

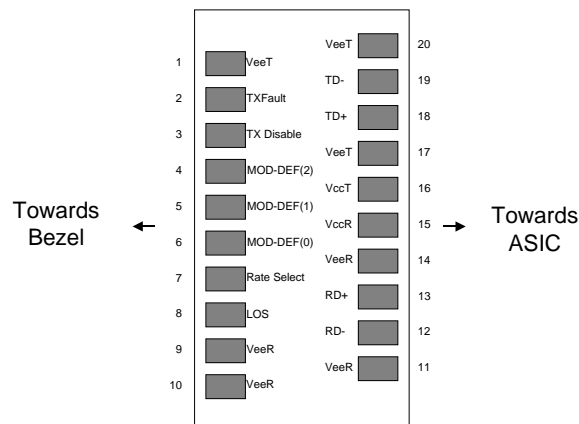
| Wavelength | xx | Clasp Color Code | Wavelength | xx | Clasp Color Code |
|-------------------|-----------|-------------------------|-------------------|-----------|-------------------------|
| 1471 nm | 47 | Gray | 1551 nm | 55 | Yellow |
| 1491 nm | 49 | Violet | 1571 nm | 57 | Orange |
| 1511 nm | 51 | Blue | 1591 nm | 59 | Red |
| 1531 nm | 53 | Green | 1611 nm | 61 | Brown |

I. Pin Descriptions

| Pin | Symbol | Name/Description | Ref. |
|-----|--------------------|--|------|
| 1 | V _{EET} | Transmitter Ground (Common with Receiver Ground) | 1 |
| 2 | T _{FAULT} | Transmitter Fault. Not supported. | |
| 3 | T _{DIS} | Transmitter Disable. Laser output disabled on high or open. | 2 |
| 4 | MOD_DEF(2) | Module Definition 2. Data line for Serial ID. | 3 |
| 5 | MOD_DEF(1) | Module Definition 1. Clock line for Serial ID. | 3 |
| 6 | MOD_DEF(0) | Module Definition 0. Grounded within the module. | 3 |
| 7 | Rate Select | Unused | 4 |
| 8 | LOS | Loss of Signal indication. Logic 0 indicates normal operation. | 5 |
| 9 | V _{EER} | Receiver Ground (Common with Transmitter Ground) | 1 |
| 10 | V _{EER} | Receiver Ground (Common with Transmitter Ground) | 1 |
| 11 | V _{EER} | Receiver Ground (Common with Transmitter Ground) | 1 |
| 12 | RD- | Receiver Inverted DATA out. AC Coupled | |
| 13 | RD+ | Receiver Non-inverted DATA out. AC Coupled | |
| 14 | V _{EER} | Receiver Ground (Common with Transmitter Ground) | 1 |
| 15 | V _{CCR} | Receiver Power Supply | |
| 16 | V _{CCT} | Transmitter Power Supply | |
| 17 | V _{EET} | Transmitter Ground (Common with Receiver Ground) | 1 |
| 18 | TD+ | Transmitter Non-Inverted DATA in. AC Coupled. | |
| 19 | TD- | Transmitter Inverted DATA in. AC Coupled. | |
| 20 | V _{EET} | Transmitter Ground (Common with Receiver Ground) | 1 |

Notes:

- Circuit ground is internally isolated from chassis ground.
- Laser output disabled on T_{DIS} > 2.0V or open, enabled on T_{DIS} < 0.8V.
- Should be pulled up with 4.7k - 10 kohms on host board to a voltage between 2.0V and 3.6V. MOD_DEF(0) pulls line low to indicate module is plugged in.
- LOS is open collector output. Should be pulled up with 4.7k - 10 kohms on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.



Pinout of Connector Block on Host Board

II. Absolute Maximum Ratings

| Parameter | Symbol | Min | Typ | Max | Unit | Ref. |
|------------------------|-----------------|------|-----|-----|------|------|
| Maximum Supply Voltage | V _{CC} | -0.5 | | 4.5 | V | |
| Storage Temperature | T _S | -40 | | 85 | °C | |

| | | | | | | |
|----------------------------|-----------------|----|--|----|----|---|
| Case Operating Temperature | T _{OP} | -5 | | 75 | °C | |
| Relative Humidity | RH | 0 | | 85 | % | 1 |

III. Electrical Characteristics (T_{OP} = -5 to 75 °C, V_{CC} = 3.1 to 3.5 Volts)

| Parameter | Symbol | Min | Typ | Max | Unit | Ref. |
|---|---------------------------------|-----------------------|-----|-----------------------|------|------|
| Supply Voltage | V _{CC} | 3.135 | | 3.465 | V | |
| Supply Current | I _{CC} | | | 350 | mA | |
| Transmitter | | | | | | |
| Input differential impedance | R _{in} | | 100 | | Ω | 2 |
| Single ended data input swing | V _{in,pp} | 125 | | 800 | mV | |
| Transmit Disable Voltage | V _D | V _{CC} - 1.3 | | V _{CC} | V | 3 |
| Transmit Enable Voltage | V _{EN} | V _{EE} | | V _{EE} + 0.8 | V | |
| Transmit Disable Assert Time | | | | 10 | us | |
| Receiver | | | | | | |
| Single ended data output swing | V _{out,pp} | 300 | | 470 | mV | 4 |
| Data output rise/fall time < 4.25 Gb/s | t _r , t _f | | | 175 | ps | 5 |
| Data output rise/fall time = 4.25 Gb/s | t _r , t _f | | | 120 | ps | 5 |
| LOS Fault | V _{LOS fault} | V _{CC} - 0.5 | | V _{CC,HOST} | V | 6 |
| LOS Normal | V _{LOS norm} | V _{EE} | | V _{EE} +0.5 | V | 6 |
| Power Supply Rejection | PSR | 100 | | | mVpp | 7 |
| Deterministic Jitter Contribution < 4.25 Gb/s | RX Δ DJ | | | 51.7 | ps | 8 |
| Total Jitter Contribution < 4.25 Gb/s | RX Δ TJ | | | 122.4 | ps | |
| Deterministic Jitter Contribution = 4.25 Gb/s | RX Δ DJ | | | 25.9 | ps | 8 |
| Total Jitter Contribution = 4.25 Gb/s | RX Δ TJ | | | 61.2 | ps | |

Notes:

1. Non-condensing.
2. AC coupled.
3. Or open circuit.
4. Into 100 ohm differential termination.
5. 20 – 80 %
6. LOS is LVTTTL. Logic 0 indicates normal operation; logic 1 indicates no signal detected.
7. All transceiver specifications are compliant with a power supply sinusoidal modulation of 20 Hz to 1.5 MHz up to specified value applied through the power supply filtering network shown on page 23 of the Small Form-factor Pluggable (SFP) Transceiver MultiSource Agreement (MSA)¹, September 14, 2000.
8. Measured with DJ-free data input signal. In actual application, output DJ will be the sum of input DJ and Δ DJ.

IV. Optical Characteristics (T_{OP} = -5 to 75 °C, V_{CC} = 3.1 to 3.5 Volts)

| Parameter | Symbol | Min | Typ | Max | Unit | Ref. |
|---|--------------------|-------|-----|-------|-------|------|
| Transmitter | | | | | | |
| Output Opt. Power (Rate Select High) | P _{O,RH} | +1 | | +5 | dBm | 1 |
| Output Opt. Power (Rate Select Low) | P _{O,RL} | +1 | | +5 | dBm | 2,3 |
| Optical Wavelength | λ | X-6.5 | X | X+6.5 | nm | 4 |
| Spectral Width | σ | | | 1 | nm | |
| Optical Extinction Ratio | ER | 4.5 | | | dB | |
| RIN | | | | -120 | dB/Hz | |
| Deterministic Jitter Contribution = 4.25 Gb/s | TX Δ DJ | | | 28.2 | ps | 5 |
| Total Jitter Contribution = 4.25 Gb/s | TX Δ TJ | | | 59.8 | ps | |
| Deterministic Jitter Contribution \leq 2.125 Gb/s | TX Δ DJ | | | 56.5 | ps | 5 |
| Total Jitter Contribution \leq 2.125 Gb/s | TX Δ TJ | | | 119 | ps | |
| Receiver | | | | | | |
| Receiver Sensitivity = 4.25 Gb/s | R _{SENS4} | | | 5.6 | uW | 6 |
| Average Received Power | R _{X,MAX} | | | -8 | dBm | |
| Optical Center Wavelength | λ_C | 1260 | | 1620 | nm | |
| Return Loss | | 12 | | | dB | |
| LOS De-Assert | LOS _D | | | -26 | dBm | 7 |
| LOS Assert | LOS _A | -42 | | | dBm | 8 |
| LOS Hysteresis | | 0.5 | | | dB | |

Notes:

- High Bandwidth Mode. Class 1 Laser Safety per FDA/CDRH and EN (IEC) 60825 regulations.
- Low Bandwidth Mode. Class 1 Laser Safety per FDA/CDRH and EN (IEC) 60825 regulations.
- Applicable for rate selectable version only in low bandwidth mode.
- Over case temperature of -5 to 75 °C. The Transmitter Center Wavelength "X" is as specified by the customer. The current available wavelengths are: 1471, 1491, 1511, 1531, 1551, 1571, 1591, and 1611 nm. Please see the "Product Selection" section on page 2.
- Measured with DJ-free data input signal. In actual application, output DJ will be the sum of input DJ and Δ DJ.
- Measured with conformance signals defined in FC-PI-2 Rev. 10.0 specifications. Value in OMA. Measured with PRBS 2⁷-1 at 10⁻¹² BER.
- ER of Reference TX \geq 6dB
- ER of Reference TX \leq 6dB

V. General Specifications

| Parameter | Symbol | Min | Typ | Max | Units | Ref. |
|---|--------|------|-----|-------------------|--------|------|
| Data Rate | BR | 1062 | | 4250 | Mb/sec | 1 |
| Bit Error Rate | BER | | | 10 ⁻¹² | | 2 |
| Dipsersion Penalty at 4.25Gpbs, 80km 9/125um SMF | DP | | | 3 | dB | 3 |

Notes:

- Gigabit Ethernet and 1x/2x/4x Fibre Channel compliant.
- Tested with a PRBS 2⁷-1 test pattern @4.25G
- With 80km SMF (1600ps/nm), @BER=1E-12, max case T=75°C

VI. Environmental Specifications

| Parameter | Symbol | Min | Typ | Max | Units | Ref. |
|-------------------------------------|------------------|------------|------------|------------|--------------|-------------|
| Case Operating Temperature for 4/5G | T _{op} | -5 | | 75 | °C | |
| Storage Temperature | T _{sto} | -40 | | 85 | °C | |

VII. Regulatory Compliance

Finisar transceivers are Class 1 Laser Products and comply with US FDA regulations. These products are certified by TÜV and CSA to meet the Class 1 eye safety requirements of EN (IEC) 60825 and the electrical safety requirements of EN (IEC) 60950. Copies of certificates are available at Finisar Corporation upon request.

VIII. Digital Diagnostic Functions

All Finisar SFPs support the 2-wire serial communication protocol outlined in the SFP MSA⁵. These SFPs use an Atmel AT24C01A 128 byte E²PROM with an address of A0h (see table below for E²PROM contents). For details on interfacing with the E²PROM, see the Atmel data sheet titled “AT24C01A/02/04/08/16 2-Wire Serial CMOS E²PROM.”⁶

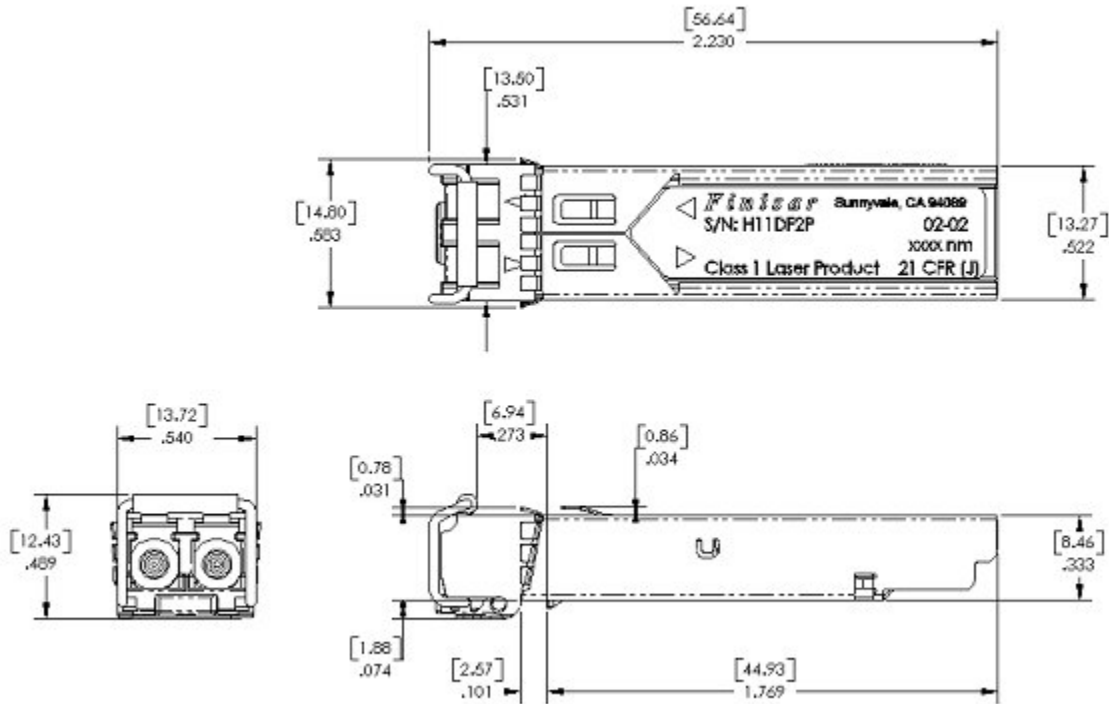
Finisar’s CWDM SFPs also support extended diagnostic features as described in Finisar Applications Note AN-2030, “Digital Diagnostic Monitoring Interface for Optical Transceivers”⁷, and additional information is available in SFF standard titled: “Digital Diagnostic Monitoring Interface for Optical Transceivers”⁸ (SFF-8472 rev9.3). A controller IC that monitors system parameters such as laser current, module temperature, transmitter power, and received power is accessible at address A2H.

I2C clock speed, digital diagnostic accuracy and digital diagnostic range can be found in the table below. Values in the table represent the worst-case values over temperature, voltage, and life.

| Parameter | Symbol | Min | Typ | Max | Units | Notes/Conditions |
|------------------------------|---------------------------|-----|-----|---------|-------|-------------------------|
| I ² C Clock Speed | | 0 | | 100,000 | Hz | Bus can be driven blind |
| Accuracy | | | | | | |
| Transceiver Temperature | DD _{Temperature} | -5 | | +5 | °C | Case temperature |
| Transceiver Supply Voltage | DD _{Voltage} | -3 | | +3 | % | |
| Tx Bias Current | DD _{Bias} | -10 | | +10 | % | |
| Tx Output Power | DD _{TxPower} | -3 | | +3 | dB | |
| Received Average Power | DD _{RxPower} | -3 | | +3 | dB | |
| Range | | | | | | |
| Transceiver Temperature | DD _{Temperature} | -10 | | 80 | °C | |
| Transceiver Supply Voltage | DD _{Voltage} | 3.0 | | 4.0 | V | |
| Tx Bias Current | DD _{Bias} | 0 | | 100 | mA | |
| Tx Output Power | DD _{TxPower} | -10 | | +7 | dBm | |
| Received Average Power | DD _{RxPower} | -28 | | -7 | dBm | |

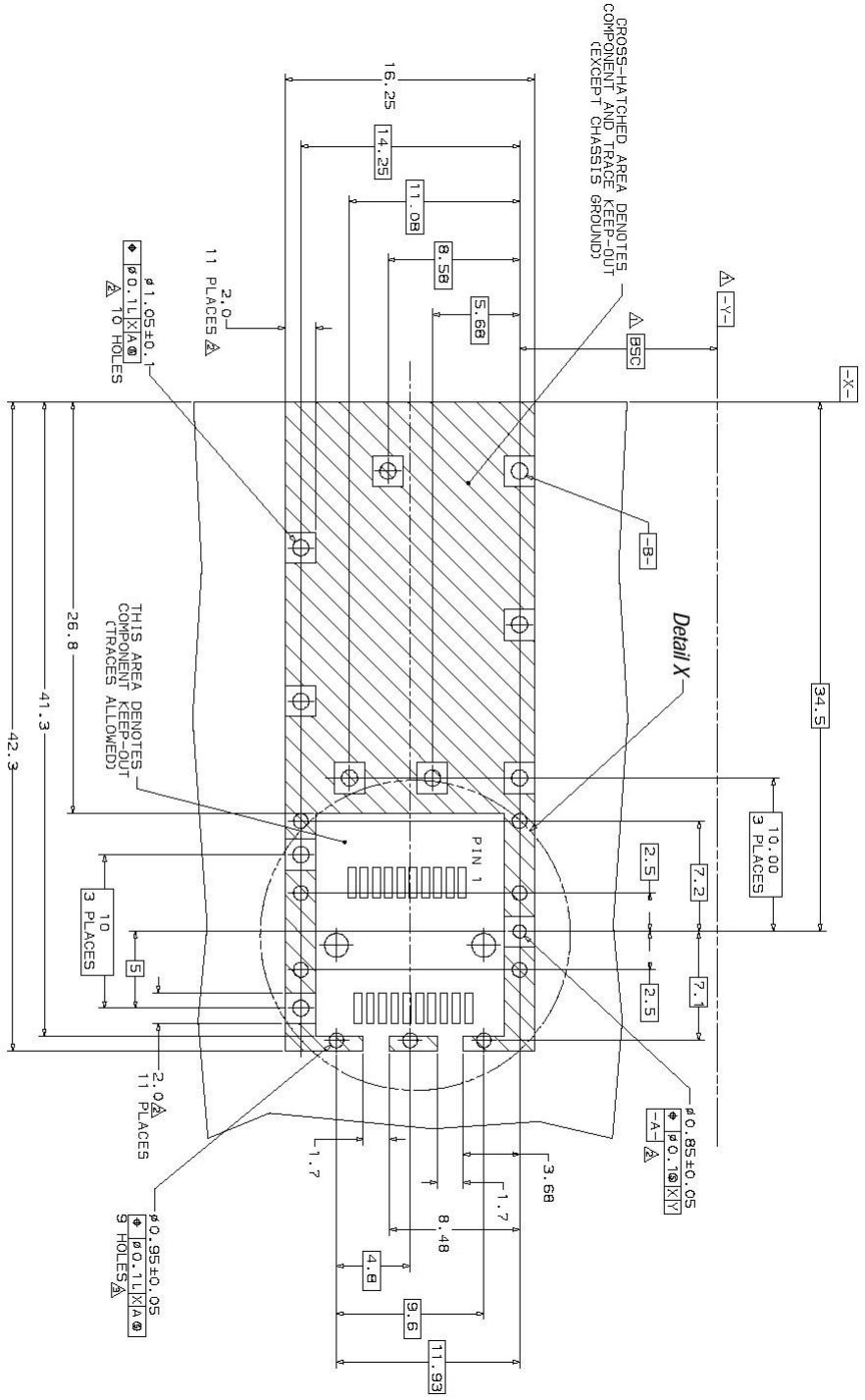
IX. Mechanical Specifications

Finisar's Small Form Factor Pluggable (SFP) transceivers are compatible with the dimensions defined by the SFP Multi-Sourcing Agreement (MSA)¹.

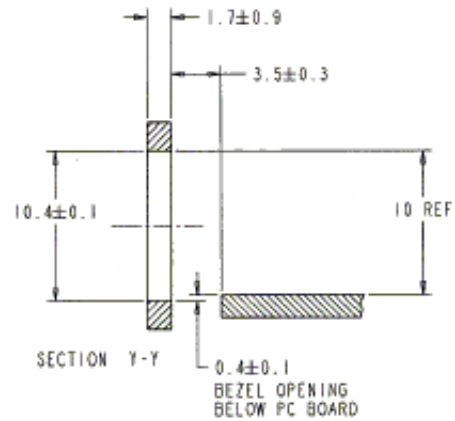
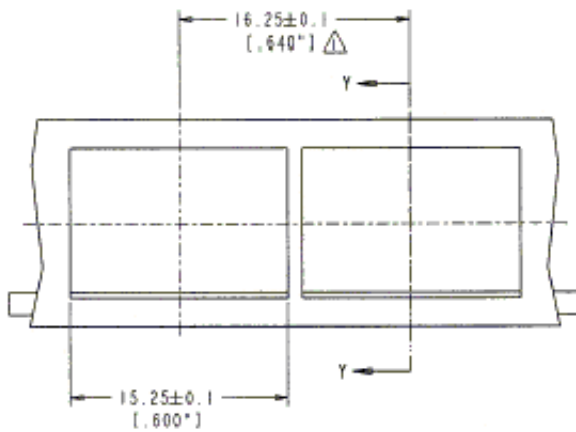
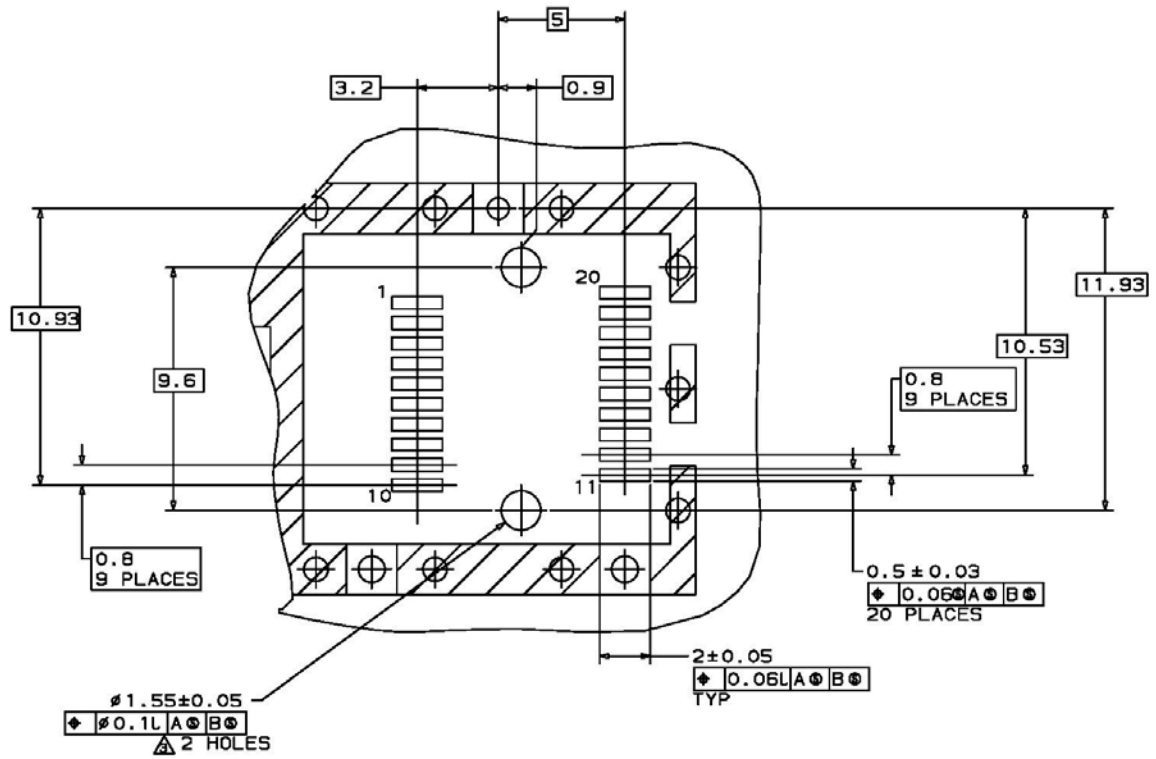


FWLF1625P2yxx Outline Drawing

X. PCB Layout and Bezel Recommendations



- Δ Datum and Basic Dimension Established by Customer
- Δ Rads and Vias are Chassis Ground, 11 Places
- Δ Through Holes are Unplated



NOTES:

△ MINIMUM PITCH ILLUSTRATED, ENGLISH DIMENSIONS ARE FOR REFERENCE ONLY

2. NOT RECOMMENDED FOR PCI EXPANSION CARD APPLICATIONS

XI. References

1. Small Form-factor Pluggable (SFP) Transceiver Multi-source Agreement (MSA), September 14, 2000.
2. “Fibre Channel Draft Physical Interface Specification (FC-PI-2 Rev. 10.0)”. American National Standard for Information Systems.
3. IEEE Std 802.3, 2002 Edition, Clause 38, PMD Type 1000BASE-LX. IEEE Standards Department, 2002.
4. Directive 2011/65/EU of the European Council Parliament and of the Council, “on the restriction of the use of certain hazardous substances in electrical and electronic equipment”. Certain products may use one or more exemptions as allowed by the Directive.
5. Small Form Factor Pluggable (SFP) Transceiver Multi-Source Agreement (MSA), September 2000. Documentation is currently available at Finisar upon request.
6. “AT24C01A/02/04/08/16 2-Wire Serial CMOS E²PROM”, Atmel Corporation. www.Atmel.com
7. “Application Note AN-2030: Digital Diagnostic Monitoring Interface for Optical Transceivers”, Finisar Corporation, April 2002.
8. “Digital Diagnostic Monitoring Interface For Optical Transceivers Rev 9.3”. SFF Document No. SFF-8472.

XII. For More Information

Finisar Corporation
1389 Moffett Park Drive
Sunnyvale, CA 94089-1133
Tel. 1-408-548-1000
Fax 1-408-541-6138
sales@finisar.com
www.finisar.com

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