



4GFC SFP SW Transceiver

Hot Pluggable, Duplex LC, 850nm VCSEL, MMF OM2 150M, DDM, Multi-Rate

Part Number: FSFP-F7-M85-X1DM



Overview

FSFP-F7-M85-X1DM is a Small Form Factor Pluggable SFP transceivers compliant with the current SFP Multi-Source Agreement (MSA) standard. The High performance uncooled 850nm VCSEL transmitter and high sensitivity PIN receiver provide superior performance for 4x/2x/1x Fiber Channel Multi-Rate applications up to MMF OM2 150m optical links.

Applications

- Fiber Channel
400-M6 / M5 / M5E / M5F 4GFC @4.25G,
200-M6 / M5 / M5E 2GFC @2.125G,
100-M6 / M5 / M5E 1GFC @1.0625G

Features

- Compliant with Fiber Channel 400- M6 / M5 / M5E / M5F-SN-I
- Compliant with INF-8074i SFP MSA
- Support 4x/2x/1x Fiber Channel
- Support 4.25G / 2.125G / 1.0625G Multi-Rate
- Hot Pluggable
- 850nm VCSEL laser transmitter
- Duplex LC connector
- 2-wire interface for management and diagnostic monitor compliant with SFF-8472
- Single +3.3V power supply
- Link distance @4GFC: OM1 70m / OM2 150m / OM3 380m / OM4 400m
- Link distance @2GFC: OM1 150m / OM2 300m / OM3 500m
- Link distance @1GFC: OM1 300m / OM2 500m / OM3 860m
- RoHS Compliant



Laser Safety

- This is a Class 1 Laser Product complies with 21 CFR 1040.10 and 1040.11 except for conformance with IEC 60825-1 Ed. 3., as described in Laser Notice No. 56, dated May 8, 2019.
- Caution: Use of control or adjustments or performance of procedure other than those specified herein may result in hazardous radiation exposure.

Absolute Maximum Ratings

Parameters	Symbol	Min.	Max.	Unit
Storage Temperature	T _{ST}	-40	+85	°C
Storage Relative Humidity	RH	5	95	%
Supply Voltage	V _{CC}	-0.5	+4.0	V

Recommended Operating Conditions

Parameters	Symbol	Min.	Typ.	Max.	Unit
Case Operating Temp. (FSFP-F7-M85-X1DM)	T _{OP}	0	-	+70	°C
Case Operating Temp. (FSFP-F7-M85-X1DMi)	T _{OP}	-40	-	+85	°C
Supply Voltage	V _{CC}	+3.13	+3.3	+3.47	V
Supply Current (FSFP-F7-M85-X1DM)	I _{CC}			220	mA
Supply Current (FSFP-F7-M85-X1DMi)	I _{CC}			250	mA



Transmitter Electro-optical Characteristics

$V_{CC} = 3.13V$ to $3.47V$, $T_{OP} = 0^{\circ}C$ to $70^{\circ}C$ (FSFP-F7-M85-X1DM); $T_{OP} = -40^{\circ}C$ to $85^{\circ}C$ (FSFP-F7-M85-X1DMi)

Parameters	Symbol	Min.	Typ.	Max.	Unit	Note
Operating Data Rate	DR	1.0625	4.25		Gb/s	
Optical Launch Power	Po	-6.5		-1	dBm	1
Optical Center Wavelength	λ_c	840	850	860	nm	
Spectral Width (RMS)	$\Delta\lambda$			0.45	nm	
Optical Extinction Ratio	ER	3			dB	
Relative Intensity Noise	RIN			-128	dB/Hz	
Differential Data Input Swing	V _{IN}	180		950	mV	
Tx Disable Input Voltage-Low (Tx ON)	TDISV _L	GND		0.8	V	
Tx Disable Input Voltage-High (Tx OFF)	TDISV _H	2.0		V _{CC}	V	
Tx Fault Output Voltage-Low (Tx Normal)	TFLTV _L	GND		0.8	V	
Tx Fault Output Voltage-High (Tx Fault)	TFLTV _H	2.0		V _{CC}	V	

Note1: The optical power is launched into a 50/125 μ m multi-mode fiber.

Receiver Electro-optical Characteristics

$V_{CC} = 3.13V$ to $3.47V$, $T_{OP} = 0^{\circ}C$ to $70^{\circ}C$ (FSFP-F7-M85-X1DM); $T_{OP} = -40^{\circ}C$ to $85^{\circ}C$ (FSFP-F7-M85-X1DMi)

Parameters	Symbol	Min.	Typ.	Max.	Unit	Note
Operating Data Rate	DR	1.0625	4.25		Gb/s	
Receiver Sensitivity @4.25G	SEN			-12	dBm	1
Receiver Sensitivity @2.125G				-11		2
Receiver Sensitivity @1.0625G				-10		3
Maximum Receive Power	P _{Rx-MAX}	+0.5			dBm	1
Optical Center Wavelength	λ_c	840	850	860	nm	
LOS De-Assert	LOS _D			-13	dBm	
LOS Assert	LOS _A	-22			dBm	
LOS Hysteresis	LOS _{HY}	0.5			dB	
Differential Data Output Swing	V _{OUT}	500		900	mV	
Receiver LOS Signal Output Voltage-Low	LOS _{V_L}	GND		0.8	V	
Receiver LOS Signal Output Voltage-High	LOS _{V_H}	2.0		V _{CC}	V	

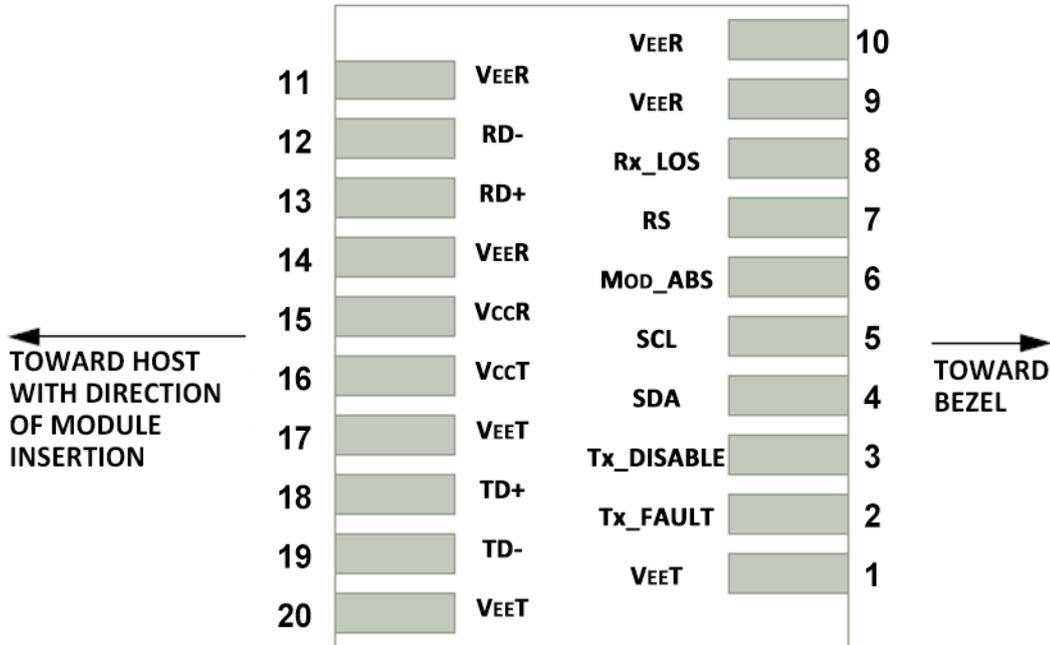
Note1: Measured with a PRBS 2⁷-1 test pattern @4.25Gbps BER<10⁻¹².

Note2: Measured with a PRBS 2⁷-1 test pattern @2.125Gbps BER<10⁻¹².

Note3: Measured with a PRBS 2⁷-1 test pattern @1.0625Gbps BER<10⁻¹².



Pin Assignment



Host PCB SFP Pad Assignment Top View

Pin Description

Pin	Name	Function / Description
1	VEET	Transmitter Ground
2	Tx_FAULT	Transmitter Fault Indication (1)
3	Tx_DISABLE	Transmitter Disable – Turns off transmitter laser output (2)
4	SDA	2-wire Serial Interface Data Line (SDA: Serial Data Signal) (3)
5	SCL	2-wire Serial Interface Clock (SCL: Serial Clock Signal) (3)
6	MOD_ABS	Module Absent, connected to VEET or VEER in the module (3)
7	RS	Rate Select, optional (5)
8	Rx_LOS	Receiver Loss of Signal Indication (4)
9	VEER	Receiver Ground
10	VEER	Receiver Ground
11	VEER	Receiver Ground
12	RD-	Receiver Inverted Data output, AC coupled
13	RD+	Receiver Non-Inverted Data output, AC coupled



14	VEER	Receiver Ground
15	VCCR	Receiver 3.3V Power Supply
16	VcCT	Transmitter 3.3V Power Supply
17	VEET	Transmitter Ground
18	TD+	Transmitter Non-Inverted Data Input, AC coupled
19	TD-	Transmitter Inverted Data Input, AC coupled
20	VEET	Transmitter Ground

Note1: Tx Fault is open collector/drain output which should be pulled up externally with a 4.7K~10KΩ resistor on the host board to supply $<V_{ccT}+0.3V$ or $V_{ccR}+0.3V$. When high, this output indicates a laser fault of some kind. Low indicates normal operation. In the low state, the output will be pulled to $<0.8V$.

Note2: Tx Disable input is used to shut down the laser output per the state table below. It is pulled up within the module with a 4.7K~10KΩ resistor. 1) Low(0~0.8V): Transmitter on; 2) Between(0.8V and 2V): Undefined; 3) High (2.0~ V_{ccT}): Transmitter Disabled; 4) Open: Transmitter Disabled.

Note3: These are the module definition pins. They should be pulled up with a 4.7K~10KΩ resistor on the host board to supply less than $V_{ccT}+0.3V$ or $V_{ccR}+0.3V$. MOD_ABS is grounded by the module to indicate that the module is present.

Note4: Rx_LOS (Loss of signal) is an open collector/drain output which should be pulled up externally with a 4.7K~10KΩ resistor on the host board to supply $<V_{ccT}+0.3V$ or $V_{ccR}+0.3V$. When high, this output indicates the received optical power is below the worst case receiver sensitivity (as defined by the standard in use). Low indicates normal operation. In the low state, the output will be pulled to $<0.8V$.

Note5: No connect on this module.

Digital Diagnostic Functions

As defined by the SFP MSA (SFF-8472) Ficer's SFP transceivers provide digital diagnostic functions via a 2-wire serial interface, which allows real-time access to the following operating parameters:

- Transceiver temperature
- Laser bias current
- Transmitted optical power
- Received optical power
- Transceiver supply voltage

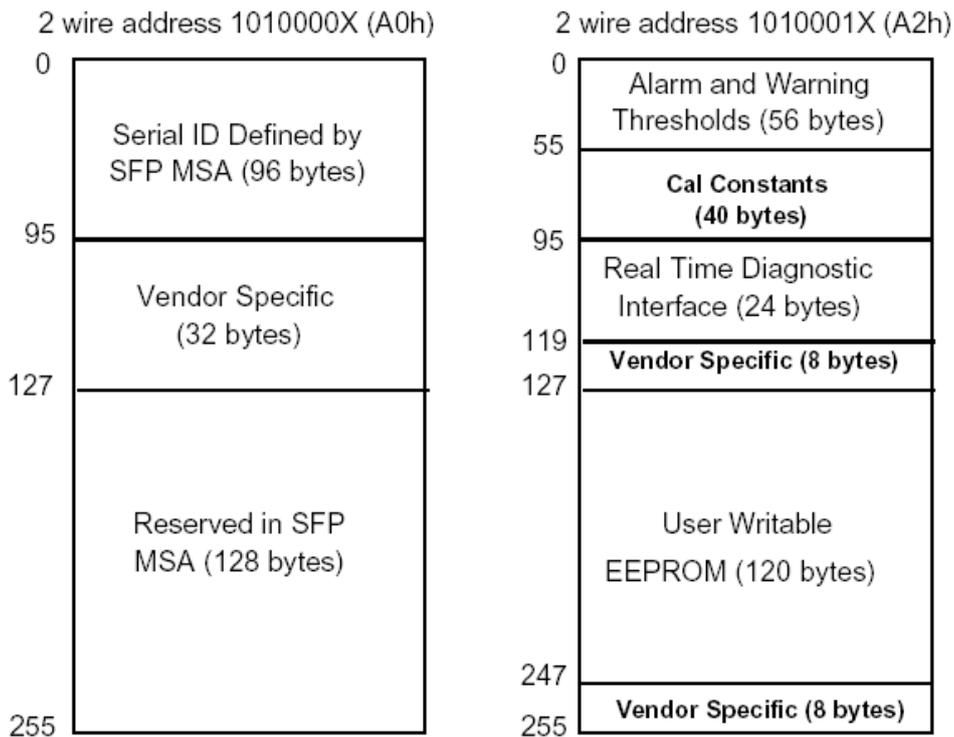
It also provides a sophisticated system of alarm and warning flags, which may be used to alert end-users when particular operating parameters are outside of a factory-set normal range.

The operating and diagnostics information is monitored and reported by a Digital Diagnostics Controller (DDC) inside the transceiver, which is accessed through the 2-wire serial interface. When the serial protocol is activated, the serial clock signal (SCL pin) is generated by the host. The positive edge clocks data into the SFP transceiver into those segments of its memory map that are not write-protected. The negative edge clocks data from the SFP transceiver. The serial data signal (SDA pin) is bi-directional for serial data transfer. The host uses SDA in conjunction with SCL to mark the start and end of serial protocol activation. The memories are organized as a series of 8-bit data words that can be addressed individually or sequentially.



For more detailed information including memory map definitions, please see the SFP MSA (SFF-8472) Specification.

Digital Diagnostic Memory Map

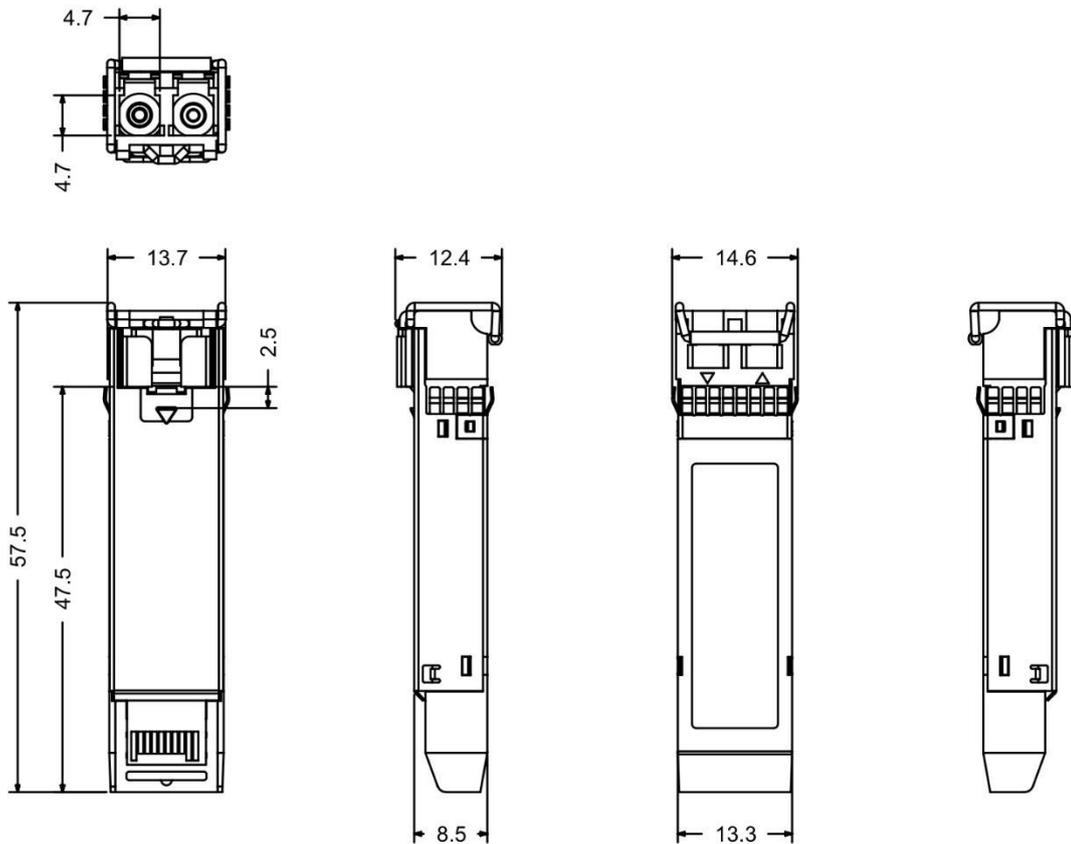


Digital Diagnostic Monitoring Characteristics

Parameter	Accuracy	Unit	Note
Temperature	±3	°C	Internal Calibration
Supply Voltage	±0.1	V	Internal Calibration
Tx Bias Current	±5	mA	Internal Calibration
Tx Output Power	±3	dB	Internal Calibration
Rx Received Optical Power	±3	dB	Internal Calibration



Mechanical Dimensions



(All Dimensions are $\pm 0.20\text{mm}$ Unless Otherwise Specified, Unit: mm)

Ordering Information

Part No.	Tx	Rx	Link	DDM	Temp.
FSFP-F7-M85-X1DM	850nm	850nm	MM OM4: 400m MM OM3: 380m MM OM2: 150m MM OM1: 70m	Yes	0~70°C
FSFP-F7-M85-X1DMi					-40~85°C

Note: Distances are indicative only. To calculate a more precise link budget based on specific conditions in your application, please refer to the optical characteristics.