

CFP 100G 1310nm Single mode Optical Transceiver



Description

The BlueOptics© BO91L13610D CFP transceiver is a high performance, cost effective module supporting a data rate up to 103.125Gbps with 10 Kilometer link length on single mode fiber.

BlueOptics© transceivers are 100% compliant with CFP Multi-Source Agreement (MSA).

All BlueOptics© CFP transceivers are always equipped with digital diagnostic function compliant to MSA SFF-8436.

Using digital diagnostic, BlueOptics© CFP transceivers provide the following real time information:

- Supply voltage
- Laser bias current
- Laser average output power
- Laser received input power
- Temperature

The transceiver consists of five sections: A CWDM transmitter, a PIN photodiode, a trans-impedance preamplifier (TIA), the LD Driver and the digital diagnostic function.

Applications

- ✓ Ethernet
- ✓ Infiniband
- ✓ Fibre Channel

Features

- ✓ 27.952 Gb/s data rate per channel compliant to IEEE 802.3bm and IEEE802.3ba
- ✓ Hot-pluggable CFP footprint compliant to CFP MSA
- ✓ Duplex LC/UPC type pluggable optical interface
- ✓ Link length up to 10 Kilometer on SM
- ✓ MDIO Management Interface compliant to CFP MSA
- ✓ Compliant to OIF-CEI-28G-VSR
- ✓ Metal enclosure, for lower EMI
- ✓ RoHS compliant and lead-free
- ✓ Low power dissipation: maximum 3.5W
- ✓ Single +3.3V power supply
- ✓ Case operating temperature
 - Commercial: 0°C to +70°C
 - Extended: -10°C to +80°C
 - Industrial: -40°C to +85°C

Warnings

Handling Precautions: This device is susceptible to damage as a result of electrostatic discharge (ESD). A static free environment is highly recommended.

Laser Safety: Even small radiation emitted by laser devices can be dangerous to human eyes and lead to permanent eye injuries. Be sure to avoid eye contact with direct or indirect radiation.

Warranty

Every BlueOptics© transceiver comes with a 5 year replacement warranty and lifetime support. For a warranty inquiry, please contact your CBO sales representative.

This warranty covers the first user of the equipment only.

Important Notice

Performance figures, data and any illustrative material provided in this data sheet are typical and must be specifically confirmed in writing by CBO before they become applicable to any particular order or contract. In accordance with the CBO policy of continuous improvement specifications may change without notice.

The publication of information in this data sheet does not imply freedom from patent or other protective rights of CBO or others.

Further details are available from any CBO sales representative.

Installation

Before installation attach an ESD-preventive wrist to ensure not to damage the transceiver or hardware.

BlueOptics© BO91L13610D can be installed in any Small Form Factor Pluggable (CFP) port. You can install the BO91L13610D regardless if the system is powered on or off, because it is hot-swappable.

Insert the transceiver into the CFP port and remove the dust cap.

You can now connect your cable.

Order Information

| Part No. | Temp. | DDM |
|---------------|----------------|-----|
| BO91L13610D | 0°C to +70°C | ✓ |
| BO91L13610DEX | -10°C to +80°C | ✓ |
| BO91L13610DIN | -40°C to +80°C | ✓ |

Regulatory Compliance

| Feature | Standard | Co. |
|------------------------------------|---------------------------------------------------------|-----|
| Electrostatic Discharge (ESD) | - IEC/EN 61000-4- 2 | ✓ |
| Electromagnetic Interference (EMI) | - FCC Part 15 Class B EN 55022 - Class B (CISPR 22A) | ✓ |
| Component Recognition | - IEC/EN 60950, UL | ✓ |
| RoHS | - 2002/95/EC | ✓ |
| EMC | - EN61000-3 | ✓ |

1. Absolute Maximum Ratings

| Parameter | Symbol | Min. | Typ. | Max. | Unit |
|--------------------------|--------|------|------|------|------|
| Storage Temperature | Ts | -40 | | 85 | °C |
| Storage Ambient Humidity | HA | 5 | | 95 | % |

2. Recommended Operating Conditions

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Note | |
|-----------------------|--------|-------------------|----------|------|------|---------------|-------------|
| | | 0 | | 70 | | BO91L13610D | |
| | | -10 | | 80 | °C | BO91L13610DEX | |
| | | -40 | | 85 | | BO91L13610DIN | |
| Ambient Humidity | HA | 5 | | 70 | % | | |
| Transmission Distance | | | | 10 | KM | | |
| Data Rate | BR | | 25.78125 | | Gbps | per channel | |
| Coupled Fiber | | Single mode fiber | | | | | 9/125µm SMF |

3. High Speed Electrical Interface

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Note |
|-----------------------------------|--------|------|------|------|------|------|
| Transmitter | | | | | | |
| Differential voltage pk-pk | | 100 | | 1200 | mV | |
| Differential termination mismatch | | | | 10 | % | |
| Common mode noise (rms) | | | | 17.5 | mV | |
| Transition time | | 10 | | | ps | 1 |
| Common mode voltage | | -0.3 | | 2.8 | V | |
| Receiver | | | | | | |
| Differential voltage pk-pk | | 100 | | 1200 | mV | |
| Differential termination mismatch | | | | 10 | % | |
| Common mode noise (rms) | | | | 17.5 | mV | |
| Transition time | | 9.5 | | | ps | |

Notes:

- 20/80%

4. Low Speed Electrical Interface

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Note |
|----------------------------------------------------------|-----------------|----------------------|------|-----------------------|------|------|
| Supply currents and voltages | | | | | | |
| Voltage | V _{cc} | 3.2 | 3.3 | 3.4 | V | 1 |
| Supply current | I _{cc} | | | 1.8 | A | |
| Power dissipation | P _{wr} | | | 6.0 | W | |
| Power dissipation (low power mode) | P _{lp} | | | 1.0 | W | |
| Low speed control and sense signals, 3.3 V LVCMOS | | | | | | |
| Input low voltage | V _{OL} | -0.3 | | 0.8 | V | |
| Input high voltage | V _{OH} | 2 | | V _{cc3} +0.3 | V | |
| Input leakage current | V _{IL} | -10 | | 10 | µA | |
| Outputs low voltage | V _{IH} | -0.3 | | 0.2 | V | |
| Output high voltage | I _{IN} | V _{cc} -0.2 | | V _{cc} +0.3 | V | |
| Low speed control and sense signals, 1.2 V LVCMOS | | | | | | |
| Input low voltage | V _{IL} | -0.3 | | 0.8 | V | |
| Input high voltage | V _{IH} | 2 | | V _{cc3} +0.3 | V | |
| Input leakage current | V _{IN} | -10 | | 10 | µA | |
| Input capacitance | C | | | 10 | pF | |
| MDC clock rate | | 0.1 | | 4 | MHz | |
| Output low voltage | V _{OL} | -0.3 | | 0.2 | V | |
| Output high voltage | V _{OH} | 1.0 | | 1.5 | V | |
| Output low current | I _{OL} | 4 | | | mA | |
| Output high current | I _{OH} | | | -4 | mA | |

4. Transmitter Specifications - Optical

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Note |
|--------------------------------------------------------|-------------------|------------------------------------|---------|---------|-------|------|
| Total Average Output Power | POUT | | | 10.5 | dBm | |
| Lane Average Output Power | | -4.3 | | 4.5 | | |
| | λ_0 | 1294.53 | 1295.56 | 1296.59 | nm | |
| | λ_1 | 1299.02 | 1300.05 | 1301.09 | nm | |
| | λ_2 | 1303.54 | 1304.58 | 1305.63 | nm | |
| | λ_3 | 1308.09 | 1309.14 | 1310.19 | nm | |
| Extinction Ratio | ER | 4 | | | dB | |
| RIN | RIN | | | -130 | dB/Hz | |
| SMSR | | 30 | | | dB | |
| Optical modulation amplitude, each lane (OMA) | OMA | -1.3 | | 4.5 | dBm | |
| Difference in launch power between any two lanes (OMA) | | | | 5 | dB | |
| Relative Intensity Noise | RIN ₂₀ | | | -130 | dB/Hz | |
| Transmitter reflectance | | | | -12 | dB | |
| Transmitter eye mask {X1, X2, X3, Y1, Y2, Y3} | | {0.25, 0.4, 0.45, 0.25, 0.28, 0.4} | | | | |

5. Receiver Specifications - Optical

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Note |
|-------------------------------|-------------------|-------|------|------|------|------|
| Receiver Sensitivity per lane | P _{AVG} | -10.6 | | 4.5 | dBm | 1 |
| Total Receiver Sensitivity | R _{SENS} | | | 4.5 | dBm | |

Notes:

1. Measured with BER = $\leq 10^{-12}$ @PRBS=2³¹-1 @25.78Gb/s

6. CFP to Host Connector Pin Out

| Pin no. | Name | Logic | Description |
|---------|-----------|-------|--------------------------------------------------|
| 1 | 3.3V_GND | | |
| 2 | 3.3V_GND | | |
| 3 | 3.3V_GND | | |
| 4 | 3.3V_GND | | |
| 5 | 3.3V_GND | | |
| 6 | 3.3V | | |
| 7 | 3.3V | | |
| 8 | 3.3V | | |
| 9 | 3.3V | | |
| 10 | 3.3V | | |
| 11 | 3.3V | | |
| 12 | 3.3V | | |
| 13 | 3.3V | | |
| 14 | 3.3V | | |
| 15 | 3.3V | | |
| 16 | 3.3V_GND | | |
| 17 | 3.3V_GND | | |
| 18 | 3.3V_GND | | |
| 19 | 3.3V_GND | | |
| 20 | 3.3V_GND | | |
| 21 | NUC | | Module Vendor I/O. Must No Connect at host board |
| 22 | NUC | | Module Vendor I/O. Must No Connect at host board |
| 23 | GND | | |
| 24 | TX_M_CLKn | | TX Monitor Clock Output (Negative) |
| 25 | TX_M_CLKp | | TX Monitor Clock Output (Positive) |
| 26 | GND | | |

| | | | |
|----|------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| 27 | NUC | | Module Vendor I/O. Must No Connect at host board |
| 28 | NUC | | Module Vendor I/O. Must No Connect at host board |
| 29 | NUC | | Module Vendor I/O. Must No Connect at host board |
| 30 | PRG_CNTL1 | LVC MOS w/ PUR | Programmable Control 1 set over MDIO, M SA Default: TRXIC_RSTn, TX & RX ICs reset, "0": reset, "1" or NC: enabled = not used |
| 31 | PRG_CNTL2 | LVC MOS w/ PUR | Programmable Control 2 set over MDIO, M SA Default: Hardware Interlock LSB,"00": ≤8W, "01":≤16W, "10": ≤24W, "11" or NC: ≤32W = not used |
| 32 | PRG_CNTL3 | LVC MOS w/ PUR | Programmable Control 2 set over M DIO, M SA Default: Hardware Interlock M SB,"00": ≤8W, "01":≤16W, "10": ≤24W, "11" or NC: ≤32W = not used |
| 33 | PRG_ALRM 1 | LVC M OS | Programmable Alarm 1 set over MDIO, M SA Default: HIPWR_ON, "1": module, power up completed, "0": module not high powered up |
| 34 | PRG_ALRM 2 | LVC M OS | Programmable Alarm 2 set over MDIO, M SA Default: M OD_READY, "1": Ready, "0":not Ready, |
| 35 | PRG_ALRM 3 | LVC M OS | Programmable Alarm 3 set over MDIO, M SA Default: M OD_FAULT, fault detected,1": Fault, "0": No Fault |
| 36 | TX_DIS | LVC M OS w/ PUR | Transmitter Disable for all lanes, "1" or NC = transmitter disabled, "0" = transmitter enabled |
| 37 | MOD_LOPWR | LVC M OS w/ PUR | Module Low Power M ode. "1" or NC: module in low power (safe) mode, "0": power-on enabled |
| 38 | MOD_ABS | | Module Absent. "1" or NC: module absent, "0": module present, Pull Up Resistor on Host |
| 39 | MOD_RSTn | LVC M OS w/ PUR | Module Reset. "0" resets the module, "1" or NC = module enabled, Pull Down Resistor in Module |
| 40 | RX_LOS | LVC M OS | Receiver Loss of Optical Signal, "1": low optical signal, "0": normal condition |
| 41 | GLB_ALRM n | LVC M OS | Global Alarm. "0": alarm condition in any M DIO Alarm register, "1": no alarm condition, Open Drain, Pull Up Resistor on Host |
| 42 | PRTADR4 | 1.2V CM OS | M DIO Physical Port address bit 4 |
| 43 | PRTADR3 | 1.2V CM OS | M DIO Physical Port address bit 3 |
| 44 | PRTADR2 | 1.2V CM OS | M DIO Physical Port address bit 2 |
| 45 | PRTADR1 | 1.2V CM OS | M DIO Physical Port address bit 1 |
| 46 | PRTADR0 | 1.2V CM OS | M DIO Physical Port address bit 0 |
| 47 | M DIO | 1.2V CM OS | Management Data I/O bi-directional data (electrical specs as per 802.3ae and ba) |
| 48 | M DC | 1.2V CM OS | Management Data Clock (electrical specs as per 802.3ae and ba) |
| 49 | GND | | |
| 50 | NUC | | Module Vendor I/O. Must No Connect at host board |
| 51 | NUC | | Module Vendor I/O. Must No Connect at host board |
| 52 | GND | | |
| 53 | NUC | | Module Vendor I/O. Must No Connect at host board |
| 54 | NUC | | Module Vendor I/O. Must No Connect at host board |
| 55 | 3.3V_GND | | |
| 56 | 3.3V_GND | | |
| 57 | 3.3V_GND | | |
| 58 | 3.3V_GND | | |
| 59 | 3.3V_GND | | |
| 60 | 3.3V | | |
| 61 | 3.3V | | |
| 62 | 3.3V | | |
| 63 | 3.3V | | |
| 64 | 3.3V | | |
| 65 | 3.3V | | |
| 66 | 3.3V | | |
| 67 | 3.3V | | |
| 68 | 3.3V | | |
| 69 | 3.3V | | |
| 70 | 3.3V_GND | | |
| 71 | 3.3V_GND | | |
| 72 | 3.3V_GND | | |
| 73 | 3.3V_GND | | |

| | | | |
|-----|----------|--------|-------------------------------------|
| 74 | 3.3V_GND | | |
| 75 | 3.3V_GND | | |
| 76 | RX_MCLKp | | RX Monitor Clock Output (Positive) |
| 77 | RX_MCLKn | | RX Monitor Clock Output (Negative) |
| 78 | GND | | |
| 79 | RX0p | HS I/O | Lane 0 Receiver Output (Positive) |
| 80 | RX0n | HS I/O | Lane 0 Receiver Output (Negative) |
| 81 | GND | | |
| 82 | RX1p | HS I/O | Lane 1 Receiver Output (Positive) |
| 83 | RX1n | HS I/O | Lane 1 Receiver Output (Negative) |
| 84 | GND | | |
| 85 | RX2p | HS I/O | Lane 2 Receiver Output (Positive) |
| 86 | RX2n | HS I/O | Lane 2 Receiver Output (Negative) |
| 87 | GND | | |
| 88 | RX3p | HS I/O | Lane 3 Receiver Output (Positive) |
| 89 | RX3n | HS I/O | Lane 3 Receiver Output (Negative) |
| 90 | GND | | |
| 91 | RX4p | HS I/O | Lane 4 Receiver Output (Positive) |
| 92 | RX4n | HS I/O | Lane 4 Receiver Output (Negative) |
| 93 | GND | | |
| 94 | RX5p | HS I/O | Lane 5 Receiver Output (Positive) |
| 95 | RX5n | HS I/O | Lane 5 Receiver Output (Negative) |
| 96 | GND | | |
| 97 | RX6p | HS I/O | Lane 6 Receiver Output (Positive) |
| 98 | RX6n | HS I/O | Lane 6 Receiver Output (Negative) |
| 99 | GND | | |
| 100 | RX7p | HS I/O | Lane 7 Receiver Output (Positive) |
| 101 | RX7n | HS I/O | Lane 7 Receiver Output (Negative) |
| 102 | GND | | |
| 103 | RX8p | HS I/O | Lane 8 Receiver Output (Positive) |
| 104 | RX8n | HS I/O | Lane 8 Receiver Output (Negative) |
| 105 | GND | | |
| 106 | RX9p | HS I/O | Lane 9 Receiver Output (Positive) |
| 107 | RX9n | HS I/O | Lane 9 Receiver Output (Negative) |
| 108 | GND | | |
| 109 | NC | | Not Connected Internally |
| 110 | NC | | Not Connected Internally |
| 111 | GND | | |
| 112 | GND | | |
| 113 | TX0p | HS I/O | Lane 0 Transmitter Input (Positive) |
| 114 | TX0n | HS I/O | Lane 0 Transmitter Input (Negative) |
| 115 | GND | | |
| 116 | TX1p | HS I/O | Lane 1 Transmitter Input (Positive) |
| 117 | TX1n | HS I/O | Lane 1 Transmitter Input (Negative) |
| 118 | GND | | |
| 119 | TX2p | HS I/O | Lane 2 Transmitter Input (Positive) |
| 120 | TX2n | HS I/O | Lane 2 Transmitter Input (Negative) |
| 121 | GND | | |
| 122 | TX3p | HS I/O | Lane 3 Transmitter Input (Positive) |
| 123 | TX3n | HS I/O | Lane 3 Transmitter Input (Negative) |
| 124 | GND | | |
| 125 | TX4p | HS I/O | Lane 4 Transmitter Input (Positive) |
| 126 | TX4n | HS I/O | Lane 4 Transmitter Input (Negative) |
| 127 | GND | | |
| 128 | TX5p | HS I/O | Lane 5 Transmitter Input (Positive) |
| 129 | TX5n | HS I/O | Lane 5 Transmitter Input (Negative) |
| 130 | GND | | |
| 131 | TX6p | HS I/O | Lane 6 Transmitter Input (Positive) |
| 132 | TX6n | HS I/O | Lane 6 Transmitter Input (Negative) |
| 133 | GND | | |
| 134 | TX7p | HS I/O | Lane 7 Transmitter Input (Positive) |
| 135 | TX7n | HS I/O | Lane 7 Transmitter Input (Negative) |
| 136 | GND | | |

| | | | |
|-----|---------|--------|-------------------------------------|
| 137 | TX8p | HS I/O | Lane 8 Transmitter Input (Positive) |
| 138 | TX8n | HS I/O | Lane 8 Transmitter Input (Negative) |
| 139 | GND | | |
| 140 | TX9p | HS I/O | Lane 9 Transmitter Input (Positive) |
| 141 | TX9n | HS I/O | Lane 9 Transmitter Input (Negative) |
| 142 | GND | | |
| 143 | NC | | Not Connected Internally |
| 144 | NC | | Not Connected Internally |
| 145 | GND | | |
| 146 | REFCLKp | | Reference Clock Input (Positive) |
| 147 | REFCLKn | | Reference Clock Input (Negative) |
| 148 | GND | | |

7. EEPROM Information

The SFP MSA defines a 256-byte memory map in EEPROM describing the transceivers capabilities, standard interfaces, manufacturer, and other information, which is accessible over a 2 wire serial interface at the 8-bit address 1010000X (A0h).

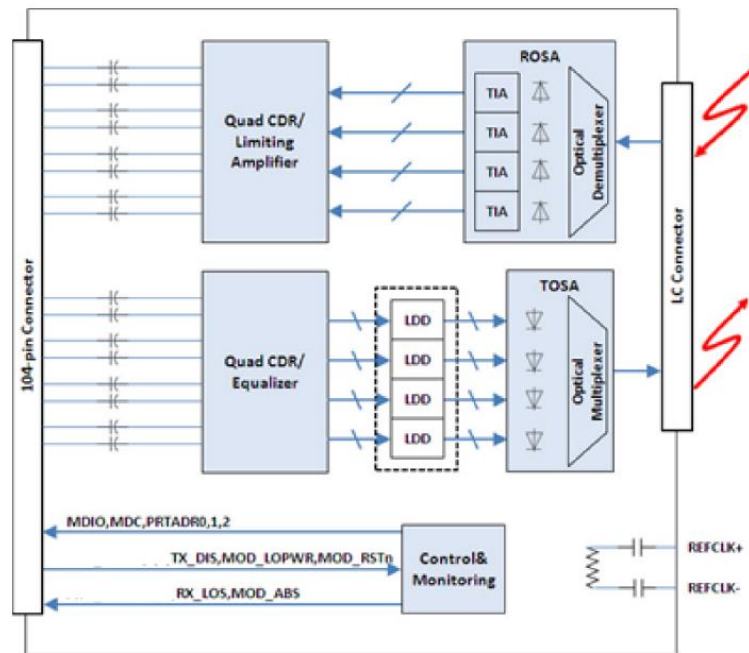
| Data Address | Field Size (Bytes) | Name of Field | Description |
|--------------|--------------------|--------------------------------|--------------------------------------------------------------------------------------------------------------|
| 128 | 1 | Identifier | Formfactor |
| 129 | 1 | Ext. Identifier | |
| 130 | 1 | Connector | |
| 131-138 | 8 | Transceiver | Transmitter Code |
| 139 | 1 | Encoding | |
| 140 | 1 | BR, Nominal | Transceiver Speed |
| 141 | 1 | Extended RateSelect Compliance | Tags for Extended RateSelect compliance |
| 142 | 1 | Length (9µm) km | Max. link length in KM |
| 143 | 1 | Length (9µm) 100m | Max. link length in M |
| 144 | 1 | Length (50µm) 10m | Max. link length in M |
| 145 | 1 | Length(62.5µm)10m | Max. link length in M |
| 146 | 1 | Length (Copper) | Max. link length in M |
| 147 | 1 | Device Tech | Device technology |
| 148-163 | 16 | Vendor name | Vendor name - OEM |
| 164 | 1 | Extended Transceiver | Extended Transceiver Codes for InfiniBand |
| 165-167 | 3 | Vendor OUI | |
| 168-183 | 16 | Vendor PN | Product Number - depending on Part |
| 184-185 | 2 | Vendor rev | Vendor revision |
| 186-187 | 2 | Wavelength | Transceiver Wavelength |
| 188-189 | 2 | Wavelength tolerance | Guaranteed range of laser wavelength (+/- value) from Nominal wavelength (Wavelength Tol. = value/200 in nm) |
| 190 | 1 | Max Case Temp | Maximum Case Temperature in Degrees C |
| 191 | 1 | CC_BASE | Check code for Base ID Fields (addresses 128-190) |
| 192-195 | 4 | Options | Rate Select, TX Disable, TX Fault, LOS |
| 196-211 | 16 | Vendor SN | Part serial number |
| 212-219 | 8 | Vendor date code | Year, Month, Day |
| 220 | 1 | Diagnostic type | Diagnostics |
| 221 | 1 | Enhanced option | Indicates which optional enhanced features are implemented in the transceiver. |
| 222 | 1 | Reserved | Reserved |
| 223 | 1 | CC_EXT | Check code for the Extended ID Fields (addresses 192-222) |
| 224-255 | 32 | Vendor Specific | Vendor Specific EEPROM |

8. Digital Diagnostics / Digital Optical Monitoring

The transceiver provides serial ID memory contents and diagnostic information about the present operating conditions by the 2-wire serial interface (SCL, SDA).

The diagnostic information with internal calibration or external calibration are all implemented, including received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and temperature monitoring.

9. Recommended Interface Circuit



10. Mechanical Specifications (Unit: mm)

