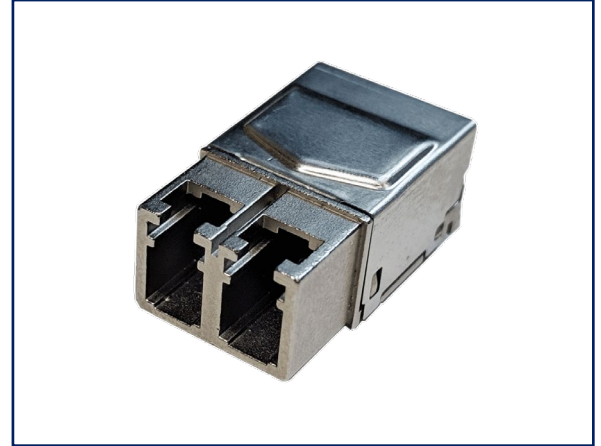


### Features:

- Duplex transceiver module
- Supports data rates of 6Gbps to 10.3125Gbps
- Compliant to IEEE 802.3 40GBASE-LR4
- 1271, 1291, 1311, and 1331nm DFB transmitter options
- Wideband PIN receiver
- Compliant to IEC-60825-1, Class 1 Laser eye safety
- Duplex LC or ARINC 801 receptacle options
- Solder-down 1x12 electrical interface
- Screw posts for securing module to host
- SFF-8472 compliant control and diagnostics monitor interface
- -40°C to +85°C operating temperature
- Parylene conformal coating option



The RJ-10G-LR4 is ideal for harsh environment connectivity because of its low cost, availability, and wide operating parameters.



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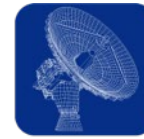
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MILITARY  
TACTICAL



SUBSEA  
NETWORKING



RADAR &  
SENSING



OIL &  
EXPLORATION

### General Specifications

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Data Rate	DR	6.0	-	10.3125	Gbps	64b66 Encoding, Balanced NRZ data protocols
Optical Wavelength (27)	$\lambda_{27}$	-	1271	-	nm	
Optical Wavelength (29)	$\lambda_{29}$	-	1291	-	nm	
Optical Wavelength (31)	$\lambda_{31}$	-	1311	-	nm	
Optical Wavelength (33)	$\lambda_{33}$	-	1331	-	nm	
Output Power	P <sub>OUT</sub>	-5	-	0.5	dBm	
RX Sensitivity	RX <sub>SENS</sub>	-	-	-14	dBm	

### Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit	Notes
Maximum Supply Voltage	V <sub>CC</sub>	-0.3	4	V	
Storage Temperature	T <sub>sto</sub>	-55	100	°C	
Case Operating Temperature	T <sub>OP</sub>	-40	85	°C	
Relative Humidity	RH	0	95	%	Based on conformal coating, (1)
Hot Bar Soldering Temperature	-	-	260	°C	10 seconds, leads only, (2)
Hand Lead Soldering Temperature	-	-	260	°C	10 seconds, leads only, (2)
Conformal Coating	-	0.8	1.2	mil	(3)

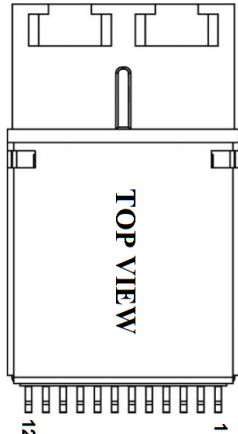
#### Notes:

- 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.
- 3) See ruggedization notes on page 8.

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

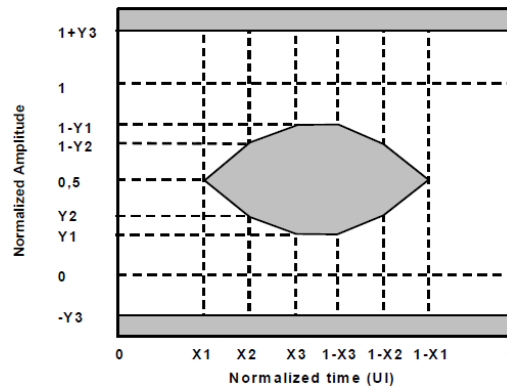
Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Total Module Power Dissipation	$P_{DISS}$	-	0.75	1.4	W	
<b>Transmitter</b>						
Supply Current	$I_{CC}$	-	-	270	mA	
Input Differential Impedance	$R_{in}$	90	100	110	$\Omega$	
TX Single-Ended Input Voltage Swing	$V_{DTX}$	100	-	400	mV	
TX Disable Input Voltage	$V_D$	2	-	-	V	
TX Enable Input Voltage	$V_{EN}$	-	-	0.8	V	
<b>Receiver</b>						
Supply Current	$I_{CC}$	-	-	130	mA	
Rx Single-Ended Output Voltage Swing	$V_{DRX}$	250	-	450	mV	
Data Output Rise Time	$t_r$	-	-	45	ps	(1)
Data Output Fall Time	$t_f$	-	-	45	ps	(1)
Total Contributed Jitter	$RX_{\Delta TJ}$	-	-	0.44	UI	
Signal Detect Assert	$SD_{NORM}$	2.4	-	-	V	(2)
Signal Detect De-Assert	$SD_{FAULT}$	-	-	0.4	V	(2)
Signal Detect Assert Time	$t_d$	2.5	-	80	$\mu s$	
Signal Detect De-Assert Time	$t_a$	2.5	-	80	$\mu s$	
<b>Serial Bus</b>						
Data, Clock Input Low Voltage	$V_{IL}$	-0.3	-	$0.3 \cdot V_{CC}$	V	
Data, Clock Input High Voltage	$V_{IH}$	$0.7 \cdot V_{CC}$	-	$V_{CC} + 0.3$	V	
Data, Clock Output Low Voltage	$V_{OL}$	-	-	0.4	V	
Data, Clock Output High Voltage	$V_{OH}$	$V_{CC} - 0.4$	-	-	V	
<b>Notes:</b>						
1) 20% to 80%.						
2) SD is LVTTTL. 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	TX_VCC	Transmitter Supply	3.3V	
5	TX_DIS	Transmitter Disable	LVTTTL	
6	SCL	I2C Clock	I2C	
7	SDA	I2C Data	I2C	
8	SD	Receiver Signal Detect	LVTTTL	
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	
<b>Notes:</b>				
1) N/A.				

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

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
<b>Transmitter</b>						
Average Output Optical Power	$P_{OUT}$	-5	-	0.5	dBm	(1)(2)(4)
Optical Wavelength (27)	$\lambda_{27}$	$\lambda_{27}-5.5$	1271	$\lambda_{27}+5.5$	nm	
Optical Wavelength (29)	$\lambda_{29}$	$\lambda_{29}-5.5$	1291	$\lambda_{29}+5.5$	nm	
Optical Wavelength (31)	$\lambda_{31}$	$\lambda_{31}-5.5$	1311	$\lambda_{31}+5.5$	nm	
Optical Wavelength (33)	$\lambda_{33}$	$\lambda_{33}-5.5$	1331	$\lambda_{33}+5.5$	nm	
Spectral Width (RMS)	$\sigma$	-	-	0.45	nm	(1)(2)
Extinction ratio	ER	3.5	-	-	dB	(1)(2)
Optical Rise Time	$t_r$	-	-	60	ps	(1)(5)
Optical Fall Time	$t_f$	-	-	60	ps	(1)(5)
Transmitter and Dispersion Eye Closure	TDEC	-	-	2.6	dB	
TX Mask Compliance	-	$\{X1, X2, X3, Y1, Y2, Y3\} =$ $\{0.25, 0.40, 0.45, 0.25, 0.28, 0.40\}$				



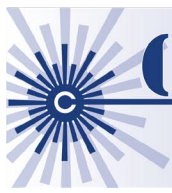
<b>Receiver</b>						
Receiver Sensitivity (6Gbps)	$RX_{SENS6G}$	-	-	-16	dBm	(1)(3)
Receiver Sensitivity (10.3125Gbps)	$RX_{SENS10G}$	-	-	-14	dBm	(1)(2)
Receiver Saturation	$RX_{SAT}$	1.5	-	-	dBm	
Signal Detect Assert	$SD_A$	-	-	-19	dBm	
Signal Detect De-Assert	$SD_D$	-29	-	-	dBm	
Signal Detect Hysteresis	$SD_H$	1	-	5	dB	

**Notes:**

- 1) Measured at the end of a 2–5m patch cord consisting of laser optimized 9/125 $\mu\text{m}$  SM fiber.
- 2) Measured running 10.3125Gbps, PRBS  $2^{31}-1$ , BER  $1\text{E}-12$ .
- 3) Measured running 6Gbps, PRBS  $2^{31}-1$ , BER  $1\text{E}-12$ .
- 4) Class 1 Laser Safety per FDA/CDRH and IEC-60825-1 regulations.
- 5) 20% – 80%.

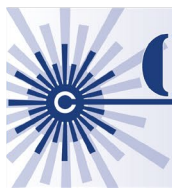
**Address A0h Data Fields**

A0h Address (dec)	# Bytes	Name	Description	Value (hex)
<b>Base ID Fields</b>				
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	24
04				00
05				00
06				00



07				22
08				00
09				01
10				40
11	1	Encoding	Code for high speed serial encoding algorithm	06
12	1	BR, Nominal	Nominal signaling rate, units of 100 MBd	67
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	0F
15	1	Length (SMF)	Link length supported for single mode fiber, units of 100 m	96
16	1	Length (50um)	Link length supported for 50 um OM2 fiber, units of 10 m	08
17	1	Length (62.5um)	Link length supported for 62.5 um OM1 fiber, units of 10 m	03
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	37
19	1	Length (OM3)	Link length supported for 50 um OM3 fiber, units of 10 m	1E
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				31
43				30
44				47
45				4C
46				52
47				XX
48				XX
49				XX
50				XX
51				XX
52				XX
53				XX



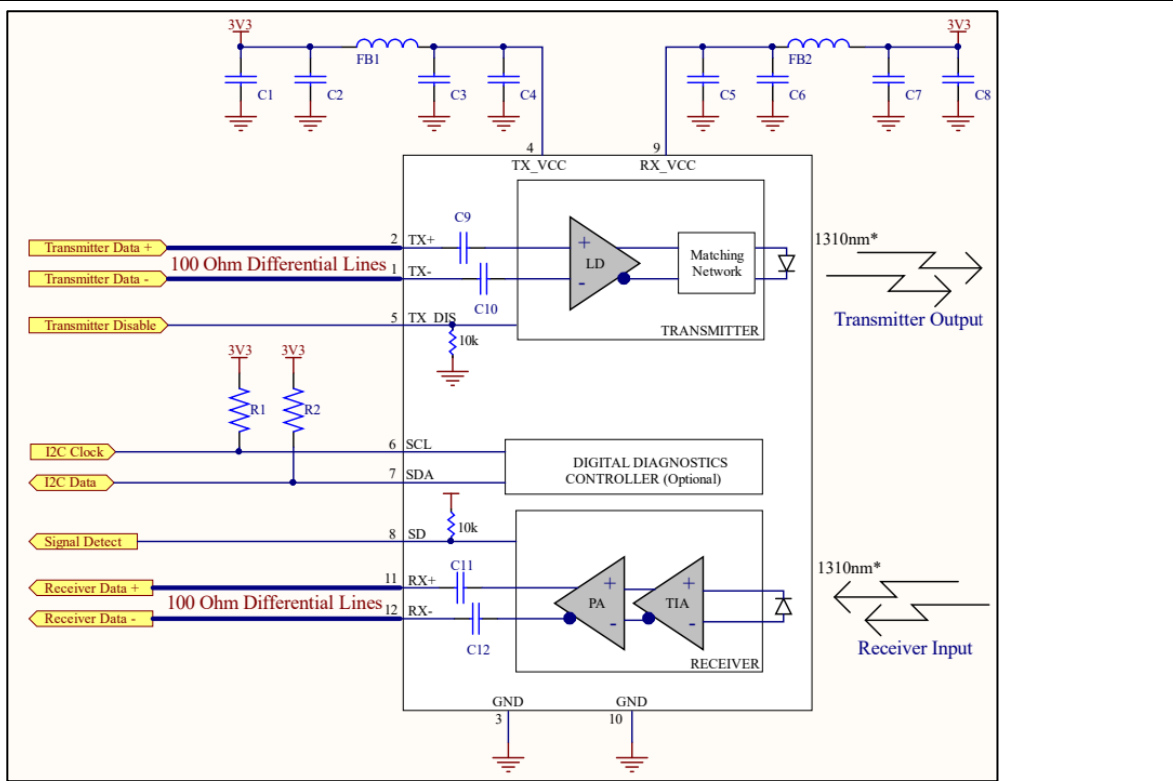


54				XX
55				XX
56	4	Vendor rev	Revision level for part number provided by vendor (ASCII)	30
57				30
58				30
59				30
60				XX
61	2	Wavelength	Laser wavelength	XX
62	1	Unallocated		00
63	1	CC_BASE	Check code for Base ID Fields (addresses 0 to 62)	XX
<b>Extended ID Fields</b>				
64	2	Options	Indicates which optional transceiver signals are implemented	10
65				14
66	1	BR, max	Upper bit rate margin, units of %	00
67	1	BR, min	Lower bit rate margin, units of %	28
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	70
94	1	SFF-8472 Compliance	Indicates which revision of SFF-8472 the transceiver complies with	08
95	1	CC_EXT	Check code for the Extended ID Fields (addresses 64 to 94)	XX

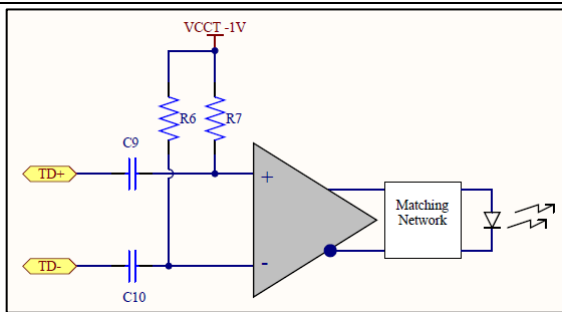




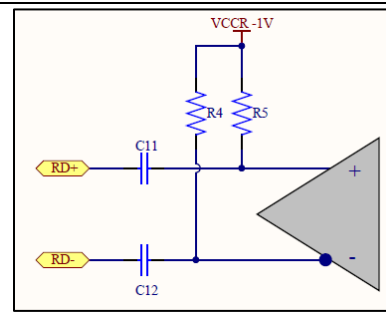
### Application Schematics

**Notes:**

- 1) Recommend host routes separate supply voltages and filtering for RJ-module transmitter and receiver 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.
  - c. C2/C3/C6/C7 de-coupling capacitors; Murata GRM155R71C104KA88D, 0402, 0.1μF, 16V.
- 2) R1/R2 2-wire bus pull-up resistors required on host for implementing optional digital diagnostics; 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.
- 5) For host with LVPECL electrical interface contact COTSWORKS' applications engineering.

**TRANSMITTER EQUIVALENT INPUT CIRCUIT****Notes:**

- 1) C9/C10 0.1μF internal input data coupling capacitors.
- 2) R6/R7 are 50Ω pull-up resistors to Vcc.
- 3) Transmitter electrical input is CML compatible.

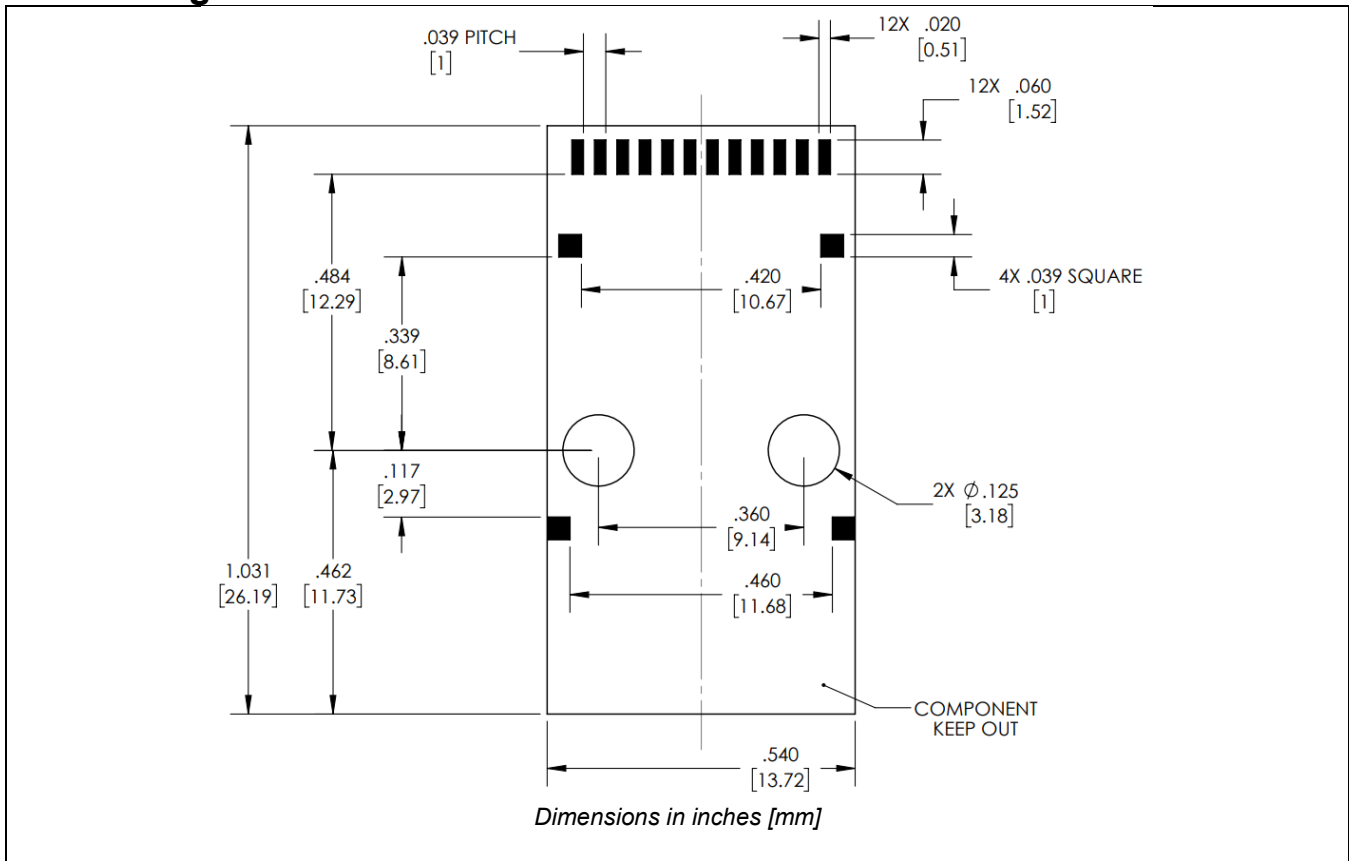
**RECEIVER EQUIVALENT OUTPUT CIRCUIT****Notes:**

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

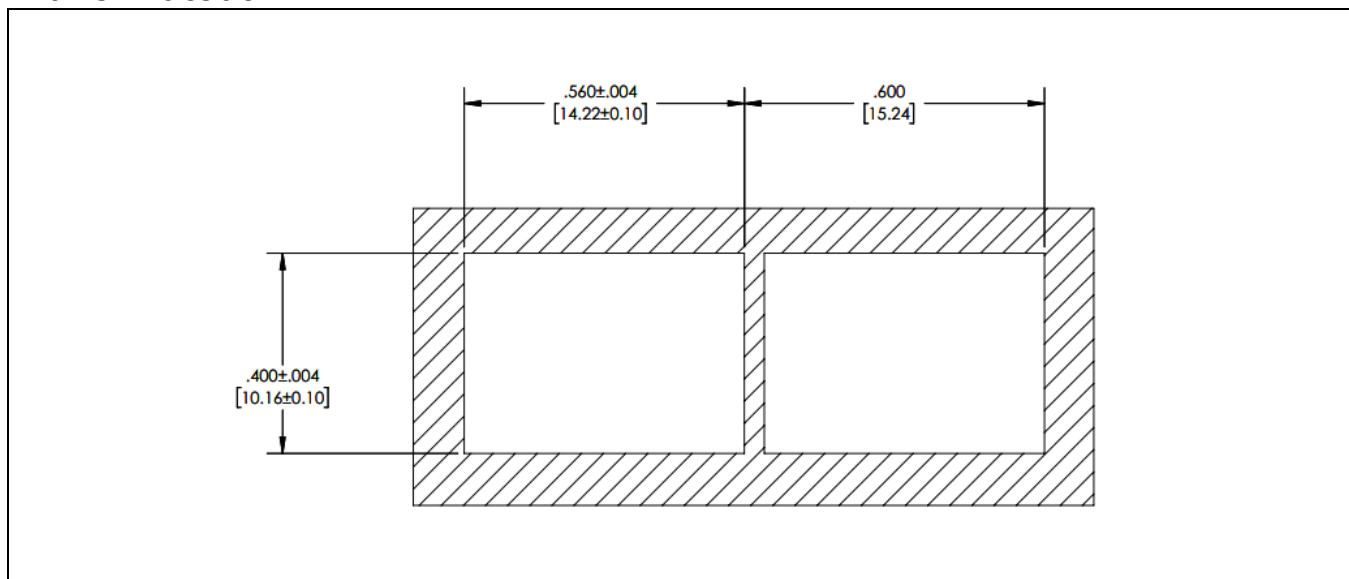




#### PCB Design Guidelines

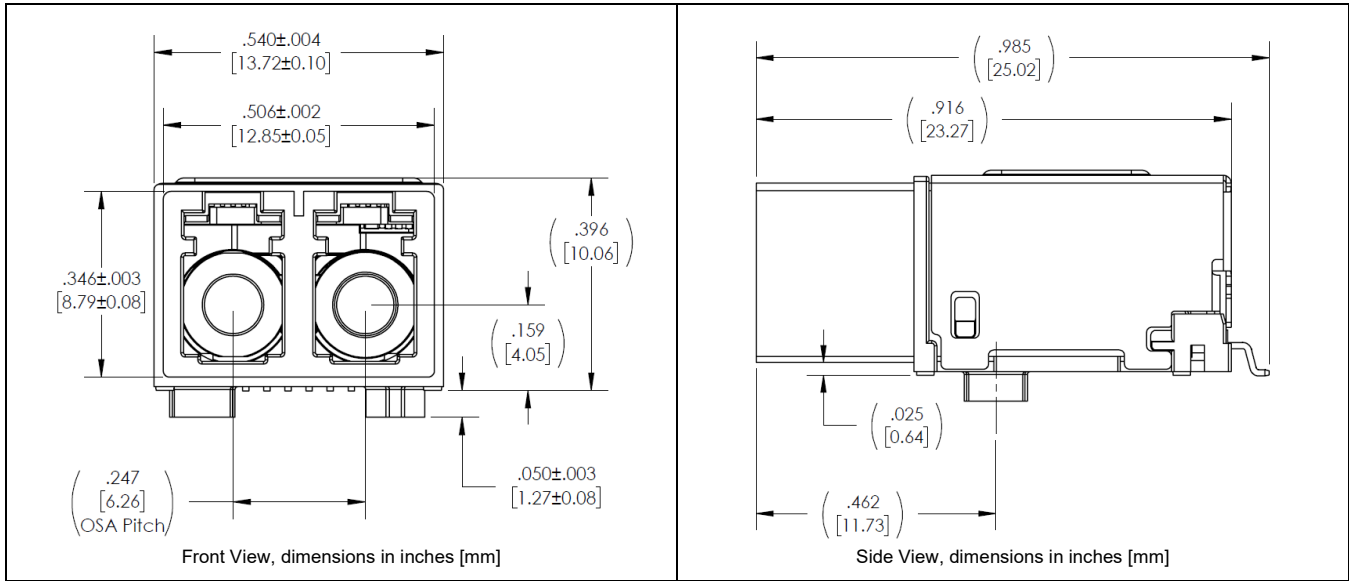


#### Panel Cutout

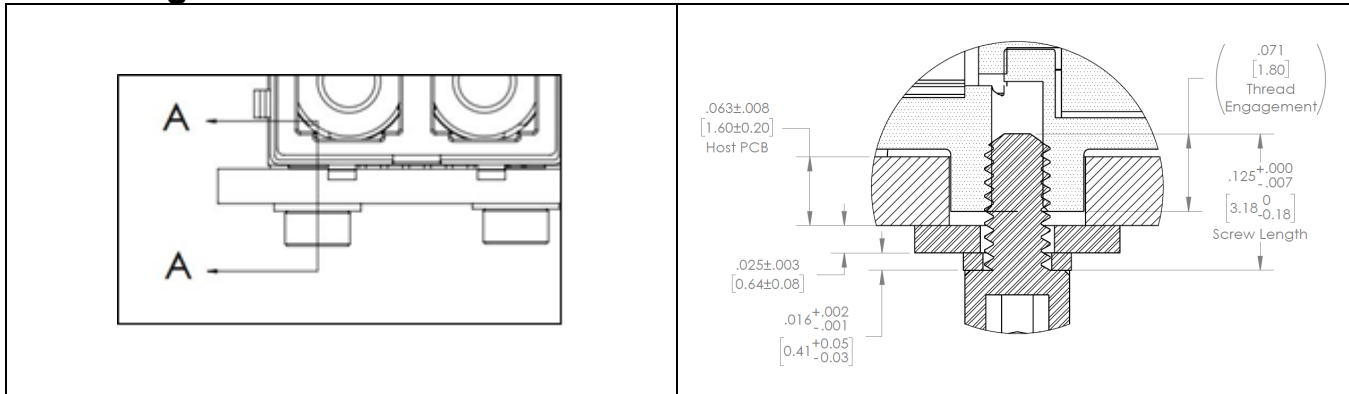




### Standard Mechanical Dimensions



### Mounting Hardware Guidelines



### Ruggedization Notes

- Parylene Type 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 COTSWORKS for all SDS and case composition information.





### Reference Information

- 1) IEEE Standard 802.3-2018, Section 6, 40GBASE-LR4.
- 2) IEC Standard 60825-1:2014.

### 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-LR4	-xx	-xx	-x	-x	-x	-x	-x
	<b>Wavelength</b>	<b>Connector Type</b>	<b>Ruggedized Coating</b>	<b>Operating Temp Range</b>	<b>EMI Shield</b>	<b>RoHS Level</b>	<b>Mounting</b>
<b>RJ Form Factor</b>	27: 1271nm						(): Imperial Screw
<b>10Gbps MAX Data Rate</b>	29: 1291nm	(): Standard LC	(): Non-coated	A: -40° to 85°C	(): No Shield	(): Level 5	
<b>Long Reach (SMF)</b>	31: 1311nm 33: 1331nm	LX: ARINC 801	R: Parylene.		E: Shield	6: Level 6	U: Metric Screw

#### Example part number: RJ-10G-LR4-27-R-A

[Rugged Jack Surface Mount, 10.3125Gbps Long Reach Transceiver, Digital Diagnostics, 1271nm Transmitting Wavelength, Standard LC Receptacle, Parylene Conformal Coated, -40° to 85°C Operating Temperature Range, No EMI Shield, RoHS Level 5(6), Imperial Screw Thread]

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

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