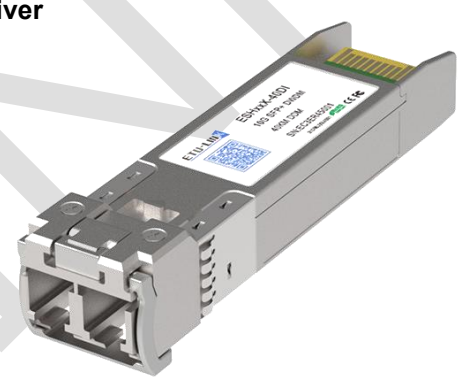
ESXxxX-40D(I)

10Gb/s SFP+ DWDM 40km DDM Transceiver

PRODUCT FEATURES



- **Support data rate up to 11.3Gb/s**
- **Support 40 km link distances**
- **Available in all C-Band Wavelengths on the 150GHz DWDM ITU Grid**
- **Temperature-Stabilized DWDM EML Transmitter and PIN Receiver**
- **Duplex LC connector**
- **Low power consumption:**
  - **Commercial:<1.5W**
  - **Industrial: <1.8W**
- **Positive power supply lines: 3.3 V**
- **Operating case temperature range:**
  - **Commercial:0 to 70°C**
  - **Industrial: -40 to 85°C**
- **RoHS 6 compliant**
- **Compliant with SFF-8431 / SFF-8472**

APPLICATIONS

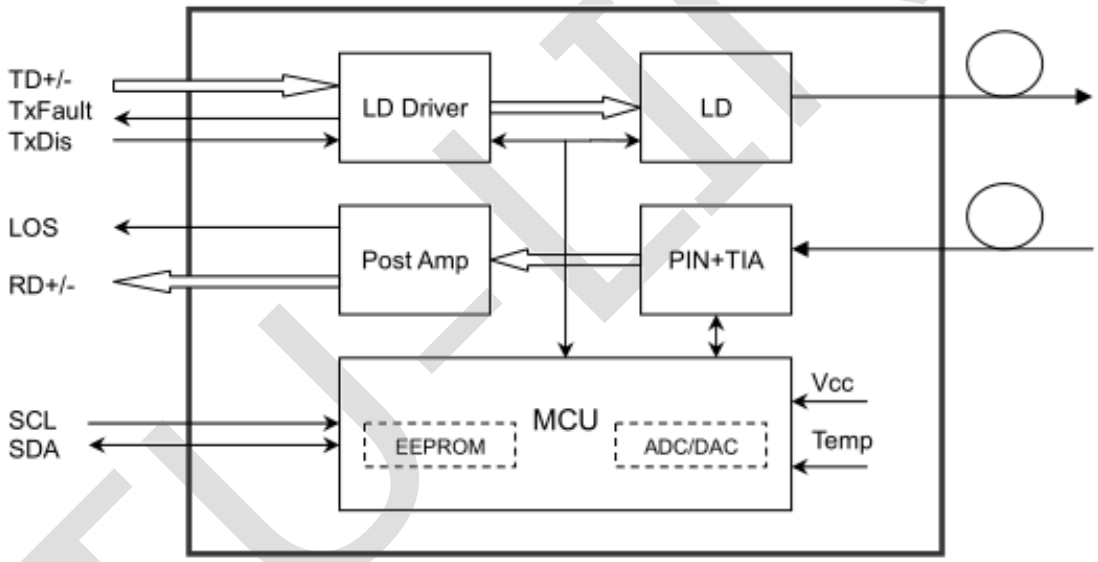
- **DWDM 10Gb/s Ethernet**
- **OTU2/2e**
- **Other Optical Links**

Description

The ESXxxX-40D(I) series single mode transceiver is small form factor pluggable module for duplex optical data communications such as 10GBASE-ER defined by IEEE 802.3. The ESHxxX-40D(I) module is designed for single mode fiber and operates at a nominal wavelength of 1528.38nm to 1564.45nm; the transmitter section uses a multiple quantum well EML, which is class 1 laser compliant according to International Safety Standard IEC-60825.

The SFP+ 40km 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
ESXxxX-40D	10.3125Gbps	EML	SMF	40km	LC	0~70℃	Y
ESXxxX-40DI	10.3125Gbps	EML	SMF	40km	LC	-40~85℃	Y

Wavelength Guide Table

SFP+ 10G DWDM 150Ghz 40km LC			SFP+ 10G DWDM 150Ghz 40km LC		
Channel Code	Center Freq.	λ	Channel Code	Center Freq.	λ
CH01	191.4	1566.31	CH19	194.10	1544.53
CH02	191.55	1565.09	CH20	194.25	1543.33
CH03	191.7	1563.86	CH21	194.40	1542.14
CH04	191.85	1562.64	CH22	194.55	1540.95
CH05	192	1561.42	CH23	194.70	1539.77
CH06	192.15	1560.2	CH24	194.85	1538.58
CH07	192.3	1558.98	CH25	195.00	1537.4
CH08	192.45	1557.77	CH26	195.15	1536.22
CH09	192.6	1556.55	CH27	195.30	1535.04
CH10	192.75	1555.34	CH28	195.45	1533.86
CH11	192.9	1554.13	CH29	195.60	1532.68
CH12	193.05	1552.93	CH30	195.75	1531.51
CH13	193.2	1551.72	CH31	195.90	1530.33
CH14	193.35	1550.52	CH32	196.05	1529.16
CH15	193.5	1549.32	CH33	196.2	1527.99
CH16	193.65	1548.11	CH34	196.35	1526.85
CH17	193.8	1546.92	CH35	196.5	1525.66
CH18	193.95	1545.72	CH36	196.65	1524.49

Absolute Maximum Ratings

Parameter	Symbol	Min	Typ	Max	Units
Storage Temperature	T_{stg}	-40	-	85	ºC
Relative Humidity - Storage	RH_O	5	-	95	%
Relative Humidity - Operating	RH_S	5	-	85	%
Power Supply	V_{CC}	-0.5	-	3.6	V

Recommended Operating Conditions

Parameter	Symbol	Min	Typ	Max	Units	Notes
Case Operating Temperature		-40	25	85	ºC	Temperature Range = I
Case Operating Temperature		0	25	70	ºC	Temperature Range = C
DC Supply Voltage	V_{CC}	3.13	-	3.47	V	
Transmission Distance	TD	-	-	40	km	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
Supply Voltage		V_{CC}	3.135		3.465	V	
Supply Current		I_{CC}			450	mA	Commercial
					540		Industrial
Power Consumption		P			1.5	W	Commercial
					1.8		Industrial
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 Characteristics

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Transmitter						
Average Output Power	POUT	-1		4	dBm	1
Average Output Power(Laser Off)	POFF			-30	dBm	
Wavelength	λ	λ-0.1		λ+0.1	nm	
Center Wavelength Spacing			100		GHz	4
Spectrum Bandwidth @ -20dB	Δλ			1	nm	
Side mode suppression ratio(SMSR)	SMSR	30			dB	
Extinction ratio	ER	8.2			dB	
$RIN_{20}OMA$	RIN			-128	dB/Hz	2
Optical return loss tolerance	ORLT	20			dB	
Receiver						
Wavelength	λ	1270		1610	nm	
Received Sensitivity	P_{IN}			-16	dBm	3
Optical Power Overload	P_{IN}(SAT)	0			dBm	
Rx_LOS of Signal Assert	P_A	-30			dBm	
Rx_LOS of Signal De-assert	P_D			-17	dBm	
Rx_LOS of Signal Hysteresis	PHy	0.5			dB	

Optical Return Loss Tolerance	ORLT	20			dB	

Notes:

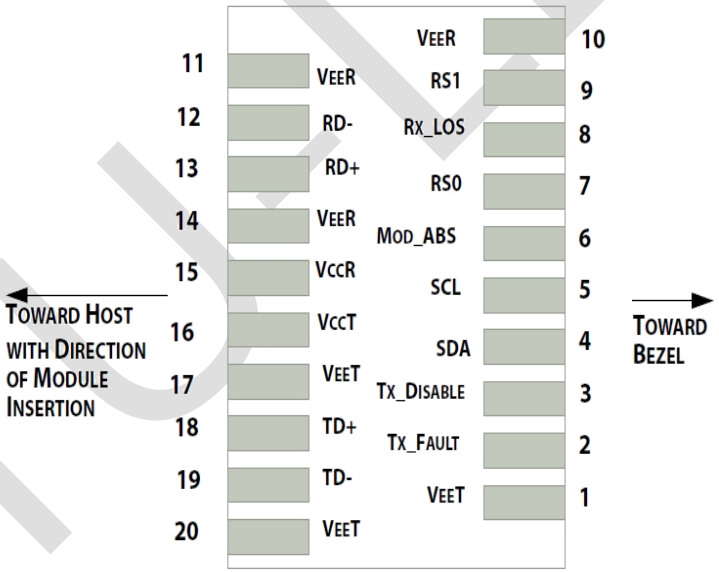
1. Output is coupled into a 9/125um SMF.
2. 12dB reflection.
3. Measured with worst ER, BER less than 1E-12 and PRBS 2^31-1 at 10.3125Gbps.
4. Corresponds to approximately 0.8 nm.

Digital Diagnostic Monitor Accuracy

The following characteristics are defined over recommended operating condition

Parameter	Range	Accuracy	Unit	Calibration
Temperature	-40 to 85	±3	ºC	Internal
Voltage	3 to 3.6	±3%	V	Internal
Tx Bias Current	0 to 100	±10%	mA	Internal
Tx Output Power	-1 to 4	±3	dB	Internal
Rx Input Power	-16 to 0	±3	dB	Internal

Pin Diagram



Pin Descriptions

PIN #	Name	Function	Notes
1	VeeT	Module transmitter ground	1
2	Tx Fault	Module transmitter fault	2
3	Tx Disable	Transmitter Disable; Turns off transmitter laser output	3
4	SDL	2 wire serial interface data input/output (SDA)	4
5	SCL	2 wire serial interface clock input (SCL)	4

6	MOD-ABS	Module Absent, connect to VeeR or VeeT in the module	4
7	RS0	Rate select0, optionally control SFP+ receiver. When high, input data rate >4.5Gb/s; when low, input data rate <=4.5Gb/s	5
8	LOS	Receiver Loss of Signal Indication	6
9	RS1	Rate select0, optionally control SFP+ transmitter. When high, input data rate >4.5Gb/s; when low, input data rate <=4.5Gb/s	1
10	VeeR	Module receiver ground	1
11	VeeR	Module receiver ground	1
12	RD-	Receiver inverted data output	
13	RD+	Receiver non-inverted data output	
14	VeeR	Module receiver ground	1
15	VccR	Module receiver 3.3V supply	
16	VccT	Module transmitter 3.3V supply	
17	VeeT	Module transmitter ground	1
18	TD+	Transmitter inverted data output	
19	TD-	Transmitter non-inverted data output	
20	VeeT	Module transmitter ground	1

Notes:

1. Circuit ground is internally isolated from chassis ground

2. Tx 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.

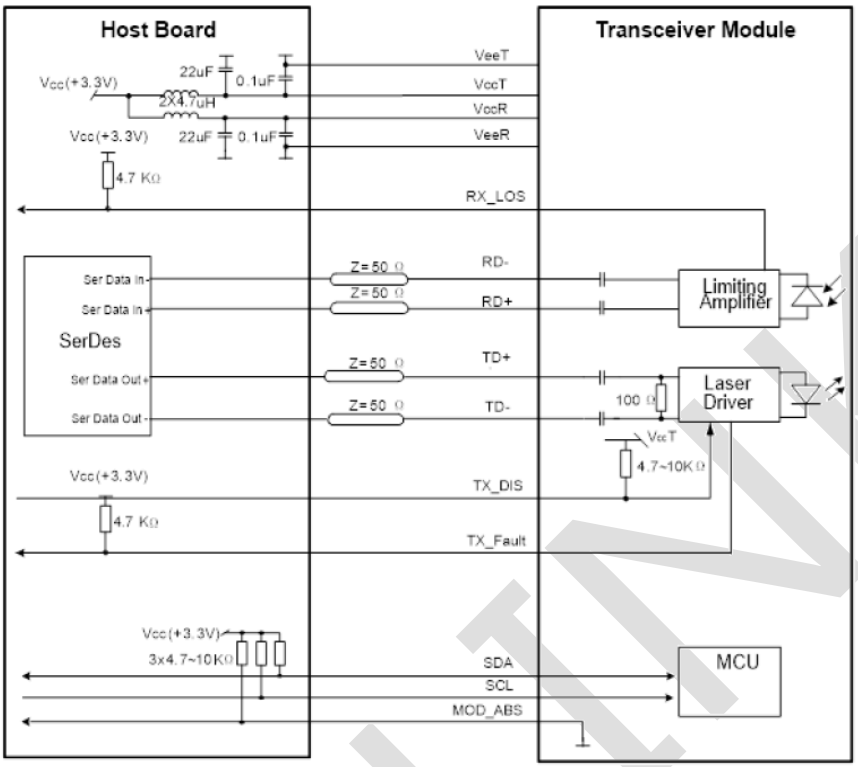
3. Laser output disabled on Tx DIS >2.0V or open, enabled on Tx DIS <0.8V.

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.

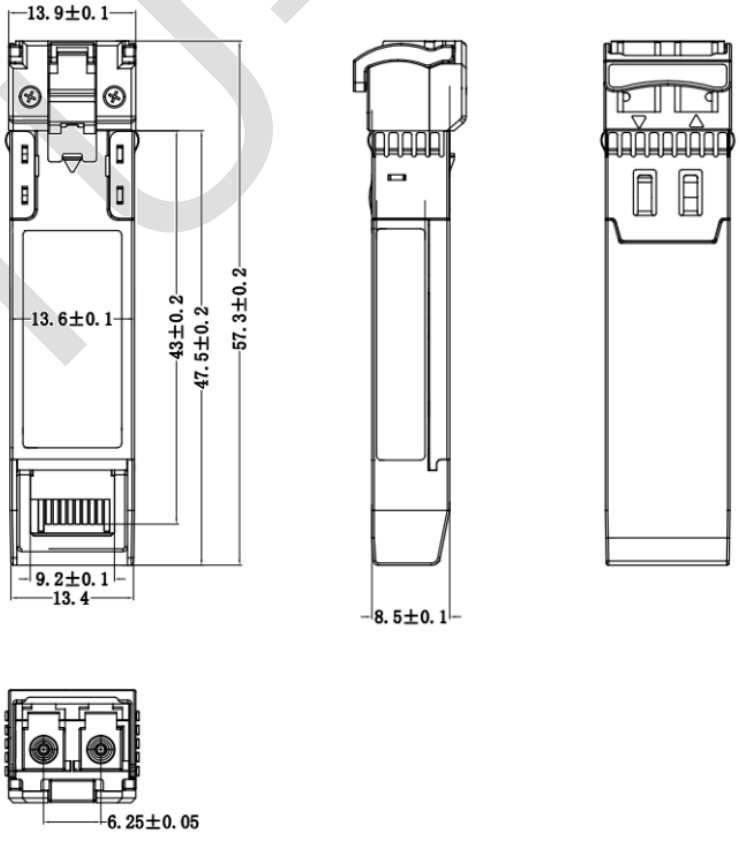
5. Internally pulled down per SFF-8431 Rev 4.1.

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.

Recommend Circuit Schematic



Mechanical Specifications(Unit: mm)



Revision History

Version No.	Date	Description
1.0	Apr 09 2025	Preliminary datasheet
1.1	October 22, 2025	Update Wavelength Guide Table

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