

## ESLxx2X-10D(I)

25Gb/s SFP28 LWDM 10km DDM Transceiver

### PRODUCT FEATURES

- All metal housing for superior EMI performance
- Up to 10km transmission on SMF
- DFB laser with TEC 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 12.4 compliant
- Complies with EU Directive 2015/863/EU



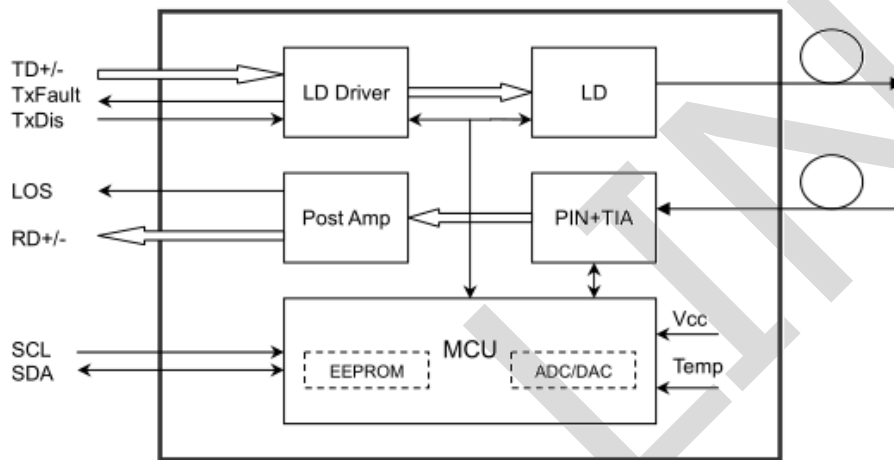
### APPLICATIONS

- CPRI Option 1.2288Gbps
- CPRI Option 2.4576Gbps
- CPRI Option 4.9152Gbps
- CPRI Option 9.8304Gbps
- CPRI Option 10.3125Gbps
- CPRI Option 25.78125Gbps

## DESCRIPTIONS

The ESLxx2X-10D(I) is a hot pluggable 3.3V Small-Form-Factor pluggable SFP28 transceiver module for use in the up to 25.78Gb/s single mode high-speed communications equipment. The laser based 25Gigabit SFP28 LWDM 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.

## Module Block Diagram



## Ordering Information

Part No.	Data Rate(optical)	Laser	Fiber Type	Distance	Optical Interface	Temp	DDMI	Latch Color
ESLxx2X-10D	25.78125Gbps	DFB	SMF	10km	LC	0~70°C	Y	Red
ESLxx2X-10DI	25.78125Gbps	DFB	SMF	10km	LC	-40~85°C	Y	Red

## Wavelength Guide Table

Channel	Wavelength (nm)			Unit
	Min	Typ	Max	
L01	1268.24	1269.23	1270.22	nm
L02	1272.55	1273.54	1274.54	nm
L03	1276.89	1277.89	1278.89	nm
L04	1281.25	1282.66	1283.27	nm
L05	1285.65	1286.66	1287.69	nm
L06	1290.09	1290.10	1292.13	nm

L07	1294.53	1295.56	1296.59	nm
L08	1299.02	1300.05	1301.09	nm
L09	1303.54	1304.58	1305.63	nm
L10	1308.09	1309.14	1310.19	nm
L11	1312.67	1313.73	1314.79	nm
L12	1317.28	1318.35	1319.42	nm

## Absolute Maximum Ratings

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
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.	Typical	Max.	Unit	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	
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_Ios	Normal Operation	V <sub>OL</sub>	-0.3	-	0.4	V

	Loss Signal	V <sub>OH</sub>	2		VCCHOST	V	
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## Optical and Characteristics

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
<b>Transmitter</b>						
Average Output Power	POUT	3		7	dBm	
Average Output Power(Laser Off)	POFF			-30	dBm	
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)				2	dB	
Optical Eye Mask	IEEE 802.3 cc					BER $\leq 5 \times 10^{-5}$
RIN <sub>20OMA</sub>	RIN			-130	dB/Hz	
<b>Receiver</b>						
Wavelength	$\lambda$	1260		1620	nm	
Received Sensitivity	P <sub>IN</sub>			-13.5	dBm	1
Optical Power Overload	P <sub>IN</sub> (SAT)	0.5			dBm	
Rx_LOS of Signal Assert	P <sub>A</sub>	-30			dBm	
Rx_LOS of Signal De-assert	P <sub>D</sub>			-16	dBm	
Rx_LOS of Signal Hysteresis	PHy	0.5		5	dB	
CDR setting						2

Notes:

- For 25G :BER $\leq 5 \times 10^{-5}$
- CDR setting

	Hard Pin Status RS0: Hard Pin #7 RS1: Hard Pin #10	Soft Bit Status RS0: A2h/110[b3] (Initial Value: 1) RS1: A2h/118[b3] (Initial Value: 1)	Mode of Operation	Date Rate
RS0	0	0	Rx CDR bypass	$\leq 10.3125$ Gbps
	0	1	Rx CDR engaged	25.78125Gbps
	1	0		
	1	1		
RS1	0	0	Tx CDR bypass	$\leq 10.3125$ Gbps
	0	1	Tx CDR engaged	25.78125Gbps
	1	0		
	1	1		

## Digital Diagnostics

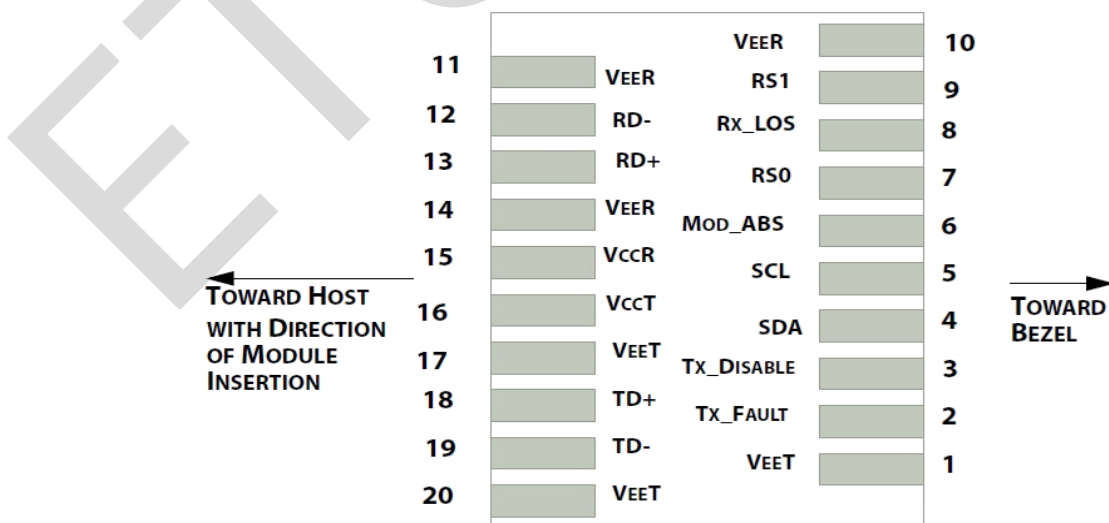
The following characteristics are defined over recommended operating condition

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	0 to 5	±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 Negate Time	t_on			1	ms	
Tx Disable Assert Time	t_off			10	µs	
Time To Initialize, including Reset of Tx Fault	t_init			300	ms	
Tx Fault Assert Time	t_fault			100	µs	
Tx Disable To Reset	t_reset	10			µs	
LOS Assert Time	t_loss_on			100	µs	
LOS De-assert Time	t_loss_off			100	µs	
Serial ID Clock Rate	f_serial_clock		100	400	KHz	
MOD_DEF (0:2)-High	V <sub>H</sub>	2		V <sub>cc</sub>	V	
MOD_DEF (0:2)-Low	V <sub>L</sub>			0.8	V	

## Pin Diagram



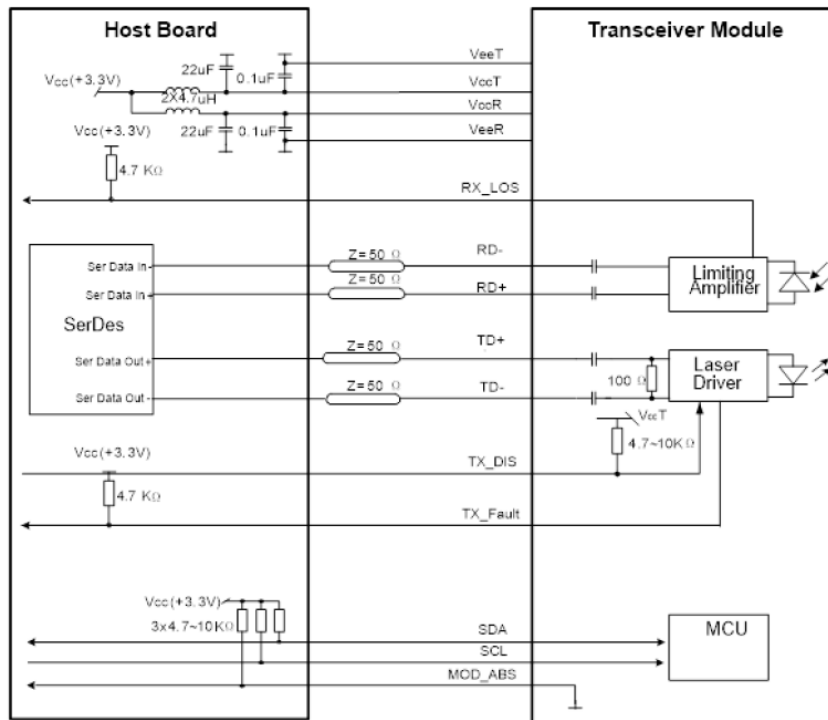
## Pin Definitions

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

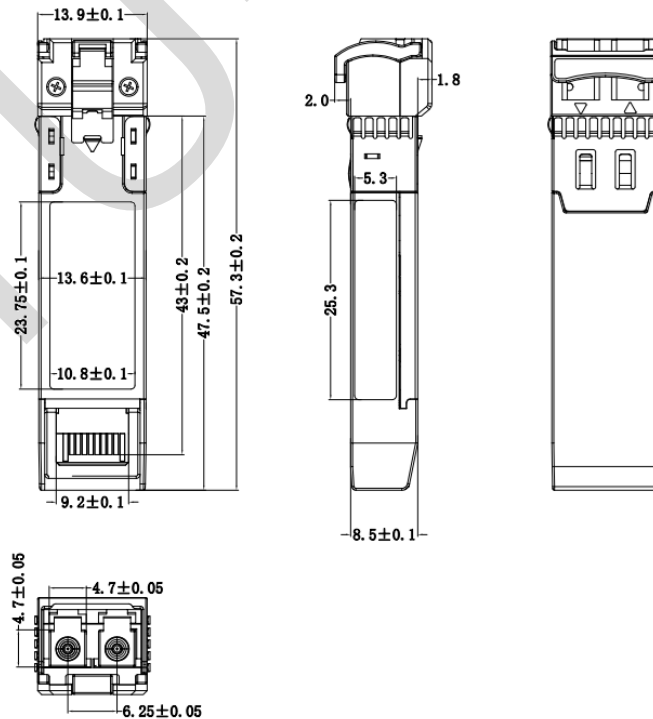
### Notes:

- 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, 2020	Preliminary datasheet
2.0	October 11, 2023	Product upgrades
2.1	Aug 21, 2024	Format change

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