# uClamp0544P µClamp™ 4-Line ESD Protection

### 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  $\mu\text{Clamp}^{\text{TM}}0544\text{P}$  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

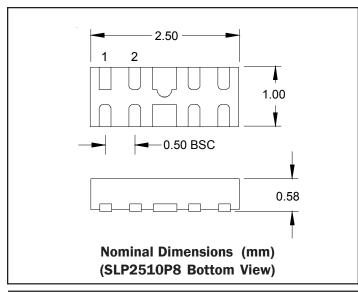
### **Mechanical Characteristics**

- 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

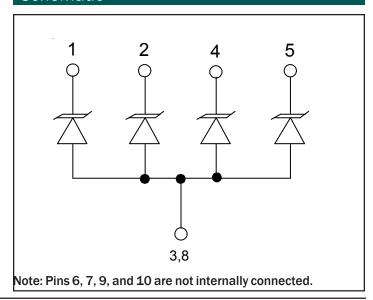
### Applications

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

### **Dimensions**



### **Schematic**





# Absolute Maximum Rating

Rating	Symbol	Value	Units
Peak Pulse Power (tp = 8/20μs)	P <sub>pk</sub>	25	Watts
Maximum Peak Pulse Current (tp = 8/20μs)	I <sub>pp</sub>	2	Amps
ESD per IEC 61000-4-2 (Air) ESD per IEC 61000-4-2 (Contact)	V <sub>ESD</sub>	+/- 20 +/- 15	kV
Operating Temperature	T <sub>J</sub>	-55 to +125	°C
Storage Temperature	T <sub>STG</sub>	-55 to +150	°C

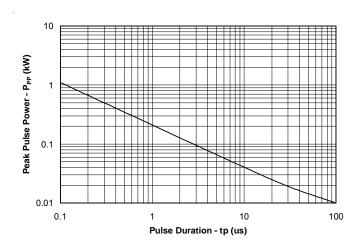
# Electrical Characteristics (T=25°C)

Parameter	Symbol	Conditions	Minimum	Typical	Maximum	Units
Reverse Stand-Off Voltage	V <sub>RWM</sub>				5	V
Reverse Breakdown Voltage	V <sub>BR</sub>	I <sub>t</sub> = 1mA	6	7.1	8.5	V
Reverse Leakage Current	I <sub>R</sub>	V <sub>RWM</sub> = 5V, T=25°C		0.010	0.10	μΑ
Forward Voltage	V <sub>F</sub>	I <sub>F</sub> = 10mA		1	1.2	V
Clamping Voltage	V <sub>c</sub>	$I_{pp} = 2A, t_p = 8/20\mu s$			12.5	V
Junction Capacitance	C <sub>j</sub>	$V_R = OV, f = 1MHz$			10	pF
Junction Capacitance	C <sub>j</sub>	V <sub>R</sub> = 3.3V, f = 1MHz		4.5		pF

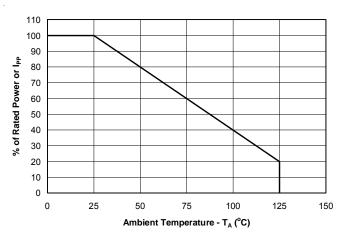


# **Typical Characteristics**

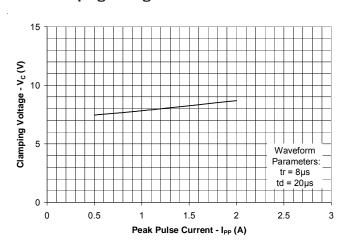
#### Non-Repetitive Peak Pulse Power vs. Pulse Time



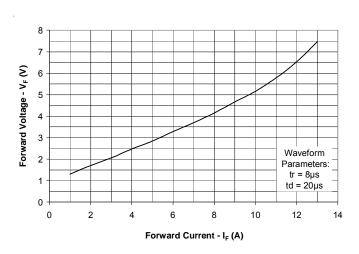
### **Power Derating Curve**



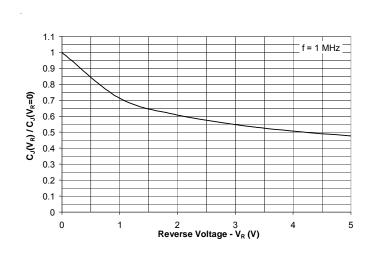
### Clamping Voltage vs. Peak Pulse Current



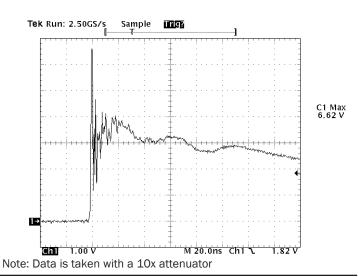
Forward Voltage vs. Forward Current



### Normalized Junction Capacitance vs. Reverse Voltage



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





### **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.

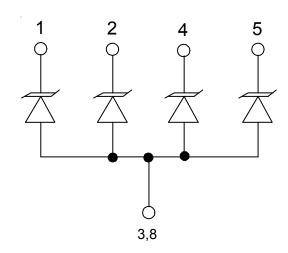
The uClamp0544P is designed such that the traces flow straight through the device. This is accomplished by using PCB traces to connect the pin pairs for each line (pin 1 to pin 10, pin 2 to pin 9, pin 4 to pin 7, pin 5 to pin 6). For example, line 1 enters at pin 1 and exits at Pin 10 and the PCB trace 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.

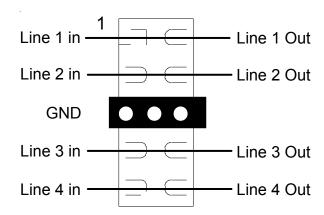
Good circuit board layout is critical for the suppression of ESD induced transients. The following guidelines are recommended:

- 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**

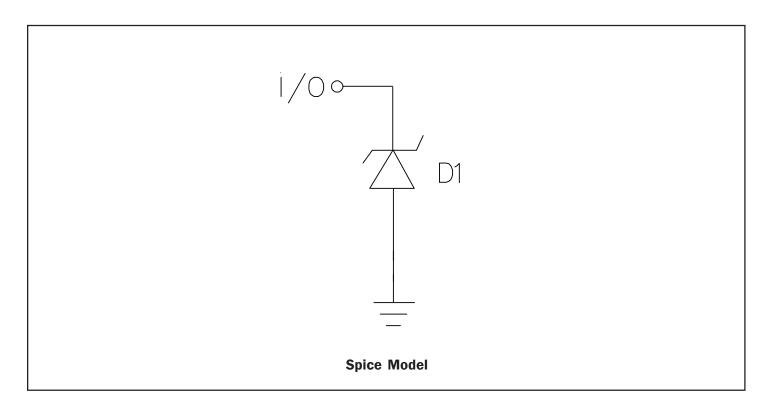


#### **Layout Example**





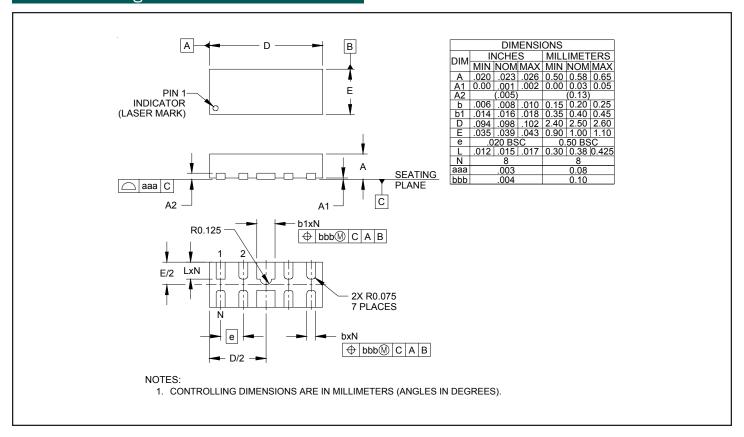
# Applications Information - Spice Model



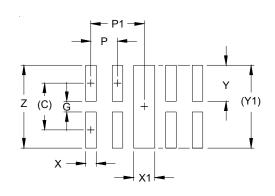
uClamp0544P Spice Parameters							
Parameter	Unit	D1 (TVS)					
IS	Amp	2.05e-15					
BV	Volt	7.2					
۸٦	Volt	0.79					
RS	Ohm	0.908					
IBV	Amp	1.0E-3					
C10	Farad	9.7e-12					
TT	sec	2.541E-9					
M		0.25					
N		1.1					
EG	eV	1.11					



### Outline Drawing - SLP2510P8



# Land Pattern - SLP2510P8



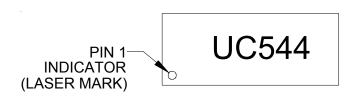
	DIMENSIONS							
DIM	INCHES	MILLIMETERS						
С	(.034)	(0.875)						
G	.008	0.20						
Р	.020	0.50						
P1	.039	1.00						
X	.008	0.20						
X1	.016	0.40						
Υ	.027	0.675						
Y1	(.061)	(1.55)						
Ζ	.061	1.55						

#### NOTES:

- 1. CONTROLLING DIMENSIONS ARE IN MILLIMETERS (ANGLES IN DEGREES).
- THIS LAND PATTERN IS FOR REFERENCE PURPOSES ONLY. CONSULT YOUR MANUFACTURING GROUP TO ENSURE YOUR COMPANY'S MANUFACTURING GUIDELINES ARE MET.



### Marking Code



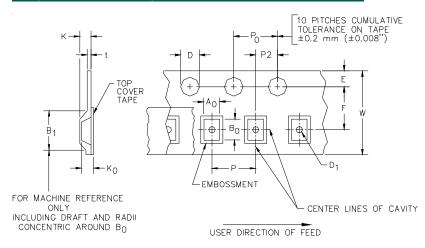
# Ordering Information

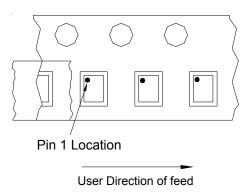
Part Number	Working Voltage	Qty per Reel	Reel Size	
uClamp0544P.TCT	5V	3,000	7 Inch	

#### Notes:

1) This is a lead-free, RoHS/WEEE compliant product MicroClamp, uClamp and  $\mu\text{Clamp}$  are marks of Semtech Corporation

# Tape and Reel Specification





#### **Device Orientation in Tape**

A0	ВО	ко		
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)	Р	PO	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±.00- 4)	4.0±0.1 mm (.157±.00- 4)	2.0±0.05m- m (.079±.002)	0.4 mm (.016)	8.0 mm + 0.3 mm - 0.1 mm (.312±.012)

# Contact Information

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