

**SEMTECH**

# TClamp1202P

## Low Capacitance TClamp®

### Surge Protection for 12V Interfaces

#### PROTECTION PRODUCTS - TransClamp®

##### Description

TClamp®1202P provides dedicated surge and ESD protection for RS-485 and other 12V lines in industrial applications. It features high surge current capability of 100A (tp=8/20us) and low clamping voltage making them ideal for use in harsh transient environments.

This device is designed to replace multiple discrete components by integrating low capacitance, surge-rated compensation diodes with a high power transient voltage suppressor (TVS). Capacitance is limited to 12pF maximum to ensure correct signal transmission on high-speed lines. Each TClamp1202P may be used to protect up to two lines. A voltage bus operating up to 12V can also be optionally protected.

The TClamp1202P is in a 5-pin SLP2020P5 package, measuring 2.0 x 2.0mm with a nominal height of 0.60mm. The flow-through package design simplifies PCB layout.

##### Features

- ◆ Transient protection for high-speed data lines to **IEC 61000-4-2 (ESD) 20kV (air), 15kV (contact)**
- ◆ **IEC 61000-4-4 (EFT) 40A (5/50ns)**
- ◆ **IEC 61000-4-5 (Lightning) 100A (8/20μs)**
- ◆ Array of surge rated diodes with internal TVS Diode
- ◆ Protects up to two lines
- ◆ Low capacitance: (**<12pF**)
- ◆ Operating voltage: **12V**
- ◆ Low leakage current
- ◆ Solid-state silicon-avalanche technology

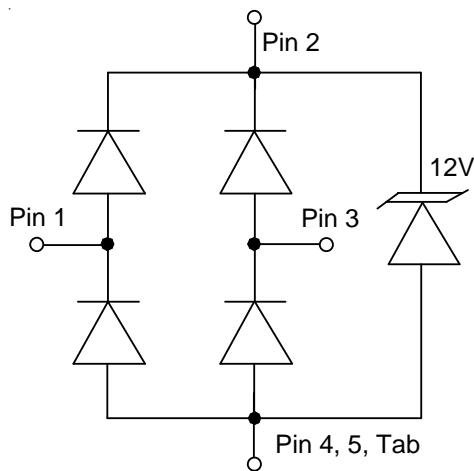
##### Mechanical Characteristics

- ◆ SLP2020P5 Package
- ◆ Pb-Free, Halogen Free, RoHS/WEEE Compliant
- ◆ Lead Finish: NiPdAu
- ◆ Molding Compound Flammability Rating: UL 94V-0
- ◆ Marking : Marking code + Date Code
- ◆ Packaging : Tape and Reel

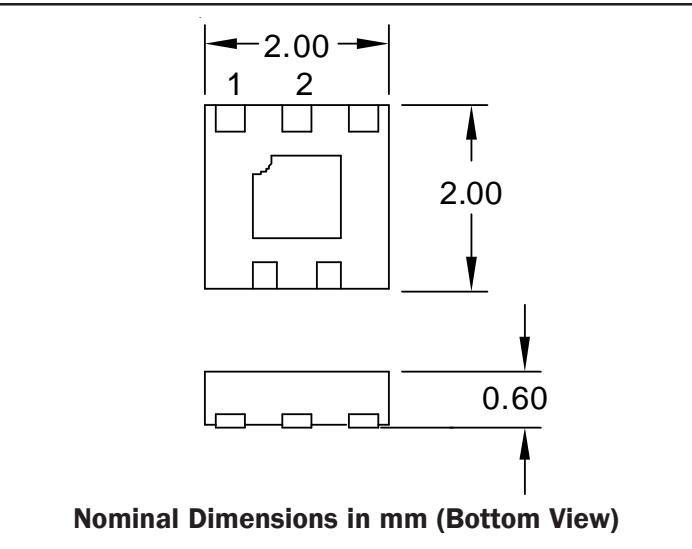
##### Applications

- ◆ RS-485 Surge Protection
- ◆ RS-422 Surge Protection
- ◆ Industrial Equipment
- ◆ Remote Meter Readers
- ◆ Automatic Teller Machines
- ◆ Digital Surveillance Cameras
- ◆ CAN-bus

##### Functional Circuit Diagram



##### Package Configuration



Nominal Dimensions in mm (Bottom View)

**PROTECTION PRODUCTS**
**Absolute Maximum Rating**

Rating	Symbol	Value	Units
Peak Pulse Power ( $t_p = 10/1000\mu s$ ), T=25°C	$P_{pk}$	300	Watts
Peak Pulse Current ( $t_p = 10/1000 \mu s$ ), T=25°C	$I_{pp}$	12	A
Peak Pulse Current ( $t_p = 8/20\mu s$ ), T=25°C	$I_{pp}$	100	A
ESD per IEC 61000-4-2 (Air) <sup>1</sup> ESD per IEC 61000-4-2 (Contact) <sup>1</sup>	$V_{ESD}$	+/- 20 +/- 15	kV
Operating Temperature	$T_J$	-55 to +125	°C
Storage Temperature	$T_{STG}$	-55 to +150	°C

**Electrical Characteristics (T=25°C unless otherwise specified)**

Parameter	Symbol	Conditions	Minimum	Typical	Maximum	Units
Reverse Stand-Off Voltage	$V_{RWM}$				12	V
Reverse Breakdown Voltage	$V_{BR}$	$I_t = 1mA$ Pins 1, 2 or 3 to pins 4, 5, and Tab <sup>5</sup>	13.3	15	18.5	V
Reverse Leakage Current	$I_R$	$V_{RWM} = 12V$ , T=25°C Pins 1, 2 or 3 to pins 4, 5, and Tab <sup>5</sup>			0.100	µA
Reverse Leakage Current	$I_R$	$V_{RWM} = 12V$ , T=125°C Pins 1, 2 or 3 to pins 4, 5, and Tab <sup>5</sup>			0.500	µA
Dynamic Resistance <sup>2, 3</sup>	$R_{DYN}$	$t_{lp} = 0.2 / 100ns$ Pin 1 and 3		0.11		Ohms
Clamping Voltage <sup>4</sup>	$V_c$	$I_{pp} = 12A$ , $t_p = 10/1000\mu s$ Pins 1, 2 or 3 to pins 4, 5, and Tab <sup>5</sup>			25	V
Clamping Voltage <sup>4</sup>	$V_c$	$I_{pp} = 100A$ , $t_p = 8/20\mu s$ Pins 1, 2 or 3 to pins 4, 5, and Tab <sup>5</sup>			40	V
Junction Capacitance <sup>4</sup>	$C_j$	Pin 1 or 3 to pins 4, 5, and Tab <sup>5</sup> $V_R = 0V$ , $f = 1MHz$			12	pF

**Notes**

1)ESD gun return path connected to ESD ground reference plane.

 2)Transmission Line Pulse Test (TLP) Settings:  $t_p = 100ns$ ,  $t_r = 0.2ns$ ,  $I_{TLP}$  and  $V_{TLP}$  averaging window:  $t_1 = 70ns$  to  $t_2 = 90ns$ .

 3) Dynamic resistance calculated from  $I_{pp} = 4A$  to  $I_{pp} = 16A$ 

4)Guaranteed by design. Not production tested.

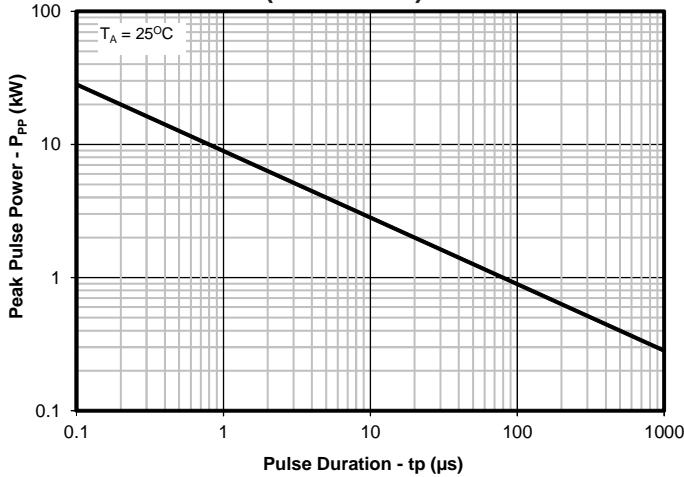
5)Pins 4, 5 and center tab are internally connected



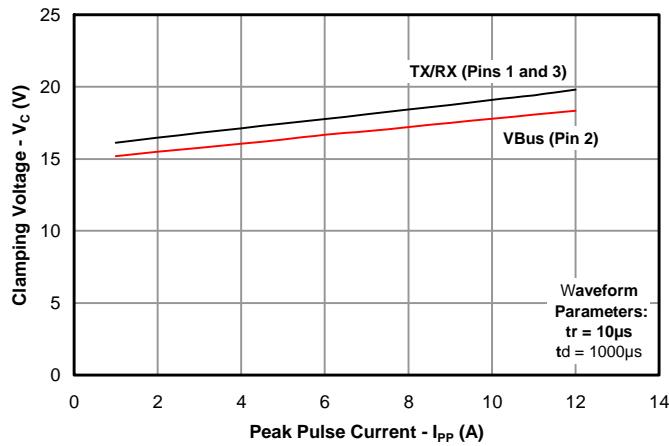
## PROTECTION PRODUCTS

## Typical Characteristics

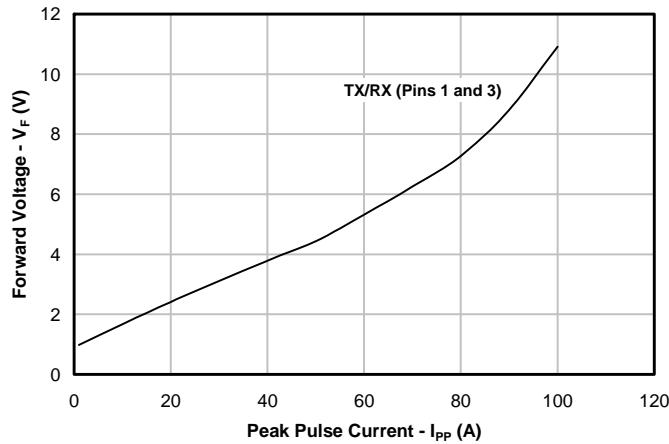
**Non-Repetitive Peak Pulse Power vs. Pulse Time (VBus Pin 1)**



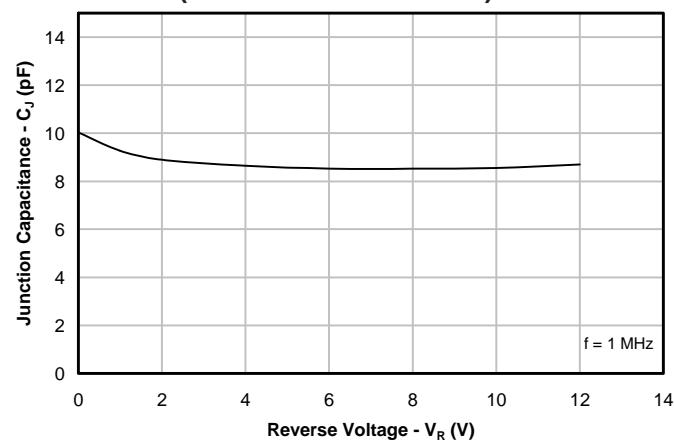
**Clamping Voltage vs. Peak Pulse Current (10/1000μs Pulse Waveform)**



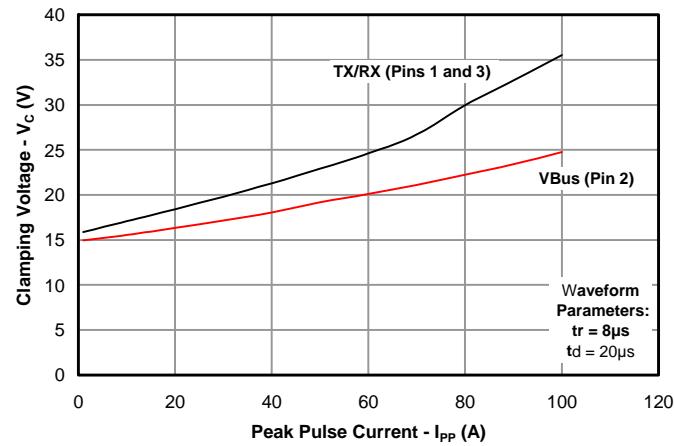
**Forward Voltage vs. Peak Pulse Current (8/20μs Pulse Waveform)**



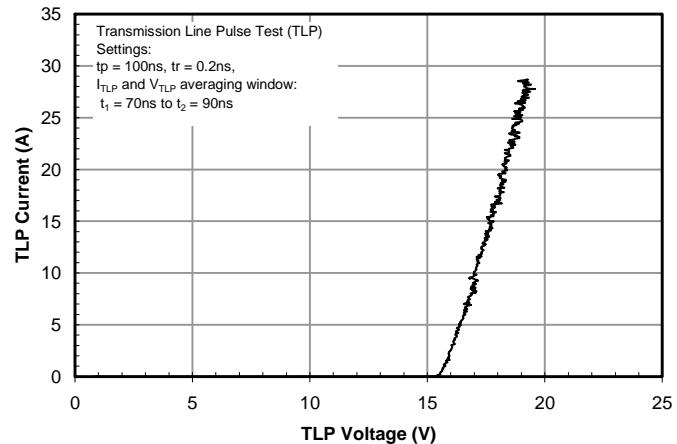
**Capacitance vs. Reverse Voltage (Data Line Pins 1 and 3)**



**Clamping Voltage vs. Peak Pulse Current (8/20μs Pulse Waveform)**



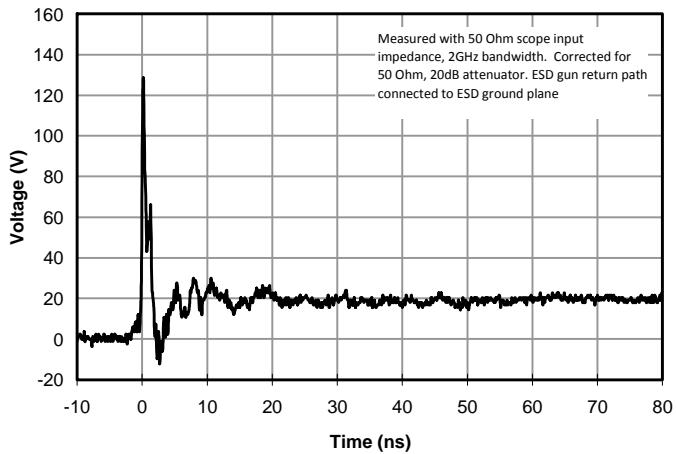
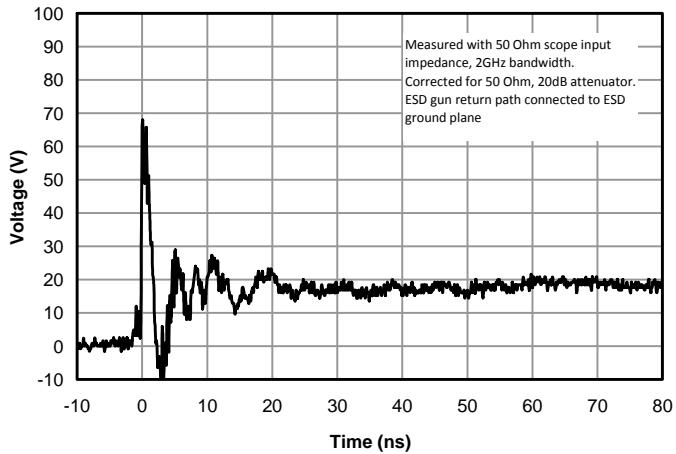
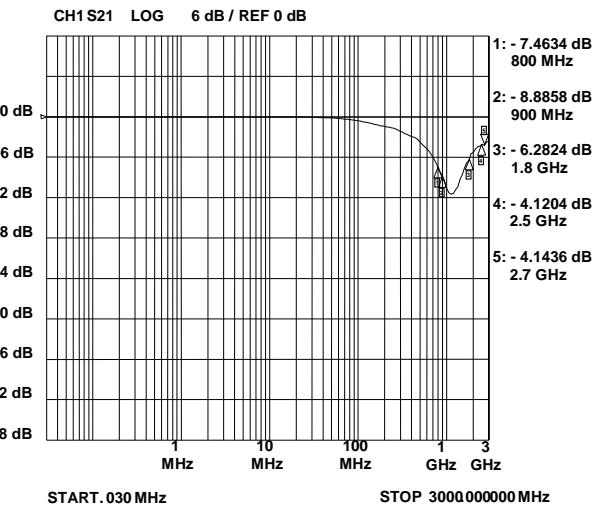
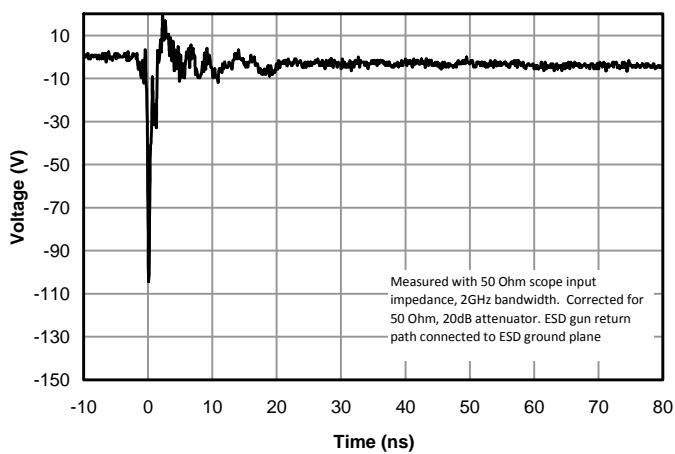
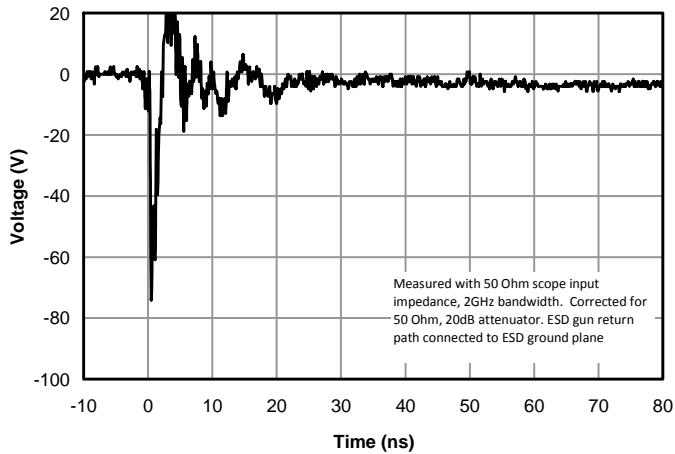
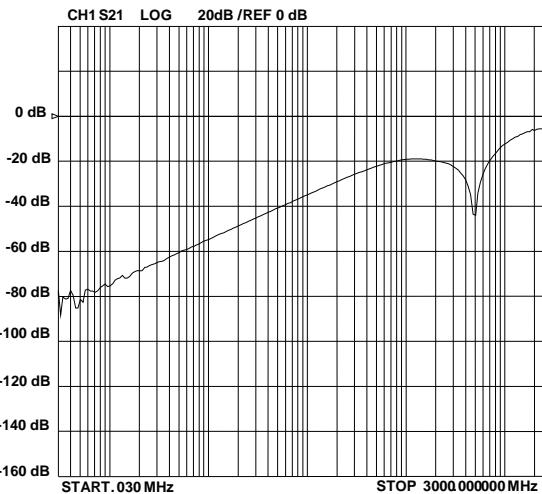
**TLP Characteristic (Data Line Pins 1 and 3)**





## PROTECTION PRODUCTS

## Typical Characteristics

**ESD Clamping (+8kV Contact per IEC 61000-4-2)  
(Data Line Pins 1 and 3)****ESD Clamping (+8kV Contact per IEC 61000-4-2)  
(VBus Pin 2)****Typical Insertion Loss S21  
(Data Line Pins 1 and 3)****ESD Clamping (-8kV Contact per IEC 61000-4-2)  
(Data Line Pins 1 and 3)****ESD Clamping (-8kV Contact per IEC 61000-4-2)  
(VBus Pin 2)****Analog Crosstalk  
(Pin 1 to 3)**



## PROTECTION PRODUCTS

## Applications Information

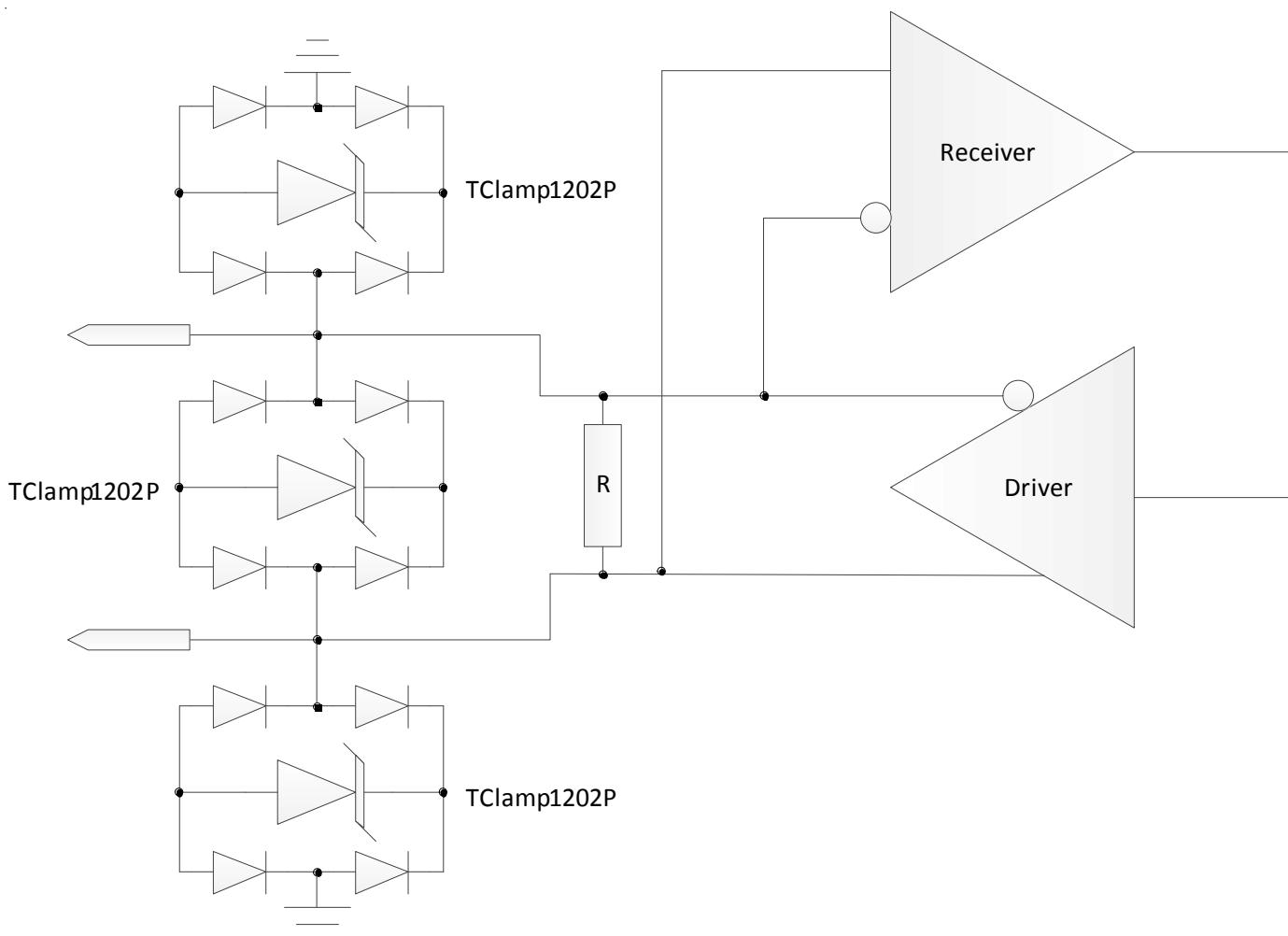
## Device Connection for Protection of RS-485 Interfaces

EIA RS-485 specifies a  $\pm 7V$  ground difference between devices on the bus. This permits the bus voltage to range from  $+12V$  ( $5V + 7V$ ) to  $-7V$  ( $0 - 7V$ ).

Because of this requirement, each TClamp1202P can be configured to protect one line for common mode surges or one line pair for differential surges.

The example below illustrates how to connect the TClamp1202P for common mode and differential mode protection on an RS-485 interface. For common

mode protection, one of the TClamp1202P data pins (pin 1 or 3) is connected to the TX/RX line and the other is connected to ground. Pins 4 and 5 as well as the center tab are not connected. This effectively makes the device look like a bidirectional 12V TVS to the circuit. For differential mode protection, each of the device data pins (1 and 3) are connected to the transceiver RX/TX pins as shown. Again, Pins 4, 5 and the center tab are not connected.

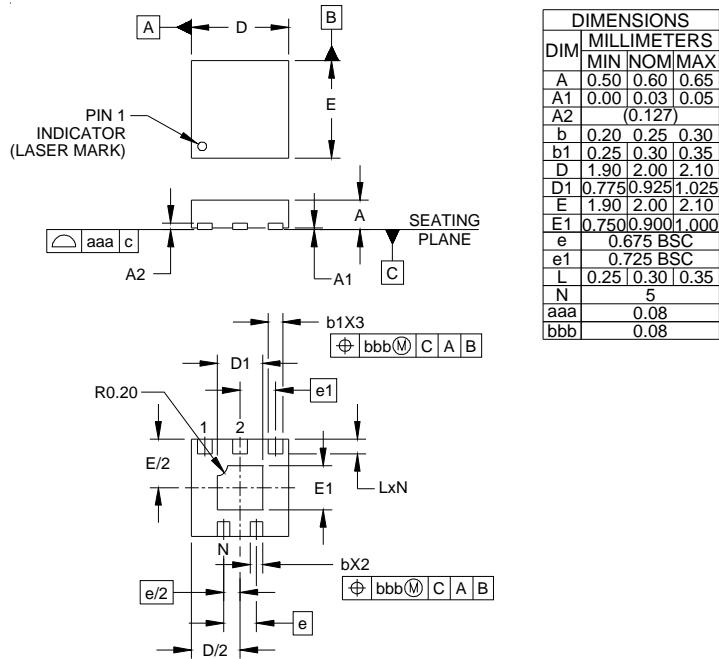


## RS-485 Common Mode and Differential Surge Protection



## PROTECTION PRODUCTS

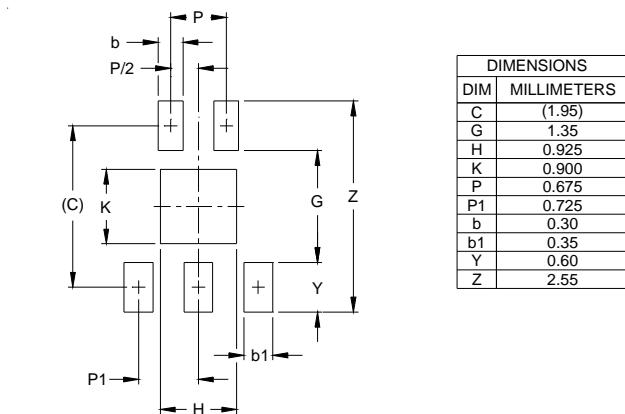
## Outline Drawing - SLP2020P5



## NOTES:

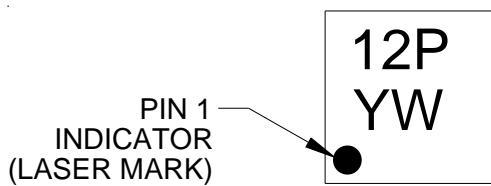
1. CONTROLLING DIMENSIONS ARE IN MILLIMETERS (ANGLES IN DEGREES).
2. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

## Land Pattern - SLP2020P5



## NOTES:

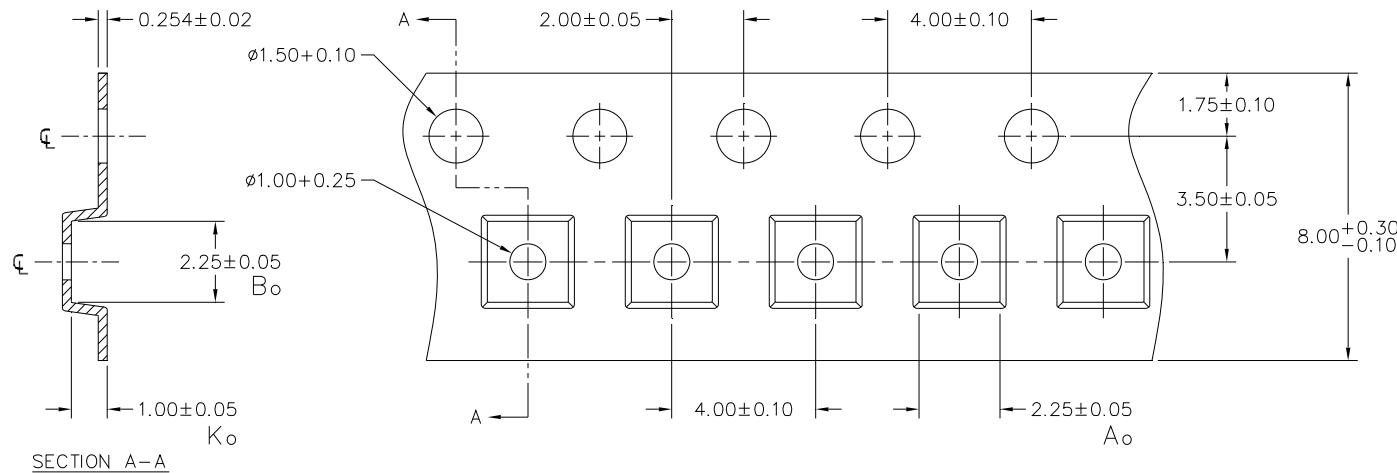
1. CONTROLLING DIMENSIONS ARE IN MILLIMETERS (ANGLES IN DEGREES).
2. THIS LAND PATTERN IS FOR REFERENCE PURPOSES ONLY.  
CONSULT YOUR MANUFACTURING GROUP TO ENSURE YOUR COMPANY'S MANUFACTURING GUIDELINES ARE MET.

**PROTECTION PRODUCTS**
**Marking Codes**

**Ordering Information**

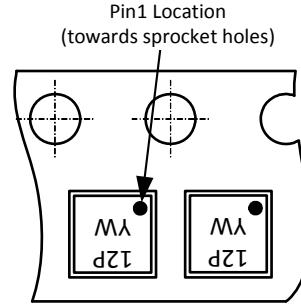
Part Number	Qty per Reel	Reel Size
TClamp1202P.TGT	10,000	13 Inch

TransClamp and TClamp are trademarks of Semtech Corporation.

YW = Alphanumeric character Date Code

**Carrier Tape Specification**


NOTES: 1.) ALL DIMENSIONS IN MILLIMETERS UNLESS OTHERWISE SPECIFIED.


**Device Orientation in Tape**
**Contact Information**

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**Protection Products Division**  
**200 Flynn Road, Camarillo, CA 93012**  
**Phone: (805)498-2111 FAX (805)498-3804**