

Product Specification

Industrial Temperature Range 10Gb/s 850nm Multimode Datacom XFP Optical Transceiver FTLX8512D3BTL

PRODUCT FEATURES

- Hot-pluggable XFP footprint
- Supports 8.5Gb/s to 10.5Gb/s bit rates*
- Power dissipation <1.5W
- RoHS-6 compliant (lead-free)
- Temperature range -40°C to +85°C
- Single power supply: 3.3V
- Maximum link length of 300m
- 850nm heated VCSEL laser.
- Duplex LC connector
- No Reference Clock required
- Built-in digital diagnostic functions
- Standard bail release mechanism



APPLICATIONS

- 10GBASE-SR/SW 10G Ethernet
- 1200-Mx-SN-I 10G Fibre Channel
- 800-Mx-SN0I 8G Fibre Channel
- G.709 OTN/FEC (OTU1e and OTU2e)


Finisar's FTLX8512D3BTL Small Form Factor 10Gb/s (XFP) transceivers are compliant with the current XFP Multi-Source Agreement (MSA) Specification¹ now available with Industrial Temperature Range of Operation (-40°C to +85°C). They comply with 10-Gigabit Ethernet 10GBASE-SR/SW per IEEE 802.3ae, 10G Fibre Channel 1200-Mx-SN-I, 8G Fibre Channel 800-Mx-SN-I, and OTN/FEC protocols OTU1e and OTU2e upon request. Digital diagnostics functions are available via a 2-wire serial interface, as specified in the XFP MSA. The transceiver is RoHS compliant and lead free per Directive 2002/95/EC³, and Finisar Application Note AN-2038⁴.

PRODUCT SELECTION

| |
|----------------------|
| FTLX8512D3BTL |
|----------------------|

*Contact Finisar for higher data-rate support

I. Pin Descriptions

| Pin | Logic | Symbol | Name/Description | Ref. |
|-----|-----------|---|--|------|
| 1 | | GND | Module Ground | 1 |
| 2 | | VEE5 | Optional –5.2 Power Supply – Not required | |
| 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 – Not required | |
| 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-I/O | 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; Finisar defines it as a logical OR between RX_LOS and Loss of Lock in TX/RX. | 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 – Not required | |
| 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 | |
| | | | 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 | PECL-I | RefCLK+ | Reference Clock non-inverted input, AC coupled on the host board – Not required | 3 |
| 25 | PECL-I | 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 | 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 Ω – 10k Ω on host board to a voltage between 3.15V and 3.6V.
3. A Reference Clock input is not required by the FTLX8512D3BTL. If present, it will be ignored.

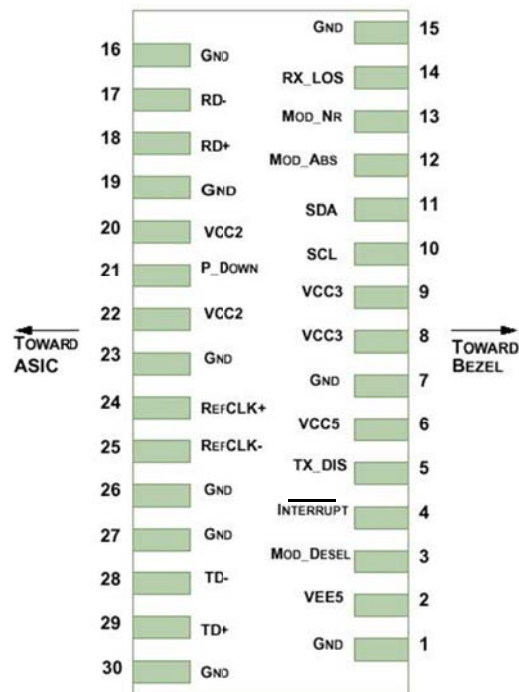


Diagram of Host Board Connector Block Pin Numbers and Name

II. Absolute Maximum Ratings

| Parameter | Symbol | Min | Typ | Max | Unit | Ref. |
|----------------------------|------------------|------|-----|-----|------|------|
| Maximum Supply Voltage | V _{cc3} | -0.5 | | 4.0 | V | |
| Case Operating Temperature | T _{OP} | -40 | | +85 | °C | |

III. Electrical Characteristics ($T_{OP} = -40$ to $+85^{\circ}\text{C}$, $V_{CC3} = 3.13$ to 3.45 Volts)

| Parameter | Symbol | Min | Typ | Max | Unit | Ref. |
|--------------------------------|------------------------|-----------------------|-----|---------------------|----------|------|
| Supply Voltage | V _{cc3} | 3.13 | | 3.45 | V | |
| Supply Current | I _{cc3} | | 360 | 435 | mA | 1 |
| Module total power consumption | P | | 1.2 | 1.5 | W | 1 |
| Transmitter | | | | | | |
| Input differential impedance | R _{in} | | 100 | | Ω | 2 |
| Differential data input swing | V _{in,pp} | 120 | | 1000 | mV | |
| Transmit Disable Voltage | V _D | 2.0 | | V _{cc} | V | 3 |
| Transmit Enable Voltage | V _{EN} | GND | | GND+ 0.8 | V | |
| Transmit Disable Assert Time | | | | 10 | us | |
| Receiver | | | | | | |
| Differential data output swing | V _{out,pp} | 340 | | 850 | mV | 4 |
| Data output rise time | t _r | | | 40 | ps | 5 |
| Data output fall time | t _f | | | 40 | ps | 5 |
| LOS Fault | V _{LOS fault} | V _{cc} – 0.5 | | V _{ccHOST} | V | 6 |
| LOS Normal | V _{LOS norm} | GND | | GND+0.5 | V | 6 |
| Power Supply Rejection | PSR | See Note 7 below | | | | 7 |

Notes:

- Maximum total power consumption value is specified across the full temperature and voltage range.
Typical current at -40C is ~400mA.
- After internal AC coupling.
- Or open circuit.
- Into 100 ohms differential termination.
- 20 – 80 %.
- Loss Of Signal is open collector to be pulled up with a 4.7k Ω – 10k Ω resistor to 3.15 – 3.6V. Logic 0 indicates normal operation; logic 1 indicates no signal detected.
- Per Section 2.7.1. in the XFP MSA Specification¹.

IV. Optical Characteristics (T_{OP} = -40 to +85°C, V_{CC3} = 3.13 to 3.45 Volts)

| Parameter | Symbol | Min | Typ | Max | Unit | Ref. |
|--|-----------------------|--------------------------|------|-------|-------|------|
| Transmitter | | | | | | |
| Optical Modulation Amplitude (OMA) | P _{OMA} | -2.8 | -1.5 | | dBm | |
| Average Optical Power | P _{AVE} | -5.0 | | -1.0 | | 1 |
| Optical Wavelength | λ | 840 | 850 | 860 | nm | |
| RMS Spectral Width | $\Delta\lambda_{rms}$ | | 0.4 | 0.45 | dB | |
| Optical Extinction Ratio | ER | 3.0 | 5.5 | | dB | |
| Transmitter and Dispersion Penalty | TDP | | | 3.9 | dB | |
| Average Launch power of OFF transmitter | P _{OFF} | | | -30 | dBm | |
| Tx Jitter | Tx _j | Per 802.3ae requirements | | | | |
| Encircled Flux | <4.5 μ m | | | 30 | % | 2 |
| | <19 μ m | 86 | | | | |
| Relative Intensity Noise | RIN ₁₂ OMA | | | -128 | dB/Hz | |
| Receiver | | | | | | |
| Receiver Sensitivity (OMA) @ 10.5Gb/s | R _{SENS1} | | | -11.1 | dBm | 3 |
| Stressed Receiver Sensitivity (OMA) @ 10.3Gb/s | R _{SENS2} | | | -7.5 | dBm | 4 |
| Maximum Input Power | P _{MAX} | +0.5 | | | dBm | |
| Wavelength Range | λ_C | 840 | | 860 | nm | |
| Receiver Reflectance | R _{rx} | | | -12 | dB | |
| LOS De-Assert | LOS _D | | | -14 | dBm | |
| LOS Assert | LOS _A | -30 | | | dBm | |
| LOS Hysteresis | | 0.5 | | | dB | |

Notes:

1. Average power figures are informative only, per IEEE 802.3ae.
2. Measured into Type A1a (50/125 μ m multimode) fiber per ANSI/TIA/EIA-455-203-2.
3. Measured with worst ER; BER<10⁻¹²; 2³¹ – 1 PRBS.
4. Per IEEE 802.3ae.

V. General Specifications

| Parameter | | Symbol | Min | Typ | Max | Units | Ref. |
|------------------------------------|---------------------|--------|-----|-----|------------|-------|------|
| Bit Rate | | BR | 8.5 | | 10.5 | Gb/s | 1 |
| Bit Error Ratio | | BER | | | See Note 2 | | 2 |
| Maximum Supported Distances | | | | | | | |
| Fiber Type | 850nm OFL Bandwidth | | | | | | |
| 62.5μm | 160MHz-km | Lmax | | | 26 | m | |
| | OM1 200MHz-km | | | | 33 | | |
| 50μm | 400MHz-km | Lmax | | | 66 | m | |
| | OM2 500MHz-km | | | | 82 | | |
| | OM3 2000MHz-km | | | | 300 | | |

Notes:

- 10GBASE-SR/SW, 1200-Mx-SN-I, 800-Mx-SN-I. Contact Finisar for higher data-rate support.
- 10GBASE-SR/SW, 1200-Mx-SN-I tested with $2^{31} - 1$ PRBS @ 10^{-12} BER.

VI. Environmental Specifications

This Finisar XFP transceiver model has an operating temperature range from -40°C to +85°C case temperature.

| Parameter | Symbol | Min | Typ | Max | Units | Ref. |
|----------------------------|------------------|-----|-----|-----|-------|------|
| Case Operating Temperature | T _{op} | -40 | | 85 | °C | 1 |
| Storage Temperature | T _{sto} | -40 | | 85 | °C | |

Notes:

- Warm-up time at -40°C case temperature is 10 seconds.

VII. Regulatory Compliance

Finisar XFP transceivers are Class 1 Laser Products. They are certified per the following standards:

| Feature | Agency | Standard | Certificate Number |
|-------------------|----------|--------------------------------------|--------------------|
| Laser Eye Safety | FDA/CDRH | CDRH 21 CFR 1040 and Laser Notice 50 | 9210176-77 |
| Laser Eye Safety | TÜV | EN60825 | R7201686 |
| Electrical Safety | TÜV | EN 60950 | R7201686 |
| Electrical Safety | UL/CSA | CLASS 3862.07 CLASS 3862.87 | 2283290 |

Copies of the referenced certificates will be available at Finisar Corporation upon request.

VIII. Digital Diagnostic Functions

As defined by the XFP MSA¹, Finisar 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

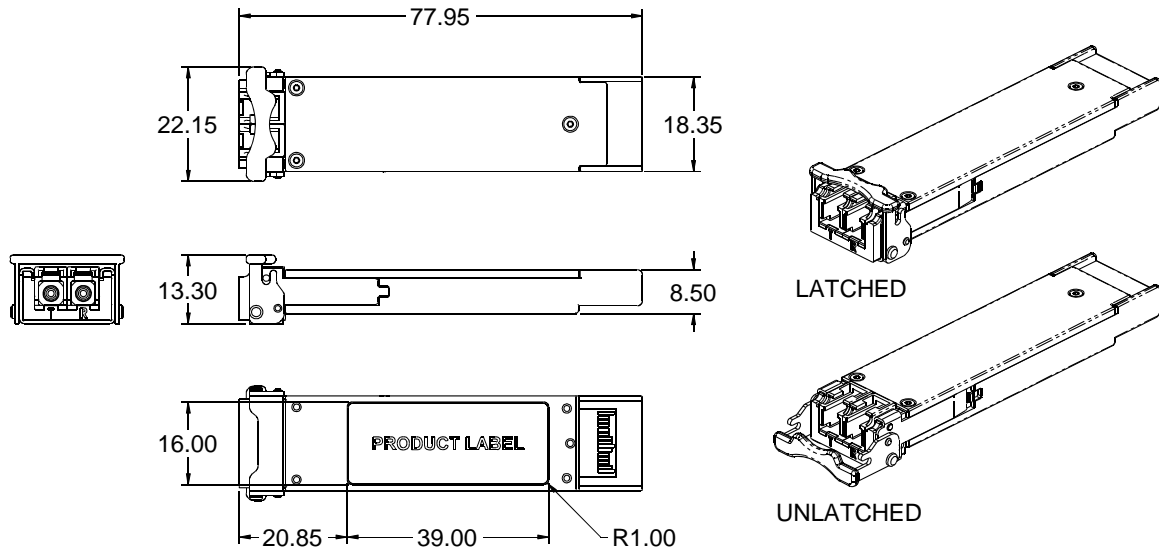
It also provides a sophisticated system of alarm and warning flags, which may be used to alert end-users when particular operating parameters are outside of a factory-set normal range.

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 Finisar Application Note AN-2035 “Digital Diagnostic Monitoring Interface for XFP Optical Transceivers”, or the XFP MSA Specification¹.

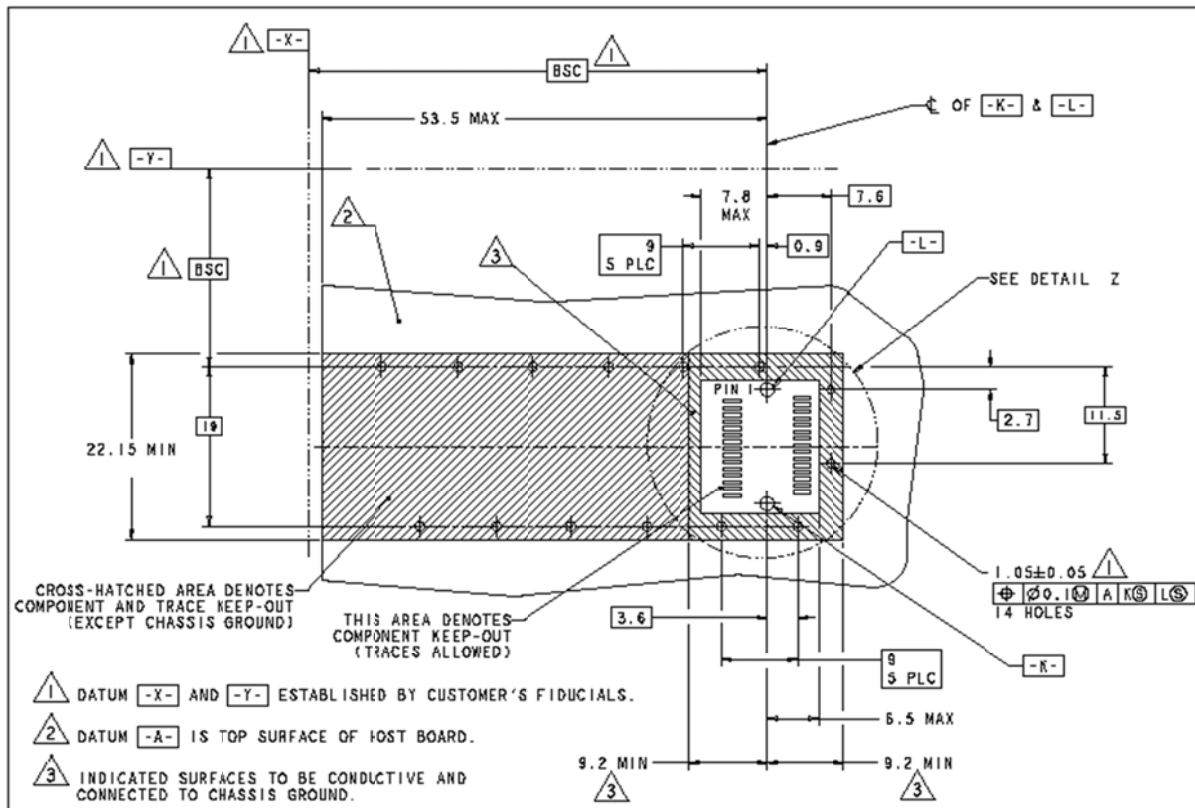
IX. Mechanical Specifications

Finisar's XFP transceivers are compliant with the dimensions defined by the XFP Multi-Sourcing Agreement (MSA). Bail color is beige.

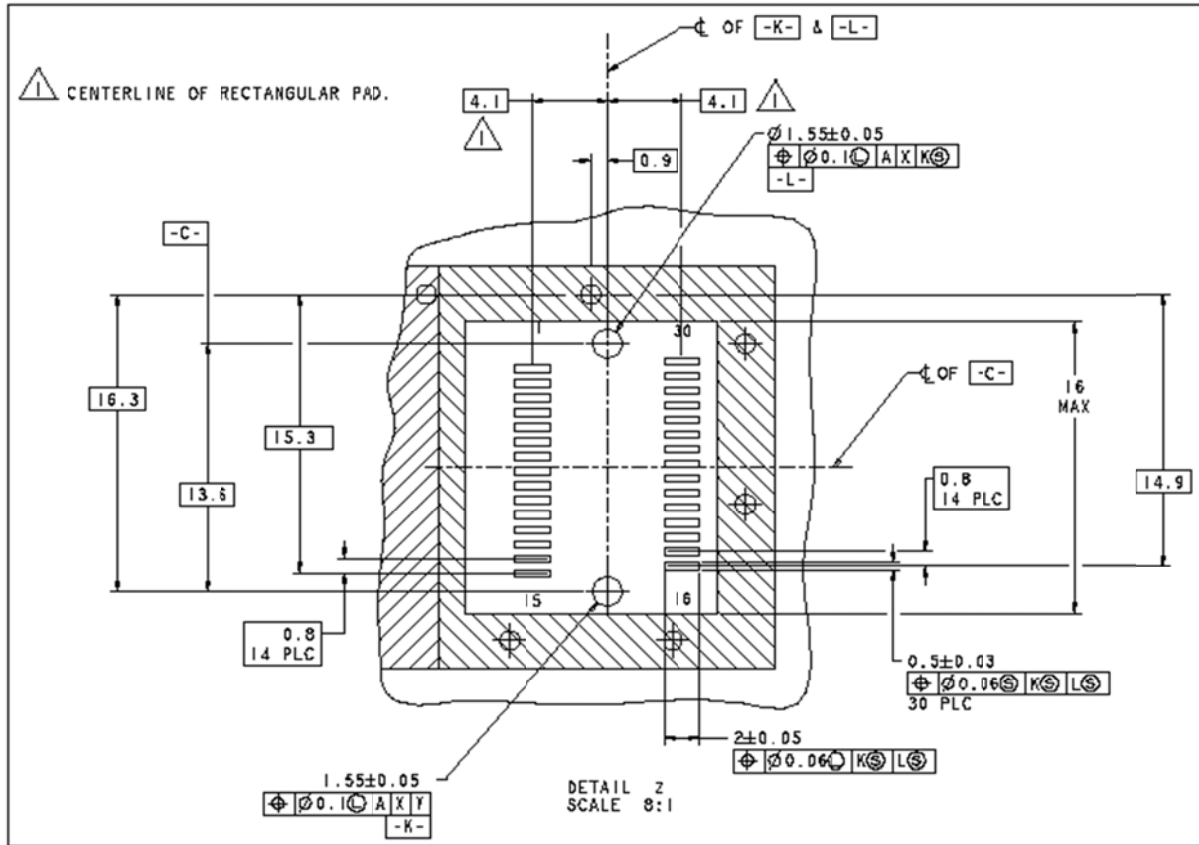


XFP Transceiver (dimensions are in mm)

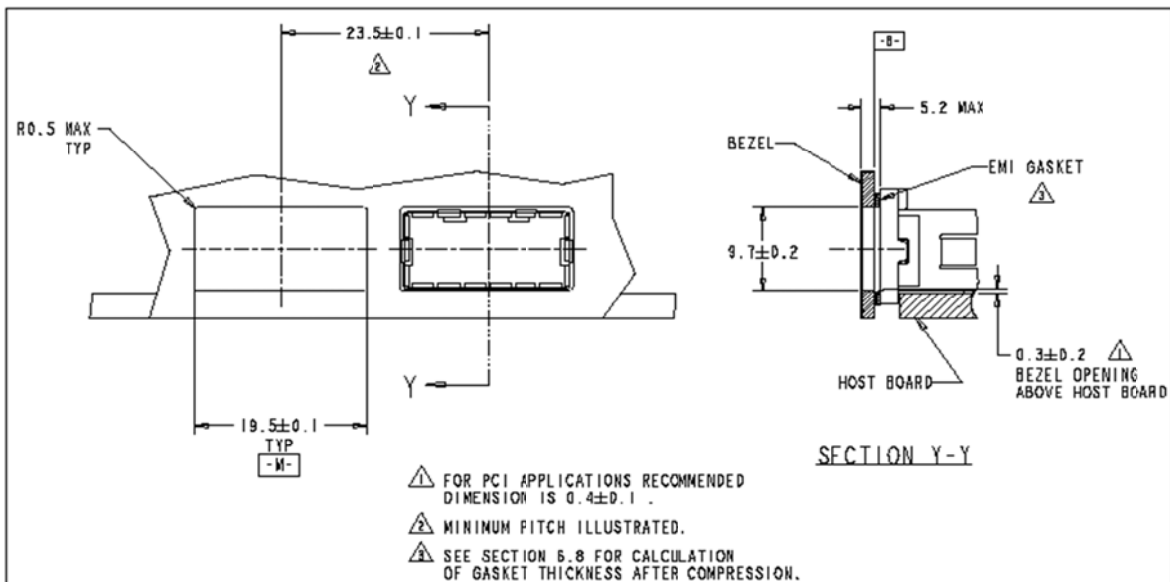
X. PCB Layout and Bezel Recommendations



XFP Host Board Mechanical Layout (dimensions are in mm)



XFP Detail Host Board Mechanical Layout (dimensions are in mm)



XFP Recommended Bezel Design (dimensions are in mm)

XI. References

1. 10 Gigabit Small Form Factor Pluggable Module (XFP) Multi-Source Agreement (MSA), INF-8077i, Rev 4.5 - August 2005. Documentation is currently available at <http://www.xfpmsa.org/>
2. Application Note AN-2035: “Digital Diagnostic Monitoring Interface for XFP Optical Transceivers” – Finisar Corporation, December 2003
3. Directive 2002/95/EC of the European Council Parliament and of the Council, “on the restriction of the use of certain hazardous substances in electrical and electronic equipment”. January 27, 2003.
4. “Application Note AN-2038: Finisar Implementation Of RoHS Compliant Transceivers”, Finisar Corporation, January 21, 2005.

XII. For More Information

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