

**ESCxxX-10D(I)**  
**10Gbps CWDM 10KM SFP+ Transceiver**

**PRODUCT FEATURES**

- Support data rate up to 11.3Gb/s
- Hot-Pluggable SFP Footprint and Single LC Connector
- Up to 10km reach for G.652 SMF
- CWDM DFB laser and PIN receiver
- Temperature Range:
  - Commercial: 0°C ~70°C
  - Extended: -20°C ~85°C
  - Industrial: -40°C ~85°C
- Power consumption <1W
- Compliant with SFP-8431
- Compliant with SFP-8432
- Compliant with SFP-8472
- Compliant with IEEE802.3ae
- RoHS 6 compliance
- Complies with EU Directive 2015/863/EU



**APPLICATIONS**

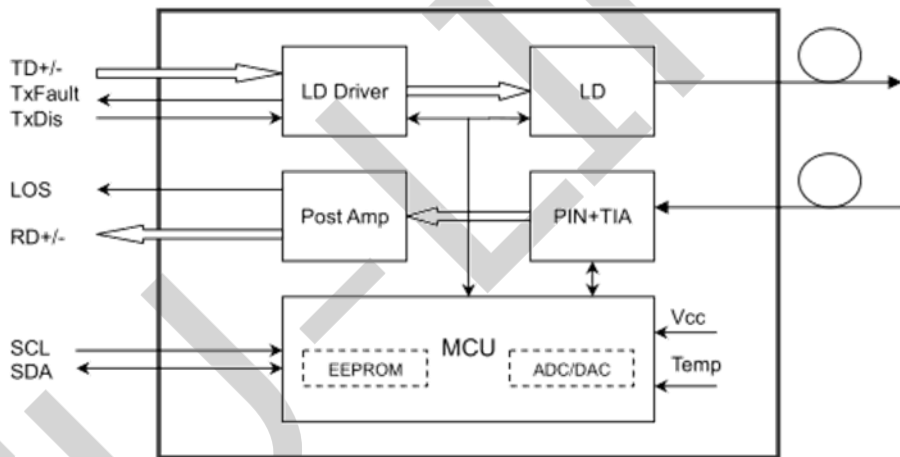
- 10GBASE-LR/LW
- OTU2/2e
- Other Optical Links

## DESCRIPTIONS

This CWDM DFB 10Gbps SFP+ transceiver is designed to transmit and receive optical data over single mode optical fiber for link length 10km.

The SFP+ 10km 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
ESCxxX-10D	10.3125Gbps	CWDM	SMF	10km	LC	0~70℃	Y
ESCxxX-10DE	10.3125Gbps	CWDM	SMF	10km	LC	-20~85℃	Y
ESCxxX-10DI	10.3125Gbps	CWDM	SMF	10km	LC	-40~85℃	Y

## Wavelength Guide Pin Descriptions

Part No.	Channel	Wavelength(nm)		
		min	typical	max
ESC27X-10D	C27	1264.5	1271	1277.5
ESC29X-10D	C29	1284.5	1291	1297.5
ESC31X-10D	C31	1304.5	1311	1317.5
ESC33X-10D	C33	1324.5	1331	1337.5
ESC35X-10D	C35	1344.5	1351	1357.5
ESC37X-10D	C37	1364.5	1371	1377.5
ESC39X-10D	C39	1384.5	1391	1397.5
ESC41X-10D	C41	1404.5	1411	1417.5
ESC43X-10D	C43	1424.5	1431	1437.5
ESC45X-10D	C45	1444.5	1451	1457.5
ESC47X-10D	C47	1464.5	1471	1477.5
ESC49X-10D	C49	1484.5	1491	1497.5
ESC51X-10D	C51	1504.5	1511	1517.5
ESC53X-10D	C53	1524.5	1531	1537.5
ESC55X-10D	C55	1544.5	1551	1557.5
ESC57X-10D	C57	1564.5	1571	1577.5
ESC59X-10D	C59	1584.5	1591	1597.5
ESC61X-10D	C61	1604.5	1611	1617.5
ESC27X-10DI	C27	1263.5	1271	1278.5
ESC29X-10DI	C29	1283.5	1291	1298.5
ESC31X-10DI	C31	1303.5	1311	1318.5
ESC33X-10DI	C33	1323.5	1331	1338.5
ESC35X-10DI	C35	1343.5	1351	1358.5
ESC37X-10DI	C37	1363.5	1371	1378.5
ESC39X-10DI	C39	1383.5	1391	1398.5
ESC41X-10DI	C41	1403.5	1411	1418.5
ESC43X-10DI	C43	1423.5	1431	1438.5
ESC45X-10DI	C45	1443.5	1451	1458.5
ESC47X-10DI	C47	1463.5	1471	1478.5
ESC49X-10DI	C49	1483.5	1491	1498.5
ESC51X-10DI	C51	1503.5	1511	1518.5
ESC53X-10DI	C53	1523.5	1531	1538.5
ESC55X-10DI	C55	1543.5	1551	1558.5
ESC57X-10DI	C57	1563.5	1571	1578.5
ESC59X-10DI	C59	1583.5	1591	1598.5
ESC61X-10DI	C61	1603.5	1611	1618.5

## 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	-	-	10	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	
<b>Transmitter (Module Input)</b>							
Differential Input Resistance	R <sub>Rdin</sub>	80	100	120	Ω		
Input Differential Voltage	R <sub>Vdiff</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 <sub>Rd</sub>	80	100	120	Ohm		
Output Differential Voltage	T <sub>Vdiff</sub>	360	-	770	mVpp		
Differential Termination Resistance Mismatch	T <sub>Rdm</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> HOST	V	

## Optical and Characteristics

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
<b>Transmitter</b>						
Average Output Power	POUT	-6		-0.5	dBm	1
Average Output Power(Laser Off)	POFF			-30	dBm	
Extinction ratio	ER	3.5			dB	
Transmitter waveform and dispersion				4.7	dB	

penalty (TWDP)						
RIN20OMA	RIN			-128	dB/Hz	
Optical return loss tolerance	ORLT	20			dB	
<b>Receiver</b>						
Wavelength	$\lambda$	1260		1620	nm	
Received Sensitivity	$P_{IN}$			-15	dBm	BER<1x10 <sup>-12</sup>
Optical Power Overload	$P_{IN}$ (SAT)	0.5			dBm	
Damage threshold			1.5		dBm	2
Receiver Reflectance	RFL			-12	dB	
Rx_LOS of Signal Assert	$P_A$	-30			dBm	
Rx_LOS of Signal De-assert	$P_D$			-18	dBm	
Rx_LOS of Signal Hysteresis	$P_{Hy}$	0.5		5	dB	
Optical Return Loss Tolerance	ORLT	20			dB	

Notes:

1. The optical power is launched into SMF.
2. The receiver shall be able to tolerate, without damage, continuous exposure to an optical input signal having this average power level. The receiver does not have to operate correctly at this input power.

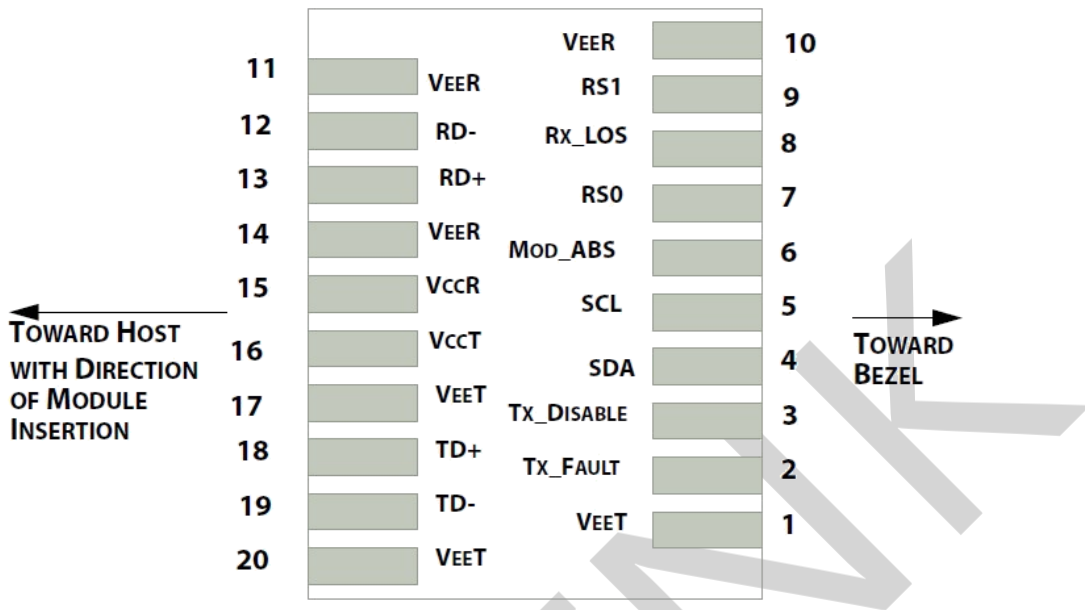
## Digital Diagnostics

Parameter	Range	Accuracy	Unit	Calibration
Temperature	-40 to 85	±3	°C	Internal
Voltage	3 to 3.6	±3%	V	Internal
Tx Bias Current	0 to 100	±10%	mA	Internal
Tx Output Power	-6 to 0	±3	dB	Internal
Rx Input Power	-15 to 0.5	±3	dB	Internal

## Communication Interface Timing Characteristics

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
TX_Disable Assert Time	$t_{off}$			100	us	
TX_Disable Negate Time	$t_{on}$			2	ms	
Time to Initialize Include Reset of TX_FAULT	$t_{int}$			300	ms	
TX_FAULT from Fault to Assertion	$t_{fault}$			100	us	
TX_Disable Time to Start Reset	$t_{reset}$	10			us	
Receiver Loss of Signal Assert Time	$T_A, RX\_LOS$			100	us	
Receiver Loss of Signal Deassert Time	$T_d, RX\_LOS$			100	us	
Rate-Select Chage Time	$t_{ratesel}$			10	us	

## Pin Diagram



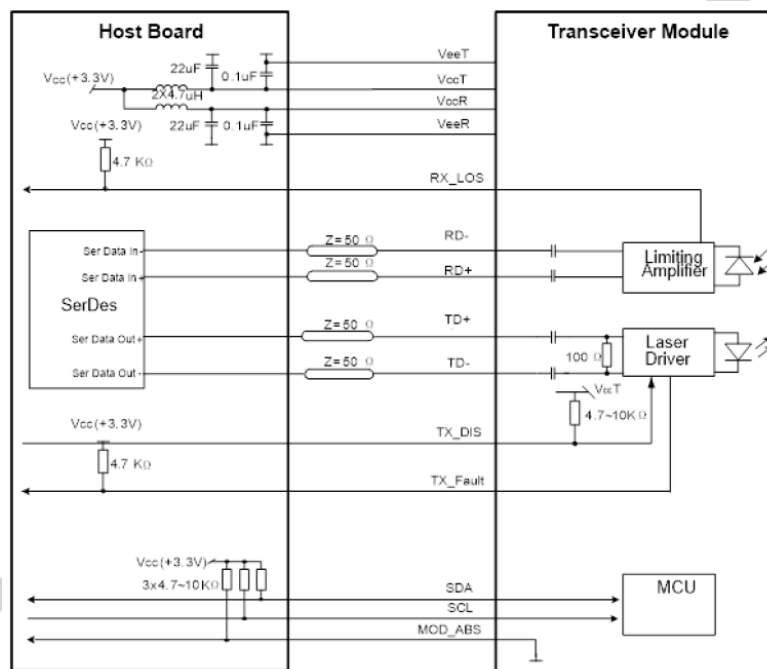
## Pin Definitions

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

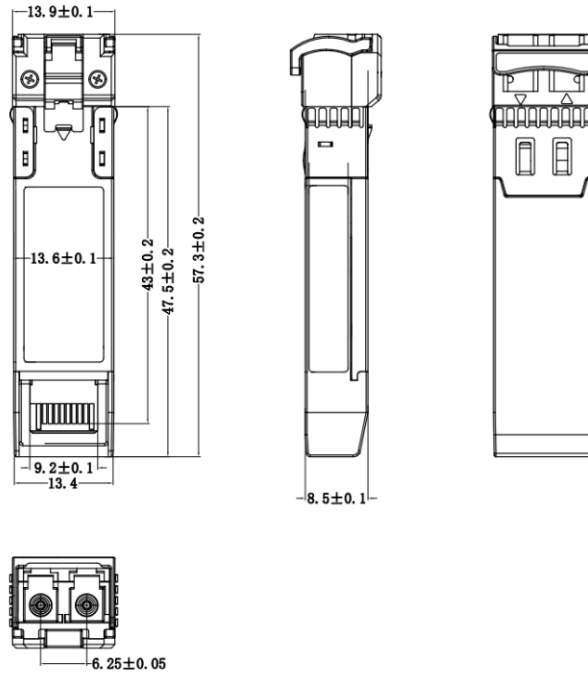
Notes:

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

### Recommended Interface Circuit



## Mechanical Diagram



## Revision History

Version No.	Date	Description
1.0	February 4, 2016	Preliminary datasheet
2.0	December 10, 2023	Product upgrades
2.0	Aug 21, 2024	Format change

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