

PROTECTION PRODUCTS - MicroClamp™

Description

The μClamp™ series of TVS arrays are designed to protect sensitive electronics from damage or latch-up due to ESD. It is designed to replace single line devices such as multilayer varistors (MLVs) in space constrained applications such as cell phones, notebook computers, and other portable electronics. It features large cross-sectional area junctions for conducting high transient currents. TVS diodes offer desirable characteristics for board level protection including fast response time, low operating and clamping voltage, and no device degradation.

The μClamp™0544P is in a 10-pin, RoHS/WEEE compliant, SLP2510P8 package. It measures 2.5 x 1.0 with a nominal height of 0.58mm. 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. Each device features four TVS diodes with an operating voltage of 5 volts and a maximum loading capacitance of only 10pF.

They may be used to meet the ESD immunity requirements of IEC 61000-4-2, Level 4 (±15kV air, ±8kV contact discharge). The combination of small size and high ESD surge capability makes them ideal for use in portable applications such as cellular phones, digital cameras, and notebook computers.

Features

- ◆ Transient protection for data lines to **IEC 61000-4-2 (ESD) ±15kV (air), ±8kV (contact)**
IEC 61000-4-4 (EFT) 40A (tp = 5/50ns)
Cable Discharge Event (CDE)
- ◆ Ultra-small package
- ◆ Protects four data lines
- ◆ Low clamping voltage
- ◆ Working voltage: 5V
- ◆ Low capacitance (10pF)
- ◆ Solid-state silicon-avalanche technology

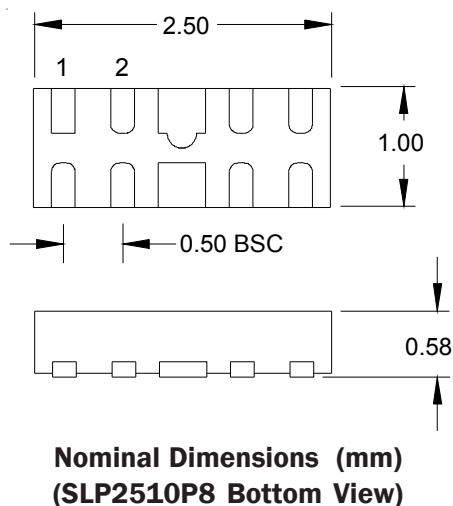
Mechanical Characteristics

- ◆ SLP2510P8 package
- ◆ RoHS/WEEE Compliant
- ◆ Nominal Dimensions: 2.5 x 1.0 x 0.58 mm
- ◆ Lead Finish: NiPdAu
- ◆ Molding compound flammability rating: UL 94V-0
- ◆ Marking : Marking code
- ◆ Packaging : Tape and Reel

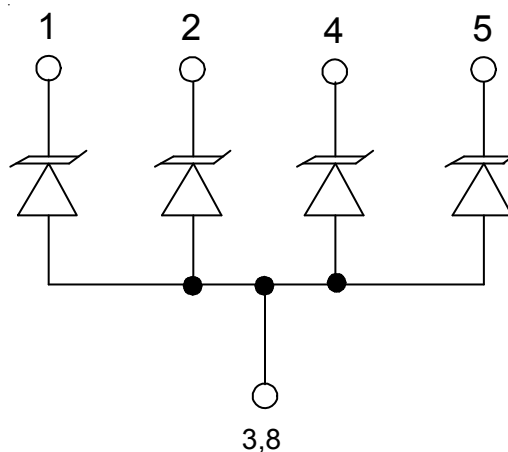
Applications

- ◆ Cellular Handsets & Accessories
- ◆ Notebooks & Handhelds
- ◆ mp3 Players
- ◆ Cordless Phones
- ◆ Portable Instrumentation
- ◆ Digital Cameras
- ◆ Peripherals

Dimensions



Schematic



Note: Pins 6, 7, 9, and 10 are not internally connected.

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Absolute Maximum Rating

| Rating | Symbol | Value | Units |
|--|-----------|------------------|-------|
| Peak Pulse Power ($t_p = 8/20\mu s$) | P_{pk} | 25 | Watts |
| Maximum Peak Pulse Current ($t_p = 8/20\mu s$) | I_{pp} | 2 | Amps |
| ESD per IEC 61000-4-2 (Air) ESD per IEC 61000-4-2 (Contact) | V_{ESD} | +/- 20 +/- 15 | kV |
| Operating Temperature | T_J | -55 to +125 | °C |
| Storage Temperature | T_{STG} | -55 to +150 | °C |

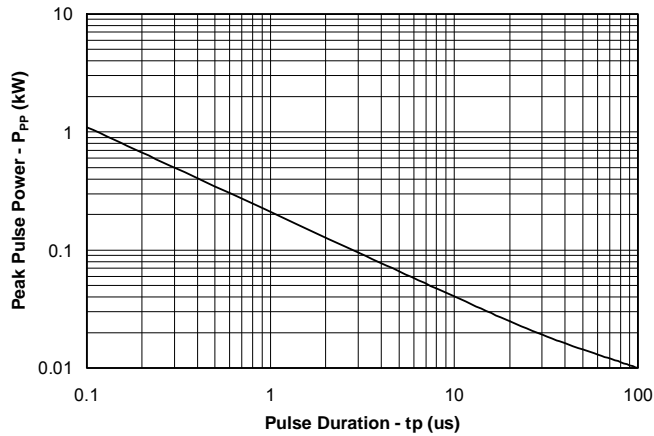
Electrical Characteristics (T=25°C)

| Parameter | Symbol | Conditions | Minimum | Typical | Maximum | Units |
|---------------------------|-----------|--------------------------------|---------|---------|---------|---------|
| Reverse Stand-Off Voltage | V_{RWM} | | | | 5 | V |
| Reverse Breakdown Voltage | V_{BR} | $I_t = 1mA$ | 6 | 7.1 | 8.5 | V |
| Reverse Leakage Current | I_R | $V_{RWM} = 5V, T=25^\circ C$ | | 0.010 | 0.10 | μA |
| Forward Voltage | V_F | $I_F = 10mA$ | | 1 | 1.2 | V |
| Clamping Voltage | V_C | $I_{pp} = 2A, t_p = 8/20\mu s$ | | | 12.5 | V |
| Junction Capacitance | C_j | $V_R = 0V, f = 1MHz$ | | | 10 | pF |
| Junction Capacitance | C_j | $V_R = 3.3V, f = 1MHz$ | | 4.5 | | pF |

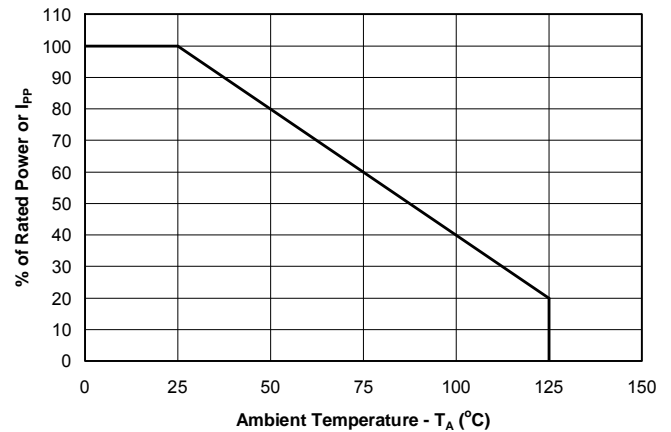
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Typical Characteristics

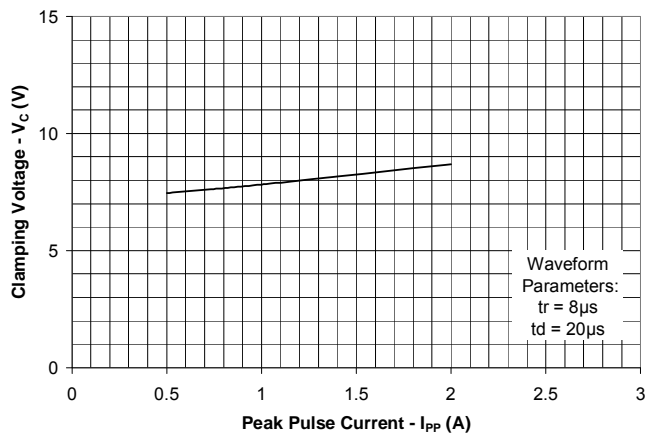
Non-Repetitive Peak Pulse Power vs. Pulse Time



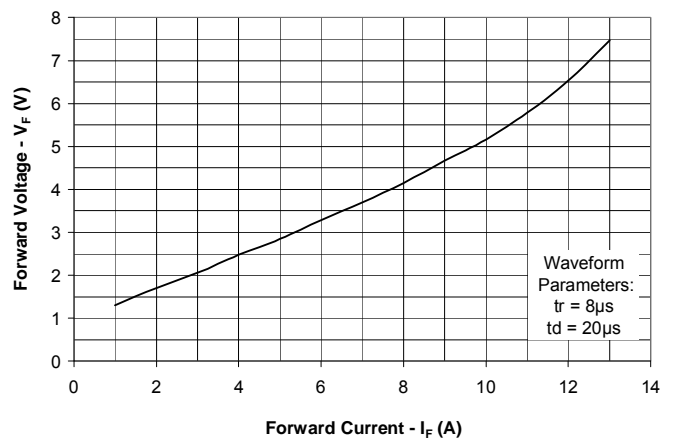
Power Derating Curve



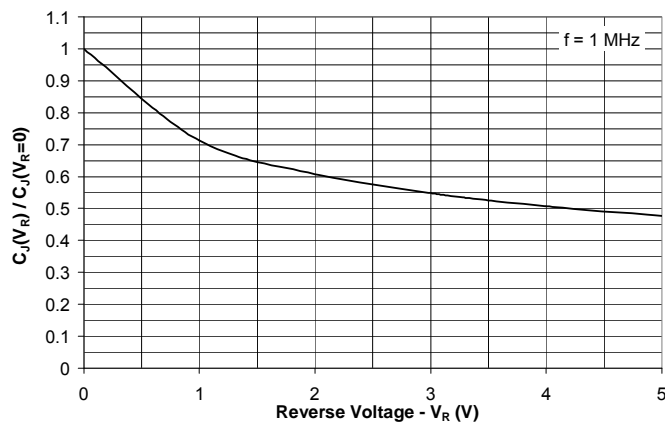
Clamping Voltage vs. Peak Pulse Current



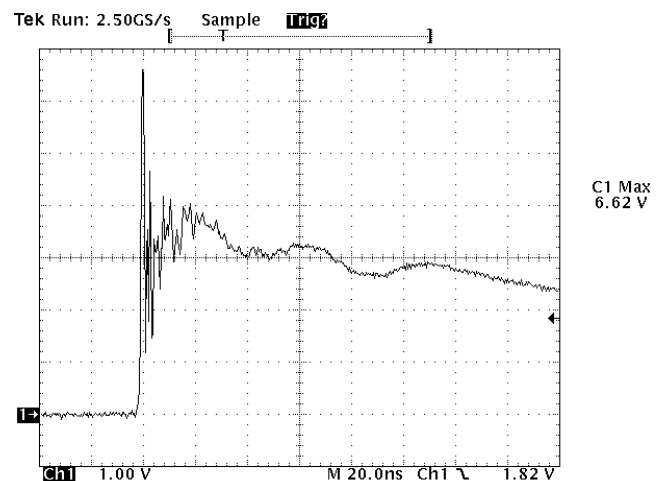
Forward Voltage vs. Forward Current



Normalized Junction Capacitance vs. Reverse Voltage



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



Note: Data is taken with a 10x attenuator

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Applications Information

Device Connection

This device is designed to protect four data lines. The device is unidirectional and may be used on lines where the signal polarity is above ground.

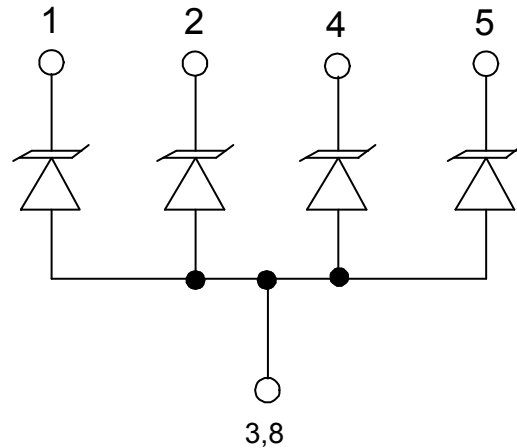
The uClamp0544P is designed such that the traces flow straight through the device. This is accomplished by using PCB traces to connect the pin pairs for each line (pin 1 to pin 10, pin 2 to pin 9, pin 4 to pin 7, pin 5 to pin 6). For example, line 1 enters at pin 1 and exits at Pin 10 and the PCB trace connects pin 1 and 10 together. This is true for lines connected at pins 2, 4, and 5 also. Ground is connected at pins 3 and 8. One large ground pad should be used in lieu of two separate pads. Multiple ground vias are recommended in order to reduce inductance in the ground path. This will maximize the device's effectiveness during an ESD event.

Circuit Board Layout Recommendations for Suppression of ESD.

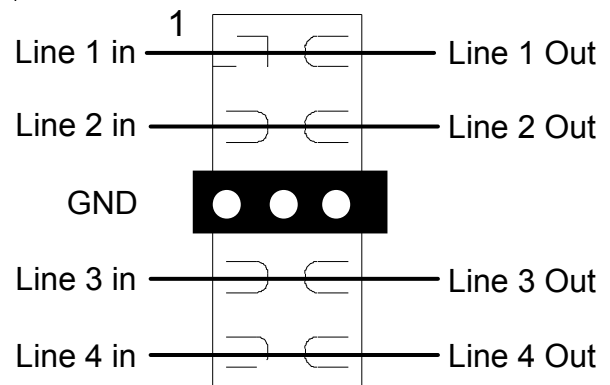
Good circuit board layout is critical for the suppression of ESD induced transients. The following guidelines are recommended:

- Place the TVS near the input terminals or connectors to restrict transient coupling.
- Minimize the path length between the TVS and the protected line.
- Minimize all conductive loops including power and ground loops.
- The ESD transient return path to ground should be kept as short as possible.
- Never run critical signals near board edges.
- Use ground planes whenever possible.

Circuit Diagram

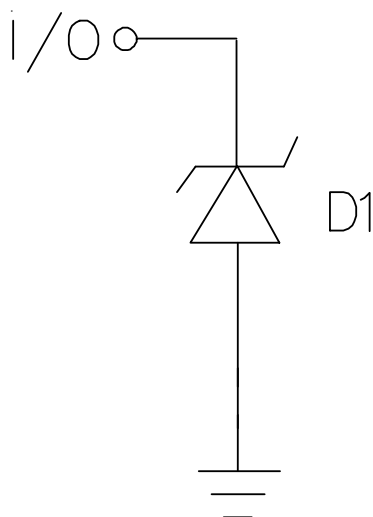


Layout Example



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Applications Information - Spice Model

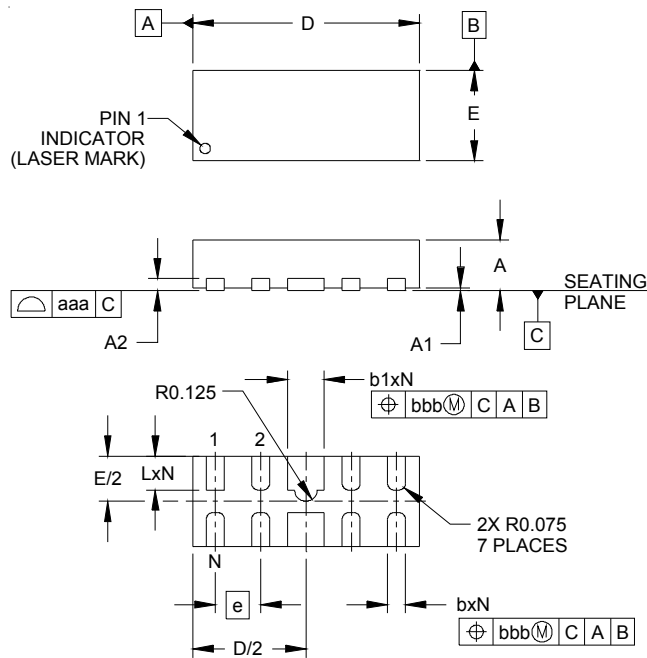


Spice Model

| uClamp0544P Spice Parameters | | |
|------------------------------|-------|----------|
| Parameter | Unit | D1 (TVS) |
| IS | Amp | 2.05e-15 |
| BV | Volt | 7.2 |
| VJ | Volt | 0.79 |
| RS | Ohm | 0.908 |
| IBV | Amp | 1.0E-3 |
| CJO | Farad | 9.7e-12 |
| TT | sec | 2.541E-9 |
| M | -- | 0.25 |
| N | -- | 1.1 |
| EG | eV | 1.11 |

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Outline Drawing - SLP2510P8

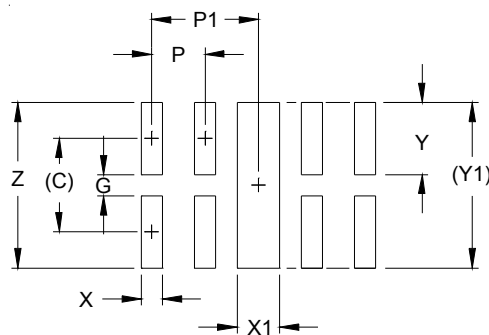


| DIM | INCHES | | | MILLIMETERS | | |
|-----|--------|----------|------|-------------|----------|-------|
| | MIN | NOM | MAX | MIN | NOM | MAX |
| A | .020 | .023 | .026 | 0.50 | 0.58 | 0.65 |
| A1 | 0.00 | .001 | .002 | 0.00 | 0.03 | 0.05 |
| A2 | | (.005) | | | (0.13) | |
| b | .006 | .008 | .010 | 0.15 | 0.20 | 0.25 |
| b1 | .014 | .016 | .018 | 0.35 | 0.40 | 0.45 |
| D | .094 | .098 | .102 | 2.40 | 2.50 | 2.60 |
| E | .035 | .039 | .043 | 0.90 | 1.00 | 1.10 |
| e | | .020 BSC | | | 0.50 BSC | |
| L | .012 | .015 | .017 | 0.30 | 0.38 | 0.425 |
| N | | 8 | | | 8 | |
| aaa | | .003 | | | 0.08 | |
| bbb | | .004 | | | 0.10 | |

NOTES:

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

Land Pattern - SLP2510P8



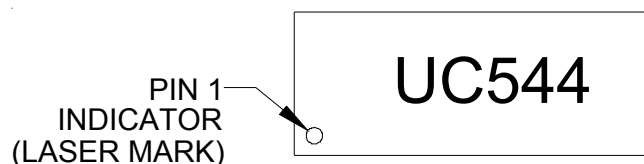
| DIM | DIMENSIONS | |
|-----|------------|-------------|
| | INCHES | MILLIMETERS |
| C | (.034) | (0.875) |
| G | .008 | 0.20 |
| P | .020 | 0.50 |
| P1 | .039 | 1.00 |
| X | .008 | 0.20 |
| X1 | .016 | 0.40 |
| Y | .027 | 0.675 |
| Y1 | (.061) | (1.55) |
| Z | .061 | 1.55 |

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 Code



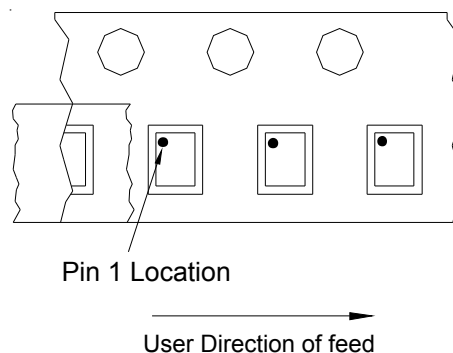
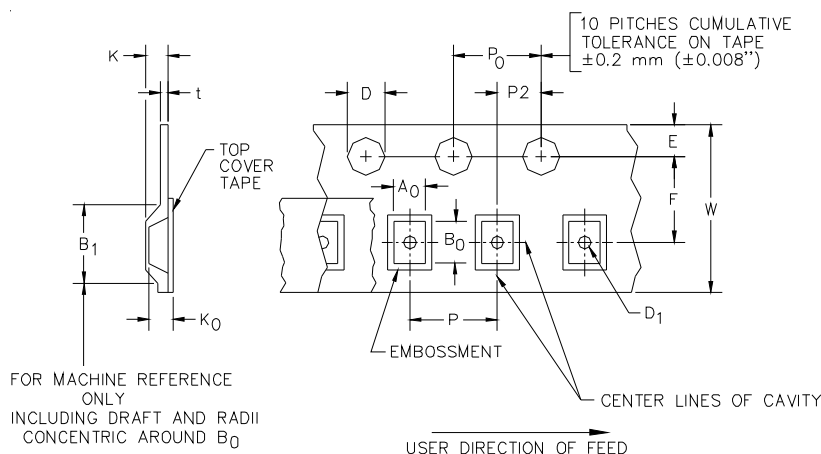
Ordering Information

| Part Number | Working Voltage | Qty per Reel | Reel Size |
|-----------------|-----------------|--------------|-----------|
| uClamp0544P.TCT | 5V | 3,000 | 7 Inch |

Notes:

1) This is a lead-free, RoHS/WEEE compliant product
MicroClamp, uClamp and μ Clamp are marks of Semtech Corporation

Tape and Reel Specification



Device Orientation in Tape

| A0 | B0 | K0 |
|-----------------|-----------------|-----------------|
| 1.23 +/-0.10 mm | 2.70 +/-0.10 mm | 0.70 +/-0.10 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 (0.59 +.005 - .000) | 0.8 mm ±0.05 (.031) | 1.750±.10 mm (.069±.004) | 3.5±0.05 mm (.138±.002) | 2.4 mm (.094) | 4.0±0.1 mm (.157±.004) | 4.0±0.1 mm (.157±.004) | 2.0±0.05mm (.079±.002) | 0.4 mm (.016) | 8.0 mm + 0.3 mm - 0.1 mm (.312±.012) |

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