

PROTECTION PRODUCTS

Absolute Maximum Rating

Rating	Symbol	Value	Units
Peak Pulse Power ($t_p = 8/20\mu s$)	P_{pk}	40	Watts
Maximum Peak Pulse Current ($t_p = 8/20\mu s$)	I_{pp}	5	Amps
ESD per IEC 61000-4-2 (Air) ESD per IEC 61000-4-2 (Contact)	V_{pp}	+/- 20 +/- 15	kV
Operating Temperature	T_j	-55 to +125	°C
Storage Temperature	T_{STG}	-55 to +150	°C

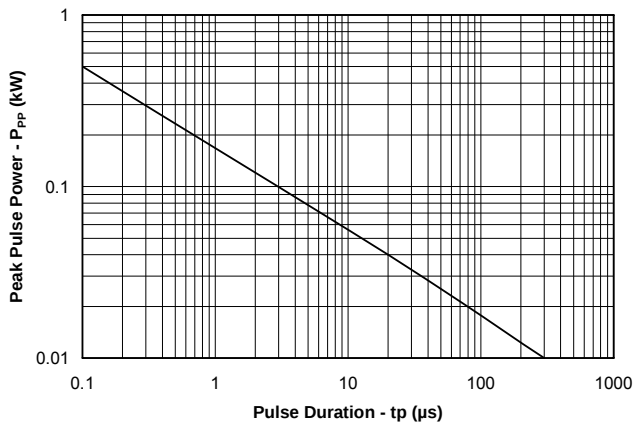
Electrical Characteristics (T=25°C)

Parameter	Symbol	Conditions	Minimum	Typical	Maximum	Units
Reverse Stand-Off Voltage	V_{RWM}				3.3	V
Punch-Through Voltage	V_{PT}	$I_{PT} = 2\mu A$	3.5			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	$I_{pp} = 1A$, $t_p = 8/20\mu s$ Any I/O to Gnd			5.5	V
Clamping Voltage	V_C	$I_{pp} = 5A$, $t_p = 8/20\mu s$ Any I/O to Gnd			8.0	V
Reverse Clamping Voltage	V_{CR}	$I_{pp} = 1A$, $t_p = 8/20\mu s$ Any I/O to Gnd			2.4	V
Junction Capacitance	C_j	I/O pin to Gnd $V_R = 0V$, $f = 1MHz$		20	25	pF
		I/O pin to Gnd $V_R = 3.3V$, $f = 1MHz$		12		pF
		I/O pin to I/O pin $V_R = 0V$, $f = 1MHz$		10	12.5	pF
		I/O pin to I/O pin $V_R = 3.3V$, $f = 1MHz$		7.5		pF

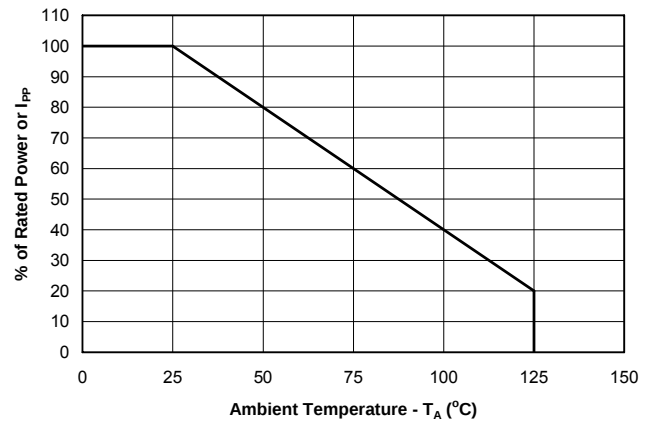
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Typical Characteristics

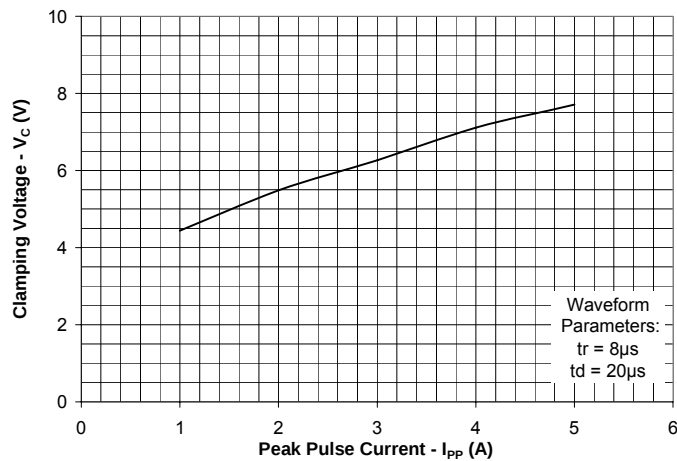
Non-Repetitive Peak Pulse Power vs. Pulse Time



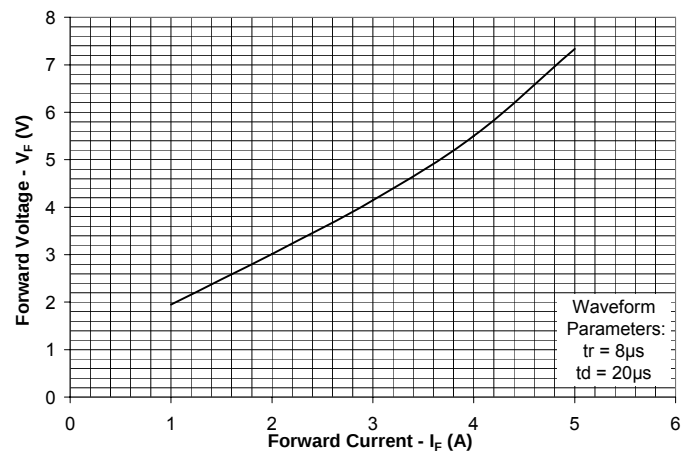
Power Derating Curve



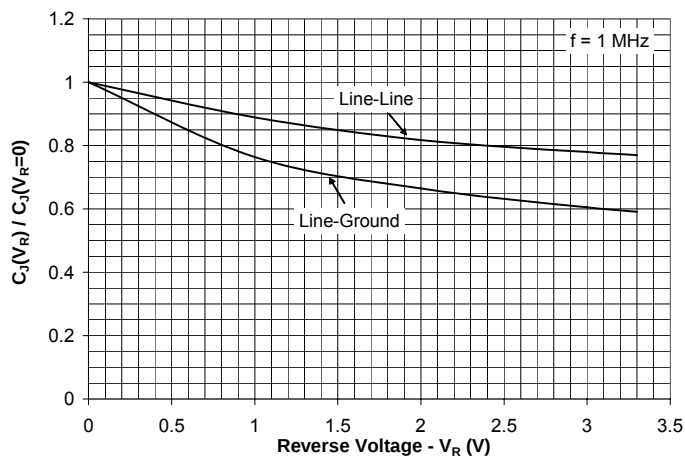
Clamping Voltage vs. Peak Pulse Current



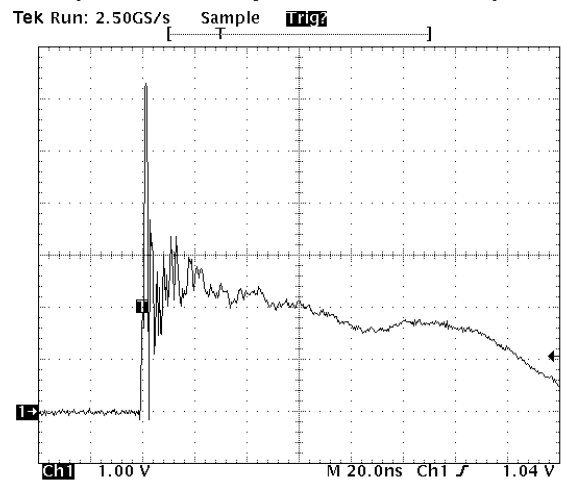
Forward Voltage vs. Forward Current

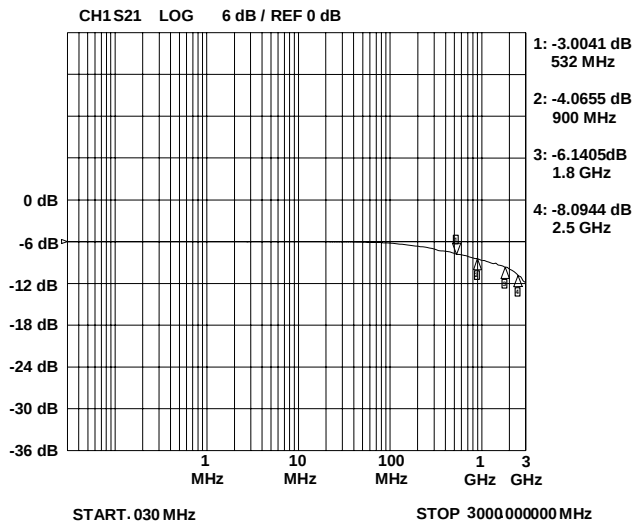
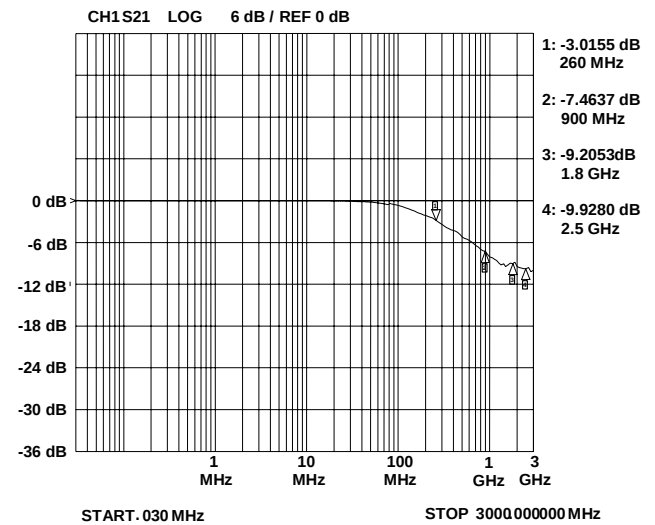
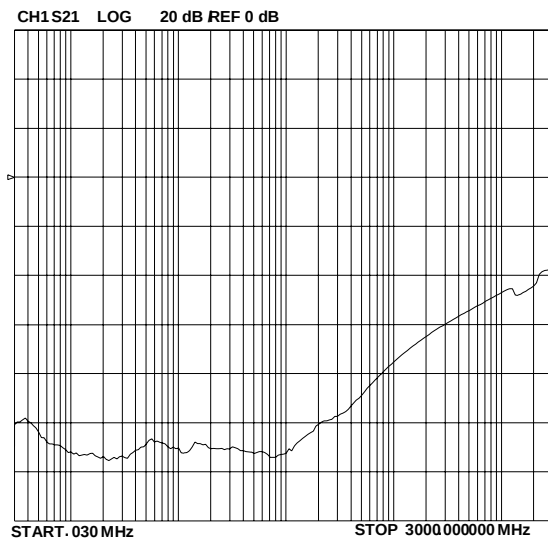


Normalized Capacitance vs. Reverse Voltage



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



Insertion Loss S21 - LtoL (I/O to I/O)

Insertion Loss S21 -LtoG (I/O to Pin 2)

Crosstalk S21 (I/O to Pin 4)


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Applications Information

Device Connection Options

The μ Clamp3306P is designed to protect 6 signal lines with an operating voltage of 0 to 3.3V. 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.

Pins 1, 2, 3, 4, 5, and 6 are connected to I/O signals. The center tab is connected to system ground. All signal lines and ground should be made with the lowest impedance and inductance path as possible. This will improve signal quality of the lines and keep the clamping voltage as low as possible during a fast transient.

EPD TVS Characteristics

These devices are 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, these devices can effectively operate at 3.3V while maintaining excellent electrical characteristics.

The EPD TVS employs a complex npnp structure in contrast to the pn structure normally found in traditional silicon-avalanche TVS diodes. The EPD mechanism is achieved by engineering the center region of the device such that the reverse biased junction does not avalanche, but will “punch-through” to a conducting state. This structure results in a device with superior DC electrical parameters at low voltages while maintaining the capability to absorb high transient currents.

Figure 1 - Circuit Diagram

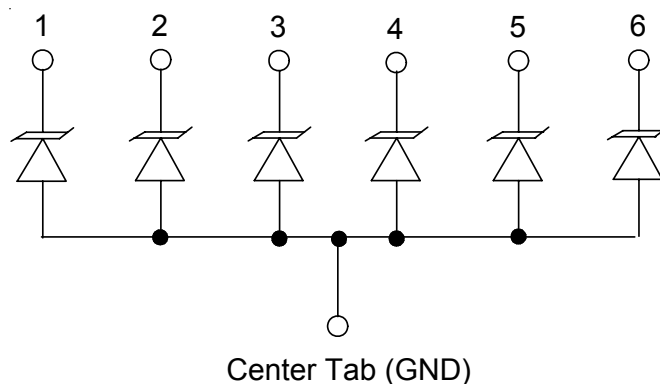


Figure 2 - Layout Example

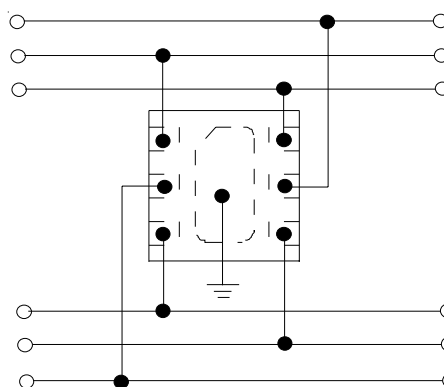
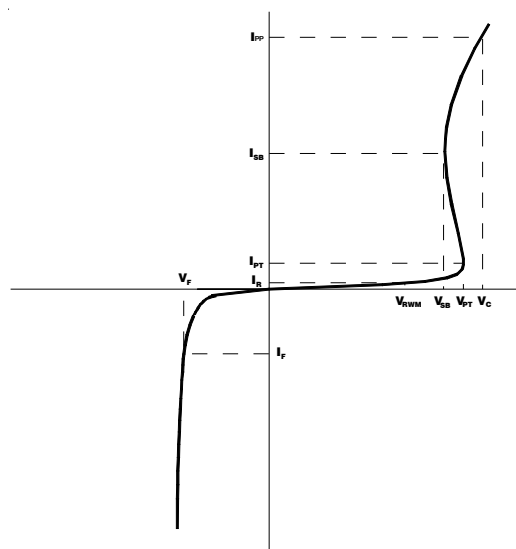
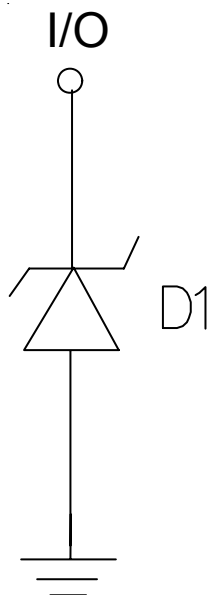
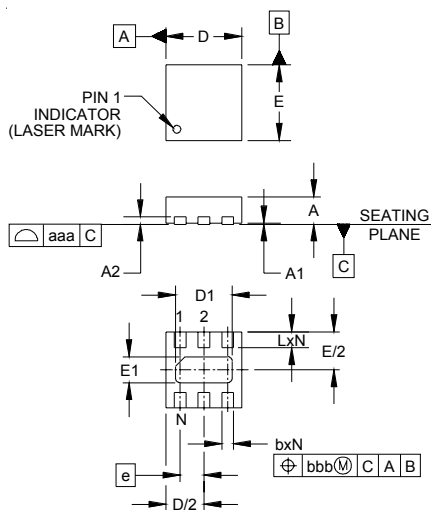


Figure 3 - EPD TVS IV Characteristic Curve



PROTECTION PRODUCTS
Applications Information - Spice Model

Figure 3 - μ Clamp3306P Spice Model

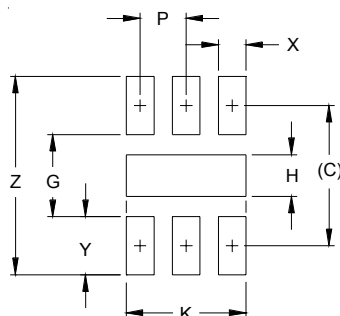
μClamp3306P Spice Parameters		
Parameter	Unit	D1 (TVS)
IS	Amp	2E-12
BV	Volt	20
VJ	Volt	0.57
RS	Ohm	1.444
IBV	Amp	1.0 E-3
CJO	Farad	20E-12
TT	sec	2.541E-9
M	--	0.236
N	--	1.1
EG	eV	1.11

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Outline Drawing - SLP1616P6


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	.008	.010	.012	0.20	0.25	0.30
D	.059	.063	.067	1.50	1.60	1.70
D1	.041	.047	.051	1.05	1.20	1.30
E	.059	.063	.067	1.50	1.60	1.70
E1	.010	.016	.020	0.25	0.40	0.50
e	.020	BSC		0.50	BSC	
L	.010	.013	.016	0.25	0.33	0.40
N		6			6	
aaa		.003			0.08	
bbb		.004			0.10	

NOTES:

1. CONTROLLING DIMENSIONS ARE IN MILLIMETERS (ANGLES IN DEGREES).
2. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

Land Pattern - SLP1616P6


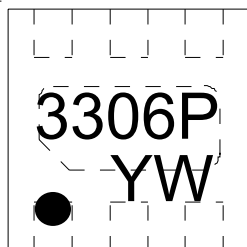
DIM	DIMENSIONS	
	INCHES	MILLIMETERS
C	.060	1.52
G	.035	0.89
H	.018	0.45
K	.051	1.30
P	.020	0.50
X	.012	0.30
Y	.025	0.63
Z	.085	2.15

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.
3. THERMAL VIAS IN THE LAND PATTERN OF THE EXPOSED PAD SHALL BE CONNECTED TO A SYSTEM GROUND PLANE. FAILURE TO DO SO MAY COMPROMISE THE THERMAL AND/OR FUNCTIONAL PERFORMANCE OF THE DEVICE.

PROTECTION PRODUCTS

Marking



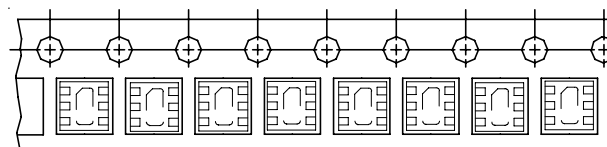
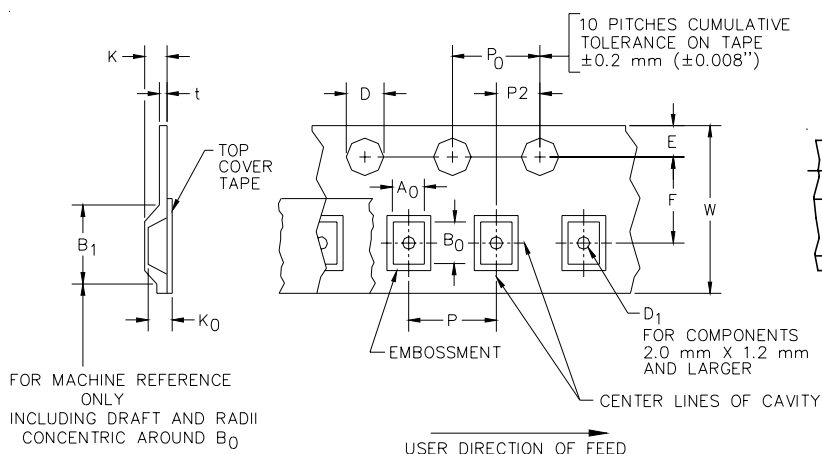
Y = year
W = Week

Ordering Information

Part Number	Working Voltage	Lead Finish	Qty per Reel	Reel Size
uClamp3306P.TCT	3.3V	Pb Free	3,000	7 Inch

MicroClamp, uClamp and μ Clamp are marks of Semtech Corporation

Tape and Reel Specification



Device Orientation in Tape

A0	B0	K0
1.78 $\pm$ 0.05 mm	1.78 $\pm$ 0.05 mm	0.69 $\pm$ 0.05 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 $\pm$ 0.05 (.031)	1.750 $\pm$.10 mm (.069 $\pm$.004)	3.5 $\pm$ 0.05 mm (.138 $\pm$.002)	2.4 mm (.094)	4.0 $\pm$ 0.1 mm (.157 $\pm$.004)	4.0 $\pm$ 0.1 mm (.157 $\pm$.004)	2.0 $\pm$ 0.05 mm (.079 $\pm$.002)	0.4 mm (.016)	8.0 mm + 0.3 mm - 0.1 mm (.312 $\pm$.012)

Contact Information

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