



### **FTL4C1QL2L-OPC**

Finisar® FTL4C1QL2L Compatible TAA 40GBase-IR4 QSFP+ Transceiver (SMF, 1270nm to 1330nm, 2km, 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 Finisar® FTL4C1QL2L compatible QSFP+ transceiver provides 40GBase-IR4 throughput up to 2km over single-mode fiber (SMF) using a wavelength of 1270nm to 1330nm via an LC connector. It is guaranteed to be 100% compatible with the equivalent Finisar® transceiver. This easy to install, hot swappable transceiver has been programmed, uniquely serialized and data-traffic and application tested to ensure that it will initialize and perform identically. 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.

OptioConnect's 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   |
| Operating Case Temperature           | Tc     | 0    |         | 70   | °C   |
| Power Supply Voltage                 | Vcc    | -0.5 |         | 3.6  | V    |
| Relative Humidity (non-condensation) | RH     | 0    |         | 85   | %    |
| Damage Threshold, each lane          | THd    | 4.5  |         |      | dBm  |
| Link Distance with G.652             | D      |      |         | 2    | km   |
| Data Rate, each lane                 |        |      | 10.3125 | 11.2 | Gbps |

## Electrical Characteristics

| Parameter                                      | Symbol                     | Min.  | Typ. | Max.  | Unit   | Notes                          |
|------------------------------------------------|----------------------------|-------|------|-------|--------|--------------------------------|
| Power Supply Voltage                           | Vcc                        | 3.135 | 3.3  | 3.465 | V      |                                |
| Supply Current                                 | ICC                        |       |      | 1.1   | A      |                                |
| Control Input Voltage High                     |                            | 2     |      | VCC   | V      |                                |
| Control Input Voltage Low                      |                            | 0     |      | 0.8   | V      |                                |
| Power Consumption                              |                            |       |      | 3.5   | W      |                                |
| Transceiver Power-on Initialization Time       |                            |       |      | 2000  | ms     | 1                              |
| Transmitter (each lane)                        |                            |       |      |       |        |                                |
| Single-ended Input Voltage Tolerance (Note 2)  |                            | -0.3  |      | 4.0   | V      | Referred to TP1 signal common  |
| AC Common Mode Input Voltage Tolerance         |                            | 15    |      |       | mV     | RMS                            |
| Differential Input Voltage Swing Threshold     |                            | 50    |      |       | mVpp   | LOSA Threshold                 |
| Differential Input Voltage Swing               | Vin,pp                     | 190   |      | 700   | mVpp   |                                |
| Differential Input Impedance                   | Zin                        | 90    | 100  | 110   | Ohm    |                                |
| Differential Input Return Loss                 | See IEEE 802.3ba 86A.4.11  |       |      |       | dB     | 10MHz-11.1GHz                  |
| J2 Jitter tolerance                            | Jt2                        | 0.17  |      |       | UI     |                                |
| J9 Jitter Tolerance                            | Jt9                        | 0.29  |      |       | UI     |                                |
| Data Dependent Pulse Width Shrinkage Tolerance | DDPWS                      | 0.07  |      |       | UI     |                                |
| Eye Mask Coordinates {X1, X2, Y1, Y2}          | 0.1, 0.31, 95, 350         |       |      |       | UI, mV | Hit Ratio = 5x10 <sup>-5</sup> |
| Receiver (each lane)                           |                            |       |      |       |        |                                |
| Single Ended Output Voltage                    |                            | -0.3  |      | 4.0   | V      | Referred to signal common      |
| AC Common Mode Output Voltage                  |                            |       |      | 7.5   | mV     | RMS                            |
| Differential Output Voltage Swing              | Vout,pp                    | 300   |      | 850   | mVpp   |                                |
| Differential Output Impedance                  | Zout                       | 90    | 100  | 110   | Ohm    |                                |
| 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.4.2.2 |       |      |       | dB     | 10MHz-11.1GHz                  |
| Output Transition Time                         |                            | 28    |      |       | ps     | 20% to 80%                     |
| J2 Jitter Output                               | Jo2                        |       |      | 0.42  | UI     |                                |
| J9 Jitter Output                               | Jo9                        |       |      | 0.65  | UI     |                                |
| Eye Mask Coordinates {X1, X2, Y1, Y2}          | 0.29, 0.5, 150, 425        |       |      |       | UI, mV | Hit Ratio = 5x10 <sup>-5</sup> |

### Notes:

1. Power-on Initialization Time is the time from when the power supply voltages reach and remain above the minimum recommended operating supply voltages to the time when the module is fully functional.
2. 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                                               |                                    | -7.0   |      | 2.3    | dBm   |       |
| Optical Modulation Amplitude, each Lane                                       | POMA                               | -6.0   |      | 3.5    | dBm   | 1     |
| Difference in launch Power between any two lanes (OMA)                        | P <sub>tx</sub> , diff             |        |      | 6.5    | dB    |       |
| Launch Power in OMA minus Transmitter and Dispersion Penalty (TDP), each Lane |                                    | -6.8   |      |        | dBm   |       |
| TDP, each Lane                                                                | TDP                                |        |      | 2.6    | dB    |       |
| Extinction Ratio                                                              | ER                                 | 3.5    |      |        | dB    |       |
| Relative Intensity Noise                                                      | R <sub>in</sub>                    |        |      | -128   | dB/Hz | 2     |
| Optical Return Loss Tolerance                                                 | TOL                                |        |      | 20     | dB    |       |
| Transmitter Reflectance                                                       | R <sub>T</sub>                     |        |      | -12    | dB    |       |
| 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 OFF Transmitter, each Lane                               | P <sub>off</sub>                   |        |      | -30    | dBm   |       |
| <b>Receiver</b>                                                               |                                    |        |      |        |       |       |
| Damage Threshold, each lane                                                   | TH <sub>d</sub>                    | 4.5    |      |        | dBm   | 3     |
| Total Average Receive Power                                                   |                                    |        |      | 8.3    | dBm   |       |
| Average Receive Power, each Lane                                              |                                    | -11.7  |      | 2.3    | dBm   |       |
| Receiver Reflectance                                                          | R <sub>R</sub>                     |        |      | -26    | dB    |       |
| Receive Power (OMA), each Lane                                                |                                    |        |      | 3.5    | dBm   |       |
| Receiver Sensitivity (OMA), each Lane                                         | SEN                                |        |      | -11.5  | dBm   |       |
| Difference in Receive Power between any Two Lanes (OMA)                       |                                    |        |      | 7.5    | dB    |       |
| LOS Assert                                                                    | LOSA                               | -28    |      |        | dBm   |       |
| LOS Deassert                                                                  | LOSD                               |        |      | -15    | dBm   |       |
| LOS Hysteresis                                                                | LOSH                               | 0.5    |      |        | dB    |       |
| Receiver Electrical 3dB upper Cut-off Frequency, each Lane                    |                                    |        |      | 12.3   | GHz   |       |

### Notes:

1. Even if the TDP < 0.8 dB, the OMA min must exceed the minimum value specified here.
2. 12dB reflection
3. 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.

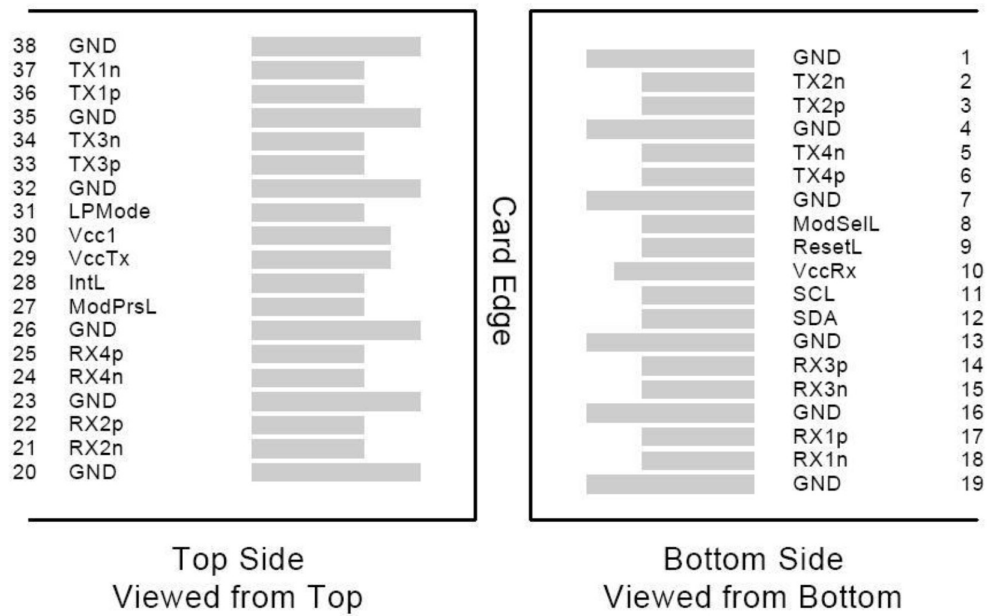
## Pin Descriptions

| Pin | Logic       | Symbol  | Name/Descriptions                    | Ref. |
|-----|-------------|---------|--------------------------------------|------|
| 1   |             | GND     | 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   | LVTLL-I     | ModSelL | Module Select                        |      |
| 9   | LVTLL-I     | ResetL  | Module Reset                         |      |
| 10  |             | VccRx   | +3.3V Power Supply Receiver          | 2    |
| 11  | LVC MOS-I/O | SCL     | 2-Wire Serial Interface Clock        |      |
| 12  | LVC MOS-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    |
| 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    |

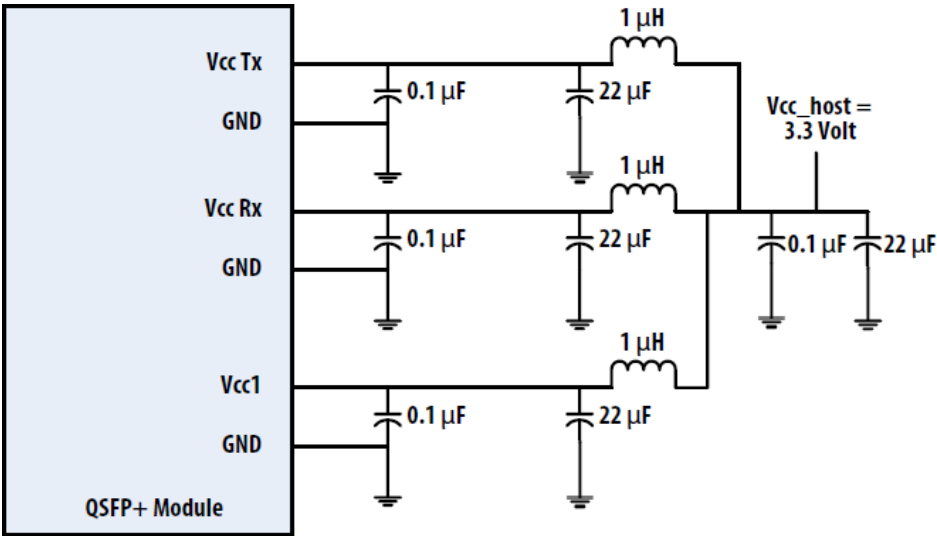
**Notes:**

- 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 in Figure 3 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.

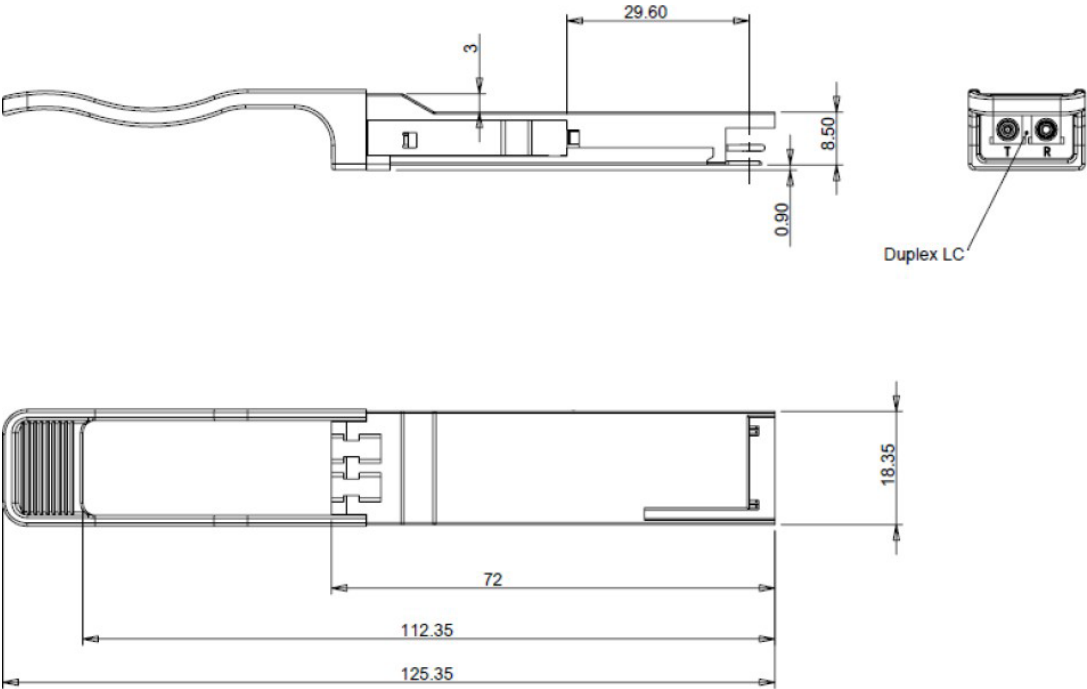
**Electrical Pin-out Details**



Recommended Power Supply Filter



Mechanical Specifications



### Digital Diagnostic Functions

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

| Parameter                               | Symbol       | Min  | Max | Units | Notes                            |
|-----------------------------------------|--------------|------|-----|-------|----------------------------------|
| Temperature monitor absolute error      | DMI_Temp     | -3   | 3   | °C    | Over operating temperature range |
| Supply voltage monitor absolute error   | DMI_VCC      | -0.1 | 0.1 | V     | Over full operating range        |
| Channel RX power monitor absolute error | DMI_RX_Ch    | -2   | 2   | dB    | 1                                |
| Channel Bias current monitor            | DMI_Ibias_Ch | -10% | 10% | mA    |                                  |
| Channel TX power monitor absolute error | DMI_TX_Ch    | -2   | 2   | dB    | 1                                |

#### Notes:

1. Due to measurement accuracy of different single mode fibers, there could be an additional +/-1 dB fluctuation, or a +/- 3 dB total accuracy.



## **OptioConnect**

### **Innovation for the Future of High-Speed Networking**

#### **Who We Are**

OptioConnect is reshaping the landscape of communication and high-speed networking through intelligent technology. With a core focus on cutting edge technology, we deliver smarter fiber optic solutions for enterprise networks, data centers, and next-gen telecom infrastructures.

#### **What We Do**

At OptioConnect, we fuse advanced engineering with intelligent automation to drive the future of networking. Our AI-integrated solutions are designed to optimize performance and streamline operations with:

- Superior Performance
- Network and traffic optimization
- Intelligent energy management
- Seamless OEM compatibility
- Scalable cost-efficiency

#### **Smarter Networks by Design**

Innovation isn't just a goal—it's our process. We embed AI and machine learning across our R&D and product lines, enabling adaptive performance, automated tuning, and faster deployment cycles. The result? Networks that don't just work—they learn, evolve, and outperform.

#### **Our Team**

Our engineers, data scientists, and network architects bring decades of experience and a future-focused mindset. We provide hands-on support with intelligent insights that turn complex challenges into simple solutions.

#### **Our Mission**

To deliver AI-enhanced connectivity that reduces cost, increases speed, and maximizes efficiency—empowering our partners to operate at the forefront of a rapidly evolving digital world.

#### **Let's Connect**

Discover how OptioConnect's intelligent infrastructure solutions can power your network's next leap forward.

[www.optioconnect.com](http://www.optioconnect.com) | [info@optioconnect.com](mailto:info@optioconnect.com)

