

# TQD014-TUNC-SO

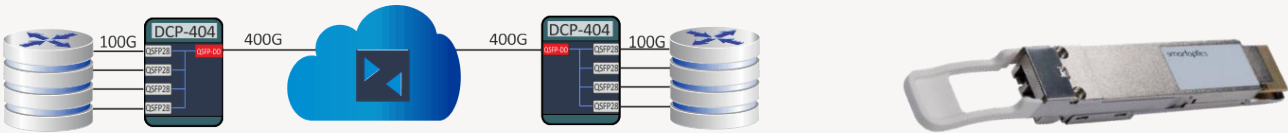
QSFP-DD, OpenZR+, Coh Tunable, High-power, CMIS5.1, LC

## OVERVIEW

The TQD014-TUNC-SO is an QSFP-DD form-factor (type 2a) DWDM transceiver conforming to the OpenZR+ MSA for 100Gbps to 400Gbps Ethernet application as well as the application 100GBASE-ZR.

The output power of 0dBm unlocks the potential for the module to transmit 400G signals in already existing, 100GHz spacing, ROADM architectures.

The OpenZR+ MSA provides a flexible solution for operators having routers that not yet have migrated to 400G services. The TQD014-TUNC-SO can as an example be used in the Smartoptics DCP-404 Muxponder to combine up to 4x 100G flows to a 100G/200G/300G/400G OpenZR+ signal to be transported over an optical network.



The below table lists the OIF 400ZR and OpenZR+ modes supported by TQD014-TUNC-SO.

| CMIS Application Code | Host format   | Electrical interface  | Payload | FEC    | Modulation | Line Symbol Baud Rate | MSA format  |
|-----------------------|---------------|-----------------------|---------|--------|------------|-----------------------|-------------|
| 1                     | 400GBASE-R    | 1x 400GAUI-8 (8x 50G) | 400G    | oFEC   | DP-16QAM   | 60.1GBd               | OpenZR+ MSA |
| 2                     | 4x 100GBASE-R | 4x 100GAUI-2 (2x 50G) | 400G    | oFEC   | DP-16QAM   | 60.1GBd               | OpenZR+ MSA |
| 3                     | 3x 100GBASE-R | 3x 100GAUI-2 (2x 50G) | 300G    | oFEC   | DP-8QAM    | 60.1GBd               | OpenZR+ MSA |
| 4                     | 2x 100GBASE-R | 2x 100GAUI-2 (2x 50G) | 200G    | oFEC   | DP-QPSK    | 60.1GBd               | OpenZR+ MSA |
| 5                     | 100GBASE-R    | 1x 100GAUI-2 (2x 50G) | 100G    | oFEC   | DP-QPSK    | 30.0GBd               | OpenZR+ MSA |
| 6                     | 100GBASE-R    | 1x 100GAUI-2 (2x 50G) | 100G    | SC-FEC | DP-QPSK    | 30.0GBd               | 100GBASE-ZR |

## TECHNICAL DATA

The optical characteristics are into Generic and Application code sections. The *Generic* section defines the common characteristics, independent of the selected application modes. The *Application* code section defines application code based optical characteristics.

The performance is compliant with the respective specifications but can exceed the minimum requirements on some parameters.

## GENERIC

| Parameter             | Value                              |
|-----------------------|------------------------------------|
| Technology            | DWDM QSFP-DD type 2a               |
| Transmission media    | SM (2x LC)                         |
| Nominal wavelengths   | 191.3 - 196.1THz (tunable) 6.25GHz |
| Interface standards   | OpenZR+, 100GBASE-ZR               |
| Operating temperature | -5°C to +75°C                      |
| Storage temperature   | -40°C to +85°C                     |
| DDM functions         | Total received power               |
|                       | Coherent channel power             |
|                       | OSNR, eSNR, PDL, dispersion, DGD   |
|                       | Case temperature                   |

| Parameter                    | Value                             |
|------------------------------|-----------------------------------|
| MSA                          | QSFP-DD MSA's, CMIS5.1, C-CMIS1.2 |
| Power consumption            | < 22.5W                           |
| Tx Power, configurable range | -6 to +1dBm                       |
| Tx In-band OSNR              | Min 43dB/0.1nm                    |
| Tx Out-Of-Band OSNR          | Min 40dB/0.1nm                    |
| Receiver turn-up             | Max 100ms from warm start         |
|                              | Max 150s from cold start          |
| Absolute max conditions      | Rx signal input power: +3dBm      |
|                              | Rx total input power: +13dBm      |

### Safety/regulatory compliance:

TUV/UL/FDA (contact Smartoptics for latest certification information)

RoHS compliance

## OPTICAL SPECIFICATION - APPLICATION CODES

The table below lists the primary optical parameters for each supported application code.

| Appl mode | Line rate | Host format  | Tx Power <sup>1)</sup> | Rx sens @ OSNR >35dB | Rx @ OSNR     | CDC range @0.5dB OSNR penalty |
|-----------|-----------|--------------|------------------------|----------------------|---------------|-------------------------------|
| 1         | 400G      | 1x 400GAUI-8 | 0dBm                   | -23dBm               | 23.5dB@-12dBm | 12 000 ps/nm                  |
| 2         | 400G      | 4x 100GAUI-2 | 0dBm                   | -23dBm               | 23.5dB@-12dBm | 12 000 ps/nm                  |
| 3         | 300G      | 3x 100GAUI-2 | 0dBm                   | -26dBm               | 20.0dB@-12dBm | 18 000 ps/nm                  |
| 4         | 200G      | 2x 100GAUI-2 | 0dBm                   | -30dBm               | 15.0dB@-12dBm | 24 000 ps/nm                  |
| 5         | 100G      | 1x 100GAUI-2 | 0dBm                   | -32dBm               | 12.0dB@-12dBm | 48 000 ps/nm                  |
| 6         | 100G      | 1x 100GAUI-2 | 0dBm                   | --28dBm              | 15.0dB@-12dBm | 40 000 ps/nm                  |

1) The module transmit power can be provisioned up to the maximum available TX power.

## ORDERING INFORMATION

| Ordering code  | Item Name                             |
|----------------|---------------------------------------|
| TQD014-TUNC-SO | QSFP-DD OpenZR+ HPow Coh-T SM CMIS5.1 |

## GENERAL DEFINITIONS

| Parameter                    | Description                                                                                                                                                                                                                                                                                                                    |
|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Technology                   | Grey; Transceiver type for non-WDM applications. Electrical or optical.<br>CWDM; Transceiver type for CWDM applications using G.694.2 channel grid.<br>DWDM; Transceiver type for DWDM applications using G.694.1 channel grid.<br>BiDi; Transceiver pair using two different wavelength channels operating on a single-fiber. |
| Transmission Media           | Type of fiber, e.g. Multimode (MM) or Singlemode (SM). Number of and connector type within brackets (e.g. 2x LC, 1x MPO).                                                                                                                                                                                                      |
| Typical reach                | Nominal distance performance based on typical fiber dispersion, fiber loss and power budget properties, i.e. w/o dispersion compensation and optical amplification. Actual distance is dependent on actual optical path loss and dispersion properties.                                                                        |
| Bit rate range               | Supported bit rate range in Gigabit or Megabit per second (Gbps or Mbps).                                                                                                                                                                                                                                                      |
| Protocols                    | Protocols within supported bit rate range.                                                                                                                                                                                                                                                                                     |
| Nominal wavelength           | Typical wavelength(s) from transmitter.                                                                                                                                                                                                                                                                                        |
| Interface standards          | Referenced interface standards or MSA's, e.g. IEEE 802.3 standard for 10GbE services or 100G 4WDM-10 etc.                                                                                                                                                                                                                      |
| Power budget                 | Min and max power budget between Transmitter and Receiver w/o optical path penalties.                                                                                                                                                                                                                                          |
| Dispersion tolerance/penalty | Maximum amount of tolerated dispersion and required reduction of power budget to maintain stipulated Bit Error Rate (BER) and at a given bit rate.                                                                                                                                                                             |
| Temperature range            | Max operating case temperature range.<br>Standard temperature range (C-temp): 0°C to +70°C (32°F to +158°F)<br>Extended temperature range (E-temp): typically -20°C to +75°C (-4°F to +167°F)<br>Industrial temperature range (I-temp): -40°C to +85°C (-40°F to +185°F)                                                       |
| Power consumption            | Worst case power consumption. Will vary over temperature.                                                                                                                                                                                                                                                                      |
| Transmitter Output power     | Average output power. Provided in min and max values.                                                                                                                                                                                                                                                                          |
| Receiver minimum input power | Minimum average input power at specified BER, normally $1E^{-12}$ . Note that some protocols require FEC to achieve sufficient BER.                                                                                                                                                                                            |
| Receiver max input power     | Maximum average input power giving a BER, normally $1E^{-12}$ .                                                                                                                                                                                                                                                                |
| DDM                          | Digital Diagnostic Monitoring functionality as defined in e.g. SFF-8472 MSA.                                                                                                                                                                                                                                                   |

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