Data Sheet

40G QSFP+ eSR4 300m Transceiver

P/N: WST-QSFP+eSR4-C

Features:

- Hot Pluggable QSFP form factor
- Support 10.3125Gb/s per channel
- Low Power Dissipation, Max 1.5W
- Operating Case Temperature: 0℃~70℃
- Single MPO12 receptacle
- Link length of 300m on OM3 Multimode Fiber (MMF) and 400m on OM4 MMF
- 850nm VCSEL Laser/PIN photo detector
- SFF-8636 Management Interface
- SFF-8661: Pluggable Module
- SFF-8679: General Electrical
- GR-468: Reliability Qualification
- IEEE 802.3ba: Physical Layer Specifications and Management Parameters
- ROHS: Environment Safety

Applications:

- Ethernet for 40GBASE-SR4
- InfiniBand SDR, QDR, DDR, FDR
- Proprietary Interconnections

Absolute Maximum Ratings

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Supply Voltage	Vcc	-0.5		+3.6	V	
Storage Temperature	T_s	-40		+85	°C	
Operating Humidity	RH	+5		+85	%	1

Notes:

1. No-condensing.

Recommended Operating Conditions

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Operating Case Temperature	T_C	0		+70	°C	
Power Supply Voltage	Vcc	3.14	3.3	3.47	V	
Power Dissipation	Pd			1.5	W	
Bit Rate	BR		10.3125		Gbps	Per lane
Bit Error Ratio	BER			10-12		1
Center wavelength	λ_c	840		860	nm	2
Transmit Distance	T_D	0		300	M	OM3
		0		400		OM4
Number of Lanes		4				
Management Interface		Serial, I2C-based, maximum frequency 400 kHz				3
Logic Input Voltage High	V_{ih}	2		Vcc+0.3	V	
Logic Input Voltage Low	V_{il}	-0.3		0.8	V	

Notes:

1. PRBS= 2^{31}-1 @ 10.3125Gb/s
2. As defined by IEEE Std. 802.3ba -2015
3. As defined by SFF-8636

Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Units	Notes
Transceiver Power Supply Current	I_{cc}			460	mA	
Transceiver Power on Initialization Time	T_{init}			2000	ms	
Transmitter at TP1a						
Differential Data Input Swing	$V_{in,P-P}$	200		1000	mV_{PP}	
Input Differential Impedance	Z_{IN}	90	100	110	Ω	
Differential Input Return Loss	SDD11	$< -12 + 2 \times \mathrm{SQRT}(f), f \text{ in GHz}$			dB	0.01-4.1GHz
		$< -6.3 + 13 \times \log_{10}\left(\frac{f}{5.5}\right), f \text{ in GHz}$			dB	4.1-11.1GHz
Differential to Common Mode Loss	SCD11			-10	dB	0.01-11.1GHz
Jitter Tolerance (Total)	TJ			0.4	UI	

Jitter Tolerance (Deterministic)	DJ			0.15	UI	
Receiver at TP4						
Differential Date Output Swing	V_{out}	200		1000	mV	
Output Differential Impedance	Z_D	90	100	110	Ω	
Differential Output Impedance	Zout	90	100	110	Ohms	
Differential Output Return Loss	SDD22	$< -12 + 2 \times \mathrm{SQRT}(f), f$ in GHz			dB	0.01-4.1GHz
		$< -6.3 + 13 \times \log_{10}\left(\frac{f}{5.5}\right), f\ in\ GHz$			dB	4.1-11.1GHz
Common Mode Output Return Loss	SCC22	$< -7 + 1.6 \times f, f$ in GHz			dB	0.01-2.5GHz
				-3	dB	2.5-11.1GHz
Output Rise and Fall time (20% to 80%)	T_r, T_f	24			ps	
Deterministic Jitter	DJ_{out}			0.38	UI	
Total Jitter	TJ_{out}			0.64	UI	

Optical Characteristics

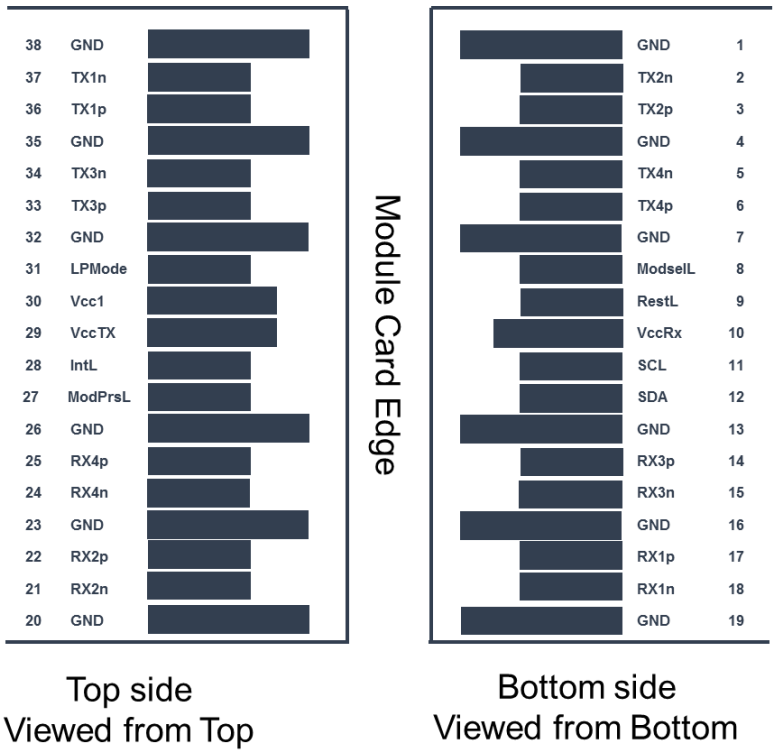
Parameter	Symbol	Min	Typ	Max	Unit	Notes
Transmitter						
Bit Rate	BR	10.3125±100ppm			Gbps	Per lane
Center Wavelength Range	λc	840	850	860	nm	
RMS Spectral Width	Δλ			0.65	nm	
Average Launch power Tx_off	Poff			-30	dBm	
Launch Optical Power	P_0	-7.6		2.4	dBm	
Optical Modulation Amplitude	OMA	-5.6		3	dBm	
Differential in Launch power between any two lanes (OMA)				4	dB	
Extinction Ratio	ER	3			dB	
Transmitter and dispersion penalty, each lane	TDP			3.5	dB	
Average launch power of OFF transmitter, each lane	P_{off}			-30	dBm	
Encircled flux		≥ 86% at 19μm ≤ 30% at 4.5μm				
Transmitter eye mask definition		{0.23, 0.34, 0.43, 0.27, 0.35, 0.40}				1

Receiver						
Bit Rate	BR	10.3125±100ppm			Gbps	Per lane
Sensitivity@BER=E-12	BER			-11.1	dBm	
Center Wavelength Range	λc	840		860	nm	
Damage threshold		+3.4			dBm	
Average receiver power, each lane		-9.5		2.4	dBm	
Optical Modulation Amplitude (OMA), each lane	OMA			3	dBm	
Receiver sensitivity power in OMA, each lane	RXsen			-11.1	dBm	2

Notes:

1. Hit ratio = $5x10^{-5}$ per sample.
2. Measured with PRBS= 2^{31}-1 @ 10.3125Gb/s

Pin Assignment



Pin out of Connector Block on Host Board

Pin	Symbol	Name/Description	Notes
1	GND	Ground	1
2	Tx2n	Transmitter Inverted Data Input	
3	Tx2p	Transmitter Non-Inverted Data Input	
4	GND	Ground	1
5	Tx4n	Transmitter Inverted Data Input	
6	Tx4p	Transmitter Non-Inverted Data Input	
7	GND	Ground	1
8	ModSelL	Module Select	2
9	ResetL	Module Reset	2
10	Vcc Rx	+3.3V Power Supply Receiver	
11	SCL	2-wire serial interface clock	2
12	SDA	2-wire serial interface data	2
13	GND	Ground	1
14	Rx3p	Receiver Non-Inverted Data Output	

15	Rx3n	Receiver Inverted Data Output	
16	GND	Ground	1
17	Rx1p	Receiver Non-Inverted Data Output	
18	Rx1n	Receiver Inverted Data Output	
19	GND	Ground	1
20	GND	Ground	1
21	Rx2n	Receiver Inverted Data Output	
22	Rx2p	Receiver Non-Inverted Data Output	
23	GND	Ground	1
24	Rx4n	Receiver Inverted Data Output	
25	Rx4p	Receiver Non-Inverted Data Output	
26	GND	Ground	1
27	ModPrsL	Module Present	
28	IntL	Interrupt	
29	Vcc Tx	+3.3V Power supply transmitter	
30	Vcc1	+3.3V Power supply	
31	LPMode	Low Power Mode	2
32	GND	Ground	1
33	Tx3p	Transmitter Non-Inverted Data Input	
34	Tx3n	Transmitter Inverted Data Input	
35	GND	Ground	1
36	Tx1p	Transmitter Non-Inverted Data Input	
37	Tx1n	Transmitter Inverted Data Input	
38	GND	Ground	1

Note:

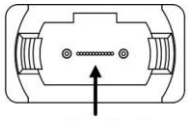
1. GND is the symbol for signal and supply (power) common for the module. All are common within the module and all module voltages are reference to this potential unless otherwise noted. Module circuit ground is isolated from module chassis ground within the module.
2. Open collector, should be pulled up with 4.7~10K ohms on the host board to a voltage between 3.15V and 3.6V

Memory map

2-Wire Serial Address 1010000x
Lower Page 00h
0 Identifier
1- 2 Status
3- 21 Interrupt Flags
22- 33 Free Side Device Monitors
34- 81 Channel Monitors
82- 85 Reserved
86- 98 Control
99 Reserved
100-104 Hardware Interrupt Pin Masks
105-106 Vendor Specific
107 Reserved
108-110 Free Side Device Properties
111-112 Assigned for use by PCI Express
113 Free Side Device Properties
114-118 Reserved
119-122 Password Change Entry Area (Optional)
123-126 Password Entry Area (Optional)
127 Page Select Byte

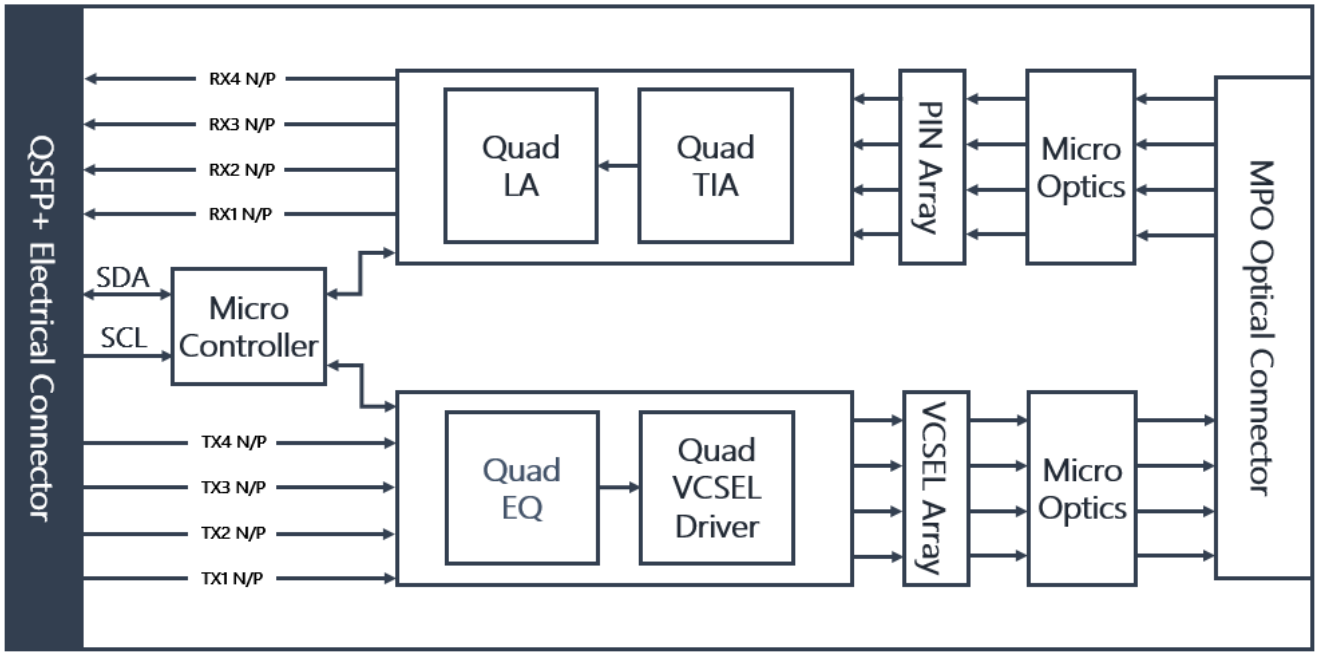
	Optional	Optional	Optional
Upper Page 00h	Page 01h	Page 02h	Page 03h
128 Identifier	128 CC_APPS	128-255 User EEPROM Data	128-175 Free Side Device Thresholds
129-191 Base ID Fields	129 AST Table Length (TL)		
	130-131 Application Code Entry 0		
	132-133 Application Code Entry 1		
	134-253 other entries		176-223 Channel Thresholds
192-223 Extended ID			224 Tx EQ & Rx Emphasis Magnitude ID
224-255 Vendor Specific ID			225 RX output amplitude indicators
			226-241 Channel Controls
			242-251 Channel Monitor Masks
	254-255 Application Code Entry TL		252-255 Reserved

Optical interface arrangement

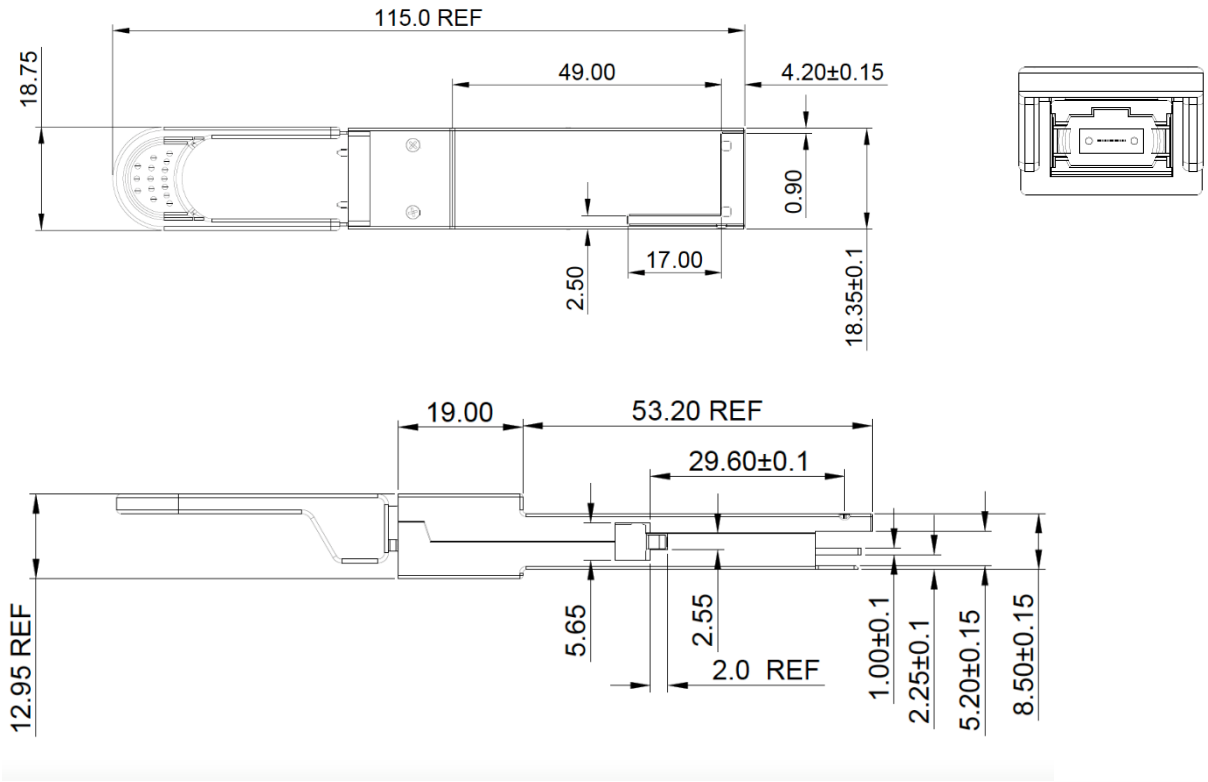


Fiber Number: 12 11 10 9 ..... 4 3 2 1
Transmit Channels: 1 2 3 4
Receive Channels: 4 3 2 1

Recommended Host - Transceiver Interface Block Diagram



Mechanical Drawing



Unit: mm

Ordering Information

Part No	Specification									
	Package	Data rate per Lane	Laser	Optical Power	Detector	Max. Receive Sensitivity (OMA)	Temp	Reach	Other	Application code
WST-QSFP+eSR4-C	QSFP+	10.3125 Gbps each Channel	850nm	-7.6~ +2.4 each Channel	PIN	-11.1 dBm each Channel	0~70°C	300m (OM3) 400m (OM4)	DDM RoHS	40G Ethernet

Modification History

Revision	Date	Description	Originator	Review	Approved
V1.0	07-Sep-2020	New Issue	ShaoYu Lee	Wayne Liao	Wayne Liao

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