

# FTM-3128C-L15x

Preliminary **155M ~ 2.67G** 1310nm SFP with monitoring function

Members Of Flexon<sup>™</sup> 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.

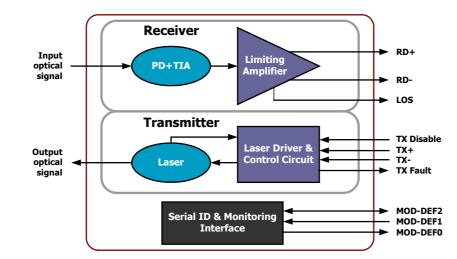
## **Block Diagram**

Figure 1 illustrates the block diagram of this product.

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#### **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>™</sup> regulatory specification and safety guidelines, or contact with Fiberxon, Inc. America sales office listed at the end of documentation.

Table	1 -	Regu	latory	Compli	ance
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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.

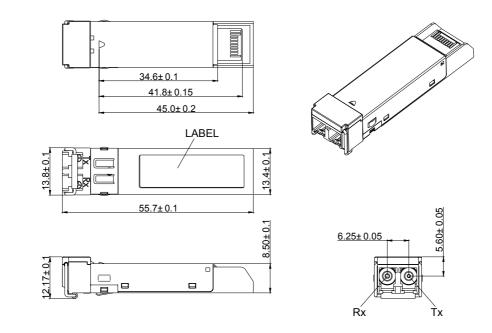
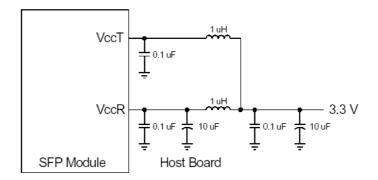


Figure 2, Mechanical Design Diagram

## **Recommended Host Board Power Supply Circuit**

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





#### **Recommended Interface Circuit**

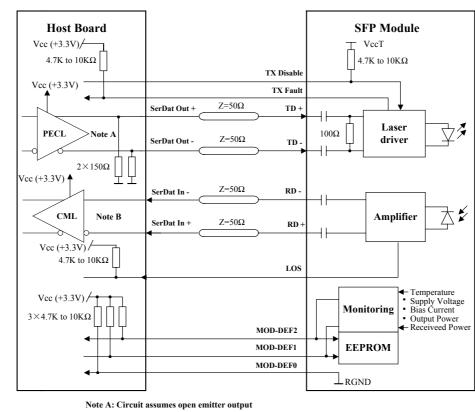
Figure 4 shows the recommended interface circuit.

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Note B: Circuit assumes that proper internal bias is provided.



## **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	2 –	Absolute	Maximum	Ratings
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Parameter	Symbol	Min.	Max.	Unit
Storage Temperature	Ts	-40	+85	°C
Supply Voltage	V <sub>CC</sub>	-0.5	3.6	V
Voltage at any Input Pin	-	-0.5	V <sub>cc</sub> +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).



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#### **Table 3 - Recommended Operating Conditions**

Para	Symbol	Min.	Typical	Max.	Unit	Notes	
Ambient	FTM-3128C-L15	т	0		+70	°C	
Operating Temperature	FTM-3128C-L15E	T <sub>A</sub>	-10		+70		
Supply Voltage		V <sub>CC</sub>	3.13		3.47	V	
Data Rate			155M	2.488G	2.67G	bit/s	
Fiber Length on	9/125µm SMF	L		15		km	1

Notes:

1. 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.

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Transmitter						
Centre Wavelength	λ <sub>C</sub>	1260		1360	nm	
Spectral Width (-20dB)	Δλ			1	nm	
Average Output Power	P <sub>0ut</sub>	-5		0	dBm	1
Side Mode Suppression Ratio	SMSR	30			dB	
Extinction Ration	EX	8.2			dB	
P <sub>0ut</sub> @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
	Recei	ver				
Centre Wavelength	$\lambda_{C}$	1260		1570	nm	
Receiver Sensitivity				-18	dBm	3
Receiver Overload		0			dBm	
Reflection				-27	dB	
LOS De-Assert	LOS <sub>D</sub>			-20	dBm	
LOS Assert	LOS <sub>A</sub>	-35			dBm	
LOS Hysteresis		0.5		4.5	dB	

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

Notes:

1. The optical power is launched into 9/125 SMF.

2. Measured with a PRBS  $2^{23}$ -1 test pattern @2.488Gbps.

3. Measured with a PRBS  $2^{23}$ -1 test pattern @2.488Gbps, BER better than or equal to  $1 \times 10^{-10}$ 



# **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 LVTTL. Table 5 below shows the detailed electrical characteristics of this product.

Para	meter	Symbol	Min.	Typical	Max.	Unit	Notes
		Transce	iver Pow	ver Supply			
Supply Voltag	je	$V_{CC}$	3.13		3.47	V	
Supply Curre	nt	I <sub>CC</sub>		210	300	mA	
	Transmitter						
Data Input	Differential	M	400		2000	mV	1
Swing	Single ended	$V_{IN}$	200		1000	111V	T
Input Differer Impedance	ntial	$Z_{IN}$		100		Ω	
TV Disable	Disable		2.0		Vcc+0.3	V	
TX Disable	Enable		0		0.8	V	
TV Fault	Fault		2.0		Vcc+0.3	V	
TX Fault	Normal		0		0.8	V	
TX Disable As	sert Time	t_off			10	μs	
			Receive	er			
Data Output	Differential	M	400		1200	m)/	2
Swing	Single ended	V <sub>OUT</sub>	200		600	mV	2
LOS	High		2.0		Vcc+0.3	V	
103	Low		0		0.8	V	

Table 5 - Electrical Characteristics (over Operating Temperature, unless otherwise spec
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Notes:

- 1. Internally AC-coupled and terminated to  $100\Omega$  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**

Pa	rameter	Range	Accuracy	Calibration <sup>*</sup>
FTM-3128C-L15		L15 -10 to 80°C ±3°C		Internal
Temperature	FTM-3128C-L15E	-20 to 80°C	13°C	Internal
١	/oltage	3.0 to 3.6V	±3%	Internal
Bia	s Current	0 to 100mA	±10%	Internal
T	X Power	-6 to 1dBm	±3dB	Internal

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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.

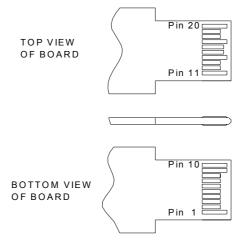
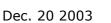


Figure 5, Pin View

Table 6 – Pin Function	Definitions
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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



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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.
- 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  $4.7k \sim 10k\Omega$  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
- 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 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  $100\Omega$  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-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<sup>TM</sup> SFP Installation Guide
- Flexon<sup>TM</sup> SFP Installation Guide
- SFP Multi-Source Agreement (MSA)
- SFF-8472



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