Absolute Maximum Rating

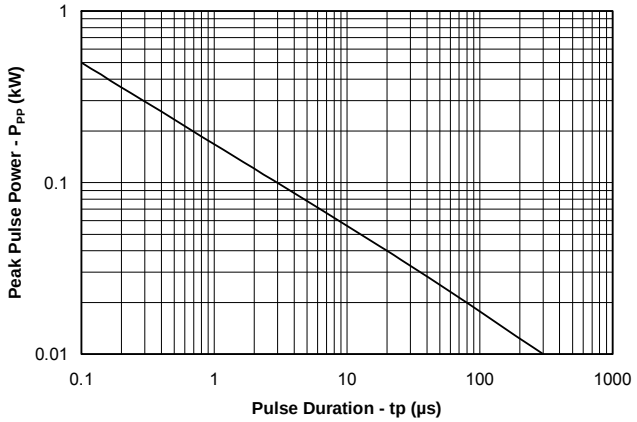
Rating	Symbol	Value	Units
Peak Pulse Power (tp = 8/20µs)	P_{pk}	40	Watts
Maximum Peak Pulse Current (tp = 8/20µs)	I_{pp}	5	Amps
ESD per IEC 61000-4-2 (Air) ESD per IEC 61000-4-2 (Contact)	V_{ESD}	+/- 20 +/- 15	kV
Operating Temperature	T_J	-40 to +85	°C
Storage Temperature	T_{STG}	-55 to +150	°C

Electrical Characteristics (T=25°C)

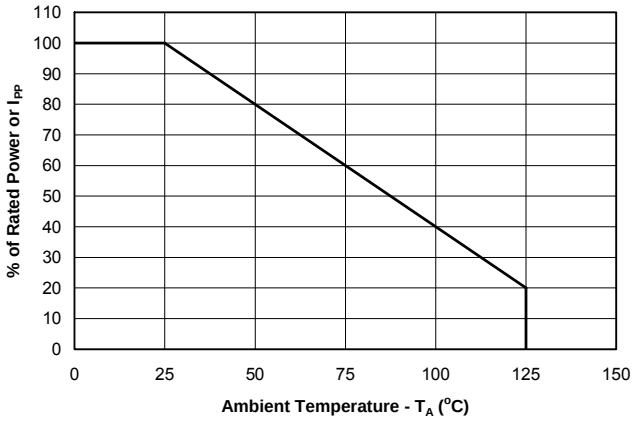
Parameter	Symbol	Conditions	Minimum	Typical	Maximum	Units
Reverse Stand-Off Voltage	V_{RWM}				3.3	V
Punch-Through Voltage	V_{PT}	I_{PT} = 2µA	3.5	3.9	4.6	V
Snap-Back Voltage	V_{SB}	I_{SB} = 50mA	2.8			V
Reverse Leakage Current	I_R	V_{RWM} = 3.3V		0.05	0.5	µA
Clamping Voltage	V_C	I_{PP} = 1A, tp = 8/20µs			5.5	V
Clamping Voltage	V_C	I_{PP} = 5A, tp = 8/20µs			8.0	V
Reverse Clamping Voltage	V_{CR}	I_{PP} = 1A, tp = 8/20µs			2.4	V
Junction Capacitance	C_j	I/O pin to Gnd V_R = 0V, f = 1MHz		25	30	pF
		I/O pin to Gnd V_R = 3.3V, f = 1MHz		14		pF

Typical Characteristics

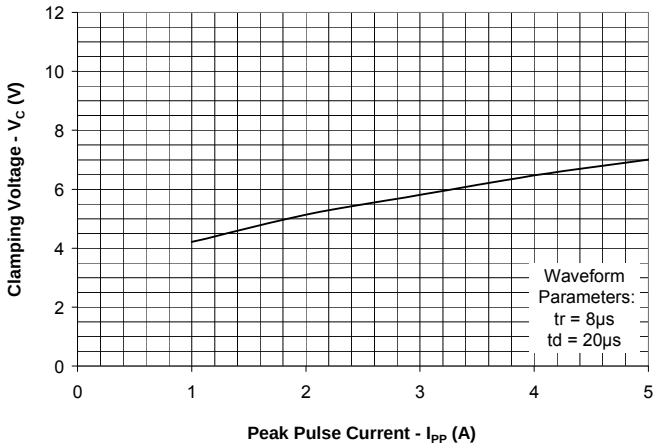
Non-Repetitive Peak Pulse Power vs. Pulse Time



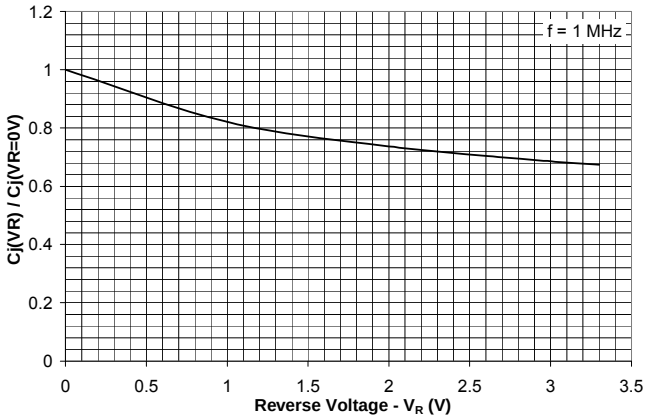
Power Derating Curve



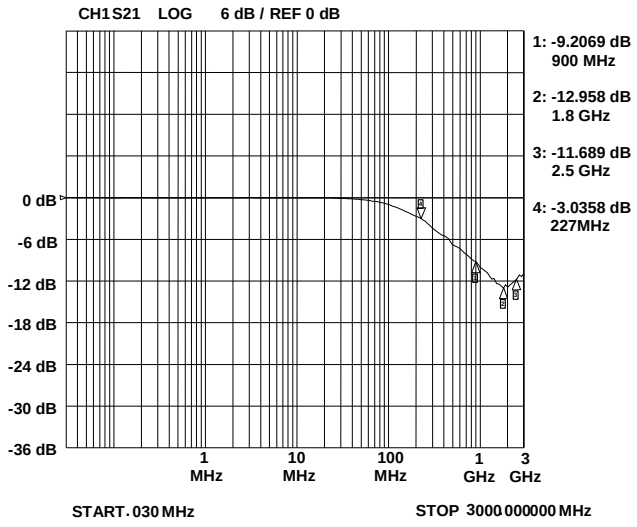
Clamping Voltage vs. Peak Pulse Current



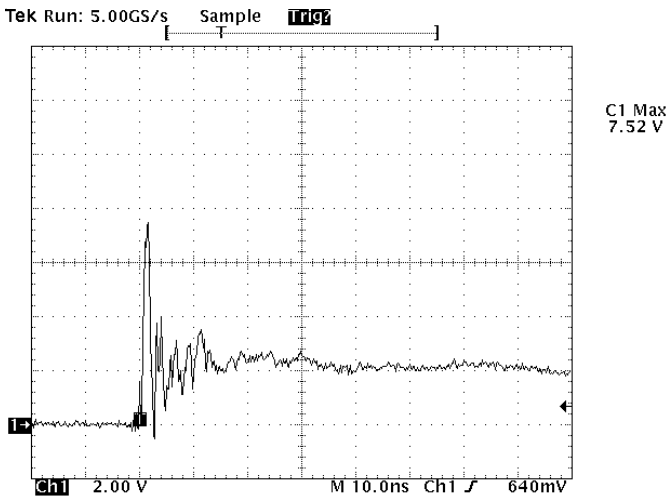
Normalized Junction Capacitance vs. Reverse Voltage



Insertion Loss S21



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



Note: Data is taken with a 10x attenuator

Applications Information

Device Connection Options

The µClamp3301P is designed to protect one data or I/O line operating at 3.3 volts. It will present a high impedance to the protected line up to 3.3 volts. It will "turn on" when the line voltage exceeds 3.5 volts. The device is unidirectional and may be used on lines where the signal polarity is above ground. The cathode band should be placed towards the line that is to be protected. These devices should not be connected to DC supply rails as they can latch up as described below.

Due to the "snap-back" characteristics of the low voltage TVS, it is not recommended that the I/O line be directly connected to a DC source greater than snap-back votlage (V_{SB}) as the device can latch on as described below.

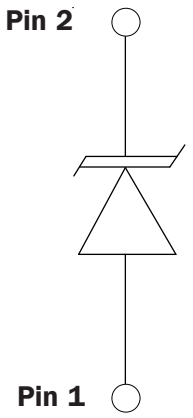
EPD TVS Characteristics

The µClamp3301P is constructed using Semtech's proprietary EPD technology. The structure of the EPD TVS is vastly different from the traditional pn-junction devices. At voltages below 5V, high leakage current and junction capacitance render conventional avalanche technology impractical for most applications. However, by utilizing the EPD technology, the µClamp3301P can effectively operate at 3.3V while maintaining excellent electrical characteristics.

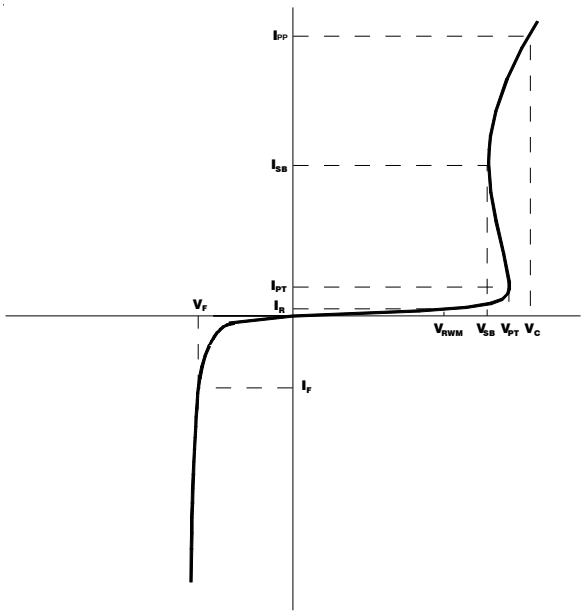
The EPD TVS employs a complex nppn structure in contrast to the pn structure normally found in traditional silicon-avalanche TVS diodes. Since the EPD TVS devices use a 4-layer structure, they exhibit a slightly different IV characteristic curve when compared to conventional devices. During normal operation, the device represents a high-impedance to the circuit up to the device working voltage (V_{RWM}). During an ESD event, the device will begin to conduct and will enter a low impedance state when the punch through voltage (V_{PT}) is exceeded. Unlike a conventional device, the low voltage TVS will exhibit a slight negative resistance characteristic as it conducts current. This characteristic aids in lowering the clamping voltage of the device, but must be considered in applications where DC voltages are present.

When the TVS is conducting current, it will exhibit a slight "snap-back" or negative resistance characteristics due to its structures. This point is defined on the curve by the snap-back voltage (V_{SB}) and snap-back current (I_{SB}). To return to a non-conducting state, the current through the device must fall below the I_{SB} (approximately <50mA) and the voltage must fall below the V_{SB} (normally 2.8 volts for a 3.3V device). If a 3.3V TVS is connected to 3.3V DC source, it will never fall below the snap-back voltage of 2.8V and will therefore stay in a conducting state.

Device Schematic & Pin Configuration



EPD TVS IV Characteristic Curve



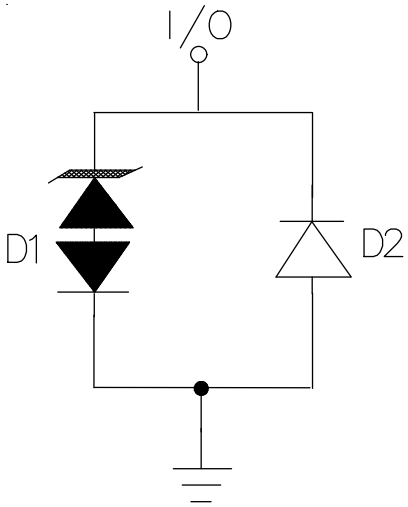
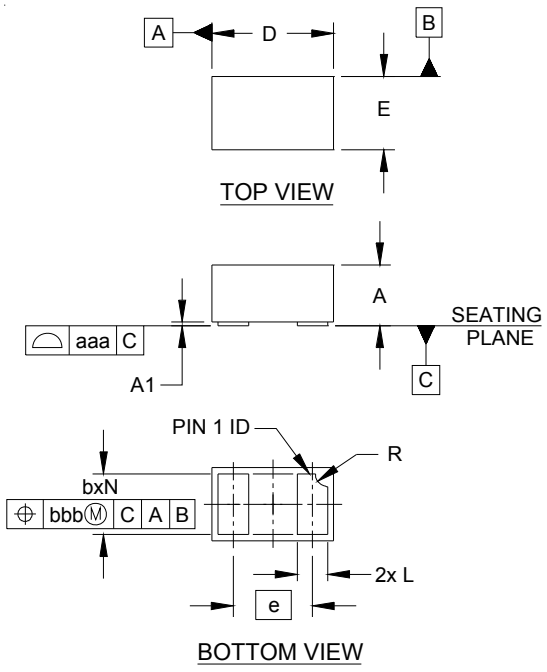


Figure 1 - uClamp3301P Spice Model

Table 1 - µClamp3301P Spice Parameters

Parameter	Unit	D1 (TVS)	D2 (LCRD)
IS	Amp	1.00E-20	1.00E-20
BV	Volt	3.3	8
VJ	Volt	14	0.69
RS	Ohm	0.482	0.898
IBV	Amp	1.0E-3	1.0E-3
CJO	Farad	14E-12	7E-12
TT	sec	2.541E-9	2.541E-9
M	--	0.155	0.155
N	--	1.1	1.1
EG	eV	1.11	1.11

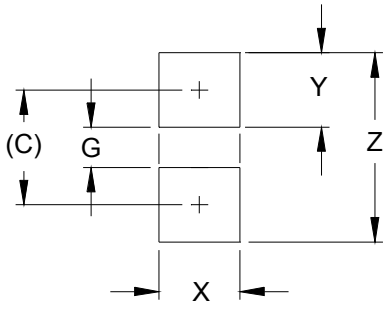
Outline Drawing - SLP1006P2



DIMENSIONS						
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		

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

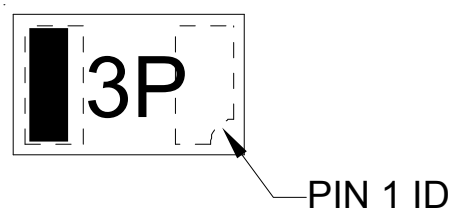
Land Pattern - SLP1006P2



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

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



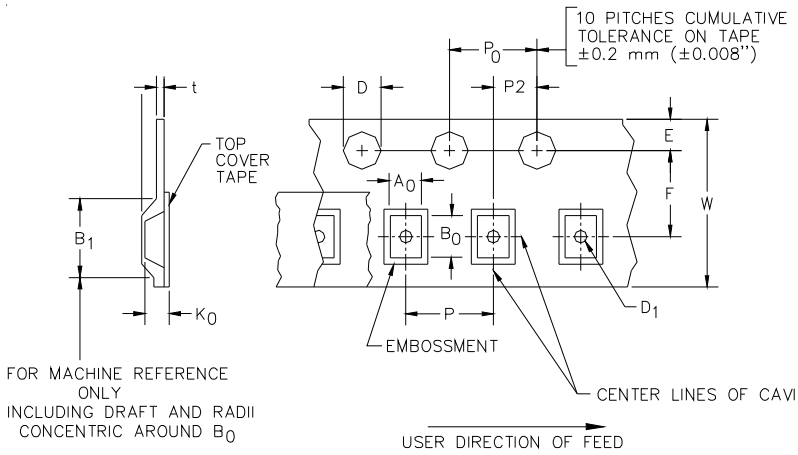
Note: Cathode band at Pin 2

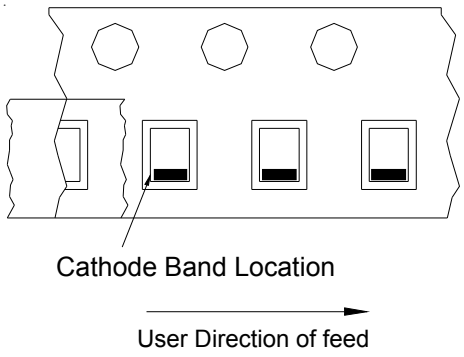
Ordering Information

Part Number	Working Voltage	Qty per Reel	Reel Size
uClamp3301P.TCT	3.3V	3,000	7 Inch

Notes:
1) MicroClamp, uClamp and µClamp are trademarks of Semtech Corporation

Tape and Reel Specification





Device Orientation in Tape

A0	B0	K0
0.69 +/-0.10 mm	1.19 +/-0.10 mm	0.66 +/-0.10 mm

Tape Width	B, (Max)	D	D1	E	F	P	P0	P2	T	W
8 mm	4.2 mm (.165)	1.5 + 0.1 mm - 0.0 mm (0.59 +.005 - .000)	0.4 mm ±0.25 (.031)	1.750±.10 mm (.069±.004)	3.5±0.05 mm (.138±.002)	4.0±0.10 mm (.157±.00-4)	4.0±0.1 mm (.157±.00-4)	2.0±0.05 mm (.079±.002)	0.254±0.02 mm (.016)	8.0 mm + 0.3 mm - 0.1 mm (.312±.012)

Contact Information

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