

TIBTRONIX TECHNOLOGY CO., LTD.



TSPL1G80D-XX

1.25Gb/s 80km CWDM SFP Transceiver
Hot Pluggable, Duplex LC, +3.3V, 1270nm~1610nm, CWDM DFB, Single-mode, DDM

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Shenzhen Tibtronix Technology Co., Ltd.

3/F, 12th Building, Nangang 1st Industrial Park, Baimang Xili, Songbai Road, Nanshan District, Shenzhen, China

Tel: +86 755 23316583

Fax: +86 755 29810056

E-mail: sales@tibtronix.com

<http://www.tibtronix.com>

Features:

- ✧ Data-rate of 1.25Gbps operation
- ✧ 18-Wavelength CWDM DFB LD Transmitter from
- ✧ 1270nm to 1610nm, with Step 20nm
- ✧ Compliant with SFP MSA and SFF-8472
- ✧ Compatible with SONET OC-24-LR-1
- ✧ Compatible with RoHS
- ✧ +3.3V single power supply
- ✧ Hot-Pluggable SFP Footprint Duplex LC
- ✧ Operating case temperature
 - Standard : 0°C to +70°C
 - Extended: -20°C to +85°C
 - Industrial: -40°C to +85°C

Applications:

- ✧ Gigabit Ethernet
- ✧ Fiber Channel Switch Infrastructure
- ✧ Router/Server interface
- ✧ Other optical transmission systems

Description:

The TSPL1G80D-xx series single mode transceiver is small form factor pluggable module for duplex optical data communications such as Gigabit Ethernet 1000BASE-ZX and Fiber Channel 1x SM-LC-L FC-PI. It is with the SFP 20-pin connector to allow hot plug capability. This module is designed for single mode fiber and operates at a nominal wavelength of CWDM wavelength. There are eighteen center wavelengths available from 1270nm to 1610nm, with each step 20nm.

The transmitter section uses a multiple quantum well CWDM DFB laser and is a class 1 laser compliant according to International Safety Standard IEC-60825. The receiver section uses an

integrated InGaAs detector preamplifier (IDP) mounted in an optical header and a limiting post-amplifier IC. The TSPL1G80D-xx series are designed to be compliant with SFF-8472.

● Absolute Maximum Ratings

| Parameter | Symbol | Min. | Typical | Max. | Unit |
|---------------------|----------|------|---------|------|------|
| Storage Temperature | T_S | -40 | | +85 | °C |
| Supply Voltage | V_{CC} | -0.5 | | 3.6 | V |
| Relative Humidity | RH | 0 | | 90 | % |

● Recommended Operating Environment:

| Parameter | Symbol | Min. | Typical | Max. | Unit |
|----------------------------|----------|------|---------|------|------|
| Case operating Temperature | T_C | 0 | | +70 | °C |
| Supply Voltage | V_{CC} | 3.15 | | 3.45 | V |
| Supply Current | I_{CC} | | | 300 | mA |
| Data rate | GBE | | 1.25 | | Gbps |
| | FC | | 1.063 | | Gbps |

● Electrical Characteristics($T_{OP} = 0$ to 70°C , $V_{CC} = 3.135$ to 3.465 Volts)

| Parameter | Symbol | Min. | Typical | Max. | Unit | Note |
|--------------------------------|-----------------|---------|---------|----------|----------|------|
| Transmitter Section: | | | | | | |
| Input differential impedance | R_{in} | 85 | 100 | 115 | Ω | |
| Single ended data input swing | $V_{in\ PP}$ | 400 | | 2000 | mVp-p | |
| Transmit Disable Voltage | V_D | 2.0 | | V_{CC} | V | |
| Transmit Enable Voltage | V_{EN} | 0 | | 0.8 | V | |
| Tx Fault | Fault | Tx_f | 2.0 | | V | |
| | Normal | Tx_n | 0 | | V | |
| Receiver Section: | | | | | | |
| Single ended data output swing | $V_{out,pp}$ | 370 | | 1800 | mv | |
| LOS Fault | $V_{losfault}$ | 2 | | V_{CC} | V | |
| LOS Normal | $V_{los\ norm}$ | 0 | | 0.8 | V | |

● Optical Parameters($T_{OP} = 0$ to $70^{\circ}C$, $VCC = 3.135$ to 3.465 Volts)

| Parameter | Symbol | Min. | Typical | Max. | Unit | Note |
|--|---|-------------|------------|---------------|------|------|
| Transmitter Section: | | | | | | |
| Center Wavelength | λ_c | $\lambda-6$ | λ | $\lambda+7.5$ | nm | |
| Spectral Width(-20dB) | $\Delta\lambda$ | | | 1 | nm | |
| Side Mode Suppression Ratio | SMSR | 30 | | | dB | |
| Optical Output Power | P_{out} | 0 | | +5 | dBm | 1 |
| Optical Rise/Fall Time | t_r / t_f | | | 260 | ps | 2 |
| Extinction Ratio | ER | 8.2 | | | dB | |
| Eye Mask for Optical Output | Compliant with IEEE802.3z(class 1 laser safety) | | | | | |
| Receiver Section: | | | | | | |
| Optical Input Wavelength | λ_c | 1260 | | 1620 | nm | |
| Receiver Overload | P_{ol} | -8 | | | dBm | 3 |
| RX Sensitivity | Sen | | | -24 | dBm | 3 |
| RX_LOS Assert | LOS_A | -40 | | | dBm | |
| RX_LOS De-assert | LOS_D | | | -25 | dBm | |
| RX_LOS Hysteresis | LOS_H | 0.5 | | | dB | |
| General Specifications: | | | | | | |
| Data Rate | BR | | 1.063/1.25 | | Gb/s | |
| Bit Error Rate | BER | | | 10^{-12} | | |
| Max. Supported Link Length on 9/125 μ m SMF@1.25Gb/s | L_{MAX} | | 80 | | km | |
| Total System Budget | LB | 24 | | | dB | |

Note

1. The optical power is launched into SMF.
2. 20-80%.
3. Measured with PRBS 2^{7-1} at 10^{-12} BER

● Pin Assignment

Diagram of Host Board Connector Block Pin Numbers and Name

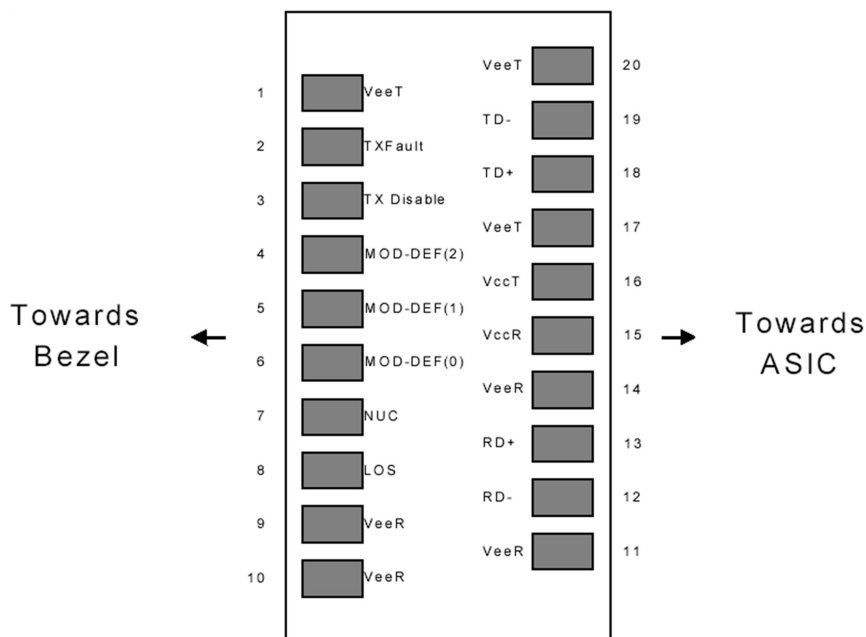


Diagram of Host Board Connector Block Pin Numbers and Names

● Pin Function Definitions

| Pin No | Name | Function | Plug Seq | Notes |
|--------|-------------|------------------------------|----------|-------|
| 1 | VeeT | Transmitter Ground | 1 | 1 |
| 2 | TX Fault | Transmitter Fault Indication | 3 | |
| 3 | TX Disable | Transmitter Disable | 3 | 2 |
| 4 | MOD-DEF2 | Module Definition | 2 | 3 |
| 5 | MOD-DEF1 | Module Definition 1 | 3 | 3 |
| 6 | MOD-DEF0 | Module Definition 0 | 3 | 3 |
| 7 | Rate Select | Not Connected | 3 | 4 |
| 8 | LOS | Loss of Signal | 3 | 5 |
| 9 | VeeR | Receiver Ground | 1 | 1 |
| 10 | VeeR | Receiver Ground | 1 | 1 |
| 11 | VeeR | Receiver Ground | | 1 |
| 12 | RD- | Inv. Received Data Out | 3 | 6 |
| 13 | RD+ | Received Data Out | 3 | 6 |
| 14 | VeeR | Receiver Ground | 3 | 1 |
| 15 | VccR | Receiver Power | 2 | 1 |
| 16 | VccT | Transmitter Power | 2 | |
| 17 | VeeT | Transmitter Ground | 1 | |
| 18 | TD+ | Transmit Data In | 3 | 6 |
| 19 | TD- | Inv. Transmit In | 3 | 6 |

| | | | | |
|----|------|--------------------|---|--|
| 20 | VeeT | Transmitter Ground | 1 | |
|----|------|--------------------|---|--|

Notes:

1. Circuit ground is internally isolated from chassis ground.
2. Laser output disabled on TDIS >2.0V or open, enabled on TDIS <0.8V.
3. Should be pulled up with 4.7k - 10 kohms 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. Rate select is not used
5. LOS is open collector output. Should be pulled up with 4.7k – 10 kohms on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.
6. AC Coupled

● **SFP Module EEPROM Information and Management**

The SFP modules implement the 2-wire serial communication protocol as defined in the SFP -8472. The serial ID information of the SFP modules and Digital Diagnostic Monitor parameters can be accessed through the I²C interface at address A0h and A2h. The memory is mapped in Table 1. Detailed ID information (A0h) is listed in Table 2. And the DDM specification at address A2h. For more details of the memory map and byte definitions, please refer to the SFF-8472, “Digital Diagnostic Monitoring Interface for Optical Transceivers”. The DDM parameters have been internally calibrated.

Table 1. Digital Diagnostic Memory Map (Specific Data Field Descriptions)

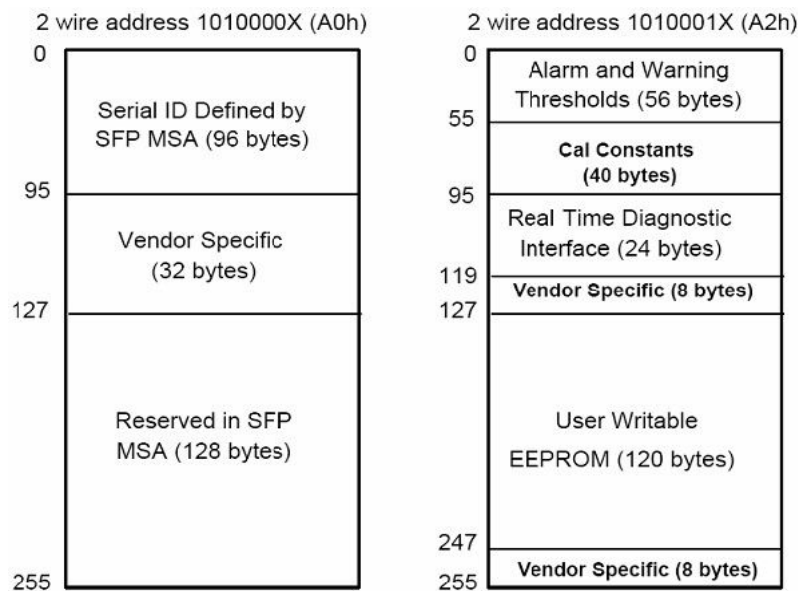


Table 2 - EEPROM Serial ID Memory Contents (A0h)

| Data Address | Length (Byte) | Name of Length | Description and Contents |
|----------------|---------------|----------------|--------------------------------------|
| Base ID Fields | | | |
| 0 | 1 | Identifier | Type of Serial transceiver (03h=SFP) |

| | | | |
|----------------------------------|-----|----------------|---|
| 1 | 1 | Reserved | Extended identifier of type serial transceiver (04h) |
| 2 | 1 | Connector | Code of optical connector type (07=LC) |
| 3-10 | 8 | Transceiver | |
| 11 | 1 | Encoding | NRZ(03h) |
| 12 | 1 | BR, Nominal | Nominal baud rate, unit of 100Mbps |
| 13-14 | 2 | Reserved | (0000h) |
| 15 | 1 | Length(9um) | Link length supported for 9/125um fiber, units of 100m |
| 16 | 1 | Length(50um) | Link length supported for 50/125um fiber, units of 10m |
| 17 | 1 | Length(62.5um) | Link length supported for 62.5/125um fiber, units of 10m |
| 18 | 1 | Length(Copper) | Link length supported for copper, units of meters |
| 19 | 1 | Reserved | |
| 20-35 | 16 | Vendor Name | SFP vendor name: FTTX |
| 36 | 1 | Reserved | |
| 37-39 | 3 | Vendor OUI | SFP transceiver vendor OUI ID |
| 40-55 | 16 | Vendor PN | Part Number: "TSPL1G80D-xx" (ASCII) |
| 56-59 | 4 | Vendor rev | Revision level for part number |
| 60-62 | 3 | Reserved | |
| 63 | 1 | CCID | Least significant byte of sum of data in address 0-62 |
| Extended ID Fields | | | |
| 64-65 | 2 | Option | Indicates which optical SFP signals are implemented (001Ah = LOS, TX_FAULT, TX_DISABLE all supported) |
| 66 | 1 | BR, max | Upper bit rate margin, units of % |
| 67 | 1 | BR, min | Lower bit rate margin, units of % |
| 68-83 | 16 | Vendor SN | Serial number (ASCII) |
| 84-91 | 8 | Date code | FTTX's Manufacturing date code |
| 92-94 | 3 | Reserved | |
| 95 | 1 | CCEX | Check code for the extended ID Fields (addresses 64 to 94) |
| Vendor Specific ID Fields | | | |
| 96-127 | 32 | Readable | FTTX specific date, read only |
| 128-255 | 128 | Reserved | Reserved for SFF-8079 |

● Digital Diagnostic Monitor Characteristics

| Data Address | Parameter | Accuracy | Unit |
|--------------|----------------------------------|----------|------|
| 96-97 | Transceiver Internal Temperature | ±3.0 | °C |
| 98-99 | VCC3 Internal Supply Voltage | ±3.0 | % |

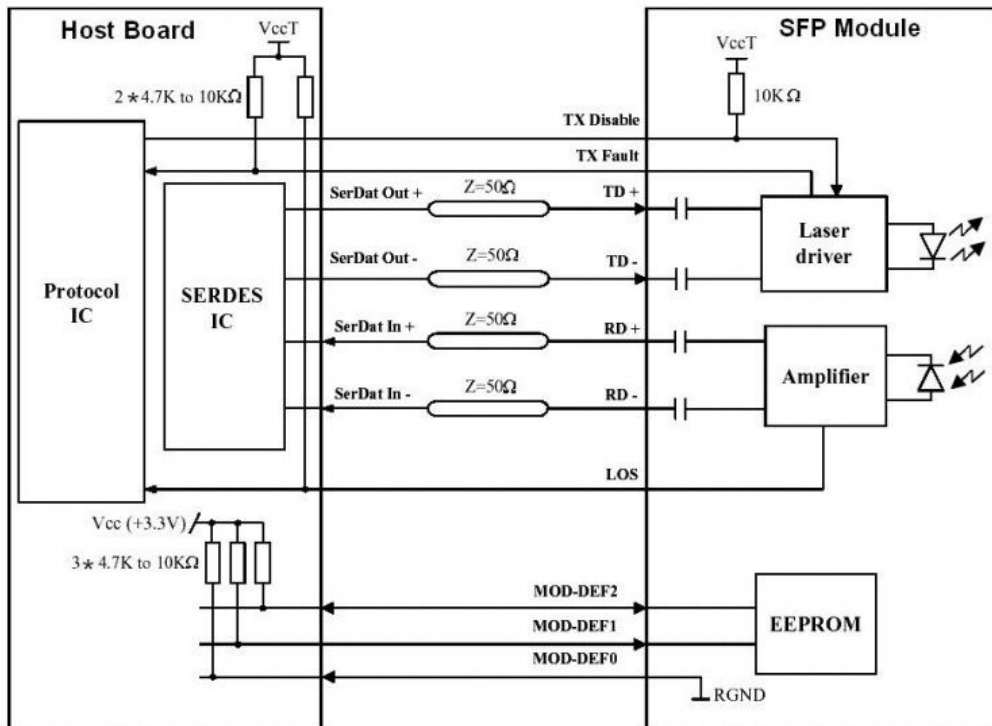
| | | | |
|---------|--------------------|-----------|-----|
| 100-101 | Laser Bias Current | ± 10 | % |
| 102-103 | Tx Output Power | ± 3.0 | dBm |
| 104-105 | Rx Input Power | ± 3.0 | dBm |

● Regulatory Compliance

The **TSPL1G80D-xx** complies with international Electromagnetic Compatibility (EMC) and international safety requirements and standards (see details in Table following).

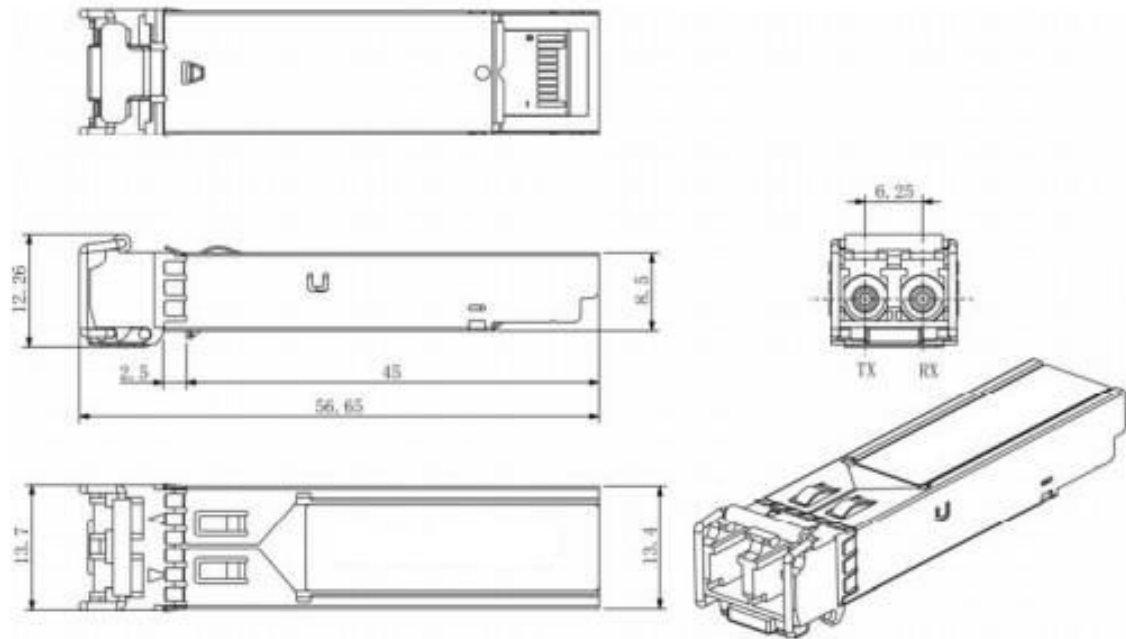
| | | |
|---|--|--|
| Electrostatic Discharge (ESD) to the Electrical Pins | MIL-STD-883E Method 3015.7 | Class 1(>1000 V) |
| Electrostatic Discharge (ESD) to the Duplex LC Receptacle | IEC 61000-4-2 GR-1089-CORE | Compatible with standards |
| Electromagnetic Interference (EMI) | FCC Part 15 Class B EN55022 Class B (CISPR 22B) VCCI Class B | Compatible with standards |
| Laser Eye Safety | FDA 21CFR 1040.10 and 1040.11 EN60950, EN (IEC) 60825-1,2 | Compatible with Class 1 laser product. |

● Recommended Circuit



SFP Host Recommended Circuit

- **Mechanical Dimensions**



Mechanical Drawing

- **Order Information:**

In the Part No. of TSPL1G80D-xx, xx stands for central wavelength, such as:

27: for 1270nm, 29: for 1290nm, 31: for 1310nm,..... 61: for 1610nm.