

## DWDM-SFP-DW-C-AO

Cisco® Compatible TAA 1000Base-DWDM SFP Transceiver (SMF, Tunable, 80km, LC, DOM)

### Features

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



### Applications

- 1000Base Ethernet over DWDM
- Access, Metro and Enterprise

### Product Description

This Cisco® compatible SFP+ transceiver provides 1000Base-DWDM throughput up to 80km over single-mode fiber (SMF) using a wavelength of 1530nm to 1565nm via an LC connector. It is guaranteed to be 100% compatible with the equivalent Cisco® transceiver. This easy to install, hot swappable transceiver has been programmed, uniquely serialized and data-traffic and application tested to ensure that it will initialize and perform identically. Digital optical monitoring (DOM) support is also present to allow 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.

AddOn's transceivers are RoHS compliant and lead-free.

TAA refers to the Trade Agreements Act (19 U.S.C. & 2501-2581), which is intended to foster fair and open international trade. TAA requires that the U.S. Government may acquire only "U.S.-made or designated country end products."



### Tunable SFP+ Channel Number and Wavelength

| Channel No. | Frequency (THz) | Center Wavelength (nm) | Channel No | Frequency (THz) | Center Wavelength (nm) |
|-------------|-----------------|------------------------|------------|-----------------|------------------------|
| 1           | 191.35          | 1566.72                | 49         | 193.75          | 1547.32                |
| 2           | 191.40          | 1566.31                | 50         | 193.80          | 1546.92                |
| 3           | 191.45          | 1565.90                | 51         | 193.85          | 1546.52                |
| 4           | 191.50          | 1565.50                | 52         | 193.90          | 1546.12                |
| 5           | 191.55          | 1565.09                | 53         | 193.95          | 1545.72                |
| 6           | 191.60          | 1564.68                | 54         | 194.00          | 1545.32                |
| 7           | 191.65          | 1564.27                | 55         | 194.05          | 1544.92                |
| 8           | 191.70          | 1563.86                | 56         | 194.10          | 1544.53                |
| 9           | 191.75          | 1563.45                | 57         | 194.15          | 1544.13                |
| 10          | 191.80          | 1563.05                | 58         | 194.20          | 1543.73                |
| 11          | 191.85          | 1562.64                | 59         | 194.25          | 1543.33                |
| 12          | 191.90          | 1562.23                | 60         | 194.30          | 1542.94                |
| 13          | 191.95          | 1561.83                | 61         | 194.35          | 1542.54                |
| 14          | 192.00          | 1561.42                | 62         | 194.40          | 1542.14                |
| 15          | 192.05          | 1561.01                | 63         | 194.45          | 1541.75                |
| 16          | 192.10          | 1560.61                | 64         | 194.50          | 1541.35                |
| 17          | 192.15          | 1560.20                | 65         | 194.55          | 1540.95                |
| 18          | 192.20          | 1559.79                | 66         | 194.60          | 1540.56                |
| 19          | 192.25          | 1559.39                | 67         | 194.65          | 1540.16                |
| 20          | 192.30          | 1558.98                | 68         | 194.70          | 1539.77                |
| 21          | 192.35          | 1558.58                | 69         | 194.75          | 1539.37                |
| 22          | 192.40          | 1558.17                | 70         | 194.80          | 1538.98                |
| 23          | 192.45          | 1557.77                | 71         | 194.85          | 1538.58                |
| 24          | 192.50          | 1557.36                | 72         | 194.90          | 1538.19                |
| 25          | 192.55          | 1556.96                | 73         | 194.95          | 1537.79                |
| 26          | 192.60          | 1556.56                | 74         | 195.00          | 1537.40                |
| 27          | 192.65          | 1556.15                | 75         | 195.05          | 1537.00                |
| 28          | 192.70          | 1555.75                | 76         | 195.10          | 1536.61                |
| 29          | 192.75          | 1555.34                | 77         | 195.15          | 1536.22                |
| 30          | 192.80          | 1554.94                | 78         | 195.20          | 1535.82                |
| 31          | 192.85          | 1554.54                | 79         | 195.25          | 1535.43                |
| 32          | 192.90          | 1554.13                | 80         | 195.30          | 1535.04                |
| 33          | 192.95          | 1553.73                | 81         | 195.35          | 1534.64                |
| 34          | 193.00          | 1553.33                | 82         | 195.40          | 1534.25                |
| 35          | 193.05          | 1552.93                | 83         | 195.45          | 1533.86                |
| 36          | 193.10          | 1552.52                | 84         | 195.50          | 1533.47                |
| 37          | 193.15          | 1552.12                | 85         | 195.55          | 1533.07                |
| 38          | 193.20          | 1551.72                | 86         | 195.60          | 1532.68                |
| 39          | 193.25          | 1551.32                | 87         | 195.65          | 1532.29                |
| 40          | 193.30          | 1550.92                | 88         | 195.70          | 1531.90                |
| 41          | 193.35          | 1550.52                | 89         | 195.75          | 1531.51                |
| 42          | 193.40          | 1550.12                | 90         | 195.80          | 1531.12                |
| 43          | 193.45          | 1549.72                | 91         | 195.85          | 1530.72                |
| 44          | 193.50          | 1549.32                | 92         | 195.90          | 1530.33                |
| 45          | 193.55          | 1548.91                | 93         | 195.95          | 1529.94                |
| 46          | 193.60          | 1548.52                | 94         | 196.00          | 1529.55                |
| 47          | 193.65          | 1548.11                | 95         | 196.05          | 1529.16                |
| 48          | 193.70          | 1547.72                | 96         | 196.10          | 1528.77                |

## Absolute Maximum Ratings

| Parameter                  | Symbol | Min. | Max. | Unit | Notes   |
|----------------------------|--------|------|------|------|---------|
| Maximum Supply Voltage     | VccT   | 0    | +3.6 | V    | +3.3V   |
| Optical Receiver Input     | PIMAX  |      | +5   | dBm  | Average |
| Operating Case Temperature | Tc     | 0    | 70   | °C   |         |
| Storage Temperature        | TSTR   | -40  | 85   | °C   |         |
| ESD SFI pins               | ESD1   |      | 1    | kV   | HBM     |
| ESD except for SFI pins    | ESD2   |      | 2    | kV   | HBM     |

## Electrical Characteristics

| Parameter                                 | Symbol   | Min.    | Typ.  | Max.      | Unit | Notes   |
|---|----------|---------|-------|-----------|------|---|
| Supply Voltage                            | Vcc      | 3.135   | 3.300 | 3.465     | V    | +3.3V   |
| Supply Current                            | Icc3     |         |       | 0.54      | A    | Note 1  |
| Power Consumption                         | PDS      |         |       | 1.7       | W    | Note 2  |
| <b>Low Speed Control Pin Logic Levels</b> |          |         |       |           |      |   |
| Host Vcc Range                            | Host_Vcc | 3.14    |       | 3.47      | V    | with ± 5% variation                           |
| TX_Fault,<br>RX_LOS                       | VOL      | 0.0     |       | 0.4       | V    | Note 3  |
|   | VOH      | Vcc-0.5 |       | Vcc+0.3   | V    | Note 3  |
| TX_Disable                                | VIL      | -0.3    |       | 0.8       | V    | Pulled up with 10k ohms to VccT in the module |
|   | VIH      | 2.0     |       | VccT +0.3 | V    |   |

### Notes:

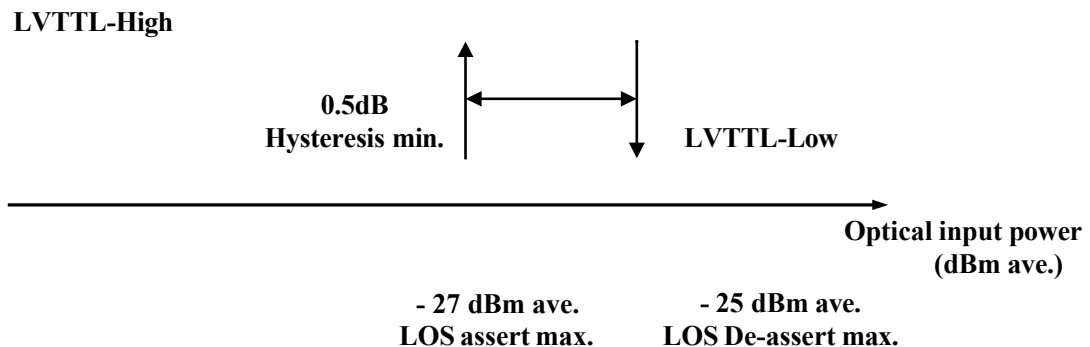
1. < 0.64 A Tc<25degC
2. <2.0 W Tc<25degC
3. Rpullup (Rp) is the pull up resistor. Active bus termination may be used by the host in place of a pullup resistor. Pull ups can be connected to multiple power supplies, however the host board design shall ensure that no module pin has voltage exceeding module. Measures at the Host side of the connector.

## Optical Characteristics

| Parameter                                      | Symbol            | Min.                | Typ. | Max.   | Unit | Notes                                  |
|--|-------------------|---------------------|------|--------|------|--|
| <b>Transmitter</b>                             |                   |                     |      |        |      |  |
| Data Rate                                      |                   | 9.95                |      | 11.3   | Gbps | NRZ                                    |
| Frequency range                                |                   | 191.35              |      | 196.10 | THz  | 50GHz grid, 96 channels                |
| Frequency accuracy                             |                   | -2.5                |      | +2.5   | GHz  | EOL                                    |
| Optical transmit power                         | Po                | -1.0                |      | +3.0   | dBm  | EOL                                    |
| Shuttered output power                         |                   |                     |      | -35    | dBm  |  |
| Optical power stability                        | $\Delta P_o$      | -1.0                |      | +1.0   | dB   | All channels, SOL                      |
| Side mode suppression                          | SMSR              | 35                  |      |        | dB   | $\pm 2.5$ nm, modulated                |
| Spectral width                                 | $\Delta\lambda$   |                     | 0.3  | 0.5    | nm   | -20dB, modulated                       |
| Extinction ratio                               | ER                | 9.0                 |      |        | dB   | Filtered, 10.709Gb/s                   |
| Eye diagram compliance                         |                   | GR-253, ITU-T G.691 |      |        |      |  |
| Mask margin                                    |                   | 10                  |      |        | %    |  |
| Tuning speed                                   |                   |                     |      | 10     | s    | warmed-up, from any CH to any other CH |
| <b>Receiver</b>                                |                   |                     |      |        |      |  |
| Data Rate                                      |                   | 9.95                |      | 11.3   | Gbps | NRZ                                    |
| Input operating wavelength                     |                   | 1525                |      | 1575   | nm   |  |
| Minimum Receiver Sensitivity (Back to Back)    | P <sub>rmin</sub> |                     |      | -24    | dBm  | 10.709Gb/s, 1E-12, OSNR>35dB           |
| Minimum receiver sensitivity (-300~+1400ps/nm) | P <sub>rmin</sub> | 0                   |      | -21    | dBm  |  |
| Maximum input power (overload)                 | P <sub>ro</sub>   | -7                  |      |        | dBm  |  |
| Receiver Reflectance                           | RL                |                     |      | -27    | dB   |  |
| LOS Assert                                     |                   |                     |      | -27    | dBm  | Note 1                                 |
| LOS De-Assert                                  |                   |                     |      | -25    | dBm  | Note 1                                 |
| LOS Hysteresis                                 |                   | 0.5                 |      | 4.0    | dB   | Note 1                                 |
| LOS Assert Time                                |                   |                     |      | 100    | us   |  |
| LOS De-Assert Time                             |                   |                     |      | 100    | us   |  |

### Notes:

1.

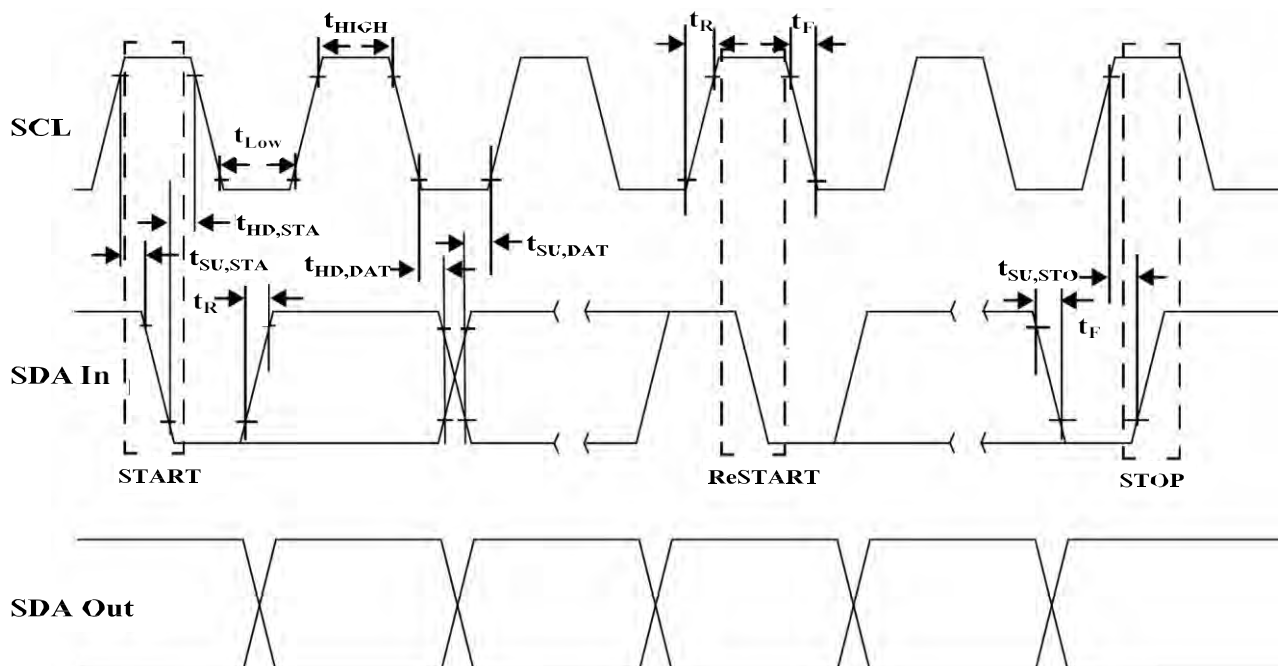


## SFP+ 2 Wire Interface Timing Requirements

| Parameter  | Symbol                  | Min  | Max  | Unit   | Conditions   |
|--|-------------------------|------|------|--------|--|
| Clock Frequency                                      | fSCL                    | 100  | 400  | kHz    |  |
| Clock Pulse Width Low                                | t <sub>LOW</sub>        | 1.3  |      | μs     |  |
| Clock Pulse Width High                               | t <sub>HIGH</sub>       | 0.6  |      | μs     |  |
| Time bus free before new transaction can start       | t <sub>BUF</sub>        | 20   |      | μs     | Between STOP and START   |
| START Hold time                                      | t <sub>HD,STA</sub>     | 0.6  |      | μs     |  |
| START Set-Up time                                    | t <sub>SU,STA</sub>     | 0.6  |      | μs     |  |
| Data in Hold time                                    | t <sub>HD,DAT</sub>     | 0    |      | μs     |  |
| Data in Set-Up time                                  | t <sub>SU,DAT</sub>     | 0.1  |      | μs     |  |
| Input Rise time (100 kHz)                            | t <sub>R,100</sub>      |      | 1000 | ns     | Note 1   |
| Input Rise time (400 kHz)                            | t <sub>R,400</sub>      |      | 300  | ns     | Note 1   |
| Input Fall time (100 kHz)                            | t <sub>F,100</sub>      |      | 300  | ns     | Note 1   |
| Input Fall time (400 kHz)                            | t <sub>F,400</sub>      |      | 300  | ns     | Note 1   |
| STOP Set-Up time                                     | t <sub>SU,STO</sub>     | 0.6  |      | μs     |  |
| Serial Interface Clock Holdoff<br>"Clock Stretching" | T <sub>clock_hold</sub> |      | 500  | μs     | Maximum time the SFP+ may hold the SCL line low before continuing R or W operation |
| Complete Single or Sequential Write                  | t <sub>WR</sub>         |      | 40   | ms     | Complete (up to) 8 Byte Write  |
| Endurance (Write Cycles)                             |                         | 10 k |      | Cycles | @ Max Operating Temperature  |

### Notes:

1. From (VIL, MAX -0.15) to (VIH, MIN +0.15)



## SFP+ Timing Requirements

| Parameter  | Symbol             | Min | Max | Unit | Conditions   |
|--|--------------------|-----|-----|------|--|
| <b>Tx_Disable assert time</b>  | t_off              |     | 100 | µs   | Rising edge of TX_Disable to fall of output signal below 10% of nominal.   |
| <b>TX_Disable negate time</b>  | T_on               |     | 2   | ms   | Falling edge of TX Disable to rise output signal above 90% of nominal. This only applies in normal operation, not during start up or fault recovery.   |
| <b>Time to initialize 2-wire interface</b>   | t_2w_start_up      |     | 300 | ms   | From power on or hot plug after the supply meeting   |
| <b>Time to initialize cooled module and time to power up a cooled module to Power Level II</b> | t_start_up_cooled  |     | 90  | sec  | From power supplies meeting or hot plug, or Tx disable negated during power up or Tx_Fault recovery, until cooled power level II part during fault recovery is fully operational. Also, from stop bit-low-to-high SDA transition enabling Power Level II until cooled module is fully operational. |
| <b>Tx_Fault assert for cooled module</b>   | Tx_fault_on_cooled |     | 1   | ms   | From occurrence of fault to assertion of TX_Fault  |
| <b>Tx_Fault Reset</b>  | t_reset            | 10  |     | µs   | Time TX_disable must be held high to reset TX_Fault  |
| <b>RX_LOS assert delay</b>   | t_los_on           |     | 100 | µs   | From occurrence of loss of signal to assertion of RX_LOS   |
| <b>Rx_LOS negate delay</b>   | t_los_off          |     | 100 | µs   | From occurrence of presence of signal to negation of RX_LOS.   |
| <b>Maximum Current Ramp on Power Supply</b>  |                    |     |     |      |  |
| <b>Icc instantaneous peak current</b>  |                    |     | 600 | mA   | Note 1,2   |
| <b>Icc sustained peak current</b>  |                    |     | 500 | mA   | Note 1,2   |

### Notes:

1. The maximum currents are the allowed currents for each power supply VccT or VccR, therefore the total module peak currents can be twice this value. The instantaneous peak current is allowed to exceed to specified maximum current capacity of the connector contact for a short period.
2. Not to exceed the sustained peak limit for the more than 50 µs; may exceed this limit for shorter durations.

## Pin Descriptions

| Pin | Logic      | Symbol     | Power Sequence Order | Name/Descriptions                                      | Ref. |
|-----|------------|------------|----------------------|--|------|
| 1   |            | VeeT       | 1                    | Module Transmitter Ground                              | 1    |
| 2   | LVTTTL-O   | TX_Fault   | 3                    | Module Transmitter Fault                               | 2    |
| 3   | LVTTTL-I   | TX_Disable | 3                    | Transmitter Disable; Turn off laser output             | 3    |
| 4   | LVTTTL-I/O | SDA        | 3                    | 2-Wire Serial Interface Data Line                      |      |
| 5   | LVTTTL-I/O | SCL        | 3                    | 2-Wire Serial Interface Clock                          |      |
| 6   |            | Mod_Abs    | 3                    | Module Absent, connected to VeeT or VeeR in the module | 4    |
| 7   | LVTTTL-I   | RS0        | 3                    | NA. 30kohm pull down inside the module                 |      |
| 8   | LVTTTL-O   | RX_LOS     | 3                    | Receiver Loss of Signal Indicator                      | 2    |
| 9   | LVTTTL-I   | RS1        | 3                    | NA. 30kohm pull down inside the module                 |      |
| 10  |            | VeeR       | 1                    | Module Receiver Ground                                 | 1    |
| 11  |            | VeeR       | 1                    | Module Receiver Ground                                 | 1    |
| 12  | CML-O      | RD-        | 3                    | Receiver Inverted Data Output(SFI)                     |      |
| 13  | CML-O      | RD+        | 3                    | Receiver Non-Inverted Data Output(SFI)                 |      |
| 14  |            | VeeR       | 1                    | Module Receiver Ground                                 | 1    |
| 15  |            | VccR       | 2                    | Module Receiver 3.3V Supply                            | 5    |
| 16  |            | VccT       | 2                    | Module Transmitter 3.3V Supply                         | 5    |
| 17  |            | VeeT       | 1                    | Module Transmitter Ground                              | 1    |
| 18  | CML-I      | TD+        | 3                    | Transmitter Non-Inverted Data Output(SFI)              |      |
| 19  | CML-I      | TD-        | 3                    | Transmitter Inverted Data Output(SFI)                  |      |
| 20  |            | VeeT       | 1                    | Module Transmitter Ground                              | 1    |

### Notes:

1. The module signal ground pins, VeeR and VeeT, are isolated from the module case.
2. This pin is an open drain output pin and shall be pulled up with a 4.7k-10kohms to Host\_Vcc on the host board. Pull ups can be connected to multiple power supplies, however the host board design shall ensure that no module pin has voltage exceeding module VccT/R + 0.5V.
3. This pin is an input pin with 10kohms pull up to VccT in the module.
4. This pin shall be pulled up with 4.7k-10kohms to Host\_Vcc on the host board.
5. VccT and VccR are tied together inside the module.



Pin-out of connector Block on Host board

### Recommended Circuit Schematic



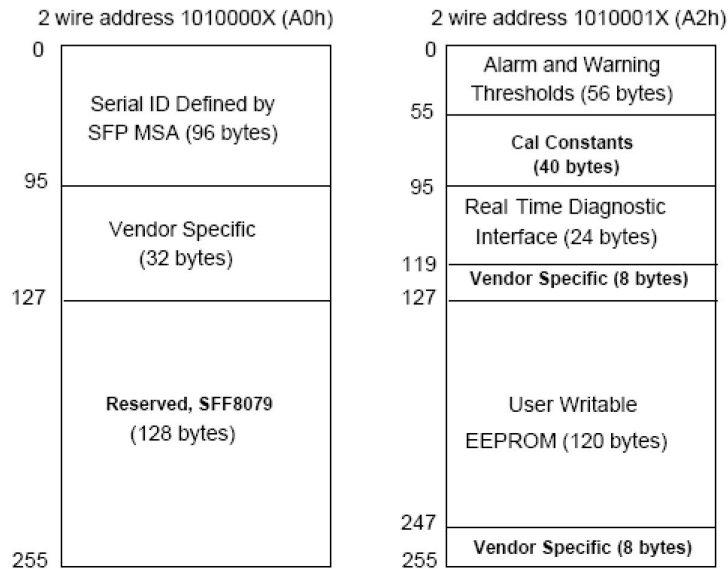
### Mechanical Specifications

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:



## About AddOn Networks

In 1999, AddOn Networks entered the market with a single product. Our founders fulfilled a severe shortage for compatible, cost-effective optical transceivers that compete at the same performance levels as leading OEM manufacturers. Adhering to the idea of redefining service and product quality not previously had in the fiber optic networking industry, AddOn invested resources in solution design, production, fulfillment, and global support.

Combining one of the most extensive and stringent testing processes in the industry, an exceptional free tech support center, and a consistent roll-out of innovative technologies, AddOn has continually set industry standards of quality and reliability throughout its history.

Reliability is the cornerstone of any optical fiber network and is ingrained in AddOn's DNA. It has played a key role in nurturing the long-term relationships developed over the years with customers. AddOn remains committed to exceeding industry standards with certifications ranging from NEBS Level 3 to ISO 9001:2015 with every new development while maintaining the signature reliability of its products.



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