ESP31X-02D

10Gbps 1310nm MM 220M SFP+ Optical Transceiver

PRODUCT FEATURES

- **Supports 9.95 to 10.3Gbps bit rates**
- **Transmission distance up to 220m (OM1 fiber)**
- **Hot Pluggable SFP+ footprint**
- **1310nm DFB transmitter, PIN photo-detector**
- **Digital Status monitoring Interface**
- **Duplex LC connector**
- **RoHS compliant and Lead Free**
- **Metal enclosure for lower EMI**
- **Single 3.3V power supply**
- **Power dissipation < 1W**
- **Operating case temperature: 0 to 70℃**

  Compliant with FC-PI-4 800-Mx-SN-I, SFF-8431 I,SFF-8432 and SFF-8472

APPLICATIONS

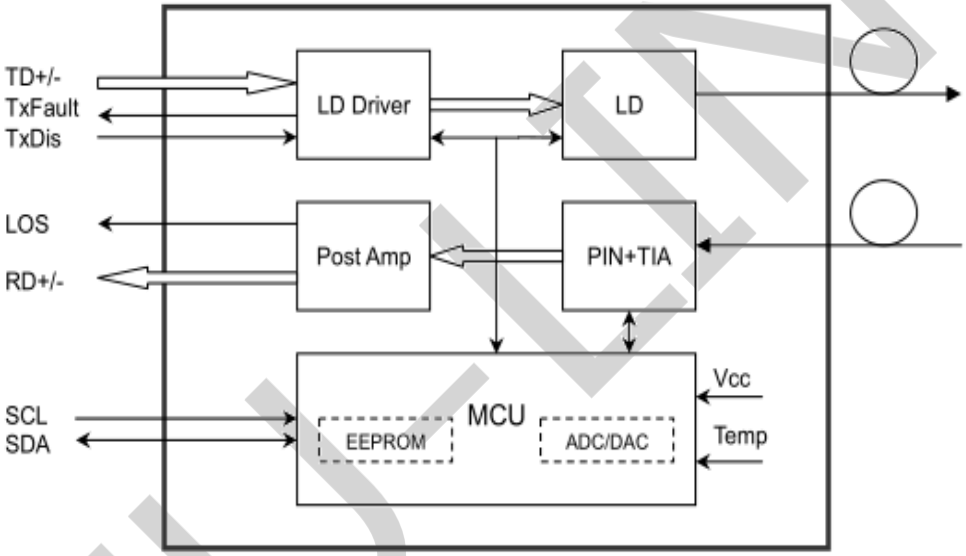
- **10GBASE-LRM 10G Ethernet**
- **Legacy FDDI multimode links**
- **Compliant with SFF-8472 SFP+ MSA.**
- **Compliant to SFP+ SFF-8431 and SFF-8432.**
- **Compliant to 802.3ae 10GBASE-LRM.**
- **RoHS Compliant.**

DESCRIPTIONS

This 1310nm DFB 10Gbps SFP+ transceiver is designed to transmit and receive optical data over multimode. optical fiber for link length 220m

The SFP+ 220m module electrical interface is compliant to SFI electrical specifications. The transmitter input and receiver output impedance is 100 Ohms differential. Data lines are internally AC coupled. The module provides differential termination and reduce differential to common mode conversion for quality signal termination and low EMI.

Module Block Diagram



Ordering Information

Part No.	Data Rate(optical)	Laser	Fiber Type	Distance	Optical Interface	Temp	DDMI	Latch Color
ESP31X-02D	10Gbps	**DFB**	MM	220M	LC	0~70℃	Y	Blue

Absolute Maximum Ratings

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Maximum Supply Voltage	Vcc	-0.5		3.6	V	
Storage Temperature	TS	-40		85	°C	
Case Operating Temperature	Tcase	-5		70	°C	

Recommended Operating Conditions

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Case Operating Temperature	Top	0	-	70	℃	Commercial
Power Supply Voltage	V_{CC}	3.13	3.3	3.47	V	
Power Supply Current				1	W	
Transmission Distance	TD	-	-	220	m	Over MMF

Electrical Characteristics

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Supply Voltage	Vcc	3.14	3.3	3.46	V	
Supply Current	Icc			300	mA	
Transmitter						
Input differential impedance	Rin		100		Ω	1
Single ended data input swing	Vin,pp	180		700	mV	
Transmit Disable Voltage	VD	Vcc–1.3		Vcc	V	
Transmit Enable Voltage	VEN	Vee		Vee+ 0.8	V	2
Transmit Disable Assert Time				10	us	
Receiver						
Differential data output swing	Vout,pp	300		850	mV	3
Data output rise time	tr	28			ps	4
Data output fall time	tf	28			ps	4
LOS Fault	VLOS fault	Vcc–1.3		VccHOST	V	5
LOS Normal	VLOS norm	Vee		Vee+0.8	V	5
Power Supply Rejection	PSR	100			mVpp	6

Notes:

1) Connected directly to TX data input pins. AC coupled thereafter.
2) Or open circuit.
3) Into 100 ohms differential termination.
4) 20 – 80 %.
5) Loss of Signal is LVTTL. Logic 0 indicates normal operation; logic 1 indicates no signal detected.

Receiver sensitivity is compliant with power supply sinusoidal modulation of 20 Hz to 1.5 MHz up to specified value applied through the recommended power supply filtering network.

Optical and Characteristics

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Transmitter						
Output Opt. Pwr	POUT	-6		-0.5	dBm	1

Optical Wavelength	λ	1260	1310	1355	nm	
Wavelength Temperature Dependence			0.08	0.125	nm/°C	
Spectral Width (-20dB)	σ			1	nm	
Optical Extinction Ratio	ER	3.5			dB	
Transmitter and Dispersion Penalty	TDP			3.2	dB	
Optical Rise/Fall Time	tr/ tf		0.1	0.26	ns	
RIN	RIN			-128	dB/Hz	
Output Eye Mask	Compliant with IEEE 0802.3ae					
Receiver						
Rx Sensitivity	RSENS			-6	dBm	2
Input Saturation Power (Overload)	Psat	-3			dBm	
Wavelength Range	λ_C	1270		1610	nm	
LOS De -Assert	LOSD			-11	dBm	
LOS Assert	LOSA	-30			dBm	
LOS Hysteresis		0.5	1.0		dB	

Notes:

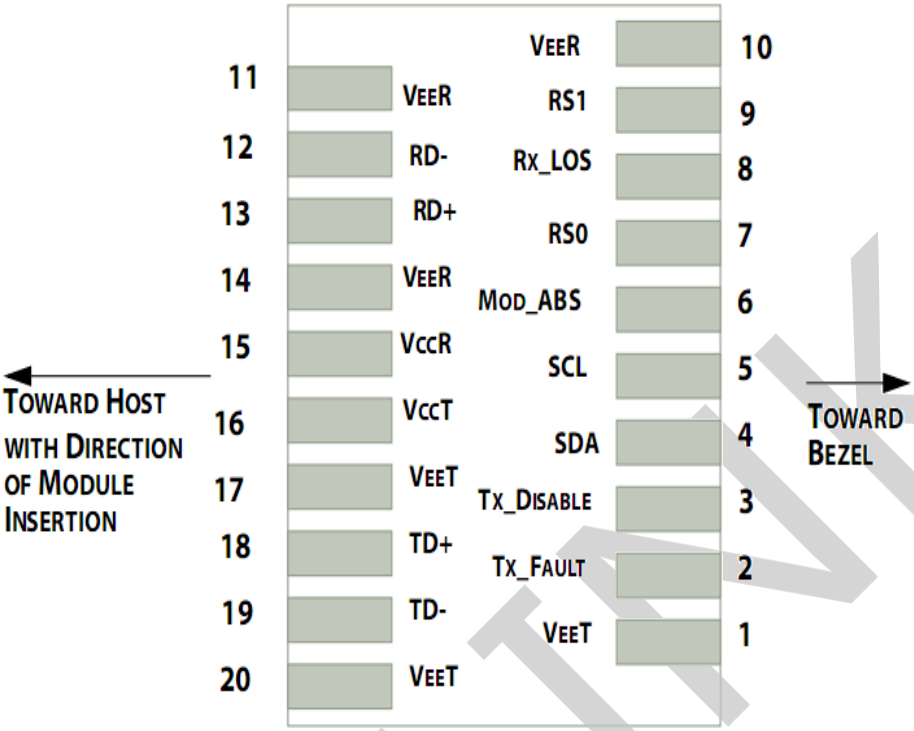
1) Class 1 Laser Safety per FDA/CDRH and IEC-825-1 regulations.

With worst-case extinction ratio. Measured with a PRBS 2^{31}-1 test pattern, @10.325Gb/s, BER<10^{-12}.

Digital Diagnostics

Parameter	Range	Accuracy	Unit	Calibration
Temperature	0 to 70	±3	℃	Internal
Voltage	0 to Vcc	±3%	V	Internal
Tx Bias Current	0 to 100	±10%	mA	Internal
Tx Output Power	-6 to -0.5	±3	dB	Internal
Rx Input Power	-6 to-0.5	±3	dB	Internal

Pin Diagram



Pin Definitions

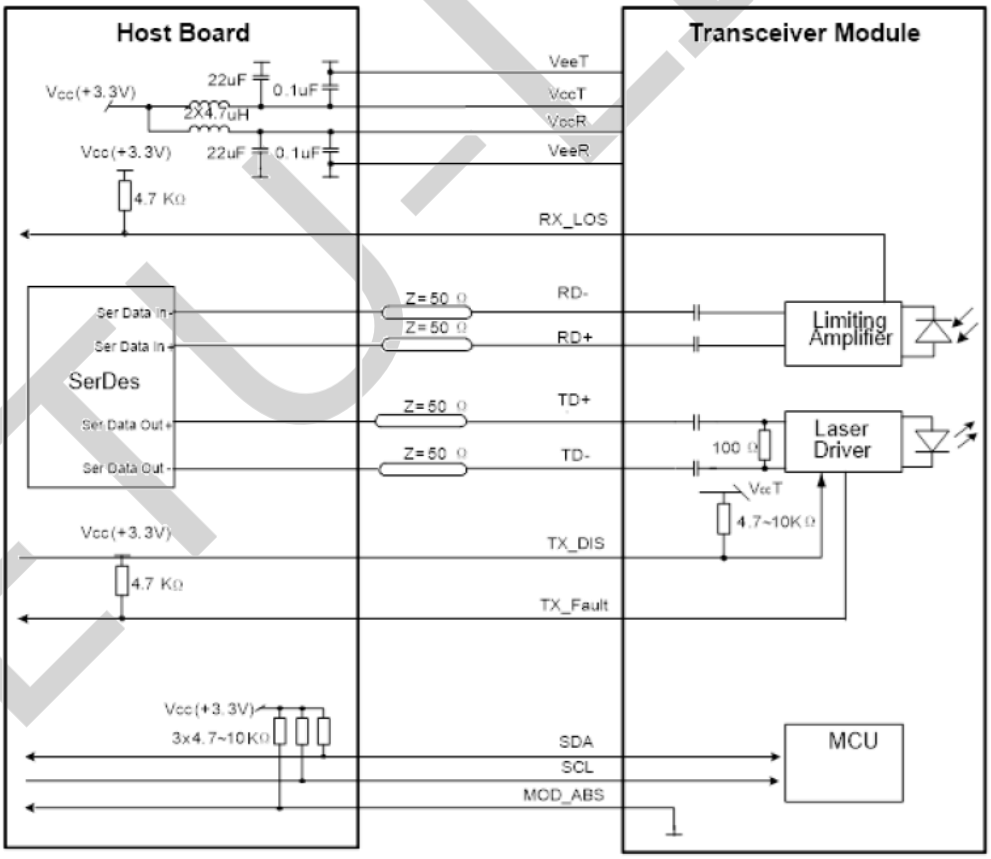
Pin	Symbol	Name/Description	Ref.
1	V_{EET}	Transmitter Ground (Common with Receiver Ground)	1
2	T_{FAULT}	Transmitter Fault.	2
3	T_{DIS}	Transmitter Disable. Laser output disabled on high or open.	3
4	SDA	2-wire Serial Interface Data Line	4
5	SCL	2-wire Serial Interface Clock Line	4
6	MOD_ABS	Module Absent. Grounded within the module	4
7	RS0	Rate Select 0	5
8	LOS	Loss of Signal indication. Logic 0 indicates normal operation.	6
9	RS1	No connection required	1
10	V_{EER}	Receiver Ground (Common with Transmitter Ground)	1
11	V_{EER}	Receiver Ground (Common with Transmitter Ground)	1
12	RD-	Receiver Inverted DATA out. AC Coupled	
13	RD+	Receiver Non-inverted DATA out. AC Coupled	
14	V_{EER}	Receiver Ground (Common with Transmitter Ground)	1
15	V_{CCR}	Receiver Power Supply	
16	V_{CCT}	Transmitter Power Supply	
17	V_{EET}	Transmitter Ground (Common with Receiver Ground)	1
18	TD+	Transmitter Non-Inverted DATA in. AC Coupled.	

19	TD-	Transmitter Inverted DATA in. AC Coupled.	
20	V_{EET}	Transmitter Ground (Common with Receiver Ground)	1

Notes:

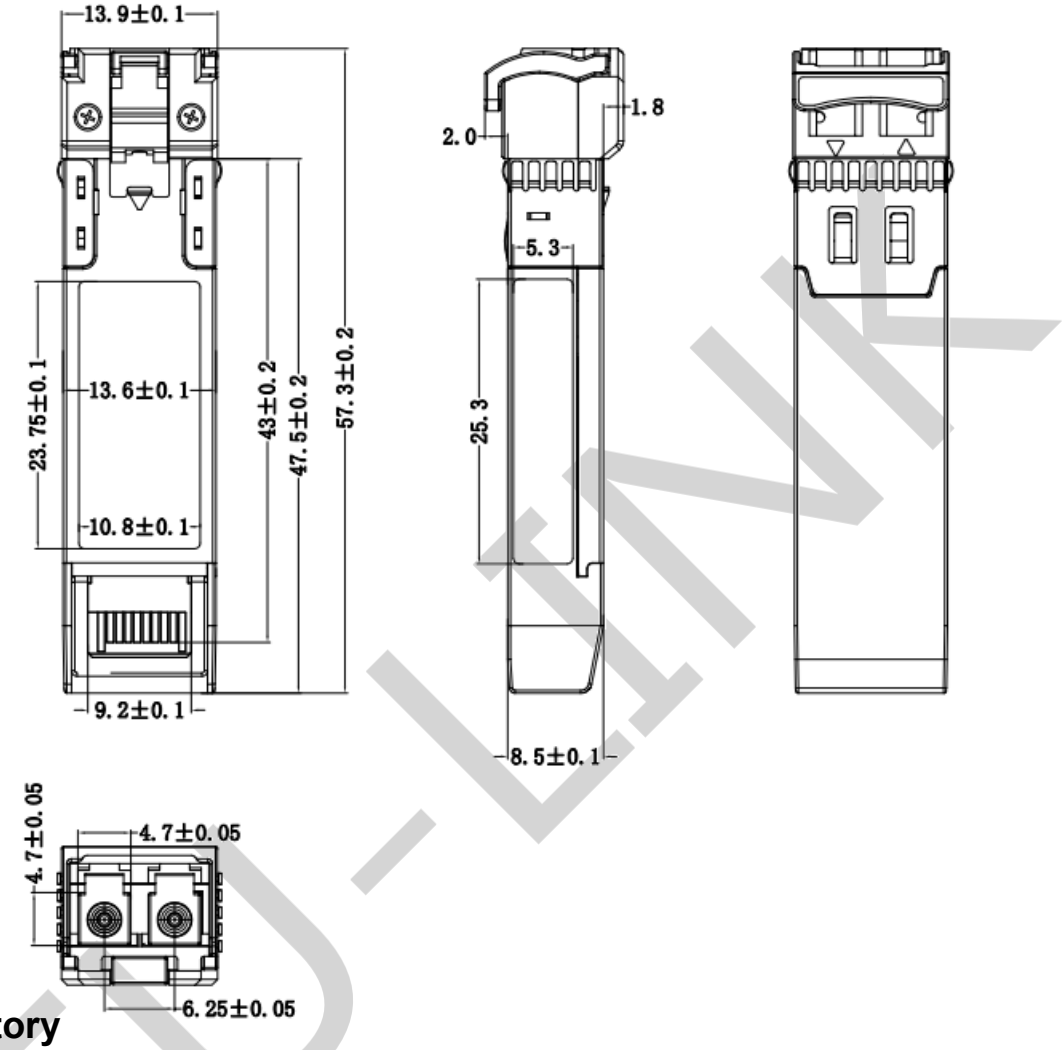
1) Circuit ground is internally isolated from chassis ground.
2) T_{FAULT} is an open collector/drain output, which should be pulled up with a 4.7k – 10k Ohms resistor on the host board if intended for use. Pull up voltage should be between 2.0V to Vcc + 0.3V.A high output indicates a transmitter fault caused by either the TX bias current or the TX output power exceeding the preset alarm thresholds. A low output indicates normal operation. In the low state, the output is pulled to <0.8V.
3) Laser output disabled on T_{DIS}>2.0V or open, enabled on T_{DIS}<0.8V.
4) Should be pulled up with 4.7kΩ- 10kΩ host board to a voltage between 2.0V and 3.6V. MOD_ABS pulls line low to indicate module is plugged in.
5) Internally pulled down per SFF-8431 Rev 4.1.
6) LOS is open collector output. It should be pulled up with 4.7kΩ – 10kΩ on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.

Recommended Interface Circuit



Mechanical Diagram

Comply with SFF-8432 rev. 5.0, the improved Pluggable form factor specification.



Revision History

Version No.	Date	Description
1.0	February 8, 2016	Preliminary datasheet
2.0	May 11,2019	Product upgrades
3.0	Aug 30, 2024	Format change

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