# SPT-PBXX-X40D

# 155Mbps SFP Bi-Directional Transceiver,40km Reach

## 1310nm TX / 1550 nm RX & 1550nm TX / 1310 nm RX

## Features

- Up to155Mbps data rate
- Single +3.3V power supply
- Single LC receptacle optical
- Hot pluggable
- AC coupling of LVPECL signals
- Receiver Loss of Signal out
- Serial ID module on MOD(0~2)
- International Class 1laser safety certified
- Transmitter disable input
- Without DDM function
- RoHS compliant

## Applications

- SDH STM-1, S-1.1, L-1.1, L-1.2
- SONET OC-3 IR1, LR1, LR2
- Fast Ethernet
- Other optical links

## Description

The SFP-BIDI transceivers are high performance, cost effective modules supporting data-rate of 155Mbps and 40km transmission distance with SMF.

The transceiver consists of three sections: a LP or DFB laser transmitter, a PIN photodiode integrated with a trans-impedance preamplifier (TIA) and MCU control unit. All modules satisfy class I laser safety requirements.

The transceivers are compatible with SFP Multi-Source Agreement (MSA) and SFF-8472. For further information, please refer to SFP MSA.
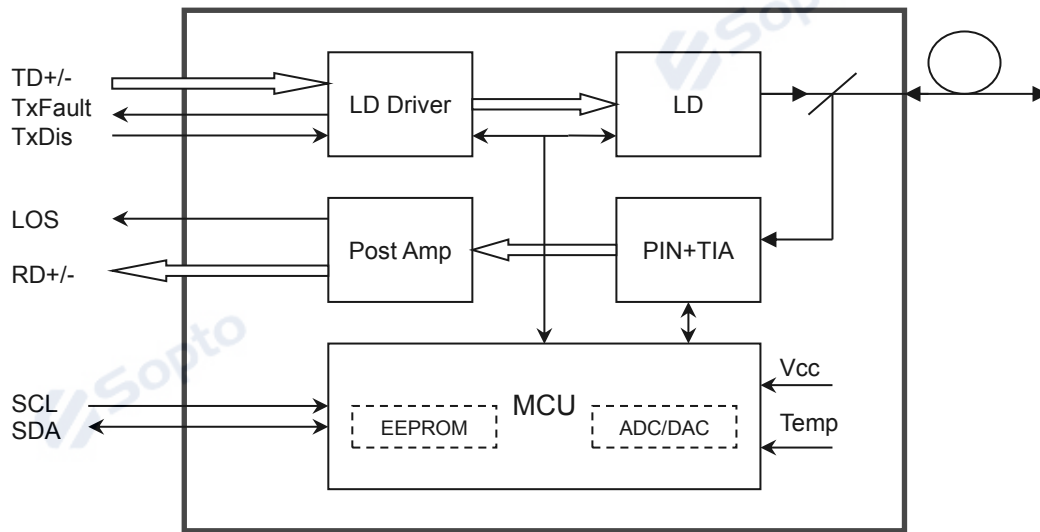
## Absolute Maximum Ratings

| Parameter | Symbol | Min | Max | Unit |
|---|---|---|---|---|
| Supply Voltage | Vcc | -0.5 | 4.5 | V |
| Storage Temperature | Ts | -40 | +85 | °C |
| Operating Humidity | - | 5 | 85 | % |

## Recommended Operating Conditions

| Parameter | | Symbol | Min | Typical | Max | Unit |
|---|---|---|---|---|---|---|
| Operating Case Temperature | Standard | Tc | 0 | | +70 | °C |
| Power Supply Voltage | | Vcc | 3.13 | 3.3 | 3.47 | V |
| Power Supply Current | | Icc | | | 160 | mA |
| Data Rate | | | | 155 | | Mbps |

## Optical and Electrical Characteristics

(Tested under recommended operating conditions, unless otherwise noted)

| Parameter | Symbol | Unit | Min | Typ | Max | Notes |
|---|---|---|---|---|---|---|
| **Electrical Characteristics** | | | | | | |
| Supply Current(TX+RX) | Icc | mA | | | 300 | |
| Single Ended Data Input Swing | | mV | 150 | | 1100 | |
| Single Ended Data Output Swing | | mV | 300 | | 600 | |
| TX_fault/LOS output(TTL) | $V_{OH}$ | V | 2.0 | | Vcc | |

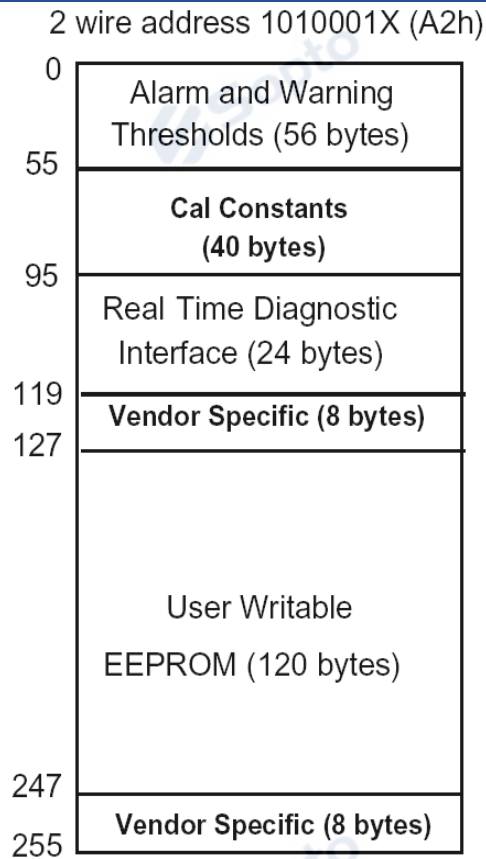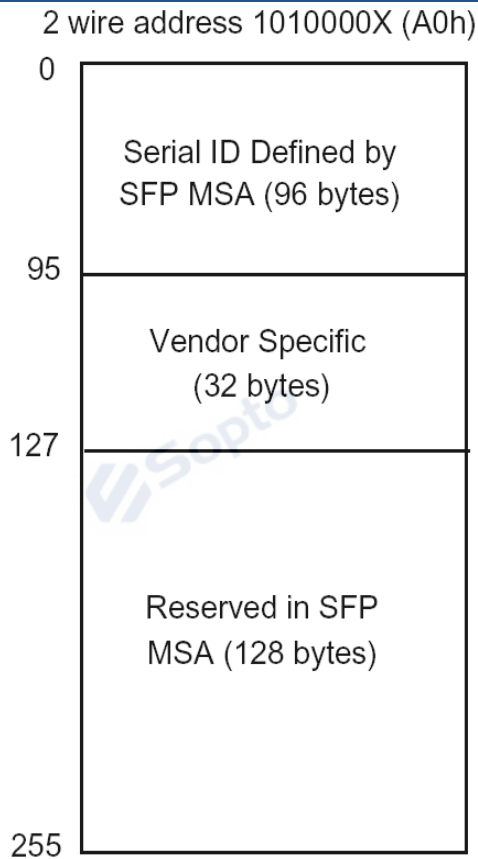| | | | | | | |
|---|---|---|---|---|---|---|
| | $V_{OL}$ | V | 0 | | 0.8 | |
| TX_disable input(TTL) | $V_{OH}$ | V | 2.0 | | Vcc | |
| | $V_{OL}$ | V | 0 | | 0.8 | |
| **Optical transmitter Characteristics** | | | | | | |
| Launch Optical Power | P0 | dBm | -9 | | -3 | |
| Center Wavelength Range | λc | nm | 1270 | 1310 | 1355 | 1310nmFP-LD |
| | | | 1500 | 1550 | 1580 | 1550nm DFB-LD |
| Spectral Width | Δλ | nm | | | 6 | 1310nmFP-LD |
| | | | | | 3 | 1550nm DFB-LD |
| Extinction Ratio | EXT | dB | 8.2 | 10 | | |
| Side Mode Suppression Ratio | SMSR | dB | 30 | | | DFB-LD |
| Relative Intensity Noise | RIN | dB/Hz | | | -116 | |
| **Optical receiver Characteristics** | | | | | | |
| Receiver Sensitivity | Sen | dBm | | | -35 | |
| Overload Input Optical Power | Pin | dBm | -3 | | | |
| LOS   Optical Dessert | | dBm | | | Sen | |
| LOS Optical Assert | | dBm | -40 | | | |
| LOS Hysteresis | | dB | 0.5 | 3 | 5 | |

Notes:

Optical transition time is the time interval required for the rising or falling edge of an optical pulse to transition between the 20% and 80% amplitudes relative to the logical 1 and 0 levels

## Digital Diagnostic Memory Map

The transceivers provide serial ID memory contents and diagnostic information about the present operating conditions by the 2-wire serial interface (SCL, SDA).

The diagnostic information with internal calibration or external calibration all are implemented, including received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and temperature monitoring.

The digital diagnostic memory map specific data field defines as following.

2 wire address 1010000X (A0h)

| | |
|---|---|
| 0 | |
| | Serial ID Defined by SFP MSA (96 bytes) |
| 95 | |
| | Vendor Specific (32 bytes) |
| 127 | |
| | Reserved in SFP MSA (128 bytes) |
| 255 | |

2 wire address 1010001X (A2h)

| | |
|---|---|
| 0 | Alarm and Warning Thresholds (56 bytes) |
| 55 | |
| | **Cal Constants (40 bytes)** |
| 95 | |
| | Real Time Diagnostic Interface (24 bytes) |
| 119 | |
| | **Vendor Specific (8 bytes)** |
| 127 | |
| | User Writable EEPROM (120 bytes) |
| 247 | |
| 255 | **Vendor Specific (8 bytes)** |

## EEPROM Serial ID Memoery Contents

| Data Address | Size (Bytes) | Name of Field | Contents(Hex) | Description |
|---|---|---|---|---|
| 0 | 1 | Identifier | 03 | SFP |
| 1 | 1 | Ext.Identifier | 04 | SFP function is defined by serial ID only |
| 2 | 1 | Connector | 07 | LC Connector |
| 3~10 | 8 | Transceiver | | Transceiver Codes |
| 11 | 1 | Encoding | 03 | NRZ |
| 12 | 1 | BR,Nominal | 01 | 155Mbit/s |
| 13 | 1 | Reserved | 00 | |
| 14 | 1 | Length(9um)km | | Transceiver transmit distance |
| 15 | 1 | Length(9um)100m | | |
| 16 | 1 | Length(50um)10m | | |
| 17 | 1 | Length62.5um)10m | | |
| 18 | 1 | Length(Copper) | 00 | Not compliant |

| | | | | |
|---|---|---|---|---|
| 19 | 1 | Reserved | 00 | |
| 20~35 | 16 | Vendor name | Not detailed | "SOPTO" ASSCII |
| 36 | 1 | Reserved | 00 | |
| 37~39 | 3 | Vendor OUI | 00 00 00 | |
| 40~55 | 16 | Vendor PN | Not detailed | Transceiver part number |
| 56~59 | 4 | Vendor rev | 20 20 20 | |
| 60~61 | 2 | wavelength | | Transceiver wavelength |
| 62 | 1 | Reserved | 00 | |
| 63 | 1 | CC_BASE | Check Sum(Variable) | Check code for Base ID Fields |
| EXTENDED ID FIELDS | | | | |
| 64~65 | 2 | Options | 00 1A | TX_DISABLE,TX_FAULT and LOSS of Signal implemented |
| 66 | 1 | BR,max | 00 | |
| 67 | 1 | BR,min | 00 | |
| 68~83 | 16 | Vendor SN | | Serial Number of transceiver (ASSCII) |
| 84~91 | 8 | Date code | | Manufactory date code |
| 92~94 | 3 | Reserved | 00 00 00 | |
| 95 | 1 | CC_EXT | Check Sum(Variable) | Check sum for Extended ID Field |
| VENDOR SPECIFIC ID FIELDS | | | | |
| 96~127 | 32 | Vendor Specific | Read only | Depends on customer information |
| 128~255 | 128 | Reserved | Read only | Filled by zero |

## PIN Definitions

Pin Diagram



**Top of Board**

**Bottom of Board (as viewed thru top of board)**
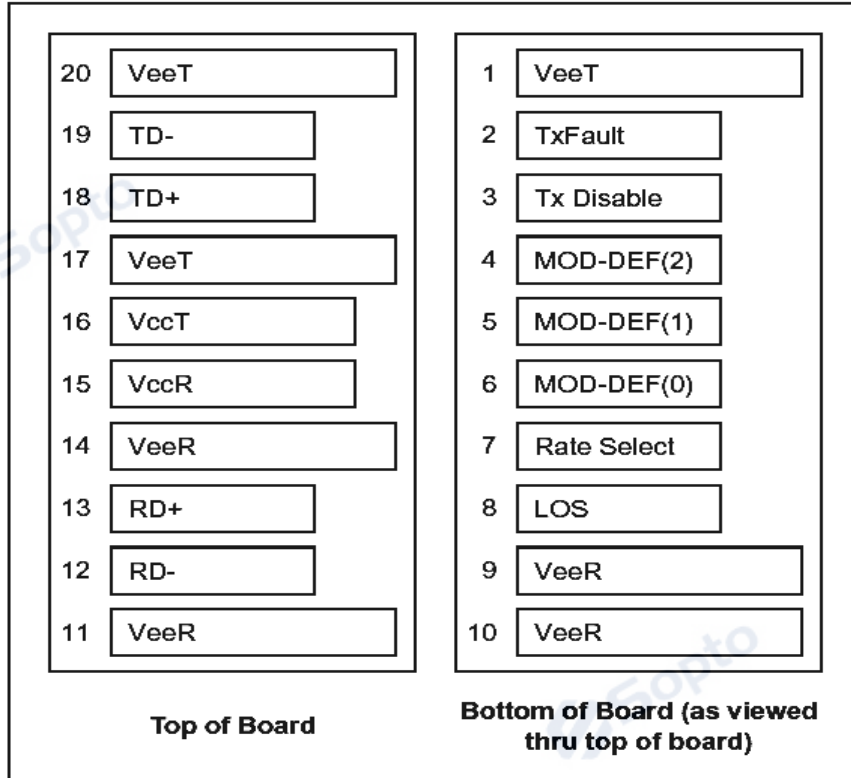
### Pin Descriptions

| Pin | Signal Name | Description | Plug Seq. | Notes |
|-----|-------------|-------------|-----------|-------|
| 1 | VEET | Transmitter Ground | 1 | |
| 2 | TX FAULT | Transmitter Fault Indication | 3 | Note 1 |
| 3 | TX DISABLE | Transmitter Disable | 3 | Note 2 |
| 4 | MOD_DEF(2) | SDA Serial Data Signal | 3 | Note 3 |
| 5 | MOD_DEF(1) | SCL Serial Clock Signal | 3 | Note 3 |
| 6 | MOD_DEF(0) | TTL Low | 3 | Note 3 |
| 7 | Rate Select | Not Connected | 3 | |
| 8 | LOS | Loss of Signal | 3 | Note 4 |
| 9 | VEER | Receiver ground | 1 | |
| 10 | VEER | Receiver ground | 1 | |
| 11 | VEER | Receiver ground | 1 | |
| 12 | RD- | Inv. Received Data Out | 3 | Note 5 |
| 13 | RD+ | Received Data Out | 3 | Note 5 |
| 14 | VEER | Receiver ground | 1 | |
| 15 | VCCR | Receiver Power Supply | 2 | |
| 16 | VCCT | Transmitter Power Supply | 2 | |
| 17 | VEET | Transmitter Ground | 1 | |
| 18 | TD+ | Transmit Data In | 3 | Note 6 |

| 19 | TD- | Inv. Transmit Data In | 3 | Note 6 |
| 20 | VEET | Transmitter Ground | 1 | |

Notes:

Plug Seq.: Pin engagement sequence during hot plugging.

1) TX Fault is an open collector output, which should be pulled up with a 4.7k~10kΩ resistor on the host board to a voltage between 2.0V and Vcc+0.3V. Logic 0 indicates normal operation; Logic 1 indicates a laser fault of some kind. In the low state, the output will be pulled to less than 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 4.7k~10kΩ resistor. Its states are:

Low (0 to 0.8V):                    Transmitter on
(>0.8V, < 2.0V):            Undefined
High (2.0 to 3.465V):       Transmitter Disabled
Open:                         Transmitter Disabled

3) Mod-Def 0,1,2. These are the module definition pins. They should be pulled up with a 4.7k~10kΩ resistor on the host board. The pull-up voltage shall be VccT or VccR.

Mod-Def 0 is grounded by the module to indicate that the module is present

Mod-Def 1 is the clock line of two wire serial interface for serial ID

Mod-Def 2 is the data line of two wire serial interface for serial ID

4) LOS is an open collector output, which should be pulled up with a 4.7k~10kΩ resistor. Pull up voltage between 2.0V and Vcc+0.3V. Logic 1 indicates loss of signal; Logic 0 indicates normal operation. In the low state, the output will be pulled to less than 0.8V.

5) RD-/+: These are the differential receiver outputs. They are internally AC-coupled 100 differential lines which should be terminated with 100Ω (differential) at the user SERDES.

6) TD-/+: These are the differential transmitter inputs. They are internally AC-coupled, differential lines with 100Ω differential termination inside the module.
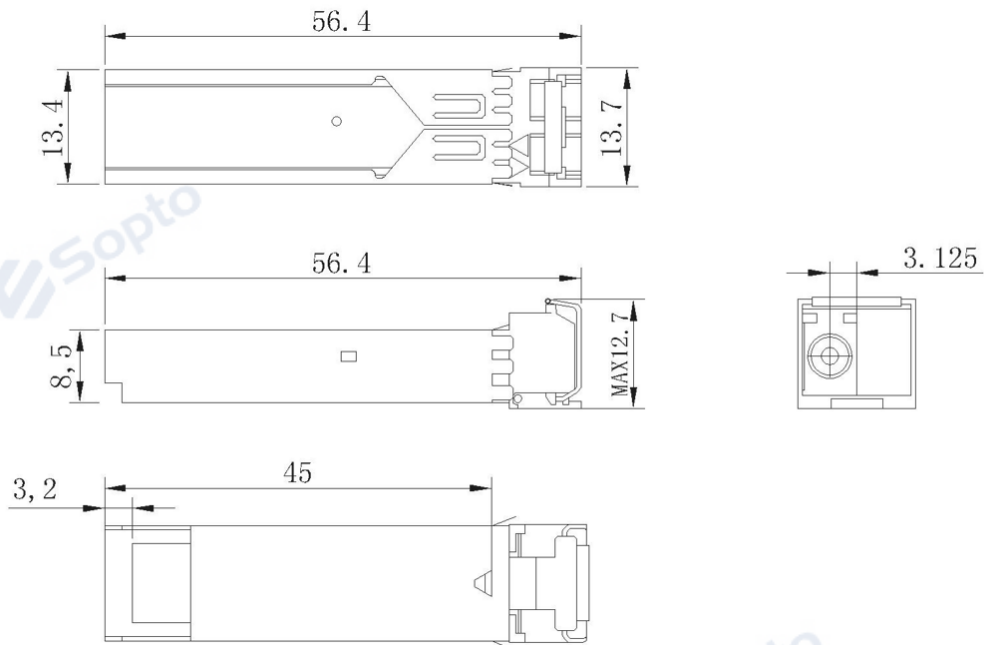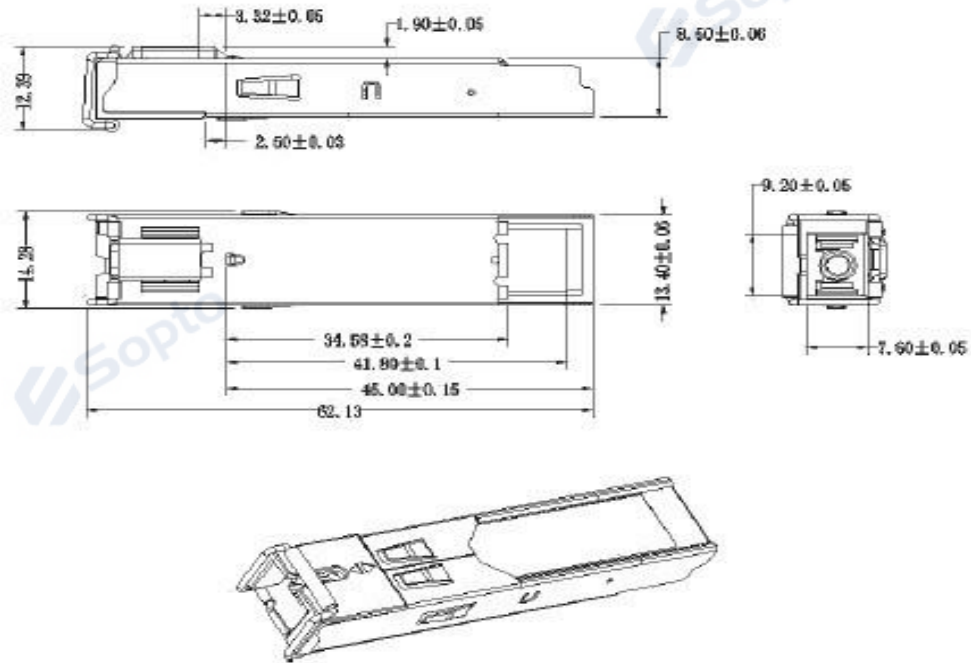
## Block Diagram
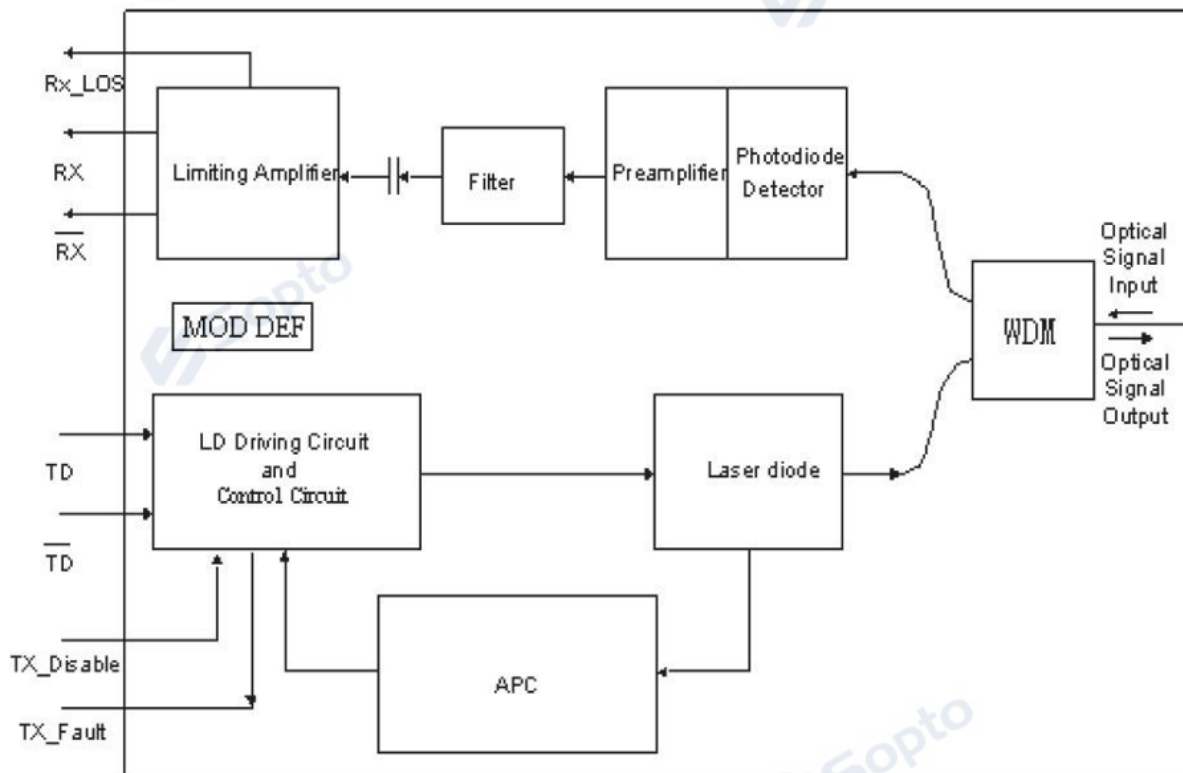
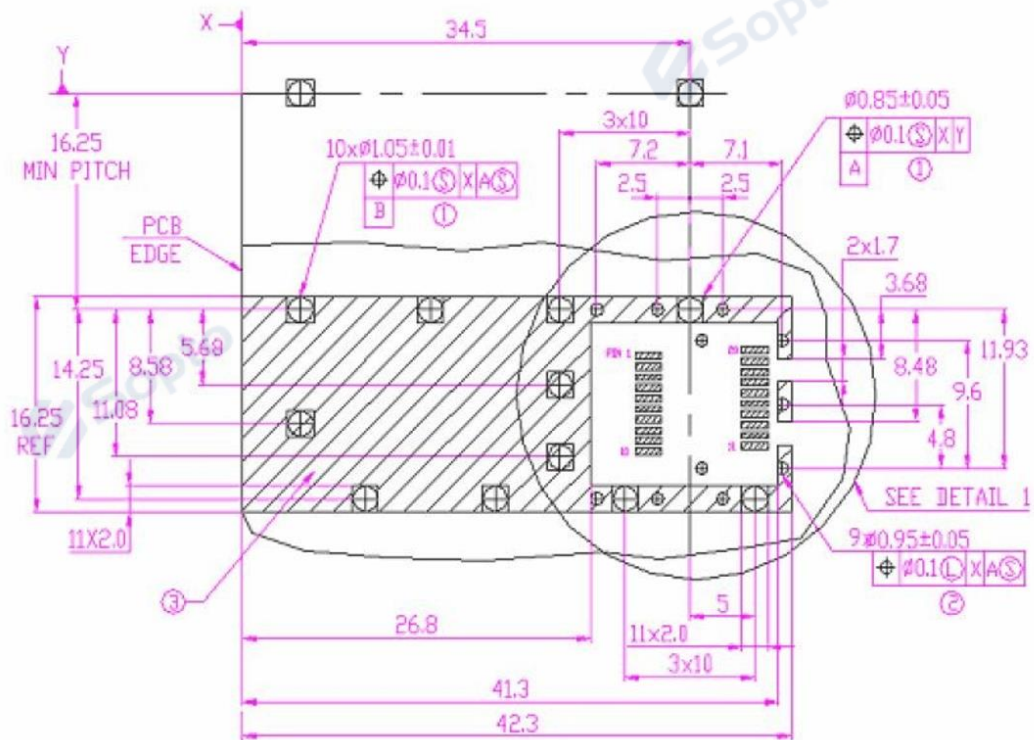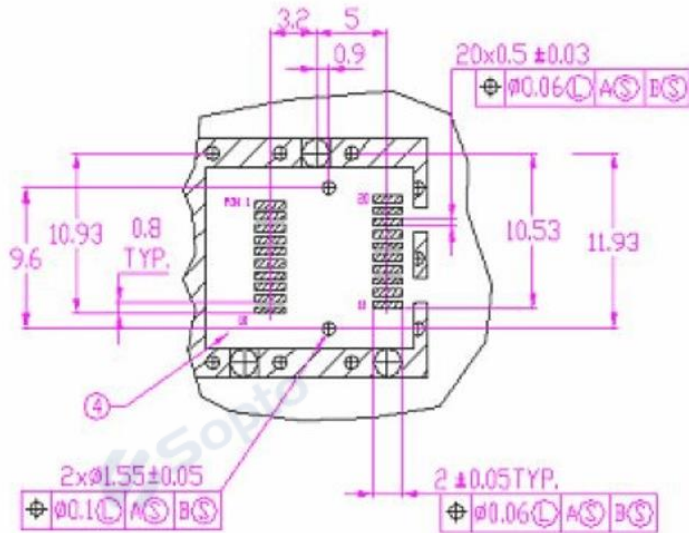## Typical Application Circuit
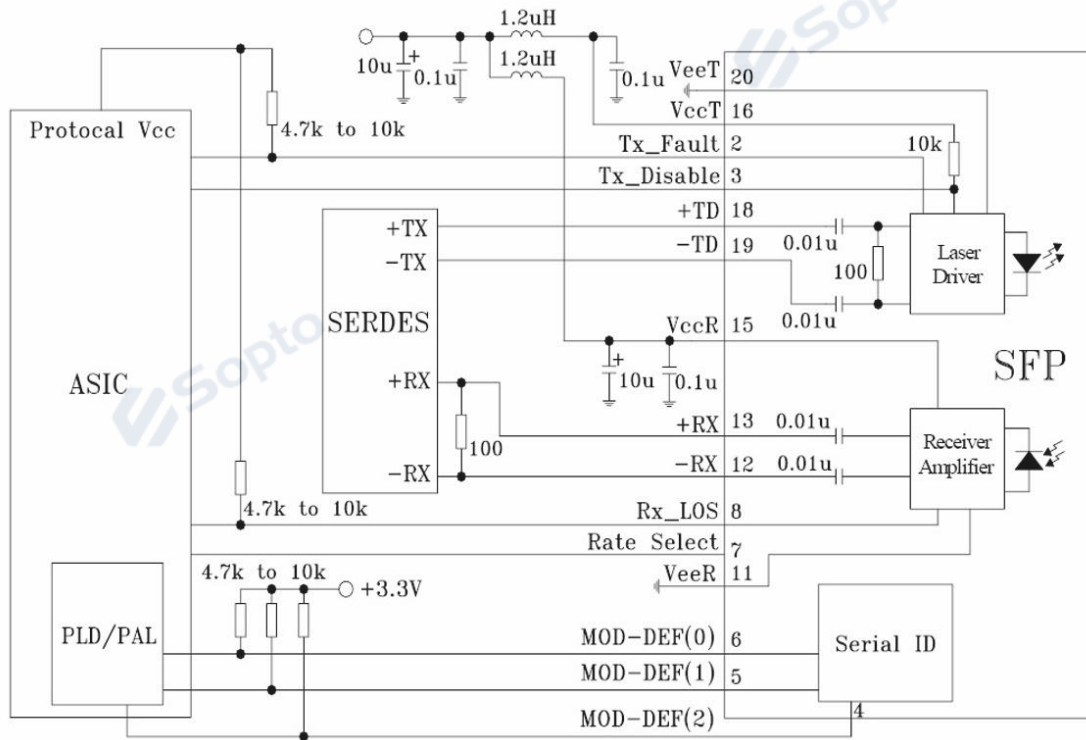


## Mechanical Dimensions

**A.LC**

**B.SC**



## PCB Layout Recommendation

DETAIL 1

NOTES:

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 IN MILLIMETERS

## Regulatory Compliance

| Feature | Test Method | Performance |
|---|---|---|
| Electrostatic Discharge (ESD)to the Electrical Pins | MIL-STD-833E Method 3015.7 | Class1(>1.5kV)-Human Body Model |
| Electrostatic Discharge (ESD) Immunity | IEC61000-4-2 | Class2(>4.0kV) |
| Electromagnetic | CISPR22 ITE Class B | Compliant with standard |
| Interference(EMI) | FCC Class B CENELEC EN55022 VCCI Class 1 | |
| Immunity | IEC61000-4-3 Class 2 | Typically show no measurable effect from a 3V/m field swept from 80 to 1000MHZ applied to the transceiver without a chassis enclosure. |
| Safety | FDA 0322110-00 CDRH 21-CFR 1040 Class1 | |
| | UL E239070 | |
| | TUV-GS B0501 54481 001 | |
| | CE E8 0501 54481 004 | |

## Odering Information

| Part Number | Product Description |
|---|---|
| 1310nm TX / 1550 nm RX | |
| SPT-PB3503-L40D | 1310nm Tx, 155Mbps, LC, 40km, 0°C~+70°C, With DDM |
| SPT-PB3503-S40D | 1310nm Tx, 155Mbps, SC, 40km, 0°C~+70°C, With DDM |
| 1550nm TX / 1310 nm RX | |
| SPT-PB5303-L40D | 1550nm Tx, 155Mbps , LC, 40km, 0°C ~ +70°C, With DDM |
| SPT-PB5303-S40D | 1550nm Tx, 155Mbps , SC, 40km, 0°C ~ +70°C, With DDM |

Note:

1、 Default operating case temperature is 0 ~ 70℃. If you need -40 ~85℃ products , please contact us.

2、 If you need more customized services, please contact us.

E-mail:  **info@sopto.com.cn**

Web   :   **http://www.sopto.com.cn**