

**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**

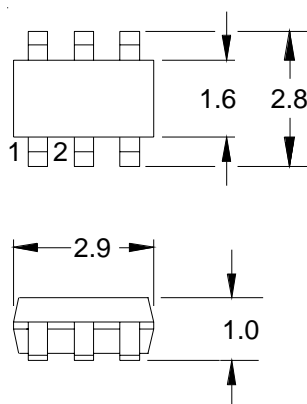
- ◆ ESD protection for high-speed data lines to **IEC 61000-4-2 (ESD)  $\pm 15\text{kV}$  (air),  $\pm 8\text{kV}$  (contact)**
- ◆ **IEC 61000-4-4 (EFT) 40A (5/50ns)**
- ◆ Array of surge rated diodes with internal TVS Diode
- ◆ Small package saves board space
- ◆ Protects four I/O lines
- ◆ Low capacitance: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

**Mechanical Characteristics**

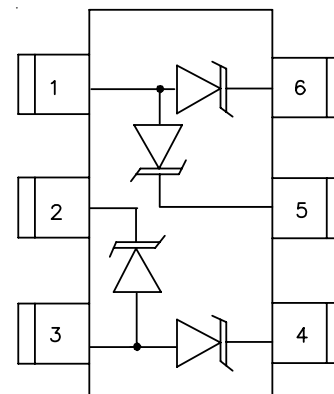
- ◆ JEDEC SOT-23 6L package
- ◆ Molding compound flammability rating: UL 94V-0
- ◆ Marking : S05
- ◆ Packaging : Tape and Reel
- ◆ RoHS/WEEE Compliant

**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) ESD per IEC 61000-4-2 (Contact)	$V_{ESD}$	15 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

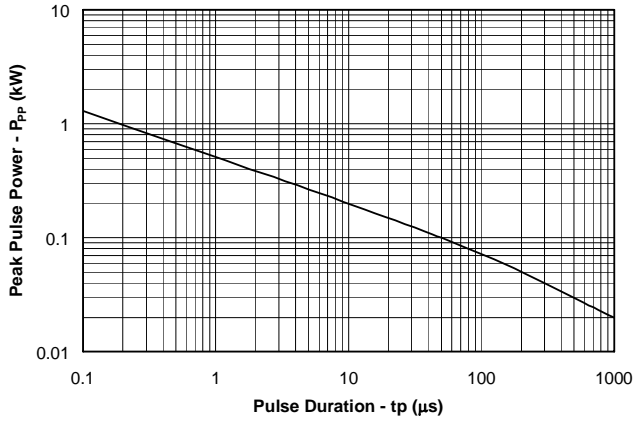
**Electrical Characteristics (T=25°C unless otherwise specified)**

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

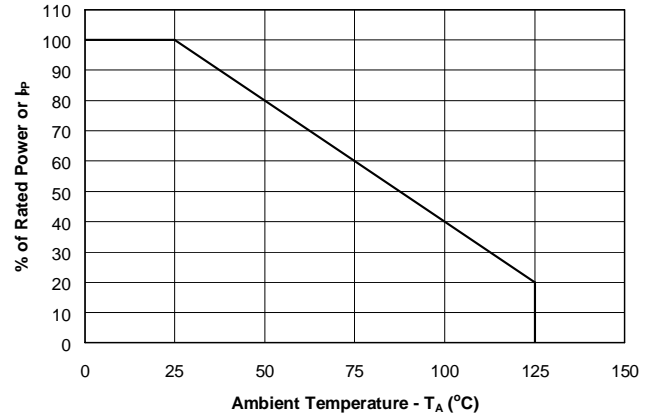
## PROTECTION PRODUCTS

### Typical Characteristics

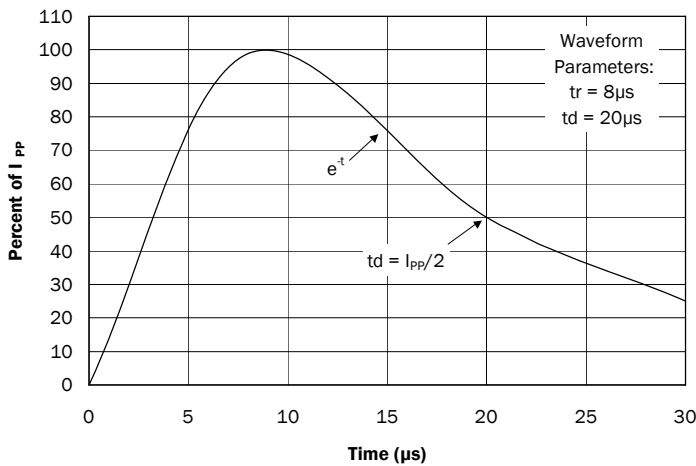
#### Non-Repetitive Peak Pulse Power vs. Pulse Time



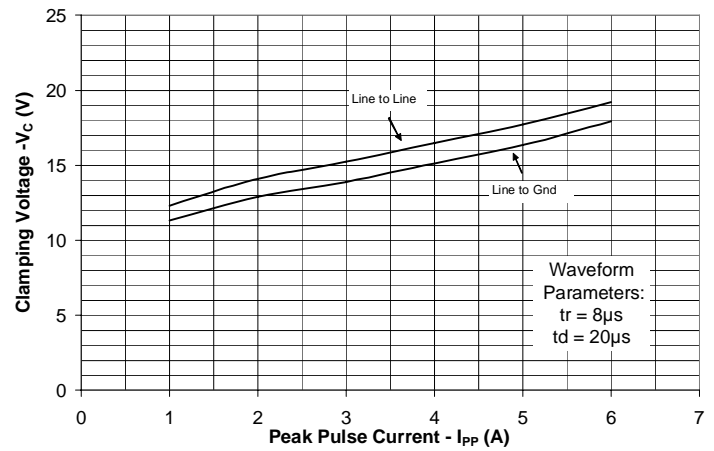
#### Power Derating Curve



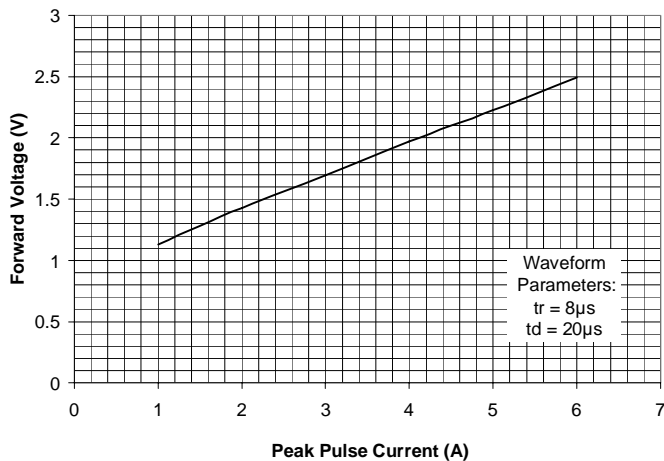
#### Pulse Waveform



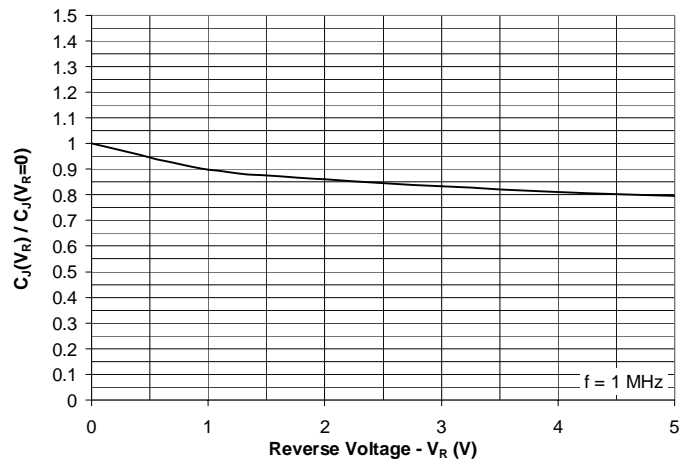
#### Clamping Voltage vs. Peak Pulse Current



#### Forward Voltage vs. Forward Current



#### Normalized Capacitance vs. Reverse Voltage

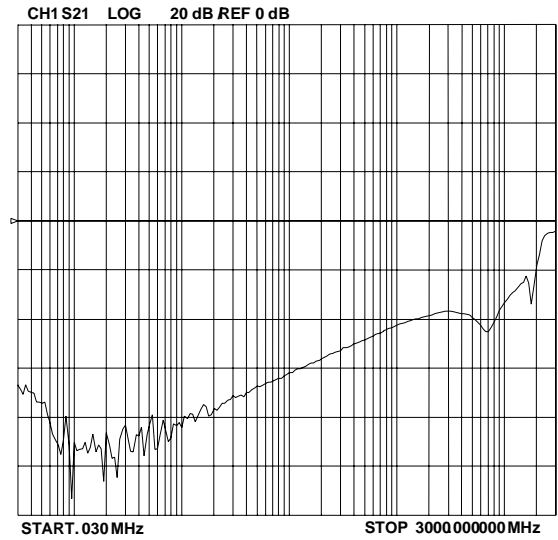
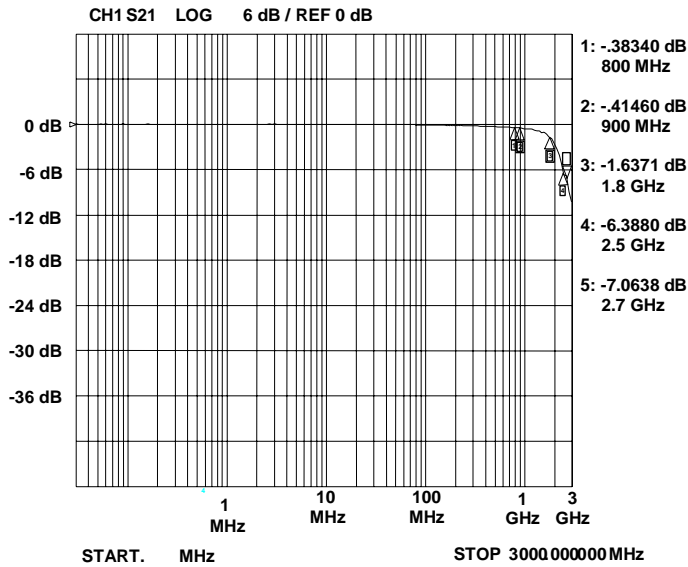


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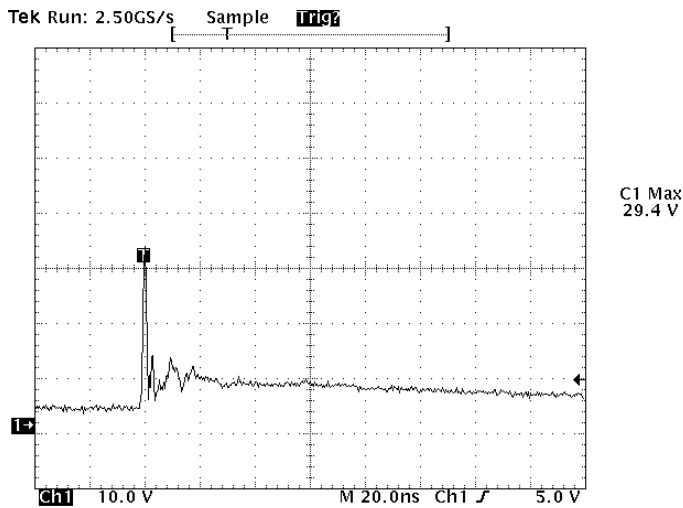
Applications Information

Insertion Loss S21

Analog Cross Talk



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



Note: Data is taken with a 10x attenuator

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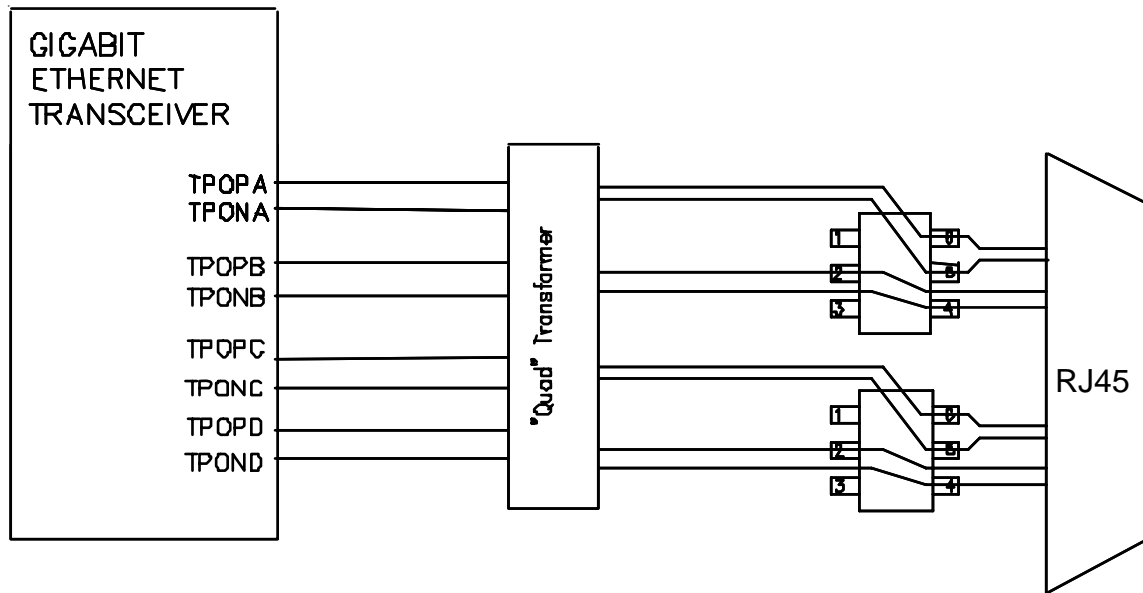


Figure 1 - GbE Ethernet Differential Protection

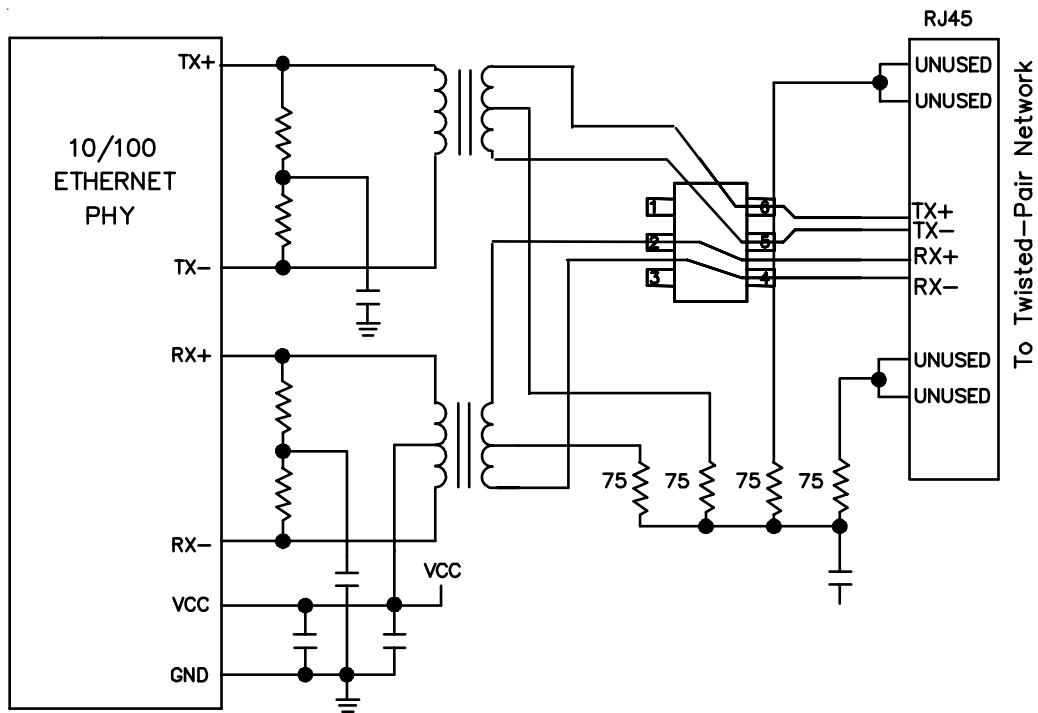
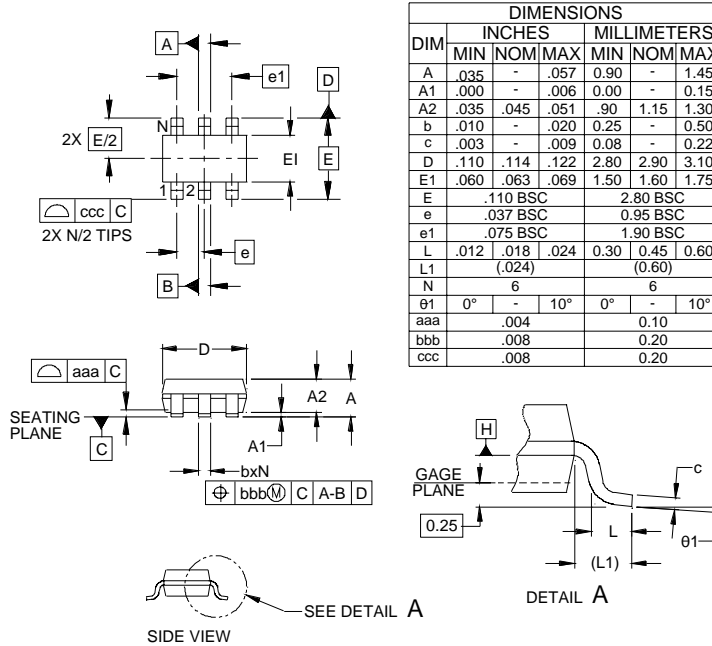


Figure 2 - 10/100 Ethernet Differential Mode Protection

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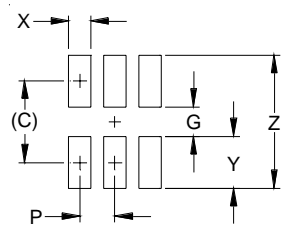
Outline Drawing -SOT23 6L



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	(0.024)			(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

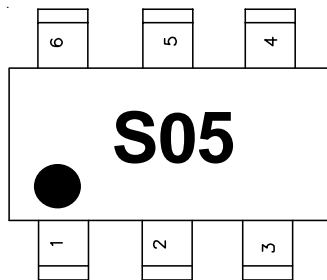


DIM	INCHES	MILLIMETERS
C	(.098)	(2.50)
G	.055	1.40
P	.037	0.95
X	.024	0.60
Y	.043	1.10
Z	.141	3.60

- NOTES:
1. THIS LAND PATTERN IS FOR REFERENCE PURPOSES ONLY. CONSULT YOUR MANUFACTURING GROUP TO ENSURE YOUR COMPANY'S MANUFACTURING GUIDELINES ARE MET.

## PROTECTION PRODUCTS

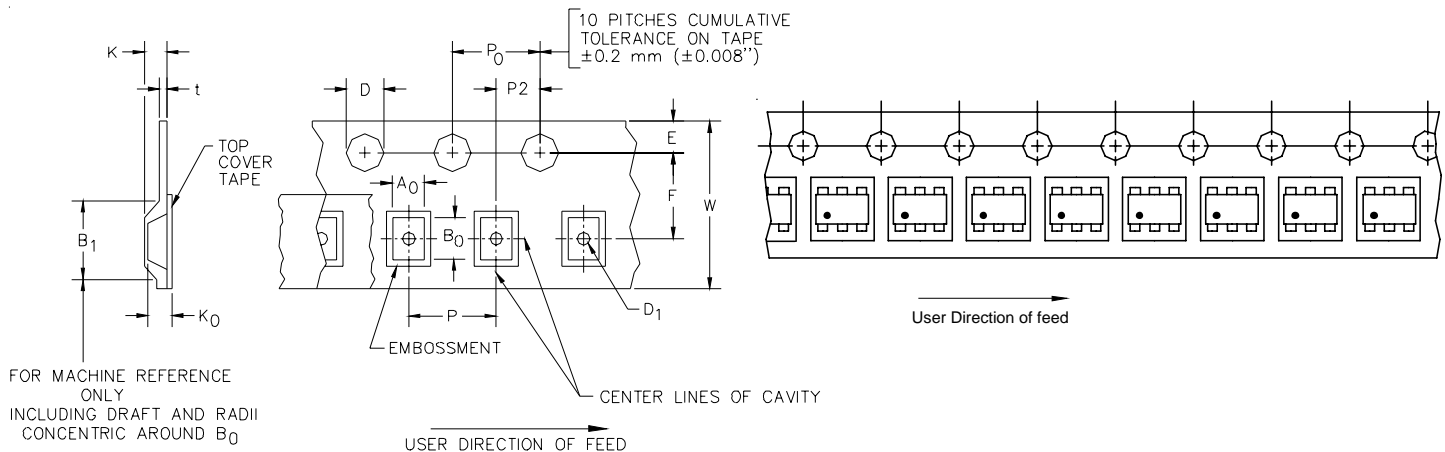
### Marking Codes



### 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

Semtech Corporation  
 Protection Products Division  
 200 Flynn Road, Camarillo, CA 93012  
 Phone: (805)498-2111 FAX (805)498-3804

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