

Features:

- 125 Mbps to 3.125 Gbps duplex data links
- Compliant to 802.3z Ethernet, Fiber Channel (1x/2x/3x), Infiniband SDR, sFPDP, FCAV and ARINC818
- 1550nm DFB laser transmitter and PIN Receiver
- Class 1 Laser Int. Safety Std. IEC-825 compliant
- Up to 80 km on 9/125 μm SMF
- 1x10 surface mount connector, standard
- 1x12 surface mount connector option providing Digital Diagnostics
- Rugged LC connector housing including screw mounted OSAs
- -40 to +85 C operating temperature
- Option for RoHS 6/6 compliant and lead free per Directive 2011/65/EU
- Single +3.3V power supply
- AC-Coupled Transmitter & Receiver Data
- Conformal coating options for harsh environment use
- COTSWORKS RJs are fully tested over the operating temperature range



The RJ-3G-ZX is ideal for harsh environment connectivity because of its low cost, availability, and wide operating parameters



Commercial Aerospace



Military Aerospace



Military Tactical



Industrial Oil & Gas



Military Sensing



Undersea Networking

Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit	Note
Maximum Supply Voltage	V_{CC}	-0.5	4.5	V	
Storage Temperature	T_{sto}	-50	105	$^{\circ}\text{C}$	
Case Operating Temperature	T_{OP}	-40	85	$^{\circ}\text{C}$	
Relative Humidity	RH	0	95	%	Based on conformal coating
Lead Soldering Temperature			260	$^{\circ}\text{C}$	10 seconds on leads only
Conformal Coating		0.8	1.2	mil	See ruggedization notes

Notes:

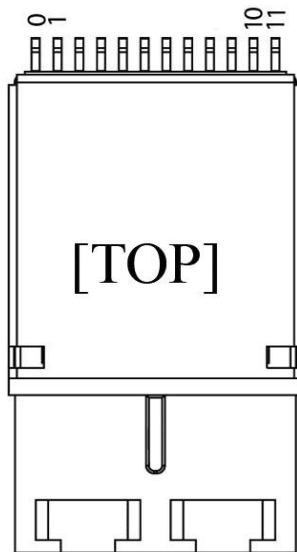
- 1) RJ transceivers may be water washed. The process must be followed by an 80 $^{\circ}\text{C}$ bake for one hour to ensure the drying of any water inside the shell.
- 2) The components should not undergo Reflow Soldering under any circumstances.

General Specifications

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Data Rate	BR	0.125		3.125	Gb/s	

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 Supply Current	I_{CC}			375	mA	
Module Power Dissipation	P_{DIS}			1.3	W	
Transmitter						
Supply Current	I_{CCTX}			275	mA	
Input differential impedance	R_{in}		100		Ω	
TX Differential Input Voltage	$V_{D_{TX}}$	200		2400	mV	
Transmit Disable Voltage Threshold	V_D	2.0		V_{CC}	V	
Transmit Enable Voltage Threshold	V_{EN}	0		0.8	V	
Receiver						
Supply Current	I_{CCRX}			100	mA	
RX Differential Output Voltage	$V_{D_{RX}}$	600		900	mV	
Total Contributed Jitter (p-p)	$RX\Delta TJ$			0.4	UI	FCPI-4 ($\delta_R - \gamma_R$)
Data Output Rise/Fall Time	t_r/t_f			130	ps	20% - 80%
Signal Detect Assert Voltage	SD_{norm}	2.4		V_{CC}	V	
Signal Detect De-Assert	SD_{fault}	0		0.4	V	

Pin Configuration


PIN #	Symbol	Description	Logic Family
GP	GP	Grounding Posts Connect to chassis ground	N/A
0	SCL	I2C Clock (1)(2)	I2C
1	TD+	Transmitter DATA In +	LVPECL
2	V_{EET}	Transmitter Signal Ground	N/A
3	TD-	Transmitter DATA In -	LVPECL
4	V_{CCT}	Transmitter Power Supply	N/A
5	SD	Signal Detect output Satisfactory Optical Input: Logic "1" Output Fault Condition: Logic "0" Output	LVTTTL
6	T_{DIS}	Transmit Disable input Logic 1 = Disable Optical Output Logic 0 = Enable Optical Output Internal 10K ohm pull-down (enable)	LVTTTL
7	RD+	Receiver DATA Out +	CML
8	V_{CCR}	Receiver Power Supply	N/A
9	RD-	Receiver DATA Out -	CML
10	V_{EER}	Receiver Signal Ground	N/A
11	SDA	I2C Data (1)(2)	I2C

Notes:

- 1) Pins 0 and 11 are optional pins for the I2C bus that is used for Digital Diagnostics per SFF-8472.
- 2) Pins 1-10 are the only pins on a transceiver without DDMI.

Optical Characteristics (T_{OP} = -40 to 85°C, V_{CC} = 3.135 to 3.465 Volts)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Transmitter						
Output Optical Power (9/125 SMF)	P _{OUT}	-1		5	dBm	(1)
Optical Wavelength	λ	1541	1550	1558	nm	(2)
Spectral Width	σ			1	nm	(2)
Extinction Ratio	ER	8.2			dB	(3)
Optical Rise/Fall Time	t _r /t _f			130	ps	(3)(4) 20% - 80%
Relative Intensity Noise	RIN			-120	dB/Hz	(3) FCPI-4 (δ _R - γ _R)
Total Jitter Contribution (p-p)	T _{JTX}			0.4	UI	
Receiver						
Receiver Sensitivity @ 1.25Gbps	RX _{SENS1}			-22	dBm	(1)(4)(5)
Receiver Sensitivity @ 3.125Gbps	RX _{SENS2}			-16	dBm	
Overload	RX _{MAX}	0			dBm	
Optical Center Wavelength	λ _c	1270		1620	nm	
Return Loss	RL	12			dB	
Signal Detect Assert	P _{SDA}			-20	dBm	(1)(5)
Signal Detect De-Assert	P _{SDD}	-32			dBm	(1)(5)
Signal Detect Hysteresis	P _{SDA} - P _{SDD}	1			dB	
NOTES:						
1) Measured using a broad area detector optical power meter.						
2) Measured using an optical spectrum analyzer.						
3) Measured using a high-speed oscilloscope.						
4) Measured using a BERT set running PRBS 2 ⁷ -1 at 3.125Gbps.						
5) Measured using a 9μm single-mode variable optical attenuator.						

Digital Diagnostics Information

The COTSWORKS RJ module is available with optional signal pins for a 2-wire bus required in order to access digital diagnostics compliant to SFF 8472 multi-source agreement. The transceiver pinout (including those pins required for 2-wire communication to access the digital diagnostics) appears on the previous page.

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	04
04				0C
05				40
06				02
07				10
08				10
09				01
10				05



11	1	Encoding	Code for high speed serial encoding algorithm	01
12	1	BR, Nominal	Nominal signaling rate, units of 100 MBd	1F
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	28
15	1	Length (SMF)	Link length supported for single mode fiber, units of 100 m	FF
16	1	Length (50um)	Link length supported for 50 um OM2 fiber, units of 10 m	00
17	1	Length (62.5um)	Link length supported for 62.5 um OM1 fiber, units of 10 m	00
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	00
19	1	Length (OM3)	Link length supported for 50 um OM3 fiber, units of 10 m	00
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				33
43				47
44				5A
45				58
46				XX
47				XX
48				XX
49				XX
50				XX
51				XX
52				XX
53				XX
54				XX
55				XX
56	4	Vendor rev		30



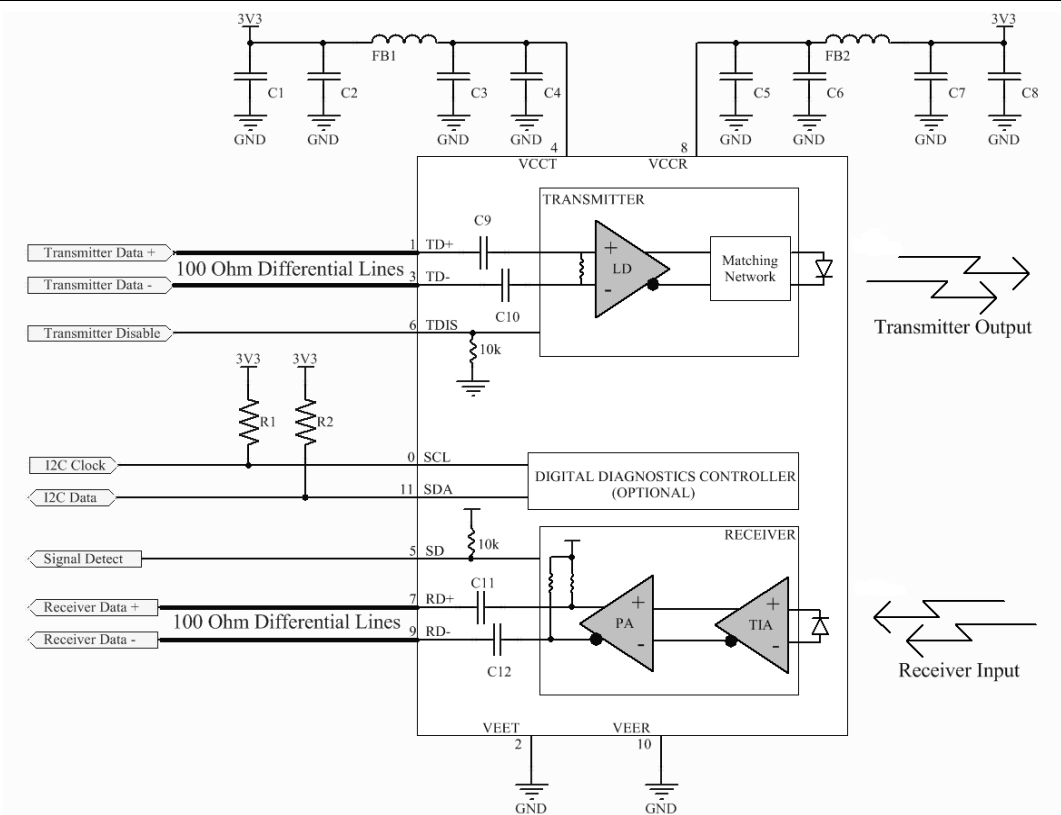


57				30
58			Revision level for part number provided by vendor (ASCII)	30
59				30
60	2	Wavelength	Laser wavelength	06
61				0E
62	1	Unallocated		00
63	1	CC_BASE	Check code for Base ID Fields (addresses 0 to 62)	XX
Extended ID Fields				
64	2	Options	Indicates which optional transceiver signals are implemented	00
65				14
66	1	BR, max	Upper bit rate margin, units of %	00
67	1	BR, min	Lower bit rate margin, units of %	00
68	16	Vendor SN	Serial number provided by vendor (ASCII)	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	8	Date code	Vendor's manufacturing date code	XX
85				XX
86				XX
87				XX
88				XX
89				XX
90				20
91				20
92	1	Diagnostic Monitoring Type	Indicates which type of diagnostic monitoring is implemented (if any) in the transceiver	68
93	1	Enhanced Options	Indicates which optional enhanced features are implemented (if any) in the transceiver	00
94	1	SFF-8472 Compliance	Indicates which revision of SFF-8472 the transceiver complies with	05
95	1	CC_EXT	Check code for the Extended ID Fields (addresses 64 to 94)	XX



Application Schematics

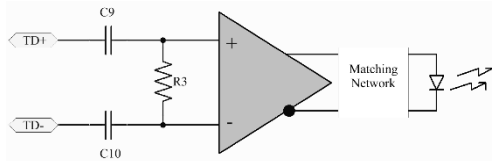
HOST BOARD APPLICATION SCHEMATIC



Notes:

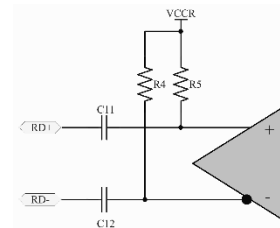
- Recommend host routes separate supply voltages and filtering for RJ-module transmitter and receiver as shown in the schematic above
 - FB1/FB2 ferrite bead for power supply noise suppression; Murata BLM18KG601SN1, 0603, 600Ω @ 100MHz, 1300mA
 - C1/C4/C5/C8 bulk capacitance; Murata GRM21BR61C106KE15L, 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
- 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



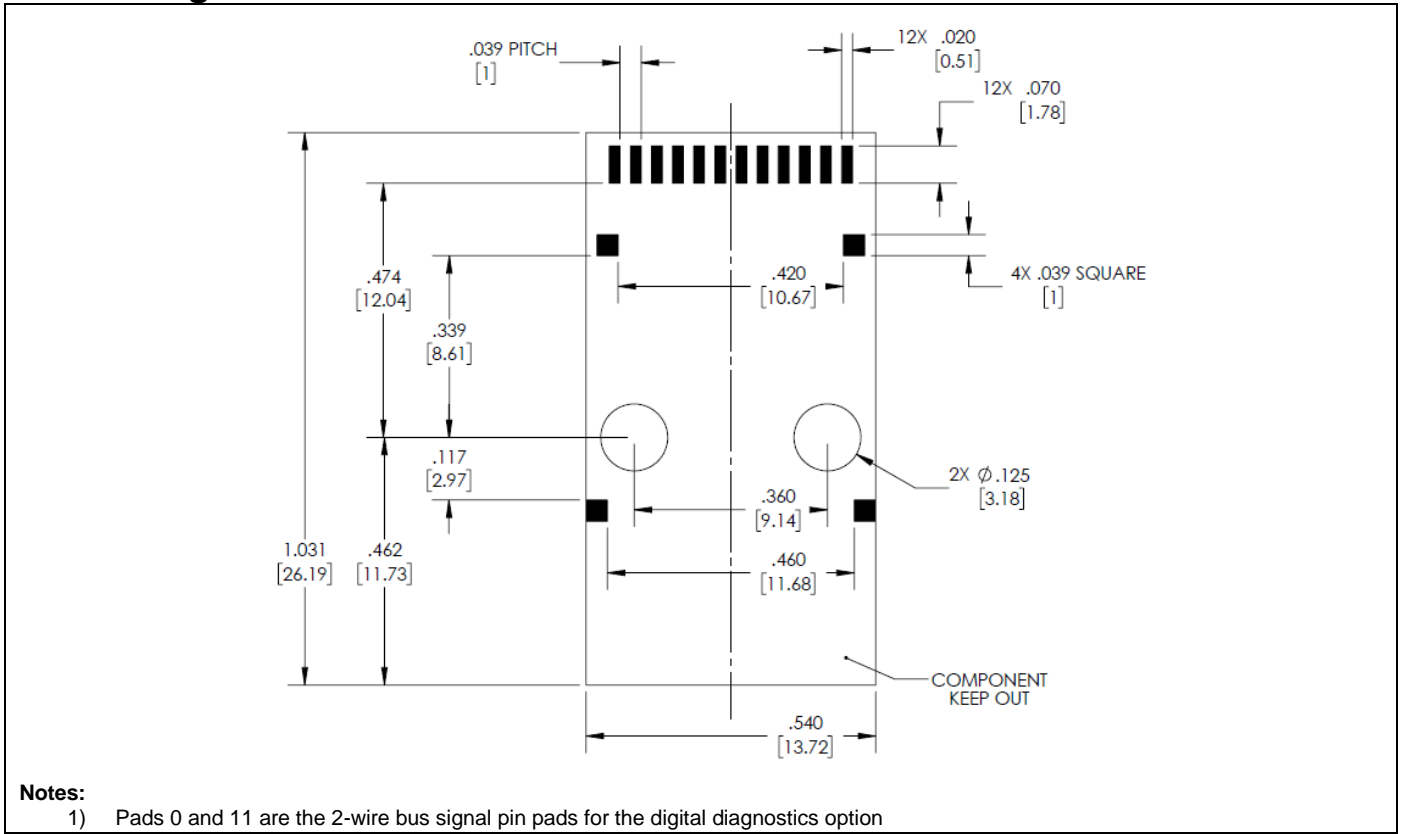
- C9/C10 0.1μF internal input data coupling capacitors
- R3 internal 100Ω input differential termination
- Transmitter electrical input is CML compatible

RECEIVER EQUIVALENT OUTPUT CIRCUIT

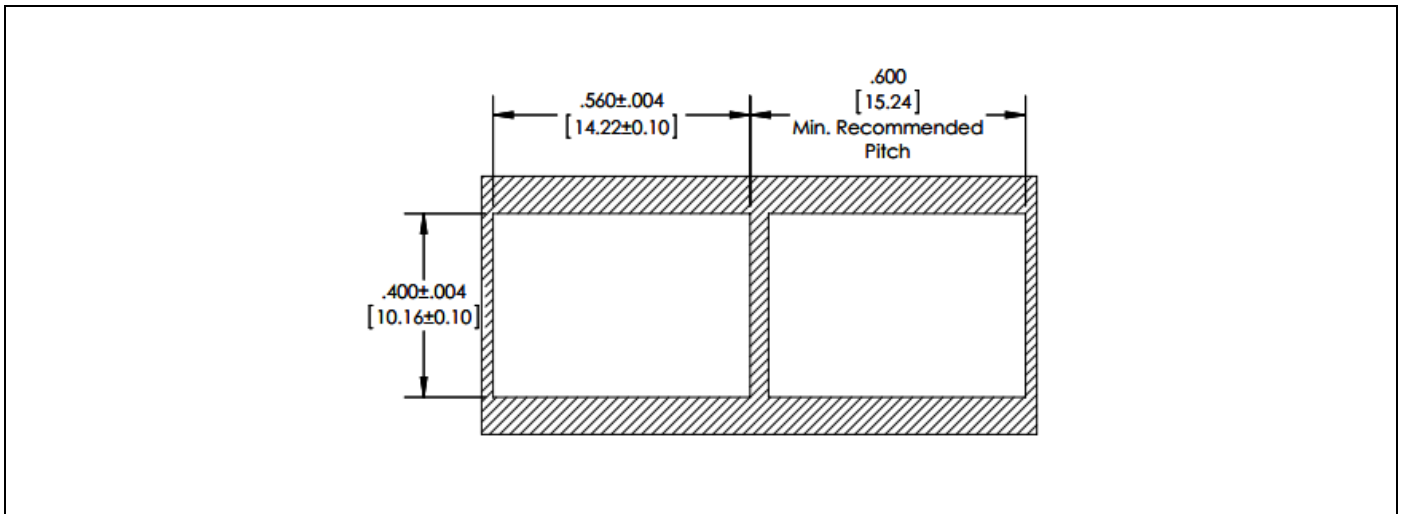


- C11/C12 are 0.1μF output data coupling capacitors
- R4/R5 are 50Ω pull-up resistors to VCCR
- Receiver electrical output is CML compatible

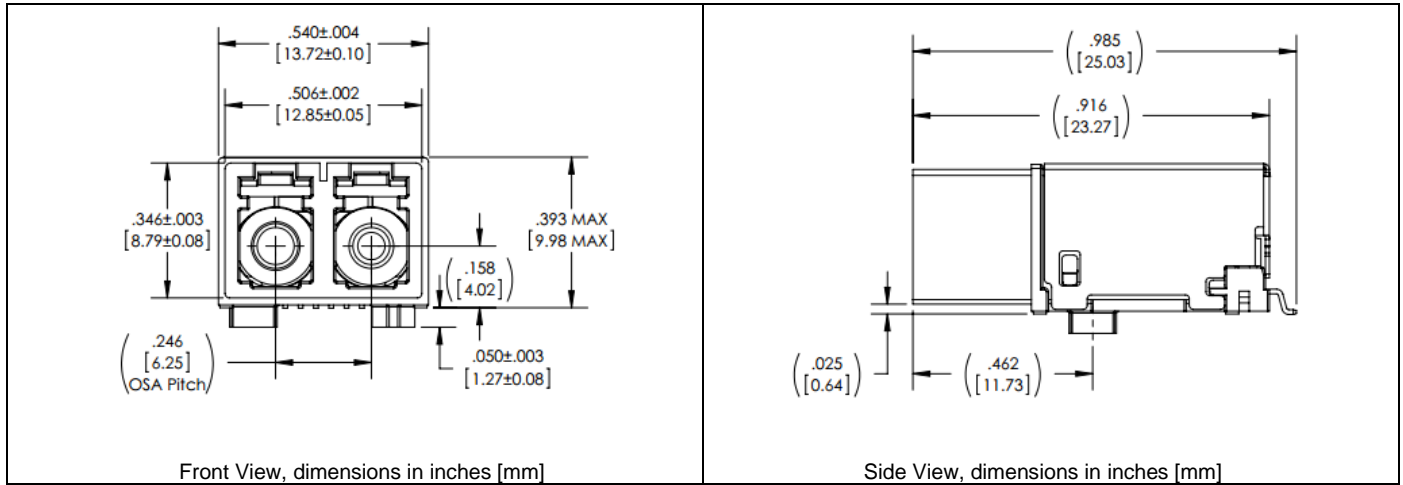
PCB Design Guidelines



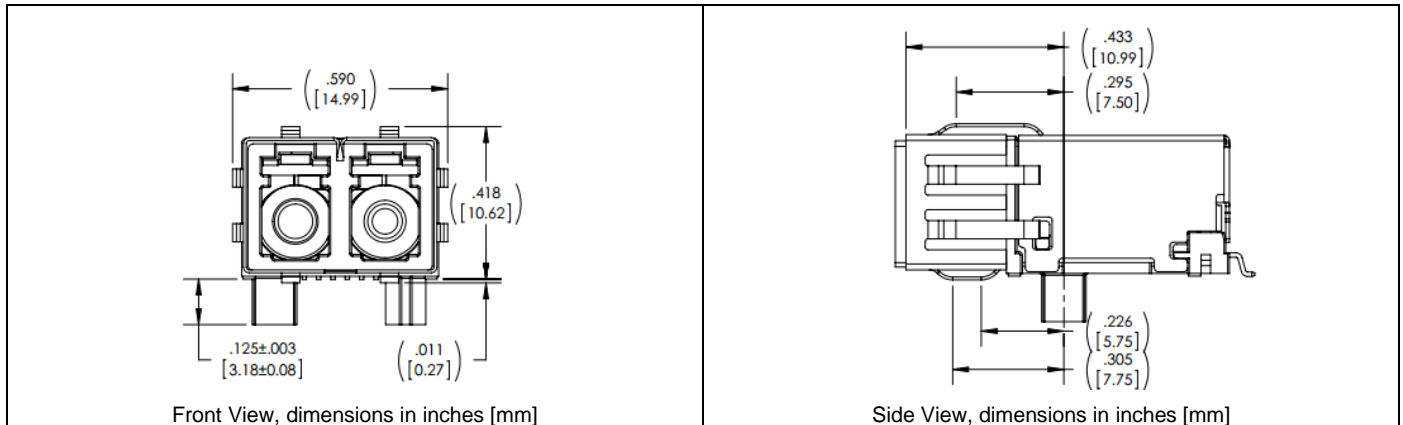
Panel Cutout



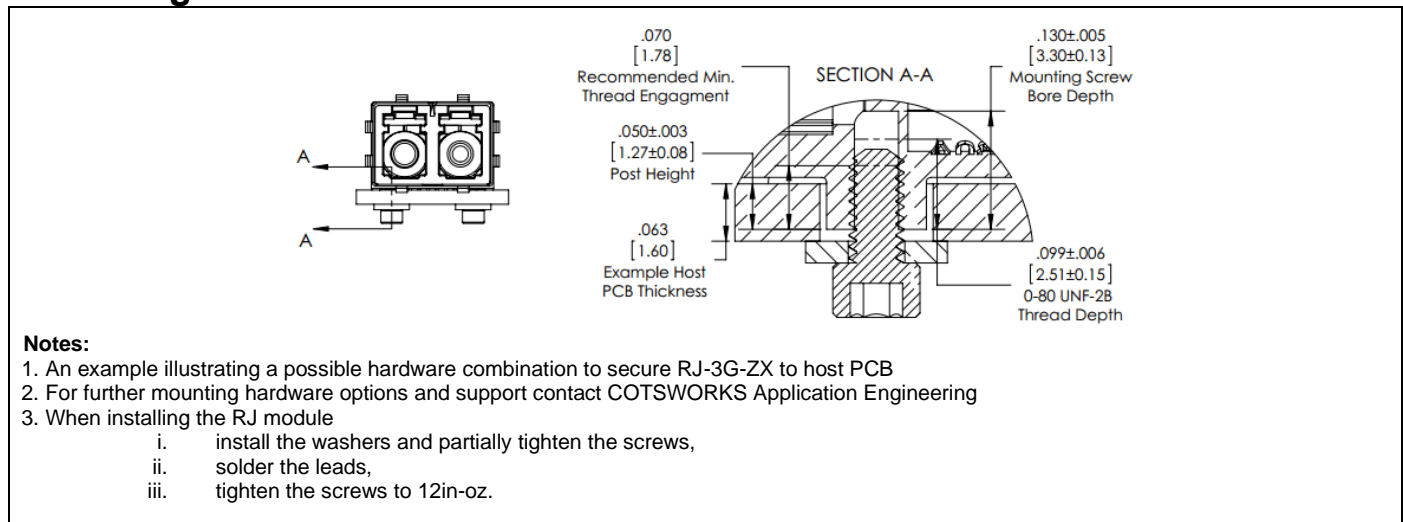
Screw Post Mechanical Dimensions



Solder Post Mechanical Dimensions



Mounting Hardware Guidelines



Ruggedization Notes

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

Reference Information

- IEEE Standard 802.3, 2002 Edition, Clause 38, PMD Type 1000BASE-LX. IEEE Standards Department, 2002
- "Fibre Channel Draft Physical Interface Specification (FC-PI-2 Rev. 10.0)". American National Standard for Information Systems
- ARINC 818 specification at 1.0625 Gb/s, <http://www.arinc.com/>
- 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)
 - 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.

Ordering Information

RJ-3G-ZX	-X-	DPLX	-LC-	x	-x-	x	-x-	x
RJ Form Factor	Pins and Diagnostics	Duplex		Ruggedized Coating	Operating Temp Range	EMI Shield	RoHS Level	Mounting
3Gbps Max Data Rate	(): 1x10	LC Connector		(): Non-coated	A: -40 to 85°C	(): No Shield	(): Lvl 5	(): Imperial Screw
Very Long Reach (SMF)	No Diagnostics D: 1x12 Digital Diagnostics			R: Parylene		E: Shield	6: Lvl 6	U: Metric Screw
								P: Solder Posts

Example part number: RJ-3G-ZX-DPLX-LC-R-A

[3G RJ Transceiver, 1550nm, long-reach, Duplex LC connectors, Parylene-coated, -40 to 85 °C operating temp range, imperial-threaded screw posts]

Contact COTSWORKS for mechanical dimensional information and other configuration options.

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