

## **8.5Gb/s SFP+ 10km Transceiver**

**P/N: AB-SFP+-LR-FC**

### **PRODUCT FEATURES**

- Supports 8.5Gbps bit rates
- Up to 10km transmission on SMF
- DFB Laser and PIN receiver
- Metal enclosure, for lower EMI
- 2-wire interface with integrated Digital Diagnostic monitoring
- Hot-pluggable SFP+ footprint
- Specifications compliant with SFF 8472
- Compliant with SFP+ MSA with LC connector
- Single 3.3V power supply
- Case operating temperature range:0°C to 70°C
- Power dissipation < 1.5 W

### **APPLICATIONS**

- Multi-rate 8x / 4x / 2x Fiber Channel

### **STANDARD**

- Compliance with Fiber Channel FC-PI-4 800-SM-LC-L
- Compliant with 8G, 4G and, 2G Fiber Channel
- RoHS Compliant.

## I Absolute Maximum Ratings

| Parameter            | Symbol | Min.    | Typ. | Max.    | Unit | Note |
|----------------------|--------|---------|------|---------|------|------|
| Storage Temperature  | Ts     | -40     | -    | 85      | °C   |      |
| Relative Humidity    | RH     | 5       | -    | 95      | %    |      |
| Power Supply Voltage | VCC    | -0.3    | -    | 4       | V    |      |
| Signal Input Voltage |        | Vcc-0.3 | -    | Vcc+0.3 | V    |      |

## II Recommended Operating Conditions

| Parameter                  | Symbol | Min.              | Typ. | Max. | Unit | Note             |             |
|----------------------------|--------|-------------------|------|------|------|------------------|-------------|
| Case Operating Temperature | Tcase  | 0                 | -    | 70   | °C   | Without air flow |             |
| Power Supply Voltage       | VCC    | 3.14              | 3.3  | 3.47 | V    |                  |             |
| Power Supply Current       | ICC    | -                 |      | 450  | mA   |                  |             |
| Data Rate                  | BR     |                   | 8.5  |      | Gbps |                  |             |
| Transmission Distance      | TD     |                   | -    | 10   | km   |                  |             |
| Coupled fiber              |        | Single mode fiber |      |      |      |                  | 9/125um SMF |

## III Optical Characteristics

| Parameter                          | Symbol                 | Min  | Typ  | Max   | Unit | NOTE |
|------------------------------------|------------------------|------|------|-------|------|------|
| <b>Transmitter</b>                 |                        |      |      |       |      |      |
| Output Opt. Power                  | POUT                   | -6   |      | -0.5  | dBm  | 1    |
| Optical Wavelength                 | $\lambda$              | 1260 | 1310 | 1355  | nm   |      |
| Spectral Width (-20dB)             | $\sigma$               |      |      | 1     | nm   |      |
| Optical Extinction Ratio           | ER                     | 3.5  |      |       | dB   |      |
| Transmitter and Dispersion Penalty | TDP                    |      |      | 3.2   | dB   |      |
| Output Eye Mask                    | Compliant with FC-PI-4 |      |      |       |      |      |
| <b>Receiver</b>                    |                        |      |      |       |      |      |
| Rx Sensitivity                     | RSNS                   |      |      | -14.4 | dBm  | 2    |
| Input Saturation Power (Overload)  | Psat                   | 0.5  |      |       | dBm  |      |
| Wavelength Range                   | $\lambda_c$            | 1270 |      | 1610  | nm   |      |
| LOS De -Assert                     | LOSD                   |      |      | -17   | dBm  |      |
| LOS Assert                         | LOSA                   | -30  |      |       | dBm  |      |
| LOS Hysteresis                     |                        | 0.5  | 1.0  |       | dB   |      |

**Notes:**

1. Class 1 Laser Safety per FDA/CDRH and IEC-825-1 regulations.
2. Measured with a PRBS  $2^{31}-1$  test pattern, @8.5Gb/s, BER <math>10^{-12}</math>.

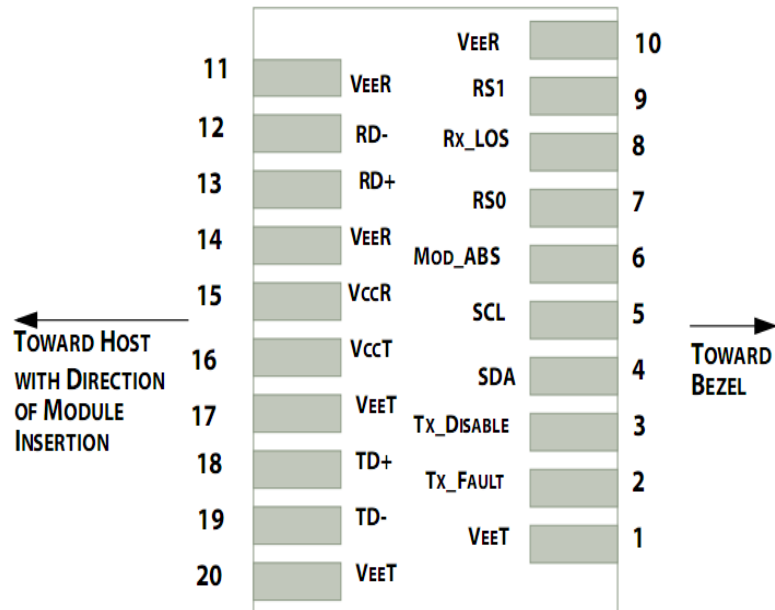
## IV. Electrical Characteristics

| Parameter                      | Symbol     | Min     | Typ | Max      | Unit     | NOTE |
|--------------------------------|------------|---------|-----|----------|----------|------|
| Supply Voltage                 | Vcc        | 3.14    | 3.3 | 3.46     | V        |      |
| Supply Current                 | Icc        |         |     | 450      | mA       |      |
| <b>Transmitter</b>             |            |         |     |          |          |      |
| Input differential impedance   | Rin        |         | 100 |          | $\Omega$ | 1    |
| Single ended data input swing  | Vin,pp     | 180     |     | 700      | mV       |      |
| Transmit Disable Voltage       | VD         | Vcc-1.3 |     | Vcc      | V        |      |
| Transmit Enable Voltage        | VEN        | Vee     |     | Vee+ 0.8 | V        | 2    |
| Transmit Disable Assert Time   |            |         |     | 10       | us       |      |
| <b>Receiver</b>                |            |         |     |          |          |      |
| Differential data output swing | Vout,pp    | 300     |     | 850      | mV       | 3    |
| Data output rise time          | tr         | 28      |     |          | ps       | 4    |
| Data output fall time          | tf         | 28      |     |          | ps       | 4    |
| LOS Fault                      | VLOS fault | Vcc-1.3 |     | VccHOST  | V        | 5    |
| LOS Normal                     | VLOS norm  | Vee     |     | Vee+0.8  | V        | 5    |
| Power Supply Rejection         | PSR        | 100     |     |          | mVpp     | 6    |

**Notes:**

1. Connected directly to TX data input pins. AC coupled thereafter.
2. Or open circuit.
3. Into 100 ohms differential termination.
4. 20 – 80 %.
5. Loss Of Signal is LVTTTL. Logic 0 indicates normal operation; logic 1 indicates no signal detected.
6. 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.

## V. Pin Assignment



Pin out of Connector Block on Host Board

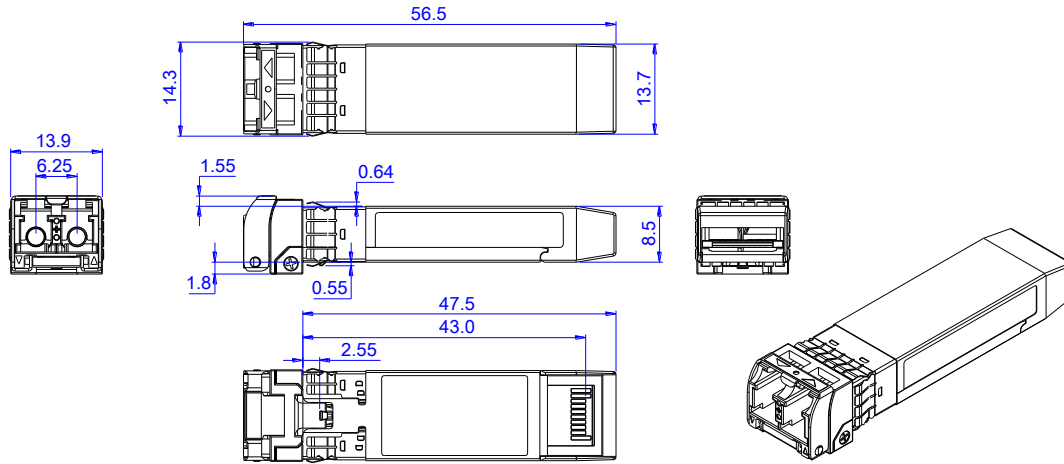
| Pin | Symbol      | Name/Description   | NOTE |
|-----|-------------|--|------|
| 1   | $V_{EET}$   | Transmitter Ground (Common with Receiver Ground)               | 1    |
| 2   | $T_{FAULT}$ | Transmitter Fault.   | 2    |
| 3   | $T_{DIS}$   | Transmitter Disable. Laser output disabled on high or open.    | 3    |
| 4   | SDA         | 2-wire Serial Interface Data Line                              | 4    |
| 5   | SCL         | 2-wire Serial Interface Clock Line                             | 4    |
| 6   | MOD_ABS     | Module Absent. Grounded within the module                      | 4    |
| 7   | RS0         | Rate Select 0  | 5    |
| 8   | LOS         | Loss of Signal indication. Logic 0 indicates normal operation. | 6    |
| 9   | RS1         | No connection required   | 1    |
| 10  | $V_{EER}$   | Receiver Ground (Common with Transmitter Ground)               | 1    |
| 11  | $V_{EER}$   | 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  | $V_{EER}$   | Receiver Ground (Common with Transmitter Ground)               | 1    |
| 15  | $V_{CCR}$   | Receiver Power Supply  |      |
| 16  | $V_{CCT}$   | Transmitter Power Supply                                       |      |
| 17  | $V_{EET}$   | 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  | $V_{EET}$   | Transmitter Ground (Common with Receiver Ground)               | 1    |

**Notes:**

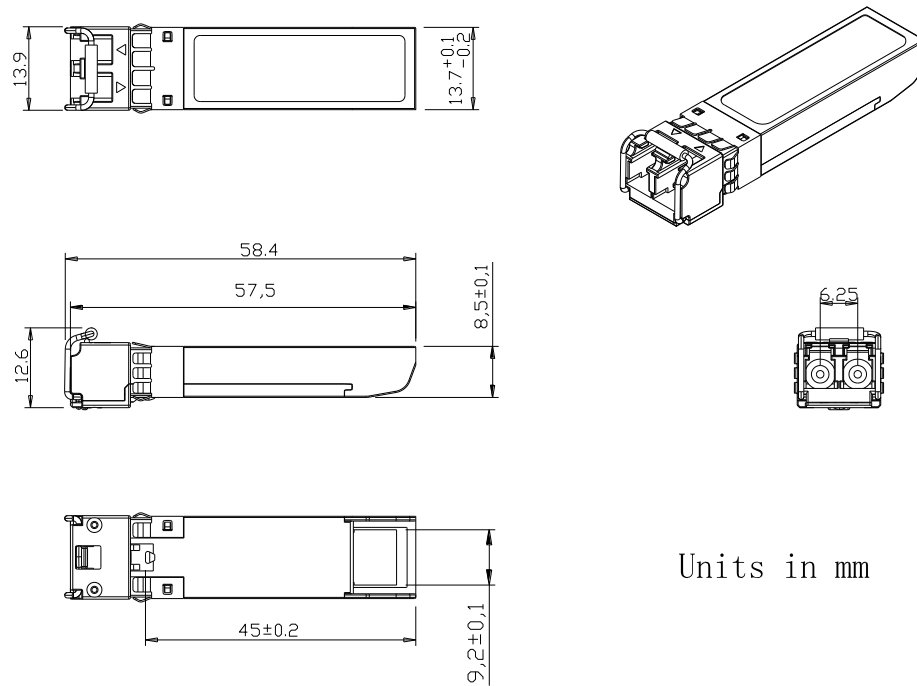
1. Circuit ground is internally isolated from chassis ground.
2.  $T_{\text{FAULT}}$  is an open collector/drain output, which should be pulled up with a 4.7k – 10k Ohms resistor on the host board if intended for use. Pull up voltage should be between 2.0V to  $V_{\text{cc}} + 0.3\text{V}$ . A high output indicates a transmitter fault caused by either the TX bias current or the TX output power exceeding the preset alarm threshold. A low output indicates normal operation. In the low state, the output is pulled to <0.8V.
3. Laser output disabled on  $T_{\text{DIS}} > 2.0\text{V}$  or open, enabled on  $T_{\text{DIS}} < 0.8\text{V}$ .
4. Should be pulled up with 4.7k $\Omega$ - 10k $\Omega$  host board to a voltage between 2.0V and 3.6V. MOD\_ABS pulls line low to indicate module is plugged in.
5. Internally pulled down per SFF-8431 Rev 4.1.
6. LOS is open collector output. It should be pulled up with 4.7k $\Omega$  – 10k $\Omega$  on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.

## VI. Outline Dimensions

### Type 1:



### Type 2:



Units in mm