RClamp0531Z
Ultra Small RClamp®
1-Line ESD protection

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.

The RClamp®0531Z has a typical capacitance of only 0.30pF. This allows it to be used on circuits operating in excess of 5GHz without signal attenuation.

The RClamp0531Z is in a 2-pin SLP0603P2X3B package. It measures 0.6 x 0.3 mm with a nominal height of only 0.25mm. The 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 RF modules.

Features

- High ESD withstand Voltage: **+/-12kV** (Contact) and **+/- 15kV** (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: <5nA typical (VR=5V)
- Working voltage: +/- 5V
- Low capacitance: 0.30pF typical
- Dynamic resistance: 0.67 Ohm (Typ)
- Solid-state silicon-avalanche technology

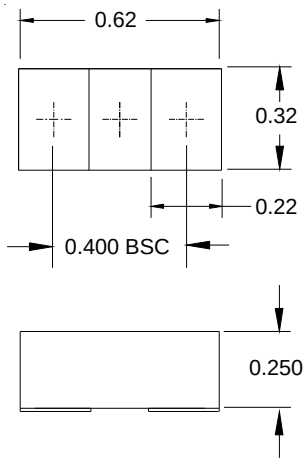
Mechanical Characteristics

- 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

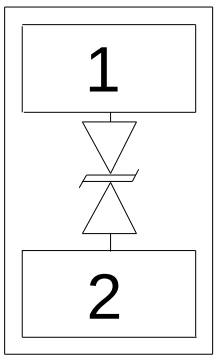
- RF Antenna and Modules
- FM Antenna
- USB 2.0
- MHL
- GPS

Dimensions



Nominal Dimensions (mm)

Circuit Diagram



SLP0603P2X3B (Bottom View)

Absolute Maximum Rating

Rating	Symbol	Value	Units
Peak Pulse Power (tp = 8/20µs)	Ppk	60	Watts
Peak Pulse Current (tp = 8/20µs)	IPP	3	A
ESD per IEC 61000-4-2 (Air)[1] ESD per IEC 61000-4-2 (Contact)[1]	V_{ESD}	+/- 15 +/- 12	kV
Operating Temperature	T_J	-55 to +125	°C
Storage Temperature	T_{STG}	-55 to +150	°C

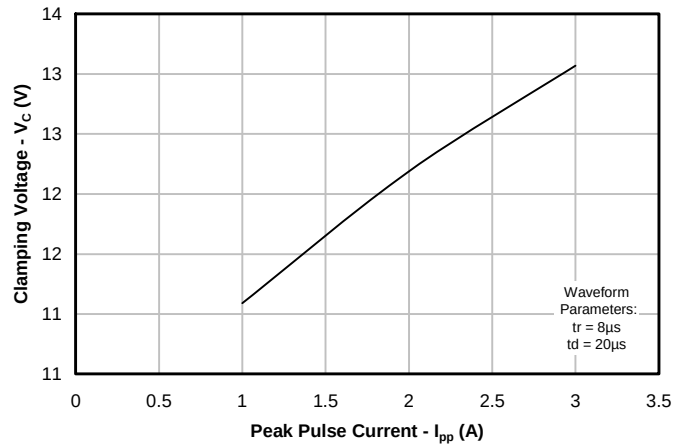
Electrical Characteristics (T=25°C)

Parameter	Symbol	Conditions	Minimum	Typical	Maximum	Units
Reverse Stand-Off Voltage	V_{RWM}	Pin 1 to 2 or 2 to 1			5	V
Reverse Breakdown Voltage	V_{BR}	I_t = 1mA Pin 1 to 2 or 2 to 1	7	9	11	V
Reverse Leakage Current	I_R	V_{RWM} = 5V, T=25°C Pin 1 to 2 or 2 to 1		5	20	nA
Clamping Voltage	V_C	I_{PP} = 1A, tp = 8/20µs Pin 1 to 2 or 2 to 1			15	V
Clamping Voltage	V_C	I_{PP} = 3A, tp = 8/20µs Pin 1 to 2 or 2 to 1			20	V
ESD Clamping Voltage[2]	V_C	IPP = 4A, tlp = 0.2/100ns		13		V
ESD Clamping Voltage[2]	V_C	IPP = 16A, tlp = 0.2/100ns		21		V
Dynamic Resistance[2, 3]	R_D	tp = 100ns		0.67		Ohms
Junction Capacitance	C_j	V_R = 0V to 5V, f = 1MHz		0.30	0.40	pF
Junction Capacitance[4]	C_j	V_R = 0V to 5V, f = 1GHz			0.40	pF
Change in Capacitance Over V_R[4]	ΔC_{jVR}	V_R = 0V to 5V, f = 1MHz			0.040	pF

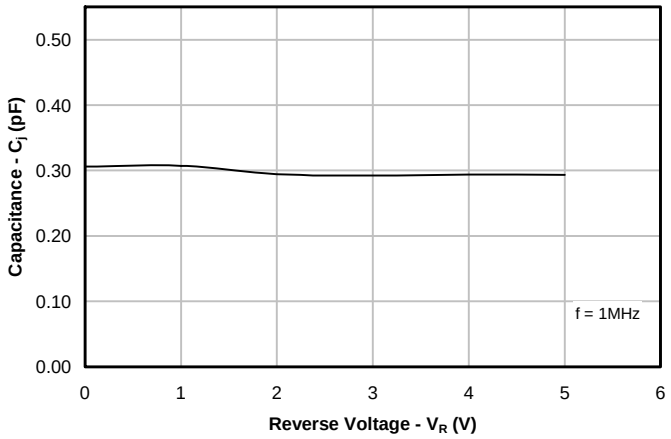
Notes
1)ESD gun return path connected to ESD ground reference plane.
2)Transmission Line Pulse Test (TLP) Settings: t_p = 100ns, t_r = 0.2ns, I_{TLP} and V_{TLP} averaging window: t_1 = 70ns to t_2 = 90ns.
3) Dynamic resistance calculated from I_{TLP} = 4A to I_{TLP} = 16A
4)Guaranteed by design. Not production tested

Typical Characteristics

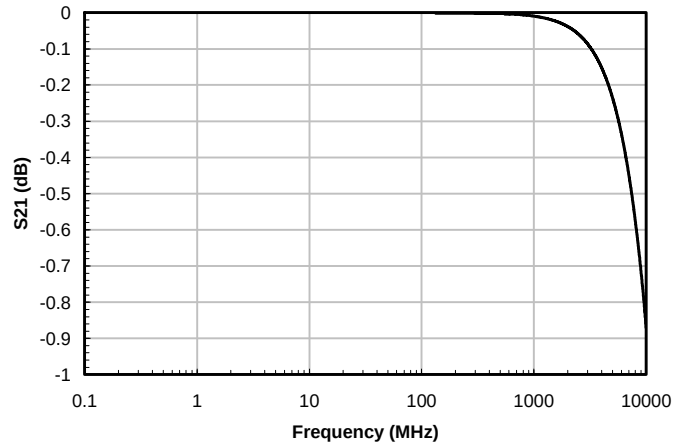
Clamping Voltage vs. Peak Pulse Current



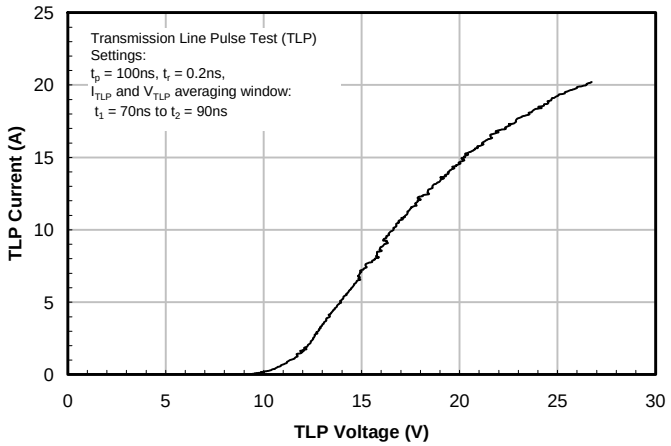
Junction Capacitance vs. Reverse Voltage



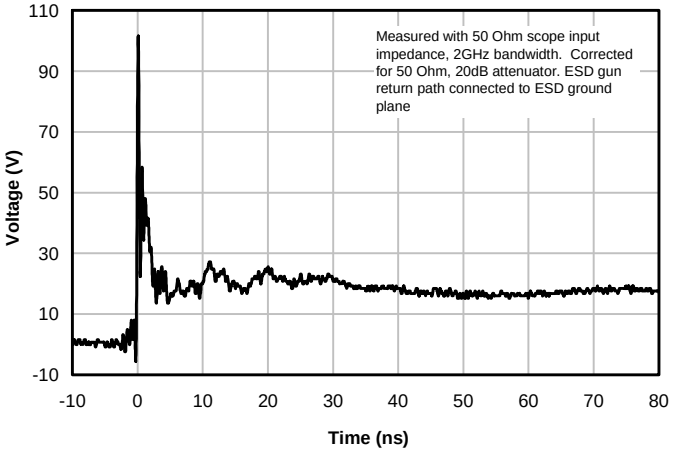
Typical Insertion Loss (S21)



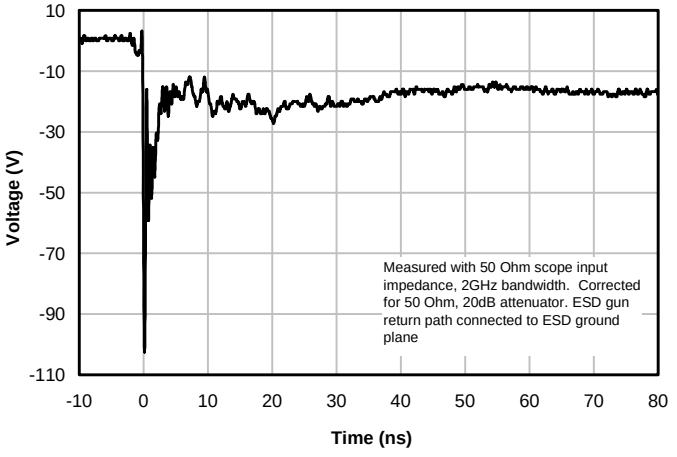
TLP Characteristic



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



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

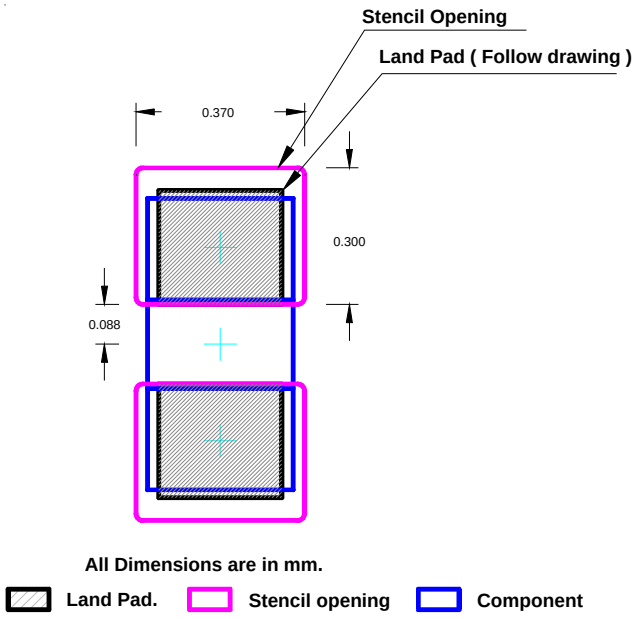


Applications Information

Assembly Guidelines

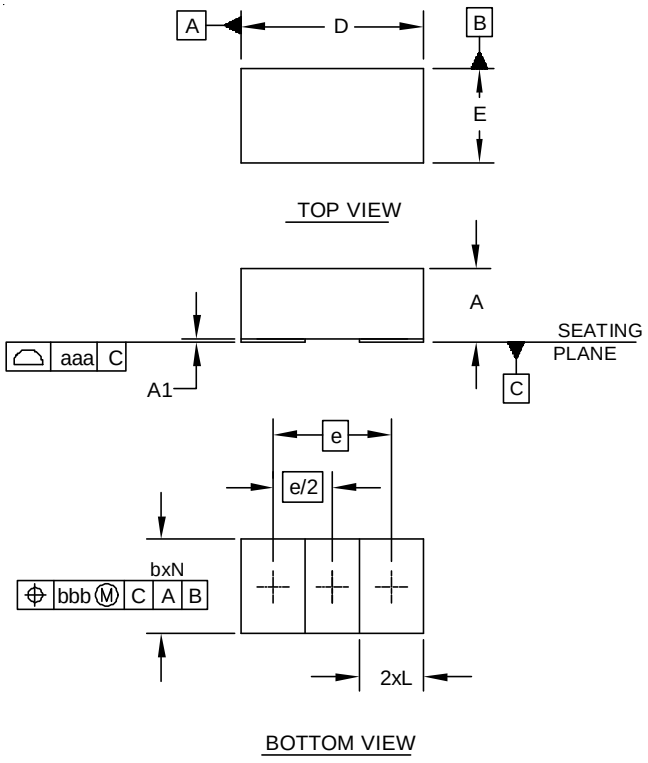
The small size of this device means that some care must be taken during the mounting process to insure reliable solder joint. The table below provides Semtech's recommended assembly guidelines for mounting this device. The figure at the right details Semtech's recommended aperture based on the below 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

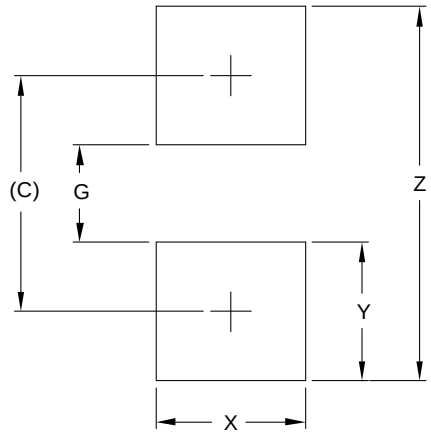
Outline Drawing - SLP0603P2X3B



DIM	DIMENSIONS MILLIMETERS		
	MIN	NOM	MAX
A	0.235	0.250	0.265
A1	0.000	0.010	0.050
b	0.300	0.320	0.340
D	0.605	0.620	0.675
E	0.285	0.320	0.355
e	0.40 BSC		
L	0.18	0.22	0.250
N	2		
aaa	0.08		
bbb	0.10		

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

Land Pattern - SLP0603P2X3B

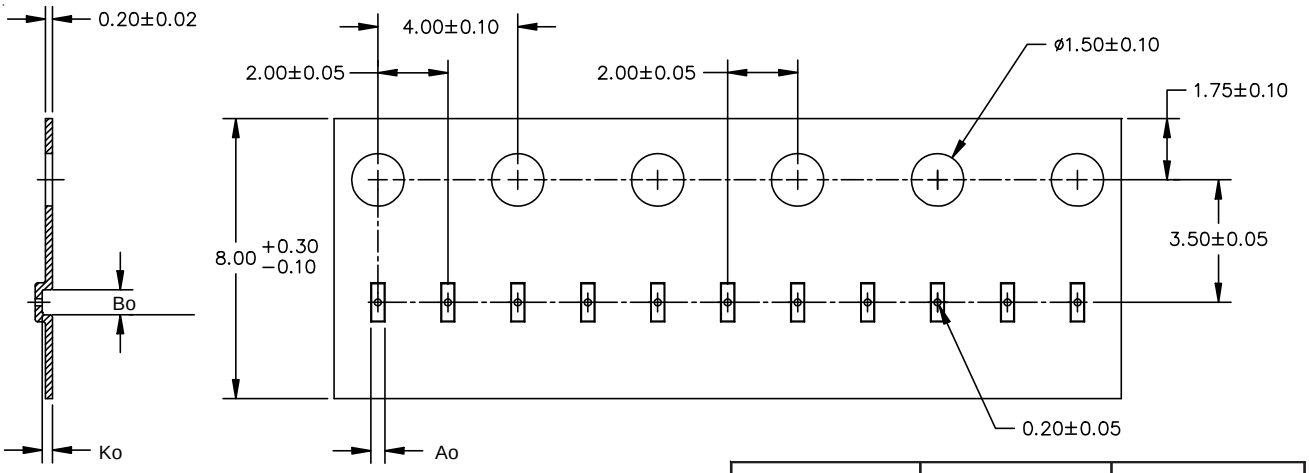


DIM	DIMENSIONS MILLIMETERS
C	(0.425)
G	0.175
X	0.270
Y	0.250
Z	0.675

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.

Carrier Tape Specification

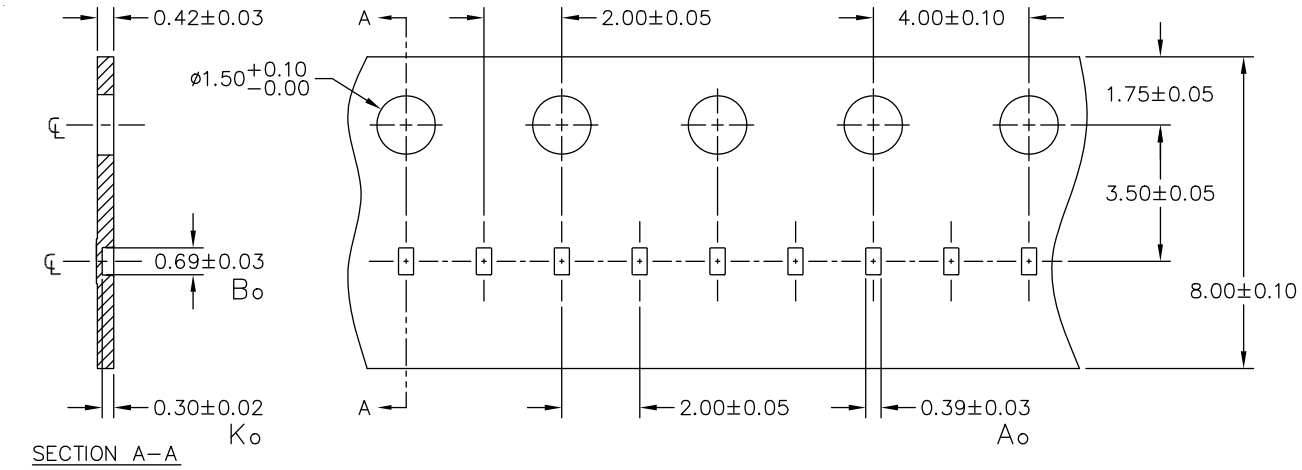
Plastic Tape



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

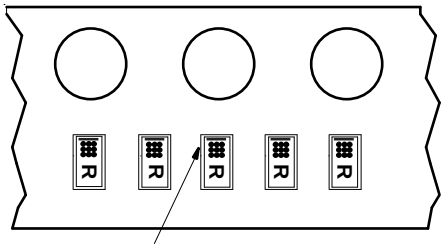
Note: All dimensions in mm unless otherwise specified

Paper Tape



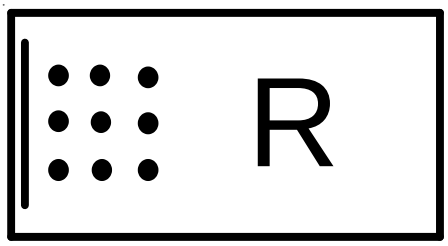
NOTES: ALL DIMENSIONS IN MILLIMETERS UNLESS OTHERWISE SPECIFIED.

Device Orientation in Tape



PIN 1 Location
(Towards Sprocket Holes)

Marking Codes



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

Ordering Information

Ordering Number	Qty per Reel	Carrier Tape	Reel Size	Comments
RClamp0531Z.TNT	10,000	Plastic	7 Inch	Not recommended for new designs
RClamp0531Z.TFT	15,000	Paper	7 Inch	

RailClamp and RClamp are trademarks of Semtech Corporation.

Contact Information

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