

Low Cost Component Feasibility for 100GBASE-CWDM CFP4

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Outline

- Introduction
- 100GBASE-CWDM CFP4 Block Diagram
- 4x25G Micro-optic MUX and DMUX
- 25G CWDM DML Lasers Development Status
- 4x25G CFP4 Chipset Development
- CFP4 BOM Costs comparison between 100GBASE-CWDM (500m) and 100GBASE-LR4 (10km)
- Conclusions

100GBASE-CWDM Proposal

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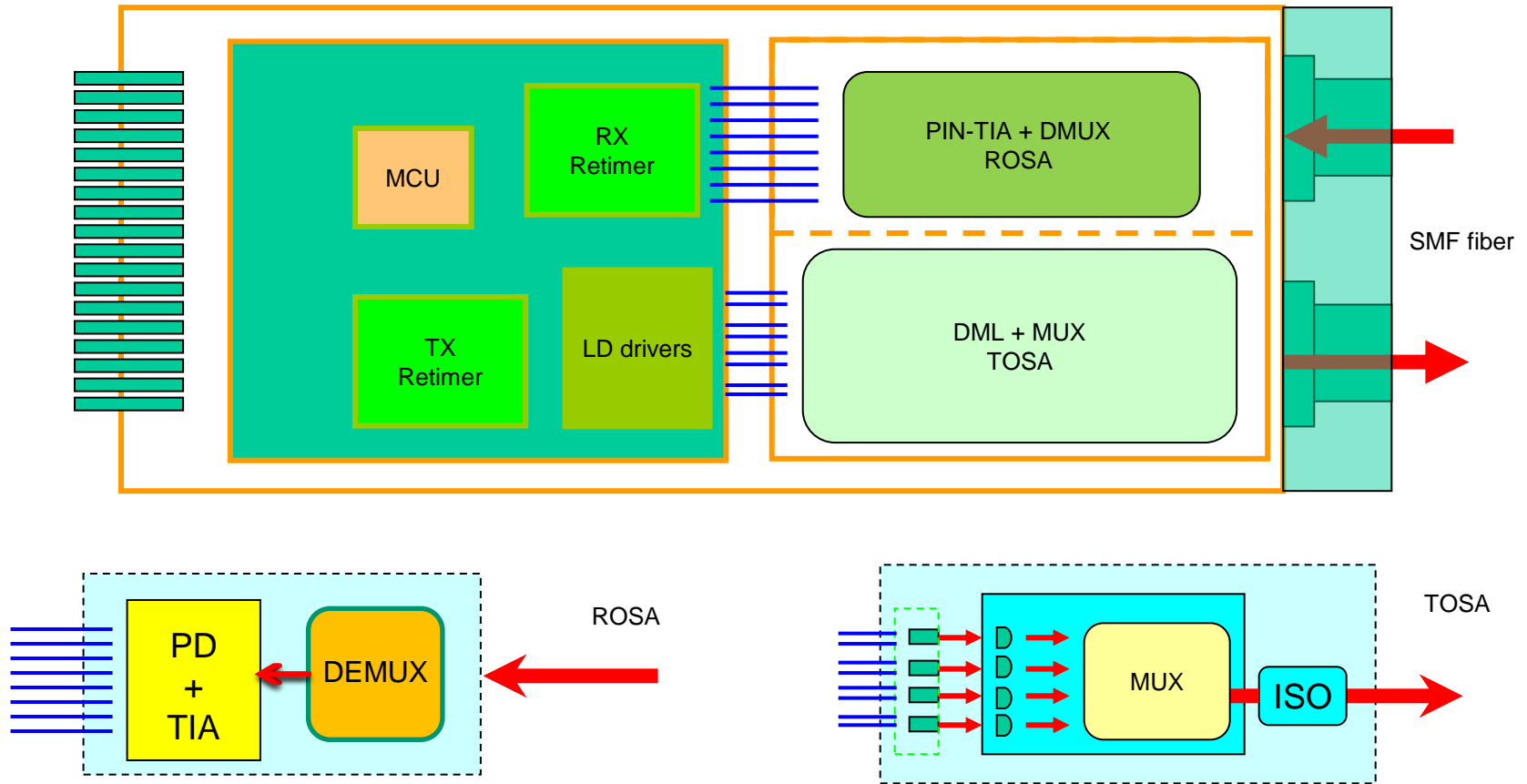
Table 96-5—Wavelength-division-multiplexed lane assignments

Lane	Center wavelength	Wavelength range
L ₀	1271 nm	1264.5 to 1277.5 nm
L ₁	1291 nm	1284.5 to 1297.5 nm
L ₂	1311 nm	1304.5 to 1317.5 nm
L ₃	1331 nm	1324.5 to 1337.5 nm

Table 96-6—100GBASE-?R4 operating range

PMD type	Required operating range
100GBASE-?R4	500 m

100GBASE-CWDM CFP4 Block Diagram



Key 100GBASE-CWDM CFP4 Components

- 25Gb/s TOSA/ROSA Housing
- 4x25G optical MUX and DMUX
- 25G CWDM DML lasers (1271-1331nm)
- 25G IC chipsets: DML driver, TIA, Re-timer

Optical CWDM Mux

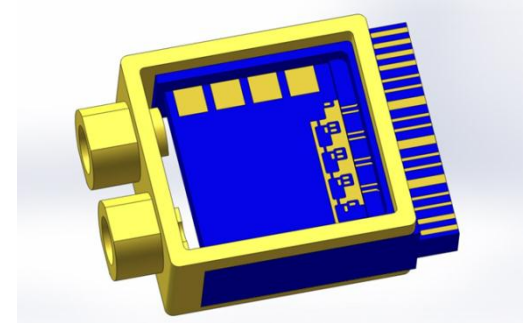
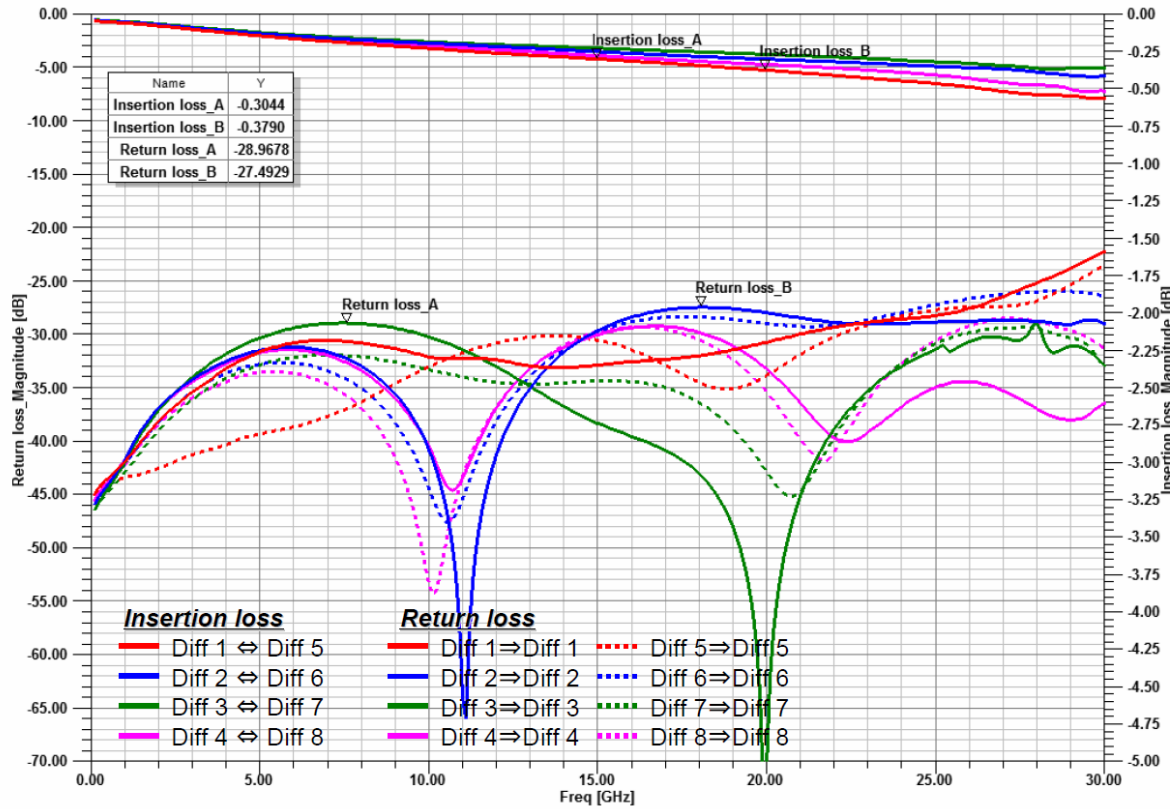
40G QSFP+

Low Cost BOSA Housing

- 25Gbps hermetic BOSA housing is the most expensive part in a transceiver module;
- Since CWDM DML lasers do not require temperature control, it is possible to build a BOSA with one housing, resulting significant cost saving compared with two-package TOSA/ROSA in LR4; The BOSA package is small enough to fit into either CFP4 or QSFP28;
- The BOSA configuration affords extra space for employing discrete CWDM lasers and PD+TIA, further lowering BOM costs.

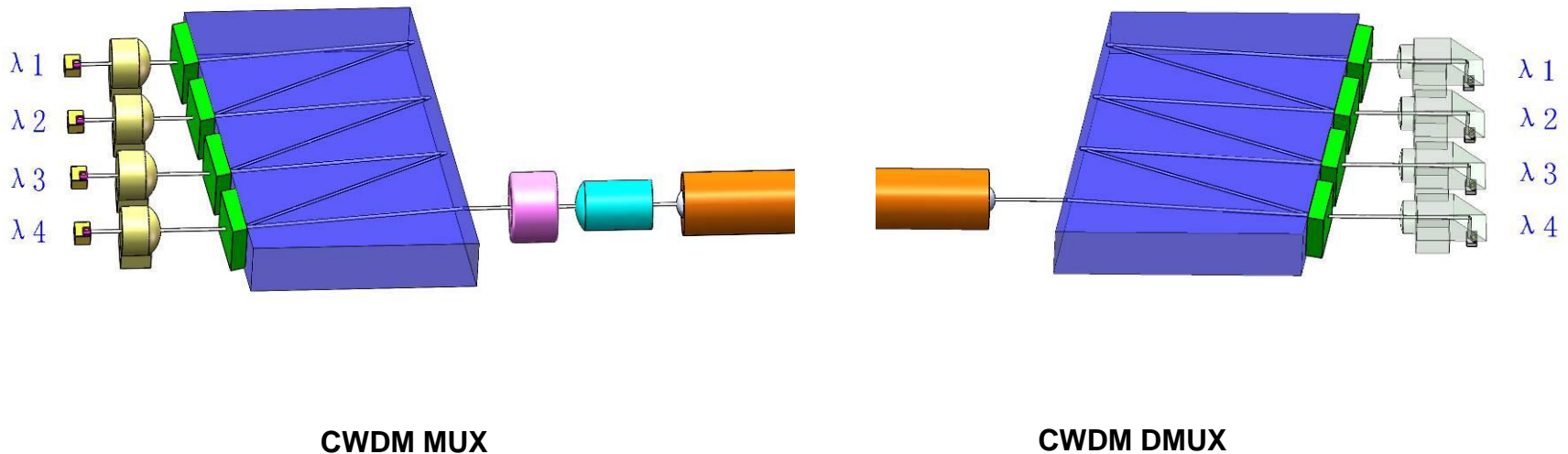


4x25G Housing RF Interface Simulations



Micro-Optic CWDM MUX/DMUX

- CWDM filter-based micro-optic MUX and DMUX can achieve high optical performance at low cost.
- Filters cost for 20nm BW is lower than 800GHz;
- Large bandwidth CWDM filters facilitate easy assembly .



Micro-Optic MUX/DMUX Optical Performance

Component	CWDM MUX	CWDM DMUX
Insertion Loss (dB)	<6dB (including coupling loss)	<1.5dB (including coupling loss)
Isolation (dB)	>30dB	>30dB
Return Loss (dB)	>40dB	>40dB
PDL (dB)	<0.2dB	<0.2dB
Channel Pitch (mm)	Customized	Customized

25Gb/s DML Lasers Status

■ Requirements

- 25Gb/s Directly modulated DFB
- Uncooled operation (-5C to +85C)
- Low drive current

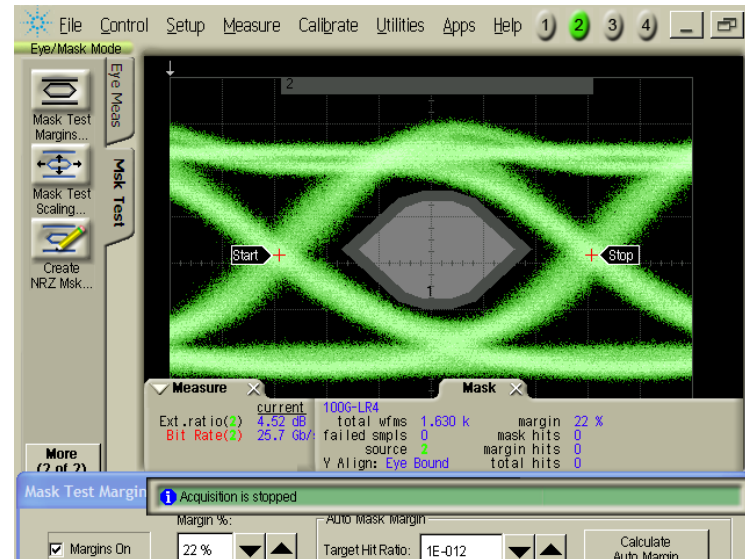
■ Current status – two vendors have samples available now:

- 18~22% Eye Margin at 25°C
- 15~20% at 50°C
- Good eyes up to 85°C

■ Ongoing work

- Improve slope efficiency
- Improve high temp performance

25°C 60mA bias
2³¹-1 PRBS



22% margin is repeatable

4x28Gbps IC Chipsets Status

	Vendor A	Vendor B	Vendor C
28G TIA	Samples - now	Samples - now	Samples - now
28G DML Driver	Samples - now	Samples - now	Samples - now
28G RX Retimer (CDR)	Samples - now	Samples - now	Samples - Q3-13
28G TX Retimer (CDR)	Samples - now	Samples - now	Samples - Q3-13

CFP4 BOM Cost Comparison

Component	100GBASE-CWDM	100GBASE-LR4
MUX/DMUX	0.7t	1t
Uncooled DML (discrete vs. array)	0.2u	1u
PD +TIA (discrete vs. array)	0.25v	1v
TOSA/ROSA Housing	0.5w	1w
Laser Driver IC's (DML vs. EML drivers)	0.6x	1x
Re-Timer IC's	1y	1y
AVG. CFP4 Module Costs	~ 0.5Z	1Z

Conclusions

- **Key components for CFP4 are available for 100GBASE-CWDM;**
- **Major BOM cost savings are in TOSA/ROSA for 100GBASE-CWDM, compared with 100GBASE-LR4; It is possible that a CFP4 of 100GBASE-CWDM could be half of the cost of 100GBASE-LR4;**
- **100GBASE-CWDM is a practical and economic solution for 500m reach 100G links.**