



## SFP-1GB-DW51-80-FT-SKY

Fortinet® Compatible 1000Base-DWDM SFP+ Transceiver C-Band 100GHz (SMF, 1536.61nm, 80km, LC, DOM)

### Product Description

This Fortinet® compatible SFP+ transceiver provides 1000Base-DWDM throughput up to 80km over single-mode fiber (SMF) using a wavelength of 1536.61nm via an LC connector. It can operate at temperatures between 0 and 70C. Our transceiver is built to meet or exceed OEM specifications and is guaranteed to be 100% compatible with Fortinet®. It has been programmed, uniquely serialized, and tested for data-traffic and application to ensure that it will initialize and perform identically. All of our transceivers comply with Multi-Source Agreement (MSA) standards to provide seamless network integration. Additional product features include Digital Optical Monitoring (DOM) support which allows access to real-time operating parameters. We stand behind the quality of our products and proudly offer a limited lifetime warranty.

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

### Features:

- INF-8074 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:

- Gigabit Ethernet over DWDM
- Access, Metro and Enterprise
- 1x Fibre Channel

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*For your product safety, please read the following information carefully before any manipulation of the transceiver:*



#### **ESD**

This transceiver is specified as ESD threshold 1kV for SFI pins and 2kV for all others electrical input pins, tested per MIL-STD-883G, Method 3015.4 /JESD22-A114-A (HBM). However, normal ESD precautions are still required during the handling of this module.



#### **LASER SAFETY**

This is a Class1 Laser Product according to IEC 60825-1:2007. This product complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated (June 24, 2007).

*The optical ports of the module need to be terminated with an optical connector or with a dust plug in order to avoid contamination.*

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## 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)

| ITU Channel # | Frequency (THZ) | Center Wavelength (nm) |
|---------------|-----------------|------------------------|
| 61            | 196.1           | 1528.77                |
| 60            | 196.0           | 1529.55                |
| 59            | 195.9           | 1530.33                |
| 58            | 195.8           | 1531.12                |
| 57            | 195.7           | 1531.90                |
| 56            | 195.6           | 1532.68                |
| 55            | 195.5           | 1533.47                |
| 54            | 195.4           | 1534.25                |
| 53            | 195.3           | 1535.04                |
| 52            | 195.2           | 1535.82                |
| 51            | 195.1           | 1536.61                |
| 50            | 195.0           | 1537.40                |
| 49            | 194.9           | 1538.19                |
| 48            | 194.8           | 1538.98                |
| 47            | 194.7           | 1539.77                |
| 46            | 194.6           | 1540.56                |
| 45            | 194.5           | 1541.35                |
| 44            | 194.4           | 1542.14                |
| 43            | 194.3           | 1542.94                |
| 42            | 194.2           | 1543.73                |
| 41            | 194.1           | 1544.53                |
| 40            | 194.0           | 1545.32                |
| 39            | 193.9           | 1546.12                |
| 38            | 193.8           | 1546.92                |
| 37            | 193.7           | 1547.72                |
| 36            | 193.6           | 1548.51                |
| 35            | 193.5           | 1549.32                |
| 34            | 193.4           | 1550.12                |
| 33            | 193.3           | 1550.92                |
| 32            | 193.2           | 1551.72                |
| 31            | 193.1           | 1552.52                |
| 30            | 193.0           | 1553.33                |
| 29            | 192.9           | 1554.13                |
| 28            | 192.8           | 1554.94                |
| 27            | 192.7           | 1555.75                |
| 26            | 192.6           | 1556.55                |

|    |       |         |
|----|-------|---------|
| 25 | 192.5 | 1557.36 |
| 24 | 192.4 | 1558.17 |
| 23 | 192.3 | 1558.98 |
| 22 | 192.2 | 1559.79 |
| 21 | 192.1 | 1560.61 |
| 20 | 192.0 | 1561.42 |
| 19 | 191.9 | 1562.23 |
| 18 | 191.8 | 1563.05 |
| 17 | 191.7 | 1563.86 |

### Absolute Maximum Ratings

| Parameter                  | Symbol           | Min. | Max. | Unit |
|----------------------------|------------------|------|------|------|
| Maximum Supply Voltage     | V <sub>CC</sub>  | -0.5 | 3.6  | V    |
| Storage Temperature        | T <sub>S</sub>   | -40  | 85   | °C   |
| Operating Case Temperature | T <sub>C</sub>   | 0    | 70   | °C   |
| Operating Humidity         | RH               | 0    | 95   | %    |
| Receiver Power             | R <sub>MAX</sub> |      | -3   | dBm  |
| Maximum Bitrate            | B <sub>max</sub> |      | 1.25 | Gbps |

### Electrical Characteristics (TOP=25°C, V<sub>CC</sub>=3.3Volts)

| Parameter                      | Symbol               | Min. | Typ. | Max. | Unit | Notes |
|--------------------------------|----------------------|------|------|------|------|-------|
| Power Supply Voltage           | V <sub>CC</sub>      | 3.15 | 3.30 | 3.45 | V    |       |
| Power Supply Current           | I <sub>CC</sub>      |      |      | 300  | mA   |       |
| Transmitter                    |                      |      |      |      |      |       |
| Differential data input swing  | V <sub>in,pp</sub>   | 120  |      | 850  | mV   |       |
| Input differential impedance   | Z <sub>in</sub>      | 80   | 100  | 120  | Ω    |       |
| Receiver                       |                      |      |      |      |      |       |
| Differential data output swing | V <sub>out, pp</sub> | 300  |      | 850  | mV   |       |
| Output differential impedance  | Z <sub>in</sub>      | 80   | 100  | 120  | Ω    |       |

## Optical Characteristics

| Parameter                | Symbol     | Min.  | Typ. | Max.  | Unit | Notes |
|--------------------------|------------|-------|------|-------|------|-------|
| Transmitter              |            |       |      |       |      |       |
| Optical Power (average)  | $P_{AVE}$  | 0     |      | 5     | dBm  | 1     |
| Optical Wavelength       | $T\lambda$ | x-0.1 | x    | X+0.1 | nm   |       |
| Optical Extinction Ratio | ER         | 8.2   |      |       | dB   |       |
| Channel Spacing          | $\Delta f$ |       | 100  |       | GHz  |       |
| Insertion loss           | IL         |       | 0.7  |       |      |       |
| Receiver                 |            |       |      |       |      |       |
| Receiver Sensitivity     | $P_{min}$  |       |      | -24   | dBm  | 2     |
| Receiver overload        | $P_{max}$  | -10   |      |       | dBm  | 3     |
| Receiver wavelength      | $R\lambda$ | 1260  |      | 1620  | nm   |       |

### Notes:

1. Coupled into a Single-mode fibre
2. Minimum average optical power is measured at BER less than  $1E-12$ , with  $2^7-1$  PRBS and ER=9 dB
3. Exceeding the Receiver overload can physically damage the module. Please use appropriate attenuation.

## 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. LVTT-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 4.7KΩ 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 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:

| 2 wire address 1010000X (A0h) |                                         | 2 wire address 1010001X (A2h) |                                           |
|-------------------------------|-----------------------------------------|-------------------------------|-------------------------------------------|
| 0                             | Serial ID Defined by SFP MSA (96 bytes) | 0                             | Alarm and Warning Thresholds (56 bytes)   |
| 95                            |                                         | 55                            | Cal Constants (40 bytes)                  |
| 127                           | Vendor Specific (32 bytes)              | 95                            | Real Time Diagnostic Interface (24 bytes) |
|                               | Reserved, SFF8079 (128 bytes)           | 119                           | Vendor Specific (8 bytes)                 |
| 255                           |                                         | 127                           | User Writable EEPROM (120 bytes)          |
|                               |                                         | 247                           | Vendor Specific (8 bytes)                 |
|                               |                                         | 255                           |                                           |

# About Skylane Optics

Skylane is a leading provider of transceivers for optical communication.

We offer an extensive portfolio for the enterprise, access, datacenter and metropolitan fiber optical market as well as for smart home applications and home networks.

We cover the European, South American and North American market with a strong partner network and have offices in Belgium, Brazil, Sweden and USA.

Our offerings are characterized by high quality and performance. In combination with our strong technical support, we enable our customers to build cost optimized network solutions.

We offer an extensive range of high-quality products including transceivers (Optical and copper), Active Optical Cable (AOC), Direct Attach Cable (DAC), Mux/Demux, Coding Box.

