MDI option for 4x25G copper

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Photo courtesy of TE Connectivity
MDI considerations for 100GBase-CR4

- Backwards compatible (100GBase-CR4 to 40Gbase-CR4)
- Common MDI for Copper and (at least) short reach optical
MDI for 40GBase-CR4 and SR4

- QSFP+ was referenced as possible MDI for 40GBase-CR4. (Clause 85.11.1.1)
- QSFP+ is currently being used by other groups for 4x10G applications (InfiniBand℠, Fibre Channel etc)
QSFP+ options today

Stacked Integrated Connectors

Belly-to-Belly Cages

Light Pipe & Thermal Options

Single SMT Connectors with Single (& Ganged) Cages

Passive & Active Copper Cables

Passive Optical Cables

Active Optical Cables

Copper & Optical Loop-backs

Pluggable Modules

Photo courtesy Molex
QSFP+ options today

Supports both Copper & Optical Solutions

- Standard PCI Card (4) Ports
- Low Profile PCI Card (2) Ports
- Blades (8) Ports /side (16) ports total

Single SMT Connectors & Cages
- (16) Ports /side
- 32 ports total

Single SMT Connectors & Ganged Cages
- (18) Ports /side
- 36 ports total

Stacked Integrated Connectors
- (36) Ports one side
QSFP+ cages, connector, plug

Photos courtesy Amphenol
What is needed for 100GBase-CR4 MDI?

- Good signal integrity
  - Low insertion loss
  - Low crosstalk
  - Good differential return loss

- Support for direct attach low loss copper cable
  - 24 AWG twinax cable?

- Support for active cables?
What might be needed by 4x25G optical solutions?

- Good signal integrity
  - Low insertion loss
  - Low crosstalk
  - Good differential return loss
- Support for separable module
  - Multi-mode and Single mode?
- Support for active cables?
- Good thermals
  - 5-6W?
QSFP25 differential return loss

BLACK = Spec Limit, -12dB up to 14GHz
Red = existing QSFP+
Blue = zQSFP+

<table>
<thead>
<tr>
<th>Max Reflection -12dB</th>
<th>7GHz</th>
<th>14GHz</th>
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<tbody>
<tr>
<td>QSFP+</td>
<td>-17</td>
<td>-7</td>
</tr>
<tr>
<td>zQSFP+</td>
<td>-18</td>
<td>-14</td>
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</tbody>
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SDD11
QSFP25 crosstalk

Red = existing QSFP+
Blue = zQSFP+

MDNEXT

MDFEXT
QSFP25 insertion loss

BLACK = Spec limit, maximum of -1.4dB @14GHz

Red = existing QSFP+

Blue = zQSFP+

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<tr>
<td>Max Insertion -1.4dB</td>
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<td></td>
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<tr>
<td>QSFP+</td>
<td>-0.3</td>
<td>-1.6</td>
</tr>
<tr>
<td>zQSFP+</td>
<td>-0.3</td>
<td>-0.8</td>
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Thermal improvements for QSFP25

- Larger heatsink contact area for improved thermals
- ‘Fixed fin’ heat sinks provide lower thermal impedance
New 25G QSFP+ SFF Specification to be submitted which will enable larger thermal contact area

Gain additional surface area for the thermal interface/contact area
QSFP+ / zQSFP+ Thermal Simulations

Popular solution *today*

**QSFP+ Riding Pin Array Heat Sink**
- 64.2°C @ 3rd module

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**Parameters**
- 1x4 Cages
- Typical Heat Sink Designs (not optimized)
- Flow = 1 m/s at inlet
- Module Power = 2W
- Height = 1 RU

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**Proposed Enhancement** - approx 10 degree gain

**zQSFP+ Fixed Fin Heat Sink**
- 55.4°C @ 3rd module
Current QSFP+ thermal contact area definition - based on the original QSFP MSA design
100GBase-CR4 MDI summary

- QSFP could provide backwards compatibility to 40GBase-CR4 and 40GBase-SR4 variants
- QSFP25 provides excellent signal integrity for 25G signals
- QSFP25 provides improved thermals required for 100GBase-SR4 variants

Photo courtesy of TE Connectivity