PClamp1211P

Power MicroClamp™ High-Surge TVS Diode

PROTECTION PRODUCTS

Description

PClamp TVS diodes are designed for use in harsh transient environments to protect sensitive electronics from damage or latch-up due to EOS, lightning, CDE, and ESD. They feature large cross-sectional area junctions for conducting high transient currents. These devices offer desirable characteristics for board level protection including fast response time, low operating and clamping voltage, and no device degradation.

They feature extremely good protection characteristics highlighted by high surge current capability (180A, tp = 8/20µs), low peak ESD clamping voltage, and high ESD withstand voltage (+/- 30kV per IEC 61000-4-2). Each device will protect power line operating up to 13.5V.

PClamp1211P is in a 6-pin SLP2018P6 package measuring 2.0 x 1.8 mm with a nominal height of 0.57mm. The leads are finished with lead-free NiPdAu. High surge current capability and low clamping voltage making them ideal for protecting VBus, battery, and other power lines in portable electronics, industrial, and automotive applications.

Features

- Transient Protection to
  - IEC 61000-4-2 (ESD) 30kV (Air), 30kV (Contact)
  - IEC 61000-4-4 (EFT) 4kV (5/50ns)
  - IEC 61000-4-5 (Lightning) 180A (8/20µs)
  - ISO-10605 (ESD) 30kV (Air), 30kV (Contact)
- Protects power line
- Working Voltage: 13.5V
- Low leakage current
- Solid-state silicon-avalanche technology

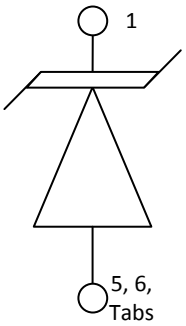
Mechanical Characteristics

- SLP2018P6 package
- Pb-Free, Halogen Free, RoHS/WEEE compliant
- Nominal Dimensions: 2.0 x 1.8 x 0.57 mm
- Lead Finish: NiPdAu
- Marking: Marking code
- Packaging: Tape and Reel

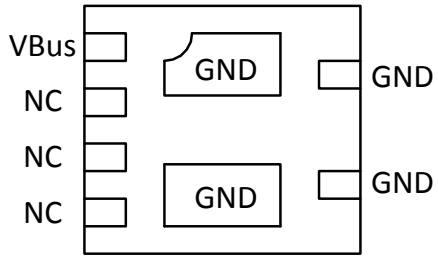
Applications

- Cellular Handsets & Accessories
- Industrial Equipment
- Voltage Supply Lines
- Battery protection
- USB VBus

Schematic



Pin Configuration



SLP2018P6 (Top View)

Absolute Maximum Ratings

Rating	Symbol	Value	Units
Peak Pulse Power (tp = 8/20µs)	P_{PK}	5000	W
Peak Pulse Current (tp = 8/20µs)	I_{PP}	180	A
Peak Pulse Current (tp = 10/1000µs)	I_{PP}	15	A
ESD per IEC 61000-4-2 (Contact)(1) ESD per IEC 61000-4-2 (Air)(1)	V_{ESD}	±30 ±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)

PClamp1211P

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Reverse Stand-Off Voltage	V_{RWM}	Pin 1 to Pin 5, 6(5)			13.5	V
Reverse Breakdown Voltage	V_{BR}	I_t = 1mA, Pin 1 to Pin 5, 6(5)	14.5	15	17.5	V
Reverse Leakage Current	I_R	V_{RWM} = 13.5V Pin 1 to Pin 5, 6(5)		0.300	0.350	µA
Clamping Voltage(2)	V_C	I_{PP} = 100A, tp = 8/20µs, Pin 1 to Pin 5, 6(5)		18	25	V
Clamping Voltage(2)	V_C	I_{PP} = 180A, tp = 8/20µs, Pin 1 to Pin 5, 6(5)		23.5	28	V
Dynamic Resistance(3), (4)	R_{DYN}	tp = 0.2/100ns (TLP) Pin 1 to Pin 5, 6(5)		0.01		Ohms
Junction Capacitance	C_J	V_R = 0V, f = 1MHz Pin 1 to Pin 5, 6(5)		1500	2500	pF

Notes:

(1): ESD Gun return path to Ground Reference Plane (GRP)

(2):Tested using a constant current source

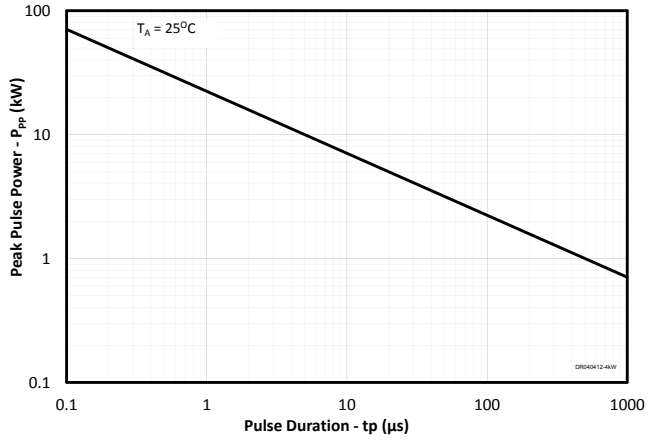
(3): Transmission Line Pulse Test (TLP) Settings: tp = 100ns, tr = 0.2ns, I_{TLP} and V_{TLP} averaging window: t_1 = 70ns to t_2 = 90ns.

(4): Dynamic resistance calculated from I_{TLP} = 4A to I_{TLP} = 16A

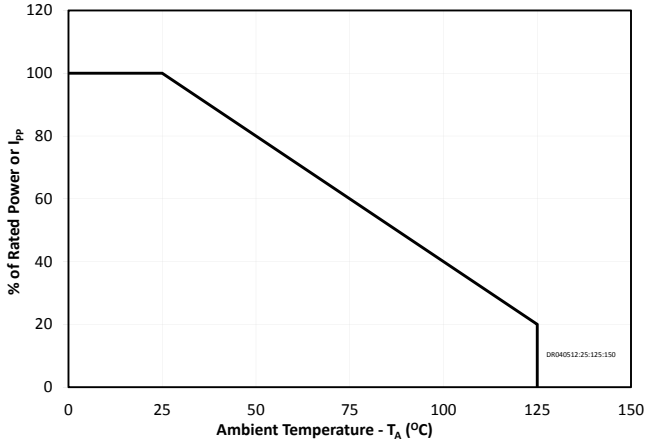
(5) Pins 5 and 6 are electrically connected to the center tabs

Typical Characteristics

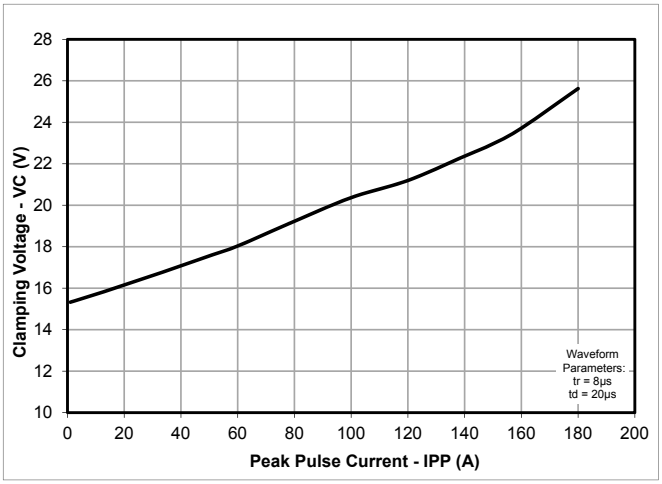
Non-Repetitive Peak Pulse Power vs. Pulse Time



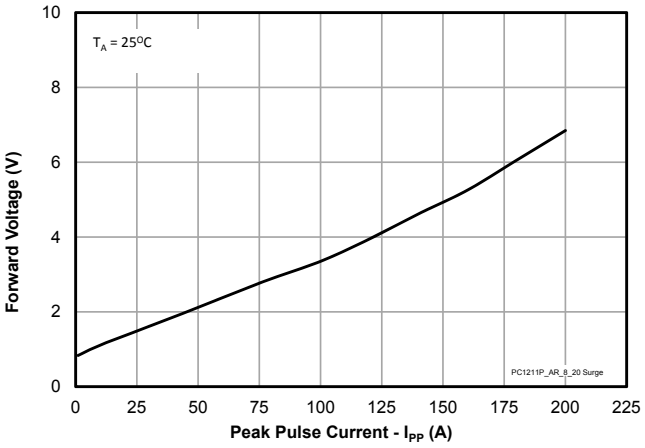
Power Derating Curve



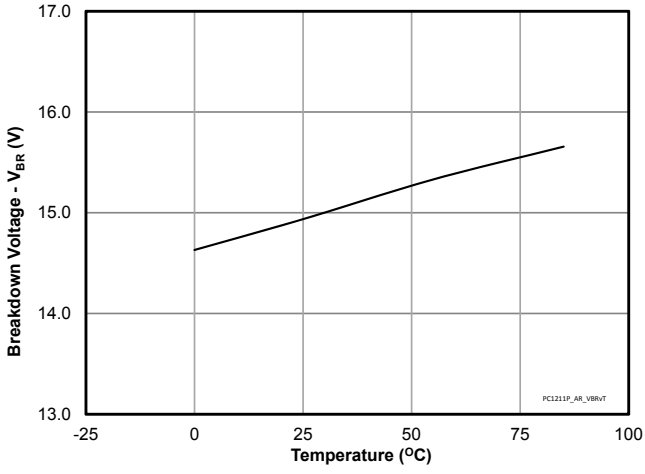
Clamping Voltage vs. Peak Pulse Current (tp=8/20µs)



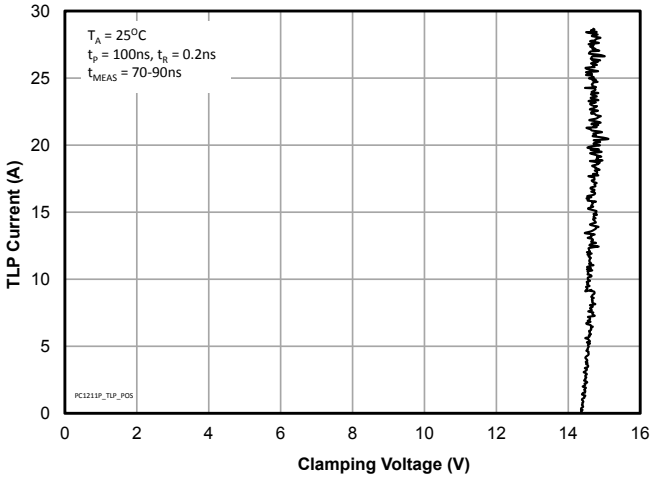
Forward Voltage vs. Peak Pulse Current (tp=8/20µs)



Breakdown Voltage (V_{BR}) vs. Temperature

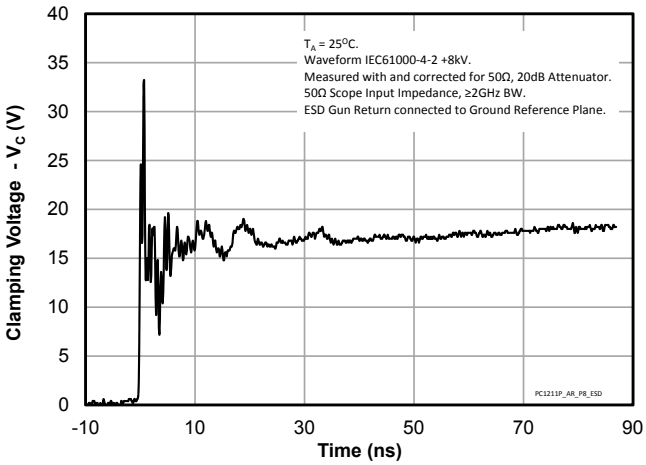


TLP Characteristic

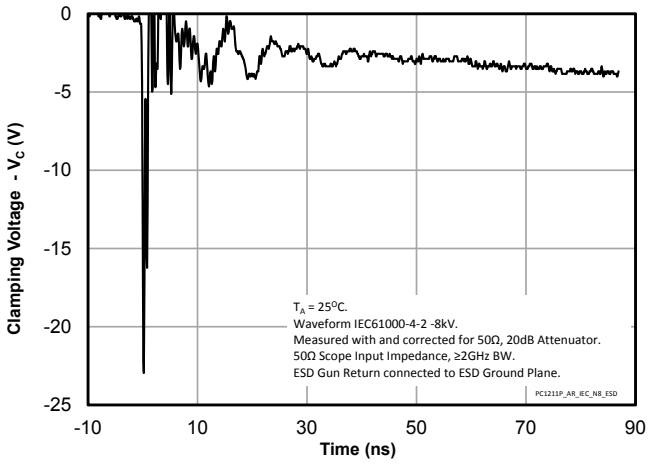


Typical Characteristics

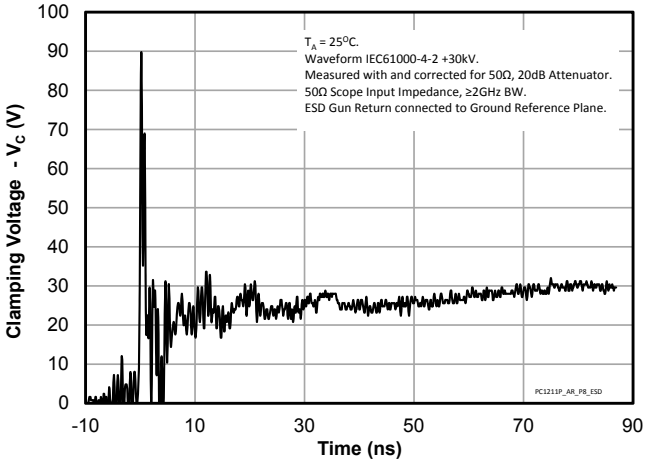
ESD Clamping (8kV Contact per IEC 61000-4-2)



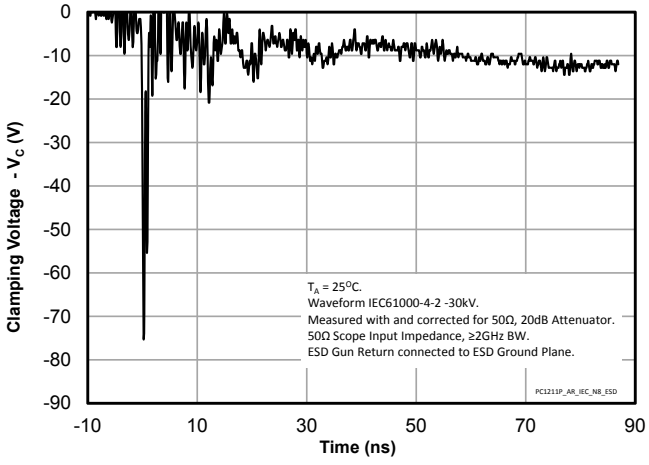
ESD Clamping (-8kV Contact per IEC 61000-4-2)



ESD Clamping (30kV Contact per IEC 61000-4-2)



ESD Clamping (-30kV Contact per IEC 61000-4-2)



Application Information

Assembly Guidelines

The figure at the right details Semtech's recommended mounting pattern. Recommended assembly guidelines are shown in Table 1. Note that these are only recommendations and should serve only as a starting point for design since there are many factors that affect the assembly process. Exact manufacturing parameters will require some experimentation to get the desired solder application. Semtech's recommended mounting pattern is based on the following design guidelines:

Land Pattern

The recommended land pattern follows IPC standards and is designed for maximum solder coverage. Detailed dimensions are shown elsewhere in this document.

Solder Stencil

Stencil design is one of the key factors which will determine the volume of solder paste deposited onto the land pad. The area ratio of the stencil aperture will determine how well the stencil will print. The area ratio takes into account the aperture shape, aperture size, and stencil thickness. An area ratio of 0.70 – 0.75 is preferred for the subject package. The area ratio of a rectangular aperture is given as:

Area Ratio = (L * W)/ (2 * (L + W) * T)

Where:
L = Aperture Length
W = Aperture Width
T = Stencil Thickness

Semtech recommends a stencil thickness of 0.125mm for this device. The stencil should be laser cut with electro-polished finish. The stencil should have a positive taper of approximately 5 degrees. Electro polishing and tapering the walls results in reduced surface friction and better paste release. Solder paste with Type 3 or smaller particles are recommended. Assuming a 125µm thick stencil, the aperture dimensions shown will yield an area ratio of approximately 0.75.

Recommended Mounting Pattern

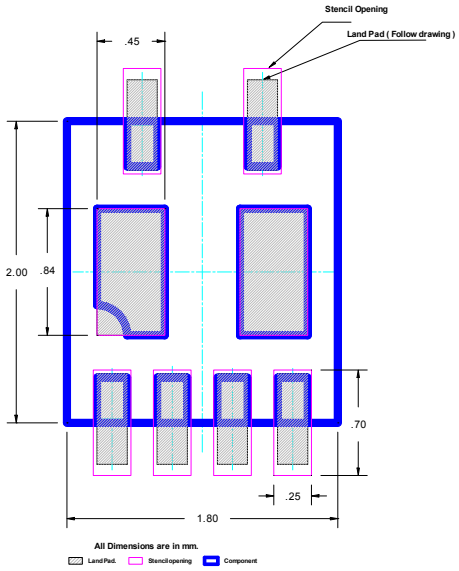
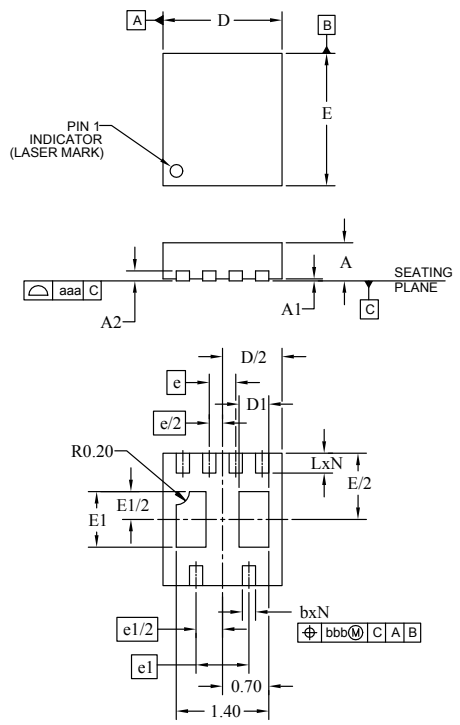


Table 1 - Recommended Assembly Guidelines

Assembly Parameter	Recommendation
Solder Stencil Design	Laser Cut, Electro-Polished
Aperture Shape	Rectangular
Solder Stencil Thickness	0.125mm (0.005")
Solder Paste Type	Type 3 size sphere or smaller
Solder Reflow Profile	Per JEDEC J-STD-020
PCB Solder pad Design	Non-Solder Mask Defined
PCB Pad Finish	OSP or NiAu

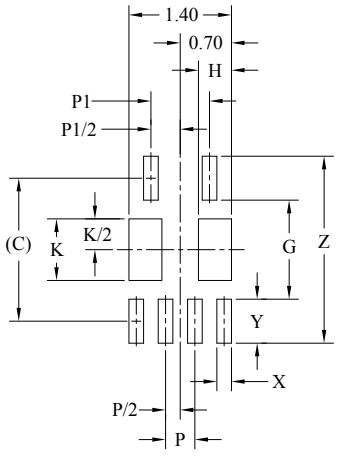
Outline Drawing - SLP2018P6



DIMENSIONS			
DIM	MILLIMETERS		
	MIN	NOM	MAX
A	0.50	0.575	0.65
A1	0.00	0.03	0.05
A2		(0.127)	
b	0.15	0.20	0.25
D	1.70	1.80	1.90
E	1.90	2.00	2.10
D1	0.30	0.45	0.55
E1	0.69	0.84	0.94
e		0.40 BSC	
e1		0.80 BSC	
L	0.25	0.30	0.35
N		6	
aaa		0.08	
bbb		0.10	

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

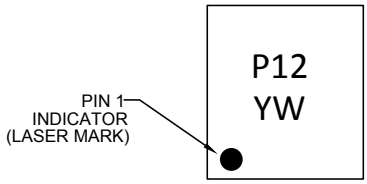
Land Pattern - SLP2018P6



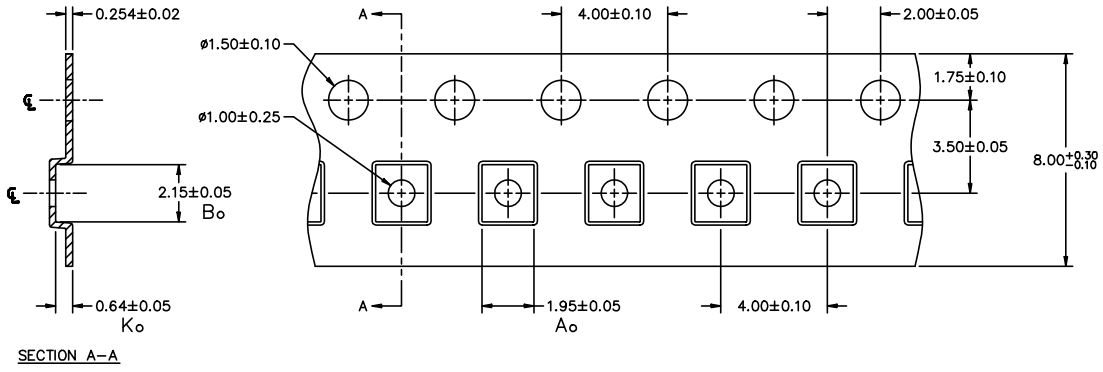
DIMENSIONS	
DIM	MILLIMETERS
C	(1.95)
G	1.35
H	0.45
K	0.84
P	0.40
P1	0.80
X	0.20
Y	0.60
Z	2.55

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.

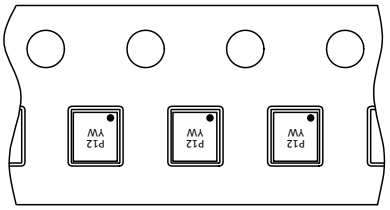
Marking Example



Tape and Reel Specification



NOTE: ALL DIMENSIONS IN MILLIMETERS UNLESS OTHERWISE SPECIFIED.



Pin 1 Located Towards
Sprocket Holes

Ordering Information

Part Number	Working Voltage	Qty per Reel	Reel Size
PClamp1211P. TGT	12V	10,000	13”
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Contact Information

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