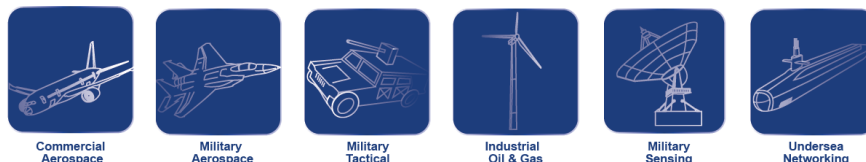


Features:

- Duplex transceiver module
- Supports data rates of 8Gbps to 10.3125Gbps
- Transmitter 1310nm wideband DFB
- PIN Receiver
- Transmitter compliant to IEC-60825-1, Class 1 Laser (eye safe)
- Option for RoHS 6/6 compliant and lead free per Directive 2011/65/EU
- 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
- -55°C to +100°C storage temperature
- Parylene conformal coating option



The RJ-10G-LR Transceiver 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}	-0.3	4.0	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	
Relative Humidity	RH	0	95	%	(2)
Conformal Coating		0.8	1.2	mil	(3)

Notes:

- 1) Proper ESD conditions should be employed while attaching RJ to the host board
- 2) Non-condensing based on conformal coating
- 3) See "Ruggedization Notes" on pg. 7

General Specifications

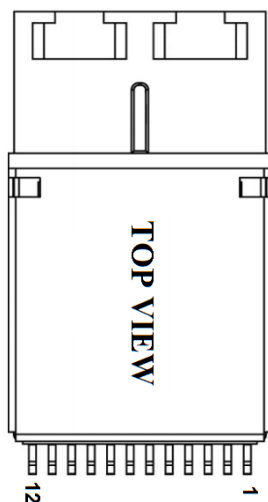
Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Supply Voltage	V _{CC}	3.14	3.3	3.47	V	+/- 5%
Data Rate	BR	8		10.3125	Gbps	Balanced NRZ data protocols
Operating Temperature	T _{OP}	-40		85	°C	



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

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Total Module Power Dissipation	P _{DISS}			1.32	W	
Transmitter						
Supply Current	I _{CC}			250	mA	
Input Differential Impedance	R _{in}	90	100	110	Ω	
Single Ended Input Voltage Swing	V _{in,pp}	100		800	mV _{pp}	
TX Disable Input Voltage	V _{DIS}	2.0			V	LVTTTL
TX Enable Input Voltage	V _{EN}			0.8	V	LVTTTL
Receiver						
Supply Current	I _{CC}			130	mA	
Output Differential Impedance	Z _{OUT}	90		110		
Single Ended Output Voltage Swing	V _{OPP}	250	350	450	mV	
Data Output Rise Time	t _r			45	ps	(1)
Data Output Fall Time	t _f			45	ps	(1)
Total Contributed Jitter	T _J			0.44	UI	
Signal Detect De-Assert	V _{SDD}			0.4	V	(2)
Signal Detect Assert	V _{SDA}	2.4			V	(2)
Notes:						
1) 20% to 80%						
2) SD is LVTTTL. Logic 1 indicates normal operation; logic 0 indicates no signal is detected.						

RJ-10G-LR Host Pin Assignment



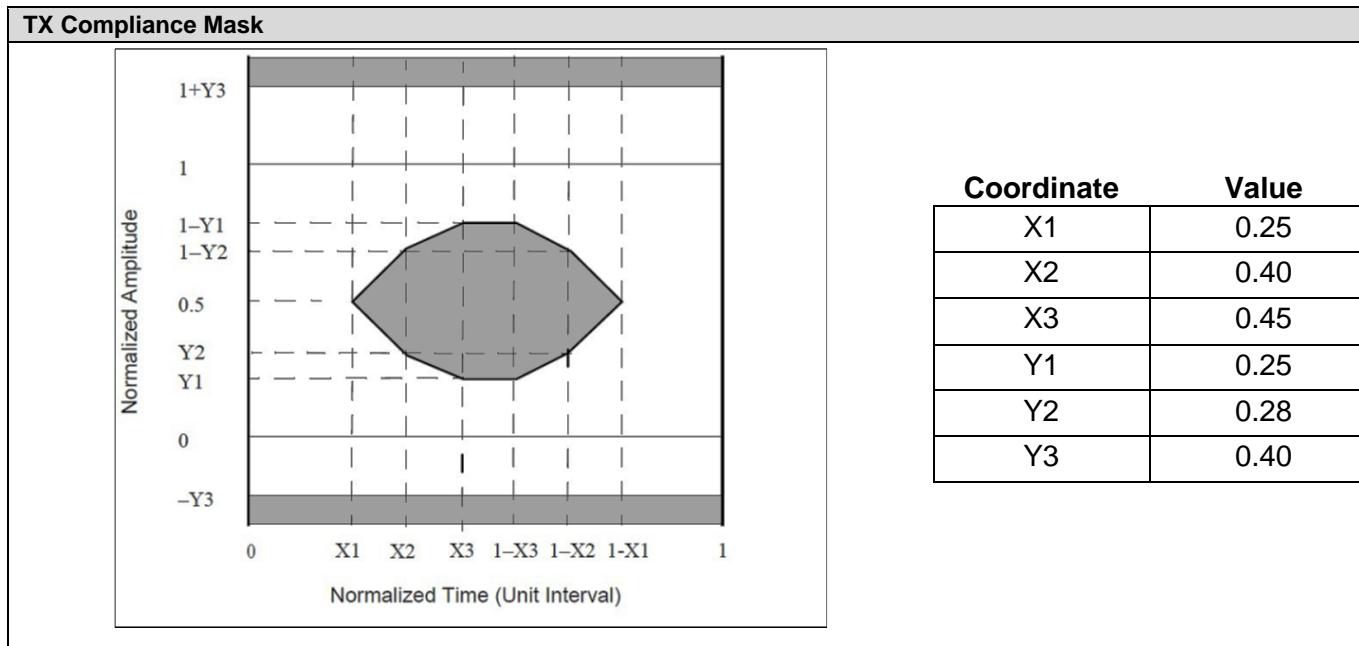
Pin	Symbol	Description	Logic/Protocol
1	TX-	Transmitter Data Input, Negative	CML
2	TX+	Transmitter Data Input, Positive	CML
3	GND	Ground	0V
4	TX_VCC	Transmitter Supply	3.3V
5	TX_DIS	Transmitter Disable	LVTTTL
6	SCL	I2C Clock	I2C
7	SDA	I2C Data	I2C
8	SD	Receiver Signal Detect	LVTTTL
9	RX_VCC	Receiver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





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

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Transmitter						
Output Optical Power	P _{OUT}	-5		-1	dBm	(1,2)
Extinction ratio	ER	3.5			dB	
RMS Spectral Width	Δλ _{RMS}			0.45	nm	
TX Mask Compliance	See TX Compliance Mask			(3)		
Receiver						
Receiver Sensitivity	RX _{SENS}			-12.6	dBm	(3) , BER = 1E-12
Receiver Saturation	RX _{SAT}	0.5			dBm	
Receiver Wavelength Range	λ _{RX}	1260		1620	nm	
Return Loss	RL	12			dB	
Signal Detect Assert	P _{SDA}			-17	dBm	
Signal Detect De-Assert	P _{SDD}	-30			dBm	
Signal Detect Hysteresis	P _{SHD}	1		5		
Notes:						
1) Class 1 Laser Safety per IEC-60825-1 regulations						
2) Measured with 2-5 meter patch cord consisting of 9/125μm SMF						
3) Measured using PRBS 2 ³¹ -1 pattern						



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	24
04				00
05				00
06				00





Rugged Single Mode 10G 1x12 Optical Transceiver

07				22
08				00
09				01
10				40
11	1	Encoding	Code for high speed serial encoding algorithm	06
12	1	BR, Nominal	Nominal signalling 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





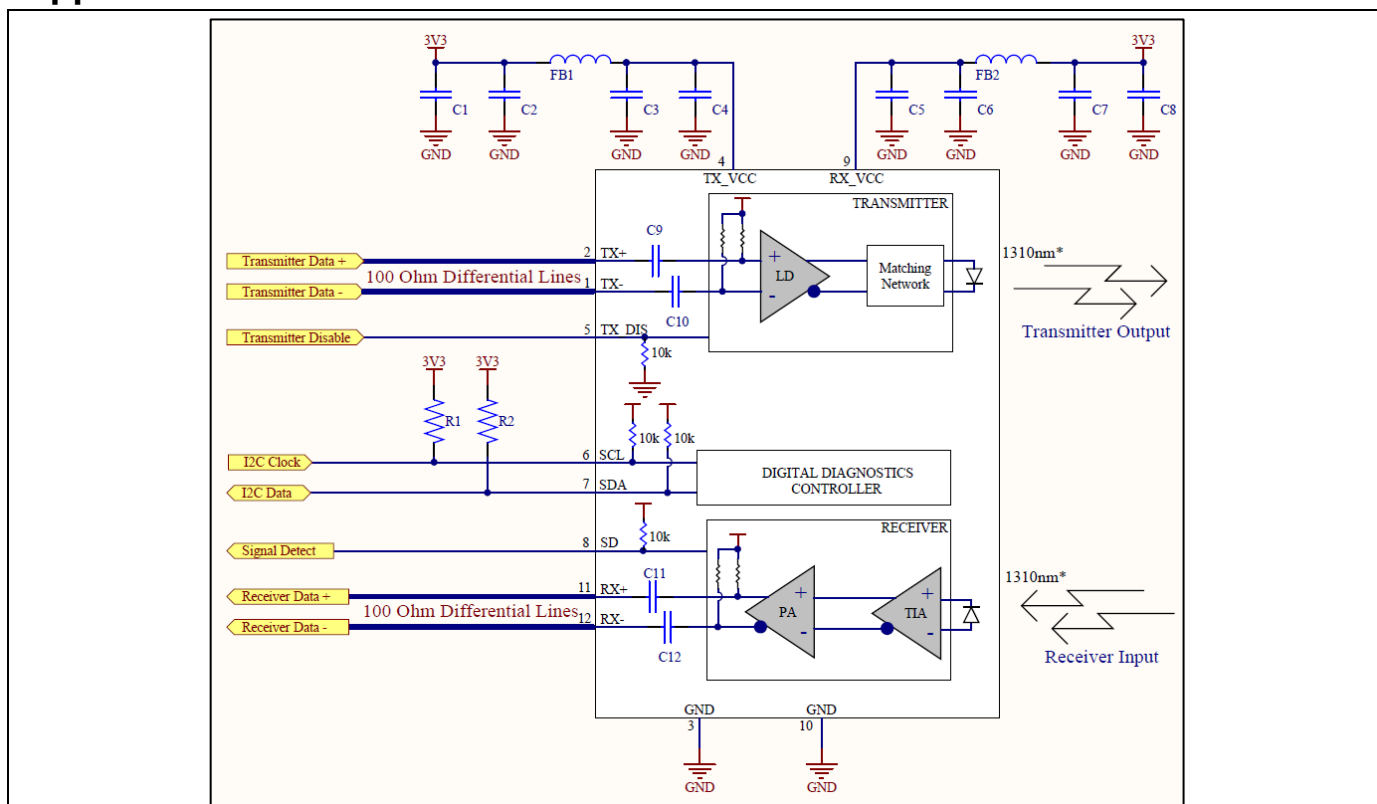
Rugged Single Mode 10G 1x12 Optical Transceiver

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	2	Wavelength	Laser wavelength	05
61				1E
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	10
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	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





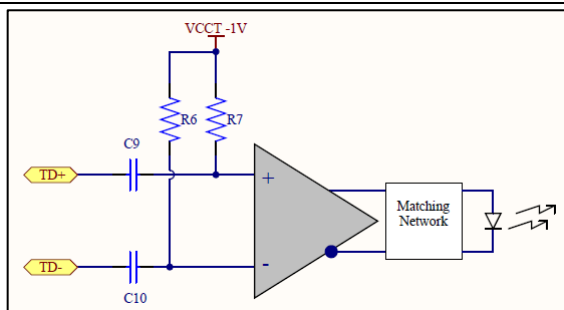
Application Schematics



Notes:

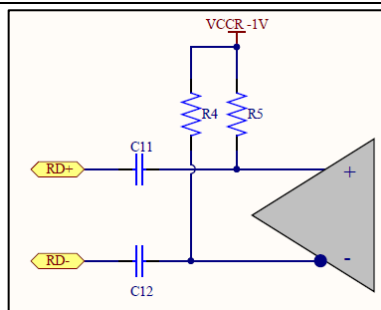
- Recommend host routes separate supply voltages and filtering for RJ-module transmitter and receiver as shown in the schematic above:
 - FB1/FB2 ferrite bead for power supply noise suppression; Murata BLM18KG601SN1, 0603, 600Ω @ 100MHz, 1300mA.
 - C1/C4/C5/C8 bulk capacitance; Murata GRM21BR61C106KE15L, 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.
- R6/R7 are 50Ω pull-up resistors to Vcc.
- Transmitter electrical input is CML compatible.

RECEIVER EQUIVALENT OUTPUT CIRCUIT

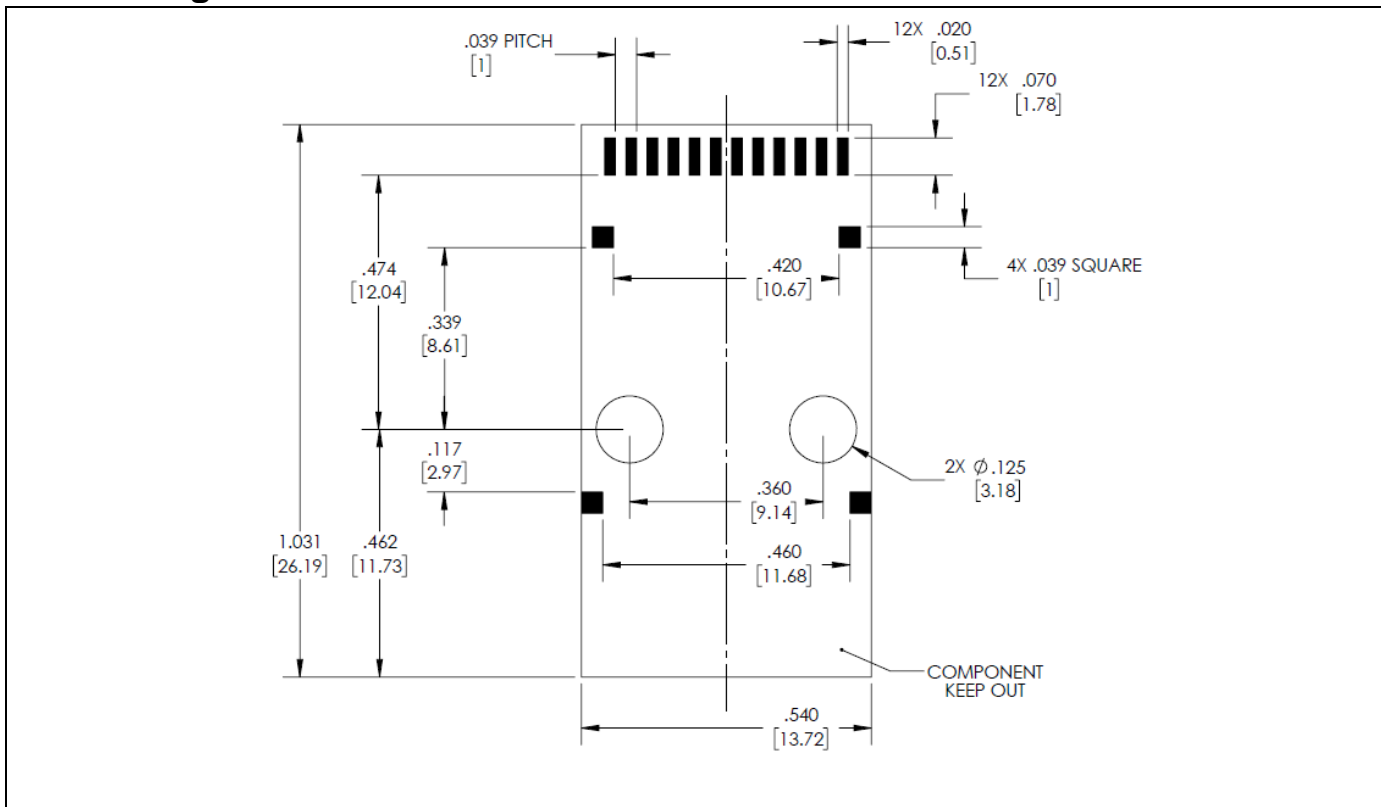


- C11/C12 are 0.1μF output data coupling capacitors.
- R4/R5 are 50Ω pull-up resistors to Vcc.
- Receiver electrical output is CML compatible.

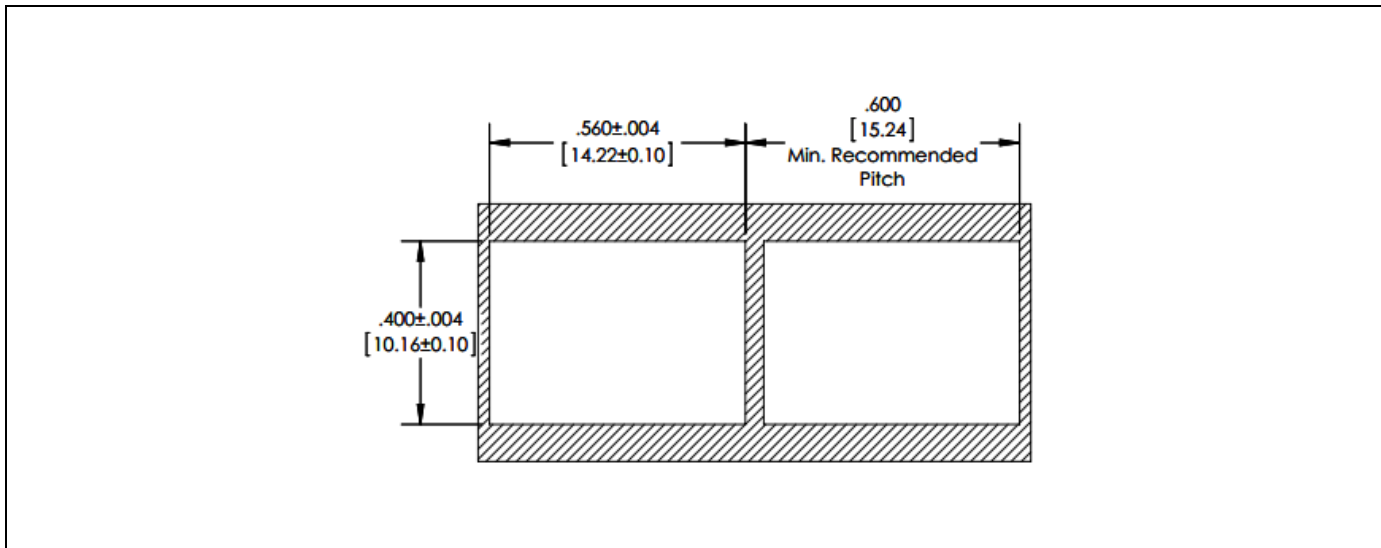




PCB Design Guidelines

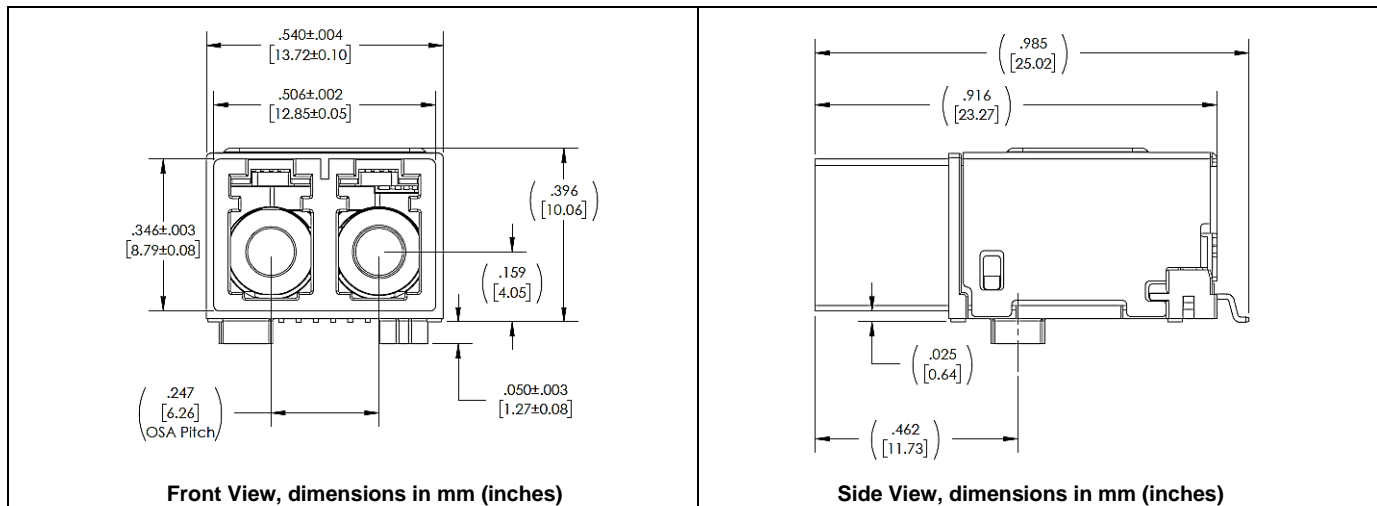


Panel Cutout

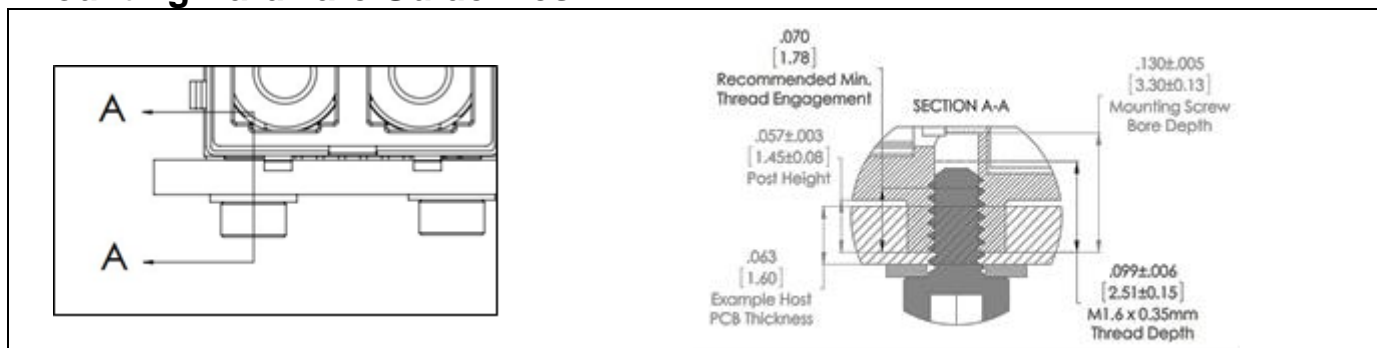




Standard Mechanical Dimensions



Mounting Hardware Guidelines



Notes:

- 1) An example illustrating a possible hardware combination to secure RJ-10G to host PCB
- 2) For further mounting hardware options and support contact COTSWORKS Application Engineering
- 3) When installing the RJ module
 - i. Install the washers and partially tighten the screws,
 - ii. second: solder the leads,
 - iii. tighten the screws to 12 in-oz





Ruggedization Notes

- Parylene C coating can be used for conformal coating 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.
- Contact COTSWORKS for all MSDS, case composition, and burn analysis.

Reference Information

- 1) IEEE Standard 802.3-2008, Section 6
- 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 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 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-10G-LR	-XX	-X	-X	-X	-X	-X
RJ Form Factor	Receptacle Type	Ruggedized Coating	Operating Temp Range	EMI Shield	RoHS Level	Mounting
10Gbps Max Data Rate	(): Standard LC	(): Non-coated	A: -40 to 85°C	(): No Shield	(): Level 5	(): Imperial Screw
Long Reach (SMF)	LX: ARINC-801	R: Parylene		E: Shield	6: Level 6	U: Metric Screw
						P: Posts

Example part numbers: RJ-10G-LR-R-A

[10 Gbps RJ Transceiver, 1310nm, long-reach, Duplex LC receptacles, Parylene-coated, Industrial operating temperature range]

Contact COTSWORKS for mechanical dimensional information and other configuration options.

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