

### **SFP-1G-BX53-D-60-C**

MSA and TAA 1000Base-BX SFP Transceiver (SMF, 1550nmTx/1310nmRx, 60km, LC, DOM)

#### **Features:**

- INF-8074 and SFF-8472 Compliance
- Simplex LC Connector
- Uncooled DFB transmitter and PIN receiver
- Single-mode Fiber
- Commercial Temperature 0 to 70 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 MSA Compliant SFP transceiver provides 1000Base-BX throughput up to 80km over single-mode fiber (SMF) using a wavelength of 1550nmTx/1310nmRx via an LC connector. It is built to MSA standards and is uniquely serialized and data-traffic and application tested to ensure that they will integrate into your network seamlessly. 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."



## Absolute Maximum Ratings

| Parameter                   | Symbol           | Min. | Typ. | Max. | Unit | Notes |
|-----------------------------|------------------|------|------|------|------|-------|
| Maximum Supply Voltage      | V <sub>cc</sub>  | -0.5 |      | 4.0  | V    |       |
| Storage Temperature         | T <sub>stg</sub> | -40  |      | 85   | °C   |       |
| Operating Case Temperature  | T <sub>c</sub>   | -10  | 25   | 70   | °C   |       |
| Operating Relative Humidity | RH               | 5    |      | 95   | %    |       |
| Power Supply Current        | I <sub>cc</sub>  |      |      | 300  | mA   |       |
| Data Rate                   |                  | 0.1  |      | 1.25 | Gbps |       |

## Electrical Characteristics

| Parameter   | Symbol                     | Min.  | Typ. | Max.            | Unit  | Notes |
|---|----------------------------|-------|------|-----------------|-------|-------|
| Supply Voltage  | V <sub>cc</sub>            | 3.135 | 3.3  | 3.465           | V     |       |
| Module Supply Current   | I <sub>cc</sub>            |       |      | 300             | mA    |       |
| Power Dissipation   | P <sub>DISS</sub>          |       |      | 1000            | mW    |       |
| Transmitter Differential Input Voltage (TD+/-)                      |                            | 300   |      | 2200            | mVp-p | 1     |
| Receiver Differential Output Voltage (RD+/-)                        |                            | 600   |      | 1200            | mVp-p | 2     |
| Low-Speed Output: Transmitter Fault (Tx_Fault)/Loss of Signal (LOS) | VOH                        | 2.0   |      | V <sub>cc</sub> | V     | 3     |
|   | VOL                        | 0     |      | 0.8             | V     |       |
| Low-Speed Input: Transmitter Fault (Tx_Fault), MOD_DEF1, MOD_DEF2   | VIH                        | 2.0   |      | V <sub>cc</sub> | V     | 4     |
|   | VIL                        | 0     |      | 0.8             | V     |       |
| Timing Characteristics  |                            |       |      |                 |       |       |
| Tx_Disable Assert Time  | T <sub>off</sub>           |       |      | 10              | μs    |       |
| Tx_Disable Negate Time  | T <sub>on</sub>            |       |      | 1               | ms    |       |
| Time to Initialize (Includes Reset of Tx_Fault)                     | T <sub>init</sub>          |       |      | 300             | ms    |       |
| Tx_Fault From Fault to Assertion                                    | T <sub>fault</sub>         |       |      | 100             | μs    |       |
| Tx_Disable Time to Start Reset                                      | T <sub>reset</sub>         | 10    |      |                 | μs    |       |
| Receiver LOS Assert Timer (On to Off)                               | T <sub>D</sub> ,<br>Rx_LOS |       |      | 80              | μs    |       |
| Receiver LOS Assert Timer (Off to On)                               | T <sub>A</sub> ,<br>Rx_LOS |       |      | 80              | μs    |       |
| Serial I2C Clock Rate   | I2C_Clock                  |       |      | 100             | kHz   |       |

## Notes:

1. Internally AC coupled and terminated to 100Ω differential load.
2. Internally AC coupled but requires a 100Ω differential termination or internal to Serializer/Deserializer.
3. Pulled up externally with a 4.7kΩ to 10kΩ resistor on the host board to the V<sub>ccT/R</sub>.
4. MOD\_DEF1 and MOD\_DEF2 must be pulled up externally with a 4.7kΩ to 10kΩ resistor on the host board to the V<sub>ccT/R</sub>.

## Optical Characteristics

| Parameter                   | Symbol                                       | Min. | Typ. | Max. | Unit | Notes |
|-----------------------------|--|------|------|------|------|-------|
| Transmitter                 |  |      |      |      |      |       |
| Launch Optical Power        | Po   | 0    |      | 5    | dBm  |       |
| Center Wavelength           | λC   | 1530 | 1550 | 1570 | nm   |       |
| Extinction Ratio            | ER   | 9    |      |      | dB   |       |
| Spectral Width (-20dB)      | Δλ   |      |      | 1    | nm   |       |
| Side-Mode Suppression Ratio | SMSR   | 30   |      |      | dB   |       |
| Optical Rise/Fall Time      | Tr/Tf  |      |      | 260  | ps   |       |
| POUT @Tx_Disable Asserted   | Poff   |      |      | -45  | dBm  |       |
| Eye Diagram                 | IEEE Std 802.3-2005 1000Base-BX-D Compatible |      |      |      |      |       |
| Receiver                    |  |      |      |      |      |       |
| Wavelength Range            |  | 1260 | 1310 | 1360 | nm   |       |
| Receiver Sensitivity        | S  |      |      | -26  | dBm  | 1     |
| Receiver Overload           | Pol  | -3   |      |      | dBm  | 1     |
| Optical Return Loss         | ORL  | 12   |      |      | dB   |       |
| LOS De-Assert               | LOSD   |      |      | -27  | dBm  |       |
| LOS Assert                  | LOSA   | -35  |      |      | dBm  |       |
| LOS Hysteresis              |  | 0.5  | 3    | 5    | dB   |       |

### Notes:

1. Measured with a PRBS  $2^7-1$  test pattern, @1.25Gbps, and  $BER < 10^{-12}$ .

## Pin Descriptions

| Pin | Symbol      | Name/Description  | Plug Seq. | Notes |
|-----|-------------|---|-----------|-------|
| 1   | VeeT        | Transmitter Ground.                                       | 1         |       |
| 2   | Tx_Fault    | Transmitter Fault Indication.                             | 3         | 1     |
| 3   | Tx_Disable  | Transmitter Disable. Module disables on "high" or "open." | 3         | 2     |
| 4   | MOD-DEF2    | Module Definition 2. 2-Wire Serial ID Interface.          | 3         | 3     |
| 5   | MOD-DEF1    | Module Definition 1. 2-Wire Serial ID Interface.          | 3         | 3     |
| 6   | MOD-DEF0    | Module Definition 0. Grounded within the module.          | 3         | 3     |
| 7   | Rate Select | Not Connected. Function not available.                    | 3         |       |
| 8   | LOS         | Loss of Signal.   | 3         | 4     |
| 9   | VeeR        | Receiver Ground.  | 1         |       |
| 10  | VeeR        | Receiver Ground.  | 1         |       |
| 11  | VeeR        | Receiver Ground.  | 1         |       |
| 12  | RD-         | Inverse Received Data Out.                                | 3         | 5     |
| 13  | RD+         | Received Data Out.  | 3         | 5     |
| 14  | VeeR        | Receiver Ground.  | 1         |       |
| 15  | VccR        | 3.3±5% Receiver Power.                                    | 2         | 6     |
| 16  | VccT        | 3.3±5% Transmitter Power.                                 | 2         | 6     |
| 17  | VeeT        | Transmitter Ground.                                       | 1         |       |
| 18  | TD+         | Transmitter Data In.                                      | 3         | 7     |
| 19  | TD-         | Inverse Transmitter Data In.                              | 3         | 7     |
| 20  | VeeT        | Transmitter Ground.                                       | 1         |       |

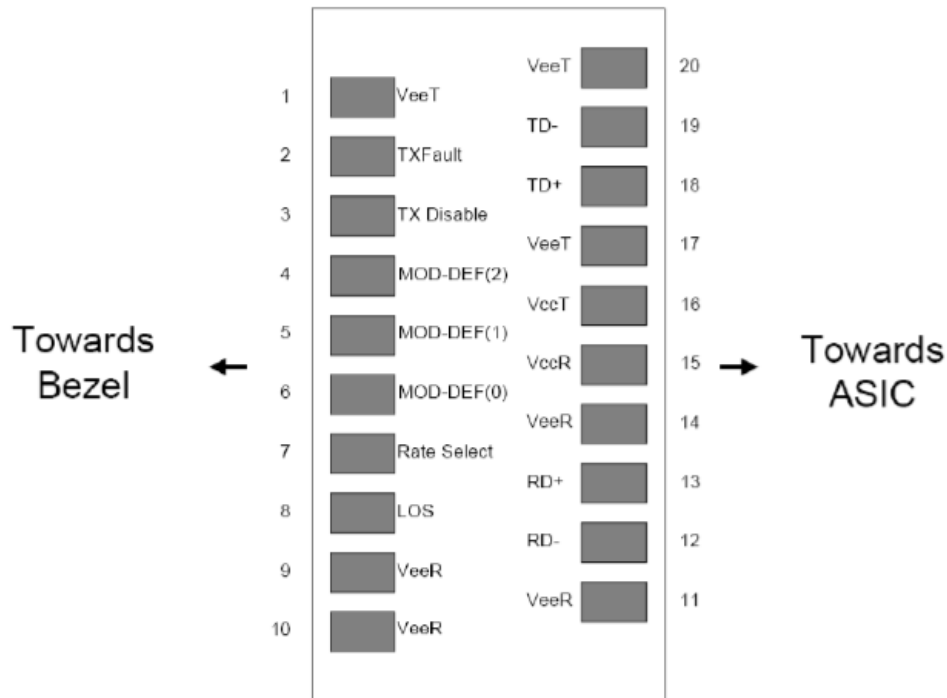
### Notes:

1. Tx\_Fault is an open collector/drain output which should be pulled up with a 4.7kΩ to 10kΩ resistor on the host board. Pull-up voltage between 2.0V and VccT/R+0.3V. When "high," output indicates a laser fault of some kind. "Low" indicates normal operation. In the "low" state, the output will be pulled to <0.8V.
2. Tx\_Disable is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7kΩ to 10kΩ resistor. Its states are:
  - Low (0V – 0.8V): Transmitter On.
  - Between (0.8V and 2.0V): Undefined.
  - High (2.0V – VccT): Transmitter Disabled.
  - Open: Transmitter Disabled.
3. MOD-DEF0, 1, & 2. These are the module definition pins. They should be pulled up with a 4.7kΩ to 10kΩ resistor on the host board. The pull-up voltage shall be VccT or VccR.
  - MOD-DEF0 is grounded by the module to indicate that the module is present.
  - MOD-DEF1 is the clock line of the 2-wire serial interface for optional serial ID.
  - MOD-DEF2 is the data line of the 2-wire serial interface for optional serial ID.
4. LOS (Loss of Signal) is an open collector/drain output which should be pulled up with a 4.7kΩ to 10kΩ

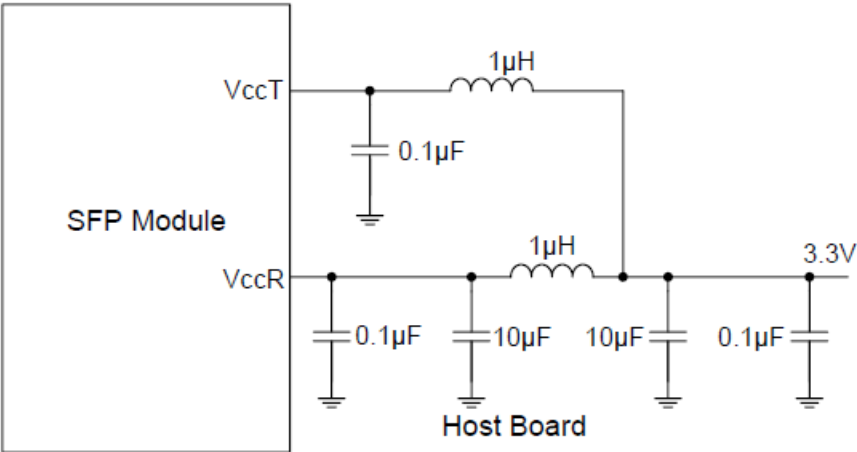
resistor on the host board to supply  $<V_{ccT}+0.3V$  or  $V_{ccR}+0.3V$ . When "high," this output indicates the received optical power is below the worst-case receiver sensitivity (as defined by the standard in use). "Low" indicates normal operation. In the "low" state, the output will be pulled to  $<0.8V$ .

5. RD-/+ : These are the differential receiver outputs. They are AC coupled  $100\Omega$  differential lines which should be terminated with  $100\Omega$  (differential) at the user SERDES. The AC coupling is done inside the module and is thus not required on the host board.
6. VccR and VccT are the receiver and transmitter power supplies. They are defined as  $3.3V\pm5\%$  at the SFP connector pin. The in rush current will typically be more than 30mA above steady state supply current after 500ns.
7. TD-/+ : These are the differential transmitter inputs. They are AC-coupled, differential lines with  $100\Omega$  differential terminations inside the module. They are AC coupled differential lines with  $100\Omega$  differential termination inside the module. The AC coupling is done inside the module and is thus requires on host board.

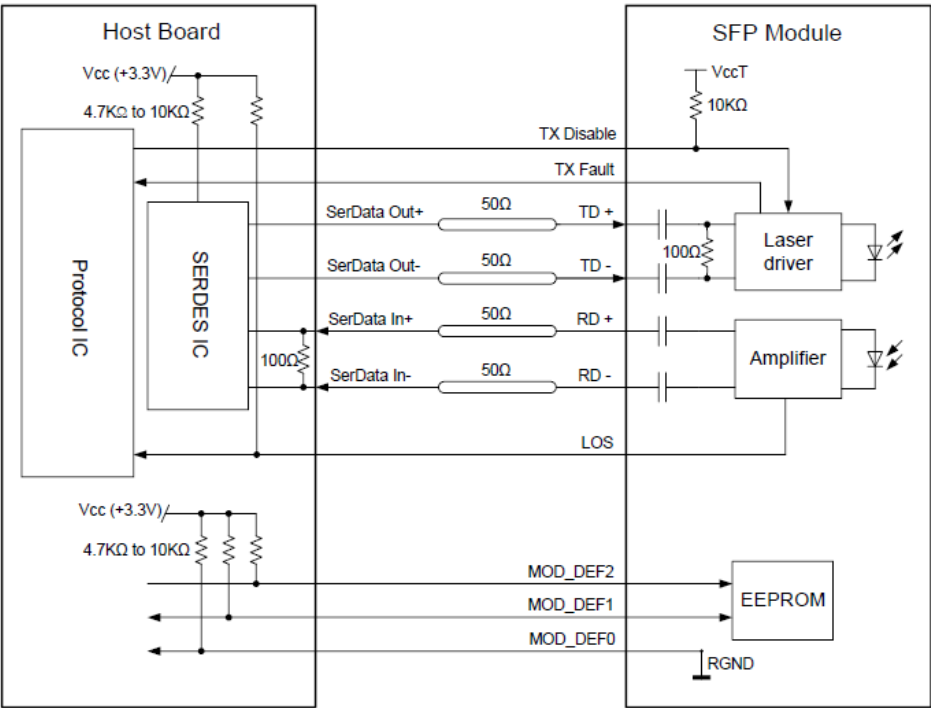
## Pin Connectors



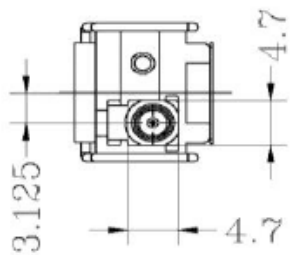
Recommended Host Board Power Supply Circuit



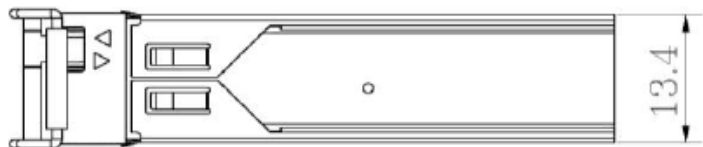
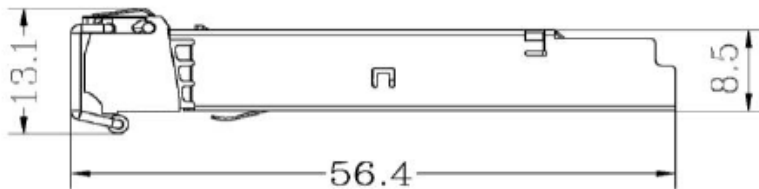
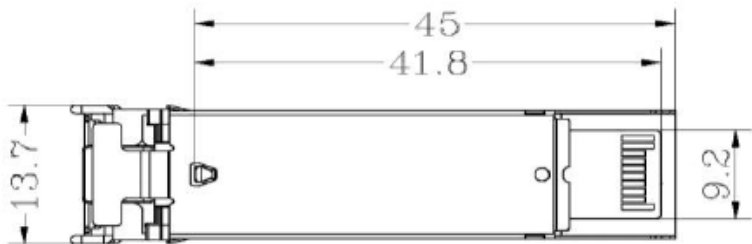
Recommended Application Interface Circuit



Mechanical Specifications



Unit:mm



## About ProLabs

Our experience comes as standard; for over 15 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 over 90 optical switching and transport platforms.

## 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 400G 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.

## Trusted Partner

Customer service is our number one value. ProLabs has invested in people, labs and manufacturing capacity to ensure that you get immediate answers to your questions and compatible product when needed. 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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