

## EQ23110X-3LCD10

### QSFP28 100Gb/s LR4 Single-mode 10km DDM Transceiver

#### PRODUCT FEATURES

- Support line rates from 103.125 Gbps;
- Transmission data rate up to 25.78 (NRZ) per channel;
- Up to 10km transmission on single mode fiber;
- LAN WDM DML laser and PIN ROSA;
- High speed I/O electrical interface (CAUI-4);
- I2C interface with integrated Digital Diagnostic monitoring;
- QSFP28 MSA package with duplex LC connector;
- Single +3.3V power supply;
- Temperature Range: Commercial: 0°C ~+70°C; Industrial: -40°C ~+85°C
- Power Dissipation: Commercial: < 4W; Industrial: < 5W
- Complies with EU Directive 2015/863/EU

#### APPLICATIONS

- ✓ 100GBASE-LR4 Ethernet
- ✓ 100G Datacom & Telecom connections

## DESCRIPTIONS

EQ23110X-3LCD10 is designed for 10km optical communication applications. This module contains 4-lane optical transmitter, 4-lane optical receiver and module management block including 2 wire serial inter-face. The optical signals are multiplexed to a single-mode fiber through an industry standard LC connector.

## Ordering information

Package	Product part NO.	Data Rate(G bps)	Media	Transmission Distance(km)	Temperature Range (°C)		Laser	Power Dissipation (W)
					Min	Max		
QSFP28	EQ23110X-3LCD10	103.125	SMF	10	0~70	Commercial	LWDM	<4
QSFP28	EQ23110X-3LID10	103.125	SMF	10	-40~85	Industrial	LWDM	<5

## I. Absolute Maximum Ratings

It has to be noted that the operation in excess of any individual absolute maximum ratings might cause permanent damage to this module.

Parameter	Symbol	Min	Max	Units	Notes
Storage Temperature	T <sub>s</sub>	-40	85	degC	
Operating Case Temperature	T <sub>OP</sub>	0	70	degC	
Power Supply Voltage	V <sub>CC</sub>	-0.5	3.6	V	
Relative Humidity (non-condensation)	RH	0	85	%	

## II. Recommended Operating Conditions and Power Supply Requirement

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Operating Case Temperature	T <sub>OP</sub>	0		+70	°C	EQ23110X-3LCD10
		-40		+85		EQ23110X-3LID10
Power Supply Voltage	V <sub>CC</sub>	3.13	3.3	3.47	V	
Power Supply Current	I <sub>CC</sub>			1.21	A	EQ23110X-3LCD10
				1.51	A	EQ23110X-3LID10

Maximum Power Dissipation	$P_D$		4	W	EQ23110X-3LCD10
			5		EQ23110X-3LID10
Aggregate Bit Rate	$BR_{AVE}$		103.125	Gb/s	
Lane Bit Rate	$BR_{LANE}$		25.7812 5	Gb/s	
Transmission Distance	TD		10	km	
Coupled fiber	Single mode fiber				9/125um SMF

Note:

1. The optical power is launched into SMF.
2. Measured with a PRBS  $2^{31}-1$  test pattern @25.78125, Hit ratio $\leq 5E-5$ .
3. Measured with a PRBS  $2^{31}-1$  test pattern @25.78125 Gb/s, BER $\leq 1E-12$ .

### III. Optical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
<b>Transmitter</b>						
Signaling Speed per Lane			25.78125		Gbps	
Lane Wavelength	L0	1294.53	1295.56	1296.59	nm	
	L1	1299.02	1300.05	1301.09	nm	
	L2	1303.54	1304.58	1305.63	nm	
	L3	1308.09	1309.14	1310.19	nm	
Total Average Launch Power	$P_T$			10.5	dBm	1
Average Launch Power per Lane,	$P_{avg}$	-4.3		4.5	dBm	1
OMA, each Lane	$P_{OMA}$	-1.3		4.5	dBm	1
Difference in launch power between any two lanes(Average and OMA) between any Two Lanes (OMA)	$P_{tx,diff}$			3	dB	
Average Output Power (Laser Turn off)	$P_{off}$			-30	dBm	
Side Mode Suppression Ratio	SMSR	30			dB	
Extinction Ratio	ER	4			dB	
RIN <sub>20OMA</sub>	RIN			-130	dB/Hz	
Optical Return Loss Tolerance	TOL			20	dB	
Transmitter Reflectance	$R_T$			-12	dB	
Optical Eye Mask	{0.25,0.4, 0.45, 0.25, 0.28, 0.4}				%	2
<b>Receiver</b>						
Signaling rate, each lane			25.78125		Gbps	
Center Wavelength Lane 0	$\lambda_0$	1294.53	1295.56	1296.59	nm	
Center Wavelength Lane 1	$\lambda_1$	1299.02	1300.05	1301.09	nm	
Center Wavelength Lane 2	$\lambda_2$	1303.54	1304.58	1305.63	nm	
Center Wavelength Lane 3	$\lambda_3$	1308.09	1309.14	1310.19	nm	

Damage threshold , each lane	Pdamage	5.5			dBm	
Average Receive Power, each lane		-10.6		4.5	dBm	
Receiver Sensitivity (OMA) per Lane	SEN			-8.6	dBm	3
Los Assert	LosA	-30			dBm	
Los De-assert	LosDA			-12	dBm	
Los Hysteresis	LosH	0.5			dB	

Note:

1. The optical power is launched into SMF.
2. Measured with a PRBS 2<sup>31</sup>-1 test pattern @25.78125, Hit ratio≤5E-5.
3. Measured with a PRBS 2<sup>31</sup>-1 test pattern @25.78125 Gb/s, BER≤1E-12.

## IV. Electrical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
<b>Transmitter (Module Input)</b>						
Data Rate, each lane			25.78125		Gbps	
Differential Voltage pk-pk	Vpp			900	mV	1
Common Mode Voltage	Vcm	-350		2850	mV	
Transition time	Trise/Tfa 	10			ps	2
<b>Receiver (Module Output)</b>						
Data Rate, each lane			25.78125		Gbps	
Common Mode Noise, RMS	Vrms			17.5	mV	
Differential output voltage swing	Vout, pp			900	mV	
Eye width	EW15	0.57			UI	
Eye height	EH15	228			mV	
Differential Termination Resistance Mismatch				10	%	1
Transition time	Trise/Tfa 	12			ps	

Notes:

1. At 1 MHz
2. 20%~80%

## V. Digital Diagnostic Functions

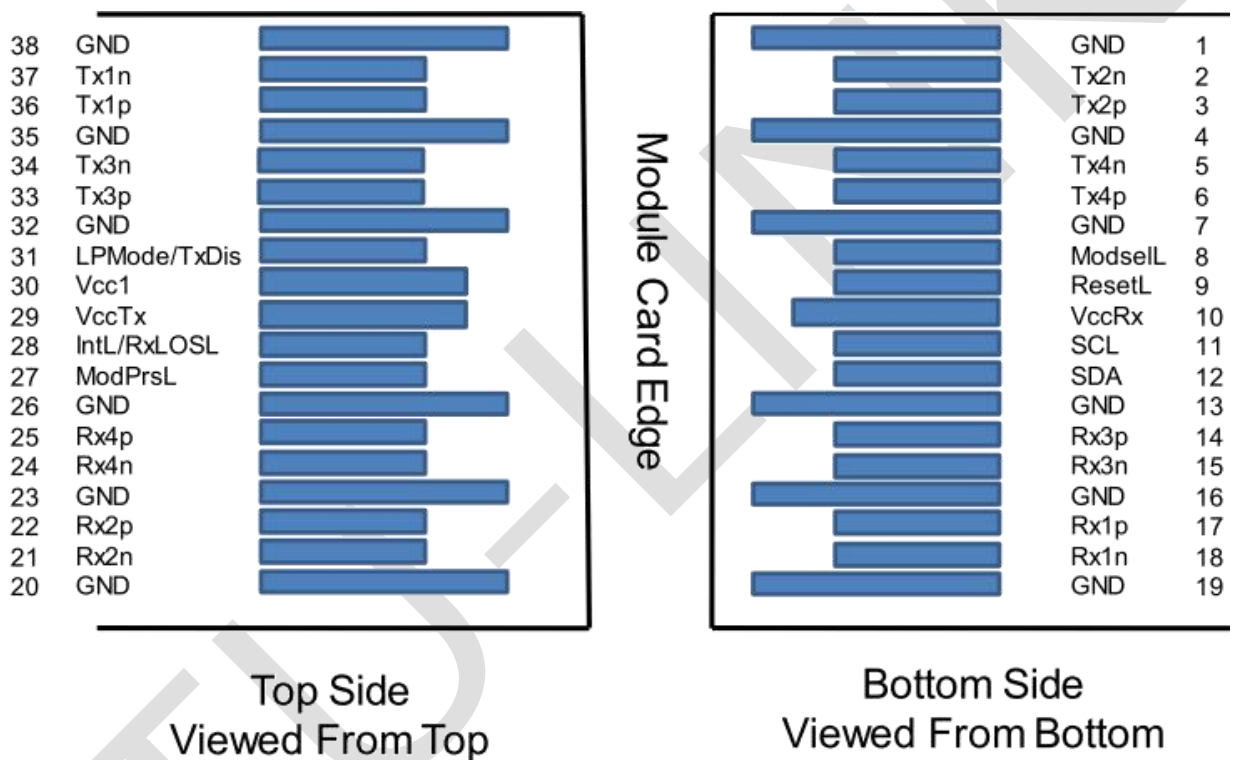
Parameter	Range	Unit	Accuracy	Calibration
Temperature	-40 to +85	°C	±3°C	Internal / External
Voltage	3.0 to 3.6	V	±3%	Internal / External

Bias Current	30 to 100	mA	±10%	Internal / External
TX Power	-4.3 to 4.5	dBm	±3dB	Internal / External
RX Power	-10.6 to 4.5	dBm	±3dB	Internal / External

Note:

- The transceivers provide serial ID memory contents and diagnostic information about the present operating conditions by the 2-wire serial interface (SCL, SDA). The diagnostic information with internal calibration or external calibration all are implemented, including received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and temperature monitoring.

## VI. Pin Diagram



## VII. Pin Descriptions

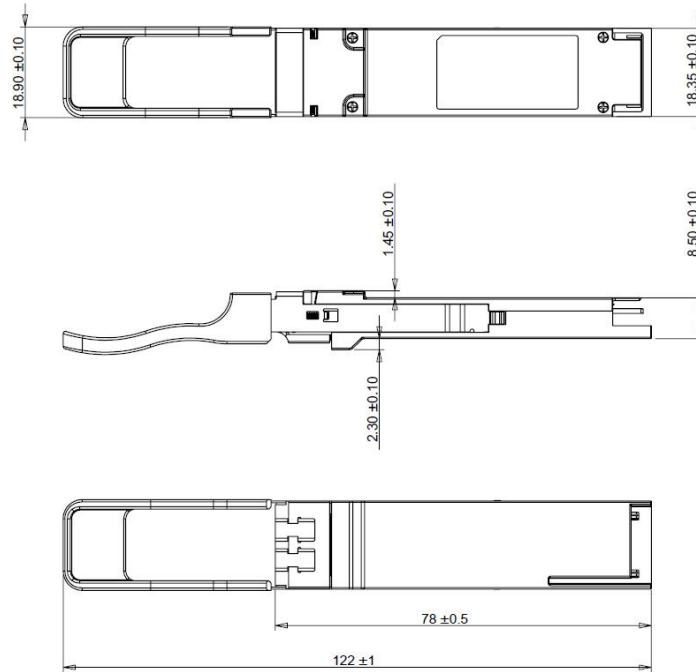
PIN	Logic	Symbol	Description	Plug Seq.	Notes
1		GND	Ground	1	1
2	CML-I	Tx2n	Transmitter Inverted Data Input	3	
3	CML-I	Tx2p	Transmitter Non-Inverted Data output	3	
4		GND	Ground	1	1
5	CML-I	Tx4n	Transmitter Inverted Data Input	3	
6	CML-I	Tx4p	Transmitter Non-Inverted Data output	3	
7		GND	Ground	1	1
8	LVTLL-I	ModSelL	Module Select	3	

9	LVTTTL-I	ResetL	Module Reset	3	
10		VccRx	+ 3.3V Power Supply Receiver	2	2
11	LVC MOS-I/O	SCL	2-Wire Serial Interface Clock	3	
12	LVC MOS-I/O	SDA	2-Wire Serial Interface Data	3	
13		GND	Ground	1	
14	CML-O	Rx3p	Receiver Non-Inverted Data Output	3	
15	CML-O	Rx3n	Receiver Inverted Data Output	3	
16		GND	Ground	1	1
17	CML-O	Rx1p	Receiver Non-Inverted Data Output	3	
18	CML-O	Rx1n	Receiver Inverted Data Output	3	
19		GND	Ground	1	1
20		GND	Ground	1	1
21	CML-O	Rx2n	Receiver Inverted Data Output	3	
22	CML-O	Rx2p	Receiver Non-Inverted Data Output	3	
23		GND	Ground	1	1
24	CML-O	Rx4n	Receiver Inverted Data Output	3	1
25	CML-O	Rx4p	Receiver Non-Inverted Data Output	3	
26		GND	Ground	1	1
27	LVTTTL-O	ModPrsL	Module Present	3	
28	LVTTTL-O	IntL/Rx_LOS	Interrupt/Rx_LOS	3	
29		VccTx	+3.3 V Power Supply transmitter	2	2
30		Vcc1	+3.3 V Power Supply	2	2
31	LVTTTL-I	LPMoDe/TxDI S	Low Power Mode/Tx_Disable	3	
32		GND	Ground	1	1
33	CML-I	Tx3p	Transmitter Non-Inverted Data Input	3	
34	CML-I	Tx3n	Transmitter Inverted Data Output	3	
35		GND	Ground	1	1
36	CML-I	Tx1p	Transmitter Non-Inverted Data Input	3	
37	CML-I	Tx1n	Transmitter Inverted Data Output	3	
38		GND	Ground	1	1

## Notes:

- GND is the symbol for signal and supply (power) common for the QSFP28 module. All are common within the QSFP28 module and all module voltages are referenced to this potential unless otherwise noted. Connect these directly to the host board signal-common ground plane.
- Vcc Rx, Vcc1 and Vcc Tx are the receiver and transmitter power supplies and shall be applied concurrently. Requirements defined for the host side of the Host Edge Card Connector are listed in MSA. The connector pins are each rated for a maximum current of 1000 mA.

## VIII. Mechanical Dimensions



**Figure 4. Mechanical Outline**

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