

Absolute Maximum Rating

Rating	Symbol	Value	Units
Peak Pulse Current (tp = 8/20μs)	I _{PP}	4.5	A
ESD per IEC 61000-4-2 (Contact) ⁽¹⁾ ESD per IEC 61000-4-2 (Air) ⁽¹⁾	V _{ESD}	±17 ±20	kV
Operating Temperature	T _J	-40 to +125	°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}	-40°C to 125°C Any I/O pin to GND				3.3	V
Trigger Voltage	V _{TRIG}	tp = 0.2/100ns (TLP) Any I/O pin to GND			8		V
Reverse Leakage Current	I _R	V _{RWM} = 3.3V	T = 25°C		0.01	0.05	μA
			T = 125°C			0.150	μA
Clamping Voltage ⁽²⁾	V _C	I _{PP} = 1A, tp = 8/20μs, Any I/O pin to GND			2.5	3.5	V
Clamping Voltage ⁽²⁾	V _C	I _{PP} = 4.5A, tp = 8/20μs, Any I/O pin to GND			3.5	4.5	V
ESD Clamping Voltage ⁽³⁾	V _C	I _{PP} = 4A, tp = 0.2/100ns (TLP) Any I/O pin to GND			3.5		V
ESD Clamping Voltage ⁽³⁾	V _C	I _{PP} = 16A, tp = 0.2/100ns (TLP) Any I/O pin to GND			5.3		V
Dynamic Resistance ^{(3), (4)}	R _{DYN}	tp = 0.2/100ns (TLP) Any I/O pin to GND			0.15		Ohms
Junction Capacitance	C _J	V _R = 0V, f = 1MHz Any I/O pin to GND			0.60	0.65	pF
		V _R = 0V, f = 1MHz Between I/O Pins			0.30	0.40	pF

Notes:

(1): ESD Gun return path to Ground Reference Plane (GRP)

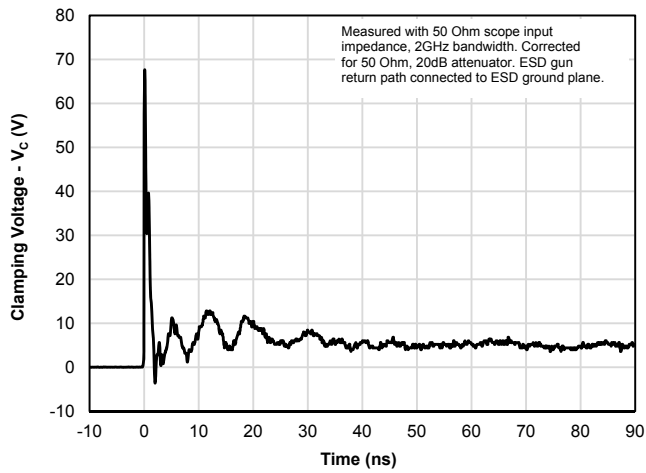
(2): Measured using an 8/20us constant current source.

(3): Transmission Line Pulse Test (TLP) Settings: tp = 100ns, tr = 0.2ns, I_{TLP} and V_{TLP} averaging window: t₁ = 70ns to t₂ = 90ns.

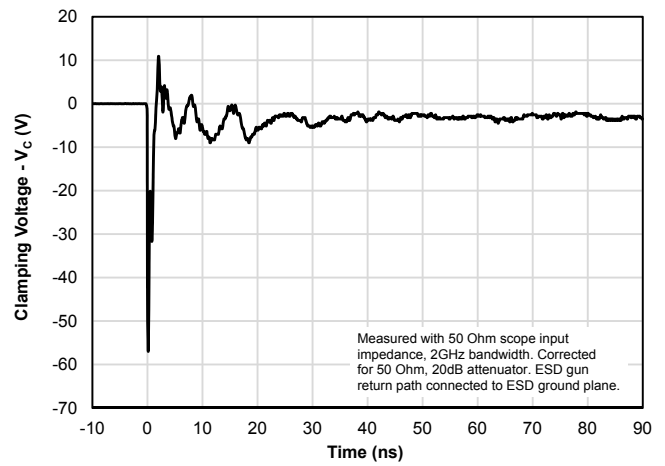
(4): Dynamic resistance calculated from I_{TLP} = 4A to I_{TLP} = 16A

Typical Characteristics

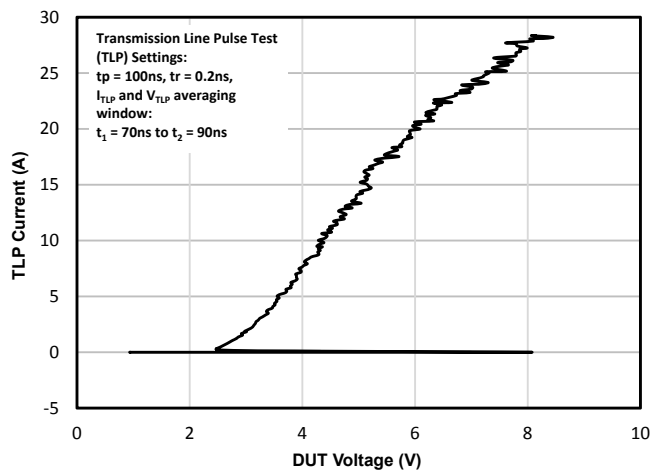
ESD Clamping (+8kV Contact per IEC 61000-4-2)



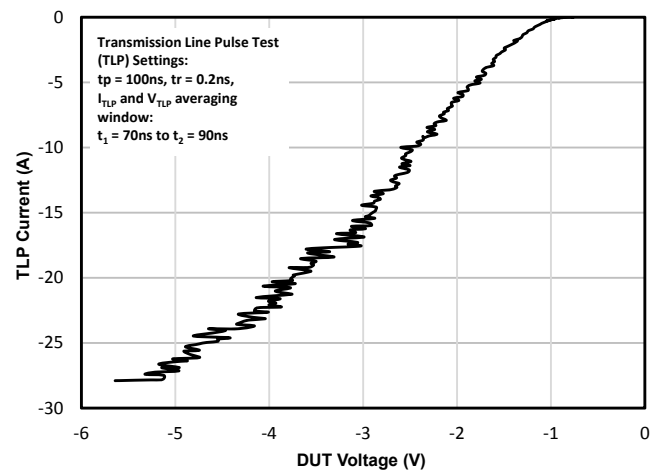
ESD Clamping (-8kV Contact per IEC 61000-4-2)



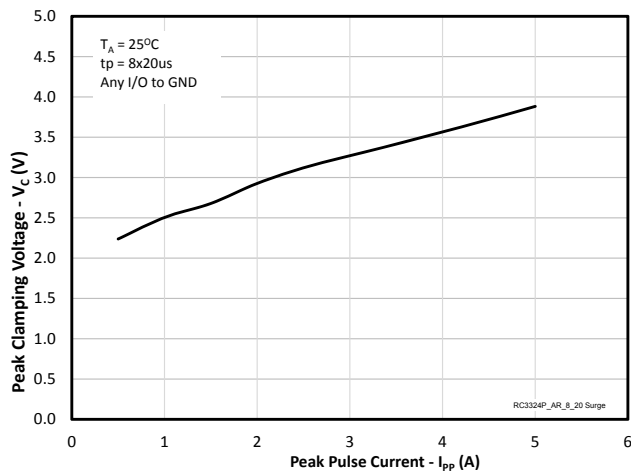
TLP Curve (Positive Pulse)



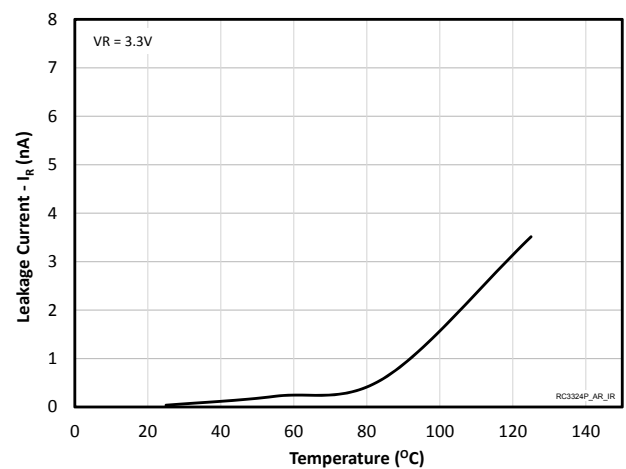
TLP Curve (Negative Pulse)



Clamping Voltage vs. Peak Pulse Current ($t_p=8/20\mu\text{s}$)

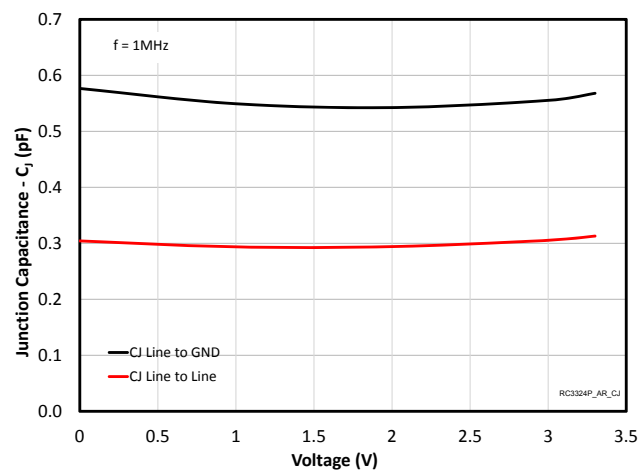


Reverse Leakage Current (I_R) vs. Temperature

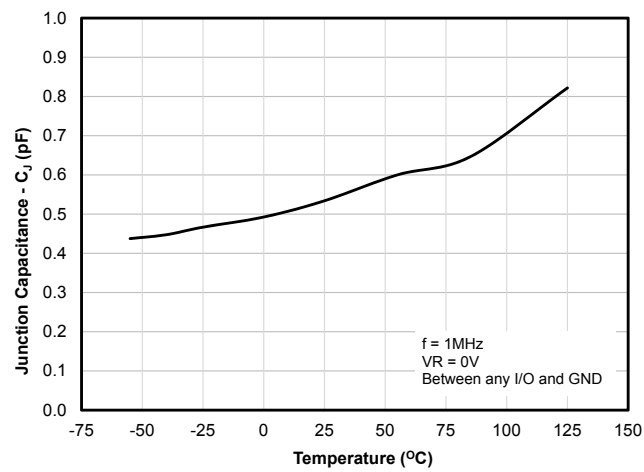


Typical Characteristics (Continued)

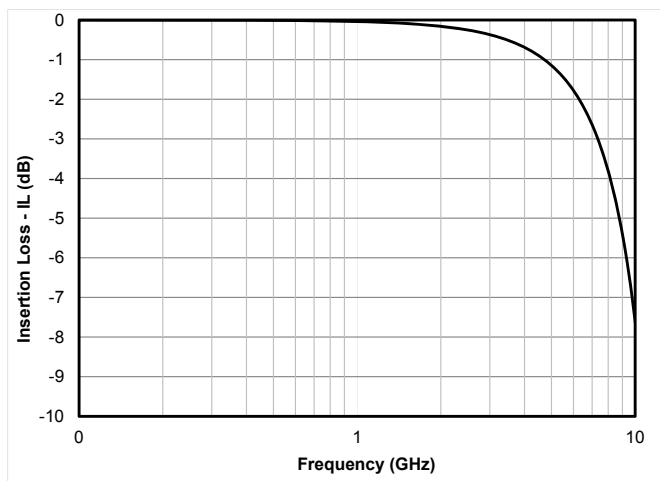
Capacitance vs. Reverse Voltage



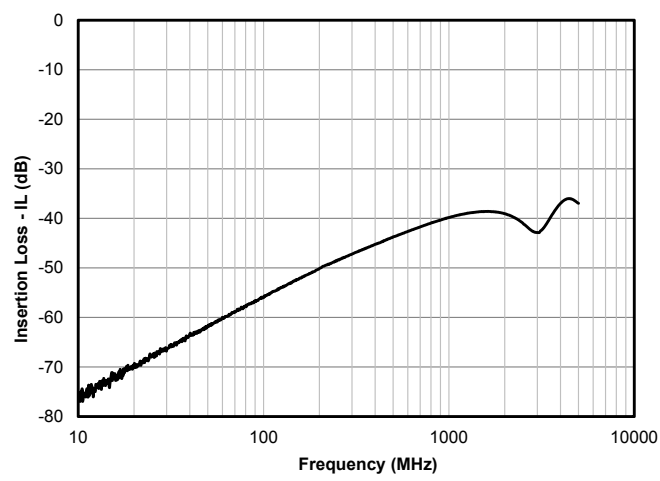
Capacitance vs. Temperature



Insertion Loss - S21



Analog Crosstalk



Application Information

USB Interface Protection

For USB 3.0 applications, RClamp3324P is recommended for protecting the 5Gb/s SuperSpeed line pairs. Figure 1 below shows an example of protecting a USB 3.0 Type-A interfaces (host side shown). Lines are routed through each device entering at pins 1, 2, 4, and 5 and exiting at pins 10, 9, 7, and 6 respectively (Figure 2). Each trace should run under the device and connect the pins together. Ground connection is made at the center tabs (pins 3, and 8). Traces should be kept the same length to avoid impedance mismatch. The differential impedance of each pair can be controlled for USB 3.0 (85 Ohms +/-15%) while maintaining a minimum trace-to-trace and trace-to-pad spacing. Individual PCB design constraints may necessitate different spacing or trace width. Both ground pads should be connected for optimal performance. Ground connection is made using filled via-in-pad.

RClamp0512TQ is be used to protect D+ and D- lines. These lines are routed through RClamp0512TQ at pin1 and pin 2. Pin 3 is connected to the ground plane. RClamp0512TQ is qualified to AEC-Q100. Additional information may be found on the device data sheet.

Single line devices such as uClamp0571P are recommended for surge and ESD protection of the VBus line. This device features high surge and ESD capability and may be used on 5V power rails. In power delivery (PD) applications, higher working voltage TVS device may be needed. Options exist for ESD and surge protection up to 24V.

Device Placement

Placement of the protection component is a critical element for effective ESD suppression. TVS diodes should be placed as close to the connector as possible. This helps reduce transient coupling to nearby traces. Ground connections should be made directly to the ground plane using micro-vias. This reduces parasitic inductance in the ground path and minimizes the clamping voltage seen by the protected device.

Figure 1 - USB 3.0 Type-A Protection Example

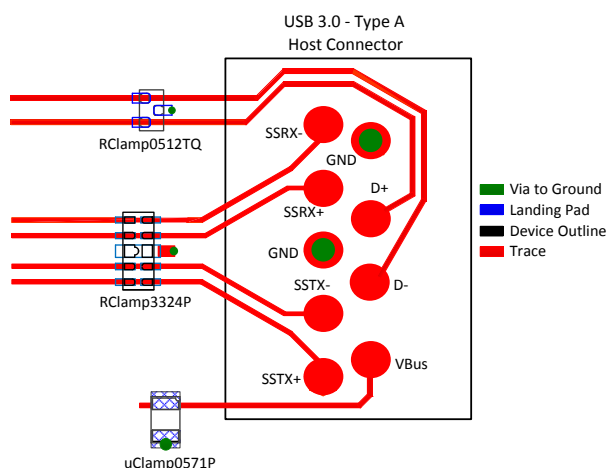
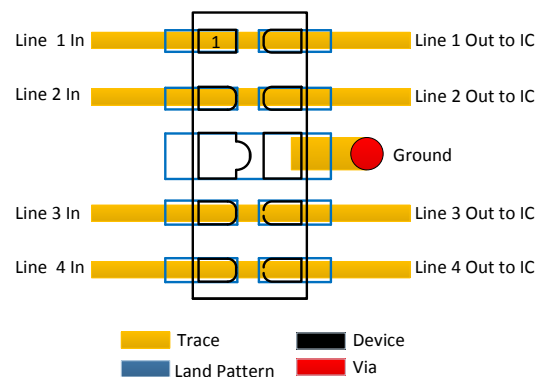
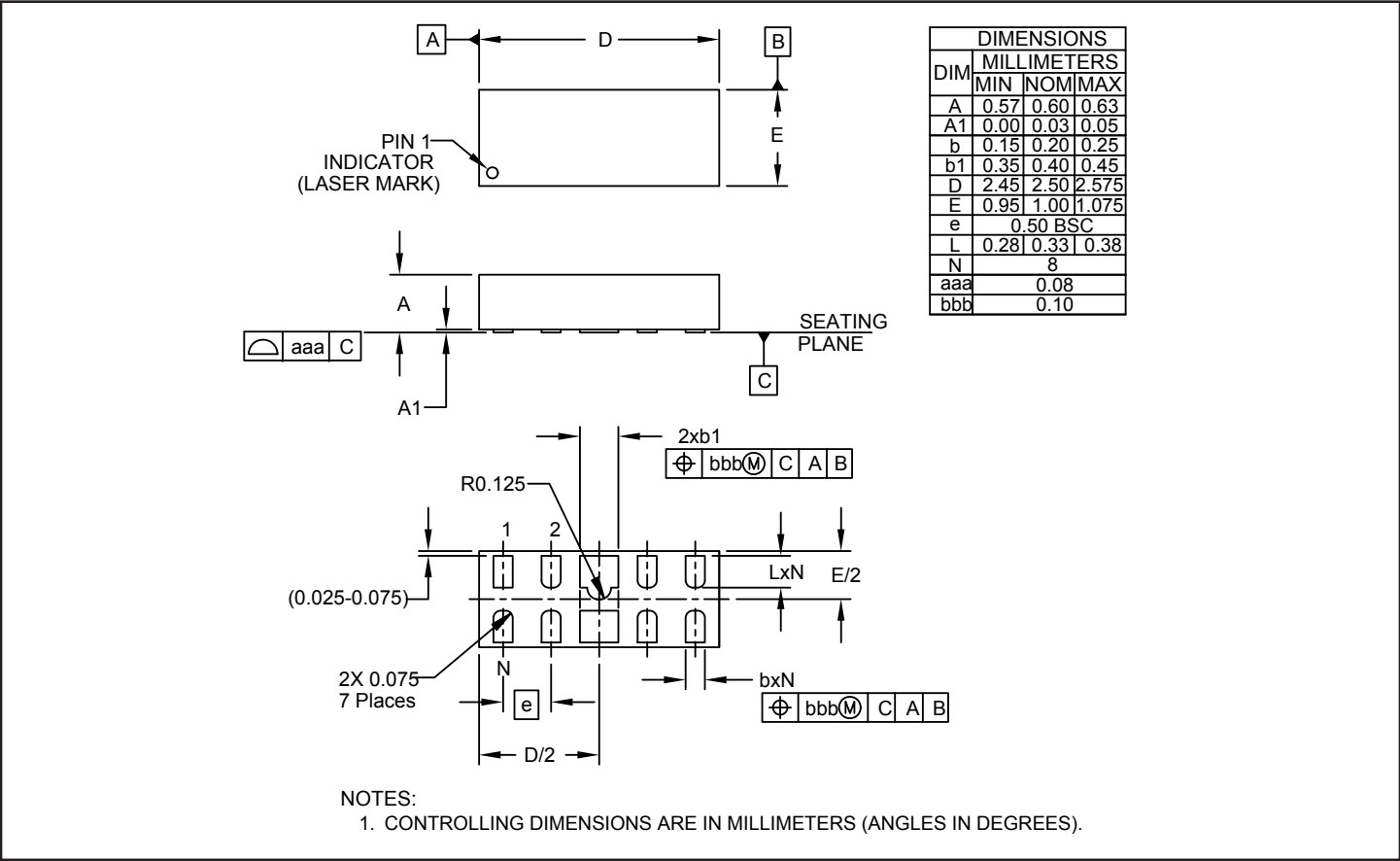


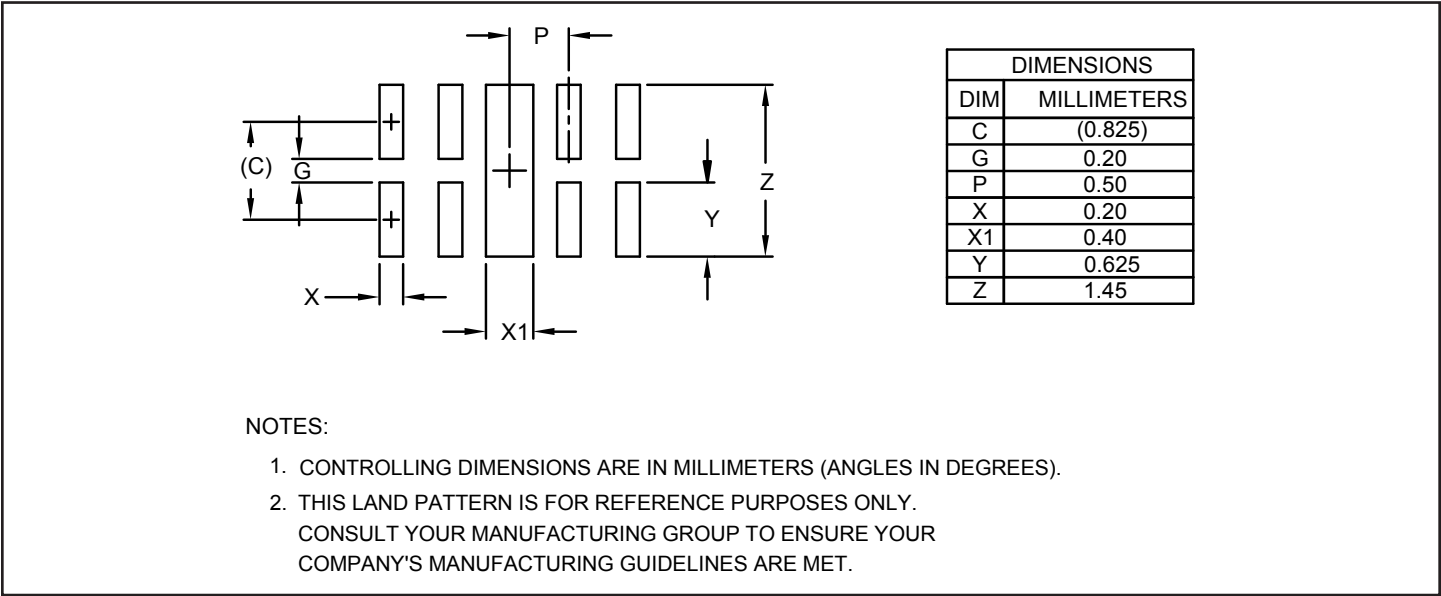
Figure 2 - Trace Routing



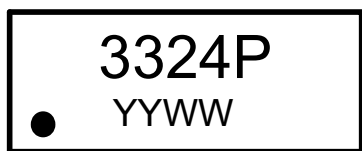
Outline Drawing - SGP2510P8



Land Pattern - SGP2510P8

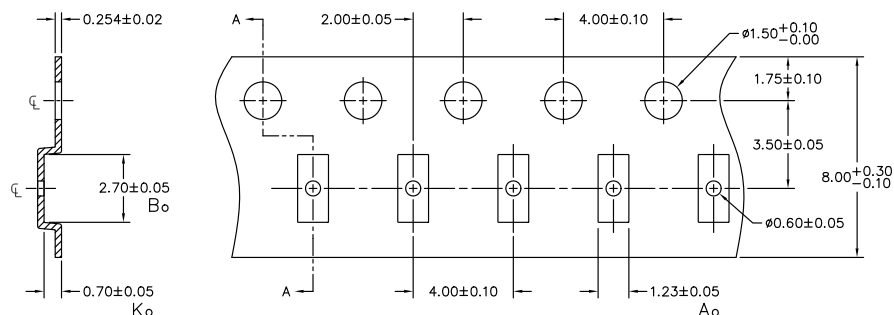


Marking Code



Notes: Dot indicates pin 1 location

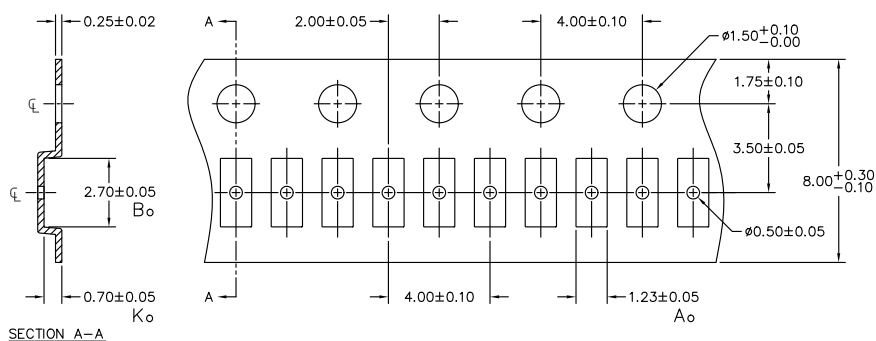
Tape and Reel Specification



SECTION A-A

NOTES: 1.) ALL DIMENSIONS IN MILLIMETERS UNLESS OTHERWISE SPECIFIED.

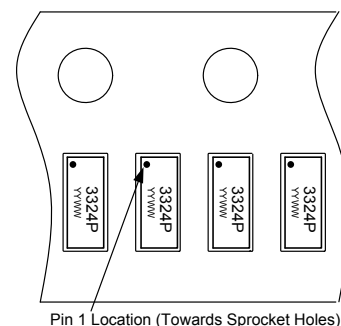
Carrier Tape, 4mm Pitch Option



SECTION A-A

NOTES: 1.) ALL DIMENSIONS IN MILLIMETERS UNLESS OTHERWISE SPECIFIED.

Carrier Tape, 2mm Pitch Option



Device Orientation in Tape

Ordering Information

Part Number	Qty per Reel	Pocket Pitch	Reel Size
RClamp3324P.TCT	3,000	4mm	7"
RClamp3324P.TNT	10,000	2mm	7"
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