



LUXTERA
NANOPHOTONIC INTEGRATED CIRCUITS

QSFP addition to SAS-2

T10/07-498r0

Gives needed support for longer distance connections

Tom Palkert

Luxtera



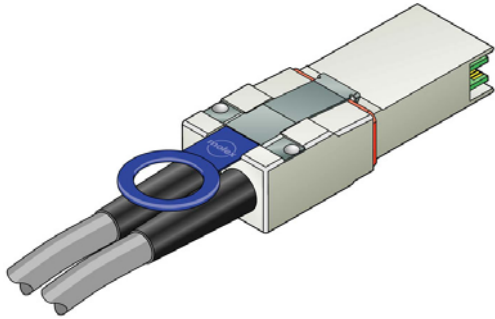
QSFP Overview

- ▶ QSFP was originally developed for 4G FC
- ▶ QSFP specification is being formally standardized within the SFF group.
 - Current MSA exists as INF-8438
 - New spec will be SFF-8436
 - Adds support for higher data rates (up to 10G)
 - Adds management I/F support for high speed electrical signal indicators i.e. SFP+ linear, SFP+ limiting

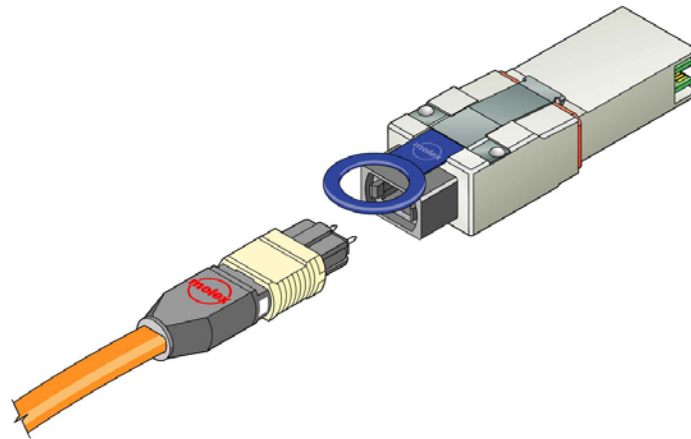


Why add QSFP to SAS?

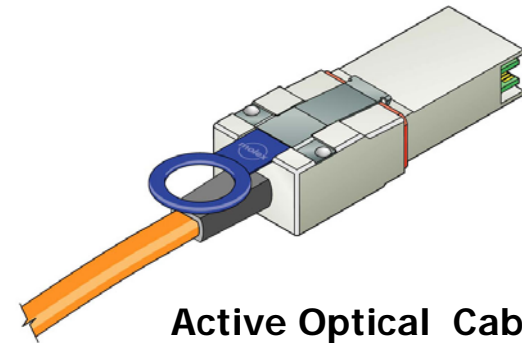
- ▶ Supports
 - longer lengths of interconnects
 - Multiple user selectable PMDs with a single connector:
 - Passive copper cables
 - Active copper cables
 - Active optical cables
 - Connectorized optical cables



**Copper Cable
Passive & Active**



Pluggable Optical Module

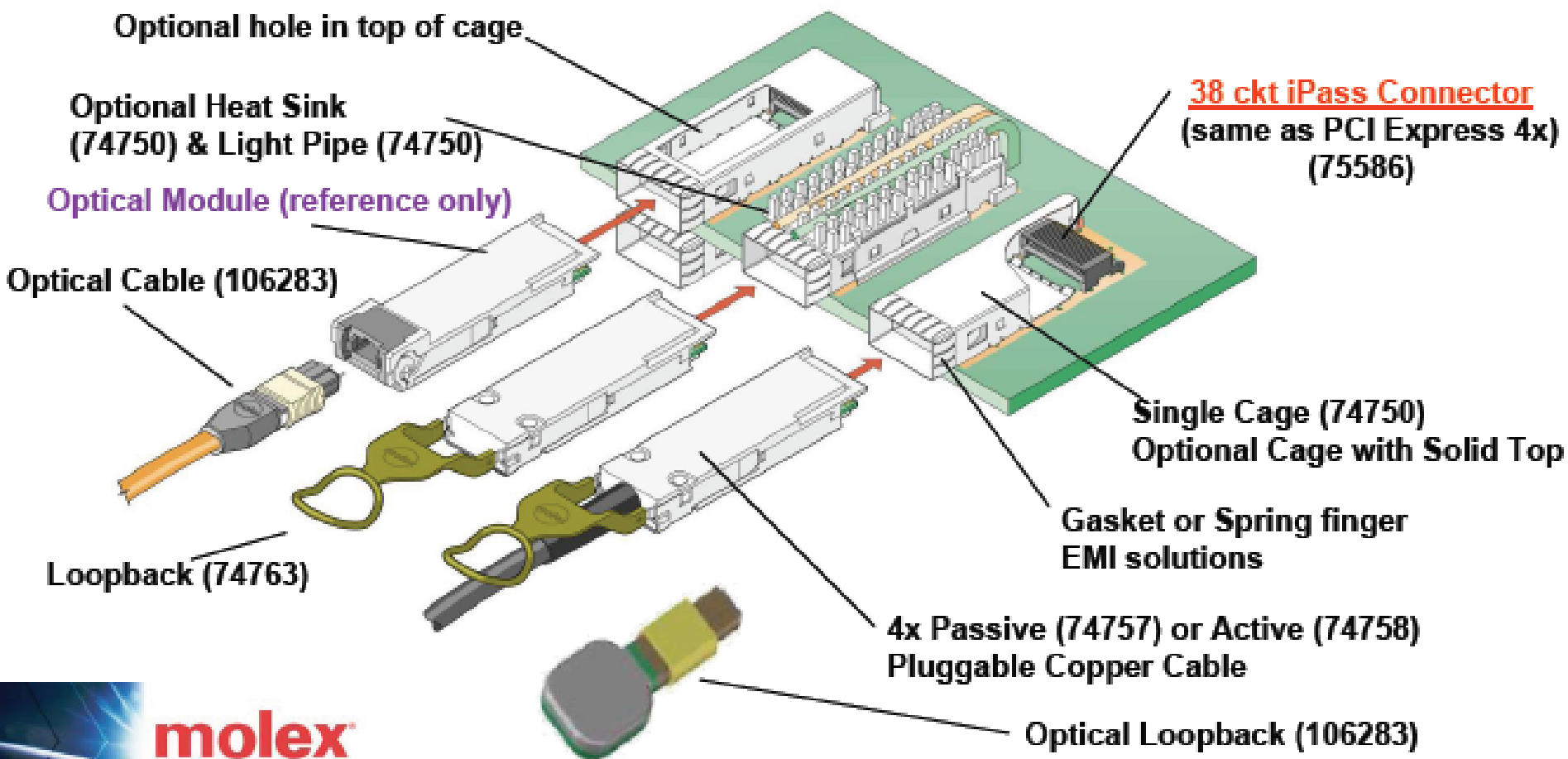
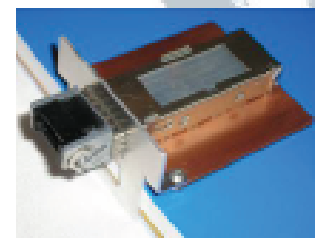


Active Optical Cable

QSFP – Quad Small Form-factor Pluggable

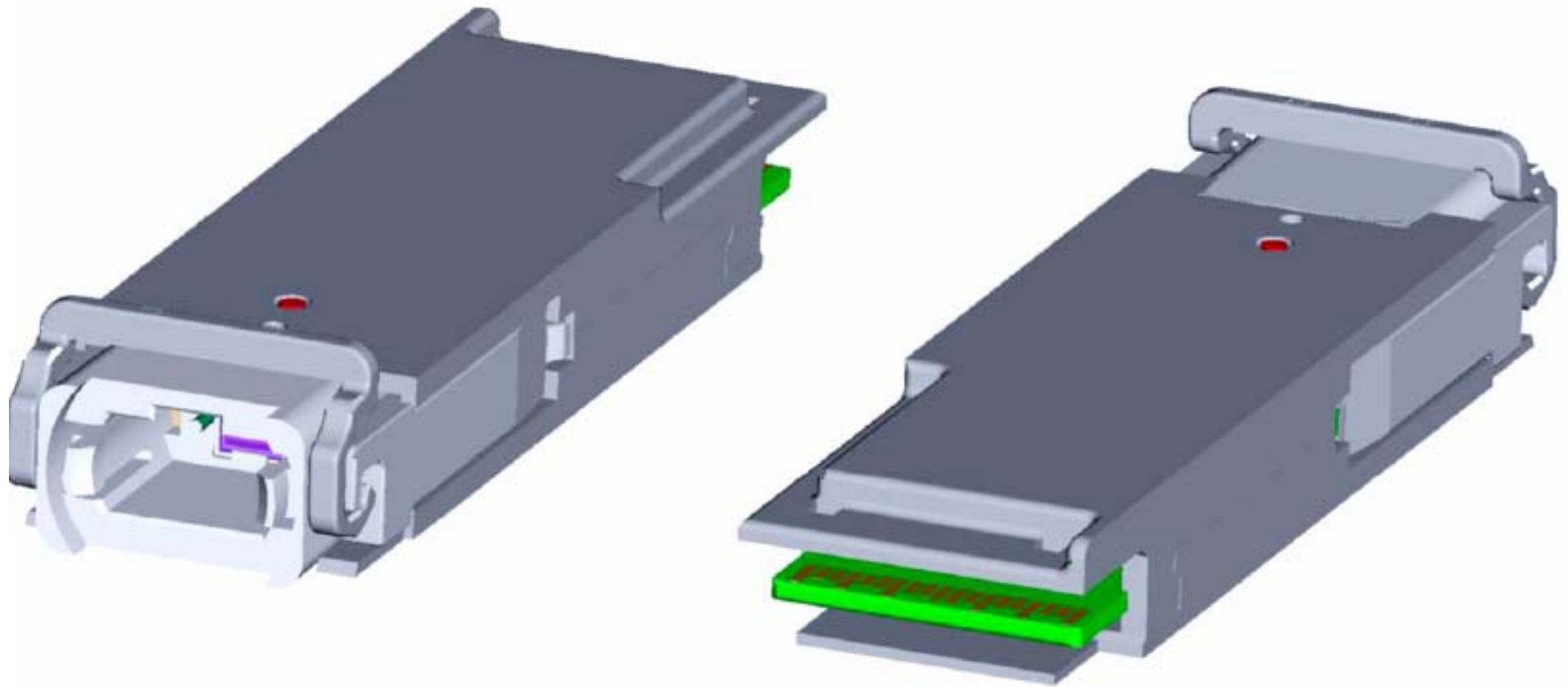
The QSFP MSA was released 12/4/2006

- The MSA defines an (8) Differential Pair / 4x Pluggable Copper & Optical Module
- 4 lanes @ up to 10 Gbps each per connector
- Uses only 30% more PCB space over SFP to get 10x data density





QSFP module





Electrical I/F support

- ▶ Support 'new' Electrical I/F: 8G to 10G
 - SFF-8431 limiting (8G-11.1G)
 - SFF-8431 linear (8G-11.1G)
 - XFI (10.3-11.1G)
 - FC-PI-4 (8.5G)
 - FC-PI-3? (10.5G)
 - 32G FC (4x8.5G?)
 - 40G FC? (4x10.5G?)
 - 40G Ethernet? (4x10.3G?)
 - IB QDR (10G)
 - 10GBASE-KR (10.3G)
 - SAS 2.0 (6G)
 - SAS 3.0 (12G?)
 - PCI Exp 3 (8G)
- ▶ Support legacy I/F: 1G to 5G
 - IB –SDR and DDR (2.5G and 5G)
 - Ethernet/SFP – (1G)
 - FC-PI-2 – (1,2,4.25G)



Media support:

- Passive copper cable
- Active copper cable
- Active optical cable
- Parallel fiber
 - SM
 - MM



Participants

- ▶ Scott Kipp (Brocade) Co-chair
- ▶ Jay Neer (Molex) Co-chair
- ▶ Tom Palkert (Luxtera) Editor
- ▶ Others?



Estimated distances supported

	Direct attach copper	Active copper	Active optical	MM optical limiting	MM optical linear	SM Optical LC-I	SM optical LC-L
FC-PI-4 delta	7m	20m	.1-2km	50	100	1400	10000
FC-PI-4 Beta	5m	20m	.1-2km	NA	NA	NA	NA
8431 limiting	7m	20m	.1-2km				10000
8431 linear	7m	20m	.1-2km			NA	NA
XFI	1m	20m	.1-2km				
IB QDR	3m	20m	.1-2km				
IB DDR	10m	20m	.1-2km				
IB SDR	17m	20m	.1-2km				
SAS 3.0	10m	20m	.1-2km	>50	>100	1400	10000



What needs to be done?

- ▶ Add QSFP connector and card cage to SAS 2.0 specification
 - SAS 3.0 is too far out to meet the industry requirements for optical links in the next 1-3 yrs.
 - Will there be a SAS 2.x?
 - No changes to SAS electrical/jitter specs.
 - No optical specs need to be added.
 - This should be considered for SAS 3.0