

QSFP-DD OPENROADM 400G HIGH POWER, ENC

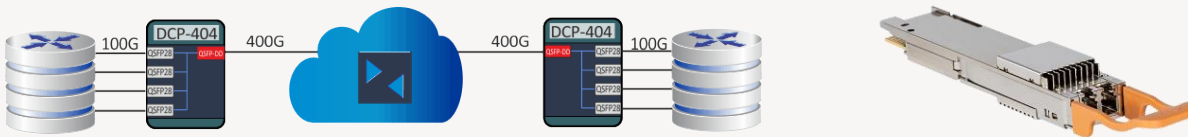
QSFP-DD, 400G, OpenROADM, Coh Tunable, High Tx power, Flexgrid, Encryption, CMIS5.0, LC

OVERVIEW – TQD017-TUNC-SO

The TQD017-TUNC-SO is an QSFP-DD form-factor (type 2a) DWDM transceiver conforming to the OpenROADM MSA. The module is also encryption capable, using AES-256.

The output power of 0dBm unlocks the potential for the module 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 TQD017-TUNC-SO can as an example be used in the Smartoptics DCP-404 Muxponder to combine 4x 100G flows to a 400G OpenZR+ signal to be transported over an optical network.



OpenROADM application codes will allow the module to run over ROADM (Reconfigurable Add/Drop Multiplexer) compliant to the OpenROADM 2.0 and 5.0 MSA.

The below table lists the OpenROADM mode supported by TQD017-TUNC-SO.

CMIS Application Code	Host format	Electrical interface	Payload	FEC	Modulation	Line Symbol Baud Rate	MSA format
1	4x100GBASE-R	4x 100GAUI-2 (2x 50G)	400G	oFEC	DP-16QAM	63.1 GBd	OpenROADM 5.0
2	3x100GBASE-R	3x 100GAUI-2 (2x 50G)	300G	oFEC	DP-8QAM	63.1 GBd	OpenROADM 5.0
3	2x100GBASE-R	2x 100GAUI-2 (2x 50G)	200G	oFEC	DP-QPSK	63.1 GBd	OpenROADM 5.0
4	2x100GBASE-R	2x 100GAUI-2 (2x 50G)	200G	oFEC	DP-16QAM	31.6 GBd	OpenROADM 5.0
5	100GBASE-R	100GAUI-2 (2x 50G)	100G	oFEC	DP-QPSK	31.6 GBd	OpenROADM 5.0
6	400GBASE-R	1x 400GAUI-8 (8x 50G)	400G	oFEC	DP-16QAM	63.1 GBd	OpenROADM 5.0
7	200GBASE-R	200GAUI-4 (2x 200G)	200G	oFEC	DP-QPSK	63.1 GBd	OpenROADM 5.0
8	200GBASE-R	200GAUI-4 (2x 200G)	200G	oFEC	DP-16QAM	31.6 GBd	OpenROADM 5.0
9	100GBASE-R	CAUI-4 w/o FEC (4x 25G)	100G	oFEC	DP-QPSK	31.6 GBd	OpenROADM 5.0
10	100GBASE-R	CAUI-4 with FEC (4x 25G)	100G	oFEC	DP-QPSK	31.6 GBd	OpenROADM 5.0
11	100GBASE-R	CAUI-4 w/o FEC (4x 25G)	100G	SC-FEC	DP-DQPSK	31.6 GBd	OpenROADM 2.0
12	100GBASE-R	CAUI-4 with FEC (4x 25G)	100G	SC-FEC	DP-DQPSK	31.6 GBd	OpenROADM 2.0
13	OTU4	OTL4.4 (4x 28G)	100G	SC-FEC	DP-DQPSK	31.6 GBd	OpenROADM 2.0

The SO-TQD017-TUNC-SO will automatically configure the above via the Application modes. The TQD017-TUNC-SO operates as an OTN transceiver/transponder, maps Ethernet signal(s) to an intermediate ODUFlex,OTUCn/FlexO-x frame structure, then adapts the frame structure with SC-FEC or oFEC. The encoded signal is subsequently DSP framed and modulated for transmission as a coherent Dual Polarity mQAM, QPSK or DQPSK signal.

TECHNICAL DATA

The optical characteristics are separated into Generic and Application code specific sections. 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) 100GHz
Interface standards	OpenROADM
Operating temperature	+15°C to +75°C ¹⁾
Storage temperature	-40°C to +85°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 the default range will increase the power consumption with 0.6W. Adding Encryption will add 0.6W@400G, 0.5W@300G, 0.4W@200G, 0.3W@100G.

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, which can be any power level in the specified 10dB range.

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, Encryption
Power consumption, EOL	24.6W @400G
@ Default CD Range	24.1W @300G
w/o Encryption ²⁾	22.6W @200G
	19.6W @100G
Tx Power	Min 0dBm ³⁾
Tx In-band OSNR	Min 38dB/0.1nm
Tx Out-Of-Band OSNR	Min 42dB/0.1nm
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 mode	Line rate	Host format	Line Modulation	Tx Power ¹⁾	Rx sens @ OSNR >36dB	Rx @ OSNR	Rx OSNR @1dB penalty	Default CDC range	Maximum CDC Search range ²⁾
1	400G	4x 100GAUI-2	DP-16QAM	1dBm	-20dBm	23.5dB@ -14dBm	25.0dB@ -16dBm	12 000 ps/nm	48 000 ps/nm
2	300G	3x 100GAUI-2	DP-8QAM	1dBm	-23dBm	20.5dB@ -16dBm	21.5dB@ -20dBm	48 000 ps/nm	96 000 ps/nm
3	200G	2x 100GAUI-2	DP-QPSK	1dBm	-28dBm	14.8dB@ -18dBm	15.8dB@ -28dBm	48 000 ps/nm	96 000 ps/nm
4	200G	2x 100GAUI-2	DP-16QAM	1dBm	-23dBm	20.5dB@ -16dBm	21.5dB@ -18dBm	30 000 ps/nm	77 000 ps/nm
5	100G	1x 100GAUI-2	DP-QPSK	1dBm	-32dBm	11.8dB@ -20dBm	12.8@ -25dBm	77 000 ps/nm	154 000 ps/nm
6	400G	1x 400GAUI-8	DP-16QAM	1dBm	-20dBm	23.5dB@ -14dBm	25.0dB@ -16dBm	12 000 ps/nm	48 000 ps/nm
7	200G	1x 200GAUI-4	DP-QPSK	1dBm	-28dBm	14.8dB@ -18dBm	15.8dB@ -28dBm	48 000 ps/nm	96 000 ps/nm
8	200G	1x 200GAUI-4	DP-16QAM	1dBm	-23dBm	20.5dB@ -16dBm	21.5dB@ -18dBm	30 000 ps/nm	77 000 ps/nm
9	100G	CAUI-4 w/o FEC	DP-QPSK	1dBm	-32dBm	11.8dB@ -20dBm	12.8@ -25dBm	77 000 ps/nm	154 000 ps/nm
10	100G	CAUI-4 with FEC	DP-QPSK	1dBm	-32dBm	11.8dB@ -20dBm	12.8@ -25dBm	77 000 ps/nm	154 000 ps/nm
11	100G	CAUI-4 w/o FEC	DP-DQPSK	1dBm	-30dBm	14.5dB@ -19dBm	15.5dB@ -24dBm	80 000 ps/nm	115 000 ps/nm
12	100G	CAUI-4 with FEC	DP-DQPSK	1dBm	-30dBm	14.5dB@ -19dBm	15.5dB@ -24dBm	80 000 ps/nm	115 000 ps/nm
13	100G	OTU4	DP-DQPSK	1dBm	-30dBm	14.5dB@ -19dBm	15.5dB@ -24dBm	80 000 ps/nm	115 000 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) Maximum provisionable CD search range. Increasing the search range will increase the power consumption of the transceiver.

ORDERING INFORMATION

Ordering code	Description
TQD017-TUNC-SO	QSFP-DD OTN High Tx Power Coh Tunable Flexgrid Encryption CMIS5.0

Latency:	w/o encryption	With encryption
400G CFEC:	8us	-
400G OFEC:	5us	7.5us
300G OFEC:	6us	8.5us
200G OFEC:	7us	9.5us
100G OFEC:	11us	13.5us
100G SC-FEC:	20µs	22.5µs

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.
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.

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