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## PROTECTION PRODUCTS

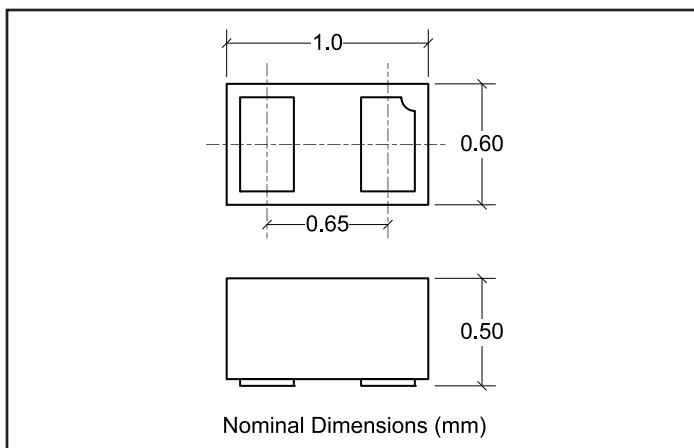
### Description

μClamp® series of TVS arrays are designed to protect sensitive electronics from damage or latch-up due to ESD. They feature large cross-sectional area junctions for conducting high transient currents. They offer desirable characteristics for board level protection including fast response time, low operating and clamping voltage, and no device degradation.

The μClamp®0511PQ is in a 2-pin, SLP1006P2 package. It measures 1.0 x 0.6 x 0.5mm. The leads are spaced at a pitch of 0.65mm and are finished with lead-free NiPdAu. Each device will protect one bidirectional line operating at ±5 volts. It gives the designer the flexibility to protect single lines in applications where arrays are not practical. They may be used to meet the ESD immunity requirements of IEC 61000-4-2 (±30kV contact & air 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 MP3 players.

The μClamp0511PQ is qualified to AEC-Q100 Grade 1 for Automotive use.

### Package Dimension



### Features

- Transient protection for data lines to IEC 61000-4-2 (ESD) ±30kV (contact & air)  
IEC 61000-4-4 (EFT) 40A (tp = 5/50ns)  
Cable Discharge Event (CDE)
- Ultra-small package (1.0 x 0.6 x 0.5mm)
- Protects one I/O or power line
- Low clamping voltage
- Working voltage: 5V
- Low leakage current
- Solid-state silicon-avalanche technology
- AEC-Q100 Grade 1 Qualified

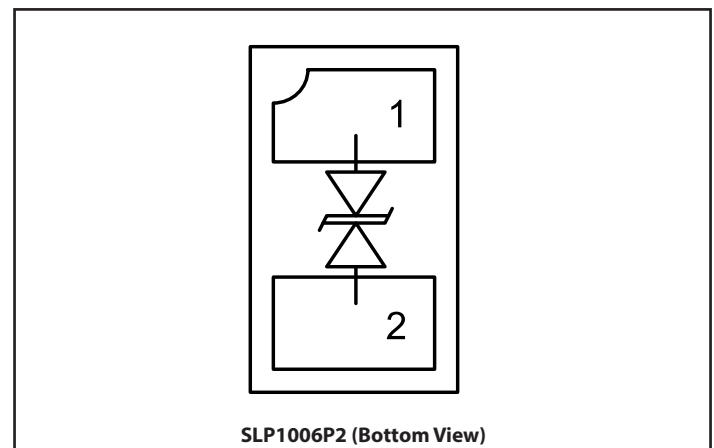
### Mechanical Characteristics

- SLP1006P2 package
- Pb-Free, Halogen Free, RoHS/WEEE Compliant
- Molding compound flammability rating: UL 94V-0
- Lead Finish: NiPdAu
- Packaging: Tape and Reel

### Applications

- Cellular Handsets & Accessories
- Cordless Phones & Smart Phones
- Notebooks & Handhelds
- Portable Instrumentation
- Digital Cameras
- MP3 Players
- Automotive Applications

### Schematic & Pin Configuration



## Absolute Maximum Rating

Rating	Symbol	Value	Units
Peak Pulse Power ( $t_p = 8/20\mu s$ )	$P_{PK}$	170	W
Peak Pulse Current ( $t_p = 8/20\mu s$ )	$I_{PP}$	12	A
ESD per IEC 61000-4-2 (Air) <sup>(1)</sup> ESD per IEC 61000-4-2 (Contact) <sup>(1)</sup>	$V_{ESD}$	$\pm 30$ $\pm 30$	kV
Operating Temperature	$T_J$	-40 to +125	°C
Storage Temperature	$T_{STG}$	-55 to +150	°C

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

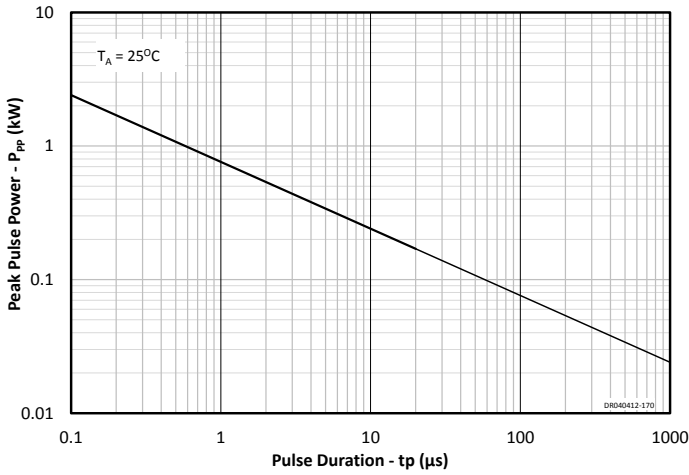
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Reverse Stand-Off Voltage	$V_{RWM}$	Pin 1 to 2 or 2 to 1			5	V
Reverse Breakdown Voltage	$V_{BR}$	$I_t = 1mA$ , Pin 1 to 2 or 2 to 1 $T = -40^\circ C$ to $+125^\circ C$	6	8	10	V
Reverse Leakage Current	$I_R$	$V_{RWM} = 5V$ Pin 1 to 2 or 2 to 1	$T = 25^\circ C$	0.025	1	$\mu A$
			$T = 125^\circ C$		1	
Clamping Voltage	$V_C$	Pin 1 to 2 or 2 to 1	$I_{PP} = 1A$ , $t_p = 8/20\mu s$		11	V
			$I_{PP} = 12A$ , $t_p = 8/20\mu s$		14	
Dynamic Resistance <sup>2,3</sup>	$R_{DYN}$	$t_p = 0.2/100ns$ , Pin1 to 2 or 2 to 1		0.19		$\Omega$
Junction Capacitance	$C_J$	$V_R = 5V$ , $f = 1MHz$ Pin 1 to 2 or 2 to 1	$T = 25^\circ C$		75	pF
			$T = 125^\circ C$		75	

### Notes

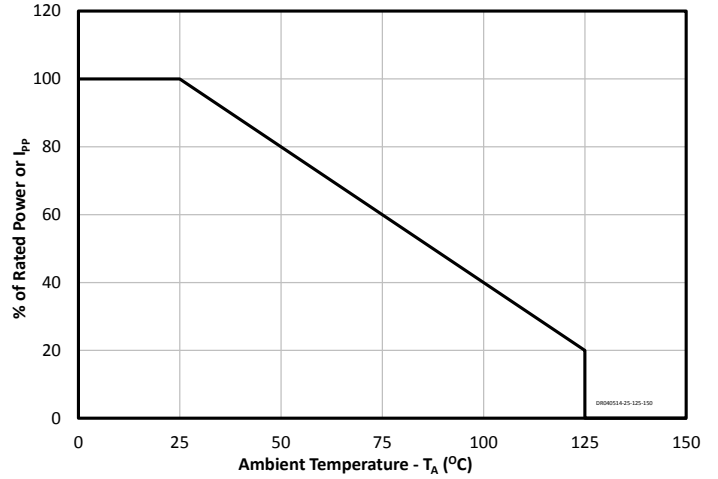
- 1) ESD gun return path connected to ESD ground reference plane.
- 2) Transmission Line Pulse Test (TLP) Settings:  $t_p = 100ns$ ,  $t_r = 0.2ns$ ,  $I_{TLP}$  and  $V_{TLP}$  averaging window:  $t_1 = 70ns$  to  $t_2 = 90ns$ .
- 3) Dynamic resistance calculated from  $I_{TLP} = 4A$  to  $I_{TLP} = 16A$ .

# Typical Characteristics

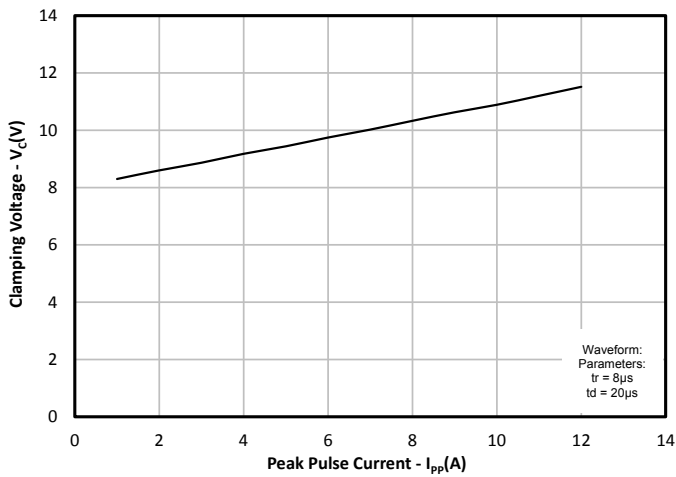
### Non-Repetitive Peak Pulse Power vs. Pulse Time



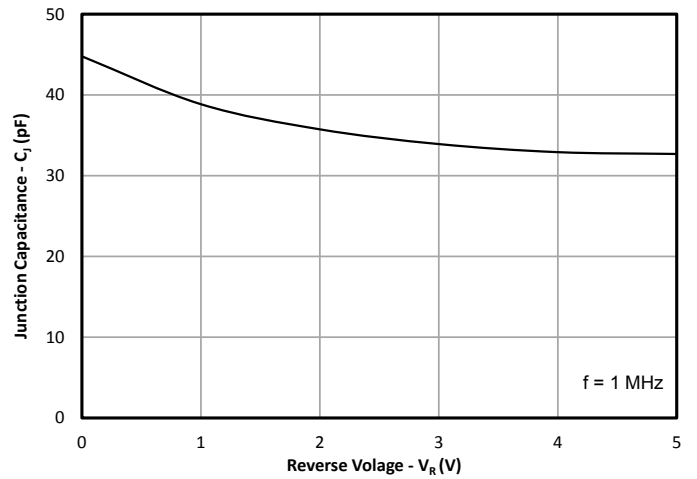
### Power Derating Curve



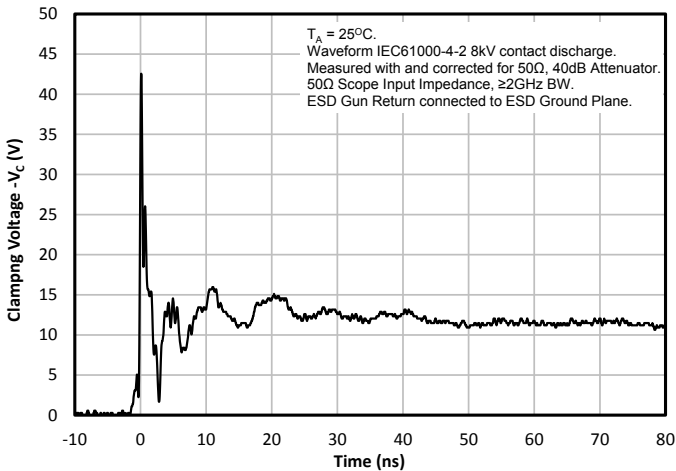
### Clamping Voltage vs. Peak Pulse Current ( $t_p=8/20\mu$ s)



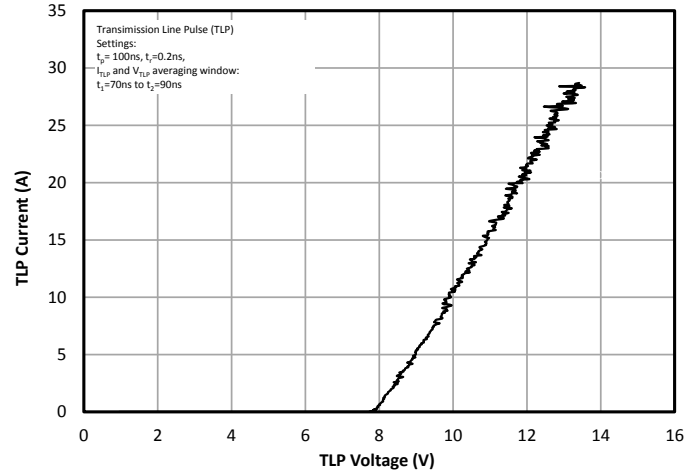
### Capacitance vs. Reverse Voltage



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

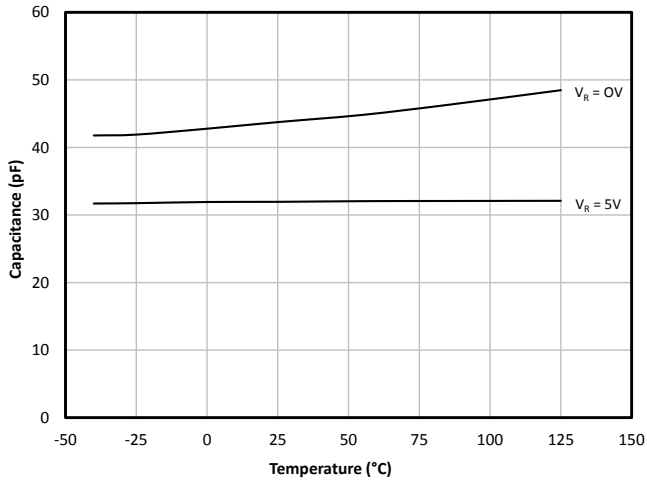


### TLP Characteristic (Positive Pulse)

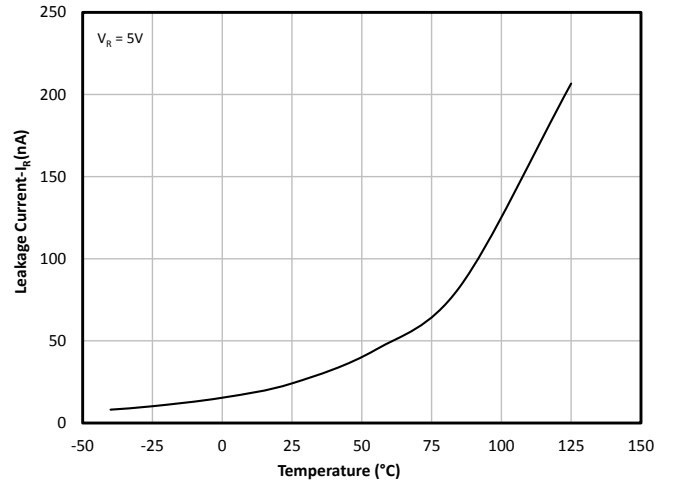


# Typical Characteristics

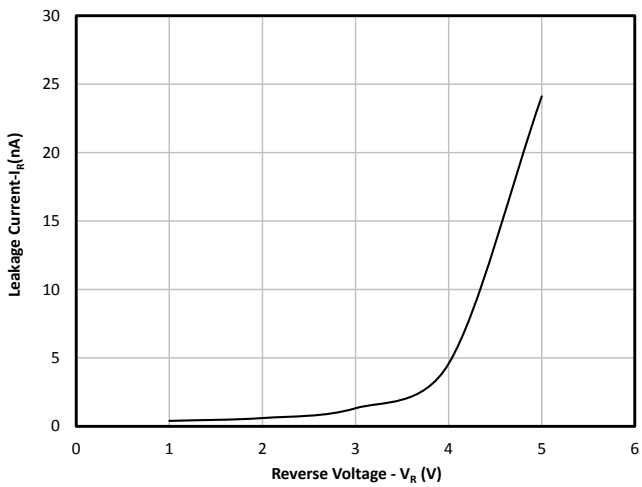
### Junction Capacitance vs. Temperature



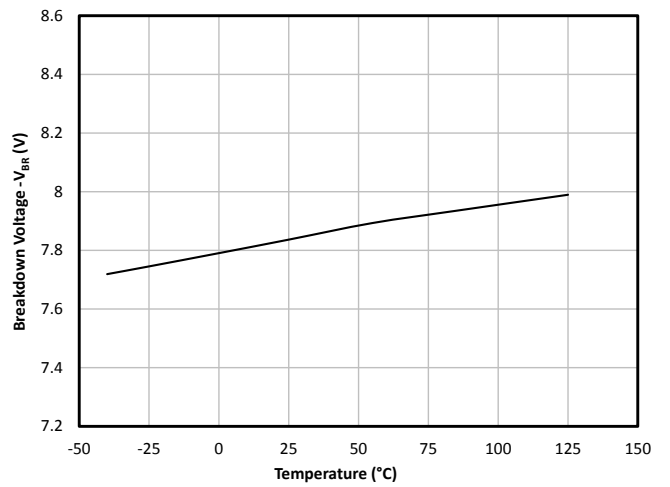
### Leakage Current vs. Temperature



### Leakage Current vs. Reverse Voltage



### Reverse Breakdown Voltage vs. Temperature



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## Application Information

### Device Connection Options

This TVS diode is designed to protect one data, I/O, or power supply line. The device is bidirectional and may be used on lines where the signal polarity can go above and below ground. The device is symmetrical, and therefore, the orientation of the device is not critical.

### Circuit Board Layout Recommendations for Suppression of ESD

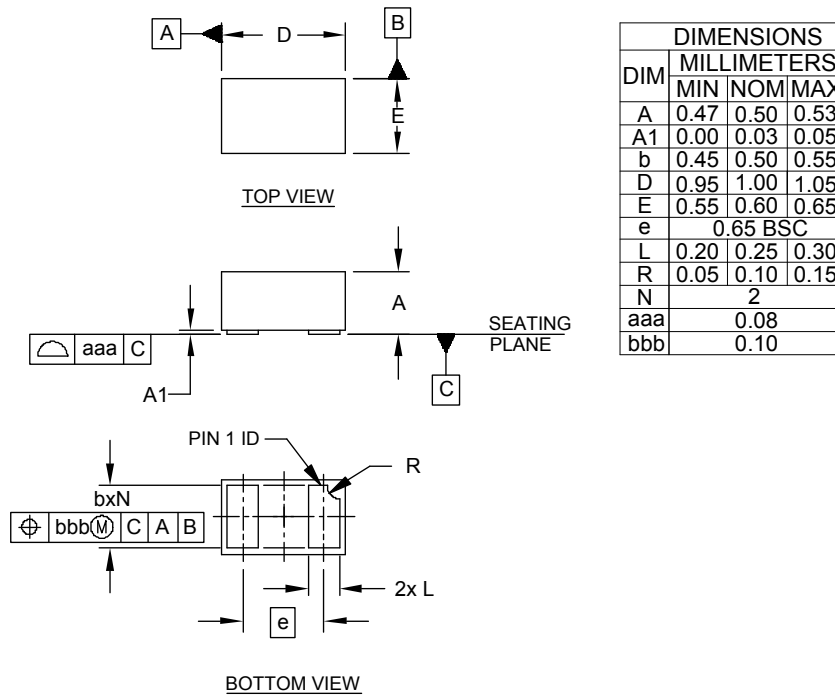
Good circuit board layout is critical for the suppression of ESD induced transients. The following guidelines are recommended:

- 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



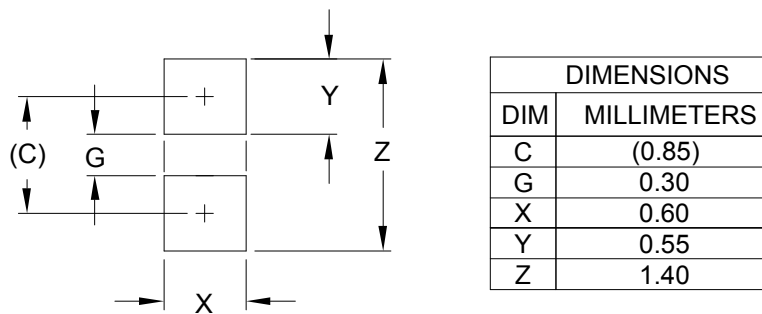
## Outline Drawing - SLP1006P2



**NOTES:**

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

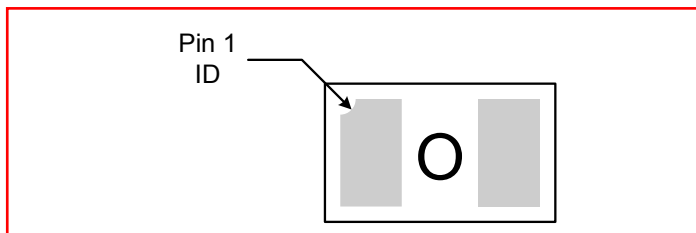
## Land Pattern - SLP1006P2



**NOTES:**

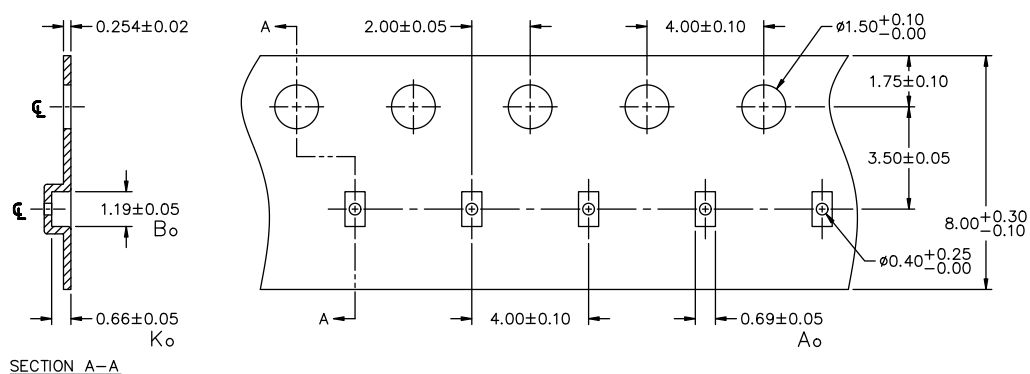
1. CONTROLLING DIMENSIONS ARE IN MILLIMETERS (ANGLES IN DEGREES).
2. THIS LAND PATTERN IS FOR REFERENCE PURPOSES ONLY. CONSULT YOUR MANUFACTURING GROUP TO ENSURE YOUR COMPANY'S MANUFACTURING GUIDELINES ARE MET.

## Marking Code

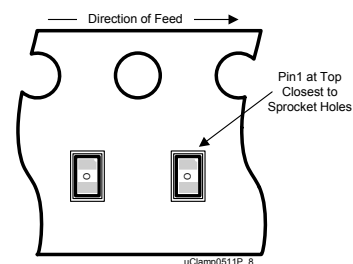


Note: Device is electrically symmetrical.

## Tape and Reel Specification



NOTES: 1.) ALL DIMENSIONS IN MILLIMETERS UNLESS OTHERWISE SPECIFIED.



Device Orientation in Tape

## Ordering Information

Part Number	Qty per Reel	Reel Size
$\mu$ Clamp0511PQCT	3,000	7"





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