WAVESPLITTER™ TECHNOLOGIES, INC.

Data Sheet

40GBase LR4 QSFP+ Optical Transceivers
P/N: WST-QSFP+LR4-C

Features:

- Compliant with QDR/DDR Infiniband data rates
- Up to 11.2Gb/s data rate per wavelength
- 4 CWDM lanes MUX/DEMUX design
- Up to 10km transmission on Single Mode Fiber (SMF).
- Maximum power consumption 3.5W
- LC duplex connector
- Operating case temperature: 0 to 70℃

Applications:

- 40GBASE-LR4 Ethernet Links
- Infiniband QDR and DDR inter-connects

Standard:

- Compliant with 40G Ethernet IEEE802.3ba and 40GBASE-LR4 Standard
- QSFP+ MSA compliant
- RoHS compliant

Functional Description

This product converts the 4-channel 10Gb/s electrical input data into CWDM optical signals (light), by a driven 4-wavelength Distributed Feedback Laser (DFB) array. The light is combined by the MUX parts as a 40Gb/s data, propagating out of the transmitter module from the SMF. The receiver module accepts the 40Gb/s CWDM optical signals input, and de-multiplexes it into 4 individual 10Gb/s channels with different wavelength. Each wavelength light is collected by a PIN, and then outputted as electric data after amplified first by a TIA and then by a post amplifier.

Absolute Maximum Ratings

Parameter	Symbol	Unit	Min	Max
Storage Temperature Range	T_S	°C	-40	+85
Supply Voltage	Vcc	V	-0.5	3.6

Operating Relative Humidity	RH	%	0	85
Rx Damage Threshold, per Lane	DT	dBm	3.3	

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

Recommended Operating Conditions

Parameter	Symbol	Min.	Typical	Max	Unit	Note
Operating Case Temperature	T_{OP}	0		70	℃	
Power Supply Voltage	VCC	3.135	3.3	3.465	V	
Data Rate, each Lane			10.3125		Gb/s	
Control Input Voltage High		2		VCC	V	
Control Input Voltage Low		0		0.8	V	
Transmission Distance	TD			10	km	
Coupled fiber		9/125um SMF				

Electrical Characteristics

Parameter	Test Point	Min	Typical	Max	Unit	Notes
Power Consumption				3.5	W	
Supply Current	ICC			1060	mA	
Transmitter (each Lane)						
Single-ended Input Voltage Tolerance		-0.3		4.0	V	
Differential Input Voltage Swing Threshold		50			mVpp	
Differential Input Voltage Swing	Vin,pp	190		700	mVpp	
Differential Input Impedance	Zin	90	100	110	Ω	
Receiver (each Lane)						
Single-ended Output Voltage		-0.3		4.0	V	
Differential Output Voltage Swing	Vout,pp	300		850	mVpp	
Differential Output Impedance	Zout	90	100	110	Ω	

Optical Characteristics

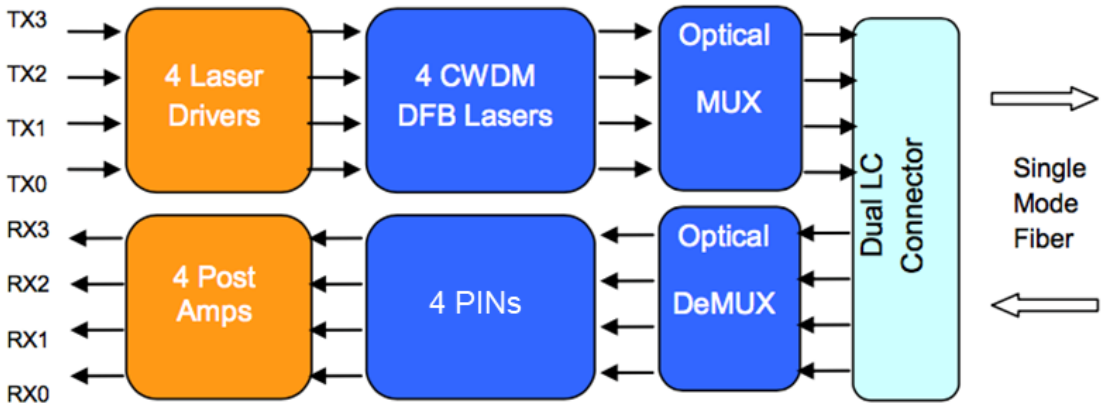
Parameter	Symbol	Min	Typ	Max	Unit	NOTE
Transmitter						
Signaling rate, each lane	DR_{PL}	10.3125 ±100 ppm			Gb/s	1
Wavelength Assignment	λ0	1264.5	1271	1277.5	nm	
	λ1	1284.5	1291	1297.5	nm	
	λ2	1304.5	1311	1317.5	nm	
	λ3	1324.5	1331	1337.5	nm	
Side Mode Suppression Ratio	SMSR	30			dB	
Total Average Launch Power	PT			8.3	dBm	
Average Launch Power Per lane		-7		2.3	dBm	
Optical Modulation Amplitude (OMA), each Lane	POMA	-4		3.5	dBm	1
Optical Extinction Ratio	ER	3.5			dB	
Relative Intensity Noise	RIN			-128	dB/Hz	
Dispersion penalty, each lane	TDP			2.6	dB	
Average launch Power off per lane	Poff			-30	dBm	
Optical Return Loss Tolerance	TOL			20	dB	
Transmitter Reflectance	RT			-12	dB	
Eye Mask coordinates: X1, X2, X3, Y1, Y2, Y3	SPECIFICATION VALUES 0.25, 0.4, 0.45, 0.25, 0.28, 0.4					
Receiver						
Damage Threshold, each Lane	THd	3.3			dBm	2
Average Receive Power, each lane	PAVE	-13.7		2.3	dBm	
Receiver Reflectance	RR			-26	dB	
Receiver Sensitivity (OMA), each Lane	RSENS			-11.5	dBm	
Difference in Receive Power between any Two Lanes (OMA)	Prx,diff			7.5	dB	
LOS Assert	LOSA	-28			dBm	
LOS De-assert	LOSD			-14	dBm	
LOS Hysteresis	LOSH	0.5			dB	

Note:

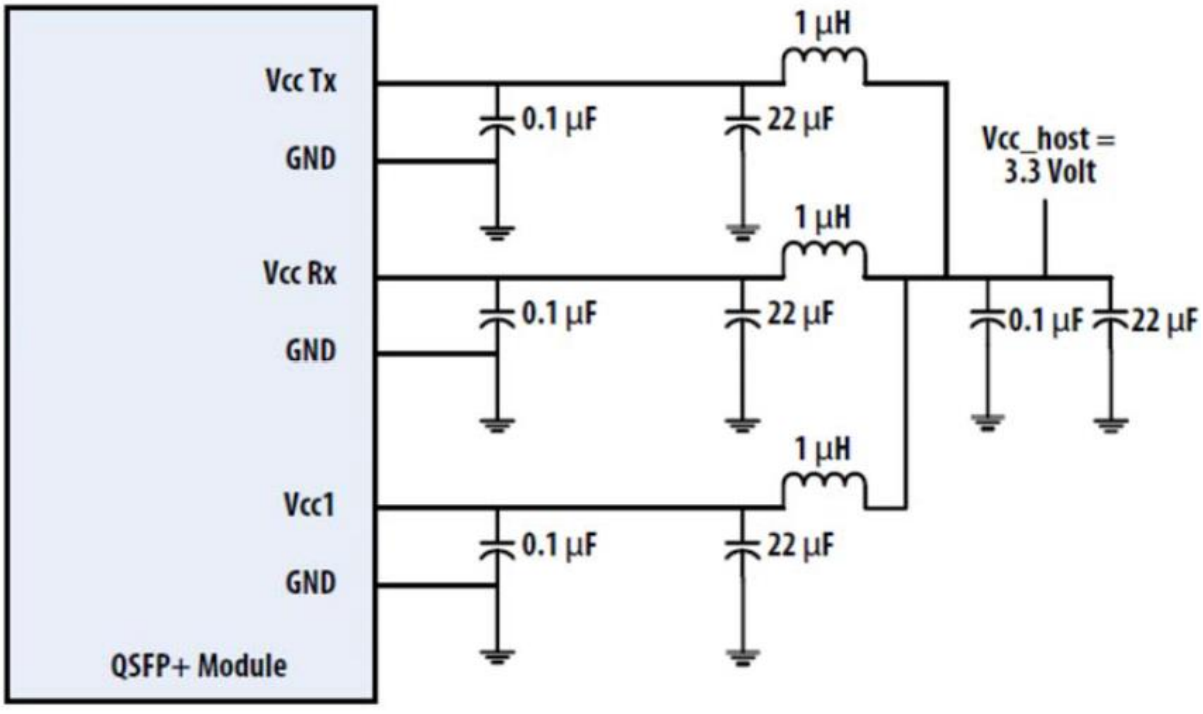
1. Even if the TDP < 0.8 dB, the OMA min must exceed the minimum value specified here.

2. 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.

Block Diagram



Recommended Circuit



Pin Definition

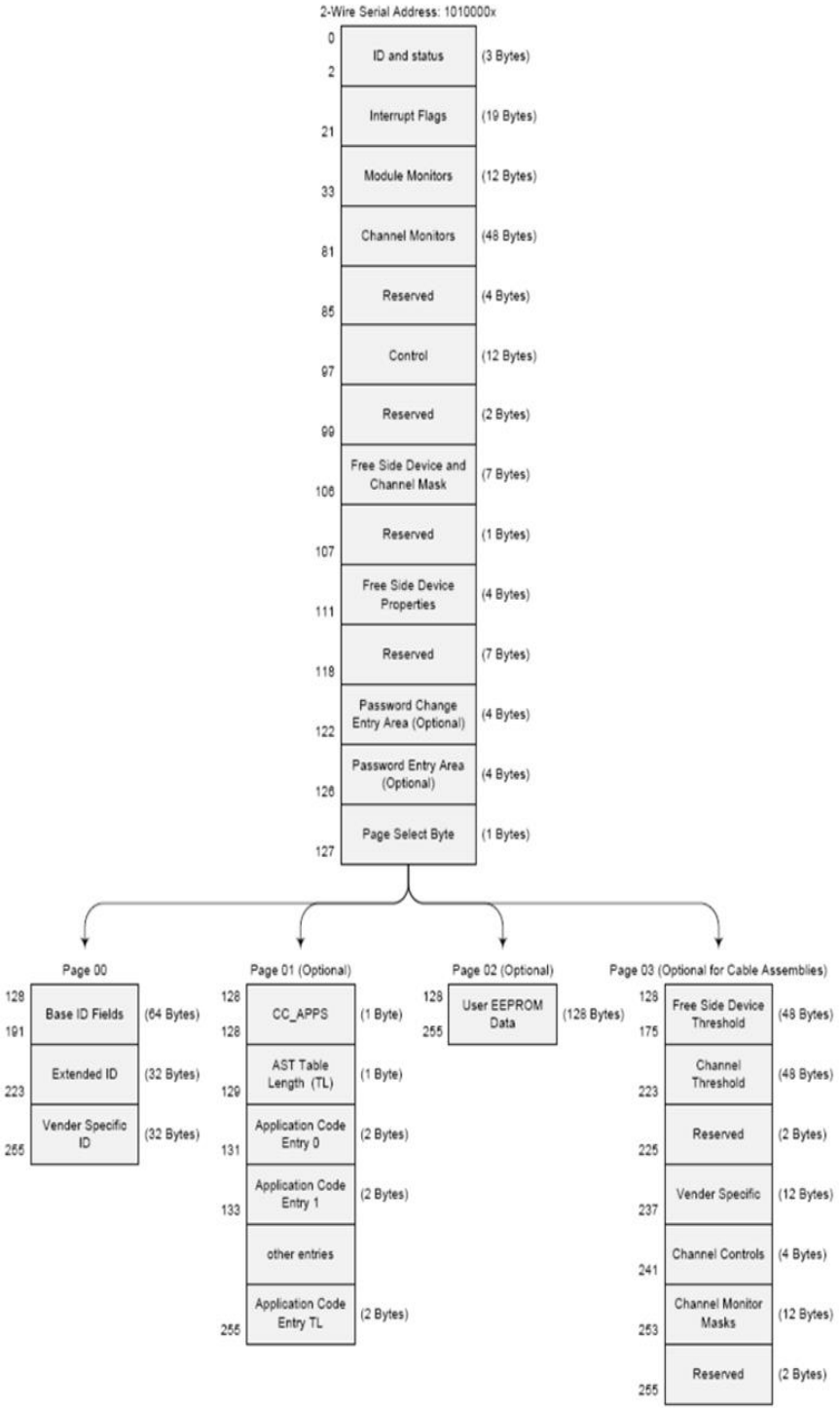
Pin	Symbol	Name/Description	NOTE
1	GND	Transmitter Ground	1
2	Tx2n	Transmitter Inverted Data Input	
3	Tx2p	Transmitter Non-Inverted Data output	
4	GND	Transmitter Ground	1
5	Tx4n	Transmitter Inverted Data Input	
6	Tx4p	Transmitter Non-Inverted Data Iutput	
7	GND	Transmitter Ground	1
8	ModSelL	Module Select	
9	ResetL	Module Reset	
10	VccRx	3.3V Power Supply Receiver	2
11	SCL	2-Wire serial Interface Clock	
12	SDA	2-Wire serial Interface Data	
13	GND	Transmitter Ground	1
14	Rx3p	Receiver Non-Inverted Data Output	
15	Rx3n	Receiver Inverted Data Output	
16	GND	Transmitter Ground	1
17	Rx1p	Receiver Non-Inverted Data Output	
18	Rx1n	Receiver Inverted Data Output	
19	GND	Transmitter Ground	1
20	GND	Transmitter Ground	1
21	Rx2n	Receiver Inverted Data Output	
22	Rx2p	Receiver Non-Inverted Data Output	
23	GND	Transmitter Ground	1
24	Rx4n	Receiver Inverted Data Output	
25	Rx4p	Receiver Non-Inverted Data Output	
26	GND	Transmitter Ground	1
27	ModPrsl	Module Present	
28	IntL	Interrupt	
29	VccTx	3.3V power supply transmitter	2
30	Vcc1	3.3V power supply	2
31	LPMode	Low Power Mode	
32	GND	Transmitter Ground	1

33	Tx3p	Transmitter Non-Inverted Data Input	
34	Tx3n	Transmitter Inverted Data Output	
35	GND	Transmitter Ground	1
36	Tx1p	Transmitter Non-Inverted Data Input	
37	Tx1n	Transmitter Inverted Data Output	
38	GND	Transmitter Ground	1

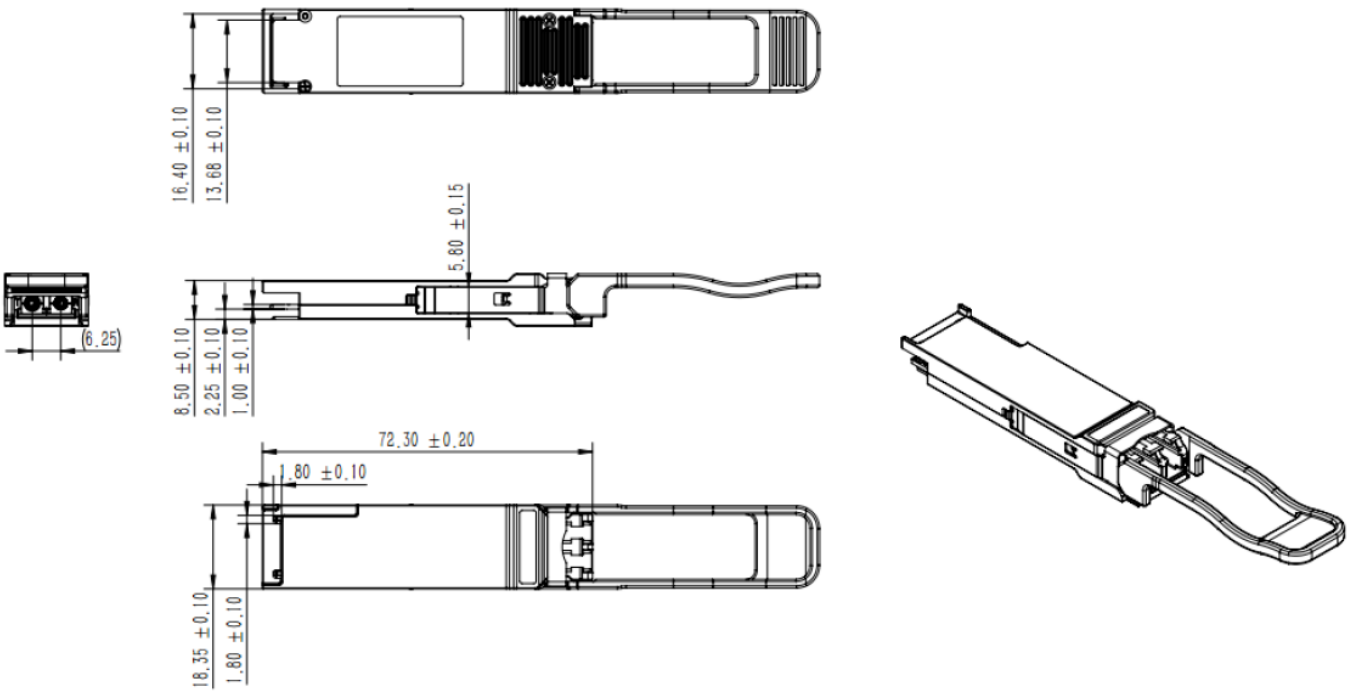
Notes:

1. GND is the symbol for signal and supply (power) common for QSFP+ modules. All are common within the QSFP+ module and all module voltages are referenced to this potential unless otherwise noted. Connect these directly to the host board signal common ground plane.
2. VccRx, Vcc1 and VccTx are the receiving and transmission power suppliers and shall be applied concurrently. Recommended host board power supply filtering is shown below. Vcc Rx, Vcc1 and Vcc Tx may be internally connected within the QSFP+ transceiver module in any combination. The connector pins are each rated for a maximum current of 500mA.

QSFP Memory Map



Mechanical Dimensions



Unit: mm

Ordering Information

Part No	Specification									
	Package	Data rate	Laser	Optical Power	Detector	Rx OMA Sensitivity	Temp	Reach	Other	Application code
WST-QSFP+LR4-C	QSFP+	10.3125 Gbps per Channel	CWDM DFB	-7~ 2.3dBm per Channel	PIN	-11.5 dBm per Channel	0~70°C	10KM	DDM RoHS	40G Ethernet InfiniBand QDR/DDR

Modification History

Revision	Date	Description	Originator	Review	Approved
V1.0	20-Jun-2024	New Issue	Joanne Ni	Ken Cheng	Wayne Liao

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