

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 | Color on Clasp |
|---|---|----------------|
| QSFP10-ER-C10 | 40G QSFP+ 1310nm LC Connectors, Up to 30km on SMF, with DOM function. | Red |
| 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_C | 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

Optical – Characteristics – Transmitter

| Parameter | Symbol | Min | Typ | Max | Unit | Remarks |
|---|-----------------------------|--------|------|--------|-------|---------|
| Total Output Optical Power | P_T | | | 10.5 | dBm | 1 |
| Average Launch Power (Each Lane) | P_{TX} | -3.7 | | 4.5 | dBm | |
| Optical Center Wavelength (L0 Lane) | λ_c | 1264.5 | 1271 | 1277.5 | nm | |
| Optical Center Wavelength (L1 Lane) | λ_c | 1284.5 | 1291 | 1297.5 | nm | |
| Optical Center Wavelength (L2 Lane) | λ_c | 1304.5 | 1311 | 1317.5 | nm | |
| Optical Center Wavelength (L3 Lane) | λ_c | 1324.5 | 1331 | 1337.5 | nm | |
| 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_{OUT_OFF} | | | -30 | dBm | 1 |

Note:

1. Average

Optical – Characteristics – Receiver

| Parameter | Symbol | Min | Typ | Max | Unit | Remarks |
|---|---------------|--------|------|--------|------|---------|
| Optical Center Wavelength (L0 Lane) | λ_C | 1264.5 | 1271 | 1277.5 | nm | |
| Optical Center Wavelength (L1 Lane) | λ_C | 1284.5 | 1291 | 1297.5 | nm | |
| Optical Center Wavelength (L2 Lane) | λ_C | 1304.5 | 1311 | 1317.5 | nm | |
| Optical Center Wavelength (L3 Lane) | λ_C | 1324.5 | 1331 | 1337.5 | nm | |
| Optical Input Power, each lane | P_{RX} | -20.2 | | -1.5 | dBm | 1 |
| 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. Average, Informative

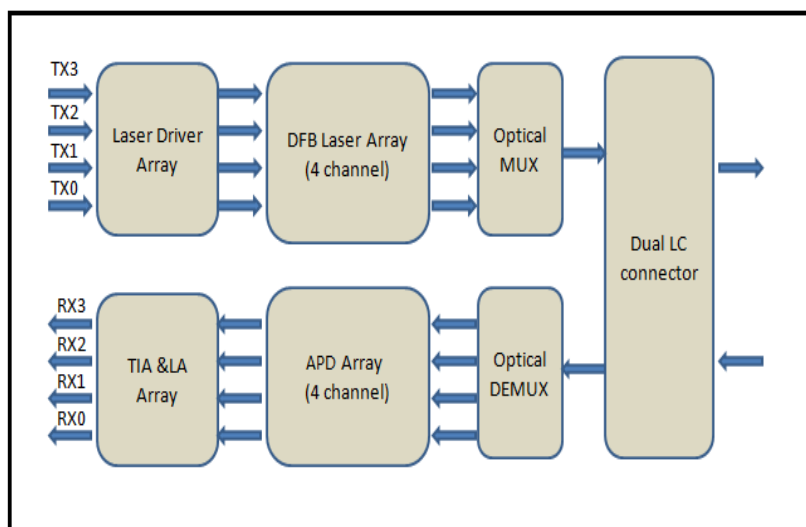
Electrical – Characteristics – Transmitter

| Parameter | Symbol | Min | Typ | Max | Unit | Remarks |
|-------------------------------|--------------|--------------|-----|--------------|----------|---------|
| Input differential impedance | R_{IN} | | 100 | | Ω | |
| 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_A} | $V_{CC}-1.3$ | | V_{CC_HOST} | V | |
| LOS Normal | V_{LOS_D} | V_{EE} | | $V_{EE}+0.5$ | V | |

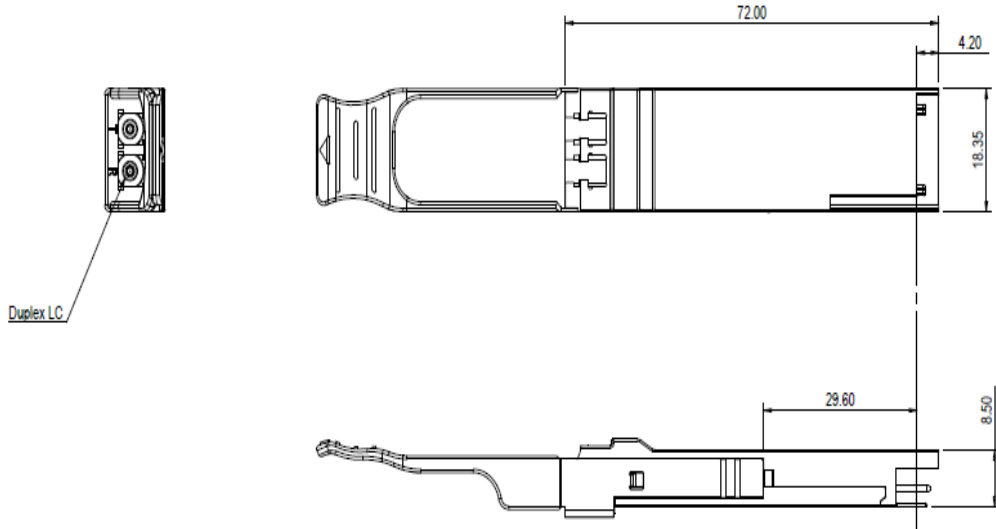
Block-Diagram-of-Transceiver



Functions Description

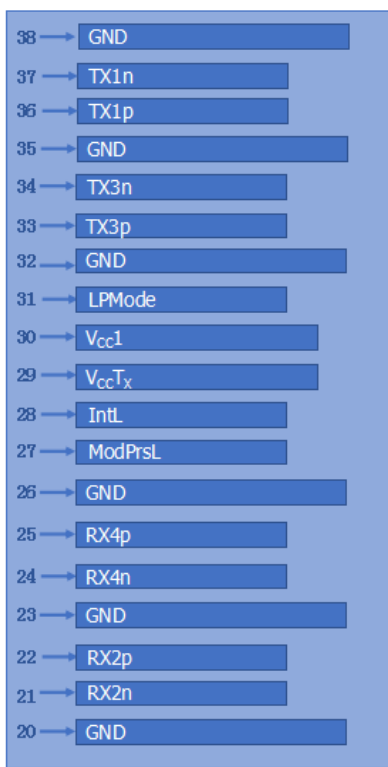
This product converts the 4-channel 10Gb/s electrical input data into CWDM optical signals (light), by a driven 4-wavelength Distributed Feedback Laser (DFB) array. The light is combined by the MUX parts as a 40Gb/s data, propagating out of the transmitter module from the SMF. The receiver module accepts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

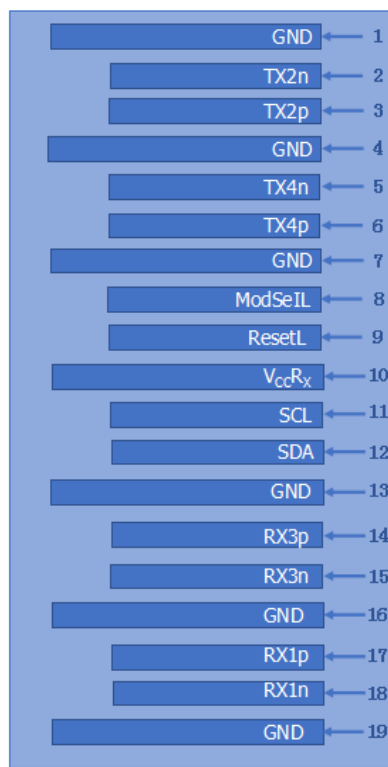


ALL DIMENSIONS ARE $\pm 0.2\text{mm}$ UNLESS OTHERWISE SPECIFIED
UNIT: mm

Electrical Pad Layout



Top Board



Bottom Board

Pin Assignment

| PIN # | Symbol | Description | Remarks |
|-------|--------------------------------|-------------------------------------|---------|
| 1 | GND | Ground | 5 |
| 2 | Tx2n | Transmitter Inverted Data Input | |
| 3 | Tx2p | Transmitter Non-Inverted Data Input | |
| 4 | GND | Ground | 5 |
| 5 | Tx4n | Transmitter Inverted Data Input | |
| 6 | Tx4p | Transmitter Non-Inverted Data Input | |
| 7 | GND | Ground | 5 |
| 8 | ModSelL | Module Insertion Indicator Pin | 1 |
| 9 | ResetL | Module Reset | 2 |
| 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 | 5 |
| 14 | Rx3p | Receiver Non-Inverted Data Output | |
| 15 | Rx3n | Receiver Inverted Data Output | |
| 16 | GND | Ground | 5 |
| 17 | Rx1p | Receiver Non-Inverted Data Output | |
| 18 | Rx1n | Receiver Inverted Data Output | |
| 19 | GND | Ground | 5 |
| 20 | GND | Ground | 5 |
| 21 | Rx2n | Receiver Inverted Data Output | |
| 22 | Rx2p | Receiver Non-Inverted Data Output | |
| 23 | GND | Ground | 5 |
| 24 | Rx4n | Receiver Inverted Data Output | |
| 25 | Rx4p | Receiver Non-Inverted Data Output | |
| 26 | GND | Ground | 5 |
| 27 | ModPrsL | Module Present | 3 |
| 28 | IntL | Interrupt | 4 |
| 29 | V _{cc} T _X | +3.3V Power Supply transmitter | |
| 30 | V _{cc} 1 | +3.3V Power Supply | |
| 31 | LPMode | Low Power Mode | 5 |
| 32 | GND | Ground | 5 |
| 33 | Tx3p | Transmitter Non-Inverted Data Input | |

| | | | |
|----|------|-------------------------------------|---|
| 34 | Tx3n | Transmitter Inverted Data Input | |
| 35 | GND | Ground | 5 |
| 36 | Tx1p | Transmitter Non-Inverted Data Input | |
| 37 | Tx1n | Transmitter Inverted Data Input | |
| 38 | GND | Ground | 5 |

Notes:

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

References

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