



## 40G DWDM QSFP+ Transceiver

### Features

- ◆ Single wavelength 40GE transmission
- ◆ Fixed wavelengths on DWDM 100GHz Grid
- ◆ Up to 80km over SMF (with DCM and EDFA)
- ◆ Duplex LC connector
- ◆ Power dissipation 3.5W (Typical)
- ◆ 4 x 10G Electrical interface at host side
- ◆ Compliant with QSFP+ MSA SFF-8679
- ◆ Compliant with QSFP+ MSA SFF-8636
- ◆ QSFP+ MSA digital monitoring functions

### Applications

- ◆ DWDM 40GE

### Ordering Information

| Part No.                          | Data Rate | Fiber | CDR | Interface | Temp.     | DDMI |
|-----------------------------------|-----------|-------|-----|-----------|-----------|------|
| DO-40G--D80-XX <sup>(note1)</sup> | 40GE      | SMF   | Yes | LC        | 0°C~+70°C | Yes  |

Note1: Standard version, XX refers to ITU-T defined DWDM wavelength channel as showing in the following table.

**Table 1: ITU-T 100GHz Spacing Channel Numbers (xx)**

| Ch(nm) | Freq(THz) | Central Wavelength(nm) | Ch(nm) | Freq(THz) | Central Wavelength(nm) |
|--------|-----------|------------------------|--------|-----------|------------------------|
| 20     | 192.0     | 1561.42                | 40     | 194.0     | 1545.32                |
| 21     | 192.1     | 1560.61                | 41     | 194.1     | 1544.53                |
| 22     | 192.2     | 1559.79                | 42     | 194.2     | 1543.73                |
| 23     | 192.3     | 1558.98                | 43     | 194.3     | 1542.94                |
| 24     | 192.4     | 1558.17                | 44     | 194.4     | 1542.14                |
| 25     | 192.5     | 1557.36                | 45     | 194.5     | 1541.35                |
| 26     | 192.6     | 1556.55                | 46     | 194.6     | 1540.56                |
| 27     | 192.7     | 1555.75                | 47     | 194.7     | 1539.77                |
| 28     | 192.8     | 1554.94                | 48     | 194.8     | 1538.98                |
| 29     | 192.9     | 1554.13                | 49     | 194.9     | 1538.19                |
| 30     | 193.0     | 1553.33                | 50     | 195.0     | 1537.40                |
| 31     | 193.1     | 1552.52                | 51     | 195.1     | 1536.61                |
| 32     | 193.2     | 1551.72                | 52     | 195.2     | 1535.82                |
| 33     | 193.3     | 1550.92                | 53     | 195.3     | 1535.04                |
| 34     | 193.4     | 1550.12                | 54     | 195.4     | 1534.25                |
| 35     | 193.5     | 1549.32                | 55     | 195.5     | 1533.47                |
| 36     | 193.6     | 1548.51                | 56     | 195.6     | 1532.68                |
| 37     | 193.7     | 1547.72                | 57     | 195.7     | 1531.90                |
| 38     | 193.8     | 1546.92                | 58     | 195.8     | 1531.12                |
| 39     | 193.9     | 1546.12                | 59     | 195.9     | 1530.33                |
|        |           |                        | 60     | 196.0     | 1529.55                |



## Product Description

The 40GE DWDM QSFP+ pluggable optical transceiver modules are designed for multiple 40GE links up to 80km distance over standard G.652 single mode optical fibers (SMF). For short distances, e.g. several kilometers, no EDFA and dispersion compensation modules (DCM) are required. But for relative longer distances, EDFA and DCM are required to compensate the fiber link loss and fiber dispersion.

The module's DWDM transmitter is on the ITU-T defined 100GHz spacing DWDM grid, and is Laser Class 1 compliant according to International Safety Standard IEC-60825. The receiver section uses a wideband PIN-PD detector and is DWDM channel independent. Digital diagnostics functions are available via the I<sup>2</sup>C interface as specified by QSFP+ MSA specification SFF-8636.

## Absolute Maximum Ratings

| Parameter                   | Symbol          | Min. | Max.                   | Unit |
|-----------------------------|-----------------|------|------------------------|------|
| Storage Temperature         | T <sub>s</sub>  | -40  | +85                    | °C   |
| Supply Voltage              | V <sub>cc</sub> | 0    | 3.5                    | V    |
| Operating Relative Humidity | RH              | 5    | 85<br>(Non-condensing) | %    |
| Receiver Damage Threshold   |                 | 5    |                        | dBm  |

Note: Exceeding any of these maximum ratings may cause permanent damage to the device.

## Recommended Operating Conditions

| Parameter                                     | Symbol          | Min. | Typical | Max. | Unit |
|-----------------------------------------------|-----------------|------|---------|------|------|
| Operating Case Temperature <sup>(note3)</sup> | T <sub>c</sub>  | 0    | 25      | 70   | °C   |
| Power Supply Voltage                          | V <sub>cc</sub> | 3.15 | 3.3     | 3.45 | V    |
| Power Dissipation                             | P <sub>D</sub>  |      | 3.2     | TBD  | W    |

Note3: Case temperature measured at the hottest point on the module case.



## Performance Specifications – Electrical

| Parameter                | Symbol           | Min.                 | Typ.    | Max                  | Unit   | Notes          |
|--------------------------|------------------|----------------------|---------|----------------------|--------|----------------|
| HS Data rate per lane    |                  |                      | 10.3125 |                      | Gbit/s | Total 4 lanes  |
| Data rate variation      |                  | -100                 |         | +100                 | ppm    |                |
| <b>Transmitter</b>       |                  |                      |         |                      |        |                |
| Input swing (diff.)      | V <sub>in</sub>  | 250                  |         | 800                  | mVpp   | AC coupled     |
| Input impedance (diff.)  | Z <sub>in</sub>  | 85                   | 100     | 115                  | ohm    |                |
| <b>Receiver</b>          |                  |                      |         |                      |        |                |
| Output swing (diff.)     | V <sub>out</sub> | 450                  |         |                      | mVpp   | AC coupled     |
| Output impedance (diff.) | Z <sub>out</sub> | 85                   | 100     | 115                  | ohm    |                |
| <b>Low Speed Signals</b> |                  |                      |         |                      |        |                |
| LPMode, Reset, ModSel    | V <sub>IL</sub>  | -0.3                 |         | 0.8                  | V      |                |
|                          | V <sub>IH</sub>  | 2                    |         | V <sub>cc</sub> +0.3 |        |                |
| ModPrs, Int              | V <sub>OL</sub>  | 0                    |         | 0.4                  | V      | IOL=2.0mA      |
|                          | V <sub>OH</sub>  | V <sub>cc</sub> -0.5 |         | V <sub>cc</sub> +0.3 |        |                |
| SCL, SDA                 | V <sub>IL</sub>  | -0.3                 |         | 0.3*V <sub>cc</sub>  | V      |                |
|                          | V <sub>IH</sub>  | 0.7*V <sub>cc</sub>  |         | V <sub>cc</sub> +0.3 |        |                |
| SCL, SDA                 | V <sub>OL</sub>  | 0                    |         | 0.4                  | V      | IOL(max)=3.0mA |
|                          | V <sub>OH</sub>  | V <sub>cc</sub> -0.5 |         | V <sub>cc</sub> +0.3 |        |                |

## Optical Characteristics

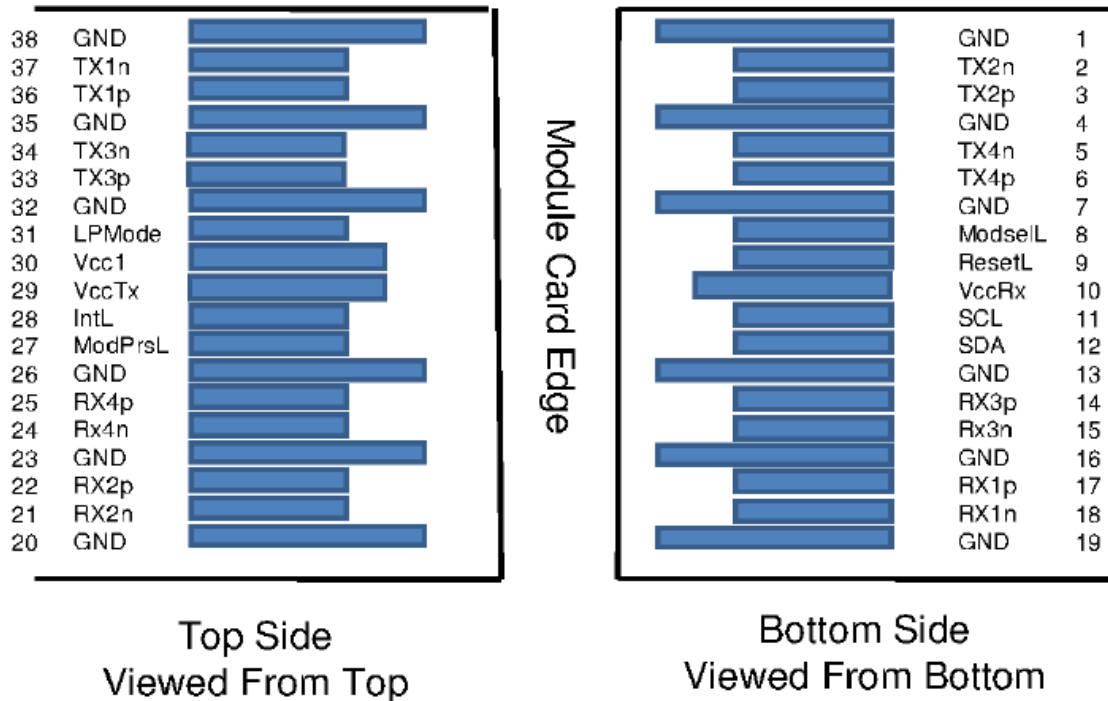
| Parameter                                            | Symbol           | Min.              | Typical     | Max.              | Unit |
|------------------------------------------------------|------------------|-------------------|-------------|-------------------|------|
| Data Rate                                            |                  |                   | 41.25       |                   | Gbps |
| <b>Transmitter</b>                                   |                  |                   |             |                   |      |
| Optical Central Wavelength                           | $\lambda_c$      |                   | See Table 1 |                   | nm   |
| Central Wavelength Stability                         |                  | $\lambda_c - 0.1$ |             | $\lambda_c + 0.1$ | nm   |
| Average Output Power                                 | P <sub>out</sub> | -1                |             | 3                 | dBm  |
| Optical Output Power (Tx: OFF)                       | P <sub>off</sub> |                   |             | -30               | dBm  |
| <b>Receiver</b>                                      |                  |                   |             |                   |      |
| Operating Wavelength                                 |                  | 1260              |             | 1570              | nm   |
| Receiver Sensitivity (ave. power) <sup>(note4)</sup> | P <sub>sen</sub> |                   |             | TBD               | dBm  |

|                                                  |      |        |  |     |       |
|--------------------------------------------------|------|--------|--|-----|-------|
| Receiver Overload (ave. power)                   | Psat | +4     |  |     | dBm   |
| Optical Return Loss                              | ORL  | -27    |  |     | dB    |
| Receiver Dispersion Tolerance <sup>(note5)</sup> |      | Note 5 |  |     | ps/nm |
| Receiver OSNR tolerance                          |      | TBD    |  |     | dB    |
| LOS Asserted                                     | LOSA | TBD    |  |     | dBm   |
| LOS De-asserted                                  | LOSD |        |  | TBD | dBm   |
| LOS Hysteresis                                   |      | 1      |  |     | dB    |

Note4: Rx sensitivity is measured with our specified TX optical signal without dispersion and noise load.

Note5: Rx dispersion tolerance may be adjusted depending on application conditions

## QSFP+ Transceiver Electrical Pad Layout



## Pin Arrangement and Definition

| Pin | Logic    | Symbol  | Description                         | Plug Sequence | Notes |
|-----|----------|---------|-------------------------------------|---------------|-------|
| 1   |          | GND     | Ground                              | 1             | 1     |
| 2   | CML-I    | Tx2n    | Transmitter Inverted Data Input     | 3             |       |
| 3   | CML-I    | Tx2p    | Transmitter Non-Inverted Data Input | 3             |       |
| 4   |          | GND     | Ground                              | 1             | 1     |
| 5   | CML-I    | Tx4n    | Transmitter Inverted Data Input     | 3             |       |
| 6   | CML-I    | Tx4p    | Transmitter Non-Inverted Data Input | 3             |       |
| 7   |          | GND     | Ground                              | 1             | 1     |
| 8   | LVTTTL-I | ModSelL | Module Select                       | 3             |       |
| 9   | LVTTTL-I | ResetL  | Module Reset                        | 3             |       |



|    |              |         |                                     |   |   |
|----|--------------|---------|-------------------------------------|---|---|
| 10 |              | VccRx   | +3.3V Power Supply Receiver         | 2 | 2 |
| 11 | LVC MOS- I/O | SCL     | 2-wire serial interface clock       | 3 |   |
| 12 | LVC MOS- I/O | SDA     | 2-wire serial interface data        | 3 |   |
| 13 |              | GND     | Ground                              | 1 | 1 |
| 14 | CML-O        | Rx3p    | Receiver Non-Inverted Data Output   | 3 |   |
| 15 | CML-O        | Rx3n    | Receiver Inverted Data Output       | 3 |   |
| 16 |              | GND     | Ground                              | 1 | 1 |
| 17 | CML-O        | Rx1p    | Receiver Non-Inverted Data Output   | 3 |   |
| 18 | CML-O        | Rx1n    | Receiver Inverted Data Output       | 3 |   |
| 19 |              | GND     | Ground                              | 1 | 1 |
| 20 |              | GND     | Ground                              | 1 | 1 |
| 21 | CML-O        | Rx2n    | Receiver Inverted Data Output       | 3 |   |
| 22 | CML-O        | Rx2p    | Receiver Non-Inverted Data Output   | 3 |   |
| 23 |              | GND     | Ground                              | 1 | 1 |
| 24 | CML-O        | Rx4n    | Receiver Inverted Data Output       | 3 |   |
| 25 | CML-O        | Rx4p    | Receiver Non-Inverted Data Output   | 3 |   |
| 26 |              | GND     | Ground                              | 1 | 1 |
| 27 | LVTTL-O      | ModPrsL | Module Present                      | 3 |   |
| 28 | LVTTL-O      | IntL    | Interrupt                           | 3 |   |
| 29 |              | VccTx   | +3.3V Power supply transmitter      | 2 | 2 |
| 30 |              | Vcc1    | +3.3V Power supply                  | 2 | 2 |
| 31 | LVTTL-I      | LPMode  | Low Power Mode                      | 3 |   |
| 32 |              | GND     | Ground                              | 1 | 1 |
| 33 | CML-I        | Tx3p    | Transmitter Non-Inverted Data Input | 3 |   |
| 34 | CML-I        | Tx3n    | Transmitter Inverted Data Input     | 3 |   |
| 35 |              | GND     | Ground                              | 1 | 1 |
| 36 | CML-I        | Tx1p    | Transmitter Non-Inverted Data Input | 3 |   |
| 37 | CML-I        | Tx1n    | Transmitter Inverted Data Input     | 3 |   |
| 38 |              | GND     | Ground                              | 1 | 1 |

1: GND is the symbol for signal and supply (power) common for the QSFP+ module. All module voltages are referenced to this potential unless otherwise noted. Connect these directly to the host board signal-common ground plane.

2: Vcc Rx, Vcc1 and Vcc Tx are the receiver and transmitter power supplies and shall be applied concurrently.

## Mechanical Specifications

