



# Evolution of a 3U VPX Slot Interface

Meeting the Demand for Density and Speed



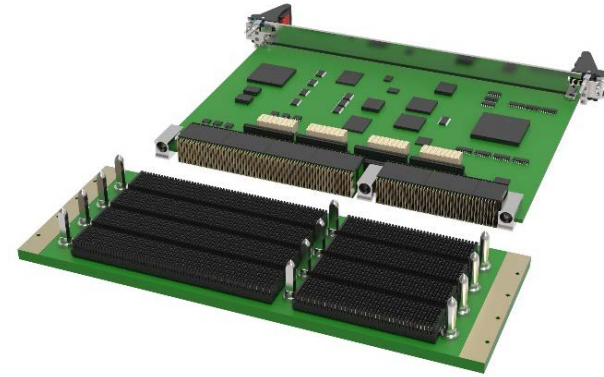
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EVERY CONNECTION COUNTS



A refresher where we left off last year:

# Drive for increased functional density



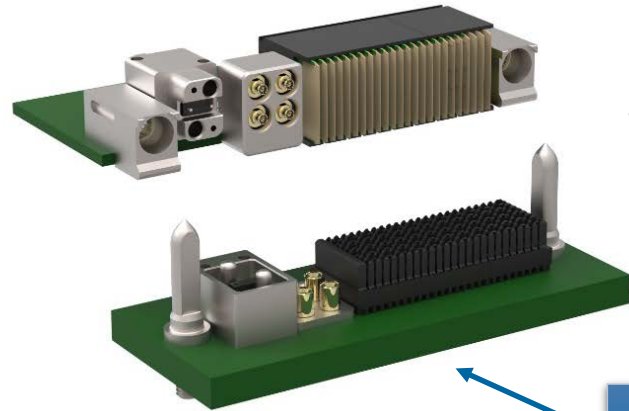
## *Embedded Computing Industry Trends*

- Faster processors, more cores
- Increased I/O count and functionality within a plug-in module
- Reduced SWAP (Size Weight And Power)
  - smaller packaging
  - lighter weight solutions
  - more efficient power
- Open systems architecture
- Modular, scalable systems

## *Interconnect Challenges*

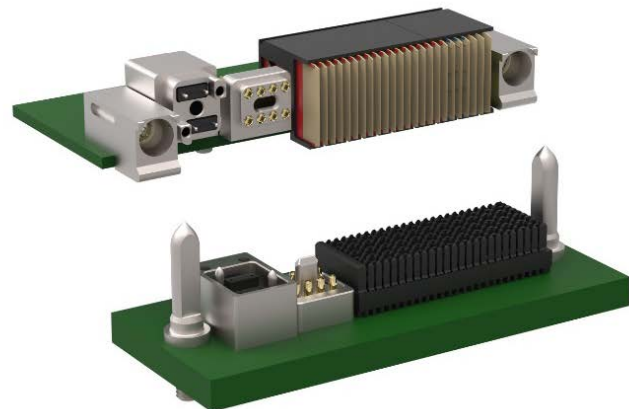
- Connector signal integrity and board terminations for higher data rates
- More functionality within modules
- Higher density contacts
- Lightweight materials, solutions
- Expand interconnect configurations – add flexibility while using standard solutions

# A boost in interconnect density and speed is imminent

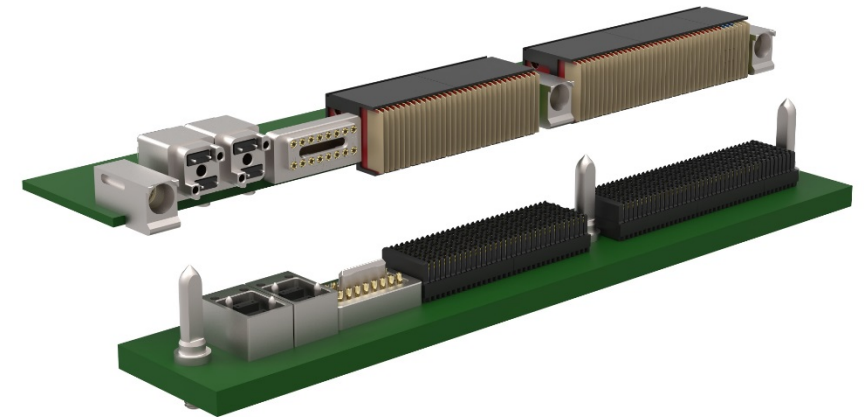


SLT3-PAY-2F1F2U1H-14.6.3-2

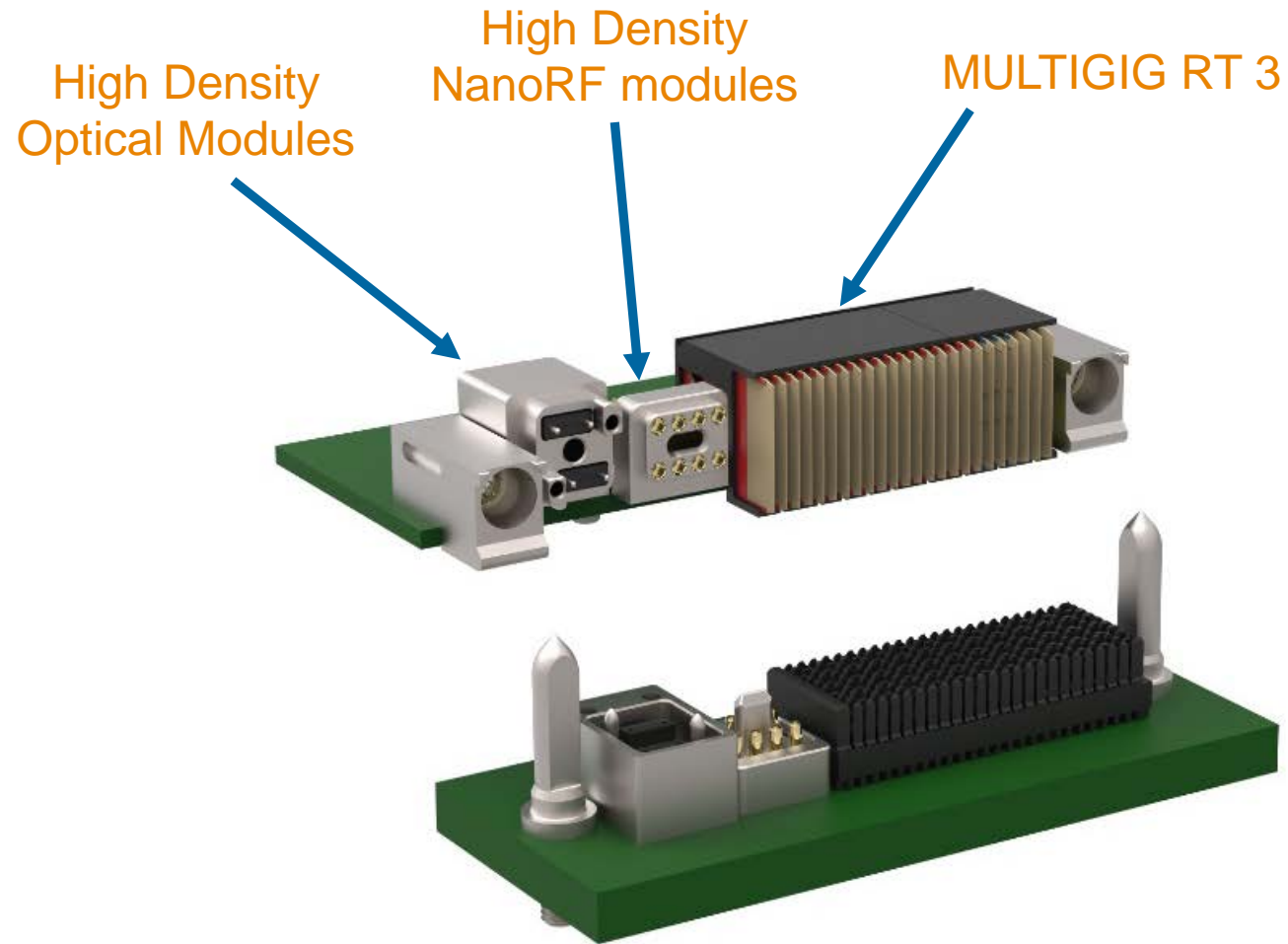
<b>Today</b>	32 diff pairs @ 10 Gb/s	4 RF contacts @ 26.5 GHz	12-24 optical lanes @ 25 Gb/s
<b>Tomorrow (not literally)</b>	32 diff pairs @ 25 Gb/s	8+ RF contacts @ 60 GHz	24-48 optical lanes @ 25 Gb/s



The evolution is not limited to 3U...



# How we got there...



# MULTIGIG RT 3 – ready for next generation speeds

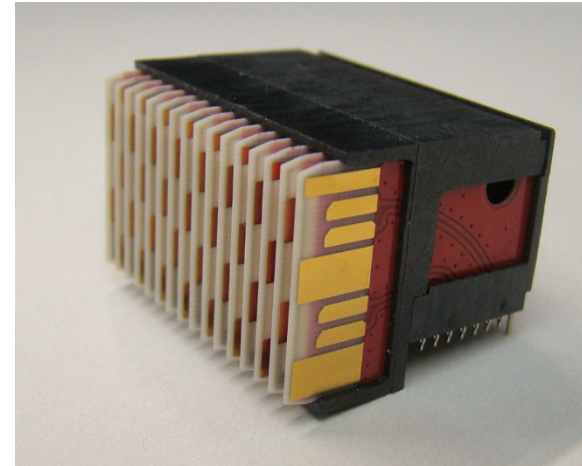
MULTIGIG RT 2 and RT 2-R – implemented at 10+ Gb/s today

MULTIGIG RT 3 - supports up to 25Gb/s:

*PCIe Gen 4*

*InfiniBand FDR*

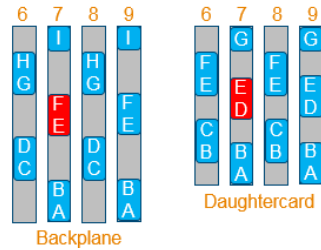
*Ethernet 100GBase-KR4*



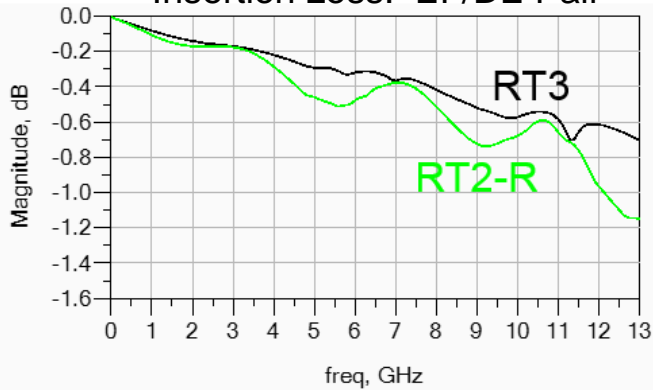
- Intermateable with VITA 46 (backward compatible with legacy VPX systems)
- Same rugged interface as MULTIGIG RT 2-R
- Smaller compliant pins to optimize performance at board termination
- RT 3 can be integrated with legacy VITA 46 (MULTIGIG RT 2 and RT 2-R) in same VPX slot

# MULTIGIG RT 3 Performance

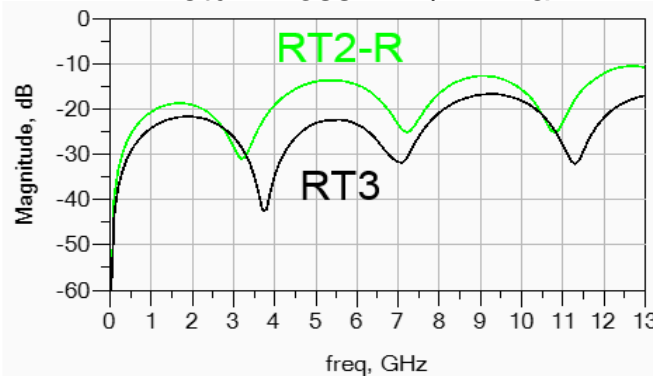
Connector-Only Model :



Insertion Loss: EF/DE Pair



Return Loss: EF/DE Pair



## COM KR4 Package 25.78125 GT/s / Worst Case Victim Pair

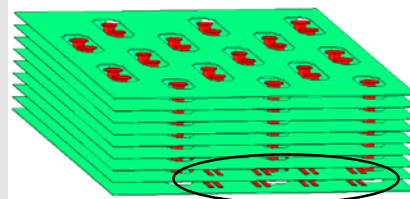
Channel: 16 in BP 4 in (x2) DC	MULTIGIG	Case 1 (12 mm)	Case 2 (30 mm)	COM Requirement
	RT 3	4.983 dB	4.466 dB	≥ 3 dB
	RT 2-R	2.550 dB	1.934 dB	≥ 3 dB

## Seasim Gen4 Package / Backplane Straight Route / Worst Case Victim Pair

16 GT/s	Simulated Results	PCIe 4.0 Requirement
	<b>Eye Height</b> <b>Eye Width</b>	<b>≥ 15 mVpp</b> <b>≥ 0.3 UI</b>

### Backplane PCB

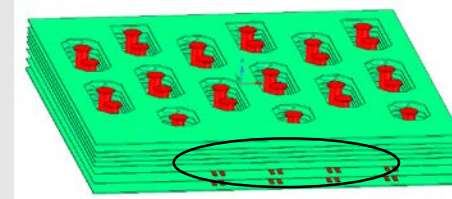
- Low-loss material:  $\tan\delta \sim 0.007$
- Overall Thickness: 4.29 mm (0.169")
- Route: 7-7-7 mil traces (0.5 oz. Cu)



BP Trace Route Out

### Daughtercard PCB

- Low-loss material:  $\tan\delta \sim 0.007$
- Overall Thickness: 1.93 mm (0.076")
- Route: 5-5-5 mil traces (0.5 oz. Cu)

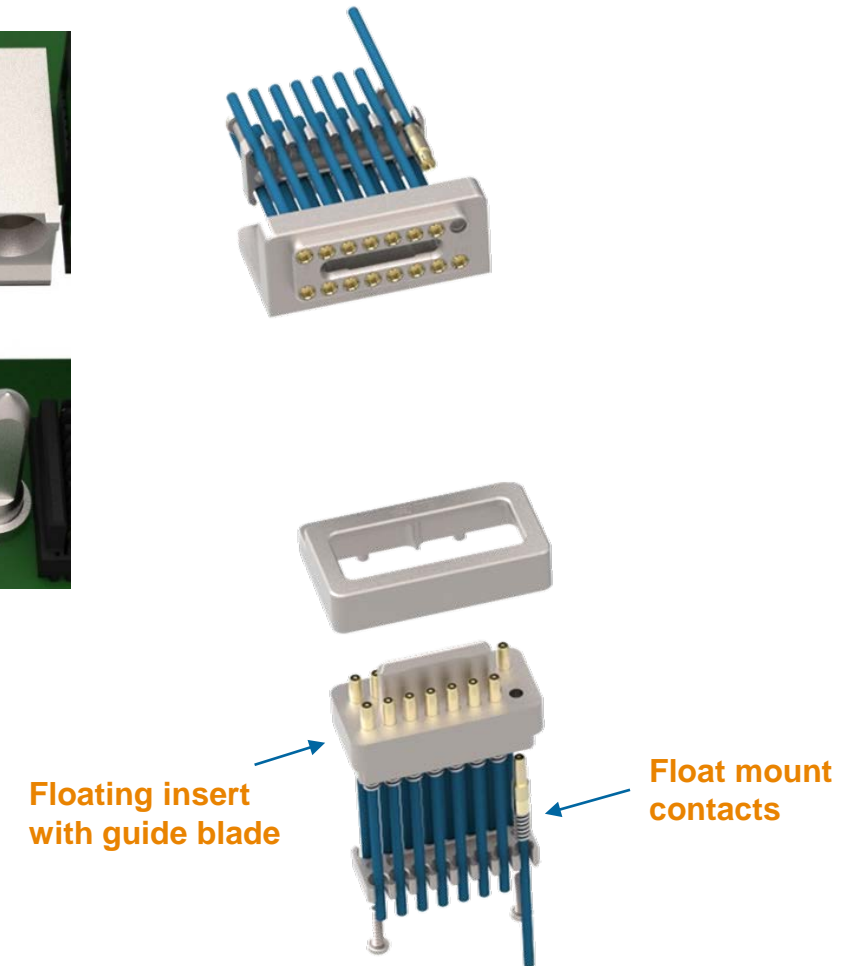
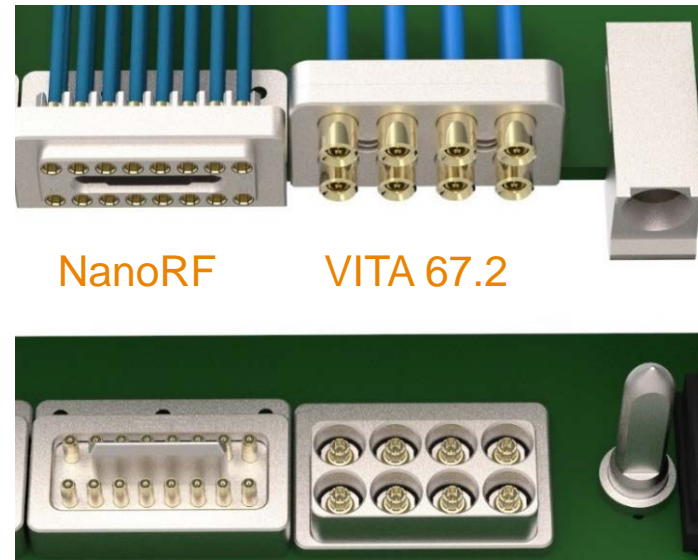
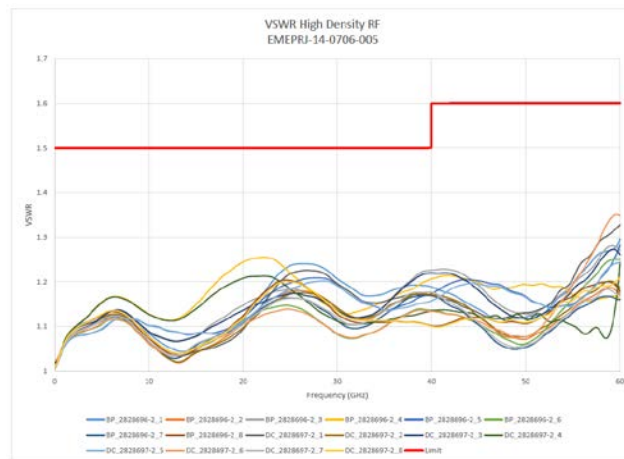


DC Trace Route Out

Channel Models :

# NanoRF – doubling RF density in a rugged platform

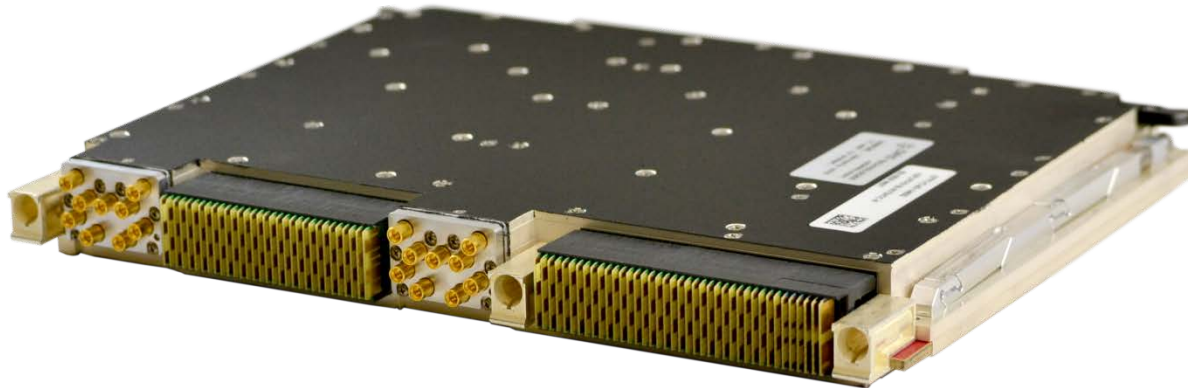
- Doubles RF contact density vs current VITA 67 solutions
- Extends frequency to 65 GHz with 90 dB isolation
- Robust solution with floating insert on backplane to provide pre-alignment (leverage from VITA 66)



# VITA 67.3 - Adds New Flexibility in Module Design

## More RF Module Sizes

Modules that support 1.0 inch slot pitches (versus 0.8 inch) provide more space for additional RF contacts



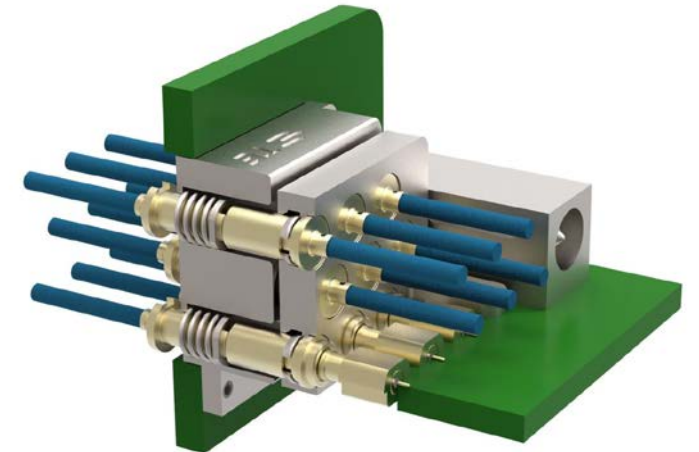
6U Vesper SI-9173 picture courtesy of Leonardo DRS

## Flexibility in Contact Locations

User defines the contact locations required within a VITA 67.3 standard connector module

## Fixed board termination options for Plug-In Modules

Floating contact moved to backplane to allow edge launch or cabled terminations within the Plug-In Module

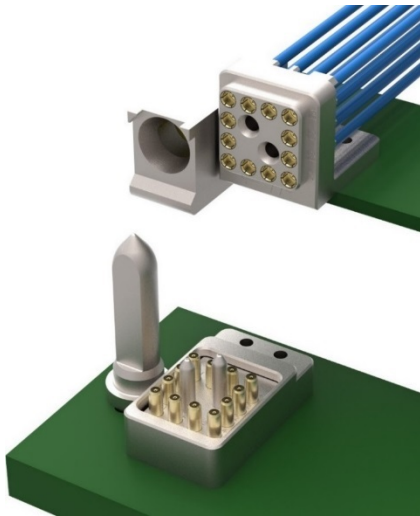




# NanoRF enabled by VITA 67.3

## More RF Module Sizes

Allows 3x contact density over VITA 67.1 and 67.2



12-position half module – fits VITA 67.3D backplane

## Flexibility in Contact Locations

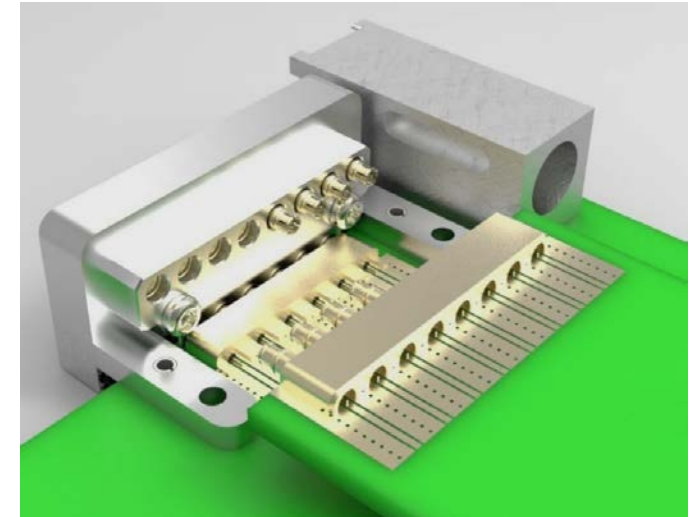
User defines the contact locations required within a VITA 67.3 standard connector module



26-position full module – fits VITA 67.3C backplane

## Fixed board termination options for Plug-In Modules

Floating contact moved to backplane to allow edge launch or cabled terminations within the Plug-In Module



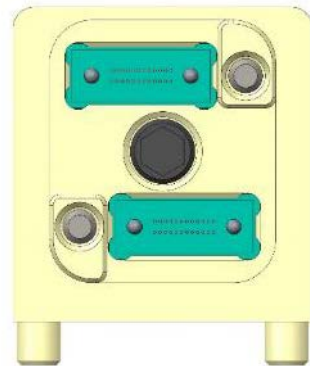
# High Density VITA 66.4 Derivative- Two Horizontal, MT Ferrules

## Features:

- Smaller guide pins enable two 24-fiber MT ferrules per **Half-size** Connector Location
- MT Ferrules are spring-supported within both the backplane & module connectors to optimize optical IL & RL performance



Backplane connector  
mating face

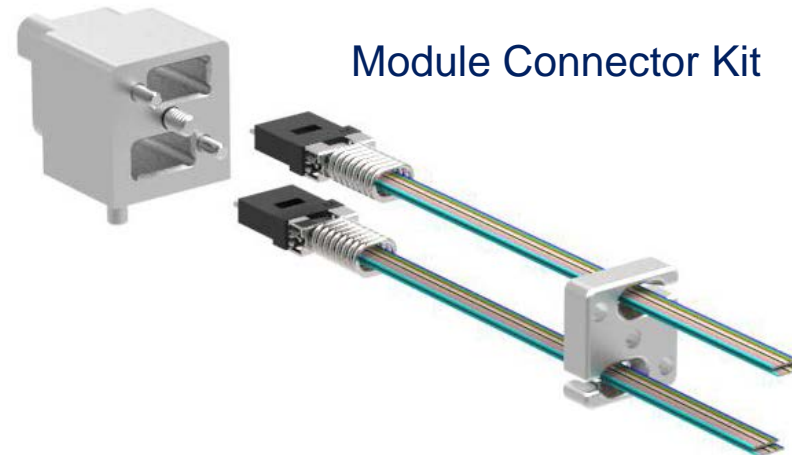


Module connector  
mating face

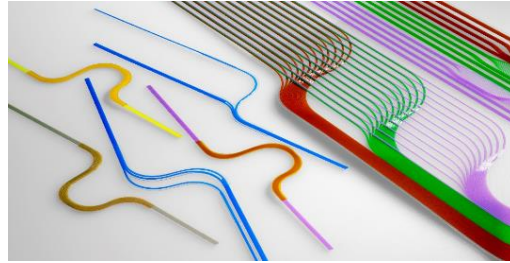
Backplane Connector Kit



Module Connector Kit



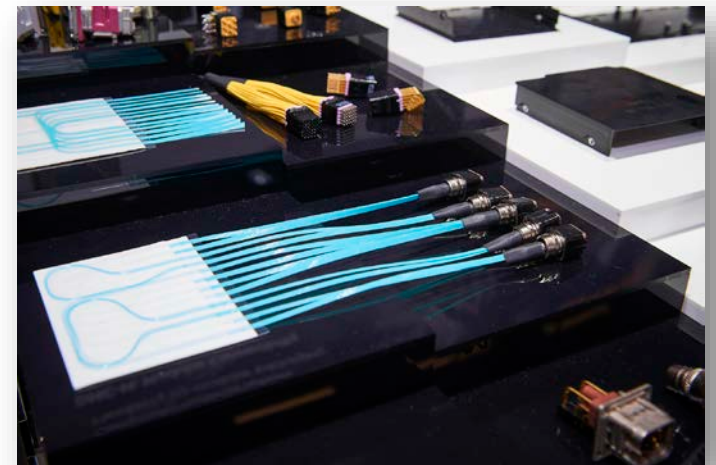
# Optical flex



Optical Flex Circuits comprise of a number of individual fibers precisely positioned into a predetermined form or pattern and fixed in place using a special coating designed to bond the fibers together in position.

## Benefits:

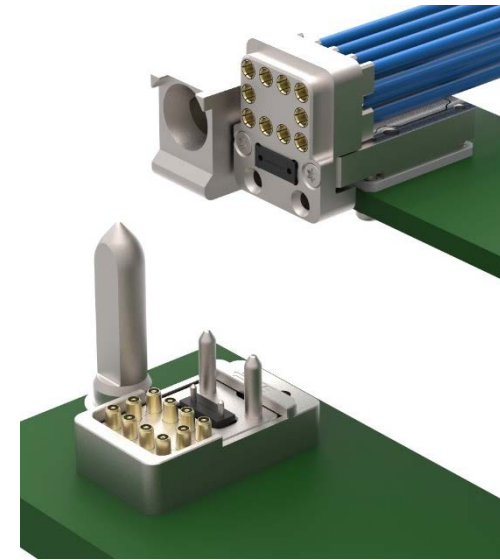
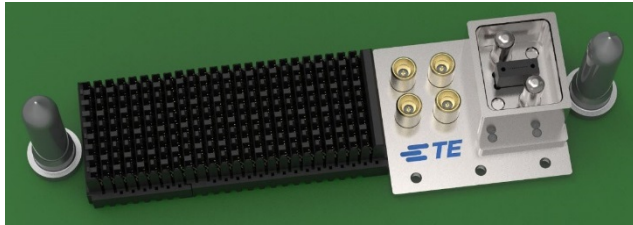
- Easy Routing and Advanced Management of Thousands of Fibers on a Single Rugged Substrate
- Lightweight
- Save Valuable Space
- Offers Flexibility in Systems Design
- Durable and Reliable
- Mounting hole Embedded in Substrate



# Path for integrating NanoRF and optics

*Evolving from a side-by-side hybrid RF/optical module...*

*... to a fully integrated module*



Design features Reflex Photonics LightCONEX  
blind mate optical interconnect

Floating insert on the backplane connector module is shared for both RF and Optics (supports VITA 66.5)

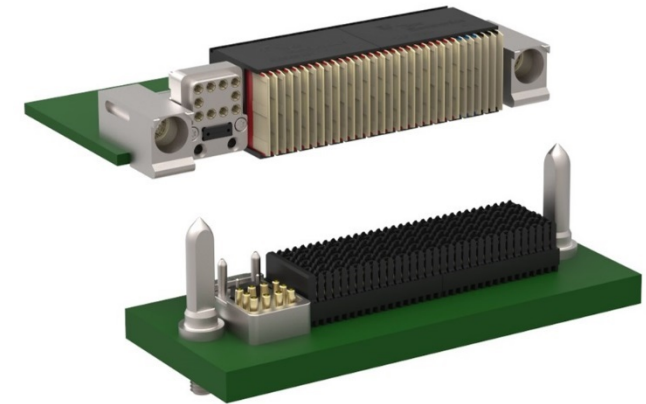
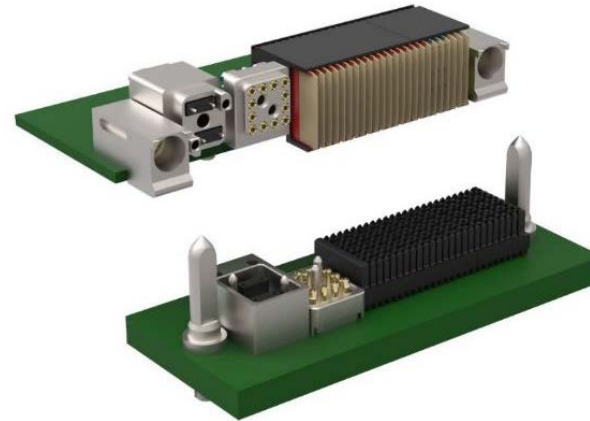
Guide features assure reliable mating of both the MT ferrules and RF contacts

# The evolution of a 3U VPX slot interface

Today's Standards



Tomorrow's Standards... countless opportunities



<b>Digital</b>	32 diff pairs @ 10Gb/s	32 diff pairs @ 25Gb/s	48 diff pairs @ 25Gb/s
<b>Optical</b>	12-24 optical lanes @ 25Gb/s	24-48 optical lanes @ 25Gb/s	12-24 optical lanes @ 25Gb/s
<b>RF</b>	4 RF contacts @ 26.5 GHz	12 RF contacts @ 70 GHz	10 RF contacts @ 70 GHz

# Thank You

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