

# YSP96-8503M

## Features

- ✓ Up to 10.6Gbps data links
- ✓ 850nm VCSEL Laser and PIN photo-detector
- ✓ Up to 300m on 50/125μm MMF(OM3)
- ✓ Duplex LC receptacle optical interface compliant
- ✓ Hot pluggable
- ✓ All-metal housing for superior EMI performance
- ✓ RoHS6 compliant (lead free)
- ✓ Operating case temperature:  
Commercial: -5°C to +70°C  
Extended: -20°C to +80°C  
Industrial: -40°C to +85°C



## Applications

- ✓ 10GBASE-SR/SW
- ✓ Other optical links

## Standards

- ✓ Compliant with SFP+ MSA
- ✓ Compliant with SFF-8472
- ✓ Compatible with IEEE802.3ae

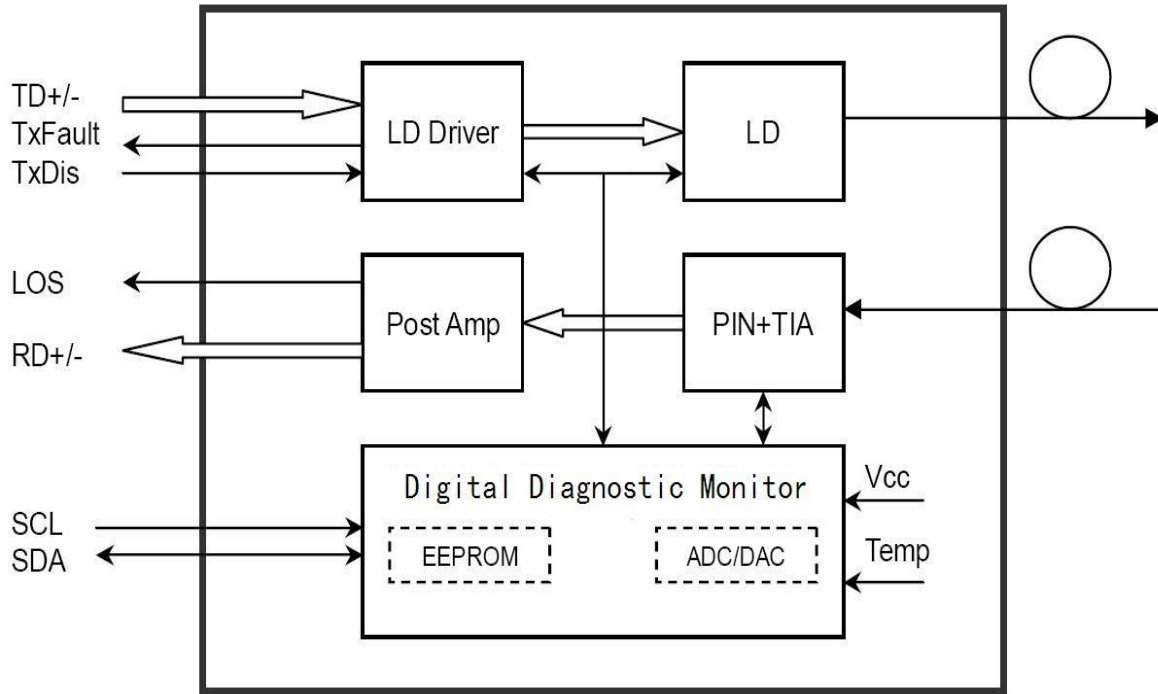
## Description

The SFP+ SR transceivers are designed for use in 10-Gigabit Ethernet links up to 300m over Multimode Mode Fiber (OM3).

| Maximum Supported Distances |                               |      |         |      |      |
|-----------------------------|-------------------------------|------|---------|------|------|
| Fiber Type                  | Minimum modal bandwidth@850nm | Min. | Typical | Max. | Unit |
| 62.5μm MMF                  | 160MHz*km                     | 2    |         | 26   | m    |
|                             | OM1:200MHz*km                 | 2    |         | 33   | m    |
| 50μm MMF                    | 400MHz*km                     | 2    |         | 66   | m    |
|                             | OM2:500MHz*km                 | 2    |         | 82   | m    |
|                             | OM3:2000MHz*km                | 2    |         | 300  | m    |
|                             | OM4:4700MHz*km                | 2    |         | 400  | m    |

The transceivers are compatible with SFP+ MSA and SFF-8472. For further information, please refer to SFP+ MSA and SFF-8472.

## Module Block Diagram



## Absolute Maximum Ratings

| Parameter              | Symbol           | Min. | Typical | Max. | Unit |
|------------------------|------------------|------|---------|------|------|
| Power Supply Voltage   | V <sub>CC</sub>  | 0    |         | 3.6  | V    |
| Storage Temperature    | T <sub>s</sub>   | -40  |         | +85  | °C   |
| Relative Humidity      | RH               | 0    |         | 85   | %    |
| RX Input Average Power | P <sub>max</sub> | -    |         | 1.5  | dBm  |

## Recommended Operating Environment

| Parameter                  | Symbol          | Min. | Typical | Max. | Unit |
|----------------------------|-----------------|------|---------|------|------|
| Power Supply Voltage       | V <sub>CC</sub> | 3.13 | 3.3     | 3.46 | V    |
| Power Supply Current       | I <sub>CC</sub> |      |         | 300  | mA   |
| Operating Case Temperature | Commercial      | -5   |         | +70  | °C   |
|                            | Extended        | -20  |         | +80  |      |
|                            | Industrial      | -40  |         | +85  |      |
| Data Rate                  |                 |      | 10.3125 |      | Gbps |

## Electrical Characteristics

| Parameter                      | Symbol           | Min.           | Typical | Max.           | Unit     | Note |
|--------------------------------|------------------|----------------|---------|----------------|----------|------|
| <b>Transmitter Section</b>     |                  |                |         |                |          |      |
| Input Differential Impedance   | $R_{in}$         | 90             | 100     | 110            | $\Omega$ |      |
| Differential Data Input Swing  | $V_{in\ PP}$     | 180            |         | 700            | mV       | 1    |
| Transmit Disable Voltage       | $V_D$            | $V_{cc} - 1.3$ |         | $V_{cc}$       | V        |      |
| Transmit Enable Voltage        | $V_{EN}$         | $V_{ee}$       |         | $V_{ee} + 0.8$ | V        |      |
| <b>Receiver Section</b>        |                  |                |         |                |          |      |
| Differential Data Output Swing | $V_{out\ PP}$    | 300            |         | 850            | mV       |      |
| LOS Fault                      | $V_{los\ fault}$ | $V_{cc} - 0.5$ |         | $V_{cc\_host}$ | V        | 2    |
| LOS Normal                     | $V_{los\ norm}$  | $V_{ee}$       |         | $V_{ee} + 0.5$ | V        | 2    |

### Notes:

1. Connected directly to TX data input pins. AC coupling from pins into laser driver IC.
2. LOS is an open collector output. Should be pulled up with 4.7k $\Omega$  – 10k $\Omega$  on the host board. Normal operation is logic 0; loss of signal is logic 1.

## Optical Parameters

| Parameter                             | Symbol                                             | Min.  | Typical | Max. | Unit  | Note |
|---------------------------------------|----------------------------------------------------|-------|---------|------|-------|------|
| Transmitter Section                   |                                                    |       |         |      |       |      |
| Centre Wavelength                     | $\lambda_c$                                        | 840   | 850     | 860  | nm    |      |
| Spectral Width (RMS)                  | $\sigma$                                           |       |         | 0.45 | nm    |      |
| Average Optical Power (avg.)          | P <sub>out</sub>                                   | -7    |         | -1   | dBm   | 1    |
| Laser Off Power                       | P <sub>off</sub>                                   | -     | -       | -30  | dBm   |      |
| Extinction Ratio                      | ER                                                 | 3.5   | -       | -    | dB    | 2    |
| Relative Intensity Noise              | RIN                                                | -     | -       | -128 | dB/Hz |      |
| Optical Rise/Fall Time                | t <sub>r</sub> / t <sub>f</sub>                    |       | -       | 50   | ps    | 3    |
| Optical Return Loss Tolerance         |                                                    | -     | -       | 12   | dB    |      |
| Output Optical Eye                    | Compliant with IEEE802.3ae eye masks when filtered |       |         |      |       | 2    |
| Receiver Section                      |                                                    |       |         |      |       |      |
| Receiver Center Wavelength            | $\lambda_c$                                        | 840   |         | 860  | nm    |      |
| Receiver Sensitivity in Average Power | Sen                                                | -11.1 |         | -1   | dBm   | 4    |
| Los Assert                            | LOS <sub>A</sub>                                   | -30   | -       | -    | dBm   |      |
| Los Dessert                           | LOS <sub>D</sub>                                   | -     | -       | -13  | dBm   |      |
| Los Hysteresis                        | LOS <sub>H</sub>                                   | 0.5   | -       | 5    | dB    |      |
| Overload                              | P <sub>in-max</sub>                                | -     | -       | -1   | dBm   | 4    |
| Receiver Reflectance                  |                                                    | -     | -       | -12  | dB    |      |
| Receiver power (damage)               |                                                    | -     | -       | 1.5  | dBm   |      |

#### Notes:

1. The optical power is launched into 50/125μm MMF.
2. Measured with a PRBS  $2^{31}-1$  test pattern @10.3125Gbps.
3. Unfiltered, 20-80%. Measured with a PRBS  $2^{31}-1$  test pattern @10.3125Gbps.
4. Measured with a PRBS  $2^{31}-1$  test pattern @10.3125Gbps, ER=4dB, BER <  $10^{-12}$ .

#### Timing Characteristics

| Parameter              | Symbol           | Min. | Typical | Max. | Unit |
|------------------------|------------------|------|---------|------|------|
| TX_Disable Assert Time | t_off            |      |         | 100  | us   |
| TX_Disable Negate Time | t_on             |      |         | 2    | ms   |
| Time to Initialize     | t_start_up       |      |         | 300  | ms   |
| Tx_Fault Assert        | t_fault_on       |      |         | 1    | ms   |
| Tx_Fault Reset         | t_reset          | 10   |         |      | us   |
| Rx_LOS Assert Delay    | t_los_on         |      |         | 100  | us   |
| Rx_LOS Negate Delay    | t_los_off        |      |         | 100  | us   |
| Clock Frequency        | f <sub>SCL</sub> | 0    |         | 400  | kHz  |

#### Digital Diagnostic Monitor Characteristics (DDM)

The following digital diagnostic characteristics are defined over the Recommended Operating Environment unless otherwise specified. It is compliant to SFF8472 Rev10.2 with internal calibration mode. For external calibration mode please contact our sales stuff.

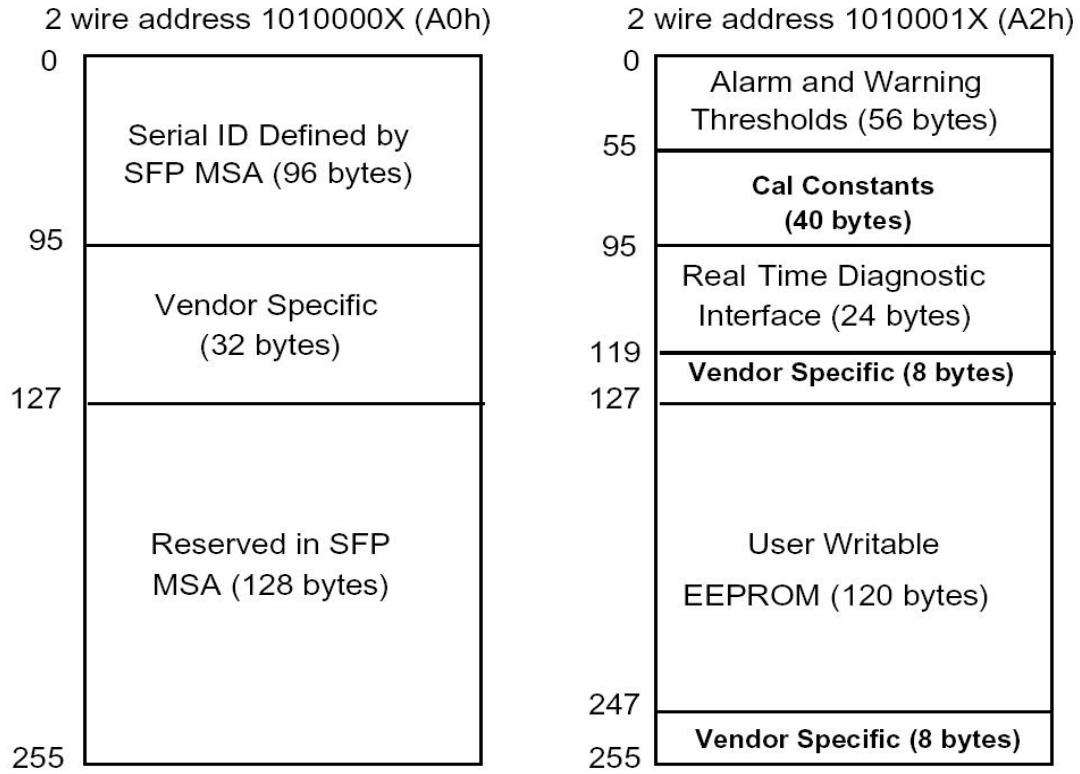
| Parameter                             | Symbol    | Min. | Max. | Unit |
|---------------------------------------|-----------|------|------|------|
| Temperature Monitor Absolute Error    | DMI_Temp  | -3   | 3    | °C   |
| Laser Power Monitor Absolute Error    | DMI_TX    | -3   | 3    | dB   |
| RX Power Monitor Absolute Error       | DMI_RX    | -3   | 3    | dB   |
| Supply Voltage Monitor Absolute Error | DMI_VCC   | -3%  | 3%   | V    |
| Bias Current Monitor Absolute Error   | DMI_Ibias | -10% | 10%  | mA   |

#### Digital Diagnostic Memory Map (Compliant with SFF-8472)

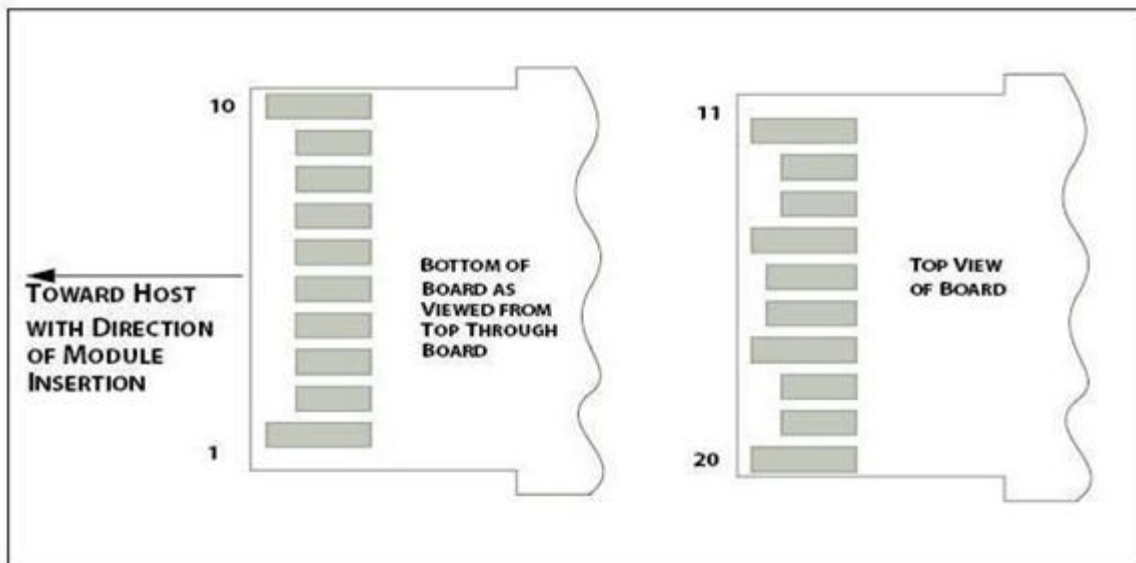
The transceivers provide serial ID memory contents and diagnostic information about the present operating conditions by the 2-wire serial interface (SCL, SDA).

The diagnostic information with internal calibration or external calibration all are implemented, including received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and temperature monitoring.

The digital diagnostic memory map specific data field defines as following (For further information, please refer to SFF-8472).



## Pin Definitions



SFP+ module contact assignment

## Pin Descriptions

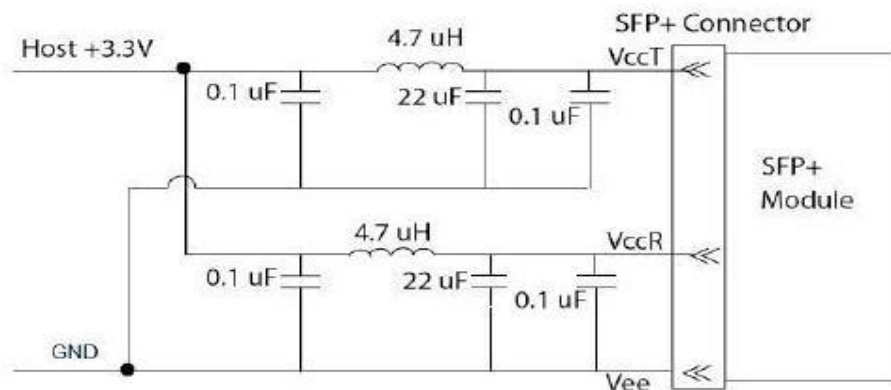
| Pin | Signal Name | Description                                             | Plug Seq. | Notes |
|-----|-------------|---------------------------------------------------------|-----------|-------|
| 1   | VeeT        | Module Transmitter Ground                               | 1         | 1     |
| 2   | TX FAULT    | Module Transmitter Fault                                | 3         |       |
| 3   | TX Disable  | Transmitter Disable; Turns off transmitter laser output | 3         |       |
| 4   | SDA         | 2-Wire Serial Interface Data Line                       | 3         | 2     |
| 5   | SCL         | 2-Wire Serial Interface Clock                           | 3         | 2     |
| 6   | Mod_ABS     | Module Definition, Grounded in the module               | 3         |       |
| 7   | RS0         | Receiver Rate Select (not used)                         | 3         |       |
| 8   | LOS         | Receiver Loss of Signal Indication Active LOW           | 3         |       |
| 9   | RS1         | Transmitter Rate Select (not used)                      | 3         |       |
| 10  | VeeR        | Module Receiver Ground                                  | 1         | 1     |
| 11  | VeeR        | Module Receiver Ground                                  | 1         | 1     |
| 12  | RD-         | Receiver Inverted Data Output                           | 3         |       |
| 13  | RD+         | Receiver Non-Inverted Data Output                       | 3         |       |
| 14  | VeeR        | Module Receiver Ground                                  | 1         | 1     |
| 15  | VccR        | Module Receiver 3.3 V Supply                            | 2         |       |
| 16  | VccT        | Module Transmitter 3.3 V Supply                         | 2         |       |
| 17  | VeeT        | Module Transmitter Ground                               | 1         | 1     |
| 18  | TD+         | Transmitter Non-Inverted Data Input                     | 3         |       |
| 19  | TD-         | Transmitter Inverted Data Input                         | 3         |       |
| 20  | VeeT        | Module Transmitter Ground                               | 1         | 1     |

### Notes:

Plug Seq.: Pin engagement sequence during hot plugging.

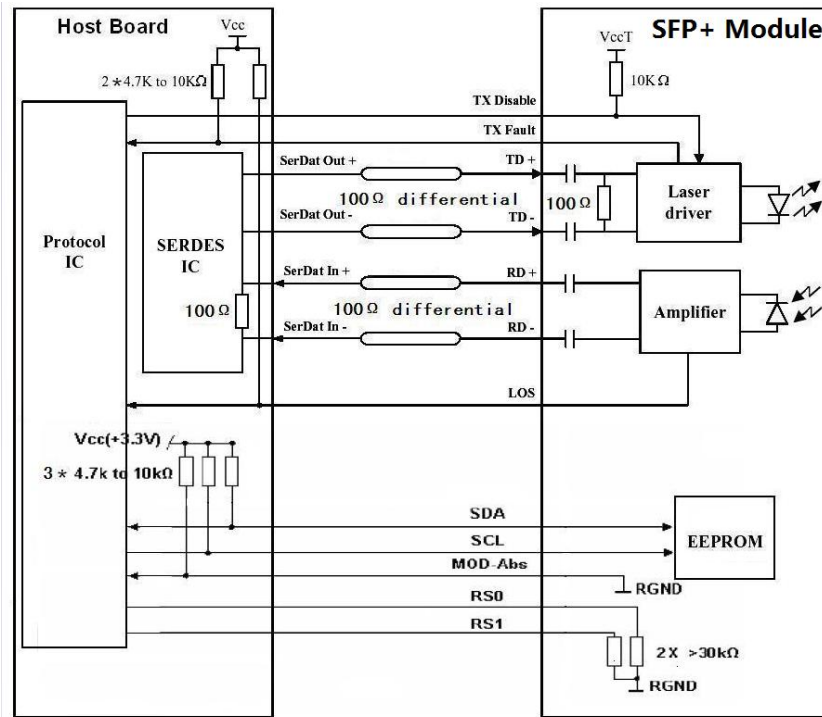
1. Module ground pins GND are isolated from the module case.
2. Shall be pulled up with 4.7K-10Kohms to a voltage between 3.15V and 3.45V on the host board.

## Recommended Power Interface Circuit

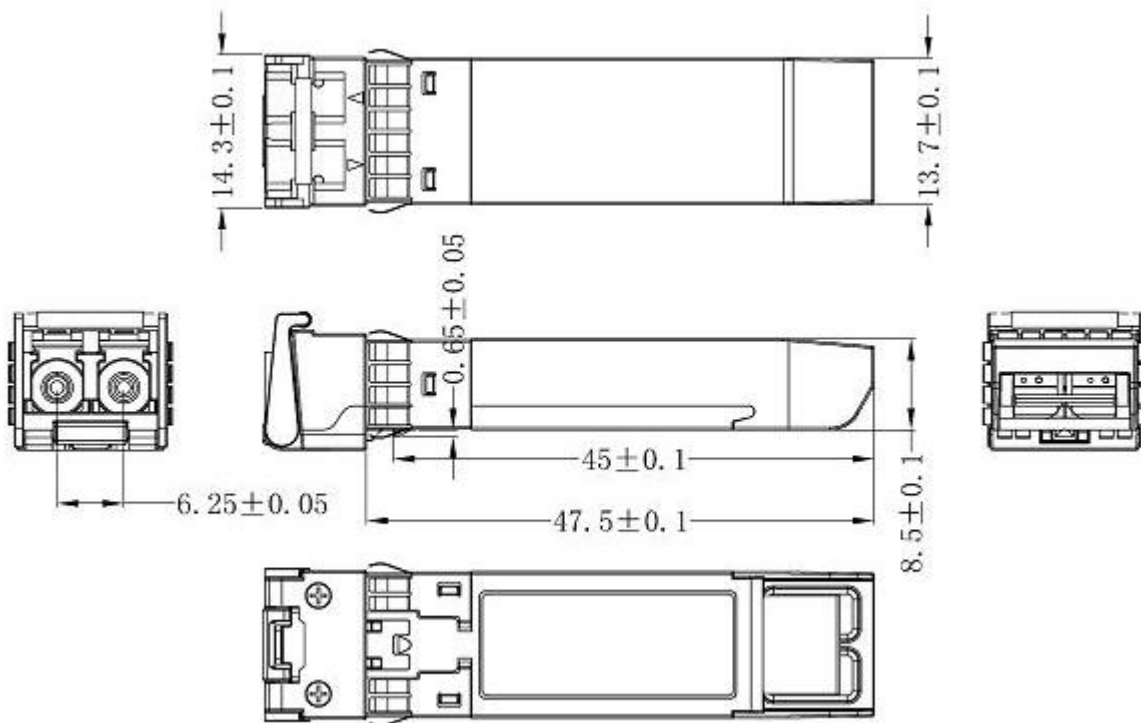


Host Board Power Supply Filters Circuit

## Recommended Interface Circuit



## Mechanical Dimensions



## Ordering information

| Part Number  | Product Description                                                       |
|--------------|---------------------------------------------------------------------------|
| YSP96-8503M  | 850nm, 10Gbps, 300m, Duplex LC SFP+ Transceiver, -5°C ~ +70°C, With DDM.  |
| YSP96-8503ME | 850nm, 10Gbps, 300m, Duplex LC SFP+ Transceiver, -20°C ~ +80°C, With DDM. |
| YSP96-8503MT | 850nm, 10Gbps, 300m, Duplex LC SFP+ Transceiver, -40°C ~ +85°C, With DDM. |

## References

1. "Specifications for Enhanced Small Form Factor Pluggable Module SFP+", SFF-8431, Rev 4.1, July 6, 2009.
2. "Improved Pluggable Form factor", SFF-8432, Rev 4.2, Apr 18, 2007.
3. "Diagnostic Monitoring Interface for Optical Transceivers" SFF-8472, Rev 10.2, June 1, 2007.
4. IEEE802.3ae 2002.

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## Contact Information

SHENZHEN YOUTHTON TECHNOLOGY CO., LTD.

ADD: ROOM 601, BUILDING A6, ZHU'AO INDUSTRIAL PARK, GUXING COMMUNITY, XIXIANG STREET, BAO'AN DISTRICT, SHENZHEN, CHINA

EMAIL: [info@youthton.com](mailto:info@youthton.com)