



10G / 25G SFP28 eSR Transceiver

Hot Pluggable, Duplex LC, 850nm VCSEL, MMF OM4 300M, DDM, Dual-Rate

Part Number: FSPP-N7-M85-X3DR



Overview:

FSPP-N7-M85-X3DR is a Small Form Factor Pluggable transceiver compliant with SFF-8402 SFP28 MSA standard. The high performance uncooled 850nm VCSEL transmitter and high sensitivity PIN receiver with built-in CDR provide superior performance for 10GBASE-SR / 25GBASE-SR Ethernet and CPRI Option #10 applications up to MMF OM4 300m optical links.

Applications:

- 10GBASE-SR/SW Ethernet @10.3125G
- 25GBASE-SR Ethernet @25.78G
- CPRI Option #10 @24.33G
- eCPRI 5G Mobile Networks

Features:

- Compliant with IEEE802.3by 25GBASE-SR
- Compatible with IEEE802.3ae 10GBASE-SR/SW
- Compliant with CPRI option10
- Compliant with SFF-8402 SFP28 MSA
- Support 10.3125G / 25.78G Dual-Rate Ethernet
- Built-in CDR on both Transmitter and Receiver
- Hot Pluggable
- 850nm VCSEL laser transmitter
- Duplex LC connector
- 2-wire interface for management and diagnostic monitor compliant with SFF-8472
- Single +3.3V power supply
- Link distance 200m over MM OM3 fiber and 300m over MM OM4 fiber
- Maximum Power consumption 1.0W
- RoHS Compliant

Absolute Maximum Ratings:

| Parameters | Symbol | Min. | Max. | Unit |
|---------------------------|-----------------|------|------|------|
| Storage Temperature | T _{ST} | -40 | +85 | °C |
| Storage Relative Humidity | RH | 5 | 95 | % |
| Supply Voltage | V _{CC} | -0.5 | +4.0 | V |



Recommended Operating Conditions:

| Parameters | Symbol | Min. | Typ. | Max. | Unit |
|--|-----------------|-------|------|-------|------|
| Case Operating Temp. (FSPP-N7-M85-X3DR) | T _{OP} | 0 | - | +70 | °C |
| Case Operating Temp. (FSPP-N7-M85-X3DRi) | T _{OP} | -40 | - | +85 | °C |
| Supply Voltage | V _{CC} | +3.13 | +3.3 | +3.47 | V |
| Supply Current (FSPP-N7-M85-X3DR) | I _{CC} | | | 270 | mA |
| Supply Current (FSPP-N7-M85-X3DRi) | I _{CC} | | | 300 | mA |
| Power Consumption | P | | | 1.0 | W |

Transmitter Electro-optical Characteristics:

V_{CC}= 3.13V to 3.47V, T_{OP} = 0 °C to 70 °C(FSPP-N7-M85-X3DR); T_{OP} = -40 °C to 85 °C(FSPP-N7-M85-X3DRi)

| Parameters | Symbol | Min. | Typ. | Max. | Unit | Note |
|---|--------------------|-------------|-------|-----------------|------|------|
| Operating Data Rate | DR | 10.3125 | 25.78 | | Gb/s | |
| Optical Launch Power | P _o | -8.4 | | +2.4 | dBm | 1 |
| Optical Center Wavelength | λ _c | 840 | 850 | 860 | nm | |
| Spectral Width (RMS) | Δλ | | | 0.5 | nm | |
| Optical Extinction Ratio | ER | 2.0 | | | dB | |
| Optical Eye Mask | | IEEE802.3by | | | | |
| Differential Data Input Swing | V _{IN} | 180 | | 950 | mV | |
| TX Disable Input Voltage-Low (TX ON) | TDISV _L | GND | | 0.8 | V | |
| TX Disable Input Voltage-High (TX OFF) | TDISV _H | 2.0 | | V _{CC} | V | |
| TX Fault Output Voltage-Low (TX Normal) | TFLTV _L | GND | | 0.8 | V | |
| TX Fault Output Voltage-High (TX Fault) | TFLTV _H | 2.0 | | V _{CC} | V | |

Note1: The optical power is launched into a 50/125μm multi-mode fiber.



Receiver Electro-optical Characteristics:

V_{CC}= 3.13V to 3.47V, T_{OP} = 0 °C to 70 °C(FSPP-N7-M85-X3DR); T_{OP} = -40 °C to 85 °C(FSPP-N7-M85-X3DRi)

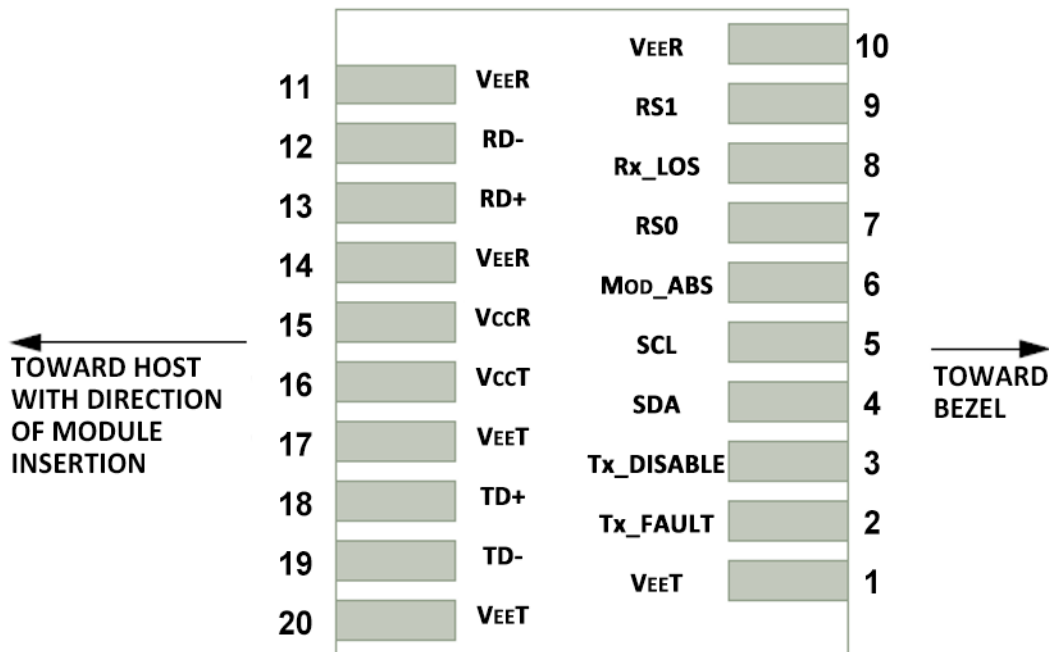
| Parameters | Symbol | Min. | Typ. | Max. | Unit | Note |
|---|---------------------|---------|-------|-----------------|------|------|
| Operating Data Rate | DR | 10.3125 | 25.78 | | Gb/s | |
| Receiver Sensitivity @25G | P _{IN_min} | | | -11.9 | dBm | 1 |
| Receiver Sensitivity @10G | | | | -13 | | 2 |
| Maximum Input Power | P _{IN_max} | +2.4 | | | dBm | 1 |
| Optical Center Wavelength | λ _c | 840 | | 860 | nm | |
| LOS De-Assert | LOS _D | | | -14 | dBm | |
| LOS Assert | LOS _A | -30 | | | dBm | |
| LOS Hysteresis | LOS _{HY} | 0.5 | | | dB | |
| Differential Data Output Swing | V _{OUT} | 500 | | 900 | mV | |
| Receiver LOS Signal Output Voltage-Low | LOS _{VL} | GND | | 0.8 | V | |
| Receiver LOS Signal Output Voltage-High | LOS _{VH} | 2.0 | | V _{CC} | V | |

Note1: Measured with a PRBS 2³¹-1 test pattern @25.78125Gbps BER<5x10⁻⁵.

Note2: Measured with a PRBS 2³¹-1 test pattern @10.3125Gbps BER<10⁻¹².



Pin Assignment:



Host PCB SFP28 Pad Assignment Top View

Pin Description:

| Pin | Name | Function / Description |
|-----|------------|---|
| 1 | VEET | Transmitter Ground |
| 2 | Tx_FAULT | Transmitter Fault Indication (1) |
| 3 | Tx_DISABLE | Transmitter Disable – Turns off transmitter laser output (2) |
| 4 | SDA | 2-wire Serial Interface Data Line (SDA: Serial Data Signal) (3) |
| 5 | SCL | 2-wire Serial Interface Clock (SCL: Serial Clock Signal) (3) |
| 6 | MOD_ABS | Module Absent, connected to VEET or VEER in the module (3) |
| 7 | RS0 | Rate Select 0, optional (5) |
| 8 | Rx_LOS | Receiver Loss of Signal Indication (4) |
| 9 | RS1 | Rate Select 1, optional (5) |
| 10 | VEER | Receiver Ground |
| 11 | VEER | Receiver Ground |
| 12 | RD- | Receiver Inverted Data output, AC coupled |



| | | |
|----|------|---|
| 13 | RD+ | Receiver Non-Inverted Data output, AC coupled |
| 14 | VEER | Receiver Ground |
| 15 | VccR | Receiver 3.3V Power Supply |
| 16 | VccT | Transmitter 3.3V Power Supply |
| 17 | VEET | Transmitter Ground |
| 18 | TD+ | Transmitter Non-Inverted Data Input, AC coupled |
| 19 | TD- | Transmitter Inverted Data Input, AC coupled |
| 20 | VEET | Transmitter Ground |

Note1: TX Fault is open collector/drain output which should be pulled up externally with a 4.7K~10KΩ resistor on the host board to supply $V_{ccT}+0.3V$ or $V_{ccR}+0.3V$. When high, this output indicates a laser fault of some kind. Low indicates normal operation. In the low state, the output will be pulled to <math><0.8V</math>.

Note2: TX Disable input is used to shut down the laser output per the state table below. It is pulled up within the module with a 4.7K~10KΩ resistor. 1) Low(0~0.8V): Transmitter on; 2) Between(0.8V and 2V): Undefined; 3) High (2.0~ VccT): Transmitter Disabled; 4) Open: Transmitter Disabled.

Note3: These are the module definition pins. They should be pulled up with a 4.7K~10KΩ resistor on the host board to supply less than $V_{ccT}+0.3V$ or $V_{ccR}+0.3V$. MOD_ABS is grounded by the module to indicate that the module is present.

Note4: Rx_LOS (Loss of signal) is an open collector/drain output which should be pulled up externally with a 4.7K~10KΩ resistor on the host board to supply $V_{ccT}+0.3V$ or $V_{ccR}+0.3V$. 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 <math><0.8V</math>.

Note5: No connect on this module. Rate select can be set through the 2-wire bus in accordance with SFF-8472 v12.1c. Rx Rate Select is set at Bit 3, Byte 110, Address A2h. Tx Rate Select is set at Bit 3, Byte 118, Address A2h. Writing a "1" selects maximum bandwidth operation.

Digital Diagnostic Functions:

As defined by the SFP MSA (SFF-8472) Ficer's SFP28 transceivers provide digital diagnostic functions via a 2-wire serial interface, which allows real-time access to the following operating parameters:

- Transceiver temperature
- Laser bias current
- Transmitted optical power
- Received optical power
- Transceiver supply voltage

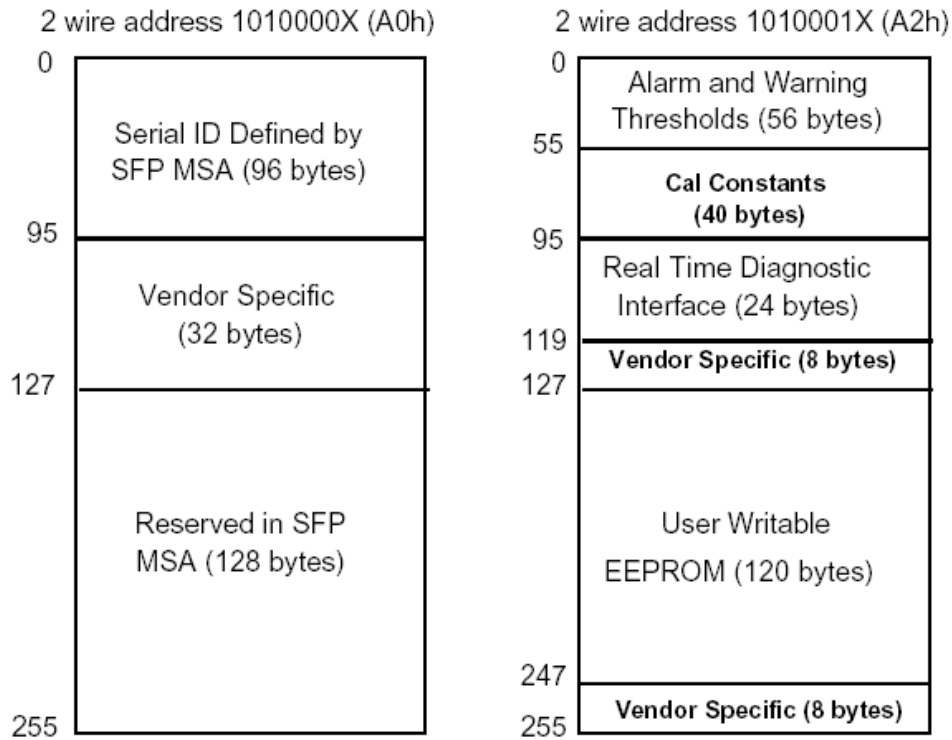
It also provides a sophisticated system of alarm and warning flags, which may be used to alert end-users when particular operating parameters are outside of a factory-set normal range.

The operating and diagnostics information is monitored and reported by a Digital Diagnostics Controller (DDC) inside the transceiver, which is accessed through the 2-wire serial interface. When the serial protocol is activated, the serial clock signal (SCL pin) is generated by the host. The positive edge clocks data into the SFP28 transceiver into those segments of its memory map that are not write-protected. The negative edge clocks data from the SFP28 transceiver. The serial data signal (SDA pin) 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.



For more detailed information including memory map definitions, please see the SFP MSA (SFF-8472) Specification.

Digital Diagnostic Memory Map

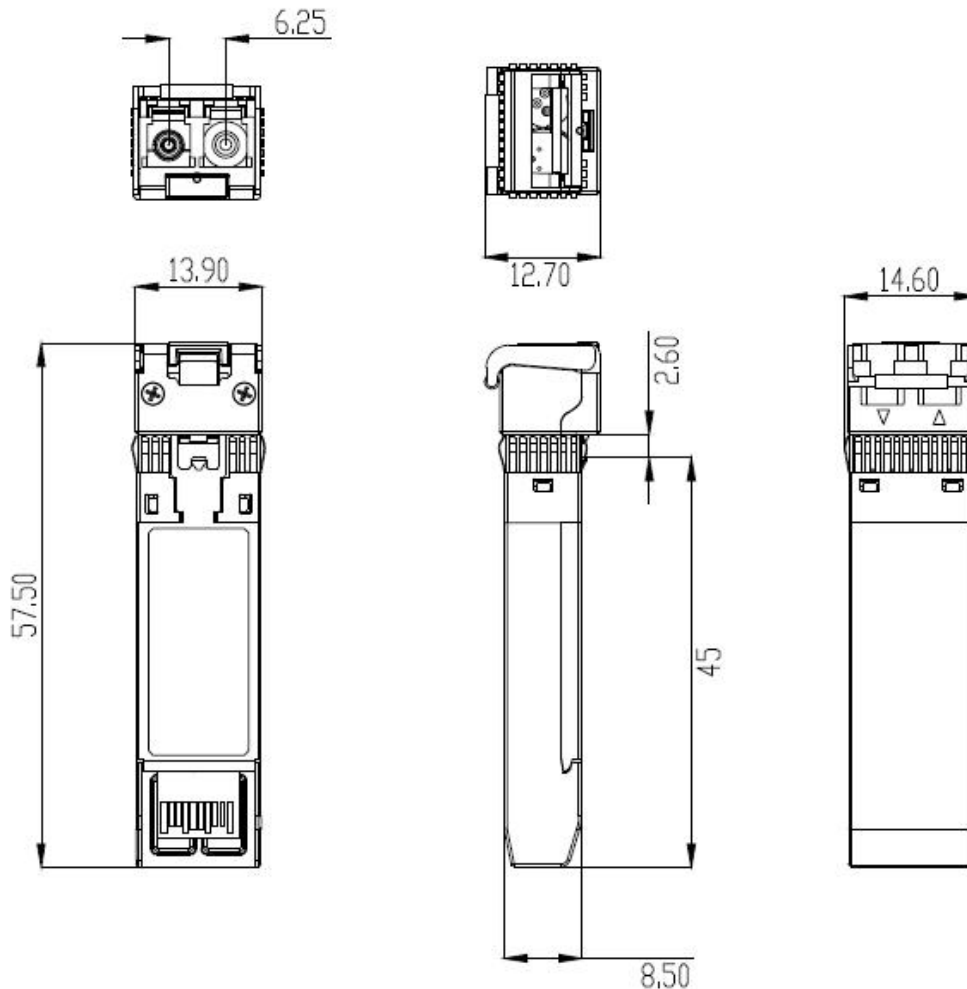


Digital Diagnostic Monitoring Characteristics

| Parameter | Accuracy | Unit | Note |
|---------------------------|----------|------|----------------------|
| Temperature | ±3 | °C | Internal Calibration |
| Supply Voltage | ±0.1 | V | Internal Calibration |
| TX Bias Current | ±5 | mA | Internal Calibration |
| TX Output Power | ±3 | dB | Internal Calibration |
| RX Received Optical Power | ±3 | dB | Internal Calibration |



Mechanical Dimensions:



(All Dimensions are $\pm 0.20\text{mm}$ Unless Otherwise Specified, Unit: mm)

Ordering Information:

| Part No. | TX | RX | Link | DDM | Temp. |
|------------------|-------|-------|------------------------------|-----|----------|
| FSP-P7-M85-X3DR | 850nm | 850nm | MM OM4: 300m MM OM3: 200m | Yes | 0~70°C |
| FSP-P7-M85-X3DRi | | | | | -40~85°C |

NOTE: Distances are indicative only. To calculate a more precise link budget based on specific conditions in your application, please refer to the optical characteristics.