High Speed I/O & Cable Assemblies Product Presentation

January 2010

Our sales proposition

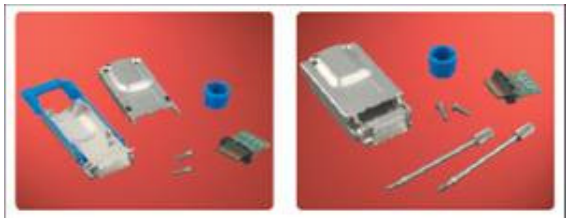
- **FCI sells qualified interconnect link solutions**
  - **From transmit chip (Tx) to receiver chip (Rx)**
  - **FCI defines and validates the functionality of the proposed solution**
    - **SI validation**
    - **Mechanical validation**
    - **Connectors and cables – complete interconnect solution**
    - **To industry standards**
- **Standard cable interfaces / custom solutions**
  - **Address customer needs for**
    - **Standard interfaces**
    - **Specialized needs to fit their system architectures**

Cable Assembly Offerings

High Speed - Eyemax

EyeMax® Product Overview

- **Use as a high-speed link between servers, storage enclosures, switches and other data networking or communication equipment**
- **External Copper Serial I/O Link selected by various standards organizations**
- **Low-cost alternative to fiber optics**
- **Standards**
  - Infiniband
  - 10G Fibre Channel
  - SAS / SATA
  - 10G Ethernet – CX4
- **Data rates – standards**:
  - Infiniband - SDR – 2.5 GB/s per channel
  - Infiniband - DDR – 5.0 GB/s per channel
  - Infiniband - QDR – 10.0 GB/s per channel
  - 10G Ethernet CX4 – 3.125 GB/s per channel
- **Receptacles, Plug Kits, Cable Assemblies**
- **Impedance-controlled paddle card with capability to upgrade for equalization**
- **Various high-speed raw cable sources**
- **Robust die-cast shells for EMI shielding**



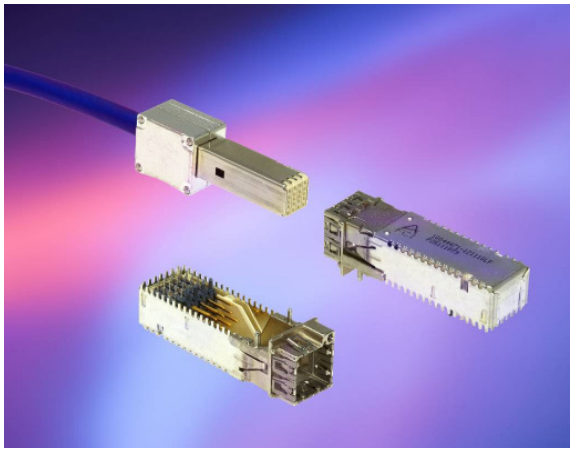
High Speed CONNECTIONS

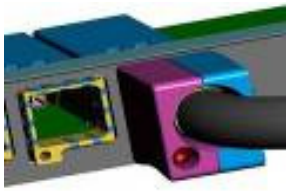
Cable Assembly Offerings

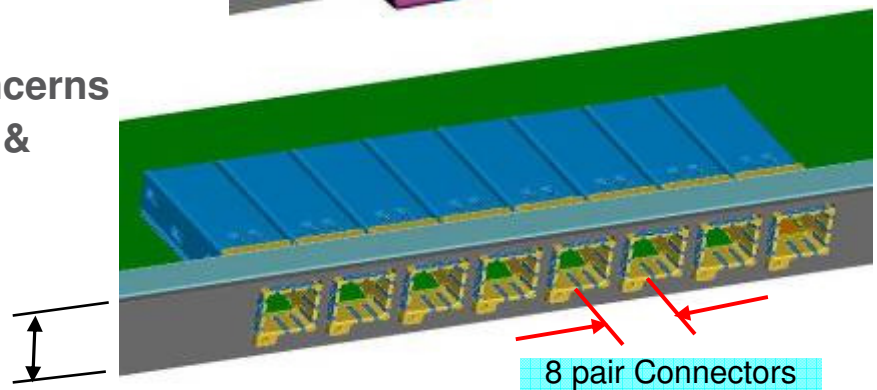
High Speed - DensiShield

DensiShield I/O System

- I/O link targeting Rack in cabinet-based systems that require higher bandwidth and density
- 2.5 to 10 Gb/s per channel capable
- 12.5mm pitch enabling multiple I/O ports along a card edge
- 8 differential pair (100 Ω) cable construction
  - 4 channel (4x) capability
- Jackscrew or Torx™ screw drive
- 26 & 30 AWG wire size options
- Long mating engagement
  - Guidance
  - Addresses cable weight or routing concerns
  - Tighter cable routing between chassis & cabinet door
- Robust EMC termination systems
- Dual-beam contact system provides redundancy and long term reliability

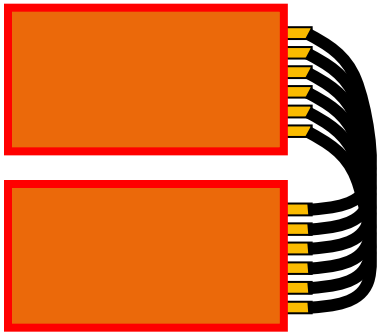






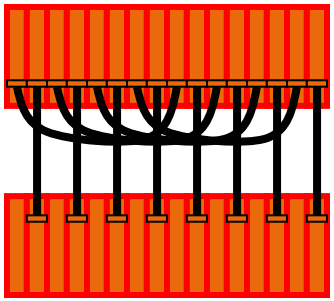
High Speed CONNECTIONS

Applications



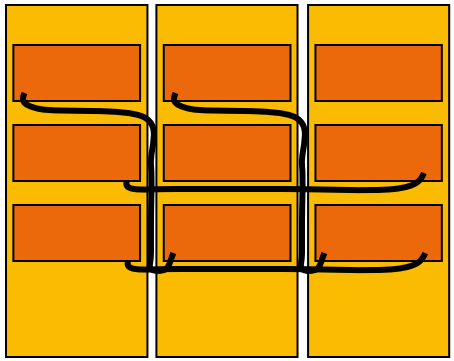
Between Plug-in units in same subrack / shelf

- "Cable Backplane" applications.
- Small PCB edge and panel length usage
  - ✓ Allows Many Separate I/O's from one panel
- Maintaining shielding on subrack level.



Jumpering between Subracks / Shelves

- **From one interface board per subrack**
- **Example: For system upgrade capability**



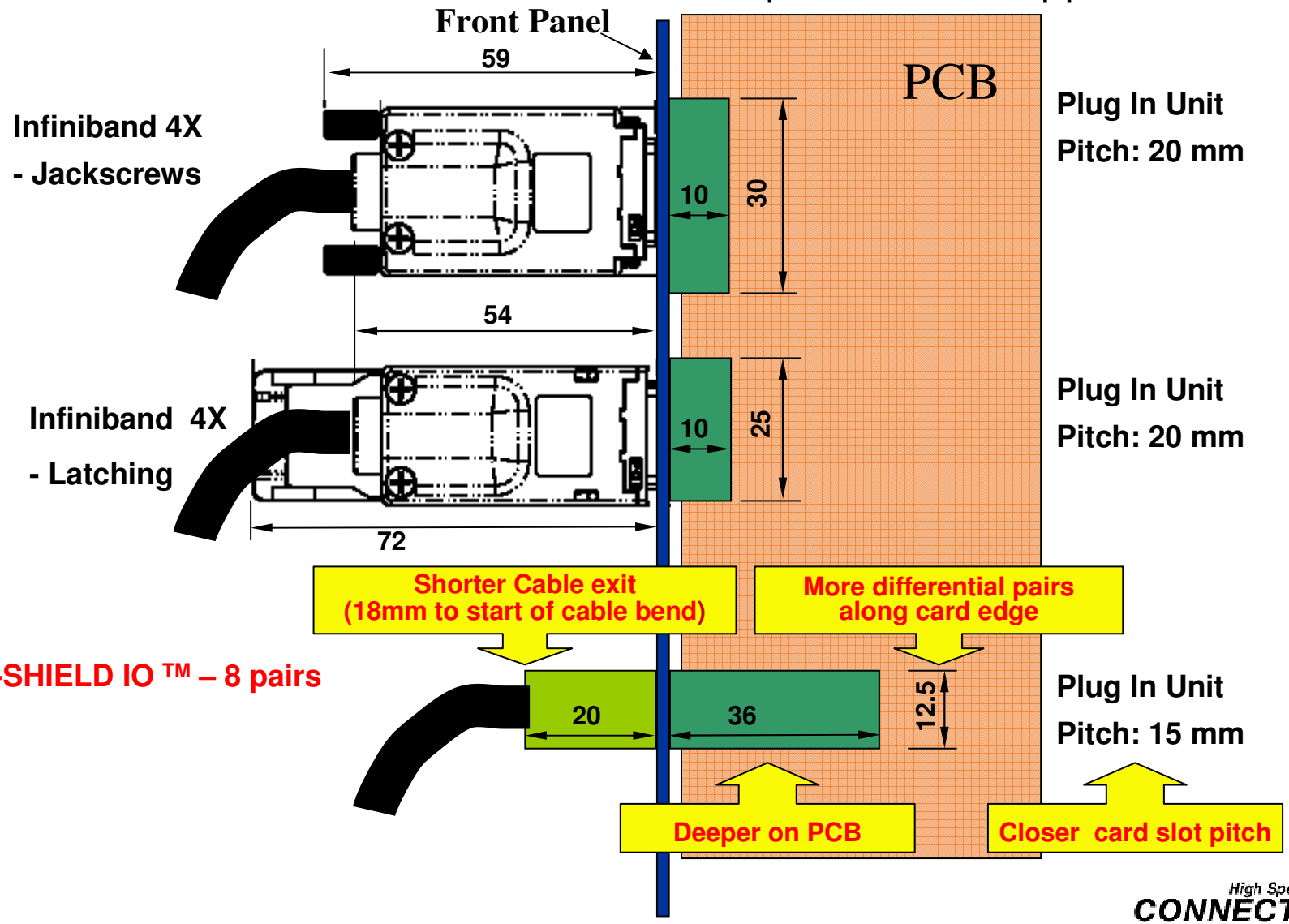
Between Cabinets

- **High system flexibility / easy upgrade**
- **"EMC-proof"**

High Speed CONNECTIONS

DensiShield I/O™ Density vs Eyemax

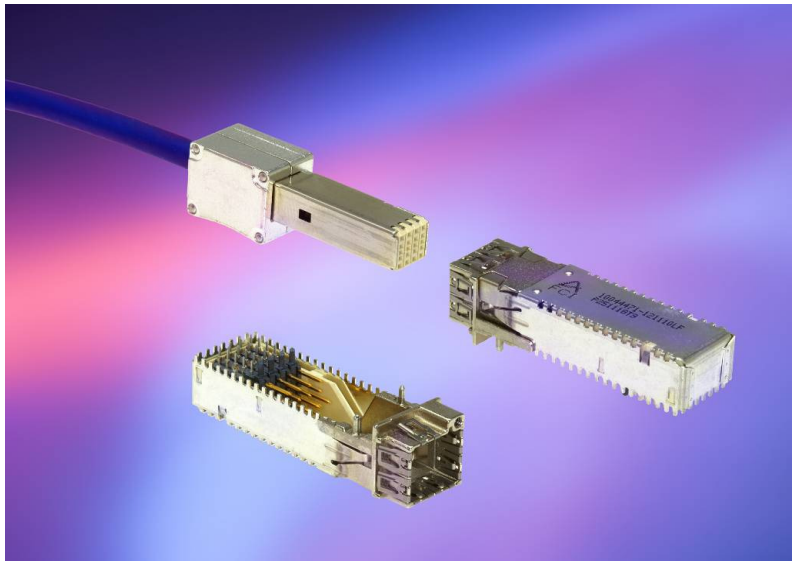
8 pair front I/O application



FCI's DensiShield cable assembly

DensiShield Header & Cable assembly part numbers

- Cable assembly P/N's
  - 10054999
  - See customer print for dash number definition
- Mating header P/N's
  - 10044471 – standard
  - 10076181 – uTCA compliant



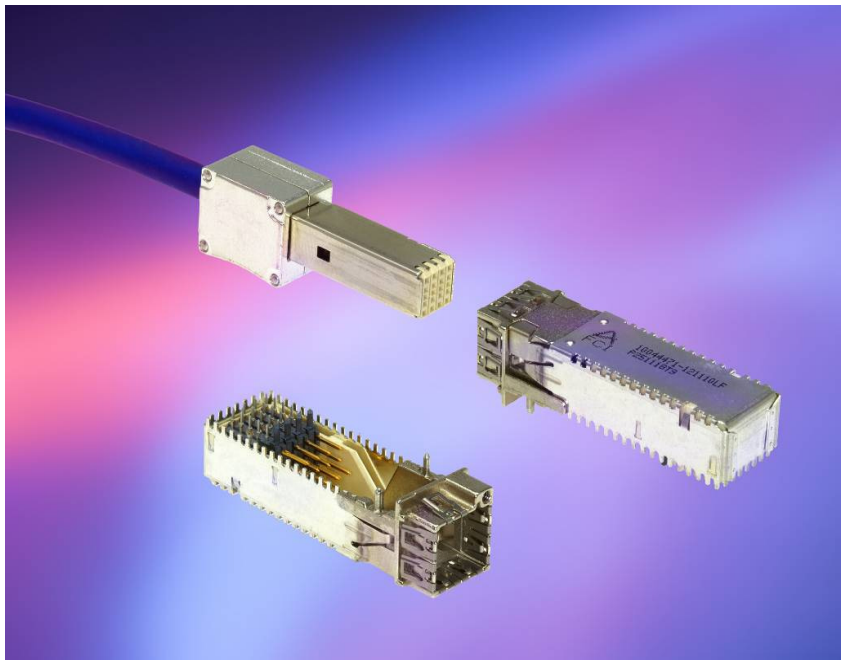
- Capability matrix - Based on Infiniband defined acceptance thresholds

DensiShield	Unequalized cable length												
Performance Level	1m	2m	3m	4m	5m	6m	7m	8m	9m	10m	11m	12m	13m
Infiniband - SDR	30	30	30	26	26								
Infiniband - DDR	30	26	26										
Infiniband - QDR	26												
10G - Ethernet - CX4	30	30	30	30	30	30	30	26	26	26	26	26	

DensiShield product Information

DensiShield Cable assembly & header documentation

- **Documentation available on FCI web site**
  - **Product data sheet**
  - **Product specification**
  - **Electrical models**
  - **3-D mechanical models**
  - **Electrical test report**
  - **Application specifications**
- Web links
  - www.fciconnect.com/highspeedio
  - www.fciconnect.com/densishield
- Available upon request
  - **Electrical test boards**
  - **Cable assembly qualification samples**



Other information – DensiShield

FCI's DensiShield™ High-Speed I/O Links Demonstrate 10Gb/s Performance

ETTERS, P.A. (January XX, 2009)– FCI, a leading developer of connectors and interconnect systems has developed the DensiShield™, a high-speed copper I/O solution. It has demonstrated 10Gb/s per channel differential performance using common wire gauges in cable lengths up to 10 meters. The DensiShield test set up feature Broadcom BCM8072 dual-channel transceivers compliant to the IEEE802.3ap test criterion. The 10Gb/s differential performance can be achieved at 6 meters or less by utilizing 30 AWG cable, at 8 meters or less by utilizing 28 AWG cable and 10 meters or less by utilizing 26 AWG cable.

In addition to the 10Gb/s performance, the DensiShield high-density/speed solution has demonstrated performance meeting both the 10GBase-CX4 Ethernet and Infiniband® industry standards. The DensiShield system is also able to accommodate card slot pitch as low as 15mm and achieve a port-to-port centerline of 12.5mm along a card edge. FCI also offers a DensiShield header that fits within the uTCA defined packaging profile.

"The DensiShield I/O system meets the emerging market requirements for 10Gb/s per channel performance at cable lengths typically required for within-rack or rack-to-rack cabling applications," said Jim David, global high-speed I/O market manager. "Customers have acknowledged FCI's expertise in delivering high-speed and high-density solutions that support the markets ever increasing needs for 10Gb/s per channel and greater performance."

For more information on how FCI's DensiShield high-speed I/O solutions can satisfy specific application requirements, visit www.fci.com/densishield. The DensiShield™ high-speed I/O dedicated landing page simplifies access to 3D models, signal integrity models, data sheets, product prints, product and application specifications as well as a complete product presentation providing significant detail on FCI's complete line of high-speed I/O products.

Contact FCI at 825 Old Trail Road, Etters, PA, 17319-7883; call 800-237-2374, email at electronics.us@fci.com or visit FCI on the web at www.fci.com.Press contacts: Bavo Teunissen +31-73-6206840 bavo.teunissen@fci.comPatricia Staino 919-872-8172 patricia@btbmarketing.com

About FCIWith operations in 30 countries and sales of 1.3 billion euros in 2007, FCI is a leading manufacturer of connectors. Our 14,200 employees are committed to providing customers with high-quality, innovative products for a wide range of consumer and industrial applications.For more information: www.fci.com

Important points– DensiShield

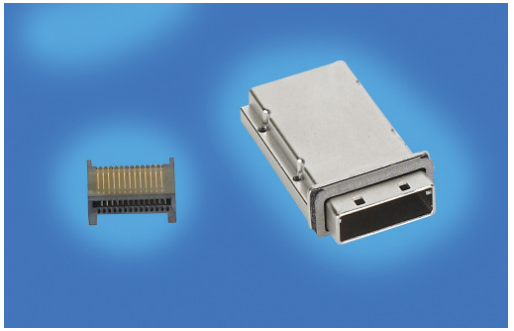
- **Advantages**
  - **4x equivalent interface**
  - **Superior linear board differential pair (DP) density**
    - **QSFP- 9.7 DP per linear inch**
    - **DensiShield – 16 DP per linear inch**
  - **12.5 mm port to port pitch**
  - **Fits in 15mm board to board spacing**
  - **10 Gb/s per channel capability up to 10 meters**
  - **Robust EMI / shielding system**
    - **External**
    - **Internal**
  - **Positive cable retention – Screw mounting**
  - **Minimized area for cable routing**
    - **From front face of chassis to cable bend**

Cable Assembly Offerings

High Speed – mini-SAS / SATA

Mini-SAS / SATA I/O system

- I/O link targeting Network and mass storage applications
  - High speed cable assemblies
  - Connector & cage offerings
- Latest generation of Serial Attached SCSI / Serial ATA
  - SFF-8086 & 8088 compatible
  - 26 position I/O interconnect; 100 Ω system
  - Designed for 1.5GB/s to 6GB/s per channel transmission
    - Meets SAS 2.0 & SAS 2.1 performance
- Cable assemblies
  - 8 differential pair cable construction
  - 24, 26 and 28 AWG wire size options
  - Highly engineered mating PCB interface
    - Optimized SI performance
  - Robust EMC termination systems
    - Ruggedized die cast covers
    - Adaptive EMI chassis gasket

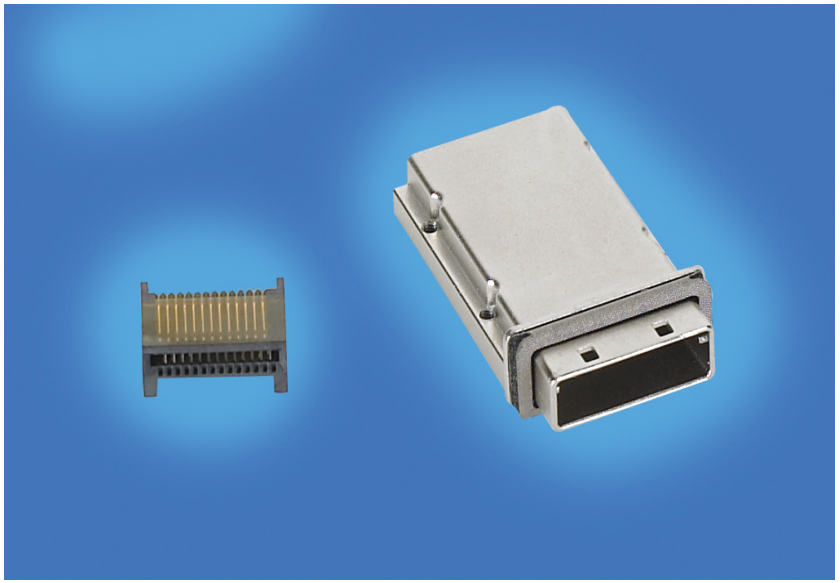


Mini-SAS / SATA connectors & cages

Mating header & Cage P/N's

mini-SAS R/A 26 position connector – P/N 10098870

- 0.8mm contact pitch
- SMT termination
- Pick-n-place compatible
  - Tape & reel packaging
- 30u" gold plating on contact interface
- 250 cycle durability
- 0.5 amps per contact



mini-SAS single port cage (1x1) – P/N 10098871

- Robust zinc diecasting with 150u" nickel plating
- 0 degree & 1 degree
- Multiple keying options
- With and without location pegs
- Adaptive EMI gasket
  - Assures reliable EMI seal with chassis
- RoHs compliant

mini-SAS 1x2 cage – P/N 10098872

- Robust zinc diecasting with 150u" nickel plating
- 0 degree & 1 degree
- Multiple keying options
- With and without location pegs
- Adaptive EMI gasket
  - Assures reliable EMI seal with chassis
- RoHs compliant

Mini-SAS / SATA I/O system

Mini-SAS / SATA Cable assembly P/N's

- **Cable assembly P/N's – un-equalized (SAS 2.0 & 2.1)**
  - 10084749 – SAS 2.0 & SATA- See customer print for dash number definition
  - 10111837 – SAS 2.1 - See customer print for dash number
- **Mating header & Cage P/N's**
  - 10098870 – mini-SAS 26 position connector
  - 10098871 – mini-SAS single port cage – 0 & 1 degree
  - 10098872 - mini-SAS 1x2 cage – 0 degree & 1 degree
- **Based on Serial ATA Revision 2.6 and T10/1760-D Revisio SAS-2.0 requirements & performance thresholds**
  - Performance thresholds for SAS 2.0 and SAS 2.1 differ and is the reason why different cable lengths of compliance are listed below

Mini-SAS / SATA										
	Unequalized cable length									
Performance Level	1m	2m	3m	4m	5m	6m	7m	8m	9m	10m
SAS 2.0 (1.5 & 3.0 Gb/s)	28	28	28	26	26	24				
SATA	28	26	28	26	26	24				
SAS 2.1 (6 Gb/s)	28	28	28	28	28	26	26	24	TBD	TBD

TBD - Cables currently being tested to this standard

Product Documentation

Mini-SAS / SATA cable assemblies

- Documentation available on FCI web site
  - Product data sheet
  - Product specification
  - Electrical models
  - 3-D Mechanical models
  - Electrical test report
    - Web links
    - www.fciconnect.com/highspeedio
    - www.fciconnect.com/minisas
  - Available upon request
    - Electrical test boards
    - Cable assembly qualification samples

Cable Assembly Offerings

High Speed – SFP+

SFP+ I/O system

- **SFP+** (**S**mall **F**orm factor **P**luggable **+**)
  - Next generation SFP
  - Single (1x) channel
  - 10Gb/s per channel capability
  - SFF- 8431 & 8461 compatible
  - Fully qualified I/O link
    - From transmitter to receiver
    - Link qualification includes connectors & cable assembly
  - System management interface
    - EEPROM programming
  - Support bandwidth requirements of:
    - 10 Gigabit-Ethernet (10G Base –CU)
    - 8G Fibre Channel (FC)
    - 10G Fibre Channel over Ethernet (FCoE)

SFP+ Copper cable assemblies

- **SFP+** (**S**mall **F**orm factor **P**luggable **+**)
  - **Optimized PCB design**
    - For signal integrity
    - For cable termination & strain relief
    - For process repeatability & control
  - **Edge card connector interface**
    - 30u” gold plating
  - **Stamped EMI girdle**
  - **Twin-axial cable – 100 ohm**
    - 2 differential pair construction
    - Overall EMI braid
    - 32 AWG to 24 AWG
    - Standard and Leoni Paralink 11 raw cable
  - **User friendly pull lanyard**
  - **RoHs compliant**

SFP+ Copper cable assemblies

Passive & actively equalized cable assemblies

- **Passive cable assemblies – P/N 10110818 (Standard raw cable)**
  - P/N 10101497 (Leoni raw cable)
  - Available with PVC or halogen free jacket
- **Active equalized cable assemblies – P/N 10110819 (Standard raw cable)**
  - P/N 10101498 (Leoni raw cable)
  - Maximizes copper based cable length
    - Avoids moving to FO based systems
  - Minimizes cable bulk & weight
    - Increases air flow; easier to route
    - Reduces cable bulk weight
  - 24 AWG to 15 meters
  - 32 AWG to 5 meters
  - Available with PVC or halogen free jacket
- **Passive cable assemblies qualification samples available**
- **Actively equalized cable assembly samples available**
- **Ethernet-Alliance plug-fest in October, 2009**
  - All FCI cables passed full interoperability testing

High Speed CONNECTIONS

SFP+ Connectors & cages

Mating header & Cage P/N's

- **SFP+ R/A 20 position connector – P/N 10099099**
  - 0.8mm contact pitch
  - SMT termination
  - Pick-n-place compatible
    - Tape & reel packaging
  - 30u" gold plating on contact interface
  - 150u" tin in SMT termination area
  - 100 cycle durability
  - 0.5 amps per contact
  - RoHs compliant

- **SFP+ cages – P/N's listed below**
  - Copper alloy with 50u" nickel over-plate
  - EMI fingers – Copper alloy with 50u' tin over 50u" nickel
  - Conductive elastomeric EMI gasket
  - EON press fit PCB termination
  - Tray packaging
  - Current cage configuration options
    - 1x1 (single) SFP+ cage with EMI fingers – P/N 10099100
    - 1x2 SFP+ ganged cage with EMI fingers – P/N 10099101
    - 1x4 SFP+ ganged cage with EMI fingers – P/N 10099102
  - Current cage configurations with light pipes
    - 1x1 SFP+ cage with EMI fingers – P/N 10099103
    - 1x4 SFP+ cage with EMI gasket – P/N 10099104
  - RoHs compliant

FCI's SFP+ Product information

SFP+ Product part numbers

- Cable assembly P/N's
  - Passive cable assemblies – 10110818 or 10101497
  - Actively equalized cable assemblies –10110819 or 10101498
  - See customer print for dash number definition

- Mating header & Cage P/N's
  - 10099099 – standard top mount SFP+ connector
  - 10099100 – 1x1 SFP+ cage – EMI fingers; top mount
  - 10099101- 1x2 ganged SFP+ cage
  - 10099102- 1x4 ganged SFP+ cage
  - 10099103 – 1x1 SFP+ cage – EMI fingers with light pipes
  - 10099104 – 1x4 SFP+ cage – Elastomeric EMI; with light pipes

- Capability matrix - Based on SFF-8431defined acceptance thresholds

SFP+

	Unequalized cable length														
Performance Level	**1m**	**2m**	**3m**	**4m**	**5m**	**6m**	**7m**	**8m**	**9m**	**10m**	**11m**	**12m**	**13m**	**14m**	**15m**
SFF-8431	32	30	30	28	28	26	24								
IEEE 802.3ba	TBD	TBD	TBD	TBD	TBD	TBD	TBD								
Fibre Channel	TBD	TBD	TBD	TBD	TBD	TBD	TBD								

	Actively equalized cable length														
Performance Level	**1m**	**2m**	**3m**	**4m**	**5m**	**6m**	**7m**	**8m**	**9m**	**10m**	**11m**	**12m**	**13m**	**14m**	**15m**
SFF-8431	32	32	32	32	32	30	30	28	28	28	26	26	24	24	24
IEEE 802.3ba	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD			
Fibre Channel	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD			

TBD - Cables currently being tested to this standard

High Speed CONNECTIONS

FCI's SFP+ Product Information

SFP+ Cable assembly & cage & connector documentation

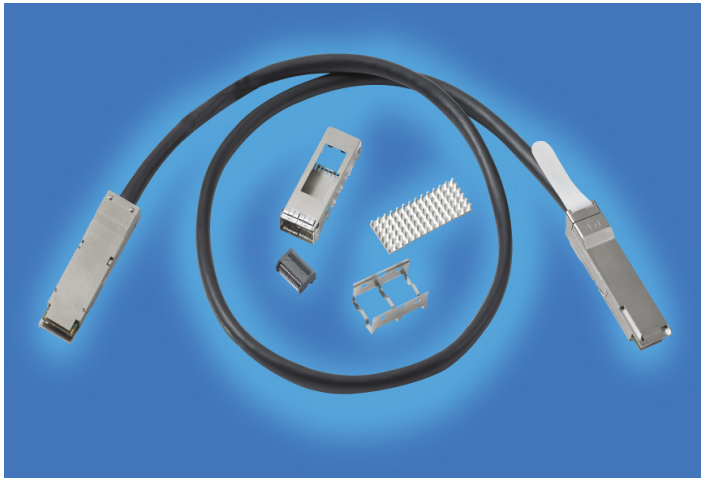
- **Documentation available on FCI web site**
  - **Product data sheet**
  - **Product specification**
  - **Electrical models**
  - **3-D mechanical models**
  - **Electrical test report**
  - **Application specifications**
- Web links
  - www.fciconnect.com/highspeedio
  - www.fciconnect.com/SFP+
- **Available upon request**
  - **Electrical test boards**
  - **Cable assembly qualification samples**

Cable Assembly Offerings

High Speed – QSFP / QSFP+

QSFP & QSFP+ I/O system

- **QSFP (Quad Small form Factor Pluggable)**
  - **4 channels @ 5 Gb/s per channel (4x)**
    - Targeted for 20 Gb/s total bandwidth per port
  - **Next generation extension of SFP+**
- **QSFP+ (Quad Small Form factor Pluggable +)**
  - **Next generation SFP+**
  - **4 channel @ 10 Gb/s per channel**
    - Targeted for 40 Gb/s total bandwidth per port
  - **SFF- 8436 compatible**
  - **Fully qualified I/O link**
    - Link qualification includes connectors & cable assembly
  - **System management interface**
    - EEPROM programming
  - **Support bandwidth requirements of:**
    - IEEE 802.3ba (40 Gb/s)
    - InfiniBand QDR specifications



QSFP & QSFP+ cable assemblies

- **QSFP & QSFP+** (**Q**uad **S**mall **F**orm factor **P**luggable **+**)
  - Utilizes same optimized PCB design as SFP+
    - EEPROM mapping for cable & system management & recognition
  - IBTA plug-fest in October, 2009
    - IBTA Integrator's list
  - Passive qualification cable assemblies available
  - Actively equalized evaluation cable assembly samples available
  - Cage & connector samples available

QSFP & QSFP+ cable assemblies

- **QSFP & QSFP+** (**Q**uad **S**mall **F**orm factor **P**luggable **+**)
  - **Optimized PCB design**
    - For signal integrity
    - For cable termination & strain relief
    - For process repeatability & control
  - **Board edge connector interface**
    - 30u” gold plating
  - **Stamped EMI girdle**
  - **Twin-axial cable – 100 ohm**
    - 8 differential pair construction
    - Overall EMI braid
    - 32 AWG to 24 AWG
    - Leoni Paralink 11 raw cable
  - **User friendly pull lanyard**
  - **RoHs compliant**

QSFP & QSFP+ cable assemblies

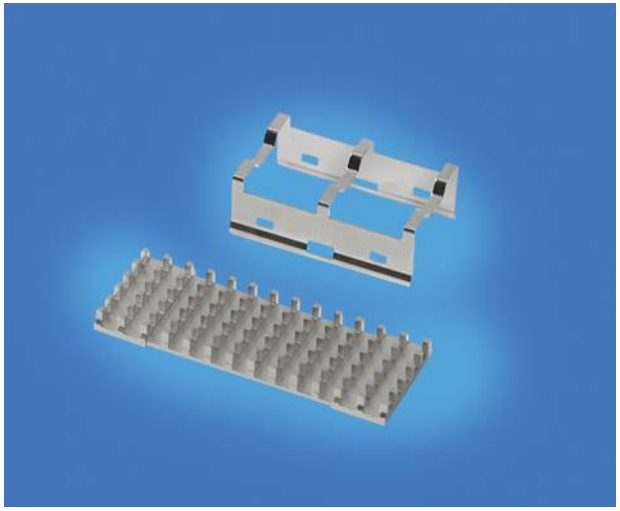
- **Passive & actively equalized cable assemblies**
  - **Passive cable assemblies – P/N 10093084**
    - Per Infiniband QDR requirements
    - Available with PVC or halogen free jacket
  - **Active equalized cable assemblies – P/N 10107528**
    - Maximizes copper based cable length
      - Avoids moving to FO based systems
    - Minimizes cable bulk & weight
      - Increases air flow; Easier to route
      - Reduces cable bulk weight
    - 26 AWG to 12 meters
    - 32 AWG to 5 meters
    - Available with PVC or halogen free jacket
  - **Passive cable assemblies available**
  - **Actively equalized cable assemblies**
    - Evaluation samples available
  - **IBTA plug-fest in October, 2009**
    - Cables submitted to IBTA plug-fest will be listed on the IBTA Integrator's list for adherence to interoperability & certification

QSFP / QSFP+ Connectors & cages

- **Mating header & Cage P/N's**

- **QSFP+ R/A 38 position connector – P/N 10099113**
  - 0.8mm contact pitch
  - SMT termination
  - Pick-n-place compatible
    - Tape & reel packaging
  - 30u" gold plating on contact interface
  - 150u" tin in SMT termination area
  - 100 cycle durability
  - 0.5 amps per contact
  - RoHs compliant

- **QSFP+ cages – P/N's listed below**
  - Copper alloy with 50u" nickel over-plate
  - EMI fingers – Copper alloy with 50u' tin over 50u" nickel
  - EON press fit PCB termination
  - Tray packaging
  - Current cage configuration
    - 1x1 (single) QSFP+ cage with EMI fingers – P/N 10099114
    - QSFP+ cage heat sink – P/N 10099115
    - QSFP+ cage heat sink clip– P/N 10099116
  - RoHs compliant



High Speed CONNECTIONS

FCI's QSFP / QSFP+ Product information

QSFP+ Product part numbers

- Cable assembly P/N's
  - Passive cable assemblies – 10093084 – Qualification samples available today; production in Q2, 2010
  - Actively equalized cable assemblies – 10107528 - Evaluation samples available; production in Q2, 2010
  - See customer print for dash number definition

- Mating header & Cage P/N's – Samples available in October; production in November
  - 10099113 – standard QSFP+ connector
  - 10099114 – 1x1 QSFP+ cage – EMI fingers
  - 10099115- QSFP+ cage heat sink
  - 10099116- QSFP+ cage heat sink clip

- Capability matrix - Based on SFF-8436 defined acceptance thresholds

QSFP+															
	Unequalized cable length														
Performance Level	1m	2m	3m	4m	5m	6m	7m	8m	9m	10m	11m	12m	13m	14m	15m
Infiniband - QDR	32	32	30	28	26	26	24								
IEEE 802.3ba	TBD	TBD	TBD	TBD	TBD	TBD									
Fibre Channel / SAS 2.1	TBD	TBD	TBD	TBD	TBD	TBD									

	Actively equalized cable length														
Performance Level	1m	2m	3m	4m	5m	6m	7m	8m	9m	10m	11m	12m	13m	14m	15m
Infiniband - QDR	32	32	32	32	32	30	30	28	28	28	26	26			
IEEE 802.3ba	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD					
Fibre Channel / SAS 2.1	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD					

TBD - Cables currently being tested to this standard

FCI's QSFP+ Product Information

SFP+ Cable assembly & cage & connector documentation

- **Documentation available on FCI web site**
  - **Product data sheet**
  - **Product specification**
  - **Electrical models**
  - **3-D mechanical models**
  - **Electrical test report**
  - **Application specifications**
- Web links
  - www.fciconnect.com/highspeedio
  - www.fciconnect.com/QSFP+
- **Available upon request**
  - **Electrical test boards**
  - **Cable assembly qualification samples**

Thank you for your time