

## **HERMESYS 100Gb 10km QSFP28 Transceiver**

### **Features:**

- LC Duplex optical interface
- Distance up to 10km
- Up to 103.1Gb/s data rate
- Single 3.3V Power supply
- Power consumption<4.5W
- Hot-Pluggable QSFP28 footprint
- 4X25Gb/s LAN WDM DML laser
- High sensitivity PIN/TIA optical receiver
- Integrated 4-channel LAN WDM mux/demux for duplex LC operation
- Case Operating temperature ranges:  
Commercial: 0 to 70°C
- ROHS compliance

### **Applications**

- 100GBASE-LR4 Ethernet links
- Client-side 100G Telecom connections

### **Standards**

- SFF-8679
- SFF-8636
- IEEE802.3bm

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## Description

The 100G QSFP28 LR4 optical transceiver integrates the transmit and receive path onto one module. On the transmit side, the four lanes of optical data channels are optically multiplexed by the integrated optical multiplexer. On the receive side, four lanes of optical data streams are optically demultiplexed by an integrated optical demultiplexer. Each data stream is recovered by a PIN photodetector and transimpedance amplifier, retimed, and passed on to an output driver.

## Absolute Maximum Ratings

| Parameter                     | Symbol           | Min | Max | Units |
|-------------------------------|------------------|-----|-----|-------|
| Storage Temperature           | T <sub>stg</sub> | -40 | +85 | °C    |
| Case Operating Temperature    | T <sub>OP</sub>  | 0   | 70  | °C    |
| Relative Humidity - Storage   | RH <sub>S</sub>  | 0   | 95  | %     |
| Relative Humidity - Operating | RH <sub>O</sub>  | 0   | 85  | %     |
| DC Supply Voltage             | V <sub>CC</sub>  | 0   | 3.6 | V     |

## Recommended Operating Conditions

| Parameter                  | Symbol            | Min   | Typ | Max   | Units | Notes |
|----------------------------|-------------------|-------|-----|-------|-------|-------|
| Case Operating Temperature | T <sub>CASE</sub> | 0     |     | 70    | °C    |       |
| DC Supply Voltage          | V <sub>CC</sub>   | 3.135 | 3.3 | 3.465 | V     |       |
| Module Supply Current      | I <sub>CC</sub>   |       |     | 1300  | mA    |       |

## Transmitter Electrical Characteristics

| Parameter                       | Symbol          | Min | Typ | Max | Units | Notes |
|---------------------------------|-----------------|-----|-----|-----|-------|-------|
| Differential Data input Swing   | V <sub>IN</sub> | 190 |     | 700 | mV    |       |
| Tx Differential Input Impedence | Z <sub>IN</sub> |     | 100 |     | Ω     |       |

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## Receiver Electrical Characteristics

| Parameter                        | Symbol           | Min | Typ | Max | Units | Notes |
|----------------------------------|------------------|-----|-----|-----|-------|-------|
| Differential Data Output Swing   | V <sub>OUT</sub> | 300 |     | 850 | mV    |       |
| Rx Differential Output Impedence | Z <sub>OUT</sub> |     | 100 |     | Ω     |       |

## Transmitter Optical Characteristics

| Parameter                         | Symbol                             | Minimum | Typical | Maximum | Unit | Notes |
|-----------------------------------|------------------------------------|---------|---------|---------|------|-------|
| Launch Optical Power per lane     | P <sub>o</sub>                     | -4.3    | -       | +4.5    | dBm  | 1     |
| Total Launch Optical Power        | P                                  | -       | -       | +10.5   | dBm  | 1     |
| Center Wavelength Range           | L1                                 | 1294.53 | 1295.56 | 1296.59 | nm   | -     |
|                                   | L2                                 | 1299.02 | 1300.05 | 1301.09 | nm   | -     |
|                                   | L3                                 | 1303.54 | 1304.58 | 1305.63 | nm   | -     |
|                                   | L4                                 | 1308.09 | 1309.14 | 1310.19 | nm   | -     |
| Extinction Ratio                  | ER                                 | 4.0     | -       | -       | dB   | 2     |
| Spectral width(-20dB)             | Δλ                                 | -       | -       | 1       | nm   | -     |
| Side Mode Suppression Ratio       | SMSR                               | 30      | -       | -       | dB   | -     |
| Optical Return Loss Tolerance     | ORLT                               | -       | -       | 20      | dB   | -     |
| Pout @TX-Disable Asserted         | P <sub>off</sub>                   | -       | -       | -30     | dBm  | 1     |
| Eye Mask {X1, X2, X3, Y1, Y2, Y3} | {0.25, 0.4, 0.45, 0.25, 0.28, 0.4} |         |         |         |      |       |

Notes :

1. The optical power is launched into SMF.
2. Measured with a PRBS 2<sup>31</sup>-1 test pattern @25.78125Gbps.

## Receiver Optical Characteristics

| Parameter                       | Symbol              | Minimum | Typical | Maximum | Unit | Notes |
|---------------------------------|---------------------|---------|---------|---------|------|-------|
| Center Wavelength               | L1                  | 1294.53 | 1295.56 | 1296.59 | nm   | -     |
|                                 | L2                  | 1299.02 | 1300.05 | 1301.09 | nm   | -     |
|                                 | L3                  | 1303.54 | 1304.58 | 1305.63 | nm   | -     |
|                                 | L4                  | 1308.09 | 1309.14 | 1310.19 | nm   | -     |
| Sensitivity per Channel (OMA)   | S                   | -       | -       | -8.6    | dBm  | 1     |
| Overload (each channel)         | POL                 | 4.5     | -       | -       | dBm  | 1     |
| Damage Threshold (each channel) | P <sub>damage</sub> | 5.5     | -       | -       | dBm  | -     |
| Optical Return Loss             | ORL                 | 26      | -       | -       | dB   | -     |
| LOS De-Assert                   | LOSD                | -       | -       | -15     | dBm  | -     |

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|                |      |     |   |   |     |   |
|----------------|------|-----|---|---|-----|---|
| LOS Assert     | LOSA | -30 | - | - | dBm | - |
| LOS Hysteresis | -    | 0.5 | - | - | dB  | - |

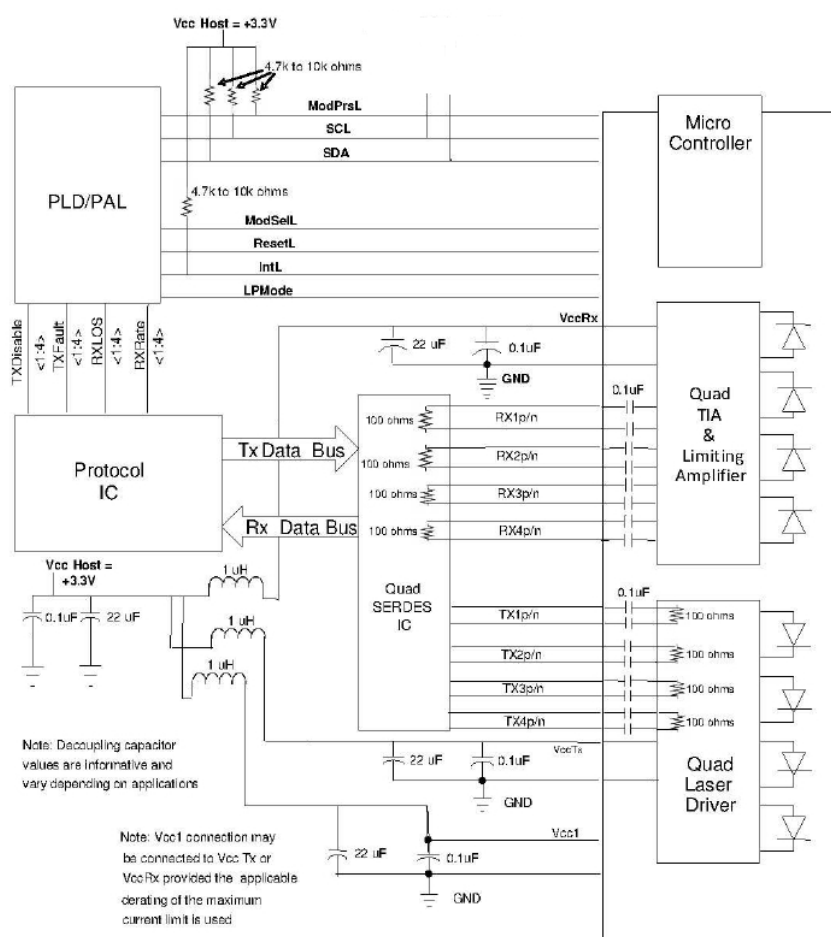
#### Notes :

1. Measured with PRBS 2<sup>31</sup>-1 test pattern, 25.78125Gb/s;

### Monitoring Interface

| Parameter   | Symbol | Spec   | Units | Conditions / Notes |
|-------------|--------|--------|-------|--------------------|
| Temperature |        | +/-3°C | °C    |                    |
| Voltage     |        | +/-5%  | V     |                    |
| IBias       |        | +/-10% | mA    |                    |
| Rx power    |        | +/-2   | dBm   | @25°C              |
| Tx power    |        | +/-2   | dBm   | @25°C              |

### Typical Application Circuit



Recommended Application Interface Block Diagram

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## Pin Description

| Pin | Name    | Function/Description                             | Notes |
|-----|---------|--------------------------------------------------|-------|
| 1   | GND     | Transmitter Ground (Common with Receiver Ground) | 1     |
| 2   | Tx2-    | Transmitter Inverted Data Input                  |       |
| 3   | Tx2+    | Transmitter Non-Inverted Data output             |       |
| 4   | GND     | Transmitter Ground (Common with Receiver Ground) | 1     |
| 5   | Tx4-    | Transmitter Inverted Data Input                  |       |
| 6   | Tx4+    | Transmitter Non-Inverted Data output             |       |
| 7   | GND     | Transmitter Ground (Common with Receiver Ground) | 1     |
| 8   | ModSelL | Module Select                                    | 2     |
| 9   | ResetL  | Module Reset                                     | 2     |
| 10  | VccRx   | 3.3V Power Supply Receiver                       |       |
| 11  | SCL     | 2-Wire serial Interface Clock                    | 2     |
| 12  | SDA     | 2-Wire serial Interface Data                     | 2     |
| 13  | GND     | Transmitter Ground (Common with Receiver Ground) | 1     |
| 14  | Rx3+    | Receiver Non-Inverted Data Output                |       |
| 15  | Rx3-    | Receiver Inverted Data Output                    |       |
| 16  | GND     | Transmitter Ground (Common with Receiver Ground) | 1     |
| 17  | Rx1+    | Receiver Non-Inverted Data Output                |       |
| 18  | Rx1-    | Receiver Inverted Data Output                    |       |
| 19  | GND     | Transmitter Ground (Common with Receiver Ground) | 1     |
| 20  | GND     | Transmitter Ground (Common with Receiver Ground) | 1     |
| 21  | Rx2-    | Receiver Inverted Data Output                    |       |
| 22  | Rx2+    | Receiver Non-Inverted Data Output                |       |
| 23  | GND     | Transmitter Ground (Common with Receiver Ground) | 1     |
| 24  | Rx4-    | Receiver Inverted Data Output                    |       |
| 25  | Rx4+    | Receiver Non-Inverted Data Output                |       |
| 26  | GND     | Transmitter Ground (Common with Receiver Ground) | 1     |
| 27  | ModPrsL | Module Present                                   |       |
| 28  | IntL    | Interrupt                                        | 2     |
| 29  | VccTx   | 3.3V power supply transmitter                    |       |
| 30  | Vcc1    | 3.3V power supply                                |       |
| 31  | LPMODE  | Low Power Mode                                   | 2     |
| 32  | GND     | Transmitter Ground (Common with Receiver Ground) | 1     |
| 33  | Tx3+    | Transmitter Non-Inverted Data Input              |       |

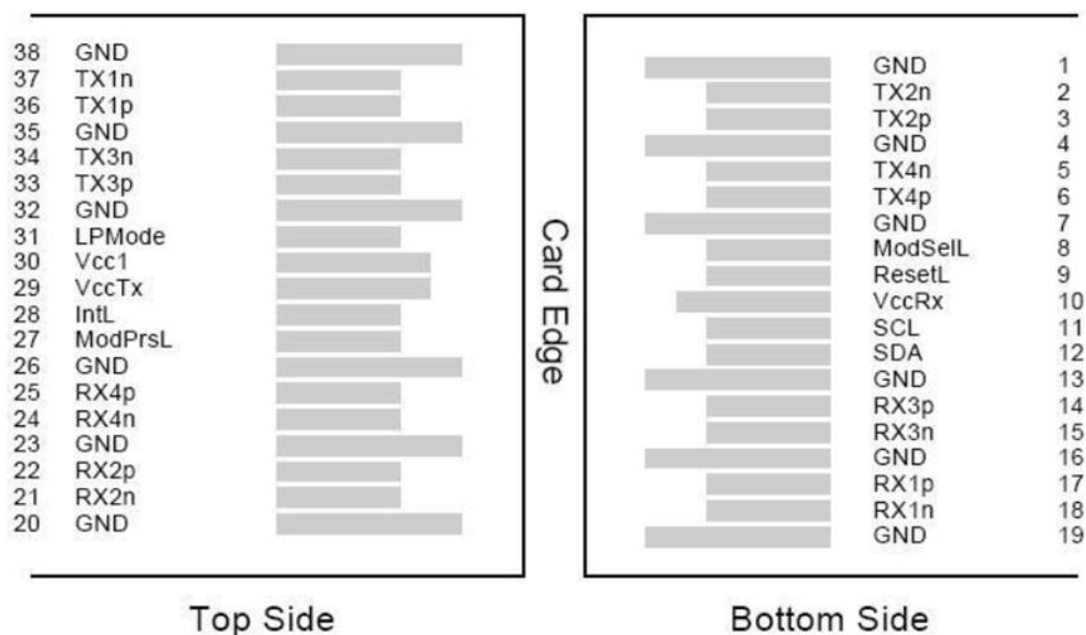
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|    |      |                                                  |   |
|----|------|--------------------------------------------------|---|
| 34 | Tx3- | Transmitter Inverted Data Output                 |   |
| 35 | GND  | Transmitter Ground (Common with Receiver Ground) | 1 |
| 36 | Tx1+ | Transmitter Non-Inverted Data Input              |   |
| 37 | Tx1- | Transmitter Inverted Data Output                 |   |
| 38 | GND  | Transmitter Ground (Common with Receiver Ground) | 1 |

Notes:

1. The module signal grounds are isolated from the module case.
2. This is an open collector/drain output that on the host board requires a 4.7KΩ to 10KΩ pull-up resistor to Vcc Host.

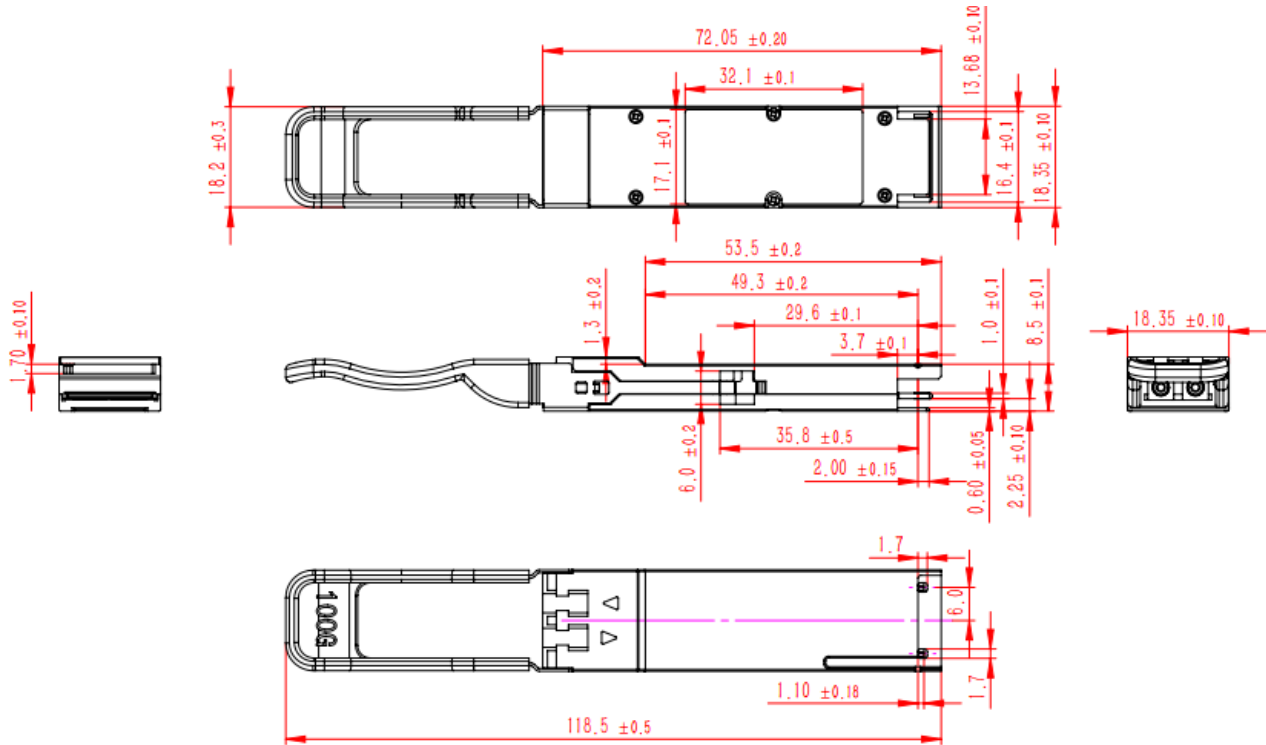


QSFP28 pad assignment top view

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## Mechanical Dimensions



Outline Drawin

### Notes:

1. Tolerance: +/-0.1mm.
2. Light port according with fiber connector SPEC.

## Regulatory Compliance

| Feature                                              | Test Method                                           | Performance                                                                 |
|------------------------------------------------------|-------------------------------------------------------|-----------------------------------------------------------------------------|
| Electrostatic Discharge (ESD) to the Electrical Pins | MIL-STD-883C Method 3015.7                            | Class 1 (> 1500 Volts)                                                      |
| Electrostatic Discharge (ESD) Immunity               | Variation of IEC 61000-4-2                            | LV4(Air discharge :15KV;Contact discharge:8 KV)<br>Performance criterion: B |
| Electromagnetic Interference (EMI)                   | CISPR22 ITE Class B<br>EN55022 Class B<br>FCC Class B | Compliant with standards                                                    |

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|          |                                 |                                                                                                                                        |
|----------|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| Immunity | IEC61000-4-3 Class 2<br>EN55024 | Typically show no measurable effect from a 3V/m field swept from 80 to 1000MHz applied to the transceiver without a chassis enclosure. |
|----------|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|

## Ordering Information

| Specifications    |        |             |                                          |          |     |         |          |            |       |
|-------------------|--------|-------------|------------------------------------------|----------|-----|---------|----------|------------|-------|
| Part. No          | Pack   | Rate (Gbps) | Tx (nm)                                  | P (dBm)  | Rx  | S (dBm) | Top (°C) | Reach (km) | Other |
| QSFP-2210010061DW | QSFP28 | 4x25.78     | 1295.56<br>1300.05<br>1304.58<br>1309.14 | -4.3~4.5 | PIN | <-8.6   | 0~70     | 10         | RoHS  |

## Warnings

### Handling Precautions:

This device is susceptible to damage as a result of electrostatic discharge (ESD). A static free environment is highly recommended. Please follow guidelines according to proper ESD procedures.

### Laser Safety:

Radiation emitted by laser devices can be dangerous to human eyes. Avoid eye exposure to direct or indirect radiation.



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