

Backplane Channels Using Embedded Capacitor Connectors as an Enabler for 400GE 40" System Measurements

Nathan Tracy
Megha Shanbhag
TE Connectivity

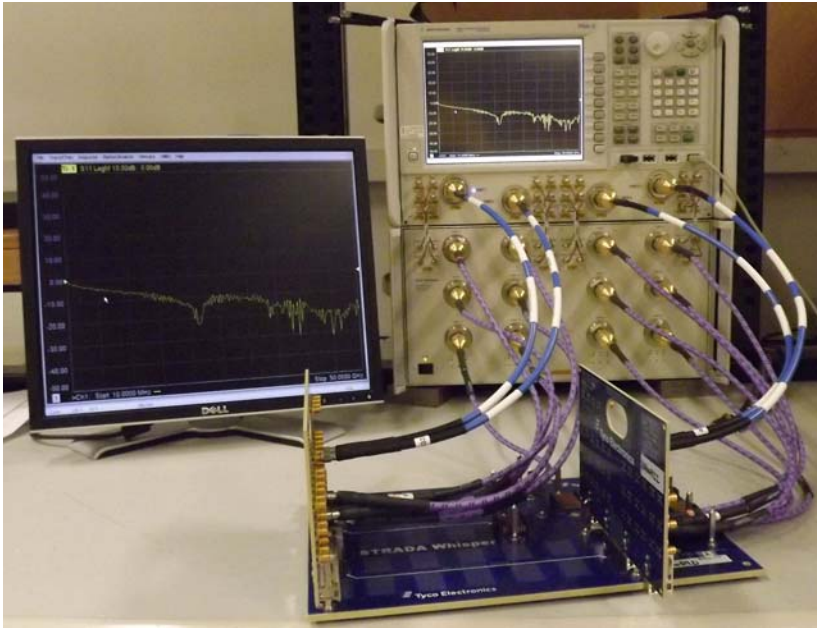


Motivation

- At next generation data rates, conventional PCB implementations can cause significant channel impairments
 - DC blocking capacitors and associated vias
- Measured data has been contributed showing 40 inch backplane channels with blocking capacitors embedded in the connector that show performance similar to a backplane channel without blocking capacitors
- COM calculation shown in the following slides is based on 25Gb/s per lane. A 400Gb/s implementation would operate 16x25Gb/s lanes.
- Provide measured channel data to allow others to run simulations that can be shared with the community.

STRADA Whisper™ Backplane Channel

40" Link Test Set-up



H11-H12

H14-H15

H17-H18

G11-G12

G14-G15

G17-G18

F11-F12

F14-F15

F17-F18

- All data is measured and includes 2.4mm test points
- Measurements are pair G14-G15 centric .s4p files
- 4 Near-End and 4 Far-End measurements
- Data is from 0-30GHz in 10MHz steps

DAUGHTER CARD

- Board Material = Megtron6 VLP
- Trace length = 5"
- Trace geometry = Stripline
- Trace width = 6 mils
- Differential trace spacing = 9 mils
- PCB thickness = 110mils, 14 layers
- Counterbored vias, up to 6mil stub
- Test Points = 2.4mm (included in data)

BACKPLANE

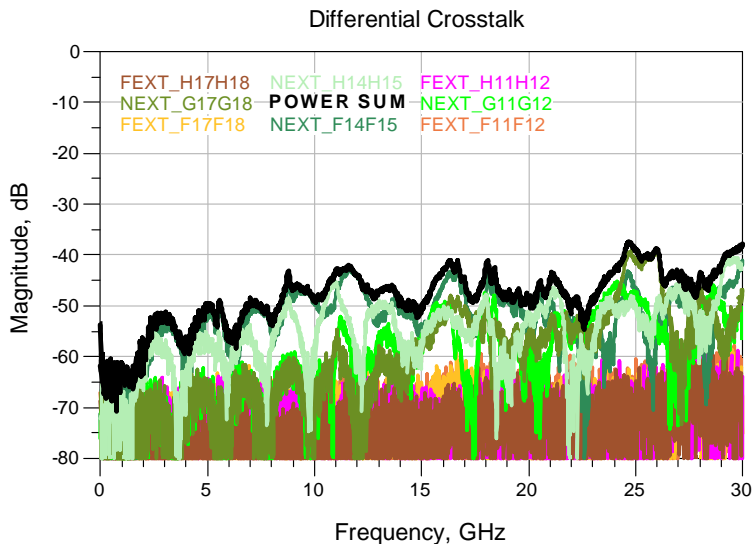
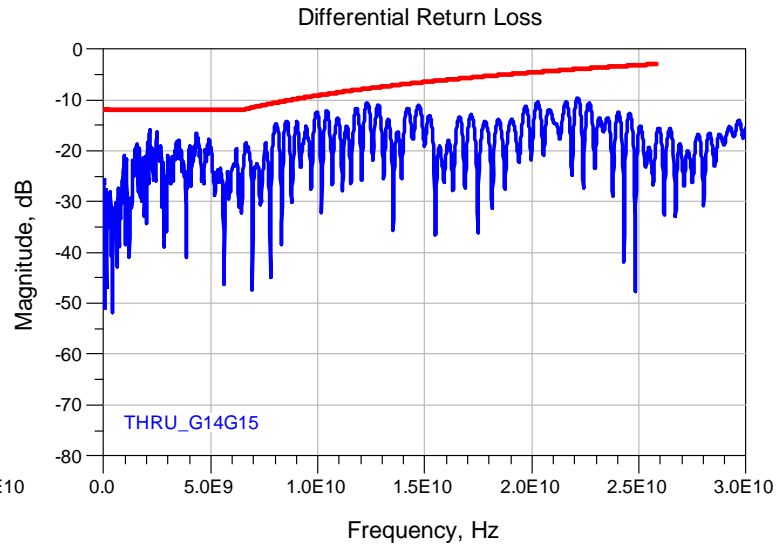
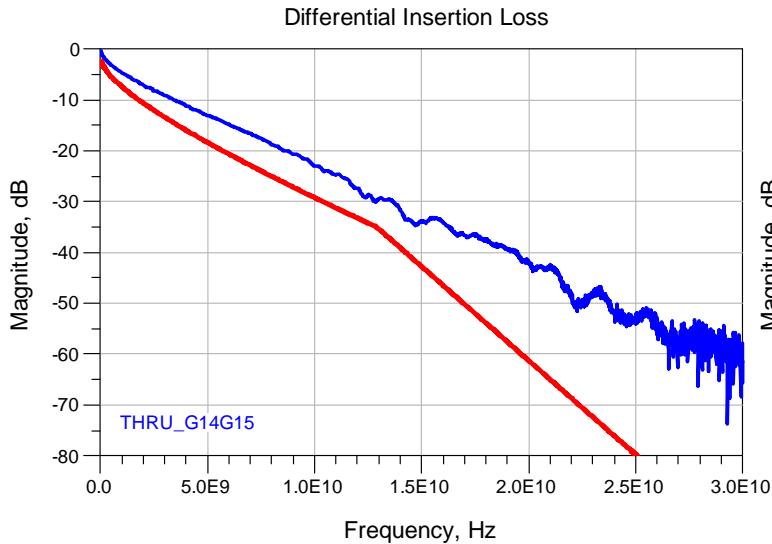
- Board Material = Megtron6 HVLP
- Trace length = 30"
- Trace geometry = Stripline
- Trace width = 7 mils
- Differential trace spacing = 9 mils
- PCB thickness = 200 mils, 20 layers
- Counterbored vias, up to 6mil stub

CONNECTORS

- **Dataset 1** includes
 - Mated standard STRADA Whisper connector at each end
- **Dataset 2** includes
 - Mated Embedded Capacitor STRADA Whisper connector at one end and,
 - Mated standard STRADA Whisper connector at other end

STRADA Whisper 4.5mm System

STANDARD



8 Crosstalk Aggressors – 4 NEXT AND 4 FEXT
 Maximum Frequency = 30 GHz

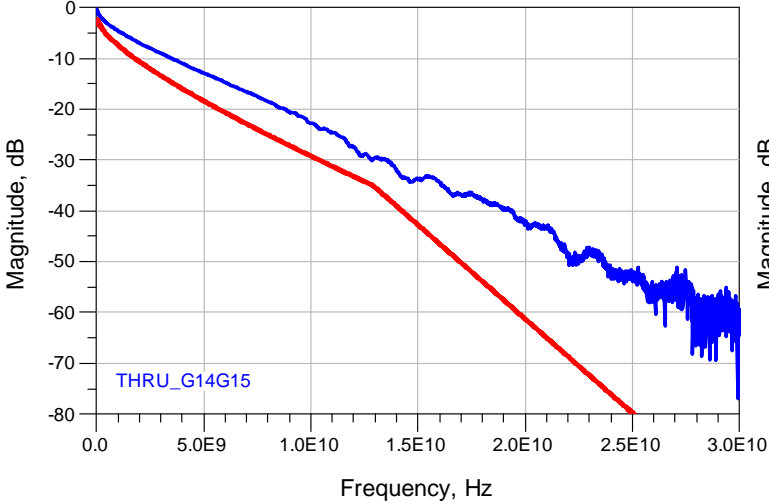
	PAM-2 [100GBASE-KR4]	PAM-4 [100GBASE-KP4]
COM*	5.4817 dB	8.6749 dB

* COM = Channel Operating Margin, Figure of Merit for the channel per IEEE802.3bj Draft 2.1
 Calculated using COM Matlab code provided on the IEEE 802.3bj website
 Code Revision = com_d2p1_02_0613
 COM needs to be >3dB for the channel to be compliant.

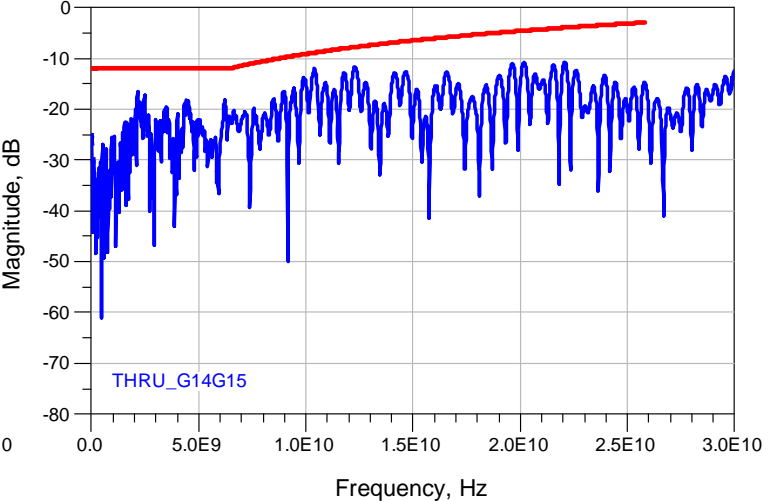
STRADA Whisper 4.5mm System

EMBEDDED CAPACITOR

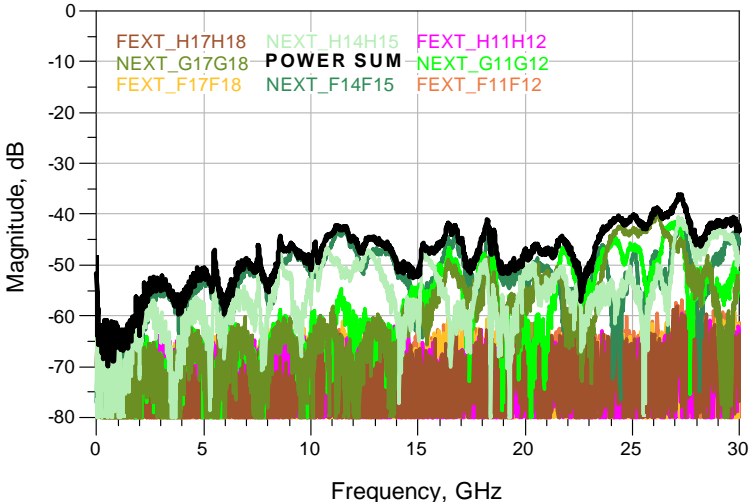
Differential Insertion Loss



Differential Return Loss



Differential Crosstalk



8 Crosstalk Aggressors – 4 NEXT AND 4 FEXT
Maximum Frequency = 30 GHz

	PAM-2 [100GBASE-KR4]	PAM-4 [100GBASE-KP4]
COM*	5.663 dB	9.0487 dB

* COM = Channel Operating Margin, Figure of Merit for the channel per IEEE802.3bj Draft 2.1
Calculated using COM Matlab code provided on the IEEE 802.3bj website
Code Revision = com_d2p1_02_0613
COM needs to be >3dB for the channel to be compliant.



Summary

- Measured data has been contributed to the study group suggesting that 16x25Gb/s implementations are one option to achieve 400Gb/s copper backplane solutions
- We encourage additional simulations to investigate other possible scenarios such as 10x40Gb/s