

400G QSFP-DD SR4 Optical Transceiver

Features

- Hot-pluggable QSFP-DD form factor
- 1 Maximum link length of 100m on OM4 fiber with FEC
- 1 +3.3V single power supply
- 1 Power dissipation < 8W
- 1 Operating case temp Commercial: 0°C to +70 °C
- 1 Single MPO-12 APC connector
- 1 RoHS compliant
- 1 Compliant with IEEE 802.3bs standard: 400GAUI-8 electrical interface

Application

- Application case 1, 400G SR4, 1 of 400G per port point to point connections
- Application case 2, 2x200G SR2, 2 of 200G per channel breakout connections
- Application case 3, 4x100G SR, 4 of 100G per channel breakout connections

Order Information

Table 1-Order Information

Part No.	Bit Rate (Gbps)	Laser (nm)	Distance note1	Fiber Type	DDMI	Connector	Tempnote2
400G QSFP-DD SR4	425.0	850	50m	MMF	YES	MPO 1x12 APC	0°C~+70°C

Note:

1.OM4 fiber, 60m for OM3 fiber, with FEC

2.Case Temperature

Absolute Maximum Ratings

Table2- Absolute Maximum Ratings

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Supply Voltage	Vcc3	-0.5	-	+3.6	V	
Storage Temperature	Ts	-40	-	+85	° C	
Operating Humidity	RH	0	-	+85	%	1
Control Input Voltage	VI	-0.3	-	VCC+0.5	V	1

Note:1 No condensation

Recommended Operating Conditions

Table 3- Recommended operating Conditions

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Operating Case Temperature	TC	0	-	+70	° C	
Power Supply Voltage	Vcc	3.135	3.3	3.465	V	
Power Dissipation	Pd	-	-	8	W	
Supply Current	Icc	-	-	2550	mA	
Pre-FEC Bit Error Ratio	-	-	-	2.4x10-4	-	
Post-FEC Bit Error Ratio	-	-	-	1x10-12	-	1
Link Distance (OM4)	-	2	-	100	m	2
Link Distance (OM3)	-	2	-	60	m	

Note:

1.FEC provided by host system

2.FEC required on host system to support maximum distance

Electrical Characteristics

Table 4- Electrical Characteristics

Parameter	Symbol	Unit	Min	Typ	Max	Notes
Transmitter						
Differential pk-pk input Voltage tolerance	-	mV	900	-	-	
Differential termination mismatch	-	%	-	-	10	
Single-ended voltage tolerance range	-	V	-0.4	-	3.3	
DC common mode Voltage	-	mV	-350	-	2850	
Receiver						
AC common-mode output Voltage (RMS)	-	mV	-	-	17.5	
Differential output Voltage	-	mV	-	-	900	
Near-end Eye height, differential	-	mV	70	-	-	
Far-end Eye height, differential	-	mV	30	-	-	
Far end pre-cursor ISI ratio	-	%	-4.5	-	2.5	
Differential Termination Mismatch	-	%	-	-	10	
Transition Time (min, 20% to 80%)	-	ps	9.5	-	-	
DC common mode Voltage	-	mV	-350	-	2850	

Table 5-Optical Characteristics

Parameter	Symbol	Unit	Min	Typ	Max	Notes
Transmitter						
Signaling Rate per Lane	SR	Gbd	53.125 ± 100 ppm			
Modulation format	-	-	PAM4			
Center wavelength	CW	nm	842	-	948	
RMS Spectral Width	SW	dBm	-	-	0.65	1
Average Launch Power per Lane	AOP	dBm	-4.6	-	4.0	
Outer Optical Modulation Amplitude (OMA _{outer}), each lane (min)	TxOMA	dBm	-2.6 -4.4+max(	-	3.5	
For max(TECQ,TDECQ)≤1.8dB For 1.8<max(TECQ,TDECQ)≤4.4dB			TECQ,TDE CQ)			
Transmitter and Dispersion Eye Closure for PAM4 (TDECQ), each lane	TDECQ	dB	-	-	4.4	
Overshoot/undershoot	-	%	-	-	29	
Transmitter power excursion,each lane	-	dBm	-	-	2.3	
Transition Time	T _t	ps	-	-	17	
Average Launch Power of OFF Transmitter, each lane	TOFF	dBm	-	-	-30	
Extinction Ratio, each lane	ER	dB	2.5	-	-	
Encircled flux	-	dBm	≥86% at 19 μm ≤30% at 4.5 μm			2
Receiver						
Signaling Rate per Lane	SR	Gbd	53.125 ± 100 ppm			
Modulation format	-	-	PAM4			
Wavelength	W	nm	842	-	948	
Damage Threshold, average optical power, each lane	DT	dBm	5	-	-	3
Average Receive Power, each lane	RXP _x	dBm	-6.3	-	4	4
Receive Power (OMA) per Lane	RxOMA	dBm	-	-	3.5	
LOS Assert	LOSA	dBm	-15	-	-	
LOS De-assert	LOSD	dBm	-	-	-9.2	
LOS Hysteresis	LOSH	dB	0.5	-	-	
OMA _{outer} of each aggressor lane	-	dBm	-	3.5	-	

Note:

- 1.RMS spectral width is the standard deviation of the spectrum
2. If measured into type A1a.2 or type A1a.3, or A1a.4, 50 μm fiber, in accordance with IEC 61280-1-4
3. The receiver shall be able to tolerate, without damage, continuous exposure to a modulated optical input signal having this power level on one lane. The receiver does not have to operate correctly at this input power
4. Average receive power, each lane (min) is informative and not the principal indicator of signal strength.A received power below this value cannot be compliant; however, a value above this does not ensure compliance

5. Receiver sensitivity (OMA_{outer}) is informative and is defined for a transmitter with a value of TECQ up to 4.4 dB

Digital Diagnostic Specifications

Table 6-Digital Diagnostic Characteristics

Parameter	Symbol	Unit	Min	Max	Notes
Temperature monitor absolute error	DMI_Temp	degC	-5	5	Over operating temperature range
Supply voltage monitor absolute error	DMI_VCC	V	-0.1	0.1	Over full operating range
Channel RX power monitor absolute error	DMI_RX_Ch	dB	-3	3	1
Channel Bias current monitor	DMI_Ibias_Ch	mA	-10%	10%	
Channel TX power monitor absolute error	DMI_TX_Ch	dB	-3	3	1

Notes:

1. Due to measurement accuracy of different multi-mode fibers, there could be an additional
2. +/-1 dB fluctuation, or a +/- 3 dB total accuracy

Recommended Interface

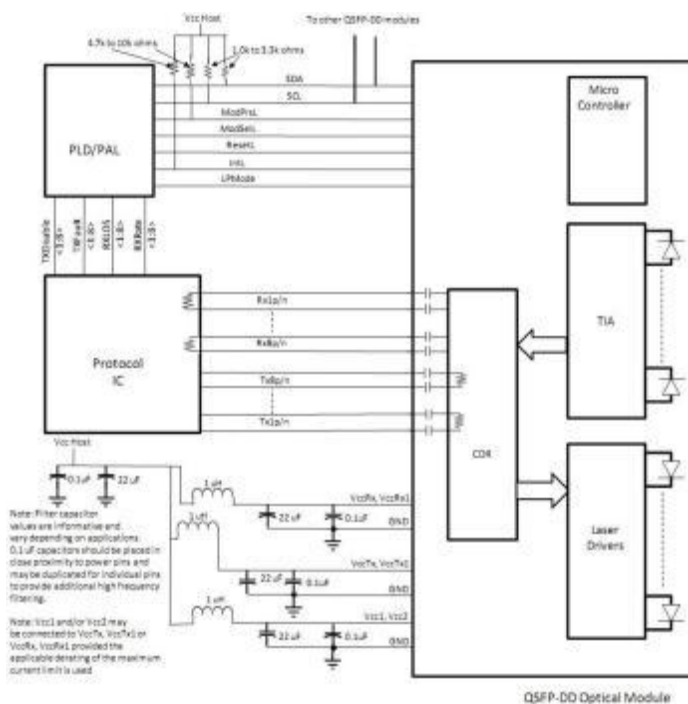


Figure 1, Recommended Interface Circuit

Pin arrangement

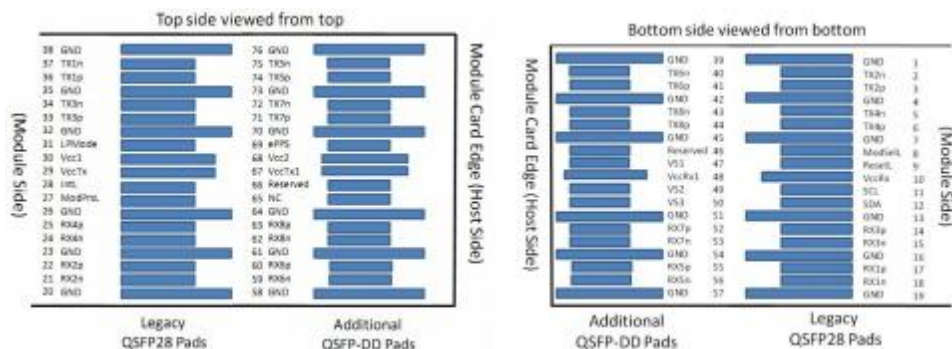


Figure 2, Pin View

Table 7-Pin Function Definitions

Pin #	Logic	Symbol	Definition	Pin #	Logic	Symbol	Definition
1		GND	Ground	39		GND	Ground
2	CML-I	Tx2n	Transmitter Inverted Data Input	40	CML-I	Tx6n	Transmitter Inverted Data Input
3	CML-I	Tx2p	Transmitter Non-inverted Data Input	41	CML-I	Tx6p	Transmitter Non-inverted Data Input
4		GND	Ground	42		GND	Ground
5	CML-I	Tx4n	Transmitter Inverted Data Input	43	CML-I	Tx8n	Transmitter Inverted Data Input
6	CML-I	Tx4p	Transmitter Non-inverted Data Input	44	CML-I	Tx8p	Transmitter Non-inverted Data Input
7		GND	Ground	45		GND	Ground
8	LVTTL-I	ModSelL	Module Select	46		Reserved	
9	LVTTL-I	ResetL	Module Reset	47		VS1	Module Vendor Specific 1
10		VccRx	+3.3V Power Supply Receiver	48		VccRx1	3.3V Power Supply
11	LVC MOS-I/O	SCL	2-wire serial interface clock	49		VS2	Module Vendor Specific 2
12	LVC MOS-I/O	SDA	2-wire serial interface data	50		VS3	Module Vendor Specific 3
13		GND	Ground	51		GND	Ground
14	CML-O	Rx3p	Receiver Non-inverted Data Output	52	CML-O	Rx7p	Receiver Non-inverted Data Output
15	CML-O	Rx3n	Receiver Inverted Data Output	53	CML-O	Rx7n	Receiver Inverted Data Output
16		GND	Ground	54		GND	Ground
17	CML-O	Rx1p	Receiver Non-inverted Data Output	55	CML-O	Rx5p	Receiver Non-inverted Data

							Output
18	CML-O	Rx1n	Receiver Inverted Data Output	56	CML-O	Rx5n	Receiver Inverted Data Output
19		GND	Ground	57		GND	Ground
20		GND	Ground	58		GND	Ground
21	CML-O	Rx2n	Receiver Inverted Data Output	59	CML-O	Rx6n	Receiver Inverted Data Output
22	CML-O	Rx2p	Receiver Non-inverted Data Output	60	CML-O	Rx6p	Receiver Non-inverted Data Output
23		GND	Ground	61		GND	Ground
24	CML-O	Rx4n	Receiver Inverted Data Output	62	CML-O	Rx8n	Receiver Inverted Data Output
25	CML-O	Rx4p	Receiver Non-inverted Data Output	63	CML-O	Rx8p	Receiver Non-inverted Data Output
26		GND	Ground	64		GND	Ground
27	LVTTL-O	ModPrsL	Module Present	65		NC	Not connected
28	LVTTL-O	IntL	Interrupt	66		Reserved	
29		VccTx	+3.3V Power Supply Transmitter	67		VccTx1	3.3V Power Supply
30		Vcc1	+3.3V Power Supply	68		Vcc2	3.3V Power Supply
31	LVTTL-I	InitMode	Initialization mode	69		Reserved	
32		GND	Ground	70		GND	Ground
33	CML-I	Tx3p	Transmitter Non-inverted Data Input	71	CML-I	Tx7p	Transmitter Non-inverted Data Input
34	CML-I	Tx3n	Transmitter Inverted Data Input	72	CML-I	Tx7n	Transmitter Inverted Data Input
35		GND	Ground	73		GND	Ground
36	CML-I	Tx1p	Transmitter Non-inverted Data Input	74	CML-I	Tx5p	Transmitter Non-inverted Data Input
37	CML-I	Tx1n	Transmitter Inverted Data Input	75	CML-I	Tx5n	Transmitter Inverted Data Input
38		GND	Ground	76		GND	Ground

Memory Map

Compatible with CMIS rev 5.2.

Optical interface arrangement

The optical port is a male MPO connector receptacle, with fiber lane assignments as shown in Figure 3

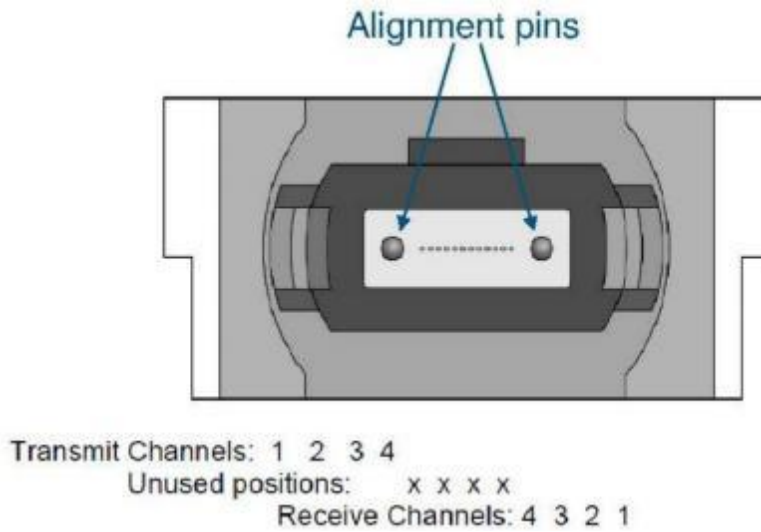


Figure 3,Optical interface arrangement.

Mechanical

400G SR4 QSFP-DD transceivers are compatible with the QSFP-DD Type 2 Specification for pluggable form factor modules.

Unit mm

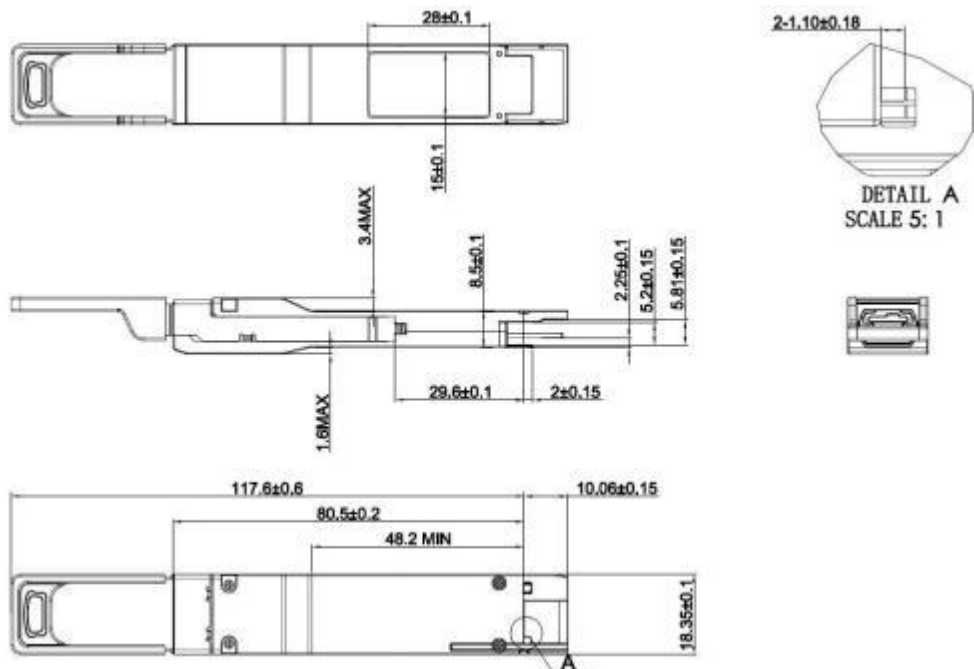


Figure 4,Mechanical Diagram