

### PROTECTION PRODUCTS - $\mu$ Clamp<sup>®</sup>

#### Description

RClamp<sup>®</sup>7534P is a high performance TVS array aimed at simultaneously protecting 4 signal lines from overvoltage events caused by ESD, CDE (Cable Discharge Events) and EFT (electrical fast transients). RClamp7534P features an extremely low max capacitance of 0.19pF (Typical) and is designed to protect high speed interfaces such as HDMI 2.0, 10-gigabit Ethernet, and USB 3.0.

RClamp7534P is a bi-directional device designed to provide extremely low clamping voltage for both positive and negative ESD pulses. With a typical dynamic resistance of 1.0 Ohm, the RClamp7534P turns on quickly during overvoltage events to protect sensitive systems.

RClamp7534P is in a 5-pin SGP2010N5 package measuring 2.0 x 1.0mm with a nominal height of 0.50mm. The leads have a nominal pin-to-pin pitch of 0.40mm. Flow-through package design simplifies PCB layout and maintains signal integrity on high-speed lines.

The combination of low peak ESD clamping, low dynamic resistance, and innovative package design enables this device to provide the highest level of ESD protection.

#### Features

- ◆ ESD protection for high-speed data lines to **IEC 61000-4-2 (ESD)  $\pm 25\text{kV}$  (air),  $\pm 20\text{kV}$  (contact)**
- ◆ **IEC 61000-4-5 (Lightning) 4A (8/20 $\mu$ s)**
- ◆ **IEC 61000-4-4 (EFT) 40A (5/50ns)**
- ◆ Package design optimized for high speed lines
- ◆ Protects four high-speed lines
- ◆ Low capacitance: 0.19pF Typical (I/O to Ground)
- ◆ Low ESD clamping voltage
- ◆ Low dynamic resistance: 1.0 Ohm (Typ)
- ◆ Low leakage current
- ◆ Solid-state silicon-avalanche technology

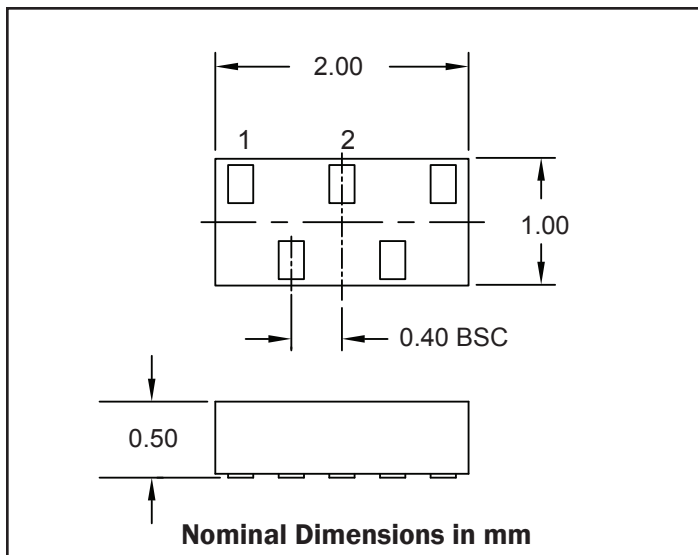
#### Mechanical Characteristics

- ◆ SGP2010N5 5-pin package (2.0 x 1.0 x 0.50mm)
- ◆ Pb-Free, Halogen Free, RoHS/WEEE Compliant
- ◆ Lead Finish: NiPdAu
- ◆ Marking: Marking code
- ◆ Packaging: Tape and Reel

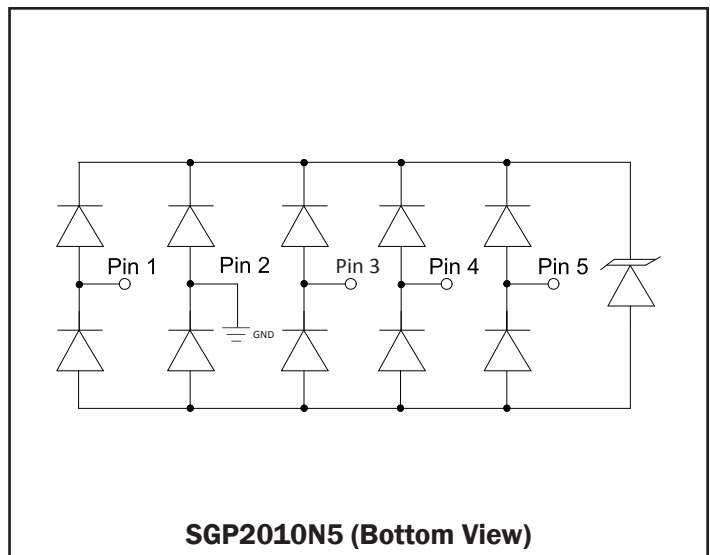
#### Applications

- ◆ HDMI 2.0
- ◆ USB 3.1
- ◆ Display Port 1.2
- ◆ Thunderbolt
- ◆ 10GbE
- ◆ V-By-One
- ◆ MHL

#### Package Dimensions



#### Circuit Diagram



**PROTECTION PRODUCTS**
**Absolute Maximum Ratings**

Rating	Symbol	Value	Units
Peak Pulse Current (tp = 8/20μs)	I <sub>PP</sub>	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 ±20	kV
Operating Temperature	T <sub>J</sub>	-40 to +85	°C
Storage Temperature	T <sub>STG</sub>	-55 to +150	°C

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

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Reverse Stand-Off Voltage	V <sub>RWM</sub>	Any I/O to Ground			5	V
Reverse breakdown Voltage	V <sub>BR</sub>	I <sub>BR</sub> = 1mA Any I/O to Ground	6.5	9.7	11.5	V
Reverse Leakage Current	I <sub>R</sub>	V <sub>RWM</sub> = 5V Any I/O to Ground		5	100	nA
Clamping Voltage	V <sub>C</sub>	I <sub>PP</sub> = 1A, tp = 8/20μs			15	V
		I <sub>PP</sub> = 4A, tp = 8/20μs			25	V
ESD Clamping Voltage <sup>2</sup>	V <sub>C</sub>	I <sub>PP</sub> = 4A tp = 0.2/100ns		14		V
ESD Clamping Voltage <sup>2</sup>	V <sub>C</sub>	I <sub>PP</sub> = 16A tp = 0.2/100ns		24		V
Dynamic Resistance <sup>2,3</sup>	R <sub>DYN</sub>	tp = 100ns		1.0		Ohms
Junction Capacitance	C <sub>J</sub>	I/O pin to GND f = 1MHz		0.19	0.22	pF

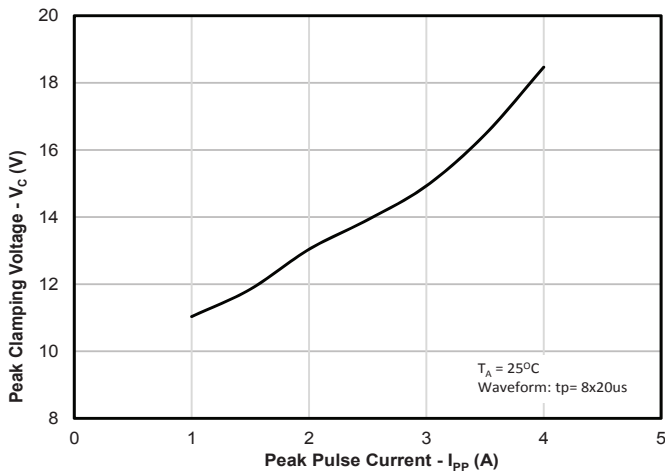
**Notes**

- 1) Measured with a 20dB attenuator, 50 Ohm scope input impedance, 2GHz bandwidth. ESD gun return path connected to ESD ground plane.
- 2) Transmission Line Pulse Test (TLP) Settings: tp = 100ns, tr = 0.2ns, I<sub>TLP</sub> and V<sub>TLP</sub> averaging window: t1 = 70ns to t2 = 90ns.
- 3) Dynamic resistance calculated from I<sub>TLP</sub> = 4A to I<sub>TLP</sub> = 16A

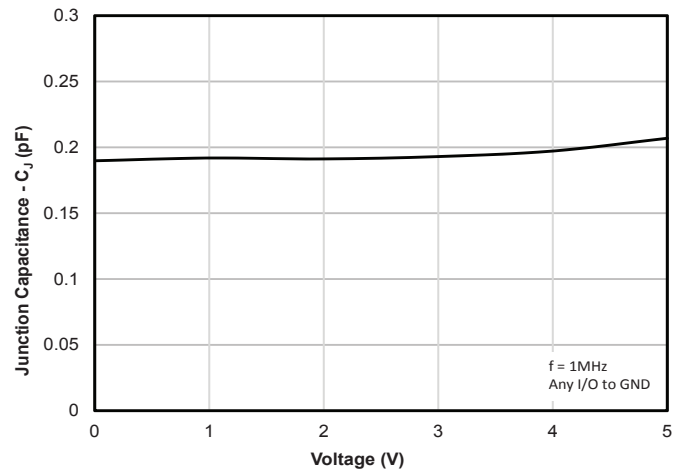
## PROTECTION PRODUCTS

### Typical Characteristics

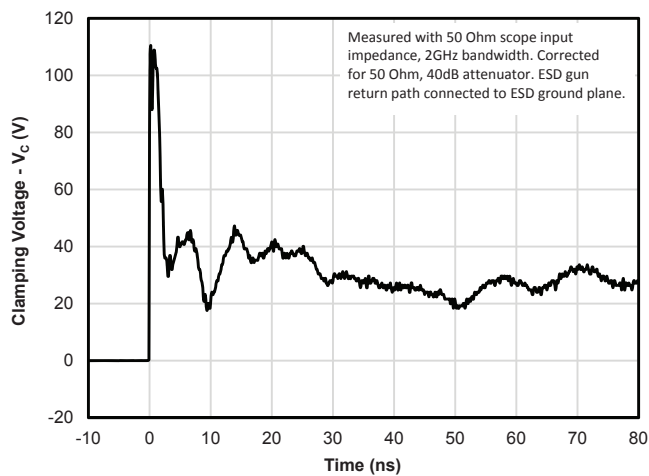
#### Clamping Voltage vs. Peak Pulse Current



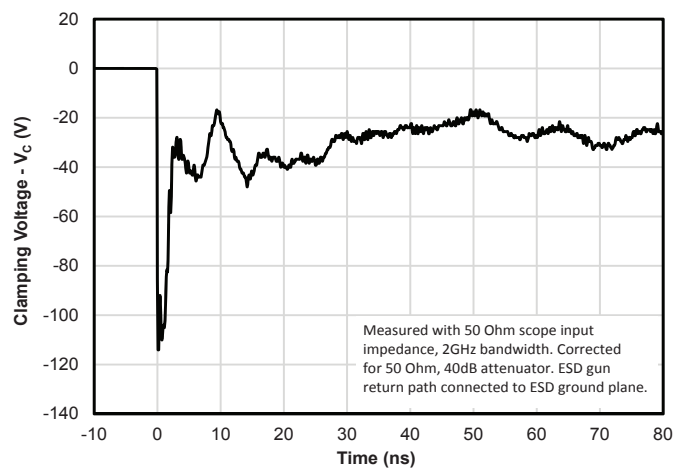
#### Junction Capacitance vs. Reverse Voltage



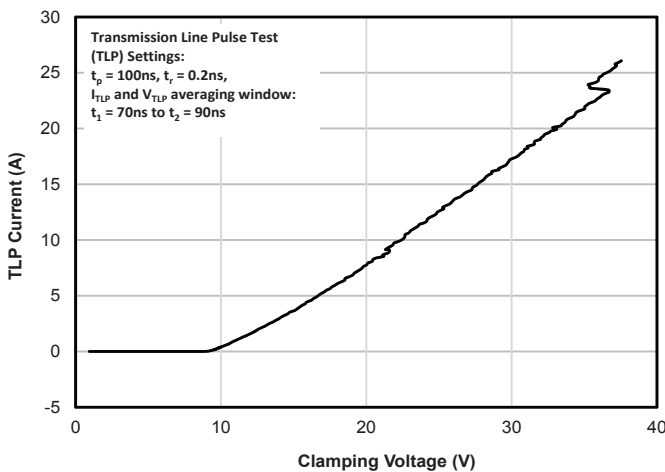
#### ESD Clamping (8kV Contact per IEC 61000-4-2)



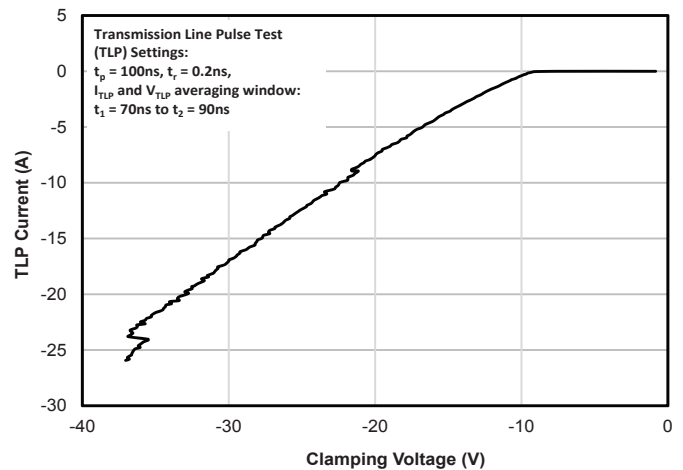
#### ESD Clamping (-8kV Contact per IEC 61000-4-2)



#### TLP Characteristic (Positive Pulse)



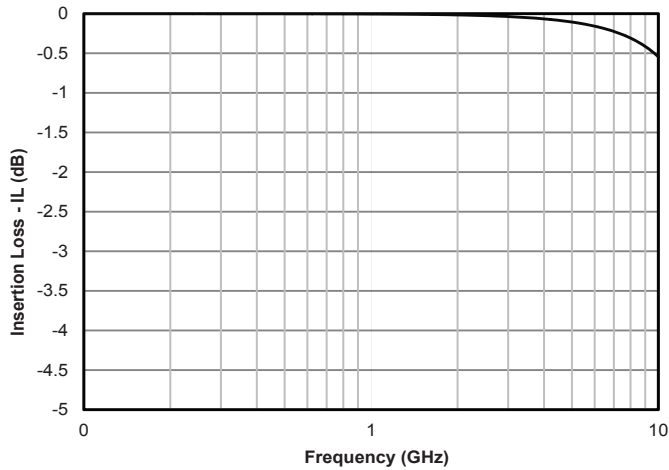
#### TLP Characteristic (Negative Pulse)



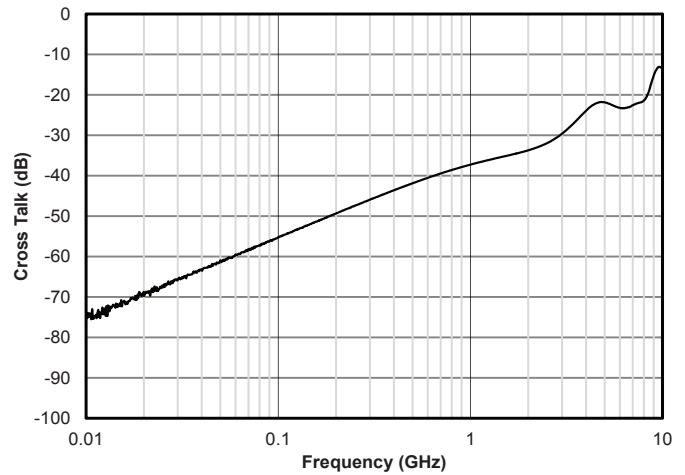
## PROTECTION PRODUCTS

### Typical Characteristics

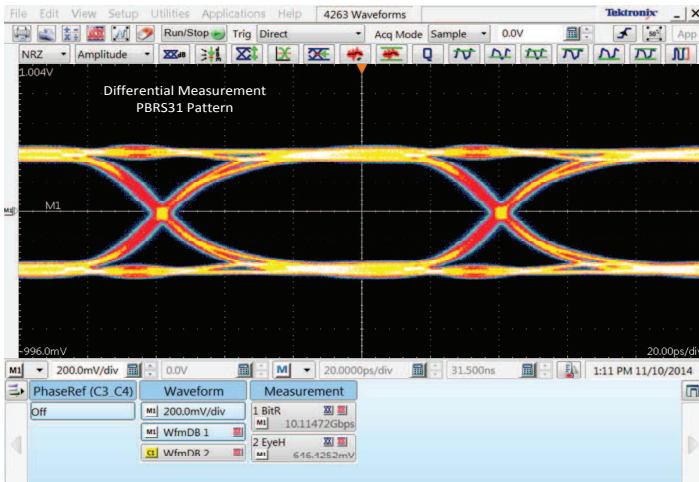
#### Insertion Loss (S21)



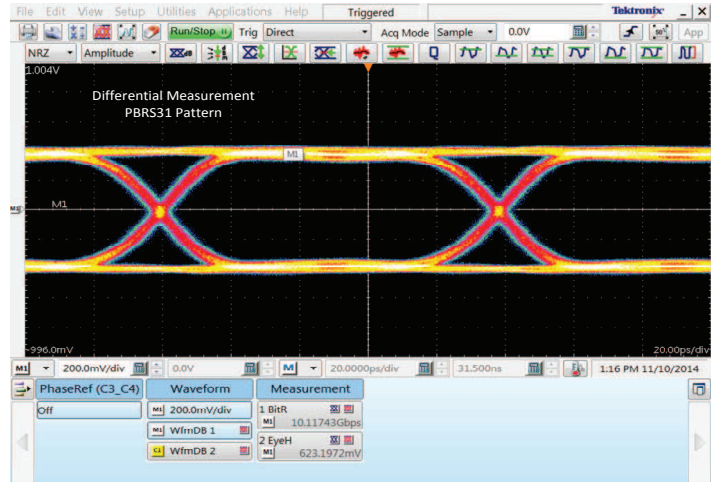
#### Analog Crosstalk



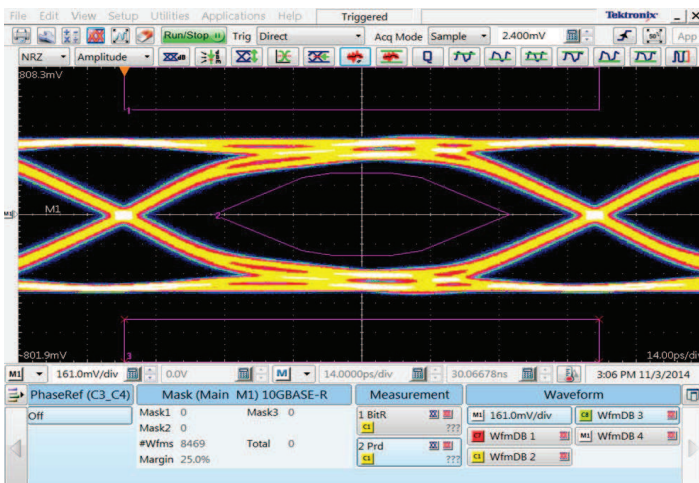
#### 10Gb/s (USB 3.1) Eye Diagram with RClamp7534P



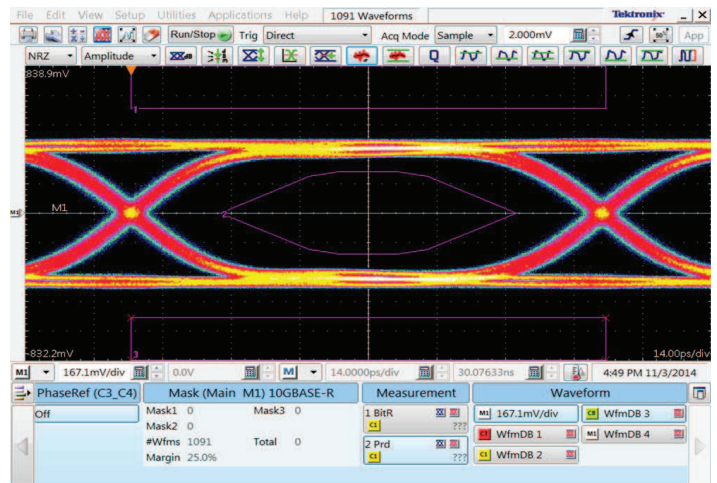
#### 10Gb/s (USB 3.1) Eye Diagram without RClamp7534P



#### 10GbE Eye Diagram with RClamp7534P

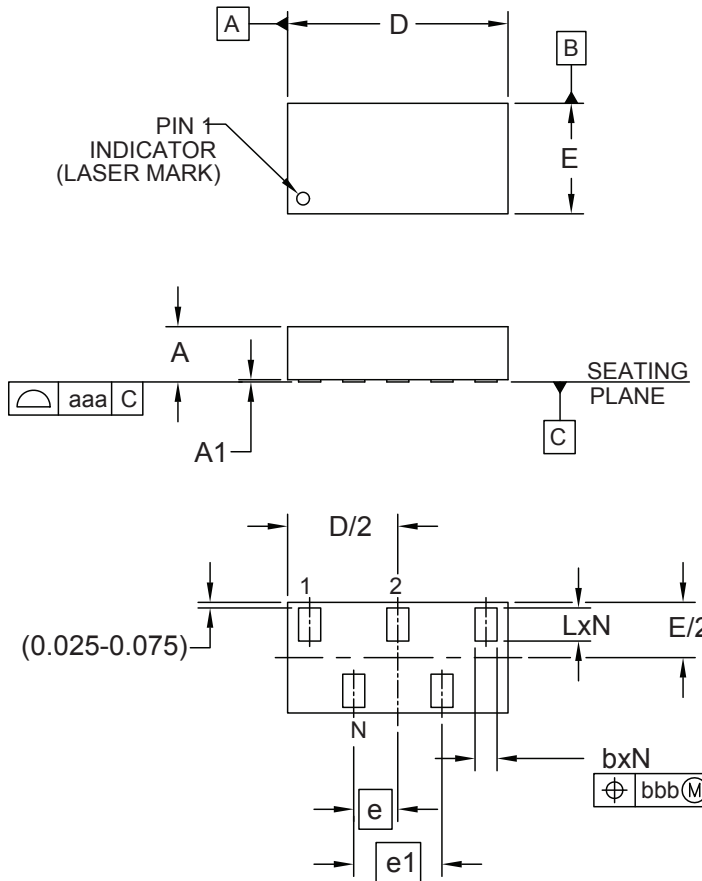


#### 10GbE Eye Diagram without RClamp7534P



PROTECTION PRODUCTS

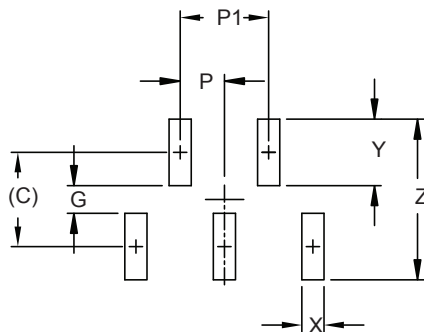
Outline Drawing - SGP2010N5



DIM	MILLIMETERS		
	MIN	NOM	MAX
A	0.45	0.50	0.55
A1	0.00	0.02	0.05
b	0.15	0.20	0.25
D	1.95	2.00	2.08
E	0.95	1.00	1.08
e	0.40 BSC		
e1	0.80 BSC		
L	0.25	0.30	0.35
N	5		
aaa	0.08		
bbb	0.10		

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

Land Pattern - SGP2010N5

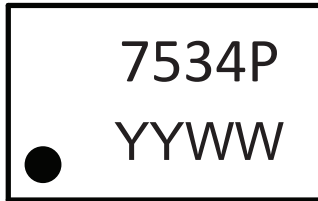


DIM	MILLIMETERS
C	(0.85)
G	0.25
P	0.40
P1	0.80
X	0.20
Y	0.60
Z	1.45

- 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



Notes: Device is Electrically Symmetrical

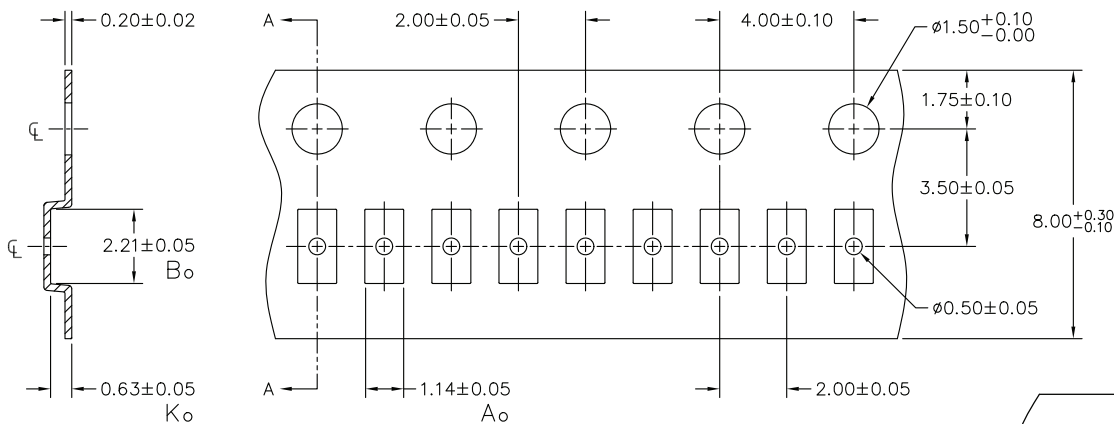
### Ordering Information

Part Number	Qty per Reel	Reel Size
RClamp7534P.TNT	10000	7"

Notes:

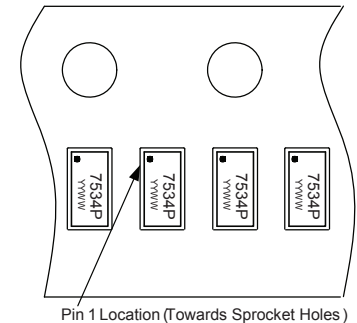
- 1) Lead finish is lead-free NiPdAu.
- 2) RailClamp and RClamp are trademarks of Semtech Corporation.

### Tape and Reel Specification



SECTION A-A

NOTE: ALL DIMENSIONS IN MILLIMETERS UNLESS OTHERWISE SPECIFIED.



Device Orientation in Tape

### Contact Information

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