QDD-400GB-DR4-C

MSA and TAA 400GBase-DR4 QSFP-DD Transceiver (SMF, 1310nm, 500m, MPO, DOM)

Features:

- INF-8628 Compliance
- MPO Connector
- Single-mode Fiber
- Commercial Temperature 0 to 70 Celsius
- Hot Pluggable
- Metal with Lower EMI
- Excellent ESD Protection
- RoHS Compliant and Lead Free

Applications:

- 400GBase Ethernet
- Access and Enterprise

Product Description

This MSA Compliant 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 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. This transceiver is Trade Agreements Act (TAA) compliant. We stand behind the quality of our products and proudly offer a limited lifetime warranty.

ProLabs' transceivers are RoHS compliant and lead-free.

TAA refers to the Trade Agreements Act (19 U.S.C. & 2501-2581), which is intended to foster fair and open international trade. TAA requires that the U.S. Government may acquire only "U.S. – made or designated country end products."

Rev. 031723

Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit	Notes
Maximum Power Supply Voltage	V$_{CC}$	0	3.6	V	1, 2
Storage Temperature	Ts	-40	+85	°C	1, 2
Low-speed Input	Vin	-0.5	Vcc + 0.3	V	1, 2
Recommended Operating Conditions					
Case Operating Temperature	Top	0	+70	°C	
Relative Humidity (non-condensing)	RH	5	85	%	

Notes:

1. Absolute Maximum Ratings are those beyond which damage to the device may occur.
2. Between the Recommended Operating conditions and Absolute Maximum ratings, prolonged operation is not intended, and permanent device degradation may occur.

Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Power Supply Voltage	Vcc	3.10	3.3	3.47	V	
Power Consumption				10	W	1
Low Speed Electrical Interface						
Low Speed Outputs: ModPrsL, IntL	VOL	0		0.4	V	Iol = 2mA
	VOH	Vcc-0.5		Vcc+0.3	V	
Low Speed Inputs: ModSelL, ResetL	VIL	-0.3		0.8	V	
	VIH	2		Vcc+0.3	V	
SCL, SDA Input	VIL	-0.3		Vcc*0.3	V	
	VIH	Vcc*0.7		Vcc+0.5	V	
SCL, SDA Output	VOL	0		0.4	V	
	VOH	Vcc-0.5		Vcc+0.3	V	
ESD Specifications						
Electro-Static Discharge	Human Body Model (HBM, MIL_STD 883 Method 3015.7)			1000	V	high speed pins
Electro-Static Discharge				2000	V	all other pins

High Speed Electrical Specifications

Parameter	Min	Typ	Max	Units
Module Electrical Input Characteristics				
Signaling rate per lane ± 100 ppm		26.5625		GBd
Differential peak-to-peak input voltage tolerance	900			mV
Differential termination mismatch			10	%
Single-ended voltage tolerance range	-0.4		3.3	V
DC common mode voltage	-350		2850	mV
Module Electrical Output Characteristics				
Signaling rate per lane ± 100 ppm		26.5625		GBd
AC common-mode output voltage RMS			17.5	mV
Differential peak-to-peak output voltage			900	mV
Near-end eye symmetry mask width (ESMW)		0.265		ul
Near-end eye height, differential	70			mV
Far-end eye symmetry mask width (ESMW)		0.2		ul
Far-end eye height, differential	30			mV
Far-end pre-cursor ISI ratio	-4.5		2.5	%
Differential termination mismatch			10	%
Transition time, 20-80%	9.5			ps
DC common mode voltage	-350		2850	mV

Optical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Transmitter						
PAM4 Signaling rate, each lane (±100ppm)	Boptic		53.125		GBd	
Lane Wavelength	λ0	1304.5		1317.5	nm	
Side-mode Suppression ratio	SMSR	30			dB	
Average Launch Power	PAVG	-2.9		4.0	dBm	1
Optical Modulation Amplitude (OMAouter)	POMA	-0.8		4.2	dBm	
Launch Power in OMA minus TDECQ		-2.2			dB	
Transmitter and Dispersion Eye Closure for PAM4, each lane	TDECQ			3.4	dB	2
Average Launch Power OFF Transmitter, each lane	Poff			-15	dBm	
Extinction Ratio, each lane	ER	3.5			dB	
Optical Return Loss Tolerance				21.4	dB	
Transmitter Reflectance	RL			-26	dB	
RIN21.4 OMA				-136	dB/Hz	
Receiver						
PAM4 Signaling rate, each lane (±100ppm)	Boptic		53.125		GBd	
Lane Wavelength	λ0	1304.5		1317.5	nm	
Damage Threshold	THd	5			dBm	3
Average Receive power	ROP	-5.9		4	dBm	4
Receiver Power (OMAouter)				4.2	dBm	
Receiver Reflectance	RR			-26	dB	
Receiver Sensitivity (OMAouter)				-4.4	dBm	
Stressed Receiver Sensitivity (OMAouter)	SRSmask			-1.9	dBm	5
Stressed Conditions for Stress Receiver Sensitivity						
Stressed eye closure for PAM4 (SECQ), lane under test	SECQ	0.9		3.4	dB	
OMAouter of each aggressor lane				4.2	dBm	
Rx_LOS Assert Level	LOSA	-16			dBm	
Rx_LOS De-Assert Level	LOSD			-7.5	dBm	
Rx_LOS Hysteresis	LOSHys	0.5			dB	

Notes:

1. Average launch power (min) 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. Transmitter reflectance is defined looking into the transmitter.
3. The receiver shall be able to tolerate, without damage, continuous exposure to an optical signal having this average power level.
4. Average receive power (min) 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.
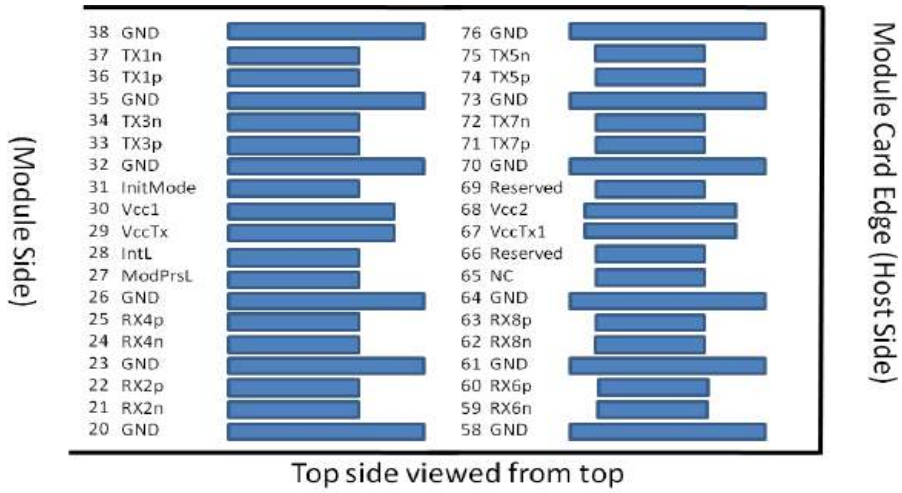
5. Measured with conformance test signal at TP3 for BER = 2.4x10-4. A compliant receiver shall have stressed receiver sensitivity (OMA outer), each lane values below the mask, for SECQ values between 0.9 and 3.4 dB.

Pin Descriptions

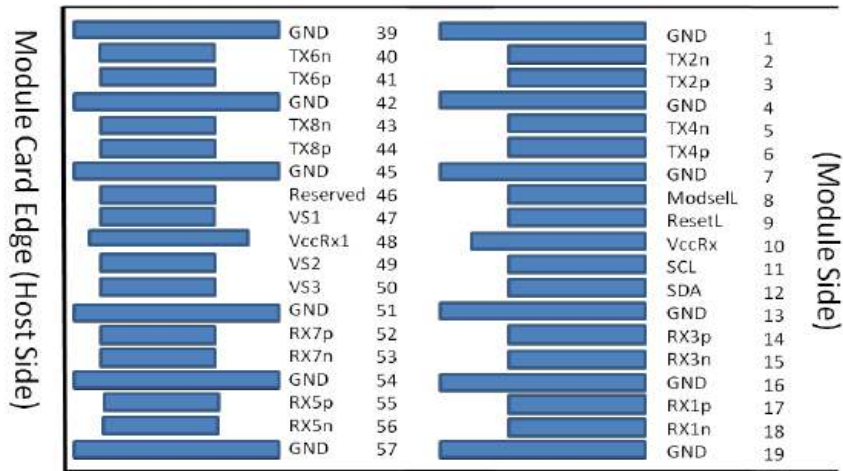| Pin	Logic	Symbol	Name/Descriptions	Plug Sequence
1		GND	Ground	1B
2	CML-I	Tx2n	Transmitter Inverted Data Input	3B
3	CML-I	Tx2p	Transmitter Non-Inverted Data Input	3B
4		GND	Ground	1B
5	CML-I	Tx4n	Transmitter Inverted Data Input	3B
6	CML-I	Tx4p	Transmitter Non-Inverted Data Input	3B
7		GND	Ground	1B
8	LVTTL-I	ModSelL	Module Select	3B
9	LVTTL-I	ResetL	Module Reset	3B
10		VccRx	+3.3V Power Supply Receiver	2B
11	LVCMOS-I/O	SCL	2-wire serial interface clock	3B
12	LVCMOS-I/O	SDA	2-wire serial interface data	3B
13		GND	Ground	1B
14	CML-O	Rx3p	Receiver Non-Inverted Data Output	3B
15	CML-O	Rx3n	Receiver Inverted Data Output	3B
16	GND	Ground	1B	
17	CML-O	Rx1p	Receiver Non-Inverted Data Output	3B
18	CML-O	Rx1n	Receiver Inverted Data Output	3B
19		GND	Ground	1B
20		GND	Ground	1B
21	CML-O	Rx2n	Receiver Inverted Data Output	3B
22	CML-O	Rx2p	Receiver Non-Inverted Data Output	3B
23		GND	Ground	1B
24	CML-O	Rx4n	Receiver Inverted Data Output	3B
25	CML-O	Rx4p	Receiver Non-Inverted Data Output	3B
26		GND	Ground	1B
27	LVTTL-O	ModPrsL	Module Present	3B
28	LVTTL-O	IntL	Interrupt	3B
29		VccTx	+3.3V Power supply transmitter	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	Ground	1B
33	CML-I	Tx3p	Transmitter Non-Inverted Data Input	3B
34	CML-I	Tx3n	Transmitter Inverted Data Input	3B

35		GND	Ground	1B
36	CML-I	Tx1p	Transmitter Non-Inverted Data Input	3B
37	CML-I	Tx1n	Transmitter Inverted Data Input	3B
38		GND	Ground	1B
39		GND	Ground	1A
40	CML-I	Tx6n	Transmitter Inverted Data Input	3A
41	CML-I	Tx6p	Transmitter Non-Inverted Data Input	3A
42		GND	Ground	1A
43	CML-I	Tx8n	Transmitter Inverted Data Input	3A
44	CML-I	Tx8p	Transmitter Non-Inverted Data Input	3A
45		GND	Ground	1A
46		Reserved	For future use	3A
47		VS1	Module Vendor Specific 1	3A
48		VccRx1	3.3V Power Supply	2A
49		VS2	Module Vendor Specific 2	3A
50		VS3	Module Vendor Specific 3	3A
51		GND	Ground	1A
52	CML-O	Rx7p	Receiver Non-Inverted Data Output	3A
53	CML-O	Rx7n	Receiver Inverted Data Output	3A
54		GND	Ground	1A
55	CML-O	Rx5p	Receiver Non-Inverted Data Output	3A
56	CML-O	Rx5n	Receiver Inverted Data Output	3A
57		GND	Ground	1A
58		GND	Ground	1A
59	CML-O	Rx6n	Receiver Inverted Data Output	3A
60	CML-O	Rx6p	Receiver Non-Inverted Data Output	3A
61		GND	Ground	1A
62	CML-O	Rx8n	Receiver Inverted Data Output	3A
63	CML-O	Rx8p	Receiver Non-Inverted Data Output	3A
67		GND	Ground	1A
68		NC	No Connect	3A
69		Reserved	For future use	3A
70		VccTx1	3.3V Power Supply	2A
71		Vcc2	3.3V Power Supply	2A
72		Reserved	For Future Use	3A
73		GND	Ground	1A
74	CML-I	Tx7p	Transmitter Non-Inverted Data Input	3A
75	CML-I	Tx7n	Transmitter Inverted Data Input	3A
76		GND	Ground	1A

QSFPDD Connector Pin Definition

(Module Side) — **Module Card Edge (Host Side)**

	Legacy QSFP28 Pads	Additional QSFP-DD Pads	
38	GND	76	GND
37	TX1n	75	TX5n
36	TX1p	74	TX5p
35	GND	73	GND
34	TX3n	72	TX7n
33	TX3p	71	TX7p
32	GND	70	GND
31	InitMode	69	Reserved
30	Vcc1	68	Vcc2
29	VccTx	67	VccTx1
28	IntL	66	Reserved
27	ModPrsL	65	NC
26	GND	64	GND
25	RX4p	63	RX8p
24	RX4n	62	RX8n
23	GND	61	GND
22	RX2p	60	RX6p
21	RX2n	59	RX6n
20	GND	58	GND

Top side viewed from top

Legacy QSFP28 Pads — Additional QSFP-DD Pads

Module Card Edge (Host Side) — **(Module Side)**

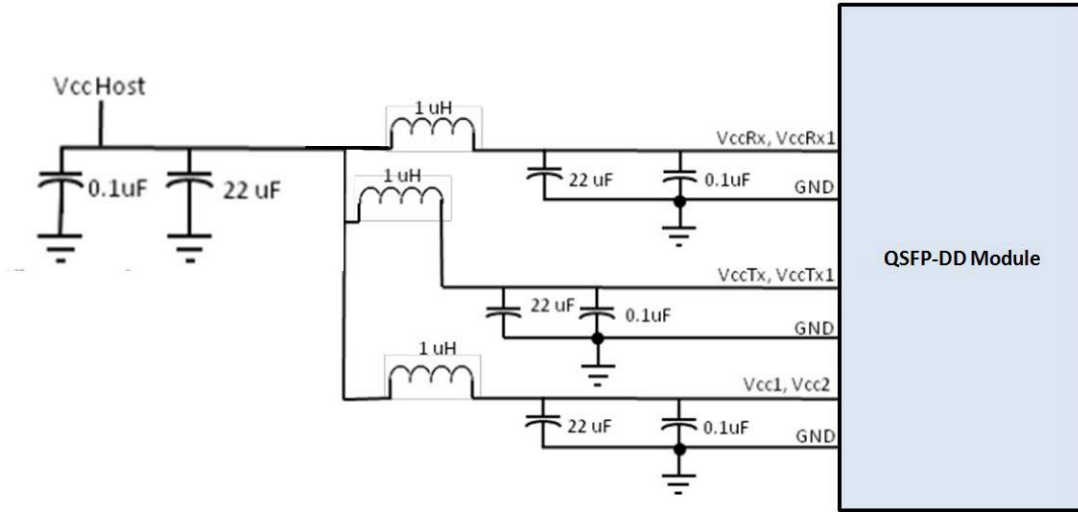| Additional QSFP-DD Pads		Legacy QSFP28 Pads	
GND	39	GND	1
TX6n	40	TX2n	2
TX6p	41	TX2p	3
GND	42	GND	4
TX8n	43	TX4n	5
TX8p	44	TX4p	6
GND	45	GND	7
Reserved	46	ModselL	8
VS1	47	ResetL	9
VccRx1	48	VccRx	10
VS2	49	SCL	11
VS3	50	SDA	12
GND	51	GND	13
RX7p	52	RX3p	14
RX7n	53	RX3n	15
GND	54	GND	16
RX5p	55	RX1p	17
RX5n	56	RX1n	18
GND	57	GND	19

Bottom side viewed from bottom

Additional QSFP-DD Pads — Legacy QSFP28 Pads

Recommended Power Supply Filter

Digital Diagnostic Functions

The following digital diagnostic characteristics are defined over the normal operating conditions unless otherwise specified.

Parameter	Accuracy
Module Monitor 1: Temperature	± 3 C
Module Monitor 2: Supply 3.3 voltage	± 0.1 V
Lane Monitor: TX output optical power	± 3 dB
Lane Monitor: TX bias current	± 10 %
Lane Monitor: RX input optical power	± 3 dB

Mechanical Specifications
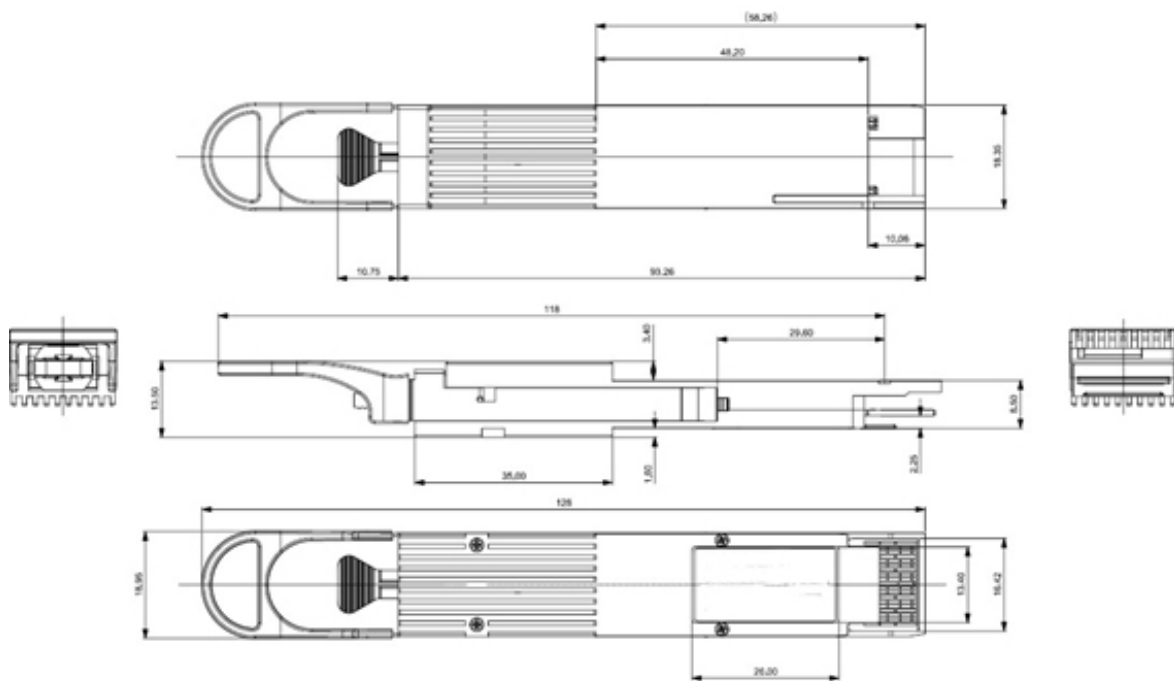
About ProLabs

Our experience comes as standard; for over 15 years ProLabs has delivered optical connectivity solutions that give our customers freedom and choice through our ability to provide seamless interoperability. At the heart of our company is the ability to provide state-of-the-art optical transport and connectivity solutions that are compatible with over 90 optical switching and transport platforms.

Complete Portfolio of Network Solutions

ProLabs is focused on innovations in optical transport and connectivity. The combination of our knowledge of optics and networking equipment enables ProLabs to be your single source for optical transport and connectivity solutions from 100Mb to 400G while providing innovative solutions that increase network efficiency. We provide the optical connectivity expertise that is compatible with and enhances your switching and transport equipment.

Trusted Partner

Customer service is our number one value. ProLabs has invested in people, labs and manufacturing capacity to ensure that you get immediate answers to your questions and compatible product when needed. With Engineering and Manufacturing offices in the U.K. and U.S. augmented by field offices throughout the U.S., U.K. and Asia, ProLabs is able to be our customers best advocate 24 hours a day.

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