

RT-QA0GCM-C00

100Gb/s QSFP28 CWDM4 Optical Transceiver

Product Features

- Four-channel full-duplex transceiver modules
- Transmission data rate up to 26Gbit/s per channel
- Up to 2km transmission of single mode fiber
- Low power consumption <3.5W
- Operating case temperature 0°C to +70°C
- 3.3V power supply voltage
- RoHS 6 compliant
- Hot Pluggable QSFP form factor
- LC connector receptacle
- Built-in digital diagnostic function

Applications

- 100G Ethernet
- Proprietary High Speed Interconnections
- Datacenter
- 100G CWDM4 application with FEC

The Rayoptek RT-QA0GCM-C00 is a Four-Channel, Pluggable, dual LC, Fiber-Optic QSFP28 Transceiver for 100G Ethernet applications. The QSFP28 full-duplex optical module offers 4 independent transmit and receive channels, each capable of 26Gbps operation for an aggregate data rate of 104Gbps 2km using single mode fiber. These modules are designed to operate over single mode fiber systems using 1271nm-1331nm DFB laser array. QSFP28 CWDM4 is one kind of transceiver which provides increased port density and total system cost savings. They are compliant with the QSFP28 MSA, CWDM4 MSA and portions of IEEE P802.3bm.

Ordering Information

| Part Number | Description |
|---------------|---|
| RT-QA0GCM-C00 | QSFP28 CWDM4 2km optical transceiver with full real-time digital diagnostic monitoring and pull tab |

For More Information:

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Regulatory Compliance

| Feature | Standard | Performance |
|--------------------------------------|--|---------------------------------------|
| Electromagnetic Interference (EMI) | FCC Part 15 Class B EN 55022:2010, Class B | Compatible with standards |
| Electromagnetic susceptibility (EMS) | EN 55024:2010 | Compatible with standards |
| Laser Eye Safety | FDA 21CFR 1040.10 and 1040.11 EN60950, EN (IEC) 60825-1,2 | Compatible with Class I laser product |

Absolute Maximum Ratings

The operation in excess of any absolute maximum ratings might cause permanent damage to this module.

| Parameter | Symbol | Min | Max | Unit | Notes |
|--------------------------------------|-----------------|------|----------------------|------|-------|
| Storage Temperature | T _s | -40 | 85 | °C | |
| Operating Case Temperature | T _{OP} | 0 | 70 | °C | |
| Supply Voltage | V _{CC} | -0.5 | 3.6 | V | |
| Input Voltage | V _{in} | -0.5 | V _{CC} +0.3 | V | |
| Relative Humidity (non-condensation) | RH | 0 | 85 | % | |

Recommended Operating Conditions and Power Supply Requirements

| Parameter | Symbol | Min | Typical | Max | Unit | Notes |
|----------------------------|-----------------|-------|----------|-------|------|-------|
| Operating Case Temperature | T _{OP} | 0 | | 70 | °C | |
| Power Supply Voltage | V _{CC} | 3.135 | 3.3 | 3.465 | V | |
| Data Rate, each Lane | DR | | 25.78125 | | Gb/s | |
| Power Consumption | | | | 3.5 | W | |
| Data Speed Tolerance | ΔDR | -100 | | +100 | ppm | |
| Link Distance with G.652 | D | 0 | | 2 | km | |

Electrical Characteristics

The following electrical characteristics are defined over the Recommended Operating Environment unless otherwise specified.

| Parameter | Symbol | Min | Typical | Max | Unit | Notes |
|---------------------------------------|--------------------|----------------------|---------|-----------------|-------|-------|
| Differential input impedance | Z _{in} | 90 | 100 | 110 | ohm | |
| Differential input impedance | Z _{out} | 90 | 100 | 110 | ohm | |
| Differential input voltage amplitude | Δ V _{in} | 300 | | 1100 | mVp-p | |
| Differential output voltage amplitude | Δ V _{out} | 500 | | 800 | mVp-p | |
| Input Logic Level High | V _{IH} | 2.0 | | V _{CC} | V | |
| Input Logic Level Low | V _{IL} | 0 | | 0.7 | V | |
| Output Logic Level High | V _{OH} | V _{CC} -0.5 | | V _{CC} | V | |
| Output Logic Level Low | V _{OL} | 0 | | 0.4 | V | |

Optical Characteristics

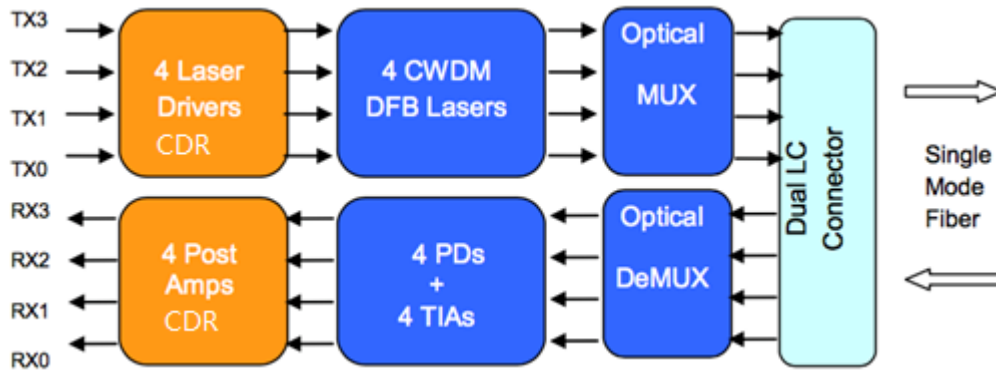
| Parameter | Symbol | Min | Typical | Max | Unit | Notes |
|--|----------------------|--------|---------|--------|------|-------|
| Wavelength Assignment | L0 | 1264.5 | 1271 | 1277.5 | nm | |
| | L1 | 1284.5 | 1291 | 1297.5 | nm | |
| | L2 | 1304.5 | 1311 | 1317.5 | nm | |
| | L3 | 1324.5 | 1331 | 1337.5 | nm | |
| Transmitter | | | | | | |
| RMS Spectral Width | λ _{rms} | | | 3.5 | nm | 1 |
| Average Launch Power, each lane | PAVG | | | 2.5 | dBm | |
| Optical Modulation Amplitude (OMA) | POMA | -4 | | 2.5 | dBm | 1 |
| Difference in Launch Power between any two lanes | P _{tx,diff} | | | 4.0 | dB | |
| Transmitter and Dispersion Penalty per Lane | TDP | | | 3 | dBm | |

| | | | | | | |
|--|-------|------------------------------------|-----|-------|-----|---|
| Rise/Fall Time | Tr/Tf | | | 30 | ps | |
| Extinction Ratio | ER | 3.5 | | | dB | |
| Transmitter Reflectance | RT | | | -12 | dB | |
| Transmitter Eye Mask Margin | EMM | 10 | | | % | 2 |
| Average Launch Power OFF Transmitter, each Lane | Poff | | | -30 | dBm | |
| Transmitter Eye Mask Definition {X1, X2, X3, Y1, Y2, Y3} | | {0.31, 0.4, 0.45, 0.34, 0.38, 0.4} | | | | |
| Receiver | | | | | | |
| Damage Threshold | THd | 3.5 | | | dBm | |
| Overload, each lane | OVL | 2.5 | | | dBm | |
| Receiver Sensitivity in OMA, each Lane | SEN | | | -10 | dBm | 3 |
| Signal Loss Assert Threshold | LOSA | -24 | | -13.6 | dBm | |
| Signal Loss Deassert Threshold | LOSD | | | -11.6 | dBm | |
| LOS Hysteresis | LOSH | | 1.5 | | dB | |
| Optical Return Loss | ORL | | | -12 | dBm | |

Notes:

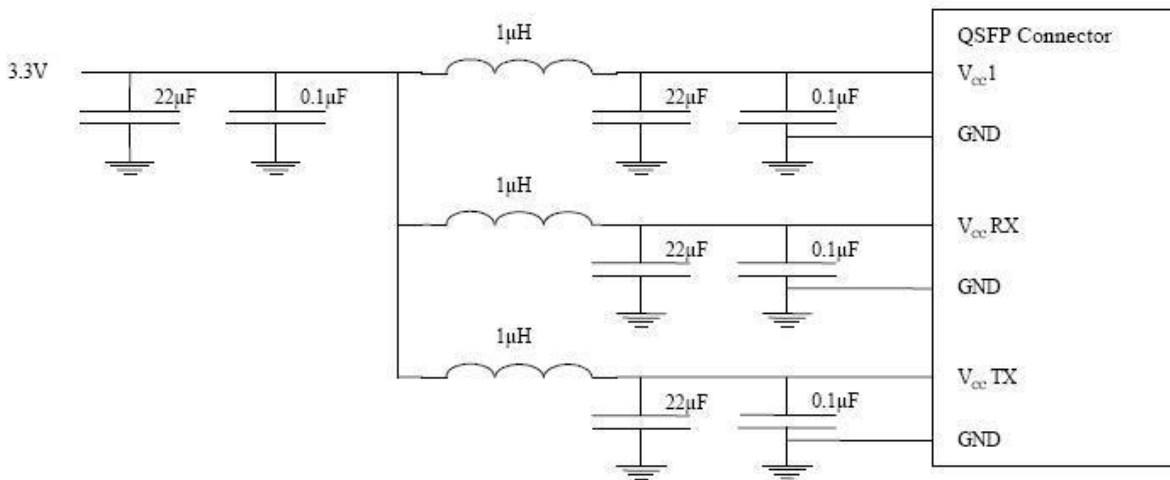
1. Transmitter wavelength, RMS spectral width and power need to meet the OMA minus TDP specs to guarantee link performance.
2. The eye diagram is tested with 1000 waveform.
3. Sensitivity is specified at 5x10⁻⁵ BER.

Block Diagram of Transceiver



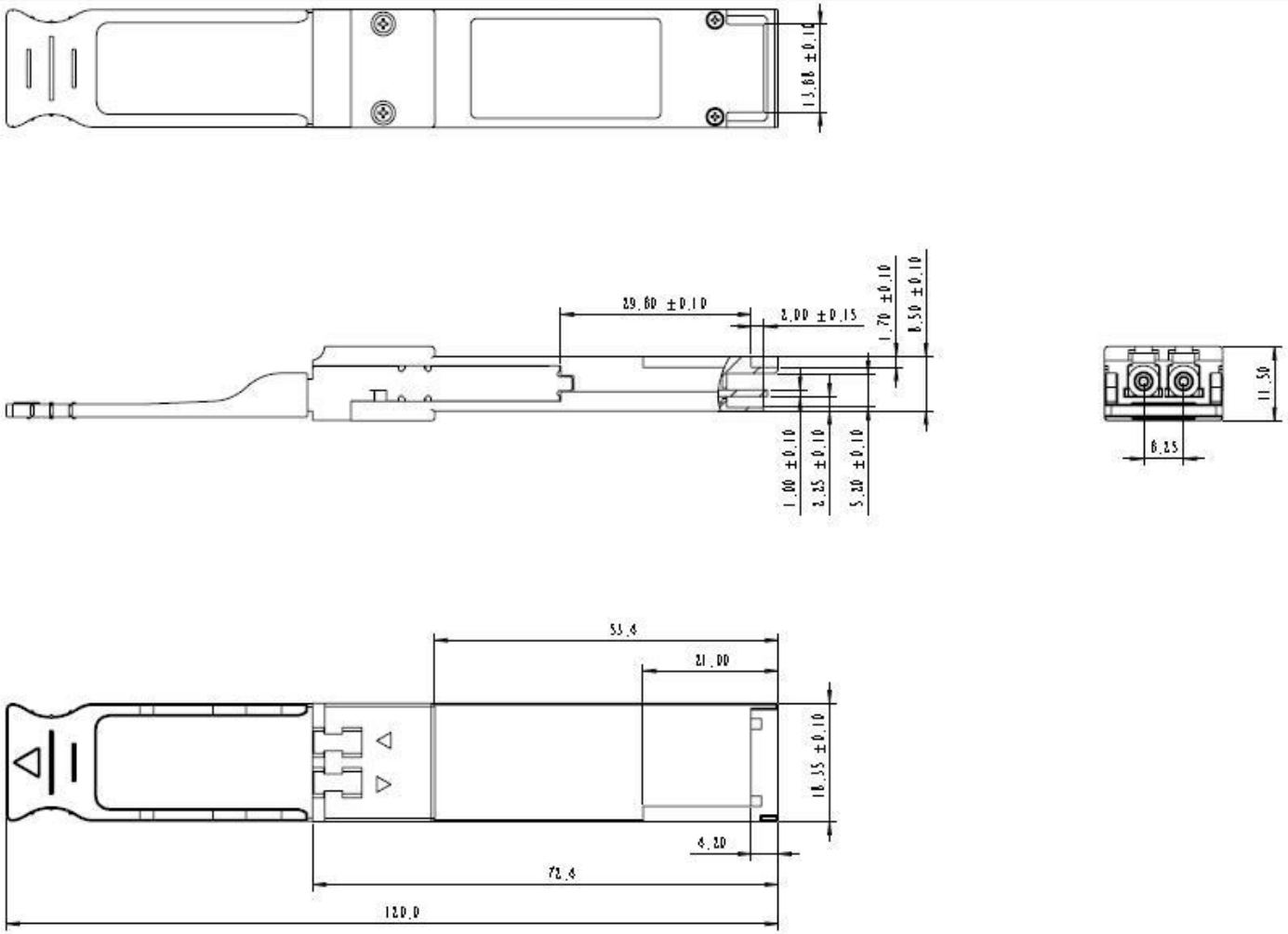
Recommended Power Supply Filter

The host board should use the power supply filtering shown as below.



Host Board Power Supply Filtering

Mechanical Dimensions



ESD

This transceiver is specified as ESD threshold 1kV for SFI pins and 2kV for all other electrical input pins, tested per MIL-STD-883, Method 3015.4 /JESD22-A114-A (HBM). However, normal ESD precautions are still required during the handling of this module. This transceiver is shipped in ESD protective packaging. It should be removed from the packaging and handled only in an ESD protected environment.

Laser Safety

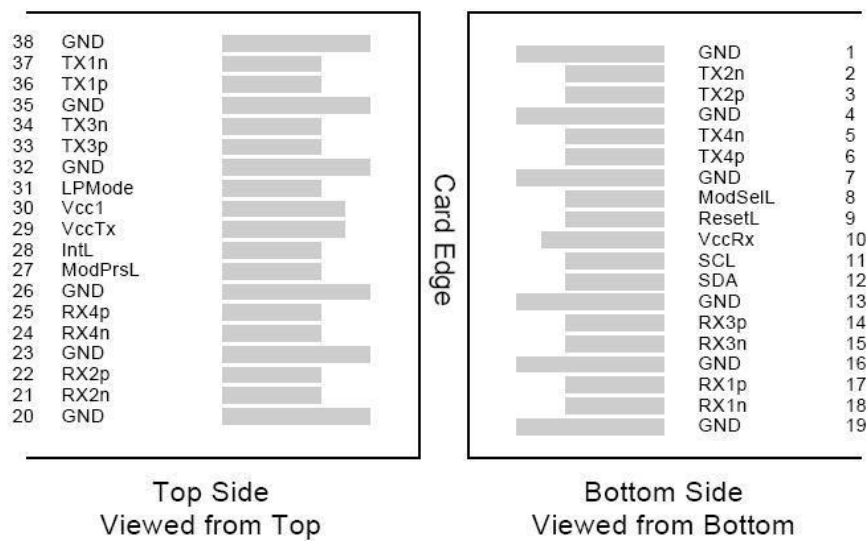
This is a Class 1 Laser Product according to IEC 60825-1:2007. This product complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated (June 24, 2007).

Digital Diagnostic Functions

The following digital diagnostic characteristics are defined over the normal operating conditions unless otherwise specified.

| Parameter | Symbol | Min | Max | Unit | Notes |
|---|--------------|------|------|------|----------------------------------|
| Temperature monitor absolute error | DMI_Temp | -3 | +3 | °C | Over operating temperature range |
| Supply voltage monitor absolute error | DMI_VCC | -0.1 | +0.1 | V | Over full operating range |
| Channel RX power monitor absolute error | DMI_RX_Ch | -3 | 3 | dB | |
| Channel Bias current monitor | DMI_Ibias_Ch | -10% | +10% | mA | |
| Channel TX power monitor absolute error | DMI_TX_Ch | -3 | 3 | dB | |

Pin Assignment and Description



Pin Assignment

| PIN # | Logic | Symbol | Description | Notes |
|-------|-------------|---------|--------------------------------------|-------|
| 1 | | GND | Ground | 1 |
| 2 | CML-I | Tx2n | Transmitter Inverted Data Input | |
| 3 | CML-I | Tx2p | Transmitter Non-Inverted Data output | |
| 4 | | GND | Ground | 1 |
| 5 | CML-I | Tx4n | Transmitter Inverted Data Input | |
| 6 | CML-I | Tx4p | Transmitter Non-Inverted Data output | |
| 7 | | GND | Ground | 1 |
| 8 | LVTLL-I | ModSelL | Module Select | |
| 9 | LVTLL-I | ResetL | Module Reset | |
| 10 | | VccRx | +3.3V Power Supply Receiver | 2 |
| 11 | LVC MOS-I/O | SCL | 2-Wire Serial Interface Clock | |
| 12 | LVC MOS-I/O | SDA | 2-Wire Serial Interface Data | |
| 13 | | GND | Ground | |
| 14 | CML-O | Rx3p | Receiver Non-Inverted Data Output | |
| 15 | CML-O | Rx3n | Receiver Inverted Data Output | |
| 16 | | GND | Ground | 1 |

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

Notes:

1. GND is the symbol for signal and supply (power) common for QSFP+ modules. 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. VccRx, Vcc1 and VccTx are the receiving and transmission power suppliers and shall be applied concurrently. Recommended host board power supply filtering is shown in Figure 3 below. Vcc Rx, Vcc1 and Vcc Tx may be internally connected within the QSFP+ transceiver module in any combination. The connector pins are each rated for a maximum current of 500mA.

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