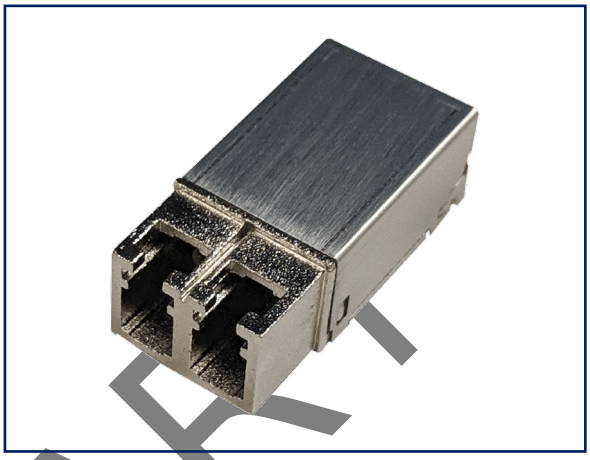
RJ-10G-CWDM

5Gbps to 10.3125Gbps

Rugged RJ Size Fiber Optic Transceiver

Features:

- 5Gbps to 10.3125Gbps duplex data links
- CWDM EML Transmitter and PIN Receiver
- 1x12 surface mount connector 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 2002/95/EC
- +3.3V and +2.5V power supply
- AC-Coupled Transmitter & Receiver Data
- Conformal coating options for harsh environment use
- COTSWORKS RJs are fully tested over the operating temperature range
- Pigtail Assembly option is available. Contact COTSWORKS for details



The RJ-10G-CWDM is ideal for harsh environment connectivity because of its low cost, availability, and wide operating parameters.

General Specifications

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Data Rate	DR	6.0	-	10.3125	Gbps	Balanced NRZ data protocols
3.3V Supply Voltage	V_{CC3V3}	3.14	3.3	3.47	V	+/- 5%
2.5V Supply Voltage	V_{CC2V5}	2.375	2.5	2.625	V	+/- 5%
Output Power	P_{OUT}	-1	-	3.0	dBm	
RX Sensitivity	RX_{SENS}	-	-	-15.0	dBm	

Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit	Notes
Maximum 3.3V Supply Voltage	V_{CC3V3}	–0.3	4.0	V	
Maximum 2.5V Supply Voltage	V_{CC2V5}	–0.5	3.0	V	
Electrostatic Discharge, Data I/O pins	ESD	-	500	V	(1)
Storage Temperature	T_{sto}	–55	100	°C	
Operating Temperature	T_{OP}	–40	85	°C	(7)
Relative Humidity	RH	0	95	%	(2)(4)
Hot Bar Soldering Temperature		-	260	°C	10 seconds, leads only, (5)(6)
Hand Lead Soldering Temperature		-	260	°C	10 seconds, leads only, (5)(6)
Conformal Coating		0.8	1.2	mil	(3)

Notes:

1) Proper ESD conditions should be employed while attaching the RJ to the host board.
2) Non-condensing based on conformal coating.
3) See ruggedization notes on pg. 8.
4) 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.
5) The components should not undergo Reflow Soldering under any circumstances.
6) Case temperature.

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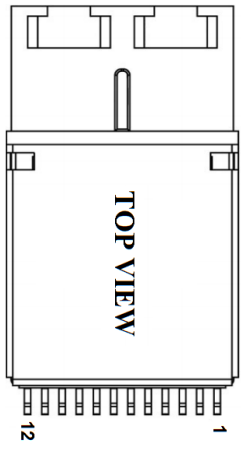
Electrical Specifications (T_{OP} = –40 to 85°C, V_{CC3V3} = 3.14 to 3.47 Volts, V_{CC2V5} = 2.375 to 2.625 Volts)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Total Module Power Dissipation	P_{DISS}	-	-	2.66	W	0°C to +85°C
3.3V Supply Current	I_{CC3V3}	-	-	500	mA	
2.5V Supply Current	I_{CC2V5}	-	-	350	mA	
Transmitter						
Input Differential Impedance	R_{in}	80	100	120	Ω	
TX Single-Ended Input Voltage Swing	V_{in}	100	-	625	mV	
Data Input Total Jitter	TX_{TJ}	-	-	0.44	UI	
TX Disable Input Voltage	V_D	2	-	V_{CC}+0.3	V	
TX Enable Input Voltage	V_{EN}	-	-	0.8	V	
TX Fault Output Low	V_{TFL}	–0.3	-	0.4	V	
Initialization Time for cooled module	T_{Start_Up}	-	-	1	s	
Disable Assert Time	T_{ON}	-	-	100	ms	
Enable Assert Time	T_{OFF}	-	-	2	ms	
Receiver						
Rx Single-Ended Output Voltage Swing	V_{DRX}	150	-	500	mV	
Data Output Rise Time (10G)	t_r	-	45	60	ps	(1)
Data Output Rise Time (5G)	t_r	-	75	125	ps	(1)
Data Output Fall Time (10G)	t_f	-	45	60	ps	(1)
Data Output Fall Time (5G)	t_f	-	75	125	ps	(1)
Total Contributed Jitter	RXΔTJ	-	-	0.42	UI	
Signal Detect De-Assert Voltage	SD_D	2.64	-	3.77	V	(2)
Signal Detect Assert Voltage	SD_A	-	-	0.4	V	(2)
Signal Detect De-Assert Time	t_d	-	12	100	µs	
Signal Detect Assert Time	t_a	-	12	100	µs	
Serial Bus						
Data, Clock Input Low Voltage	V_{IL}	–0.3	-	0.3*V_{CC3V3}	V	
Data, Clock Input High Voltage	V_{IH}	0.7*V_{CC3V3}	-	V_{CC3V3}+0.3	V	
Data, Clock Output Low Voltage	V_{OL}	-	-	0.4	V	
Data, Clock Output High Voltage	V_{OH}	V_{CC3V3}–0.4	-	-	V	

Notes:
1) 20% to 80%.
2) SD is LVTTL. Logic 1 indicates normal operation; logic 0 indicates no signal is detected.

Pin Configuration



PIN #	Symbol	Description	Notes
1	TX–	Transmitter Data Input, Negative	CML
2	TX+	Transmitter Data Input, Positive	CML
3	GND	Ground	0V
4	VCC_2V5	2.5V Supply	2.5V
5	TX_DIS	Transmitter Disable	LVTTL
6	SCL	I2C Clock	I2C
7	SDA	I2C Data	I2C
8	SD	Receiver Signal Detect	LVTTL
9	VCC_3V3	3.3V Supply	3.3V
10	GND	Ground	0V
11	RX+	Receiver Data Output. Positive	CML
12	RX–	Receiver Data Output, Negative	CML

Notes:
1) N/A

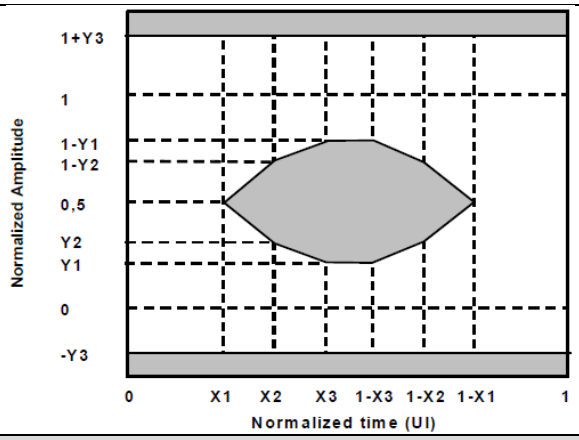
Digital Diagnostics Information

The COTSWORKS RJ module utilizes signal pins for a 2-wire bus required in order to access digital diagnostics. The transceiver pinout (including those pins required for 2-wire communication to access the digital diagnostics) appears on the previous table.

For more information on Digital Diagnostics, visit cotsworks.com/support-documents/

Optical Characteristics (T_{OP} = –40 to 85°C, V_{CC3V3} = 3.14 to 3.47 Volts, V_{CC2V5} = 2.375 to 2.625 Volts)

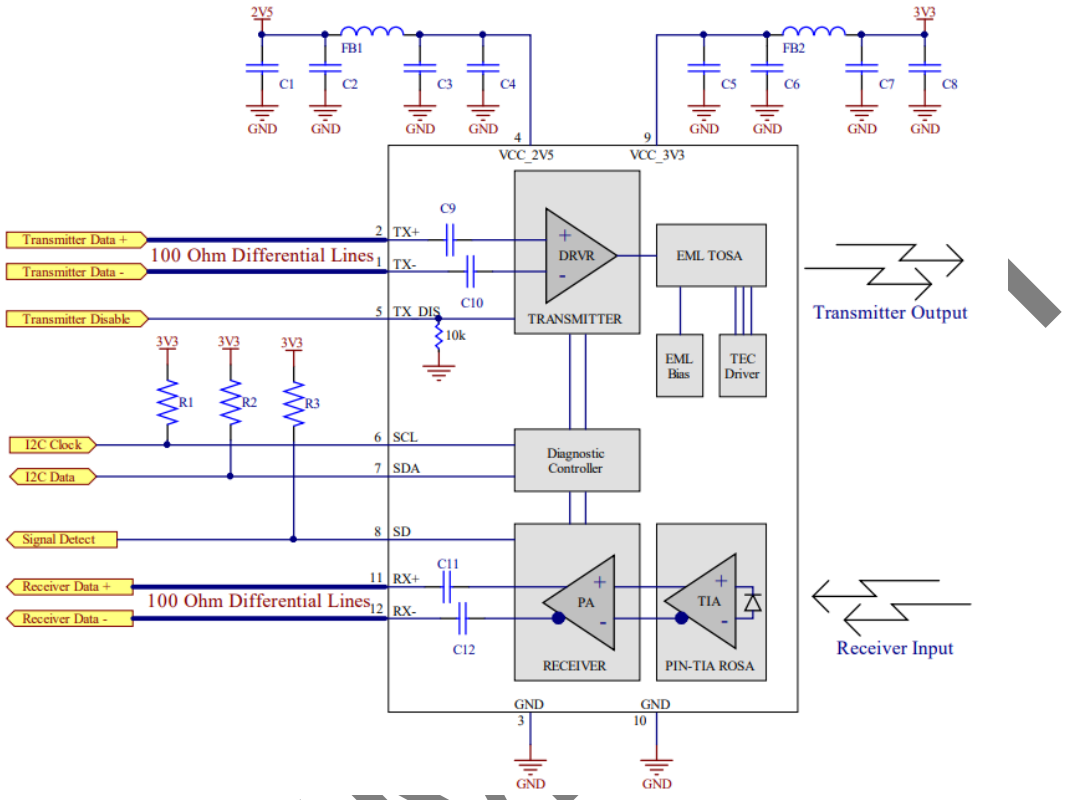
Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Transmitter						
Output Optical Power	P_{OUT}	–1	-	+3	dBm	(1)(2)
Optical Wavelength	λ	1304.5	1311	1317.5	nm	RJ-10G-CWDM-31
	λ	1324.5	1331	1337.5	nm	RJ-10G-CWDM-33
	λ	1464.5	1471	1477.5	nm	RJ-10G-CWDM-47
	λ	1484.5	1491	1497.5	nm	RJ-10G-CWDM-49
	λ	1504.4	1511	1517.5	nm	RJ-10G-CWDM-51
	λ	1524.5	1531	1537.5	nm	RJ-10G-CWDM-53
	λ	1544.5	1551	1557.5	nm	RJ-10G-CWDM-55
	λ	1564.6	1571	1577.5	nm	RJ-10G-CWDM-57
	λ	1584.5	1591	1597.5	nm	RJ-10G-CWDM-59
	λ	1604.5	1611	1617.5	nm	RJ-10G-CWDM-61
Extinction ratio	ER	8.2	-	-	dB	
Relative Intensity Noise	RIN	-	-	-130	dB/Hz	
TX Mask Compliance	-	{X1, X2, X3, Y1, Y2, Y3} = {0.25, 0.40, 0.45, 0.25, 0.28, 0.75}				(3)



Receiver						
Receiver Sensitivity	$RX_{SENS10G}$	-	-18	–15	dBm	(3)
Receiver Saturation	RX_{SAT}	–1	-	-	dBm	
Optical Center Wavelength	λ_C	1264.5	-	1627.5	Nm	
Return Loss	RL	12	-	-	dB	
Signal Detect Assert	SD_A	-	-	–16	dBm	
Signal Detect De-Assert	SD_D	–35	-	-	dBm	
Signal Detect Hysteresis	SD_H	0.5	-	5	dB	

Notes:
1) Class 1 Laser Safety per IEC-60825-1 regulations.
2) Measured at the end of a 2–5m patch cord consisting of laser optimized 9/125µm SM fiber.
3) Measured using PRBS 2^{31}–1, BER = 1E-12.

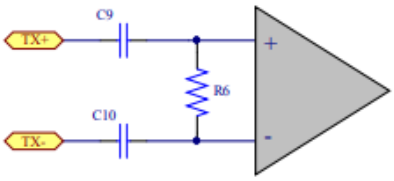
Application Schematics



Notes:

1) Recommend host routes separate filtering for RJ-CWDM module power planes as shown in the schematic above:
   a. FB1/FB2 ferrite bead for power supply noise suppression; Murata BLM18KG601SN1, 0603, 600Ω @ 100MHz, 1300mA.
   b. C1/C4/C5/C8 bulk capacitance; Murata GRM21BR61C106KE15L, 0805, 10µF, 16V.
2) R1/R2/R3 2-wire bus and SD pull-up resistors required on host for implementing digital diagnostics and SD; 4.7kΩ to 10kΩ.
3) Screw posts are not internally connected to signal ground. Recommend screw posts be connected to chassis ground if available, otherwise they should be tied to local signal ground.
4) For host with LVPECL electrical interface contact COTSWORKS' applications engineering.
5) 2V5 power plane powers data transmission transceiver IC.
6) 3V3 power plane powers digital diagnostics, digital controls, and analog performance functions.

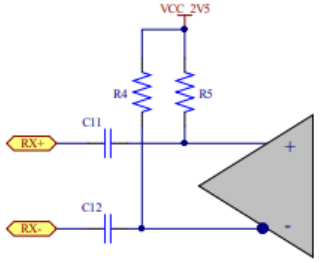
TRANSMITTER EQUIVALENT INPUT CIRCUIT



Notes:

1) C9/C10 0.1µF internal input data coupling capacitors.
2) R6 is an internal 100Ω input differential termination.
3) Transmitter electrical input is CML compatible.

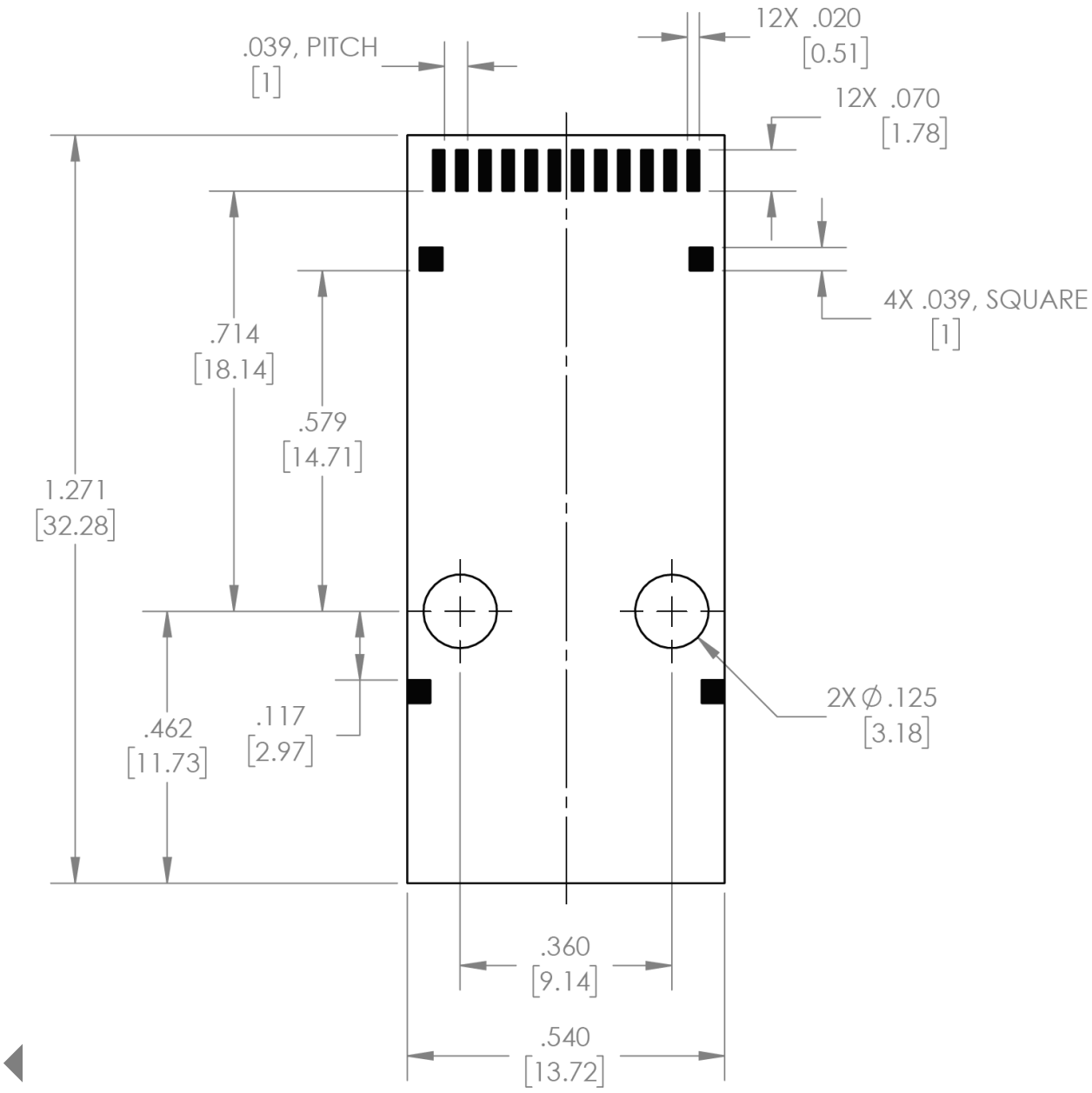
RECEIVER EQUIVALENT OUTPUT CIRCUIT



Notes:

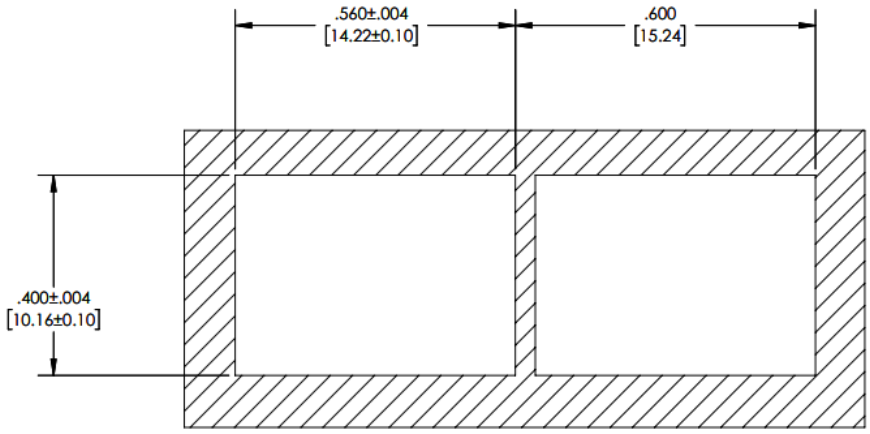
1) C11/C12 are 0.1µF output data coupling capacitors.
2) R4/R5 are 45Ω pull-up resistors to V_{CC2V5}.
3) Receiver electrical output is CML compatible.

PCB Design Guidelines



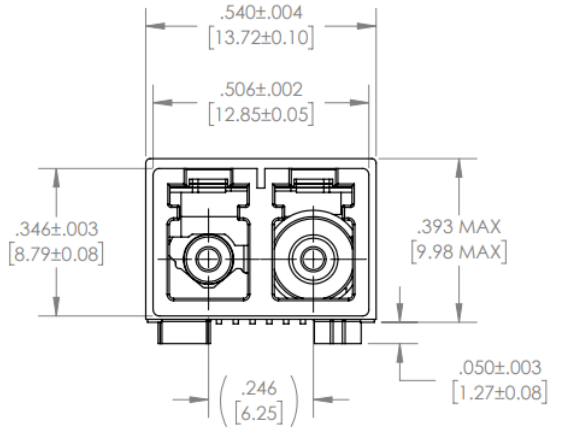
Dimensions in inches [mm]
Dimensions and pad placements shown are preliminary and are subject to change in final product

Panel Cutout

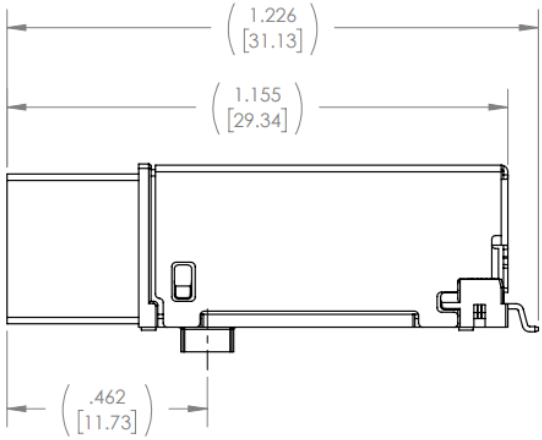


Dimensions in inches [mm]

Standard Mechanical Dimensions

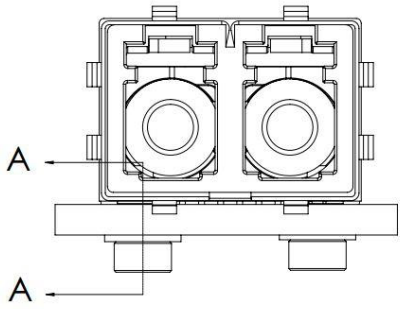


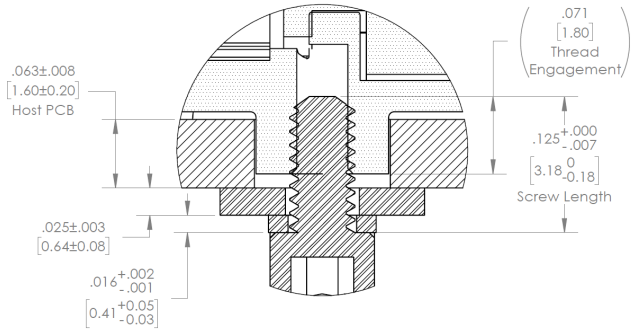
Front View, dimensions in inches [mm]
Dimensions shown are preliminary and are subject to change in final product



Side View, dimensions in inches [mm]
Dimensions shown are preliminary and are subject to change in final product

Mounting Hardware Guidelines





Notes:

1) An example illustrating a possible hardware combination to secure RJ-10G-CWDM to host PCB.
2) For further mounting hardware options and support contact COTSWORKS Application Engineering.
3) 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

Ruggedization Notes

- Parylene Type C coating is 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 and case composition information.

Reference Information

1) IEEE Standard 802.3-2018
2) IEC Standard 60825-1:2014
3) ITU-T G.694.2

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 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-10G-CWDM	-xx	-xx	-x	-x	-x	-x	-x
	ITU Channel Wavelength 31: *1311nm* 33: *1331nm* 47: *1471nm* 49: *1491nm* 51: *1511nm* 53: *1531nm* 55: *1551nm* 57: *1571nm* 59: *1591nm* 61: *1611nm*	**Connector Type** LC: *Standard LC* LX: *ARINC 801*	**Ruggedized Coating** N: *Non-coated* R: *Parylene.*	**Operating Temp Range** A: *–40° to 85°C*	**EMI Shield** N: *No Shield* E: *Shield*	**RoHS Level** 5: *Level 5* 6: *Level 6*	**Mounting** I: *Imperial Screw* U: *Metric Screw*
RJ Form Factor **10Gbps MAX Data Rate** **Long Reach (SMF)** **CWDM ITU Spacing**							

Example part number: RJ-10G-CWDM-55-LC-R-A-N-6-U
[Rugged Jack Surface Mount, 10.3125Gbps CWDM Long Reach Transceiver, Digital Diagnostics, ITU Channel 55 Transmitting Wavelength, Standard LC Receptacle, Parylene Conformal Coated, –40° to 85°C Operating Temperature Range, No EMI Shield, RoHS Level 6(6), Metric Screw Thread]

Contact COTSWORKS for mechanical dimensional information, lead times, additional wavelengths, and other configuration options.