

## PROTECTION PRODUCTS - EMIClamp®

### Description

The EClamp® 0501T TVS diode is designed to protect sensitive electronics from damage or latch-up due to ESD. This state-of-the-art device utilizes solid-state silicon-avalanche technology for superior clamping performance and DC electrical characteristics. It has been optimized for **protection of digital lines** in cellular phones and other portable electronics.

The device replaces two discrete components in a small footprint. It consists of a TVS diode and a series 1K Ohm resistor. The TVS diode presents a maximum loading capacitance of 15pF for maximum signal integrity. The TVS diodes provide effective suppression of ESD voltages in excess of  $\pm 15\text{kV}$  (air discharge) and  $\pm 8\text{kV}$  (contact discharge) per IEC 61000-4-2, level 4.

The EClamp0501T is in a 3-pin, SLP1006P3T package. It measures 1.0 x 0.6 mm with a nominal height of only 0.4mm. The leads are spaced at a pitch of 0.65mm and are finished with lead-free NiPdAu. Each device will protect one line operating at 5 volts. It gives the designer the flexibility to protect single lines in applications where arrays are not practical. The small package makes it ideal for use in portable electronics such as cell phones, digital still cameras, and PDAs.

### Features

- ◆ Transient protection for data lines to **IEC 61000-4-2 (ESD)  $\pm 15\text{kV}$  (air),  $\pm 8\text{kV}$  (contact)**
- ◆ **IEC 61000-4-4 (EFT) 40A (tp = 5/50ns)**
- ◆ **Cable Discharge Event (CDE)**
- ◆ Ultra-small package (1.0 x 0.6 x 0.4mm)
- ◆ Protects one data line
- ◆ TVS working voltage: 5V
- ◆ Series Resistor: 1K Ohm
- ◆ Capacitance: 15pF (Maximum at VR = 0V)
- ◆ Low leakage current
- ◆ Solid-state silicon-avalanche technology

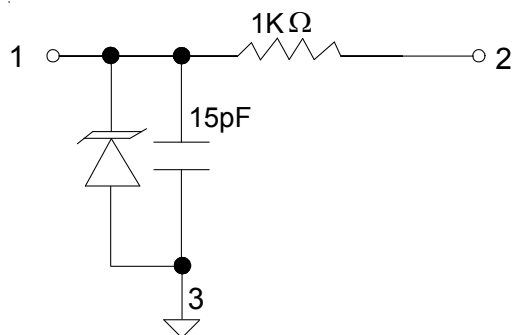
### Mechanical Characteristics

- ◆ SLP1006P3T package
- ◆ Pb-Free, Halogen Free, RoHS/WEEE Compliant
- ◆ Nominal Dimensions: 1.0 x 0.6 x 0.4 mm
- ◆ Lead Finish: NiPdAu
- ◆ Molding compound flammability rating: UL 94V-0
- ◆ Marking : Marking code, cathode band
- ◆ Packaging : Tape and Reel

### Applications

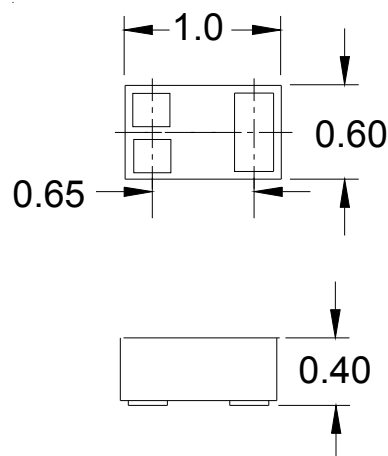
- ◆ Cellular Handsets & Accessories
- ◆ Personal Digital Assistants (PDAs)
- ◆ Notebooks & Handhelds
- ◆ Portable Instrumentation
- ◆ Peripherals
- ◆ MP3 Players

### Schematic



**Pin Identification and Configuration  
(Top Side View)**

### Package Configuration



**3 Pin SLP package (Bottom Side View)  
Nominal Dimensions in mm**

## PROTECTION PRODUCTS

### Absolute Maximum Rating

| Rating                                                                                   | Symbol    | Value            | Units |
|------------------------------------------------------------------------------------------|-----------|------------------|-------|
| Peak Pulse Power ( $t_p = 8/20\mu s$ )                                                   | $P_{pk}$  | 25               | Watts |
| Maximum Peak Pulse Current ( $t_p = 8/20\mu s$ )                                         | $I_{pp}$  | 2                | Amps  |
| ESD per IEC 61000-4-2 (Air) <sup>1</sup><br>ESD per IEC 61000-4-2 (Contact) <sup>1</sup> | $V_{ESD}$ | +/- 17<br>+/- 12 | kV    |
| Operating Temperature                                                                    | $T_J$     | -40 to +85       | °C    |
| Storage Temperature                                                                      | $T_{STG}$ | -55 to +150      | °C    |

Notes:

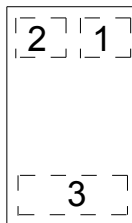
1) ESD rating between pin 1 and ground. Pin 2 not rated for IEC level ESD discharges

### Electrical Characteristics (T=25°C)

| Parameter                     | Symbol    | Conditions                                         | Minimum | Typical | Maximum | Units   |
|-------------------------------|-----------|----------------------------------------------------|---------|---------|---------|---------|
| TVS Reverse Stand-Off Voltage | $V_{RWM}$ |                                                    |         |         | 5       | V       |
| TVS Reverse Breakdown Voltage | $V_{BR}$  | $I_t = 1mA$                                        | 6       | 8       | 10      | V       |
| TVS Reverse Leakage Current   | $I_R$     | $V_{RWM} = 5.0V$                                   |         |         | 0.5     | $\mu A$ |
| Total Series Resistance       | R         | Each Line                                          | 850     | 1000    | 1150    | Ohms    |
| Total Capacitance             | $C_{in}$  | Input to Gnd,<br>Each Line<br>$V_R = 0V, f = 1MHz$ | 10      | 12      | 15      | pF      |

### Pin Identification and Configuration

| Pin | Symbol  | Identification                |
|-----|---------|-------------------------------|
| 1   | I/O In  | Data Input (Connector Side)   |
| 2   | I/O Out | Data Output (To Protected IC) |
| 3   | GND     | Ground                        |

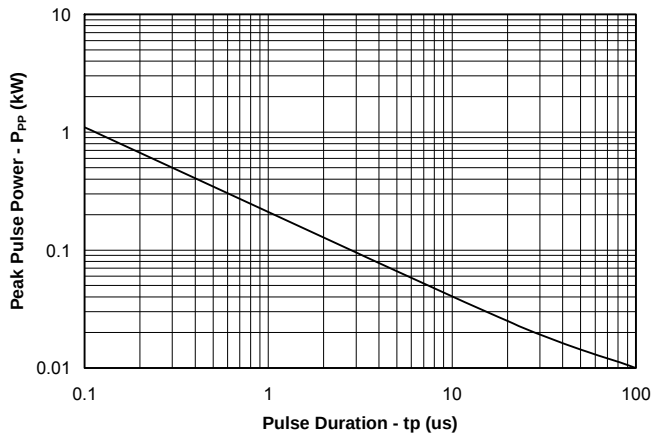


**Pin Configuration (Top View)**

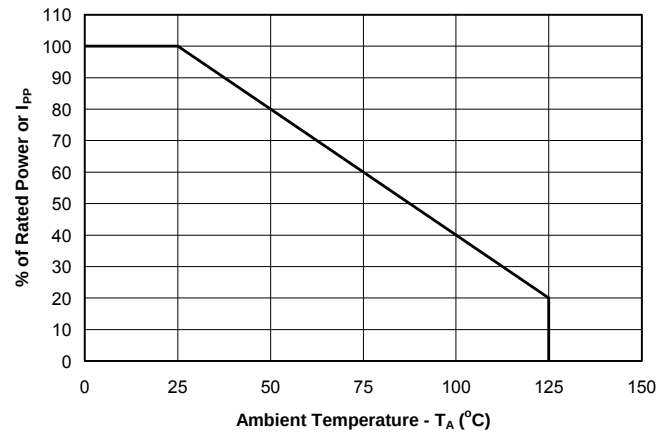
## PROTECTION PRODUCTS

### Typical Characteristics

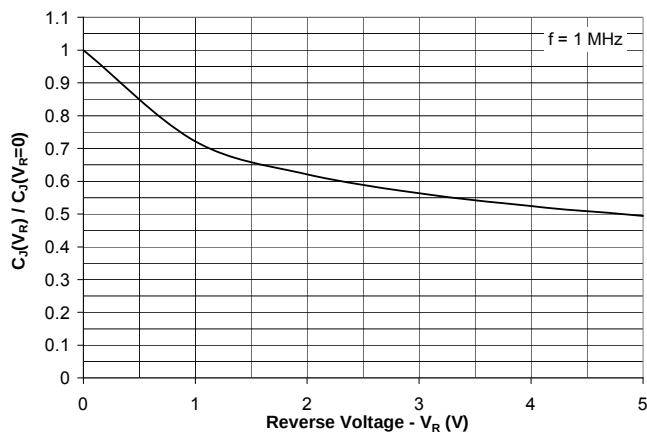
#### Non-Repetitive Peak Pulse Power vs. Pulse Time



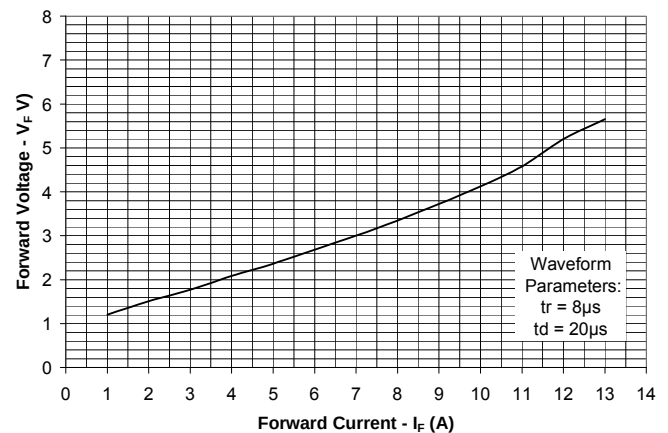
#### Power Derating Curve



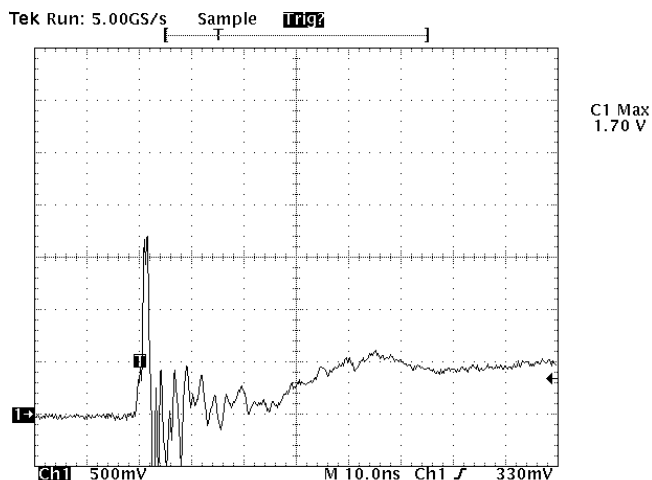
#### Normalized Junction Capacitance vs. Reverse Voltage



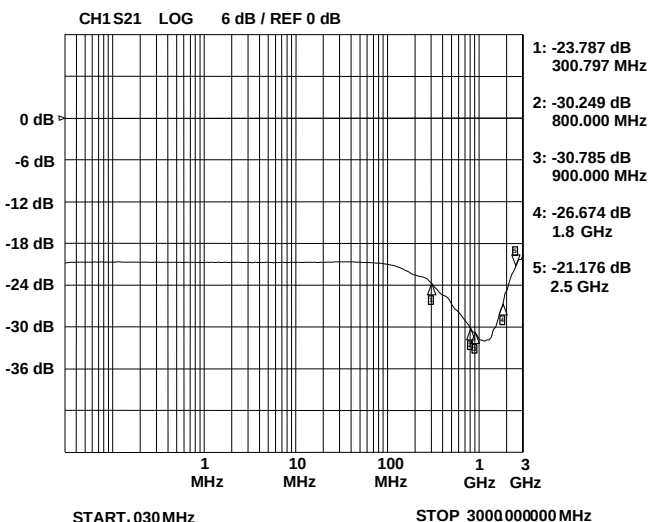
#### Forward Voltage vs. Forward Current



#### ESD Clamping (Measured between Pin2 and Gnd) (8kV Contact per IEC 61000-4-2)



#### Insertion Loss S21



Note: Data is taken with a 10x attenuator

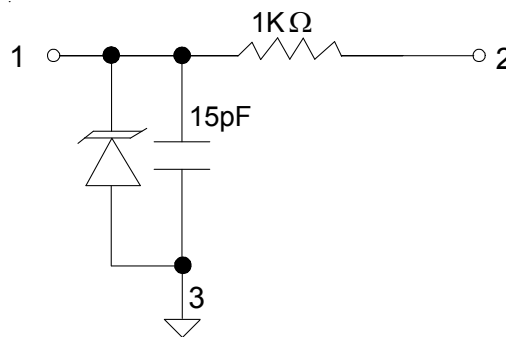
**PROTECTION PRODUCTS****Applications Information****Device Connection Options**

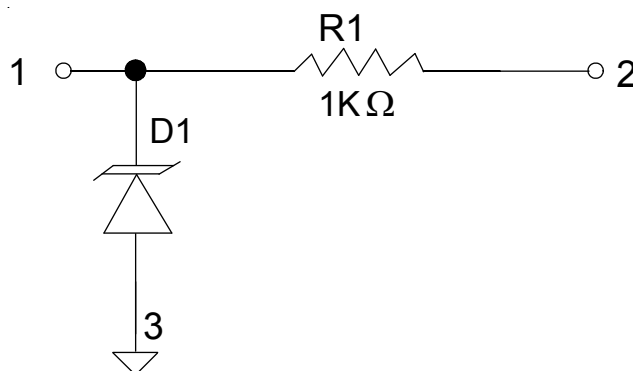
This device is designed to protect one data line. The device is unidirectional and may be used on lines where the signal polarity is above ground. The cathode band should be placed towards the line that is to be protected.

**Circuit Board Layout Recommendations for Suppression of ESD.**

Good circuit board layout is critical for the suppression of ESD induced transients. The following guidelines are recommended:

- Place the TVS near the input terminals or connectors to restrict transient coupling.
- Minimize the path length between the TVS and the protected line.
- Minimize all conductive loops including power and ground loops.
- The ESD transient return path to ground should be kept as short as possible.
- Never run critical signals near board edges.
- Use ground planes whenever possible.

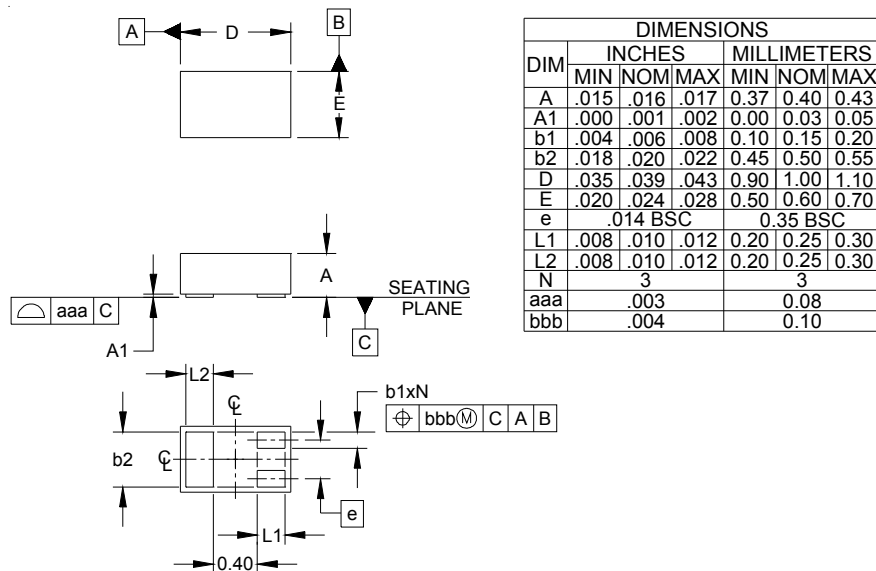
**Circuit Diagram**

**PROTECTION PRODUCTS**
**Applications Information - Spice Model**

**EClamp0501T Spice Model**
**Table 1 - EClamp0501T Spice Parameters**

| Parameter | Unit  | D1 (TVS) |
|-----------|-------|----------|
| IS        | Amp   | 2E-15    |
| BV        | Volt  | 7.56     |
| VJ        | Volt  | 0.776    |
| RS        | Ohm   | 0.912    |
| IBV       | Amp   | 1.0E-3   |
| CJO       | Farad | 11.5E-12 |
| TT        | sec   | 2.541E-9 |
| M         | --    | 0.23     |
| N         | --    | 1.1      |
| EG        | eV    | 1.11     |

# PROTECTION PRODUCTS

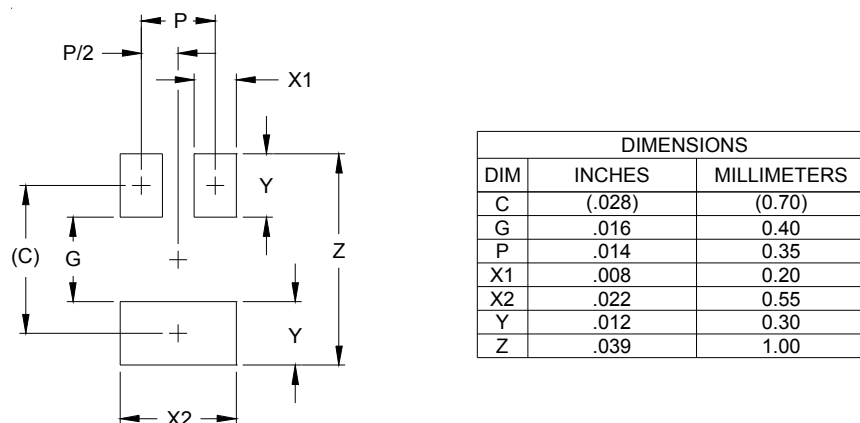
## Outline Drawing - SLP1006P3T



### NOTES:

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

## Land Pattern - SLP1006P3T

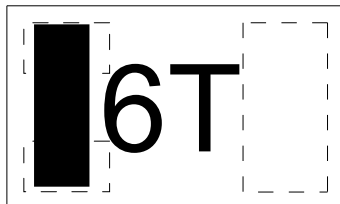


### NOTES:

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.

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### Marking Code



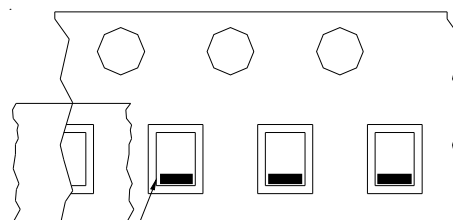
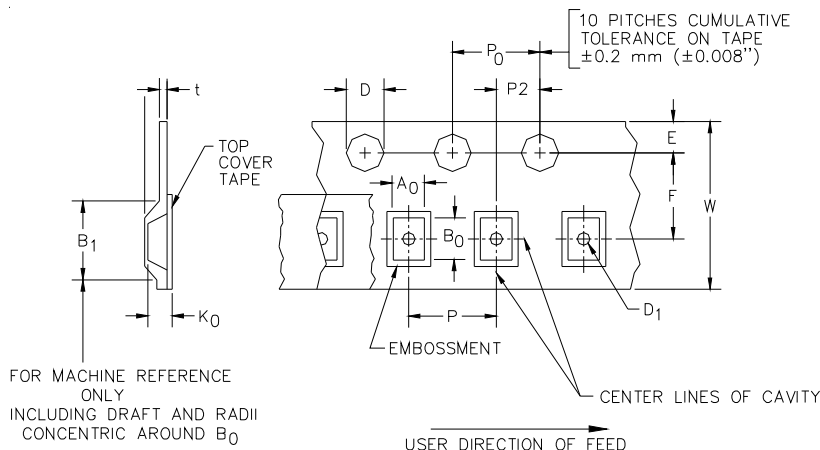
### Ordering Information

| Part Number     | Working Voltage | Qty per Reel | Reel Size |
|-----------------|-----------------|--------------|-----------|
| EClamp0501T.TCT | 5V              | 3,000        | 7 Inch    |

#### Notes:

1) This is a lead-free, RoHS/WEEE compliant product  
EMIClamp and EClamp are marks of Semtech Corporation

### Tape and Reel Specification



Pin 1 Location

User Direction of feed

#### 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<br>(.165) | 1.5 + 0.1 mm<br>- 0.0 mm<br>(0.59 +.005<br>- .000) | 0.4 mm<br>±0.25<br>(.031) | 1.750±.10 mm<br>(.069±.004) | 3.5±0.05 mm<br>(.138±.002) | 4.0±0.10 mm<br>(.157±.00-4) | 4.0±0.1 mm<br>(.157±.00-4) | 2.0±0.05 mm<br>(.079±.002) | 0.254±0.02 mm (.016) | 8.0 mm<br>+ 0.3 mm<br>- 0.1 mm<br>(.312±.012) |

### Contact Information

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