




## XFP LR Optical Transceiver, 10km Reach FX-31192-LRC

### Features

- ◆ Supports 9.95Gb/s to 11.1Gb/s bit rates
- ◆ Hot-pluggable XFP footprint
- ◆ Maximum link length of 10km with SMF
- ◆ 1310nm uncooled DFB laser
- ◆ XFP MSA package with duplex LC connector
- ◆ No reference clock required
- ◆ +1.8V,+3.3V Supply Voltage
- ◆ XFI and lineside loopback Mode Supported
- ◆ -5°C to 70°C Operating Case Temperature
- ◆ Diagnostic Performance Monitoring of module temperature, Supply Voltages, laser bias current, transmit optical power, and receive optical power
- ◆ RoHS6 compliant (lead free) 



### Applications

- ◆ 10GBASE-LR at 10.3125Gbps
- ◆ Other optical links, up to 11.1Gbps

### Description

FIBERER FX-31192-LRC is compliant with the 10G Small Form-Factor Pluggable (XFP) Multi-Source Agreement (MSA), supporting data-rate of 10.3125Gbps(10GBASE-LR) or 9.953Gbps 10GBASE-LW), and transmission distance up to 10km on SMF.

The transceiver module comprises a transmitter with 1310nm Uncooled DFB laser and a receiver with a PIN photodiode. Transmitter and receiver are separate within a wide temperature range of 0°C to +70°C and offers optimum heat dissipation and excellent electromagnetic shielding thus enabling high port densities for 10G systems.

### Absolute Maximum Ratings

| Parameter                  | Symbol | Min  | Max | Unit |
|----------------------------|--------|------|-----|------|
| Supply Voltage 1           | Vcc3   | -0.5 | 4.0 | V    |
| Supply Voltage 2           | Vcc5   | -0.5 | 6.0 | V    |
| Supply Voltage 3           | Vcc2   | -0.5 | 2   | V    |
| Storage Temperature        | Tst    | -40  | 85  | °C   |
| Case Operating Temperature | Top    | -5   | 70  | °C   |

### Electrical Characteristics



| Parameter                        | Symbol                 | Min              | Typ | Max                 | Unit | Note |   |
|----------------------------------|------------------------|------------------|-----|---------------------|------|------|---|
| Operating Case Temperature Range | Tc                     | 0                |     | +70                 | °C   |      |   |
| Power Supply Voltage @ 3.3V      | Vcc3                   | 3.13             | 3.3 | 3.47                | V    |      |   |
| Module total power               | P                      |                  |     | 2.5                 | W    |      |   |
| <b>Transmitter</b>               |                        |                  |     |                     |      |      |   |
| Input differential impedance     | Rin                    |                  | 100 |                     | Ω    | 1    |   |
| Differential data input swing    | Vin,pp                 | 120              |     | 820                 | mV   |      |   |
| Transmit Disable Voltage         | VD                     | 2.0              |     | Vcc                 | V    |      |   |
| Transmit Enable Voltage          | VEN                    | GND              |     | GND+0.8             | V    |      |   |
| Transmit Disable Assert Time     |                        |                  |     | 10                  | us   |      |   |
| <b>Receiver</b>                  |                        |                  |     |                     |      |      |   |
| Differential data output swing   | Vout,pp                | 500              |     | 850                 | mV   |      |   |
| Data output rise time            | tr                     |                  |     | 38                  | ps   | 2    |   |
| Data output fall time            | tf                     |                  |     | 38                  | ps   | 2    |   |
| LOS Fault                        | V <sub>LOS fault</sub> | Vcc - 0.5        |     | Vcc <sub>HOST</sub> | V    | 3    |   |
| LOS Normal                       | V <sub>LOS norm</sub>  | GND              |     | GND+0.5             | V    | 3    |   |
| Power Supply Rejection           | PSR                    | See Note 3 below |     |                     |      |      | 4 |

**Notes:**

1. After internal AC coupling.
2. 20 – 80 %
3. Loss Of Signal is open collector to be pulled up with a 4.7k – 10kohm resistor to 3.15 – 3.6V. Logic 0 indicates normal operation; logic 1 indicates no signal detected.
4. Per Section 2.7.1. in the XFP MSA Specification.

**Optical Characteristics**

| Parameter                   | Symbol           | Min                                       | Typ | Max   | Unit | Ref. |  |
|-----------------------------|------------------|---|-----|-------|------|------|--|
| <b>Transmitter</b>          |                  |   |     |       |      |      |  |
| Optical output Power        | P                | -6.5                                      |     | +0.5  | dBm  |      |  |
| Optical Wavelength          | λ                | 1260                                      |     | 1355  | nm   |      |  |
| Optical Extinction Ratio    | ER               | 6   |     |       | dB   | 1    |  |
| Side Mode Suppression Ratio | SMSR             | 30  |     |       | dB   |      |  |
| Average Launch power of OFF | POFF             | -30                                       |     |       | dBm  |      |  |
| Tx Jitter                   | T <sub>xj</sub>  | Compliant with each standard requirements |     |       |      |      |  |
| <b>Receiver</b>             |                  |   |     |       |      |      |  |
| Receiver Sensitivity        | RSENS            |   | -16 | -14.5 | dBm  | 2    |  |
| Receiver Sensitivity in OMA | RSENS            |   |     | -12.5 | dBm  | 2    |  |
| Maximum Input Power         | P <sub>MAX</sub> | +0.5                                      |     |       | dBm  |      |  |
| Optical Center Wavelength   | λ <sub>C</sub>   | 1260                                      |     | 1600  | nm   |      |  |
| LOS De-Assert               | LOS <sub>D</sub> |   |     | -15   | dBm  |      |  |
| LOS Assert                  | LOS <sub>A</sub> | -25                                       |     |       | dBm  |      |  |
| LOS Hysteresis              |                  | 1   |     | 4     | dB   |      |  |

**Notes:**

- 1, PRBS 2<sup>31</sup>-1 test pattern @10.3125Gbps.
- 2, PRBS 2<sup>31</sup>-1 test pattern @10.3125Gbps, BER≤10<sup>-12</sup>.

**Pin Descriptions**

| Pin | Logic | Symbol | Name/Description | Ref |
|-----|-------|--------|------------------|-----|
| 1   |       | GND    | Module Ground    | 1   |



|    |         |            |  |   |
|----|---------|------------|--|---|
| 2  |         | VEE5       | Optional -5.2 Power Supply – <b>Not required</b>   |   |
| 3  | LVTTL-I | Mod-Desel  | Module De-select; When held low allows the module to , respond to 2-wire serial interface commands   |   |
| 4  | LVTTL-O | Interrupt  | Interrupt (bar); Indicates presence of an important condition which can be read over the serial 2-wire interface   | 2 |
| 5  | LVTTL-I | TX_DIS     | Transmitter Disable; Transmitter laser source turned off   |   |
| 6  |         | VCC5       | +5 Power Supply – <b>Not required</b>  |   |
| 7  |         | GND        | Module Ground  | 1 |
| 8  |         | VCC3       | +3.3V Power Supply   |   |
| 9  |         | VCC3       | +3.3V Power Supply   |   |
| 10 | LVTTL-I | SCL        | Serial 2-wire interface clock  | 2 |
| 11 | LVTTL-  | SDA        | Serial 2-wire interface data line  | 2 |
| 12 | LVTTL-O | Mod_Abs    | Module Absent; Indicates module is not present. Grounded in the module.  | 2 |
| 13 | LVTTL-O | Mod_NR     | Module Not Ready;  | 2 |
| 14 | LVTTL-O | RX_LOS     | Receiver Loss of Signal indicator  | 2 |
| 15 |         | GND        | Module Ground  | 1 |
| 16 |         | GND        | Module Ground  | 1 |
| 17 | CML-O   | RD-        | Receiver inverted data output  |   |
| 18 | CML-O   | RD+        | Receiver non-inverted data output  |   |
| 19 |         | GND        | Module Ground  | 1 |
| 20 |         | VCC2       | +1.8V Power Supply   |   |
| 21 | LVTTL-I | 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<br>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   |   |
| 23 |         | GND        | Module Ground  | 1 |
| 24 | PECL-I  | RefCLK+    | Reference Clock non-inverted input, AC coupled on the host board – <b>Not required</b>   | 3 |
| 25 | PECL-I  | RefCLK-    | Reference Clock inverted input, AC coupled on the host board – <b>Not required</b>   | 3 |
| 26 |         | GND        | Module Ground  | 1 |
| 27 |         | GND        | Module Ground  | 1 |
| 28 | CML-I   | TD-        | Transmitter inverted data input  |   |
| 29 | CML-I   | TD+        | Transmitter non-inverted data input  |   |
| 30 |         | GND        | Module 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 – 10k ohms on host board to a voltage between 3.15V and 3.6V.
3. A Reference Clock input is not required.

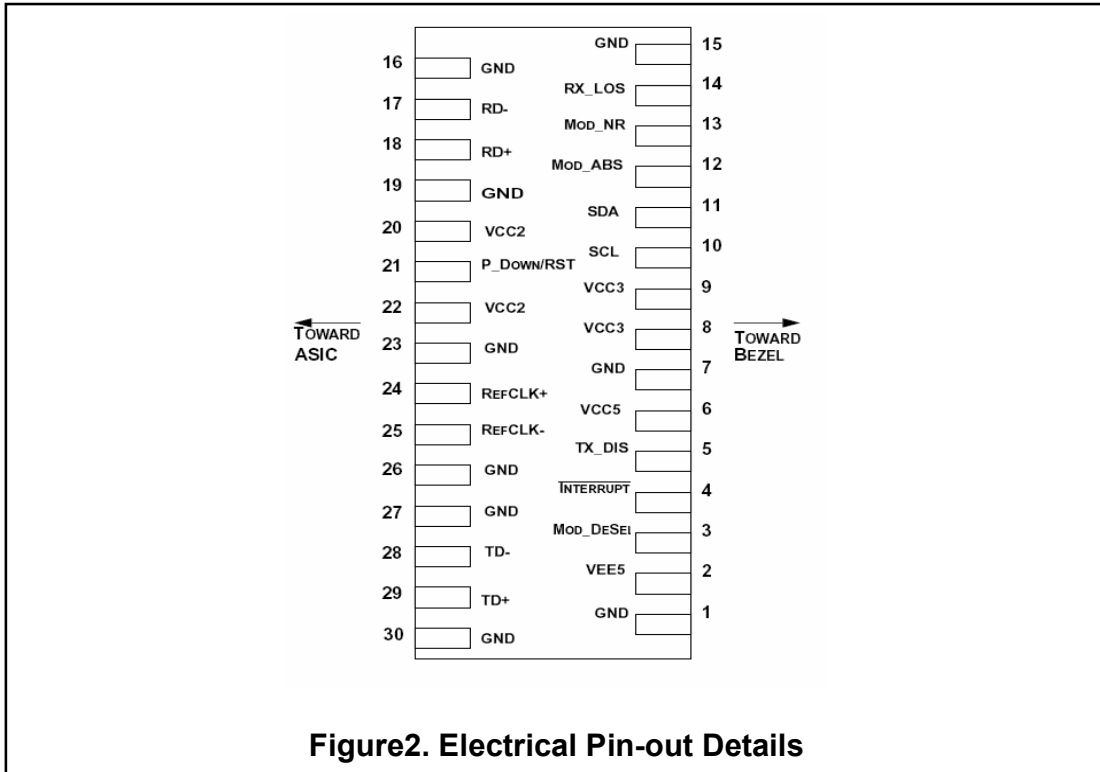


Figure2. Electrical Pin-out Details

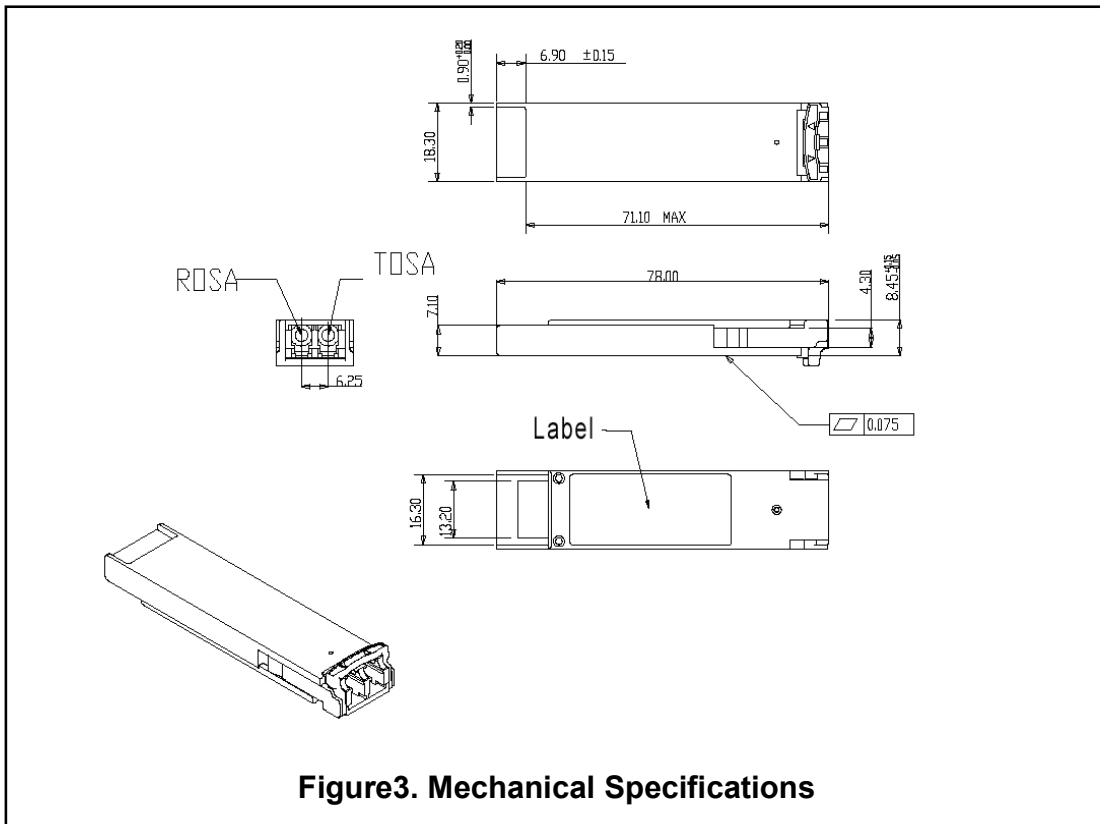
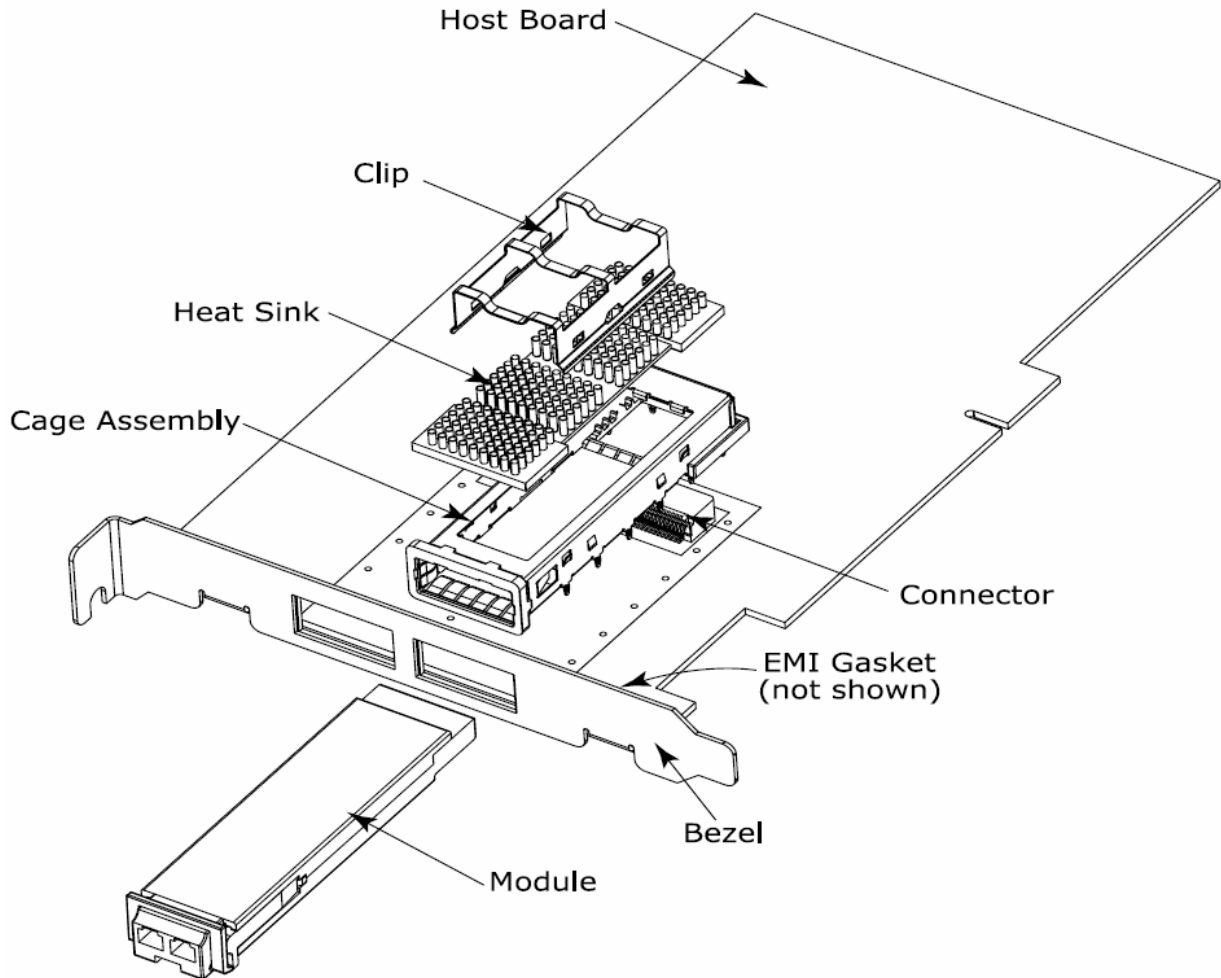


Figure3. Mechanical Specifications



**Figure4. XFP Mechanical Components**

**The mechanical components defined:**

1. The module, clip and connector dimensions are constant for all applications. While the bezel, cage assembly, EMI gasket and heat sink can be designed and/or adjusted for the individual application.
2. The relatively small form factor of the XFP module combined with an adaptable heatsink option allows host system design optimization of module location, heatsink shape/dimension/fins design, and airflow control. The module can be inserted and removed from the cage with the heat sink and clip attached.

**Regulatory Compliance**

FIBERER XFP transceiver is designed to be Class I Laser safety compliant and is certified per the following standards:



| Feature                  | Agency | Standard  | Certificate / Comments |
|--------------------------|--------|---|------------------------|
| Laser Safety             | FDA    | CDRH 21 CFR 1040 and Laser Notice No. 50            | 1120288-000            |
| Product Safety           | UL     | UL and CUL EN60950-2:2007                           | E347511                |
| Environmental protection | SGS    | RoHS Directive 2002/95/EC                           | GZ1001008706/CHEM      |
| EMC                      | WALTEK | EN 55022:2006+A1:2007<br>EN 55024:1998+A1+A2:2003 - | WT10093768-D-E-E       |

### Ordering information

| Part Number    | Product Description                                     |
|----------------|---|
| FX-31192-LRCKE | 1310nm DFB, 10Gbps, 10km, 0°C ~ +70°C, Ethernet Version |
| FX-31192-LRCKS | 1310nm DFB, 10Gbps, 10km, 0°C ~ +70°C, SDH Version      |

### References

1. 10 Gigabit Small Form Factor Pluggable Module (XFP) Multi-Source Agreement (MSA), Rev 4.5 – August 2005. Documentation is currently available at <http://www.xfpmsa.org/>
2. IEEE802.3ae – 2002
3. ITU-T G.709 / ITU-T G.959.1 <http://www.itu.int/>
4. Telcordia GR-253-CORE

### Important Notice

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