Data Sheet

# 40GBase QSFP+ PSM4 10km Optical Transceiver
# P/N: WST-QSFP+PLR4-x

## Features:

- Transmission data rate up to 11.2Gbit/s per channel
- 1310nm DFB transmitter and PIN receiver
- Four-channel full-duplex transceiver modules
- Single MPO/APC optical connector
- Transmission distance up to 10km on SMF
- 3.3V power supply
- Low power consumption <2.5W meet class 3
- Hot Pluggable QSFP form factor
- Built-in digital diagnostic function
- Operating case temperature:
  - 0 ~ 70°C: WST-QSFP+PLR4-C
  - -20 ~ 85°C: WST-QSFP+PLR4-E

## Applications:

- 40 Gigabit Ethernet
- Infiniband QDR and DDR interconnects
- Proprietary High Speed
- Interconnections
- Data center

## Standard:

- RoHS compliant
- SFF-8636: Management Interface

## *Description*

WST-QSFP+PLR4-x is a Four-Channel, Pluggable, Parallel, Fiber-Optic QSFP+ Transceiver for InfiniBand QDR/DDR/SDR,10G/8G/4G/2G fiber channel, PCIe and SAS Applications. The QSFP full-duplex optical module offers 4 independent transmit and receive channels, each capable of 10.3Gbps operation for an aggregate data rate of 40Gbps 10km using single mode fiber. These modules are designed to operate over single mode fiber systems using 1310nm DFB laser .An optical fiber ribbon cable with an MPO/MTPTM connector can be plugged into the QSFP module receptacle. QSFP+ PSM LR4 is one kind of parallel transceiver which provides increased port density and total system cost savings.

All contents are Copyright © 1996 - present WaveSplitter Technologies, Inc. All rights reserved. Preliminary and Proprietary

## *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 | Unit |
|---|---|---|---|---|
| Storage Temperature | Tst | -40 | 85 | ˚C |
| Operating Relative Humidity (non-condensation) | RH | 0 | 85 | % |
| Operating Case Temperature | Topc | 0 | 70 | ˚C |
| | $Top_I$ | -20 | 85 | ˚C |
| Supply Voltage | VCC | -0.3 | 3.6 | V |
| Input Voltage | Vin | -0.3 | Vcc+0.3 | V |

## *Recommended Operating Conditions*

| Parameter | Symbol | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|
| Operating Case Temperature | Topc | 0 | | 70 | ˚C |
| | $Top_I$ | -20 | | 85 | ˚C |
| Power Supply Voltage | Vcc | 3.135 | 3.3 | 3.465 | V |
| Power Consumption | | | 1.7 | 2.5 | W |
| Data Rate | DR | | 10.3 | | Gbps |
| Data Speed Tolerance | ΔDR | -100 | | +100 | ppm |
| Link Distance with G652 | D | | | 10 | km |

## *Electrical Characteristics*

| Parameter | Symbol | Min. | Typical | Max | Unit | Notes |
|---|---|---|---|---|---|---|
| **Transmitter** | | | | | | |
| Differential Input Impedance | | 90 | 100 | 110 | Ω | |
| Differential input voltage amplitude | | 300 | | 1100 | mV | |
| BER with stressed input signal | | | | $1x10^{-12}$ | | |
| Input Logic Level High | | 2.0 | | Vcc | V | |
| Input Logic Level Low | | 0 | | 0.8 | V | |
| **Receiver** | | | | | | |

All contents are Copyright © 1996 - present WaveSplitter Technologies, Inc. All rights reserved. Preliminary and Proprietary

| | | | | | | |
|---|---|---|---|---|---|---|
| Differential Output impedance | $Z_d$ | 90 | 100 | 110 | Ω | |
| Differential output voltage amplitude | | 500 | | 800 | mV | |
| Output Logic Level High | | Vcc-0.5 | | Vcc | V | |
| Output Logic Level Low | | 0 | | 0.4 | | |

## *Optical Characteristics*

| Parameter | Symbol | Min. | Typical | Max | Unit | Notes |
|---|---|---|---|---|---|---|
| **Transmitter** | | | | | | |
| Center Wavelength | λC | 1270 | 1310 | 1350 | nm | 1 |
| Average Launch Power, each lane | PAVG | -5.5 | -0.5 | +2.3 | dBm | |
| Optical Modulation Amplitude (OMA) | POMA | -4.5 | -0.5 | +3.5 | dBm | 1 |
| Difference in Launch Power between any two lanes | Ptx, diff | | | 5.0 | dB | |
| Launch Power in OMA minus Transmitter and Dispersion Penalty (TDP), each lane | OMA-TDP | -9.7 | | | dBm | 1 |
| Rise/Fall Time | Tr/Tf | | | 50 | ps | |
| Extinction Ratio | ER | 3.5 | | | dB | |
| Relative Intensity Noise | Rin | | | -128 | dB/Hz | |
| Optical return loss tolerance | ORL | | | 12 | dB | |
| Transmitter reflectance | | | | -12 | dB | |
| Transmitter Eye Mask Margin | | 10 | | | % | 2 |
| Transmitter Eye Mask Definition (X1, X2, X3, Y1, Y2, Y3) | | {0.25, 0.4, 0.45, 0.25, 0.28, 0.4} | | | | |
| Average Launch Power of OFF Transmitter | $P_{off}$ | | | -30 | dBm | |
| **Receiver** | | | | | | |
| Signaling Speed (±100ppm, per Lane) | B | | 10.3125 | | Gb/s | |
| Lane Wavelengths | λ | 1270 | 1310 | 1350 | Nm | |

All contents are Copyright © 1996 - present WaveSplitter Technologies, Inc. All rights reserved. Preliminary and Proprietary

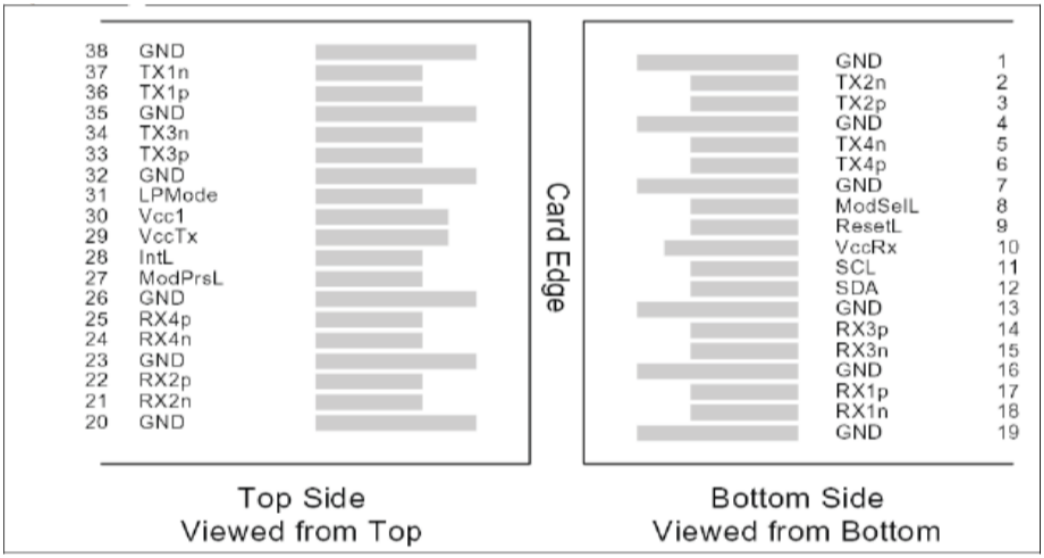
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Damage Threshold | | | 3 | | | dBm | |
| Overload, each lane | | | 2.3 | | | | |
| Receiver Sensitivity in OMA, each Lane | | SEN | | | -11.5 | dBm | |
| Difference in receiver power between any two lanes (OMA) | | | | | 5 | dB | |
| Optical Return Loss | | | | | -12 | dBm | |
| Receive Electrical 3 dB upper Cutoff Frequency, each Lane | | | | | 12 | GHz | |
| Conditions of stressed receiver sensitivity test: | | | | | | | |
| LOS Hysteresis | | | 0.5 | | 6 | dB | |
| LOS Thresholds | Increasing Light Input | $P_{los+}$ | | | -15 | dBm | 4 |
| | Decreasing Light Input | $P_{los-}$ | -30 | | | dBm | |

Notes:

1.Transmitter wavelength, power need to meet the OMA minus TDP specs to guarantee link performance.

2.The eye diagram is tested with 1000 waveform

## *Pin Assignment and Pin Description*




All contents are Copyright © 1996 - present WaveSplitter Technologies, Inc. All rights reserved. Preliminary and Proprietary

## *Pin Definitions*

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

All contents are Copyright © 1996 - present WaveSplitter Technologies, Inc. All rights reserved. Preliminary and Proprietary

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

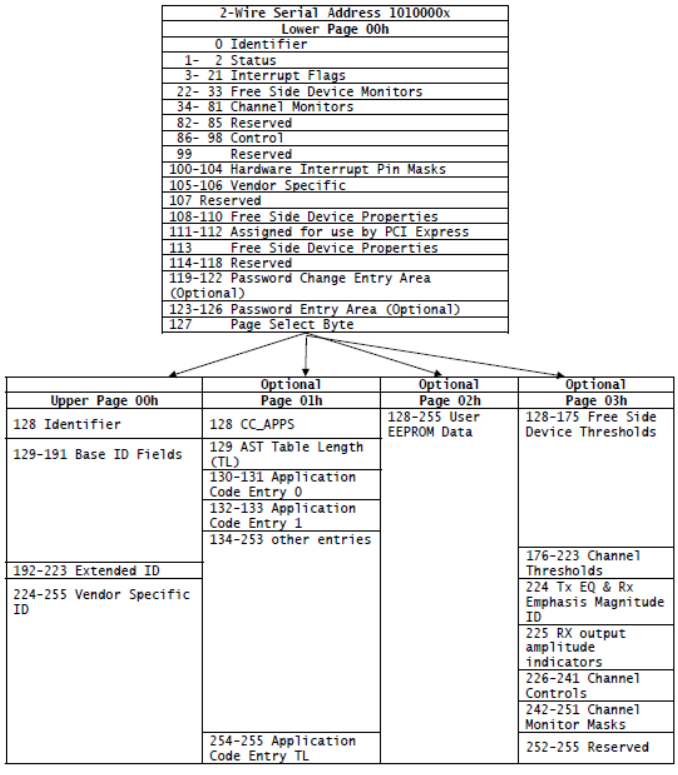
Notes:

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. VccRx, Vcc1 and VccTx may be internally connected within the QSFP transceiver module in any combination. The connector pins are each rated for a maximum current of 500mA.

### *EEPROM Serial ID Memory Contents*

Accessing Serial ID Memory uses the 2 wire address 1010000X (A0H). Memory Contents of Serial ID are shown in Table as below.

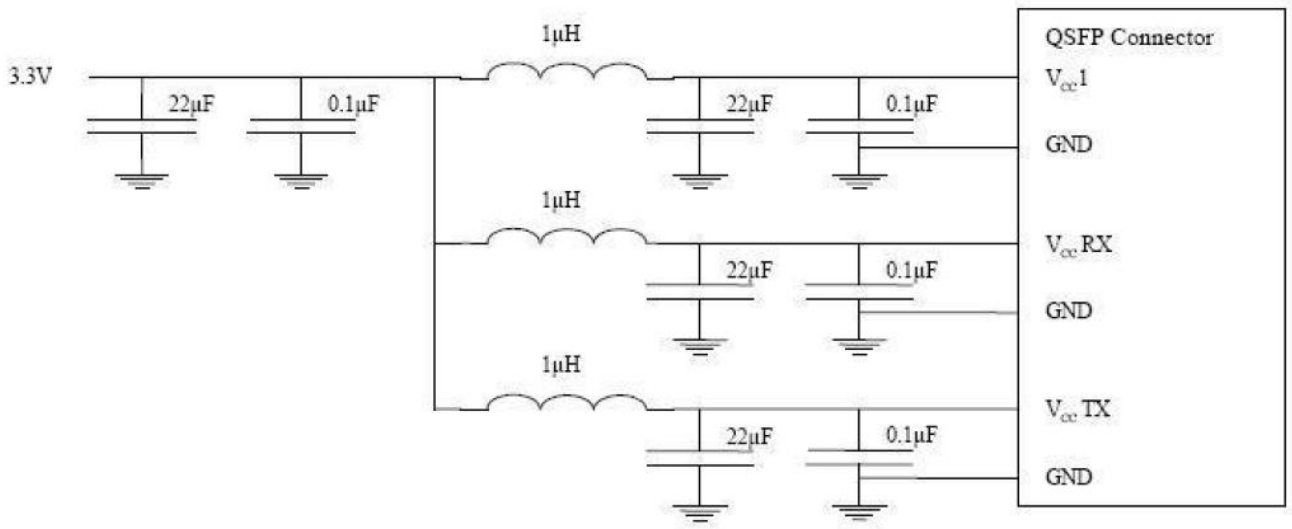



All contents are Copyright © 1996 - present WaveSplitter Technologies, Inc. All rights reserved. Preliminary and Proprietary

## *Digital Diagnostic Monitor Functions*

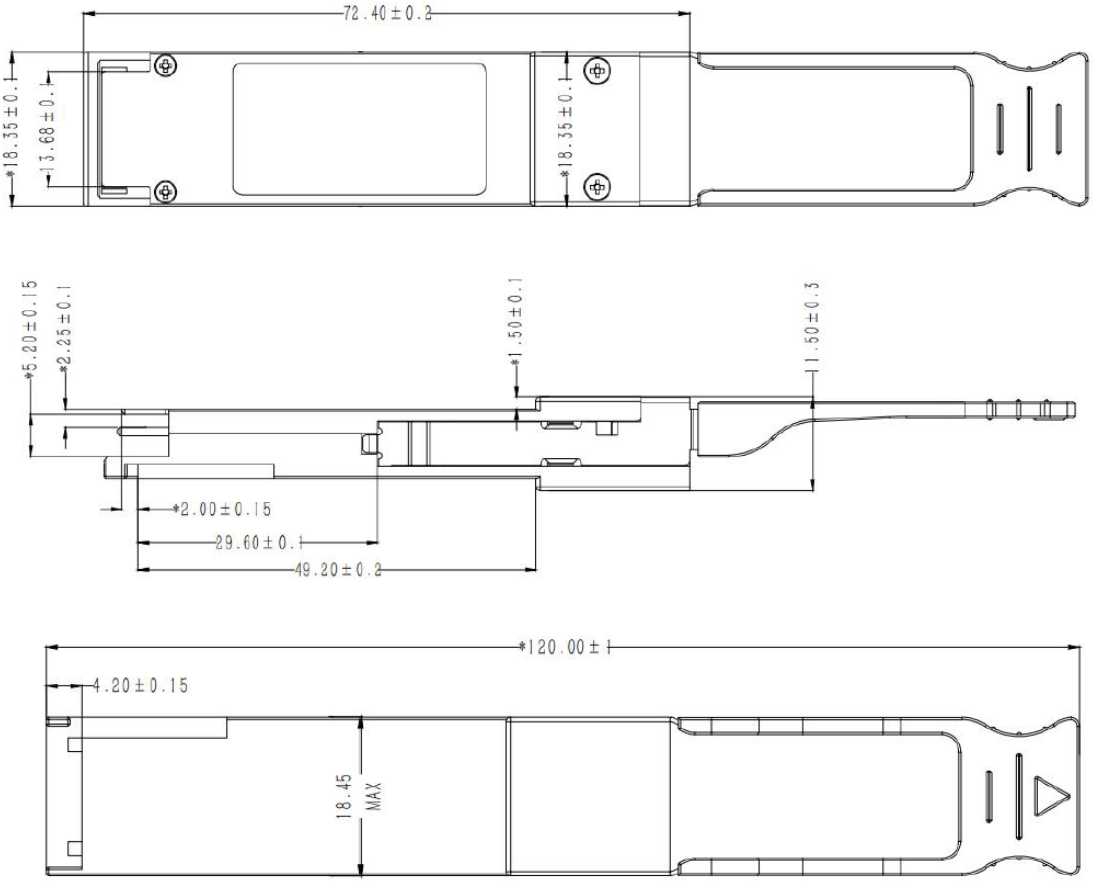
| Parameter | Symbol | Min. | Max | Unit | Notes |
|---|---|---|---|---|---|
| Temperature monitor absolute error | DMI_Temp | -3 | 3 | degC | Over operating temp |
| Supply voltage monitor absolute error | DMI_VCC | -0.1 | 0.1 | V | Full operating range |
| Channel RX power monitor absolute error | DMI_RX_Ch | -3 | 3 | dB | Ch1 ~ Ch4 |
| Channel Bias current monitor | DMI_Ibias_Ch | -10% | 10% | mA | Ch1 ~ Ch4 |
| Channel TX power monitor absolute error | DMI_TX_Ch | -3 | 3 | dB | Ch1 ~ Ch4 |

## *Recommended Power Supply Filter*



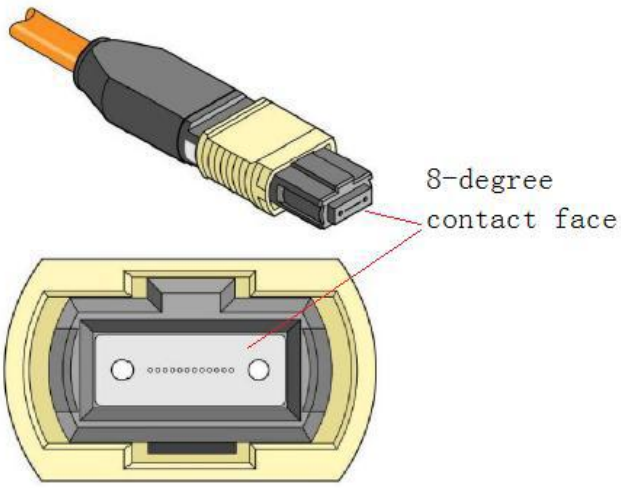

All contents are Copyright © 1996 - present WaveSplitter Technologies, Inc. All rights reserved. Preliminary and Proprietary

## *Mechanical Design Diagram*




Unit: mm

Attention: To minimize MPO connection induced reflections, an MPO receptacle with 8-degree angled end-face is utilized for this product. A male MPO connector with 8-degree end-face should be used with this product as illustrated in below




All contents are Copyright © 1996 - present WaveSplitter Technologies, Inc. All rights reserved. Preliminary and Proprietary

## *Ordering Information*

| Part No | Specification | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Package | Data rate per Lane | Laser | Optical Power in OMA | Detector | Receive Sensitivity (OMA) | Temp | Reach | Other | Application code |
| WST-QSFP+PLR4-C | QSFP+ | 10.3 Gbps | 1310nm DFB | -5.5 dBm~ +2.3dBm | PIN | -11.5dBm in OMA | 0~70℃ | 10km for SMF | DDM RoHS | 40GBASE-PLR4 4x10GBASE LR |
| WST-QSFP+PLR4-E | QSFP+ | 10.3 Gbps | 1310nm DFB | -5.5 dBm~ +2.3dBm | PIN | -11.5dBm in OMA | -20~85℃ | 10km for SMF | DDM RoHS | 40GBASE-PLR4 4x10GBASE LR |

## *Modification History*

| Revision | Date | Description | Originator | Review | Approved |
|---|---|---|---|---|---|
| V1.0 | 03-Mar-2025 | New Release | Joanne Ni | Ken Cheng | Wayne Liao |

**Headquarters**
16F-5, No. 75, Sec. 1, Xintai 5th Rd., Xizhi Dist.,
New Taipei City 22101, Taiwan
Tel: +886-2-2698-7208
Fax: +886-2-2698-7210
Email: sales@wavesplitter.com
Website: https://wavesplitter.com/

All contents are Copyright © 1996 - present WaveSplitter Technologies, Inc. All rights reserved. Preliminary and Proprietary