

## CFP2 100G 10KM SMF MULTI-RATE

GCF2-100G-LR4



### Overview

GZ-LINK GCF2-100G-LR4 are designed for use in 100 Gigabit Ethernet and 4x28G OTN client interfaces over single mode fiber.

They are compliant with the CFP MSA1, IEEE 802.3ba 100GBASE-LR42 and OTU4 4I1-9D1F requirements specified in ITU-T Recommendations G.959.1/G.709 and Supplement 39 (G.sup39). Digital diagnostics functions are available via the MDIO interface, as specified by the CFP MSA. The transceiver is RoHS-6 compliant and lead-free per Directive 2002/95/EC3.

### Features

- ◆ Hot-pluggable CFP2 form factor
- ◆ Supports 103.1Gb/s and 112Gb/s aggregate bit rates
- ◆ Power dissipation < 8W
- ◆ RoHS-6 compliant (lead-free)
- ◆ Commercial case temperature range of 0°C to 70°C
- ◆ Single 3.3V power supply
- ◆ Maximum link length of 10km on Single Mode Fiber (SMF)
- ◆ 4x28Gb/s DFB-based LAN-WDM transmitter
- ◆ 4x28G electrical interface
- ◆ Duplex LC receptacles
- ◆ MDIO management interface

### Applications

- ◆ OTN OTU4 4I1-9D1F
- ◆ 100GBASE-LR4 100G Ethernet

### Ordering Information

| Part Number   | Product Description                               |
|---------------|---------------------------------------------------|
| GCF2-100G-LR4 | CFP2 100G LR4 10Km LC straight receptacles on SMF |

### General Specifications

| Parameter                           | Symbol | Min   | Typical | Max               | Units | Note      |
|-------------------------------------|--------|-------|---------|-------------------|-------|-----------|
| Bit Rate (all wavelengths combined) | BR     | 103.1 |         | 112.0             | Gb/s  |           |
| Bit Error Ratio @25.78Gb/s          | BER1   |       |         | 10 <sup>-12</sup> |       |           |
| Bit Error Ratio @27.95Gb/s          | BER2   |       |         | 10 <sup>-6</sup>  |       |           |
| Maximum Supported Distances         | Lmax1  |       |         | 10                | Km    | SMF G.652 |

### Absolute Maximum Ratings

| Parameter                           | Symbol | Min  | Max | Unit |
|-------------------------------------|--------|------|-----|------|
| Supply Voltage                      | Vcc    | -0.5 | 4.0 | V    |
| Storage Temperature                 | Tst    | -40  | 85  | °C   |
| Case Operating Temperature          | Top    | -5   | 75  | °C   |
| Humidity (non-condensing)           | Rh     | 15   |     | %    |
| Receiver Damage Threshold, per Lane | PRdmg  | 5.5  |     | dBm  |

### Electrical Characteristics

| Parameter                               | Symbol               | Min                                                 | Typical | Max   | Unit     | Note |
|-----------------------------------------|----------------------|-----------------------------------------------------|---------|-------|----------|------|
| Supply Voltage                          | Vcc                  | 3.2                                                 |         | 3.4   | V        |      |
| Supply Current                          | Icc                  |                                                     |         | 2.5   | A        |      |
| Module total power                      | P                    |                                                     |         | 8     | W        | 1    |
| <b>Transmitter</b>                      |                      |                                                     |         |       |          |      |
| Signaling rate per lane                 |                      |                                                     |         | 27.95 | Gb/s     | 2    |
| Input differential impedance            | R <sub>in</sub>      | CEI-28G-VSR as defined by the OIF                   |         |       | Ω        |      |
| Differential data input swing per lane  | V <sub>in,pp</sub>   |                                                     |         |       | mV       |      |
| Data input rise time tolerance          | t <sub>r</sub>       |                                                     |         |       | ps       |      |
| Data input rise time tolerance          | t <sub>f</sub>       |                                                     |         |       | ps       |      |
| Electrical input eye mask definition    | {X1, X2}<br>{Y1, Y2} |                                                     |         |       | UI<br>mV |      |
| <b>Receiver</b>                         |                      |                                                     |         |       |          |      |
| Signaling rate per lane                 |                      |                                                     |         | 11.2  | Gb/s     | 2    |
| Differential data output swing per lane | V <sub>out,pp</sub>  | CEI-28G-VSR as defined by the OIF                   |         |       | mV       |      |
| Data output rise time                   | t <sub>r</sub>       |                                                     |         |       | ps       |      |
| Data output fall time                   | t <sub>f</sub>       |                                                     |         |       | ps       |      |
| Electrical output eye mask definition   | {X1, X2}<br>{Y1, Y2} |                                                     |         |       | UI<br>mV |      |
| Power Supply Noise Tolerance            | Vrip                 | Per Table 4-1 in the CFP2 MSA document <sup>1</sup> |         |       |          |      |

- Note:**
1. Maximum total power value is specified across the full temperature and voltage range.
  2. +/- 100ppm

## Optical Characteristics

## OTU4 Operation

| Parameter                          | Symbol        | Min   | Typical                                                                          | Max   | Unit | Note |
|------------------------------------|---------------|-------|----------------------------------------------------------------------------------|-------|------|------|
| <b>Transmitter</b>                 |               |       |                                                                                  |       |      |      |
| Signaling Speed per Channel        |               | 27.95 |                                                                                  | 27.95 | Gb/s | 1    |
| Channel center wavelengths (range) |               |       | 1294.53 – 1296.59<br>1299.02 – 1301.09<br>1303.54 – 1305.63<br>1308.09 – 1310.19 |       | nm   |      |
| Total Average Launch Power         | POUT          |       |                                                                                  | 10    | dBm  |      |
| Average Launch Power per Channel   | TXPx          | -2.9  |                                                                                  | 4.5   | dBm  |      |
| Optical Channel Extinction Ratio   | ER            | 4.0   |                                                                                  | 6.5   | dB   |      |
| Channel Power Difference           | $\Delta$ POUT |       |                                                                                  | 5     | dB   |      |
| Optical Return Loss                | ORL           |       |                                                                                  | 20    | dB   |      |
| <b>Receiver</b>                    |               |       |                                                                                  |       |      |      |
| Signaling Speed per Channel        |               | 27.95 |                                                                                  | 27.95 | GBd  | 2    |
| Channel center wavelengths (range) |               |       | 1294.53 – 1296.59<br>1299.02 – 1301.09<br>1303.54 – 1305.63<br>1308.09 – 1310.19 |       | nm   |      |
| Average Input Power per Channel    | RXPx          | -6.9  |                                                                                  | 4.0   | dBm  | 3    |
| Optical Path Penalty               | OPP           |       |                                                                                  | 1.5   | dB   |      |
| Equivalent Sensitivity per Channel | Rxsens        |       |                                                                                  | -9.2  | dBm  | 3    |
| Total Average Input Power          | PIN           |       |                                                                                  | 10.0  | dBm  |      |
| Channel Power Difference           | $\Delta$ PIN  |       |                                                                                  | 5.5   | dB   |      |
| LOS De-Assert                      | LOSD          |       |                                                                                  | -11.6 | dBm  |      |
| LOS Assert                         | LOSA          |       |                                                                                  | -13.6 | dBm  |      |
| LOS Hysteresis                     |               |       | 1                                                                                |       | dBm  |      |

**Note:**

1. Transmitter consists of 4 lasers operating at 27.95Gb/s each.
2. Receiver consists of 4 photodetectors operating at 27.95Gb/s each.
3. Specified at a BER of  $10^{-6}$  (pre-FEC), per ITU-T G.sup39.

## 100GbE Operation

| Parameter                                                | Symbol             | Min   | Typical                                                                          | Max   | Unit  | Note |
|----------------------------------------------------------|--------------------|-------|----------------------------------------------------------------------------------|-------|-------|------|
| <b>Transmitter</b>                                       |                    |       |                                                                                  |       |       |      |
| Signaling Speed per Lane                                 |                    | 25.78 |                                                                                  | 25.78 | Gb/s  | 1    |
| Lane center wavelengths (range)                          |                    |       | 1294.53 – 1296.59<br>1299.02 – 1301.09<br>1303.54 – 1305.63<br>1308.09 – 1310.19 |       | nm    |      |
| Total Average Launch Power                               | P <sub>OUT</sub>   |       |                                                                                  | 10.5  | dBm   |      |
| Transmit OMA per Lane                                    | TxOMA              | -1.3  |                                                                                  | 4.5   | dBm   |      |
| Average Launch Power per Lane                            | TXP <sub>x</sub>   | -4.3  |                                                                                  | 4.5   | dBm   | 2    |
| Optical Extinction Ratio                                 | ER                 | 4     |                                                                                  |       | dB    |      |
| Sidemode Suppression ratio                               | SSR <sub>min</sub> | 30    |                                                                                  |       | dB    |      |
| Average launch power of OFF transmitter, per lane        |                    |       |                                                                                  | -30   | dBm   |      |
| Relative Intensity Noise                                 | RIN                |       |                                                                                  | -130  | dB/Hz |      |
| Optical Return Loss Tolerance                            |                    |       |                                                                                  | 20    | dB    |      |
| Transmitter Reflectance                                  |                    |       |                                                                                  | -12   | dB    |      |
| Transmitter eye mask definition {X1, X2, X3, Y1, Y2, Y3} |                    |       | {0.25, 0.4, 0.45, 0.25, 0.28, 0.4}                                               |       |       |      |
| <b>Receiver</b>                                          |                    |       |                                                                                  |       |       |      |
| Signaling Speed per Lane                                 |                    | 25.78 |                                                                                  | 25.78 | GBd   | 3    |
| Lane center wavelengths (range)                          |                    |       | 1294.53 – 1296.59<br>1299.02 – 1301.09<br>1303.54 – 1305.63<br>1308.09 – 1310.19 |       | nm    |      |
| Receive Power (OMA) per Lane                             | RxOMA              |       |                                                                                  | 4.5   | dBm   |      |
| Average Receive Power per Lane                           | RXP <sub>x</sub>   | -10.6 |                                                                                  | 4.5   | dBm   | 4    |
| Receiver Sensitivity (OMA) per Lane                      | Rxsens             |       |                                                                                  | -10.2 | dBm   |      |
| Stressed Receiver Sensitivity (OMA) per Lane             | SRS                |       |                                                                                  | -6.8  | dBm   |      |
| Return Loss                                              | RL                 | -26   |                                                                                  |       | dB    |      |
| Vertical eye closure penalty, per lane                   |                    |       |                                                                                  | 1.8   | dB    |      |
| Receive electrical 3 dB upper cutoff frequency, per lane |                    |       |                                                                                  | 31    | GHz   |      |
| LOS De-Assert                                            | LOSD               |       |                                                                                  | -11.6 | dBm   |      |
| LOS Assert                                               | LOSA               |       |                                                                                  | -13.6 | dBm   |      |
| LOS Hysteresis                                           |                    |       | 1                                                                                |       | dBm   |      |

**Note:**

1. Transmitter consists of 4 lasers operating at 25.78Gb/s each.
2. Minimum value is informative.
3. Receiver consists of 4 photodetectors operating at 25.78Gb/s each.
4. Minimum value is informative, equals min TxOMA with infinite ER and max channel insertion loss.

## Pin Descriptions

|     | Top Row   |    | Bottom Row |
|-----|-----------|----|------------|
| 104 | GND       | 1  | GND        |
| 103 | N.C.      | 2  | {TX_MCLKn} |
| 102 | N.C.      | 3  | {TX_MCLKp} |
| 101 | GND       | 4  | GND        |
| 100 | TX3n      | 5  | N.C.       |
| 99  | TX3p      | 6  | N.C.       |
| 98  | GND       | 7  | 3.3V_GND   |
| 97  | TX2n      | 8  | 3.3V_GND   |
| 96  | TX2p      | 9  | 3.3V       |
| 95  | GND       | 10 | 3.3V       |
| 94  | N.C.      | 11 | 3.3V       |
| 93  | N.C.      | 12 | 3.3V       |
| 92  | GND       | 13 | 3.3V_GND   |
| 91  | N.C.      | 14 | 3.3V_GND   |
| 90  | N.C.      | 15 | VND_IO_A   |
| 89  | GND       | 16 | VND_IO_B   |
| 88  | TX1n      | 17 | PRG_CNTL1  |
| 87  | TX1p      | 18 | PRG_CNTL2  |
| 86  | GND       | 19 | PRG_CNTL3  |
| 85  | TX0n      | 20 | PRG_ALARM1 |
| 84  | TX0p      | 21 | PRG_ALARM2 |
| 83  | GND       | 22 | PRG_ALARM3 |
| 82  | N.C.      | 23 | GND        |
| 81  | N.C.      | 24 | TX_DIS     |
| 80  | GND       | 25 | RX_LOS     |
| 79  | {REFCLKn} | 26 | MOD_LOPWR  |

|    | Top Row   |    | Bottom Row |
|----|-----------|----|------------|
| 78 | {REFCLKp} | 27 | MOD_ABS    |
| 77 | GND       | 28 | MOD_RSTn   |
| 76 | N.C.      | 29 | GLB_ALRMn  |
| 75 | N.C.      | 30 | GND        |
| 74 | GND       | 31 | MDC        |
| 73 | RX3n      | 32 | MDIO       |
| 72 | RX3p      | 33 | PRTADR0    |
| 71 | GND       | 34 | PRTADR1    |
| 70 | RX2n      | 35 | PRTADR2    |
| 69 | RX2p      | 36 | VND_IO_C   |
| 68 | GND       | 37 | VND_IO_D   |
| 67 | N.C.      | 38 | VND_IO_E   |
| 66 | N.C.      | 39 | 3.3V_GND   |
| 65 | GND       | 40 | 3.3V_GND   |
| 64 | N.C.      | 41 | 3.3V       |
| 63 | N.C.      | 42 | 3.3V       |
| 62 | GND       | 43 | 3.3V       |
| 61 | RX1n      | 44 | 3.3V       |
| 60 | RX1p      | 45 | 3.3V_GND   |
| 59 | GND       | 46 | GND        |
| 58 | RX0n      | 47 | N.C.       |
| 57 | RX0p      | 48 | N.C.       |
| 56 | GND       | 49 | GND        |
| 55 | N.C.      | 50 | {RX_MCLKn} |
| 54 | N.C.      | 51 | {RX_MCLKp} |
| 53 | GND       | 52 | GND        |

Figure1. Pin Descriptions

### Bottom Row Pin Function Definition

The CFP2 connector has 104 pins which are arranged in Top and Bottom rows. The pin map is shown in Table below. The detailed description of the Bottom row ranges from pin 1 through pin 52 and is shown below. The pin orientation is shown below:

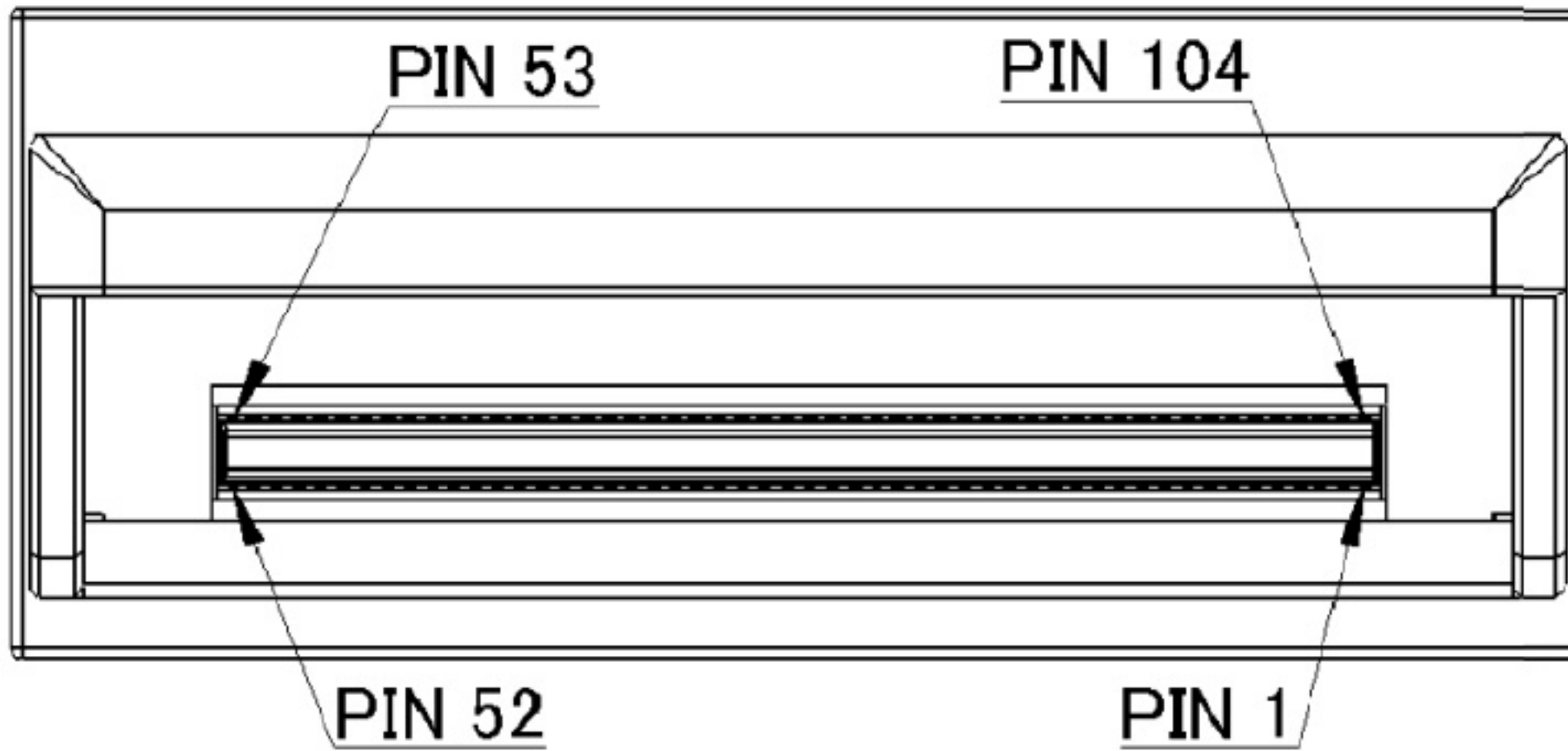


Figure2. CFP2 Pin Map Orientation

### Bottom Row Pin Function Definition

| PIN | Name      | I/O | Logic          | Description                                                                     |
|-----|-----------|-----|----------------|---------------------------------------------------------------------------------|
| 1   | GND       |     |                |                                                                                 |
| 2   | TX_MCLKn  |     |                | Supported.                                                                      |
| 3   | TX_MCLKp  |     |                | Supported.                                                                      |
| 4   | GND       |     |                |                                                                                 |
| 5   | N.C.      |     |                |                                                                                 |
| 6   | N.C.      |     |                |                                                                                 |
| 7   | 3.3V_GND  |     |                | 3.3V Module Supply Voltage Return Ground, internally connected to Signal Ground |
| 8   | 3.3V_GND  |     |                | 3.3V Module Supply Voltage Return Ground, internally connected to Signal Ground |
| 9   | 3.3V      |     |                | 3.3V Module Supply Voltage                                                      |
| 10  | 3.3V      |     |                | 3.3V Module Supply Voltage                                                      |
| 11  | 3.3V      |     |                | 3.3V Module Supply Voltage                                                      |
| 12  | 3.3V      |     |                | 3.3V Module Supply Voltage                                                      |
| 13  | 3.3V_GND  |     |                | 3.3V Module Supply Voltage Return Ground, internally connected to Signal Ground |
| 14  | 3.3V_GND  |     |                | 3.3V Module Supply Voltage Return Ground, internally connected to Signal Ground |
| 15  | VND_IO_A  | I/O |                | Module Vendor I/O A. Do Not Connect!                                            |
| 16  | VND_IO_B  | I/O |                | Module Vendor I/O B. Do Not Connect!                                            |
| 17  | PRG_CNTL1 | I   | LVC MOS w/ PUR | Programmable Control 1 set over MDIO                                            |

|    |               |     |                |                                                                                                                              |
|----|---------------|-----|----------------|------------------------------------------------------------------------------------------------------------------------------|
| 18 | PRG_CNTL2     | I   | LVC MOS w/ PUR | Programmable Control 2 set over MDIO                                                                                         |
| 19 | PRG_CNTL3     | I   | LVC MOS w/ PUR | Programmable Control 3 set over MDIO                                                                                         |
| 20 | PRG_ALRM1     | O   | LVC MOS        | Programmable Alarm 1 set over MDIO                                                                                           |
| 21 | PRG_ALRM2     | O   | LVC MOS        | Programmable Alarm 2 set over MDIO                                                                                           |
| 22 | PRG_ALRM3     | O   | LVC MOS        | Programmable Alarm 3 set over MDIO                                                                                           |
| 23 | GND           |     |                |                                                                                                                              |
| 24 | TX_DIS        | I   | LVC MOS w/ PUR | Transmitter Disable for all lanes, "1" or NC = transmitter disabled, "0" = transmitter enabled                               |
| 25 | RX_LOS        | O   | LVC MOS        | Receiver Loss of Optical Signal, "1": low optical signal, "0": normal condition                                              |
| 26 | MOD_LOPW<br>R | I   | LVC MOS w/ PUR | Module Low Power Mode. "1" or NC: module in low power (safe) mode, "0": power-on enabled                                     |
| 27 | MOD_ABS       | O   | GND            | Module Absent. "1" or NC: module absent, "0": module present, Pull Up Resistor on Host                                       |
| 28 | MOD_RSTn      | I   | LVC MOS w/ PDR | Module Reset. "0" resets the module, "1" or NC = module enabled, Pull Down Resistor in Module                                |
| 29 | GLB_ALRMn     | O   | LVC MOS        | Global Alarm. "0": alarm condition in any MDIO Alarm register, "1": no alarm condition, Open Drain, Pull Up Resistor on Host |
| 30 | GND           |     |                |                                                                                                                              |
| 31 | MDC           | I/O | 1.2V CMOS      | Management Data I/O bi-directional data (electrical specs as per 802.3ae and ba)                                             |
| 32 | MDIO          | I   | 1.2V CMOS      | Management Data Clock (electrical specs as per 802.3ae and ba)                                                               |
| 33 | PRTADR0       | I   | 1.2V CMOS      | MDIO Physical Port address bit 0                                                                                             |
| 34 | PRTADR1       | I   | 1.2V CMOS      | MDIO Physical Port address bit 1                                                                                             |
| 35 | PRTADR2       | I   | 1.2V CMOS      | MDIO Physical Port address bit 2                                                                                             |
| 36 | VND_IO_C      | I/O |                | Module Vendor I/O C. Do Not Connect!                                                                                         |
| 37 | VND_IO_D      | I/O |                | Module Vendor I/O D. Do Not Connect!                                                                                         |
| 38 | VND_IO_E      | I/O |                | Module Vendor I/O E. Do Not Connect!                                                                                         |
| 39 | 3.3V_GND      |     |                | 3.3V Module Supply Voltage Return Ground, internally connected to Signal Ground                                              |
| 40 | 3.3V_GND      |     |                | 3.3V Module Supply Voltage Return Ground, internally connected to Signal Ground                                              |
| 41 | 3.3V          |     |                | 3.3V Module Supply Voltage                                                                                                   |
| 42 | 3.3V          |     |                | 3.3V Module Supply Voltage                                                                                                   |
| 43 | 3.3V          |     |                | 3.3V Module Supply Voltage                                                                                                   |
| 44 | 3.3V          |     |                | 3.3V Module Supply Voltage                                                                                                   |
| 45 | 3.3V_GND      |     |                | 3.3V Module Supply Voltage Return Ground, internally connected to Signal Ground                                              |
| 46 | GND           |     |                |                                                                                                                              |
| 47 | N.C.          |     |                |                                                                                                                              |
| 48 | N.C.          |     |                |                                                                                                                              |
| 49 | GND           |     |                |                                                                                                                              |
| 50 | RX_MCLKn      |     |                | Supported.                                                                                                                   |
| 51 | RX_MCLKp      |     |                | Supported.                                                                                                                   |
| 52 | GND           |     |                |                                                                                                                              |

**Mechanical Dimensions**

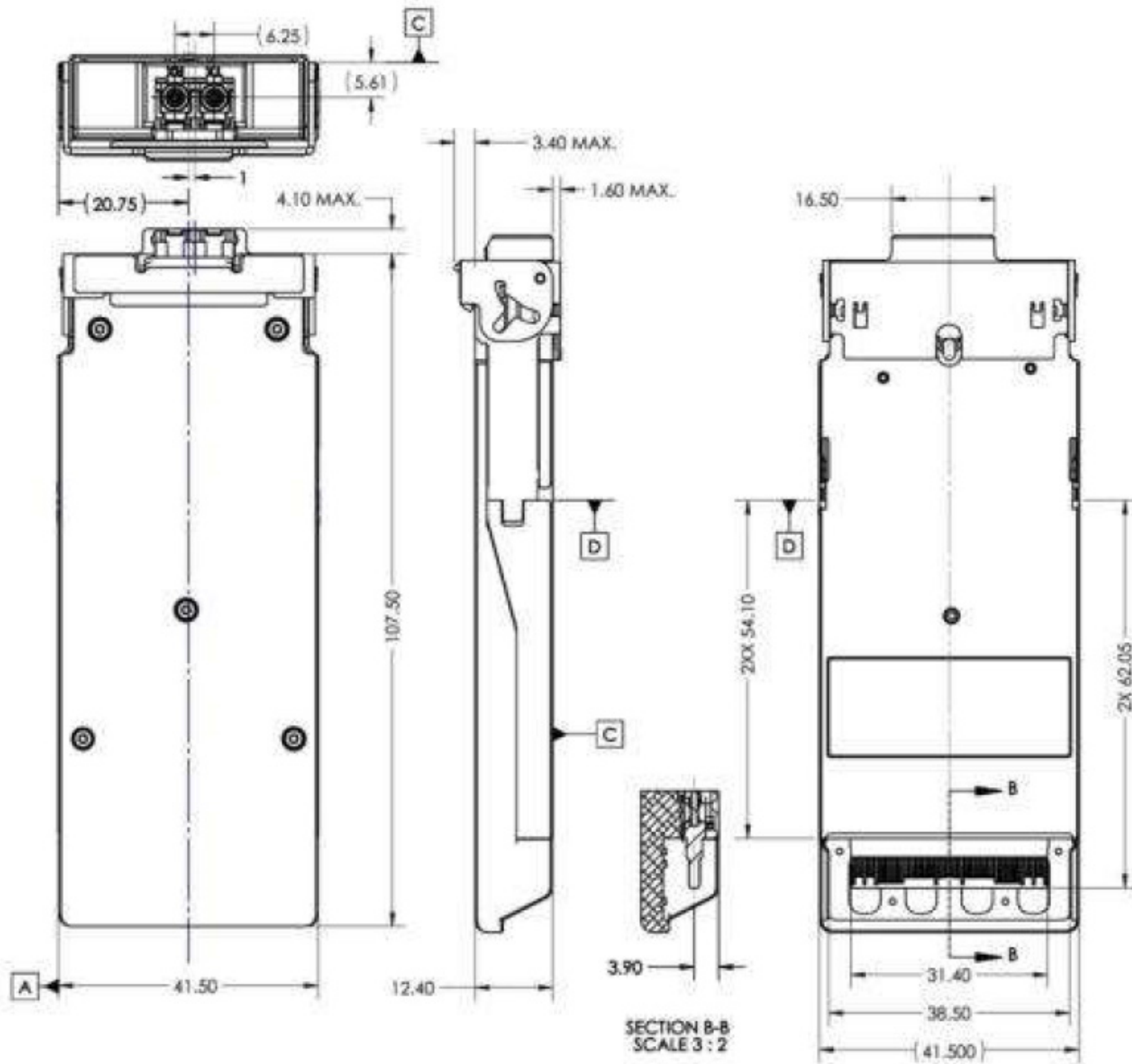


Figure3. Mechanical Specifications

**References**

1. CFP2 Hardware Specification and CFP MSA Management Interface Specifications (MIS), Rev 2.2.; CFP MSA.
2. Compliant to IEEE 802.3ba specification for 100GBASE-LR4
3. IEEE P802.3bm, CAUI-4 Interface.
4. OIF CEI-28G-VSR Interface

**Shenzhen GZ-LINK Technology Co., Ltd**

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