ESTxx85-80D(I)

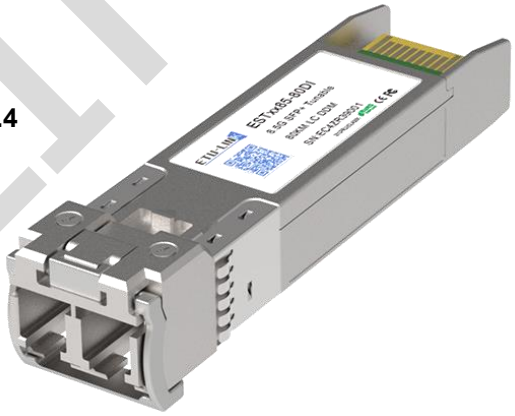
8.5Gbps Tunable DWDM 80km SFP+ Transceiver

PRODUCT FEATURES

- **Up to 8.5Gb/s data links**
- **Monolithically integrated full C-band tunable transmitter and APD receiver**
- **50 GHz ITU channel spacing with integrated wavelength locker**
- **Up to 80km on 9/125μm SMF**
- **Hot-pluggable SFP+ footprint**
- **Compliant with SFP+ MSA with LC connector**
- **Metal enclosure, for lower EMI**
- **RoHS-10 compliant and lead-free**
- **Support Digital Diagnostic Monitoring interface**
- **Specifications compliant with SFF-8472 V11.3& SFF-8690 V1.4**
- **Single +3.3V power supply**
- **Case operating temperature range:**

  Commercial:0°C ~70°C

  Industrial: -40°C ~85°C



APPLICATIONS

- **8.5GBASE-ZR/ZW**
- **8.5G Fiber Channel**

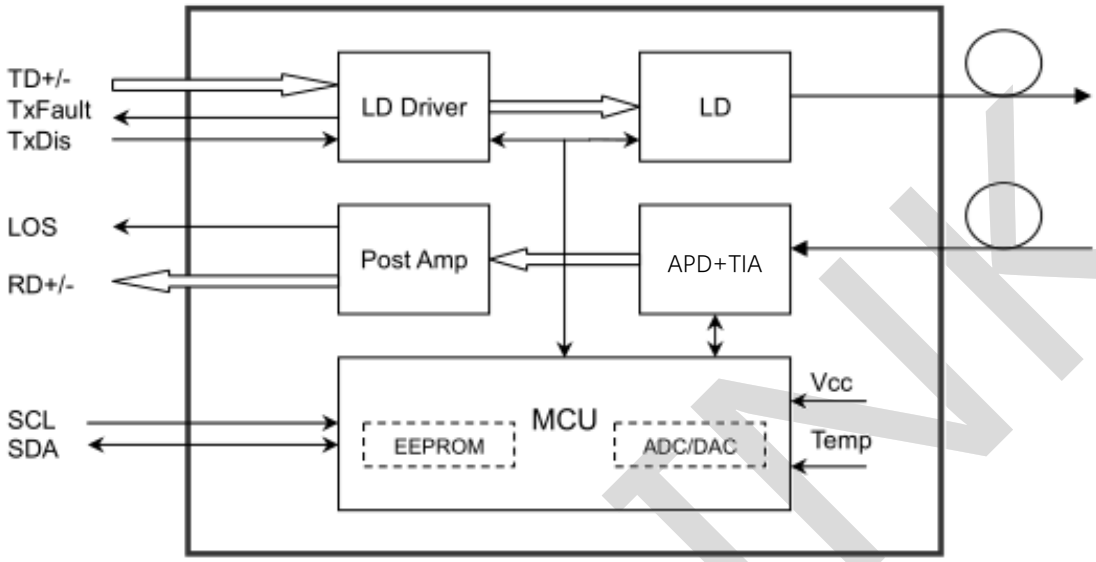
DESCRIPTIONS

ETU-LINK's tunable transceiver is an integrated fiber optic transceiver that provides a high-speed serial link at signaling rates up to 8.5 Gb/s. The module complies with the 10 Gigabit Enhanced Small Form Factor Pluggable （SFP+）multisource agreement-MSA（SFF-8431） and SFF-8432，SFF-8690，SFF-8472. It complies with the ITU-T G.698.1 standard with 50 GHz channel spacing for SONET/SDH, IEEE DWDM 10GBASE-ZR for 80 km reach (Ethernet), and DWDM 8GFC for 80 km reach (Fiber Channel) applications.

transceivers provide a unique enhanced digital diagnostic monitoring interface, which allows real-time access to device operating parameters such as transceiver temperature, laser bias current, transmitted optical power, and received optical power and transceiver supply voltage. It also defines a sophisticated system of alarm and warning flags, which alerts end-users when particular operating parameters are outside of a factory set normal range.
The SFP+ MSA defines a 256-byte memory map in EEPROM that is accessible over a 2-wire serial interface at the

8 bit address 1010000X (A0h). The digital diagnostic monitoring interface makes use of the 8 bit address 1010001X (A2h), so the originally defined serial ID memory map remains unchanged.

Module Block Diagram



Ordering Information

Part No.	Data Rate(optical)	Laser	Fiber Type	Distance	Optical Interface	Temp	DDMI
ESTxx85-80D	8.5Gbit/s	EML	SMF	80km	LC	0~70℃	Y
ESTxx85-80DI	8.5Gbit/s	EML	SMF	80km	LC	-40~85℃	Y

Product Selection

C-band λc Wavelength Guide Pin Descriptions

Channel	Wavelength (nm)	Frequency (THZ)	Channel	Wavelength (nm)	Frequency (THZ)
C17	1563.86	191.70	C39	1546.12	193.90
H17	1563.45	191.75	H39	1545.72	193.95
C18	1563.05	191.80	C40	1545.32	194.00
H18	1562.64	191.85	H40	1544.92	194.05
C19	1562.23	191.90	C41	1544.53	194.10
H19	1561.83	191.95	H41	1544.13	194.15
C20	1561.42	192.00	C42	1543.73	194.20
H20	1561.01	192.05	H42	1543.33	194.25

C21	1560.61	192.10	C43	1542.94	194.30
H21	1560.20	192.15	H43	1542.54	194.35
C22	1559.79	192.20	C44	1542.14	194.40
H22	1559.39	192.25	H44	1541.75	194.45
C23	1558.98	192.30	C45	1541.35	194.50
H23	1558.58	192.35	H45	1540.95	194.55
C24	1558.17	192.40	C46	1540.56	194.60
H24	1557.77	192.45	H46	1540.16	194.65
C25	1557.36	192.50	C47	1539.77	194.70
H25	1556.96	192.55	H47	1539.37	194.75
C26	1556.55	192.60	C48	1538.98	194.80
H26	1556.15	192.65	H48	1538.58	194.85
C27	1555.75	192.70	C49	1538.19	194.90
H27	1555.34	192.75	H49	1537.79	194.95
C28	1554.94	192.80	C50	1537.40	195.00
H28	1554.54	192.85	H50	1537.00	195.05
C29	1554.13	192.90	C51	1536.61	195.10
H29	1553.73	192.95	H51	1536.22	195.15
C30	1553.33	193.00	C52	1535.82	195.20
H30	1552.93	193.05	H52	1535.43	195.25
C31	1552.52	193.10	C53	1535.04	195.30
H31	1552.12	193.15	H53	1534.64	195.35
C32	1551.72	193.20	C54	1534.25	195.40
H32	1551.32	193.25	H54	1533.86	195.45
C33	1550.92	193.30	C55	1533.47	195.50
H33	1550.52	193.35	H55	1533.07	195.55
C34	1550.12	193.40	C56	1532.68	195.60
H34	1549.72	193.45	H56	1532.29	195.65
C35	1549.32	193.50	C57	1531.90	195.70
H35	1548.91	193.55	H57	1531.51	195.75
C36	1548.51	193.60	C58	1531.12	195.80
H36	1548.11	193.65	H58	1530.72	195.85
C37	1547.72	193.70	C59	1530.33	195.90
H37	1547.32	193.75	H59	1529.94	196.95
C38	1546.92	193.80	C60	1529.55	196.00
H38	1546.52	193.85	H60	1529.16	196.05
Non-ITU	Peak wavelength between 1528.77nm-1563.86		C61	1528.77	196.10

Notes:

1. When a tunable module is plugged in for the first time, it will go to a default channel, ESTDxx85-3LCD80 default channel is 1568.36nm, compatible with channel range from 1 to 99

2. When the module is power cycled it will automatically go to the last channel selected, or when Tx _Disable asserted and then re-enabled, the module returns to the last channel selected.

Absolute Maximum Ratings

It has to be noted that the operation in excess of any individual absolute maximum ratings might cause permanent damage to this module.

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Storage Temperature	TS	-40		85	℃	
Power Supply Voltage	VCC	-0.5		3.6	V	
Relative Humidity (non-condensation)	RH	5		95	%	
Damage Threshold	THd	0			dBm	

Recommended Operating Conditions

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Case Operating Temperature	Top	0	-	70	℃	Commercial
		-40		85		Industrial
Power Supply Voltage	Vcc	3.135	3.3	3.465	V	
Data Rate			8.5		Gb/s	
Control Input Voltage High		2		Vcc	V	
Control Input Voltage Low		0		0.8	V	
Link Distance (SMF)	D			80	km	9/125um

Electrical Characteristics

The following electrical characteristics are defined over the Recommended Operating Environment unless otherwise specified.

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Supply Voltage	p			1.5	W	
Supply Current	Icc			450	mA	
Transmitter (Module Input)						
Single-ended Input Voltage Tolerance	Vcc	-0.3		4.0	V	
AC Common Mode Input Voltage Tolerance (RMS)		15			mV	

Differential Input Voltage Swing	Vin,pp	240		910	mVpp	
Differential Input Impedance	Zin	90	100	110	Ohm	1
Transmit Disable Assert Time				10	us	
Transmit Disable Voltage	Vdis	Vcc-1.3		Vcc	V	
Transmit Enable Voltage	Ven	Vee		Vee +0.8	V	2
Receiver (Module Output)						
Differential Output Voltage Swing	Vout,pp	350		800	mVpp	
Differential Output Impedance	Zout	90	100	110	Ohm	3
Data output rise/fall time	Tr/Tf	30			ps	4
LOS Assert Voltage	VlosH	Vcc-1.3		Vcc	V	5
LOS De-assert Voltage	VlosL	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. Input 100 ohms differential termination.
4. These are unfiltered 20-80% values.
5. Loss of Signal is LVTTL. 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 and Characteristics

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Transmitter						
Optical Wavelength	λc	λc -0.05		λc +0.05	nm	1
Center Wavelength Spacing			50		GHz	
Optical Spectral Width	Δλ			1	nm	
Side Mode Suppression Ratio	SMSR	35			dB	
Average Optical Power	P_{AVG}	0		4	dBm	2
Optical Extinction Ratio	ER	6			dB	
Transmitter and Dispersion Penalty	TDP			3	dB	
Transmitter off Output power	Poff			-30	dBm	
Frequency stability (BOL)	-1.5			1.5	GHz	
Frequency stability (EOL)	-2.5			2.5	GHz	
Transmitter Eye Mask		Compliant with FC-PI-4				
Receiver						
Center Wavelength	λ_C	1270		1610	nm	
Receiver Sensitivity(Average power)	Sen.			-23	dBm	3
Input Saturation Power (overload)	Psat	-6			dBm	

LOS Assert	LOSA	-36			dB	
LOS De-assert	LOSD			-27	dBm	
LOS Hysteresis	LOSH	0.5			dBm	

Notes:

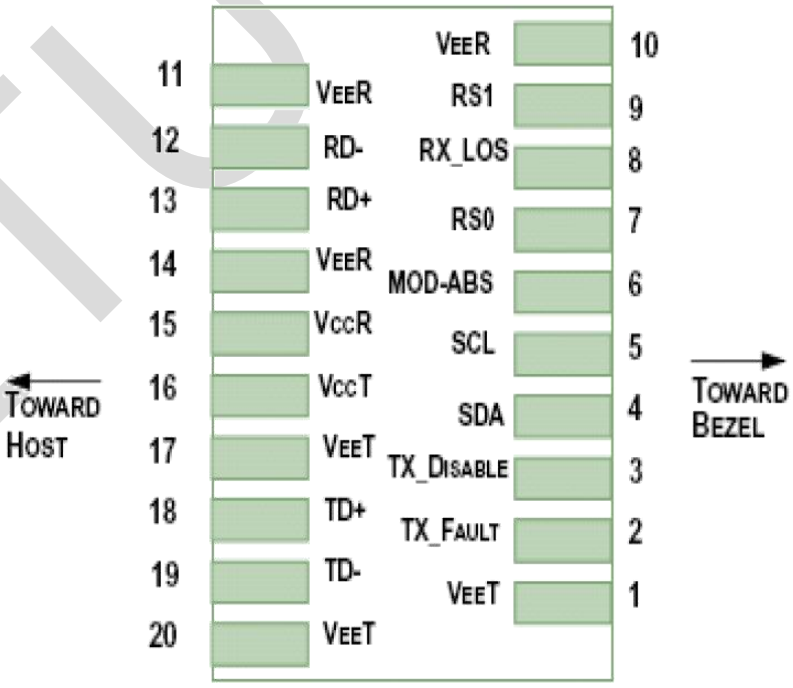
1. λc refer to wavelength selection, and corresponds to approximately 0.4 nm
2. Class 1 Laser Safety per FDA/CDRH and IEC-825-1 regulations.
3. Measured with Light source 1529.16~1568.36nm, ER=6.0dB; BER =<10^-12 @8.5Gbps, PRBS=2^31-1 NRZ.

Digital Diagnostics

The following digital diagnostic characteristics are defined over the Recommended Operating Environment unless otherwise specified. It is compliant to SFF-8472 Rev10.2 with internal calibration mode. For external calibration mode please contact our sales staff.

Parameter	Range	Accuracy	Unit	Calibration
Temperature	-40 to 85	±3	ºC	Internal
Voltage	0 to Vcc	±3%	V	Internal
Tx Bias Current	0 to 100	±10%	mA	Internal
Tx Output Power	-2to 6	±3	dB	Internal
Rx Input Power	-24 to -5	±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	
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. TFAULT 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.

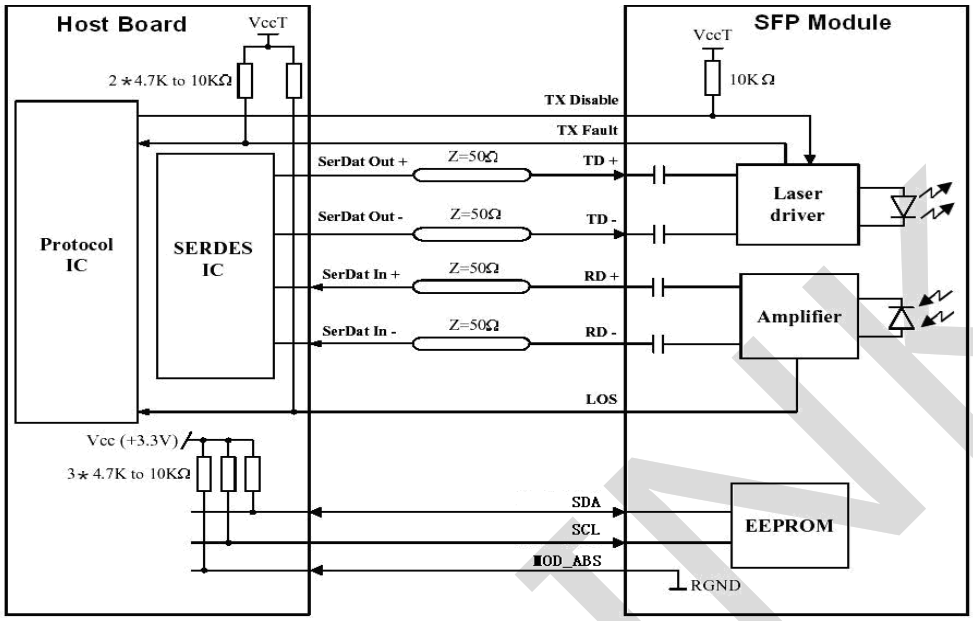
3. Laser output disabled on TDIS >2.0V or open, enabled on TDIS <0.8V.

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.

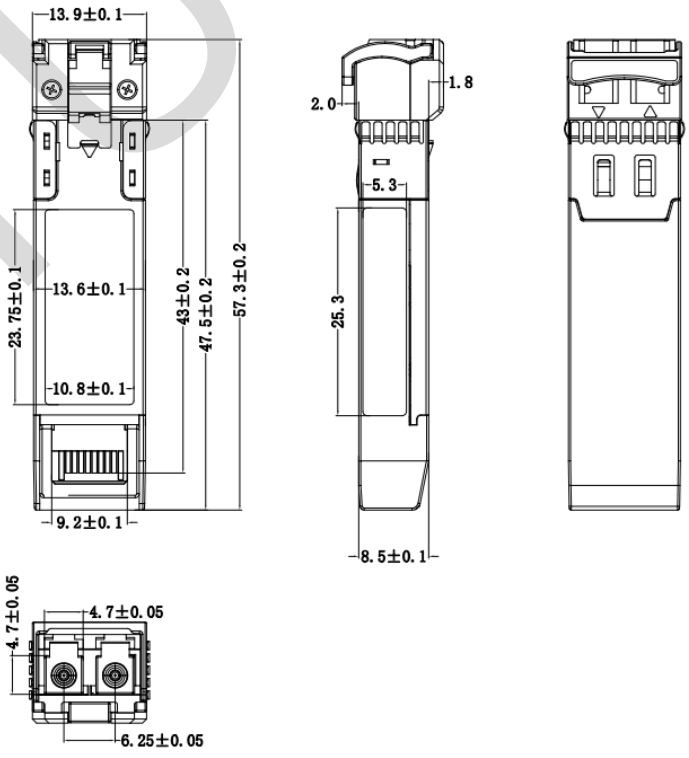
5. Internally pulled down per SFF-8431 Rev 4.1.

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	February 8, 2016	Preliminary datasheet
2.0	October 11,2023	Product upgrades
2.1	Sep 02, 2024	Format change

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