Tyco Electronics Proposal T10/08-434r1 for a New Internal and External High Density Mini-SAS Connector System

*Electrical Connector and Mechanical Cage for Pluggable Interfaces up to 12 Gbps / Channel*

Submittal Date: October 2008
Revised October 31 2008
Our Commitment, Your Advantage

TE’s new High Density Mini-SAS proposal provides the following advantages to customers using Mini-SAS technology.

- Suitable for 6 & 12 Gbps SAS Applications
- PCI Bracket Compatible
- External Push or Pull Latching capability (Customers discretion)
- Improved Insertion and Return Loss Performance
- Designed for External Fiber Cable Option
- Designed for Active Cable Assembly Option
- Heat Sink Compatible Designs
- Single Port or Multi-port Configurations Available
- Various EMI Containment Options
Physical Information
## External Embedded Fiber and Copper Plug Cable Description

26, 28 and 30 AWG Cable will be available.

<table>
<thead>
<tr>
<th></th>
<th>Embedded Fiber</th>
<th>Copper</th>
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</thead>
<tbody>
<tr>
<td><strong>Cable Diameter</strong></td>
<td>6.2mm (Dual 4x)</td>
<td>11mm (1 cable), 8.2mm (2 Cables)</td>
</tr>
<tr>
<td></td>
<td>13.2mm (8x)</td>
<td></td>
</tr>
<tr>
<td><strong>Cable Construction</strong></td>
<td>12 or 24 fiber</td>
<td>8 or 16 pair</td>
</tr>
<tr>
<td><strong>Cable Bend Radius, min</strong></td>
<td>5x Dia min</td>
<td>6X Cable Dia</td>
</tr>
<tr>
<td><strong>Industry Specification</strong></td>
<td>TIA-492AAAC-XBAX ICEA S-83-596-2001</td>
<td></td>
</tr>
<tr>
<td><strong>Max Cable Length @ 12Gbps</strong></td>
<td>100 Meters</td>
<td>10m (Passive) 30m (Active)</td>
</tr>
<tr>
<td><strong>Power (Watts)</strong></td>
<td>2.0 – 2.5 max</td>
<td>1.5 max (Active)</td>
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</table>
External PCI Compatible Single Port Receptacle with optional EMI Springs

- EMI Springs provide full EMI containment on both bezel and cable plug
- Accommodates a wide tolerance range between the cage and bezel.

Thru holes for screw attachment (4 places)
Thru holes for guide pins (2 places)
External Single port PCI Configuration

Push or pull actuation of cable assembly plugs

Push or pull actuator

- 22.80mm
- 26.80mm
- 12.0mm max
- 59.5mm max
External 1x3 Multi-Port PCI Configuration

Die cast housing FULLY encapsulates module boards to provide robust stabilization, polarization and to prevent stubbing during insertion of the plug into the receptacle.
2-Piece Plug Option

- Adding a straddle mount connector:
  - Eliminates hard gold plating on the module board
  - Permits tighter tolerances between the contact pads and exterior surfaces
- Lowers the cost of the module PCB
- Increases the vendor base for PCB suppliers
  - Improves durability to 500 cycles
Internal Assembly Details

Press fit pins

Plastic shell with guide rails to prevent stubbing during insertion of the plug into the receptacle

Preassembled Single Unit
Internal Single Port Configuration

Press actuator

Dimensions:
- 23.42mm
- 12.18mm
- 31.13mm
- 25.5mm
- 14.65mm
Pinout Options

• Current offerings for SAS applications are 26 positions for external and 36 positions for internal assemblies
  – Requests have been made by various customers for the ability to increase the density of the 36 position internal assembly
  – Additional requests have been made to add power and EEPROM features to the external assembly
• Active cable assemblies for longer distances
• Active equalization options
• External direct attach optics
Ground contact Chicklets contain 5 terminations to the Host Board to minimize crosstalk. Each differential pair is surrounded by a ground contact.

3 Chicklet Approach; Ground, Signal 1 & Signal 2
Optional Pinouts

- Existing external assemblies are 26 positions
- Potential to add additional contacts for power, I²C, or other user defined features

<table>
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<tr>
<th>Connector 1</th>
<th>Connector 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAS Style (38pos)</td>
<td>SAS Style (32pos)</td>
</tr>
</tbody>
</table>
• Preferred pinout for a powered, external assembly

SAS Style (32pos)
Electrical Performance Summary
Electrical Performance Update

• Product has been fully simulated and various .s4p, .s8p, and .s16p files are available for the interface and/or cable assembly
• Production assemblies have been tested with the following data collected
  – Characteristic Impedance (Time domain)
    • Interface (card edge style for module usage)
    • Two piece connector version with cable attached to contacts
    • Card edge with cable attach (Similar to current MiniSAS)
  – NEXT and FEXT (Time domain)
    • Interface (card edge style for module usage)
    • Two piece connector version with cable attached to contacts
    • Card edge with cable attach (Similar to current MiniSAS)
Electrical Performance Update, cont’d

- Production assemblies have been tested with the following data collected
  - Insertion and Return Loss
    - Interface (module usage)
    - Two piece connector version with cable attached to contacts
    - Card edge with cable attach
  - NEXT and FEXT (frequency domain)
    - Interface (module usage)
    - Two piece connector version with cable attached to contacts
    - Card edge with cable attach
Insertion and Return Loss Performance

- Host to Module Board (Does not include cable)
- Data is de-embedded to include through-hole/connector/footprint
  - Test board is 1.0mm thick, 6 layer construction, signals on layer 5
Crosstalk Performance

- Host to Module Board (Does not include cable)
- Data is de-embedded to include through-hole/connector/footprint
Insertion and Return Loss Performance (Spectrastrip Cable)

- 4m Cable Assembly (28 AWG, 100 Ohm)
- Data is de-embedded to include through-hole/connector/footprint
- Assembly is unequalized
Insertion and Return Loss Performance (Leoni 28 AWG)

- 4m Cable Assembly (28 AWG, 100 Ohm)
- Data is de-embedded to include through-hole/connector/footprint
- Assembly is unequalized
Time Domain Performance - Throughput

- Host to Module Board (Does not include cable)
  - Includes 3” Micro-strip trace

Reference Eye Results:
- 627 mV
- 9.8 psec Tj

Upper Row Eye Normalized Results:
- 545 mV (0.87 V_{reference})
- 2.4 ps additional jitter (12.2 ps total)
Time Domain Testing – Single Aggressor Noise

- Host to Module Board (Does not include cable)
  - Includes 3” Micro-strip trace

Noise Floor Results:
3.4 mV
(10.3125 Gbps)

Single Aggressor Noise Normalized Results:
7.2 mV additional noise (1.4% \( V_{\text{output}} \))
(10.3125 Gbps)
Current Status

• Full Channel testing capability
• Side Band access
• Assemblies and test boards available now
Questions?

- For more information or if you have questions you can contact one of the following people.
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