

Dec. 20, 2003



FTM-3112C-L20

Preliminary

1.25G 1310nm SFP Transceiver with monitoring function

Members Of Flexon™ Family

Features

- ◆ 1310nm DFB laser transmitter
- ◆ 2m~20km with 9/125 μ m SMF
- ◆ Multi-source package with LC optical interface
- ◆ With spring latch for high density application
- ◆ Up to 1.25Gbps bi-directional data links
- ◆ Single +3.3V power supply
- ◆ Hot-pluggable capability
- ◆ Low power dissipation
- ◆ Low EMI and excellent ESD protection
- ◆ Class 1 laser product
- ◆ Monitoring interface compliant with SFF-8472



Applications

FTM-3112C-L20 SFP is well suited for Local Area Network (LAN) and Storage Area Network (SAN), typically used in:

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

Standards

- ◆ Compliant with SFP MSA
- ◆ Compliant with SFF 8472
- ◆ Compliant with IEEE 802.3z
- ◆ Compliant with ANSI specifications for Fibre Channel
- ◆ Compliant with FCC 47 CFR Part 15, Class B
- ◆ Compliant with FDA 21 CFR 1040.10 and 1040.11, Class I

Product Description

FTM-3112C-L20 is fully compliant with SFP Multi-Source Agreement (MSA). It can offer maximum flexibility to designers, manufacturers, and operators of Gigabit Ethernet and Fibre Channel networking equipments.

FTM-3112C-L20 can be installed into MSA standard SFP ports at any time even with the host equipment operating online. This facilitates the rapid configuration of equipment to meet the user's needs precisely: reducing inventory costs and network downtime. Compared with traditional transceivers, the size of the Small Form Factor package enables higher port densities.

FTM-3112C-L20 meets the requirements of IEEE 802.3 Gigabit Ethernet standard and ANSI specifications for Fibre Channel. It is developed with highly reliable 1310nm DFB laser.

This transceiver enables cost-effective data transmission over optical fibers at a distance of 20km with 9/125 μ m single-mode fiber.

Low Power Dissipation

By utilizing the latest chipset technology, FTM-3112C-L20 realizes low power dissipation. Typical current is 200mA, at +3.3V operation, only 66.7% of the maximum current allowed by the SFP specification (300mA).

Spring latch for high-density application

FTM-3112C-L20 features a spring latch that allows user to easily remove the SFP transceiver by hand in high-density application.

Monitoring Interface Compliant With SFF-8472

FTM-3112C-L20 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

This product consists of two basic parts: transmitter and receiver. They are illustrated in Figure 1.

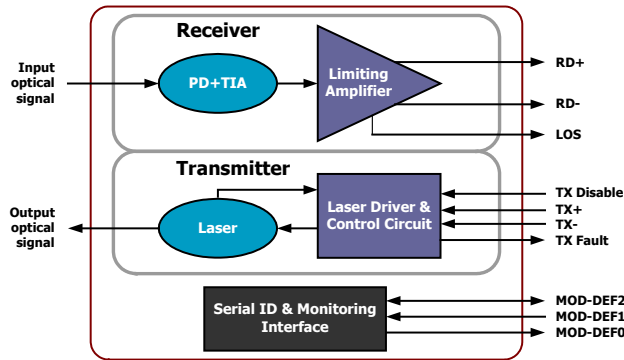


Figure 1, Product Block Diagram

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.

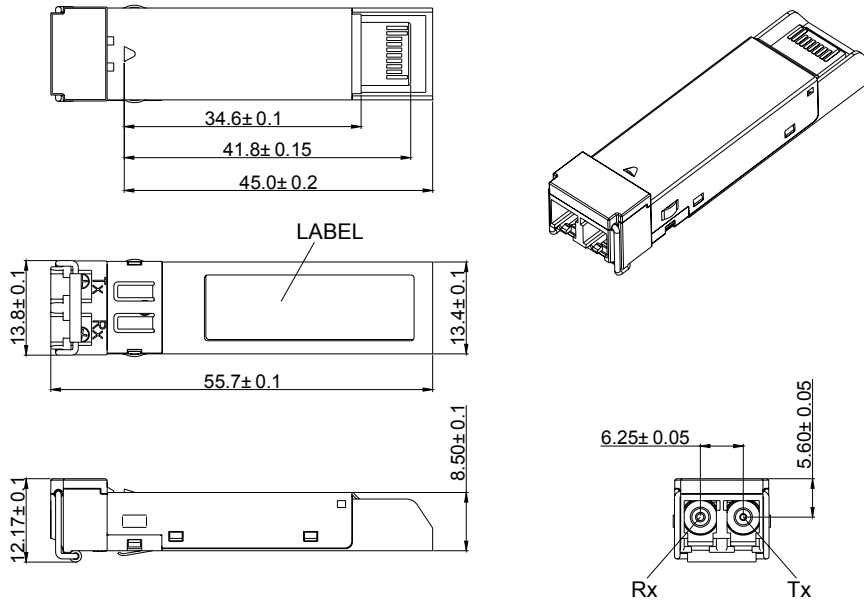


Figure 2, Mechanical Design Diagram

Recommended Host Board Power Supply Circuit

FTM-3112C-L20 is hot pluggable SFP transceiver. Figure 3 shows the recommended host board power supply circuit.

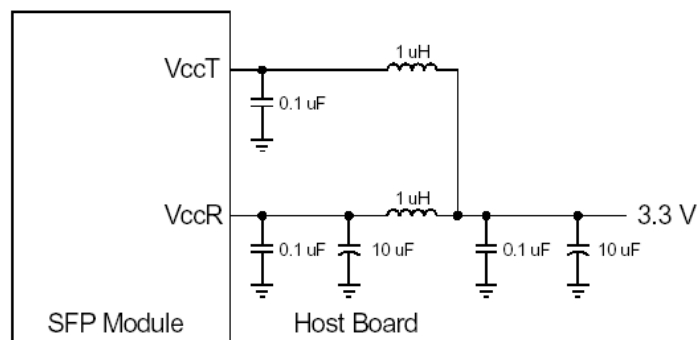
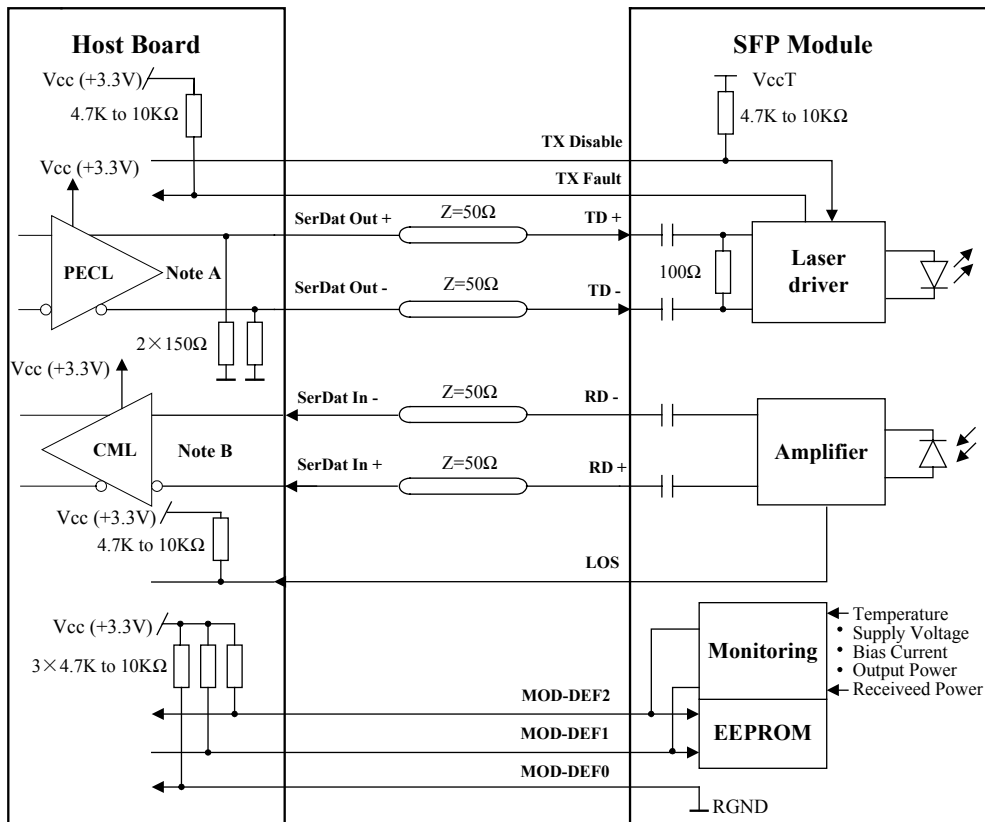


Figure 3, Recommended Host Board Power Supply Circuit

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 device may occur. Exposure to conditions above the Absolute Maximum Ratings listed in Table 2 may negatively impact the reliability of this product.

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 this device 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	Gigabit Ethernet			1.25		Gbps
	Fibre Channel			1.0625		

Optical Characteristics

Table 4 lists the optical characteristics of FTM-3112C-L20.

Table 4 – Optical Characteristics (Over Operating Temperature, 3.13V to 3.47V)

Parameter		Symbol	Min.	Typical	Max.	Unit	Notes	
Transmitter								
Centre Wavelength		λ_c	1270	1310	1355	nm		
Spectral Width (-20dB)		$\Delta\lambda$			1	nm		
Output Power		P_{OUT}	-5.5		-3	dBm	1	
Rise/Fall Time (20%~80%)		t_r/t_f			0.26	ns	2	
Extinction Ratio		ER	9			dB		
Total Jitter	1.25G	TJ			0.431	UI	3	
	1.0625G				0.43			
Deterministic Jitter	1.25G	DJ			0.2	UI	3	
	1.0625G				0.21			
P_{OUT} @TX Disable Asserted					-45	dBm		
Output Optical Eye		IEEE 802.3z and ANSI Fibre Channel Compliant						4
Receiver								
Centre Wavelength		λ_c	1260	1310	1580	nm		
Receiver Sensitivity					-20	dBm	5	
Receiver Overload			-3			dBm		
Return Loss			12			dB		
LOS Assert			-35			dBm		
LOS De-Assert					-21	dBm		
LOS Hysteresis			1		4	dB		

Notes:

1. Measured average power coupled 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 @1.25/1.0625Gbps.
5. measured with a PRBS 2^7-1 test pattern @1.25Gbps, BER better than or equal to 1×10^{-12}

Electrical Characteristics

FTM-3112C-L20 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 TTL. Table 5 below shows the detailed electrical characteristics of this product.

Table 5 – Electrical Characteristics (Over Operating Temperature, 3.13V to 3.47V)

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Transceiver Power Supply						
Supply Voltage	V_{CC}	3.13		3.47	V	
Supply Current	I_{CC}		200		mA	
Transmitter						
Differential Data Input Swing	V_{IN}	400		2000	mV	1
Differential Input Impedance	Z_{IN}	90	100	110	Ω	
TX Disable	Disable		2.0	V_{CC}	V	2
	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						
Differential Data Output Swing	V_{OUT}	400		1200	mV	3
Total Jitter	1.25G	TJ		0.749	UI	4
	1.0625G			0.61		
Deterministic Jitter	1.25G	DJ		0.462	UI	4
	1.0625G			0.36		
LOS Output Voltage	High		2.0	$V_{CC}+0.3$	V	
	Low		0	0.8	V	

Notes:

1. Internally AC coupled and terminated (100Ω differential).
2. If Pin 3 (TX Disable) is left open, TX is disabled.
3. Internally AC coupled, should be terminated with 100Ω (differential).
4. Meet the specified maximum output jitter requirements if the specified maximum input jitter is present.

Monitoring Specification

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

Table 6 - Monitoring Specification

Parameter	Range	Accuracy	Calibration*
Temperature	-10 to 80°C	±3°C	Internal
Voltage	3.0 to 3.6V	±3%	Internal
Bias Current	0 to 100mA	±10%	Internal
TX Power	-7 to -2dBm	±3dB	Internal
RX Power	-21 to -2dBm	±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.

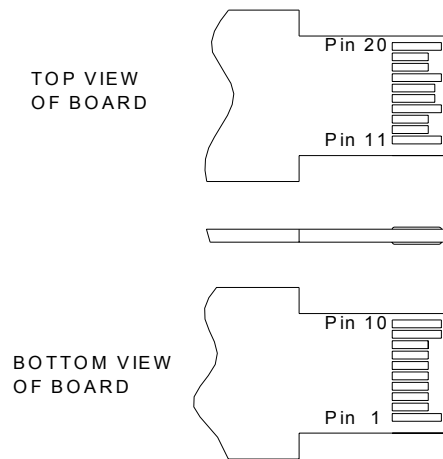


Figure 5, Pin View

FTM-3112C-L20 has three stages of contact sequencing during insertion. The ground make contact at first in sequence stage 1, then followed by power supply in sequence stage 2, finally, signal lines engage in sequence stage 3. Conversely, when the module is plugged out from the host system, signal lines disengage firstly, then power supply and ground.

It is the responsibility of the system integrator to assure that no thermal, energy, or voltage hazard exists during the hot-plug-unplug sequence. It is also the responsibility of the system integrator and end-user to minimize static electricity and the probability of ESD events by careful design.

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-3112C-L20	1310nm 1.25/1.0625Gbps 20km SFP with Spring latch, with monitoring function, T _A =0 to 70°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)*
- *SFF 8472*

Obtaining Document

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