400G QSFP-DD ZR+ High Power(+1dBm) Coherent Transceiver Extended Temperature （ -20°C to 85°C ）

CL400GQDDZR+HP-E

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: -20°C to 85°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

Table 1-Recommended Operating Conditions

Parameter		Symbol	Min.	Typ.	Max.	Unit	Note
Operating Case Temperature		TC	-20		85	°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

Table 2-Transmitter Operating Characteristic-Optical , Electrical

Parameters		Unit	Min.	Typ.	Max.	Note
			ZR400-CFEC-16QAM			CFEC FEC, NCG 10.8dB

Modulation format	400G		ZR400-OFEC-16QAM		OFEC FEC, NCG 11.6dB
	300G		ZR300-OFEC-8QAM		
	200G		ZR200-OFEC-QPSK		
	100G		ZR100-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
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	dB			-26	
perpolarization)					
I-Q instantaneous offset	dB			-20	

Table 3- Receiver Operating Characteristic-Optical

Parameters		**Unit**	**Min.**	**Typ.**	**Max.**	**Note**
Modulation format	400G		ZR400-CFEC-16QAM			CFEC FEC, Net Coding Gain(NCG) 10.8dB
			ZR400-OFEC-16QAM			OFEC FEC, Net Coding Gain(NCG) 11.6dB， Theoretical Max Pre-FEC BER 2.0E-2
	300G		ZR300-OFEC-8QAM			
	200G		ZR200-OFEC-QPSK			
	100G		ZR100-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	dBm	-12		0	Signal power, OSNR>26dB,400ZR	
			-12		0	Signal power, OSNR>23dB,400ZR+	
	300G		-15		0	Signal power, OSNR>21dB,300ZR+	
	200G		-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	
			-23		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		
	400G				2,400	400ZR	Tolerance to CD with ≤ 0.5 dB penalty to OSNR sensitivity when change in SOP is ≤ 1 rad/ms. For ZR+
					20,000	400ZR+	
	300G				40,000	300ZR+	
	200G				50,000	200ZR+	

Chromatic dispersion tolerance	100G	ps/nm			100,000	100ZR+	modes, customer can Configurable the dispersion thresholds value through register 0h 130~137, module power consumption 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.	
	400G		-28	-26	-24	OIF 400ZR app code 0x01，0x2, 0x03	

Optical Rx_LOS Assert Threshold	400G	dBm	-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 power transient tolerance		dB	-2		2	Tolerance to change in input power with < 0.5 dB penalty to OSNR tolerance. The 20% to 80% rise/fall times for the input power change shall be no faster than 50 µs.
Service recovery time		ms			40	

Ordering Information

Table 4 - Ordering Information

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