TQD032-TUNC-SO

QSFP-DD OIF 400G-ZR Ethernet Coh Tunable Flexgrid 120km LC D9128-D9612, CMIS5.0

OVERVIEW

The TQD032-TUNC-SO is a QSFP-DD form-factor (type 2) DWDM transceiver for 400 Gbps Ethernet applications. The transceiver is intended for use in interconnect applications between data centers with switches, routers etc.

TQD032-TUNC-SO supports both the amplified (Application Code 0x01) and the un-amplified (Application Code 0x02) use cases as defined in the OIF 400ZR specification. Application code 3 is

The dispersion performance is in accordance with OIF 400ZR for distances up to 120km over a SingleMode (SM) fiber using a single optical carrier at 60Gbaud and 16QAM coherent modulation. The transmitter is tunable over the ITU C-Band at 100 GHz grid (75 GHz grid is optional).

The electrical interface is according to IEEE 802.3bs 400GAUI-8 enabling SO-TQSFP-DD-4CC-ZR to support 400G transport according to OIF-ZR specification. The 400GAUI-8 client/electrical interface is compatible with IEEE P802.3bs 8 lane 56G PAM-4, as used for “grey” datacenter optical transceivers, for example 400GBASE-DR4.

This transceiver provides digital diagnostic functions via a 2-wire serial interface and a management interface according to CMIS5.0.

The transceiver supports the commercial temperature range (C-temp): 0°C to 70°C (32°F to 158°F).

CMIS Application Code	Host format	Electrical interface	Payload	FEC	Modulation	Line Symbol Baud Rate	MSA format	Media ID (hex)
1	400GBASE-R	1x 400GAUI-8 (8x 50G)	400G	CFEC	DP-16QAM	59.8GBd	OIF 400ZR, app code 0x01	0x3E
2	400GBASE-R	1x 400GAUI-8 (8x 50G)	400G	CFEC	DP-16QAM	59.8GBd	OIF 400ZR, app code 0x02	0x3F
3	4 × 100GBASE-R	4x 100GAUI-2 (2x 50G)	400G	CFEC	DP-16QAM	59.8GBd	OIF 400ZR, app code 0x01	0x3E

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 Grid
Interface standards	OIF 400ZR
Operating temperature	+15^{O}C to +75^{O}C [1)]
Storage temperature	-40^{O}C to +85^{O}C
DDM functions	Total received power
	Coherent channel power
	OSNR, eSNR, PDL, dispersion, DGD
	Case temperature

[1)] The module will turn up from cold start at ambient temperature as low as -5C and will reach specifications after self-heating up to min temperature.

[2)] Increasing the CD range with 2x of default range will increase the power consumption by 0.6W.

[3)] The module transmit power can be provisioned up to the maximum available TX power. If the TX power is not provisioned by the host, the module TX power will default to the maximum available power. The provisional Tx power range of the module is 10dB.

[4)] Set to comply with 400G modes. Can be changed on individual modules to fully support other modes.

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

Parameter	Value
MSA	QSFP-DD MSA's, CMIS5.0
Misc	Sync-E support, LLDP, RMON
Power consumption, EOL	17.9W @400G
Tx Power	Min -10dBm [3)]
Tx In-band OSNR	Min 34dB/0.1nm
Tx Out-Of-Band OSNR	Min 30dB/0.1nm
Rx overload	Max: +1dBm
Rx_LOS Assert	-28.0dBm [4)]
Receiver turn-up	Max 30ms from warm start
	Max 120s from cold start
Absolute max conditions	Rx signal input power: +13dBm
	Rx total input power: +15dBm

OPTICAL SPECIFICATION - APPLICATION CODES

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

Appl code	Line rate	Host format	Tx Power[1)]	Rx sens @ OSNR > 36dB	Rx @ OSNR [2)]	Rx OSNR @0.5dB penalty [2)]	Rx OSNR @1dB penalty [2)]	Default CDC range	Maximum CDC search range [3)]
1	400G	1x 400GAUI-8	-10dBm to -6dBm	-20dBm	26dB@-12dBm	26.5dB@-14dBm	27.0dB@-15dBm	4 000 ps/nm	4 000 ps/nm
2	400G	1x 400GAUI-8	-10dBm to -6dBm	-20dBm	26dB@-12dBm	26.5dB@-14dBm	27.0dB@-15dBm	4 000 ps/nm	4 000 ps/nm
3	400G	1x 400GAUI-8	-10dBm to -6dBm	-21dBm	26dB@-12dBm	26.5dB@-14dBm	27.0dB@-15dBm	4 000 ps/nm	4 000 ps/nm

1) Minimum Tx power without attenuation. The module Tx power can be attenuated with 10dB from the maximum available Tx power. If the Tx power is not provisioned by the host, the module Tx power will default to the maximum available power.
2) Specified as [Min OSNR Value @ Min Rx power for the OSNR value].
3) Maximum provisionable CD search range. Increasing the search range will increase the power consumption of the transceiver.

ORDERING INFORMATION

Ordering code	Description
TQD032-TUNC-SO	QSFP-DD OIF 400ZR Coh Tunable Flexgrid LC, Low power, CMIS5.0

Latency:
400G CFEC: 8us

GENERAL DEFINITIONS

Parameter	Description
Technology	Grey; Transceiver type for non-WDM applications. Electrical or optical. CWDM; Transceiver type for CWDM applications using G.694.2 channel grid. DWDM; Transceiver type for DWDM applications using G.694.1 channel grid. BiDi; Transceiver pair using two different wavelength channels operating on a single-fiber. DAC: Direct Attach Cable. Electrical cable with attached connectors. 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. Standard temperature range (C-temp): 0°C to +70°C (32°F to +158°F) Extended temperature range (E-temp): typically -20°C to +75°C (-4°F to +167°F) 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.