

## 1.25Gb/s CWDM SFP\_Duplex LC, 1271~1611nm 40km DFB& PIN

### Features:

Up to 1.25Gb/s Data Links  
 Hot-Pluggable  
 Duplex LC connector  
 24dB optical link budget  
 18-Wavelength CWDM 1271~1611nm DFB laser transmitter  
 Single +3.3V Power Supply  
 Monitoring Interface Compliant with SFF-8472  
 Low power dissipation <1W typically  
 Operating temperature range: 0°C to 70°C  
 RoHS compliant and Lead Free

### Applications:

Gigabit Ethernet  
 1×Fiber Channel  
 CWDM Networks

### Description:

The CWDM Transceiver products provide optical networking equipment manufacturers with a timely and cost effective tool in supporting the unceasing demand for higher bandwidth equipment build-outs in the enterprise access and metropolitan area networks. There are 18 center wavelengths available from 1271nm to 1611nm. The 20nm channel spacing allows for un-cooled laser operation, a high yield manufacturing process, and lower cost Mux/Demux technology, thus providing a complete cost effective solution for various data and telecom applications.

### Absolute Maximum Ratings

| Parameter           | Symbol          | Min. | Typical | Max. | Unit |
|---------------------|-----------------|------|---------|------|------|
| Storage Temperature | T <sub>s</sub>  | -40  |         | +85  | °C   |
| Supply Voltage      | V <sub>cc</sub> | -0.5 |         | 4    | V    |
| Relative Humidity   | RH              | 0    |         | 85   | %    |

### Recommended Operating Environment

| Parameter                  | Symbol          | Min.  | Typical | Max.  | Unit |
|----------------------------|-----------------|-------|---------|-------|------|
| Case operating Temperature | T <sub>c</sub>  | 0     |         | +70   | °C   |
| Supply Voltage             | V <sub>cc</sub> | 3.135 |         | 3.465 | V    |

|                |                    |  |  |                     |    |
|----------------|--------------------|--|--|---------------------|----|
| Supply Current | I <sub>cc</sub>    |  |  | 300                 | mA |
| Inrush Current | I <sub>surge</sub> |  |  | I <sub>cc</sub> +30 | mA |
| Maximum Power  | P <sub>max</sub>   |  |  | 1                   | W  |

## Electrical Characteristics(TOP =T<sub>c</sub>, VCC = 3.135 to 3.465 Volts)

| Parameter                      | Symbol                | Min.                  | Typical | Max.                  | Unit  | Note |
|--------------------------------|-----------------------|-----------------------|---------|-----------------------|-------|------|
| <b>Transmitter Section:</b>    |                       |                       |         |                       |       |      |
| Input differential impedance   | R <sub>in</sub>       | 90                    | 100     | 110                   | Ω     | 1    |
| Single ended data input swing  | V <sub>in PP</sub>    | 250                   |         | 1200                  | mVp-p |      |
| Transmit Disable Voltage       | V <sub>D</sub>        | V <sub>CC</sub> – 1.3 |         | V <sub>CC</sub>       | V     | 2    |
| Transmit Enable Voltage        | V <sub>EN</sub>       | V <sub>EE</sub>       |         | V <sub>EE</sub> + 0.8 | V     |      |
| Transmit Disable Assert Time   | T <sub>dessert</sub>  |                       |         | 10                    | us    |      |
| <b>Receiver Section:</b>       |                       |                       |         |                       |       |      |
| Single ended data output swing | V <sub>out,pp</sub>   | 300                   |         | 800                   | mv    | 3    |
| Data output rise time          | t <sub>r</sub>        |                       |         | 260                   | ps    | 4    |
| Data output fall time          | t <sub>f</sub>        |                       |         | 260                   | ps    | 4    |
| LOS Fault                      | V <sub>losfault</sub> | V <sub>CC</sub> – 0.5 |         | V <sub>CC_host</sub>  | V     | 5    |
| LOS Normal                     | V <sub>los norm</sub> | V <sub>EE</sub>       |         | V <sub>EE</sub> +0.5  | V     | 5    |
| Power Supply Rejection         | PSR                   | 100                   |         |                       | mVpp  | 6    |

### Note:

1. AC coupled.
2. Or open circuit.
3. Into 100 ohm differential termination.
4. 20 – 80 %
5. LOS is LVTTTL. Logic 0 indicates normal operation; logic 1 indicates no signal detected.
6. All transceiver specifications are compliant with a power supply sinusoidal modulation of 20 Hz to 1.5MHz up to specified value applied through the power supply filtering network shown on page 23 of the Small Form-factor Pluggable (SFP) Transceiver Multi-Source Agreement (MSA), September 14, 2000.

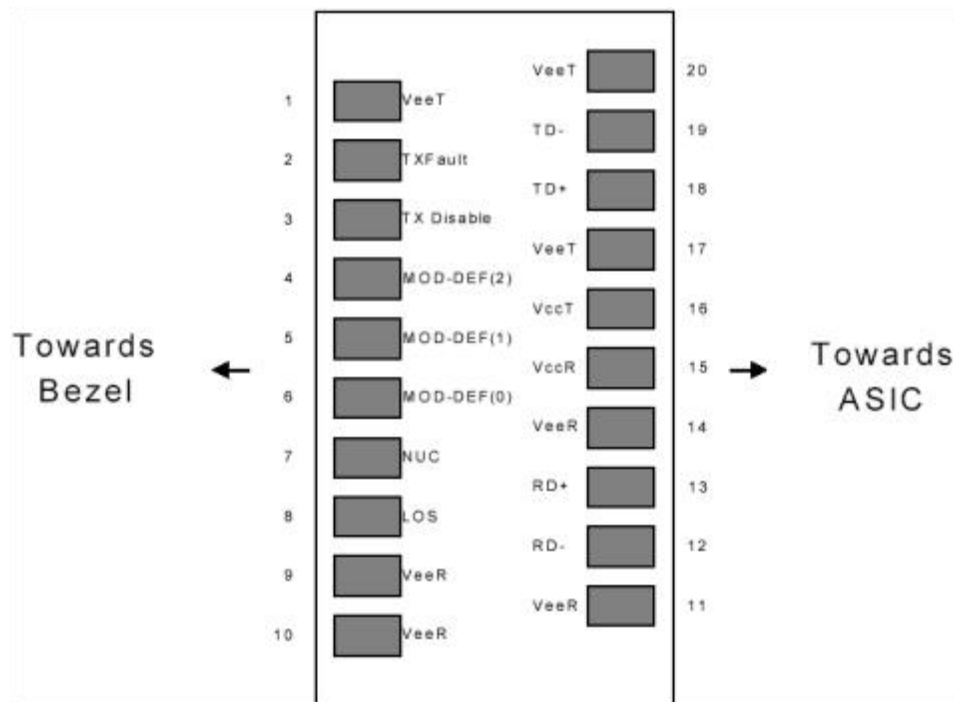
## Optical Parameters(TOP =T<sub>c</sub>, VCC = 3.135 to 3.465 Volts)

| Parameter                       | Symbol                                          | Min.           | Typical   | Max.           | Unit | Note |
|---------------------------------|-------------------------------------------------|----------------|-----------|----------------|------|------|
| Transmitter Section:            |                                                 |                |           |                |      |      |
| Center Wavelength               | $\lambda_c$                                     | $\lambda$ -6.5 | $\lambda$ | $\lambda$ +6.5 | nm   |      |
| Spectral Width                  | $\sigma$                                        |                |           | 1              | nm   |      |
| Side Mode Suppression Ratio     | SMSR                                            | 30             |           |                | dB   |      |
| Optical Output Power            | P <sub>out</sub>                                | -5             |           | 0              | dBm  | 1    |
| Optical Rise/Fall Time          | t <sub>r</sub> / t <sub>f</sub>                 |                |           | 260            | ps   | 2    |
| Extinction Ratio                | ER                                              | 9              |           |                | dB   |      |
| Generated Jitter (peak to peak) | J <sub>TXp-p</sub>                              |                | 0.1       |                | UI   |      |
| Generated Jitter (rms)          | J <sub>TXrms</sub>                              |                | 0.01      |                | UI   |      |
| Eye Mask for Optical Output     | Compliant with IEEE802.3z(class 1 laser safety) |                |           |                |      |      |
| Receiver Section:               |                                                 |                |           |                |      |      |

|                                                          |                  |      |      |                   |      |   |
|----------------------------------------------------------|------------------|------|------|-------------------|------|---|
| Optical Input Wavelength                                 | $\lambda_c$      | 1260 |      | 1620              | nm   |   |
| Receiver Overload                                        | P <sub>OL</sub>  | 0    |      |                   | dBm  | 3 |
| RX Sensitivity                                           | Sen              |      |      | -24               | dBm  | 3 |
| RX_LOS Assert                                            | LOS <sub>A</sub> | -40  |      |                   | dBm  |   |
| RX_LOS De-assert                                         | LOS <sub>D</sub> |      |      | -25               | dBm  |   |
| RX_LOS Hysteresis                                        | LOS <sub>H</sub> | 0.5  |      |                   | dB   |   |
| <b>General Specifications:</b>                           |                  |      |      |                   |      |   |
| Data Rate                                                | BR               |      | 1.25 |                   | Gb/s |   |
| Bit Error Rate                                           | BER              |      |      | 10 <sup>-12</sup> |      |   |
| Max. Supported Link Length on 9/125 $\mu$ m SMF@1.25Gb/s | L <sub>MAX</sub> |      | 40   |                   | km   |   |
| Total System Budget                                      | LB               | 19   |      |                   | dB   |   |

**Note:**

1. Class 1 Laser Safety per FDA/CDRH and EN (IEC) 60825 regulations.
2. Unfiltered, 20-80%. Complies with IEEE 802.3 (Gig. E), FC 1x and 2x eye masks when filtered.
3. Measured with PRBS 2<sup>23</sup>-1 @1.25G ,BER $\leq$ 1x10<sup>-12</sup> .

**Pin Assignment****Figure1:Diagram of Host Board Connector Block Pin Numbers and Names****Pin Function Definitions**

| Pin NO. | Name       | Function                     | Plug Seq | Notes |
|---------|------------|------------------------------|----------|-------|
| 1       | VeeT       | Transmitter Ground           | 1        | 1     |
| 2       | TX Fault   | Transmitter Fault Indication | 3        |       |
| 3       | TX Disable | Transmitter Disable          | 3        | 2     |
| 4       | MOD-DEF2   | Module Definition            | 2        | 3     |
| 5       | MOD-DEF1   | Module Definition 1          | 3        | 3     |

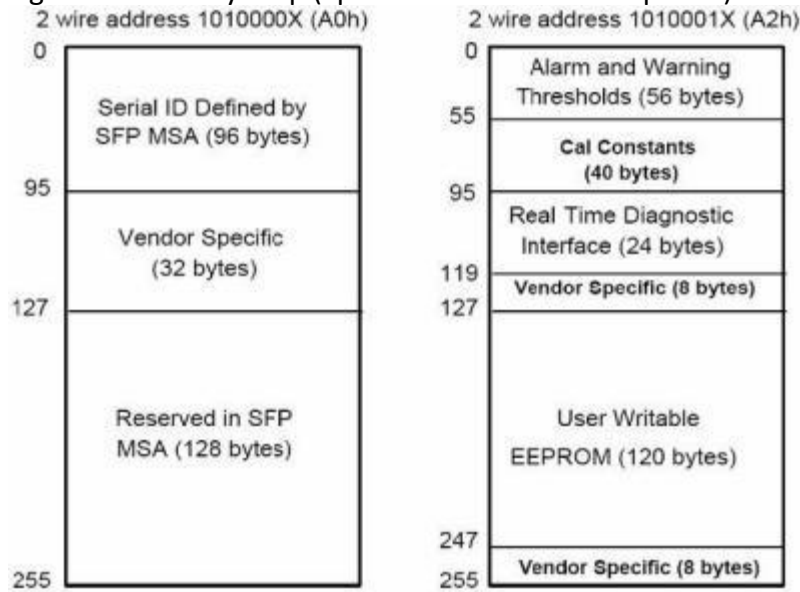
|           |             |                        |          |          |
|-----------|-------------|------------------------|----------|----------|
| <b>6</b>  | MOD-DEF0    | Module Definition 0    | <b>3</b> | 3        |
| <b>7</b>  | Rate Select | Not Connected          | <b>3</b> | <b>4</b> |
| <b>8</b>  | LOS         | Loss of Signal         | <b>3</b> | 5        |
| <b>9</b>  | VeeR        | Receiver Ground        | <b>1</b> | <b>1</b> |
| <b>10</b> | VeeR        | Receiver Ground        | <b>1</b> | <b>1</b> |
| <b>11</b> | VeeR        | Receiver Ground        | <b>1</b> | <b>1</b> |
| <b>12</b> | RD-         | Inv. Received Data Out | <b>3</b> | <b>6</b> |
| <b>13</b> | RD+         | Received Data Out      | <b>3</b> | <b>6</b> |
| <b>14</b> | VeeR        | Receiver Ground        | <b>3</b> | <b>1</b> |
| <b>15</b> | VccR        | Receiver Power         | <b>2</b> | <b>1</b> |
| <b>16</b> | VccT        | Transmitter Power      | <b>2</b> |          |
| <b>17</b> | VeeT        | Transmitter Ground     | <b>1</b> |          |
| <b>18</b> | TD+         | Transmit Data In       | <b>3</b> | 6        |
| <b>19</b> | TD-         | Inv. Transmit In       | <b>3</b> | 6        |
| <b>20</b> | VeeT        | Transmitter Ground     | <b>1</b> |          |

**Notes:**

1. Circuit ground is internally isolated from chassis ground.
2. Laser output disabled on TDIS >2.0V or open, enabled on TDIS <0.8V.
3. Should be pulled up with 4.7k - 10 kohms on host board to a voltage between 2.0V and 3.6V. MOD\_DEF(0) pulls line low to indicate module is plugged in.
4. Rate select is not used
5. LOS is open collector output. Should be pulled up with 4.7k — 10 kohms on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.
6. AC Coupled

## SFP Module EEPROM Information and Management

The SFP modules implement the 2-wire serial communication protocol as defined in the SFP-8472. The serial ID information of the SFP modules and Digital Diagnostic Monitor parameters can be accessed through the I<sup>2</sup>C interface at address A0h and A2h. The memory is mapped in Table 1. Detailed ID information (A0h) is listed in Table 2. And the DDM specification at address A2h. For more details of the memory map and byte definitions, please refer to the SFF-8472, “Digital Diagnostic Monitoring Interface for Optical Transceivers”. The DDM parameters have been internally calibrated.

**Table 1.** Digital Diagnostic Memory Map (Specific Data Field Descriptions)**Table 2 - EEPROM Serial ID Memory Contents (A0h)**

| Data Address       | Length (Byte) | Name of Length | Description and Contents                                                                              |
|--------------------|---------------|----------------|-------------------------------------------------------------------------------------------------------|
| Base ID Fields     |               |                |                                                                                                       |
| 0                  | 1             | Identifier     | Type of Serial transceiver (03h=SFP)                                                                  |
| 1                  | 1             | Reserved       | Extended identifier of type serial transceiver (04h)                                                  |
| 2                  | 1             | Connector      | Code of optical connector type (07=LC)                                                                |
| 3-10               | 8             | Transceiver    |                                                                                                       |
| 11                 | 1             | Encoding       | NRZ(03h)                                                                                              |
| 12                 | 1             | BR, Nominal    | Nominal baud rate, unit of 100Mbps                                                                    |
| 13-14              | 2             | Reserved       | (0000h)                                                                                               |
| 15                 | 1             | Length(9um)    | Link length supported for 9/125um fiber, units of 100m                                                |
| 16                 | 1             | Length(50um)   | Link length supported for 50/125um fiber, units of 10m                                                |
| 17                 | 1             | Length(62.5um) | Link length supported for 62.5/125um fiber, units of 10m                                              |
| 18                 | 1             | Length(Copper) | Link length supported for copper, units of meters                                                     |
| 19                 | 1             | Reserved       |                                                                                                       |
| 20-35              | 16            | Vendor Name    | SFP vendor name                                                                                       |
| 36                 | 1             | Reserved       |                                                                                                       |
| 37-39              | 3             | Vendor OUI     | SFP transceiver vendor OUI ID                                                                         |
| 40-55              | 16            | Vendor PN      | Part Number                                                                                           |
| 56-59              | 4             | Vendor rev     | Revision level for part number                                                                        |
| 60-62              | 3             | Reserved       |                                                                                                       |
| 63                 | 1             | CCID           | Least significant byte of sum of data in address 0-62                                                 |
| Extended ID Fields |               |                |                                                                                                       |
| 64-65              | 2             | Option         | Indicates which optical SFP signals are implemented (001Ah = LOS, TX_FAULT, TX_DISABLE all supported) |

|                           |     |           |                                                            |
|---------------------------|-----|-----------|------------------------------------------------------------|
| 66                        | 1   | BR, max   | Upper bit rate margin, units of %                          |
| 67                        | 1   | BR, min   | Lower bit rate margin, units of %                          |
| 68-83                     | 16  | Vendor SN | Serial number (ASCII)                                      |
| 84-91                     | 8   | Date code | Manufacturing date code                                    |
| 92-94                     | 3   | Reserved  |                                                            |
| 95                        | 1   | CCEX      | Check code for the extended ID Fields (addresses 64 to 94) |
| Vendor Specific ID Fields |     |           |                                                            |
| 96-127                    | 32  | Readable  | Specific date, read only                                   |
| 128-255                   | 128 | Reserved  | Reserved for SFF-8079                                      |

## Digital Diagnostic Monitor Characteristics

| Data Address | Parameter                        | Accuracy | Unit |
|--------------|----------------------------------|----------|------|
| 96-97        | Transceiver Internal Temperature | ±3.0     | °C   |
| 98-99        | VCC3 Internal Supply Voltage     | ±3.0     | %    |
| 100-101      | Laser Bias Current               | ±10      | %    |
| 102-103      | Tx Output Power                  | ±3.0     | dBm  |
| 104-105      | Rx Input Power                   | ±3.0     | dBm  |

## Regulatory Compliance

This transceiver complies with international Electromagnetic Compatibility (EMC) and international safety requirements and standards (see details in Table following).

|                                                           |                                                                    |                                        |
|-----------------------------------------------------------|--------------------------------------------------------------------|----------------------------------------|
| Electrostatic Discharge (ESD) to the Electrical Pins      | MIL-STD-883E<br>Method 3015.7                                      | Class 1(>1000 V)                       |
| Electrostatic Discharge (ESD) to the Duplex LC Receptacle | IEC 61000-4-2<br>GR-1089-CORE                                      | Compatible with standards              |
| Electromagnetic Interference (EMI)                        | FCC Part 15 Class B<br>EN55022 Class B (CISPR 22B)<br>VCCI Class B | Compatible with standards              |
| Laser Eye Safety                                          | FDA 21CFR 1040.10 and 1040.11<br>EN60950, EN (IEC) 60825-1,2       | Compatible with Class 1 laser product. |

## ● Recommended Circuit

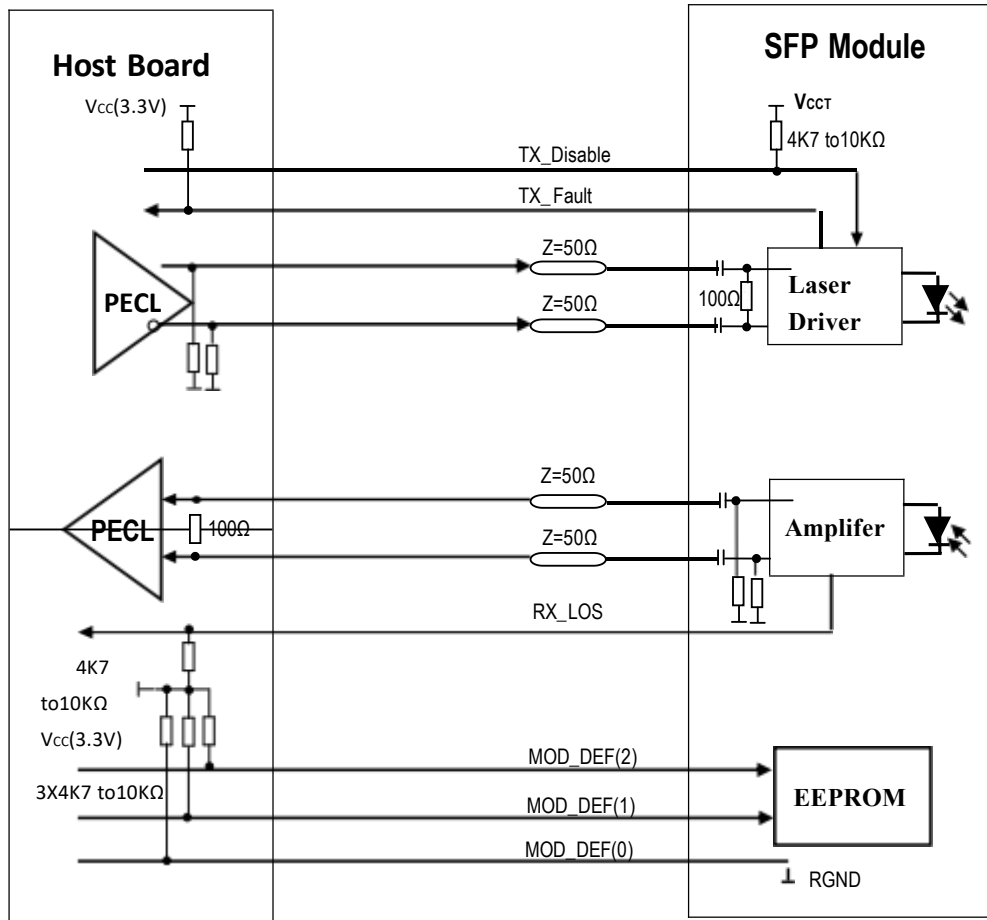


Figure 2. SFP Host Recommended Circuit

## Mechanical Dimensions

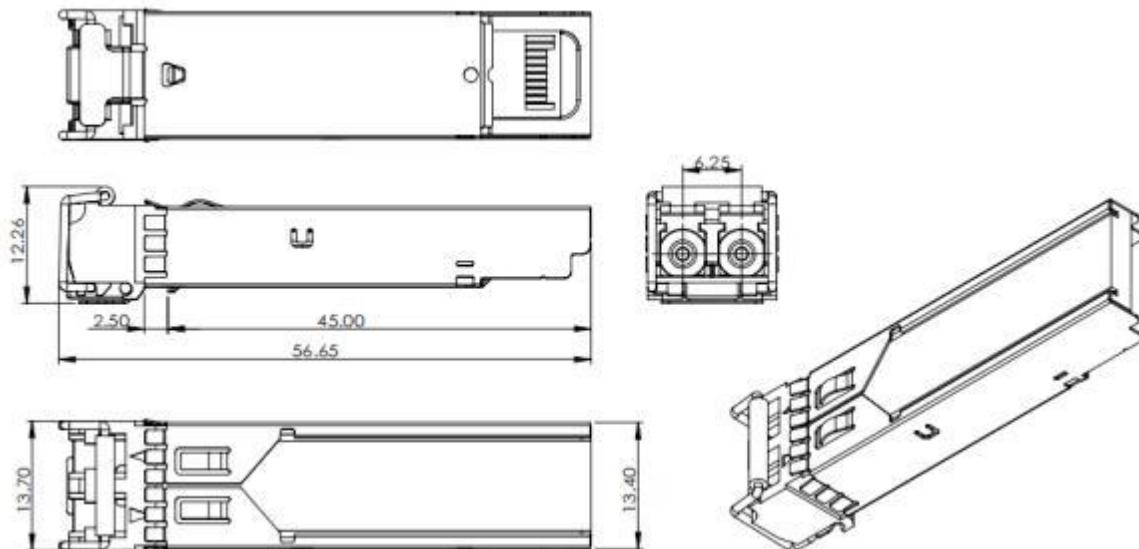


Figure 3. Mechanical Drawing