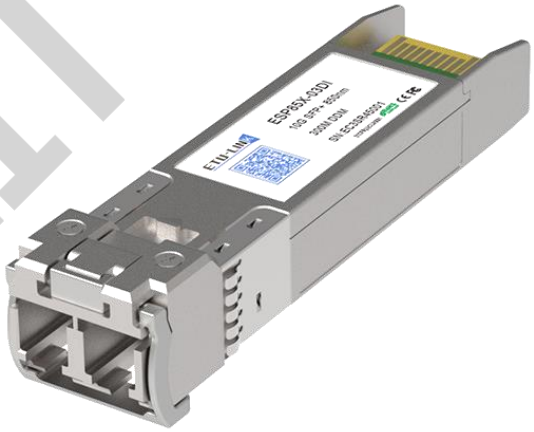
ESP85X-03D-3

10Gbps 850nm 300M SFP+ Optical Transceiver

PRODUCT FEATURES



- Support line rates from 1.25 Gbps to 11.3 Gbps
- Optical interface compliant to IEEE 802.3ae
- Electrical interface compliant to SFF-8431
- Hot-Pluggable
- 850nm VCSEL transmitter, PIN photo-detector
- Maximum link length of 300m on OM3 MMF
- Maximum link length of 500M on 4700MHz/km MMF
- Temperature Range:
  Commercial：0°C ~70°C
- Low power consumption
- All-metal housing for superior EMI performance
- RoHS6 compliant (lead free)

APPLICATIONS

- 10GBASE-SR at 10.3125Gbps
- 10GBASE-SW at 9.953Gbps
- Other optical links
- Gigabit Ethernet

ETU-LINK

DESCRIPTIONS

This 850nm VCSEL10Gigabit SFP+ transceiver is designed to transmit and receive optical data over 50/125μm or 62.5/125μm multimode optical fiber (Table 1).

Fiber type	Minimum modal bandwidth @ 850 nm (MHz•km)	Operating range (meters)
62.5 μm MMF	160	2 to 26
	200	2 to 33
50 μm MMF	400	2 to 66
	500	2 to 82
	2000	2 to 300

Table 1: SFP+ SR Operating Range for each Optical Fiber Type

The SFP+ SR 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.

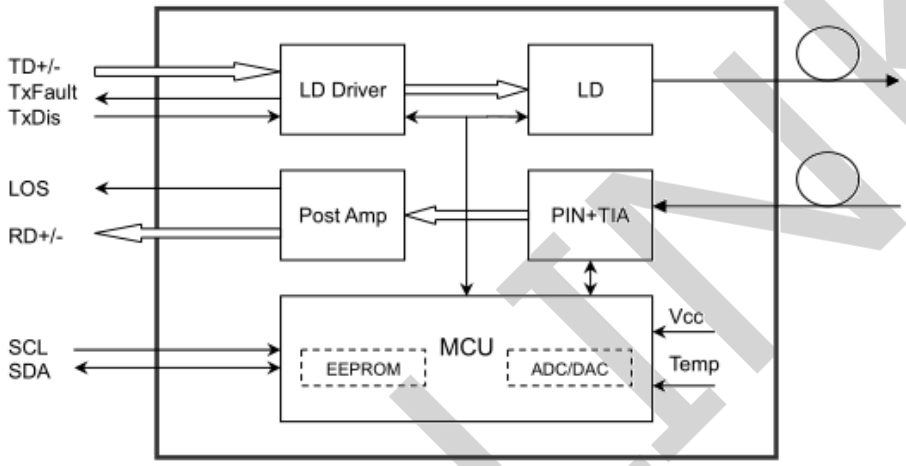
The module provides differential termination and reduce differential to common mode conversion for quality signal termination and low EMI. SFI typically operates over 200 mm of improved FR4 material or up to about 150mmof standard FR4 with one connector.

The transmitter converts 10Gbit/s serial PECL or CML electrical data into serial optical data compliant with the 10GBASE-SR standard. An open collector compatible Transmit Disable (Tx_Dis) is provided. Logic “1” or no connection on this pin will disable the laser from transmitting. Logic “0” on this pin provides normal operation. The transmitter has an internal automatic power control loop (APC) to ensure constant optical power output across supply voltage and temperature variations. An open collector compatible Transmit Fault (TFault) is provided. TX_Fault is a module output contacts that when high, indicates that the module transmitter has detected a fault condition related to laser operation or safety. The TX_Fault output contact is an open drain/collector and shall be pulled up to the Vcc_Host in the host with a resistor in the range 4.7-10 kΩ. TX_Disable is a module input contact. When TX_Disable is asserted high or left open, the SFP+ module transmitter output shall be turned off. This contact shall be pulled up to VccT with a 4.7 kΩ to 10 kΩ resistor.

The receiver converts 10Gbit/s serial optical data into serial PECL/CML electrical data. An open collector compatible Loss of Signal is provided. Rx_LOS when high indicates an optical signal level below that specified in the relevant standard. The Rx_LOS contact is an open drain/collector output and shall be pulled up to Vcc_Host in the

host with a resistor in the range 4.7-10 kΩ, or with an active termination. Power supply filtering is recommended for both the transmitter and receiver. The Rx_LOS signal is intended as a preliminary indication to the system in which the SFP+ is installed that the received signal strength is below the specified range. Such an indication typically points to non-installed cables, broken cables, or a disabled, failing or a powered off transmitter at the far end of the cable.

Module Block Diagram



Ordering Information

Part No.	Data Rate(optical)	Laser	Fiber Type	Distance	Optical Interface	Temp	DDMI	Latch Color
ESP85X-03D-3	1.25G 10.3125Gbps	VCSEL	MMF	300m	LC	0~70℃	Y	Black

Absolute Maximum Ratings

Parameter	Symbol	Min	Typ	Max	Unit
Maximum Supply Voltage	Vcc	-0.5		3.6	V
Storage Temperature	TS	-40		85	°C
Case Operating Temperature	Tcase	0		70	°C

Recommended Operating Conditions

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Case Operating Temperature	Top	0	-	70	℃	Commercial
Power Supply Voltage	Vcc	3.13	3.3	3.47	V	
Power Supply Current				1	W	
Transmission Distance	TD	-	-	300	m	Over SMF

Electrical Characteristics

High-Speed Signal: Compliant to CEI-11G-SR

Low-Speed Signal: Compliant to SFF-8419

Parameter		Symbol	Min.	Typical	Max.	Unit	Notes
Transmitter (Module Input)							
Differential Input Resistance		R_R_{din}	80	100	120	Ω	
Input Differential Voltage		R_V_{diff}	110	-	1050	mVpp	
Tx_Disable	Normal Operation	V_{IL}	-0.3	-	0.8	V	
	Laser Disable	V_{IH}	2.0	-	V_{CC}+0.3	V	
Receiver (Module Output)							
Differential Resistance		T_R_d	80	100	120	Ohm	
Output Differential Voltage		T_V_{diff}	360	-	770	mVpp	
Differential Termination Resistance Mismatch		T_R_{dm}	-	-	5	%	
Rx los	Normal Operation	V_{OL}	-0.3	-	0.4	V	
	Loss Signal	V_{OH}	2		VCCHOST	V	

Optical and Characteristics

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Transmitter						
Output Opt. Pwr	POUT	-6		-1	dBm	1
Optical Wavelength	λ	840	850	860	nm	
Optical Extinction Ratio	ER	3.5			dB	
RIN	RIN			-128	dB/Hz	
Optical Return Loss Tolerance	ORL			-12	dBm	
Output Eye Mask	Compliant with IEEE 0802.3ae					
Receiver						
Rx Sensitivity	RSENS			-11.1	dBm	2
Input Saturation Power (Overload)	Psat	-3			dBm	
Wavelength Range	λ_C	770	850	860	nm	
LOS De -Assert	LOSD			-14	dBm	
LOS Assert	LOSA	-30			dBm	
LOS Hysteresis		0.5			dB	

Notes:

1. Class 1 Laser Safety per FDA/CDRH and IEC-825-1 regulations.
2. With worst-case extinction ratio. Measured with a PRBS 2^{31}-1 test pattern, @10.325Gb/s, BER<10^{-12}.

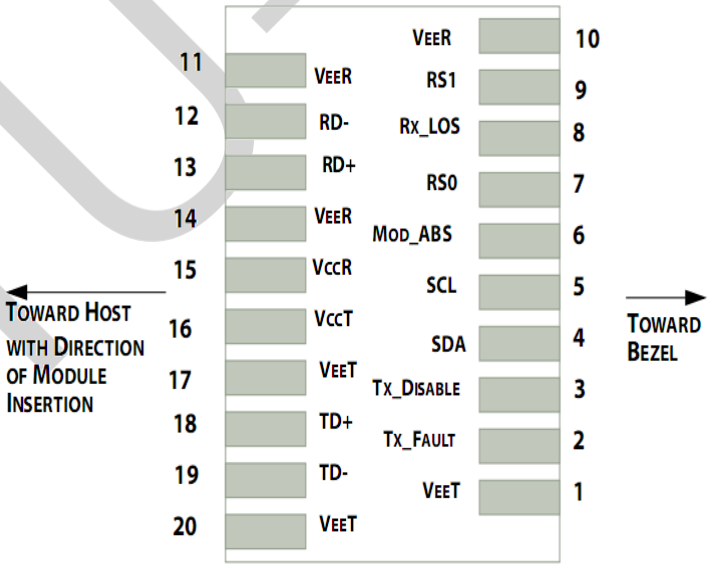
Digital Diagnostics

Parameter	Range	Accuracy	Unit	Calibration
Temperature	-40 to 85	±3	℃	Internal
Voltage	0 to Vcc	±3%	V	Internal
Tx Bias Current	0 to 10	±10%	mA	Internal
Tx Output Power	-6 to -1	±3	dB	Internal
Rx Input Power	-10 to -3	±3	dB	Internal

Communication Interface Timing Characteristics

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
TX_Disable Assert Time	t_off			100	us	
TX_Disable Negate Time	t_on			2	ms	
Time to Initialize Include Reset of TX_FAULT	t_int			300	ms	
TX_FAULT from Fault to Assertion	t_fault			100	us	
TX_Disable Time to Start Reset	t_reset	10			us	
Receiver Loss of Signal Assert Time	T_A,RX_LOS			100	us	
Receiver Loss of Signal Deassert Time	T_d,RX_LOS			100	us	
Rate-Select Chage Time	t_ratesel			10	us	

Pin Diagram



Pin out of Connector Block on Host Board

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 4.7kΩ– 10 kΩ 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.

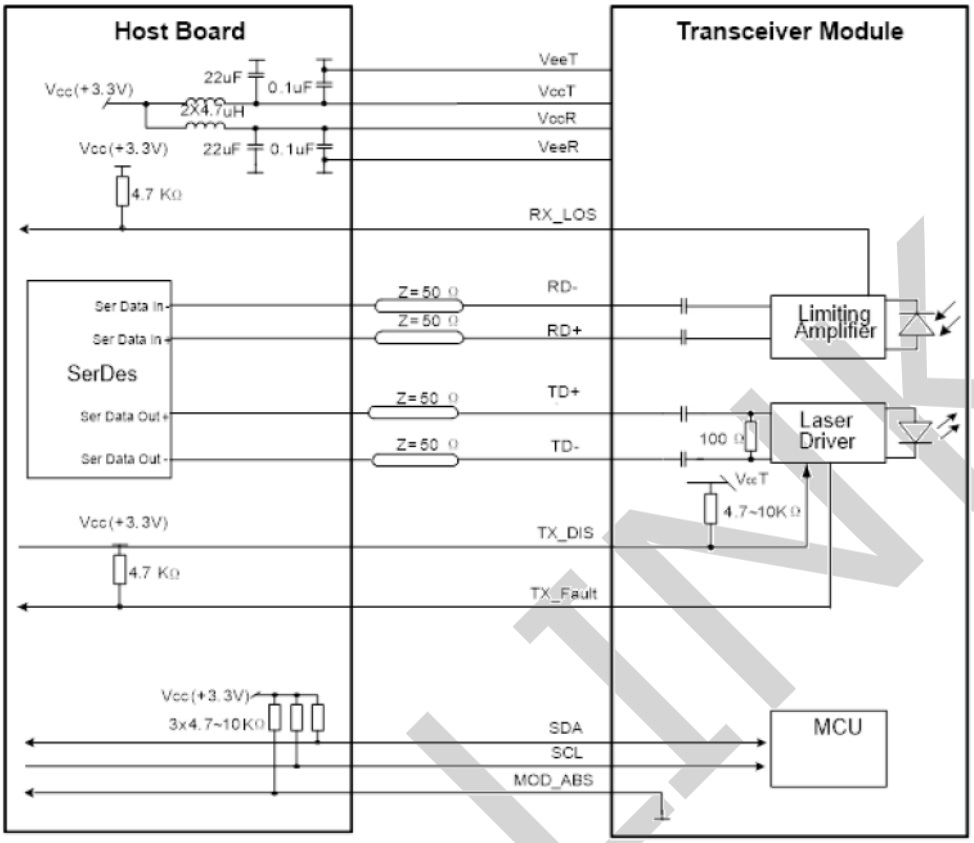
3) Laser output disabled on T_{DIS}>2.0V or open, enabled on T_{DIS}<0.8V.

4) Should be pulled up with 4.7kΩ- 10kΩ on host board to a voltage between 2.0V and 3.6V. MOD_ABS pulls line low to indicate module is plugged in.

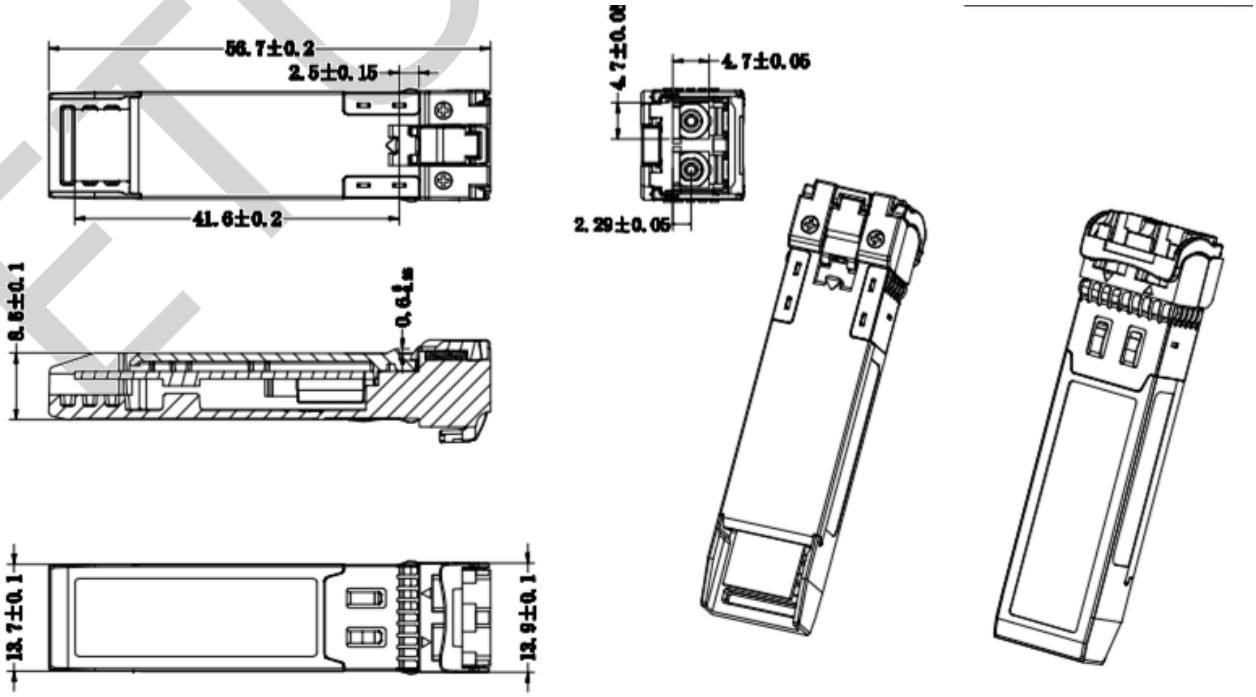
5) Internally pulled down per SFF-8431 Rev 4.1.

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



Revision History

Version No.	Date	Description
1.0	Sep 12, 2015	Preliminary datasheet
2.0	October 25,2019	Product upgrades
3.0	Aug 26, 2024	Format change

Company: ETU-Link Technology Co., LTD
Production base: Right side of 3rd floor, No. 102 building, Longguan expressway, Dalang street, Longhua District, Shenzhen city, GuangDongProvince,China 518109
R&D base: Floor 4, Building 4, Nanshan Yungu Phase LI, Taoyuan Community, XiliStreet,Nanshan District, Shenzhen
Tel: +86-755 2328 4603

Addresses and phone number also have been listed at www.etulinktechnology.com.
Please e-mail us at sales@etulinktechnology.com or call us for assistance.

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