



## E40G-QSFP-SR-SWLC-SKY

Ruckus Wireless® E40G-QSFP-SR-SWLC Compatible 40GBase-SWDM4 QSFP Transceiver (MMF, 850nm, 350m, LC, DOM)

### Product Description

This Ruckus Wireless® E40G-QSFP-SR-SWLC compatible QSFP+ transceiver provides 40GBase-SWDM4 throughput up to 350m over multi-mode fiber (MMF) using a wavelength of 850nm via an LC connector. It is guaranteed to be 100% compatible with the equivalent Ruckus Wireless® transceiver. This easy to install, hot swappable transceiver has been programmed, uniquely serialized and data-traffic and application tested to ensure that it will initialize and perform identically. Digital optical monitoring (DOM) support is also present to allow access to real-time operating parameters. We stand behind the quality of our products and proudly offer a limited lifetime warranty.

Skylane's transceivers are RoHS compliant and lead-free.

### Features:

- SFF-8436 Compliance
- Duplex LC Connector
- Commercial Temperature 0 to 70 Celsius
- Multi-mode Fiber
- Hot Pluggable
- Excellent ESD Protection
- Metal with Lower EMI
- RoHS Compliant and Lead Free



### Applications:

- 40GBase Ethernet
- Access and Enterprise

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*For your product safety, please read the following information carefully before any manipulation of the transceiver:*



#### **ESD**

This transceiver is specified as ESD threshold 1kV for SFI pins and 2kV for all others electrical input pins, tested per MIL-STD-883G, Method 3015.4 /JESD22-A114-A (HBM). However, normal ESD precautions are still required during the handling of this module.



#### **LASER SAFETY**

This is a Class1 Laser Product according to IEC 60825-1:2007. This product complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated (June 24, 2007).

*The optical ports of the module need to be terminated with an optical connector or with a dust plug in order to avoid contamination.*

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## Characteristics

| Parameter                        | Value                                        | Unit  | Notes                           |
|----------------------------------|----------------------------------------------|-------|---------------------------------|
| Module Form Factor               | QSFP+                                        |       |                                 |
| Maximum Aggregate Data Rate      | 41.2                                         | Gb/s  |                                 |
| Maximum Data Rate per Lane       | 10.3                                         | Gb/s  |                                 |
| Protocols Supported              | 40G Ethernet                                 |       |                                 |
| Electrical Interface and Pin-out | 38-pin edge connector                        |       | Pin-out as defined by QSFP+ MSA |
| Maximum Power Consumption        | 2.5                                          | Watts |                                 |
| Management Interface             | Serial, I2C-based, 400 kHz maximum frequency |       | As defined by the QSFP+ MSA     |

## Data Rate Specifications

| Parameter            | Symbol | Min | Typ | Max               | Units  | Notes |
|----------------------|--------|-----|-----|-------------------|--------|-------|
| Bit Rate per Lane    | BR     |     |     | 10.3125           | Mb/sec | 1     |
| Bit Error Ratio      | BER    |     |     | 10 <sup>-12</sup> |        | 2     |
| Link distance on OM3 | d      | 0   |     | 240               | meters |       |
| Link distance on OM4 | d      | 0   |     | 350               | meters |       |

### Notes:

1. Compliant with XLPPI per IEEE 802.3ba.
2. Tested with a PRBS 2<sup>31</sup>-1 test pattern.

## Absolute Maximum Ratings

| Parameter                          | Symbol                                                         | Min  | Typ | Max | Unit | Notes |
|------------------------------------|----------------------------------------------------------------|------|-----|-----|------|-------|
| Maximum Supply Voltage             | V <sub>cc1</sub> ,<br>V <sub>ccTx</sub> ,<br>V <sub>ccRx</sub> | -0.5 |     | 3.6 | V    |       |
| Storage Temperature                | T <sub>s</sub>                                                 | -40  |     | 85  | °C   |       |
| Case Operating Temperature         | TOP                                                            | 0    |     | 70  | °C   |       |
| Relative Humidity (non-condensing) | RH                                                             | 0    |     | 85  | %    |       |
| Damage Threshold, per Lane         | DT                                                             | 4    |     |     | dBm  |       |

**Electrical Characteristics** ( $T_{OP} = 0$  to  $70^{\circ}\text{C}$ ,  $V_{CC} = 3.1$  to  $3.47$  Volts)

| Parameter                                    | Symbol                        | Min                                  | Typ | Max                       | Unit     | Notes |
|----------------------------------------------|-------------------------------|--------------------------------------|-----|---------------------------|----------|-------|
| Supply Voltage                               | $V_{CC1}, V_{CCTx}, V_{CCRx}$ | 3.1                                  |     | 3.47                      | V        |       |
| Supply Current                               | $I_{CC}$                      |                                      |     | 0.9                       | A        | 1     |
| Link turn-on time                            |                               |                                      |     |                           |          |       |
| Transmit turn-on time                        |                               |                                      |     | 2000                      | ms       | 2     |
| Transmitter (per Lane)                       |                               |                                      |     |                           |          |       |
| Single-ended input voltage tolerance         | $V_{inT}$                     | -0.3                                 |     | 4.0                       | V        |       |
| Differential data input swing                | $V_{in,pp}$                   | 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                          | $J_{t2}$                      | 0.17                                 |     |                           | UI       |       |
| J9 Jitter Tolerance                          | $J_{t9}$                      | 0.29                                 |     |                           | UI       |       |
| Data Dependent Pulse Width Shrinkage         | DDPWS                         | 0.07                                 |     |                           | UI       |       |
| Eye mask coordinates {X1, X2, Y1, Y2}        |                               | 0.11, 0.31 95, 350                   |     |                           | UI<br>mV | 5     |
| Receiver (per Lane)                          |                               |                                      |     |                           |          |       |
| Single-ended output voltage                  |                               | -0.3                                 |     | 4.0                       | V        |       |
| Differential data output swing               | $V_{out,pp}$                  | 200<br>300<br>400<br>600             |     | 400<br>600<br>800<br>1200 | mVpp     | 6, 7  |
| 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                                   |     |                           | ps       |       |
| J2 Jitter output                             | $J_{o2}$                      |                                      |     | 0.42                      | UI       |       |
| J9 Jitter output                             | $J_{o9}$                      |                                      |     | 0.65                      | UI       |       |
| Eye mask coordinates #1 {X1, X2, Y1, Y2}     |                               | 0.29, 0.5<br>150, 425                |     |                           | UI<br>mV | 5     |
| Power Supply Ripple Tolerance                | PSR                           | 50                                   |     |                           | mVpp     |       |

**Notes:**

1. Will be  $<2.5\text{W}$  in link established mode. If the input optical signal is without data, the CDR will keep searching and push the supply current over the maximum spec.

2. From power-on and end of any fault conditions.
3. After internal AC coupling. Self-biasing 100Ω differential input.
4. 10 MHz to 11.1 GHz range.
5. Hit ratio =  $5 \times 10^{-5}$ .
6. AC coupled with 100Ω differential output impedance.
7. Output voltage is settable in 4 discrete steps via I2C.

# Optical Characteristics (T<sub>OP</sub> = 0 to 70°C, V<sub>CC</sub> = 3.1 to 3.47 Volts)

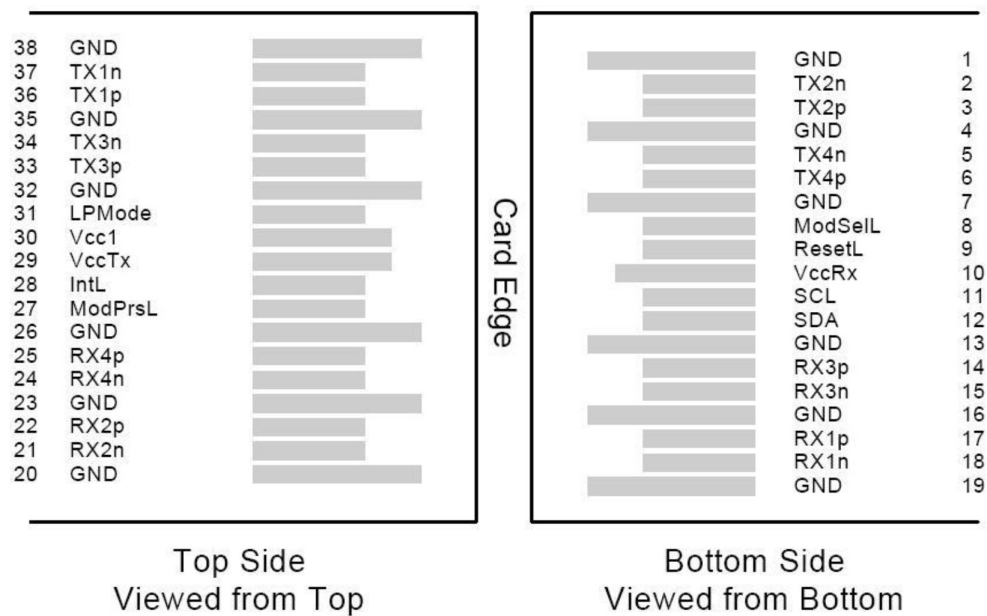
Per-channel optical characteristics vary over the 4 wavelengths. Below are the worst-case.

| Parameter                                                          | Symbol | Min                               | Typ                      | Max  | Unit  | Notes |
|--------------------------------------------------------------------|--------|-----------------------------------|--------------------------|------|-------|-------|
| Transmitter (each lane)                                            |        |                                   |                          |      |       |       |
| Signaling Speed per Lane                                           |        |                                   | 10.3125                  |      | GBd   | 1     |
| Lane center wavelengths                                            |        |                                   | 850<br>880<br>910<br>940 |      | nm    |       |
| Spectral width @ 850nm                                             | SBW    |                                   |                          | 0.53 |       |       |
| Spectral width @ 880nm, 910nm, 940nm                               | SBW    |                                   |                          | 0.59 | nm    |       |
| Total Average Launch Power                                         | POUT   | -1.6                              |                          | 9.0  | dBm   | 3     |
| Average Launch Power per Lane                                      | TXPx   | -7.6                              |                          | 3.0  | dBm   | 2,3   |
| Transmit OMA per Lane                                              | TxOMA  | -5.3                              |                          | 3    | dBm   | 2     |
| Launch Power Tx OMA - TDP                                          |        | -6.6                              |                          |      | dBm   |       |
| Transmitter and Dispersion Penalty                                 | TDP    |                                   |                          | 4.9  | dB    | 2     |
| Optical Extinction Ratio                                           | ER     | 3.0                               |                          |      | dB    |       |
| Average launch power of OFF transmitter, per lane                  |        |                                   |                          | -30  | dBm   |       |
| Relative Intensity Noise                                           | RIN    |                                   |                          | -128 | dB/Hz | 4     |
| Optical Return Loss Tolerance                                      |        | 12                                |                          |      | dB    |       |
| Transmitter eye mask definition {X1, X2, X3, Y1, Y2, Y3}           |        | 0.23, 0.34, 0.43, 0.27, 0.35, 0.4 |                          |      |       |       |
| Receive (each lane)                                                |        |                                   |                          |      |       |       |
| Signaling Speed per Lane                                           |        |                                   | 10.3125                  |      | GBd   | 5     |
| Lane center wavelengths                                            |        |                                   | 850<br>880<br>910<br>940 |      | nm    |       |
| Average Receive Power per Lane                                     | RXPx   | -9.0                              |                          | 3.0  | dBm   | 2,6   |
| Receive Power (OMA) per Lane                                       | RxOMA  |                                   |                          | 3    | dBm   | 2     |
| Receiver Sensitivity (OMA) per Lane                                | Rxsens |                                   |                          | -9.1 | dBm   | 2,7   |
| Stressed Receiver Sensitivity (OMA) per Lane @ 850nm               | SRS    |                                   |                          | -5.7 | dBm   | 2     |
| Stressed Receiver Sensitivity (OMA) per Lane @ 880nm, 910nm, 940nm | SRS    |                                   |                          | -4.4 | dBm   | 2     |
| Return Loss                                                        | RL     |                                   |                          | 12   | dB    |       |
| LOS De-Assert                                                      | LOSD   |                                   |                          | -13  | dBm   |       |
| LOS Assert                                                         | LOSA   | -30                               |                          |      | dBm   |       |
| LOS Hysteresis                                                     |        | 0.5                               |                          |      | dB    |       |

**Notes:**

- 1. Transmitter consists of 4 lasers operating at 10.3Gb/s each.
- 2. This value varies among the 4 channels. The value shown is for the worst-case channel.
- 3. Minimum value is informative.
- 4. Maximum value is informative. TDP guarantees Tx performance
- 5. Receiver consists of 4 photodetectors operating at 10.3 Gb/s each.
- 6. Minimum value is informative, equals min TxOMA with infinite ER and max channel insertion loss.
- 7. Maximum value is informative based on a theoretical perfect unstressed optical source

**Electrical Pin-out Details**



## Pin Descriptions

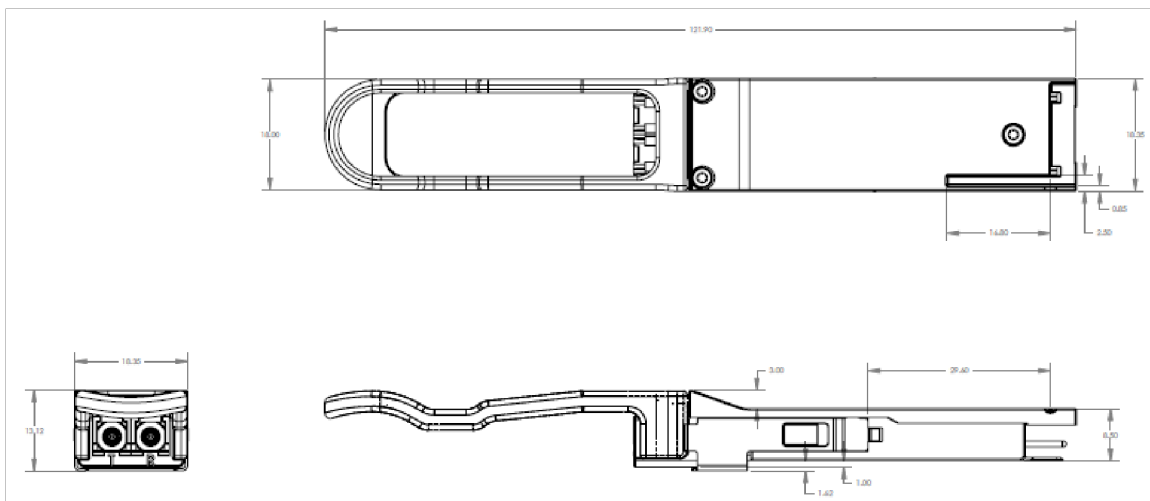
| Pin | Logic       | Symbol  | Name/Descriptions                                   | Ref. |
|-----|-------------|---------|-----------------------------------------------------|------|
| 1   |             | GND     | Module Ground                                       | 1    |
| 2   | CML-I       | Tx2-    | Transmitter inverted data input                     |      |
| 3   | CML-I       | Tx2+    | Transmitter non-inverted data input                 |      |
| 4   |             | GND     | Module Ground                                       | 1    |
| 5   | CML-I       | Tx4-    | Transmitter inverted data input                     |      |
| 6   | CML-I       | Tx4+    | Transmitter non-inverted data input                 |      |
| 7   |             | GND     | Module Ground                                       | 1    |
| 8   | LVTTL-I     | MODSEIL | Module Select                                       | 2    |
| 9   | LVTTL-I     | ResetL  | Module Reset                                        | 2    |
| 10  |             | VCCRx   | +3.3v Receiver Power Supply                         |      |
| 11  | LVC MOS-I   | SCL     | 2-wire Serial interface clock                       | 2    |
| 12  | LVC MOS-I/O | SDA     | 2-wire Serial interface data                        | 2    |
| 13  |             | GND     | Module Ground                                       | 1    |
| 14  | CML-O       | RX3+    | Receiver non-inverted data output                   |      |
| 15  | CML-O       | RX3-    | Receiver inverted data output                       |      |
| 16  |             | GND     | Module Ground                                       | 1    |
| 17  | CML-O       | RX1+    | Receiver non-inverted data output                   |      |
| 18  | CML-O       | RX1-    | Receiver inverted data output                       |      |
| 19  |             | GND     | Module Ground                                       | 1    |
| 20  |             | GND     | Module Ground                                       | 1    |
| 21  | CML-O       | RX2-    | Receiver inverted data output                       |      |
| 22  | CML-O       | RX2+    | Receiver non-inverted data output                   |      |
| 23  |             | GND     | Module Ground                                       | 1    |
| 24  | CML-O       | RX4-    | Receiver inverted data output                       |      |
| 25  | CML-O       | RX4+    | Receiver non-inverted data output                   |      |
| 26  |             | GND     | Module Ground                                       | 1    |
| 27  | LVTTL-O     | ModPrsL | Module Present, internal pulled down to GND         |      |
| 28  | LVTTL-O     | IntL    | Interrupt output, should be pulled up on host board | 2    |
| 29  |             | VCCTx   | +3.3v Transmitter Power Supply                      |      |
| 30  |             | VCC1    | +3.3v Power Supply                                  |      |
| 31  | LVTTL-I     | LPMODE  | Low Power Mode                                      | 2    |
| 32  |             | GND     | Module Ground                                       | 1    |
| 33  | CML-I       | Tx3+    | Transmitter non-inverted data input                 |      |
| 34  | CML-I       | Tx3-    | Transmitter inverted data input                     |      |
| 35  |             | GND     | Module Ground                                       | 1    |
| 36  | CML-I       | Tx1+    | Transmitter non-inverted data input                 |      |
| 37  | CML-I       | Tx1-    | Transmitter inverted data input                     |      |
| 38  |             | GND     | Module Ground                                       | 1    |

**Notes:**

1. Module circuit ground is isolated from module chassis ground with in the module.
2. Open collector; should be pulled up with 4.7k-10k ohms on host board to a voltage between 3.15V and 3.6V.

**Mechanical Specifications**

The mechanical specifications are compliant to the QSFP+ MSA transceiver module specifications.





# About Skylane Optics

Skylane is a leading provider of transceivers for optical communication.

We offer an extensive portfolio for the enterprise, access, datacenter and metropolitan fiber optical market as well as for smart home applications and home networks.

We cover the European, South American and North American market with a strong partner network and have offices in Belgium, Brazil, Sweden and USA.

Our offerings are characterized by high quality and performance. In combination with our strong technical support, we enable our customers to build cost optimized network solutions.

We offer an extensive range of high-quality products including transceivers (Optical and copper), Active Optical Cable (AOC), Direct Attach Cable (DAC), Mux/Demux, Coding Box.

