

### SFP-16GB-DW18-40-PRO

MSA and TAA Compliant 16GBase-DWDM Fibre Channel 100GHz SFP+ Transceiver (SMF, 1563.05nm, 40km, DOM, 0 to 70C, LC)

#### Features

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



#### Applications:

- 16x Gigabit Ethernet over DWDM
- 8x/10x Fibre Channel
- Access, Metro and Enterprise

#### Product Description

This MSA Compliant SFP+ transceiver provides 16GBase-DWDM Fibre Channel throughput up to 40km over single-mode fiber (SMF) using a wavelength of 1563.05nm via an LC connector. It is built to MSA standards and is uniquely serialized and data-traffic and application tested to ensure that they will integrate into your network seamlessly. 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.

Proline'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.



### 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.

### Wavelength Guide (100GHz ITU-T Channel)

| Channel # | Frequency (THz) | Center Wavelength (nm) |
|-----------|-----------------|------------------------|
| 17        | 191.7           | 1563.86                |
| 18        | 191.8           | 1563.05                |
| 19        | 191.9           | 1562.23                |
| 20        | 192.0           | 1561.42                |
| 21        | 192.1           | 1560.61                |
| 22        | 192.2           | 1559.79                |
| 23        | 192.3           | 1558.98                |
| 24        | 192.4           | 1558.17                |
| 25        | 192.5           | 1557.36                |
| 26        | 192.6           | 1556.55                |
| 27        | 192.7           | 1555.75                |
| 28        | 192.8           | 1554.94                |
| 29        | 192.9           | 1554.13                |
| 30        | 193.0           | 1553.33                |
| 31        | 193.1           | 1552.52                |
| 32        | 193.2           | 1551.72                |
| 33        | 193.3           | 1550.92                |
| 34        | 193.4           | 1550.12                |
| 35        | 193.5           | 1549.32                |
| 36        | 193.6           | 1548.51                |
| 37        | 193.7           | 1547.72                |
| 38        | 193.8           | 1546.92                |
| 39        | 193.9           | 1546.12                |
| 40        | 194.0           | 1545.32                |
| 41        | 194.1           | 1544.53                |
| 42        | 194.2           | 1543.73                |
| 43        | 194.3           | 1542.94                |
| 44        | 194.4           | 1542.14                |

|    |       |         |
|----|-------|---------|
| 45 | 194.5 | 1541.35 |
| 46 | 194.6 | 1540.56 |
| 47 | 194.7 | 1539.77 |
| 48 | 194.8 | 1538.98 |
| 49 | 194.9 | 1538.19 |
| 50 | 195.0 | 1537.40 |
| 51 | 195.1 | 1536.61 |
| 52 | 195.2 | 1535.82 |
| 53 | 195.3 | 1535.04 |
| 54 | 195.4 | 1534.25 |
| 55 | 195.5 | 1533.47 |
| 56 | 195.6 | 1532.68 |
| 57 | 195.7 | 1531.90 |
| 58 | 195.8 | 1531.12 |
| 59 | 195.9 | 1530.33 |
| 60 | 196.0 | 1529.55 |
| 61 | 196.1 | 1528.77 |

### Absolute Maximum Ratings

| Parameter                  | Symbol | Min. | Typ.   | Max. | Unit | Notes |
|----------------------------|--------|------|--------|------|------|-------|
| Maximum Supply Voltage     | Vcc    | -0.5 |        | 4.5  | V    |       |
| Storage Temperature        | Tstg   | -40  |        | 85   | °C   |       |
| Operating Case Temperature | Tc     | 0    |        | 70   | °C   |       |
| Operating Humidity         | RH     | 5    |        | 95   | %    |       |
| Data Rate                  | BR     | 4.25 | 14.025 |      | Gbps |       |

## Electrical Characteristics

| Parameter                      | Symbol  | Min.  | Typ. | Max.  | Unit     | Notes |
|--------------------------------|---------|-------|------|-------|----------|-------|
| Power Supply Voltage           | Vcc     | 3.135 | 3.30 | 3.465 | V        |       |
| Power Supply Current           | Icc     |       |      | 550   | mA       |       |
| <b>Transmitter</b>             |         |       |      |       |          |       |
| Differential Data Input Swing  | VIN     | 180   |      | 850   | mV       | 1     |
| Input Differential Impedance   | ZIN     | 90    | 100  | 110   | $\Omega$ |       |
| Tx_Disable                     | Disable | VIH   | 2.0  | Vcc   | V        |       |
|                                | Enable  | VIL   | 0    | 0.8   | V        |       |
| Tx_Fault                       | Fault   | VOH   | 2.0  | Vcc   | V        |       |
|                                | Normal  | VOL   | 0    | 0.8   | V        |       |
| <b>Receiver</b>                |         |       |      |       |          |       |
| Differential Data Output Swing | VOUT    | 300   |      | 900   | mV       | 2     |
| LOS                            | High    | 2.0   |      | Vcc   | V        |       |
|                                | Low     |       |      | 0.8   | V        |       |

### Notes:

1. PECL input. Internally AC-coupled and terminated.
2. Internally AC-coupled.

## Optical Characteristics

| Parameter                   | Symbol          | Min.    | Typ. | Max.    | Unit | Notes |
|-----------------------------|-----------------|---------|------|---------|------|-------|
| <b>Transmitter</b>          |                 |         |      |         |      |       |
| Center Wavelength           | $\lambda_C$     | 1528.77 |      | 1563.86 | nm   |       |
| Spectral Width (-20dB)      | $\Delta\lambda$ |         |      | 1       | nm   |       |
| Side-Mode Suppression Ratio | SMSR            | 30      |      |         | dB   |       |
| Average Output Power        | POUT            | -1      |      | 3       | dBm  | 1     |
| Extinction Ratio            | ER              | 8.2     |      |         | dB   |       |
| <b>Receiver</b>             |                 |         |      |         |      |       |
| Center Wavelength           | $\lambda_C$     | 1260    |      | 1620    | nm   |       |
| Receiver Sensitivity        | S               |         |      | -14     | dBm  | 2     |
| Receiver Overload           | POL             | 0.5     |      |         | dBm  | 2     |
| LOS De-Assert               | LOSD            |         |      | -15     | dBm  |       |
| LOS Assert                  | LOSA            | -28     |      |         | dBm  |       |
| LOS Hysteresis              | LOSH            | 0.5     |      |         | dB   |       |

**Notes:**

1. The optical power is launched into the SMF.
2. Measured with a PRBS 2<sup>31</sup>-1 test pattern @14025Mbps, BER ≤1×10<sup>-12</sup>.

**Timing and Electrical Specifications**

| Parameter                                      | Symbol         | Min. | Typ. | Max. | Unit |
|--|----------------|------|------|------|------|
| Tx_Negate Time                                 | T_on           |      |      | 2    | ms   |
| Tx_Disable Assert Time                         | T_off          |      |      | 100  | μs   |
| Time To Initialize Including Reset of Tx_Fault | T_init         |      |      | 300  | ms   |
| Tx_Fault Assert Time                           | T_fault        |      |      | 100  | μs   |
| Tx_Disable To Reset                            | T_reset        | 10   |      |      | μs   |
| LOS Assert Time                                | T_loss_on      |      |      | 100  | μs   |
| LOS De-Assert Time                             | T_loss_off     |      |      | 100  | μs   |
| Serial ID Clock Rate                           | T_serial_clock |      | 100  | 400  | KHz  |
| MOD_DEF (0:2) - High                           | VOH            | 2    |      | Vcc  | V    |
| MOD_DEF (0:2) - Low                            | VOL            |      |      | 0.8  | V    |

**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.” LVTTT-I.   | 3    |
| 4   | SDA        | 2-Wire Serial Interface Data (Same as MOD-DEF2 in INF-8074i). LVTTTL-I/O.  |      |
| 5   | SCL        | 2-Wire Serial Interface Clock (Same as MOD-DEF2 in INF-8074i). LVTTTL-I.   |      |
| 6   | MOD_ABS    | Module Absent. Connect to VeeT or VeeR in the 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 Host\_Vcc 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+0.5V.
3. Tx\_Disable is an input contact with a 4.7kΩ to 10kΩ pull-up resistor to VccT inside the module.
4. MOD\_ABS is connected to VeeT or VeeR in the SFP+ module. The host may pull the contract up to Host\_Vcc with a resistor in the range from 4.7kΩ to 10kΩ. 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 the Host Board

### Transceiver Functional Diagram



### Recommended Interface Circuit Schematic



## Mechanical Specifications



## EEPROM Information

EEPROM memory map-specific data field description is as below:





**About Us:**

Proline Options is one of North America's leading providers of transceivers and high speed cabling. With a reputation for quality, tested products that cover the connectivity spectrum, Proline Options has a solution for you regardless of the specification.

At Proline Options, every product is tested in its intended application - never batch or spec tested only. We run bandwidth, distance and IOS network tests. We have documented an impressive 0.03% failure rate over the last 10 years. To continue this rate of success we invest millions annually in our own on-site testing lab.



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