

## **SFP-10GB-CW-59-40-OPC**

MSA and TAA 10GBase-CWDM SFP+ Transceiver (SMF, 1590nm, 40km, LC, DOM)

### **Features**

- SFF-8432 and SFF-8472 Compliance
- Duplex LC Connector
- Single-mode Fiber
- Commercial Temperature 0 to 70 Celsius
- Hot Pluggable
- Metal with Lower EMI
- Excellent ESD Protection
- RoHS Compliant and Lead Free



### **Applications:**

- 10x Gigabit Ethernet over CWDM
- 8x/10x Fibre Channel
- Access, Metro and Enterprise
- Mobile Fronthaul CPRI/OBSAI

### **Product Description**

This MSA compliant SFP+ transceiver provides 10GBase-CWDM throughput up to 40km over single-mode fiber (SMF) using a wavelength of 1590nm via an LC connector. The listed reach has been determined using a link budget calculation and tested in a standard environment. Actual link distances achieved will be dependent upon the deployed environment. All of our transceivers are built to comply with Multi-Source Agreement (MSA) standards and are uniquely serialized and tested for data-traffic and application to ensure seamless network integration. Additional product features include Digital Optical Monitoring (DOM) support which allows access to real-time operating parameters. This transceiver is Trade Agreements Act (TAA) compliant. We stand behind the quality of our products and proudly offer a limited lifetime warranty.

### Regulatory Compliance

- ESD to the Electrical PINs: compatible with MIL-STD-883E Method 3015.4
- ESD to the LC Receptacle: compatible with IEC 61000-4-3
- EMI/EMC compatible with FCC Part 15 Subpart B Rules, EN55022:2010
- Laser Eye Safety compatible with FDA 21CFR, EN60950-1& EN (IEC) 60825-1,2
- RoHS compliant with EU RoHS 2.0 directive 2015/863/EU

### CWDM Available Wavelengths

| Wavelengths | Min.   | Typ. | Max.   |
|-------------|--------|------|--------|
| 47          | 1464.5 | 1471 | 1477.5 |
| 49          | 1484.5 | 1491 | 1497.5 |
| 51          | 1504.5 | 1511 | 1517.5 |
| 53          | 1524.5 | 1531 | 1537.5 |
| 55          | 1544.5 | 1551 | 1557.5 |
| 57          | 1564.5 | 1571 | 1577.5 |
| 59          | 1584.5 | 1591 | 1597.5 |
| 61          | 1604.5 | 1611 | 1617.5 |

### Absolute Maximum Ratings

| Parameter                  | Symbol | Min. | Typ. | Max.              | Unit | Notes |
|----------------------------|--------|------|------|-------------------|------|-------|
| Maximum Supply Voltage     | Vcc    | -0.5 |      | 4.0               | V    | 1     |
| Storage Temperature        | TS     | -40  |      | 85                | °C   | 2     |
| Operating Case Temperature | Tc     | 0    |      | 70                | °C   |       |
| Data Rate                  | DR     | 1.2  |      | 11.3              | Gb/s | 3     |
| Bit Error Rate             | BER    |      |      | 10 <sup>-12</sup> |      |       |

### Notes:

1. For electrical power interface
2. Ambient temperature
3. IEEE 802.3ae

### Electrical Characteristics (V<sub>CC</sub>=3.14V to 3.46V, T<sub>C</sub>)

| Parameter                                 | Symbol                         | Min.            | Typ. | Max.                 | Unit | Notes |
|-------------------------------------------|--------------------------------|-----------------|------|----------------------|------|-------|
| Power Supply Voltage                      | V <sub>CC</sub>                | 3.14            | 3.3  | 3.46                 | V    |       |
| Power Supply Current                      | I <sub>CC</sub>                |                 | 400  | 450                  | mA   |       |
| Transmitter                               |                                |                 |      |                      |      |       |
| Input differential impedance              | R <sub>IN</sub>                |                 | 100  |                      | Ω    |       |
| Differential data input swing             | V <sub>IN</sub> PP             | 120             |      | 850                  | mV   |       |
| Transmit Disable Voltage                  | V <sub>D</sub>                 | 2               |      | V <sub>CC</sub>      | V    |       |
| Transmit Enable Voltage                   | V <sub>EN</sub>                | V <sub>EE</sub> |      | V <sub>EE</sub> +0.8 | V    |       |
| Receiver                                  |                                |                 |      |                      |      |       |
| Differential data output swing            | V <sub>OUT</sub> PP            | 300             |      | 850                  | mV   |       |
| Data output rise time/fall time (20%-80%) | t <sub>r</sub> /t <sub>f</sub> | 28              |      |                      | ps   |       |
| LOS Fault                                 | V <sub>LOS</sub> A             | 2               |      | V <sub>CC</sub> HOST | V    |       |
| LOS Normal                                | V <sub>LOS</sub> D             | V <sub>EE</sub> |      | V <sub>EE</sub> +0.5 | V    |       |

### Optical Characteristics

| Parameter                       | Symbol                                | Min. | Typ. | Max. | Unit  | Notes |
|---------------------------------|---------------------------------------|------|------|------|-------|-------|
| Transmitter                     |                                       |      |      |      |       |       |
| Output Optical Power            | P <sub>TX</sub>                       | -1   |      | 4    | dBm   | 1     |
| Optical Center Wavelength       | λ <sub>c</sub>                        | λ-6  | λ    | λ+6  | nm    |       |
| Optical Modulation Amplitude    | OMA                                   | -5.2 |      |      |       | 2     |
| Extinction Ratio                | ER                                    | 8.2  |      |      | dB    |       |
| Spectral Width (-20dB)          | Δλ                                    |      |      | 0.6  | nm    |       |
| Side Mode Suppression Ratio     | SMSR                                  | 30   |      |      | dB    |       |
| Relative Intensity Noise        | RIN                                   |      |      | -128 | dB/Hz |       |
| Transmitter Dispersion Penalty  | TDP                                   |      |      | 2    | dB    |       |
| Launch Power of OFF Transmitter | P <sub>OUT_OFF</sub>                  |      |      | -30  | dBm   | 1     |
| Transmitter Jitter              | According to IEEE 802.3ae requirement |      |      |      |       |       |
| Receiver                        |                                       |      |      |      |       |       |
| Optical Center Wavelength       | λ <sub>c</sub>                        | 1260 |      | 1620 | nm    |       |
| Average Receive Power           | P <sub>RX</sub>                       | -16  |      | -1   | dBm   |       |
| Receiver Sensitivity @10.3Gb/s  | R <sub>X_SEN</sub>                    |      |      | -16  | dBm   | 3     |
| Receiver Reflectance            | TR <sub>RX</sub>                      |      |      | -27  | dB    |       |
| LOS Assert                      | LOS <sub>A</sub>                      | -25  |      |      | dBm   |       |

|                |                  |     |  |     |     |  |
|----------------|------------------|-----|--|-----|-----|--|
| LOS De-Assert  | LOS <sub>D</sub> |     |  | -18 | dBm |  |
| LOS Hysteresis | LOS <sub>H</sub> | 0.5 |  |     | dB  |  |

**Notes:**

1. Average
2. Per IEEE 802.3ae
3. Measured with worst ER: BER<10<sup>-12</sup>; 2<sup>31</sup>-1 PRBS

**Pin Descriptions**

| Pin | Symbol     | Name/Descriptions                                                              | Ref. |
|-----|------------|--------------------------------------------------------------------------------|------|
| 1   | VeeT       | Transmitter Ground (Common with Receiver Ground).                              | 1    |
| 2   | TX Fault   | Transmitter Fault. LVTTTL-O                                                    | 2    |
| 3   | TX Disable | Transmitter Disable. Laser output disabled on high or open. LVTTTL-I.          | 3    |
| 4   | SDA        | 2-Wire Serial Interface Data Line (Same as MOD-DEF2 in INF-8074i). LVTTTL-I/O. |      |
| 5   | SCL        | 2-Wire Serial Interface Data Line (Same as MOD-DEF2 in INF-8074i). LVTTTL-I.   |      |
| 6   | MOD_ABS    | Module Absent, Connect to VeeT or VeeR in Module.                              | 4    |
| 7   | RS0        | Rate Select 0. Not used                                                        | 5    |
| 8   | LOS        | Loss of Signal indication. Logic 0 indicates normal operation. LVTTTL-O.       | 2    |
| 9   | RS1        | Rate Select 1. Not used                                                        | 5    |
| 10  | VeeR       | Receiver Ground (Common with Transmitter Ground).                              | 1    |
| 11  | VeeR       | Receiver Ground (Common with Transmitter Ground).                              | 1    |
| 12  | RD-        | Receiver Inverted DATA out. AC Coupled. CML-O.                                 |      |
| 13  | RD+        | Receiver Non-inverted DATA out. AC Coupled. CML-O.                             |      |
| 14  | VeeR       | Receiver Ground (Common with Transmitter Ground).                              | 1    |
| 15  | VccR       | Receiver Power Supply.                                                         |      |
| 16  | VccT       | Transmitter Power Supply.                                                      |      |
| 17  | VeeT       | Transmitter Ground (Common with Receiver Ground).                              | 1    |
| 18  | TD+        | Transmitter Non-Inverted DATA in. AC Coupled. CML-I.                           |      |
| 19  | TD-        | Transmitter Inverted DATA in. AC Coupled. CML-O.                               |      |
| 20  | VeeT       | Transmitter Ground (Common with Receiver Ground).                              | 1    |

**Notes:**

1. The module signal ground contacts, VeeR and VeeT, should be isolated from the module case.
2. This contact is an open collector/drain output and should be pulled up to the Vcc\_Host with resistor in the range 4.7KΩ to 10KΩ. Pull ups can be connected to one or several power supplies, however the host board design shall ensure that no module contract has voltage exceeding module VccT/R +0.5.V.
3. Tx\_Disable is an input contact with a 4.7KΩ to 10KΩ pull-up resistor to VccT inside module.

4. Mod\_ABS is connected to VeeT or VeeR in the SFP+ module. The host may pull the contract up to Vcc\_Host with a resistor in the range from 4.7K $\Omega$  to 10K $\Omega$ . Mod\_ABS is asserted "High" when the SFP+ module is physically absent from a host slot.
5. Internally pulled down per SFF-8431



Pin-out of connector Block on Host board

### Recommended Circuit Schematic



**Mechanical Specifications**

Small Form Factor Pluggable (SFP) transceivers are compatible with the dimensions defined by the SFP Multi-Sourcing Agreement (MSA).



**EEPROM Information**

EEPROM memory map specific data field description is as below:

