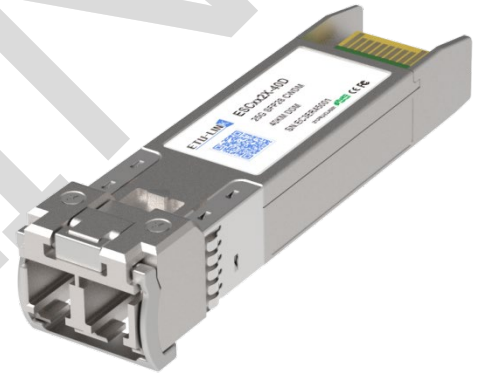


## ESCxx2X-40D(I)

### 25Gb/s SFP28 CWDM 40km DDM Transceiver

#### PRODUCT FEATURES

- Support data rate up to 25.78125Gb/s
- Hot-Pluggable SFP Footprint and duplex LC receptacle
- Up to 40km reach for G.652 SMF
- CWDM DFB laser and APD receiver
- Temperature Range:
  - Commercial:0°C ~70°C
  - Industrial: -40°C ~85°C
- Power consumption
  - Commercial:1W
  - Industrial:1.2W
- RoHS 6 compliance
- Compliant to IEEE 802.3cc, SFF-8472 and SFF-8419
- Complies with EU Directive 2015/863/EU



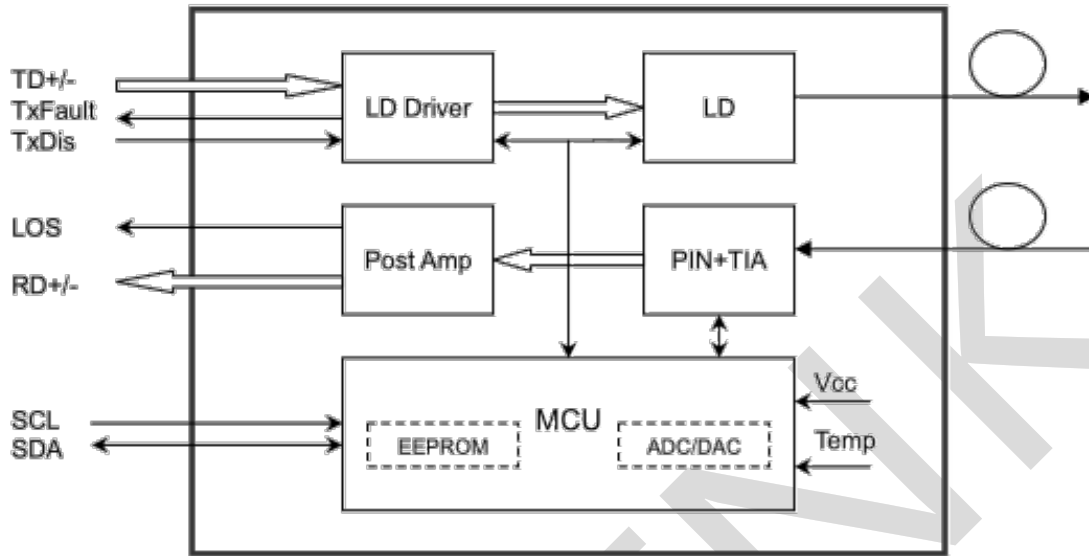
#### APPLICATIONS

- 25GBASE Ethernet
- CPRI option 10

#### DESCRIPTIONS

The ESCxx2X-40D(I) is a single Channel, Pluggable, Fiber Optic SFP28 for 25 Gigabit Ethernet Application. It is a high performance module for short-range data communication and interconnect applications which operate at 25.78125 Gbps up to 40km. They are compliant with SFF-8431, SFF-8432. The transmitter converts serial CML electrical data into serial optical data. The receiver converts serial optical data into serial CML electrical data. Digital diagnostics functions are available via a 2-wire serial interface, as specified in SFF-8472.

## Module Block Diagram



## Ordering Information

Part No.	Data Rate(optical)	Laser	Fiber Type	Distance	Optical Interface	Temp	DDMI
ESCxx2X-40D	25.78125Gbps	DFB	SMF	40km	LC	0~70°C	Y
ESCxx2X-40DI	25.78125Gbps	DFB	SMF	40km	LC	-40~85°C	Y

## Wavelength Guide Table

Part No.	Channel	Wavelength(nm)		
		min	typical	max
ESC272X-40D	C27	1264.5	1271	1277.5
ESC292X-40D	C29	1284.5	1291	1297.5
ESC312X-40D	C31	1304.5	1311	1317.5
ESC332X-40D	C33	1324.5	1331	1337.5
ESC272X-40DI	C27	1263.5	1271	1278.5
ESC292X-40DI	C29	1283.5	1291	1298.5
ESC312X-40DI	C31	1303.5	1311	1318.5
ESC332X-40DI	C33	1323.5	1331	1338.5

## Absolute Maximum Ratings

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Storage Temperature	T <sub>stg</sub>	-40		+85	°C	
Case Operating	T <sub>o</sub>	0		70	°C	

Temperature(Commercial)						
Case Operating Temperature (Industrial)	T <sub>o</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	T <sub>op</sub>	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-25G-VSR

Low-Speed Signal: Compliant to SFF-8419

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes	
<b>Transmitter (Module Input)</b>							
Differential Input Resistance	R <sub>Rdin</sub>	90	100	110	Ω		
Input Differential Voltage	R <sub>Vdiff</sub>	-	-	900	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 <sub>Rd</sub>	90	100	110	Ohm		
Output Differential Voltage	T <sub>Vdiff</sub>	-	-	900	mVpp		
Differential Termination Resistance Mismatch	T <sub>Rdm</sub>	-	-	10	%		
Rx los	Normal Operation	V <sub>OL</sub>	-0.3	-	0.4	V	
	Loss Signal	V <sub>OH</sub>	2		V <sub>CC</sub> HOST	V	

## Optical and Characteristics

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
<b>Transmitter</b>						
Optical Modulation Amplitude(OMA)	POMA	0		6	dBm	
Average Output Power	POUT	0		6	dBm	
Average Output Power(Laser Off)	POFF			-30	dBm	
Spectrum Bandwidth @ -20dB	Δλ			1	nm	
Side mode suppression ratio(SMSR)	SMSR	30			dB	
Extinction ratio	ER	3.5			dB	

RIN <sub>20</sub> OMA	RIN			-130	dB/Hz	
<b>Receiver</b>						
Wavelength	$\lambda$	1260		1620	nm	
Received Sensitivity(OMA)	$P_{SEN-OMA}$			-18	dBm	1
Optical Power Overload	$P_{IN(SAT)}$	-4			dBm	
Receiver Reflectance	RFL			-26	dB	
Rx_LOS of Signal Assert	$P_A$	-38			dBm	
Rx_LOS of Signal De-assert	$P_D$			-21	dBm	
Rx_LOS of Signal Hysteresis	$P_{Hy}$	0.5		5	dB	
Optical Return Loss Tolerance	ORLT	20			dB	

Notes:

1. Test pattern: PRBS31. BER<5x10<sup>-5</sup>;

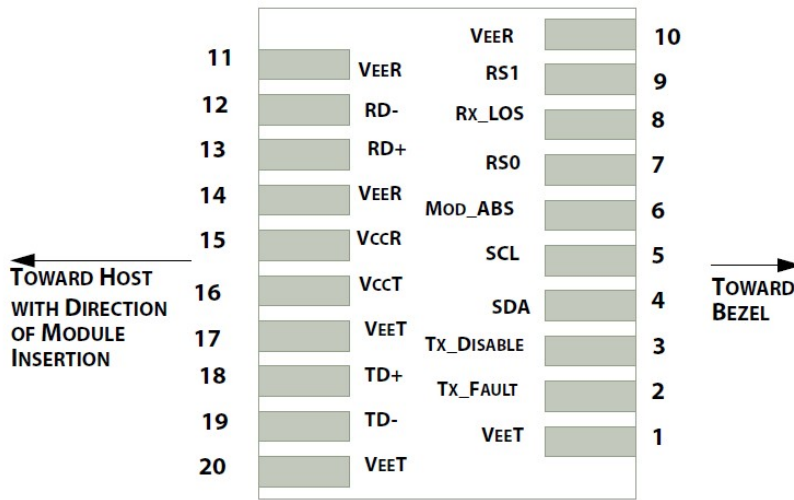
## Digital Diagnostics

Parameter	Range	Accuracy	Unit	Calibration
Temperature	-40 to 85	±3	°C	Internal
Voltage	3.13 to 3.47	±3%	V	Internal
Tx Bias Current	0 to 100	±10%	mA	Internal
Tx Output Power	0 to 6	±3	dB	Internal
Rx Input Power	-21 to -4	±3	dB	Internal

## Communication Interface Timing Characteristics

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
TX_Disable Assert Time	t <sub>off</sub>			100	us	
TX_Disable Negate Time	t <sub>on</sub>			2	ms	
Time to Initialize Include Reset of TX_FAULT	t <sub>int</sub>			300	ms	
TX_FAULT from Fault to Assertion	t <sub>fault</sub>			100	us	
TX_Disable Time to Start Reset	t <sub>reset</sub>	10			us	
Receiver Loss of Signal Assert Time	T <sub>A,RX_LOS</sub>			100	us	
Receiver Loss of Signal Deassert Time	T <sub>d,RX_LOS</sub>			100	us	
Rate-Select Chage Time	t <sub>ratesel</sub>			10	us	

## Pin Diagram



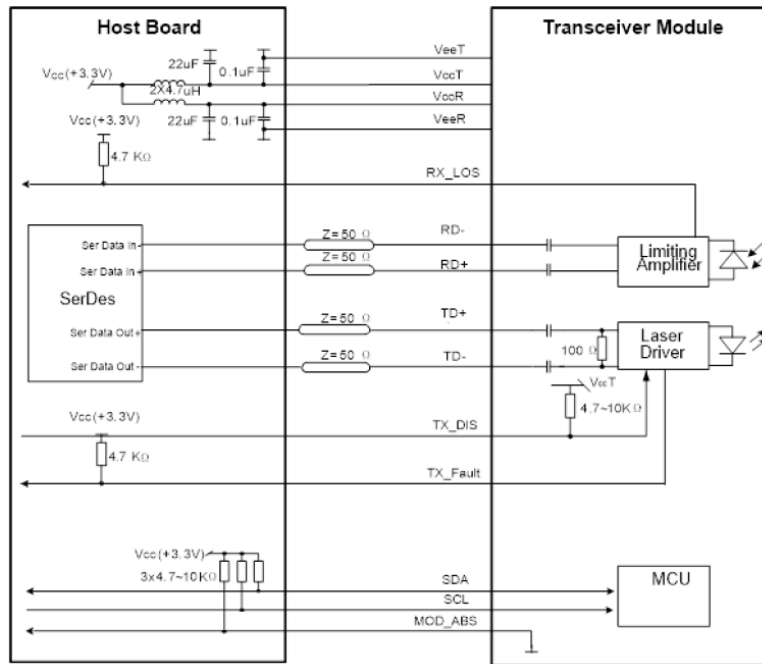
### Pin Definitions

PIN #	Name	Function	Notes
1	VeeT	Transmitter Ground	1
2	Tx Fault	Transmitter Fault - High indicates a fault condition	2
3	Tx Disable	Transmitter Disable – High or open disables the transmitter	
4	SDL	2-wire Serial Interface Data Line (MOD-DEF2)	3
5	SCL	2-wire Serial Interface Clock (MOD-DEF1)	3
6	MOD-ABS	Module Absent, connected to VeeT or VeeR in the module	
7	RS0	Rate Select 0	5
8	RX_LOS	Receiver Loss of Signal(LVTTL-O). Logic 0 indicates normal operation	4
9	RS1	Rate Select 1	1
10	VeeR	Receiver Ground	1
11	VeeR	Receiver Ground	1
12	RD-	Inverse Received Data out (CML-O), AC Coupled	
13	RD+	Receiver Non-inverted DATA out. AC Coupled	
14	VeeR	Receiver Ground	1
15	VccR	Receiver Power Supply	
16	VccT	Transmitter Power Supply	
17	VeeT	Transmitter Ground	1
18	TD+	Transmitter Non-Inverted DATA in. AC Coupled.	
19	TD-	Transmitter Inverted DATA in. AC Coupled.	
20	VeeT	Transmitter Ground	1

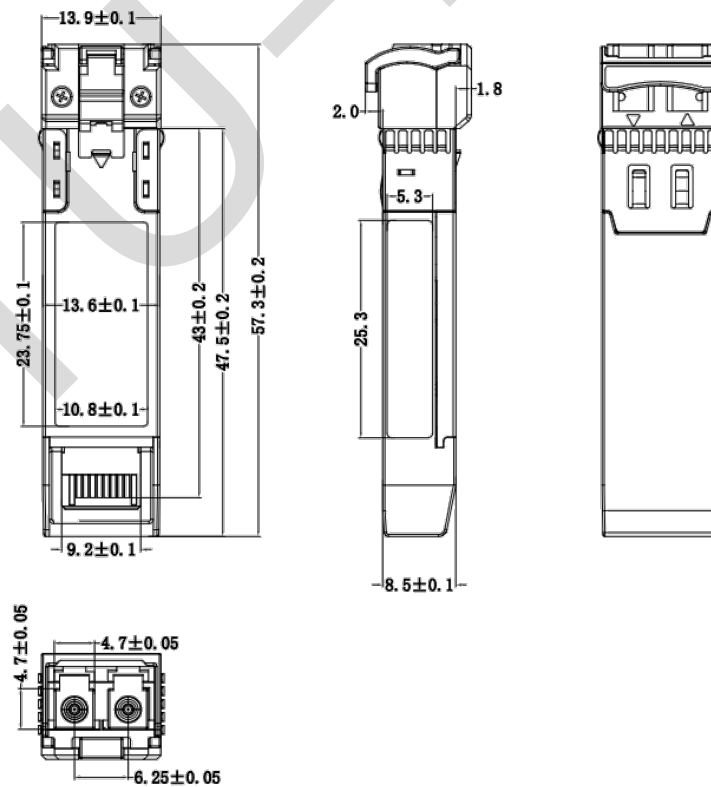
Notes:

1. Module ground pins GND are isolated from the module case.
2. Tx\_Fault is an open collector/drain output, which should be pulled up with a 4.7k – 10k Ohms resistor on Host board.
3. Should be pulled up with 4.7k–10kohms on host board to a voltage between 2.0V and 3.6V.
4. LOS is open collector output. Should be pulled up with 4.7k–10kohms on host board to a voltage between 2.0V and 3.6V.
5. RS0 and RS1 pins are pulled low to GND with a resistor > 30KΩ in module.

### Recommended Interface Circuit



### Mechanical Diagram



## Revision History

Version No.	Date	Description
1.0	February 8, 2021	Preliminary datasheet
2.0	Aug 21, 2024	Format change

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