# SFPP-AT-LP-XXXX-60D 10 Gb/s BIDI SFP+ 60 km Transceiver


- **Up to 11.1 Gbps data links**
- **Up to 60 km transmission on SMF**
- **Power dissipation < 1.5W**
- **1270 nm DFB laser and APD receiver for SFPP-AT-LP-2733-60D**
  **1330 nm DFB laser and APD receiver for SFPP-AT-LP-3327-60D**
- **2-wire interface with integrated Digital Diagnostics Monitoring**
- **EEPROM with serial ID functionality**
- **Hot-pluggable SFP+ footprint**
- **Compliant with SFP+ MSA with LC connector**
- **Single + 3.3V power supply**
- **Case operating temperature: 0 ~ 70°C**

SFPP-AT-LP-XXXX-60D is a hot pluggable 3.3V small form-factor pluggable transceiver module. It is designed expressly for high-speed communication applications that require rates up to 11.1 Gb/s, and is compliant with SFF-8472 SFP+ MSA. The module data link can handle distances up to 60 km with a 9/125 µm single-mode fiber.

ASCENT SFPP-AT-LP-XXXX-60D transceivers support the 2-wire serial communication protocol defined in the SFP+MSA.

The standard SFP serial ID provides access to identification information that describes the transceiver's capabilities, standard interfaces, manufacturer, and other information.

ASCENT SFP+ transceivers provide a unique enhanced digital diagnostic monitoring interface, which allows real-time access to device operating parameters such as transceiver temperature, laser bias current, transmitted optical power, received optical power, and transceiver supply voltage. It also defines a sophisticated system of alarms and warning flags, which can alert end-users when particular operating parameters are outside of a factory set normal range.

The SFP+ MSA defines a 256-byte memory map in EEPROM that is accessible over a 2-wire serial interface at the 8 bit address 1010000X (A0h). The digital diagnostic monitoring interface makes use of the 8-bit address 1010001X (A2h), so the originally defined serial ID memory map remains unchanged.

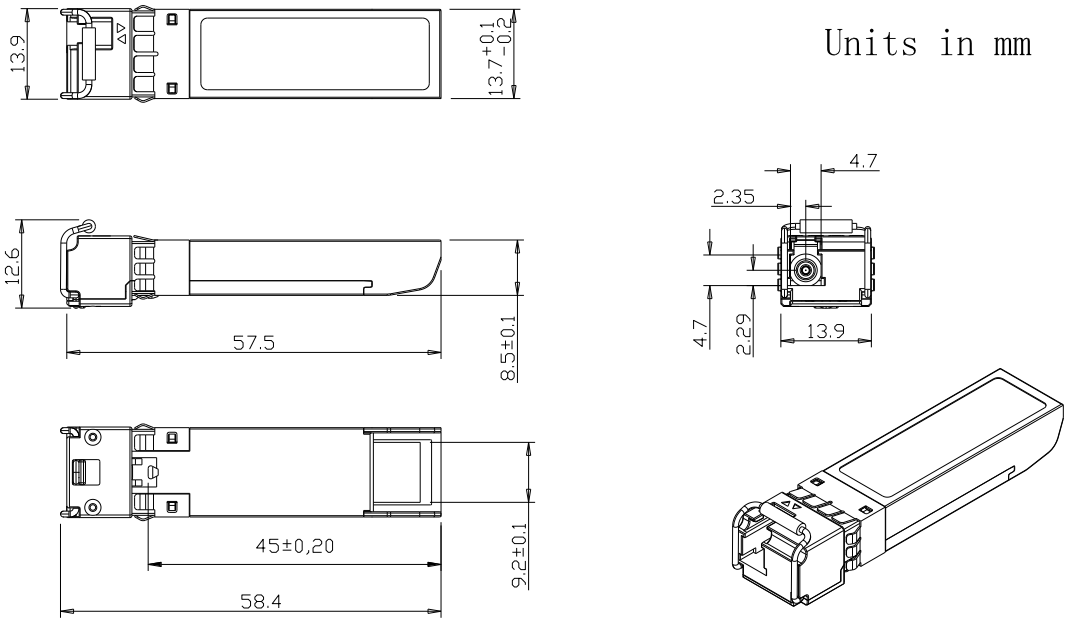
Operational and diagnostics information is monitored and reported by a Digital Diagnostics Transceiver Controller (DDTC) inside the transceiver, which is accessed through a 2-wire serial interface. When the serial protocol is activated, the serial clock signal (SCL, Mod Def 1) is generated by the host. The positive edge clocks data into the SFP transceiver in the segments of the E2PROM that are not write-protected. The negative edge clocks data from the SFP transceiver. The serial data signal (SDA, Mod Def 2) 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.

## Key Features

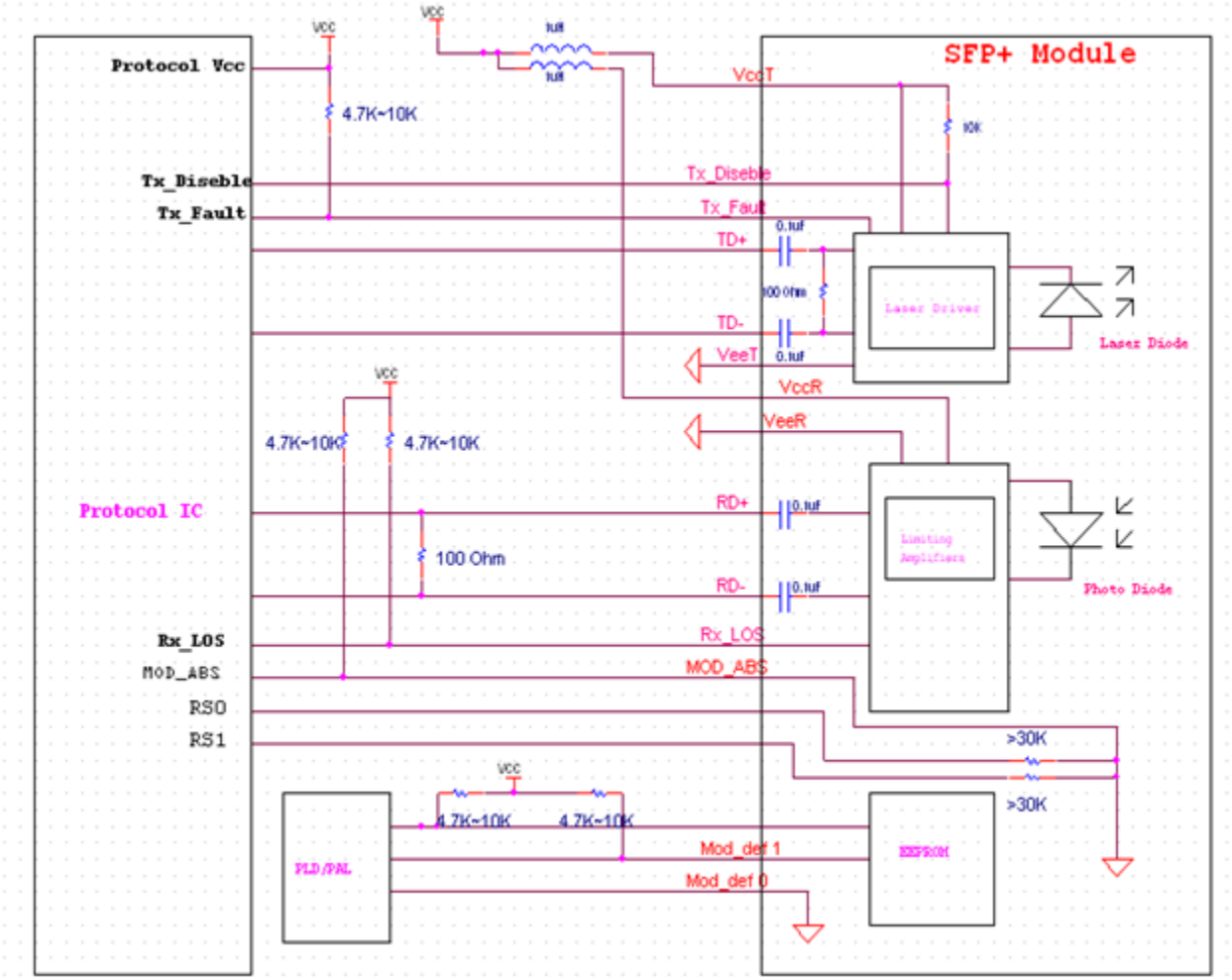
- Applicable for 10GBASE-BX networks
- Compliant with SFF-8472
- Compliant with SFF-8431
- RoHS compliant

## Outline Dimensions

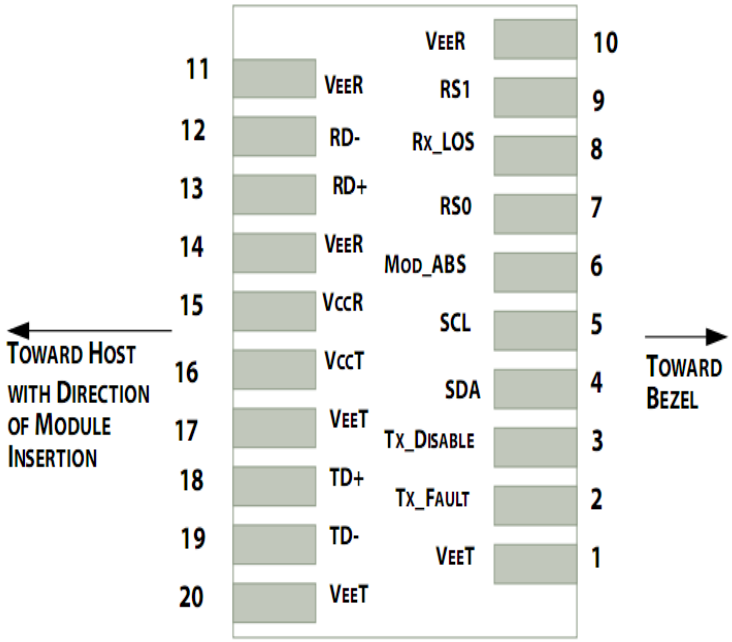
Units in mm



## Recommended Interface Circuit



## Pin Descriptions




**Pin Out of Connector Block on Host Board**

| Pin | Symbol | Name/Description | NOTE |
|---|---|---|---|
| 1 | $V_{EET}$ | Transmitter Ground (Common with Receiver Ground) | 1 |
| 2 | $T_{FAULT}$ | Transmitter Fault | 2 |
| 3 | $T_{DIS}$ | Transmitter Disable. Laser output disabled on high or open. | 3 |
| 4 | SDA | 2-wire Serial Interface Data Line | 4 |
| 5 | SCL | 2-wire Serial Interface Clock Line | 4 |
| 6 | MOD_ABS | Module Absent. Grounded within the module | 4 |
| 7 | RS0 | Rate Select 0 | 5 |
| 8 | LOS | Loss of Signal indication. Logic 0 indicates normal operation. | 6 |
| 9 | RS1 | No connection required | 1 |
| 10 | $V_{EER}$ | Receiver Ground (Common with Transmitter Ground) | 1 |
| 11 | $V_{EER}$ | Receiver Ground (Common with Transmitter Ground) | 1 |
| 12 | RD- | Receiver Inverted DATA out. AC Coupled. | |
| 13 | RD+ | Receiver Non-inverted DATA out. AC Coupled. | |
| 14 | $V_{EER}$ | Receiver Ground (Common with Transmitter Ground) | 1 |
| 15 | $V_{CCR}$ | Receiver Power Supply | |
| 16 | $V_{CCT}$ | Transmitter Power Supply | |
| 17 | $V_{EET}$ | Transmitter Ground (Common with Receiver Ground) | 1 |

| | | | |
|---|---|---|---|
| 18 | TD+ | Transmitter Non-Inverted DATA in. AC Coupled. | |
| 19 | TD- | Transmitter Inverted DATA in. AC Coupled. | |
| 20 | $V_{EET}$ | Transmitter Ground (Common with Receiver Ground) | 1 |

**Notes:**

1. Circuit ground is internally isolated from chassis ground.
2. $T_{FAULT}$ is an open collector/drain output, which should be pulled up with a 4.7kΩ – 10 kΩ resistor on the host board if intended for use. Pull up voltage should be between 2.0V to Vcc + 0.3V.A high output indicates a transmitter fault caused by either the TX bias current or the TX output power exceeding the preset alarm thresholds. A low output indicates normal operation. In the low state, the output is pulled to <0.8V.
3. Laser output disabled on $T_{DIS}$ >2.0V or open, enabled on $T_{DIS}$ <0.8V.
4. Should be pulled up with 4.7kΩ- 10kΩ on host board to a voltage between 2.0V and 3.6V. MOD_ABS pulls line low to indicate module is plugged in.
5. Internally pulled down per SFF-8431 Rev 4.1.
6. LOS is open collector output. It should be pulled up with 4.7kΩ – 10kΩ on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.

## Specifications

| Parameter | Symbol | Value | Notes |
|---|---|---|---|
| **Absolute Maximum Ratings** | | | |
| Storage Temperature | Ts | -40 ~ 85°C | |
| Relative Humidity | RH | 5 ~ 95% | |
| Power Supply Voltage | VCC | -0.3 ~ 4V | |
| Signal Input Voltage | | Vcc – 0.3 ~ Vcc + 0.3 | |
| **Recommended Operating Conditions** | | | |
| Case Operating Temperature | Tcase | -5 ~ 70°C | Without air flow |
| Power Supply Voltage | VCC | 3.14 ~ 3.47V, 3.3V typical | |
| Power Supply Current | ICC | 450 mA maximum | |
| Data Rate | BR | 10.3125 Gbps | |
| Transmission Distance | TD | 60 km | |
| Coupled Fiber | Single-mode fiber | | 9/125 µm SMF |
| **Optical Characteristics** | | | |
| **Transmitter** | | | |
| Average Launched Power | PO | 0 ~ 5 dBm | |
| Average Launched Power(Laser Off) | Poff | -30 dBm maximum | Note (1) |
| Center Wavelength Range | λC | 1260 ~ 1280 nm, 1270 nm typical | SFPP-AT-LP-2733-60D |
| | | 1320 ~ 1340 nm, 1330 nm typical | SFPP-AT-LP-3327-60D |
| Side Mode Suppression Ratio | SMSR | 30 dB minimum | |
| Spectrum Bandwidth (-20 dB) | σ | 1 nm maximum | |
| Extinction Ratio | ER | 3.5 dB minimum | Note (2) |
| Output Eye Mask | Compliant with IEEE 802.3ae | | Note (2) |
| **Receiver** | | | |
| Input Optical Wavelength | λIN | 1320 ~ 1340 nm, 1330 nm typical | SFPP-AT-LP-2733-60D |
| | | 1260 ~ 1280 nm, 1270 nm typical | SFPP-AT-LP-3327-60D |
| Receiver Sensitivity | Psen | -20 dBm maximum | Note (3) |
| Input Saturation Power (Overload) | PSAT | -6 dBm minimum | Note (3) |
| LOS -Assert Power | PA | -35 dBm minimum | |
| LOS -Deassert Power | PD | -21 dBm maximum | |
| LOS -Hysteresis | PHys | 0.5 ~ 5 dB | |
| **Electrical Interface Characteristics** | | | |
| Total power supply current | Icc | 450 mA maximum | |
| **Transmitter** | | | |
| Differential Data Input Voltage | VDT | 180 ~ 700 mVp-p | |
| Differential line input Impedance | RIN | 85 ~ 115 Ω, 100 Ω typical | |
| Transmitter Fault Output-High | VFaultH | 2.4V ~ Vcc | |
| Transmitter Fault Output-Low | VFaultL | -0.3 ~ 0.8V | |
| Transmitter Disable Voltage- High | VDisH | 2V ~ Vcc + 0.3 | |
| Transmitter Disable Voltage- low | VDisL | -0.3 ~ +0.8V | |
| **Receiver** | | | |
| Differential Data Output Voltage | VDR | 300 ~ 850 mVp-p | |
| Differential line Output Impedance | ROUT | 80 ~ 120 Ω, 100 Ω typical | |
| Receiver LOS Pull up Resistor | RLOS | 4.7 ~ 10 kΩ | |
| Data Output Rise/Fall time | tr/tf | 38 ps maximum | |
| LOS Output Voltage-High | VLOSH | 2V ~ Vcc | |
| LOS Output Voltage-Low | VLOSL | -0.3 ~ +0.4V | |

Notes:

1. The optical power is launched into SMF
2. Measured with RPBS 2^31-1 test pattern @10.3125 Gbs
3. Measured with RPBS 2^31-1 test pattern @10.3125 Gbs BER=<10^-12

## Regulatory Compliance

| Feature | Reference | Performance |
|---|---|---|
| Electrostatic discharge（ESD） | IEC/EN 61000-4-2 | Compatible with standards |
| Electromagnetic Interference (EMI) | FCC Part 15 Class B EN 55022 Class B (CISPR 22A) | Compatible with standards |
| Laser Eye Safety | FDA 21CFR 1040.10, 1040.11 IEC/EN 60825-1, 2 | Class 1 laser product |
| Component Recognition | IEC/EN 60950, UL | Compatible with standards |
| ROHS | 2002/95/EC | Compatible with standards |
| EMC | EN61000-3 | Compatible with standards |

## Ordering Information

| Product Part Number | Data Rate (Gbps) | Media | Wavelength (nm) | Transmission Distance (km) | Temperature Range ($T_{case}$) (°C) | |
|---|---|---|---|---|---|---|
| SFPP-AT-LP-2733-60D | 10.3125 | Single-mode fiber | 1270/1330 | 60 | -5 ~ 70 | Commercial |
| SFPP-AT-LP-3327-60D | 10.3125 | Single-mode fiber | 1330/1270 | 60 | -5 ~ 70 | Commercial |

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