# QSFP28 100G COHERENT DWDM CMIS

QSFP28, 100GBASE-ZR/OTU4 Coh 50/100GHz Tunable 80km, 22dB, CMIS, LC

## TQ2025-TUNX-SO

The TQ2025-TUNx-SO is a pluggable QSFP28 DWDM transceiver designed for high capacity 100 Gigabit Ethernet (100GbE) Data Center Interconnect (DCI) optical communication applications up to 80km unamplified or 300km amplified over a singlemode fiber.

The transceiver utilizes a tunable DP-QPSK modulated 28 Gbps wavelength with ability to be tuned with either 50GHz or 100GHz spacing enabling up to 96 channels over a 50GHz DWDM grid system as specified in the ITU-T 694.1 standard. The module provides two types of integrated FEC: Staircase FEC (SC-FEC) and RS(255,239) FEC.

The electrical signals are transmitted and received from the host via a standard 38 pin connector described in the QSFP28 MSA (SFF-8679). The electrical interface is compliant to CAUI-4 (IEEE P802.3bm Annex 83E), splitting the 100Gbps signal into four parallel 25 Gbps NRZ streams as well as OTU4 (ITU-T 100G OTN).

The management interface specification of the module is CMIS. For SFF-8636 compliant version, see p/n: TQ2028-TUNx-SO.

## TECHNICAL DATA

| Parameter | Value |
|---|---|
| Technology | DWDM QSFP28 100GBASE-ZR |
| Transmission media | SM (2x LC) |
| Typical reach, unamplified | 80km[1)] |
| Typical reach, amplified | 120km [2)] |
| | 300km [3)] |
| Nominal wavelength | 191.35 – 196.10 THz (96ch) |
| Bit rate support | 103.12Gbps |
| Protocol support | 100GbE/OTU4 |
| Dispersion tolerance | ±2400ps/nm; ±6000ps/nm [3)] |
| Power budget | 0 – 22dB |
| Power consumption | < 5.5W (TQ2025-TUNC-SO) |
| | < 6.0W (TQ2025-TUNI-SO) |
| Operating temperature | 0°C to +70°C (TQ2025-TUNC-SO) |
| | -40°C to +85°C (TQ2025-TUNI-SO) |
| Storage temperature | -40°C to +85°C |

| Parameter | Value |
|---|---|
| **Transmitter data:** | |
| Output power per lane | Min: -8.0dBm [4)] |
| | Max: -4.0dBm [4)] |
| Transmit wavelength | 191.35 – 196.10 THz |
| **Receiver data:** | |
| Minimum input power, unamplified | -30.0dBm [4) 5) 6)] |
| | -24.0dBm [4) 5) 7)] |
| Minimum input power, amplified | -18dBm [4)] |
| | -22dBm [4) 8)] |
| Overload (max power) | 3.0dBm [4)] |
| OSNR Tolerance | 16.5 dB/0.1nm [6)] |
| | 21.5 dB/0.1nm [7)] |
| Rx power monitor range | Signal power: -21dBm to +3dBm |
| | Total power: -21dBm to +6dBm |
| -40°C to +85°C | 191.35 – 196.10 THz |
| Misc | Remote Diagnostic Monitoring |
| | Flextune™ |
| MSA compliance | SFF-8665, -8661, -8679 |
| | CMIS5.2 / OIF C-CMIS-01.2 |

[1)] Limited by power budget

[2)] Limited by dispersion compensation

[3)] Extended mode, set through the host when the transceiver is in Low Power mode. The Extended mode will increase the power consumption of the module by 0.2W.

[4)] Average power

[5)] Receiver Sensitivity at unamplified configurations; OSNR >35dB/0.1nm

[6)] 100G DQPSK SC-FEC

[7)] 100G DQPSK RS-FEC

[8)] Extended range; Rx signal input power range over which performance can be guaranteed with <1dB OSNR penalty relative to Rx OSNR tolerance limit

| Media FEC | Latency [µs] |
|---|---|
| SC-FEC | 24 |
| RS-FEC | 5 |

| Safety/regulatory compliance: |
|---|
| TUV/UL/FDA (contact Smartoptics for latest certification information) |
| RoHS compliance |

## APPLICATION MODES

The below table lists the Host and NTWK modes supported by TQ2025-TUNx-SO

| CMIS App. Code | Host format | Host/Electrical interface | Host ID | Payload | Media FEC | Media ID | MSA |
|---|---|---|---|---|---|---|---|
| 1 | 100GBASE-R | CAUI-4 C2M (Annex 83E) w/o FEC | 0x41 | 100G | SC-FEC | 0x44 | 100GBASE-ZR (Clause 154) |
| 2 | 100GBASE-R | CAUI-4 C2M (Annex 83E) with RS (528,514) FEC | 0x42 | 100G | SC-FEC | 0x44 | 100GBASE-ZR (Clause 154) |
| 3 | 100GBASE-R | CAUI-4 C2M (Annex 83E) w/o FEC | 0x41 | 100G | RS-FEC | 0xC0 | OTU4, RS-FEC*) (Undefined) |
| 4 | 100GBASE-R | CAUI-4 C2M (Annex 83E) with RS (528,514) FEC | 0x42 | 100G | RS-FEC | 0xC0 | OTU4, RS-FEC*) (Undefined) |
| 5 | OTU4 | OTL4.4 | 0x39 | 100G | RS-FEC | 0xC0 | OTU4, RS-FEC*) (Undefined) |

1) The media code is defined through the reference code tables listed in SFF-8024.

## ORDERING INFORMATION

| Ordering code | Description |
|---|---|
| TQ2025-TUNC-SO | QSFP28, 100GBASE-ZR/OTU4 Coh 50GHz Tunable 80km, 22dB, CMIS5.2 LC |
| TQ2025-TUNI-SO | QSFP28, 100GBASE-ZR/OTU4 Coh 50GHz Tunable 80km, 22dB, CMIS5.2 LC, I-temp |

## 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.<br>DAC: Direct Attach Cable. Electrical cable with attached connectors.<br>AOC: Active Optical Cable. Optical cable with attached connectors. |
| 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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