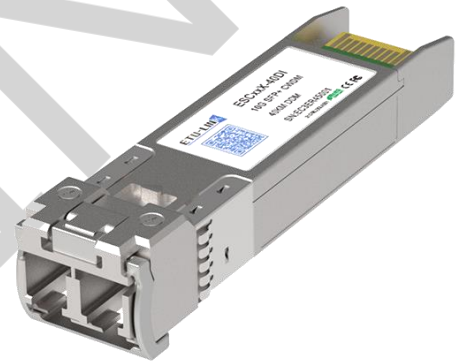


## ESCxxX-40DI

10Gb/s SFP+ CWDM Transceiver, Single Mode, 40km Reach

### PRODUCT FEATURES

- Supports up to 11.3Gbps bit rates
- Hot-Pluggable SFP Footprint and Single LC Connector
- CWDM DFB laser and PIN photodiode, Up to 40km for SMF transmission
- Compatible with RoHS
- Single +3.3V power supply
- Real Time Digital Diagnostic Monitoring
- Temperature Range:
  - Commercial: 0°C ~70°C
  - Extended: -20°C ~85°C
  - Industrial: -40°C ~85°C
- Low power consumption :<1.2W
- Compliant with SFP-8431
- Compliant with SFP-8432
- Compliant with SFP-8472
- Compliant with IEEE802.3ae
- Complies with EU Directive 2015/863/EU



### APPLICATIONS

- 10Gbps CWDM Optical systems
- 10GBASE-ER at 10.3125Gbps
- 10GBASE-EW at 9.953Gbps
- Other Optical links

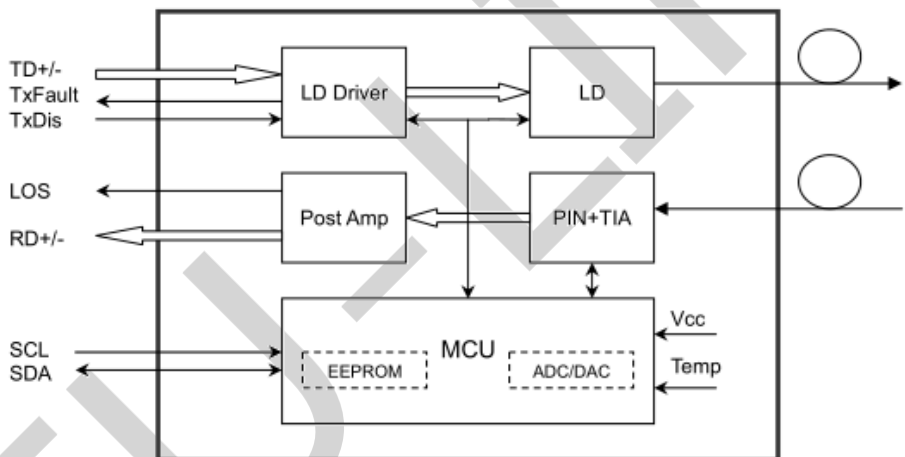
## DESCRIPTIONS

The SFP+ transceivers are high performance, cost effective modules supporting data rate of 10Gbps and 40km transmission distance with SMF.

The transceiver consists of three sections: a uncooled DFB laser transmitter, a PIN photodiode integrated with a trans-impedance preamplifier (TIA) and MCU control unit. All modules satisfy class I laser safety requirements.

The transceivers are compatible with SFP Multi-Source Agreement and SFF-8472 digital diagnostics functions.

## Module Block Diagram



## Ordering Information

Part No.	Data Rate(optical)	Laser	Fiber Type	Distance	Optical Interface	Temp	DDMI
ESCxxX-40D	10.3125Gbps	CWDM	SMF	40km	LC	0~70°C	Y
ESCxxX-40DE	10.3125Gbps	CWDM	SMF	40km	LC	-20~85°C	Y
ESCxxX-40DI	10.3125Gbps	CWDM	SMF	40km	LC	-40~85°C	Y

## Wavelength Guide Pin Descriptions

Part No.	Channel	Wavelength(nm)		
		min	typical	max
ESC27X-40D	C27	1264.5	1271	1277.5
ESC29X-40D	C29	1284.5	1291	1297.5
ESC31X-40D	C31	1304.5	1311	1317.5
ESC33X-40D	C33	1324.5	1331	1337.5
ESC35X-40D	C35	1344.5	1351	1357.5
ESC37X-40D	C37	1364.5	1371	1377.5
ESC39X-40D	C39	1384.5	1391	1397.5
ESC27X-40DI	C27	1263.5	1271	1278.5
ESC29X-40DI	C29	1283.5	1291	1298.5
ESC31X-40DI	C31	1303.5	1311	1318.5
ESC33X-40DI	C33	1323.5	1331	1338.5
ESC35X-40DI	C35	1343.5	1351	1358.5
ESC37X-40DI	C37	1363.5	1371	1378.5
ESC39X-40DI	C39	1383.5	1391	1398.5

## Absolute Maximum Ratings

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Storage Temperature	T <sub>stg</sub>	-40		+85	°C	
Relative Humidity - Storage	R <sub>HS</sub>	5		95	%	
Relative Humidity - Operating	R <sub>HO</sub>	5		85	%	
DC Supply Voltage	V <sub>CC</sub>	0		3.6	V	

## 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	-	-	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 <sub>CC</sub>	3.135		3.465	V	
Supply Current		I <sub>CC</sub>			360	mA	
Power Consumption		P			1.2	W	
<b>Transmitter (Module Input)</b>							
Differential Input Resistance		R <sub>Rdin</sub>	80	100	120	Ω	
Input Differential Voltage		R_V <sub>diff</sub>	110	-	1050	mVpp	
Tx_Disable	Normal Operation	V <sub>IL</sub>	-0.3	-	0.8	V	
	Laser Disable	V <sub>IH</sub>	2.0	-	V <sub>CC</sub> +0.3	V	
<b>Receiver (Module Output)</b>							
Differential Resistance		T_R <sub>d</sub>	80	100	120	Ohm	
Output Differential Voltage		T_V <sub>diff</sub>	360	-	770	mVpp	
Differential Termination Resistance Mismatch		T_R <sub>dm</sub>	-	-	5	%	
Rx los	Normal Operation	V <sub>OL</sub>	-0.3	-	0.4	V	
	Loss Signal	V <sub>OH</sub>	2		V <sub>CC</sub> H <sub>OST</sub>	V	

## Optical and Characteristics

Parameter	Symbol	Min	Typical	Max	Unit	Notes
<b>Transmitter</b>						
Centre Wavelength	λ <sub>c</sub>	λ <sub>c</sub> -6.5	λ <sub>c</sub>	λ <sub>c</sub> +6.5	nm	
Spectral Width (-20dB)	Δλ			1	nm	
Side-Mode Suppression Ratio	SMSR	30	-		dB	
Average Output Power	P <sub>out</sub>	0		5	dBm	1
Extinction Ratio	ER	3.5			dB	
RIN <sub>20OMA</sub>	RIN			-128	dB/Hz	2
<b>Receiver</b>						
Centre Wavelength	λ <sub>c</sub>	1260		1620	nm	
Receiver Sensitivity				-16	dBm	3
Receiver Overload		0.5			dBm	
LOS De-Assert	LOS <sub>D</sub>			-17	dBm	
LOS Assert	LOS <sub>A</sub>	-30			dBm	
LOS Hysteresis		0.5			dB	

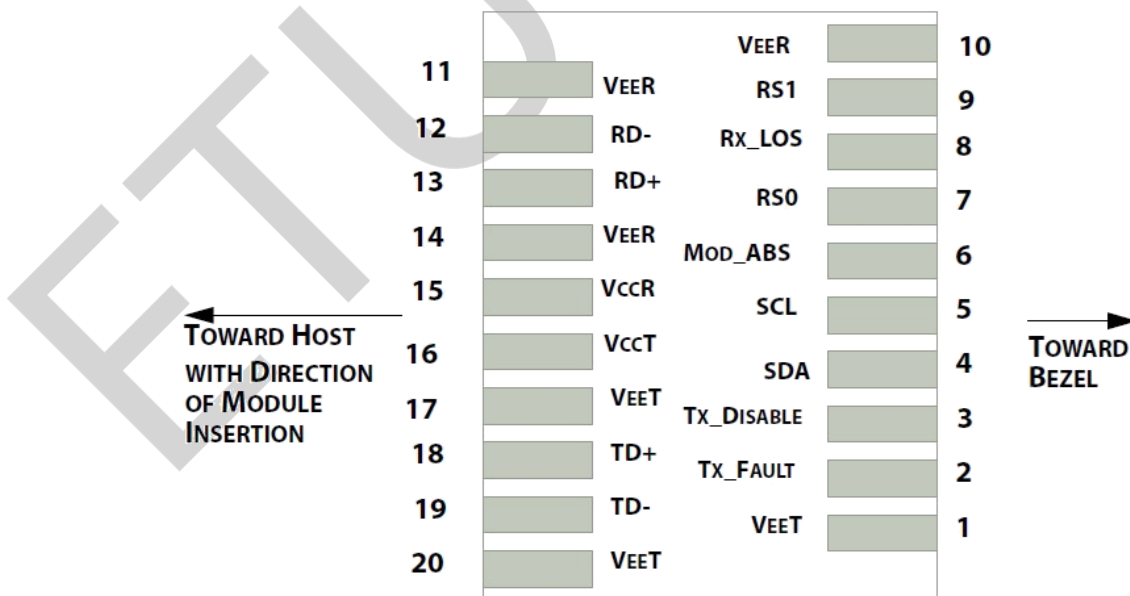
**Notes:**

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.

**Digital Diagnostics**

Parameter	Range	Unit	Accuracy	Calibration
Temperature	-40 to +85	°C	±3°C	Internal
Voltage	3.0 to 3.6	V	±3%	Internal
Bias Current	0 to 100	mA	±10%	Internal
TX Power	0 to 5	dBm	±3dB	Internal
RX Power	-16 to 0.5	dBm	±3dB	Internal

**Pin Diagram**



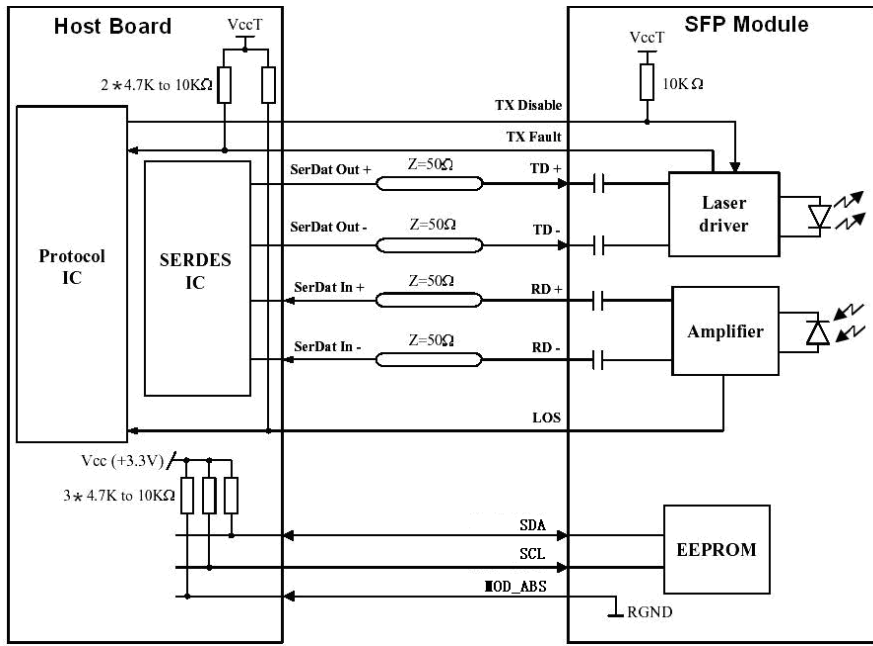
## Pin Definitions

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

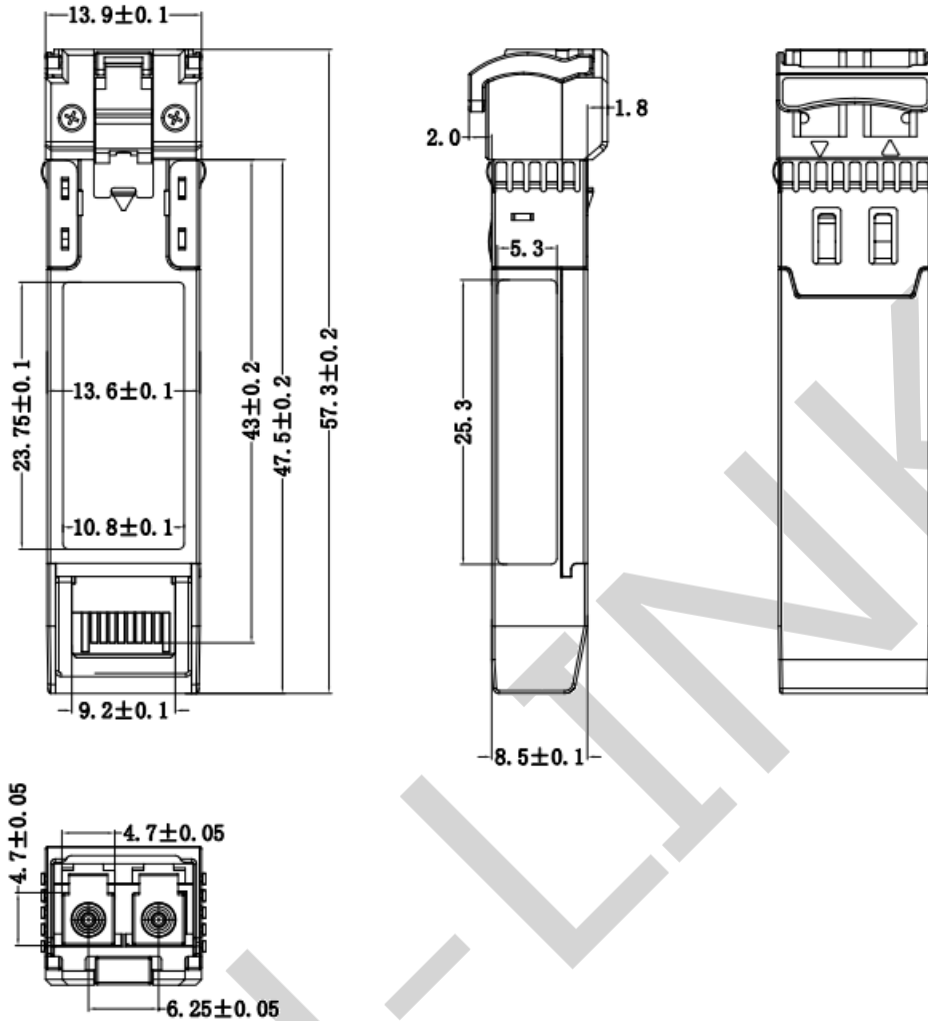
### Notes:

- Circuit ground is internally isolated from chassis ground
- 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.
- Laser output disabled on Tx DIS >2.0V or open, enabled on Tx DIS <0.8V.
- 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.
- Internally pulled down per SFF-8431 Rev 4.1.
- 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 15, 2016	Preliminary datasheet
2.0	December 18, 2023	Product upgrades
2.0	Aug 8, 2024	Format change

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