HONDIATECH

**HD-800GQDD-2FR4**

**Features:**

- Compliant with IEEE 802.3cu-2021:
- - 2x400GBASE-FR4 optical interface
- Compliant with IEEE P802.3ck D3.0
- - 2x400GAUI-4 C2M electrical interface
- Compliant with QSFP-DD800 MSA HW Rev 6.01 with dual LC connector
- Compliant with CMIS Rev 5.0
- Case operating temperature 0°C to 70°C
- Two wire serial Interface with digital diagnostic monitoring
- Complies with EU Directive 2011/65/EU (RoHS compliant)

**Ordering Information**

**Table 1 - Ordering Information**

| Part No. | Application | Data Rate | Laser Source | Fiber Type |
|---|---|---|---|---|
| TLP-QDD-800G-2FR4 | 2x400GBASE-FR4<br>8x100GBASE-FR1 | 850Gb/s | EML | Single Mode Fiber |

**Absolute Maximum Ratings**

**Table 2 – Absolute Maximum Ratings**

| Parameter | Symbol | Min. | Max. | Unit | Notes |
|---|---|---|---|---|---|
| Storage Temperature | $T_S$ | -40 | 85 | ºC | |
| Supply Voltage | $V_{CC}$ | -0.5 | 3.6 | V | |
| Relative Humidity (non-condensing) | RH | 5 | 95 | % | |
| Data Input Voltage Differential | $\|V_{DIP-VDIN}\|$ | - | 1 | V | |
| Control Input Voltage | $V_I$ | -0.3 | VCC+0.5 | V | |
| Control Output Current | $I_O$ | -20 | 20 | mA | |

**Recommended Operating Conditions**

**Table 3 – Recommended Operating Conditions**

| Parameter | Symbol | Min. | Typical | Max. | Unit | Notes |
|---|---|---|---|---|---|---|
| Operating Case Temperature | $T_{OPR}$ | 0 | - | 70 | ºC | 1 |
| Power Supply Voltage | $V_{CC}$ | 3.135 | 3.3 | 3.465 | V | |
| Instantaneous peak current at hot plug | $I_{CC\_IP}$ | - | - | 6800 | mA | |
| Sustained peak current at hot plug | $I_{CC\_SP}$ | - | - | 5611 | mA | |
| Maximum Power Dissipation | $P_D$ | - | - | 17 | W | |
| Maximum Power Dissipation, Low Power Mode | $P_{DLP}$ | - | - | 2 | W | |
| Signalling Speed per Lane | $D_{RL}$ | - | 53.125 | - | GBd | |
| Control Input Voltage High | $V_{IH}$ | $V_{CC}$*0.7 | - | $V_{CC}$+0.3 | V | |
| Control Input Voltage Low | $V_{IL}$ | -0.3 | - | $V_{CC}$*0.3 | V | |
| Two Wire Serial Interface Clock Rate | - | - | - | 400 | kHz | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Power Supply Noise 1 kHz - 1 MHz (p-p) | - | - | - | 66 | mVpp | |
| Operating Distance | - | 2 | - | 2000 | m | |

**Functional Characteristics (Optical)**

The following tables list the performance specifications for the various functional blocks of the integrated optical transceiver module.

**Table 4 – Transmitter Optical Specifications**

| Parameter | Symbol | Min. | Typical | Max. | Unit | Notes |
|---|---|---|---|---|---|---|
| Wavelength L0, L4 | $\lambda_{C0}$ , $\lambda_{C4}$ | 1264.5 | 1271 | 1277.5 | nm | |
| Wavelength L1, L5 | $\lambda_{C1}$ , $\lambda_{C5}$ | 1284.5 | 1291 | 1297.5 | nm | |
| Wavelength L2, L6 | $\lambda_{C2}$ , $\lambda_{C6}$ | 1304.5 | 1311 | 1317.5 | nm | |
| Wavelength L3, L7 | $\lambda_{C3}$ , $\lambda_{C7}$ | 1324.5 | 1331 | 1337.5 | nm | |
| Side Mode Suppression Ratio | SMSR | 30 | - | - | dB | |
| Total average launch power | $AOP_T$ | - | - | 10.4 | dBm | |
| Average Launch Power, each lane | $AOP_L$ | -3.2 | - | 4.4 | dBm | 1 |
| Outer Optical Modulation Amplitude (OMAouter), each Lane<br>for TDECQ <1.4 dB<br>for 1.4 dB ≤TDECQ ≤3.4 dB | $T_{OMA}$ | -0.2<br>-1.6 + TDECQ | - | 3.7 | dBm | |
| Difference in launch power between any two lanes (OMAouter) | $AOP_d$ | - | - | 3.9 | dB | |
| Transmitter and Dispersion Eye Closure for PAM4 (TDECQ), each lane | TDECQ | - | - | 3.4 | dB | |
| Transmitter eye closure for PAM4 (TECQ), each lane | TECQ | - | - | 3.4 | dB | |
| \| TDECQ - TECQ \| | - | - | - | 2.5 | dB | |
| Over/under-shoot | - | - | - | 22 | % | |
| Transmitter power excursion | - | - | - | 1.8 | dBm | |
| Average Launch Power of OFF Transmitter, each lane | $T_{OFF}$ | - | - | -16 | dBm | |
| Extinction Ratio | ER | 3.5 | - | - | dB | |
| Transmitter transition time (max) | Tr | - | - | 17 | ps | |
| RIN17.1OMA (max) | RIN | - | - | -136 | dB/Hz | |
| Optical Return Loss Tolerance | ORL | - | - | 17.1 | dB | |
| Transmitter Reflectance | $T_R$ | - | - | -26 | dB | 2 |

Note 1: Average launch power, each lane (min) is informative and not the principal indicator of signal strength

Note 2: Transmitter reflectance is defined looking into the transmitter.

**Table 5 – Receiver Optical Specifications**

| Parameter | Symbol | Min. | Typical | Max. | Unit | Notes |
|---|---|---|---|---|---|---|
| Wavelength L0, L4 | $\lambda_{C0}$ , $\lambda_{C4}$ | 1264.5 | 1271 | 1277.5 | nm | |
| Wavelength L1, L5 | $\lambda_{C1}$ , $\lambda_{C5}$ | 1284.5 | 1291 | 1297.5 | nm | |
| Wavelength L2, L6 | $\lambda_{C2}$ , $\lambda_{C6}$ | 1304.5 | 1311 | 1317.5 | nm | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Wavelength L3, L7 | $\lambda_{C3}$ , $\lambda_{C7}$ | 1324.5 | 1331 | 1337.5 | nm | |
| Damage Threshold, each Lane | $AOP_D$ | 5.4 | - | - | dBm | |
| Average Receive Power, each Lane | $AOP_R$ | -7.2 | - | 4.4 | dBm | |
| Receive Power (OMAouter), each Lane | $OMA_R$ | - | - | 3.7 | dBm | |
| Difference in receive power between any two lanes (OMAouter) (max) | $AOP_g$ | - | - | 4.1 | dB | |
| Receiver Reflectance | RR | - | - | -26 | dB | |
| Receiver sensitivity (OMAouter), each lane for TECQ < 1.4 dB<br>for 1.4 dB≤TECQ ≤3.4 dB | $S_{OMA}$ | - | - | -4.6<br>-6 + TECQ | dBm | |
| Stressed Receiver Sensitivity (OMAouter), each Lane | SRS | - | - | -2.6 | dBm | 1 |
| Conditions of stressed receiver sensitivity test | | | | | | |
| Stressed eye closure for PAM4 (SECQ), lane under test | - | - | 3.4 | - | dB | |
| OMAouter of each aggressor lane | - | - | 1.4 | - | dBm | |

Note 1: Measured with conformance test signal at TP3 for the BER = $2.4x10^{-4}$

**Functional Characteristics (Electrical)**

**Table 6 – Electrical Specification High Speed Signal (compliant with IEEE802.3ck C2M)**

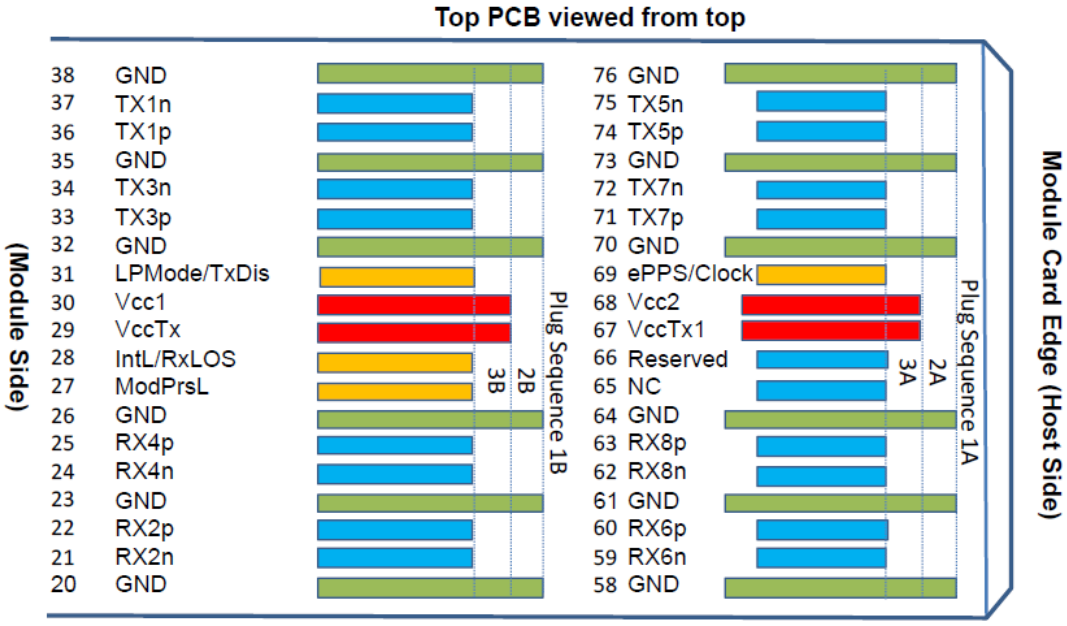
| **Receiver (Module Output, TP4)** | | | | | | |
|---|---|---|---|---|---|---|
| **Parameter** | **Symbol** | **Min.** | **Typical** | **Max.** | **Unit** | **Notes** |
| AC common-mode output Voltage (RMS) | - | - | - | 25 | mV | |
| Differential peak-to-peak output voltage<br>Short mode<br>Long mode | - | - | - | 600<br>845 | mV | |
| Eye height | EH | 15 | - | - | mV | |
| Vertical eye closure | VEC | - | - | 12 | dB | |
| Common-mode to differential-mode return loss | RLDc | 802.3ck 120G-1 | | | dB | |
| Effective return loss | ERL | 8.5 | - | - | dB | |
| Differential termination mismatch | - | - | - | 10 | % | |
| Transition time | - | 8.5 | - | - | ps | |
| DC common-mode voltage tolerance | - | -0.35 | - | 2.85 | V | |
| **Transmitter (Module Input, TP1)** | | | | | | |
| **Parameter** | **Symbol** | **Min.** | **Typical** | **Max.** | **Unit** | **Notes** |
| Differential pk-pk input Voltage tolerance (TP1a) | - | 750 | - | - | mV | |
| AC common-mode RMS voltage tolerance (TP1a) | - | 25 | - | - | mV | |
| Differential-mode to common-mode return loss | RLcd | 802.3ck 120G-2 | | | dB | |
| Effective return loss | ERL | 8.5 | - | - | dB | |
| Differential termination mismatch | - | - | - | 10 | % | |
| Single-ended voltage tolerance range | - | -0.4 | - | 3.3 | V | |

| | | | | | | |
|---|---|---|---|---|---|---|
| DC common-mode voltage tolerance | - | -0.35 | - | 2.85 | V | |

**Table 7 – Electrical Specification Low Speed Control and Sense Signals**

| Parameter | Symbol | Min. | Max. | Unit | Condition |
|---|---|---|---|---|---|
| Module output SCL and SDA | $V_{OL}$ | 0 | 0.4 | V | |
| Module Input SCL and SDA | $V_{IL}$ | -0.3 | VCC*0.3 | V | |
| | $V_{IH}$ | VCC*0.7 | VCC+0.5 | V | |
| InitMode, ResetL and ModSelL | $V_{IL}$ | -0.3 | 0.8 | V | |
| | $V_{IH}$ | 2 | VCC+0.3 | V | |
| IntL | $V_{OL}$ | 0 | 0.4 | V | |
| | $V_{OH}$ | VCC-0.5 | VCC+0.3 | V | |

**Pin Definitions**



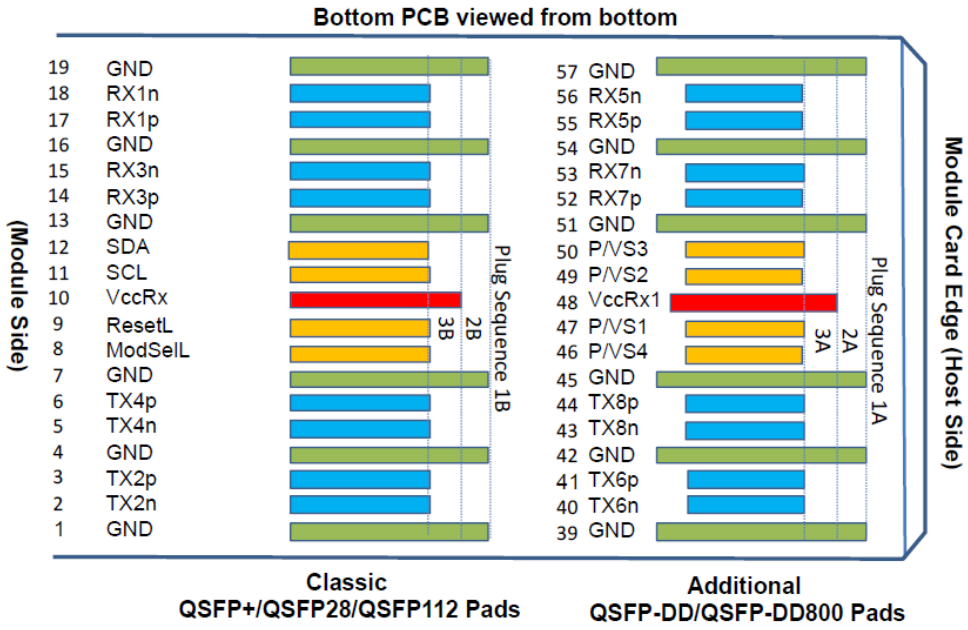



**Figure 1 – Pin definitions of the module high speed inputs/outputs**

**Table 8 - Module Pin Definitions**

| Pin # | Logic | Symbol | Definition | Pin # | Logic | Symbol | Definition |
|---|---|---|---|---|---|---|---|
| 1 | | GND | Ground | 39 | | GND | Ground |
| 2 | CML-I | Tx2n | Transmitter Inverted Data Input | 40 | CML-I | Tx6n | Transmitter Inverted Data Input |
| 3 | CML-I | Tx2p | Transmitter Non-inverted Data Input | 41 | CML-I | Tx6p | Transmitter Non-inverted Data Input |
| 4 | | GND | Ground | 42 | | GND | Ground |
| 5 | CML-I | Tx4n | Transmitter Inverted Data Input | 43 | CML-I | Tx8n | Transmitter Inverted Data Input |
| 6 | CML-I | Tx4p | Transmitter Non-inverted Data Input | 44 | CML-I | Tx8p | Transmitter Non-inverted Data Input |
| 7 | | GND | Ground | 45 | | GND | Ground |
| 8 | LVTTL-I | ModSelL | Module Select | 46 | LVCMOS/CML- I | P/VS4 | Programmable/Module Vendor Specific 4 |
| 9 | LVTTL-I | ResetL | Module Reset | 47 | LVCMOS /CML-I | P/VS1 | Programmable/Module Vendor Specific 1 |
| 10 | | VccRx | +3.3V Power Supply Receiver | 48 | | VccRx1 | 3.3V Power Supply |
| 11 | LVCMOS -I/O | SCL | TWI serial interface clock | 49 | LVCMOS /CML-O | P/VS2 | Programmable/Module Vendor Specific 2 |
| 12 | LVCMOS -I/O | SDA | TWI serial interface data | 50 | LVCMOS /CML-O | P/VS3 | Programmable/Module Vendor Specific 3 |
| 13 | | GND | Ground | 51 | | GND | Ground |
| 14 | CML-O | Rx3p | Receiver Non-inverted Data Output | 52 | CML-O | Rx7p | Receiver Non-inverted Data Output |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 15 | CML-O | Rx3n | Receiver Inverted Data Output | 53 | CML-O | Rx7n | Receiver Inverted Data Output |
| 16 | | GND | Ground | 54 | | GND | Ground |
| 17 | CML-O | Rx1p | Receiver Non-inverted Data Output | 55 | CML-O | Rx5p | Receiver Non-inverted Data Output |
| 18 | CML-O | Rx1n | Receiver Inverted Data Output | 56 | CML-O | Rx5n | Receiver Inverted Data Output |
| 19 | | GND | Ground | 57 | | GND | Ground |
| 20 | | GND | Ground | 58 | | GND | Ground |
| 21 | CML-O | Rx2n | Receiver Inverted Data Output | 59 | CML-O | Rx6n | Receiver Inverted Data Output |
| 22 | CML-O | Rx2p | Receiver Non-inverted Data Output | 60 | CML-O | Rx6p | Receiver Non-inverted Data Output |
| 23 | | GND | Ground | 61 | | GND | Ground |
| 24 | CML-O | Rx4n | Receiver Inverted Data Output | 62 | CML-O | Rx8n | Receiver Inverted Data Output |
| 25 | CML-O | Rx4p | Receiver Non-inverted Data Output | 63 | CML-O | Rx8p | Receiver Non-inverted Data Output |
| 26 | | GND | Ground | 64 | | GND | Ground |
| 27 | LVTTL-O | ModPrsL | Module Present | 65 | | NC | Not connected |
| 28 | LVTTL-O | IntL/ RxLOS | Interrupt/optional RxLOS | 66 | | Reserved | |
| 29 | | VccTx | +3.3V Power Supply Transmitter | 67 | | VccTx1 | 3.3V Power Supply |
| 30 | | Vcc1 | +3.3V Power Supply | 68 | | Vcc2 | 3.3V Power Supply |
| 31 | LVTTL-I | LPMode/ TxDis | Low Power mode/optional TX Disable | 69 | LVCMO S-I | ePPS/Clock | 1PPS PTP clock or reference clock input |
| 32 | | GND | Ground | 70 | | GND | Ground |
| 33 | CML-I | Tx3p | Transmitter Non-inverted Data Input | 71 | CML-I | Tx7p | Transmitter Non-inverted Data Input |
| 34 | CML-I | Tx3n | Transmitter Inverted Data Input | 72 | CML-I | Tx7n | Transmitter Inverted Data Input |
| 35 | | GND | Ground | 73 | | GND | Ground |
| 36 | CML-I | Tx1p | Transmitter Non-inverted Data Input | 74 | CML-I | Tx5p | Transmitter Non-inverted Data Input |
| 37 | CML-I | Tx1n | Transmitter Inverted Data Input | 75 | CML-I | Tx5n | Transmitter Inverted Data Input |
| 38 | | GND | Ground | 76 | | GND | Ground |

**Recommended QSFP-DD/QSFP-DD800 Host Board Schematic**

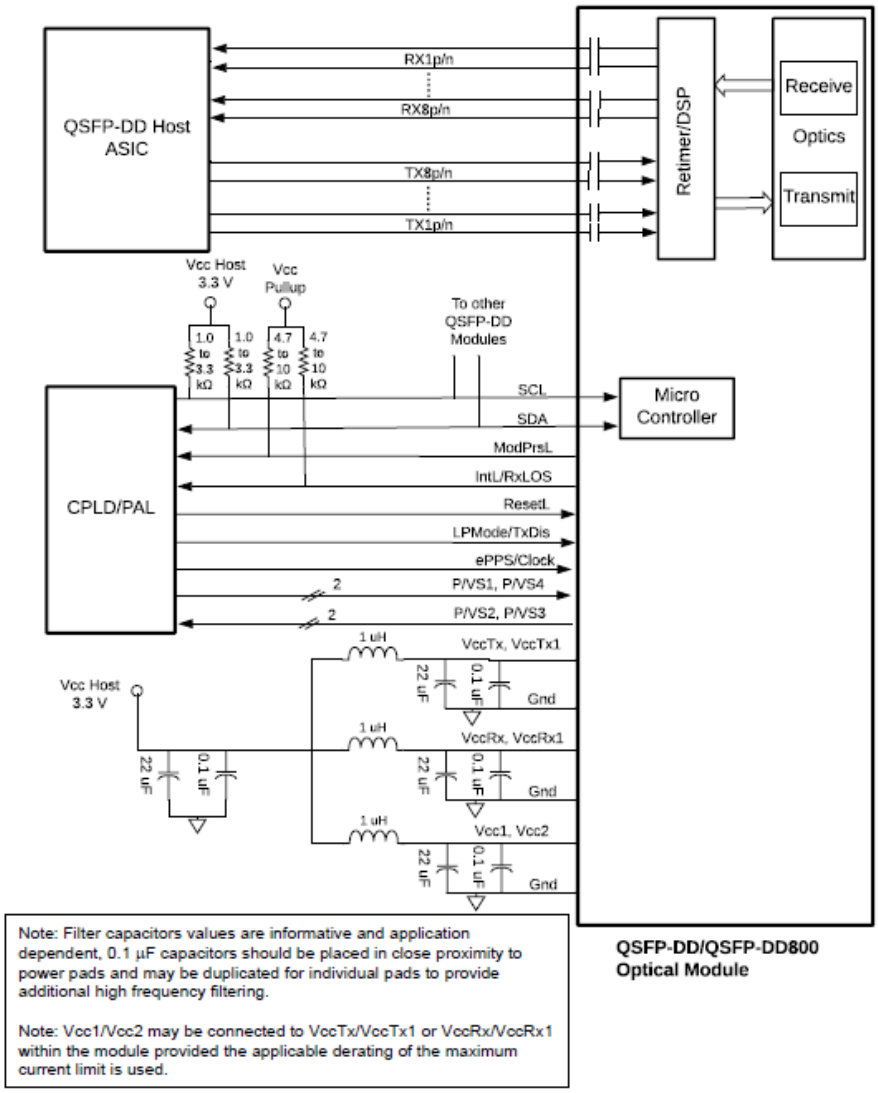
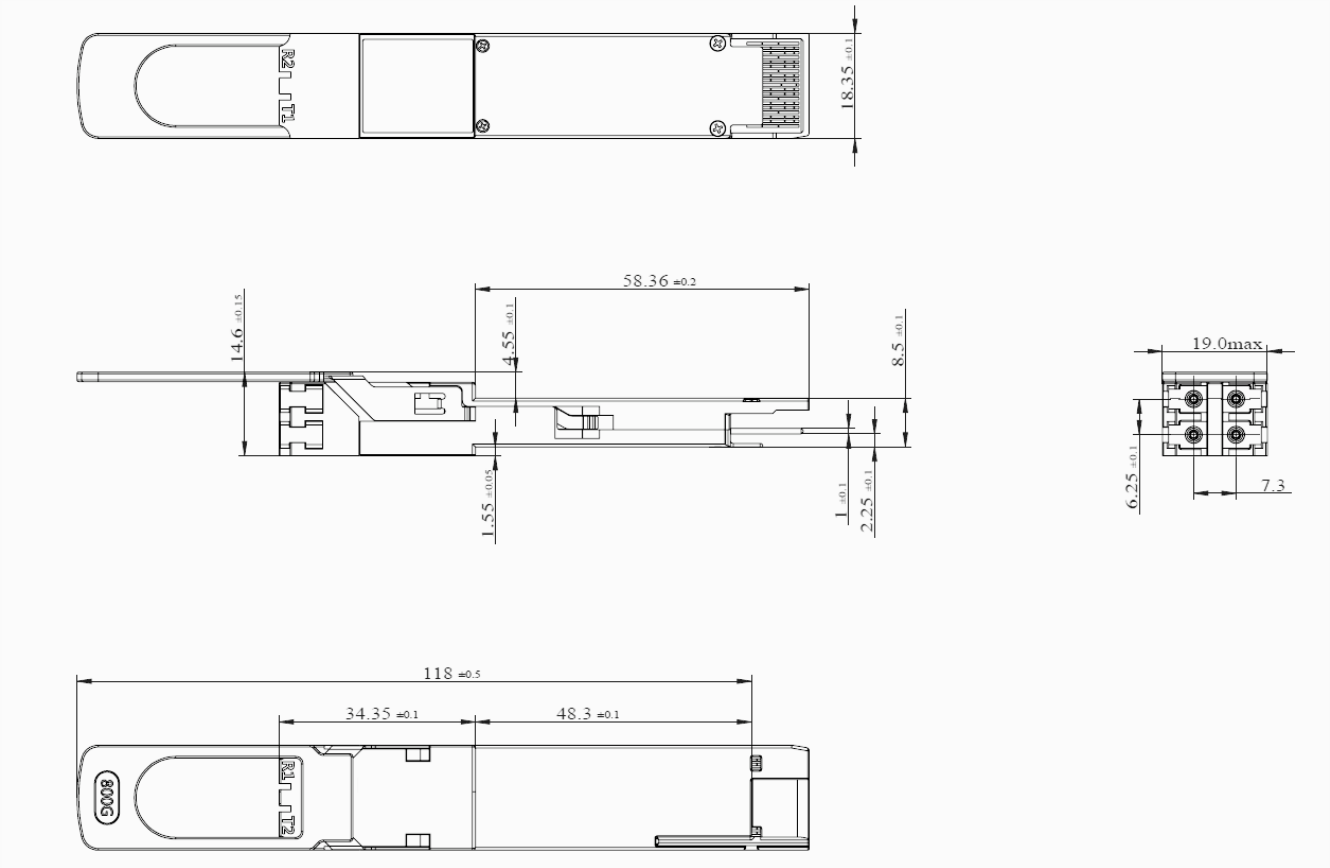



**Figure 2 – Recommended QSFP-DD/QSFP-DD800 Host Board Schematic**

**Table 9 – Digital Diagnostics**

| Parameter | Range | Accuracy | Unit | Calibration |
|---|---|---|---|---|
| Temperature | 0 to 70 | ±3 | ºC | Internal |
| Voltage | 3.135 to 3.465 | ±3% | V | Internal |
| Tx Bias Current (Each Lane) | 0 to 100 | 10% | mA | Internal |
| Tx Output Power (Each Lane) | -3.2 to +4.4 | ±3 | dB | Internal |
| Rx Receive Power (Each Lane) | -7.2 to +4.4 | ±3 | dB | Internal |

**Mechanical Diagram**




**Warnings**

Handling Precautions: This device is susceptible to damage as a result of electrostatic discharge (ESD). A static free environment is highly recommended. Follow guidelines according to proper ESD procedures.
Laser Safety: Class 1 Laser Product. Complies with FDA performance standards for laser products except for conformance with IEC 60825-1 Ed. 3., as described in Laser Notice No. 56, dated May 8, 2019. Radiation emitted by laser devices can be dangerous to human eyes. Avoid eye exposure to direct or indirect radiation.

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