

SFP-10GB-DW-C-40-C

MSA and TAA 10GBase-DWDM 50GHz SFP+ Transceiver (SMF, Tunable, 40km, LC, DOM)

Features:

- SFF-8432 and SFF-8472 Compliance
- Duplex LC 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:

- 10x Gigabit Ethernet over DWDM
- 8x/10x Fibre Channel
- Access, Metro and Enterprise

Product Description

This MSA Compliant SFP+ transceiver provides 10GBase-DWDM throughput up to 40km over single-mode fiber (SMF) using a wavelength of 1530nm to 1565nm via 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. 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."



100GHz Duplex Full Band Auto-Tune Channel Map

| Channel | Frequency (THz) | Wavelength (nm) | Channel | Frequency (THz) | Wavelength (nm) |
|---------|-----------------|-----------------|---------|-----------------|-----------------|
| 14 | 191.4 | 1566.31 | 38 | 193.8 | 1546.92 |
| 15 | 191.5 | 1565.5 | 39 | 193.9 | 1546.12 |
| 16 | 191.6 | 1564.68 | 40 | 194.0 | 1545.32 |
| 17 | 191.7 | 1563.86 | 41 | 194.1 | 1544.53 |
| 18 | 191.8 | 1563.05 | 42 | 194.2 | 1543.73 |
| 19 | 191.9 | 1562.23 | 43 | 194.3 | 1542.94 |
| 20 | 192.0 | 1561.42 | 44 | 194.4 | 1542.14 |
| 21 | 192.1 | 1560.61 | 45 | 194.5 | 1541.35 |
| 22 | 192.2 | 1559.79 | 46 | 194.6 | 1540.56 |
| 23 | 192.3 | 1558.98 | 47 | 194.7 | 1539.77 |
| 24 | 192.4 | 1558.17 | 48 | 194.8 | 1538.98 |
| 25 | 192.5 | 1557.36 | 49 | 194.9 | 1538.19 |
| 26 | 192.6 | 1556.55 | 50 | 195.0 | 1537.4 |
| 27 | 192.7 | 1555.75 | 51 | 195.1 | 1536.61 |
| 28 | 192.8 | 1554.94 | 52 | 195.2 | 1535.82 |
| 29 | 192.9 | 1554.13 | 53 | 195.3 | 1535.04 |
| 30 | 193.0 | 1553.33 | 54 | 195.4 | 1534.25 |
| 31 | 193.1 | 1552.52 | 55 | 195.5 | 1533.47 |
| 32 | 193.2 | 1551.72 | 56 | 195.6 | 1532.68 |
| 33 | 193.3 | 1550.92 | 57 | 195.7 | 1531.9 |
| 34 | 193.4 | 1550.12 | 58 | 195.8 | 1531.12 |
| 35 | 193.5 | 1549.32 | 59 | 195.9 | 1530.33 |
| 36 | 193.6 | 1548.51 | 60 | 196.0 | 1529.55 |
| 37 | 193.7 | 1547.72 | 61 | 196.1 | 1528.77 |

Absolute Maximum Ratings

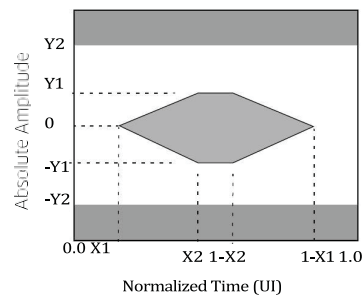
| Parameter | Symbol | Min. | Max. | Unit | Notes |
|----------------------------|--------|------|------|------|---------|
| Maximum Supply Voltage | VCCT | 0 | +3.6 | V | +3.3V |
| Maximum Supply Voltage | VCCR | 0 | +3.6 | V | +3.3V |
| Storage Temperature | TS | -40 | 85 | °C | |
| Operating Case Temperature | Tc | 0 | 70 | °C | |
| Optical Receiver Input | PIMAX | | +5 | dBm | Average |
| ESD SFI pins | ESD1 | | 1 | kV | HBM |
| ESD except for SFI pins | ESD2 | | 2 | kV | HBM |

Electrical Characteristics

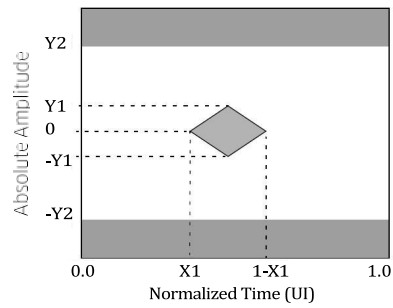
| Parameter | Symbol | Min. | Typ. | Max. | Unit | Notes |
|---|--------|-------|-------|-------|------|-------|
| Supply Voltage | VCCT | 3.135 | 3.300 | 3.465 | V | |
| Supply Voltage | VCCR | 3.135 | 3.300 | 3.465 | V | |
| Supply Current | Icc3 | | | 0.73 | A | |
| Power Consumption | PDS | | | 2.3 | W | |
| Transmitter Electrical Characteristics at B'' | | | | | | |
| Eye mask | X1 | | | 0.12 | UI | 1 |
| Eye mask | X2 | | | 0.33 | UI | 1 |
| Eye mask | Y1 | 95 | | | mV | 1 |
| Eye mask | Y2 | | | 350 | mV | 1 |
| Receiver Electrical Characteristics at C' | | | | | | |
| Eye mask | X1 | | | 0.35 | UI | 2 |
| Eye mask | Y1 | 150 | | | mV | 2 |
| Eye mask | Y2 | | | 425 | mV | 2 |

Notes:

1. Eye mask at B''



2. Eye mask at C'



Inrush Current

| Parameter | Symbol | Min. | Max. | Unit | Notes |
|--|--------|------|------|------|-------|
| I _{cc} instantaneous peak current | | | 800 | mA | 1, 2 |
| I _{cc} sustained peak current | | | 600 | mA | 1, 2 |

Notes:

1. The maximum currents are the allowed currents for each power supply V_{ccT} or V_{ccR}, therefore the total module peak currents can be twice this value. The instantaneous peak current is allowed to exceed the specified maximum current capacity of the connector contact for a short period.
2. Not to exceed the sustained peak limit for more than 50 μ s; may exceed this limit for shorter durations

Optical Characteristics

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Notes |
|---|---------------------|--------|------|--------|--------|-------------------|
| Transmitter | | | | | | |
| Data Rate | | 1.2 | | 11.3 | Gbit/s | NRZ |
| Optical Extinction Ratio | ER | 8.2 | | | dB | 1 |
| Side Mode Suppression Ratio | SMSR | 35 | | | dB | 2 |
| Frequency Range | | 191.35 | | 196.10 | THz | 4 |
| Frequency Accuracy | | -2.5 | | +2.5 | GHz | EOL |
| Optical Transmit Power | Po | -1.0 | | +3.0 | dBm | EOL |
| Shuttered Output power | | | | -35 | dBm | |
| Optical power stability | ΔPo | -1.0 | | +1.0 | dB | All channels, SOL |
| Spectral Width (-20dB) | Δλ | | 0.3 | 0.5 | nm | modulated |
| Tuning speed | | | | 10 | sec | 5 |
| Mask margin | | 10 | | | % | |
| Eye Diagram | GR-253, ITU-T G.691 | | | | | |
| Receiver | | | | | | |
| Input Operating Wavelength | | 1525 | | 1575 | nm | |
| Data Rate | | 1.2 | | 11.3 | Gbit/s | NRZ |
| Minimum Receiver Sensitivity (Back to back) | Prmin | | | -24 | dBm | 3 |
| Minimum Receiver Sensitivity (+1100ps/nm) | Prmin | | | -23 | dBm | 3 |
| Minimum Receiver Sensitivity (-300 to +1400ps/nm) | Prmin | | | -21 | dBm | 3 |
| Maximum input power (overload) | Pro | -7 | | | dBm | 3 |
| Receiver Reflectance | RL | | | -27 | dB | |
| LOS assert | | -27.5 | | | dBm | |
| LOS de-assert | | | | -24 | dBm | |
| LOS Hysteresis | | 0.1 | | | dB | |
| LOS assert time | | | | 100 | us | |
| LOS de-assert time | | | | 100 | us | |

Notes:

1. Filtered, 10.3Gb/s
2. ± 2.5 nm, modulated
3. 10.3Gb/s, 1E-12, OSNR>35dB
4. 50GHz grid, 96 channels
5. Warmed-up, from any CH to any other CH

Auto Tuning

The auto tuning process is a host independent scheme. When the TSFP+ modules with auto-tuning implemented are inserted into the corresponding electrical ports at a central office and a remote site, both modules will automatically start the automatic tuning process.

The process ensures that the TSFP+ modules tune to the channel defined by the DWDM filter (MUX/DeMUX) which both modules are connected to. The first module to converge on the correct channel initiates a unique process, which helps both sides of the link communicate properly.

After completion of the auto-tune process, both modules fix their wavelengths and move into normal 10 Gbit/s operation. A LOS condition, a shutdown condition (Tx Disable) and a power cycle shall trigger a restart of the auto tuning process.

The TSFP+ module shall appear as a regular Tunable product to the host system once Auto-tune is completed.

Tuning Parameter

| Parameter | Min | Max | Unit | Description |
|--|----------------------------|-------|--------|--------------------------|
| Channel to Channel Switch Time During Tuning | | 3.256 | s | |
| Tuning Convergence Time | | 340 | s | Not including cold start |
| Timeout (t1) | 400 | | s | |
| LOS Timeout (t2) | 15 | 16 | s | |
| Default Channel | 191.35 | | THz | |
| Channel Sequence | 191.35 191.40,...,196.1 | | THz | 50GHz grid |
| Modulation Rate | 125 | | Baud/s | Manchester encoding |
| Bit Rate | 62.5 | | Bit/s | |

The TSFP+ module shall follow standard MSA behavior according to SFF-8472 and SFF-8690 with the following exceptions:

- During the auto-tune phase, the TSFP+ shall accept host tuning command and restart the auto-scanning from the channel set by host
- When the auto-tune phase is completed and the operational state is reached, the TSFP+ shall accept host tuning commands and set the channel accordingly (just a pure wavelength switch, no message protocol)
- When a loss-of-signal occurs (after a 15s time-out) the TSFP+ shall go back into the auto-tune phase

SFP+ Module Timing

In the table below figures are shown the required timing for TX_Fault and TX_Disable in various conditions. For more detail, please refer to SFF-8431.

| Parameter | Symbol | Min. | Max. | Unit | Conditions |
|---|--------------------|------|------|------|--|
| TX_disable assert time | t_off | | 100 | μs | 1 |
| TX_disable negate time | T_on | | 2 | ms | 2 |
| Time to initialize 2-wire interface | t_2w_start_up | | 300 | ms | 3 |
| Time to initialize cooled module and time to power up a cooled module to Power Level II | t_start_up_cooled | | 90 | sec | 4 |
| Tx_fault assert for cooled module | Tx_fault_on_cooled | | 1 | ms | From occurrence of fault to assertion of TX_Fault |
| Tx_fault_reset | t_reset | 10 | | μs | Time TX_disable must be held high to reset TX_Fault. |
| RX_LOS assert delay | t_los_on | | 100 | μs | 5 |
| RX_LOS negate delay | t_los_off | | 100 | μs | 6 |

Conditions:

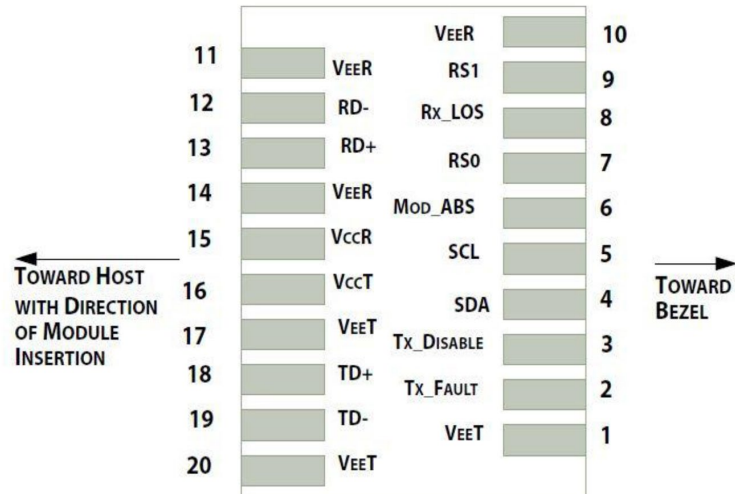
1. Rising edge of TX_disable to fall of output signal below 10% of nominal.
2. Falling edge of TX_disable to rise of output signal above 90% of nominal. This only applies in normal operation, not during start up or fault recovery.
3. From power on or hot plug after the supply meeting as shown in Electrical Characteristics table.
4. From power supplies meeting as shown in Electrical Characteristics table or hot plug, or Tx disable negated during power up or Tx_fault recovery, until cooled power level II part during fault recovery is fully operational. Also, from stop bit low-to- high SDA transition enabling power level II until cooled module is fully operational.
5. From occurrence of loss of signal to assertion of RX_LOS
6. From occurrence of presence of signal to negation of RX_LOS

Pin Descriptions

| Pin | Symbol | Name/Descriptions | Ref. |
|-----|------------|--|------|
| 1 | VeeT | Transmitter Ground (Common with Receiver Ground). | 1 |
| 2 | TX Fault | Transmitter Fault. LVTTTL-O | 2 |
| 3 | TX Disable | Transmitter Disable. Laser output disabled on high or open. LVTT-I. | 3 |
| 4 | SDA | 2-Wire Serial Interface Data Line (Same as MOD-DEF2 in INF-8074i). LVTTTL-I/O. | |
| 5 | SCL | 2-Wire Serial Interface Data Line (Same as MOD-DEF2 in INF-8074i). LVTTTL-I. | |
| 6 | MOD_ABS | Module Absent, Connect to VeeT or VeeR in Module. | 4 |
| 7 | RS0 | Rate Select 0. Not used | 5 |
| 8 | LOS | Loss of Signal indication. Logic 0 indicates normal operation. LVTTTL-O. | 2 |
| 9 | RS1 | Rate Select 1. Not used | 5 |
| 10 | VeeR | Receiver Ground (Common with Transmitter Ground). | 1 |
| 11 | VeeR | Receiver Ground (Common with Transmitter Ground). | 1 |
| 12 | RD- | Receiver Inverted DATA out. AC Coupled. CML-O. | |
| 13 | RD+ | Receiver Non-inverted DATA out. AC Coupled. CML-O. | |
| 14 | VeeR | Receiver Ground (Common with Transmitter Ground). | 1 |
| 15 | VccR | Receiver Power Supply. | |
| 16 | VccT | Transmitter Power Supply. | |
| 17 | VeeT | Transmitter Ground (Common with Receiver Ground). | 1 |
| 18 | TD+ | Transmitter Non-Inverted DATA in. AC Coupled. CML-I. | |
| 19 | TD- | Transmitter Inverted DATA in. AC Coupled. CML-O. | |
| 20 | VeeT | Transmitter Ground (Common with Receiver Ground). | 1 |

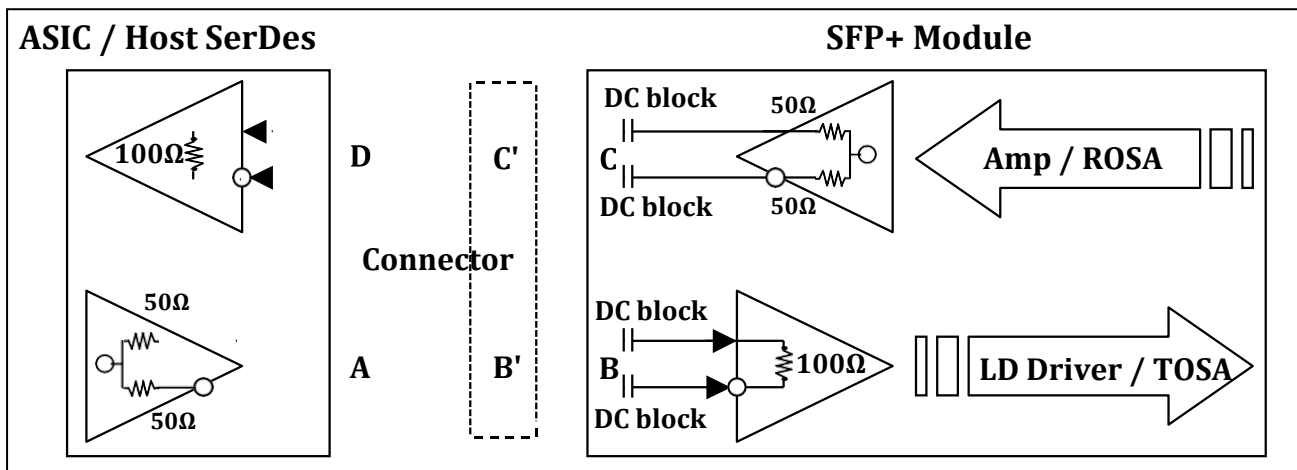
Notes:

1. The module signal ground contacts, VeeR and VeeT, should be isolated from the module case.
2. This contact is an open collector/drain output and should be pulled up to the Vcc_Host with resistor in the range 4.7KΩ to 10KΩ. Pull ups can be connected to one or several power supplies, however the host board design shall ensure that no module contract has voltage exceeding module VccT/R +0.5.V.
3. Tx_Disable is an input contact with a 4.7KΩ to 10KΩ pull-up resistor to VccT inside module.
4. Mod_ABS is connected to VeeT or VeeR in the SFP+ module. The host may pull the contract up to Vcc_Host with a resistor in the range from 4.7KΩ to 10KΩ. Mod_ABS is asserted "High" when the SFP+ module is physically absent from a host slot.
5. Internally pulled down per SFF-8431

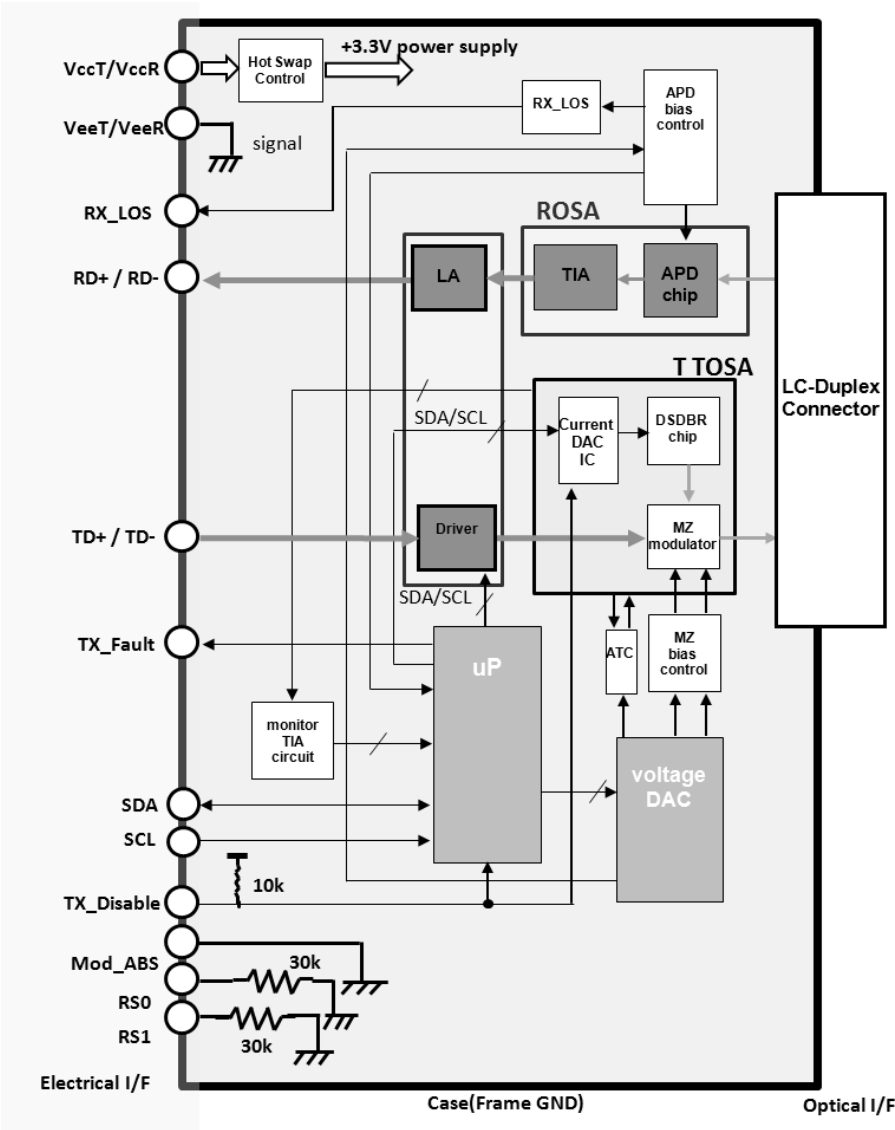


Pin-out of connector Block on Host board

SFI Data Interface

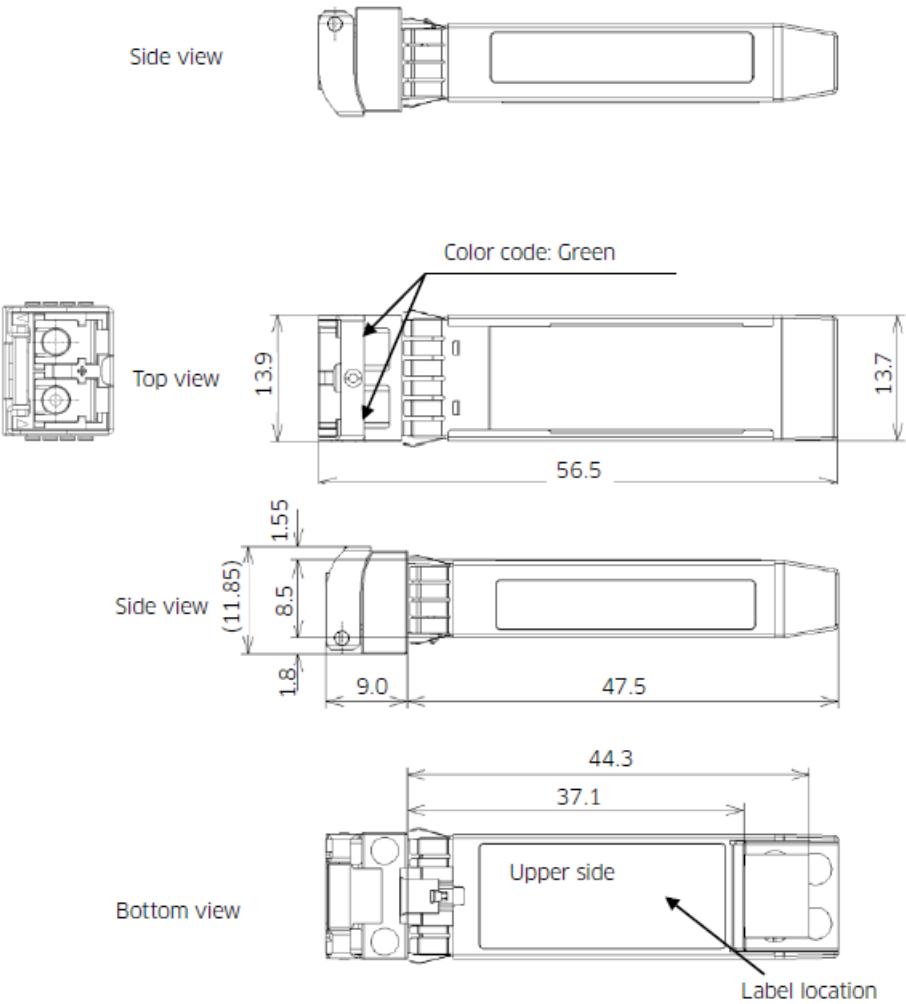


Block Diagram



Mechanical Specifications

Comply to SFF-8432, the improved Pluggable form factor specification, with technique #2 latch. Comply to optional operational mechanical shock test in issue 2 of GR468.



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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