

Product Specification

OC-3 SR-1/STM I-1 or OC-3 IR-1/STM S-1.1 2x10 SFF Transceiver

FTLF1323S2xTR

PRODUCT FEATURES

- Up to OC-3/STM-1 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-3 SR-1 / SDH STM I-1
- SONET OC-3 IR-1 / SDH STM S-1.1

Finisar's FTLF1323S2xTR Small Form Factor (SFF) transceivers are compatible with the Small Form Factor Multi-Sourcing Agreement (MSA)¹. They comply with SONET OC-3 SR-1/IR-1 (SDH STM I-1/S-1.1) standards². The transceivers are RoHS compliant and lead-free per Directive 2002/95/EC⁵ and Finisar Application Note AN-2038⁶.

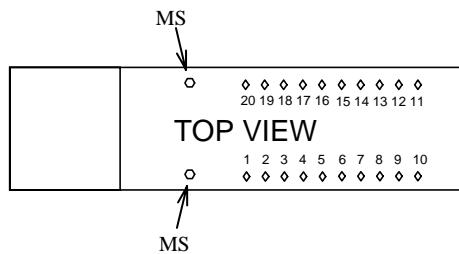
PRODUCT SELECTION

FTLF1323S2xTR

| | | |
|---|---|------------------------------------|
| 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. Chassis ground is internally isolated from circuit ground. Connection to chassis ground is recommended. | NA |
| 1 | NC | Not Connected | |
| 2,3,6 | V_{EER} | Receiver Ground (Common with Transmitter Ground) | NA |
| 4,5 | NC | Not Connected. | |
| 7 | V_{CCR} | 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_{CCT} | Transmitter Power Supply | NA |
| 12,16 | V_{EET} | Transmitter Ground (Common with Receiver Ground) | NA |
| 13 | T_{DIS} | 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 _{CC} | -0.5 | | 4.5 | V | |
| Storage Temperature | T _S | -40 | | 100 | °C | |
| Case Operating Temperature | T _{OP} | -40 | | 85 | °C | |
| Relative Humidity | RH | 0 | | 85 | % | 1 |
| Lead Soldering Temperature/Time | | | | 260/10 | °C/s | |

III. Electrical Characteristics (T_{OP} = -40 to 85 °C, V_{CC} = 3.00 to 3.60 Volts)

| Parameter | Symbol | Min | Typ | Max | Unit | Ref. |
|--|--------------------------|-----------------------|-----|-----------------------|------|------|
| Supply Voltage | V _{CC} | 3.00 | | 3.60 | V | |
| Supply Current | I _{CC} | | 190 | 300 | mA | |
| Transmitter | | | | | | |
| Input differential impedance | R _{in} | | 100 | | Ω | 2 |
| 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 | 3 |
| Transmit Disable Assert Time | | | | 10 | μs | |
| Receiver | | | | | | |
| Single ended data output swing | V _{out,pp} | 300 | 400 | 800 | mV | 4 |
| Data output rise/fall time | t _r | | | 1250 | ps | 5 |
| SD Assert | V _{SD assert} | 2.4 | | V _{CC} | V | 6 |
| SD De-Assert | V _{SD deassert} | V _{EE} | | 0.5 | V | 6 |
| Power Supply Rejection | PSR | 100 | | | mVpp | 7 |
| Total Generated Receiver Jitter (peak to peak) | J _{RXP-p} | | | 0.07 | UI | |
| Total Generated Receiver Jitter (rms) | J _{RXrms} | | | 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 LVTTL. 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_{OP} = -40 to 85 °C, V_{CC} = 3.00 to 3.60 Volts)

| Parameter | Symbol | Min | Typ | Max | Unit | Ref. |
|---|---------------------------------|------|-----|-------|-------|------|
| Transmitter | | | | | | |
| Output Opt. Pwr: 9/125 SMF | P _{OUT} | -15 | | -8 | dBm | 1 |
| Optical Wavelength | λ | 1260 | | 1360 | nm | 2 |
| Spectral Width | σ | | | 7.7 | nm | 2 |
| Optical Extinction Ratio | ER | 8.2 | | | dB | |
| Optical Rise/Fall Time | t _r / t _f | | | 1250 | ps | 3 |
| Relative Intensity Noise | RIN | | | -120 | dB/Hz | |
| Total Generated Transmitter Jitter (peak to peak) | J _{TXp-p} | | | 0.07 | UI | |
| Total Generated Transmitter Jitter (rms) | J _{TXrms} | | | 0.007 | UI | |
| Receiver | | | | | | |
| Rx Sensitivity @ OC-3 | R _{SENS1} | -28 | | -8 | dBm | 4 |
| Rx Sensitivity @ 125Mb/s | R _{SENS2} | -28 | | -8 | dBm | 4 |
| Optical Center (Input) Wavelength | λ _C | 1260 | | 1600 | nm | |
| SD Assert | SD _A | | | -34 | dBm | |
| SD De-Assert | SD _D | -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 2²³-1 test pattern.

V. General Specifications

| Parameter | Symbol | Min | Typ | Max | Units | Ref. |
|--|-------------------|-----|-----|------------|--------|------|
| Data Rate | BR | 125 | | 156 | Mb/sec | 1 |
| Bit Error Rate | BER | | | 10^{-10} | | 2 |
| Max. Supported Link Length on 9/125 μ m SMF @ OC-3 | L _{MAX5} | | 15 | | km | 4 |

Notes:

1. SONET OC-3 SR/SDH STM I-1 and SONET OC-3 IR-1/SDH STM S-1.1 compliant. Compatible with Ethernet.
2. Tested with a PRBS 2³¹-1 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°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 | | 100 | °C | |

VII. Regulatory Compliance

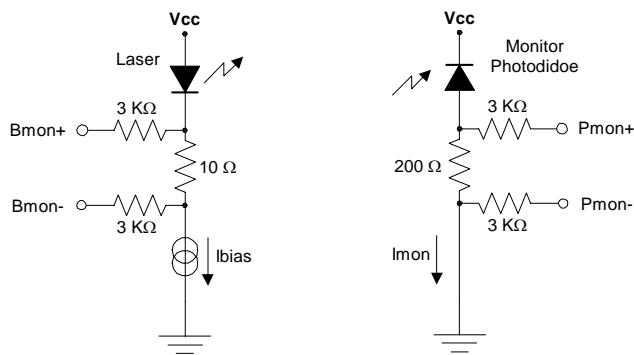
Finisar transceivers are Class 1 Laser Products and comply with US FDA regulations. These products are certified by TÜV and CSA to meet the Class 1 eye safety requirements of EN (IEC) 60825 and the electrical safety requirements of EN (IEC) 60950. Copies of certificates are available at Finisar Corporation 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. |
|------------------------------------|-----------------|-----|-----|-----|------|------|
| Transmitter | | | | | | |
| Monitor photodiode current monitor | Pmon+, Pmon- | 0 | | Vcc | V | 1 |
| Laser bias current monitor | Bmon+, Bmon- | 0 | | Vcc | V | 2 |

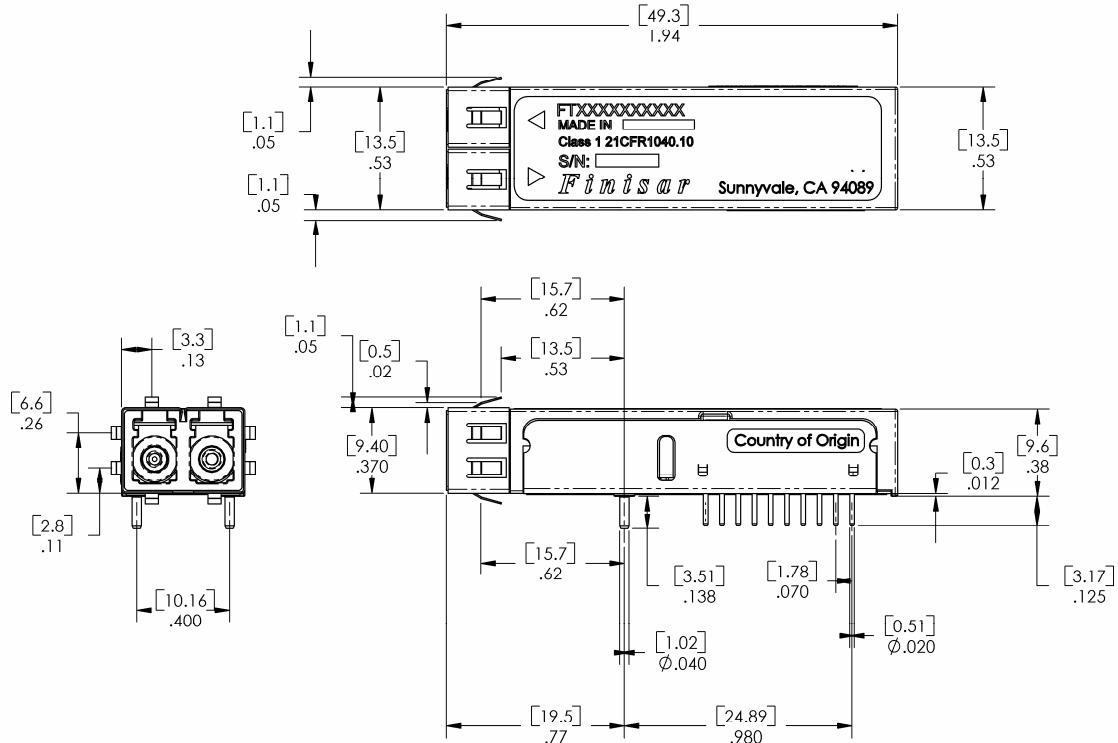
Notes:

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

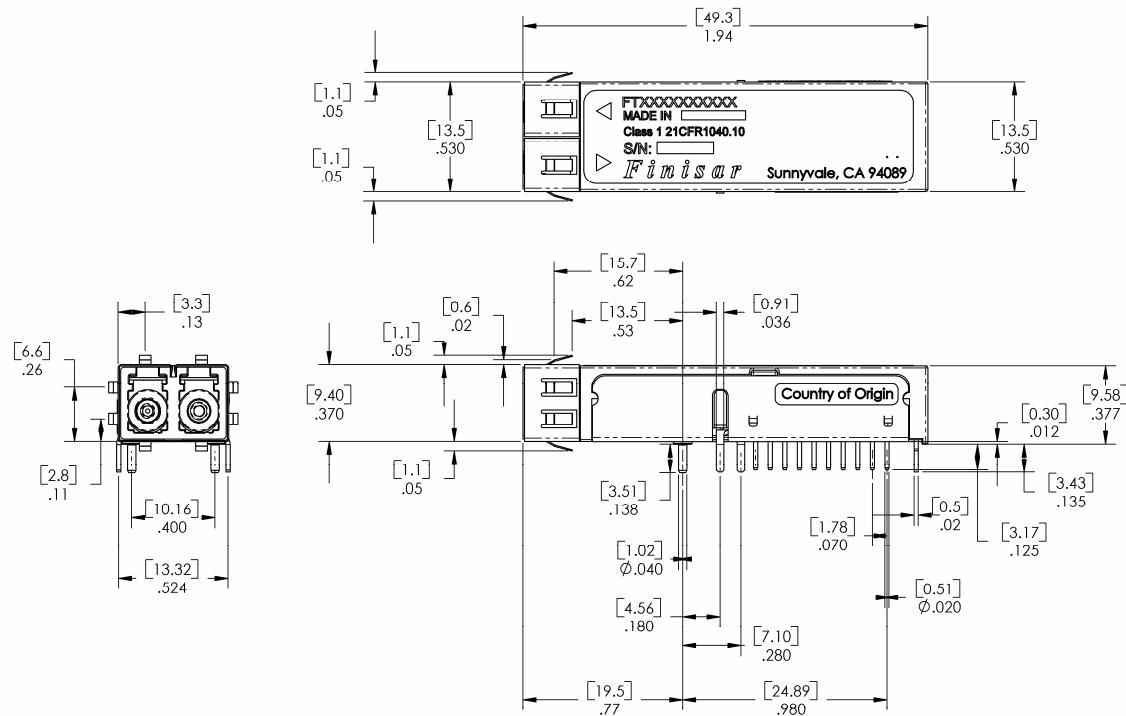
**Analog monitoring function connections.**

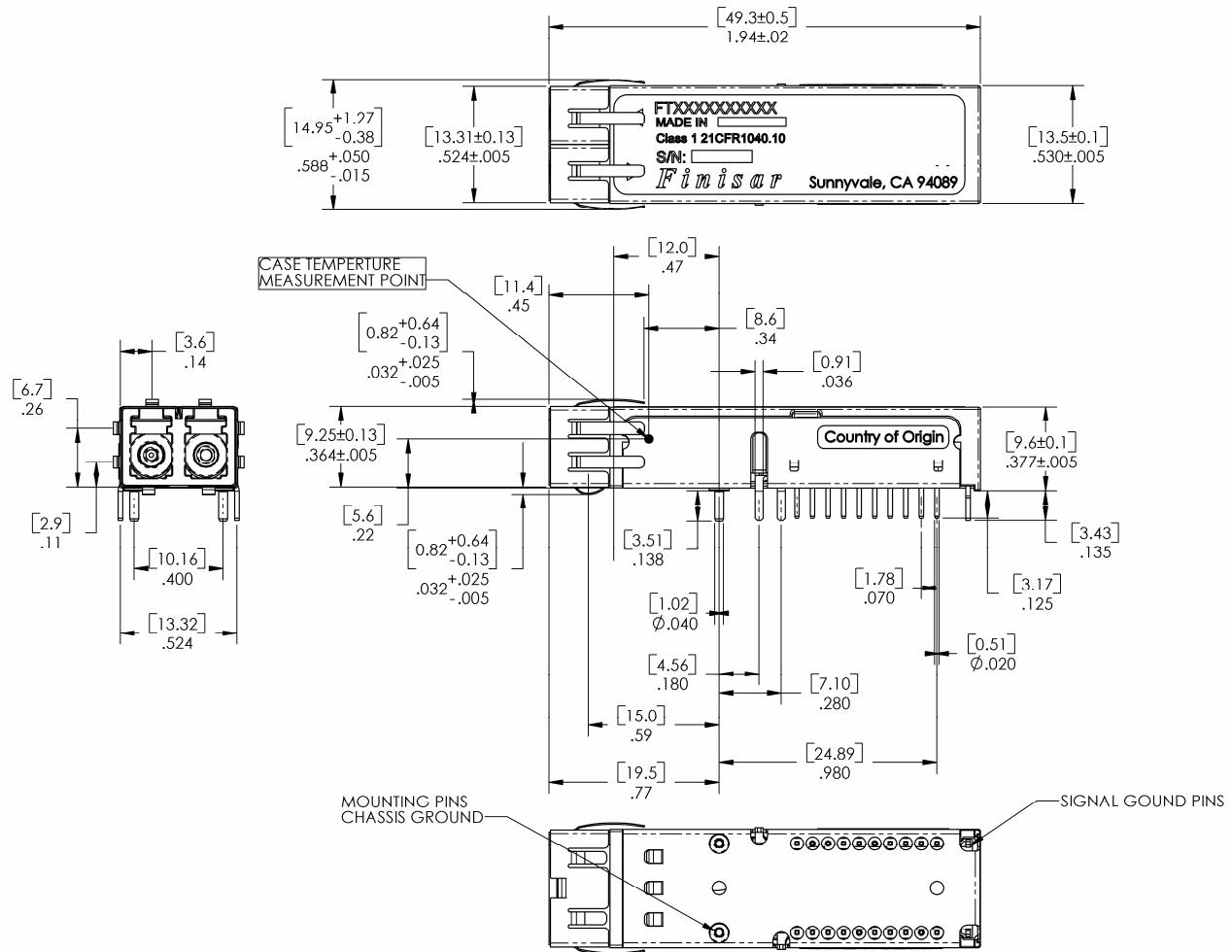
IX. Mechanical Specifications

Finisar's OC-3/STM-1 Small Form Factor (SFF) transceivers comply with the standard dimensions defined by the Small Form Factor Multi-Sourcing Agreement (MSA).

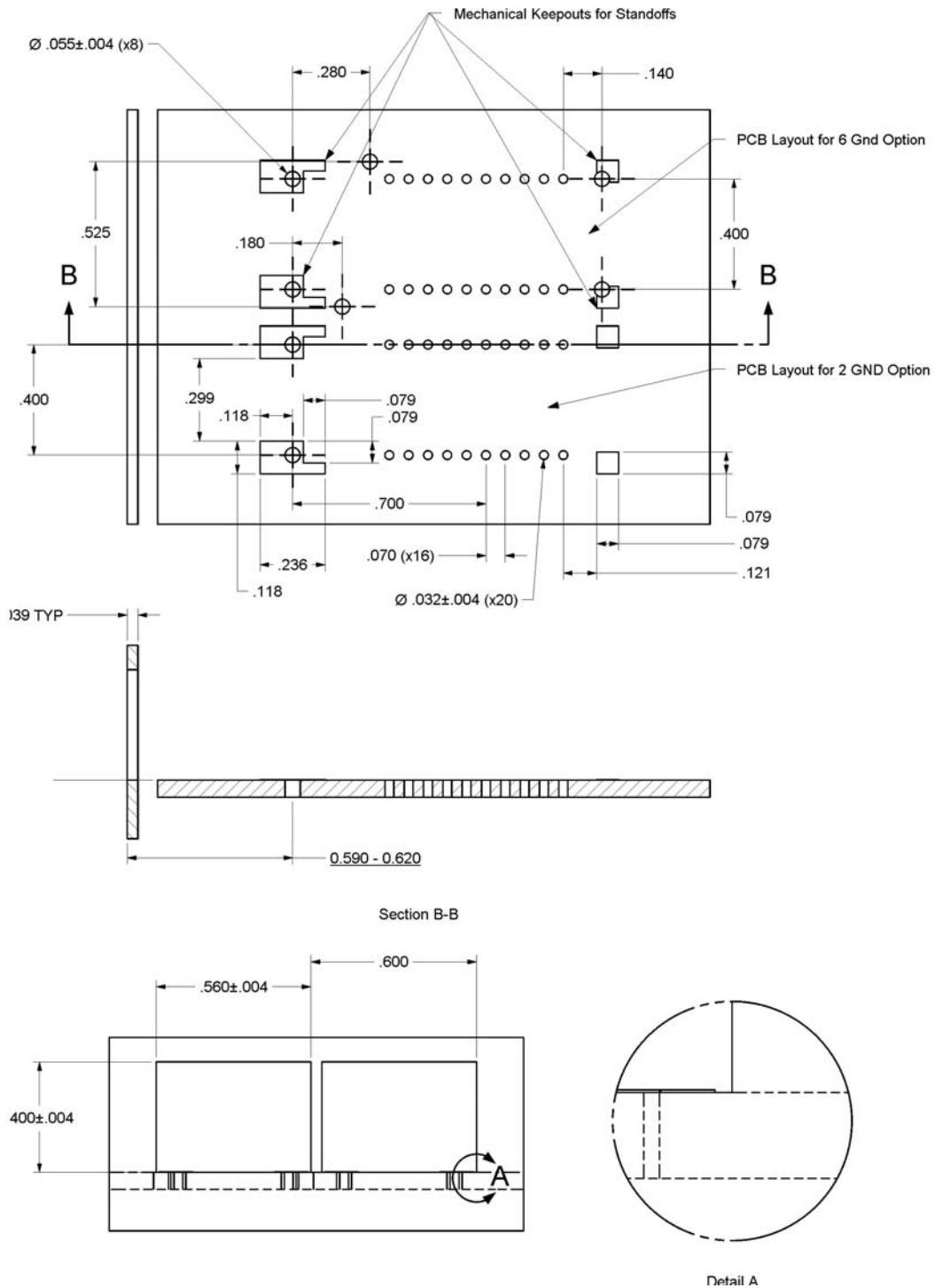


FTLF1323S2GTR – 2 pin version

**FTLF1323S2MTR – 6 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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II-VI:

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