

PROTECTION PRODUCTS - MicroClamp[®]

Description

μ Clamp[®] TVS diodes 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 such as cell phones, notebook computers, and other portable electronics. They feature large cross-sectional area junctions for conducting high transient currents. This device offers desirable characteristics for board level protection including fast response time, low operating and clamping voltage, and no device degradation.

The μ Clamp[®]5612T is in a 5-pin SLP1508N5T package. It measures 1.5 x 0.8 x 0.40mm. The leads are spaced at a pitch of 0.35mm and are finished with lead-free NiPdAu. Each device will protect one line operating at 12 volts and two lines operating at 5 volts. They may be used to meet the ESD immunity requirements of IEC 61000-4-2. The combination of small size and high ESD surge capability, and dual operating voltage makes them ideal for protecting battery interfaces in cellular phones.

Features

- ◆ High ESD withstand Voltage: $\pm 30\text{kV}$ (air), $\pm 30\text{kV}$ (contact) per IEC 61000-4-2
- ◆ Small package saves board space
- ◆ Protects two battery sensor pins to 5V
- ◆ Protects battery voltage bus operating up to 12V
- ◆ Low reverse current
- ◆ Innovative flow-through design allows easy pcb layout
- ◆ Solid-state silicon-avalanche technology

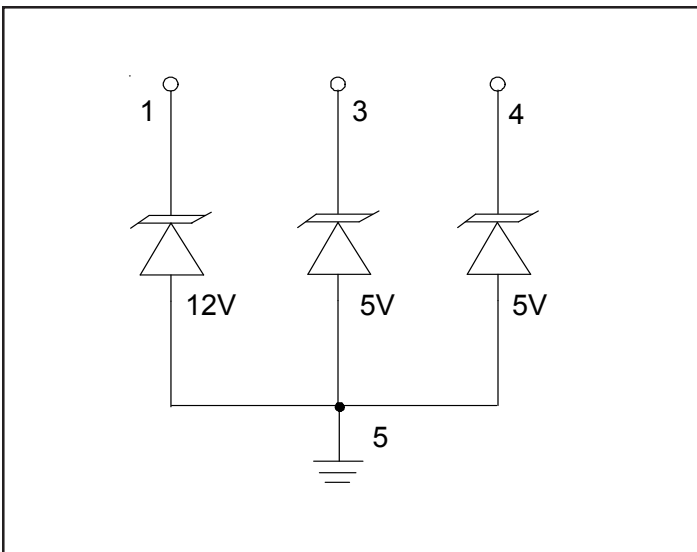
Mechanical Characteristics

- ◆ SLP1508N5T 5L package
- ◆ Pb-Free, Halogen Free, RoHS/WEEE Compliant
- ◆ Nominal Dimensions: 1.5 x 0.8 x 0.40 mm
- ◆ Lead Finish: NiPdAu
- ◆ Molding compound flammability rating: UL 94V-0
- ◆ Marking : Marking code + date code
- ◆ Packaging : Tape and Reel

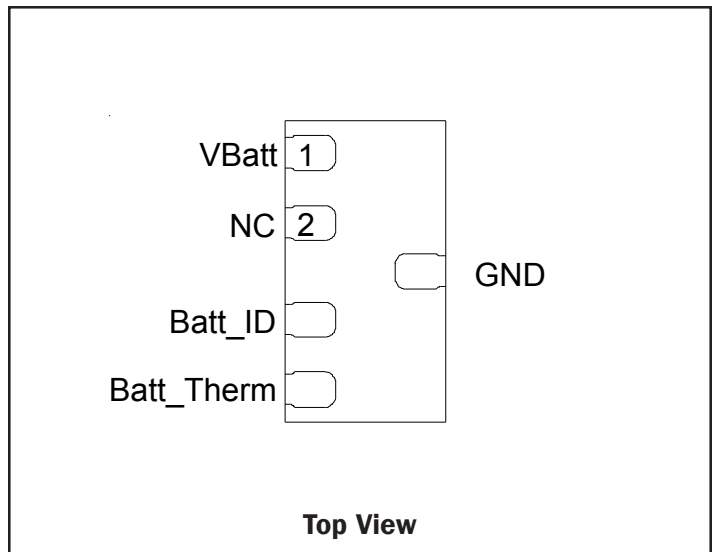
Applications

- ◆ Cellular Handsets
- ◆ Battery Interfaces

Schematic



PIN Configuration



PROTECTION PRODUCTS
Absolute Maximum Rating

Rating	Symbol	Value	Units
Batt_Therm, Batt_ID			
Peak Pulse Power (tp = 8/20μs)	P_{pk}	125	Watts
Peak Pulse Current (tp = 8/20μs)	I_{PP}	10	A
ESD per IEC 61000-4-2 (Air) ESD per IEC 61000-4-2 (Contact)	V_{ESD}	±30 ±30	kV
Operating Temperature	T_J	-55 to +125	°C
Storage Temperature	T_{STG}	-55 to +150	°C
VBatt			
Peak Pulse Power (tp = 8/20μs)	P_{pk}	300	Watts
Peak Pulse Current (tp = 8/20μs)	I_{PP}	10	A
ESD per IEC 61000-4-2 (Air) ESD per IEC 61000-4-2 (Contact)	V_{ESD}	±30 ±30	kV
Operating Temperature	T_J	-55 to +125	°C
Storage Temperature	T_{STG}	-55 to +150	°C

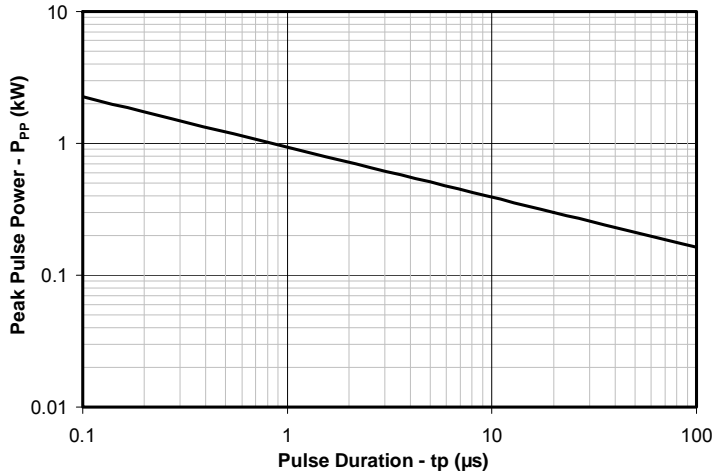
PROTECTION PRODUCTS
Electrical Characteristics (T=25°C)

Batt_Therm, Batt_ID						
Parameter	Symbol	Conditions	Minimum	Typical	Maximum	Units
Reverse Stand-Off Voltage	V_{RWM}	Pin 3, or 4 to GND			5	V
Reverse Breakdown Voltage	V_{BR}	$I_t = 1mA$ Pin 3, or 4 to GND	6.5	7.5	11	V
Reverse Leakage Current	I_R	$V_{RWM} = 5V, T=25^\circ C$ Pin 3, or 4 to GND		0.050	0.500	μA
Clamping Voltage	V_C	$I_{pp} = 1A, t_p = 8/20\mu s$ Pin 3, or 4 to GND			10	V
Clamping Voltage	V_C	$I_{pp} = 10A, t_p = 8/20\mu s$ Pin 3, or 4 to GND			12.5	V
Junction Capacitance	C_j	$V_R = 0V, f = 1MHz$ Pin 3, or 4 to GND		90	115	pF
VBatt						
Parameter	Symbol	Conditions	Minimum	Typical	Maximum	Units
Reverse Stand-Off Voltage	V_{RWM}	Pin 1 to GND			12	V
Reverse Breakdown Voltage	V_{BR}	$I_t = 1mA,$ Pin 1 to GND	15	16.5	18	V
Reverse Leakage Current	I_R	$V_{RWM} = 12V$ Pin 1 to GND		0.005	0.100	μA
Forward Voltage	V_F	$I_f = 10mA$ GND to Pin 1	0.6		1.0	V
Clamping Voltage	V_C	$I_{pp} = 10A, t_p = 8/20\mu s$ Pin 1 to Ground			30	V
Forward Clamping Voltage	V_{FC}	$I_{pp} = 10A, t_p = 8/20\mu s$ Ground to Pin 1			3	V
Junction Capacitance	C_j	$V_R = 0V, f = 1MHz$ Pin 1 to GND		50	75	pF

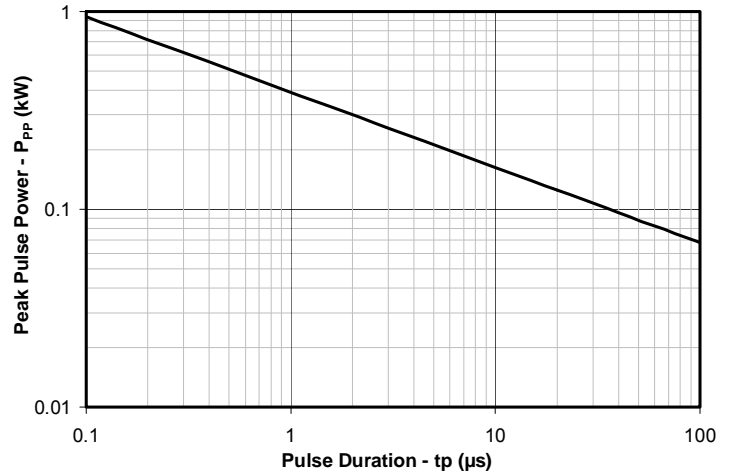
PROTECTION PRODUCTS

Typical Characteristics

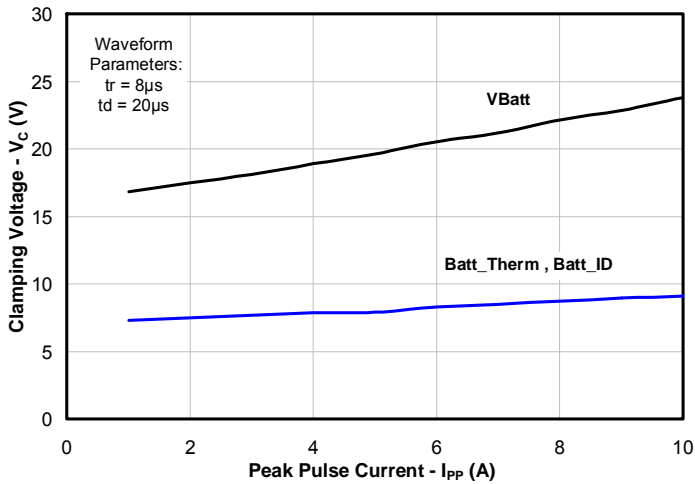
Non-Repetitive Peak Pulse Power vs. Pulse Time (VBatt)



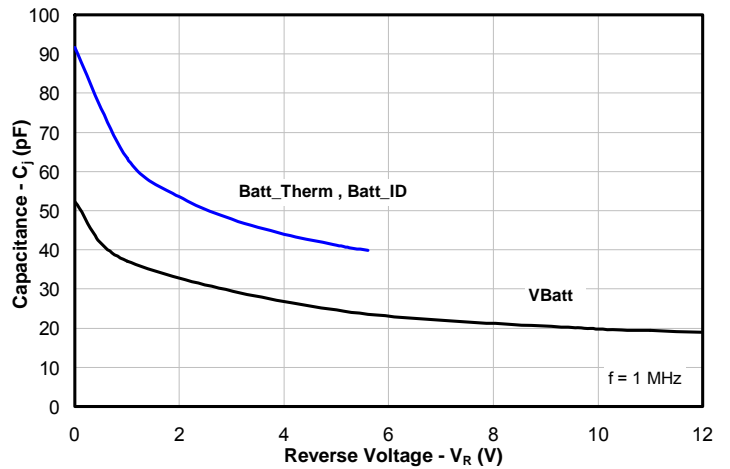
Non-Repetitive Peak Pulse Power vs. Pulse Time (Batt_Therm, Batt_ID)



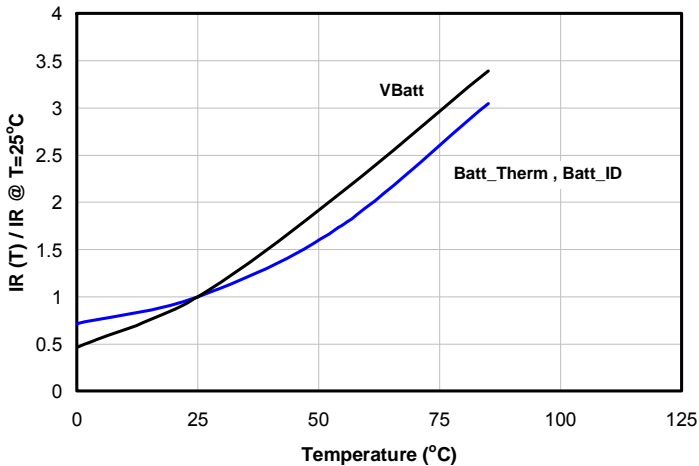
Clamping Voltage vs. Peak Pulse Current (tp=8/20us)



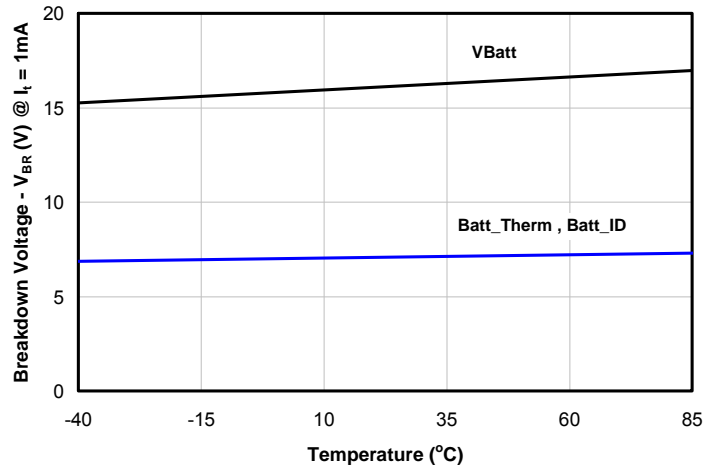
Junction Capacitance vs. Reverse Voltage



Normalized Leakage Current (IR) vs. Temperature



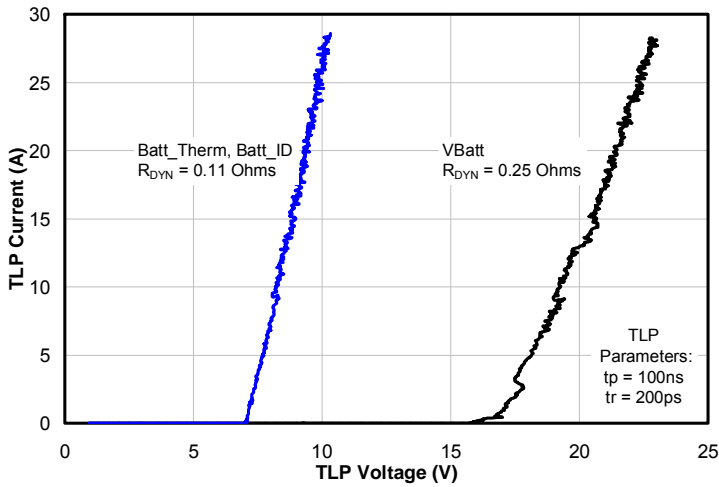
Breakdown Voltage (VBR) vs. Temperature



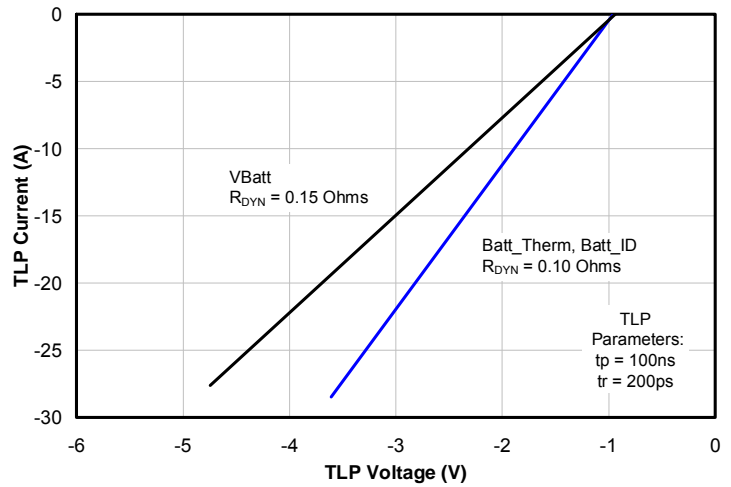
PROTECTION PRODUCTS

Typical Characteristics

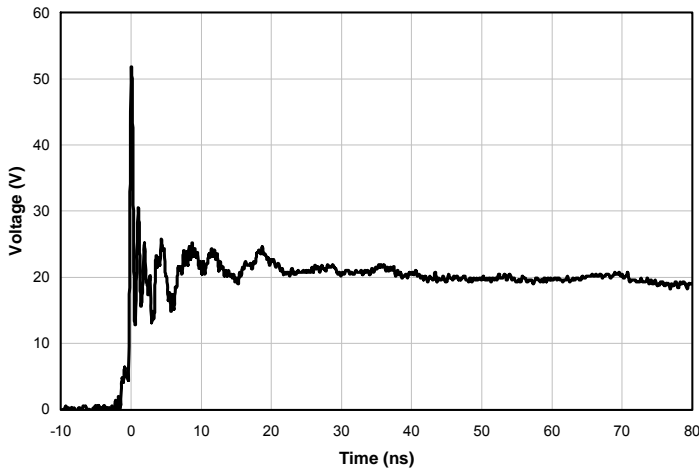
TLP Characteristic (Positive)



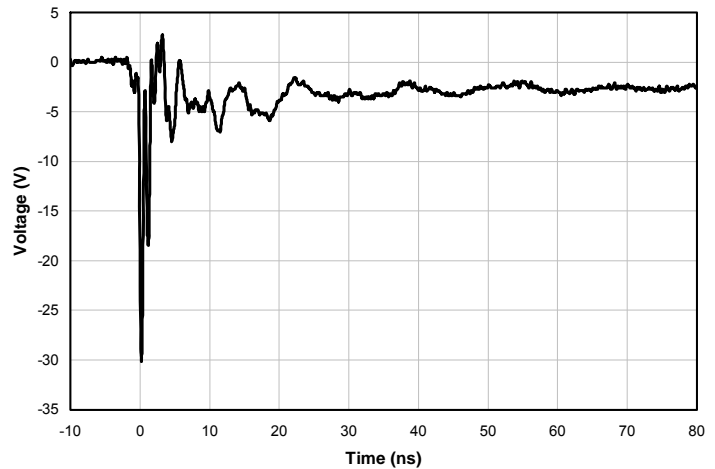
TLP Characteristic (Negative)



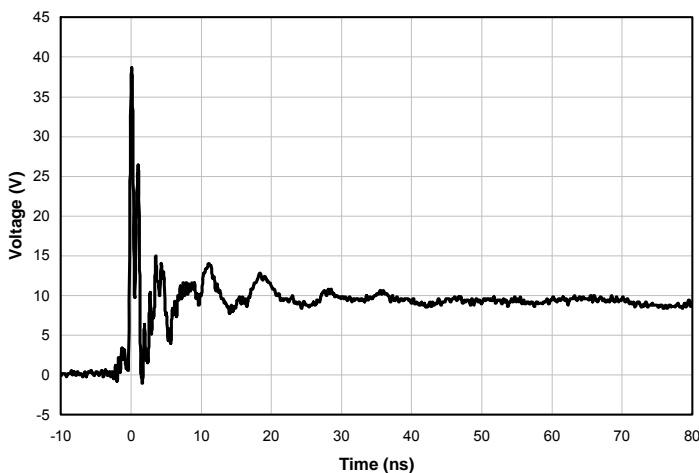
ESD Clamping (+8kV Contact per IEC 61000-4-2)
VBatt Pin (Pin 1)



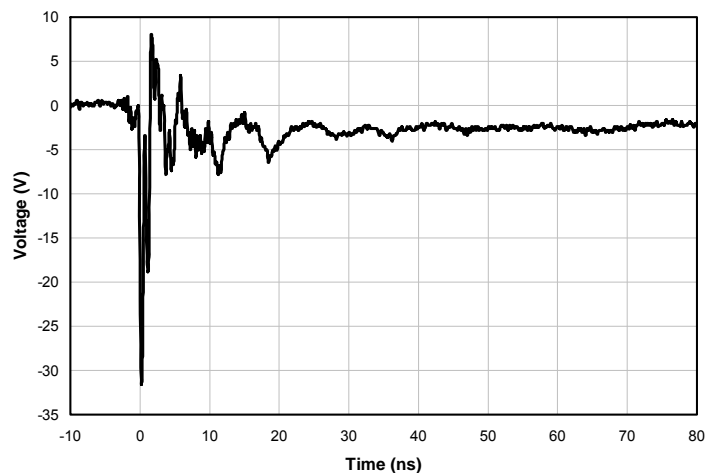
ESD Clamping (-8kV Contact per IEC 61000-4-2)
VBatt Pin (Pin 1)



ESD Clamping +8kV Contact per IEC 61000-4-2)
Batt_Therm, Batt_ID Pins (Pins 3, 4)



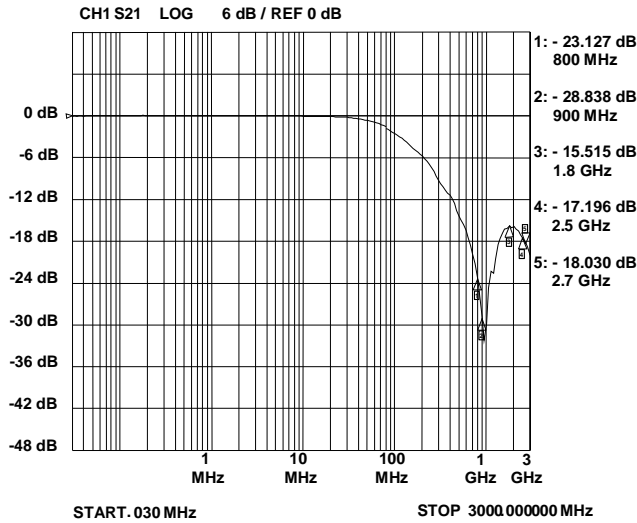
ESD Clamping -8kV Contact per IEC 61000-4-2)
Batt_Therm, Batt_ID Pins (Pins 3, 4)



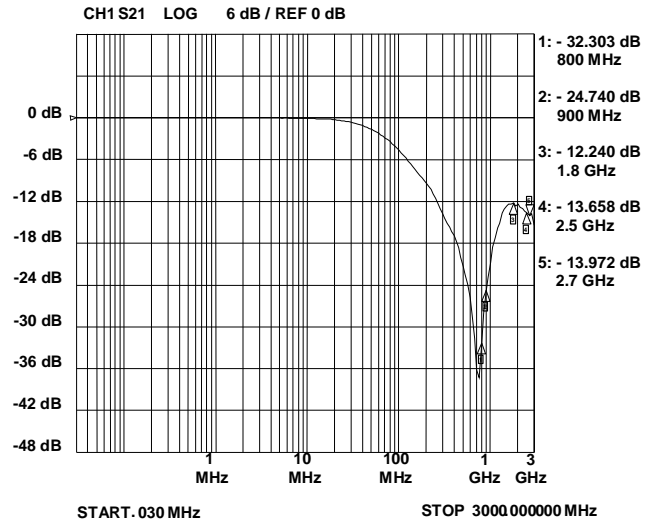
PROTECTION PRODUCTS

Typical Characteristics

Typical Insertion Loss S21
VBus Pin (Pin 1)



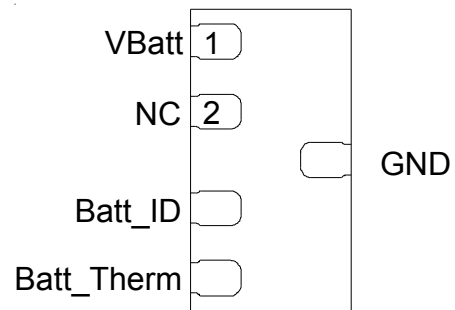
Typical Insertion Loss S21
Batt_ID, Batt Pins (Pins 3, 4)



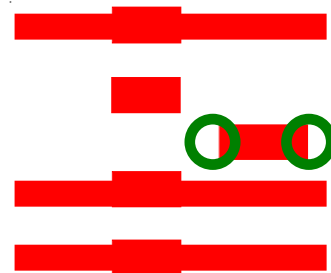
Applications Information

Device Connection Options

The μ Clamp5612T is designed to protect two data lines operating up to 5 volts and one voltage supply line operating up to 12 volts. It is specifically designed for protection of battery interfaces in mobile phones. The 12 volt TVS is located at pin 1. The 5 volt TVS diodes are located at pins 3 and 4. Pin 2 is not internally connected. Ground is provided at pin 5. Multiple micro vias connected to ground are recommended for best ESD performance. This will reduce parasitic inductance in the ground path and minimize the clamping voltage seen by the protected device.



Pin Configuration



PCB Layout Example

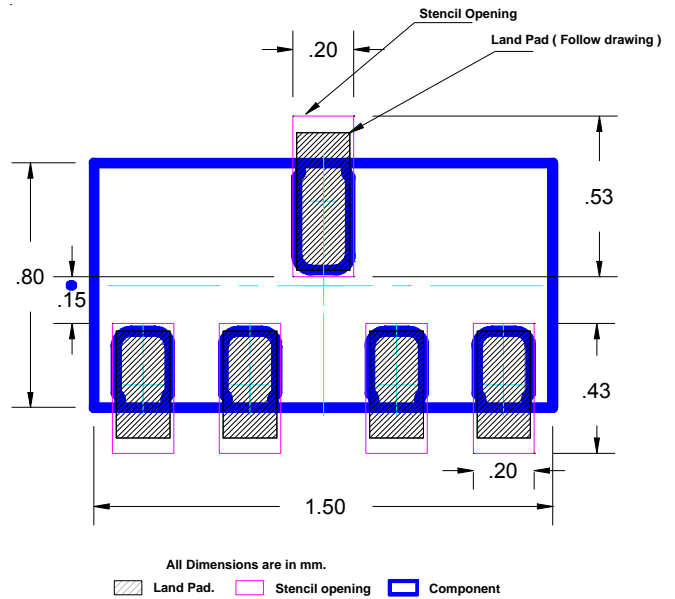
PROTECTION PRODUCTS

Applications Information

Assembly Guidelines

The small size of this device means that some care must be taken during the mounting process to insure reliable solder joint. The table below provides Semtech's recommended assembly guidelines for mounting this device. The figure at the right details Semtech's recommended aperture based on the below recommendations. 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. The exact manufacturing parameters will require some experimentation to get the desired solder application.

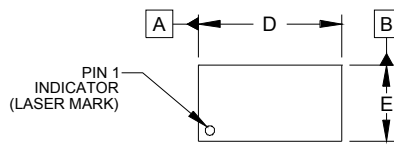
Assembly Parameter	Recommendation
Solder Stencil Design	Laser cut, Electro-polished
Aperture shape	Rectangular
Solder Stencil Thickness	0.100 mm (0.004")
Solder Paste Type	Type 4 size sphere or smaller
Solder Reflow Profile	Per JEDEC J-STD-020
PCB Solder Pad Design	Non-Solder mask defined
PCB Pad Finish	OSP OR NiAu



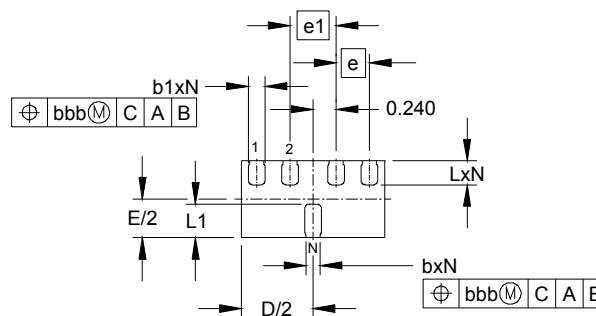
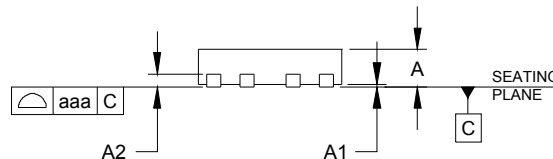
Recommended Mounting Pattern

PROTECTION PRODUCTS

Outline Drawing - SLP1508N5T

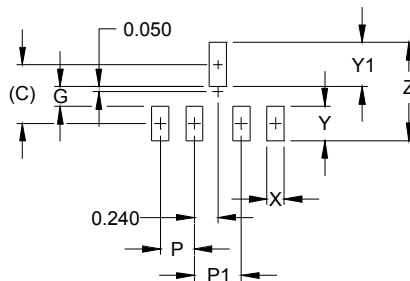


DIMENSIONS		
DIM	MILLIMETERS	
	MIN	NOM/MAX
A	-	0.39 / 0.40
A1	0.00	0.02 / 0.05
A2	(0.13)	
b	0.10	0.15 / 0.20
b1	0.125	0.175 / 0.225
D	1.45	1.50 / 1.55
E	0.75	0.80 / 0.85
e	0.35 BSC	
e1	0.48 BSC	
L	0.20	0.25 / 0.30
L1	0.30	0.35 / 0.40
N	5	
aaa	0.08	
bbb	0.10	



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

Land Pattern - SLP1508N5T

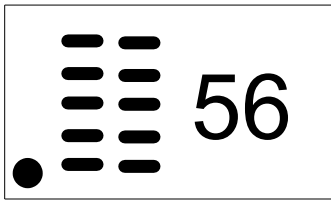


DIMENSIONS	
DIM	MILLIMETERS
C	(0.600)
G	0.200
P	0.35
P1	0.48
X	0.175
Y	0.350
Y1	0.450
Z	1.000

- 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 Code



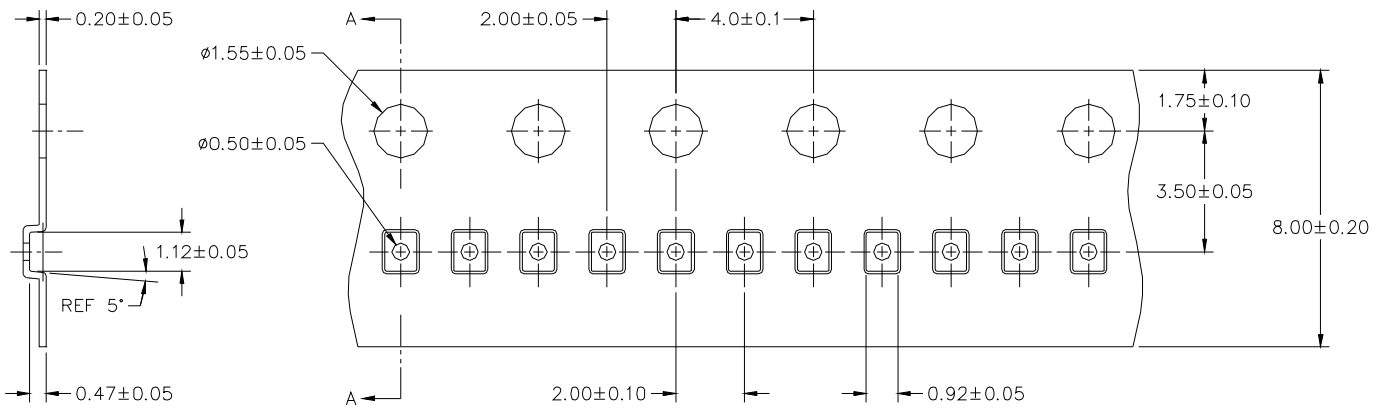
Notes:
Marking will also include line matrix date code

Ordering Information

Part Number	Qty per Reel	Reel Size
uClamp5612T.TNT	10,000	7 Inch

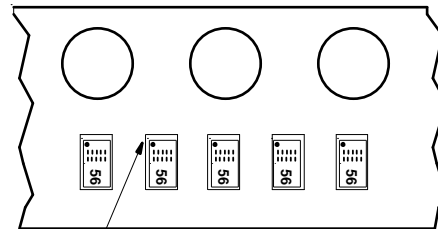
Notes:
MicroClamp, uClamp and μ Clamp are trademarks of Semtech Corporation

Carrier Tape Specification



SECTION A-A

Device Orientation in Tape



Pin 1 Location
(Towards Sprocket Holes)

Contact Information

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