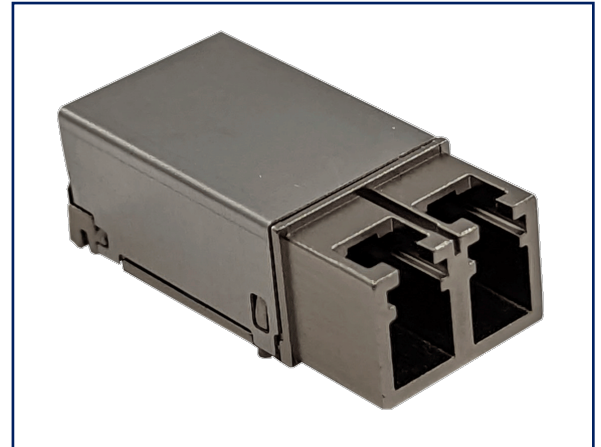


Features:

- Duplex transceiver module.
- Compliant operation at 10.3125Gbps.
- EML DWDM transmitter and APD wideband receiver.
- Compliant to IEC-60825-1, Class 1 laser eye safe.
- Solder-down 1x12 electrical interface.
- +3.3V and +2.5V power supply.
- SFF-8472 compliant control and diagnostics monitor interface.
- -40°C to +85°C case temperature operating range.
- -55°C to +105°C storage temperature range.
- Conformal coating options for harsh environment use.
- Option for RoHS 6(6) compliant and lead free per Directive 2002/95/EC.



The RJ-10G-DW-E is a unique ruggedized fiber optic transceiver designed to provide peak performance in hazardous environments.



COMMERCIAL AEROSPACE



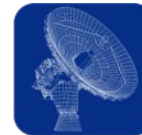
MILITARY AEROSPACE



MILITARY TACTICAL



SUBSEA NETWORKING



RADAR & SENSING



OIL & EXPLORATION

Absolute Maximum Ratings

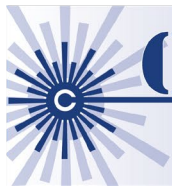
Parameter	Symbol	Min.	Max.	Unit	Notes
3.3V Supply Voltage	V _{CC_3V3}	-0.3	4.0	V	
2.5V Supply Voltage	V _{CC_2V5}	-0.5	3.0	V	
Storage Temperature	T _{sto}	-55	105	°C	
Case Operating Temperature	T _{OP}	-40	85	°C	
Relative Humidity	RH	-	85	%	Based on conformal coating, (1)
Hot Bar Soldering Temperature	-	-	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° 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 9.

General Specifications

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Data Rate, Ethernet	BR _{EE}	6	-	10.3125	Gbps	64b/66b
3.3V Supply Voltage	V _{CC_3V3}	3.14	3.3	3.47	V	
2.5V Supply Voltage	V _{CC_2V5}	2.375	2.5	2.625	V	

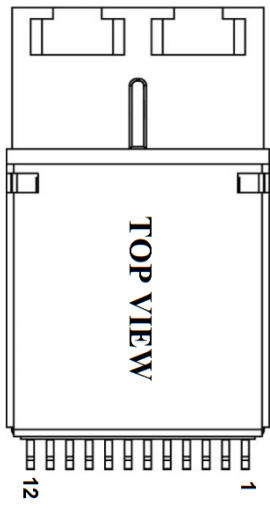


Electrical Specifications (T_{OP} = -40 to 85°C, V_{CC_3V3} = 3.14 to 3.47 Volts, V_{CC_2V5} = 2.375 to 2.625 Volts)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Total Module Power Dissipation	P _{DISS}	-	-	2.5	W	
Total Module Power Dissipation (TX Disable)	P _{DISS_TXD}	-	-	2.0	W	
3.3V Supply Current	I _{CC3V3}	-	-	500	mA	
2.5V Supply Current	I _{CC2V5}	-	-	380	mA	
Transmitter						
Differential Input Impedance	R _{IN}	80	100	120	Ω	
Differential Data Input Swing	V _{DTX}	150	-	1250	mV	
TX Disable Input Voltage	V _D	2.0	-	V _{CC} +0.3	V	
TX Enable Input Voltage	V _{EN}	-0.3	-	0.8	V	
TX Fault Output Low	V _{TFL}	-0.3	-	0.4	V	
TX Disable Assert Time	t _{off}	-	-	100	ms	
TX Enable Assert Time	t _{on}	-	-	2	ms	
Initialization Time for Cooled Module	t _{startup}	-	-	90	s	
Receiver						
Differential Output Impedance	R _{OUT}	80	100	120	Ω	
Differential Data Output Swing	V _{DRX}	500	-	-	mV	
Data Output Rise Time	t _r	-	-	90	ps	(1)
Data Output Fall Time	t _f	-	-	90	ps	(1)
Data Dependent Output Jitter	DDJ	-	-	0.42	UI	(2)
Total Contributed Jitter	RXΔTJ	-	-	0.75	UI	(3)
LOS De-Assert Voltage	SD _A	0	-	0.4	V	(4)
LOS Assert Voltage	SD _D	V _{CC_3V3} - 0.5	-	V _{CC_3V3} + 0.3	V	(4)
Signal Detect Assert Time	t _a	-	12	100	μs	
Signal Detect De-Assert Time	t _d	-	12	100	μs	
Serial Bus						
Data, Clock Input Low Voltage	V _{IL}	-0.3	-	0.3*V _{CC}	V	
Data, Clock Input High Voltage	V _{IH}	0.7*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	
Notes:						
1) K28.5.						
2) 231 ⁻¹ .						
3) 20% to 80%.						
4) SD is LVTTTL. Logic 1 indicates normal operation; logic 0 indicates no signal is detected.						



Pin Configuration

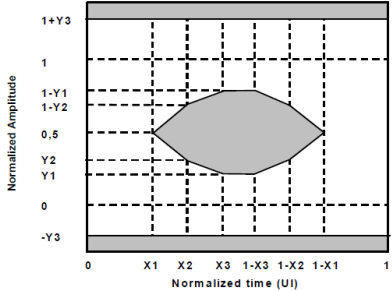
	PIN #	Symbol	Description	Notes
	1	TX-	Transmitter Data Input, Negative	CML
	2	TX+	Transmitter Data Input, Positive	CML
	3	GND	Ground	0V
	4	VCC_2V5	2.5V Supply	2.5V
	5	TX_DIS	Transmitter Disable	LVTTTL
	6	SCL	I2C Clock	I2C
	7	SDA	I2C Data	I2C
	8	SD	Receiver Signal Detect	LVTTTL
	9	VCC_3V3	3.3V Supply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

Digital Diagnostics Information:

The COTSWORKS RJ module utilizes signal pins for a 2-wire bus required 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 table.

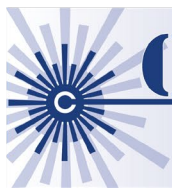
For more information on Digital Diagnostics, visit www.cotsworks.com/support.

Optical Characteristics ($T_{OP} = -40$ to 85°C , $V_{CC_3V3} = 3.14$ to 3.47 Volts, $V_{CC_2V5} = 2.375$ to 2.625 Volts)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Transmitter						
Average Output Optical Power (SMF)	P_{OUT}	0	-	+2	dBm	(1)
Optical Modulation Amplitude (SMF)	OMA	1.70	-	-	dBm	(1)
Optical Center Wavelength	λ	-	λ	-	nm	(3)
Spectral Width (RMS) (-20dB)	σ	-	-	0.11	nm	(4)
Extinction ratio	ER	8.2	-	-	dB	
Side Mode Suppression Ratio	SMSR	35	-	-	dB	Based on center wavelength
TX Mask Compliance	-	{X1, X2, X3, Y1, Y2, Y3} = {0.25, 0.40, 0.45, 0.25, 0.28, 0.75}				
						
Receiver						
Receiver Sensitivity	RX_{SENS}	-	-	-22.8	dBm	(2)(4)
Receiver Sensitivity (OMA)	RX_{SENS_OMA}	-	-	-21.11	dBm	(2)(4)
Receiver Saturation	RX_{SAT}	-4.0	-	-	dBm	
Optical Wavelength	λ_C	1270	-	1577	nm	
LOS De-Assert	SD_A	-	-	-26	dBm	
LOS Assert	SD_D	-36	-	-	dBm	
Signal Detect Hysteresis	SD_H	0.5	-	5	dB	
Notes:						
1) Measured at the end of a 2m SMF jumper.						
2) Measured at a 10.3125Gbps with a BER= 10^{-12} .						
3) See ITU Channel Ordering Options table on sheet 10.						
4) Defined as \pm the parameter value.						

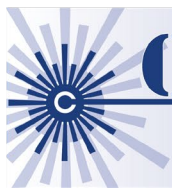
Address A0h Data Fields

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	00
04				00
05				00
06				00
07				90
08				10
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	50
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				31
43				30
44				44
45				57
46				45
47				XX
48				XX
49				XX
50				XX
51				XX
52				41
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



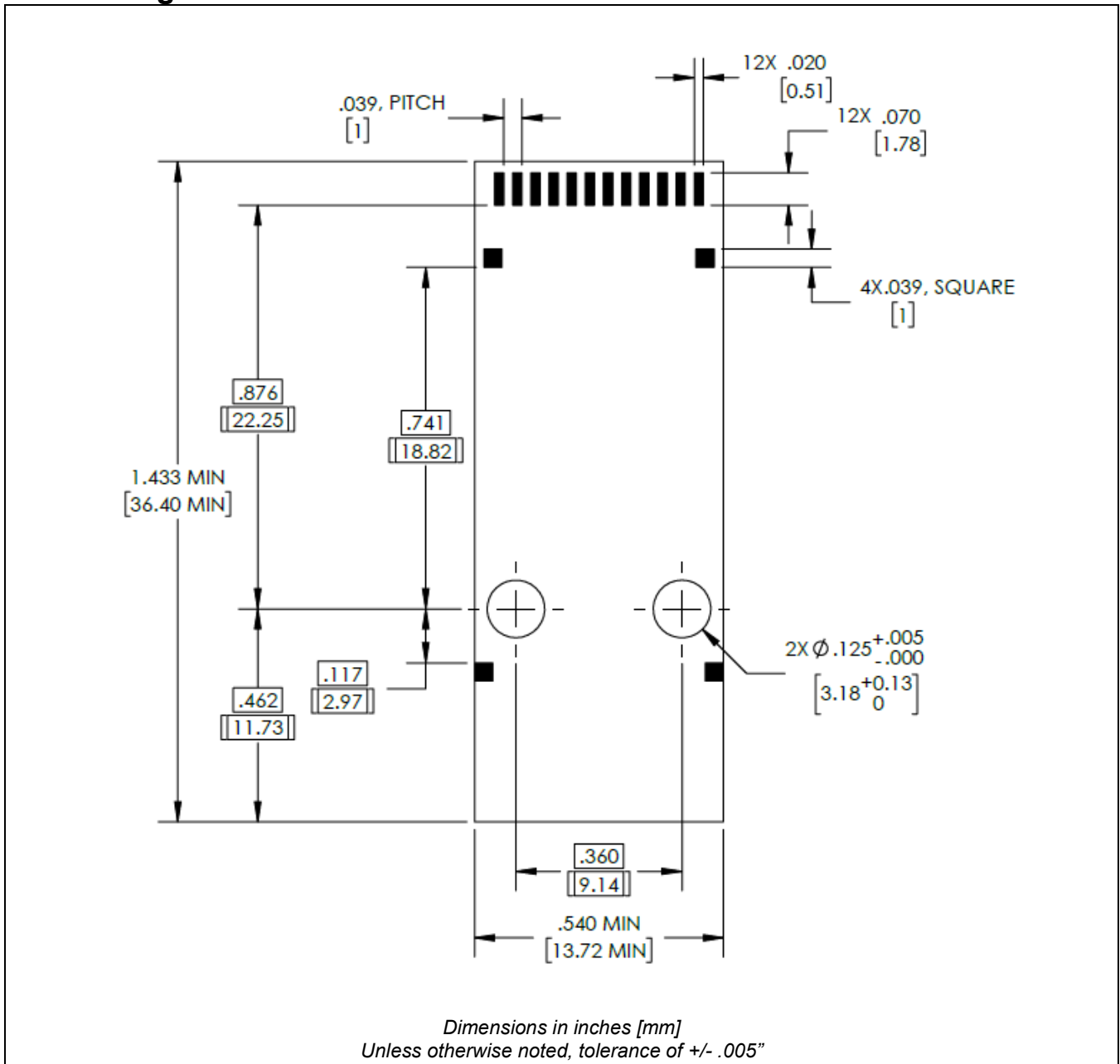


60	1	Left Shift of Wavelength Designation	Laser wavelength (DEC 15)	0F
61	1	Right Shift of Wavelength Designation	Laser Wavelength Varies by ITU Channel Option	XX
62	1	Unallocated		00
63	1	CC_BASE	Check code for Base ID Fields (addresses 0 to 62)	XX
Extended ID Fields				
64	2	Options	Indicates which optional transceiver signals are implemented	14
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	F0
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



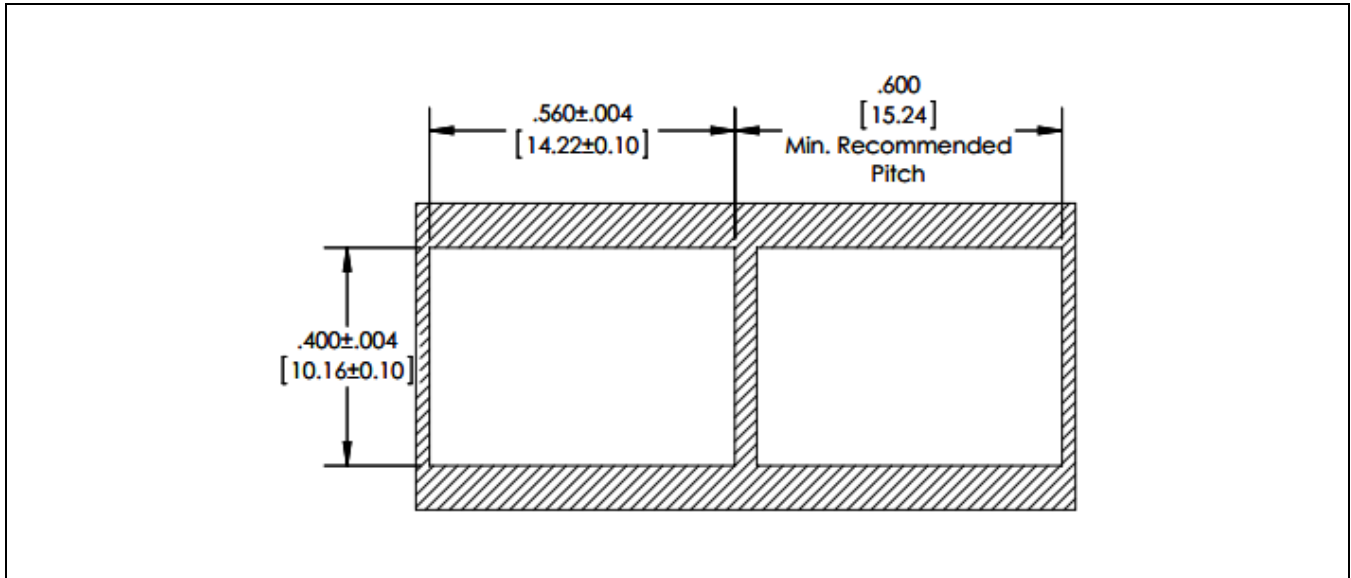


PCB Design Guidelines

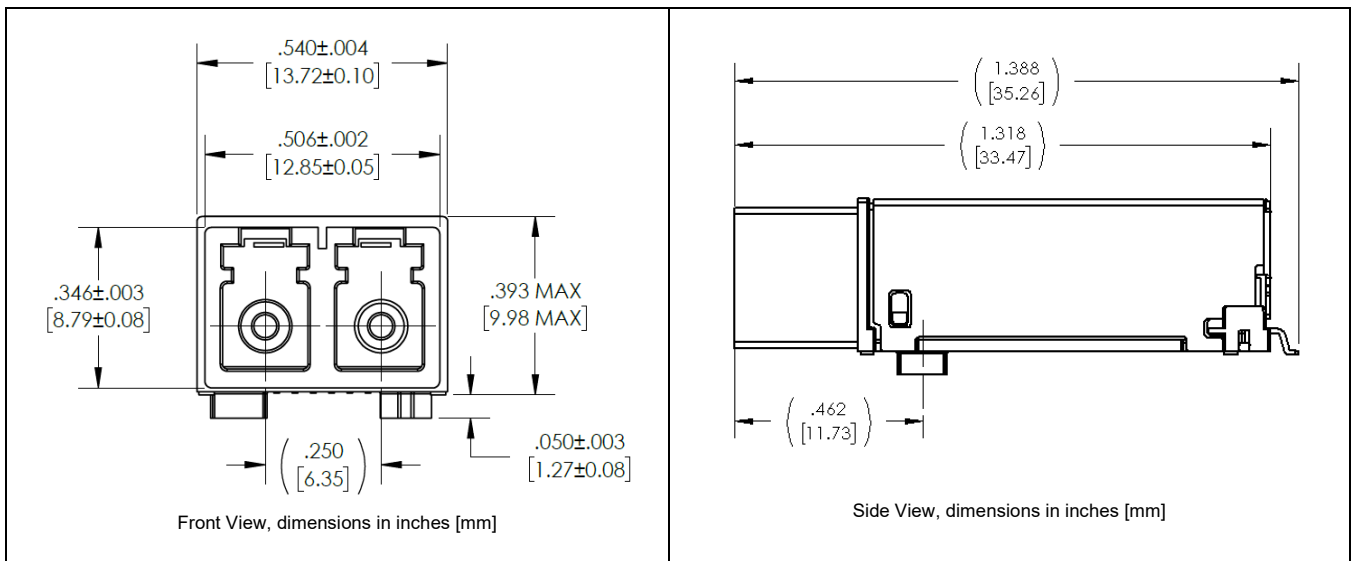




Panel Cutout



Standard Mechanical Dimensions





Mounting Hardware Guidelines

Notes:

- 1) An example illustrating a possible hardware combination to secure RJ-10G-DW-E to host PCB.
- 2) For further mounting hardware options and support contact COTSWORKS.
- 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 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 MSDS and case composition information.

Reference Information

- 1) IEC-60825-1 Safety of laser products.
- 2) IEC-60950-1 Information technology equipment – Safety.
- 3) SFF-8472 Management Interface for SFP+.
- 4) ITU-T G.694.1.

Regulatory Compliance

- COTSWORKS transceivers are Class 1 Laser Products and 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.

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-DW-E	-XX	-XX	-X	-X	-X	-X	-X
RJ Form Factor 10Gbps MAX Data Rate	ITU Channel Wavelength	Connector Type	Ruggedized Coating	Operating Temp Range	EMI Shield	RoHS Level	Mounting
Long Reach (SMF) DWDM 100Ghz Spacing Extended Link Budget (APD RX)	ITU Channel from ITU Channel Ordering Options Table	LC: <i>Standard LC</i> LX: <i>ARINC 801</i>	N: <i>Non-coated</i> R: <i>Parylene</i>	A: <i>-40° to 85°C</i>	N: <i>No Shield</i> E: <i>Shield</i>	5: <i>Level 5</i> 6: <i>Level 6</i>	I: <i>Imperial Screw</i> U: <i>Metric Screw</i>

Example part Number: RJ-10G-DW-E-45-LC-R-A-N-5-I

[Rugged Jack Surface Mount, 10.3125Gbps DWDM Long Reach Transceiver, Extended Link Budget, Digital Diagnostics, ITU Channel 45 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]

ITU Channel Ordering Options

ITU Channel	Center Wavelength (nm)	ITU Channel	Center Wavelength (nm)
18	1563.05	34	1550.12
19	1562.23	35	1549.32
20	1561.42	36	1548.51
21	1560.61	37	1547.72
22	1559.79	38	1546.92
23	1558.98	39	1546.12
24	1558.17	40	1545.32
25	1557.36	41	1544.53
26	1556.55	42	1543.73
27	1555.75	43	1542.94
28	1554.94	44	1542.14
29	1554.13	45	1541.35
30	1553.33	46	1540.56
31	1552.52	47	1539.77
32	1551.72	48	1538.98
33	1550.92	49	1538.19

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