



QDD4-400GB-ER4L-SKY

MSA Compliant 400GBase-ER4L PAM4 QSFP-DD Transceiver (SMF, 1310nm, 30km, LC, DOM, CMIS 4.0)

Product Description

This MSA Compliant QSFP-DD transceiver provides 400GBase-ER4L throughput up to 30km over single-mode fiber (SMF) using a wavelength of 1310nm via an LC connector. This easy to install, hot swappable transceiver has been programmed, uniquely serialized and data-traffic and application tested to ensure that it will initialize and perform identically. Digital optical monitoring (DOM) support is also present to allow access to real-time operating parameters. All of our transceivers comply with Multi-Source Agreement (MSA) standards to provide seamless network integration. Additional product features include Digital Optical Monitoring (DOM) support which allows 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:

- Compliant to QSFP-DD MSA
- 8x53.125Gbps Electrical Interface (400GAUI-8)
- 4 Narrow LWDM Lanes, MUX/DEMUX Design
- Power Consumption: 12W
- Duplex LC Connector
- Up to 30km Transmission on Single-Mode Fiber (SMF) with FEC
- RoHS Compliant and Lead-Free
- Operating Temperature: 0 to 70 Celsius
- RoHS Compliant and Lead-Free
- Operating Temperature: 0 to 70 Celsius



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
Data Rate Per Lane			26.5625		GBd	PAM4
Data Rate Accuracy		-100		100	ppm	
Operating Case Temperature	T _c	0		70	°C	
Storage Temperature	T _{stg}	-40		85	°C	
Maximum Voltage	V _{cc}	-0.5		3.6	V	
Relative Humidity (Non-Condensing)	RH	0		85	%	
Damage Threshold Per Lane	TH _d	-2.4			dBm	
Pre-FEC Bit Error Ratio				2.4x10 ⁻⁴		
Post-FEC Bit Error Ratio				1x10 ⁻¹²		1
Link Distance	D	0.002		30	km	2

Notes:

1. FEC is provided by the host system.
2. Additional attenuation is required to support short distances. Ensure that the receiver input power does not exceed the overload point or damage the receiver (APD).

Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Supply Voltage	V _{cc}	3.135	3.3	3.465	V	
Supply Current	I _{cc}			3.64	A	
Power Consumption				12	W	
Transmitter						
Signaling Rate Per Lane	TP1	26.5625 ± 100ppm			GBd	
Differential Pk-Pk Input Voltage Tolerance	TP1a	900			mVp-p	1
Differential Termination Mismatch	TP1			10	%	
Differential Input Return Loss	TP1	IEEE 802.3-2015 Equation (83E-5)			dB	
Differential to Common-Mode Input Return Loss	TP1	IEEE 802.3-2015 Equation (83E-6)			dB	
Module Stressed Input Test	TP1a	See IEEE 802.3bs 120E.3.4.1				2
Single-Ended Voltage Tolerance Range (Minimum)	TP1a	-0.4 to 3.3			V	
DC Common-Mode Input Voltage	TP1	-350		2850	mV	3
Receiver						
Signaling Rate Per Lane	TP4	26.5625 ± 100ppm			GBd	
Differential Pk-Pk Output Voltage	TP4			900	mVp-p	
AC Common-Mode Output Voltage (RMS)	TP4			17.5	mV	
Differential Termination Mismatch	TP4			10	%	

Differential Output Return Loss	TP4	IEEE 802.3-2015 Equation (83E-2)				
Common- to Differential-Mode Conversion Return Loss	TP4	IEEE 802.3-2015 Equation (83E-3)				
Transition Time (20-80%)	TP4	9.5			ps	
Near-End Eye Symmetry Mask Width (ESMW)	TP4		0.265		UI	
Near-End Eye Height (Differential)	TP4	70			mV	
Far-End Eye Symmetry Mask Width (ESMW)	TP4		0.2		UI	
Far-End Eye Height (Differential)	TP4	30			mV	
Far-End Pre-Cursor ISI Ratio	TP4	-4.5		2.5	%	
Common-Mode Output Voltage (Vcm)	TP4	-350		2850	mV	3

Notes:

1. With the exception to IEEE 802.3bs 120E.3.1.2 that the pattern is PRBS31Q or scrambled idle.
2. Meets BER specified in IEEE 802.3bs 120E.1.1.
3. DC common-mode voltage generated by the host. Specification includes the effects of ground offset voltage.

Optical Characteristics

Parameter		Symbol	Min.	Typ.	Max.	Unit	Notes
Transmitter							
Wavelength		L0	1304.06	1304.58	1305.10	nm	
		L1	1306.33	1306.85	1307.38	nm	
		L2	1308.61	1309.14	1309.66	nm	
		L3	1310.90	1311.43	1311.96	nm	
Data Rate Per Lane			53.125 ± 100ppm			GBd	
Modulation Format			PAM4				
Side-Mode Suppression Ratio		SMSR	30			dB	
Total Average Launch Power		PT			11.6	dBm	
Average Launch Power Per Lane		PAVG	0		5.6	dBm	
Outer Optical Modulation Amplitude (OMA _{outer}) Per Lane	TDECQ<1.4dB	POMA	3		6.4	dBm	
	1.4dB≤TDECQ≤3.9dB		1.6+TDECQ				
Difference in Launch Power Between Any Two Lanes (OMA _{outer})					3	dB	
Transmitter and Dispersion Eye Closure for PAM4 Per Lane	CD <16ps/nm	TDECQ			3.5	dB	
	CD >16ps/nm				3.9		
Transmitter Eye Closure for PAM4 Per Lane		TECQ			3.5	dB	
TDECQ-TECQ Per Lane	CD <16ps/nm				2.3	dB	
	CD >16ps/nm				2.7		
Average Launch Power of Off Transmitter Per Lane		Poff			-15	dBm	

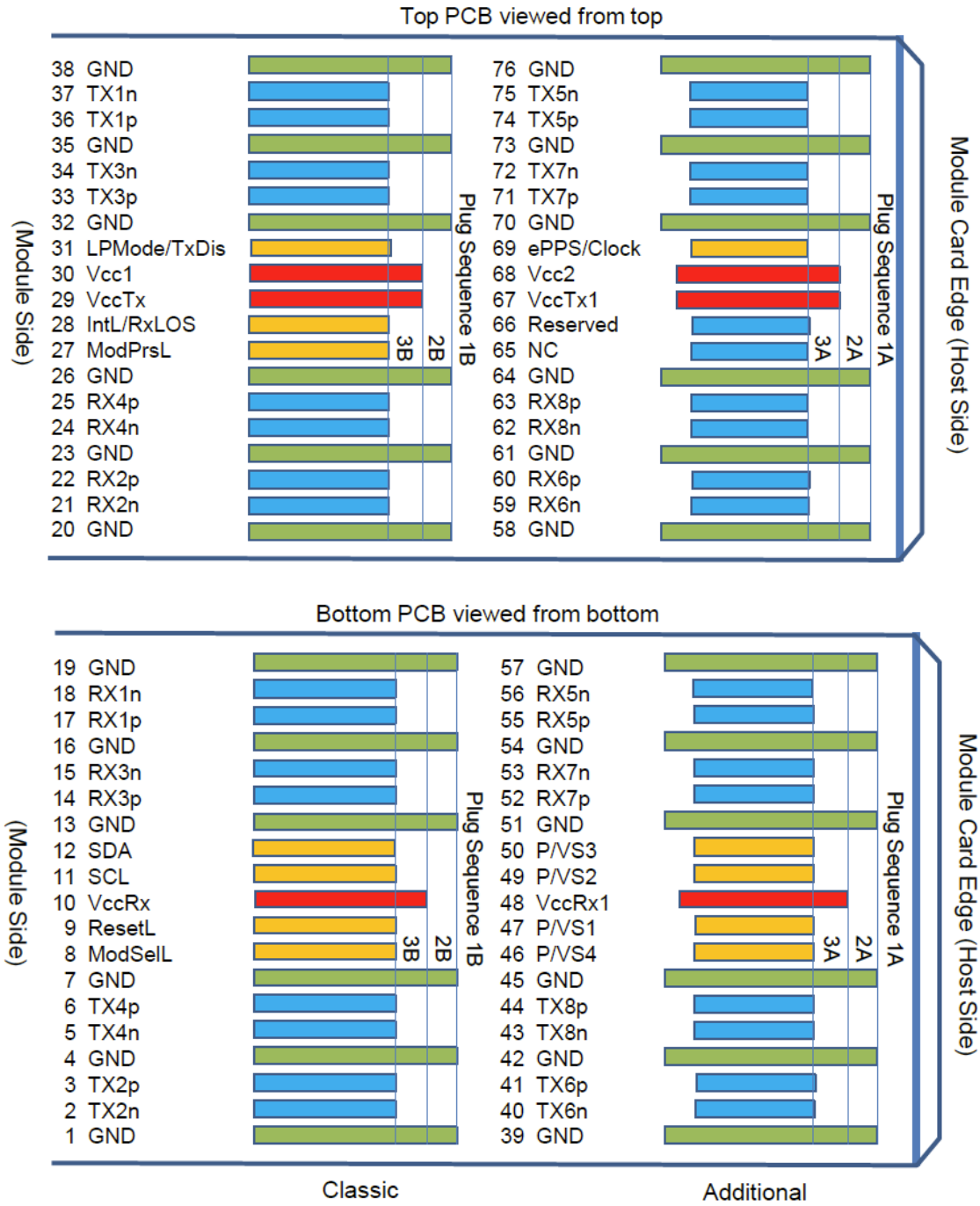
Extinction Ratio		ER	5			dB	
Transmitter Transition Time					17	ps	
Transmitter Over/Under-Shoot					22	%	
Transmitter Power Excursion					3.9	dB	
RIN ₁₅ OMA		RIN			-136	dB/Hz	
Optical Return Loss Tolerance		ORLT			15	dB	
Transmitter Reflectance		TR			-26	dB	
Receiver							
Wavelength			L0	1304.06	1304.58	1305.10	nm
			L1	1306.33	1306.85	1307.38	nm
			L2	1308.61	1309.14	1309.66	nm
			L3	1310.90	1311.43	1311.96	nm
Data Rate Per Lane		53.125 ± 100ppm				GBd	
Modulation Format		PAM4					
Damage Receiver Power Per Lane			-2.4			dBm	
Average Receiver Power Per Lane			-14.7		-3.4	dBm	
Receiver Power (OMAouter) Per Lane					-2.6	dBm	
Difference in Receiving Power Between Any Two Lanes (OMAouter)					3.6	dB	
Receiver Reflectance		RR			-26	dB	
Receiver Sensitivity (OMAouter) Per Lane	TDECQ<1.4dB	Sen			-12.5	dBm	
	1.4dB≤TDECQ≤3.9dB				-13.9+TECQ		
Stress Receiver Sensitivity (OMAouter) Per Lane					-10.0	dBm	
Conditions of Stressed Receiver Sensitivity Test							
Stressed Eye Closure for PAM4 (SECQ) Per Lane Under Test				3.9		dB	
OMAouter of Each Aggressor Lane				-6.4		dBm	

Pin Descriptions

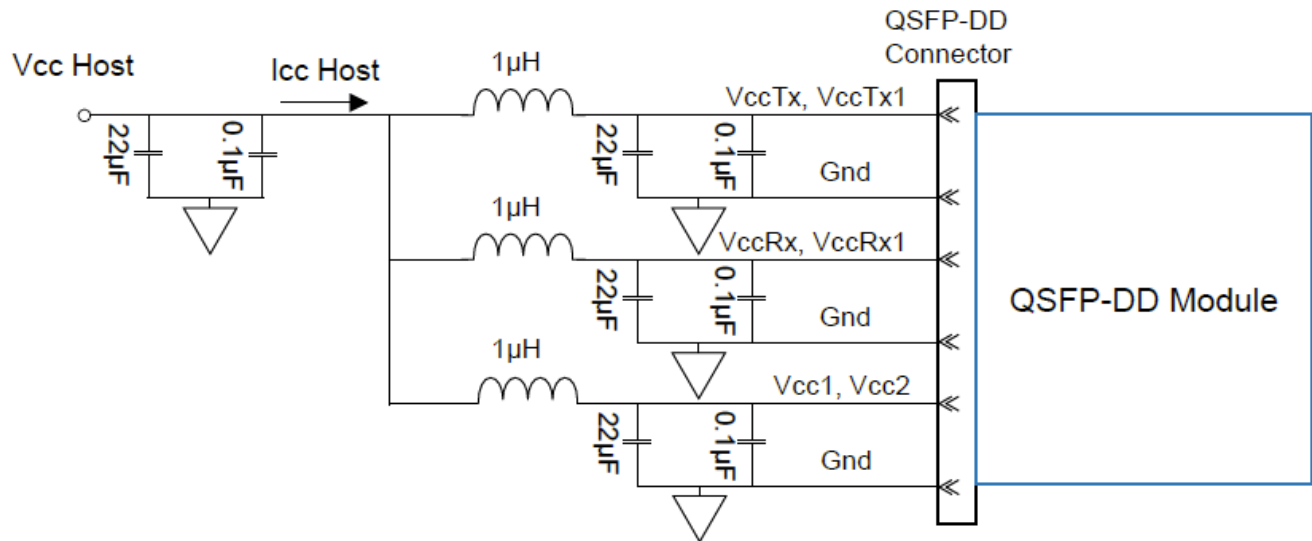
Pin	Logic	Symbol	Name/Description	Plug Seq.
1		GND	Module Ground.	1B
2	CML-I	Tx2-	Transmitter Inverted Data Input.	3B
3	CML-I	Tx2+	Transmitter Non-Inverted Data Input.	3B
4		GND	Module Ground.	1B
5	CML-I	Tx4-	Transmitter Inverted Data Input.	3B
6	CML-I	Tx4+	Transmitter Non-Inverted Data Input.	3B
7		GND	Module Ground.	1B
8	LVTTL-I	ModSelL	Module Select.	3B
9	LVTTL-I	ResetL	Module Reset.	3B
10		VccRx	+3.3V Receiver Power Supply.	2B
11	LVC MOS-I/O	SCL	2-Wire Serial Interface Clock.	3B
12	LVC MOS-I/O	SDA	2-Wire Serial Interface Data.	3B
13		GND	Module Ground.	1B
14	CML-O	Rx3+	Receiver Non-Inverted Data Output.	3B
15	CML-O	Rx3-	Receiver Inverted Data Output.	3B
16		GND	Module Ground.	1B
17	CML-O	Rx1+	Receiver Non-Inverted Data Output.	3B
18	CML-O	Rx1-	Receiver Inverted Data Output.	3B
19		GND	Module Ground.	1B
20		GND	Module Ground.	1B
21	CML-O	Rx2-	Receiver Inverted Data Output.	3B
22	CML-O	Rx2+	Receiver Non-Inverted Data Output.	3B
23		GND	Module Ground.	1B
24	CML-O	Rx4-	Receiver Inverted Data Output.	3B
25	CML-O	Rx4+	Receiver Non-Inverted Data Output.	3B
26		GND	Module Ground.	1B
27	LVTTL-O	ModPrsL	Module Present.	3B
28	LVTTL-O	IntL	Interrupt.	3B
29		VccTx	+3.3V Transmitter Power Supply.	2B
30		Vcc1	+3.3V Power Supply.	2B
31	LVTTL-I	InitMode	Initialization Mode. In legacy QSFP applications, InitMode pad is called LPMODE.	3B
32		GND	Module Ground.	1B
33	CML-I	Tx3+	Transmitter Non-Inverted Data Input.	3B
34	CML-I	Tx3-	Transmitter Inverted Data Input.	3B
35		GND	Module Ground.	1B
36	CML-I	Tx1+	Transmitter Non-Inverted Data Input.	3B
37	CML-I	Tx1-	Transmitter Inverted Data Input.	3B

38		GND	Module Ground.	1B
39		GND	Module Ground.	1A
40	CML-I	Tx6-	Transmitter Inverted Data Input.	3A
41	CML-I	Tx6+	Transmitter Non-Inverted Data Input.	3A
42		GND	Module Ground.	1A
43	CML-I	Tx8-	Transmitter Inverted Data Input.	3A
44	CML-I	Tx8+	Transmitter Non-Inverted Data Input.	3A
45		GND	Module Ground.	1A
46		Reserved	For Future Use.	3A
47		VS1	Module Vendor-Specific 1.	3A
48		VccRx1	+3.3V Receiver Power Supply.	2A
49		VS2	Module Vendor-Specific 2.	3A
50		VS3	Module Vendor-Specific 3.	3A
51		GND	Module Ground.	1A
52	CML-O	Rx7+	Receiver Non-Inverted Data Output.	3A
53	CML-O	Rx7-	Receiver Inverted Data Output.	3A
54		GND	Module Ground.	1A
55	CML-O	Rx5+	Receiver Non-Inverted Data Output.	3A
56	CML-O	Rx5-	Receiver Inverted Data Output.	3A
57		GND	Module Ground.	1A
58		GND	Module Ground.	1A
59	CML-O	Rx6-	Receiver Inverted Data Output.	3A
60	CML-O	Rx6+	Receiver Non-Inverted Data Output.	3A
61		GND	Module Ground.	1A
62	CML-O	Rx8-	Receiver Inverted Data Output.	3A
63	CML-O	Rx8+	Receiver Non-Inverted Data Output.	3A
64		GND	Module Ground.	1A
65		NC	Not Connected.	3A
66		Reserved	For Future Use.	3A
67		VccTx1	+3.3V Transmitter Power Supply.	2A
68		Vcc2	+3.3V Power Supply.	2A
69		Reserved	For Future Use.	3A
70		GND	Module Ground.	1A
71	CML-I	Tx7+	Transmitter Non-Inverted Data Input.	3A
72	CML-I	Tx7-	Transmitter Inverted Data Input.	3A
73		GND	Module Ground.	1A
74	CML-I	Tx5+	Transmitter Non-Inverted Data Input.	3A
75	CML-I	Tx5-	Transmitter Inverted Data Input.	3A
76		GND	Module Ground.	1A

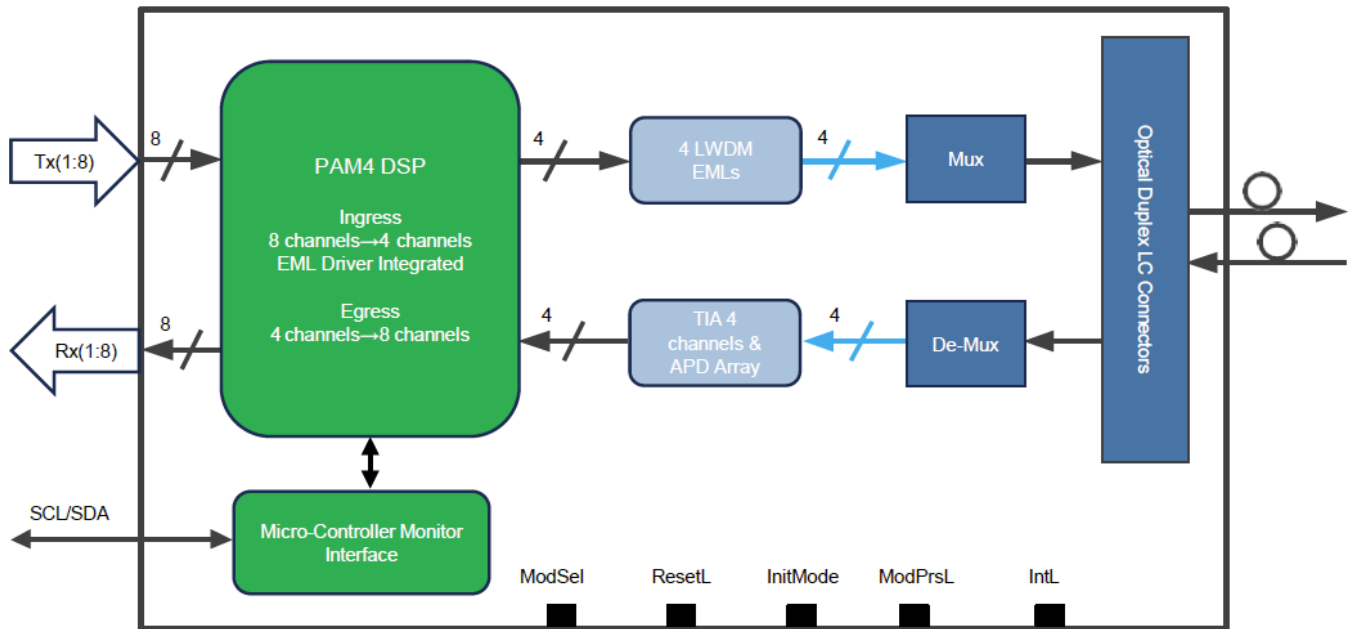
Pin-Out Details



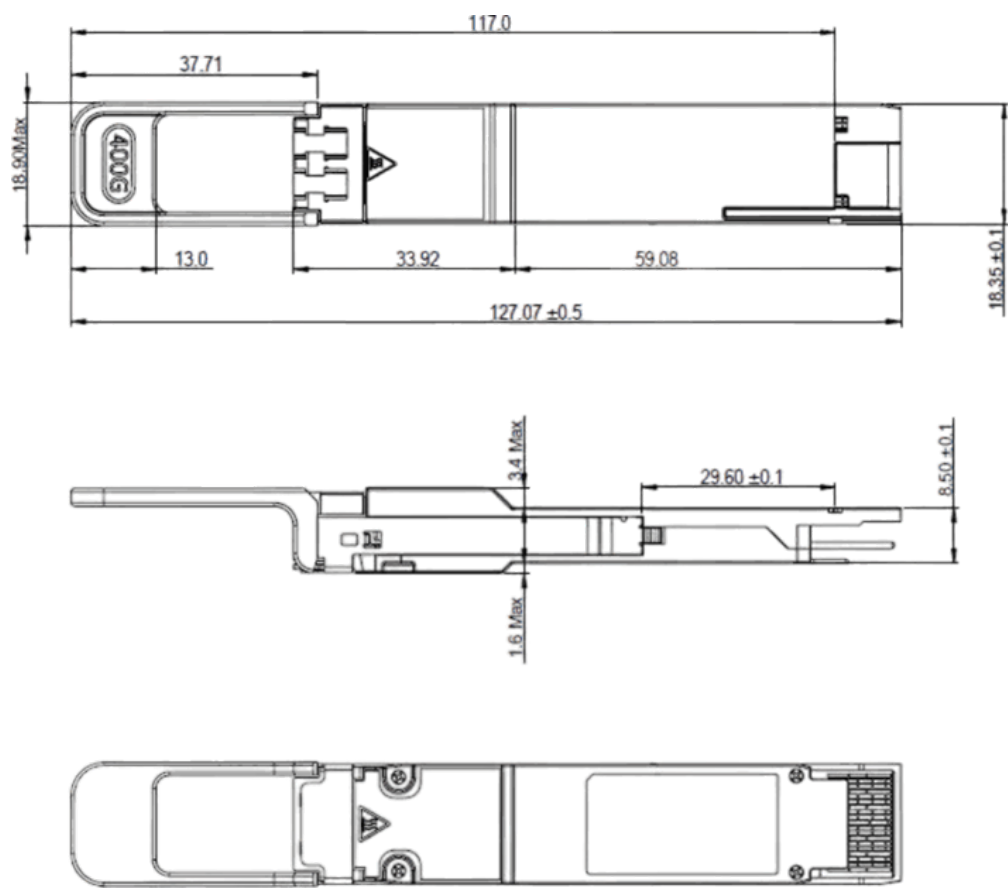
Recommended Power Supply Filter



Block Diagram of Transceiver



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.

