

# Stratos 100G Transceivers

QSFP28 100G CWDM4 2km Transceiver



## Features

- Hot-pluggable QSFP28 form factor
- 4 x CWDM – uncooled DFB laser
- (1271/1291/1311/1331 nm)
- PIN photo detector
- 0°C to 70°C case operating temperature range
- 2km transmission with SMF
- 3.3 V power supply
- Contain clock data recovery (CDR)
- Power consumption < 3.5 W
- Compliant with QSFP+ MSA SFF-8665
- Compliant with IEEE 802.3bm/100G-CWDM4 MSA specification
- Digital diagnostic functions (Via I<sup>2</sup>C)
- RoHS compliant
- Compliant with UL & TUV



## Applications

- 100 Gigabit Ethernet, Dual LC, CWDM4

## Part Numbers

| Part Number    | Form Factor    | Data Rate | Media | Distance | Wavelength                               | TX Power   | Voltage | Coupling | DDM | Temp      |
|----------------|----------------|-----------|-------|----------|--|------------|---------|----------|-----|-----------|
| STA-100G-CWDM4 | QSFP28 Dual LC | 100G      | SMF   | 2km      | 1271 nm<br>1291 nm<br>1311 nm<br>1331 nm | -6.5 ~ 2.5 | 3.3 V   | AC/AC    | Y   | 0 ~ +70 C |

## Absolute Maximum Ratings

| Parameter                | Symbol   | Conditions     | Min | Max | Unit |
|--------------------------|----------|----------------|-----|-----|------|
| Storage temperature      | $T_s$    |                | -40 | +85 | °C   |
| Supply relative humidity | RH       | Non condensing | 0   | 85  | %    |
| Supply voltage           | $V_{cc}$ |                | 0   | 3.6 | V    |

## Recommended Operating Conditions

| Parameter                  | Symbol   | Conditions | Min   | Typical | Max  | Unit |
|----------------------------|----------|------------|-------|---------|------|------|
| Case operating temperature | $T_c$    |            | 0     |         | 70   | °C   |
| Supply voltage             | $V_{cc}$ |            | 3.13  | 3.3     | 3.47 | V    |
| Supply voltage             | $I_{cc}$ |            |       |         | 1000 | mA   |
| Data rate                  | DR       |            |       | 100     |      | Gbps |
| Distance                   |          |            | 0.002 |         | 2    | km   |

## Electrical Characteristics

| Parameter                                    | Symbol           | Conditions               | Min | Typical             | Max                | Unit |
|--|------------------|--------------------------|-----|---------------------|--------------------|------|
| <b>Transmitter</b>                           |                  |                          |     |                     |                    |      |
| Differential input impedance                 | $R_{DI}$         |                          |     | 100                 |                    | Ohm  |
| High speed differential input voltage (CML)  | $V_{CML\_DI}$    | AC-coupled, peak to peak | 0.2 |                     | 1.0                | V    |
| Low speed input voltage - low (LVCOMS)       | $V_{LVCMOS\_IL}$ |                          |     |                     | $V_{cc} \cdot 0.2$ | V    |
| Low speed input voltage - high (LVCOMS)      | $V_{LVCMOS\_IH}$ |                          |     | $V_{cc} \cdot 0.75$ | 3.465              | V    |
| <b>Receiver</b>                              |                  |                          |     |                     |                    |      |
| Differential output impedance                | $R_{DO}$         |                          |     | 100                 |                    | Ohm  |
| High speed differential output voltage (CML) | $V_{CML\_DO}$    | AC-coupled, peak to peak | 0.3 |                     | 0.8                | V    |
| Low speed output voltage - low (LVCOMS)      | $V_{LVCMOS\_OL}$ |                          | 0   |                     | 0.4                | V    |
| Low speed output voltage -high (LVCOMS)      | $V_{LVCMOS\_OH}$ |                          |     | $V_{cc} - 0.5$      | $V_{cc} + 0.3$     | V    |

## Optical Characteristics

| Parameter  | Symbol            | Conditions   | Min                                 | Typical | Max    | Unit |
|--|-------------------|--------------|-------------------------------------|---------|--------|------|
| <b>Transmitter</b>   |                   |              |                                     |         |        |      |
| Lane wavelengths (range)                                       | $\lambda_c$       |              | 1264.5                              | 1271    | 1277.5 | nm   |
|  |                   |              | 1284.5                              | 1291    | 1297.5 | nm   |
|  |                   |              | 1304.5                              | 1311    | 1317.5 | nm   |
|  |                   |              | 1324.5                              | 1331    | 1337.5 | nm   |
| Side mode suppression ratio                                    | SMSR              |              | 30                                  |         |        | dB   |
| Total average launch power                                     | P <sub>tot</sub>  |              |                                     |         | 8.5    | dBm  |
| Average launch power, each lane                                | P <sub>o</sub>    |              | -6.5                                |         | 2.5    | dBm  |
| OMA, each lane   | OMA               | CW, ER>3.5dB | -4                                  |         | 2.5    | dBm  |
| Difference in launch power between any two lanes (OMA)         |                   |              |                                     |         | 5      | dB   |
| TDP, each lane   | TDP               |              |                                     |         | 3.0    | dB   |
| Average launch power of OFF transmitter, each lane             | P <sub>off</sub>  |              |                                     |         | -30    | dBm  |
| Extinction ratio   | ER                |              | 3.5                                 |         |        | dB   |
| Eye mask definition {X1, X2, X3, Y1, Y2, Y3}                   |                   |              | {0.31, 0.40, 0.45, 0.34, 0.38, 0.4} |         |        |      |
| <b>Receiver</b>  |                   |              |                                     |         |        |      |
| Center wavelength - lane 0                                     | $\lambda_{c0}$    |              | 1264.5                              |         | 1277.5 | nm   |
| Center wavelength - lane 1                                     | $\lambda_{c1}$    |              | 1284.5                              |         | 1297.5 | nm   |
| Center wavelength - lane 2                                     | $\lambda_{c2}$    |              | 1304.5                              |         | 1317.5 | nm   |
| Center wavelength - lane 3                                     | $\lambda_{c3}$    |              | 1324.5                              |         | 1337.5 | nm   |
| Damage threshold   |                   |              | 3.5                                 |         |        | dBm  |
| Receiver power (OMA), each lane                                |                   |              |                                     |         | 2.5    | dBm  |
| Receiver reflectance   |                   |              |                                     |         | -26    | dB   |
| Difference in receiver power between any two lanes (OMA) (max) |                   |              |                                     |         | 5.5    | dB   |
| Average receive power, each lane                               |                   |              | -11.5                               |         | 2.5    | dBm  |
| Receiver sensitivity (OMA), each lane                          | R <sub>sens</sub> | At 5E-5 BER  |                                     |         | -10.0  | dBm  |
| Stressed receiver sensitivity (OMA), each lane                 | SRS               | At 5E-5 BER  |                                     |         |        |      |
| Conditions of stressed receiver sensitivity test:              |                   |              |                                     |         |        |      |
| Vertical eye closure penalty, each lane                        | VECP              |              |                                     | 1.9     |        | dB   |
| Stressed eye J2 jitter, each lane                              | J2                |              |                                     | 0.33    |        | UI   |
| Stressed eye J4 jitter, each lane                              | J4                |              |                                     | 0.48    |        | UI   |
| SRS eye mask definition {X1, X2, X3, Y1, Y2, Y3}               |                   |              | {0.39, 0.50, 0.50, 0.39, 0.39, 0.4} |         |        |      |

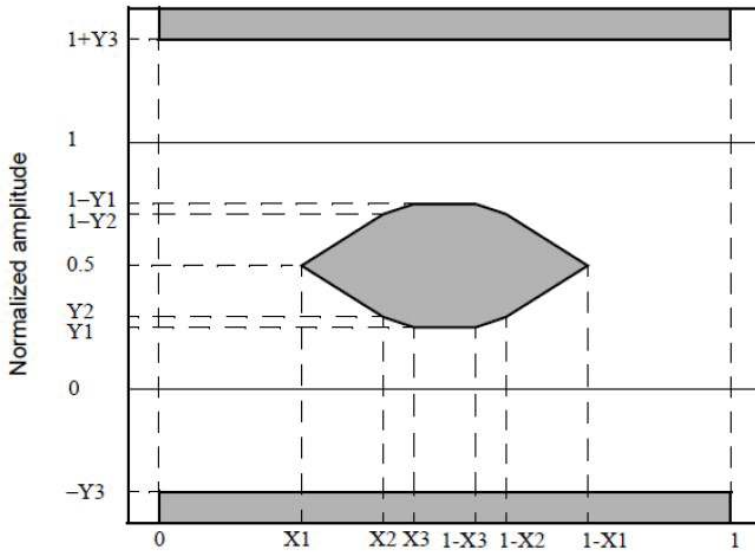
1. FEC requirements as defined by the 100G CWDM4 MSA Technical Specification Rev 1.1
2. The Receiver sensitivity (OMA), each lane (Max) at 5E-5 BER is a normative specification
3. The conditions of the stressed receiver sensitivity test section are NOT characteristics of the receiver

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## Product Label



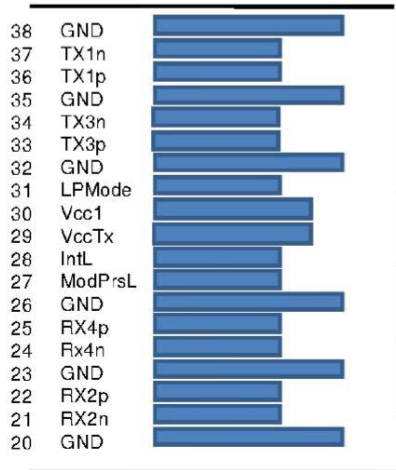
## Eye Mask Definition



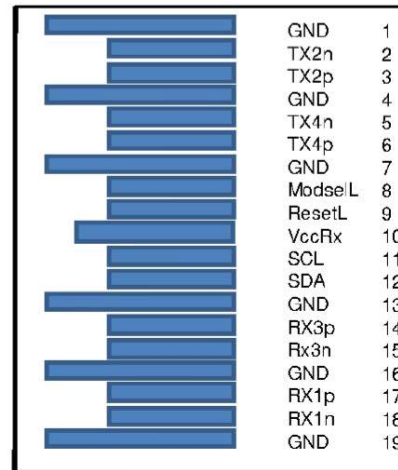
|    |      |    |      |
|----|------|----|------|
| X1 | 0.31 | Y1 | 0.34 |
| X2 | 0.40 | Y2 | 0.38 |
| X3 | 0.45 | Y3 | 0.4  |

Normalized time (Unit Interval)

## Pin Description



Top Side  
Viewed From Top



Bottom Side  
Viewed From Bottom

## Pin Function Definitions

| Pin | Logic         | Symbol  | Description                         | Notes |
|-----|---------------|---------|-------------------------------------|-------|
| 1   |               | GND     | Ground                              | 1     |
| 2   | CML-I         | Tx2n    | Transmitter inverted data input     |       |
| 3   | CML-I         | Tx2p    | Transmitter non-inverted data input |       |
| 4   |               | GND     | Ground                              | 1     |
| 5   | CML-I         | Tx4n    | Transmitter inverted data input     |       |
| 6   | CML-I         | Tx4p    | Transmitter non-inverted data input |       |
| 7   |               | GND     | Ground                              | 1     |
| 8   | LVTTL-I       | ModSelL | Module select                       |       |
| 9   | LVTTL-I       | ResetL  | Module reset                        |       |
| 10  |               | Vcc Rx  | +3.3 V power supply receiver        | 2     |
| 11  | LVC MOS I / O | SCL     | 2-wire serial interface clock       |       |
| 12  | LVC MOS I / O | SDA     | 2-wire serial interface data        |       |
| 13  |               | GND     | Ground                              | 1     |
| 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       |       |
| 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  |               | Vcc Tx  | +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 input     |       |
| 35  |               | GND     | Ground                              | 1     |
| 36  | CML-I         | Tx1p    | Transmitter non-inverted data input |       |
| 37  | CML-I         | Tx1n    | Transmitter inverted data input     |       |
| 38  |               | GND     | Ground                              | 1     |

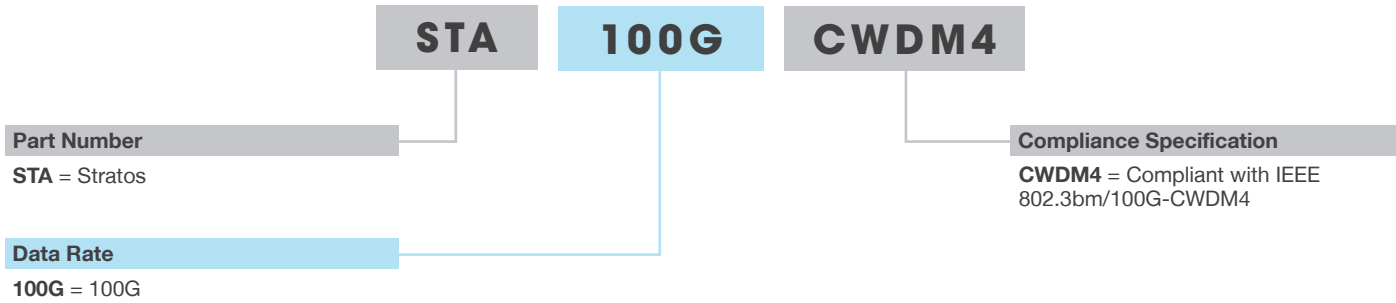
Note 1 : GND is the symbol for signal and supply (power) common for the QSFP+ module. All are common within the QSFP+ module and all module voltages are referenced to this potential unless otherwise noted. Connect these directly to the host board signal-common ground plane.

Note 2 : Vcc Rx, Vcc1 and Vcc Tx are the receiver and transmitter power supplies and shall be applied concurrently.

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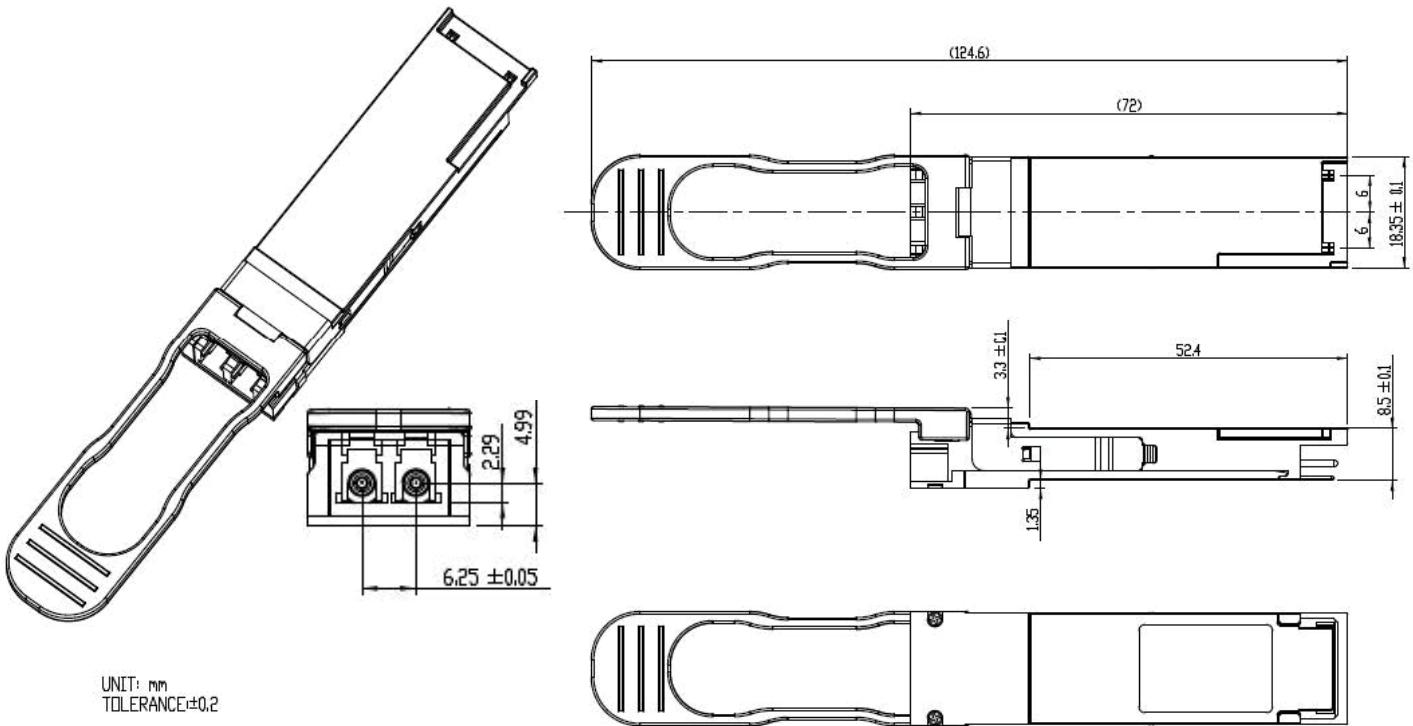


## Ordering Information



## Part Drawings

Mechanical Design Diagram (mm)



## Regulatory Compliance

| Item                               | Standard   |
|------------------------------------|--|
| Electromagnetic interference (EMI) | FCC art 15 Class B CE EN55032+EN55035 VCCI CISPR32 |
| ESD (Module case)                  | Contact discharge EN61000-4-2 criterion B          |
| ESD (Module case)                  | Air discharge EN61000-4-2 criterion B              |
| ESD (Electrical connector)         | ANSI/ESDA/JEDEC JS-001                             |
| RoHS                               | 2011/65/EU   |
| Laser eye safety                   | FDA 21CFR 1040.10 and 1040.11                      |
| Component recognition              | UL and TUV   |

## Laser Safety Information

All versions of this laser are Class 1 laser products per IEC/EN 60825-1. Users should observe safety precautions such as those recommended by ANSI<sup>3</sup> Z136.1, ANSI Z36.2 and IEC 60825-1.

This product conforms to FDA (CDRH) 21 CFR 1040.10 and 1040.11 except for deviations of laser safety class designation pursuant to '[Laser Notice No.50](#)'

Product labeling:  
Class 1 Laser Product  
Compliance with 21 CFR  
1040.10 and 1040.11

If labeling is not affixed to the module due to size constraints; then rather, labeling is placed on the outside of the shipping box. This product is not shipped with a power supply.

Caution: use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

## Certifications

UL: 62368-1  
TUV: EN62368-1, EN 60825-1, EN 60825-2  
Documentation is available upon request.

- (1) IEC is a registered trademark of the International Electrotechnical Commission
- (2) Within Europe the IEC standard has been adopted as a European Normative standard known as EN 60825, and each European country will have its own version of this standard, for example, the British Standards version known as BS EN 60825. There can be small differences between the different countries versions of EN 60825, and these are in part caused by the process of translating the standard into the native language of that country.
- (3) ANSI is a registered trademark of the American National Standards Institute