

400G QSFP-DD VR4 Optical Transceiver Module

P/N: WST-QD4-VR4-C

Applications:

- Application case 1, 400G VR4, 1 of 400G per port point to point connection

Standard:

- RoHS compliant
- Compliant with IEEE 802.3bs standard: 400GAUI-8 electrical interface

Features:

- Hot-pluggable QSFP-DD form factor
- Maximum link length of 100m on OM4 fiber with FEC
- +3.3V single power supply
- Power dissipation < 8W
- Single MPO- 12 APC connector
- 100m max reach with MMF OM4
- Operating Case Temperature: 0°C~70°C

Absolute Maximum Ratings

Exceeding the limits below may damage the module permanently.

Parameter	Symbol	Min.	Typ.	Max.	Unit.	Note
Storage Temperature	T _s	-40		85	°C	
Supply Voltage	VCC	-0.5		3.6	V	
Relative Humidity	RH	0		85	%	1
Control Input Voltage	VI	-0.3	-	VCC+0.5	V	1

Notes:

1. No condensation

Recommended Operating Conditions

Parameter	Symbol	Min	Typical	Max	Unit	Note
Operating Case Temperature	TOP	0		70	°C	
Power Supply Voltage	VCC	3.135	3.3	3.465	V	
Maximum Power Consumption	P _{Con}			8	Watts	
Supply Current	I _{cc}			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	2

Notes:

1. FEC provided by host system
2. Note2: FEC required on host system to support maximum distance

Electrical Characteristics

Parameter	Symbol	Unit	Min	Typical	Max	Note
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	

Optical Characteristics

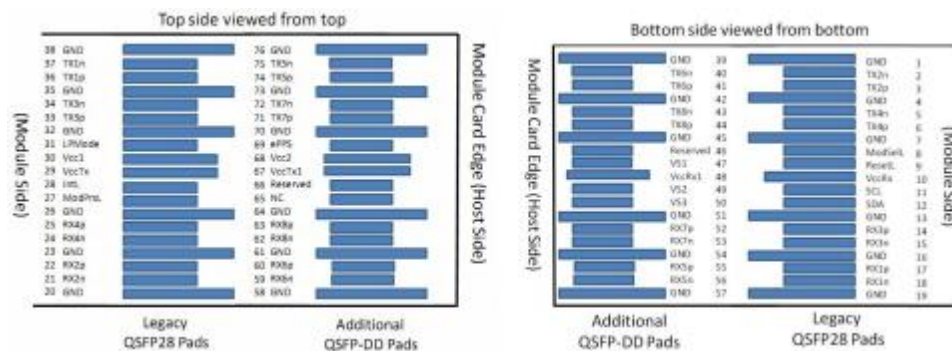
Parameter	Symbol	Unit	Min	Typical	Max	Note
Transmitter						
Signaling rate, each lane (range)	SR	Gbd	53.125 ± 100 ppm			
Modulation format			PAM4			
Center wavelength	CW	nm	842		948	
RMS Spectral Width	SW	dBm	-		0.65	1
Average Launch Power per Lane	AOP	dBm	-4.6		4.0	
Outer Optical Modulation Amplitude (OMA _{outer}), each lane (min); For max(TECQ,TDECQ)≤1.8dB; For 1.8<max(TECQ,TDECQ)≤4.4dB	Tx OMA	dBm	-2.6~-4.4 (max TECQ,TDECQ)		3.5	
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	Tt	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 9μm ≤30% at 4.5μm	2		
Receiver						
Signaling rate, each lane (range)	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	RXPx	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		5

Note

1. RMS spectral width is the standard deviation of the spectrum

- If measured into type A1a.2 or type A1a.3, or A1a.4 of 50um fiber, in accordance with IEC 61280-1-4
- 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
- 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
- Receiver sensitivity (OMAouter) is informative and is defined for a transmitter with value of TECQ up to 4.4 dB

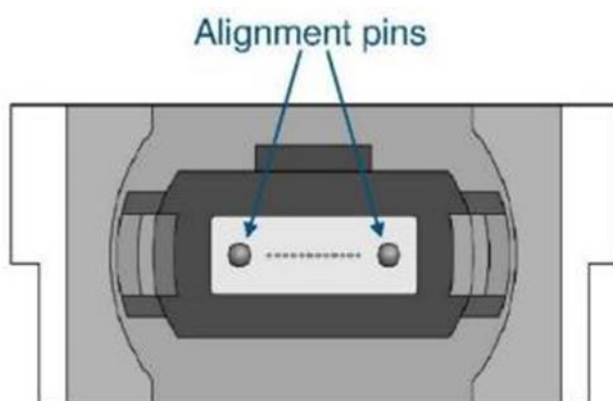
Pin arrangement



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

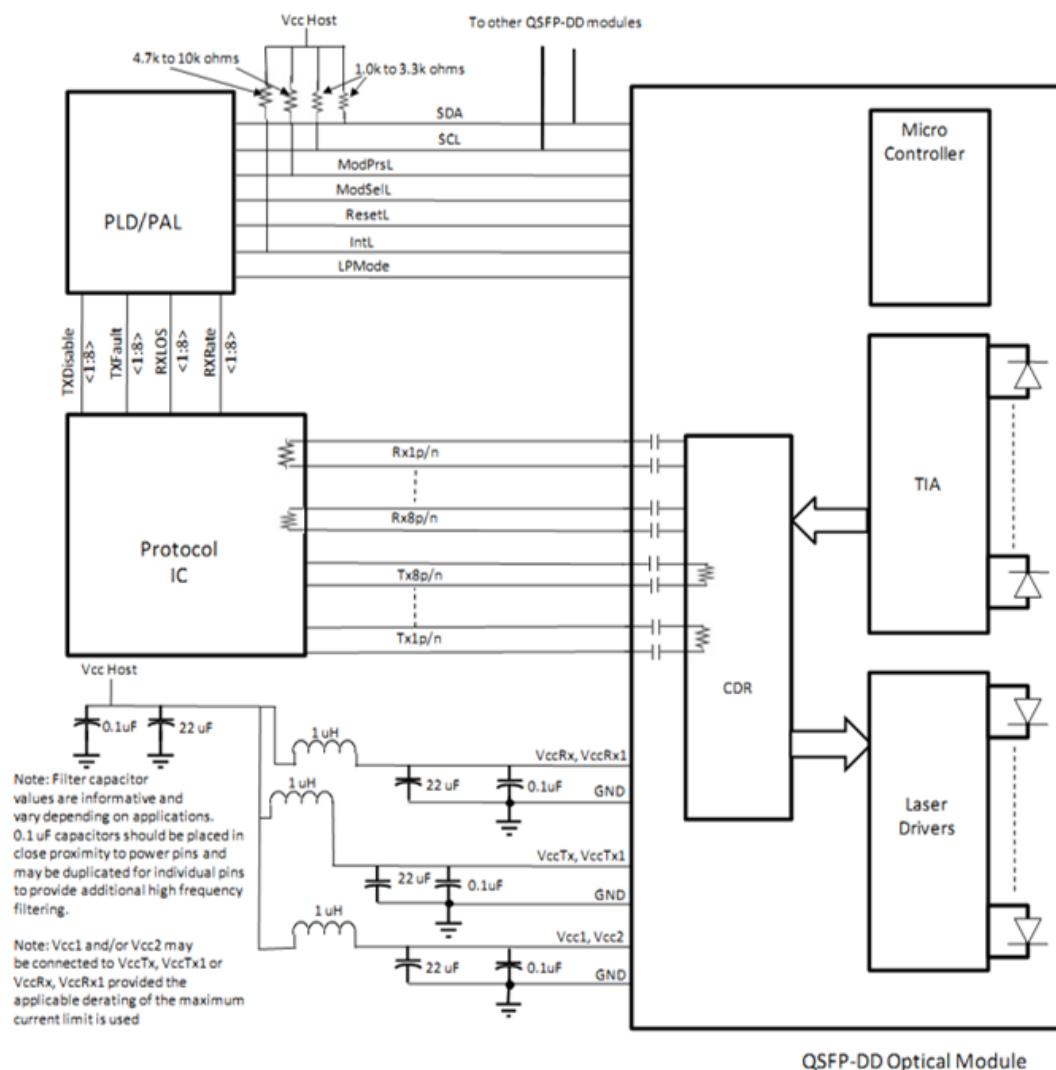
21	CML-O	Rx2n	Receiver Inverted Data Output	59	CML-O	Rx6n	Receiver Inverted Data Output
22	CML-O	Rx2p	Receiver Non-inverted Data Output	60	CML-O	Rx6p	Receiver Non-inverted Data Output
23		GND	Ground	61		GND	Ground
24	CML-O	Rx4n	Receiver Inverted Data Output	62	CML-O	Rx8n	Receiver Inverted Data Output
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

Optical interface arrangement



Transmit Channels: 1 2 3 4
 Unused positions: x x x x
 Receive Channels: 4 3 2 1

Recommended Interface Circuit

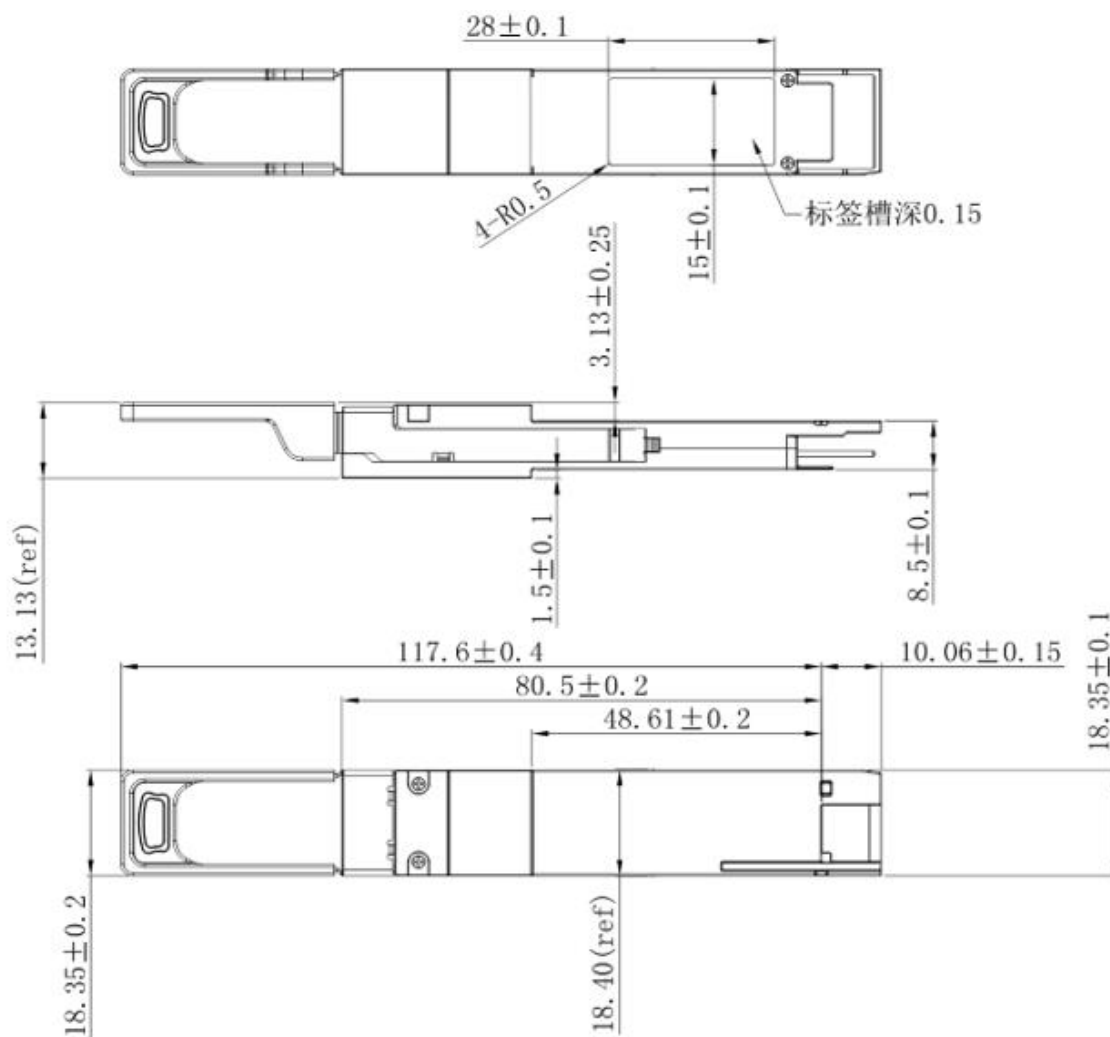


Digital Diagnostic Monitor Accuracy

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

Note:

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

Mechanical Drawing

Unit: mm

Ordering Information

Part No	Specification								
	Package	Data rate per Lane	Laser	Optical Power (OMAouter)	Detector	Temp	Reach	Other	Application code
WST-QD4-VR4-C	QSFP-DD	53.125Gbd (PAM4) each Channel	900nm EML	-4.6~4 dBm each Channel	PIN	0~70°C	OM4 100m OM3 60m	DDM RoHS	400G Ethernet

Modification History

Revision	Date	Description	Originator	Review	Approved
V1.0	12-Aug-2024	New Release	Ken Cheng	Joanne Ni	Tom Tang



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