

# QSFP-ER4-40-40GD

## 40GBASE, QSFP+ ER4, SMF TRANSCEIVER

### 1271-1331, 40km REACH, DUPLEX LC CONNECTOR

#### Product Features

- Hot-pluggable QSFP+ form factor
- Supports 41.3 Gb/s aggregate bitrate
- Power dissipation < 3.5W
- 18.5 dB link insertion loss budget
- Single 3.3V power supply
- Maximum link length of 40km
- Uncooled 4x10Gb/s CWDM transmitter
- XLPPI electrical interface
- Duplex LC receptacles
- Built-in digital diagnostic functions, including Tx/Rx power monitoring
- RoHS-6, MSA, IEEE 802.3ba compliant
- Case operating temperature:
  - Commercial: 0 ~ 70°C



#### Product Applications

- 40GBASE-ER
- 40G Ethernet

#### I. Maximum Ratings

Exceeding the limits below may damage the transceiver module permanently.

| Parameter                          | Symbol            | Min. | Max | Units | Notes |
|------------------------------------|-------------------|------|-----|-------|-------|
| Storage Temperature                | T <sub>s</sub>    | -40  | +85 | °C    |       |
| Maximum Supply Voltage             | V <sub>cc1</sub>  | -0.5 | 3.6 | V     |       |
|                                    | V <sub>ccTx</sub> |      |     |       |       |
|                                    | V <sub>ccRx</sub> |      |     |       |       |
| Relative Humidity (non-condensing) | RH                | 0    |     | 85    | %     |
| Damage Threshold, per Lane         | DT                | 3.8  |     |       | dBm   |

## II. Operating Specifications

| Parameter                  | Symbol | Min.  | Typ.    | Max.              | Units | Notes      |
|----------------------------|--------|-------|---------|-------------------|-------|------------|
| Operating Case Temperature | Top    | 0     |         | 70                | °C    | Commercial |
| Supply Voltage             | Vcc    | 3.135 | 3.3     | 3.465             | V     |            |
| Max Data Rate, each lane   |        |       | 10.3125 |                   | Gb/s  |            |
| Max Aggregate Data Rate    |        |       | 41.25   |                   | Gb/s  |            |
| Max Power Consumption      | Pmax   |       |         | 3.5               | w     |            |
| Bit Rate, per lane         | BR     |       | 10.3125 |                   | Gb/s  | 1          |
| Bit Error Ratio            | BER    |       |         | 10 <sup>-12</sup> |       | 2          |
| Link Distance              | D      | .0002 |         | 2                 | km    | 3          |

Notes:

- ± 100 ppm , compliant with 40GBASE-ER4 and XLPP1 per IEEE 802.3bm.
- Tested with a PRBS 231-1 test pattern.
- Per 40GBASE-ER4, IEEE 802.3bm. Links longer than 30km are considered to be engineered links, with losses less than the worst case specified for the fiber type.

## III. Electrical Characteristics

| Parameter                                    | Symbol                               | Min.                    | Typ. | Max. | Unit  | Notes |
|----------------------------------------------|--------------------------------------|-------------------------|------|------|-------|-------|
| Supply Voltage                               | Vcc1                                 | 3.1                     |      | 3.47 | V     |       |
|                                              | VccTx                                |                         |      |      |       |       |
|                                              | VccRx                                |                         |      |      |       |       |
| Supply Current                               | Icc                                  |                         |      | 1.13 | A     |       |
| <b>Link (turn-on) Time</b>                   |                                      |                         |      |      |       |       |
| Transmit turn-on time                        |                                      |                         |      | 2000 | ms    | 2     |
| <b>Transmitter</b>                           |                                      |                         |      |      |       |       |
| Single ended input voltage tolerance         | VinT                                 | -0.3                    |      | 4.0  | V     |       |
| Differential data input swing                | Vin,pp                               | 120                     |      | 1200 | mVpp  | 3     |
| 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    | 4     |
| 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 coordinates<br>{X1, X2, Y1, Y2}     |                                      | { 0.11, 0.31, 95, 350 } |      |      | UI/mV | 5     |

| Parameter                                | Symbol                               | Min.                    | Typ. | Max. | Unit | Notes |
|------------------------------------------|--------------------------------------|-------------------------|------|------|------|-------|
| <b>Receiver</b>                          |                                      |                         |      |      |      |       |
| Single-ended output voltage              |                                      | -0.3                    |      | 4.0  | V    |       |
| Differential data output swing           | V <sub>out,pp</sub>                  | 0                       |      | 800  | mVpp | 6     |
| 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   | 4     |
| Common mode output return loss           | Per IEEE P802.3ba, Section 86A.4.2.2 |                         |      |      | dB   | 4     |
| Output transition time, 20% to 80%       |                                      | 28                      |      |      |      |       |
| J2 Jitter output                         | Jo2                                  |                         |      | 0.42 |      |       |
| J9 Jitter output                         | Jo9                                  |                         |      | 0.65 |      |       |
| Eye mask coordinates #1 {X1, X2, Y1, Y2} |                                      | { 0.29, 0.5, 150, 425 } |      |      |      | 5     |
| Power Supply Ripple Tolerance            | PSR                                  | 50                      |      |      | mVpp |       |

**Notes:**

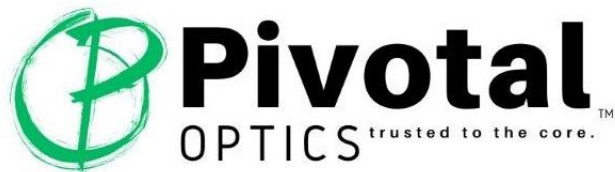
1. Maximum total power value is specified across the full temperature and voltage range.
2. From power-on and end of any fault conditions.
3. After internal AC coupling. Self-biasing 100 $\Omega$  differential input.
4. 10 MHz to 11.1 GHz range.
5. Hit ratio = 5 x 10E-5.
6. AC coupled with 100 $\Omega$  differential output impedance.

## IV. Optical Characteristics

| Parameter                                                | Symbol      | Min                             | Typical | Max    | Unit  | Notes                          |
|----------------------------------------------------------|-------------|---------------------------------|---------|--------|-------|--------------------------------|
| Center Wavelength                                        | $\lambda_C$ | 1264.5                          | 1271    | 1277.5 | nm    |                                |
|                                                          |             | 1284.5                          | 1291    | 1297.5 |       |                                |
|                                                          |             | 1304.5                          | 1311    | 1317.5 |       |                                |
|                                                          |             | 1324.5                          | 1331    | 1337.5 |       |                                |
| Signaling Speed per Lane                                 |             |                                 | 10.3125 |        | GBd   | (note 1 - TX)<br>(note 4 - RX) |
| Transmitter                                              |             |                                 |         |        |       |                                |
| Total Average Launch Power                               | POUT        |                                 |         | 10.5   | dBm   |                                |
| Transmit OMA per Lane                                    | TxOMA       | 0.3                             |         | 5.0    | dBm   |                                |
| Average Launch Power per Lane                            | TXPx        | -2.7                            |         | 4.5    | dBm   | 2                              |
| Difference in launch power between any two lanes (OMA)   |             |                                 |         | 4.7    | dB    |                                |
| Transmitter Dispersion Penalty                           | TDP         |                                 |         | 2.6    | dB    |                                |
| Launch power (OMA) minus TDP per lane                    |             | -0.5                            |         |        | dBm   |                                |
| Optical Extinction Ratio                                 | ER          | 5.5                             |         |        | dB    |                                |
| Sidemode Suppression ratio                               | SSRmin      | 30                              |         |        | dB    |                                |
| Average launch power of OFF transmitter, per lane        |             |                                 |         | -30    | dBm   |                                |
| Relative Intensity Noise                                 | RIN         |                                 |         | -128   | dB/Hz | 3                              |
| Optical Return Loss Tolerance                            |             |                                 |         | 20     | dB    |                                |
| Transmitter Eye Mask definition {X1, X2, X3, Y1, Y2, Y3} |             | { 0.25,0.4,0.45,0.25,0.28,0.4 } |         |        |       |                                |
| Receiver                                                 |             |                                 |         |        |       |                                |
| Receive Power (OMA) per Lane                             | RxOMA       |                                 |         | -4.0   | dBm   |                                |
| Average Receive Power per Lane                           | RXPx        | -21.2                           |         | -4.5   | dBm   | 5, 6                           |
| Receiver Sensitivity (OMA) per Lane                      | Rxsens      |                                 |         | -19    | dBm   |                                |
| Stressed Receiver Sensitivity (OMA)                      | SRS         |                                 |         | -16.8  | dBm   |                                |
| per Lane                                                 | PMAX        |                                 |         | 3.8    | dBm   |                                |
| Damage Threshold per Lane                                | RL          |                                 |         | -26    | dB    |                                |
| Return Loss                                              |             |                                 |         | 2.2    | dB    |                                |
| Vertical eye closure penalty, per lane                   |             |                                 |         | 12.3   | GHz   |                                |

## QSFP-ER4-40-40GD

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1271-1331, 40km REACH, DUPLEX LC CONNECTOR



### Notes:

1. Transmitter consists of 4 lasers operating at up to 10.3 Gb/s each,  $\pm 100$ ppm
2. Minimum value is informative.
3. RIN is scaled by  $10 \cdot \log(10/4)$  to maintain SNR outside of transmitter.
4. Receiver consists of 4 photodetectors operating at up to 10.3125 Gb/s each,  $\pm 100$ ppm
5. Minimum value is informative, equals min TxOMA with infinite ER and max channel insertion loss.
6. Maximum value is based on a min. of 9dB loss. Additional attenuation may be required when connected in loopback or short fiber link.

## V. Ordering Information

| Pivotal Part Number | Description                                  |
|---------------------|----------------------------------------------|
| QSFP-ER4-40-40GD    | QSFP+, 1310nm, ER4 SMF 40km, 40G DDM, C-Temp |

### Notes:

1. Please contact sales for specific OEM Platform part numbers to fit your network.

### Warranty

<https://pivotaloptics.com/warranty/>

### Disclaimer

External physical characteristics are subject to variation. This may include, but is not limited to, external case designs, pull tab colors and/or shapes, removal latch styles or colors, and label sizes and placement. These variations do not affect the function or characteristics of the transceivers.