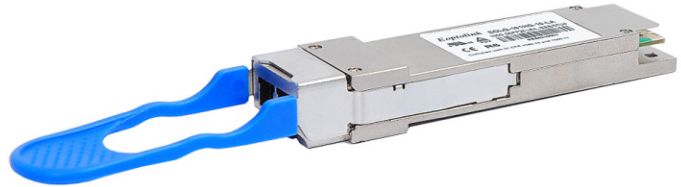


EOLQ-161HG-10-LB Series

Single-Mode 100GBASE-LR4 QSFP28 Transceiver
 Single-Mode OTU4 4I1-9D1F QSFP28 Transceiver
 RoHS6 Compliant



Features

- ◆ Supports 103Gbps and 112Gbps
- ◆ Single 3.3V Power Supply and Power dissipation < 3.5W
- ◆ Up to 10km over SMF
- ◆ RoHS-6 compliant (lead-free)
- ◆ Commercial case temperature range of 0°C to 70°C
- ◆ Four 25Gbps/28Gbps DML LAN-WDM channels on transmitter side
- ◆ PIN and TIA array on the receiver side
- ◆ 4x25G/28G electrical interface
- ◆ Duplex LC receptacles
- ◆ I²C interface with integrated Digital Diagnostic Monitoring

Applications

- ◆ 100GBASE-LR4 100G Ethernet
- ◆ OTU4 4I1-9D1F

Ordering Information

Part No.	Data Rate	Fiber	Distance *(note2)	Interface	Temp.	DDMI
EOLQ-161HG-10-LB*(note1)	112Gbps	SMF	10km	LC	0°C~+70°C	Yes

Note1: also support 103Gbps

Note2: Over SMF

*The product image only for reference purpose.

Regulatory Compliance*

Product Certificate	Certificate Number	Applicable Standard
TUV	R50135086	EN 60950-1:2006+A11+A1+A12+A2
		EN 60825-1:2014
		EN 60825-2:2004+A1+A2
UL	E317337	UL 60950-1
		CSA C22.2 No. 60950-1-07
EMC CE	AE 50285865 0001	EN 55022:2010
		EN 55024:2010
FCC	WTF14F0514417E	47 CFR PART 15 OCT., 2013
FDA	/	CDRH 1040.10
ROHS	/	2011/65/EU

*The above certificate number updated to June 2014, because some certificate will be updated every year, such as FDA and ROHS. For the latest certification information, please check with Eoptolink.

Product Description

Eoptolink's EOLQ-161HG-10-LB QSFP28 transceiver module is designed for 112 Gigabit Ethernet links over 10Km single mode fiber. It is compliant with IEEE 802.3ba 100GBASE-LR4 and OTU4. Digital diagnostics functions are available via an I2C interface, as specified by the QSFP+MSA.

Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit
Storage Temperature	T _s	-40	+85	°C
Supply Voltage	V _{cc}	-0.5	3.6	V
Operating Relative Humidity	RH	5	85	%

*Exceeding any one of these values may destroy the device immediately.

Recommended Operating Conditions

Parameter	Symbol	Min.	Typical	Max.	Unit
Operating Case Temperature	T _c	0		70	°C
Power Supply Voltage	V _{cc}	3.135	3.3	3.465	V
Power Dissipation	P _D			3.5	W

Performance Specifications - Electrical

Parameter	Symbol	Min.	Typ.	Max	Unit	Notes
Transmitter						
Differential Input amplitude		150		1200	mv _{p-p}	
Input Impedance (Differential)	Z _{in}	85	100	115	ohms	R _{in} > 100 kohms @ DC
Receiver						
Differential output amplitude		200		1100	mv _{p-p}	
Output Impedance (Differential)	Z _{out}	85	100	115	ohms	
Output Rise/Fall Time	t _r /t _f		12		ps	10%~90%

Optical Characteristics

100GBASE-LR4 Operation

Parameter	Symbol	Min.	Typical	Max.	Unit
Transmitter					
Signaling Speed per Lane	BR _{AVE}		25.78		Gbps
Data Rate Variation		-100		+100	ppm
Lane_0 Center Wavelength	λ _{C0}	1294.53	1295.56	1296.59	nm
Lane_1 Center Wavelength	λ _{C1}	1299.02	1300.05	1301.09	nm
Lane_2 Center Wavelength	λ _{C2}	1303.54	1304.58	1305.63	nm
Lane_3 Center Wavelength	λ _{C3}	1308.09	1309.14	1310.19	nm
Total Average Output Power*(Note3)	P _o			10.5	dBm
Average Launch Power per Lane	P _e ach	-4.3		4.5	dBm
Average launch power of OFF transmitter per lane				-30	dBm
Optical modulation amplitude	P _o ma	-1.3		4.5	dBm
Optical Return Loss Tolerance				20	dB
Extinction Ratio	ER	4			dB
Transmitter eye mask definition {X1, X2, X3, Y1, Y2, Y3}*(Note4)			(Note4)		
Receiver					
Signaling Speed per Lane	BR _{AVE}		25.78		Gbps
Data Rate Variation		-100		+100	ppm
Damage threshold	R _{dam}	4.5			dBm
Lane_0 Center Wavelength	λ _{C0}	1294.53	1295.56	1296.59	nm
Lane_1 Center Wavelength	λ _{C1}	1299.02	1300.05	1301.09	nm
Lane_2 Center Wavelength	λ _{C2}	1303.54	1304.58	1305.63	nm

Lane_3 Center Wavelength	λ_{C3}	1308.09	1309.14	1310.19	nm
Average Receive Power per Lane	Rpow	-10.6		4.5	dBm
Receive Sensitivity in OMA per Lane ^{*(Note5)}	Pmin			-8.6	dBm
Optical Return Loss	ORL			-26	dB
LOS Assert	LOSA	-25			dBm
LOS De-Assert	LOSD			-11.6	dBm
LOS Hysteresis		0.5			dB

OTU4 411-9D1F Operation

Parameter	Symbol	Min.	Typical	Max.	Unit
Transmitter					
Signaling Speed per Lane	BR _{AVE}		27.95		Gbps
Data Rate Variation		-20		+20	ppm
Lane_0 Center Wavelength	λ_{C0}	1294.53	1295.56	1296.59	nm
Lane_1 Center Wavelength	λ_{C1}	1299.02	1300.05	1301.09	nm
Lane_2 Center Wavelength	λ_{C2}	1303.54	1304.58	1305.63	nm
Lane_3 Center Wavelength	λ_{C3}	1308.09	1309.14	1310.19	nm
Total Average Output Power ^{*(Note6)}	P _o			10.5	dBm
Average Launch Power per Lane	P _{each}	-4.3		4.5	dBm
Maximum channel power difference				5	dB
Channel spacing			800		GHz
Maximum spectral excursion		-184		184	GHz
Side Mode Suppression Ratio	SMSR	30			dB
Optical Return Loss Tolerance				20	dB
Extinction Ratio	ER	4			dB
Transmitter eye mask definition {X1, X2, X3, Y1, Y2, Y3} ^{*(Note4)}			(Note4)		
Receiver					
Signaling Speed per Lane	BR _{AVE}		27.95		Gbps
Data Rate Variation		-20		+20	ppm
Damage threshold (per lane)	R _{dam}	4.5			dBm
Lane_0 Center Wavelength	λ_{C0}	1294.53	1295.56	1296.59	nm
Lane_1 Center Wavelength	λ_{C1}	1299.02	1300.05	1301.09	nm
Lane_2 Center Wavelength	λ_{C2}	1303.54	1304.58	1305.63	nm
Lane_3 Center Wavelength	λ_{C3}	1308.09	1309.14	1310.19	nm
Average Receive Power per Lane	Rpow	-8		2.9	dBm
Equivalent Receive Sensitivity per Lane ^{*(Note7)}	Pmin			-8	dBm
Maximum channel power difference				5.5	dB
Maximum optical path penalty				1.5	dB
Optical Return Loss	ORL			-26	dB

LOS Assert	LOSA	-25			dBm
LOS De-Assert	LOSD			-11.6	dBm
LOS Hysteresis		0.5			dB

Note3: Output is coupled into a 9/125µm single-mode fiber.

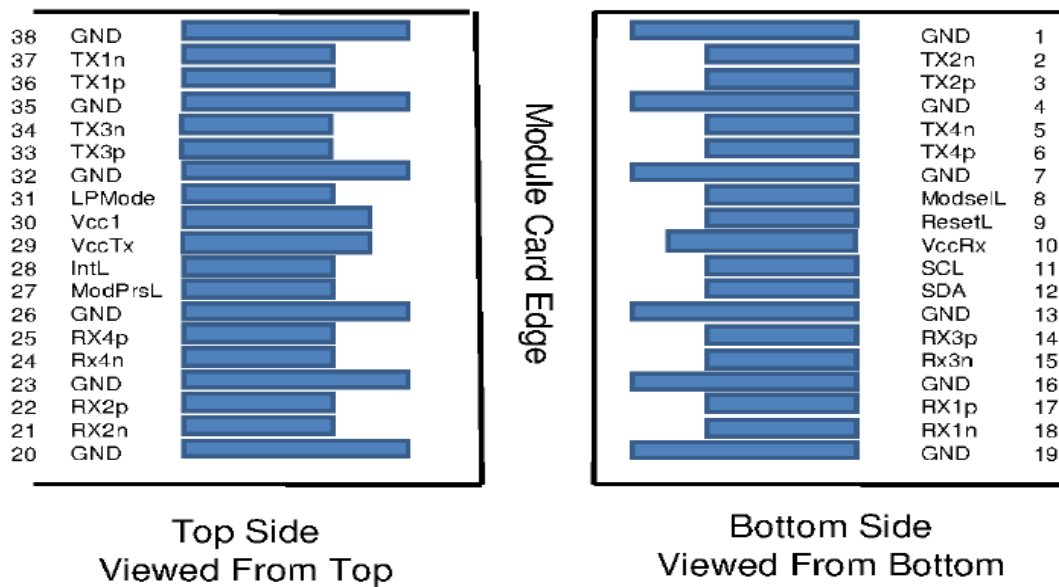
Note4: Eye mask margin is not guaranteed dual to DML laser, still could run 10km single-mode fiber over all temperature.

Note5: Minimum average optical power measured at BER less than 1E-12, with a 2³¹-1 PRBS.

Note6: Output is coupled into a 9/125µm single-mode fiber.

Note7: Minimum average optical power measured at BER less than 1E-12, with a 2³¹-1 PRBS.

QSFP28 Transceiver Electrical Pad Layout



Pin Arrangement and Definition

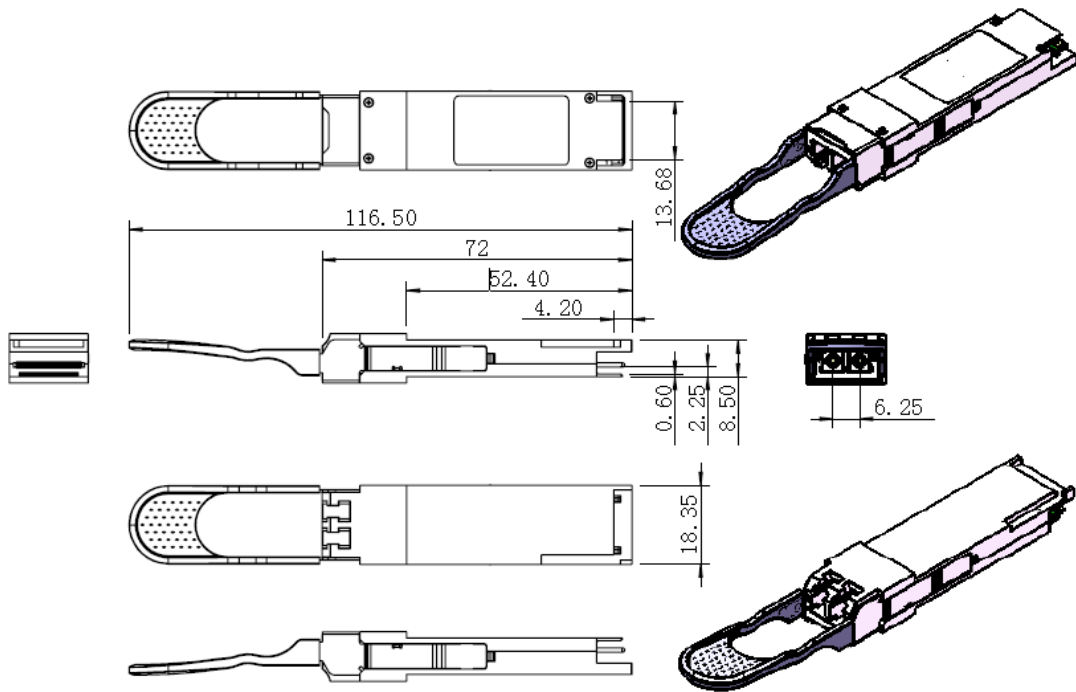
Pin	Logic	Symbol	Description	Plug Sequence	Notes
1		GND	Ground	1	1
2	CML-I	Tx2n	Transmitter Inverted Data Input	3	
3	CML-I	Tx2p	Transmitter Non-Inverted Data Input	3	
4		GND	Ground	1	1
5	CML-I	Tx4n	Transmitter Inverted Data Input	3	
6	CML-I	Tx4p	Transmitter Non-Inverted Data Input	3	
7		GND	Ground	1	1
8	LVTTL-I	ModSelL	Module Select	3	
9	LVTTL-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	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	
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	Interrupt	3	
29		VccTx	+3.3V Power supply transmitter	2	2
30		Vcc1	+3.3V Power supply	2	2
31	LVTTTL-I	LPMode	Low Power Mode	3	
32		GND	Ground	1	1
33	CML-I	Tx3p	Transmitter Non-Inverted Data Input	3	
34	CML-I	Tx3n	Transmitter Inverted Data Input	3	
35		GND	Ground	1	1
36	CML-I	Tx1p	Transmitter Non-Inverted Data Input	3	
37	CML-I	Tx1n	Transmitter Inverted Data Input	3	
38		GND	Ground	1	1

1: 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.

2: 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 Table 6. Recommended host board power supply filtering is shown in Figures 3 and 4. Vcc Rx Vcc1 and Vcc Tx may be internally connected within the QSFP28 Module in any combination. The connector pins are each rated for a maximum current of 500mA.

Mechanical Specifications



*This 2D drawing only for reference, please check with Eoptolink before ordering.

Obtaining Document

You can visit our website: <http://www.eoptolink.com>

Or contact Eoptolink Technology Inc., Ltd. Listed at the end of the documentation to get the latest documents.

Revision History

Revision	Initiated	Reviewed	Approved	Revision History	Release Date
V1.a	Erik	David/Peter		Preliminary.	June 24, 2016

Notice:

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