# SNR-SFP-WXX-3

6 dB Power Budget SFP 1.25G WDM Transceiver

## SNR-SFP-W35-3 Series

## SNR-SFP-W53-3 Series

**Single-Mode 100M～1.25Gbps FE/GBE /FC**
**SC/LC Single-Fiber SFP Transceiver**
**RoHS6 Compliant**

### Features

- Up to 1.25Gbps Data Links
- A type: 1310nm FP TX /1550nm RX
  B type: 1550nm FP TX /1310nm RX
- 3km with 9/125 μm SMF
- Single 3.3V Power supply and TTL Logic Interface
- Hot-Pluggable SFP Footprint Simplex SC/LC Connector Interface
- Class 1 FDA and IEC60825-1 Laser Safety Compliant
- Operating Case Temperature
  Standard: -5℃~+70℃
- Compliant with SFP MSA Specification
- Compliant with Digital Diagnostic Monitor Interface SFF-8472

### Applications

- Fiber Channel Links
- Gigabit Ethernet
- Fast Ethernet
- WDM Gigabit Ethernet Links
- Other Optical Links

## Ordering Information

| Part No. | Data Rate | Wavelength | Interface | Temp. | DDMI |
|---|---|---|---|---|---|
| SNR-SFP-W35-3*(note1)<br>SNR-SFP-W53-3*(note1) | 125~1250Mbps | 1310nm | SC | Standard | NO |
| | 125~1250Mbps | 1550nm | SC | Standard | NO |

Note1: Standard version

## Regulatory Compliance

| Feature | Standard | Performance |
|---|---|---|
| Electrostatic Discharge (ESD) to the Electrical Pins | MIL-STD-883G Method 3015.7 | Class 1C (>1000 V) |
| Electrostatic Discharge to the enclosure | EN 55024:1998+A1+A2<br>IEC-61000-4-2<br>GR-1089-CORE | Compliant with standards |
| Electromagnetic Interference (EMI) | FCC Part 15 Class B<br>EN55022:2006<br>CISPR 22B :2006<br>VCCI Class B | Compliant with standards<br>Noise frequency range: 30MHz to 6GHz. Good system EMI design practice required to achieve Class B margins.<br>System margins are dependent on customer host board and chassis design. |
| Immunity | EN 55024:1998+A1+A2<br>IEC 61000-4-3 | Compliant 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<br>EN (IEC) 60825-1:2007<br>EN (IEC) 60825-2:2004+A1 | CDRH compliant and Class I laser product.<br>TьV Certificate No. 50135086 |
| Component Recognition | UL and CUL<br>EN60950-1:2006 | UL file E317337<br>TьV Certificate No. 50135086<br>(CB scheme ) |
| RoHS6 | 2002/95/EC 4.1&4.2<br>2005/747/EC 5&7&13 | Compliant with standards*note3 |

Note2: For update of the equipments and strict control of raw materials, SNR has the ability to supply the customized products since Jan 1st, 2007, which meet the requirements of RoHS6 (Restrictions on use of certain Hazardous Substances) of European Union.

In light of item 5 in RoHS exemption list of RoHS Directive 2002/95/EC, Item 5: Lead in glass of cathode ray tubes, electronic components and fluorescent tubes.

In light of item 13 in RoHS exemption list of RoHS Directive 2005/747/EC, Item 13: Lead and cadmium in optical and filter glass. The three exemptions are being concerned for SNR's transceivers, because SNR's transceivers use glass, which may contain Pb, for components such as lenses, windows, isolators, and other electronic components.

## Product Description

The SNR-SFP-WXX-3 series is small form factor pluggable module for Gigabit Ethernet 1000BASE-BX and Fiber Channel single fiber applications by using 1310nm / 1550nm transmitter and 1550nm / 1310nm receiver. It is with the SFP 20-pin connector to allow hot plug capability.

The transmitter section uses a multiple quantum well A type / B type laser and is a class 1 laser compliant according to International Safety Standard IEC 60825. The receiver section uses an integrated B type / A type detector preamplifier (IDP) mounted in an optical header and a limiting post-amplifier IC.

The SNR-SFP-WXX-3 series are designed to be compliant with SFF-8472 Multi-source Agreement (MSA).

## Absolute Maximum Ratings

| Parameter | Symbol | Min. | Max. | Unit |
|---|---|---|---|---|
| Storage Temperature | Ts | -40 | +85 | °C |
| Supply Voltage | Vcc | -0.5 | 3.6 | V |
| Operating Relative Humidity | | - | 95 | % |

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

## Recommended Operating Conditions

| Parameter | | Symbol | | Min. | Typical | Max. | Unit |
|---|---|---|---|---|---|---|---|
| Operating Case Temperature | | TA | SNR-SFP-WXX-3 | -5 | | +70 | °C |
| Power Supply Voltage | | Vcc | | 3.15 | 3.3 | 3.45 | V |
| Power Supply Current | | Icc | | | | 300 | mA |
| Date Rate | FE | | | | 100 | | Mbps |
| | FC | | | | 1.063 | | Gbps |
| | GBE | | | | 1.25 | | Gbps |

## Performance Specifications - Electrical

| Parameter | | Symbol | Min. | Typ. | Max | Unit | Notes |
|---|---|---|---|---|---|---|---|
| **Transmitter** | | | | | | | |
| LVPECL Inputs(Differential) | | Vin | 400 | | 2000 | mVpp | AC coupled inputs*(note5) |
| Input Impedance (Differential) | | Zin | 85 | 100 | 115 | ohm | Rin > 100 kohm @ DC |
| TX_Dis | Disable | | 2 | | Vcc+0.3 | V | |
| | Enable | | 0 | | 0.8 | | |
| TX_FAULT | Fault | | 2 | | Vcc+0.3 | V | |
| | normal | | 0 | | 0.5 | | |
| **Receiver** | | | | | | | |
| LVPECL Outputs (Differential) | | Vout | 400 | | 2000 | mVpp | AC coupled outputs*(note5) |
| Output Impedance (Differential) | | Zout | 85 | 100 | 115 | ohm | |
| RX_LOS | LOS | | 2 | | Vcc+0.3 | V | |
| | Normal | | 0 | | 0.8 | V | |
| MOD_DEF ( 0:2 ) | | VoH | 2.5 | | | V | With Serial ID |
| | | VoL | 0 | | 0.5 | V | |

## Optical and Electrical Characteristics

### (SNR-SFP-W35-3, 1310nm FP and PIN, 3km)

| Parameter | Symbol | Min. | Typical | Max. | Unit |
|---|---|---|---|---|---|
| 9μm Core Diameter SMF | L | | 3 | | km |
| Data Rate | | 100 | 1063/1250 | | Mbps |
| **Transmitter** | | | | | |
| Center Wavelength | $\lambda_C$ | 1260 | 1310 | 1360 | nm |
| Spectral Width (RMS) | Δλ | | | 4 | nm |
| Average Output Power*(note3) | Pout | -14 | | -10 | dBm |
| Extinction Ratio | ER | 9 | | | dB |
| Rise/Fall Time(20%～80%) | tr/tf | | | 0.26 | ns |
| Total Jitter | TJ | | | 260 | ps |
| Output Optical Eye*(note4) | Compliant with IEEE 802.3z*(note7) | | | | |
| TX_Disable Assert Time | t_off | | | 10 | us |
| $P_{out}$@TX Disable Asserted | Pout | | | -45 | dBm |
| **Receiver** | | | | | |
| Center Wavelength | $\lambda_C$ | 1500 | 1550 | 1580 | nm |
| Receiver Sensitivity*(note6) | Pmin | | | -22 | dBm |
| Receiver Overload | Pmax | -3 | | | dBm |
| LOS De-Assert@1250Mbps | LOSD | | | -25 | dBm |
| LOS De-Assert@100Mbps | | | | -29 | dBm |

| | | | | | |
|---|---|---|---|---|---|
| LOS Assert | LOSA | -42 | | | dBm |
| LOS Hysteresis*(note8) | | 0.5 | | | dB |

**(SNR-SFP-W53-3, 1550nm FP and PIN, 3km)**

| Parameter | Symbol | Min. | Typical | Max. | Unit |
|---|---|---|---|---|---|
| 9μm Core Diameter SMF | L | | 3 | | km |
| Data Rate | | 100 | 1063/1250 | | Mbps |
| **Transmitter** | | | | | |
| Center Wavelength | $\lambda_C$ | 1480 | 1550 | 1580 | nm |
| Spectral Width (RMS) | Δλ | | | 4 | nm |
| Average Output Power*(note3) | Pout | -14 | | -10 | dBm |
| Extinction Ratio | ER | 9 | | | dB |
| Rise/Fall Time(20%～80%) | $t_r/t_f$ | | | 0.26 | ns |
| Output Optical Eye*(note4) | Compliant with IEEE 802.3ah-2004*(note7) | | | | |
| TX_Disable Assert Time | t_off | | | 10 | us |
| $P_{out}$@TX Disable Asserted | Pout | | | -45 | dBm |
| **Receiver** | | | | | |
| Center Wavelength | $\lambda_C$ | 1260 | | 1600 | nm |
| Receiver Sensitivity*(note6) | Pmin | | | -22 | dBm |
| Receiver Overload | Pmax | -3 | | | dBm |
| Return Loss | | 12 | | | dB |
| Optical Path Penalty | | | | 1 | dB |
| LOS De-Assert@1250Mbps | LOSD | | | -25 | dBm |
| LOS De-Assert@100Mbps | | | | -29 | dBm |
| LOS Assert | LOSA | -45 | | | dBm |
| LOS Hysteresis*(note8) | | 0.5 | | | dB |

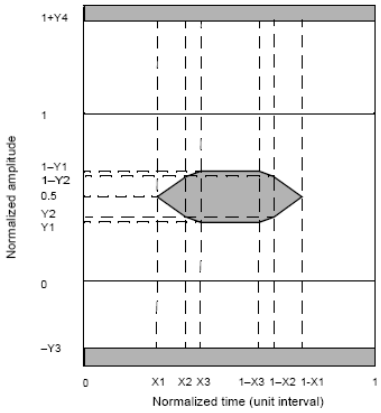
Note3: Output power is power coupled into a 9/125μm single-mode fiber.

Note4: Filtered, measured with a PRBS $2^7$-1.

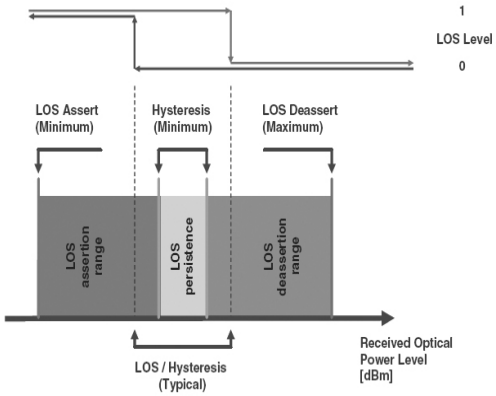
Note5: LVPECL logic, internally AC coupled.

Note6: Minimum average optical power measured at BER less than 1E-12, with a $2^7$-1 PRBS and ER=9 dB.

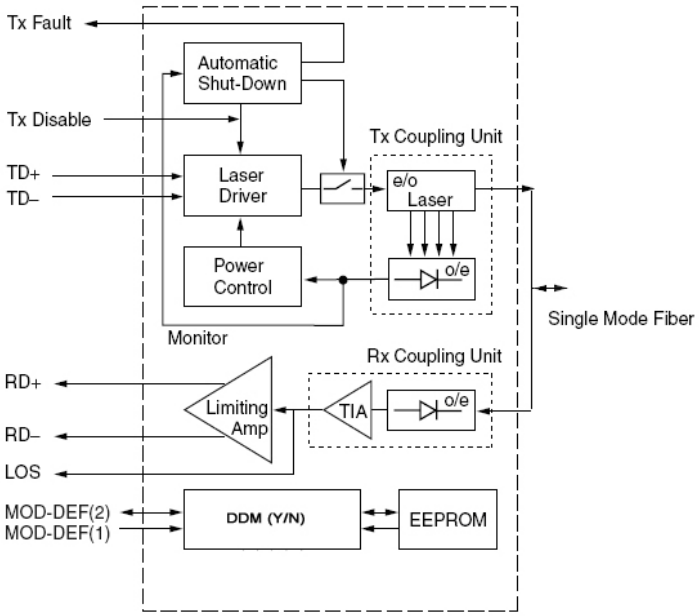
Note7: Eye Pattern Mask



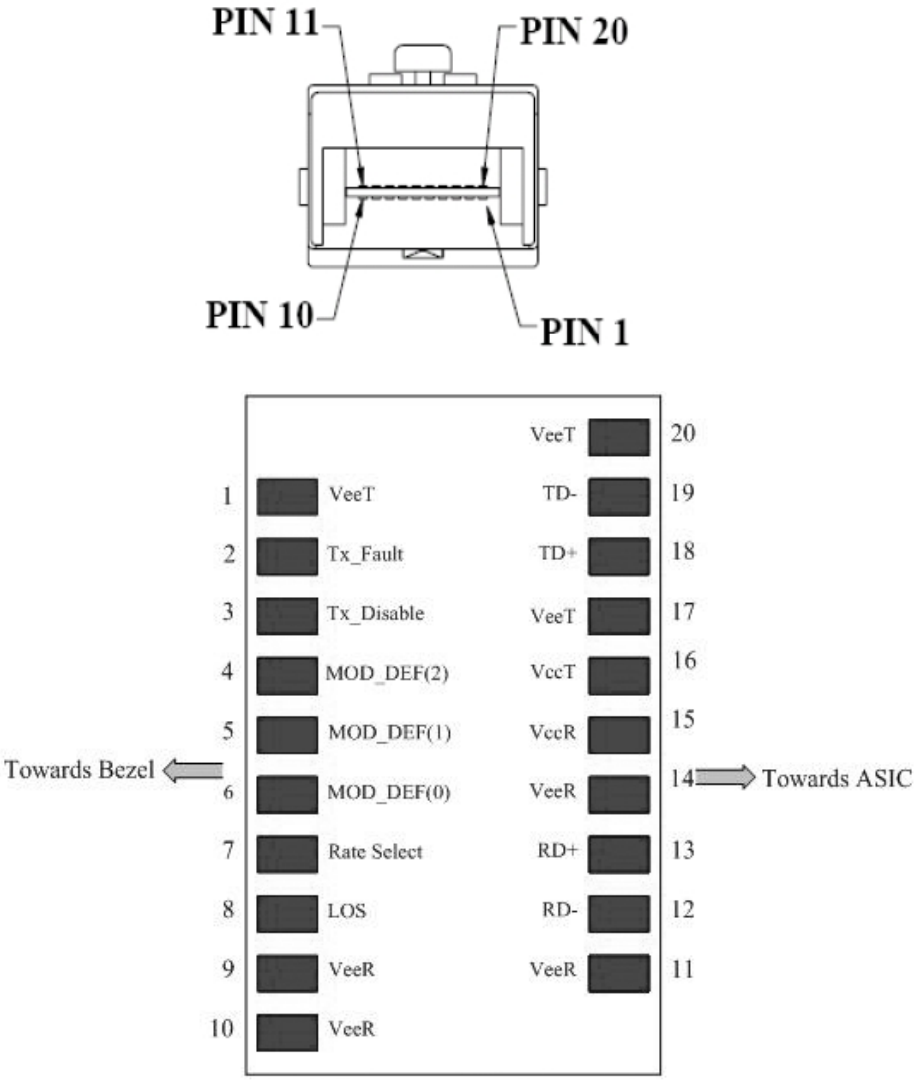

Note8: LOS Hysteresis




## Functional Description of Transceiver



## SFP Transceiver Electrical Pad Layout




## Pin Function Definitions

| Pin NO. | Name | Function | Plug | Notes |
|---|---|---|---|---|
| 1 | VeeT | Transmitter Ground | 1 | 5) |
| 2 | TX Fault | Transmitter Fault Indication | 3 | 1) |
| 3 | TX Disable | Transmitter Disable | 3 | 2) Module disables on high or open |
| 4 | MOD-DEF2 | Module Definition 2 | 3 | 3) Data line for Serial ID. |
| 5 | MOD-DEF1 | Module Definition 1 | 3 | 3) Clock line for Serial ID. |
| 6 | MOD-DEF0 | Module Definition 0 | 3 | 3) Grounded within the module. |
| 7 | Rate Select | Not Connect | 3 | Function not available |
| 8 | LOS | Loss of Signal | 3 | 4) |
| 9 | VeeR | Receiver Ground | 1 | 5) |

| | | | | |
|---|---|---|---|---|
| 10 | VeeR | Receiver Ground | 1 | 5) |
| 11 | VeeR | Receiver Ground | 1 | 5) |
| 12 | RD- | Inv. Received Data Out | 3 | 6) |
| 13 | RD+ | Received Data Out | 3 | 6) |
| 14 | VeeR | Receiver Ground | 1 | 5) |
| 15 | VccR | Receiver Power | 2 | 7) 3.3 ± 5% |
| 16 | VccT | Transmitter Power | 2 | 7) 3.3 ± 5% |
| 17 | VeeT | Transmitter Ground | 1 | 5) |
| 18 | TD+ | Transmit Data In | 3 | 8) |
| 19 | TD- | Inv. Transmit Data In | 3 | 8) |
| 20 | VeeT | Transmitter Ground | 1 | 5) |

## Notes:

1) TX Fault is an open collector/drain output, which should be pulled up with a 4.7K – 10KΩ resistor on the host board. Pull up voltage between 2.0V and VccT, R+0.3V. When high, output indicates a laser fault of some kind. Low indicates normal operation. In the low state, the output will be pulled to < 0.8V.

2) TX disable is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7 – 10 KΩ resistor. Its states are:
Low (0 – 0.8V): Transmitter on
(>0.8, < 2.0V): Undefined
High (2.0 – 3.465V): Transmitter Disabled
Open: Transmitter Disabled

3) Modulation Absent, connected to VEET or VEER in the module.

4) LOS (Loss of Signal) is an open collector/drain output, which should be pulled up with a 4.7K – 10KΩ resistor. Pull up voltage between 2.0V and VccT, R+0.3V. When high, this output indicates the received optical power is below the worst-case receiver sensitivity (as defined by the standard in use). Low indicates normal operation. In the low state, the output will be pulled to < 0.8V.

5) VeeR and VeeT may be internally connected within the SFP module.

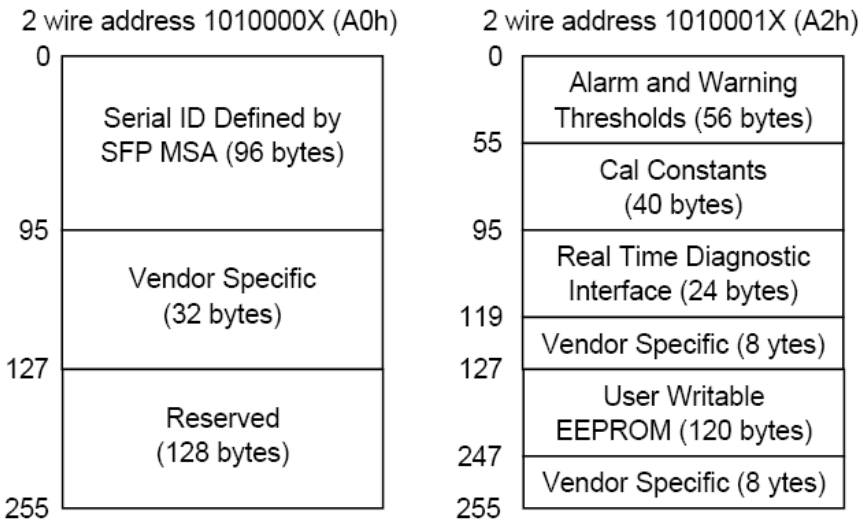
6) RD-/+: These are the differential receiver outputs. They are AC coupled 100Ω differential lines which should be terminated with 100Ω (differential) at the user SERDES. The AC coupling is done inside the module and is thus not required on the host board.

7) VccR and VccT are the receiver and transmitter power supplies. They are defined as 3.3V ±5% at the SFP connector pin. Maximum supply current is 300mA. Recommended host board power supply filtering is shown below. Inductors with DC resistance of less than 1 ohm should be used in order to maintain the required voltage at the SFP input pin with 3.3V supply voltage. When the recommended supply-filtering network is used, hot plugging of the SFP transceiver module will result in an inrush current of no more than 30mA greater than the steady state value. VccR and VccT may be internally connected within the SFP transceiver module.

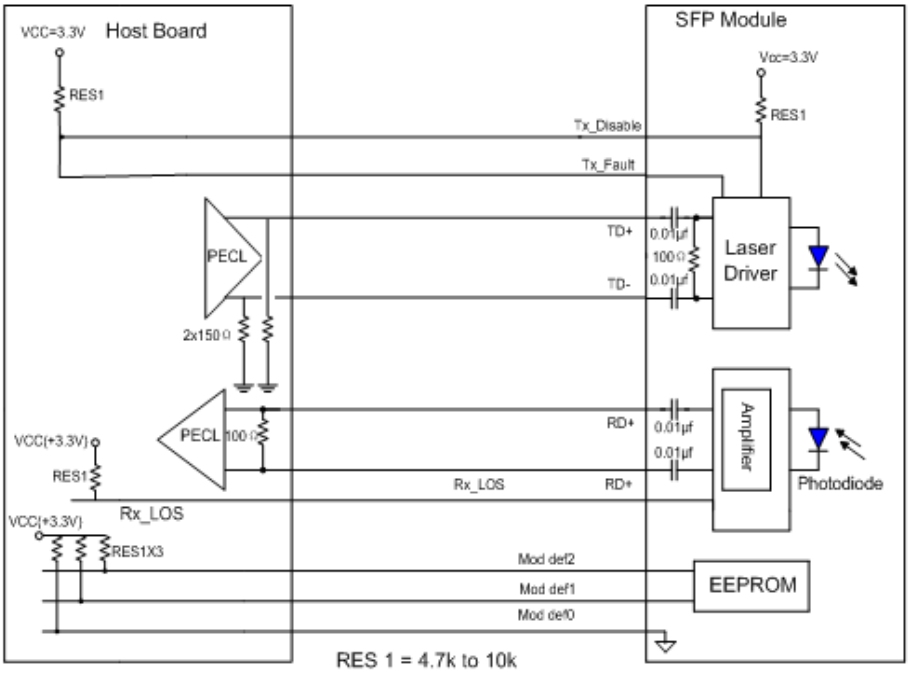
8) TD-/+: These are the differential transmitter inputs. They are AC-coupled, differential lines with 100Ω differential termination inside the module. The AC coupling is done inside the module and is thus not required on the host board.

## EEPROM

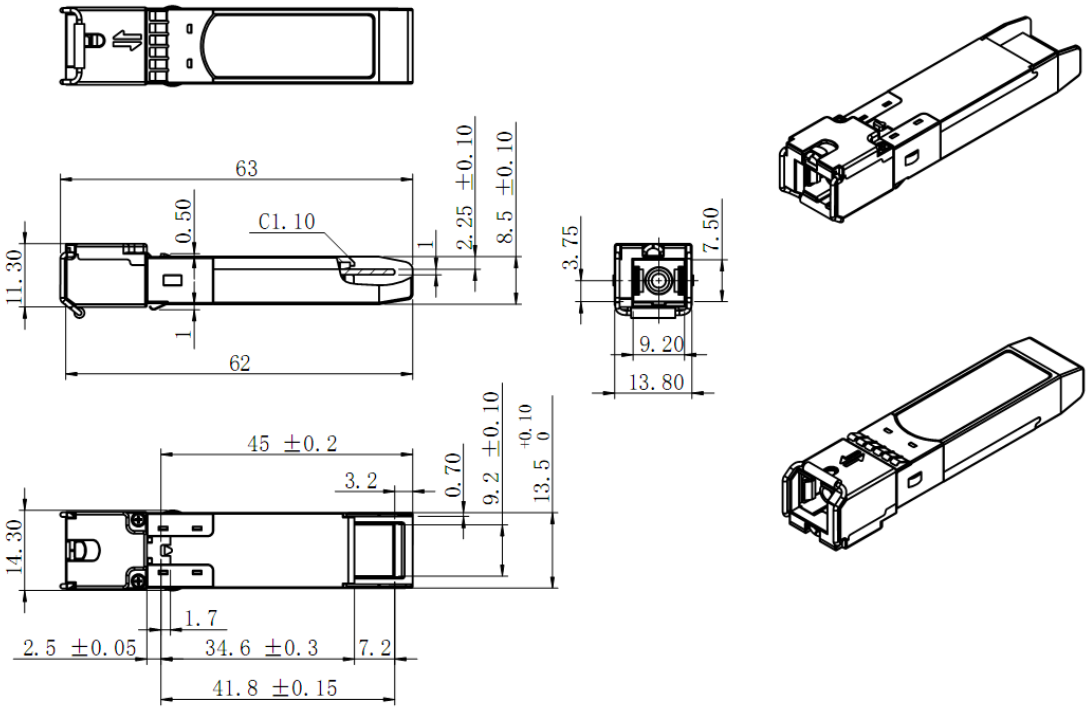
The serial interface uses the 2-wire serial CMOS EEPROM protocol defined for the ATMEL AT24C02/04 family of components. When the serial protocol is activated, the host generates the serial clock signal (SCL). The positive edge clocks data into those segments of the EEPROM that are not write protected within the SFP transceiver. The negative edge clocks data from the SFP transceiver. The serial data signal (SDA) is bi-directional for serial data transfer. The host uses SDA in conjunction with SCL to mark the start and end of serial protocol activation. The memories are organized as a series of 8-bit data words that can be addressed individually or sequentially.
The Module provides diagnostic information about the present operating conditions. The transceiver generates this diagnostic data by digitization of internal analog signals. Calibration and alarm/warning threshold data is written during device manufacture. Received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and temperature monitoring all are implemented. If the module is defined as external calibrated, the diagnostic data are raw A/D values and must be converted to real world units using calibration constants stored in EEPROM locations 56 – 95 at wire serial bus address A2H. The digital diagnostic memory map specific data field define as following .For detail EEPROM information, please refer to the related document of SFF 8472 Rev 9.3.



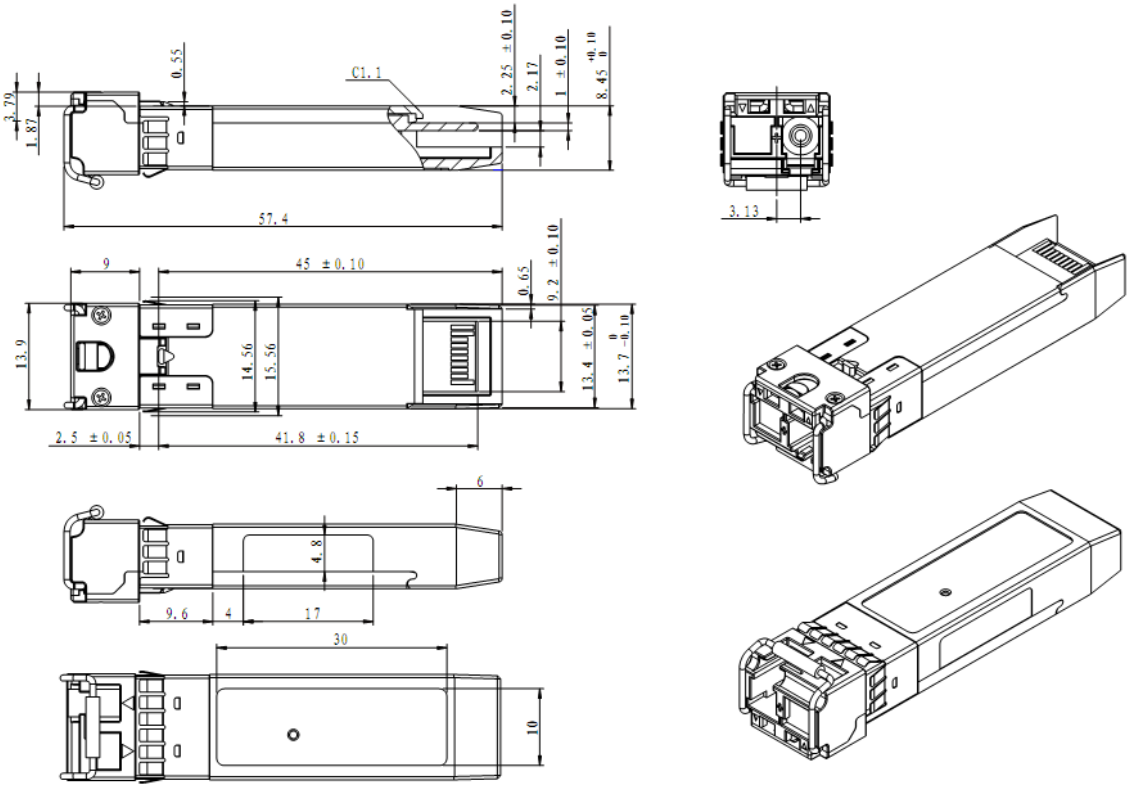
## Recommended Circuit Schematic



## Mechanical Specifications

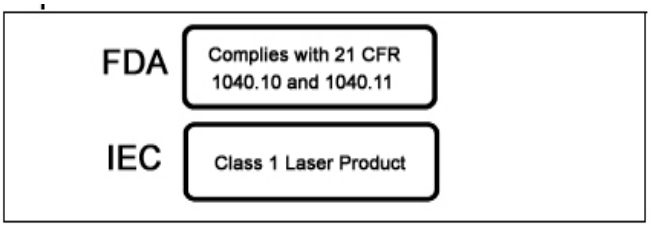



**SC**




**LC**

## Class 1 Labels

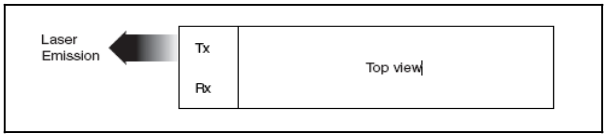



## Laser Emission Data

| Wavelength | 1310nm |
|---|---|
| Total output power (as defined by FDA: 7mm aperture at 20cm distance) | <0.195mW |
| Total output power (as defined by IEC: 7mm aperture at 10cm distance) | <15.6mW |
| Beam divergence | 12.5° |
| Wavelength | 1550nm |
| Total output power (as defined by FDA: 7mm aperture at 20cm distance) | <0.79mW |

| | |
|---|---|
| Total output power (as defined by IEC: 7mm aperture at 10cm distance) | <10mW |
| Beam divergence | 12.5° |

## Laser Emission

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## GUARANTEE:


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