

## SFP 1.25G Copper RJ45 Transceiver



### Description

The BlueOptics® BO08C28S1 SFP transceiver is a high performance, cost effective module supporting a data rate up to 1.25Gbps with 100 Meter link length on twisted pair Cat5E cable.

BlueOptics® transceivers are 100% compliant with SFP Multi-Source Agreement (MSA).

### Features

- ✓ 1.25Gb/s serial optical interface compliant to 802.3ab 1000BASE-T
- ✓ Hot-pluggable SFP footprint compliant to SFF-8074i
- ✓ RJ-45 connector interface
- ✓ Auto MDI-X
- ✓ Access to physical layer IC via 2 wire serial bus
- ✓ Metal enclosure, for lower EMI
- ✓ RoHS compliant and lead-free
- ✓ Low power dissipation: maximum 1.2W
- ✓ Single +3.3V power supply
- ✓ Compliant with SFF-8472
- ✓ Case operating temperature
  - Commercial: 0°C to +70°C
  - Extended: -10°C to +80°C
  - Industrial: -40°C to +85°C

### Applications

- ✓ 1000Base-T
- ✓ Ethernet
- ✓ Switch to Switch Interface
- ✓ Router/Server Interface
- ✓ Other links

## 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 only covers the first user of the equipment.

## 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® BO08C28S1 can be installed in any Small Form Factor Pluggable (SFP) port. You can install the BO08C28S1 regardless if the system is powered on or off, because it is hot-swappable.

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

You can now connect your cable.

## Order Information

| Part No.    | Temp.          | DDM |
|-------------|----------------|-----|
| BO08C28S1   | 0°C to +70°C   | -   |
| BO08C28S1EX | -10°C to +80°C | -   |
| BO08C28S1IN | -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<br>- Class B (CISPR 22A) | ✓            |
| Laser Eye Safety                   | - FDA 21CFR 1040.10, 1040.11<br>- IEC/EN 60825-1, 2     | Class 1<br>✓ |
| 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                   |
|----------------------------|--------------|------|-----------|------|------|------------------------|
| Case Operating Temperature | Tcase        | 0    |           | 70   |      | BO08C28S1              |
|                            |              | -10  |           | 80   | °C   | BO08C28S1EX            |
|                            |              | -40  |           | 85   |      | BO08C28S1IN            |
| Ambient Humidity           | HA           | 5    |           | 70   | %    |                        |
| Data Rate                  |              |      | 1250/1250 |      | Mbps | Does not support SGMII |
| Transmission Distance      |              |      |           | 100  | M    |                        |
| Coupled Copper Cable       | Twisted Pair |      |           |      |      | Min. Cat5E             |

## 3. Electrical Interface Characteristics

| Parameter       | Symbol | Min. | Typ. | Max. | Unit | Note |
|-----------------|--------|------|------|------|------|------|
| Supply Current  | Is     |      | 320  | 375  | mA   | 1    |
| Input Voltage   | Vcc    | 3.13 | 3.3  | 3.47 | V    | 2    |
| Maximum Voltage | Vmax   |      |      | 4    | V    |      |
| Surge Current   | Isurge |      |      | 30   | mA   | 3    |

### Notes:

1. 1.2W maximum power consumption
2. Referenced to GND
3. Power consumption and surge current are higher than the specified values in MSA

## 4. Low Speed Signals

| Parameter       | Symbol | Min.             | Typ. | Max.              | Unit | Note |
|-----------------|--------|------------------|------|-------------------|------|------|
| SFP Output LOW  | Vol    | 0                |      | 0.5               | V    | 1    |
| SFP Output HIGH | Voh    | host_Vcc<br>-0.5 |      | host_Vcc<br>+ 0.3 | V    | 1    |
| SFP Input LOW   | Vil    | 0                |      | 0.8               | V    | 2    |
| SFP Input HIGH  | Vih    | 2                |      | Vcc+0.3           | mA   | 2    |

### Notes:

1. 4.7k to 10k pull-up to host\_Vcc, measured at host side of connector
2. 4.7k to 10k pull-up to Vcc, measured at SFP side of connector

## 5. High Speed Signals

| High-Speed Electrical Interface - Transmission Line-SFP |         |      |      |      |      |      |
|---------------------------------------------------------|---------|------|------|------|------|------|
| Parameter                                               | Symbol  | Min. | Typ. | Max. | Unit | Note |
| Line Frequency                                          | fL      |      | 125  |      | MHz  | 1    |
| Tx Output Impedance                                     | Zout,TX |      | 100  |      | Ohm  | 2    |
| Rx Input Impedance                                      | Zin,RX  |      | 100  |      | Ohm  | 2    |

### Notes:

1. 5 level encoding, per IEEE802.3
2. Differential, for all frequencies between 1MHz and 125MHz

| High-Speed Electrical Interface - Host-SFP |          |      |      |      |      |      |
|--------------------------------------------|----------|------|------|------|------|------|
| Parameter                                  | Symbol   | Min. | Typ. | Max. | Unit | Note |
| Single ended data input swing              | Vinsing  | 250  |      | 1200 | mV   | 1    |
| Single ended data output swing             | Voutsing | 350  |      | 800  | mV   | 1    |
| Rise/Fall Time                             | Tr ,Tf   |      | 175  |      | Psec | 2    |
| Tx Input Impedance                         | Zin      |      | 50   |      | Ohm  | 1    |
| Rx Output Impedance                        | Zout     |      | 50   |      | Ohm  | 1    |

### Notes:

1. Single ended
2. 20%-80%

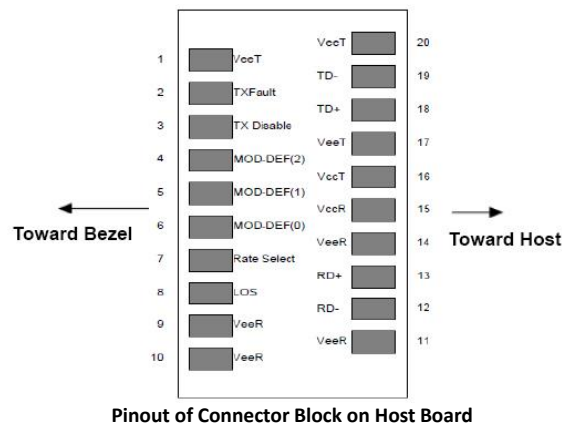
## 6. SFP to Host Connector Pin Out

| Pin | Symbol             | Name / Description                               | Note |
|-----|--------------------|--------------------------------------------------|------|
| 1   | V <sub>EET</sub>   | Transmitter Ground (Common with Receiver Ground) | 1    |
| 2   | T <sub>FAULT</sub> | Transmitter Fault indication                     |      |
| 3   | T <sub>DIS</sub>   | Transmitter Disable                              |      |
| 4   | MOD_DEF(2)         | Module Definition 2. Data line for Serial ID.    | 2    |
| 5   | MOD_DEF(1)         | Module Definition 1. Data line for Serial ID.    | 2    |
| 6   | MOD_DEF(0)         | Module Definition 0. Data line for Serial ID.    | 2    |
| 7   | RS0                | Rate Select 0                                    |      |
| 8   | LOS                | Loss of Signal indication                        | 3    |
| 9   | V <sub>EER</sub>   | Receiver Ground (Common with Transmitter Ground) | 1    |
| 10  | V <sub>EER</sub>   | Receiver Ground (Common with Transmitter Ground) | 1    |
| 11  | V <sub>EER</sub>   | Receiver Ground (Common with Transmitter Ground) | 1    |
| 12  | RD-                | Inv. Received Data Out                           |      |
| 13  | RD+                | Received Data Out                                |      |
| 14  | V <sub>EER</sub>   | Receiver Ground (Common with Transmitter Ground) | 1    |
| 15  | V <sub>CCR</sub>   | Receiver Power Supply                            |      |
| 16  | V <sub>CCT</sub>   | Transmitter Power                                |      |
| 17  | V <sub>EET</sub>   | Transmitter Ground (Common with Receiver Ground) | 1    |
| 18  | TD+                | Transmit Data In                                 |      |
| 19  | TD-                | Inv. Transmit Data In                            |      |
| 20  | V <sub>EET</sub>   | Transmitter Ground (Common with Receiver Ground) | 1    |

### Notes:

1. Circuit ground is connection chassis ground.
2. It is pulled up within the module with a 4.7k~10kΩ resistor. Voltage is between 2.0V and 3.6.  
MOD\_DEF(0) indicates if module is plugged in.

3. LVTTTL compatible with a maximum voltage of 2.5V.



## 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     | Contents (Hex)                                     | Description                        |
|--------------|--------------------|-------------------|----------------------------------------------------|------------------------------------|
| 0            | 1                  | Identifier        | XX                                                 | Formfactor                         |
| 1            | 1                  | Ext. Identifier   | XX                                                 |                                    |
| 2            | 1                  | Connector         | XX                                                 |                                    |
| 3-10         | 8                  | Transceiver       | XX XX XX XX XX XX XX XX                            | Transmittter Code                  |
| 11           | 1                  | Encoding          | XX                                                 |                                    |
| 12           | 1                  | BR, Nominal       | XX                                                 | Transceiver Speed                  |
| 13           | 1                  | Reserved          | 00                                                 |                                    |
| 14           | 1                  | Length (9μm) km   | XX                                                 | Max. link length in KM             |
| 15           | 1                  | Length (9μm) 100m | XX                                                 | Max. link length in M              |
| 16           | 1                  | Length (50μm) 10m | XX                                                 | Max. link length in M              |
| 17           | 1                  | Length(62.5μm)10m | XX                                                 | Max. link length in M              |
| 18           | 1                  | Length (Copper)   | XX                                                 | Max. link length in M              |
| 29           | 1                  | Reserved          | 00                                                 |                                    |
| 30-35        | 16                 | Vendor name       | XX XX XX XX XX XX XX XX<br>XX XX XX XX XX XX XX XX | Vendor name - OEM                  |
| 36           | 1                  | Reserved          | 00                                                 |                                    |
| 37-39        | 3                  | Vendor OUI        | XX XX XX                                           |                                    |
| 40-55        | 16                 | Vendor PN         | XX XX XX XX XX XX XX XX<br>XX XX XX XX XX XX XX XX | Product Number - depending on Part |
| 56-59        | 4                  | Vendor rev        | XX XX XX XX                                        | Vendor revision                    |
| 60-61        | 2                  | Wavelength        | XX XX                                              | Transceiver Wavelength             |
| 62           | 1                  | Reserved          | 00                                                 |                                    |
| 63           | 1                  | CC BASE           | XX                                                 | Checksum of bytes 0-62             |
| 64-65        | 2                  | Options           | XX XX                                              |                                    |
| 66           | 1                  | BR, max           | XX                                                 |                                    |
| 67           | 1                  | BR, min           | XX                                                 |                                    |
| 68-83        | 16                 | Vendor SN         | XX XX XX XX XX XX XX XX<br>XX XX XX XX XX XX XX XX | Part serial number                 |

|        |     |                  |                         |                         |
|--------|-----|------------------|-------------------------|-------------------------|
| 84-91  | 8   | Vendor date code | XX XX XX XX XX XX 20 20 | Year, Month, Day        |
| 92     | 1   | Diagnostic type  | XX                      | Diagnostics             |
| 93     | 1   | Enhanced option  | XX                      | Diagnostics             |
| 94     | 1   | SFF-8472         | XX                      | Diagnostics             |
| 95     | 1   | CC_EXT           | XX                      | Checksum of bytes 64-94 |
| 96-255 | 160 | Vendor Specific  |                         |                         |

## 8. Mechanical Specifications (Unit: mm)

