



**RoHS compliant**  
**Multi-Rate 1550 nm Single-mode Transceiver, (LR2/L16.2)**  
**Small Form Pluggable (SFP), with Diagnostic Monitoring**  
**2.67Gb/OC48/2FC/GbE/FC/OC12/OC3/Fast Ethernet**



**Features**

- Compliant with SFF8472 diagnostic monitoring interface
- Industry standard small form pluggable (SFP) package
- Multi-Rate
- Duplex LC connector
- Single power supply 3.3V
- TTL signal detect indicator
- Hot Pluggable
- Class 1 laser product complies with EN 60825-1

**Ordering Information**

| PART NUMBER      | INPUT/OUTPUT | SIGNAL DETECT | VOLTAGE | TEMPERATURE   | LD Type |
|------------------|--------------|---------------|---------|---------------|---------|
| LS48-E3U-TC-N-DD | AC/AC        | TTL           | 3.3V    | 0°C to 70°C   | DFB     |
| LS48-E3U-TI-N-DD | AC/AC        | TTL           | 3.3V    | -40°C to 85°C | DFB     |

**Diagnostics**

| Parameter    | Range      | Accuracy | Unit | Calibration |
|--------------|------------|----------|------|-------------|
| Temperature  | -40 to 95  | ± 3      | °C   | External    |
| Voltage      | 0 to VCC   | ± 0.1    | V    |             |
| Bias Current | 0 to 120   | ± 5      | mA   |             |
| TX Power     | -5 to +6   | ± 3 dB   | dBm  |             |
| RX Power     | -28 to -10 | ± 3 dB   | dBm  |             |



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**Absolute Maximum Ratings**

| PARAMETER           | SYMBOL   | MIN  | MAX      | UNITS | NOTE |
|---------------------|----------|------|----------|-------|------|
| Storage Temperature | $T_S$    | -40  | 85       | °C    |      |
| Supply Voltage      | $V_{CC}$ | -0.5 | 4.0      | V     |      |
| Input Voltage       | $V_{IN}$ | -0.5 | $V_{CC}$ | V     |      |
| Operating Current   | $I_{OP}$ | ---  | 400      | mA    |      |

**Recommended Operating Conditions**

| PARAMETER                  | SYMBOL            | MIN      | MAX      | UNITS | NOTE |
|----------------------------|-------------------|----------|----------|-------|------|
| Case Operating Temperature | $T_C$             | 0<br>-40 | 70<br>85 | °C    |      |
| Supply Voltage             | $V_{CC}$          | 3.1      | 3.5      | V     |      |
| Supply Current             | $I_{TX} + I_{RX}$ | ---      | 300      | mA    |      |

**Transmitter Electro-optical Characteristics**

$V_{CC} = 3.1\text{ V to }3.5\text{ V}, T_C = 0^\circ\text{C to }70^\circ\text{C}(-40^\circ\text{C to }85^\circ\text{C})$

| PARAMETER   | SYMBOL  | MIN  | TYP. | MAX  | UNITS | NOTE    |
|---|---|------|------|------|-------|---------|
| Output Optical Power<br>9/125 $\mu\text{m}$ fiber | $P_{out}$   | -2   | ---  | +3   | dBm   | Average |
| Extinction Ratio                                  | $ER$  | 8.2  | ---  | ---  | dB    |         |
| Center Wavelength                                 | $\lambda_C$   | 1530 | 1550 | 1570 | nm    |         |
| Spectral Width (-20dB)                            | $\Delta\lambda$   | ---  | ---  | 1    | nm    |         |
| Side Mode Suppression Ratio                       | $SMSR$  | 30   | ---  | ---  | dB    |         |
| Output Eye  | Compliant with Telcordia GR-253-CORE Issue 3 and ITU-T recommendation G-957 |      |      |      |       |         |
| Max. $P_{out}$ TX-DISABLE Asserted                | $P_{OFF}$   | ---  | ---  | -45  | dBm   |         |
| Differential Input Voltage                        | $V_{DIFF}$  | 0.4  | ---  | 2.0  | V     |         |
| Optical path penalty                              |   |      |      | 2    | dB    |         |
| Maximum dispersion                                |   |      |      | 1680 | ps/nm |         |



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**Receiver Electro-optical Characteristics**

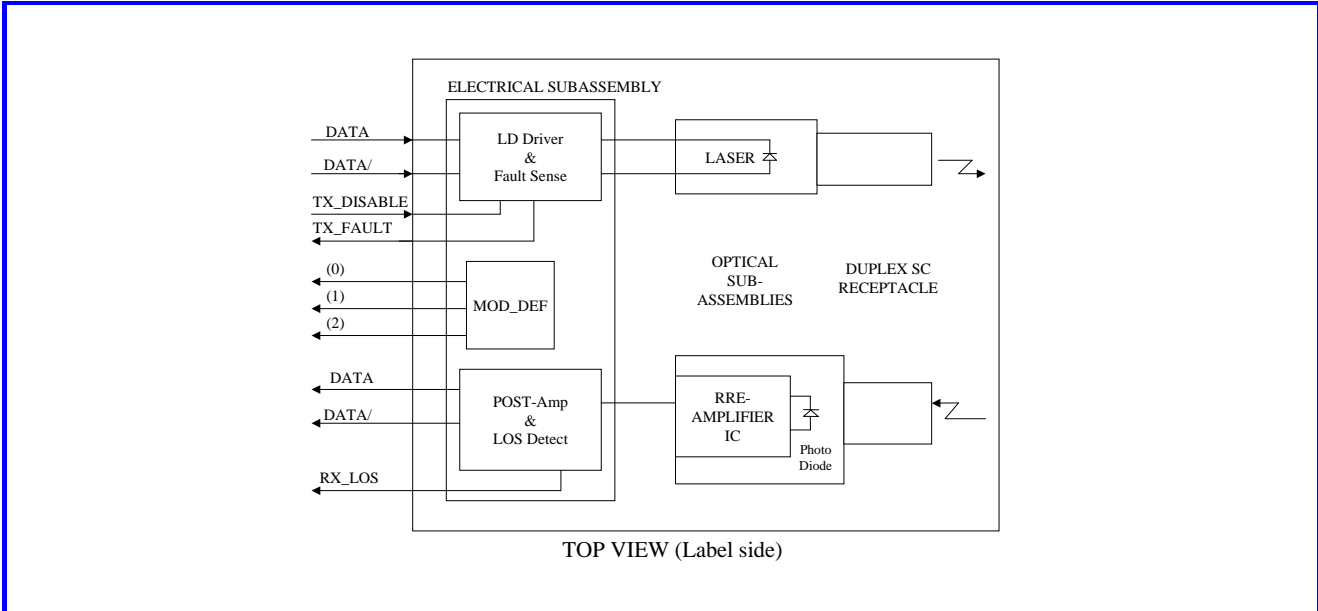
$V_{CC} = 3.1 \text{ V to } 3.5 \text{ V}, T_C = 0^\circ \text{C to } 70^\circ \text{C} (-40^\circ \text{C to } 85^\circ \text{C})$

| PARAMETER                                   | SYMBOL      | MIN  | TYP. | MAX      | UNITS | NOTE                     |
|---|-------------|------|------|----------|-------|--------------------------|
| Optical Input Power-maximum                 | $P_{IN}$    | -8   | ---  | ---      | dBm   | BER < $10^{-10}$         |
| RX Sensitivity @2.67 Gb/s                   | $P_{IN}$    | ---  | ---  | -28      | dBm   | PRBS23, BER < $10^{-10}$ |
| RX Sensitivity @OC-48                       | $P_{IN}$    | ---  | ---  | -28      | dBm   | PRBS23, BER < $10^{-10}$ |
| RX Sensitivity @2xFC                        | $P_{IN}$    | ---  | ---  | -28      | dBm   | PRBS7, BER < $10^{-12}$  |
| RX Sensitivity @GbE                         | $P_{IN}$    | ---  | ---  | -28      | dBm   | PRBS7, BER < $10^{-12}$  |
| RX Sensitivity @OC-12                       | $P_{IN}$    | ---  | ---  | -28      | dBm   | PRBS23, BER < $10^{-10}$ |
| RX Sensitivity @OC-3                        | $P_{IN}$    | ---  | ---  | -28      | dBm   | PRBS23, BER < $10^{-10}$ |
| RX Sensitivity @Fast ethernet               | $P_{IN}$    | ---  | ---  | -28      | dBm   | PRBS7, BER < $10^{-10}$  |
| Operating Center Wavelength                 | $\lambda_C$ | 1260 | ---  | 1610     | nm    |                          |
| Optical Return Loss                         | $ORL$       | -27  | ---  | ---      | dB    |                          |
| Signal Detect-Asserted                      | $P_A$       | ---  | ---  | -28      | dBm   |                          |
| Signal Detect-Deasserted                    | $P_D$       | -45  | ---  | ---      | dBm   |                          |
| Differential Output Voltage                 | $V_{DIFF}$  | 0.5  | ---  | 1.2      | V     |                          |
| Receiver Loss of Signal Output Voltage-Low  | $RX\_LOS_L$ | 0    | ---  | 0.5      | V     |                          |
| Receiver Loss of Signal Output Voltage-High | $RX\_LOS_H$ | 2.4  | ---  | $V_{CC}$ | V     |                          |



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**Block Diagram of Transceiver**



**Transmitter Section**

The transmitter section consists of a 1550 nm InGaAsP laser in an eye safe optical subassembly (OSA) which mates to the fiber cable. The laser OSA is driven by a LD driver IC which converts differential input LVPECL logic signals into an analog laser driving current.

**TX\_DISABLE**

The TX\_DISABLE signal is high (TTL logic “1”) to turn off the laser output. The laser will turn on when TX\_DISABLE is low (TTL logic “0”).

**Receiver Section**

The receiver utilizes an APD photodiode mounted together with a trans-impedance preamplifier IC in an OSA. This OSA is connected to a circuit providing post-amplification quantization, and optical signal detection.

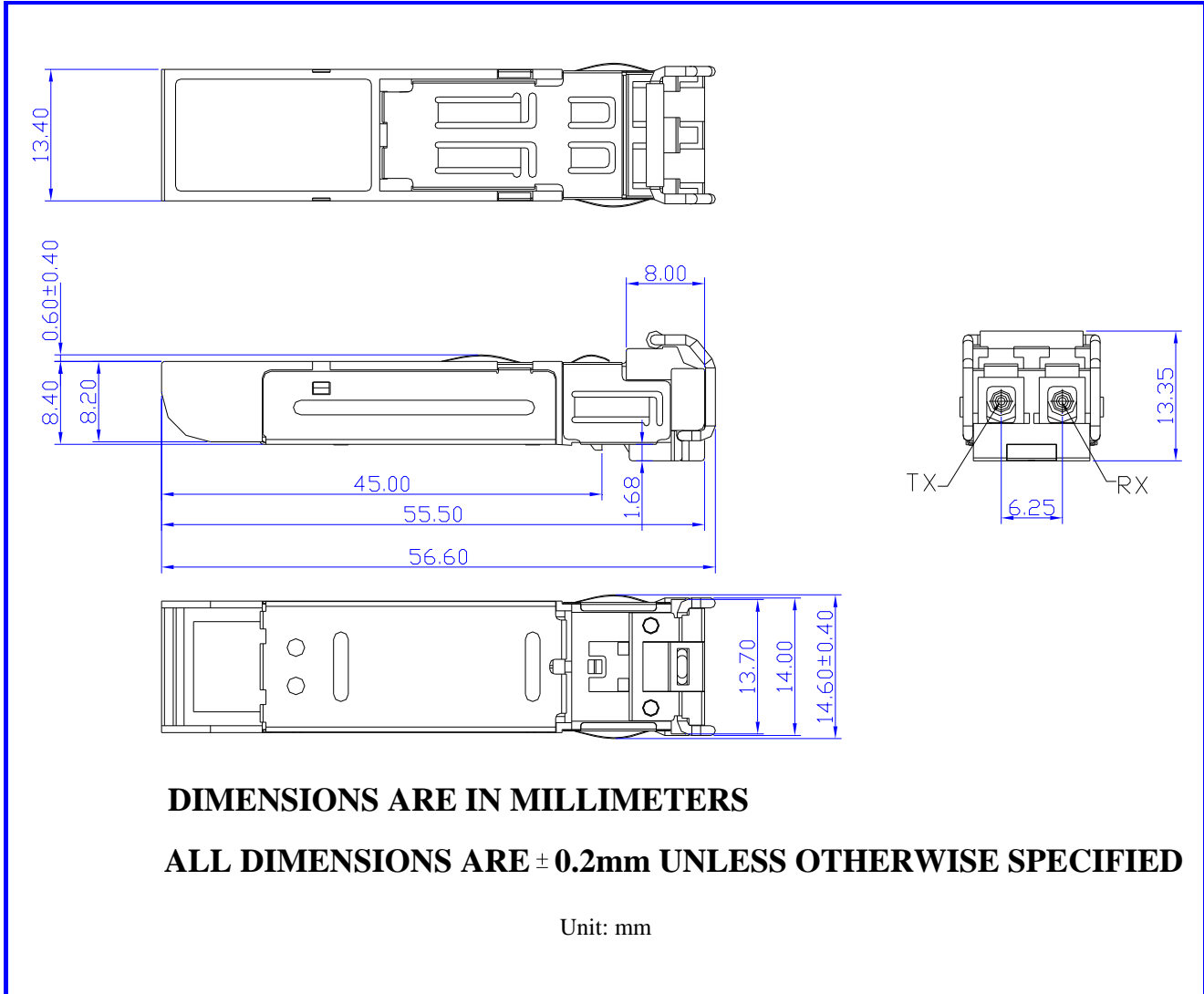
**Receive Loss (RX\_LOS)**

The RX\_LOS is high (logic “1”) when there is no incoming light from the companion transceiver. This signal is normally used by the system for the diagnostic purpose. The signal is operated in TTL level.

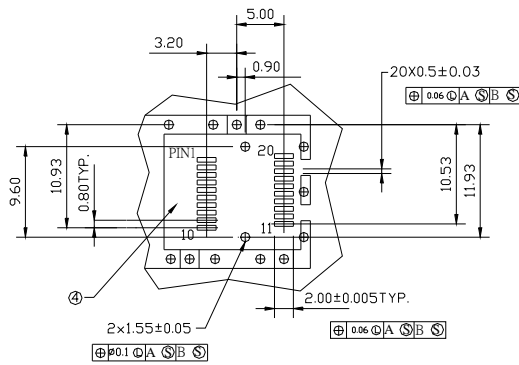
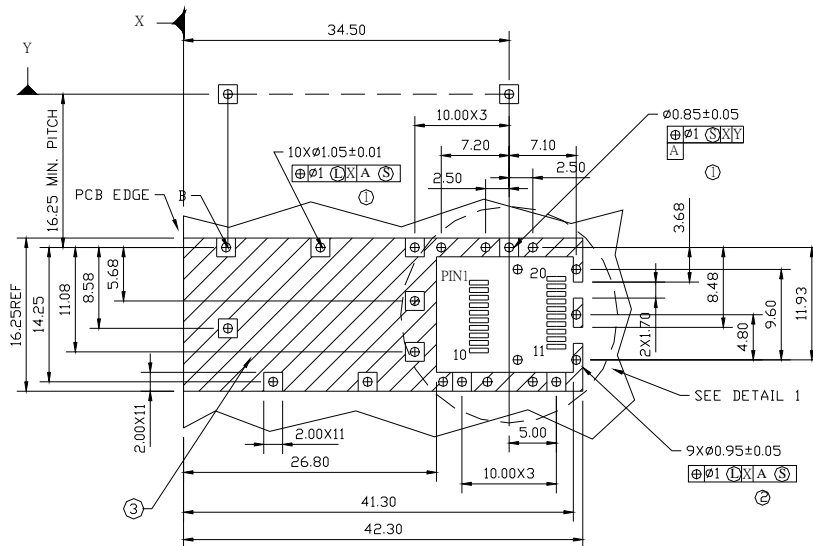


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**Dimensions**



**SFP host board mechanical layout**



DETAIL 1

**LEGEND**

- 1.PADS AND VIAS ARE CHASSIS GROUND
- 2.THROUGH HOLES, PLATING OPTIONAL
- 3.HATCHED AREA DENOTES COMPONENT AND TRACE KEEPOUT(EXCEPT CHASSIS GROUND)
- 4.AREA DENOTES COMPONENT KEEPOUT (TRACES ALLOWED)

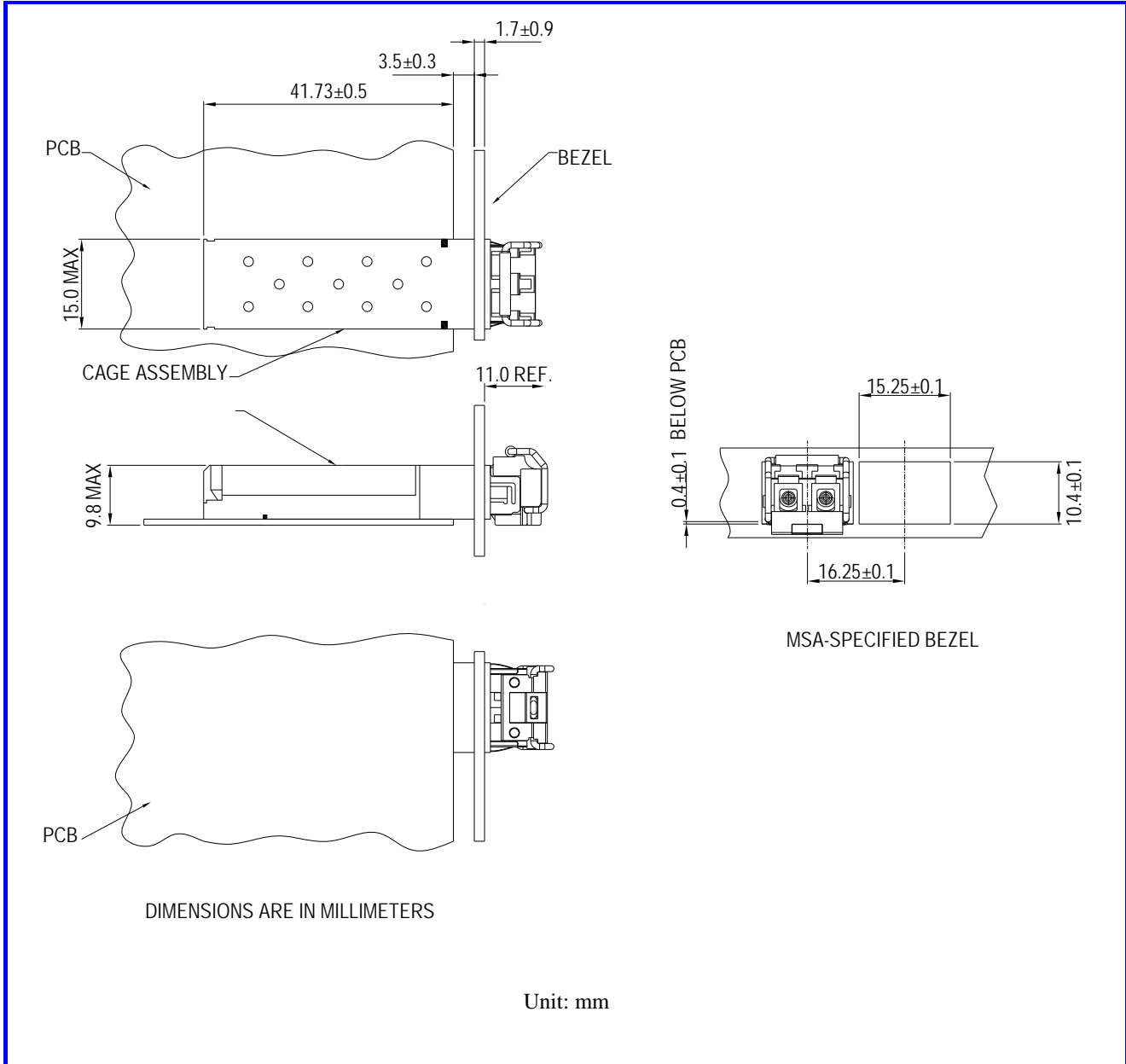
DIMENSIONS ARE IN MILLIMETERS

Unit: mm



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**Assembly drawing**

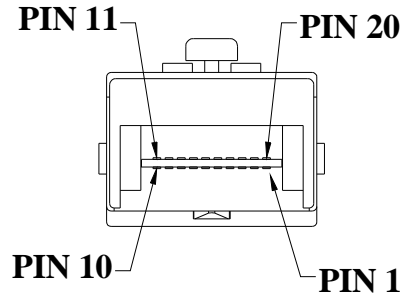




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**Pin Assignment**

Pin-Out



| Pin | Signal Name    | Description                                       |
|-----|----------------|---|
| 1   | $T_{GND}$      | Transmit Ground                                   |
| 2   | $TX\_FAULT$    | Transmit Fault                                    |
| 3   | $TX\_DISABLE$  | Transmit Disable                                  |
| 4   | $MOD\_DEF (2)$ | SDA Serial Data Signal                            |
| 5   | $MOD\_DEF (1)$ | SCL Serial Clock Signal                           |
| 6   | $MOD\_DEF (0)$ | TTL Low   |
| 7   | $RATE\_SELECT$ | Open Circuit                                      |
| 8   | $RX\_LOS$      | Receiver Loss of Signal, TTL High, open collector |
| 9   | $R_{GND}$      | Receiver Ground                                   |
| 10  | $R_{GND}$      | Receiver Ground                                   |
| 11  | $R_{GND}$      | Receiver Ground                                   |
| 12  | $RX-$          | Receive Data Bar, Differential PECL, ac coupled   |
| 13  | $RX+$          | Receive Data, Differential PECL, ac coupled       |
| 14  | $R_{GND}$      | Receiver Ground                                   |
| 15  | $V_{CCR}$      | Receiver Power Supply                             |
| 16  | $V_{CCT}$      | Transmitter Power Supply                          |
| 17  | $T_{GND}$      | Transmitter Ground                                |
| 18  | $TX+$          | Transmit Data, Differential PCEL, ac coupled      |
| 19  | $TX-$          | Transmit Data Bar, Differential PCEL, ac coupled  |
| 20  | $T_{GND}$      | Transmitter Ground                                |





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**Eye Safety Mark**

The LS4 series singlemode transceiver is a class 1 laser product. It complies with EN 60825-1 and FDA 21 CFR 1040.10 and 1040.11. In order to meet laser safety requirements the transceiver shall be operated within the Absolute Maximum Ratings.

**Caution**

**All adjustments have been done at the factory before the shipment of the devices. No maintenance and user serviceable part is required. Tampering with and modifying the performance of the device will result in voided product warranty.**

**Required Mark**

Class 1 Laser Product  
Complies with  
21 CFR 1040.10 and 1040.11

Note : All information contained in this document is subject to change without notice.