

# 1G~2.5Gbps Spring-latch SFP Transceiver

(With monitoring function, for 2km transmission, RoHS compliant)

## Members of Flexon™ Family



1040.11, Class I

- ◆ RoHS compliant

## Description

Fiberxon 1G~2.5Gbps spring-latch SFP transceiver is high performance, cost effective module that supports data-rate up to 2.5Gbps and transmission distance of 2km.

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

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 1G ~ 2.5Gbps SFP transceiver is compliant with RoHS.

## Features

- ◆ Support 1G~2.5Gbps multi-rate data links
- ◆ 1310nm FP laser and PIN photodiode for 2km transmission
- ◆ Digital diagnostic monitor interface compliant 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:  
Commercial: 0 to +70°C  
Industrial : -40 to +85°C

## Applications

- ◆ 1x/2x Fiber Channel
- ◆ Gigabit Ethernet
- ◆ CPRI optical link
- ◆ Other optical links

## Standard

- ◆ Compatible with SFP MSA
- ◆ Compatible with SFF-8472 Rev 9.5
- ◆ Compatible with FCC 47 CFR Part 15, Class B
- ◆ Compatible with FDA 21 CFR 1040.10 and

## 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

## 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	%
Input Optical Power	$P_{max}$		+3	dBm

## Recommended Operating Conditions

**Table 3 - Recommended Operating Conditions**

Parameter	Symbol	Min.	Typical	Max.	Unit
Operating Case Temperature	Commercial	$T_c$		+70	°C
				Industrial	
Power Supply Voltage	$V_{CC}$	3.13		3.47	V
Power Supply Current	$I_{CC}$			300	mA
Data Rate		1		2.5	Gbps

## Optical and Electrical Characteristics

**Table 4 –Optical and Electrical Characteristics**

Parameter		Symbol	Min.	Typical	Max.	Unit	Notes
<b>Transmitter</b>							
Centre Wavelength		$\lambda_C$	1270		1360	nm	
Spectral Width (RMS)		$\sigma$			4	nm	
Average Output Power		$P_{Out}$	-9.5		-3	dBm	1
$P_{Out}$ @TX Disable Asserted		$P_{Out}$			-40	dBm	2
Extinction Ratio		EX	9			dB	
Total Jitter		$T_J$			0.44	UI	3
Deterministic Jitter		$D_J$			0.26	UI	3
Data Input Swing Differential		$V_{IN}$	400		2400	mV	4
Input Differential Impedance		$Z_{IN}$	90	100	110	$\Omega$	
TX Disable	Disable		2.0		Vcc	V	
	Enable		0		0.8	V	
TX Fault	Fault		2.0		Vcc	V	
	Normal		0		0.5	V	
<b>Receiver</b>							
Centre Wavelength		$\lambda_C$	1260	1310	1580	nm	
Receiver Sensitivity					-18	dBm	5
Receiver Overload			-3			dBm	5
Return Loss			12			dB	
LOS De-Assert		$LOS_D$			-19	dBm	
LOS Assert		$LOS_A$	-31			dBm	
LOS Hysteresis			0.5		4	dB	
Total Jitter (pk-pk)		$T_J$			0.64	UI	3
Deterministic Jitter (pk-pk)		$D_J$			0.39	UI	3
Data Output Swing Differential		$V_{OUT}$	350		2000	mV	4
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 @2.5Gbps
3. Measured with a PRBS  $2^7-1$  test pattern @2.5Gbps, meet the specified maximum output jitter requirements if the specified maximum input jitter is present.
4. Internally AC coupled.
5. Measured with a PRBS  $2^7-1$  test pattern @2.5Gbps, BER  $\leq 1 \times 10^{-12}$ .

## 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 two-wire serial interface at the 8-bit address 1010000X (A0h). The memory contents refer to Table 5

**Table 5 - 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 42 00 01 04	1000BASE-LX, 200-SM-LC-L, Short distance
11	1	Encoding	01	8B10B
12	1	BR, nominal	19	2.5Gbps
13	1	Reserved	00	
14	1	Length (9um)-km	02	2km
15	1	Length (9um)	14	2000m
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 37 43 2D 53 4C 32 xx 47 20	"FTM-3127C-SL2xG" (ASC II)
56—59	4	Vendor rev	xx xx xx xx	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	68	Diagnostics (Int.Cal)
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 6

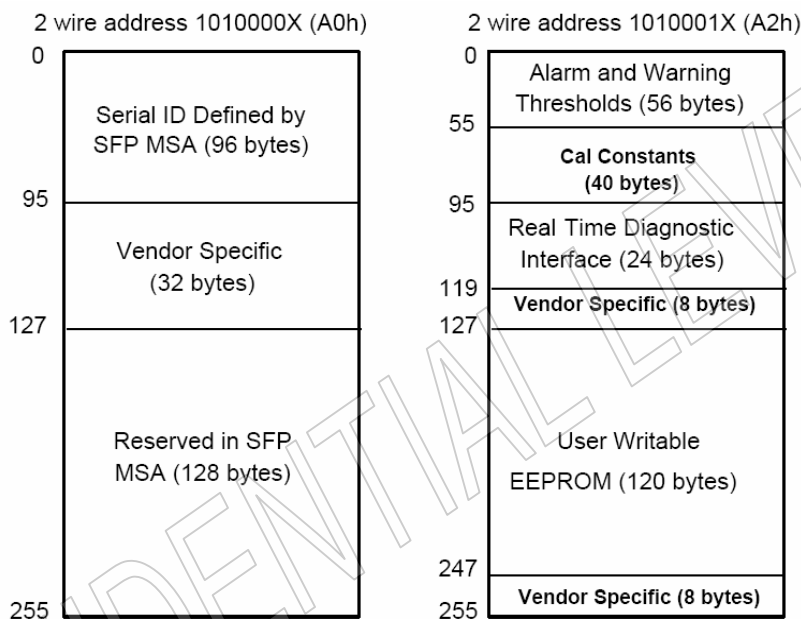


Figure 1, EEPROM Memory Map Specific Data Field Descriptions

Table 6 - Monitoring Specification

Parameter		Range	Accuracy	Calibration*
Temperature	FTM-3127C-SL2G	-10 to +80°C	±3°C	Internal
	FTM-3127C-SL2iG	-40 to +95°C		
Voltage		3.0 to 3.6V	±3%	Internal
Bias Current		0 to 80mA	±10%	Internal
TX Power		-11 to -2dBm	±3dB	Internal
RX Power		-20 to -2dBm	±3dB	Internal

### Recommended Host Board Power Supply Circuit

Figure 2 shows the recommended host board power supply circuit.

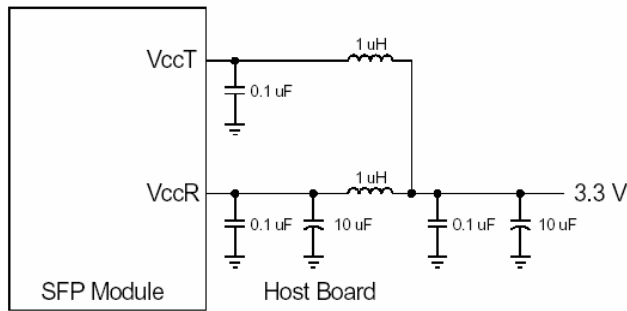


Figure 2, Recommended Host Board Power Supply Circuit

### Recommended Interface Circuit

Figure 3 shows the recommended interface circuit.

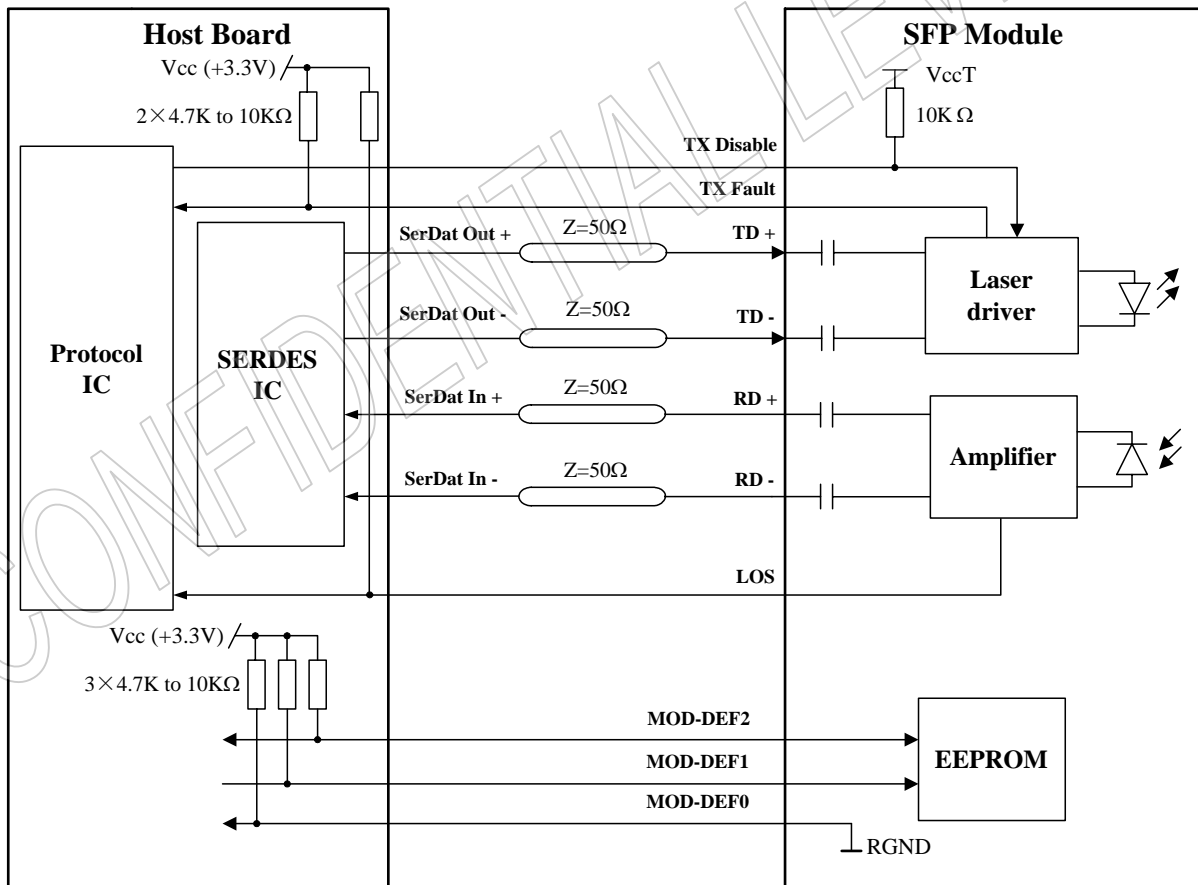


Figure 3, Recommended Interface Circuit

### Pin Definitions

Figure 4 below shows the pin numbering of SFP electrical interface. The pin functions are described in Table 7 and the accompanying notes.

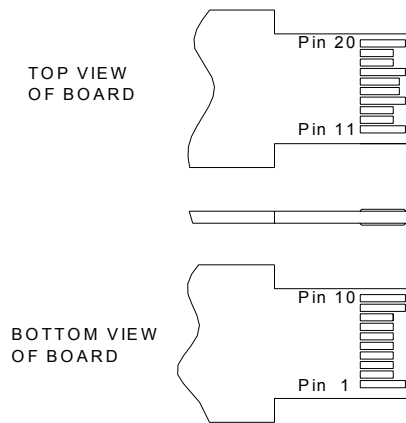


Figure 4, Pin View

Table 7 – 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	

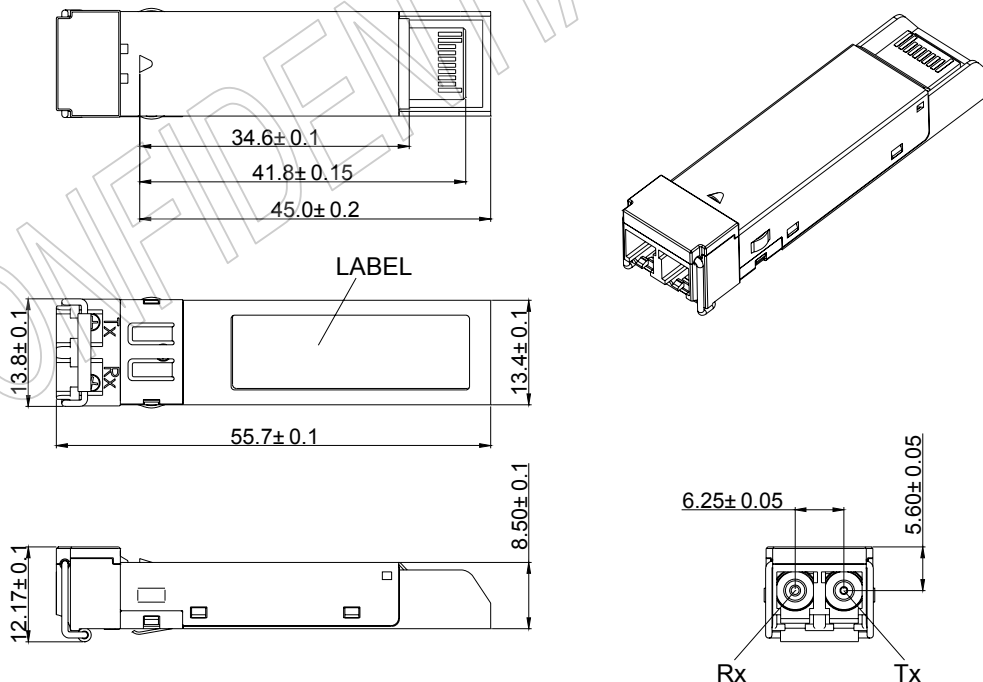
Notes:

- 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 (2.0~3.465V): Transmitter Disabled  
 Open: Transmitter Disabled
- 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 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
  - 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.
  - These are the differential receiver outputs. They are AC-coupled 100Ω differential lines which should be terminated with 100Ω (differential) at the user SERDES.
  - These are the differential transmitter inputs. They are AC-coupled, differential lines with 100Ω differential termination inside the module.

## Mechanical Design Diagram

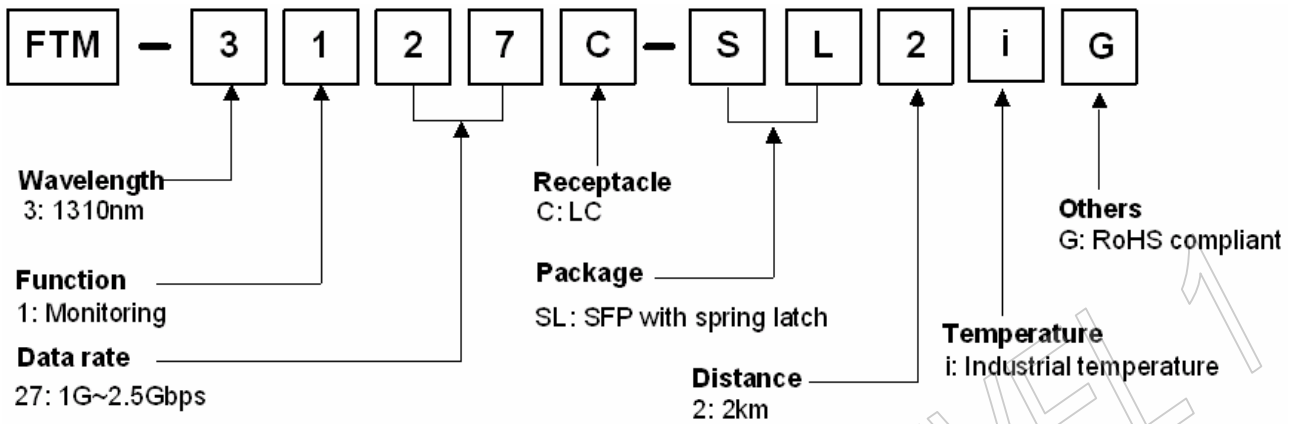
The mechanical design diagram is shown in Figure 5.



**Figure 5, Mechanical Design Diagram of SFP with Spring Latch**



### Ordering Information



Part No.	Product Description
FTM-3127C-SL2G	1310nm, 1G~2.5Mbps, 2km, SFP with Spring latch, Monitoring function, 0°C~+70°C, RoHS compliant
FTM-3127C-SL2iG	1310nm, 1G~2.5Mbps, 2km, SFP with Spring latch, Monitoring function, -40°C~+85°C, RoHS compliant

### 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	Monica.We	Walker. Wei	Initial datasheet	Jan. 23, 2007

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