

PROTECTION PRODUCTS - RailClamp®

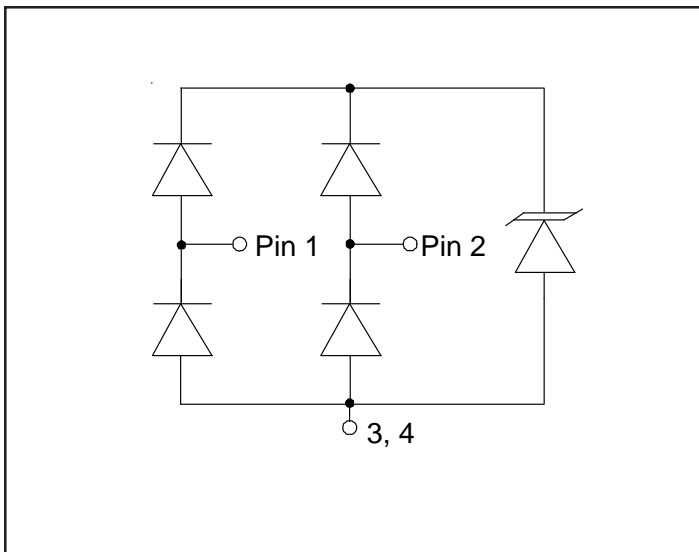
Description

RailClamp® TVS diode arrays are specifically designed to protect sensitive components which are connected to high-speed data and transmission lines from over-voltage caused by **ESD** (electrostatic discharge), **CDE** (Cable Discharge Events), and **EFT** (electrical fast transients).

The RClamp®0542T has a typical capacitance of only 0.25pF between I/O pins. This allows it to be used on circuits operating in excess of 3GHz without signal attenuation. These devices are constructed using Semtech's proprietary RailClamp process technology. This technology yields superior electrical characteristics including reduced leakage current (IR), a key requirement for high-speed interfaces. As such, the RClamp0542T has a maximum IR of only 50nA at 5 volts.

The RClamp0542T is in a 6-pin SLP1610P4T package. It measures 1.6 x 1.0 x 0.4mm. The leads are spaced at a pitch of 0.5mm and are finished with lead-free NiPdAu. They are designed for easy PCB layout by allowing the traces to run straight through the device. They may be used to meet the ESD immunity requirements of IEC 61000-4-2. Each device is designed to protect two lines (one differential pair). The combination of small size, low capacitance, low leakage current, and high level of ESD protection makes them a flexible solution for protection of next generation interfaces including 10Gigabit Ethernet, HDMI 1.4, and USB 3.0.

Circuit Diagram



Features

- ◆ Transient protection for high-speed data lines to **IEC 61000-4-2 (ESD) ±18kV (air), ±12kV (contact) IEC 61000-4-4 (EFT) 40A (5/50ns)**
- ◆ Array of surge rated diodes with internal TVS Diode
- ◆ Small package saves board space
- ◆ Protects up to 6-Lines operating at 5V
- ◆ Low capacitance: **0.25pF** typical (I/O to I/O)
- ◆ No insertion loss to **3.0GHz**
- ◆ Low leakage current
- ◆ Low clamping voltage
- ◆ Innovative package for easy pcb layout
- ◆ Solid-state silicon-avalanche technology

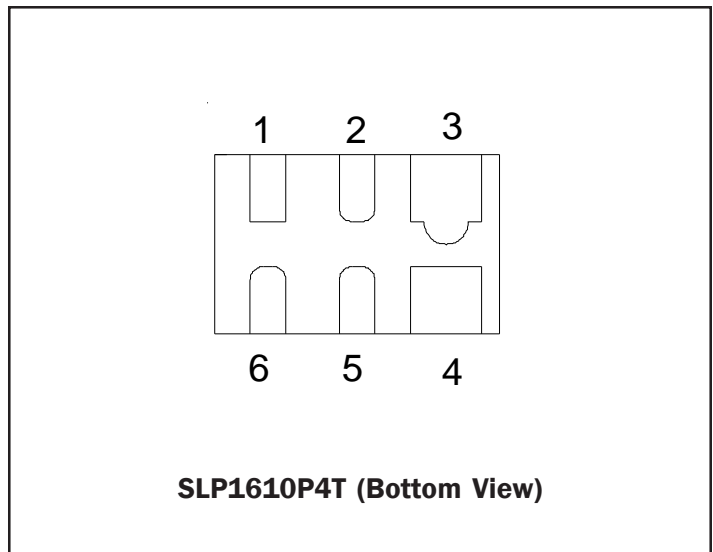
Mechanical Characteristics

- ◆ SLP1610P4T 6-pin package
- ◆ Pb-Free, Halogen Free, RoHS/WEEE Compliant
- ◆ Nominal Dimensions: 1.6 x 1.0 x 0.40 mm
- ◆ Lead Finish: NiPdAu
- ◆ Molding compound flammability rating: UL 94V-0
- ◆ Marking: Marking code
- ◆ Packaging: Tape and Reel

Applications

- ◆ 10GBASE-T Ethernet
- ◆ 10/100/1000 Ethernet
- ◆ SATA
- ◆ USB 3.0
- ◆ HDMI 1.4

PIN Configuration



PROTECTION PRODUCTS
Absolute Maximum Rating

Rating	Symbol	Value	Units
Peak Pulse Power (tp = 8/20μs)	P_{pk}	75	Watts
Peak Pulse Current (tp = 8/20μs)	I_{pp}	5	A
ESD per IEC 61000-4-2 (Air) ESD per IEC 61000-4-2 (Contact)	V_{ESD}	+/- 18 +/- 12	kV
Operating Temperature	T_J	-55 to +125	°C
Storage Temperature	T_{STG}	-55 to +150	°C

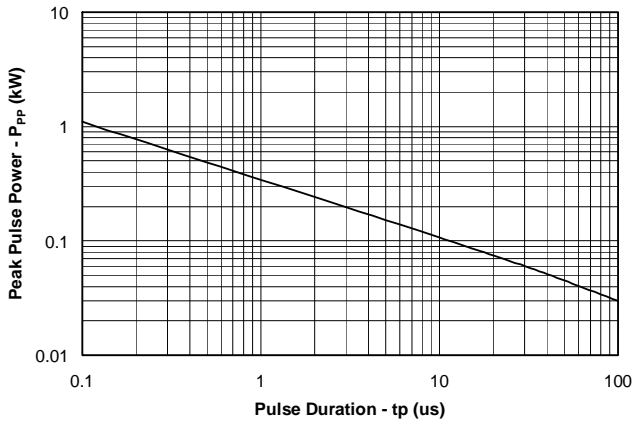
Electrical Characteristics (T = 25°C)

Parameter	Symbol	Conditions	Minimum	Typical	Maximum	Units
Reverse Stand-Off Voltage	V_{RWM}	Any I/O to GND			5	V
Reverse Breakdown Voltage	V_{BR}	$I_t = 1mA$, Any I/O to GND	6.5	8	11	V
Reverse Leakage Current	I_R	$V_{RWM} = 5.0V$, Any I/O to GND		0.005	0.050	μA
Forward Voltage	V_F	$I_f = 15mA$ Any I/O to GND	0.6		1.2	V
Clamping Voltage	V_C	$I_{pp} = 1A$, tp = 8/20μs Any I/O to GND			12	V
Clamping Voltage	V_C	$I_{pp} = 5A$, tp = 8/20μs Any I/O to GND			15	V
Junction Capacitance	C_j	$V_R = 0V$, f = 1MHz, Any I/O to GND		0.45	0.60	pF
		$V_R = 0V$, f = 1MHz, Between I/O pins		0.25	0.4	pF

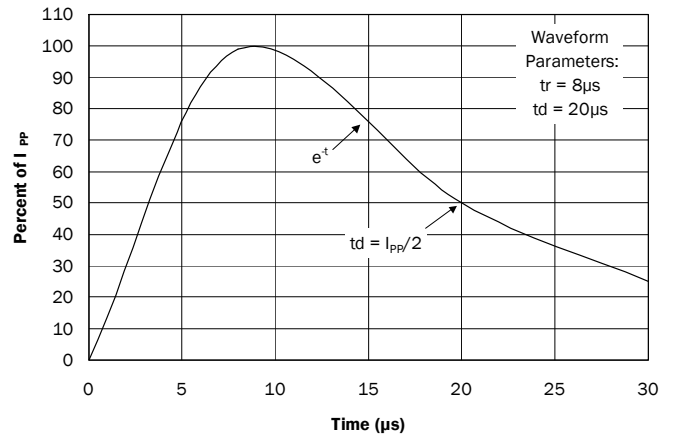
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Typical Characteristics

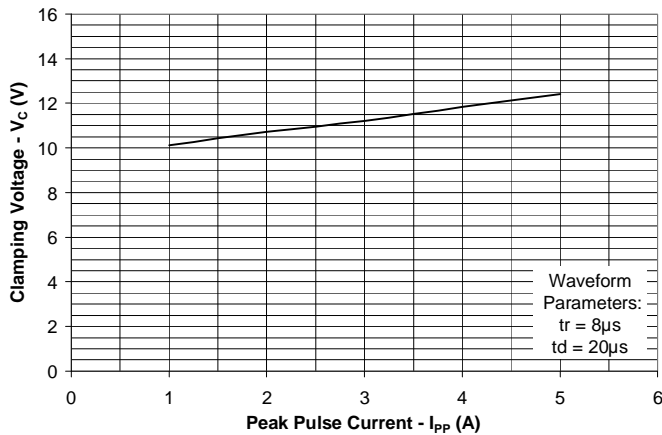
Non-Repetitive Peak Pulse Power vs. Pulse Time



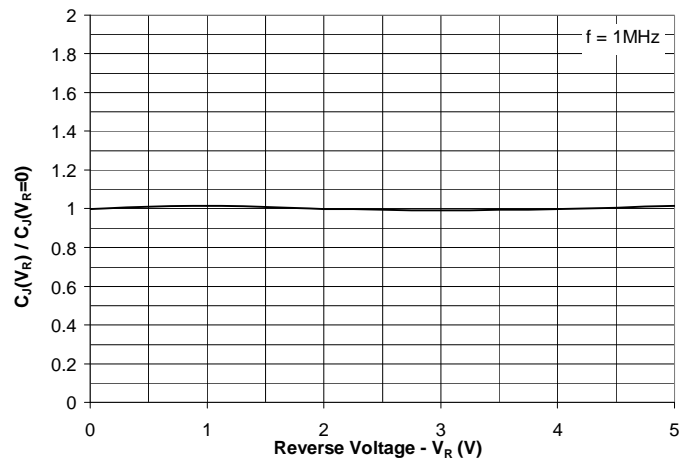
Pulse Waveform



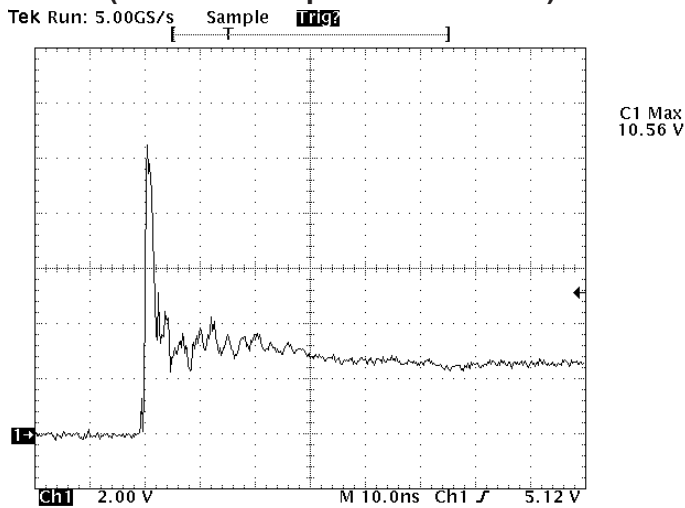
Clamping Voltage vs. Peak Pulse Current



Normalized Capacitance vs. Reverse Voltage



ESD Clamping (Any I/O to GND)
(+8kV Contact per IEC 61000-4-2)



Note: Data is taken with a 10x attenuator

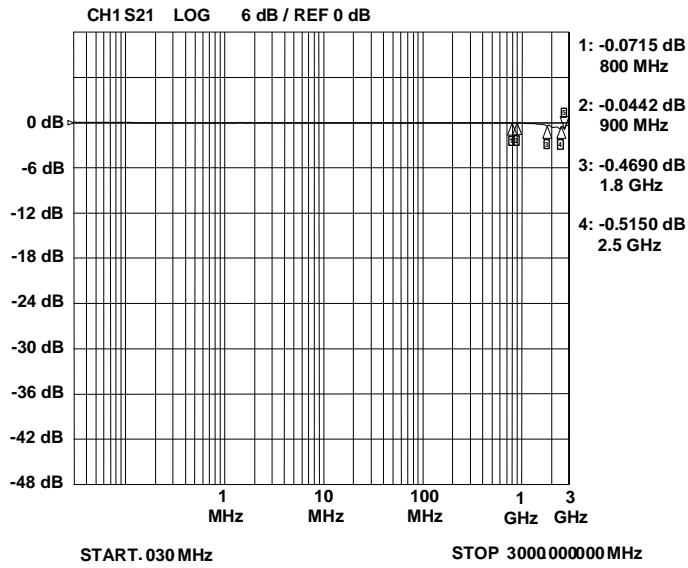
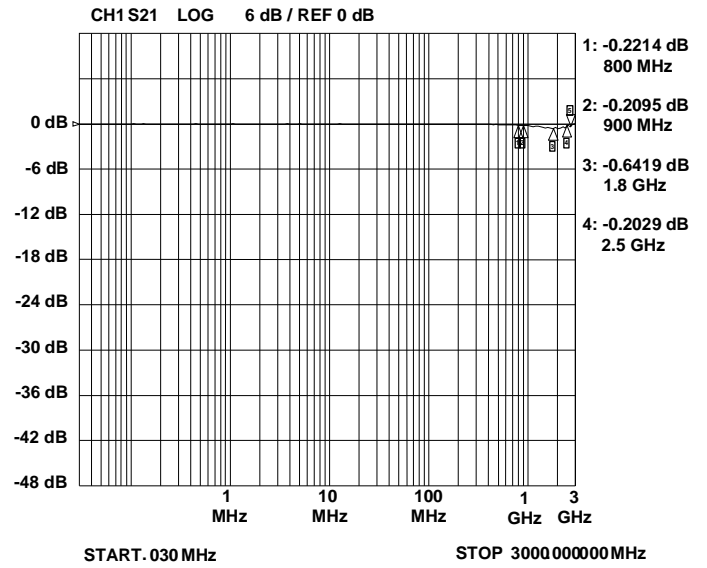
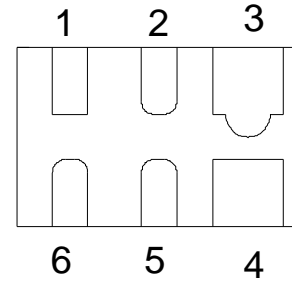
PROTECTION PRODUCTS
Typical Characteristics
Insertion Loss S21 - I/O to I/O

Insertion Loss S21 - I/O to GND


Figure 1- Pin Configuration



Pin	Identification
1 - 2	Input Lines
5 - 6	Output Lines (No Internal Connection)
3 - 4	Ground

Figure 2 - Circuit Diagram

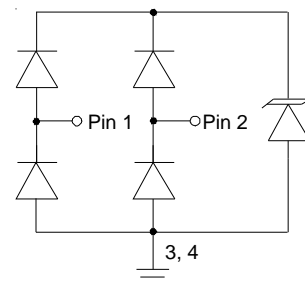
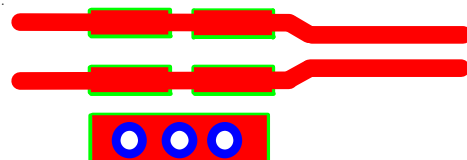
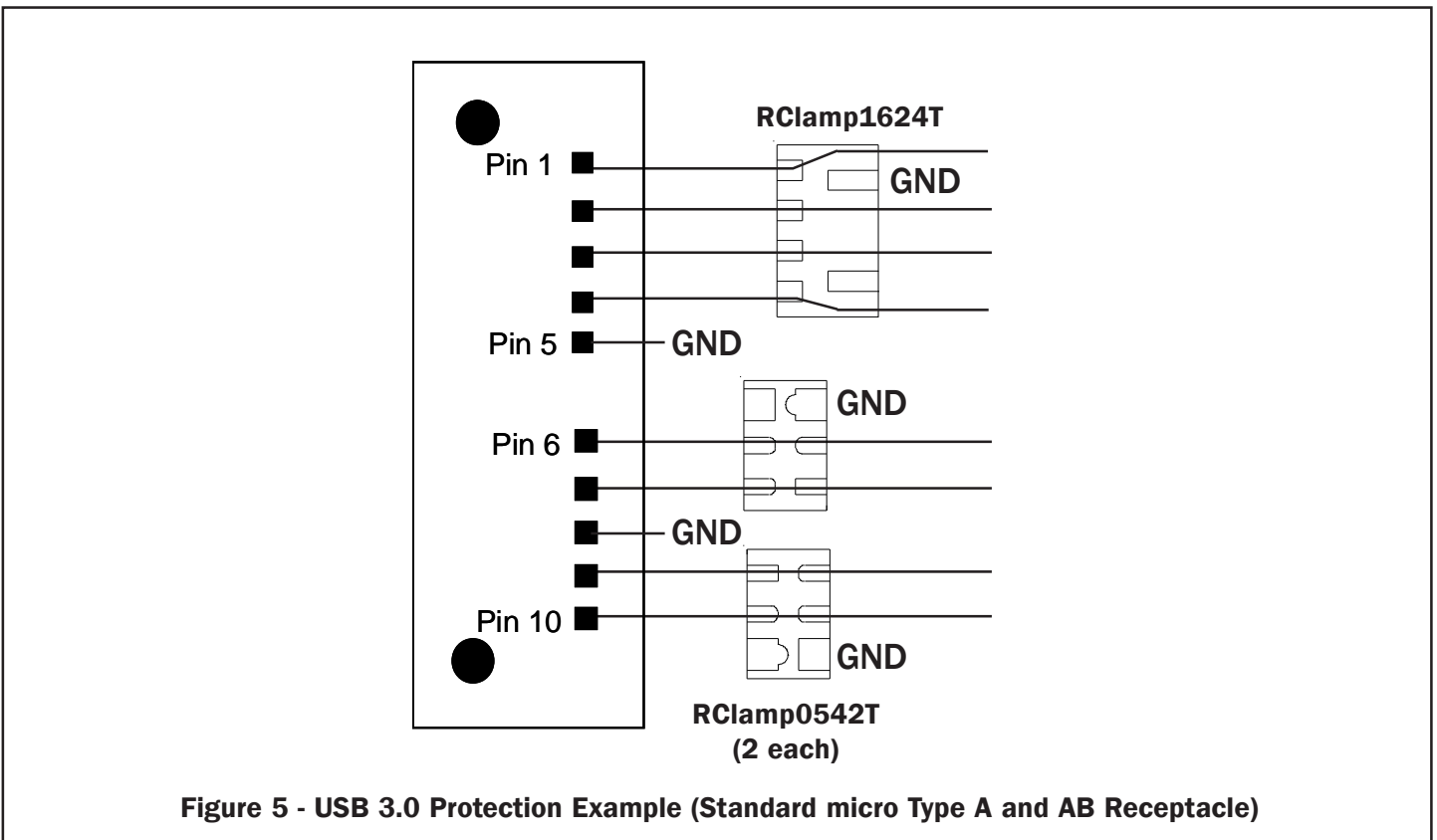
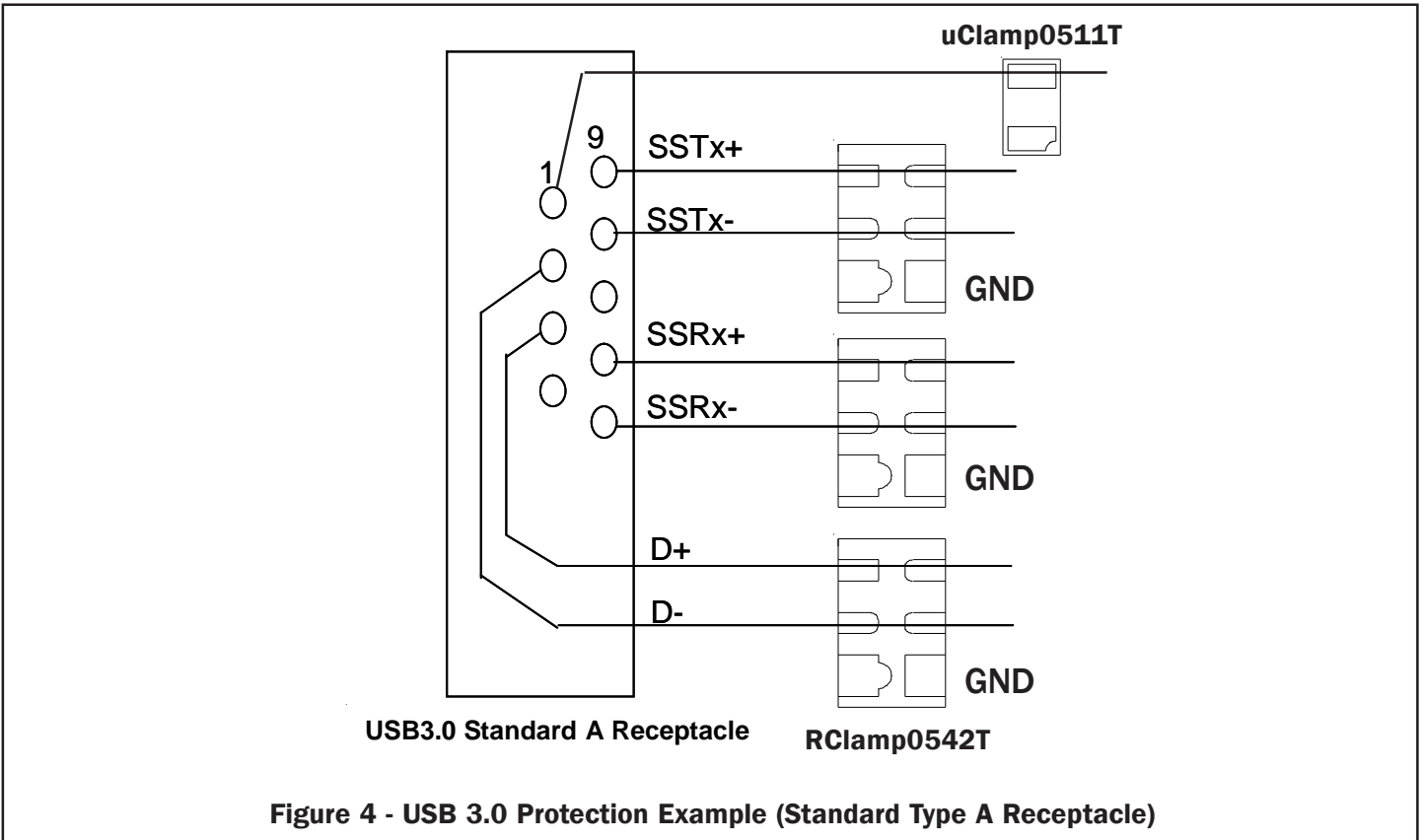


Figure 3 - Layout Example



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Applications Information



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10GbaseT Ethernet Protection

RClamp0542T

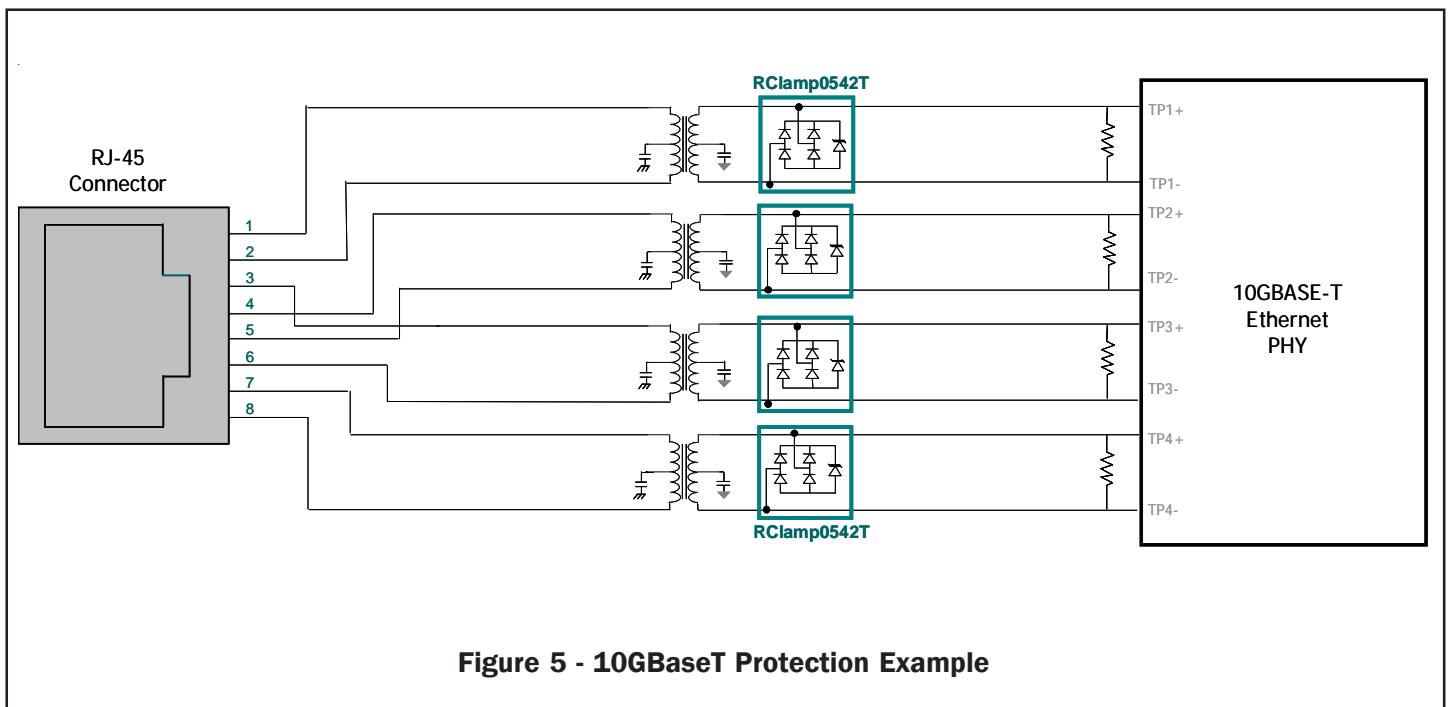
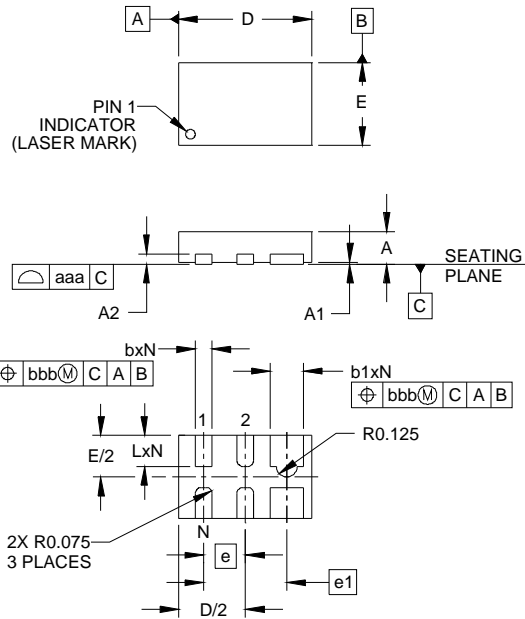


Figure 5 - 10GBaseT Protection Example

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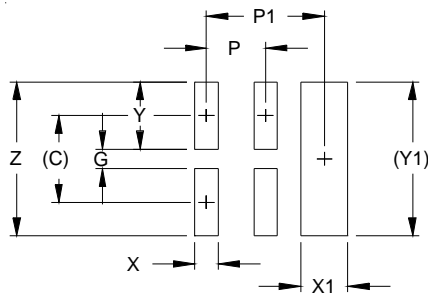
Outline Drawing - SLP1610P4T



DIM	INCHES			MILLIMETERS		
	MIN	NOM	MAX	MIN	NOM	MAX
A	.015	.016	.017	0.37	0.40	0.43
A1	0.00	.001	.002	0.00	0.03	0.05
A2	(.005)			(0.13)		
b	.006	.008	.010	0.15	0.20	0.25
b1	.014	.016	.018	0.35	0.40	0.45
D	.059	.063	.067	1.50	1.60	1.70
E	.035	.039	.043	0.90	1.00	1.10
e	.020 BSC			0.50 BSC		
e1	.039 BSC			1.00 BSC		
L	.012	.015	.017	0.30	0.38	0.43
N	4			4		
aaa	.003			0.08		
bbb	.004			0.10		

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

Land Pattern - SLP1610P4T

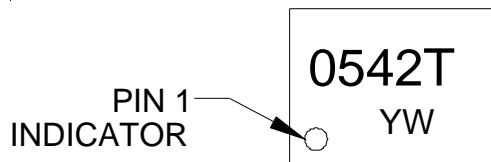


DIM	DIMENSIONS	
	INCHES	MILLIMETERS
C	(.034)	(0.875)
G	.008	0.20
P	.020	0.50
P1	.039	1.00
X	.008	0.20
X1	.016	0.40
Y	.027	0.675
Y1	(.061)	(1.55)
Z	.061	1.55

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



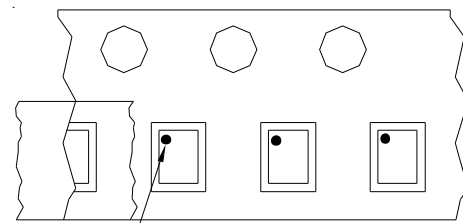
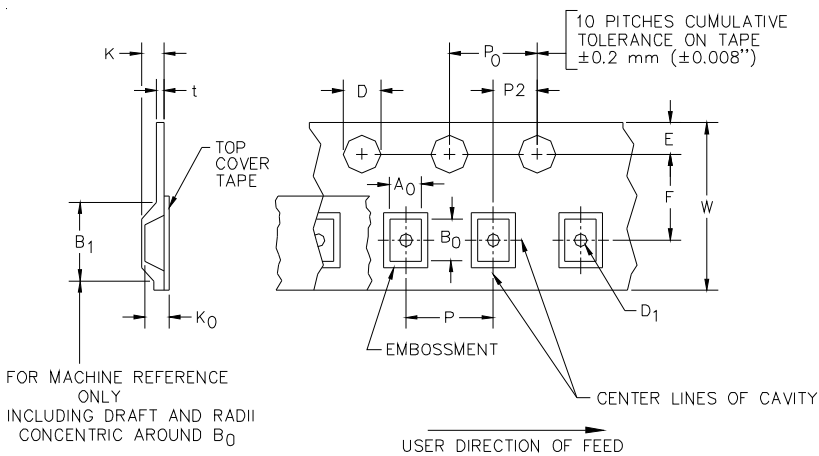
Ordering Information

Part Number	Lead Finish	Qty per Reel	Reel Size
RClamp0542T.TCT	Pb Free	3,000	7 Inch

RailClamp and RClamp are marks of Semtech Corporation

YW = Date Code

Tape and Reel Specification



Pin 1 Location

→
User Direction of feed

Device Orientation in Tape
Pin 1 in upper left towards sprocket holes

A0	B0	K0
1.30 +/-0.05 mm	1.75 +/-0.05 mm	0.70 +/-0.05 mm

Tape Width	B, (Max)	D	D1	E	F	K (MAX)	P	P0	P2	T(MAX)	W
8 mm	4.2 mm	1.5 + 0.1 mm - 0.0 mm)	0.5 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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