

10Gbps 10km Duplex LC CWDM SFP+ Transceiver
PSP96-CXX10

Features

- ✓ Up to 10.6Gbps data links
- ✓ CWDM DFB Laser and PIN photo-detector
- ✓ Up to 10km on 9/125µm SMF
- ✓ 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

Applications

- ✓ 10GBASE-LR/LW
- ✓ 10G Fiber Channel

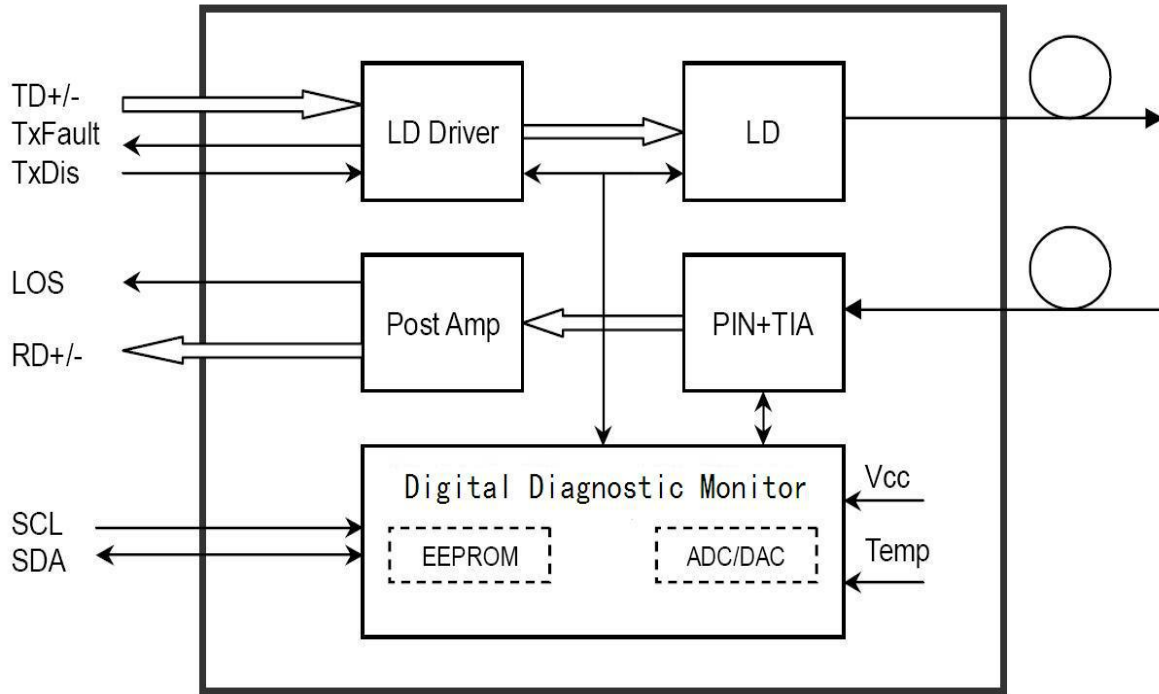
Standards

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

Description

The SFP+ transceivers are designed for use in 10-Gigabit Ethernet links up to 10km over Single Mode Fiber. 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 _{CC} | 0 | | 3.6 | V |
| Storage Temperature | T _s | -40 | | +85 | °C |
| Relative Humidity | RH | 0 | | 85 | % |
| RX Input Average Power | P _{max} | - | | 1.5 | dBm |

Recommended Operating Environment

| Parameter | Symbol | Min. | Typical | Max. | Unit |
|----------------------------|-----------------|------------|---------|------|------|
| Power Supply Voltage | V _{CC} | 3.13 | 3.3 | 3.46 | V |
| Power Supply Current | I _{CC} | | | 300 | mA |
| Operating Case Temperature | T _C | Commercial | -5 | +70 | °C |
| | | Extended | -20 | +80 | |
| Data Rate | | | 10.3125 | | Gbps |

Electrical Characteristics

| Parameter | Symbol | Min. | Typical | Max. | Unit | Note |
|--------------------------------|-----------------|----------------|---------|----------------|----------|------|
| Transmitter Section | | | | | | |
| Input Differential Impedance | R_{in} | 90 | 100 | 110 | Ω | |
| 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 | |
| Receiver Section | | | | | | |
| Differential Data Output Swing | $V_{out PP}$ | 300 | | 800 | 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 Ω – 10k Ω 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 | λ_c | $\lambda_c - 6.5$ | λ_c | $\lambda_c + 6.5$ | nm | |
| Spectral Width(-20dB) | $\Delta\lambda$ | | | 1 | nm | |
| Side Mode Suppression Ratio | SMSR | 30 | | | dB | |
| Average Optical Power (avg.) | P_{out} | -6 | | +0.5 | dBm | 1 |
| Laser Off Power | P_{off} | - | - | -30 | dBm | |
| Extinction Ratio | ER | 3.5 | - | - | dB | 2 |
| Relative Intensity Noise | RIN | - | - | -128 | dB/Hz | |
| Transmitter Dispersion Penalty | TDP | | | 3 | dB | |
| Optical Rise/Fall Time | t_r / t_f | | - | 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 | λ_c | 1260 | | 1620 | nm | |
| Receiver Sensitivity in Average Power | Sen | -14.4 | | 0.5 | dBm | 4 |
| Los Assert | LOS_A | -30 | - | - | dBm | |
| Los Dessert | LOS_D | - | - | -16 | dBm | |
| Los Hysteresis | LOS_H | 0.5 | - | 5 | dB | |
| Overload | P_{in-max} | - | - | 0.5 | dBm | 4 |
| Receiver Reflectance | | - | - | -12 | dB | |
| Receiver Power (damage) | | - | - | 1.5 | dBm | |

Notes:

1. The optical power is launched into 9/125µm SMF.
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 _{SCL} | 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 staff.

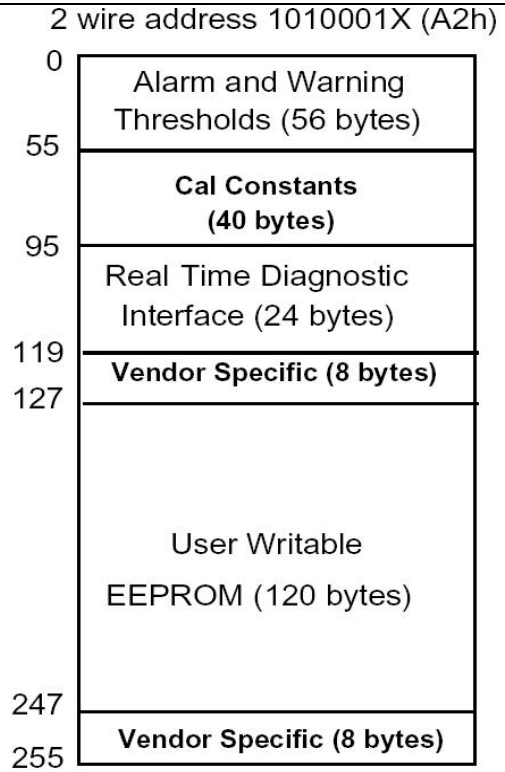
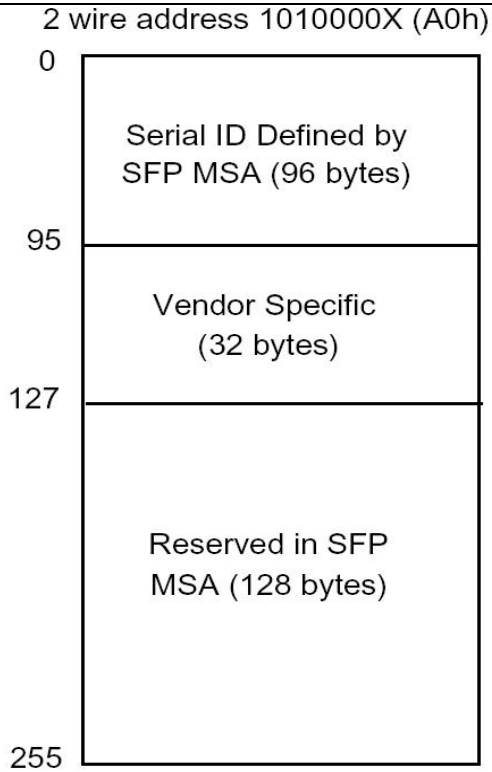
| Parameter | Symbol | Min. | Max. | Unit |
|---------------------------------------|-----------|------|------|------|
| Temperature Monitor Absolute Error | DMI_Temp | -3 | 3 | °C |
| Laser Power Monitor Absolute Error | DMI_TX | -3 | 3 | dB |
| RX Power Monitor Absolute Error | DMI_RX | -3 | 3 | dB |
| 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)

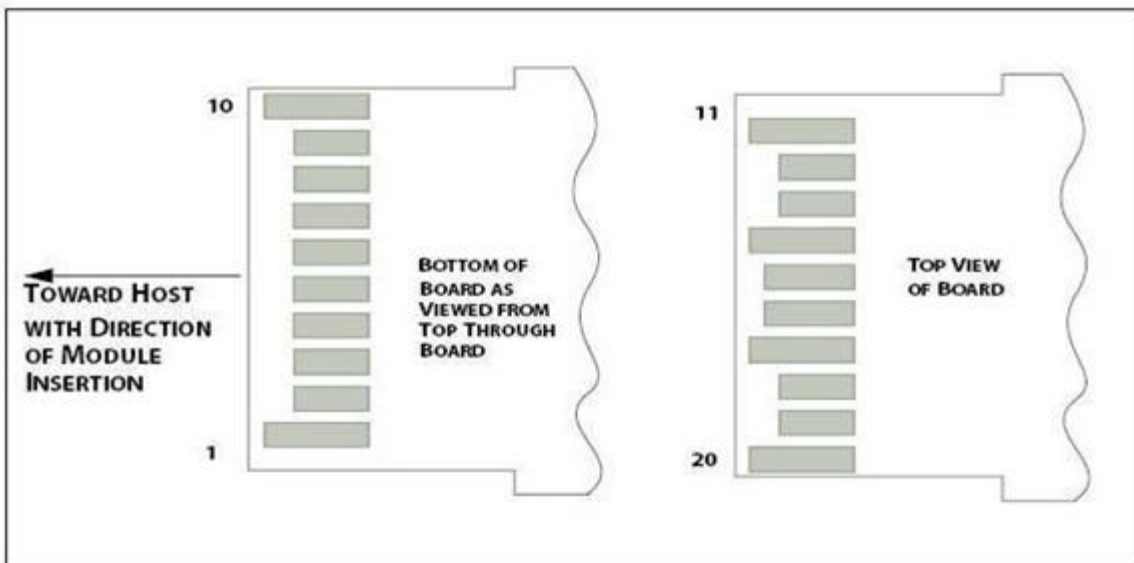
The transceivers provide serial ID memory contents and diagnostic information about the present operating conditions by the 2-wire serial interface (SCL, SDA).

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

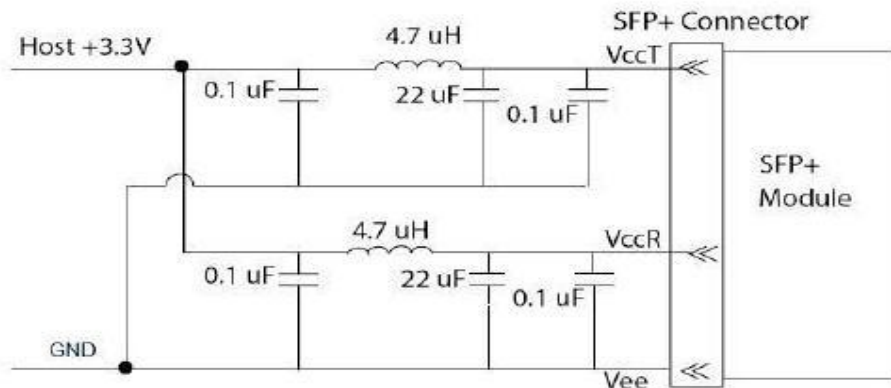
| Pin | Signal Name | Description | Plug Seq. | Notes |
|-----|-------------|---|-----------|-------|
| 1 | VeeT | Module Transmitter Ground | 1 | 1 |
| 2 | TX FAULT | Module Transmitter Fault | 3 | |
| 3 | TX Disable | Transmitter Disable; Turns off transmitter laser output | 3 | |
| 4 | SDA | 2-Wire 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.

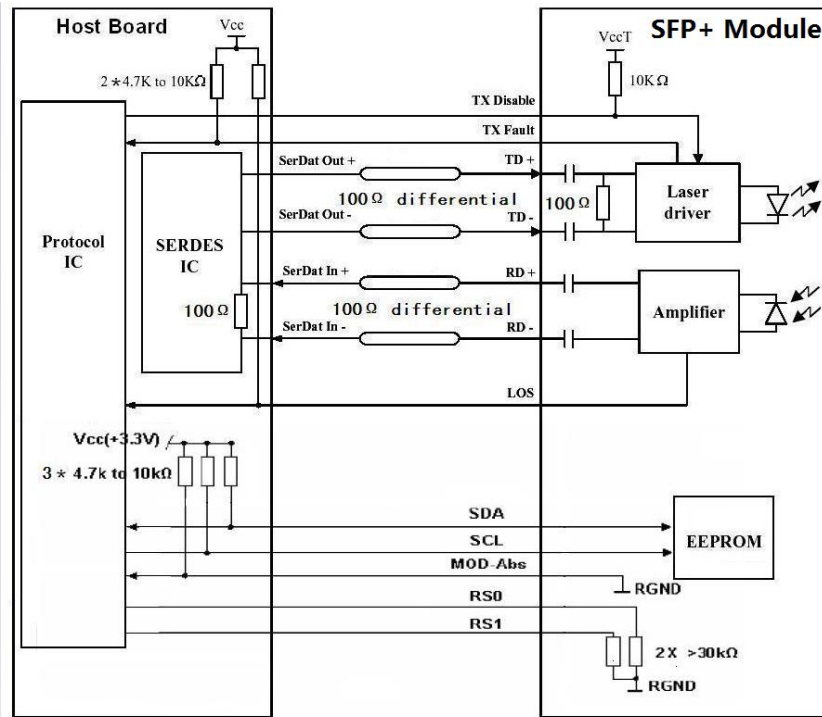
1. Module ground pins GND are isolated from the module case.
2. Shall be pulled up with 4.7K-10Kohms to a voltage between 3.15V and 3.45V on the host board.

Recommended Power Interface Circuit

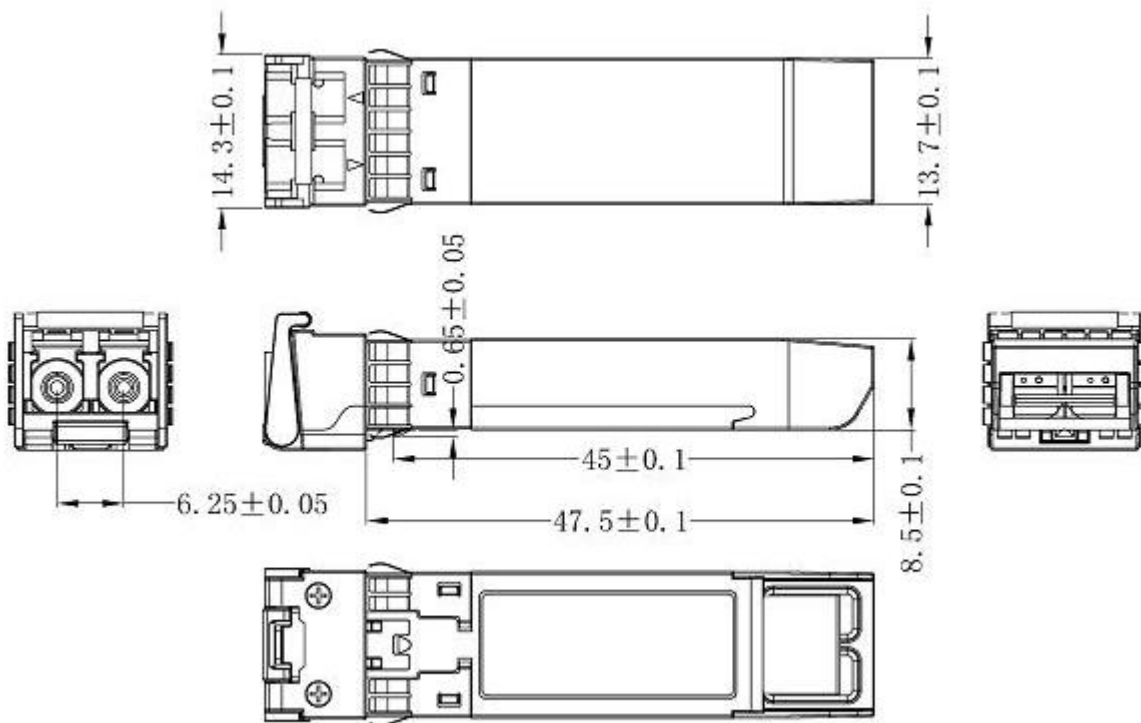


Host Board Power Supply Filters Circuit

Recommended Interface Circuit



Mechanical Dimensions



Ordering information

| Part Number | Product Description |
|--------------|--|
| PSP96-CXX10 | CWDM-XX, 10Gbps, 10km, Duplex LC CWDM SFP+ Transceiver, -5°C ~ +70°C, With DDM. |
| PSP96-CXX10E | CWDM-XX, 10Gbps, 10km, Duplex LC CWDM SFP+ Transceiver, -20°C ~ +80°C, With DDM. |

| Wavelength | xx | Clasp Color Code | Wavelength | xx | Clasp Color Code |
|------------|----|------------------|------------|----|------------------|
| 1271nm | 27 | Gray | 1451nm | 45 | Black |
| 1291nm | 29 | Violet | 1471nm | 47 | Gray |
| 1311nm | 31 | Blue | 1491nm | 49 | Violet |
| 1331nm | 33 | Green | 1511nm | 51 | Blue |
| 1351nm | 35 | Yellow | 1531nm | 53 | Green |
| 1371nm | 37 | Orange | 1551nm | 55 | Yellow |
| 1391nm | 39 | Red | 1571nm | 57 | Orange |
| 1411nm | 41 | Brown | 1591nm | 59 | Red |
| 1431nm | 43 | White | 1611nm | 61 | Brown |

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.

Important Notice

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