

## PROTECTION PRODUCTS

### Description

RailClamps® are low capacitance TVS arrays designed to protect high speed data interfaces. This series has been specifically designed to protect sensitive components which are connected to data and transmission lines from overvoltage caused by **ESD** (electrostatic discharge), **CDE** (Cable Discharge Events), and **EFT** (electrical fast transients).

The unique design incorporates two identical circuits. Each circuit is comprised of surge rated, low capacitance steering diodes and a TVS diode in a single package. During transient conditions, the steering diodes direct the transient current to ground. The internal TVS diode clamps the transient voltage to a safe level. The RClamp0524S has a low maximum capacitance of only 5pF per line. Each device will protect up to four data lines. The dual circuits make it ideal for applications like power over Ethernet (PoE) where each signal pair sits at a different potential.

The RClamp™0524S is in a 6-pin, RoHS/WEEE compliant, SOT-23 package. The leads are finished with lead-free matte tin. They may be used to meet the ESD immunity requirements of IEC 61000-4-2, Level 4 ( $\pm 15\text{kV}$  air,  $\pm 8\text{kV}$  contact discharge).

### Features

- ◆ ESD protection for high-speed data lines to **IEC 61000-4-2 (ESD)  $\pm 15\text{kV}$  (air),  $\pm 8\text{kV}$  (contact)**
- ◆ **IEC 61000-4-4 (EFT) 40A (5/50ns)**
- ◆ Array of surge rated diodes with internal TVS Diode
- ◆ Small package saves board space
- ◆ Protects four I/O lines
- ◆ Low capacitance: **5pF** maximum
- ◆ Low clamping voltage
- ◆ Low operating voltage: 5.0V
- ◆ Solid-state silicon-avalanche technology

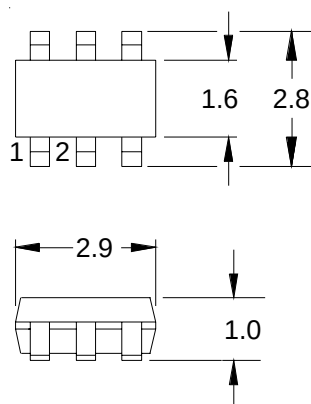
### Mechanical Characteristics

- ◆ JEDEC SOT-23 6L package
- ◆ Molding compound flammability rating: UL 94V-0
- ◆ Marking : S05
- ◆ Packaging : Tape and Reel
- ◆ RoHS/WEEE Compliant

### Applications

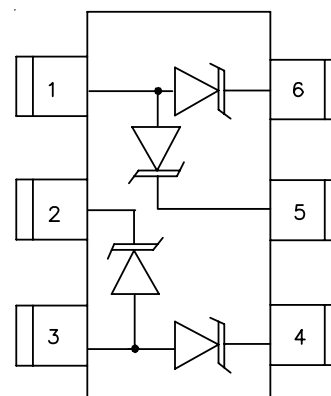
- ◆ PoE
- ◆ Monitors and Flat Panel Displays
- ◆ Digital Video Interface (DVI)
- ◆ 10/100/1000 Ethernet
- ◆ Notebook Computers

### Package Dimensions



**6 Pin SOT-23 package**  
**Nominal Dimensions in mm**

### Equivalent Circuit and PIN Configuration



**SOT-23 6L (Top View)**

**PROTECTION PRODUCTS**
**Absolute Maximum Rating**

| Rating                                                         | Symbol    | Value         | Units |
|----------------------------------------------------------------|-----------|---------------|-------|
| Peak Pulse Power ( $t_p = 8/20\mu s$ )                         | $P_{pk}$  | 150           | Watts |
| ESD per IEC 61000-4-2 (Air)<br>ESD per IEC 61000-4-2 (Contact) | $V_{ESD}$ | 15<br>8       | kV    |
| Lead Soldering Temperature                                     | $T_L$     | 260 (10 sec.) | °C    |
| Operating Temperature                                          | $T_J$     | -55 to +125   | °C    |
| Storage Temperature                                            | $T_{STG}$ | -55 to +150   | °C    |

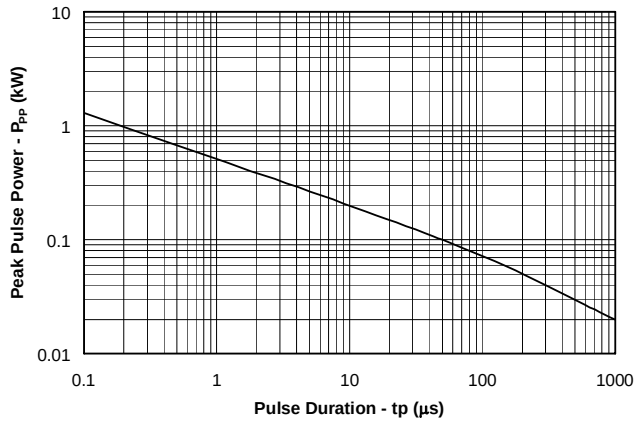
**Electrical Characteristics (T=25°C unless otherwise specified)**

| Parameter                 | Symbol    | Conditions                                                                      | Minimum | Typical | Maximum | Units |
|---------------------------|-----------|---------------------------------------------------------------------------------|---------|---------|---------|-------|
| Reverse Stand-Off Voltage | $V_{RWM}$ | Pin 2 or 4 to Pin 3<br>Pin 5 or 6 to Pin 1                                      |         |         | 5       | V     |
| Reverse Breakdown Voltage | $V_{BR}$  | $I_t = 1mA$<br>Pin 2 or 4 to Pin 3<br>Pin 5 or 6 to Pin 1                       | 6       |         |         | V     |
| Reverse Leakage Current   | $I_R$     | $V_{RWM} = 5V$ , T=25°C<br>Pin 2 or 4 to Pin 3<br>Pin 5 or 6 to Pin 1           |         |         | 1       | μA    |
| Clamping Voltage          | $V_C$     | $I_{pp} = 1A$ , $t_p = 8/20\mu s$<br>Pin 2 or 4 to Pin 3<br>Pin 5 or 6 to Pin 1 |         |         | 15      | V     |
| Clamping Voltage          | $V_C$     | $I_{pp} = 1A$ , $t_p = 8/20\mu s$<br>Pin 3 to Pin 2 or 4<br>Pin 1 to Pin 5 or 6 |         |         | 2       | V     |
| Clamping Voltage          | $V_C$     | $I_{pp} = 6A$ , $t_p = 8/20\mu s$<br>Pin 2 or 4 to Pin 3<br>Pin 5 or 6 to Pin 1 |         |         | 24      | V     |
| Clamping Voltage          | $V_C$     | $I_{pp} = 6A$ , $t_p = 8/20\mu s$<br>Pin 2 to Pin 4<br>Pin 5 to Pin 6           |         |         | 26      | V     |
| Junction Capacitance      | $C_j$     | $V_R = 0V$ , $f = 1MHz$<br>Pin 2 or 4 to Pin 3<br>Pin 5 or 6 to Pin 1           |         |         | 5       | pF    |
|                           |           | $V_R = 0V$ , $f = 1MHz$<br>Pin 2 to 4<br>Pin 5 to 6                             |         | 1.5     |         | pF    |

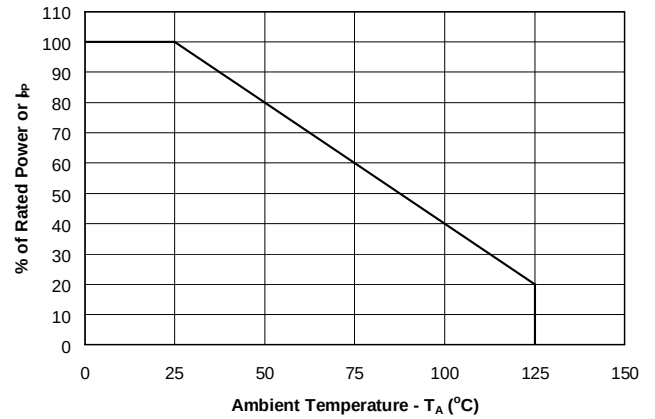
## PROTECTION PRODUCTS

### Typical Characteristics

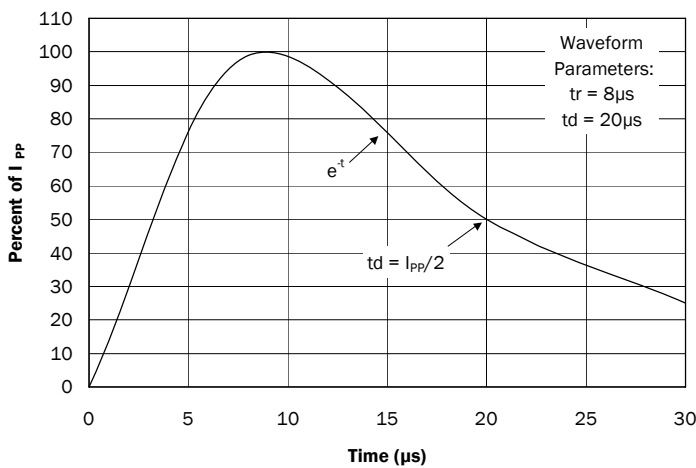
#### Non-Repetitive Peak Pulse Power vs. Pulse Time



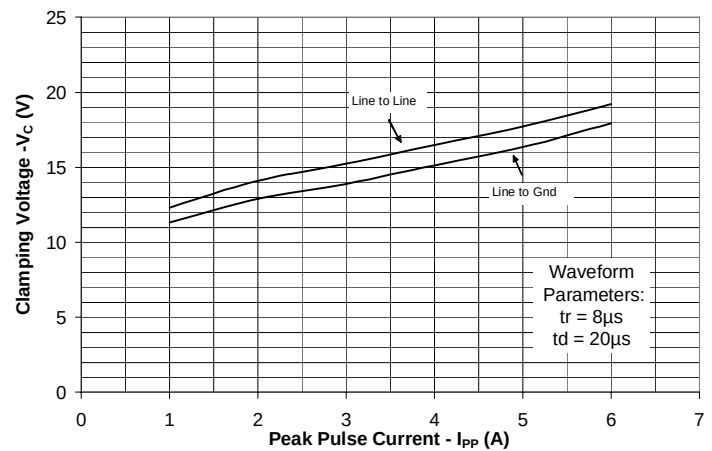
#### Power Derating Curve



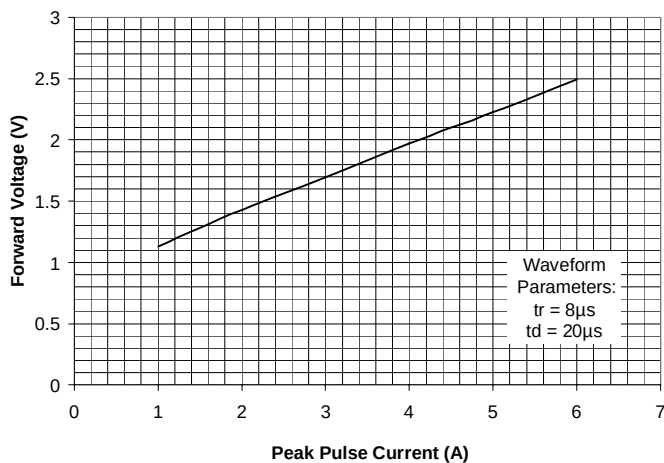
#### Pulse Waveform



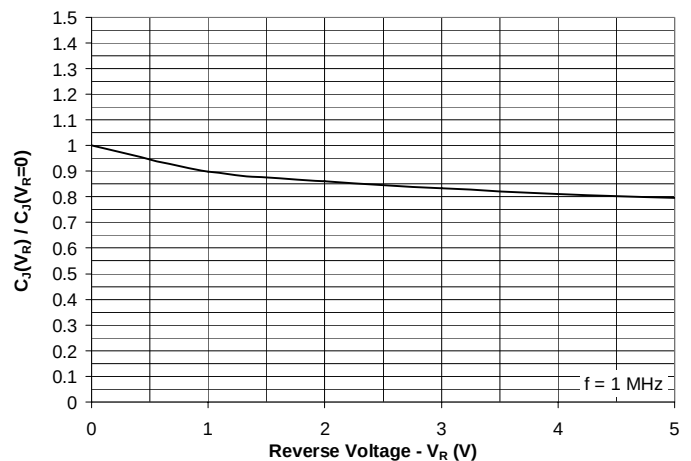
#### Clamping Voltage vs. Peak Pulse Current

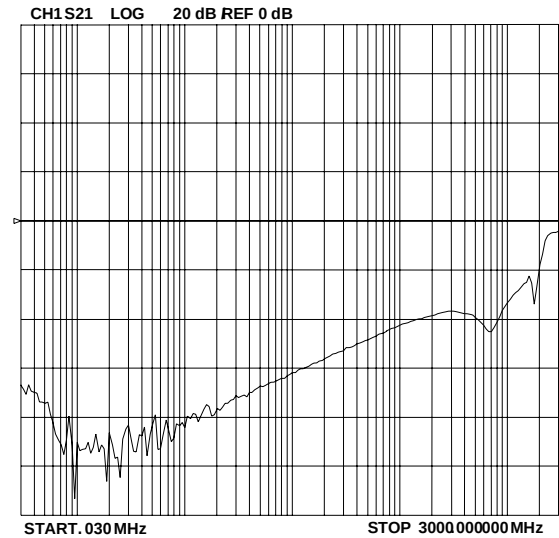
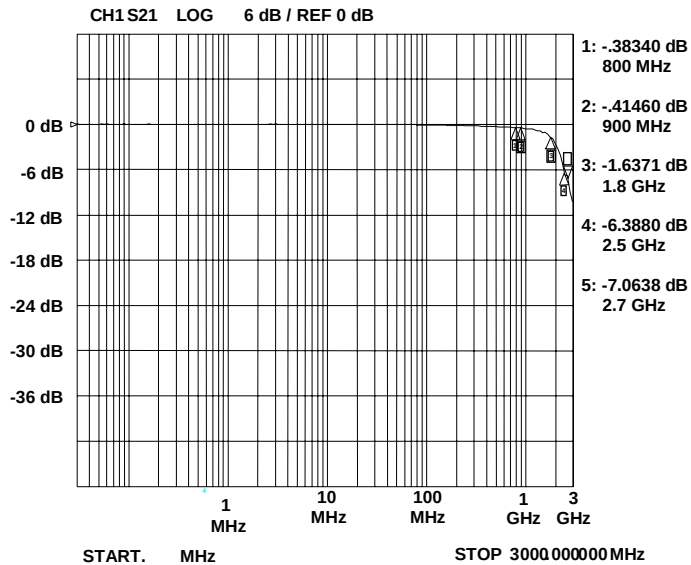
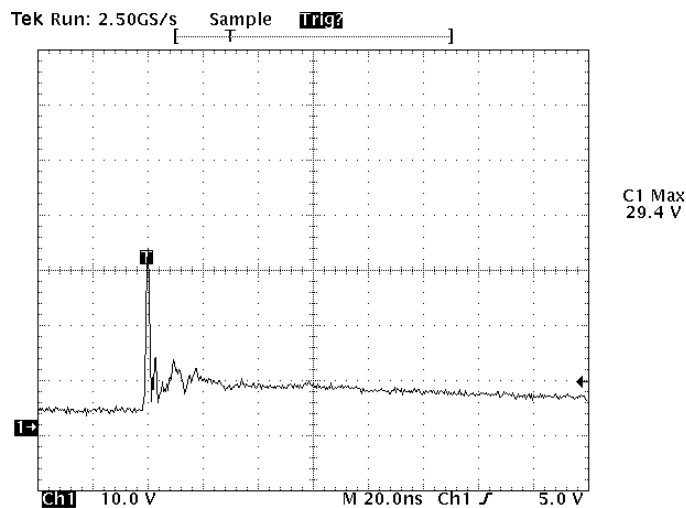


#### Forward Voltage vs. Forward Current

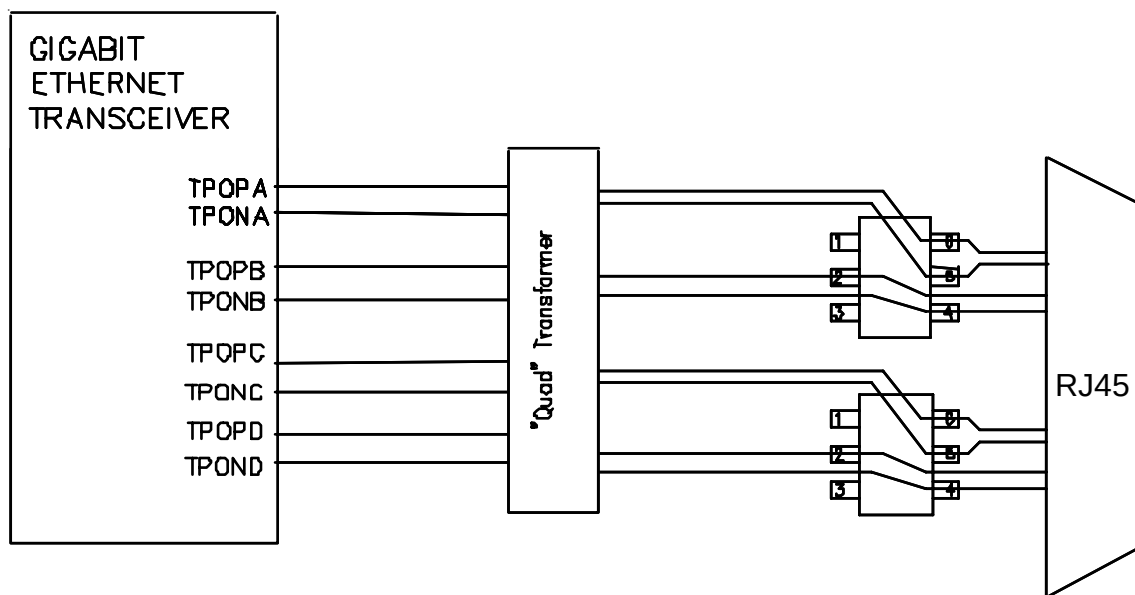


#### Normalized Capacitance vs. Reverse Voltage

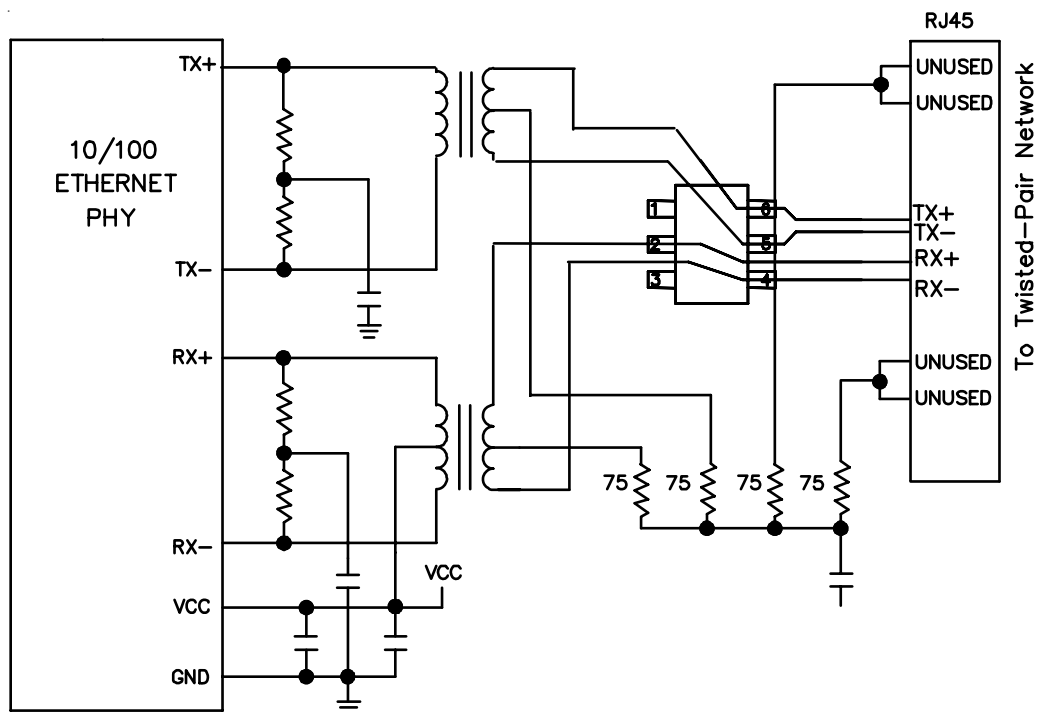


**PROTECTION PRODUCTS**
**Applications Information**
**Insertion Loss S21**
**Analog Cross Talk**

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


Note: Data is taken with a 10x attenuator

**PROTECTION PRODUCTS**


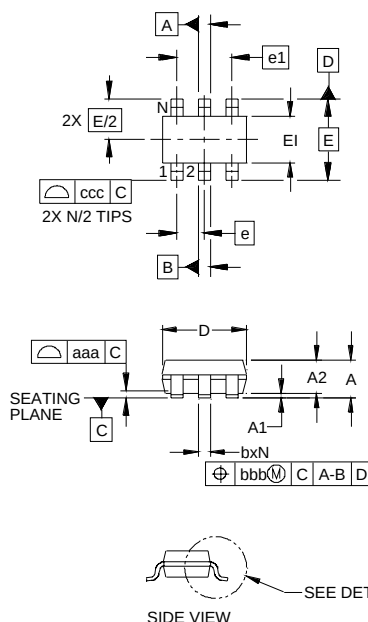
**Figure 1 - GbE Ethernet Differential Protection**



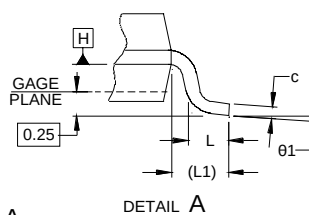
**Figure 2 - 10/100 Ethernet Differential Mode Protection**

# PROTECTION PRODUCTS

## Outline Drawing -SOT23 6L



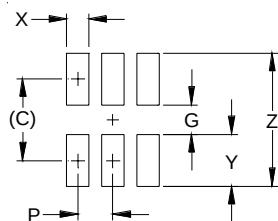
| DIM    | INCHES   |      |      | MILLIMETERS |      |      |
|--------|----------|------|------|-------------|------|------|
|        | MIN      | NOM  | MAX  | MIN         | NOM  | MAX  |
| A      | .035     | -    | .057 | 0.90        | -    | 1.45 |
| A1     | .000     | -    | .006 | 0.00        | -    | 0.15 |
| A2     | .035     | .045 | .051 | .90         | 1.15 | 1.30 |
| b      | .010     | -    | .020 | 0.25        | -    | 0.50 |
| c      | .003     | -    | .009 | 0.08        | -    | 0.22 |
| D      | .110     | .114 | .122 | 2.80        | 2.90 | 3.10 |
| E1     | .060     | .063 | .069 | 1.50        | 1.60 | 1.75 |
| E      | .110 BSC |      |      | 2.80 BSC    |      |      |
| e      | .037 BSC |      |      | 0.95 BSC    |      |      |
| e1     | .075 BSC |      |      | 1.90 BSC    |      |      |
| L      | .012     | .018 | .024 | 0.30        | 0.45 | 0.60 |
| L1     | (.024)   |      |      | (0.60)      |      |      |
| N      | 6        |      |      | 6           |      |      |
| theta1 | 0°       | -    | 10°  | 0°          | -    | 10°  |
| aaa    | .004     |      |      | 0.10        |      |      |
| bbb    | .008     |      |      | 0.20        |      |      |
| ccc    | .008     |      |      | 0.20        |      |      |



### NOTES:

1. CONTROLLING DIMENSIONS ARE IN MILLIMETERS (ANGLES IN DEGREES).
2. DATUMS  $\boxed{-A-}$  AND  $\boxed{-B-}$  TO BE DETERMINED AT DATUM PLANE  $\boxed{-H-}$
3. DIMENSIONS "E1" AND "D" DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.

## Land Pattern -SOT23 6L



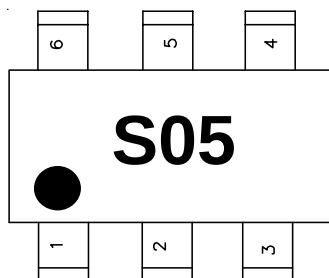
| DIM | DIMENSIONS |             |
|-----|------------|-------------|
|     | INCHES     | MILLIMETERS |
| C   | (.098)     | (2.50)      |
| G   | .055       | 1.40        |
| P   | .037       | 0.95        |
| X   | .024       | 0.60        |
| Y   | .043       | 1.10        |
| Z   | .141       | 3.60        |

### NOTES:

1. 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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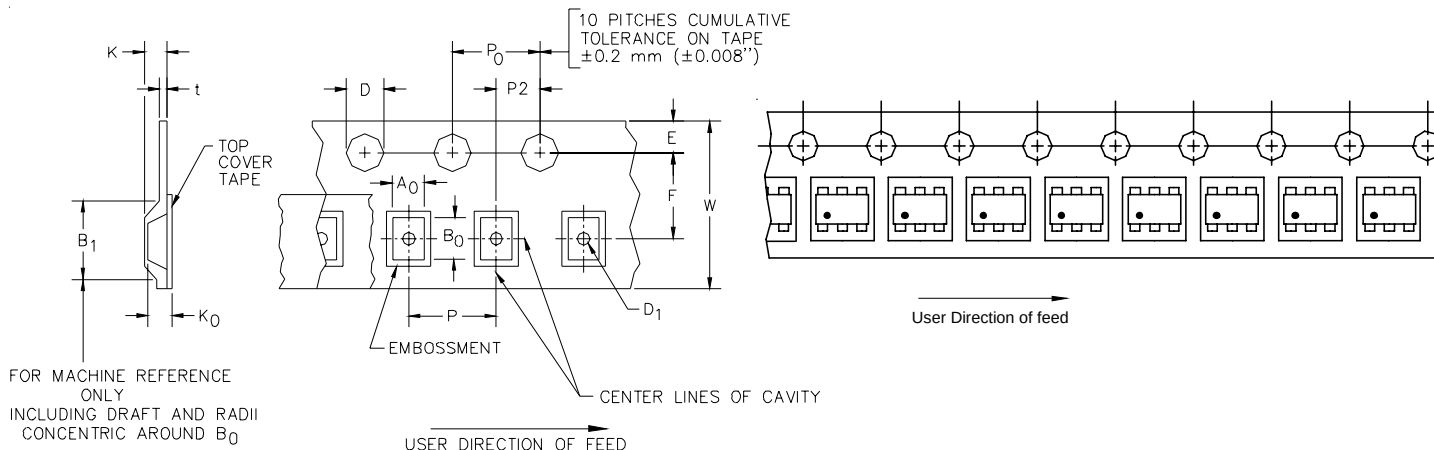
### Marking Codes



### Ordering Information

| Part Number     | Lead Finish | Qty per Reel | Reel Size |
|-----------------|-------------|--------------|-----------|
| RClamp0524S.TCT | Pb free     | 3,000        | 7 Inch    |

### Tape and Reel Specification



| A0              | B0              | K0              |
|-----------------|-----------------|-----------------|
| 3.23 +/-0.05 mm | 3.17 +/-0.05 mm | 1.37 +/-0.05 mm |

| Tape Width | B, (Max)      | D                     | D1           | E            | F           | K (MAX) | P          | P0         | P2          | T(MAX) | W                        |
|------------|---------------|-----------------------|--------------|--------------|-------------|---------|------------|------------|-------------|--------|--------------------------|
| 8 mm       | 4.2 mm (.165) | 1.5 + 0.1 mm - 0.0 mm | 1.0 mm ±0.05 | 1.750±.10 mm | 3.5±0.05 mm | 2.4 mm  | 4.0±0.1 mm | 4.0±0.1 mm | 2.0±0.05 mm | 0.4 mm | 8.0 mm + 0.3 mm - 0.1 mm |

### Contact Information

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