## Product Features

- Transceiver unit with independent
  - 1550nm DFB Laser Diode transmitter
  - InGaAs PIN photodiode receiver
- Multi-sourced SFP package style with duplex LC receptacle
- Hot-pluggable
- Metal enclosure for lower EMI
- +3.3V single power supply.
- Qualified to meet the intent of Bellcore reliability practices
- LVPECL logic interface simplifies interface to external circuitry
- LVTTL logic level signal detect
- SONET OC-48/ SDH STM-16 applications
- Compliant ROHS and lead free
- Compliant with UL standard

## Product Applications

- Gigabit Ethernet 1000BASE-LX
- High speed links for Gigabit Ethernet
- Switches
- Routers
- Hubs

## Product Descriptions

SSFP5251-23-1(2)25+ optical transceiver is compliant with the Small Form- Factor Pluggable (SFP) Multi-Source Agreement (MSA) and SFF-8472. It offers previously unavailable system cost, upgrade, and reliability benefits by virtue of being hot-pluggable.

## Transmitter Section

Transmitter is designed for single mode fiber and operates at a nominal wavelength of 1550nm. The transmitter module uses a DFB laser diode and full IEC825 and CDRH class 1 eye safety. The output power can be disabled via the single TXDIS pin. Logic LVTTL HIGH level disables the transmitter. It contains APC function, temperature compensation circuit, PECL data inputs, LVTTL TXDIS input and TX fault Output interface, as shown in figure 1.

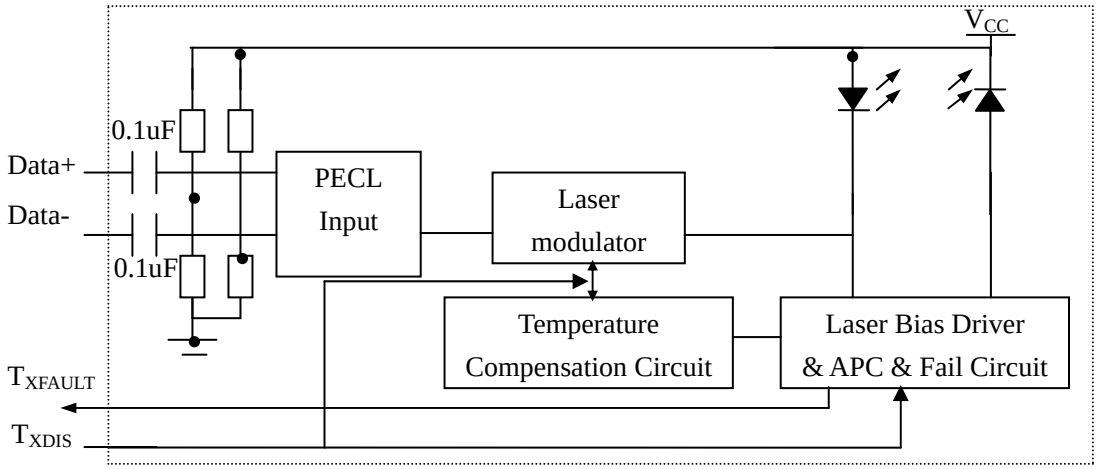



Figure1.Transmitter Block Diagram

## Receiver Section

The receiver section uses a hermetic packaged front end receiver (InGaAs PIN and preamplifier). The post-amplifier is AC coupled to preamplifier through a capacitor and a low pass filter. The capacitor and LPF are enough to pass the signal from 5Mb/s to 1250Mb/s without significant distortion or performance penalty. The LPF limits the preamplifier bandwidth to improve receiver sensitivity. Figure 2 shows the receiver section which proves PECL logic differential outputs and a signal detect output.

As the input optical is decreased, Signal Detect will switch from low to high. As the input optical power is increased from very low levels, Signal Detect will switch back from high to low.

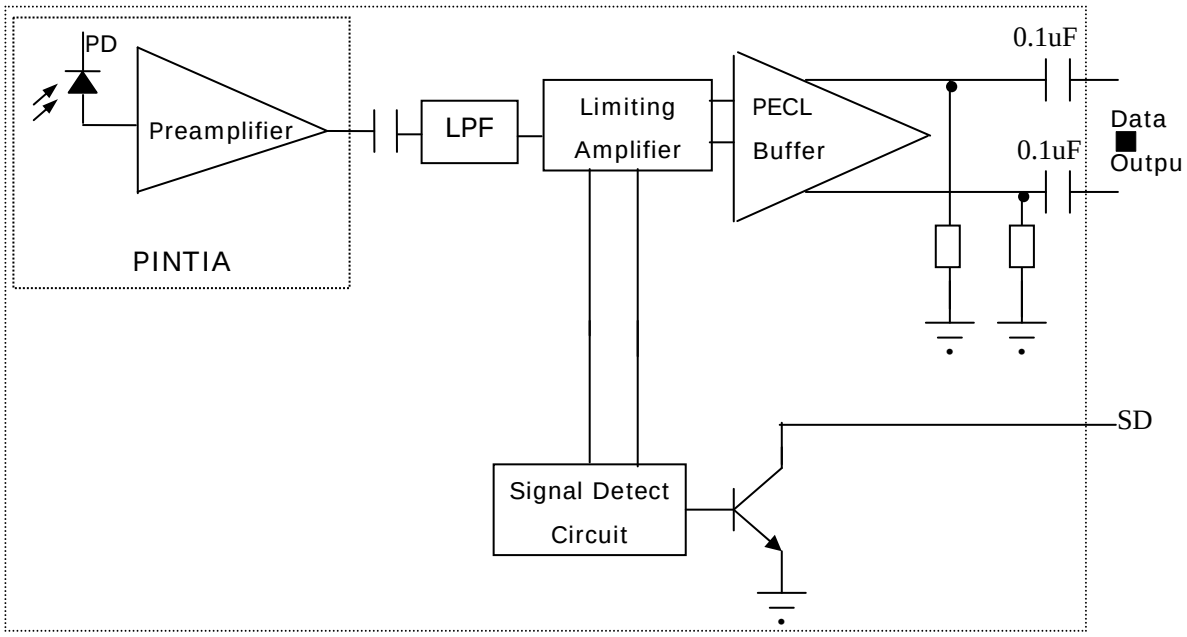



Figure 2. Receiver Block Diagram

## EEPROM Section

The module contains an EEPROM. It provides access to sophisticated identification information that describes the transceiver's capabilities, standard interfaces, manufacturer, and other information.

The serial interface uses the 2-wire serial CMOS EEPROM protocol defined for the ATMEL AT24C01A/02/04 family of components. When the serial protocol is activated, the host generates the serial clock signal (SCL, Mod Def 1). The positive edge clocks data into those segments of the EEPROM that are not writing protected within the SFP transceiver. 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.

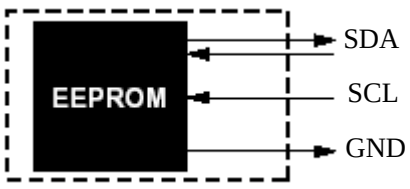



Figure 3. EEPROM Block Diagram

## Performance Specifications

### Absolute Maximum Ratings

| Parameter | Symbol | | Min. | Max. | Unit |
|---|---|---|---|---|---|
| Storage Temperature | TST | | -40 | +85 | ℃ |
| Operating Temperature | To | SSFP5251-23-125+ | 0 | 70 | ℃ |
| | | SSFP5251-23-225+ | -40 | +85 | |
| Input Voltage | - | | GND | VCC | V |
| Power Supply Voltage | VCC-VEE | | -0.5 | +3.6 | V |

**Note: Stress in excess of maximum absolute ratings can cause permanent damage to the module**

### Operating Environment

| Parameter | Symbol | | Min. | Max. | Unit |
|---|---|---|---|---|---|
| Power Supply Voltage | VCC | | +3.1 | +3.5 | V |
| Ambient Operating Temperature | To | SSFP5251-23-125+ | 0 | +70 | ℃ |
| | | SSFP5251-23-225+ | -40 | +85 | |

### Transmitter E-O characteristics

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|
| Center Wavelength | λ | 1480 | 1550 | 1580 | nm | - |
| Spectral Width (-20dB) | Δλ | - | - | 1 | nm | - |
| Side Mode Suppression Ratio | SMSR | 30 | - | - | dB | - |
| Average Optical Output Power | Po | -3 | - | +2 | dBm | - |
| Extinction Ratio | ER | 8.2 | - | - | dB | - |
| Power Supply Current | ICC | - | 70 | 180 | mA | 1 |
| Transmitter Enable Voltage | VEN | 0 | - | 0.8 | - | - |
| Transmitter disable Voltage | VD | 2.0 | - | VCC | V | - |
| Data Inputs Voltage | VPP | 300 | 800 | 1600 | mV | - |
| Optical Rise/Fall Time | Tr/Tf | - | - | 0.26 | ns | - |
| Output Eye Digaram | Compliant with IEEE802.3Z | | | | | |

### Receiver O-E characteristics

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|
| Sensitivity | Sen | - | -24 | -22 | dBm | 2 |
| Saturation | Ps | -3 | - | - | dBm | 2 |
| Signal Detect Assert Level | - | -35 | - | - | dBm | High level: Alarm |
| Signal Detect Dessert Level | - | - | - | -22 | dBm | |
| SD Hysteresis | - | - | 3 | - | dB | |
| Power Supply Current | ICC | - | 80 | 170 | mA | 1 |
| Data Outputs Voltage | VPP | 500 | 800 | 1000 | mV | - |
| Los low voltage | $V_{Lout}$ | - | - | 0.8 | V | - |
| Los high voltage | $V_{Hout}$ | 2.0 | - | - | V | - |

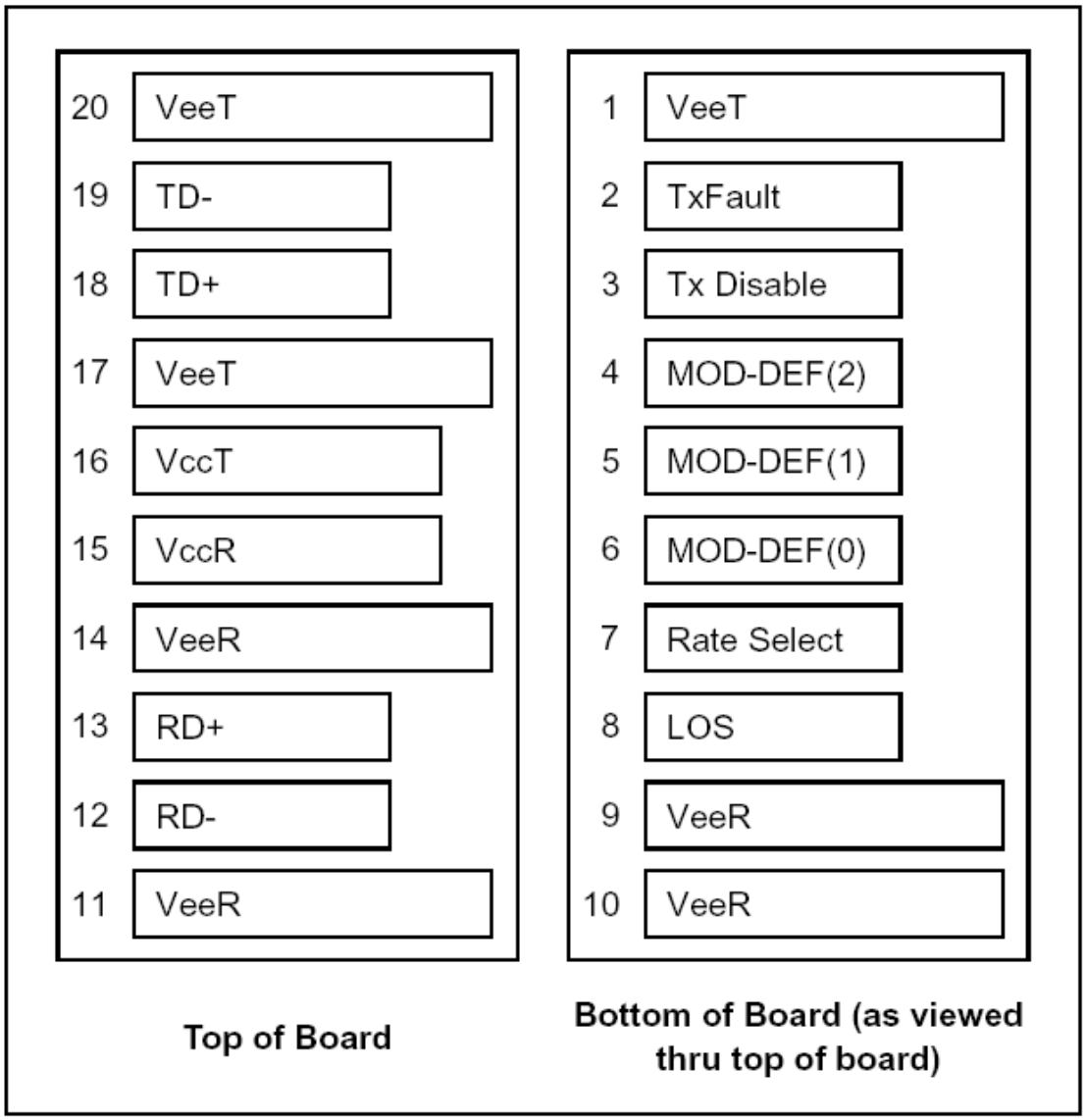
**Notes:**

**1. The current excludes the output load current**

**2. Minimum Sensitivity and saturation levels for a $2^7-1$ PRBS test pattern@1.25Gb/s**

**Pin Description**

**Pin Out Diagram**



## .Pin Function Definitions

| Pin# | Name | Description | Notes |
|---|---|---|---|
| 1 | VeeT | Transmitter Ground | - |
| 2 | TX Fault | Transmitter Fault Indication | Notes 1 |
| 3 | TX Disable | Transmitter Disable | Note 2, Module disables on high or open |
| 4 | MOD-DEF2 | Module Definition 2 | Note3, 2 wire serial ID interface |
| 5 | MOD-DEF1 | Module Definition 1 | Note 3, 2 wire serial ID interface |
| 6 | MOD-DEF0 | Module Definition 0 | Note 3, Grounded in Module |
| 7 | Rate Select | Not use | - |
| Pin# | Name | Description | Notes |
| 8 | LOS | Loss of Signal | Notes 4 |
| 9 | VeeR | Receiver Ground | Note 5 |
| 10 | VeeR | Receiver Ground | Note 5 |
| 11 | VeeR | Receiver Ground | Note 5 |
| 12 | RD- | Inv. Received Data Out | Notes 6 |
| 13 | RD+ | Receiver Data out | Notes 6 |
| 14 | VeeR | Receiver Ground | Note 5 |
| 15 | VccR | Receiver Power | Note 7, 3.3V± 5% |
| 16 | VccT | Transmitter Power | Note 7, 3.3V± 5% |
| 17 | VeeT | Transmitter Ground | Note 5 |
| 18 | TD+ | Transmit Data In | Note 8 |
| 19 | TD- | Inv. Transmit Data In | Notes 8 |
| 20 | VeeT | Transmitter Ground | Notes 5 |

**Note:**

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**

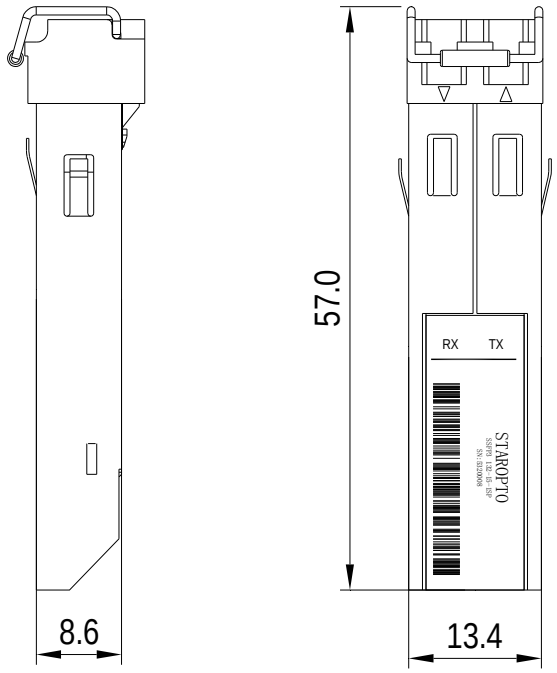
   **High (2.0 – 3.465V): Transmitter Disabled**

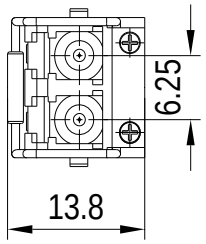
Open: Transmitter Disabled

3. 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 (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 1Ω should be used in order to maintain the required voltage at the SFP input pin with3.3V supply voltage. When the recommended supply filtering network is used, hotplugging of the SFP transceiver module will result in an inrush current of no more than 30 mA 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.

## Package Information




Unit: mm

## Recommended Circuit

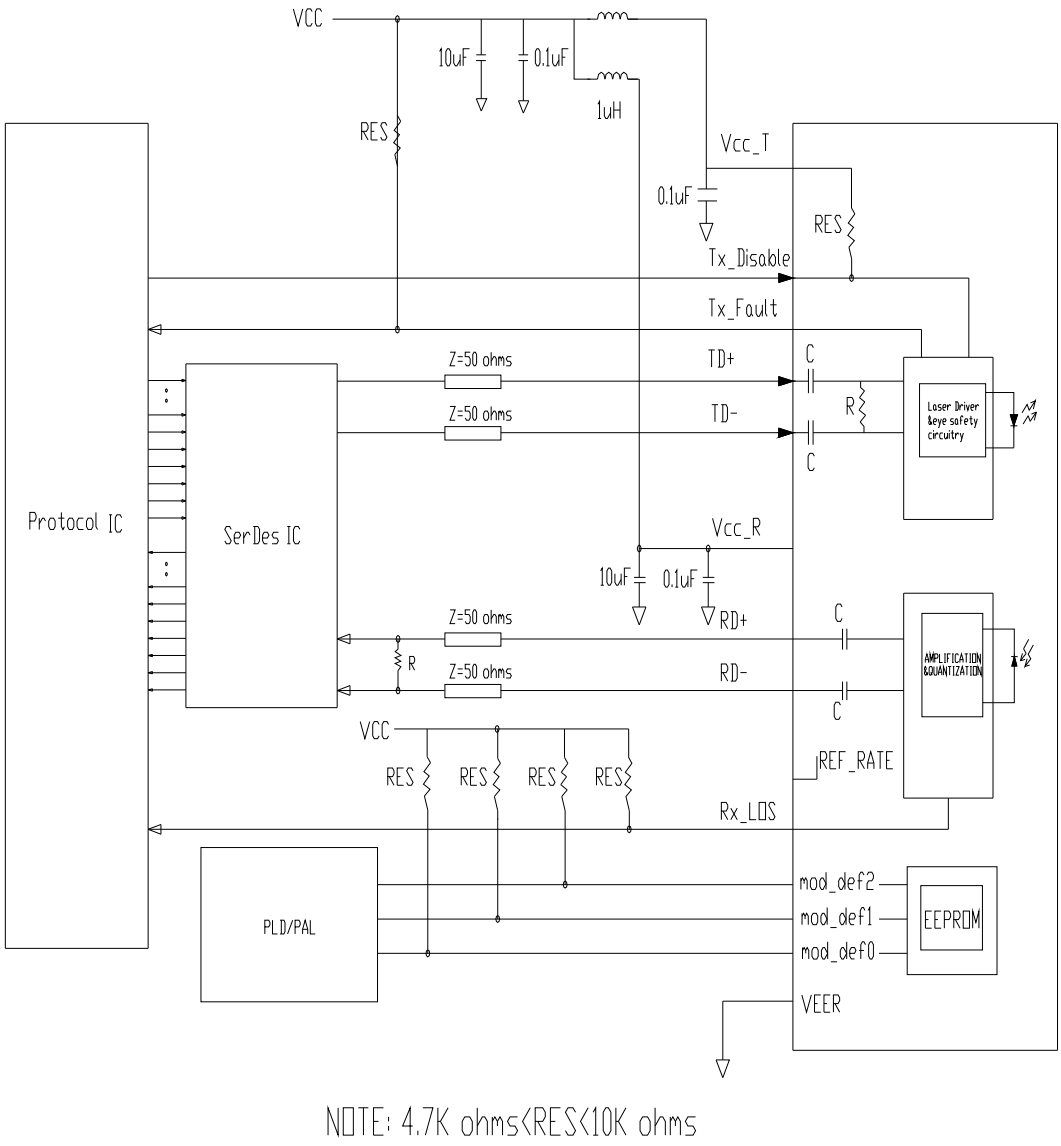



Figure 5. Circuit of SFP Transceiver

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## Ordering Information

**SSFP5 2 5 1 - 2 3 - 1(2) 2 5 +**

| Wavelength (nm) | LD Type | Data Rate (Mb/s) | Package Type | Output power | Operation Voltage | Operation Temperature | Data/ Alarm Interface | Connector | Compliant ROHS |
|---|---|---|---|---|---|---|---|---|---|
| 5：1550 | 2：DFB | 5：1250 | 1：With DDM | 2：-3~+2 | 3：3.3V | 1：0~70℃ 2：-40~+85℃ | 2：Data/PECL Alarm /TTL | 5：LC/PC | |