RClamp7534P
Ultra Low Capacitance RClamp®
4-Line ESD Protection

PROTECTION PRODUCTS - µClamp®

Description

RClamp®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.

RCamp7534P 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) ±25kV (air), ±20kV (contact)
  IEC 61000-4-5 (Lightning) 4A (8/20µs)
  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

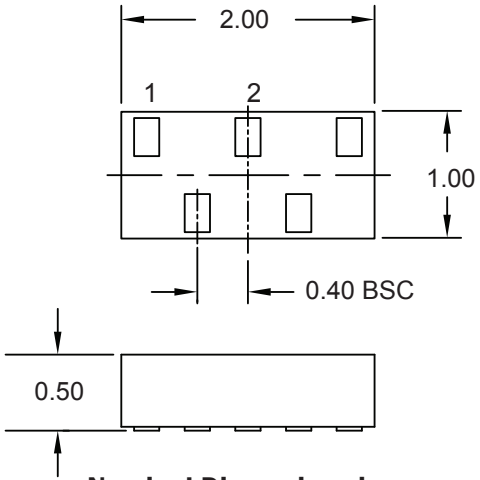
Mechanical Characteristics

- 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

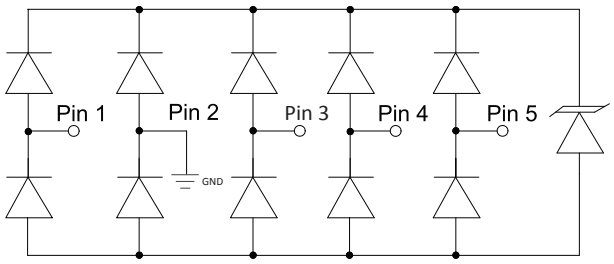
- HDMI 2.0
- USB 3.1
- Display Port 1.2
- Thunderbolt
- 10GbE
- V-By-One
- MHL

Package Dimensions



Nominal Dimensions in mm

Circuit Diagram



SGP2010N5 (Bottom View)

Absolute Maximum Ratings

Rating	Symbol	Value	Units
Peak Pulse Current (tp = 8/20μs)	I_{PP}	4	A
ESD per IEC 61000-4-2 (Air)(1) ESD per IEC 61000-4-2 (Contact)(1)	V_{ESD}	±25 ±20	kV
Operating Temperature	T_J	-40 to +85	°C
Storage Temperature	T_{STG}	-55 to +150	°C

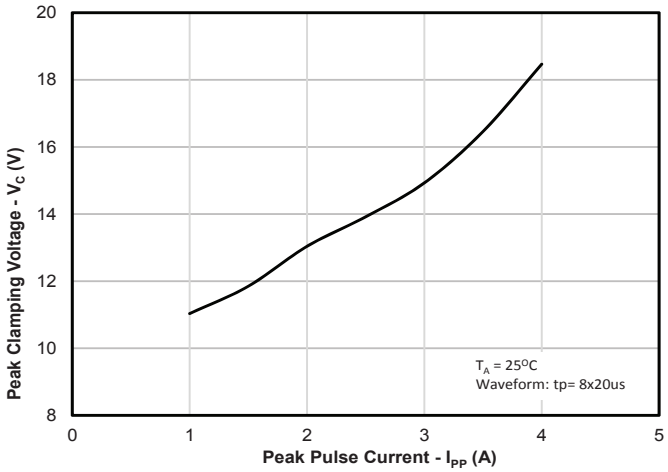
Electrical Characteristics (T=25°C unless otherwise specified)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Units
Reverse Stand-Off Voltage	V_{RWM}	Any I/O to Ground				5	V
Reverse breakdown Voltage	V_{BR}	I_{BR} = 1mA Any I/O to Ground		6.5	9.7	11.5	V
Reverse Leakage Current	I_R	V_{RWM} = 5V Any I/O to Ground			5	100	nA
Clamping Voltage	V_C	I_{PP} = 1A, tp = 8/20μs				15	V
		I_{PP} = 4A, tp = 8/20μs				25	V
ESD Clamping Voltage[2]	V_C	I_{PP} = 4A tp = 0.2/100ns			14		V
ESD Clamping Voltage[2]	V_C	I_{PP} = 16A tp = 0.2/100ns			24		V
Dynamic Resistance[2, 3]	R_{DYN}	tp = 100ns			1.0		Ohms
Junction Capacitance	C_J	I/O pin to GND f = 1MHz	V_R = 0V		0.19	0.22	pF

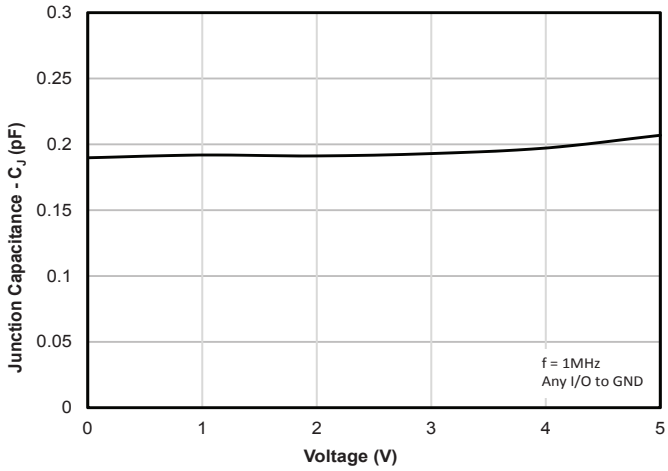
Notes
1)Measured with a 20dB attenuator, 50 Ohm scope input impedance, 2GHz bandwidth. ESD gun return path connected to ESD ground plane.
2)Transmission Line Pulse Test (TLP) Settings: tp = 100ns, tr = 0.2ns, I_{TLP} and V_{TLP} averaging window: t1 = 70ns to t2 = 90ns.
3) Dynamic resistance calculated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

Typical Characteristics

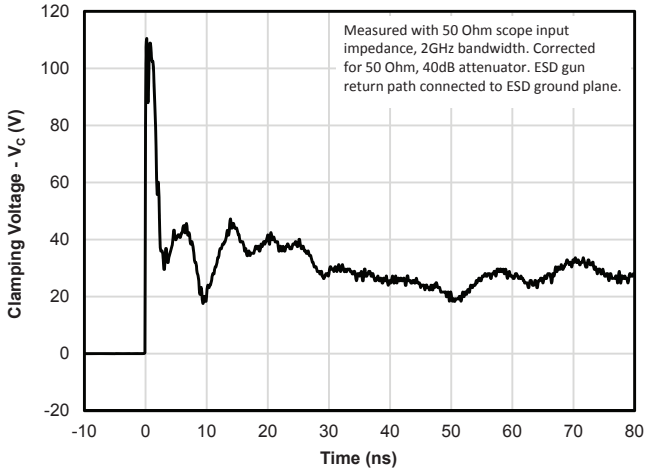
Clamping Voltage vs. Peak Pulse Current



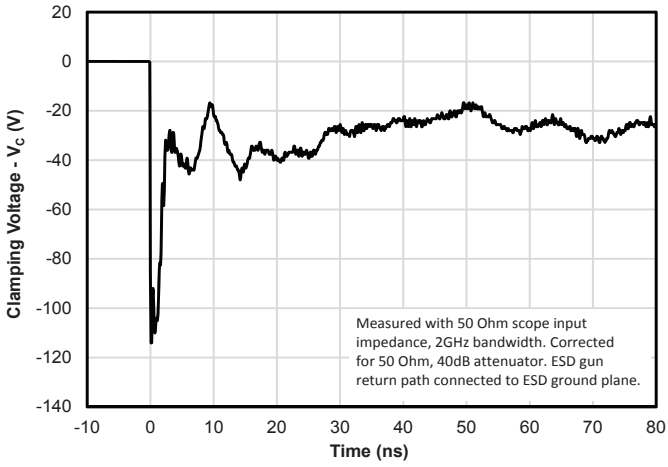
Junction Capacitance vs. Reverse Voltage



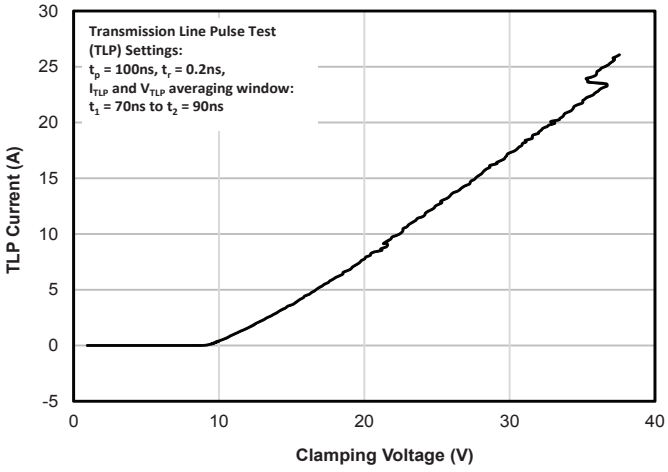
ESD Clamping (8kV Contact per IEC 61000-4-2)



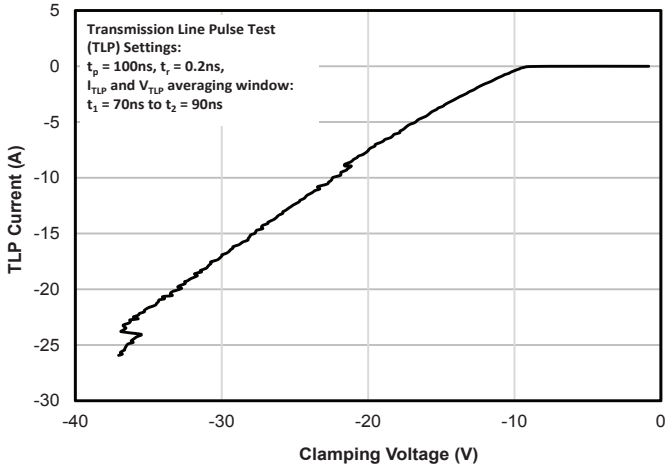
ESD Clamping (-8kV Contact per IEC 61000-4-2)



TLP Characteristic (Positive Pulse)



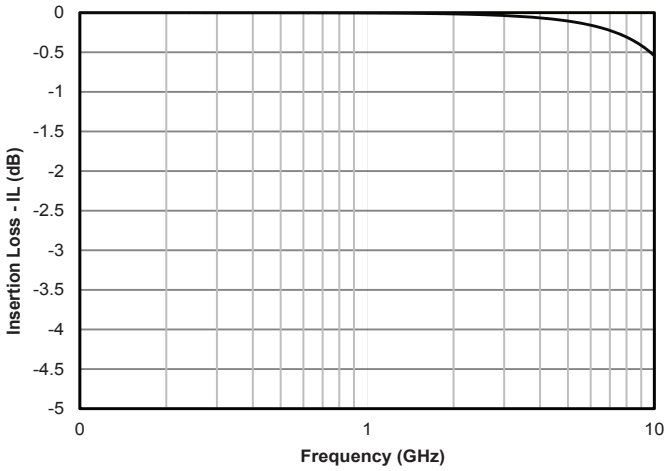
TLP Characteristic (Negative Pulse)



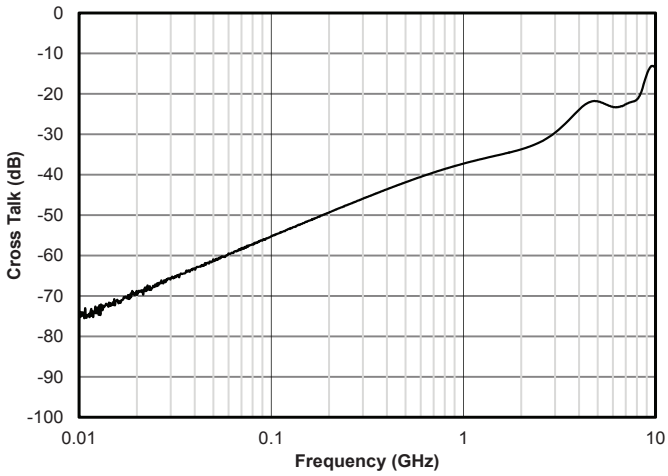
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Typical Characteristics

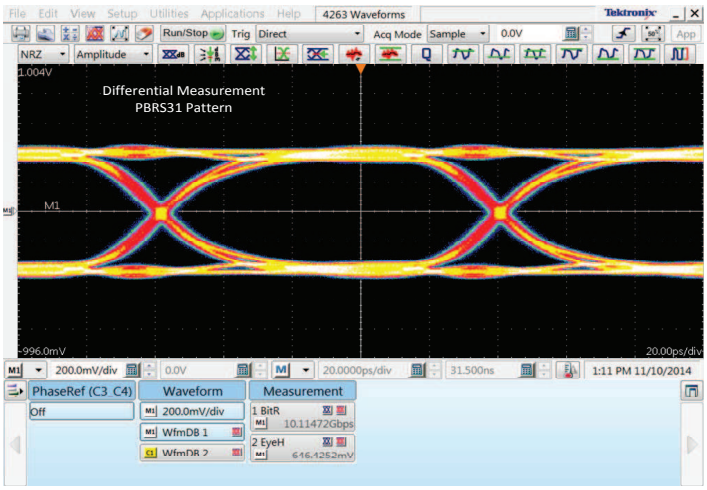
Insertion Loss (S21)



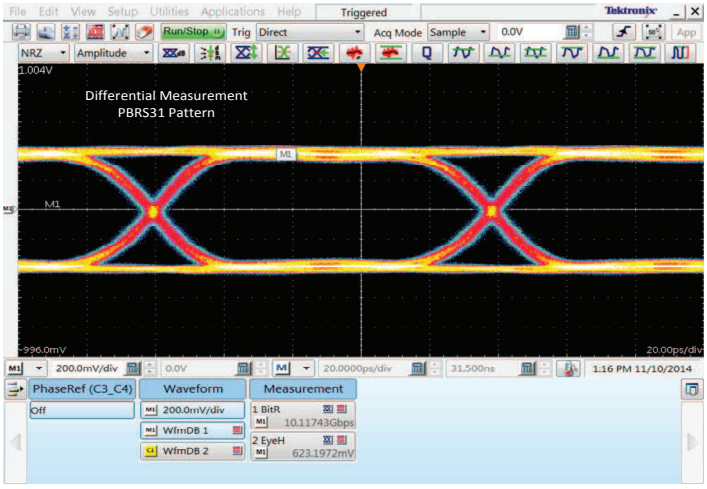
Analog Crosstalk



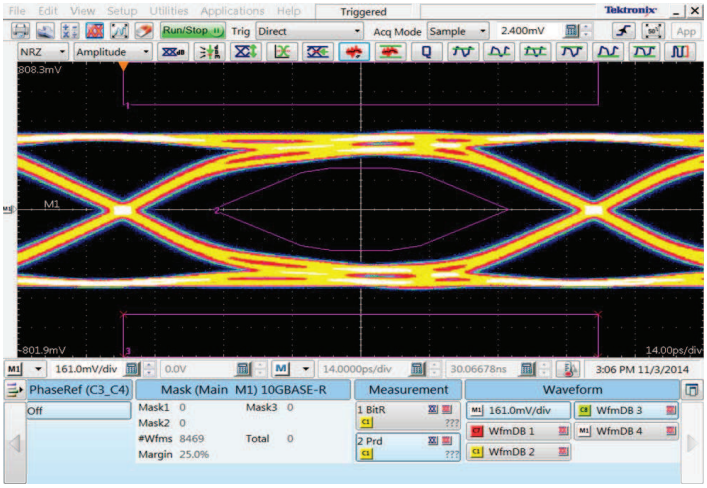
10Gb/s (USB 3.1) Eye Diagram with RClamp7534P



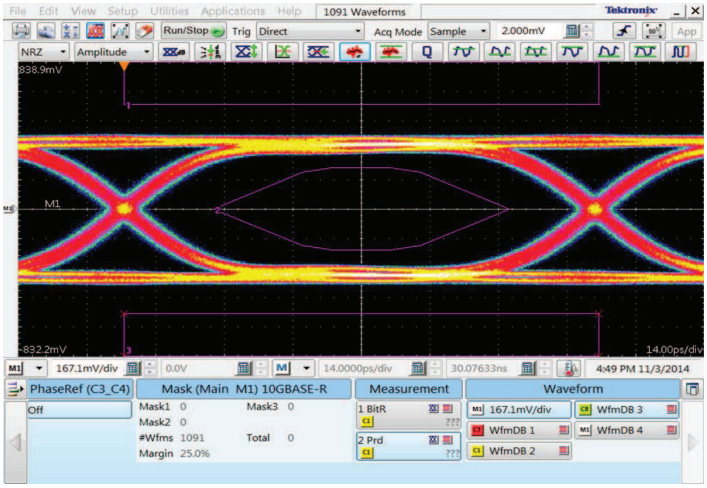
10Gb/s (USB 3.1) Eye Diagram without RClamp7534P



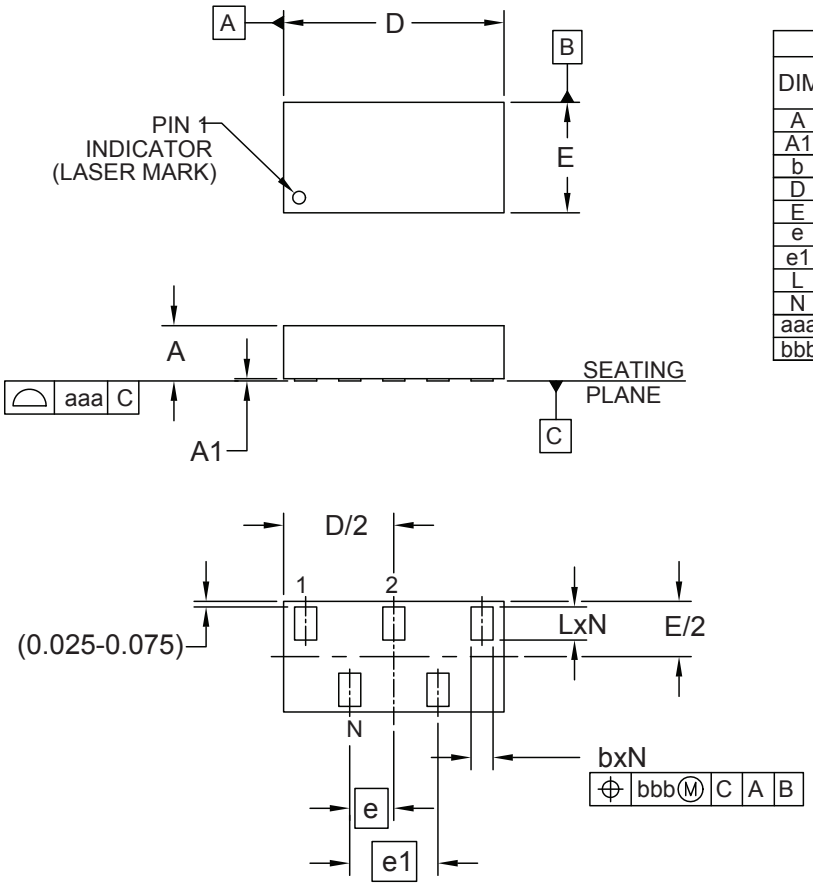
10GbE Eye Diagram with RClamp7534P



10GbE Eye Diagram without RClamp7534P



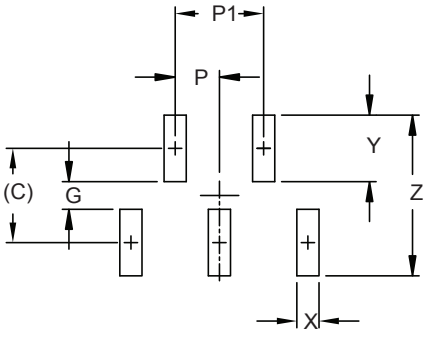
Outline Drawing - SGP2010N5



DIMENSIONS			
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

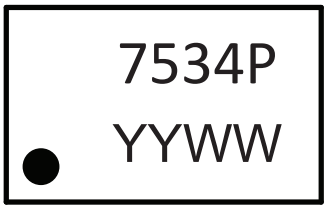


DIMENSIONS	
DIM	MILLIMETERS
C	(0.85)
G	0.25
P	0.40
P1	0.80
X	0.20
Y	0.60
Z	1.45

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.

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Marking



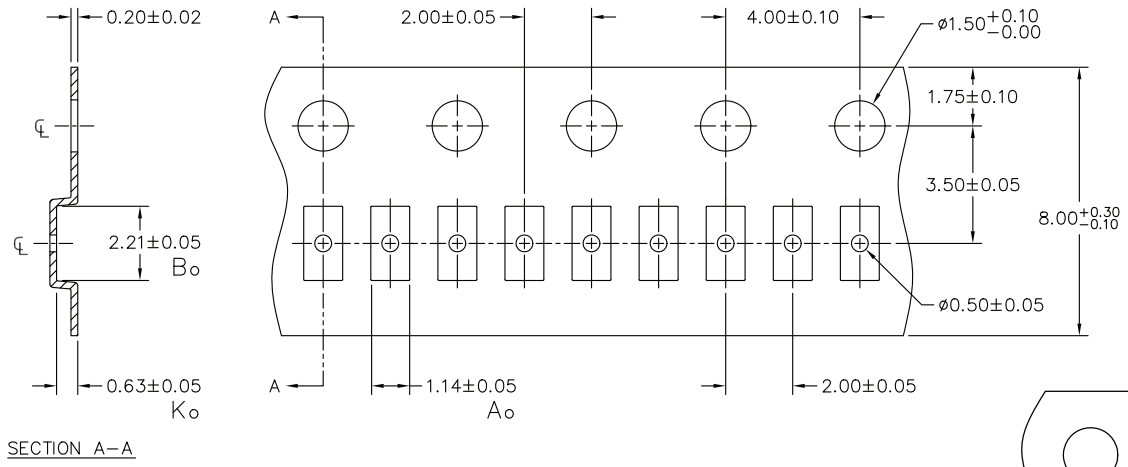
Notes: Device is Electrically Symmetrical

Ordering Information

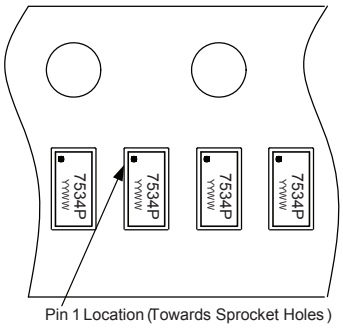
Part Number	Qty per Reel	Reel Size
RClamp7534P.TNT	10000	7”

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

Tape and Reel Specification



NOTE: ALL DIMENSIONS IN MILLIMETERS UNLESS OTHERWISE SPECIFIED.



Device Orientation in Tape

Contact Information

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