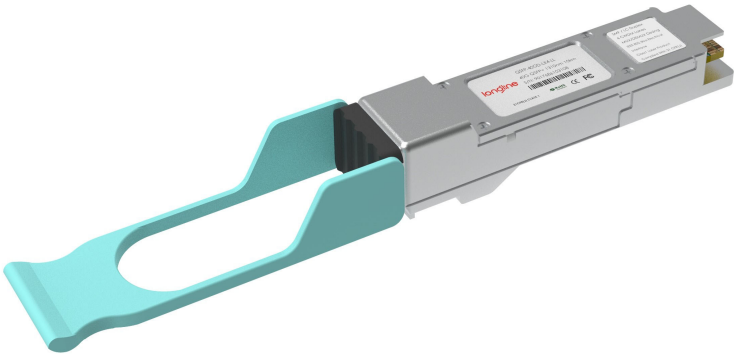


40GBASE-UNIV QSFP+ 1310nm 2km DOM Optical Transceiver Module for SMF/MMF

QSFP-40GD-LX4-LL



Application

- 40G Ethernet over MMF and SMF
- Infiniband QDR and DDR interconnects

Features

- Hot-pluggable QSFP+ form factor
- Operates over duplex multimode and single mode fiber with dual LC receptacles
- Supports 41.2 Gb/s aggregate bit rate
- Power dissipation <3.5W
- Commercial case temperature range 0° C to 70° C
- Maximum link length of 150m on OM3, and 2km on SMF
- Uncooled 4x10Gb/s CWDM transmitter
- XLPI electrical interface
- Built-in digital diagnostic functions, including Tx/Rx power monitoring
- RoHS-6 Compliant

Description

The QSFP-LX4-40G is a transceiver module designed for 2km (SMF) / 150m (MMF) optical communication applications. They are compliant with the IEEE 802.3ba 40GBASE-LR4 referred to as LM4. The module converts 4 inputs channels (ch) of 10Gb/s electrical data to 4 CWDM optical signals, and multiplexes them into a single channel for 40Gb/s optical transmission. Reversely, on the receiver side, the module optically de-multiplexes a 40Gb/s input into 4 CWDM channels signals, and converts them to 4 channel output electrical data.

Product Specifications

I.General Specifications

Parameter	Value	Unit	Notes
Module Form Factor	QSFP+		
Maximum Aggregate Data Rate	41.2	Gb/s	
Maximum Data Rate per Lane	10.3125	Gb/s	
Protocols Supported	40G Ethernet		
Electrical Interface and Pin-out	38-pin edge connector		Pin-out as defined by the QSFP+ MSA
Maximum Power Consumption	3.5	Watts	
Management Interface	Serial, I2C-based, 400 kHz maximum frequency		As defined by the QSFP+ MSA

Data Rate Specifications	Symbol	Min	Typ.	Max	Units	Ref.
Bit Rate per Lane	BR			10,313	Mb/sec	1
Bit Error Ratio	BER			10-12		2
Link distance on OM3	d			150	meters	
Link distance on OM4	d			160	meters	
Link distance on SMF	d			2000	meters	

Notes:

- 1. Adapted from 40GBASE-LR4, IEEE 802.3ba
- 2. Tested with a PRBS 231-1 test pattern.

II. Absolute Maximum Ratings

Parameter	Symbol	Min	Typ.	Max	Unit	Ref.
Maximum Supply Voltage	Vcc1, VccTx, VccRx	-0.5		4	V	
Storage Temperature	Ts	-40		85	° C	
Case Operating Temperature	Top	0		70	° C	
Relative Humidity	RH	0		85	%	1
Damage Threshold, per Lane	DT	3.4			dBm	

Notes:

Non-condensing.

III. Electrical Characteristics (TOP= 0 to 70°C, VCC = 3.1 to 3.47 Volts)

Parameter	Symbol	Min	Typ.	Max	Unit	Ref.
Supply Voltage	Vcc1, VccTx, VccRx	3.1		3.47	V	
Supply Current	Icc			1.13	A	
Transmit turn-on time				2000	ms	1
Transmitter (per Lane)						
Single ended input voltage tolerance	VinT	-0.3		4.0	V	
Differential data input swing	Vin,pp	120		1200	mVpp	2
Differential input threshold			50		mV	
AC common mode input voltage tolerance (RMS)		15			mV	
Differential input return loss		Per IEEE P802.3ba,Section 86A.4.1.1			dB	3
J2 Jitter Tolerance	Jt2	0.17			UI	
J9 Jitter Tolerance	Jt9	0.29			UI	
Data Dependent Pulse Width Shrinkage	DDPWS	0.07			UI	
Eye mask colordinates {X1, X2 ,Y1, Y2}			0.11, 0.31 95, 350		UI mV	4

Receiver (per Lane)						
Single-ended output voltage		-0.3		4.0	V	
Differential data output swing	Vout,pp	0		800	mVpp	5
AC common mode output voltage (RMS)				7.5	mV	
Termination mismatch at 1 MHz				5	%	
Differential output return loss		Per IEEE P802.3ba,Section 86A.4.2.1			dB	3
Common mode output return loss		Per IEEE P802.3ba,Section 86A.4.2.2			dB	3
Output transition time, 20% to 80%		28			ps	
J2 Jitter output	Jo2			0.42	UI	
J9 Jitter output	Jo9			0.65	UI	
Eye mask coordinates #1 {X1, X2, Y1, Y2}			0.29, 0.5 150, 425		UI mV	4
Power Supply Ripple Tolerance	PSR	50			mVpp	

Notes:

- 1.From power-on and end of any fault conditions.
- 2.After internal AC coupling. Self-biasing 100Ω differential input.
- 3.10 MHz to 11.1 GHz range
- 4.Hit ratio = 5 x 10E-5.
- 5.AC coupled with 100Ω differential output impedance.

IV. Optical Characteristics (TOP = 0 to 70°C, VCC = 3.1 to 3.47 Volts)

Parameter	Symbol	Min	Typ.	Max	Unit	Ref.
Transmitter (per Lane)						
Signaling Speed per Lane				11.2	GBd	1
Lane center wavelengths (range)		1264.5 – 1277.5 1284.5 – 1297.5 1304.5 – 1317.5 1324.5 – 1337.5			nm	
Total Average Launch Power	POUT			8.3	dBm	
Average Launch Power per Lane, MMF	TXPx	-7.0		4.3	dBm	2
Average Launch Power per Lane, SMF		-10.0		2.3		
Transmit OMA per Lane, MMF	TxOMA	-3.0		4.8	dBm	
Transmit OMA per Lane, SMF		-6.0		3.5	dBm	
Transmitter Dispersion Penalty, MMF	TXP-TDP			4.7	dBm	3
Transmitter Dispersion Penalty, SMF				2.6		
Average launch power of OFF transmitter, per Lane				-30	dBm	
Relative Intensity Noise	RIN			-128	dB/Hz	4
Sidemode Suppression ratio	SSRmin	30			dB	
Optical Extinction Ratio	ER	3.5			dB	
Optical Return Loss Tolerance				20	dB	
Transmitter Reflectance				-12	dB	
Transmitter eye mask definition {X1, X2, X3, Y1, Y2, Y3}		(0.25, 0.4, 0.45, 0.25, 0.28, 0.4)				

Parameter	Symbol	Min	Typ.	Max	Unit	Ref.
Receiver(per Lane)						
Signaling Speed per Lane				11.2	GBd	5
Lane center wavelengths(range)		1264.5 – 1277.5 1284.5 – 1297.5 1304.5 – 1317.5 1324.5 – 1337.5			nm	
Receive Power (OMA) per Lane, MMF	RXOMA			4.8		
					dBm	
Receive Power (OMA) per Lane, SMF				3.3		
Damage Threshold per Lane	PMAX			5.5	dBm	
Average Receive Power per Lane, MMF	RXPx	-10.0		4.3		
					dBm	
Average Receive Power per Lane, SMF		-13.7		2.3		6
Receiver Sensitivity (OMA) per Lane, MMF	Rxsens			-10.5		
					dBm	
Receiver Sensitivity (OMA) per Lane, SMF				-10.5		7
Stressed Receiver Sensitivity (OMA) per Lane, MMF	SRS			-5.0		
					dBm	
Stressed Receiver Sensitivity (OMA) per Lane, SMF				-8.5		

Return Loss	RL			-20	dB	
Vertical eye closure penalty, per lane				3.6	dB	
Receive electrical 3 dB upper cutoff frequency, per lane				12.3	dB	
LOS De-Assert	LOSD			-12	dBm	8
LOS Assert	LOSA	-28			dBm	8
LOS Hysteresis			1		dB	

Notes:

- 1.Transmitter consists of 4 lasers operating at 10.3Gb/s each.
- 2.Minimum value is informative.
- 3.Even if TDP < 0.5 dB (MMF) or TDP < 0.8 dB (SMF), TxP – TDP must be geater than this value.
- 4.RIN is scaled by 10*log(10/4) to maintain SNR outside of transmitter.
- 5.Receiver consists of 4 photodetectors operating at 10.3Gb/s each.
- 6.Minimum value is informative, equals min TxOMA with infinite ER and max channel insertion loss.
- 7.SMF receiver sensitivity guaranteed by design, but nots measured in production.
- 8.LOS Assert and De-Assert values are informative and may vary between MMF and SMF uses.

V. Pin Description

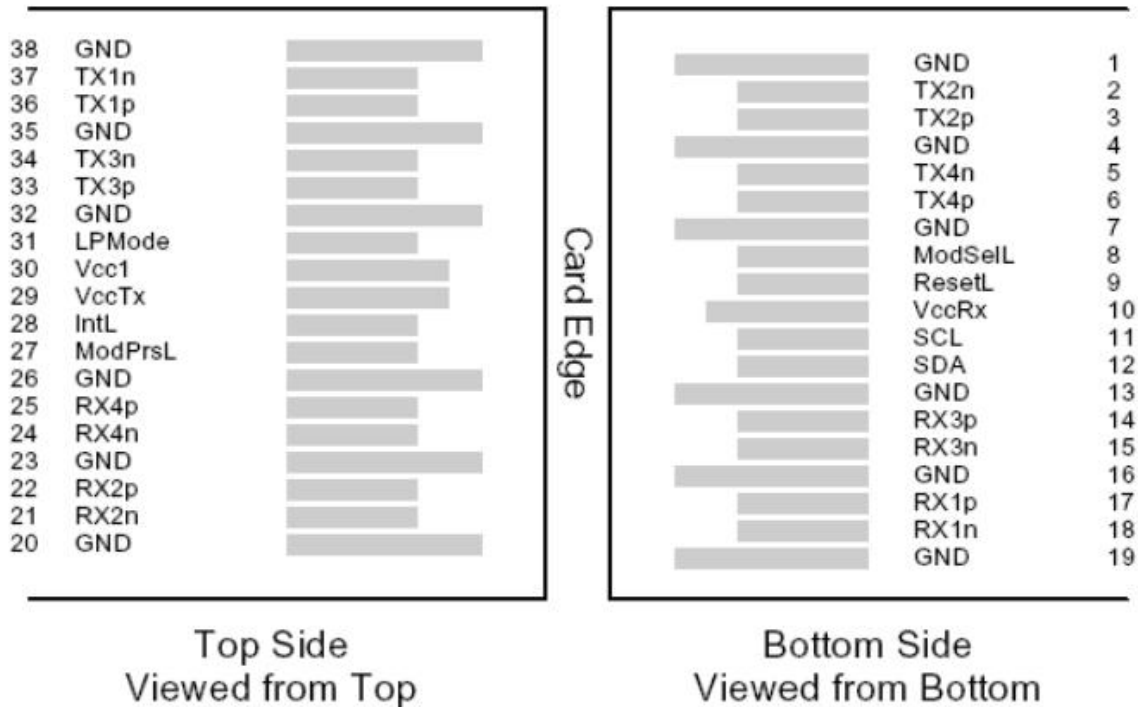


Figure 1 – QSFP+ MSA-compliant 38-pin connector

Pin	Symbol	Name/Description	Notes
1	GND	Ground	1
2	Tx2n	Transmitter Inverted Data Input	
3	Tx2p	Transmitter Non-Inverted Data Input	
4	GND	Ground	1
5	Tx4n	Transmitter Inverted Data Input	
6	Tx4p	Transmitter Non-Inverted Data Input	
7	GND	Ground	1
8	ModSelL	Module Select	
9	ResetL	Module Reset	

10	Vcc Rx	+3.3 V Power supply receiver	
11	SCL	2-wire serial interface clock	
12	SDA	2-wire serial interface data	
13	GND	Ground	1
14	Rx3p	Receiver Non-Inverted Data Output	
15	Rx3n	Receiver Inverted Data Output	
16	GND	Ground	1
17	Rx1p	Receiver Non-Inverted Data Output	
18	Rx1n	Receiver Inverted Data Output	
19	GND	Ground	1
20	GND	Ground	1
21	Rx2n	Receiver Inverted Data Output	
22	Rx2p	Receiver Non-Inverted Data Output	
23	GND	Ground	1
24	Rx4n	Receiver Inverted Data Output	
25	Rx4p	Receiver Non-Inverted Data Output	
26	GND	Ground	1
27	ModPrsL	Module Present	
28	IntL	Interrupt	
29	Vcc Tx	+3.3 V Power supply transmitter	
30	Vcc1	+3.3 V Power Supply	
31	LPMode	Low Power Mode	
32	GND	Ground	1
33	Tx3p	Transmitter Non-Inverted Data Input	

