

Product Specification

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

FTLF8519F2xTL

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
- Industrial operating temperature range: -40°C to 85°C



APPLICATIONS

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

Finisar's FTLF8519F2xTL Small Form Factor (SFF) transceivers comply with the 2x5 standard package defined by the Small Form Factor Multi-Sourcing Agreement (MSA)¹. They are simultaneously compatible with Gigabit Ethernet as specified in IEEE Std 802.3² and Fibre Channel FC- PI-2 Rev. 7.0³. They are RoHS compliant and lead-free per Directive 2002/95/EC⁴ and Finisar Application Note AN-2038.

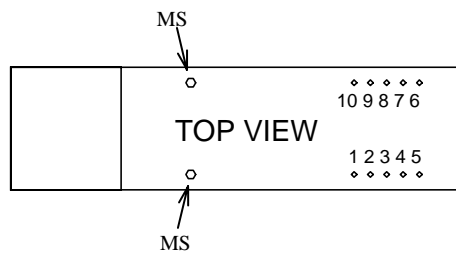
PRODUCT SELECTION

FTLF8519F2xTL

| | | |
|---|---|------------------------------------|
| x | G | 2 Grounding Pins, Short EMI shield |
| | M | 6 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. Chassis ground is internally isolated from circuit grounds. Connection to user's ground plane is recommended. | NA |
| 1 | V _{EER} | Receiver Ground (Common with Transmitter Ground) | NA |
| 2 | V _{CCR} | 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 _{CCT} | Transmitter Power Supply | NA |
| 7 | V _{EET} | Transmitter Ground (Common with Receiver Ground) | NA |
| 8 | T _{DIS} | 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 _{CC} | -0.5 | | 4.0 | V | |
| Storage Temperature | T _S | -40 | | 85 | °C | |
| Case Operating Temperature | T _{OP} | -40 | | 85 | °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} = -40 to 85 °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 | |
| Transmitter | | | | | | |
| Input differential impedance | R _{in} | | 100 | | Ω | 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 |
| Receiver | | | | | | |
| Output differential impedance | R _{out} | | 100 | | Ω | 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 |
| Mask Margin | | | 45% | | | |
| Signal Detect Normal | SD _{normal} | | | V _{CCHOST} | V | 5 |
| Signal Detect Fault | SD _{fault} | V _{EE} | | V _{EE} +0.5 | V | 5 |
| Power Supply Rejection | PSR | | | 100 | mVpp | 6 |
| Deterministic Jitter Contribution (p-p) | RX ΔDJ | | | 51.7 | ps | 7 |
| Total Jitter Contribution (p-p) | RX ΔTJ | | | 123 | ps | 8 |

Notes:

1. AC coupled.
2. Or open circuit.
3. Into 100 Ω differential termination. Data pattern is PRBS 2⁷-1.
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, 2000⁵.
7. Measured with DJ-free data input signal. In actual application, output DJ will be the sum of input DJ and ΔDJ.
8. 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 ($T_{OP} = -40$ to 85 °C, $V_{CC} = 3.0$ to 3.6 Volts)

| Parameter | Symbol | Min | Typ | Max | Unit | Ref. |
|---|----------------|-------|-----|-------|---------|------|
| Transmitter | | | | | | |
| Output Opt. Pwr: 50 or 62.5 MMF | P_{OUT} | -9 | | -2.5 | dBm | 1 |
| Optical Wavelength | λ | 830 | | 860 | nm | |
| Spectral Width | σ | | | 0.85 | nm | |
| Optical Modulation Amplitude | OMA_{TX} | 196 | | | μ W | 2 |
| Optical Rise/Fall Time | t_r/ t_f | | | 150 | ps | 3 |
| Relative Intensity Noise | RIN | | | -120 | dB/Hz | |
| Deterministic Jitter Contribution (p-p) | $TX \Delta DJ$ | | 20 | 56.5 | ps | 4 |
| Total Jitter Contribution (p-p) | $TX \Delta TJ$ | | | 119 | ps | 5 |
| Extinction Ratio @ 1.25 Gb/s | ER | 9 | | | dB | |
| Mask Margin | | | 45% | | | |
| Receiver | | | | | | |
| Receiver Sensitivity = 1.0625 Gb/s | RX_{SENS} | | | -20 | dBm | 6 |
| Receiver Sensitivity = 2.125 Gb/s | RX_{SENS} | | | -18 | dBm | 6 |
| Receiver Sensitivity = 1.25 Gb/s | RX_{SENS} | | | -20 | dBm | 7 |
| Stressed RX sens. = 1.0625 Gb/s | | 0.055 | | | mW | 8 |
| Stressed RX sens. = 2.125 Gb/s | | 0.096 | | | mW | 8 |
| Stressed RX sens = 1.25 Gb/s | | | | -13.5 | dBm | 9 |
| Average Received Power | RX_{MAX} | | | 0 | dBm | |
| Receiver Elec. 3 dB cutoff freq. | | | | 1500 | MHz | |
| Optical Center Wavelength | λ_C | 770 | | 860 | nm | |
| Return Loss | RL | 12 | | | dB | |
| Signal Detect Normal | SD_{normal} | | | -20 | dBm | |
| Signal Detect Fault | SD_{fault} | -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.
- Measured with DJ-free data input signal. In actual application, output DJ will be the sum of input DJ and ΔDJ .
- 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 Rev. 7.0 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, 1.25 2.125 | | Gb/sec | 1 |
| Bit Error Rate | BER | | | 10^{-12} | | 4 |
| Fiber Length on 50/125 μ m MMF | L | | | 500 300 | m | 2 3 |
| Fiber Length on 62.5/125 μ m MMF | L | | | 300 150 | m | 2 3 |

Notes:

1. Gigabit Ethernet and 1x, 2x Fibre Channel compatible per IEEE 802.3 and FC-PI-2 Rev. 7.0 respectively. Typical maximum data rate extends to 2.5Gb/s.
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 2^7-1 .

VI. Environmental Specifications

FTLF8519F2xTL SFF transceivers have an industrial operating temperature range from -40°C to +85°C case temperature.

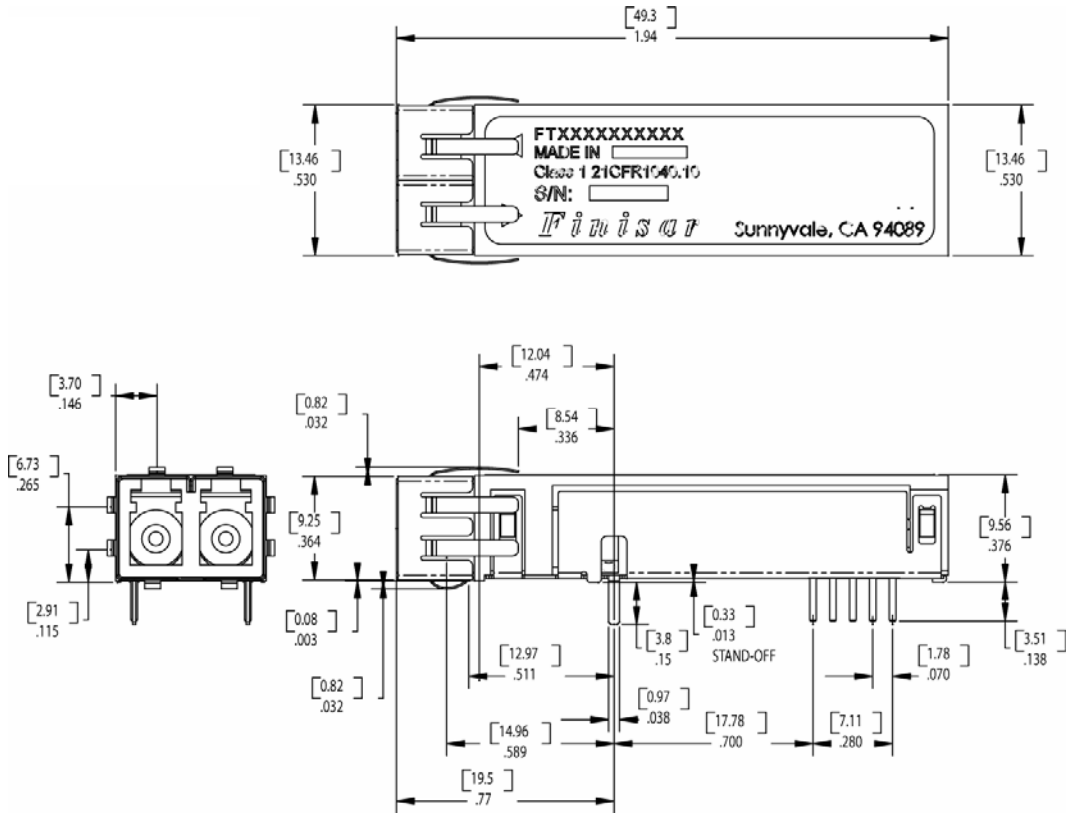
| Parameter | Symbol | Min | Typ | Max | Units | Ref. |
|----------------------------|------------------|-----|-----|-----|-------|------|
| Case Operating Temperature | T _{op} | -40 | | 85 | °C | |
| Storage Temperature | T _{sto} | -40 | | 85 | °C | |

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.



FTLF8519F2KTL

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 Rev. 7.0)”. 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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