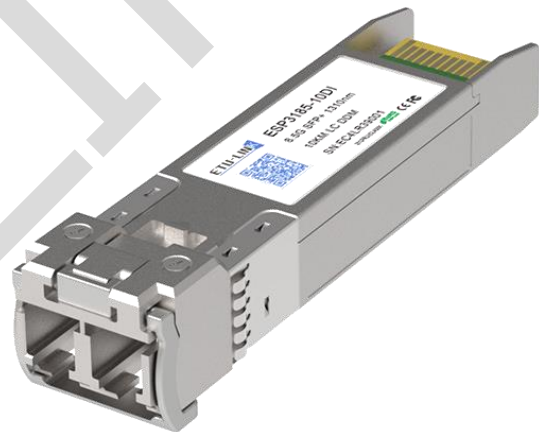


## ESP3185-10D(I)

### 8.5Gbps 1310nm 10KM SFP+ Transceiver

#### PRODUCT FEATURES

- Up to 8.5Gb/s bi-directional data links
- Hot Pluggable SFP+ footprint
- Built-in digital diagnostic functions
- 1310nm DFB laser transmitter
- Duplex LC connector
- Up to 10km at 8.5Gb/s on 9/125um SMF
- Single 3.3V power supply
- RoHS6 compliant (lead free)
- Case operating temperature range:  
Commercial: 0°C ~70°C  
Industrial: -40°C ~85°C



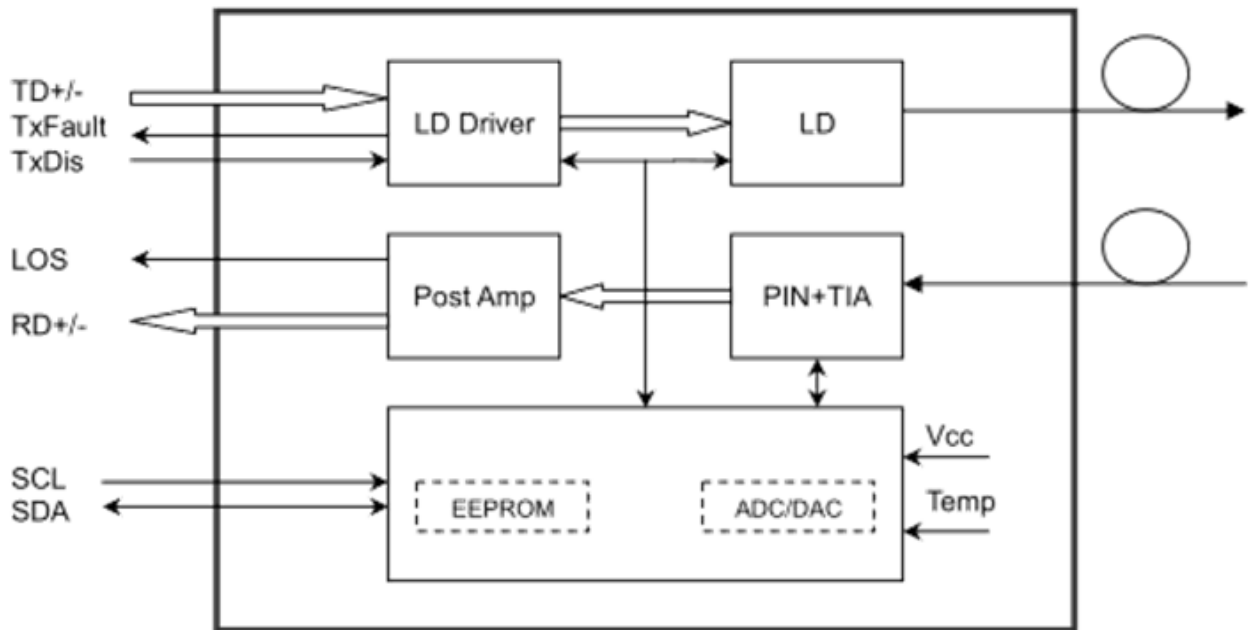
#### APPLICATIONS

- Tri Rate 2.125/4.25/8.5Gbps Fiber Channel

#### DESCRIPTIONS

ETU-Link's ESP3185-10D(I) SFP+ transceivers are designed for use in Fiber Channel links up to 10 km at 8.5Gb/s data rate. They are compliant with FCPI-4 Rev. 8.00 and SFF-8472 Rev 10.2 and compatible with SFF-8431. ETU-Link's ESP3185-10D(I) Digital diagnostics functions are available via a 2-wire serial interface, as specified in SFF-8472, 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. The product is RoHS compliant and lead-free per Directive 2002/95/EC.

## Module Block Diagram



## Ordering Information

Part No.	Data Rate(optical)	Laser	Fiber Type	Distance	Optical Interface	Temp	DDMI	Latch Color
ESP3185-10D	8.5Gbit/s	DFB	SMF	10KM	LC	0~70°C	Y	Blue
ESP3185-10DI	8.5Gbit/s	DFB	SMF	10KM	LC	-40~85°C	Y	Blue

## Absolute Maximum Ratings

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Maximum Supply Voltage	Vcc	-0.5		4.7	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	°C	Commercial

		-40		85		Industrial
Power Supply Voltage	V <sub>cc</sub>	3.13	3.3	3.47	V	
Transmission Distance	TD	-	-	10	km	Over SMF

## Electrical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Supply Voltage	V <sub>cc</sub>	3.14	3.3	3.46	V	
Supply Current	I <sub>cc</sub>			300	mA	
<b>Transmitter (Module Input)</b>						
Input differential impedance	R <sub>in</sub>		100		Ω	1
Single ended data input swing	V <sub>in,pp</sub>	180		700	mV	
Transmit Disable Voltage	VD	V <sub>cc</sub> -1.3		V <sub>cc</sub>	V	
Transmit Enable Voltage	VEN	V <sub>ee</sub>		V <sub>ee</sub> + 0.8	V	2
Transmit Disable Assert Time				10	us	
<b>Receiver (Module Output)</b>						
Differential data output swing	V <sub>out,pp</sub>	300		850	mV	3
Data output rise time	t <sub>r</sub>	28			ps	4
Data output fall time	t <sub>f</sub>	28			ps	4
LOS Fault	VLOS fault	V <sub>cc</sub> -1.3		V <sub>cc</sub> HOST	V	5
LOS Normal	VLOS norm	V <sub>ee</sub>		V <sub>ee</sub> +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 LVTTTL. Logic 0 indicates normal operation; logic 1 indicates no signal detected.
6. 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 Characteristics (T<sub>case</sub> = -5 to 70°C, V<sub>CC</sub> = 3.14 to 3.46 Volts)

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
<b>Transmitter</b>						
Output Opt. Pwr	POUT	-6		0.5	dBm	1
Optical Wavelength	λ	1285	1310	1345	nm	

Spectral Width (-20dB)	$\sigma$			1	nm	
Optical Extinction Ratio	ER	3.5			dB	
Optical Rise/Fall Time	tr/ tf			30	ps	
RIN	RIN			-128	dB/Hz	
Output Eye Mask	FC-PI-4					
<b>Receiver</b>						
Rx Sensitivity	RSENS			-14.4	dBm	2
Input Saturation Power (Overload)	Psat	0.5			dBm	
Wavelength Range	$\lambda_C$	1260		1360	nm	
LOS De -Assert	LOSD			-16	dBm	
LOS Assert	LOSA	-30			dBm	
LOS Hysteresis		0.5	1.0		dB	

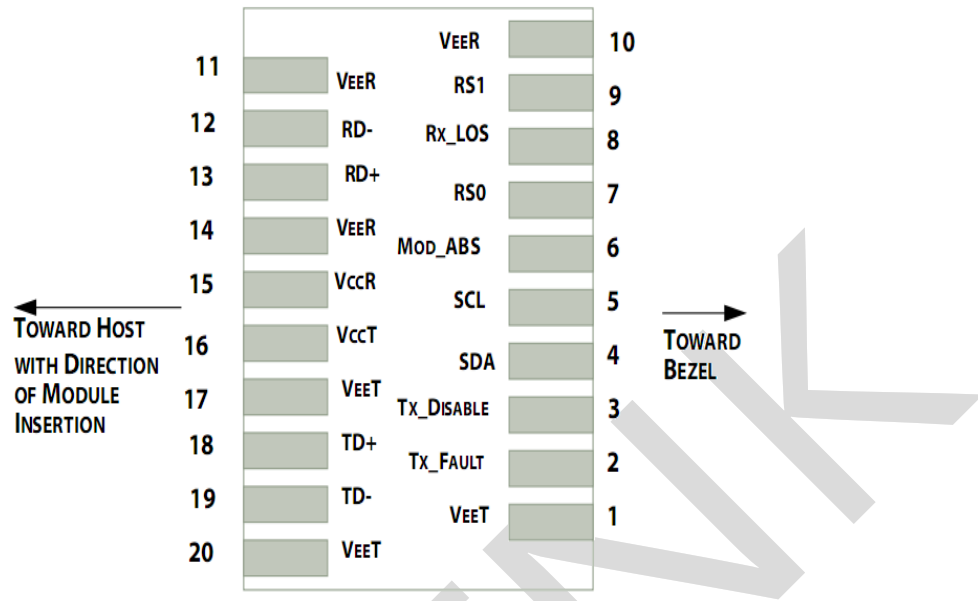
**Notes:**

1. High Bandwidth Mode. Class 1 Laser Safety per FDA/CDRH and EN (IEC) 60825 regulations.
2. Also specified to meet curves in FC-PI-4 Rev 8.001 Figures 21, 22, and 23, which allow trade-off between wavelength, spectral width and OMA.
3. Equivalent extinction ratio specification for Fiber Channel. Allows smaller ER at higher average power.
4. For 8.5 GB/s operation, Jitter values for gamma T and gamma R are controlled by TDP and stressed receiver sensitivity.
5. Measured with conformance signals defined in FC-PI-4 Rev. 8.00 specifications. Value in OMA. Measured with PRBS 31-1 at 10-12 BER.

## Digital Diagnostics

Parameter	Range	Accuracy	Unit	Calibration
Temperature	-40 to 85	$\pm 3$	$^{\circ}\text{C}$	Internal
Voltage	0 to Vcc	$\pm 3\%$	V	Internal
Tx Bias Current	0 to 100	$\pm 10\%$	mA	Internal
Tx Output Power	-6 to 1	$\pm 3$	dB	Internal
Rx Input Power	-15 to 1	$\pm 3$	dB	Internal

## Pin Diagram



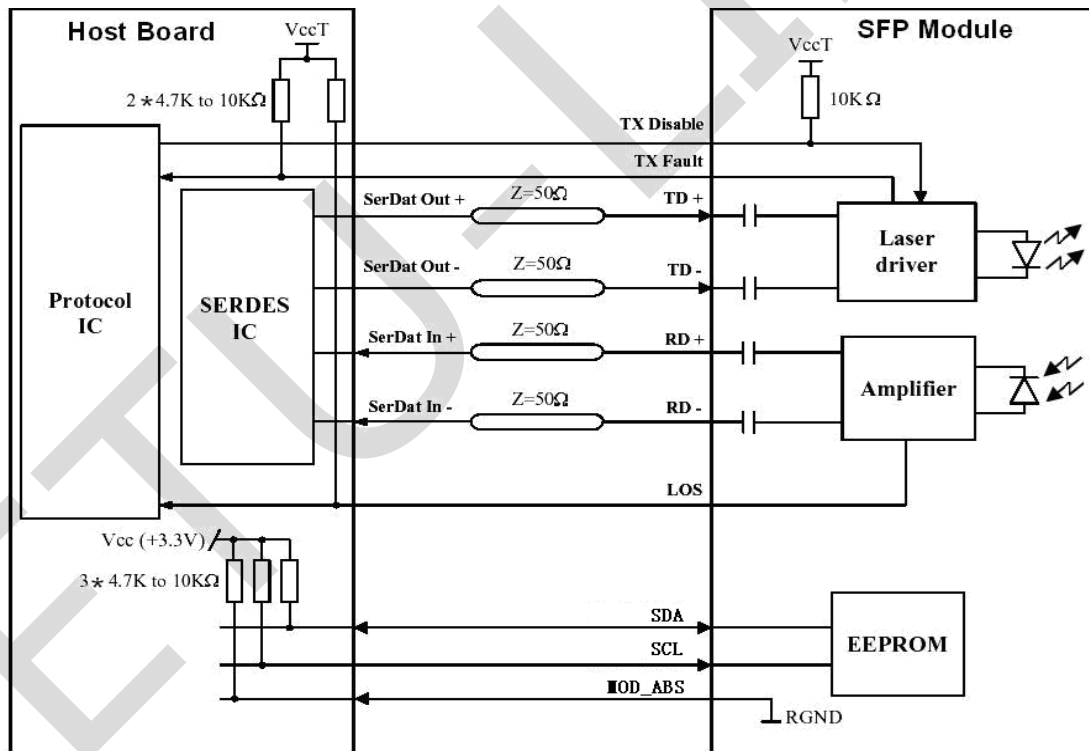
## Pin Definitions

PIN #	Name	Function	Notes
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

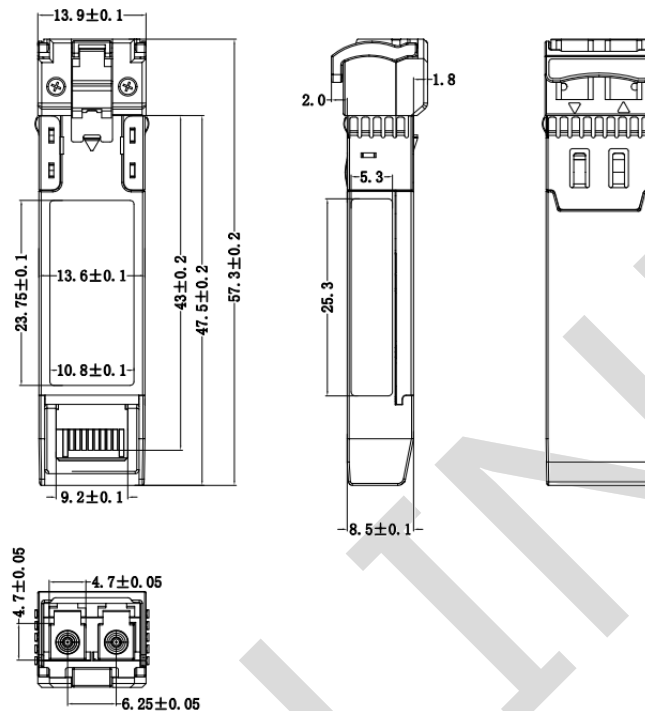
Notes:

1. Circuit ground is internally isolated from chassis ground.
2.  $T_{\text{FAULT}}$  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  $V_{\text{cc}} + 0.3\text{V}$ . 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 <math><0.8\text{V}</math>.
3. Laser output disabled on  $T_{\text{DIS}} > 2.0\text{V}$  or open, enabled on  $T_{\text{DIS}} < 0.8\text{V}$ .
4. Should be pulled up with 4.7k $\Omega$ - 10k $\Omega$  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 4.7k $\Omega$  – 10k $\Omega$  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	February 8, 2016	Preliminary datasheet
2.0	July 11, 2029	Product upgrades
2.1	Sep 02, 2024	Format change

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