

## 800G-OSFP112-DR8-IHS Finned-top MPO16 Pluggable Optical Transceiver

### Features

- OSFP MSA 5.0 and CMIS 5.1 compliant
- MPO-16/APC optical connectors
- 8x106.25Gbps (53.125GBd PAM4) electrical interface
- 8x106.25Gbps (53.125GBd PAM4) optical interface
- Up to 500m over SMF
- Power dissipation  $\leq 16.5W$
- Operating case temperature: 0°C to 70°C
- IEEE802.3ck and IEEE 802.3df compliant
- Built-in digital diagnostic functions
- 3.3V power supply voltage
- RoHS compliant



### Applications

- 800G Ethernet
- Data center networks
- InfiniBand NDR

### Product Description

The PhoScale PHOS-8OFSD85M161 transceiver is designed for 800G Ethernet and InfiniBand communication application links over 500m of single-mode fiber (SMF), and it is compliant with OSFP MSA, 800G Pluggable MSA, CMIS 5.1, IEEE802.3ck and IEEE 802.3df standards. The optical signal is transmitted over eight parallel channels at a central wavelength of 1310nm. The module contains 8 parallel channels on the transmitter and receiver, each operating at 106.25Gbps. It is suitable for 800G Ethernet, Data Center, InfiniBand, Breakout 2x400G DR4 or 8x100G DR1 Application. The optical interface is MPO-16/APC connector.

### Absolute Maximum Ratings

| Parameter                          | Symbol    | Min  | Typ | Max          | Unit |
|------------------------------------|-----------|------|-----|--------------|------|
| Supply Voltage                     | $V_{cc}$  | -0.5 | -   | 3.6          | V    |
| Storage Temperature                | $T_{sto}$ | -40  |     | 85           | °C   |
| Relative Humidity (Non-condensing) | RH        | 5    |     | 95           | %    |
| Control Input Voltage              | $V_i$     | -0.3 |     | $V_{cc}+0.5$ |      |

NOTE: Exceeding these ratings may damage the device permanently.

## Specified Operations Conditions

| Parameter                          | Symbol   | Min   | Typ | Max   | Unit |
|------------------------------------|----------|-------|-----|-------|------|
| Power Supply Voltage               | $V_{cc}$ | 3.135 | 3.3 | 3.465 | V    |
| Power Supply Current               | $I_{cc}$ |       |     | 5271  | mA   |
| Power Dissipation                  |          |       |     | 16.5  | W    |
| Case Operating Temperature         | $T_{op}$ | 0     | -   | 70    | °C   |
| Relative Humidity (Non-condensing) | RH       | 15    |     | 85    | %    |
| I2C Clock Frequency                |          |       | 100 | 400   | kHz  |

## Electrical Characteristics

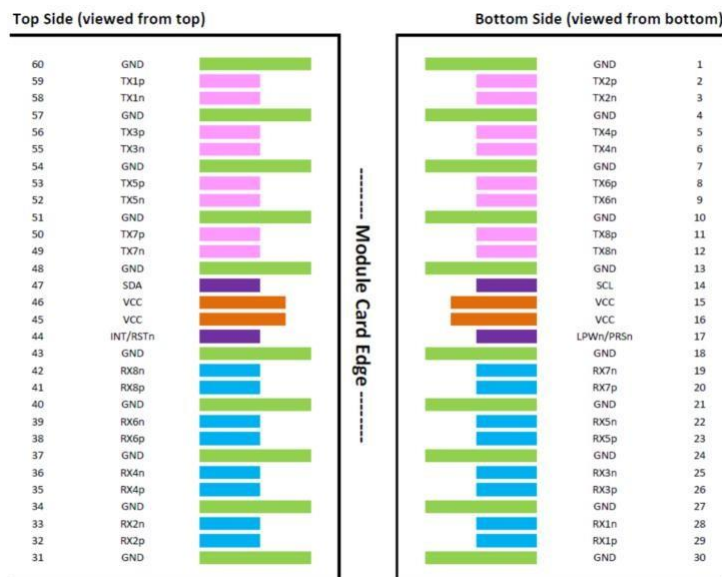
| Parameter                                                    | Symbol       | Min   | Typ    | Max        | Unit |
|--------------------------------------------------------------|--------------|-------|--------|------------|------|
| Power On Initialization Time                                 | $T_{init}$   |       |        | 2000       | ms   |
| <b>Transmitter</b>                                           |              |       |        |            |      |
| Signaling Speed, each lane                                   |              |       | 53.125 |            | GBd  |
| Signaling Speed Tolerance                                    |              | -100  |        | +100       | ppm  |
| Differential pk-pk input voltage tolerance                   | $V_{in,pp}$  | 750   |        |            | mV   |
| AC common-mode RMS voltage tolerance                         |              | 25    |        |            | mV   |
| Differential Input Impedance                                 | $Z_{in}$     | 90    | 100    | 110        | Ohms |
| Effective return loss                                        | ERL          | 8.5   |        |            | dB   |
| Single-ended voltage tolerance range                         |              | -0.4  |        | 3.3        | V    |
| DC Common Mode Voltage                                       |              | -0.35 |        | 2.85       | V    |
| <b>Receiver</b>                                              |              |       |        |            |      |
| Signaling Speed, each lane                                   |              |       | 53.125 |            | GBd  |
| Signaling Speed Tolerance                                    |              | -100  |        | +100       | ppm  |
| Differential pk-pk output voltage<br>Short mode<br>Long mode | $V_{out,pp}$ |       |        | 600<br>845 | mV   |
| Eye Height                                                   | EH           | 15    |        |            | mV   |
| Differential Output Impedance                                | $Z_{out}$    | 90    | 100    | 110        | Ohms |
| Transition Time, 20% to 80%                                  | $T_r, T_f$   | 8.5   |        |            | ps   |
| DC Common Mode Voltage                                       |              | -0.35 |        | 2.85       | V    |
| AC Common Mode output Voltage (RMS)                          |              | 25    |        |            | mV   |

## Optical Characteristics

| Parameter                                                                                                            | Symbol               | Min                | Typ    | Max               | Unit  | Notes |
|----------------------------------------------------------------------------------------------------------------------|----------------------|--------------------|--------|-------------------|-------|-------|
| <b>Transmitter</b>                                                                                                   |                      |                    |        |                   |       |       |
| Signaling Speed                                                                                                      |                      |                    | 53.125 |                   | GBd   | 1     |
| Signaling Speed Tolerance                                                                                            |                      | -100               |        | +100              | ppm   |       |
| Modulation Format                                                                                                    |                      | PAM4               |        |                   |       |       |
| Lane Wavelength                                                                                                      | $\lambda$            | 1304.5             | 1311   | 1317.5            | nm    |       |
| Side Mode Suppression Ratio                                                                                          | SMSR                 | 30                 |        |                   | dB    |       |
| Average TX Power                                                                                                     | $P_{avg}$            | -2.9               |        | 4                 | dBm   | 1     |
| Outer Optical Modulation Amplitude<br>for TDECQ < 1.4dB<br>for $1.4\text{dB} \leq \text{TDECQ} \leq 3.4\text{dB}$    | $\text{OMA}_{outer}$ | -0.8<br>-2.2+TDECQ |        | 4.2               | dBm   | 1     |
| Extinction Ratio                                                                                                     | ER                   | 3.5                |        |                   | dB    | 1     |
| Avg Launch Power TX Off                                                                                              | $P_{off}$            |                    |        | -15               | dBm   | 1     |
| Transmitter and dispersion eye closure<br>for PAM4                                                                   | TDECQ                |                    |        | 3.4               | dB    | 1     |
| Transmitter eye closure for PAM4                                                                                     | TECQ                 |                    |        | 3.4               | dB    |       |
| TDECQ - TECQ                                                                                                         |                      |                    |        | 2.5               | dB    |       |
| Transmitter transition time                                                                                          |                      |                    |        | 17                | ps    |       |
| Relative Intensity Noise                                                                                             | RIN                  |                    |        | -136              | dB/Hz |       |
| Optical Return Loss Tolerance                                                                                        | ORLT                 |                    |        | 21.4              | dB    |       |
| Reflectance                                                                                                          |                      |                    |        | -26               | dB    |       |
| <b>Receiver</b>                                                                                                      |                      |                    |        |                   |       |       |
| Signaling Speed                                                                                                      |                      |                    | 53.125 |                   | GBd   | 1     |
| Signaling Speed Tolerance                                                                                            |                      | -100               |        | +100              | ppm   |       |
| Modulation Format                                                                                                    |                      | PAM4               |        |                   |       |       |
| Lane Wavelength                                                                                                      | $\lambda$            | 1304.5             | 1311   | 1317.5            | nm    |       |
| Damage Threshold                                                                                                     |                      | 5                  |        |                   | dBm   | 1     |
| Average RX Power                                                                                                     |                      | -5.9               |        | 4                 | dBm   | 1     |
| RX Power ( $\text{OMA}_{outer}$ )                                                                                    |                      |                    |        | 4.2               | dBm   | 1     |
| RX Reflectance                                                                                                       |                      |                    |        | -26               | dBm   |       |
| RX Sensitivity ( $\text{OMA}_{outer}$ )<br>for TECQ < 1.4dB<br>for $1.4\text{dB} \leq \text{TECQ} \leq 3.4\text{dB}$ |                      |                    |        | -3.9<br>-5.3+TECQ | dBm   | 2     |
| Stressed RX Sensitivity ( $\text{OMA}_{outer}$ )                                                                     |                      |                    |        | -1.9              | dBm   |       |
| <b>Conditions of Stressed RX Sensitivity Test</b>                                                                    |                      |                    |        |                   |       |       |
| Stressed Eye Closure, lane under test                                                                                | SECQ                 |                    | 3.4    |                   | dB    |       |
| $\text{OMA}_{outer}$ of Each Aggressor Lane                                                                          |                      |                    | 4.2    |                   |       |       |

- Each lane.
- Measured with conformance test signal at TP3 for  $\text{BER}=2.4 \times 10^{-4}$ .

## Electrical Input/Output

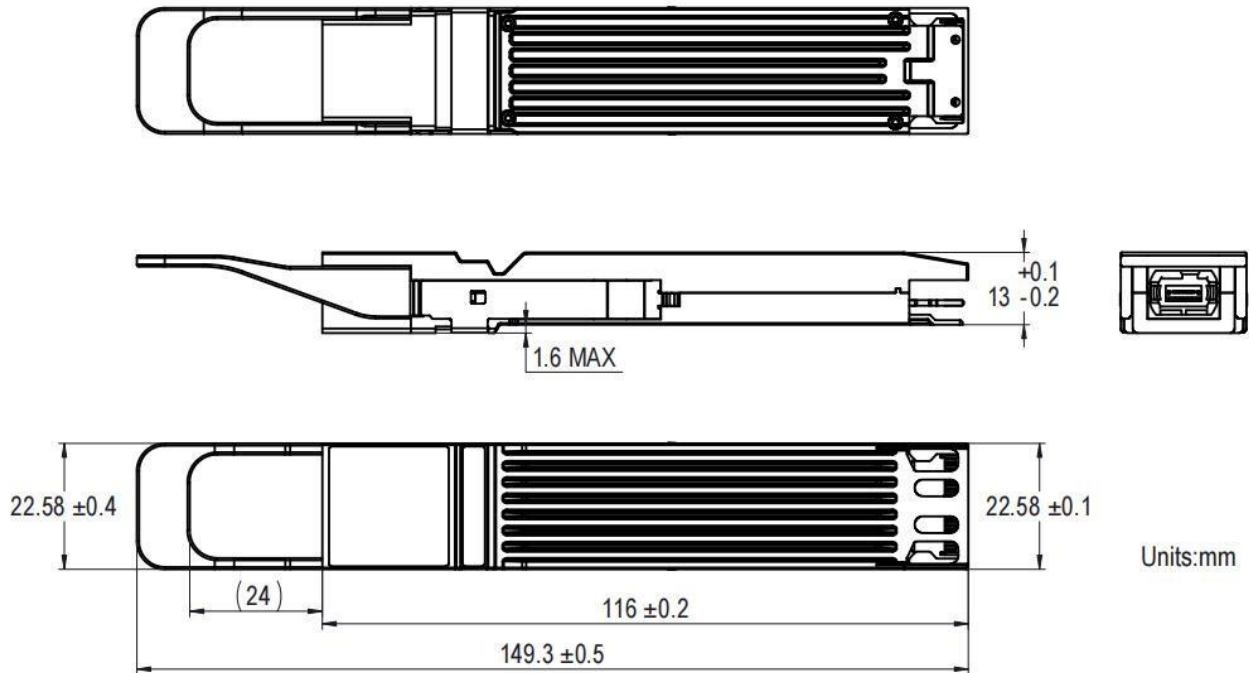


## OSFP Module contact pad electrical definition

| PIN | Symbol    | Logic           | Description                     | Notes                                    |
|-----|-----------|-----------------|---------------------------------|------------------------------------------|
| 1   | GND       |                 | Ground                          |                                          |
| 2   | TX2p      | CML-I           | Transmitter Data Non-Inverted   |                                          |
| 3   | TX2n      | CML-I           | Transmitter Data Inverted       |                                          |
| 4   | GND       |                 | Ground                          |                                          |
| 5   | TX4p      | CML-I           | Transmitter Data Non-Inverted   |                                          |
| 6   | TX4n      | CML-I           | Transmitter Data Inverted       |                                          |
| 7   | GND       |                 | Ground                          |                                          |
| 8   | TX6p      | CML-I           | Transmitter Data Non-Inverted   |                                          |
| 9   | TX6n      | CML-I           | Transmitter Data Inverted       |                                          |
| 10  | GND       |                 | Ground                          |                                          |
| 11  | TX8p      | CML-I           | Transmitter Data Non-Inverted   |                                          |
| 12  | TX8n      | CML-I           | Transmitter Data Inverted       |                                          |
| 13  | GND       |                 | Ground                          |                                          |
| 14  | SCL       | LVC MOS-I/O     | 2-wire Serial interface clock   | Open-Drain with pull up resistor on Host |
| 15  | VCC       | Power from Host | +3.3V Power                     |                                          |
| 16  | VCC       | Power from Host | +3.3V Power                     |                                          |
| 17  | LPWn/PRSn | Multi-Level     | Low-Power Mode / Module Present | See pin description for required circuit |
| 18  | GND       |                 | Ground                          |                                          |
| 19  | RX7n      | CML-O           | Receiver Data Inverted          |                                          |
| 20  | RX7p      | CML-O           | Receiver Data Non-Inverted      |                                          |

| PIN | Symbol   | Logic           | Description                     | Notes                                    |
|-----|----------|-----------------|---------------------------------|------------------------------------------|
| 21  | GND      |                 | Ground                          |                                          |
| 22  | RX5n     | CML-O           | Receiver Data Inverted          |                                          |
| 23  | RX5p     | CML-O           | Receiver Data Non-Inverted      |                                          |
| 24  | GND      |                 | Ground                          |                                          |
| 25  | RX3n     | CML-O           | Receiver Data Inverted          |                                          |
| 26  | RX3p     | CML-O           | Receiver Data Non-Inverted      |                                          |
| 27  | GND      |                 | Ground                          |                                          |
| 28  | RX1n     | CML-O           | Receiver Data Inverted          |                                          |
| 29  | RX1p     | CML-O           | Receiver Data Non-Inverted      |                                          |
| 30  | GND      |                 | Ground                          |                                          |
| 31  | GND      |                 | Ground                          |                                          |
| 32  | RX2p     | CML-O           | Receiver Data Non-Inverted      |                                          |
| 33  | RX2n     | CML-O           | Receiver Data Inverted          |                                          |
| 34  | GND      |                 | Ground                          |                                          |
| 35  | RX4p     | CML-O           | Receiver Data Non-Inverted      |                                          |
| 36  | RX4n     | CML-O           | Receiver Data Inverted          |                                          |
| 37  | GND      |                 | Ground                          |                                          |
| 38  | RX6p     | CML-O           | Receiver Data Non-Inverted      |                                          |
| 39  | RX6n     | CML-O           | Receiver Data Inverted          |                                          |
| 40  | GND      |                 | Ground                          |                                          |
| 41  | RX8p     | CML-O           | Receiver Data Non-Inverted      |                                          |
| 42  | RX8n     | CML-O           | Receiver Data Inverted          |                                          |
| 43  | GND      |                 | Ground                          |                                          |
| 44  | INT/RSTn | Multi-Level     | Module Interrupt / Module Reset | See pin description for required circuit |
| 45  | VCC      | Power from Host | +3.3V Power                     |                                          |
| 46  | VCC      | Power from Host | +3.3V Power                     |                                          |
| 47  | SDA      | LVC MOS-I/O     | 2-wire Serial interface data    | Open-Drain with pull up resistor on Host |
| 48  | GND      |                 | Ground                          |                                          |
| 49  | TX7n     | CML-I           | Transmitter Data Inverted       |                                          |
| 50  | TX7p     | CML-I           | Transmitter Data Non-Inverted   |                                          |
| 51  | GND      |                 | Ground                          |                                          |
| 52  | TX5n     | CML-I           | Transmitter Data Inverted       |                                          |
| 53  | TX5p     | CML-I           | Transmitter Data Non-Inverted   |                                          |
| 54  | GND      |                 | Ground                          |                                          |
| 55  | TX3n     | CML-I           | Transmitter Data Inverted       |                                          |
| 56  | TX3p     | CML-I           | Transmitter Data Non-Inverted   |                                          |
| 57  | GND      |                 | Ground                          |                                          |
| 58  | TX1n     | CML-I           | Transmitter Data Inverted       |                                          |
| 59  | TX1p     | CML-I           | Transmitter Data Non-Inverted   |                                          |
| 60  | GND      |                 | Ground                          |                                          |

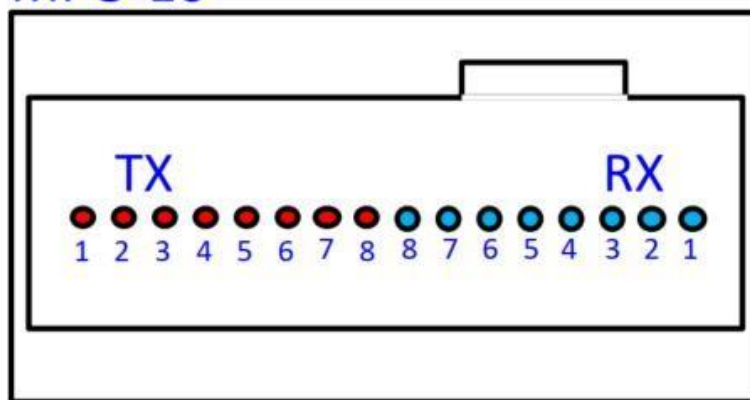
### Mechanical Specifications



Product shall be of design, construction, and physical dimensions specified on the applicable product drawing.

### Optical Interface

#### MPO-16



## Laser Safety

This is a Class 1 Laser Product as defined by IEC 60825-1:2014. When operated within the limits of this specification it is considered non-hazardous. Operating this product in a manner inconsistent with specifications and intended usage may result in hazardous radiation exposure.



## Regulatory Certifications

This product is certified to the following regulatory standards:

| Category           | Standard                                                                                                                     |
|--------------------|------------------------------------------------------------------------------------------------------------------------------|
| Radiated Emissions | EMC Directive 2014/30/EU<br>EN 55032<br>CISPR 32<br>FCC rules 47 CFR Part 15<br>ICES-003<br>VCCI-CISPR 32<br>AS/NZS CISPR 32 |
| Radiated Immunity  | EMC Directive 2014/30/EU<br>EN 55035<br>CISPR 35<br>IEC/EN 61000-4-3                                                         |
| RoHS               | EU RoHS (2011/65/EU & (EU) 2015/863) & UK RoHS<br>EN IEC 63000:2018 & BS EN IEC 63000:2018                                   |
| Flammability (PCB) | UL Class 94 V-0                                                                                                              |

## Ordering Information

| Part No.         | Data Rate | Wavelength | Max Distance | Case Temperature Range |
|------------------|-----------|------------|--------------|------------------------|
| PHOS-8OFSD85M161 | 850Gbps   | 1310nm     | 500m         | 0°C to 70°C            |

## Notice

PhoScale reserves the right to change specifications of products identified in this datasheet without notice. Applications described herein are for illustrative purposes only, and PhoScale makes no warranty that identified products will be suitable for the described applications without further testing and/or modification.