

PT745F-81-1D+

10Gb/s XFP Optical Transceiver Module

1 Features

- 1.1 10Gb/s serial optical interface
- 1.2 Transceiver unit with independent
1310nm DFB laser diode transmitter
PIN photodiode receiver
- 1.3 Meet XFP MSA completely
- 1.4 Digital diagnostic monitoring
- 1.5 Hot-pluggable
- 1.6 Metal enclosure for lower EMI
- 1.7 Duplex LC receptacle
- 1.8 XFP Mechanical Interface with bail latch for easy removal
- 1.9 LVTTTL logic level Tx_Disable and Rx_LOS functions
- 1.10 Qualified to meet the intent of Bellcore reliability practices
- 1.11 3.3V power supply only
- 1.12 Power consumption less than 2.5W
- 1.13 Links of 2~10 km with 9/125 μ m single mode fiber (SMF) of maximum interconnect distances
- 1.14 Complies with RoHS directive (2002/95/EC)



2 Applications

- 2.1 10G Ethernet
- 2.2 10G Sonet (OC-192)/SDH (STM-64)
- 2.3 10G Fiber Channel

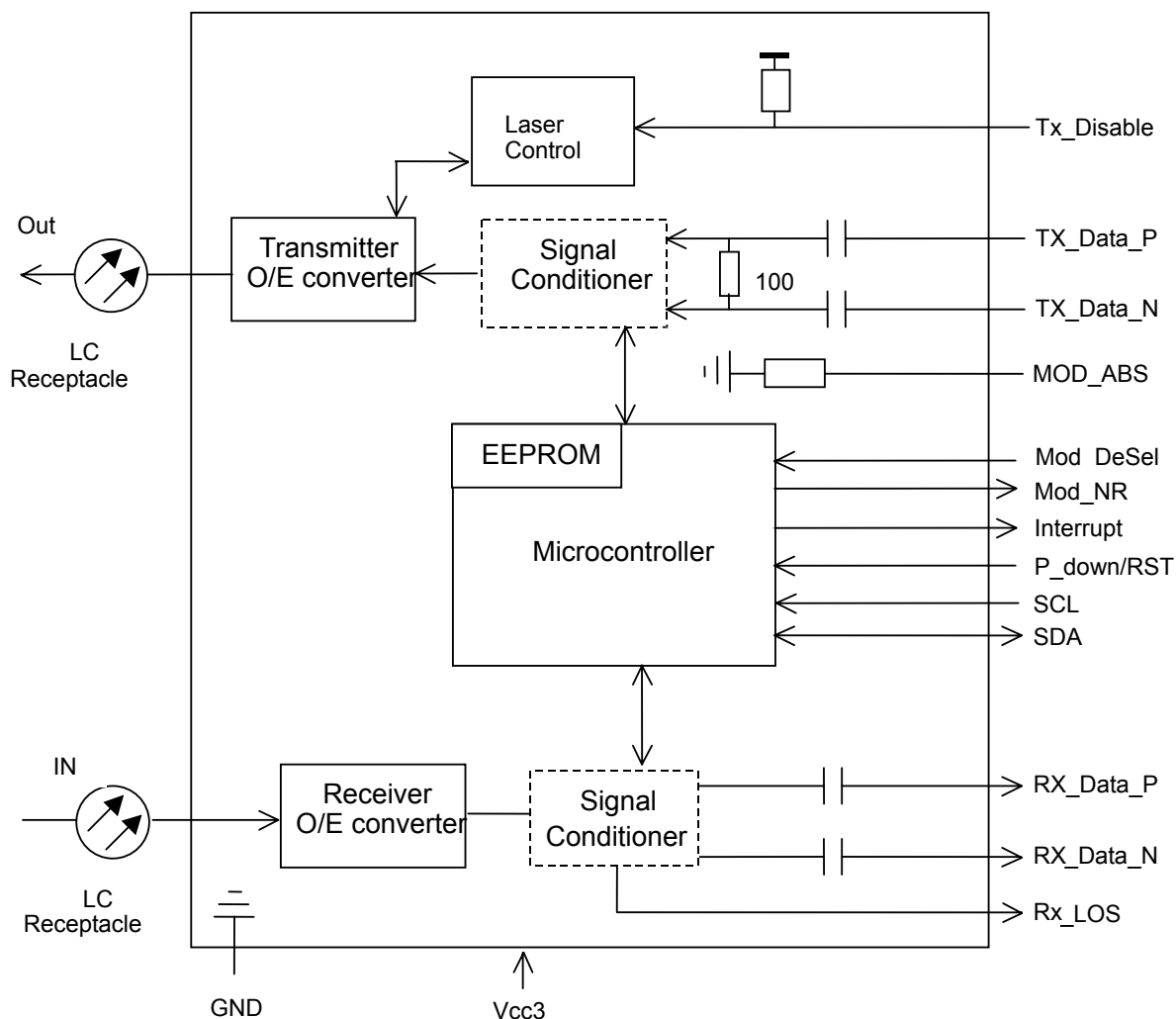
3 General

The PT745F-81-1D+ is compliant with the 10G Small Form-Factor Pluggable (XFP) Multi-Source Agreement (MSA). It offers previously unavailable system cost, upgrade, and reliability benefits by virtue of being hot-pluggable.

The PT745F-81-1D+ is a very compact 10Gb/s optical transceiver module for serial optical communication applications at 10Gb/s. The PT745F-81-1D+ converts a 10Gb/s serial electrical data stream to 10Gb/s optical output signal and a 10Gb/s optical input signal to 10Gb/s serial electrical data streams. The high speed 10Gb/s electrical interface is fully compliant with XFI specification and allows FR4 host PCB trace up to 200mm.

The PT745F-81-1D+ is designed for use in a variety of 10Gb/s SONET/SDH equipment including FEC (9.95Gb/s to 10.7Gb/s) and Ethernet LAN (10.3Gb/s) and WAN (9.95Gb/s) applications.

The high performance uncooled 1310nm DFB-LD transmitter and high sensitivity PIN receiver provide superior performance for SONET /SDH and Ethernet applications at up to 10km links.



3.1 Transmitter Section.

The transmitter contains a Clock Data Recovery (CDR) circuit that reduces the jitter of received signal and reshapes the electrical signal before the electrical to optical (E-O) conversion. The optical output power is maintained constant by a power control circuit. Transmitter is designed for single mode fiber and operates at a nominal wavelength of 1310nm. The transmitter module uses a DFB laser diode. The output power can be turned off by the single TxDis pin. Logic LVTTTL HIGH level disables the transmitter.

3.2 Receiver Section

The receiver section uses a hermetic packaged front end receiver (PIN and preamplifier). The optical receiver contains a CDR circuits that reshapes and retimes an electrical signal before sending out to the XFI channel. As the input optical is decreased, LOS will switch from low to high. As the input optical power is increased from very low levels, LOS will switch back from high to low.

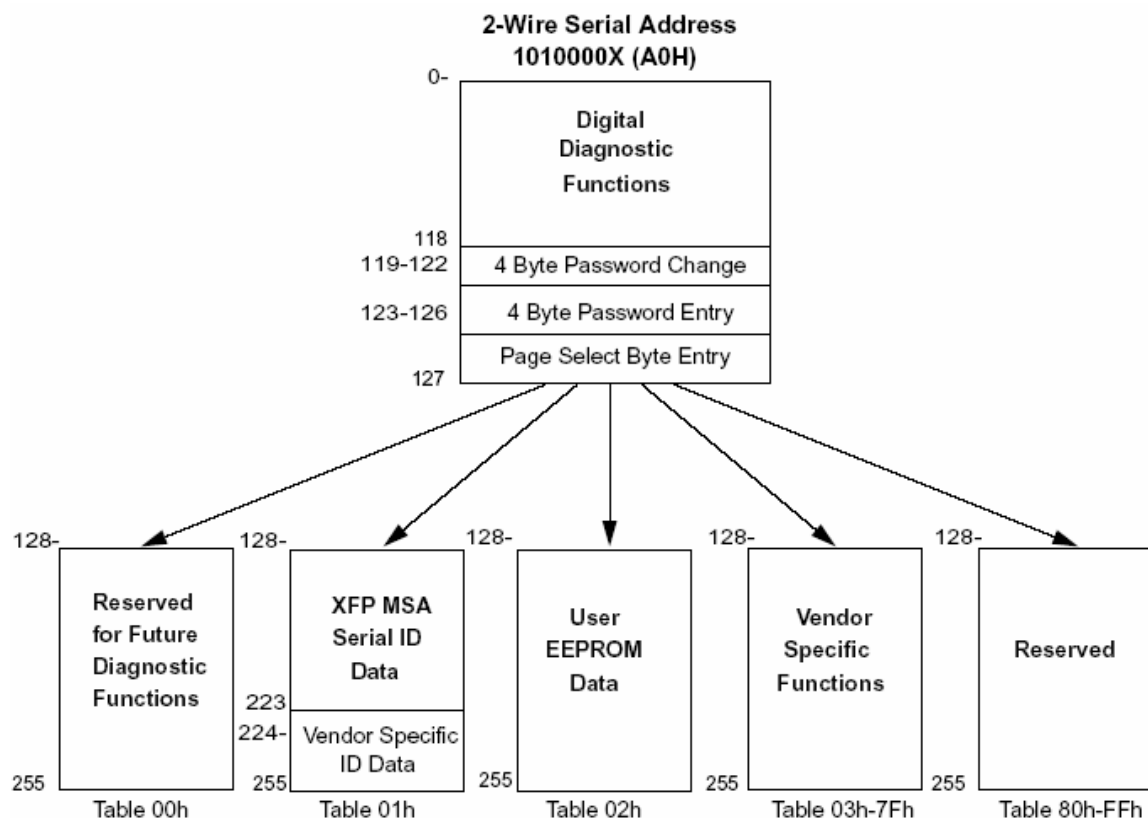
3.3 Management Interface

The optical transceiver 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 write 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.

The Module provides diagnostic information about the present operating conditions. The transceiver generates this diagnostic data by digitization of internal analog signals. 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. The diagnostic data are raw A/D values and must be converted to real world units. The digital diagnostic memory map specific data field defines as following.



4 Performance Specifications

4.1 Absolute Maximum Ratings

| Parameter | Symbol | Min. | Max. | Unit |
|------------------------------|--------|------|------|------|
| Storage Temperature | Tst | -40 | +85 | °C |
| Power Supply Voltage | VCC3 | -0.5 | 4 | V |
| Receiver Input Optical Power | Mip | - | 3 | dBm |

4.2 Operating Environment

| Parameter | Symbol | Min. | Max. | Unit |
|------------------------------------|--------|------|------|------|
| Operating Case Temperature | Topc | -5 | 70 | °C |
| Relative Humidity (non-condensing) | Rhop | 5 | 85 | % |
| Power Supply Voltage | VCC3 | 3.1 | 3.5 | V |
| Power Supply Current | ICC3 | - | 700 | mA |
| Total Power Consumption | Pd | - | 2.5 | W |

4.3 E-O and O-E Characteristics

(Normal Operating Temperature, Normal Power Supply Voltage, Normal Using Conditions)

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Note |
|------------------------------|--|------|------|------|------|------|
| Operating Data Rate | - | 9.95 | - | 10.7 | Gb/s | - |
| Center Wavelength | λ | 1290 | - | 1330 | nm | - |
| Spectral Width (-20dB) | $\Delta\lambda$ | - | - | 1.0 | nm | - |
| Side Mode Suppression Ratio | SMSR | 30 | - | - | dB | - |
| Average Optical Output Power | Po | -6 | - | -1 | dBm | 1 |
| Extinction Ratio | Er | 6 | - | - | dB | - |
| Transmitter Enable Voltage | VEN | GND | - | 0.8 | V | - |
| Transmitter Disable Voltage | VD | 2.0 | - | VCC3 | V | - |
| Data Inputs Voltage | Vpp | 120 | - | 1000 | mV | 2 |
| Output Power After Disabled | - | - | - | -30 | dBm | - |
| Output Eye Diagram | Compliant with ITUT and IEEE recommendation MASK | | | | | |

Notes:

1. The optical power is launched into SMF.
2. Internally AC coupled

4.4 Receiver O-E Characteristics

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Note |
|---------------------|--------|------|------|-------|------|----------------------|
| Operating Data Rate | - | 9.95 | - | 10.7 | Gb/s | - |
| Operate Wavelength | - | 1280 | - | 1620 | nm | - |
| Sensitivity | Pr | - | | -14.4 | dBm | 1 |
| Saturation | Ps | -1 | | | dBm | 1 |
| LOS Asserted | - | -30 | - | - | dBm | High level: Alarm |
| LOS De-Asserted | - | - | - | -15 | dBm | |
| LOS Hysteresis | - | 0.5 | - | - | dB | |

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Note |
|------------------------------|--------|------|------|------|------|------|
| Data Outputs Voltage | VPP | 500 | - | 800 | mV | 2 |
| LOS Low Voltage | VLout | GND | - | 0.4 | V | - |
| LOS High Voltage | VHout | 2.0 | - | VCC3 | V | - |
| Receiver Optical Return Loss | - | - | - | -27 | dB | - |

Notes

1 .Measured at 10.3125Gbps, Framed PRBS 2³¹-1, NRZ, BER≤10⁻¹²

2 .Internally AC coupled

4.5 Digital Diagnostic Monitoring A/D Accuracy

| Data Address | Parameter | Accuracy | Note |
|--------------|-------------|------------------------------|------|
| 96-97 | Temperature | ±3°C | 1 |
| 100-101 | Tx Bias | ±10% | 2 |
| 102-103 | Tx Power | ±2dB@BOL1 (-6 to -1D+Bm) | - |
| 104-105 | Rx Power | ±2dB@BOL1 (-16to +0.5dBm) | - |
| 106-107 | VCC3 | ±3% | 3 |

Notes:

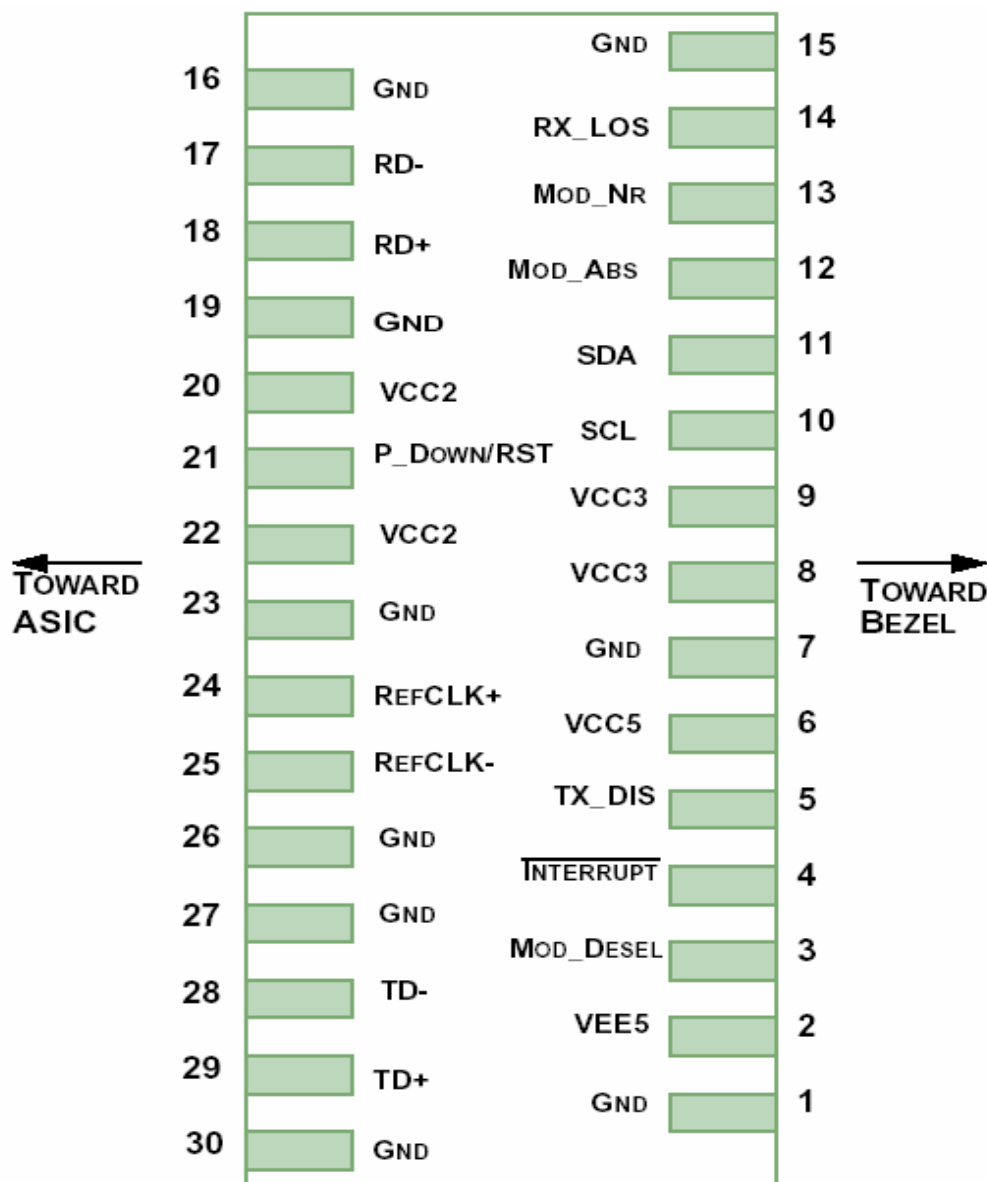
1. Junction temperature of monitoring IC, Range from -10 to +80°C.

2. Over specified temperature and voltage range over the life of the product into a fixed measurement system

3. VCC3 ranges from +3.0V to +3.7V.

5 Pin Definitions

5.1 Pin Diagram



5.2 Pin Descriptions

| Pin | Logic | Name | Description | Note |
|-----|---------|------------------|---|------|
| 1 | | GND | Module common ground | 1 |
| 2 | | VEE5 | Optional -5.2V power supply, not in use | 3 |
| 3 | LVTTL-I | Mod_DeSel | Module Deselect; when held low allows module to respond 2-wire serial interface | - |
| 4 | LVTTL-O | <u>Interrupt</u> | Indicates presence of an important condition which can be read over the 2-wire serial interface | 2 |
| 5 | LVTTL-I | TX_DIS | Transmitter Disable; turn off transmitter laser output | - |
| 6 | | VCC5 | +5V power supply, not in use | 3 |
| 7 | | GND | Module common ground | 1 |

| Pin | Logic | Name | Description | Note |
|-----|-----------|------------|--|------|
| 8 | | VCC3 | +3.3V power supply | - |
| 9 | | VCC3 | +3.3V power supply | - |
| 10 | LVTTL-I/O | SCL | 2-wire serial interface clock. | 2 |
| 11 | LVTTL-I/O | SDA | 2-wire serial interface data. | 2 |
| 12 | LVTTL-O | Mod_Abs | Indicates module is not present. ground in the module | 2 |
| 13 | LVTTL-O | Mod_NR | Module not ready, indicating module operational fault | 2 |
| 14 | LVTTL-O | RX_LOS | Receiver loss of signal indicator | 2 |
| 15 | | GND | Module common ground | 1 |
| 16 | | GND | Module common ground | 1 |
| 17 | CML-O | RD- | Receiver inverted data output | - |
| 18 | CML-O | RD+ | Receiver non-inverted data output | - |
| 19 | | GND | Module common ground | 1 |
| 20 | | VCC2 | +1.8V power supply, not in use | 3 |
| 21 | LVTTL-I | P_Down/RST | Power down; when high, requires the module to limit power consumption to 1.5w or below ,2-wire serial interface must be functional in the low power mode | - |
| | | | Reset; the falling edge initiates a complete reset of the module including the 2-wire Serial interface, equivalent to a power cycle | - |
| 22 | | VCC2 | +1.8V power supply, not in use | 3 |
| 23 | | GND | Module Common ground | 1 |
| 24 | PECL-I | RefCLK+ | Reference clock non-inverted input, ac coupled on the host board, not in use | 3 |
| 25 | PECL-I | RefCLK- | Reference clock inverted input, ac coupled on the host board, not in use | 3 |
| 26 | | GND | Module common ground | 1 |
| 27 | | GND | Module common ground | 1 |
| 28 | CML-I | TD- | Transmitter inverted data input | - |
| 29 | CML-I | TD+ | Transmitter non-inverted data input | - |
| 30 | | GND | Module common ground | 1 |

Notes:

1. Module ground pins GND are isolated from the module case and chassis ground within the module.
2. Shall be pulled up with 4.7K-10Kohms to a voltage between 3.15V and 3.45V on the host board.
3. Not connected internally.

