

## 1.Features

- Single fiber bi-directional data links asymmetric TX 2488Mbps/RX1244Mbps application
- 1490nm continuous-mode DFB laser transmitter and 1310nm burst-mode APD-TIA receiver
- Small Form Factor Pluggable package with SC/UPC Connector
- Reset burst-mode receiver design support more than 15dB dynamic range
- Single +3.3V power supply
- Digital diagnostic monitoring interface
- Digital burst RSSI function to monitor the input optical power level
- LVPECL compatible data input/output interface
- LVTTTL transmitter disable control
- LVTTTL transmitter laser fault alarm
- LVTTTL receiver Signal Detect (SD) indication
- Low EMI and excellent ESD protection
- Class I laser safety standard IEC-60825 compliant
- Operating case temperature:  
Standard: 0°C~+70°C
- RoHS 2.0 compliance

## 2.Applications

- Gigabit-capable Passive Optical Networks (GPON) C++++ 20Km application

## 3.General

The GPON OLT Transceiver module is designed for Gigabit Ethernet Passive Optical Network (GPON) 20km transmission. The module incorporates 1490nm continuous-mode transmitter and 1310nm burst-mode receiver. The transmitter section uses a 1490nm DFB laser and an integrated laser driver which is designed to be class-1 eye safe under any single fault. The laser driver includes APC and temperature compensation functions, which are used for keeping the launch optical power and extinction ratio constant over temperature and aging.

The receiver section uses an integrated APD and BM-preamplifier mounted together. The module has the function that indicates receiver burst-power-detect signal. The receiver includes digitalized burst mode optical power monitoring function, which converses any of a received ONU optical power directly in digital, with a Trigger input from system. When rising edge of Trigger detected, the DDM processor starts a burst optical power conversion, the digital result is available via DDM interface after Burst Optical Power Conversion Time. Trigger pulse width should be more than Burst Optical Power Conversion Holding Time. An integrated WDM coupler can distinguish 1310nm input light from 1490nm output light. The metallic package guarantees excellent EMI and EMC characteristics.

## 4.Order Information

**Table-1-Order Information(Standard: 0°C~+70°C)**

| Part Number          | Data Rate (TX/RX)       | Index level | PO (dBm) | Sens (dBm) | Interface | Temp. <sup>Note 1</sup> |
|----------------------|-------------------------|-------------|----------|------------|-----------|-------------------------|
| GPON OLT Class C++++ | 2.488Gbps/<br>1.244Gbps | C++++       | +9~+13   | ≤-33       | SC        | 0°C~+70°C               |

Note:

1.The Temp is Operating Case Temperature Range.

## 5. Absolute Maximum Ratings

Table 2-Absolute Maximum Ratings

| Parameter                  | Condition        | Unit | Min. | Typ. | Max. |
|----------------------------|------------------|------|------|------|------|
| Supply Voltage             |                  | V    | -0.5 | -    | 3.6  |
| Storage Temperature        | Case Temperature | °C   | -45  | -    | +85  |
| Relative Humidity, Storage | None Condensing  | %    | +5   | -    | +95  |
| Rx Total Optical Power     | Damage Threshold | dBm  | -    | -    | -8   |

## 6. Operating Environment

Table 3-Operating Environment

| Parameter                  | Condition | Unit | Min. | Typ. | Max. |
|----------------------------|-----------|------|------|------|------|
| Power Supply Voltage       |           | V    | 3.13 | 3.3  | 3.47 |
| Operating Case Temperature | Standard  | °C   | 0    | -    | +70  |
|                            |           |      |      |      |      |

\*Exceeding any one of these values may destroy the device immediately.

## 7. Electrical Characteristics

Table 4-Electrical Characteristics

| Parameter                      | Symbol           | Min             | Type | Max  | Units   | Notes |
|--------------------------------|------------------|-----------------|------|------|---------|-------|
| <b>Transmitter</b>             |                  |                 |      |      |         |       |
| Differential Data Input Swing  | V <sub>in</sub>  | 200             | -    | 2400 | mVpp    | 1     |
| Input Differential Impedance   | Z <sub>in</sub>  | 90              | 100  | 110  | ohm     |       |
| Tx_Disable                     | Disable          | V <sub>D</sub>  | 2.0  | -    | VCC     | V     |
|                                | Enable           | V <sub>EN</sub> | GND  | -    | GND+0.8 | V     |
| TX_Fault                       | Fault            | V <sub>F</sub>  | 2.0  | -    | VCC     | V     |
|                                | Normal           | V <sub>NO</sub> | GND  | -    | GND+0.8 | V     |
| <b>Receiver</b>                |                  |                 |      |      |         |       |
| Differential Date Output Swing | V <sub>out</sub> | 600             | -    | 1500 | mVpp    | 2     |
| Output Differential Impedance  | Z <sub>out</sub> | 90              | 100  | 110  | ohm     |       |
| Signal Detect de-assert Time   | T <sub>SDD</sub> | ns              | -    | -    | 12.8    | 3     |
| Signal Detect assert Time      | T <sub>SDA</sub> | ns              | -    | -    | 50      | 4     |
| Signal Detect Voltage          | High             | V <sub>OH</sub> | 2.4  | -    | VCC     | V     |
|                                | Low              | V <sub>OL</sub> | GND  | -    | GND+0.4 | V     |

Note:

1. Internally AC coupled, input termination may be required for LVPECL/CML applications.
2. Internally DC coupled, LVPECL/CML differential output stage.
3. Refer to the Reset signal rising edge
4. Refer to the Reset signal falling edge.

## 8. Specifications

Table 5-Optical Characteristics

| Parameter          | Symbol | Units | Min. | Typ. | Max. | Notes |
|--------------------|--------|-------|------|------|------|-------|
| <b>Transmitter</b> |        |       |      |      |      |       |
| Data Rate          | BR     | Mbps  | -    | 2488 | -    |       |

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| Optical Center Wavelength               | $\lambda_c$      | nm   | 1480 | 1490 | 1500 |       |
|-----------------------------------------|------------------|------|------|------|------|-------|
| Optical Spectrum Width (-20dB)          | $\Delta\lambda$  | nm   | -    | -    | 1    |       |
| Side Mode Suppression Ratio             | SMSR             | dB   | 30   | -    |      |       |
| Power-OFF Transmitter Optical Power     |                  | dBm  | -    | -    | -39  | 3     |
| Extinction Ratio                        | ER               | dB   | 8.2  | -    | -    | 4     |
| Tolerance to Transmitter Incident Light |                  | dB   | -15  | -    | -    |       |
| Transmitter and Dispersion Penalty      | TDP              | dB   | -    | -    | 1    |       |
| Optical Waveform Diagram                | ITU-T G.984.2    |      |      |      |      | 5     |
| Parameter                               | Symbol           | Unit | Min  | Typ. | Max  | Notes |
| <b>Receiver</b>                         |                  |      |      |      |      |       |
| Data Rate                               | BR               | Mbps | -    | 1244 | -    |       |
| Operating Wavelength                    | $\lambda_c$      | nm   | 1260 | 1310 | 1360 |       |
| Saturation Optical Power                | $P_{SAT}(C++)$   | dBm  | -12  | -    | -    | 6     |
|                                         | $P_{SAT}(C+++)$  | dBm  | -15  | -    | -    | 6     |
|                                         | $P_{SAT}(C++++)$ | dBm  | -15  | -    | -    | 6     |
| Signal Detect Assert Level              | SDA              | dBm  | -    | -    | -34  | 6     |
| Signal Detect De-Assert Level           | SDD              | dBm  | -45  | -    | -    | 6     |
| Signal Detect Hysteresis                |                  | dBm  | 0.5  | -    | 6    |       |
| Receiver Reflectance                    |                  | dB   | -    | -    | -12  |       |
| Receiver Burst Mode Dynamic Range       |                  | dB   | 15   |      |      | 7     |

Note:

- 1.BOL, Normal Temperature.
- 2.EOL, Over Temperature.
- 3.Launched into SMF
- 4.PRBS 2<sup>23</sup>-1+72CID @2.488Gbit/s
5. Figure 1
- 6.PRBS 2<sup>23</sup>-1+72CID@1244Mbps BER  $\leq 1 \times 10^{-10}$ .
7. Figure 2.

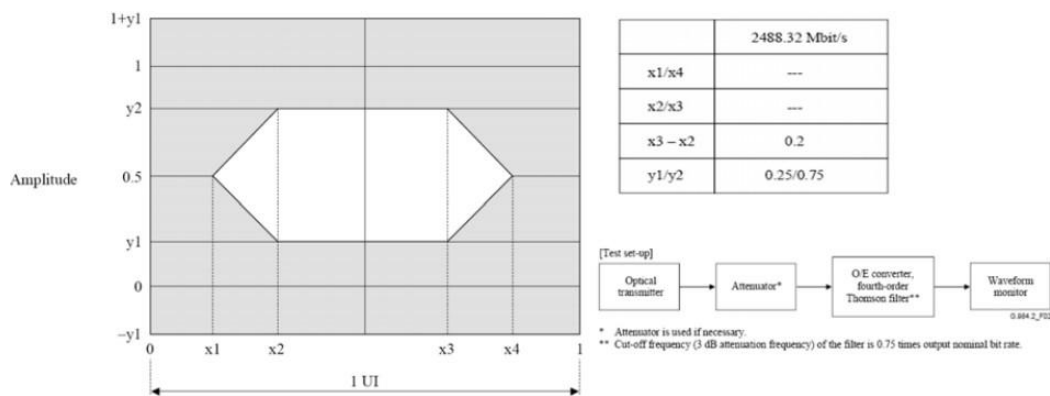


Figure 1, Transmitter Eye Mask Definitions and Test Procedure

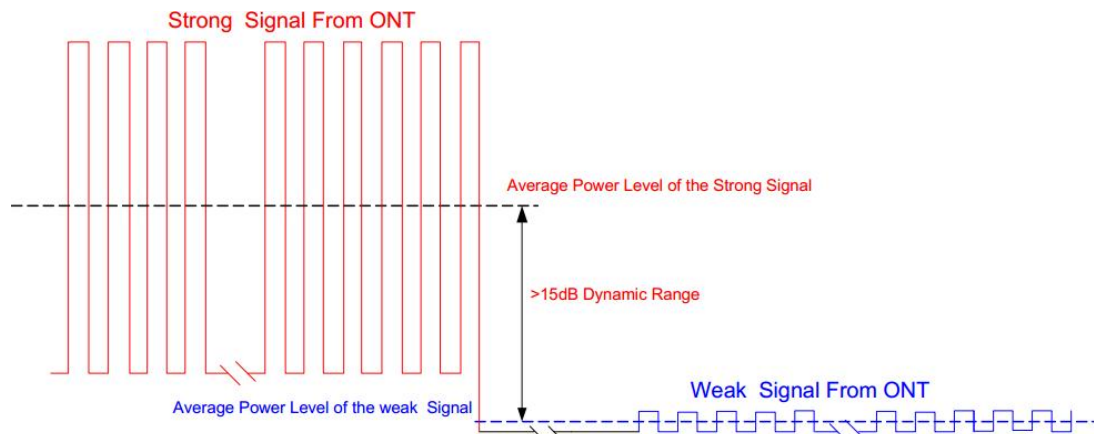


Figure 2, Burst Mode Receiver Dynamic Range in GPON System

Table 6-Digital RSSI Timing Specification

| Parameter                                                                         | Symbol                 | Unit | Min | Typ. | Max                        | Notes |
|-----------------------------------------------------------------------------------|------------------------|------|-----|------|----------------------------|-------|
| Guard time                                                                        | T <sub>GUARD</sub>     | bits | -   | 32   |                            | 1     |
| Reset width                                                                       | T <sub>RESET</sub>     | bits | -   | 16   |                            | 1     |
| Optical Signal During Time                                                        | T <sub>ONTEN_DUR</sub> | ns   | 500 | -    | -                          | 2     |
| RSSI Trigger Delay                                                                | TD                     | ns   | 30  | -    | 3000                       | 3,4   |
| RSSI Trigger width                                                                | TW                     | ns   | 300 | -    | T <sub>ONTEN_DUR</sub> -TD | 4     |
| I2C Access Prohibited Time                                                        |                        | us   | 500 | -    |                            |       |
| Measurement Accuracy of received burst optical power, range from -10dBm to -30dBm |                        | dB   | -3  | -    | +3                         |       |

Note:

1. Figure 3.
2. For RSSI Measurement, Figure 4.
3. Refer to first bit of the preamble.
4. Figure 4.

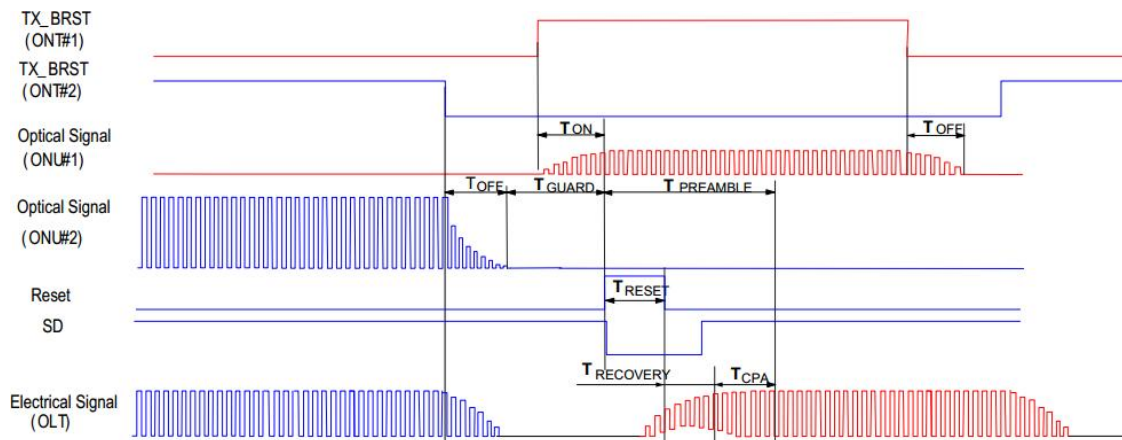


Figure 3, Burst Receiver Timing Sequence

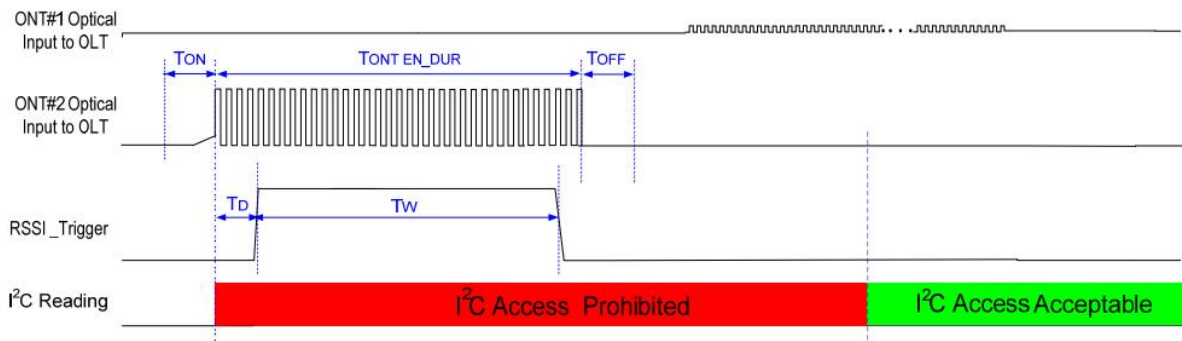


Figure 4, RSSI Timing Sequence

## 9. Digital Diagnostic Memory Map

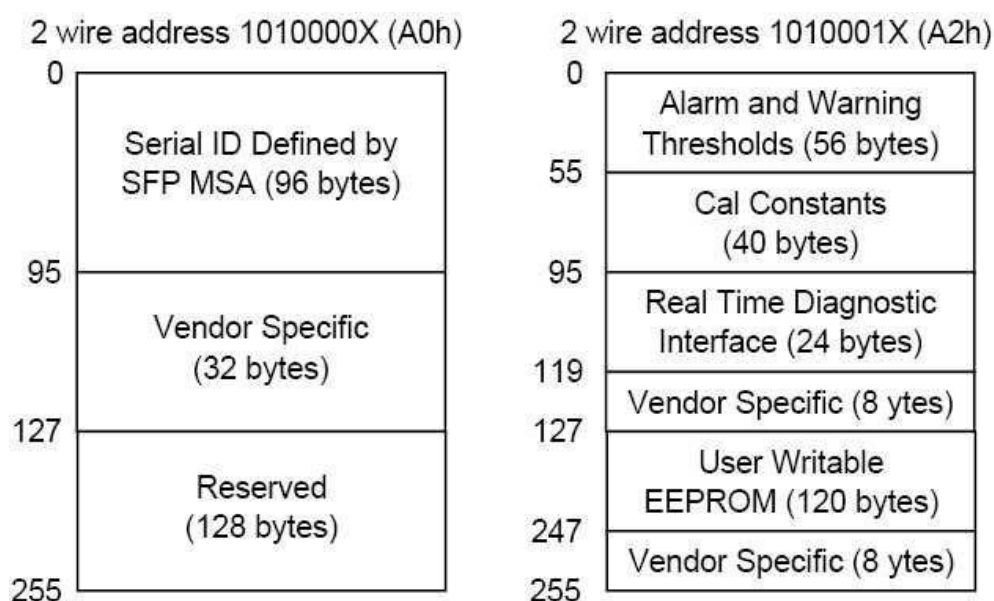


Figure 5, Memory map

## 10.Pin arrangement

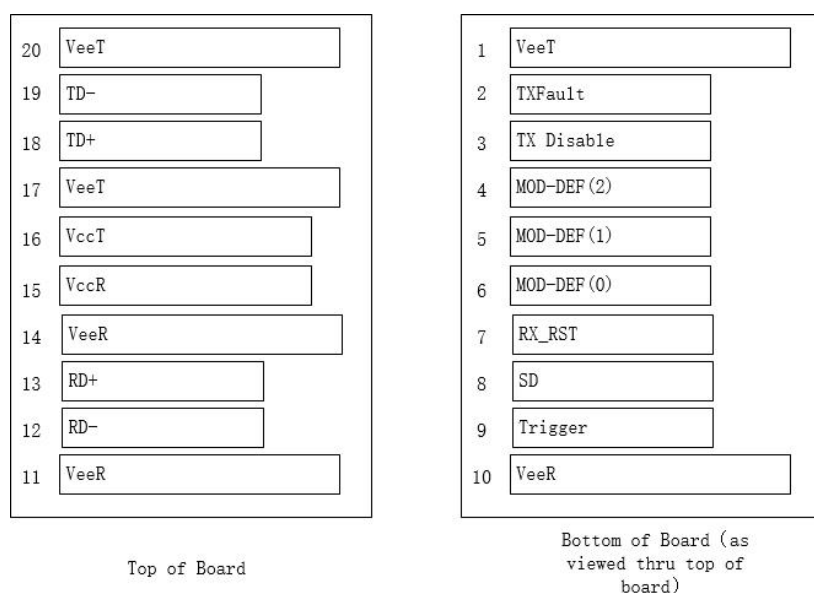


Figure 6, Pin Views

Table 7-Connector Pin Assignment

| Pin | Name       | Description                  | Notes                                                     |
|-----|------------|------------------------------|-----------------------------------------------------------|
| 1   | VeeT       | Transmitter Ground           |                                                           |
| 2   | TxFault    | Transmitter Fault Indication | High: abnormal; Low: normal                               |
| 3   | TX Disable | Transmitter Disable          | High: transmitter disable; Low: transmitter enable        |
| 4   | MOD-DEF(2) | Module Definition 2          | I2C data, SDA ,The data line of two wire serial interface |
| 5   | MOD-DEF(1) | Module Definition 1          | I2C clock, SCL ,The clock line of two wire                |

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|    |            |                                             |                                                                              |
|----|------------|---------------------------------------------|------------------------------------------------------------------------------|
|    |            |                                             | serial interface                                                             |
| 6  | MOD-DEF(0) | Module Definition 0                         | Connected to Ground in the transceiver                                       |
| 7  | RX_RST     | Receiver Reset                              | Active High                                                                  |
| 8  | SD         | Signal Detect                               | High: signal detected; Low: loss of signal                                   |
| 9  | Trigger    | RSSI Trigger for Transceiver A/D Conversion | High: enable RSSI A/D conversion                                             |
| 10 | VeeR       | Receiver Ground                             |                                                                              |
| 11 | VeeR       | Receiver Ground                             |                                                                              |
| 12 | RD-        | Inverse Received Data out                   | LVPECL logic output, DC coupled                                              |
| 13 | RD+        | Received Data out                           | LVPECL logic output, DC coupled                                              |
| 14 | VeeR       | Receiver Ground                             |                                                                              |
| 15 | VccR       | Receiver Power — +3.3V±5%                   |                                                                              |
| 16 | VccT       | Transmitter Power — +3.3 V±5%               |                                                                              |
| 17 | VeeT       | Transmitter Ground                          |                                                                              |
| 18 | TD+        | Transmitter Data In                         | LVPECL logic input, AC coupled, internally 100 ohms differential termination |
| 19 | TD-        | Inverse Transmitter Data In .               | LVPECL logic input, AC coupled, internally 100 ohms differential termination |
| 20 | VeeT       | Transmitter Ground                          |                                                                              |

### 11. Block Diagram

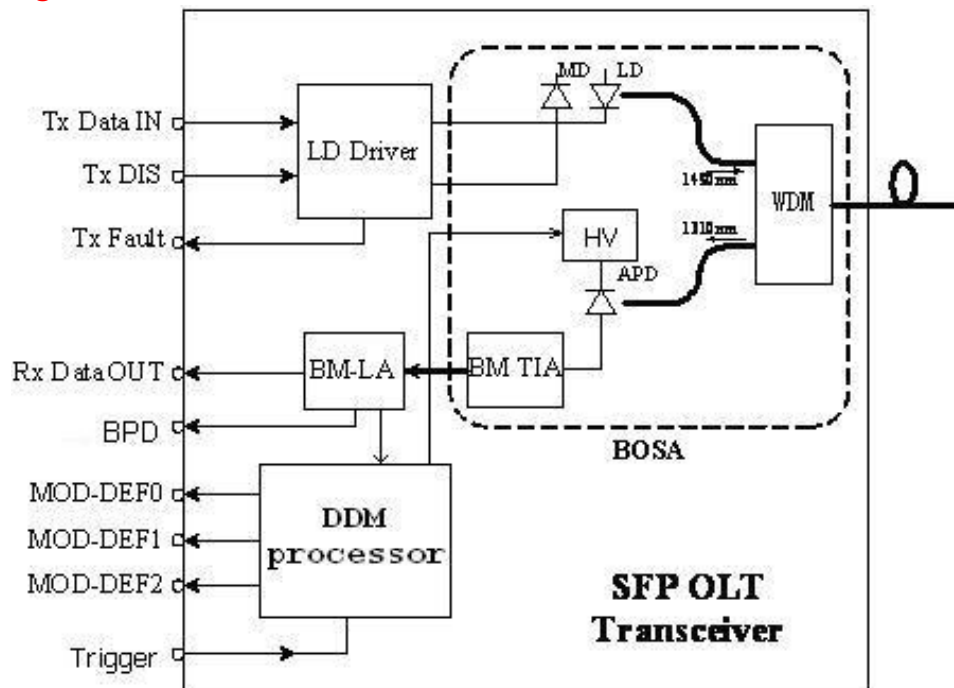


Figure 7, Block Diagram

## 12. Typical Application Circuit

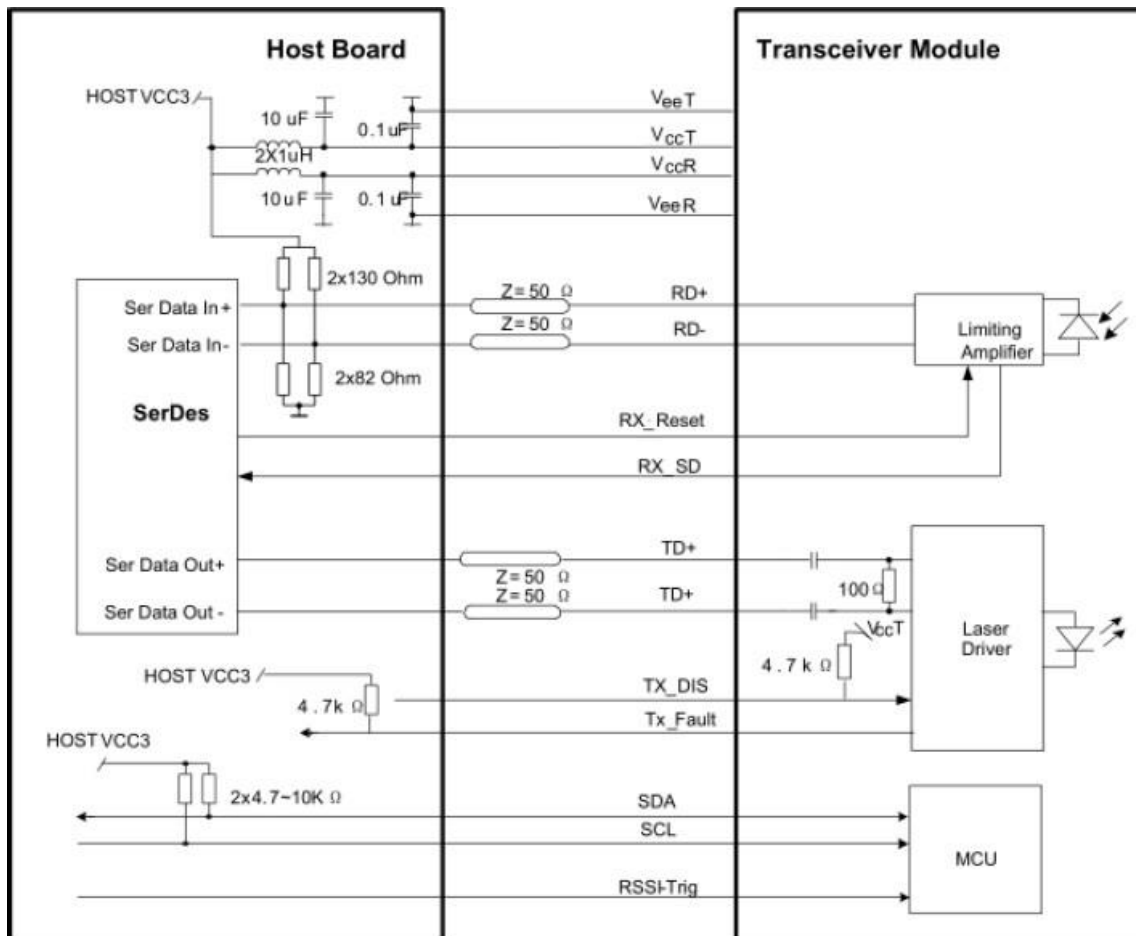


Figure 8, Typical Application Circuit

## 13. Mechanical Information

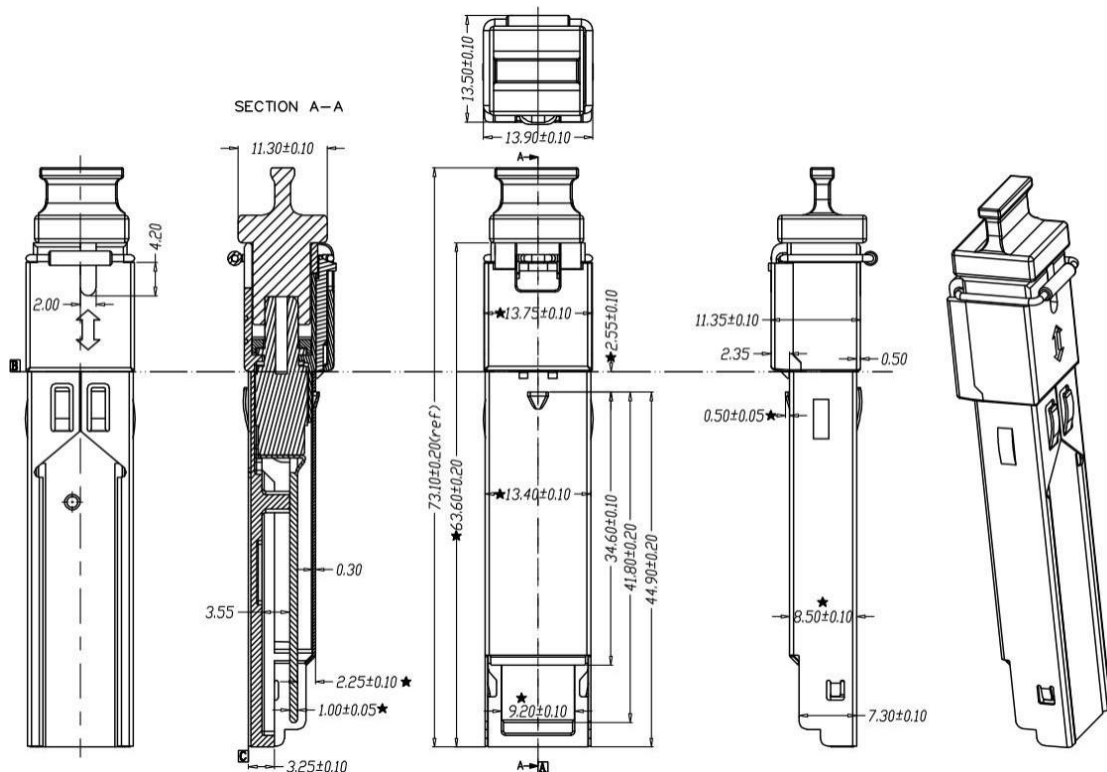


Figure 9, Mechanical Information

## 14. Regulatory Information

Table 8-List of Regulatory/Compliance

| Feature                                              | Standard                                                                        | Performance                                                                                                                                                                                                  |
|------------------------------------------------------|---------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Electrostatic Discharge (ESD) to the Electrical Pins | MIL-STD-883H Method 3015.8                                                      | Based on HBM                                                                                                                                                                                                 |
|                                                      | IEC61000-4-2                                                                    | 8kV Contact Discharge<br>15kV Air Discharge                                                                                                                                                                  |
| Electrostatic Discharge to the enclosure             | EN 55024:1998+A1+A2 IEC-61000-4-2<br>GR-1089-CORE                               | Compatible with standards                                                                                                                                                                                    |
| Electromagnetic Interference (EMI)                   | FCC Part 15 Class B<br>EN55022:2006<br>CISPR 22B :2006<br>VCCI Class B          | Compatible with standards Noise frequency range: 30MHz to 6GHz. Good system EMI design practice required to achieve Class B margins. System margins are dependent on customer host board and chassis design. |
| Immunity                                             | EN 55024:1998+A1+A2<br>IEC 61000-4-3                                            | Compatible with standards. 1KHz sine-wave, 80% AM, from 80MHz to 1GHz. No effect on transmitter/receiver performance is detectable between these limits.                                                     |
| Laser Eye Safety                                     | FDA 21CFR 1040.10 and 1040.11 EN (IEC) 60825-1:2007<br>EN (IEC) 60825-2:2004+A1 | CDRH compliant and Class I laser product.                                                                                                                                                                    |
| RoHS 2.0                                             | 2011/65/EU                                                                      | Compliant with standards                                                                                                                                                                                     |

## 15. Notice

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