# Specification

## Small Form Factor Pluggable

Simplex LC Receptacle – SFP BIDI

## ONU - Bidirectional Optical Transceivers

STM-1 / OC-3 / 100BASE-BX10-U
155.52Mbit/s



## Ordering Information

**T B D - S x A A 1 - G 1 1**

**Category**
BD : DDMI Product

**Voltage / Temperature**
1 : 3.3V / +0℃~ +70℃
2 : 3.3V / -40 ℃~ +85℃

| Model Name | Voltage | Category | Device type | Interface | SD/LOS | Temperature | Distance | Latch Color |
|---|---|---|---|---|---|---|---|---|
| TBD-S1AA1-G11 | 3.3V | With DDMI | FP / PIN | AC / AC Coupling | LVTTL | +0°C ~ +70°C | 20km | Blue |
| TBD-S2AA1-G11 | | | | | | -40°C ~ +85°C | | |

## Features

- ROHS Compliant
- Standard Small Form Factor Pluggable Package – SFP MSA Compliant
- Digital Diagnostic SFF-8472 Rev.10.2 Compliant
- SONET/SDH Standard Compliant
- IEEE802.3AH 100BASE-BX10-U Compliant
- Laser Class 1 Product –IEC/EN 60825-1 Compliant
- Standard Simplex LC Receptacle Optical Interface
- Single Fiber and Full Duplex Solution – Integrated WDM Filter
- Single + 3.3 V Power Supply
- Differential LVPECL Data Input and Output
- LVTTL Loss of Signal
- Serial ID through $I^2C$ Interface
- Low Power Consumption

## Absolute Maximum Ratings

| Parameter | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| Storage temperature | $T_S$ | -40 | -- | 85 | °C |
| Supply voltage | $V_{CC}$ | 0 | -- | 4 | V |
| Operating Relative Humidity | -- | 5 | -- | 95 | % |
| Input voltage | $V_{IN}$ | 0 | -- | $V_{CC}$ | V |

## Operating Conditions

| Parameter | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| Supply Voltage | $V_{CC}$ | 3.1 | 3.3 | 3.5 | V |
| Operating Case temperature ( TBD-S1AA1-G11 ) | Top | 0 | -- | 70 | °C |
| Operating Case temperature ( TBD-S2AA1-G11 ) | | -40 | -- | 85 | |
| Total Current ( Transmitter + Receiver ) | Icc | -- | -- | 250 | mA |

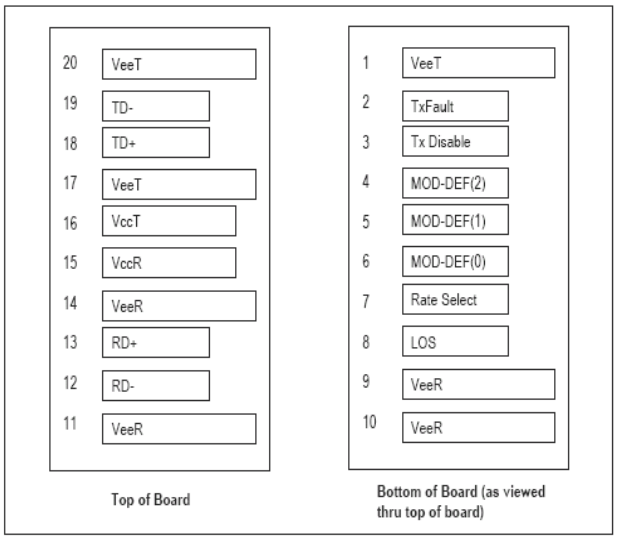
## Transmitter Specifications ( $V_{CC}$=3.1V~3.5V ; Top= 0°C~70°C / Top= -40°C~85°C )

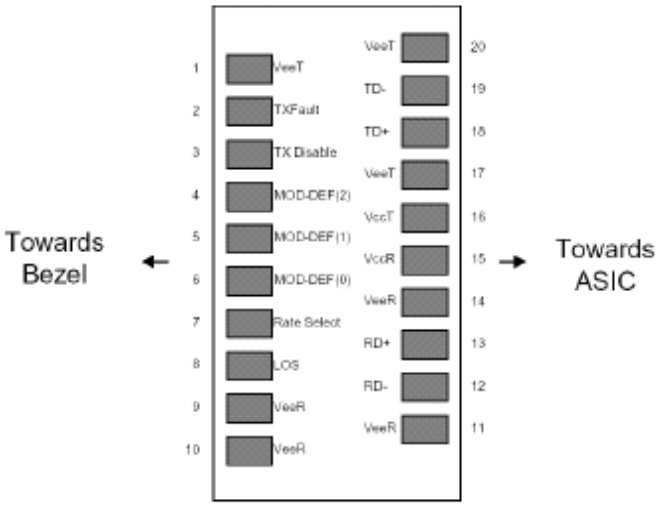
| Parameter | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| **Optical Characteristics** | | | | | |
| Output Optical Power | $P_o$ | -14 | -- | -8 | dBm |
| Extinction Ratio | ER | 9 | -- | -- | dB |
| Center Wavelength | λ | 1260 | 1310 | 1360 | nm |
| Spectral Width (RMS) | σλ | -- | -- | 7.7 | nm |
| Rise/Fall time (10-90%) | $T_{r,f}$ | -- | -- | 2 | ns |
| Output Eye | Compliant with ITU-T G.957 | | | | |
| Max. $P_{out}$ TX-DISABLE Asserted | $P_{OFF}$ | -- | -- | -45 | dBm |
| **Electrical Characteristics** | | | | | |
| Differential Input Voltage | $V_{DIFF}$ | 0.4 | -- | 2.0 | V |
| Tx_Disable_Input_High | $V_{DISH}$ | 2.0 | -- | $V_{CC}$+0.3 | V |
| Tx_Disable_Input_Low | $V_{DISL}$ | 0 | -- | 0.8 | V |
| Tx_Fault_Output_High | $V_{FH}$ | 2.0 | -- | $V_{CC}$+0.3 | V |
| Tx_Fault_Output_Low | $V_{FL}$ | 0 | -- | 0.8 | V |

## Receiver Specifications ( $V_{CC}$=3.1V~3.5V ; Top= 0°C~70°C / Top= -40°C~85°C )

| Parameter | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| **Optical Characteristics** | | | | | |
| Optical Input Power-maximum | $P_{SATIN}$ | -3 | -- | -- | dBm |
| Receiver Sensitivity ( PRBS=$2^{23}$-1 ; BER≦$10^{-12}$ ) | $P_{SAN}$ | -- | -- | -32 | dBm |
| Operating Center Wavelength | $\lambda_c$ | 1480 | -- | 1600 | nm |
| Optical Return Loss | ORL | 14 | -- | -- | dB |
| Loss of Signal – De-asserted | $P_{LD}$ | -- | -- | -32 | dBm |
| Loss of Signal - Asserted | $P_{LA}$ | -45 | -- | -- | dBm |
| Loss of Signal - Hysteresis | $P_{LH}$ | 0.5 | -- | 6 | dB |
| **Electrical Characteristics** | | | | | |
| Differential Output Voltage | $V_{DIFF}$ | 0.4 | -- | 2.0 | V |
| Receiver Loss of Signal Output Voltage -Low | $V_{LOSL}$ | 0 | -- | 0.8 | V |
| Receiver Loss of Signal Output Voltage -High | $V_{LOSH}$ | 2 | -- | $V_{CC}$+0.3 | V |

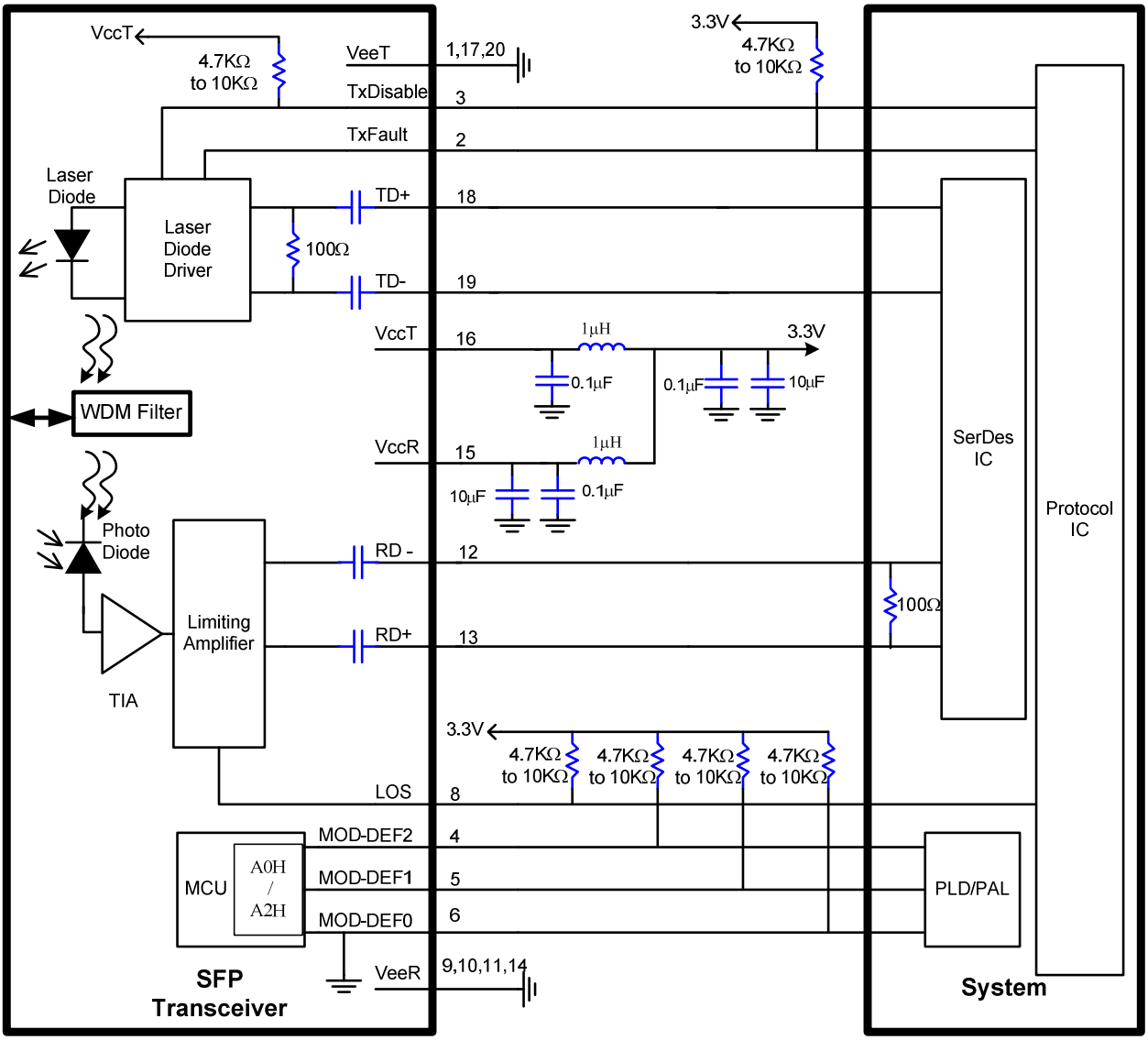
## Pin Definition and Descriptions



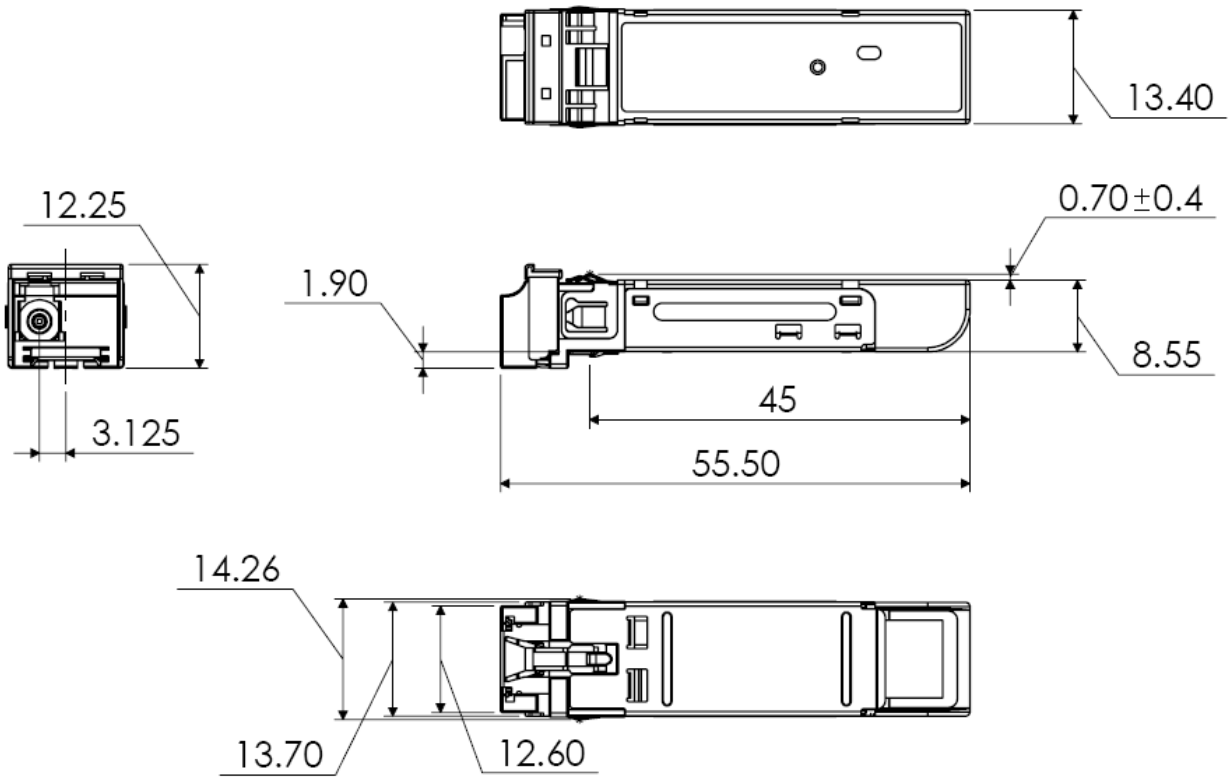
| Pin | Name | Input/Output Level | Description |
|---|---|---|---|
| 1 | VeeT | Input | Transmitter ground |
| 2 | TXFault | Output/LVTTL | Laser failure indication. High level indicates "laser failure". Externally pulled up |
| 3 | TXDisable | Input/LVTTL | Transmitter disable, High signal/open disables TX laser output. Low level enables TX output, internally pulled up. |
| 4 | MOD-DEF(2) | Input/output | Module definition 2, SDA, Data line for I2C bus. Externally pulled up |
| 5 | MOD-DEF(1) | Input | Module definition 1, SCL, Clock for I2C bus. Externally pulled up |
| 6 | MOD-DEF(0) | Output | Module definition 0, Module present. Ground inside module. |
| 7 | Rate Select | - | No connection. |
| 8 | LOS | Output/LVTTL | Receiver loss of signal indication. Low signal indicates optical signal is present at RX input. Should be Externally pulled up. |
| 9 | VeeR | Input | Receiver ground |
| 10 | VeeR | Input | Receiver ground |
| 11 | VeeR | Input | Receiver ground |
| 12 | RD - | Output/CML | Inverted receiver data output (AC coupled) |
| 13 | RD + | Output/CML | Non-inverted receiver data output (AC coupled) |
| 14 | VeeR | Input | Receiver ground |
| 15 | VccR | Input | Receiver power supply |
| 16 | VccT | Input | Transmitter power supply |
| 17 | VeeT | Input | Transmitter ground |
| 18 | TD + | Input/LVPECL | non-inverted transmitter data input (AC coupled) |
| 19 | TD - | Input/LVPECL | Inverted transmitter data input (AC coupled) |
| 20 | VeeT | Input | Transmitter ground |

## Recommended Circuit Diagram



## Mechanical Outlines

**( Unit : mm)**




## ESD

**Normal ESD precautions are required during the handling of this module. This transceiver is shipped in ESD protective packaging. It should be removed from the packaging and handled only in an ESD protected environment.**

## Contact Information

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