

# FTLF1319F1XTL

## 2 Gigabit RoHS Compliant Long-Wavelength 2x5 Pin SFF Transceiver

FTLF1319F1xTL 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 Draft P802.3z/D5.02 and Fibre Channel FC-PH, PH2, PH33 and FC-PI-2 10.04. They are RoHS compliant and lead-free per Directive 2002/95/EC<sup>5</sup> and Finisar Appl. Note AN-2038.



### FEATURES

- Up to 2.125Gb/s bi-directional data links
- Standard 2x5 pin SFF footprint (MSA compliant)
- 1310nm Fabry-Perot laser transmitter
- Duplex LC connector
- RoHS compliant and Lead Free
- Very low jitter
- Up to 10 km on 9/125µm SMF
- Metal enclosure, for lower EMI
- Single 3.3V power supply
- Low power dissipation <700mW
- Industrial operating temperature range: -40°C to 85°C

### APPLICATIONS

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

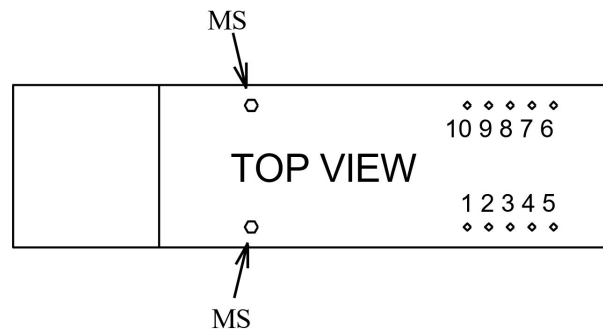
## Product Selection

# FTLF1319F1xTL

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	Notes
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 <sub>CC</sub>	0.5		5.0	V	
Storage Temperature	T <sub>S</sub>	-40		85	°C	
Case Operating Temperature	T <sub>A</sub>	-40		85	°C	
Relative Humidity	RH	0		85	%	1
Lead Soldering Temperature/Time				260/10	°C/s	

Notes:

Non-condensing.

## III. Electrical Characteristics (T<sub>OP</sub> = -40 to 85 °C, V<sub>CC</sub> = -3.0 to 3.6 Volts)

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Supply Voltage	V <sub>CC</sub>	3.00		3.60	V	
Supply Current	I <sub>CC</sub>			300	mA	
<b>Transmitter</b>						
Input differential impedance	R <sub>in</sub>		100		Ω	1
Single ended data input swing	V <sub>in,pp</sub>	250		1200	mV	
Transmit Disable Voltage	V <sub>D</sub>	V <sub>CC</sub> – 1.3		V <sub>CC</sub>	V	
Transmit Enable Voltage	V <sub>EN</sub>	V <sub>EE</sub>		V <sub>EE</sub> + 0.8	V	2
Transmit Disable Assert Time				10	us	
<b>Receiver</b>						
Single ended data output swing	V <sub>out,pp</sub>	300		800	mV	3
Data output rise time	t <sub>f</sub>		100	175	ps	4
Data output fall time	t <sub>f</sub>		100	175		4
Signal Detect Normal	V <sub>SD normal</sub>	V <sub>CC</sub> – 0.5		V <sub>CC</sub>	V	5
Signal Detect Fault	V <sub>SD fault</sub>	V <sub>EE</sub>		V <sub>EE</sub> +0.5	V	5
Power Supply Rejection	PSR	100			mVpp	6
Deterministic Jitter Contribution (p-p)	RX Δ DJ			50	ps	7
Total Jitter Contribution (p-p)	RX Δ TJ			120	ps	8

Notes:

1. AC coupled.

2. Or open circuit.

3. Into 100 Ω differential termination. Data pattern is PRBS 2<sup>7</sup>-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. Measured with DJ-free data input signal. In actual application, output DJ will be the sum of input DJ and Δ DJ.

8. If measured with TJ-free data input signal. In actual application, output TJ will be given by

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

**Optical Characteristics (T<sub>op</sub> = -40 to 85°C, V<sub>cc</sub> = 3.0 to 3.6 Volts)**

Parameter	Symbol	Min	Typ	7BMax	Unit	Ref.
Transmitter						
Output Opt. Pwr: 50 or 62.5 MMF	P <sub>OUT</sub>	-9.5		-3	dBm	1
Optical Wavelength	λ	1270		1355	nm	2
Spectral Width	δ			3	nm	2
Optical Modulation Amplitude	OMA <sub>TX</sub>	174			μW	2,3
Optical Rise/Fall Time	t <sub>r</sub> / t <sub>f</sub>		100	160	ps	4
Relative Intensity Noise	RIN			-120	dB/Hz	
Deterministic Jitter Contribution (p-p)	TX Δ DJ		20	56.5	ps	5
Total Jitter Contribution (p-p)	TX Δ TJ		<65	119	ps	6
Extinction Ratio @ 1.25 Gb/s	ER	9			dB	
Receiver						
Receiver Sensitivity = 1.0625 Gb/s	Rx <sub>SENS</sub>			-22	dBm	7, 8
Receiver Sensitivity = 2.125 Gb/s	Rx <sub>SENS</sub>			-21	dBm	7, 8
Receiver Sensitivity = 1.25 Gb/s	Rx <sub>SENS</sub>			-22	dBm	7, 8
Stressed RX sens. = 1.0625 Gb/s		0.055			mW	
Stressed RX sens. = 2.125 Gb/s		0.096			mW	
Stressed RX sens = 1.25 Gb/s			-18	-14.5	dBm	
Average Received Power	Rx <sub>MAX</sub>			0	dBm	
Receiver Elec. 3 dB cutoff freq.				1500	MHz	
Optical Center Wavelength	λ <sub>C</sub>	1270		1600	nm	
Return Loss		12			dB	
Signal Detect Assert	P <sub>A</sub>		-23	-19	dBm	
Signal Detect De-Assert	P <sub>D</sub>	-30	-25		dBm	
Signal Detect Hysteresis	P <sub>A</sub> - P <sub>D</sub>	0.5			dB	

## Notes:

1. Class 1 Laser Safety per FDA/CDRH and IEC-825-1 regulations.
2. Also specified to meet curves in FC-P1-2 10.0 Figures 18 and 19, which allow trade-off between wavelength, spectral width and OMA.
3. Equivalent extinction ratio specification for Fibre Channel. Allows smaller ER at higher average power.
4. Unfiltered, 20-80%. Complies with IEEE 802.3 (Gig. E), FC 1x and 2x eye mask when filtered.
5. Measured with DJ-free data input signal. In actual application, output DJ will be the sum of input DJ and Δ DJ.
6. If measured with TJ-free data input signal. In actual application, output TJ will be given by:

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

7. Measured with conformance signals defined in FC-P1-2 10.0 specifications.
8. Measured with PRBS 2<sup>7</sup>-1 at 10<sup>-12</sup> BER.

## 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			$10^{-12}$		2
Max. Supported Link Length on 9/125µm SMF @ 2x Fibre Channel	$L_{MAX1}$		10		Km	3
Max. Supported Link Length on 9/125µm SMF @ Gigabit Ethernet	$L_{MAX1}$		10		Km	4

### Notes:

1. Gigabit Ethernet and 1x, 2x Fibre Channel compatible per IEEE 802.3 and FC-P1-2 10.0 respectively.

Typical maximum data rate extends to 2.5Gb/s.

2. Tested with PRBS  $2^7-1$  test pattern.

3. Dispersion limited per FC-P1-2 10.0

4. Attenuation of 0.55 dB/km is used for the link length calculations. Distances are indicative only.

Please refer to the Optical Specifications in Table IV to calculate a more accurate link budget based on specific conditions in your application.

## VI. Environmental Specifications

Finisar SFF transceivers have an extended operating temperature range from  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$  case temperature.

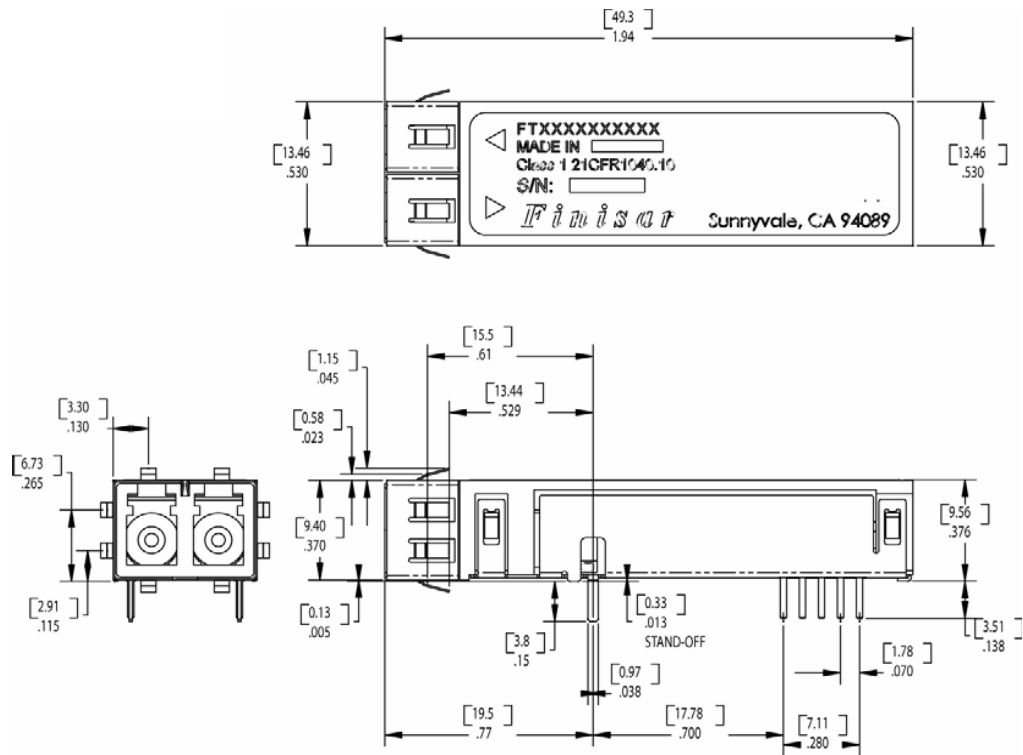
Parameter	Symbol	Min	Typ	Max	Units	Ref.
Case Operating Temperature	$T_{op}$	-40		85	$^{\circ}\text{C}$	
Storage Temperature	$T_{sto}$	-40		85	$^{\circ}\text{C}$	

## VII. Regulatory Compliance

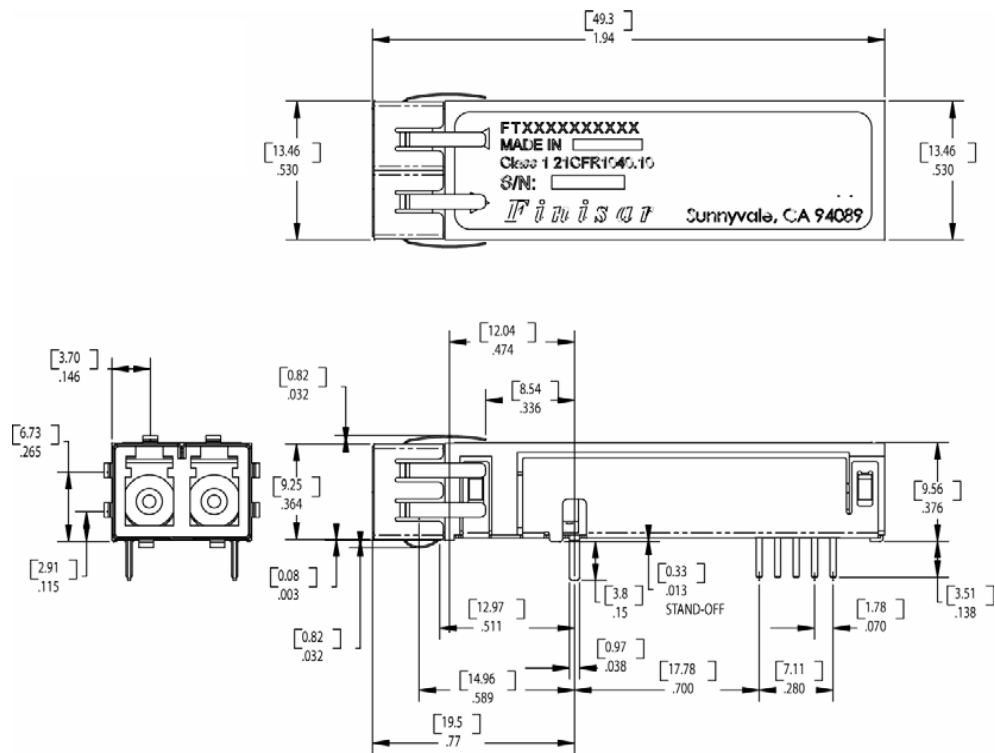
Finisar transceivers are Class 1 Laser Products and comply with US FDA regulations. These products are certified by TÜV and CSA to meet the Class 1 eye safety requirements of EN (IEC) 60825 and the electrical safety requirements of EN (IEC) 60950. Copies of certificates are available at Finisar Corporation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

## VIII. Mechanical Specifications

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

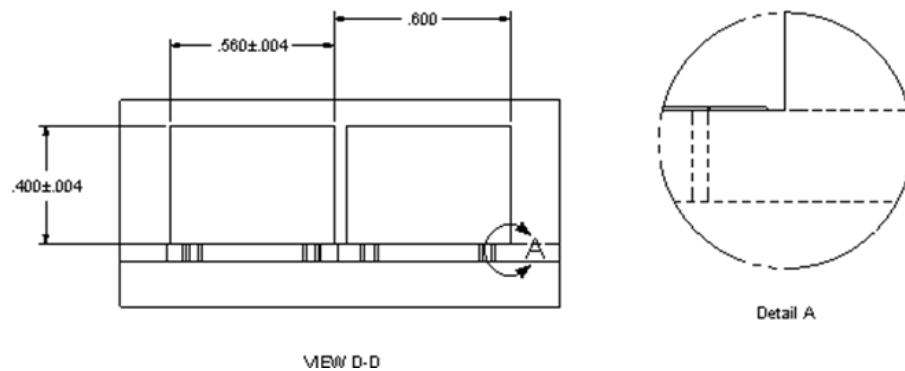
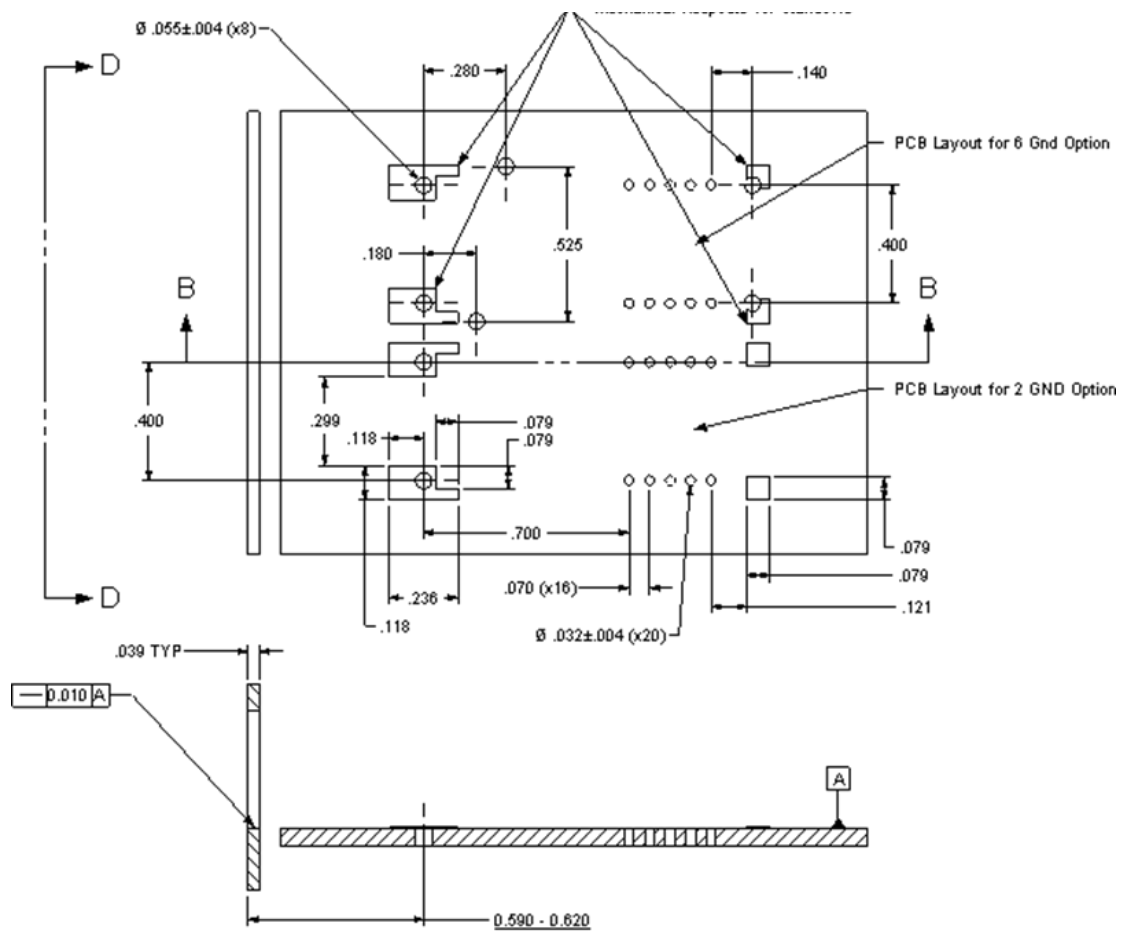


FTLF1319F1MTL



FTLF1319F1HTL

## IX. PCB Layout and Bezel Recommendations



Minimum Recommended Pitch is 0.600"

**X. References**

1. Small Form Factor (SFF) Transceiver Multi-source Agreement (MSA). January 6, 1998.
2. "IEEE Draft P802.3z/D5.0 'Media Access Control (MAC) Parameters, Physical Layer, Repeater and Management Parameters for 1000Mb/s Operation'". IEEE Standards Department, 1998.
3. "Fibre Channel Physical and Signaling Interface (FC-PH, FC-PH2, FC-PH3)". American National Standard for Information Systems.
4. "Fibre Channel Draft Physical Interface Specification (FC-PH-2 10.0)". American National Standard for Information Systems.
5. 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.