

Features:

- Four optical channels
 - DX: 2 Transmitters, 2 Receivers
 - TX: 4 Transmitters
 - RX: 4 Receivers
- Supports data rates up to 5 Gbps
- 850nm VCSEL transmitters and PIN receivers
- IEC-60825-1 Class 1 eye safety compliant
- Option for RoHS 6/6 compliant and lead free per Directive 2011/65/EU
- Typical reach of 500m on 50/125, 2000 MHz-km MMF
- Separable electrical interface for manufacturing and service convenience
- ARINC 801 fiber interface
- Enhanced status and diagnostics monitor interface
- -40°C to +85°C standard operating temperature, extended options available
- -55°C to +105°C storage temperature
- Parylene conformal coating option



The RCP-5G-SX is ideal for harsh environment connectivity because of its low cost, availability, and wide operating parameters



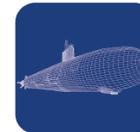
COMMERCIAL AEROSPACE



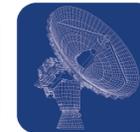
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MILITARY TACTICAL



SUBSEA NETWORKING



RADAR & SENSING



OIL & EXPLORATION

Absolute Maximum Ratings

| Parameter | Symbol | Min. | Max. | Unit | Note |
|-------------------------|------------------|------|------|------|-------------------------------|
| Maximum Supply Voltage | V _{CC} | -0.3 | 4.0 | V | |
| Electrostatic Discharge | ESD | | 500 | V | Data I/O pins (1) |
| Storage Temperature | T _{sto} | -55 | 105 | °C | |
| Relative Humidity | RH | 0 | 85 | % | Non-condensing (2) |
| Conformal Coating | | 0.8 | 1.2 | mil | See ruggedization notes, pg.5 |

Notes:

- 1) Proper ESD precautions should be observed while attaching RCP to the host board.
- 2) Based on conformal coating.

General Specifications

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Notes |
|----------------------------------|-------------------|------|------|------|------|--------------------------------------|
| Supply Voltage | V _{CC} | 3.14 | 3.3 | 3.47 | V | 3.3V ±5% |
| Supply Voltage Rise Time to 1.8V | t _{rVCC} | | | 1 | ms | Required if no ext. supervisor reset |
| Data Rate | BR | 1 | | 5 | Gbps | Balanced NRZ data protocols (1) |
| Operating Temperature | T _{OP} | -40 | | 85 | °C | -40 to 100°C option available |

Contact COTSWORKS for information regarding lower data rates.

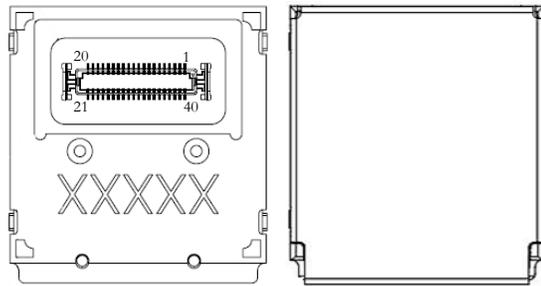
Electrical Specifications (T_{OP} = -40°C to 100°C, V_{CC} = 3.14V to 3.47 V)

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Notes |
|---|-----------------------|------|------|-----------------|------------------|--------------------------------|
| Total Module Power Dissipation | P _{DISS(DX)} | | | 1.52 | W | Dual duplex configuration |
| Total Module Power Dissipation | P _{DISS(TX)} | | | 1.39 | W | Quad transmitter configuration |
| Total Module Power Dissipation | P _{DISS(RX)} | | | 1.67 | W | Quad receiver configuration |
| Transmitter | | | | | | |
| Supply Current (Per Channel) | I _{CC} | 50 | | 100 | mA | |
| Input differential impedance | R _{in} | 90 | 100 | 110 | Ω | |
| Single-Ended Input Voltage Swing | V _{IN(p-p)} | 50 | | 600 | mV _{pp} | |
| TX FAULT Asserted | V _{FH} | 2.0 | | | V | LVTTL output |
| TX FAULT De-asserted | V _{FL} | | | 0.8 | V | LVTTL output |
| TX Disable Input Voltage | V _{DIS} | 2.0 | | | V | LVTTL, internal 10kΩ pull-up |
| TX Enable Input Voltage | V _{EN} | | | 0.8 | V | LVTTL, internal 10kΩ pull-up |
| Receiver | | | | | | |
| Supply Current (Per Channel) | I _{CC} | | | 120 | mA | |
| Single-Ended Output Voltage Swing | V _{OUT(p-p)} | 250 | | 400 | mV | |
| Data Output Rise Time | t _r | | 80 | 100 | ps | (1) |
| Data Output Fall Time | t _f | | 80 | 100 | ps | (1) |
| Contributed Total Jitter | T _{JRX(p-p)} | | | 0.45 | UI | Input Power = -16 dBm |
| Contributed Deterministic Jitter | D _{JRX(p-p)} | | | 0.2 | UI | Input Power = -16 dBm |
| Loss of Signal De-Assert Voltage | V _{LOSD} | | | 0.8 | V | LVTTL output |
| Loss of Signal Assert Voltage | V _{LOSA} | 2.5 | | V _{CC} | V | LVTTL output |
| Serial Bus | | | | | | |
| Data, Clock Input Low Voltage | V _{IL} | | | 0.8 | V | |
| Data, Clock Input High Voltage | V _{IH} | 2.0 | | V _{CC} | V | |
| Data, Clock Output Low Voltage | V _{OL} | | | 0.4 | V | |
| Data, Clock Output High Voltage | V _{OH} | 2.4 | | V _{CC} | V | |
| Notes: | | | | | | |
| 1) Measured with 9GHz minimum analog bandwidth 20% to 80% | | | | | | |

Optical Characteristics ($T_{OP} = -40^{\circ}\text{C}$ to 100°C , $V_{CC} = 3.14\text{V}$ to 3.47V)

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Notes |
|--|------------------|------|------|------|-------|---|
| Transmitter | | | | | | |
| Optical Output Power | P_O | -5 | | -1 | dBm | (1)(2) $T_{op} = -40^{\circ}\text{C}$ to 85°C |
| Optical Output Power (> 85°C) | P_{OX} | -7 | | -1 | dBm | (1)(2) $T_{op} = 85^{\circ}\text{C}$ to 100°C |
| Optical Output Wavelength | λ_c | 830 | 850 | 860 | nm | (1) |
| RMS Spectral Width | λ_{RMS} | | 0.4 | 0.5 | nm | (1) |
| Extinction Ratio | ER | 9 | | | dB | $T_{op} = -40^{\circ}\text{C}$ to 85°C |
| Extinction Ratio (> 85°C) | ER _X | 7 | | | dB | $T_{op} = 85^{\circ}\text{C}$ to 100°C |
| Optical Rise Time | t_r | | 30 | 50 | ps | (3) |
| Optical Fall Time | t_f | | 70 | 95 | ps | (3) |
| Relative Intensity Noise | RIN | | | -130 | dB/Hz | |
| Contributed Total Jitter | $TJ_{TX(p-p)}$ | | | 0.3 | UI | |
| Contributed Deterministic Jitter | $DJ_{TX(p-p)}$ | | | 0.2 | UI | |
| Receiver | | | | | | |
| Receiver Sensitivity: 5 Gbps | P_{IN_5} | | | -14 | dBm | (4) BER=1E-12 |
| Receiver Sensitivity: 4.25 Gbps | P_{IN_4} | | | -16 | dBm | (4) BER=1E-12 |
| Receiver Sensitivity: 2.13 Gbps | P_{IN_2} | | | -18 | dBm | (4) BER=1E-12 |
| Receiver Sensitivity: 1.25 Gbps | P_{IN_1} | | | -21 | dBm | (4) BER=1E-12 |
| Receiver Overload | P_{OL} | 0 | | | dBm | (4) Error Free |
| Optical Input Wavelength | λ_P | 780 | 850 | 860 | nm | |
| Optical Return Loss | ORL | 12 | | | dB | |
| Loss of Signal Assert | LOS _A | -24 | | | dBm | Invalid optical input power threshold |
| Loss of Signal De-Assert | LOS _D | | | -19 | dBm | Valid optical input power threshold |
| Loss of Signal Hysteresis | LOS _H | 1 | | 5 | dB | (LOS _D - LOS _A) |
| Notes: | | | | | | |
| 1) Measured at the end of a 2m to 5m, 50µm multi-mode patch cord. | | | | | | |
| 2) IEC 60825-1 Class 1. | | | | | | |
| 3) Measured with 9GHz minimum analog bandwidth, 20-80%. | | | | | | |
| 4) Measured running PRBS 2 ⁷ -1 using 9dB ER external reference transmitter over 50µm multi-mode fiber with a 50µm VOA. | | | | | | |

Pin Configuration



RCP Bottom View

RCP Top View

| | | | |
|-----------|-----------|-----------|----------|
| GND_1 | G3 | G2 | GND_1 |
| GND_1 | 21 | 20 | VCC_1 |
| D1- | 22 | 19 | /RST |
| D1+ | 23 | 18 | N/C |
| GND_1 | 24 | 17 | CH1_DIS |
| FLT1/LOS1 | 25 | 16 | CTRL_INT |
| GND_2 | 26 | 15 | VCC_2 |
| D2- | 27 | 14 | GND_2 |
| D2+ | 28 | 13 | GND_2 |
| GND_2 | 29 | 12 | CH2_DIS |
| FLT2/LOS2 | 30 | 11 | SCL |
| FLT3/LOS3 | 31 | 10 | SDA |
| GND_3 | 32 | 9 | CH3_DIS |
| D3- | 33 | 8 | GND_3 |
| D3+ | 34 | 7 | GND_3 |
| GND_3 | 35 | 6 | VCC_3 |
| FLT4/LOS4 | 36 | 5 | N/C |
| GND_4 | 37 | 4 | CH4_DIS |
| D4- | 38 | 3 | GND_4 |
| D4+ | 39 | 2 | GND_4 |
| GND_4 | 40 | 1 | VCC_4 |
| GND_4 | G4 | G1 | GND_4 |

Host Connector view

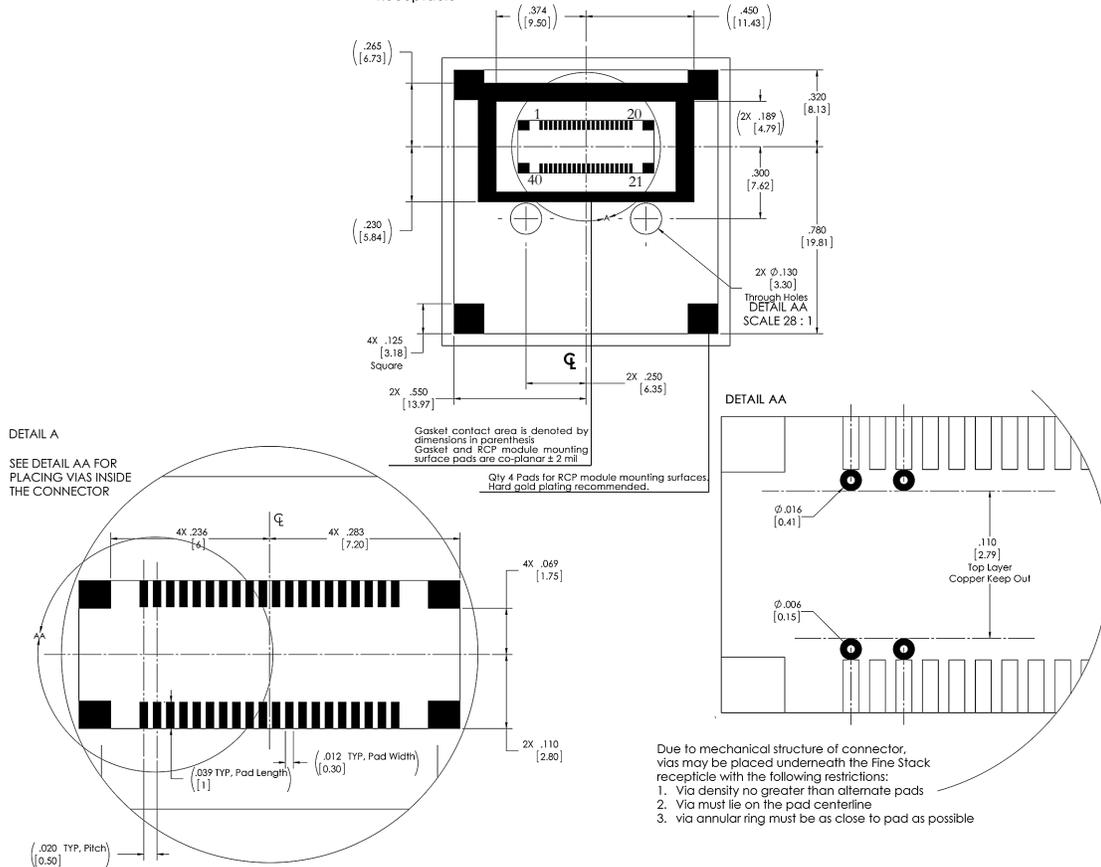
Notes:

1. Pin 19 is connected to the /RST pin of the microcontroller. See Application schematics for recommended connection.
2. Channels 1 & 4 are TX circuits and Channels 2 & 3 are RX circuits in DX transceiver configuration.
3. Data lines for all channels are AC coupled.

| Pin | Symbol | Description | Logic/Protocol |
|------|-----------|---|----------------|
| 1 | VCC_4 | Channel 4 VCC | +3.3V |
| 2 | GND_4 | Channel 4 Signal Ground | 0V |
| 3 | GND_4 | Channel 4 Signal Ground | 0V |
| 4 | CH4_DIS | Channel 4 Disable | LVTTTL |
| 5 | N/C | Do Not Connect | No Connect |
| 6 | VCC_3 | Channel 3 VCC | +3.3V |
| 7 | GND_3 | Channel 3 Signal Ground | 0V |
| 8 | GND_3 | Channel 3 Signal Ground | 0V |
| 9 | CH3_DIS | Channel 3 Disable | LVTTTL |
| 10 | SDA | 2-Wire Bus Data | I2C |
| 11 | SCL | 2-Wire Bus Clock | I2C |
| 12 | CH2_DIS | Channel 2 Disable | LVTTTL |
| 13 | GND_2 | Channel 2 Signal Ground | 0V |
| 14 | GND_2 | Channel 2 Signal Ground | 0V |
| 15 | VCC_2 | Channel 2 VCC | +3.3V |
| 16 | CTRL_INT | Controller Interrupt | LVTTTL |
| 17 | CH1_DIS | Channel 1 Disable | LVTTTL |
| 18 | N/C | Do Not Connect, Internal Use Only | No Connect |
| 19 | /RST | Controller /RST | Note 1 |
| 20 | VCC_1 | Channel 1 VCC | +3.3V |
| 21 | GND_1 | Channel 1 Signal Ground | 0V |
| 22 | D1- | Channel 1 Data Negative | CML |
| 23 | D1+ | Channel 1 Data Positive | CML |
| 24 | GND_1 | Channel 1 Signal Ground | 0V |
| 25 | FLT1/LOS1 | Fault for Tx Channel 1 or Loss of Signal for Rx Channel 1 | LVTTTL |
| 26 | GND_2 | Channel 2 Signal Ground | 0V |
| 27 | D2- | Channel 2 Data Negative | CML |
| 28 | D2+ | Channel 2 Data Positive | CML |
| 29 | GND_2 | Channel 2 Signal Ground | 0V |
| 30 | FLT2/LOS2 | Fault for Tx Channel 2 or Loss of Signal for Rx Channel 2 | LVTTTL |
| 31 | FLT3/LOS3 | Fault for Tx Channel 3 or Loss of Signal for Rx Channel 3 | LVTTTL |
| 32 | GND_3 | Channel 3 Signal Ground | 0V |
| 33 | D3- | Channel 3 Data Negative | CML |
| 34 | D3+ | Channel 3 Data Positive | CML |
| 35 | GND_3 | Channel 3 Signal Ground | 0V |
| 36 | FLT4/LOS4 | Fault for Tx Channel 4 or Loss of Signal for Rx Channel 4 | LVTTTL |
| 37 | GND_4 | Channel 4 Signal Ground | 0V |
| 38 | D4- | Channel 4 Data Negative | CML |
| 39 | D4+ | Channel 4 Data Positive | CML |
| 40 | GND_4 | Channel 4 Signal Ground | 0V |
| G1-4 | GND | Mounting Ground Pads for Connector | 0V |

PCB Design Guidelines

- No components underneath module
- Any traces and vias must be solder masked unless connected to chassis ground
- Recommend tented or solder-filled vias to maintain moisture resistance
- Origin defined as the center point Receptacle



Notes:

- 1) **Case Grounding**
 - a. Chassis (case) ground is isolated from data ground.
 - b. The method of terminating chassis ground is application dependent.
 - i. The method chosen is usually based on EMI requirements of the end application.
 - c. The RCP is designed to operate with chassis ground either floating or tied to data ground.
- 2) **40 Pin Connector Composition**
 - a. Contact: Copper Alloy (t=0.15) with Gold Plating
 - b. Solder Peg: Copper Alloy with Tin Plating
 - c. Contact: Gold Plating (0.00076 mm)
- 3) **Orientation**
 - a. PCB guideline diagrams are shown from the top view of a host PCB that is to be connected to an RCP module.

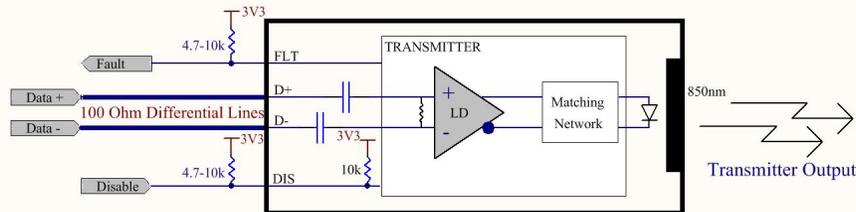
Ordering Information for 40 Pin Board-Mount Receptacle

COTSWORKS Part Number

110-00047

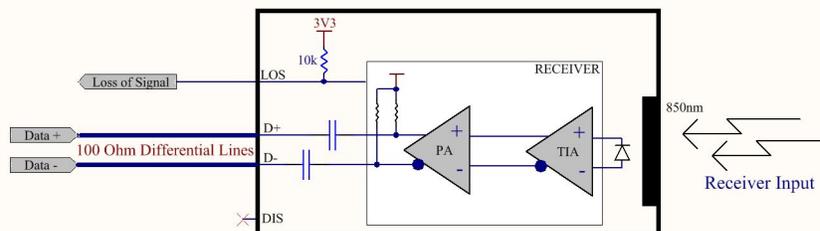
Application Schematics

Transmitter Application Schematic



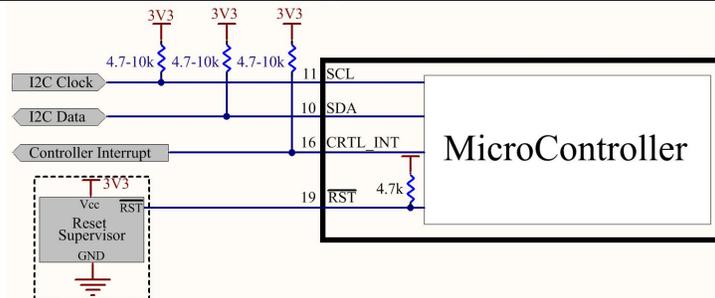
- Channels 1 & 4 are Transmitter Circuits in the standard DX version of the transceiver
 - Check Pinout on page 3 for pin assignments based on transceiver configuration
 - Capacitors are connected to data lines for AC coupling

Receiver Application Schematic



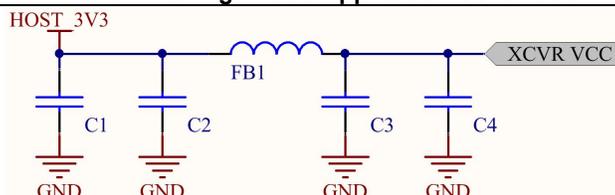
- Channels 2 & 3 are Receiver Circuits in the standard DX version of the transceiver
 - Check Pinout on page 3 for pin assignments based on transceiver configuration
 - Capacitors are connected to data lines for AC coupling

Controller Application Schematic



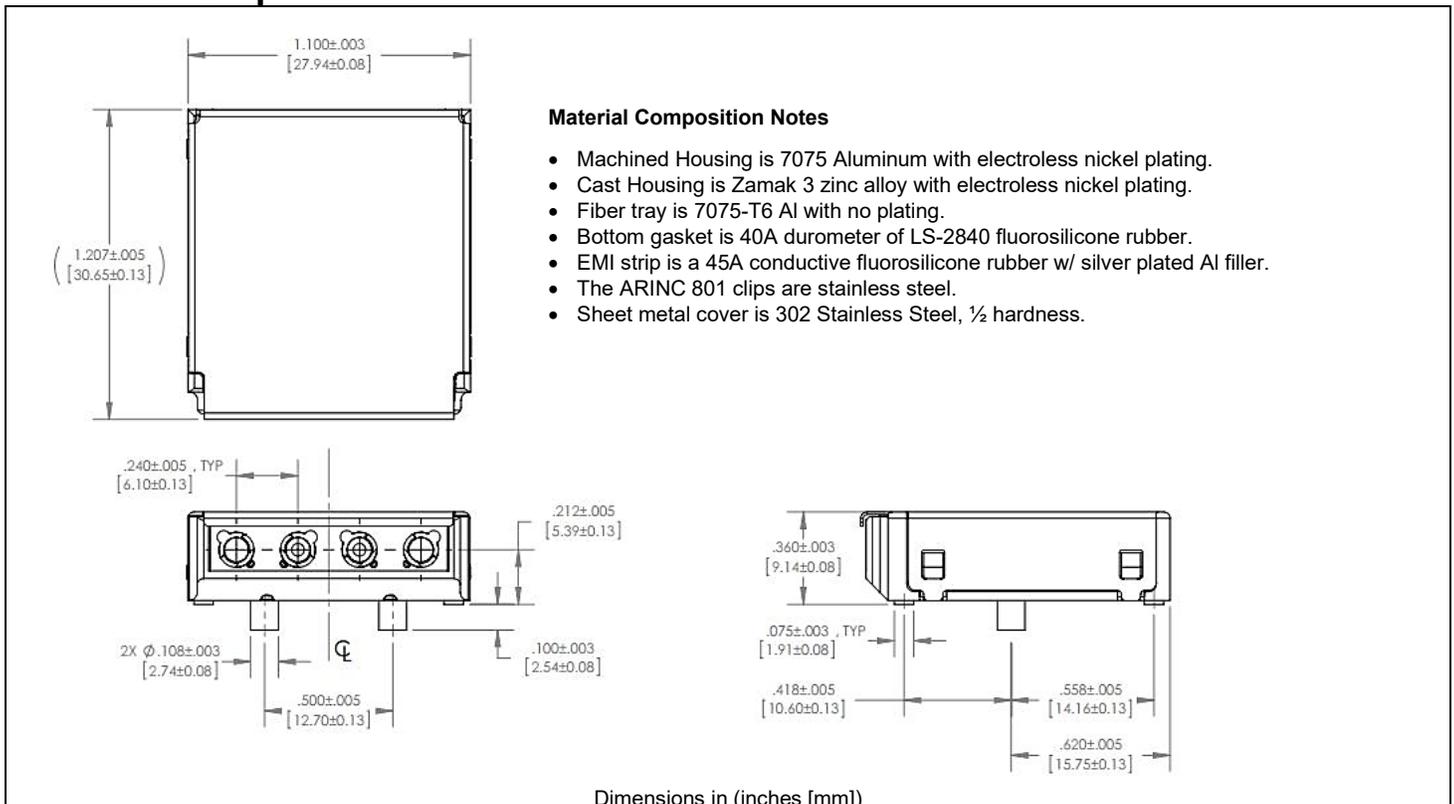
- Pin allocation and connections to the microcontroller are common to all variations of the RCP module.
- Reset supervisor shown is optional
 - Open collector reset supervisor circuit with a hold down time of 10ms or greater should be chosen
 - COTSWORKS validated with the MAX803 Reset Supervisor
- In the absence of the reset supervisor, the power to the transceiver module must reach 1.8V in 1ms or less for a valid POR on the microcontroller

Power Filtering Circuit Application Schematic



- All four channels must be powered for proper operation of the RCP module
- Recommend host routes separate supply voltages and filtering for each channel as shown above and implemented in the Host Board Application Schematic
 - FB1 ferrite bead for power supply noise suppression; Murata BLM18KG601SN1, 0603, 600Ω @ 100MHz, 1300mA
 - C1/C4 bulk capacitance; Murata GRM21BR61C106KE15L, 0805, 10μF, 16V
 - C2/C3 de-coupling capacitors; Murata GRM155R71C104KA88D, 0402, 0.1μF, 16V

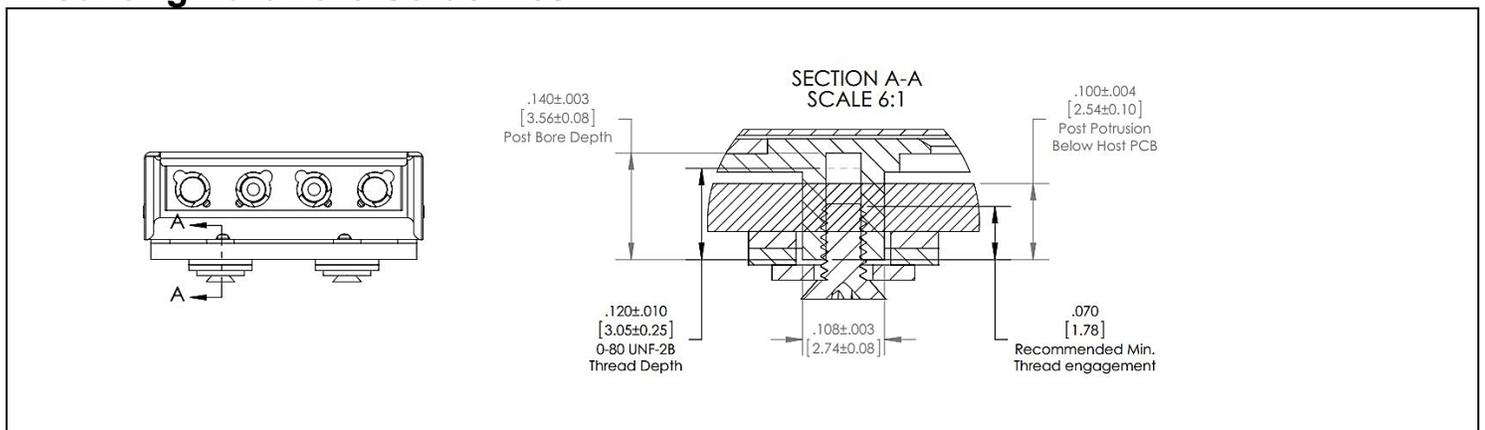
Mechanical Specifications



Dimensions in (inches [mm])

| Transceiver Variant | Optical Configuration | Mass (g) [Machined] | Mass (g) [Cast] |
|---------------------|-----------------------------|------------------------|--------------------|
| RCP-5G-SX-DX | 2 Transmitters, 2 Receivers | 14.6 | 17.3 |
| RCP-5G-SX-TX | 4 Transmitters | 14.8 | 17.5 |
| RCP-5G-SX-RX | 4 Receivers | 14.1 | 16.8 |

Mounting Hardware Guidelines



Mounting hardware shown for standard 0.0625" PCB thickness. Please contact COTSWORKS for other board thicknesses.

| | |
|--|-------------|
| Recommended Torque | 12 in-oz. |
| Recommended Minimum Thread Engagement | 0.07 inches |

Ruggedization Notes

- Parylene C coating can be used for conformal coating with a 1.0 mil ± 0.2 mil thickness through a deposition process.
 - Parylene Type C has a 5600 VPM rating, withstands high temperatures, and is extremely resistant to oil/dirt, and object impact.
- Contact COTSWORKS for all MSDS, case composition, and burn analysis.

Installation of Fiber Optic Termini

- Industry standard size 16 tooling should be used to insert/extract the ARINC 801 termini from the RCP module.
- Please contact COTSWORKS for additional support if required.

Regulatory Compliance

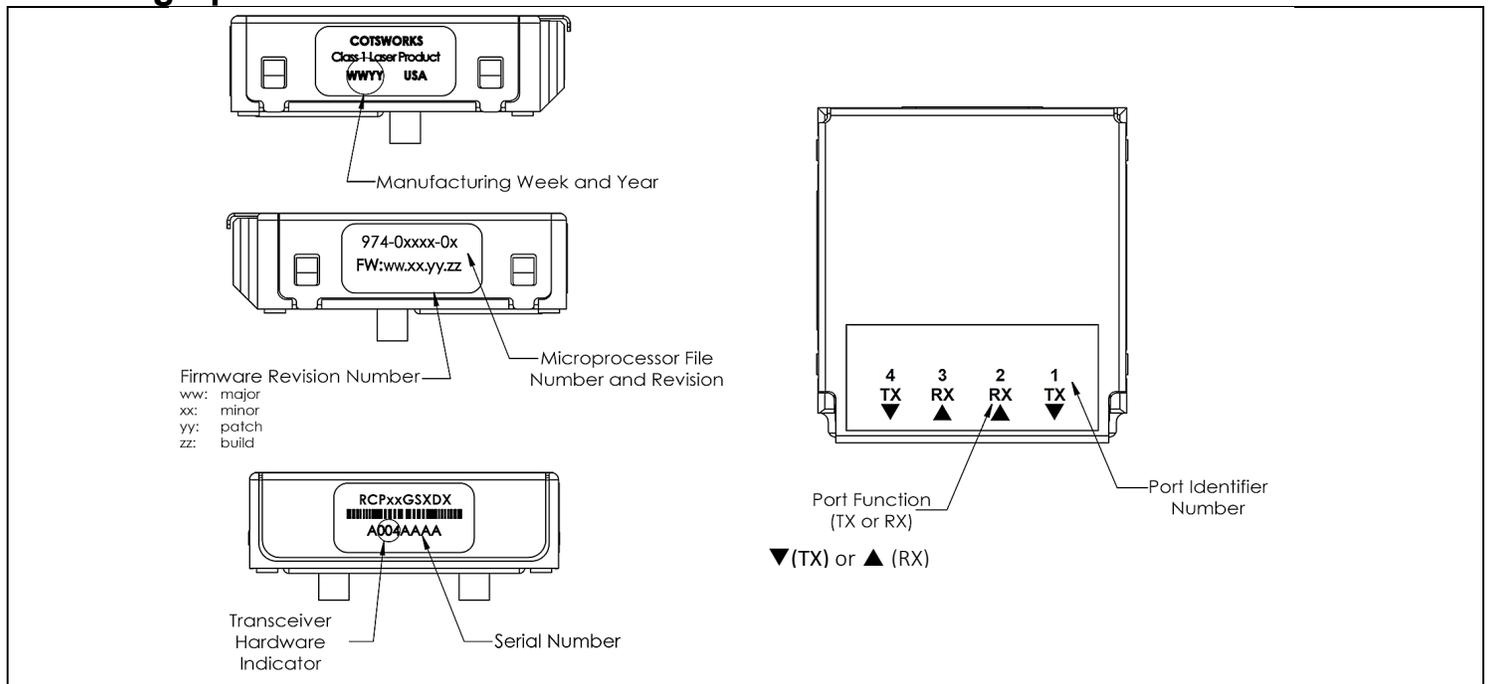
- COTSWORKS transceivers are Class 1 Laser Products and comply with US FDA regulations.
- These products are designed to comply with the Class 1 eye safety requirements of EN (IEC) 60825 and the electrical safety requirements of EN (IEC) 60950.
- This part has an option for compliance with Directive 2011/65/EU covering restriction on certain hazardous substances (RoHS)
 - Contact COTSWORKS support for a product compliance matrix

Warnings:

Handling Precautions: This device is susceptible to damage as a result of electrostatic discharge (ESD). A static free environment is highly recommended.

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

Labeling Specifications



Ordering Information

| RCP-5G-SX | -xx | -LX | -x | -x | -xx | -x | -x |
|----------------------------|-------------------------------------|------------------------|-------------------------------|--|--|-----------------------|---------------------------|
| RCP Form Factor | Channel Configuration | Fiber Interface | Ruggedized Coating | Operating Temp Range | Module Serial Bus Address (leave blank for default of C4) | RoHS Level | Screw Thread Type |
| 5Gbps Max Data Rate | DX: 2RX + 2TX RX: 4RX TX: 4TX | ARINC-801 Receptacles | (): Non-coated R: Parylene | A: -40 to 85 °C M: -40 to 95 °C S: -40 to 100 °C | C0, C2, C6, C8, CA, CC, CE, D0, D2, D4, D6, D8, DA, DC or DE | (): Lvl 5 6: Lvl 6 | (): Imperial U: Metric |
| Short Reach (MMF) | | | | | | | |

Example part number: RCP-5G-SX-RX-LX-R-A-C0-U
 [5Gbps Rugged Chip-scale pluggable quad receiver, ARINC 801 Interfaces, Parylene-coated, industrial operating temp range, C0 Serial Bus Address, Metric Screw Threads]

Contact COTSWORKS for mechanical dimensional information and other configuration options.

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