

# LXP-M31-02D

SFP+ 10Gb/s 1310nm multimode 220m DDM

## PRODUCT FEATURES

- Operating Data Rate up to 10.31Gbps
- 1310nm FP Transmitter
- 220m with 50/125  $\mu$ m MMF
- Single 3.3V Power Supply and TTL Logic Interface
- Hot-Pluggable Duplex LC Connector Interface
- Power Dissipation<1.0W
- Operating Temperature Standard: 0°C~+70°C
- Compliant with MSA SFP+ Specification SFF-8431
- Compliant with IEEE802.3ae 10GBASE-LRM
- Fully ROHS 2.0 compliant

## APPLICATIONS

- 10GBASE-LRM
- OBSAI rates 6.144 Gb/s, 3.072 Gb/s, 1.536 Gb/s, 0.768Gb/s
- CPRI rates 10.138Gb/s , 9.830 Gb/s, 7.373Gb/s, 6.144 Gb/s, 4.915 Gb/s, 2.458 Gb/s, 1.229 Gb/s, 0.614Gb/s
- Other Optical Links

## Ordering information

Part No.	Data Rate	Fiber	Distance	Interface	Temp.	DDMI
LXP-M31-02D	10.31Gbps	MMF	220m	LC	0~70°C	Yes

## I. Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit
Storage Temperature	TS	-40	+85	°C
Maximum Supply Voltage	VCC	-0.5	3.6	V
Operating Relative Humidity	RH		95	%

## II. Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit
Operating Case Temperature	Tc	0		+70	°C
Power Supply Voltage	Vcc	3.15	3.3	3.45	V
Power Supply Current	Icc			300	mA
Surge Current	I <sub>surge</sub>			+30	mA
Baud Rate		0.6	10.31		Gbps

## III. Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
<b>Transmitter</b>						
CML Inputs(Differential)	V <sub>in</sub>	150		1200	mVpp	AC Coupled Inputs*(note1)
Input Impedance(Differential)	Z <sub>in</sub>	85	100	115	ohms	R <sub>in</sub> > 100kohms @ DC
TX_Dis	High	2		Vcc	V	
	Low	0		0.8		
TX_FAULT	High	2		Vcc+0.3	V	Io = 400μA; Host Vcc
	Low	0		0.5		
<b>Receiver</b>						
CML Outputs (Differential)	V <sub>out</sub>	350		700	mVpp	After internal AC coupling.
Output Impedance(Differential)	Z <sub>out</sub>	85	100	115	ohms	
RX_LOS	High	2		Vcc+0.3		Io = 400μA; Host Vcc
	Low	0		0.8		
MOD_DEF(0.2)	VoH	2.5			V	Reference the SFF-8472 MSA.
	VoL	0		0.5		

Note1: LVPECL logic, internally AC coupled

## IV. Optical Characteristics

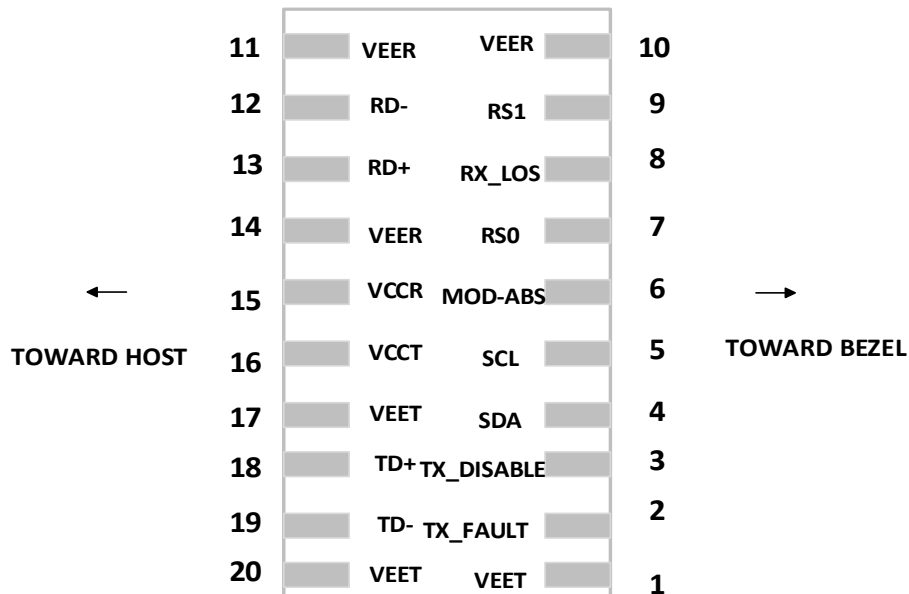
Parameter	Symbol	Min.	Typ.	Max.	Unit
50μm Core Diameter MMF	L		220		m
Data Rate			10.31		Gbps
<b>Transmitter</b>					
Center Wavelength	λ <sub>C</sub>	1260	1310	1355	nm

Spectral Width (RMS)	$\Delta\lambda$			3.5	nm
Average Output Power*(Note2)	Pout	-6.5		0.5	dBm
Extinction Ratio	ER	3.5			dB
Average Power of OFF Transmitter	Poff			-30	dBm
TX Disable Assert Time	t_off	-	-	10	us
<b>Receiver</b>					
Center Wavelength	$\lambda_C$	1260		1355	nm
Receiver Sensitivity*(Note3)	Pmin			-10	dBm
Receiver Overload	Pmax	1.5			dBm
Return Loss	ORL			-12	dB
LOS De-Assert	LOSD			-11	dBm
LOS Assert	LOSA	-25			dBm
LOS-Hysteresis	Phys	0.5			dB

Notes:

1. Output is coupled into a 9/125um SMF. The -4.7dBm is reference IEEE 802.3ae, the typical value is -1dBm.
2. Minimum average optical power measured at the BER less than 1E-12, back to back. The measure pattern is PRBS 231-1.

## V. Pin Diagram



## VI. Pin Descriptions

Pin	Name	Function	Plug Seq.	Notes
1	VeeT	Transmitter Ground	1	5)
2	TX Fault	Transmitter Fault Indication	3	1)
3	TX Disable	Transmitter Disable	3	2) Module disables on high or open
4	SDA	Transmitter Disable	3	3) 2 wire serial ID interface.
5	SCL	Module Definition 2	3	3) 2 wire serial ID interface.

6	MOD-ABS	Module Definition 1	3	3)
7	RSO	RX Rate Select(LVTTL).	3	Rate Select 0, optionally controls SFP+module receiver. This pin is pulled low to VeeT with a >30K resistor..
8	LOS	Loss of Signal	3	4)
9	RS1	TX Rate Select(LVTTL).	1	Rate Select 1, optionally controls SFP+Module transmitter. This pin is pulled low toVeeT with a >30K resistor.
10	VeeR	Receiver Ground	1	5)
11	VeeR	Receiver Ground	1	5)
12	RD-	Inv. Received Data Out	3	6)
13	RD+	Received Data Out	3	6)
14	VeeR	Receiver Ground	1	5)
15	VccR	Receiver Power	2	7) 3.3V ± 5%
16	VccT	Transmitter Power	2	7) 3.3V ± 5%
17	VeeT	Transmitter Ground	1	5)
18	TD+	Transmit Data In	3	8)
19	TD-	Inv. Transmit Data In	3	8)
20	VeeT	Transmitter Ground	1	5)

## NOTES:

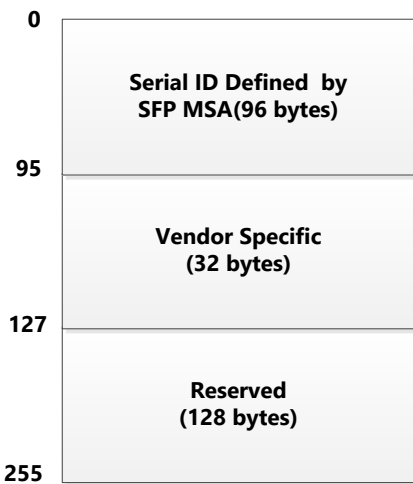
- TX Fault is an open collector/drain output, which should be pulled up with a 4.7K-10Kresistor on the host board. Pull upvoltage between 2.0V and VccT, R+0.3V. When high, outputindicates a laser fault of some kind. Low indicates normal operation. In the low state, the outputwill be pulled to < 0.8V.
- TX disable is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7-10 K resistor. It states are Low(0-0.8V): Transmitter on.(>0.8, < 2.0V): UndefinedHigh (2.0 – 3.465V): Transmitter Disabled Open: Transmitter Disabled
- Modulation Absent, connected to VEET or VEER in the module
- LOS (Loss of Signal) is an open collector/drain output, which should be pulled up with a 4.7K 10K resistor. Pull up voltage between 2.0V and VccT, R+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.
- VeeR and VeeT may be internally connected within the SFP module.
- RD-/+ : These are the differential receiver outputs. They are AC coupled 100 differential Lineswhich should be terminated with 100 (differential) at the user SERDES.The AC coupling isdone inside the module and is thus not required on the host board. The voltage swing on theselines will be between 400 and 2000 mV differential (200 –1000 mV single ended) when properly terminated.
- VccR and VccT are the receiver and transmitter power supplies.They are defined as 3.3V±5% at the SFP connector pin.Maximum supply current is 300mA.Reco-mmended host boardpower supply filtering is shown below. Inductors with DC resistance of less than 1 ohm should beused in order to maintain the required volt-age at the SFP input pin with 3.3V supply voltageWhen the recommended supply-filtering network is used, hot plugging of the SFP transceivermodule will result in anrush current of no more than 30mA greater than the steady state value.VccR and VccT may be internally connected within the SFP transceiver module.
- TD-/+ : These are the differential transmitter inputs. They are AC-coupled, differential lines with 100 differential termination inside the module.

**EEPROM**

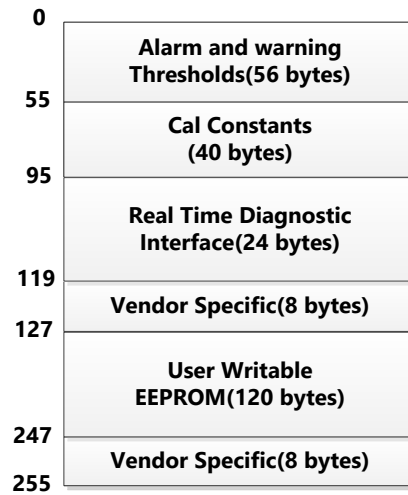
The serial interface uses the 2-wire serial CMOS EEPROM protocol defined for the ATMEL AT24C02/04 family of components. When the serial protocol is activated, the host generates the serial clock signal (SCL). The positive edge clocks data into those segments of the EEPROM that are not write protected within the SFP+ transceiver. The negative edge clocks data from the SFP+ transceiver. The serial data signal (SDA) 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.

The Module provides diagnostic information about the present operating conditions. The transceiver generates this diagnostic data by digitization of internal analog signals. Calibration and alarm/warning threshold data is written during device manufacture. Received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and temperature monitoring all are implemented. If the module is defined as external calibrated, the diagnostic data are raw A/D values and must be converted to real world units using calibration constants stored in EEPROM locations 56 – 95 at wire serial bus address A2h. The digital diagnostic memory map specific data field define as following. For detail EEPROM information please refer to the related document of SFF8472 Rev 10.2.

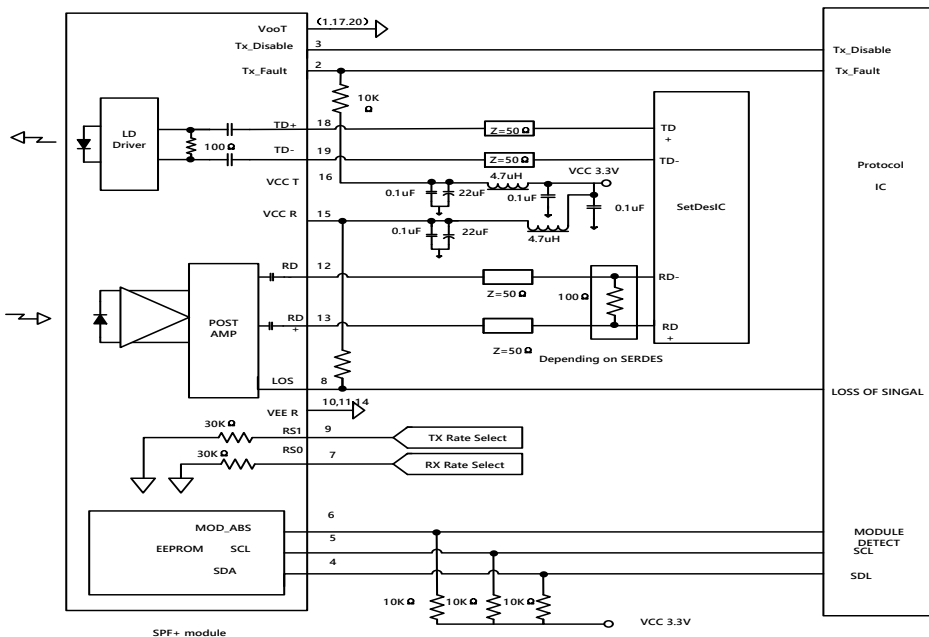
**2 wire address 1010000X(A0h)**



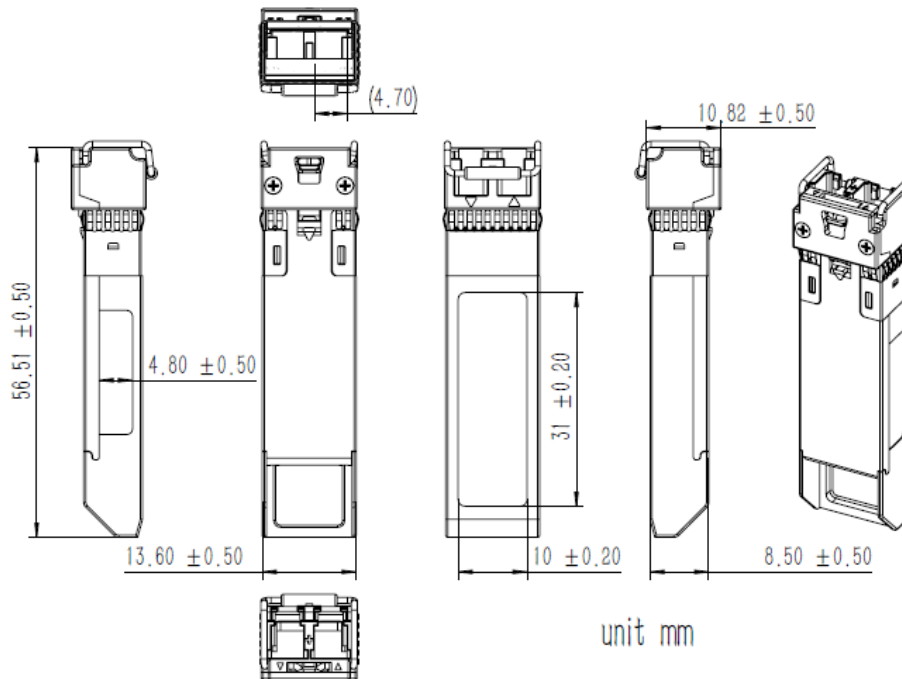
**2 wire address 1010000X (A2h)**



**VII. Recommend Circuit Schematic**



## VIII. Mechanical Specifications(Unit: mm)



## Revision History

Version No.	Date	Description
1.0	June 24, 2021	Preliminary datasheet

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