

100G Next Gen SR4 *vis-à-vis* SR10

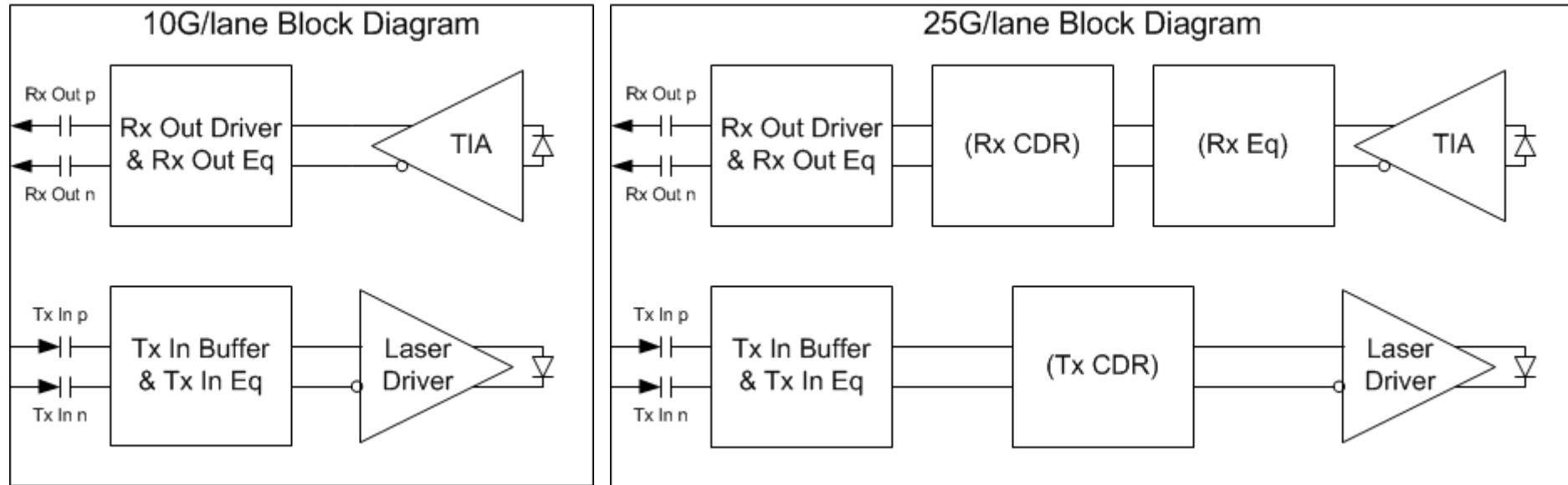
John Petrilla: Avago Technologies

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Presentation Summary

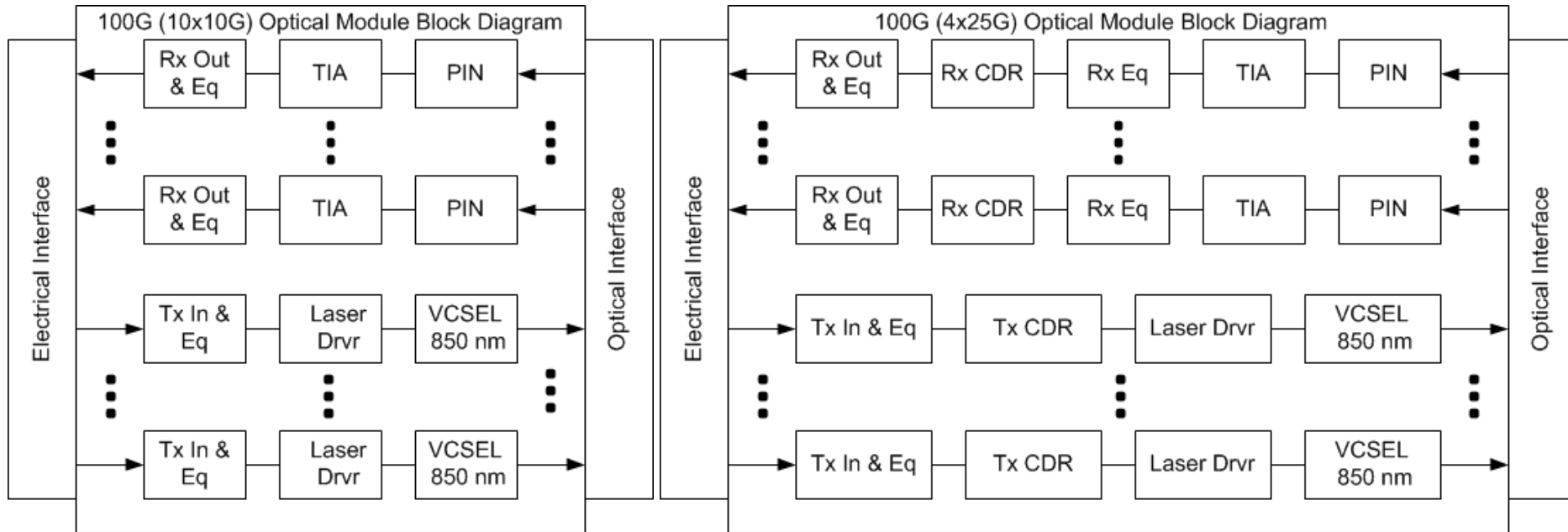
- Power consumption, density and cost comparisons are made relative to 100GBASE-SR10 transceivers.
- Optical reach as a driver of power consumption, density and costs is explored to identify inflection points.
- **Conclusions:**
 - 100G SR4 offers layout advantages to the host board implementer and substantial cable plant fiber count reduction while being competitive with SR10 in cost and power consumption.
 - A 100 m reach comprising 100G SR4 modules and OM4 cables appears both feasible and offers a good compromise for reach, power consumption, density and cost.

100G 25G/Lane Parallel MM Transceiver: Description



- NRZ modulation and 64b/66b encoding are assumed for both electrical and optical signals.
- MPO connectors are assumed for the optical interface.
- At 10G simple Tx input equalization and/or Rx output equalization (de-emphasis) may appear.
- At 25G electrical interfaces are expected to require equalization and, at least initially, retiming.
- At 25G some level of equalization is expected for the optical channel elements.

100G 10G & 25G/Lane MMF Transceivers Comparison



100GBASE-SR10 (10x10G) shown to assist comparisons

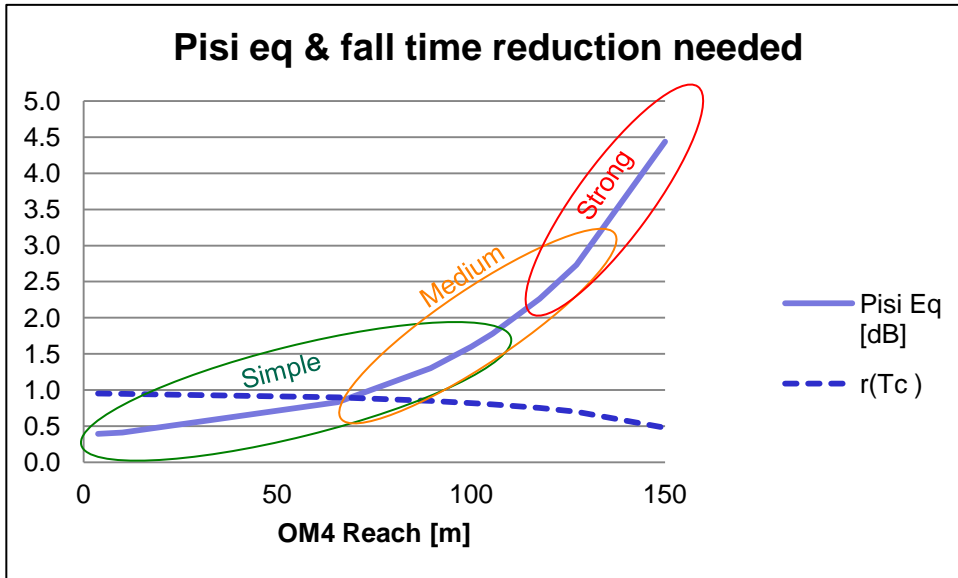
CXP is the assumed form factor for 100GBASE-SR10.

QSFP+ or CFP4, depending on power consumption and thermal management, are the assumed form factors for 100GBASE-SR4.

Comparative factors relative to 100GBASE-SR10 include lane count decrease, signal rate increase and added features.

The lower lane/channel count is expected to simplify host board layout and enable higher aggregate channel count.

100G 25G/Lane MMF Transceiver: Reach & Equalization



- The chart shows results from a link model analysis relating the amount of equalization required to support a range of reaches. The amount of equalization is indicated by the reduction in signal transition time and the end of the channel due to the equalization and by the difference in ISI penalty (in dB). Here a Simple equalizer may be a CTLE and a Strong equalizer may be an adaptive DFE.

- The effect of FEC is not included in the analysis.

- Equalization of the optical channel signal is expected due to the need to recover from BW losses in the optical elements.
- Equalization brings power and monetary costs that are dependent on the amount and type of equalization that's used.
 - Simple: 3 Watts & 1.2 x cost 100GBASE-SR10
 - Medium: 3.5 Watts & 1.3 x cost 100GBASE-SR10
 - Strong: 4.2 Watts & 1.6 x cost 100GBASE-SR10
- Without FEC, a 100 m OM4 reach objective appears feasible and offers a good compromise for reach, power consumption, density, and cost.

100G SR10 : SR4 Comparisons

	100G SR10	100G SR4	100G SR4 Totals	Comments
Lane Count	10	4		
Signal Rate/Lane	10.31 GBd	25.78 GBd		
<u>XCVR Power Consumption</u>	300 mW/lane	345 mW/lane	100G SR4 Power	
CDR	Not Required	+345 mW/lane		
CTLE Rx Eq	Not Required	+50 mW/lane	3 W	For OM4 reach objective up to ~ 90 m
DFE Rx Eq	Not Required	+175 mW/lane	3.5 W	For OM4 reach objective up to ~ 130 m
Adaptive DFE Rx Eq	Not Required	+350 mW/lane	4.2 W	For OM4 reach objective > ~ 140 m
<u>Density</u>				
Form Factor	CXP	QSFP+		QSFP+ for power consumption < 3 W
		CFP4		CFP4 for power consumption > 4 W
Cable Plant	2x10 / XCVR	1x8 / XCVR		
Host Board & Host IC	2x10 lane/channel routing	2x4 lane/channel routing		
<u>Relative XCVR Cost</u>	1x		100G SR4 Cost	
CDR	Not Required			
CTLE Rx Eq	Not Required		1.2x	
DFE Rx Eq	Not Required		1.3x	
Adaptive DFE Rx Eq	Not Required		1.5x	