

PROTECTION PRODUCTS

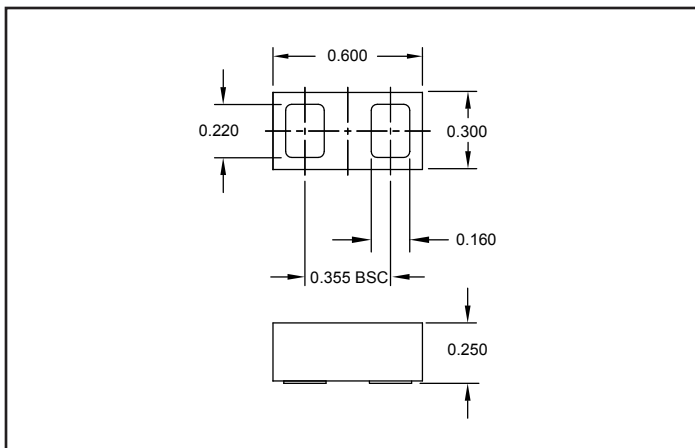
Description

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®5011ZA features extremely good ESD protection characteristics highlighted by low typical dynamic resistance of 0.15 Ohms, low peak ESD clamping voltage, and high ESD withstand voltage (+/-15kV contact per IEC 61000-4-2). Low maximum capacitance (5pF at $V_R=0V$) minimizes loading on sensitive circuits. Each device will protect one data or power line operating at 5 Volts.

μClamp5011ZA is in a 2-pin SLP0603P2X3F 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.

Package Dimension



Features

- High ESD withstand voltage: +/-15kV (contact) and +/-18kV (air) per IEC 61000-4-2
- Ultra-small 0201 package
- Protects one data line
- Low ESD clamping voltage
- Working voltage: 5V
- Low capacitance: 5pF Maximum
- Low leakage current
- Low dynamic resistance: 0.15 Ohms Typical
- Solid-state silicon-avalanche technology

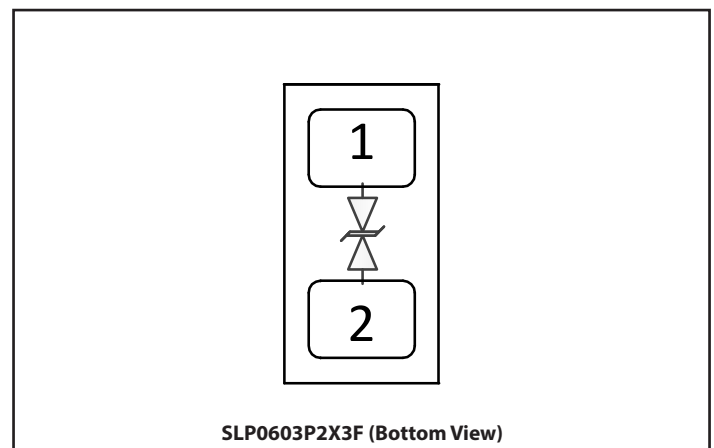
Mechanical Characteristics

- SLP0603P2X3F 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
- Peripherals
- Portable Instrumentation
- Notebook Computers
- 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}	2.5	A
ESD per IEC 61000-4-2 (Air) ⁽¹⁾ ESD per IEC 61000-4-2 (Contact) ⁽¹⁾	V _{ESD}	±18 ±15	kV
Operating Temperature	T _J	-40 to +125	°C
Storage Temperature	T _{STG}	-55 to +150	°C

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

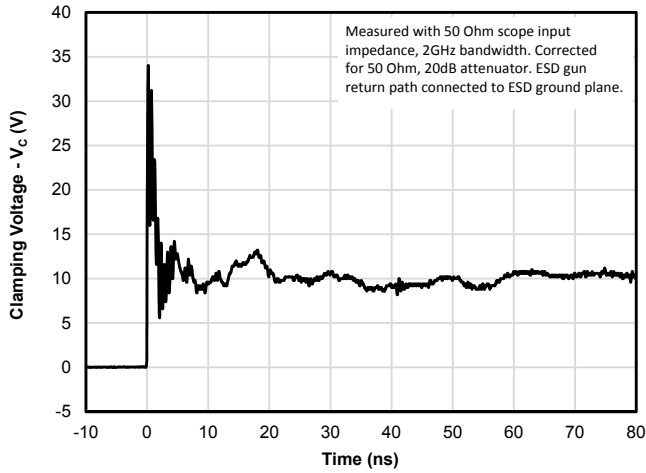
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Reverse Stand-Off Voltage	V _{RWM}	Pin 1 to 2 or Pin 2 to 1			5	V
Reverse Breakdown Voltage	V _{BR}	I _{BR} = 1mA, Pin 1 to 2 or Pin 2 to 1	6.5	8.5	10.5	V
Reverse Leakage Current	I _R	V _{RWM} = 5V, Pin 1 to 2 or Pin2 to 1		5	20	nA
Clamping Voltage	V _C	I _{PP} = 2.5A, tp = 8/20μs			12	V
ESD Clamping Voltage ²	V _C	I = 4A, tp = 0.2/100ns		8		V
		I = 16A, tp = 0.2/100ns		9.8		
Dynamic Resistance ^{2,3}	R _{DYN}	tp = 0.2/100ns		0.15		Ω
Junction Capacitance	C _J	V _R = 0V, f = 1MHz, I/O pin to GND		4.2	5	pF

Notes

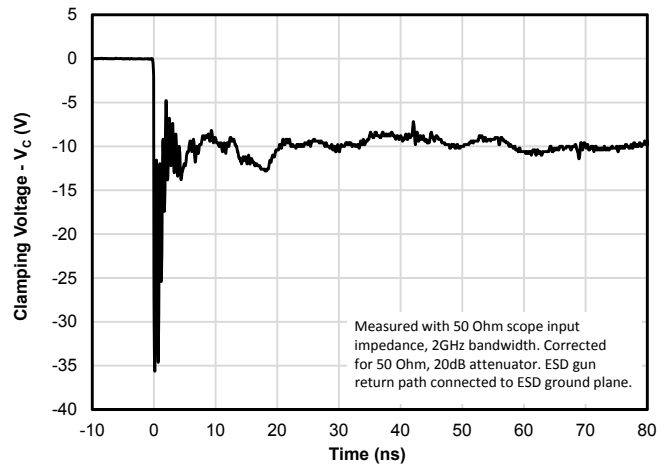
- 1) ESD gun return path connected to ESD ground plane.
- 2) Transmission Line Pulse Test (TLP) Settings: tp = 100ns, tr = 0.2ns, I_{TLP} and V_{TLP} averaging window: t1 = 70ns to t2 = 90ns.
- 3) Dynamic resistance calculated from I_{TLP} = 4A to I_{TLP} = 16A

Typical Characteristics

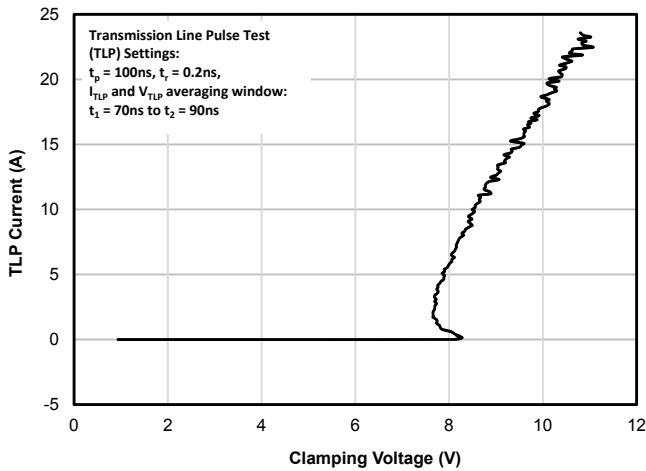
ESD Clamping (8kV Contact per IEC 61000-4-2)



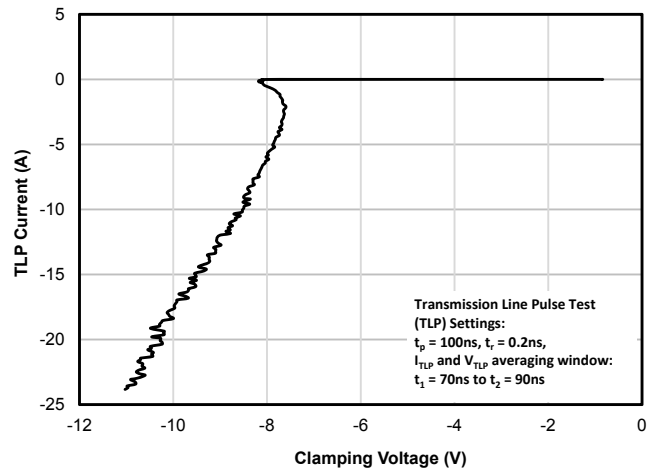
ESD Clamping (-8kV Contact per IEC 61000-4-2)



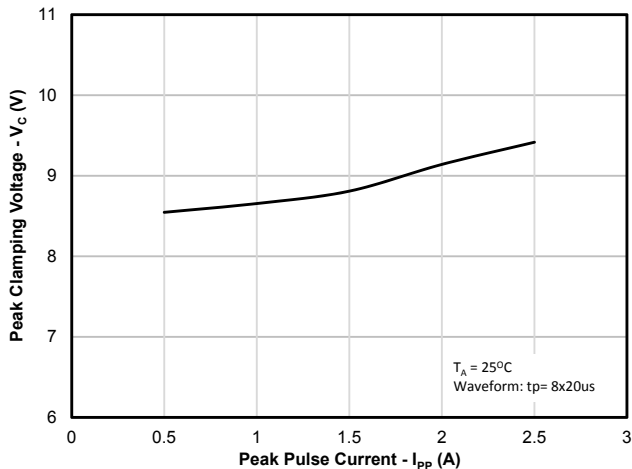
TLP Characteristic (Positive Pulse)



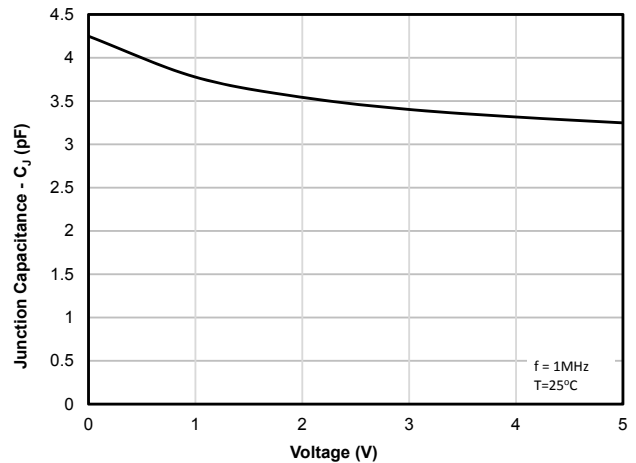
TLP Characteristic (Negative Pulse)



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



Junction Capacitance vs. Reverse Voltage



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:

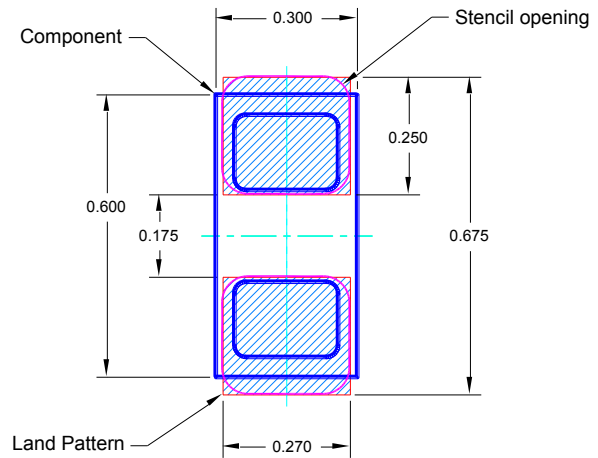
L = Aperture Length

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 electro-polished 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



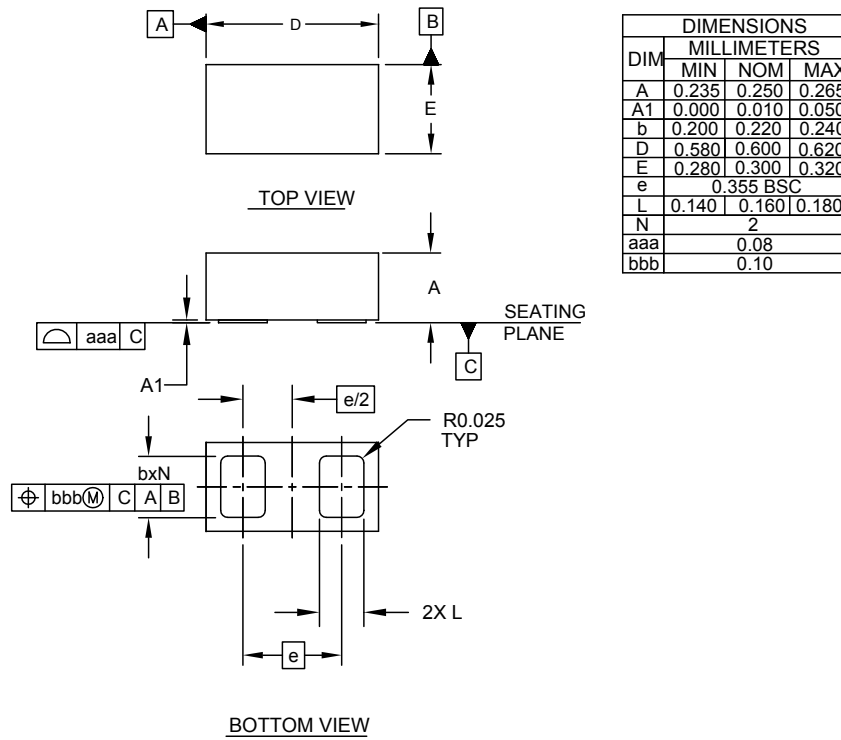
All Dimensions are in mm.

Land Pad. Stencil opening Component

Table 1 - Assembly Guidelines

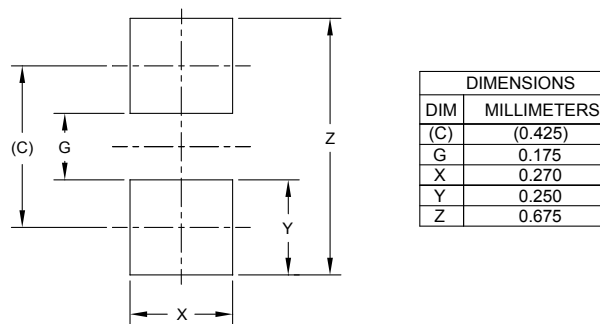
Assembly Parameter	Recommendation
Solder Stencil Design	Laser Cut, Electro-Polished
Aperture Shape	Rectangular with Rounded Corners
Solder Stencil Thickness	0.075mm (0.003") or 0.100mm (0.004")
Solder Paste Type	Type 4 Size Sphere or Smaller
Solder Reflow Profile	Per JEDEC J-STD-020
PCB Solder Pad Design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

Outline Drawing - SLP0603P2X3F



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

Land Pattern - SLP0603P2X3F



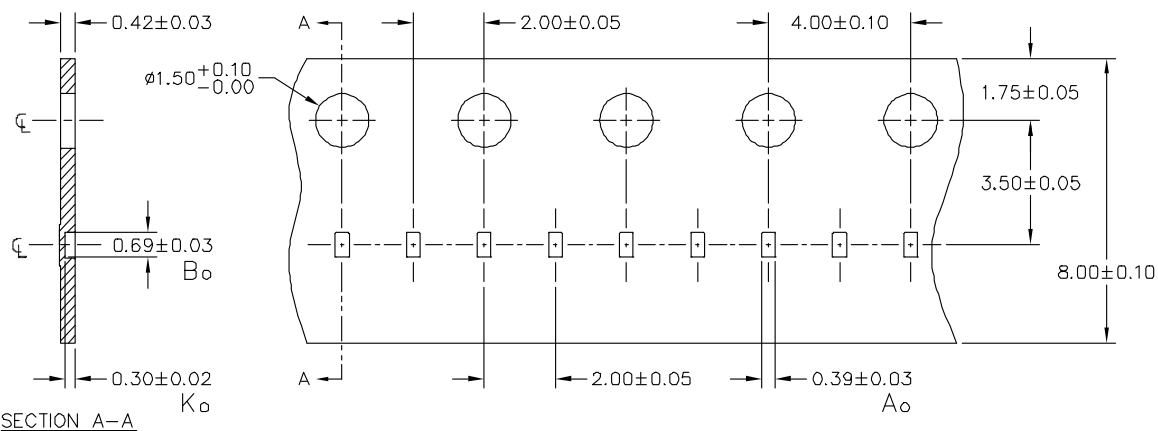
NOTES:
1. CONTROLLING DIMENSIONS ARE IN MILLIMETERS (ANGLES IN DEGREES).
2. THIS LAND PATTERN IS FOR REFERENCE PURPOSES ONLY. CONSULT YOUR MANUFACTURING GROUP TO ENSURE YOUR COMPANY'S MANUFACTURING GUIDELINES ARE MET.

Marking Code

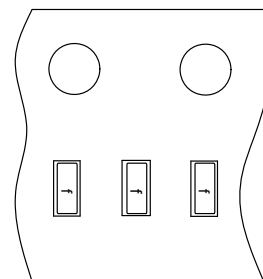
f

Notes: Device is electrically symmetrical.

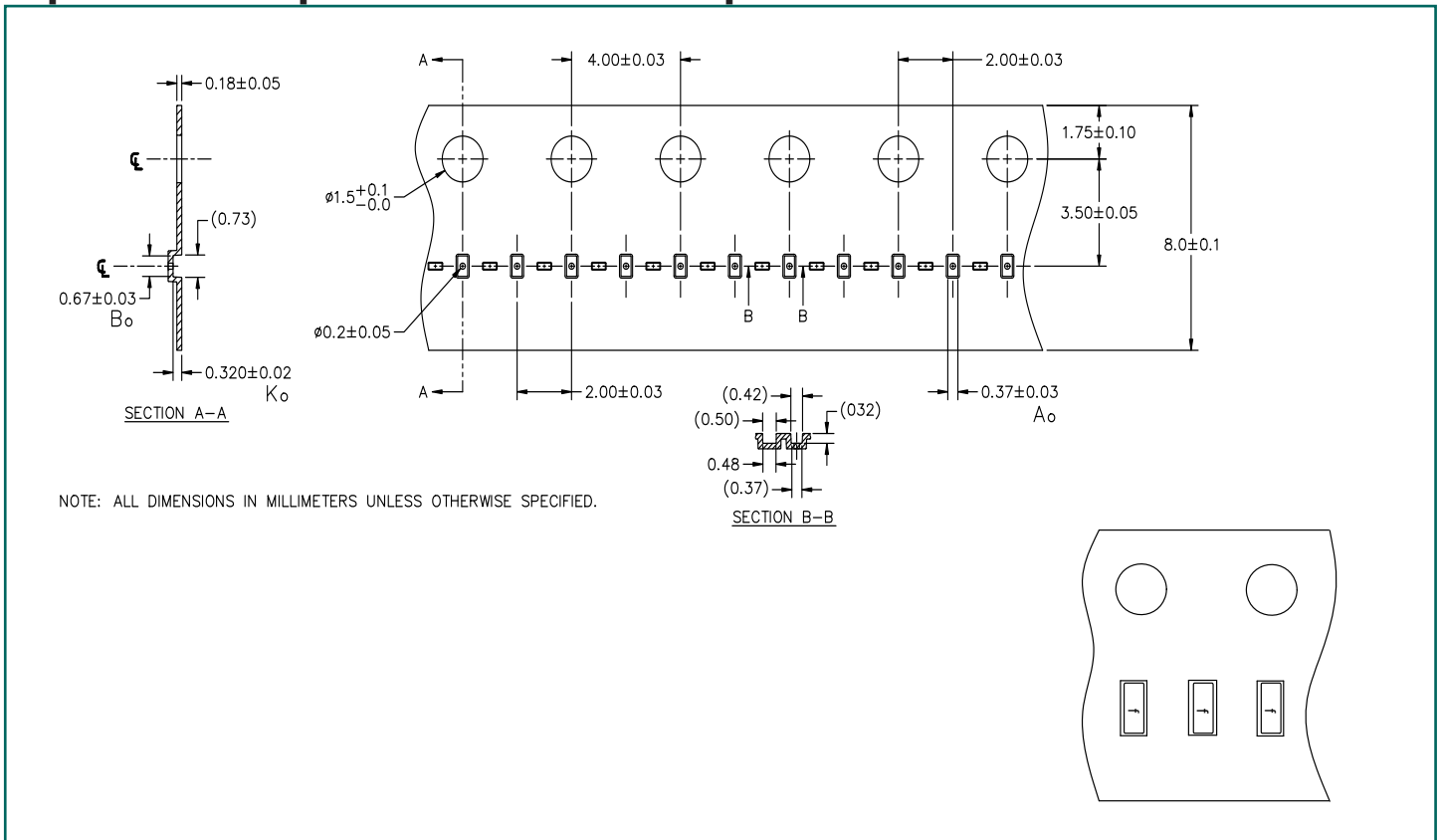
Tape and Reel Specification - Paper Tape



NOTES: ALL DIMENSIONS IN MILLIMETERS UNLESS OTHERWISE SPECIFIED.



Tape and Reel Specification - Plastic Tape



Ordering Information

Part Number	Qty per Reel	Carrier Tape	Reel Size
μClamp5011ZATFT	15,000	Paper	7"
μClamp5011ZATNT	10,000	Plastic	7"

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