



## SDDD000AJ055000

MSA Combo PON OLT SFP-DD Transceiver (SMF, 1577nmTx/1270nmRx and 1490nmTx/1310nmRx, N1/B+, SC, DOM, -40 to 85C)

### Product Description

This MSA Compliant SFP-DD transceiver provides 9.95Gbs/9.95Gbs and 2.48Gbs/1.24Gbs-PON throughput up to 20km over single-mode fiber (SMF) using a wavelength of 1577nmTx/1270nmRx and 1490nmTx/1310nmRx via a SC 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. 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:

- Comply with ITU-T G.984.5 (2014)/Amd.2 (10/2020)
- Comply with SFF-8472 Rev 11.0
- GPON & XGS-PON N1 OPL Class B+
- Single-mode Fiber
- SC Optical Connector
- Comply with SFP-DD Hardware Rev. 4.2
- Hot Pluggable
- Operating Temperature: -40 to 85 Celsius
- RoHS compliant and Lead Free



### Applications:

- XGS-PON and GPON Combo OLT N2 B+

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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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## Absolute Maximum Ratings

| Parameter                                                | Symbol | Min. | Typ. | Max. | Unit | Notes |
|----------------------------------------------------------|--------|------|------|------|------|-------|
| Power Supply Voltage                                     | Vcc    | 0    |      | 3.6  | V    |       |
| Storage Ambient Temperature                              | Ts     | -40  |      | +85  | °C   |       |
| Operating Case Temperature                               | Tc     | -40  |      | 85   | °C   |       |
| Operating Relative Humidity                              | RH     | 5    |      | +85  | %    |       |
| XGS Rx Optical Isolation<br>(From external 1290-1650nm)  | ISO    | -30  |      |      | dB   |       |
| Reflectance of XGS Rx<br>(1260- 1280nm)                  |        |      |      | -12  | dB   |       |
| GPON Rx Optical Isolation<br>(From external 1260-1280nm) | ISO    | -30  |      |      | dB   |       |
| GPON Rx Optical Isolation<br>(From external 1342-1650nm) | ISO    | -30  |      |      | dB   |       |
| Reflectance of GPON Rx<br>(1290-1330 nm)                 |        |      |      | -20  | dB   |       |
| Differential Power Range                                 |        |      |      | 20   | dB   | 1     |

## Notes:

1. Power differential between sequential ONU bursts.

## Electrical Characteristics

| Parameter                        | Symbol  | Min. | Typ. | Max. | Unit  | Notes |
|----------------------------------|---------|------|------|------|-------|-------|
| Power Supply Voltage             | VCC     | 3.14 | 3.3  | 3.47 | V     |       |
| Supply Current                   | Icc     |      |      | 1114 | mA    | 1     |
| Power Consumption                |         |      |      | 3.5  | W     |       |
| Transmitter (9.953G)             |         |      |      |      |       |       |
| Data Input Differential Swing    | VIN     | 200  |      | 850  | mVp-p |       |
| Input Differential Impedance     | ZIN     |      | 100  |      | Ω     |       |
| Tx_Disable Voltage               | VIL     | 0    |      | 0.8  | V     |       |
|                                  | VIH     | 2    |      | 3.3  | V     |       |
| Transmitter Fault Voltage - Low  | VTF, L  | 0    |      | 0.4  | V     |       |
| Transmitter Fault Voltage - High | VTF, H  | 2.4  |      | VCC  | V     |       |
| Transmitter (2.488G)             |         |      |      |      |       |       |
| Data Input Differential Swing    | VIN     | 200  |      | 850  | mVp-p |       |
| Input Differential Impedance     | ZIN     |      | 100  |      | Ω     |       |
| Tx_Disable Voltage               | VIL     | 0    |      | 0.8  | V     |       |
|                                  | VIH     | 2    |      | 3.3  | V     |       |
| Transmitter Fault Voltage - Low  | VTFI, L | 0    |      | 0.4  | V     |       |
| Transmitter Fault Voltage - High | VTFI, H | 2.4  |      | VCC  | V     |       |

| Receiver (9.953G)              |        |     |  |      |       |  |
|--------------------------------|--------|-----|--|------|-------|--|
| Data Output Differential Swing | VOUT   | 300 |  | 800  | mVP-P |  |
| Signal Detected Voltage_Low    | VSD, L | 0   |  | 0.4  | V     |  |
| Signal Detected Voltage_High   | VSD, H | 2.4 |  | VCC  | V     |  |
| Signal Detected Assert Time    | TSDA   |     |  | 100  | ns    |  |
| Signal Detected De-assert Time | TSDD   |     |  | 50   | ns    |  |
| Data Recovery Time             | Trec   |     |  | 100  | ns    |  |
| Receiver (2.488G)              |        |     |  |      |       |  |
| Data Output Differential Swing | VOUT   | 300 |  | 800  | mVP-P |  |
| Signal Detected Voltage_Low    | VSD, L | 0   |  | 0.4  | V     |  |
| Signal Detected Voltage_High   | VSD, H | 2.4 |  | VCC  | V     |  |
| Signal Detected Assert Time    | TSDA   |     |  | 50   | ns    |  |
| Signal Detected De-assert Time | TSDD   |     |  | 12.8 | ns    |  |
| Data Recovery Time             | Trec   |     |  | 25.6 | ns    |  |
| Receiver (1.244G)              |        |     |  |      |       |  |
| Data Output Differential Swing | VOUT   | 300 |  | 800  | mVP-P |  |
| Signal Detected Voltage_Low    | VSD, L | 0   |  | 0.8  | V     |  |
| Signal Detected Voltage_High   | VSD, H | 2   |  | VCC  | V     |  |
| Signal Detected Assert Time    | TSDA   |     |  | 50   | ns    |  |
| Signal Detected De-assert Time | TSDD   |     |  | 12.8 | ns    |  |
| Data Recovery Time             | Trec   |     |  | 25.6 | ns    |  |

**Notes:**

1. Based on 3.14V

## Optical Characteristics

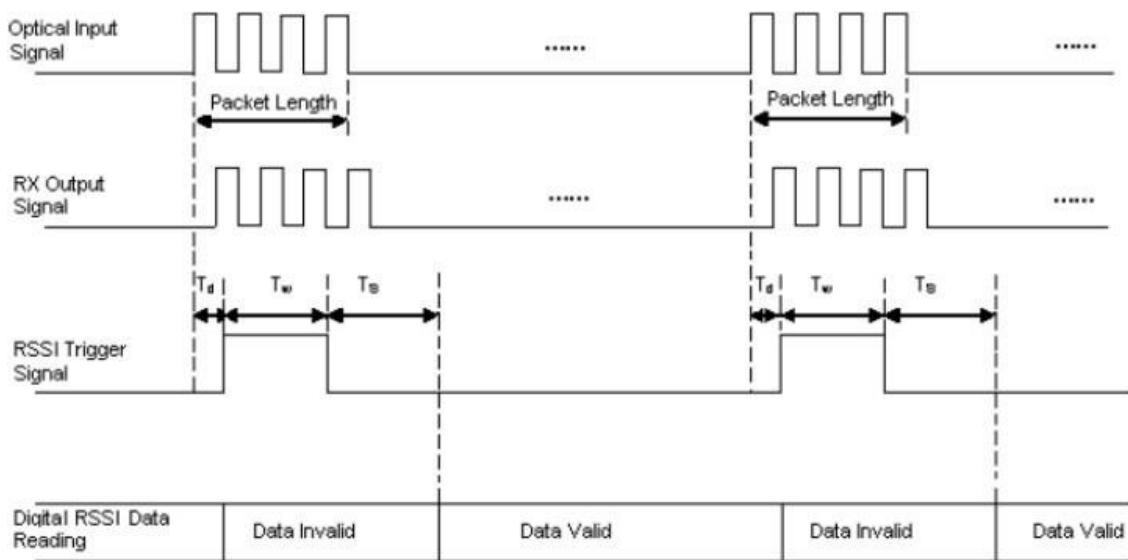
| Parameter                                | Symbol  | Min.                     | Typ. | Max.  | Unit | Notes |
|------------------------------------------|---------|--------------------------|------|-------|------|-------|
| Transmitter (9.953G)                     |         |                          |      |       |      |       |
| Centre Wavelength                        | λC      | 1575                     | 1577 | 1580  | nm   |       |
| Side Mode Suppression Ratio              | SMSR    | 30                       |      |       | dB   |       |
| Average Launch Power                     | Aop     | 1                        |      | 4     | dBm  |       |
| Average Launch Power-OFF                 | POFF    |                          |      | -39   | dBm  |       |
| Extinction Ratio                         | ER      | 8.2                      |      |       | dB   |       |
| Transmitter Tolerance to Reflected Power |         | -15                      |      |       | dB   |       |
| Eye Diagram                              |         | ITU-T G.9807.1 Compliant |      |       |      |       |
| Transmitter (2.488G)                     |         |                          |      |       |      |       |
| Centre Wavelength                        | λC      | 1480                     | 1490 | 1500  | nm   |       |
| Side Mode Suppression Ratio              | SMSR    | 30                       |      |       | dB   |       |
| Average Launch Power                     | Aop     | 1.5                      |      | 5     | dBm  |       |
| Average Launch Power-OFF                 | POFF    |                          |      | -40   | dBm  |       |
| Extinction Ratio                         | ER      | 8.2                      |      |       | dB   |       |
| Transmitter Tolerance to Reflected Power |         | -15                      |      |       | dB   |       |
| Eye Diagram                              |         | ITU-T G.984.2 Compliant  |      |       |      |       |
| Receiver (9.953G)                        |         |                          |      |       |      |       |
| Operating Wavelength                     | λC      | 1260                     | 1270 | 1280  | nm   |       |
| Sensitivity                              | PSEN    |                          |      | -25   | dBm  | 1     |
| Saturation                               | PSAT    | -4                       |      |       | dBm  | 1     |
| Signal Detected De-assert Level          | Psdd    | -45                      |      |       | dBm  |       |
| Signal Detected Assert Level             | Psda    |                          |      | -27   | dBm  |       |
| Max Optical Input                        | Pdamage |                          |      | 0     | dBm  |       |
| Receiver (2.488G)                        |         |                          |      |       |      |       |
| Operating Wavelength                     | λC      | 1260                     | 1270 | 1280  | nm   |       |
| Sensitivity                              | PSEN    |                          |      | -26.5 | dBm  | 2     |
| Saturation                               | PSAT    | -6                       |      |       | dBm  | 2     |
| Signal Detected De-assert Level          | Psdd    | -45                      |      |       | dBm  |       |
| Signal Detected Assert Level             | Psda    |                          |      | -28   | dBm  |       |
| Max Optical Input                        | Pdamage |                          |      | 0     | dBm  |       |
| Receiver (1.244G)                        |         |                          |      |       |      |       |
| Operating Wavelength                     | λC      | 1290                     | 1310 | 1330  | nm   |       |
| Sensitivity                              | PSEN    |                          |      | -28   | dBm  | 3     |
| Saturation                               | PSAT    | -8                       |      |       | dBm  | 3     |

|                                 |         |     |  |     |     |  |
|---------------------------------|---------|-----|--|-----|-----|--|
| Signal Detected De-assert Level | Psdd    | -45 |  |     | dBm |  |
| Signal Detected Assert Level    | Psda    |     |  | -29 | dBm |  |
| Max Optical Input               | Pdamage |     |  | 0   | dBm |  |

#### Notes:

1. Measured with PRBS  $2^{31}-1$  test pattern @9.953Gbps and ER=6dB BER =  $10^{-3}$ .
2. Measured with PRBS  $2^{23}-1$  test pattern @2.488Gbps and ER=8.2dB, BER =  $10^{-4}$ .
3. Measured with PRBS  $2^{23}-1$  test pattern @1.244Gbps and ER=8.2dB, BER =  $10^{-4}$ .

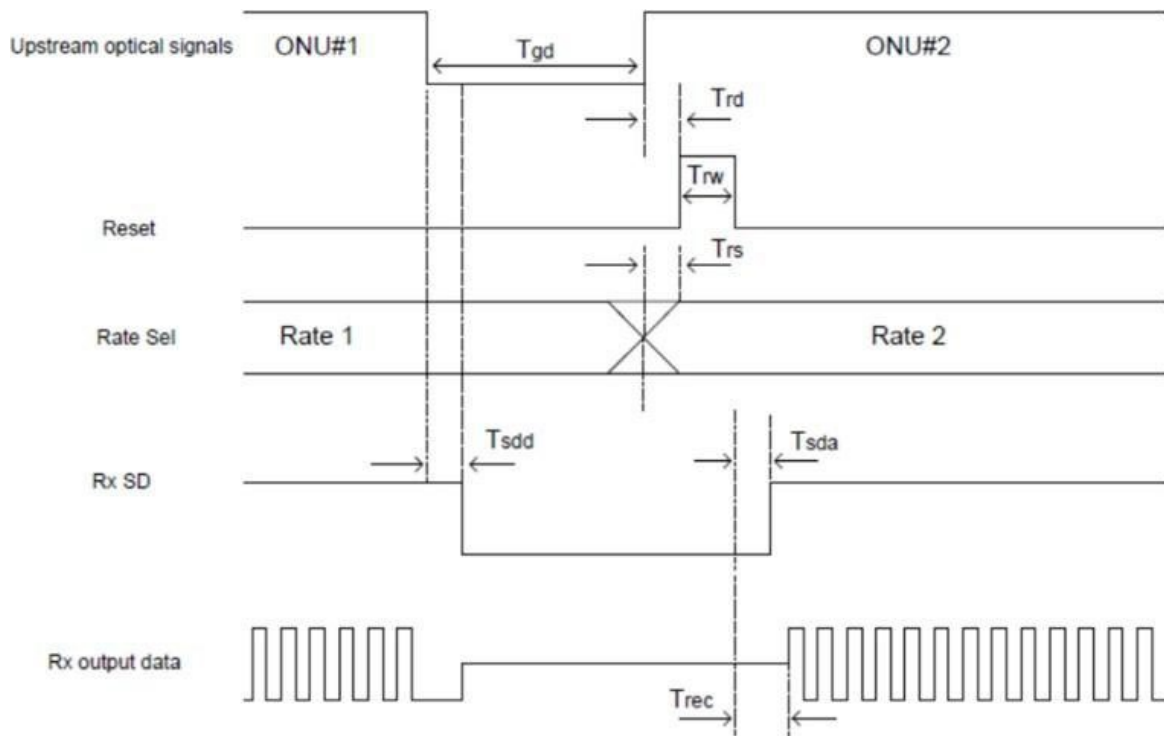
#### RSSI Timing



#### RSSI Timing Specifications

| Parameter          | Symbol       | Min. | Typ. | Max. | Unit | Notes |
|--------------------|--------------|------|------|------|------|-------|
| Packet Length      |              | 575  |      |      | ns   |       |
| RSSI Trigger Delay | $T_d$        | 100  |      |      | ns   |       |
| RSSI Trigger Width | $T_w$        | 500  |      |      | ns   |       |
| RSSI Sampling Time | $T_{SAMPLE}$ | 500  |      |      | ns   |       |
| Delay Before Read  | $T_s$        | 500  |      |      | us   |       |

## XGSPON RX Burst Timing

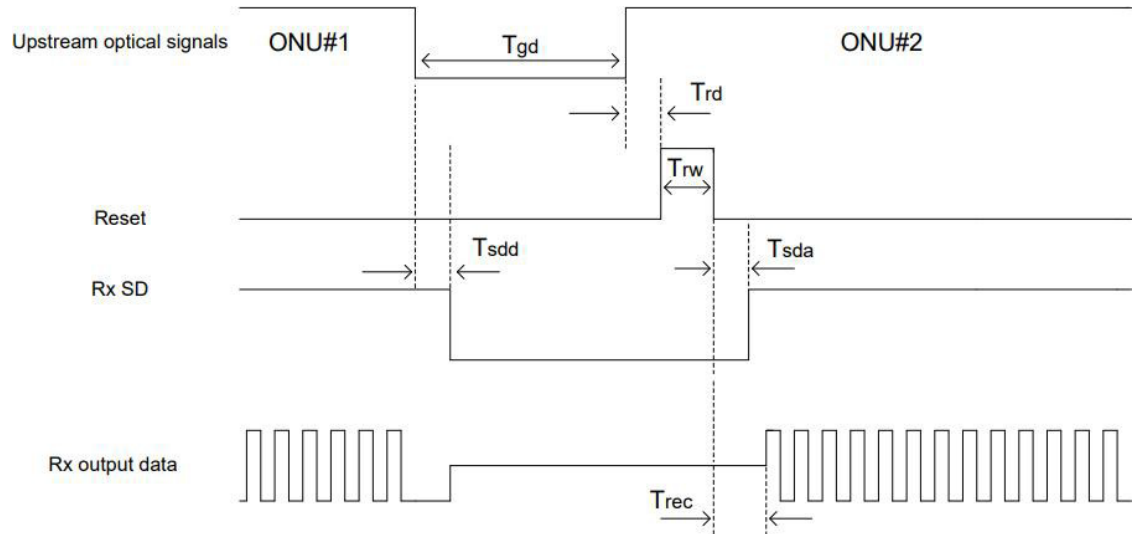


| Parameters         | Symbol    | Min  | Typ  | Max  | Units | Notes |
|--------------------|-----------|------|------|------|-------|-------|
| Guard Time         | $T_{gd}$  | 51.2 |      |      | ns    |       |
| Reset Delay        | $T_{rd}$  | 0    |      |      | ns    | 1     |
| Reset Width        | $T_{rw}$  | 25.6 |      |      | ns    |       |
| RateSel Setup Time | $T_{rs}$  | 5    |      |      | ns    | 2     |
| SD Assert Time     | $T_{sda}$ | 0    |      | 51.2 | ns    |       |
| SD De-assert Time  | $T_{sdd}$ |      | 100  |      | ns    | 3     |
| Data Recovery Time | $T_{rec}$ | 0    | 51.2 | 100  | ns    |       |

### Notes:

- Reset pulse is suggested to be fully inside the preamble.
- The polarity of RateSel signal could be customized, high = 10G rate, low = 2.5G rate by default.
- Signal detect auto reset function is applied. The signal detects de-assert time forced by auto reset is typically 100ns and could short to about 12.8ns with additional reset pulse.

GPON Rx Burst Timing

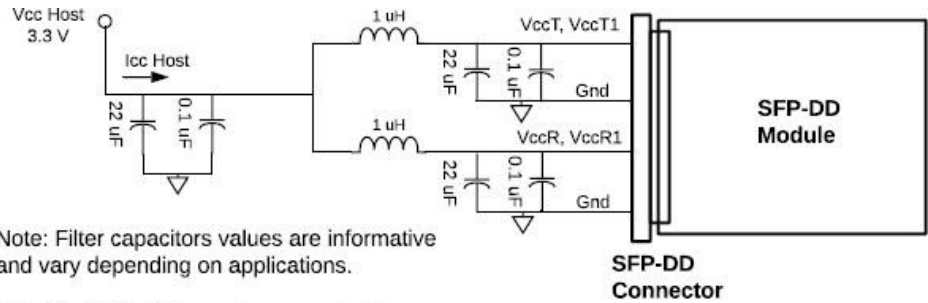


| Parameters         | Symbol    | Min  | Typ  | Max  | Units | Notes |
|--------------------|-----------|------|------|------|-------|-------|
| Guard Time         | $T_{gd}$  | 25.6 |      |      | ns    |       |
| Reset Delay        | $T_{rd}$  | 0    |      |      | ns    | 1     |
| Reset Width        | $T_{rw}$  | 12.8 |      |      | ns    |       |
| SD Assert Time     | $T_{sda}$ | 0    | 25.6 | 51.2 | ns    |       |
| SD De-assert Time  | $T_{sdd}$ |      | 100  |      | ns    | 2     |
| Data Recovery Time | $T_{rec}$ | 0    | 25.6 | 100  | ns    |       |

Notes:

1. Reset pulse is suggested to be fully inside the preamble.
2. Signal detect auto reset function is applied. The SD De-assert time forced by auto reset is typically 100ns and could short to about 12.8ns with additional reset pulse.

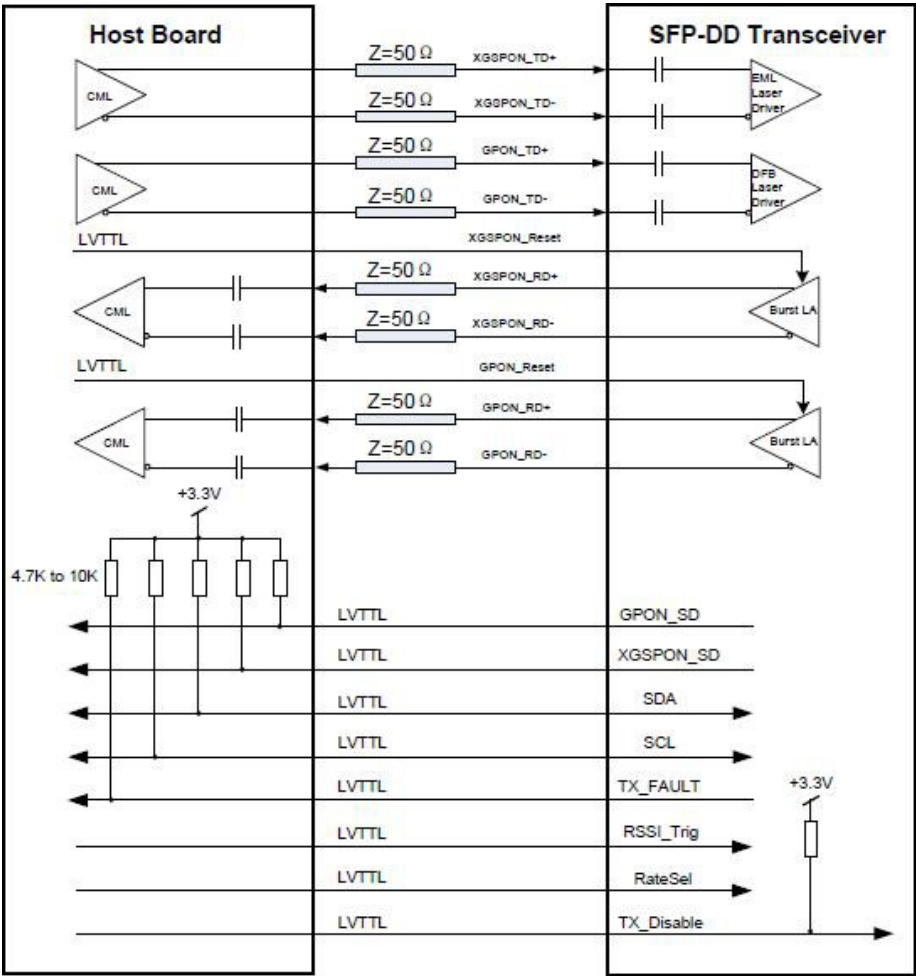
Recommended Host Board Power Supply Filtering Network



Note: Filter capacitors values are informative and vary depending on applications.

Note: VccT, VccT1 may be connected to VccR, VccR1 provided the applicable derating of the maximum current limit is used.

Recommended Host Circuit





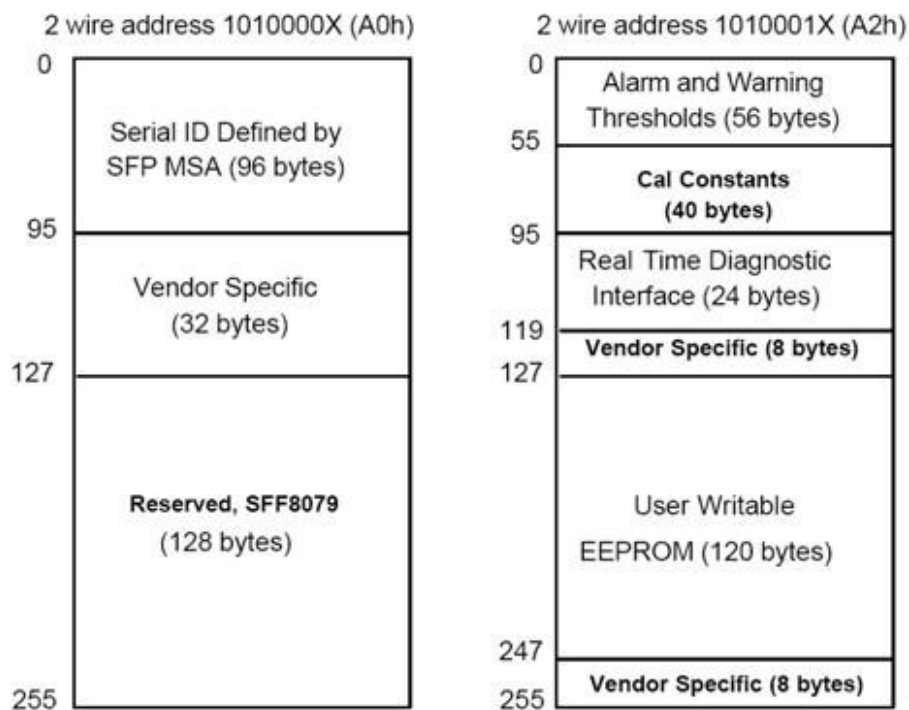
## Pin Descriptions

| Pin | Logic     | Symbol         | Name/Description                                                 | Notes |
|-----|-----------|----------------|------------------------------------------------------------------|-------|
| 1   | LVTTL-I   | Rate_S1        | 2..488G = Low, 9.953G = High.                                    |       |
| 2   | LVTTL-O   | TX_Fault1      | XGS Transmit fault, active high.                                 |       |
| 3   | LVTTL-I   | Tx_Disable1    | Active high to disable XGSPON.                                   |       |
| 4   | LVTTL-I/O | SDA            | 2-Wire serial interface SDA.                                     |       |
| 5   | LVTTL-I   | SCL            | 2-Wire serial interface SCL.                                     |       |
| 6   |           | MOB_ABS        | Module Ground.                                                   |       |
| 7   | LVTTL-I   | RESET 1        | Reset for XGSPON LA, active High.                                |       |
| 8   | LVTTL-O   | Rx_SD1         | XGS Receiver signal detect, logic 1 indicates normal operation.  |       |
| 9   | LVTTL-I   | RSSI_Trigger 1 | XGS RSSI trigger input, active high.                             |       |
| 10  |           | GND            | Module Ground.                                                   |       |
| 11  |           | GND            | Module Ground.                                                   |       |
| 12  | CML-O     | RD1-           | Inverted XGSPON received data output, DC coupling.               |       |
| 13  | CML-O     | RD1+           | XGSPON received data output, DC coupling.                        |       |
| 14  |           | GND            | Module Ground.                                                   |       |
| 15  |           | VCC            | +3.3V Power supply.                                              |       |
| 16  |           | VCC            | +3.3V Power supply.                                              |       |
| 17  |           | GND            | Module Ground.                                                   |       |
| 18  | CML-I     | TD1+           | XGS transmit data input, AC coupling.                            |       |
| 19  | CML-I     | TD1-           | Inverted XGS transmit data input, AC coupling.                   |       |
| 20  |           | GND            | Module Ground.                                                   |       |
| 21  |           | GND            | Module Ground.                                                   |       |
| 22  | LVTTL-O   | TX_Fault2      | GPON Transmit fault, active high.                                |       |
| 23  | LVTTL-I   | Tx_Disable2    | Active high to disable GPON.                                     |       |
| 24  |           | NC             | Reserved.                                                        |       |
| 25  |           | NC             | Reserved.                                                        |       |
| 26  |           | NC             | Reserved.                                                        |       |
| 27  | LVTTL-I   | RESET2         | Reset for GPON, active High.                                     |       |
| 28  | LVTTL-O   | Rx_SD2         | GPON Receiver signal detect, logic 1 indicates normal operation. |       |
| 29  | LVTTL-I   | RSSI_Trigger 2 | GPON RSSI trigger input, active high.                            |       |
| 30  |           | GND            | Module Ground.                                                   |       |
| 31  |           | GND            | Module Ground.                                                   |       |
| 32  | CML-O     | RD2-           | Inverted GPON received data output, DC coupling.                 |       |
| 33  | CML-O     | RD2+           | GPON received data output, DC coupling.                          |       |
| 34  |           | GND            | Module Ground.                                                   |       |
| 35  |           | VCC            | +3.3V Power supply.                                              |       |
| 36  |           | VCC            | +3.3V Power supply.                                              |       |
| 37  |           | GND            | Module Ground.                                                   |       |
| 38  | CML-I     | TD2+           | GPON transmit data input, AC coupling.                           |       |

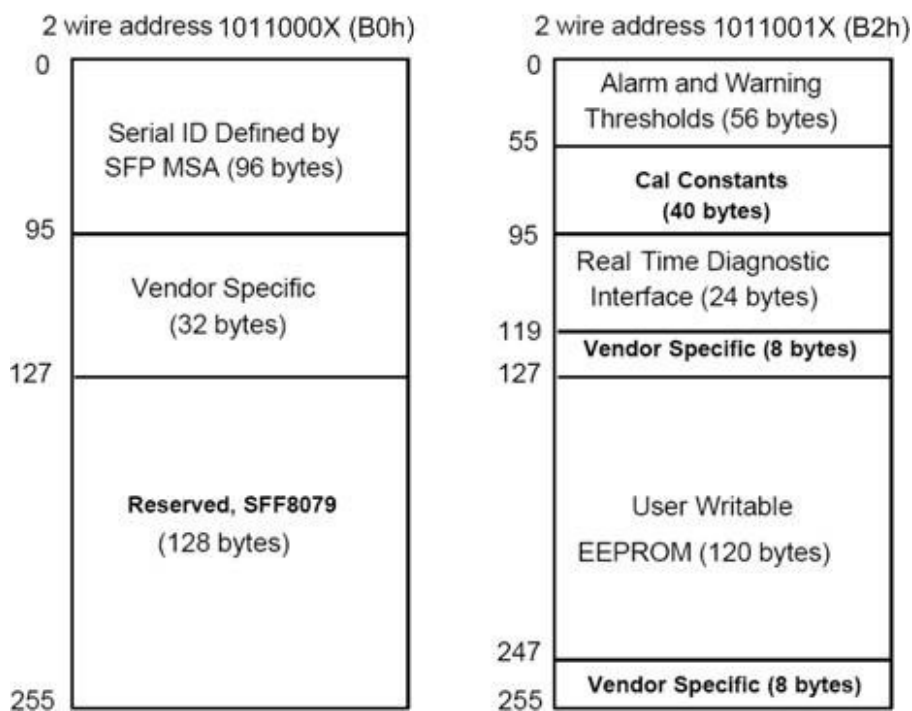
|    |       |      |                                                 |  |
|----|-------|------|-------------------------------------------------|--|
| 39 | CML-I | TD2- | Inverted GPON transmit data input, AC coupling. |  |
| 40 |       | GND  | Module Ground.                                  |  |

## EEPROM Definitions

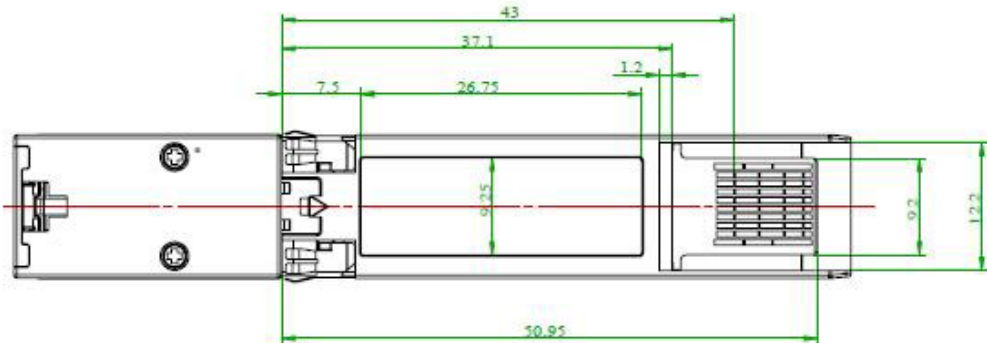
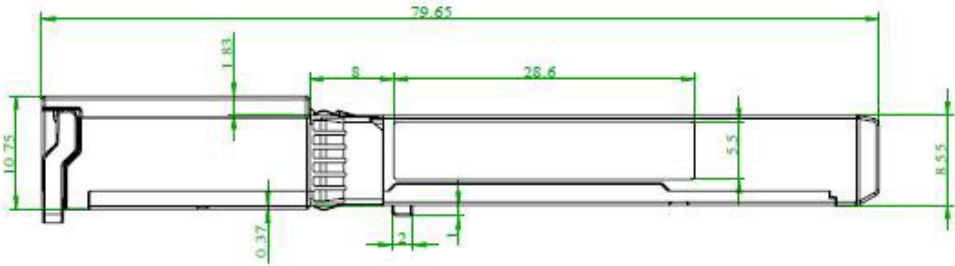
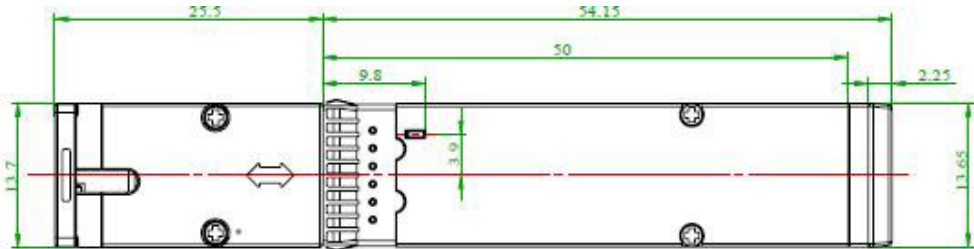
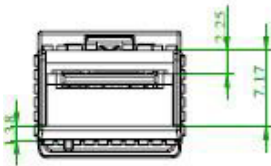
XGSPON Digital Diagnostic Memory Map



GPON Digital Diagnostic Memory Map



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.

