

407-BBOO-LEG  
1000BASE-LX SFP SMF  
1310NM 10KM REACH LC DOM



## **407-BBOO-LEG**

1.25Gbps SFP Transceiver

### **Features**

- Up to 1.25Gb/s data links
- Duplex LC connector
- Hot-pluggable SFP footprint
- 1310nm FP laser transmitter
- RoHS compliant and Lead Free
- Up to 10km on 9/125um SMF
- Metal enclosure for lower EMI
- Single +3.3V power supply
- Low power dissipation <800mW
- Commercial and industrial operating temperature optional
- SFP MSA SFF-8074i Complaint
- Digital diagnostic compatible with SFF-847 Rev11.0



### **Applications**

- 1000Base-LX
- 1x Fibre Channel

### **Product Description**

Legrand's 407-BBOO-LEG Small Form Factor Pluggable (SFP) transceivers are compatible with the Small Form Factor Pluggable Multi-Sourcing Agreement (MSA). The SFP transceivers are high performance, cost effective modules supporting dual data-rate of 1.25Gbps/1.06Gbps and 10km transmission distance with SMF.

Legrand's SFP transceivers are RoHS compliant and lead-free.

### **Regulatory Compliance**

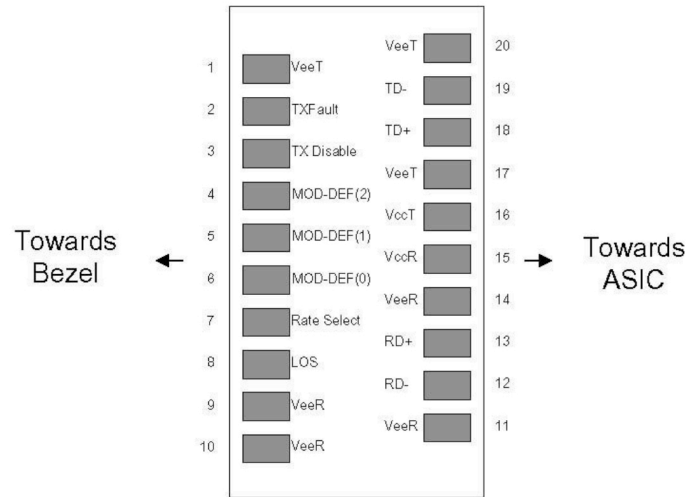
- ESD to the Electrical PINs: compatible with MIL-STD-883 Method 3015.
- ESD to the Duplex LC Receptacle: compatible with IEC 61000-4-2.
- Immunity compatible with IEC 61000-4-3.
- EMI compatible with FCC Part 15 Class B EN55022 Class B (CISPR 22B) VCCI Class B.
- Laser Eye Safety compatible with FDA 21CFR 1040.10 and 1040.11 EN60950, EN (IEC) 60825-1,2.
- RoHS compliant with 2002/95/EC 4.1&4.2 2005/747/EC.

### **Pin Descriptions**

| Pin | Symbol      | Name/Descriptions  | Ref. |
|-----|-------------|--|------|
| 1   | VeeT        | Transmitter Ground (Common with Receiver Ground)               | 1    |
| 2   | TX Fault    | Transmitter Fault.   |      |
| 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    |

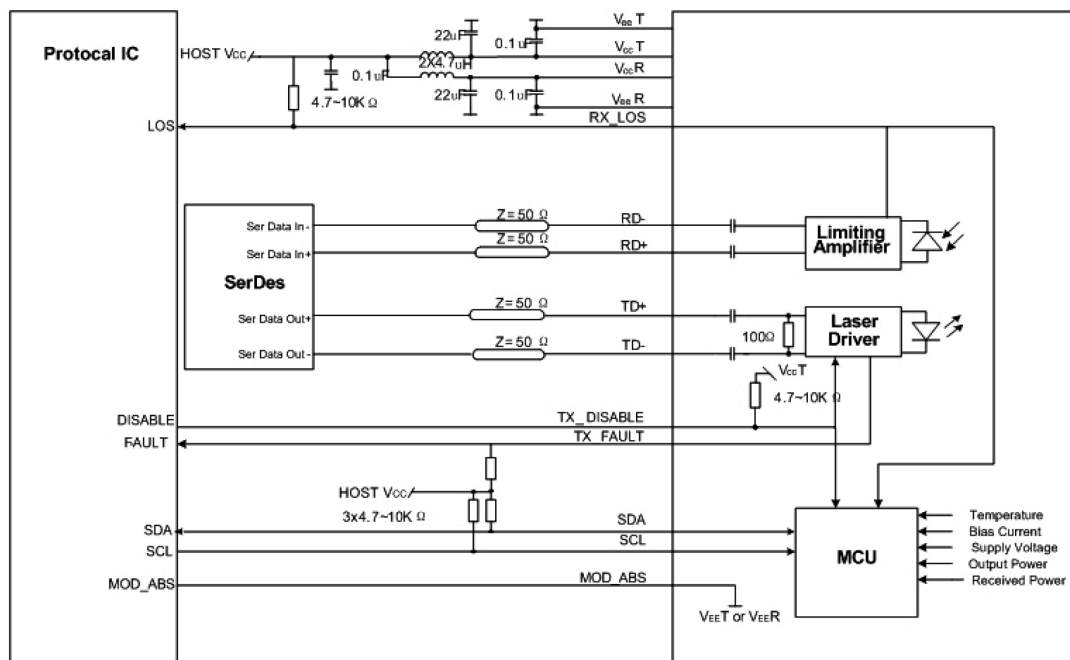
**Notes:**

1. Circuit ground is internally isolated from chassis ground.
2. Laser output disabled on TX Disable >2.0V or open, enabled on TX Disable <0.8V.
3. Should be pulled up with 4.7k-10kohms on host board to a voltage between 2.0V and 3.6V. MOD\_DEF (0) pulls line low to indicate module is plugged in.
4. 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

### Recommend Circuit Schematic



### Absolute Maximum Ratings

| Parameter              | Symbol | Min. | Max. | Unit |
|------------------------|--------|------|------|------|
| Maximum Supply Voltage | Vcc    | -0.5 | 4.0  | V    |
| Storage Temperature    | TS     | -40  | 85   | °C   |
| Operating Humidity     | RH     | 5    | 95   | %    |

### Recommended Operating Conditions

| Parameter                               | Symbol | Min. | Typ.  | Max. | Unit |
|---|--------|------|-------|------|------|
| Power Supply Voltage                    | Vcc    | 3.13 | 3.30  | 3.47 | V    |
| Power Supply Current                    | Icc    |      |       | 250  | mA   |
| Case Operating Temperature – Commercial | Tc     | 0    |       | 70   | °C   |
| Case Operating Temperature – Industrial | Ti     | -40  |       | 85   | °C   |
| Data Rate (Gigabit Ethernet)            |        |      | 1.25  |      | Gbps |
| Data Rate (Fibre Channel)               |        |      | 1.063 |      | Gbps |
| 9/125µm G.652 SMF                       | Lmax   |      |       | 10   | km   |

### Electrical Characteristics (TOP=25°C, Vcc=3.3V)

| Parameter                      | Symbol   | Min.    | Typ. | Max.    | Unit | Notes |
|--------------------------------|----------|---------|------|---------|------|-------|
| Transmitter                    |          |         |      |         |      |       |
| Input differential impedance   | Rin      |         | 100  |         | Ω    | 1     |
| Single ended data input swing  | Vin, pp  | 250     |      | 1200    | mV   |       |
| TX Disable-High                |          | Vcc-1.3 |      | Vcc     | V    |       |
| TX Disable-Low                 |          | Vee     |      | Vee+0.8 | V    |       |
| TX Fault-High                  |          | Vcc-0.5 |      | Vcc     | V    |       |
| TX Fault-Low                   |          | Vee     |      | Vee+0.5 | V    |       |
| Receiver                       |          |         |      |         |      |       |
| Single ended data output swing | Vout, pp | 300     | 400  | 800     | mV   | 2     |
| Data output rise time          | tr       |         |      | 175     | ps   | 3     |
| Data output fall time          | tf       |         |      | 175     | ps   | 3     |
| LOS-High                       |          | Vcc-0.5 |      | Vcc     | V    |       |
| LOS-Low                        |          | Vee     |      | Vee+0.5 | V    |       |

#### Notes:

1. AC coupled.
2. Into 100 ohm differential termination.
3. 20% - 80%

### Optical And Electrical Characteristics

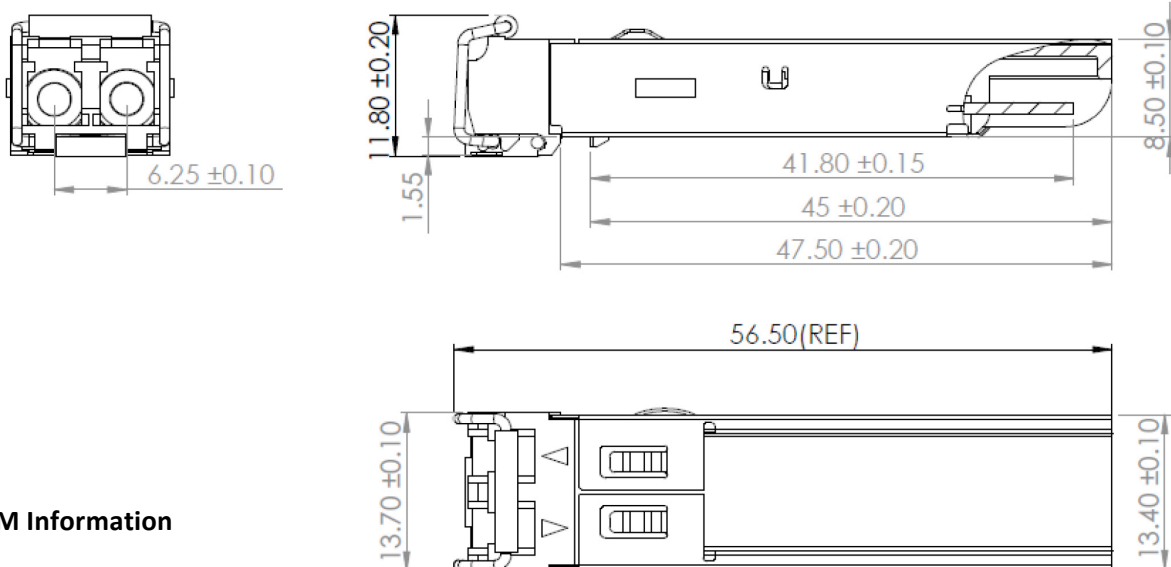
| Parameter                 | Symbol            | Min. | Typ. | Max. | Unit | Notes |
|---------------------------|-------------------|------|------|------|------|-------|
| Transmitter               |                   |      |      |      |      |       |
| Output Opt. Power         | PO                | -9.5 |      | -3   | dBm  | 1     |
| Optical Wavelength        | $\lambda$         | 1275 | 1310 | 1350 | nm   |       |
| Spectral Width            | $\sigma$          |      |      | 3    | nm   |       |
| Optical Rise/Fall Time    | tr/tf             |      |      | 260  | ps   | 2     |
| Total Jitter              | TJ                |      |      | 200  | ps   |       |
| Optical Extinction Ratio  | ER                | 9    |      |      | dB   |       |
| Receiver                  |                   |      |      |      |      |       |
| RX Sensitivity @1.25 Gb/s | RSNS              |      |      | -21  | dBm  | 3,4   |
| Maximum Received Power    | RX <sub>MAX</sub> | -3   |      |      | dBm  |       |
| Optical Center Wavelength | $\lambda_C$       | 1270 |      | 1600 | nm   |       |
| LOS De-Assert             | LOSD              |      |      | -22  | dBm  |       |
| LOS Assert                | LOSA              | -42  |      |      | dBm  |       |
| LOS Hysteresis            |                   | 0.5  |      | 5    | dB   |       |

#### Notes:

1. Class 1 Laser Safety.
2. Unfiltered, 20%-80%. Complies with GE and 1x FC eye masks when filtered.
3. Measured with conformance signals defined in FC-PI-2 Rev. 10.0 specifications.
4. Measured with PRBS 2<sup>7</sup>-1 at 10<sup>-10</sup> BER.

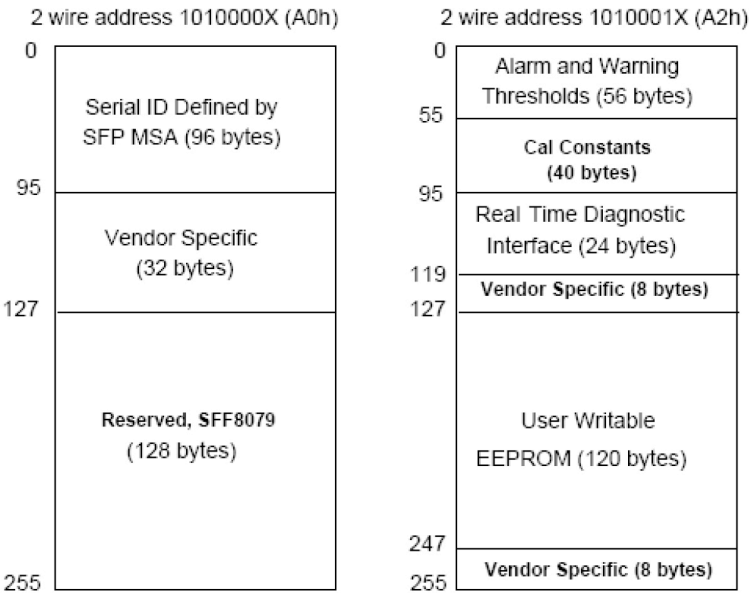
#### Mechanical Specifications

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:



**Digital Diagnostic Monitoring Interface**

Five transceiver parameter values are monitored. The following table defines the monitored parameter's accuracy.

| Parameter    | Range             | Accuracy | Calibration |
|--------------|-------------------|----------|-------------|
| Temperature  | 0°C to 70°C (C)   | ±3°C     | Internal    |
|              | -40°C to 85°C (I) |          |             |
| Voltage      | 2.97V to 3.63V    | ±3%      | Internal    |
| Bias Current | 0mA to 100mA      | ±10%     | Internal    |
| TX Power     | -9dBm to -3dBm    | ±3dB     | Internal    |
| RX Power     | -25dBm to -2dBm   | ±3dB     | Internal    |



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