



## Q28-50GP4-BXU2733-10-HW2-SKY

Huawei® Compatible 50GBase-BX QSFP28 Single Lambda Transceiver (SMF, 1271nmTx/1331nmRx, 10km, LC, DOM, with FEC)

### Product Description

This MSA compliant QSFP28 transceiver provides 50GBase-BX throughput up to 10km over single-mode fiber (SMF) PAM4 using a wavelength of 1271nmTx/1331nmRx via an LC connector. This bidirectional unit must be used with another transceiver or network appliance of complementing wavelengths. It can operate at temperatures between 0 and 70C. All of our transceivers are built to comply with Multi-Source Agreement (MSA) standards and are uniquely serialized and tested for data-traffic and application to ensure seamless network integration. Additional product features include Digital Optical Monitoring (DOM) support which allows access to real-time operating parameters. This transceiver is Trade Agreements Act (TAA) compliant. 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:

- Compliant with QSFP+ MSA
- Single LC connector for BIDI
- 2-wire management interface
- Power dissipation < 3.5W
- Maximum link length of 10km on Single Mode Fiber (SMF)
- Single 3.3V Supply Voltage
- 50GAUI-2 Serial Electrical Interface support
- IEEE STD 803.3cp Compliant
- Hot-pluggable
- Optical 26.56GBaud PAM4
- Operating Temperature: 0C to 70C
- RoHS-6 Compliant



### Applications:

- 50GBase 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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## Absolute Maximum Ratings

| Parameter                          | Symbol          | Min. | Typ.    | Max.                                         | Unit |
|------------------------------------|-----------------|------|---------|----------------------------------------------|------|
| Maximum Supply Voltage             | V <sub>CC</sub> | -0.5 |         | 4                                            | V    |
| Storage Temperature                | T <sub>S</sub>  | -40  |         | 85                                           | °C   |
| Operating Case Temperature         | T <sub>C</sub>  | 0    |         | 70                                           | °C   |
| Relative Humidity (non-condensing) | RH              | 5    |         | 85                                           | %    |
| Receiver Damage Threshold          | P <sub>T</sub>  | 5.2  |         |                                              | dBm  |
| ESD Sensitivity                    |                 |      |         | ±500 for High-speed lines<br>±2kV for others | V    |
| Data Rate (Electrical)             | D <sub>Re</sub> |      | 26.5625 |                                              | Gbps |
| Data Rate (Optical)                | D <sub>Ro</sub> |      | 53.125  |                                              | Gbps |
| Transmission Distance              |                 | 2    |         | 10000                                        | m    |

## Electrical Characteristics

| Parameter                      | Symbol          | Min.  | Typ. | Max.  | Unit | Notes |
|--------------------------------|-----------------|-------|------|-------|------|-------|
| Supply Voltage                 | V <sub>CC</sub> | 3.135 | 3.3  | 3.465 | V    |       |
| Power Dissipation              | P <sub>D</sub>  |       |      | 3.5   | W    |       |
| Transmitter                    |                 |       |      |       |      |       |
| Input Differential Impedance   |                 |       | 100  |       | Ω    |       |
| Differential Data Input Swing  |                 |       |      | 900   | mV   |       |
| Receiver                       |                 |       |      |       |      |       |
| Differential Data Output Swing |                 |       |      | 900   | mV   |       |

## Optical Characteristics

| Parameter                                                     | Symbol      | Min.              | Typ. | Max.   | Unit  | Notes |
|---------------------------------------------------------------|-------------|-------------------|------|--------|-------|-------|
| <b>Transmitter</b>                                            |             |                   |      |        |       |       |
| Signaling Rate (range)                                        |             | 26.5625 ± 100 ppm |      |        | GBd   |       |
| Wavelength (range)                                            | $\lambda_c$ | 1264.5            | 1271 | 1277.5 | nm    |       |
| Module Format                                                 |             | PAM4              |      |        |       |       |
| Average Launch Power                                          | PAVG        | -4.5              |      | 4.2    | dBm   | 1     |
| Optical modulation amplitude (OMA)                            | POMA        | -1.5              |      | 4      | dBm   | 2     |
| Side-Mode Suppression Ratio                                   | SMSR        | 30                |      |        | dB    |       |
| Extinction Ratio                                              | ER          | 3.5               |      |        | dB    |       |
| Launch power in OMA minus TDECQ (min)                         |             | -2.9              |      |        | dB    |       |
| Transmitter and dispersion eye closure for PAM4 (TDECQ) (max) | TDECQ       |                   |      | 3.2    | dB    |       |
| Average launch power of OFF transmitter (max)                 |             |                   |      | -30    | dBm   |       |
| RIN OMA (max)                                                 |             |                   |      | -132   | dB/Hz |       |
| Optical return loss tolerance (max)                           | ORL         |                   |      | 15.6   | dB    |       |
| Transmitter Reflectance (max)                                 |             |                   |      | -26    | dB    | 3     |
| <b>Receiver</b>                                               |             |                   |      |        |       |       |
| Signaling rate (range)                                        |             | 26.5625 ± 100 ppm |      |        | GBd   |       |
| Modulation format                                             |             | PAM4              |      |        |       |       |
| Wavelength (range)                                            | $\lambda_c$ | 1324.5            | 1331 | 1337.5 | nm    |       |
| Damage threshold                                              |             | 5.2               |      |        | dBm   | 4     |
| Average receive power                                         |             | -10.8             |      | 4.2    | dBm   | 5     |
| Receiver Sensitivity (OMA)                                    | RS          |                   |      | -8.9   | dBm   | 6     |
| Stressed Receiver Sensitivity (OMA)                           | RSS         |                   |      | -6.6   | dBm   | 7     |
| Receiver Reflectance                                          |             |                   |      | -26    | dB    |       |
| LOS Assert                                                    | LOSA        | -30               |      |        | dBm   |       |
| LOS De-Assert                                                 | LOSD        |                   |      | -11    | dBm   |       |
| LOS Hysteresis                                                | LOSH        | 0.5               |      |        | dB    |       |
| <b>Condition of Stressed Sensitivity Test</b>                 |             |                   |      |        |       |       |
| Stressed Eye Closure                                          | SECQ        |                   | 3.2  |        | dB    | 8     |

### Notes:

1. Min average power is informative and not the principal indicator of signal strength. Power below this value cannot be compliant; however, a value above this does not ensure compliance.
2. Even if the TDECQ < 1.4dB, the OMA<sub>outer</sub> (min) must exceed this value.
3. Transmitter reflectance is defined looking into the transmitter.

4. The receiver shall be able to tolerate, without damage, continuous exposure to an optical input signal having this average power level.
5. Average receive power (min) is informative and not the principal indicator of signal strength. A received power below this value cannot be compliant; however, a value above this does not ensure compliance.
6. Receiver sensitivity (OMAouter) (max) is informative and is defined for a transmitter with a value of SECQ up to 3.2 dB for 50GBASE-LR. The BER is below 2.4E-5 before FEC at the begin of life and below 2.4E-4 before FEC at the end of life.
7. Measured with conformance test signal at TP3 (see 139.7.10) for the BER specified in 139.1.1 (IEEE802.3cd).
8. These test conditions are for measuring stressed receiver sensitivity. They are not characteristics of the receiver

#### Control and Status I/O Timing Requirement

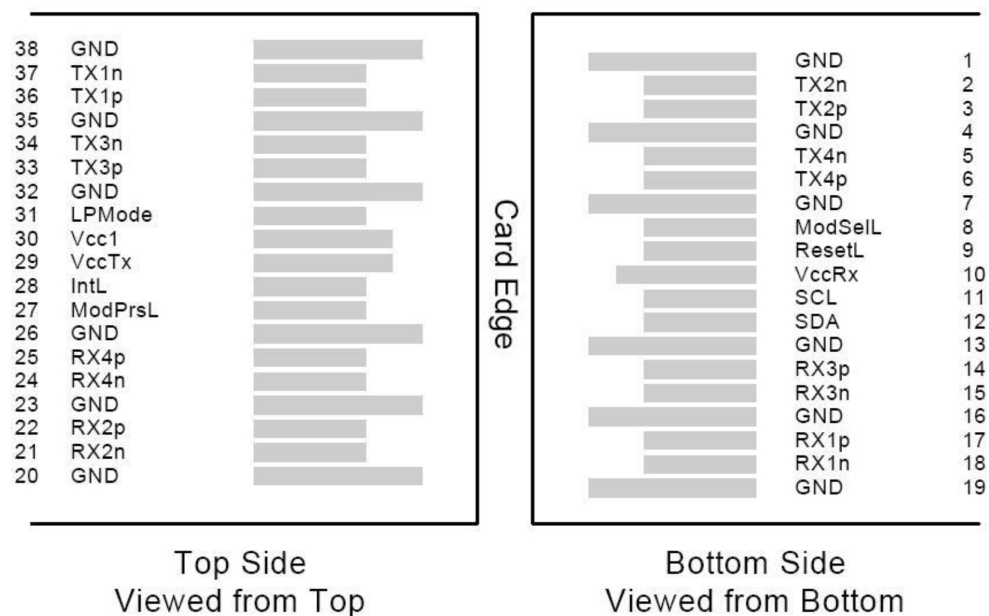
| Item                                      | Symbol       | Min. | Typ. | Max. | Unit | Notes |
|-------------------------------------------|--------------|------|------|------|------|-------|
| Initialization time                       | t_init       |      |      | 2000 | ms   | 1     |
| Reset Init Assert Time                    | t_reset_init | 10   |      |      | us   | 2     |
| Serial Bus Hardware Ready Time            | t_serial     |      |      | 2000 | ms   | 3     |
| Reset Assert Time                         | t_reset      |      |      | 2000 | ms   | 4     |
| LPMODE Assert Time                        | ton_LPMODE   |      |      | 100  | ms   | 5     |
| LPMODE Deassert Time                      | Toff_LPMODE  |      |      | 300  | ms   | 6     |
| IntL Assert Time                          | ton_IntL     |      |      | 200  | ms   | 7     |
| IntL Deassert Time                        | toff_IntL    |      |      | 500  | us   | 8     |
| Rx LOS Assert Time                        | ton_los      |      |      | 100  | ms   | 9     |
| Tx Fault Assert Time                      | ton_Txfault  |      |      | 200  | ms   | 10    |
| Flag Assert Time                          | ton_flag     |      |      | 200  | ms   | 11    |
| Mask Assert Time                          | ton_mask     |      |      | 100  | ms   | 12    |
| Mask Deassert Time                        | toff_mask    |      |      | 100  | ms   | 13    |
| Power_override or Power_set Assert Time   | ton_Pdown    |      |      | 100  | ms   | 14    |
| Power_override or Power_set Deassert Time | toff_Pdown   |      |      | 300  | ms   | 15    |

#### Notes:

1. Time from power on, hot plug or rising edge of reset until the module is fully functional. This time does not apply to non-Power level 0 modules in Low Power State.
2. A Reset is generated by a low level longer than t\_reset\_init present on the ResetL input.
3. Time from power on until the module responds to data transmission over the two wire serial bus.
4. Time from assertion of LPMODE (Vin:LPMODE = Vih) until module power consumption reaches Power Level 1.

5. Time from deassertion of LPMODE (Vin:LPMODE = Vil) until module is fully functional.
6. Time from occurrence of condition triggering IntL until Vout:IntL=Vol.
7. Time from clear on read operation of associated flag until Vout:IntL=Voh. This includes De-Assert times for Rx LOS, Tx Fault and other flag bits.
8. Time from Rx LOS state to Rx LOS bit set (value = 1b) and IntL asserted.
9. Time from Tx Fault state to Tx Fault bit set (value = 1b) and IntL asserted.
10. Time from condition triggering flag to associated flag bit set (value = 1b) and IntL asserted.
11. Time from mask bit set (value = 1b) until associated IntL assertion is inhibited.
12. Time from mask bit cleared (value = 0b) until associated IntL operation resumes.
13. Time from change of state of Application or Rate Select bit until transmitter or receiver bandwidth is in conformance with appropriate specification.
14. Time from P\_Down bit set (value = 1b) until module power consumption reaches Power Level 1.
15. Time from P\_Down bit cleared (value = 0b) until module is fully functional.

## Electrical Pin-out Details



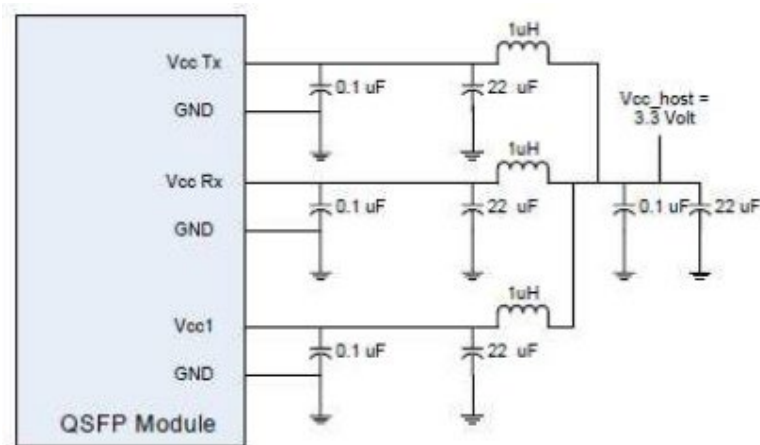
## Pin Descriptions

| Pin | Logic       | Symbol       | Descriptions                        | 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             | 3     |
| 6   | CML-I       | Tx4p         | Transmitter Non-Inverted Data Input | 3             | 3     |
| 7   |             | GND          | Ground                              | 1             | 1     |
| 8   | LVTTL-I     | ModselL      | Module Select                       | 3             |       |
| 9   | LVTTL-I     | ResetL       | Module Reset                        | 3             |       |
| 10  |             | Vcc Rx       | +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             | 3     |
| 15  | CML-O       | Rx3n         | Receiver Inverted Data Output       | 3             | 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             | 3     |
| 25  | CML-O       | Rx4p         | Receiver Non-Inverted Data Output   | 3             | 3     |
| 26  |             | GND          | Ground                              | 1             | 1     |
| 27  | LVTTL-O     | ModPrsL      | Module Present                      | 3             |       |
| 28  | LVTTL-O     | IntL/Rx LOS  | Interrupt/Rx LOS                    | 3             | 4     |
| 29  |             | Vcc Tx       | +3.3V Power supply transmitter      | 2             | 2     |
| 30  |             | Vcc1         | +3.3V Power supply                  | 2             | 2     |
| 31  | LVTTL-I     | LPMode/TxDis | Low Power Mode/Tx disable           | 3             | 4     |
| 32  |             | GND          | Ground                              | 1             | 1     |
| 33  | CML-I       | Tx3p         | Transmitter Non-Inverted Data Input | 3             | 3     |
| 34  | CML-I       | Tx3n         | Transmitter Inverted Data Input     | 3             | 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     |

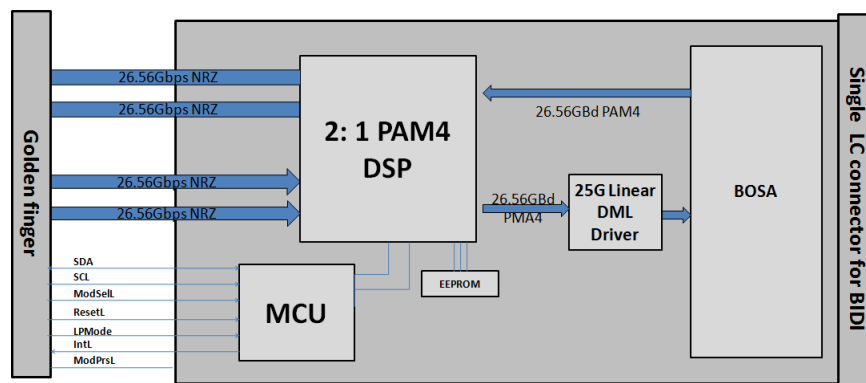
### Notes:

1. GND is the symbol for signal and supply (power) common for the QSFP+ module. All are common within the QSFP+ module and 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.
3. Not used.
4. Dual function pin as specified into SFF-8679.

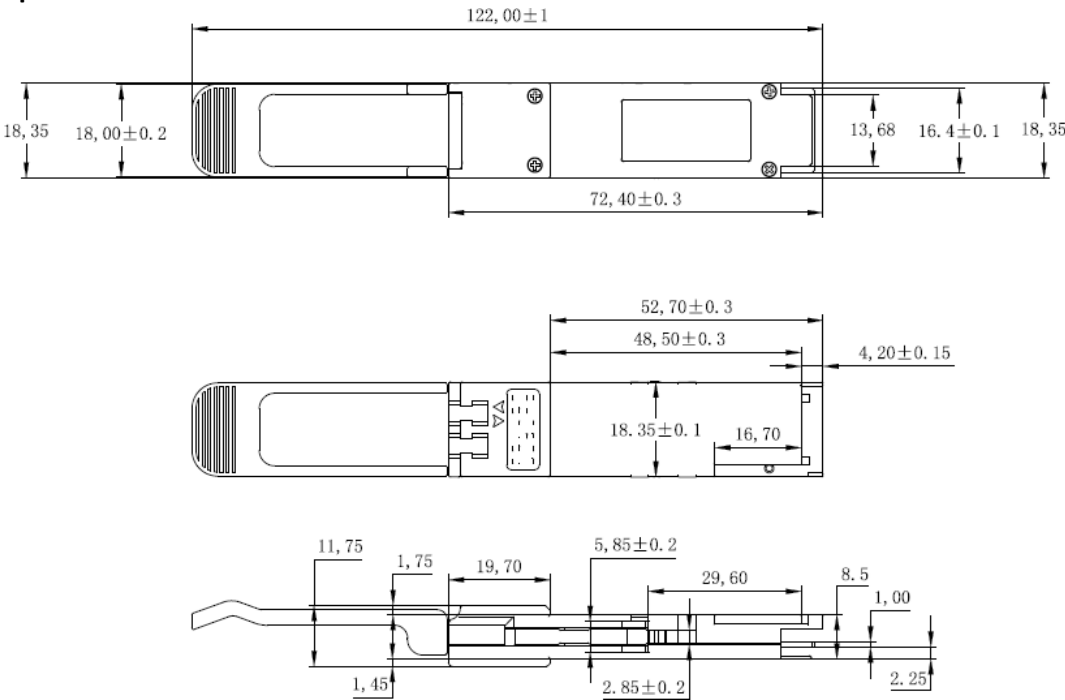
### Recommended Interface Circuit



### Transceiver Block Diagram



Mechanical Specifications



Digital Diagnostics

| Parameter                               | Symbol    | Min | Max | Unit | Notes                |
|-----------------------------------------|-----------|-----|-----|------|----------------------|
| Temperature monitor absolute error      | DMI_Temp  | -3  | +3  | °C   |                      |
| Supply voltage monitor absolute error   | DMI_VCC   | -5  | 5   | %    | Full operating range |
| Channel RX power monitor absolute error | DMI_RX    | -3  | 3   | dB   |                      |
| Channel Bias current monitor            | DMI_Ibias | -10 | 10  | %    |                      |
| Channel TX power monitor absolute error | DMI_TX    | -3  | 3   | dB   |                      |

# 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.

