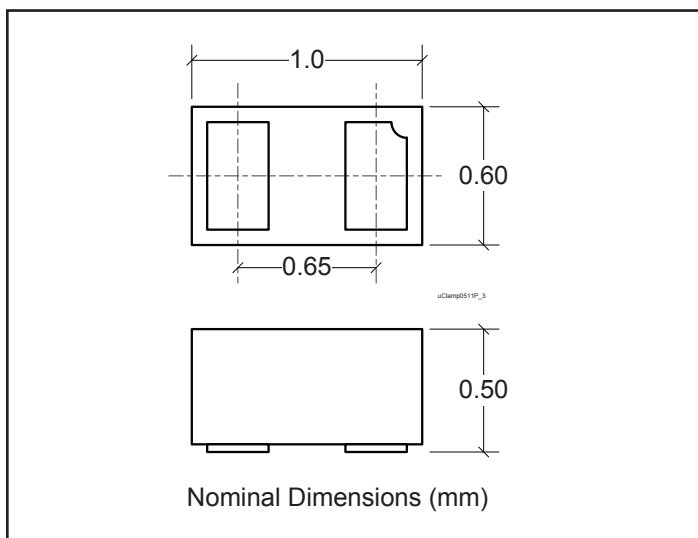


**PROTECTION PRODUCTS - MicroClamp®**
**Description**

The μClamp® series of TVS arrays are designed to protect sensitive electronics from damage or latch-up due to ESD. They are designed to replace multilayer varistors (MLVs) in portable applications. They feature large cross-sectional area junctions for conducting high transient currents and offer superior electrical characteristics such as lower clamping voltage and no device degradation when compared to MLVs. 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, Level 4 (±15kV air, ±8kV contact discharge) and higher. 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 uClamp0511PQ is qualified to AEC-Q100 Grade 1 for Automotive use.

**Package Dimensions**

**Features**

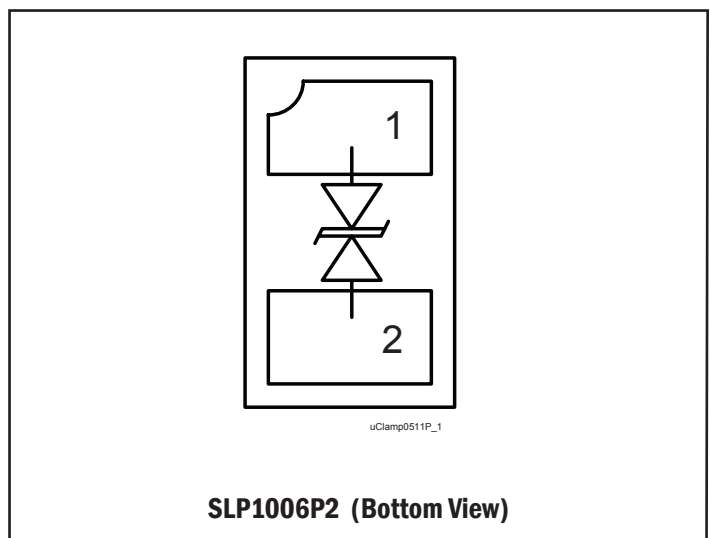
- ◆ Transient protection for data lines to **IEC 61000-4-2 (ESD) ±30kV (air and contact)**  
**IEC 61000-4-4 (EFT) 40A (tp = 5/50ns)**  
**Cable Discharge Event (CDE)**
- ◆ Ultra-small package (1.0 x 0.6 x 0.5mm)
- ◆ Protects one I/O or power line
- ◆ Low clamping voltage
- ◆ Working voltage: 5V
- ◆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

**Mechanical Characteristics**

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

**Applications**

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

**Schematic & Pin Configuration**


**PROTECTION PRODUCTS**
**Absolute Maximum Ratings**

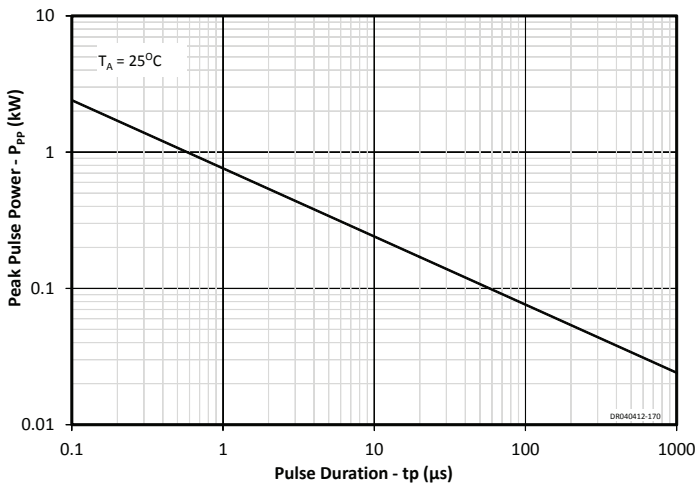
Rating	Symbol	Value	Units
Peak Pulse Power ( $t_p = 8/20\mu s$ )	$P_{pk}$	170	Watts
Peak Pulse Current ( $t_p = 8/20\mu s$ )	$I_{pp}$	12	A
ESD per IEC 61000-4-2 (Air) ESD per IEC 61000-4-2 (Contact)	$V_{ESD}$	$\pm 30$ $\pm 30$	kV
Operating Temperature	$T_J$	-40 to +125	$^{\circ}C$
Storage Temperature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

**Electrical Characteristics ( $T=25^{\circ}C$  unless otherwise specified)**

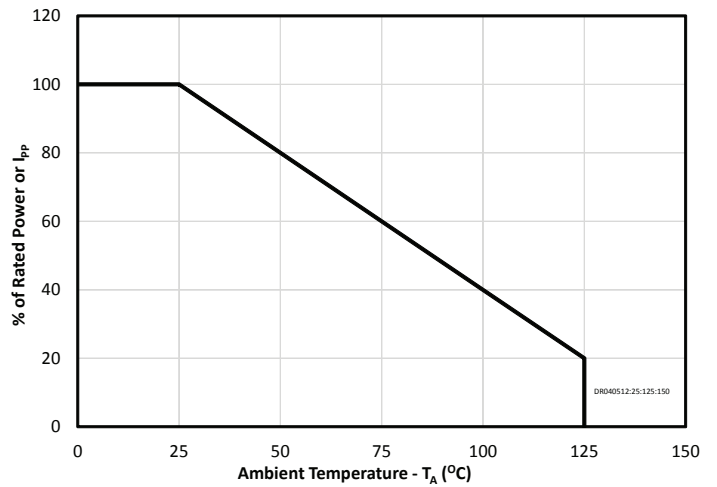
Parameter	Symbol	Conditions	Min.	Typical	Maximum	Units
Reverse Stand-Off Voltage	$V_{RWM}$	Pin 1 to 2 or 2 to 1			5	V
Reverse Breakdown Voltage	$V_{BR}$	$I_i = 1mA$ Pin 1 to 2 or 2 to 1 $T = -40^{\circ}C$ to $+125^{\circ}C$	6	8	10	V
Reverse Leakage Current	$I_R$	$V_{RWM} = 5V,$ Pin 1 to 2 or 2 to 1	$T = 25^{\circ}C$	0.025	1	$\mu A$
			$T = 125^{\circ}C$		1	
Clamping Voltage	$V_C$	$I_{pp} = 1A, t_p = 8/20\mu s$ Pin 1 to 2 or 2 to 1			11	V
Clamping Voltage	$V_C$	$I_{pp} = 12A, t_p = 8/20\mu s$ Pin 1 to 2 or 2 to 1			14	V
Junction Capacitance	$C_j$	$V_R = 0V, f = 1MHz$ Pin 1 to 2 or 2 to 1	$T = 25^{\circ}C$		75	pF
			$T = 125^{\circ}C$		75	

Typical Characteristics

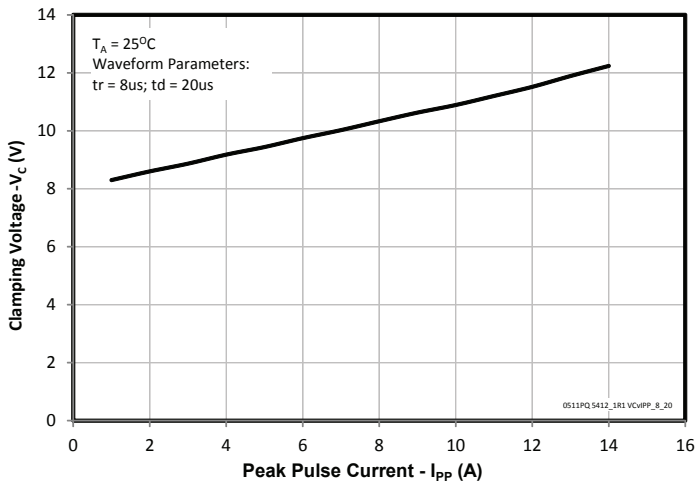
Non-Repetitive Peak Pulse Power vs. Pulse Time



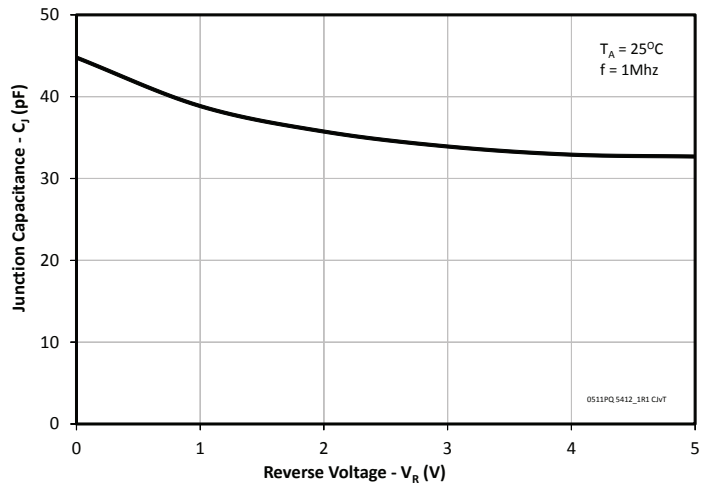
Power Derating Curve



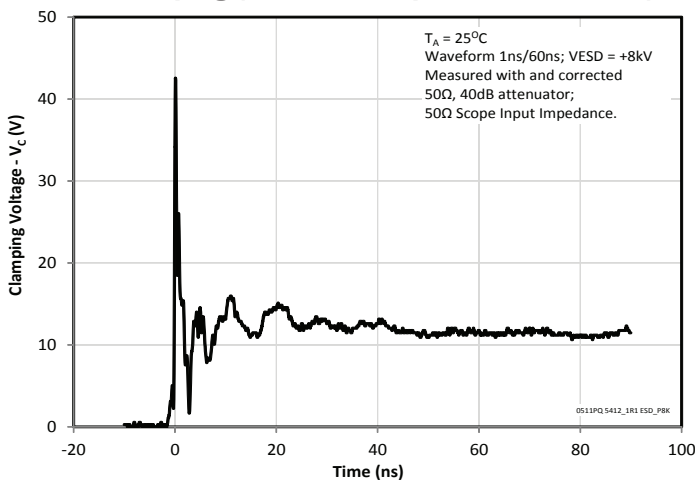
Clamping Voltage vs. Peak Pulse Current



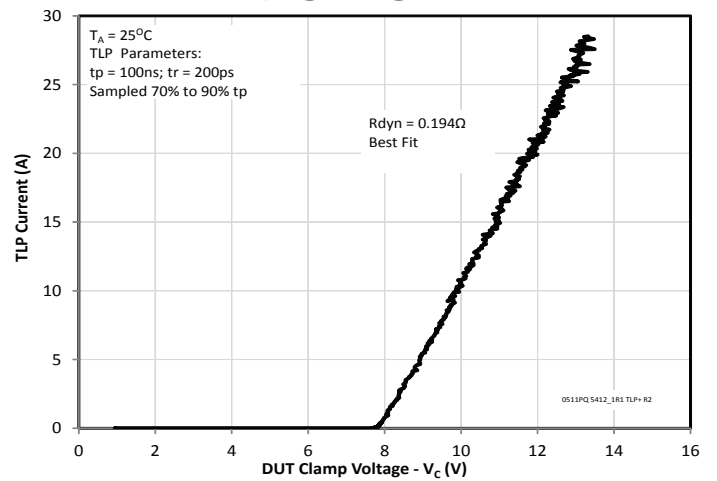
Capacitance vs. Reverse Voltage



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

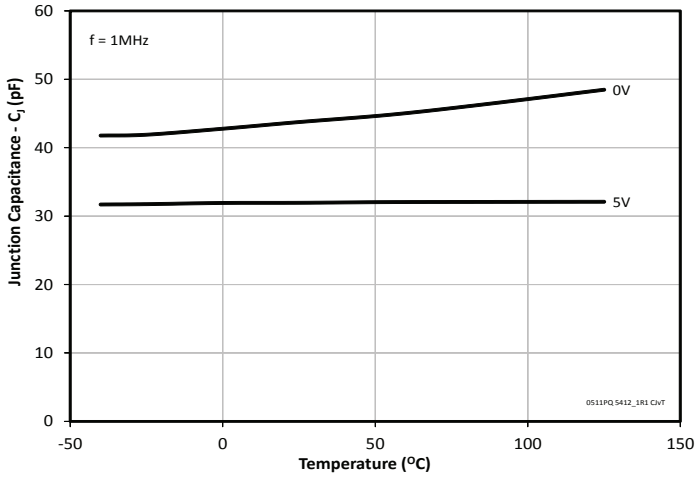


TLP Clamping Voltage vs. Current

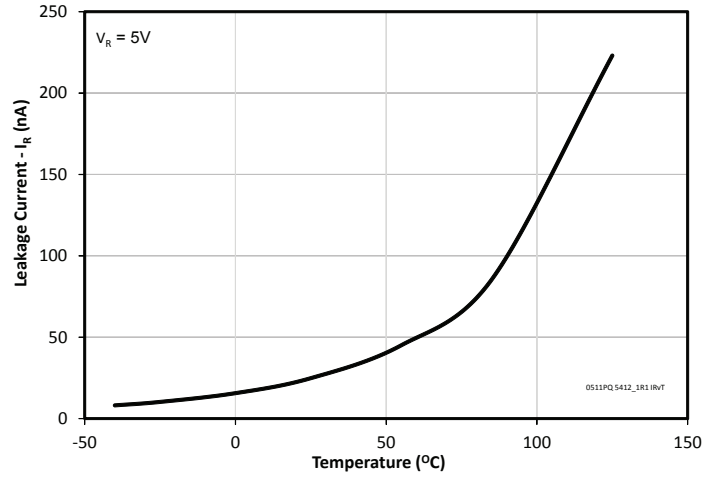


Typical Characteristics (Continued)

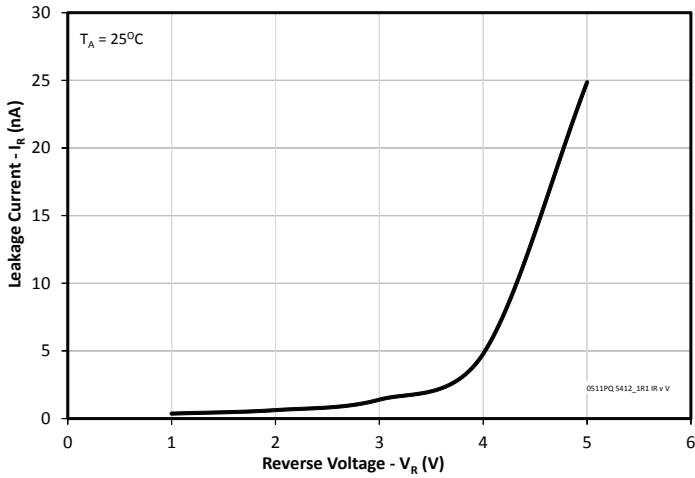
Junction Capacitance vs. Temperature



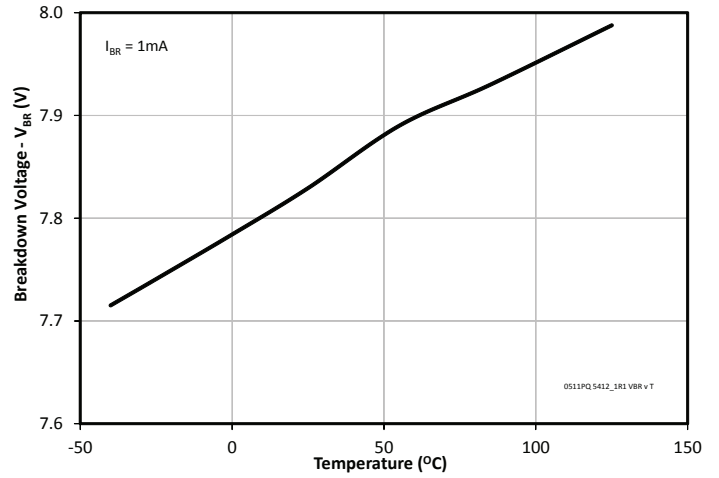
Leakage Current vs. Temperature



Leakage Current vs. Reverse Voltage



Breakdown Voltage vs. Temperature



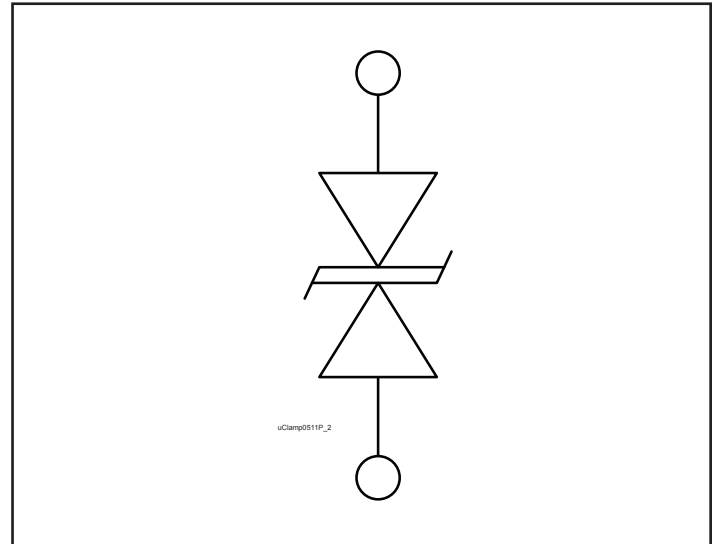
**Device Connection Options**

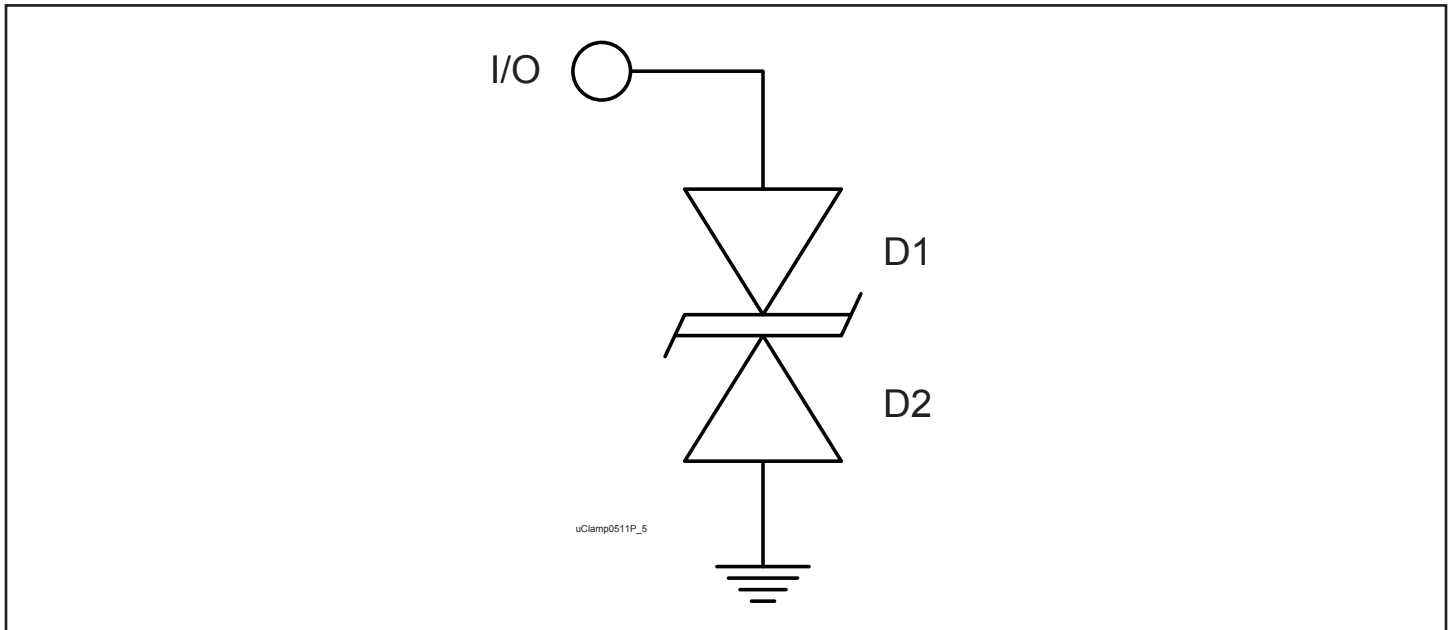
These TVS diodes are designed to protect one data, I/O, or power supply line. The device is bidirectional and may be used on lines where the signal polarity can go above and below ground.

**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.

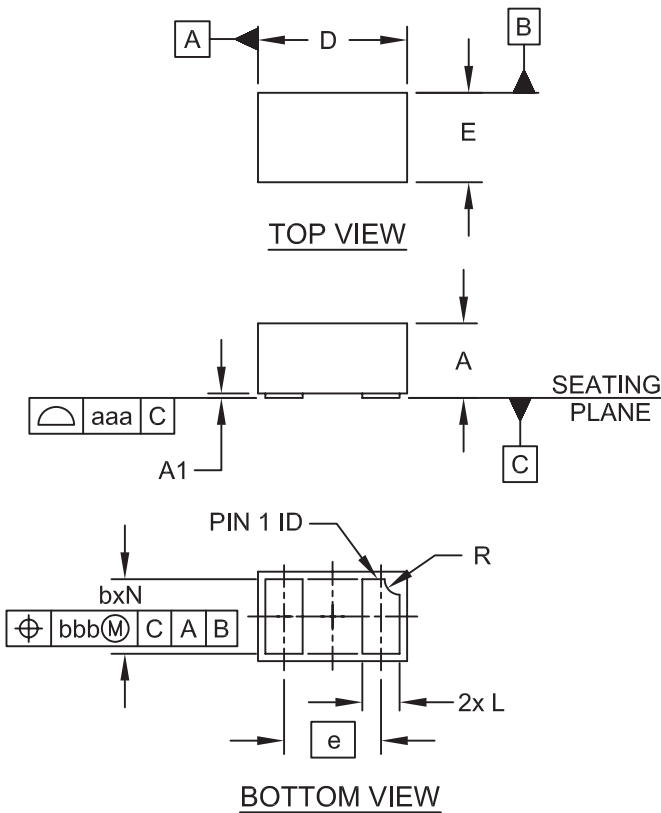
**Equivalent Circuit Diagram**


**Figure 1 - uClamp0511PQ Spice Model**

<b>Table 1 - <math>\mu</math>Clamp0511PQ Spice Parameters</b>			
<b>Parameter</b>	<b>Unit</b>	<b>D1 (TVS)</b>	<b>D2 (TVS)</b>
IS	Amp	1.48E-14	1.48E-14
BV	Volt	7.3	7.3
VJ	Volt	0.7	0.7
RS	Ohm	0.157	0.157
IBV	Amp	1E-3	1E-3
CJO	Farad	85E-12	85E-12
TT	sec	2.541E-9	2.541E-9
M	--	0.126	0.126
N	--	1.1	1.1
EG	eV	1.11	1.11

PROTECTION PRODUCTS

Outline Drawing - SLP1006P2



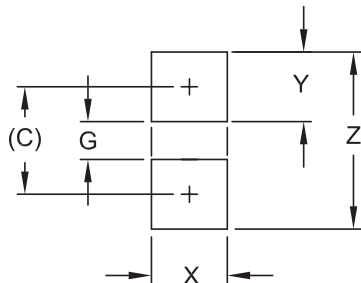
DIM	INCHES			MILLIMETERS		
	MIN	NOM	MAX	MIN	NOM	MAX
A	.016	.020	.022	0.40	0.50	0.55
A1	.000	.001	.002	0.00	0.03	0.05
b	.018	.020	.022	0.45	0.50	0.55
D	.035	.039	.043	0.90	1.00	1.10
E	.020	.024	.028	0.50	0.60	0.70
e	.026 BSC			0.65 BSC		
L	.008	.010	.012	0.20	0.25	0.30
R	.002	.004	.006	0.05	0.10	0.15
N	2			2		
aaa	.003			0.08		
bbb	.004			0.10		

LNIS-66YP35 R3

NOTES:

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

Land Pattern - SLP1006P2



DIM	DIMENSIONS	
	INCHES	MILLIMETERS
C	(.033)	(0.85)
G	.012	0.30
X	.024	0.60
Y	.022	0.55
Z	.055	1.40

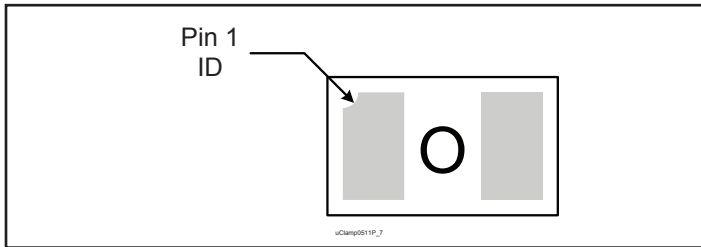
LNIS-66YP35 R3

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.

## PROTECTION PRODUCTS

### Marking



Notes:

- 1) Device is electrically symmetrical

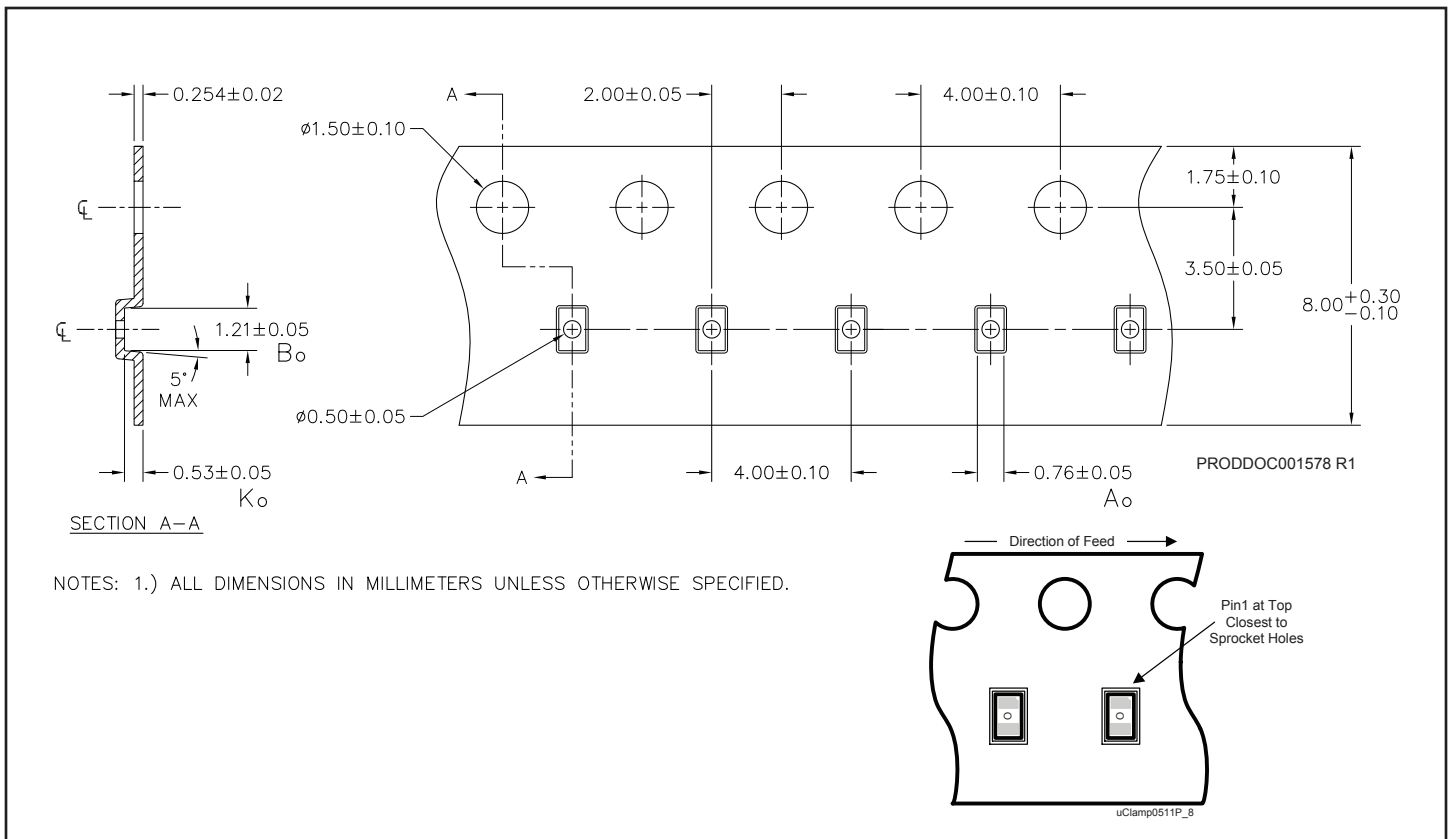
### Ordering Information

Part Number	Qty per Reel	Reel Size
uClamp0511PQTCT	3,000	7 Inch

Note: Lead finish is lead-free NiPdAu.

MicroClamp, uClamp and  $\mu$ Clamp are marks of Semtech Corporation.

### Tape and Reel Specification



### Contact Information

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