

## E1MG-BXD-I-C

Brocade® (Formerly) E1MG-BXD-I Compatible TAA 1000Base-BX SFP Transceiver (SMF, 1490nmTx/1310nmRx, 10km, LC, DOM, -40 to 85C)

### Features:

- INF-8074 and SFF-8472 Compliance
- Simplex LC Connector
- Single-mode Fiber
- Industrial Temperature -40 to 85 Celsius
- Hot Pluggable
- Metal with Lower EMI
- Excellent ESD Protection
- RoHS Compliant and Lead Free



### Applications:

- 1000Base-BX Ethernet
- 1x Fibre Channel
- Access (FTTx) and Enterprise

### Product Description

This Brocade® (Formerly) E1MG-BXD-I compatible SFP transceiver provides 1000Base-BX throughput up to 10km over single-mode fiber (SMF) using a wavelength of 1490nmTx/1310nmRx via an LC connector. This bidirectional unit must be used with another transceiver or network appliance of complementing wavelengths. It is guaranteed to be 100% compatible with the equivalent Brocade® (Formerly) 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.

ProLabs' 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. | Typ.  | Max.              | Unit | Notes |
|----------------------------|-----------------|------|-------|-------------------|------|-------|
| Maximum Supply Voltage     | V <sub>CC</sub> | -0.5 |       | 4.0               | V    | 1     |
| Storage Temperature        | T <sub>S</sub>  | -40  |       | 85                | °C   | 2     |
| Operating Case Temperature | T <sub>C</sub>  | -40  |       | +85               | °C   |       |
| Operating Humidity         | RH              | 5    |       | 85                | %    |       |
| Bit Error Rate             | BER             |      |       | 10 <sup>-12</sup> |      |       |
| Data Rate                  | DR              |      | 1.25  |                   | Gbps | 3     |
|                            | DR              |      | 1.062 |                   | Gbps | 4     |

### Notes:

1. For electrical power interface
2. Ambient temperature
3. IEEE 802.3
4. FC-PI-2 Rev7.0

## Electrical Characteristics (V<sub>CC</sub>=3.14V to 3.46V, T<sub>C</sub>=-40 °C to +85 °C)

| Parameter                            | Symbol                         | Min.                 | Typ. | Max.                 | Unit | Notes |
|--------------------------------------|--------------------------------|----------------------|------|----------------------|------|-------|
| Power Supply Voltage                 | V <sub>CC</sub>                | 3.14                 | 3.3  | 3.46                 | V    |       |
| Power Supply Current                 | I <sub>CC</sub>                |                      | 200  | 300                  | mA   | 1     |
| Transmitter                          |                                |                      |      |                      |      |       |
| Input differential impedance         | R <sub>IN</sub>                |                      | 100  |                      | Ω    |       |
| Single ended data input swing        | V <sub>IN_PP</sub>             | 250                  |      | 1200                 | mV   |       |
| Transmit disable voltage             | V <sub>D</sub>                 | V <sub>CC</sub> -1.3 |      | V <sub>CC</sub>      | V    |       |
| Transmit enable voltage              | V <sub>EN</sub>                | V <sub>EE</sub>      |      | V <sub>EE</sub> +0.8 | V    |       |
| Transmit disable assert time         |                                |                      |      | 10                   | μs   |       |
| Receiver                             |                                |                      |      |                      |      |       |
| Single ended data output swing       | V <sub>OUT_PP</sub>            | 300                  | 400  | 800                  | mV   |       |
| Data output rise/fall time (20%-80%) | t <sub>r</sub> /t <sub>f</sub> |                      |      | 300                  | ps   |       |
| LOS Assert                           | V <sub>LOS_A</sub>             | V <sub>CC</sub> -0.5 |      | V <sub>CC_HOST</sub> | V    |       |
| LOS De-Assert                        | V <sub>LOS_D</sub>             | V <sub>EE</sub>      |      | V <sub>EE</sub> +0.5 | V    |       |

**Notes:**

1. For electrical power interface

**Optical Characteristics**

| Parameter                         | Symbol           | Min. | Typ. | Max.  | Unit    | Notes |
|-----------------------------------|------------------|------|------|-------|---------|-------|
| <b>Transmitter</b>                |                  |      |      |       |         |       |
| Output Optical Power              | PTX              | -9   |      | -3    | dBm     | 1     |
| Optical Center Wavelength         | $\lambda_c$      | 1470 | 1490 | 1510  | nm      |       |
| Optical Modulation Amplitude      | OMA              | 174  |      |       | $\mu$ W | 2     |
| Extinction Ratio                  | ER               | 9    |      |       | dB      |       |
| Spectral Width (-20dB)            | $\Delta\lambda$  |      |      | 1     | nm      |       |
| Side Mode Suppression Ratio       | SMSR             | 30   |      |       |         |       |
| Optical Rise/Fall Time (20%-80%)  | $t_r/t_f$        |      | 150  | 260   | ps      |       |
| Relative Intensity Noise          | RIN              |      |      | -120  | dB/Hz   |       |
| Deterministic Jitter Contribution | DJ               |      | 30   | 60    | ps      |       |
| Total Jitter Contribution         | TJ               |      | 60   | 120   | ps      |       |
| <b>Receiver</b>                   |                  |      |      |       |         |       |
| Receiver Overload                 | POL              | -3   |      |       | dBm     |       |
| Optical Center Wavelength         | $\lambda_c$      | 1260 |      | 1360  | nm      |       |
| Receiver Sensitivity @ 1.063Gb/s  | RX_SEN1          |      |      | -19.5 | dBm     | 3     |
| Receiver Sensitivity @ 1.25Gb/s   | RX_SEN2          |      |      | -19.5 | dBm     | 4     |
| Optical Return Loss               | ORL              | 14   |      |       | dB      |       |
| Optical Isolation                 | ISO              | 35   |      |       | dB      |       |
| LOS Assert                        | LOS <sub>A</sub> | -30  |      |       | dBm     |       |
| LOS De-Assert                     | LOS <sub>D</sub> |      |      | -24   | dBm     |       |
| LOS Hysteresis                    | LOS <sub>H</sub> | 0.5  |      |       | dB      |       |

**Notes:**

1. Class 1 Product
2. Equivalent extinction ratio specification for FC
3. FC-PI-2 Rev7.0 2.
4. IEEE 802.3

## Pin Descriptions

| Pin | Symbol      | Name/Descriptions                                             | Ref. |
|-----|-------------|---------------------------------------------------------------|------|
| 1   | VEET        | Transmitter ground (common with receiver ground)              | 1    |
| 2   | TX_FAULT    | Transmitter Fault. Not supported                              |      |
| 3   | TX_DISABLE  | Transmitter Disable. Laser output disabled on high or open    | 2    |
| 4   | MOD_DEF(2)  | Module Definition 2. Data line for serial ID                  | 3    |
| 5   | MOD_DEF(1)  | Module Definition 1. Clock line for serial ID                 | 3    |
| 6   | MOD_DEF(0)  | Module Definition 0. Grounded within the module               | 3    |
| 7   | Rate Select | No connection required                                        |      |
| 8   | LOS         | Loss of Signal indication. Logic 0 indicates normal operation | 4    |
| 9   | VEER        | Receiver ground (common with transmitter ground)              | 1    |
| 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 isolated from chassis ground
2. Disabled:  $T_{DIS} > 2V$  or open, Enabled:  $T_{DIS} < 0.8V$
3. Should Be pulled up with 4.7k –10k ohm on host board to a voltage between 2V and 3.6V
4. LOS is open collector output



Pin-out of connector Block on Host board

### Block Diagram of Transceiver



**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:

| 2 wire address 1010000X (A0h)           | 2 wire address 1010001X (A2h)             |
|-----------------------------------------|-------------------------------------------|
| 0                                       | 0                                         |
| Serial ID Defined by SFP MSA (96 bytes) | Alarm and Warning Thresholds (56 bytes)   |
| 95                                      | 55                                        |
| Vendor Specific (32 bytes)              | Cal Constants (40 bytes)                  |
| 127                                     | 95                                        |
| Reserved, SFF8079 (128 bytes)           | Real Time Diagnostic Interface (24 bytes) |
|                                         | 119                                       |
|                                         | Vendor Specific (8 bytes)                 |
|                                         | 127                                       |
|                                         | User Writable EEPROM (120 bytes)          |
|                                         | 247                                       |
|                                         | Vendor Specific (8 bytes)                 |
| 255                                     | 255                                       |

### Digital Diagnostic Functions

This transceiver supports the 2-wire serial communication protocol as defined in SFP MSA. Digital diagnostic information is accessible over the 2-wire interface at the address 0xA2. Digital diagnostics are internally calibrated by default. The internal micro control unit accesses the device operating parameters in real time, such as transceiver temperature, laser bias current, transmitted optical power, received optical power and transceiver supply voltage. The module implements the alarm function of the SFP MSA, alerts the user when a particular operating parameter exceeds the factory-set normal range.

| Parameter    | Symbol          | Accuracy | Report Range |     | Unit | Notes |
|--------------|-----------------|----------|--------------|-----|------|-------|
| Temperature  | Temp            | ±3       | -40          | 95  | °C   |       |
| Voltage      | VCC             | ±0.1     | 2.7          | 3.9 | V    |       |
| Bias Current | Ibias           | ±10      | 1            | 80  | mA   |       |
| Tx Power     | P <sub>TX</sub> | ±3       | -12          | 2   | dBm  |       |
| Rx Power     | P <sub>RX</sub> | ±3       | -30          | 0   | dBm  |       |

## About ProLabs

Our extensive experience comes as standard. For over 20 years ProLabs has delivered optical connectivity solutions that give our customers freedom and choice through our ability to provide seamless interoperability. At the heart of our company is the ability to provide state-of-the-art optical transport and connectivity solutions that are compatible with more than 100 optical switching and transport platforms.

## A Complete Portfolio of Network Solutions

ProLabs is focused on innovations in optical transport and connectivity. The combination of our knowledge of optics and networking equipment enables ProLabs to be your single source for optical transport and connectivity solutions from 100Mb to 1.6T while providing innovative solutions that increase network efficiency. We provide the optical connectivity expertise that is compatible with and enhances your switching and transport equipment.

## The Trusted Partner

Customer service is our number one value. ProLabs has invested in people, labs and manufacturing capacity to ensure compatible products, and immediate answers to your questions. With Engineering and Manufacturing offices in the U.K. and U.S. augmented by field offices throughout the U.S., U.K. and Asia, ProLabs is able to be our customers best advocate 24 hours a day.



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