

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

RailClamp® TVS arrays are ultra low capacitance ESD protection devices designed to protect high speed data interfaces. They are designed to replace 0201 size multilayer varistors (MLVs) in portable applications such as cell phones, notebook computers, and other portable electronics. This device offers desirable characteristics for board level protection including fast response time, low operating and clamping voltage, and no device degradation.

RClamp®0521Z has a typical capacitance of only 0.35pF. This allows it to be used on circuits operating in excess of 5GHz without appreciable signal attenuation.

RClamp0521Z 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**

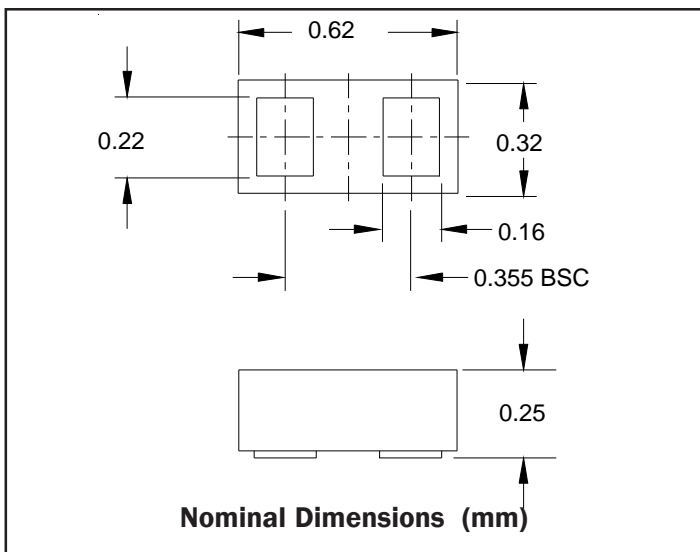
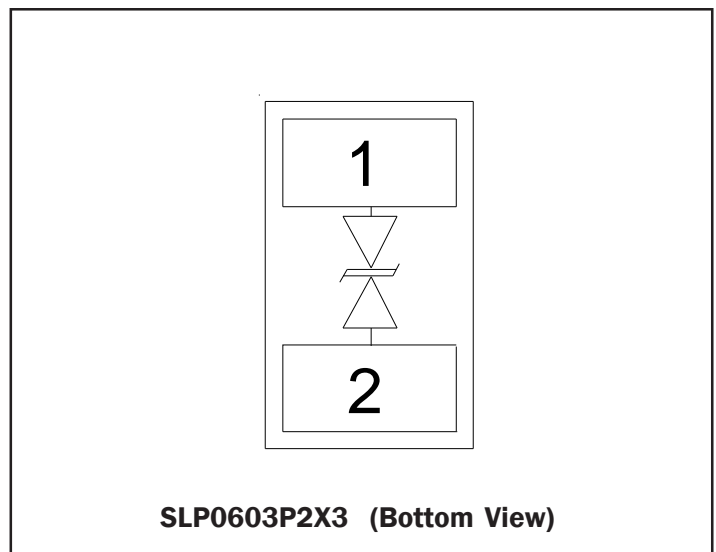
- ◆ High ESD withstand Voltage: **+/-17kV** (Contact) and **+/- 25kV** (Air) per **IEC 61000-4-2**
- ◆ Able to withstand over 1000 ESD strikes per IEC 61000-4-2 Level 4
- ◆ Ultra-small **0201 package**
- ◆ Protects one high-speed data line
- ◆ Low reverse current: <10nA typical (VR=5V)
- ◆ Working voltage: +/- 5V
- ◆ Low capacitance: 0.35pF typical
- ◆ Dynamic resistance: 0.90 Ohms (Typ)
- ◆ 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
- ◆ Molding compound flammability rating: UL 94V-0
- ◆ Marking : Marking code + dot matrix date code
- ◆ Packaging : Tape and Reel

**Applications**

- ◆ HDMI 1.3 and HDMI 1.4
- ◆ USB 2.0
- ◆ MHL
- ◆ LVDS Interfaces
- ◆ FM Antenna
- ◆ PCI Express
- ◆ eSATA Interfaces

**Dimensions**

**Circuit Diagram**


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

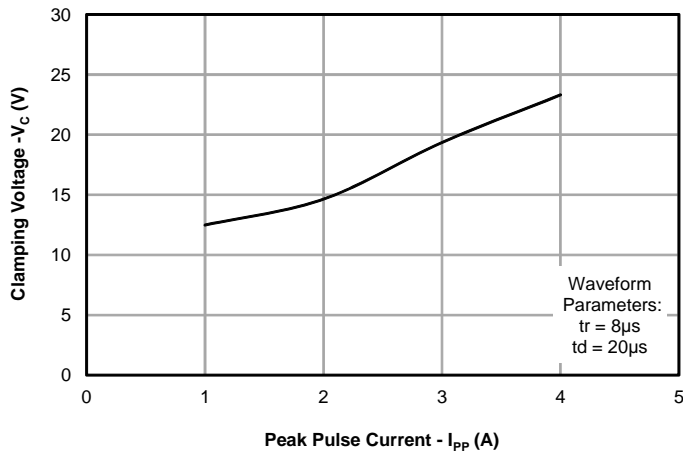
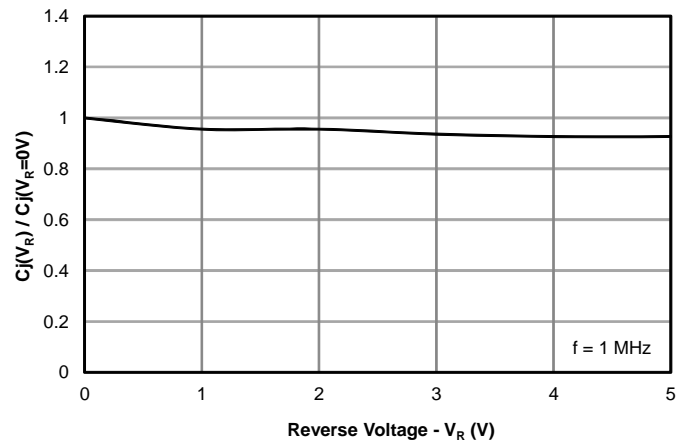
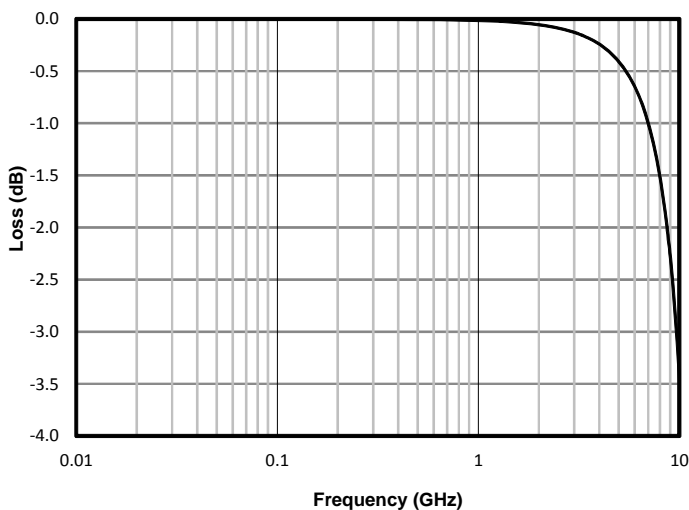
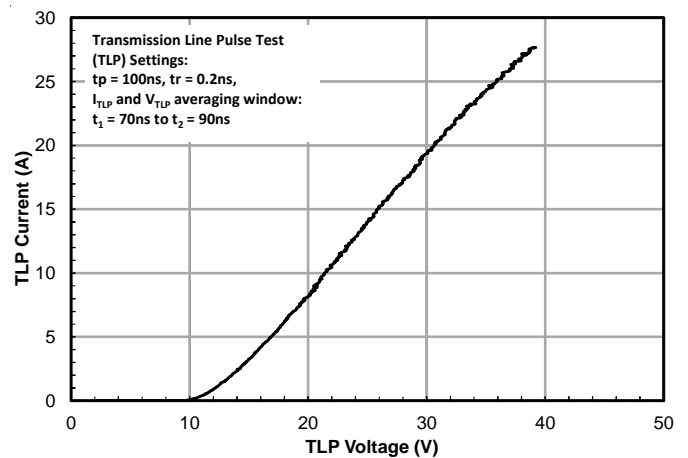
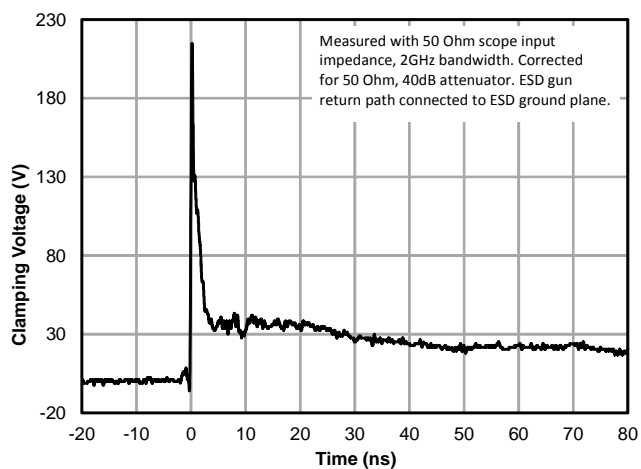
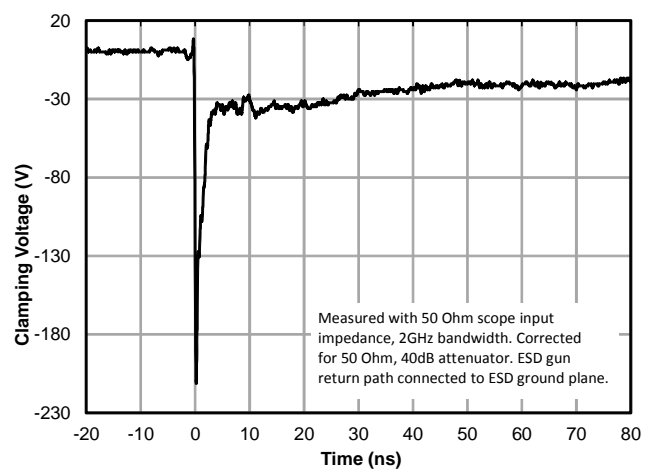
Rating	Symbol	Value	Units
Peak Pulse Power (tp = 8/20μs)	Ppk	100	Watts
Peak Pulse Current (tp = 8/20μs)	IPP	4	A
ESD per IEC 61000-4-2 (Air) <sup>1</sup> ESD per IEC 61000-4-2 (Contact) <sup>1</sup>	V <sub>ESD</sub>	+/- 25 +/- 17	kV
Operating Temperature	T <sub>J</sub>	-55 to +125	°C
Storage Temperature	T <sub>STG</sub>	-55 to +150	°C

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

Parameter	Symbol	Conditions	Minimum	Typical	Maximum	Units
Reverse Stand-Off Voltage	V <sub>RWM</sub>				5	V
Reverse Breakdown Voltage	V <sub>BR</sub>	I <sub>t</sub> = 1mA	6	9.3	11	V
Reverse Leakage Current	I <sub>R</sub>	V <sub>RWM</sub> = 5V, T=25 °C		0.005	0.100	μA
Clamping Voltage	V <sub>C</sub>	I <sub>PP</sub> = 1A, tp = 8/20μs			15	V
Clamping Voltage	V <sub>C</sub>	I <sub>PP</sub> = 4A, tp = 8/20μs			25	V
Dynamic Resistance <sup>2, 3, 4</sup>	R <sub>D</sub>	tp = 100ns		0.90		Ohms
Junction Capacitance	C <sub>J</sub>	V <sub>R</sub> = 0V, f = 1MHz		0.35	0.50	pF

**Notes**

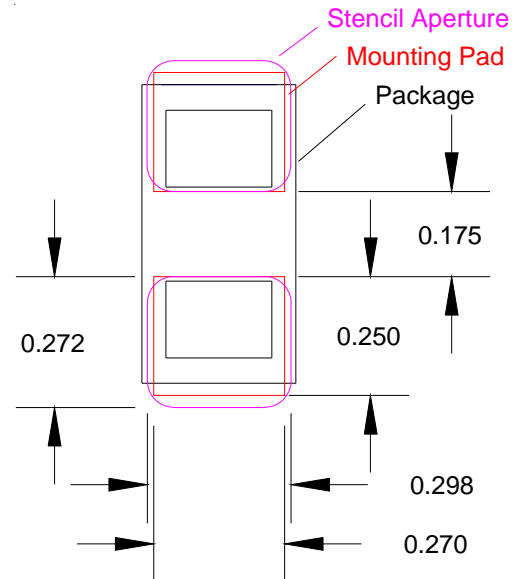
- 1)ESD gun return path connected to ESD ground reference plane.
- 2)Transmission Line Pulse Test (TLP) Settings: t<sub>p</sub> = 100ns, t<sub>r</sub> = 0.2ns, I<sub>TLP</sub> and V<sub>TLP</sub> averaging window: t<sub>1</sub> = 70ns to t<sub>2</sub> = 90ns.
- 3) Dynamic resistance calculated from I<sub>TLP</sub> = 4A to I<sub>TLP</sub> = 16A
- 4)Guaranteed by design. Not production tested

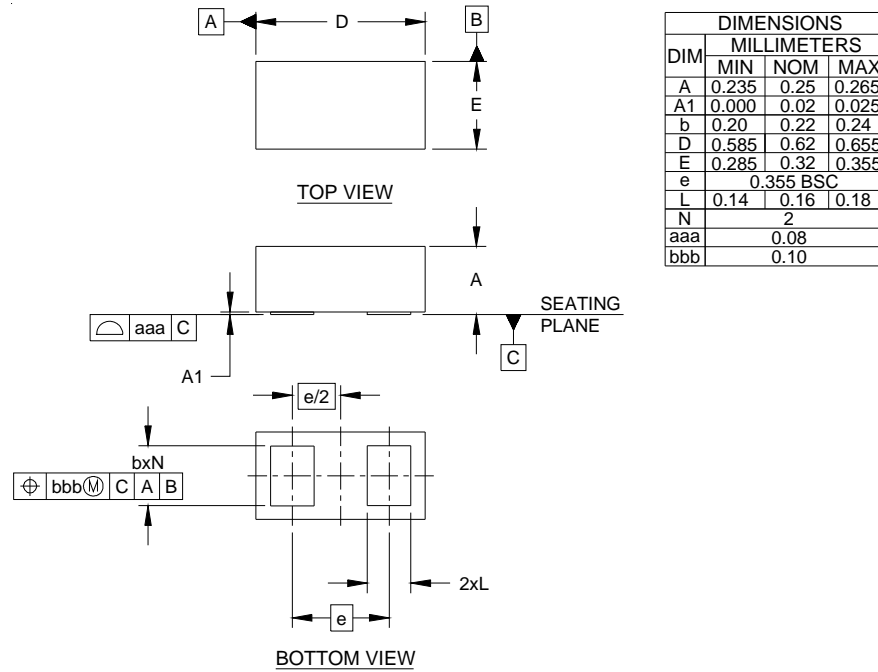
**PROTECTION PRODUCTS**
**Typical Characteristics**
**Clamping Voltage vs. Peak Pulse Current**

**Typical Capacitance vs. Reverse Voltage**

**Typical Insertion Loss (S21)**

**TLP Characteristic**

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

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


**PROTECTION PRODUCTS**
**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

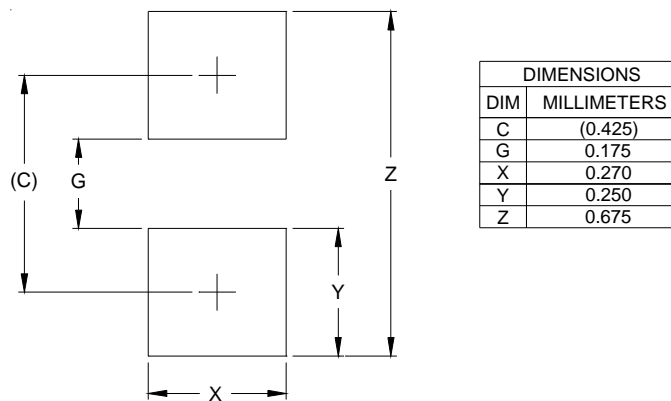
**Recommended Mounting Pattern**


**PROTECTION PRODUCTS**
**Outline Drawing - SLP0603P2X3**


DIM	DIMENSIONS MILLIMETERS		
	MIN	NOM	MAX
A	0.235	0.25	0.265
A1	0.000	0.02	0.025
b	0.20	0.22	0.24
D	0.585	0.62	0.655
E	0.285	0.32	0.355
e	0.355 BSC		
L	0.14	0.16	0.18
N	2		
aaa	0.08		
bbb	0.10		

**NOTES:**

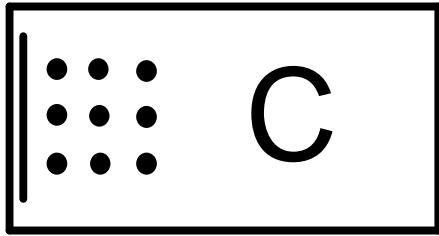
1. CONTROLLING DIMENSIONS ARE IN MILLIMETERS (ANGLES IN DEGREES).

**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 Codes



### Ordering Information

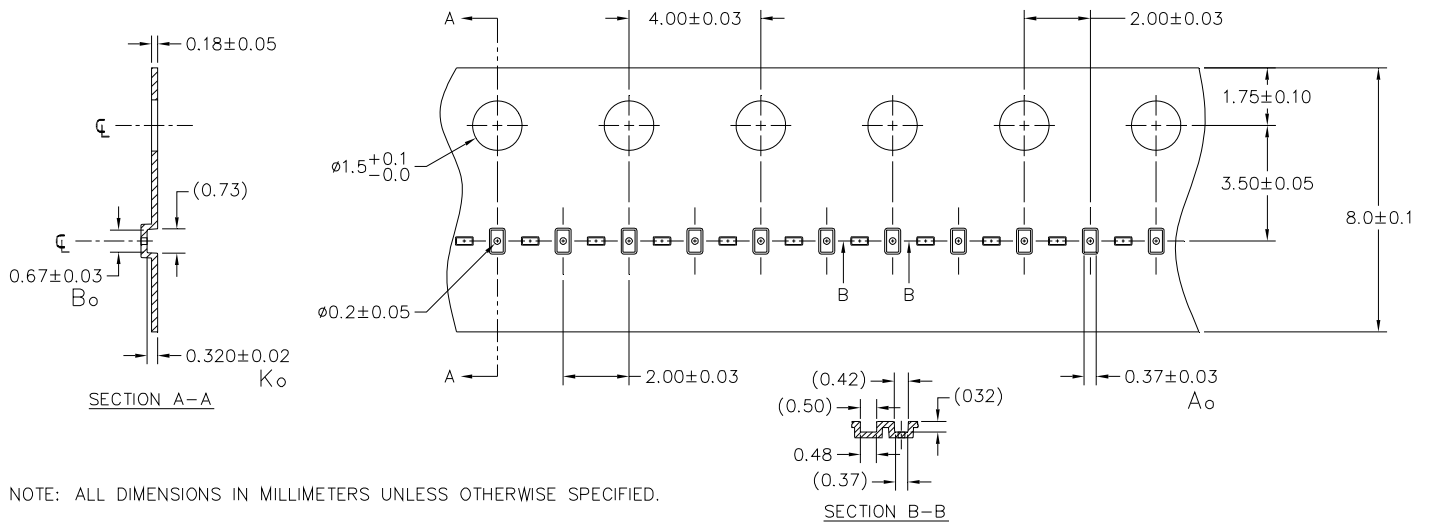
Part Number	Qty per Reel	Reel Size
RClamp0521Z.TNT	10,000	7 Inch

RailClamp and RClamp are trademarks of Semtech Corporation.

#### Notes:

- 1) Dots represent date code matrix

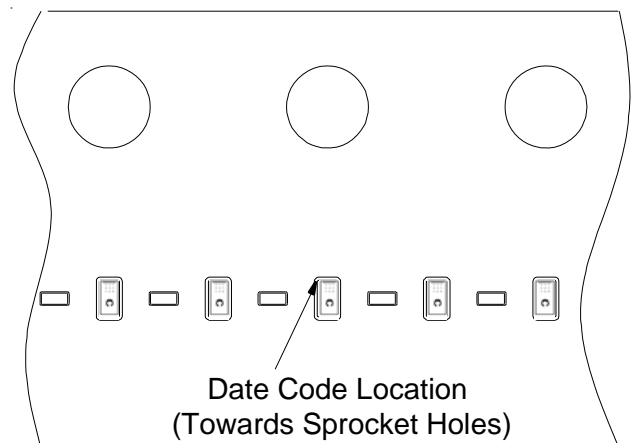
## Carrier Tape Specification



A0	B0	K0
0.37 +/-0.03 mm	0.67 +/-0.03 mm	0.32 +/-0.02 mm

Note: All dimensions in mm unless otherwise specified

### Device Orientation in Tape



**Contact Information**

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