

## **LQ-DAC1140-xMNx**

### **RoHS Compliant 40Gb/s QSFP+ to QSFP+ Copper Cable**

#### **Features**

- QSFP+ conforms to the Small Form Factor SFF-8436
- 4-Channel Full-Duplex Passive Copper Cable Transceiver
- Support for multi-gigabit data rates :1 Gb/s - 10 Gb/s (per channel)
- Maximum aggregate data rate: 40 Gb/s (4 x 10Gb/s)
- Copper link length up to 3m (passive limiting)
- High-Density QSFP 38-PIN Connector
- Power Supply :+3.3V
- Low power consumption: 0.02 W (typ.)
- I2C based two-wire serial interface for EEPROM signature which can be customized
- Temperature Range:
  - Standard: 0 to +70°C
  - Industrial: -40 to +85°C
- ROHS Compliant



#### **Applications**

- 40 Gigabit Ethernet
- InfiniBand4x SDR, DDR, QDR
- Fiber Channel over Ethernet SAS,Servers,Hubs,Switches,Routers
- QSFP+ DAC, 40G DAC, DAC Cable

## General Description

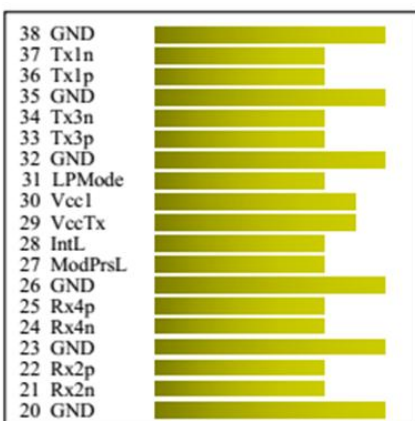
Link-pp Engine's 40G QSFP+ Passive Copper Cables(LQ-DAC1140-xMNx) are high performance, cost effective I/O solutions for 40G LAN, HPC and SAN applications. The QSFP+ passive copper cables are compliant with SFF-8436, QSFP+ MSA and IEEE P802.3ba 40GBASE-CR4. It is offer a low power consumption, short reach interconnect applications. The cable each lane is capable of transmitting data at rates up to 10Gb/s, providing an aggregated rate of 40Gb/s.

Link-pp Engine's 40G QSFP+ Passive Copper Cables are customized for an ultra-high performance, cost effective cable solution in 40-Gigabit speed applications including switched fabric I/O, switches, routers, data storage arrays, and high performance computer (HPC) clusters.

## Pin Function Definition

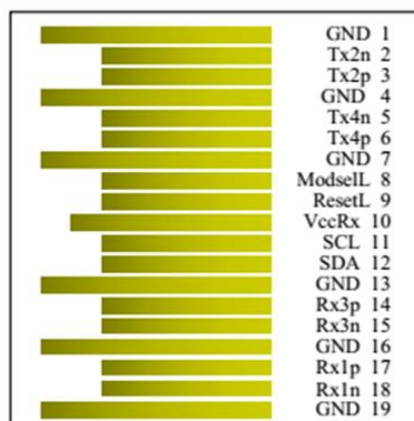
| Pin | Logic       | Symbol  | Name          | Description                                              |
|-----|-------------|---------|---------------|----------------------------------------------------------|
| 1   |             | GND     | Signal Ground | Ground                                                   |
| 2   | CML-I       | Tx2n    | Tx2n          | Transmitter Inverted Data Input.AC coupled               |
| 3   | CML-I       | Tx2p    | Tx2p          | Transmitter Non_Inverted Data Input.AC coupled           |
| 4   |             | GND     | Signal Ground | Ground                                                   |
| 5   | CML-I       | Tx4n    | Tx4n          | Transmitter Inverted Data Input.AC coupled               |
| 6   | CML-I       | Tx4p    | Tx4p          | Transmitter Non_Inverted Data Input.AC coupled           |
| 7   |             | GND     | Signal Ground | Ground                                                   |
| 8   | LVTTL-I     | ModSelL | ModSelL       | Module Select pin.Selected when held low by the host.    |
| 9   | LVTTL-I     | ResetL  | LPMode_Reset  | Module Reset.A"low" pulse induces a reset on the module. |
| 10  |             | Vcc Rx  | Vcc Rx        | +3.3V Power Supply Receiver                              |
| 11  | LVC MOS-I/O | SCL     | SCL           | 2-wire serial interface                                  |
| 12  | LVC MOS-I/O | SDA     | SDA           |                                                          |
| 13  |             | GND     | Signal Ground | Ground                                                   |
| 14  | CML-O       | Rx3p    | Rx3p          | Receiver Non_Inverted Data Input.AC coupled              |
| 15  | CML-O       | Rx3n    | Rx3n          | Receiver Inverted Data Input.AC coupled                  |
| 16  |             | GND     | Signal Ground | Ground                                                   |
| 17  | CML-O       | Rx1p    | Rx1p          | Receiver Non_Inverted Data Input.AC coupled              |
| 18  | CML-O       | Rx1n    | Rx1n          | Receiver Inverted Data Input.AC coupled                  |
| 19  |             | GND     | Signal Ground | Ground                                                   |

|    |         |         |                |                                                               |
|----|---------|---------|----------------|---------------------------------------------------------------|
| 20 |         | GND     | Signal Ground  | Ground                                                        |
| 21 | CML-O   | Rx2n    | Rx2n           | Receiver Inverted Date Input.AC coupled                       |
| 22 | CML-O   | Rx2p    | Rx2p           | Receiver Non_Inverted Date Input.AC coupled                   |
| 23 |         | GND     | Signal Ground  | Ground                                                        |
| 24 | CML-O   | Rx4n    | Rx4n           | Receiver Inverted Date Input.AC coupled                       |
| 25 | CML-O   | Rx4p    | Rx4p           | Receiver Non_Inverted Date Input.AC coupled                   |
| 26 |         | GND     | Signal Ground  | Ground                                                        |
| 27 | LVTTL-O | ModPrsL | ModPrsL        | Module Present pin.Internally grounded inside the module.     |
| 28 | LVTTL-O | IntL    | IntL           | Interrupt by the QSFP module."Low"indicates an Alarm/Warning. |
| 29 |         | Vcc Tx  | Vcc Tx         | +3.3V Power Supply Transmitter                                |
| 30 |         | Vccl    | Vccl           | +3.3V Power Supply                                            |
| 31 | LVTTL-I | LPMode  | LPMode         | Low Power Mode                                                |
| 32 |         | GND     | Signal Ground  | Ground                                                        |
| 33 | CML-I   | Tx3p    | Tx3p           | Transmitter Non_Inverted Date Input.AC coupled                |
| 34 | CML-I   | Tx3n    | Tx3n           | Transmitter Inverted Date Input.AC coupled                    |
| 35 |         | GND     | Signal Ground  | Ground                                                        |
| 36 | CML-I   | Tx1p    | Tx1p           | Transmitter Non_Inverted Date Input.AC coupled                |
| 37 | CML-I   | Tx1n    | Tx1n           | Transmitter Inverted Date Input.AC coupled                    |
| 38 |         | GND     | Signal Ground  | Ground                                                        |
| 39 |         |         | Chassis Ground |                                                               |



Top Side (Viewed From Top)

Module Card Edge



Bottom Side (Viewed From Bottom)

## Absolute Maximum Ratings

These values represent the damage threshold of the module. Stress in excess of any of the individual Absolute Maximum Ratings can cause immediate catastrophic damage to the module even if all other parameters are within Recommended Operating Conditions.

Table.1 Absolute maximum ratings

| Parameter              | Symbol | Min | Max | Unit |
|------------------------|--------|-----|-----|------|
| Maximum Supply Voltage | Vcc    | 0   | 3.6 | V    |
| Storage Temperature    | Ts     | -40 | 85  | °C   |
| Relative Humidity      | RH     | 5   | 95  | %    |

## Recommended Operating Conditions

Table.2 Recommended Operating Conditions

| Parameter                  | Symbol      | Min | Typical | Max  | Unit |
|----------------------------|-------------|-----|---------|------|------|
| Operating Case Temperature | Standard Tc | 0   | 25      | 70   | °C   |
|                            | Industrial  | -40 | 25      | 85   | °C   |
| Storage Temperature        | Ts          | -40 |         | 85   | °C   |
| Relative Humidity          | RH          | 5   |         | 95   | %    |
| Data Rate                  |             |     | 40      |      | Gbps |
| Power Dissipation          | PD          |     |         | 0.02 | W    |

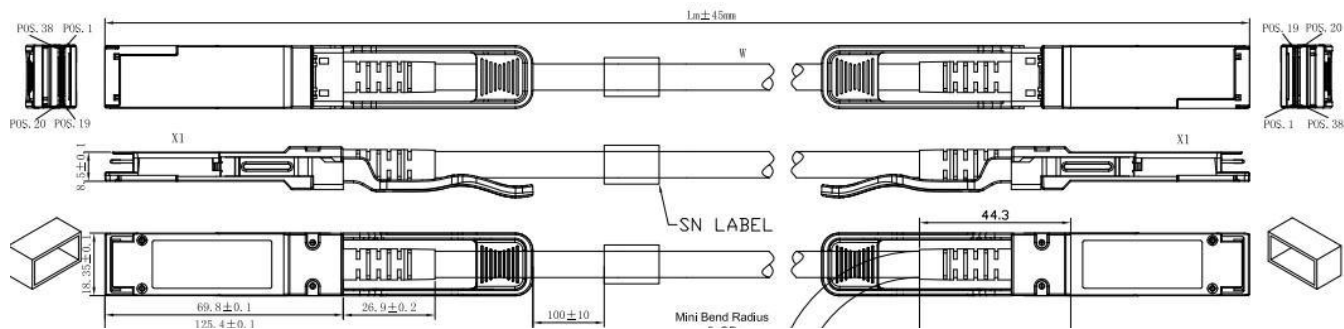
## Product Characteristics

Table.3 Product Characteristics

| Test Type                  | Test Item              | Target                                                        |                                                  | Reference                                              |
|----------------------------|------------------------|---------------------------------------------------------------|--------------------------------------------------|--------------------------------------------------------|
|                            | Differential Impedence | 100+/- 10ohm (Rise time of 50 ps (20 % 80 %))                 |                                                  | IEEE Std.802.3ba                                       |
| Electrical Characteristics | Differential Mode RL   | Frequency(GHz)<br>0.1-1.0<br>1.0-4.1                          | SDD11 & SDD22(max)<br>-10<br>-(12-2*sqrt(f))     | Per table 10 of 1B<br>Cable MOL.v 0.68                 |
|                            | Differential IL        | Frequency<br>100MHz<br>200MHz<br>625MHz<br>1250MHz<br>1875MHz | SDD21(min)<br>-8<br>-8<br>-8.5<br>-12.1<br>-14.7 | Ref table 43 of<br>Infiniband<br>Architecture Spec, V2 |

|                               |                         |                                                                |     |                                                                         |
|-------------------------------|-------------------------|----------------------------------------------------------------|-----|-------------------------------------------------------------------------|
|                               |                         | 2500MHz                                                        | -17 |                                                                         |
|                               | NEXT                    | $\geq 26\text{dB @ } 10\text{MHz to } 5.0\text{GHz}$           |     | /                                                                       |
|                               | Intra-Pair Skew         | $\leq 100\text{ ps (TDT Method) Rise time of } 35\text{ ps}$   |     | (20 %- 80 %)                                                            |
|                               | Intra-Pair Skew         | $\leq 400\text{ ps (TDT Method) Rise time of } 35\text{ ps}$   |     | (20%~80 %)                                                              |
| Environmental Characteristics | Operating Temperature   | $-40\sim 85^{\circ}\text{C}$                                   |     | Cable operating temp. range                                             |
|                               | Thermal Shock           | No evidence of physical damage                                 |     | EIA-364-32 Test                                                         |
|                               | Cyclic Temp. & Humidity | No evidence of physical damage                                 |     | EIA-364-31 Method III, Test Cond A                                      |
|                               | Salt spray              | 48 hours salt spraying after shell corrosive area less than 5% |     | EIA-364-26                                                              |
|                               | Temperature Life        | Performance meets the specification requirement                |     | EIA-364-17, Method A, Test Cond 3 at $105^{\circ}\pm 2^{\circ}\text{C}$ |
| Mechanical Characteristics    | Mechanical Vibration    | Performance meets the specification requirement                |     | EIA-364-28E.11 TC-VII, Test Cond. D 15minutes in X,Y,Z axis.            |
|                               | Cable Flex              | Performance meets the specification requirement                |     | EIA-444-1B                                                              |
|                               | Mechanical Shock        | Performance meets the specification requirement                |     | EIA-364-27B, TG-G. 3 times in 6 directions, 100g, 6ms                   |
|                               | Cable plug Insertion    | 40N Max.                                                       |     | Per QSFP MSA Rev 1.0                                                    |
|                               | Cable plug extraction   | 30N Max.                                                       |     | Per QSFP MSA Rev 1.0.                                                   |
|                               | Latch retention force   | 50N Min. No evidence of physical damage                        |     | EIA-364-13                                                              |
|                               | Durability              | 50 Time. No evidence of physical damage                        |     | EIA-364-09; perform plug&unplug cycles                                  |

## Mechanical Specifications



| Length (m) | Cable AWG |
|------------|-----------|
| 0.5        | 30        |
| 1          | 30        |
| 2          | 30        |
| 3          | 30        |

## Aplication Cautions

This transceiver is specified as ESD threshold 1kV for high speed pins and 2kV for all other electrical input pins, tested per MIL-STD-883, Method 3015.4 /JESD22-A114-A (HBM). However, normal ESD precautions are still required during the handling of this module. This transceiver is shipped in ESD protective packaging. It should be removed from the packaging and handled only in an ESD protected environment.

This is a Class 1 Laser Product according to IEC 60825-1:1993+A1:1997+A2:2001. This product complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated (July 26, 2001)

## Ordering information

| Part Number      | Product Description                                             |
|------------------|-----------------------------------------------------------------|
| LQ-DAC1140-0M5N  | QSFP+ to QSFP+ , up to 40 Gb/s, Copper Cable, 0~70℃, 0.5meter   |
| LQ-DAC1140-1MN   | QSFP+ to QSFP+ , up to 40 Gb/s, Copper Cable, 0~70℃, 1meter     |
| LQ-DAC1140-2MN   | QSFP+ to QSFP+ , up to 40 Gb/s, Copper Cable, 0~70℃, 2meter     |
| LQ-DAC1140-3MN   | QSFP+ to QSFP+ , up to 40 Gb/s, Copper Cable, 0~70℃, 3meter     |
| LQ-DAC1140-0M5NI | QSFP+ to QSFP+ , up to 40 Gb/s, Copper Cable, -40~85℃, 0.5meter |
| LQ-DAC1140-1MNI  | QSFP+ to QSFP+ , up to 40 Gb/s, Copper Cable, -40~85℃, 1meter   |
| LQ-DAC1140-2MNI  | QSFP+ to QSFP+ , up to 40 Gb/s, Copper Cable, -40~85℃, 2meter   |
| LQ-DAC1140-3MNI  | QSFP+ to QSFP+ , up to 40 Gb/s, Copper Cable, -40~85℃, 3meter   |