

SFP-10G-15KM-B

1 Features

- 1.1 Single Fiber Transceiver with single mode LC receptacle
- 1.2 1270nm DFB laser and 1330nm PIN photodiode for 15km transmission
- 1.3 Compliant with SFP+ MSA Specification SFF-8431
- 1.4 Compliant with SFP+ MSA Specification SFF-8432
- 1.5 Compliant with SFP MSA and SFF-8472
- 1.6 Digital Diagnostic Monitoring (DDM)
- 1.7 Complies with RoHS directive (2002/95/EC)

2 Applications

10GBASE-LR/LW 10G Ethernet

Wireless CPRI optical

Other optical data links

3 General

This is a high performance transceiver module for single fiber communications.

The 1270nm DFB LD transmitter has automatic power control (APC) function and temperature compensation circuitry to ensure stable optical power and extinction ratio over all operating temperature range. The transmitter meets Class 1 eye safety per IEC60825 and CDRH standards.

The receiver has a hermetically packaged PIN-TIA (trans-impedance amplifier) pre-amplifier and a limiting amplifier.

The module provides digital diagnostic information of its operating conditions and status, including transmitting power, laser bias current, module temperature, and supply voltage.

4 Performance Specifications

4.1 Absolute Maximum Ratings

| Parameter | Symbol | Min. | Max. | Unit |
|--|----------|------|----------|------|
| Storage Temperature | T_{st} | -40 | +85 | °C |
| Operating relative humidity (Non- condensing) | RH | 5 | 90 | % |
| Input Voltage | - | GND | V_{cc} | V |
| Power Supply Voltage | V_{cc} | 0 | 3.6 | V |

4.2 Recommended Operating Environment

| Parameter | Symbol | Min. | Typ. | Max. | Unit |
|-----------------------------|----------|-------|---------|-------|------|
| Power Supply Voltage | V_{cc} | +3.14 | +3.3 | +3.46 | V |
| Power Supply Current | I_{cc} | - | 200 | 300 | mA |
| Data rate | | - | 10.3125 | - | Gbps |
| Operating relative humidity | RH | 5 | | 85 | % |

| | | | | | |
|------------------------------|----------------|-----|-----|-----|-----|
| (Non- condensing) | | | | | |
| Case Temperature (Operating) | T _c | 0 | - | 70 | °C |
| | | -40 | | 85 | °C |
| I2C clock frequency | | - | 100 | 400 | KHz |
| Power consumption Max | - | - | - | 1 | W |

4.3 Transmitter Characteristics

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Note |
|-------------------------------|-------------------|------|------|------|----------|------|
| Center Wavelength | λ | 1320 | 1330 | 1340 | nm | |
| Spectral Width (-20dB) | $\Delta\lambda$ | - | - | 1 | nm | |
| Side Mode Suppression Ratio | SMSR | 30 | - | - | | |
| Average Optical Output Power | P _o | -5 | - | 0.5 | dBm | |
| Extinction Ratio | E _r | 3.5 | - | - | dB | |
| Differential Input Impedance | - | 80 | 100 | 120 | Ω | |
| Differential Data Input Swing | V _{INPP} | 100 | | 1000 | mV | |

4.4 Receiver Characteristics

| Parameter | Symbol | Min. | Typ. | Max. | Units | Notes |
|--------------------------|-----------------------|------|------|-------|-------|-------|
| Wavelength of Operation | - | 1260 | 1270 | 1280 | nm | - |
| Receiver Sensitivity | Sen. | - | - | -14.4 | dBm | 4.4.1 |
| Saturation Optical Power | Sat | 0.5 | - | - | dBm | 4.4.1 |
| LOS Asserted | T _{loss_on} | -30 | | | dBm | - |
| LOS De-Asserted | T _{loss_off} | | | -16 | dBm | - |

| | | | | | | |
|--------------------------------|--------------------|-----|--|-----|----|--|
| LOS Hysteresis | T_loss_Hs | 0.5 | | 6 | dB | |
| Differential Data Output Swing | V _{OUTPP} | 350 | | 700 | mV | |

Note4.4.1: Measured with 10.3125Gbps PRBS2³¹-1, ER=3.5dB, BER=1x10⁻¹²

4.5 Digital Diagnostic Monitoring Characteristics

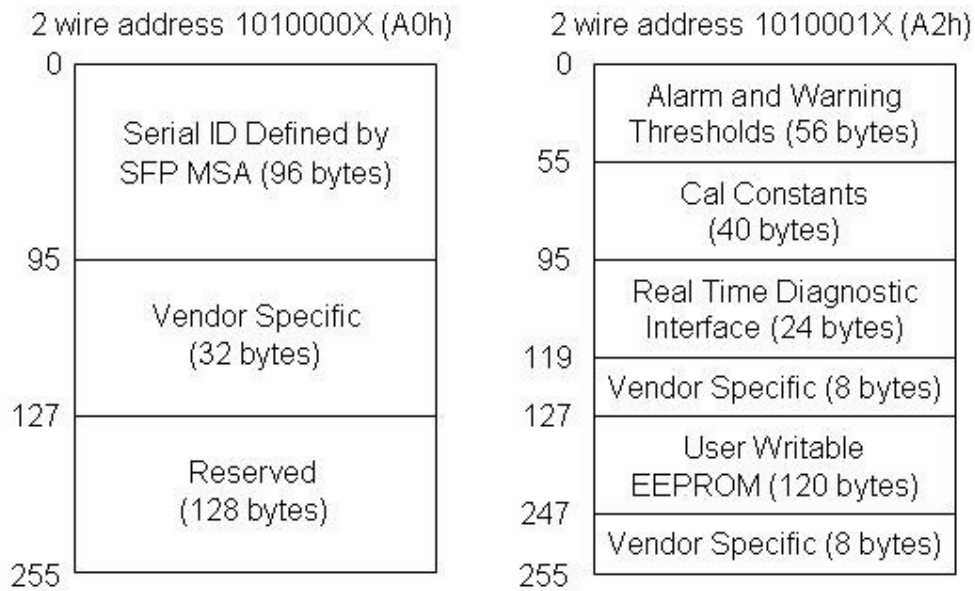
| Parameter | Symbol | Range | Accuracy |
|------------------------------|-----------------|--|----------|
| Transceiver Case Temperature | T | Measured transceiver case temperature over specified operating range | ±3°C |
| Supply Voltage | V _{cc} | Internally measured transceiver supply voltage ,3.0~3.6V | ±3% |
| TX Bias Current | I _d | Measured TX Bias current in uA | ±10% |
| TX Output Power | P _o | Measured TX Output Power in dBm Over the specified output power range | ±3dB |
| Received Optical Power | P _i | Measured RX Received Power in dBm Over the specified input power range | ±3dB |

5 EEPROM Section

The optical transceiver contains an EEPROM. It provides access to sophisticated identification

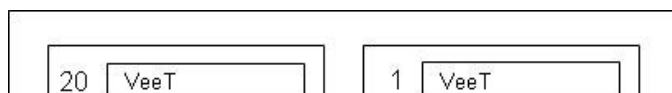
information that describes the transceiver's capabilities, standard interfaces, manufacturer, and other information.

The Module provides diagnostic information about the present operating conditions. The transceiver generates this diagnostic data by digitization of internal analog signals. Calibration and 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 using calibration constants stored in EEPROM locations 56 -95 at wire serial bus address A2h. The digital diagnostic memory map specific data field defines as following.



6 Pin Definitions

6.1 Pin Diagram



6.2 Pin Descriptions

| Pin# | Logic | Name | Function | Notes |
|------|--------|-----------|--|--------|
| 1 | | VeeT | Transmitter Ground | Note 5 |
| 2 | LVTTTL | TxFault | Transmitter Fault Indication | Note 1 |
| 3 | LVTTTL | TxDisable | Transmitter Disable | Note 2 |
| 4 | | SDA | ² I ² C Data | Note 3 |
| 5 | | SCL | ² I ² C Clock | Note 3 |
| 6 | | MOD-ABS | Internally grounded | |
| 7 | | RS0 | Not used | Note 9 |
| 8 | LVTTTL | LOS | Loss of Signal | Note 4 |
| 9 | | RS1 | Not used | Note 9 |
| 10 | | VeeR | Receiver Ground | Note 5 |
| 11 | | VeeR | Receiver Ground | Note 5 |
| 12 | | RD- | Inv. Received Data Out | Note 6 |
| 13 | | RD+ | Received Data Out | Note 6 |
| 14 | | VeeR | Receiver Ground | Note 5 |
| 15 | | VccR | Receiver Power | Note 7 |
| 16 | | VccT | Transmitter Power | Note 7 |
| 17 | | VeeT | Transmitter Ground | Note 5 |
| 18 | | TD+ | Transmit Data In | Note 8 |

| | | | | |
|----|--|------|-----------------------|--------|
| 19 | | TD- | Inv. Transmit Data In | Note 8 |
| 20 | | VeeT | Transmitter Ground | Note 7 |

Notes:

1. TX Fault is an open collector output, which should be pulled up with a 4.7k~10kΩ resistor on the hostboard 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 4.7–10 KΩ resistor. It's states are:

Low (0 – 0.8V): Transmitter on

(>0.8, < 2.0V): Undefined

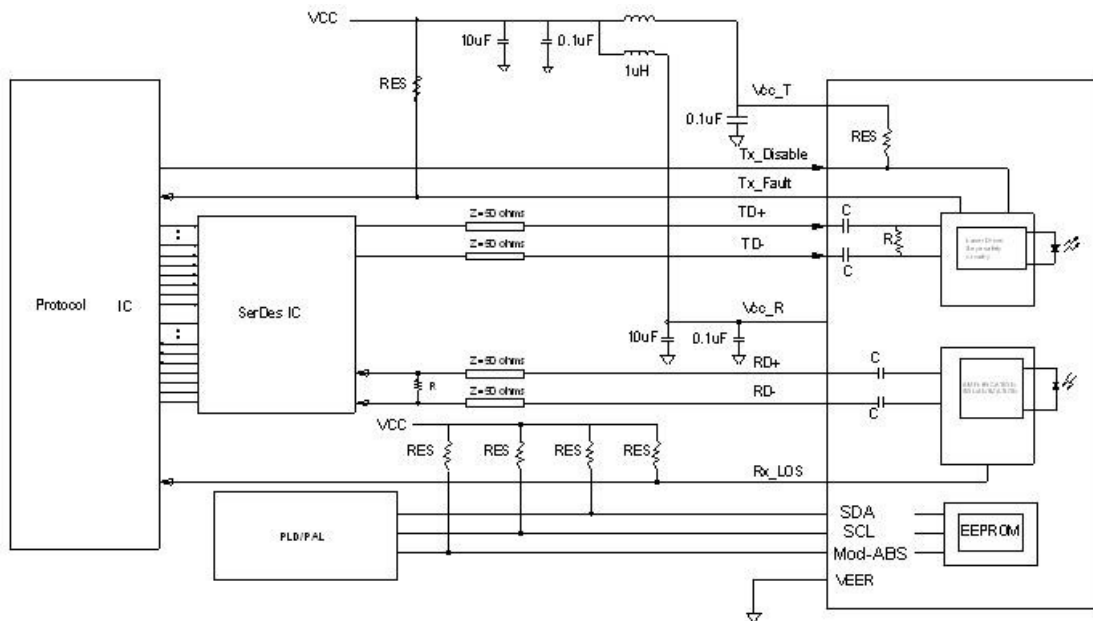
High (2.0 – 3.465V): Transmitter Disabled

Open: Transmitter Disabled.

3. SDA and SCL is communication interface for I²C . They should be pulled up with a 4.7K – 10KΩ resistor on the host board. The pull-up voltage should be VccT or VccR.
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 VccR+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 < 0.4V.
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 \pm 5% at the SFP+ connector pin. Maximum supply current is 350mA. Inductors with DC resistance of less than 1 Ω should be used in order to maintain the required voltage at the SFP+ input pin with 3.3V supply voltage. Vcc is internally connected inside the BIDI transceiver.
8. TD- and TD+ are the differential transmitter inputs. They are AC coupled differential lines with 100 Ω differential termination inside the module. The AC coupling is done inside the module and is thus not required on the host board.
9. Internally pulled down per SFF-8431 Rev 4.1.

7 Recommended Circuit



NOTE: 4.7K ohms<RES<10K ohms

8 Outline Dimensions

