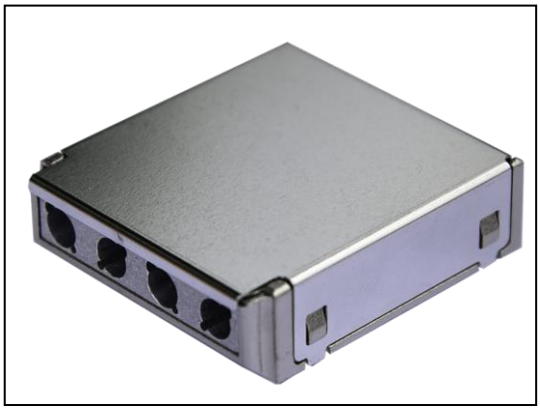
RCP-5G-SX
1Gbps to 5Gbps
Rugged Pluggable Optical Transceiver

Features:

- Four independent 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
- –40ºC to +85ºC standard operating temperature, extended options available
- Parylene conformal coating option



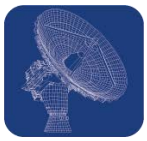
The RCP-5G-SX is ideal for harsh environment connectivity because of its low cost, availability, and wide operating parameters


COMMERCIAL AEROSPACE


MILITARY AEROSPACE


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.8

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
Operating Temperature	T_{OP}	–40	-	85	°C	–40 to 105°C option available
Contact Moog | COTSWORKS for information regarding lower data rates.						

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Electrical Specifications (T_{OP} = –40˚C to 105˚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	$TJ_{RX(p-p)}$	-	-	0.45	UI	Input Power = –16 dBm
Contributed Deterministic Jitter	$DJ_{RX(p-p)}$	-	-	0.2	UI	Input Power = –16 dBm
Loss of Signal De-Assert Voltage	VLOSD	-	-	0.8	V	LVTTL output
Loss of Signal Assert Voltage	VLOSA	2.5	-	V_{CC}	V	LVTTL output
Serial Bus						
Data, Clock Input Low Voltage	VIL	-	-	0.8	V	
Data, Clock Input High Voltage	VIH	2.0	-	V_{CC}	V	
Data, Clock Output Low Voltage	VOL	-	-	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%

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Optical Characteristics (T_{OP} = –40˚C to 105˚C, V_{CC} = 3.14V to 3.47 V)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Transmitter						
Optical Output Power	P_O	–5	-	–1	dBm	(1)(2)(3)
Optical Output Power (>85°C)	P_{OX}	–7	-	–1	dBm	(1)(2)(4)
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	(3)
Extinction Ratio (>85°C)	ER_X	7	-	-	dB	(4)
Optical Rise Time	t_r	-	30	50	ps	(5)
Optical Fall Time	t_f	-	70	95	ps	(5)
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	(6)(7)
Receiver Sensitivity: 4.25 Gbps	P_{IN_4}	-	-	–16	dBm	(6)(7)
Receiver Sensitivity: 2.13 Gbps	P_{IN_2}	-	-	–18	dBm	(6)(7)
Receiver Sensitivity: 1.25 Gbps	P_{IN_1}	-	-	–18	dBm	(6)(7)
Receiver Overload	P_{OL}	0	-	-	dBm	(6)(8)
Optical Input Wavelength	λ_P	780	850	860	nm	
Optical Return Loss	ORL	12	-	-	dB	
Loss of Signal Assert	LOS_A	–24	-	-	dBm	(9)
Loss of Signal De-Assert	LOS_D	-	-	–16	dBm	(10)
Loss of Signal Hysteresis	LOS_H	1	-	5	dB	(11)

Notes:
1) Measured at the end of a 2m to 5m, 50µm multi-mode patch cord.
2) IEC 60825-1 Class 1.
3) T_{op} = –40°C to 85°C
4) T_{op} = 85°C to 105°C
5) Measured with 9GHz minimum analog bandwidth, 20-80%.
6) Measured running PRBS 2^7–1 using 9dB ER external reference transmitter over 50µm multi-mode fiber with a 50µm VOA.
7) BER=1E–12
8) Error Free
9) Invalid optical input power threshold
10) Valid optical input power threshold
11) (LOS_D – LOS_A)

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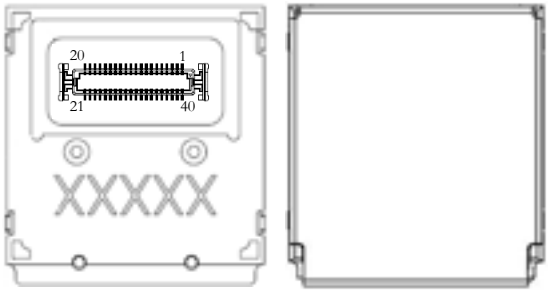
Pin Configuration



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	LVTTL
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	LVTTL
10	SDA	2-Wire Bus Data	I2C
11	SCL	2-Wire Bus Clock	I2C
12	CH2_DIS	Channel 2 Disable	LVTTL
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	LVTTL
17	CH1_DIS	Channel 1 Disable	LVTTL
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	LVTTL
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	LVTTL
31	FLT3/LOS3	Fault for Tx Channel 3 or Loss of Signal for Rx Channel 3	LVTTL
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	LVTTL
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

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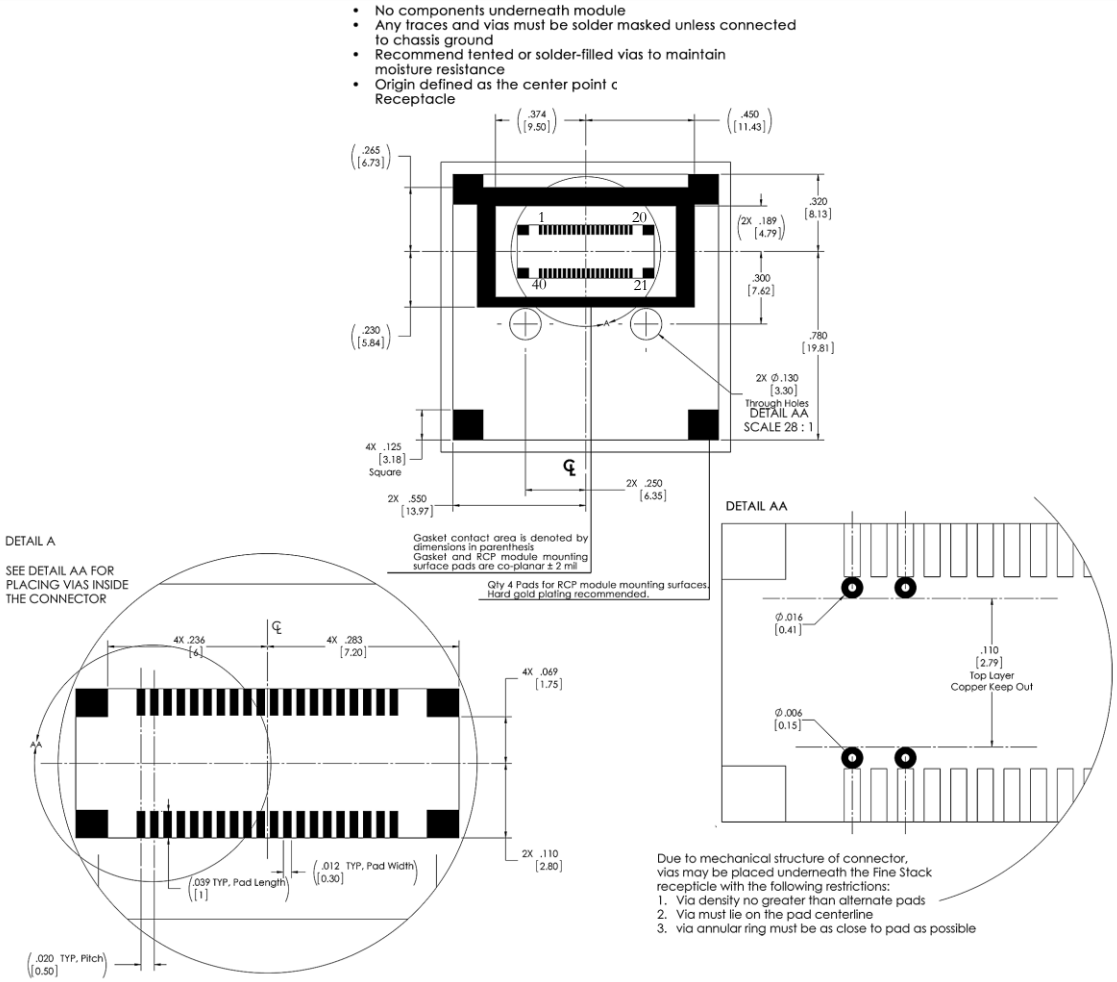
PCB Design Guidelines



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

Moog | COTSWORKS Part Number
110-00047

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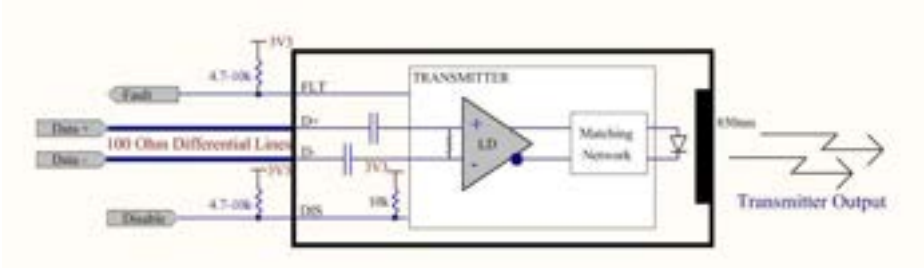
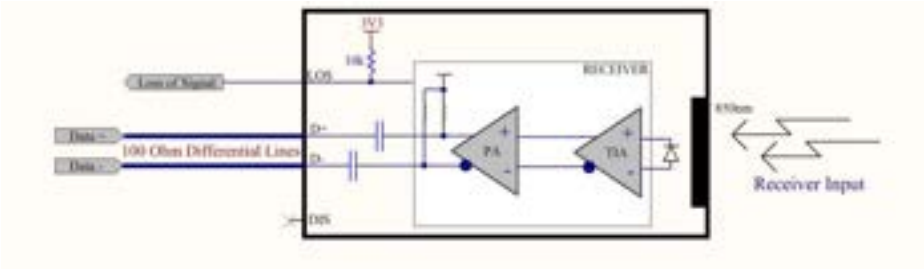
Application Schematics

Transmitter Application Schematic



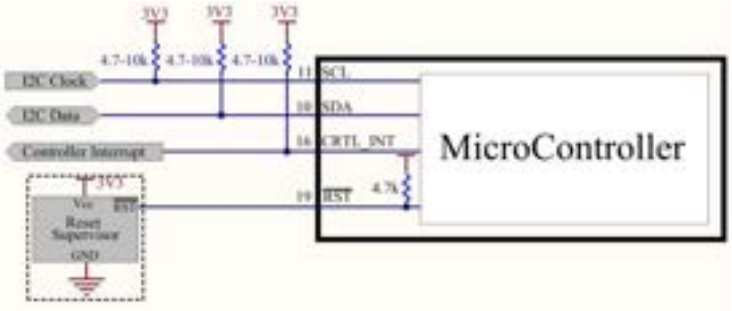
- Channels 1 & 4 are Transmitter Circuits in the standard DX version of the transceiver
  - Check Pinout on page 3 for pin assignments based on transceiver configuration
  - Capacitors are connected to data lines for AC coupling

Receiver Application Schematic



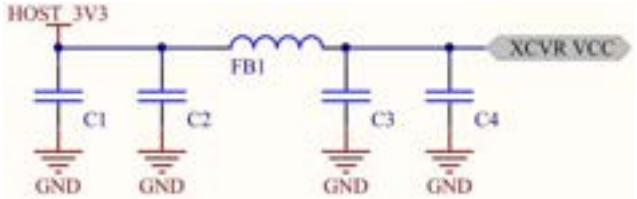
- Channels 2 & 3 are Receiver Circuits in the standard DX version of the transceiver
  - Check Pinout on page 3 for pin assignments based on transceiver configuration
  - Capacitors are connected to data lines for AC coupling

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
  - Moog | 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 suppresion; 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

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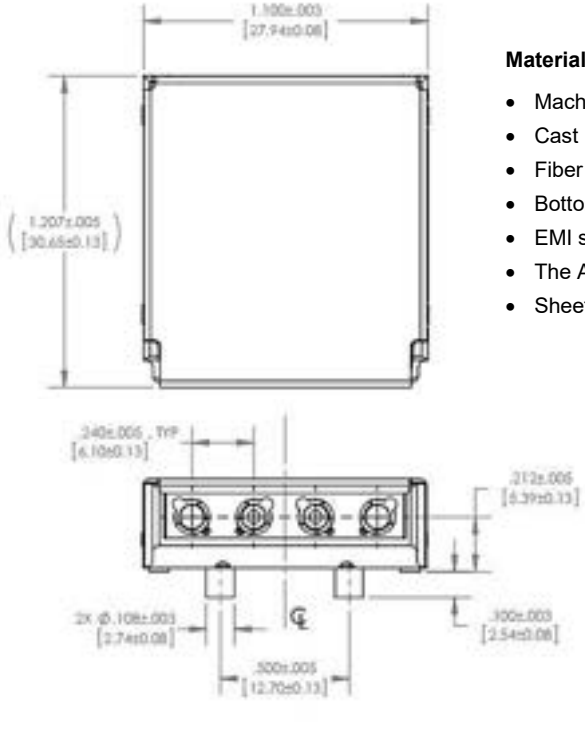
Mechanical Specifications



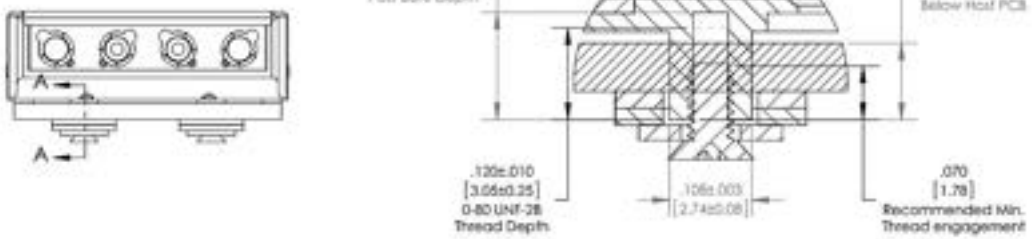
Material Composition Notes

- Machined Housing is 7075 Aluminum with electroless nickel plating.
- Cast Housing is Zamak 3 zinc alloy with electroless nickel plating.
- Fiber tray is 7075-T6 Al with no plating.
- Bottom gasket is 40A durometer of LS-2840 fluorosilicone rubber.
- EMI strip is a 45A conductive fluorosilicone rubber w/ silver plated Al filler.
- The ARINC 801 clips are stainless steel.
- Sheet metal cover is 302 Stainless Steel, ½ hardness.

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 Moog | COTSWORKS for other board thicknesses.

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

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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 Moog | COTSWORKS for all SDS, 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 Moog | COTSWORKS for additional support if required.

Regulatory Compliance

- Moog | 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 Moog | 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. **CAUTION – Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.**

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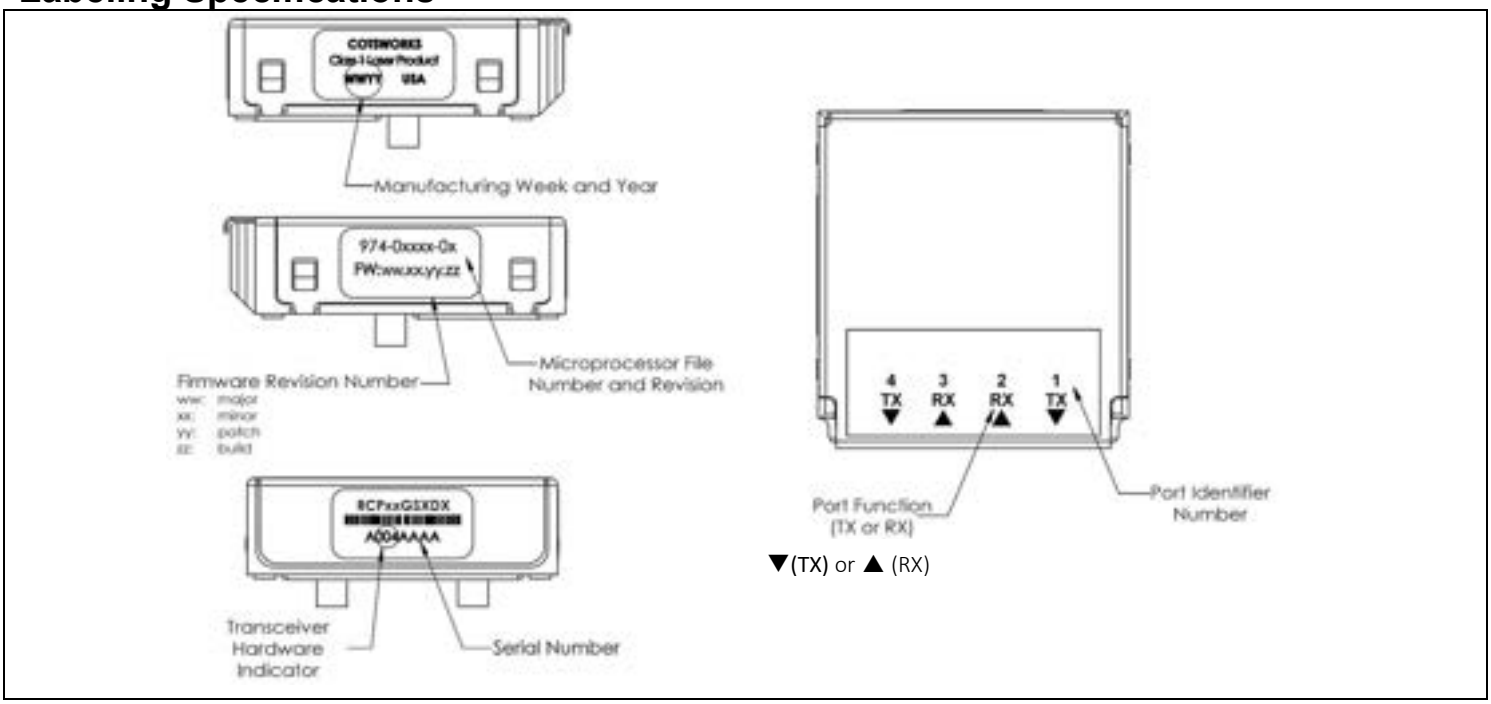
This product complies with IEC 60825-1:2014-05 Ed. 3.0

This product complies with FDA 21CFR Parts 1040.10 and 1040.11 except for deviations pursuant to LN50 dated June 24, 2007.

Labeling Specifications



Ordering Information

RCP-5G-SX	-xx	-LX	-x	-x	-xx	-x	-x
RCP Form Factor **5Gbps Max Data Rate** **Short Reach (MMF)**	**Channel Configuration** DX: *2RX + 2TX* RX: *4RX* TX: *4TX*	**Fiber Interface** *ARINC-801 Receptacles*	**Ruggedized Coating** (): *Non-coated* R: *Parylene*	**Operating Temp Range** A: *–40 to 85 °C* M: *–40 to 95 °C* S: *–40 to 100 °C* N: *–40 to 105 °C*	**Module Serial Bus Address (leave blank for default of *C4*)** *C0, C2, C6, C8, CA, CC, CE, D0, D2, D4, D6, D8, DA, DC or DE*	**RoHS Level** (): *Lvl 5* 6: *Lvl 6*	**Screw Thread Type** (): *Imperial* U: *Metric*

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 Moog | COTSWORKS for mechanical dimensional information and other configuration options.

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