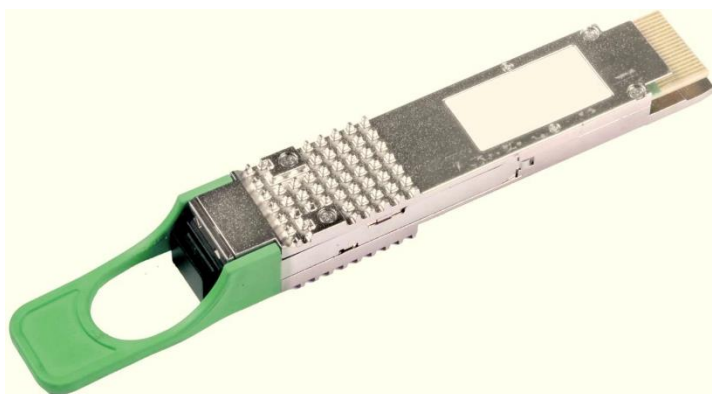


400G QSFP-DD LR4 10km Transceiver Module

P/N: WST-QD4-LR4-C



Applications:

- 400G Ethernet

Features:

- Compliant with 100G Lambda MSA: 400GBASE-LR4-10 optical interface
- Compliant with IEEE 802.3bs standard: 400GAUI-8 electrical interface
- Compliant with QSFP-DD MSA HW Rev 5.1 type 2 housing with duplex LC connector
- Compliant with QSFP-DD CMIS Rev 4.0
- Operating distance at engineering link of up to 10km
- Maximum power consumption 10 W
- Case operating temperature 0°C to 70°C
- Two wire serial Interface with digital diagnostic monitoring
- Class 1 Laser

Absolute Maximum Ratings

It has to be noted that the operation in excess of any individual absolute maximum ratings might cause permanent damage to this module.

Parameter	Symbol	Min	Max	Units	Notes
Storage Temperature	T _S	-40	85	°C	
Power Supply Voltage	V _{CC}	-0.5	3.6	V	
Relative Humidity (non-condensation)	RH	0	85	%	
Data Input Voltage Differential	V _{DIP} -V _{DIN}	-	1	V	
Control Input Voltage	V _I	-0.3	V _{CC} +0.5	V	
Control Output Current	I _O	-20	20	mA	

Recommended Operating Conditions

Parameter	Symbol	Min	Typical	Max	Units	Notes
Operating Case Temperature	TOP	0		70	°C	
Power Supply Voltage	VCC	3.135	3.3	3.465	V	
Instantaneous peak current at hot plug	ICC_IP			4000	mA	
Sustained peak current at hot plug	ICC_SP			3300	mA	
Maximum Power Dissipation	P _D			10	W	
Maximum Power Dissipation, Low Power Mode	P _{DLP}			1.5	W	
Data Rate, each Lane	SRL		53.125		GBd	PAM4
Two Wire Serial Interface Clock Rate				400	kHz	
Module power supply noise tolerance 10 Hz - 10 MHz (ptp)				66	mVpp	
Rx Differential Data Output Load			100		Ohm	
Operating Distance		2		10000	m	

Electrical Characteristics

Electrical Specification High Speed Signal (compliant with IEEE 802.3bs 400GAUI-8)

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

AC common-mode output Voltage (RMS)				17.5	mV	
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Electrical Specification Low Speed Signal (compliant with QSFP-DD HW Rev 5.1)

Parameter	Test Point	Min	Typical	Max	Units	Notes
Module output SCL and SDA	V _{OL}	0	0.4	V	mV	
Module Input SCL and SDA	V _{IL}	-0.3	V _{CC} *0.3	V	%	
	V _{IH}	V _{CC} *0.7	V _{CC} +0.5	V	V	
LPMode, ResetL, ModSelL and ePPS	V _{IL}	-0.3	0.8	V	mV	
	V _{IH}	2	V _{CC} +0.3	V	mV	
IntL	V _{OL}	0	0.4	V	mV	
	V _{OH}	V _{CC} -0.5	V _{CC} +0.3	V	mV	

Optical Characteristics

Parameter	Symbol	Min	Typical	Max	Units	Notes
Wavelength Assignment	L0	1264.5	1271	1277.5	nm	
	L1	1284.5	1291	1297.5	nm	
	L2	1304.5	1311	1317.5	nm	
	L3	1324.5	1331	1337.5	nm	
Transmitter						
Side Mode Suppression Ratio	SMSR	30			dB	
Average Launch Power, each lane	AOP _L	-2.7		5.1	dBm	1
Outer Optical Modulation Amplitude (OMA _{outer}), each lane	T _{OMA}			4.4	dBm	
Outer Optical Modulation Amplitude (OMA _{outer}) each lane: for TDECQ <1.4dB for 1.4≤TDECQ≤3.4dB	T _{OMA}	0.3 -1.1+ TDECQ				
Difference in launch power between any two lanes (OMA _{outer})	DP			4	dB	
Transmitter and Dispersion Eye Closure for PAM4 (TDECQ), each lane	TDECQ			3.9	dB	
Transmitter eye closure for PAM4(TECQ)	TECQ			3.9	dB	
TDECQ - TECQ				2.5	dB	

Over/under-shoot				25	%	
Transmitter peak-to-peak power				5.2	dBm	
Average Launch Power of OFF Transmitter, each lane	T_{OFF}			-16	dBm	
Extinction Ratio, each lane	ER	3.5			dB	
Transmitter transition time				17	ps	
$RIN_{15.6OMA}$	RIN			-136	dB/Hz	
Optical Return Loss Tolerance	ORL			15.6	dB	
Transmitter Reflectance	T_R			-26	dB	
Receiver						
Damage Threshold, each lane	AOPD	6.1			dBm	
Average Receive Power, each lane	AOPR	-9		5.1	dBm	1
Receive Power (OMA_{outer}), each lane	OMAR			4.4	dBm	
Difference in receive power between any two lanes (OMA_{outer})	DR			4.3	dB	
Receiver Reflectance	RR			-26	dB	
Receiver Sensitivity (OMA_{outer}), each lane for $TECQ < 1.4dB$ for $1.4 \leq TECQ \leq 3.4dB$	SOMA			-6.8 -8.2+TECQ	dBm	
Stressed Receiver Sensitivity (OMA_{outer}), each lane	SRS			-4.3	dBm	
Conditions of stressed receiver sensitivity test						
Stressed eye closure for PAM4 (SECQ)			3.9		dB	
OMA_{outer} of each aggressor lane			-0.4		dBm	

Notes:

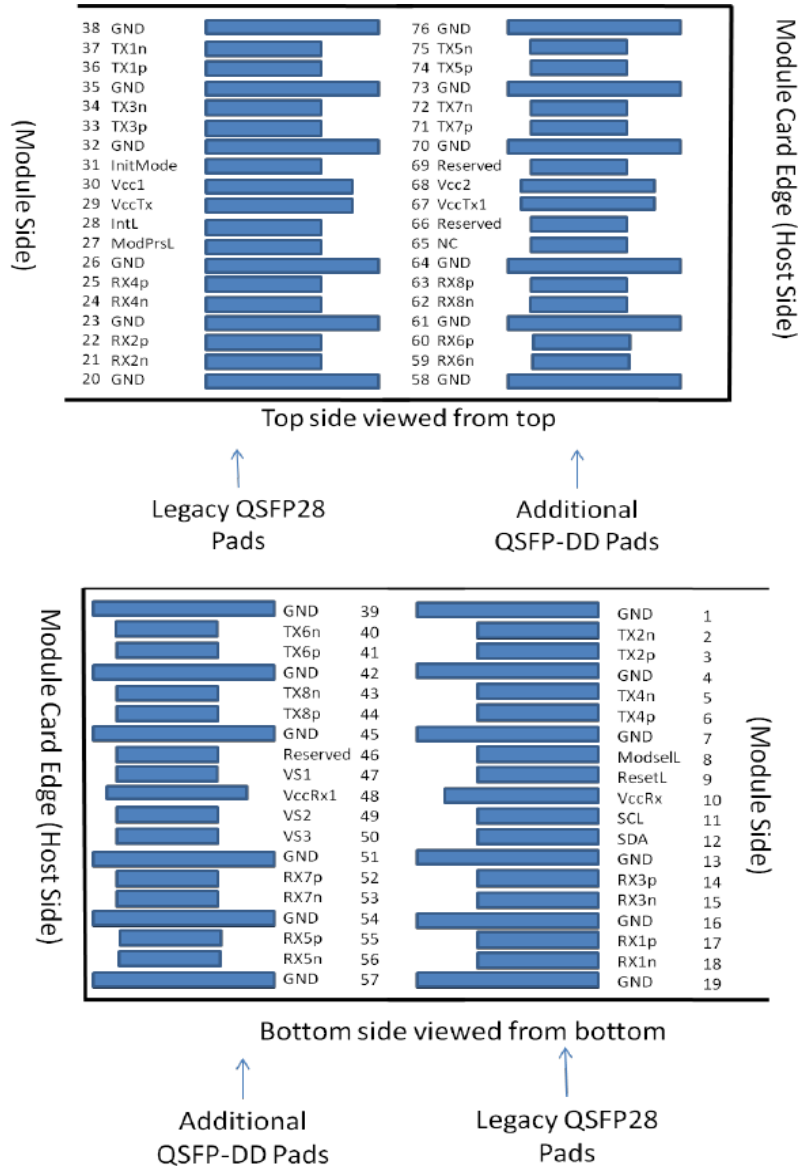
1. Average receive power, each lane (min) is informative and not the principal indicator of signal strength.

Digital Diagnostic Functions

The following digital diagnostic characteristics are defined over the normal operating conditions unless otherwise specified.

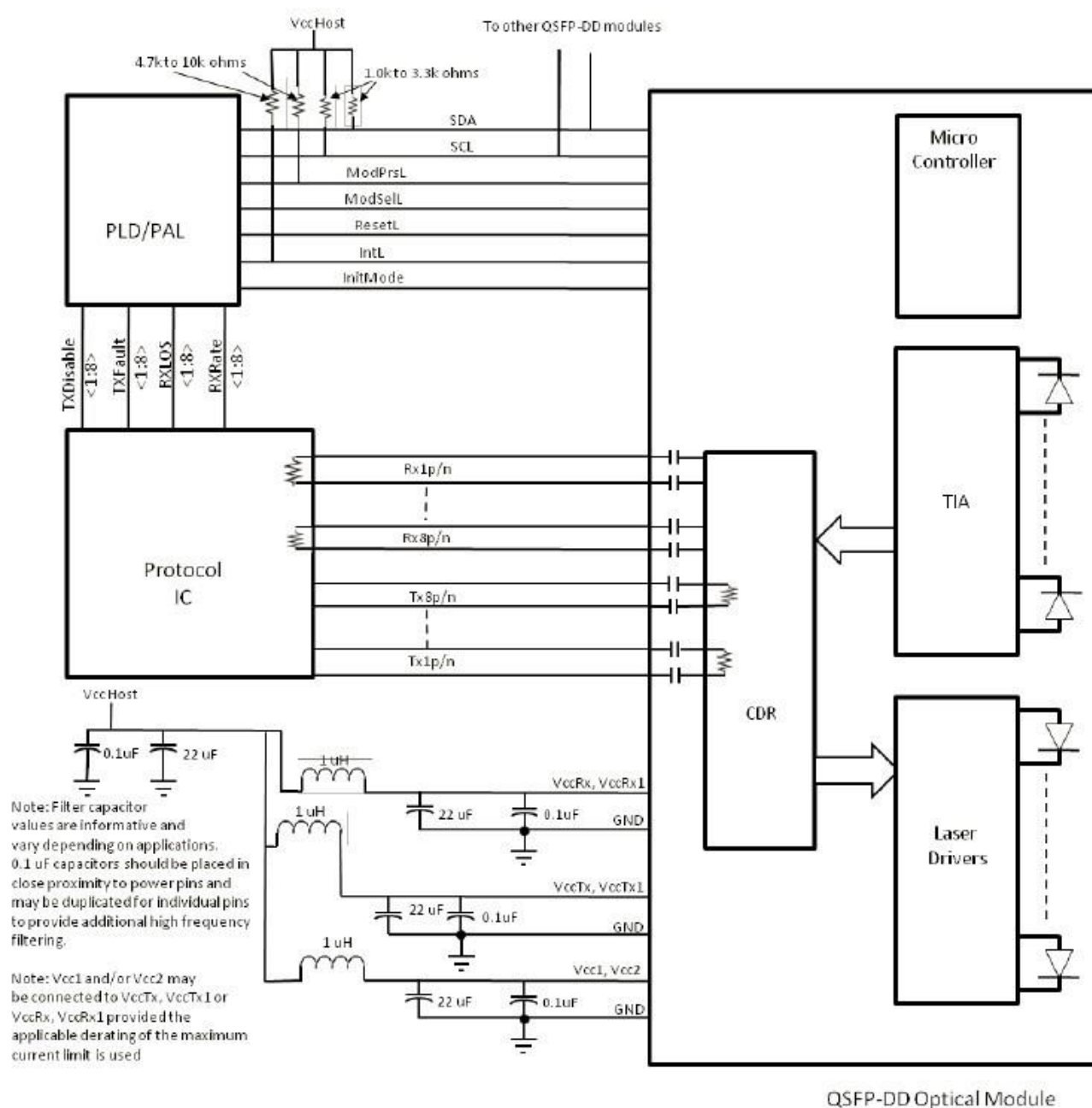
Parameter	Symbol	Accuracy	Unit	Calibration
Temperature monitor absolute error	0 to 70	±3	°C	Internal
Supply voltage monitor absolute error	0 to V _{CC}	0.1	V	Internal
Channel RX power monitor absolute error	0 to 100	10%	mA	Internal
Channel Bias current monitor	-2.7 to +5.1	±3	dB	Internal
Channel TX power monitor absolute error	-9 to +5.1	±3	dB	Internal

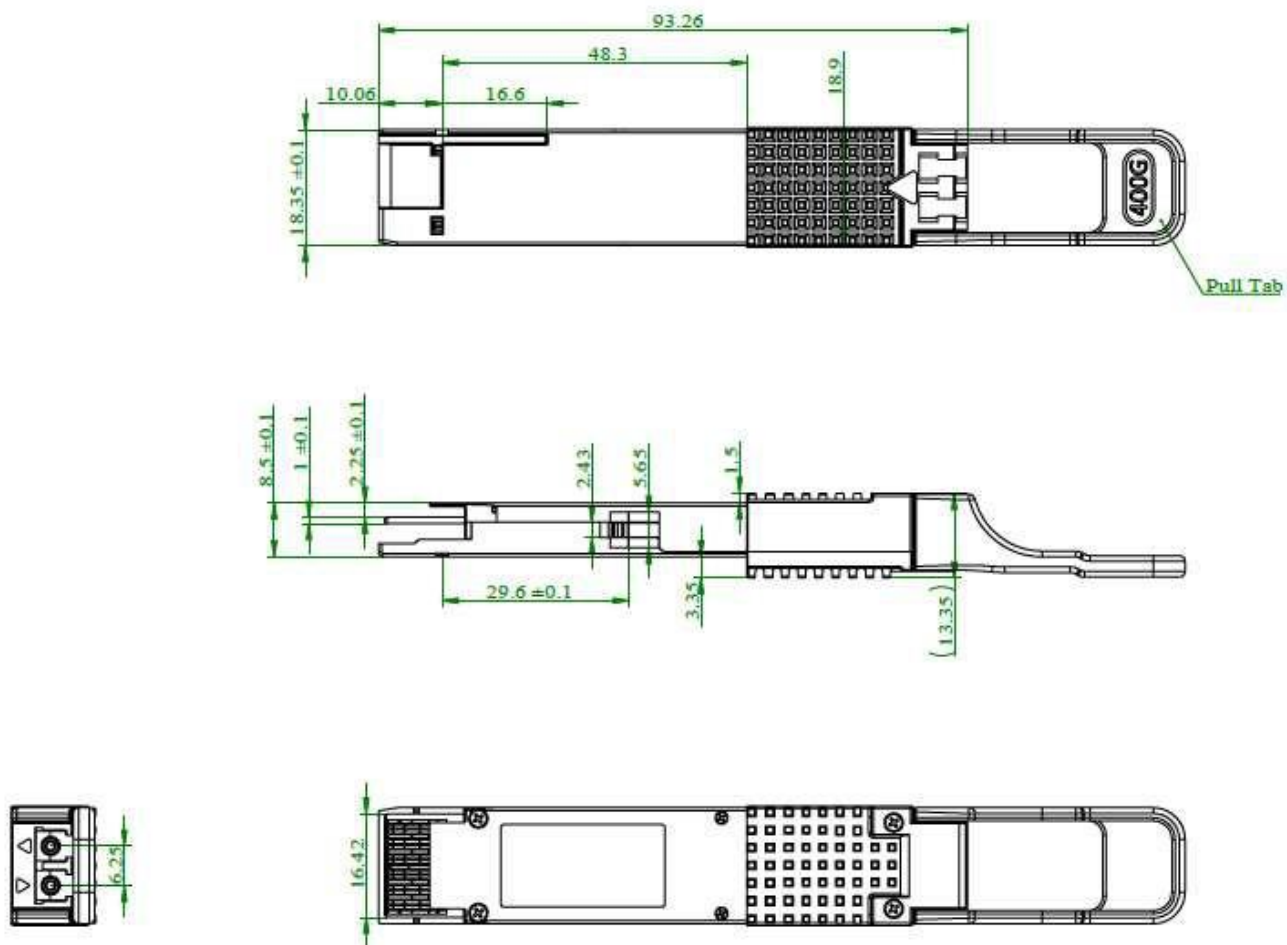
Pin Assignment



Pin #	Logic	Symbol	Description	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	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

Recommended Power Supply Filter

Mechanical Drawing

Unit: mm

Ordering Information

Part No	Specification									
	Package	Data rate	Laser	Optical Power	Detector	Max. Receive Sensitivity (OMA)	Temp	Reach	Other	Application code
WST-QD4-LR4-C	QSFP-DD	106.25Gbps (PAM4) per channel	1271nm 1291nm 1311nm 1331nm EML	-2.7~ +5.1 dBm each Channel	PIN	-6.8 dBm or -8.2+TECQ	0~70°C	10km	DDM RoHS	400G Ethernet

Modification History

Revision	Date	Description	Originator	Review	Approved
V1.0	04-Avg-2021	New Issue	Shao Yu Lee	Tom Tang	Wayne Liao

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