

Q400G-4Q56G-AOC7M-MX-C

Mellanox® Compatible TAA 400GBase-AOC QSFP-DD to 4xQSFP56 PAM-4 Active Optical Cable (850nm, MMF, 7m)

Features:

- Low latency DSP-free electronics-based CDR
- Multi-data rate up to 56.15 Gb/s per lane
- PAM4 modulation
- Single 3.3 V power supply
- Low power consumption: 7.6W on 400G end, 2.3W on 100G end with all CDRs enabled
- QSFP-DD MSA compliant
- CMIS 4.0 compliant
- Commercial temperature 0 to 70 Celsius
- Hot pluggable
- RoHS compliant and lead-free
- LSZH-rated cable
- IEEE 802.3cm



Applications:

- 400GBase Ethernet
- Data center: Switches, servers, storages and NIC adapters

Product Description

This is a Mellanox® compatible 400GBase-AOC QSFP-DD to 4xQSFP56 active optical cable that operates over multi-mode fiber with a maximum reach of 7.0m (23.0ft). At a wavelength of 850nm, it has been programmed, uniquely serialized, and data-traffic and application tested to ensure it is 100% compliant and functional. This active optical cable is TAA (Trade Agreements Act) compliant, and is built to comply with MSA (Multi-Source Agreement) standards. 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.")



Absolute Maximum Ratings

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Supply Voltage	VIN	0		4.0	V	
Input Swing	VIN-MAX			1500	mVpp	
Storage Temperature	TSTG	-40		85	°C	Ambient
Operating Case Temperature	Top	0		70	°C	
Relative Humidity	RH	5		85	%	

Electrical Specifications

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Data Rate (Per Channel)	BR		26.5625		GBd	
Power Supply Voltage	VCC	3.15	3.30	3.47	V	
Power Supply Current	400G End	ICC		2300	mA	1
	100G End	ICC		680	mA	1
Power Consumption	400G End	P		7.6	W	1
	100G End	P		2.3	W	1
Transmitter						
Input Differential Impedance	RIN		100		Ω	
Diff. Pk-Pk Input Vol. Tolerance	VINP-P	900			mV	
Receiver						
Output Differential Impedance	ROUT		100		Ω	
Differential Data Output Swing	VOUTP-P	700	800	900	mV	
Bit Error Ratio (at 26.5625 GBd)				2.4×10-4		3

Notes:

1. Per end, all channel CDRs are enabled.
2. Pre-FEC Bit Error Ratio with a PRBS 231 – 1 test pattern over a normal operating temperature range.

Pin Descriptions (QSFP-DD 400G End)

PIN	Logic	Symbol	Description	Notes
1		GND	Ground	1
2	CML-I	Tx2n	Transmitter Inverted Data Input	
3	CML-I	Tx2p	Transmitter Non-Inverted Data Input	
4		GND	Ground	1
5	CML-I	Tx4n	Transmitter Inverted Data Input	
6	CML-I	Tx4p	Transmitter Non-Inverted Data Input	
7		GND	Ground	1
8	LVTTL-I	ModSell	Module Select	
9	LVTTL-I	ResetL	Module Reset	
10		VccRx	+3.3V Power Supply Receiver	2
11	LVCMOS-I/O	SCL	2-wire serial interface clock	
12	LVCMOS-I/O	SDA	2-wire serial interface data	
13		GND	Ground	1
14	CML-O	Rx3p	Receiver Non-Inverted Data Output	
15	CML-O	Rx3n	Receiver Inverted Data Output	
16		GND	Ground	1
17	CML-O	Rx1p	Receiver Non-Inverted Data Output	
18	CML-O	Rx1n	Receiver Inverted Data Output	
19		GND	Ground	1
20		GND	Ground	1
21	CML-O	Rx2n	Receiver Inverted Data Output	
22	CML-O	Rx2p	Receiver Non-Inverted Data Output	
23		GND	Ground	1
24	CML-O	Rx4n	Receiver Inverted Data Output	
25	CML-O	Rx4p	Receiver Non-Inverted Data Output	
26		GND	Ground	1
27	LVTTL-O	ModPrsL	Module Present	
28	LVTTL-O	IntL	Interrupt	
29		VccTx	+3.3V Power Supply Transmitter	2
30		Vccl	+3.3V Power Supply	2
31	LVTTL-I	InitMode	Initialization mode; In legacy QSFP applications, the InitMode pad is called LPMODE	
32		GND	Ground	1
33	CML-I	Tx3p	Transmitter Non-Inverted Data Input	
34	CML-I	Tx3n	Transmitter Inverted Data Input	
35		GND	Ground	1
36	CML-I	Tx1p	Transmitter Non-Inverted Data Input	
37	CML-I	Tx1n	Transmitter Inverted Data Input	
38		GND	Ground	1

PIN		Symbol	Description	Notes
39		GND	Ground	1
40	CML-I	Tx6n	Transmitter Inverted Data Input	
41	CML-I	Tx6p	Transmitter Non-Inverted Data Input	
42		GND	Ground	1
43	CML-I	Tx8n	Transmitter Inverted Data Input	
44	CML-I	Tx8p	Transmitter Non-Inverted Data Input	
45		GND	Ground	1
46		Reserved	For future use	3
47		VSI	Module Vendor Specific 1	3
48		VccRx1	3.3V Power Supply	2
49		VS2	Module Vendor Specific 2	3
50		VS3	Module Vendor Specific 3	3
51		GND	Ground	1
52	CML-O	Rx7p	Receiver Non-Inverted Data Output	
53	CML-O	Rx7n	Receiver Inverted Data Output	
54		GND	Ground	1
55	CML-O	Rx5p	Receiver Non-Inverted Data Output	
56	CML-O	Rx5n	Receiver Inverted Data Output	
57		GND	Ground	1
58		GND	Ground	1
59	CML-O	Rx6n	Receiver Inverted Data Output	
60	CML-O	Rx6p	Receiver Non-Inverted Data Output	
61		GND	Ground	1
62	CML-O	Rx8n	Receiver Inverted Data Output	
63	CML-O	Rx8p	Receiver Non-Inverted Data Output	
64		GND	Ground	1
65		NC	No Connect	3
66		Reserved	For future use	3
67		VccTx1	3.3V Power Supply	2
68		Vcc2	3.3V Power Supply	2
69		Reserved	For future use	3
70		GND	Ground	1
71	CML-I	Tx7p	Transmitter Non-Inverted Data Input	
72	CML-I	Tx7n	Transmitter Inverted Data Input	
73		GND	Ground	1
74	CML-I	Tx5p	Transmitter Non-Inverted Data Input	
75	CML-I	Tx5n	Transmitter Inverted Data Input	
76		GND	Ground	1

Notes:

1. QSFP-DD uses common ground (GND) for all signals and supply (power). All are common within the QSFP-DD module and all module voltages are referenced to this potential unless otherwise noted. Connect these directly to the host board signal-common ground plane.
2. VccRx, VccRx1, Vcc1, Vcc2, VccTx and VccTx1 shall be applied concurrently. Requirements defined for the host side of the Host Card Edge Conn\ector are listed in Table 6. VccRx, VccRx1, Vcc1, Vcc2, VccTx and VccTx1 may be internally connected within the module in any combination. The connector Vcc pins are each rated for a maximum current of 1000 mA.
3. All Vendor Specific, Reserved and No Connect pins may be terminated with 50 ohms to ground on the host. Pad 65 (No Connect) shall be left unconnected within the module. Vendor specific and Reserved pads shall have an impedance to GND that is greater than 10 kOhms and less than 100 pF.
4. Plug Sequence specifies the mating sequence of the host connector and module. The sequence is 1A, 2A, 3A, 1B, 2B, 3B. (see Figure 2 for pad locations) Contact sequence A will make, then break contact with additional QSFP-DD pads. Sequence 1A, 1B will then occur simultaneously, followed by 2A, 2B, followed by 3A,3B.

Electrical Pin-out Details (QSFP-DD 400G End)

(Module Side)
Top side viewed from top
Module Card Edge (Host Side)

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

(Module Side)
Bottom side viewed from bottom
Module Card Edge (Host Side)

	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

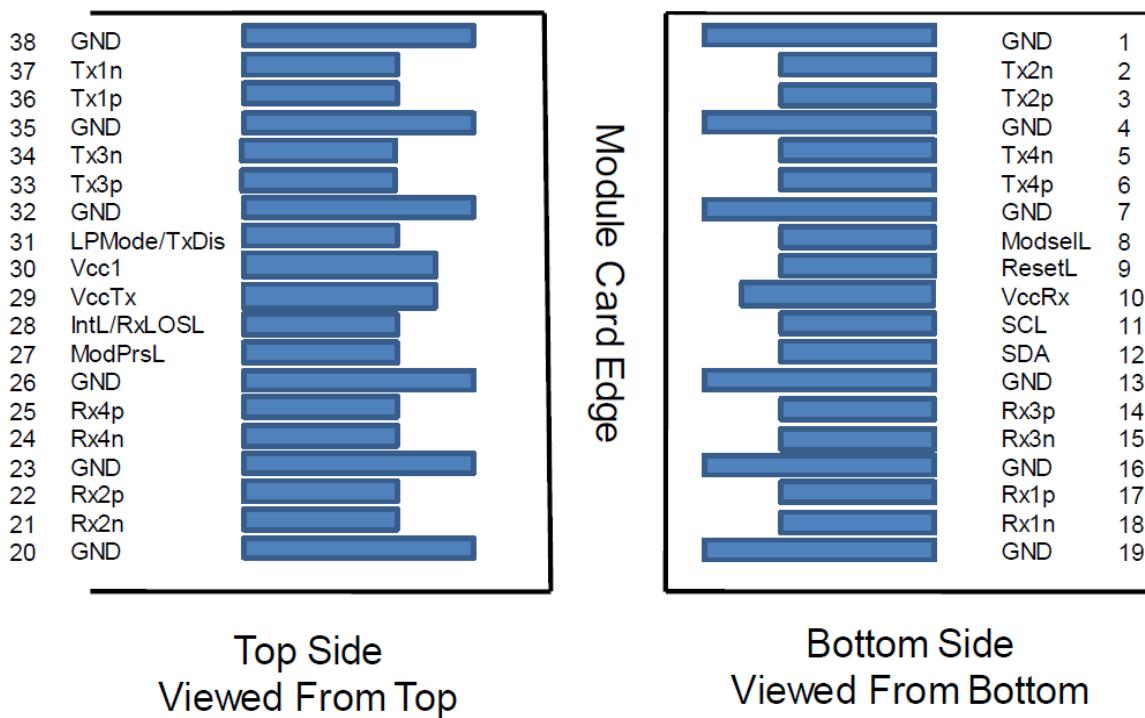
Pin Descriptions (QSFP56 100G End)

PIN	Logic	Symbol	Description	Notes
1		GND	Ground	1
2	CML-I	Tx2n	Transmitter Inverted Data Input	
3	CML-I	Tx2p	Transmitter Non-Inverted Data Input	
4		GND	Ground	1
5	CML-I	Tx4n	Transmitter Inverted Data Input	3
6	CML-I	Tx4p	Transmitter Non-Inverted Data Input	3
7		GND	Ground	1
8	LVTTL-I	ModSell	Module Select	
9	LVTTL-I	ResetL	Module Reset	
10		Vcc Rx	+3.3V Power supply receiver	2
11	LVCMOS-I/O	SCL	2-wire serial interface clock	
12	LVCMOS-I/O	SDA	2-wire serial interface data	
13		GND	Ground	1
14	CML-O	Rx3p	Receiver Non-Inverted Data Output	3
15	CML-O	Rx3n	Receiver Inverted Data Output	3
16		GND	Ground	1
17	CML-O	Rx1p	Receiver Non-Inverted Data Output	
18	CML-O	Rx1n	Receiver Inverted Data Output	
19		GND	Ground	1
20		GND	Ground	1
21	CML-O	Rx2n	Receiver Inverted Data Output	
22	CML-O	Rx2p	Receiver Non-Inverted Data Output	
23		GND	Ground	1
24	CML-O	Rx4n	Receiver Inverted Data Output	3
25	CML-O	Rx4p	Receiver Non-Inverted Data Output	3
26		GND	Ground	1
27	LVTTL-O	ModPrsL	Module Present	
28	LVTTL-O	IntL	Interrupt	
29		Vcc Tx	+3.3V Power supply transmitter	2
30		Vcc 1	+3.3V Power Supply	2
31	LVTTL-I	LPMode	Low Power Mode	
32		GND	Ground	1
33	CML-I	Tx3p	Transmitter Non-Inverted Data Input	3
34	CML-I	Tx3n	Transmitter Inverted Data Input	3
35		GND	Ground	1
36	CML-I	Tx1p	Transmitter Non-Inverted Data Input	
37	CML-I	Tx1n	Transmitter Inverted Data Input	
38		GND	Ground	1

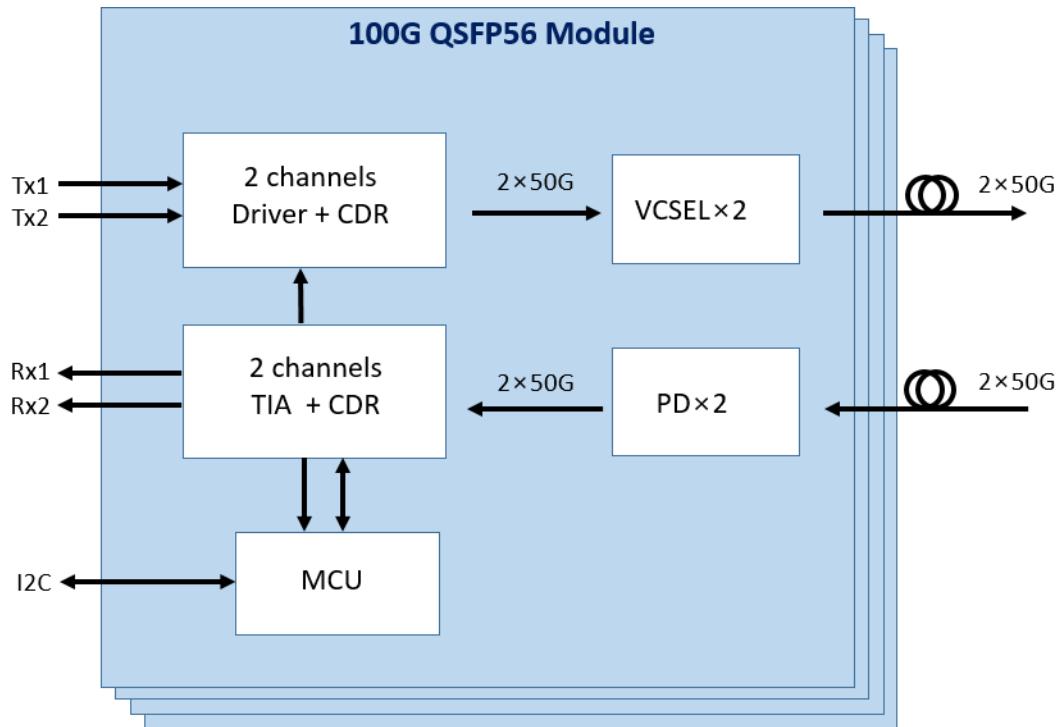
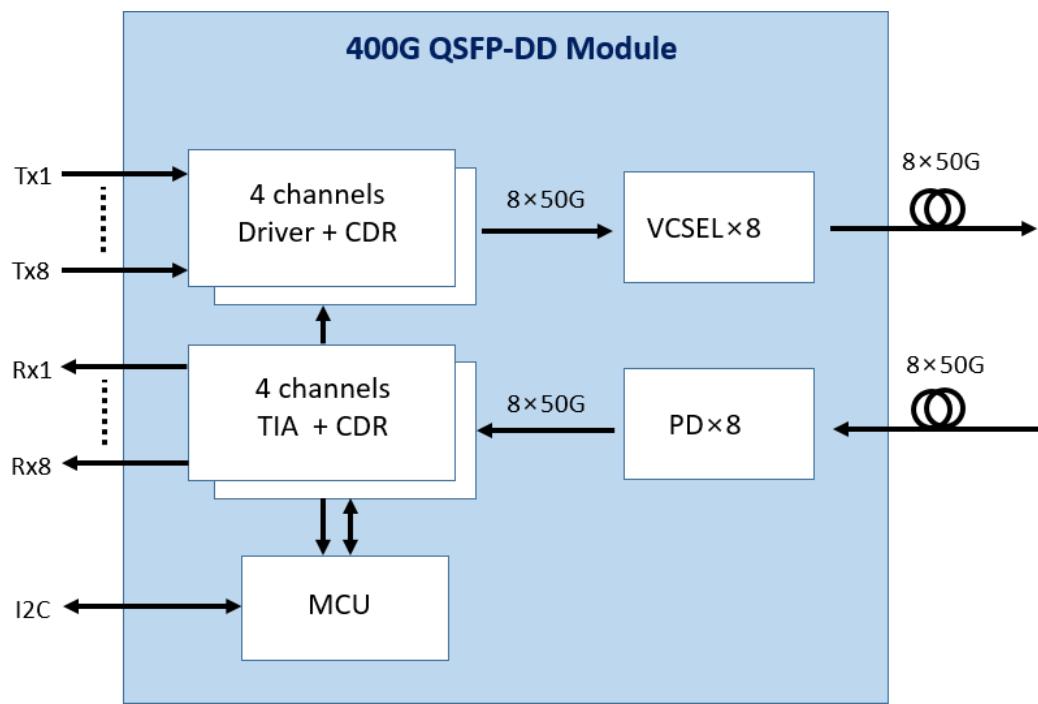
Notes:

1. GND is the symbol for signal and supply (power) common for the QSFP module. All are common within the QSFP module and all module voltages are referenced to this potential unless otherwise noted. Connect these directly to the host board signal-common ground plane.
2. Vcc Rx, Vcc1 and Vcc Tx are the receiver and transmitter power supplies and shall be applied concurrently. Vcc Rx, Vcc1 and Vcc Tx may be internally connected within the QSFP transceiver module in any combination. The connector pins are each rated for a maximum current of 500 mA.
3. Not used

Electrical Pin-out Details (QSFP56 100G End)



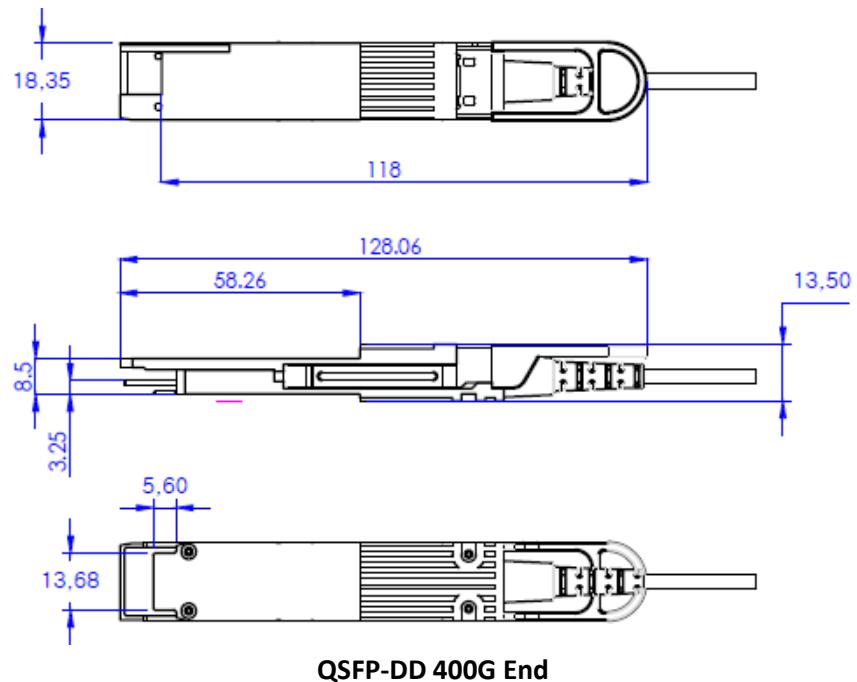
Block Diagram



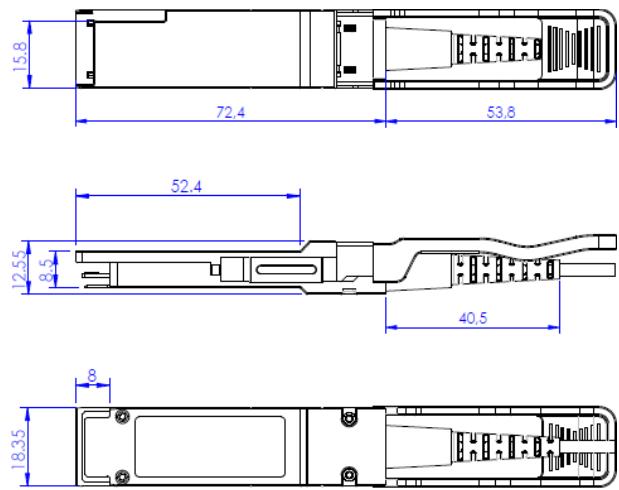
Active Optical Cable Specifications

Parameter	Value	Unit	Note
Cable Diameter	LSZH: $\varnothing 3.0 \pm 0.15$	mm	
Minimum Bend Radius	30	mm	Without tension
Length Tolerance	+300 / -0	mm	
Cable Jacket	LSZH, Aqua		

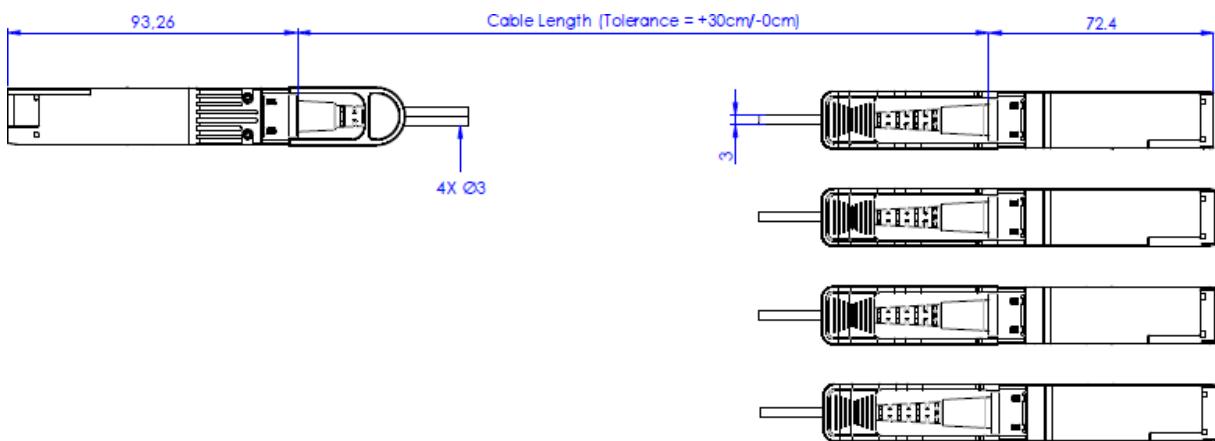
Mechanical Specifications



QSFP-DD 400G End



QSFP56 100G End



About ProLabs

Our extensive experience comes as standard. For over 20 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 more than 100 optical switching and transport platforms.

A 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 1.6T 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.

The Trusted Partner

Customer service is our number one value. ProLabs has invested in people, labs and manufacturing capacity to ensure compatible products, and immediate answers to your questions. 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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