

# PRODUCT SPECIFICATION

|                     |                                |                                    |
|---------------------|--------------------------------|------------------------------------|
| <b>Part No.:</b>    | <b>AC-XF-Q1G10-40</b>          |                                    |
| <b>Description:</b> | 10G XFP Transceiver, CWDM 40km |                                    |
| <b>Release Date</b> | <b>Rev.</b>                    | <b>Revision Change Description</b> |
| <b>2016/07/16</b>   | <b>A0</b>                      | New Release                        |
| <b>2020/12/28</b>   | <b>A1</b>                      | Template Update                    |

## Features

- ✧ Supports 9.95Gbps to 11.3Gbps bit rates
- ✧ Cooled CWDM EML and PIN receiver
- ✧ Supports Lineside and XFI loopback
- ✧ Full Duplex LC connector
- ✧ Metal enclosure, for lower EMI
- ✧ Single +3.3V power supply
- ✧ Hot-pluggable
- ✧ Power dissipation < 2.5W
- ✧ Operating temperature range:
  - ✧ Standard: 0 to +70°C
  - ✧ Industrial: -40 to +85°C
- ✧ RoHS Compliant
- ✧ No Reference Clock required
- ✧ Built-in digital diagnostic functions
- ✧ Standard bail release mechanism
- ✧ Maximum link length of 40km

## Application

- ✧ 10GBASE-ER/EW
- ✧ 10G Ethernet
- ✧ SONET OC-192 & SDH STM 64

## Standard

- ✧ Compliant with MSA SFP+ specification(SFF-8431)
- ✧ Compliant with SFF-8472
- ✧ Compliant with SFP+ MSA
- ✧ Compliant to IEEE 802.3ae

## Wavelength selection

| Wavelength | xx | Clasp Color Code | Wavelength | xx | Clasp Color Code |
|------------|----|------------------|------------|----|------------------|
| 1470 nm    | 47 | Gray             | 1550 nm    | 55 | Yellow           |
| 1490 nm    | 49 | Purple           | 1570 nm    | 57 | Orange           |
| 1510 nm    | 51 | Blue             | 1590 nm    | 59 | Red              |
| 1530 nm    | 53 | Green            | 1610 nm    | 61 | Brown            |

## Specification

| Absolute Maximum Ratings |        |         |         |      |
|--------------------------|--------|---------|---------|------|
| Parameter                | Symbol | Min     | Max     | Unit |
| Storage temperature      | TS     | -40     | 85      | °C   |
| Power Supply Voltage     | Vcc3   | -0.3    | +3.6    | V    |
| Power Supply Voltage     | Vcc2   | -0.3    | +2.0    | V    |
| Relative Humidity        | RH     | 5       | 95      | %    |
| Signal Input Voltage     |        | Vcc-0.3 | Vcc+0.3 | V    |

## Recommended Operating Conditions

| Parameter                     |            | Symbol | Min  | Typical | Max  | Unit |
|-------------------------------|------------|--------|------|---------|------|------|
| Operating Case Temperature    | Standard   | Tc     | 0    |         | +70  | °C   |
|                               | Industrial |        | -40  |         | +85  | °C   |
| Power Supply Voltage          |            | Vcc    | 3.13 | 3.30    | 3.47 | V    |
| Power Supply Current          |            | Icc    |      |         | 640  | mA   |
| Data Rate                     |            |        |      | 10.3    | 11.3 | Gbps |
| Fiber Length 9/125μm core SMF |            |        | -    | 40      | -    | km   |

| Electrical Characteristics             |         |      |         |      |      |       |
|----------------------------------------|---------|------|---------|------|------|-------|
| Parameter                              | Symbol  | Min  | Typical | Max  | Unit | Notes |
| Supply Voltage – 1.8V supply           | Vcc2    | 1.71 |         | 1.89 | V    |       |
| Supply Voltage – 3.3V supply           | Vcc3    | 3.13 |         | 3.47 | V    |       |
| Supply Current – 1.8V supply           | Icc2    |      |         | 180  | mA   |       |
| Supply Current – 3.3V supply           | Icc3    |      |         | 640  | mA   |       |
| Module total power                     | P       |      |         | 2.5  | W    |       |
| Transmitter differential input voltage | Vin,pp  | 120  |         | 820  | m V  |       |
| Receiver differential output Voltage   | Vout,pp | 340  | 650     | 850  | m V  |       |

|                              |            |         |     |         |          |   |
|------------------------------|------------|---------|-----|---------|----------|---|
| Input differential impedance | Rin        |         | 100 |         | $\Omega$ | 1 |
| LOS Fault                    | VLOS fault | Vcc-0.5 |     | VccHost | V        | 2 |
| LOS Normal                   | VLOS norm  | GND     |     | GND+0.5 | V        | 2 |
| Transmit disable voltage     | VIH        | 2.0     |     | Vcc     | v        |   |
| Transmit enable voltage      | VIL        | GND     |     | GND+0.8 | v        |   |
| Data output rise time        | Tr         | 38      |     |         | ps       |   |
| Data output fall time        | Tf         | 38      |     |         | ps       |   |
| Transmit Disable Assert Time |            |         |     | 10      | us       |   |
| Power Supply Rejection       | PSR        |         |     | 100     | mVpp     | 3 |

**Notes:**

- 1) Connected directly to TX data input pins. AC coupled thereafter.
- 2) Loss Of Signal is LVTTTL. Logic 0 indicates normal operation; logic 1 indicates no signal detected.
- 3) Receiver sensitivity is compliant with power supply sinusoidal modulation of 20 Hz to 1.5 MHz up to specified value applied through the recommended power supply filtering network.

| Optical transmitter Characteristics     |                   |                                                              |       |         |       |      |       |
|-----------------------------------------|-------------------|--------------------------------------------------------------|-------|---------|-------|------|-------|
| Parameter                               |                   | Symbol                                                       | Min   | Typical | Max   | Unit | Notes |
| Launched Power (avg.)                   |                   | P <sub>out</sub>                                             | -1    |         | 4     | dBm  | 1     |
| Operating Wavelength Range              |                   | λ <sub>c</sub>                                               | λ-6.5 |         | λ+6.5 | nm   | 2     |
| Spectral Width(-20dB)                   |                   | Δλ                                                           |       |         | 1     | nm   |       |
| Side Mode Suppression Ratio             |                   | SMSR                                                         | 30    |         |       | dB   |       |
| Extinction Ratio                        |                   | ER                                                           | 8.2   |         |       | dB   |       |
| Average Launch power of OFF transmitter |                   | P <sub>OFF</sub>                                             |       |         | -30   | dB   |       |
| Output Eye Diagram                      |                   | Compliant with ITU-T G.691 eye mask and IEEE802.3ae eye mask |       |         |       |      |       |
| Optical receiver Characteristics        |                   |                                                              |       |         |       |      |       |
| Parameter                               |                   | Symbol                                                       | Min   | Typical | Max   | Unit | Notes |
| Receiver Sensitivity                    |                   | S                                                            |       |         | -16.5 | dBm  | 3     |
| Wavelength Range                        |                   | λ <sub>c</sub>                                               | 1270  |         | 1610  | nm   |       |
| Optical Power Input Overload            |                   | P <sub>in-max</sub>                                          | 0.5   |         |       | dBm  |       |
| LOS                                     | Optical De-assert | P <sub>d</sub>                                               |       |         | -18   | dBm  |       |
|                                         | Optical Assert    | P <sub>a</sub>                                               | -32   |         |       |      |       |
| LOS hysteresis                          |                   |                                                              | 0.5   |         |       | dB   |       |

**Notes:**

- 4) Class 1 Laser Safety per FDA/CDRH and IEC-825-1 regulations.
- 5) “ $\lambda$ ” is:1470,1490,1510,1530,1550,1570,1610, please the “product selection”.
- 6) Receiver Reflectance Measured with a PRBS 2<sup>31</sup>-1 test pattern, @10.3125Gbps, ER=8.2dB, BER<10<sup>-12</sup>.

## Digital Diagnostic Monitoring Information

As defined by the XFP MSA, LONTE XFP transceivers provide digital diagnostic functions via a 2-wire serial interface, which allows real-time access to the following operating parameters:

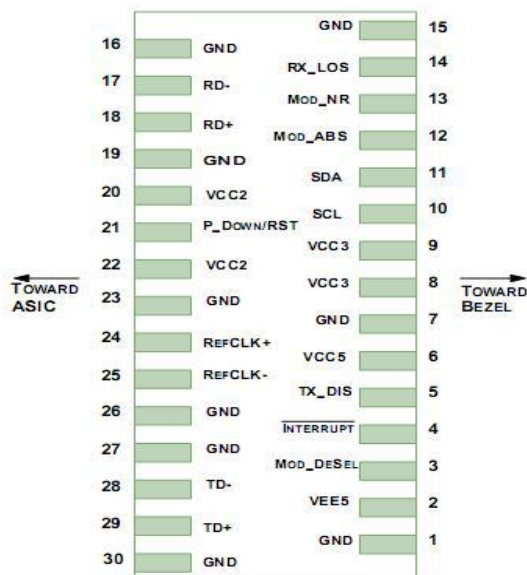
- Transceiver temperature
- Laser bias current
- Transmitted optical power
- Received optical power
- Transceiver supply voltage

It also provides a sophisticated system of alarm and warning flags, which may be used to alert end-users when particular operating parameters are outside of a factory-set normal range.

The operating and diagnostics information is monitored and reported by a Digital Diagnostics Transceiver Controller (DDTC) inside the transceiver, which is accessed through the 2-wire serial interface. When the serial protocol is activated, the serial clock signal (SCL pin) is generated by the host. The positive edge clocks data into the XFP transceiver into those segments of its memory map that are not write-protected. The negative edge clocks data from the XFP transceiver. The serial data signal (SDA pin) is bi-directional for serial data transfer. The host uses SDA in conjunction with SCL to mark the start and end of serial protocol activation. The memories are organized as a series of 8-bit data words that can be addressed individually or sequentially. The 2-wire serial interface provides sequential or random access to the 8 bit parameters, addressed from 000h to the maximum address of the memory.

For more detailed information including memory map definitions, please see the XFP MSA Specification.

## Pin Descriptions



## Pin Assignment

| Pin | Symbol    | Description                                                            | Notes |
|-----|-----------|------------------------------------------------------------------------|-------|
| 1   | GND       | Module Ground(Common with Receiver Ground)                             | 1     |
| 2   | VEE5      | Optional -5.2 Power Supply – Not required                              |       |
| 3   | Mod-Desel | Module De-select; When held low allows the module to respond to 2-wire |       |

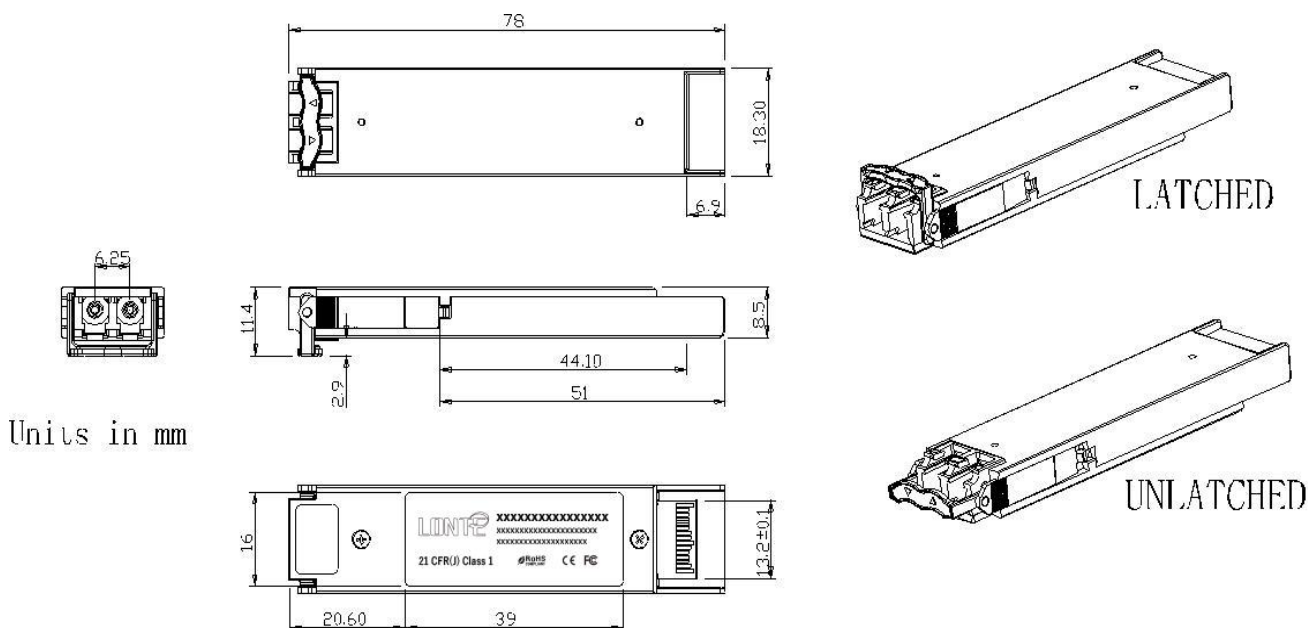
|    |            |                                                                                                                                      |   |
|----|------------|--------------------------------------------------------------------------------------------------------------------------------------|---|
|    |            | serial interface commands                                                                                                            |   |
| 4  | Interrupt  | Interrupt (bar); Indicates presence of an important condition which can be read over the serial 2-wire interface                     | 2 |
| 5  | TX_DIS     | Transmitter Disable; Transmitter laser source turned off                                                                             |   |
| 6  | VCC5       | +5 Power Supply                                                                                                                      |   |
| 7  | GND        | Module Ground                                                                                                                        | 1 |
| 8  | VCC3       | +3.3V Power Supply                                                                                                                   |   |
| 9  | VCC3       | +3.3V Power Supply                                                                                                                   |   |
| 10 | SCL        | Serial 2-wire interface clock                                                                                                        | 2 |
| 11 | SDA        | Serial 2-wire interface data line                                                                                                    | 2 |
| 12 | Mod_Abs    | Module Absent; Indicates module is not present. Grounded in the module.                                                              | 2 |
| 13 | Mod_NR     | Module Not Ready; XGIGA defines it as a logical OR between RX_LOS and Loss of Lock in TX/RX.                                         | 2 |
| 14 | RX_LOS     | Receiver Loss of Signal indicator                                                                                                    | 2 |
| 15 | GND        | Module Ground                                                                                                                        | 1 |
| 16 | GND        | Module Ground                                                                                                                        | 1 |
| 17 | RD-        | Receiver inverted data output                                                                                                        |   |
| 18 | RD+        | Receiver non-inverted data output                                                                                                    |   |
| 19 | GND        | Module Ground                                                                                                                        | 1 |
| 20 | VCC2       | +1.8V Power Supply – Not required                                                                                                    |   |
| 21 | P_Down/RST | Power Down; When high, places the module in the low power stand-by mode and on the falling edge of P_Down initiates a module reset   |   |
|    |            | Reset; The falling edge initiates a complete reset of the module including the 2-wire serial interface, equivalent to a power cycle. |   |
| 22 | VCC2       | +1.8V Power Supply – Not required                                                                                                    |   |
| 23 | GND        | Module Ground                                                                                                                        | 1 |
| 24 | RefCLK+    | Reference Clock non-inverted input, AC coupled on the host board – Not required                                                      | 3 |
| 25 | RefCLK-    | Reference Clock inverted input, AC coupled on the host board – Not required                                                          | 3 |
| 26 | GND        | Module Ground                                                                                                                        | 1 |
| 27 | GND        | Module Ground                                                                                                                        | 1 |
| 28 | TD+        | Transmitter inverted data input                                                                                                      |   |
| 29 | TD-        | Transmitter non-inverted data input                                                                                                  |   |
| 30 | GND        | Transmitter Ground                                                                                                                   | 1 |

**Notes:**

- 1) Module circuit ground is isolated from module chassis ground within the module.
- 2) Open collector; should be pulled up with 4.7k – 10kohms on host board to a voltage between 3.15V and 3.6V.
- 3) A Reference Clock input is not required by the XFP-10GER. If present, it will be ignored.

## Package Outline

Dimensions are in millimeters. All dimensions are  $\pm 0.2\text{mm}$  unless otherwise specified. (Unit: mm)



## Regulatory Compliance

| Feature                                              | Test                                                                  | Method                                               |
|------------------------------------------------------|-----------------------------------------------------------------------|------------------------------------------------------|
| Electrostatic Discharge (ESD) to the Electrical Pins | MIL-STD-883E<br>Method 3015.7                                         | Class 1(>1000V for SFI pins, >2000V for other pins.) |
| Electrostatic Discharge (ESD) Immunity               | IEC61000-4-2                                                          | Class 2(>4.0kV)                                      |
| Electromagnetic Interference (EMI)                   | CISPR22 ITE Class B<br>FCC Class B<br>CENELEC EN55022<br>VCCI Class 1 | Comply with standard                                 |
| Immunity                                             | IEC61000-4-3                                                          | Comply with standard                                 |
| Eye Safety                                           | FDA 21CFR 1040.10 and<br>1040.11<br>EN (IEC) 60825-1,2                | Compatible with Class I laser Product                |

**Ordering information**

| Part. No        | Specifications |                |             |             |     |              |              |               |     |
|-----------------|----------------|----------------|-------------|-------------|-----|--------------|--------------|---------------|-----|
|                 | Pack           | Rate<br>(Gbps) | Tx<br>(nm)  | Po<br>(dBm) | RX  | Sen<br>(dBm) | Temp<br>(°C) | Reach<br>(km) | DDM |
| AC-XF-Q1G10-40  | XFP            | 10.3125        | CWDM<br>EML | -1~4        | PIN | <-16.5       | 0~70         | 40            | Y   |
| AC-XF-Q1G10-40F | XFP            | 10.3125        | CWDM<br>EML | -1~4        | PIN | <-16.5       | -40~85       | 40            | Y   |