



QDD-400G-DCO-ZRP-CN2-SKY

MSA Compliant 400GBase-ZR+ QSFP-DD Transceiver (SMF, Coherent, LC, DOM, Open ZR+)

Product Description

This MSA compliant QSFP-DD transceiver provides 400GBase-ZR Open ZR+ throughput over Single-mode fiber (SMF) using a coherent wavelength and using an LC connector. It is built to MSA standards and is uniquely serialized and data-traffic and application tested to ensure that they will integrate into your network seamlessly. Digital optical monitoring (DOM) support is also present to allow access to real-time operating parameters. We stand behind the quality of our products and proudly offer a limited lifetime warranty.

Skylane's transceivers are RoHS compliant and lead-free.

Features:

- Hot pluggable QSFP-DD footprint (Type 2A)
- Coherent Receivers
- Tunable C-band Transmitter
- Supports 400/300/200/100Gbps Payload
- Operating Temperature -5 to 80 Celsius
- Duplex LC connector
- 8x 26.5625GBd PAM4 Serial Electrical Interface
- O-FEC (15%) with 11.6dB Net Coding Gain
- 2x 26.5625GBd PAM4 Serial Electrical Interface
- 4x 25.78125GBd NRZ Serial Electrical Interface
- RoHS Compliant and Lead-Free



Applications:

- 400GBase Ethernet
- Access and Enterprise

For your product safety, please read the following information carefully before any manipulation of the transceiver:



ESD

This transceiver is specified as ESD threshold 1kV for SFI pins and 2kV for all others electrical input pins, tested per MIL-STD-883G, Method 3015.4 / JESD22-A114-A (HBM). However, normal ESD precautions are still required during the handling of this module.



LASER SAFETY

This is a Class1 Laser Product according to IEC 60825-1:2007. This product complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated (June 24, 2007).

The optical ports of the module need to be terminated with an optical connector or with a dust plug in order to avoid contamination.

Absolute Maximum Ratings

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Storage Temperature	Tstg	-40		85	°C	
Operating Case Temperature	Tc	0		75	°C	
Control Input Voltage	Vcc	-0.3		3.6	V	
Relative Humidity (Non-Condensing)	RH	5		95	%	
Operating Humidity (Non-Condensing)		5		85	%	
Signaling Rate Per Lane	DRL		59.84375		GBd	16QAM
Operating Distance		80		120	km	

Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Power Supply Voltage	Vcc	3.135	3.3	3.465	V	
Instantaneous Peak Current at Hot Plug	I _{CC_IP}			4000	mA	
Sustained Peak Current at Hot Plug	I _{CC_SP}			3300	mA	
Maximum Power Dissipation 400GbE-ZR	PD		16.1	18.8	W	1,2
Maximum Power Dissipation (Low-Power Mode)	PD _{LP}			3.5	W	
2-Wire Serial Interface Clock Rate			400	1000	kHz	
ESD Rating	High-Speed Pins	-250		250	V	3
	All Other Pins	-500		500	V	
Tx Input Power Damage Threshold		14			dBm	
Rx Input Damage Threshold		14			dBm	4
Power Supply Noise Tolerance (10Hz-10MHz)				66	mV	
Rx Differential Data Output Load			100		Ω	
Electrical Low-Speed Control and Sense Signal Specifications						
SCL and SDA	VOL	0		0.4	V	5
SCL and SDA	VIL	-0.3		Vcc*0.3	V	
	VIH	Vcc*0.7		Vcc+0.5	V	
Capacitance for SCL and SDA IO Signal	Ci			14	pF	
Total Bus Capacitive Load for SCL and SDA	CB			100	pF	6
				200	pF	7
LPMode, ResetL, and ModSelL	VIL	-0.3		0.8	V	
	VIH	2		Vcc+0.3	V	
LPMode, ResetL, and ModSelL	I _{lin}			360	uA	8
IntL	VOL	0		0.4	V	9
	VOH	Vcc-0.5		Vcc+0.3	V	10
ModPrsL	VOL	0		0.4	V	11
	VOH					

Notes:

1. 400GE client traffic. Typical power represents the highest power at 45°C case. Maximum power represents the highest power at 75°C case.
2. 4x100GE client mode increases power by 0.5W.
3. Human Body Model.
4. Instantaneous balanced dual polarization signal.
5. IOL(maximum)= 3mA for fast-mode, 20mA for fast-mode plus.
6. For 400kHz clock rate, use 3k Ω pull-up resistor.
7. For 400kHz clock rate, use 1.6k Ω pull-up resistor.
8. 0V<VIN<Vcc.
9. IOL=2.0mA.
10. 10k Ω pull-up to Host_Vcc.
11. IOL=2.0mA. Shortened to ground in module.

Optical Power Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Transmitter						
Tx Provisional Output Power Range		-7		4	dBm	
Tx Emitted Total Output Power when Provisioned to Maximum		3			dBm	
Tx Provisional Output Power Step Size			0.1		dB	
Tx Total Output Power Monitor Accuracy		-1.0		1.0	dB	1
Output Power Stability		-0.5		0.5	dB	2
Output Power Enable Time				4	s	3
Output Power During Blanking				-20	dBm	
Output Power Disable Time				100	ms	4
Tx Optical Return Loss		20			dB	
Tolerable Optical Reflection				-27	dB	
Receiver						
Rx Operating Input Power Range		-6 12		5 -6	dBm	5 6
Rx Input Power Monitor Range		-22		5		
Rx Total Input Power Monitor Accuracy		-2.0		2.0		
Rx Signal Power Monitor Accuracy		-3.0		3.0		
Rx Input Power Transient Tolerance		-4.0		4.0		7
Rx Optical Return Loss		-22				8
Rx LOS Threshold			-18			9
Rx LOS Hysteresis		1.0				

Notes:

1. Output power monitor accuracy and output power tuning accuracy are equivalent.

2. Stability is defined as variation over time at a fixed temperature and wavelength.
3. Time to reach 90% of steady-state optical power upon de-assertion of Tx disable.
4. Time to reach output power during blanking upon assertion of Tx disable.
5. <0.5dB ROSNR penalty.
6. <1.5dB ROSNR penalty.
7. At 100us 10%-90% maximum slew rate, and operation within Rx operating input power range. ROSNR penalty <0.5dB/12.5GHz.
8. 400ZR complaint input signal.
9. Bases on Rx signal power monitor.

Optical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Transmitter						
Tx Provisional Carrier Frequency Range		191.25		196.125	THz	1
Carrier Frequency Fine-Tuning Range		-5		5	GHz	
Carrier Frequency Fine-Tuning Step Size		100		100	MHz	
Carrier Frequency Error		-1.5		1.5	GHz	EOL
Local/In-band OSNR		40			dB/12.5GHz	
Global/Out-Band OSNR		40			dB/12.5GHz	
Symbol Rate 400G-E-ZR			59.8438		GBd	
Modulated Spectral Width 400G-E-ZR			66.37		GHz	-20dB Width
Tx Spectral Shaping 400G-E-ZR			0.125		RRC	Fixed
Laser Linewidth				500	kHz	
Tx X-Y Skew				5	ps	
Tx DC I-Q Offset				-26	dB	
Tx I-Q Instantaneous Offset				-20	dB	
Tx I-Q Amplitude Imbalance				1	dB	
Tx I-Q Phase Error		-5		5	°	
Tx I-Q Skew				0.75	Ps	
Tx X-Y Power Imbalance				1.5	dB	
Receiver						
ROSNR 400G-E-ZR				23.7 26.0	dB/12.5GHz	2 3
Rx Sensitivity 400G-E-ZR				-14	dBm	4
PMD Tolerance (Mean) 400G-E-ZR				10	ps	
SOP Tracking Tolerance 400G-E-ZR				50	krad/s	5
PDL Tolerance (Peak) 400G-E-ZR				3.5	dB	6
CD Tolerance 400G-E-ZR		-2.4		2.4	ns/nm	5

Notes:

1. All grids specified in CMIS are supported.
2. ROSNR test conditions as follows unless stated otherwise:
 - Back-to-back, single wavelength present.
 - No dispersion.
 - Rx Signal Power $\geq -6\text{dBm}$.
 - Tx power provisioned to -12dBm .
 - No PDL other than the module itself.
 - PMD/DGD $\leq 2\text{ps}$ mean.
 - $\leq 5\text{krad/s}$ rate of change of SOP.
 - ROSNT is defined to be constant across all frequency channels. At different wavelengths, ROSNR is defined by:

$$\text{OSNR}_{\text{linear-per } 0.1\text{nm}(\lambda)} = \text{OSNR}_{\text{linear_per } 12.5\text{GHz}} \times (\lambda_0/\lambda\text{nm})^2$$
 Where $\lambda_0 = \text{sqrt}(c/12.5\text{GHz}) = 1548.65735\text{nm}$.
 Noise bandwidth of $0.1\text{nm} = 12.5\text{GHz}$ at 1548.65735nm .
3. Same as note 1, except the Rx input power is $>-12\text{dBm}$ and Tx power is provisioned to 10dBm .
4. Error free performance @OSNR $>35\text{dB}/12.5\text{GHz}$.
5. $<0.5\text{dB}$ ROSNR penalty.
6. $<1.3\text{dB}$ ROSNR penalty.

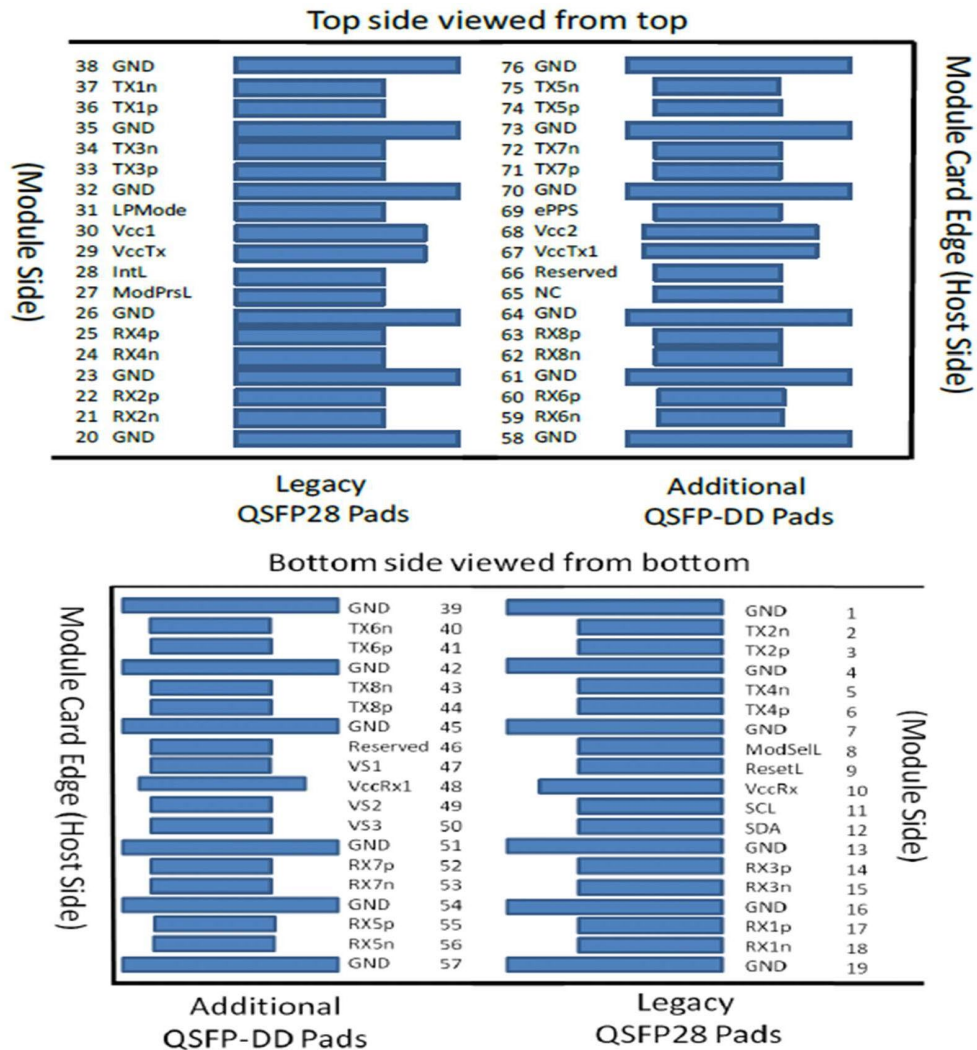
Pin Descriptions

Pin	Symbol	Logic	Name/Description	Notes
1	GND		Module Ground.	
2	Tx2-	CML	Transmitter Inverted Data Input.	
3	Tx2+	CML	Transmitter Non-Inverted Data Input.	
4	GND		Module Ground.	
5	Tx4-	CML	Transmitter Inverted Data Input.	
6	Tx4+	CML	Transmitter Non-Inverted Data Input.	
7	GND		Module Ground.	
8	ModSelL	LVTTL	Module Select Low	
9	ResetL	LVTTL	Module Select Low.	
10	VccRx		+3.3V Receiver Power Supply.	
11	SCL	LVC MOS	2-Wire Serial Interface Clock.	
12	SDA	LVC MOS	2-Wire Serial Interface Data.	
13	GND		Module Ground.	
14	Rx3+	CML	Receiver Non-Inverted Data Output.	
15	Rx3-	CML	Receiver Inverted Data Output.	
16	GND		Module Ground.	
17	Rx1+	CML	Receiver Non-Inverted Data Output.	
18	Rx1-	CML	Receiver Inverted Data Output.	
19	GND		Module Ground.	
20	GND		Module Ground.	
21	Rx2-	CML	Receiver Inverted Data Output.	
22	Rx2+	CML	Receiver Non-Inverted Data Output.	
23	GND		Module Ground.	
24	Rx4-	CML	Receiver Inverted Data Output.	
25	Rx4+	CML	Receiver Non-Inverted Data Output.	

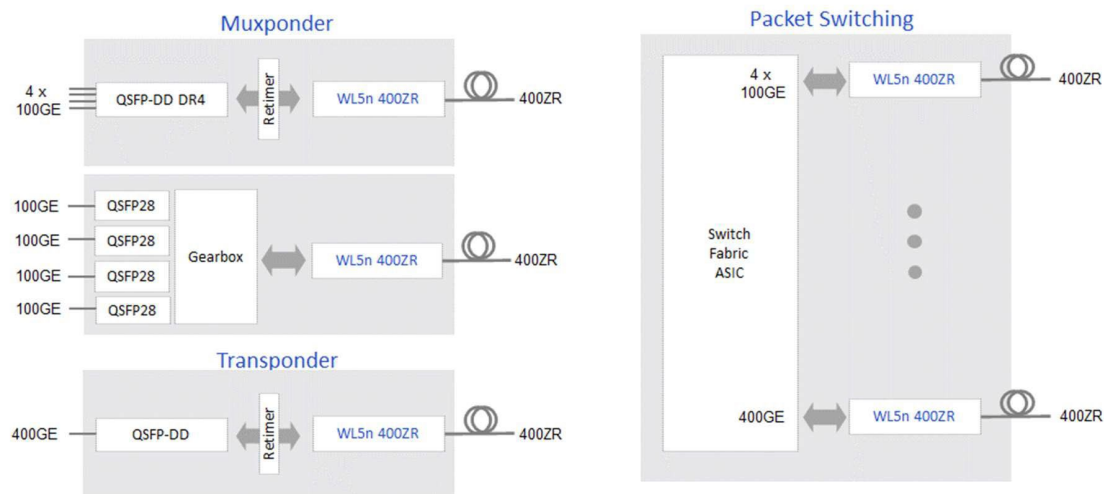
26	GND		Module Ground.	
27	ModPrsL	LVTTL	Module Present.	
28	IntL	LVTTL	Interrupt.	
29	VccTx		+3.3V Transmitter Power Supply.	
30	Vcc1		+3.3V Power Supply.	
31	LPMODE	LVTTL	Low-Power Mode.	
32	GND		Module Ground.	
33	Tx3+	CML	Transmitter Non-Inverted Data Input.	
34	Tx3-	CML	Transmitter Inverted Data Input.	
35	GND		Module Ground.	
36	Tx1+	CML	Transmitter Non-Inverted Data Input.	
37	Tx1-	CML	Transmitter Inverted Data Input.	
38	GND		Module Ground.	
39	GND		Module Ground.	
40	Tx6-	CML	Transmitter Inverted Data Input.	
41	Tx6+	CML	Transmitter Non-Inverted Data Input.	
42	GND		Module Ground.	
43	Tx8-	CML	Transmitter Inverted Data Input.	
44	Tx8+	CML	Transmitter Non-Inverted Data Input.	
45	GND		Module Ground.	
46	Reserved		For Future Use.	
47	VS1		Module Vendor-Specific 1.	
48	VccRx1		+3.3V Receiver Power Supply Receiver.	
49	VS2		Module Vendor-Specific 2.	
50	VS3		Module Vendor-Specific 3.	
51	GND		Module Ground.	
52	Rx7+	CML	Receiver Non-Inverted Data Output.	
53	Rx7-	CML	Receiver Inverted Data Output.	
54	GND		Module Ground.	
55	Rx5+	CML	Receiver Non-Inverted Data Output.	
56	Rx5-	CML	Receiver Inverted Data Output.	
57	GND		Module Ground.	
58	GND		Module Ground.	
59	Rx6-	CML	Receiver Inverted Data Output.	
60	Rx6+	CML	Receiver Non-Inverted Data Output.	
61	GND		Module Ground.	
62	Rx8-	CML	Receiver Inverted Data Output.	
63	Rx8+	CML	Receiver Non-Inverted Data Output.	
64	GND		Module Ground.	
65	NC		Not Connected.	
66	Reserved		For Future Use.	
67	VccTx1		+3.3V Power Supply Transmitter.	
68	Vcc2		+3.3V Power Supply.	
69	Reserved		For Future Use.	
70	GND		Module Ground.	
71	Tx7+	CML	Transmitter Non-Inverted Data Input.	

72	Tx7-	CML	Transmitter Inverted Data Input.	
73	GND		Module Ground.	
74	Tx5+	CML	Transmitter Non-Inverted Data Input.	
75	Tx5-	CML	Transmitter Inverted Data Input.	
76	GND		Module Ground.	

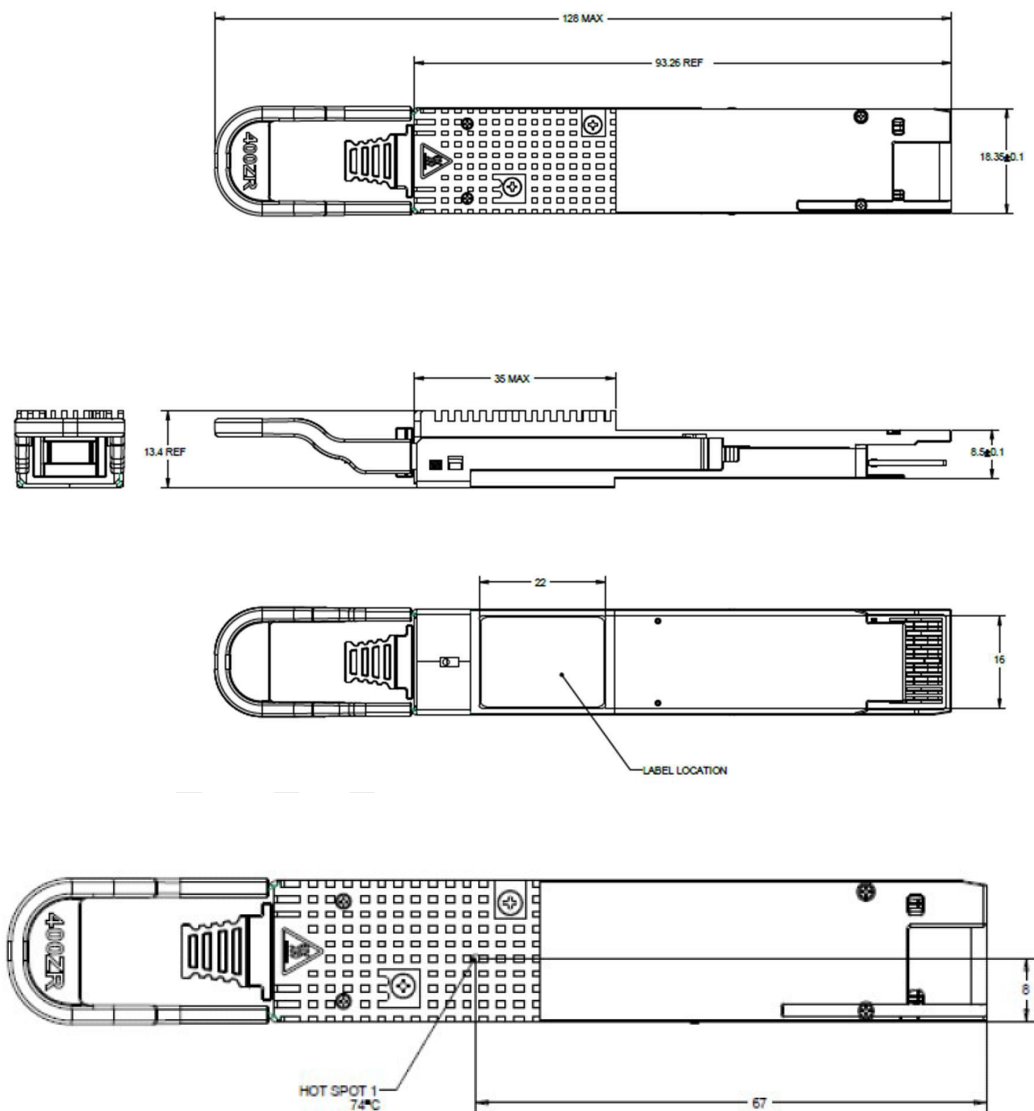
Electrical Pad Layout



Host Board Schematic



Mechanical Specifications



About Skylane Optics

Skylane is a leading provider of transceivers for optical communication.

We offer an extensive portfolio for the enterprise, access, datacenter and metropolitan fiber optical market as well as for smart home applications and home networks.

We cover the European, South American and North American market with a strong partner network and have offices in Belgium, Brazil, Sweden and USA.

Our offerings are characterized by high quality and performance. In combination with our strong technical support, we enable our customers to build cost optimized network solutions.

We offer an extensive range of high-quality products including transceivers (Optical and copper), Active Optical Cable (AOC), Direct Attach Cable (DAC), Mux/Demux, Coding Box.

