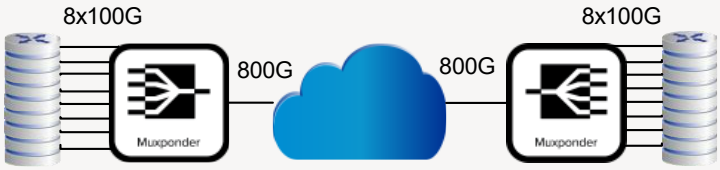
TD8006-TUNC-SO

QSFP-DD800 800G OpenROADM PCS Coh Tunable Flexgrid CMIS5.3 LC

OVERVIEW

The TD8006-TUNC-SO is an QSFP-DD form-factor (type 2a) DWDM transceiver conforming to the OpenROAM MSA, for 800Gbps Ethernet applications. The transceiver also supports 400-600Gbps rates with different modulation formats, with proprietary probabilistic constellation shaping (PCS) modulations, resulting in an optimized OSNR performance for the application needs with different channel widths.

The transceiver provides a flexible solution for operators having routers that not yet have migrated to 800G services. The TD8006-TUNC-SO can as an example be used to combine up to 8x100G/4x200G/2x400G flows to a 800G signal to be transported over an optical network.



The table below lists the Host and NTWK modes supported by TD8006-TUNC-SO.

Host framing	Network Frame	Payload	Modulation	Line Symbol Baud Rate	Channel spacing	Media code[1)]	MSA format	NTWK Mode description
800GAUI-8 400GAUI-4 200GAUI-2 100GAUI-1	FlexO-8(e)	800G	PCS-131	131.3GBd	150GHz	0xF7	FlexO-8e-MPCS131-NOS-E [2)]	800G PCS-131Gbd
800GAUI-8 400GAUI-4 200GAUI-2 100GAUI-1	FlexO-8(e)	800G	PCS-131	131.3GBd	150GHz	0x68	FLEXO-8e-DPO-16QAM / FOICe8.8-DPO	OpenROADM 800G 131Gbd
FOIC1.1	FlexO-8	800G	PCS-131	131.4GBd	150GHz	0xF8	FlexO-8-MPCS131-NOS-E [2)]	800G PCS-131Gbd (OTN)
200GAUI-2 100GAUI-1	FlexO-6(e)	600G	PCS-131	131.2GBd	150GHz	0xF5	FlexO-6e-MPCS131-NOS-E [2)]	600G-PCS-131Gbd
FOIC1.1	FlexO-6	600G	PCS-131	131.0GBd	150GHz	0xF6	FlexO-6-MPCS131-NOS-E [2)]	600G PCS-131 (OTN)
400GAUI-4/8 200GAUI-2/4 100GAUI-1/2	FlexO-4(e)	400G	PCS-131	131.3GBd	150GHz	0xEC	FlexO-4e-MPCS131-NOS [2)]	400G PCS-131Gbd
400GAUI-4/8 200GAUI-2/4 100GAUI-1/2	FlexO-4(e)	400G	PCS-66	65.7GBd	75GHz	0xC0	FlexO-4e-MPCS066-OS [2)]	400G PCS-66Gbd
400GAUI-4/8 200GAUI-2/4 100GAUI-1/2	FlexO-4(e)	400G	PCS-75	75.0GBd	87.5GHz	0xC2	FlexO-4e-MPCS075-OS [2)]	400G PCS-75Gbd
400GAUI-4/8 200GAUI-2/4 100GAUI-1/2	FlexO-4(e)	400G	PCS-87	87.4GBd	100GHz	0xC9	FlexO-4e-MPCS087-OS [2)]	400G PCS-87Gbd
400GAUI-4/8 200GAUI-2/4 100GAUI-1/2	FlexO-4(e)	400G	PCS-98	97.9GBd	112.5GHz	0xD8	FlexO-4e-MPCS098-OS [2)]	400G PCS-98Gbd
400GAUI-4/8 200GAUI-2/4 100GAUI-1/2	FlexO-4(e)	400G	PCS-108	108.5GBd	125GHz	0xE5	FlexO-4e-MPCS108-OS [2)]	400G PCS-108Gbd
FOIC1.1/1.2	FlexO-4	400G	PCS-132	131.7GBd	150GHz	0xED	FlexO-4-MPCS132-OS [2)]	400G PCS-132Gbd (OTN)
FOIC1.1/1.2	FlexO-4	400G	PCS-79	78.9GBd	87.5GHz	0xC4	FlexO-4-MPCS079-OS [2)]	400G PCS-79Gbd (OTN)
FOIC1.1/1.2	FlexO-4	400G	PCS-69	69.1GBd	75GHz	0xC1	FlexO-4-MPCS069-OS [2)]	400G PCS-69Gbd (OTN)
FOIC1.1/1.2	FlexO-4	400G	PCS-87	87.3GBd	100GHz	0xCA	FlexO-4-MPCS087-OS [2)]	400G PCS-87Gbd (OTN)
FOIC1.1/1.2	FlexO-4	400G	PCS-98	98.6GBd	112.5GHz	0xD9	FlexO-4-MPCS098-OS [2)]	400G PCS-98Gbd (OTN)
FOIC1.1/1.2	FlexO-4	400G	PCS-111	111.3GBd	125GHz	0xE9	FlexO-4-MPCS111-OS [2)]	400G PCS-108Gbd (OTN)

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

TD8006-TUNC-SO will automatically configure the above via the Host and NTWK modes. For 800G applications, the TD8006-TUNC-SO asynchronously (GMP) maps an Ethernet or OTN signal from a switch/router to an intermediate FlexO frame structure, then adapts the frame structure to the selected FEC engine. The encoded signal is subsequently DSP framed and modulated for transmission as a coherent Dual Polarity signal.

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 *NTWK/Media* 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-DD800 type 2a
Transmission media	SM (2x LC)
Nominal wavelengths	191.25 - 196.1THz (tunable) 6.25GHz Grid
Interface standards	400-800G OpenROADM
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

Parameter	Value
MSA	OSFP800 MSA's, CMIS5.3
Misc	Sync-E support, LLDP, RMON
Power consumption, EOL	See Section below.
Tx Power	Min 1dBm [2)]
Tx In-band OSNR	37dB
Tx Out-Of-Band OSNR	TDB
Receiver turn-up	Max 30ms from warm start
	Max 125s from cold start
Absolute max conditions	Rx signal input power: +1dBm
	Rx total input power: +15dBm

[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)] 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.

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

OPTICAL SPECIFICATION – NTWK/MEDIA CODES

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

Media code	Line rate	Network frame	Modulation	Tx Power[1])	Rx sens @ OSNR > 36dB	Rx @ OSNR [2)]	Rx OSNR @1dB penalty [2)]	Default CDC range [ps/nm]	Maximum CDC search range
0xF7	800G	FlexO-8(e)	PCS-131	1dBm	-20.5dBm	24.7dB@ -9dBm	25.7dB@ -13dBm	24 000	47 000
0x68	800G	FlexO-8(e)	PCS-131	1dBm	-20.5dBm	25.4dB@ -9dBm	26.4dB@ -13dBm	24 000	47 000
0xF8	800G	FlexO-8	PCS-131	1dBm	-20.0dBm	26.4dB@ -14dBm	27.4dB@ -18dBm	24 000	47 000
0xF5	600G	FlexO-6(e)	PCS-131	1dBm	-24.0dBm	21.3dB@ -9dBm	22.3dB@ -14dBm	24 000	47 000
0xF6	600G	FlexO-6	PCS-131	1dBm	-23.5dBm	22.0dB@ -14dBm	23.0dB@ -19dBm	24 000	47 000
0xEC	400G	FlexO-4(e)	PCS-131	1dBm	-27.0dBm	18.0dB@ -12dBm	19.0dB@ -18dBm	24 000	47 000
0xC0	400G	FlexO-4(e)	PCS-66	1dBm	-24.5dBm	21.2dB@ -12dBm	22.2dB@ -18dBm	75 000	150 000
0xC2	400G	FlexO-4(e)	PCS-75	1dBm	-24.0dBm	20.6dB@ -12dBm	21.6dB@ -18dBm	66 000	125 000
0xC9	400G	FlexO-4(e)	PCS-87	1dBm	-26.0dBm	19.5dB@ -12dBm	20.5dB@ -18dBm	47 000	94 000
0xD8	400G	FlexO-4	PCS-98	1dBm	-26.5dBm	19.2dB@ -12dBm	20.2dB@ -18dBm	42 000	84 000
0xE5	400G	FlexO-4(e)	PCS-108	1dBm	-26.5dBm	18.7dB@ -12dBm	19.7dB@ -18dBm	29 000	57 000
0xED	400G	FlexO-4	PCS-132	1dBm	-26.5dBm	18.5dB@ -14dBm	19.5dB@ -20dBm	24 000	47 000
0xC4	400G	FlexO-4	PCS-79	1dBm	-25.0dBm	20.5dB@ -14dBm	21.5dB@ -20dBm	63 000	125 000
0xC1	400G	FlexO-4	PCS-69	1dBm	-24.0dBm	21.5dB@ -14dBm	22.5dB@ -20dBm	72 000	125 000
0xCA	400G	FlexO-4	PCS-87	1dBm	-25.5dBm	20.1dB@ -14dBm	21.1dB@ -20dBm	47 000	94 000
0xD9	400G	FlexO-4	PCS-98	1dBm	-26.0dBm	19.7dB@ -14dBm	20.7dB@ -20dBm	42 000	84 000
0xE9	400G	FlexO-4	PCS-111	1dBm	-26.5dBm	19.1dB@ -14dBm	20.1dB@ -20dBm	28 000	56 000

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.

ELECTICAL CHARACTERISTICS

The table below lists the worst-case power consumption for each media code, under the default CD range and Muxponder mode. The power consumption will also increase based on the host interface.

Media code	Line rate	Network frame	Modulation	Worst case power consumption	If non-Muxponder mode[1)]	Additional Max CD range[2)]
0xF7	800G	FlexO-8(e)	PCS-131	30.0W	TBD	TBD
0x68	800G	FlexO-8(e)	PCS-131	30.0W	TBD	TBD
0xF8	800G	FlexO-8	PCS-131	30.0W	TBD	TBD
0xF5	600G	FlexO-6(e)	PCS-131	29.5W	TBD	TBD
0xF6	600G	FlexO-6	PCS-131	29.5W	TBD	TBD
0xEC	400G	FlexO-4(e)	PCS-131	28.5W	TBD	TBD
0xC0	400G	FlexO-4(e)	PCS-66	26.0W	TBD	TBD
0xC2	400G	FlexO-4(e)	PCS-75	26.5W	TBD	TBD
0xC9	400G	FlexO-4(e)	PCS-87	27.5W	TBD	TBD
0xD8	400G	FlexO-4	PCS-98	28.0W	TBD	TBD
0xE5	400G	FlexO-4(e)	PCS-108	28.5W	TBD	TBD
0xED	400G	FlexO-4	PCS-132	29.5W	TBD	TBD
0xC4	400G	FlexO-4	PCS-79	26.5W	TBD	TBD
0xC1	400G	FlexO-4	PCS-69	26.5W	TBD	TBD
0xCA	400G	FlexO-4	PCS-87	27.5W	TBD	TBD

0xD9	400G	FlexO-4	PCS-98	28.0W	TBD	TBD
0xE9	400G	FlexO-4	PCS-111	28.5W	TBD	TBD

1) The power consumption figures are listed with the transceiver multiplexing the host streams. If the transceiver is running a 800GBASE-R stream, the transceiver shall remove the power consumption according to the numbers listed in the table..
2) The power consumption figures are listed with the default chromatic dispersion compensation range. For maximum dispersion compensation, the transceiver shall add the power consumption figures according to the numbers listed in the table.

ORDERING INFORMATION

Ordering code	Item Name
TQD006-TUNC-SO	QSFP-DD800 800G OpenROADM PCS CMIS5.3

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.