USB 3.0 Connector

May 13, 2011
TE Connectivity Offers
USB 3.0 connector

Key Features

– Over 10X performance increase
– Support 5 Gbps data rate for fast sync-n-go
  • Minimizes user wait-time
– Backward compatible with USB 2.0 connector
– Minimize connector form factor variations
– Contain EMI
– Comprehend ease-of-use aspects
– Optimized power efficiency
  • No device polling
  • Lower active and idle power requirements
USB 3.0 Applications

• Storage
  – External hard drives
  – Flashcard readers for digital cameras
• High definition A/V equipment
• Desktop & laptop computers
• Keyboards/ mice/ joysticks
• Printers/ scanners
• Game ports
• Modems
• Cell phones
• GPS devices
• MP3 player
• Set-top-box
Comparison

• **Consumer Electronics**
  – Ease-of-use, energy efficiency, and reliability
  – Backward compatibility with existing devices/classes

• **Storage**
  – SuperSpeed data transfer with large amounts of storage
  – Superior power management of mass storage devices

• **High Definition A/V**
  – HD and real-time scenarios
  – Improved experiences for rich-media devices
Why We Need SuperSpeed USB?

- Flash-based peripherals will require much higher data rates
- User wait time requirement
- Interface performance sets the requirement

<table>
<thead>
<tr>
<th></th>
<th>Song / Pic</th>
<th>256 Flash</th>
<th>USB Flash</th>
<th>SD-Movie</th>
<th>USB Flash</th>
<th>HD-Movie</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4MB</td>
<td>256MB</td>
<td>1 GB</td>
<td>6 GB</td>
<td>16 GB</td>
<td>25 GB</td>
</tr>
<tr>
<td>USB 1.0</td>
<td>5.3 sec</td>
<td>5.7 min</td>
<td>22 min</td>
<td>2.2 hr</td>
<td>5.9 hr</td>
<td>9.3 hr</td>
</tr>
<tr>
<td>USB 2.0</td>
<td>0.1 sec</td>
<td>8.5 sec</td>
<td>33 sec</td>
<td>3.3 min</td>
<td>8.9 min</td>
<td>13.9 min</td>
</tr>
<tr>
<td>USB 3.0</td>
<td>0.01 sec</td>
<td>0.8 sec</td>
<td>3.3 sec</td>
<td>20 sec</td>
<td>53.3 sec</td>
<td>70 sec</td>
</tr>
</tbody>
</table>
USB 3.0 Standard – A Connector

- Same interface as the USB 2.0 standard – A connector, but with added pins for SuperSpeed USB signals
- Complete compatibility with USB 2.0 standard – A connector

<table>
<thead>
<tr>
<th>Pin #</th>
<th>Signal Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>VBUS</td>
<td>Power</td>
</tr>
<tr>
<td>2</td>
<td>D-</td>
<td>USB 2.0 differential pair</td>
</tr>
<tr>
<td>3</td>
<td>D+</td>
<td>USB 2.0 differential pair</td>
</tr>
<tr>
<td>4</td>
<td>GND</td>
<td>Ground for power return</td>
</tr>
<tr>
<td>5</td>
<td>StdA_SSRX-</td>
<td>SuperSpeed receiver differential pair</td>
</tr>
<tr>
<td>6</td>
<td>StdA_SSRX+</td>
<td>SuperSpeed transmitter differential pair</td>
</tr>
<tr>
<td>7</td>
<td>GND_DRAIN</td>
<td>Ground for signal return</td>
</tr>
<tr>
<td>8</td>
<td>StdA_SSTX-</td>
<td>SuperSpeed transmitter differential pair</td>
</tr>
<tr>
<td>9</td>
<td>StdA_SSTX+</td>
<td>SuperSpeed transmitter differential pair</td>
</tr>
</tbody>
</table>
USB 3.0 Standard – B Connector

• Defined for relatively large, stationary peripherals such as hard drives and printers

• Visually different from USB 2.0 standard – B connector
  – But the receptacle accepts a USB 2.0 standard – B plug
USB 3.0 Micro Connector Family

• Defined for hand held devices
• Backward compatible with USB 2.0 micro connectors
• Based on USB 2.0 micro – B connector with an extended portion for the SuperSpeed USB signals
• USB 3.0 Micro – A and - AB connectors are identical to USB 3.0 Micro – B connector except for different keying
Connector Mechanical Requirements

• **Durability**
  – Micro family: 10,000 cycles
  – All other connectors
    • Standard durability class: 1,500 cycles
    • High durability class: 5,000 cycles
• **Unmating force**
  – 10N min initial, 8N min EOL
• **4-Axis continuity**
  – Required for Micro connector family
• **Mated cable assembly voltage drop (Vbus and GND, respectively)**
  – 225mV max with a 900mA current
Connector Electrical Requirements

- **Voltage**
  - 30 VA

- **Current**
  - Pin 1 & 4 – 1.8A; other pins – 0.25A min.

- **Contact Resistance**
  - Pin 1 & pin 4 – 30mΩ; other pins – 50mΩ max.

- **Dielectric Withstanding Voltage:**
  - 100 VAC

- **Insulation Resistance**
  - 100MΩ

- **Impedance:**
  - 90Ω +/- 15Ω @ 50 ps rise time (20% - 80%)
Connector Interoperability Summary

<table>
<thead>
<tr>
<th>USB Receptacle</th>
<th>USB Plugs Accepted</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.0 Standard – A</td>
<td>USB 2.0/ 3.0 Standard (A)</td>
</tr>
<tr>
<td>3.0 Standard – A</td>
<td>USB 2.0/ 3.0 Standard (A)</td>
</tr>
<tr>
<td>2.0 Standard – B</td>
<td>USB 2.0 Standard (B)</td>
</tr>
<tr>
<td>3.0 Standard – B</td>
<td>USB 2.0/ 3.0 Standard (B)</td>
</tr>
<tr>
<td>3.0 Powered – B</td>
<td>USB 3.0 Powered (B), USB 2.0/ 3.0 Standard (B)</td>
</tr>
<tr>
<td>2.0 Micro – B</td>
<td>USB 2.0 Micro (B)</td>
</tr>
<tr>
<td>3.0 Micro – B</td>
<td>USB 2.0/ 3.0 Micro (B)</td>
</tr>
<tr>
<td>2.0 Micro – AB</td>
<td>USB 2.0 Micro (B) or (A)</td>
</tr>
<tr>
<td>3.0 Micro – AB</td>
<td>USB 2.0/ 3.0 Micro (B), 2.0/ 3.0 Micro (A)</td>
</tr>
</tbody>
</table>
In Summary

• **Over 10X performance increase**
  – Supports 5 Gbps data rate
  – HD-move transfers in 70 sec. vs. 13.9 min. with USB 2.0

• **Fast sync-n-go**
  – Minimizes user wait-time

• **Optimized Power Efficiency**
  – No device polling
  – Lower active and idle power requirements

• **Backward compatible with USB 2.0 connector**