

Dec. 20, 2003



FTM-3128C-L15x

Preliminary

155M~2.67G 1310nm SFP with monitoring function

Members Of Flexon™ Family

Features

- ◆ Multi bit rate operation from 155Mbps to 2.67Gbps
- ◆ Uncooled 1310nm DFB laser transmitter
- ◆ Multi-source package with LC optical interface
- ◆ With spring latch for high density application
- ◆ Class 1 laser product
- ◆ Very low jitter
- ◆ Low EMI and excellent ESD protection
- ◆ Single +3.3V power supply
- ◆ Hot-pluggable capability
- ◆ Low power dissipation
- ◆ 15km transmission distance
- ◆ Monitoring interface compliant with SFF-8472



Applications

Optical communication networks:

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

Standards

- ◆ Compliant with SFP MSA
- ◆ Compliant with SFF-8472
- ◆ Compliant with FCC 47 CFR Part 15, Class B
- ◆ Compliant with FDA 21 CFR 1040.10 and 1040.11, Class I
- ◆ Compliant with ITU-T G.957 and G.958
- ◆ Compliant with Telcordia GR-253-CORE

Product Description

FTM-3128C-L15x SFP transceiver is fully compliant with the SFP Multi-Source Agreement. It is designed to provide SDH/SONET compliant links at data rates from 155Mbps to 2.67Gbps and also can be used in Gigabit Ethernet and Fibre Channel equipments.

The transmitter section of FTM-3128C-L15x incorporates a highly reliable 1310nm DFB laser. And the receiver section consists of a InGaAs/InP PIN photodiode mounted together with a trans-impedance preamplifier (TIA). All modules satisfy Class 1 Laser Safety requirements.

Low Power Dissipation

By utilizing the latest chipset technology, FTM-3128C-L15x realizes low power dissipation. Typical current is 210mA, at +3.3V operation, only 70% of the maximum current allowed by the SFP specification (300mA).

Spring latch For High Density Application

FTM-3128C-L15x features a spring latch that allows user to easily remove the SFP transceiver by hand even in high-density application.

Monitoring Interface Compliant With SFF-8472

FTM-3128C-L15x 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. It also defines a sophisticated system of alarm and warning flags, which alerts end-users when particular operating parameters are outside of a factory set normal range.

The monitoring interface makes use of 2 wire address 1010001X (A2h), and is backward compatible with the SFP Multi-Source Agreement. For further information, please refer to SFP MSA and SFF-8472.

Block Diagram

Figure 1 illustrates the block diagram of this product.

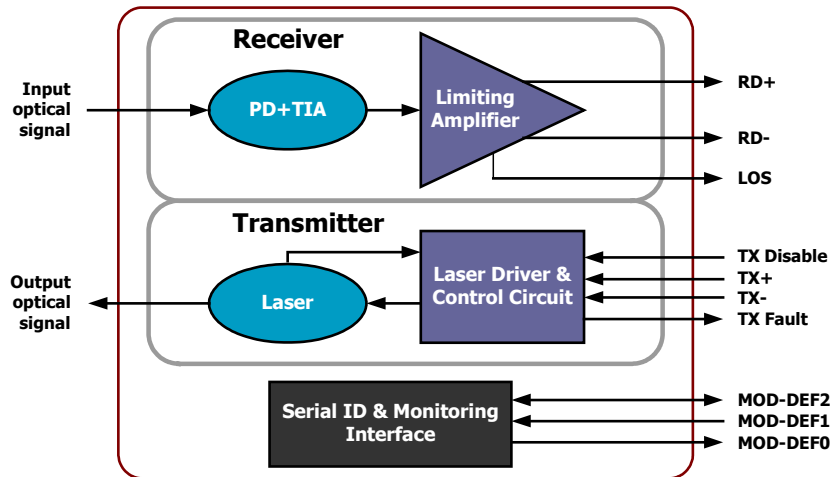


Figure 1, Product Block Diagram

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™ 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.

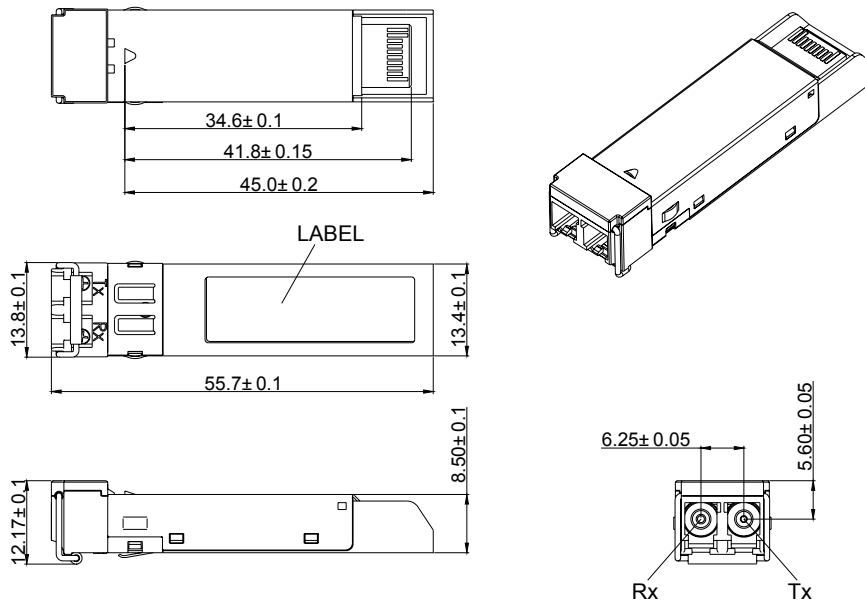


Figure 2, Mechanical Design Diagram

Recommended Host Board Power Supply Circuit

FTM-3128C-L15x is hot pluggable SFP transceiver. Figure 3 shows the recommended host board power supply circuit.

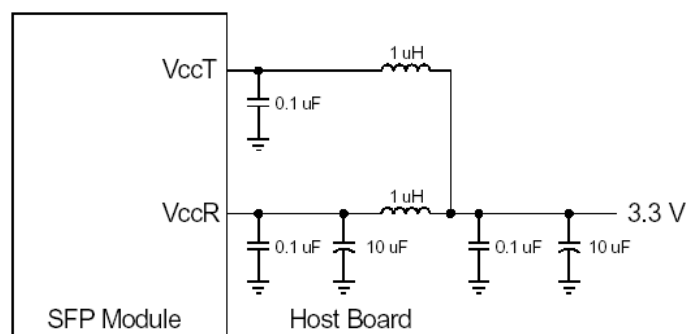
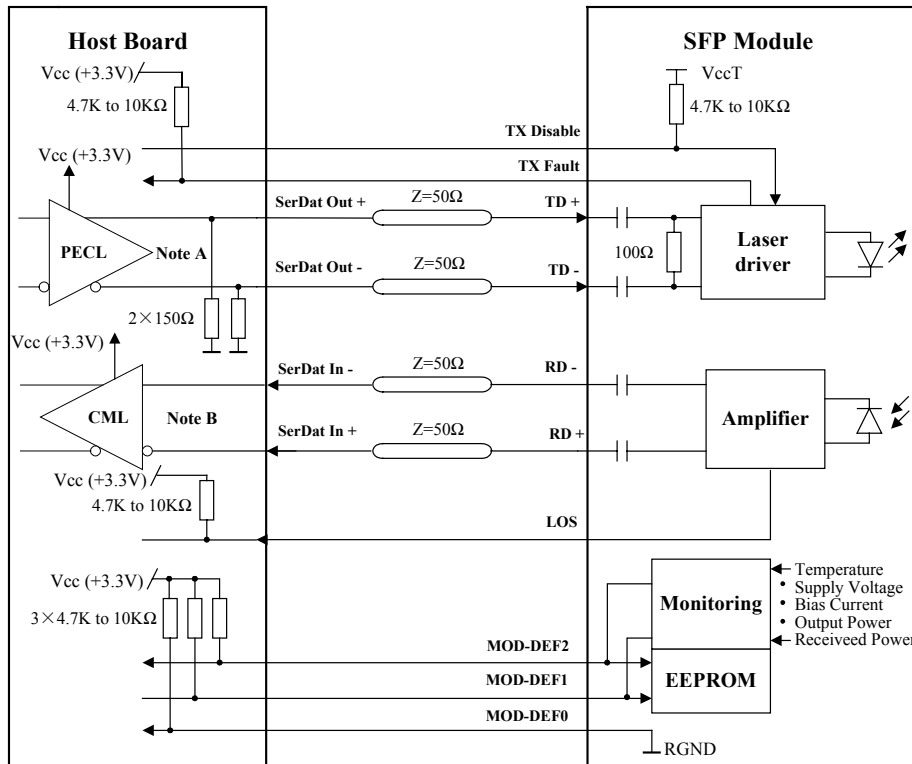


Figure 3, Recommended Host Board Power Supply Circuit

Recommended Interface Circuit

Figure 4 shows the recommended interface circuit.



Note A: Circuit assumes open emitter output
 Note B: Circuit assumes that proper internal bias is provided.

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	Notes
Ambient Operating Temperature	FTM-3128C-L15	T_A	0		+70	°C	
	FTM-3128C-L15E		-10		+70		
Supply Voltage		V_{CC}	3.13		3.47	V	
Data Rate			155M	2.488G	2.67G	bit/s	
Fiber Length on 9/125 μ m SMF		L		15		km	1

Notes:

- At the data rate of 2.48Gbps. The transmission distance is indicative only. Please refer to the Optical Characteristics in Table 4 to calculate the exact distance based on specific conditions in your application.

Optical Characteristics

Table 4 lists the optical characteristics of FTM-3128C-L15x.

Table 4 - Optical Characteristics (over Operating Temperature, unless otherwise specified)

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
Receiver							
Centre Wavelength	λ_C	1260		1570	nm		
Receiver Sensitivity				-18	dBm	3	
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		

Notes:

- The optical power is launched into 9/125 SMF.
- Measured with a PRBS $2^{23}-1$ test pattern @2.488Gbps.
- Measured with a PRBS $2^{23}-1$ test pattern @2.488Gbps, BER better than or equal to 1×10^{-10}

Electrical Characteristics

FTM-3128C-L15x features AC-coupled LVPECL/CML compatible data inputs in its transmitter section and AC-coupled CML compatible data outputs in receiver section. The low speed control and sense input/output signals are level compatible with LVTTTL. Table 5 below shows the detailed electrical characteristics of this product.

Table 5 - Electrical Characteristics (over Operating Temperature, unless otherwise specified)

Parameter		Symbol	Min.	Typical	Max.	Unit	Notes
Transceiver Power Supply							
Supply Voltage		V_{CC}	3.13		3.47	V	
Supply Current		I_{CC}		210	300	mA	
Transmitter							
Data Input Swing	Differential	V_{IN}	400		2000	mV	1
	Single ended		200		1000		
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	
TX Disable Assert Time		t_{off}			10	μs	
Receiver							
Data Output Swing	Differential	V_{OUT}	400		1200	mV	2
	Single ended		200		600		
LOS	High		2.0		$V_{CC}+0.3$	V	
	Low		0		0.8	V	

Notes:

1. Internally AC-coupled and terminated to 100 Ω differential load.
2. AC-coupled CML logic family

Monitoring Specification

The monitoring specification of this product is described in Table 6.

Table 6 - Monitoring Specification

Parameter		Range	Accuracy	Calibration*
Temperature	FTM-3128C-L15	-10 to 80°C	$\pm 3^\circ C$	Internal
	FTM-3128C-L15E	-20 to 80°C		
Voltage		3.0 to 3.6V	$\pm 3\%$	Internal
Bias Current		0 to 100mA	$\pm 10\%$	Internal
TX Power		-6 to 1dBm	$\pm 3dB$	Internal

RX Power	-20 to 1dBm	±3dB	Internal
*Note: Internal calibration is the default one, while external calibration is also available.			

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.

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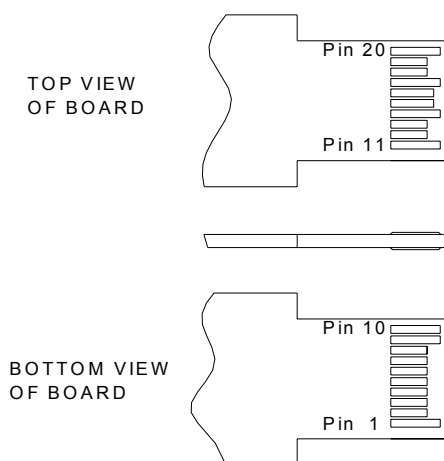


Figure 5, Pin View

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 (2.0~3.465V):	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 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
- 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.

Ordering Information

Part No.	Product Description
FTM-3128C-L15	1310nm, 155M~2.67G, IR-1, LC Receptacle, SFP Transceiver, with monitoring function, with Spring latch, 0°C~+70°C
FTM-3128C-L15E	1310nm, 155M~2.67G, IR-1, LC Receptacle, SFP Transceiver, with monitoring function, with Spring latch, -10°C~+70°C

Related Documents

For further information, please refer to the following documents:

- *Flexon™ SFP Installation Guide*
- *Flexon™ SFP Installation Guide*
- *SFP Multi-Source Agreement (MSA)*
- *SFF-8472*

Obtaining Document

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