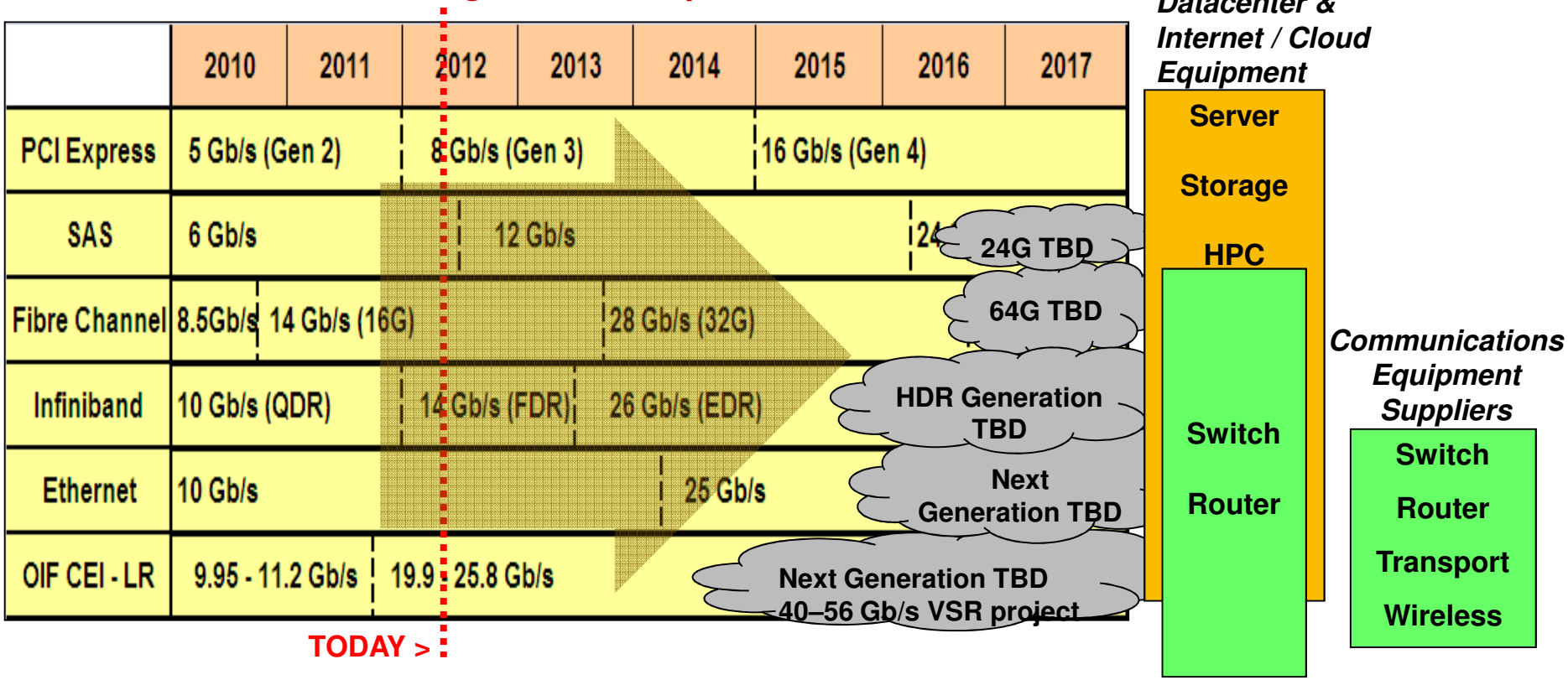
AirMax VSe® High Speed Backplane Connector System

July 2012

Where will AirMax VSe® connectors be used & Why?

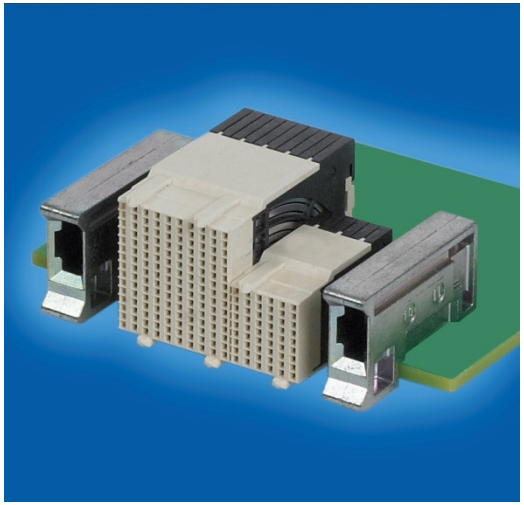
- More bandwidth density is being demanded from equipment
- Bit rates per differential signal pair continue to scale on roadmaps
  - Nearer-term: 12, 14 & 25 Gb/s needs are clear
  - Future bit rates and modulation (NRZ / PAM4) are TBD in “gray areas”

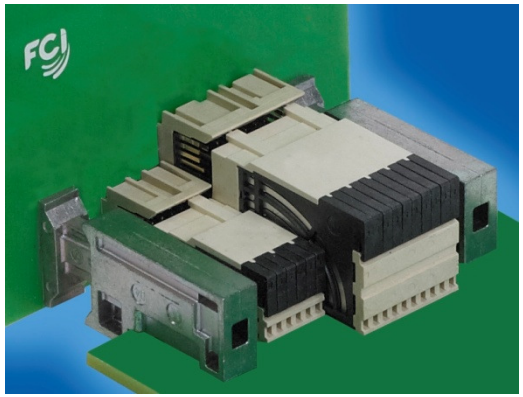
Interconnection Technologies Roadmaps



AirMax VSe® Connector Overview

- **AirMax VSe Right-Angle Receptacle and Right-Angle Header innovation provide migration path for up to 25 Gb/s per differential pair**
- **Backwards mating-compatible interfaces to AirMax VS® headers and receptacles**
- **Maintains AirMax VS open pin field design maximizing pin assignment flexibility. GND contacts are not commoned.**
- **Innovative edge-coupling technology and air dielectric between adjacent conductors deliver low insertion loss and crosstalk giving better SNR allowing more insertion loss/crosstalk margin.**
- **Contains no interleaving shields reducing connector weight, cost and PCB routing complexity**
- **Maintains AirMax VS linear signal density, press-fit termination and Hard Metric Equipment Practice**
- **Prototypes for Signal Integrity Testing**
- **Availability:**
  - Prototype samples: 3-Pair Right Angle Header
  - Limited Production: 3, 4, & 5-Pair Right-Angle Receptacle
    - Contact James Lim for available configurations
  - Production: Q3 2012 – Q1 2013

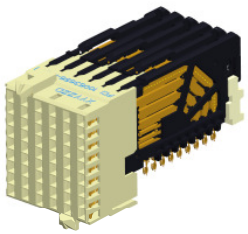




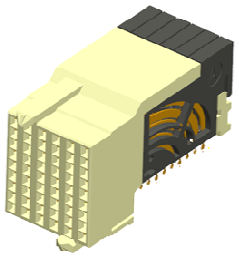
Backplane Connector Evolution – AirMax® Family

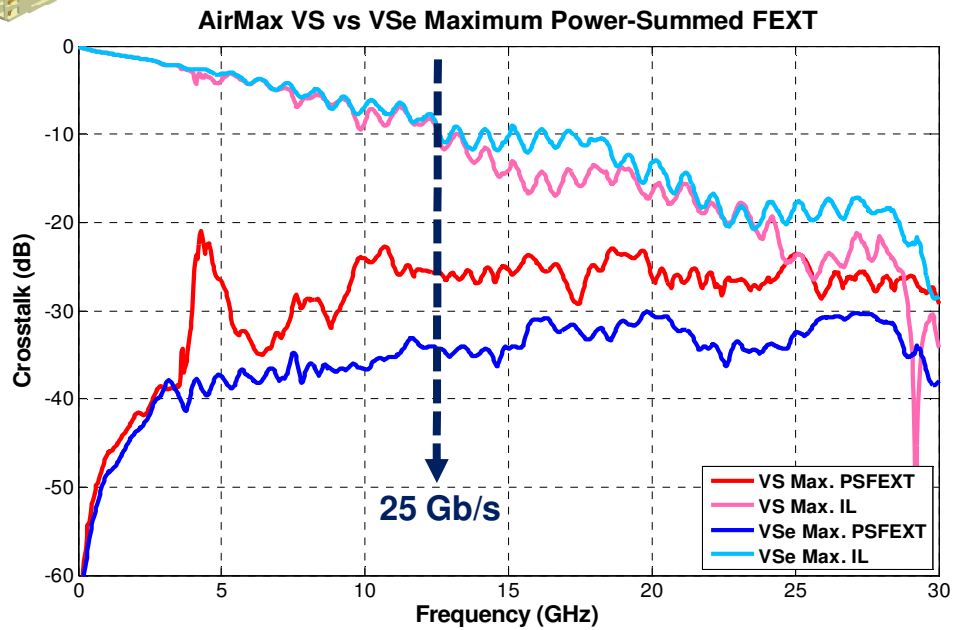
SCALABLE PERFORMANCE

6.25 Gb/s → 12.5 Gb/s → 14 - 17 Gb/s → 25 Gb/s



AirMax VS → ***AirMax VSe***

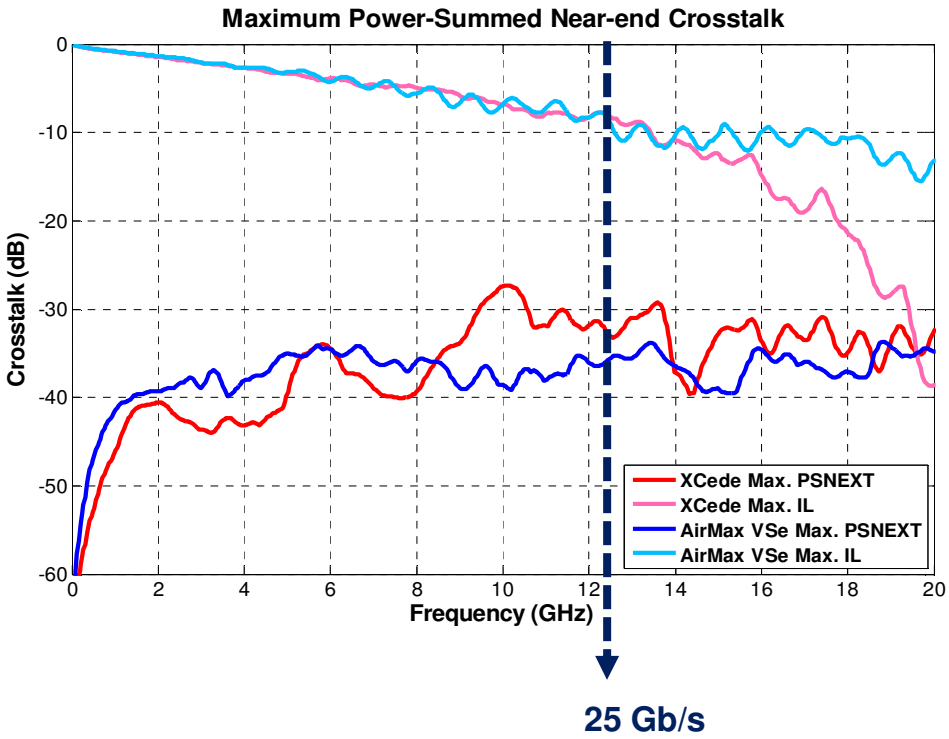


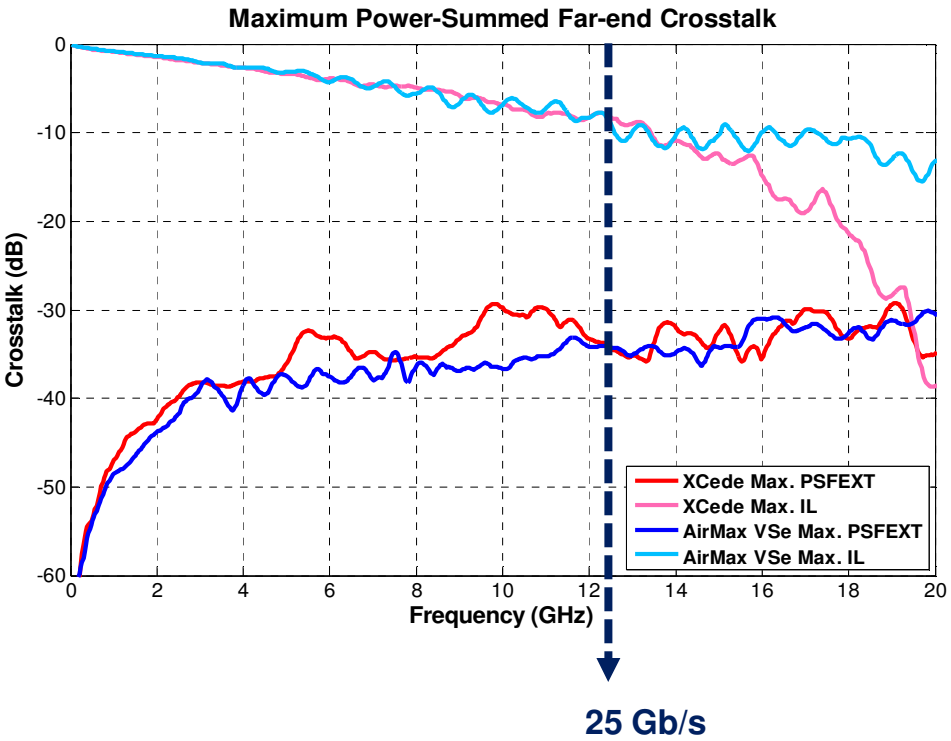


- **Substantial improvement in Crosstalk performance**
- **Backwards mating-compatible interface**
- **Maintains open pin field design**

Signal Integrity performance comparable to XCede®

- **AirMax VSe® & XCede® Signal Integrity Comparison**
  - **Maximum-hold IL and Power-Summed NEXT and FEXT are plotted**
  - **Comparable or better performance**

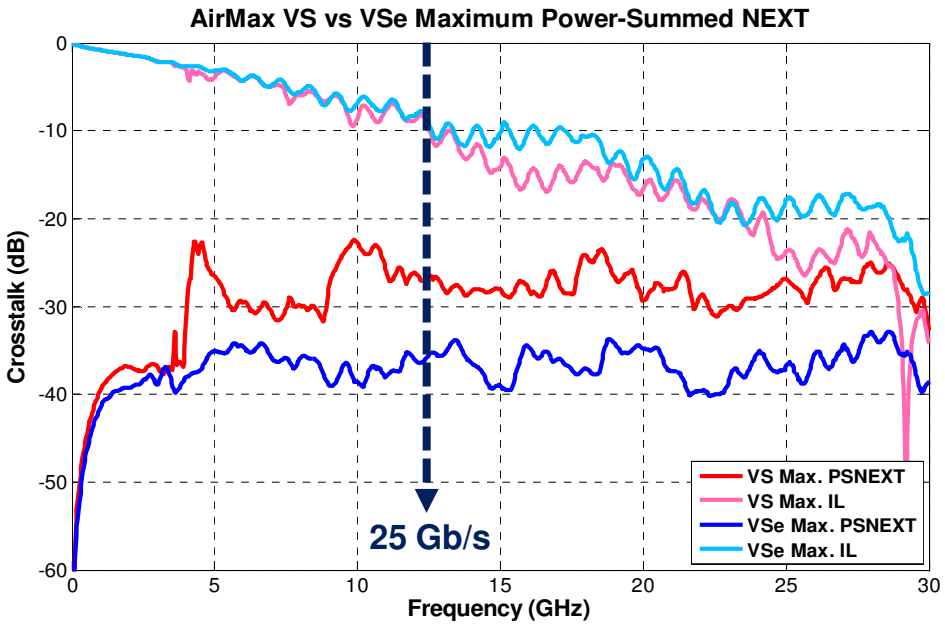


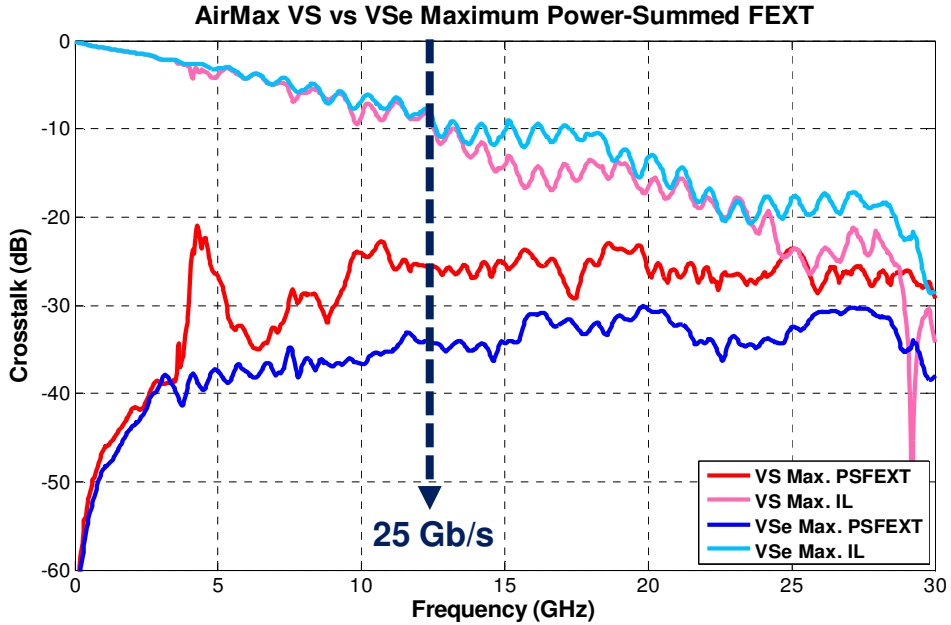


Very similar results when compared to other high speed connectors

Comparisons to AirMax VS® Connectors

Signal Integrity Comparison

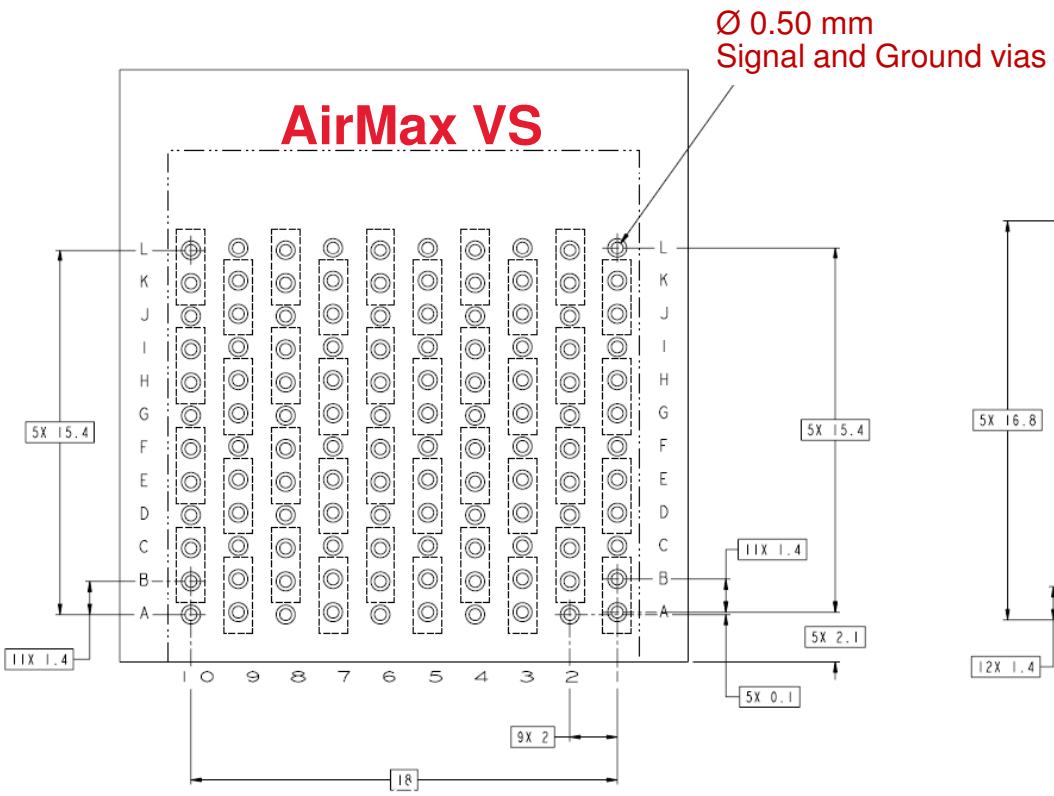


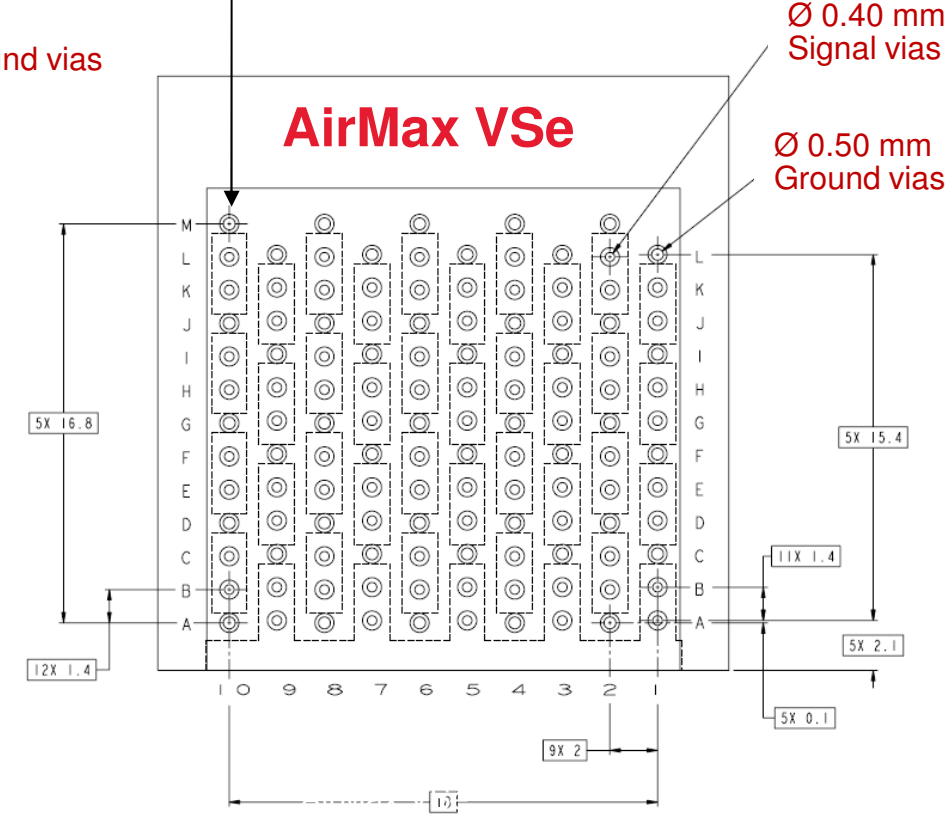


- Maximum-hold IL and Power-Summed NEXT and FEXT are plotted
  - At each frequency point, the maximum insertion loss, power-summed near-end and far-end crosstalk was plotted regardless of which differential pair it occurred on.
  - These plots make it possible to compare the worst-case margins between IL and PSXT of each connector.
- Use of the AirMax VSe daughter card connector achieves <u>substantial improvement</u> in Crosstalk performance and Insertion Loss/Crosstalk margin through and beyond 12.5 GHz, the fundamental frequency for 25 Gb/s

Board Footprint Comparison

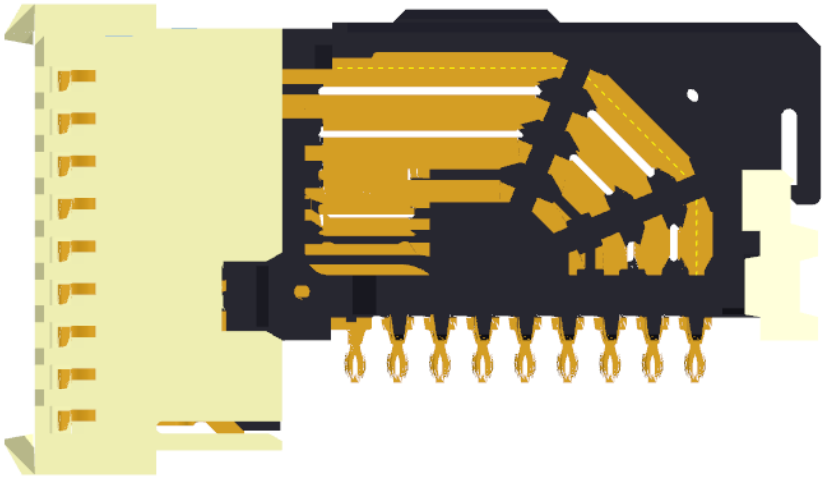
- The AirMax VSe footprint is very similar to the original AirMax VS layout. The only changes are in the SIGNAL hole diameters and the OPTIONAL row of vias (for enhanced Signal Integrity properties – no pins are assigned to these vias



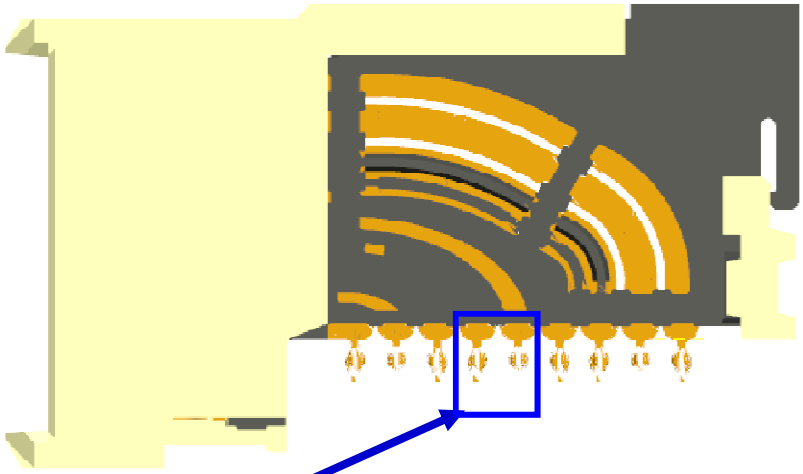


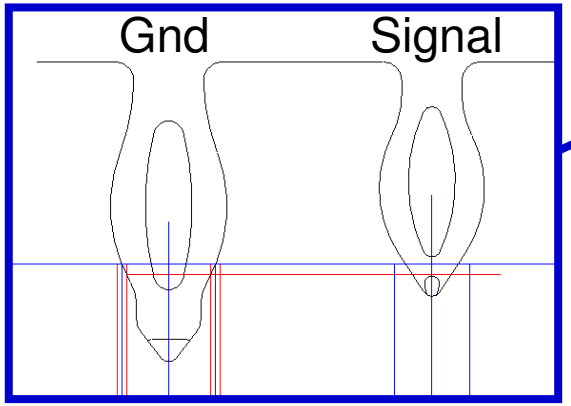
Press-Fit Tail Designs

AirMax VS



AirMax VSe



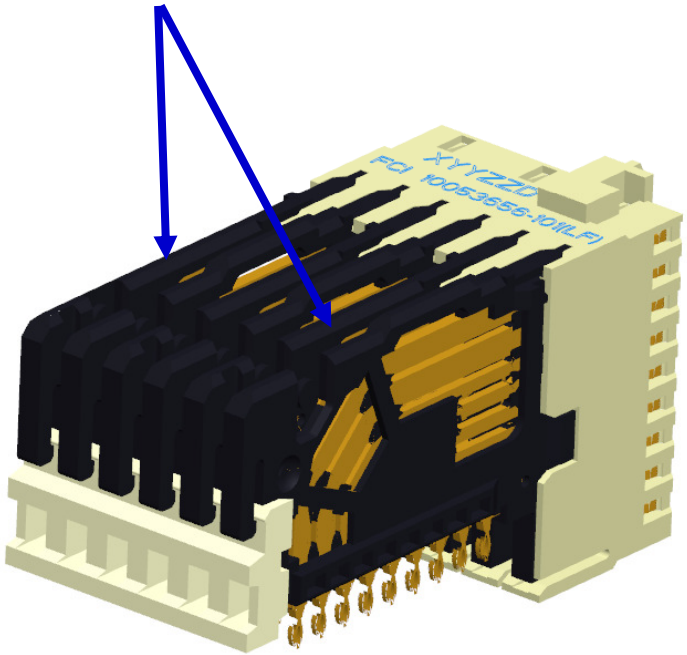


- Same press-fit tail design on the ground pin as for the AirMax VS Ground pin
- Smaller press-fit tail design for Signal pins for better impedance match

Simplified Press-fit Application Tooling

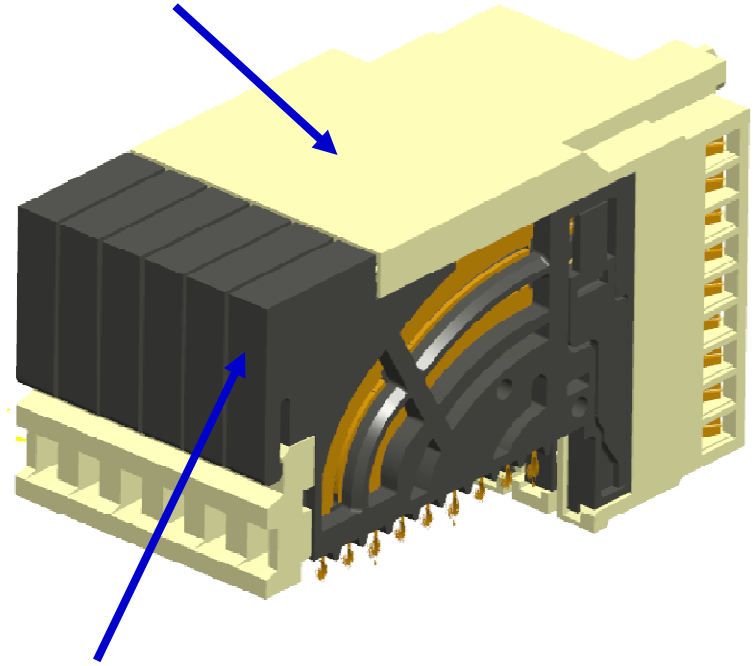
AirMax VS

- Special application tooling that fits between IMLAs
- Narrower IMLA wafers



AirMax VSe

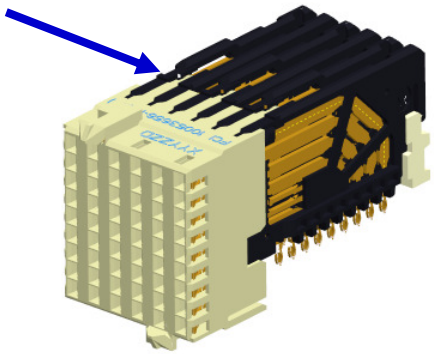
- "Flat rock" application tool presses on top surface of connector



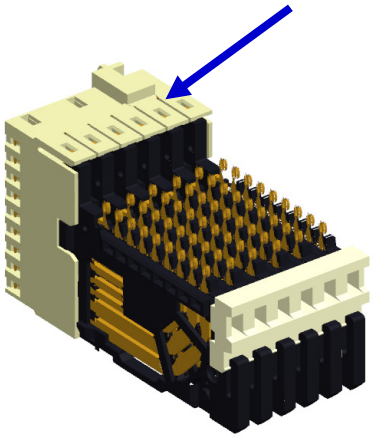
- Wider IMLA wafers provide extra strength

Improved IMLA Retention - Top and Bottom

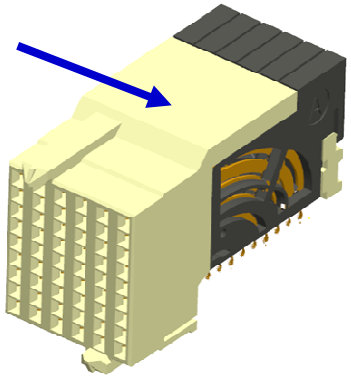
AirMax VS



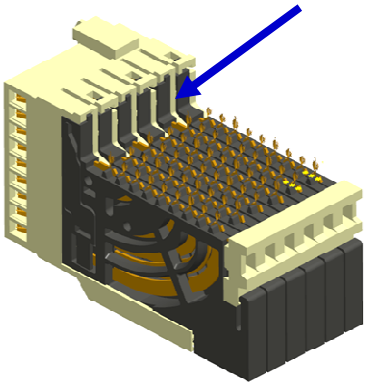
- Housing Latches engage only a few millimeters of each IMLA wafer
- Discrete housing latches for each IMLA wafer



AirMax VSe

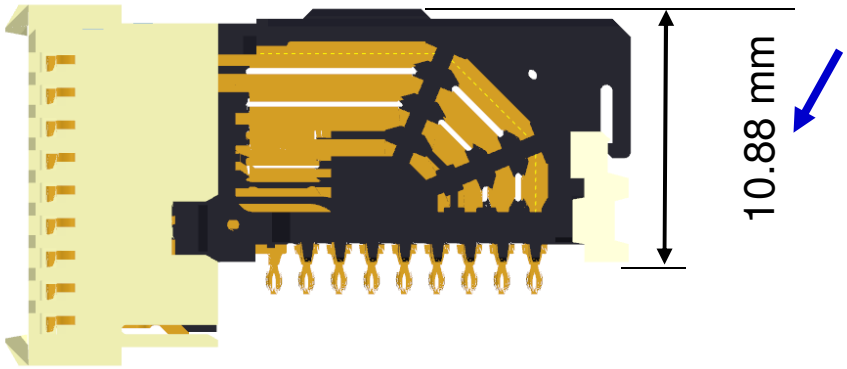


- Housing contains long slots that engage a much longer portion of each IMLA wafer to increase mechanical rigidity
- Side wall support latches for each IMLA for better “Eye of Needle” (EON) true position



Slightly Taller Right-Angle Receptacle

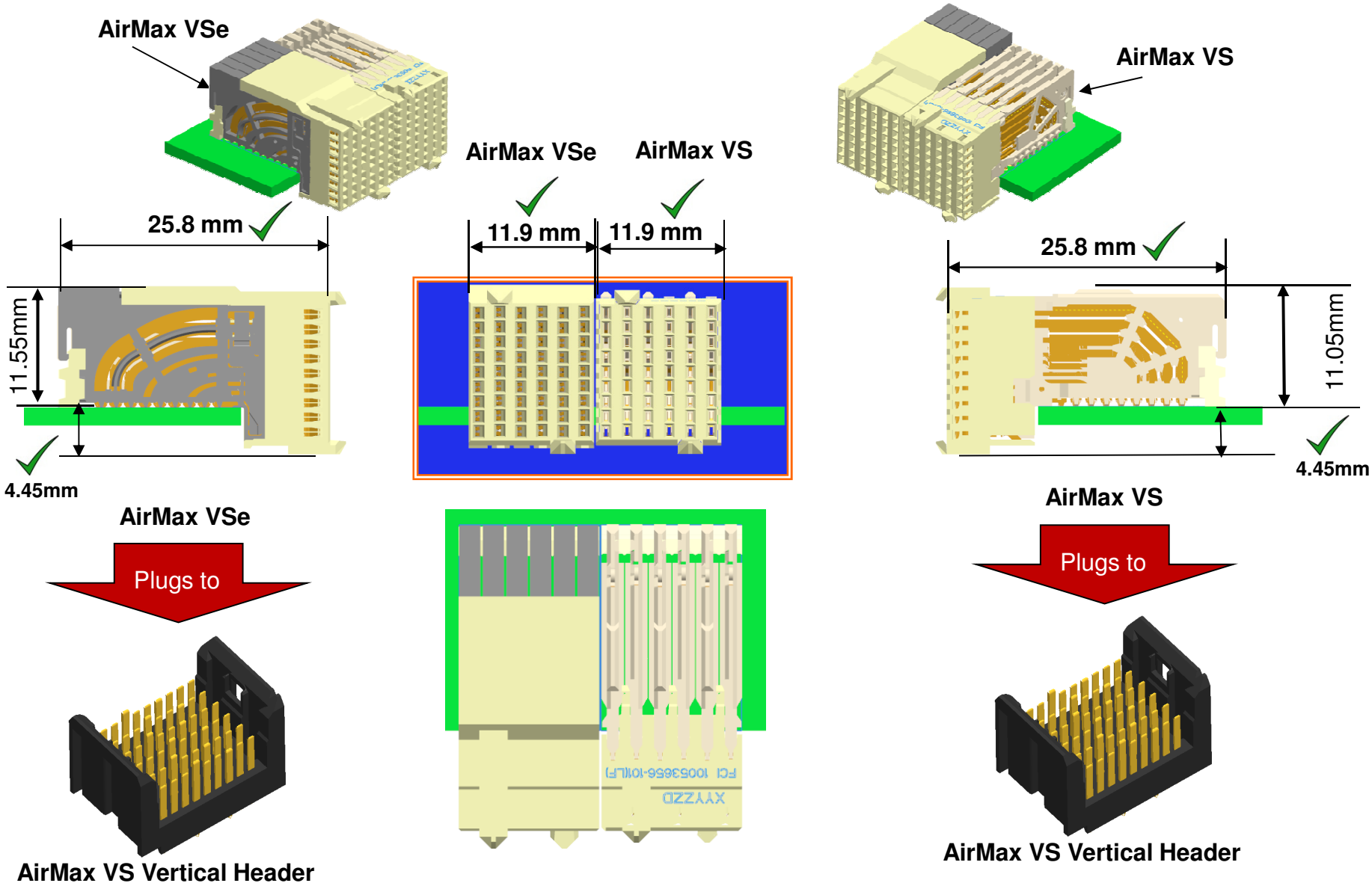
AirMax VS



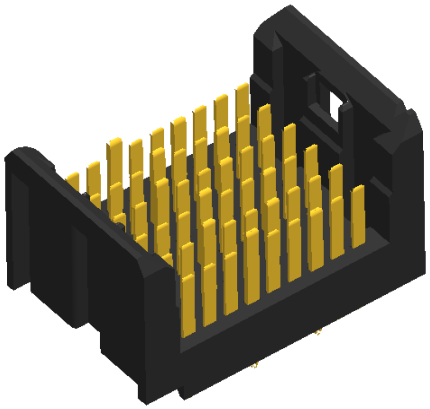
AirMax VSe

- Change results from the addition of the extended top cover
- The overall height from the top surface of a daughter card to the top surface of the right-angle AirMax VSe connector is slightly larger
- This press surface is in plane with the top surface of narrowest AirMax VS vertical header housing available.
- There is no change to the minimum achievable slot pitch
  - The mating header continues to define the minimum slot pitch
- There is no interference with mating connector

Dimensional Comparison (Example: 3 Pair x 6 IMLA)

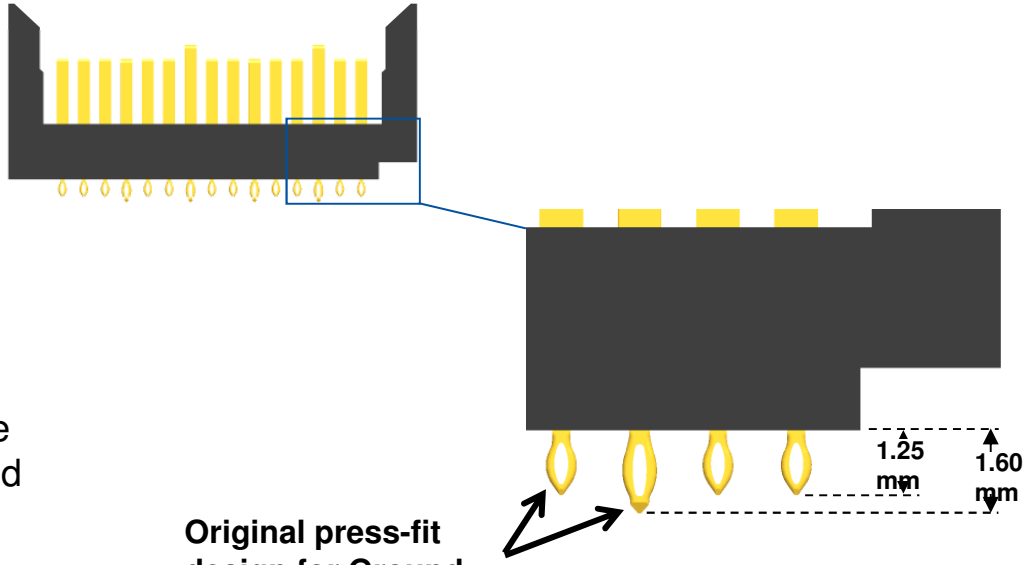


AirMax VS® Small Press Fit



AirMax VS Vertical Header

	Small Press fit
Type	P/N
3x6	10120526-101LF
4x10	10120528-101LF
5x10	10117813-101LF

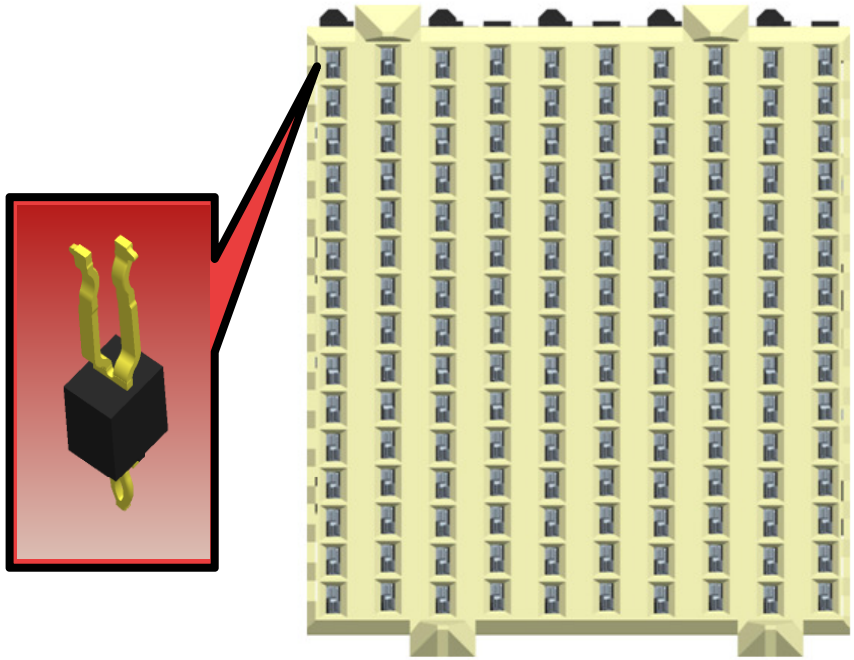


Original press-fit design for Ground, but small press-fit design for signals

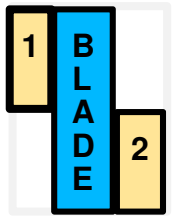
Note: Vertical receptacle with SPF are being tooled and will be available in Q4 2012

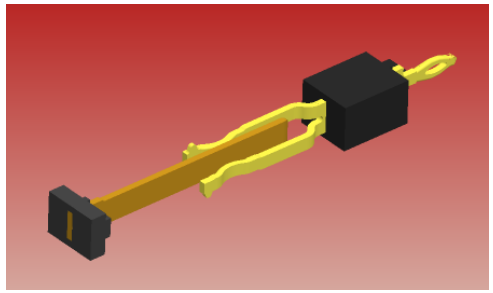
AirMax® Receptacle Contact Design Comparison

AirMax VS

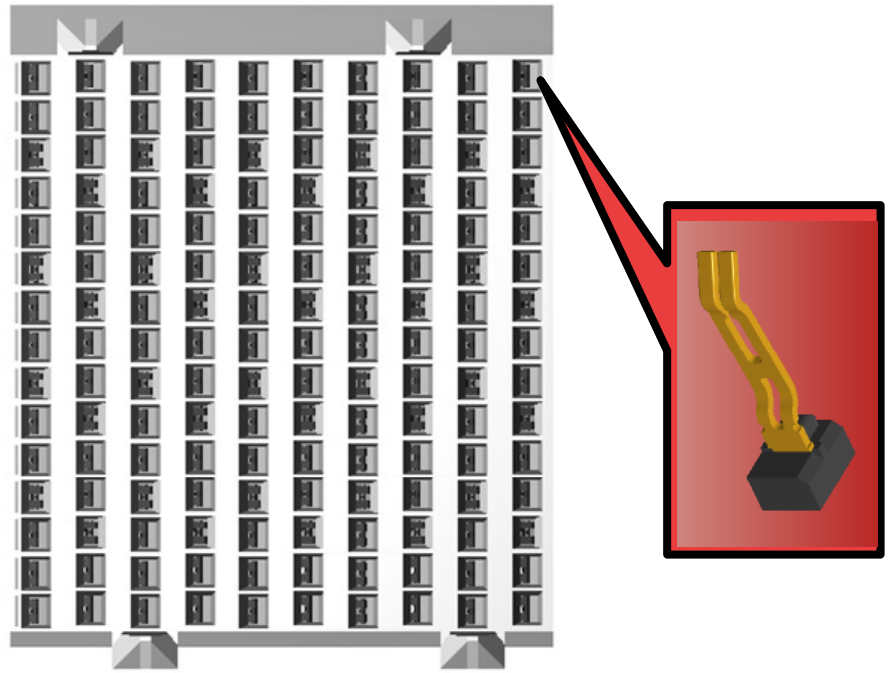


Mating beams have 1 point of contact on each side of each header blade (2 points of contact for each header blade)

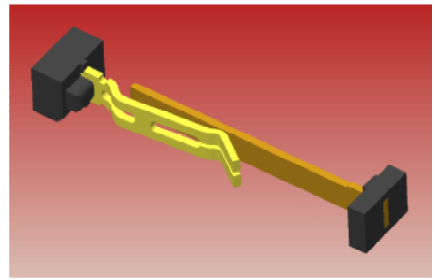


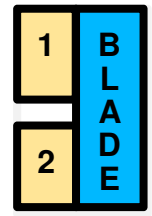


AirMax VSe



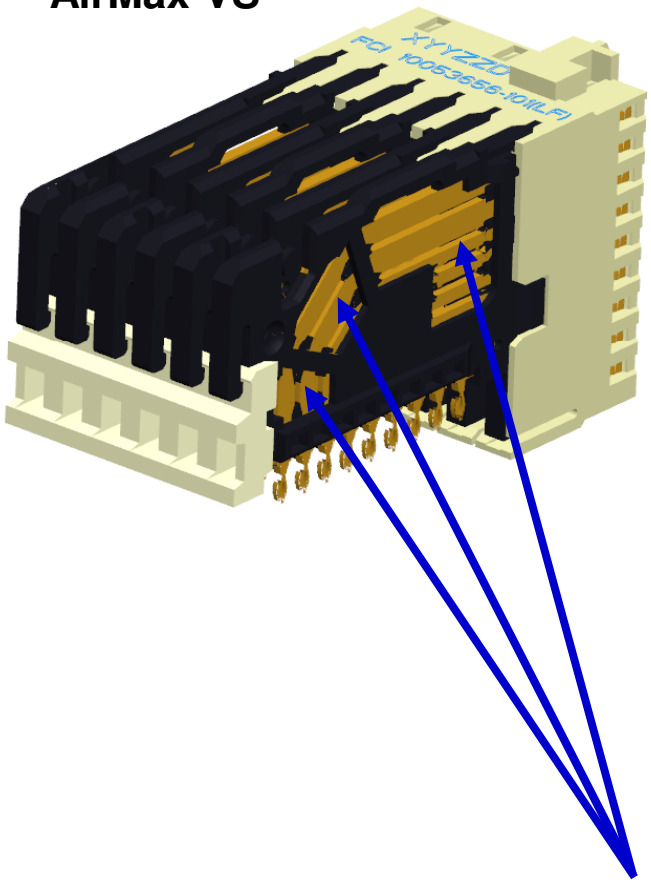
Mating beams have 2 points of contact on one side of each header blade (similar to most backpanel connector designs today)





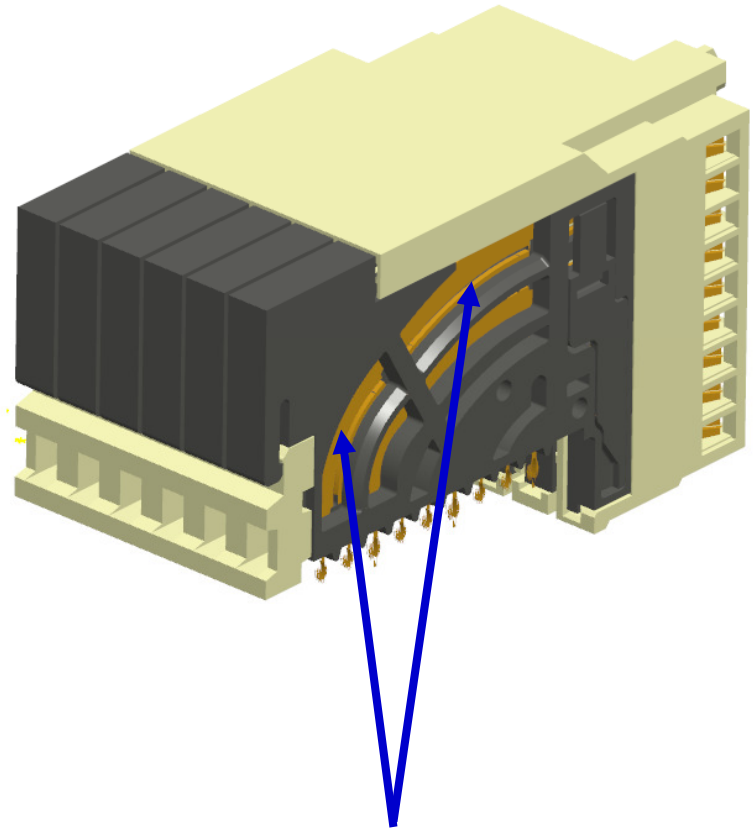
Visible Change to Leadframe Design

AirMax VS



3 sections of straight conductors

AirMax VSe



2 sections of curved conductors

Part Numbers and Development Timeline

AirMax VSe® Right-Angle Products

- Customer Prints, SI models and samples are available
- Production scheduled for Q3 / Q1 2013

Part Number	Pre-Production Part Number	Description	Status
10115910	10115165	Right-Angle Receptacle: 3 Pairs/column x 6 columns (18 differential pairs) on 2mm column pitch	Limited Production
10115911	10115015	Right-Angle Receptacle: 4 Pairs/column x 10 columns (40 differential pairs) on 2mm column pitch	Limited Production
	10115161	Right-Angle Receptacle: 4 Pairs/column x 8 columns (32 differential pairs) on 3mm column pitch	Limited Production
	10115642	Right-Angle Receptacle for Orthogonal Midplane: 4 Pairs/column x 4 columns (16 differential pairs) on 4.2mm column pitch	Limited Production
10115913	10115627	Right-Angle Receptacle: 5 Pairs/column x 10 columns (50 differential pairs) on 2mm column pitch	Limited Production
	10115637	Right-Angle Receptacle: 5 Pairs/column x 8 columns (40 differential pairs) on 2mm column pitch	Limited Production
10119886	10115608	Right-Angle Header: 3 Pairs/column x 6 columns (18 differential pairs) on 2mm column pitch	Limited qty. * Samples available
10120001		Right-Angle Header: 4 Pairs/column x 10 columns (40 differential pairs) on 2mm column pitch	Q4 2012
10120009		Right-Angle Header: 5 Pairs/column x 10 columns (50 differential pairs) on 2mm column pitch	Q1 2013

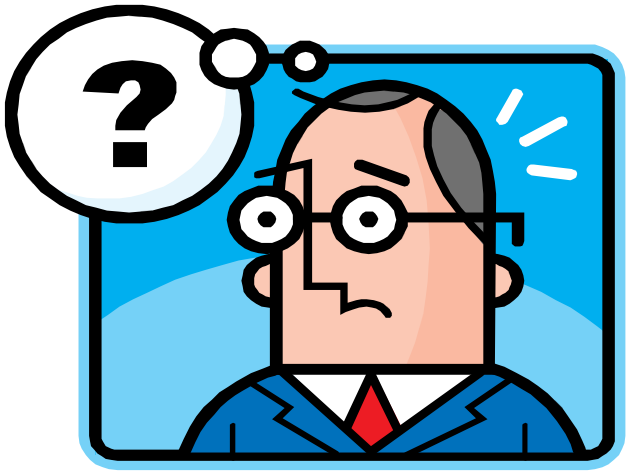
* Samples are from an earlier Prototype version

AirMax VSe® Launch Timing Plan to MP

	2012						2013				
	JUL	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY
3 Pair RAH			Sample	PreProd			MP				
3 Pair RAR				Sample	PreProd			MP			
4 Pair RAH				Sample		PreProd			MP		
4 Pair RAR					Sample	PreProd			MP		
5 Pair RAH						Sample		PreProd			MP
5 Pair RAR							Sample	PreProd			MP

Sample	Sampling
PreProd	Low Volumes
MP	Mass production

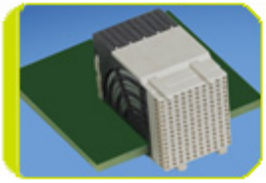
AirMax VSe® Support Materials & Resources



Web Site: Product Information

- **Use direct links to landing page**
  - www.fciconnect.com/newdevelopments
  - www.fciconnect.com/highspeed

Following products are under development



AirMax VSe®

- Provide AirMax VSe® system migration path for up to 25 Gb/s per differential pair
- Enhanced right-angle connectors offer 3, 4 or 5 signal pairs per column
- Backwards mating-compatible interfaces to existing AirMax VS® connectors
- Maintain AirMax VS open pin field design and pin assignment flexibility
- Install to PCBs using flat-rock insertion tooling
- Right-angle receptacle connectors are currently available
- Download Preliminary Datasheet
- Download Preliminary Product Specifications
- Download Preliminary Application Specification
- Download AirMax VS and AirMax VSe Signal Integrity Comparison

Receptacle preliminary drawings

- Download Preliminary product drawing 3 pair Right-Angle Receptacle
- Download Preliminary product drawing 4 pair Right-Angle Receptacle
- Download Preliminary product drawing 5 pair Right-Angle Receptacle

Orthogonal preliminary drawing

- Download Preliminary product drawing Orthogonal Receptacle

Header preliminary drawings

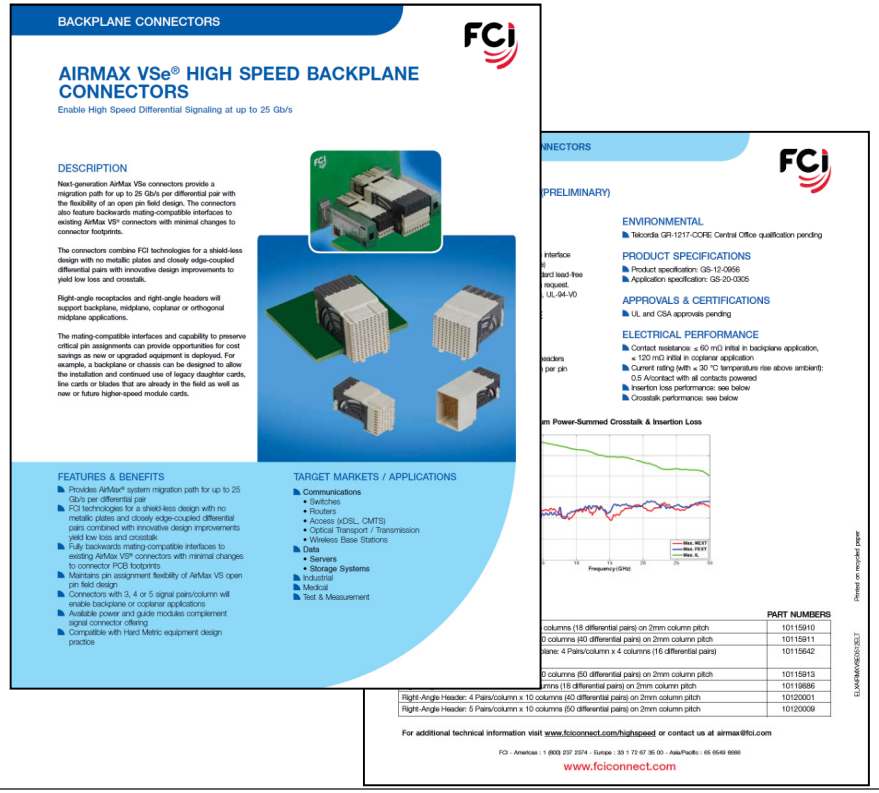
- Download Preliminary product drawing 3 pair Right-Angle Header
- Download Preliminary product drawing 4 pair Right-Angle Header
- Download Preliminary product drawing 5 pair Right-Angle Header

For more information Airmax@fci.com

- **Datasheet**
- **Product Specification**
- **Application Specification**
- **Signal Integrity Comparison**
- **Product Drawings**
- **E-mail Link to request additional information**
- **Contact: Product Manager James Lim at Airmax@fci.com**

Print Collateral

- AirMax VSe datasheet
  - Updated May 2012
  - Available online
  - Literature number
    - ELXAIRMXVSE0512ELT



BACKPLANE CONNECTORS

AIRMAX VSe® HIGH SPEED BACKPLANE CONNECTORS

Enable High Speed Differential Signaling at up to 25 Gb/s

DESCRIPTION

Next-generation AirMax VSe connectors provide a migration path for up to 25 Gb/s per differential pair with the flexibility of an open pin field design. The connectors also feature backwards mating-compatible interfaces to existing AirMax VS® connectors with minimal changes to connector footprints.

The connectors combine FCI technologies for a shield-less design with no metallic plates and closely edge-coupled differential pairs with innovative design improvements to yield low loss and crosstalk.

Right-angle receptacles and right-angle headers will support backplane, midplane, coplanar or orthogonal midplane applications.

The mating-compatible interfaces and capability to preserve critical pin assignments can provide opportunities for cost savings as new or upgraded equipment is deployed. For example, a backplane or chassis can be designed to allow the installation and continued use of legacy daughter cards, line cards or blades that are already in the field as well as new or future higher-speed module cards.

FEATURES & BENEFITS

- Provides AirMax® system migration path for up to 25 Gb/s per differential pair
- FCI technologies for a shield-less design with no metallic plates and closely edge-coupled differential pairs combined with innovative design improvements yield low loss and crosstalk
- Fully backwards mating-compatible interfaces to existing AirMax VS® connectors with minimal changes to connector PCB footprints
- Maintains pin assignment flexibility of AirMax VS open pin field design
- Connectors with 3, 4 or 5 signal pairs/column will enable backplane or coplanar applications
- Available power and guide modules complement signal connector offering
- Compatible with Hard Metric equipment design practice

TARGET MARKETS / APPLICATIONS

- Communications
  - Switches
  - Routers
  - Access (xDSL, CMTS)
  - Optical Transport / Transmission
  - Wireless Base Stations
- Data
  - Servers
  - Storage Systems
- Industrial
- Medical
- Test & Measurement

(PRELIMINARY)

ENVIRONMENTAL

- Telcordia GR-1217-CORE Central Office qualification pending

PRODUCT SPECIFICATIONS

- Product specification: GS-12-0956
- Application specification: GS-20-0305

APPROVALS & CERTIFICATIONS

- UL and CSA approvals pending

ELECTRICAL PERFORMANCE

- Contact resistance: ≤ 60 mΩ initial in backplane application, ≤ 120 mΩ initial in coplanar application
- Current rating (with ≤ 30 °C temperature rise above ambient): 0.5 A/contact with all contacts powered
- Insertion loss performance: see below
- Crosstalk performance: see below

Power-Summed Crosstalk & Insertion Loss

Frequency (GHz)

PART NUMBERS	
columns (18 differential pairs) on 2mm column pitch	10115910
0 columns (40 differential pairs) on 2mm column pitch	10115911
plane: 4 Pairs/column x 4 columns (16 differential pairs)	10115542
0 columns (50 differential pairs) on 2mm column pitch	10115913
umns (18 differential pairs) on 2mm column pitch	10119886
Right-Angle Header: 4 Pairs/column x 10 columns (40 differential pairs) on 2mm column pitch	10120001
Right-Angle Header: 5 Pairs/column x 10 columns (50 differential pairs) on 2mm column pitch	10120009

For additional technical information visit www.fciconnect.com/highspeed or contact us at airmax@fci.com

FCI - Americas : 1 (800) 237 2374 - Europe : 33 1 72 67 35 00 - Asia/Pacific : 65 6549 6999

www.fciconnect.com

ELXAIRMXVSE0512ELT

Printed on recycled paper

- Added to ELX Connector Overview
  - May 2012
  - Available online & in print
  - Literature numbers:
    - ELXOVERVIEW0512EA4
    - ELXOVERVIEW0512ELT

BACKPLANE CONNECTORS

AIRMAX VSe® HIGH SPEED BACKPLANE CONNECTORS

Enable High Speed Differential Signaling at up to 25 Gb/s

New product

FEATURES & BENEFITS

- Provides AirMax® system migration path for up to 25 Gb/s per differential pair
- FCI technologies for a shield-less design with no metallic plates and closely edge-coupled differential pairs combined with innovative design improvements yield low loss and crosstalk
- Fully backwards mating-compatible interfaces to existing AirMax VS® connectors with minimal changes to connector PCB footprints
- Maintains pin assignment flexibility of AirMax VS open pin field design
- Connectors with 3, 4 or 5 signal pairs/column will enable backplane or coplanar applications
- Available power and guide modules complement signal connector offering
- Compatible with Hard Metric equipment design practice

APPLICATIONS

- Communications
  - Switches
  - Routers
  - Access (xDSL, CMTS)
  - Optical Transport / Transmission
  - Wireless Base Stations
- Data
  - Servers
  - Storage Systems
- Industrial
- Medical
- Test & Measurement

Main Products	Part References
Right-Angle Receptacle: 3 Pairs/column x 6 columns (18 differential pairs) on 2mm column pitch	10115910
Right-Angle Receptacle: 4 Pairs/column x 10 columns (40 differential pairs) on 2mm column pitch	10115911
Right-Angle Receptacle for Orthogonal Midplane: 4 Pairs/column x 4 columns (16 differential pairs) on 4.2mm column pitch	10115542
Right-Angle Receptacle: 5 Pairs/column x 10 columns (50 differential pairs) on 2mm column pitch	10115913
Right-Angle Header: 3 Pairs/column x 6 columns (18 differential pairs) on 2mm column pitch	10119886
Right-Angle Header: 4 Pairs/column x 10 columns (40 differential pairs) on 2mm column pitch	10120001
Right-Angle Header: 5 Pairs/column x 10 columns (50 differential pairs) on 2mm column pitch	10120009

More comprehensive technical information and part number listings can be found online.

Further information can be found at: www.fciconnect.com/highspeed

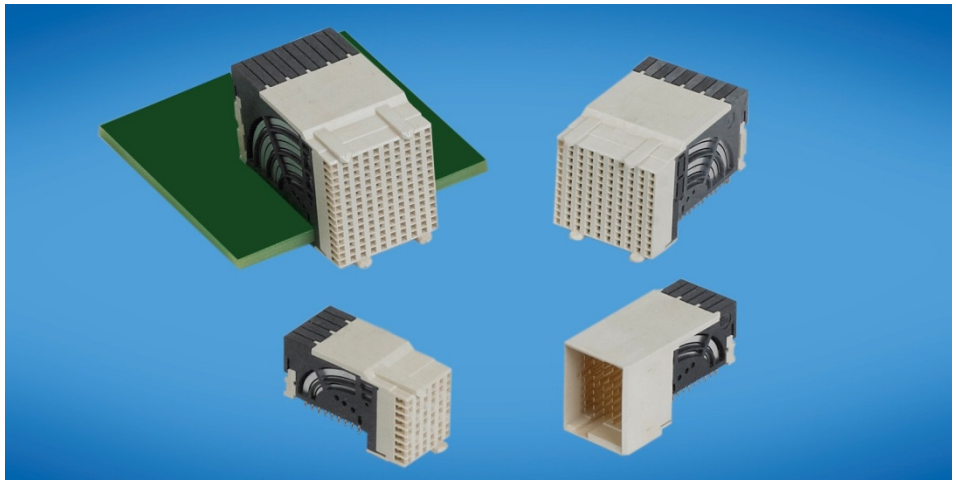
6

Technical Support Materials

- Product specification : GS 12-0956
- Application specification: GS20-0305
- Product drawings: Now: at the development site
  Dec 2012:will be uploaded into FCI Website
- 3D models : Now: On request
  Dec 2012:will be uploaded into FCI Website
- SI models & test reports – On Request
- Test board sets- On request from FCI SI group on loan to customer
- Sample boards – Dec 2012
- Product samples : Sept/Oct - 3pair
  Oct/Nov - 4 pair
  Nov/Dec - 5 pair
- For more information contact FCI Sales representative or send your request to AirMax @fci.com

AirMax VSe® Connector Summary

- AirMax® system migration path for up to 25 Gb/s
  - Change only Right-Angle Receptacle and Right-Angle Header
- Backwards mating-compatible interfaces to AirMax VS® connectors
- Maintains AirMax VS® open pin field design and pin assignment flexibility
- Offers substantial improvement in crosstalk performance
- Performance comparable to other competing high speed connectors
- Innovative edge coupling technology using air dielectric between conductors
- No Shields; low weight



Questions?

Thank you for your time