

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

| Rating                                                         | Symbol    | Value               | Units |
|----------------------------------------------------------------|-----------|---------------------|-------|
| Peak Pulse Power ( $t_p = 8/20\mu s$ )                         | $P_{pk}$  | 100                 | Watts |
| Peak Pulse Current ( $t_p = 8/20\mu s$ )                       | $I_{pp}$  | 3                   | A     |
| ESD per IEC 61000-4-2 (Air)<br>ESD per IEC 61000-4-2 (Contact) | $V_{ESD}$ | $\pm 15$<br>$\pm 8$ | kV    |
| Operating Temperature                                          | $T_J$     | -55 to +125         | °C    |
| Storage Temperature                                            | $T_{STG}$ | -55 to +150         | °C    |

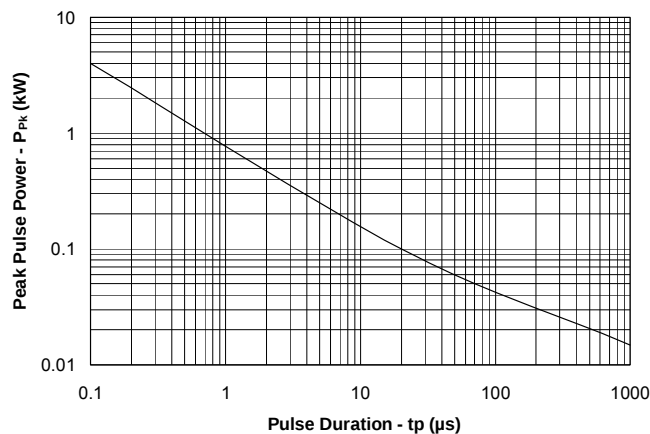
**Electrical Characteristics (T = 25°C)**

| <b>RClamp0503N</b>        |           |                                                            |         |         |         |         |
|---------------------------|-----------|------------------------------------------------------------|---------|---------|---------|---------|
| Parameter                 | Symbol    | Conditions                                                 | Minimum | Typical | Maximum | Units   |
| Reverse Stand-Off Voltage | $V_{RWM}$ | Pin 5 to GND                                               |         |         | 6.5     | V       |
| Reverse Breakdown Voltage | $V_{BR}$  | $I_t = 1mA$<br>Pin 5 to GND                                | 7       | 9.5     | 12      | V       |
| Reverse Leakage Current   | $I_R$     | $V_{RWM} = 6.5V$ , $T=25^\circ C$<br>Pin 5 to GND          |         |         | 1       | $\mu A$ |
| Forward Voltage           | $V_F$     | $I_f = 15mA$<br>Any I/O to pin 5                           |         | 0.9     | 1.2     | V       |
| Clamping Voltage          | $V_C$     | $I_{pp} = 1A$ , $t_p = 8/20\mu s$<br>Any I/O pin to Ground |         |         | 16.5    | V       |
| Clamping Voltage          | $V_C$     | $I_{pp} = 3A$ , $t_p = 8/20\mu s$<br>Any I/O pin to Ground |         |         | 30      | V       |
| Junction Capacitance      | $C_J$     | $V_R = 0V$ , $f = 1MHz$<br>Any I/O pin to Ground           |         | 0.3     | 0.5     | pF      |
|                           |           | $V_R = 0V$ , $f = 1MHz$<br>Between I/O pins                |         | 0.3     | 0.5     | pF      |

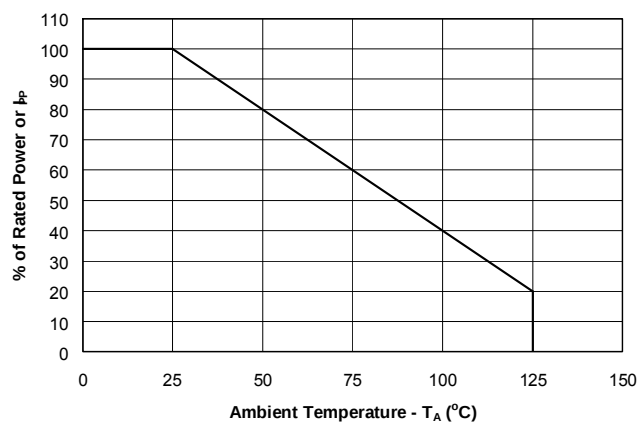
# PROTECTION PRODUCTS

## Typical Characteristics

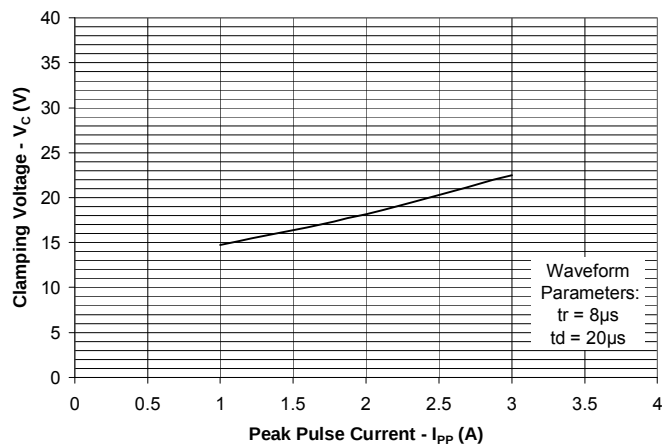
### Non-Repetitive Peak Pulse Power vs. Pulse Time



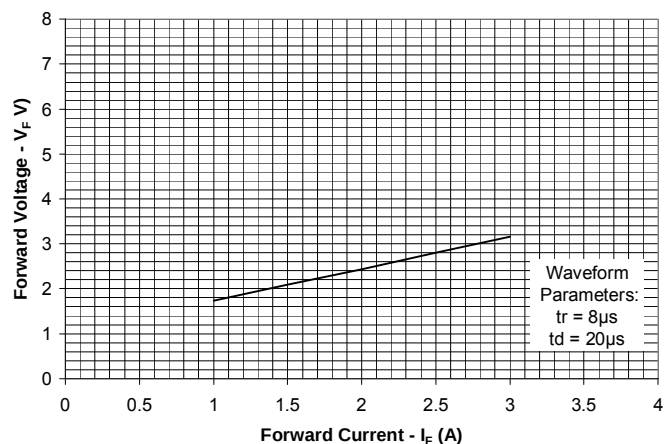
### Power Derating Curve



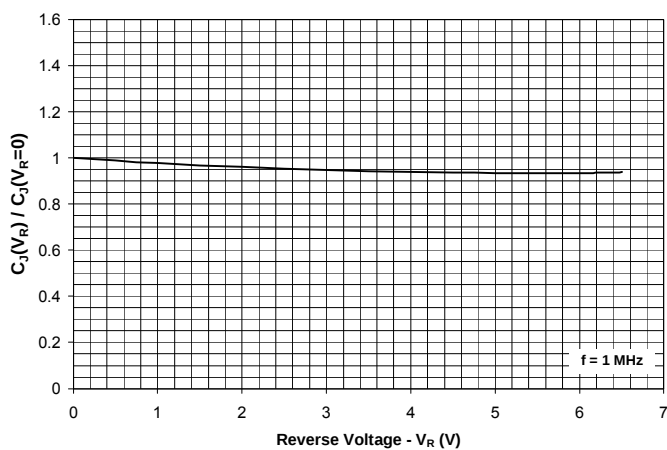
### Clamping Voltage vs. Peak Pulse Current I/O to Gnd - Pin 1, 3, 4 to Gnd at Pin 6



### Forward Voltage vs. Forward Current Pin 1,3,4 or 6 to Pin 5



### Normalize Capacitance vs. Reverse Voltage I/O to Gnd - Pin 1, 3, 4 to Gnd at Pin 6



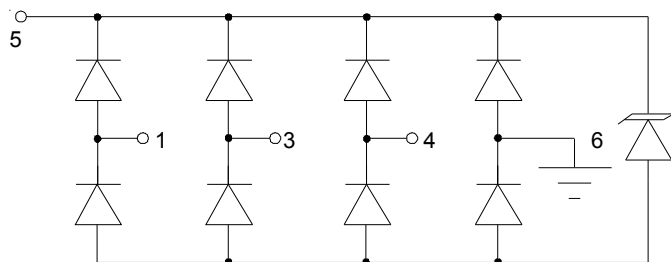
## PROTECTION PRODUCTS

### Applications Information

#### Device Connection Options for Protection of three High-Speed Data Lines

Data line inputs are normally connected at pins 1, 3, & 4 with pin 6 connected to ground. Note that the circuit at the ground pin is identical to the circuit at each data input/output pin. This is done to further reduce capacitance. The connection to ground should be made directly to a ground plane. The path length should also be kept as short as possible to minimize parasitic inductance. Pin 5 can be connected to Vcc biased or left not connected depending upon the application.

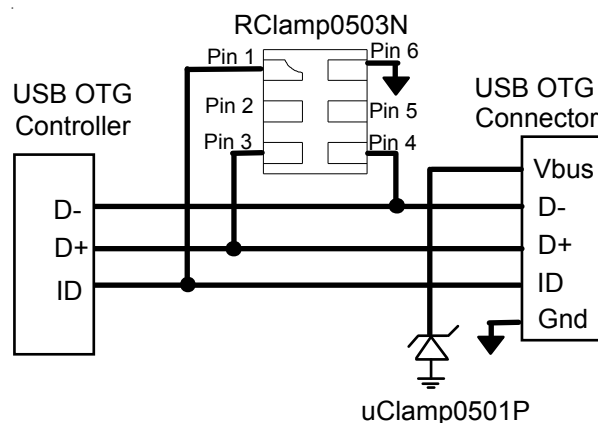
**Figure 1- Pin Configuration & Circuit Diagram**

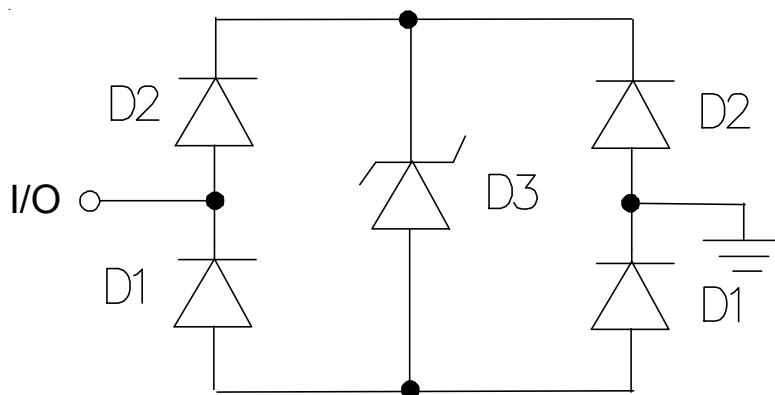


#### Protecting USB OTG Interfaces

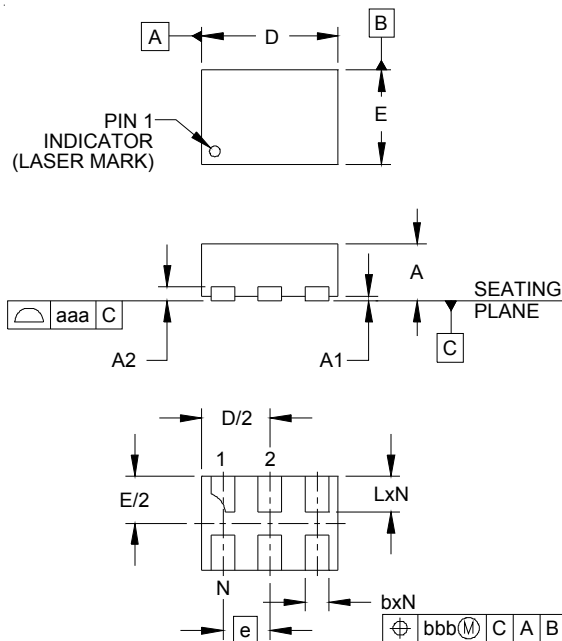
The USB OTG interface consists of Data (D- and D+) lines, ID and a 5.25V voltage bus. Since these pins are part of the connector, they are vulnerable to ESD and cable discharge events. The RClamp0503N is designed to protect D-, D+, and ID pins of USB OTG connections. Each device will protect one USB OTG port. When the voltage on the data lines exceeds the bus voltage (plus one diode drop), the internal rectifiers are forward biased conducting the transient current away from the protected controller chip. The TVS diode directs the surge to ground. For Vbus protection, an additional single line TVS, such as uClamp0501P, should be added.

**Figure 2 - USB OTG Protection**



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

**Figure 3 - RClamp0503N Spice Model**

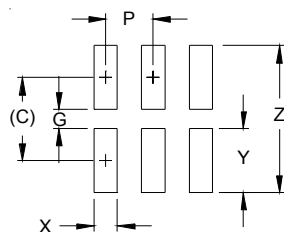
| RClamp0503N Spice Parameters |       |           |           |          |
|------------------------------|-------|-----------|-----------|----------|
| Parameter                    | Unit  | D1 (LCRD) | D2 (LCRD) | D3 (TVS) |
| IS                           | Amp   | 1.0E-20   | 1.0E-20   | 2E-12    |
| BV                           | Volt  | 100       | 100       | 9        |
| VJ                           | Volt  | 0.7       | 0.7       | 0.6      |
| RS                           | Ohm   | 0.458     | 1.0       | 2.6      |
| IBV                          | Amp   | 1.0 E-3   | 1.0 E-3   | 1.0 E-3  |
| CJO                          | Farad | 0.4E-12   | 0.4E-12   | 56E-12   |
| TT                           | sec   | 2.541E-9  | 2.541E-9  | 2.541E-9 |
| M                            | --    | 0.058     | 0.058     | 0.23     |
| N                            | --    | 1.1       | 1.1       | 1.1      |
| EG                           | eV    | 1.11      | 1.11      | 1.11     |

**PROTECTION PRODUCTS**
**Outline Drawing - SLP1510N6**


| 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   | .053   | .057     | .061 | 1.35        | 1.45     | 1.55  |
| E   | .035   | .039     | .043 | 0.90        | 1.00     | 1.10  |
| e   |        | .020 BSC |      |             | 0.50 BSC |       |
| L   | .012   | .015     | .017 | 0.30        | 0.38     | 0.425 |
| 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 - SLP1510N6**


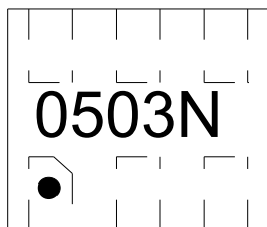
| DIM | DIMENSIONS |             |
|-----|------------|-------------|
|     | INCHES     | MILLIMETERS |
| C   | (.034)     | (0.875)     |
| G   | .008       | 0.20        |
| P   | .020       | 0.50        |
| X   | .010       | 0.25        |
| Y   | .027       | 0.675       |
| Z   | .061       | 1.55        |

**NOTES:**

1. 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

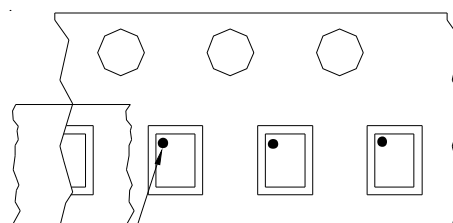
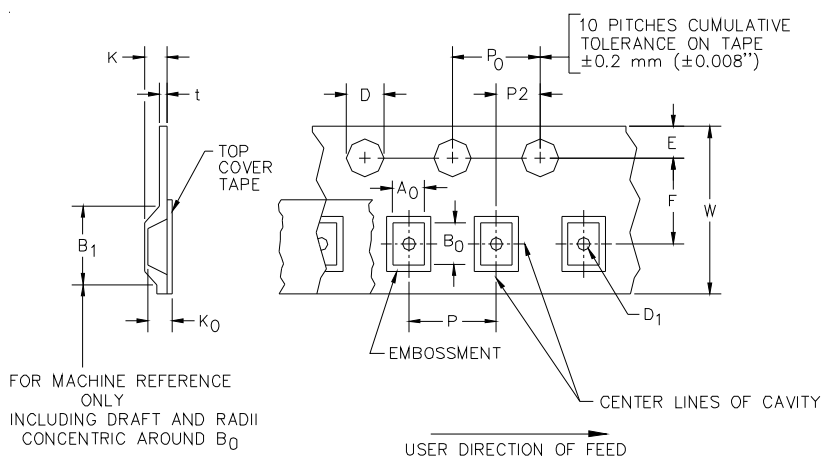


### Ordering Information

| Part Number     | Qty per Reel | Reel Size |
|-----------------|--------------|-----------|
| RClamp0503N.TCT | 3,000        | 7 Inch    |

RailClamp and RClamp are marks of Semtech Corporation

### Tape and Reel Specification



### Device Orientation in Tape

| A0          | B0          | K0          |
|-------------|-------------|-------------|
| 1.24±0.10mm | 1.70±0.10mm | 0.76±0.10mm |

| Tape Width | B, (Max)         | D                                                 | D1                        | E                           | F                          | K (MAX)          | P                         | P0                        | P2                         | T(MAX)           | W                                             |
|------------|------------------|---------------------------------------------------|---------------------------|-----------------------------|----------------------------|------------------|---------------------------|---------------------------|----------------------------|------------------|-----------------------------------------------|
| 8 mm       | 4.2 mm<br>(.165) | 1.5 + 0.1 mm<br>- 0.0 mm<br>(0.59 +.005<br>-.000) | 0.8 mm<br>±0.05<br>(.031) | 1.750±.10 mm<br>(.069±.004) | 3.5±0.05 mm<br>(.138±.002) | 2.4 mm<br>(.094) | 4.0±0.1 mm<br>(.157±.004) | 4.0±0.1 mm<br>(.157±.004) | 2.0±0.05 mm<br>(.079±.002) | 0.4 mm<br>(.016) | 8.0 mm<br>+ 0.3 mm<br>- 0.1 mm<br>(.312±.012) |

### Contact Information

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