

QSFP28 100G DCO ZR Gen2

Tech Specs

Q28-TUND-DCO-SO

QSFP28, 100GBASE-ZR, -8DB TX, DWDM TUNABLE, SMF, COHERENT, LC, DOM, SOLID OPTICS

1. PRODUCT INTRODUCTION

The Coherent QSFP28 Digital Coherent Optic (DCO) transceiver supports 100G transmission over distances up to 120km (dispersion limited, optionally extendable to 300km) for edge network applications. On the host side, the module can accommodate IEEE 100GE Ethernet or ITU-T OTN OTU4 signals. The line side coherent interface specifications are aligned with IEEE Std. 802.3-2022 100GBASE-ZR and ITU-T G.698.2 DW50U-8A2(C) F / DW100U-8A2(C)F, which define a 27.95GBd dual-polarization differential QPSK modulation format.

The module is offered in commercial temperature (0°C to 70°C), with power dissipation of less than 6.0W. The local oscillator laser is full C-band tunable and the transceiver can optionally be configured to support FlexTune™ automatic wavelength tuning.

The transceiver module is compliant to the Specification for QSFP+ 28 Gb/s 4X Pluggable Transceiver Solution (QSFP28). The transceiver is RoHS compliant.

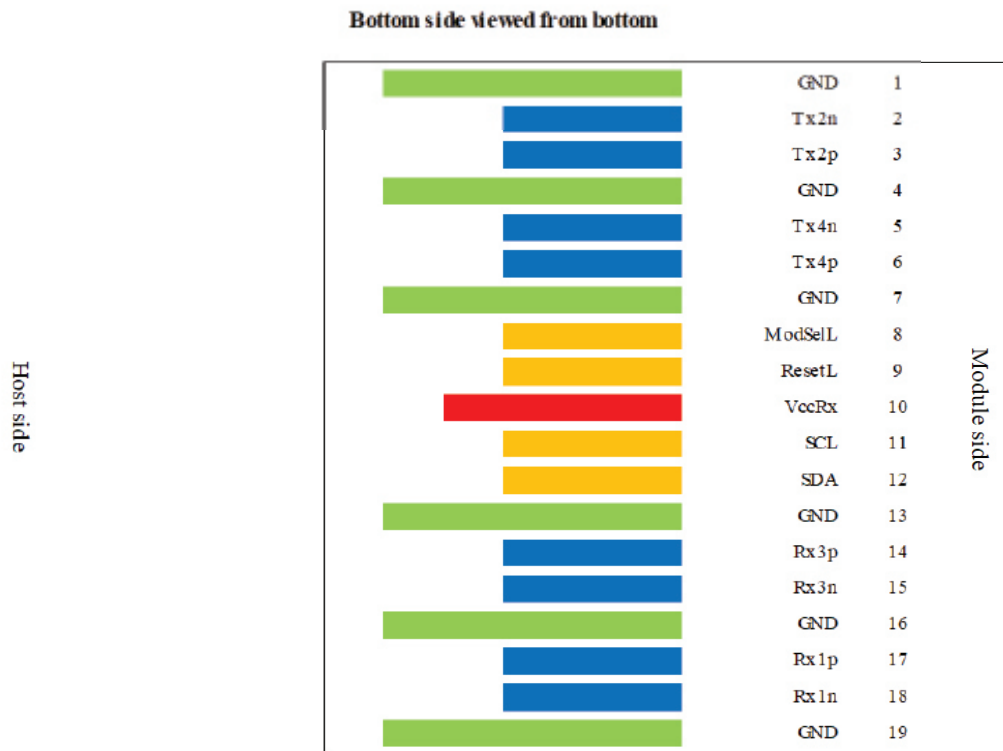
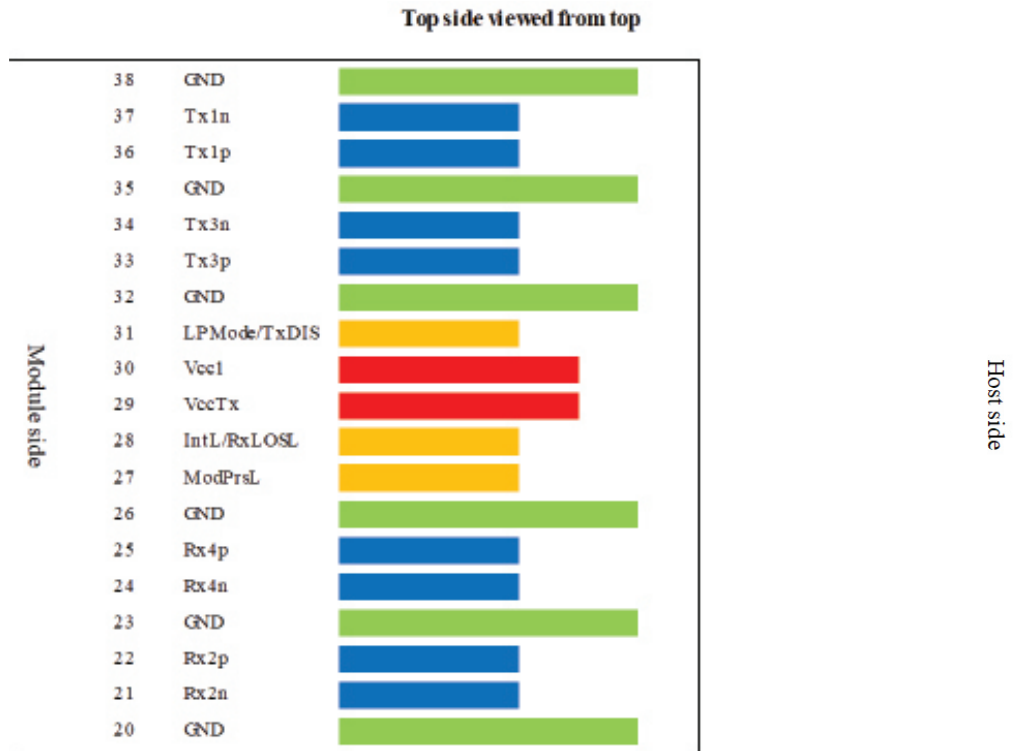
2. PRODUCT SPECIFICATION & FEATURES

- Digital Coherent Optics module, hot-pluggable QSFP28 form factor
- IEEE 100G Ethernet (CAUI-4) or ITU-T 100G OTN (OTL4.4) compliant host interface
- 100G optical coherent interface with DP-DQPSK modulation and Staircase FEC per IEEE Std. 802.3-2022 100GBASE-ZR or ITU-T G.709.2
- Transmission reach:
 - Up to 80km unamplified (loss limited)
 - Up to 120km amplified (dispersion limited, optionally extendable to 300km)
- Full C-band tunable, 50GHz or 100GHz grid
- Case temperature range 0°C to 70°C (C-temp)
- Power dissipation < 5.5W (C-temp) or < 6.0W (I-temp)
- Remote digital diagnostics monitoring

3. APPLICATIONS

- Access and aggregation networks
- Cable TV networks
- Wireless front-haul & mid-haul

4. PIN DEFINITIONS



5. PIN DESCRIPTIONS

Pad	Logic	Symbol	Description	Plug Sequence ⁴	Notes*
1		GND	Ground	1	1
2	CML-I	Tx2n	Transmitter inverted data input	3	
3	CML-I	Tx2p	Transmitter non-inverted data input	3	
4		GND	Ground	1	1
5	CML-I	Tx4n	Transmitter inverted data input	3	
6	CML-I	Tx4p	Transmitter non-inverted data input	3	
7			Ground	1	
8	LVTTL-I	ModSelL	Module Select	3	
9	LVTTL-I	ResetL	Module Reset	3	
10		VccRx	+3.3V power supply receiver	2	2
11	LVC MOS-I/O	SCL	2-wire serial interface clock	3	
12	LVC MOS-I/O	SDA	2-wire serial interface data	3	
13		GND	Ground	1	1
14	CML-O	Rx3n	Receiver non-inverted data output	3	
15	CML-O	rx3p	Receiver inverted data output	3	
16		GND	Ground	1	1
17	CML-O	Rx1n	Receiver non-inverted data output	3	
18	CML-O	Rx1p	Receiver inverted data output	3	
19		GND	Ground	1	1
20		GND	Ground	1	1
21	CML-O	Rx2n	Receiver inverted data output	3	
22	CML-O	Rx2p	Receiver non-inverted data output	3	
23		GND	Ground	1	1
24	CML-O	Rx4n	Receiver inverted data output	3	
25	CML-O	Rx4p	Receiver non-inverted data output	3	
26		GND	Ground	1	1
27	LVTTL-O	ModPrsL	Module Present	3	
28	LVTTL-O	IntL/RxLOS	Interrupt. Optionally configurable as RxLOS via the management interface (CMIS / SFF-8636).	3	
29		VccTx	+3.3V Power supply transmitter	2	2
30		VccI	+3.3V Power supply	2	2
31	LVTTL-I	LPMoDe/TxDis	Low power mode. Optionally configurable as TxDis via the management interface (CMIS / SFF-8636).	3	
32		GND	Ground	1	1
33	CML-I	Tx3n	Transmitter non-inverted data input	3	
34	CML-I	Tx3p	Transmitter inverted data input	3	
35		GND	Ground	1	1
36	CML-I	Tx1n	Transmitter non-inverted data input	3	
37	CML-I	Tx1p	Transmitter inverted data input	3	
38		GND	Ground	1	1

Notes:

1. GND is the symbol for signal and supply (power) common for the module. All are common within the module and all module voltages are referenced to this potential unless otherwise noted. Connect these directly to the host board signal-common ground plane.
2. VccRx, VccI and VccTx are applied concurrently and may be internally connected within the module in any combination.
3. Plug Sequence specifies the mating sequence of the host connector and module. The sequence is 1, 2, 3 (see Figure 1 for pad locations).

6. ABSOLUTE MAXIMUM RATINGS

Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. These are absolute stress ratings only. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of the data sheet. Exposure to absolute maximum ratings for extended periods can adversely affect device reliability.

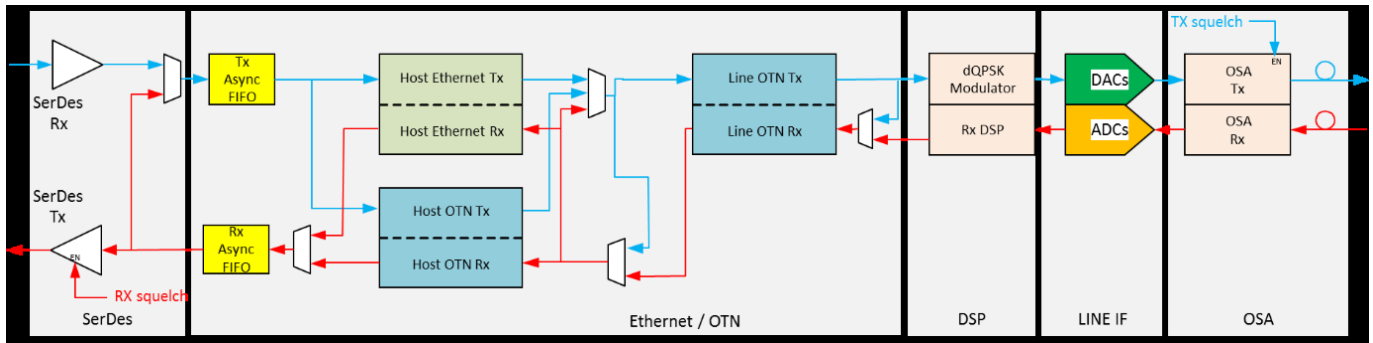
Items	Conditions	Symbol	Min	Max	Unit
DC supply voltage		VCC	-0.3	3.6	V
Low speed I/O voltages			-0.3	3.6	V
Storage temp.		T _s	-40	85	°C
Case operating temp.			-5	75	°C
Relative humidity	Non-condensing	RH	5	95	%
Rx input power		P _{Rx,in}		10	sBm
ESD damage threshold	Human body model (HBM)	DC pins	2000		V
		RF pins	1000		

Caution: Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

7. ENVIRONMENTAL SPECIFICATIONS

Items	Conditions	Symbol	Min	Max	Unit
Storage Temp.		T _s	-40	85	°C
Case operating temp.	Central office appl. (C-temp)	Long Term	0	70	°C
		Short term < 96h	-5	75	
Relative humidity	Non-condensing	RH	5	85	%

8. DATA PATH



High-level block diagram of Q28-TUND-DCO-SO module data path

A. Host Interface Modes

Host Interface ID	Description	Modulation	Forward Error Correction Codelation	Nominal Symbol Rate (GBd)	Supported Line Interface IDs
65	CAUI-4 C2M without FEC	NRZ	None	25.78125	68, 192, 193
66	CAUI-4 C2M with RS(528,514) FEC	NRZ	RS(528,514)	25.78125	68, 192, 193

B. Line Interface Modes

Line Interface ID	Description	Modulation	Forward Error Correction Codelation	Nominal Symbol Rate (GBd)	Spectral Shaping
68	100GBASE-ZR (Clause 154)	DP-DQPSK	Staircase (SC)	27.9525	None

C. Data Path Parameters

Parameter	Conditions	Min	Max	Unit	Notes
Latency					
End-to-end module transit delay	100G DQPSK SC line mode		17	μs	
	100G DQPSK RS line mode		3		
Delay variation	100GE CAUI-4 host mode		-10	μs	
	OTU4 OTL4.4 host mode		-6		

9. ELECTRICAL CHARACTERISTICS (POWER & LOW SPEED I/O)

Parameter	Conditions	Symbol	Min	Typ	Max	Unit	Notes
Power supply – General							
Power supply voltages	Including ripple, droop and noise below 100kHz		3.135	3.300	3.465	V	
Host RMS noise output	10Hz - 10MHz				25	mV	
Module RMS noise output	10Hz - 10MHz				15	mV	
Module supply noise tolerance	10Hz - 10MHz, peak-to-peak	$PSNR_{mod}$			66	mV	
Module inrush	Instantaneous peak duration	T_{ip}			50	μ s	
	Initialization time	T_{init}			500	ms	
Power supply – Low power mode							
Power dissipation		P_{ip}			1.5	W	
Power supply current	Instantaneous peak current	$I_{CC,ip,hp}$			600		
	Sustained peak current	$I_{CC,sp,hp}$			495	mA	
	Steady state current	$I_{CC,hp}$			478		1
Power supply – High power mode (Central office applications)							
Power dissipation		P_{ip}			5.5	W	
Power supply current	Instantaneous peak current	$I_{CC,ip,hp}$			2000		
	Sustained peak current	$I_{CC,sp,hp}$			1815	mA	
	Steady state current	$I_{CC,hp}$			1754		1
Low speed I/O							
Clock frequency, SCL	Default			400			
	Fast mode+	f_{SCL}		100			
Output voltage, SCL and SDA	Output low	V_{OL}	0.0		0.4	V	
	Output high	V_{OH}	$V_{CC}-0.5$		$V_{CC}+0.3$		
Input voltage, SCL and SDA	Input low	V_{IL}	-0.3		$0.3 \times V_{CC}$	V	
	Input high	V_{IH}	$0.7 \times V_{CC}$		$V_{CC}+0.5$		
Capacitance for SCL and SDA I/O signal		C_i			14	pF	
Total bus capacitive load for SCL and SDA	400kHz clock rate	3.0k Ω pull-up resistor, max.			100		
		1.6k Ω pull-up resistor, max.	C_b		200	pF	2

Parameter	Conditions	Symbol	Min	Typ	Max	Unit	Notes
Low speed I/O							
Input voltage / current, LPMode/TxDis, ResetL and ModSelL	Input voltage, low	V_{IL}	-0.3		0.8	V	
	Input voltage, high	V_{IH}	2.0		$V_{CC}+0.3$		
	Input current, $0V < V_{in} < V_{CC}$	I_{in}	-365		125	μA	
Output voltage, ModPrsL and IntL/RxLOS L	Output low, $I_{OL} = 2mA$	V_{OL}	0.0		0.4	V	
	Output high, 10k Ω pull-up resistor to host V_{CC}	V_{OH}	$V_{CC}-0.5$		$V_{CC}+0.3$		

Notes:

1. The module will stay within its advertised power class for all supply voltages.
2. For 1000kHz clock rate, refer to Figure 6-4.

10. OPTICAL CHARACTERISTICS

A. General

Parameter	Conditions	Symbol	Min	Typ	Max	Unit	Notes
Symbol rate		R_{baud}		27.95		GBd	
Modulation format				DP-DQPSK			
Channel frequency range	100GHz grid	V_c	191.400	193.700	196.100	THz	
	50GHz grid		191.350	193.700	196.100		
Channel spacing	100GHz grid	ΔV_c		100		GHz	
	50GHz grid			50			
Frequency accuracy		δVC	-1.8		1.8	GHz	
Laser intrinsic linewidth	Calculated based on FM noise power spectral density (PSD) measurement	LW			500	dB	
Side-mode suppression ratio	No modulation	SMSR	40			dB	
Relative intensity noise	Peak over 0.2GHz < f < 10GHz	RIN			-140	dB/Hz	

B. Transmitter

Parameter	Conditions	Symbol	Min	Typ	Max	Unit	Notes
Tx output power		$P_{Tx,out}$	-8		-4	dBm	
Tx output power monitor range		$P_{Tx,mon}$	-10		-2	dBm	
Tx output power monitor accuracy	Tx optical power monitor reading relative to actual Tx output power	$\delta P_{Tx,mon}$	-1.5		1.5	dB	
Tx output power during tuning or when Tx disabled		$P_{Tx,dark}$			-35	dBm	
Tx spectral excursion	ITU-T G.698.2 §7.2.3		-15		15	GHz	
Tx output power imbalance between X- and Y-polarizations		$\Delta P_{x/y}$			1.5	dB	
Tx XY skew					6.0	ps	
Tx IQ offset					-25	dB	
Tx IQ imbalance					1.0	dB	
Tx quadrature error			-0.7		7.0		
Tx IQ skew					1.5	ps	
Tx error vector magnitude mask ratio	ITU-T G.698.2 §7.2.12, with 24dB/0.1nm noise loading				23	%	
Tx in-band optical signal to noise ratio	Under modulation, $ \Delta f < 60$ GHz	$OSNR_{in}$	40			dB/ 0.1nm	
Tx out-of-band optical signal to noise ratio	Under modulation, $ \Delta f > 60$ GHz, excl. side mode peaks	$OSNR_{in}$	35			dB/ 0.1nm	
Tx reflectance					-20	dB	

C. Receiver

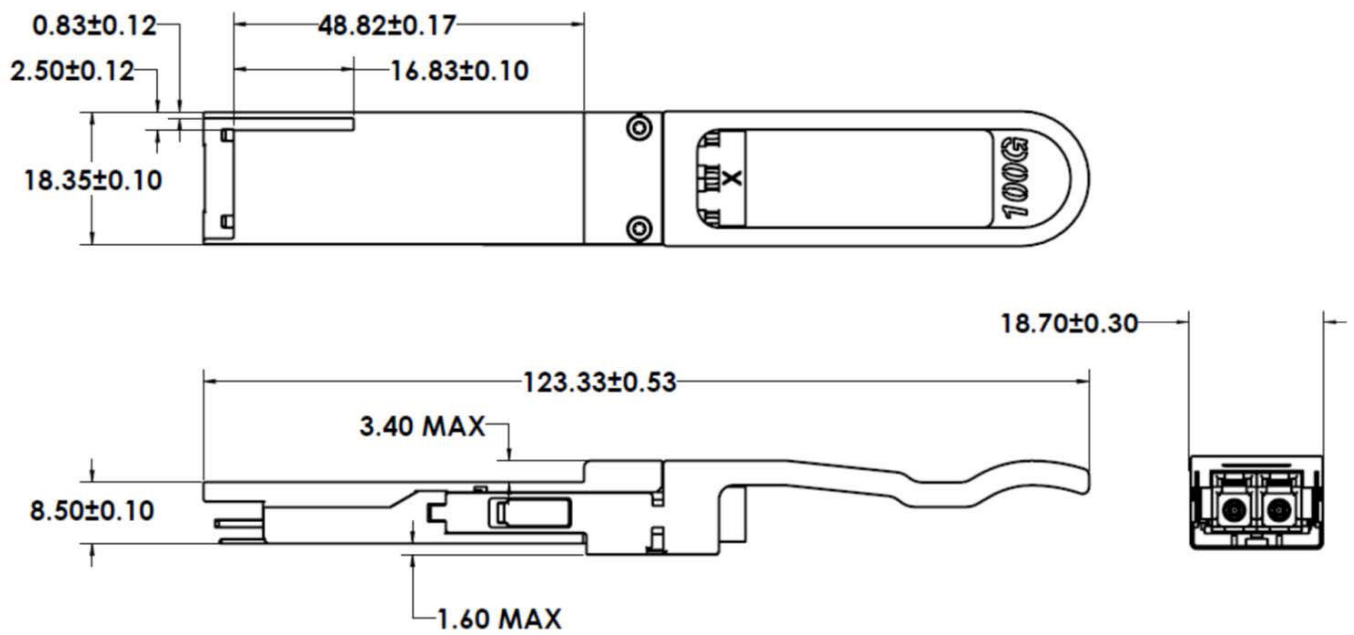
Parameter	Conditions	Symbol	Min	Typ	Max	Unit	Notes
Rx total input power	Broadband	$P_{Rx,tot}$	-30		3	dBm	
Rx signal input power (amplified)	Full Rx OSNR tolerance	$P_{Rx,sig}$	-18		1	dBm	
	Extended range		-22		3		

Parameter	Conditions	Symbol	Min	Typ	Max	Unit	Notes
Rx OSNR tolerance	Back-to-back, PRx,sig > -18dBm	100G DQPSK SC	16.5			dB/0.1nm	1
		100G DQPSK RS	21.5				
CD tolerance	OSNR penalty < 0.5dB				2.4	ns/nm	
PMD tolerance	OSNR penalty < 0.5dB				10	ps	
DGD tolerance	OSNR penalty < 0.5dB				20	ps	
Tolerance to change in SOP	OSNR penalty < 0.5dB				50	krad/s	
PDL OSNR penalty	Change in principal state of polarization < 1rad/ms	1dB PDL			0.5	dB/0.1 nm	
		2dB PDL			1.0		
		4dB PDL			3.0		
Rx signal input power transient amplitude	Peak excursion from steady state, transient within Rx signal input power (amplified) range, OSNR penalty < 0.5dB		-3		3	dB	
Rx signal input power transient rise/fall time	Rise/fall time for the above peak excursion, OSNR penalty < 0.5dB		100			μs	
Rx signal input power (unamplified)	OSNR > 35dB/0.1nm	100G DQPSK SC	-30		1	dBm	
		100G DQPSK RS	-24		1		
Rx signal input power monitor range		$P_{Rx,mon(s)}$	-21		3	dBm	
Rx signal input power monitor accuracy		$\delta P_{Rx,mon(s)}$	-2.5		2.5	dB	
Rx total input power monitor range		$P_{Rx,mon(t)}$	-21		6	dBm	
Rx total input power monitor accuracy		$\delta P_{Rx,mon(t)}$	-2.0		2.0	dB	
Rx reflectance					-20	dB	

Notes:

1. Rx signal input power range over which performance can be guaranteed with <1dB OSNR penalty relative to Rx OSNR tolerance limit

11. MECHANICAL SPECIFICATIONS



12. WARNING & SYMBOLS



Solid Optics EU N.V. has tested the equipment based on European legislation. It is safe to use, doesn't intervene with other electronic devices and it is not affected by interference from other Electronic devices



Hazardous Goods; Our equipment complies with Directive 2011/65/EU (RoHS II) and 2002/95 EC (RoHS I).



Only (dis)connect the equipment in a EPA (ESD Protected Area) while using only certified equipment and taking all necessary precautions.

13. DISCLAIMER & COPYRIGHT

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