

PROTECTION PRODUCTS

Description

μClamp® 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.

μClamp®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 ($V_R=5V$)
- Working voltage: +/- 5V
- Low capacitance: 6.5pF typical
- Solid-state silicon-avalanche technology

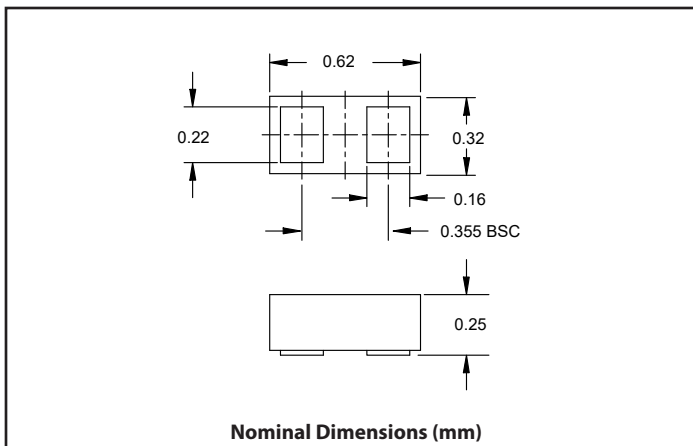
Mechanical Characteristics

- 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

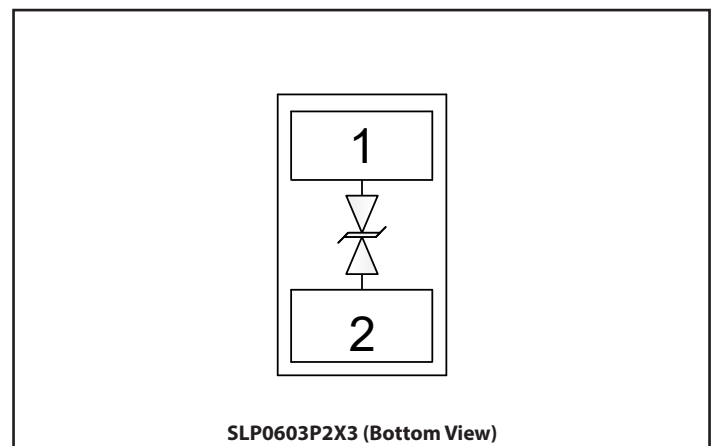
Applications

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

Package Dimension



Schematic & Pin Configuration



Absolute Maximum Rating

Rating	Symbol	Value	Units
Peak Pulse Power ($t_p = 8/20\mu s$)	P_{PK}	25	W
Peak Pulse Current ($t_p = 8/20\mu s$)	I_{PP}	2	A
ESD per IEC 61000-4-2 (Air) ⁽¹⁾ ESD per IEC 61000-4-2 (Contact) ⁽¹⁾	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 unless otherwise specified)

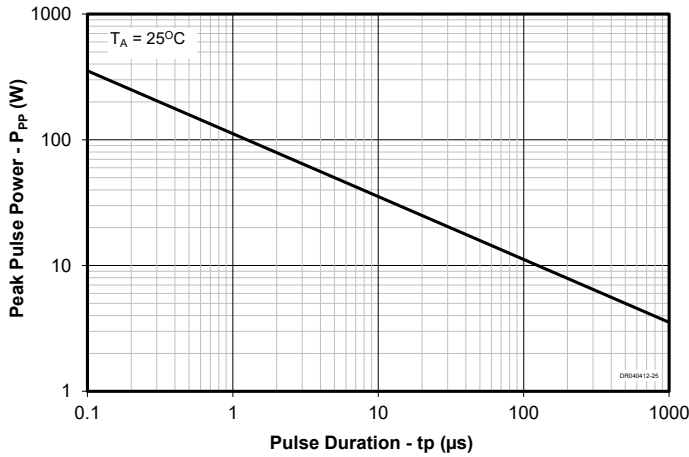
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Reverse Stand-Off Voltage	V_{RWM}	Pin 1 to 2 or 2 to 1			5	V
Reverse Breakdown Voltage	V_{Br}	$I_t = 1\text{ mA}$, Pin 1 to 2 or 2 to 1	6	8.2	9.5	V
Reverse Leakage Current	I_R	$V_{RWM} = 5V$, Pin 1 to 2 or 2 to 1		3	50	nA
Clamping Voltage	V_C	$t_p = 8/20\mu s$	$I_{PP} = 1A$		12	V
			$I_{PP} = 2A$		15	
Dynamic Resistance ^{2,3}	R_{DYN}	$t_p = 0.2/100ns$		0.78		Ω
Junction Capacitance	C_J	$V_R = 0V, f = 1MHz$		6.5	9	pF

Notes

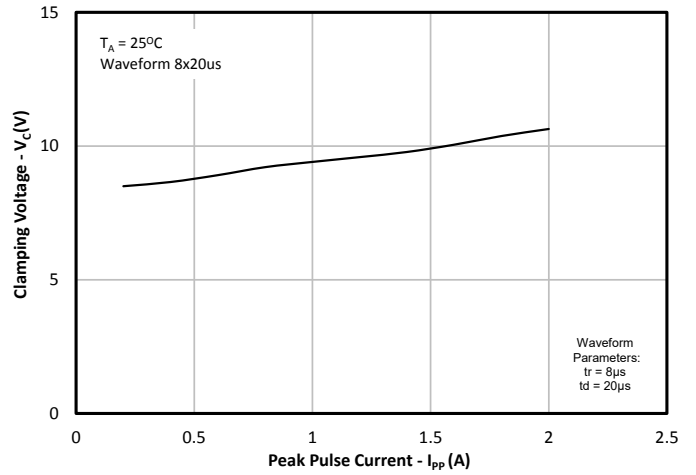
- ESD gun return path connected to ESD ground plane.
- Transmission Line Pulse Test (TLP) Settings: $t_p = 100ns$, $t_r = 0.2ns$, I_{TLP} and V_{TLP} averaging window: $t_1 = 70ns$ to $t_2 = 90ns$.
- Dynamic resistance calculated from $I_{TLP} = 4A$ to $I_{TLP} = 16A$

Typical Characteristics

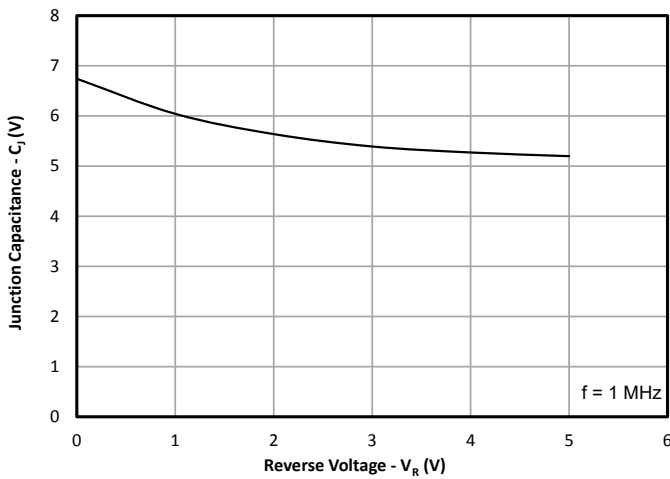
Non-Repetitive Peak Pulse Power vs. Pulse Time



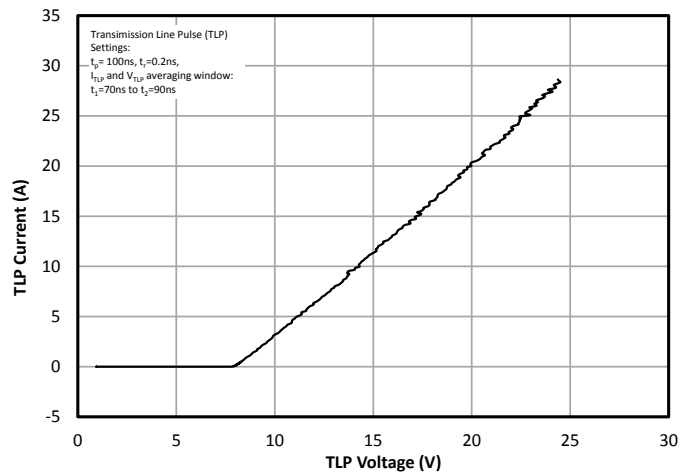
Clamping Voltage vs. Peak Pulse Current ($t_p=8/20 \mu$ s)



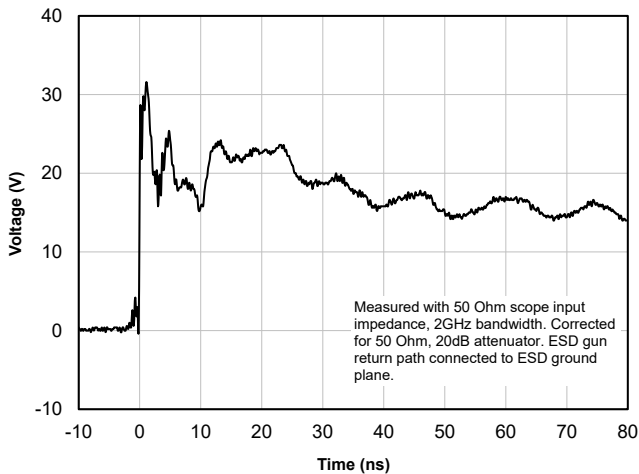
Junction Capacitance vs. Reverse Voltage



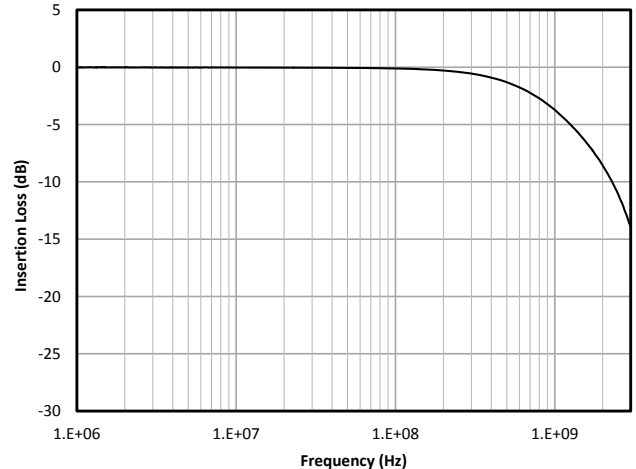
TLP Characteristic



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

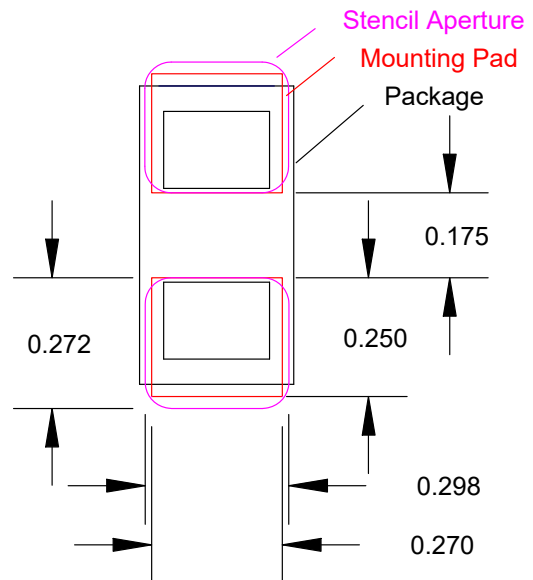
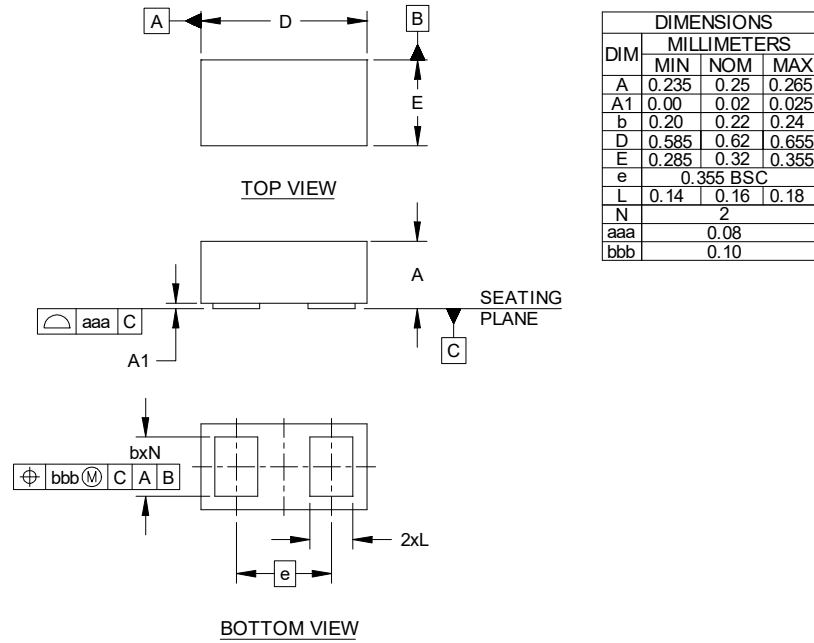


Table 1 - Assembly Guidelines

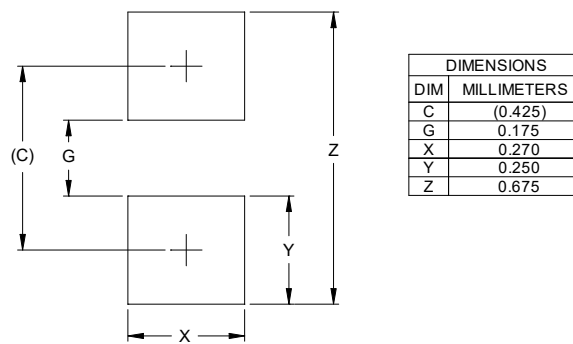
Assembly Parameter	Recommendation
Solder Stencil Design	Laser Cut, Electro-Polished
Aperture Shape	Rectangular with Rounded Corners
Solder Stencil Thickness	0.075mm (0.003") or 0.100mm (0.004")
Solder Paste Type	Type 4 Size Sphere or Smaller
Solder Reflow Profile	Per JEDEC J-STD-020
PCB Solder Pad Design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

Outline Drawing - SLP0603P2X3



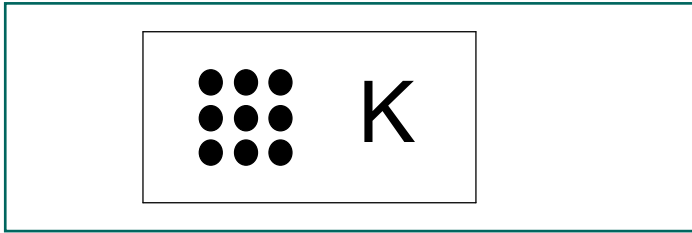
NOTES:
1. CONTROLLING DIMENSIONS ARE IN MILLIMETERS (ANGLES IN DEGREES).

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.

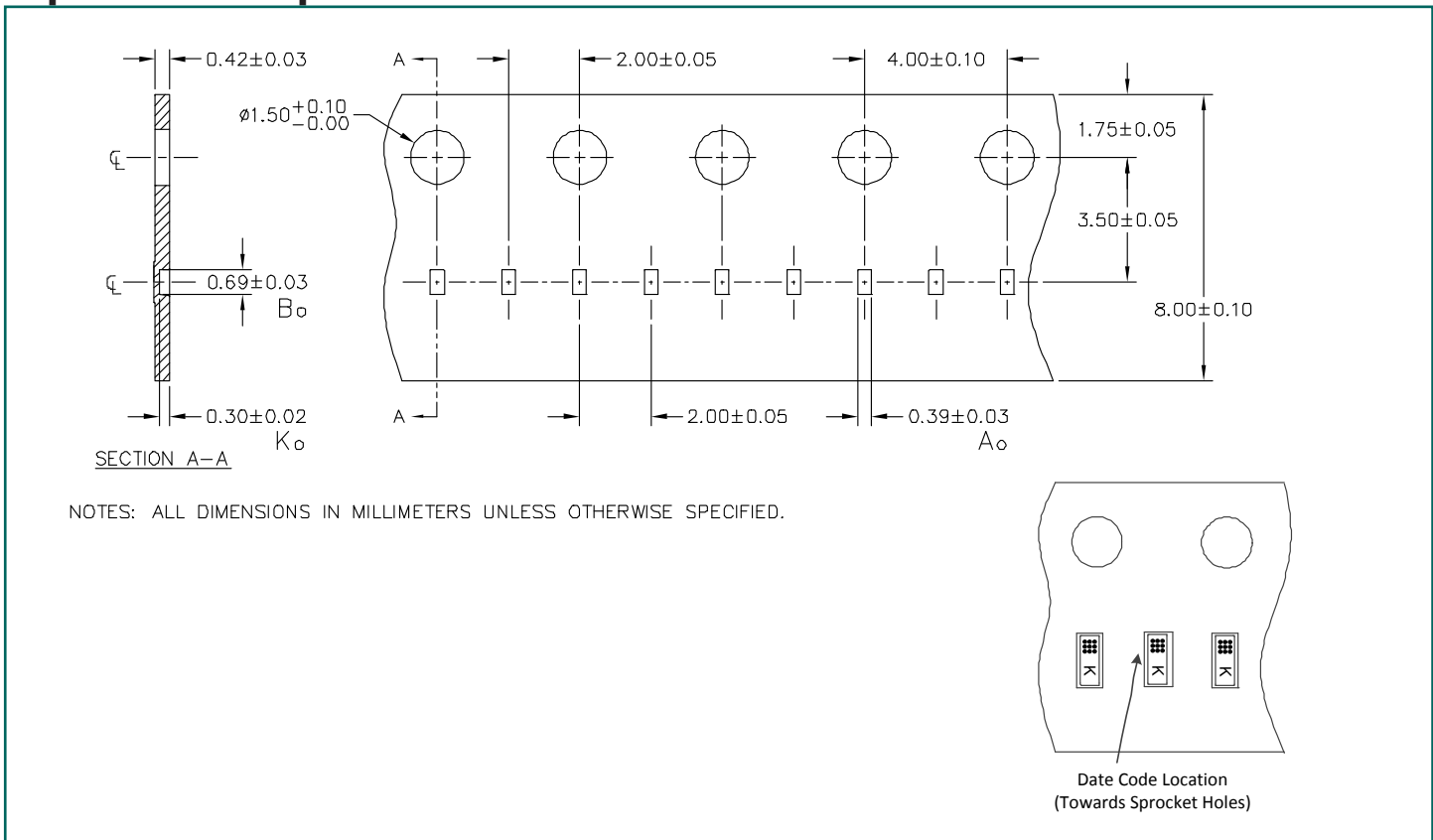
Marking Code



Notes:

- 1. Dots represent matrix date code.
- 2. The device is electrically symmetrical.

Tape and Reel Specification



Ordering Information

Part Number	Qty per Reel	Reel Size
μClamp0541Z.TFT	15,000	7"



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