ESD Solutions for USB 3.0

**RClamp®3346P**

**KEY FEATURES**
- 3.3V working voltage
- Protects six lines
- ±17kV contact/±20kV air
- Dynamic resistance: 0.15Ω
- Low capacitance: 0.65pF I/O to I/O
- Flow-through package (2.7 x 0.8 x 0.50mm)

**Alternative Solutions**

**RClamp®3324P**

**KEY FEATURES**
- 3.3V working voltage
- Protects four lines
- ±17kV contact/±20kV air
- Dynamic resistance: 0.15Ω
- Low capacitance: 0.65pF I/O to I/O
- Flow-through package (2.5 x 1.0 x 0.60mm)

**RClamp®3552T**

**KEY FEATURES**
- 3.5V working voltage
- Protects two lines
- ±17kV contact/±20kV air
- Dynamic resistance: 0.3Ω
- Low capacitance: 0.4pF I/O to I/O
- Flow-through package (1.0 x 0.6 x 0.50mm)

ESD Protection To Safeguard High-Speed USB 3.0 Data Lines

High-speed USB 3.0 data-line transceivers are vulnerable to frequent threats from ESD, EFT and Cable Discharge events. USB 3.0 ICs require state of the art transient voltage suppression (TVS) protection solutions that can both arrest dangerous fast rise-time transient threats while also presenting sufficiently low junction capacitance to not adversely impact signal integrity. Semtech has pioneered and led the way in transient protection for high speed data lines, offering industry leading TVS technology to safeguard the most sensitive USB 3.0 data lines.
# RClamp®3346P ESD & TLP Clamping Response

## Device Parameter Summary (USB 3.0 Protection)

<table>
<thead>
<tr>
<th>Part Number</th>
<th>$V_{\text{rms}}$</th>
<th>Lines</th>
<th>ESD Rating</th>
<th>Cap (I/O - I/O)</th>
<th>$I_{\text{pp}}$ @ 8/20µs</th>
<th>Package size (mm)</th>
<th>Schematic Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>RClamp3346P</td>
<td>3.3</td>
<td>6</td>
<td>±20kV</td>
<td>±17kV</td>
<td>0.6pF</td>
<td>5A</td>
<td>2.7 x 0.8 x 0.5</td>
</tr>
<tr>
<td>RClamp3324P</td>
<td>3.3</td>
<td>4</td>
<td>±20kV</td>
<td>±17kV</td>
<td>0.6pF</td>
<td>4.5A</td>
<td>2.5 x 1.0 x 0.6</td>
</tr>
<tr>
<td>RClamp3552T</td>
<td>3.5</td>
<td>2</td>
<td>±20kV</td>
<td>±17kV</td>
<td>0.3pF</td>
<td>4A</td>
<td>1.0 x 0.6 x 0.4</td>
</tr>
<tr>
<td>RClamp7524T</td>
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<td>4</td>
<td>±30kV</td>
<td>±25kV</td>
<td>0.5pF</td>
<td>5A</td>
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<tr>
<td>RClamp3521P</td>
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<td>±12kV</td>
<td>0.33pF</td>
<td>4A</td>
<td>1.0 x 0.6 x 0.5</td>
</tr>
<tr>
<td>RClamp3331ZA</td>
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<td>1</td>
<td>±18kV</td>
<td>±18kV</td>
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<td>4A</td>
<td>0.6 x 0.3 x 0.25</td>
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<tr>
<td>RClamp3361Z</td>
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<td>1</td>
<td>±15kV</td>
<td>±12kV</td>
<td>0.2pF</td>
<td>7A</td>
<td>0.62 x 0.32 x 0.3</td>
</tr>
</tbody>
</table>

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

Between any I/O and Ground

Measured with 50 Ohm scope input impedance, 250 Ohm test load. Corrected for 50 Ohm, 20dB attenuator. ESD gun return path connected to ESD ground plane.

## TLP Characteristic (Positive)

Transmission Line Pulse Test (TLP) Settings:
- $I_{\text{tp}}=100\text{ns}$, $I_{\text{tr}}=0.2\text{ns}$,
- $I_{TLP}$ and $V_{TLP}$ averaging window: $t_{\text{p}}=70\text{ns}$ to $t_{\text{p}}=90\text{ns}$