



## SFD48100GE0D000

MSA Compliant 1000Base-DWDM SFP Transceiver 100GHz (SMF, 1538.98nm, 120km, LC, DOM)

### Product Description

This MSA compliant SFP transceiver provides 1000Base-DWDM throughput up to 120km over single-mode fiber (SMF) using a wavelength of 1538.98nm via an LC connector. It can operate at temperatures between 0 and 70C. 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. 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
- Single 3.3V Power Supply
- Duplex LC Connector
- Commercial Temperature 0 to 70 Celsius
- Power Dissipation: 1.5W
- Single-mode Fiber
- Hot Pluggable
- Operating Temperature: 0 to 70 Celsius
- 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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## DWDM Wavelengths

| ITU Channel | Frequency (THz) | Center Wavelength (nm) | ITU Channel | Frequency (THz) | Center Wavelength (nm) |
|-------------|-----------------|------------------------|-------------|-----------------|------------------------|
| 16          | 191.60          | 1564.68                | 42          | 194.20          | 1543.73                |
| 17          | 191.70          | 1563.86                | 43          | 194.30          | 1542.94                |
| 18          | 191.80          | 1563.05                | 44          | 194.40          | 1542.14                |
| 19          | 191.90          | 1562.23                | 45          | 194.50          | 1541.35                |
| 20          | 192.00          | 1561.42                | 46          | 194.60          | 1540.56                |
| 21          | 192.10          | 1560.61                | 47          | 194.70          | 1539.77                |
| 22          | 192.20          | 1559.79                | 48          | 194.80          | 1538.98                |
| 23          | 192.30          | 1558.98                | 49          | 194.90          | 1538.19                |
| 24          | 192.40          | 1558.17                | 50          | 195.00          | 1537.40                |
| 25          | 192.50          | 1557.36                | 51          | 195.10          | 1536.61                |
| 26          | 192.60          | 1556.55                | 52          | 195.20          | 1535.82                |
| 27          | 192.70          | 1555.75                | 53          | 195.30          | 1535.04                |
| 28          | 192.80          | 1554.94                | 54          | 195.40          | 1534.25                |
| 29          | 192.90          | 1554.13                | 55          | 195.50          | 1533.47                |
| 30          | 193.00          | 1553.33                | 56          | 195.60          | 1532.68                |
| 31          | 193.10          | 1552.52                | 57          | 195.70          | 1531.90                |
| 32          | 193.20          | 1551.72                | 58          | 195.80          | 1531.12                |
| 33          | 193.30          | 1550.92                | 59          | 195.90          | 1530.33                |
| 34          | 193.40          | 1550.12                | 60          | 196.00          | 1529.55                |
| 35          | 193.50          | 1549.32                | 61          | 196.10          | 1528.77                |
| 36          | 193.60          | 1548.51                | 62          | 196.20          | 1527.99                |
| 37          | 193.70          | 1547.72                | 63          | 196.30          | 1527.22                |
| 38          | 193.80          | 1546.92                | 64          | 196.40          | 1526.44                |
| 39          | 193.90          | 1546.12                | 65          | 196.50          | 1525.66                |
| 40          | 194.00          | 1545.32                | 66          | 196.60          | 1524.89                |
| 41          | 194.10          | 1544.53                |             |                 |                        |

## Absolute Maximum Ratings

| Parameter                          | Symbol           | Min. | Typ. | Max. | Unit | Notes |
|------------------------------------|------------------|------|------|------|------|-------|
| Data Rate                          |                  |      |      | 1.25 | Gbps |       |
| Link Budget                        |                  | 32   |      |      | dB   |       |
| Operating Case Temperature         | T <sub>c</sub>   | 0    |      | 70   | °C   |       |
| Storage Temperature                | T <sub>stg</sub> | -40  |      | 85   | °C   |       |
| Maximum Voltage                    | V <sub>cc</sub>  | -0.5 |      | 3.6  | V    |       |
| Relative Humidity (Non-Condensing) | RH               | 5    |      | 85   | %    |       |

### Notes:

1. Exceeding any one of these values may destroy the device permanently.

## Electrical Characteristics

| Parameter                       |         | Symbol | Min. | Typ. | Max.    | Unit  | Notes |
|---------------------------------|---------|--------|------|------|---------|-------|-------|
| Power Supply Voltage            |         | Vcc    | 3.14 | 3.3  | 3.47    | V     |       |
| Power Supply Current            |         | Icc    |      |      | 450     | mA    |       |
| Transmitter                     |         |        |      |      |         |       |       |
| LVPECL Inputs (Differential)    |         | VIN    | 400  |      | 2000    | mVp-p | 1     |
| Input Impedance (Differential)  |         | ZIN    | 85   | 100  | 115     | Ω     | 2     |
| Tx_Disable                      | Disable |        | 2    |      | Vcc     | V     |       |
|                                 | Enable  |        | 0    |      | 0.8     |       |       |
| Tx_Fault                        | Fault   |        | 2    |      | Vcc+0.3 | V     |       |
|                                 | Normal  |        | 0    |      | 0.5     |       |       |
| Receiver                        |         |        |      |      |         |       |       |
| LVPECL Outputs (Differential)   |         | VOUT   | 370  |      | 700     | mVp-p | 3     |
| Output Impedance (Differential) |         | ZOUT   | 85   | 100  | 115     | Ω     |       |
| Tx_Disable Assert Time          |         | t_off  |      |      | 10      | us    |       |
| Rx_LOS                          | High    |        | 2    |      | Vcc+0.3 | V     |       |
|                                 | Low     |        | 0    |      | 0.8     |       |       |
| MOD_DEF (0.2)                   |         | VOH    | 2.5  |      |         | V     | 4     |
|                                 |         | VOL    | 0    |      | 0.5     |       |       |

### Notes:

1. LVPECL logic. Internally AC coupled inputs.
2. R<sub>IN</sub> > 100kΩ @ DC.
3. After internal AC coupling.
4. With serial ID.

## Optical Characteristics

| Parameter                        | Symbol                    | Min.                         | Typ. | Max. | Unit | Notes |
|----------------------------------|---------------------------|------------------------------|------|------|------|-------|
| Transmitter                      |                           |                              |      |      |      |       |
| Center Wavelength                | $\lambda_C$               | ITU-T DWDM Center Wavelength |      |      | nm   |       |
| Center Wavelength Variation      |                           | -0.1                         |      | 0.1  | nm   |       |
| Center Frequency Spacing         | $\Delta f$                |                              | 100  |      | GHz  |       |
| Spectral Width (-20dB)           | $\Delta\lambda$           |                              |      | 1    | nm   |       |
| Side-Mode Suppression Ratio      | SMSR                      | 30                           |      |      | dB   |       |
| Average Output Power             | POUT                      | 0                            |      | 5    | dBm  | 1     |
| Optical Extinction Ratio         | ER                        | 9                            |      |      | dB   |       |
| Transmitter Dispersion Penalty   | TDP                       |                              |      | 3.0  | dB   |       |
| Average Power of Off Transmitter | Poff                      |                              |      | -45  | dBm  |       |
| Rise/Fall Time (20-80%)          | Tr/Tf                     |                              |      | 260  | ps   |       |
| Output Optical Eye               | Compliant with IEEE 802.3 |                              |      |      |      | 2     |
| Receiver                         |                           |                              |      |      |      |       |
| Center Wavelength                | $\lambda_C$               | 1528                         |      | 1620 | nm   |       |
| Receiver Sensitivity             | PSEN                      |                              |      | -32  | dBm  | 3, 4  |
| Receiver Overload                | POVER                     | -10                          |      |      | dBm  | 4     |
| LOS De-Assert                    | LOSD                      |                              |      | -33  | dBm  |       |
| LOS Assert                       | LOSA                      | -45                          |      |      | dBm  |       |
| LOS Hysteresis                   | LOSH                      | 0.5                          |      | 6    | dB   |       |

### Notes:

1. Output power is measured by coupling into a 9/125 $\mu$ m single-mode fiber.
2. Filtered, measured with a PRBS 2<sup>7</sup>-1 test pattern @1250Mbps.
3. Minimum average optical power, measured at BER less than 1E<sup>-12</sup> with 2<sup>7</sup>-1 PRBS and ER=9dB.
4. Measured with receiving wavelength in the range of 1524nm to 1620nm.

## Pin Descriptions

| Pin | Symbol      | Name/Description                                          | Plug Sequence | Notes |
|-----|-------------|-----------------------------------------------------------|---------------|-------|
| 1   | VeeT        | Transmitter Ground.                                       | 1             | 5     |
| 2   | Tx_Fault    | Transmitter Fault Indication.                             | 3             | 1     |
| 3   | Tx_Disable  | Transmitter Disable. Module disables on “high” or “open.” | 3             | 2     |
| 4   | MOD_DEF2    | Module Definition 2. 2-wire serial ID interface.          | 3             | 3     |
| 5   | MOD_DEF1    | Module Definition 1. 2-wire serial ID interface.          | 3             | 3     |
| 6   | MOD_DEF0    | Module Definition 0. Grounded within the module.          | 3             | 3     |
| 7   | Rate Select | Not Connected. Function not available.                    | 3             |       |
| 8   | LOS         | Loss of Signal.                                           | 3             | 4     |
| 9   | VeeR        | Receiver Ground.                                          | 1             |       |
| 10  | VeeR        | Receiver Ground.                                          | 1             | 5     |
| 11  | VeeR        | Receiver Ground.                                          | 1             | 5     |
| 12  | RD-         | Inverted Received Data Out.                               | 3             | 6     |
| 13  | RD+         | Received Data Out.                                        | 3             | 6     |
| 14  | VeeR        | Receiver Ground.                                          | 1             | 5     |
| 15  | VccR        | 3.3 ± 5% Receiver Power.                                  | 2             | 7     |
| 16  | VccT        | 3.3 ± 5% Transmitter Power.                               | 2             | 7     |
| 17  | VeeT        | Transmitter Ground.                                       | 1             | 5     |
| 18  | TD+         | Transmit Data In.                                         | 3             | 8     |
| 19  | TD-         | Inverted Transmit Data In.                                | 3             | 8     |
| 20  | VeeT        | Transmitter Ground.                                       | 1             | 5     |

## Notes

1. Tx\_Fault is an open collector/drain output that should be pulled up with a 4.7kΩ to 10kΩ resistor on the host board. When “high,” the output indicates a laser fault of some kind. “Low” indicates normal operation. In the “low” state, the output will be pulled to <0.8V.
2. Tx\_Disable is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7kΩ to 10kΩ resistor. Its states are :  
Low (0V-0.8V): Transmitter On  
(>0.8V, <2.0V): Undefined  
High (2.0V–3.465V): Transmitter Disabled  
Open: Transmitter Disabled.
3. MOD\_DEF0, 1, & 2. These are the module definition pins. They should be pulled up with a 4.7kΩ to 10kΩ resistor on the host board.  
MOD\_DEF0 is grounded by the module to indicate that the module is present.  
MOD\_DEF1 is the clock line of the 2-wire serial interface for serial ID.  
MOD\_DEF2 is the data line of the 2-wire serial interface for serial ID.
4. LOS (Loss of Signal) is an open collector/drain output that should be pulled up with a 4.7kΩ to 10kΩ resistor. When “high,” this output indicates the received optical power is below the worst-case receiver sensitivity (as defined by the standard in use). “Low” indicates normal operation in the “low” state. The output will be pulled to <0.8V.
5. VeeR and VeeT may be internally connected within the SFP module.
6. RD-/+. These are the differential receiver outputs. They are AC-coupled, 100Ω differential lines that should be terminated with 100Ω (differential) at the user SERDES.

7. VccR and VccT are the receiver and transmitter power supplies. They are defined as  $3.3V \pm 5\%$  at the SFP connector pin. VccR and VccT may be internally connected within the SFP transceiver.
8. TD-/+. These are the differential transmitter inputs. They are AC-coupled, differential lines with  $100\Omega$  differential termination inside the module.

## Pin-Out Details



## Recommended Circuit Schematic



Mechanical Specifications



# 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.

