1.25Gbps Spring-latch SFP Transceiver

(With monitoring function, for 10~20km transmission)

Members of Flexon™ Family

Standard

- Compatible with SFP MSA
- Compatible with SFF-8472
- Compatible with IEEE 802.3z
- Compatible with ANSI INCITS Fibre Channel FC-PI Rev13
- Compatible with FCC 47 CFR Part 15, Class B
- Compatible with FDA 21 CFR 1040.10 and 1040.11, Class I
- RoHS compliance

Features

- Up to 1.25Gbps data rate
- 10~20km transmission distance with 9/125 μm SMF
- 1310nm FP laser transmitter
- PIN photodiode receiver
- Class I laser product
- Digital diagnostic monitor interface Compatible with SFF-8472
- SFP MSA package with duplex LC receptacle
- With Spring latch for high density application
- Very low EMI and excellent ESD protection
- Single 3.3V power supply
- Operating case temperature:
  Standard: 0 to +70°C
  Industrial: -40 to +85°C

Applications

- Switch to Switch interface
- Switched backplane applications
- Router/Server interface
- Other optical transmission systems

Description

Fiberxon 1.25Gbps Spring-latch SFP transceiver is high performance, cost effective module. It is designed for Gigabit Ethernet and 1x Fibre Channel applications, which supports 10~20km transmission with 9/125 μm SMF.

The transceiver consists of two sections: The transmitter section incorporates a 1310nm FP 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.

Fiberxon 1.25Gbps Spring-latch SFP transceiver provides an enhanced monitoring interface, which allows real-time access to device operating parameters such as transceiver temperature, laser bias current, transmitted optical power, received optical power and transceiver supply voltage. For further information, please refer to SFP MSA and SFF-8472.

FTM-3112C-SLG/FTM-3112C-SLiG/FTM-3112C-SL 20G is compliant with RoHS.

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 with 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 1(>500 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 I laser product. TUV Certificate No. 50030043
Component Recognition	UL and CSA	UL file E223705
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	Note
Operating Case Temperature	T_C	-40		+85	°C	1
		0		+70	°C	2
Power Supply Voltage	V_{CC}	3.13	3.3	3.47	V	
Power Supply Current	I_{CC}			300	mA	
Data Rate			1.25		Gbps	

1. FTM-3112C-SLiG
2. FTM-3112C-SLG/FTM-3112C-SL20G

FTM-3112C-SLG/ FTM-3112C-SLiG (1310nm FP and PIN, 10km)

Table 4 - Optical and Electrical Characteristics

Parameter		Symbol	Min.	Typical	Max.	Unit	Notes
Transmitter							
Centre Wavelength		λ_C	1270	1310	1355	nm	
Average Output Power		P_{0ut}	-9.5		-3	dBm	1
P_{0ut}@TX Disable Asserted		P_{0ut}			-45	dBm	1
Spectral Width (RMS)		σ		2	4	nm	
Extinction Ratio		ER	9			dB	
Rise/Fall Time (20%～80%)		t_r/t_f			0.26	ns	2
Total Jitter	1.25G	T_J			0.431	UI	3
	1.0625G				0.43		
Deterministic Jitter	1.25G	D_J			0.2	UI	3
	1.0625G				0.21		
Output Optical Eye		IEEE 802.3z and ANSI Fibre Channel Compatible					4
Data Input Swing Differential		V_{IN}	400		2000	mV	5
Input Differential Impedance		Z_{IN}	90	100	110	Ω	
TX Disable	Disable		2.0		Vcc	V	
	Enable		0		0.8	V	
TX Fault	Fault		2.0		Vcc	V	
	Normal		0		0.5	V	
Receiver							
Centre Wavelength		λ_C	1260	1310	1580	nm	
Receiver Sensitivity					-20	dBm	6
Receiver Overload			-3			dBm	6
Return Loss			12			dB	
LOS De-Assert		LOS_D			-21	dBm	
LOS Assert		LOS_A	-35			dBm	
LOS Hysteresis			1		4	dB	
Total Jitter	1.25G	T_J			0.749	UI	3
	1.0625G				0.61		
Deterministic Jitter	1.25G	D_J			0.462	UI	3
	1.0625G				0.36		

Data Output Swing Differential		V_{OUT}	400		2000	mV	5
LOS	High		2.0		Vcc	V	
	Low		0		0.5	V	

Notes:

1. The optical power is launched into SMF.
2. Unfiltered, measured with a PRBS 2^7-1 test pattern @1.25Gbps
3. Meet the specified maximum output jitter requirements if the specified maximum input jitter is present.
4. Measured with a PRBS 2^7-1 test pattern @1.25Gbps/1.0625Gbps.
5. Internally AC coupled.
6. Measured with a PRBS 2^7-1 test pattern @1.25Gbps, extinction ratio ER=9dB, BER ≤1×10^{-12}.

FTM-3112C-SL20G (1310nm FP and PIN, 20km)

Table 5 - Optical and Electrical Characteristics

Parameter		Symbol	Min.	Typical	Max.	Unit	Notes
Transmitter							
Centre Wavelength		λ_C	1270	1310	1355	nm	
Average Output Power		P_{0ut}	-8		-3	dBm	1
P_{0ut}@TX Disable Asserted		P_{0ut}			-45	dBm	1
Spectral Width (RMS)		σ		2	4	nm	
Extinction Ratio		ER	9			dB	
Rise/Fall Time (20%～80%)		t_r/t_f			0.26	ns	2
Total Jitter	1.25G	T_J			0.431	UI	3
	1.0625G				0.43		
Deterministic Jitter	1.25G	D_J			0.2	UI	3
	1.0625G				0.21		
Output Optical Eye		IEEE 802.3z and ANSI Fibre Channel Compatible					4
Data Input Swing Differential		V_{IN}	400		2000	mV	5
Input Differential Impedance		Z_{IN}	90	100	110	Ω	
TX Disable	Disable		2.0		Vcc	V	
	Enable		0		0.8	V	
TX Fault	Fault		2.0		Vcc	V	
	Normal		0		0.5	V	
Receiver							
Centre Wavelength		λ_C	1260	1310	1580	nm	
Receiver Sensitivity					-22	dBm	6
Receiver Overload			-3			dBm	6
Return Loss			12			dB	
LOS De-Assert		LOS_D			-22	dBm	
LOS Assert		LOS_A	-35			dBm	
LOS Hysteresis			1		4	dB	
Total Jitter	1.25G	T_J			0.749	UI	3
	1.0625G				0.61		

Deterministic Jitter	1.25G	D_J			0.462	UI	3
	1.0625G				0.36		
Data Output Swing Differential		V_{OUT}	400		2000	mV	5
LOS	High		2.0		Vcc	V	
	Low		0		0.5	V	

Notes:

1. The optical power is launched into SMF.
2. Unfiltered, measured with a PRBS 2^7-1 test pattern @1.25Gbps
3. Meet the specified maximum output jitter requirements if the specified maximum input jitter is present.
4. Measured with a PRBS 2^7-1 test pattern @1.25Gbps/1.0625Gbps.
5. Internally AC coupled.
6. Measured with a PRBS 2^7-1 test pattern @1.25Gbps, extinction ratio ER=9dB, BER ≤1×10^{-12}.

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 2 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 00 00 02 12 00 01 01	Transmitter Code
11	1	Encoding	01	8B10B
12	1	BR, nominal	0D	1.25Gbps
13	1	Reserved	00	
14	1	Length (9um)-km	0A/14	10km/20km
15	1	Length (9um)	64/C8	
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. "(ASCⅡ)
36	1	Reserved	00	
37—39	3	Vendor OUI	00 00 00	
40—55	16	Vendor PN	46 54 4D 2D 33 31 31 32 43 2D 53 4C xx xx 47 20	"FTM-3112C-SLXXG " (ASCⅡ)
56—59	4	Vendor rev	xx xx xx xx	ASCⅡ("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	68	Diagnostics(Int.Cal)
93	1	Enhanced option	B0	Diagnostics(Optional Alarm/warning flags, Soft TX_FAULT and Soft TX_LOS monitoring)
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.

EEPROM Information

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.

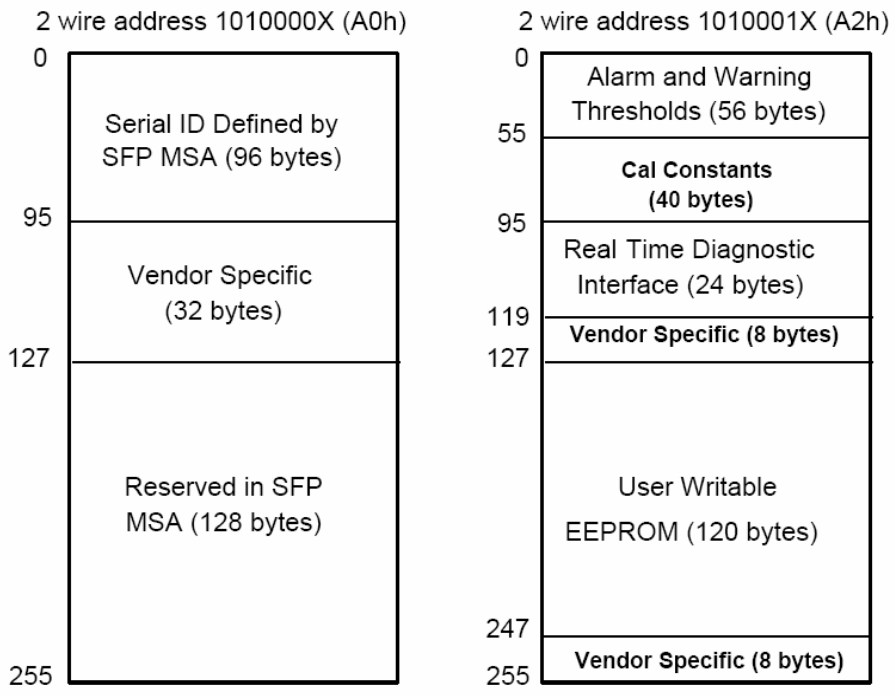


Figure 1, EEPROM Memory Map Specific Data Field Descriptions

Monitoring Specification

Table 7 - Monitoring Specification

Parameter		Range	Accuracy	Calibration
Temperature	FTM-3112C-SLG	-10 to 80°C	±3°C	Internal
	FTM-3112C-SL20G			
	FTM-3112C-SLiG	-40 to 100°C	±3°C	Internal
Voltage		3.0 to 3.6V	±3%	Internal
Bias Current		0 to 100mA	±10%	Internal
TX Power	FTM-3112C-SLG	-11 to -2dBm	±3dB	Internal
	FTM-3112C-SLiG			
	FTM-3112C-SL20G	-8 to -2dBm	±3dB	Internal
RX Power	FTM-3112C-SLG	-21 to -2dBm	±3dB	Internal
	FTM-3112C-SLiG			
	FTM-3112C-SL20G	-23 to -2dBm	±3dB	Internal

Recommended Host Board Power Supply Circuit

Figure 2 shows the recommended host board power supply circuit.

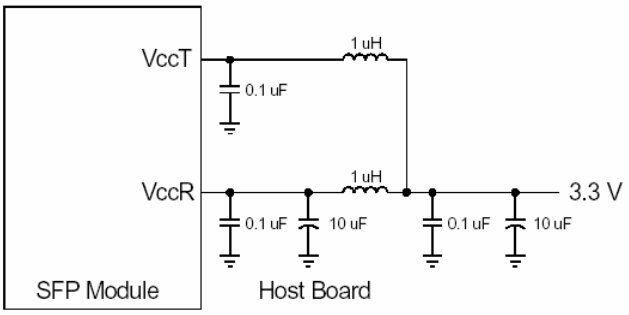


Figure 2, Recommended Host Board Power Supply Circuit

Recommended Interface Circuit

Figure 3 shows the recommended interface circuit.

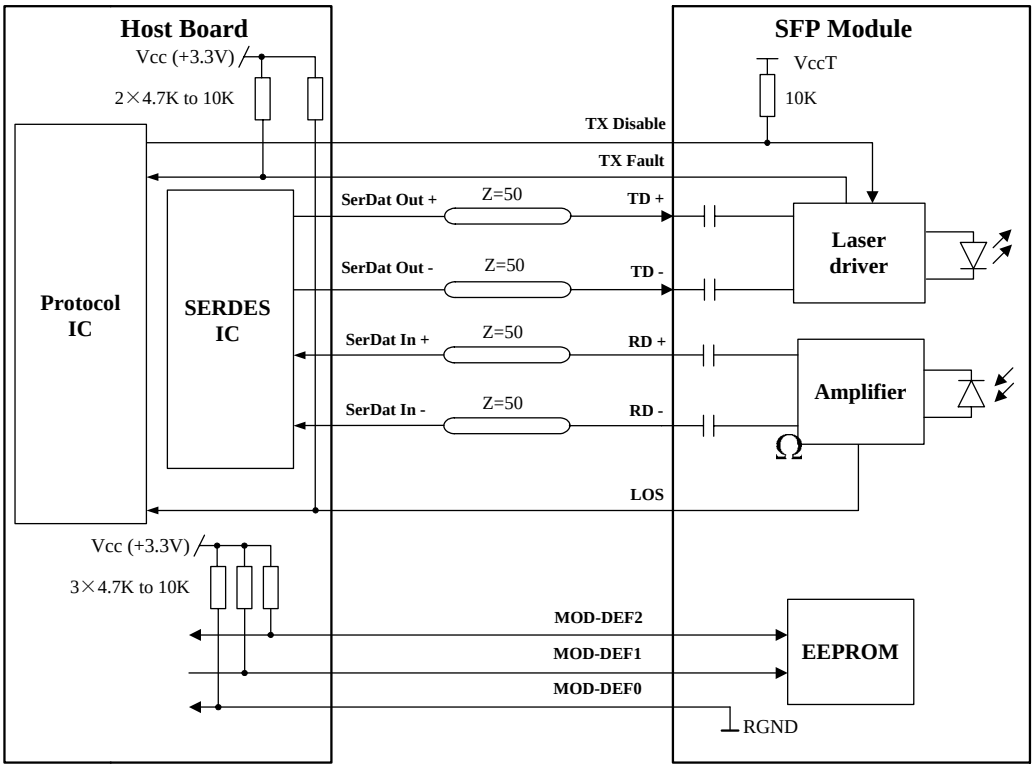


Figure 3, Recommended Interface Circuit

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.

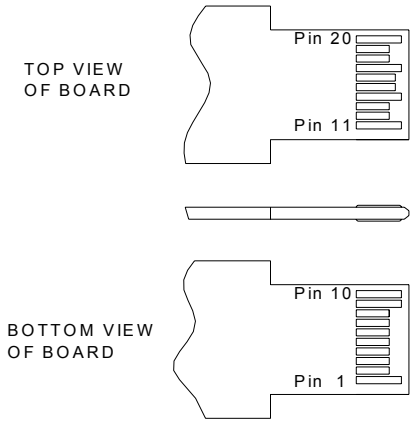


Figure 4, Pin View

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:

1. 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.
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 4.7k~10kΩ resistor. Its states are:
   Low (0~0.8V): Transmitter on
   (>0.8V, <2.0V): Undefined
   High (2.0~3.465V): 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~10kΩ resistor on the host board. The pull-up voltage shall be VccT or VccR.
   MOD-DEF 0 is grounded by the module to indicate 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~10kΩ resistor on the host board to a voltage between 2.0V and Vcc+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.

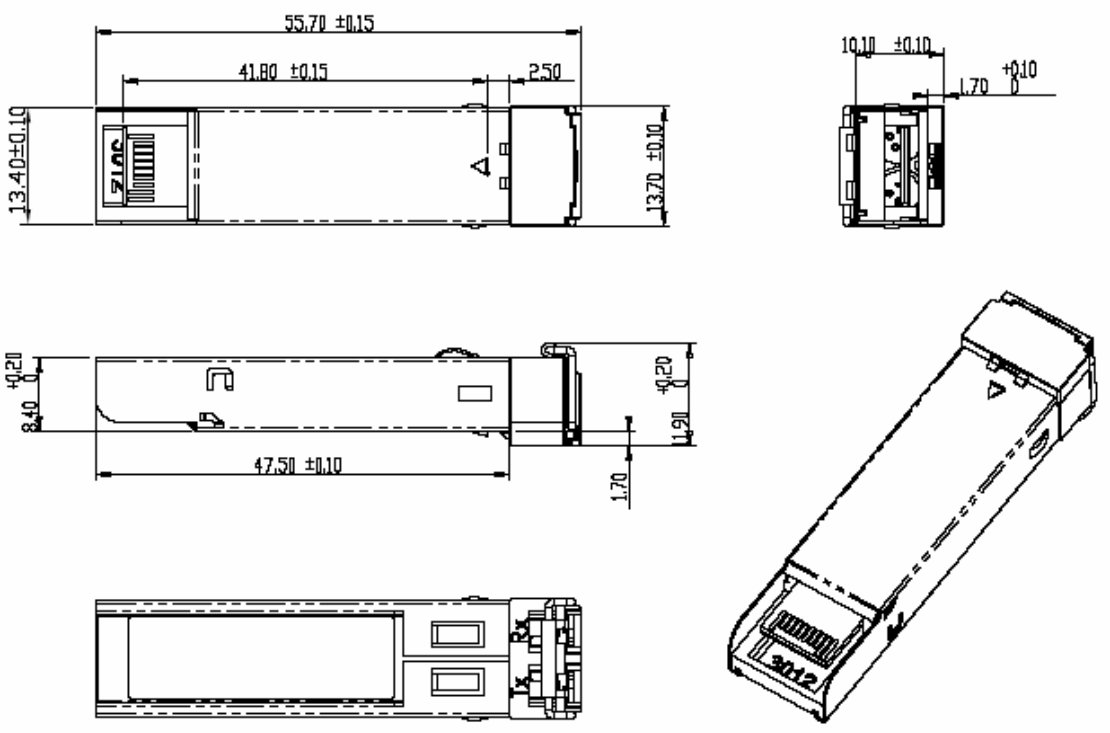
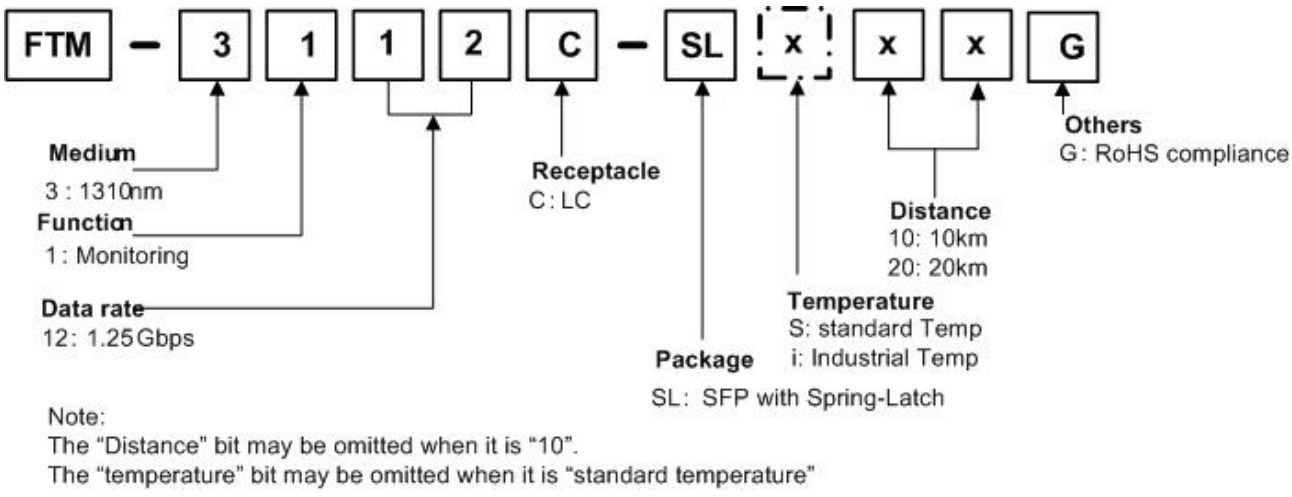


Figure 5, Mechanical Design Diagram of SFP with Spring Latch

Ordering Information



Part No.	Product Description
FTM-3112C-SLG	1310nm, 1.0625/1.25Gbps, 10km, Spring-latch SFP, Monitoring function, 0°C~+70°C, Compliant with RoHS
FTM-3112C-SLiG	1310nm, 1.0625/1.25Gbps, 10km, Spring-latch SFP, Monitoring function, -40°C~+85°C, Compliant with RoHS

FTM-3112C-SL20G	1310nm, 1.0625/1.25Gbps, 20km, Spring-latch SFP, Monitoring function, 0°C~+70°C, Compliant with RoHS

Related Documents

For further information, please refer to the following documents:

- *Flexon™ SFP Installation Guide*
- *Flexon™ SFP Application Notes*
- *Flexon™ SFP Serial ID and Digital Diagnostics Monitoring Interface 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 with Fiberxon, Inc. America Sales Office listed at the end of documentation to get the latest documents.

Revision History

Revision	Initiate	Review	Approve	Subject	Release Date
Rev. 1a	Henry xiao	Monica Wei	Walker.Wei	initialize datasheet	Nov. 30, 2005

Contact
U.S.A. Headquarter:
5201 Great America Parkway, Suite 340

Santa Clara, CA 95054
U. S. A.
Tel: 408-562-6288
Fax: 408-562-6289
Or visit our website: http://www.fiberxon.com