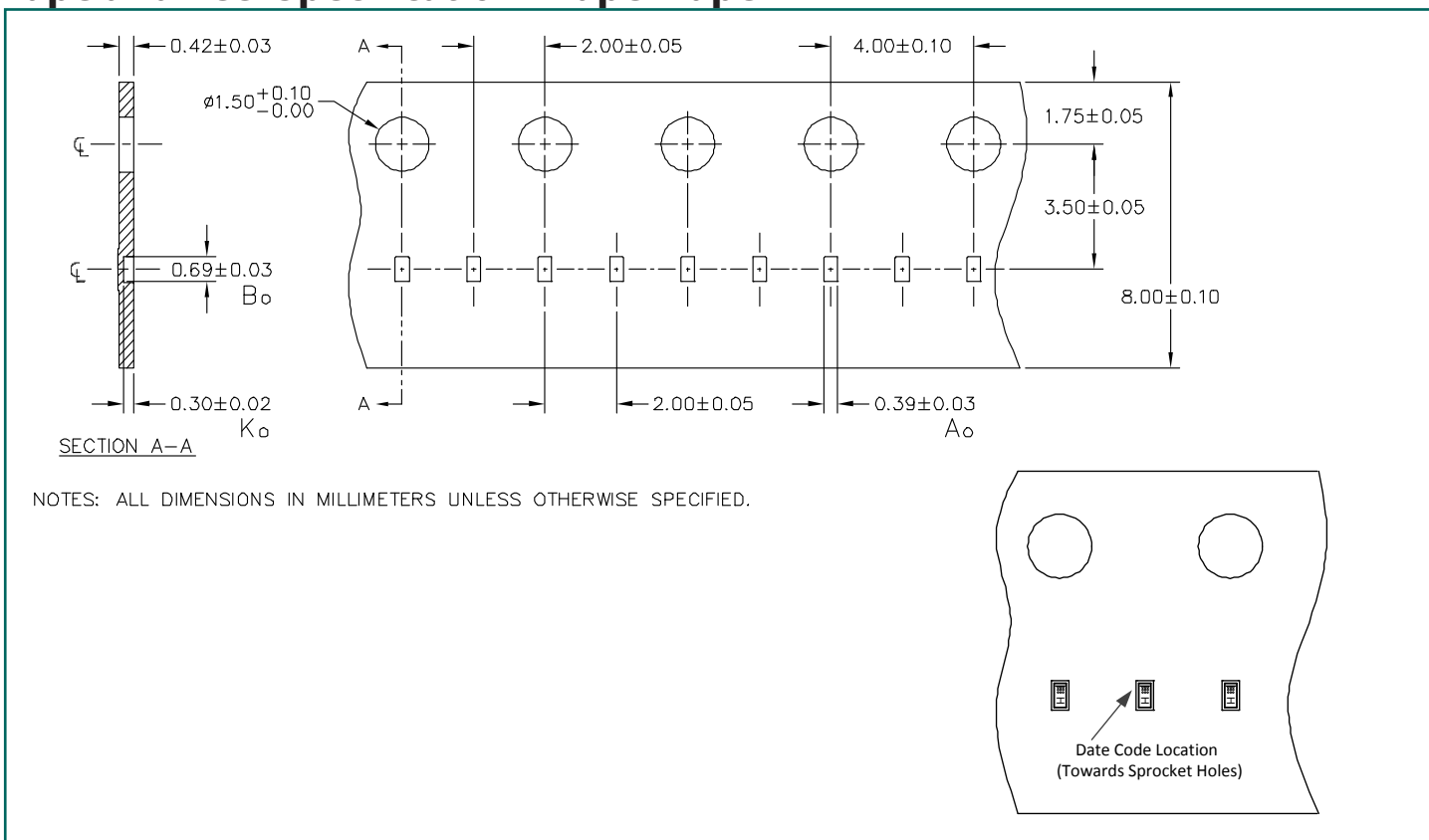
Marking Code



Notes:

1. Dots represent date code matrix and Pin 1 location.

Tape and Reel Specification - Paper Tape



Ordering Information

Part Number	Qty per Reel	Reel Size
μ Clamp3311Z.TFT	15,000	7"

Notes:

1. MicroClamp, uClamp and μ Clamp are trademarks of Semtech Corporation.



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