

## Product Specification

### OC-12 SR-1/STM I-4 or OC-12 IR-1/STM S-4.1 2x10 SFF Transceiver

#### FTLF1322S2xTR

#### PRODUCT FEATURES

- Up to OC-12/STM-4 bi-directional data links
- Standard 2x10 pin SFF footprint (MSA compliant)
- Analog diagnostics functions
- Uncooled 1310nm FP laser transmitter
- Duplex LC connector
- Very low jitter
- Metal enclosure, for lower EMI
- Single 3.3V power supply
- Low power dissipation <700 mW typical
- Extended operating temperature range: -40°C to 85°C



#### APPLICATIONS

- SONET OC-12 SR-1 / SDH STM I-4
- SONET OC-12 IR-1 / SDH STM S-4.1

Finisar's FTLF1322S2xTR Small Form Factor (SFF) transceivers are compatible with the Small Form Factor Multi-Sourcing Agreement (MSA)<sup>1</sup>. They comply with SONET OC-12 SR-1/IR-1 (SDH STM I-4/S-4.1) standards<sup>2</sup>. The transceivers are RoHS compliant and lead-free per Directive 2002/95/EC<sup>5</sup> and Finisar Application Note AN-2038<sup>6</sup>

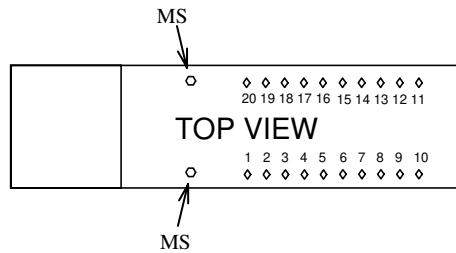
#### PRODUCT SELECTION

### FTLF1322S2xTR

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 for mechanical attachment. <b>Chassis ground is internally isolated from circuit ground.</b> Connection to chassis ground is recommended.	NA
1	NC	Not Connected	
2,3,6	V <sub>EER</sub>	Receiver Ground (Common with Transmitter Ground)	NA
4,5	NC	Not Connected.	
7	V <sub>CCR</sub>	Receiver Power Supply	NA
8	SD	Signal Detect. Logic 1 indicates normal operation.	LVTTL
9	RD-	Receiver Inverted DATA out. AC Coupled	CML
10	RD+	Receiver Non-inverted DATA out. AC Coupled	CML
11	V <sub>CCT</sub>	Transmitter Power Supply	NA
12,16	V <sub>EET</sub>	Transmitter Ground (Common with Receiver Ground)	NA
13	T <sub>DIS</sub>	Transmitter Disable	LVTTL
14	TD+	Transmitter Non-Inverted DATA in. AC Coupled.	CML ECL
15	TD-	Transmitter Inverted DATA in. AC Coupled.	CML ECL
17	Bmon-	Laser Bias Monitoring (-).	Analog Voltage
18	Bmon+	Laser Bias Monitoring (+) (Bmon+ - Bmon-) = 10Ω x laser bias current.	Analog Voltage
19	Pmon-	Laser Power Monitoring (-). Current implementation connects this pin to ground	Analog Voltage
20	Pmon+	Laser Power Monitoring (+) (Pmon+ - Pmon-) = 200Ω x mon. photodiode current.	Analog Voltage



## II. Absolute Maximum Ratings

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Maximum Supply Voltage	V <sub>CC</sub>	-0.5		4.5	V	
Storage Temperature	T <sub>S</sub>	-40		100	°C	
Case Operating Temperature	T <sub>OP</sub>	-40		85	°C	
Relative Humidity	RH	0		85	%	1
Lead Soldering Temperature/Time				260/10	°C/s	

## III. Electrical Characteristics (T<sub>OP</sub> = -40 to 85 °C, V<sub>CC</sub> = 3.00 to 3.60 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>		190	300	mA	
<b>Transmitter</b>						
Input differential impedance	R <sub>in</sub>		100		Ω	2
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	3
Transmit Disable Assert Time				10	μs	
<b>Receiver</b>						
Single ended data output swing	V <sub>out,pp</sub>	300	400	800	mV	4
Data output rise/fall time	t <sub>r</sub>			1250	ps	5
SD Assert	V <sub>SD assert</sub>	2.4		V <sub>CC</sub>	V	6
SD De-Assert	V <sub>SD deassert</sub>	V <sub>EE</sub>		0.5	V	6
Power Supply Rejection	PSR	100			mVpp	7
Total Generated Receiver Jitter (peak to peak)	J <sub>RXP-P</sub>			0.07	UI	
Total Generated Receiver Jitter (rms)	J <sub>RXrms</sub>			0.007	UI	

### Notes:

1. Non condensing.
2. AC coupled.
3. Or open circuit.
4. Into 100 ohm differential termination.
5. 20 – 80 %
6. Signal Detect is LVTTTL. Logic 1 indicates normal operation; logic 0 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), September 14, 2000.

**IV. Optical Characteristics (T<sub>OP</sub> = -40 to 85 °C, V<sub>CC</sub> = 3.00 to 3.60 Volts)**

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
<b>Transmitter</b>						
Output Opt. Pwr: 9/125 SMF	P <sub>OUT</sub>	-15		-8	dBm	1
Optical Wavelength	$\lambda$	1274		1356	nm	2
Spectral Width	$\sigma$			2.5	nm	2
Optical Extinction Ratio	ER	8.2			dB	
Optical Rise/Fall Time	t <sub>r</sub> / t <sub>f</sub>			500	ps	3
Relative Intensity Noise	RIN			-120	dB/Hz	
Total Generated Transmitter Jitter (peak to peak)	J <sub>TXP-p</sub>			0.07	UI	
Total Generated Transmitter Jitter (rms)	J <sub>TXrms</sub>			0.007	UI	
<b>Receiver</b>						
Rx Sensitivity @ OC-12	R <sub>SENS1</sub>	-28		-8	dBm	4
Optical Center (Input) Wavelength	$\lambda_C$	1260		1600	nm	
SD Assert	SD <sub>A</sub>			-34	dBm	
SD De-Assert	SD <sub>D</sub>	-45			dBm	
SD Hysteresis		0.5			dB	

Notes:

1. Class 1 Laser Safety per FDA/CDRH and EN (IEC) 60825 regulations.
2. Also specified to meet curves in FC-PI 13.0 Figures 18 and 19, which allow trade-off between wavelength, spectral width and OMA.
3. Unfiltered, 20 – 80%
4. With worst-case extinction ratio. Measured with a PRBS 2<sup>23</sup>-1 test pattern.

**V. General Specifications**

Parameter	Symbol	Min	Typ	Max	Units	Ref.
Data Rate	BR		622		Mb/sec	1
Bit Error Rate	BER			$10^{-10}$		2
Max. Supported Link Length on 9/125 $\mu$ m SMF @ OC-12	L <sub>MAX5</sub>		15		km	4

**Notes:**

1. SONET OC-12 SR/SDH STM I-4 and SONET OC-12 IR-1/SDH STM S-4.1 compliant.
2. Tested with a PRBS  $2^{31}-1$  test pattern.
3. Attenuation of 0.55 dB/km is used for the link length calculations (per GR-253 CORE). 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 1310nm SFP 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 <sub>op</sub>	-40		85	$^{\circ}\text{C}$	
Storage Temperature	T <sub>sto</sub>	-40		100	$^{\circ}\text{C}$	

**VII. Regulatory Compliance**

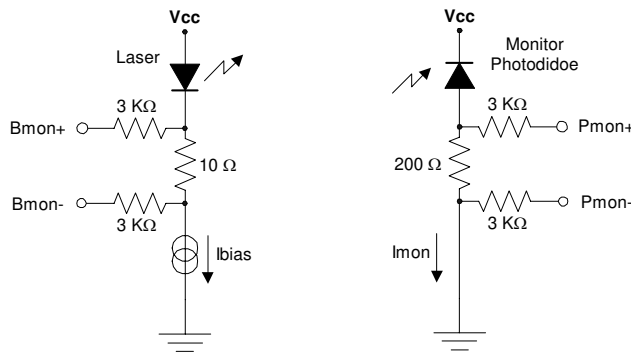
Finisar transceivers are Class 1 Laser Products and comply with US FDA regulations. These products are certified by TÜV and CSA to meet the Class 1 eye safety requirements of EN (IEC) 60825 and the electrical safety requirements of EN (IEC) 60950. Copies of certificates are available at Finisar Corporation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

**VIII. Analog Diagnostics Functions** ( $T_{op} = -40$  to  $85$  °C,  $V_{CC} = 3.00$  to  $3.60$  Volts)

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
<b>Transmitter</b>						
Monitor photodiode current monitor	Pmon+, Pmon-	0		$V_{CC}$	V	1
Laser bias current monitor	Bmon+, Bmon-	0		$V_{CC}$	V	2

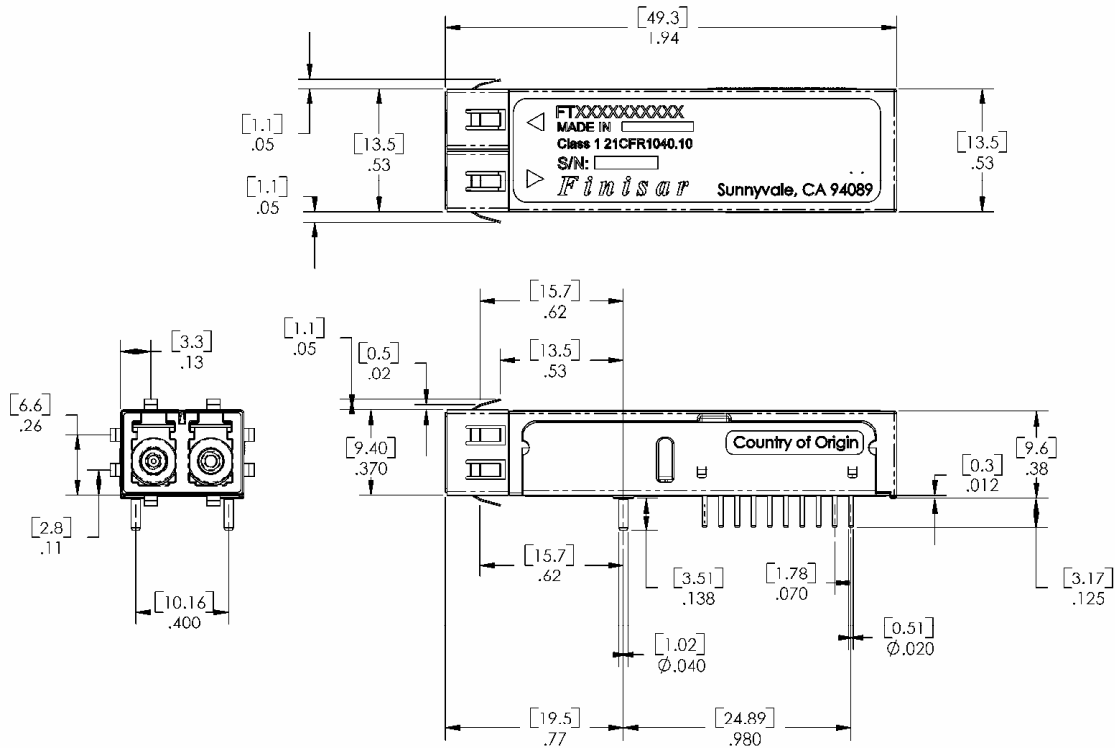
Notes:

1. Pins 19 and 20 provide an analog voltage output proportional to the monitor photodiode current, per the following formula:  $I_{BIAS} = .V(P_{mon+} - P_{mon-}) / 200\Omega$ . The figure below shows the equivalent circuit.
2. Pins 17 and 18 provide an analog voltage output proportional to the laser bias current, per the following formula:  $I_{BIAS} = .V(B_{mon+} - B_{mon-}) / 10\Omega$ . The figure below shows the equivalent circuit.
- 3.

**Analog monitoring function connections.**

**IX. Mechanical Specifications**

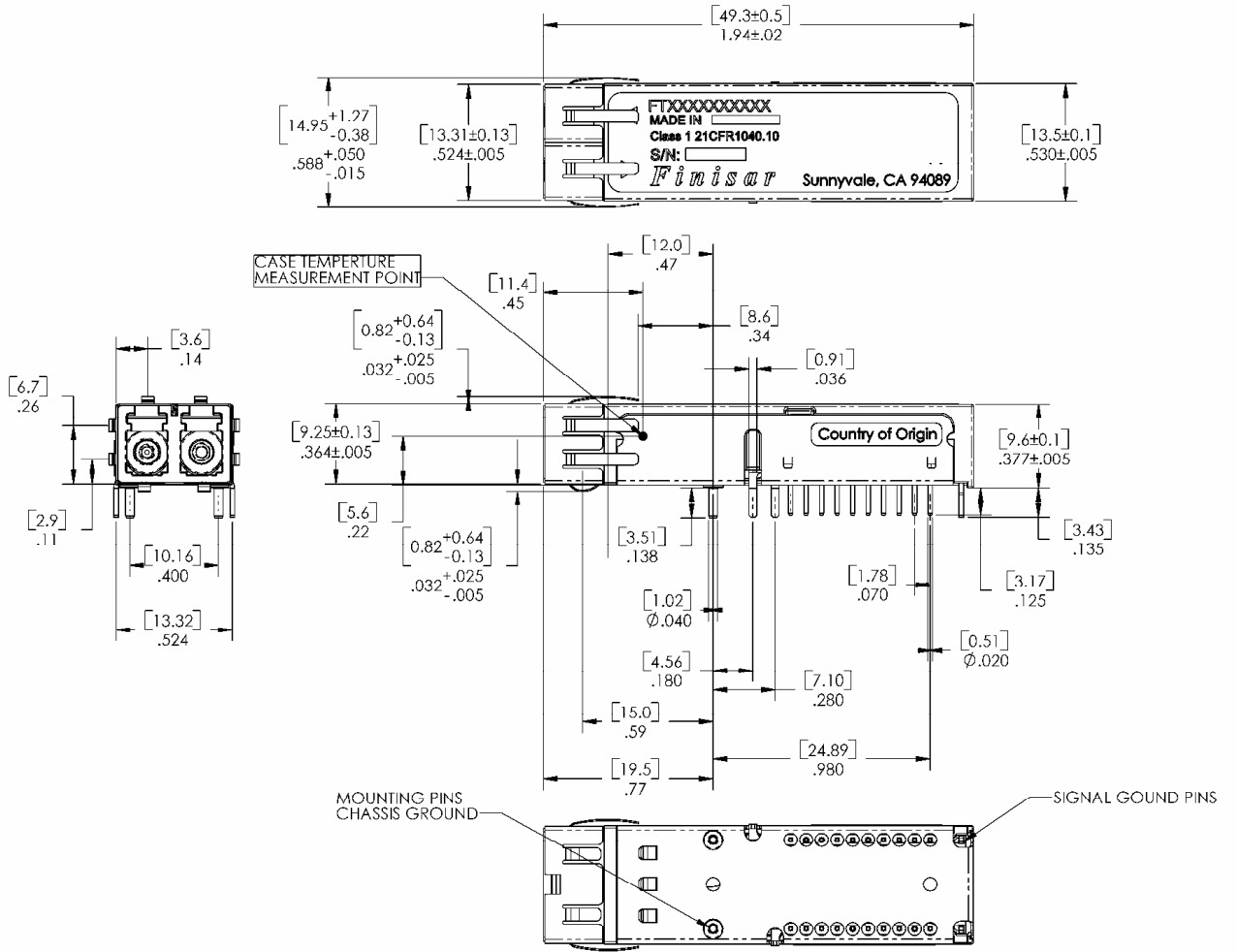
Finisar’s OC-12/STM-4 Small Form Factor (SFF) transceivers comply with the standard dimensions defined by the Small Form Factor Multi-Sourcing Agreement (MSA).



**FTLF1323S2GTR – 2 pin version**

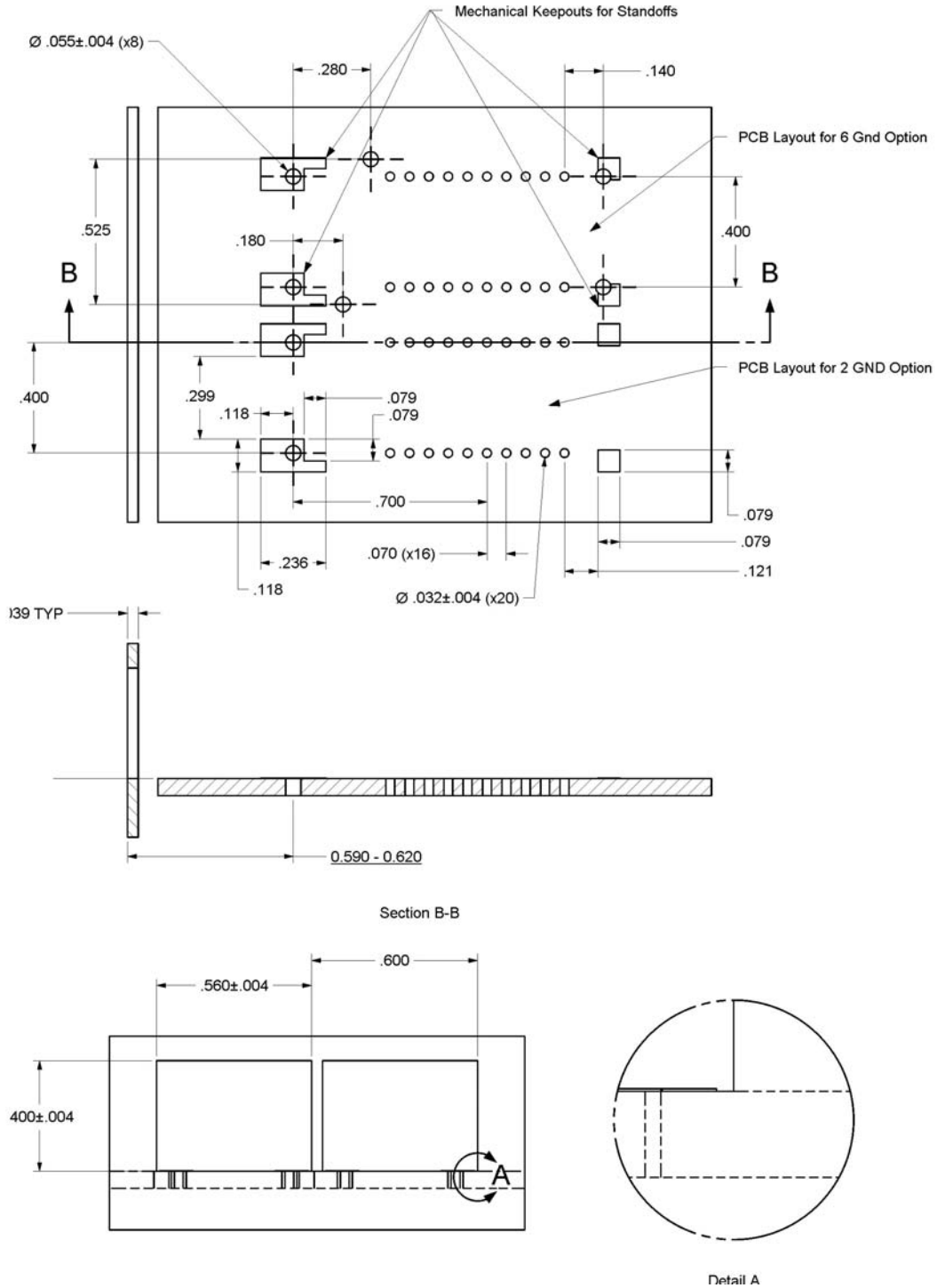






**FTLF1323S2HTR – 6 pin version (Long EMI Shield)**

**X. PCB Layout and Bezel Recommendations**



**Minimum Recommended Pitch is 0.600"**

**XI. References**

1. Small Form Factor (SFF) Transceiver Multisource Agreement (MSA). January 1998.
2. Bellcore GR-253 and ITU-T G.957 Specifications (Transmitter Optical Output Power complies with SONET OC-48 requirements only).
3. IEEE Std 802.3, 2002 Edition, Clause 38, PMD Type 1000BASE-LX. IEEE Standards Department, 2002. (Transmit Optical Output has a minimum Extinction Ratio of 8.2 dB only).
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. “Application Note AN-2038: Finisar Implementation of RoHS Compliant Transceivers: Finisar Corporation, January 21, 2005.
6. “Fibre Channel Draft Physical Interface Specification (FC-PI 13.0)”. American National Standard for Information Systems. (\*)

**XII. For More Information**

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