

# 400G Pluggable Optics

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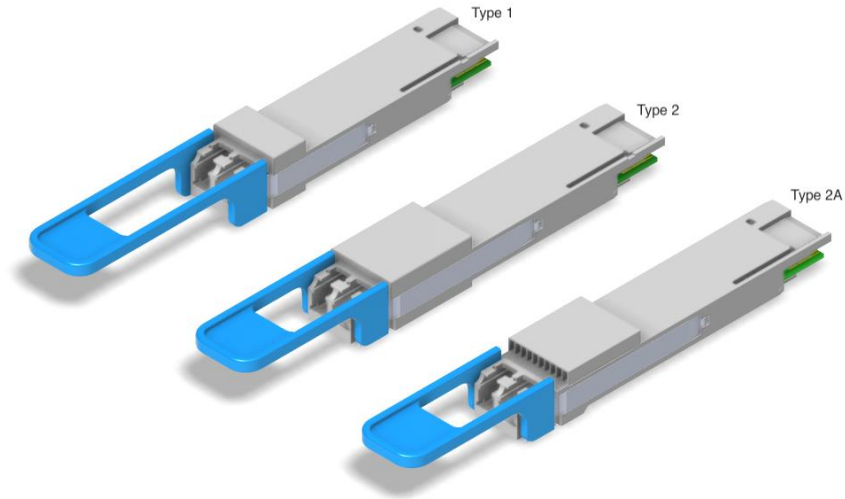
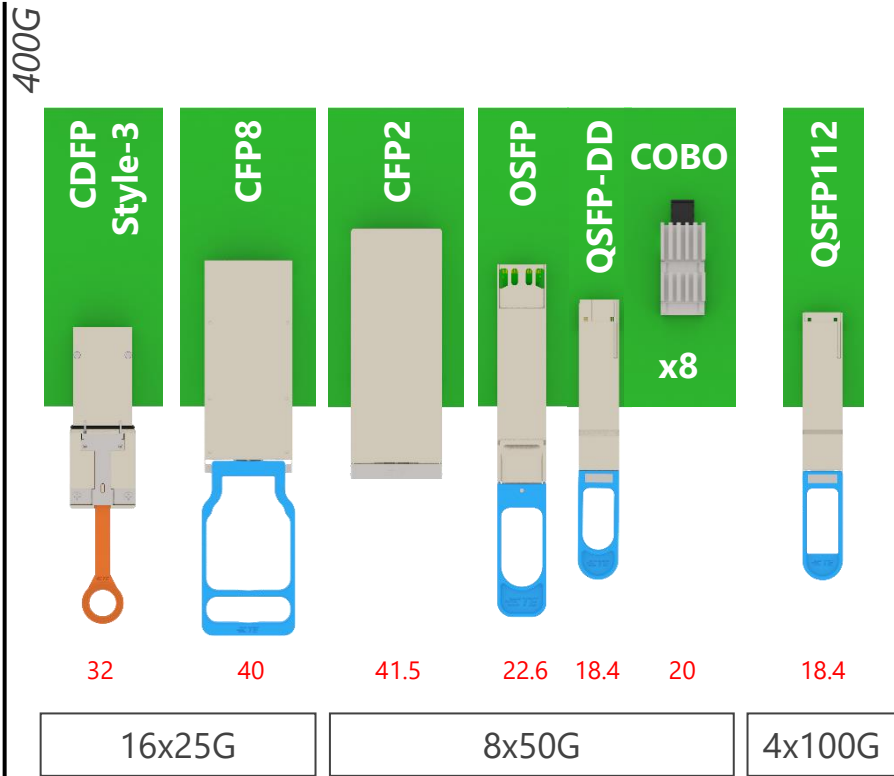
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## 400G Optics Module Form Factors



QSFP-DD cage and Type 1, Type 2, and Type 2A module designs

- New optics
- New form factors
- New Management Interface

R – Roadmap (Speculation)

## 100G Single Lambda QSFP28 Optics

Reach	100G Ethernet	Juniper Naming Scheme	Connector
SR (50m)	100GBASE-SR1	QSFP-100G-SR1	LC Duplex
DR (500m)	100GBASE-DR	<b>QSFP-100G-DR</b>	LC Duplex
FR (2km)	100GBASE-FR1	<b>QSFP-100G-FR1</b>	LC Duplex
LR (10km)	100GBASE-LR1	<b>QSFP-100G-LR1</b>	LC Duplex

- 4x25Gb/s NRZ CAUI-4 C2M Electrical Interface
- Single Lambda 53.125 GBd PAM4 Optical Signal
- Embedded RS (544,514) FEC
- Interoperate with 4x100G Optics on 400G Platforms

## Double-density Legacy 100G Optics Ports on 400G Platforms

	Application	Module Naming Schemes	
Reach	2 x 100G Ethernet	Juniper Scheme	Alt. Scheme
SR (70m)	2 x 100GBASE-SR4	<b>QDD-2x100G-SR4</b>	200G-2xSR4
DR (500m)	2 x 100G-PSM4	QDD-2x100G-PSM4	200G-2xPSM4
FR (2km)	2 x 100GBASE-CWDM4	<b>QDD-2x100G-CWDM4</b>	200G-2xCWDM4
LR (10km)	2 x 100GBASE-LR4	<b>QDD-2x100G-LR4</b>	200G-2xLR4
	2 x 100G-4WDM-10	QDD-2x100G-4WDM-10	200G-2x4WDM-10
ER (30-40km)	2 x 100G-ER4L	QDD-2x100G-ER4L	200G-2xER4L
	2 x 100G-4WDM-40	QDD-2x100G-4WDM-40	200G-2x4WDM-40

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## 400G Capacity QSFP-DD with 50G Electrical Lanes

Reach	Application			Module Naming Schemes		
	4x100G Ethernet	2x200G Ethernet	400G Ethernet	Juniper Scheme	Alt. Scheme 1	Alt. Scheme 2
SR (50-70m)	4x100G-BiDi 4x100GBASE-SR2 4x100GBASE-SR1	2x200GBASE-SR4 2x200GBASE-SR2	400GBASE-SR4.2 400GBASE-SR8 400GBASE-SR4	QDD-400G-SR4.2 QDD-400G-SR8 QDD-400G-SR4	400G-BiDi 400G-SR8 400G-SR4	
DR (500m)	4x100GBASE-DR	2x200GBASE-DR4	400GBASE-DR4	QDD-2x200G-DR4 <b>QDD-400G-DR4</b>	400G-DR8 400G-DR4	
FR (2km)	4x100GBASE-FR1	2x200GBASE-FR4	400GBASE-FR8 400GBASE-FR4	<b>QDD-4x100G-FR1</b> QDD-2x200G-FR4 QDD-400G-FR8 <b>QDD-400G-FR4</b>	400G-4xFR1 400G-2xFR4 400G-FR8 400G-FR4	400G-DR4+
LR (6km)	No standard	No standard	400GBASE-LR4-6	QDD-400G-LR4-6	400G-LR4-6	
LR (10km)	4x100GBASE-LR1	2x200GBASE-LR4	400GBASE-LR8 400G-LR4-10	QDD-4x100G-LR1 QDD-2x200G-LR4 <b>QDD-400G-LR8</b> QDD-400G-LR4-10	400G-4xLR1 400G-2xLR4 400G-LR8 400G-LR4-10	400G-DR4++
ER (30-40km)			400GBASE-ER8 400ZR (unamp)	QDD-400G-ER8 QDD-400ZR	400G-ER8 400ZR	
ZR (80-120km)			400ZR (amp) 400GBASE-ZR	QDD-400ZR QDD-400G-ZR	400ZR 400G-ZR	

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## Module Management Interface: more customer-facing features

- **Common Management Interface Specification (CMIS)**

**Form Factors:** QSFP-DD, OSFP, COBO, QSFP56; SFP-DD (Two-lane CMIS)

**Revisions:** 3.0 and 4.0 formally released; CMIS 4.1 development ongoing;  
Host software supports all revisions.

**Core Features:** Module state machine and data path state machine  
Host interface IDs and media interface IDs for different applications;  
Signal Integrity controls: plug and play.  
For example, 400GBASE-SR8, 400GBASE-DR4

**Advanced Features:** Module Diagnostics (Loopback, Pattern Generation and checking);  
Versatile Diagnostics Monitoring (VDM); CDB Messaging including firmware update  
Timing Characteristics (Data path Tx and Rx latencies, CMIS 4.1 only)

- **Firmware Update:**

**Method:** Command Data Block (CDB) Message Communication defined in CMIS 4.0/4.1

**Updatable Items:** microcontroller code, DSP code, memory map, etc.

**Advantage:** Remote Updating through host software; applicable to different optics from different vendors.

**Actual Experience:** successfully implemented by host software engineer; quite straight-forward;



# Thank you

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