

SHENZHEN TIBTRONIX TECHNOLOGY CO., LTD.



TSBLXG10D-23/32

10Gb/s 10km BiDi SFP+ Transceiver
Hot Pluggable, Single LC, +3.3V, 1270nm /1330nm CWDM DFB, DDM

2013/6/1



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Features:

- ✧ Supports 9.95Gb/s to 11.3Gb/s bit rates
- ✧ Hot-pluggable SFP+ footprint
- ✧ Single LC for Bi-directional Transmission
- ✧ Maximum link length of 10km
- ✧ Built-in 1270/1330 WDM Filter
- ✧ Uncooled 1270nm or 1330nm CWDM DFB Laser.
- ✧ Power dissipation <1.5W
- ✧ No Reference Clock required
- ✧ Built-in digital diagnostic functions
- ✧ Temperature range 0°C to 70°C
- ✧ Very low EMI and excellent ESD protection
- ✧ RoHS Compliant Part

Applications:

- ✧ 10GBASE-LR/LW Ethernet
- ✧ SONET OC-192 / SDH
- ✧ 10G Fibre Channel
- ✧ 2G/3G/4G

Description:

TIBTRONIX' TSBLXG10D-23 & TSBLXG10D-32 Bi-directional 10Gb/s (SFP+) transceivers are compliant with the current SFP+ Multi-Source Agreement (MSA) Specification. They comply with 10GBASE-LR/LW Ethernet, SONET OC-192 / SDH and 10G Fibre Channel 1200-SM-LL-L. Digital diagnostics functions are available via a 2-wire serial interface, as specified in the SFP+ MSA.

● Absolute Maximum Ratings

| Parameter | Symbol | Min. | Typical | Max. | Unit |
|---------------------|--------------|------|---------|------|------|
| Storage Temperature | T_S | -40 | | +85 | °C |
| Supply Voltage | $V_{CC,T,R}$ | -0.5 | | 4 | V |
| Relative Humidity | RH | 0 | | 85 | % |

● Recommended Operating Environment:

| Parameter | Symbol | Min. | Typical | Max. | Unit |
|----------------------------|--------------|--------|---------|--------|------|
| Case operating Temperature | T_C | -5 | | +70 | °C |
| Supply Voltage | $V_{CC,T,R}$ | +3.135 | | +3.465 | V |
| Supply Current | I_{CC} | | | 350 | mA |
| Power Dissipation | P_D | | | 1.5 | W |

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

| Parameter | Symbol | Min | Typ | Max | Unit | Note |
|-----------------------------------|----------|----------|-----|--------------|----------|------|
| Transmitter: | | | | | | |
| Differential input voltage swing | | 180 | | 700 | mVpp | 1 |
| Transmit Disable Input | H | V_{IH} | 2.0 | $V_{CC}+0.3$ | V | |
| | L | V_{IL} | 0 | 0.8 | V | |
| Transmit Enable Output | H | V_{OH} | 2.4 | $V_{CC}+0.3$ | V | |
| | L | V_{OL} | 0 | 0.4 | V | 2 |
| Input Differential Impedance | Z_{in} | 80 | 100 | 120 | Ω | |
| Receiver | | | | | | |
| Differential output voltage swing | | 300 | | 850 | mVpp | 3 |
| LOS Output | H | V_{OH} | 2.4 | $V_{CC}+0.3$ | V | 2 |
| | L | V_{OL} | 0 | 0.4 | V | |
| Output Differential Impedance | Z_{on} | 80 | 100 | 120 | Ω | |

Notes:

Note 1) TD+/- are internally AC coupled with 100 Ω differential termination inside the module.

Note 2) Tx Fault and Rx LOS are open collector outputs, which should be pulled up with 4.7k to 10k Ω resistors on the host board. Pull up voltage between 2.0V and $V_{CC}+0.3V$.

Note 3) RD+/- outputs are internally AC coupled, and should be terminated with 100 Ω (differential) at the user SERDES.

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

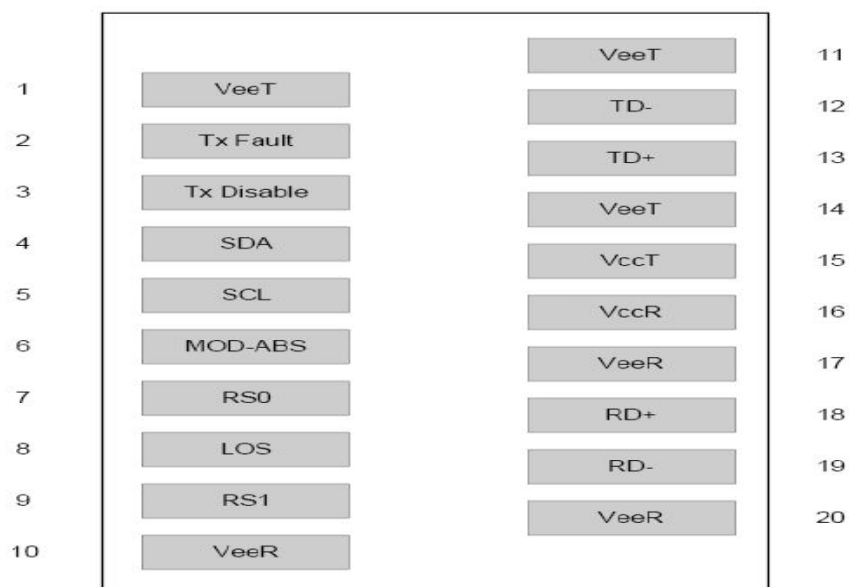
| Parameter | | Symbol | Min | Typ | Max | Unit | Ref. | |
|-----------------------------|--------------|------------------|----------------------------|------|-------|------|------|--|
| Transmitter | | | | | | | | |
| Bit Rate | | BR | 9.9 | | 11.3 | Gb/s | | |
| Optical Wavelength | TSBLXG10D-23 | λ | 1260 | 1270 | 1280 | nm | | |
| | TSBLXG10D-32 | | 1320 | 1330 | 1340 | | | |
| Average output power | | Po | -6 | | -1 | dBm | | |
| Optical Extinction Ratio | | ER | 3.5 | | | dB | | |
| Spectral width | | $\Delta\lambda$ | | | 1 | nm | | |
| Side Mode Suppression Ratio | | SMSR | 30 | | | dB | | |
| Optical Eye Mask | | | Compliant with IEEE802.3ae | | | | | |
| Receiver | | | | | | | | |
| Bit Rate | | BR | 9.9 | | 11.3 | Gb/s | | |
| Optical Wavelength | TSBLXG10D-23 | λ | 1320 | 1330 | 1340 | nm | | |
| | TSBLXG10D-32 | | 1260 | 1270 | 1280 | | | |
| Receiver Sensitivity | | Sen | | | -14.5 | dBm | 1 | |
| Maximum Input Power | | P _{MAX} | 0 | | | dBm | | |
| LOS De-Assert | | LOS _D | | | -15 | dBm | | |
| LOS Assert | | LOS _A | -25 | | | dBm | | |
| LOS Hysteresis | | LOS _H | 0.5 | | 4 | dB | | |

Notes:

Note 1) Measured with a PRBS of $2^{31}-1$ at 1×10^{-12} BER and 3.5 dB extinction ratio.

● Pin Assignment

Diagram of Host Board Connector Block Pin Numbers and Name



● Pin Function Definitions

| PIN # | Name | Function | Notes |
|-------|------------|---|-------|
| 1 | VeeT | Module transmitter ground | 1 |
| 2 | Tx Fault | Module transmitter fault | 2 |
| 3 | Tx Disable | Transmitter Disable; Turns off transmitter laser output | 3 |
| 4 | SDL | 2 wire serial interface data input/output (SDA) | |
| 5 | SCL | 2 wire serial interface clock input (SCL) | |
| 6 | MOD-ABS | Module Absent, connect to VeeR or VeeT in the module | 2 |
| 7 | RS0 | Rate select0, optionally control SFP+ receiver. When high, input data rate >4.5Gb/s; when low, input data rate <=4.5Gb/s | |
| 8 | LOS | Receiver Loss of Signal Indication | 4 |
| 9 | RS1 | Rate select0, optionally control SFP+ transmitter. When high, input data rate >4.5Gb/s; when low, input data rate <=4.5Gb/s | |
| 10 | VeeR | Module receiver ground | 1 |
| 11 | VeeR | Module receiver ground | 1 |
| 12 | RD- | Receiver inverted data out put | |
| 13 | RD+ | Receiver non-inverted data out put | |
| 14 | VeeR | Module receiver ground | 1 |
| 15 | VccR | Module receiver 3.3V supply | |
| 16 | VccT | Module transmitter 3.3V supply | |
| 17 | VeeT | Module transmitter ground | 1 |
| 18 | TD+ | Transmitter inverted data out put | |
| 19 | TD- | Transmitter non-inverted data out put | |

| | | | |
|----|------|---------------------------|---|
| 20 | VeeT | Module transmitter ground | 1 |
|----|------|---------------------------|---|

Note 1) The module ground pins shall be isolated from the module case.

Note 2) This pin is an open collector/drain output pin and shall be pulled up with 4.7K-10Kohms to Host_Vcc on the host board.

Note 3) This pin shall be pulled up with 4.7K-10Kohms to VccT in the module.

Note 4) This pin is an open collector/drain output pin and shall be pulled up with 4.7K-10Kohms to Host_Vcc on the host board.

● 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)

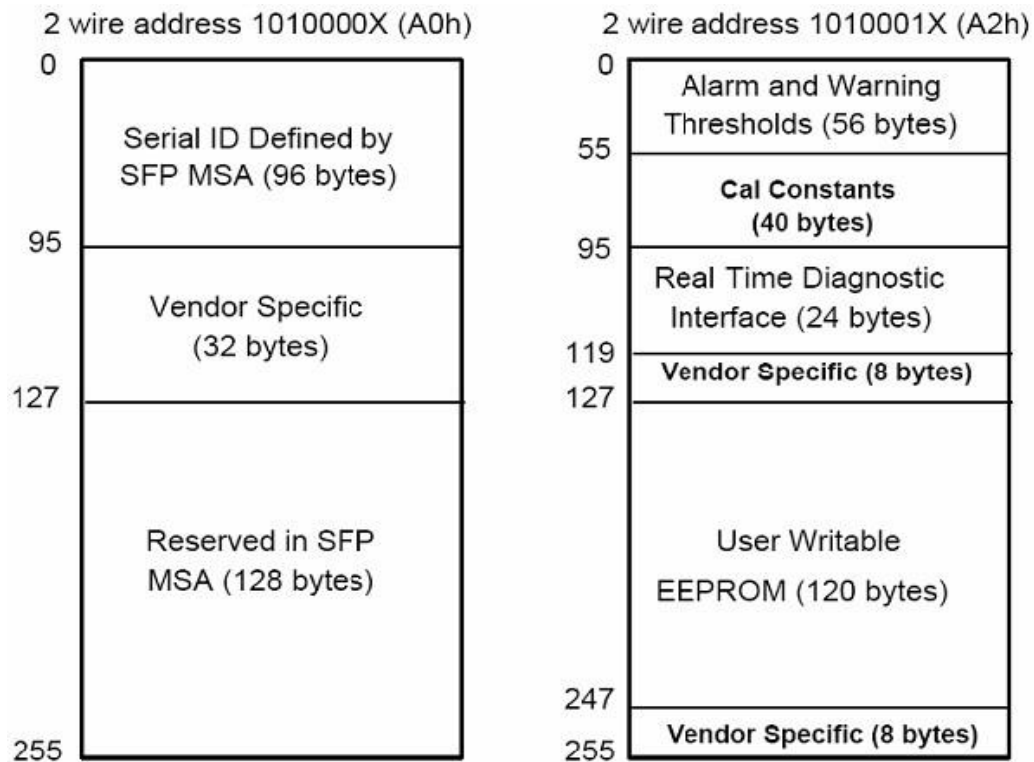


Table 2 - EEPROM Serial ID Memory Contents (A0h)

| 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 | 10G Base-LR |
| 11 | 1 | Encoding | 64B/66B |
| 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: TIBTRONIX |
| 36 | 1 | Reserved | |
| 37-39 | 3 | Vendor OUI | SFP transceiver vendor OUI ID |
| 40-55 | 16 | Vendor PN | Part Number: "FT5910D-2733" or "FT5910D-3327" (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 | TIBTRONIX'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 | TIBTRONIX specific date, read only |
| 128-255 | 128 | Reserved | Reserved for SFF-8079 |

● Digital Diagnostic Monitor Characteristics

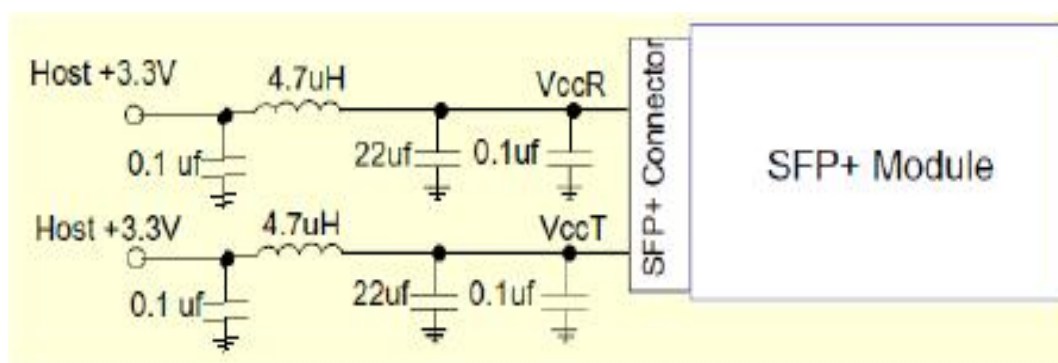
| Data Address | Parameter | Accuracy | Unit |
|--------------|----------------------------------|----------|------|
| 96-97 | Transceiver Internal Temperature | ±3.0 | °C |
| 100-101 | Laser Bias Current | ±10 | % |
| 100-101 | Tx Output Power | ±3.0 | dBm |
| 100-101 | Rx Input Power | ±3.0 | dBm |
| 100-101 | VCC3 Internal Supply Voltage | ±3.0 | % |

● Regulatory Compliance

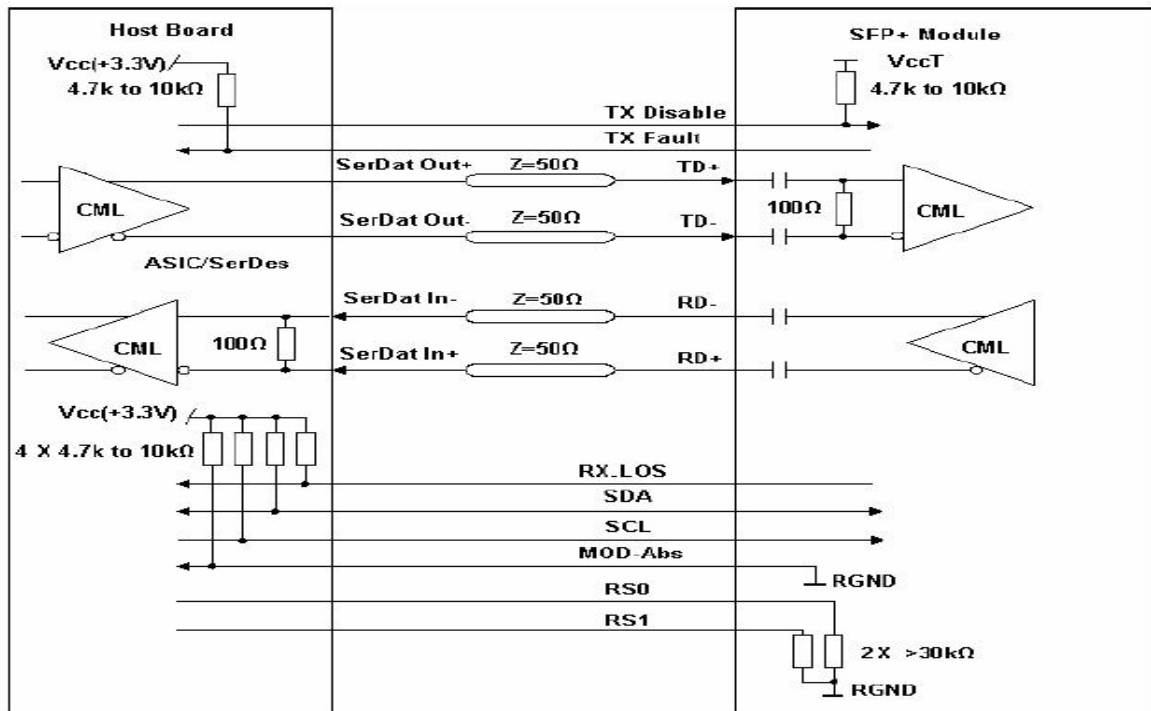
The TSBLXG10D-23 /32 complies with international Electromagnetic Compatibility (EMC) and international safety requirements and standards (see details in Table following).

| | | |
|---|--|--|
| Electrostatic Discharge (ESD) to the Electrical Pins | MIL-STD-883E Method 3015.7 | Class 1(>1000 V) |
| Electrostatic Discharge (ESD) to the Single 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

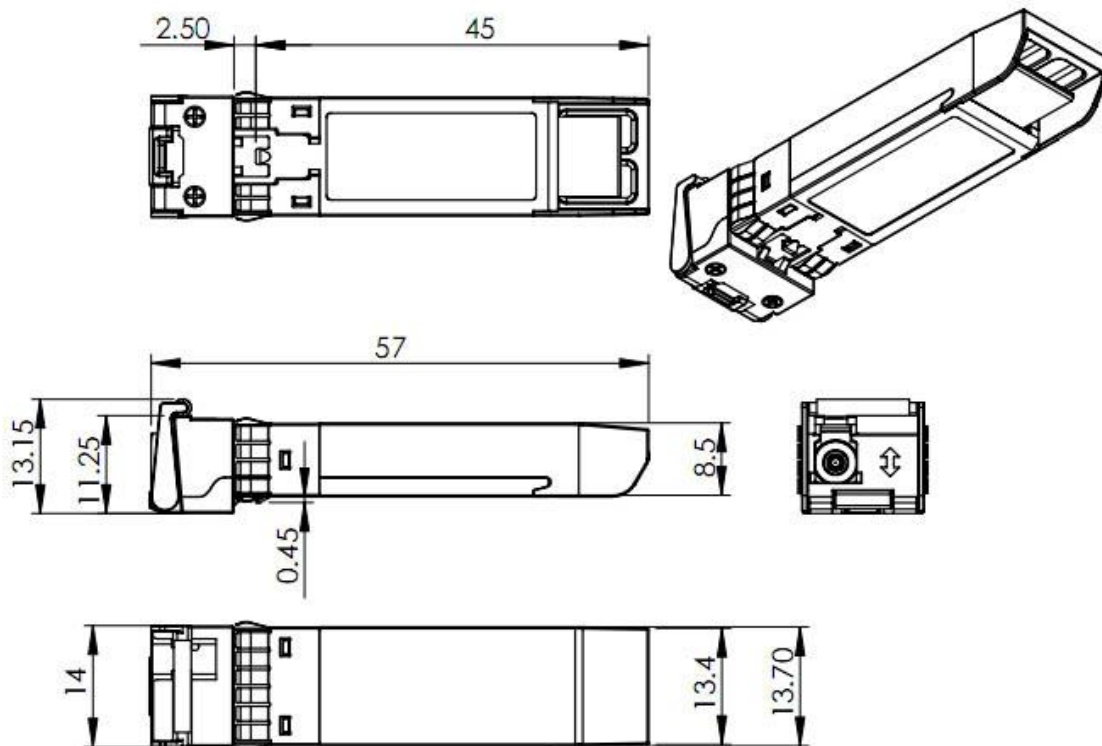


Recommended Host Board Power Supply Circuit



Recommended High-speed Interface Circuit

● Mechanical Dimensions



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