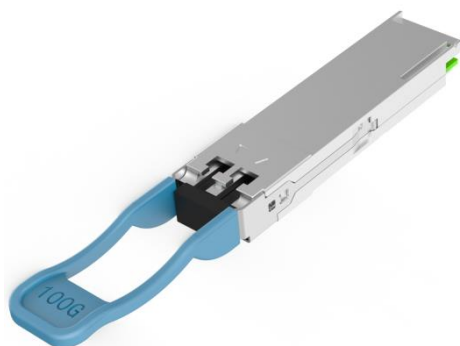


100Gb/s QSFP28 LR1 10km Transceiver HX4P-CL311x

Features

- Compliant with 100GBASE-LR1
- Lane bit rate 106.25Gb/s with PAM4
- EML laser and PIN receiver
- 4x25.78Gb/s with NRZ electrical interface (CAUI-4)
- Up to 10km transmission on SMF
- Support Digital Monitoring interface
- RoHS-10 compliant and lead-free
- QSFP28 MSA package with LC duplex connector
- Single +3.3V power supply
- Maximum power consumption 4.5W
- All-metal housing for superior EMI performance
- Compliant to 802.3cu, SFF-8636&SFF-8679 stand
- Case operating temperature
Commercial: 0 ~ +70°C
Extended: -10 ~ +80°C
Industrial: -40 ~ +85°C



Applications

- Data Center
- 100GBASE-LR1
- Ethernet switches and router applications

Part Number Ordering Information

Part Number	Data Rate (Gb/s)	Wavelength (nm)	Transmission Distance(km)	Temperature (°C) (Operating Case)
HX4P-CL311C	100	1310	10	0~70 commercial
HX4P-CL311E	100	1310	10	-10~80 Extended
HX4P-CL311I	100	1310	10	-40~85 Industrial

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	Unit	Notes
Storage Temperature	T _S	-40	85	°C	
Power Supply Voltage	V _{CC}	-0.3	4.0	V	
Relative Humidity (non-condensation)	RH	5	85	%	
Damage Threshold	TH _d	5.0		dBm	

II. Recommended Operating Conditions

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Operating Case Temperature	T _{OP}	0		70	°C	commercial
		-10		80		extended
		-40		85		Industrial
Power Supply Voltage	V _{CC}	3.13	3.3	3.47	V	
Lane Bit Rate			106.25		Gb/s	
Control Input Voltage High		2		V _{CC}	V	
Control Input Voltage Low		0		0.8	V	
Link Distance (SMF)	D			10	km	9/125um

III. Pin Assignment and Pin Description

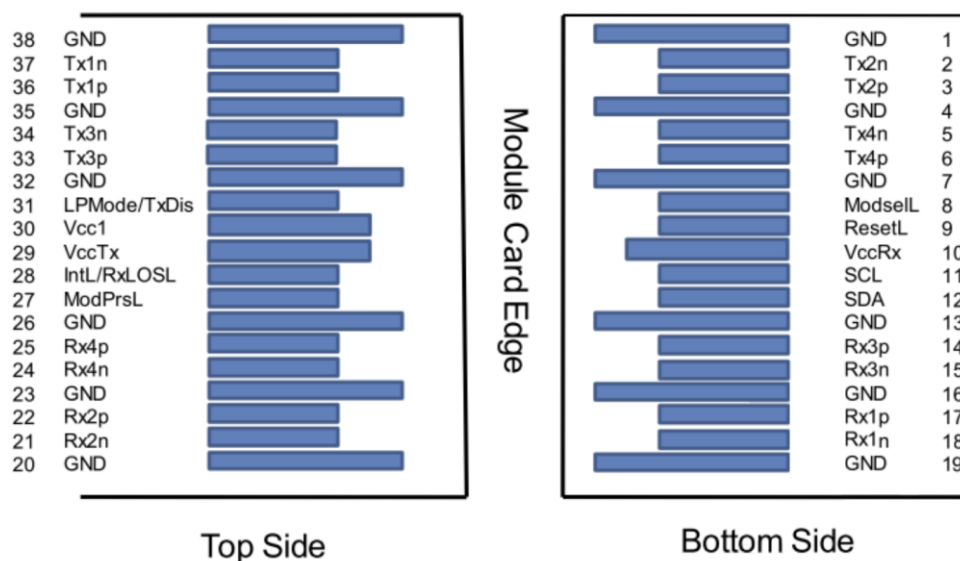


Figure1. Diagram of host board connector block pin numbers and names

Pin	Symbol	Name/Description	Notes
1	GND	Transmitter Ground (Common with Receiver Ground)	1
2	Tx2n	Transmitter Inverted Data Input	
3	Tx2p	Transmitter Non-Inverted Data output	
4	GND	Transmitter Ground (Common with Receiver Ground)	1
5	Tx4n	Transmitter Inverted Data Input	
6	Tx4p	Transmitter Non-Inverted Data output	
7	GND	Transmitter Ground (Common with Receiver Ground)	1
8	ModSelL	Module Select	
9	ResetL	Module Reset	
10	VccRx	3.3V Power Supply Receiver	2
11	SCL	2-Wire serial Interface Clock	
12	SDA	2-Wire serial Interface Data	
13	GND	Transmitter Ground (Common with Receiver Ground)	
14	Rx3p	Receiver Non-Inverted Data Output	
15	Rx3n	Receiver Inverted Data Output	
16	GND	Transmitter Ground (Common with Receiver Ground)	1
17	Rx1p	Receiver Non-Inverted Data Output	
18	Rx1n	Receiver Inverted Data Output	
19	GND	Transmitter Ground (Common with Receiver Ground)	1
20	GND	Transmitter Ground (Common with Receiver Ground)	1
21	Rx2n	Receiver Inverted Data Output	
22	Rx2p	Receiver Non-Inverted Data Output	
23	GND	Transmitter Ground (Common with Receiver Ground)	1
24	Rx4n	Receiver Inverted Data Output	1
25	Rx4p	Receiver Non-Inverted Data Output	
26	GND	Transmitter Ground (Common with Receiver Ground)	1
27	ModPrsl	Module Present	
28	IntL/Rx_LOS	Interrupt/Rx_LOS	
29	VccTx	3.3V power supply transmitter	2

30	Vcc1	3.3V power supply	2
31	LPMoDe/TxDIS	Low Power Mode/Tx_Disable	
32	GND	Transmitter Ground (Common with Receiver Ground)	1
33	Tx3p	Transmitter Non-Inverted Data Input	
34	Tx3n	Transmitter Inverted Data Output	
35	GND	Transmitter Ground (Common with Receiver Ground)	1
36	Tx1p	Transmitter Non-Inverted Data Input	
37	Tx1n	Transmitter Inverted Data Output	
38	GND	Transmitter Ground (Common with Receiver Ground)	1

Notes:

1. GND is the symbol for signal and supply (power) common for QSFP28 modules. 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.

2. VccRx, Vcc1 and VccTx are the receiving and transmission power suppliers and shall be applied concurrently. Recommended host board power supply filtering is shown below. Vcc Rx, Vcc1 and Vcc Tx may be internally connected within the QSFP28 transceiver module in any combination. The connector pins are each rated for a maximum current of 1000mA.

IV. Electrical Characteristics

The following electrical characteristics are defined over the Recommended Operating Environment unless otherwise specified.

Parameter	Symbol	Min.	Typ.	Max	Unit	Notes
Power Consumption	p			4.5	W	
Supply Current	Icc			1350	mA	
Transmitter						
Single-ended Input Voltage Tolerance	Vcc	-0.3		4.0	V	
Differential Input Voltage Swing	Vin,pp	85		900	mVpp	
Differential Input Impedance	Zin	90	100	110	Ohm	1
Differential Termination Mismatch				10	%	
Transmit Disable Voltage	Vdis	Vcc-1.3		Vcc	V	

Transmit Enable Voltage	Ven	Vee		Vee +0.8	V	2
Receiver						
Differential Output Voltage Swing	Vout,pp	200		900	mVpp	
Differential Output Impedance	Zout	90	100	110	Ohm	3
Data output rise/fall time	Tr/Tf	12			ps	4
Differential Termination Mismatch (1MHZ)				10	%	
LOS Assert Voltage	VlosH	Vcc-1.3		Vcc	V	5
LOS De-assert Voltage	VlosL	Vee		Vee +0.8	V	5

Notes:

1. Connected directly to TX data input pins. AC coupled thereafter.
2. Or open circuit.
3. Input 100 ohms differential termination.
4. These are unfiltered 20-80% values.
5. Loss of Signal is LVTTTL. Logic 0 indicates normal operation; logic 1 indicates no signal detected.

V. Optical Characteristics

The following optical characteristics are defined over the Recommended Operating Environment unless otherwise specified.

Parameter	Symbol	Min.	Typical	Max	Unit	Notes
Transmitter						
Center Wavelength	λ	1304.5	1311	1317.5	nm	
Average launch powe	Pavg	-1.4		4.5	dBm	1
OMA _{outer}	OMA	0.7		4.7	dBm	
Launch power in OMA _{outer} minus TDECQ	OMA - TDECQ	-0.7			dB	
		-0.6			dB	
Transmitter and dispersion eye closure for PAM4 (TDECQ)	TDECQ			3.5	dB	
Average Output Power (Laser Turn off)	POUT-OFF			-15	dBm	

Extinction Ratio	ER	3.5			dB	
Side-mode suppression ratio	SMSR	30				
Receiver						
Center Wavelength	λ	1304.5	1311	1317.5	nm	
Average Rx Power	PRX_LANE	-7.5		4.5	dBm	2
Receiver power (OMA _{outer})	POMA_LANE			4.7	dBm	
Receiver sensitivity (OMA _{outer})	SENOMA	100G-FR and 100G-LR Technical Spec Equation (1)			dBm	3
Stressed receiver sensitivity (OMA _{outer})	SRSOMA			-4.1	dBm	4

Notes:

1. The optical power is launched into SMF
2. Average receive power, each lane (min) is informative and not the principal indicator of signal strength
3. Receiver sensitivity (OMA_{outer}), each lane (max) is informative and is defined for a transmitter with SECQ up to 3.4dB
4. Measured with conformance test signal at TP3 using the test pattern PRBS31Q or scrambled idle for stressed receiver sensitivity for the BER= 2.4x10⁻⁴

VI. Digital Diagnostic Functions

The following digital diagnostic characteristics are defined over the normal operating conditions unless otherwise specified.

Parameter	Symbol	Min.	Max	Unit	Notes
Temperature monitor absolute error	DMI_Temp	-3	3	°C	Over operating temp
Supply voltage monitor absolute error	DMI_VCC	-3	3	%	Full operating range
RX power monitor absolute error	DMI_RX	-3	3	dB	
Bias current monitor error	DMI_bias	-10	10	%	
TX power monitor absolute error	DMI_TX	-3	3	dB	

VII. Mechanical Dimensions

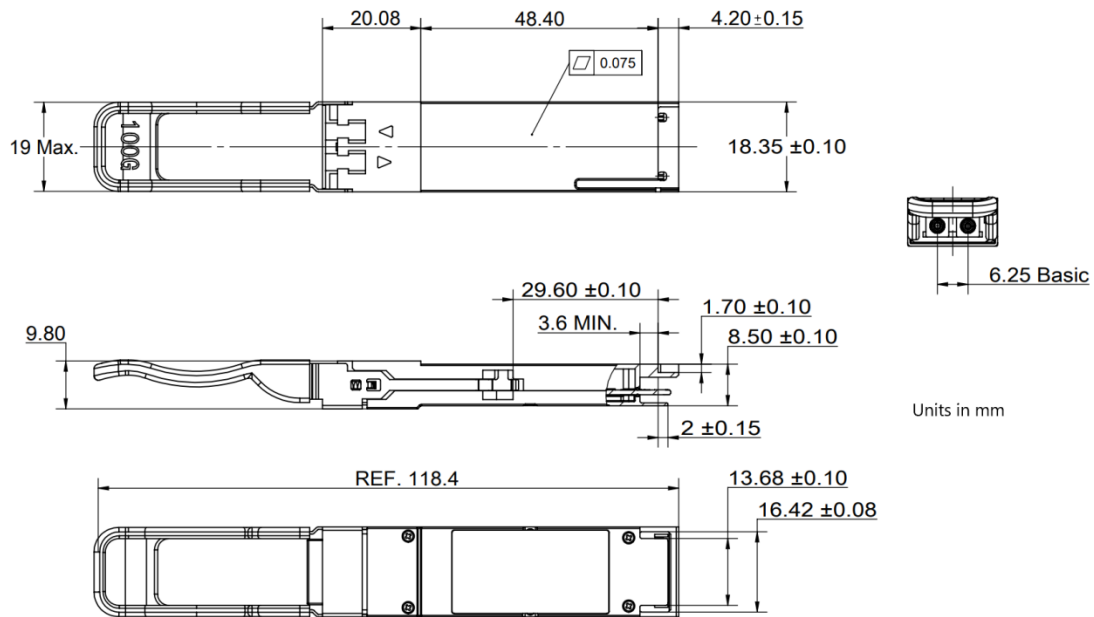


Figure2. Mechanical Outline

VIII. Revision History

Version No.	Initiated	Revised contents	Release Date
V1.0	Andy Zhang	Preliminary datasheet	2021-08-26

IX. Contact us

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