

SFP-CWDM-XX-1040

1.25Gbps SFP Transceiver

Features

- ◆ Operating data rate up to 1.25Gbps
- ◆ 18-Wavelength CWDM DFB LD Transmitter from 1270 nm to 1610 nm, with step 20 nm
- ◆ 24 dB Power Budget at Least
- ◆ Single 3.3V Power supply and TTL Logic Interface
- ◆ Duplex LC Connector Interface
- ◆ Hot Pluggable
- ◆ Operating Case Temperature
Standard: 0°C~+70°C,
Industrial:-40°C~+85°C
- ◆ Compliant with MSA SFP Specification
- ◆ Digital diagnostic monitor interface
Compatible with SFF-8472



Applications

- ◆ Gigabit Ethernet Switches and Routers
- ◆ Fiber Channel Switch Infrastructure
- ◆ XDSL Applications
- ◆ Metro Edge Switching

Product Description

The SFP-CWDM-XX-1040 series single mode transceivers is small form factor pluggable module for bi-directional serial optical data communications such as Gigabit Ethernet 1000BASE-ZX and Fiber Channel 1x SM-LC-L FC-PI. It is with the SFP 20-pin connector to allow hot plug capability. This module is designed for single mode fiber and operates at a nominal wavelength of CWDM wavelength. There are eighteen center wavelengths available from 1270 nm to 1610 nm, with each step 20 nm. A guaranteed minimum optical link budget of 24 dB is offered.

The transmitter section uses a multiple quantum well CWDM DFB laser and is a class 1 laser compliant according to International Safety Standard IEC-60825. The receiver section uses an integrated InGaAs detector preamplifier (IDP) mounted in an optical header and a limiting post-amplifier IC.

Regulatory Compliance

| Feature | Standard | Performance |
|------------------------------------------------------|--------------------------------------------------------------|-------------------------------------------------------------------------|
| Electrostatic Discharge (ESD) to the Electrical Pins | MIL-STD-883E Method 3015.7 | Class 1(>500 V) Isolation with the case |
| Electromagnetic Interference (EMI) | FCC Part 15 Class B | Compatible with standards |
| Laser Eye Safety | FDA 21CFR 1040.10 and 1040.11 EN60950, EN (IEC) 60825-1,2 | Compatible with Class I laser product. Compatible with TÜV standards |
| Component Recognition | UL and CUL | UL file E317337 |
| Green Products | RoHS | RoHS6 |

CWDM* Wavelength (0 to 70°C)

| band | Nomenclature | Wavelength(nm) | | |
|-------------------------|--------------|----------------|------|--------|
| | | Min. | Typ. | Max. |
| O-band Original | A | 1264 | 1270 | 1277.5 |
| | B | 1284 | 1290 | 1297.5 |
| | C | 1304 | 1310 | 1317.5 |
| | D | 1324 | 1330 | 1337.5 |
| | E | 1344 | 1350 | 1357.5 |
| E-band Extended | F | 1364 | 1370 | 1377.5 |
| | G | 1384 | 1390 | 1397.5 |
| | H | 1404 | 1410 | 1417.5 |
| | I | 1424 | 1430 | 1437.5 |
| | J | 1444 | 1450 | 1457.5 |
| S-band Short Wavelength | K | 1464 | 1470 | 1477.5 |
| | L | 1484 | 1490 | 1497.5 |
| | M | 1504 | 1510 | 1517.5 |
| | N | 1524 | 1530 | 1537.5 |
| C-band Conventional | O | 1544 | 1550 | 1557.5 |
| L-band Long Wavelength | P | 1564 | 1570 | 1577.5 |
| | Q | 1584 | 1590 | 1597.5 |

| | | | | |
|--|---|------|------|--------|
| | R | 1604 | 1610 | 1617.5 |
|--|---|------|------|--------|

CWDM*: 18 Wavelengths from 1270 nm to 1610 nm, each step 20 nm.

Absolute Maximum Ratings

| Parameter | Symbol | Min. | Max. | Unit |
|---------------------|-----------------|------|------|------|
| Storage Temperature | T _S | -40 | +85 | °C |
| Supply Voltage | V _{CC} | -0.5 | 3.6 | V |

Recommended Operating Conditions

| Parameter | Symbol | Min. | Typical | Max. | Unit |
|----------------------------|--------------------|-----------------|---------|------|-------|
| Operating Case Temperature | T _A | SFP-CWDM-XX-024 | 0 | +70 | °C |
| | | | -40 | +85 | |
| Power Supply Voltage | V _{CC} | 3.15 | 3.3 | 3.45 | V |
| Power Supply Current | I _{CC} | | | 300 | mA |
| Surge Current | I _{Surge} | | | +30 | mA |
| Baud Rate | | | 1.25 | | GBaud |

PERFORMANCE SPECIFICATIONS - ELECTRICAL

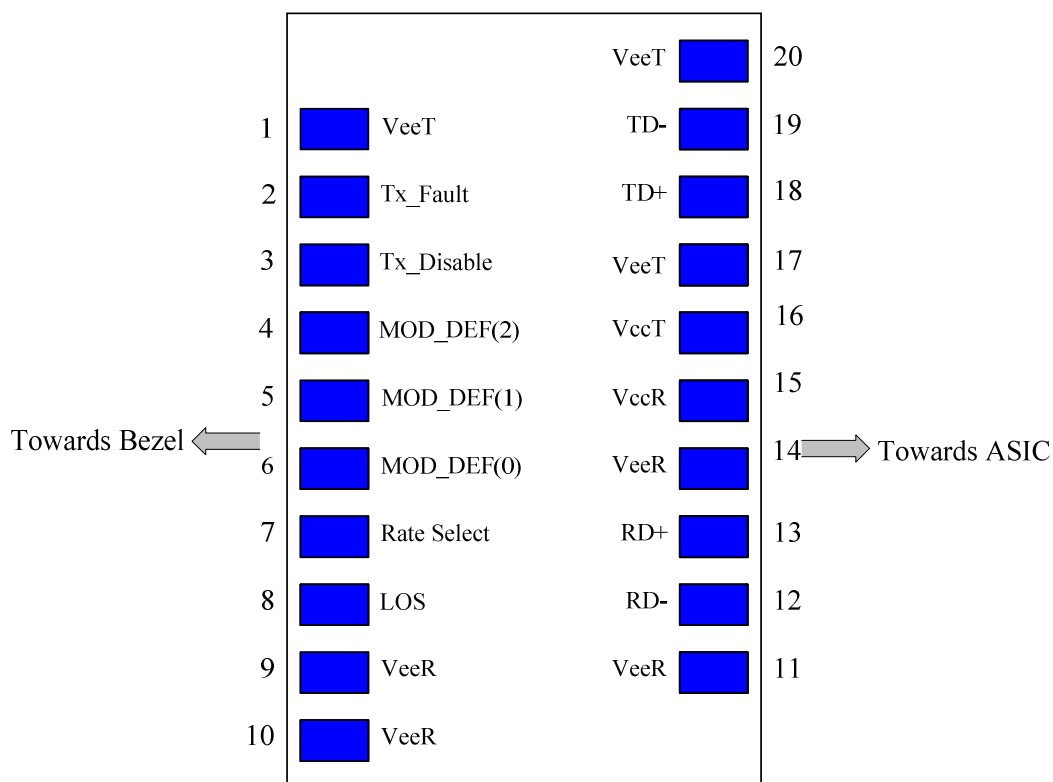
| Parameter | Symbol | Min. | Typ. | Max | Unit | Notes |
|---------------------------------|------------------|------|------|----------------------|------|----------------------------------------------|
| TRANSMITTER | | | | | | |
| LVPECL Inputs(Differential) | V _{in} | 400 | | 2500 | mVp | AC coupled inputs |
| Input Impedance (Differential) | Z _{in} | 85 | 100 | 115 | ohms | R _{in} > 100 kohms @ DC |
| Tx_DISABLE Input Voltage - High | | 2 | | 3.45 | V | |
| Tx_DISABLE Input Voltage - Low | | 0 | | 0.8 | V | |
| Tx_FAULT Output Voltage -- High | | 2 | | V _{CC} +0.3 | V | I _o = 400µA; Host V _{CC} |
| Tx_FAULT Output Voltage -- Low | | 0 | | 0.5 | V | I _o = -4.0mA |
| RECEIVER | | | | | | |
| LVPECL Outputs (Differential) | V _{out} | 400 | 800 | 1200 | mVpp | AC coupled outputs |
| Output Impedance (Differential) | Z _{out} | 85 | 100 | 115 | ohms | |
| Rx_LOS Output Voltage - High | | 2 | | V _{CC} +0.3 | V | I _o = 400µA; Host V _{CC} |

| | | | | | | |
|-----------------------------|-----|-----|--|-----|---|----------------|
| Rx_LOS Output Voltage - Low | | 0 | | 0.8 | V | Io = -4.0mA |
| MOD_DEF (0:2) | VoH | 2.5 | | | V | With Serial ID |
| | VoL | 0 | | 0.5 | V | |

Optical and Electrical Characteristics

| Parameter | Symbol | Min. | Typical | Max. | Unit |
|--------------------------------|-----------------------|-----------------|-------------|-----------------|----------|
| Data Rate | | | 1.25 | | Gbps |
| Transmitter | | | | | |
| Centre Wavelength | λ_c | $\lambda_c-5.5$ | λ_c | $\lambda_c+7.5$ | nm |
| Spectral Width (-20dB) | σ | | | 1 | nm |
| Average Output Power | P_{out} | 0 | | +5 | dBm |
| Extinction Ratio | EX | 10 | | | dB |
| Side Mode Suppression Ratio | SMSR | 30 | | | dB |
| Rise/Fall Time(20%~80%) | tr/tf | | | 2 | ns |
| Output Optical Eye | IUT-T G.957 Compliant | | | | |
| Data Input Swing Differential | V_{IN} | 500 | | 2000 | mV |
| Input Differential Impedance | Z_{IN} | 90 | 100 | 110 | Ω |
| TX_Disable | Disable | | 2.0 | $V_{CC}+0.3$ | V |
| | Enable | | 0 | 0.8 | |
| TX_Fault | Fault | | 2.0 | $V_{CC}+0.3$ | V |
| | Normal | | 0 | 0.8 | |
| TX_Disable Assert Time | t_off | | | 10 | us |
| Receiver | | | | | |
| Centre Wavelength | λ_c | 1100 | | 1600 | nm |
| Receiver Sensitivity | PIN | | | -24 | dBm |
| Output Differential Impedance | P_{IN} | 90 | 100 | 110 | Ω |
| Data Output Swing Differential | V_{OUT} | 370 | | 2000 | mV |
| Rise/Fall Time | Tr/tf | | | 2.2 | ns |
| LOS De-Assert | LOS _D | | | -25 | dBm |
| LOS Assert | LOS _A | -40 | | | dBm |
| LOS | High | | 2.0 | $V_{CC}+0.3$ | V |
| | Low | | 0 | 0.8 | |

SFP Transceiver Electrical Pad Layout



Pin Function Definitions

| Pin Num. | Name | FUNCTION | Plug Seq. | Notes |
|----------|-------------|------------------------------|-----------|-----------------------------------------|
| 1 | VeeT | Transmitter Ground | 1 | |
| 2 | TX Fault | Transmitter Fault Indication | 3 | Note 1 |
| 3 | TX Disable | Transmitter Disable | 3 | Note 2, Module disables on high or open |
| 4 | MOD-DEF2 | Module Definition 2 | 3 | Note 3, Data line for Serial ID. |
| 5 | MOD-DEF1 | Module Definition 1 | 3 | Note 3, Clock line for Serial ID. |
| 6 | MOD-DEF0 | Module Definition 0 | 3 | Note 3, Grounded within the module. |
| 7 | Rate Select | Not Connect | 3 | Function not available |
| 8 | LOS | Loss of Signal | 3 | Note 4 |
| 9 | VeeR | Receiver Ground | 1 | Note 5 |
| 10 | VeeR | Receiver Ground | 1 | Note 5 |
| 11 | VeeR | Receiver Ground | 1 | Note 5 |
| 12 | RD- | Inv. Received Data Out | 3 | Note 6 |
| 13 | RD+ | Received Data Out | 3 | Note 7 |

| | | | | |
|----|------|-----------------------|---|------------------|
| 14 | VeeR | Receiver Ground | 1 | Note 5 |
| 15 | VccR | Receiver Power | 2 | 3.3 ± 5%, Note 7 |
| 16 | VccT | Transmitter Power | 2 | 3.3 ± 5%, Note 7 |
| 17 | VeeT | Transmitter Ground | 1 | Note 5 |
| 18 | TD+ | Transmit Data In | 3 | Note 8 |
| 19 | TD- | Inv. Transmit Data In | 3 | Note 8 |
| 20 | VeeT | Transmitter Ground | 1 | Note 5 |

Notes:

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 K Ω 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 (see Section IV for further details). 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. The voltage swing on these lines will be between 370 and 2000 mV differential (185 –1000 mV single ended) when properly terminated.

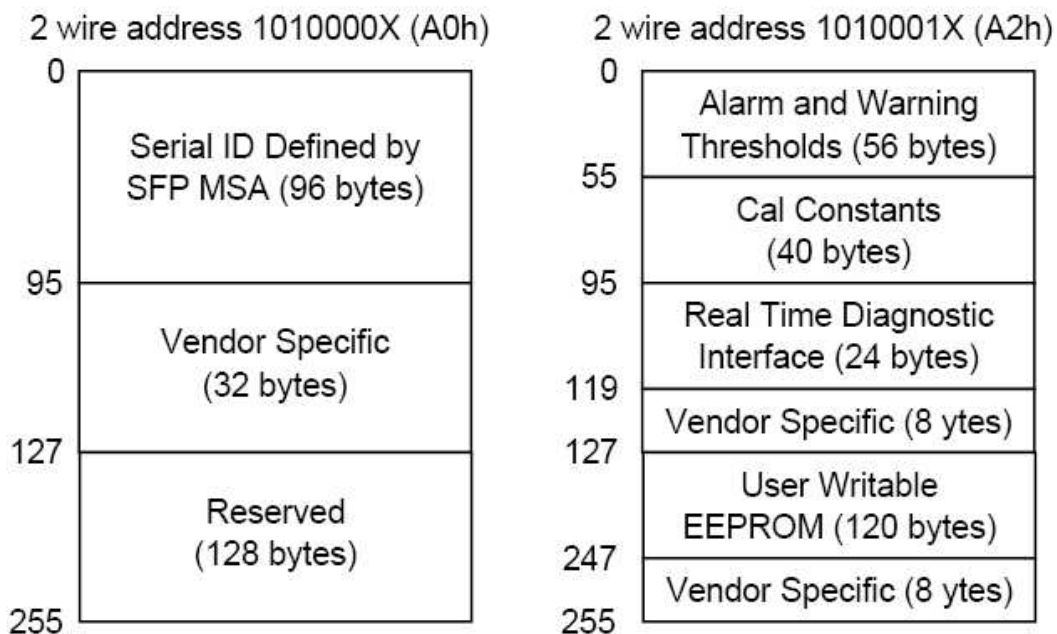
7) VccR and VccT are the receiver and transmitter power supplies. They are defined as 3.3V \pm 5% at the SFP connector pin. Maximum supply current is 300mA. Recommended host board power supply filtering is shown below. Inductors with DC resistance of less than 1 ohm should be used in order to maintain the required voltage at the SFP input pin with 3.3V supply voltage. When the recommended supply-filtering network is used, hot plugging of the SFP transceiver module will result in an inrush current of no more than 30mA 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. The inputs will accept differential swings of 500 – 2400 mV (250 – 1200mV single-ended), though it is recommended that values between 500 and 1200 mV differential (250 – 600mV single-ended) be used for best EMI performance.

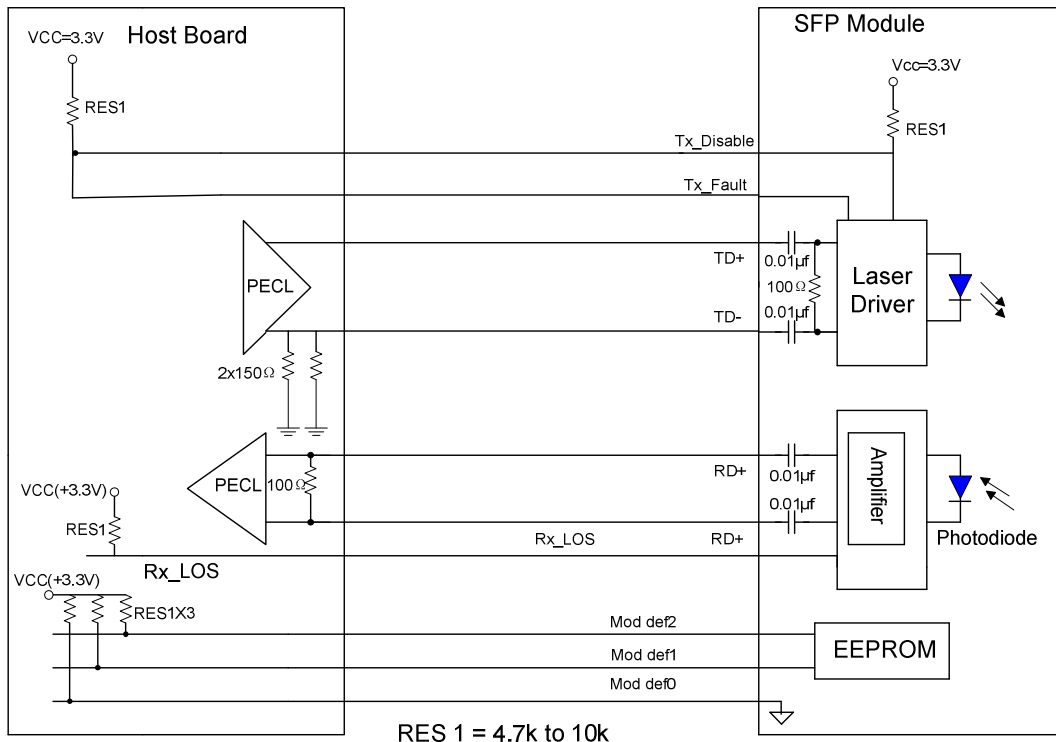
EEPROM

The serial interface uses the 2-wire serial CMOS EEPROM protocol defined for the ATMEL AT24C02/04 family of components. When the serial protocol is activated, the host generates the serial clock signal (SCL). 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) 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.

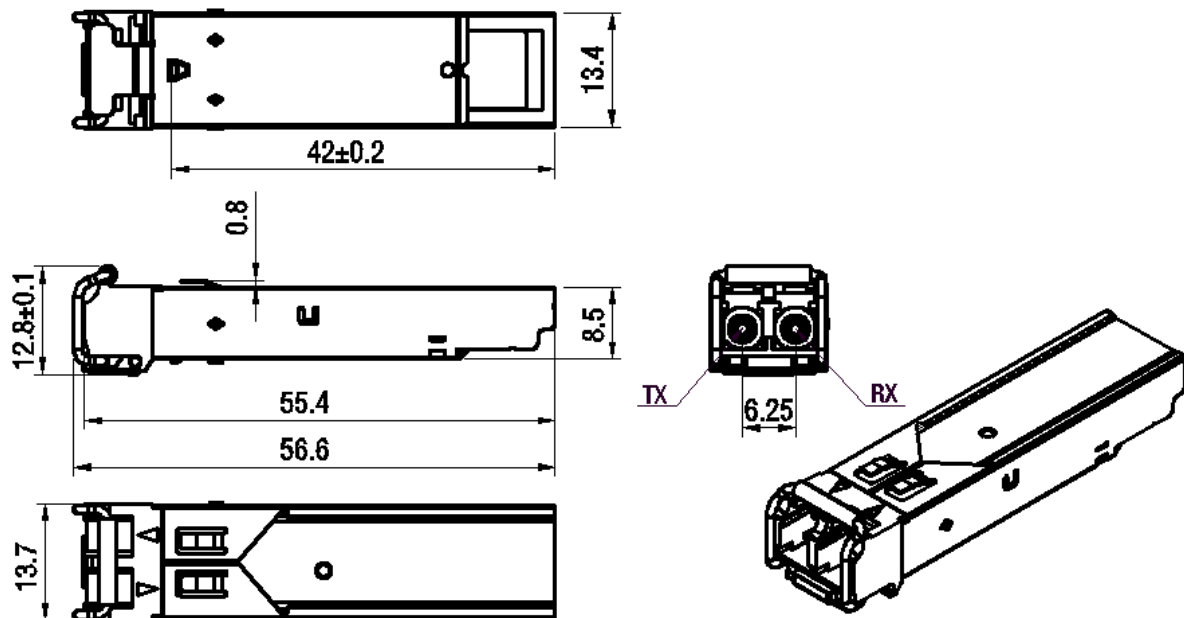
The Module provides diagnostic information about the present operating conditions. The transceiver generates this diagnostic data by digitization of internal analog signals. Calibration and alarm/warning threshold data is written during device manufacture. Received power monitoring, transmitted power 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 define as following .For detail EEPROM information, please refer to the related document of SFF 8472 Rev 9.3



Recommend Circuit Schematic



Mechanical Specifications



Ordering information

| Part No. | Data Rate | Wavelength (nm) | Fiber Type | Clasp Color Code | Optical Interface | DDMI |
|-------------------|-----------|-----------------|------------|------------------|-------------------|------|
| SFP-CWDM-47-02XXD | 1.25Gbps | 1470 | SMF | Gray | LC | YES |
| SFP-CWDM-49-02XXD | 1.25Gbps | 1490 | SMF | Violet | LC | YES |
| SFP-CWDM-51-02XXD | 1.25Gbps | 1510 | SMF | Blue | LC | YES |
| SFP-CWDM-53-02XXD | 1.25Gbps | 1530 | SMF | Green | LC | YES |
| SFP-CWDM-55-02XXD | 1.25Gbps | 1550 | SMF | Yellow | LC | YES |
| SFP-CWDM-57-02XXD | 1.25Gbps | 1570 | SMF | Orange | LC | YES |
| SFP-CWDM-59-02XXD | 1.25Gbps | 1590 | SMF | Red | LC | YES |
| SFP-CWDM-61-02XXD | 1.25Gbps | 1610 | SMF | Brown | LC | YES |
| | | | | | | |
| SFP-CWDM-47-02XX | 1.25Gbps | 1470 | SMF | Gray | LC | NO |
| SFP-CWDM-49-02XX | 1.25Gbps | 1490 | SMF | Violet | LC | NO |
| SFP-CWDM-51-02XX | 1.25Gbps | 1510 | SMF | Blue | LC | NO |
| SFP-CWDM-53-02XX | 1.25Gbps | 1530 | SMF | Green | LC | NO |
| SFP-CWDM-55-02XX | 1.25Gbps | 1550 | SMF | Yellow | LC | NO |
| SFP-CWDM-57-02XX | 1.25Gbps | 1570 | SMF | Orange | LC | NO |
| SFP-CWDM-59-02XX | 1.25Gbps | 1590 | SMF | Red | LC | NO |
| SFP-CWDM-61-02XX | 1.25Gbps | 1610 | SMF | Brown | LC | NO |

* I--- Industrial operating temperature

* D--- DDMI

* XX--- Distance(24 dB Power Budget at Least)

NOTICE:

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CONTACT:

Add: C5, 17th Floor, Yue Hu Building, Minzhi Road, Bao'an District, Shenzhen, China

Tel: (+86) 0755-8106111

Fax: (+86) 0755-26859755

Postal: 518131

E-mail: sales@zytom.com

<http://www.zyтом.com>