

Features:

- 125Mbps to 5Gbps duplex data links
- Compliant to 802.3z Ethernet, Fibre Channel (1x/2x/4x), Infiniband, sFPDP, XAUI, FCAV and ARINC 818
- ATEX and IECEx certified configuration available (contact COTSWORKS)
- 850 nm VCSEL laser transmitter and PIN receiver
- Typical reach of 500 m on 50/125 and 250 m on 62.5/125 μ m MMF
- Duplex LC or Dual ARINC-801 connector options
- -40 to +85°C operating temperature standard, -55 to +95°C option
- Option for RoHS 6/6 compliant and lead free per Directive 2011/65/EU
- Single +3.3V power supply
- AC-Coupled Transmitter & Receiver Data
- 1x12 Electrical Interface with Digital Diagnostics (DDMI) standard
- Common Pin-Out configuration
 - Matches COTSWORKS RJ-10G device pin assignments



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



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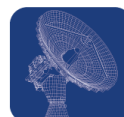
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SUBSEA
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SENSING



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EXPLORATION

Absolute Maximum Ratings

PARAMETER	SYMBOL	MIN.	MAX.	UNIT	NOTES
Maximum Supply Voltage	V_{CC}	-0.3	4.0	V	
Storage Temperature	T_{sto}	-55	105	°C	
Operating Temperature	T_{OP}	-40	85	°C	-55°C to 95°C option available
Relative Humidity	RH	0	85	%	Based on conformal coating (1)
Hot Bar Soldering Temperature		-	260	°C	10 seconds, leads only, (2)(3)
Hand Lead Soldering Temperature		-	260	°C	10 seconds, leads only, (2)(3)
Conformal Coating		0.8	1.2	mil	See ruggedization notes

Notes:

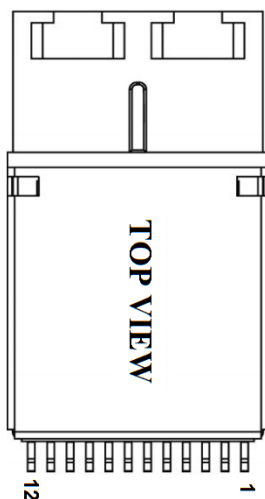
- 1)RJ transceivers may be water washed. The process must be followed by an 80°C bake for one hour to ensure drying of any water inside the shell.
- 2)For optional solder post version, solder posts are intended for mechanical retention only and do not have to comply fully to IPC J-STD-001 Class 3
- 3)The components should not undergo Reflow Soldering under any circumstances.

General Specifications

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	NOTES
Data Rate	BR	0.125	-	5	Gb/s	8b10b encoding

**Electrical Specifications** (T_{OP} = -40 to 85°C, V_{CC} = 3.14 to 3.47 Volts)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	NOTES
Supply Voltage	V _{CC}	3.14	3.3	3.47	V	
Total Module Power Dissipation	P _{DISS}	-	-	0.83	W	
Total Supply Current (Tx + Rx)	I _{CC}	-	-	240	mA	
Transmitter						
Supply Current	I _{CC}	-	-	120	mA	
Input differential impedance	R _{in}	90	100	110	Ω	
Single-Ended Input Voltage Swing	V _{DTX}	100	-	1200	mV	CML
Transmit Disable Voltage	V _D	1.8	-	V _{CC}	V	LVTTL
Transmit Enable Voltage	V _{EN}	-0.3	-	0.8	V	LVTTL
Receiver						
Supply Current	I _{CC}	-	-	120	mA	
Single-Ended Output Voltage Swing	V _{DRX}	100	300	500	mV	CML
Signal Detect Assert	SD _{norm}	V _{CC} -0.5	-	V _{CC}	V	LVTTL
Signal Detect De-assert	SD _{fault}	0	-	0.4	V	LVTTL
Deterministic Jitter Contribution	RX _Δ DJ	-	-	0.10	UI	(1)
Total Jitter Contribution (p-p)	RX _Δ TJ	-	-	0.16	UI	(2)
Notes: 1) Measured running 4.25 Gb/s, K28.5 test pattern 2) Measured running 4.25 Gb/s, PRBS 2 ⁷ -1 data						

Pin Configuration

Pin	Symbol	Description	Logic/Protocol
1	TX-	Transmitter Data Input, Negative	CML
2	TX+	Transmitter Data Input, Positive	CML
3	GND	Ground	0V
4	TX_VCC	Transmitter Supply	3.3V
5	TX_DIS	Transmitter Disable	LVTTL
6	SCL	I2C Clock	I2C
7	SDA	I2C Data	I2C
8	SD	Receiver Signal Detect	LVTTL
9	RX_VCC	Receiver Supply	3.3V
10	GND	Ground	0V
11	RX+	Receiver Data Output, Positive	CML
12	RX-	Receiver Data Output, Negative	CML



**Optical Characteristics** ($T_{OP} = -40$ to 85°C , $V_{CC} = 3.14$ to 3.47 Volts)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	NOTES
Transmitter						
Optical Output Power	P_{OUT}	-5	-	-1	dBm	(1)(4)
Optical Output Power	P_{OUT}	-7	-	-1	dBm	(1)(3)(4)
Optical Wavelength	λ	840	850	860	nm	(2)
RMS Spectral Width	σ	-	-	.85	nm	(2)
Extinction Ratio	ER	6	-	-	dB	(2)(3)
Optical Rise Time	t_r	-	-	90	ps	Unfiltered 20% - 80%, (1)(2)
Optical Fall Time	t_f	-	-	125	ps	
Relative Intensity Noise	RIN	-	-	-117	dB/Hz	
Deterministic Jitter Contribution	$TX_{\Delta DJ}$	-	-	0.12	UI	(6)
Total Jitter Contribution (p-p)	$TX_{\Delta TJ}$	-	-	0.40	UI	(2)
Receiver						
Sensitivity: 5 Gb/s	RX_{SENS5G}	-	-	-14	dBm	(5)
Sensitivity: 4.25 Gb/s	RX_{SENS4G}	-	-	-16	dBm	
Sensitivity: 3.00 Gb/s	RX_{SENS3G}	-	-	-16	dBm	
Sensitivity: 2.125 Gb/s	RX_{SENS2G}	-	-	-18	dBm	
Sensitivity: 1.25 Gb/s	RX_{SENS1G}	-	-	-21	dBm	
Sensitivity: 768 Mb/s	$RX_{SENS768M}$	-	-	-18	dBm	
Sensitivity: 125 Mb/s	$RX_{SENS125M}$	-	-	-20	dBm	
Overload	RX_{MAX}	-	-	0	dBm	
Optical Center Wavelength	λ_c	840	-	860	nm	
Return Loss	RL	12	-	-	dB	
Signal Detect Assert: 5.00 Gb/s	P_{A5G}	-	-	-14	dBm	
Signal Detect Assert: 4.25 Gb/s	P_{A4G}	-	-	-15	dBm	
Signal Detect Assert: 3.00 Gb/s	P_{A3G}	-	-	-16	dBm	
Signal Detect Assert: 2.125 Gb/s	P_{A2G}	-	-	-17	dBm	
Signal Detect Assert: 1.25 Gb/s	P_{A1G}	-	-	-20	dBm	
Signal Detect Assert: 768 Mb/s	P_{A768M}	-	-	-19	dBm	
Signal Detect Assert: 125 Mb/s	P_{A125M}	-	-	-21	dBm	
Signal Detect De-Assert	P_D	-29	-	-	dBm	All data rates
Signal Detect Hysteresis	$P_A - P_D$	1	-	5	dB	
Notes: <ol style="list-style-type: none"> 1) Measured at the end of a 2m to 5m 62.5μm multi-mode fiber patch cord 2) Measured running 4.25 Gb/s, PRBS 2⁷-1 data 3) Applicable between the extended temperature ranges of -55$^{\circ}\text{C}$ to -40$^{\circ}\text{C}$ and 85$^{\circ}\text{C}$ to 95$^{\circ}\text{C}$ 4) Class 1 Laser Safety per FDA/CDRH and IEC-825-1 regulations 5) Measured using PRBS 2⁷-1 pattern 6) Measured running 4.25 Gb/s, K28.5 test pattern 						

Digital Diagnostics Information

The COTSWORKS RJ-5G-SX-C features signal pins for a 2-wire bus which are required to access digital diagnostics compliant to SFF 8472 multi-source agreement.

The transceiver pinout, including the pins provided for 2-wire communication to access the digital diagnostics, is shown on page 2 under the section "Pin Configuration".





Address A0h Data Fields

A0h Address (dec)	# Bytes	Name	Description	Value (hex)
Base ID Fields				
00	1	Identifier	Type of transceiver	02
01	1	Ext. Identifier	Extended identifier of type of transceiver	04
02	1	Connector	Code for connector type	07
03	8	Transceiver	Code for electronic or optical compatibility	08
04				00
05				00
06				01
07				40
08				40
09				0C
10				15
11	1	Encoding	Code for high speed serial encoding algorithm	01
12	1	BR, Nominal	Nominal signaling rate, units of 100 MBd	32
13	1	Rate Identifier	Type of rate select functionality	00
14	1	Length (SMF, km)	Link length supported for single mode fiber, units of km	00
15	1	Length (SMF)	Link length supported for single mode fiber, units of 100 m	00
16	1	Length (50um)	Link length supported for 50 um OM2 fiber, units of 10 m	37
17	1	Length (62.5um)	Link length supported for 62.5 um OM1 fiber, units of 10 m	1C
18	1	Length (OM4 or copper cable)	Link length supported for 50um OM4 fiber, units of 10m. Alternatively copper or direct attach cable, units of m	64
19	1	Length (OM3)	Link length supported for 50 um OM3 fiber, units of 10 m	37
20	16	Vendor Name	SFP vendor name (ASCII)	43
21				4F
22				54
23				53
24				57
25				4F
26				52
27				4B
28				53
29				20
30				20
31				20
32				20
33				20
34				20
35				20
36	1	Transceiver	Code for electronic or optical compatibility	00
37	3	Vendor OUI	SFP vendor IEEE company ID	00
38				00
39				00
40	16	Vendor PN	Part number provided by SFP vendor (ASCII)	52
41				4A
42				32
43				47
44				53
45				58
46				48
47				XX
48				XX





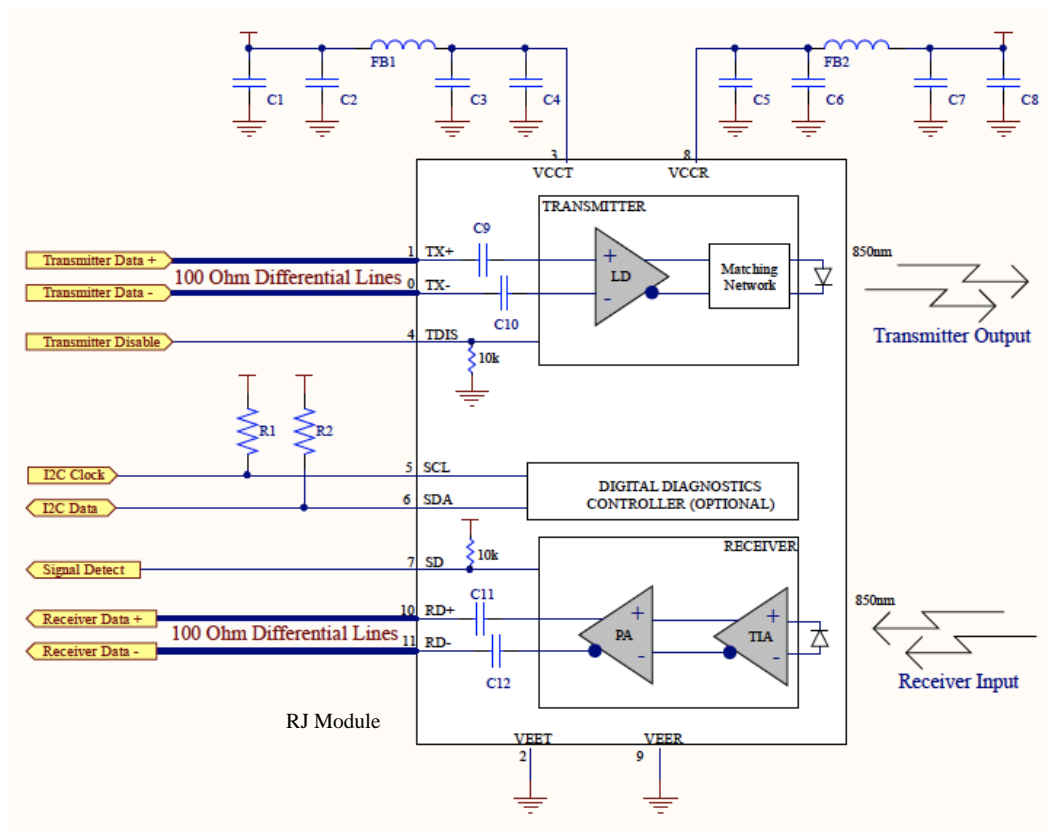
49				XX
50				XX
51				XX
52				XX
53				XX
54				XX
55				XX
56				30
57				30
58				30
59				30
60				03
61				52
62				00
63				XX
Extended ID Fields				
64				10
65				14
66				00
67				00
68				XX
69				XX
70				XX
71				XX
72				XX
73				XX
74				XX
75				XX
76				XX
77				XX
78				XX
79				XX
80				XX
81				XX
82				XX
83				XX
84				XX
85				XX
86				XX
87				XX
88				XX
89				XX
90				20
91				20
92				68
93				70
94				08
95				XX





Application Schematics

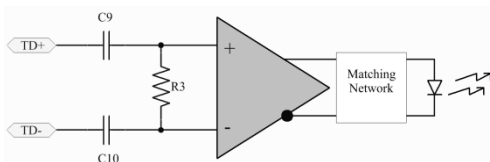
HOST BOARD APPLICATION SCHEMATIC



Notes:

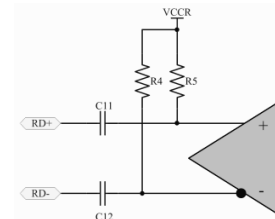
- Recommend host routes separate supply voltages and filtering for RJ-module transmitter and receiver as shown in the schematic above:
 - FB1/FB2 ferrite bead for power supply noise suppression; Murata BLM18KG601SN1, 0603, 600Ω @ 100MHz, 1300mA.
 - C1/C4/C5/C8 bulk capacitance; Murata GRM21BR61C106KE15L, 0805, 10μF, 16V.
 - C2/C3/C6/C7 de-coupling capacitors; Murata GRM155R71C104KA88D, 0402, 0.1μF, 16V.
- R1/R2 2-wire bus pull-up resistors required on host for implementing optional digital diagnostics; 4.7kΩ to 10kΩ.
- Screw or solder posts are not internally connected to signal ground. Recommend screw or solder posts be connected to chassis ground if available, otherwise they should be tied to local signal ground.
- For host with LVPECL electrical interface contact COTSWORKS' applications engineering.

TRANSMITTER EQUIVALENT INPUT CIRCUIT



- C9/C10 0.1μF internal input data coupling capacitors.
- R3 internal 100Ω input differential termination.
- Transmitter electrical input is CML compatible.

RECEIVER EQUIVALENT OUTPUT CIRCUIT

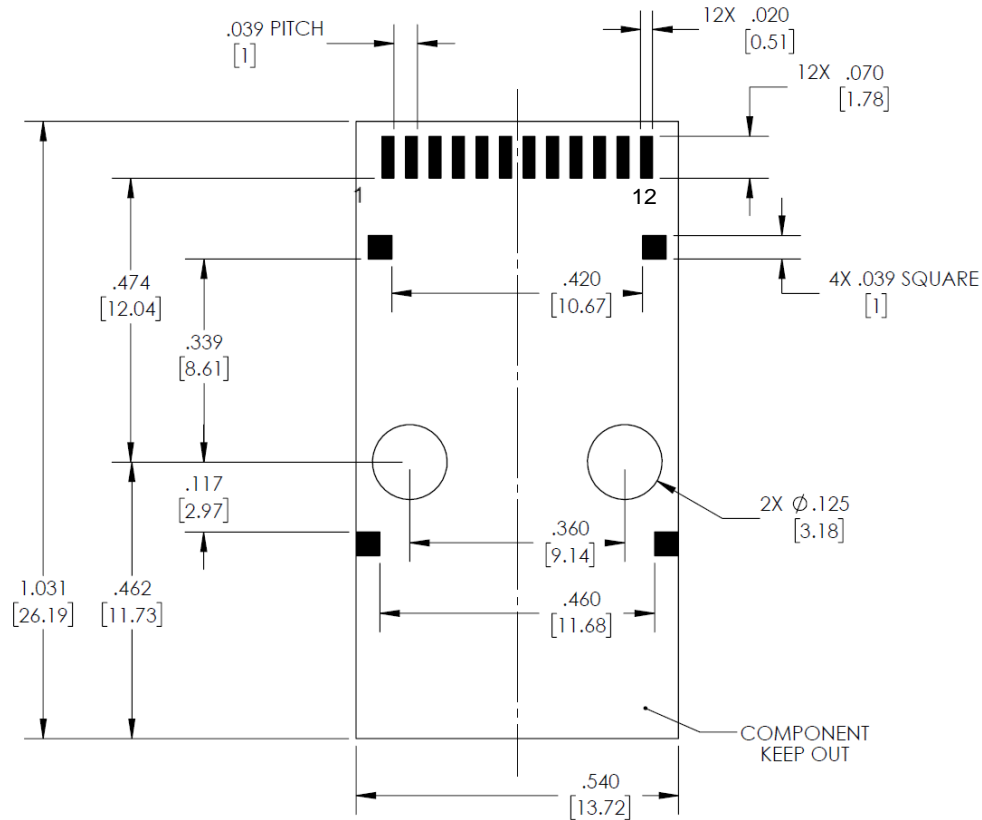


- C11/C12 are 0.1μF output data coupling capacitors.
- R4/R5 are 50Ω pull-up resistors to Vcc.
- Receiver electrical output is CML compatible.

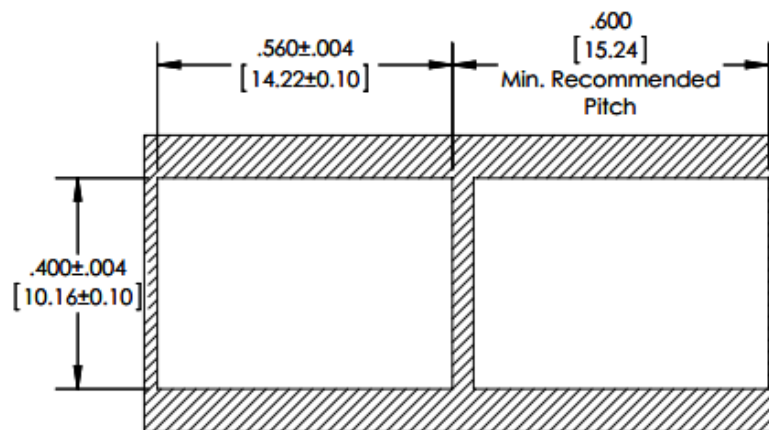




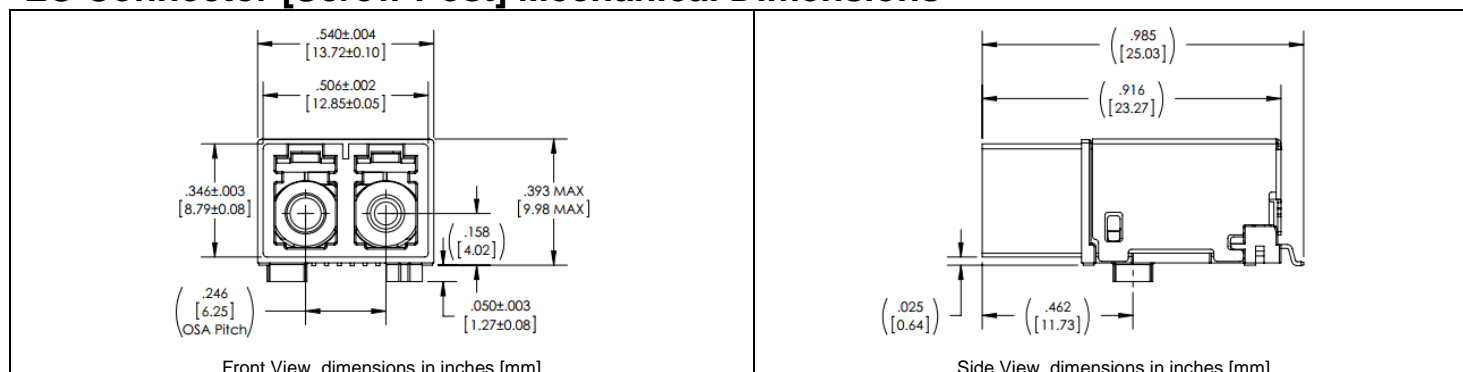
PCB Design Guidelines



Panel Cutout

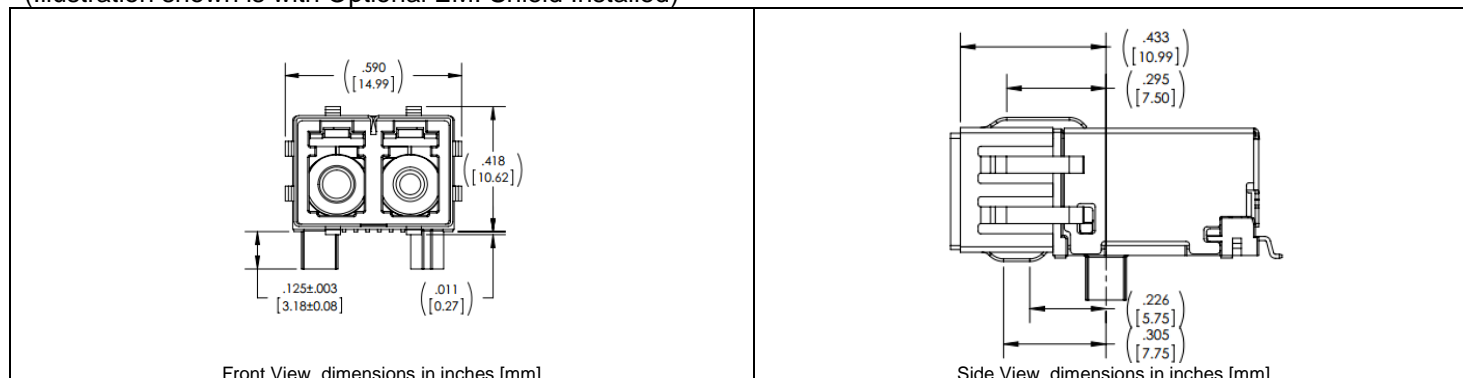


LC Connector [Screw Post] Mechanical Dimensions

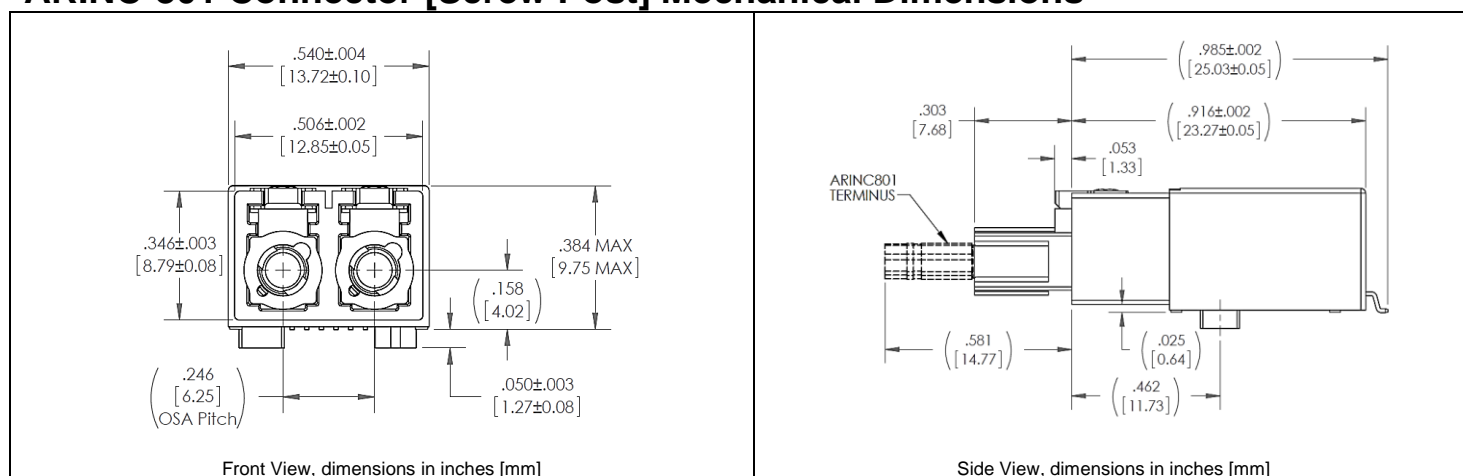


LC Connector [Solder Post] Mechanical Dimensions

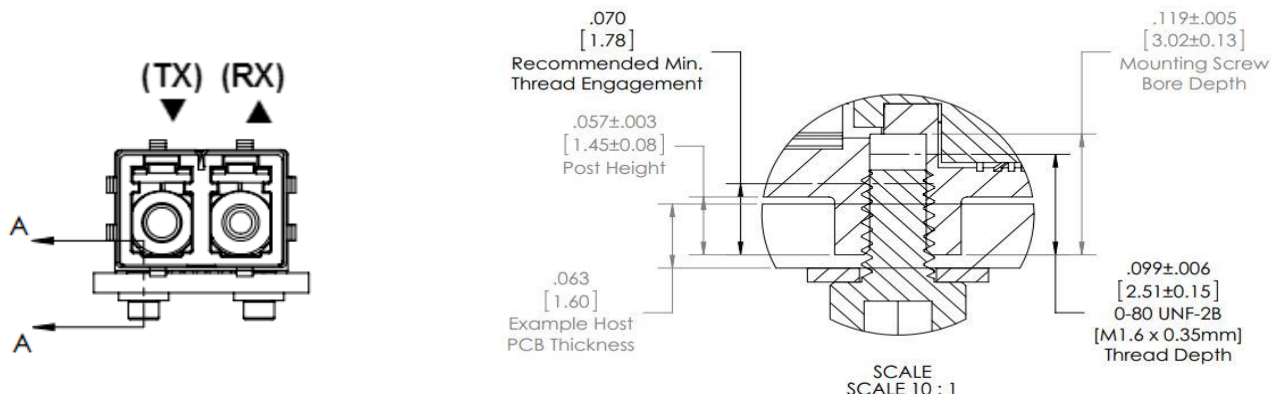
(Illustration shown is with Optional EMI Shield Installed)



ARINC-801 Connector [Screw Post] Mechanical Dimensions



Mounting Hardware Guidelines



Notes:

1. An example illustrating a possible hardware combination to secure RJ-5G-SX-C to host PCB
2. For further mounting hardware options and support contact COTSWORKS Application Engineering
3. Default case configuration: Imperial-threaded Posts. #0-80 thread size
4. Follow screw dimensions listed above to avoid damage during mounting
5. When installing the RJ module:
 - a. install the washers and partially tighten the screws,
 - b. solder the leads,
 - c. tighten the screws to 12 in-oz
6. The pins are phosphor bronze 510 spring temper with 10 micro-inches of gold.

Ruggedization Notes

- Parylene C coating can be used for conformal coating with a 1.0 mil ± 0.2 mil thickness through a deposition process
 - It has a 5600 VPM rating, withstands high temperatures, extremely resistant to oil/dirt, and object impact
- This part is also available in a pigtail fiber optic version. Contact COTSWORKS for available fiber and termini options.
- Transceiver case is nickel-plated

Reference Information

- 1) IEEE Standard 802.3, 2002 Edition
- 2) Directive 2011/65/EU of the European Parliament and of the Council, "on the restriction of the use of certain hazardous substances in electrical and electronic equipment." June 8th, 2011

Regulatory Compliance

- COTSWORKS transceivers are Class 1 Laser Products and designed to comply with US FDA regulations.
- These products are designed to comply with 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)
- ATEX / Ex Protection Provided: op is, [Ex op is IIC T4 Ga] - Special conditions for safe use:

Connecting the transceiver to a non-certified transceiver may cause the destruction of the receiver. The damaging of a receiver of the certified transceiver does not influence the optical output power level of the laser diode. The optical connection of the laser diode to a non-certified receiver in the safe area does not influence this certification. The transceiver shall be supplied by a driving circuit powered from an SELV or PELV system or via a safety isolating transformer complying with the requirements of IEC 61558-2-6 or technically equivalent standard, or directly connected to apparatus complying with IEC 60950, IEC 61010-1, or a technically equivalent standard, or fed directly from cells or batteries. The temperature range is -40° C to +85° C.



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.

Ordering Information

RJ-5G-SX	-C	-XX	-X	-X	-X	-X	-X	-X
RJ Form Factor	Pins & Diagnostics	Receptacle Type	Ruggedized Coating	Operating Temp (°C)	EMI Shield?	RoHS Level	Mounting	ATEX & IECEx
5 Gbps Max Data Rate	1x12 Header (DDMI Standard)	(): LC Receptacle	(): Non-coated	A: -40 to 85 M: -40 to 95	(): No Shield	(): Lvl 5	(): Imperial U: Metric	T: Certified
(MMF)	Common Pin Assignment (matching RJ-10G)	LX: ARINC-801 Receptacle	R: Parylene	Z: -55 to 95	E: Shield	6 Lvl 6	P: Solder Posts	(): Not Certified

Example part number: RJ-5G-SX-C-R-M

[5G RJ Form Factor Transceiver, 850nm, Common RJ Pin-Out, digital diagnostics, Duplex LC Receptacles, Parylene-coated, -40 to 95°C operating temp range, Imperial Screw Posts]

Contact COTSWORKS for mechanical dimensional information and other configuration options.

