

## DATA SHEET

### MODULETEK – QSFP10-ER-C10 40Gb/s QSFP+ ER4 Optical Transceiver

#### QSFP10-ER-C10 Overview

ModuleTek's QSFP10-ER-C10 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

- 4 CWDM Lanes MUX/DEMUX design
- Up to 11.2Gbps data rate per wavelength
- QSFP+ MSA compliant
- Duplex LC connector
- Built-in digital diagnostic functions
- up to 30km on SMF
- Maximum 3.5W operation power
- RoHS Compliant
- Operating temperature range: 0°C to 70°C.

#### Applications

- 40GBASE-ER4 Ethernet
- Infiniband QDR and DDR interconnects

#### Ordering Information

Part Number	Description
QSFP10-ER-C10	40G QSFP+ 1310nm LC Connectors, Up to 30km on SMF, with DOM function.

#### For More Information:

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## General Specifications

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

### Notes:

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

## Optical Characteristics – Transmitter

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Total Output Optical Power	P <sub>T</sub>			10.5	dBm	1
Average Launch Power (Each Lane)	P	- 3.7		4.5	dBm	
Optical Center Wavelength	λ <sub>C</sub>	1264.5	1271	1277.5	nm	2
	λ <sub>C</sub>	1284.5	1291	1297.5	nm	3
	λ <sub>C</sub>	1304.5	1311	1317.5	nm	4
	λ <sub>C</sub>	1324.5	1331	1337.5	nm	5
Optical Modulation Amplitude, Each Lane	OMA	- 0.7		5	dB	
Extinction Ratio	ER	5.5			dB	
Side Mode Suppression Ratio	SMSR	30			dB	
Relative Intensity Noise	RIN			- 128	dB/Hz	
Transmitter Dispersion Penalty	TDP			2.6	dB	
Optical Return Loss Tolerance	TOL			20	dB	
Transmitter Eye Mask			Compliant with IEEE 802.3ba			
Launch Power of OFF Transmitter	P <sub>OUT_OFF</sub>			- 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	$\lambda_C$	1264.5	1271	1277.5	nm	1
	$\lambda_C$	1284.5	1291	1297.5	nm	2
	$\lambda_C$	1304.5	1311	1317.5	nm	3
	$\lambda_C$	1324.5	1331	1337.5	nm	4
Optical Input Power, each lane	$P_{IN}$	- 20.2		- 1.5	dBm	5
Damage Threshold, each lane	P	3.8			dBm	
Receiver Sensitivity (OMA), each Lane	$R_{X\_SEN1}$			- 18	dBm	
Stressed Receiver Sensitivity in OMA, each Lane				- 15.8	dBm	
LOS Assert	$LOS_A$	- 35			dBm	
LOS De-Assert	$LOS_D$			- 20	dBm	
LOS Hysteresis	$LOS_H$	0.5			dB	

### Notes:

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

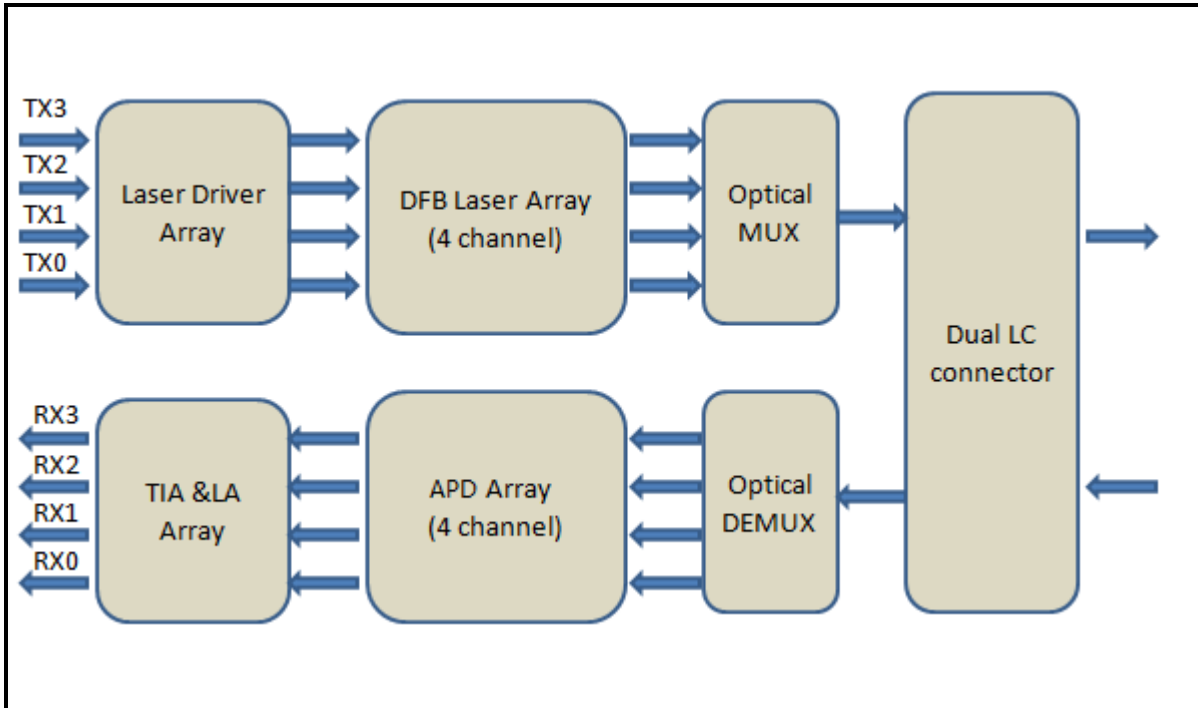
## Electrical Characteristics – Transmitter

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Input differential impedance	$R_{IN}$		100		$\Omega$	
Differential data input swing	$V_{IN\_PP}$	190		700	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	

## Electrical Characteristics – Receiver

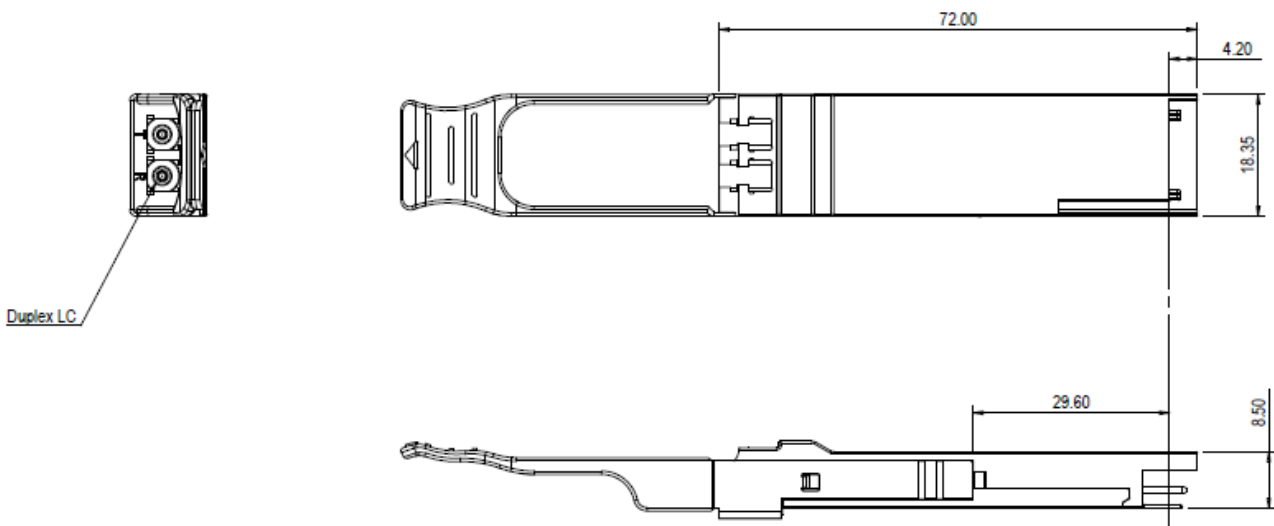
Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Differential data output swing	$V_{OUT\_PP}$	300		850	mV	
Data output rise time (20%-80%)	$T_R$		30		ps	
Data output fall time (20%-80%)	$T_F$		30		ps	
LOS Fault	$V_{LOS\_Fault}$	$V_{CC}-1.3$		$V_{CC\_HOST}$	V	
LOS Normal	$V_{LOS\_Normal}$	$V_{EE}$		$V_{EE}+0.5$	V	

## Block Diagram of Transceiver



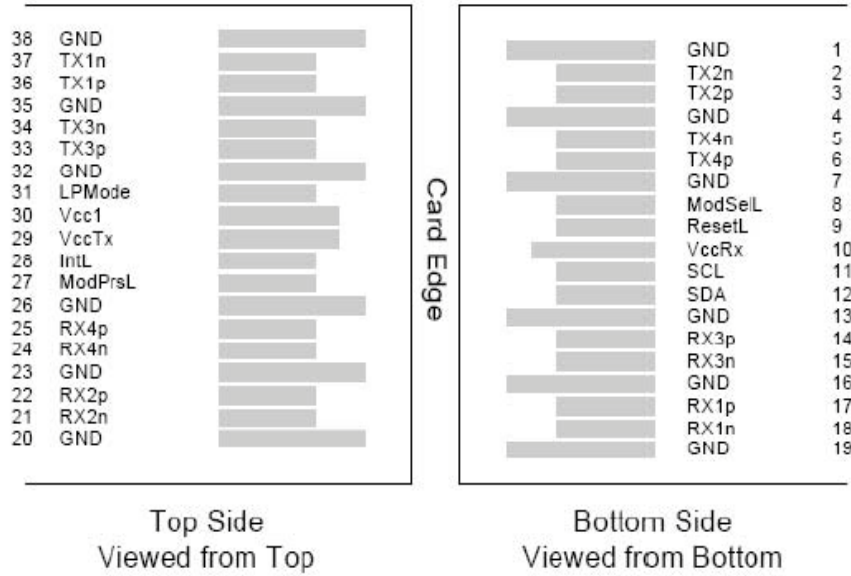
This product converts the 4-channel 10Gb/s electrical input data into CWDM optical signals (light), by a driven 4-wavelength Distributed Feedback Laser (DFB) array. The light is combined by the MUX parts as a 40Gb/s data, propagating out of the transmitter module from the SMF. The receiver module accepts 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  $\pm 0.2\text{mm}$  UNLESS OTHERWISE SPECIFIED**  
**UNIT: mm**

## Electrical Pad Layout



### 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	Vcc Rx	+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 <sub>cc</sub> TX	+3.3V Power Supply transmitter
30	V <sub>cc</sub> 1	+3.3V Power Supply
31	LPMODE	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