# Product Specification

1.25Gb/s DWDM SFP C17~C61 40km
Optical Transceiver

P/N: 1G-SFP-D40-Cxx

## Features

- Hot Pluggable SFP form factor
- Operating data rate 1.25Gbps
- Single +3.3V power supply
- Duplex LC-UPC connector
- Max power dissipation <2.0W
- Up to 40km on 9/125μm SMF
- 18-Wavelength CWDM 1270n~1610nm Available
- DWDM 100GHz ITU Grid C Band Available
- DWDM DML laser transmitter
- PIN receivers
- Built-in digital diagnostic function
- Commercial temperature range 0°C to 70°C

## Compliance

- SFP MSA
- Compliant with SFP Electrical MSA SFF-8431
- Compliant with SFP Mechanical MSA SFF-8432
- SFF-8472
- IEEE 802.3ae
- RoHS

## Applications

- Switches with SFP ports
- Router with SFP Ports
- Server or Network Adapter Card
- Optical Transmission System
- Other devices with SFP Ports
- DWDM Networks

## Description

The 1G-SFP-D40-Cxx is a high-performance Small Form Factor Pluggable (SFP) transceiver, designed to be fully compliant with the Small Form Factor Pluggable Multi-Sourcing Agreement (MSA) and SFF-8472 standards. It is engineered for use in Dense Wavelength Division Multiplexing (DWDM) applications, providing a reliable and cost-effective solution for optical data communication.

The transceiver consists of two key sections: the transmitter, which features a cooled DWDM Distributed Feedback (DML) laser, and the receiver, which integrates a PIN photodiode with a Transimpedance Amplifier (TIA). This design ensures high-performance data transmission with low power consumption.

The 1G-SFP-D40-Cxx supports data links of up to 40km over 9/125um single-mode fiber (SMF), offering a simple and convenient method to interface printed circuit boards (PCBs) with single-mode fiber optic cables. Ideal for DWDM-based networks, this module provides a cost-effective and efficient solution for serial optical data communication in both enterprise and telecom environments.

## Product performance Specifications

### 1. Basic Product Characteristics

| Parameter | Symbol | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|
| Storage Temperature | $T_S$ | -40 | - | +85 | °C |
| Supply Voltage | $V_{CC}$ | -0.5 | - | 4 | V |
| Relative Humidity | RH | 0 | - | 85 | % |
| Operating Case Temperature | $T_C$ | 0 | - | 70 | °C |
| Power Supply Voltage | $V_{CC}$ | 3.135 | 3.3 | 3.465 | V |
| Power Supply Current | $I_{CC}$ | | | 300 | mA |
| Power Dissipation | PD | - | - | 2000 | mW |
| Data Rate | DR | - | 1.25 | - | Gbps |
| Inrush Current | Isurge | | - | $I_{CC}$+30 | mA |

## 2. Product Optical and Electrical Characteristics

| Parameter | Symbol | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|
| **Transmitter** | | | | | |
| Center Wavelength | $\lambda_C$ | X-100 | X | X+100 | nm |
| RMS Spectral Width | σ | | | 1 | nm |
| Side Mode Suppression Ratio | SMSR | 30 | | | dB |
| Optical Output Power[1] | Pout | 0 | | +5 | dBm |
| Optical Rise/Fall Time[2] | tr / tf | | | 260 | ps |
| Extinction Ratio | ER | 9 | | | dB |
| Generated Jitter (peak to peak)[3] | JTXp-p | | | 0.07 | UI |
| Generated Jitter (rms)[3] | JTXrms | | | 0.007 | UI |
| Input differential impedance[4] | Rin | 90 | 100 | 110 | w |
| Optical Eye Mask | Compliant with IEEE 802.3ae | | | | |
| Single ended data input Swing | Vin PP | 250 | | 1200 | mVp-p |
| Transmit Disable Voltage[5] | VD | $V_{CC}$ – 1.3 | | $V_{CC}$ – 1.3 | V |
| Transmit Enable Voltage | VEN | $V_{EE}$ | | $V_{EE}$+ 0.8 | V |
| Transmit Disable Assert Time | Tdessert | | | 10 | us |
| **Receiver** | | | | | |
| Optical Input Wavelength | λr | 1480 | | 1580 | nm |
| Overload[6] | Pin | -8 | | | dBm |
| RX Sensitivity[6] | Sen | | | -24 | dB |
| RX_LOS Assert | LOS A | -40 | | | dBm |
| RX_LOS De-assert | LOS D | | | -25 | dBm |
| RS0 and RS1 | LOS H | 0.5 | | | dB |
| Single ended data output Swing[7] | Vout,pp | 300 | | 800 | mv |
| Data output rise time[8] | tr | | | 260 | ps |
| Data output fall time | | | | | |
| LOS Fault[9] | Vlosfault | $V_{CC}$ – 0.5 | | $V_{CC}$_host | V |
| LOS Normal[9] | Vlos norm | $V_{EE}$ | | $V_{EE}$+0.5 | V |
| Power Supply Rejection[10] | PSR | 100 | | | mVpp |

**Note1:** The optical power is launched into SMF

**Note2:** 20-80%.

**Note3:** Jitter measurements taken using Agilent OMNIBERT 718 in accordance with GR-253

**Note4:** AC couple

**Note5:** Or open circuit

**Note6:** Measured with PRBS 27 -1at 10-12 BER

**Note7:** Into 100 ohm differential termination

**Note8:** 20 – 80 %

**Note9:** LOS is LVTTL. Logic 0 indicates normal operation; logic 1 indicates no signal detected.

**Note10:** All transceiver specifications are compliant with a power supply sinusoidal modulation of 20 Hz to 1.5MHz up to specified value applied through the power supply filtering network shown on page 23 of the Small Form-factor Pluggable (SFP) Transceiver Multi-Source Agreement (MSA), September 14, 2000

## Recommended Host Board Power Supply Circuit

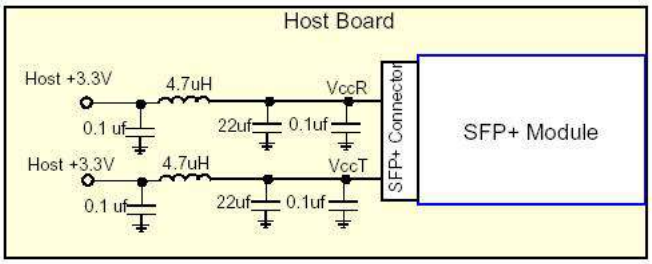



**Figure 1:**Recommended Host Board Power Supply Circuit

## Recommended Interface Circuit

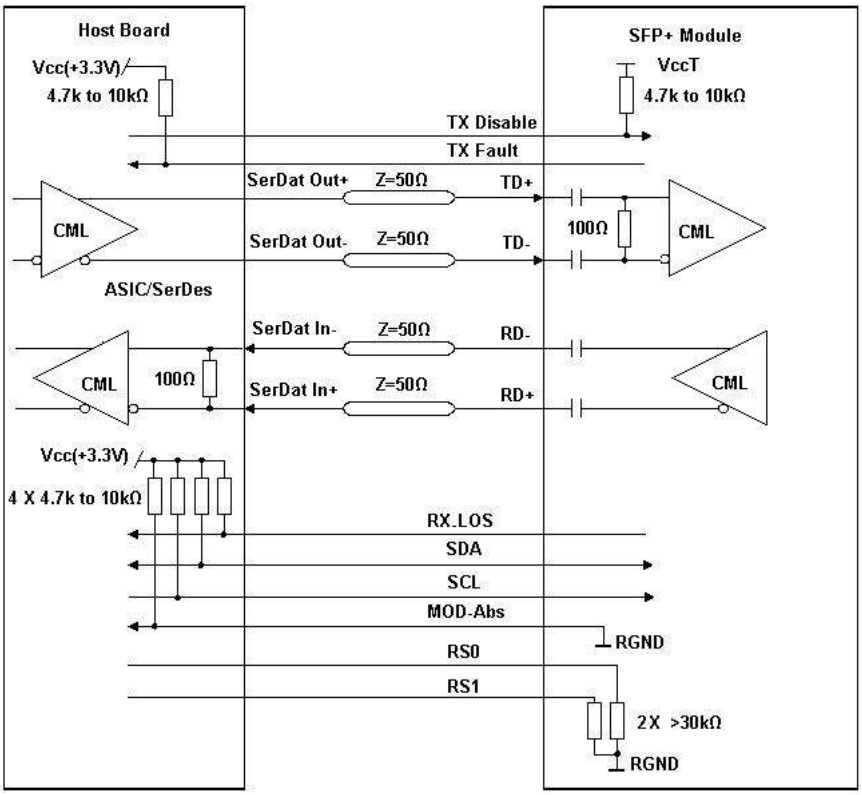



**Figure2:**Recommended Interface Circuit

## Pin-out Definition

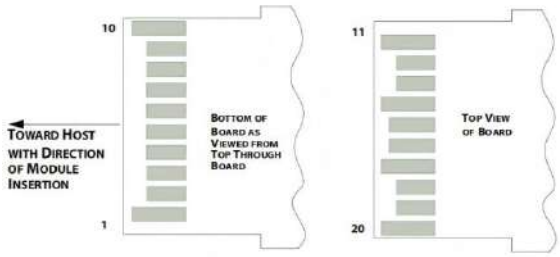



**Figure3:**Pin view

## Pin Function Definitions

| Pin | Logic | Symbol | Description | Note |
|---|---|---|---|---|
| 1 | | VeeT | Module Transmitter Ground | 1 |
| 2 | LVTTL-O | TX_Fault | Module Transmitter Fault | 2 |
| 3 | LVTTL-I | TX_Disable | Transmitter Disable; Turns off transmitter laser output | 3 |
| 4 | LVTTL-I/O | SDA | 2-wire Serial Interface Data Line (Same as MOD-DEF2 as defined in the INF-8074i) | 4 |
| 5 | LVTTL-I/O | SCL | 2-wire Serial Interface Clock (Same as MOD-DEF1 as defined in the INF-8074i) | 4 |
| 6 | | MOD_ABS | Module Absent, connected to VeeT or VeeR in the module | 5 |
| 7 | LVTTL-I | RS0 | Adaptive multi-rate operation | 6 |
| 8 | LVTTL-O | RX_LOS | Receiver Loss of Signal Indication (In FC designated as RX_LOS, in SONET designated as LOS, and in Ethernet designated at Signal Detect) | 2 |
| 9 | LVTTL-I | RS1 | Adaptive multi-rate operation | 6 |
| 10 | | VeeR | Module Receiver Ground | 1 |
| 11 | | VeeR | Module Receiver Ground | 1 |
| 12 | CML-O | RD- | Receiver Inverted Data Output | |
| 13 | CML-O | RD+ | Receiver Non-Inverted Data Output | |
| 14 | | VeeR | Module Receiver Ground | 1 |
| 15 | | VccR | Module Receiver 3.3 V Supply | |
| 16 | | VccT | Module Transmitter 3.3 V Supply | |
| 17 | | VeeT | Module Transmitter Ground | 1 |
| 18 | CML-I | TD+ | Transmitter Non-Inverted Data Input | |
| 19 | CML-I | TD- | Transmitter Inverted Data Input | |
| 20 | | VeeT | Module Transmitter Ground | 1 |

**Note1:** The module signal ground pins, VeeR and VeeT, shall be isolated from the module case.

**Note2:** This pin is an open collector/drain output pin and shall be pulled up with 4.7kΩ-10kΩ to Host_Vcc on the host board. Pull ups can be connected to multiple power supplies, however the host board design shall ensure that no module pin has voltage exceeding module VccT/R + 0.5V.

**Note3:** This pin is an open collector/drain input pin and shall be pulled up with 4.7kΩ-10kΩ to VccT in the module.

**Note4:** See SFF-8431 4.2 2-wire Electrical Specifications.

**Note5:** This pin shall be pulled up with 4.7kΩ-10kΩ to Host_Vcc on the host board.

**Note6:** Connect with 30kΩ load pulled down to GND in the module.

## Monitoring Specification

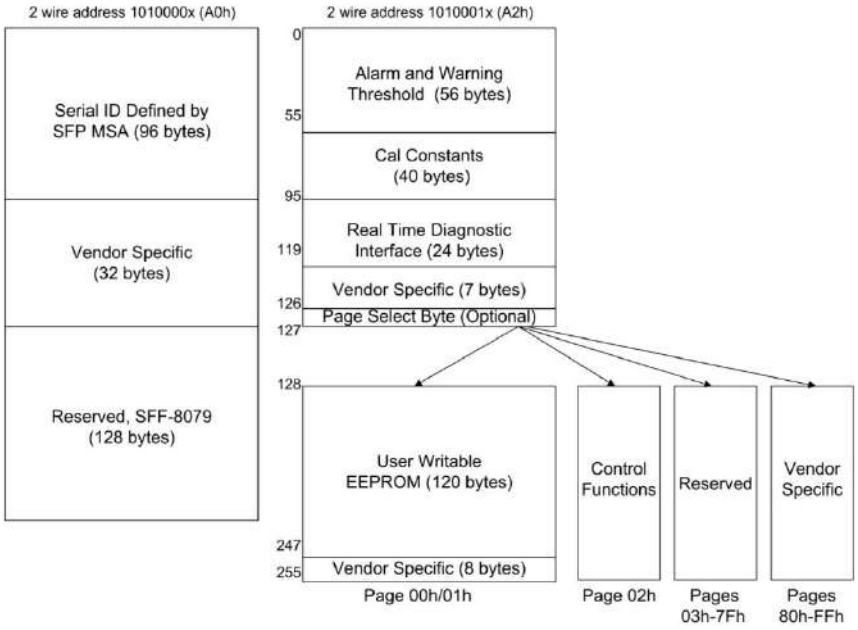



**Figure4:**Memory map

## Memory map Table

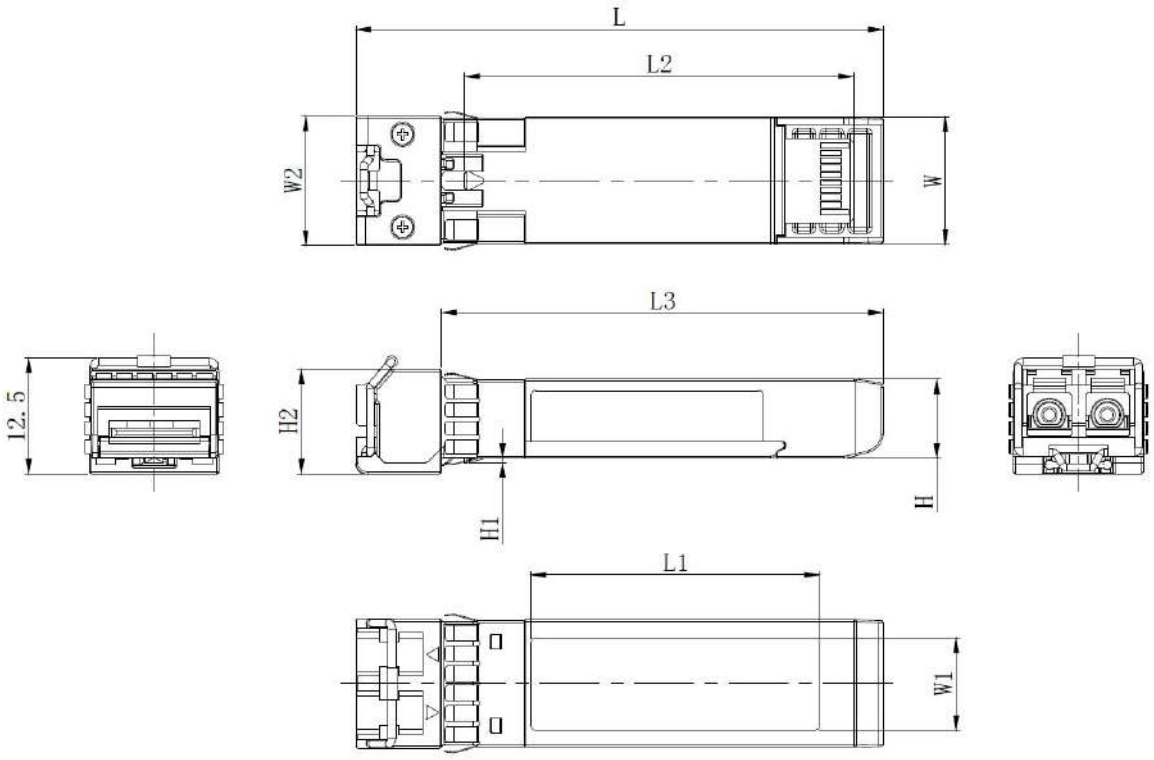
| A0h | Bytes | Name | Description |
|---|---|---|---|
| **A0h ID Fields** | | | |
| 0 | 1 | Identifier | Type of transceiver |
| 1 | 1 | Ext. Identifier | Extended identifier of type of transceiver |
| 2 | 1 | Connector | Code for connector type |
| 3-10 | 8 | Transceiver | Code for electronic or optical compatibility |
| 11 | 1 | Encoding | Code for high speed serial encoding algorithm |
| 12 | 1 | Signaling Rate, Nominal | Nominal signaling rate, units of 100 MBd. |
| 13 | 1 | Rate Identifier | Type of rate select functionality |
| 14 | 1 | Length (SMF,km) or Copper Cable | Link length supported for single-mode fiber, units of km, or copper |

| | | | |
|---|---|---|---|
| | | Attenuation | cable attenuation in dB at 12.9 GHz |
| 15 | 1 | Length (SMF) or Copper Cable Attenuation | Link length supported for single-mode fiber, units of 100 m, or copper cable attenuation in dB at 25.78 GHz |
| 16 | 1 | Length (50 um, OM2) | Link length supported for 50 um OM2 fiber, units of 10 m |
| 17 | 1 | Length (62.5 um, OM1) | Link length supported for 62.5 um OM1 fiber, units of 10 m |
| 18 | 1 | Length (OM4 or copper cable) | Link length supported for 50um OM4 fiber, units of 10 m. Alternatively, copper or direct attach cable, units of m |
| 19 | 1 | Length (OM3) or Cable length, additional | Link length supported for 50 um OM3 fiber, units of 10 m. Alternatively, copper or direct attach cable multiplier and base value |
| 20-35 | 16 | Vendor name | SFP vendor name (ASCII) |
| 36 | 1 | Transceiver | Code for electronic or optical compatibility |
| 37-39 | 3 | Vendor OUI | SFP vendor IEEE company ID |
| 40-55 | 16 | Vendor PN | Part number provided by SFP vendor (ASCII) |
| 56-59 | 4 | Vendor rev | Revision level for part number provided by vendor (ASCII) |
| 60-61 | 2 | Wavelength | Laser wavelength (Passive/Active Cable Specification Compliance) |
| 62 | 1 | Fibre Channel Speed 2 | Transceiver's Fibre Channel speed capabilities |
| 63 | 1 | CC_BASE | Check code for Base ID Fields (addresses 0 to 62) |
| 64-65 | 2 | Options | Indicates which optional transceiver signals are implemented |
| 66 | 1 | Signaling Rate, max | Upper signaling rate margin, units of % |
| 67 | 1 | Signaling Rate, min | Lower signaling rate margin, units of % |
| 68-83 | 16 | Vendor SN | Serial number provided by vendor (ASCII) |
| 84-91 | 8 | Date code | Vendor's manufacturing date code |
| 92 | 1 | Diagnostic Monitoring Type | Indicates which type of diagnostic monitoring is implemented (if any) in the transceiver |
| 93 | 1 | Enhanced Options | Indicates which optional enhanced features are implemented (if any) in the transceiver |
| 94 | 1 | SFF-8472 Compliance | Indicates which revision of SFF-8472 the transceiver complies with. |
| 95 | 1 | CC_EXT | Check code for the Extended ID Fields (addresses 64 to 94) |
| 96-127 | 32 | Vendor Specific | Vendor Specific EEPROM |
| 128-255 | 128 | Reserved | Reserved (was assigned to SFF-8079) |
| **A2h ID Fields** | | | |
| 00-01 | 2 | Temp High Alarm | MSB at low address |
| 02-03 | 2 | Temp Low Alarm | MSB at low address |
| 04-05 | 2 | Temp High Warning | MSB at low address |
| 06-07 | 2 | Temp Low Warning | MSB at low address |
| 08-09 | 2 | Voltage High Alarm | MSB at low address |
| 10-11 | 2 | Voltage Low Alarm | MSB at low address |
| 12-13 | 2 | Voltage High Warning | MSB at low address |
| 14-15 | 2 | Voltage Low Warning | MSB at low address |

| | | | |
|---|---|---|---|
| 16-17 | 2 | Bias High Alarm | MSB at low address |
| 18-19 | 2 | Bias Low Alarm | MSB at low address |
| 20-21 | 2 | Bias High Warning | MSB at low address |
| 22-23 | 2 | Bias Low Warning | MSB at low address |
| 24-25 | 2 | TX Power High Alarm | MSB at low address |
| 26-27 | 2 | TX Power Low Alarm | MSB at low address |
| 28-29 | 2 | TX Power High Warning | MSB at low address |
| 30-31 | 2 | TX Power Low Warning | MSB at low address |
| 32-33 | 2 | RX Power High Alarm | MSB at low address |
| 34-35 | 2 | RX Power Low Alarm | MSB at low address |
| 36-37 | 2 | RX Power High Warning | MSB at low address |
| 38-39 | 2 | RX Power Low Warning | MSB at low address |
| 40-41 | 2 | Optional Laser Temp High Alarm | MSB at low address |
| 42-43 | 2 | Optional Laser Temp Low Alarm | MSB at low address |
| 44-45 | 2 | Optional Laser Temp High Warning | MSB at low address |
| 46-47 | 2 | Optional Laser Temp Low Warning | MSB at low address |
| 48-49 | 2 | Optional TEC Current High Alarm | MSB at low address |
| 50-51 | 2 | Optional TEC Current Low Alarm | MSB at low address |
| 52-53 | 2 | Optional TEC Current High Warning | MSB at low address |
| 54-55 | 2 | Optional TEC Current Low Warning | MSB at low address |
| 56-91 | 36 | Ext Cal Constants or Additional Enhanced Features | Diagnostic calibration constants for optional External Calibration if External Calibration bit, A0h, byte 92, bit 4 is 1<br>Additional Enhanced Features advertisement, control and status if External Calibration bit, A0h, byte 92, bit 4 is 0 |
| 92-94 | 3 | Reserved | |
| 95 | 1 | CC_DMI | Check code for Base Diagnostic Fields (addresses 0 to 94) |
| 96-105 | 10 | Diagnostics | Diagnostic Monitor Data (internally or externally calibrated) |
| 106-109 | 4 | Optional Diagnostics | Monitor Data for Optional Laser temperature and TEC current |
| 110 | 1 | Status/Control | Optional Status and Control Bits |
| 111 | 1 | Reserved | Reserved (was assigned to SFF-8079) |
| 112-113 | 2 | Alarm Flags | Diagnostic Alarm Flag Status Bits |
| 114 | 1 | Tx Input EQ control | Tx Input equalization level control |
| 115 | 1 | Rx Out Emphasis control | Rx Output emphasis level control |
| 116-117 | 2 | Warning Flags | Diagnostic Warning Flag Status Bits |
| 118-119 | 2 | Ext Status/Control | Extended module control and status bytes |
| 120-126 | 7 | Vendor Specific | Vendor specific memory addresses |
| 127 | 1 | Table Select | Optional Page Select |
| **A2h Page 00-01h** | | | |

| | | | |
|---|---|---|---|
| 128-247 | 120 | User EEPROM | User writable non-volatile memory |
| 248-255 | 8 | Vendor Control | Vendor specific control addresses |
| **A2h Page 02h** | | | |
| 128-129 | 2 | Reserved | Reserved for SFF-8690 (Tunable Transmitter) |
| 130 | 1 | Reserved | Reserved for future receiver controls |
| 131 | 1 | Rx Decision Threshold | RDT value setting |
| 132-172 | 41 | Reserved | Reserved for SFF-8690 |
| 173-255 | 83 | Reserved | Reserved |

## Mechanical Dimension



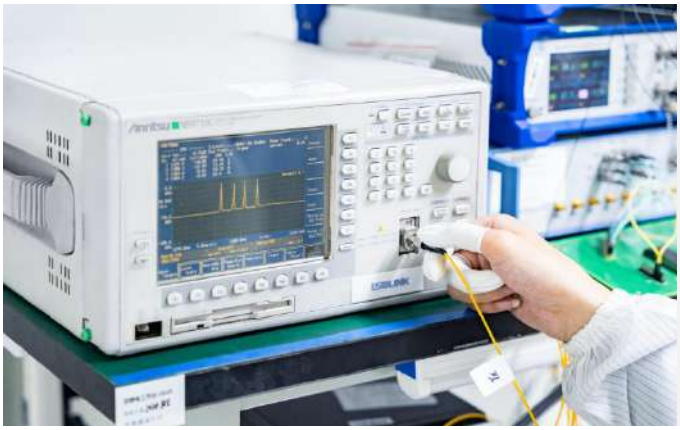

Unit: mm

| | L | L1 | L2 | L3 | W | W1 | W2 | H | H1 | H2 |
|---|---|---|---|---|---|---|---|---|---|---|
| MAX | 56.9 | 31.2 | 41.95 | 47.7 | 13.8 | 10.2 | 14.0 | 8.6 | 0.6 | 11.5 |
| Typical | 56.7 | 31.0 | 41.80 | 47.5 | 13.7 | 10.0 | - | 8.5 | 0.5 | 11.3 |
| MIN | 56.5 | 30.8 | 41.65 | 47.3 | 13.5 | 9.8 | - | 8.4 | 0.4 | 11.1 |

# Test Center

## 1. Performance Testing

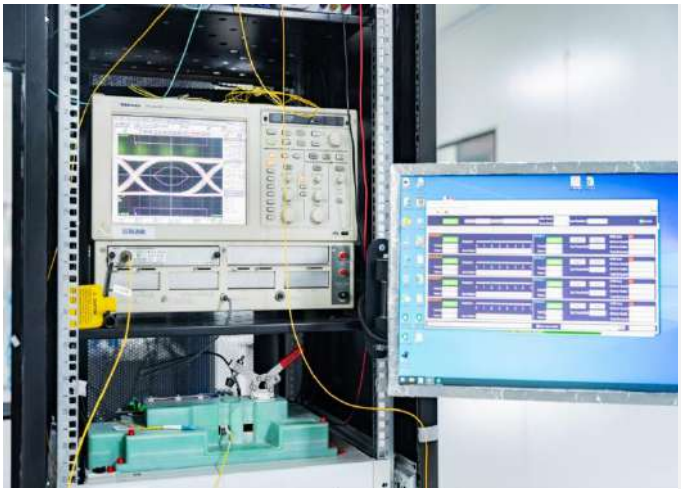
Every fiber optic transceiver is thoroughly tested by the LSOLINK Assurance Program, which is equipped with the world's most advanced analytical equipment to ensure that our transceivers meet the industry's international public protocol standards while still functioning flawlessly in your facility.



### Optical Spectrum Inspection

Using the industry's leading optical spectrum analyser to check in real time that the parameters of the optical transceiver's laser comply with industry standards.

- **Peak:** Peak wavelength and peak level
- **2nd Peak:** Side-mode wavelength and level
- **Mean WI:** Center wavelength
- **Total Power:** Total power of spectrum
- **SMSR:** Side-Mode Suppression Ratio



### Optical Signal Quality Inspection

Using highly efficient sampling oscilloscopes and BERT testers, equipped with an automated test platform to accurately test the signal quality of the transceiver, test records are kept for up to 5 years to ensure the traceability of each transceiver.

- **Eye Mask Margin(NRZ)**
- **TDECQ(PAM4):**transmitter dispersion eye closure
- **OMA:** Optical modulation amplitude
- **BER:** Bit error rate
- **ER:** Extinction Ratio


### Flow Pressure Test

Using multi-protocol network traffic analyser with various brands of switches to test the transceiver's ability to transmit at full speed.

- **Bandwidth:** Actual transceiver bandwidth on the port
- **Packet Loss**
- **Packet Errors:**CRC Errors/PCS Errors/Symbol Errors
- **LinkDown Counts**
- **latency**

Aboveis part of our test bed network equipment. For more information, Please click download for optical transceiver performance test report.

## 2. Quality Control

We adopt advanced quality management solutions. Each transceiver is self-inspected, including:20x microscope inspection, 200x microscope inspection, and QC process inspection.

visual inspection

Microscopic inspection: 20X

Microscopic inspection: 200X

Reliability Verification

Optical endface inspection

OQC Inspection

## 3. Compatibility Testing

Each optical transceiver is tested in LSOLINK's library of compatibility test equipment to ensure perfect compatibility with multiple brands on the market.


Alcatel OS6900-X20

Arista DCS-7060SX2-48YC6-R

Cisco Nexus N9K-C9318YC-EX

Dell S4048-ON

Huawei S6720-30L-HI-24


Juniper QFX5110-48S-4C

Aboveis part of our test bed network equipment. For more information, Please click download to get the compatibility test report of each brand of optical transceiver.

## Order Information

| Part Number | Description |
|---|---|
| 1G-SFP-C40-xx | 1000BASE-CWDM SFP 1270~1610nm 40km DOM LC SMF Transceiver Module |
| 1G-SFP-C80-xx | 1000BASE-CWDM SFP 1270~1610nm 80km DOM LC SMF Transceiver Module |
| 1G-SFP-C120-xx | 1000BASE-CWDM SFP 1470~1610nm 120km DOM Duplex LC SMF Transceiver Module |
| 1G-SFP-D40-Cxx | 1000BASE-DWDM SFP C17~C61 40km DOM LC SMF Transceiver Module |
| 1G-SFP-D80-Cxx | 1000BASE-DWDM SFP C17~C61 80km DOM LC SMF Transceiver Module |

# Further Information

LSOLINK | Lighting the Path to Global Links

Web | www.lsolink.com

Email | For Sales@lsolink.com

# Disclaimer

1. We are committed to continuous product improvement and feature upgrades, and the contents con t ained in this manual are subject to change without notice.

2. Nothing herein should be construed as constituting an additional warranty.

3. LSOLINK assumes no responsibility for the use or reliability of equipment or software not provided by LSOLINK. 