

DATA SHEET

MODULETEK-QSFP10-LRL4-C10

40Gb/s QSFP+ 2km Optical Transceiver

QSFP10-LRL4-C10 Overview

ModuleTek's QSFP10-LRL4-C10 QSFP+ 2km optical transceivers are based on Ethernet IEEE 802.3ba standard and SFF-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 wavelengths of the 4 CWDM channels are 1271, 1291, 1311 and 1331 nm as members of the CWDM wavelength grid defined in ITU-T G694.2.

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 2km on SMF
- Maximum 3.5W operation power
- RoHS Compliant
- Operating temperature range: 0°C to 70°C

Applications

- 40G Ethernet
- Infiniband interconnects

Ordering Information

Part Number	Description	Color on Clasp
QSFP10-LRL4-C10	40G QSFP+ 1310nm LC, Up to 2km on SMF, with DOM function	Blue
For More Information: ModuleTek Limited Web: www.moduletek.com Email: sales@moduletek.com		

General Specifications

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Bit Error Rate	BER			10^{-12}		
Operating Temperature	T _{OP}	0		70	°C	1
Storage Temperature	T _{STO}	-40		85	°C	2
Input Voltage	V _{CC}	3.14	3.3	3.46	V	
Maximum Voltage	V _{MAX}	-0.5		3.6	V	3

Notes:

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

Link Distances

Parameter	Fiber Type	Distance Range (Km)
40Gb/s	OM3 MMF	0.1
40Gb/s	OM4 MMF	0.15
40Gb/s	9/125um SMF	2

Optical - Characteristics - Transmitter

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Total Output Optical Power	P_T			8.3	dBm	1
Average Launch Power (Each Lane)	P_{TX}	-10		2.3	dBm	
Optical Center Wavelength	λ_C	1264.5	1271	1277.5	nm	2
	λ_C	1284.5	1291	1297.5	nm	3
	λ_C	1304.5	1311	1317.5	nm	4
	λ_C	1324.5	1331	1337.5	nm	5
Optical Modulation Amplitude, Each Lane	OMA	-6		3.5	dB	
Extinction Ratio	ER	3.5			dB	
Spectral Width (-20dB)	$\Delta\lambda$			0.6	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	Compliant with IEEE 802.3ba					
Launch Power of OFF Transmitter, per lane	P_{OUT_OFF}			-30	dBm	1

Notes:

1. Average
2. L0 Lane
3. L1 Lane
4. L2 Lane
5. L3 Lane

Optical-Characteristics-Receiver

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Optical Center Wavelength	λ_C	1264.5	1271	1277.5	nm	1
	λ_C	1284.5	1291	1297.5	nm	2
	λ_C	1304.5	1311	1317.5	nm	3
	λ_C	1324.5	1331	1337.5	nm	4
Optical Input Power(each lane)	P_{RX}	-13.7		2.3	dBm	5
Damage Threshold(per lane)	P	1			dBm	
Receiver Sensitivity (OMA), each Lane	R_{X_SEN1}			-10.5	dBm	
Stressed Receiver Sensitivity in OMA, Each Lane	SRS			-8.5	dBm	
Receiver Reflectance	TR_{RX}			-26	dB	
LOS Assert	LOS_A	-28			dBm	
LOS De-Assert	LOS_D			-15	dBm	
LOS Hysteresis	LOS_H	1			dB	

Notes:

1. L0 Lane
2. L1 Lane
3. L2 Lane
4. L3 Lane
5. Average, Informative

Electrical - Characteristics - Transmitter

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Input differential impedance	R_{IN}		100		Ω	1
Differential data input swing	V_{IN_PP}	120		1200	mV	
Transmit Disable Voltage	V_D	$V_{CC}-1.3$		V_{CC}	V	
Transmit Enable Voltage	V_{EN}	V_{EE}		$V_{EE}+0.8$	V	

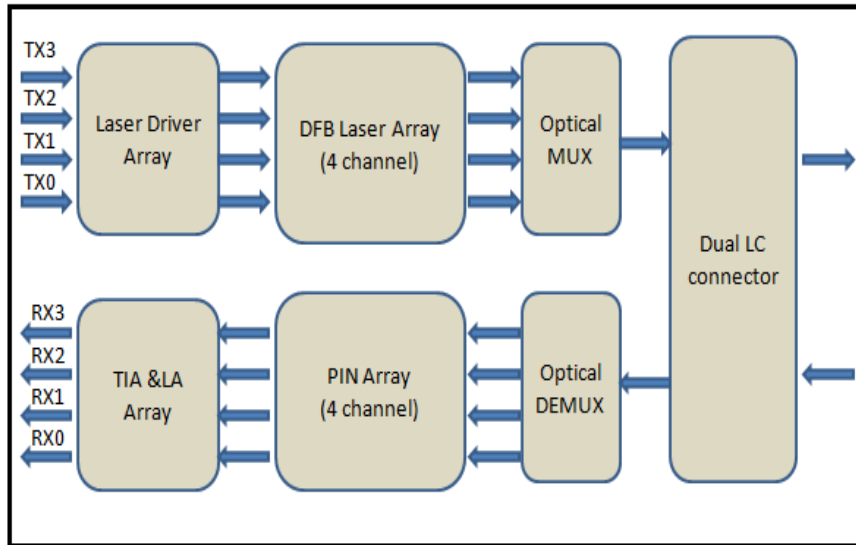
Notes:

1. Non-condensing

Electrical - Characteristics - Receiver

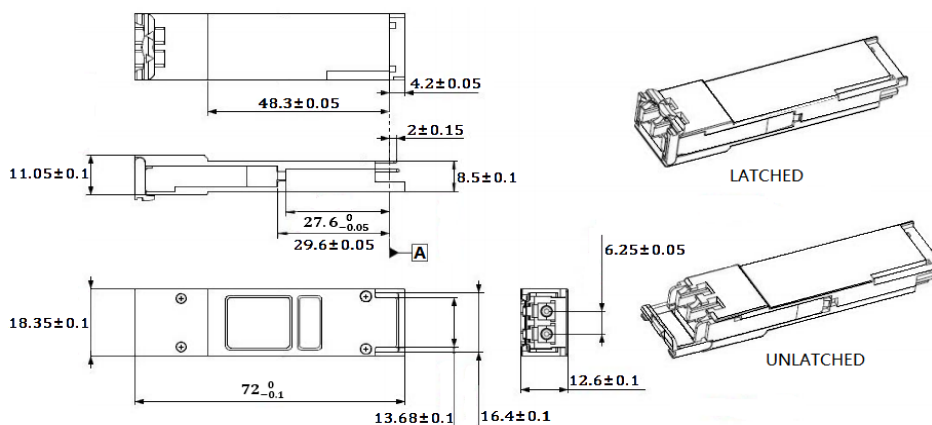
Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Differential data output swing	V_{OUT_PP}	400	550	800	mV	
Data output rise time (20%-80%)	T_R		30		ps	
Data output fall time(20%-80%)	T_F		30		ps	
LOS Fault	V_{LOS_A}	$V_{CC}-1.3$		V_{CC_HOST}	V	
LOS Normal	V_{LOS_D}	V_{EE}		$V_{EE}+0.5$	V	

Block-Diagram-of-Transceiver



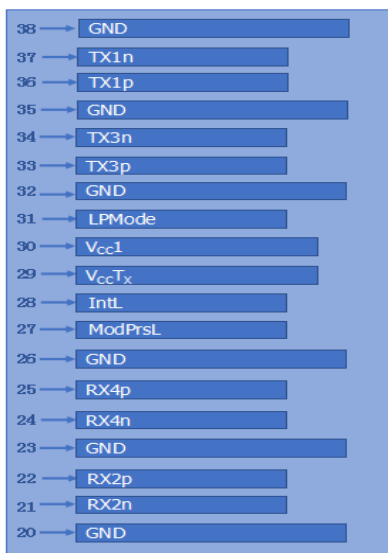
This product converts the 4-channel 10Gb/s electrical input data into CWDM optical signals (light), by a driven 4-wavelength Distributed Feedback Laser (DFB) array. The light is combined by the MUX parts as a 40Gb/s data, propagating out of the transmitter module from the SMF. The receiver module accepts the 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 outputted as electric data after amplified by a TIA.

Dimensions

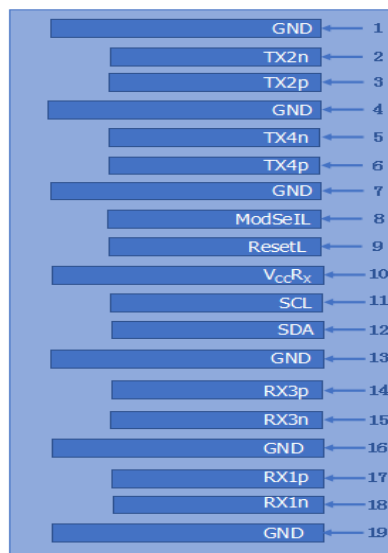


ALL DIMENSIONS ARE ±0.2mm UNLESS OTHERWISE SPECIFIED
UNIT: mm

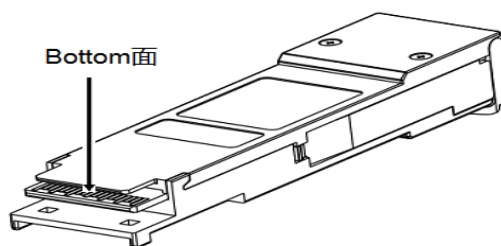
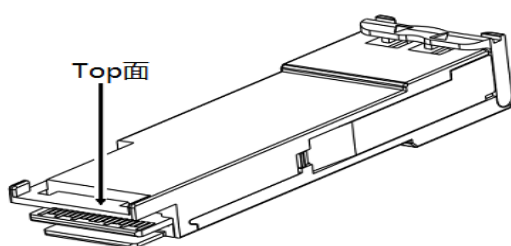
Electrical Pad Layout



Top of Board



Bottom of Board



Pin Assignment

PIN #	Symbol	Description	Remarks
1	GND	Ground	
2	Tx2n	Transmitter Inverted Data Input	
3	Tx2p	Transmitter Non-Inverted Data Input	
4	GND	Ground	
5	Tx4n	Transmitter Inverted Data Input	
6	Tx4p	Transmitter Non-Inverted Data Input	
7	GND	Ground	
8	ModSelL	Module Select	
9	ResetL	Module Reset	
10	V _{cc} R _X	+3.3V Power Supply Receiver	
11	SCL	2-wire serial interface clock	
12	SDA	2-wire serial interface data	
13	GND	Ground	
14	Rx3p	Receiver Non-Inverted Data Output	
15	Rx3n	Receiver Inverted Data Output	
16	GND	Ground	
17	Rx1p	Receiver Non-Inverted Data Output	
18	Rx1n	Receiver Inverted Data Output	
19	GND	Ground	
20	GND	Ground	
21	Rx2n	Receiver Inverted Data Output	
22	Rx2p	Receiver Non-Inverted Data Output	
23	GND	Ground	
24	Rx4n	Receiver Inverted Data Output	
25	Rx4p	Receiver Non-Inverted Data Output	
26	GND	Ground	
27	ModPrsL	Module Present	
28	IntL	Interrupt	
29	V _{cc} T _X	+3.3V Power Supply transmitter	
30	V _{cc} 1	+3.3V Power Supply	
31	LPMMode	Low Power Mode	
32	GND	Ground	
33	Tx3p	Transmitter Non-Inverted Data Input	
34	Tx3n	Transmitter Inverted Data Input	

35	GND	Ground	
36	Tx1p	Transmitter Non-Inverted Data Input	
37	Tx1n	Transmitter Inverted Data Input	
38	GND	Ground	

References

1. IEEE standard 802.3ba. IEEE Standard Department, 2010.
2. QSFP+ 10Gbs 4X PLUGGABLE TRANSCEIVER –SFF-8436