

# ESDxx2X-10D(I)

## 25Gb/s SFP28 DWDM 10km DDM Transceiver

### PRODUCT FEATURES

- All metal housing for superior EMI performance
- Bit rate:
  - 25.78 Gb/s
  - 24.33 Gb/s
- Up to 10km transmission on SMF
- EML laser and PIN receiver
- High speed I/O electrical interface (25GAUI)
- I2C interface with integrated Digital Diagnostic monitoring
- SFP28 MSA package with duplex LC connector
- Single +3.3V power supply
- Power consumption: <2.0 W
- Operating case temperature: -40 to 85°C
- Digital Monitoring SFF-8472 Rev 10.2 compliant
- Complies with EU Directive 2015/863/EU



### APPLICATIONS

- 25G Ethernet
- CPRI Option 10

## Description

The ESDxx2X-10D(I) is a hot pluggable 3.3V Small-Form-Factor pluggable tunable SFP28 transceiver module for use in the up to 25.78Gb/s single mode high-speed communications equipment. The laser based 25Gigabit SFP28 DWDM Transceiver is designed to transmit and receive serial optical data over single mode optical fiber with 10km. Digital diagnostic functions are available via 2-wire serial interface, as specified in SFF-8431.

## Ordering information

Part No.	Data Rate(optical)	Laser	Fiber Type	Distance	Optical Interface	Temp	DDMI
ESDxx2X-10D	25.78125Gbps	EML	SMF	10km	LC	0~70°C	Y
ESDxx2X-10DI	25.78125Gbps	EML	SMF	10km	LC	-40~85°C	Y

## Wavelength Guide Table

Channel	Wavelength (nm)	Frequency(THZ)	Channel	Wavelength (nm)	Frequency(THZ)
C12	1567.95	191.20	C42	1543.73	194.20
C13	1567.13	191.30	C43	1542.94	194.30
C14	1566.31	191.40	C44	1542.14	194.40
C15	1565.50	191.50	C45	1541.35	194.50
C16	1564.68	191.60	C46	1540.56	194.60
C17	1563.86	191.70	C47	1539.77	194.70
C18	1563.05	191.80	C48	1538.98	194.80
C19	1562.23	191.90	C49	1538.19	194.90
C20	1561.42	192.00	C50	1537.40	195.00
C21	1560.61	192.10	C51	1536.61	195.10
C22	1559.79	192.20	C52	1535.82	195.20
C23	1558.98	192.30	C53	1535.04	195.30
C24	1558.17	192.40	C54	1534.25	195.40
C25	1557.36	192.50	C55	1533.47	195.50
C26	1556.55	192.60	C56	1532.68	195.60
C27	1555.75	192.70	C57	1531.90	195.70
C28	1554.94	192.80	C58	1531.12	195.80
C29	1554.13	192.90	C59	1530.33	195.90

C30	1553.33	193.00	C60	1529.55	196.00
C31	1552.52	193.10	C61	1528.77	196.10
C32	1551.72	193.20	C62	1527.99	196.20
C33	1550.92	193.30	C63	1527.22	196.30
C34	1550.12	193.40	C64	1526.44	196.40
C35	1549.32	193.50	C65	1525.66	196.50
C36	1548.51	193.60	C66	1524.89	196.60
C37	1547.72	193.70	C67	1524.11	196.70
C38	1546.92	193.80	C68	1523.34	196.80
C39	1546.12	193.90	C69	1522.56	196.90
C40	1545.32	194.00	C70	1521.79	197.00
C41	1544.53	194.10			

## Absolute Maximum Ratings

Parameter	Symbol	Min	Typ	Max	Units
Storage Temperature	T <sub>stg</sub>	-40	-	85	°C
Relative Humidity - Storage	RH <sub>o</sub>	5	-	95	%
Relative Humidity - Operating	RH <sub>s</sub>	5	-	85	%
Power Supply	V <sub>cc</sub>	-0.5	-	3.6	V

## Recommended Operating Conditions

Parameter	Symbol	Min	Typ	Max	Units	Notes
Case Operating Temperature		-40	25	85	°C	Temperature Range = I
Case Operating Temperature		0	25	70	°C	Temperature Range = C
DC Supply Voltage	V <sub>cc</sub>	3.13	-	3.47	V	

## 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	

## Optical Communications Products Alliance

Input Differential Voltage		R_V <sub>diff</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_R <sub>d</sub>	90	100	110	Ohm	
Output Differential Voltage		T_V <sub>diff</sub>	-	-	900	mVpp	
Differential Termination Resistance Mismatch		T_R <sub>dm</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 Characteristics

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes	
<b>Transmitter</b>							
Average Output Power	POUT	0		5	dBm		
Average Output Power(Laser Off)	POFF			-30	dBm		
Wavelength	$\lambda$	$\lambda_c-0.1$	$\lambda_c$	$\lambda_c+0.1$	nm	1	
Spectrum Bandwidth @ -20dB	$\Delta\lambda$			1	nm		
Side mode suppression ratio(SMSR)	SMSR	30			dB		
Extinction ratio	ER	4			dB		
Transmitter waveform and dispersion penalty (TWDP)				4.7	dB		
Optical Eye Mask		IEEE 802.3 cc					BER $\leq 5 \times 10^{-5}$
RIN <sub>20</sub> OMA	RIN			-130	dB/Hz		
Optical return loss tolerance	ORLT	20			dB		
<b>Receiver</b>							
Wavelength	$\lambda$	1260		1620	nm		
Received Sensitivity	P <sub>IN</sub>			-13.5	dBm	BER $\leq 5 \times 10^{-5}$	
Optical Power Overload	P <sub>IN</sub> (SAT)	2			dBm		
Rx_LOS of Signal Assert	P <sub>A</sub>	-25			dBm		
Rx_LOS of Signal De-assert	P <sub>D</sub>			-15	dBm		
Rx_LOS of Signal Hysteresis	PHy	0.5		5	dB		

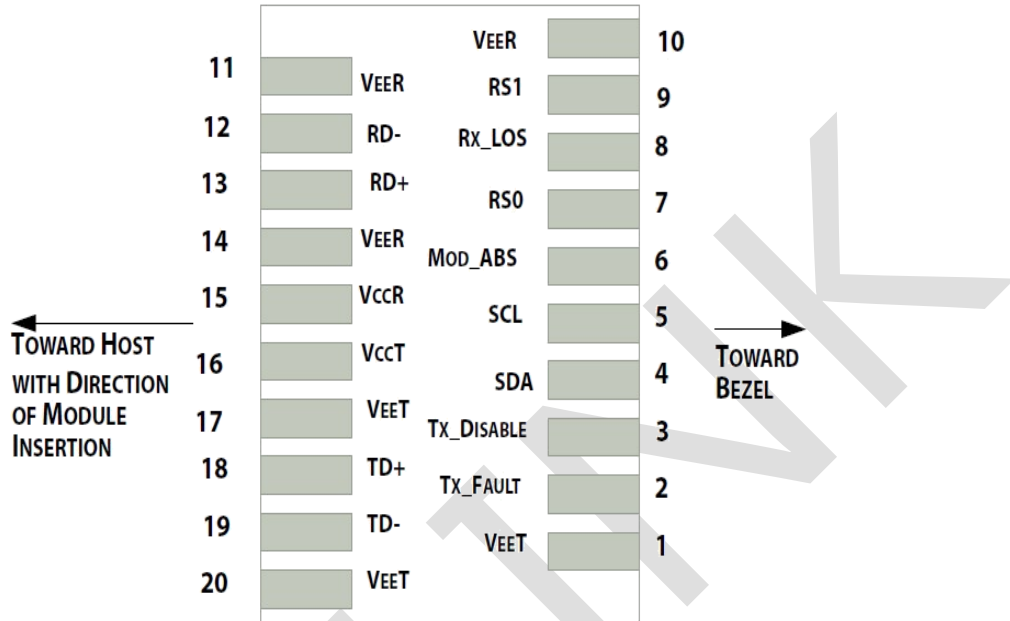
## Digital Diagnostic Monitor Accuracy

The following characteristics are defined over recommended operating condition

Parameter	Range	Accuracy	Unit	Calibration
Temperature	-40 to 85	$\pm 3$	$^{\circ}\text{C}$	Internal
Voltage	0 to V <sub>CC</sub>	$\pm 3\%$	V	Internal
Tx Bias Current	0 to 100	$\pm 10\%$	mA	Internal
Tx Output Power	-1 to 4	$\pm 3$	dB	Internal

Rx Input Power	-15 to 2	±3	dB	Internal
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## Pin Diagram



## Pin Descriptions

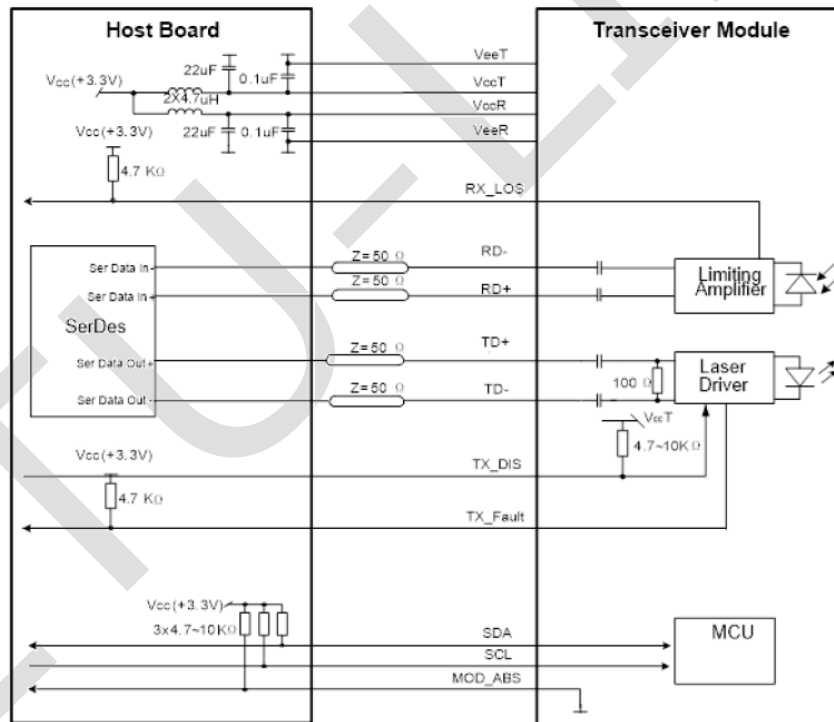
PIN #	Name	Function	Notes
1	VeeT	Module transmitter ground	1
2	Tx Fault	Module transmitter fault	2
3	Tx Disable	Transmitter Disable; Turns off transmitter laser output	3
4	SDL	2 wire serial interface data input/output (SDA)	4
5	SCL	2 wire serial interface clock input (SCL)	4
6	MOD-ABS	Module Absent,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

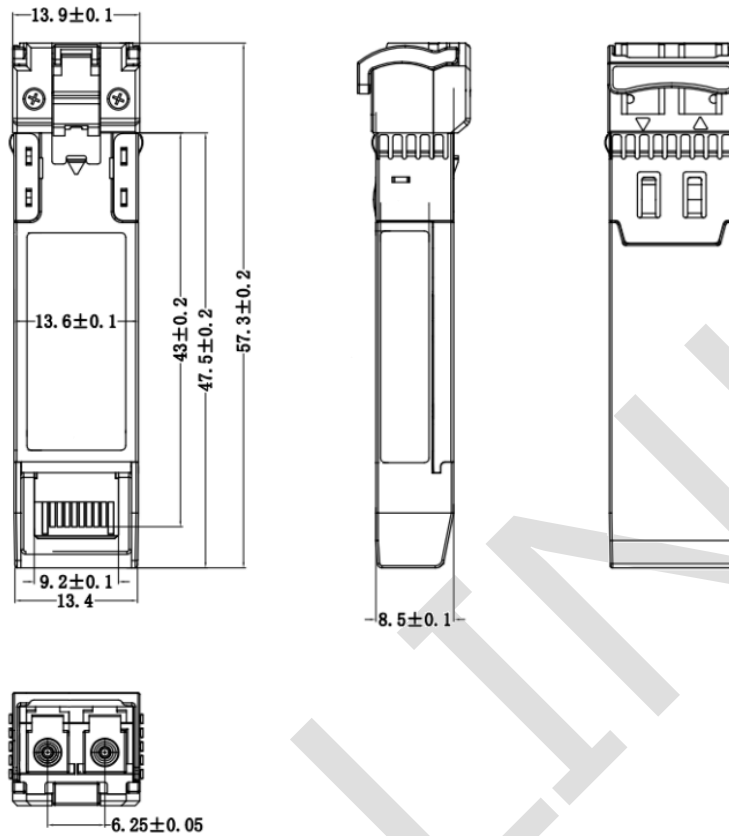
Notes:

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	May 11 2019	Preliminary datasheet
2.0	Dec 15 2023	Product upgrades
2.1	Aug 20, 2024	Format change

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