

Kaiam Technical Brief

Migration Path from QSFP+ 40G-LR4 & -LR4-Lite to QSFP28 100G-CWDM4

Introduction

The **Kaiam LightScale®2** (LS2) platform provides superior performance, manufacturability, and cost compared to the legacy **LightScale1** (LS1) platform. For this reason, **Kaiam** will soon discontinue legacy 40G transceivers based on the LS1 platform:

- QSFP+ 40G-LR4 XQX21**, XQX24**
- QSFP+ 40G-LR4-Lite XQX25**
- QSFP+ 40G-UNIV XQX32**

For customers using those legacy 40G transceivers, **Kaiam** provides an attractive upgrade path to XQX5*** transceivers based on the LS2 platform. The XQX5*** series are mechanically, electrically and optically backward compatible with 40G-LR4 and 40G-LR4-Lite with the added advantage of being able to upgrade to 100G by simply changing registers. Please note there will not be a **Kaiam** direct replacement for 40G-UNIV XQX32** series as this offered MM and SM fiber interface in one transceiver.

Using XQX5000 transceivers in 40G mode

The **Kaiam** XQX5*** series, QSFP28 CWDM4 modules operate at 100Gbps data rate by default, but they are fully backward compatible with 40G-LR4 and 40G-LR4-Lite in form fit and function. To operate in 40G mode, simply set MSA register byte 98 (pg. 00h) to 00h. Additionally, set control bytes 87 and 88 (pg. 00h) to 00h (rate select set from 2 to 0 per SFF-8636). Please note those settings are volatile, parts revert back to default 100G setting after a Power Sequence or RESET.

Design validation testing (DVT) of XQX5*** QSFP28 transceivers was performed at nine operating points to cover the entire case temperature and supply voltage ranges and validate compliance to product specifications. The nine operating points (P1–P9) are defined in **Table 1**.

Supply Voltage (V)	Case Temp. (°C)		
	0	40	75
3.13	P1	P2	P3
3.30	P4	P5	P6
3.46	P7	P8	P9

Table 1: Operating point definitions over case temperature and supply voltage

Table 2 compares 40G-LR4 and 40G-LR4-Lite major specifications and DVT results of **Kaiam’s XQX5*****-family of transceiver **when operated in 40Gbps mode**. The DVT results show that XQX5*** transceivers meet all 40G specifications when operated in 40Gbps mode.

						100G LS2 Operated at 40G Module Performance Test (P1-P9)		
Measurement Name	40G-LR4 Spec. Min	40G-LR4 Spec. Max	40G-LR4-Lite Spec. Min	40G-LR4-Lite Spec. Max	Unit	Measurement Standard deviation	Measurement Average	Remark
Module Power Dissipation (W)		3.5		3.5	W	0.04	2.47	meet both specs
Supply Voltage Monitor Accuracy(%)	-3	3	-3	3	%	0.04	-0.17	meet both specs
Temperature Monitor Accurage(degree C)	-3	3	-3	3	°C	0.26	0.15	meet both specs

						100G LS2 Operated at 40G Transmitter(Tx) Test (P-P9)			
Item #	Measurement Name	40G-LR4 Spec. Min	40G-LR4 Spec. Max	40G-LR4-Lite Spec. Min	40G-LR4-Lite Spec. Max	Unit	Measurement Standard deviation	Measurement Average	Remark
1	Tx Eye LR4 Mask Margin (MM)	15		15		%	1.11	61.1	customer specific spec
2	Tx Average Power Pavg	-7	2.3	-10	2.3	dBm	0.16	-0.5	meet both specs
3	Tx Optical Modulation Amplitude(OMA)	-4	3.5	-6	3.5	dBm	0.19	-0.39	meet both specs
4	Tx Extinction Ratio(ER)	3.5		3.5		dB	0.16	5.06	meet both specs
5	Tx Eye Crossing(%)					%	0.21	53.54	customer specific spec
6	TX Jitter Rms					ps	0.12	2.22	customer specific spec
7	TX Dispersion Penalty(dB)		2.6		2.3	dB	0.16	0.01	meet both specs
8	Tx Power Accuracy	-3	3	-3	3	dB	0.09	0.77	meet both specs
9	Side Mode Suppression Ratio(SMSR)	30		30		dB	2.44	49.7	meet both specs

						100G LS2 Operated at 40G Receiver(Rx) Test (P1-P9)		
Measurement Name	40G-LR4 Spec. Min	40G-LR4 Spec. Max	40G-LR4-Lite Spec. Min	40G-LR4-Lite Spec. Max	Unit	Measurement Standard deviation	Measurement Average	Remark
Rx Electrical Eye Test Mask Margin	15				%	6.24	38.42	customer specific spec
Rx Sensitivity 1e-12 OMA		-11.5		-11.5	dBm	0.071	-14.09	meet both specs
Receiver Power Monitor Accuracy(dB)	-3	3	-3	3	dB	0.09	0.77	meet both specs
Optical Return Loss Tolerance(ORL)(dB)		20			dB			meet both specs
Overload Test Pav(dBm)		2.3			dBm			meet both specs

Table 2: 40G-LR4 and 40G-LR4-Lite major specifications and DVT results of Kaiam’s XQX5* in 40G mode**

Figure 1 and **Figure 2** compare the mechanical dimensions of the XQX5*** 100G QSFP28 module to the 40G variants packaged in a QSFP+ in compliance with SFF-8661 Rev 2.3 specification. The QSFP28 module is fully compatible with any QSFP+ slot.

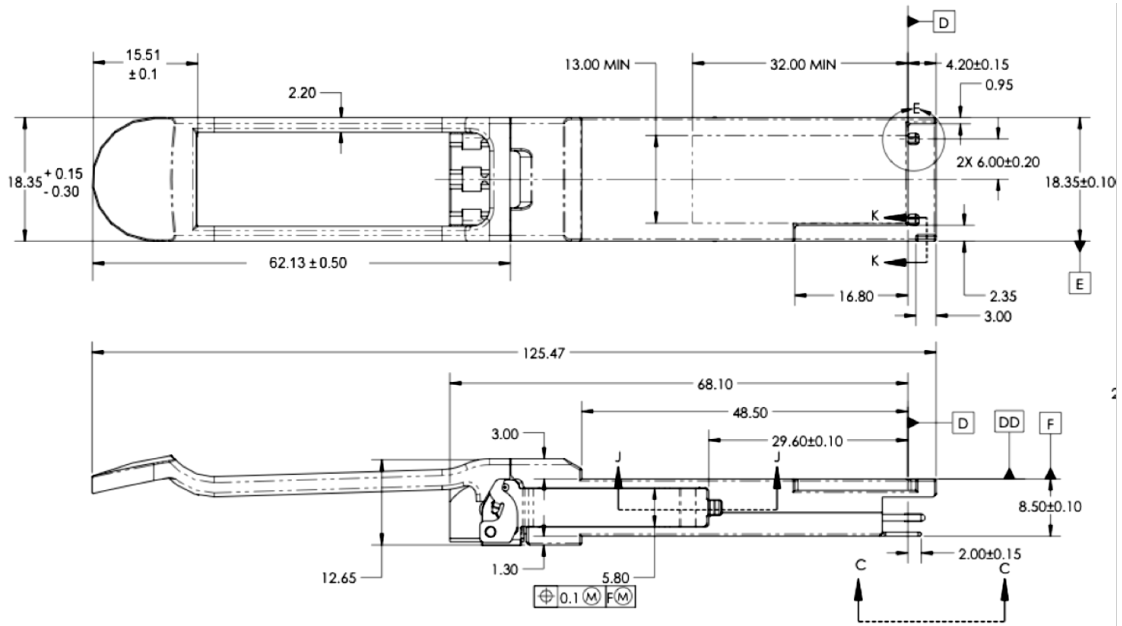


Figure 1: QSFP28 Module Mechanical Outline (all dimensions are in mm)

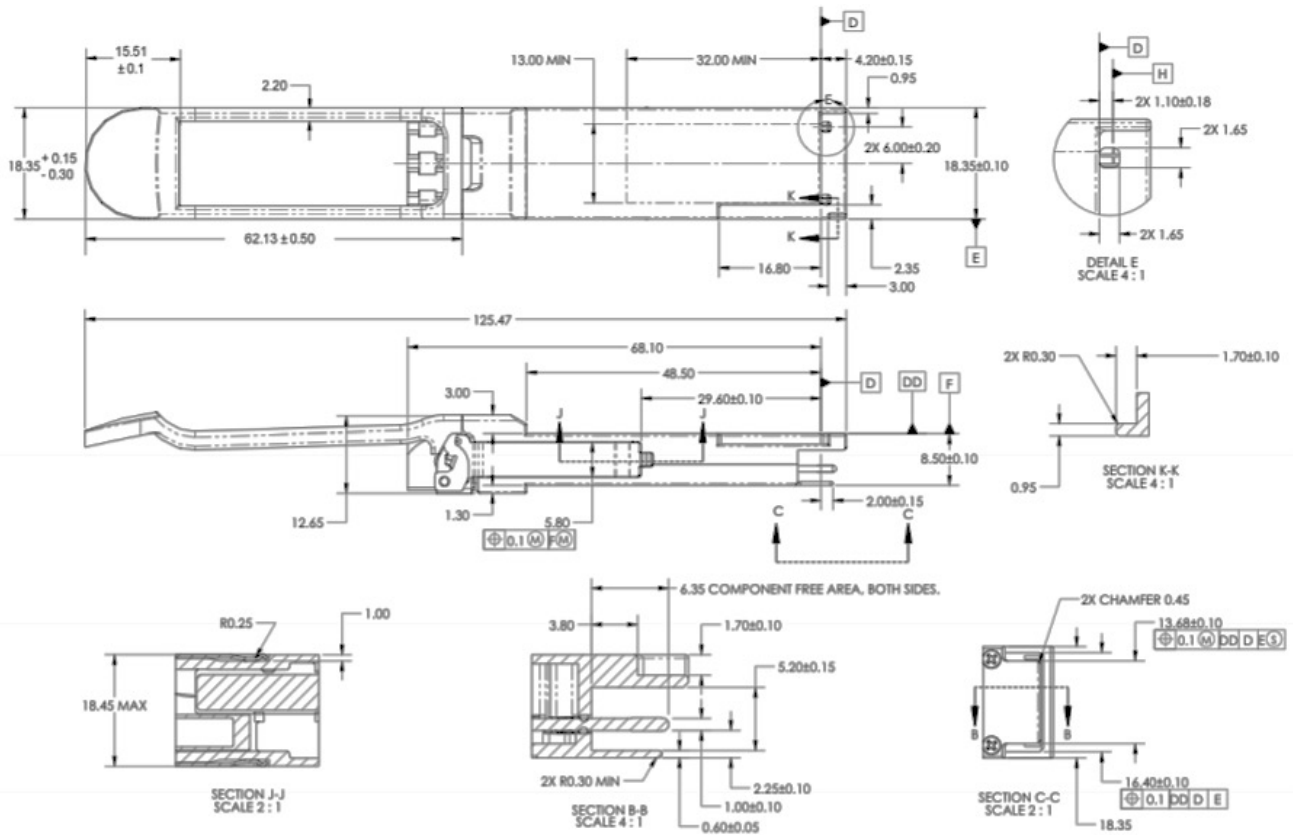


Figure 2: QSFP+ Module Mechanical Outline (all dimensions are in mm)

The pull tab color for 100G CWDM4 XQX5*** is green (PANTONE 354U) as defined by MSA, to differentiate from 40G transceivers. (Click on the product images to access their brochures as PDF online.)

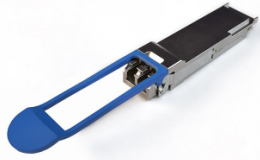


Figure 3: XQX24
40G-LR4**

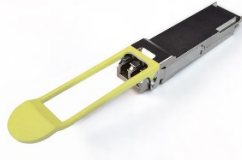


Figure 4: XQX25
40G-LR4L**



Figure 5: XQX5*
100G-CWDM4 (40G operation)**

Summary

As illustrated by DVT results and mechanical drawings, **Kaiam** XQX5*** are fully backward compatible with 40G-LR4 and 40G-LR4-Lite. We strongly encourage our valued customers to engage with **Kaiam** support staff to achieve a seamless transition from 40G to 100G.

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