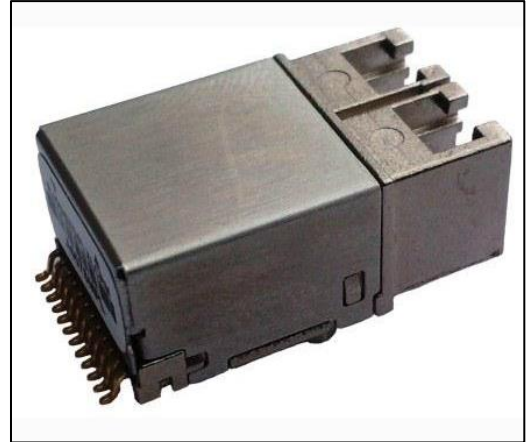


### Features:

- 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  $\mu$ m 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



### 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	°C	
Case Operating Temperature	$T_{OP}$	-40	85	°C	
Relative Humidity	RH	0	95	%	Based on conformal coating
Lead Soldering Temperature			260	°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°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.

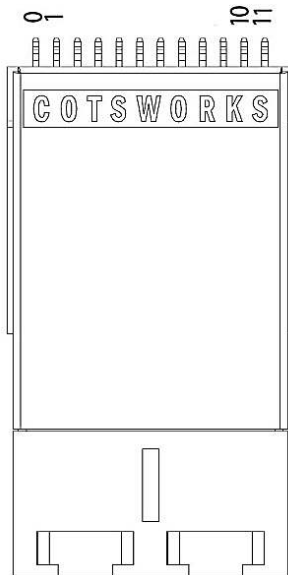
### General Specifications

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

### Electrical Specifications (T<sub>OP</sub> = -40 to 85°C, V<sub>CC</sub> = 3.14 to 3.47 Volts)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Supply Voltage	V <sub>CC</sub>	3.14	3.3	3.47	V	
Total Supply Current	I <sub>CC</sub>			375	mA	
Module Power Dissipation	P <sub>DIS</sub>			1.3	W	
<b>Transmitter</b>						
Supply Current	I <sub>CC</sub> TX			275	mA	
Input differential impedance	R <sub>IN</sub>		100		Ω	
TX Differential Input Voltage	V <sub>DTX</sub>	200		2400	mV	
Transmit Disable Voltage Threshold	V <sub>D</sub>	2.0		V <sub>CC</sub>	V	
Transmit Enable Voltage Threshold	V <sub>EN</sub>	0		0.8	V	
<b>Receiver</b>						
Supply Current	I <sub>CC</sub> RX			100	mA	
RX Differential Output Voltage	V <sub>DRX</sub>	600		900	mV	
Total Contributed Jitter (p-p)	RXΔTJ			0.4	UI	FCPI-4 (δ <sub>R</sub> - γ <sub>R</sub> )
Data Output Rise/Fall Time	t <sub>r</sub> /t <sub>f</sub>			130	ps	20% - 80%
Signal Detect Assert Voltage	SD <sub>norm</sub>	2.4		V <sub>CC</sub>	V	
Signal Detect De-Assert	SD <sub>fault</sub>	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 <sub>EET</sub>	Transmitter Signal Ground	N/A
3	TD-	Transmitter DATA In -	LVPECL
4	V <sub>CCT</sub>	Transmitter Power Supply	N/A
5	SD	Signal Detect output Satisfactory Optical Input: Logic "1" Output Fault Condition: Logic "0" Output	LVTTTL
6	T <sub>DIS</sub>	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 <sub>CCR</sub>	Receiver Power Supply	N/A
9	RD-	Receiver DATA Out -	CML
10	V <sub>EER</sub>	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 DDML.

### Optical Characteristics (T<sub>OP</sub> = -40 to 85°C, V<sub>CC</sub> = 3.135 to 3.465 Volts)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
<b>Transmitter</b>						
Output Optical Power (9/125 SMF)	P <sub>OUT</sub>	-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 <sub>r</sub> /t <sub>f</sub>			130	ps	(3)(4) 20% - 80%
Relative Intensity Noise	RIN			-120	dB/Hz	(3) FCPI-4 (δ <sub>R</sub> - γ <sub>R</sub> )
Total Jitter Contribution (p-p)	TJ <sub>TX</sub>			0.4	UI	
<b>Receiver</b>						
Receiver Sensitivity@ 1.25Gbps	RX <sub>SENS1</sub>			-22	dBm	(1)(4)(5)
Receiver Sensitivity@ 3.125Gbps	RX <sub>SENS2</sub>			-16	dBm	
Overload	RX <sub>MAX</sub>	0			dBm	
Optical Center Wavelength	λ <sub>c</sub>	1270		1620	nm	
Return Loss	RL	12			dB	
Signal Detect Assert	P <sub>SDA</sub>			-20	dBm	(1)(5)
Signal Detect De-Assert	P <sub>SDD</sub>	-32			dBm	(1)(5)
Signal Detect Hysteresis	P <sub>SDA</sub> - P <sub>SDD</sub>	1			dB	

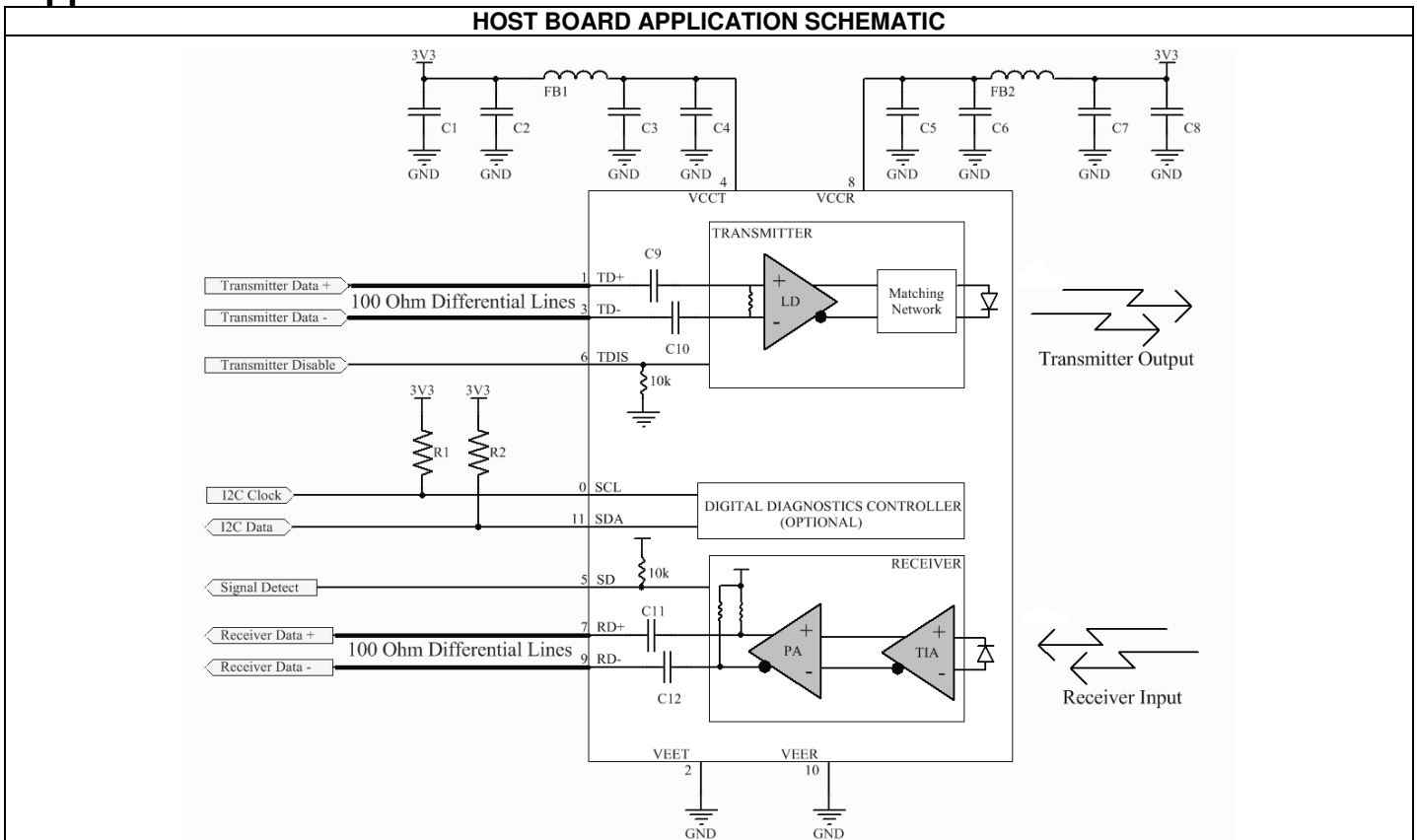
**NOTES:**

- 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<sup>7</sup>-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.

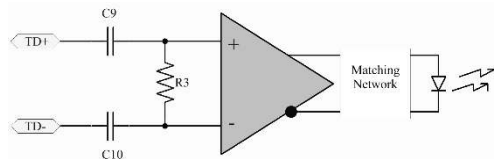
### Application Schematics



**Notes:**

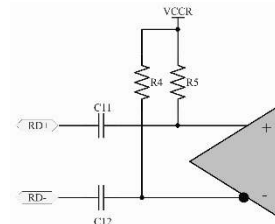
- Recommend host routes separate supply voltages and filtering for RJ-module transmitter and receiver as shown in the schematic above
  - FB1/FB2 ferrite bead for power supply noise suppression; Murata BLM18KG601SN1, 0603, 600Ω @ 100MHz, 1300mA
  - C1/C4/C5/C8 bulk capacitance; Murata GRM21BR61C106KE15L,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



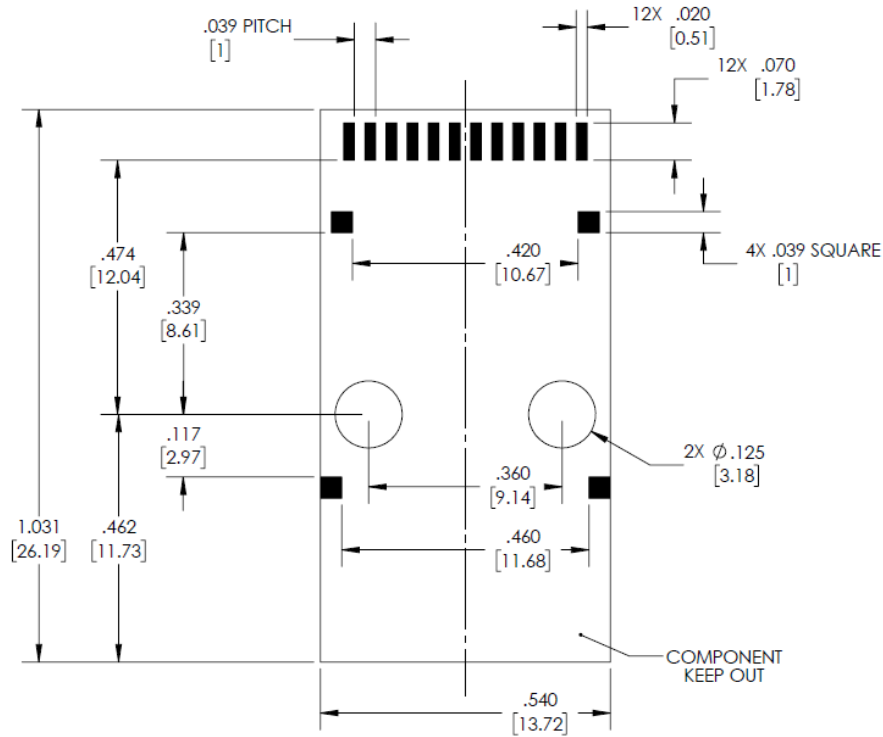
- C9/C10 0.1μF internal input data coupling capacitors
- R3 internal 100Ω input differential termination
- Transmitter electrical input is CML compatible

#### RECEIVER EQUIVALENT OUTPUT CIRCUIT



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

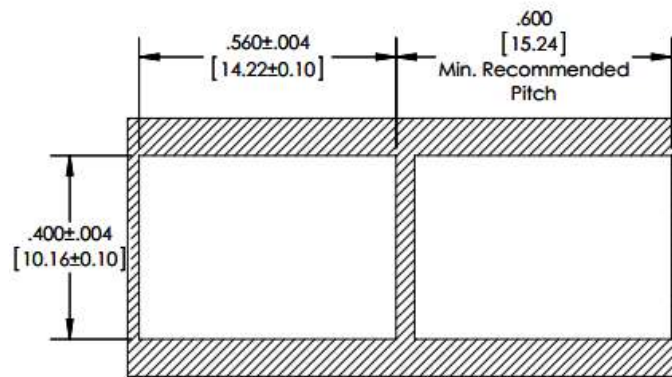
### PCB Design Guidelines



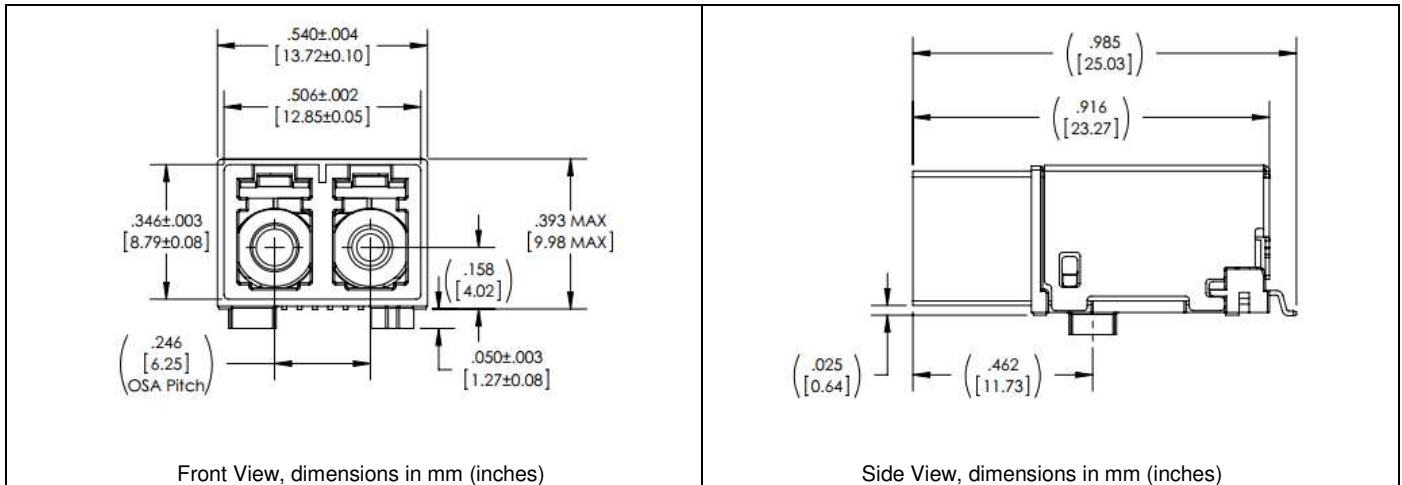
**Notes:**

- 1) Pads 0 and 11 are the 2-wire bus signal pin pads for the digital diagnostics option

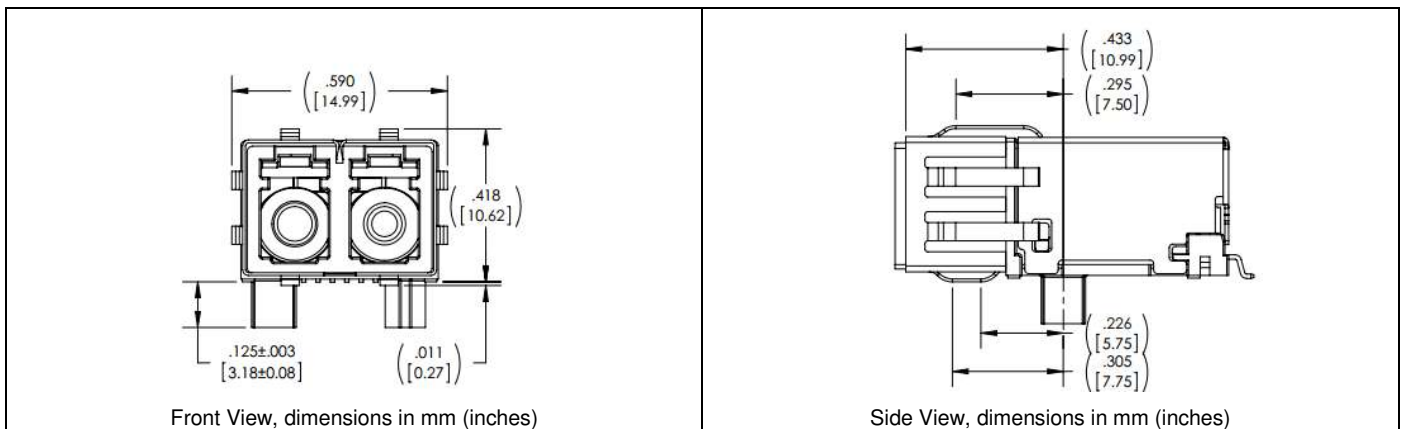
### Panel Cutout



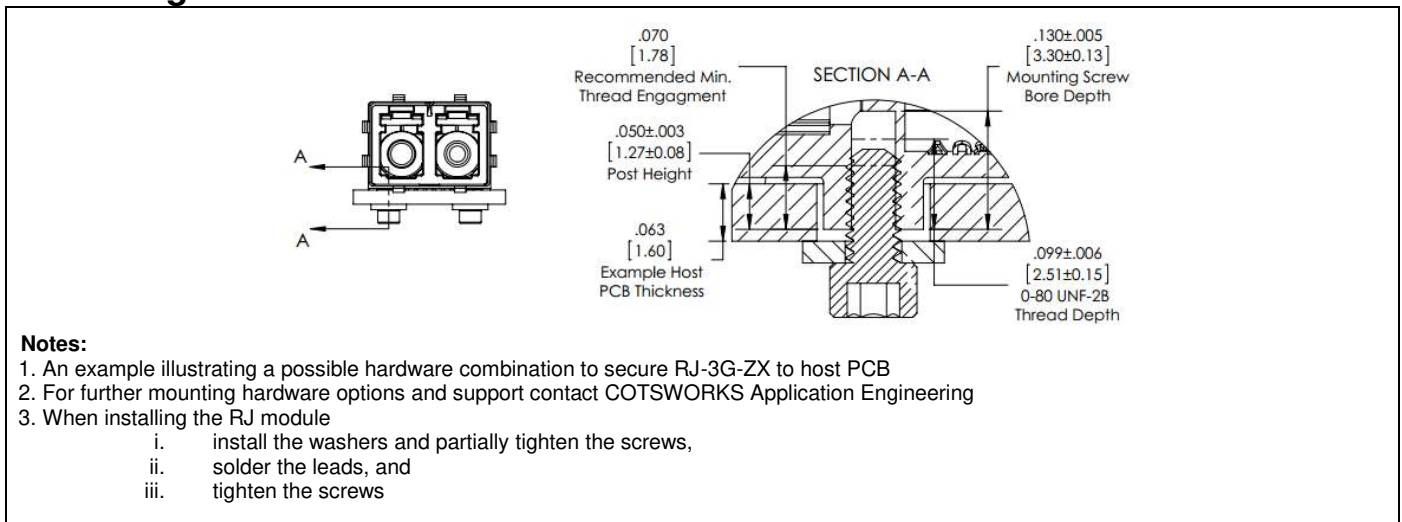
### Screw Post Mechanical Dimensions



### 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

- 1) IEEE Standard 802.3, 2002 Edition, Clause 38, PMD Type 1000BASE-LX. IEEE Standards Department, 2002
- 2) "Fibre Channel Draft Physical Interface Specification (FC-PI-2 Rev. 10.0)". American National Standard for Information Systems
- 3) ARINC 818 specification at 1.0625 Gb/s, <http://www.arinc.com/>
- 4) 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
<b>RJ Form Factor</b>	<b>Pins and Diagnostics</b>	<b>Duplex</b>		<b>Ruggedized Coating</b>	<b>Operating Temp Range</b>	<b>EMI Shield</b>	<b>RoHS Level</b>	<b>Mounting</b>
<b>3Gbps Max Data Rate</b>	(): 1x10	<b>LC Connector</b>		(): Non-coated	A: -40 to 85°C	(): No Shield	(): Lvl 5	(): Imperial Screw
<b>Very Long Reach (SMF)</b>	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]

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