

400G QSFP-DD ZR+ High Power(+1dBm) Coherent Transceiver

CL400GQDDZR+HP

Features

- ◆ Compliant with QSFP-DD MSA, Type 2B package
- ◆ Compliant with Open ZR+ MSA and OIF 400ZR MSA, support OFEC and CFEC FEC
- ◆ Line rate 100G/200G/300G/400G
- ◆ Client rate 1/2/3/4x100GbE or 1x400GbE
- ◆ C-band tunable, supports 100/75/50GHz grid spacing, support 0.1GHz fine turning
- ◆ EDFA inside, High output Power, max TX power +4dBm at 193.7THz, +1dBm at C-band
- ◆ TX VOA inside, output power -10~+1dBm tunable
- ◆ Support ingress LF hold-off time configure
- ◆ Support hitless firmware upgrade
- ◆ Compact size (18.35 mm x 93.26 mm x 8.50 mm)
- ◆ Duplex LC connector
- ◆ Operating case temperature: 0°C to 75°C
- ◆ Single 3.3 V power supply
- ◆ Typical power consumption 22W(400GbE), maximum power consumption 22.5W(400GbE)
- ◆ RoHS 2 compliant

Applications

- ◆ Edge DCI with extended Reach or with OLP protection
- ◆ IP Over Metro or Long Haul DWDM
- ◆ Up to 80km ~ 120km at 400G Gray Light mode unamplified 400G P2P link

Compliance

- ◆ Open ZR+ MSA 2.0 and OIF-400ZR-02.0
- ◆ OIF-CMIS-05.2
- ◆ IA OIF-C-CMIS-01.2
- ◆ QSFP-DD-Hardware-Rev6.3
- ◆ IEEE Std 802.3-2018

Recommended Operating Conditions

Table2-Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Operating Case Temperature	TC	0		75	°C	
Power supply voltage	VCC	3.135	3.3	3.465	V	
	ICC			7.2	A	Note1
Maximum sustained peak Current(<500ms)				7.4	A	
Maximum Instantaneous peak current(<50us)				9	A	



Electro-Static discharge		ESD		1000	V	
Power Consumption		PD	22	22.5	W	Note1
Relative humidity		RH	15	85	%	
Client Mode	400G (400ZR)	1 x 400GAUI-8				
		4 x 100GAUI-2				
	400G (400ZR+)	1 x 400GAUI-8				
		4 x 100GAUI-2				
	300G (300ZR+)	3 x 100GAUI-2				
	200G (200ZR+)	2 x 100GAUI-2				
2 x CAUI-4				Note2		
100G (100ZR+)	1 x 100GAUI-2					
	1 x CAUI-4				Note2	
Transmission Distance (DWDM Amplified)	400G (400ZR)			120	Km	
	400G (400ZR+)			450		
	300G (300ZR+)			600		
	200G (200ZR+)			1000		
	100G (100ZR+)			2000		
Transmission Distance (single wavelength unamplified)	400G ZR Gray			80	Km	Note3
	400G ZR+ Gray			90		Note3
Power Supply Noise	Vrip			1%	DC-1MHz	
				2%	1-10MHz	

Optical, Electrical Characteristic

Tested under recommended operating conditions, unless otherwise noted

Table3-Transmitter Operating Characteristic-Optical , Electrical

Parameters		Unit	Min.	Typ.	Max.	Note
Modulation format	400G		ZR400-CFEC-16QAM			CFEC FEC, NCG 10.8dB
			ZR400-OFEC-16QAM			
	300G		ZR300-OFEC-8QAM			
			ZR200-OFEC-QPSK			
	100G		ZR100-OFEC-QPSK			
400G		59.843750000±20ppm			400ZR, SFF-8024 Media ID 3Eh/3Fh	
		60.138546798±20ppm			400ZR+, SFF-8024 Media ID 46h	
		60.138546798±20ppm			300ZR+, SFF-8024 Media ID 47h	



Baud Rate	200G	GBd	60.138546798±20ppm			200ZR+, SFF-8024 Media ID 48h
	100G		30.069273399±20ppm			100ZR+, SFF-8024 Media ID 49h
Transmitter frequency range		THz	191.3		196.1	For Gray modes, the transmitter frequency is fixed at 193.7THz and not configurable.
Flexible DWDM Grid		GHz	3.125			
Frequency Fine Tuning range		GHz	-5		5	bright tuning
Frequency Fine Tuning step		GHz	0.1			
Laser frequency accuracy		GHz	-1.8		1.8	
TX spectral Upper Mask		(GHz,dB)			(30.0, 0.0) (37.0, -10.0) (39.2, -15.0) (40.4, -20.0)	Refer to OIF-400ZR-02.0 13.3.201a Refer to openzrplus_2p0 11.4.10
TX spectral Lower Mask		(GHz,dB)	(30.0, -9.0) (31.3, -20.0) (31.3, -35.0)			Refer to OIF-400ZR-02.0 13.3.201b Refer to openzrplus_2p0 11.4.10
Transmitter laser disable time		ms			100	
Transmitter wavelength switching time		s			60	
Transmitter laser enable time		s			10	
Transmit Output Power Adjustable Range		dBm	-10		1	The absolute accuracy is ±1dB
Transmit Output Power at 400G ZR Gray and 400G ZR+ Gray mode		dBm	3	4	5	For Gray modes, the output power and frequency are not configurable.
Transmit Output Power Adjust step		dB	0.1			
Optical power setting accuracy		dB	-1		1	Diff between setting and reporting
Output power monitor accuracy		dB	-1		1	
Power stability		dB	-0.5		0.5	At fixed wavelength, room temp
			-1		1	At fixed wavelength, environment temp
Total output power with Tx disabled		dBm			-20	



Total output power during wavelength switching	dBm			-20	
Transmitter reflectance	dB			-20	Looking into the Tx
Inband (IB) OSNR	dB	38			
Lorentzian linewidth	kHz			300	Tx and LO
Relative intensity noise	dB/Hz			-140	
Mean I-Q amplitude imbalance	dB			1	
Transmitter polarization dependent power	dB			1.5	
DC I-Q offset (mean per polarization)	dB			-26	
I-Q instantaneous offset	dB			-20	

Table4- Receiver Operating Characteristic-Optical

Parameters		Unit	Min.	Typ.	Max.	Note
Modulation format	400G		ZR400-CFEC-16QAM			CFEC FEC, Net Coding Gain(NCG) 10.8dB
	300G		ZR400-OFEC-16QAM			OFEC FEC, Net Coding Gain(NCG) 11.6dB, Theoretical Max Pre-FEC BER 2.0E-2
	200G		ZR300-OFEC-8QAM			
	100G		ZR200-OFEC-QPSK			
Baud Rate	400G	GBd	59.843750000±20ppm			400ZR, SFF-8024 Media ID 3Eh/3Fh
			60.138546798±20ppm			400ZR+, SFF-8024 Media ID 46h
	300G		60.138546798±20ppm			300ZR+, SFF-8024 Media ID 47h
	200G		60.138546798±20ppm			200ZR+, SFF-8024 Media ID 48h
	100G		30.069273399±20ppm			100ZR+, SFF-8024 Media ID 49h
Frequency offset between received carrier and LO		GHz	-3.6		+3.6	
Input power range(DWDM Amplified)	400G		-12		0	Signal power, OSNR>26dB,400ZR
			-12		0	Signal power, OSNR>24dB,400ZR+
	300G		-15		0	Signal power, OSNR>21dB,300ZR+



	200G	dBm	-18		0	Signal power, OSNR>16dB,200ZR+	
	100G		-18		0	Signal power, OSNR>12.5dB, 100ZR+	
Input power range (single wavelength unamplified)	400G	dBm	-20		0	400G ZR Gray, OSNR>34dB,193.7THz	
			-22		0	400G ZR+ Gray, OSNR>34dB, 193.7THz	
OSNR Tolerance	400G	dB/0.1nm			26	400ZR	Measured back-to-back with short optical channel
					24	400ZR+	
	300G			21	300ZR+		
	200G			16	200ZR+		
	100G				12.5	100ZR+	
RX sensitivity (single wavelength unamplified)	400G Gray Light	dBm	-20			400ZR	Inband (IB) OSNR≥34dB
			-22			400ZR+	
non-damaging input power		dBm			10	Total power	
Optical input power monitor accuracy		dB	-2		2	Total power	
MAX Pre-FEC BER				0.017	0.020		
Chromatic dispersion tolerance	400G	ps/nm			2,400	400ZR	Tolerance to CD with ≤ 0.5 dB penalty to OSNR sensitivity when change in SOP is ≤ 1 rad/ms. For ZR+ modes, customer can Configurable the dispersion thresholds value through register 0h 130~137, module power consumption
					20,000	400ZR+	
	300G				40,000	300ZR+	
	200G				50,000	200ZR+	
	100G					100,000	100ZR+



							may increase 0.8W when configured to the max value.
	400G Gray Light				2400	400G ZR and 400G ZR+ Gray modes	
CD monitor accuracy		ps/nm	-200		200		
DGD tolerance	400G	ps	33			400ZR	OSNR penalty < 0.5dB
			66			400ZR+	
	300G		83			300ZR+	
	200G		83			200ZR+	
	100G		100			100ZR+	
DGD monitor accuracy		ps	-15		15	0~40ps for 400ZR 0~100ps for	
						400/300/200/100ZR+	
Peak PDL tolerance		dB			3.0	Tolerance to peak PDL with ≤ 1.3dB additional OSNR penalty when change in SOP is ≤ 1 rad/ms	
					3.5	Tolerance to peak PDL with ≤ 1.8dB additional OSNR penalty when change in SOP is ≤ 1 rad/ms	
Tolerance to change in SOP		krad/s	50			With ≤ 0.5 dB additional OSNR penalty over all PMD and PDL values	
Optical return loss		dB	20			Optical reflectance at Rx connector input.	
Optical Rx_LOS Threshold	Assert	dBm	400G	-28	-26	-24	OIF 400ZR app code 0x01, 0x2, 0x03
			400G	-30	-28	-26	400G ZR+ DWDM and Gray mode
			300G	-32	-30	-28	
			200G	-32	-30	-28	
			100G	-32	-30	-28	
Optical Rx_LOS Hysteresis		dB	1	1.5	2.5		



Optical input tolerance power transient	dB	-2		2	<p>Tolerance to change in input power with < 0.5 dB penalty to OSNR tolerance.</p> <p>The 20% to 80% rise/fall times for the input power change shall be no faster than 50 μs.</p>
Service recovery time	ms			40	

Ordering Information

Part No.	Application	Data Rate	Laser Source	Fiber Type
CL400GQDDZR+HP	400G ZR/ ZR+ High Power QSFP-DD +1 dBm	400G /300G/200G/100G	191.3-196.1 THz	Single Mode Fiber