

### XBR-000238-PRO

Brocade® XBR-000238 Compatible TAA Compliant 32GBase-LW Fibre Channel SFP+ Transceiver (SMF, 1310nm, 10km, DOM, 0 to 70C, LC)

#### Features

- SFF-8432 and SFF-8472 Compliance
- Duplex LC Connector
- Commercial Temperature 0 to 70 Celsius
- Single-mode Fiber
- Hot Pluggable
- Excellent ESD Protection
- Metal with Lower EMI
- RoHS Compliant and Lead Free



#### Applications:

- 32GBase Fibre Channel
- Access and Enterprise

#### Product Description

This Brocade® XBR-000238 compatible SFP+ transceiver provides 32GBase-LW Fibre Channel throughput up to 10km over single-mode fiber (SMF) using a wavelength of 1310nm via an LC connector. It is guaranteed to be 100% compatible with the equivalent Brocade® transceiver. This easy to install, hot swappable transceiver has been programmed, uniquely serialized and data-traffic and application tested to ensure that it will initialize and perform identically. Digital optical monitoring (DOM) support is also present to allow access to real-time operating parameters. This transceiver is Trade Agreements Act (TAA) compliant. We stand behind the quality of our products and proudly offer a limited lifetime warranty.

Proline's transceivers are RoHS compliant and lead-free.

TAA refers to the Trade Agreements Act (19 U.S.C. & 2501-2581), which is intended to foster fair and open international trade. TAA requires that the U.S. Government may acquire only "U.S. – made or designated country end products.



## Regulatory Compliance

- ESD to the Electrical PINs: compatible with MIL-STD-883E Method 3015.4
- ESD to the LC Receptacle: compatible with IEC 61000-4-3
- EMI/EMC compatible with FCC Part 15 Subpart B Rules, EN55022:2010
- Laser Eye Safety compatible with FDA 21CFR, EN60950-1& EN (IEC) 60825-1,2
- RoHS compliant with EU RoHS 2.0 directive 2015/863/EU

## Absolute Maximum Ratings

| Parameter                           | Symbol           | Min. | Max.                                  | Unit |
|-------------------------------------|------------------|------|---------------------------------------|------|
| Maximum Supply Voltage              | V <sub>CC</sub>  | -0.5 | 4.0                                   | V    |
| Storage Temperature                 | T <sub>S</sub>   | -40  | 85                                    | °C   |
| Operating Case Temperature          | T <sub>C</sub>   | 0    | 70                                    | °C   |
| Operating Humidity (Non-Condensing) | RH               | 5    | 85                                    | %    |
| Maximum Bitrate                     | B <sub>max</sub> | 8.5  | 28.05                                 | Gbps |
| Bit Error Rate                      | BER              |      | 10 <sup>-12</sup><br>10 <sup>-6</sup> |      |

## Electrical Characteristics (T<sub>A</sub>, V<sub>CC</sub> = 3.15 to 3.46 Volts)

| Parameter                      | Symbol                 | Min.               | Typ. | Max.                 | Unit | Notes |  |
|--------------------------------|------------------------|--------------------|------|----------------------|------|-------|--|
| Power Supply Voltage           | V <sub>CC</sub>        | 3.15               |      | 3.46                 | V    |       |  |
| Power Supply Current           | I <sub>CC</sub>        |                    |      | 400                  | mA   | 1     |  |
| Power Consumption              | P <sub>DISS</sub>      |                    |      | 1.5                  | W    |       |  |
| <b>Transmitter</b>             |                        |                    |      |                      |      |       |  |
| Differential data input swing  | 28.05Gbps              | V <sub>in,pp</sub> | 250  |                      | 900  | mV    |  |
|                                | 14.025Gbps & 8.5Gbps   | V <sub>in,pp</sub> | 180  |                      | 700  | mV    |  |
| Input differential impedance   | Z <sub>in</sub>        |                    | 100  |                      | Ω    | 2     |  |
| Inner Eye Height               | EH <sub>6</sub>        | 50                 |      |                      | mV   | 3     |  |
| Transmit Disable Voltage       | V <sub>D</sub>         | 2                  |      | V <sub>CC</sub>      | V    | 4     |  |
| Transmit Enable Voltage        | V <sub>EN</sub>        | V <sub>EE</sub>    |      | V <sub>EE</sub> +0.8 | V    |       |  |
| <b>Receiver</b>                |                        |                    |      |                      |      |       |  |
| Single ended data output swing | V <sub>out, pp</sub>   | 185                |      | 425                  | mV   | 5     |  |
| Output differential impedance  | Z <sub>in</sub>        |                    | 100  |                      | Ω    |       |  |
| LOS Fault                      | V <sub>LOS fault</sub> | 2                  |      | V <sub>CC</sub> HOST | V    | 6     |  |
| LOS Normal                     | V <sub>LOS norm</sub>  | V <sub>EE</sub>    |      | V <sub>EE</sub> +0.8 | V    | 6     |  |
| Power Supply Rejection         | PSR                    | 100                |      |                      | mVpp | 7     |  |

**Notes:**

1. With established link, the total power dissipation shall not exceed 1.3W.
2. Connected directly to TX data input pins. AC coupling from pins into CDR, BER contour  $10^{-6}$ , per FC-PI 6 and FC-MSQS-2.
3. Inner eye height (EH6) for high loss case
4. Or open circuit.
5. Into 100 ohms differential termination.
6. LOS is an open collector output. Should be pulled up with 4.7k – 10kohms on the host board. Normal operation is logic 0; loss of signal is logic 1. Maximum pull-up voltage is 5.5V.
7. Receiver sensitivity is compliant with power supply sinusoidal modulation of 20 Hz to 1.5 MHz up to specified value applied through the recommended power supply filtering network.

## Optical Characteristics

| Parameter                             | Symbol                   | Min.                | Typ.       | Max. | Unit   | Notes   |     |
|---------------------------------------|--------------------------|---------------------|------------|------|--------|---------|-----|
| <b>Transmitter</b>                    |                          |                     |            |      |        |         |     |
| Optical Power (average)               | 28.05Gbps/<br>14.025Gbps | P <sub>OUT</sub>    | -5         |      | +2.0   | dBm     | 1,2 |
|                                       | 8.5Gbps                  | P <sub>OUT</sub>    | -8.4       |      | +2.0   | dBm     | 1   |
| Optical Modulation amplitude (OMA)    | 28.05Gbps                | OMA                 | 631 (-2.0) |      | (+3)   | μW(dBm) |     |
|                                       | 14.025Gbps               | OMA                 | 631 (-2.0) |      | (+3)   | μW(dBm) |     |
|                                       | 8.5Gbps                  | OMA                 | 290 (-5.4) |      | (+3)   | μW(dBm) |     |
| Optical Extinction Ratio              | 28.05Gbps                | ER                  | 4          |      |        | dB      |     |
|                                       | 14.025Gbps/<br>8.5Gbps   | ER                  | 3.5        |      |        | dB      |     |
| Optical Wavelength                    | λ                        | 1295                |            | 1325 | nm     |         |     |
| Spectral Width (-20dB)                | σ                        |                     |            | 1    | nm     |         |     |
| Side Mode Suppression Ratio           |                          | 30                  |            |      | dB     |         |     |
| Transmitter Dispersion Penalty        | 28.05Gbps                | TDP                 |            |      | 2.7    | dB      |     |
|                                       | 14.025Gbps               | TDP                 |            |      | 4.4    | dB      |     |
|                                       | 8.5Gbps                  | TDP                 |            |      | 3.2    | dB      |     |
| Relative Intensity Noise              | 28.05Gbps/<br>14.025Gbps | RIN                 |            |      | -130   | dB/Hz   |     |
|                                       | 8.5Gbps                  | RIN                 |            |      | -128   | dB/Hz   |     |
| <b>Receiver</b>                       |                          |                     |            |      |        |         |     |
| Average Receiver Power                |                          | R <sub>X</sub> MAX  |            |      | 2      | dBm     |     |
| Unstressed Receiver Sensitivity (OMA) | 28.05Gbps                | R <sub>X</sub> SENS |            |      | -11.4  | dBm     | 3   |
|                                       | 14.025Gbps               | R <sub>X</sub> SENS |            |      | -12.0  | dBm     | 3   |
|                                       | 8.5Gbps                  | R <sub>X</sub> SENS |            |      | -13.8) | dBm     | 3   |
| Optical Return Loss                   | 28.05Gbps                |                     | 26         |      |        | dB      |     |
|                                       | 14.025Gbps/<br>8.5Gbps   |                     | 12         |      |        | dB      |     |
| LOS De-Assert                         |                          | LOS <sub>D</sub>    |            |      | -17    | dBm     |     |
| LOS Assert                            |                          | LOS <sub>A</sub>    | -30        |      |        | dBm     |     |
| LOS Hysteresis                        |                          |                     | 0.5        |      |        | dB      |     |

### Notes:

1. Class 1 Laser Safety limit per FDA/CDRH, and EN (IEC) 60825 laser safety standards.
2. 3200-SM-LC-L OMA in dBm shall also exceed -5.0 TDP.
3. For 32GFC with FEC, receiver sensitivity is defined at 10<sup>-6</sup> BER level, not 10<sup>-12</sup> BER level.

## Pin Descriptions

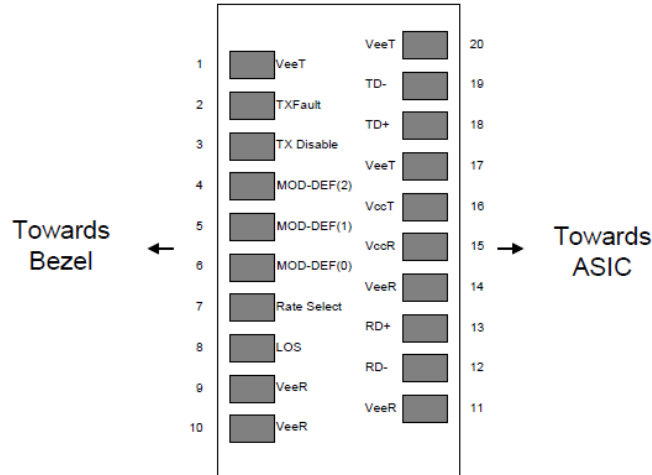
| Pin | Symbol  | Name/Descriptions  | Ref. |
|-----|---------|--|------|
| 1   | VEET    | Transmitter Ground (Common with Receiver Ground)   | 1    |
| 2   | TFAULT  | Transmitter Fault.   | 2    |
| 3   | TDIS    | Transmitter Disable. Laser output disabled on high or open.  | 3    |
| 4   | SDA     | 2-wire Serial Interface Data Line (MOD-DEF2)   | 4    |
| 5   | SCA     | 2-wire Serial Interface Clock (MOD-DEF1)   | 4    |
| 6   | MOD_ABS | Module Absent, connected to V <sub>EET</sub> or V <sub>EER</sub>   | 4    |
| 7   | RS0     | Rx Rate Select:<br>Open or Low = 8.5 or 14.025 Gb/s Fibre Channel (Low Bandwidth) High = 28.05 Gb/s Fibre Channel (High Bandwidth) | 5    |
| 8   | LOS     | Loss of Signal indication. Logic 0 indicates normal operation.   | 6    |
| 9   | RS1     | Tx Rate Select:<br>Open or Low = 8.5 or 14.025 Gb/s Fibre Channel (Low Bandwidth) High = 28.05 Gb/s Fibre Channel (High Bandwidth) | 5    |
| 10  | VEER    | Receiver Ground (Common with Transmitter Ground)   | 1    |
| 11  | VEER    | Receiver Ground (Common with Transmitter Ground)   | 1    |
| 12  | RD-     | Receiver Inverted DATA out. AC Coupled   |      |
| 13  | RD+     | Receiver Non-inverted DATA out. AC Coupled   |      |
| 14  | VEER    | Receiver Ground (Common with Transmitter Ground)   | 1    |
| 15  | VCCR    | Receiver Power Supply  |      |
| 16  | VCCT    | Transmitter Power Supply   |      |
| 17  | VEET    | Transmitter Ground (Common with Receiver Ground)   | 1    |
| 18  | TD+     | Transmitter Non-Inverted DATA in. AC Coupled.  |      |
| 19  | TD-     | Transmitter Inverted DATA in. AC Coupled.  |      |
| 20  | VEET    | Transmitter Ground (Common with Receiver Ground)   | 1    |

### Notes:

1. Circuit ground is internally isolated from chassis ground.
2. T<sub>FAULT</sub> is an open collector/drain output, which should be pulled up with a 4.7k – 10k Ohms resistor on the host board if intended for use. Pull up voltage should be between 2.0V to V<sub>cc</sub> + 0.3V. A high output indicates a transmitter fault caused by either the TX bias current or the TX output power exceeding the preset alarm thresholds. A low output indicates normal operation. In the low state, the output is pulled to <0.8V.
3. Laser output disabled on T<sub>DIS</sub> >2.0V or open, enabled on T<sub>DIS</sub> <0.8V.
4. Should be pulled up with 4.7k – 10kohms on host board to a voltage between 2.0V and 3.6V. MOD\_ABS pulls line low to indicate module is plugged in.
5. Rate select can also be set through the 2-wire bus in accordance with SFF-8472 v. 12.1c. Rx Rate Select is set at Bit 3, Byte 110, Address A2h. Tx Rate Select is set at Bit 3, Byte 118, Address A2h. Note: writing a

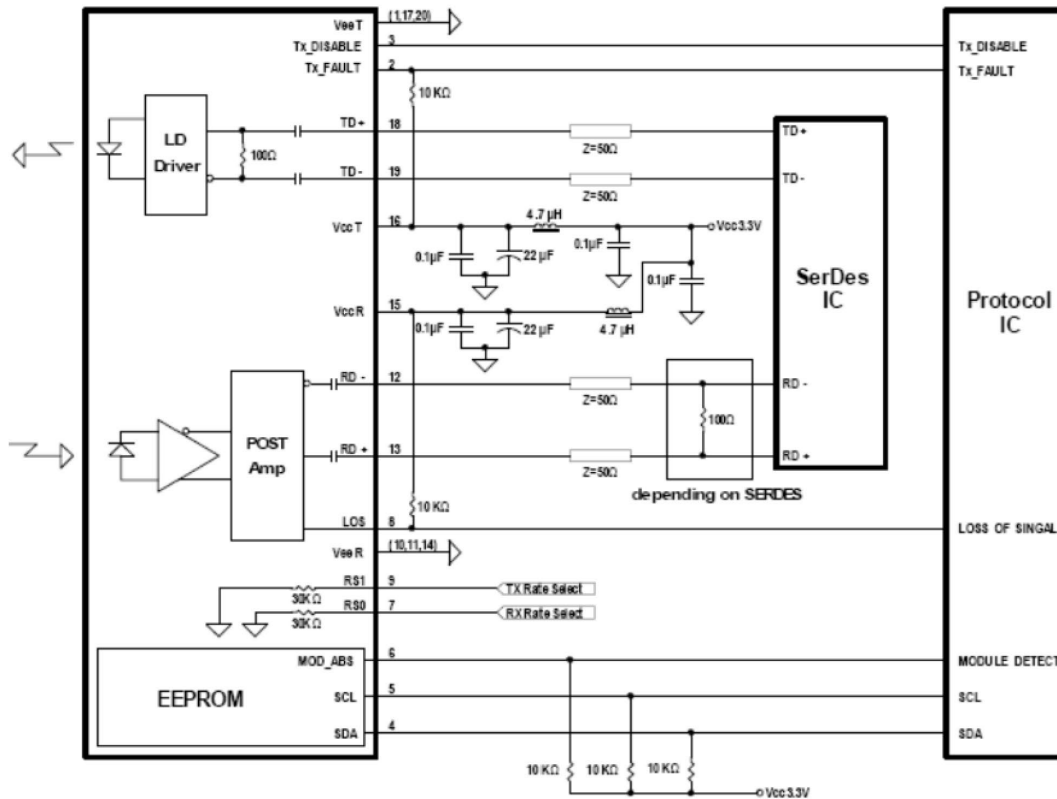
“1” selects maximum bandwidth operation. Rate select is the logic OR of the input state of Rate Select Pin and 2-wire bus.

6. LOS is open collector output. Should be pulled up with 4.7k – 10kohms on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.



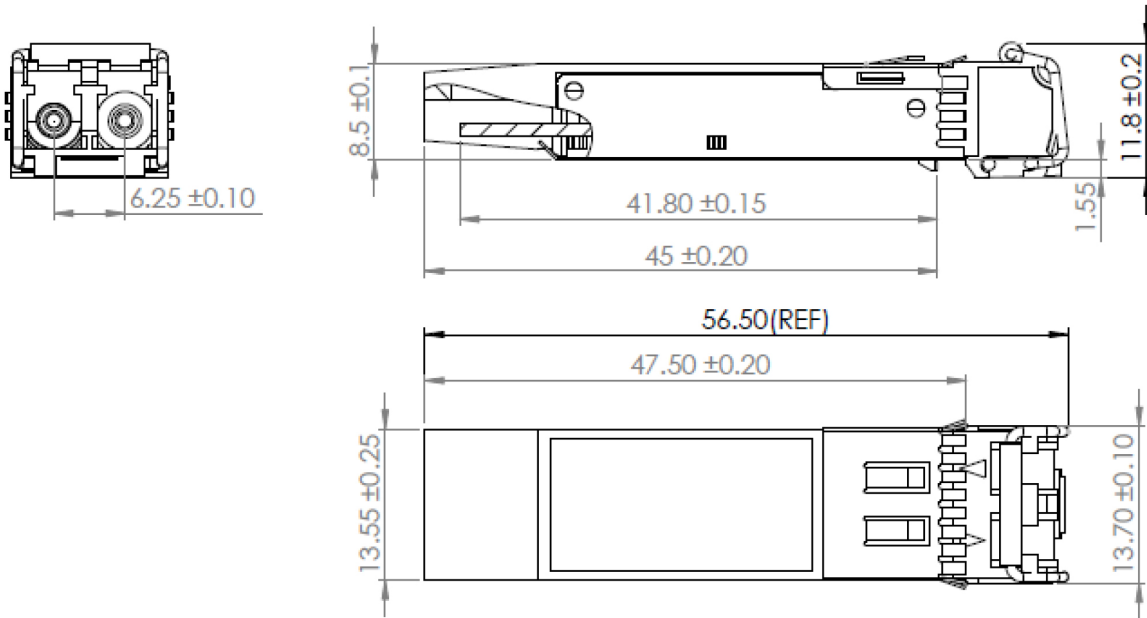
Pin-out of connector Block on Host board

### Recommended Circuit Schematic



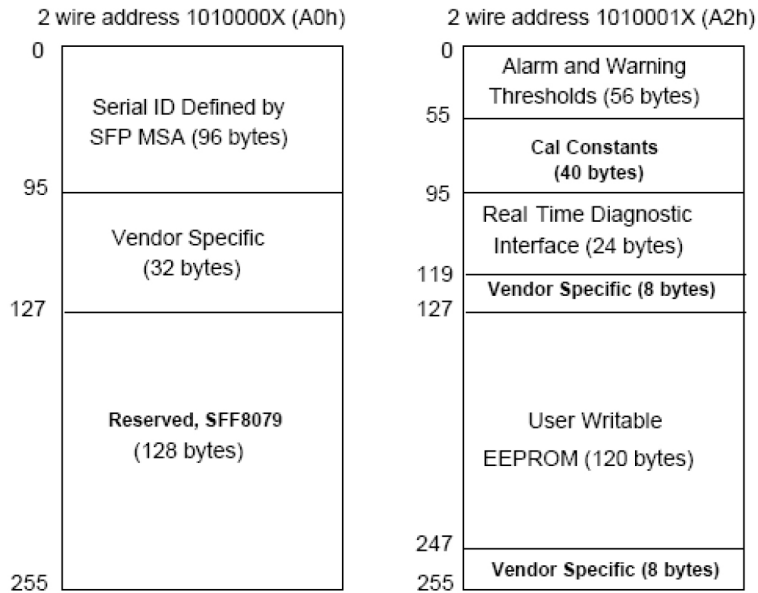
### Mechanical Specifications

Small Form Factor Pluggable (SFP) transceivers are compatible with the dimensions defined by the SFP Multi-Sourcing Agreement (MSA).



### EEPROM Information

EEPROM memory map specific data field description is as below:



**About Us:**

Proline Options is one of North America's leading providers of transceivers and high speed cabling. With a reputation for quality, tested products that cover the connectivity spectrum, Proline Options has a solution for you regardless of the specification.

At Proline Options, every product is tested in its intended application - never batch or spec tested only. We run bandwidth, distance and IOS network tests. We have documented an impressive 0.03% failure rate over the last 10 years. To continue this rate of success we invest millions annually in our own on-site testing lab.



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