

## PROTECTION PRODUCTS

### Description

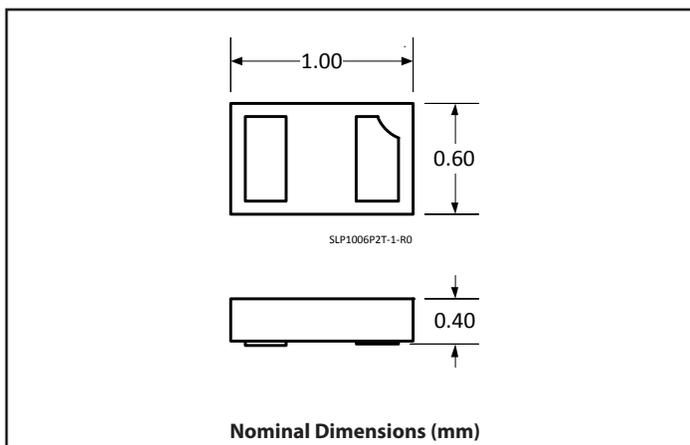
RailClamp is an ultra low capacitance Transient Voltage Suppressor (TVS) designed to protect high speed data interfaces. This device has been specifically designed to protect sensitive components which are connected to high-speed data and transmission lines from overvoltage caused by ESD (electrostatic discharge), CDE (Cable Discharge Events), and EFT (electrical fast transients).

The RClamp™0531TQ has a maximum capacitance of only 0.80pF. This allows it to be used on circuits operating in excess of 2.5GHz without signal attenuation. They may be used to meet the ESD immunity requirements of IEC 61000-4-2.

The RClamp0531TQ is in a 2-pin SLP1006P2T package measuring 1.0 x 0.6 x 0.4mm. The leads are spaced at a pitch of 0.65mm and feature a lead-free finish. Each device will protect one high-speed 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, low capacitance, and high ESD surge capability makes them ideal for use in applications such as cellular phones and digital video interfaces.

The RClamp0531TQ is AEC-Q100 Grade 1 qualified for Automotive use.

### Package Dimension



### Features

- Transient protection for data lines to IEC 61000-4-2 (ESD)  $\pm 20\text{kV}$  (air),  $\pm 12\text{kV}$  (contact)
- IEC 61000-4-4 (EFT) 40A (tp = 5/50ns)
- Cable Discharge Event (CDE)
- Ultra-small package (1.0 x 0.6 x 0.4mm)
- Protects one I/O line
- Low capacitance: 0.8pF
- Low clamping voltage
- Solid-state silicon-avalanche technology
- AEC-Q100 Grade 1 qualified

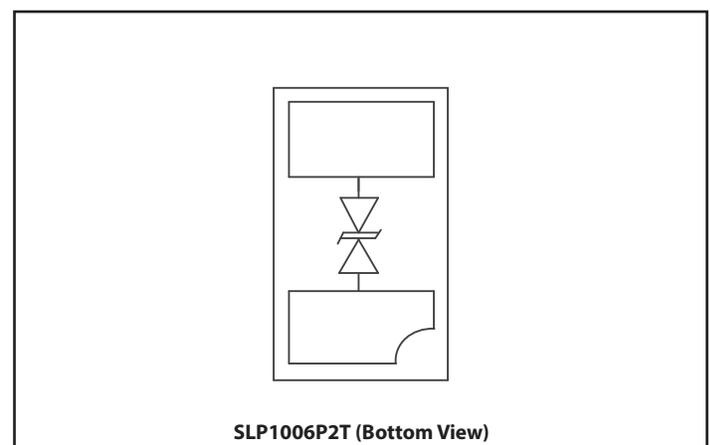
### Mechanical Characteristics

- SLP1006P2T package
- Molding compound flammability rating: UL 94V-0
- Marking: Marking code + date code
- Packaging : Tape and Reel
- Lead Finish: NiPdAu
- Pb-Free, Halogen Free, RoHS/WEEE Compliant

### Applications

- Cellular Handsets & Accessories
- Digital Visual Interface (DVI)
- FM Antenna
- MDDI Ports
- USB Ports
- PCI Express
- Serial ATA
- Automotive Applications

### Schematic & Pin Configuration



## Absolute Maximum Rating

Rating	Symbol	Value	Units
Peak Pulse Power ( $t_p = 8/20\mu s$ )	$P_{PK}$	80	W
Peak Pulse Current ( $t_p = 8/20\mu s$ )	$I_{PP}$	4	A
ESD per IEC 61000-4-2 (Air) <sup>(1)</sup> ESD per IEC 61000-4-2 (Contact) <sup>(1)</sup>	$V_{ESD}$	$\pm 20$ $\pm 12$	kV
Operating Temperature	$T_J$	-40 to +125	$^{\circ}C$
Storage Temperature	$T_{STG}$	-55 to +150	$^{\circ}C$

## Electrical Characteristics (T=25 $^{\circ}C$ unless otherwise specified)

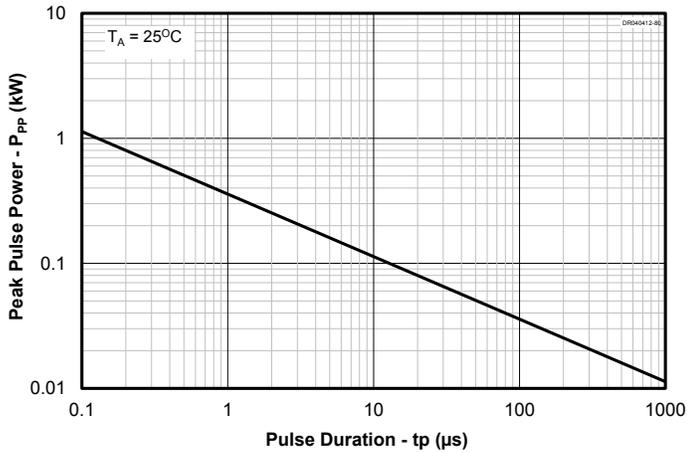
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units	
Reverse Stand-Off Voltage	$V_{RWM}$				5	V	
Reverse Breakdown Voltage	$V_{BR}$	$I_{BR} = 1\text{ mA}$	6	9.3	11	V	
Reverse Leakage Current	$I_R$	$V_{RWM} = 5V, T = 25\text{ }^{\circ}C$		0.010	0.100	$\mu A$	
		$V_{RWM} = 5V, T = 125\text{ }^{\circ}C$		0.020	0.200		
Clamping Voltage	$V_C$	$t_p = 8/20\mu s$	$I_{PP} = 1A$			12	V
			$I_{PP} = 4A$			20	
Junction Capacitance	$C_J$	$V_R = 0V\text{ to }5V, f = 1\text{ MHz}, T = 25\text{ }^{\circ}C$		0.50	0.80	pF	
		$V_R = 0V\text{ to }5V, f = 1\text{ GHz}, T = 125\text{ }^{\circ}C$		0.85	1.5		

### Notes

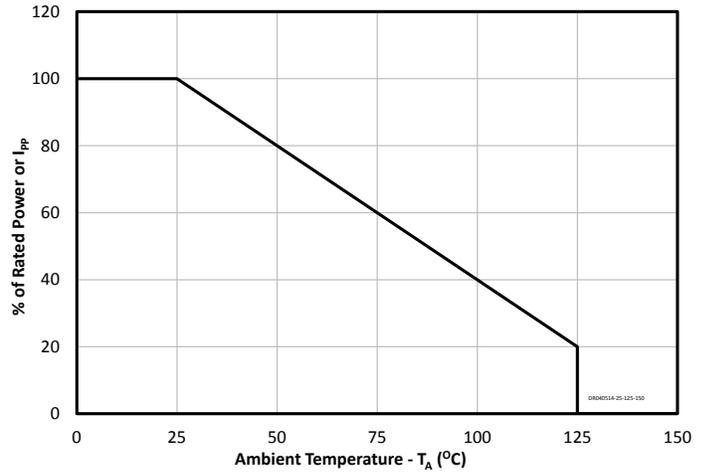
1) ESD gun return path connected to ESD ground plane.

# Typical Characteristics

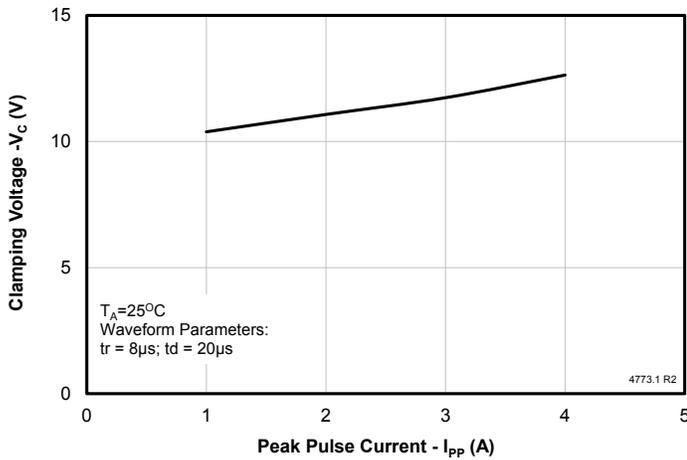
### Non-Repetitive Peak Pulse Power vs. Pulse Time



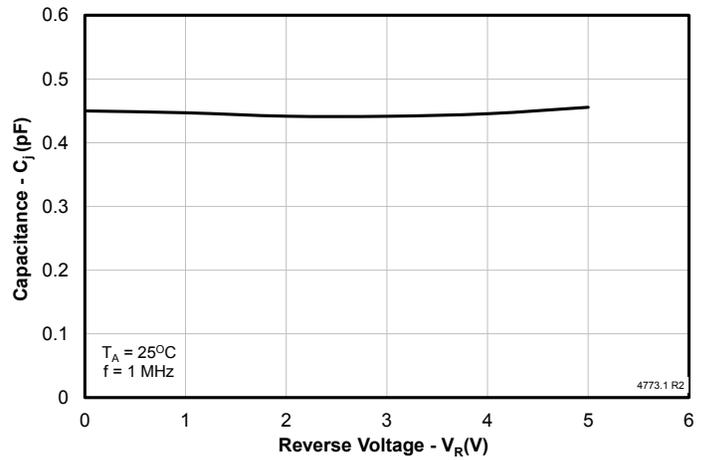
### Power Derating Curve



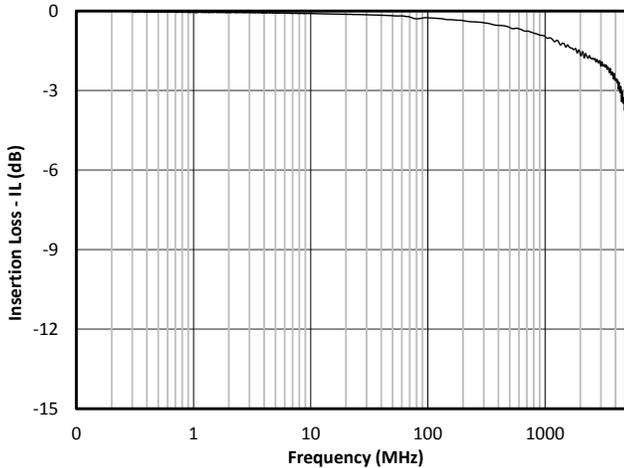
### Clamping Voltage vs. Peak Pulse Current



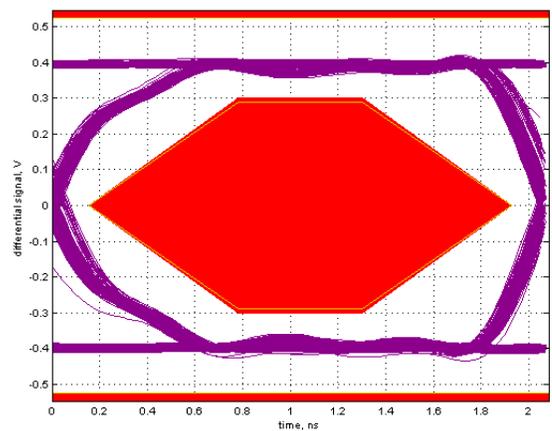
### Junction Capacitance vs. Reverse Voltage



### Insertion Loss (S21)

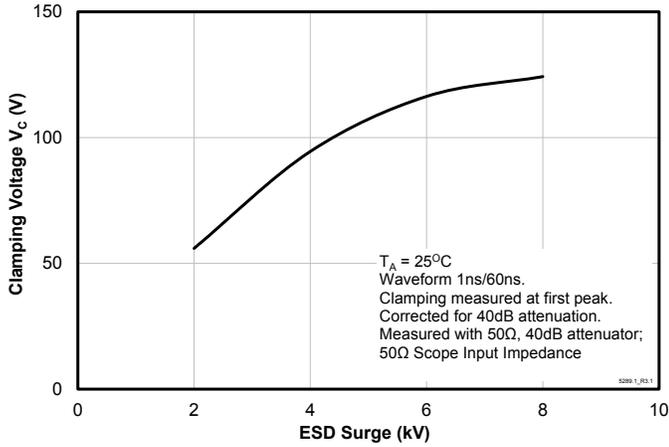


### USB 2.0 Eye Pattern with RClamp0531TQ

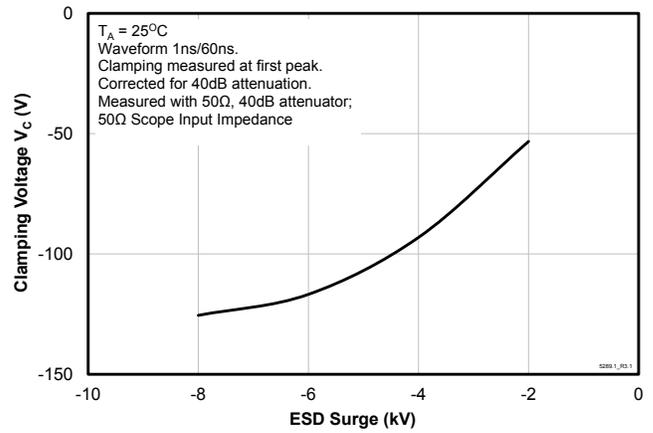


# Typical Characteristics

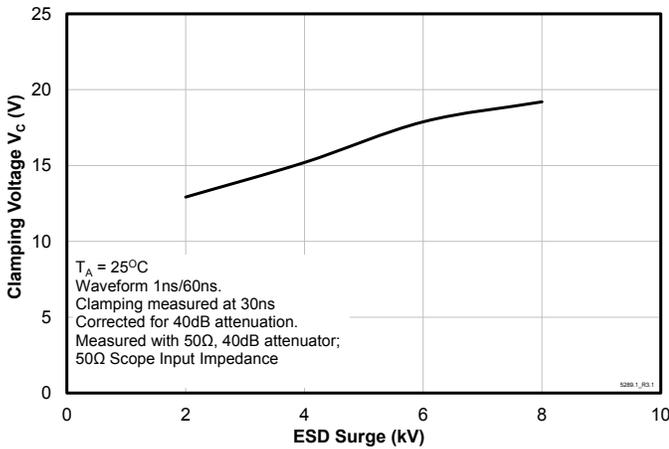
**ESD Clamping per IEC61000-4-2**  
**Positive clamping voltage at first peak**



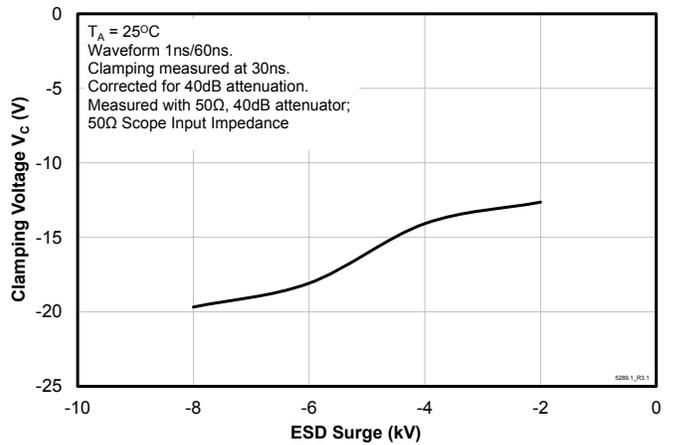
**ESD Clamping per IEC61000-4-2**  
**Negative clamping voltage at first peak**



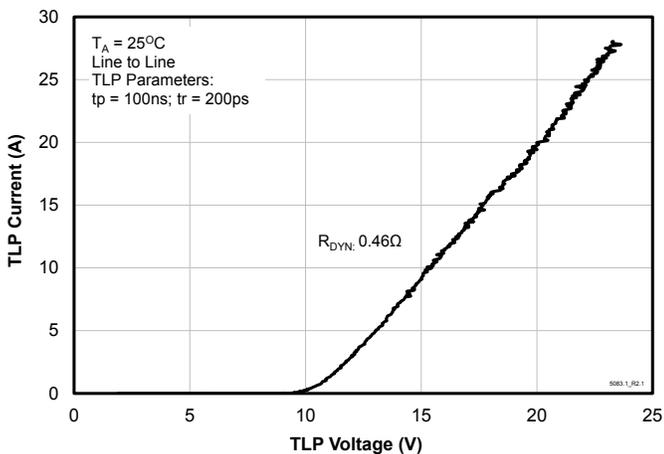
**ESD Clamping per IEC61000-4-2**  
**Positive clamping voltage at 30ns**



**ESD Clamping per IEC61000-4-2**  
**Negative clamping voltage at 30ns**

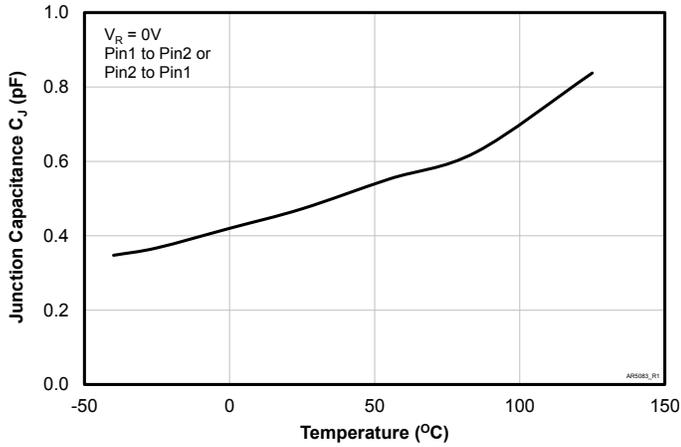


## Typical TLP Characteristics

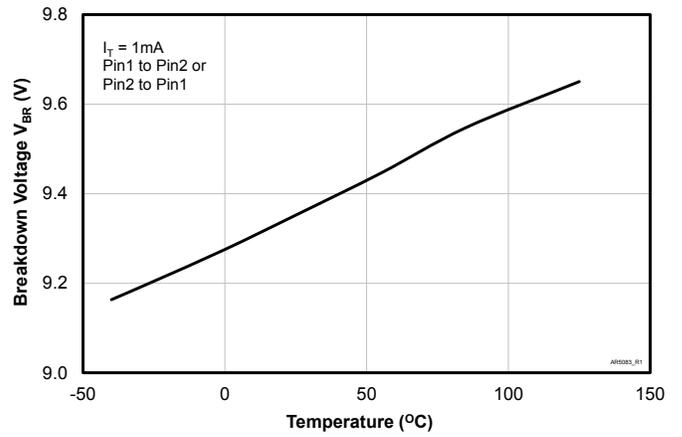


# Typical Characteristics

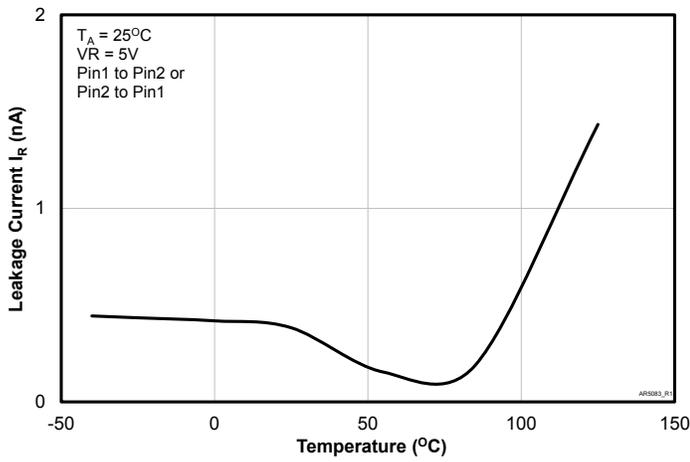
### Typical Capacitance vs. Temperature



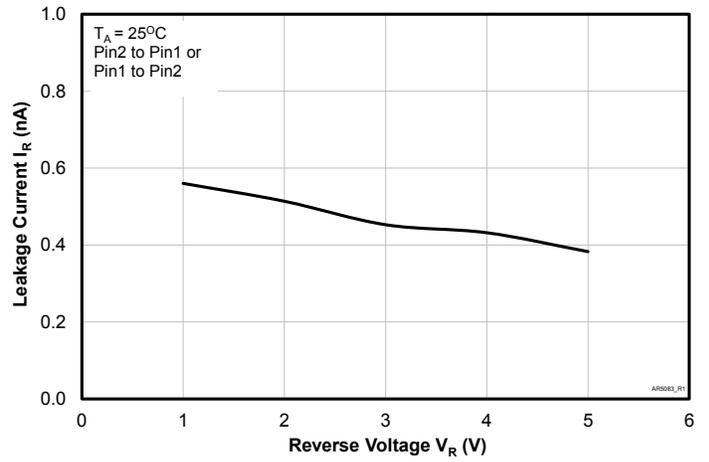
### Typical Breakdown Voltage vs. Temperature



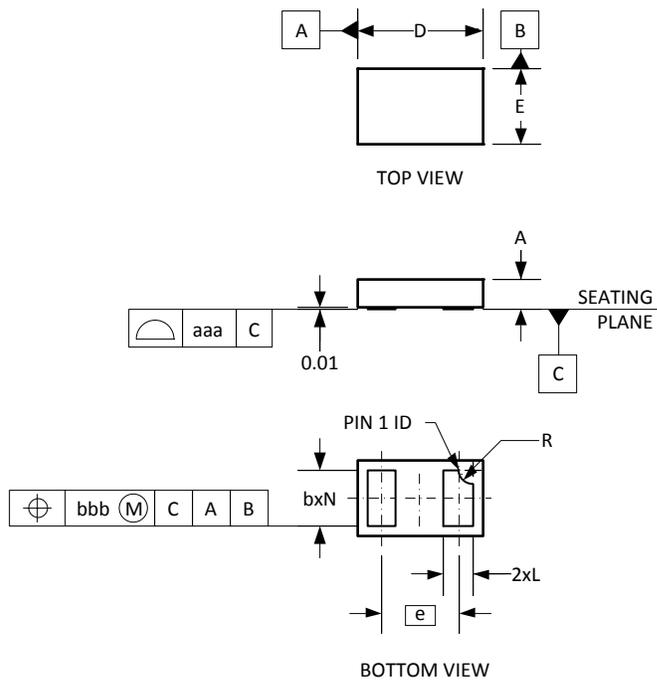
### Typical Leakage Current vs. Temperature



### Typical Leakage Current vs. Reverse Voltage



# Outline Drawing - SLP1006P2T



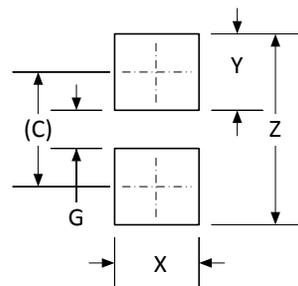
DIM	INCHES			MILLIMETERS		
	MIN	NOM	MAX	MIN	NOM	MAX
A	.015	.016	.017	0.37	0.40	0.43
A1	.000	.001	.002	0.00	0.03	0.05
b	.018	.020	.022	0.45	0.50	0.55
D	.035	.039	.043	0.90	1.00	1.10
E	.020	.024	.028	0.50	0.60	0.70
e	.026 BSC		0.65 BSC			
L	.008	.010	.012	0.20	0.25	0.30
R	.002	.004	.006	0.05	0.10	0.15
N	2			2		
aaa	.003			0.08		
bbb	.004			0.10		

SLP1006P2T-2-R0

NOTES:

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

# Land Pattern - SLP1006P2T



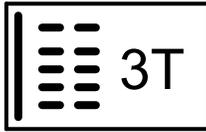
DIM	DIMENSIONS	
	INCHES	MILLIMETERS
C	(.033)	(0.85)
G	.012	0.30
X	.024	0.60
Y	.022	0.55
Z	.055	1.40

SLP1006P2T-3-R0

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.

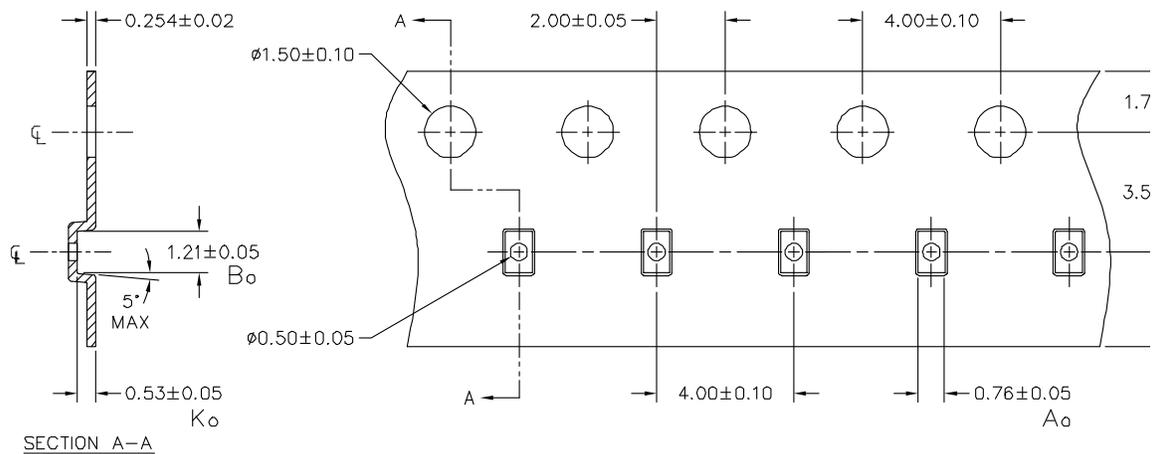
## Marking Code



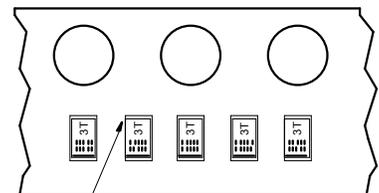
Notes:

1. Marking will also include line matrix date code.
2. Device is electrically symmetrical.

## Tape and Reel Specification



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



Pin 1 Location  
(Towards Sprocket Holes)

## Ordering Information

Part Number	Qty per Reel	Reel Size
RClamp0531TQCT	3,000	7"



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