

# Finisar

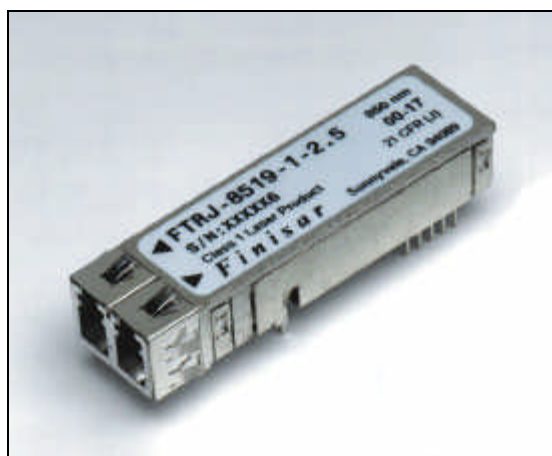
## Product Specification

### 2 Gigabit Short-Wavelength 2x5 Pin SFF Transceiver

#### FTRJ-8519-1-2.5

#### PRODUCT FEATURES

- Up to 2.125 Gb/s bi-directional data links
- Standard 2x5 pin SFF footprint (MSA compliant)
- 850nm VCSEL laser transmitter
- Duplex LC connector
- Very low jitter
- No Rate Select input required for Fibre Channel 1x/2x Operation.
- Up to 300m on 50/125 $\mu$ m MMF, 150m on 62.5/125 $\mu$ m MMF
- Metal enclosure, for lower EMI
- Single 3.3V power supply
- Low power dissipation <750mW
- Extended operating temperature range: -10 $^{\circ}$ C to 85 $^{\circ}$ C



#### APPLICATIONS

- 2.125Gb/s Fibre Channel
- Dual Rate 1.06 / 2.125 Gb/s Fibre Channel

Finisar's FTRJ-8519-1-2.5 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 1x and 2x Fibre Channel as defined in FC-PI 10.0<sup>2</sup>.

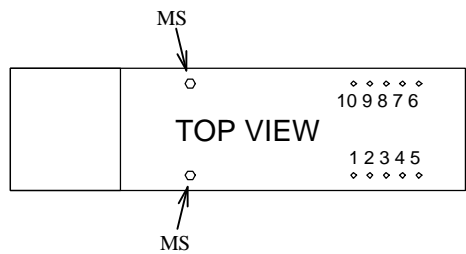
**PRODUCT SELECTION**

**FTRJ-8519xyz-2.5**

<b>x</b>	-	Standard EMI Shield
	E	Extended EMI Shield
	N	No EMI Shield
<b>y</b>	1	LC Connector
<b>z</b>	[blank]	2-pin Grounding
	B	6-pin Grounding

**I. Pin Descriptions**

Pin	Symbol	Name/Description	Logic Family
MS	MS	Mounting Studs for mechanical attachment. <b>Chassis ground is internally connected to 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	PECL Swing
5	RD+	Receiver Non-inverted DATA out. AC Coupled	PECL Swing
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. 100-ohm termination between TD+ and TD-, AC Coupled thereafter.	PECL Swing
10	TD-	Transmitter Inverted DATA in. See TD+	PECL Swing



**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>OP</sub>	-10		85	°C	
Lead Soldering Temperature/Time				260/10	°C/s	

**III. Electrical Characteristics ( $T_{OP} = -10$  to  $85\text{ }^{\circ}\text{C}$ ,  $V_{CC} = 3.15$  to  $3.60$  Volts)**

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Supply Voltage	$V_{CC}$	3.15		3.60	V	
Supply Current	$I_{CC}$		180	240	mA	
<b>Transmitter</b>						
Input differential impedance	$R_{in}$		100		$\Omega$	1
Single ended data input swing	$V_{in,pp}$	250		1200	mV	
Transmit Disable Voltage	$V_D$	$V_{CC} - 1.3$		$V_{CC}$	V	
Transmit Enable Voltage	$V_{EN}$	$V_{EE}$		$V_{EE} + 0.8$	V	2
<b>Receiver</b>						
Single ended data output swing	$V_{out,pp}$	200	250	600	mV	3
Data output rise time	$t_r$		90	175	ps	4
Data output fall time	$t_f$		90	175	ps	4
Signal Detect Normal	$V_{SD\ norm}$	$V_{CC} - 0.5$		$V_{CC}$	V	5
Signal Detect Fault	$V_{SD\ fault}$	$V_{EE}$		$V_{EE} + 0.5$	V	5
Power Supply Rejection	PSR	100			mVpp	6

Notes:

1. Connected directly to TX data input pins. AC coupling from pins into laser driver IC.
2. Or open circuit.
3. Into  $100\ \Omega$  differential termination.
4. 20 – 80 %
5. Signal detect is LVTTTL. Logic 1 indicates normal operation; logic 0 indicates no signal detected.
6. Receiver sensitivity is compliant with power supply sinusoidal modulation of 20 Hz to 1.5 MHz up to specified value applied through the recommended power supply filtering network.

**IV. Optical Characteristics (T<sub>OP</sub> = -10 to 85 °C, V<sub>CC</sub> = 3.15 to 3.60 Volts)**

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
<b>Transmitter</b>						
Output Opt. Pwr: 50 or 62.5 MMF	P <sub>OUT</sub>	-9		-4	dBm	1
Optical Wavelength	λ	830		860	nm	
Spectral Width	σ			0.85	nm	
Optical Modulation Amplitude	OMA	196			μW	2
Optical Rise/Fall Time	t <sub>r</sub> / t <sub>f</sub>		100	150	ps	3
Relative Intensity Noise	RIN			-120	dB/Hz	
Deterministic Jitter Contribution	TX ΔDJ		20	56.5	ps	4
Total Jitter Contribution	TX ΔTJ		70	119	ps	5
Peak-to-Peak Jitter Contribution	TX J-pp		40		ps	6
<b>Receiver</b>						
Receiver Sensitivity ≤1.06 Gb/s	R <sub>XSENS</sub> (FC1x)		-22	-18	dBm	7
Receiver Sensitivity > 1.06 Gb/s	R <sub>XSENS</sub> (FC2x)		-20	-15	dBm	7
Stressed RX sens. ≤1.062 Gb/s				-13.5	dBm	8
Stressed RX sens. 2.125Gb/s			-18	-12.1	dBm	8
Receiver Elec. 3 dB cutoff freq.				1500	MHz	
Deterministic Jitter Contribution	RX ΔDJ			51.7	ps	9
Total Jitter Contribution	RX ΔTJ			122.4	ps	10
Peak-to-Peak Jitter Contribution	RX J-pp		55		ps	6
Optical Center Wavelength	λ <sub>C</sub>	770		860	nm	
Return Loss	RL	12			dB	
Signal Detect Assert	P <sub>A</sub>		-22	-18	dBm	
Signal Detect De-Assert	P <sub>D</sub>	-30	-24		dBm	
Signal Detect Hysteresis	P <sub>A</sub> - P <sub>D</sub>	0.5			dB	

**Notes:**

- Class 1 Laser Safety per FDA/CDRH and IEC-825-1 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:

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

- Typical peak-to-peak jitter (=6\*RMS width of Jitter).
- As measured with 9dB extinction ratio.
- Measured with conformance signals defined in FC-PI 10.0 specifications.
- 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:

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

**V. General Specifications**

Parameter	Symbol	Min	Typ	Max	Units	Ref.
Data Rate	BR		1.062 2.125		Gb/sec	1
Bit Error Rate	BER			$10^{-12}$		
Fiber Length on 50/125 $\mu$ m MMF	L			550 300	m	2 3
Fiber Length on 62.5/125 $\mu$ m MMF	L			300 150	m	2 3

Notes:

- 1x, 2x Fibre Channel compatible, per FC-PI 10.0. Typical maximum data rate extends to 2.5Gb/s.
- At 1.0625 Gb/s Fibre Channel data rate.
- At 2.125 Gb/s Fibre Channel data rate.

**VI. Environmental Specifications**

Finisar SFF transceivers have an extended operating temperature range from  $-10^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$  case temperature.

Parameter	Symbol	Min	Typ	Max	Units	Ref.
Case Operating Temperature	$T_{op}$	-10		85	$^{\circ}\text{C}$	
Storage Temperature	$T_{sto}$	-40		85	$^{\circ}\text{C}$	

Notes:

- SFF transceivers may be water washed. However, the process must be followed by a baking step at  $80^{\circ}\text{C}$  for one hour, to ensure the drying of water which may be trapped inside the shells of the modules.

**VII. Regulatory Compliance**

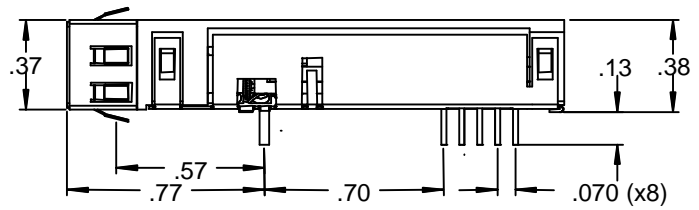
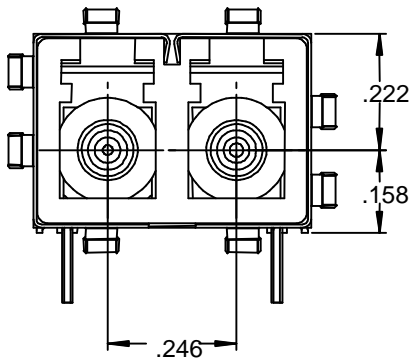
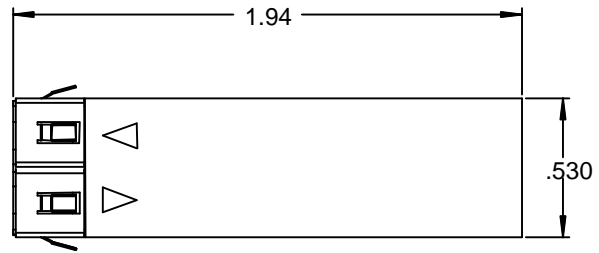
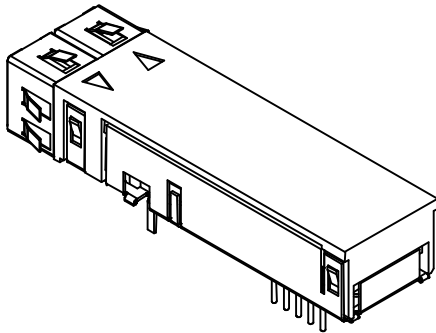
Finisar 850nm SFF transceivers are Class 1 Laser Products. They are certified per the following standards:

Feature	Agency	Standard	Certificate Number
Laser Eye Safety	FDA/CDRH	FDA 21(J) CFR	9210176-17
Laser Eye Safety	TÜV	EN 60950 EN 60825-1 EN 60825-2	R9772230.07
Electrical Safety	UL/CSA	CLASS 3862.07 CLASS 3862.87	CSA 1034405

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

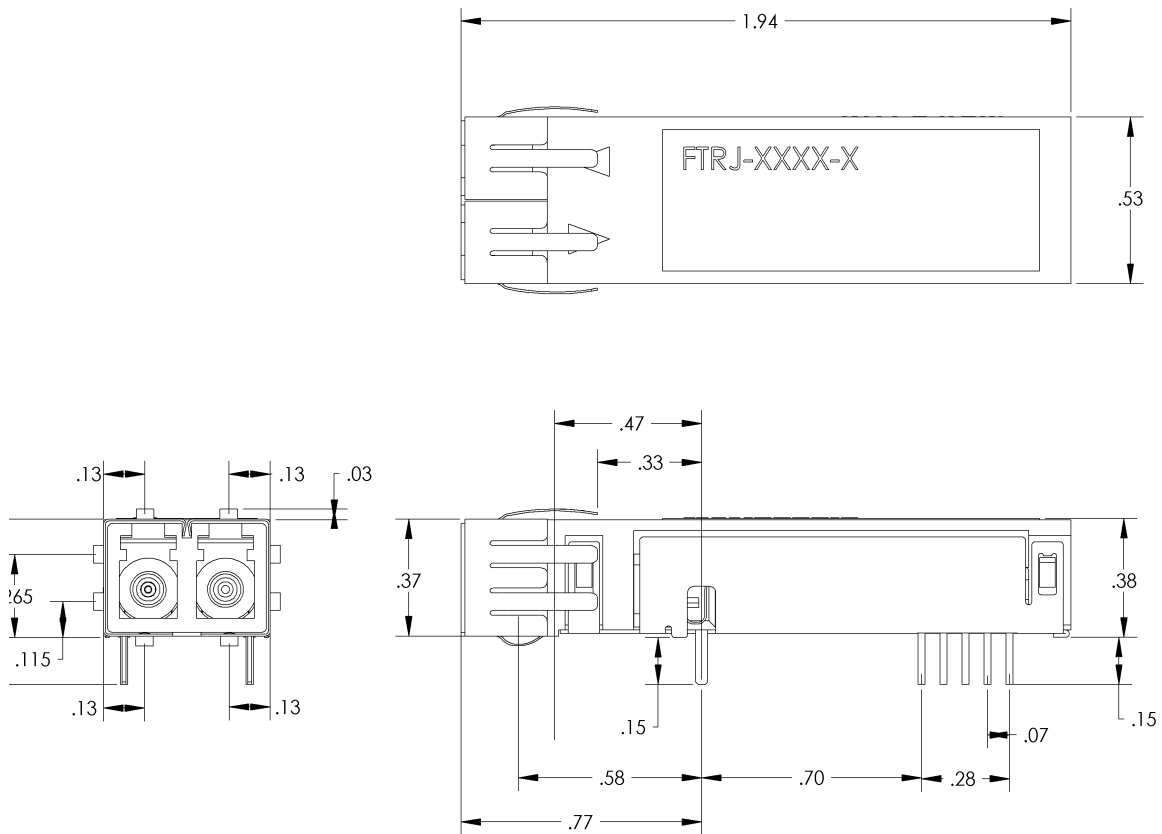
**VIII. Mechanical Specifications**

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

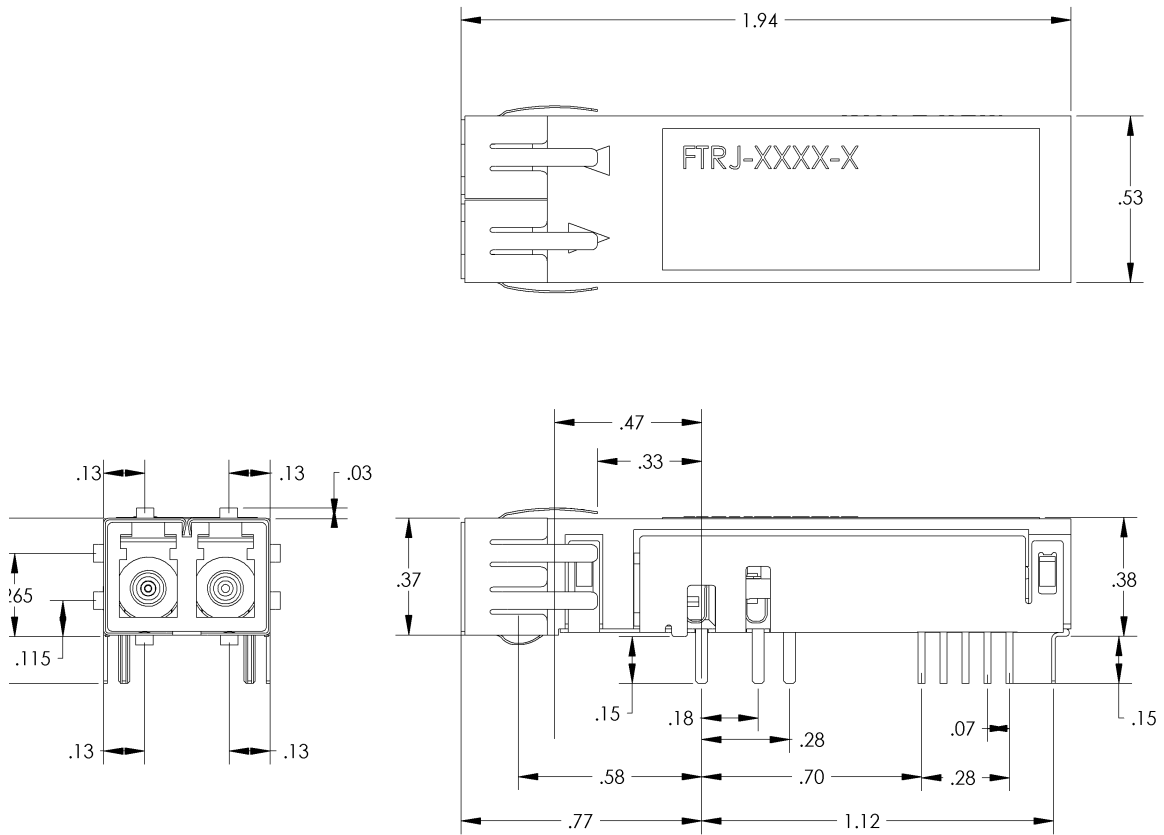


A 6-pin grounding version is also available.

**FTRJ-8519-1-2.5 (dimensions are in inches)**

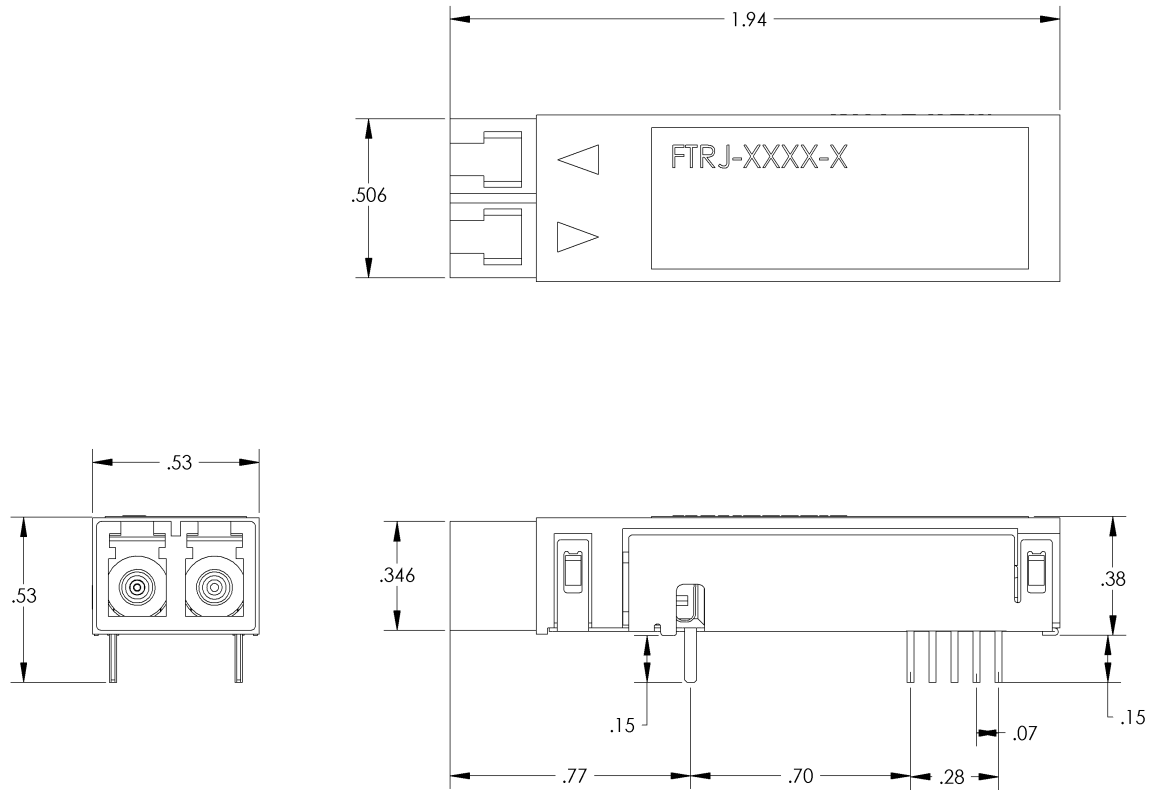


**FTRJ-8519E1-2.5 (dimensions are in inches)**

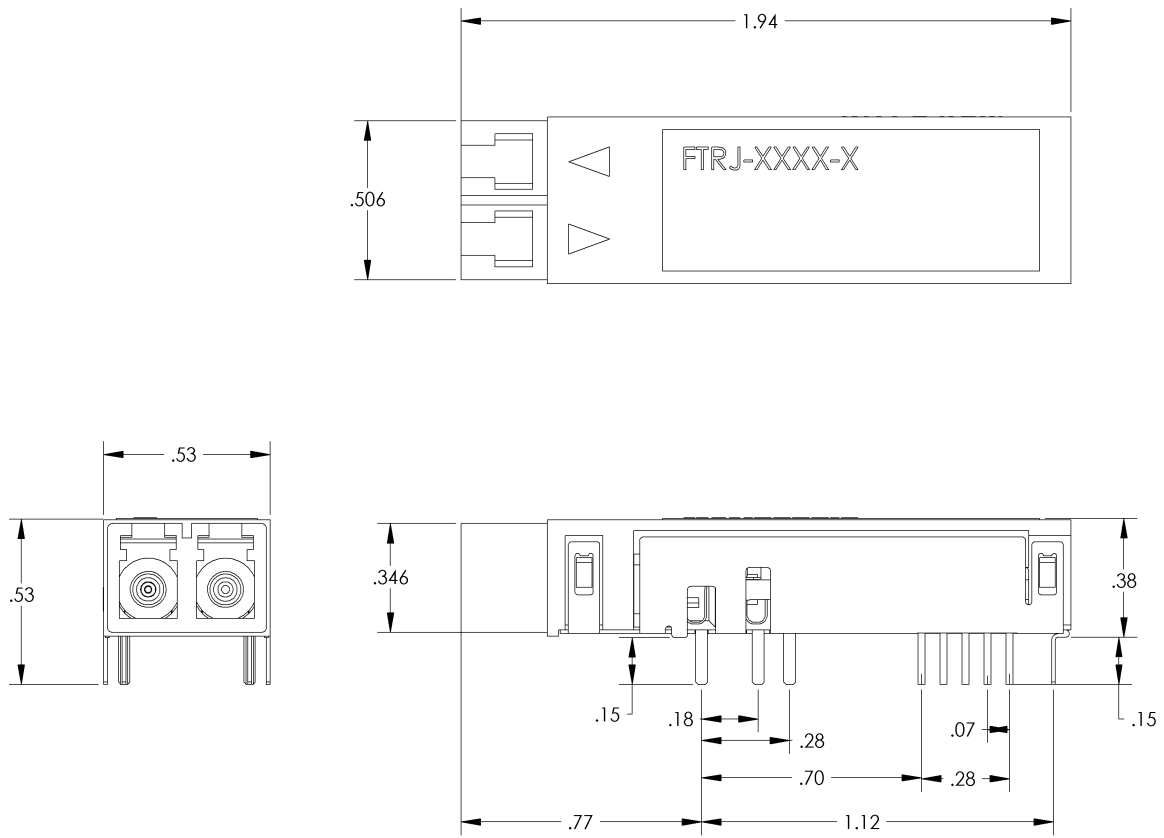


**FTRJ-8519E1B-2.5 (dimensions are in inches)**



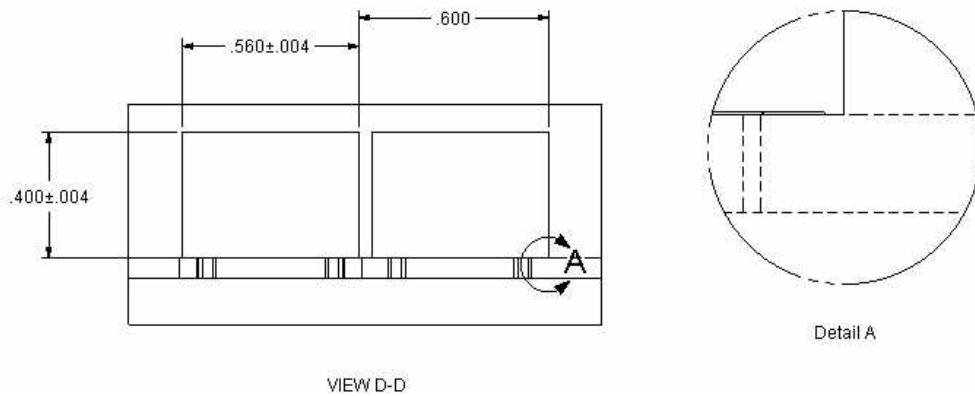
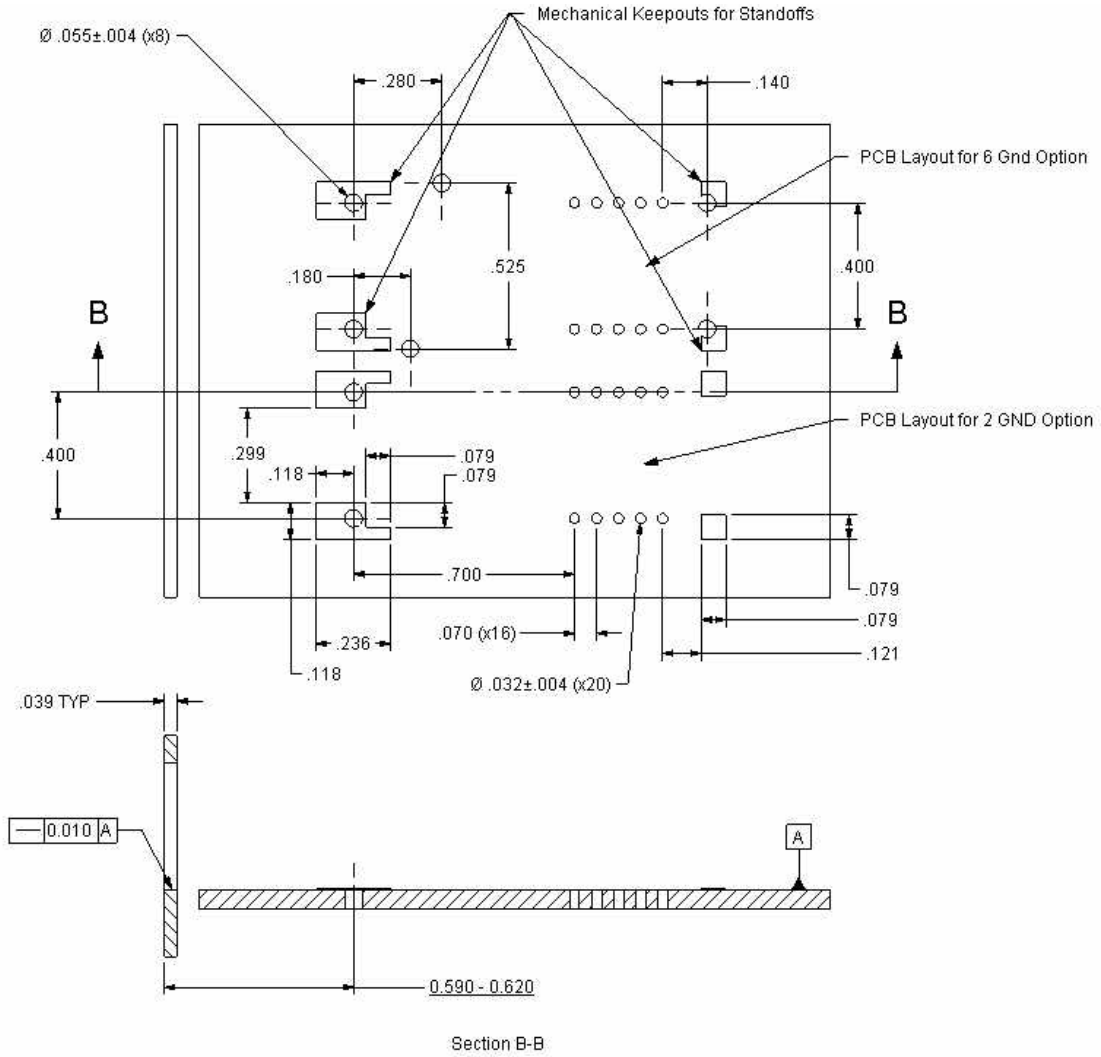


**FTRJ-8519N1-2.5 (dimensions are in inches)**



**FTRJ-8519N1B-2.5 (dimensions are in inches)**

**IX. PCB Layout and Bezel Recommendations**



**Minimum Recommended Pitch is 0.600"**

## **X. References**

1. Small Form Factor (SFF) Transceiver Multisource Agreement (MSA). January 6, 1998. This document is available at Finisar upon request.
2. “Fibre Channel Draft Physical Interface Specification (FC-PI 10.0)”. American National Standard for Information Systems.

## **XI. For More Information**

Finisar Corporation  
1308 Moffett Park Drive  
Sunnyvale, CA 94089-1133  
Tel. 1-408-548-1000  
Fax 1-408-541-6138  
[sales@finisar.com](mailto:sales@finisar.com)  
[www.finisar.com](http://www.finisar.com)