

Dec. 20, 2003



## FTM-8001C-S

Preliminary

### **155M** 850nm SFP Transceiver

Members Of Flexon™ Family

#### Features

- ◆ Up to 155.52Mbps bi-directional data links
- ◆ 850nm VCSEL laser
- ◆ Multi-source package with LC optical interface
- ◆ Class 1 laser product
- ◆ 2km transmission distance with MMF
- ◆ Low EMI and excellent ESD protection
- ◆ Single +3.3V power supply
- ◆ Hot-pluggable capability
- ◆ Detailed product information in EEPROM
- ◆ Operating temperature 0°C to 70°C



#### Applications

Optical communication networks:

- ◆ SDH/STM-1, SONET/OC-3, ATM
- ◆ 100Base Fast Ethernet
- ◆ Other optical links

#### Standards

- ◆ Compliant with SFP MSA
- ◆ Compliant with FCC 47 CFR Part 15, Class B
- ◆ Compliant with FDA 21 CFR 1040.10 and 1040.11, Class I

FTM-8001C-S SFP transceiver is a member of Flexon™ family, which is a series of high performance optical modules suitable for the construction of high-speed communication networks.

## Product description

FTM-8001C-S SFP transceiver is fully compliant with the SFP Multi-Source Agreement. It is designed to provide SDH/SONET/ATM compliant links at a data rate of 155.52Mbps. Further, it also supports 100Base Fast Ethernet application.

The transmitter section of FTM-8001C-S incorporates a highly reliable 850nm VCSEL laser. And the receiver section consists of a PIN photodiode mounted together with a trans-impedance preamplifier (TIA). All modules satisfy Class 1 Laser Safety requirements.

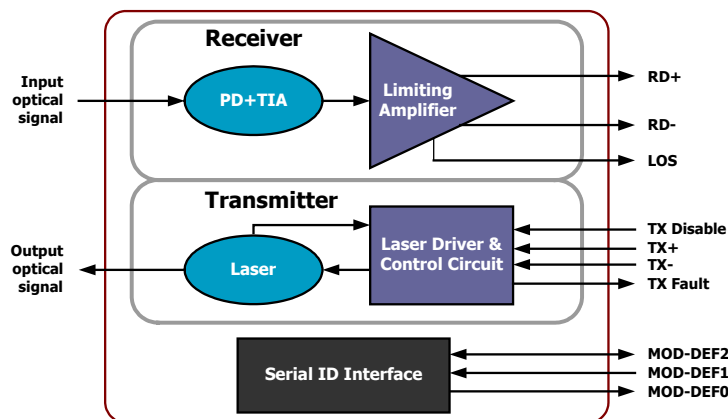
This transceiver enables cost-effective data transmission at a distance of 2km with 50/125 $\mu$ m or 62.5/125 $\mu$ m multi-mode fiber.

## Detailed Product Information In EEPROM

FTM-8001C-S features an EEPROM that contains the detailed product information stored for retrieval by host equipment. This information is accessed via the 2-wire serial CMOS EEPROM protocol. For further information, please refer to SFP Multi-Source Agreement (MSA).

## Block Diagram

Figure 1 illustrates the block diagram of this product.



**Figure 1, Block Diagram**

## Regulatory Compliance

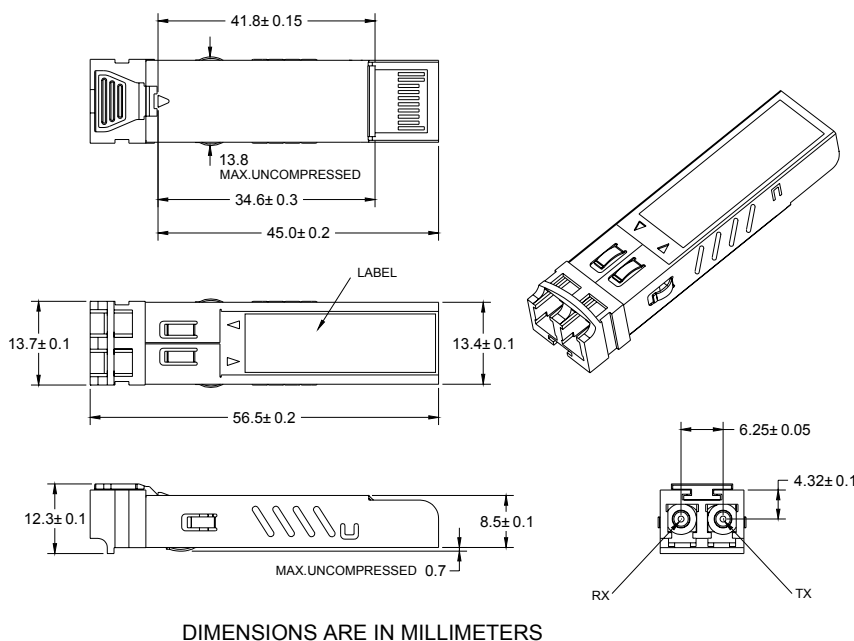
This product has been tested according to American and European product safety and electromagnetic compatibility regulations (See Table 1). For further information regarding regulatory certification, please refer to Flexon<sup>TM</sup> regulatory specification and safety guidelines, or contact with Fiberxon,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

**Table 1 - Regulatory Compliance**

Feature	Test Method	Target 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	Variation of IEC 61000-4-2	Typically withstand at least 15 kV without damage when port is contacted by a Human Body Model probe.
Electromagnetic Interference (EMI)	FCC Part 15 Class B CENELEC EN55022 Class B (CISPR 22B) VCCI Class B	Compliant with standards
Immunity	Variation of IEC 61000-4-3	Typically show no measurable effect from a 10 V/m field swept from 80 MHz to 1000 MHz applied to the transceiver without a chassis enclosure
Laser Eye Safety	FDA 21CFR 1040.10 and 1040.11 EN60950, EN(IEC)60825-1,2	AEL Class I, FDA/CDRH TUV Certificate No. 50030043
Component Recognition	UL and CSA	UL file E223705

**Mechanical Design Diagram**

The mechanical design diagram is shown in Figure 2.



**Figure 2, Mechanical Design Diagram**

### Recommended Host Board Power Supply Circuit

FTM-8001C-S is hot pluggable SFP transceiver. Figure 3 shows the recommended host board power supply circuit.

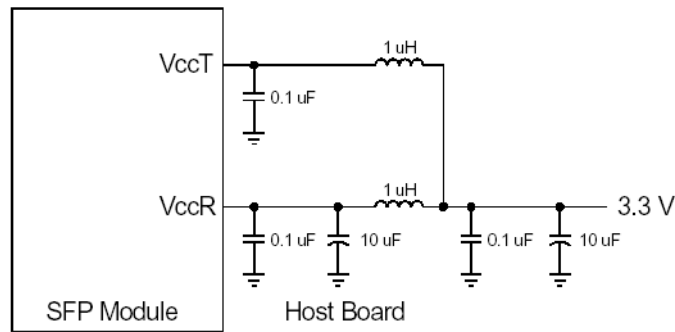
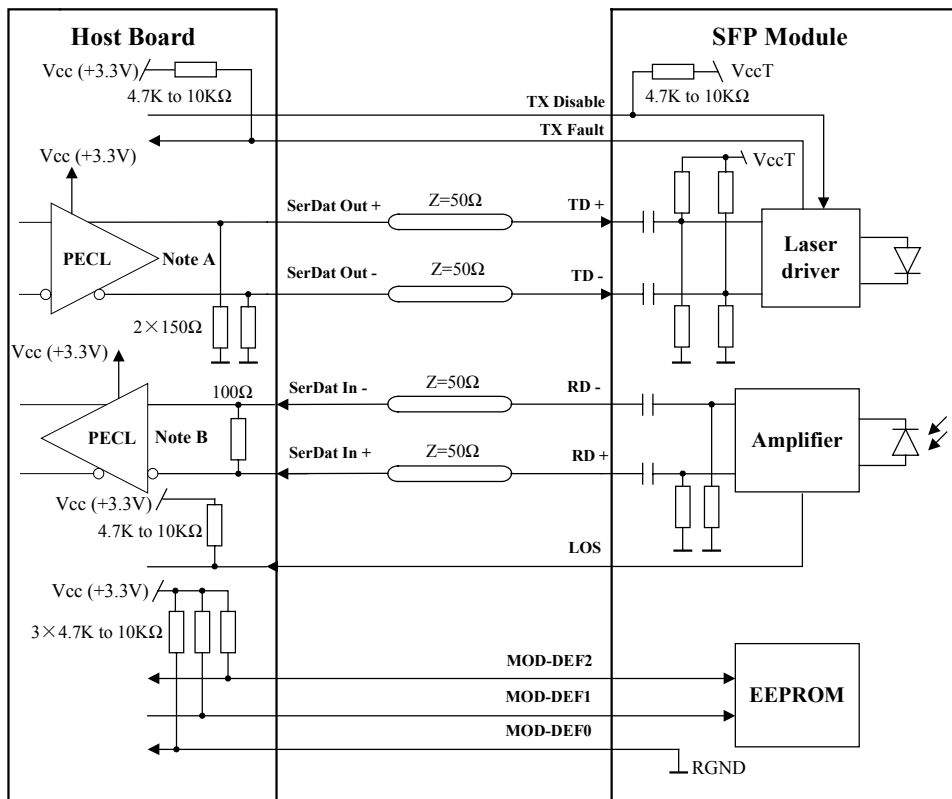


Figure 3, Recommended Host Board Power Supply Circuit

### Recommended Interface Circuit

Figure 4 shows the recommended interface circuit.



Note A: Circuit assumes open emitter output

Note B: Circuit assumes high impedance internal bias @Vcc-1.3V

Figure 4, Recommended Interface Circuit

## Absolute Maximum Ratings

Absolute Maximum Ratings are those values beyond which damage to the devices may occur. Exposure to conditions above the Absolute Maximum Ratings listed in Table 2 may negatively impact the reliability of the products.

**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
Voltage at any Input Pin	-	-0.5	$V_{CC}+0.3$	V
Operating Humidity	-	5	95	%

## Recommended Operating Conditions

Functional operation of the devices is implied at Recommended Operating Conditions (shown in Table 3).

**Table 3 - Recommended Operating Conditions**

Parameter	Symbol	Min.	Typical	Max.	Unit
Ambient Operating Temperature	$T_A$	0		+70	°C
Supply Voltage	$V_{CC}$	3.13		3.47	V
Data Rate		100	155.52		Mbps

## Optical Characteristics

Table 4 lists the optical characteristics of FTM-8001C-S.

**Table 4 - Optical Characteristics ( $T_A=0$  to  $70^\circ\text{C}$ , unless otherwise specified)**

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
<b>Transmitter</b>						
Centre Wavelength	$\lambda_C$	830		860	nm	
Spectral Width (RMS)	$\sigma$			0.85	nm	
Average Output Power	$P_{out}$	-10		-4	dBm	1
Extinction Ration	EX	9			dB	
$P_{out}$ @TX Disable Asserted				-40	dBm	
Rise/Fall Time	$t_r/t_f$			2.5	ns	
Output Optical Eye	ITU-T G.957 compliant					2
<b>Receiver</b>						
Centre Wavelength	$\lambda_C$	760		860	nm	
Receiver Sensitivity				-27	dBm	3
Receiver Overload		0			dBm	

LOS De-Assert	LOS <sub>D</sub>			-28	dBm	
LOS Assert	LOS <sub>A</sub>	-40			dBm	
LOS Hysteresis		1		4	dB	

**Notes:**

1. The optical power is launched into MMF.
2. Measured with a PRBS 2<sup>23</sup>-1 test pattern @155.52Mbps.
3. Measured with a PRBS 2<sup>23</sup>-1 test pattern @155.52Mbps, BER better than or equal to 1×10<sup>-10</sup>

## Electrical Characteristics

All the electrical interfaces are full compliant with SFP MSA specifications. The high speed DATA interface uses PECL signal that is AC-coupled. The low speed control and sense input/output signals are level compatible with TTL. Table 5 below shows the detailed electrical characteristics of this product.

**Table 5 - Electrical Characteristics (T<sub>A</sub>=0 to 70°C, unless otherwise specified)**

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
<b>Transceiver Power Supply</b>						
Supply Voltage	V <sub>CC</sub>	3.13		3.47	V	
Supply Current	I <sub>CC</sub>			190	mA	
<b>Transmitter</b>						
Differential Data Input Swing	V <sub>IN</sub>	500		2000	mV	1
Input Differential Impedance	Z <sub>IN</sub>	90	100	110	Ω	
TX Disable	Disable		2.0	V <sub>CC</sub> +0.3	V	
	Enable		0	0.8	V	
TX Fault	Fault		2.0	V <sub>CC</sub> +0.3	V	
	Normal		0	0.8	V	
TX Disable Assert Time	t <sub>off</sub>			10	μs	
<b>Receiver</b>						
Differential Data Output Swing	V <sub>OUT</sub>	370		2000	mV	2
LOS	High		2.0	V <sub>CC</sub> +0.3	V	
	Low		0	0.8	V	
Rise/Fall Time	t <sub>r</sub> /t <sub>f</sub>			2.2	ns	

**Notes:**

1. Internally AC-coupled and terminated to 100Ω differential load.
2. Internally AC coupled, should be terminated with 100Ω (differential).

## Pin Definitions

Figure 5 below shows the pin numbering of SFP electrical interface. The pin functions are described in Table 6 and the accompanying notes.

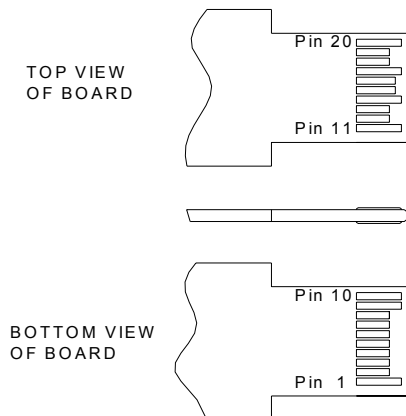


Figure 5, Pin View

Table 6 – 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 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  $4.7k\sim 10k\Omega$  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  $100\Omega$  differential lines which should be terminated with  $100\Omega$  (differential) at the user SERDES.
6. These are the differential transmitter inputs. They are AC-coupled, differential lines with  $100\Omega$  differential termination inside the module.

## Ordering information

Part No.	Product Description
FTM-8001C-S	850nm 155Mbps 2km SFP, $T_A = 0$ to $70^\circ C$

## Related Documents

For further information, please refer to the following documents:

- *Flexon™ SFP Installation Guide*
- *Flexon™ SFP Application Notes*
- *SFP Multi-Source Agreement (MSA)*

## Obtaining Document

You can visit our website:

<http://www.fiberxon.com>

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**Contact**

U.S.A. Headquarter:

5201 Great America Parkway, Suite 350

Santa Clara, CA 95054

U. S. A.

Tel: 408-562-6288

Fax: 408-562-6289

Or visit our website: <http://www.fiberxon.com>