

155M~2.67Gbps Spring-latch SFP Transceiver

(With monitoring function, for 2~15km transmission, RoHS compliance)

Members of Flexon™ Family



- ◆ Compatible with Telcordia GR-253-CORE
- ◆ Compatible with FCC 47 CFR Part 15, Class B
- ◆ Compatible with FDA 21 CFR 1040.10 and 1040.11, Class I
- ◆ RoHS compliance

Description

Fiberxon 155M ~ 2.67Gbps Spring-latch SFP transceiver is high performance, cost effective module that supports data-rate up to 2.67Gbps and transmission distance from 2km to 15km.

The transceiver consists of two sections: The transmitter section incorporates a FP or uncooled DFB laser, and the receiver section consists of a PIN photodiode integrated with a trans-impedance preamplifier (TIA). All modules satisfy class I laser safety requirements.

The optical output can be disabled by a TTL logic high-level input of Tx Disable. Tx Fault is provided to indicate degradation of the laser. Loss of signal (LOS) output is provided to indicate the loss of an input optical signal of receiver.

The transceiver provides an enhanced monitoring interface, which allows real time access to the transceiver operating parameters such as transceiver temperature, laser bias current, transmitted optical power, received optical power and transceiver supply voltage by reading a built-in memory with I2C interface. For further information, please refer to SFF-8472 Rev 9.5.

Fiberxon's SFP transceivers are compliant with RoHS.

Features

- ◆ Support 155M~2.67Gbps multi-rate data links
- ◆ 1310nm FP laser and PIN photodiode for 2km transmission
- ◆ 1310nm uncooled DFB laser and PIN photodiode for 15km transmission
- ◆ Digital diagnostic monitor interface compatible with SFF-8472
- ◆ SFP MSA package with duplex LC connector
- ◆ With spring latch for high density application
- ◆ Class I laser product
- ◆ Hot-pluggable capability
- ◆ Operating case temperature: 0 to +70°C

Applications

- ◆ 1x/2x Fiber Channel
- ◆ Gigabit Ethernet
- ◆ SDH/SONET/ATM
- ◆ Other optical links

Standard

- ◆ Compatible with SFP MSA
- ◆ Compatible with SFF-8472 Rev 9.5
- ◆ Compatible with ITU-T G.957 and G.958

Regulatory Compliance

The transceivers have been tested according to American and European product safety and electromagnetic compatibility regulations (See Table 1). For further information regarding regulatory certification, please refer to Flexon™ regulatory specification and safety guidelines, or contact Fiberxon, Inc. America sales office listed at the end of the documentation.

Table 1 - Regulatory Compliance

| Feature | Standard | Performance |
|---|--|--|
| Electrostatic Discharge (ESD) to the Electrical Pins | MIL-STD-883E Method 3015.7 | Class 2(>2000 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 |
| Immunity | IEC 61000-4-3 | 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. |
| Component Recognition | UL and CSA | Compatible with standards |
| RoHS | 2002/95/EC 4.1&4.2 2005/747/EC | Compliant with standards ^{note} |

Note:

In light of item 5 in Annex of 2002/95/EC, "Pb in the glass of cathode ray tubes, electronic components and fluorescent tubes." and item 13 in Annex of 2005/747/EC, "Lead and cadmium in optical and filter glass.", the two exemptions are being concerned for Fiberxon's transceivers, because Fiberxon's transceivers use glass, which may contain Pb, for components such as lenses, windows, isolators, and other electronic components.

Absolute Maximum Ratings

Absolute Maximum Ratings are those values beyond which damage to the devices may occur.

Table 2 – Absolute Maximum Ratings

| Parameter | Symbol | Min. | Max. | Unit |
|---------------------|-----------------|------|------|------|
| Storage Temperature | T _S | -40 | +85 | °C |
| Supply Voltage | V _{CC} | -0.5 | 3.6 | V |
| Operating Humidity | - | 5 | 95 | % |

Recommended Operating Conditions

Table 3 - Recommended Operating Conditions

| Parameter | Symbol | Min. | Typical | Max. | Unit |
|----------------------------|----------------|------|---------|------|------|
| Operating Case Temperature | T _C | 0 | | +70 | °C |

| | | | | | |
|----------------------|----------|------|------|------|------|
| Power Supply Voltage | V_{CC} | 3.13 | | 3.47 | V |
| Power Supply Current | I_{CC} | | | 300 | mA |
| Data Rate | | 155 | 2488 | 2670 | Mbps |

Optical and Electrical Characteristics

All parameters are specified at overall operating case temperature and power supply range, and with a PRBS $2^{23}-1$ test pattern @2.488Gbps unless otherwise stated.

FTM-3128C-SL2G (1310nm FP and PIN, I-16, Monitoring function)

Table 4 –Optical and Electrical Characteristics

| Parameter | Symbol | Min. | Typical | Max. | Unit | Notes |
|--------------------------------|-------------|-----------------------|---------|--------------|----------|-------|
| Transmitter | | | | | | |
| Centre Wavelength | λ_C | 1266 | | 1360 | nm | |
| Spectral Width (RMS) | σ | | 2 | 4 | nm | |
| Average Output Power | P_{Out} | -10 | | -3 | dBm | 1 |
| Extinction Ratio | EX | 8.2 | | | dB | |
| P_{Out} @TX Disable Asserted | | | | -45 | dBm | |
| Jitter Generation (RMS) | | | | 0.01 | UI | |
| Jitter Generation (pk-pk) | | | | 0.1 | UI | |
| Output Optical Eye | | ITU-T G.957 compliant | | | | 2 |
| Data Input Differential Swing | V_{IN} | 400 | | 2000 | mV | 3 |
| Input Differential Impedance | Z_{IN} | | 100 | | Ω | |
| TX Disable | Disable | 2.0 | | $V_{CC}+0.3$ | V | |
| | Enable | 0 | | 0.8 | V | |
| TX Fault | Fault | 2.0 | | $V_{CC}+0.3$ | V | |
| | Normal | 0 | | 0.8 | V | |
| Receiver | | | | | | |
| Centre Wavelength | λ_C | 1260 | | 1580 | nm | |
| Receiver Sensitivity | | | | -18 | dBm | 4 |
| Receiver Overload | | -3 | | | dBm | |
| Reflection | | | | -27 | dB | |
| LOS De-Assert | LOS_D | | | -20 | dBm | |
| LOS Assert | LOS_A | -35 | | | dBm | |
| LOS Hysteresis | | 0.5 | | 4.5 | dB | |
| Data Output Differential Swing | V_{OUT} | 400 | | 1200 | mV | 5 |
| LOS | High | 2.0 | | $V_{CC}+0.3$ | V | |
| | Low | 0 | | 0.8 | V | |

Notes:

- The optical power is launched into 9/125 SMF.
- Measured with a PRBS $2^{23}-1$ test pattern @2.488Gbps.

3. Internally AC-coupled and terminated to 100Ω differential load.
4. Measured with a PRBS $2^{23}-1$ test pattern, BER better than or equal to 1×10^{-10}
5. AC-coupled CML logic family

FTM-3128C-SL15G (1310nm DFB and PIN, S-16.1, Monitoring function)

Table 5 –Optical and Electrical Characteristics

| Parameter | Symbol | Min. | Typical | Max. | Unit | Notes | |
|--------------------------------|-----------------|-----------------------|---------|--------------|------|-------|---|
| Transmitter | | | | | | | |
| Centre Wavelength | λ_C | 1260 | | 1360 | nm | | |
| Spectral Width (-20dB) | $\Delta\lambda$ | | | 1 | nm | | |
| Average Output Power | P_{Out} | -5 | | 0 | dBm | 1 | |
| Side Mode Suppression Ratio | SMSR | 30 | | | dB | | |
| Extinction Ration | EX | 8.2 | | | dB | | |
| $P_{Out}@TX$ Disable Asserted | | | | -45 | dBm | | |
| Jitter Generation (RMS) | | | | 0.01 | UI | | |
| Jitter Generation (pk-pk) | | | | 0.1 | UI | | |
| Output Optical Eye | | ITU-T G.957 compliant | | | | | 2 |
| Data Input Differential Swing | V_{IN} | 400 | | 2000 | mV | 3 | |
| Input Differential Impedance | Z_{IN} | | 100 | | Ω | | |
| TX Disable | Disable | 2.0 | | $V_{CC}+0.3$ | V | | |
| | Enable | 0 | | 0.8 | V | | |
| TX Fault | Fault | 2.0 | | $V_{CC}+0.3$ | V | | |
| | Normal | 0 | | 0.8 | V | | |
| Receiver | | | | | | | |
| Centre Wavelength | λ_C | 1260 | | 1580 | nm | | |
| Receiver Sensitivity | | | | -18 | dBm | 4 | |
| Receiver Overload | | 0 | | | dBm | | |
| Reflection | | | | -27 | dB | | |
| LOS De-Assert | LOS_D | | | -20 | dBm | | |
| LOS Assert | LOS_A | -35 | | | dBm | | |
| LOS Hysteresis | | 0.5 | | 4.5 | dB | | |
| Data Output Differential Swing | V_{OUT} | 400 | | 1200 | mV | 5 | |
| LOS | High | 2.0 | | $V_{CC}+0.3$ | V | | |
| | Low | 0 | | 0.8 | V | | |

Notes:

1. The optical power is launched into 9/125 SMF.
2. Measured with a PRBS $2^{23}-1$ test pattern @2.488Gbps.
3. Internally AC-coupled and terminated to 100Ω differential load.
4. Measured with a PRBS $2^{23}-1$ test pattern, BER better than or equal to 1×10^{-10}
5. AC-coupled CML logic family

EEPROM Information

The SFP MSA defines a 256-byte memory map in EEPROM describing the transceiver's capabilities, standard interfaces, manufacturer, and other information, which is accessible over a two-wire serial interface at the 8-bit address 1010000X (A0h). The memory contents refer to Table 6

Table 6 - EEPROM Serial ID Memory Contents (A0h)

| Addr. | Field Size (Bytes) | Name of Field | Hex | Description |
|--------|--------------------|------------------|--|--|
| 0 | 1 | Identifier | 03 | SFP |
| 1 | 1 | Ext. Identifier | 04 | MOD4 |
| 2 | 1 | Connector | 07 | LC |
| 3—10 | 8 | Transceiver | 00 xx 00 00 00 00 00 00 | OC 48 short/intermediate/long distance |
| 11 | 1 | Encoding | 03 | NRZ |
| 12 | 1 | BR, nominal | xx | 155~2670Mbps |
| 13 | 1 | Reserved | 00 | |
| 14 | 1 | Length (9um)-km | xx | 2km/15km (02/0F) |
| 15 | 1 | Length (9um) | xx | 2km/15km (14/96) |
| 16 | 1 | Length (50um) | 00 | |
| 17 | 1 | Length (62.5um) | 00 | |
| 18 | 1 | Length (copper) | 00 | |
| 19 | 1 | Reserved | 00 | |
| 20—35 | 16 | Vendor name | 46 49 42 45 52 58 4F 4E 20 49 4E 43 2E 20 20 20 | "FIBERXON INC." (ASC II) |
| 36 | 1 | Reserved | 00 | |
| 37—39 | 3 | Vendor OUI | 00 00 00 | |
| 40—55 | 16 | Vendor PN | 46 54 4D 2D 33 31 32 38 43 2D 53 4C xx xx 47 20 | "FTM-3128C-SLxxG" (ASC II) |
| 56—59 | 4 | Vendor rev | xx xx 20 20 | ASC II ("31 30 20 20" means 1.0 revision) |
| 60-61 | 2 | Wavelength | 05 1E | 1310nm |
| 62 | 1 | Reserved | 00 | |
| 63 | 1 | CC BASE | xx | Check sum of bytes 0 - 62 |
| 64—65 | 2 | Options | 00 1A | LOS, TX_FAULT, and TX_DISABLE |
| 66 | 1 | BR, max | 00 | |
| 67 | 1 | BR, min | 00 | |
| 68—83 | 16 | Vendor SN | xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx | ASC II, |
| 84—91 | 8 | Vendor date code | xx xx xx xx xx xx 20 20 | Year (2 bytes), Month (2 bytes), Day (2 bytes) |
| 92 | 1 | Diagnostic type | 58 | Diagnostics (Inter.) |
| 93 | 1 | Enhanced option | B0 | Diagnostics (Optional Alarm/warning flags) |
| 94 | 1 | SFF-8472 | 02 | Diagnostics (SFF-8472 Rev 9.4) |
| 95 | 1 | CC EXT | xx | Check sum of bytes 64 - 94 |
| 96—255 | 160 | Vendor specific | | |

Note: The "xx" byte should be filled in according to practical case. For more information, please refer to the related document of SFF-8472 Rev 9.5.

Monitoring Specification

The digital diagnostic monitoring interface also defines another 256-byte memory map in EEPROM, which makes use of the 8 bit address 1010001X (A2h). Please see Figure 1. For detail EEPROM information, please refer to the related document of SFF-8472 Rev 9.5. The monitoring specification of this product is described in Table 7

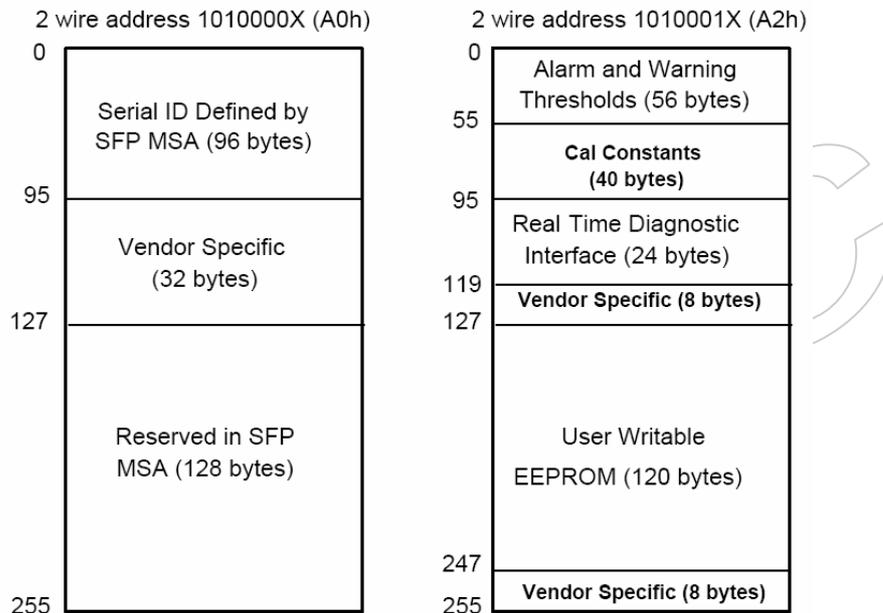


Figure 1, EEPROM Memory Map Specific Data Field Descriptions

Table 7 - Monitoring Specification

| Parameter | | Range | Accuracy | Calibration* |
|--------------|-----------------|--------------|----------|--------------|
| Temperature | FTM-3128C-SL2G | -10 to +80°C | ±3°C | Internal |
| | FTM-3128C-SL15G | | | Internal |
| Voltage | FTM-3128C-SL2G | 3.0 to 3.6V | ±3% | Internal |
| | FTM-3128C-SL15G | | | Internal |
| Bias Current | FTM-3128C-SL2G | 0 to 60 mA | ±10% | Internal |
| | FTM-3128C-SL15G | | | Internal |
| TX Power | FTM-3128C-SL2G | -11 to -2dBm | ±3dB | Internal |
| | FTM-3128C-SL15G | -6 to 1dBm | | Internal |
| RX Power | FTM-3128C-SL2G | -20 to -2dBm | ±3dB | Internal |
| | FTM-3128C-SL15G | -20 to 1dBm | | Internal |

Recommended Host Board Power Supply Circuit

Figure 2 shows the recommended host board power supply circuit.

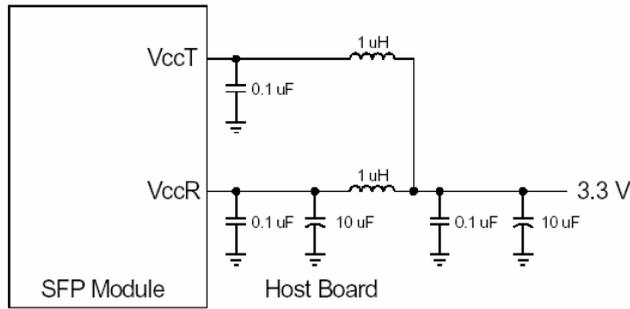


Figure 2, Recommended Host Board Power Supply Circuit

Recommended Interface Circuit

Figure 3 shows the recommended interface circuit.

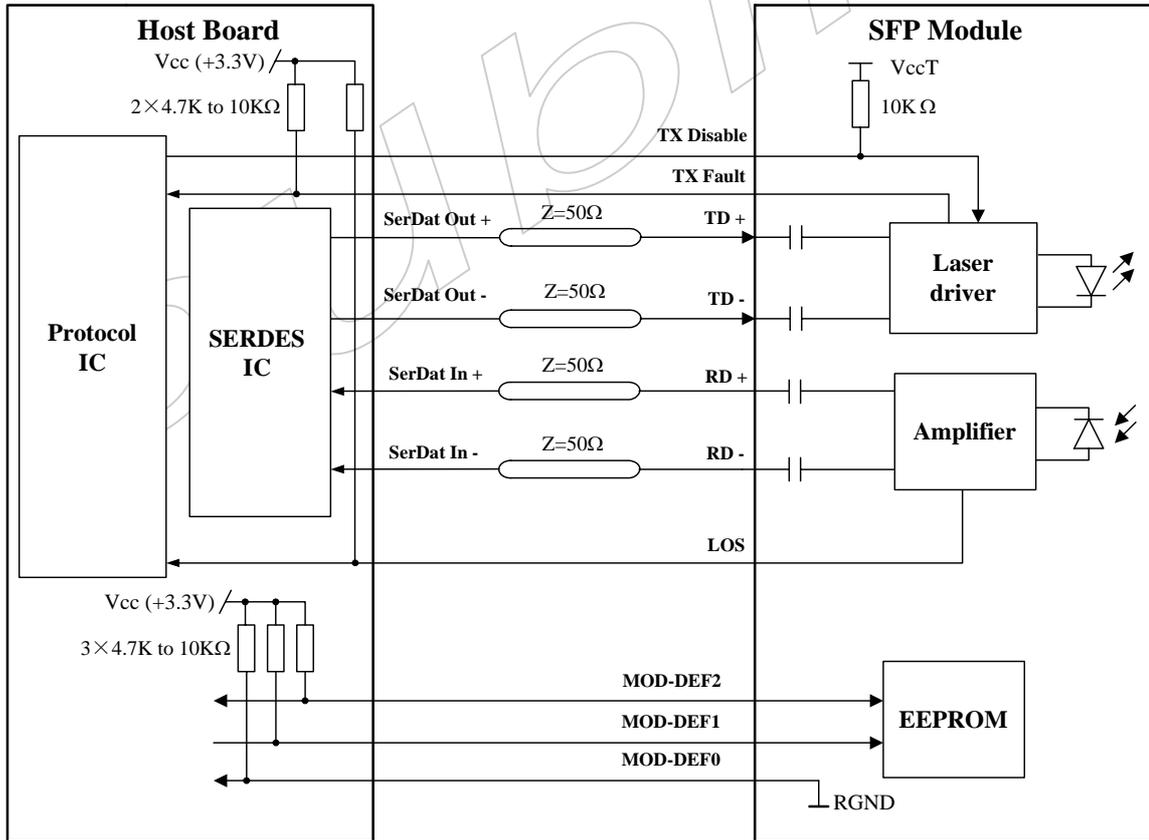


Figure 3, Recommended Interface Circuit

Pin Definitions

Figure 4 below shows the pin numbering of SFP electrical interface. The pin functions are described in Table 8 and the accompanying notes.

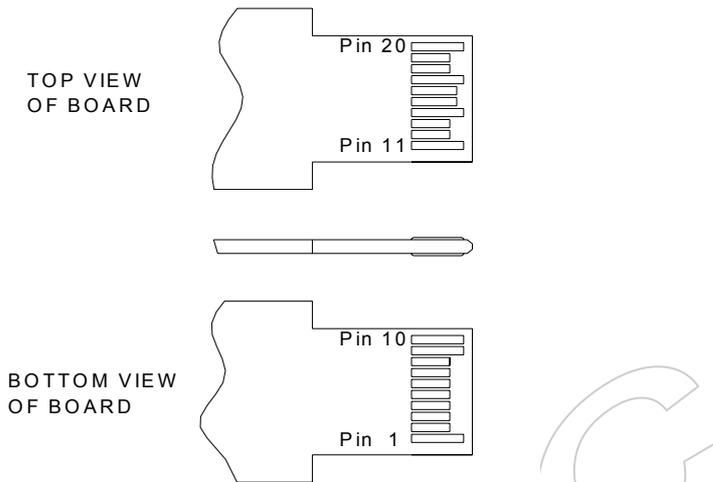


Figure 4, Pin View

Table 8 – Pin Function Definitions

| Pin No. | Name | Function | Plug Seq. | Notes |
|---------|-------------|------------------------------|-----------|--------|
| 1 | VeeT | Transmitter Ground | 1 | |
| 2 | TX Fault | Transmitter Fault Indication | 3 | Note 1 |
| 3 | TX Disable | Transmitter Disable | 3 | Note 2 |
| 4 | MOD-DEF2 | Module Definition 2 | 3 | Note 3 |
| 5 | MOD-DEF1 | Module Definition 1 | 3 | Note 3 |
| 6 | MOD-DEF0 | Module Definition 0 | 3 | Note 3 |
| 7 | Rate Select | Not Connected | 3 | |
| 8 | LOS | Loss of Signal | 3 | Note 4 |
| 9 | VeeR | Receiver Ground | 1 | |
| 10 | VeeR | Receiver Ground | 1 | |
| 11 | VeeR | Receiver Ground | 1 | |
| 12 | RD- | Inv. Received Data Out | 3 | Note 5 |
| 13 | RD+ | Received Data Out | 3 | Note 5 |
| 14 | VeeR | Receiver Ground | 1 | |
| 15 | VccR | Receiver Power | 2 | |
| 16 | VccT | Transmitter Power | 2 | |
| 17 | VeeT | Transmitter Ground | 1 | |
| 18 | TD+ | Transmit Data In | 3 | Note 6 |
| 19 | TD- | Inv. Transmit Data In | 3 | Note 6 |
| 20 | VeeT | Transmitter Ground | 1 | |

Notes:

- TX Fault is an open collector output, which should be pulled up with a 4.7k~10kΩ resistor on the host board to a voltage between 2.0V and Vcc+0.3V. Logic 0 indicates normal operation; logic 1 indicates a laser fault of some kind. In the low state, the output will be pulled to less than 0.8V.
- TX Disable is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7k~10kΩ resistor. Its states are:

Low (0~0.8V): Transmitter on

- ($>0.8V$, $<2.0V$): Undefined
 - High ($2.0\sim 3.465V$): Transmitter Disabled
 - Open: Transmitter Disabled
3. MOD-DEF 0,1,2 are the module definition pins. They should be pulled up with a $4.7k\sim 10k\Omega$ resistor on the host board. The pull-up voltage shall be V_{ccT} or V_{ccR} .
 MOD-DEF 0 grounded by the module indicates that the module is present
 MOD-DEF 1 is the clock line of two-wire serial interface for serial ID
 MOD-DEF 2 is the data line of two-wire serial interface for serial ID
 4. LOS is an open collector output, which should be pulled up with a $4.7k\sim 10k\Omega$ resistor on the host board to a voltage between $2.0V$ and $V_{cc}+0.3V$. Logic 0 indicates normal operation; logic 1 indicates loss of signal. In the low state, the output will be pulled to less than $0.8V$.
 5. These are the differential receiver outputs. They are AC-coupled 100Ω differential lines which should be terminated with 100Ω (differential) at the user SERDES.
 6. These are the differential transmitter inputs. They are AC-coupled, differential lines with 100Ω differential termination inside the module.

Mechanical Design Diagram

The mechanical design diagram is shown in Figure 5.

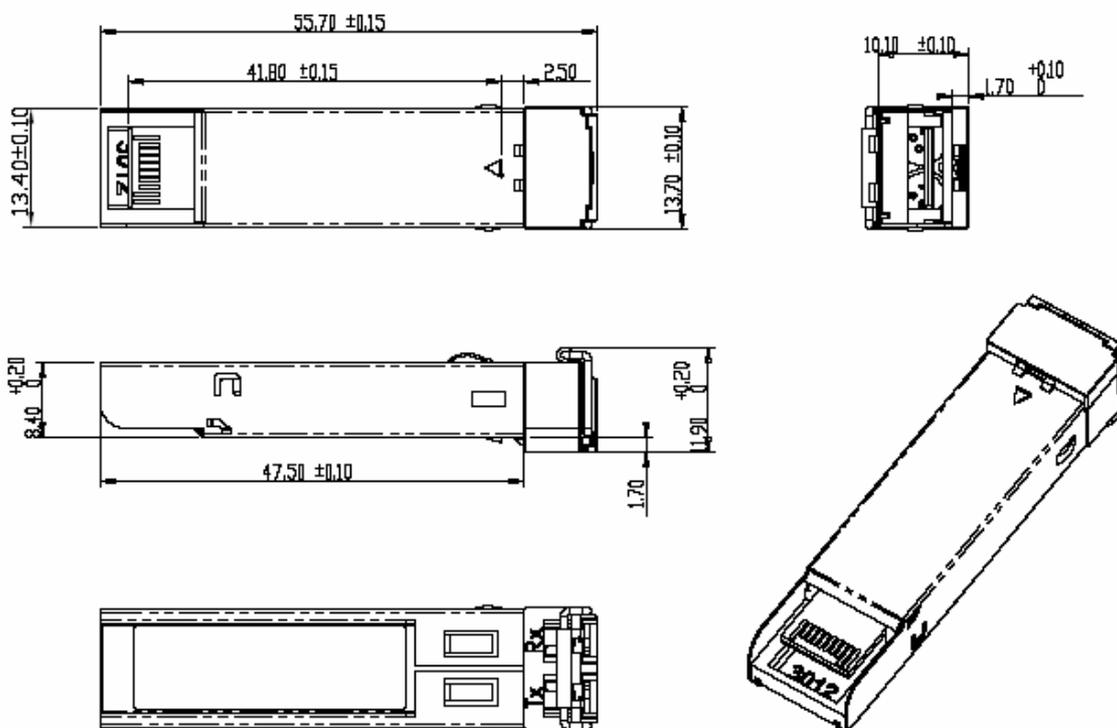
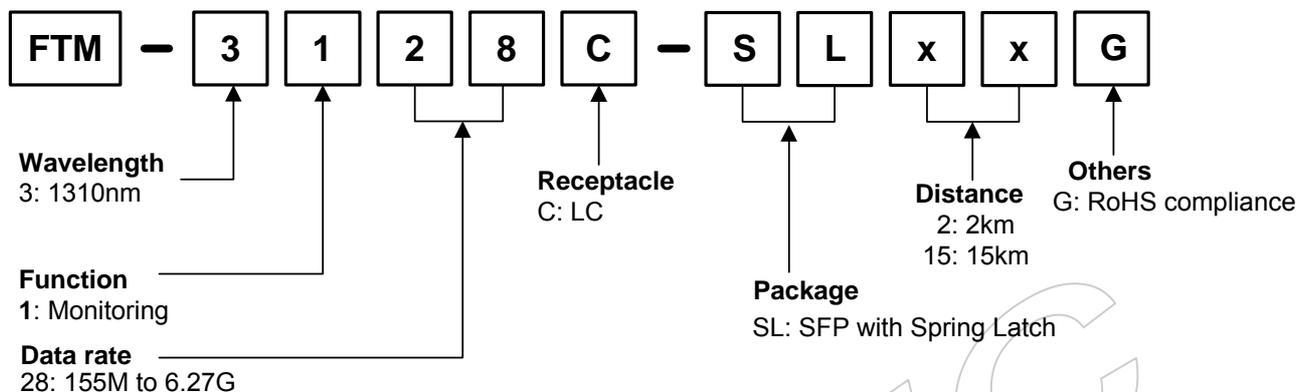


Figure 5, Mechanical Design Diagram of SFP with Spring Latch

Ordering Information



| Part No. | Product Description |
|-----------------|--|
| FTM-3128C-SL2G | 1310nm, 155M~2.67Gbps, 2km, SFP with spring latch, Monitoring function, 0°C~+70°C, RoHS compliance. |
| FTM-3128C-SL15G | 1310nm, 155M ~ 2.67Gbps, 15km, SFP with spring latch, Monitoring function, 0°C~+70°C, RoHS compliance. |

Related Documents

For further information, please refer to the following documents:

- Flexon™ SFP Installation Guide
- Flexon™ SFP Application Notes
- SFP Multi-Source Agreement (MSA)
- SFF-8472 Rev 9.5

Obtaining Document

You can visit our website:

<http://www.fiberxon.com>

Or contact Fiberxon, Inc. America Sales Office listed at the end of the documentation to get the latest documents.

Revision History

| Revision | Initiate | Review | Approve | Subject | Release Date |
|----------|-------------|------------|-----------|---|-----------------|
| Rev. 1a | Univer.Yang | Bell.Huang | Walker.We | Initial datasheet | May. 30, 2006 |
| Rev. 1b | Univer.Yang | Bell.Huang | Walker.We | Update the “mechanical diagram” to C-SL2.0 version and “SFF-8472” to Rev 9.5. | April. 17, 2007 |
| Rev. 1c | Univer.Yang | Bell.Huang | Walker.We | Formal edition. | Jun. 13, 2007. |

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