



GZ40GQPS31M-10

40Gbps QSFP+ 10km PSM4 Transceivers

Product Description

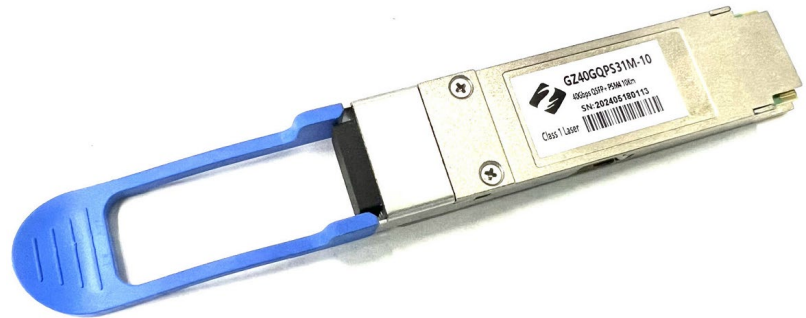
The GZ40GQPS31P-10 QSFP+ PSM4 optical transceiver is intended for up to 10km reach service with four-lane 10.3125G data rate. It is based on 3.3V DC power supply and operates in the Commercial temperature range. It is compliant with QSFP MSA 、SFF-8436 and IEEE802.3ba-2018. Digital diagnostic functions are available via I2C interface, and the control functions can be achieved by LVTTTL interfaces on the host, mainly including Module Select(ModSelL)、Module Reset(ResetL)、Low Power Mode(LPMode). The transceiver incorporates a four-laser array which is usually DFB 、four-PIN diode array 、an integrated four drivers and TIAs IC separately. The differential AC coupled Tx and Rx data interfaces are CML compatible.

Applications

- 40G BASE Ethernet
- Infiniband EDR interconnects
- Enterprise networking

Features

- MPO-12 optical interface
- Maximum link length up to 10km
- Up to 10.3125Gb/s data links per lane
- +3.3 V power supply
- QSFP MSA compliant package
- Hot Pluggable
- High performance single mode DML transmitter
- High sensitivity PIN/TIA optical receiver
- Single Mode operation
- Case Operating temperature : 0 to 70°C
- Data and Control Interfaces
- Tx Data CML/AC Coupled
- Rx Data CML/AC Coupled
- ModSelL LVTTTL
- ResetL LVTTTL
- ModPrsL LVTTTL
- LPMode LVTTTL
- 2-wire I2C communication bus
- RoHS 6 compliant



Shenzhen Guangzhi Communication Technology Co., LTD.

Production Address: 5th floor, Building 2, Peninsula Industrial Park, No. 3, Gangbian Tian Road, East Lake High-tech Zone, Wuhan Hubei Province, China.

Contact: Mr. Yang Tel.: +86-18607555895 E-mail: yanghan@optst.com

Website: www.optst.com

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Absolute maximum parameters

| Absolute Maximum Ratings (EXCEEDING THESE RATINGS MAY CAUSE IRREVERSIBLE DAMAGE TO THE DEVICE) | | | | | |
|--|-----------|------|-----|-------|---|
| Parameter | Symbol | Min | Max | Units | Notes |
| Storage Temperature | T_{stg} | -40 | +95 | °C | Exceeding the absolute maximum ratings may cause irreversible damage to the device. The device is not intended to be operated under the condition of simultaneous absolute maximum ratings, which may cause irreversible damage to the device. |
| Case Operating Temperature (Commercial) | T_O | 0 | 70 | °C | |
| Relative Humidity - Storage | R_{HS} | 0 | 95 | % | |
| Relative Humidity - Operating | R_{HO} | 0 | 85 | % | |
| Supply Voltage | VCC | -0.3 | 3.6 | V | |

Operating conditions

| Recommended Operating Conditions | | | | | | |
|----------------------------------|------------|-------|-----|-------|-------|-------|
| Parameter | Symbol | Min | Typ | Max | Units | Notes |
| Case Operating Temperature | T_{case} | 0 | - | +70 | °C | |
| DC Supply Voltage | VCC | 3.135 | - | 3.465 | V | |
| Module Supply Current | I_{in} | - | - | 1060 | mA | |

Electrical Characteristics

| Transmitter Electrical Characteristics | | | | | | |
|--|-----------|-----|-----|---------|----------|-------|
| Parameter | Symbol | Min | Typ | Max | Units | Notes |
| Differential Data input Swing | V_{in} | 180 | - | 900 | mV | |
| Tx Differential Input Impedance | Z_{in} | 90 | 100 | 110 | Ω | |
| Tx Differential Output Impedance | Z_{out} | 45 | 50 | 55 | Ω | |
| ResetL Disable Voltage | V_r | 2.0 | - | Vcc+0.3 | V | |
| ResetL Enable Voltage | V_{rEN} | 0 | - | 0.8 | V | |
| ModSelL Disable Voltage | V_m | 2.0 | - | Vcc+0.3 | V | |
| ModSelL Enable Voltage | V_{mEN} | 0 | - | 0.8 | V | |

| Receiver Electrical Characteristics | | | | | | |
|-------------------------------------|--|--|--|--|--|--|
|-------------------------------------|--|--|--|--|--|--|

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| Parameter | Symbol | Min | Typ | Max | Units | Notes |
|----------------------------------|------------|---------|-----|---------|----------|-------|
| Differential Data Output Swing | V_{out} | 180 | - | 900 | mV | |
| Rx Differential Output Impedance | Z_{out} | 90 | 100 | 110 | Ω | |
| IntL Assert Voltage | V_{Int} | VCC-0.5 | - | VCC+0.3 | V | |
| IntL De-assert Voltage | VD_{Int} | 0 | - | +0.4 | V | |

Optical Specification

Transmitter Optical Specification

| Transmitter Optical Specification | | | | | | |
|---|-----------|------------------------------------|----------------|------|-------|-------|
| Parameter | Symbol | Min | Typ | Max | Units | Notes |
| Signal Rate Each Lane | | | 10.3125±100ppm | | Gbps | |
| Lane Wavelength | L0 | 1295 | 1310 | 1325 | nm | |
| | L1 | 1295 | 1310 | 1325 | nm | |
| | L2 | 1295 | 1310 | 1325 | nm | |
| | L3 | 1295 | 1310 | 1325 | nm | |
| Side Mode Suppression Ratio | SMSR | 30 | | | dB | |
| Average Launch Power Each Lane | P_{avg} | -7 | | 2.5 | dBm | |
| Optical Modulation Amplitude Each Lane | OMA | | | 2.5 | dBm | 1 |
| Transmitter and dispersion penalty Each Lane | TDP | | | 2.6 | dB | |
| Eye Mask coordinates: X1, X2, X3, Y1, Y2, Y3 | | {0.25, 0.4, 0.45, 0.25, 0.28, 0.4} | | | | |
| Average launch power of OFF transmitter Each Lane | | | | -30 | dBm | |
| Extinction Ratio | ER | 3.5 | | | dB | |
| Spectral Width _{20dB} | | | | 1 | nm | |
| Transmitter Reflectance | | | | -12 | dB | |
| Optical return loss tolerance | | | | 20 | dB | |

Note:

1. Even if the TDP < 0.8dB, the OMA min must exceed the minimum value specified here.
2. Hit ratio@ 5e-5, per IEEE.

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Receiver Optical Specification

| Receiver Optical Specification | | | | | | |
|---|--------|-------|--------------------|------|-------|-------|
| Parameter | Symbol | Min | Typ | Max | Units | Notes |
| Signal Speed Per Lane | | | 10.3125± 100ppm | | Gbps | |
| Lane Wavelength | L0 | 1295 | 1310 | 1325 | nm | |
| | L1 | 1295 | 1310 | 1325 | nm | |
| | L2 | 1295 | 1310 | 1325 | nm | |
| | L3 | 1295 | 1310 | 1325 | nm | |
| Damage threshold _{Each Lane} | THd | 2.5 | | | dBm | 1 |
| Average Receive Power _{Each Lane} | | -12.6 | | 2 | dBm | |
| Receiver reflectance | | | | -26 | dB | |
| Sensitivity OMA _{Each Lane} ^[1] | Sen1 | | | -12 | dBm | 2 |
| Stressed Receiver Sensitivity (OMA), each Lane | | | | -8.6 | dBm | |
| LOS Assert | LOSA | -30 | - | | dBm | |
| LOS Deassert | LOSD | | | -17 | dBm | |
| LOS Hysteresis | LOSH | 0.5 | | 5 | dB | |
| Vertical Eye Closure Penalty | VECP | 1.9 | | | dB | 3 |
| Stressed Eye J2 Jitter | J2 | 0.3 | | | UI | |
| Stressed Eye J4 Jitter | J4 | 0.47 | | | UI | |

Note:

1. The receiver shall be able to tolerate, without damage, continuous exposure to a modulated optical input signal having this power level on one lane. The receiver does not have to operate correctly at this input power.
2. Measured with conformance test signal at receiver input for BER = 1e-12 .
3. Vertical eye closure penalty and stressed eye jitter are test conditions for measuring stressed receiver sensitivity. They are not characteristics of the receiver.

Digital diagnostic

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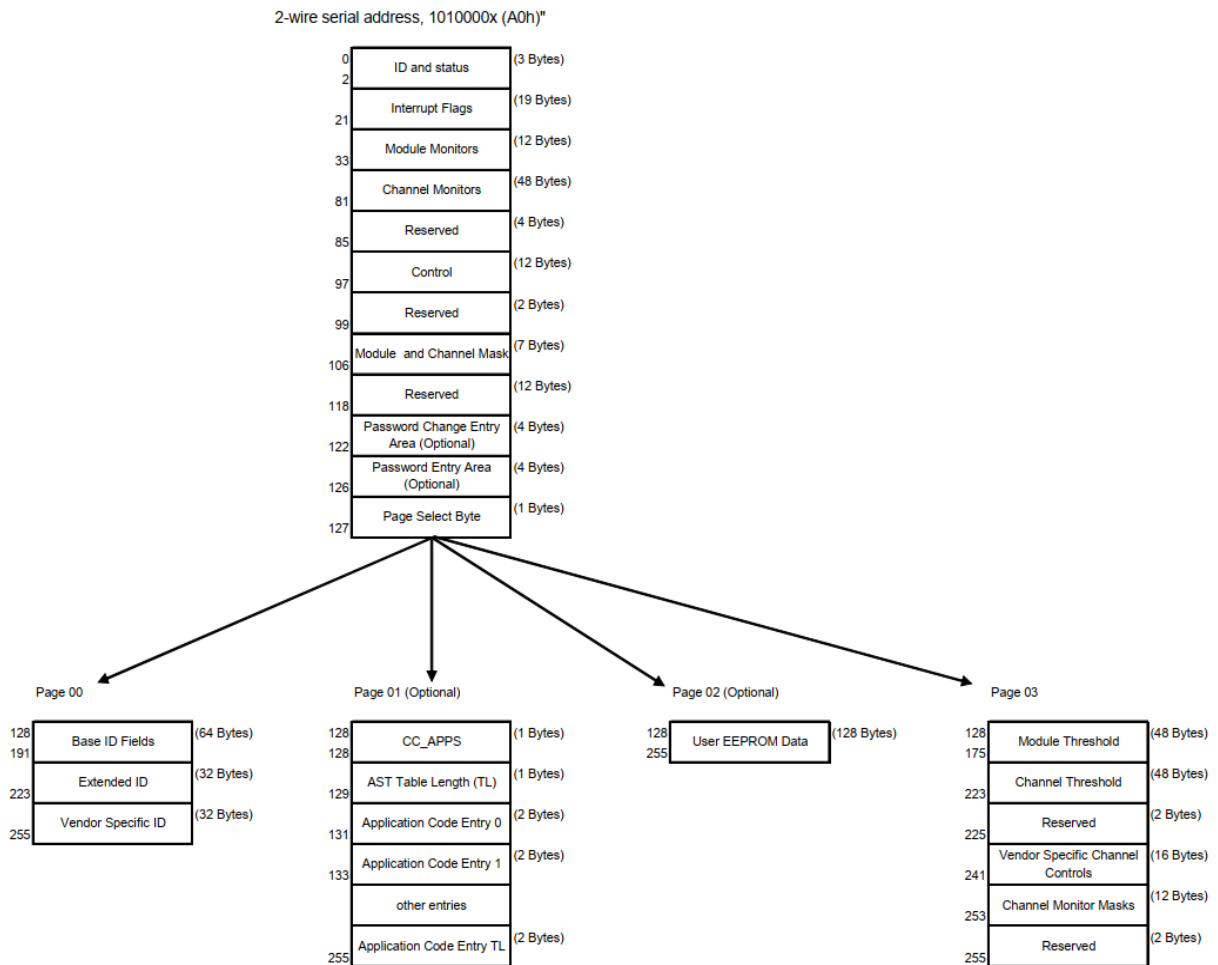
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Memory Map



| Monitoring Interface | | | | |
|----------------------|--------|--------|-------|-----------------|
| Parameter | Symbol | Spec | Units | Condition/Notes |
| Temperature | Te | +/-3 | °C | |
| Voltage | VCC | +/-5% | V | |
| IBias | BIAS | +/-10% | mA | |
| Rx power | Rx-pwr | +/-3 | dBm | |
| Tx power | Tx-pwr | +/-3 | dBm | |

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PIN Assignment

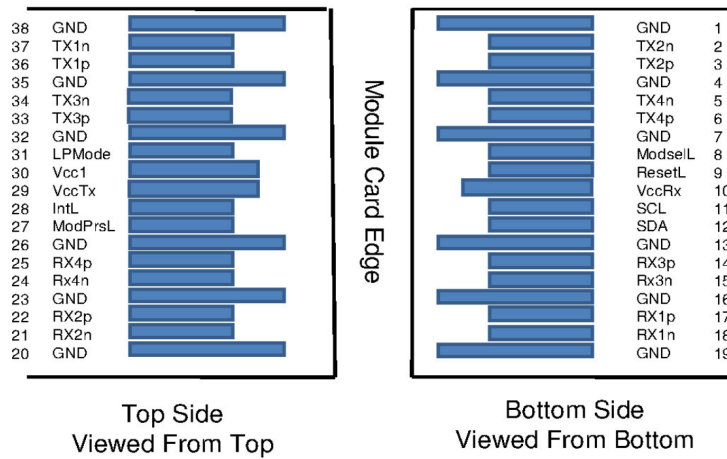


Table 1: Transceiver pin descriptions

| PIN Description | | | |
|-----------------|--------|--------------------------------------|------|
| PIN | Symbol | Name/Description | Note |
| 1 | GND | Ground | 1 |
| 2 | Tx2n | Transmitter Inverted Data Input | |
| 3 | Tx2p | Transmitter Non-Inverted Data output | |
| 4 | GND | Ground | 1 |
| 5 | Tx4n | Transmitter Inverted Data Input | |
| 6 | Tx4p | Transmitter Non-Inverted Data output | |
| 7 | GND | Ground | 1 |
| 8 | ModSeL | Module Select | |
| 9 | ResetL | Module Reset | |
| 10 | VccRx | +3.3V Power Supply Receiver | 2 |
| 11 | SCL | 2-Wire Serial Interface Clock | |
| 12 | SDA | 2-Wire Serial Interface Data | |
| 13 | GND | Ground | 1 |
| 14 | Rx3p | Receiver Non-Inverted Data Output | |

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| | | | |
|----|---------|--------------------------------------|---|
| 15 | Rx3n | Receiver Inverted Data Output | |
| 16 | GND | Ground | 1 |
| 17 | Rx1p | Receiver Non-Inverted Data Output | |
| 18 | Rx1n | Receiver Inverted Data Output | |
| 19 | GND | Ground | 1 |
| 20 | GND | Ground | 1 |
| 21 | Rx2n | Receiver Inverted Data Output | |
| 22 | Rx2p | Receiver Non-Inverted Data Output | |
| 23 | GND | Ground | 1 |
| 24 | Rx4n | Receiver Inverted Data Output | |
| 25 | Rx4p | Receiver Non-Inverted Data Output | |
| 26 | GND | Ground | 1 |
| 27 | ModPrsL | Module Present | |
| 28 | IntL | Interrupt | |
| 29 | VccTx | +3.3 V Power Supply transmitter | 2 |
| 30 | Vcc1 | +3.3 V Power Supply | 2 |
| 31 | LPMODE | Low Power Mode | |
| 32 | GND | Ground | 1 |
| 33 | Tx3p | Transmitter Non-Inverted Data output | |
| 34 | Tx3n | Transmitter Inverted Data Input | |
| 35 | GND | Ground | 1 |
| 36 | Tx1p | Transmitter Non-Inverted Data output | |
| 37 | Tx1n | Transmitter Inverted Data Input | |
| 38 | GND | Ground | 1 |

Notes

Notes1: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.

Note 2: Vcc Rx, Vcc1 and Vcc Tx are the receiver and transmitter power supplies and shall be applied concurrently. Requirements defined for the host side of the Host Edge Card Connector are listed . Recommended host board power supply filtering is shown in Figures 3 and 4. Vcc Rx Vcc1 and Vcc Tx may be internally connected within the QSFP+ Module in any combination. The connector pins are each rated for a maximum current of 500 mA

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ModSelL

The ModSelL is an input pin. When held low by the host, the module responds to 2-wire serial communication commands. The ModSelL allows the use of multiple QSFP modules on a single 2-wire interface bus. When the ModSelL is “High”, the module shall not respond to or acknowledge any 2-wire interface communication from the host. ModSelL signal input node must be biased to the “High” state in the module. In order to avoid conflicts, the host system shall not attempt 2-wire interface communications within the ModSelL de-assert time after any QSFP modules are deselected. Similarly, the host must wait at least for the period of the ModSelL assert time before communicating with the newly selected module. The assertion and de-asserting periods of different modules may overlap as long as the above timing requirements are met

ResetL

The ResetL pin must be pulled to Vcc in the QSFP module. A low level on the ResetL pin for longer than the minimum pulse length (t_{Reset_init}) initiates a complete module reset, returning all user module settings to their default state. Module Reset Assert Time (t_{init}) starts on the rising edge after the low level on the ResetL pin is released. During the execution of a reset (t_{init}) the host shall disregard all status bits until the module indicates a completion of the reset interrupt. The module indicates this by posting an IntL signal with the Data_Not_Ready bit negated. Note that on power up (including hot insertion) the module should post this completion of reset interrupt without requiring a reset.

ModPrsL

ModPrsL is pulled up to Vcc_Host on the host board and grounded in the module. The ModPrsL is asserted “Low” when inserted and deasserted “High” when the module is physically absent from the host connector

IntL

IntL is an output pin. When “Low”, it indicates a possible module operational fault or a status critical to the host system. The host identifies the source of the interrupt using the 2-wire serial interface. The IntL pin is an open collector output and must be pulled to host supply voltage on the host board.

LPMMode

The LPMMode pin shall be pulled up to Vcc in the QSFP module. This function is affected by the LPMMode pin and the combination of the Power_over-ride and Power_set software control bits (Address A0h, byte 93 bits 0,1). The module has two modes a low power mode and a high power mode. The high power mode operates in one of the four power classes.

When the module is in a low power mode it has a maximum power consumption of 1.5W. This protects hosts that are not capable of cooling higher power modules, should such modules be accidentally inserted.

The modules 2-wire serial interface and all laser safety functions must be fully operational in this low power mode. The module shall still support the completion of reset interrupt in this low power mode. If the Extended Identifier bits (Page 00h, byte 129 bits 6-7) indicate a power consumption greater than 1.5W and the module is in low power mode it must reduce its power consumption to less than 1.5W while still maintaining the functionality above. The exact method of accomplishing low power is not specified, however it is likely that either the Tx or Rx or both will not be operational in this state. If the Extended Identifier bits (Page 00h, byte 129 bits 6-7) indicate that its power consumption is less than 1.5W then the module shall be fully functional independent of whether it is in low power or high power mode.

The Module should be in low power mode if the LPMMode pin is in the high state, or if the Power_over-ride bit is in the high state and the Power_set bit is also high. The module should be in high power mode if the

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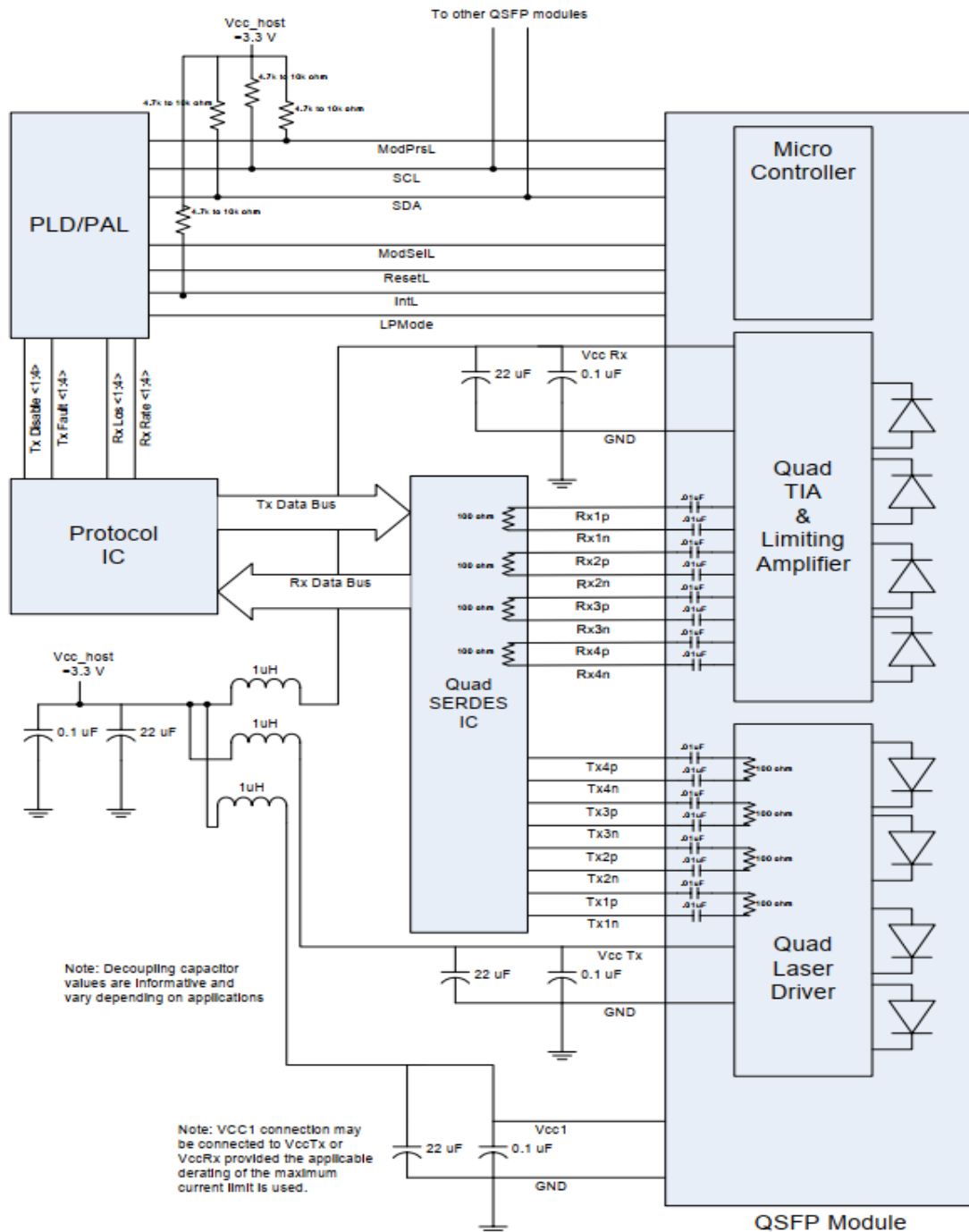
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LPMODE pin is in the low state, or the Power_over-ride bit is high and the Power_set bit is low. Note that the default state for the Power_over-ride bit is low.

Electrical Interface



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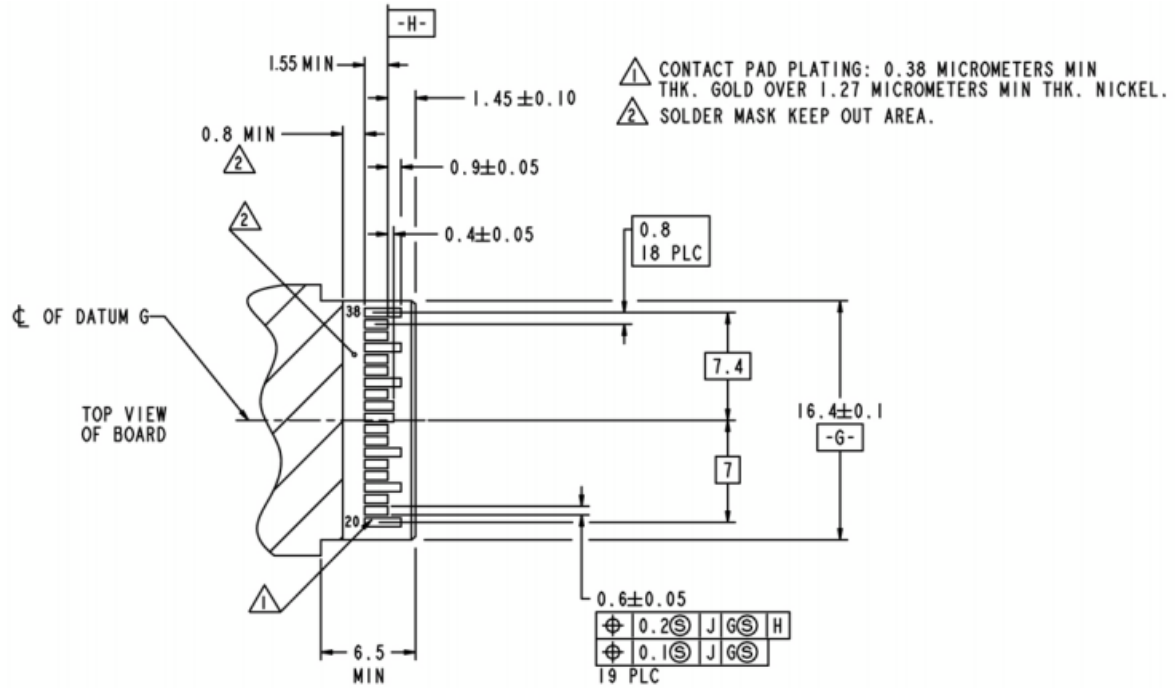
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Recommended PCB Layout



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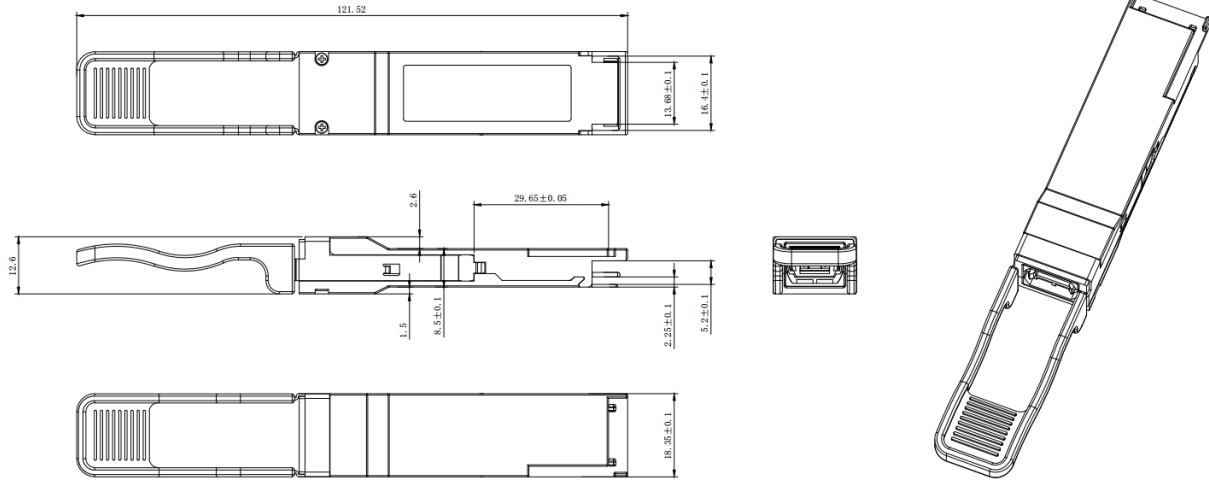
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Mechanical Dimensions



Notes:

- 1、Tolerance: +/-0.1mm.
- 2、Others according to SFF-8661 or customer spec .
- 3、Optical port according to fiber connector spec.

Ordering Information

| Part. No | Specifications | | | | | | | | |
|----------------|----------------|-----|-------------|-----------|-----|-------------|------------|-------------|--------|
| | Rate Gb/s | Tx | Tx WL nm | Po dBm | Rx | Sen. dBm | Temp °C | Reach Km | Other |
| GZ40GQPS31M-10 | 41.25 | DML | 1310 | -7~+2.5 | PIN | <-12 | 0~70 | 10 | MPO-12 |

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.

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Laser Safety:

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

Notice:

The information provided on this page contains the product target specifications which are subject to change without notice.

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