

## 10G SFP+ CWDM Optical Transceiver

PN: OP3940D-xx

### Product Specification

#### Features:

- ✧ Supports 1.0 to 11.3Gb/s bit rates
- ✧ Hot-Pluggable SFP+ form factor
- ✧ Duplex LC connector
- ✧ 1471~1611nm CWDM EML transmitter, PIN photo-detector
- ✧ 16dB optical link budget
- ✧ Built-in digital diagnostic functions
- ✧ Single +3.3V Power Supply
- ✧ Operating case temperature: 0~ 70°C
- ✧ Power dissipation: <1.5W
- ✧ RoHS compliant

#### Applications:

- ✧ 10G Ethernet
- ✧ SDH/SONET
- ✧ Fibre Channel

#### Description:

Opway' OP3940D-xx is a very compact 10Gb/s optical transceiver module for serial optical communication applications at 10Gb/s. The OP3940D-xx converts a 10Gb/s serial electrical data stream to 10Gb/s optical output signal and a 10Gb/s optical input signal to 10Gb/s serial electrical data streams. The high speed 10Gb/s electrical interface is fully compliant with SFI specification.

The high performance CWDM EML transmitter and high sensitivity PIN receiver provide superior performance for Multiple applications.

The SFP+ Module compliant with SFF-8431, SFF-8432. Digital diagnostics functions are available via a 2-wire serial interface, as specified in SFF-8472.

The fully SFP compliant form factor provides hot pluggability, easy optical port upgrades and low EMI emission.

● **Absolute Maximum Ratings**

| Parameter                  | Symbol | Min. | Typical | Max. | Unit |
|----------------------------|--------|------|---------|------|------|
| Power Supply Voltage       | VCC    | 0    |         | 3.6  | V    |
| Storage Temperature        | Ts     | -40  |         | 85   | °C   |
| Operating Case Temperature | TA     | 0    |         | 70   | °C   |
| Relative Humidity          | RH     | 0    |         | 85   | %    |

● **Electrical Characteristics**

| Parameter                         | Symbol                | Min.            | Typical | Max.                 | Unit | Note |
|-----------------------------------|-----------------------|-----------------|---------|----------------------|------|------|
| Supply Voltage                    | Vcc                   | 3.135           |         | 3.465                | V    |      |
| Supply Current                    | Icc                   |                 |         | 455                  | mA   |      |
| Power Consumption                 | P                     |                 |         | 1.5                  | W    |      |
| <b>Transmitter Section:</b>       |                       |                 |         |                      |      |      |
| Input differential impedance      | R <sub>in</sub>       |                 | 100     |                      | Ω    | 1    |
| Differential input voltage swing  | V <sub>in,pp</sub>    | 100             |         | 1000                 | 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    |      |
| <b>Receiver Section:</b>          |                       |                 |         |                      |      |      |
| Differential output voltage swing | V <sub>O</sub>        | 120             |         | 800                  | mV   |      |
| LOS Fault                         | V <sub>losfault</sub> | 2               |         | V <sub>CC_host</sub> | V    | 2    |
| LOS Normal                        | V <sub>los norm</sub> | V <sub>ee</sub> |         | V <sub>ee</sub> +0.8 | 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 – 10kΩ on the host board. Normal operation is logic 0; loss of signal is logic 1.

● **Optical Parameters**

| Parameter                        | Symbol           | Min.  | Typical | Max.  | Unit | Note |
|----------------------------------|------------------|-------|---------|-------|------|------|
| <b>Transmitter Section:</b>      |                  |       |         |       |      |      |
| Center Wavelength                | λ <sub>t</sub>   | λ-6.5 | λ       | λ+6.5 | nm   |      |
| Spectral width                   | Δλ               |       |         | 0.4   | nm   |      |
| Side Mode Suppression Ratio      | SMSR             | 30    |         |       | dB   |      |
| Average Optical Power            | P <sub>avg</sub> | 0     |         | +5.5  | dBm  |      |
| Laser Off Power                  | P <sub>off</sub> |       |         | -30   | dBm  |      |
| Extinction Ratio                 | ER               | 6     |         |       | dB   |      |
| <b>Receiver Section:</b>         |                  |       |         |       |      |      |
| Center Wavelength                | λ <sub>r</sub>   | 1260  |         | 1620  | nm   |      |
| Receiver Sensitivity             | Sen              |       |         | -16   | dBm  | 1    |
| Input Saturation Power(Overload) | Sat              | 0     |         |       | dBm  |      |
| Los Assert                       | LOS <sub>A</sub> | -30   |         | -     | dBm  |      |

|                |                  |     |  |     |     |  |
|----------------|------------------|-----|--|-----|-----|--|
| Los Dessert    | LOS <sub>D</sub> |     |  | -17 | dBm |  |
| Los Hysteresis | LOS <sub>H</sub> | 0.5 |  |     | dB  |  |

**Notes:**

1. Measured with a PRBS 2<sup>31</sup>-1 test pattern, @10.3125Gb/s, BER < 10<sup>-12</sup>.

● **Pin Assignment**

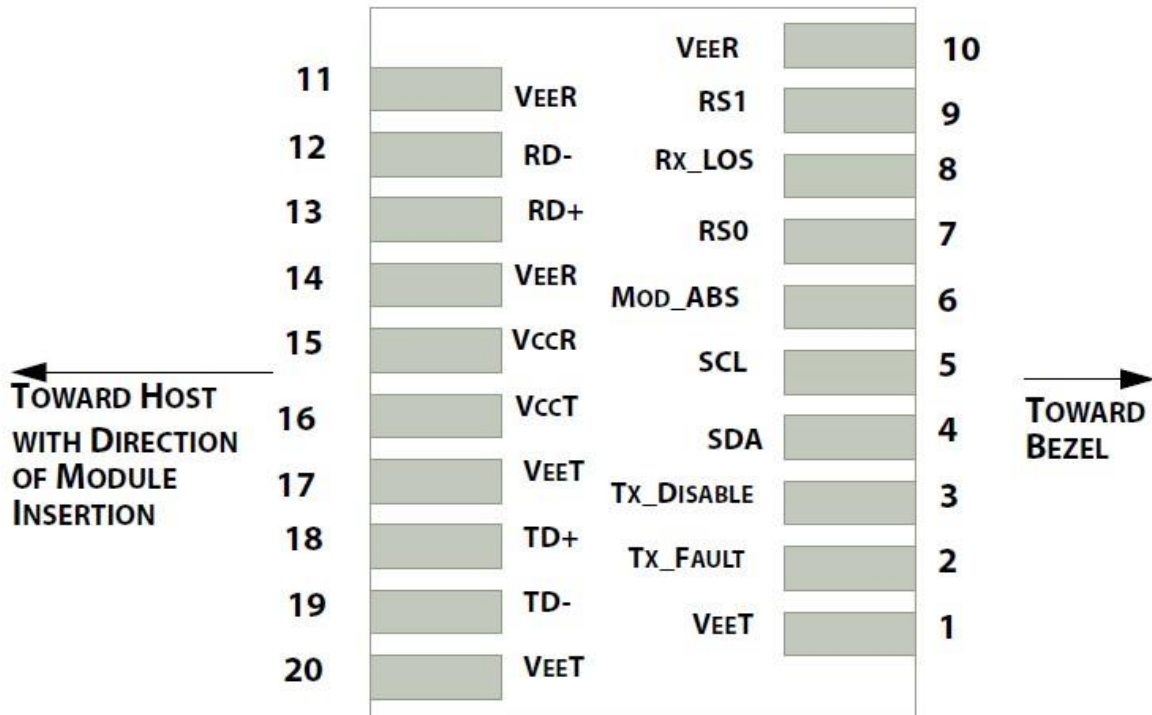


Diagram of Host Board Connector Block Pin Numbers and Names

● **Pin Function Definitions**

| PIN # | Name       | Function  | Notes |
|-------|------------|---|-------|
| 1     | VeeT       | Module transmitter ground                               | 1     |
| 2     | Tx Fault   | Module transmitter fault                                | 2     |
| 3     | Tx Disable | Transmitter Disable; Turns off transmitter laser output | 3     |
| 4     | SDA        | 2 wire serial interface data input/output (SDA)         |       |
| 5     | SCL        | 2 wire serial interface clock input (SCL)               |       |
| 6     | MOD-ABS    | Module Absent, connect to VeeR or VeeT in the module    | 2     |
| 7     | RS0        | Rate Select 0. Not Used                                 |       |
| 8     | LOS        | Receiver Loss of Signal Indication                      | 4     |
| 9     | RS1        | Rate Select 1. Not Used                                 |       |
| 10    | VeeR       | Module receiver ground                                  | 1     |
| 11    | VeeR       | Module receiver ground                                  | 1     |
| 12    | RD-        | Receiver inverted data out put                          |       |
| 13    | RD+        | Receiver non-inverted data out put                      |       |
| 14    | VeeR       | Module receiver ground                                  | 1     |
| 15    | VccR       | Module receiver 3.3V supply                             |       |

|    |      |                                       |   |
|----|------|---------------------------------------|---|
| 16 | VccT | Module transmitter 3.3V supply        |   |
| 17 | VeeT | Module transmitter ground             | 1 |
| 18 | TD+  | Transmitter non-inverted data out put |   |
| 19 | TD-  | Transmitter inverted data out put     |   |
| 20 | VeeT | Module transmitter ground             | 1 |

**Notes:**

- 1.The module ground pins shall be isolated from the module case.
- 2.This pin is an open collector/drain output pin and shall be pulled up with 4.7K-10Kohms to Host\_Vcc on the host board.
- 3.This pin shall be pulled up with 4.7K-10Kohms to VccT in the module.
- 4.This pin is an open collector/drain output pin and shall be pulled up with 4.7K-10Kohms to Host\_Vcc on the host board.

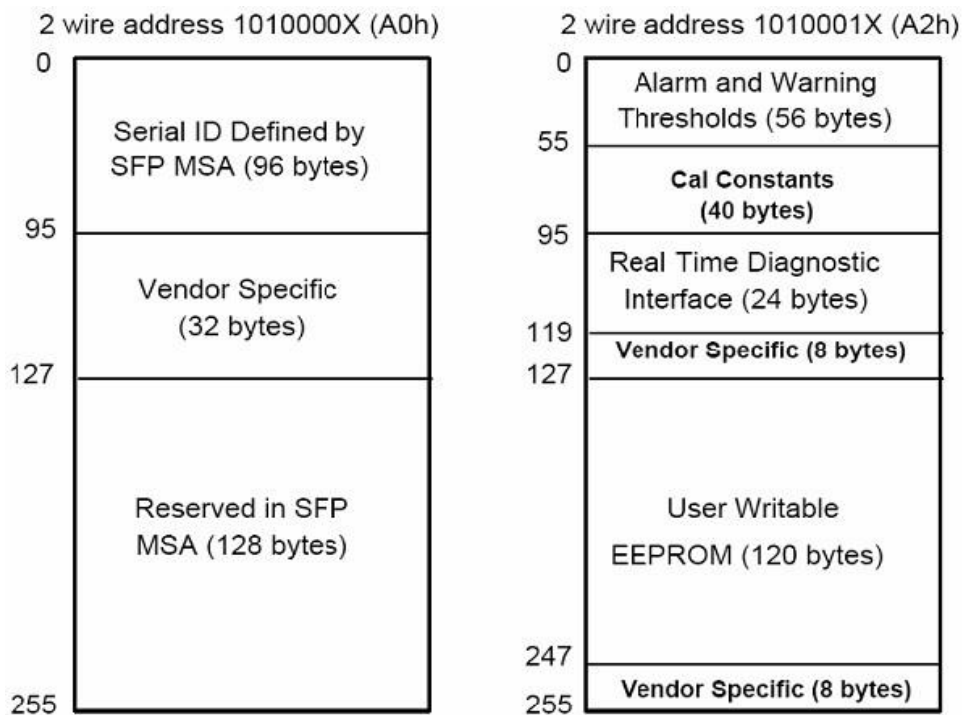
● **SFP Module EEPROM Information and Management**

The SFP modules implement the 2-wire serial communication protocol as defined in the SFF -8472. The serial ID information of the SFP modules and Digital Diagnostic Monitor parameters can be accessed through the I2C interface at address A0h and A2h.

The memory is mapped in Table 1.

For more details of the memory map and byte definitions, please refer to the SFF-8472, “Digital Diagnostic Monitoring Interface for Optical Transceivers”. The DDM parameters have been internally calibrated.

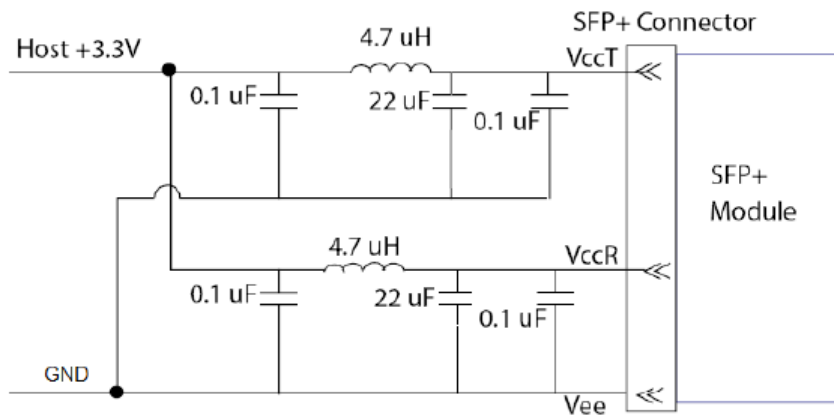
**Table 1.** Digital Diagnostic Memory Map (Specific Data Field Descriptions)



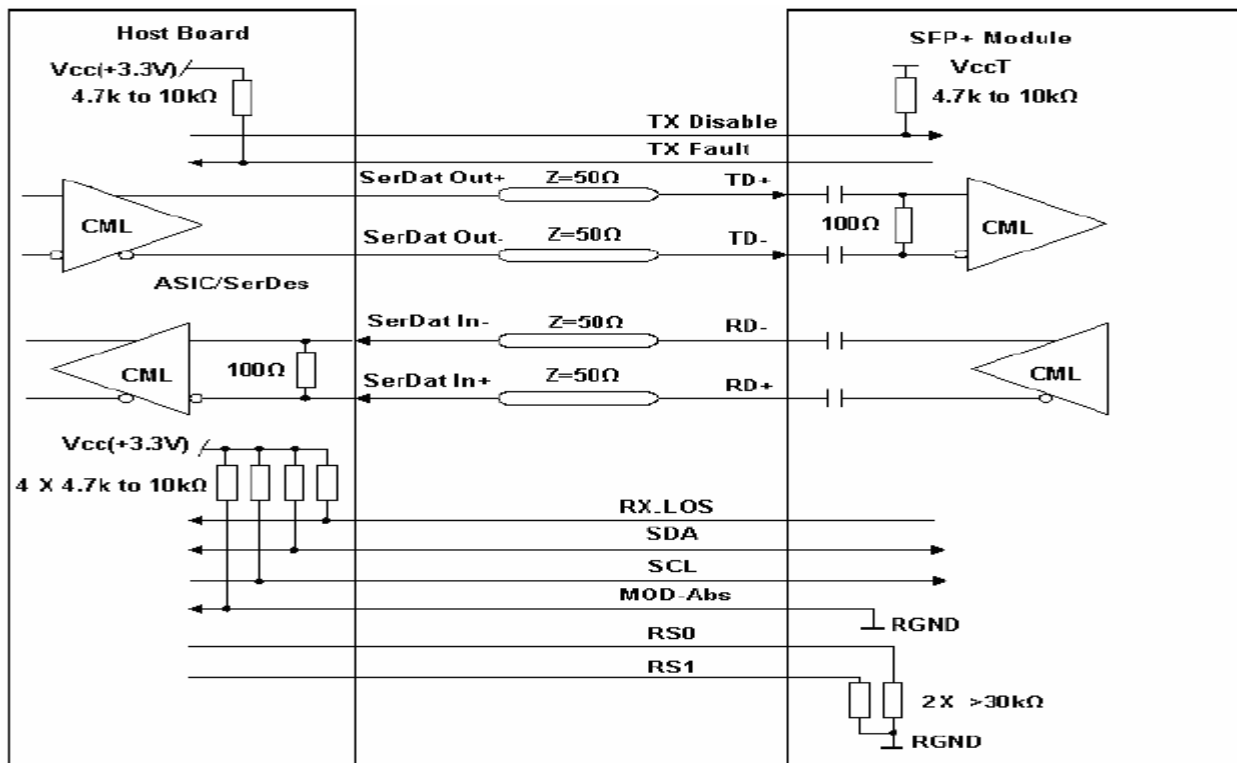
● **Digital Diagnostic Monitor Characteristics**

| Data Address | Parameter                        | Accuracy | Unit |
|--------------|----------------------------------|----------|------|
| 96-97        | Transceiver Internal Temperature | ±3.0     | °C   |
| 98-99        | VCC Internal Supply Voltage      | ±3.0     | %    |
| 100-101      | Laser Bias Current               | ±10      | %    |
| 102-103      | Tx Output Power                  | ±3.0     | dB   |
| 104-105      | Rx Input Power                   | ±3.0     | dB   |

● **Recommended Circuit**

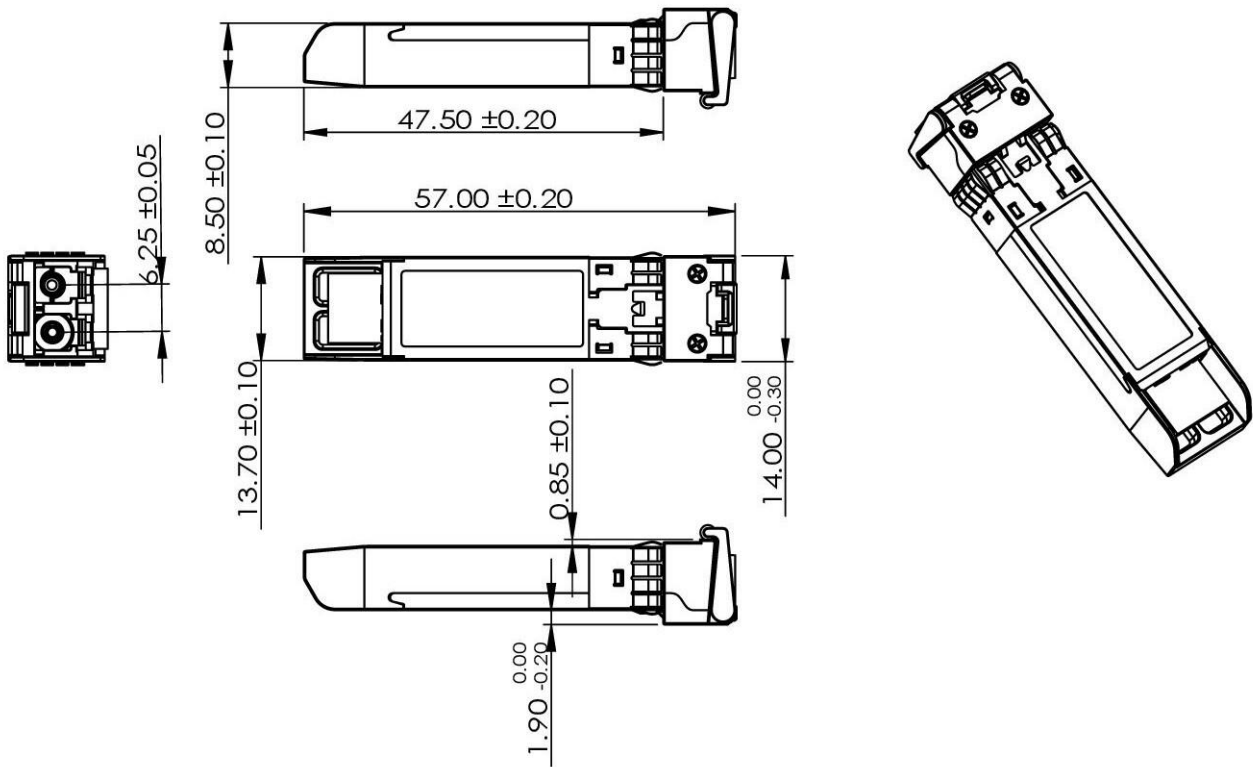


**Recommended Host Board Power Supply Circuit**



**Recommended High-speed Interface Circuit**

● **Mechanical Dimensions(Unit:mm)**



● **Order Information**

| Part No.   | Data Rate | Central wavelength | Optical Link budget | Recommend Distance |
|------------|-----------|--------------------|---------------------|--------------------|
| OP3940D-47 | 10Gbps    | 1471nm             | 16dB                | 40km               |
| OP3940D-49 | 10Gbps    | 1491nm             | 16dB                | 40km               |
| OP3940D-51 | 10Gbps    | 1511nm             | 16dB                | 40km               |
| OP3940D-53 | 10Gbps    | 1531nm             | 16dB                | 40km               |
| OP3940D-55 | 10Gbps    | 1551nm             | 16dB                | 40km               |
| OP3940D-57 | 10Gbps    | 1571nm             | 16dB                | 40km               |
| OP3940D-59 | 10Gbps    | 1591nm             | 16dB                | 40km               |
| OP3940D-61 | 10Gbps    | 1611nm             | 16dB                | 40km               |

● **Document Revision**

| Version No. | Date       | Reviser | Description    |
|-------------|------------|---------|----------------|
| V1.0        | 2023-11-13 | Kevin   | Initial issued |
|             |            |         |                |
|             |            |         |                |

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