

### OC40-LR4-OPT-1-C

MSA and TAA 40GBase-LR4 QSFP+ Transceiver (SMF, 1270nm to 1330nm, 10km, LC, DOM)

#### Features:

- SFF-8436 Compliance
- Duplex LC Connector
- Single-mode Fiber
- Commercial Temperature 0 to 70 Celsius
- Hot Pluggable
- Metal with Lower EMI
- Excellent ESD Protection
- RoHS Compliant and Lead Free



#### Applications:

- 40GBase Ethernet
- Access and Enterprise

#### Product Description

This MSA Compliant QSFP+ transceiver provides 40GBase-LR4 throughput up to 10km over single-mode fiber (SMF) using a wavelength of 1270nm to 1330nm via an LC connector. It is built to MSA standards and is uniquely serialized and data-traffic and application tested to ensure that they will integrate into your network seamlessly. Digital optical monitoring (DOM) support is also present to allow access to real-time operating parameters. This transceiver is Trade Agreements Act (TAA) compliant. We stand behind the quality of our products and proudly offer a limited lifetime warranty.

ProLabs' transceivers are RoHS compliant and lead-free.

TAA refers to the Trade Agreements Act (19 U.S.C. & 2501-2581), which is intended to foster fair and open international trade. TAA requires that the U.S. Government may acquire only "U.S. – made or designated country end products."



## Absolute Maximum Ratings

| Parameter                  | Symbol | Min. | Typ. | Max. | Unit |
|----------------------------|--------|------|------|------|------|
| Storage Temperature        | TS     | -40  |      | 85   | °C   |
| Relative Humidity          | Rh     | 0    |      | 85   | %    |
| Supply Voltage             | Vcc    | -0.5 |      | 4.0  | V    |
| Case Operating Temperature | Tc     | 0    |      | 70   | °C   |

## Electrical Characteristics

| Parameter                              | Symbol                     | Min. | Typ. | Max. | Unit   | Notes                          |
|--|----------------------------|------|------|------|--------|--------------------------------|
| Power Supply Voltage                   | Vcc                        | 3.13 | 3.3  | 3.47 | V      |                                |
| Power Consumption                      |                            |      |      | 3.5  | W      |                                |
| Supply Current                         | ICC                        |      | 0.75 | 1.0  | A      |                                |
| Control I/O Voltage, High              | VIH                        | 2.0  |      | VCC  | V      |                                |
| Control I/O Voltage, Low               | VIL                        | 0    |      | 0.7  | V      |                                |
| Inter-Channel Skew                     | TSK                        |      |      | 150  | ps     |                                |
| RESETL Duration                        |                            |      | 10   |      | us     |                                |
| RESETL De-assert time                  |                            |      |      | 100  | ms     |                                |
| Power on time                          |                            |      |      | 100  | ms     |                                |
| Transmitter                            |                            |      |      |      |        |                                |
| Single Ended Output Voltage Tolerance  |                            | -0.3 |      | 4    | V      |                                |
| AC Common mode Voltage Tolerance (RMS) |                            | 15   |      |      | mV     |                                |
| Tx Input Diff Voltage                  | VI                         | 90   |      | 1600 | mV     |                                |
| Tx Input Diff Impedance                | ZIN                        | 80   | 100  | 120  | Ω      |                                |
| Differential Input Return Loss         | See IEEE 802.3ba 86A.4.11  |      |      |      | dB     | 10MHz-11.1GHz                  |
| J2 Jitter tolerance                    | Jt2                        |      |      | 0.18 | UI     |                                |
| J9 Jitter Tolerance                    | Jt9                        |      |      | 0.26 | UI     |                                |
| Data Dependent Pulse Width Shrinkage   | DDPWS                      |      |      | 0.07 | UI     |                                |
| Eye Mask Coordinates: X1, X2, Y1, Y2   | 0.1, 0.31, 95, 350         |      |      |      |        |                                |
| Receiver                               |                            |      |      |      |        |                                |
| Single Ended Output Voltage Tolerance  |                            | -0.3 |      | 4    | V      | Preferred to TP1 signal common |
| AC Common mode Voltage Tolerance (RMS) |                            |      |      | 7.5  | mV     |                                |
| Termination Mismatch at 1MHz           |                            |      |      | 5    | %      |                                |
| Differential Output Return Loss        | See IEEE 802.3ba 86A.4.2.1 |      |      |      | dB     | 10MHz-11.1GHz                  |
| Common-mode Output Return Loss         | See IEEE 802.3ba 86A.4.2.1 |      |      |      | dB     | 10MHz-11.1GHz                  |
| Rx Output Diff Voltage                 | Vo                         |      | 600  | 800  | mV     |                                |
| Rx Output Rise and Fall Time           | Tr/Tf                      |      |      | 35   | ps     | 20% to 80%                     |
| J2 Jitter Tolerance                    | Jr2                        |      |      | 0.46 | UI     |                                |
| J9 Jitter Tolerance                    | Jr9                        |      |      | 0.63 | UI     |                                |
| Eye Mask Coordinates: X1, X2, Y1, Y2   | 0.29, 0.5, 150, 425        |      |      |      | UI, mV |                                |

**Notes:**

1. The single ended input voltage tolerance is the allowable range of the instantaneous input signals

**Optical Characteristics**

| Parameter   | Symbol   | Min.   | Typ. | Max.   | Unit  | Notes           |
|---|--|--------|------|--------|-------|-----------------|
| Wavelength  | 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    |                 |
| <b>Transmitter</b>  |  |        |      |        |       |                 |
| Side-mode Suppression Ratio   | SMSR   | 30     |      |        | dB    |                 |
| Total Average Launch Power  | P <sub>T</sub>   |        |      | 8.3    | dBm   |                 |
| Average Launch Power, each Lane   |  | -7     |      | 2.3    | dBm   |                 |
| Optical Modulation Amplitude, each Lane                                       | OMA  | -4     |      | 3.5    | dBm   |                 |
| Difference in launch Power between any two lanes (OMA)                        |  |        |      | 6.5    | dB    |                 |
| Launch Power in OMA minus Transmitter and Dispersion Penalty (TDP), each Lane |  | -4.8   |      |        | dBm   |                 |
| TDP, each Lane  | TDP  |        |      | 2.3    | dB    |                 |
| Extinction Ratio  | ER   | 3.5    |      |        | dB    |                 |
| Relative Intensity Noise  | R <sub>in</sub>  |        |      | -128   | dB/Hz | 12dB reflection |
| Optical Return Loss Tolerance   |  |        |      | 20     | dB    |                 |
| Transmitter Reflectance   | R <sub>T</sub>   |        |      | -12    | dB    |                 |
| Transmitter Eye Mask Definition X1, X2, X3, Y1, Y2, Y3                        | Specification Values<br>0.25, 0.4, 0.45, 0.25, 0.28, 0.4 |        |      |        |       |                 |
| Average Launch Power OFF Transmitter, each Lane                               | P <sub>off</sub>   |        |      | -30    | dBm   |                 |
| <b>Receiver</b>   |  |        |      |        |       |                 |
| Damage Threshold  | TH <sub>d</sub>  | 3.3    |      |        | dBm   | 1               |
| Average Power at receiver Input, each Lane                                    |  | -13.7  |      | 2.3    | dB    |                 |
| Receiver Reflectance  | R <sub>R</sub>   |        |      | -26    | dB    |                 |
| Receiver Power (OMA), each Lane   |  |        |      | 3.5    | dBm   |                 |
| Stressed Receiver Sensitivity in OMA, each Lane                               |  |        |      | -9.9   | dBm   |                 |
| Receiver Sensitivity, each Lane   | S <sub>R</sub>   |        |      | -11.5  | dBm   |                 |
| Difference in Receive Power between any Lanes (OMA)                           |  |        |      | -7.5   | dBm   |                 |
| <b>Condition of Stress Receiver Sensitivity Test</b>                          |  |        |      |        |       |                 |
| Vertical Eye Closure Penalty, each Lane                                       |  |        | 1.6  |        | dB    |                 |
| Stressed Eye Jitter, each Lane  |  |        | 0.3  |        | UI    |                 |

**Notes:**

1. 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.

## Pin Descriptions

| Pin | Logic       | Symbol              | Name/Descriptions                                  | Ref. |
|-----|-------------|---------------------|--|------|
| 1   |             | GND                 | Module Ground                                      | 1    |
| 2   | CML-I       | Tx2-                | Transmitter inverted data input                    |      |
| 3   | CML-I       | Tx2+                | Transmitter non-inverted data input                |      |
| 4   |             | GND                 | Module Ground                                      | 1    |
| 5   | CML-I       | Tx4-                | Transmitter inverted data input                    |      |
| 6   | CML-I       | Tx4+                | Transmitter non-inverted data input                |      |
| 7   |             | GND                 | Module Ground                                      | 1    |
| 8   | LVTTL-I     | MODSEIL             | Module Select                                      | 2    |
| 9   | LVTTL-I     | ResetL              | Module Reset                                       | 2    |
| 10  |             | VCCR <sub>x</sub>   | +3.3v Receiver Power Supply                        |      |
| 11  | LVC MOS-I   | SCL                 | 2-wire Serial interface clock                      | 2    |
| 12  | LVC MOS-I/O | SDA                 | 2-wire Serial interface data                       | 2    |
| 13  |             | GND                 | Module Ground                                      | 1    |
| 14  | CML-O       | RX3+                | Receiver non-inverted data output                  |      |
| 15  | CML-O       | RX3-                | Receiver inverted data output                      |      |
| 16  |             | GND                 | Module Ground                                      | 1    |
| 17  | CML-O       | RX1+                | Receiver non-inverted data output                  |      |
| 18  | CML-O       | RX1-                | Receiver inverted data output                      |      |
| 19  |             | GND                 | Module Ground                                      | 1    |
| 20  |             | GND                 | Module Ground                                      | 1    |
| 21  | CML-O       | RX2-                | Receiver inverted data output                      |      |
| 22  | CML-O       | RX2+                | Receiver non-inverted data output                  |      |
| 23  |             | GND                 | Module Ground                                      | 1    |
| 24  | CML-O       | RX4-                | Receiver inverted data output                      |      |
| 25  | CML-O       | RX4+                | Receiver non-inverted data output                  |      |
| 26  |             | GND                 | Module Ground                                      | 1    |
| 27  | LVTTL-O     | ModPrsL             | Module Present, internal pulled down to GND        |      |
| 28  | LVTTL-O     | IntL                | Interrupt output should be pulled up on host board | 2    |
| 29  |             | VCCT <sub>x</sub>   | +3.3v Transmitter Power Supply                     |      |
| 30  |             | VCC1                | +3.3v Power Supply                                 |      |
| 31  | LVTTL-I     | LPM <sub>Mode</sub> | Low Power Mode                                     | 2    |
| 32  |             | GND                 | Module Ground                                      | 1    |
| 33  | CML-I       | Tx3+                | Transmitter non-inverted data input                |      |
| 34  | CML-I       | Tx3-                | Transmitter inverted data input                    |      |
| 35  |             | GND                 | Module Ground                                      | 1    |
| 36  | CML-I       | Tx1+                | Transmitter non-inverted data input                |      |
| 37  | CML-I       | Tx1-                | Transmitter inverted data input                    |      |
| 38  |             | GND                 | Module Ground                                      | 1    |

**Notes:**

- 1. Module circuit ground is isolated from module chassis ground with in the module.
- 2. Open collector; should be pulled up with 4.7k-10k ohms on host board to a voltage between 3.15V and 3.6V.

**Electrical Pin-out Details**



## Recommended Circuit Schematic



EEPROM Information



Mechanical Specifications





## About ProLabs

Our experience comes as standard; for over 15 years ProLabs has delivered optical connectivity solutions that give our customers freedom and choice through our ability to provide seamless interoperability. At the heart of our company is the ability to provide state-of-the-art optical transport and connectivity solutions that are compatible with over 90 optical switching and transport platforms.

## Complete Portfolio of Network Solutions

ProLabs is focused on innovations in optical transport and connectivity. The combination of our knowledge of optics and networking equipment enables ProLabs to be your single source for optical transport and connectivity solutions from 100Mb to 400G while providing innovative solutions that increase network efficiency. We provide the optical connectivity expertise that is compatible with and enhances your switching and transport equipment.

## Trusted Partner

Customer service is our number one value. ProLabs has invested in people, labs and manufacturing capacity to ensure that you get immediate answers to your questions and compatible product when needed. With Engineering and Manufacturing offices in the U.K. and U.S. augmented by field offices throughout the U.S., U.K. and Asia, ProLabs is able to be our customers best advocate 24 hours a day.



## Contact Information

ProLabs US

Email: [sales@prolabs.com](mailto:sales@prolabs.com)

Telephone: 952-852-0252

ProLabs UK

Email: [salesupport@prolabs.com](mailto:salesupport@prolabs.com)

Telephone: +44 1285 719 600