

## PROLABS – QSFP-4x10G-AC7M-C

### *QSFP+ to 4 SFP+ Active Copper Cable Assembly*

#### QSFP-4x10G-AC7M-C Overview

PROLABS's QSFP-4x10G-AC7M-C QSFP+ (Quad Small Form-factor Pluggable Plus) to 4 SFP+ Active Copper are suitable for very short distances and offer a highly cost-effective way to connect QSFP+ and SFP+ equipment. The direct-attach assemblies support 4 lanes of 10Gbps (40Gbps composite). This interconnect system is fully compliant with QSFP+ MSA and SFP+ MSA.

#### Product Features

- QSFP+ End: Compliant with QSFP+ MSA specifications
- SFP+ End: Compliant with SFP+ MSA specifications
- 4 independent duplex channels operating at 10Gbps, also support for 2.5Gbps, 5Gbps data rates
- All-metal housing for superior EMI performance
- Single power supply 3.3V, low power consumption
- RoHS Compliance
- Operating temperature range: 0°C to 70°C.

#### Applications

- 10Gigabit Ethernet
- Serial Data Transmission
- Networking
- Storage
- Fiber Channel

#### Ordering Information

| <i>Part Number</i> | <i>Description</i>                                    |
|--------------------|---|
| QSFP-4x10G-AC7M-C  | QSFP+ to 4 SFP+ Active Copper Cable Assembly, 7 Meter |

## General Specifications

| <i>Parameter</i>      | <i>Symbol</i> | <i>Min</i> | <i>Typ</i> | <i>Max</i> | <i>Unit</i> | <i>Remarks</i>                 |
|-----------------------|---------------|------------|------------|------------|-------------|--------------------------------|
| Bit Error Rate        | $BER$         |            |            | $10^{-12}$ |             |                                |
| Operating Temperature | $T_{OP}$      | 0          |            | 70         | °C          | Case temperature               |
| Storage Temperature   | $T_{STO}$     | - 40       |            | 85         | °C          | Ambient temperature            |
| Input Voltage         | $V_{CC}$      | 3          | 3.3        | 3.6        | V           |                                |
| Maximum Voltage       | $V_{MAX}$     | - 0.5      |            | 4          | V           | For electrical power interface |

## Cable Mechanical Specifications

| <i>Parameter</i> | <i>Symbol</i> | <i>Min</i> | <i>Typ</i> | <i>Max</i> | <i>Unit</i> | <i>Remarks</i> |
|------------------|---------------|------------|------------|------------|-------------|----------------|
| Wire Gauge       |               |            | 30AWG      |            |             |                |
| Cable Impedance  | $Z$           | 95         | 100        | 105        | Ohm         |                |

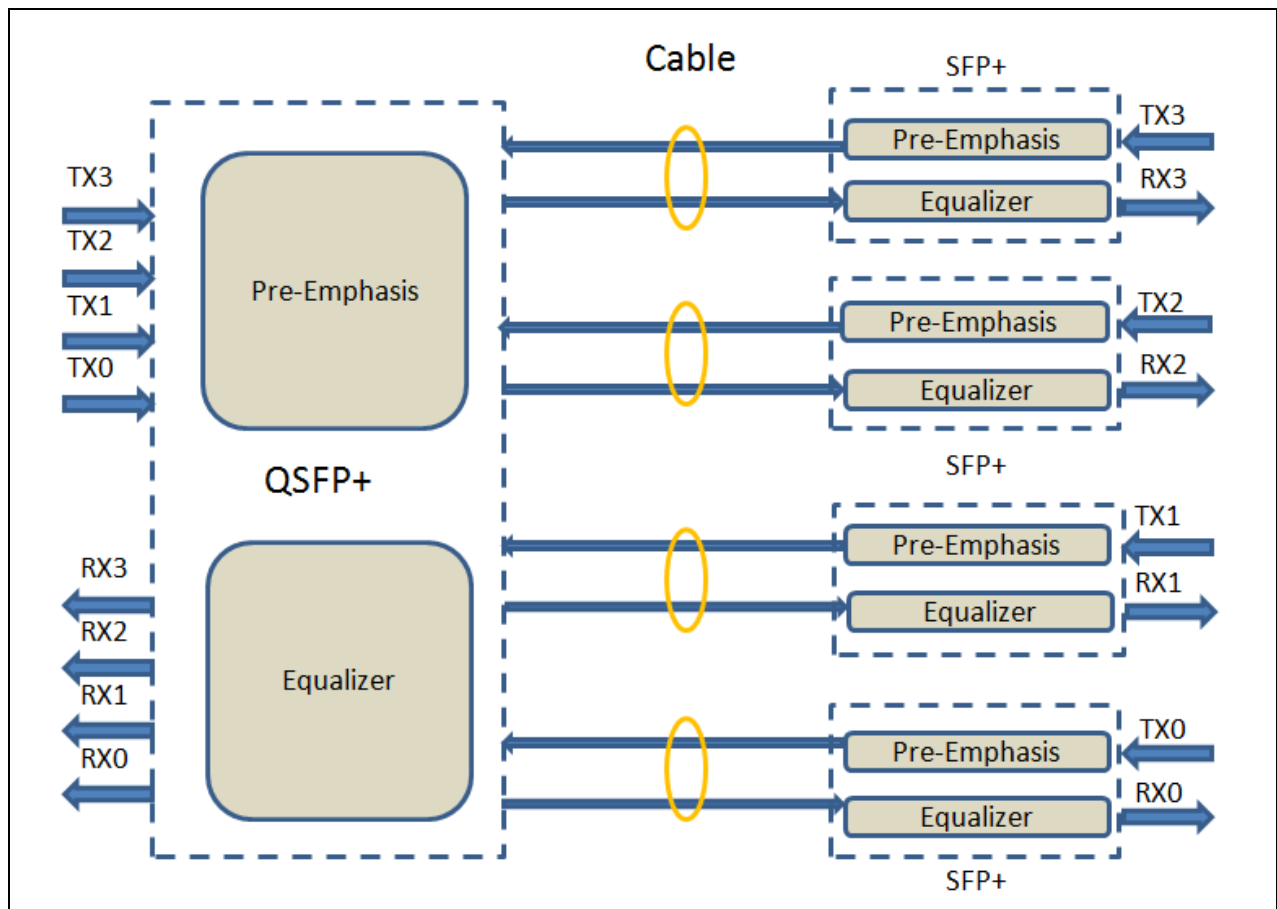
## Electrical Input Requirements

| <i>Parameter</i>               | <i>Symbol</i> | <i>Min</i> | <i>Typ</i> | <i>Max</i> | <i>Unit</i> | <i>Remarks</i> |
|--------------------------------|---------------|------------|------------|------------|-------------|----------------|
| Data Rate Per Channel          | $Dr$          | 2.5G       |            | 10.3G      | GB/s        | Non condensing |
| Differential Input Amplitude   | $V_{IN\ PP}$  | 190        |            | 1600       | mV          |                |
| Single Ended Voltage Tolerance | $V$           | -0.3       |            | 3.8        | V           |                |

## Electrical Output Requirements

| <i>Parameter</i>              | <i>Symbol</i> | <i>Min</i> | <i>Typ</i> | <i>Max</i> | <i>Unit</i> | <i>Remarks</i> |
|-------------------------------|---------------|------------|------------|------------|-------------|----------------|
| Data Rate Per Channel         | $Dr$          | 2.5G       |            | 10.3G      | GB/s        | Non condensing |
| Differential Output Amplitude | $V_{OUT\ PP}$ | 350        |            | 900        | mV          |                |
| Output Common-Mode Voltage    | $V_{CM-AC}$   |            | 4.5        |            | mV          |                |
| TX IDLE Output Voltage        |               |            |            | 30         | mV          |                |

## Block Diagram of Transceiver



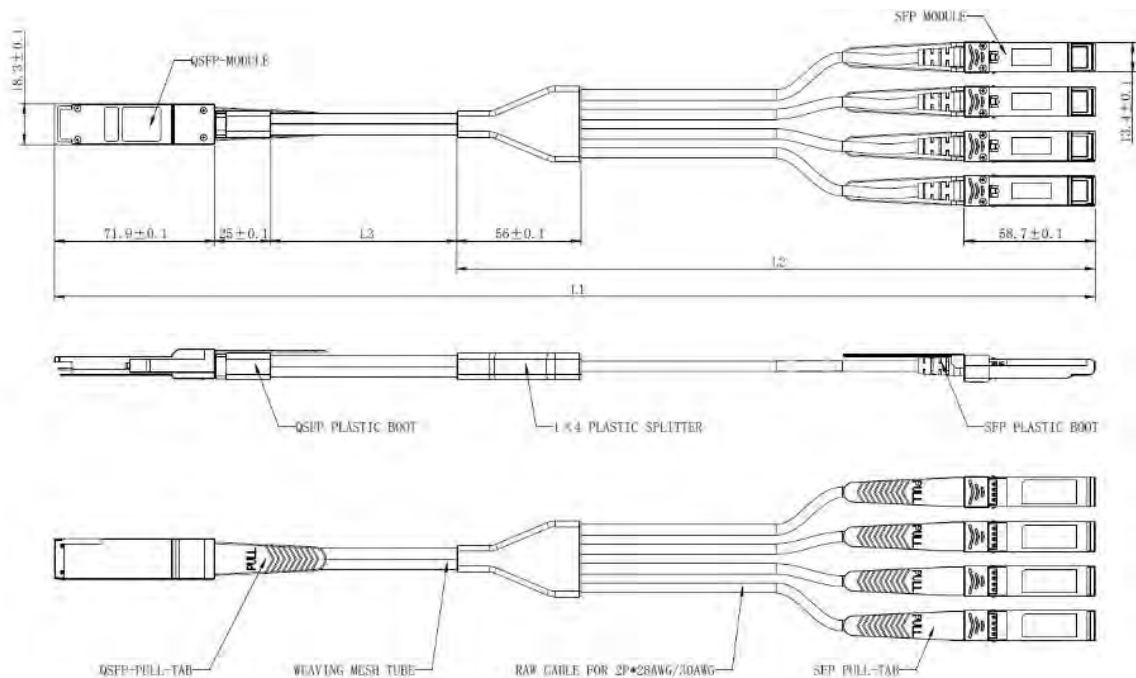
The transmitter side accepts electrical input signals. All input data signals are differential LVPECL or CML logic and they are internally terminated. The parallel input electrical signal first is processed via the Pre-Emphasis.

At the receiver side, the parallel electrical signals are recovered via Equalizer. The outputs electrical signals of receive side are voltage compatible with Current Mode Logic (CML) levels. All data signals are differential and support a data rate up to 10Gbps per channel.

All transmitter signals and receiver signals are AC coupled internally on both modules ends.

Active cable assembly has built-in MCU, offer a number of additional host-management capabilities. I2C (Inter-IC bus protocol) interface and on-board EEPROM features enable the host to detect or configure specific performance characteristics.

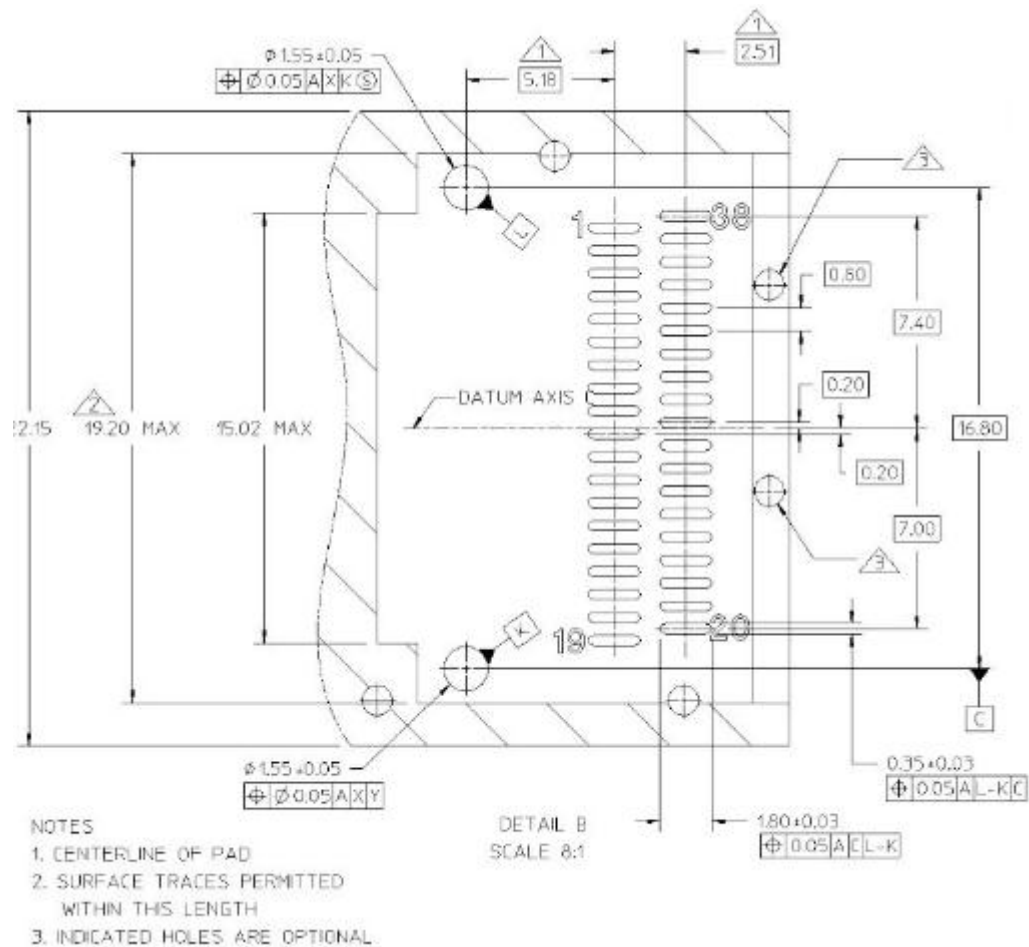
## Outline Dimensions



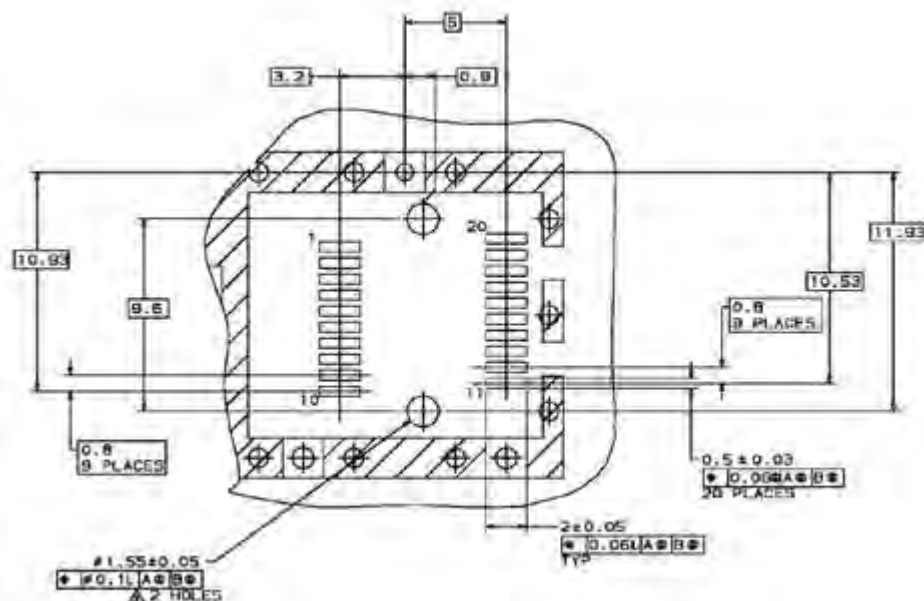
L1:7000mm±90mm

**ALL DIMENSIONS (NOT INCLUDING THE LENGTH OF THE CABLE) ARE ±0.2mm  
UNLESS OTHERWISE SPECIFIED  
UNIT: mm**

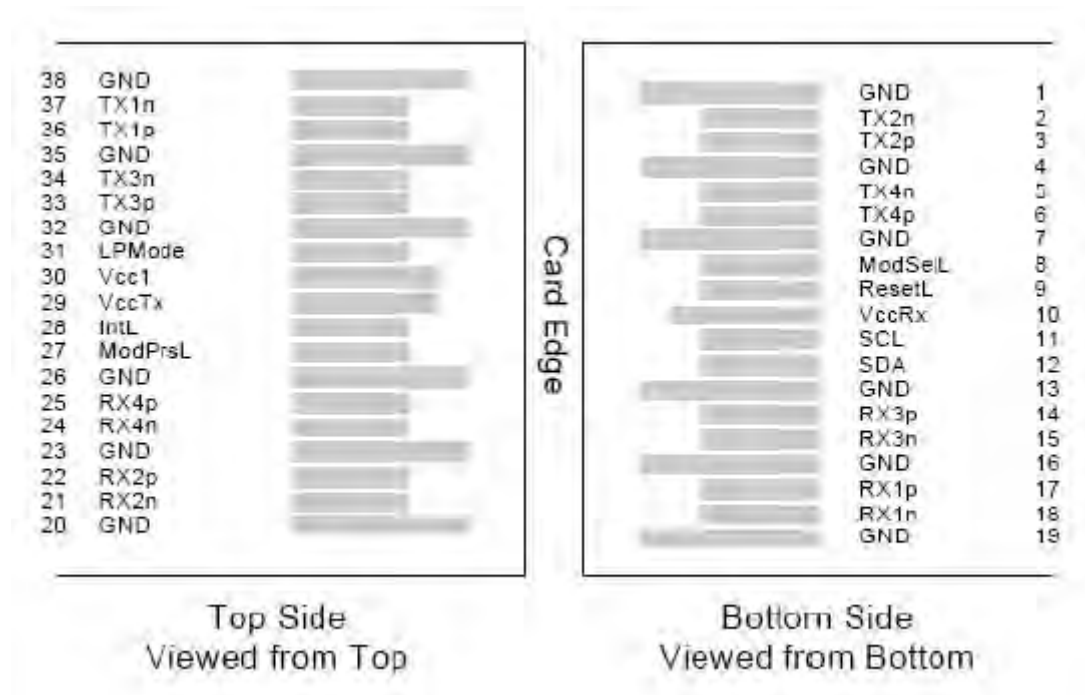
## PCB Layout Recommendation (QSFP+ END)



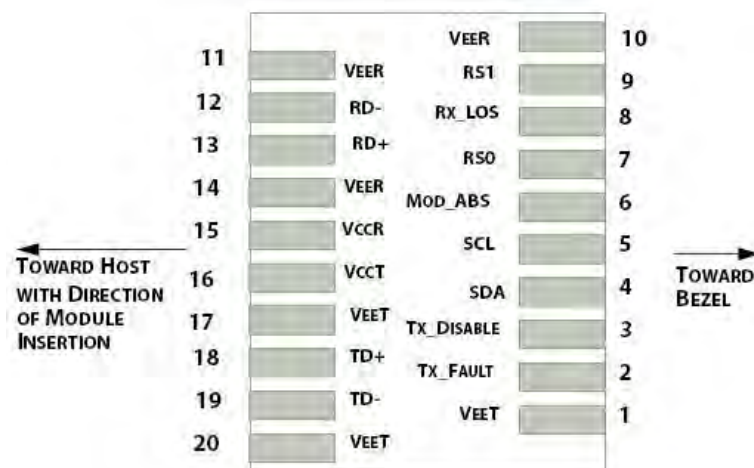
## PCB Layout Recommendation (SFP+ END)



## Electrical Pad Layout (QSFP+ END)



## Electrical Pad Layout (SFP+ END)



## Pin Assignment (QSFP+ END)

| <i><b>PIN #</b></i> | <i><b>Symbol</b></i> | <i><b>Description</b></i>           | <i><b>Remarks</b></i> |
|---------------------|----------------------|-------------------------------------|-----------------------|
| 1                   | GND                  | Ground                              |                       |
| 2                   | Tx2n                 | Transmitter Inverted Data Input     |                       |
| 3                   | Tx2p                 | Transmitter Non-Inverted Data Input |                       |
| 4                   | GND                  | Ground                              |                       |
| 5                   | Tx4n                 | Transmitter Inverted Data Input     |                       |
| 6                   | Tx4p                 | Transmitter Non-Inverted Data Input |                       |
| 7                   | GND                  | Ground                              |                       |
| 8                   | ModSelL              | Module Select                       |                       |
| 9                   | ResetL               | Module Reset                        |                       |
| 10                  | V <sub>cc</sub> RX   | +3.3V Power Supply Receiver         |                       |
| 11                  | SCL                  | 2-wire serial interface clock       |                       |
| 12                  | SDA                  | 2-wire serial interface data        |                       |
| 13                  | GND                  | Ground                              |                       |
| 14                  | Rx3p                 | Receiver Non-Inverted Data Output   |                       |
| 15                  | Rx3n                 | Receiver Inverted Data Output       |                       |
| 16                  | GND                  | Ground                              |                       |
| 17                  | Rx1p                 | Receiver Non-Inverted Data Output   |                       |
| 18                  | Rx1n                 | Receiver Inverted Data Output       |                       |
| 19                  | GND                  | Ground                              |                       |
| 20                  | GND                  | Ground                              |                       |
| 21                  | Rx2n                 | Receiver Inverted Data Output       |                       |
| 22                  | Rx2p                 | Receiver Non-Inverted Data Output   |                       |
| 23                  | GND                  | Ground                              |                       |
| 24                  | Rx4n                 | Receiver Inverted Data Output       |                       |
| 25                  | Rx4p                 | Receiver Non-Inverted Data Output   |                       |
| 26                  | GND                  | Ground                              |                       |
| 27                  | ModPrsL              | Module Present                      |                       |
| 28                  | IntL                 | Interrupt                           |                       |
| 29                  | V <sub>cc</sub> TX   | +3.3V Power Supply transmitter      |                       |
| 30                  | V <sub>cc1</sub>     | +3.3V Power Supply                  |                       |
| 31                  | LPMode               | Low Power Mode                      |                       |
| 32                  | GND                  | Ground                              |                       |
| 33                  | Tx3p                 | Transmitter Non-Inverted Data Input |                       |
| 34                  | Tx3n                 | Transmitter Inverted Data Input     |                       |
| 35                  | GND                  | Ground                              |                       |
| 36                  | Tx1p                 | Transmitter Non-Inverted Data Input |                       |
| 37                  | Tx1n                 | Transmitter Inverted Data Input     |                       |
| 38                  | GND                  | Ground                              |                       |

## Pin Assignment (SFP+ END)

| <b>PIN #</b> | <b>Symbol</b>      | <b>Description</b>  | <b>Remarks</b> |
|--------------|--------------------|---|----------------|
| 1            | V <sub>EET</sub>   | Transmitter ground (common with receiver ground)              |                |
| 2            | T <sub>FAULT</sub> | Transmitter Fault.  |                |
| 3            | T <sub>DIS</sub>   | Transmitter Disable. Laser output disable on high or open     |                |
| 4            | SDA                | Data line for serial ID                                       |                |
| 5            | SCL                | Clock line for serial ID                                      |                |
| 6            | MOD_ABS            | Module Absent. Grounded within the module                     |                |
| 7            | RS0                | No connection required  |                |
| 8            | LOS                | Loss of Signal indication. Logic 0 indicates normal operation |                |
| 9            | RS1                | No connection required  |                |
| 10           | V <sub>EER</sub>   | Receiver ground (common with transmitter ground)              |                |
| 11           | V <sub>EER</sub>   | Receiver ground (common with transmitter ground)              |                |
| 12           | RD-                | Receiver Inverted DATA out. AC coupled                        |                |
| 13           | RD+                | Receiver Non-inverted DATA out. AC coupled                    |                |
| 14           | V <sub>EER</sub>   | Receiver ground (common with transmitter ground)              |                |
| 15           | V <sub>CCR</sub>   | Receiver power supply   |                |
| 16           | V <sub>CCT</sub>   | Transmitter power supply                                      |                |
| 17           | V <sub>EET</sub>   | Transmitter ground (common with receiver ground)              |                |
| 18           | TD+                | Transmitter Non-Inverted DATA in. AC coupled                  |                |
| 19           | TD-                | Transmitter Inverted DATA in. AC coupled                      |                |
| 20           | V <sub>EET</sub>   | Transmitter ground (common with receiver ground)              |                |

## References

- Enhanced 8.5 and 10 Gigabit Small Form Factor Pluggable Module "SFP+" – SFF-8431
- IEEE standard 802.3ae. IEEE Standard Department, 2008.
- QSFP+ 10 Gbs 4X PLUGGABLE TRANSCEIVER –SFF-8436