

QBP13P50E0PFC4S

Juniper Networks® QDD-400G-DR4 Compatible 400GBase-DR4 QSFP-DD Transceiver (SMF, 1310nm, 500m, MPO, DOM)

Product Description

This Juniper Networks® QDD-400G-DR4 compatible QSFP-DD transceiver provides 400GBase-DR4 throughput up to 500m over single-mode fiber (SMF) using a wavelength of 1310nm via an MPO connector. It is guaranteed to be 100% compatible with the equivalent Juniper Networks® transceiver. 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. 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:

- QSFP-DD MSA compliant
- IEEE 802.3bs 400GBASE-DR4 Specification compliant
- Parallel 4 Optical Lanes
- Data Rate 106.25Gbps (PAM4) per channel
- Commercial Temperature 0 to 70 Celsius
- 8x53.125Gb/s electrical interface (400GAUI-8)
- MPO-12 connector
- Maximum power consumption 10.5W
- 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
Power Supply Voltage	V _{cc}	-0.5		3.6	V	
Storage Temperature	T _{stg}	-40		85	°C	
Case Operating Temperature	T _c	0		70	°C	
Relative Humidity	RH	0		85	%	Non-Condensing
Damage Threshold Per Lane	TH _d	5			dBm	
Data Rate Per Lane			26.5625		GBd	PAM4
Data Rate Accuracy		-100		100	ppm	
Pre-FEC Bit Error Ratio				2.4x10 ⁻⁴		
Post-FEC Bit Error Ratio				1x10 ⁻¹²		1
Link Distance	D	2		500	m	2

Notes:

1. FEC provided by host system.
2. FEC required on host system to support maximum distance.

Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Supply Voltage	V _{cc}	3.135	3.3	3.465	V	
Supply Current	I _{cc}			3.18	A	
Power Consumption	PD			10.5	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 (V _{cm})	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 effects of ground offset voltage.

Optical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Transmitter						
Data Rate Per Lane		53.125 ± 100ppm			GBd	
Modulation Format		PAM4				
Center Wavelength	λ_C	1304.5	1310	1317.5	nm	
Side-Mode Suppression Ratio	SMSR	30			dB	
Average Launch Power Per Lane	Pavg	-2.9		4	dBm	1
Outer Optical Modulation Amplitude (OMA _{outer}) Per Lane	POMA	-0.8		4.2	dBm	2
Launch Power in OMA _{outer} Minus TDECQ Per Lane	For ER≥5dB	-2.2			dB	
	For ER≤5dB	-1.9			dB	
Transmitter and Dispersion Eye Closure for PAM4 Per Lane	TDECQ			3.4	dB	
TDECQ – 10*log ₁₀ (Ceq) Per Lane				3.4	dB	3
Extinction Ratio	ER	3.5			dB	
RIN _{21.4} OMA	RIN			-136	dB/Hz	
Optical Return Loss Tolerance	TOL			21.4	dB	
Transmitter Reflectance	T _R			-26	dB	
Transmitter Transition Time				17	ps	
Average Launch Power of Off Transmitter Per Lane	P _{off}			-15	dBm	
Receiver						
Center Wavelength	λ_C	1304.5	1310	1317.5	nm	
Data Rate Per Lane		53.125 ± 100ppm			GBd	
Modulation Format		PAM4				
Damage Threshold Per Lane	TH _d	5			dBm	4
Average Receive Power Per Lane		-5.9		4	dBm	5
Receive Power (OMA _{outer}) Per Lane				4.2	dBm	
Receiver Sensitivity (OMA _{outer}) Per Lane	SEN			Equation (1)	dBm	6
Stressed Receiver Sensitivity (OMA _{outer}) Per Lane	SRS			-1.9	dBm	7
Receiver Reflectance	R _R			-26	dB	
LOS Assert	LOSA	-15			dBm	
LOS De-Assert	LOSD			-8.9	dBm	
LOS Hysteresis	LOSH	0.5			dB	
Stressed Conditions for Stress Receiver Sensitivity (Note 8)						
Stressed Eye Closure for PAM4 (SECQ) Lane Under Test			3.4		dB	

SECQ – $10 \cdot \log_{10} (C_{eq})$ Per Lane Under Test				3.4	dB	
OMA _{outer} of Each Aggressor Lane			4.2		dBm	

Notes:

1. Average launch power, each lane (minimum), is informative and not the principal indicator of signal strength. A transmitter with launch power below this value cannot be compliant; however, a value above this does not ensure compliance.
2. Even if the TDECQ < 1.4dB for an extinction ratio of ≥ 5dB or TDECQ < 1.1dB for an extinction ratio of < 5dB, the OMA_{outer} (minimum) must exceed the minimum value specified here.
3. Ceq is a coefficient defined in IEEE Std 802.3-2018 Clause 121.8.5.3 which accounts for reference equalizer noise enhancement.
4. Average receive power, each lane (minimum), is informative and not the principal indicator of signal strength. A received power below this value cannot be compliant; however, a value above this does not ensure compliance.
5. The receiver shall be able to tolerate, without damage, continuous exposure to a modulated optical input signal having this power level on one lane. The receiver does not have to operate correctly at this input power.
6. Receiver sensitivity (OMA_{outer}), each lane (maximum), is informative and is defined for a transmitter with a value of SECQ up to 3.4 dB. It should meet Equation (1), which is illustrated in below:

$$RS = \text{Max.}(-3.9, SECQ - 5.3) \text{ dBm} \quad (1)$$

Where:

RS is the receiver sensitivity, and

SECQ is the SECQ of the transmitter used to measure the receiver sensitivity.

7. Measured with conformance test signal at TP3 for the BER equal to 2.4×10^{-4} .
8. These test conditions are for measuring stressed receiver sensitivity. They are not characteristics of the receiver.

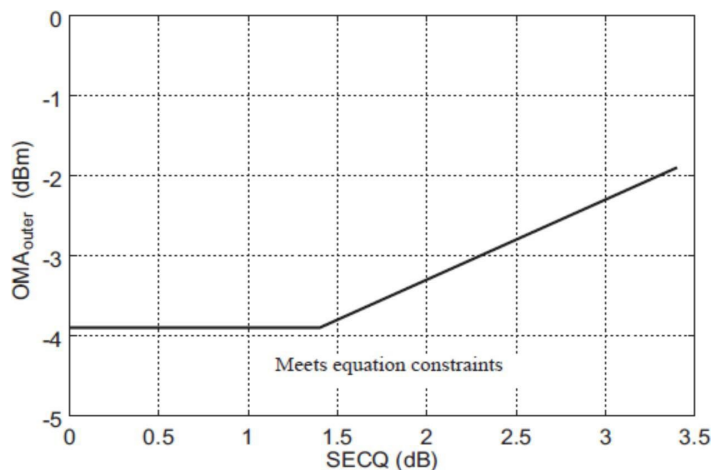


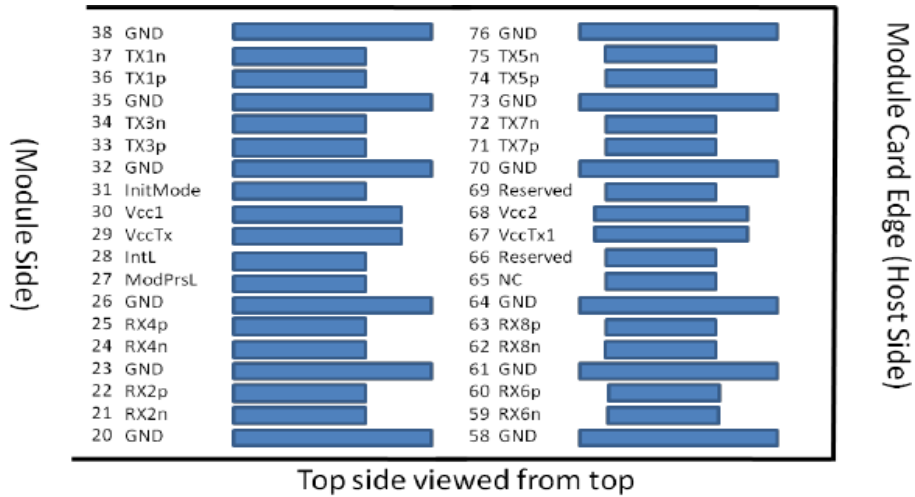
Illustration of Receiver Sensitivity Mask for 400G-DR4

Pin Descriptions

Pin	Logic	Symbol	Name/Description	Plug Sequence
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, the 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

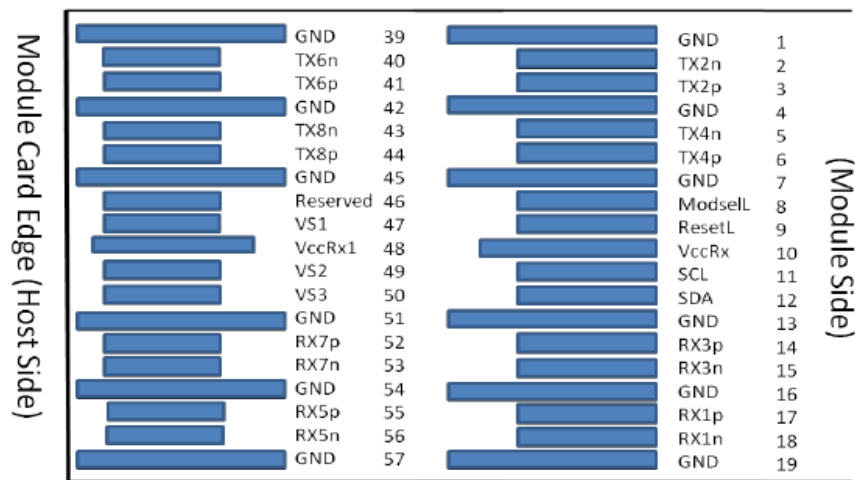
39		GND	Module Ground.	1A
40	CML-I	Tx6-	Transmitter Inverted Data Input.	3A
41	CML-I	Tx6+	Transmitter Non-Inverted Data Input.	3A
42		GND	Module Ground.	1A
43	CML-I	Tx8-	Transmitter Inverted Data Input.	3A
44	CML-I	Tx8+	Transmitter Non-Inverted Data Input.	3A
45		GND	Module Ground.	1A
46		Reserved	For 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
67		GND	Module Ground.	1A
68		NC	Not Connected.	3A
69		Reserved	For Future Use.	3A
70		VccTx1	+3.3V Transmitter Power Supply.	2A
71		Vcc2	+3.3V Power Supply.	2A
72		Reserved	For Future Use.	3A
73		GND	Module Ground.	1A
74	CML-I	Tx7+	Transmitter Non-Inverted Data Input.	3A
75	CML-I	Tx7-	Transmitter Inverted Data Input.	3A
76		GND	Module Ground.	1A

Electrical Pin-Out Details



Legacy QSFP28 Pads

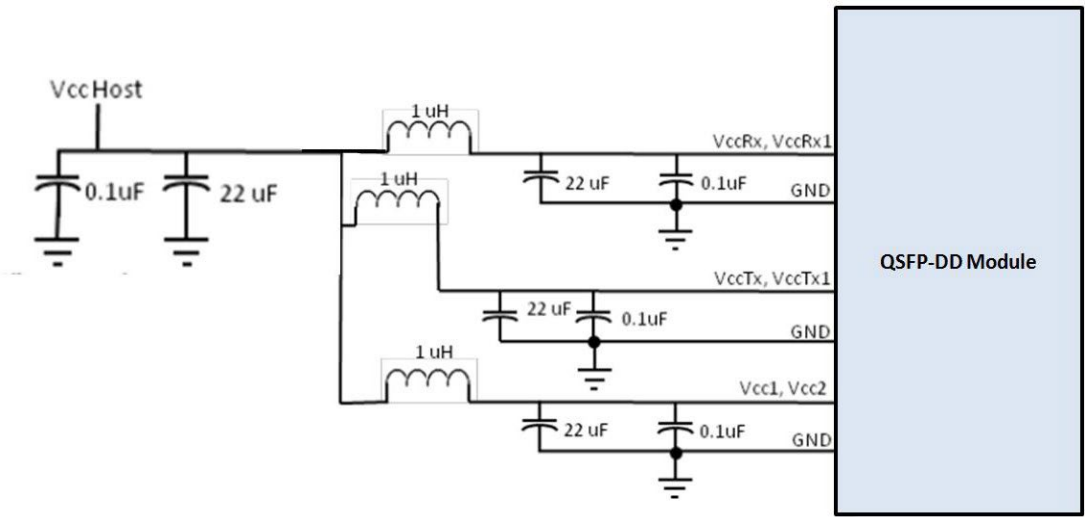
Additional QSFP-DD Pads



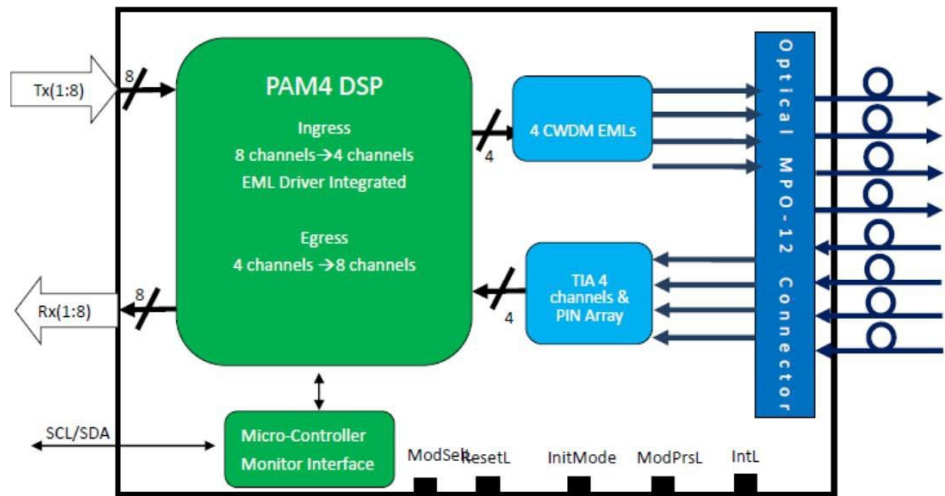
Additional QSFP-DD Pads

Legacy QSFP28 Pads

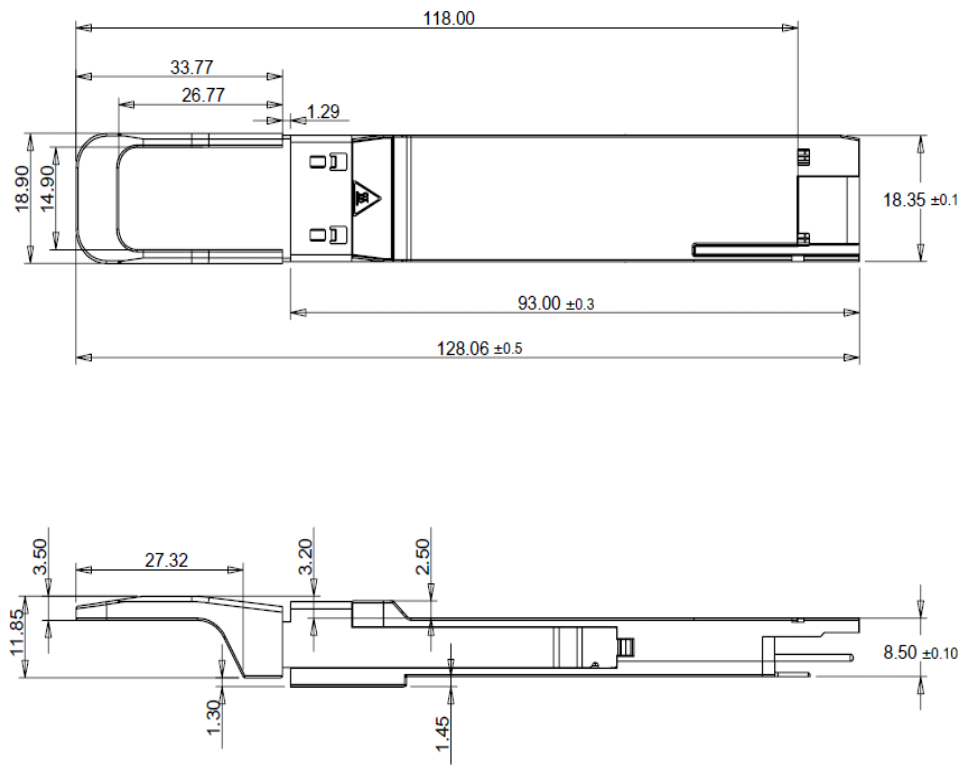
Recommended Power Supply Filter



Block Diagram



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.

