Product Name	**GAOTek 40G QSFP LR4 4-CWDM 1310nm 10KM LC/MPO Optical Transceiver Module**
Product SKU	**GAOTek-QSFP-109**
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Contents

GAOTek 40G QSFP LR4 4-CWDM 1310nm 10KM LC/MPO QSFP Optical Transceiver Module

1. QSFP-40G-LR4 Overview

QSFP-40G-LR4 QSFP+ LR4 optical transceivers are based on Ethernet IEEE P802.3ba standard andSFF 8436 standard. The QSFP+ transceiver converts 4 inputs channels 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. The central wave- lengths of the 4 CWDM channels are 1271, 1291, 1311 and 1331 nm as members of the CWDM wave- length grid defined in ITU-T G694.2.

2. Product Features

- Uncooled 4x10Gb/s CWDM transmitter
- Up to 11.2Gbps data rate per wavelength
- QSFP+ MSA compliant
- Duplex LC connector
- Built-in digital diagnostic functions
- Up to 10km on SMF
- Maximum 3.5W operation power
- RoHS Compliant
- Operating temperature range: 0℃ to 75℃

3. Applications

- 40G Ethernet
- Infiniband interconnects

4. General specification

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Bit Error Rate	BER			10^{-12}		
Operating Temperature	TC	0		75	°C	1
Storage Temperature	TSTO	-40		85	°C	2
Input Voltage	VCC	3.14	3.3	3.46	V	
Maximum Voltage	**VMAX**	**-0.5**		**3.6**	**V**	**3**

Notes:

1. Case temperature
2. Ambient temperature
3. For electrical power interface

5. Link Distances

Data Rate	Fiber Type	Distance Range (km)
40 Gb/s	9/125um SMF	10

6. Optical – Characteristics – Transmitter

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Total Output Optical Power	PT			8.3	dBm	1
Average Launch Power (Each Lane)	PTX	-7		2.3	dBm	
Optical Center Wavelength(L0 Lane)	λC	1264.5	1271	1277.5	nm	
Optical Center Wavelength(L1 Lane)	λC	1284.5	1291	1297.5	nm	
Optical Center Wavelength(L2 Lane)	λC	1304.5	1311	1317.5	nm	
Optical Center Wavelength(L3 Lane)	λC	1324.5	1331	1337.5	nm	
Optical Modulation Amplitude	OMA	-4		3.5	dB	
Extinction Ratio	ER	3.5			dB	
Spectral Width (-20dB)	$\Delta\lambda$			1	nm	
Side Mode Suppression Ratio	SMSR	30			dB	
Relative Intensity Noise	RIN			-128	dB/Hz	
Transmitter Dispersion Penalty	TDP			2.3	dB	
Optical Return Loss Tolerance	TOL			20	dB	
Transmitter Eye Mask						2
Launch Power of OFF Transmitter,per lane	POUT_OFF			**-30**	dBm	1

Notes:

1. Average

2. Compliant with IEEE 802.3ba

7. Optical – Characteristics – Receiver

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Optical Center Wavelength (L0 Lane)	λC	1264.5	1271	1277.5	nm	
Optical Center Wavelength (L1 Lane)	λC	1284.5	1291	1297.5	nm	
Optical Center Wavelength (L2 Lane)	λC	1304.5	1311	1317.5	nm	
Optical Center Wavelength (L3 Lane)	λC	1324.5	1331	1337.5	nm	
Optical Input Power (each lane)	PRX	-13.7		2.3	dBm	1
Damage Threshold (each lane)	P	3.3			dBm	
Receiver Sensitivity (OMA)(eachlane)	RX SEN1			-11.5	dBm	
Receiver Reflectance	TRRX			-26	dB	
LOS Assert	LOS A	-28			dBm	
LOS De-Assert	LOS D			-15	dBm	
LOS Hysteresis	LOS H	0.5		6	dB	

Notes:

1. Average, Informative

8. Electrical – Characteristics – Transmitter

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Input differential impedance	R_{IN}		100		Ω	
Differential data input swing	V_{IN} PP	120		1200	mV	
Transmit Disable Voltage	VD	VCC-1.3		VCC	V	
Transmit Enable Voltage	V_{EN}	VEE		VEE +0.8	V	

9. Electrical – Characteristics – Receiver

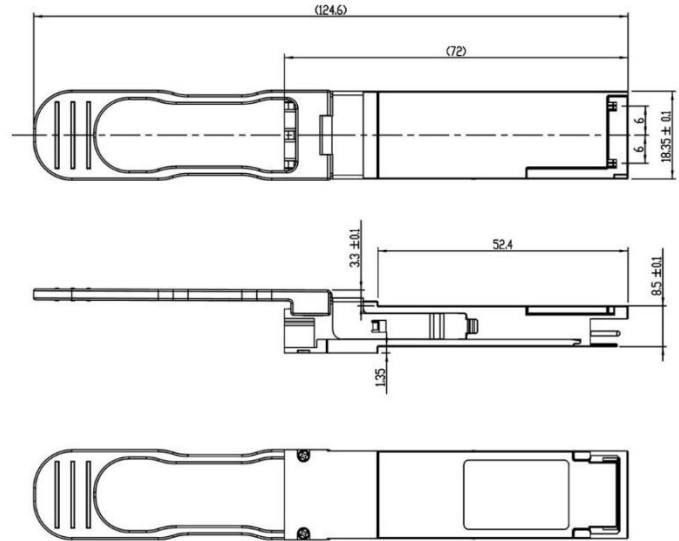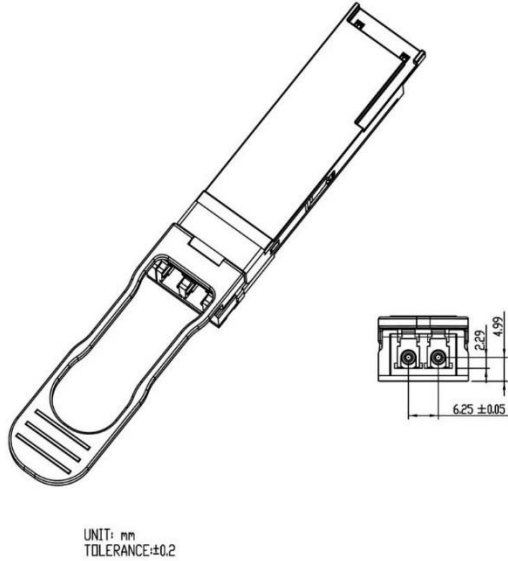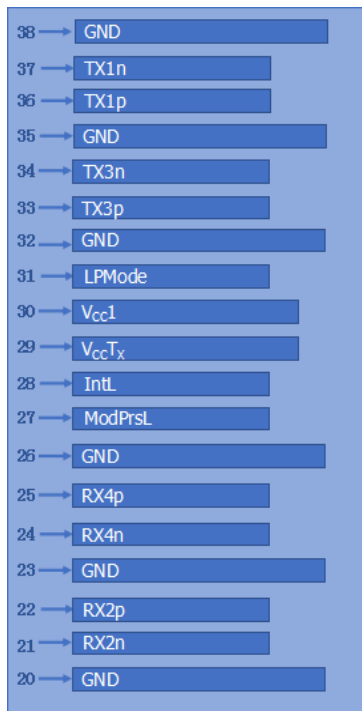| Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Differential data output swing	V_{OUT} PP	400	550	800	mV	
Data output rise/fall time(20%-80%)	tr/tf	28			ps	
LOS Fault	V_{LOS} A	VCC-1.3		VCC HOST	V	
LOS Normal	VLOS D	VEE		VEE+ 0.5	V	

10. Block-Diagram-of-Transceiver
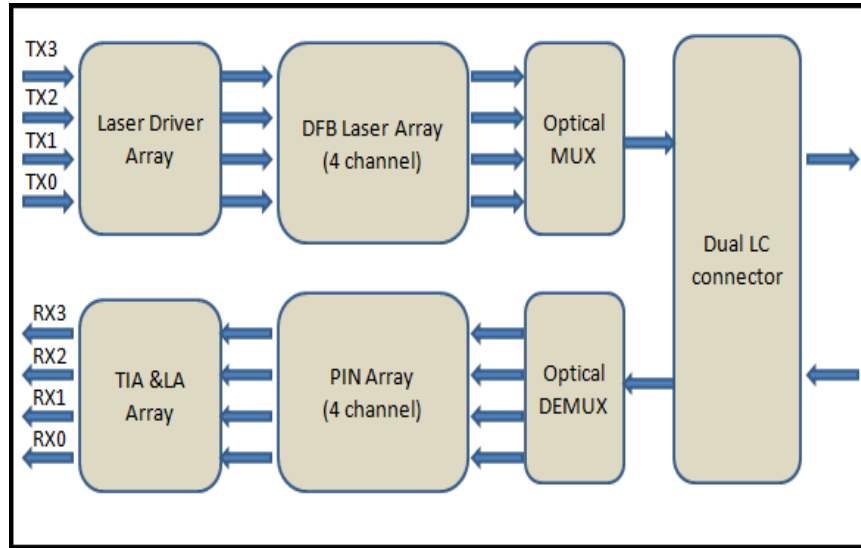
11. Functions Description

This product converts the 4-channel 10Gb/s electrical input data into CWDM optical signals (light), by adriven 4-wavelength Distributed Feedback Laser (DFB) array. The light is combined by the MUX partsas a 40Gb/s data, propagating out of the transmitter module from the SMF. The receiver module acceptsthe 40Gb/s CWDM optical signals input, and de-multiplexes it into 4 individual 10Gb/s channels with different wavelength. Each wavelength light is collected by a discrete photo diode, and then outputtedas electric data after amplified by a TIA.

12. Dimensions（mm）

UNIT: mm
TOLERANCE:±0.2

13. Electrical Pad Layout

38 → GND	GND ← 1
37 → TX1n	TX2n ← 2
36 → TX1p	TX2p ← 3
35 → GND	GND ← 4
34 → TX3n	TX4n ← 5
33 → TX3p	TX4p ← 6
32 → GND	GND ← 7
31 → LPMode	ModSeIL ← 8
30 → $V_{cc}1$	ResetL ← 9
29 → $V_{cc}T_x$	$V_{cc}R_x$ ← 10
28 → IntL	SCL ← 11
27 → ModPrsL	SDA ← 12
26 → GND	GND ← 13
25 → RX4p	RX3p ← 14
24 → RX4n	RX3n ← 15
23 → GND	GND ← 16
22 → RX2p	RX1p ← 17
21 → RX2n	RX1n ← 18
20 → GND	GND ← 19
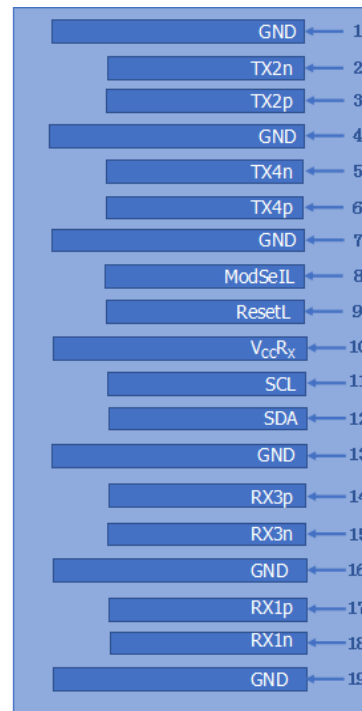
Top of Board   Bottom of Board

14. Pin Assignment

PIN #	Symbol	Description	Remarks
1	GND	Ground	5
2	Tx2n	Transmitter Inverted Data Input, LAN2	
3	Tx2p	Transmitter Non-Inverted Data Input, LAN2	
4	GND	Ground	5
5	Tx4n	Transmitter Inverted Data Input, LAN4	
6	Tx4p	Transmitter Non-Inverted Data Input, LAN4	
7	GND	Ground	5
8	ModSelL	Module select pin, the module responds to two-wire serialcommunication when low level	1
9	ResetL	Module Reset	2
10	V$_{cc}$RX	+3.3V Power Supply Receiver	
11	SCL	2-wire serial interface clock	
12	SDA	2-wire serial interface data	
13	GND	Ground	5
14	Rx3p	Receiver Non-Inverted Data Output, LAN3	
15	Rx3n	Receiver Inverted Data Output, LAN3	
16	GND	Ground	5
17	Rx1p	Receiver Non-Inverted Data Output, LAN1	
18	Rx1n	Receiver Inverted Data Output, LAN1	
19	GND	Ground	5
20	GND	Ground	5
21	Rx2n	Receiver Inverted Data Output, LAN2	
22	Rx2p	Receiver Non-Inverted Data Output, LAN2	
23	GND	Ground	5
24	Rx4n	Receiver Inverted Data Output, LAN4	
25	Rx4p	Receiver Non-Inverted Data Output, LAN4	
26	GND	Ground	5
27	ModPrsL	The module is inserted into the indicate pin and groundedin the module.	3

28	IntL	Interrupt	4
29	V_{CC}T X	+3.3V Power Supply transmitter	
30	V_{cc}1	+3.3V Power Supply	
31	LPMo de	Low Power Mode	5
32	**GND**	**Ground**	**5**

33	**Tx3p**	**Transmitter Non-Inverted Data Input, LAN3**	
34	Tx3n	Transmitter Inverted Data Input, LAN3	
35	GND	Ground	5
36	Tx1p	Transmitter Non-Inverted Data Input, LAN1	
37	Tx1n	Transmitter Inverted Data Input, LAN1	
38	**GND**	**Ground**	**5**

Notes:

1. ModSel L is the input pin. The module responds to 2-wire serial communication commands when it is held low bythe host. ModSel L allows multiple QSFP modules to be used on a single 2-wire interface bus. If ModSel L is High,the module will not respond to any 2-wire interface communication from the host. ModSel L has internal pull-up resistors in the module

2. The module restart pin, when the low level on the Reset L pin lasts longer than the minimum pulse length, resets the module and restores all user modules to their default state. When performing reset device, the host should ignore all status bits. Until the module reset interrupt is completed, please note that during hot plugging, the module will issue this information to complete the reset interrupt without resetting

3. This pin is active high, indicating that the module is running under a low power module.

4. Int L is the output pin, which is the open collector output and must be pulled up to Vcc on the motherboard. When it is low, it indicates that the module may malfunction. The host uses a 2-wire serial interface to identify the interrupt source.

5. Circuit ground is internally isolated from chassis ground.