# Q2813002C0PD000

MSA Compliant 100GBase-PSM4 QSFP28 Transceiver (SMF, 1310nm, 2km, MPO, DOM)

**Product Description**

This MSA compliant QSFP28 transceiver provides 100GBase-PSM4 throughput up to 2km over single-mode fiber (SMF) using a wavelength of 1310nm via an MPO connector. It is guaranteed to be 100% compatible with the equivalent MSA 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. 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:**

- SFF-8665 Compliance
- MPO 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:**

- 100GBase Ethernet
- Access and Enterprise

*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.***

**Absolute Maximum Ratings**

| Parameter | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| **Maximum Supply Voltage** | Vcc | -0.5 | | 3.6 | V |
| **Storage Temperature** | TS | -40 | | 85 | ℃ |
| **Operating Case Temperature** | Tc | 0 | | 70 | ℃ |
| **Relative Humidity (non-condensation)** | RH | 0 | | 85 | % |
| **Data Rate, each Lane** | | | 25.78125 | | Gbps |
| **Damage Threshold, each Lane** | THd | 3.0 | | | dBm |
| **Data Rate Accuracy** | | -100 | | 100 | ppm |
| **Link Distance with G.652** | D | 0.002 | | 2 | km |

**Electrical Characteristics**

| Parameter | Test Point | Min. | Typ. | Max. | Unit | Notes |
|---|---|---|---|---|---|---|
| **Power Supply Voltage** | Vcc | 3.135 | 3.30 | 3.465 | V | |
| **Power Supply Current** | Icc | | | 1.06 | A | |
| **Power Consumption** | | | | 3.5 | W | |
| **Control Input Voltage High** | | 2 | | Vcc | V | |
| **Control Input Voltage Low** | | 0 | | 0.8 | V | |
| **Transmitter (each Lane)** | | | | | | |
| **Overload Differential Voltage pk-pk** | TP1a | 900 | | | mV | |
| **Common Mode Voltage (Vcm)** | TP1 | -350 | | 2850 | mV | 1 |
| **Differential Termination Resistance Mismatch** | TP1 | | | 10 | % | At 1MHz |
| **Differential Return Loss (SDD11)** | TP1 | | | See CEI- 28G-VSR Equation 13-19 | dB | |
| **Common Mode to Differential conversion and Differential to Common Mode conversion (SDC11, SCD11)** | TP1 | | | See CEI- 28G-VSR Equation 13-20 | dB | |
| **Stressed Input Test** | TP1a | See CEI- 28G-VSR Section 13.3.11.2.1 | | | | |
| **Receiver (each Lane)** | | | | | | |
| **Differential Voltage, pk-pk** | TP4 | | | 900 | mV | |
| **Common Mode Voltage (Vcm)** | TP4 | -350 | | 2850 | mV | 1 |
| **Common Mode Noise, RMS** | TP4 | | | 17.5 | mV | |
| **Differential Termination Resistance Mismatch** | TP4 | | | 10 | % | At 1MHz |
| **Differential Return Loss (SDD22)** | TP4 | | | See CEI- 28G-VSR Equation 13-19 | dB | |
| **Common Mode to Differential conversion and Differential to Common Mode conversion (SDC22, SCD22)** | TP4 | | | See CEI- 28G-VSR Equation 13-21 | dB | |
| **Common Mode Return Loss (SCC22)** | TP4 | | | -2 | dB | 2 |
| **Transition Time, 20 to 80%** | TP4 | 9.5 | | | ps | |
| **Vertical Eye Closure (VEC)** | TP4 | | | 5.5 | dB | |
| **Eye Width at $10^{-15}$ probability (EW15)** | TP4 | 0.57 | | | UI | |
| **Eye Height at $10^{-15}$ probability (EH15)** | TP4 | 228 | | | mV | |

**Notes:**

1. Vcm is generated by the host. Specification includes effects of ground offset voltage.
2. From 250MHz to 30GHz.

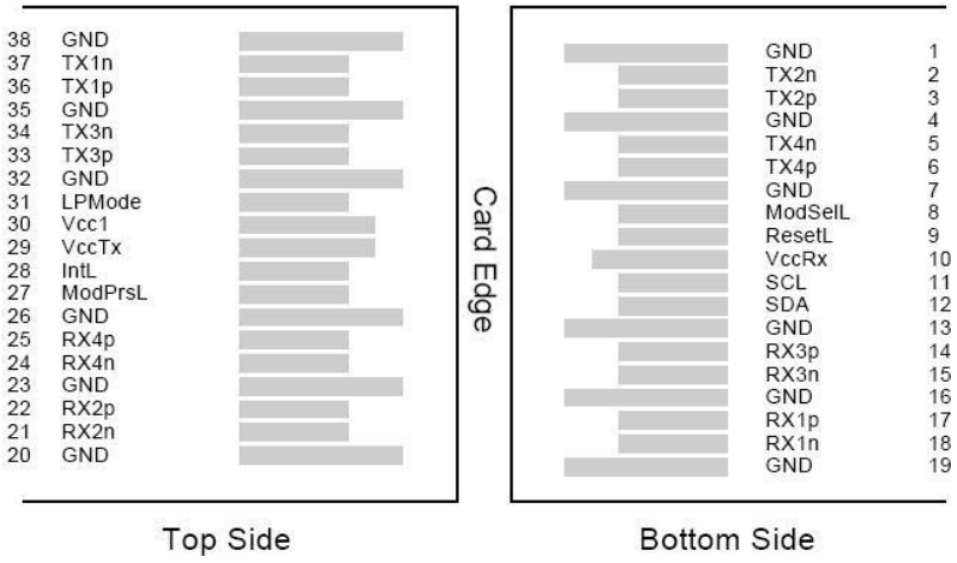
## Optical Characteristics

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Notes |
|---|---|---|---|---|---|---|
| **Transmitter** | | | | | | |
| **Center Wavelength** | $\lambda_C$ | 1295 | 1310 | 1325 | nm | 1 |
| **Side Mode Suppression Ratio** | SMSR | 30 | | | dB | |
| **Total Average Launch Power** | $P_T$ | | | 8.0 | dBm | |
| **Average Launch Power, each Lane** | $P_{AVG}$ | -5.5 | | 2.0 | dBm | 2 |
| **Optical Modulation Amplitude (OMA), each Lane** | $P_{OMA}$ | -3.5 | | 2.2 | dBm | 1 |
| **Launch Power in OMA minus Transmitter and Dispersion Penalty (TDP), each Lane** | | -4.3 | | | dBm | |
| **TDP, each Lane** | TDP | | | 2.9 | dB | |
| **Extinction Ratio** | ER | 3.5 | | | dB | |
| **Optical Return Loss Tolerance** | TOL | | | 20 | dB | |
| **Transmitter Reflectance** | $R_T$ | | | -12 | dB | |
| **Average Launch Power OFF Transmitter, each Lane** | Poff | | | -30 | dBm | |
| **Transmitter Eye Mask Definition {X1, X2, X3, Y1, Y2, Y3}** | {0.31,0.4,0.45,0.34,0.38,0.4} | | | | | |
| **Receiver** | | | | | | |
| **Center Wavelength** | $\lambda_C$ | 1295 | 1310 | 1325 | nm | |
| **Damage Threshold, each Lane** | $TH_d$ | 3.0 | | | dBm | 2 |
| **Average Receive Power, each Lane** | | -10.2 | | 2.0 | dBm | |
| **Receive Power (OMA), each Lane** | | | | 2.2 | dBm | |
| **Receiver Sensitivity (OMA), each Lane** | SEN1 | | | -9.0 | dBm | for BER = $1x10^{-12}$ |
| **Stressed Receiver Sensitivity (OMA), each Lane** | | | | -6.44 | dBm | for BER = $1x10^{-12}$ |
| **Receiver Sensitivity (OMA), each Lane** | SEN2 | | | -11.35 | dBm | for BER = $5x10^{-5}$ |
| **Stressed Receiver Sensitivity (OMA), each Lane** | | | | -8.79 | dBm | for BER = $5x10^{-5}$ |
| **Receiver Reflectance** | $R_R$ | | | -26 | dB | |
| **LOS Assert** | LOSA | -30 | | | dBm | |
| **LOS Deassert** | LOSD | | | -15 | dBm | |
| **LOS Hysteresis** | LOSH | 0.5 | | | dB | |
| **Receiver Electrical 3 dB upper Cutoff Frequency, each Lane** | Fc | | | 31 | GHz | |
| **Conditions of Stress Receiver Sensitivity Test (Note 3)** | | | | | | |
| **Vertical Eye Closure Penalty, each Lane** | | | 1.9 | | dB | |
| **Stressed Eye J2 Jitter, each Lane** | | | 0.27 | | UI | |
| **Stressed Eye J4 Jitter, each Lane** | | | 0.39 | | UI | |
| **Stressed Eye Mask Definition {X1, X2, X3, Y1, Y2, Y3}** | {0.24, 0.5, 0.5, 0.24, 0.24, 0.4} | | | | | |

**Notes:**

1. Even if the TDP < 0.8 dB, the OMA min must exceed the minimum value specified here.
2. The receiver shall be able to tolerate, without damage, continuous exposure to a modulated optical input signal having this power level on one lane. The receiver does not have to operate correctly at this input power.
3. Vertical eye closure penalty, stressed eye J2 jitter, stressed eye J4 jitter, and stressed receiver eye mask definition are test conditions for measuring stressed receiver sensitivity. They are not characteristics of the receiver.

**Electrical Pin-out Details**



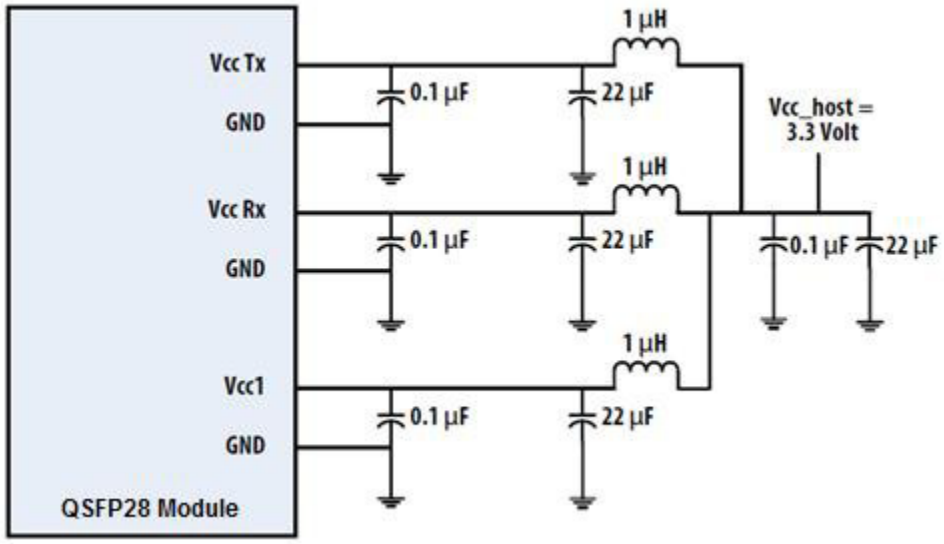
**Pin Descriptions**

| Pin | Logic | Symbol | Name/Descriptions | Notes |
|---|---|---|---|---|
| **1** | | GND | Ground | 1 |
| **2** | CML-I | Tx2n | Transmitter Inverted Data Input | |
| **3** | CML-I | Tx2p | Transmitter Non-Inverted Data output | |
| **4** | | GND | Ground | 1 |
| **5** | CML-I | Tx4n | Transmitter Inverted Data Input | |
| **6** | CML-I | Tx4p | Transmitter Non-Inverted Data output | |
| **7** | | GND | Ground | 1 |
| **8** | LVTLL-I | ModSelL | Module Select | |
| **9** | LVTLL-I | ResetL | Module Reset | |
| **10** | | VccRx | +3.3V Power Supply Receiver | 2 |
| **11** | LVCMOS-I/O | SCL | 2-Wire Serial Interface Clock | |
| **12** | LVCMOS-I/O | SDA | 2-Wire Serial Interface Data | |
| **13** | | GND | Ground | |
| **14** | CML-O | Rx3p | Receiver Non-Inverted Data Output | |
| **15** | CML-O | Rx3n | Receiver Inverted Data Output | |
| **16** | | GND | Ground | 1 |
| **17** | CML-O | Rx1p | Receiver Non-Inverted Data Output | |
| **18** | CML-O | Rx1n | Receiver Inverted Data Output | |
| **19** | | GND | Ground | 1 |
| **20** | | GND | Ground | 1 |
| **21** | CML-O | Rx2n | Receiver Inverted Data Output | |
| **22** | CML-O | Rx2p | Receiver Non-Inverted Data Output | |
| **23** | | GND | Ground | 1 |
| **24** | CML-O | Rx4n | Receiver Inverted Data Output | 1 |
| **25** | CML-O | Rx4p | Receiver Non-Inverted Data Output | |
| **26** | | GND | Ground | 1 |
| **27** | LVTTL-O | ModPrsL | Module Present | |
| **28** | LVTTL-O | IntL | Interrupt | |
| **29** | | VccTx | +3.3 V Power Supply transmitter | 2 |
| **30** | | Vcc1 | +3.3 V Power Supply | 2 |
| **31** | LVTTL-I | LPMode | Low Power Mode | |
| **32** | | GND | Ground | 1 |
| **33** | CML-I | Tx3p | Transmitter Non-Inverted Data Input | |
| **34** | CML-I | Tx3n | Transmitter Inverted Data Output | |
| **35** | | GND | Ground | 1 |
| **36** | CML-I | Tx1p | Transmitter Non-Inverted Data Input | |
| **37** | CML-I | Tx1n | Transmitter Inverted Data Output | |
| **38** | | GND | Ground | 1 |

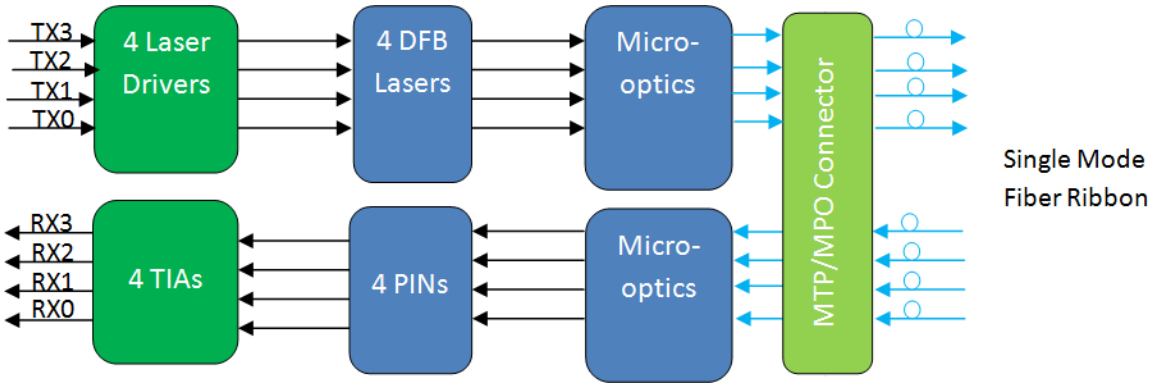
**Notes:**

1. The module signal grounds are isolated from the module case.
2. This is an open collector/drain output that on the host board requires a 4.7KΩ to 10KΩ pull-up resistor to VccHost.

**Recommended Host Board Power Supply Filter Network**




**Transceiver Block Diagram**

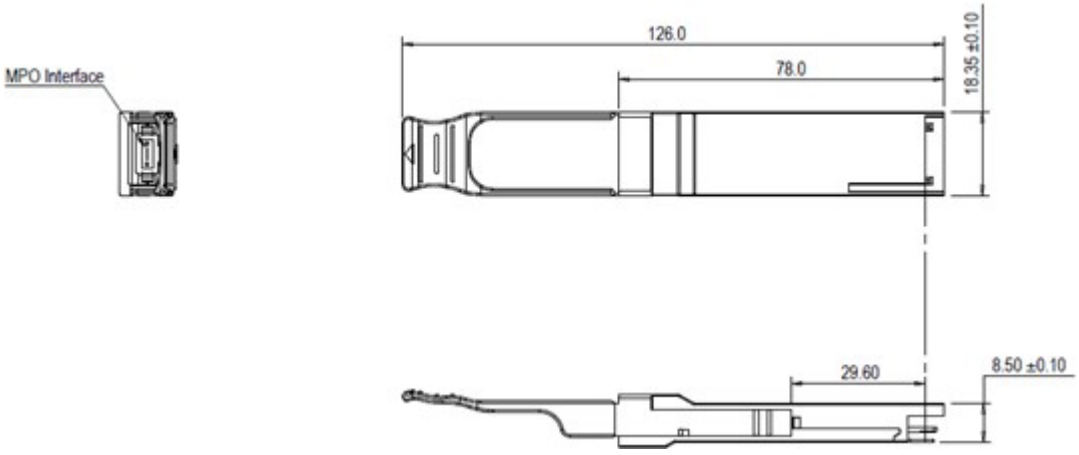


**Digital Diagnostic Functions**

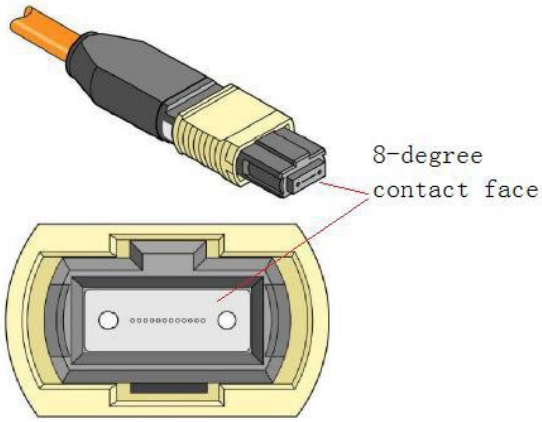
The following digital diagnostic characteristics are defined over the normal operating conditions unless otherwise specified.

| Parameter | Symbol | Min | Max | Units | Notes |
|---|---|---|---|---|---|
| **Temperature monitor absolute error** | DMI_Temp | -3 | 3 | degC | Over operating temperature range |
| **Supply voltage monitor absolute error** | DMI _VCC | -0.1 | 0.1 | V | Over full operating range |
| **Channel RX power monitor absolute error** | DMI_RX_Ch | -2 | 2 | dB | 1 |
| **Channel Bias current monitor** | DMI_Ibias_Ch | -10% | 10% | mA | |
| **Channel TX power monitor absolute error** | DMI_TX_Ch | -2 | 2 | dB | 1 |

**Mechanical Specifications**




**Attention:** To minimize MPO connection induced reflections, an MPO receptacle with 8-degree angled end-face is utilized for this product. A female MPO connector with 8-degree end-face should be used with this product as illustrated in below Figure.



# 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.