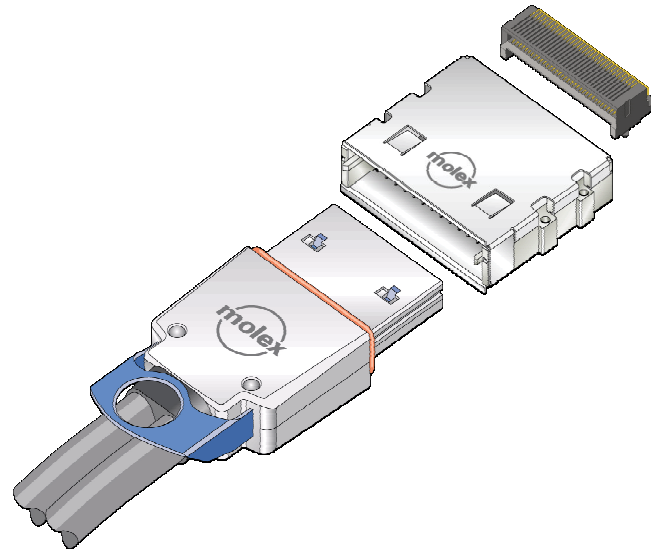


SFF 8086, 8087, 8088

Molex iPass™ for SAS



May 26, 2005

Houston, TX



Connector Products Division: Signal Integrity Group



Overview

- The Molex connector proposal has been chosen by the PCI Express External Cable Assembly Work Group for X4,X8,X16
- The Molex iPass™ connector (reduced width) was accepted in March to the SFF and SATA.
- The Molex iPass™ connector (reduced width) is out for ballot in the SAS Rev 1.1.
- Molex will offer RAND terms to support the proliferation of this technology into the market place

Latest Schedule

- ❖ T10 Workgroup – vote to add iPASS to the Rev 1.1 SAS standard
Passed 03/08/2005
- ❖ T10 Plenary – vote to add iPASS to the Rev 1.1 SAS standard
Passed 03/10/2005
- ❖ Standard allowed to set until following meeting in July – Forwarded to INCITS
- ❖ INCITS board ballot – could take 2 – 3 months, depending on meeting schedule
- ❖ Then forwarded to ANSI for publication

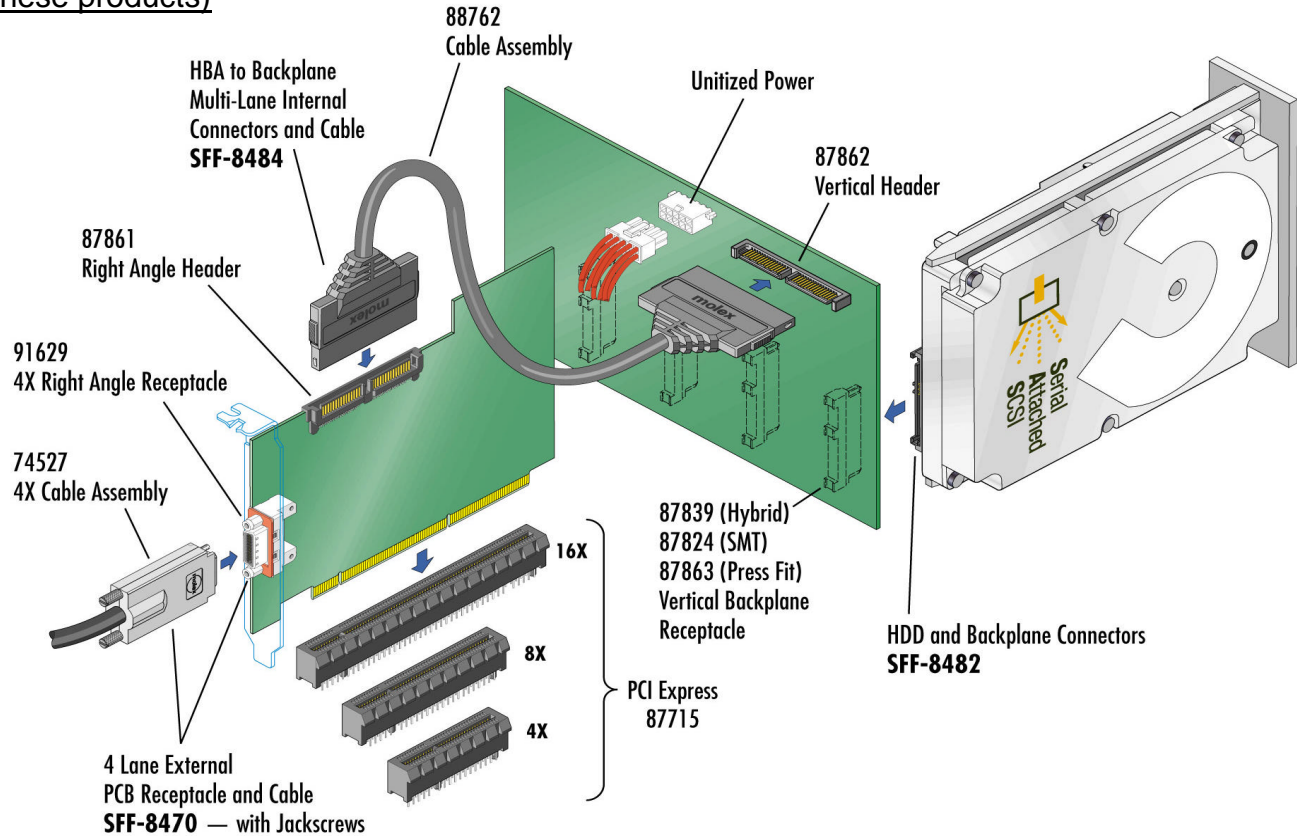
SAS Reduced Width Connectors



Serial Attached SCSI / SAS – Standards/Products as of 10/04

Typical Application 1 – PCI Host Bus Adapter

(See Molex Website: www.Molex.com/productname/sas/ for Sales Drawings for these products)



SAS_01e_5F



Connector Products Division: Signal Integrity Group



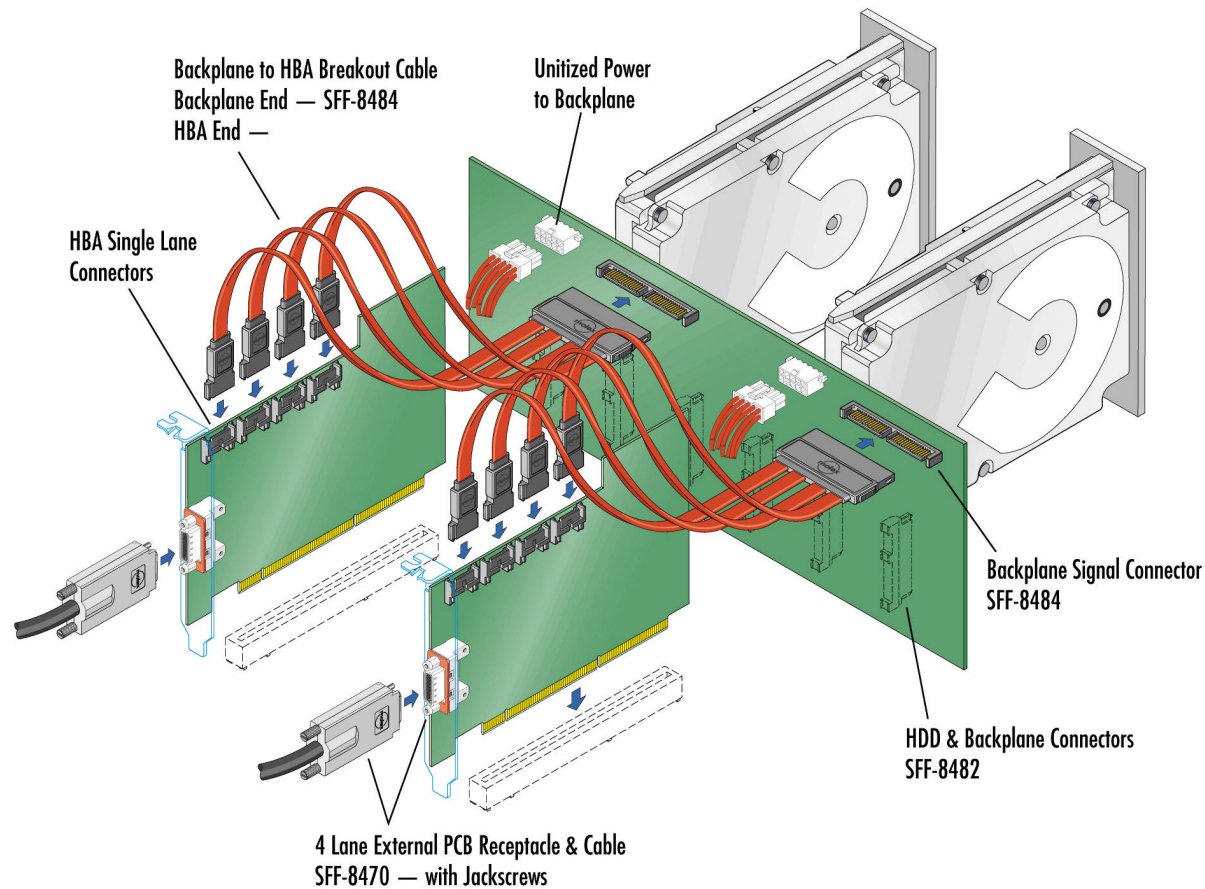
SAS Reduced Width Connectors



Serial Attached SCSI / SAS – Standards/Products as of 10/04

Typical Application 2 – PCI Redundant Adapters & Raid Controllers

(See Molex Website: www.Molex.com/productname/sas/ for Sales Drawings for these products)



Connector Products Division: Signal Integrity Group



SAS Reduced Width Connectors

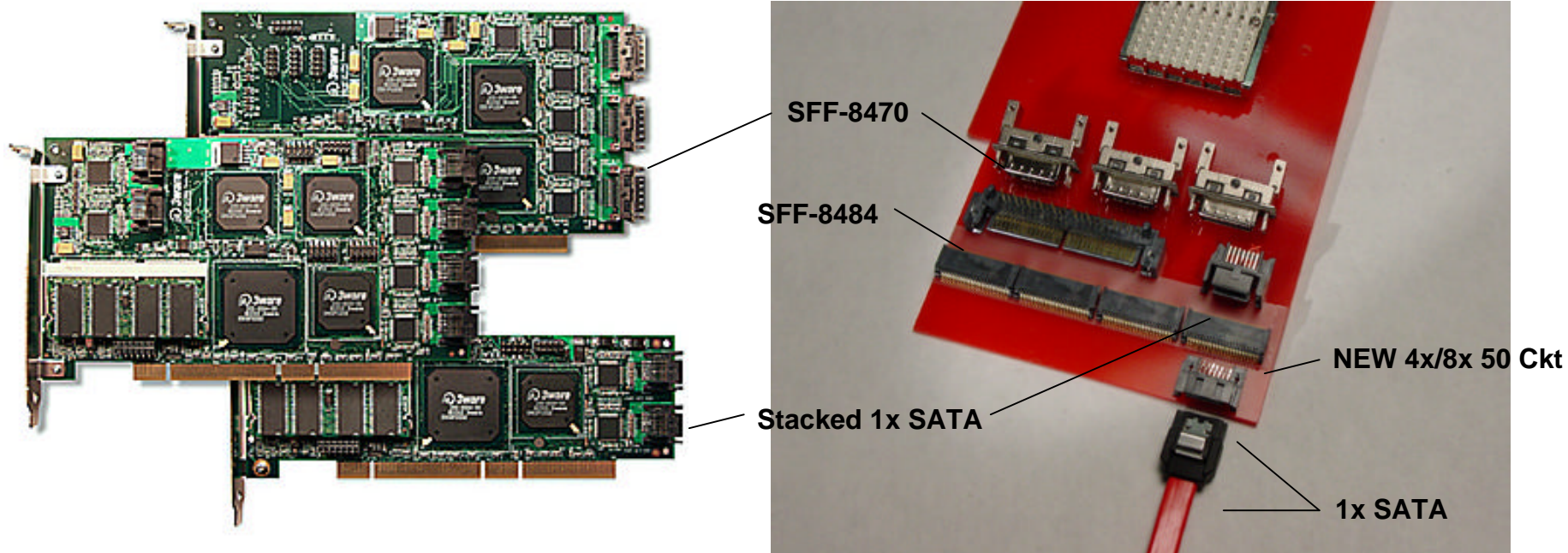


The problem with the current products & standards:

The Physical Sizes of the 4x Internal & 4x External Connectors

-Internal requirements for 8x, 16x ports on a PCI card – SFF-8484 only (1) 4x fits

-External requirements for (4) 4x ports on a PCI Card – SFF-8470 only (2) 4x fit



SAS Reduced Width Connectors

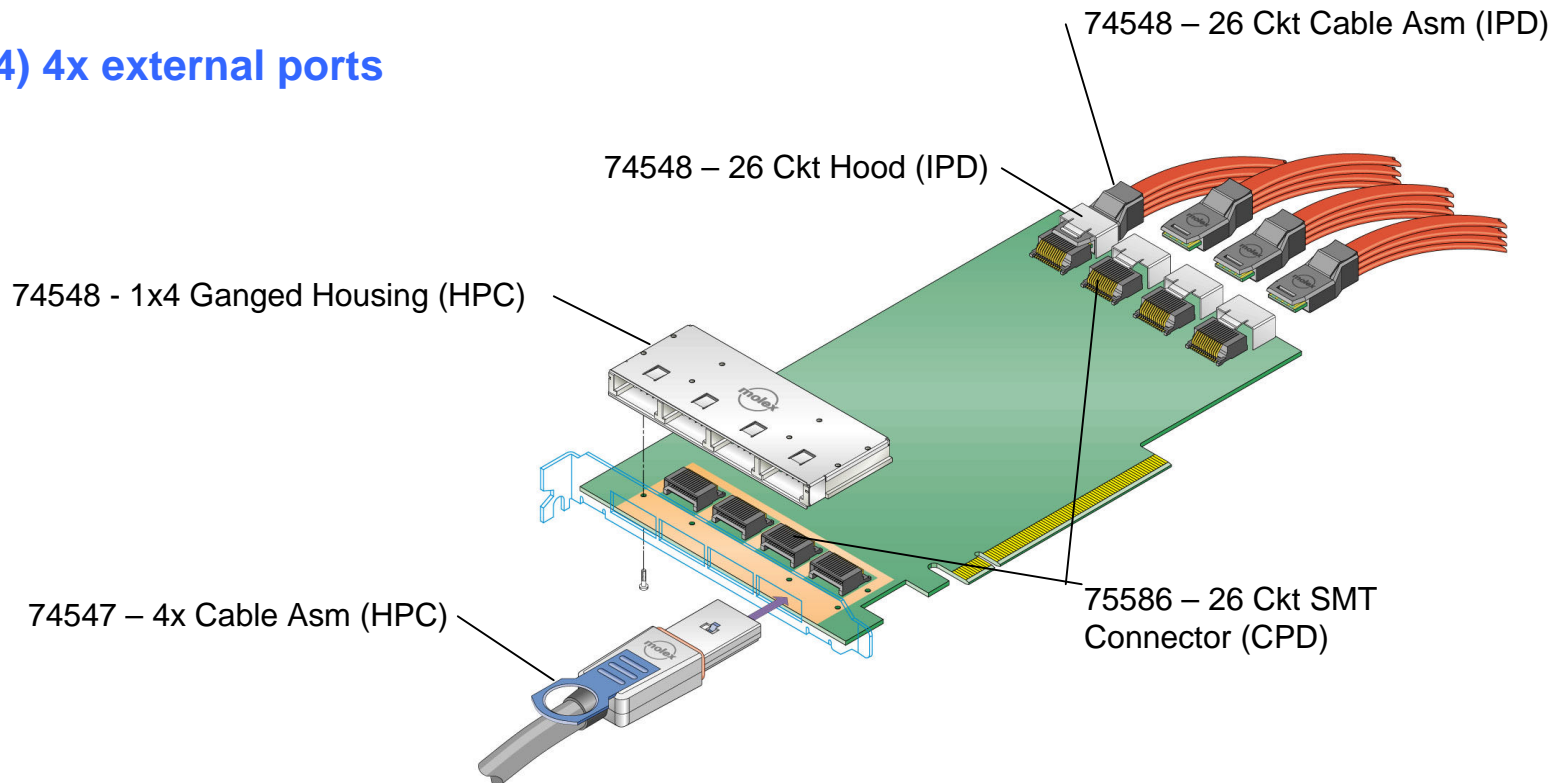


The Solution:

-A single surface mount connector can now be used for both internal and external apps
- the connector is rated at 10G (per the XFP MSA Spec)

-Enables (4) 4x internal ports

-Enables (4) 4x external ports



SAS Reduced Width Connectors



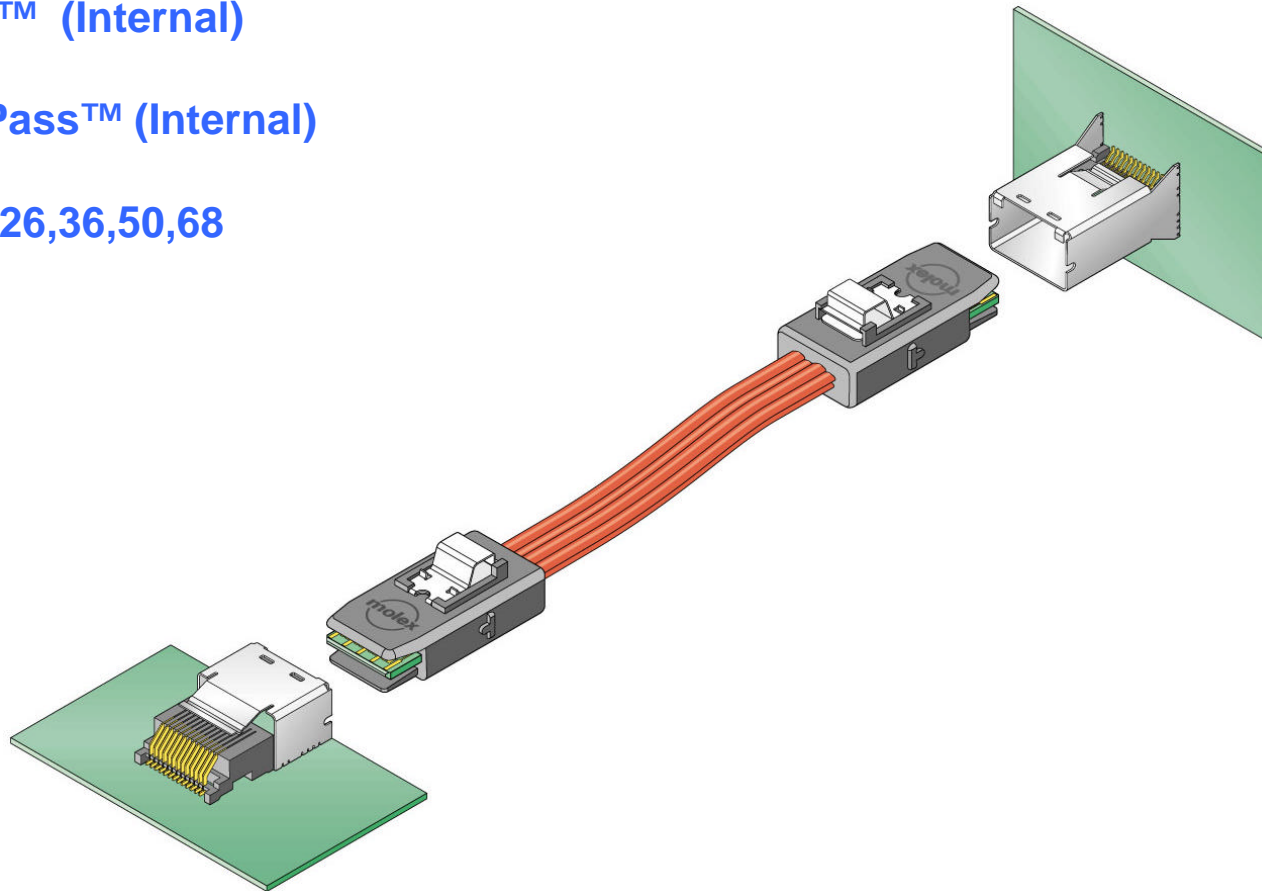
The Solution:

-A single surface mount connector can now be used for both internal and external apps
- the connector is rated at 10G (per the XFP MSA Spec)

-Vertical iPass™ (Internal)

-Right Angle iPass™ (Internal)

-Circuit Sizes: 26,36,50,68



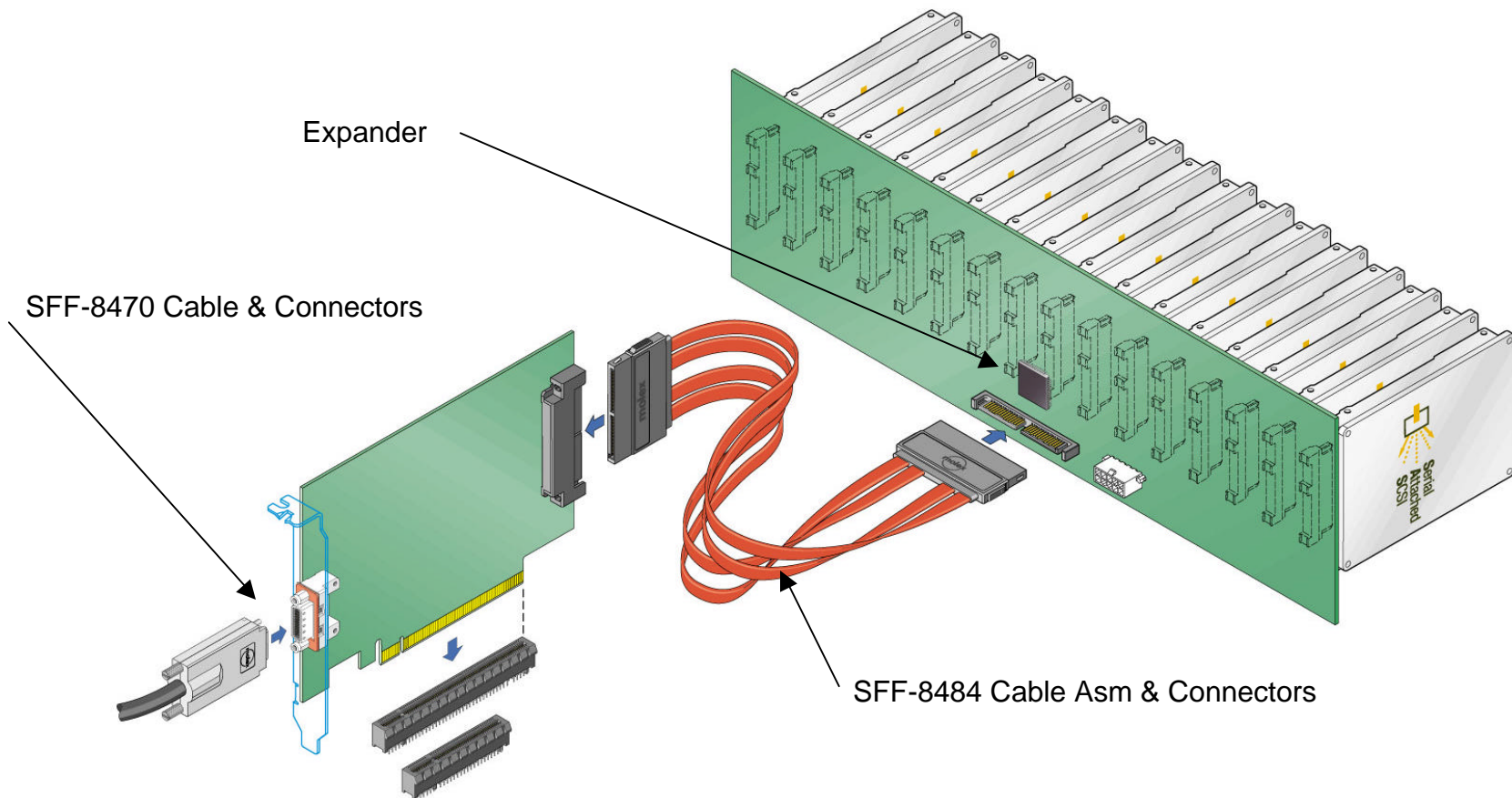
Connector Products Division: Signal Integrity Group



SAS Reduced Width Connectors



SFF- 8484 – Current Internal Connectors & Cable
SFF- 8470 – Current External Connectors & Cable



Connector Products Division: Signal Integrity Group

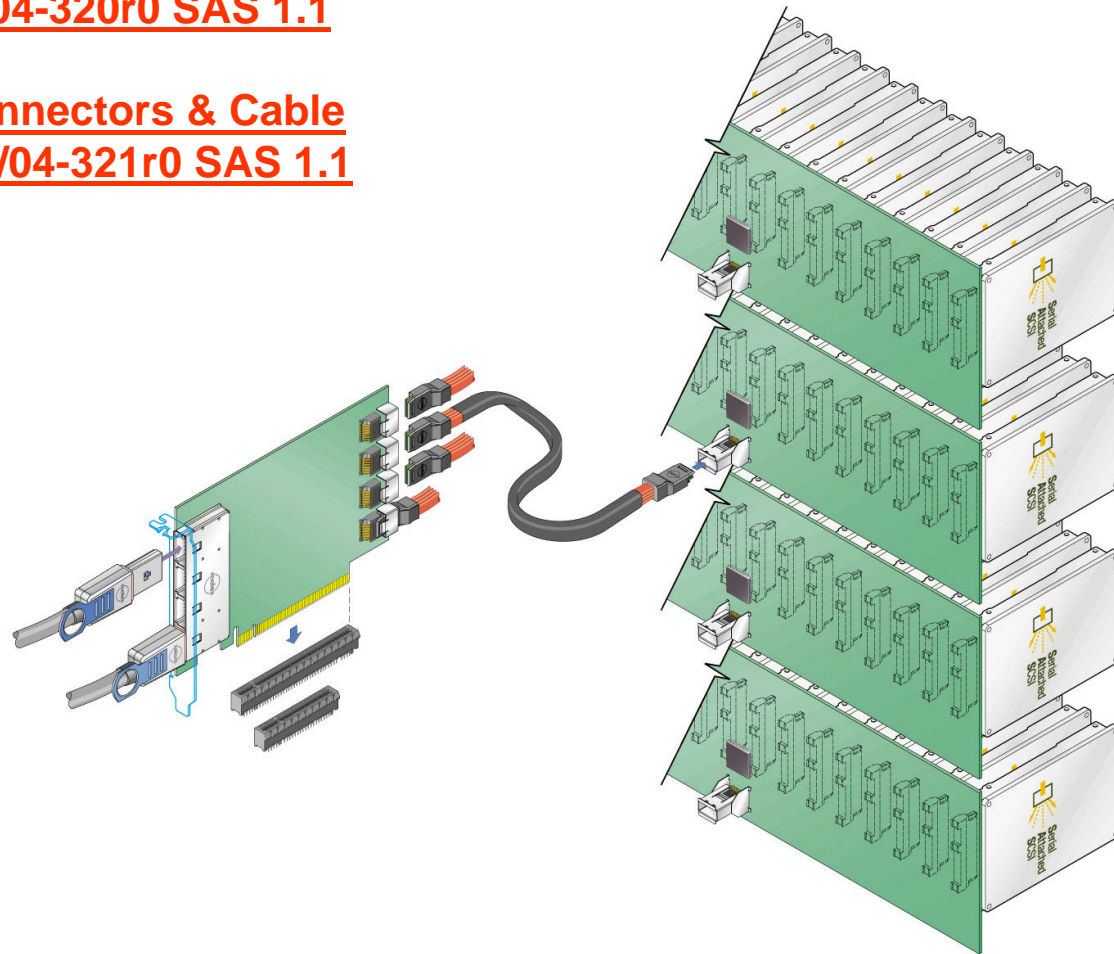


SAS Reduced Width Connectors



New Internal Connectors & Cable
SFF- 8087& T10/04-320r0 SAS 1.1

New External Connectors & Cable
SFF- 8088 & T10/04-321r0 SAS 1.1



Connector Products Division: Signal Integrity Group

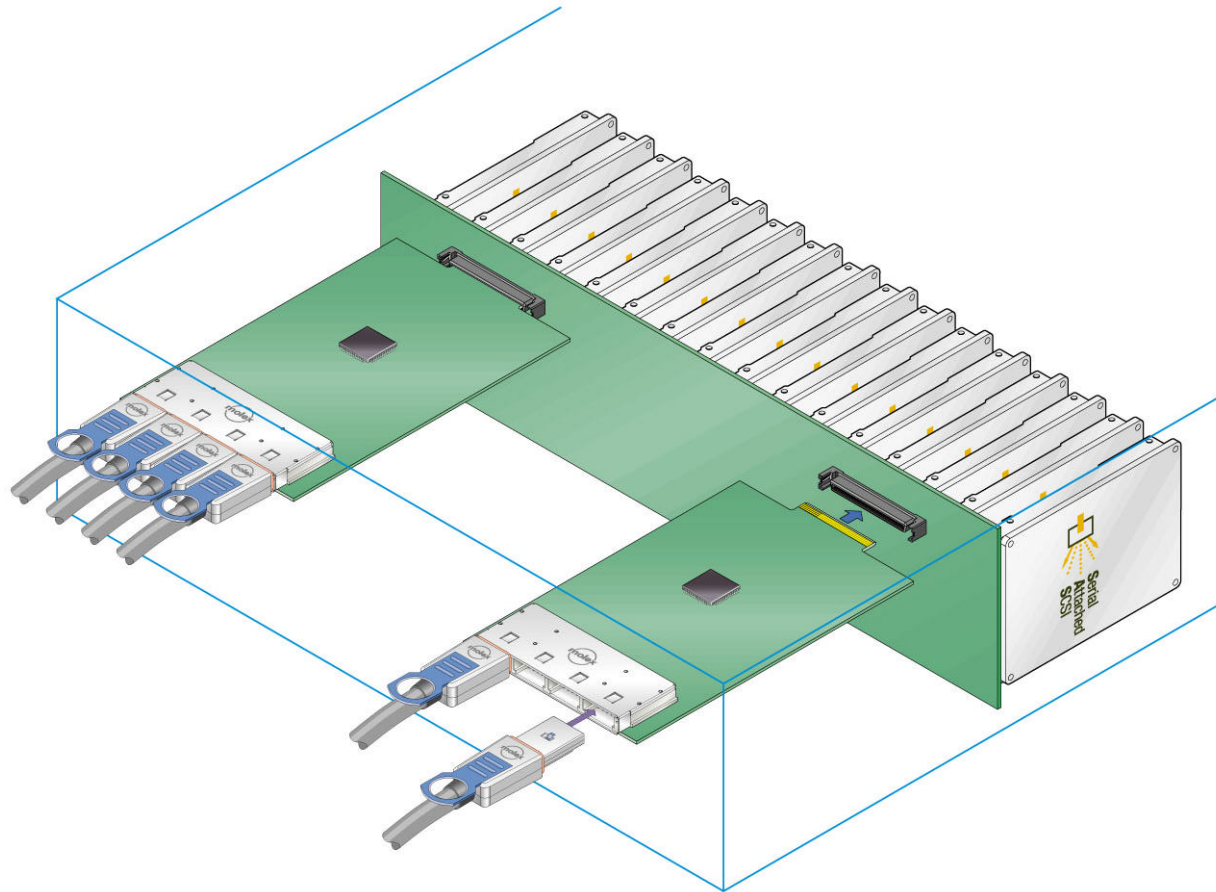


SAS Reduced Width Connectors



Proprietary Controller to Back Plane Packaging

SFF- 8088 & T10/04-321r0 SAS 1.1 New External Connectors & Cables



Connector Products Division: Signal Integrity Group

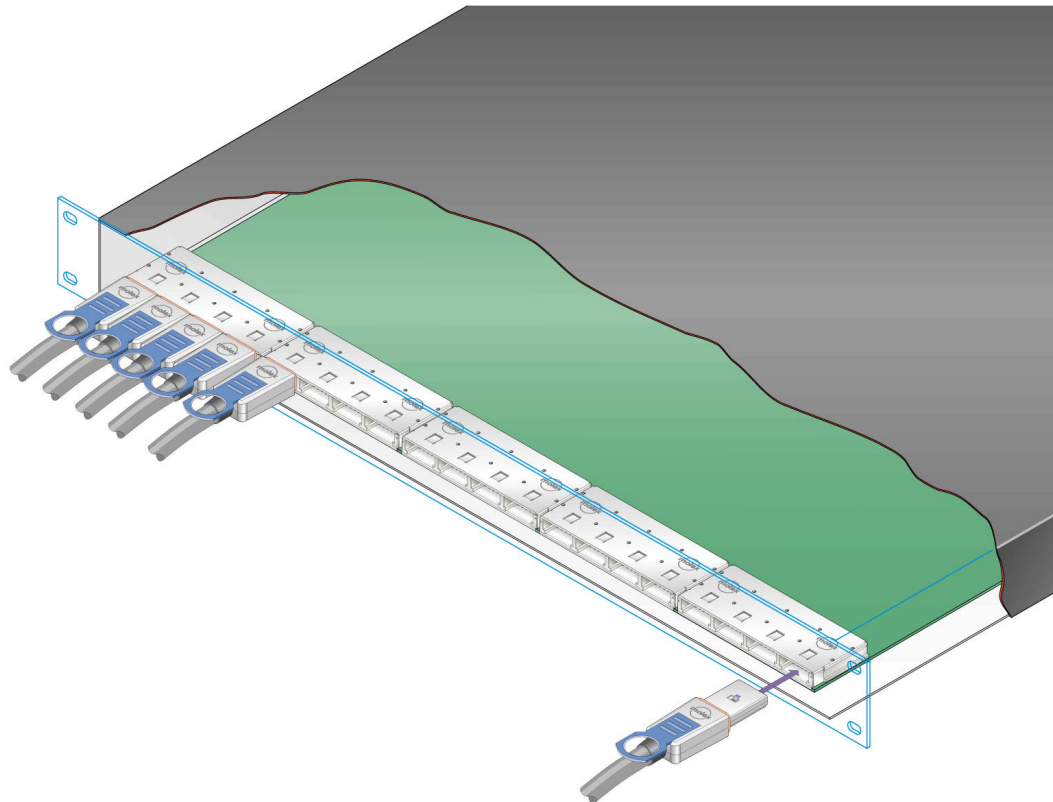


SAS Reduced Width Connectors



High Density I/O Applications

SFF- 8088 & T10/04-321r0 SAS 1.1 New External Connectors & Cables



Connector Products Division: Signal Integrity Group

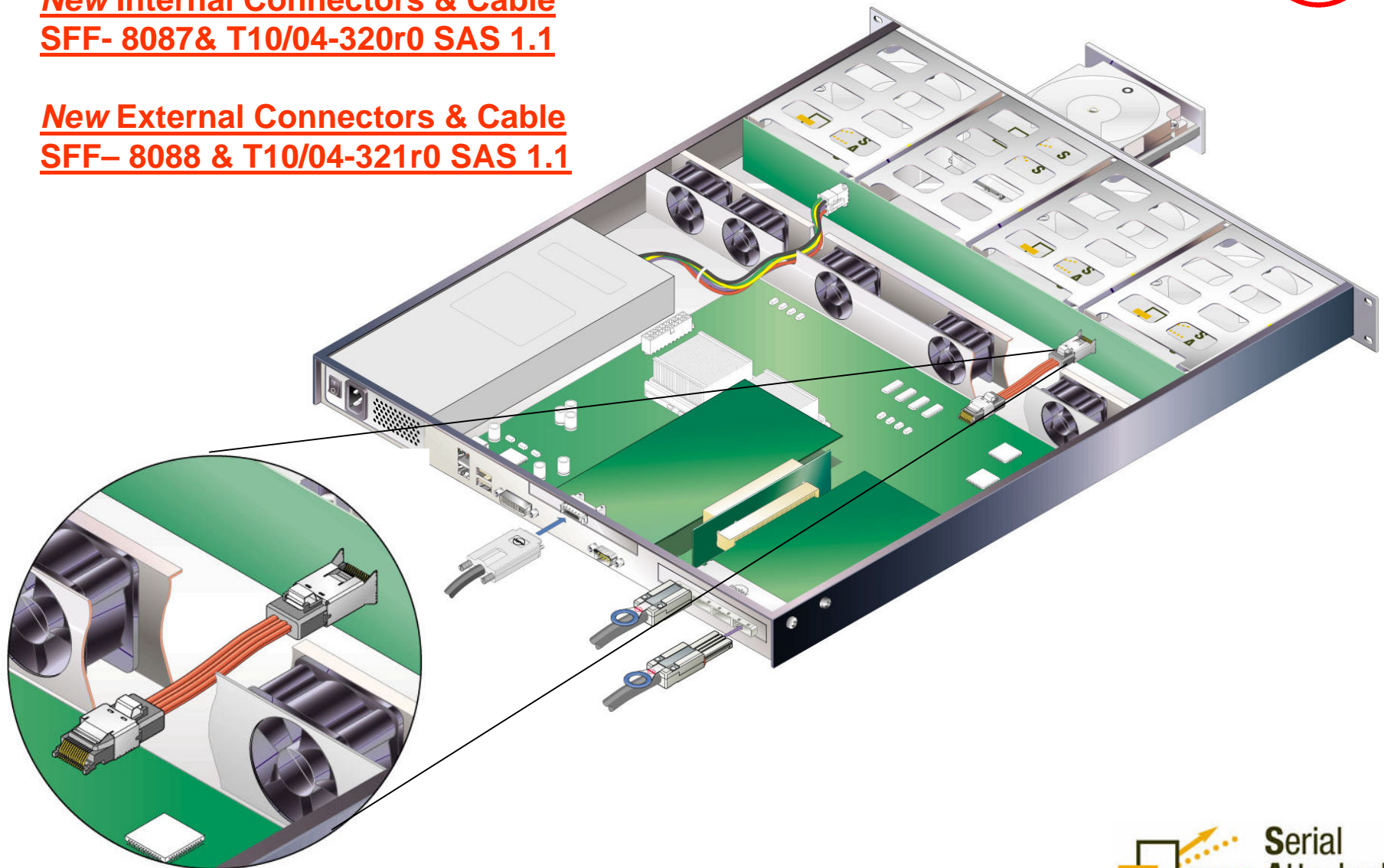


SAS Reduced Width Connectors



New Internal Connectors & Cable
SFF- 8087& T10/04-320r0 SAS 1.1

New External Connectors & Cable
SFF- 8088 & T10/04-321r0 SAS 1.1



Connector Products Division: Signal Integrity Group



■ Low Cost Host Connector:

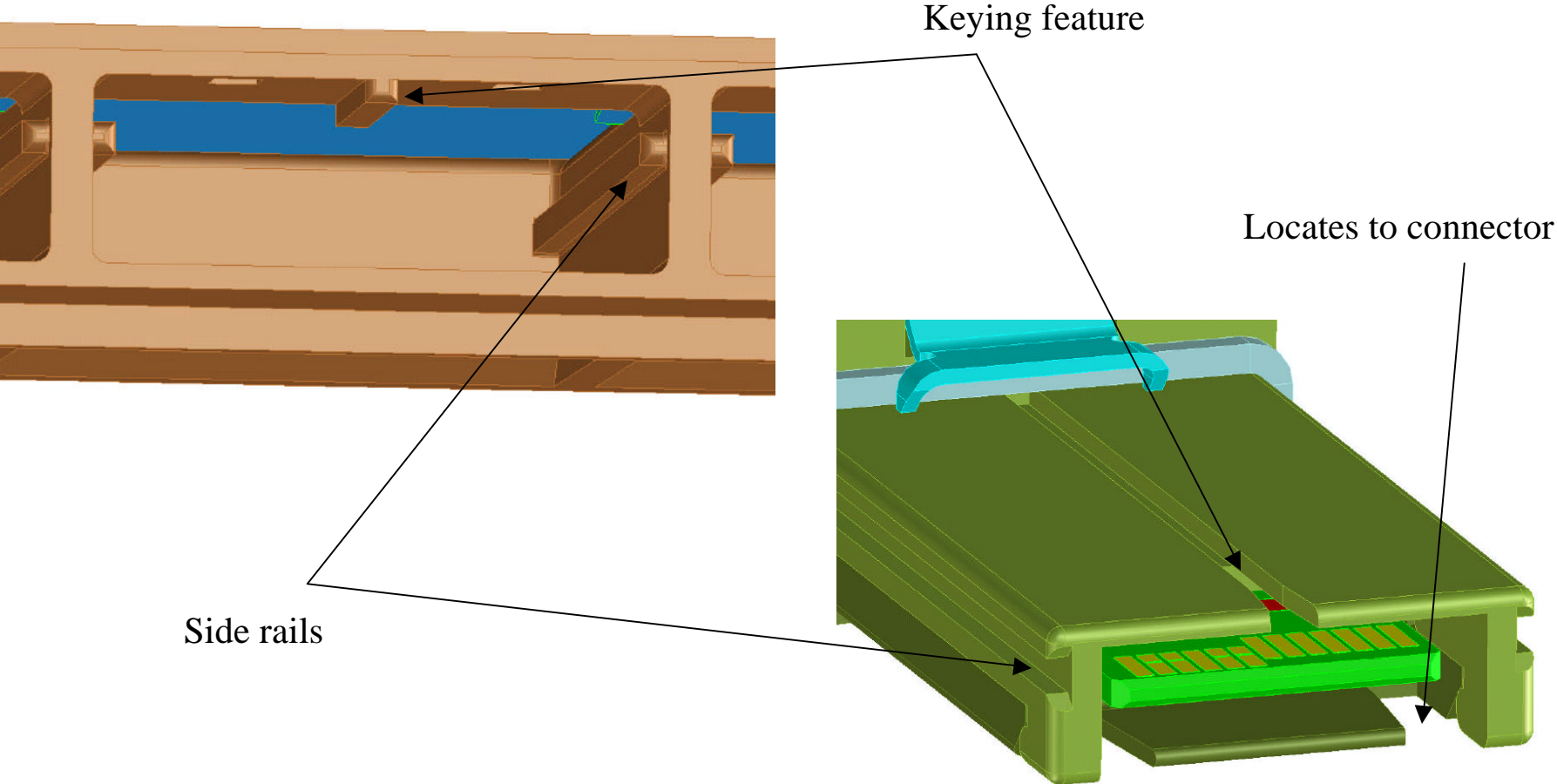
–Performance

- Meets PCI External Cabling specification for both Gen1, Gen2
- The SMT leads route out efficiently
- 10Gb/s contact interface
 - Derived from a 0.8mm pitch connector currently in volume production, the SFP/XFP/XPAK pluggable module connector
- End user visible personality keying available
- Through hole leads available if needed

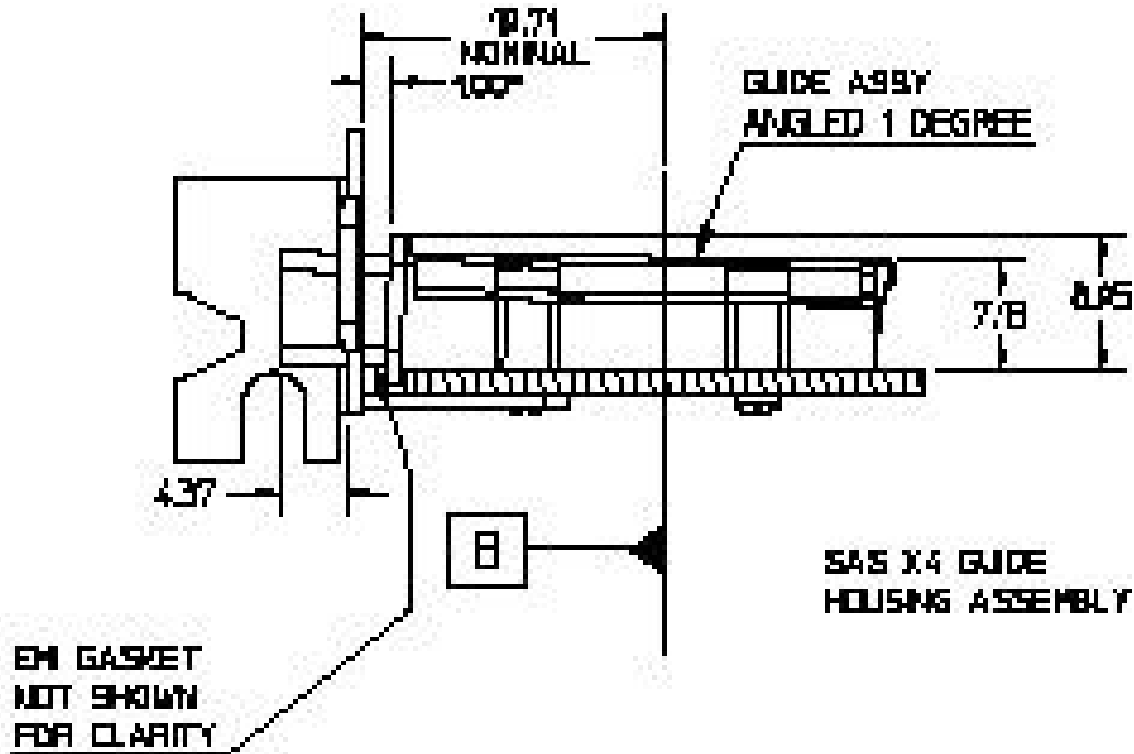
–Applications

- Low profile fits current mechanical architectures
 - PCI, PCIe, cPCI/VME, PMC/VMC, ATCA/AMC half & full high, 1U
- The SMT leads and the housing design enable high density belly-to-belly implementations

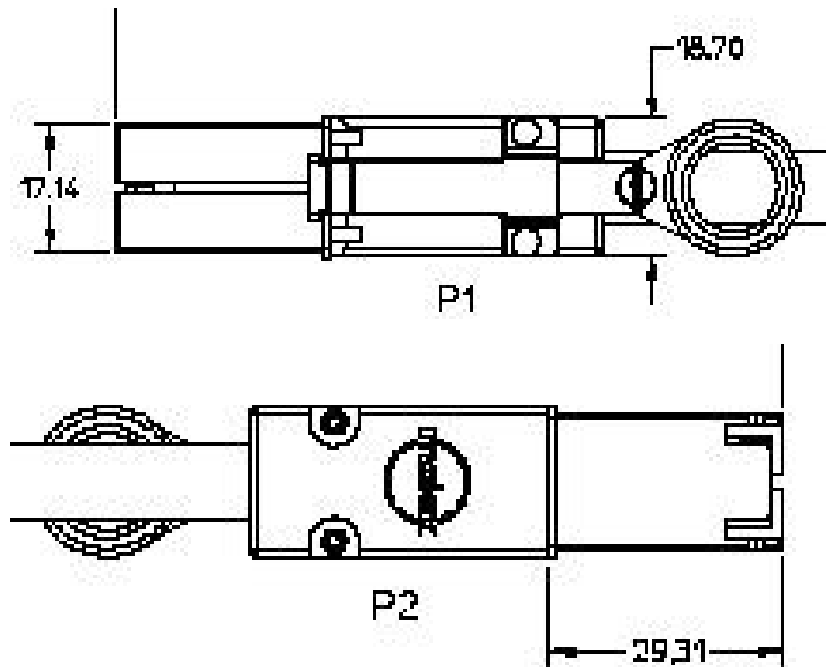
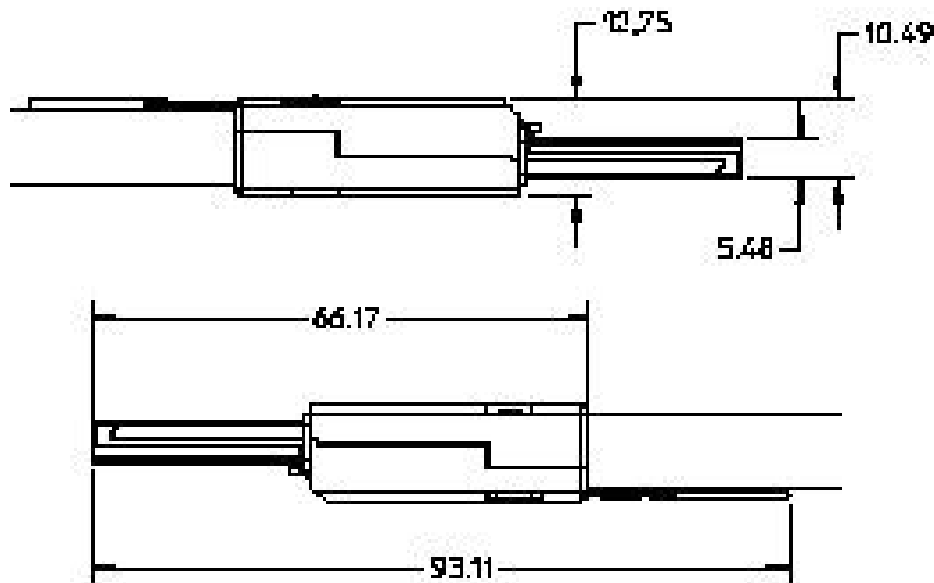
26 ckt - Guidance and alignment



36ckt - 1x4 cage - faceplate



26 ckt Cable plug dimensions

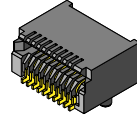


Summary

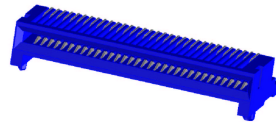
- ❖ Reduced width design allows (4) ports to be used on a standard PCI bracket vs (3) for the 8470.
- ❖ Cage and cable to faceplate gasketing provide enhanced EMI suppression.
- ❖ Reduced backshell/cable protrusion from the faceplate – 37mm vs 49mm for the 8470.
- ❖ Higher bandwidth – connector testing beyond Gen II signaling up to 10 Gb/s.

Molex iPASS™

■ Vertical and Right-Angle Connector Electrical Testing



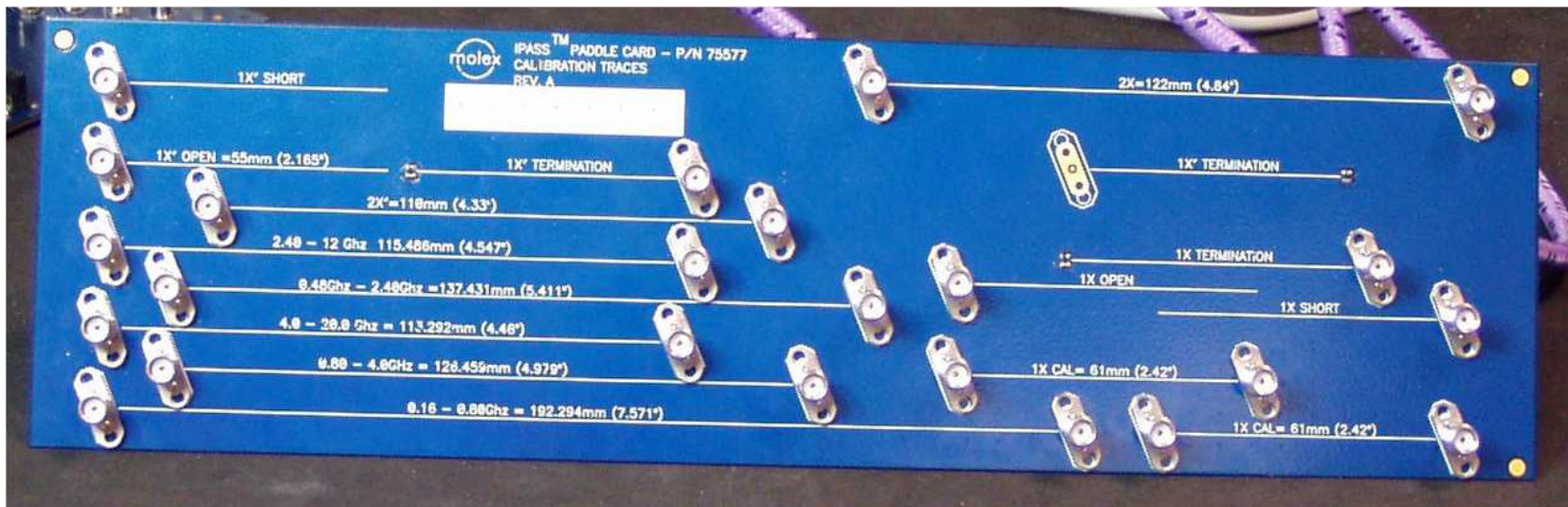
- Tested to (and beyond) XFP MSA 10G specifications
- Impedance, Insertion loss & Crosstalk (isolation) data shown
- Data collected using Agilent 8364B PNA, 4421B port expander, PLTS software, connector test vehicles



Molex iPASS™

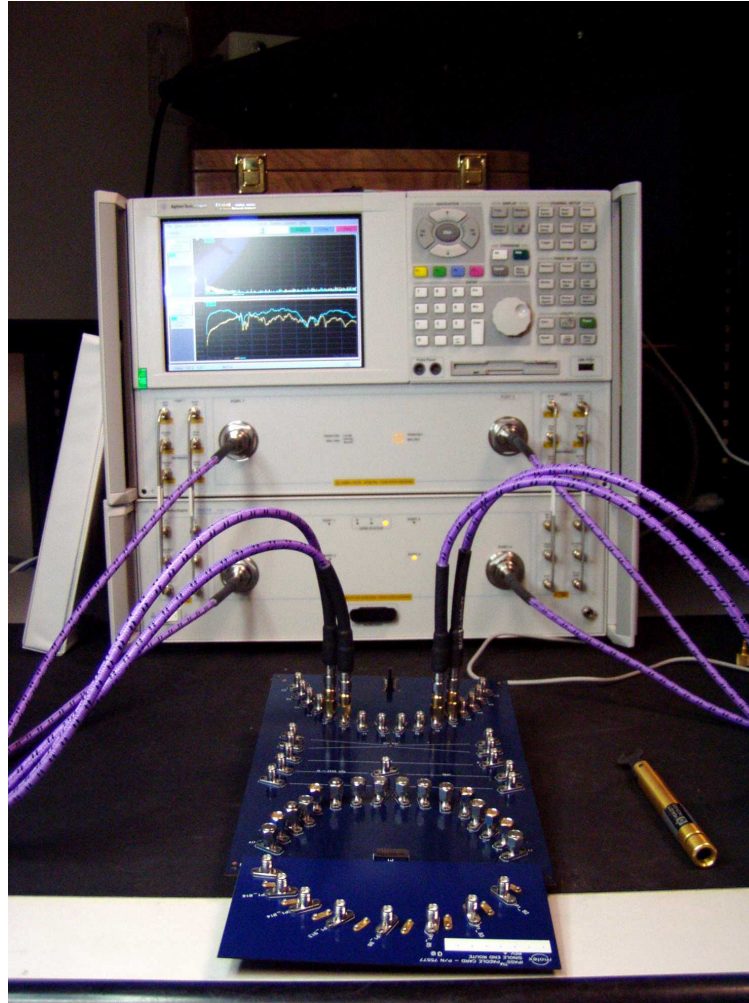
■ Vertical and Right-Angle Connector Electrical Testing

- TRL Calibration structures used, incorporating lines from 10 MHz to 20 GHz coverage
- Reference planes assigned 5 mm from connector SMT attach and edge-card contact



Molex iPASS™

■ Vertical and Right-Angle Connector Electrical Testing

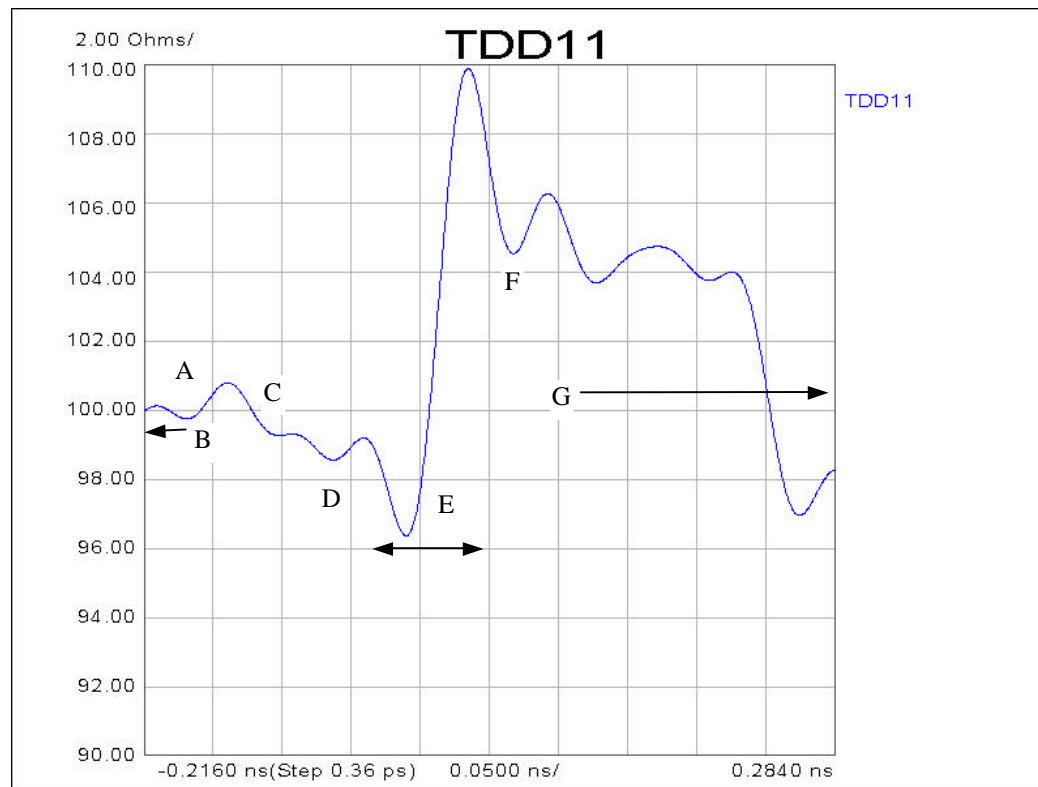


Connector Products Division: Signal Integrity Group



■ Vertical Connector Impedance

- Beyond Gen2 (10 Gb/s)
- Provides 100 +/- 10ohms Performance @ 36ps (10-90%)



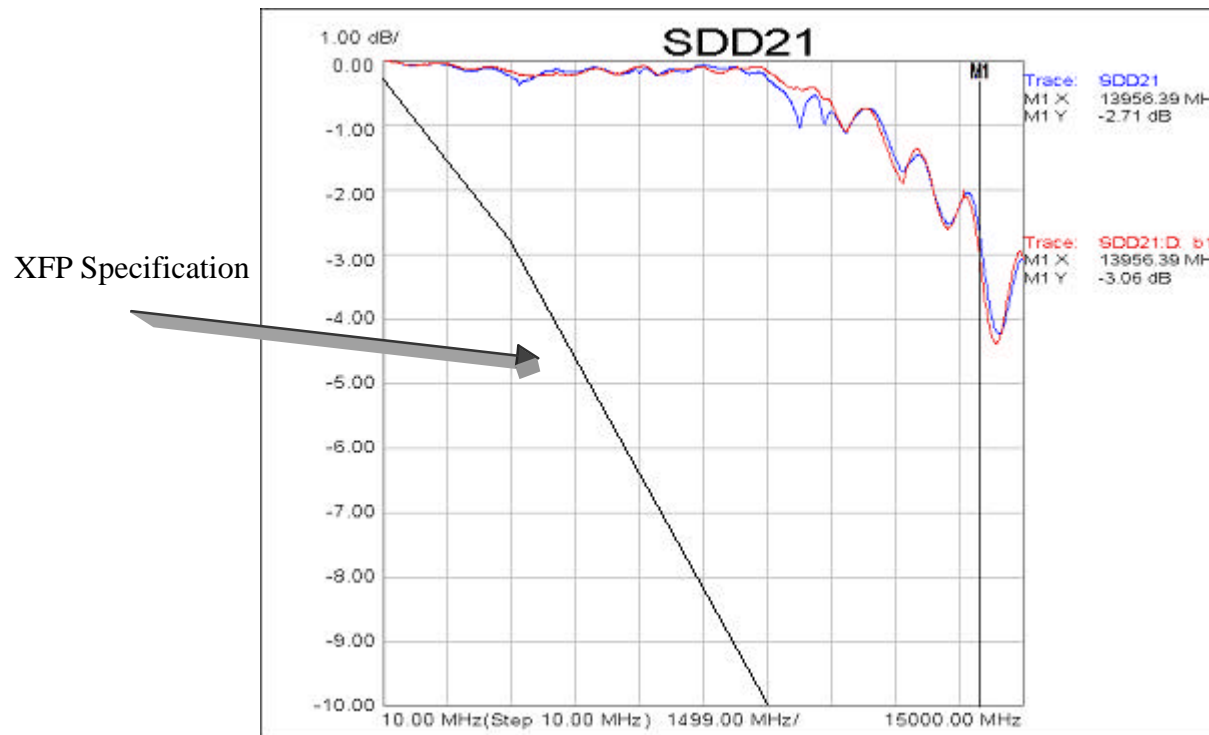
Feature Key:
A - Motherboard
B - Thru hole via
C - Microstrip
D - SMT pad
E - Connector
F - Contact interface
G - Paddle card



Molex iPASS™

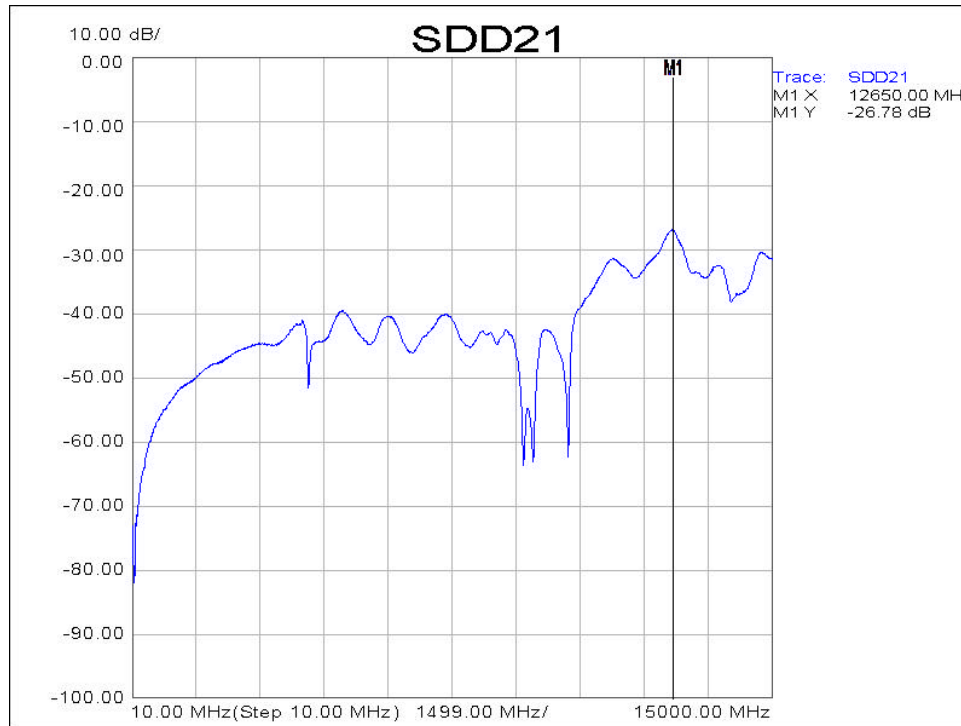
■ Vertical Connector Insertion Loss

- 3 dB threshold > 12 GHz
- XFP 10Gb/s, specification (up to 15GHz shown on b13b14 pair)



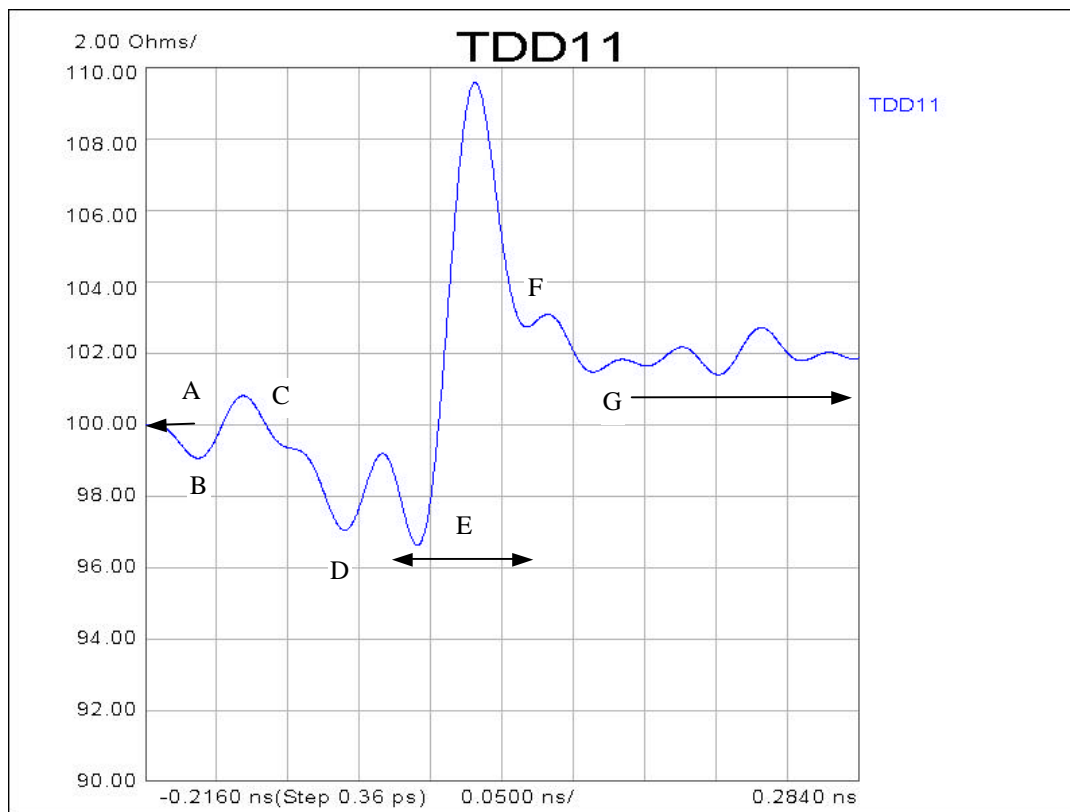
■ Vertical Connector Near-End Isolation

- Frequency-Domain Isolation, nearest-neighbor aggressor
- Swept to 15 GHz
- 26 dB threshold > 12 GHz



■ Right-Angle Connector Impedance

- Beyond Gen2 (10 Gb/s)
- Long Row Provides 100 +/- 10ohms Performance @ 36ps (10-90%)



Feature Key:

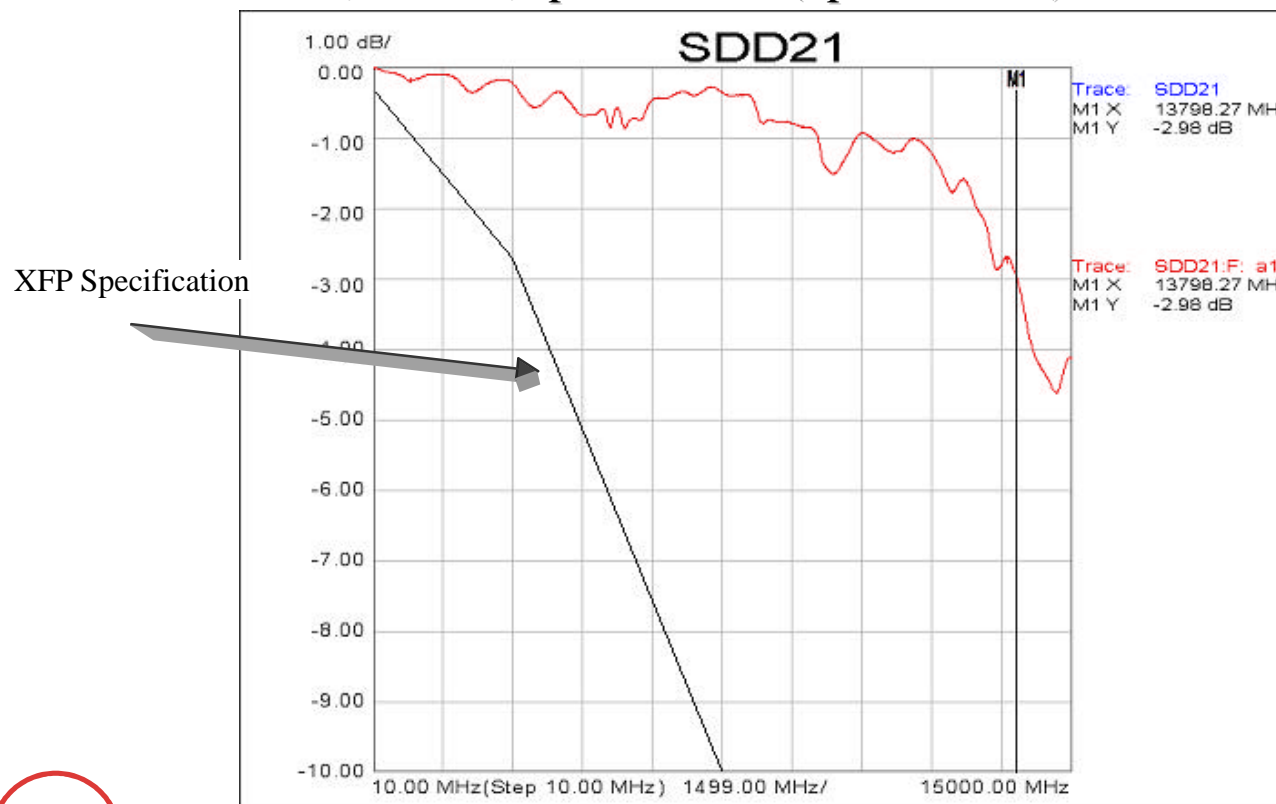
- A - Motherboard
- B - Thru hole via
- C - Microstrip
- D - SMT pad
- E - Connector
- F - Contact interface
- G - Paddle card



Molex iPASS™

■ Right-Angle Connector Insertion Loss

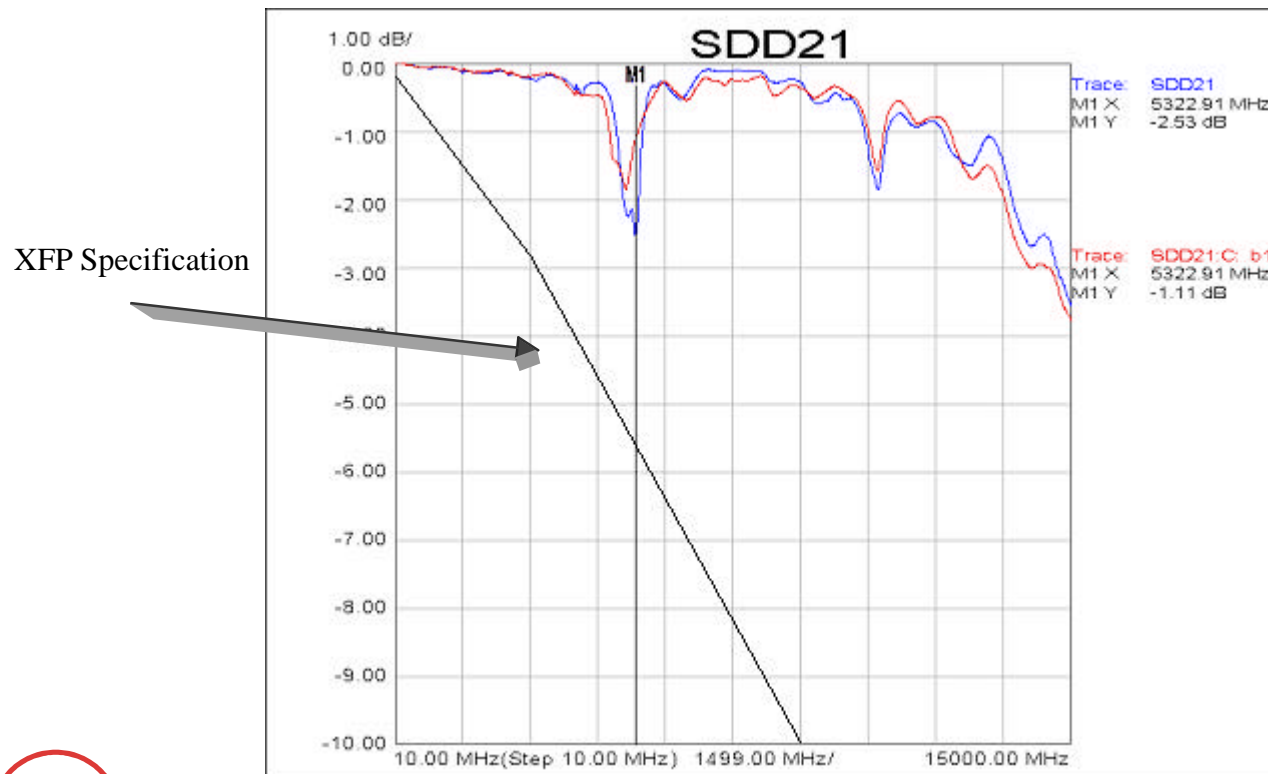
- 3 dB threshold > 12 GHz on lower row
- XFP, 10Gb/s, specification (up to 15GHz)



Molex iPASS™

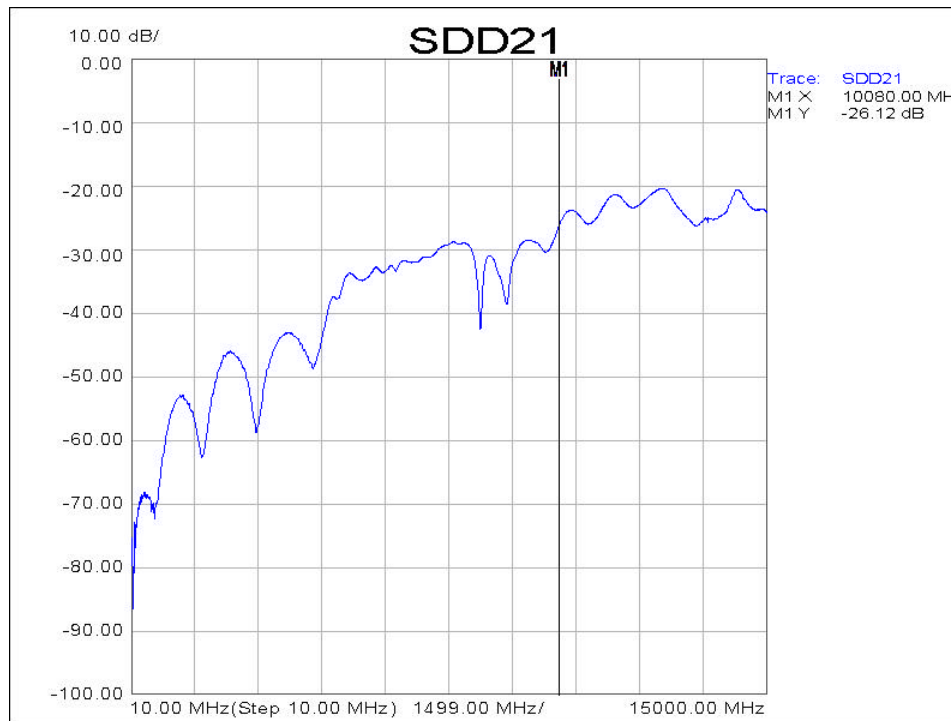
■ Right-Angle Connector Insertion Loss

- 3 dB threshold > 10 GHz on upper row
- XFP, 10Gb/s, specification (up to 15GHz)



■ Right-Angle Connector Near-End Isolation

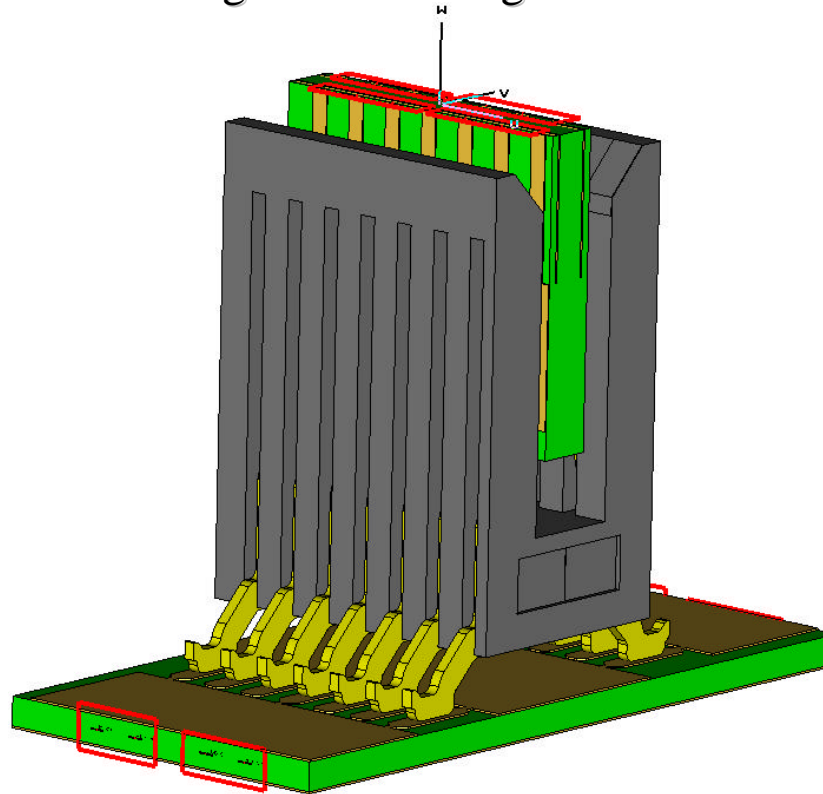
- Frequency-Domain Isolation, nearest-neighbor aggressor, long row
- Swept to 15 GHz
- 26 dB threshold at 10 GHz



Molex iPASS™

■ Frequency-domain modeling

- Connector and Channel Empirical (single pair) and Analytical frequency-domain (multipair) models available
- Analytical models generated using CST

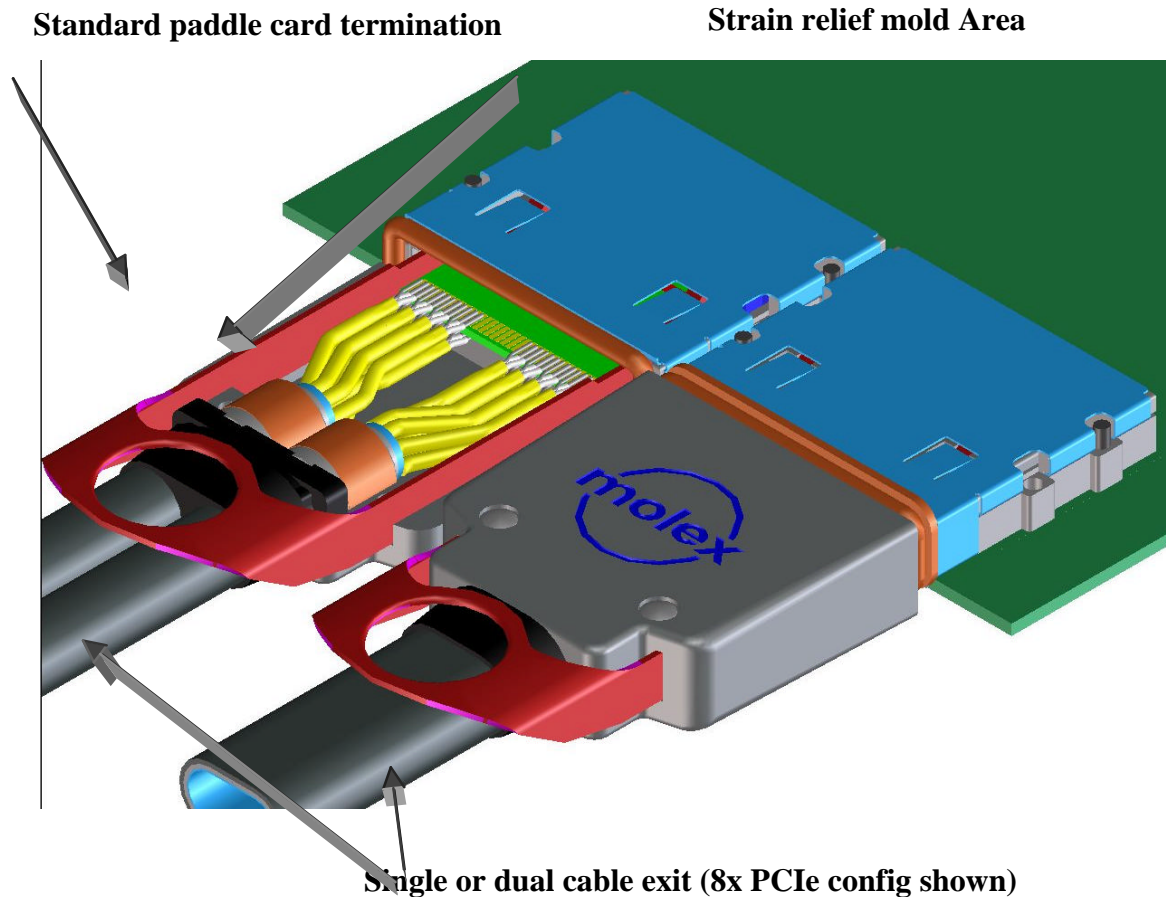


36 ckt External cables and cage

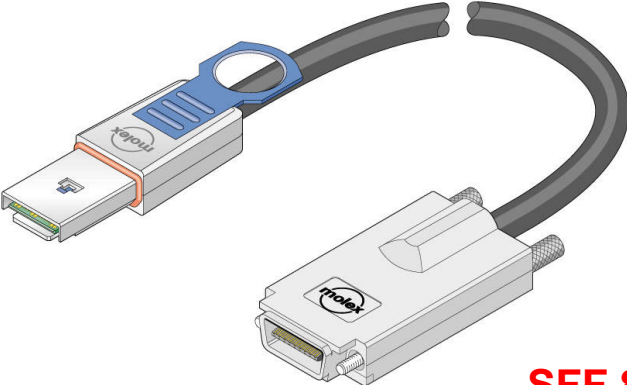
- Cable Assembly
 - Provides
 - Standard paddle card termination process consistent with current low cost methods. Compliant to the IPC 620 soldering specification.
 - Impedance controlled paddle card design enables equalization, minimizes crosstalk between pairs and provides space for the termination of 24 AWG raw cable.
 - Die cast backshell provides 360 degree shielding for EMI control and a rugged strain relief for the cable exit.
 - Low profile backshell design is compatible with the AMC (Advanced mezzanine card) form factor.
 - Epoxy molding process provides a secure strain relief for the termination area.
 - Flexible, intuitive, pull to release latch provides a reliable connection to the PCB connector and allows for stack-ability.

Molex iPASS™

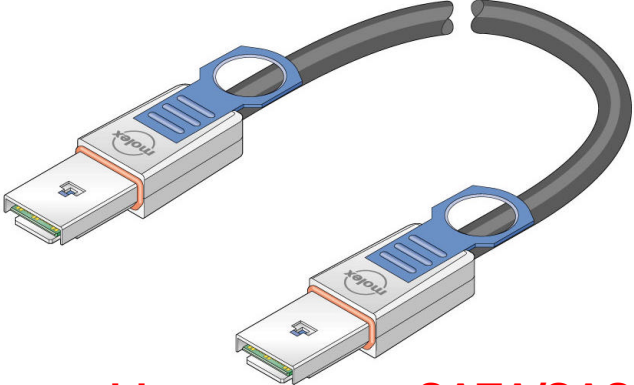
■ Cable Assembly



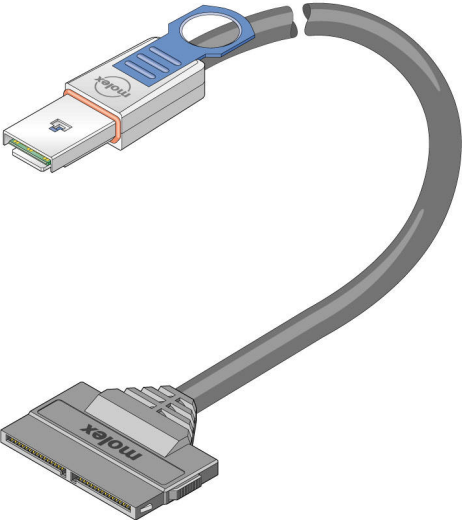
SFF 8470 adapter cables



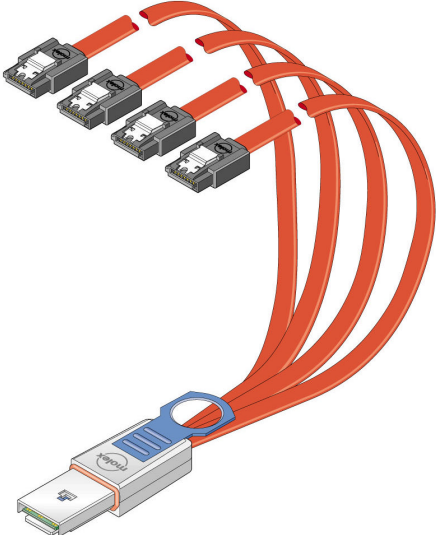
SFF 8088 external



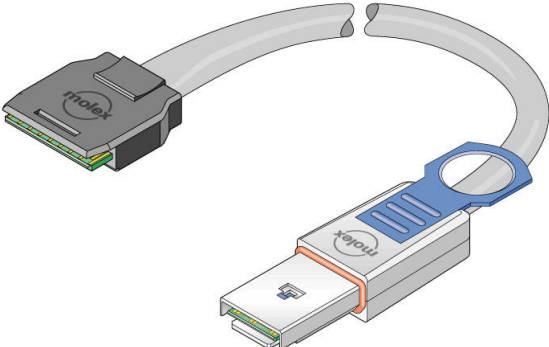
SFF 8484 adapter cables



SATA/SAS adapter cables



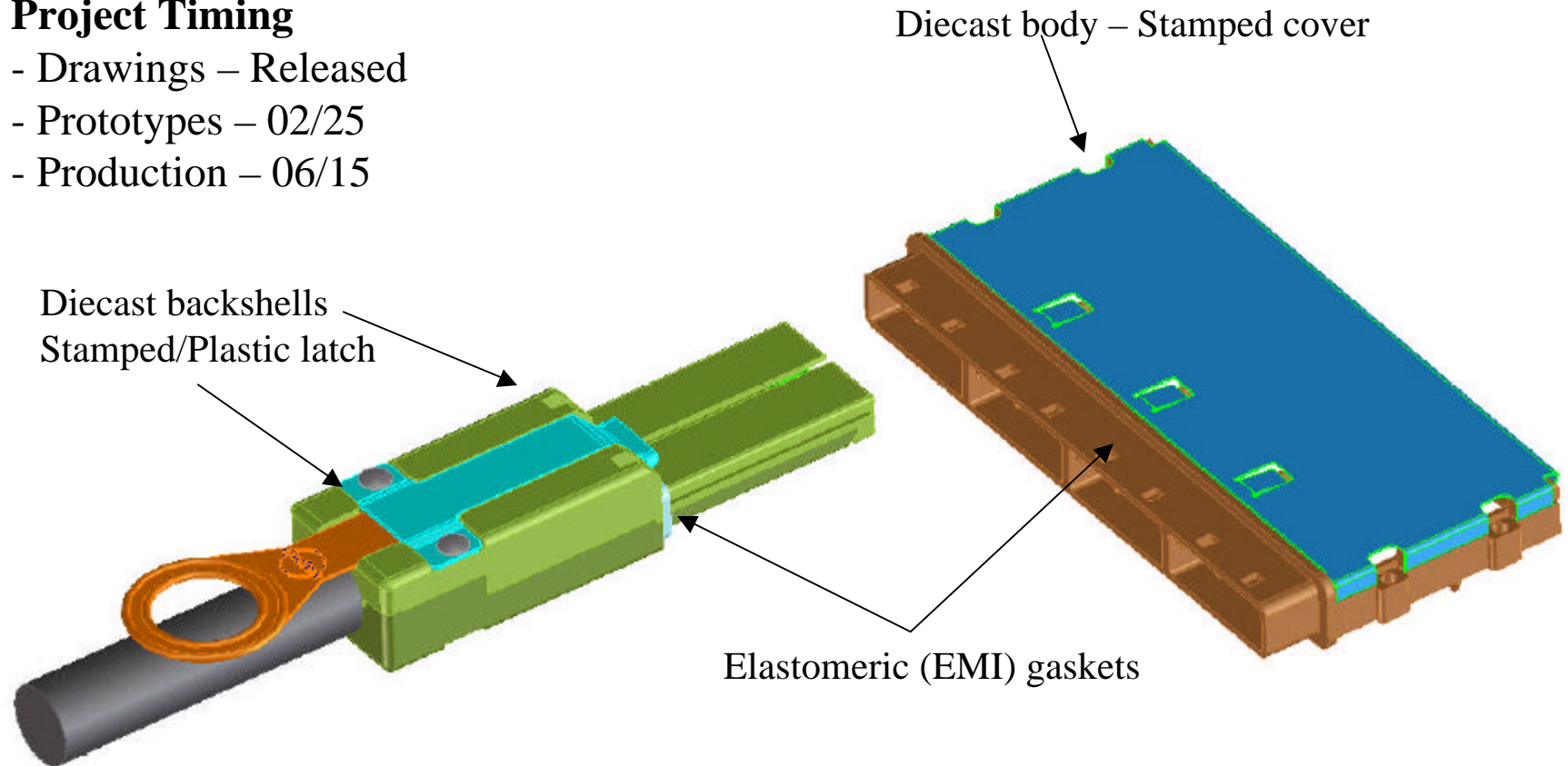
36ckt adapter cables



36 ckt - 4 port solution

Project Timing

- Drawings – Released
- Prototypes – 02/25
- Production – 06/15

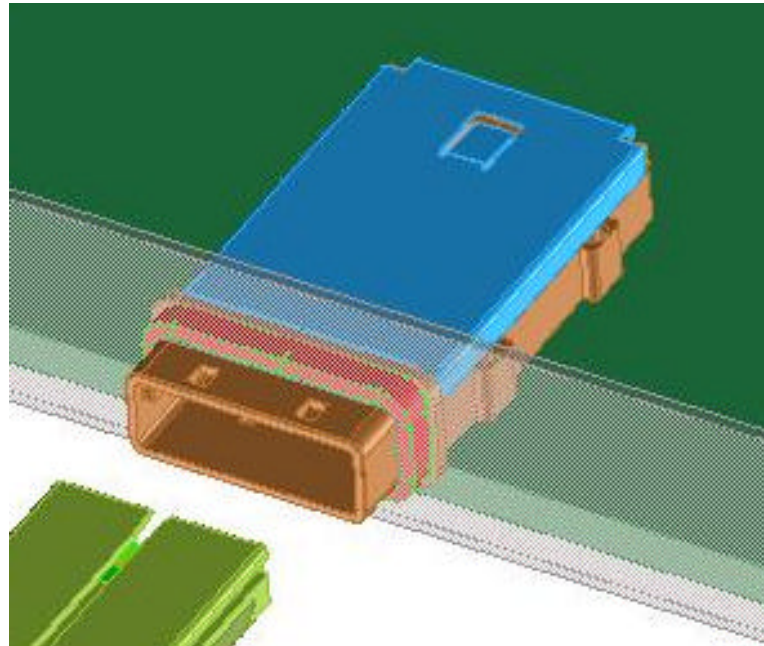


Reduced size provides 4 ports on PCI faceplate

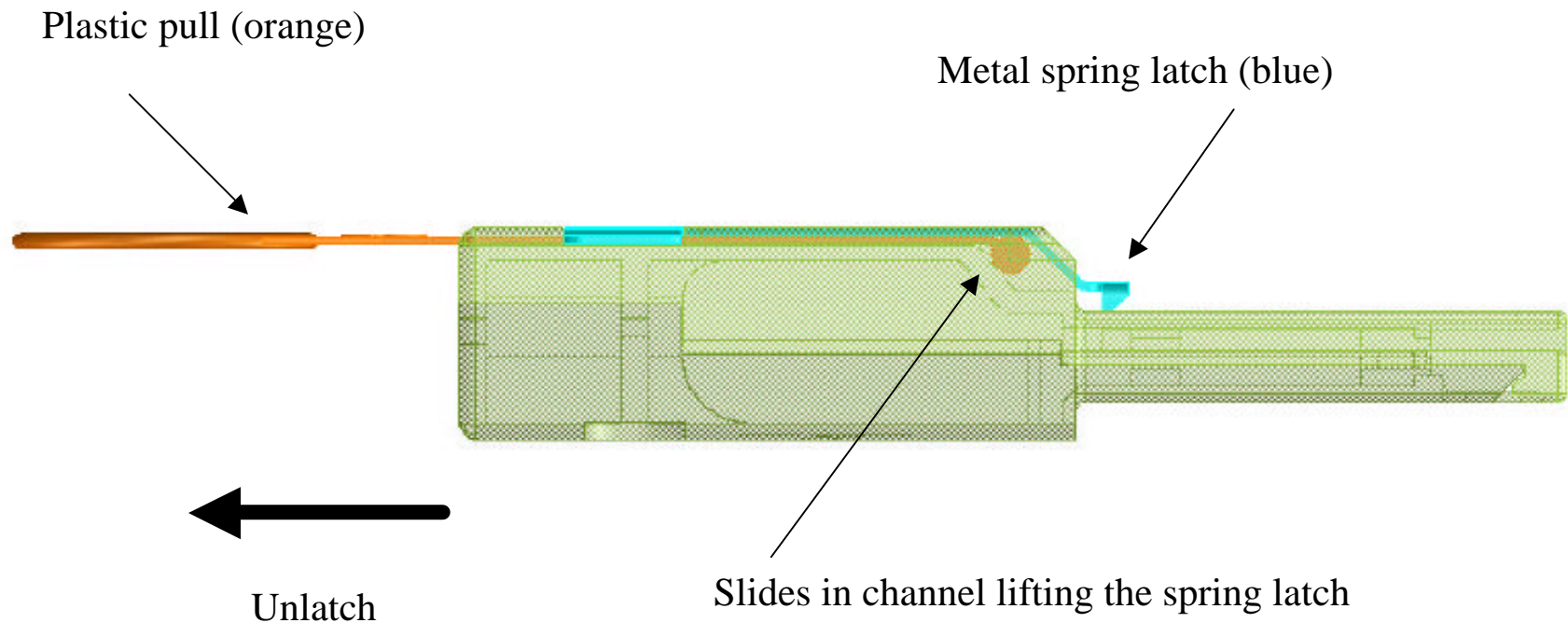
36 ckt – 1x single and 1x2, 2 port solution

Project Timing

- Drawings – Released
- Prototypes – 04/20
- Production – 08/15

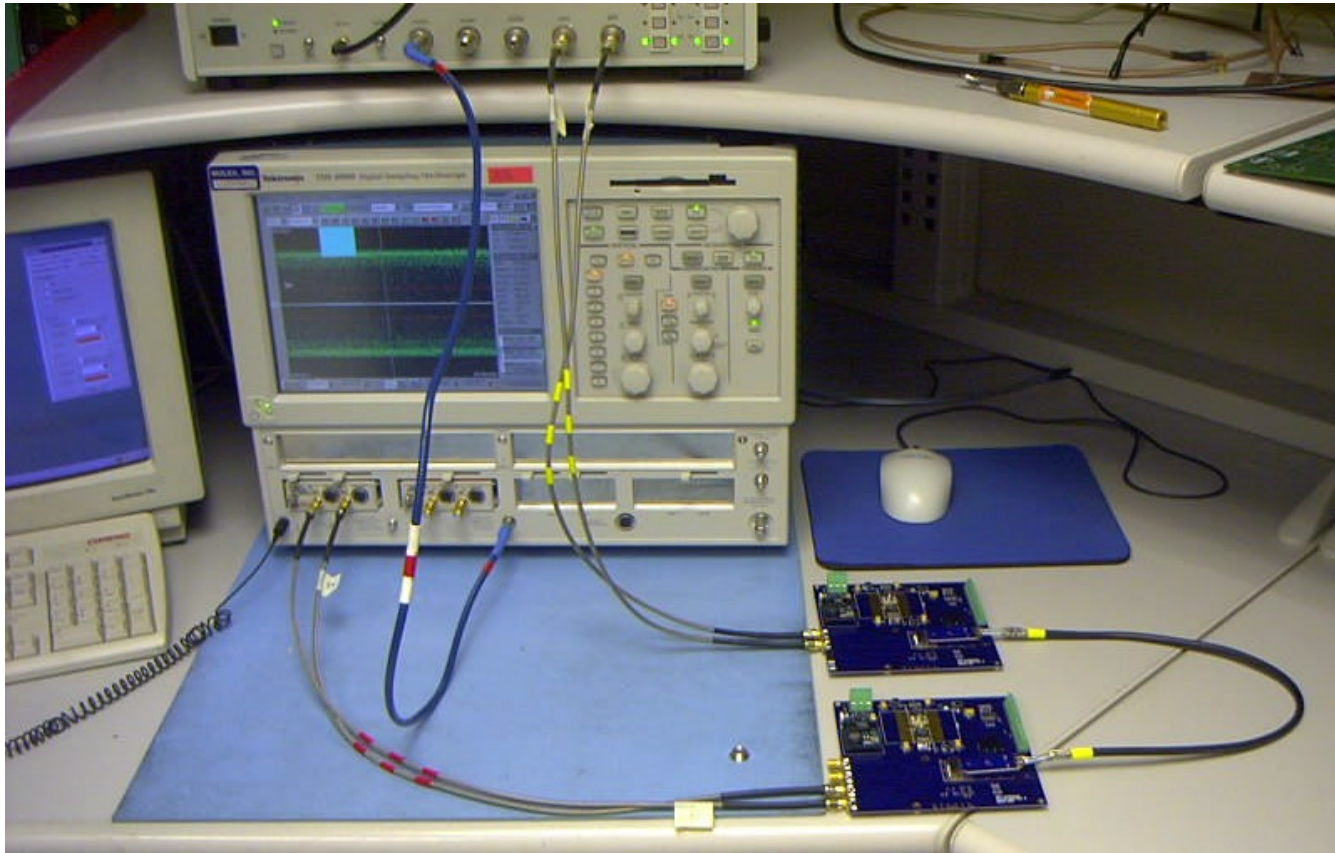


36 ckt Pull Latch function



Molex iPASS™

■ Cable Assembly Test Setup

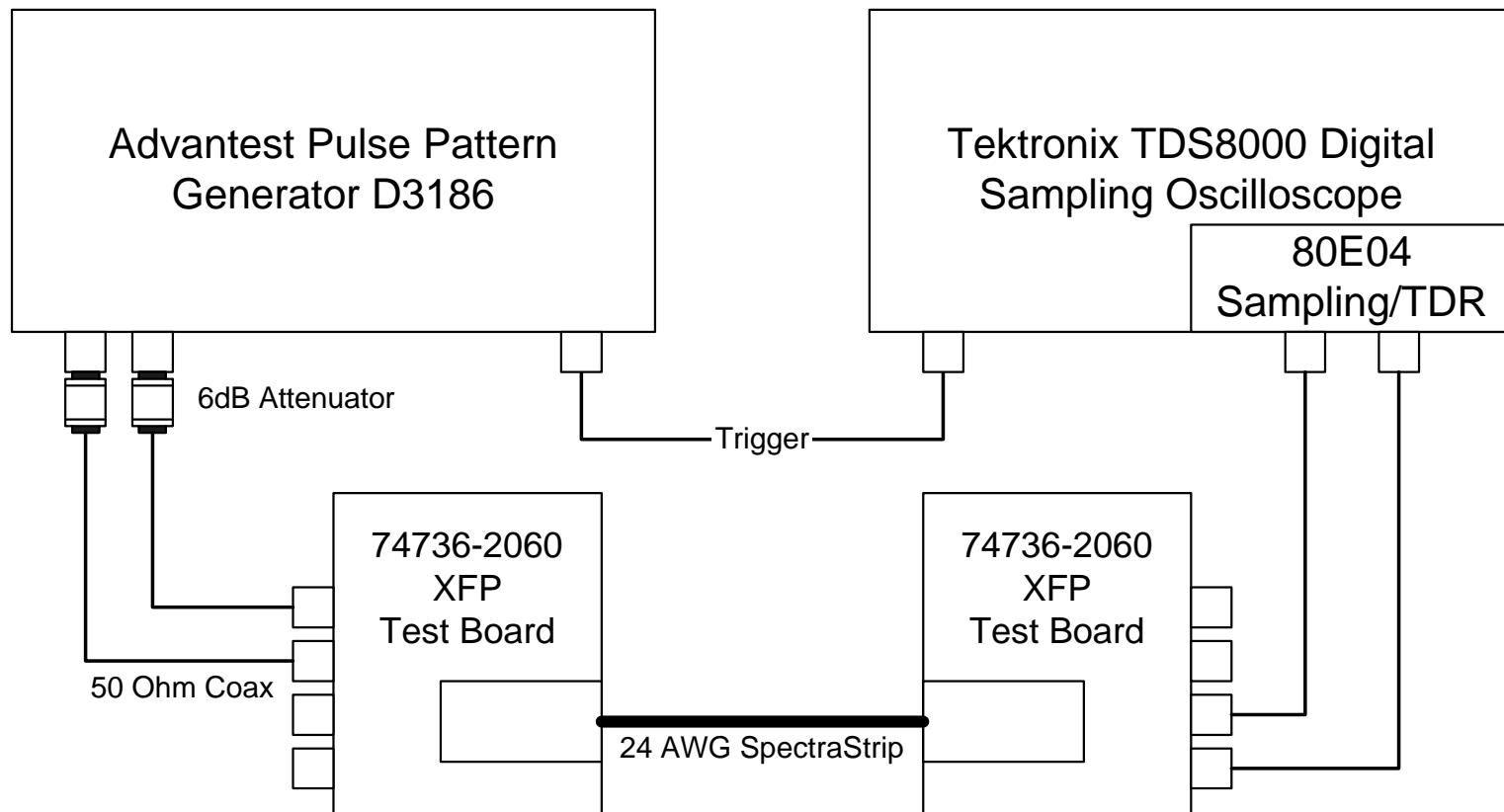


Connector Products Division: Signal Integrity Group



Serial Attached SCSI

■ Cable Assembly Test Setup Block Diagram



Molex iPASS™

■ Cable Assembly Test Setup Parameters

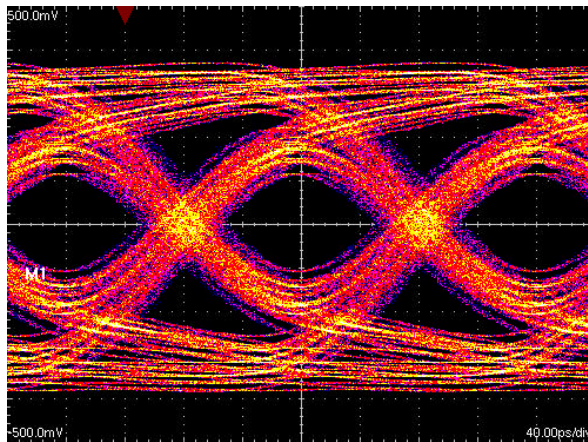
- **Signal Source:**
 - **Advantest Pulse Pattern Generator D3186**
 - **Source Rise Time:** 24 ps (20% - 80%)
 - **Data Pattern:** PBRS 2⁷-1
 - **Bit Rate (Gbps):** 6.0, 10.0
 - **Attenuation:** Attenuator (6dB)
 - **Signal Input:** 800 mVpp
- **Measuring Instruments:**
 - **Tektronix TDS 8000 Sampling Oscilloscope**
 - **Tektronix 80E04 Sampling Head**
- **Cable:** 24 AWG Spectra Strip
- **Test Board:** 74736-2060 Rev A



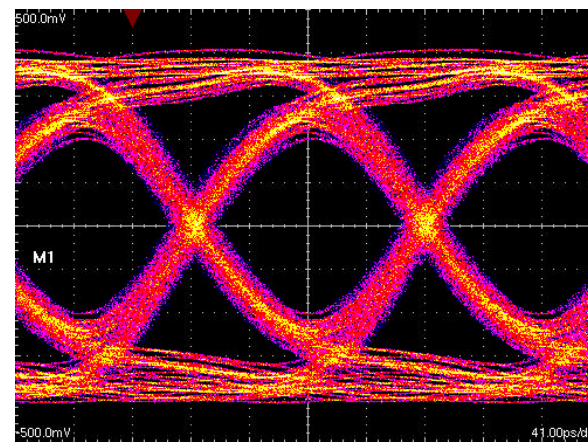
Molex iPASS™

■ Cable Assembly Eye Pattern (Gen 2, 6 Gbps)

(3 meters)



(1 meter)

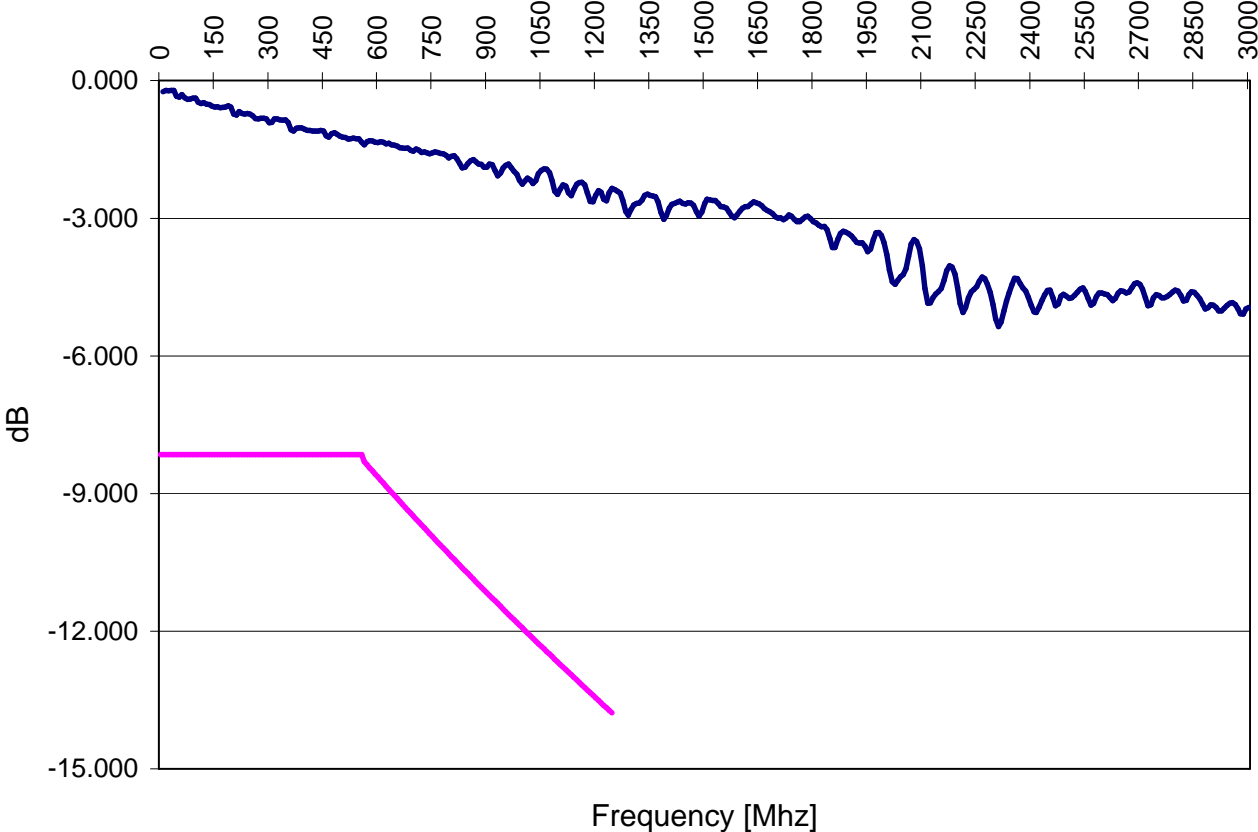


Parameters	Results (3 meters)	Results (1 meter)	Reference	Units
Voltage rail-to-rail	755.0	791.0	860.0	mVpp (diff)
Eye Height	213.5	391.9	794.6	mVpp (diff)
Jitter (pp)	62.4	37.27	10.0	ps



Molex iPASS™

■ Cable Assembly Insertion Loss (1 meter)



— PCI-X Insertion Loss Minimum

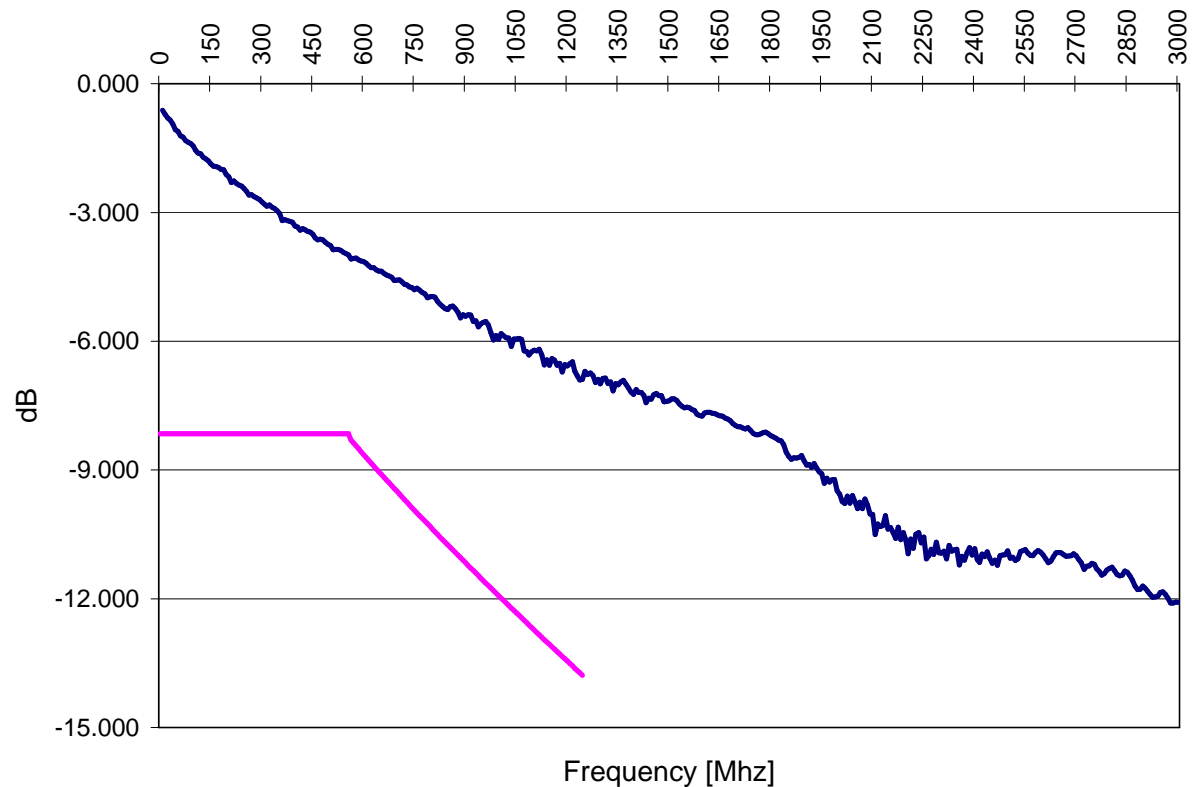


Connector Products Division: Signal Integrity Group



Molex iPASS™

■ Cable Assembly Insertion Loss (6 meters)



— PCI-X Insertion Loss Minimum

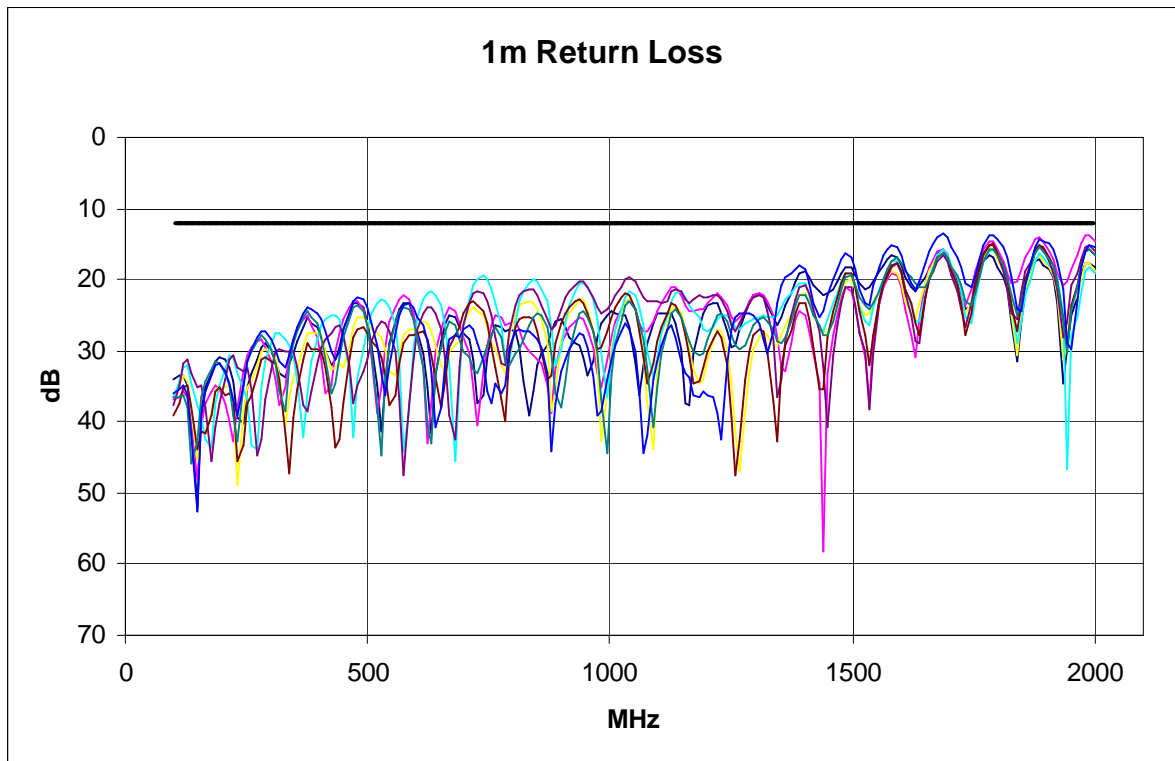
Connector Products Division: Signal Integrity Group



Molex iPASS™

■ Cable Assembly Return Loss

— 1 meter



Paddle Card Termination Similar to SAS Assembly

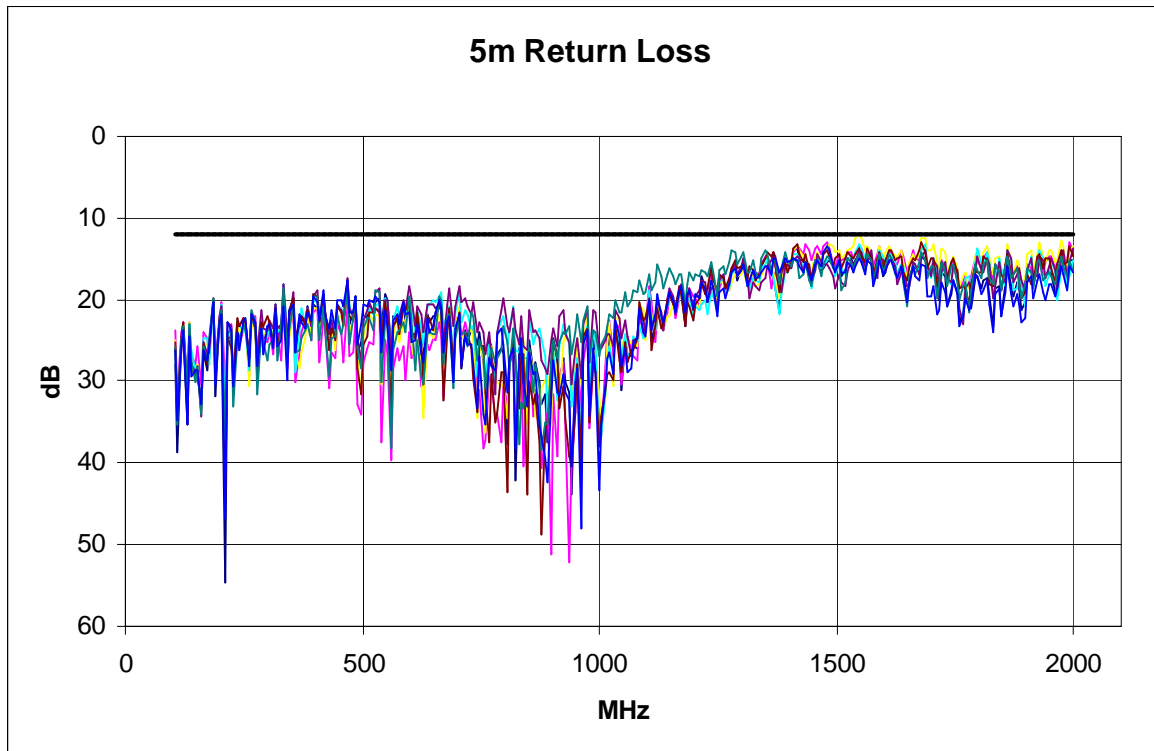
Connector Products Division: Signal Integrity Group



Molex iPASS™

■ Cable Assembly Return Loss

— 5 meters



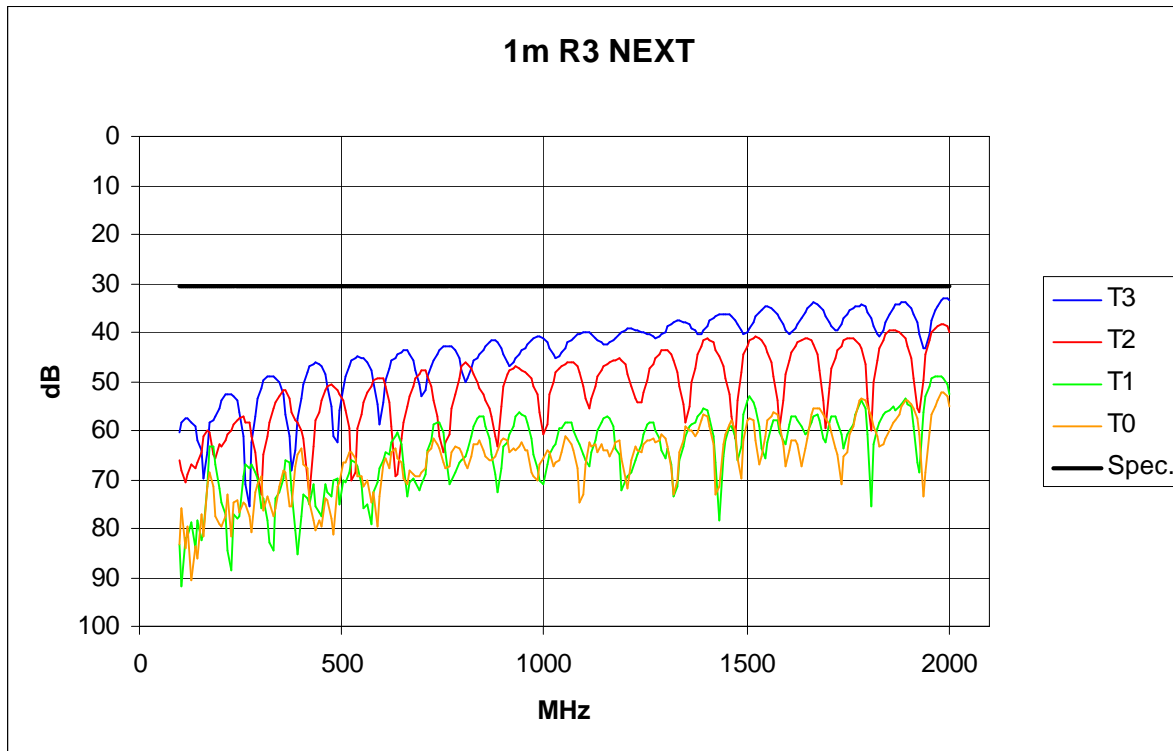
Paddle Card Termination Similar to SAS Assembly

Connector Products Division: Signal Integrity Group



Molex iPASS™

■ Cable Termination Crosstalk – (1 meter NEXT)



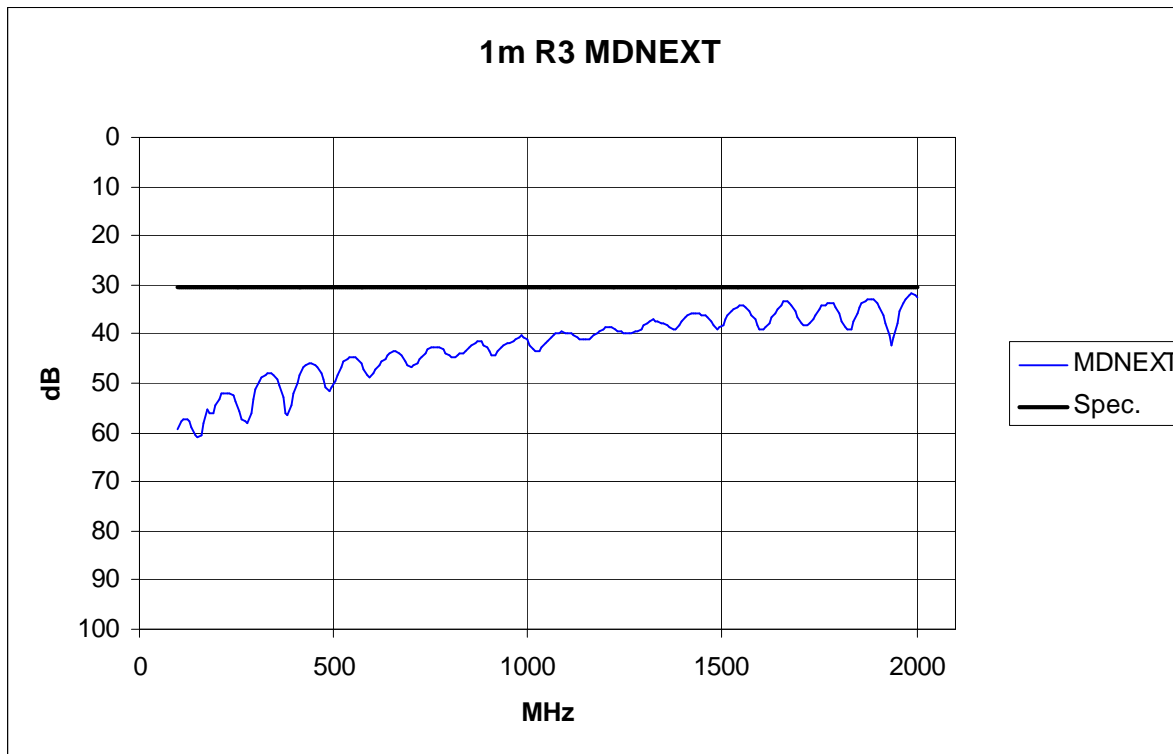
Paddle Card Termination Similar to SAS Assembly

Connector Products Division: Signal Integrity Group



Molex iPASS™

■ Cable Termination Crosstalk – (1 meter MDNEXT)

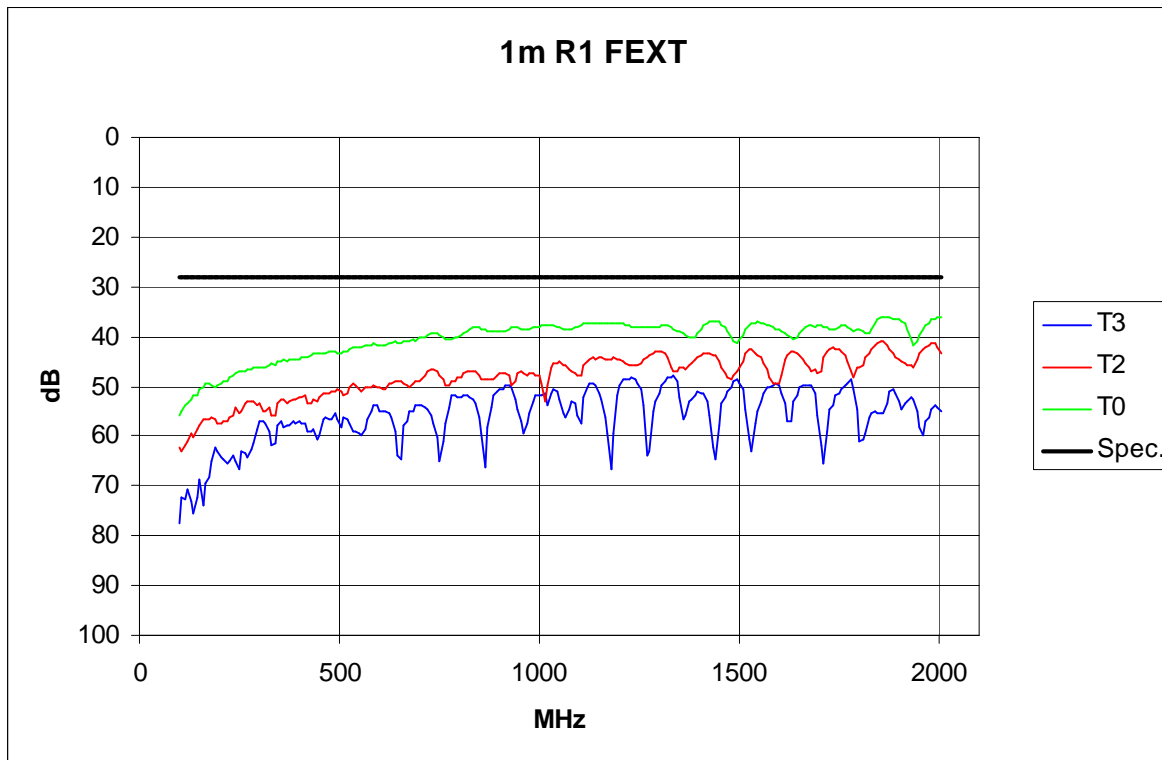


Paddle Card Termination Similar to SAS Assembly

Connector Products Division: Signal Integrity Group



■ Cable Termination Crosstalk – (1 meter FEXT)



Paddle Card Termination Similar to SAS Assembly

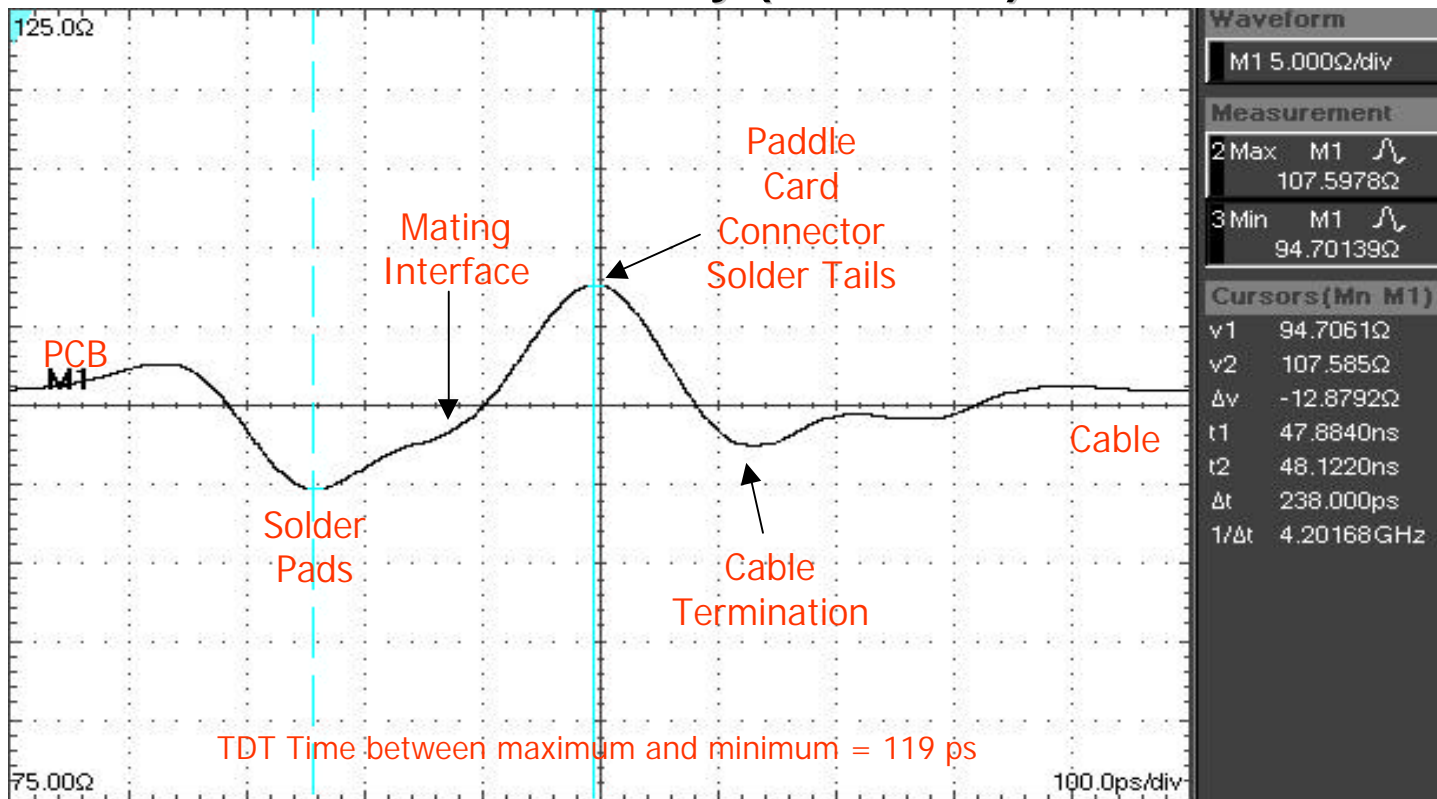
Connector Products Division: Signal Integrity Group



Molex iPASS™

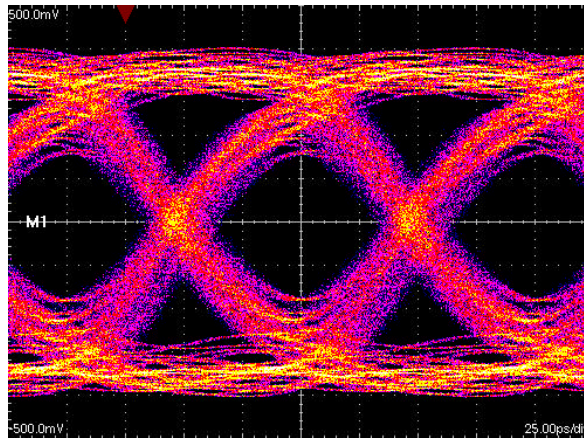
■ Cable Termination Impedance

– Test Fixture w/ Assembly (Near End)



■ Active Cable Assembly Eye Pattern

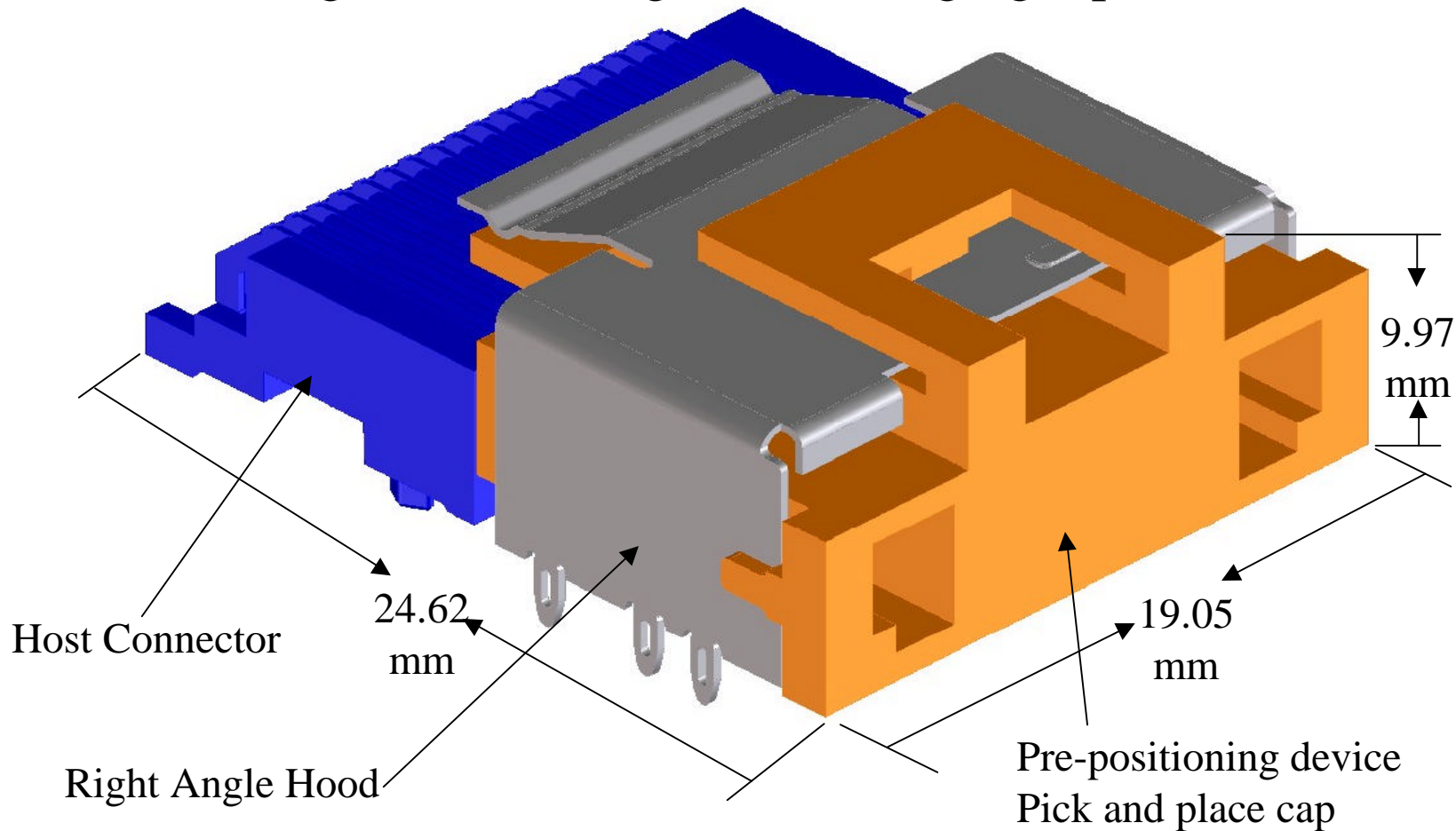
- Future Gen (1 meter, XFP Termination active @ 10Gbps)



Parameters	Results (1 meter)	Reference	Units
Voltage rail-to-rail	812.5	872.5	mVpp (diff)
Eye Height	327.0	794.6	mVpp (diff)
Jitter (pp)	33.0	13.5	ps

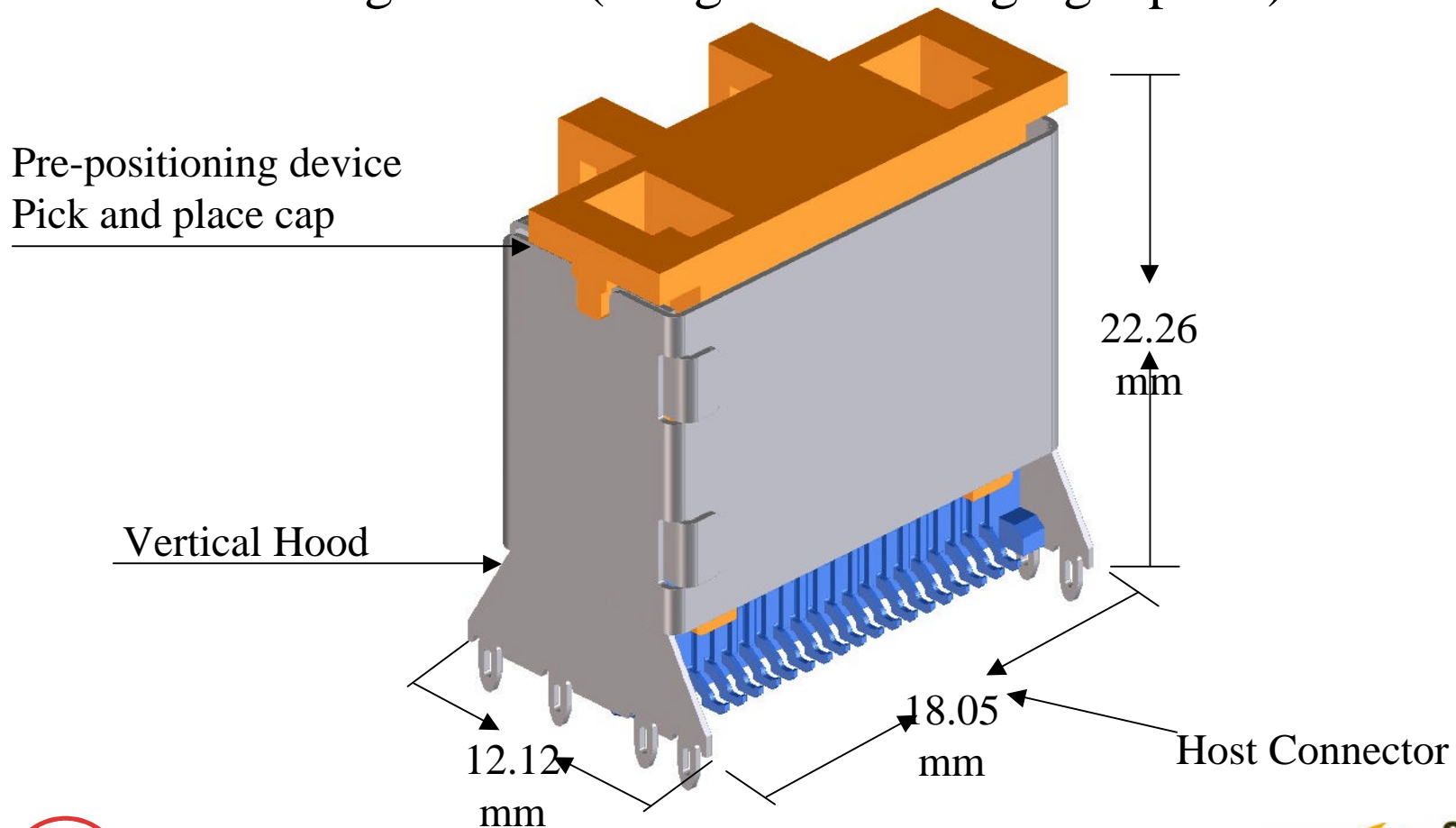
Right Angle – Host Connector/Hood (Series 75783)

- Pre-Positioning Device (Integrated Packaging Option)



Vertical – Host Connector/Hood (Series 75784)

- Pre-Positioning Device (Integrated Packaging Option)



36 ckt External cables and cage

- EMI Guide Housing
 - Provides:
 - Guidance for reliable cable mating
 - Integrated latching for the cable plug
 - A strain relief for the connector
 - relieves SMT joint stress induced from cable bending and management
 - Three levels of EMI control
 - Ground connections around the base of the housing to the host PCB
 - Gasket between the housing and the system face plate
 - Gasket between the cable plug and the face plate
 - Multiple ground connections from the cable plug through the housing to the PCB
 - Screw attach to enable thin PCB applications and provide mechanical stability
 - Visible keying options
 - Polarization keying
 - Low profile enables PCI and AMC form factors

The 4x,8x Solution

For More Information Contact:

- Debbie Kiley
Host Connector/Hoods
-Email: debbie.kiley@molex.com
-Telephone: (630)527-4643
- Jairo Guerrero
Internal Cables
-Email: jairo.guerrero@molex.com
-Telephone: 011-52-3336681408
- Chad Jameson
External Cables / Guide frame
-Email: chad.jameson@molex.com
-Telephone: (501)851-4850 ext.403
- Jay Neer
Standards Related Activity / General Product
Email: jay.neer@molex.com
Telephone: (561)251-8016