

## Product Specification

### 2.125 Gb/s RoHS Compliant Short Wavelength 2x5 SFF Transceiver

#### FTLF8519F2xCL

#### PRODUCT FEATURES

- Up to 2.125 Gb/s bi-directional data links
- Standard 2x5 pin SFF footprint (MSA compliant)
- 850nm Oxide VCSEL laser transmitter
- Duplex LC connector
- RoHS compliant and Lead Free
- Up to 500m on 50/125µm MMF, 300m on 62.5/125µm MMF
- Metal enclosure, for lower EMI
- Single 3.3V power supply
- Low power dissipation <750mW
- Commercial operating temperature range: 0°C to 70°C



#### APPLICATIONS

- 1.25 Gb/s 1000Base-SX Ethernet
- Dual Rate 1.063/2.125 Gb/s Fibre Channel

Finisar's FTLF8519F2xCL Small Form Factor (SFF) transceivers comply with the 2x5 standard package defined by the Small Form Factor Multi-Sourcing Agreement (MSA)<sup>1</sup>. They are simultaneously compatible with Gigabit Ethernet as specified in IEEE Std 802.3<sup>2</sup> and Fibre Channel FC-PI-2 10.0<sup>3</sup>. They are RoHS compliant and lead-free per Directive 2002/95/EC<sup>4</sup> and Finisar Application Note AN-2038.

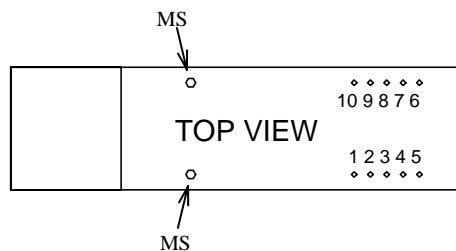
#### PRODUCT SELECTION

### FTLF8519F2xCL

|   |   |                                    |
|---|---|------------------------------------|
| x | G | 2 Grounding Pins, Short EMI shield |
|   | K | 2 Grounding Pins, Long EMI shield  |
|   | H | 6 Grounding Pins, Long EMI shield  |

**I. Pin Descriptions**

| Pin | Symbol           | Name/Description   | Logic Family |
|-----|------------------|--|--------------|
| MS  | MS               | Mounting Studs are for mechanical attachment and are connected to chassis ground. <b>Chassis ground is internally isolated from circuit grounds.</b> Connection to user's ground plane is recommended. | NA           |
| 1   | V <sub>EER</sub> | Receiver Ground (Common with Transmitter Ground)   | NA           |
| 2   | V <sub>CCR</sub> | Receiver Power Supply  | NA           |
| 3   | SD               | Signal Detect. Logic 1 indicates normal operation.   | LVTTL        |
| 4   | RD-              | Receiver Inverted DATA out. AC Coupled   | See Rx spec. |
| 5   | RD+              | Receiver Non-inverted DATA out. AC Coupled   | See Rx spec. |
| 6   | V <sub>CCT</sub> | Transmitter Power Supply   | NA           |
| 7   | V <sub>EET</sub> | Transmitter Ground (Common with Receiver Ground)   | NA           |
| 8   | T <sub>DIS</sub> | Transmitter Disable  | LVTTL        |
| 9   | TD+              | Transmitter Non-Inverted DATA in. AC Coupled.  | See Tx spec. |
| 10  | TD-              | Transmitter Inverted DATA in. AC Coupled   | See Tx spec. |

**II. Absolute Maximum Ratings**

| Parameter                            | Symbol          | Min  | Typ | Max    | Unit | Ref. |
|--------------------------------------|-----------------|------|-----|--------|------|------|
| Maximum Supply Voltage               | V <sub>CC</sub> | -0.5 |     | 4.0    | V    |      |
| Storage Temperature                  | T <sub>S</sub>  | -40  |     | 85     | °C   |      |
| Case Operating Temperature           | T <sub>OP</sub> | 0    |     | 70     | °C   |      |
| Relative Humidity                    | RH              | 0    |     | 85     | %    | 1    |
| Hand Lead Soldering Temperature/Time |                 |      |     | 260/10 | °C/s |      |
| Wave Lead Soldering Temperature/Time |                 |      |     | 260/10 | °C/s |      |

Notes:

1. Non condensing.

**III. Electrical Characteristics** ( $T_{OP} = 0$  to  $70$  °C,  $V_{CC} = 3.0$  to  $3.6$  Volts)

| Parameter                       | Symbol         | Min      | Typ | Max             | Unit     | Ref. |
|---------------------------------|----------------|----------|-----|-----------------|----------|------|
| Supply Voltage                  | $V_{CC}$       | 3.0      |     | 3.6             | V        |      |
| Supply Current                  | $I_{CC}$       |          | 180 | 240             | mA       |      |
| <b>Transmitter</b>              |                |          |     |                 |          |      |
| Input differential impedance    | $R_{in}$       | 80       | 100 | 120             | $\Omega$ | 1    |
| Single ended data input swing   | $V_{in,pp}$    | 250      |     | 1200            | mV       |      |
| Transmit Disable Voltage        | $V_D$          | 2        |     | $V_{CC}$        | V        |      |
| Transmit Enable Voltage         | $V_{EN}$       | $V_{EE}$ |     | $V_{EE} + 0.8$  | V        | 2    |
| <b>Receiver</b>                 |                |          |     |                 |          |      |
| Output differential impedance   | $R_{out}$      | 80       | 100 | 120             | $\Omega$ | 1    |
| Single ended data output swing  | $V_{out,pp}$   | 250      | 350 | 550             | mV       | 3    |
| Data output rise/fall time      | $t_r / t_f$    |          |     | 170             | ps       | 4    |
| Signal Detect Normal            | $SD_{normal}$  |          |     | $V_{CC_{HOST}}$ | V        | 5    |
| Signal Detect Fault             | $SD_{fault}$   | $V_{EE}$ |     | $V_{EE} + 0.5$  | V        | 5    |
| Power Supply Rejection          | PSR            |          |     | 100             | mVpp     | 6    |
| Total Jitter Contribution (p-p) | $RX \Delta TJ$ |          |     | 123             | ps       | 7    |

Notes:

1. AC coupled.
2. Or open circuit.
3. Into  $100 \Omega$  differential termination. Data pattern is PRBS  $2^7-1$ .
4. 20 – 80 %.
5. Signal detect is LVTTTL. Logic 1 indicates normal operation; logic 0 indicates no signal detected.
6. 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), September 14, 2000<sup>5</sup>.
7. If measured with TJ-free data input signal. In actual application, output TJ will be given by:

$$TJ_{OUT} = DJ_{IN} + \Delta DJ + \sqrt{(TJ_{IN} - DJ_{IN})^2 + (\Delta TJ - \Delta DJ)^2}$$

**IV. Optical Characteristics (T<sub>OP</sub> = 0 to 70 °C, V<sub>CC</sub> = 3.0 to 3.6 Volts)**

| Parameter                          | Symbol                          | Min   | Typ | Max   | Unit  | Ref. |
|------------------------------------|---------------------------------|-------|-----|-------|-------|------|
| <b>Transmitter</b>                 |                                 |       |     |       |       |      |
| Output Opt. Pwr: 50 or 62.5 MMF    | P <sub>OUT</sub>                | -9    |     | -3    | dBm   | 1    |
| Optical Wavelength                 | λ                               | 830   |     | 860   | nm    |      |
| Spectral Width                     | σ                               |       |     | 0.85  | nm    |      |
| Optical Modulation Amplitude       | OMA <sub>TX</sub>               | 196   |     |       | μW    | 2    |
| Optical Rise/Fall Time             | t <sub>r</sub> / t <sub>f</sub> |       |     | 150   | ps    | 3    |
| Relative Intensity Noise           | RIN                             |       |     | -120  | dB/Hz |      |
| Total Jitter Contribution (p-p)    | TX Δ TJ                         |       |     | 119   | ps    | 4    |
| Extinction Ratio @ 1.25 Gb/s       | ER                              | 9     |     |       | dB    |      |
| <b>Receiver</b>                    |                                 |       |     |       |       |      |
| Receiver Sensitivity = 1.0625 Gb/s | R <sub>XSENS</sub>              |       |     | -20   | dBm   | 5    |
| Receiver Sensitivity = 2.125 Gb/s  | R <sub>XSENS</sub>              |       |     | -18   | dBm   | 5    |
| Receiver Sensitivity = 1.25 Gb/s   | R <sub>XSENS</sub>              |       |     | -20   | dBm   | 6    |
| Stressed RX sens. = 1.0625 Gb/s    |                                 | 0.055 |     |       | mW    | 7    |
| Stressed RX sens. = 2.125 Gb/s     |                                 | 0.096 |     |       | mW    | 7    |
| Stressed RX sens = 1.25 Gb/s       |                                 |       |     | -13.5 | dBm   | 8    |
| Average Received Power             | R <sub>XMAX</sub>               |       |     | 0     | dBm   |      |
| Receiver Elec. 3 dB cutoff freq.   |                                 |       |     | 1500  | MHz   |      |
| Optical Center Wavelength          | λ <sub>C</sub>                  | 770   |     | 860   | nm    |      |
| Return Loss                        | RL                              | 12    |     |       | dB    |      |
| Signal Detect Normal               | SD <sub>normal</sub>            |       |     | -20   | dBm   |      |
| Signal Detect Fault                | SD <sub>fault</sub>             | -30   |     |       | dBm   |      |
| Signal Detect Hysteresis           |                                 | 0.5   |     |       | dB    |      |

**Notes:**

- Class 1 Laser Safety per FDA/CDRH, EN (IEC) 60825 laser safety regulations.
- Equivalent extinction ratio specification for Fibre Channel. Allows smaller ER at higher average power.
- Unfiltered, 20-80%. Complies with FC 1x and 2x eye mask when filtered.
- If measured with TJ-free data input signal. In actual application, output TJ will be given by:

$$TJ_{OUT} = DJ_{IN} + \Delta DJ + \sqrt{(TJ_{IN} - DJ_{IN})^2 + (\Delta TJ - \Delta DJ)^2}$$

- Specifications are for 50 micro-meter or 62.5 micro-meter fiber
- As measured with 9dB extinction ratio.
- Measured with conformance signals defined in FC-PI-2 10.0 specifications.
- Measured with conformance signals defined in IEEE 802.3 specifications.

**V. General Specifications**

| Parameter                      | Symbol | Min | Typ                     | Max               | Units  | Ref.   |
|--------------------------------|--------|-----|-------------------------|-------------------|--------|--------|
| Data Rate                      | BR     |     | 1.062,<br>1.25<br>2.125 |                   | Gb/sec | 1      |
| Bit Error Rate                 | BER    |     |                         | 10 <sup>-12</sup> |        | 4      |
| Fiber Length on 50/125µm MMF   | L      |     |                         | 500<br>300        | m      | 2<br>3 |
| Fiber Length on 62.5/125µm MMF | L      |     |                         | 300<br>150        | m      | 2<br>3 |

Notes:

1. Gigabit Ethernet and 1x, 2x Fibre Channel compatible per IEEE 802.3 and FC-PI-2 10.0 respectively.
2. At 1.0625 Gb/s Fibre Channel and 1.25 Gb/s Gigabit Ethernet data rates.
3. At 2.125 Gb/s Fibre Channel data rate.
4. At 1.0625, 1.25, and 2.125Gb/s with PRBS 2<sup>7</sup>-1.

**VI. Environmental Specifications**

FTLF8519F2xCL SFF transceivers have an operating temperature range from 0°C to +70°C case temperature.

| Parameter                  | Symbol           | Min | Typ | Max | Units | Ref. |
|----------------------------|------------------|-----|-----|-----|-------|------|
| Case Operating Temperature | T <sub>op</sub>  | 0   |     | 70  | °C    |      |
| Storage Temperature        | T <sub>sto</sub> | -40 |     | 85  | °C    |      |

Notes:

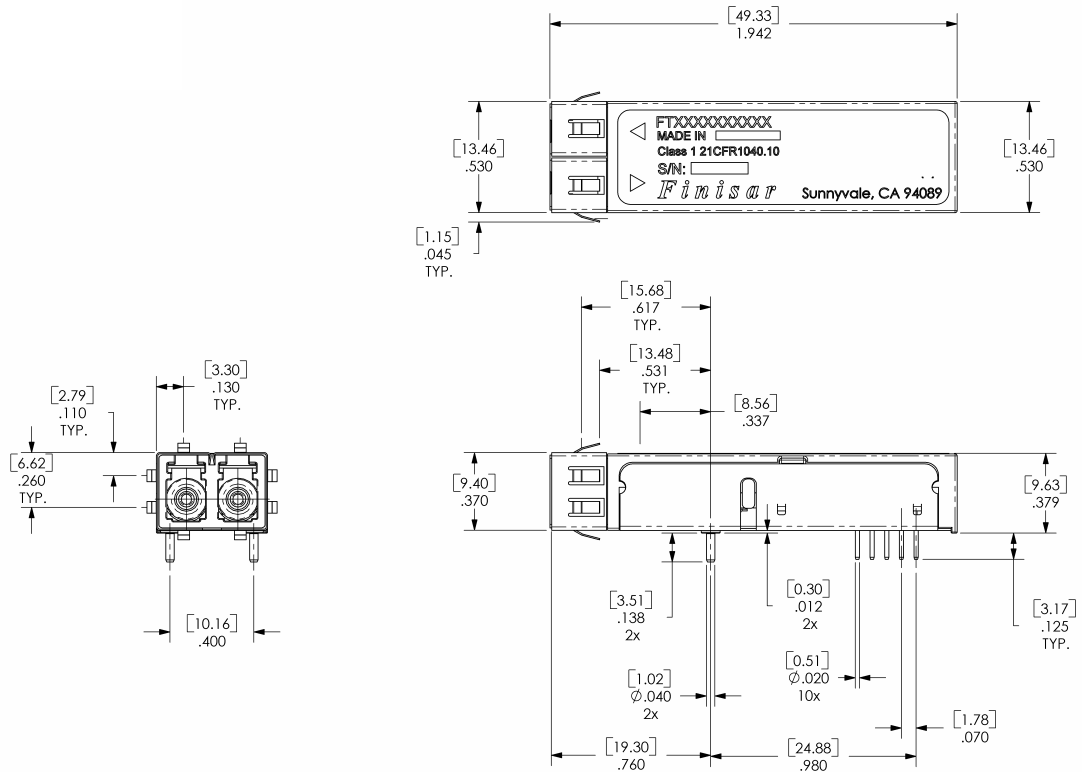
1. SFF transceivers may be water washed. However, the process must be followed by a baking step at 80°C for one hour, to ensure the drying of any water which may be trapped inside then shells of the modules.

**VII. Regulatory Compliance**

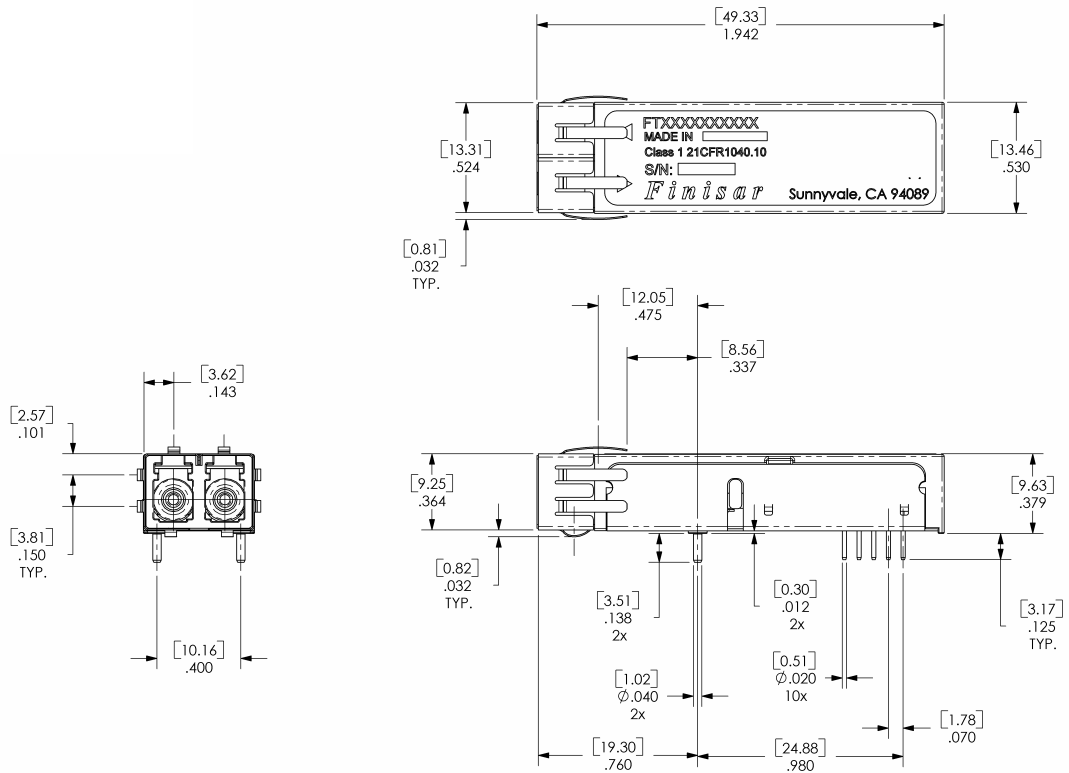
Finisar transceivers are Class 1 Laser Products and comply with US FDA regulations. These products are certified by TÜV and CSA to meet the Class 1 eye safety requirements of EN (IEC) 60825 and the electrical safety requirements of EN (IEC) 60950. Copies of certificates are available at Finisar Corporation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

**VIII. Mechanical Specifications**

Finisar’s Small Form Factor (SFF) transceivers comply with the standard dimensions defined by the Small Form Factor Multi-Sourcing Agreement (MSA).



**FTLF8519F2GCL**

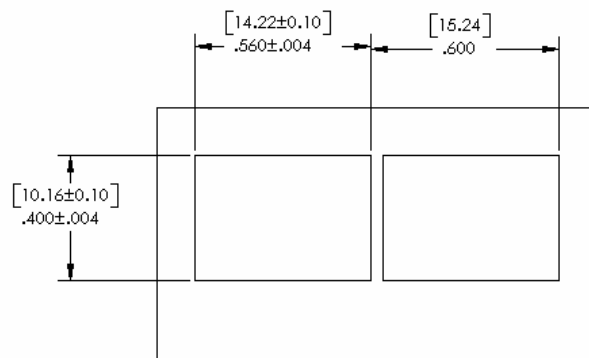
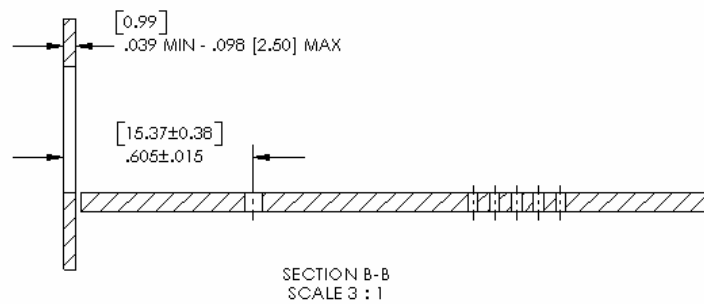
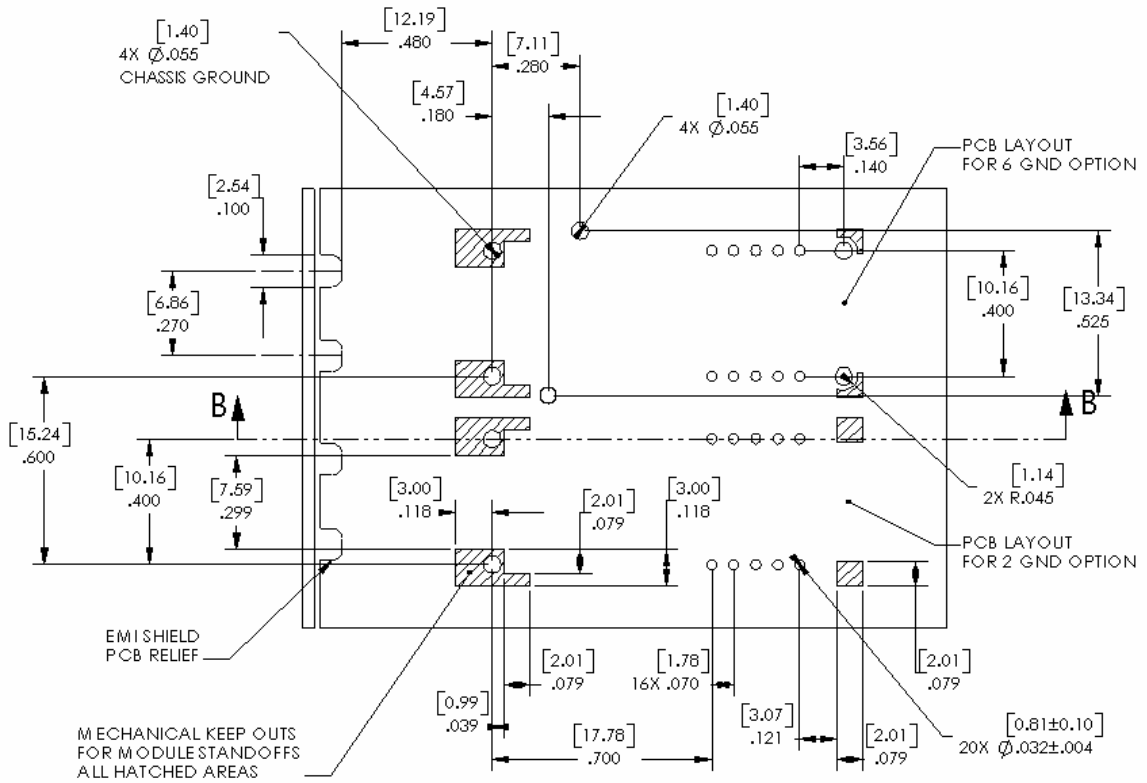


**FTLF8519F2KCL**





**IX. PCB Layout and Bezel Recommendations**



**Minimum Recommended Pitch is 0.600"**

**X. References**

1. Small Form Factor (SFF) Transceiver Multi-source Agreement (MSA). July 5, 2000.
2. IEEE Std 802.3, 2002 Edition, Clause 38, PMD Type 1000BASE-SX.  
IEEE Standards Department, 2002.
3. “Fibre Channel Draft Physical Interface Specification (FC-PI-2 10.0)”. American National Standard for Information Systems.
4. 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.
5. Small Form-factor Pluggable (SFP) Transceiver Multi-source Agreement (MSA), September 14, 2000.

**XI. For More Information**

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