

#### 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®1821Z has a maximum capacitance of only 0.8pF. This allows it to be used on circuits operating in excess of 3GHz without signal attenuation.

RClamp1821Z is in a 2-pin SLP0603P2X3B 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 18 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: **+/-15kV** (Contact), **+/-18kV** (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: <5nA typical (VR=18V)
- ◆ Working voltage: +/- 18V
- ◆ Low capacitance: 0.8pF Maximum
- ◆ Solid-state silicon-avalanche technology

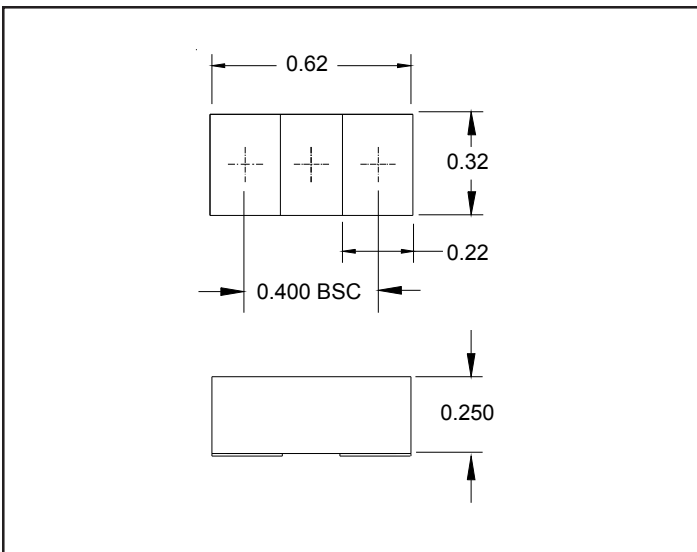
#### Mechanical Characteristics

- ◆ SLP0603P2X3B 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

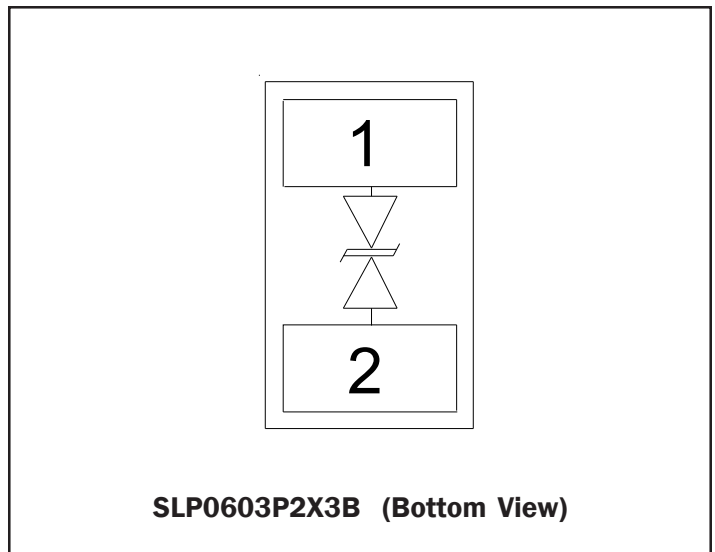
#### Applications

- ◆ Cellular Handsets & Accessories
- ◆ Near Field Communication (NFC) lines
- ◆ RF signal lines
- ◆ FM Antenna
- ◆ Digital Lines
- ◆ USB VBus

#### Nominal Dimensions



#### Schematic



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

Rating	Symbol	Value	Units
Peak Pulse Power (tp = 8/20μs)	$P_{pk}$	85	Watts
Maximum Peak Pulse Current (tp = 8/20μs)	$I_{pp}$	2.5	Amps
ESD per IEC 61000-4-2 (Air) <sup>1</sup> ESD per IEC 61000-4-2 (Contact) <sup>1</sup>	$V_{ESD}$	+/- 18 +/- 15	kV
Operating Temperature	$T_J$	-55 to +125	°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	$V_{RWM}$	Pin 1 to 2 or 2 to 1			18	V
Reverse Breakdown Voltage	$V_{BR}$	$I_t = 1mA$ Pin 1 to 2 or 2 to 1	20	22	24	V
Reverse Leakage Current	$I_R$	$V_{RWM} = 18V, T=25°C$ Pin 1 to 2 or 2 to 1		5	50	nA
Clamping Voltage	$V_C$	$I_{pp} = 2.5A, tp = 8/20μs$ Pin 1 to 2 or 2 to 1			34	V
ESD Clamping Voltage <sup>2</sup>	$V_C$	IPP = 4A, tIp = 0.2/100ns		30		V
ESD Clamping Voltage <sup>2</sup>	$V_C$	IPP = 16A, tIp = 0.2/100ns		48		V
Dynamic Resistance <sup>2, 3</sup>	$R_D$	tp = 100ns		1.5		Ohms
Junction Capacitance	$C_j$	$V_R = 0V, f = 1MHz$		0.63	0.8	pF

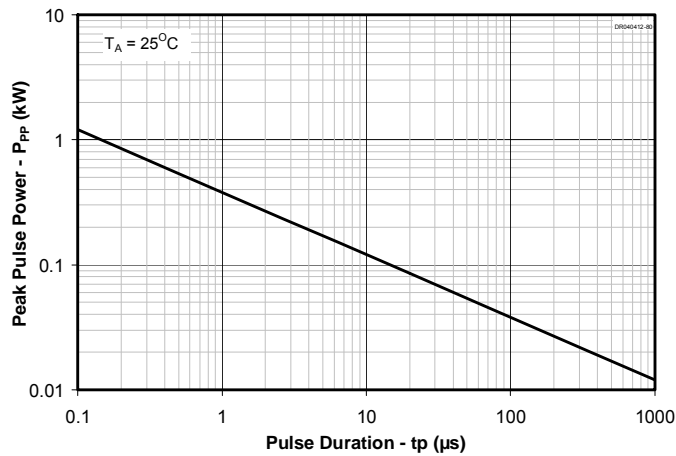
**Notes**

- 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  $I_{TLP} = 16A$

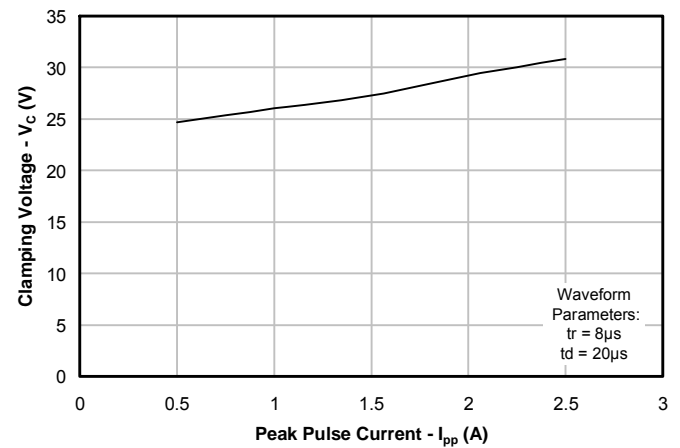
## PROTECTION PRODUCTS

### Typical Characteristics

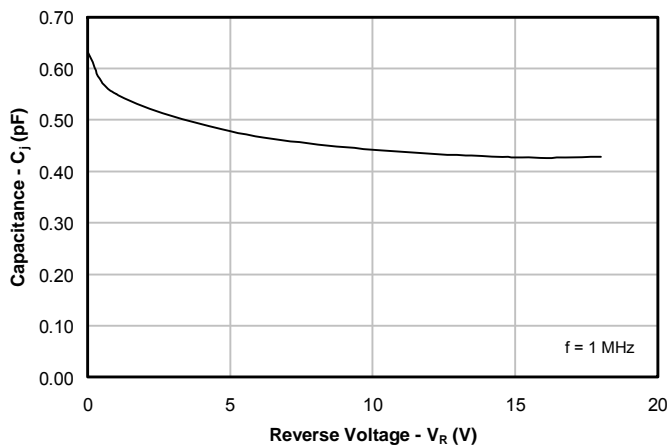
**Non-Repetitive Peak Pulse Power vs. Pulse Time**



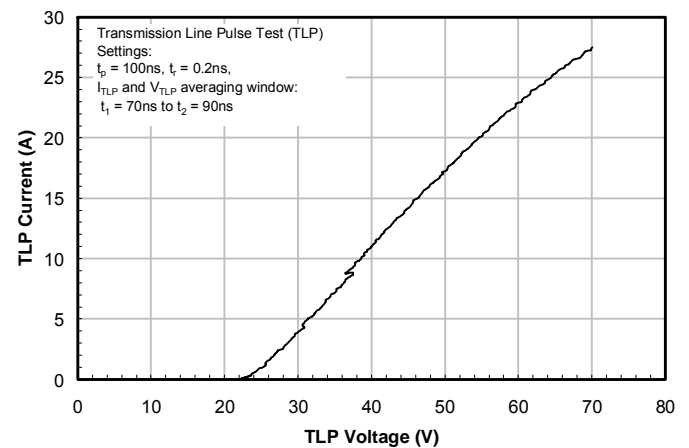
**Clamping Voltage vs. Peak Pulse Current (t<sub>p</sub>=8/20μs)**



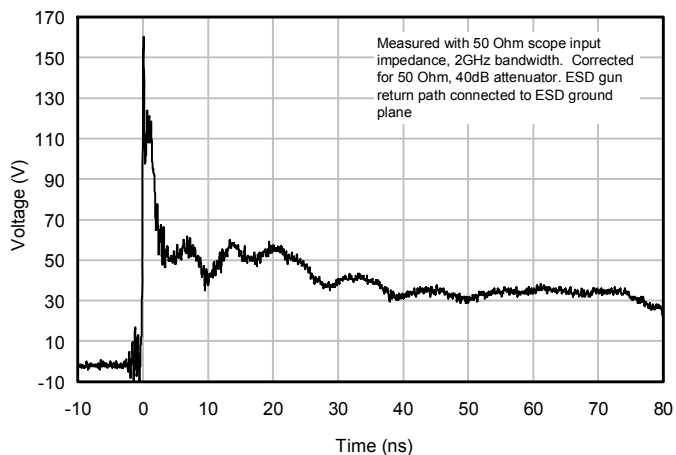
**Junction Capacitance vs. Reverse Voltage**



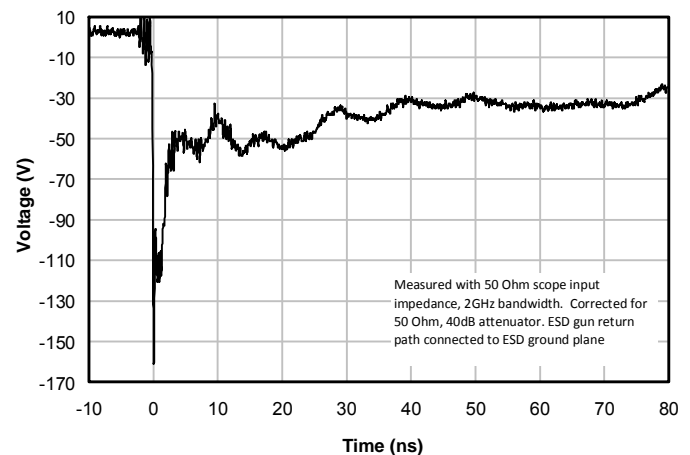
**TLP Characteristic**



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



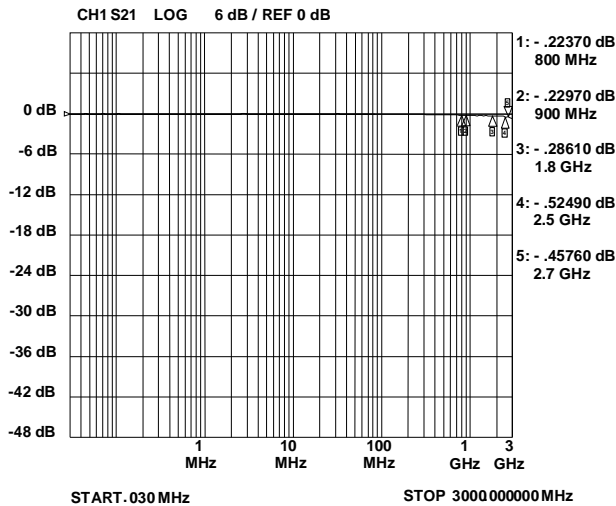
**ESD Clamping (-8kV Contact per IEC 61000-4-2)**



## PROTECTION PRODUCTS

### Typical Characteristics

**Typical Insertion Loss S21**

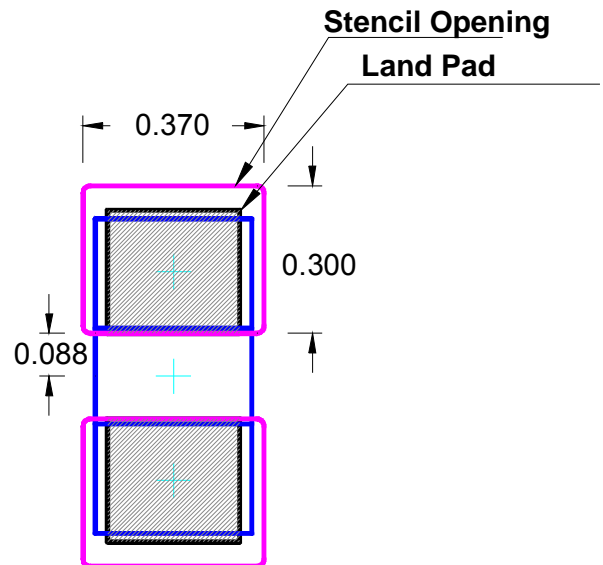


## Applications Information

### 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



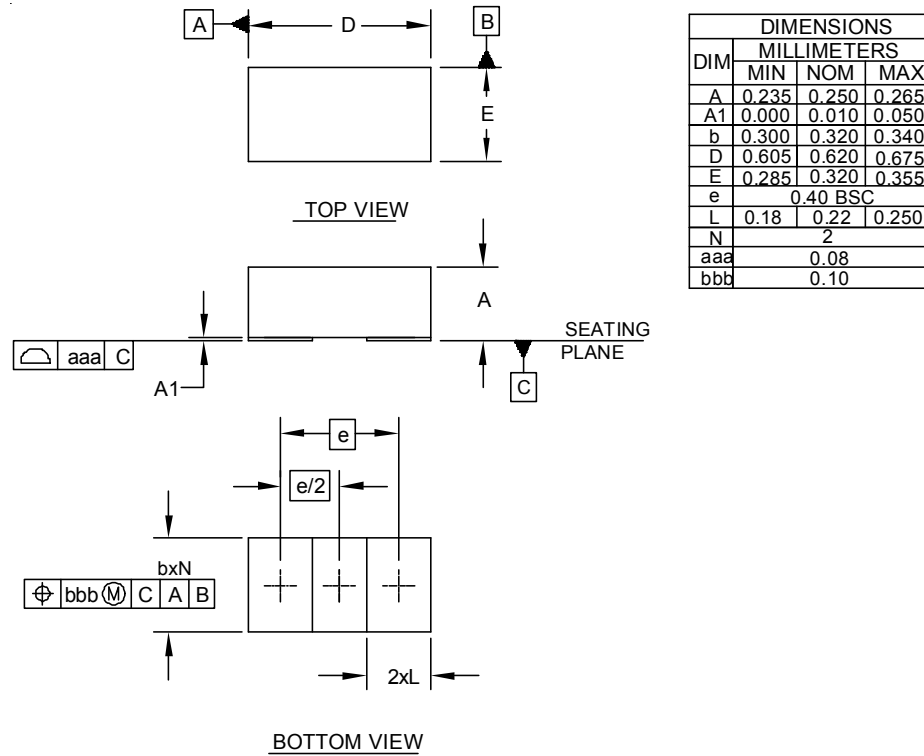
All Dimensions are in mm.

Land Pad. Stencil opening Component

### Recommended Stencil Design

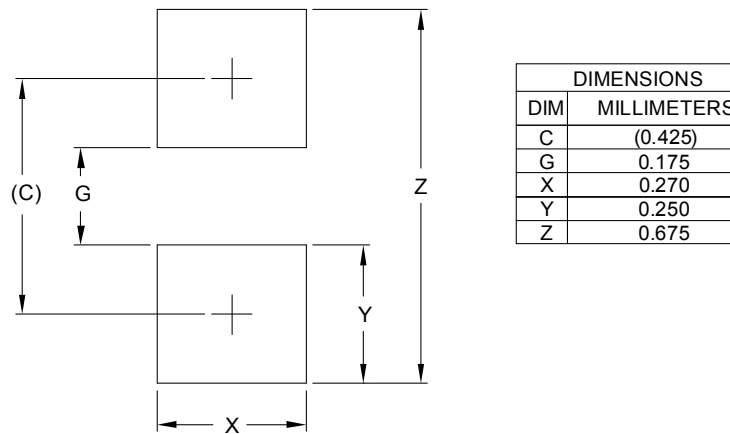
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Outline Drawing - SLP0603P2X3B



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

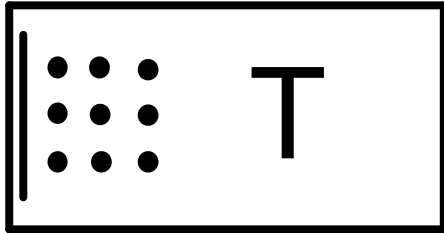
Land Pattern - SLP0603P2X3B



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



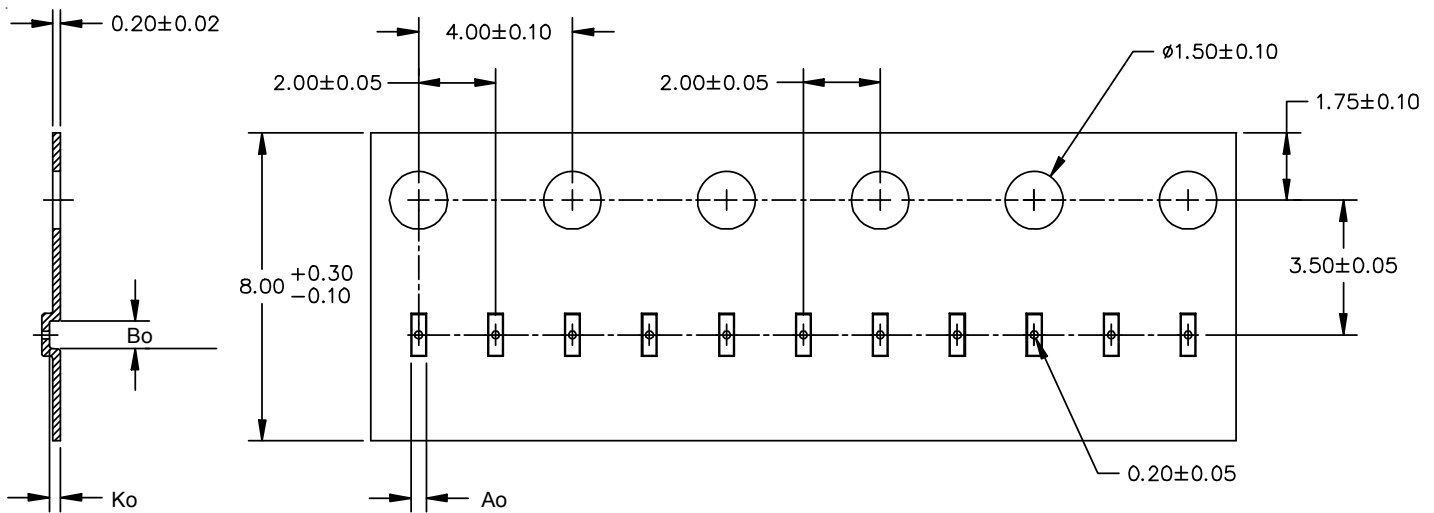
### Ordering Information

Part Number	Qty per Reel	Reel Size
RClamp1821Z.TNT	10,000	7 Inch

Notes:  
RailClamp and RClamp are trademarks of Semtech Corporation

Notes:  
1) Dots represent date code matrix and Pin 1 location

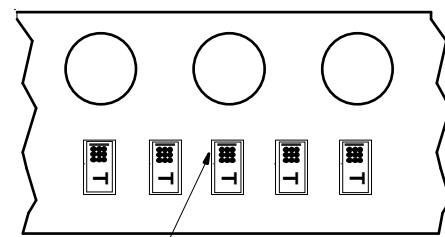
### Carrier Tape Specification



A0	B0	K0
0.40 +/-0.05 mm	0.71 +/-0.05 mm	0.29 +/-0.05 mm

Note: All dimensions in mm unless otherwise specified

### Device Orientation in Tape



PIN 1 Location  
(Towards Sprocket Holes)

**Contact Information**

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